New York City
Department of
Transportation

Downtown Brooklyn Traffic Calming Project

May 2004

FINAL REPORT

City of New York
Michael R. Bloomberg, Mayor

New York City
Department of Transportation
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New York City Department of Transportation

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CONTENTS

1. INTRODUCTION

The Downtown Brooklyn Traffic Calming Study Final Report is the end product of over three years of work undertaken by Arup, the New York City Department of Transportation, and the Downtown Brooklyn community. This report discusses the context in which the project has been undertaken, the approach adopted for calming traffic in Brooklyn, and the various results – in particular, a pilot program and an area-wide strategy recommendation.

The specific contents of the sections that follow are:

- **Section 2** provides a background on how the project was conceived, initiated, and organized. It discusses community concerns that led to the initiation of the project. Section 2 also provides a description of the scope, objectives, and organization of the study.
- **Section 3** provides a description of traffic and travel issues in the study area.
- **Section 4** discusses traffic calming concepts and the role of traffic calming in a comprehensive transportation management program. Section 4 also discusses individual traffic calming treatments and their applicability to Downtown Brooklyn.
- **Section 5** discusses the approach used to calm traffic in the study area and the Street Management Framework that provided a foundation for the study. Section 5 also describes the public outreach project and discusses how ideas and strategies were developed.
- **Section 6** describes the Pilot Program including its development, review, installation, monitoring and evaluation.
- **Section 7** provides the core of the project – the Action Program, a traffic management strategy for the area. It provides detailed street and corridor recommendations. It includes sketches of proposed project recommendations and discusses costs and a strategy for implementing the proposed improvements.
- **Section 8** discusses how to build on the project and advance the concepts learned to other areas in the city.

The recommendations in this report were developed in response to concerns raised by the community. The recommendations were based on technical analysis; field observations of conditions; experience gained through the pilot program; and discussions between the consultant and Community Boards, citizens, NYCDOT and other agencies. The recommendations, are, in many cases, conceptual and may require more detailed engineering analysis to determine those that can be implemented. Measures that have already been implemented and those whose implementation is imminent are noted as such in the text.

2. BACKGROUND

2.1 Origins of the Downtown Brooklyn Traffic Calming Study

In the past twenty years, Downtown Brooklyn has enjoyed a revitalization that has brought economic growth to this collection of dense, diverse urban neighborhoods. Coupled with regional travel growth, this revitalization has also brought increasing traffic impacts to these neighborhoods. The Downtown Brooklyn Traffic Calming Study is an effort to mitigate those traffic impacts to ensure the area's ongoing vitality, safety, accessibility, and mobility.

2.1.1 Revitalization of Downtown Brooklyn

Downtown Brooklyn is like the downtown areas of many older American cities, in that new development lies adjacent to older land uses. Both old development and new depends on available transport infrastructure, which is old and inflexible. This creates economic and environmental strains. In particular, the Downtown Brooklyn civic and commercial center has undergone considerable renewal and growth over the last twenty years. The resulting traffic must be managed to reduce its impact on the community.

In its 1969 "Master Plan for the City of New York", the Department of City Planning recommended the creation of satellite commercial centers in the City's outer boroughs to complement the growth then concentrated in Manhattan, and to distribute the stimulus and benefits of this growth. Downtown Brooklyn, the civic and business center immediately across the East River from Manhattan and with some of the best subway connections in the City, was well positioned to take advantage of this recommendation. However, much of the area was run-down. Although not subject to widespread abandonment, it faced many of the challenges of urban renewal. In 1983, a Regional Plan Association study asserted that to reverse the deterioration of Downtown Brooklyn required its transformation into the city's third CBD. Today the area has achieved that rank and is still growing.

The opening of Pierrepont Plaza in 1987 marked the beginning of Downtown Brooklyn's revival. Bounded by Pierrepont and Clinton Streets and Cadman Plaza West, it was the first large development project to be completed in this area. Efforts to revitalize the commercial center resulted in the opening of Fulton Mall, between Adams Street and Flatbush Avenue, as a retail counterweight to the auto-dependent Kings Plaza shopping center at Marine Park/Mill Basin. The mall has 200 stores anchored by the Macy's department store. Mall traffic is generally restricted to pedestrians, buses and emergency vehicles. The State court building erected in the 1950s and the many Transit Authority offices that were eventually consolidated at a new building on Livingston Street at Boerum Place during the early 1990s have stabilized the civic center.

The largest contributor to Downtown Brooklyn's resurgence as a viable business nexus has been MetroTech Center. Conceived during the mid 1970s by the president of Polytechnic University as a way to improve the area and attract more students, MetroTech Center is a noteworthy example of the successful collaboration between academia, industry and government. With an investment of over $1 billion, a five million square-foot development was created with new and renovated buildings around a 4-acre, landscaped and auto-free commons. It is reported that nearly all MetroTech properties are leased.

The revival of Downtown Brooklyn has brought 25,000 new workers to the area. Downtown Brooklyn attracts approximately 100,000 people every day, in addition to an estimated 50,000 office workers in public and private offices. Approximately 10,000 jurors serve each week in the City, State and Federal court system in this area. The five colleges in the area contain an estimated total daily student and faculty population of over 45,000. The Department of City Planning reports that there are more than 22,000 parking spaces within this area, a number that will grow when Renaissance Plaza and other plans for Downtown are completed[1].

Even before the World Trade Center disaster companies were moving labor-intensive and other businesses out of Manhattan to avoid expensive office space. This process has accelerated since that time. The Downtown Brooklyn area and its traffic will continue to grow, with such projects as Atlantic Center at Flatbush Avenue and Atlantic Avenue, the expansion of the Federal Court, the pending redevelopment of the landmark Post Office building between Cadman Plaza East and Adams Street and the new Renaissance Plaza Hotel in the MetroTech Center, with its 1,100-space parking garage. Recent plans to redevelop other sites in Downtown Brooklyn will add still more traffic pressure on the area.

Along with the emergence of the greater Downtown area as the city's third largest CBD, adjacent historic residential neighborhoods have continued to attract young urban professionals seeking easy walking access to Downtown Brooklyn and transit access to Manhattan. It has been estimated that the seven zip codes including and immediately surrounding this area have a total adult population of over 270,000 within easy walking distance of the civic/commercial center.

2.1.2 Transportation Impacts on Downtown Communities

Providing a point of access to Manhattan has always been an important function of the Downtown Brooklyn area. It is served by more bus and subway lines than any other point in New York City. Eleven bus and ten subway train lines converge in the vicinity of Brooklyn Borough Hall and the nearby LIRR Atlantic Terminal. The area serves as a conduit for vehicular traffic to Manhattan via the Brooklyn-Battery Tunnel and the Brooklyn and Manhattan Bridges. Major roads such as Interstate 278 (Brooklyn/Queens Expressway – the BQE), which connects directly to the Prospect Expressway/Ocean Parkway and Gowanus Expressway, and major roads in the street grid system, such as Flatbush, Atlantic, Third and Fourth Avenues, bring traffic to this area from all parts of Brooklyn. Over 200,000 vehicles are estimated to use this area's major roads and surface streets each day.

Traffic conditions deteriorate as the amount of traffic on a road increases. At low traffic volumes, each driver can proceed more or less unconstrained by surrounding vehicles; at higher volumes, each driver is constrained in the choice of speed, travel lane and so on by surrounding vehicles. At high volumes, roads and intersections become congested and drivers find themselves completely constrained by other vehicles in the traffic jams that are a familiar part of street life in Downtown Brooklyn.

This progression from unconstrained travel to extremely constrained travel with increasing traffic volumes is matched by a progression from stable to unstable conditions. At low traffic volumes, a car stopped where it should not be or a traffic accident or construction has little effect on traffic flow: drivers are able to pass without undue problems. At high traffic volumes, even minor interruptions can cause substantial problems of delay. At extreme traffic levels gridlock can result from minor problems.

Nevertheless, except in the case of gridlock, traffic continues to move, even if traffic conditions become unpredictable and frustrating. It is this optimistic expectation that traffic will continue to flow and the resignation when it does not that keeps people getting into their cars each day.

Downtown Brooklyn's intense levels of development and redevelopment over the last twenty years have been a regional success story and a boon to the borough. They have resulted in increased traffic congestion on the major routes. These conditions have diverted traffic to local streets – for many drivers, this congestion is extremely frustrating and the opportunity to avoid the

[1] Source: New York City Department of City Planning

long queues and delays that accompany traffic congestion by taking a different route proves irresistible. This has happened in Downtown Brooklyn with the result that traffic has increasingly utilized local streets not designed to carry it. Many of these pass through residential neighborhoods in the Downtown Brooklyn area. The community has widely reported problems associated with speeding vehicles.

This traffic intrusion has been exacerbated by recent construction work on the Gowanus and Prospect Expressways, the Manhattan and Brooklyn Bridges, arterial roads like Flatbush Avenue, and public and private construction at and around the Atlantic Terminal. The persistent traffic congestion in Downtown Brooklyn has caused this area to become one of New York's severe carbon monoxide hot spots; this poses a potential health burden.

The results are the pervasive presence of both private and commercial vehicles on Downtown Brooklyn's streets, deteriorating air quality, and impacts on safety for all street users. All of these problems contribute to an overall adverse impact on quality of life for those who live in and use the Downtown Brooklyn area.

2.1.3 The role of traffic calming in strengthening Downtown Brooklyn's vitality

The communities of Downtown Brooklyn see their streets as overtaxed with traffic and in need of strong protective measures. The Downtown Brooklyn Traffic Calming Project was conceived through the cooperative efforts of local elected officials and community groups, with additional support from the New York City administration. Elected officials and community groups alike consider revitalization of Downtown Brooklyn and preservation of the historic character of the surrounding residential communities as vital for maintaining a high quality of life locally and citywide. Most importantly, both the Downtown Brooklyn community and New York City administration see this project as signaling a new direction for managing traffic in the city. Thus, the project's goal is to make all types of streets function better for all users of the public space.

2.2 Scope and objectives of this study

2.2.1 Study area

The project area is bounded by the East River to the north, Washington Avenue to the east, 15th Street and Prospect Park to the south and New York Harbor's Buttermilk Channel to the west. The area includes the communities of Clinton Hill, Fort Greene, Prospect Heights, Park Slope, Gowanus, Red Hook, Carroll Gardens, Cobble Hill, Boerum Hill, Columbia Terrace, Brooklyn Heights, Fulton Landing, Downtown Brooklyn and Vinegar Hill. The project area is divided into a 10-square mile primary study area, which contains 254 signalized intersections, and a secondary study area. The primary area has been studied in depth. Consideration has been given to the impacts of the recommended strategy and the pilot program on the secondary area. *Figure 2.1* shows the boundaries of the primary and secondary study areas.

2.2.2 Goals and Objectives

The project's goals are to establish a more equitable balance in the use of area streets by pedestrians, bicyclists and motorists, to rationalize circulation and to maintain or improve mobility for all transportation modes without adversely impacting community access and adjacent area traffic.

The project's objectives are to:

- improve pedestrian safety and access, including safer crossings at problem locations, reduce vehicular speeds and enhance mobility between neighborhoods;
- reduce unwanted traffic impacts, including congestion, excessive vehicle volumes, speeding, noise, air pollution, and damage to infrastructure;
- preserve and improve civic, cultural & institutional, commercial and residential area access by providing a traffic-calmed street network for improved connectivity among these destinations; and
- improve air quality so as to help attain national ambient air quality standards; and
- protect the unique character of historic residential communities.

A complementary list of objectives flowed from the outreach process undertaken for the project:

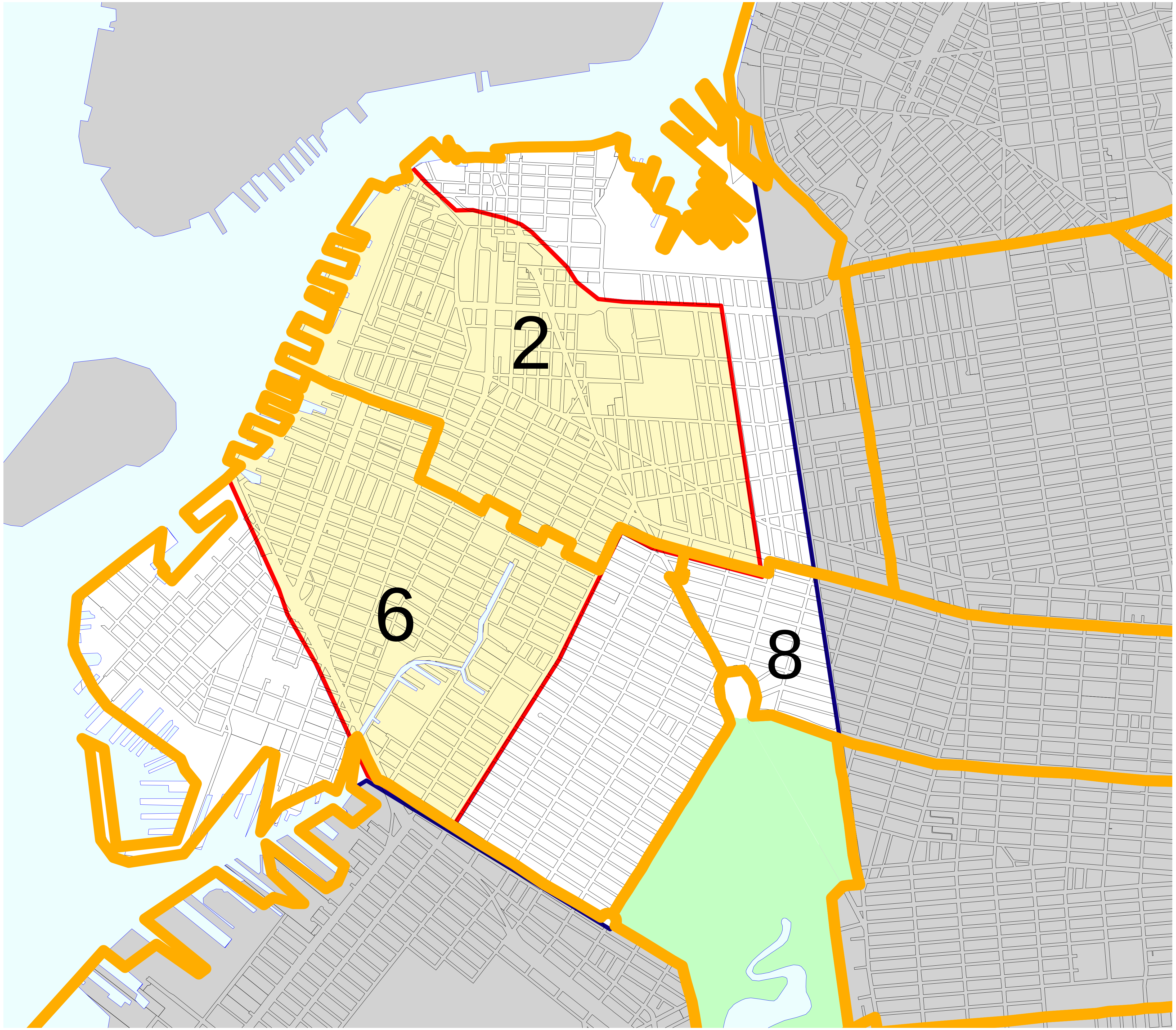
- improve pedestrian circulation and safety;
- improve surface transit operations and safety;
- develop the local cycling network;
- manage truck access and routing appropriately while reducing trucks' impacts on the community;
- manage through traffic in appropriate locations while reducing its impact in all locations;
- maintain local traffic permeability; and
- maintain or enhance emergency vehicle access.

2.3 Project organization

For years, citizens from neighborhoods within the study area had expressed concern regarding the impacts of traffic (i.e. cut through and diverted traffic) on their neighborhoods. This concern was continuously raised as a serious quality of life issue that was negatively affecting their communities. Elected officials were urged to assist in addressing this issue.

In 1997, a task force was established by Borough President Howard Golden to develop a scope of work for the project. This scope of work provided for the application of an areawide traffic calming plan through a collaborative process involving NYCDOT, the community, and the Task Force described below. The Mayor's Office negotiated an agreement with Brooklyn Borough President Howard Golden and Council Member Kenneth K. Fisher to fund a study including a pilot program that would lead to the development of a traffic management plan for the area. Total funding for the project was $6 million. Council Member Kenneth Fisher provided $500,000, and Borough President Howard Golden provided $1.5 million, for a total of $2 million. The study and pilot program utilized approximately $1.2 million of these funds, with an additional $250,000 provided by Assembly Member Joan Millman to supplement funding for the pilot program. The City has also agreed to provide $4 million in the future to implement recommendations developed during the study. The consultant team was selected in January 1999 and work began in March 1999.

Understanding the high level of community interest in the project, NYCDOT agreed to vary from usual practice and have three neighborhood representatives - as designated by Borough President Golden and Council Member Fisher - served as voting members of the Selection Committee along with four NYCDOT members. The community-based Task Force chaired by the Brooklyn Borough President monitored the study. NYCDOT chaired a Technical Advisory Committee, which consisted of government agencies, elected officials, and Community Boards. The primary study area and the majority of the secondary study area falls with Brooklyn Community Boards 2 and 6; Community Board 8 encompasses the balance of the secondary study area. Community Board boundaries are shown in *Figure 2.1* (see next page).



Downtown Brooklyn Traffic Calming Project

Final Report

LEGEND

Primary Study Area

Secondary Study Area

Community Board Boundaries

Figure 2.1

Study Area

N

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3. TRAVEL IN DOWNTOWN BROOKLYN

3.1 Traffic Issues

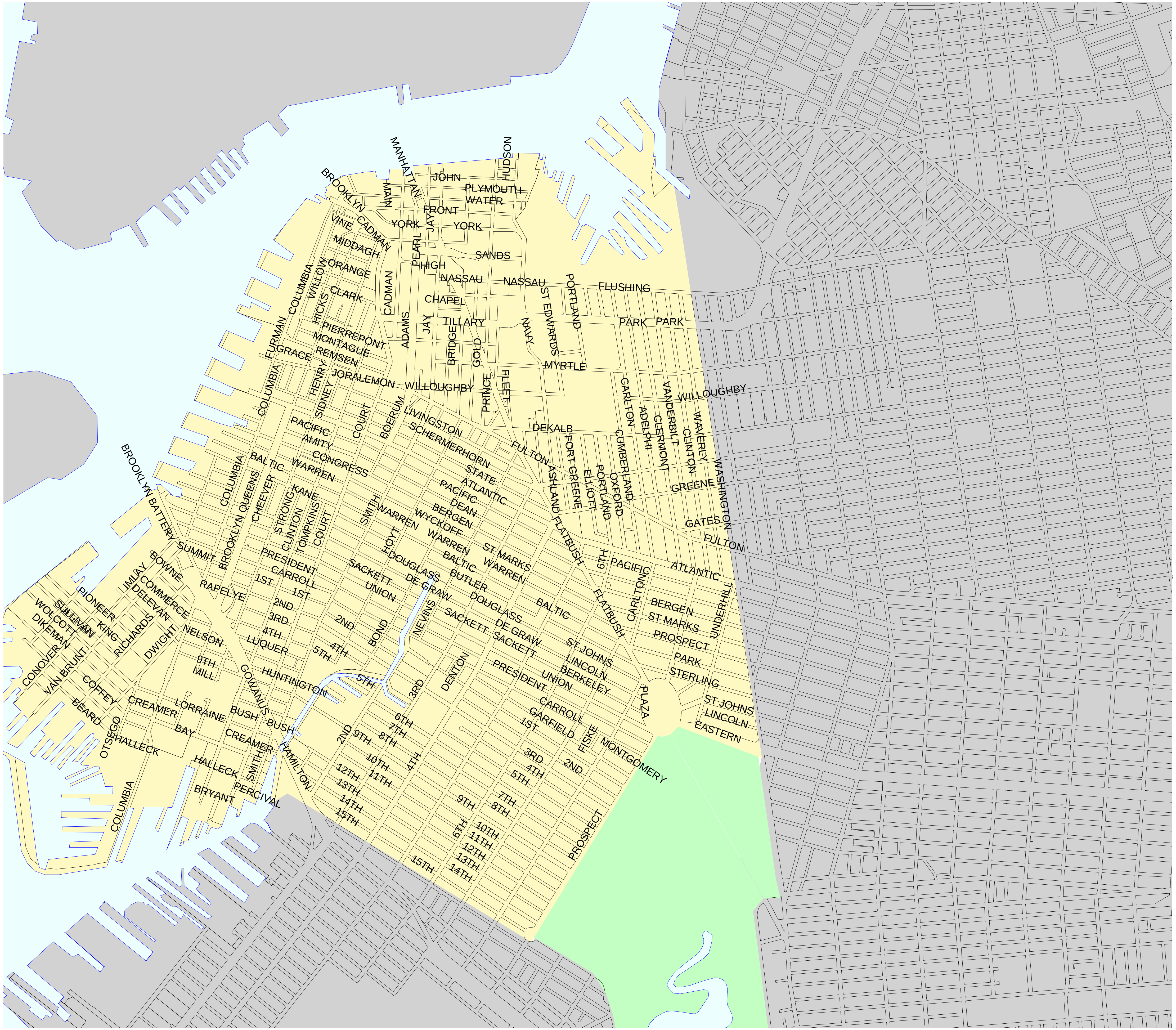
Together with the Brooklyn-Battery Tunnel, the Brooklyn and Manhattan Bridges provide the major points of entry into Lower Manhattan from Brooklyn. As each of these bridges is located at the northern edge of Downtown Brooklyn, traffic traveling to and from Manhattan from southwestern Long Island must pass through the study area. The Brooklyn/Queens Expressway (BQE) is intended to carry regional-scale traffic around the area. However, the BQE runs at capacity for much of each day and many drivers choose alternate routes through Downtown Brooklyn, where such feasible routes exist. *Figure 3.1* (see next page) shows the streets in the project study area.

4th Avenue, and to a lesser extent **3rd Avenue**, provides north-south capacity in the east of the study area. There is no real route through Downtown Brooklyn's street system with equivalent high capacity in the western part of the study area (although the BQE provides a high capacity link with limited access to streets in the area through which it passes), so overflow traffic from the BQE plus north-south traffic originating in or bound for the west of the area is forced onto streets where its presence is obvious and its impact is great – **Columbia/Van Brunt Streets, Hicks Street, Clinton Street, Henry Street, Court Street** and **Smith Street** all share the load of north-south traffic demand. The traffic-carrying role of a number of these streets is at odds with their predominantly residential uses. Also, many of these streets are one-way. This introduces asymmetry into the area's traffic patterns and means that some streets carry significant traffic only in one of the morning and evening peak periods.

Atlantic Avenue, which forms the southern boundary of the commercial core, is heavily congested, with the result that parallel streets to the south in Boerum Hill (**Pacific Street, Dean Street**) and to the north (**State Street, Schermerhorn Street, Livingston Street**) carry through traffic. For those streets to the south of Atlantic Avenue, this traffic intrusion is inconsistent with their predominantly residential nature. There is no other clear east-west route in the study area between Atlantic Avenue and **Hamilton Avenue**, which forms its southern boundary. However, the capacity of Atlantic Avenue is governed by the congested intersections with Fourth and Flatbush Avenues, meaning some opportunities exist to calm the blocks west of these intersections without compromising throughput.

Flatbush Avenue acts as a major traffic corridor through the study area and to the Manhattan Bridge. It carries a substantial amount of traffic, is congested in many places and acts as a barrier between the commercial core to its west and Fort Greene to the east. Wherever the heavily-trafficked Flatbush Avenue meets another road carrying a high traffic volume, substantial congestion ensues. The Flatbush Avenue/Atlantic Avenue/4th Avenue/3rd Avenue area, which represents the greatest confluence of traffic in the study area, is particularly badly congested. The Flatbush Avenue/Schermerhorn Street intersection is also heavily congested.

Tillary Street forms the northern boundary of the commercial core and performs an important east-west traffic function, linking access to the Brooklyn Bridge, Manhattan Bridge and the BQE to the east of the downtown area. The intersections of Tillary Street with both Adams Street and Flatbush Avenue carry heavy conflicting traffic volumes for much of the day. In this area, connections between the BQE and the access streets to the Brooklyn and Manhattan Bridges need improvement.



Downtown Brooklyn Traffic Calming Project

Final Report

Figure 3.1

Streets in the Study Area

N

1000 0 1000 Feet

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3.1.1 Morning peak period

In the morning peak period, the major movement of traffic is north- and west bound, as it converges on the commercial core or travels through it to reach either the Brooklyn or Manhattan bridges. *Figure 3.2* (see next page) shows cordons of expected travel time to the Manhattan side of the Brooklyn Bridge for northbound vehicles in the AM peak hour, as measured in 2000.

The congestion that ensues from the confluence of the BQE and Prospect Expressway south of Hamilton Avenue forces some traffic onto local streets. Convenient connections between the southern boundary of the study area and the Brooklyn Bridge are provided by way of Clinton Street and Hicks Street. Both these streets carry substantial traffic volumes despite their 30 foot width, residential natures and low traffic capacity. The substantial congestion that results from this traffic in the morning peak has historically been accommodated through the imposition of morning peak period parking restrictions on sections of Clinton Street, particularly south of Atlantic Avenue and between Atlantic Avenue and Tillary Street, where congestion is particularly severe. These parking restrictions have served to increase the number of vehicles that can queue on this street, without improving its through traffic capacity. As part of this study, the morning peak parking restrictions have been removed from sections of Clinton Street.

Smith Street also carries substantial commuter traffic in the morning peak period. This also forms part of a convenient route from the southern boundary of the study area to the commercial core and the Brooklyn Bridge via Atlantic Avenue, Boerum Place and Adams Street. Morning peak period parking restrictions are also imposed on the northern (congested) section of Smith Street on its approach to Atlantic Avenue.

4th Avenue acts as a major northbound traffic conduit in the morning peak period. It terminates at its intersection with Flatbush Avenue. Traffic traveling north on 4th Avenue generally connects to Flatbush Avenue and from there to the eastern side of the commercial core or the Manhattan Bridge, or to the Atlantic Avenue corridor and then to the southern and western side of the commercial core or the Brooklyn Bridge. **3rd Avenue** acts as an important traffic route parallel to 4th Avenue and suffers significant congestion, especially at its intersection with Atlantic Avenue.

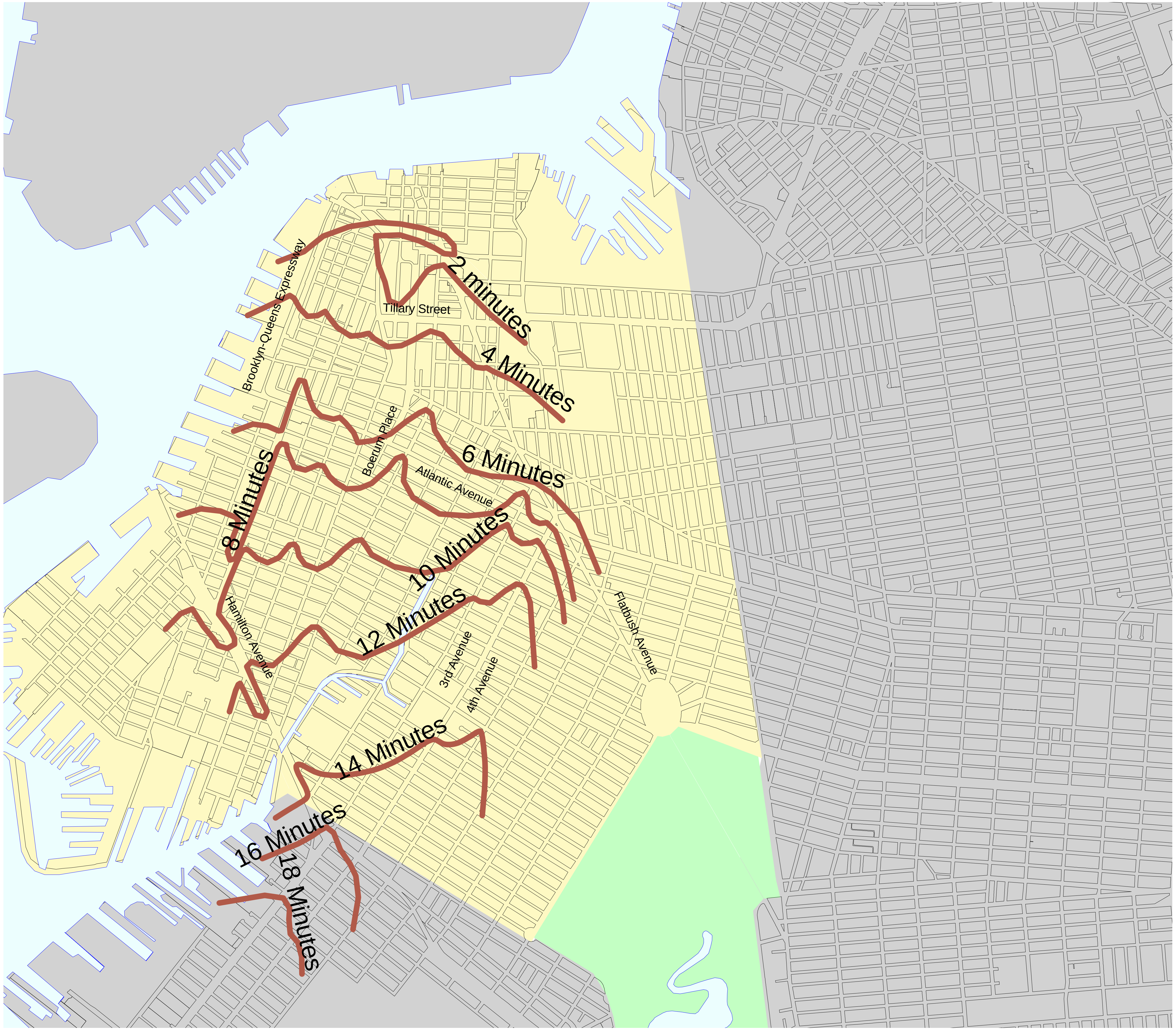
As noted above, the **Flatbush Avenue /Atlantic Avenue /4th Avenue /3rd Avenue** group of intersections is heavily congested in the morning peak and some traffic intrusion is experienced in surrounding streets as a result of northbound drivers avoiding this congested area. Bond Street provides an important northbound connection into the commercial core that avoids the heaviest congestion in the area.

Previously, the congestion at the **3rd Avenue /Atlantic Avenue** intersection has been addressed through imposition of a left turn ban from 3rd Avenue northbound into Atlantic Avenue westbound. This movement is important at this intersection (not least because both 3rd Avenue and Atlantic Avenue are truck routes) and so this turn ban exacerbates the problem of traffic intrusion into surrounding streets.

Atlantic Avenue and **Flatbush Avenue** act as major arteries for northbound and westbound commuter traffic in the morning peak. They provide good connections to both the Manhattan and Brooklyn Bridges, as well as the commercial core. Both suffer substantial congestion in the morning peak period, notably at points were they meet roads carrying substantial traffic volumes: Flatbush Avenue/Atlantic Avenue/4th Avenue/3rd Avenue as noted above, Smith Street/Atlantic Avenue, Boerum Place/Atlantic Avenue, Schermerhorn Street/Flatbush Avenue, Livingston Street/Flatbush Avenue and Tillary Street/Flatbush Avenue.

Tillary Street suffers congestion, particularly at its intersection with Adams Street, the northern extension of Boerum Place. At this point traffic approaching the Brooklyn Bridge from three directions meets: traffic traveling north on Boerum Place/Adams Street, traffic traveling west from Flatbush Avenue and traffic traveling east from the northern terminus of Clinton Street.

In the Fort Greene area, **DeKalb Avenue** is one-way westbound and carries peak traffic to its terminus at Flatbush Avenue. Congestion primarily occurs at the intersection of DeKalb and Flatbush Avenues; traffic flows at higher speeds east of this intersection. Other two-way streets (**Myrtle Avenue** and **Fulton Street**) also carry some inbound volume in the morning peak.



Downtown Brooklyn Traffic Calming Project

Final Report

DESCRIPTION

Each contour line represents a two-minute difference in travel time

Figure 3.2

A.M. Peak Travel Time to Manhattan

N

1000 0 1000 Feet

NEW YORK CITY DOT

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3.1.2 Evening peak period

Apart from the differences imposed by one-way streets, the traffic problems experienced in the morning peak period are mirrored in the evening peak. The major traffic demand is south and east, with substantial traffic leaving the commercial core and entering Brooklyn from the Brooklyn and Manhattan Bridges and the BQE. **Flatbush Avenue** and **Adams Street/Boerum Place**/**Atlantic Avenue** carry substantial traffic volumes and experience congestion at various points along their length. The confluence of traffic at the Flatbush Avenue/Atlantic Avenue/4th Avenue/3rd Avenue intersection yields the most significant congestion problem in the study area. This results in significant delays and traffic intrusion into surrounding streets and influences traffic patterns throughout the northern part of the Downtown Brooklyn area. An evening peak period parking restriction serves to increase its ability to store queued vehicles, but not its traffic capacity.

In Brooklyn Heights and Cobble Hill the southbound streets suffer traffic pressure: **Henry Street** (a residential street parallel to Clinton Street) and **Court Street** (a commercial street parallel to Smith Street) carry significant traffic. **Old Fulton Street** and **Furman Street** provide an attractive route for southbound traffic; because Furman Street is one-way southbound and has no nearby northbound twin, this traffic flow is not reflected in the morning peak period. In Fort Greene, the high speeds experienced on DeKalb Avenue in the morning are observed on **Lafayette Avenue** in the evening, while **Myrtle Avenue** and **Fulton Street** also carry peak traffic loads.

3.2 Parking

The shortage of parking is an important issue throughout the study area.

Parking is at a premium through much of the study area. Morning peak period parking regulations reduce the available parking supply for residents and offer an opportunity for those traveling into the area to park on-street provided they arrive at the time that the parking restrictions come to an end. Peak parking restrictions on certain streets ensure extra capacity for peak travel, but this prevents parking in these locations at these times.

Parking by vehicles carrying permits (formally vehicles whose drivers are on official government business) is a problem in some parts of the study area, both because legitimate parking spaces are occupied by permit vehicles and because permit vehicles are able to park with impunity in what would otherwise be illegal spaces. This problem is exacerbated by the apparent problem of control over availability of permits. This is a policy issue whose solution lies beyond the scope of this study, though it is noted that Mayor Bloomberg has already effected a 30% reduction in the number of city employee parking permits.

4. TRAFFIC CALMING

4.1 What Is Traffic Calming?

Agreement about what constitutes traffic calming was an important first step in the process of developing a traffic calming plan for Downtown Brooklyn. Perceptions of what the term encompasses vary not only within the broad community but also within the traffic engineering profession. It became apparent in the course of the study that the perception of the meaning of traffic calming has a clear and important impact on expectations of what can be achieved by a traffic calming plan.

At its most general, the term "traffic calming" describes actions to reduce vehicular traffic's intrusion into and its effects on urban life. One means of achieving this is a citywide reduction in traffic levels through such policies as land use control, road pricing, improving public transport and restricting road travel by limiting road or parking supply. Various suggestions made by the community in the course of the Downtown Brooklyn Traffic Calming project reflected a desire for use of such measures. While such measures can play an important role in urban policy and could well be important tools in limiting the amount of traffic in Downtown Brooklyn, they are not included as key elements of the Downtown Brooklyn Traffic Calming Strategy, as their implementation would require a coordinated city agency effort that would entail significant political, administrative, and community changes that fall outside the scope of this study.

Traffic calming practice typically consists of various forms of physical management of vehicles implemented at a street or neighborhood level. Although the most familiar forms of traffic calming action worldwide involve the use of physical treatments at the local street level, international traffic calming practice is not limited to low-volume neighborhood streets. Traffic calming may also describe traffic management in busier streets and corridors. Indeed, in an area such as Downtown Brooklyn in which the adverse effects of traffic are felt on all streets, it is critical that the traffic calming strategy extends beyond the confines of the local neighborhood, and that it is integrated within some form of traffic management framework.

The range of traffic calming actions is wide. Ewing (1999) distinguishes between traffic control devices, such as “Stop” signs and speed limit signs that require enforcement and traffic calming measures that are *self-enforcing*. Ewing contends that this distinction implies that effective traffic calming actions “rely on the laws of physics rather than human psychology to slow down traffic.” While the strategy has been developed with the idea of self-enforcement firmly in mind, it does not exclude any means of improving the street environment that can be effective. Brindle and O’Brien (1999) contend that traffic calming is the end rather than the means. In this context, arguments about what should and should not be considered traffic calming actions are unimportant. The critical motivator of traffic calming is the underlying desire to improve the street environment. This moves the discussion from the kinds of *actions* that can legitimately be grouped under the traffic calming banner to the kinds of *outcomes* being sought.

In an environment such as Downtown Brooklyn, in which the effects of vehicular traffic dominate public space, the obvious and simple response is try to decrease the motorized traffic. Implementing such a strategy may well create a pleasant environment, but by no mean guarantees that other objectives for the use of public space implicit in eliminating traffic will be met.

Traffic calming, as it relates to this project, revolves around the idea of better use of public space. This may be manifested in various ways: it may involve de-emphasizing vehicular traffic in favor of pedestrians and other street users. This type of approach might be appropriate for residential streets. It might also involve ensuring motorized traffic takes its place in the life of a commercial street without dominating it. After all, many successful and vibrant commercial streets accommodate traffic as an important part of their makeup; the key in such situations is that the traffic does not exclude other users of the space. Traffic calming may also involve optimizing the operations of a major road, such that traffic capacity is maintained or enhanced, without precluding effective use of the space by other users.

Brindle and O'Brien (1999) have defined three levels of traffic calming:

- *Level I traffic calming*: results of actions to restrain traffic speed and lessen traffic impacts at a local level, where traffic volumes, levels of service, and network capacity are *not* an issue.
- *Level II traffic calming*: results of actions to restrain traffic speed and lessen traffic impacts on corridors and traffic routes (district or sub-arterial roads), where traffic volumes, levels of service, and network capacity are or may become an issue.
- *Level III traffic calming:* results of actions on a broader scale, to lessen traffic levels and impacts citywide. This brings traffic calming into the area of urban transport policy and away from its original singular focus on traffic management.

Level III traffic calming differs from Levels I and II not just in the matter of scale. At the citywide scale, a different kind of outcome is implied – not just *calming* but rather a *change in travel behavior*. While each of the levels can legitimately lay claim to the term traffic calming, the approach adopted for this study is confined to Levels I and II, as defined above. This has been done not through any assessment of the value of changes in the life of New York implied by strategies designed to achieve Level III traffic calming, but through a desire to confine the study's focus to strategies and underlying actions that can be implemented in a reasonable time within budgets and levels of support likely to be available. This conforms to the mainstream idea around the world of what constitutes practical traffic calming.

Brindle and O'Brien distinguish between those actions that concern engineering techniques and the physical environment from those that imply social and cultural change. They have used a classification matrix they call the "Darwin Matrix" (*Table 4.1*) consisting of three rows for the three levels described above and two columns. The first column covers measures instituted. The second column reflects social or attitudinal changes that may occur over a period, either spontaneously or by intervention, at the local or broader scale.

Table 4.1 Brindle and O'Brien's classification matrix

Scope of measure	Type of Measure	
	Physical/Environmental ('Techniques')	Social/Cultural/Attitudinal ('Ethos')
Local (street or neighborhood)	Level I traffic calming techniques: Speed and accident physical countermeasures; local area/neighborhood traffic management; Low-speed street design	Level I social change: neighborhood speed watch; community action; attitudinal change
Intermediate (zone, traffic corridor regional road)	Level II traffic calming techniques: environmentally-adapted through roads (Denmark); shared zones, lower-speed zones; pedestrianized retail precincts; bike lanes; transit lanes; corridors; precinct road pricing; parking policies	Level II social change: voluntary behavior change: mode choice, speed; acceptance of provisions for cyclists.
City-wide	Level III traffic calming techniques: travel demand management; transport system management; total system measures (fares policy, city-wide road pricing, bike systems, etc); manipulation of urban form and structure; parking policies	Level III social change: cultural change; cycling culture; loss of choice (e.g., energy constraints, significant drop in living standard); population decline; alternative futures

Source: Brindle and O'Brien (1999)

The second key element of traffic calming is the need to adopt an area-wide approach. This is informed by two issues:

- the need to see neighborhoods as systems; and
- the resulting need to follow a systematic planning approach when managing an area.

An area-wide plan for local area traffic management requires more than a catalog of traffic measures; an effective area-wide plan must be designed in a coordinated way. The adaptability of networks is well known to traffic engineers. It is no coincidence that average travel times from Hamilton Avenue (in the south of the study area) to the Brooklyn Bridge approaches (in the north) during the morning commuter peak are approximately the same by all routes. This phenomenon is demonstrated in *Figure 3.2*, which shows observed peak hour travel times. Drivers learn how to travel through an area as quickly as possible and experienced drivers quickly exploit a perceived shortcut so that an area's traffic demand is typically in equilibrium. Any change to traffic conditions modifies this equilibrium point, but not the certainty that equilibrium will occur. Accordingly, implementation of an isolated traffic calming treatment will act to alter traffic patterns; traffic volumes may diminish in the vicinity of the treatment, but only at the expense of streets that provide alternative routes.

In developing a traffic management scheme such as the Downtown Brooklyn Traffic Calming Project it is therefore critical to take account of the effects of physical treatments on travel decisions and driver route choice.

Regardless of the many benefits engineering-based traffic calming techniques can bring, sustainable cities will not be created through such techniques alone. The achievement of traffic calming at a citywide level requires widespread and fundamental changes in the community's attitudes to urban development, travel mode, and driver behavior. Traffic management at a significant level cannot lead social attitudes. Cultural change cannot be completed through traffic engineering alone.

A comprehensive planning approach may well lead to the conclusion that the proper solution to future traffic problems does not lie in engineering treatments, but rather in holistic planning and design. Traffic and roads are only one part of the urban system. At the very least, an attempt should be made to see problems and solutions in the context of the neighborhood as a functioning unit, not just as a site-specific traffic problem.

4.2 Integrated Traffic Management

Transportation planners and engineers have a range of tools available to them. Typical traffic calming tools are shown in *Figure 4.1* (see following pages). Used properly, these and other tools may be integrated to yield an effective means of building and maintaining an efficient and effective transport system.

As in any toolbox, different tools serve different purposes. It is important that appropriate tools are used to address each transport management issue. A traffic calming tool can be used to address a number of the pressing transport issues confronting Downtown Brooklyn, but it is not appropriate for all issues. A number of legitimate transport-related issues were raised in the course of this study for which traffic calming is not the most appropriate tool. These are discussed, together with suggestions regarding appropriate means of addressing them, in *Appendix E* of this report.

However, a traffic calming plan and the integrated traffic management approach that such a plan implies can significantly improve the street environment and the travel experience for people in Downtown Brooklyn. Such a plan and approach are the focus of this study.

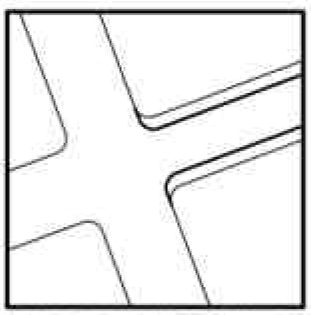
Figure 4.1 Typical traffic calming devices

NECKDOWNS

A neckdown (also known as a curb extension) consists of a localized narrowing of the street achieved by widening the sidewalk. They may occur either at intersections or mid-block, and may include landscaping.

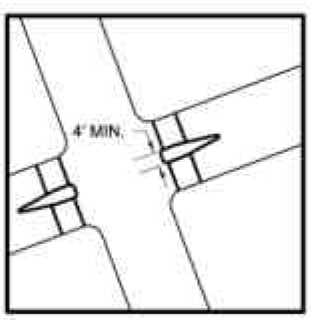
BUS BULB

A bus bulb consists of widening the sidewalk at a bus stop location so that buses remain in the travel lane when stopped at that bus stop.



ROADWAY NARROWING

Roadway narrowing involves the reduction of typical pavement width along a roadway. The narrowing can be achieved by removing a portion of the pavement width (typically by widening the sidewalk), or by using pavement markings to indicate narrow travel lanes.

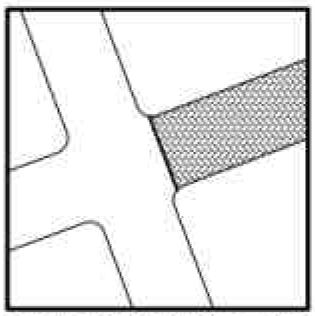


PEDESTRIAN REFUGES

Pedestrian refuges are small islands placed in the center of a two-way street. These islands separate opposing streams of traffic and allow pedestrians to cross the street in stages. They can also be used to narrow the travel lanes at the crossing location.

BIKE LANES

A designated on-street right-of-way that is delineated by pavement markings and signs. For bicycle lanes (Class II Bikeways) the Federal Highway Administration permits a minimum width of five feet when located adjacent to a curb or parking. In New York City, on-street lanes may be supplemented with an adjacent buffer zone to further define the separation of roadway use.

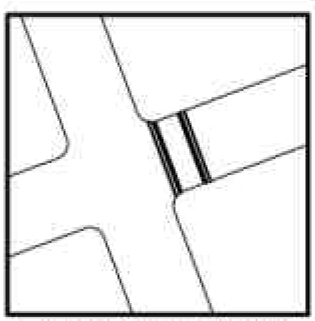


ROADWAY COLOR AND TEXTURE

Construction of roadway surfaces with materials that introduce surface texture to the roadway, such as paver stones, bricks, surface concrete patterns or stamped asphalt. Surface texture can create visual, vibratory and auditory effects. Texture can be utilized in a variety of applications, from treating entire streets, sidewalks or intersections to accenting and defining pedestrian crossing locations.

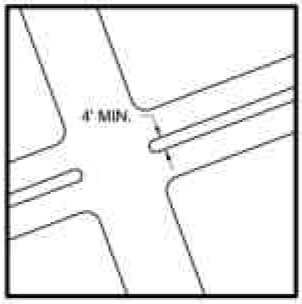
SPEED HUMP

A speed hump is a raised area in the roadway pavement extending across the road. Speed humps generally have a maximum height of 3 or 4 inches, with a travel length of 12 to 22 feet. The profile can be circular, parabolic or flat topped with sloping approaches. Longer, flat-topped speed humps are also known as speed tables, and may be combined with raised crosswalks



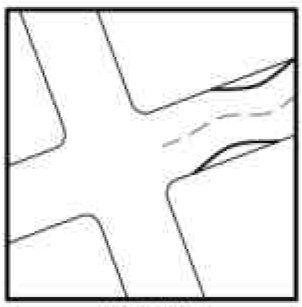
RAISED CROSSWALK

Raised crosswalks are constructed 2-4 inches above the normal roadway surface. Raised crosswalks are essentially flat-topped speed humps (speed tables). They are often constructed with concrete ramps and may also incorporate textured pavements in the crosswalk. Raised crosswalks can be placed mid-block or at intersections.



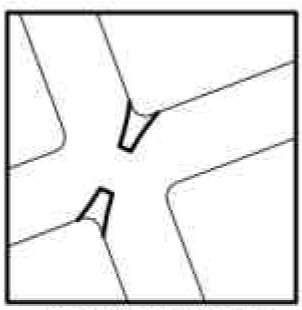
ROADWAY MEDIANS

A roadway median is defined as a raised island on the centerline of the street. A roadway median can include landscaping, space for pedestrian refuges and storage lanes for left turning vehicles.



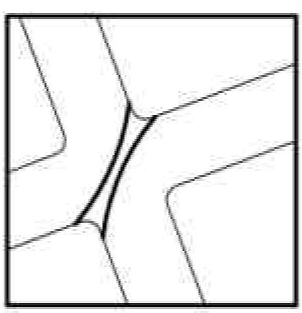
CHICANE

Chicanes introduce horizontal deflection by building out curb lines on alternating sides of the roadway. These built-out areas may be landscaped. A chicane-like effect can also be achieved by alternating on-street parking from one side of the street to another.



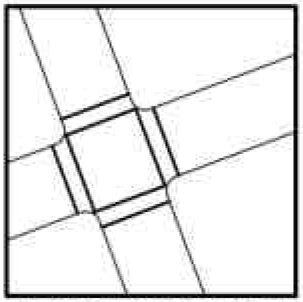
PARTIAL DIVERTER

A partial diverter consists of a curb extension or island that blocks one direction of travel at an intersection. It often includes landscaping and can be designed to retain bicycle access in both directions. Typically used on minor two-way streets.



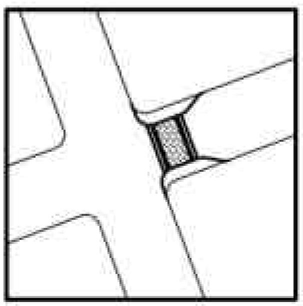
DIAGONAL DIVERTER

Diagonal diverters consist of a physical barrier placed diagonally across an intersection, forcing all traffic to turn.



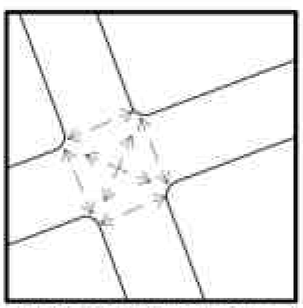
RAISED INTERSECTION

Raised intersections are flat raised areas covering entire intersections with ramps on all approaches. They typically rise to the sidewalk level or just below. Raised intersections are often constructed with textured pavement materials on the flat portion.



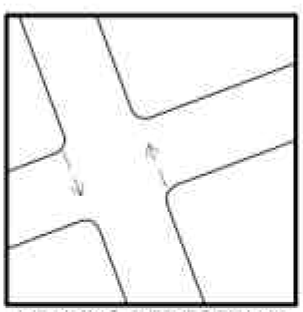
GATEWAY TREATMENT

Gateway treatments consist of a combination of physical traffic calming measures (such as curb extensions, raised crosswalks and textured surfaces) to create a threshold effect at entrances to streets and neighborhoods.



ALL PEDESTRIAN PHASE (APP)

An all-pedestrian phase (also known as Barnes Dance) is a signal phase that gives all vehicles a red indication, but gives all pedestrians a green "WALK" indication. It is used at intersections with heavy traffic in all directions to increase pedestrian visibility and confidence.



LEADING PEDESTRIAN INTERVAL (LPI)

A leading pedestrian interval is a signal phase that holds all vehicles at a red indication while giving pedestrians on at least one approach a green "WALK" indication. The vehicles are typically held for 5-10 seconds - just long enough for pedestrians to enter the crosswalk ahead of turning vehicles. Once pedestrians have begun crossing, vehicles on the parallel legs are given a green indication. LPIs are used at intersections with heavy traffic in at least one direction to increase pedestrian visibility and confidence.

Table 4.2 summarizes the traffic calming measures described in this report. It includes the primary objective of each measure, as well as a general assessment of suitability for use in the study area. More detailed descriptions of each measure are provided in Figure 4.1 above.

Table 4.2 Traffic calming measures and their suitability for Downtown Brooklyn

Traffic Calming Measure	Primary Desired Impact			Generally Suitable for Downtown Brooklyn?
	Lower Traffic Speed	Lower Traffic Volume	Other (Pedestrian Safety, Street Environment, etc)	
Physical Measures				
Speed Humps	X			X
Rumble Strips	X			
Speed Cushions	X			
Surface Texture	X			X
Raised Crosswalks	X		X	X
Traffic Circles	X			
Chicanes	X			
Street Narrowing	X		X	X
Curb Extensions (Neckdowns)			X	X
Gateway Treatments	X	X	X	X
Partial Diverters		X		
Diagonal Diverters		X		
Street Closures		X		
Median Barriers		X	X	
Roadway Medians			X	X
Pedestrian Refuges			X	X
Bicycle Lanes			X	X
Raised Intersections	X		X	X
Management Measures				
Signing and Striping	X	X	X	X
Traffic Signal Timing	X	X	X	X
Speed Enforcement	X			X
Safety Zones	X			X
Truck Restrictions		X		X
Street Direction		X		X
Educational Measures				
MUTCD-compliant Warning Signs	X			X
Road Safety Programs	X		X	X
Speed Watch Programs	X			X
School Safety Programs	X		X	X

5. DOWNTOWN BROOKLYN TRAFFIC CALMING APPROACH

5.1 Calming Brooklyn's Traffic

As noted in *Section 4.2*, planners and engineers can meet the challenges of managing an intensely-used area like Downtown Brooklyn using one or more tools. That these tools can be used individually or in combination to meet different challenges reflects their differing foci; no single tool is appropriate for meeting all challenges. Nor can traffic calming solve all Downtown Brooklyn's traffic problems. Appropriately focused, a traffic calming approach can be used to ameliorate the effects of a number of the traffic problems that currently beset the area.

An important distinction must be drawn between ameliorating traffic problems and ameliorating their effects. It is possible to reduce traffic as a means of reducing its impacts; throughout the study, many in the community expressed the need to reduce traffic as an objective in its own right. However, this study has maintained a focus on reducing the *effects* of traffic on the environment of Downtown Brooklyn's streets as its key objective. This emphasis on reducing effects is consistent with the generally accepted Institute of Transportation Engineers (ITE) definition of traffic calming and has provided the community and the project team with an achievable traffic calming goal.

In the context of reducing traffic's impacts, the objectives of the study were refined to more closely meet achievable goals. Specific objectives were as follows:

- Do not increase total traffic capacity through the area. Rather, improve efficiency of primary streets while discouraging through movement on other streets in order to redirect traffic from inappropriate routes.
- Reinforce appropriate travel patterns and street usage consistent with the Street Management Framework (see *Section 5.2*)
- Examine and improve high pedestrian accident locations.
- Examine and reinforce the truck network.
- Examine and reinforce the bicycle network.
- Integrate specific treatments with area-wide strategies.

A process with four broad steps was followed in developing a traffic calming strategy for Downtown Brooklyn:

- **Define street categories** – Classify each type of street by different *characteristics* (physical, land use, movement, connections) and management *objectives* (safety, access, street environment)
- **Classify streets** – Organize the street network to act as a unit, to meet the varying needs of those who use it. This implies that different streets have different functions.
- **Identify conflicts and problems** – Determine where conditions on individual streets fail to meet the ideals, given their functions.
- **Formulate strategies** – Establish what can be done to improve the street environment.

5.2 Downtown Brooklyn Street Management Framework

5.2.1 What is a street management framework?

Streets are not only parts of the transportation system but are also public spaces that serve community roles. A management framework is a way of classifying different types of street based on both their transportation functions and their community roles. A street management framework provides a basis for developing and evaluating a coherent traffic calming strategy and sets of measures designed to support that strategy. The framework provides a basis for:

- establishing a picture of how different streets should function;
- identifying where streets are functioning poorly (that is, not in accordance with their designated function);
- developing management strategies to help streets function as they should; and
- ensuring management measures are implemented in a coordinated way.

5.2.2 Types of Street

A conventional hierarchy based on road function designates streets as arterials, collectors or local streets on the basis of their traffic movement and access functions. The Downtown Brooklyn Street Management Framework broadens the range of functions considered in designating street types to include the roles streets play as public spaces and community resources.

The management framework for Downtown Brooklyn was developed with reference to similar approaches adopted elsewhere in the world. In this case, the Danish street management model has been the primary source of guidance. The Danish model includes two categories of street: *Traffic Streets* and *Living Streets*. This concept has been adapted for use in Brooklyn, taking into account the local environment, the streetscape, and also the objectives for street improvements identified by the community. The framework itself emerged from discussions with the community about their visions for each street in the study area; the need to provide a framework with enough structure to guide planning but enough flexibility to consider the interests of both motorized and non-motorized street users became obvious during these discussions. The framework was validated through discussions with the project's Task Force and participating Community Boards.

The following street categories were defined:

- Travel Streets
- Community Streets
- Living Streets

Not all streets fit comfortably into a single category. In such cases the management strategy developed reflects the street's multiple functions and characteristics.

The characteristics of each street category are described below.

5.2.2.1 Travel Streets

Travel Streets provide critical transportation links and allow for movement, while also serving as destinations in their own right for commercial, cultural and institutional activities. Typically, regional commercial and institutional uses front Travel Streets; in some cases they are mixed with limited residential space.

Travel Streets comprise the skeleton of the roadway system and provide important connections to expressways and other Travel Streets. Travel Streets should be designated as through or local truck routes, typically form part of bus routes, and provide access to subway stations. Because of the types of land use on them, Travel Streets typically experience significant pedestrian activity.

Generally, Travel Streets are wide, are composed of multiple lanes in each direction and have high traffic capacity, although the main function of a Travel Street may be to provide good connectivity, rather than high traffic capacity. This means that a relatively narrow street can act effectively as a Travel Street provided that its main function is to connect two parts of Downtown Brooklyn and provide connections to other areas, rather than necessarily to carry a high volume of traffic.

Travel Streets should provide a comfortable, attractive and safe environment for all street users. They should not act as barriers for pedestrians and bike riders. They should allow efficient traffic flow and should provide access to adjacent businesses and institutions.

These characteristics can be distilled into a set of objectives for managing Travel Streets:

- Alleviate traffic bottlenecks with traffic management strategies.
- Facilitate pedestrian and bicycle movement.
- Improve street environment for pedestrians, bicyclists, businesses and residents.
- Discourage excessive speeds and aggressive driving.
- Improve access to businesses and institutions.
- Reduce the degree to which major streets are barriers between neighborhoods

5.2.2.2 Community Streets

Community Streets serve as "Town Centers" for neighborhoods and the Central Business District (CBD), by providing shopping, services, and entertainment and by acting as gathering places. Community Streets are typically fronted by mixed neighborhood commercial and residential uses and consequently experience high levels of pedestrian activity. These streets also typically provide important transportation connections between Travel Streets and Living Streets. Typically, Community Streets form parts of bus routes and in many cases provide access to subway stations. In CBD areas, vehicle mobility may be more limited on Community Streets.

Community Streets should provide an attractive pedestrian environment to encourage neighborhood activity. They should provide access to businesses and services. In managing these streets, a balance must be struck between the need to allow efficient traffic movement and the need for an attractive local environment.

Objectives for managing Community Streets include:

- Facilitate pedestrian crossings.
- Improve street environment for pedestrians, bicyclists, businesses and residents.
- Discourage excessive speeds and aggressive driving.
- Improve access to businesses and reinforce neighborhood commercial "cores".

5.2.2.3 Living Streets

Living Streets provide access to living or working spaces. Living Streets are the local, typically residential streets where quality of life is the primary concern. In some cases, Living Streets exclusively serve industrial or educational uses.

Typically, Living Streets are narrow, are not located directly on transit routes, and have a low level of traffic movement (although some provide important intra-neighborhood connections). Living Streets' primary role is to provide access to residents and local land uses. Living Streets should be safe for all users. Motor vehicles should have minimal impact on the local environment and quality of life and traffic volumes should be low.

Living Streets' management objectives include:

- Protect the street environment.
- Maintain safety for residents.
- Discourage excessive speeds and aggressive driving.
- Discourage through traffic.
- Discourage inappropriate truck activity.

5.2.2.4 Vision for streets

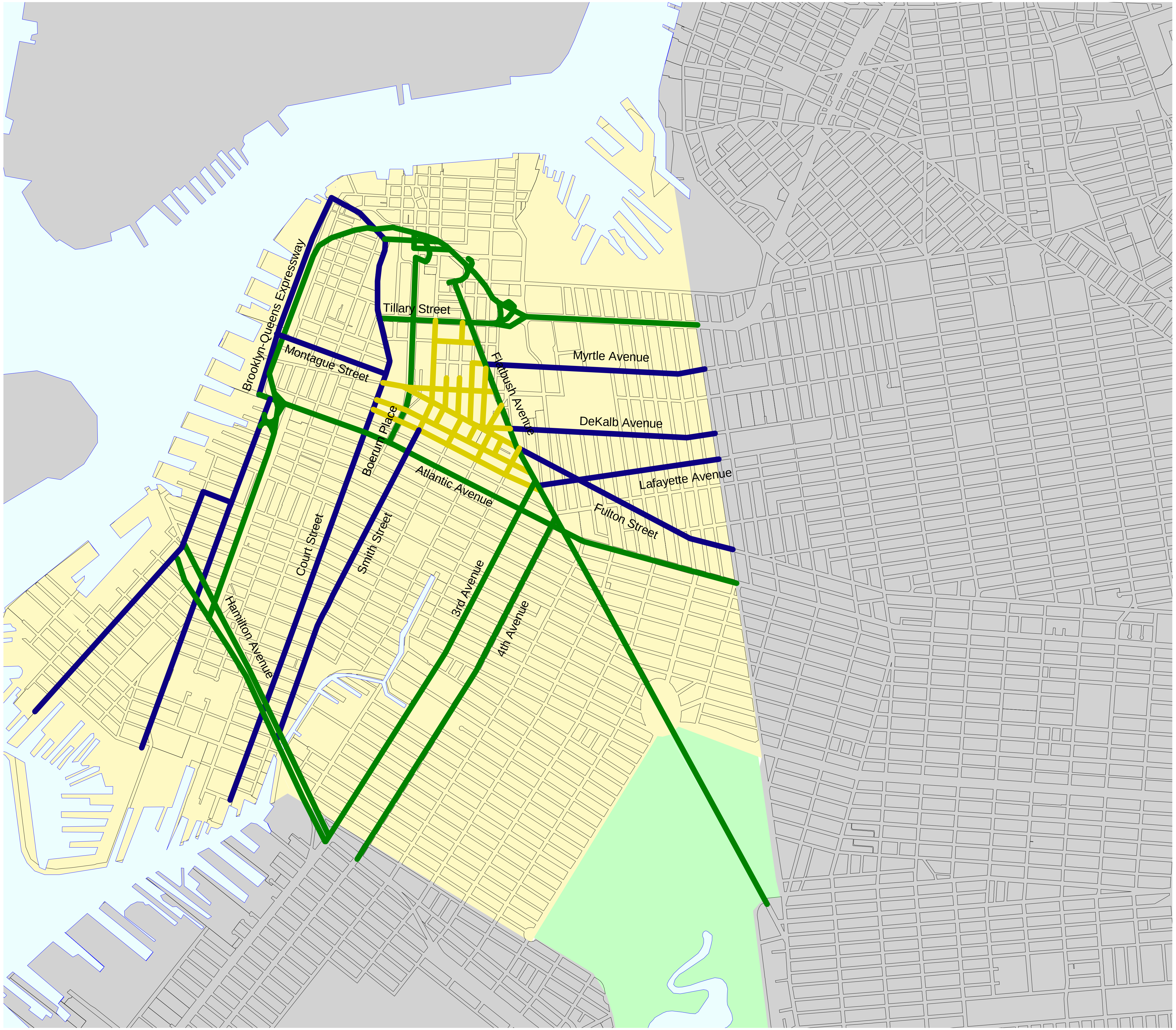
Each street's classification is based both on its existing characteristics and on the vision for how the street should function. For example, a street that is located within a residential block may be designated a Living Street, even if it currently carries a large amount of unwelcome traffic. A Living Street designation signals that the street's primary function is not to carry substantial traffic and if it is doing so, it may be performing below a desirable standard. So the designation "Living Street" conveys the idea of the street's overriding residential nature and also serves as a declaration of intent that it should operate in a manner that does not prioritize its role as a through-traffic carrier. In spite of this classification, there is still a need to provide vehicular access to all blocks in the study area. And while the framework may call for changing a corridor's traffic flow to lower speed and capacity it is still critical to maintain a safe driving, walking, and cycling environment. Likewise, a Community Street designation signals that a street's primary function is to balance the competing demands for parking, walking, cycling, traffic, and other uses, and a Travel Street designation signals that a street's primary function is to carry traffic. In both cases, the streets' designations guide the design of traffic calming measures, in the context of maintaining safe environments for pedestrians, vehicles, and cyclists.

It should be recognized that some streets do not fit perfectly into any of the three categories, and some streets fulfill different types of functions at different times of day (Smith Street, which functions like a Community Street at all times except the morning peak period, is a good example). While the framework is used as a guide, strategies for specific streets must recognize their varying characteristics. But, most importantly, use of a traffic management framework implies that traffic calming improvements can be applied to all categories of street.

5.3 Downtown Brooklyn Street Designations

The following sections describe the networks of Travel, Community, and Living Streets. These sections discuss the role of each street in the overall traffic network; more detailed descriptions of current and proposed conditions for each street are given in *Section 7.*

Figure 5.1 (see next page) indicates individual street designations for the study area.



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Street Management Framework

- Travel Streets
- Community Streets - Neighborhood
- Community Streets - CBD

Figure 5.1

Street Management Framework

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5.3.1 Travel Streets

4^{th} Avenue and **3^{rd} Avenue** provide the major north-south traffic capacity and connectivity through the area in addition to the BQE. Providing adequate north-south connectivity for surface streets in the west of the study area is important, given the congested nature of the BQE.

Along with the **BQE**, which borders the study area to the south and west, **Atlantic Avenue**, **Hamilton Avenue** and **Tillary Street** provide the major east-west traffic capacity and connectivity through the study area. North of Atlantic Avenue, **Adams Street** and **Boerum Place** provide substantial traffic capacity for entrance to the Brooklyn Bridge. **Flatbush Avenue** cuts diagonally across Downtonn Brooklyn's street grid, providing northwest-to-southeast connectivity and capacity.

There is no obvious east-west candidate for a Travel Street designation in the part of the study area between Atlantic Avenue and Hamilton Avenue. This, together with the limited number of crossings of the Gowanus Canal in the southern section of the study area, means that a number of residential streets in Boerum Hill share the (limited) east-west traffic load.

All Travel Streets described here should be managed with the aim of optimizing their traffic performance, because acting as traffic conduits is their primary function. In many cases, traffic performance can be optimized through improvements to intersection operations; in some cases, improvements can also be achieved through rationalization of mid-block operations.

Optimizing traffic performance does not necessarily mean maximizing traffic capacity and sacrificing the interests of all users other than those traveling through the study area. Most of the Travel Streets in the study area have vibrant retail and other land uses that depend at the very least on comfortable pedestrian access and generally on users' ability to park either in front of or close by those uses. Accordingly, successful management of the Travel Streets depends on achievement of a balance between the various legitimate users of these streets.

Fortunately, analysis has shown that operational efficiencies can be achieved in a number of places in the study area. A typical tactic of traffic managers in such situations is to use the benefit achieved from improved traffic efficiency to increase local traffic capacity. However, the focus of this project has been to spread the benefits of such improvements across a range of goals for management of the study area's road network: improved safety, better parking provision, better transit provision and greater attention to pedestrian needs, as well as, where appropriate, greater traffic capacity. Where it is recommended that such benefits be used to achieve greater traffic capacity on a Travel Street, this forms part of a coordinated program directed at limiting intrusion of traffic into streets less suited to carrying traffic.

5.3.2 Community Streets

Supporting the Travel Streets and providing for accessibility through Downtown Brooklyn are the Community Streets. As described in the previous section, these streets act as retail and community foci. Many of them act as bus routes.

Court Street and **Smith Street** act as a one-way pair through the heart of the study area and represent major community foci. Smith Street plays an important northbound (morning) commuter peak capacity role, which does not conflict substantially with its community role throughout the rest of the day. Smith Street has become an important shopping and restaurant destination in Downtown Brooklyn. Court Street plays the same role for southbound traffic; the conflict between evening commuter peak traffic and shopping and other community activity that occurs on this street is somewhat more problematic than on Smith Street.

East-west Community Streets through Fort Greene include **DeKalb Avenue, Fulton Street, Myrtle Avenue** and **Lafayette Avenue** . Fulton Street and Myrtle Avenue are mixed-use community centers, while DeKalb Avenue and Lafayette Avenue are one-way streets that are more residential in character. All four streets have bus service. Maintaining smooth operations and appropriate speeds both for bus and auto traffic was a major objective on these streets.

Furman Street, which currently provides only southbound connectivity and capacity, partially completes the Travel Street framework in the northwest of the study area and **Columbia Street/Van Brunt Street** provide two-way connectivity in the southwest of the study area.

Furman Street currently provides access to the waterfront. This function will become increasingly important as the Brooklyn Bridge Park located on the waterfront is developed. The park will bring with it an additional set of traffic needs that must be addressed as the implementation plan for that space is refined. Part of that plan may well include redevelopment and realignment of Furman Street in a way that ensures that its traffic function does not overwhelm the pedestrian environment on the waterfront, while providing continuity and connectivity of the major street network important for the broader travel needs of the area.

Similarly, in discussing draft ideas for the study area, a number of members of the community suggested that **Old Fulton Street** in the Fulton Ferry landing area, while logically forming part of a Travel Street framework in the northwestern section of the study area, should be designated as a Community Street. This reflects its importance as a community resource.

Community Board 6 recommended that in light of its important role for the local community, **Columbia Street** should be managed as a Community Street rather than a Travel Street. This street provides north-south connectivity along the waterfront south of Atlantic Avenue but is also the site of a revitalized mixed-use community.

Finally, all streets in Brooklyn's Central Business District are classified as Community Streets. This reflects the way these streets function within the intensively-used downtown area. This area is bounded by Tillary Street on the north, Flatbush Avenue on the east, Atlantic Avenue on the south, and Adams Street/Boerum Place on the west.

5.3.3 Living Streets

All other streets are classified as Living Streets. This designation recognizes that catering for access to local land uses and activities is more important than providing for traffic traveling through the area.

This does not mean that traffic should be excluded from these streets. Indeed, Downtown Brooklyn's street grid is highly permeable, meaning it provides drivers with multiple choices of routes between origins and destinations. Experience around the world has shown that making travel through a permeable street network more difficult through street closures and localized reversal of flow on one-way streets generally causes as many problems as it solves. The street network becomes difficult to negotiate for those who know it and impenetrable for those who do not.

However, it does mean that the needs of those who live on these streets should be assigned higher priority than the needs of those who travel through them. Of course in conjunction with downgrading the relative importance of through traffic it is important to retain adequate accessibility for emergency service and service vehicles.

5.4 Public outreach

The primary objective of the public outreach program was to harness input from as many sources as possible during each phase of the project, from planning to implementation. Input was focused in a structured manner to allow decisions to be informed by as broad a base of interests as possible. Four public outreach tools were used: information gathering, idea development, pilot program development and implementation, and strategy development.

The major formal mechanisms for public outreach consisted of a project Task Force convened by the Brooklyn Borough President; a Technical Advisory Committee convened by NYCDOT; and subcommittees of Brooklyn Community Boards 2 and 6, the two Community Boards within the primary study area. Community Board 8 also provided input on the secondary study area. Community Boards 2 and 6 referred monitoring of the project to their Transportation Committees. Community Board 6 convened several transportation committee public meetings to review the project strategies. In the latter stages of the project, Community Board 2 convened a task force specifically to address and respond to the draft ideas presented to them.

The outreach approach and process taken and resulting inputs are described below. Organizations represented on the Task Force and Technical Advisory Committee are listed in *Appendix B*.

5.4.1 Information gathering

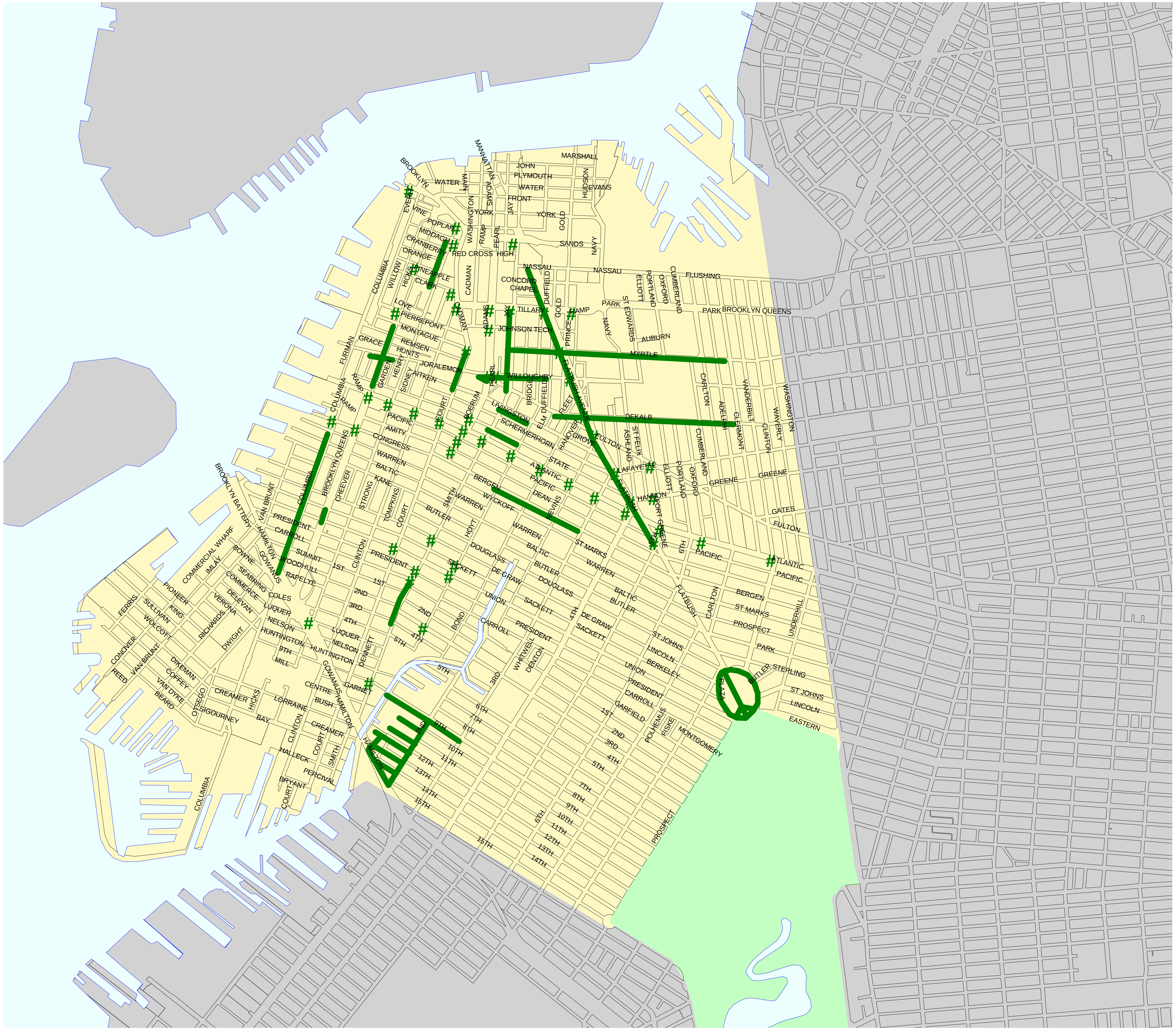
Like all studies, the Downtown Brooklyn Traffic Calming Study relied on collecting enough useful information to identify problems and to develop a means of addressing them. The information gathering process relied on a partnership between those who know the area best (those who live and work there) and the project team. Residents and businesses have an unparalleled understanding of local issues. A partnership between local stakeholders and the project team was critical throughout the study, but was most important in the early information gathering stage.

For this study, data were gathered in three broad ways: collation and limited collection of hard traffic operational data, discussions with members of the community, and discussions with members of city agencies, including NYCDOT. The data collection process was the subject of an intensive effort at the beginning and continued throughout the study as the project team's understanding of conditions in Downtown Brooklyn evolved. The hard traffic data collected through the study is summarized in *Appendix C* and is contained in the CD provided with this report.

A series of workshops was convened under the auspices of the Task Force and Community Boards to gather data regarding specific problem locations, the needs of Downtown Brooklyn, and the role that individual streets should serve. These workshops yielded many valuable insights into traffic issues in Downtown Brooklyn. Details of those workshops are provided in *Appendix B*.

5.4.1.1 Issue identification

An initial task for the project was identification of issues of concern to the local communities. This process was established through a series of meetings with Task Force members. It should be noted that the issues identified on the following pages (*Figures 5.2* through *5.5*) reflect the perceptions of the attendees of the Issue Identification Meetings and members of the general public. This section simply summarizes the comments provided, and does not reflect any independent verification or analysis of traffic issues raised.



Downtown Brooklyn Traffic Calming Project

Final Report

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Pedestrian Safety Issues

Intersections

Corridors

Figure 5.2

Community-Identified Pedestrian Safety Issues

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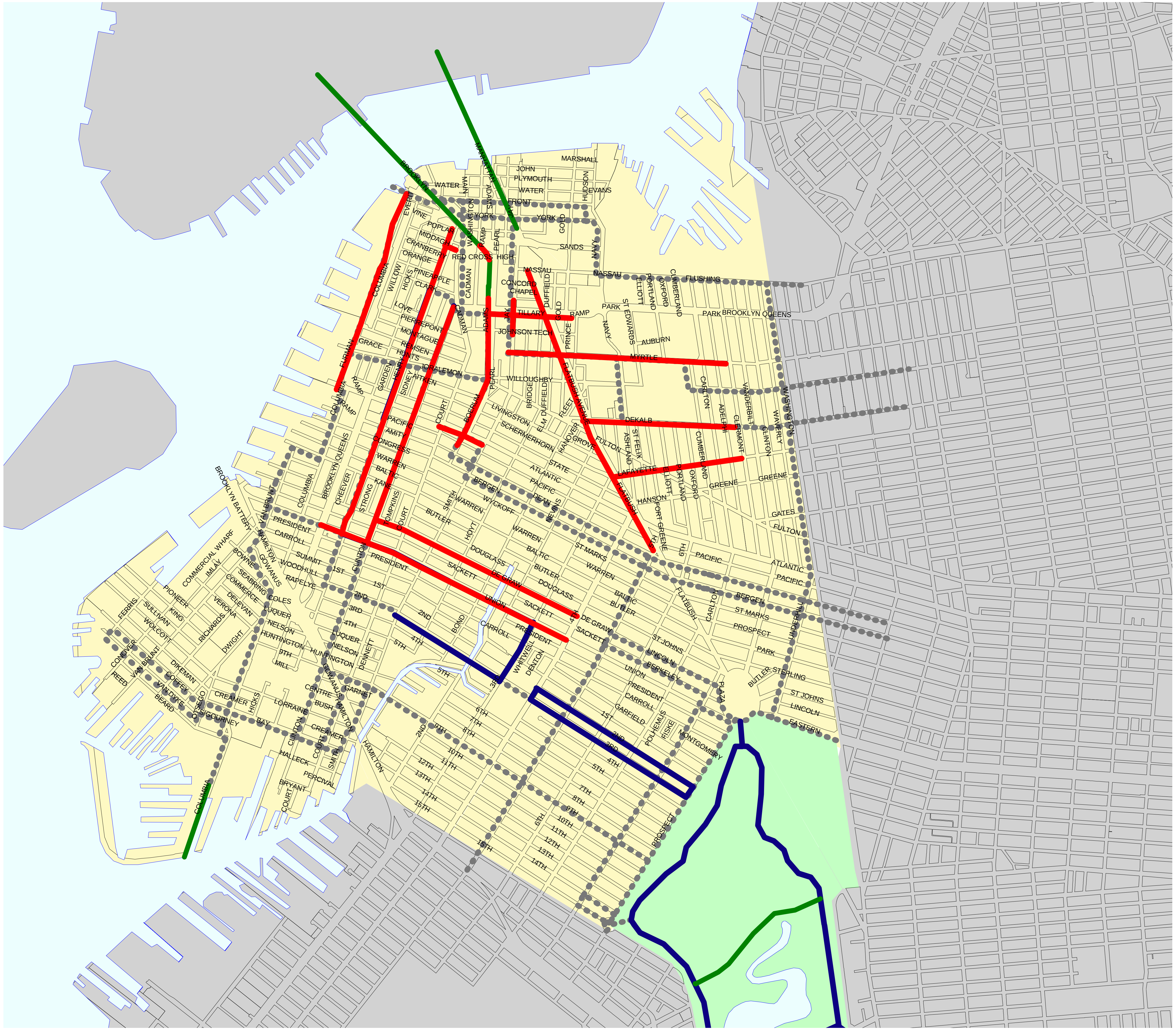

Downtown Brooklyn Traffic Calming Project

Final Report

LEGEND

- Cycling Safety Issues
- Off-Street Cycling Routes
- On-Street Cycling Lanes
- On-Street Recommended Routes

Figure 5.3

Community-Identified Cycling Issues

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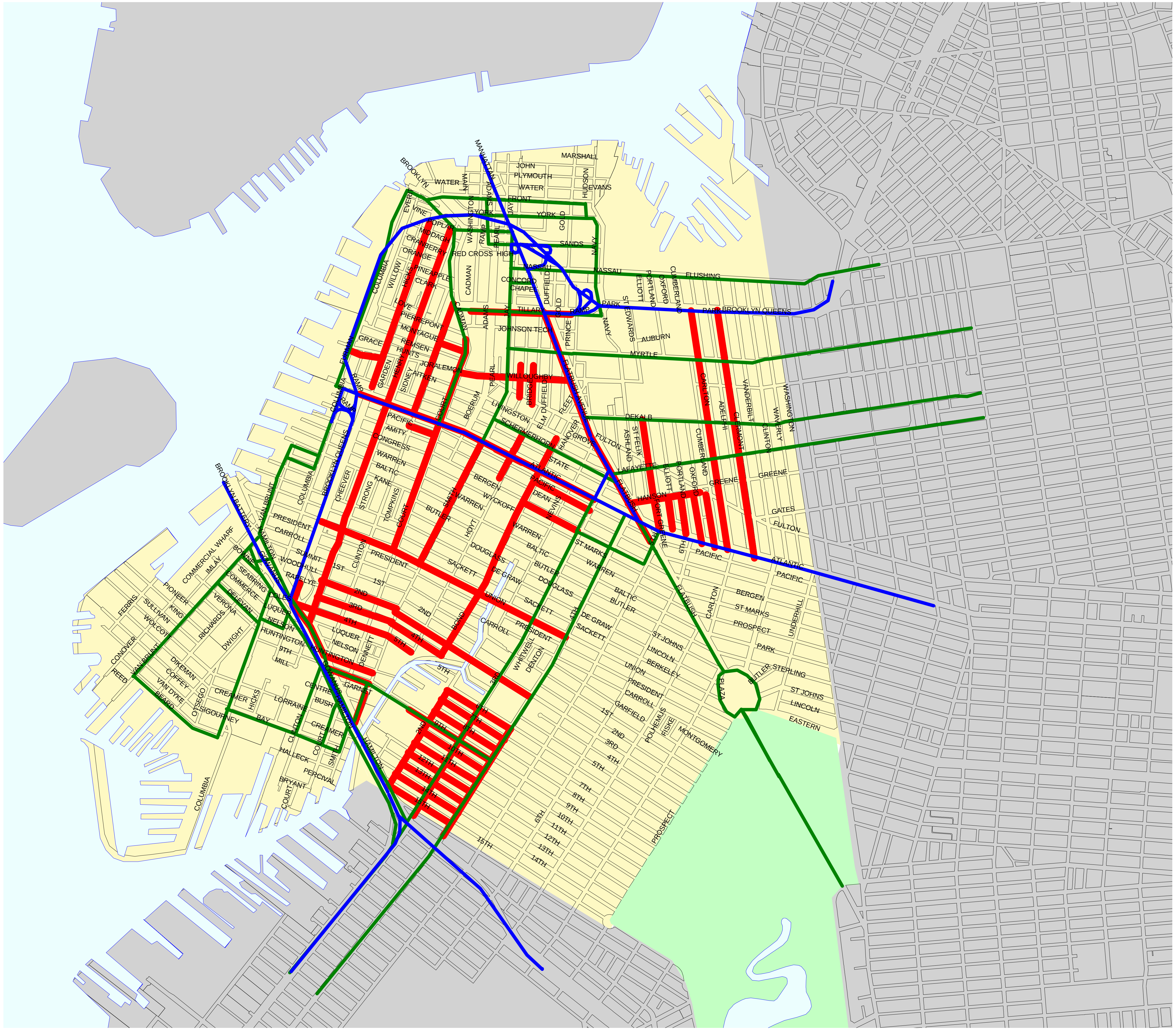
Final Report



LEGEND

- Truck Traffic Issues
- Through Truck Routes
- Local Truck Routes

Figure 5.4

Community-Identified Truck Traffic Issues

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NEW YORK CITY DOT

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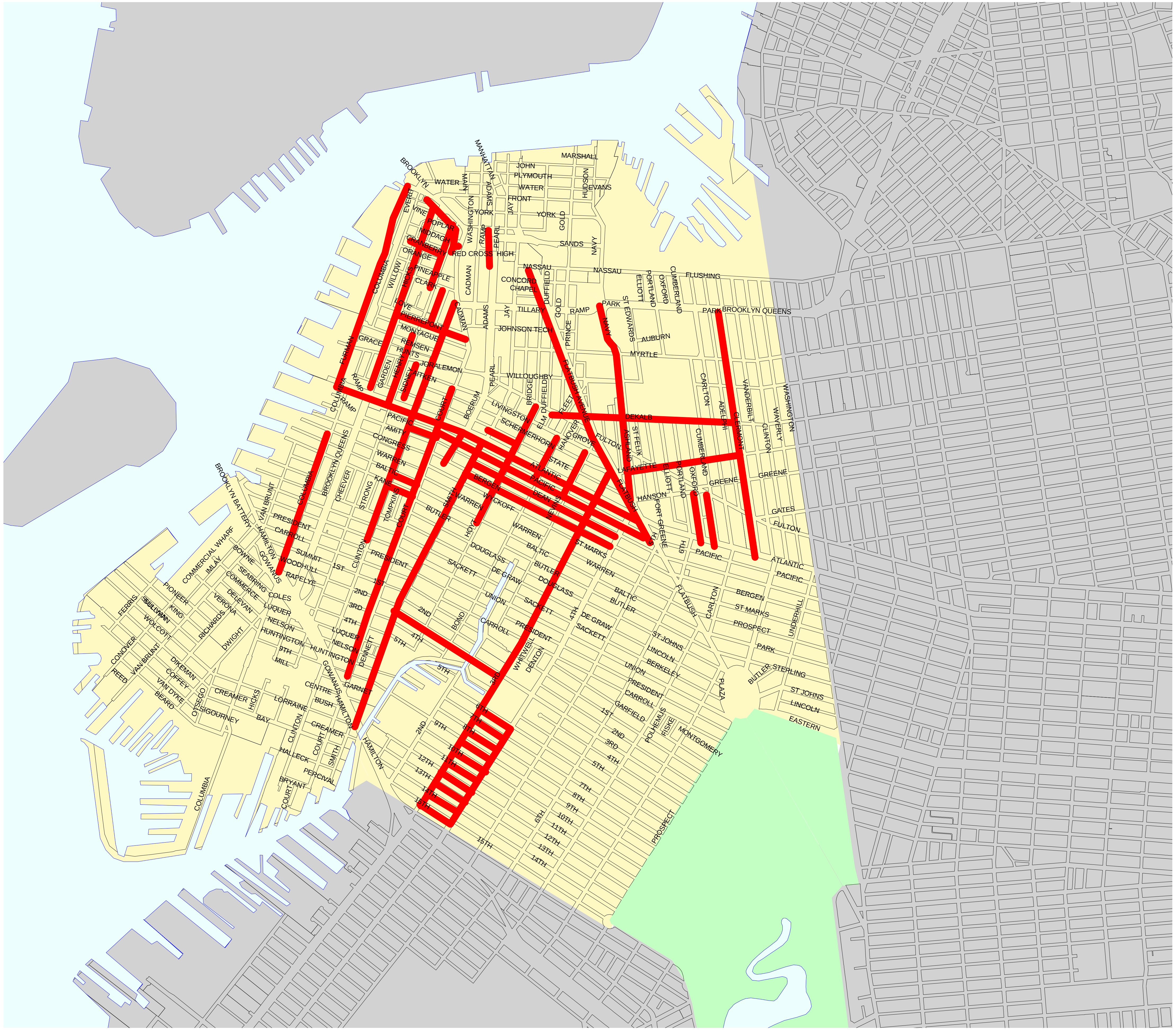
Downtown Brooklyn Traffic Calming Project

Final Report



LEGEND

Vehicle Speeding Issues

Figure 5.5

Community-Identified Vehicle Speeding Issues

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5.4.1.2 Issue categories

Through the course of the issue identification meetings, it became clear that the issues raised could be grouped into distinct categories. These categories are defined below. Community-identified problem locations for each of these issues, are listed in *Appendix D.*

- pedestrian safety
- through traffic
- congestion
- parking
- vehicle speed
- bicycle safety
- transit issues
- truck issues
- general issues

5.4.2 Idea development

As the project progressed and transitioned from identifying problems to examining potential solutions, interaction with members of the general community also evolved. Information flowed in both directions and contact was ongoing. Accordingly, the format for interaction changed from small homogenous groups with a shared geographic interest to open houses set up to encourage area-wide thinking by creating geographically diverse groups of participants. This format allowed the project team to engage those who were already a part of the process as well as new constituencies. The format is described in more detail in *Appendix B.* Information obtained at the open houses is summarized in *Appendix A3*.

5.4.3 Pilot program development and implementation

Development and implementation of the pilot program was based on community response to the project team's suggestions that were presented to and discussed with the Task Force. Initial ideas for the pilot program were very limited in scope, reflecting the modest budget allocation made in the contract and the project team's view of the pilots' role in the project. However, when the limited scope of the proposed pilot program was discussed, Task Force members indicated they had expected something more substantial. NYCDOT consulted with the other funders of the study and agreed to expand the funding and scope of the pilot program.

An expanded set of pilot program proposals was then developed and provided to Community Boards 2 and 6. Those Community Boards considered the proposals and, with certain modifications, endorsed the proposals. These suggestions were then developed further, installed, and evaluated.

The pilot program represented a major point at which community expectations and the realities of the project differed. The project team explained to the community that the purpose of the pilot program was to test specific treatments, and that locations were chosen because of the ease of implementing the treatments. The pilot treatments that were proven effective would then be incorporated into the strategy for the entire study area. Nevertheless it became clear throughout the project that some members of the community felt that the pilot program should represent a temporary but comprehensive version of the overall strategy for the area and that the process of moving from the pilot program to the final strategy should be one of reviewing and refining the pilot program and converting temporary installations into more permanent ones.

The project team took pains to explain that the use of temporary treatments was not only unrealistic but also counterproductive; experience around the world demonstrates the adverse effects of temporary physical treatments on the community view of traffic calming. Notwithstanding these efforts, it was not until the draft ideas for the overall strategy were presented that concerns among some members of the community about the commitment of NYCDOT and the project team were allayed.

5.4.4 Strategy development

The final phase of the project revolved around turning the management framework developed with the community and the ideas for managing traffic in Downtown Brooklyn into a coherent strategy. This was achieved by preparing an ideas paper that formed the basis for intense discussion in various forums: a series of open houses, a series of Technical Advisory Committee meetings, meetings with individual agencies and, most importantly, a series of detailed working sessions with Community Board 6's Transportation Subcommittee and Community Board 2's Downtown Brooklyn Traffic Calming Task Force. These meetings provided the forum for creating a draft strategy in a form acceptable to those committees. Committee leaders were able to work with their respective boards and committees and obtain their endorsement. In this way, the normal disagreements on the details of the strategy were dealt with within the subcommittees and were resolved without derailing the overall strategy development process.

This process proved very successful, due in large part to the intense efforts made by the members of Community Board 2's Task Force and Community Board 6's Transportation Committee.

6. PILOT PROGRAM

6.1 Introduction – Why a pilot program?

An important part of the Downtown Brooklyn Traffic Calming Project was the implementation and evaluation of a pilot program of traffic calming treatments in Downtown Brooklyn. The purpose of this pilot program was to explore practical issues surrounding implementation of typical traffic calming measures, and to gauge the impacts each had on safety, traffic operations, and public perception and it has indeed proved a rich source of insights into such practical issues. The pilot program was not intended to implement a scaled-down version of the overall strategy; such an objective would be impossible to achieve in advance of the strategy's development and within the budget earmarked for the pilot program. In this context, the pilot program was an experiment that helped inform the overall strategy – the lessons learned on the practical issues of traffic calming were coupled with intense study of Downtown Brooklyn's conditions to develop the specific recommendations in the strategy.

At an agency level, the pilot program:

- provided the project team with an understanding of the NYCDOT's design approach and allowed the team to expand on that approach and foster acceptance that traffic management can be approached in various ways;
- explored issues with emergency service agencies (NYPD and FDNY) and built confidence that traffic calming treatments are workable and that operational and design issues unique to New York City can be addressed;
- built confidence among other agencies that such measures are workable;
- provided an understanding of construction and permitting issues; and
- provided an understanding of inter-agency issues.

At a community level, the pilot program:

- yielded safety and traffic operations data from these measures in the field in Brooklyn; and
- allowed the project team to gauge public acceptance of actual traffic calming measures.

Implementing the pilot program demonstrated to the community what traffic calming treatments look like, allowed the project team to investigate how New Yorkers react to traffic calming, and built confidence in these methods. An illustration of the benefits of the pilot program was the changing position of Community Board 6. The Board initially rejected several pilot program treatments based on perceived safety and parking loss concerns, yet eighteen months later, after pilot program implementation, the Board was willing to approve a much more comprehensive set of measures for inclusion in the broad strategy.

6.2 Pilot program overview

6.2.1 Pilot program development process

Early in the project a list of traffic calming measures appropriate for Downtown Brooklyn was compiled. This is reproduced in *Appendix E* and summarized in *Table 4.2*.

This list was the starting point for development of the pilot program. However, although a treatment's appropriateness for Downtown Brooklyn was necessary for inclusion in the pilot program, it was not sufficient justification. For the pilot program, a further assessment was made of the suitability of these calming measures for installation as test cases in specific locations. Nine criteria were used for this purpose. These are summarized below:

- *The measure addresses issues raised by community*: Initial public outreach identified such issues as vehicle speeds, pedestrian crossing safety, etc. These issues are summarized in *Appendix A3*.
- *The measure is likely to be utilized in final area-wide strategy*: Initial investigation by the project team identified those measures likely to be most practical and suitable for Downtown Brooklyn, as described in *Table 4.2*.
- *The measure's applicability at other locations*: The types of measure should, as much as possible, be able to be utilized elsewhere so their evaluation can provide useful guidance in development of an area-wide program
- *The measure has limited physical scope (and hence construction cost)*: Funds for traffic calming implementation were allocated for the finalized program; the cost of pilot test cases was minimized in order to allow the limited pilot program budget to be spread over as many measures as possible.
- *The measure minimizes impact on existing street infrastructure, such as drainage and other services and street lighting*: Pilot program measures should as far as possible avoid the need to modify existing street infrastructure and utility plant.
- *The impacts of the measure can be evaluated*: The impacts of pilot program measures should be measurable, in terms of safety, traffic impact, and public acceptance.
- *The measure has more than one traffic calming effect*: Measures are most useful for the pilot program where they address a number of local issues – for instance, they reduce speeds *and* improve pedestrians' ability to cross *and* enhance the local environment.
- *The measure is compatible with the draft Street Management Framework*: Measures should fit with the management approach appropriate for the Street Management Framework as it stood at the time the pilot program was designed.
- *The measure provides guidance on detailed construction issues*: Measures can be useful in assessing construction methods and layouts – for instance, pedestrian ramp layouts, the height of raised crosswalks, and drainage details.

For the pilot program, the focus was on physical and management measures that could have an impact in the short term, rather than on educational measures that focus on improved driver behavior in the long-term. The preferred measures for consideration for the pilot program can be categorized broadly as either:

- **Localized physical measures** with particular traffic calming effects such as neckdowns to improve pedestrian crosswalk facilities; or
- **Traffic management measures** involving changes to the way a street handles traffic, such as restricting traffic flow along a street, or modifying signal timings to achieve changes in flows or speeds.

In light of the above criteria and given that various types of measure have already been implemented in New York City, an initial screen of the suitability of types of measure for inclusion in the pilot program was undertaken. This is summarized in *Table 6.1*.

Table 6.1: Pilot Program Suitability		
Measure	**Pilot Program suitability**	**Comments**
Speed Humps	No	In use already; therefore not appropriate for testing in pilot program
Surface Texture	Yes	Could be used in combination with other measure
Raised Crosswalks	Yes	Could be used in combination with other measure
Raised Intersection	Yes	Could be used in combination with surface texture
Street Narrowing	No	Only if no major traffic capacity implications
Curb Extensions (Neckdowns)	Yes	Only if no major traffic capacity implications
Gateway Treatments	Yes	Could be used in combination with other measure
Roadway Medians	No	Would result in major traffic re-routing, therefore not suitable in pilot program
Pedestrian Refuges	Yes	Could be used where excess road space exists
Bicycle Lanes	Yes	Could test effect of on-street bicycle lanes on traffic behavior
Signing and Striping	No	Limited impact without physical changes, therefore not appropriate in pilot program
Traffic Signal Timing	Yes	Relatively straightforward to introduce
Leading Pedestrian Interval	Yes	Relatively straightforward to introduce
Speed Enforcement	No	Requires enforcement regime and therefore not suitable in pilot program
Safety Zones	No	Limited short-term impact and therefore not suitable in pilot program
Truck Restrictions	No	Difficult to enforce in pilot program
Angled Parking	Yes	Need to satisfy existing DOT roadway width standards for angled parking
Street Direction / Restriction	Yes	Could be tested if current road works involve street traffic restrictions

6.2.2 Pilot program scope

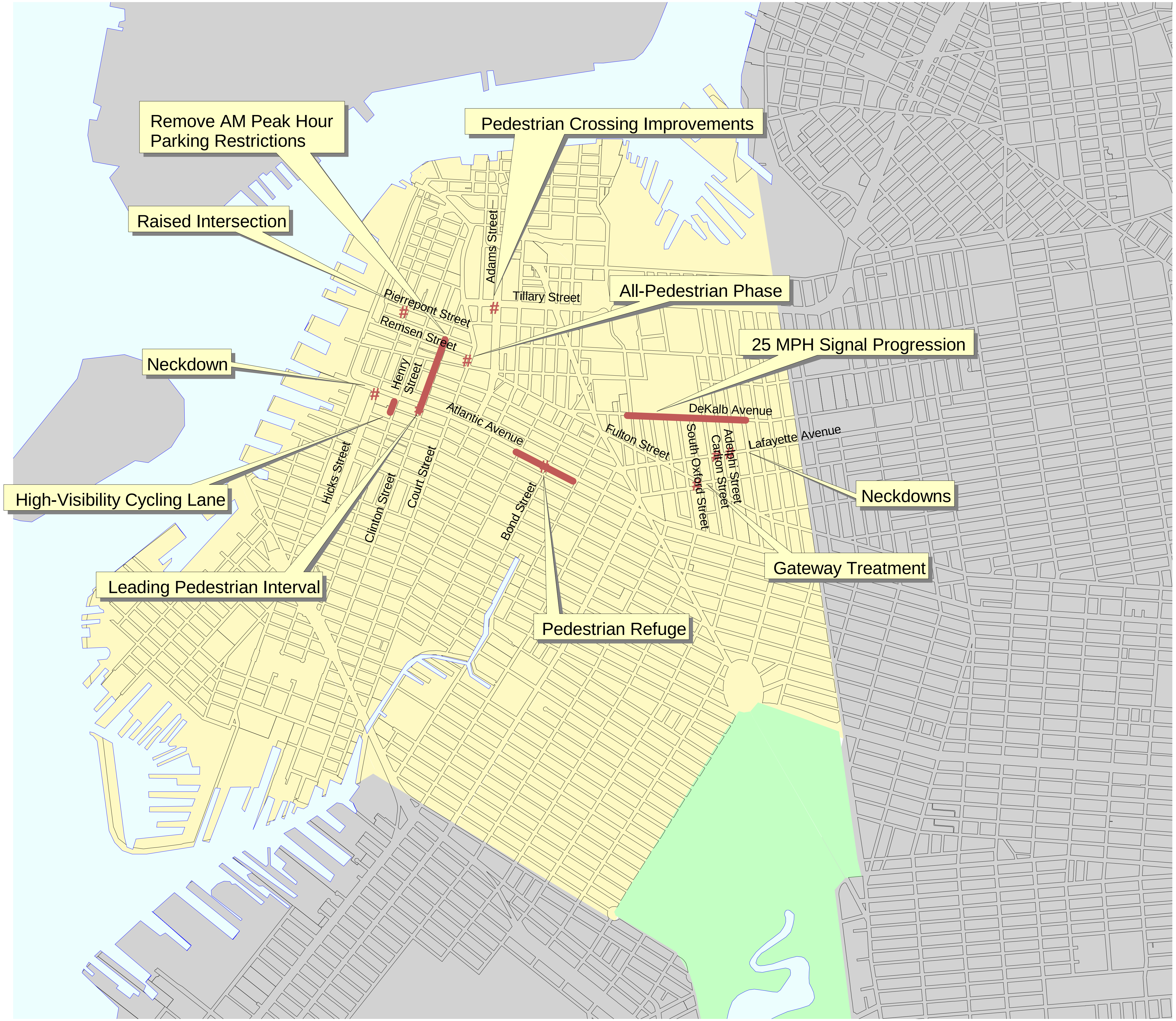
An initial set of potential pilot program treatments was developed in consultation with the community and shared with the Brooklyn Borough President's Task Force. While the scope of this initial set of treatments was consistent with the funds available in the project contract, members of the task force indicated a strong desire to implement a broader set of measures for the pilot program. Accordingly, NYCDOT reviewed the funding arrangements for its broader traffic calming program (of which this study is part) and allocated an additional amount for development and implementation of the pilot program utilizing funding supplied by Assembly Member Joan Millman.

An expanded set of pilot program measures was presented to the Brooklyn Borough President's Task Force and thereafter to Community Boards 2 and 6. The expanded set of measures is shown in *Figure 6.1* (see next page), summarized in *Table 6.2*, and described below. The project Task Force and Community Boards 2 and 6 endorsed the pilot program, with the exception of proposed neckdowns on Court Street at President and Carroll Streets. These latter measures, although endorsed by Community Board 6's Transportation Committee, were rejected by the full board of Community Board 6, based on perceived accident risk, loss of parking (each scheme would have resulted in the loss of two spaces) and FDNY maneuverability concerns. Accordingly, these measures were dropped from the pilot program and an additional pair of neckdowns on Lafayette Avenue at Carlton and Adelphi Streets was substituted. The proposed pilot program, with the exception of the two measures rejected by Community Board 6 and with the additional measures on Lafayette Avenue, were taken through the design process and constructed by April 2002.

Table 6.2 Candidate pilot program measures

Measure	Location	Status
Widen pedestrian island	Tillary Street/Adams Street	Implemented August 2001
All pedestrian phase ("Barnes Dance")	Court Street/Remsen Street	Implemented December 2000
Raised intersection	Hicks Street/Pierrepont Street	Implemented October 2001
Neckdown	Atlantic Avenue/Hicks Street	Implemented September 2001
High-visibility on-street cycling lane	Henry Street between Atlantic Avenue and Amity Street	Implemented August 2001 Expanded March 2002 [2]
Leading Pedestrian Interval	Atlantic Avenue/Clinton Street	Implemented 2001
Remove morning peak parking restrictions	Clinton Street north of Atlantic Avenue	Implemented 2001
Road closure (part of reconstruction of water main)	Clinton Street south of Atlantic Avenue	Implemented 2000
Pedestrian island, lane realignment, neckdown	Atlantic Avenue/Bond Street	Implemented April 2002
Neckdown	Fulton Street/South Oxford Street	Implemented October 2001
Neckdown	Lafayette Avenue/Adelphi Street	Implemented October 2001
Neckdown	Lafayette Avenue/Carlton Avenue	Implemented October 2001
Neckdown	Court Street/President Street	Not implemented [3]
Neckdown	Court Street/Carroll Street	Not implemented [4]
Slower signal progression	DeKalb Avenue	Implemented 2001

[2] After the cycling community reacted positively to the October 2001 installation of the high-visibility lane between Atlantic and Pacific, the lane was extended in March 2002 to the block of Henry Street between Pacific and Amity Streets.
[3] Neckdowns at Court/President were part of the original pilot proposal, but were rejected by Community Board #6.
[4] Neckdowns at Court/Carroll were part of the original pilot proposal, but were rejected by Community Board #6.



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LEGEND

Pilot Program Measures

\# Intersections

Corridors

Figure 6.1

Pilot Program Measures

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6.2.3 Design of pilot program treatments

The process of turning concept designs into construction drawings provided rich insights into the issues surrounding implementation of physical measures designed to support a traffic calming program. The team undertook extensive discussions with representatives of various units of NYCDOT. During the process, various design ideas were explored and underlying design philosophies tested. Some compromises were made in the interests of reaching agreement on the pilot program designs; these are discussed below in relation to each of the treatments.

In addition, the emergency service agencies – FDNY and NYPD – had to be reassured that their vehicles could negotiate physical treatments designed to slow and control traffic. By their nature, such treatments cannot differentiate between the movements of general road users and the needs of emergency and other service users. This is an issue inherent to traffic calming and one whose resolution depends partly on appropriate design and partly on building confidence on the part of those affected that their interests have been protected.

The process of designing the neckdown at Hicks Street and Atlantic Avenue illustrates how the team worked with emergency services users. As part of the design development process, meetings were held with FDNY representatives and a field trial was set up designed to determine the physical requirements of FDNY vehicles. The field trial demonstrated that the design for seven-foot-wide neckdowns was generally appropriate for the types of FDNY vehicles used in the area, but in the interest of building confidence within FDNY that they could negotiate these devices, the width of the neckdown at Hicks Street and Atlantic Avenue was reduced to six feet. Although some of the effectiveness of the devices in relation to controlling general traffic was sacrificed, the likelihood that emergency services and Sanitation Department users would find them acceptable increased.

Figure 6.2 Example of pilot information sign, Hicks Street and Pierrepont Street

Another key factor in the design process was the requirement that traffic calming devices must follow a set of guidelines called the Manual of Uniform Traffic Control Devices (MUTCD). The Federal Highway Administration (FHWA) publishes the MUTCD, which contains all national design, application, and placement standards for traffic control devices. The purpose of these devices, which includes signs, signals, and pavement markings, is to promote safety, efficiency, and uniformity so that traffic can move efficiently on the Nation's streets and highways. The manual gives certain criteria that should be met before NYCDOT can use a particular device. The MUTCD is a dynamic document because standards change to address travel patterns and road conditions, and to incorporate technology and materials advancements. The job of totally rewriting the manual is undertaken about every 10 to 20 years. The FHWA has previously relied on periodic updates, usually every 2 to 3 years, to revise existing manuals. For example, the 1988 edition has been updated 7 times. It is recommended that the MUTCD be updated to reflect the increased use of traffic calming devices and to provide statutory support for their implementation.

6.2.4 Signage

To make the public aware of traffic calming treatments, signs were installed at each pilot location. These signs are 11”x17”, with white text on a blue background, and were mounted either on existing lampposts and driverails or on new driverails adjacent to each pilot treatment. *Figure 6.2* shows the sign installed at Hicks Street and Pierrepont Street as an example. *Appendix G1* contains images of each sign installed as part of the pilot program[5].

6.2.5 Monitoring program

In order to evaluate the effectiveness of the pilot program, a before-and-after survey program was established. It was important that the survey program be as focused and effective as possible. In addition, since the World Trade Center disaster occurred before “after” surveys could be conducted, the resulting change in traffic patterns and levels required the amendment to some of elements of the survey program. It was concluded that while traffic volumes at individual locations would have changed as a result of the Trade Center disaster, local speed and other behavioral factors would not. Accordingly, the survey program focused on these speed and behavioral issues. In any event, it is clear that a small number of isolated treatments would not have a substantial impact on traffic volumes and so collecting traffic volume data would have been an inefficient use of resources.

Table 6.3 summarizes the data collected to monitor the performance of the pilot program.

[5] In January 2002, pilot information signs were updated to read *Mayor Michael R. Bloomberg*.

Table 6.3 Monitoring of Final Pilot Program

Measure	Location	User Survey	Video Monitoring	Speed Survey
Widen pedestrian island	Tillary Street/Adams Street	X	X	
All pedestrian phase ("Barnes Dance")	Court Street/Remsen Street	X	X	X
Raised Intersection	Hicks Street/Pierrepont Street	X	X	X
Neckdown	Atlantic Avenue/Hicks Street	X	X	X
High-visibility on-street cycling lane	Henry Street		X	
Leading Pedestrian Interval	Atlantic Avenue/Clinton Street	X	X	
Remove morning peak parking restrictions	Clinton Street north of Atlantic Avenue			[6]
Road closure (part of reconstruction of water main)	Clinton Street south of Atlantic Avenue			X[7]
Pedestrian island, lane realignment, neckdown	Atlantic Avenue/Bond Street	X	X	X
Neckdown	Fulton Street/South Oxford Street	X	X	X
Neckdown	Lafayette Avenue/Carlton Street	X	X	X
Neckdown	Lafayette Avenue/Adelphi Street	X	X	X
Slower signal progression	DeKalb Avenue		X	X

6.2.6 Construction issues

Construction of the pilot program measures was part of the scope of the consultant's service on this study. Arup satisfied this component of the scope by procuring a contractor, Westmoreland Construction, to install the treatments designed in concert with NYCDOT.

A number of implementation issues arose because of the peculiarities of this procurement process. Since some of these have general relevance to implementing traffic calming devices, they are briefly reviewed below.

6.2.6.1 Limited scope of traffic calming implementation/construction

It proved difficult to find contractors willing to bid for a construction program with the limited scope of the pilot program. While this did not prove insuperable, it was somewhat difficult to obtain adequate competitive bids for this project. This may be a problem for future small-scale, neighborhood-based applications in New York City. It may be prudent to develop a "where and when" contract for these types of installations.

6.2.6.2 Permitting and coordination requirements

The permitting requirements proved particularly onerous for a construction project of this size. Once NYCDOT was satisfied with the design of the pilots, a variety of construction permits were required from the DOT, New York City Department of Environmental Protection (NYCDEP), and New York City Transit (NYCT). In the end, this process was so time-consuming that Westmoreland Construction chose to use an expediter to obtain permits even though it knew the expediter's fee could not be paid by this project.

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[6] Data on traffic volume throughout the northbound corridor between the BQE and Fourth Avenue was collected to monitor the extent to which traffic unable to use Clinton Street either changed to parallel routes, or stopped driving through Downtown Brooklyn altogether. These data are presented in *Appendix C*.

[7] Results of these speed surveys are discussed in *Section 7.2.3.5*.

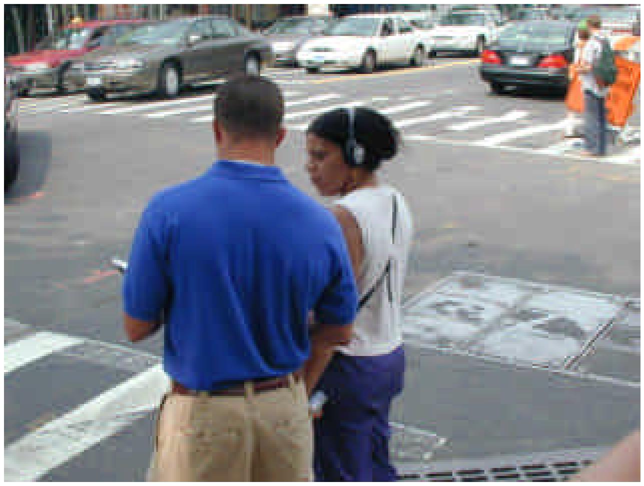
Coordination within and between authorities also proved difficult for a project of this size. The contractor needed to coordinate its construction with utilities, NYCDEP, and NYCT, all of whom own utilities in Brooklyn's roadways; and the New York City Department of Design and Construction (DDC), which was reconstructing the water main on Atlantic Avenue.

6.3 Evaluation

This section describes each traffic calming device and its implementation in detail, and evaluates its impact. The following surveys were undertaken to evaluate the impacts of each pilot measure:

- **Speed surveys** – Taken before and after implementation, these surveys measure the median and 85th percentile travel speeds of vehicles traveling past each measure. As with all traffic speed data, the median reading represents a typical driver, while the 85th percentile helps define safe travel speeds and represents the upper end of the speed profile – the drivers most likely to cause accidents. Note that speed data were only collected at intersections and blocks where speed reduction was a goal or an expected outcome of the traffic calming measure.
- **Video surveys** – Taken before and after implementation, these videos provided an opportunity to observe any significant changes in driver and pedestrian behavior that resulted from the pilot measures.
- **User surveys** – At all but two pilot locations, a mix of mailbox-dropped and face-to-face surveys were conducted, asking residents, merchants, and pedestrians their opinions on the pilot traffic calming treatment. At least 50 people at each location were asked whether each measure was a good idea, whether it influenced driver and pedestrian behavior, whether it made pedestrians safer, and whether it was effective at meeting its overall goal. The responses provided an important gauge of the public's understanding and acceptance of various treatments. User surveys were not conducted at the Henry Street blue cycling lane and the DeKalb Avenue 25 m.p.h. speed progression because of the difficulty of distributing questionnaires to the primary targets of these measures - cyclists and motorists, respectively.

Figure 6.3 User surveys underway at Atlantic Avenue and Bond Street, July 2002



6.3.1 Tillary St/Adams St: Pedestrian Refuge

6.3.1.1 Design

The pedestrian refuges at this location are actually widenings of the existing raised medians in the east and west (Tillary Street) legs of the intersection. The existing medians were 11’3” medians and terminated at the east and westbound stop bars, respectively. The pilot project doubled the width of these medians at the crosswalk to 22’6”, and extended them 10’ into the intersection. An at-grade channel was provided for pedestrians, and three steel bollards were installed at the end of the median extension to further protect pedestrians from turning vehicles.

6.3.1.2 Evaluation

Video Surveys

Evaluation of the impacts of this measure on pedestrian behavior has been difficult because the crosswalk on the west leg of the intersection has been closed since mid-2001 due to the construction of the Federal Courthouse. Only the east leg of the intersection can be compared to its pre-pilot condition. Video surveys showed pedestrians waiting on the refuge, rather than standing off the curb in the path of left-turning vehicles, as they had prior to the median installation. However, these surveys also showed that southbound pedestrians still attempt to cross Tillary Street against “Don’t Walk” signals – a maneuver that puts them in the path of vehicles turning left off the Brooklyn Bridge.

Figure 6.4 Pedestrian refuge on west leg of Tillary Street – Adams Street intersection

User Surveys

While the long-term strategy for the Tillary Street-Adams Street intersection remains unresolved (see *Section 7*), the user surveys revealed strongly positive attitudes about the particular pilot measure. The surveys showed that:

- 66% of respondents said drivers turn more slowly
- 84% said drivers are more aware of pedestrians
- 98% said pedestrians are safer
- 96% said pedestrians have better opportunitie s to cross
- 88% said the sidewalk environment had been improved

These surveys encourage the notion that reclaiming unused road space can begin to restore pedestrian safety and confidence at major Travel Street intersections, with no loss of traffic capacity.

6.3.1.3 General Application

Enlarging medians and installing bollards clearly increases pedestrians' visibility, confidence, and feeling of safety. However, the ongoing jaywalking problem is a concern. This is due to a unique timing pattern that protects left turns from each leg of the intersection, and contains short Walk phases that often mean slow moving pedestrians use the median refuge. At Tillary Street and Adams Street, because of the heavy turning movements leading to and from the Brooklyn Bridge, retiming signals to give extra time to these slow-moving pedestrians is impossible, however, without reducing the intersection's vehicular capacity.

6.3.2 Court Street/Remsen Street: All-Pedestrian Phase

6.3.2.1 Design

The all-pedestrian phase was designed to regularize pedestrian crossing at an extremely busy crosswalk with a chronic jaywalking problem. Instead of displaying Walk signs only when parallel traffic signals are green, the pilot timing plan provides three distinct signal phases:

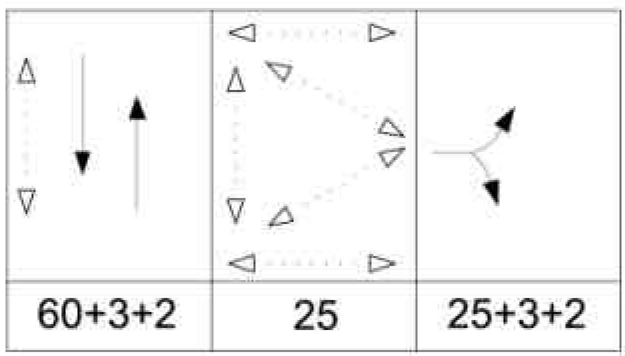
i. Green indication to north-south traffic on Court Street, Walk indication to north-south pedestrians crossing Remsen Street (65 seconds)

ii. All-pedestrian phase: Red indication to all traffic, Walk indication to all pedestrians. (25 seconds)

iii. Green indication to eastbound traffic turning off Remsen Street, Don't Walk indication to all pedestrians (30 seconds)

This phasing plan is illustrated in *Figure 6.5*.

Figure 6.5 Pilot signal timing at Court Street and Remsen Street, showing the time (in seconds) given to green, yellow, and all-red indications in each phase



No construction or capital costs were incurred in relation to with this treatment.

6.3.2.2 Evaluation

Video Surveys

The Court Street /Remsen Street pilot measure aims to separate pedestrian movement from conflicts with vehicles turning off Remsen Street. It succeeds in that there is now a conflict-free pedestrian move across Court Street, and a greater sense of pedestrian priority at the intersection. This has not impacted vehicle throughput, since turning volumes from Remsen Street have always been minimal, but it removes the conflict between pedestrians and turning vehicles. However, this has come at a cost – pedestrians on Remsen Street, however, are observed to disobey the "Don't Walk" sign in practice, and to begin crossing Court Street during Phase 3 of the cycle, when vehicles are meant to be turning off Remsen Street, rather than waiting for the all-pedestrian phase. . Finally, when the pilot was first implemented in December 2000, it was observed that stopped drivers on Court Street would begin to lurch forward through the intersection at the end of Phase 2, only to stop when they realized they did not get a green light immediately. By the time the video surveys were conducted in May 2002, this was no longer occurring; it was concluded this was because regular drivers (Court Street is used heavily by buses, delivery vehicles, and commuters) became accustomed to the timing change.

Figure 6.6 Court Street and Remsen Street

User Surveys

The most telling statistic revealed by the user surveys at this intersection is only 2% of those surveyed were even aware that an all-pedestrian phase had been introduced. This is evident in video surveys that show rampant jaywalking against "Don't Walk" indications, causing conflicts with traffic on both Court Street and Remsen Street. Once it was described to them, 74% of users thought the all-pedestrian phase significantly improved pedestrian safety. On the other hand, users perceived the fact that the measure was not well-observed – only 28% said it significantly changed driver behavior, and only 30% said it significantly changed pedestrian behavior.

6.3.2.3 General Application

In New York City, where pedestrians tend to cross whenever parallel traffic streams have green indications (rather than waiting for their "Walk" indications), simple signage may be necessary to describe a unique signal plan like the one introduced at Court Street and Remsen Street to pedestrians and drivers. Also, the initial problem of vehicles lurching forward as soon as opposing traffic movements received red indications could be solved by simply adding a standard MUTCD "Delayed Green" sign above the signal head.

6.3.3 Hicks Street/Pierrepont Street: Raised Intersection

6.3.3.1 Design

The intersection of Hicks and Pierrepont Streets was raised two inches to reinforce the low-speed, Living Street nature of Hicks Street and Pierrepont Street. The height of the raised intersection was a focus of much discussion. Community and advocacy groups, such as Transportation Alternatives, believed the intersection should be raised four inches in order for the treatment to control travel speeds and driver behavior.. This height is commonly adopted in this situation around the world. However, NYCDOT was concerned that adoption of this height would raise the pavement to sidewalk level, thereby blurring the distinction between road and sidewalk, and that such a grade change would impact on traffic operations. For test purposes, DOT determined that two inches was appropriate. In order to maintain safe conditions for pedestrians crossing the roadway, curb lines were rebuilt with ramps at an 8.33% grade. Road striping, "Stop," and "Bump" signs were installed to indicate the raised intersection to oncoming motorists. In 2002, the raised intersection was removed and a traffic signal was installed. This is discussed in *Section 6.3.3.3*.

Figure 6.7 Raised intersection at Hicks Street and Pierrepont Street

6.3.3.2 Evaluation

Speed Surveys

Both before and after surveys were taken in off-peak periods when traffic was flowing freely. Speed data showed a substantial reduction in median speed on Hicks Street, but not in 85th percentile speed. . Therefore, the raised intersection slowed most drivers down, but had no effect on the fastest 15% of drivers.

Table 6.4 Vehicle Speeds on Hicks Street north of Pierrepont Street

Data Collected	*Median Speed (mph)*	*85th Percentile Speed (mph)*
10/5/99 (before)	25	30
7/3/02 (after)	21	30
Percent Change	- 16%	0%

Video Surveys

Video observation of the raised intersection showed some positive impacts on traffic behavior, but also revealed a negative impact on the neighborhood environment. The positive impact was that the raised intersection, along with the “Stop” sign, caused most northbound drivers on Hicks Street to at least slow down, if not stop, at the stop bar. In particular, turning movements seemed to be slowed particularly by this measure, especially when pedestrians were present. On the negative side, the installation of a pure asphalt raised intersection did not perform well from a noise point of view – a lip developed at the north (upstream) end of the intersection, where the roadway sloped back down to grade. This lip caused heavy vehicles to drop back to grade loudly, just when they were accelerating away from the intersection. The sound was clearly a nuisance to residents and unacceptable on a Living Street.

User Surveys

The user surveys showed that pedestrians perceived a real change in the behavior and travel speed of drivers in the Hicks Street corridor. When asked whether cars turned more slowly on Hicks Street, 46% said "Significantly," and 31% said "Slightly." Asked if the raised intersection slows traffic, 54% said "Significantly," and another 37% said "Slightly." When traffic data shows a reduction in speed, and that reduction is perceived by over 75% of pedestrians, the sense of a Living Street environment can be seen to emerge. At the same time, the noise caused by the lip at the upstream end of the intersection detracted from this environment; indeed, even respondents who praised the pilot measure's effect on travel speeds criticized the noise it created in a dense residential area. Such concerns need to be addressed (see *Section 6.3.3.3* below) if traffic calming is to be generally accepted.

6.3.3.3 General Application

Provided noise and other impacts can be managed, coupling a raised intersection with a legal speed control like a "Stop" sign or a traffic signal can reinforce the message to drivers that they are traveling through a slow-speed zone and should behave accordingly. Wherever warrants for a "Stop" or signal are met at proposed speed table locations, they should be installed to strengthen the sense of the Living Street. As for the noise problem, it is clear that raised intersections need to be constructed with a concrete base, not simply with asphalt. Ramps should be graded to return drivers to the base road elevation gently; in terms of slowing through traffic, the vertical deflection at the upstream end is more important than that at the downstream end. Finally, DOT should consider allowing a higher raised intersection. The international standard of 4" would bring traffic closer to curb level – a condition that would actually signal to drivers that they should slow down.

Since the pilot installation, a traffic signal has been installed at the Hicks Street/Pierrepont Street intersection. In general, there is no conflict between traffic signals and the various forms of physical traffic calming treatment that might be implemented at this intersection, in particular:

- Neckdowns
- Raised crosswalk
- Raised intersection
- Textured or colored pavement

However, due to community concerns about noise at the raised intersection, it was removed once the signal was installed.

6.3.4 Hicks Street/Atlantic Avenue: Neckdown

6.3.4.1 Design

The Hicks Street /Atlantic Avenue treatment was originally planned as a full gateway treatment on the north leg of the intersection, combining a color-textured raised crosswalk and a 7 foot wide neckdown to signal to drivers that they were entering a Living Street environment. Because there is a firehouse on Hicks Street two blocks north of Atlantic Avenue, FDNY expressed concern that their trucks would not be able to negotiate the neckdown. Though a field trial with cones placed 7 feet from the west curb of Hicks Street showed that the largest truck housed at the Hicks Street firehouse could negotiate the neckdown, the measure was reduced to 6 feet to provide FDNY with an added level of comfort. After the neckdown was installed in September 2001, DOT chose not to proceed with the raised crosswalk. Instead, the final installation of the brick red color-textured marking in the crosswalk was completed in October 2001. In April 2002, this marking was removed in the east half of the crosswalk when DDC temporarily resurfaced Atlantic Avenue as part of its water main replacement project.

6.3.4.2 Evaluation

Speed Surveys

Speed data showed a surprising, and counterintuitive, result of the Hicks Street neckdown – that vehicles actually travel faster once they are past the measure. This is likely due to the fact that the neckdown introduces an additional choke point at an intersection that is already a traffic bottleneck. While the neckdown may discourage opportunistic drivers from cutting through Living Streets to make regional trips, those drivers who choose to go north may be so frustrated by the measure and the jockeying for position it causes (see *Section 6.3.4.3*) that they speed up once they are past it.

Table 6.5 Vehicle Speeds on Hicks Street north of Atlantic Avenue

Data Collected	Median Speed (mph)	85th Percentile Speed (mph)
4/19/01 (before)	20	26
7/3/02 (after)	23	34
Percent Change	+ 13%	+ 31%

Video Surveys

Video surveys showed little improvement in driver behavior through the necked-down north leg of the intersection. Before the pilot installation, two lanes of traffic proceeded northbound through the intersection in peak periods, only to merge down to one lane one block north on Hicks Street, between Atlantic Avenue and State Streets. Narrowing the intersection seems to have displaced this problem southward – instead of merging north of Atlantic Avenue, drivers jockey for position in the intersection itself, swinging close to the crosswalk (see *Figure 6.8).* While this maneuver is illegal (the three lanes of the Hicks Street approach from the south are striped as left, through, and right), and traffic does not move at high speeds in the peak due to downstream congestion, the pilot has not regularized the through movement.

Although the crossing distance is already short across Hicks Street, the neckdown allows pedestrians to wait safely off the main line of the sidewalk, allowing a quicker crossing. This helps them navigate the traffic conditions described above.

Figure 6.8 Looking south on Hicks Street at Atlantic Avenue: Vehicles jockey for position

Figure 6.9 Color-textured crosswalk at Hicks Street and Atlantic Avenue before its removal

User Surveys

The goal of the Hicks Street/Atlantic Avenue neckdown was to differentiate between two types of road – Atlantic Avenue, a Travel Street with direct access to the BQE, and Hicks Street, a Living Street with primarily residential character. This differentiation would manifest itself most in the perception that vehicle speeds were decreasing as motorists entered the Living Street area. As noted above, this speed reduction did not occur. However, it is interesting that despite an objective increase in travel speeds north of Atlantic Avenue, some 20% of pedestrians perceived a significant speed *decrease* due to the neckdown – probably a simple, positive response to the idea that something was being done about speeding traffic. At the same time, users do perceive some benefits for pedestrians – 49% said the neckdown significantly improved crossing opportunities, and 53% said it significantly improves the visibility of pedestrians at the intersection.

6.3.4.3 General Application

In general, traffic calming devices work best when they are self-enforcing. So, while the neckdown forces traffic to form a single lane on northbound Hicks Street, it cannot prevent drivers from ignoring striped lanes as they approach from the south, nor can it prevent them from speeding once they pass the choke point. However, as at the Court Street/Remsen Street intersection, signage may help reinforce the fact that the neckdown signals entry into a Living Street environment. Further downstream, additional measures such as mid-block narrowing, speed tables, or chicanes) may be necessary to slow drivers down on Living Streets.

The partial removal of the red color-textured crosswalk on Hicks Street points to a need for NYCDOT to raise the profile of traffic calming measures and educate its own and other agencies' contractors on how to install and maintain them.

6.3.5 Henry Street/Atlantic Avenue: High-Visibility Bicycle Lane

6.3.5.1 Design

This measure involved resurfacing one 170 foot long block of the existing Henry Street bike lane from Atlantic Avenue to Pacific Street using a color-textured pavement treatment. The new lane is five feet wide, including a four-inch wide white stripe separating the bike lane from the travel lane, and runs from Atlantic Avenue to Pacific Street. The color-textured material used on this block is the epoxy-and-aggregate compound "TyreGrip," marketed by Traffic Safety Systems. The surface is now bright blue and has a granular texture. After the August 2001 installation of this treatment, DOT received positive feedback from the cycling community and requested that the next block of the Henry Street bike lane (between Pacific and Amity Streets) be converted to a high-visibilty surface. However, because the TyreGrip surface had already begun to fail – it did not adhere properly to the asphalt due to oily residues and bituminous materials on the surface – and because of its rough texture a different product was chosen. The new product, "ColorSet," marketed by Statewide Paving and Striping, is also an epoxy-and-aggregate compound with a slightly brighter blue hue, granular texture, and better skid resistance. This second installation, completed in March 2002, has been successful: it has retained its bright color and smooth texture and there is no evidence of breakdown of the surface.

Figure 6.10 Blue bike lane on Henry Street, between Pacific Street and Amity Street

6.3.5.2 Evaluation

Video Surveys

The increased visibility of the bike lane has reduced drivers' tendency to encroach on cyclists' space on Henry Street. The "before" video showed cars and trucks frequently straddling the nearly-invisible white stripe of the bike lane, especially when ambulances serving Long Island College Hospital were laying over on the east curb of the street. The introduction of the blue lane has resulted in increased compliance with regulations. Today, the only violators seem to be the occasional trucks that need to swerve into the lane to avoid parked ambulances.

6.3.5.3 General Application

Due to their low cost, positive effect on lane discipline, and popularity among cyclists, color-textured lanes should be explored elsewhere in New York City, especially where lane discipline problems exist. The experience with TyreGrip at this location, however, indicates that any product deployed on a busy, multiuse street needs to be simple to install and durable. TyreGrip's specifications required a nearly perfectly-clean, dry road surface, something the contractor could not achieve even by powerwashing the road. Products like ColorSet, which are able to adhere to suboptimal pavement surfaces, are always preferred when working in urban areas, where streets are used too intensely and vary too much in surface condition to expect ideal installation conditions.

6.3.6 Clinton Street/Atlantic Avenue: Leading Pedestrian Interval

6.3.6.1 Design

The Leading Pedestrian Interval (LPI) at Clinton Street and Atlantic Avenue was installed to give pedestrians crossing Atlantic Avenue a head start before vehicles making the heavy left and right turn movements onto Atlantic Avenue begin turning. Walk indications for north- and southbound pedestrian movements across Atlantic Avenue are now displayed five seconds sooner than the

Green indication for northbound traffic (there is no southbound traffic because Clinton Street is one-way northbound). The new signal cycle consists of the following phases:

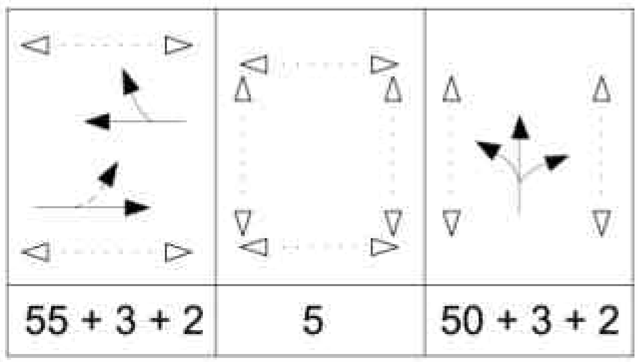
i. Green indication for east-west traffic on Atlantic Avenue, "Walk" indication for east-west pedestrians (60 seconds)

ii. Leading pedestrian interval: Red indication for all vehicular traffic, "Walk" indication for north-south pedestrians crossing Atlantic Avenue (5 seconds)

iii. Green indication for northbound traffic on Clinton Street, "Walk" indication for north-south pedestrians (55 seconds)

This phasing plan is illustrated in *Figure 6.11*.

Figure 6.11 Pilot signal timing at Clinton Street and Atlantic Avenue, showing the time (in seconds) given to green, yellow, and all-red indications in each phase



No construction or capital costs were incurred in implementing this treatment.

Figure 6.12 Using the leading pedestrian interval to cross Atlantic Avenue at Clinton Street

6.3.6.2 Evaluation

Video Surveys

Public response to the LPI has been almost universally positive. Video surveys at this location bear out the frequently heard comment that the new signal timing gives pedestrians more confidence when crossing Atlantic Avenue. The before video showed that many pedestrians had to wait to cross, either on the curb or on the centerline, for turning vehicles to clear the intersection. After the LPI was installed, virtually all pedestrians are able to cross before turning vehicles proceed. The exceptions were slow-moving pedestrians trying to cross the west leg of the intersection in the path of left-turning vehicles, who are not able to reach the centerline before drivers start turning left. It should also be noted that the after videos were shot while construction was taking place elsewhere on Atlantic Avenue, meaning that drivers who would normally turn onto Atlantic Avenue may have continued north on Clinton Street instead to avoid construction downstream.

User Surveys

User surveys confirmed the anecdotal evidence that the LPI was popular with pedestrians: 89% said the measure increased pedestrian safety at the intersection and 96% said it increased pedestrian crossing possibilities. However, only 35% said the measure improved driver behavior even slightly. And many respondents said the LPI actually decreased traffic throughput on Clinton Street, causing a honking problem during the morning peak hour – current signal timings already give cars much shorter phases (30 seconds) at Atlantic Avenue than at upstream intersections (60 seconds at Pacific Street, for example).

6.3.6.3 General Application

LPIs are an inexpensive way to improve pedestrian safety and crossing conditions at busy intersections, particularly at intersections where a wide street with heavy traffic and the majority of the signal cycle split intersects a narrow street with less traffic. Indeed, the areawide strategy recommends them for all intersections along Atlantic Avenue from Hicks to Hoyt Streets. However, since LPIs are typically timed to take green time away from the low-traffic street, the impacts on upstream intersections should be considered. In the case of Clinton Street, simply "feathering" northbound traffic (giving drivers slightly less green time at successive intersections in a corridor in order to store vehicles evenly across intersections – a strategy the DOT uses with great success in peak hours at the north end of 4th Avenue) would decrease the driver frustration and honking at the Atlantic Avenue intersection.

Finally, the pilot LPI gave pedestrians a 5-second head start to cross Atlantic Avenue. While this is enough time for most pedestrians to make enough progress across the intersection so that drivers do not try to cut them off, at times the first car in the queue on Clinton Street turns left in front of pedestrians. Ideally, the phase would be lengthened at intersections where the pedestrians cannot reach the centerline of the major roadway in 5 seconds (when left-turning traffic begins to move), such as Atlantic Avenue and Clinton Street. However, this would further reduce vehicle throughput on the minor street.

6.3.7 Bond Street/Atlantic Avenue: Pedestrian Refuge

6.3.7.1 Design

The Bond Street /Atlantic Avenue pilot measure was originally planned to consist of a 12-foot wide raised concrete median refuge in the east leg of Atlantic Avenue and a 7-foot wide neckdown on the west side of the north leg of Bond Street, which is one-way northbound. To allow traffic to pass the refuge safely, eastbound lanes on Atlantic Avenue had to be restriped so they tapered away from the centerline as they approach Bond Street from the west, and tapered back toward the centerline as they continue to the east. This required the removal of a total of ten metered parking spaces from the south curb of Atlantic Avenue on each side of Bond Street. In keeping with DOT policy, the taper was designed to comply with the 85th percentile observed speed on Atlantic Avenue, which in 2000 was 38 mph. This raised some objections among Atlantic Avenue merchants, who believe that the road should be designed physically for a lower travel speed.

Figure 6.13 Using the pedestrian refuge to cross Atlantic Avenue at Bond Street

Because of the scheduled reconstruction of Atlantic Avenue, NYCDOT elected to proceed with the refuge, but not with the neckdown on Bond Street. DOT also decided to introduce eight full-time parking spaces on the west curb of Bond Street between Atlantic Avenue and Schermerhorn Street – parking spaces that were previously marked "No Standing 7-10 a.m." The refuge, whose western limit is flush with the east curb of Bond Street, contained a pedestrian channel and three steel bollards to protect pedestrians from oncoming traffic. It broke the 60-foot crossing distance on Atlantic Avenue into two legs – 26 feet wide north of the refuge, and 20 feet wide south of the refuge. DDC installed this measure as part of the temporary road surface during water main construction. When the road was rebuilt permanently in August 2002, DDC and NYCDOT agreed that the pedestrian refuge should be removed, but the proposed neckdown on Bond Street – which was not installed in the pilot program – would be installed.

6.3.7.2 Evaluation

Speed Surveys

Speed surveys show that the horizontal deflection created by the pedestrian refuge has had an effect on travel speeds. Under free-flowing midday traffic conditions, both median and 85th percentile speeds fell as a result of this measure.

Table 6.6 Vehicle Speeds on eastbound Atlantic Avenue east of Bond Street

Data Collected	Median Speed (mph)	85th Percentile Speed (mph)
3/20/01 (before)	30	36
6/27/02 (after)	28	33
Percent Change	- 7%	- 8%

Video Surveys

The installation of a pedestrian refuge introduced a driver discipline problem on Atlantic Avenue and Bond Street. When the refuge was designed, existing travel lanes were realigned to allow traffic to flow around it. This means that drivers who formerly traveled parallel to the Atlantic Avenue curb should have now traveled a path that tapered toward the curb as they approached Bond Street and back toward the centerline as they drove away from it.

However, the video surveys showed that eastbound drivers were not following the tapered lane striping but rather taking a straight-line course through the intersection. This may be because the refuge exists nowhere elseon Atlantic Avenue, and because drivers have clear sightlines for several blocks beyond the intersection, with no parking maneuvers to block their view.

Due to the shorter crossing distance between sidewalk and refuge, pedestrians were observed to cross against the "Don't Walk" sign when traffic gaps occurred on either side of Atlantic Avenue.

User Surveys

Surveys showed that user perceptions of the pedestrian refuge were mainly negative in changing the use of the street space at Atlantic Avenue and Bond Street. Only 4% said the measure improved crossing time or distance significantly, only 13% said it improved crossing opportunities significantly, and 57% said the measure had no impact on driver behavior. On the other hand, 71% said the measure improved pedestrian visibility at least slightly.

In addition to the formal surveys of pedestrians, merchants along Atlantic Avenue also complained that the loss of parking along the south curb of Atlantic Avenue and the loss of the bus stop on the southeast corner made their businesses less accessible and degraded the quality of the street's pedestrian environment by bringing high-speed traffic right up to the curb. Many of these businesses are furniture and antique stores that depend on high turnover parking and loading in front of their doors.

6.3.7.3 General Application

As noted in *Section 6.3.1* (regarding the Tillary Street-Adams Street measure), pedestrian refuges may be an effective way of reclaiming unused streetspace on Travel Streets for pedestrians. Such reclamation may be a "win-win" situation, in which pedestrians' visibility and safety is improved with no loss in traffic capacity. However, the application on Atlantic Avenue involved a trade-off – not between safety and capacity, but between safety in the crosswalk and safety on and accessibility to the fronting land uses. While the refuge may have improved crossing conditions slightly, the lane shift forced parking to be removed from the curb, making pedestrians on the sidewalk feel exposed and less safe. Moreover, the loss of parking and the bus stop made the blocks adjacent to Atlantic Avenue and Bond Street less accessible, creating concern among the local merchants. In general, street reclamation measures should be focused on win-win locations like Tillary Street before locations like Atlantic Avenue, which require tradeoffs.

6.3.8 Fulton Street/South Oxford Street: Gateway Treatment

6.3.8.1 Design

The gateway treatment at Fulton and South Oxford Streets was originally planned to include two 7-foot neckdowns, one on either side of South Oxford Street, steel bollards to protect pedestrians, and a raised crosswalk with a blue color-textured surface. The goal was to manage the behavior of turning drivers (in terms of speed and turning path) by signaling the transition from a busy Community Street, Fulton Street, onto a quiet Living Street, South Oxford Street. This measure was constructed to plan in October 2001. However, a week after it was installed, the raised crosswalk was inadvertently paved over by an NYCDOT road maintenance crew resurfacing South Oxford Street. The neckdowns, and bollards remain intact. The neckdowns narrow what used to be a 32-foot wide crosswalk that allowed sweeping turns into a tight, 18-foot wide entrance into a Living Street. Located directly above the Lafayette Avenue subway station, this measure presented an additional civil engineering challenge, as an existing catch basin on New York City Transit property had to be relocated.

Figure 6.14 Gateway treatment at Fulton Street and South Oxford Street

6.3.8.2 Evaluation

Speed Surveys

While the community perceived a travel speed problem at this intersection, the actual safety problem was not the speed, but rather the wide sweeping movement of turning traffic. Travel speeds on South Oxford Street, never dangerously high before the pilot program, were virtually unchanged after the gateway was installed. A one mile per hour (mph) increase in median speed was offset by a two mph decrease in 85^{th} percentile speed. Possibly, more aggressive drivers are slowed slightly by this measure, but the data collection indicated that speed was a perceived problem, not an actual problem on South Oxford Street, before or after the pilot measure.

Table 6.7 Vehicle Speeds on South Oxford Street north of Fulton Street

Data Collected	*Median Speed (mph)*	*85th Percentile Speed (mph)*
3/29/01 (before)	25	30
7/10/02 (after)	26	28
Percent Change	+ 4%	- 7%

Video Surveys

As expected, by narrowing the entrance to South Oxford Street, the gateway treatment has improved the discipline of turning drivers. Before the gateway treatment, drivers turning right off westbound Fulton Street were able to make a sweeping turn along the curb, running nearly parallel to pedestrians crossing South Oxford Street. Westbound pedestrians could not see these cars coming. With the gateway treatment in place, drivers do not start turning until they are perpendicular with South Oxford Street. The smaller turning radius slows drivers slightly, and also forces them to drive through the crosswalk perpendicular to pedestrians, giving both users of the road space (drivers and pedestrians) better views of one another. In this sense, the measure succeeds in managing turning traffic.

User Surveys

User surveys revealed a new perception of the relationship between pedestrians and vehicles at the intersection – 96% said it increased pedestrian opportunities to cross South Oxford Street, 88% said the gateway increased pedestrian visibility, and 83% said it gave priority to pedestrians crossing South Oxford Street. The measure also succeeds at demonstrating how traffic calming measures can differentiate between types of street space – in this case, a Community Street (Fulton Street) from a Living Street (South Oxford Street) – 90% said the measure made them feel that South Oxford Street had a "different character or nature" than Fulton Street.

6.3.8.3 General Application

Fulton Street presents a special challenge because it runs diagonally across the Fort Greene street grid, creating awkward intersections, many of which have more than four approaches. The existing curb lines leave a great deal of road space that could be reclaimed for pedestrians. Rectilinear intersections elsewhere in Brooklyn may be simpler places to install gateway treatments, since less pavement needs to be reclaimed to make turning vehicles slow down when entering Living Streets. This may, however cause problems where gateways are designed to protect Living Streets from Travel Streets. Because westbound Fulton Street had a "No Standing" zone along the curb east of South Oxford Street, turning vehicles could store along the curb while westbound traffic flowed around them. Generally, thought should be given as to how to store at least one turning vehicle at such an intersection, even if the goal is to discourage any but local destination traffic from turning onto the Living Street.

6.3.9 Lafayette Avenue/Adelphi Street and Carlton Ave: Neckdowns

6.3.9.1 Design

Neckdowns on Lafayette Avenue were constructed at two intersections, Adelphi Street and Carlton Avenue. At both intersections, the neckdowns consist of seven foot curb extensions into both sides of Lafayette Avenue and an additional seven foot curb extension into the west curb of the upstream side of the cross street. This design provides the maximum benefit for pedestrians while ensuring that left-turning vehicles off Lafayette Avenue have, at most, one neckdown to negotiate. As at Hicks Street and Atlantic Avenue, the extent of the neckdowns was a concern for DOT and FDNY, but because the streets in this section of Fort Greene are wider and less congested, and because Lafayette Avenue is a two-lane, one-way street that allows large vehicles to make sweeping turns if necessary, the seven-foot width was deemed acceptable. Ramps from the curb to the crosswalk were constructed at a maximum incline of 8.33%.

Figure 6.15 Neckdowns at Lafayette Avenue and Adelphi Street

6.3.9.2 Evaluation

Video Surveys

The primary effect of the Lafayette Avenue neckdowns has been to regularize a practice common among pedestrians at this location – standing in the parking lane while waiting for lights to change. Midday traffic volumes on Lafayette Avenue and its side streets are light, and before the neckdowns, pedestrians felt comfortable standing in the roadway, behind parked cars, while waiting to cross the street – a potentially dangerous situation if cars turn quickly off Lafayette Avenue. The neckdowns provide these pedestrians a safe, legal space to stand, and shorten the crossing distance, with no impact on traffic flow.

User Surveys

The neckdowns at Carlton Avenue and Adelphi Street have increased pedestrians' confidence and sense of safety – 94% said pedestrians felt safer and had better crossing opportunities, and 100% said pedestrians were more visible. Pedestrians, however, had varying perceptions of changes in travel speeds – only 12% said traffic was slowed significantly, but 90% said that, at least sometimes, cars turned more slowly onto Carlton Avenue or Adelphi Street.

6.3.9.3 General Application

While the neckdowns along Lafayette Avenue have succeeded in regularizing a potentially unsafe pedestrian practice, they have not slowed traffic either mid-block or in the crosswalk. While this was not the primary goal of the measure, it does point to the need for further devices downstream to control speeds on Living Streets, especially wide streets like those in Fort Greene. Such measures might include mid-block neckdowns, speed tables, or chicanes.

One design issue that must be addressed in future neckdown construction is the radius of the new curbline at the beginning of the taper back to the original curbline (the far end of the neckdown, away from the intersection). The pilot neckdowns were designed with a 4' radius at both the beginning and end of this taper. This radius proved too tight for the Sanitation Department's normal street sweepers to negotiate, meaning they had to leave a section of the gutter unswept (see *Figure 6.21*). Contrast this with Hicks Street and Atlantic Avenue, where a demonstration was set up using cones that simulated the actual neckdown layout to ensure that FDNY's fire trucks could negotiate the device (see *Section 6.3.4.1)*. The same demonstration should be given to Sanitation Department vehicles; had this been done, the turning radii of the Lafayette Avenue neckdowns would have been larger.

6.3.10 DeKalb Avenue: 25 mph Signal Progression

6.3.10.1 Design

To address a community identified speeding problem on DeKalb Avenue (at one location, initial speed surveys found an 85th percentile speed of 40 mph in a 25 mph zone), the traffic signals along DeKalb Avenue were retimed between Clermont and Flatbush Avenues to ensure safe travel speed. Formerly, there was no standard progression speed on this stretch of DeKalb Avenue. The new signals were set to allow traffic to proceed through a green wave no faster than the speed limit of 25 mph. There was no capital cost associated with implementing this measure.

6.3.10.2 Evaluation

Speed Surveys

The slow speed progression on DeKalb Avenue has not only failed to control speeds, but actually increased them. This may be because drivers are not warned at the upstream end of the new progression that their driving conditions are about to change. Thus, they not only drive at the same speed as they did upstream, but also become frustrated when they fall out of sync with the green band. This is discussed in detail in *Section 6.3.10.3*.

Table 6.8 Vehicle Speeds on DeKalb Avenue west of Washington Park

Data Collected	*Median Speed (mph)*	*85th Percentile Speed (mph)*
10/7/01 (before)	28	34
7/10/02 (after)	31	35
Percent Change	+ 11%	+ 3%

Video Surveys

Apart from changing travel speeds, this measure was also aimed at changing driver behavior. It was expected that once the signal offsets were standardized, drivers would not race from one intersection to the next and await a green light. Rather, it was thought drivers would proceed at the progression speed (25 mph) and remain in the green band. But just as speed surveys showed little difference in travel speed, video surveys showed little difference in driver behavior on DeKalb Avenue. During peak hours, queued vehicles accelerated beyond 25 mph as soon as they saw a green light, only to brake when they came to a red light downstream. After a few seconds, they accelerated again, only to repeat the process at the next signal. This pattern was especially evident along Fort Greene Park, where there are no signals on DeKalb Avenue for three blocks. Drivers would accelerate in this downhill section, only to lose any time they hoped to gain by driving above the speed limit when they came to a red signal at the west end of the park.

User Surveys

The project team attempted to distribute survey forms to drivers traveling west on DeKalb Avenue in the AM peak period. However, few drivers accepted the forms and the team felt it was unsafe to continue to walk in the heavily-traveled roadway handing out the forms. Accordingly, user survey distribution at this location was suspended and there are no results to report.

6.3.10.3 General Application

In order for slower signal progressions to be effective, drivers must be aware of them. DeKalb Avenue east of Clermont Avenue is still timed to allow 38 mph travel, and drivers are given no indication that conditions change west of Clermont Avenue. Without clear signage, signal timing changes may not only be ineffective but actually counterproductive – in this case, the change seems to have promoted slightly faster driving. The New York State MUTCD provides for signage reading "Signals Set For 25 M.P.H[8].," warning drivers of upcoming progression speeds. While the effectiveness of such signage is uncertain, it could be tested at other signal progression changes in the future, to see whether drivers react to timing changes less aggressively.

6.3.11 User Surveys: Summary of common questions

Certain questions were included on all pilot survey forms. The common questions were:

- Are you familiar with the Downtown Brooklyn Traffic Calming Project? (Yes or no)
- Do you think the Downtown Brooklyn Traffic Calming Project is a good idea? (Yes or no)
- Does the recent change in traffic volumes and patterns in Downtown Brooklyn make this particular pilot treatment more or less effective? (More effective, less effective, or the same)
- Were you aware that a pilot program/installation of traffic calming measures was being implemented in general and specifically in this location? (Yes or no)
- Does this measure succeed in its goal (the goal of each measure was described to respondents before the survey began)? (Significantly, slightly, or not at all)

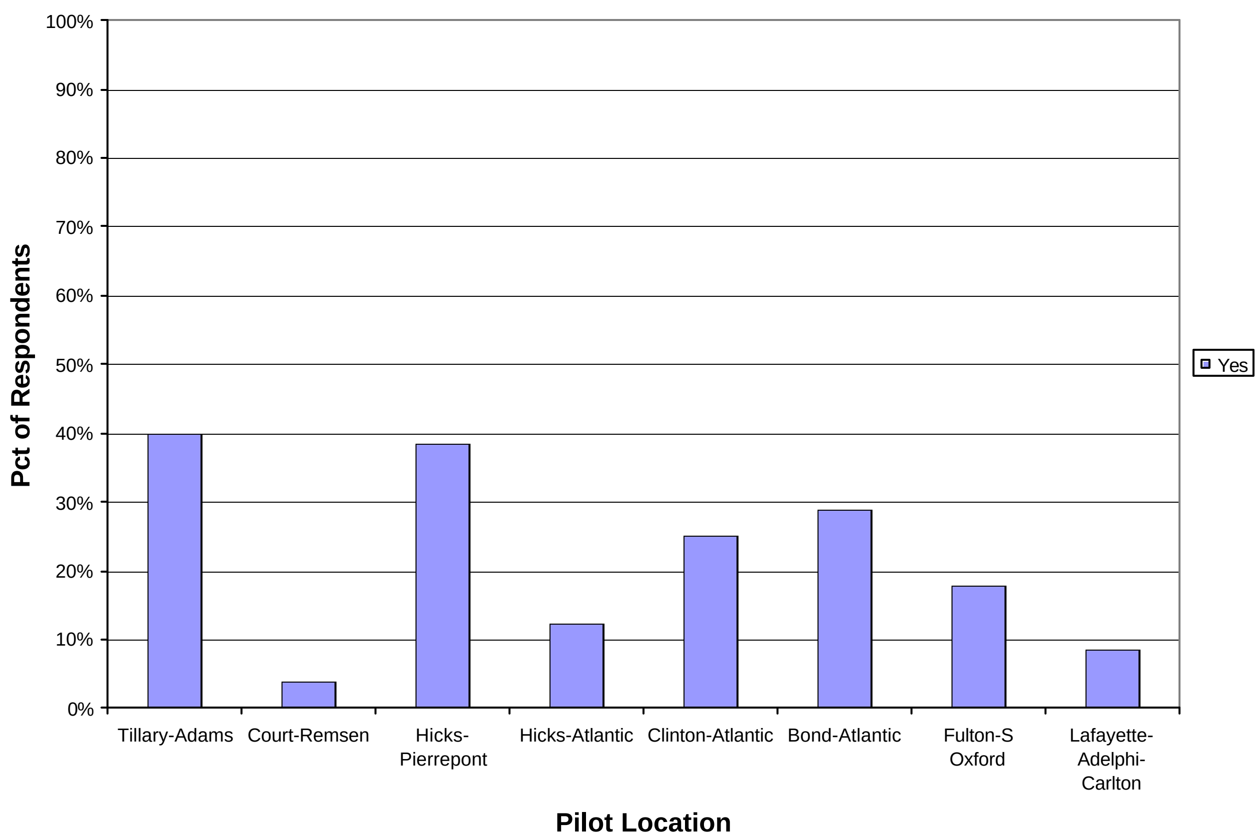
Comparing the responses to these questions leads to the conclusion that users were generally unfamiliar with the traffic calming project, but felt positively about it. Most importantly, the measures of which users were aware tended to be physical measures; this points to the need to maintain a role for physical measures not only to calm traffic but also to maintain awareness and enthusiasm for traffic calming in Brooklyn over the long term. Another distinction is that measures located on community and Living Streets (Court-Remsen, Hicks-Pierrepont, Hicks-

[8] Section 253.4 of the *New York State Manual of Uniform Traffic Control Devices* provides for this "traffic signal speed sign," which is to be placed "near the first signal and at subsequent intersections in the signal system as circumstances require." The sign should contain white lettering on green background and should display the speed limit for which the signals are set, rounded to the nearest multiple of 5 mph.

Atlantic, Fulton-South Oxford, and Lafayette-Carlton-Adelphi) tended to be slightly better received than those on Travel Streets (Tillary-Adams, Clinton-Atlantic, and Bond-Atlantic).

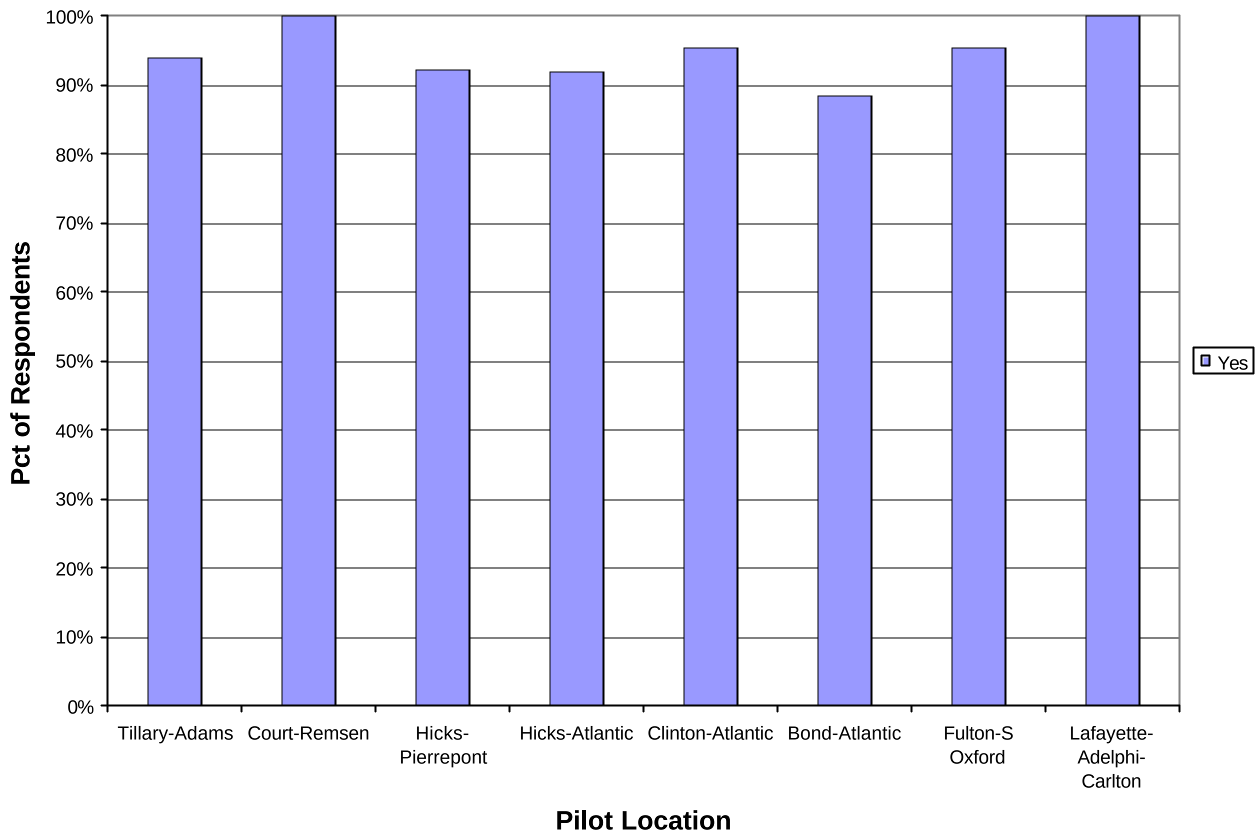
The following graphs show how the answers to these questions varied among the pilot locations.

Figure 6.16 Are you familiar with the Downtown Brooklyn Traffic Calming Project?



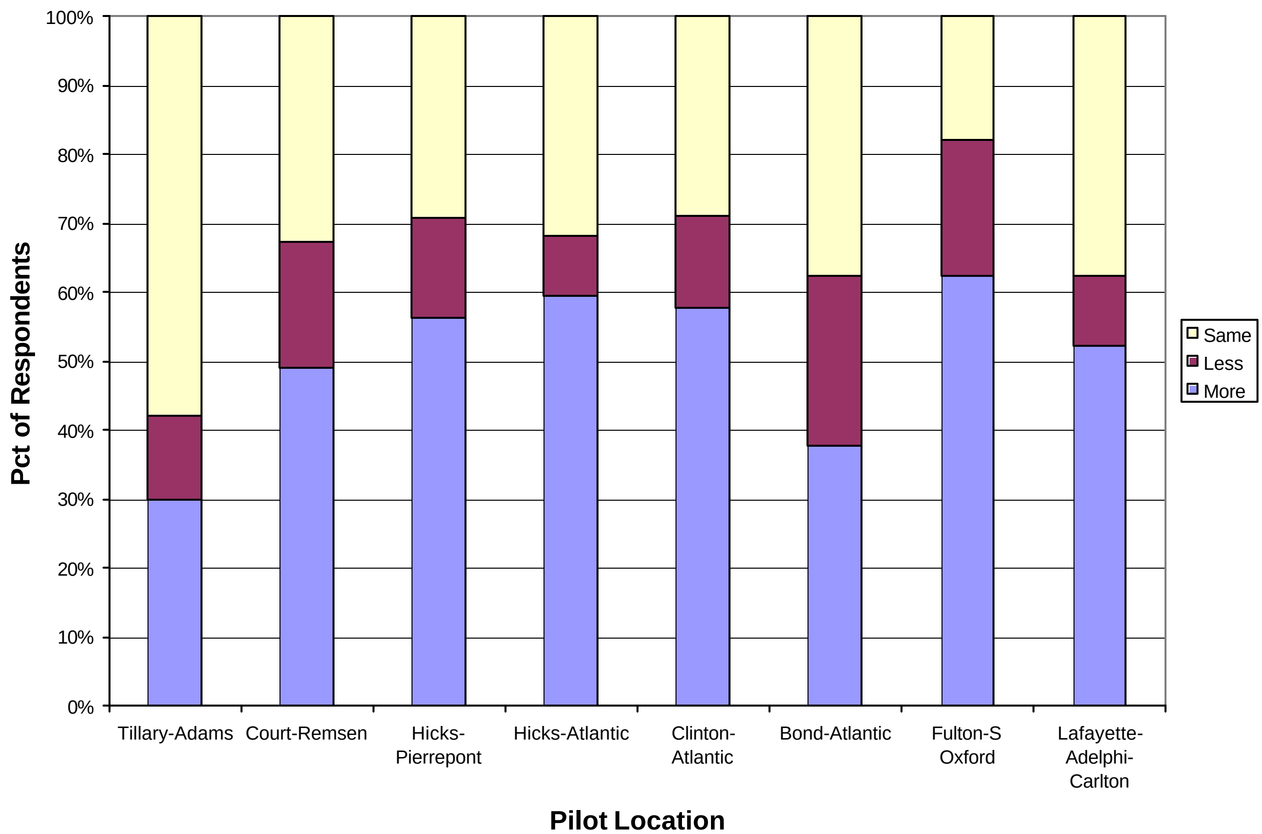
This question indicated the general profile of the Downtown Brooklyn Traffic Calming Project. Generally, respondents were most familiar with the project in the areas of the most "physical" treatments, like Tillary-Adams, Hicks-Pierrepont, and Bond-Atlantic.

Figure 6.17 Do you think the Downtown Brooklyn Traffic Calming Project is a good idea?



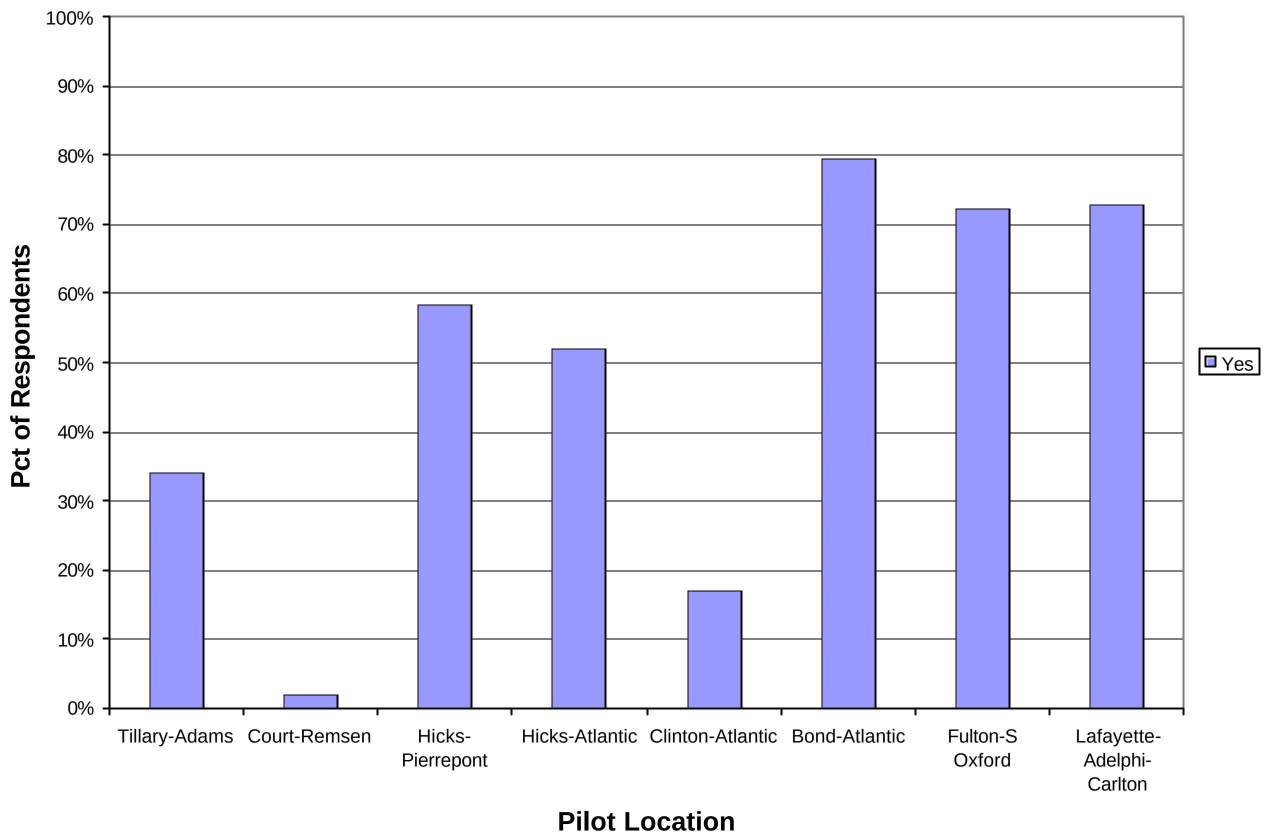
The overwhelmingly positive responses to this question indicate general support for the idea of traffic calming in Downtown Brooklyn. The response rates are fairly uniform across all locations, meaning no connections can be drawn between types of treatments and respondents' acceptance of traffic calming.

Figure 6.18 Does the recent change in traffic volumes and patterns in Downtown Brooklyn make this particular pilot more or less effective?



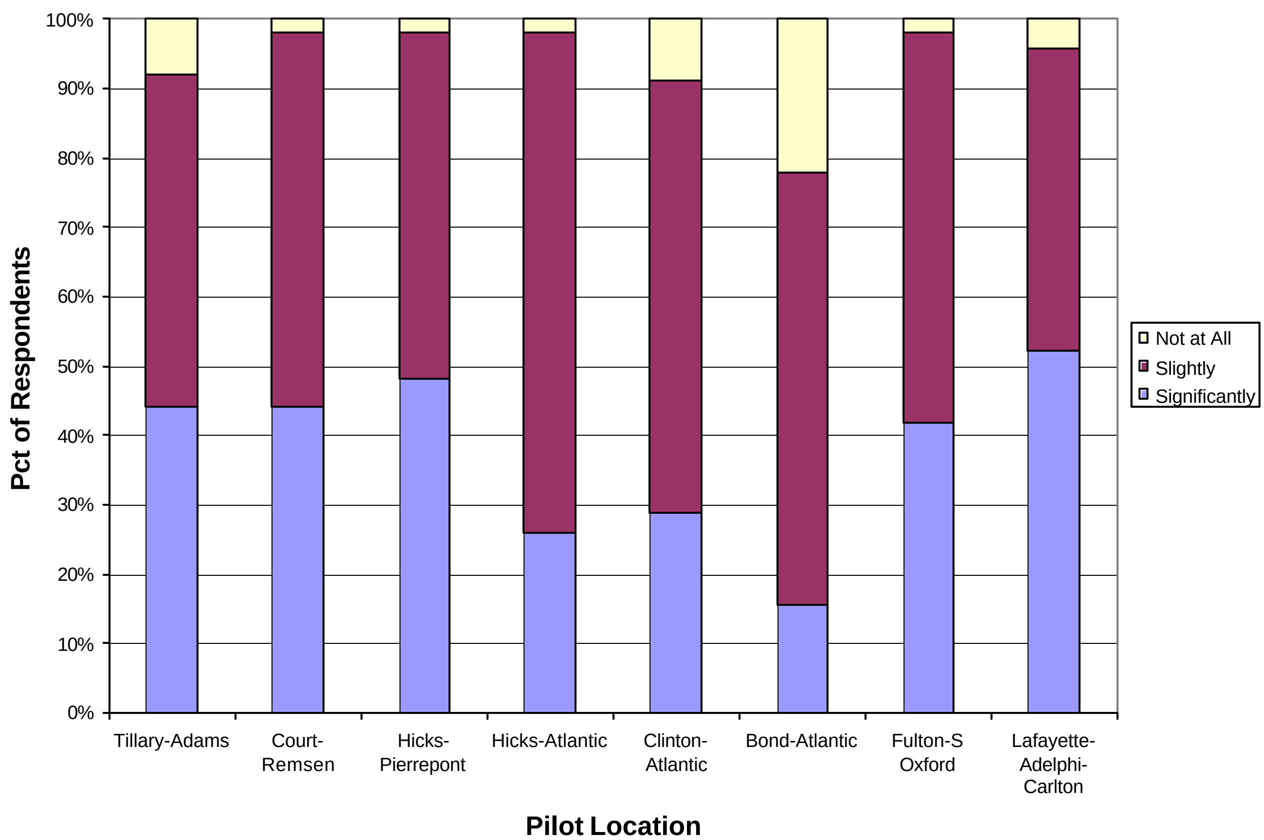
This question was intended to make respondents think about the relationship of traffic calming to managing roads and public spaces in the post-September 11th urban context. Even though some measures were located on residential blocks and some near major public buildings and landmarks (Tillary-Adams and Court-Remsen), there was no specific pattern in the responses.

Figure 6.19 Were you aware that a pilot program/installation of traffic calming measures was being implemented in general and specifically at this location?



Responses to this question again highlight the connection between the physicality of traffic calming devices and user perceptions. Measures involving neckdowns, pedestrian refuges, and raised intersections scored high on this question. The only two measures at which fewer than 20% of respondents were aware of the pilot program were signal timing changes (Court-Remsen and Clinton-Atlantic).

Figure 6.20 Does this measure succeed in its goal?



Before the surveys began, each respondent was told the stated goal of each pilot measure (the same goal as printed on the measure's pilot information sign). Responses to this question showed the Bond-Atlantic treatment was viewed as the least successful with the fewest respondents indicating that the measure had "significantly succeeded" in achieving its goal. The negative community feedback that NYCDOT received regarding this measure supported the survey results.

6.4 Lessons learned

This section summarizes lessons learned from pilot program design, construction, and operations.

6.4.1 Design

6.4.1.1 Improving traffic operations

Opportunities exist to address the issues of importance to traffic calming without adverse impact on motorized traffic, even on busy Travel Streets. Various simple measures could be used to improve intersection operations to provide benefits for all street users. Improving traffic channelization, for instance, by better defining lanes and the boundary of the section of road used for moving cars is consistent with a desire to minimize pedestrian crossing distances with neckdowns and center medians. In concert with the agency's goal, NYCDOT staff were enthusiastic about the opportunity to improve conditions for pedestrians, for instance by increasing the available pedestrian walk times at busy intersections.

6.4.1.2 Roadway design guidelines

As discussed in *Section 6.2.3*, the MUTCD has evolved to provide some guidance for the design of traffic calming treatments. Design for traffic calming should both conform to the MUTCD and reflect the traffic calming project's implicit street management framework. It is important that the manual reflects the increased use of traffic calming devices and provides statutory support for their implementation.

6.4.1.3 Catch basins and other utilities

An important virtue of traffic calming treatments is that they can in many cases be implemented inexpensively. However, their cost can increase significantly if catch basins and other utilities need to be relocated to accommodate the treatments. In designing the pilot program treatments, the project team investigated various design options with NYCDOT staff that minimized the need for relocation of utilities. However, the realities of maintenance and cleaning practice in New York City mean that it is generally not possible to avoid relocating catch basins or raising service pits.

For instance, while it would be possible to design a traffic island at an intersection that fulfilled the same traffic management purpose as a neckdown without interrupting storm water drainage paths, the additional manual effort required to clean the device is currently regarded as too onerous by Department of Sanitation, which currently relies almost exclusively on street cleaning vehicles. Quite legitimately, the Department of Sanitation is concerned about any design solution that places an additional burden on its cleaning staff, particularly after the experience with the Lafayette Avenue neckdowns. These are important issues to investigate as acceptance of traffic calming devices matures in New York City.

6.4.1.4 Standards of design

Because many pilot treatments had not been tried before in New York City, various design compromises were reached in the interests of implementing the designs as part of this study. These compromises gave NYCDOT and other agencies more confidence in the treatments' safety. As traffic calming becomes more familiar to city agencies responsible for street design, these compromises warrant further consideration.

For instance, NYCDOT required that all raised pavement treatments retain a two inch height differential between road pavement and sidewalk. On roads where successive road resurfacing efforts over the years has diminished the nominal six inch level difference between road surface and sidewalk to three or four inches, traffic calming devices involving a two-inch vertical displacement become almost indistinguishable from general surface roughness. This issue may have contributed to the ineffectiveness of the raised intersection treatment at Hicks and Pierrepont Streets – the minimal height of the raised table demanded by the required level difference between road and sidewalk meant that the treatment was almost invisible, and that the intended ramp up to and down from the table could only be formed as a lip. This led to the problem of noise as vehicles (especially trucks) passed over it. NYCDOT required maintenance of the height differential in order to retain the firm delineation between road and sidewalk and so protect pedestrians. Such delineation has been achieved elsewhere without the requirement of a level difference – through such means as surface texture, bollards, and signage. With this in mind, NYCDOT should review its standard to allow raised pavement all the way to curb level, provided some combination of the aforementioned delineation measure are installed.

6.4.1.5 Slow speed zones

While communities in Downtown Brooklyn were eager to take advantage of the New York State law that permits local jurisdictions to establish slow speed zones in residential neighborhoods, NYCDOT is reviewing the law to determine the spacing of traffic calming treatments that are needed to qualify as a low speed zone. The pilot measures show that speed control can be effected by strategically placed traffic calming measures and that perhaps an alternative interpretation of the slow speed zone law is in order. That said, slow speed zones are more effective when a series of traffic calming measures are implemented. Ultimately, a site-by-site examination is recommended to determine what is reasonable and how "physical" traffic calming treatments need to be, and DOT needs to finalize its policy for implementing slow speed zones.

6.4.1.6 Driver behavior

Notwithstanding the previous lesson about strategic speed reductions, it is also clear that certain traffic calming devices like gateway treatments are not enough to slow vehicles downstream of the treatment. While aggressive driving is not by any means unique to New York City, it seems clear that treatments located at transition points between Travel Streets and Living Streets require further downstream reinforcement.

6.4.2 Construction

6.4.2.1 Quality Materials

A lesson learned around the world in implementating traffic calming treatments is that use of temporary materials can be entirely counterproductive. Physical treatments implemented temporarily can create opposition to their more permanent implementation, more than outweighing the construction cost savings. This does not mean the most appropriate construction materials and design solutions are necessarily the most expensive. When doubts arise about construction materials, the default solution should be to use familiar materials whose installation, reliability and maintenance schedules will be predictable. This is particularly important when testing new treatments, which may need to be removed if they prove unsuccessful.

6.4.2.2 Color-textured concrete treatments

Some color-texture surface treatments are effective. However, they demand ongoing maintenance due to inevitable utility and resurfacing projects and the time and skill required to maintain a non-standard road surface. The trials of colored surface treatments yielded mixed results. The trial of TyreGrip on the Henry Street bike lane was disappointing; this material began to flake after only one winter season. The ColorSet trial proved more successful, although it has not yet been subjected to the rigors of a winter. As noted in *Section 6.3.5*, the traffic volumes, surface conditions, and weather in New York all require extremely durable surface treatments. In any case, when quality color-textured surfacing materials are identified, they should be installed at multiple locations; this will allow NYCDOT to justify procuring a large enough supply to support ongoing maintenance required by inevitable utility and resurfacing projects. The issue of time and skill required to maintain non-standard road surface remains.

6.4.2.3 Construction permitting

NYCDOT's construction permitting and approval of unique treatments at disparate single locations was a lengthy process. This is a process issue that should be addressed when the construction program for the broad strategy begins (see *Section 6.2.5)* – all agency staff reviewing traffic calming proposals should be brought on board at the outset of the project.

6.4.3 Operations

6.4.3.1 Emergency services

Emergency service concerns about the impact of traffic calming treatments on their operations were generally not borne out by experience. This is consistent with experience elsewhere in the world, where appropriately designed physical treatments do not hinder emergency service access or movement. In any event, emergency service workers reported that they are used to taking actions necessary to access their destinations (witness the common practice of emergency vehicles traveling the wrong way down one-way streets) and so during discussions they indicated their pragmatic acceptance of allowing their vehicles to mount curbs if absolutely necessary to enter a street. However, these services must be consulted and worked with in a collaborative manner so that implementation does not impede their operation.

6.4.3.2 Sanitation services

The design of traffic calming treatments must recognize the Department of Sanitation's vehicle operations and cleaning practices. Unlike emergency vehicles, street sweepers do not have the ability to mount curbs and still be effective, and any difficult-to-sweep locations will impact their operations.

Figure 6.21 Lafayette Avenue neckdown: Small curb radius created areas difficult to reach with streetsweepers

6.4.3.3 Road surface maintenance

Maintenance of the road surface is a major issue in New York City. Coordinating maintenance, installation and construction activities is extremely problematic, with the result that road surfaces are routinely opened by any of a number of agencies authorized to do so. In many cases, the quality of road reinstatement is poor, with the result that road surfaces very quickly become uneven and inconsistent. In this environment, any unusual road surface treatments are extremely difficult to maintain. Throughout the city, examples can be found of well-meaning attempts to improve the street environment through use of unique surface treatments that have been rendered ineffective through maintenance practices that do not restore the roadway treatment.

All special treatments are subject to the problems caused by utility maintenance and construction – in very short order some of the pilot treatments (at the Hicks Street/Atlantic Avenue and Fulton Street/South Oxford Street intersections) were affected by roadway construction. This is a problem that cannot be solved through specification; it can only be solved by implementing much more stringent maintenance practices. Whether and how this is achievable lies beyond the scope of this study. However, ease of maintenance and installation of treatment is a factor that should be considered in selecting materials.

7. ACTION PROGRAM

This section outlines a comprehensive strategy for calming traffic in the study area, based on actions that were developed with the community to implement the area-wide strategy described above. *Section 7.1* introduces seven themes that underlie the strategy; *Section 7.2* describes the action plans for each corridor that form the bulk of the strategy. The drawings that accompany each corridor's strategy show the options for which the community showed preference during the extensive Open House and Community Board consultation in 2001 and 2002. Definitions and explanations of all traffic calming measures proposed in this section can be found in *Figure 4.1*.

In developing the action plan, the project team, community, and elected officials reached a consensus that development of plans for a number of areas should be deferred to separate investigation. These areas are noted in *Section 7.2. Section 7.4* outlines a staging plan and provides an estimate of broad costs for each implementation stage. Finally, *Section 7.5* reviews some of the ideas considered but rejected for inclusion in the final strategy.

While this document outlines a comprehensive strategy, specific actions can not be implemented without the level of detailed, site-specific investigation undertaken in the Pilot Program phase. Thus, all changes to the physical layout of roadways are subject to approval and revision by NYCDOT's Highway Design section, and all changes to signal timings are subject to warrant studies by NYCDOT's Signal Timing section.

7.1 Traffic Management Themes

Seven themes underlie the traffic calming strategy for Downtown Brooklyn. These themes, and the appropriate traffic calming tools to address them, are introduced briefly below. Each of these themes was considered in the development of the traffic calming action plan for each corridor. Note that these are not site-specific recommendations, but rather generic actions available to planners in the development of the areawide traffic calming strategy.

7.1.1 Pedestrian circulation and connectivity

Because Brooklyn's surface streets carry large volumes of vehicles, some high-traffic streets are difficult for pedestrians to cross during peak hours and logical pedestrian desire lines go unserved. Strategy recommendations that address pedestrian connectivity issues include:

- **neckdowns** and **medians** to shorten crossing distances,
- signalized **mid-block crossings** to introduce connections on long blocks, and
- **leading pedestrian intervals (LPI), all-pedestrian phases (APP)**, and **turn restrictions** to build pedestrian confidence and visibility at key intersections.

7.1.2 Improving transit operations

Although eighteen New York City Transit bus routes serve Downtown Brooklyn, roadway congestion slows bus speeds, causes bus bunching, and hinders the ability of buses to merge back into traffic after stopping. Illegal parking and standing in bus stops create difficulties for bus drivers and for boarding and exiting passengers. Strategy recommendations that address transit operations issues include:

- **bus bulbs** to simplify bus maneuvers and improve the bus-to-sidewalk interface, and
- improved **subway/sidewalk** passenger connection.

7.1.3 Developing the bicycle network

Although many neighborhoods in Downtown Brooklyn have dedicated bicycle lanes, critical gaps still exist in the area-wide cycling network. Strategy recommendations that address bicycle network issues include:

• **new bike lanes** to give cyclists safe, dedicated routes to ride,

• **neckdowns, gateways,** and other measures aimed at slowing traffic, and

• **enhanced bike lanes** to clearly delineate routes

Since the Downtown Brooklyn Traffic Calming Project began, NYCDOT has developed a policy regarding using high-visibility treatments to enhance bicycle lanes. Lanes adjacent to the curb will receive priority for high-visibility bicycle treatments; this will clearly indicate that the lane is designated for movement of bicycles and should not be blocked by parked vehicles. This is a higher priority than "non-curbside" lanes because violations by parked vehicles in curbside lanes result in blockage of cyclists' movement. The Department's goal is to implement bicycle lanes identified in this report and the New York City Bicycle Master Plan in as expeditious a manner as possible. Therefore, "non-curbside" lanes will be implemented using standard treatments.

7.1.4 Truck access and routing

While trucks are blamed for many traffic problems in Downtown Brooklyn, they are the primary mode of freight access in the City. Maintaining a clear and logical truck network is critical to the local economy. Strategy recommendations that mitigate truck impacts while maintaining truck access to Downtown Brooklyn include:

• **neckdowns and gateways** to keep trucks off Living Streets, and

• **improved street management** to improve conditions for trucks on Travel and Community Streets.

7.1.5 Managing through traffic

The concept of a Street Management Framework argues that Travel Streets are the appropriate places to accommodate through traffic in Downtown Brooklyn. At the same time, through traffic should be discouraged from using Community and Living Streets, and its impacts should be mitigated on all streets. Strategy recommendations that address through traffic issues include:

• **neckdowns, gateways, raised intersections**, and other measures to discourage through traffic from using Living and Community Streets and to reclaim street space for pedestrians,

• **improved signal progressions** on Travel Streets to create "green waves" that allow for appropriate free-flow travel speeds, and

• **channelization** of intersections with high pedestrian volumes to delineate vehicle and pedestrian space.

7.1.6 Local traffic permeability

While many traffic calming measures aim to reduce vehicular impacts and keep regional traffic off Living and Community Streets, it is important that the street grid remain permeable to appropriate volumes of local traffic. Strategy recommendations that aim to preserve local permeability include:

• **raised intersections and crosswalks,** and **slow signal progressions** that slow but do not block traffic,

• **gateways,** and **neckdowns** that discourage but do not prevent traffic from entering Living Streets.

7.1.7 Emergency vehicle access

Traffic calming projects are sometimes criticized for decreasing access and slowing response times for emergency vehicles. In the Downtown Brooklyn Traffic Calming project, every recommendation that changes street geometry was tested to ensure that turning fire engines and other large emergency vehicles were able to negotiate the new street alignments safely. Every recommendation that alters the normal flow of traffic was tested to make sure emergency vehicles can still permeate the entire street grid easily. Strategy recommendations that required this testing included:

• **neckdowns, raised intersections,** and **gateway treatments**: tested for safe vehicle movements

• **partial diverters** and **street direction changes**: tested for continued network permeability

Figure 7.1 Testing the Hicks Street neckdown for FDNY turning radius

7.2 Action Plans

Coordinated action plans have been developed for all streets in the study area on a corridor-by-corridor basis. These action plans are consistent with the street management framework described in *Section 5.2*, the traffic management themes and tools described in *Section 7.1,* and the overall street management strategy described throughout this document. The plans also address the issues and ideas that arose throughout the community outreach process[9]. Community Boards that were directly affected reviewed early drafts of each action plan, and engaged the project team in a

[9] A comprehensive list of ideas raised by the community at the outset of the process can be found in *Appendix A3: Idea Development*. A comprehensive list of public comments suggesting and reacting to the action plans can be found in *Appendix D: Public Comments Received*

detailed discussion of their own ideas for improving the plans. These discussions led to a final action plan for each corridor, with the reviewing Community Board's endorsement. In each case, the full Community Board adopted the endorsement of the Community Board's designated review committee (the Transportation Subcommittee in the case of Community Board 6 and a specially constituted review panel in the case of Community Board 2).

The action plans reflect the objectives for each street, based on the agreed street designation.

7.2.1 Travel Streets

Plans for Travel Streets were developed based on the functions of streets discussed in the Street Management Framework in *Section 5.3.1*. The overall objectives for Travel Streets are to:

- Alleviate traffic bottlenecks with traffic management strategies,
- Facilitate pedestrian and bicycle movement,
- Improve the street environment for pedestrians, bicyclists, businesses and residents,
- Discourage excessive speeds and aggressive driving,
- Improve access to businesses and institutions, and
- Reduce the degree to which Travel Streets are barriers between neighborhoods.

7.2.1.1 3rd Avenue

3rd Avenue is an important north-south link in the eastern part of Downtown Brooklyn. Though it does not carry substantial traffic (it carries approximately 9,700 vehicles per day in the peak northbound direction), it acts as a relief route when congestion occurs on 4th Avenue. In 1980, NYCDOT installed a bicycle lane on 3rd Avenue along the southbound roadway between Union and 3rd Streets. The treatment includes a buffer between the bicycle lane and the travel lane in the segment from Carroll to 3rd Streets. The strategy for this street recognizes the need to maintain smooth flow on 3rd Avenue while reclaiming unused space for other users – in this case, cyclists.

Suggestions include striping northbound and southbound Class II bike lanes from 9th Street to Dean Street, providing a flat, moderate-traffic link for north- and southbound cyclists. From Dean to Carroll Streets, the cross-section would consist of a parking, cycling, and travel lane on either side of the centerline. The cycling lane would replace an existing travel lane south of Dean Street, where volumes on 3rd Avenue are under capacity and there is little turning movement. The cycling lane is not recommended north of Dean Street, where the second northbound travel lane is needed to store traffic approaching Atlantic Avenue. South of Carroll Street, 3rd Avenue widens, providing an opportunity to add a painted buffer with diagonal striping between the bike lane and travel lane. This would give cyclists an additional buffer against traffic and encourage lane discipline for motorists. Community Board 6 preferred the painted buffer to another option suggested for the segment south of Carroll Street involving a raised median, which would have slowed traffic but provided little benefit for pedestrians or cyclists.

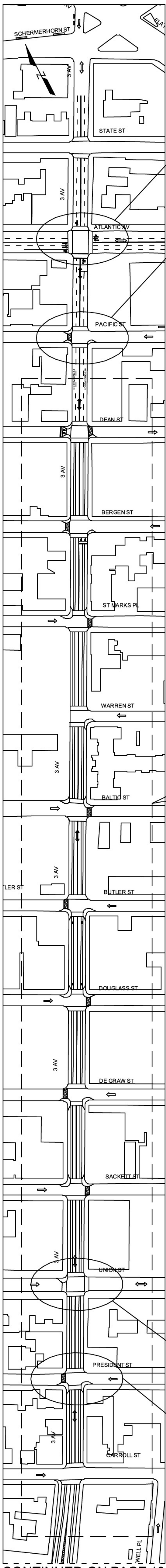
The bike lane recommendation seeks to reclaim currently underused street space for cyclists, an approach which entails a trade-off. As noted above, 3rd Avenue has an additional role as a relief route when 4th Avenue is congested. Reducing vehicular capacity on 3rd Avenue would not compromise its normal peak hour operation, but would reduce its ability to relieve periodic congestion on 4th Avenue. This trade-off, which the project team and community judged to be worth making, should be recognized in the ongoing management of 3rd Avenue.

Gateway treatments involving neckdowns and raised, color-textured intersections are recommended at Living Streets that intersect 3rd Avenue between 9th and 15th Streets. Leading Pedestrian Intervals (LPIs) should be installed to allow pedestrians a head start across 3rd Avenue. North of Dean Street, where the bike lane ends, LPIs should be installed to improve crossing conditions at Pacific Street and Atlantic Avenue. For a detailed discussion of the issues surrounding the intersection of 3rd Avenue, Flatbush Avenue and Schermerhorn Street, see *Sections 7.2.1.9* and *7.5.2.*

As the process moves towards implementation, NYCDOT will pursue part of the bike recommendations for 3rd Avenue. In Spring 2004, the existing southbound bike lane will be extended from 3rd Street to 15th Street. This southbound bike lane will also be linked to the bicycle lane on Clinton Street to the west via 3rd Street, which will act as an "east-west" connector. After implementation of the southbound bicycle lane and an evaluation of its operations, a companion northbound lane could be considered. Also in Spring 2004, Leading Pedestrian Indicators (LPIs) will be installed at the intersections of 3rd Avenue/9th Street and 3rd Avenue/Atlantic Avenue. Other recommended treatments will require further detailed evaluation and design work and will be part of future implementation efforts.

3RD AVENUE (TRAVEL STREET)

FROM STATE STREET TO CARROLL STREET



- *Add LPI*

- *Add LPI*
- *Start of neckdowns and gateways with raised crosswalks and textured pavement*

- *Add an extra wide neckdown to enforce transition from two-way street to a one-way street*
- *End neckdowns and gateway treatments with a raised crosswalk and textured pavement*

150' 0 150' 300'

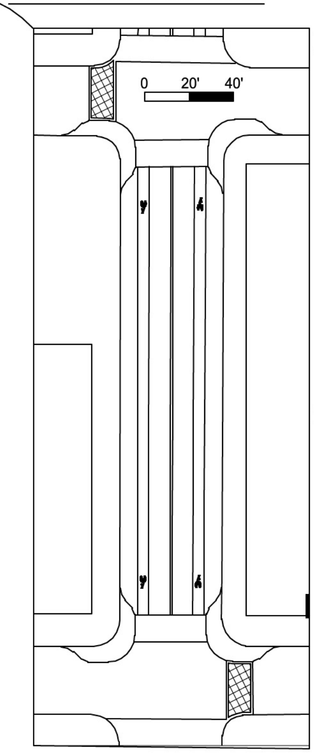
CONTINUED ON PAGE 10

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Improve the pedestrian environment at busy intersections in the corridor by installing neckdowns to reduce the distance pedestrians must walk to cross, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Discourage traffic from using community streets as short cuts to neighborhoods west of 3rd Avenue by adding gateway treatments with raised crosswalks or textured pavement.
- Create an on-street bicycle lane from 9th Street to Dean Street positioned between the parking lane and the travel lane.
- ***Overview of Operational Improvements***
  Provide more signal time for pedestrians at the north end of the corridor by implementing Leading Pedestrian Intervals.

PREFERRED OPTION



Pros:

- Provide improved bicycling facilities
- Provide all-day parking

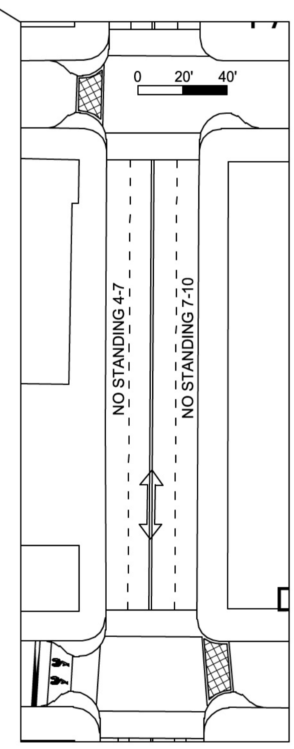
Cons:

- One travel lane will result in slight decrease in capacity
  Example: Butler Street
  (Before: LOS B Delay 12s)
  (After: LOS B Delay 17s)

- *Neckdowns and gateways*

1A. 5 Ft Class II (On-street) bicycle lane

DISCARDED OPTION



Pros:

- Maintain existing capacity in the peak hour

Cons:

- Lack of bicycle facilities along this corridor

- *Neckdowns and gateways*

2A. Maintain peak hour lanes

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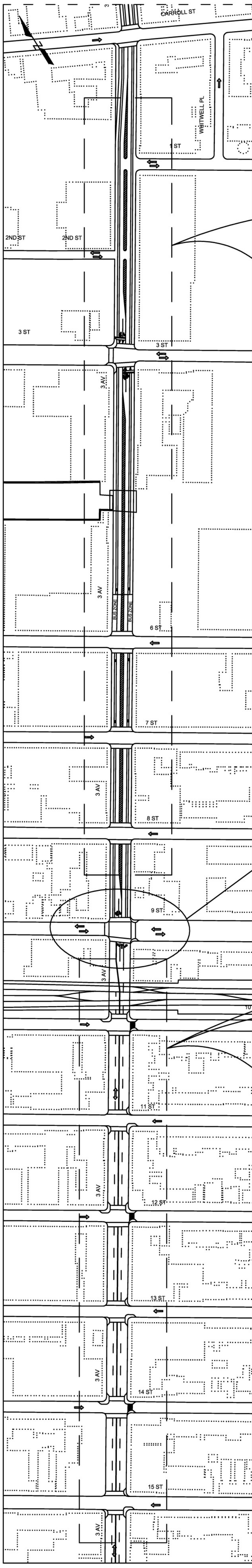
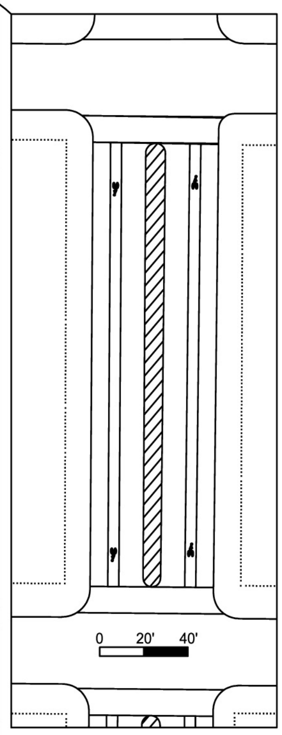
3RD AVENUE (TRAVEL STREET)

FROM CARROLL STREET TO 15TH STREET



CARROLL ST TO 9TH ST DISCARDED OPTION:



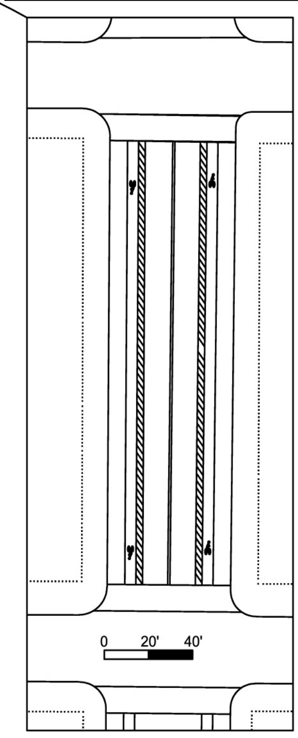
Pros:
- Provides improved bicycle facilities
- Striped Island reduces ambiguous driving conditions

Cons:
- Median does not help pedestrians because it does not extend into the crosswalks

- *Add a 5 ' Class II (on street) bicycle lane*

1A. Add a striped median

CARROLL ST TO 9TH ST PREFERRED TYPICAL SECTION:



Pros:
- Single lanes reduce ambiguous driving conditions
- Narrow roads will result in more cautious driving conditions
- Provides extra parking supply

Cons:
- Extra wide bicycle area could result in illegal parking

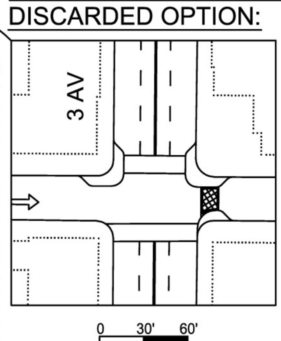
- *Add a 5 ' Class II (on street) bicycle lane*

2A. Add 3' wide bicycle lane buffers

- *Add left turn lanes*
- *Convert one northbound lane into a right-turn lane*
- *Restripe 3rd Ave into single travel lanes*

End of 3 Ave bicycle lane

9TH ST TO 15 TH ST TYPICAL INTERSECTION DISCARDED OPTION:



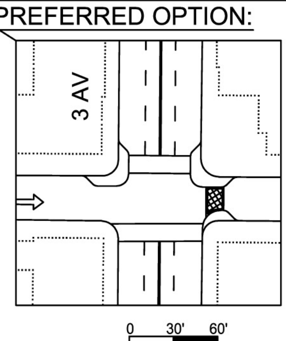
Pros:
- Reclaim space for pedestrians
- Narrowed streets encourage slower speeds

Cons:
- Might reduce parking supply

- *Add gateway treatments*

1A. Add neckdowns

9TH ST TO 15 TH ST TYPICAL INTERSECTION PREFERRED OPTION:



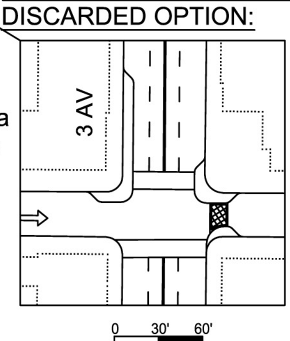
Pros:
- Give E/W pedestrians a head start to cross the Intersection

Cons:
- Slight reduction in capacity

- *Add gateway treatments*

2A. Add neckdowns
2B. Add LPI

9TH ST TO 15 TH ST TYPICAL INTERSECTION DISCARDED OPTION:



Pros:
- Added benefits for pedestrians, transit users, and bus drivers

Cons:
- Slight reduction in capacity

- *Add gateway treatments*

3A. Add bus bulbs

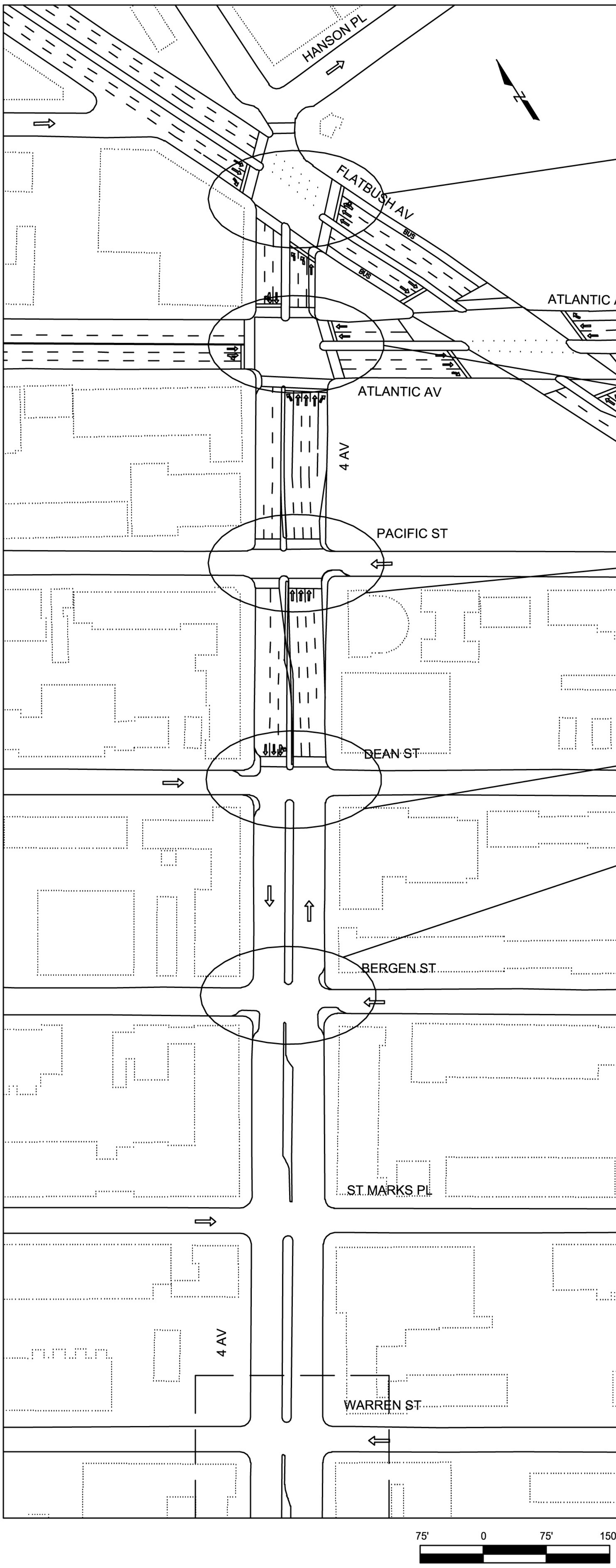
7.2.1.2 4th Avenue

4th Avenue is a major north-south artery that forms the eastern boundary of the primary study area. It carries 17,800 vehicles per day (vpd) in the peak northbound direction. Due to its width it acts as a barrier for east-west movement, particularly by pedestrians. Accordingly, the strategy for this corridor is to improve conditions for pedestrians crossing 4th Avenue without compromising its traffic-carrying capacity. This should be accomplished by reducing crossing distances and providing maximum possible crossing times for pedestrians wherever possible. In order to improve pedestrian conditions, space should also be reclaimed for pedestrian use wherever possible and particularly around the subway stations at Pacific, Union, and 9th Streets.

To the west of 4th Avenue are Living Streets on which through traffic should be minimized. Particularly at 4th Avenue's northern end, where the traffic congestion at its intersection with Atlantic and Flatbush Avenues in the morning commuter peak encourages drivers to seek alternate routes, such intrusion is a problem. A number of options for discouraging left turns by northbound drivers onto east-west Living Streets west of 4th Avenue were investigated, including removing the short left turn lanes at each intersection, which would provide greater pedestrian storage area in the middle of the road, and banning some left turns. It should be noted that the design of the 4th Avenue median is constrained to some extent by the subway that runs beneath the road and the subway vents in the median strip. In consultation with the community, it was recommended that NYCDOT investigate LPIs for pedestrians crossing 4th Avenue and continue to provide left turns off it.

4TH AVENUE (TRAVEL STREET)

FROM FLATBUSH AVE TO WARREN ST



- Improve signal co-ordination with the intersections along 4th Ave south of Flatbush Ave
- Increase length of existing APP
- Reconfigure EB approach to two through lanes and one exclusive right-turn lane
- Install medians

- Install medians
- Increase pedestrian crossing times
- Improve signal coordination along Atlantic Ave
- Add a neckdown
- Make NB 4th Ave left-turns protected

- Add neckdowns
- Add an APP
- Ban westbound left turns
- Re-align & re-stripe intersection to allow one of the through lanes to feed directly into the left turn lane at 4th Ave and Atlantic Ave

- Add neckdowns
- Add an APP

- Add neckdowns

ACTIONS SUPPORTING STRATEGY

General Improvement Strategies

- Reduce the distance pedestrians must walk to cross 4th Avenue.
- Improve the pedestrian environment around subway stations in the corridor.
- Provide more time for pedestrians to cross 4th Avenue.
- Reclaim excess street capacity for pedestrians.
- Maintain efficient through movement of vehicles through corridor.
- Maintain existing signal progression on 4th Avenue from Prospect Expressway to Times Plaza.
- Provide protected left turns onto 4th Avenue from major cross streets to reduce blocking of bus stops.
- Manage left-turning traffic off north bound 4th Avenue to protect living streets.

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4TH AVENUE (TRAVEL STREET)

FROM WARREN STREET TO 15TH STREET

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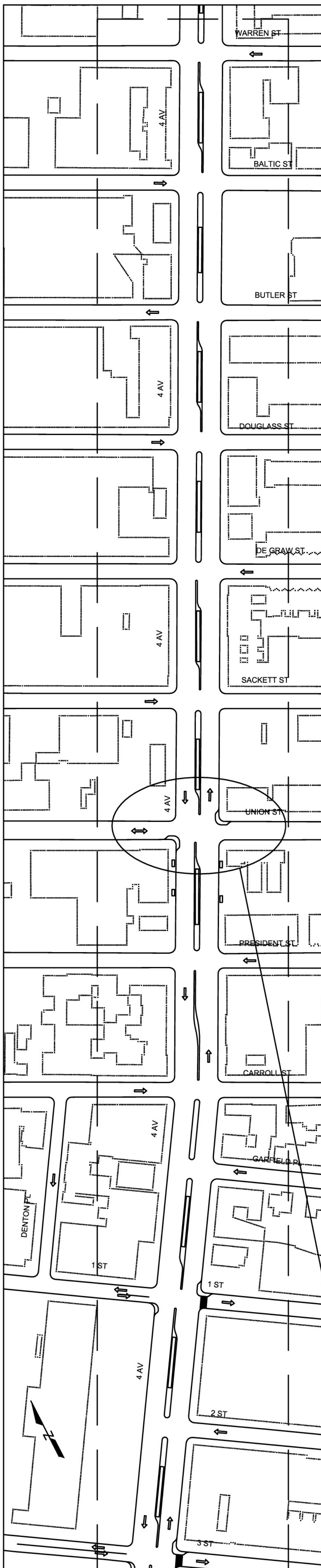

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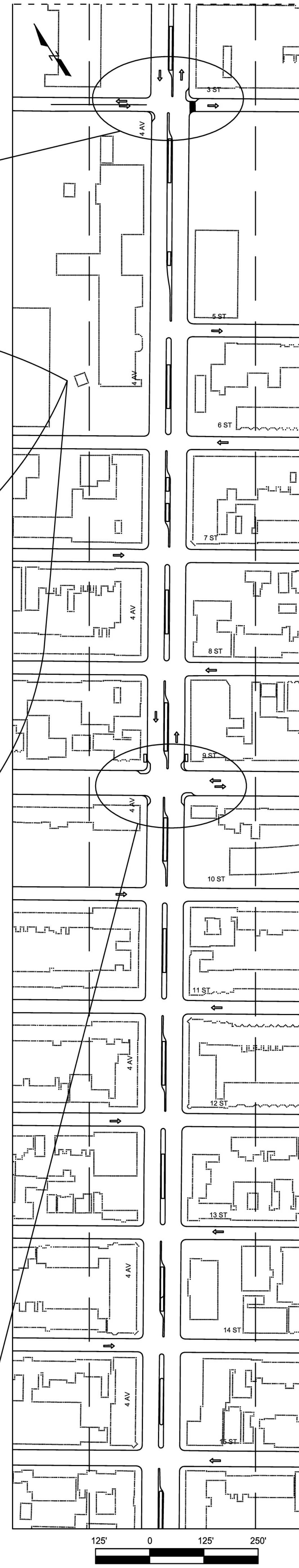
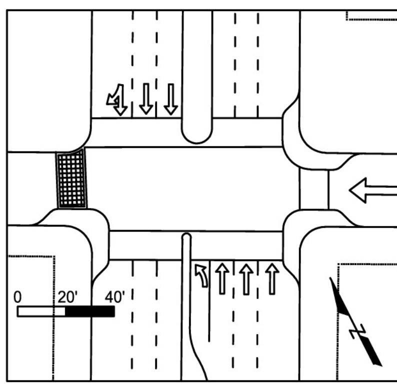


- *Add a gateway treatment*
- *Add neckdowns*
- *Add LPI*

TYPICAL INTERSECTION PREFERRED OPTION:

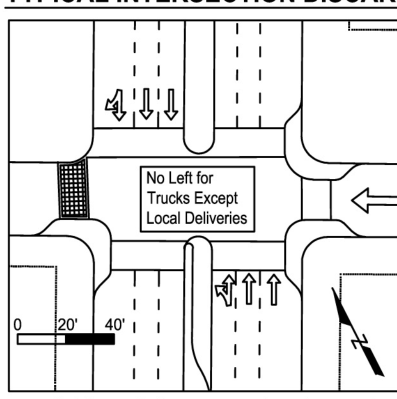


Pros:
- Increase pedestrian safety
- Reduce traffic speeds
- Discourage cut-through traffic

Cons:
- Might reduce parking supply

- *Add neckdowns and gateway treatments*
- *Add protected left turns and LPIs*

TYPICAL INTERSECTION DISCARDED OPTION:



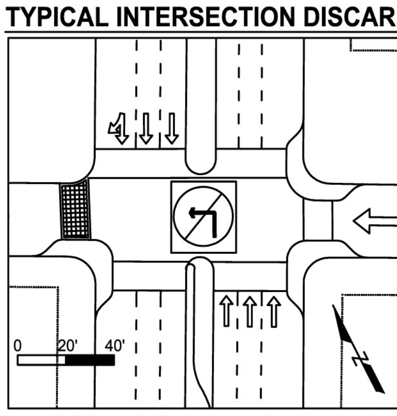
Pros:
- Increase pedestrian safety
- Reduce traffic speeds
- Discourage cut-through traffic
- Eliminate sub-standard turning lanes
- Keep trucks out of living streets

Cons:
- Small Reduction in capacity
- Hard to enforce through traffic ban

- *Add neckdowns and gateway treatments*

2A. *Create median by eliminating left turn lane*
2B. *Restrict left turns*

TYPICAL INTERSECTION DISCARDED OPTION:



Pros:
- Increase pedestrian safety
- Reduce traffic speeds
- Discourage cut-through traffic
- Eliminate sub-standard turning lanes
- Keep trucks out of living streets

Cons:
- Small reduction in capacity
- Adds turning vehicles to larger intersections

- *Add neckdowns and gateway treatments*

3A. *Create median by eliminating left turn lane*
3B. *Eliminate left turns except at major intersections*

NOTE: Options 2 and 3 would require further analysis to determine its feasability

- *Add neckdowns*
- *Add LPI*

- *Add neckdowns*
- *Add LPI*

7.2.1.3 Adams Street

Adams Street is the major north-south street through the center of the study area. It links the Brooklyn Bridge with Downtown Brooklyn. North of Tillary Street, Adams Street's substantial median is an important pedestrian and bicycle link between Brooklyn and Manhattan. Barriers separate the median from the road throughout this section and these create a limited access feeling for the road, a feeling that accords with the high traffic volumes and travel speeds observed here. Moreover, this intersection has substantial impacts on local air quality problems, constraining the ability to alter its capacity significantly.

Though the community generally agreed on the objectives for the Tillary/Adams vicinity, no consensus was reached on an action plan. In particular, residents of Concord Village, who hold strong views about improvements that could be implemented in this area, remained unconvinced by the draft ideas presented for discussion by the project team. These ideas included retrieval of road space, simplification of the effort needed to cross Adams Street and improvement to its traffic operations. Although the lack of agreement on the details of a plan for this area is disappointing, it is encouraging that the idea of improving the layout and operations of this intersection has been broached. This is discussed in *Section 7.3*.

However, agreement was reached that the current configuration sends no signals to drivers entering Brooklyn that they are in a dense, mixed-use urban area and that they should drive accordingly. It was agreed that a better approach would be to force drivers to acknowledge their surroundings north of their current point of entry into the surface street system at Tillary Street. This would allow the community to reclaim some of that section of open space north of Tillary Street and provide a much needed connection between Concord Village and Cadman Plaza to the west of Adams Street. Some area residents believe that this could be accomplished by introducing a signalized pedestrian crossing north of the Tillary Street/Adams Street intersection. Community members and the project team developed alternative designs for such a crossing.

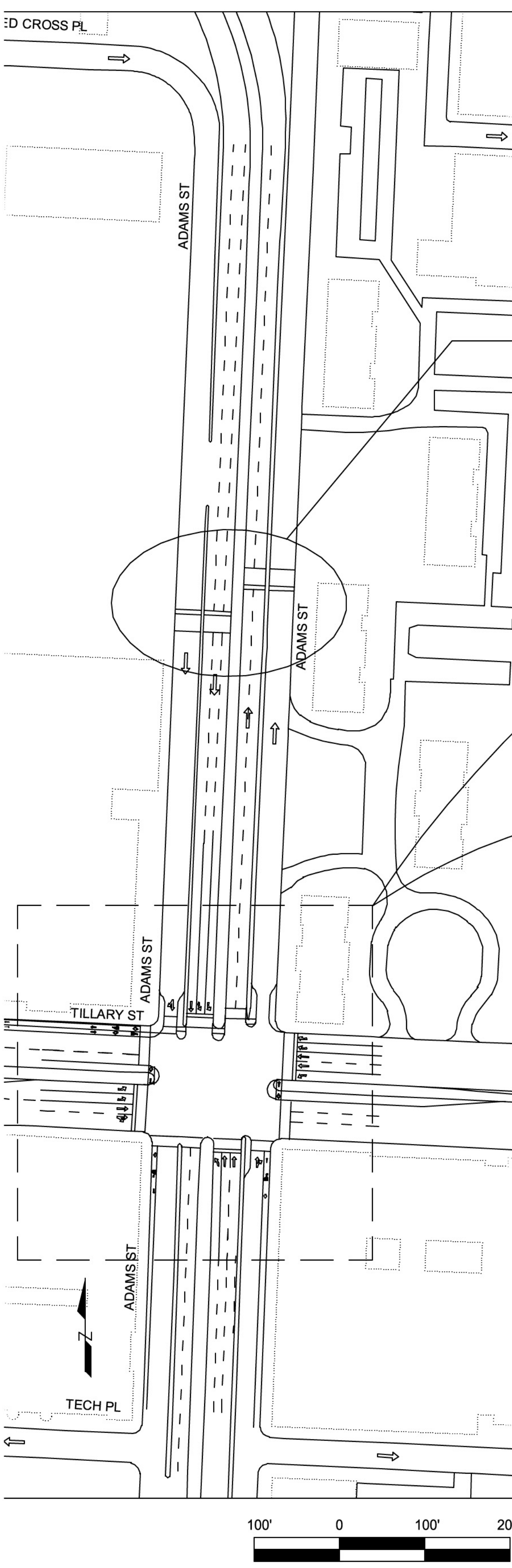
Although these plans had potential benefits, there were serious safety concerns related to the need to provide adequate stopping sight distance for southbound traffic exiting the Brooklyn Bridge between the curve at the end of the bridge and any new pedestrian crossing that might be constructed. (Stopping sight distance is the distance required for a driver to identify the need to stop, react and then to stop his or her vehicle. This is related to prevailing travel speed.) As the proposed crosswalk is north of the current crosswalk, the amount of space between the bridge exit and the crosswalk is reduced. Therefore, when queues occur, a potentially hazardous condition may occur from the spillback approaching the curved section of roadway exiting the bridge. Additionally, any plan for a pedestrian crossing would still need to accommodate pedestrians crossing the northern leg of the intersection of Adams Street and Tillary Street, and safety and operational concerns associated with the new Federal Courthouse on the west side of Adams Street would have to be considered.

ADAMS STREET (TRAVEL STREET)

ACTIONS SUPPORTING STRATEGY

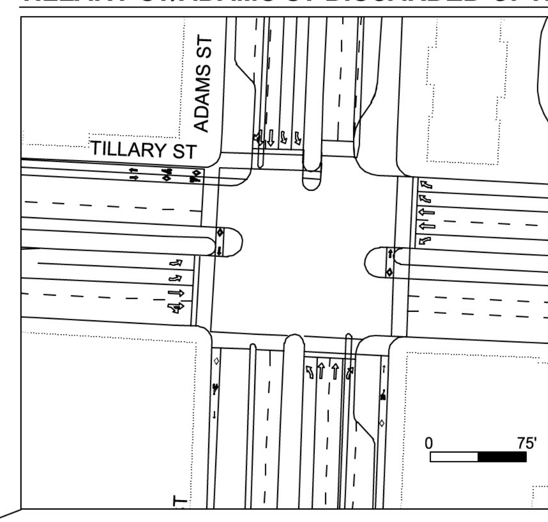
Overview of Physical Improvements
- Widen medians and reclaim road space to provide for both pedestrian and bicycle movements.

Overview of Operational Improvements
- Modify signal timing and phasing to maximize protected pedestrian phases where possible. Specific improvements include longer crossing times and protected left turn phases to further reduce vehicular conflicts.



- *Add a staggered mid-block crossing*
  Note: This treatment would require an in depth study to determine its feasibility.

TILLARY ST/ADAMS ST DISCARDED OPTION:



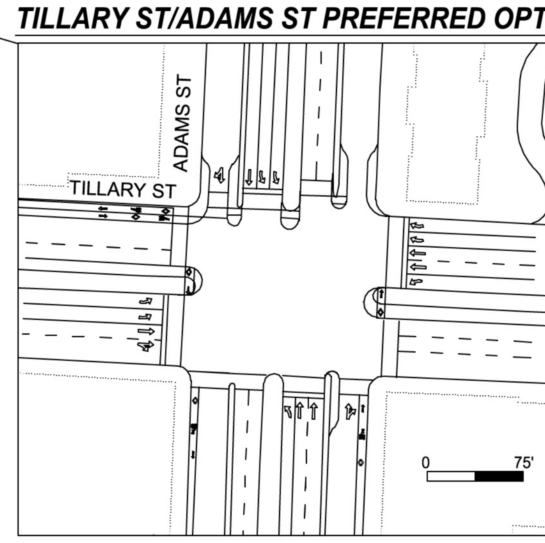
Pros:
- Greatly reduces pedestrian crossing distance across Adams St and improves pedestrian safety
- Creates area for landscaping and beautification
- Improves traffic and parking discipline
- Provides clear routes for cyclists

Cons:
- Some loss of parking

Widen Medians
- *Revise signal timing to protect WB left-turns*
- *Split pedestrian crossing on north leg*

1A. Modify service road connections to Adams St to allow narrowing of roadway

TILLARY ST/ADAMS ST PREFERRED OPTION:



Pros:
- Reduces crossing distance across Adar

Cons:
- Pedestrians still have cross four roadways

- *Widen medians*
- *Revise signal timing to protect WB left-turns*
- *Split pedestrian crossing on north leg*

2A. Re-align service roads to allow for better crossing facilities

7.2.1.4 Atlantic Avenue

Two distinct sections characterize the portion of Atlantic Avenue that falls within the study area. The section to the west of Court Street is largely a neighborhood center and, despite its width, serves a mainly connective function, linking Brooklyn's downtown and the BQE. The section to the east of Court Street extending to 4th Avenue has a stronger retail focus with some residential and institutional uses.

Atlantic Avenue also suffers from significant traffic congestion at bottlenecks along its length, in particular the eastbound approach to 3rd Avenue and 4th Avenue in the evening commuter peak and the westbound approach to Boerum Place in the morning commuter peak. Converting this parking lane into a traffic lane in the evening peak period merely creates additional storage space for drivers waiting to get through the bottleneck at 3rd Avenue and 4th Avenue. While this limits the length of the traffic queue, it does nothing to increase the amount of traffic that can pass through the bottleneck, especially when illegally parked vehicles commonly block the peak period traffic lane. An earlier NYCDOT study supported maintaining the peak hour parking bans, and found that with less than three lanes, the road did not have adequate capacity to serve peak hour traffic and was susceptible to illegal standing that further reduced capacity. This finding received further confirmation when the traffic consultants for the Atlantic Avenue Master Plan undertook a new analysis of volume conditions in Summer 2003. Their independent data showed that peak hour volumes continue to be high necessitating that three lanes be maintained to provide adequate capacity at each intersection. On the other hand, Atlantic Avenue operated with only two eastbound lanes during the pilot program phase (Spring/Summer 2002), with no observed adverse impact on queuing at intersections west of 3rd Avenue. However, various sections of the street were under construction by DDC's water main contractor throughout the pilot phase, and so traffic was not operating normally.

Throughout its length, it is difficult for pedestrians to cross Atlantic Avenue. The focus of this plan is to make the street easier and safer to cross. This may be achieved by a variety of means: by changing signal timing to provide longer crossing times for pedestrians; by introducing LPIs (tested with success at Atlantic Avenue's intersection with Clinton Street) to give crossing pedestrians higher priority than at present; and by creating a median to break up the crossing (tested as a pilot treatment at Atlantic Avenue's intersection with Bond Street, this received mixed reviews; see *Section 6*). Priority locations for introducing LPIs to Atlantic Avenue include the intersections at 3rd Avenue, 4th Avenue, Hoyt Street, Bond Street, and Nevins Street.

Accordingly, the idea of rethinking the use of Atlantic Avenue's road space was introduced into the study and two options for Atlantic Avenue's cross section were advanced. The first was tested in the pilot program and involved reducing Atlantic Avenue eastbound to two through lanes except on the immediate approach to 3rd and 4th Avenues. At cross streets, the current third travel lane could be converted to a median island that would serve to improve pedestrian crossing opportunities as well as better define travel lanes. A turning lane would be twinned with the median island at each intersection. The two through lanes would shift along the length of Atlantic Avenue: at mid-block locations they would occupy the middle two lanes, with 24-hour parking in the adjacent curbside lane; at cross streets the travel lanes would occupy the two outer lanes to accommodate the median island and exclusive turning lane.

Transitions would be required to move through traffic from the two outer lanes to the two inner lanes. In these transition areas no parking would be possible. At the Atlantic Avenue/Bond Street pilot, the curbside space permanently lost to these transition elements was a cause of great disappointment to a number of Atlantic Avenue merchants, who had hoped that only a very short transition could be achieved with attendant minimal impact on parking. Access to convenient parking is particularly important for many merchants in this area, as the nature of their businesses (e.g. furniture retailing) require more immediate access to parking than other businesses. This problem illustrates the inevitable conflict that occurs between the needs of the various users of a street like Atlantic Avenue. In this case, providing 24-hour a day parking and accommodating more effectively for the needs of pedestrians was achieved at the expense of a number of parking spaces on Atlantic Avenue. It should be noted that in the Atlantic Avenue/Bond Street trial additional parking spaces were created on Bond Street at no net parking loss in the area (see *Section 6.3.7.1*).

The minimum length of the transition is a safety issue that is a function of travel speeds on the street. Because the pilot program was implemented at only a single location and without supporting broad changes to the street environment, NYCDOT determined that a conservative approach should be taken to the choice of design speed and so required that the transitions be designed for the 85th percentile design speed observed on Atlantic Avenue (38 mph). In a more permanent design for the whole street, a lower design speed might be feasible as part of a strategy to drive down average speeds along Atlantic Avenue. This would allow more parking spaces to be conserved, though it would require re-evaluating current policy of engineering streets to accommodate the observed 85th percentile speed.

Elsewhere on the corridor, a number of locations would benefit from gateway treatments, since it is important to signal to drivers that when they turn off Atlantic Avenue north or south they are generally entering Living Streets. In these areas, gateways serve a number of purposes: they signal to drivers that they should turn off Atlantic Avenue carefully; they reinforce the strong pedestrian movement parallel to Atlantic Avenue; and they create additional sidewalk space in an important pedestrian corridor.

ATLANTIC AVENUE (TRAVEL STREET)

FROM FURMAN STREET TO SMITH STREET

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Install neckdowns on side streets where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Install gateway treatments consisting of neckdowns and raised, textured crosswalks at minor side streets in the outbound direction. These gateways will have localized pedestrian safety and speed reduction benefits, while also communicating to drivers that they are entering residential streets.
- A comprehensive streetscape program could be implemented.

Overview of Operational Improvements

- Modify signal timing and phasing in order to include protected pedestrian phases where possible. Specific improvements include exclusive pedestrian phases with no vehicular conflicts, Leading Pedestrian Intervals (LPI) to give pedestrians a headstart free of vehicular conflict, longer crossing times and protected left turn phases to further reduce vehicular conflicts.

• Remove crosswalk from slip ramp that provides free right-turn onto SB Columbia (on south leg of intersection west of traffic island)
• Increase pedestrian time

• Implement protected EB left turn phase

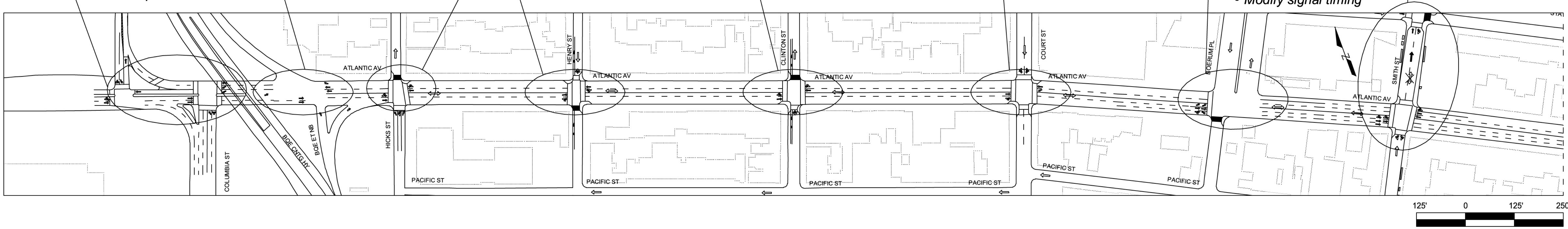
• Add neckdowns with bollards
• Add gateway treatments

• Add neckdowns
• Add gateway treatments
• Add LPI (Implemented 2001)
• Align bike lanes
• Allow parking on all sides

• Add neckdowns
• Add a pedestrian phase
• Implement a protected WB left-turn phase and exclusive left-turn lane

• Add neckdowns, gateway entrance, and island
• Widen the median
• Make only one SB through-lane
• Modify signal timing

• Convert Smith St to one-way NB only
• For further details please refer to the Smith St page



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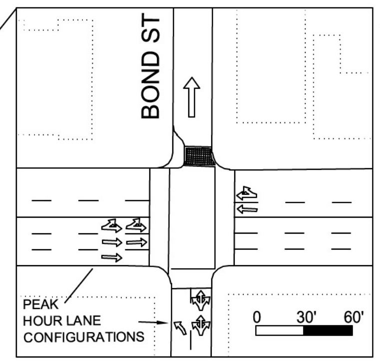
ATLANTIC AVENUE (TRAVEL STREET)

FROM SMITH STREET TO FLATBUSH AVENUE

HOYT/BOND/NEVINS PREFERRED OPTION:

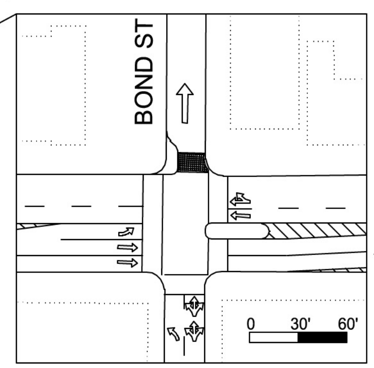


Pros:
- Increases pedestrian safety on sidewalks and crosswalks
- Reduces feeling of exposure on Atlantic

Cons:
- Doesn't shorten distance crossing Atlantic Ave

- Add gateway treatments
- Add Leading Pedestrian Interval (LPI)

HOYT/BOND/NEVINS DISCARDED OPTION:



Pros:
- Increases pedestrian safety on crosswalks
- Divides and reduces crossing distance on Atlantic Ave

Cons:
- Loss of parking on Atlantic Ave
- Feeling of exposure for pedestrians along Atlantic

- *Add gateway treatments*
- *Shift lanes to provide a pedestrian refuge*

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Install neckdowns on side streets where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Install gateway treatments consisting of neckdowns and raised, textured crosswalks at minor side streets in the outbound direction. These gateways will have localized pedestrian safety and speed reduction benefits, while also communicating to drivers that they are entering residential streets.
- A comprehensive streetscape program could be implemented.

Overview of Operational Improvements

- Modify signal timing and phasing to maximize protected pedestrian phases where possible. Specific improvements include exclusive pedestrian phases with no vehicular conflicts, Leading Pedestrian Intervals (LPI) to give pedestrians a headstart free of vehicular conflict, longer crossing times and protected left turn phases to further reduce vehicular conflicts.

- *Increase pedestrian time to cross Atlantic Ave*

- *Install medians*
- *Increase pedestrian crossing times*
- *Improve signal coordination along Atlantic Ave*
- *Add a neckdown*
- *Make NB 4th Ave left-turns protected*

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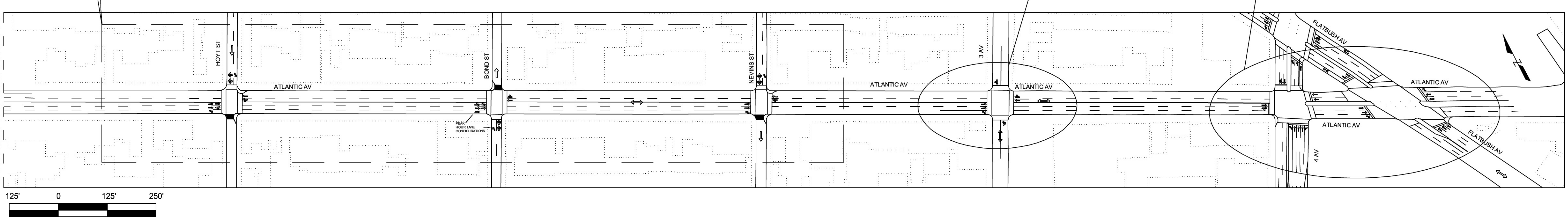


7.2.1.5 Boerum Place North

Boerum Place North is the subject of a separate planning effort by the Department of Design and Construction under the auspices of the office of the Brooklyn Borough President and so is not addressed separately as part of this strategy.

7.2.1.6 Cadman Plaza West/Court Street North

Cadman Plaza West/Court Street North carries a large number of pedestrians, especially in its southern section near Brooklyn Borough Hall and the Atlantic Avenue intersection. The strategy is therefore to facilitate this pedestrian activity through gateway treatments on a number of side streets. These entrance treatments consist of textured crosswalks at some locations and textured crosswalks combined with neckdowns at others. They serve to encourage and facilitate north-south pedestrian movement along the road and to reduce the perceived threat to pedestrians posed by cars turning in and out of these side streets.

At the Tillary Street/Clinton Street/Cadman Plaza West intersection substantial current road space is retrieved for non-motorized use. At the northwest corner of this intersection the project team initially suggested reclaiming a large area of unused road space for sidewalk; however, members of the Community Board 2 Traffic Calming Task Force pointed out that this space is used for pick up and drop off of elderly residents in the area and so it has been redesigned to facilitate this activity.

CADMAN PLAZA WEST/COURT STREET (TRAVEL STREET)

OLD FULTON STREET TO JORALEMON STREET

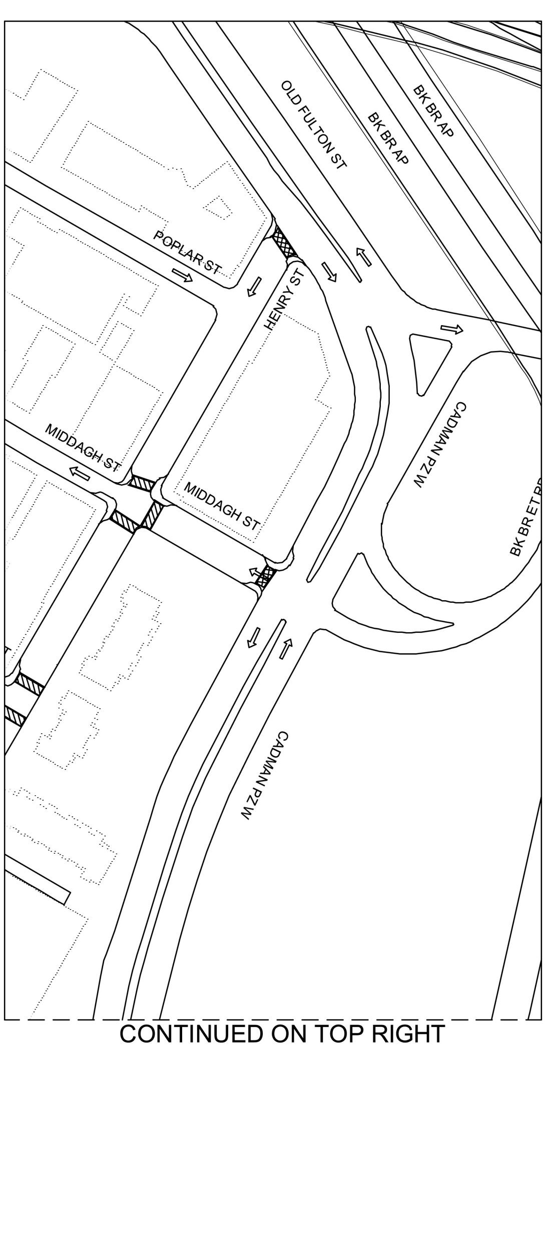
ACTIONS SUPORTING STRATEGY

Overview of Physical Improvements

- With the high number of pedestrians, a primary measure is to install neck downs on side streets where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- At the Cadman Plaza West/Clinton Street/Tillary Street intersection, modify the northbound lane configuration to one through and one right turn lane. Create a new island separating northbound right turn and through movements. Widen the median to shorten the eastbound left turn lane. Also, widen the sidewalks and median to remove two westbound Tillary St lanes.
- Add an off-street bike facility on the north side of Tillary Street between Cadman Plaza W. and Adams Street.
- A similar streetscaping program to that of Court Street south of Atlantic Avenue could be used, or perhaps a distinct streetscaping program could be implemented.

Overview of Operational Improvements

- Modify signal timing and phasing to maximize protected pedestrian phases where possible.
- Specific improvements include an exclusive pedestrian phase with no vehicular conflicts, Leading Pedestrian Intervals (LPI) to give pedestrians a vehicular conflict-free head start, longer crossing times and protected left turn phases to further reduce vehicular conflicts.



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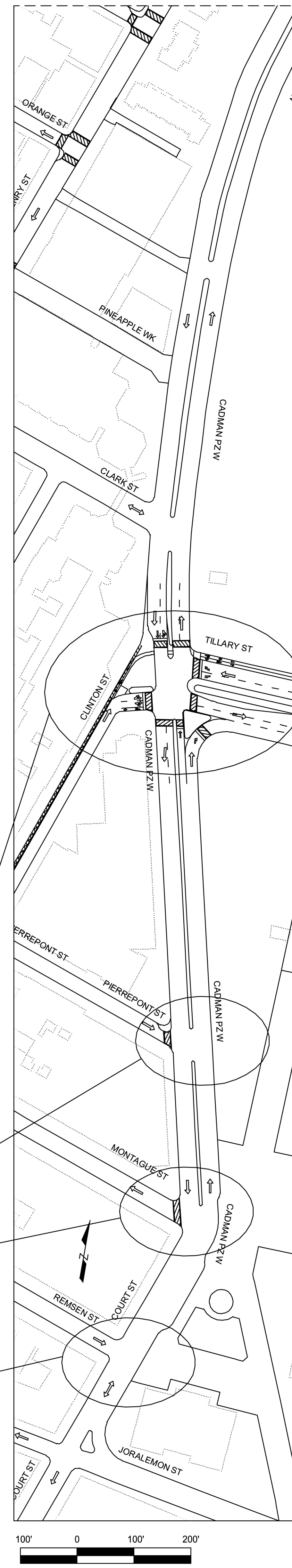


- *Widen medians and sidewalks*
- *Modify signal timing*
- *Create new island with controlled right turn*
- *Modify lane configurations*
- *Add an off-street bike trail on the north side of Tillary Street*
- *Maintain access to apartment building on corner*

- *Add a neckdown*
- *Texture crosswalk*

- *Texture Crosswalk*

- *Add an All Pedestrian Phase (completed as part of the pilot program)*

7.2.1.7 Flatbush Avenue

Flatbush Avenue is one of the major traffic arteries in the study area and its efficient operation is an important ingredient in Downtown Brooklyn's management plan. While it currently carries a heavy volume of traffic effectively, Flatbush Avenue is less effective in accommodating pedestrians walking along and across it. It divides Fort Greene from the Central Business District (CBD) and also contains obstacles – curb breaks and alignment discontinuities - for pedestrians walking along it. Flatbush Avenue's lack of consistent and high quality urban design elements and high traffic volumes make for an overall suboptimal pedestrian experience.

The width and alignment of Flatbush Avenue and the high traffic volume it carries makes it difficult for pedestrians to cross. This was addressed by identifying locations for additional mid-block pedestrian crossings in the long sections of Flatbush Avenue that lack signalized crossing opportunities. In field surveys in 1999 and 2000, jaywalking was observed at these long blocks, which exist because of Flatbush Avenue's diagonal orientation with respect to the Downtown Brooklyn street grid. Warrant surveys were conducted at Fleet Street and Tech Place and found that both satisfied the warrant for new signalized pedestrian crossings (refer *Appendix G).* NYCDOT has since installed the signalized crossing at Fleet Street and the proposed design for a pedestrian crossing at Tech Place has been advanced.

Some of the major traffic initiatives investigated to resolve major traffic bottlenecks along this corridor are discussed in *Section 7.5*. In addition, a number of other opportunities to improve the street environment and to return road space to non-motorized use along the length of Flatbush Avenue without adversely affecting traffic operations are identified. This is consistent with the traffic calming objective of improving the operations of streets in the broad sense and to share the dividend between all its users.

Throughout the length of Flatbush Avenue between Tillary Street and Atlantic Avenue, some opportunities exist to widen the median or install new median. Urban design treatments along this median would soften the visual barrier that Flatbush Avenue presents, although the location of subway gratings may limit what can be done here.

Other opportunities exist to reclaim roadway space for pedestrians. At Flatbush Avenue's intersection with Tillary Street, the medians currently stop short of the crosswalks and leave pedestrians exposed during their whole road crossing. Extending the existing medians to encompass the crosswalks would provide greater protection to pedestrians. Widening the medians on the west and south legs of the intersection at Tillary Street and Flatbush Avenue is also recommended. This latter treatment would increase space available for pedestrians and improve lane discipline for motorized traffic. All turns should be protected, which for safety reasons is more appropriate at this intersection (NYCDOT modified the left turn signal phase for both directions from "permitted-protected" to "protected only" in December 2000). The signal timings should also be adjusted, though only to the extent that the intersection operates as well as at present in peak periods. The revised signal timings at Tillary Street mean that the length of the exclusive left turn lane on its southern approach can be reduced and the median widened at Tech Place to provide better protection for pedestrians at the recommended pedestrian crossing described above.

Duffield and Gold Streets currently act as a service road running parallel to and west of Flatbush Avenue in the vicinity of MetroTech. The design of Myrtle Avenue's western approach has reflected this, with its median stopping well short of Flatbush Avenue. This design allows traffic traveling south on Flatbush Avenue to cut through its intersection with Myrtle Avenue to reach Gold Street. Pedestrians on the west side of Flatbush Avenue must execute a dogleg to walk through this intersection and contend with traffic – and in particular trucks – turning off Flatbush Avenue at high speed. While the needs for a service road are understood, a variety of safety and operational problems are apparent. The reconfiguration of this intersection involves realigningthe access to Gold Street to a point south of Myrtle Avenue. This should be designed to allow easy access by the service vehicles that access loading docks on Gold Street south of Myrtle Avenue while preventing the current high-speed maneuver. Moving the access point south of Myrtle Avenue also allows substantial space to be recovered for non-motorized use. This will benefit pedestrians in the area by providing them with a less circuitous path along Flatbush Avenue and an important streetscape opportunity. Design and implementation of the realignment of Gold Street will be subject to NYCDOT Highway Design approval.

Figure 7.2 Pedestrian conditions on Flatbush Avenue south of Myrtle Avenue

At Flatbush Avenue's intersections with both Myrtle Avenue and Willoughby Street the project team initially suggested replacing the current left turn for northbound Flatbush Avenue traffic with "jug handle" diversions to the east of Flatbush Avenue onto Myrtle Avenue and Willoughby Street respectively. By replacing left turns from Flatbush Avenue with crossing traffic from the east, the Flatbush Avenue median could be widened at these locations. However, the plan does have drawbacks in terms of clarity and intuitiveness – clear and prominent signage would be needed to alert left turning drivers to the need to turn right up Prince Street and Fleet Street respectively, since this is the main point of access to MetroTech. In addition, this idea created traffic intrusion into the area to the east of Flatbush Avenue, potentially conflicted with plans for development of the Brooklyn Academy of Music (BAM) Cultural District, and reduced access to the Willoughby Street corridor targeted for redevelopment by the Downtown Brooklyn Council.

Accordingly, Community Board 2 and the project team decided that retention of the current left turn lanes on Flatbush Avenue was a better approach for these intersections.

The intersection of Fulton Street with Flatbush Avenue experiences a heavy concentration of pedestrian activity because of heavy bus traffic on Fulton Street, the presence of subway station entrances and concetration of business and retail uses in the surrounding area. The action plan widens medians and introduces neckdowns to maximize the space available for pedestrians. It also introduces a more direct pedestrian crosswalk on the intersection's southern leg and introduces a leading pedestrian interval and a protected left turn from Fulton Street east to make the task of crossing Flatbush Avenue easier and safer for pedestrians. Some of the operational problems at this intersection result from poor crossing discipline by pedestrians, a problem exacerbated by the pedestrian crossing immediately to its south, which encourages pedestrians to use all road space between Fulton Street and the pedestrian crossing as an active crossing area. Extension of the pedestrian fencing at this location is suggested to encourage pedestrians to cross at appropriate locations. Finally, signal timing changes can be implemented to improve traffic flow through this intersection, as shown in *Table 7.1*. Detailed Synchro analysis of these improvements can be found in *Appendix F*.

Table 7.1 Current and Proposed Traffic Conditions at Flatbush Avenue/Fulton Street Intersection

Approach	Existing (2000)				Proposed Changes			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	LOS	*Int. Delay*	*LOS*	*Int. Delay*	*LOS*	*Int. Delay*	*LOS*	*Int. Delay*
Fulton Street WB	D	30.5 sec	C	33.5 sec	D	38.2 sec	C	28.7 sec
Fulton Street EB	C	34.2 sec	C	34.1 sec	C	28.1 sec	D	38.2 sec
Flatbush Avenue NB	A	0.2 sec	A	6.4 sec	A	4.8 sec	B	10.8 sec
Flatbush Avenue SB	B	17.7 sec	C	22.5 sec	A		B	10.4 sec

Source: Traffic volumes from 330 Jay Street EIS

Pedestrians crossing at the intersection of Flatbush Avenue and Livingston Street currently must use a traffic island at the intersection's northwest corner. This island exists to facilitate right turns for southbound traffic on Flatbush Avenue to Livingston Street; however, this occurs at the expense of pedestrians who must gather on the exposed traffic island. The action plan for this location reconnects the pedestrian island to the sidewalk, with obvious benefits for pedestrians. The small number of right turning vehicles[10] can turn at Nevins Street to reach Livingston Street with no impact on intersection level of service.

At Flatbush Avenue's intersection with Schermerhorn Street, 3rd Avenue and Lafayette Avenue, BAM's master planners have identified Lafayette and 3rd Avenues as a pedestrian axis linking

[10] Right-turning volumes from southbound Flatbush Avenue to westbound Livingston Street are 19 in the AM peak hour, 14 in the PM peak hour according to the 330 Jay Street Environmental Impact Statement

BAM with Atlantic Avenue. Some modifications to lane marking and signal timing are suggested at this intersection. A median on Schermerhorn Street to improve lane discipline and to make crossing easier for pedestrians is recommended. This intersection also marks the northern end of a median on Flatbush Avenue that could extend south to and beyond 4th Avenue. This median is intended to provide protection for pedestrians crossing Flatbush Avenue as well as a landscaping opportunity. Although not shown on the plan, the traffic island on the southwest corner of the Flatbush Avenue/Schermerhorn Street intersection could be reconnected to the sidewalk and a pedestrian plaza created; the traffic feasibility of this would need to be explored.

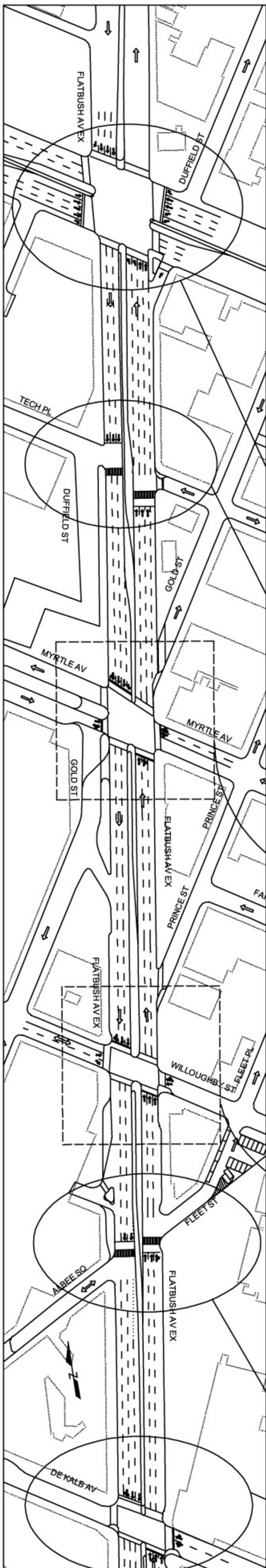
At Flatbush Avenue's intersections with 4th Avenue and Atlantic Avenue a number of median islands intended to create pedestrian refuges are suggested; these would improve traffic discipline, improve the street environment, and strengthen the connection to the Long Island Rail Road station. Some limited improvements to traffic operations can be achieved through improved signal coordination in this area. This is discussed further in *Section 7.5. Table 7.2* shows the improvements in traffic operations which these signal timing changes yield. Detailed Synchro analysis of these improvements can be found in *Appendix F*. In November 2003, NYCDOT installed Advanced Solid State Traffic Controllers for the signals at this intersection to optimize coordination.

Table 7.2 Current and Proposed Traffic Conditions at Flatbush-Atlantic-Fourth Avenue Intersection

Approach	*Existing (2000)*				*Proposed Changes*			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	LOS	*Int. Delay*	*LOS*	*Int. Delay*	*LOS*	*Int. Delay*	*LOS*	*Int. Delay*
Flatbush Ave – Fourth Ave	C	26.3 sec	C	20.0 sec	D	32.5 sec	B	17.0 sec
Flatbush Ave – Atlantic Ave	C	23.4 sec	C	29.2 sec	C	23.4 sec	C	28.9 sec
Atlantic Ave – Fourth Ave	D	49.7 sec	D	43.4 sec	C	27.6 sec	C	22.0 sec

Source: Traffic volumes from 330 Jay Street EIS

As a major Travel Street with considerable commercial and institutional activity, Flatbush Avenue plays a vital role in Downtown Brooklyn. Its traffic carrying role is cited in a number of environmental impact statements (EISs) and the State Implementation Plan (SIP). Any changes on Flatbush Avenue could have areawide as well as localized impacts. In addition, it is the centerpiece of a development proposal being advanced by the Department of City Planning, EDC and the Mayor's Office for Economic Development and Rebuilding. DCP has developed a series of proposals to improve conditions along the corridor. Therefore, the proposals for Flatbush Avenue would need to be evaluated not only for capacity and LOS impacts but for their impacts on the SIP, EISs and Downtown Brooklyn redevelopment.



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FLATBUSH AVENUE (TRAVEL STREET)

FROM TILLARY STREET TO DEKALB AVENUE

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Widen sidewalks to take advantage of unused roadspace and provide pedestrian refuges that extend into the crosswalk and are wide enough to make pedestrians feel safe.
- Install neckdowns on side streets where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at lower speeds.
- Provide mid block crossings to break up the long blocks and create safer crossing opportunities at popular crossing locations.
- Rationalize lanes at various locations to reduce ambiguous driving conditions that lead to safety problems.

Overview of Operational Improvements

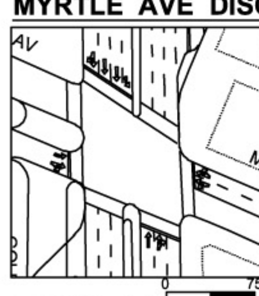
- Modify signal timing and phasing to maximize protected pedestrian phases where possible. Specific improvements include exclusive pedestrian phases with no vehicular conflicts, Leading Pedestrian Intervals (LPI) to give pedestrians a head start free of vehicular conflicts, longer crossing times and protected left turn phases to further reduce vehicular conflicts.
- Improve coordination between signals along this corridor to improve vehicular traffic conditions which will encourage drivers to use Flatbush Avenue as opposed to the neighborhood side streets.

Note: All improvements require NYCDOT review.

- *Revise signal timings to make left-turns protected-only*
- *Widen medians*
- *Remove one NB through lane*
- *Add landscaping barriers*
- *Modify park in NW corner to remove pedestrian shortcut*

- *Add signalized mid-block crossing*
- *Shorten storage length of a NB left-turn lane to widen the median*

MYRTLE AVE DISCARDED OPTION:



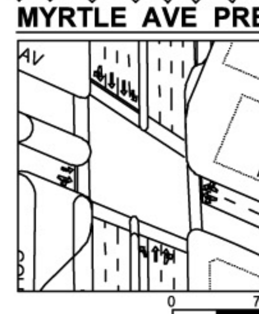
Pros:
- Provides a wide safe median into the crosswalk

Cons:
- Drivers have to make a jug-handle turn in order to make a left onto Myrtle

- *Add Neckdowns*
- *Provide an extra pedestrian phase*
- *Make SB left-turn lane protected-only*
- *Rationalize U-shaped entry/exit*

1A. *Widen existing median*
1B. *Re-route Flatbush left-turns*

MYRTLE AVE PREFERRED OPTION:



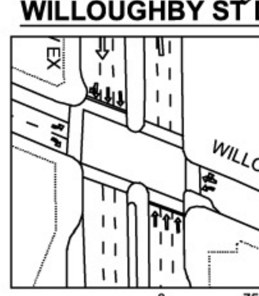
Pros:
- Provides a median in the crosswalk for pedestrians

Cons:
- Median is not wide enough to handle pedestrian volumes

- *Add neckdowns*
- *Provide an extra pedestrian phase*
- *Make SB left-turn lane protected-only*
- *Rationalize U-shaped entry/exit*

2A. *Extend median Into crosswalk*

WILLOUGHBY ST DISCARDED OPTION:



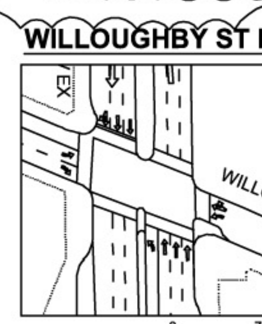
Pros:
- Provides a wide safe median into the crosswalk

Cons:
- Drivers have to make a jug-handle turn in order to make a left onto Myrtle

- *Provide Willoughby phase with more green time*

1A. *Remove Flatbush NB left-turn phase*
1B. *Re-route NB left-turns*
1C. *Widen existing median and extend into crosswalk*

WILLOUGHBY ST PREFERRED OPTION:



Pros:
- Provides a median in the crosswalk for pedestrians

Cons:
- Median is not wide enough to handle pedestrian volumes

- *Provide Willoughby phase with more green time*

2A. *Extend median Into crosswalk*

- *Add Signalized mid-block crossing*
- *Reduce and remove slip roads*
- *Widen existing medians*
- *Add neckdowns*
- *Rationalize lane widths and alignments for WB approach*
- *Add more time to the existing LPI*

100' 0 100' 200'

FLATBUSH AVENUE (TRAVEL STREET)
FROM FULTON ST TO ATLANTIC AVE

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Widen sidewalks to take advantage of unused roadspace and provide pedestrian refuges that extend into the crosswalk and are wide enough to make pedestrians feel safe.
- Install neck downs on side streets where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at lower speeds.
- Remove the right turn movement from Livingston Street to provide more pedestrian facilities.
- Rationalize lanes at various locations to reduce ambiguous driving conditions that lead to safety problems.

Overview of Operational Improvements

- Modify signal timing and phasing to maximize protected pedestrian phases where possible. Specific improvements include exclusive pedestrian phases with no vehicular conflicts, Leading Pedestrian Intervals (LPI) to give pedestrians a vehicular conflict-free head start, longer crossing times and protected left turn phases to further reduce vehicular conflicts.
- Improve co-ordination between signals along this corridor to improve vehicular traffic conditions which will encourage drivers to use Flatbush Avenue as opposed to the neighborhood side streets.

Note: All improvements require NYCDOT review

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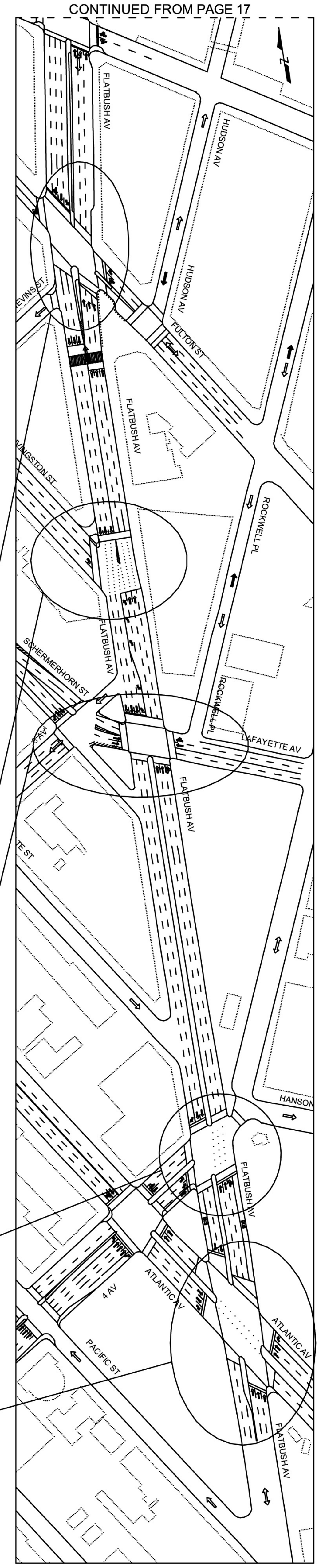


- *Introduce a more direct crossing at the south leg*
- *Make SB left-turns protected only*
- *Add neckdowns*
- *Add a 5 second LPI*
- *Widen existing median*
- *Direct pedsetrian to appropriate crossing locations with pedestrian fencing*

- *Remove SB right-turns*

- *Modify signal timings with 3rd and Schermerhorn*
- *Make two through lanes for WB approach*
- *Install median*

- *Improve signal coordination with 4th Avenue*
- *Increase all pedestrian phase*
- *Reconfigure EB approach to two through lanes and one exclusive right-turn lane*
- *Install medians*

- *Improve signal coordination with Atlantic Avenue*
- *Implement LPI*
- *Install medians*

7.2.1.8 Furman Street

Returning Furman Street to its original two-way operation is an important element of the Travel Street strategy for the area. A two-way Furman Street would improve the movement options around the area and, provided the streets are designed and managed appropriately, this improved accessibility could be achieved without significant adverse impact on the surrounding street environment. Indeed, the strategy for Old Fulton Street (described in *Section 7.2.2.10*) has the potential to improve the street environment in this area substantially. The approach at Furman Street reflects the idea that Travel Streets need not carry heavy volumes to fulfill their traffic function. Some Travel Streets, like Furman Street, act as links in the skeletal network that provides direct, though not necessarily high-speed or high-capacity, connections for inter-neighborhood movement. Synchro analysis showing the proposed operations of Furman and Old Fulton Streets can be found in *Appendix F*.

In July 2003, Community Board #2 endorsed the concept of two-way Furman Street, to manage traffic and to provide access to the planned Brooklyn Bridge Park[11].

[11] An earlier draft (Spring 2003) of this report stated that Community Board #2's Traffic Calming Task Force deferred taking a position on two-way Furman Street until plans for the Brooklyn Bridge Park evolve. Since then, the Community Board has endorsed two-way Furman in response to the earlier draft.

7.2.1.9 Hamilton Avenue

Hamilton Avenue acts as the study area's southern boundary and so this study's investigation is confined to its northern half. While the future reconstruction of the Gowanus Expressway will be an important determinant of the future management of Hamilton Avenue, short term opportunities exist to improve its operations and to limit through traffic intrusion on streets running north from Hamilton Avenue. The intersections of Hamilton Avenue with Clinton, Luquer, Henry and Columbia Streets would all benefit from curb realignment. Such realignment would create a consistent and direct pedestrian path along Hamilton where none exists today, while retrieving substantial unused road space. The designs also require traffic turning from Hamilton Avenue onto these Living Streets to do so at low speeds, with safety benefits for all users in the immediate local area and the potential for improved environment on streets north of Hamilton Avenue.

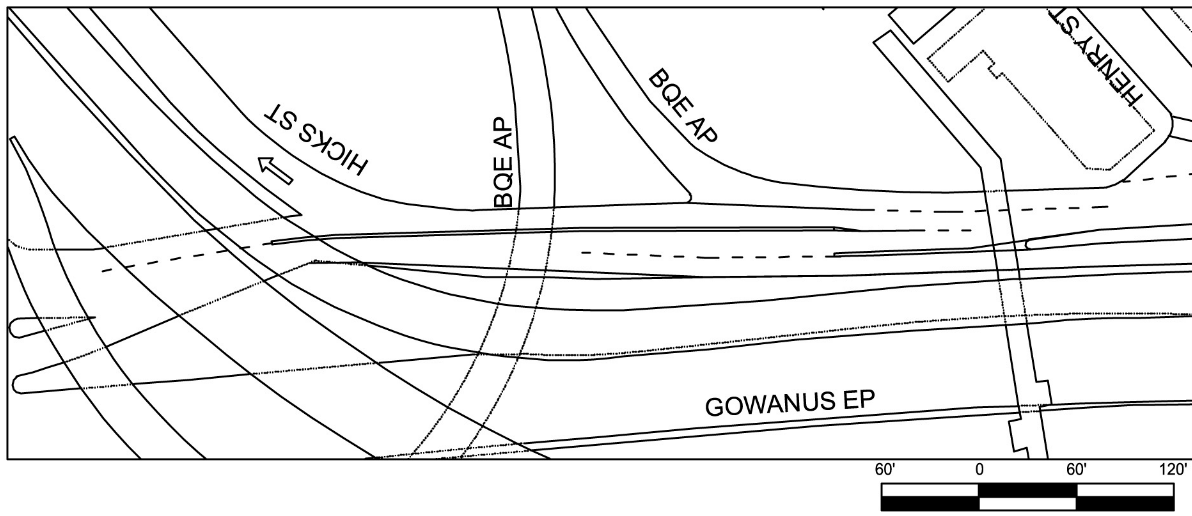
The project team also considered but then recommended against the idea of closing Clinton Street at Hamilton Avenue. This is described in *Section 7.2.3.5.*

The final element of the strategy for Hamilton Avenue is to address the safety problems caused by traffic weaving from the Gowanus Expressway across Hamilton Avenue traffic to the on-ramp of the BQE (i.e. jumping the line of traffic on the Gowanus/BQE) or to Hicks Street. Two options were explored, one of which would deny access to both the BQE on-ramp and Hicks Street from the Gowanus Expressway by constructing a physical barrier, and the other which would deny access only to the BQE on-ramp. Discussions with the community indicated that the first and more restrictive option was regarded as too extreme and had the potential for an unintended and adverse consequence of forcing traffic traveling from the Gowanus Expressway to the local area north of Hamilton Avenue into Red Hook. The agreed measure addresses the most severe safety concerns at this intersection but does not protect Hicks Street. NYCDOT implemented this measure in 2001.

Figure 7.3. New striping and treatment implemented in 2001 restricts weaving on Hamilton Avenue at the BQE.

HAMILTON AVENUE (TRAVEL STREET)

HAMILTON AVE DISCARDED OPTION

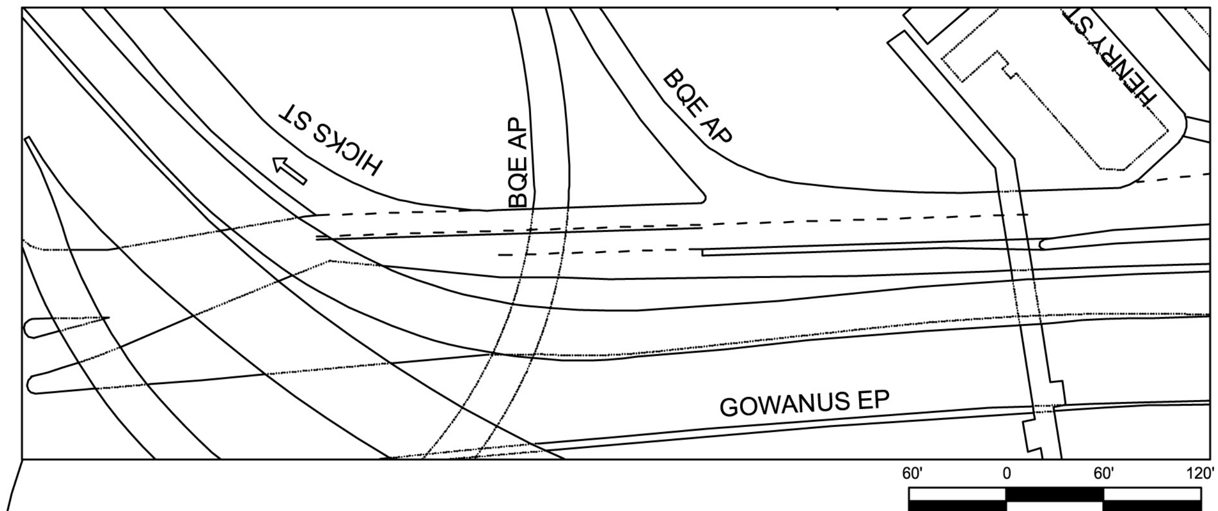


Pros:
- Would reduce unsafe weaving on Hamilton Ave
- Would reduce through-traffic on Hicks St

Cons:
- Potential for more traffic on Columbia St

1A. Eliminate re-entry onto the BQE from the Hamilton Ave off-ramp from the Gowanus Expressway.
1B. Eliminate access onto Hicks St from the Hamilton Ave off-ramp from the Gowanus Expressway.

HAMILTON AVE PREFERRED OPTION



Pros:
- Would discourage through-traffic on Hicks St

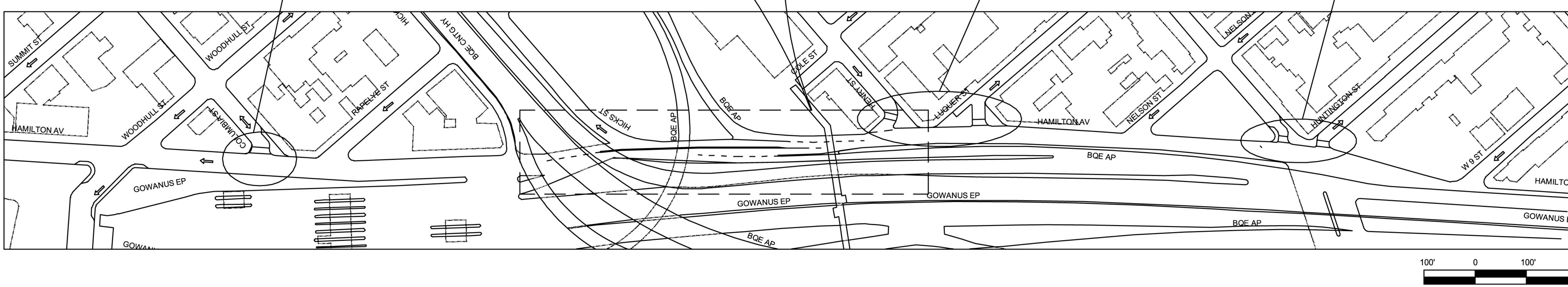
Cons:
- Would not reduce unsafe weaving

2A. Discourage access onto Hicks St from the Hamilton Ave off-ramp from the Gowanus Expressway.

- *Discourage access onto Columbia St from Hamilton Ave to encourage use of Van Brunt St as a through/truck route.*

- *Reclaim roadspace*
- *Slow vehicles turning into Luquer St*

- *Discourage access from Hamilton Avenue to Clinton St/Huntington St*



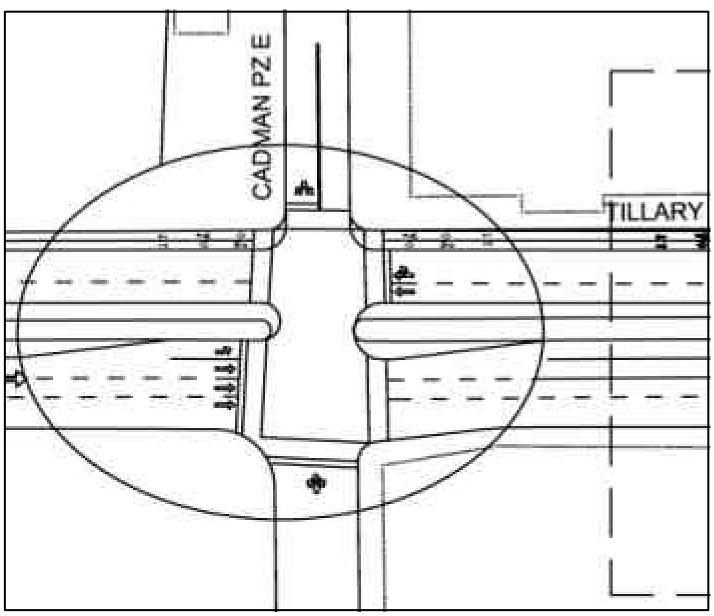
7.2.1.10 Tillary Street

Tillary Street presents a great opportunity to rationalize the overall use of street space to meet broad community needs. Road space adjacent to the current narrow median can be reclaimed over the whole length of the street between Cadman Plaza West and Flatbush Avenue. This can be done either by interrupting the currently continuous left turn lane on the eastbound side of the road or by reclaiming through travel lanes not required for traffic capacity.

An example of the space able to be reclaimed by interrupting the left turn lane was provided by the pilot program treatment at the Tillary Street/Adams Street intersection. This treatment shows that traffic operations can be improved by rationalizing road space. The existing continuous left turn lane sends an inappropriate signal to drivers – in this case that they can use a left turn lane to travel straight through an intersection. Given that drivers know that in practice they cannot do this, there is no traffic capacity cost to reclaiming the left turn lane immediately downstream of each intersection, but there are pedestrian safety and mobility benefits.

The width of Tillary Street west of Adams Street is much wider than is required for traffic – particularly westbound traffic – and New York City Transit bus staging, which occurs on the south side of this section of Tillary Street. Accordingly, the northern curb line can be moved as far as two lanes south without adversely affecting traffic operations. It is proposed that this space be turned over in part to an off street bike lane that links the bike lane on Clinton Street and the bike path to and across the Brooklyn Bridge in the median of Adams Street north of Tillary Street.

Figure 7.4 Plan for the intersection of Tillary Street and Cadman Plaza East, illustrating the use of medians and bike lanes to narrow the roadway



The plans for the part of Tillary Street west of Adams Street are subject to security decisions that impact the road management approach in front of the new courthouse on the northwest corner of Tillary Street and Adams Street. For this and other reasons, the Tillary Street/Adams Street intersection is one that requires further evaluation.

Just west of its intersection with Flatbush Avenue, a number of students cross Tillary Street mid-block while walking between the school on the Flatbush Avenue Extension and the downtown area. This is an illegal activity that many in the community want to discourage. Short of creating a physical barrier there is only a limited amount that can be done to combat this problem using street design tools. Suggestions include:

- Design of the median to discourage mid-block crossing through dense planting in a raised garden bed. This does, of course, raise the perennial problem of maintenance responsibility.
- Reconfiguration of the pocket park on the north west corner of the Tillary Street/Flatbush Avenue intersection so that pedestrians are not led to the current mid-block crossing point but instead are directed to the signalized crosswalk.

Implementation of the recommended widened medians may be constrained by present requirements from Environmental Impact Statements for surrounding developments (330 Jay Street and others) that stipulate the present lane/median configuration as part of their traffic mitigation plan.

TILLARY STREET (TRAVEL STREET)

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

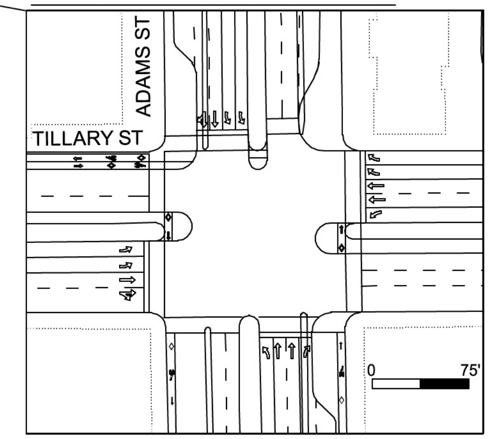
- Remove lanes where possible and reclaim road space for bicycle lanes, pedestrian refuges and wider sidewalks.
- Install neckdowns on side streets where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Add bike lanes to connect existing bike routes, to provide safe bicycling area, and to visually narrow the road.
- A comprehensive streetscaping program could be implemented which could match that of Adams Street or with an identity of its own.

Overview of Operational Improvements

- Modify signal timing and phasing to maximize protected pedestrian phases where possible. Specific improvements include Leading Pedestrian Intervals (LPI) to give pedestrians a vehicular conflict-free head start, longer crossing times and protected left turn phases to further reduce vehicular conflicts.

Implementation of the recommended widened medians may be constrained by present requirements from Environmental Impact Statements for surrounding developments (ex. 330 Jay Street, and others) that stipulate the present lane/median configuration as part of their traffic mitigation plan.

TILLARY/ADAMS OPTION 1:



•Widen Medians

•Revise signal timing to protect WB left-turns

•Split pedestrian crossing on north leg

1A. Modify service road connections to Adams St to allow narrowing of roadway

Pros:

•Greatly reduces pedestrian crossing distance across Adams St and improves pedestrian safety

•Creates area for landscaping and beautification

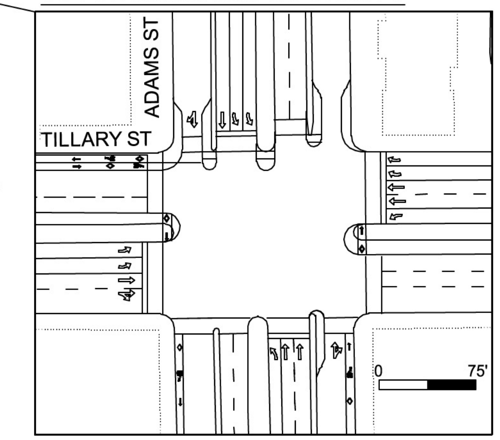
•Improve traffic and parking discipline

•Provides clear route for cyclists

Cons:

•Some loss of parking

TILLARY/ADAMS OPTION 2:



•Widen medians

•Revise signal timing to protect WB left-turns

•Split pedestrian crossing on north leg

2A. Re-align service roads to allow for better crossing facilities

Pros:

•Reduces crossing distance across Adams St

Cons:

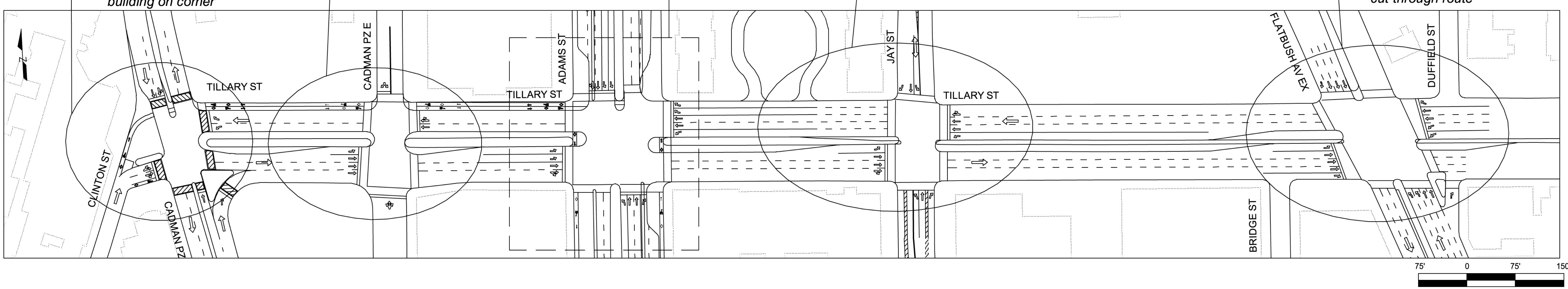
•Pedestrians still have to cross four roadways

•Widen sidewalks and median
•Modify lane configuration
•Create new island
•Modify signal timing
•Add an off-street bike facility
•Maintain access to apartment building on corner

•Widen sidewalks and median
•Add an off-street bike facility that could either be on the north side of Tillary St or in the median
•Increase traffic signal cycle length to be consistent with adjacent intersections
•Maintain bus layover lane in the EB direction

•Widen Tillary St medians
•Revise signal timings to make left-turns protected only
•Extend NB right-turn lane

•Widen medians on Tillary St
•Widen medians & islands on Flatbush Ave
•Revise signal timings to make dual left-turns protected only
•Add landscaping and physical barriers to Tillary St median
•Modify park in NW corner of intersection to remove pedestrian cut-through route



7.2.2 Community Streets

Plans for Community Streets were developed based on the functions of streets discussed in the Street Management Framework in *Section 5.3.2.* As discussed in *Section* 5.3.2, overall objectives for Community Streets are to:

- Facilitate pedestrian crossings,
- Improve the street environment for pedestrians, bicyclists, businesses and residents,
- Discourage excessive vehicle speeds and aggressive driving, and
- Improve access to businesses and reinforce neighborhood commercial cores.

7.2.2.1 Columbia Street

Columbia Street and Van Brunt Street are the subject of a separate ongoing planning effort by NYCDOT and the Department of Design and Construction and therefore are not addressed as part of this strategy. However, any plan for the Columbia Street/Van Brunt Street corridor should explore the possibility of building a pedestrian/bicycle pathway that connects Red Hook to the planned Brooklyn Bridge Park.

7.2.2.2 Court Street

As Court Street is an important neighborhood center running through the heart of the study area, its management is of critical importance. Like many Community Streets, it serves multiple functions: it is an important retail destination over much of its length, it serves as an important commuter traffic route in the evening peak period and it is an important bus route. It carries 11,900 vehicles per day (vpd). While the idea of eliminating commuter traffic is an attractive one for those who use Court Street for other purposes, this is not feasible in the scope of a traffic calming effort such as this. Accordingly, the focus must be on minimizing the adverse effects of such traffic on the street and on ensuring that the street's other functions are not compromised by this traffic. At the same time, it should be recognized that the presence of traffic, in itself, is not necessarily uniformly negative. Some of the most attractive and vibrant shopping streets in New York City carry plenty of traffic. Parked vehicles on a shopping street provide pedestrians with an increased perception of safety as they create a buffer between the sidewalk and travel lanes. So, as everywhere, a balance must be struck between the needs of the various users of the street in advancing these plans.

Figure 7.5 Court Street: Buses stopped far from curbs force passengers to board in street

Figure 7.6 Court Street: Buses partially blocking the travel lane encourage vehicles to straddle two lanes while passing

In developing ideas for Court Street, the starting point was the aim to retrieve as much road space as possible without compromising traffic capacity or eliminating on-street parking. Preservation of the on-street parking supply is a sensitive issue throughout the study area – initially a trial of neckdowns was suggested at several locations on Court Street as part of the pilot program (see *Section 6*), but these were rejected by Community Board 6 because of nearby merchants' concerns about lost parking.

In addition, evaluation of the current operations of Court Street showed that buses were experiencing the kinds of problems that beset them on many roads of this type. Buses in many cases do not pull into designated bus stops either because illegally parked vehicles block the stops or because bus drivers do not feel that they will be able to pull back into the traffic stream when leaving the stop. As a result, buses commonly stop either in the rightmost of the two travel lanes or are pulled only partially into the bus stop. This results in passengers having to walk into the road to board and exit buses. Moreover, when a bus partially pulls into a bus stop following drivers are tempted to pass it by creating two lanes of traffic in less than two lanes of remaining road space.

A solution to this problem is to consider the issue of travel through the Court Street corridor in a broader context. The corridor's existing traffic capacity, which may be defined as the number of vehicles able to travel its length in the peak hour, should not be compromised. In heavily developed urban areas such as Downtown Brooklyn's, this capacity is governed by the capacity of the most congested intersections. In the case of Court Street, the most congested intersections are at Atlantic Avenue and at Hamilton Avenue. Provided the amount of traffic that reaches these intersections in the peak hour is not compromised, the traffic efficiency of the corridor is maintained.

It is in this context that bus bulbs have been included in the strategy for the Court Street corridor. Bus bulbs are curb extensions at bus stops that are approximately as long as a single bus and that allow buses to pick up and drop off passengers without leaving the travel lane. Following traffic in the rightmost travel lane is forced to wait behind the bus while passengers are dropped off and picked up. The benefits for buses and bus passengers are obvious. Buses would no longer have to negotiate exit and entry from the traffic stream and therefore benefit from less problematic operations and improved schedule adherence. Bus passengers would be able to enter and exit buses without having to walk into the road. Other road traffic would benefit as well. Traffic traveling the length of Court Street would take no longer than it does currently as the corridor's capacity and travel time along it are governed by the operations of the intersections at its two ends. Safety benefits would accrue from the improved certainty for vehicles following buses – at no point would drivers be tempted to squeeze past a stopped bus partially pulled into a bus stop.

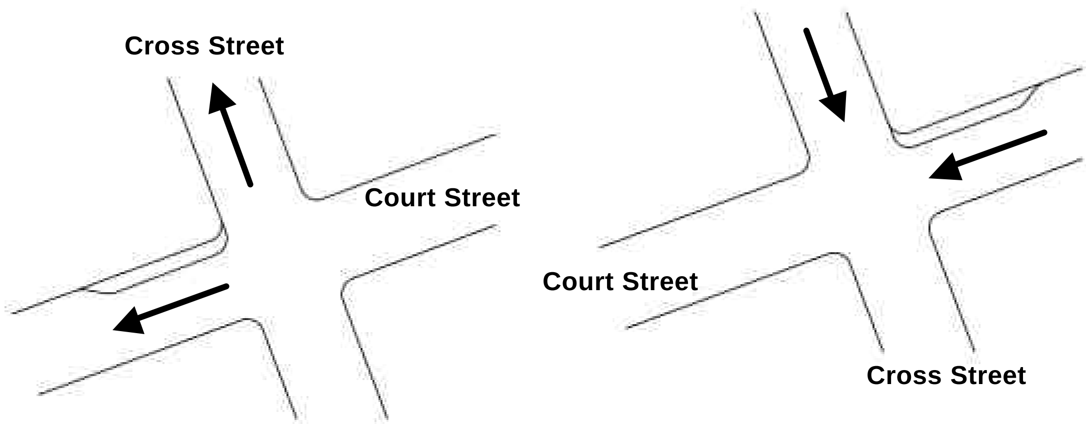
Care must be taken in the placement of bus bulbs. It is important that drivers looking to turn right from Court Street not be tempted to pull past a stopped bus and cut in front of it to turn right. The team initially suggested placing all bus bulbs upstream of intersections of Court Street with streets running one-way eastbound (where right turns are impossible), in order to avoid this problem. In their discussions with the Community Board 6 Transportation Committee, the relative merits of bus stops on the near side and far side of intersections were reviewed. It was agreed that on balance far side bus stops are most appropriate for New York City because of New Yorkers' tendency to cross the road immediately on exit from the bus – a move that could be dangerous if passengers do so in front of a stopped bus. But given that this will be less disruptive since existing bus stop locations can be retained, it was deemed appropriate that the bus bulbs should be placed to the far side of intersections (see *Figure 7.7*).

A final benefit of bus bulbs is that they can increase the number of legal parking spaces in Court Street. Existing designated bus stops are 90 ft long; a bus bulb can be shorter than this because no room needs to be provided for buses to pull in or out of stops. A typical bus bulb design (and the one adopted for this strategy) is approximately 70 ft long. In general, this creates a parking space wherever a bus bulb replaces an existing curbside bus stop.

However, it should be noted that illegal standing at a bus bulb, if it forces the bus to stop in the outer travel lane, could result in the blockage of all travel lanes. This may in turn result in motorists making dangerous and illegal maneuvers in order to avoid the blockage - in other words, a worse operational condition than exists today. Bus bulbs are still recommended because they are designed to discourage illegal standing, and because the potential for infrequent illegal use exists with any traffic control device and thus should not be used as an argument against traffic calming device that will result in better and safer roadway operations.

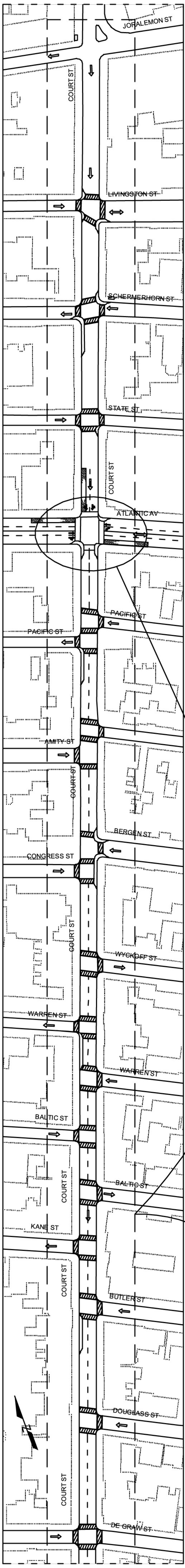
Elsewhere on Court Street, a number of neckdowns aimed at further retrieving road space for use by pedestrians are part of the strategy. As with the bus bulbs, certain intersections can be narrowed because turns are prohibited due to the pattern of one-way streets.

Figure 7.7 Far side (left) and original near side (right) design of Court Street bus bulbs. The far-side design was chosen due to concerns about the safety of exiting passengers.



COURT STREET (COMMUNITY STREET)

JORALEMON STREET TO HAMILTON AVENUE



ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

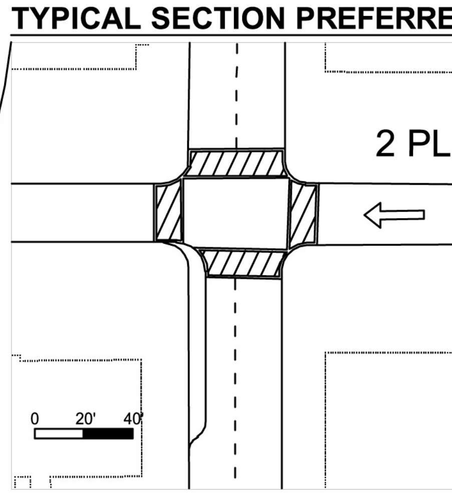
- With the high number of pedestrians, a primary action is to install neckdowns on side streets where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Install bus bulbs on the portion of Court Street that the B75 uses. These bus bulbs will have localized pedestrian safety and transit benefits.
- A distinct streetscaping program could be implemented.

Overview of Operational Improvements

- Modify signal timing and phasing to maximize protected pedestrian phases where possible.
- Specific improvements include an exclusive pedestrian phase with no vehicular conflicts, Leading Pedestrian Intervals (LPI) to give pedestrians a head start free of vehicular conflict, longer crossing times and protected left turn phases to further reduce vehicular conflicts.

- *Add neckdowns*
- *Add a dedicated WB left-turn lane and phase*
- *Add LPI*
- *Increase pedestrian time at Atlantic Ave in the PM peak period*

TYPICAL SECTION PREFERRED OPTION:



- *Add textured crosswalks*
- *Add neckdowns where possible*

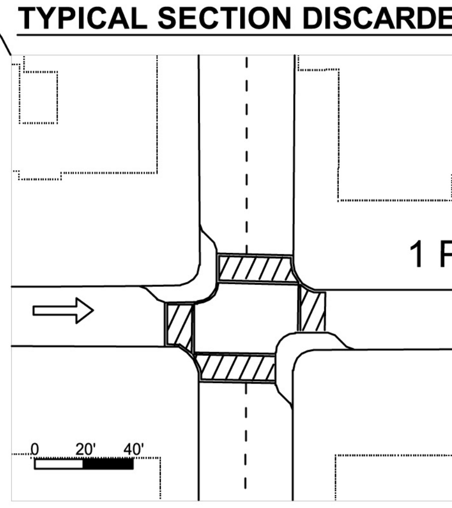
1A. Add bus bulbs at appropriate locations

Pros:
- Enhance benefits for pedestrians, transit users, and bus drivers
- Reclaim space for pedestrians
- Create safer crossing areas
- Create more parking area or a loading zone

Cons:
- Minor reduction in street capacity

NOTE: Relocating bus stops contingent upon MTA approval.

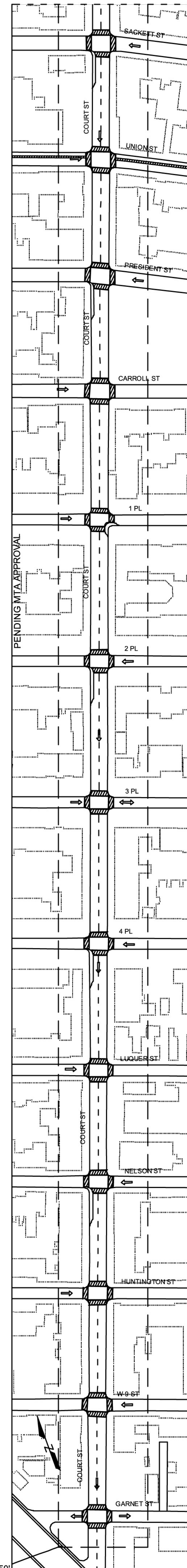
TYPICAL SECTION DISCARDED OPTION:

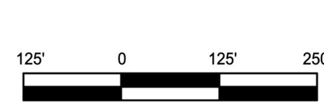


- *Add textured crosswalks*
- *Add neckdowns where possible*

Pros:
- Create safer crossing areas

Cons:
- Reclaims less streetpace for non-auto uses





7.2.2.3 DeKalb Avenue

DeKalb Avenue is a Community Street with a residential focus and frequent bus service. Community-identified concerns include controlling the speed of vehicles on DeKalb Avenue, especially during off-peak periods. Reduced (25 mph) progression speed was tested as part of the pilot program and remains in place. This measure could be augmented with clear signage warning drivers of the timing change, as noted in *Section 6.* A Class II bicycle lane is recommended on the left hand side of the road west of Cumberland Street. This lane can be accommodated in the existing cross-section without removing parking or travel lanes. East of Cumberland Street, the roadway width is narrower (40 feet). For this segment, a Class III bicycle route is recommended. This is consistent with the New York City Bicycle Master Plan, which currently shows DeKalb Avenue as a Class III bicycle route.

Neckdowns are also recommended on DeKalb Avenue as a means of creating additional pedestrian space and facilitating pedestrian crossings. Bus bulbs are recommended at each of the bus stops. The benefits of bus bulbs are discussed in *Section 7.2.2.2* above. As on Court Street, the bus bulbs recommended for DeKalb Avenue are located on the downstream (far) side of the intersection. This is consistent with NYCT policy, which holds that downstream bus stops prevent passengers from crossing in front of the stopped bus. Because of these concerns, a bus bulb is not recommended for the near side bus stop at Flatbush Avenue.

7.2.2.4 Fulton Street

Fulton Street's angled orientation with respect to the street grid in this area creates unusual intersections and opportunities to reclaim road space. A pilot program treatment was installed at South Oxford Street on the north side of Fulton Street. By itself, this measure was successful at changing the image of the intersection, but it forms only part of a larger scheme to reclaim road space and rationalize traffic movement at the intersection of Fulton, Greene and South Oxford Streets. The plan calls for substantial extensions of the sidewalk on the southern side of the intersection that improves traffic control and provides a much safer and more orderly pedestrian environment. This work should maintain loading access for storefronts along Fulton, and would not compromise access to the Brooklyn Academy of Music (BAM) complex. The pilot treatment at South Oxford Street included a raised crosswalk as part of the gateway treatment protecting the residential area to the north. The crosswalk was removed accidentally as part of routine road maintenance, but it is recommended that it be reinstalled. A similar treatment is recommended at Fulton Street's intersection with Lafayette Avenue and Fort Greene Place. The objective of this treatment is to promote driver discipline for east-west traffic, and to prevent sweeping turns onto Fort Greene Place.

A final recommendation for this corridor involves reversing the directions of Hudson Avenue (currently one-way northbound) and Rockwell Place (currently one-way southbound). Hudson Avenue intersects Fulton Street just east of its intersection with Flatbush Avenue. Currently, eastbound vehicles wishing to turn left onto northbound Hudson Avenue can cause traffic to back up all the way down the short block to Flatbush Avenue. Shifting this turning movement one block east, to Rockwell Place, would alleviate this condition. This improvement to traffic movement and safety for all road users on a Travel Street (Flatbush Avenue) and a Community Street (Fulton Street) would come at the expense of the small number of drivers wishing to exit Hudson Avenue onto Fulton Street, who would experience longer wait times trying to turn onto Fulton Street.

The Fulton Street/Flatbush Avenue intersection is discussed in detail in *Section 7.2.1.6*.

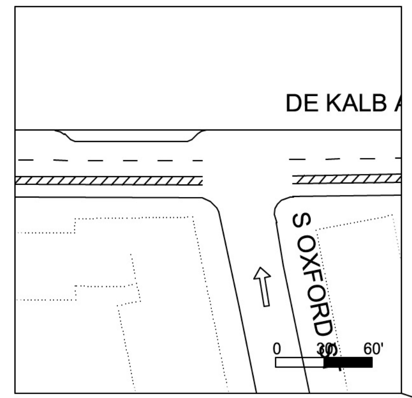
DEKALB AVENUE (COMMUNITY STREET)

ACTIONS SUPPORTING STRATEGY

General Improvement Strategies

- Reduce traffic speeds to levels appropriate for a community street (25 mph) by lengthening the signal offsets on DeKalb.
- Neckdown busy intersections to shorten crossing distance, improve pedestrian visibility, and encourage vehicles to turn at lower speeds.

PREFERRED TYPICAL SECTION:



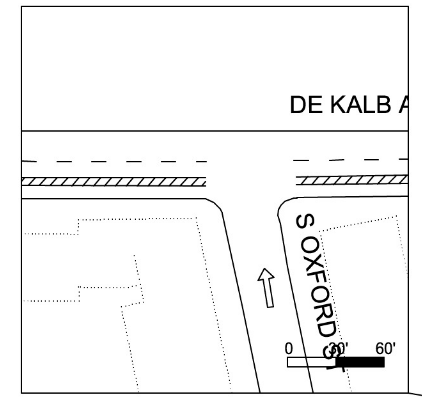
- *Add neckdowns where possible*

1A *Add bus bulbs*
1B *Add a 5' Class II (on-street) bicycle lane on the left hand side*

Pros:
- *Enhances benefits for pedestrians, transit users, and bus drivers*
- *Provides improved bicycling facilities*
- *Creates more parking or a delivery zone compared to a regular bus stop*

Cons:
- *Minor reduction in capacity*

DISCARDED TYPICAL SECTION:

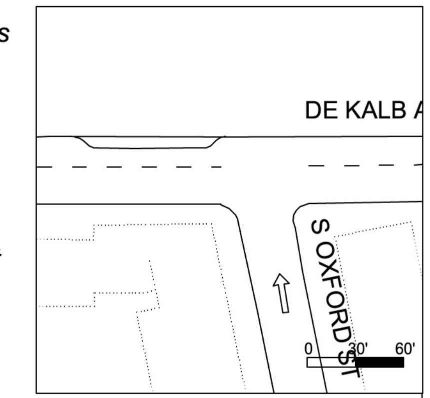


2A *Add a 5' Class II (on-street) bicycle lane on the left hand side*

Pros:
- *Provides better bicycling facilities*

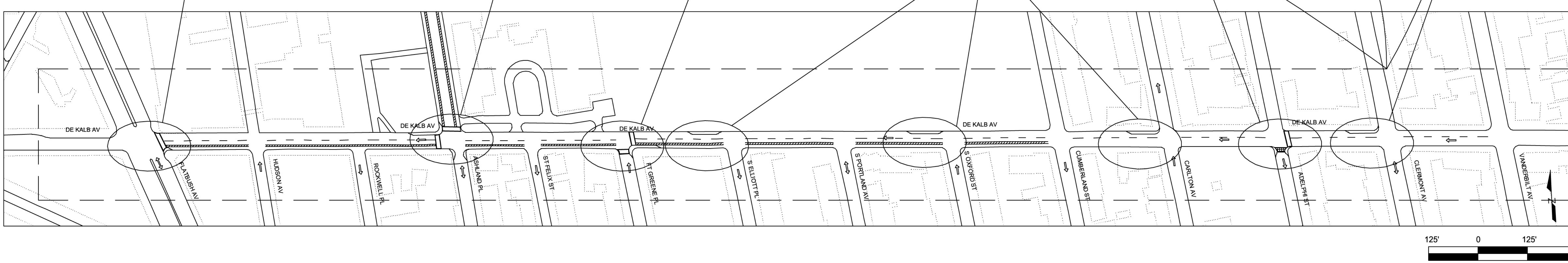
Cons:
- *No improvement to transit operations*

DISCARDED TYPICAL SECTION:



3A Add bus bulbs

Pros:
- *Enhances benefits for pedestrians, transit users, and bus drivers*
- *Creates more parking or a delivery zone compared to a regular bus stop*



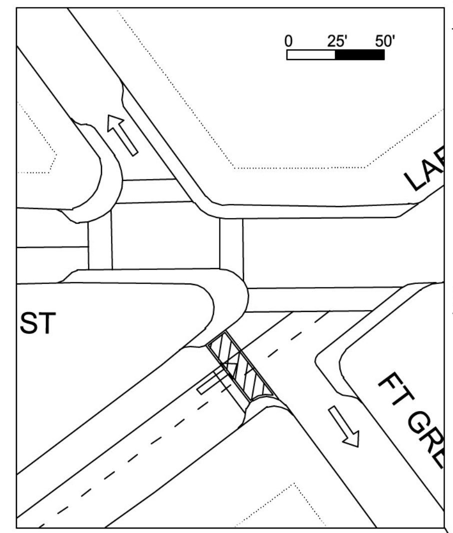
FULTON STREET (COMMUNITY STREET)

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Use neckdowns and gateways to reduce crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Prevent vehicles turning onto eastbound Fulton St from cutting across the westbound travel lane by installing a raised median island in Fulton St between Flatbush Ave and Hudson Ave, separating the east and west travel lanes.
- Prevent through movement on Fort Greene Pl by extending the west curb of Fort Greene Pl into the intersection as a triangle. Build a new crosswalk connecting this triangle to the north curb of Fulton St between Fort Greene Pl and Lafayette Ave.
- Reclaim roadspace and discourage cut-through traffic by building medians, neckdowns, and curb widenings.

PREFERRED TYPICAL SECTION:

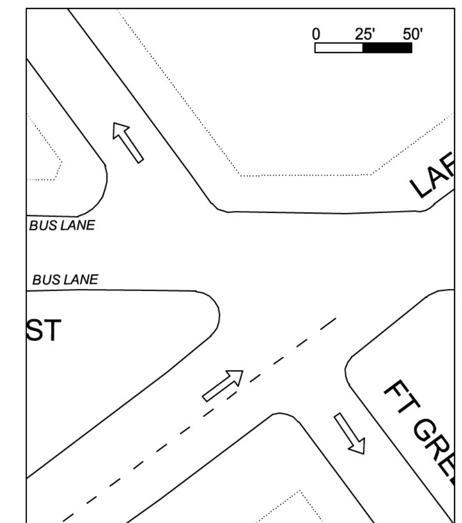


Pros:
- Enhanced pedestrian environment
- Better channelization of traffic
- Prevents cut-through traffic movement

Cons:
- Some loss of parking

- *Install gateway treatment and neckdowns where possible*
- *Extend curbs and reclaim roadspace*
- *Add LPIs where possible*

DISCARDED TYPICAL SECTION:



Pros:
- Enhanced pedestrian environment
- Better channelization of traffic
- Prevents cut-though traffic movement
- Improved transit operations

Cons:
- Some loss of parking
- Less streetscape reclaimed than in option 1
- No buffer between pedestrians and traffic

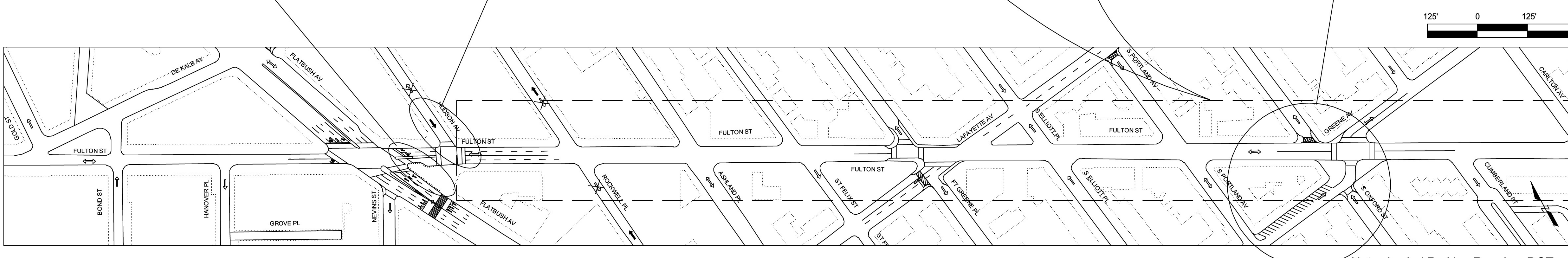
- *Add LPIs where possible*

3A Add bus lanes

- *Add bollards around plaza*
- *Install raised median*

- *Reverse street direction on Hudson Ave*
- *Move stop bar*
- *Paint crosswalk*

- *Extend curbs*
- *Install neckdowns and gateway treatments*



Note: Angled Parking Requires DOT Analysis

7.2.2.5 Jay Street

Jay Street presents a number of challenges. Between Fulton Street and Tillary Street it carries heavy pedestrian volumes bound for the MetroTech area, serves multiple bus routes, carries a Class III (designated, not striped) bike route, and carries private and service vehicle traffic. Two options for this section of Jay Street were investigated:

- a configuration that introduced a median, the aim of which is to better direct traffic and make crossing easier for pedestrians; and
- a configuration with a 11 foot curbside bus lane between 7am and 7pm, a marked 5 foot Class II (on-street) bike lane and a regular 10 foot travel lane in each direction. This latter option would extend the transit-friendly environment of Fulton Mall north to Tillary Street.

NYCDOT's bicycle planner and the NYCT Bus Operations office endorsed the second option, since it would improve the level of service for cyclists and bus riders, two groups who suffer from Downtown Brooklyn's current traffic conditions. However, consultation with Community Board 2 revealed a preference for the first option, as concerns were raised with the idea of dual bus and bike lanes, and some parking spaces would be lost just south of Tillary.

North of Tillary Street, Jay Street serves the local area and acts as a ramp between the Manhattan Bridge/Flatbush Avenue Extension and the BQE. While Jay Street is not wide enough to carry a Class II bike lane north of Tillary Street it was suggested that this area could be made safer for cyclists by installing a signal at the base of the off ramp from the Manhattan Bridge. This ramp leads traffic north on Jay Street to Sands Street – the only way drivers can reach the northbound BQE. However, NYCDOT studied and rejected this signal due to safety concerns, including the potential for rear end and side collisions on the bridge. This conflict could be removed, however, by constructing a direct connection from the Manhattan Bridge to the BQE.

7.2.2.6 Lafayette Avenue

The objectives for Lafayette Avenue are to slow all traffic (but particularly off-peak traffic) and to reinforce the idea for drivers turning off Lafayette Avenue that they are entering Living Streets. To manage traffic speeds, the traffic signal timing progression on Lafayette Avenue was reduced to 25 mph. NYCDOT's analysis indicates that this treatment has been effective in reducing speeds, without the need for signage to inform drivers about the signal timing pattern.

To manage turning traffic, gateway treatments on intersecting streets are recommended. These gateways would include neckdowns and raised crosswalks and would resemble the pilot measure at the intersection of Fulton and South Oxford streets. Construction of bus bulbs along Lafayette Avenue's length is also recommended to improve bus flow and regularize the movement of buses in travel lanes (issues surrounding bus bulbs are discussed at length in *Section 7.2.2.2)*. The treatment of the Lafayette Avenue/Fulton Street intersection is discussed in *Section 7.2.2.4*.

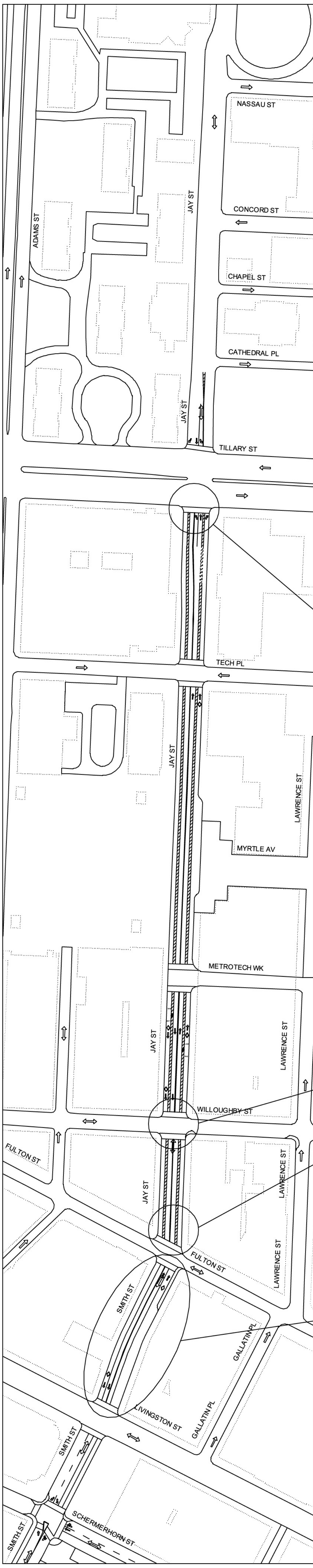
JAY STREET (COMMUNITY STREET)

ACTIONS SUPPORTING STRATEGY

Overview of Improvements

- Stripe a Class II bike lane on Jay Street from Livingston to Tillary to improve north-south cycling conditions.

- Add neckdowns to improve crossing conditions where possible.



Begin new cross-section:

- *Add two 5' Class II (on-street) bicycle lanes*

Add a Neckdown

End of new cross-section

- *Restripe roadway to provide a bus lane during the daytime*
- *Create an extra wide curb lane with a bus-bulb for buses maneuvering around parked buses*

125' 0 125' 250'

LAFAYETTE AVENUE (COMMUNITY STREET)

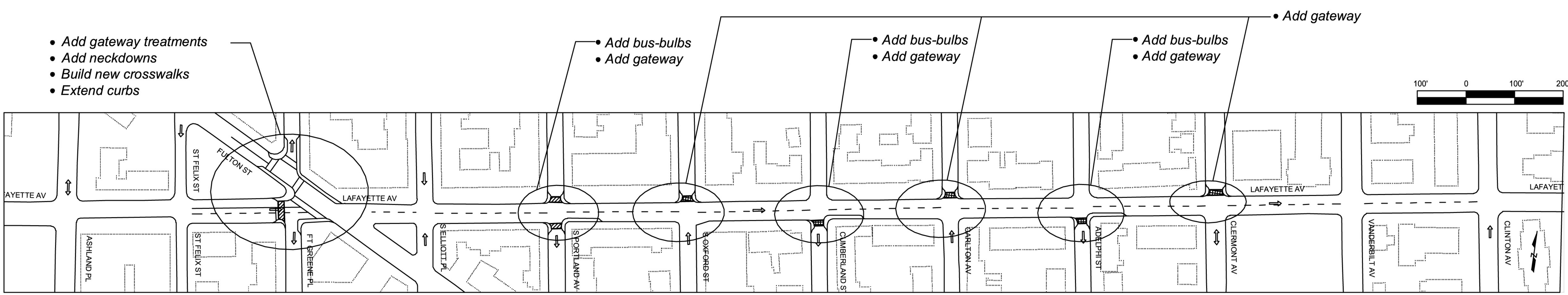
ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Channelize Fulton-Lafayette intersection and prevent through-traffic movement on Fort Greene Pl.
- Use neckdowns and gateways to reduce crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Extend the curb to slow down traffic moving through the newly channelized intersection.

Overview of Operational Improvements

- Reduce through traffic speeds by adjusting offsets of signals from Fulton St to Clermont Ave so the traffic flows at 25 mph.
- Add a leading pedestrian interval to the signal timing to allow pedestrians to cross the new crosswalk before right-turning vehicles from Lafayette Ave enter the intersection.



7.2.2.7 Livingston Street

No significant recommendations are made for Livingston Street. The main issue to address is the high vehicle speed prompted by its long, uninterrupted blocks. NYCDOT has already installed the recommended signalized mid-block crossings at Livingston Street and Elm Place, and at Livingston Street and Hanover Place. These provide benefits for shoppers and workers by making the Fulton Mall area more accessible from the south for pedestrians. A Leading Pedestrian Interval at Livingston Street's intersection with Smith Street is recommended to improve crossing conditions for pedestrians at this major bus stop. This will require further study by NYCDOT's Signal Timing Division, which is monitoring the needs for signal timing changes in this area to support its implementation of one-way Smith Street north of Atlantic Avenue (see *Section 7.2.2.12*).

7.2.2.8 Montague Street

Montague Street is an important commercial street in Brooklyn Heights and serves a mixture of restaurants, shops and residential buildings. Accordingly, the strategy's focus is on making pedestrian crossings as safe and easy as possible. Recommendations are concentrated at the cross streets, where a combination of neckdowns and textured crosswalks are recommended to minimize crossing distances and highlight the visibility of pedestrians, thereby encouraging slower vehicle speeds. At the signalized intersections Leading Pedestrian Intervals and/or longer pedestrian crossing times could be provided to augment the neckdowns and textured crosswalks. However, the need for LPIs may be obviated by the short crossing distance as there would only be one lane to cross once the neckdowns are installed.

At Montague Street's western end color-textured repaving of three entire intersections – Montague Terrace/Remsen Street, Montague Street/Montague Terrace/Pierrepont Place and Pierrepont Street/Pierrepont Place – is recommended to provide visual reinforcement of pedestrian crossing areas in the vicinity of the Promenade. Because this is a City landmarked historic district, care should be taken to choose a pavement color in keeping with the character of the neighborhood's architecture.

7.2.2.9 Myrtle Avenue

Myrtle Avenue is a mixed use corridor whose character transitions from CBD to neighborhood center as one moves east. It is the site of several high-density housing projects, as well as an important local shopping strip. It is a difficult corridor for pedestrians to use. The strategy addresses this through a series of neckdowns. Together these increase the number of crossing opportunities and increase the safety and ease of crossing. Also recommended is a treatment of the intersection of Carlton Street and Myrtle Avenue that reclaims a swath of underutilized road space that the community perceives as promoting speeding between Fort Greene and Park Avenue. Such reclamation would improve pedestrian safety with no loss of parking.

A Class II on-street bicycle lane is recommended running eastbound on Myrtle Avenue; this lane would complement the westbound lane on DeKalb Avenue (see *Section 7.2.2.3*). This lane can be accommodated in the existing cross-section without removing parking or travel lanes.

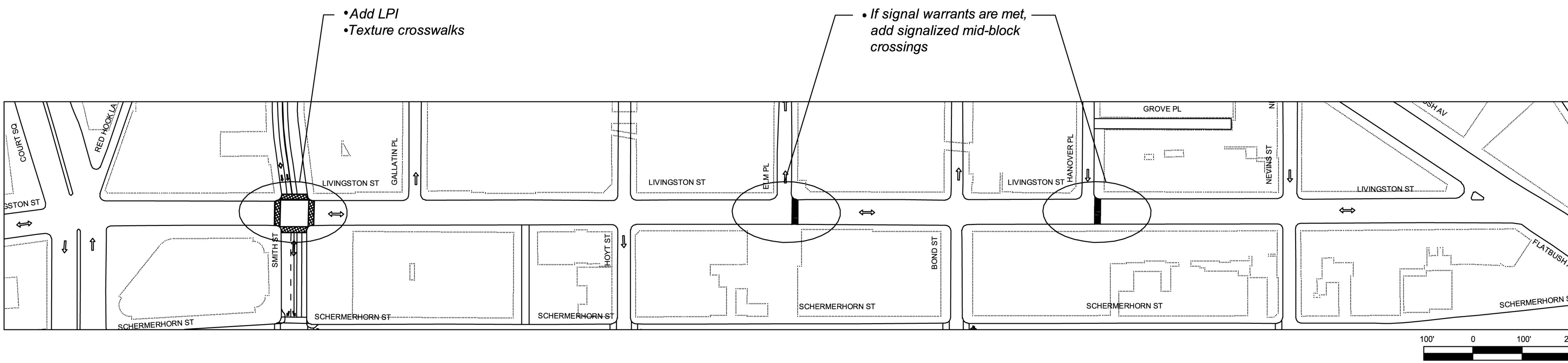
LIVINGSTON STREET (COMMUNITY STREET)

ACTIONS SUPPORTING STRATEGY

Overview of Improvements

- If signal warrants are met, install signalized midblock crossings to break up long blocks on Livingston Street and to serve north-south desire lines between Fulton and Livingston Streets.

- Add a leading pedestrian interval at Smith St and Livingston St to improve crossing conditions for pedestrians.



MONTAGUE STREET (COMMUNITY STREET)

ACTIONS SUPPORTING STRATEGY

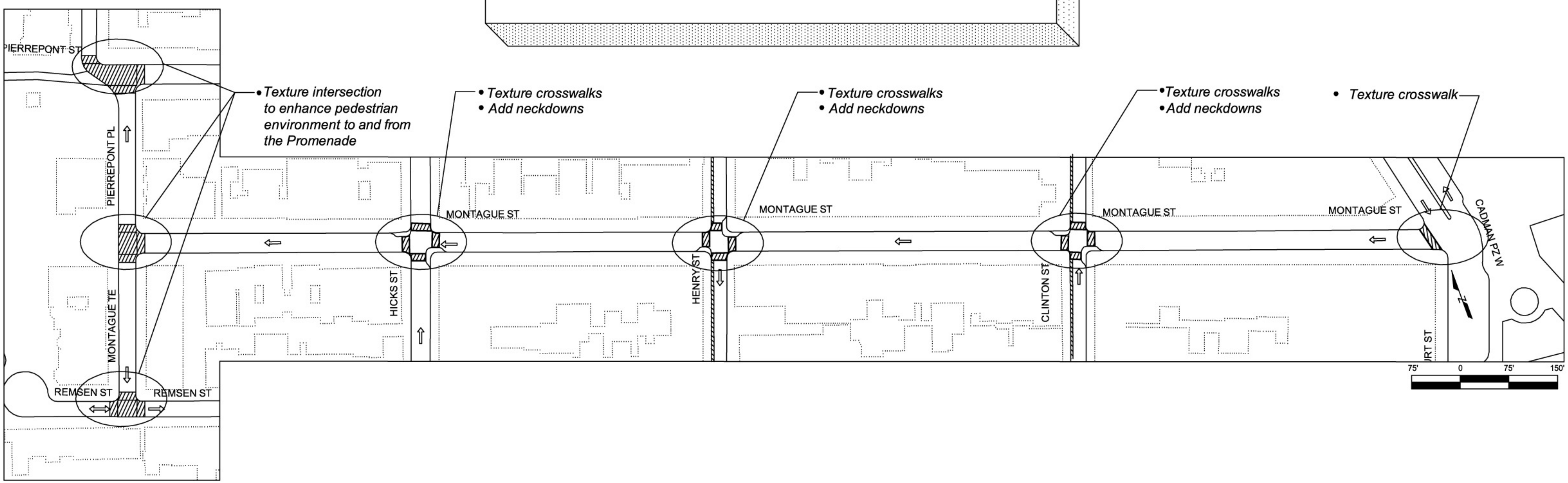
Overview of Physical Improvements

- Install neckdowns where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.

- Texture crosswalks along Montague St as well as the entire intersections of Remsen St/Montague St, Montague St/Pierrpont Pl and Pierrpont St/Pierrpont Pl to visually enforce pedestrian crossing areas.

Overview of Operational Improvements

- Provide LPI's and longer crossing times if possible.

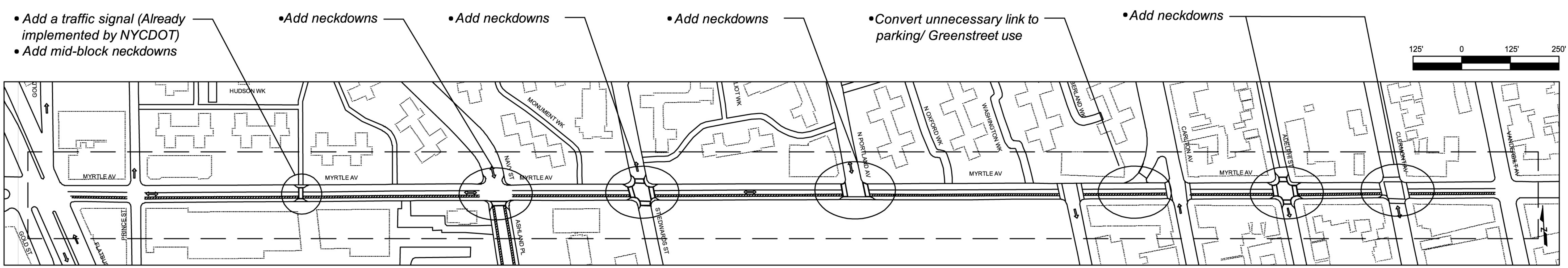


MYRTLE AVENUE (COMMUNITY STREET)

ACTIONS SUPPORTING STRATEGY

General Improvement Strategies

- Improve safety and ease of crossing Myrtle Avenue by adding mid-block crossings on long blocks by parks or housing projects.
- Neckdown busy intersections to shorten crossing distance, improve pedestrian visibility, and encourage vehicles to turn at lower speeds.
- Add an eastbound bicycle lane on Myrtle Avenue to complement the proposed westbound lane on DeKalb Avenue.
- If signal warrants permit, add a traffic signal at Myrtle Avenue that is offset with the signals at Prince Street and Ashland Place to allow continuous traffic flow. (Already implemented by NYCDOT)



7.2.2.10 Old Fulton Street

Like Tillary Street, Old Fulton Street provides a great opportunity to reclaim road space and put it to use in creating community space at an important historic site, while at the same time rationalizing traffic operations in this area.

Old Fulton Street also illustrates many of the street management conflicts that arise when an older manufacturing area is reborn as a mixed-use infill community. New residents have succeeded in transforming the image of the area to one of arts, shopping, and restaurant use. These uses require parking and a calm street environment to flourish, creating a conflict between the desire to maintain parking space and the desire to reclaim underused street space for plazas and greening. Meanwhile, enduring industrial uses continue to require truck access which conflicts directly with the neighborhood's emerging residential character. Finally, unique traffic issues like commuters using Furman Street in the evening and tour buses that park at the foot of Old Fulton Street for the views of the Brooklyn Bridge and Lower Manhattan must be addressed.

NYCT and tour bus operations need to be altered in this area to reduce their impact on the Fulton Ferry Landing. NYCT buses could use their off peak counter-clockwise loop via Main and Water Streets at all times in order to reduce the number of turning buses at the Water Street/Old Fulton Street intersection. Tour bus storage can be rationalized on Water Street as part of the Parks Department's redevelopment of that area. It is possible further bus storage could be created as part of the implementation of the Brooklyn Bridge Park.

The recommendations reflect the preference that Furman Street revert to two-way operation although the plans for Old Fulton Street could be adapted to suit conditions in which Furman Street operates only one-way. Community Board 2 has endorsed converting Furman Street to two-way operation (see *Section 7.2.1.8)*. If Furman Street were to revert to two-way operation, it is possible and desirable to retrieve much additional road space in the vicinity of the Fulton Ferry Landing and additional road space along Old Fulton Street's full length. The action plan shows a road with one lane in each direction separated by a median and with curb lines significantly closer together than at present. Limiting Old Fulton Street to a single through lane in each direction would reduce the current intrusion of evening peak commuter traffic and limit the temptation for motorists to use it in the morning commuter peak period. Parking lanes on both north and south sides would provide greater separation between traffic and pedestrians on both sides of the road. Two options were designed for this area: one with and one without an on-street Class II bicycle lane in each direction.

Currently pedestrians must contend with discontinuous sidewalk conditions. Continuous and predictable pedestrian routes on Old Fulton Street's sidewalks would ease these conditions and promote greater pedestrian access to Fulton Ferry Landing and the Brooklyn Bridge Park. On the south side of Old Fulton Street and moving from east to west, a gateway treatment should be installed at Henry Street to facilitate pedestrian flow. The arrangement of ramps on and off the BQE should also be modified to rationalize flow and facilitate pedestrian crossing the ramps. Provided the signal warrant is met, the northbound off ramp can be signalized and modified to provide two approach lanes. The current wide throat for southbound traffic entering the BQE with effectively two entry points can be consolidated into a single two-lane ramp. This will force drivers to enter this ramp more slowly and with more care for pedestrians and will reduce pedestrians' exposure to traffic. The sidewalk on the approach to Fulton Ferry can also be widened. On the north side of Old Fulton Street and moving from east to west, a widening and better alignment of the traffic islands in and around Front Street is recommended to accomodate pedestrian movement to and from the water. Between Front Street and Water Street substantial road space exists that is used only for parking. The plans show that space retrieved for sidewalk (and by implication, community uses), although members of the community have identified the importance of its current use for restaurant parking.

Residents of this area are understandably concerned about the potential for their area to be dominated by traffic should Furman Street revert to two-way use. The plans provide a means of avoiding adverse consequences of such a decision while providing the opportunity for a substantially enhanced street environment. Synchro analysis of these proposed changes can be found in *Appendix F*.

OLD FULTON STREET (COMMUNITY STREET)

ACTIONS SUPPORTING STRATEGY

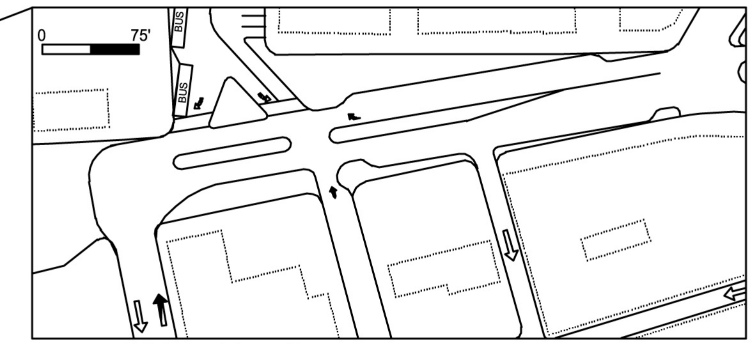
Overview of Physical Improvements

- Reclaim large amounts of the unused road space for bicycle lanes, pedestrian refuges/medians, wider sidewalks, and landscaping.

Overview of Operational Improvements

- Modify signal timing and phasing to maximize protected pedestrian phases where possible. Specific improvements include longer crossing times and protected left turn phases to further reduce vehicular conflicts. Also, by bringing together and rationalizing close intersections, pedestrian safety will improve.

OLD FULTON STREET DISCARDED OPTION:

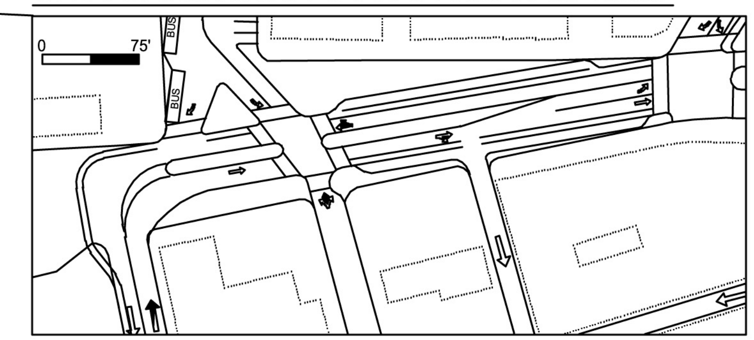


- *Widen sidewalks*
- *Add medians*
- *Add neckdowns where possible*

Pros:
- Improve pedestrian environment
- Substantial sidewalk space created
- Rationalized traffic movement

Cons:
- Some loss of parking
- No provision for cyclists

OLD FULTON STREET PREFERRED OPTION:



- *Widen sidewalks*
- *Add medians*
- *Add neckdowns where possible*

2A. Add a Class II (on-street) bicycle lane

Pros:
- Improve pedestrian environment
- Substantial sidewalk space created
- Rationalized traffic movement
- Provides bicycle facilities along this NYC Bicycle Masterplan route

Cons:
- Some loss of parking

- *Rationalize intersection and allow two-way movement on Water Street for block immediately north of Old Fulton.*
- *Re-align parking on Water St to provide bus parking bays*

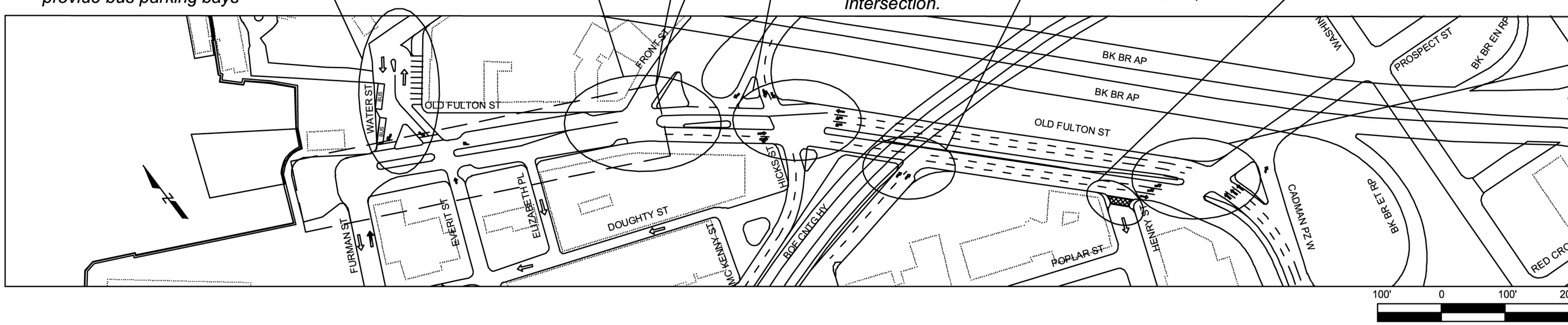
- *Add medians*
- *Add neckdowns*
- *Modify island to improve traffic mobility*

- *Combine intersections*
- *Close east slip ramp on south side of intersection to reduce the number of pedestrian crossings.*
- *Channel all southbound on-ramp traffic through west slip ramp south of intersection.*

- *If the signal warrant is met, signalize intersection and modify to provide two approach lanes from the BQE*

- *Provide a gateway entrance*

- *Widen existing medians*
- *Modify lane configurations and signal timings to improve operations*



7.2.2.11 Schermerhorn Street

Schermerhorn Street provides a useful and potentially important east-west route parallel to Atlantic Avenue. Its ability to provide significant traffic capacity is constrained by congestion at its eastern end at 3rd Avenue and Flatbush Avenue and by its one-way designation immediately to the east of Boerum Place. The unsuccessful attempts to find a low-cost traffic calming solution to its eastern bottleneck are discussed in *Sections 7.3* and *7.5*. Synchro analysis of the proposals for the Schermerhorn-Flatbush-Third Avenue intersection can be found in *Appendix F*.

The section of Schermerhorn Street between Smith Street and Boerum Place is currently one-way westbound. An important idea and one that has general community support is to convert this to two-way operation. There are no insurmountable physical constraints to this idea. Indeed, the current problem of poorly disciplined parking may well be solved through greater traffic use of this section of Schermerhorn Street. A novel median treatment that provided vehicles with a third parking lane to address this issue was suggested, although Community Board 2 did not adopt this scheme.

Conversion to two-way operation would allow Schermerhorn Street to operate more effectively to relieve traffic demands on Atlantic Avenue, although unless the bottleneck at its eastern end is removed, peak period traffic that shifts from Atlantic Avenue westbound to Schermerhorn Street westbound will largely need to rejoin Atlantic Avenue using Hoyt Street or Nevins Street. It is instructive in this context to think of Atlantic Avenue and Schermerhorn Street as a corridor through which traffic passes and which should be managed in a coordinated way – which may mean designing traffic flows on Schermerhorn Street in such a manner as to more evenly distribute the long queues that now back up at its and Atlantic Avenue's eastern ends. The community strongly endorsed the idea of distributing some of Atlantic Avenue's peak hour traffic onto Schermerhorn Street.

SCHERMERHORN STREET (COMMUNITY STREET)

ACTIONS SUPPORTING STRATEGY

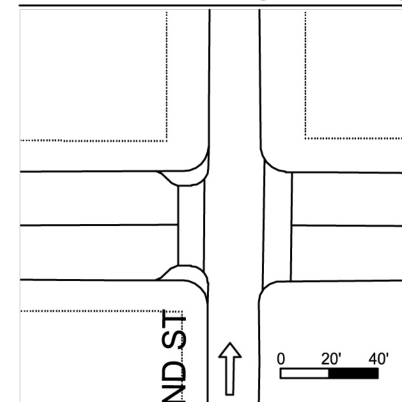
Overview of Improvements

- Build neckdowns or raised pedestrian refuges with a parkable median to reduce driving speeds and reorganize street space on Schermerhorn Street.

- Could add a median along Schermerhorn St that allows for parking along the westbound side.

- Add a leading pedestrian interval at Smith St and Schermerhorn St, to improve crossing conditions for pedestrians.

PREFERRED TYPICAL INTERSECTION:

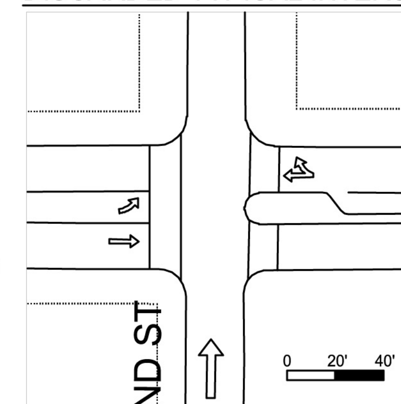


Pros:
- *Provides safer crossing facilities for pedestrians*

Cons:
- *Does not take advantage of this wide street or address vehicle speeds*

1A. Add neckdowns

DISCARDED TYPICAL INTERSECTION:

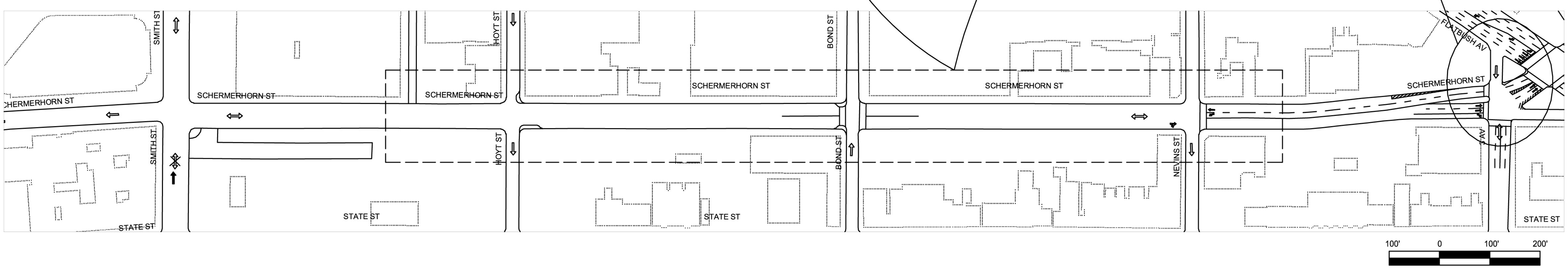


Pros:
- *Provides safer crossing facilities for pedestrians*

Cons:
- *Could create an unfamiliar driving environment*

2A. Add left-turn bays
2B. Add pedestrian refuges
2C. Add parking along the westbound side of the median

- *Re-align roadways and modify signal timings to help relieve congestion on Flatbush Avenue*



7.2.2.12 Smith Street

Smith Street and Court Street are a pair of one-way pair of streets that provide north-south capacity through the middle of the study area. Smith Street provides northbound capacity, which is used most heavily in the morning peak. Court Street provides parallel southbound capacity, which is used most heavily in the evening peak. However, the conflict between commuters and other users is not as great on Smith Street as it is on Court Street, because non-commuter uses of the street especially shopping and socializing) are less pronounced in the morning peak period when northbound commuter traffic is heaviest. This implies that a different balance may be struck here between the needs of commuters and other users of the street. Smith Street carries 8,700 vehicles per day (vpd).

Smith Street suffers substantial congestion on its approaches to Atlantic Avenue. This congestion stems from the present configuration of this intersection, which presents traffic conflicts – Smith Street north of Atlantic Avenue is two-way, while south of Atlantic Avenue it is one-way. Traffic flows approaching the intersection from north and south are centered on the same line.

Figure 7.8 Current traffic conditions at Atlantic Avenue and Smith Street (looking southwest) – north and westbound traffic in conflict in the a.m. peak

The recommended action plan for this intersection involves extending the one-way section of Smith Street north to Schermerhorn Street and reconfiguring Smith Street north of Atlantic Avenue accordingly. This improves the operations of the intersection of Atlantic Avenue and Smith Street, which benefits all users of this street space, with the possible exception of buses. The B61 bus service previously passed through this intersection; extension of the one-way section of Smith Street north to Schermerhorn Street means that southbound buses now need to divert to

Boerum Place by way of Schermerhorn Street or Livingston Street (Schermerhorn Street was the route of the B61 until 1997). It is noted that New York City Transit has concerns about the enforcement of "No Standing" rules on Schermerhorn Street between Smith Street and Boerum Place (in front of the Criminal Courts building). Prior to the 1997 reroute, illegal standing on this block often hampered bus movement.

The extension of one-way Smith Street to Schermerhorn Street, with associated signal timing, marking and sign changes, was implemented in November 2003. Roadway space was reclaimed for angled parking as a short-term alternative to the sidewalk extensions and neckdowns (drawn) that require capital construction. The B61 bus was rerouted to Livingston Street.

Table 7.3 shows the traffic impacts of the one-way Smith Street proposal on the peak hour operations of the Smith Street-Atlantic Avenue intersection. Detailed Synchro analysis of these improvements can be found in *Appendix F*.

Table 7.3 Current and Proposed Traffic Conditions at Atlantic Avenue/Smith Street Intersection

Approach	Existing (2000)				Proposed Changes			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	LOS	Int. Delay	LOS	Int. Delay	LOS	Int. Delay	LOS	Int. Delay
Smith St NB	F	100.1 sec	F	158.7 sec	F	93.4 sec	D	38.0 sec
Smith St SB	F	204.4 sec	C	23.8 sec	N/A			
Atlantic Ave EB	D	48.9 sec	E	77.3 sec	E	76.3 sec	C	27.9 sec
Atlantic Ave WB	C	24.7 sec	B	14.9 sec	E	58.3 sec	C	24.3 sec

Source: Traffic volumes from 330 Jay Street EIS

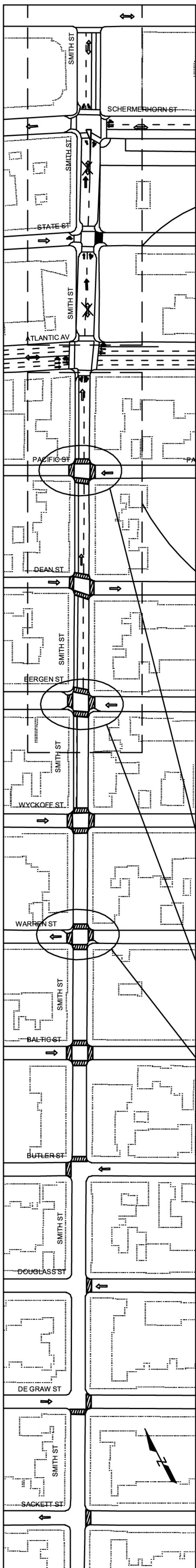
South of Atlantic Avenue in the Cobble Hill-Carroll Gardens commercial core, the action plan focuses on eliminating unproductive traffic capacity, facilitating pedestrian crossing of the street, and introducing markings to improve driver discipline.

In November 2003, morning peak period No Standing regulations on the west curb were removed between 9th Street and Dean Street. This serves to discourage through traffic and provides on-street parking for residents, short-term parkers, and commercial operations.

Proposals for pedestrian crossing improvements are focused near subway stations at Bergen and Carroll Streets. These included combinations of neckdowns and textured crosswalks at existing crossings to raise the visibility of pedestrians and to reduce their exposure.

Between Bergen Street and Atlantic Avenue a Class II bike lane is recommended, consistent with the New York City Bicycle Master Plan. This lane could be accommodated in the existing cross-section without removing parking or travel lanes. This lane would be striped on the left side of the road, as per the community's preference and typical practice on one-way streets elsewhere in the city; cyclists riding to the left of traffic on one-way streets are closer, and thus more visible, to drivers. Furthermore, this configuration reduces the problem of cyclists being caught by a suddenly opened car door. The bike lane and the change in parking regulations would combine to improve lane discipline in this area.

SMITH STREET (COMMUNITY STREET)



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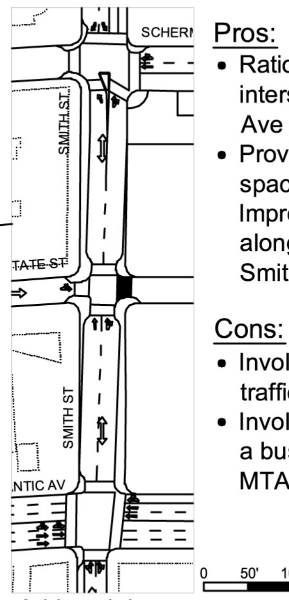


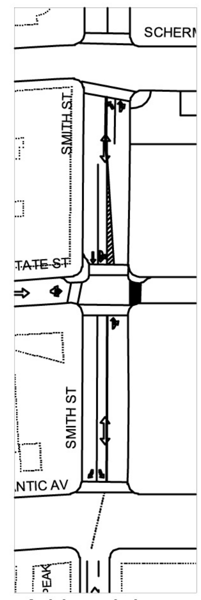
Pros:
- Rationalizes the intersection of Atlantic Ave and Smith St
- Provides more sidewalk space for pedestrians Improves operations along Atlantic Ave and Smith St

Cons:
- Involves re-routing some traffic
- Involves re-routing part of a bus route subject to MTA approval

- *Add neckdowns*
- *Add gateways*

1A. Convert Smith Street to one-way northbound to Schermerhorn St. to improve street alignment and reduce conflicts

NORTH OF ATLANTIC DISCARDED:



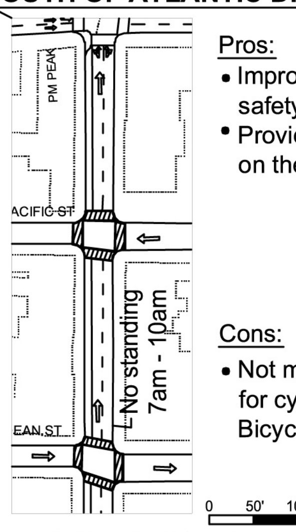
Pros:
- Provides some pedestrian benfits

Cons:
- Does little to improve the intersection of Atlantic Ave and Smith St

- *Add neckdowns*
- *Add gateways*

2A. Re-stripe streets to improve traffic flow

SOUTH OF ATLANTIC DISCARDED:



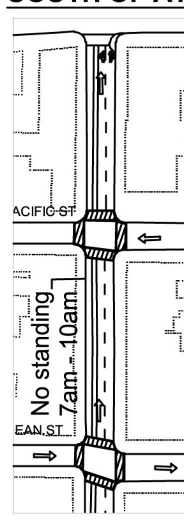
Pros:
- Improves pedestrian safety
- Provides all day parking on the west side

Cons:
- Not many improvements for cyclists on this NYC Bicycle Masterplan route

- *Add pedestrian phases*
- *Add neckdowns/gateway treatments where possible*

1A. Allow all day parking on the left hand side

SOUTH OF ATLANTIC PREFERRED:



Pros:
- Improves pedestrian safety
- Provides all-day parking on the east side
- Provides safer bicycling facilities

Cons:
- Poor connections to other cycling facilities

- *Add pedestrian phases*
- *Add neckdowns/gateway treatments where possible*

2A. Allow all day parking on the right hand side

2B. Provide a 5' class 2 bike lane on the right hand side

- *Add neckdowns adjacent to subway stations*

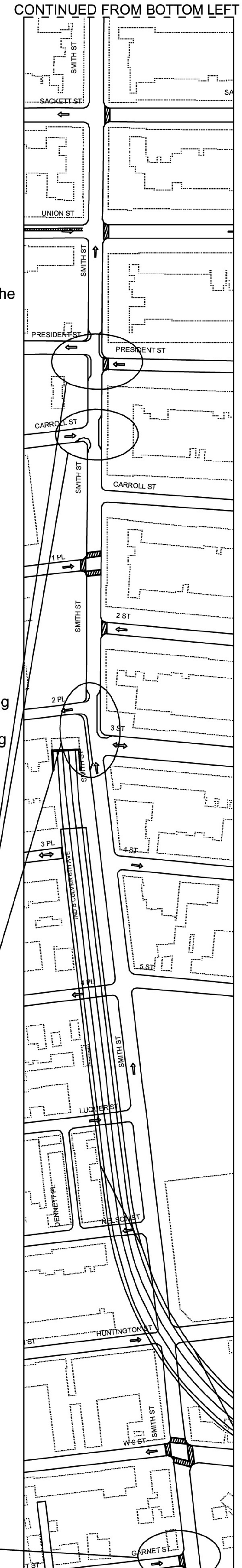
Start of textured crosswalks at every existing crosswalk southbound along Smith St.

- *Add neckdowns adjacent to subway stations*

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Install neck-downs near subway stations and on side streets where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Stripe parking and travel lanes to reduce ambiguous driving conditions.
- Texture existing crosswalks to reinforce the pedestrian safety areas to the drivers.



End of textured crosswalks along Smith St.

125' 0 125' 250'

7.2.2.13 Willoughby Street

Pedestrians on Willoughby Street have insufficient sidewalk space, especially near the Lawrence Street subway entrances. In order to counteract this, the action plan recommends neckdowns along the length of the street. In addition to providing needed space for pedestrians on the sidewalk, these neckdowns will slow turning traffic, which is important as it transitions from narrow Willoughby Street to the wider cross streets into the MetroTech complex. While these neckdowns will slow trucks down, they will not preclude them from accessing MetroTech; indeed, it is recognized that despite its narrow section, Willoughby Street necessarily acts as the final distributor of truck trips among the various loading areas in the CBD and many parts of MetroTech.

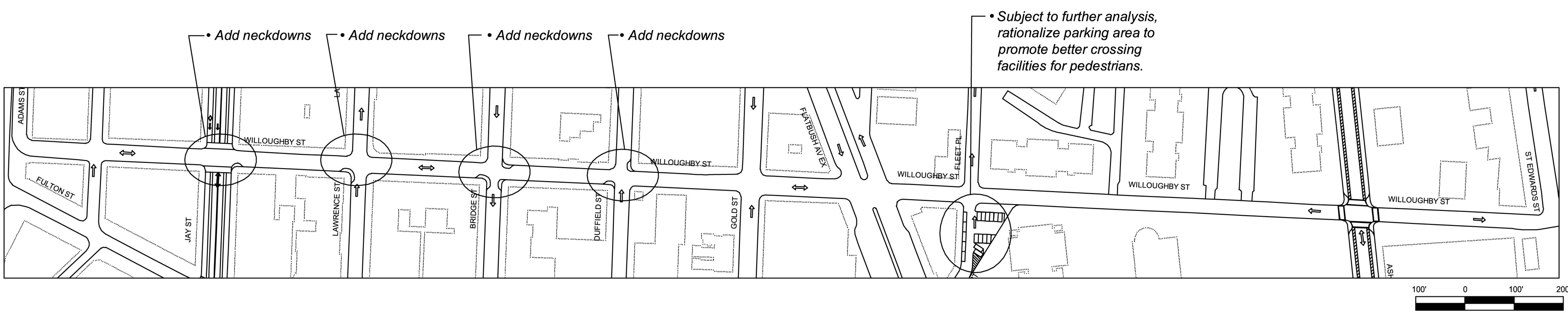
In the aftermath of the September 11, 2001 attacks, several streets leading into Willoughby Street were closed due to security considerations. These street closures may be permanent and provide the opportunity to enhance these locations by installing neckdowns and other traffic calming treatments. These treatments should be integrated with measures identified in the Downtown Brooklyn Redevelopment plan being performed by The Department of City Planning and the New York City Economic Development Corporation. NYCDOT is coordinating with EDC/Department of City Planning as it advances its redevelopment plan for the Brooklyn Central Business District. NYCDOT has already identified funds for improving Willoughby Street and put this work in its capital budget.

WILLOUGHBY STREET (COMMUNITY STREET)

ACTIONS SUPPORTING STRATEGY

Overview of Improvements

- Build neckdowns to increase pedestrian space on congested sections of Willoughby Street, especially near the Lawrence Street subway station. These will also serve to reduce turning speeds for vehicles transitioning from narrow Willoughby to wider cross streets into the MetroTech complex.



7.2.3 Living Streets

Plans for Living Streets were developed based on the functions of streets discussed in the Street Management Framework in *Section 5.3.3*. As noted in *Section 5.3.3*, the objectives for Living Streets are to:

- Protect the street environment,
- Discourage excessive speeds and aggressive driving,
- Discourage through traffic, and
- Discourage inappropriate truck activity.

7.2.3.1 3rd Street

Although 3rd Street is designated as a Living Street, it provides one of a limited number of east-west crossings of the Gowanus Canal; together with 2nd Place, it forms a continuous east-west route through the study area. While 3rd Street has a strongly industrial character east of Bond Street, it is strongly residential west of Bond Street. Residents report a problem of truck traffic, as Smith Street provides an alternative route from the east to industrial sites in the Gowanus Canal area when the approaches from the west – 3rd and 4th Avenues – are congested.

The action plan for 3rd Street is designed to separate the operations of the sections east and west of Bond Street. To this end, a strong gateway treatment has been defined for the western side of the 3rd Street/Bond Street intersection to signal to westbound traffic that this section of the street has a primarily residential nature. NYCDOT has implemented signage that directs trucks to use 4th Street east to Hoyt Street, then Hoyt Street one block north to 3rd Street for access to the industrial areas.

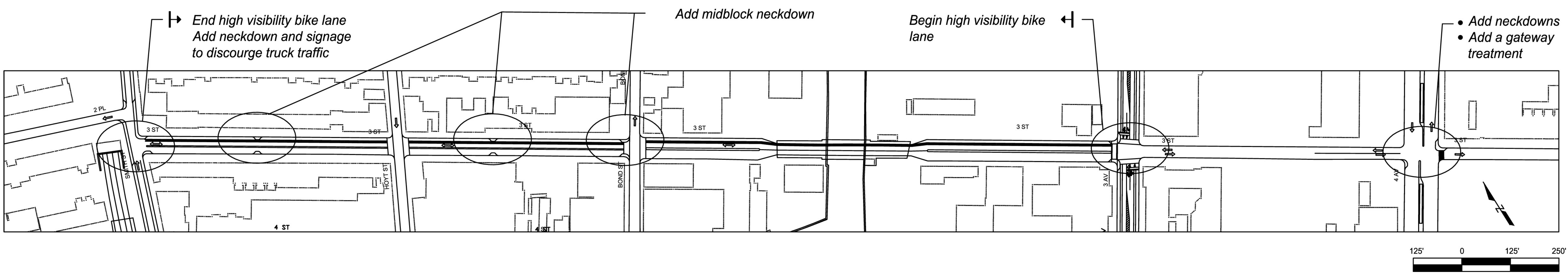
7.2.3.2 Ashland Place

Ashland Place is a wide street with only limited traffic demands. Its width exposes pedestrians to traffic and its long block lengths encourage drivers to speed. Installation of neckdowns at each of its three intersecting streets (DeKalb Avenue, Willoughby Street and Myrtle Avenue) is recommended together with creation of a Class II on-street bicycle lane in each direction. This latter device will serve to link the bicycle lanes recommended for DeKalb Avenue and Myrtle Avenue and called for in the NYC Bicycle Master Plan. In addition, a high visibility bicycle lane will visually narrow the street and encourage less aggressive driving. These lanes can be accommodated in the existing cross-section without removing parking or travel lanes.

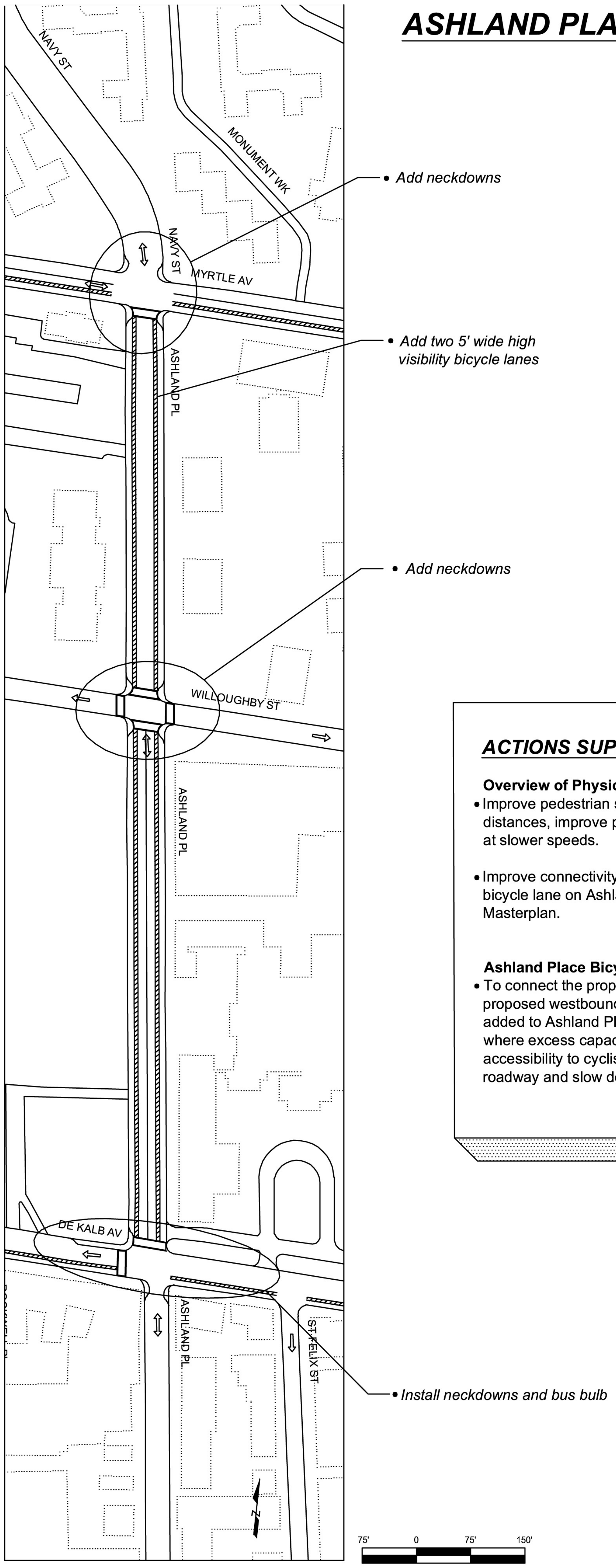
3RD STREET (LIVING STREET)

ACTIONS SUPPORTING STRATEGY

- Discourage 3rd Street as a through street for trucks wanting to cross Gowanus canal.
- Protect bicyclists with a high visibility bike lane.



ASHLAND PLACE (LIVING STREET)



ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Improve pedestrian safety by installing neck-downs to reduce crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.

- Improve connectivity of bicycle network in Fort Greene by adding a bicycle lane on Ashland Place - as recommended in the NYC Bicycle Masterplan.

Ashland Place Bicycle Lane

- To connect the proposed eastbound bicycle lane on Myrtle and the proposed westbound lane on DeKalb, Class II bicycle lanes should be added to Ashland Place in both directions between Myrtle and DeKalb, where excess capacity exists. In addition to providing safety and accessibility to cyclists, the lane would narrow the effective width of the roadway and slow down north-south traffic.

7.2.3.3 Bergen Street/Dean Street/Pacific Street

Bergen Street, Pacific Street and Dean Street all experience traffic intrusion because of their east-west connectivity through Boerum Hill and the congestion on Atlantic Avenue. While these corridors offer marginal improvements to east-west vehicle throughput, their traffic levels are inconsistent with the idea that a Living Street should be about creating a safe environment for residents first, and accommodating traffic second. Indeed, a more appropriate place to store east-west traffic is Schermerhorn Street, if a reasonable management strategy for the Atlantic Avenue/Schermerhorn Street corridor can be worked out – see *Section 7.2.2.11*.

In a situation such as this, where the street network provides an opportunity for drivers to use Living Streets as alternate through routes to Travel Streets, very restrictive measures to prevent this traffic intrusion may be considered. However, it is more important to retain permeability of the network for those who need to use it every day, including residents of the impacted blocks. To this end, the capacity for through traffic intrusion on Dean Street was reduced significantly with the removal of peak hour parking restrictions in 1999. Additionally, the installation of Class II (on-street) bicycle lanes on Bergen and Dean Streets began in Fall 2003. The lanes visually narrow these streets and discourage speeding while accommodating the needs of cyclists.

The remainder of the action plan is the recommended construction of a raised intersection with neckdowns is recommended for diagonal corners at the Bergen Street/Hoyt Street, Dean Street/Bond Street and Pacific Street/Nevins Street intersections. These treatments will force very slow movement through these intersections, which will discourage through traffic use effectively without compromising the permeability of the network. They will also reinforce drivers' awareness that they are passing through a residential area, reinforcing the concept that Living Streets are inappropriate for regional traffic.

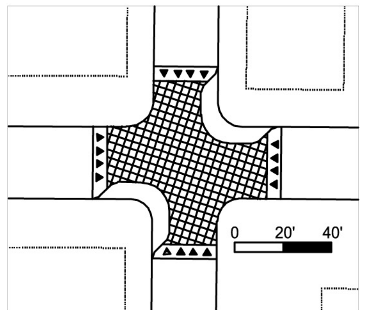
7.2.3.4 Boerum Place (south)

Boerum Place changes capacity and nature radically when it crosses Atlantic Avenue. The busy and wide Travel Street north of Atlantic Avenue becomes a narrow Living Street south of Atlantic. However, apart from the difference in cross section, there is no traffic management recognition of this difference. Cars can travel south through Boerum Place's intersection with Atlantic Avenue without losing speed. Peak hour parking regulations are in place to facilitate traffic flow. This regulation complemented a similar regulation along Dean Street that was in place to provide an alternate eastbound route in the evening peak. In the early stages of the study in 1999, NYCDOT met with local residents and removed the rush hour regulations along Dean Street, replacing them with street cleaning regulations. This change reflected the Living Street character of Dean Street and discouraged its use for through traffic.

One means of augmenting this strategy would be to close the southern section of Boerum Place to southbound traffic at Atlantic Avenue; however, maintenance of traffic permeability is more important than preventing intrusion, and so street closures are an inadequate solution. Instead it is recommended that a gateway treatment be constructed at Atlantic Avenue to signal drivers that they are entering a residential area; that peak period parking restrictions be removed from Boerum Place south of Atlantic Avenue; that neckdowns be implemented at each intersecting street; and that a high visibility on-street bicycle lane be marked on the road. These measures will force drivers to enter the southern section of Boerum Place slowly and will restrict traffic capacity to one lane within a visually narrow street environment. In concert with the previously implemented removal of peak parking restrictions on Dean Street, this popular cut through route will become less attractive and the traffic less intrusive. In addition, the bicycle lane on Boerum Place will provide connectivity with the bicycle lanes north of Atlantic Avenue and with the recently installed bicycle lanes on Dean and Bergen Streets.

PACIFIC STREET/DEAN STREET/BERGEN STREET-(LIVING STREET)

PACIFIC/NEVINS, DEAN/BOND,
PREFERRED OPTION:

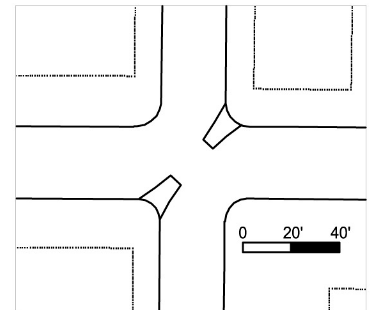


1A. Add a raised intersection
1B. Add neckdowns
1C. Add all-way stops

Pros:
- All traffic would be slowed at critical intersections, but the entire Boerum Hill grid south of Atlantic would remain permeable to both local and through vehicles.

Cons:
- Drivers might not change routes, since travel times would change only marginally.

PACIFIC/NEVINS, DEAN/BOND,
DISCARDED OPTION:



2A. Add a partial diverter

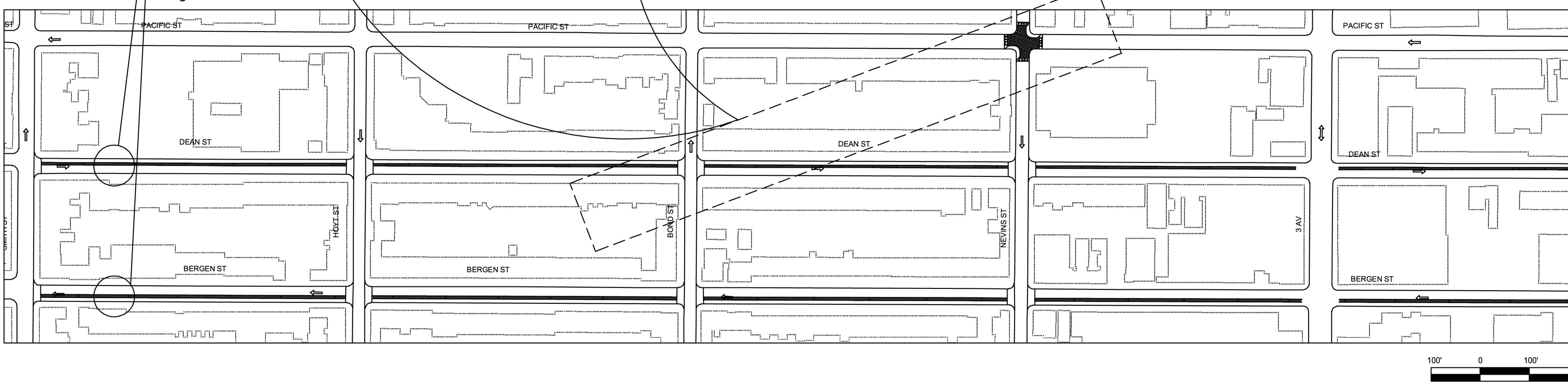
Pros:
- The grid would remain permeable, but all vehicles would have to stop at each intersection, then proceed one at a time at even slower speeds than at a raised intersection. Through traffic would be deterred by a more visible, physical barrier.

Cons:
- The intersections would have to be signed as four-way stops, and the design might be unfamiliar to drivers.

ACTIONS SUPPORTING STRATEGY

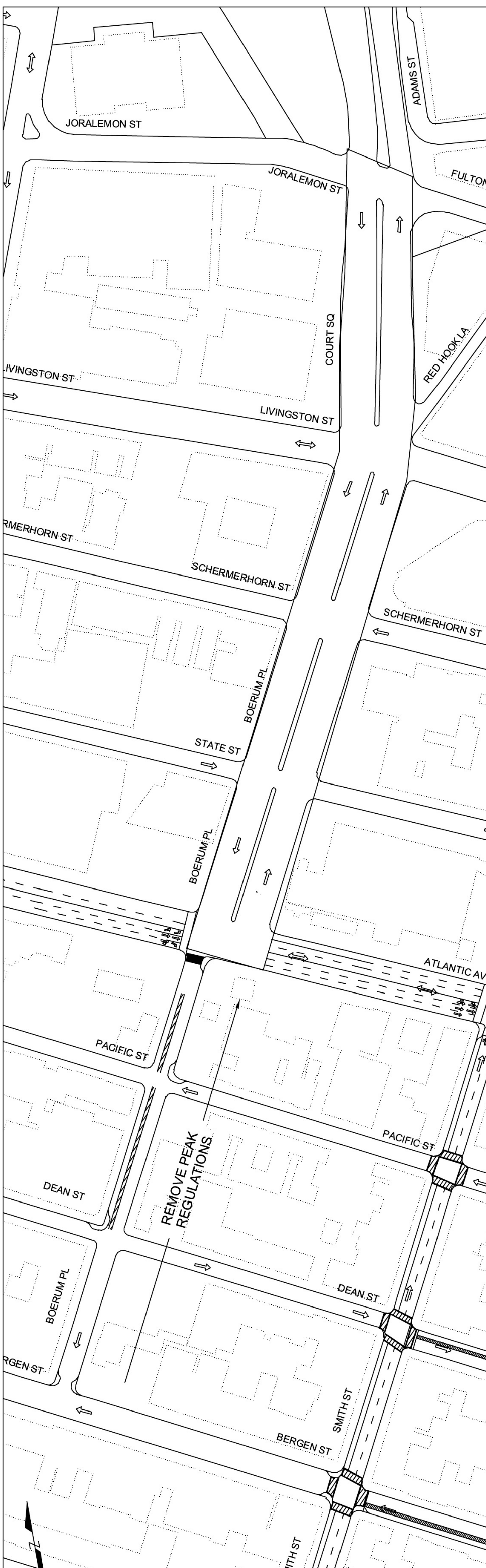
- Reduce peak-hour through traffic on living streets by improving traffic operations on Atlantic Avenue and slowing traffic on parallel living streets.
- East-west traffic can be calmed throughout this living streets corridor by focusing on three intersections for speed reduction or traffic diversion: Pacific and Nevins Streets, Dean and Bond Streets, and Hoyt and Bergen Streets.
- Stripe bicycle lanes along the Dean St and Bergen St bicycle routes outlined in the NYC Bicycle Masterplan.
Note: Implementation begun 2003.

Add high visibility bicycle lanes along the Dean St and Bergen St bicycle routes outlined in the NYC Bicycle Masterplan.
Note: Implementation Begun 2003



BOERUM PLACE (LIVING STREET)

SOUTH OF ATLANTIC AVENUE



- *Streetscape project to be implemented by EDC.*

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Reduce peak hour traffic on this living street by providing a gateway treatment into Boerum Place south of Atlantic Avenue and adding neckdowns where possible.
- Stripe a bicycle lane south of Atlantic Ave that connects to the Dean St bicycle route to encourage bicyclists to use this route that is part of the NYC Bicycle Masterplan.

Overview of Operational Improvements

- Reduce peak hour traffic on this street, as well as Dean Street, by removing peak hour parking restrictions resulting in only one travel lane.

7.2.3.5 Clinton Street

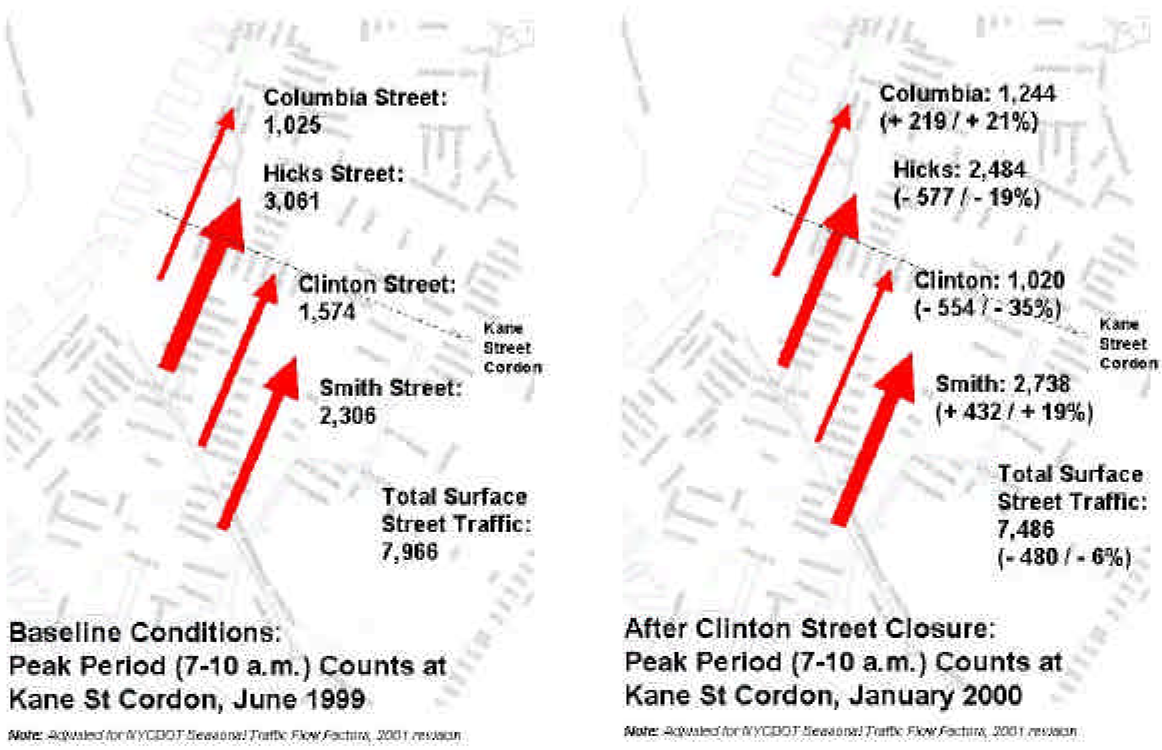
Clinton Street provides south-to-north connectivity through the Cobble Hill and Brooklyn Heights neighborhoods. It also carries substantial AM peak hour northbound traffic. This de facto peak hour traffic carrying function is at odds with its Living Street designation and its width and design. Ideally, through traffic should travel on parallel Travel Streets (the BQE) or even nearby Community Streets, such as Smith Street. However, the reality is that Clinton Street provides a convenient connection to the Brooklyn Bridge, by way of its connection to Tillary Street. Clinton Street carries 6,800 vehicles per day (vpd).

Those who live and travel in the area value this connection, both when they are driving and because it encourages use of the street by taxis; surveys revealed a number of people that found it useful to know that northbound taxis could generally be found on Clinton Street. When the option of closing Clinton Street's southern connection to Hamilton Avenue was investigated, opposition was encountered from residents of both Cobble Hill and Brooklyn Heights (see Section 7.5.6).

Figure 7.9 Peak hour traffic on Clinton Street

However, connectivity comes at a cost. Perceived problems of speeding arise in the southern section of Clinton Street through Cobble Hill. In the northern section on either side of Atlantic Avenue, traffic bound for Tillary Street forms a solid line in the morning peak. Traffic counts in 1999 found 1,574 vehicles traveling north on Clinton Street past Kane Street between 7:00 a.m. and 10:00 a.m. In an effort to accommodate this traffic, morning commuter peak period parking restrictions were used in the past to increase the amount of vehicle storage on Clinton (whose capacity is still governed by its intersections with Tillary Street and Atlantic Avenue), but were removed north of Atlantic Avenue as part of the pilot program and south of Atlantic Avenue soon after. The impact of closing Clinton Street at Hamilton Avenue during water main construction is shown in Figure 7.10.

Figure 7.10 Effect of Clinton Street closure on northbound traffic, 1999-2000



Accordingly, the focus of the action plan for Clinton Street is not to cbse off the street, but to discourage speeding in its southern section and to end the rewards further north for those commuting into the area by car.

Specific actions therefore include the following elements:

- Rationalize the layout of the Clinton Street/Hamilton Avenue intersection and in the process reconfigure the curb line to prevent high speed turns into Clinton Street from Hamilton Avenue, which are encouraged by the current design. Implement a raised crosswalk at the intersection to further reinforce the idea that drivers are entering a residential area.
- Remove the 7am-10am parking restrictions in the area south of Atlantic Avenue in order to increase the useful parking supply for residents of the street and discourage parking by those commuting into the area by car, after 10 a.m. NYCDOT implemented this initiative in 2000 due to the construction that occurred along the corridor. These changes were made permanent after construction ended. Additionally, the *7am-11am No Standing* regulations were removed from both the east and west curbs in the area north of Atlantic Avenue as part of the plan to discourage through traffic on Clinton Street.
- Increase the green time for Clinton Street at Atlantic Avenue. In January 2004, NYCDOT increased the green time for Clinton Street by 12 seconds. This is designed to

help alleviate the back-up at the intersections that immediately precede the Clinton Street/Atlantic Avenue intersection.

- Reduce the signal progression speed to 20 mph. This change was implemented along Clinton Street between Nelson Street and Pacific Street to encourage through-traveling motorists to use more appropriate routes (such as the BQE) and may reduce speeding by motorists during low volume periods.

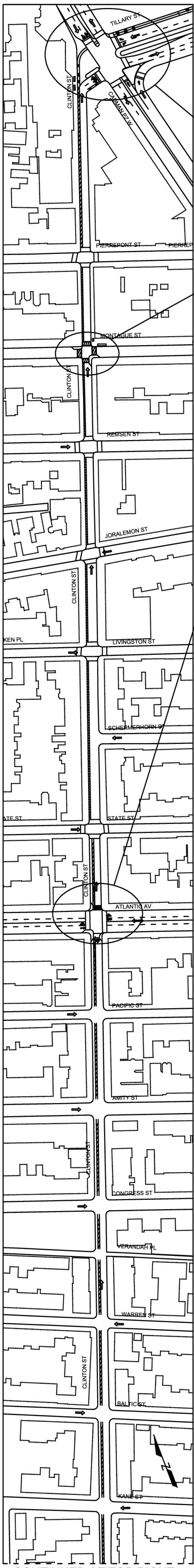
- "Feather" the Clinton Street signal progression from Kane Street to Pacific Street. As discussed in *Section 6.3.6.3*, feathering refers to the strategy of giving drivers slightly less green time at successive intersections in a corridor in order to store vehicles evenly across intersections. The intended results are a steadier progression along the corridor, shorter queues at Atlantic Avenue, and decreased driver frustration. This change was implemented in March 2004.

- Reconfigure the intersection of Clinton Street and Tillary Street to return more of the street space to pedestrian use. However, it should be noted that the initial plan to recapture a large area of road space at the northwestern corner of this intersection for pedestrian use by returning it to sidewalk has been modified, in light of advice from Community Board 2 that this space serves a useful purpose for drop off and pickup of disabled and elderly people in the area. Accordingly, this space has been retained in a redesign of the initial suggestions.

- Mark an on-street color-textured Class II bicycle lane on the west side of the street. This does not affect parking availability but provides a visual narrowing of the street and so will encourage drivers to travel more slowly in the southern section of the street.

During street cleaning periods, the bike lane is problematic because residents are permitted to double-park informally on one side of the street while the other is being cleaned. If a bike lane is present, double-parked vehicles are subject to summons for a moving violation (blocking a bike lane), not a parking violation (double-parking); moreover, cyclists are subject to a moving violation summons for riding outside a bike lane on a street where one is provided. Because this conflict between cyclists and parked cars occurs only once a week, for two hours, and because common sense should prevail in this situation it is believed that enforcement of the bike lane is manageable.

CLINTON STREET (LIVING ST)



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- Widen sidewalks and median
- Modify lane configuration
- Create new island
- Modify signal timing
- Maintain access to apartment buildings on corner

End high visibility bike lane

- Add neckdowns
- Texture crossing
- Reduce signal progression speed

- Add neckdowns
- Add a gateway treatment on the north side of Atlantic Ave

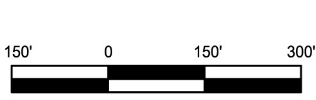
ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Install neck-downs on side streets and where possible minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Texture a 5' wide bicycle lane along the entire length of Clinton Street to match the route indicated in the NYC Bicycle Masterplan

Overview of Operational Improvements

- Modify signal timing and phasing where possible and provide pedestrian phases.



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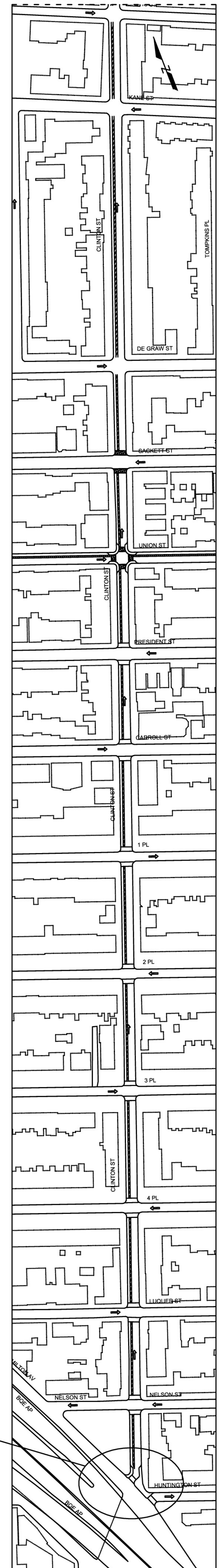

- Tighten up radius and entrance to discourage cut-through traffic

Start high visibility bike lane

7.2.3.6 Henry Street

Though it is designated as a Living Street, Henry Street carries moderate volumes of southbound traffic, particularly south of Atlantic Avenue – 3,500 vpd at the Kane Street cordon. Throughout the corridor, the objectives are to protect pedestrians and increase their visibility and to encourage less aggressive driver behavior. From Old Fulton Street to Clark Street neckdowns and textured crosswalks are recommended where possible to support these objectives.

Henry Street is also the major southbound cycling route through Brooklyn Heights. A successful high visibility, blue color-textured on-street bicycle lane was marked for two blocks south of Atlantic Avenue as part of the pilot program (see *Section 6.3.5*). It is recommended that this color-texturing be extended north along the existing, poorly delineated Class II bike lane, in accordance with the New York City Bicycle Master Plan. South of Amity Street, Henry Street is too narrow to accommodate a parking, travel, and bicycle lane. In this section, where traffic volumes are lower but travel speeds are a community concern, clear signage informing motorists that cyclists have equal rights to use the travel lane are recommended. While this signage is appropriate for immediate installation on Henry Street, over the long term NYCDOT might develop and install a "Share The Road" sign that differs from the current MUTCD version (DOT sign #SW-522). Pennsylvania has recently deployed "Share The Road" signs that show not only those words but also equal-size images of a car and a bicycle riding together. The concept of all users sharing the road is, of course, a traffic calming goal for all streets.

HENRY STREET (LIVING STREET)

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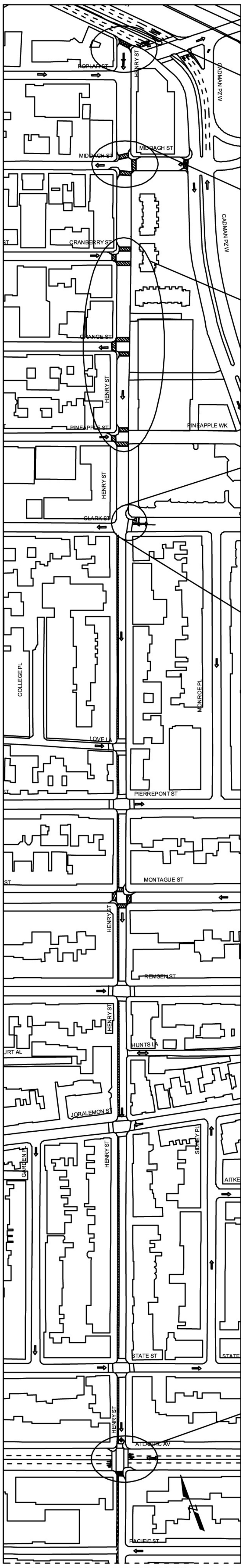

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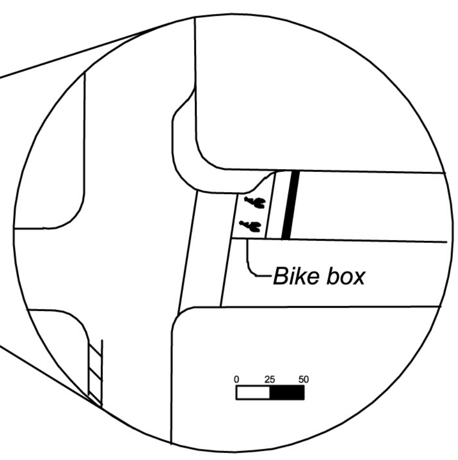
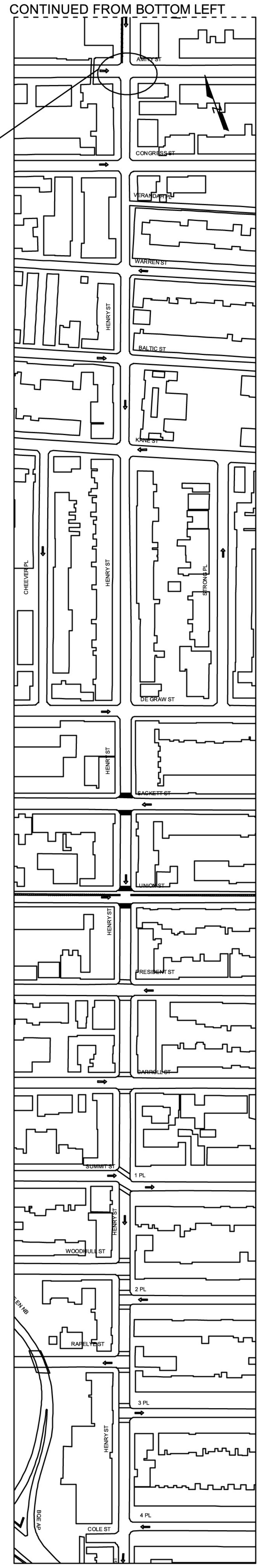
- Provide a gateway entrance
- Add neckdowns and textured crosswalks
- Add neckdowns and textured crosswalks

Begin high visibility bike lane



- Add neckdowns and textured crosswalks
- Add a bike box

End of high visibility bike lane



ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- From Old Fulton Street to Clark Street, install neck-downs where possible to minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Texture crosswalks in the commercial portion of this street to enhance pedestrian crossing towards the Brooklyn Heights Promenade.
- Provide a high visibility bike lane along the portion of this street that is part of the NYC Bicycle Masterplan route to delineate bicycling area and also to visually narrow the vehicular road width.

Overview of Operational Improvements

- Modify signal timing and phasing to maximize protected pedestrian phases where possible.
- If warrants are met, provide all-way stops at unsignalized intersections between Middagh Street and Clark Street to protect pedestrians crossing towards the Brooklyn Heights Promenade.
- Provide a Bike Box at Clark Street with, if possible, a Leading Bike Interval (LBI) to reduce bicycle/vehicular conflicts.

- *Add neckdowns*
- *Add a gateway treatment on the south side of Atlantic Avenue*
- *Increase pedestrian crossing time*

Begin high visibility bike lane (already constructed as part of the Pilot Program)

7.2.3.7 Hicks Street

Hicks Street runs parallel to the BQE between Hamilton Avenue and Atlantic Avenue and experiences intrusion by overflow traffic from the Gowanus Expressay/BQE, particularly at times of peak hour congestion (northbound average daily traffic is 11,000 vpd at the Kane Street screenline). In the northbound direction, this problem is exacerbated by the unconstrained operations of Hicks Street, which has no traffic signals south of Summit Street (see *Section 7.2.1.9*). Hicks Street's proximity to the BQE trench creates some visibility problems for pedestrians crossing Hicks Street because of high walls and narrow sidewalks. The action plan for Hicks Street is built on the Living Street idea that it could be managed in a way that does not encourage through traffic intrusion and that access to properties could take precedence over moving traffic through the corridor.

This approach begins at the south end of Hicks Street, at its intersection with Hamilton Avenue. (see *Section 7.2.1.9*) Discussions with the community indicated that the more restrictive option for managing the Hamilton Avenue/BQE/Hicks Street off-ramps was too intrusive and had the potential for an unintended and adverse consequence of forcing traffic traveling from the Gowanus Expressway to the local area north of Hamilton Avenue into Red Hook. The agreed measure addresses the most severe safety concerns at this intersection but does not protect Hicks Street. NYCDOT has implemented this design, as noted in *Section 7.2.1.9*.

South of Atlantic Avenue the action plan focuses on breaking up the potential for high-speed progression by cut-through drivers attempting to jump the BQE queue, while raising the status of east-west movement across Hicks Street. This has the advantage of improving the safety for pedestrians crossing Hicks Street and of improving the connection between neighborhoods east and west of the BQE trench. The signalized intersections of Hicks Street with Union, Sackett, Kane and Congress Streets – which provide the few road and pedestrian crossings of the BQE trench – could be redesigned to include high profile, color-textured crosswalks on Hicks Street and leading pedestrian intervals for east-west pedestrians (signal timing changes may require further study by NYCDOT's Signal Timing Division). Gateway treatments are also suggested on these east-west streets, as well as on the western legs of President and Summit Streets, to reinforce the residential ambience of the area.

In November 2003, NYCDOT implemented several improvements for the area of Hicks Street south of Atlantic Avenue. They consisted of modified traffic signals to provide leading pedestrian intervals and new roadway markings to designate recommended crosswalks. In addition, on the west roadway, which operates southbound, markings were installed to provide a buffer between pedestrians and motorists and to reduce the number of travel lanes from two to one. These markings were installed between Congress and Woodhull Streets.

From Atlantic Avenue northwards, Hicks Street's Living Street environment could be reinforced by raised intersection treatments at a number of intersections and neckdowns at Atlantic Avenue and Montague Street. A raised intersection was constructed as a pilot project at Hicks and Pierrepont Streets, but removed due to community concerns about noise. The design of future raised intersections should take note of the lessons learned from the Hicks/Pierrepont experience *(see Section 6.3.3)*. Reduced progression speeds are also recommended along the length of Hicks Street to discourage high speeds. On a street such as Hicks Street, which attracts a high level of through traffic, traffic calming measures should be designed to be mutually reinforcing. The traffic signal NYCDOT installed in 2002 at the intersection of Hicks Street and Pierrepont Street complements the raised intersections suggested throughout the corridor – a pattern which could be repeated throughout the section of Hicks Street north of Atlantic Avenue.

There was substantial discussion with Community Board 6 about the possibility of converting the current eastbound Congress Street bridge to two-way operation, as the DOT considered. Congress Street could provide convenient two-way access between Columbia Street and Cobble Hill and – should Furman Street be converted to two-way operation as suggested – to the northern end of the study area and to the Brooklyn Bridge. One drawback would be that two-way traffic on the bridge would require removal of parking spaces. A benefit of this measure would be improved permeability of and accessibility to the area.

7.2.3.8 Joralemon Street

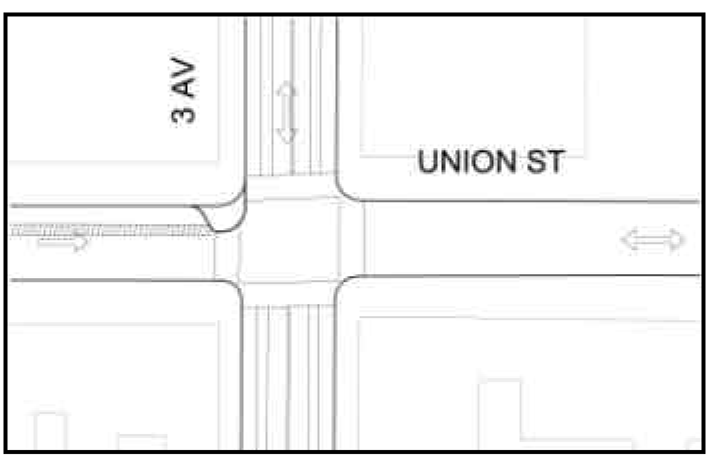
Joralemon Street provides one of the few connections from Brooklyn Heights to the waterfront. Its slope and surface discourage high traffic speeds, although the fact that it provides one of the few connections to Furman Street encourages its use as a cut-through route. In fact, Community Board 2 noted that it welcomes having a street that is able to quickly release traffic from the congested Brooklyn Heights grid. Joralemon Street's intersection with Furman Street is currently designed to allow sweeping turns onto southbound Furman Street. It is recommended that this intersection be squared off to provide some refuge for pedestrians in all directions and to discourage cut-through traffic.

A series of neckdowns at Joralemon Street's intersection with Hicks Street are also recommended, as discussed in *Section 7.2.3.7* above.

7.2.3.9 Union Street

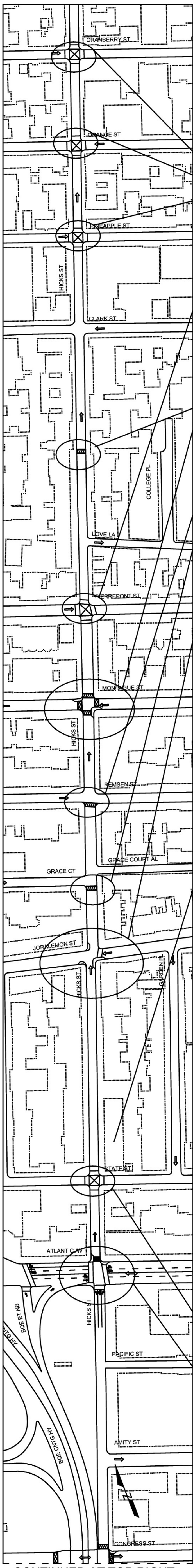
East of 3rd Avenue, Union Street is a two-way road; west of 3rd Avenue it is one-way eastbound. At present the layout of the Union Street/3rd Avenue intersection does not indicate to westbound drivers heading towards 3rd Avenue on the two-way section that they must turn off Union Street. It is recommended as an important matter of safety that this intersection be redesigned to provide an extra-wide neckdown that would channelize traffic safely and indicate the new traffic pattern to drivers. Design and implementation of such a neckdown is subject to NYCDOT Highway Design approval.

Figure 7.11 Proposed neckdown on Union Street at 3rd Avenue



Union Street is also a proposed cycling route designated in the NYC Bicycle Master Plan. It is recommended that the existing lane be marked as a high-visibility lane. This will draw attention to motorists’ and cyclists’ equal right to use the road space and will visually narrow the road, slowing through traffic.

HICKS STREET (LIVING STREET)



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- Add raised intersections
- Add neckdowns and textured crosswalks
- Add textured crosswalks
- Add neckdowns and progression breaks

- Add a raised intersection

- Add neckdowns
- Add a gateway treatment
- Add LPI

- Add gateway treatments
- Texture crosswalks
- Add a LPI
- Allow 2-way traffic over the bridge

- Add gateway treatments
- Texture walkways
- Add a LPI

- Add gateway treatments

- Re-channelize roads to reduce/eliminate cut-through traffic
- For more information see Hamilton Ave sheet

ACTIONS SUPPORTING STRATEGY

Overview of Physical Improvements

- Install neckdowns on side streets and where possible minimize crossing distances, improve pedestrian visibility, and encourage vehicles to turn at slower speeds.
- Install gateway treatments - on the neighborhood side of intersections which cross the BQE - to discourage through-traffic and speeding.
- Texture crossings at key intersections to visually break-up long stretches of roadway and to enhance crosswalk locations.
- At the intersection of Hamilton Avenue/Hicks Street and the Gowanus Expressway exit, physical improvements should be placed to encourage the use of the BQE and Hamilton Avenue/Van Brunt as a through street as opposed to Hicks Street.
- Vehicles exiting from the Gowanus will be discouraged from using Hicks Street as well as the BQE on-ramp from Hamilton Avenue.

Overview of Operational Improvements

- Modify signal timing and phasing to maximize protected pedestrian phases where possible.
- Longer crossing times should be given to pedestrians trying to cross the BQE/Hicks Street.
- Implement Leading Pedestrian Intervals (LPI) to allow pedestrians time to cross streets while traffic halts.
- Allow two-way traffic on the Congress Street bridge over the BQE to encourage vehicles to use Columbia Street/Furman Street as opposed to Hicks Street.

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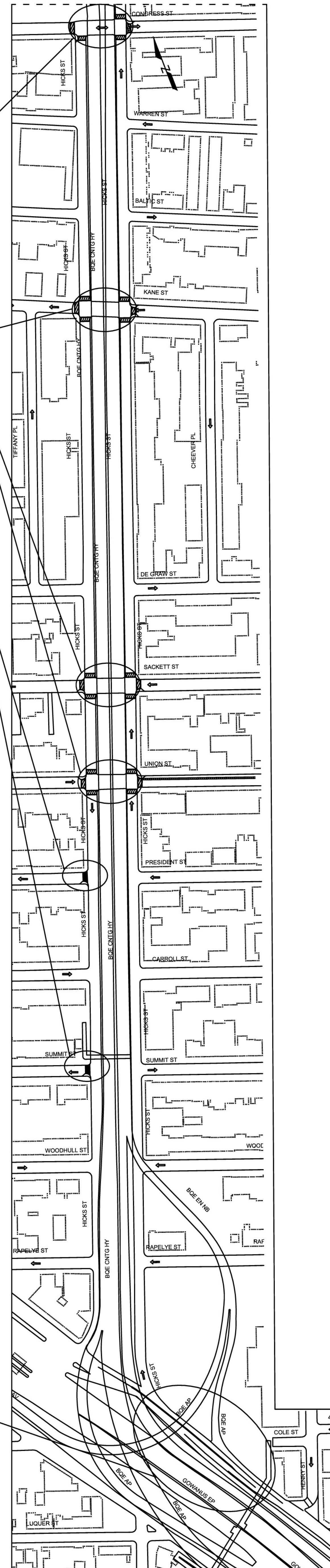
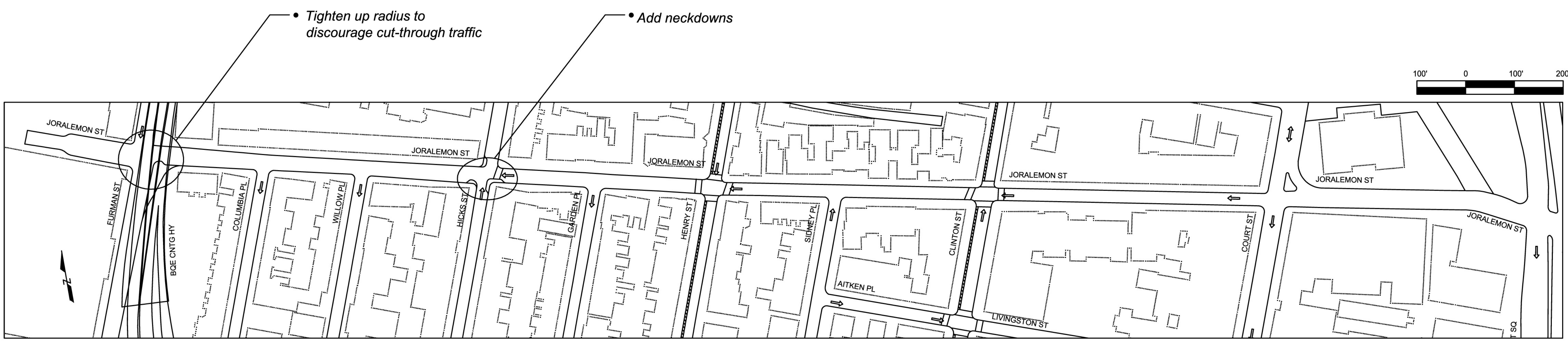


150' 0 150' 300'

JORALEMON STREET (LIVING STREET)

ACTIONS SUPPORTING STRATEGY

- Discourage cut-through traffic and speeding as well as improve pedestrian safety with the use of neckdowns and raised crosswalks.



UNION STREET (LIVING STREET)

ACTIONS SUPPORTING STRATEGY

Overview of Improvements

- Convert the bike lane between Henry Street and 3rd Avenue to a high-visibility, textured bike lane.
- Build an extra-wide neckdown on eastbound Union Street at 3rd Avenue, to channelize traffic at the point where Union changes from a one-way to a two-way street.

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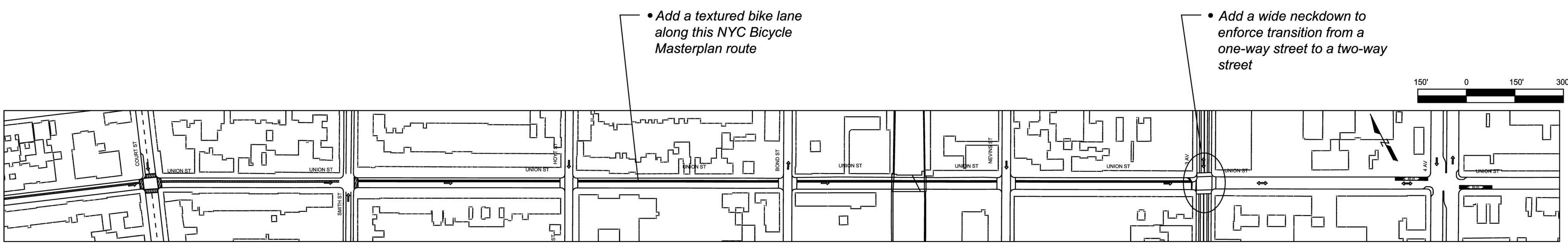


7.2.3.10 Prince Street/Johnson Street/Gold Street

The current arrangements of Gold and Prince Streets (southbound and northbound, respectively) encourage cut-through traffic between Flatbush Avenue and Tillary Street to use Prince Street during peak hours, and tempts drivers to make an illegal right turn across free-flowing traffic from northbound Prince Street to the BQE on-ramp off Tillary Street.

Converting Gold Street from southbound to northbound, and Prince Street from northbound to southbound, will eliminate these illegal movements. This scheme requires that Johnson Street, currently eastbound east of Gold Street but westbound west of Gold Street, be converted to run westbound all the way from Prince Street to Flatbush Avenue.

The management of these streets needs to be coordinated with the Downtown Brooklyn Development plan.

7.2.3.11 Other Fort Greene streets

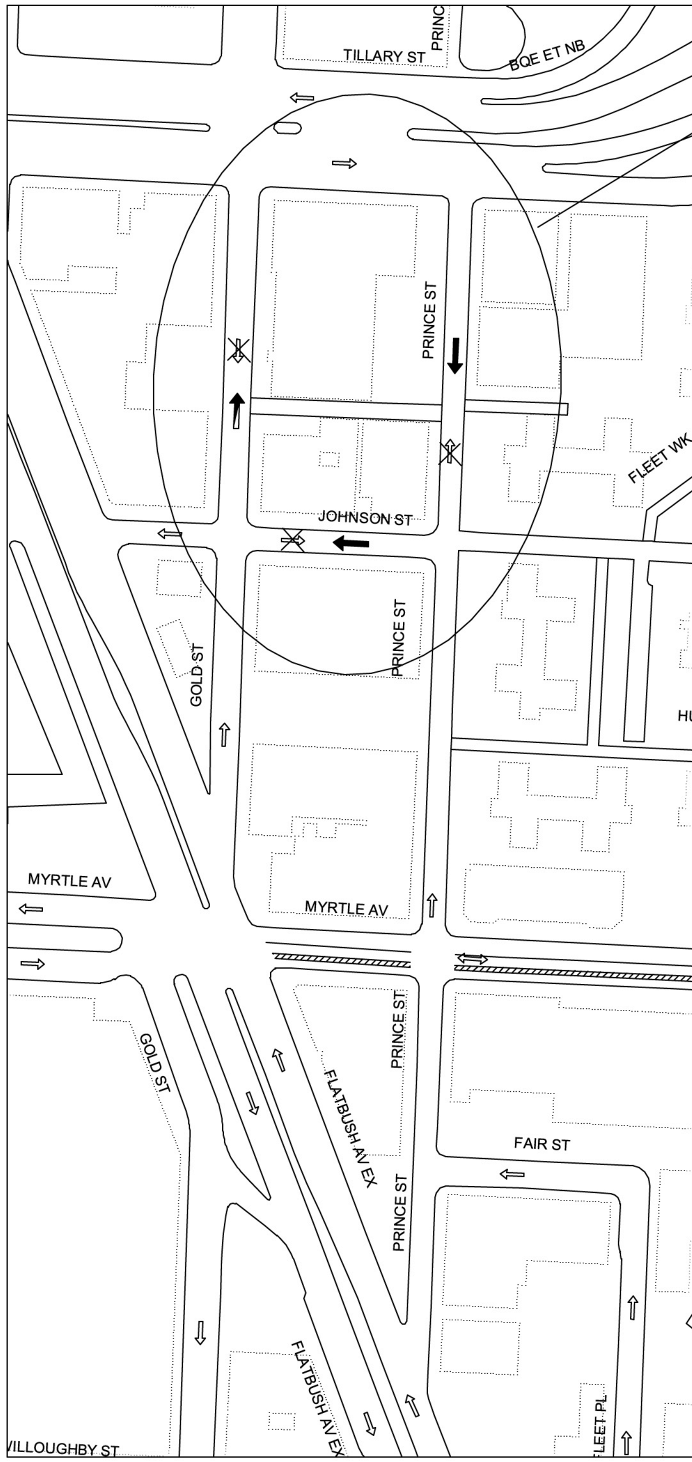
Local residents have long complained of a speeding problem on certain north-south streets through Fort Greene. This is inconsistent with these streets' Living Street character. On Adelphi, Clermont and Carlton Streets, it is recommended that neckdowns and controlled mid-block crossings adjacent to schools and residential buildings be introduced. These treatments will control through travel speeds and indicate to drivers that they are traveling on Living Streets.

7.2.3.12 Other Southeast area streets

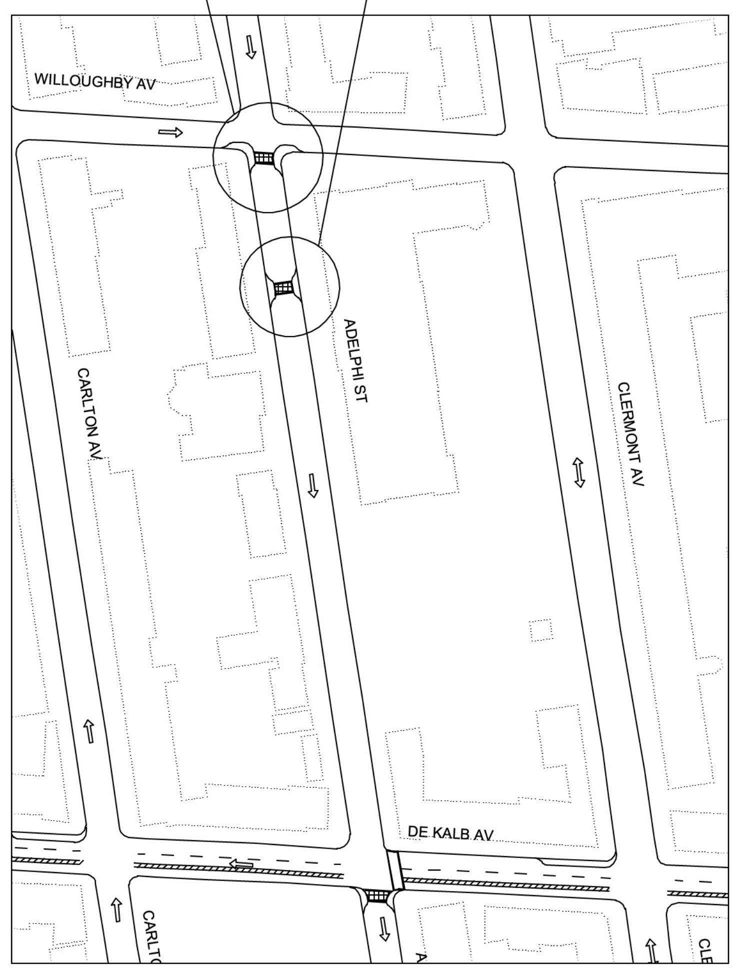
South of the Pacific Street/Dean Street/Bergen Street corridor (see *Section 7.2.3.3*), only a few opportunities exist for east-west movement. Two of these streets, Wyckoff Street and Baltic Street, were widened when the Gowanus Houses were built in the 1950s. To control speeds, improve crossing opportunities, and provide the community with more parking spaces, mid-block crossings (pending NYCDOT warrant analysis) and back-in diagonal parking between Hoyt and Bond Streets are recommended. This treatment will narrow the available road space. Community Board 6 preferred this scheme to a more radical chicane treatment, which would have reduced the available road space further.

OTHER FORT GREENE STREETS (LIVING STREETS)

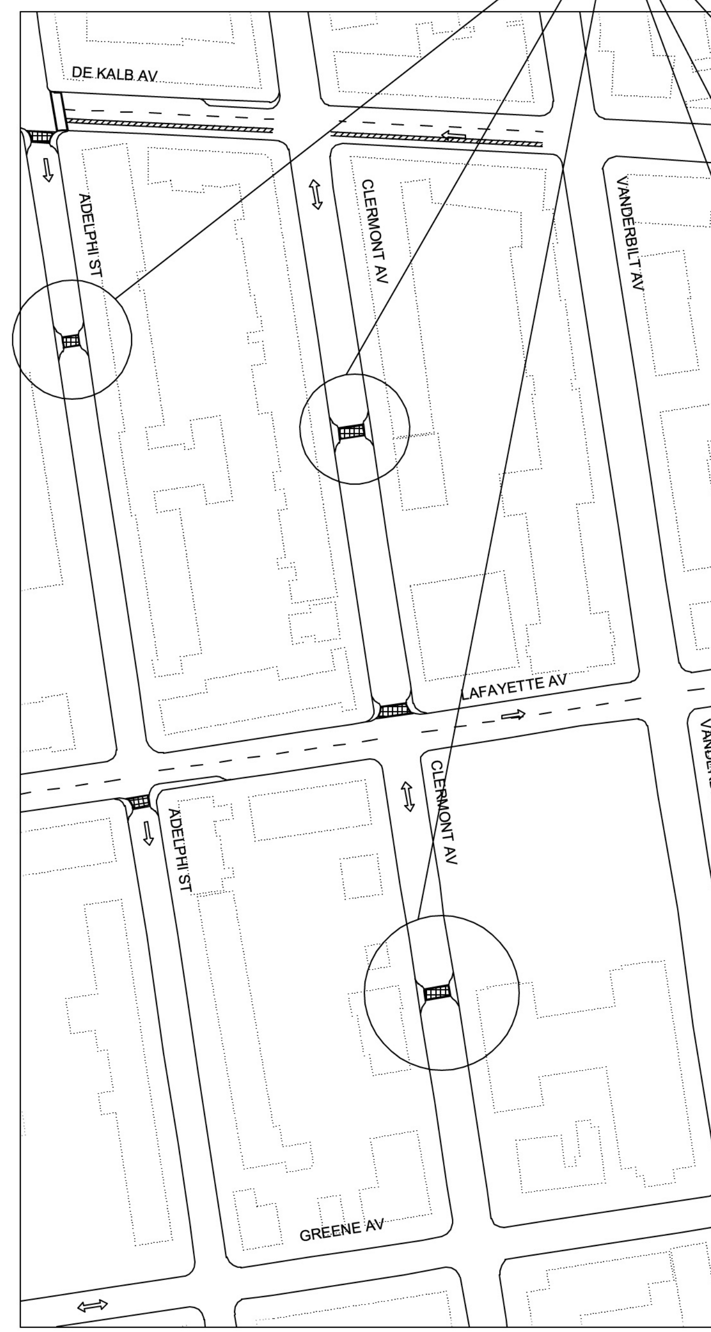
- Change street directions to eliminate cut-through traffic on Prince St from Flatbush Ave to the BQE

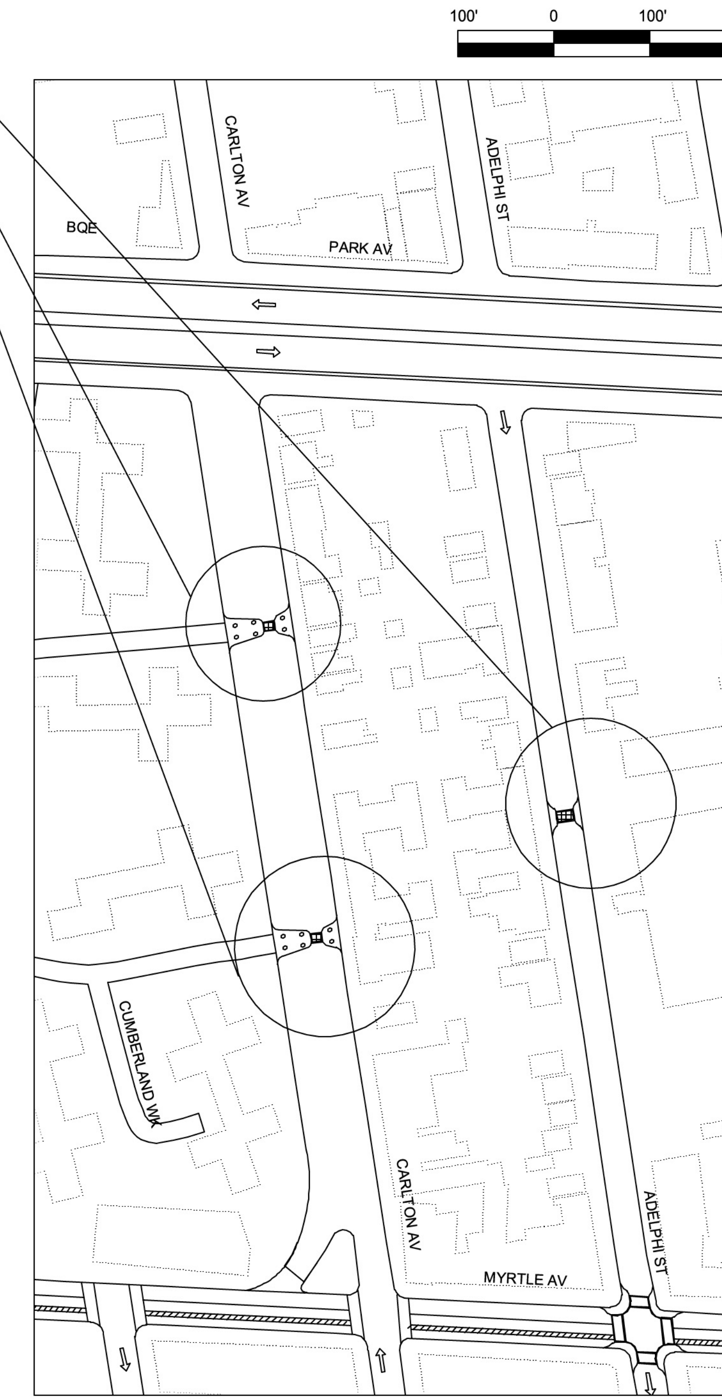


- Add a gateway treatment
- Add a mid-block crossing (subject to further analysis)

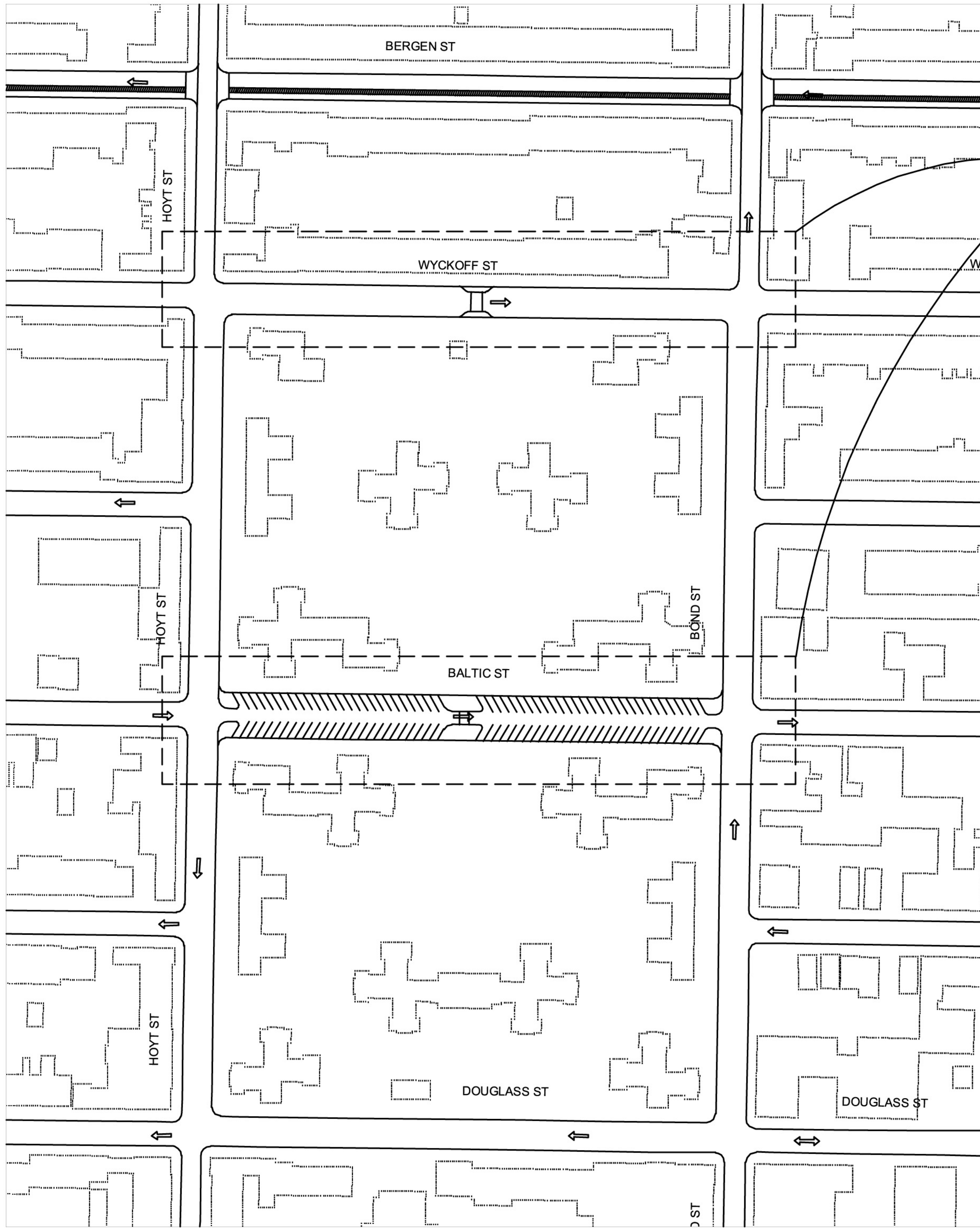


- Add mid-block crossings for schools and other pedestrian desire lines (subject to further analysis)

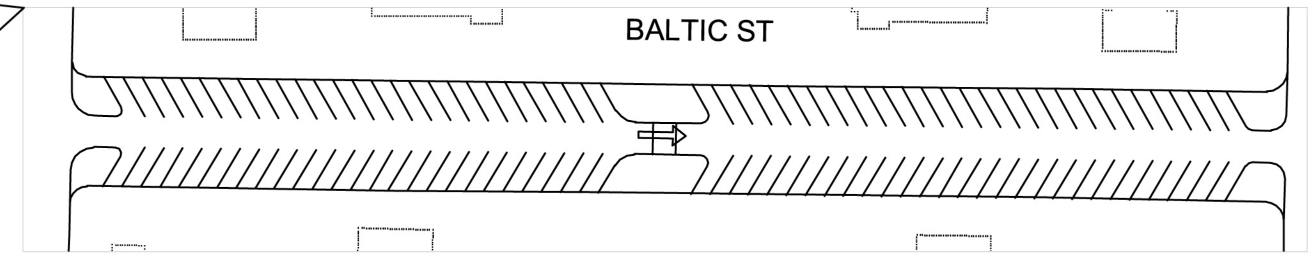




OTHER SOUTHEAST AREA STREETS (COMMUNITY STREET)



BALTIC AND WYCKOFF STREETS PREFERRED OPTION:



- *Add neckdowns and perhaps gateway treatments*
- *Stripe 60° reverse-in parking (on Baltic Street only)*

1A.Add a mid-block crossing

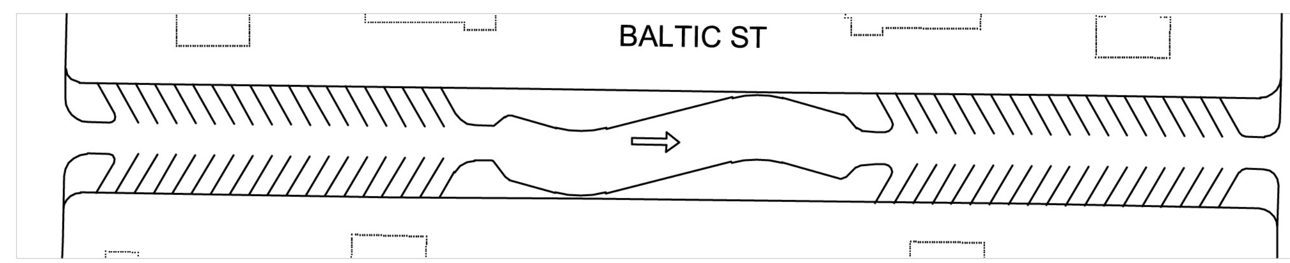
Pros:

- Maintain majority of parking
- Provide narrow streets and midblock crossing opportunities

Cons:

- Some loss of parking
- Not a major deterrent of cut-through traffic

BALTIC AND WYCKOFF STREETS DISCARDED OPTION:



- *Add neckdowns and perhaps gateway treatments*
- *Stripe 60° reverse-in parking (on Baltic Street only)*

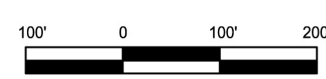
1A.Add a mid-block chicane

Pros:

- Maintain majority of parking
- Provide narrow streets and midblock crossing oppurtunities
- Chicane breaks up the long straight block

Cons:

- Some loss of parking
  Design might be unfamiliar to drivers



7.3 Areas Requiring Further Consideration

Inevitably some areas could not be resolved through this process, either because the issues are too broad to be resolved within the ambit of a traffic calming study such as this (for example Tillary and Adams Streets) or because decisions about specific traffic calming tactics logically need to be deferred until other matters that govern areawide traffic management strategies are resolved (such as the area around the Brooklyn Bridge Park). However, useful discussion took place and ideas for treating these areas are discussed here and in *Section 7.*6. Areas deferred to a different forum include:

7.3.1 Flatbush Avenue/Atlantic Avenue/4th Avenue

This large and complex intersection represents the greatest point of traffic congestion in the study area. This stems from the confluence of major traffic flows on Flatbush Avenue, Atlantic Avenue and 4th Avenue throughout the day, but especially during commuter peak periods. The effects of this congestion are felt for substantial distances along each of the roads that approach this intersection and on surrounding streets as a result of intrusion by vehicles seeking to avoid the congestion. A solution to this problem would provide opportunities to improve street operations over a wide area.

The project team spent considerable effort seeking a low-cost traffic management solution to this congestion. A range of schemes based on better managing the traffic passing through the intersection was investigated but no effective solution of this type could be found. It was reluctantly concluded that the solution to the traffic problems at this intersection relies on more substantial measures than can be contemplated as part of a traffic calming program such as this.

A solution to the traffic problems at this intersection could well be found if the range of potential solutions is widened to include more substantial road construction than was considered for this traffic calming study; however, any reconfiguring of this intersection should address the needs of cyclists and pedestrians, especially those who seek to cross Flatbush Avenue in this vicinity, as well as the needs of motorized traffic. A summary of the options considered for this intersection and surrounding areas is provided in *Section 7.6*.

7.3.2 Flatbush Avenue/Schermerhorn Street

Congestion at this intersection constrains NYCDOT's ability to better manage traffic in the Atlantic Avenue/Schermerhorn Street corridor – if additional capacity could be found for eastbound traffic approaching the intersection on Schermerhorn Street then more aggressive measures could be adopted to address traffic problems on Atlantic Avenue and on parallel residential streets such as Dean Street. The project team expended substantial effort in seeking a low-cost traffic management solution to this problem. However, potential solutions exhibited problems at adjacent intersections. A summary of the options considered for this intersection and surrounding areas is provided in *Section 7.6*.

As above, any reconfiguration of this intersection should address the needs of cyclists and pedestrians, especially those who seek to cross Flatbush Avenue in this vicinity, as well as the needs of motorized traffic.

7.3.3 Tillary Street/Adams Street

This is a critical intersection in the road network and is the gateway into Downtown Brooklyn for traffic arriving on the Brooklyn Bridge. The traffic congestion problems at this intersection have been the subject of debate and analysis for years. Some low-cost ideas for improving the operations of this intersection were advanced but agreement among all stakeholders could not be reached.

There is, however, general agreement that the Tillary Street/Adams Street intersection and the northern Adams Street approach needs to be reconfigured not only to improve traffic operations and to accommodate all motorists, pedestrians, and cyclists, but also to declare to arriving drivers that they have arrived in Brooklyn's dense urban fabric. However, agreement on a physical and management solution that achieves this aim could not be found. It is important, however, that the momentum of discussion that has been created as part of this study be maintained.

In addition, security concerns in the wake of the World Trade Center disaster have impinged on the operations of the roadway in front of the new Federal Court House soon to be completed on the intersection's northwest corner. Development of a rational management plan that meets security needs while accommodating the area's traffic demands must be a high priority.

7.3.4 Fulton Ferry/Two-way Furman Street

Two important elements of the proposed action plan were reconverting Furman Street to two-way operation (in place of the current one-way southbound operation) and reconfiguring the Fulton Ferry area to create a space more in keeping with its important historic and community role. The community saw Furman Street's role in the upcoming Brooklyn Bridge Park master plan (the park will run between between Atlantic Avenue and the Brooklyn Bridge and will become an important regional resource), and Community Board #2 endorsed the two-way operation of Furman Street. However, this corridor will require more attention as the park's design evolves. A master plan has been developed for the park and implementation will begin soon. Traffic access should be at the forefront of any consideration for development of the park, and NYCDOT should play a leading advisory role in the traffic access study for that park, to ensure that the broader road network issues be taken into account in that study.

7.4 Cost Estimates

This section describes the assumptions used in developing unit costs for traffic calming devices. The costs themselves were developed from the project team's experience in implementing the Downtown Brooklyn Traffic Calming pilot program and from engineer's estimates of material costs for typical traffic calming treatments. A summary of the estimated construction cost, including materials and labor, of each corridor is given in *Section 7.4.9.* It was assumed that intersections would be partially closed during construction.

7.4.1 Neckdown

The unit cost for a neckdown assumes that on two corners, sidewalks are extended 7 feet in each direction. The cost allows for the reconstruction of the concrete corner sidewalk and the removal and reinstallation of steel-face curb with six inches of reveal (unless a raised intersection or crosswalk is proposed). Since neckdowns are typically planned at several intersections in a corridor, the cost estimate allows for the fact that catch basins must be relocated whenever neckdowns are built at corners to which drainage flows, but not at all corners.

7.4.1.1 Unit Cost

$18,000 for neckdowns on two corners; $27,000 to neckdown all four corners.

7.4.2 Bus Bulb

The unit cost for a bus bulb assumes a sidewalk extension 7 feet wide and 55 feet long (the length of a single-unit NYCTA coach). As with neckdown costs, bus bulb costs include the cost to reconstruct the sidewalk, relocate the steel-faced curb, and relocate catch basins at sites where drainage is toward the bus bulb.

7.4.2.1 Unit Cost

$30,000 per bus bulb

7.4.3 Raised Intersection

The unit cost for a raised intersection assumes that the intersection is raised 4" above the existing roadway crown, and that the raised portion of the intersection is built in concrete, not asphalt. The raised section of the intersection is assumed to reach all four corners of the intersection.

7.4.3.1 Unit Cost

$10,000 per raised intersection

7.4.4 Full Gateway

The unit cost for a gateway is a combination of the cost of necking down two corners and the cost of building an asphalt (not concrete) raised crosswalk with color-textured markings. As with neckdown costs, gateway costs include the cost to reconstruct the sidewalk, relocate the steel-faced curb, and relocate catch basins at sites where drainage is toward the gateway.

7.4.4.1 Unit Cost

$21,000 per gateway

7.4.5 Chicane or Mid-block Crossing

The unit cost for a chicane or a mid-block crossing is the same as the unit cost for necking down two corners of an intersection. As with neckdown costs, chicane and mid-block crossing costs include the cost to reconstruct the sidewalk, relocate the steel-faced curb, and relocate catch basins at sites where drainage is toward the chicane or mid-block crossing. Additionally, as with all signal timing changes, NYCDOT should confirm that a signal is warranted where a signalized mid-block crossing is proposed.

7.4.5.1 Unit Cost

$25,000 per chicane or mid-block crossing

7.4.6 High-visibility bike lane

The unit cost for a high-visibility bike lane is a per-block cost, assuming a 5 foot-wide lane and a 200 foot-long block. The unit cost includes the costs of powersweeping and the lane, installing ColorSet or a comparable color-texturing product, and laying all lane striping and symbols.

7.4.6.1 Unit Cost

$7,860 per block (based on a 200-foot long block).

7.4.7 High-visibility crosswalk

The unit cost for a high-visibility sidewalk is given for a single leg of an intersection, assuming a 10 foot wide crosswalk. The unit cost includes the costs of power sweeping and the lane, installing ColorSet or a comparable color-texturing product, and restoring all striping.

7.4.7.1 Unit Cost

$1,690 per leg of intersection

7.4.8 Median

The unit cost for a median treatment is a per-block cost, assuming a 4 foot-wide median and a 200 foot-long block at a construction cost of $50/square foot. The unit cost assumes a basic raised concrete median with steel-faced curb at intersections and concrete-faced curb mid-block. It does not include the cost of landscaping or otherwise beautifying the median.

7.4.8.1 Unit Cost

$40,000 per block

7.4.9 Implementation costs by street

Table 7.4 (see next page) summarizes the estimated cost of implementing the Downtown Brooklyn Traffic Calming Strategy for each street in the study area. These estimates are compiled based on the unit costs described in *Sections 7.4.1* through *7.4.8.* The table shows three cost estimates – a low end, midpoint, and high end cost. The midpoint cost is a direct sum of the unit costs described above multiplied by the quantities specified in the strategy. A detailed breakdown of the quantities used to arrive at the estimates is shown in *Table 7.5* (see following page)

The unit costs used in both tables are, as noted, based on actual field experience, and include allowances for such contingencies as catch basin relocation. The low end and high end costs show 25% decreases and increases, respectively, from the midpoint cost. A low end cost can be used where existing curbs are not steel-faced and no catch basin relocations are required. A high end cost can be used where, in addition to steel-faced curb replacement and catch basin relocation, relocation of some utilities and manholes are also required. All cost estimates are rounded to the nearest $1,000.

Table 7.4 Estimated implementation cost of Downtown Brooklyn Traffic Calming Strategy, by street

Street	Cost Estimate		
	Low end	Midpoint	High end
3rd Avenue	$ 505,000	$ 674,000	$ 842,000
4th Avenue	$1,147,000	$1,529,000	$ 1,911,000
Adams Street	$ 15,000	$ 20,000	$ 25,000
Atlantic Avenue	$ 272,000	$ 362,000	$ 453,000
Court St/Cadman Plaza	$ 62,000	$ 83,000	$ 104,000
Flatbush Avenue	$ 360,000	$ 480,000	$ 600,000
Furman Street	$ 60,000	$ 80,000	$ 100,000
Hamilton Avenue	$ 121,000	$ 161,000	$ 201,000
Old Fulton Street	$ 231,000	$ 308,000	$ 385,000
Tillary Street	$ 191,000	$ 255,000	$ 319,000
Court Street	$ 900,000	$1,200,000	$ 1,500,000
DeKalb Avenue	$ 339,000	$ 452,000	$ 564,000
Fulton Street	$ 273,000	$ 364,000	$ 455,000
Jay Street	$ 48,000	$ 65,000	$ 81,000
Lafayette Avenue	$ 296,000	$ 395,000	$ 494,000
Livingston Street	$ 2,000	$ 3,000	$ 4,000
Montague Street	$ 89,000	$ 119,000	$ 148,000
Myrtle Avenue	$ 224,000	$ 299,000	$ 373,000
Schermerhorn Street	$ 110,000	$ 147,000	$ 184,000
Smith Street	$ 371,000	$ 495,000	$ 619,000
Willoughby Street	$ 91,000	$ 121,000	$ 151,000
3rd Street	$ 106,000	$ 141,000	$ 176,000
Ashland Place	$ 52,000	$ 69,000	$ 86,000
Pacific/Dean/Bergen Streets	$ 149,000	$ 199,000	$ 249,000
Boerum Place	$ 32,000	$ 42,000	$ 53,000
Clinton Street	$ 198,000	$ 264,000	$ 330,000
Henry Street	$ 197,000	$ 263,000	$ 328,000
Hicks Street	$ 320,000	$ 427,000	$ 534,000
Joralemon Street	$ 20,000	$ 27,000	$ 34,000
Union Street	$ 74,000	$ 99,000	$ 124,000
Other Fort Greene Streets	$ 172,000	$ 230,000	$ 287,000
Other Southeast Streets	$ 20,000	$ 27,000	$ 34,000
Total Cost, All Streets	**$7,047,000**	**$9,397,000**	**$11,746,000**

DOWNTOWN BROOKLYN TRAFFIC CALMING DETAILED COST ESTIMATE, BY CORRIDOR

Example	Hicks/ Atlantic	(based on neckdown)	Hicks/ Pierrpont	Fulton/S. Oxford	(based on neckdown)	Henry per block	Hicks/ Atlantic	Atlantic/ Bond	Tillary- Adams	
Generic Cost	$ 18,000	$ 30,000	$ 10,000	$ 21,000	$ 25,000	$ 7,860	$ 1,690	$ 40,000	$ 10,000	
								per block	per corner	
Quantities by Corridor										**Sum**
Corridor	**Neckdown two corners**	**Bus bulb**	**Raised intersection**	**Full gateway**	**Chicane**	**High-visibility bike lane**	**High-visibility crosswalk**	**Medians/ Road reclamation**	**Bollards/ Ped Fencing**	$ 9,404,520
3 Av	13			14		18.5				$ 673,410
4 Av	44			27.5				4		$ 1,529,500
Adams								0	2	$ 20,000
Atlantic	11			4				2		$ 362,000
Cadman							2	2		$ 83,380
Flatbush								11.5	2	$ 480,000
Furman								2		$ 80,000
Hamilton	4.5							2		$ 161,000
Tillary						2		6		$ 255,720
Court	33	9					104	4		$ 1,199,760
DeKalb	6	6		1		13		1		$ 451,180
Fulton	2			8				4		$ 364,000
Jay	1					6				$ 65,160
Lafayette	1	3		6			1	4		$ 395,690
Livingston							2			$ 3,380
Montague	4						28			$ 119,320
Myrtle	7					17		1		$ 299,620
Old Fulton	6							5		$ 308,000
Schermerhorn	6							1		$ 148,000
Smith	14					22	41			$ 494,210
Willoughby	4.5							1		$ 121,000
3 St	4			2		3.5				$ 141,510
Ashland	3					2				$ 69,720
Pac/Dean/Berg	4		2			13.5				$ 198,110
Boerum	1.5					2				$ 42,720
Clinton	2					29				$ 263,940
Dean										$ -
Henry	6.5			1		11	23			$ 263,330
Hicks	10.5		5	7			24			$ 426,560
Joralemon	1.5									$ 27,000
Union	1					8	11			$ 99,470
Other NE stree	11			1			7			$ 230,830
Other SE stree	1.5									$ 27,000

	Component Cost								
Corridor	**Neckdown two corners**	**Bus bulb**	**Raised intersection**	**Full gateway**	**Chicane**	**High-visibility bike lane**	**High-visibility crosswalk**	**Medians/ Road reclamation**	**Bollards/ Ped Fencing**
3 Av	$ 234,000	$ -	$ -	$ 294,000	$ -	$ 145,410	$ -	$ -	$ -
4 Av	$ 792,000	$ -	$ -	$ 577,500	$ -	$ -	$ -	$ 160,000	$ -
Adams	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,000
Atlantic	$ 198,000	$ -	$ -	$ 84,000	$ -	$ -	$ -	$ 80,000	$ -
Cadman	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,380	$ 80,000	$ -
Flatbush	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 460,000	$ 20,000
Furman	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	$ -
Hamilton	$ 81,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	$ -
Tillary	$ -	$ -	$ -	$ -	$ -	$ 15,720	$ -	$ 240,000	$ -
Court	$ 594,000	$ 270,000	$ -	$ -	$ -	$ -	$ 175,760	$ 160,000	$ -
DeKalb	$ 108,000	$ 180,000	$ -	$ 21,000	$ -	$ 102,180	$ -	$ 40,000	$ -
Fulton	$ 36,000	$ -	$ -	$ 168,000	$ -	$ -	$ -	$ 160,000	$ -
Jay	$ 18,000	$ -	$ -	$ -	$ -	$ 47,160	$ -	$ -	$ -
Lafayette	$ 18,000	$ 90,000	$ -	$ 126,000	$ -	$ -	$ 1,690	$ 160,000	$ -
Livingston	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,380	$ -	$ -
Montague	$ 72,000	$ -	$ -	$ -	$ -	$ -	$ 47,320	$ -	$ -
Myrtle	$ 126,000	$ -	$ -	$ -	$ -	$ 133,620	$ -	$ 40,000	$ -
Old Fulton	$ 108,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 200,000	$ -
Schermerhorn	$ 108,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000	$ -
Smith	$ 252,000	$ -	$ -	$ -	$ -	$ 172,920	$ 69,290	$ -	$ -
Willoughby	$ 81,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000	$ -
3 St	$ 72,000	$ -	$ -	$ 42,000	$ -	$ 27,510	$ -	$ -	$ -
Ashland	$ 54,000	$ -	$ -	$ -	$ -	$ 15,720	$ -	$ -	$ -
Pac/Dean/Berg	$ 72,000	$ -	$ 20,000	$ -	$ -	$ 106,110	$ -	$ -	$ -
Boerum	$ 27,000	$ -	$ -	$ -	$ -	$ 15,720	$ -	$ -	$ -
Clinton	$ 36,000	$ -	$ -	$ -	$ -	$ 227,940	$ -	$ -	$ -
Dean	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Henry	$ 117,000	$ -	$ -	$ 21,000	$ -	$ 86,460	$ 38,870	$ -	$ -
Hicks	$ 189,000	$ -	$ 50,000	$ 147,000	$ -	$ -	$ 40,560	$ -	$ -
Joralemon	$ 27,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Union	$ 18,000	$ -	$ -	$ -	$ -	$ 62,880	$ 18,590	$ -	$ -
Other NE stree	$ 198,000	$ -	$ -	$ 21,000	$ -	$ -	$ 11,830	$ -	$ -
Other SE stree	$ 27,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

7.5 Staging implementation of the action plan

A staging strategy for implementing the Downtown Brooklyn Traffic Calming strategy has been developed. The staging strategy balances several considerations:

- costs must be spread evenly over several years of construction,
- strategies must be implemented to prevent sudden increases or decreases in capacity that might induce additional driving in Downtown Brooklyn, and
- visible progress must be made in order to build and maintain momentum (see *Section 8.3*).

The staging program outlined in the Final Report spreads out the strategy's $10 million cost over four distinct phases, each roughly equal in cost. Estimated costs include all individual physical works associated with the treatments and any necessary utilities relocation. The actions in each phase are coordinated so that traffic impacts result in a logical fashion consistent with the Street Management Framework, and so that visible locations are treated early in the process to maintain visibility and enthusiasm. The order of the phases is not meant to imply a hierarchy of importance among the corridors or an indication of priorities. Instead, it is intended to group corridors on a systematic basis for implementation. Implementation phasing should be based on community priorities and coordination with the City's Capital Plan. In fact, the phases are interchangeable in two senses – each phase bundles a coordinated set of actions that can stand alone from a traffic operations point of view, and the costs are roughly equal among phases. A summary of costs, by phase, is given in *Section 7.5.5*. Note that this plan constitutes the project team's recommendation, and is subject to change if community or NYCDOT priorities change.

7.5.1 Phase 1

Phase 1 focuses on two of the corridors that generated the most discussion during the Downtown Brooklyn Traffic Calming process – Atlantic Avenue (east-west) and Brooklyn Heights (north-south). The approximate total cost of Phase 1 is expected to range between $1.9 million and $3.2 million.

7.5.1.1 Atlantic Avenue east-west corridor

This phase begins by improving pedestrian conditions and rationalizing traffic flow and queuing patterns along Atlantic Avenue. The introduction of operational measures like LPIs and 24-hour parking (currently, only off-peak parking exists), and physical measures like neckdowns on intersecting Living Streets will improve pedestrian conditions on Atlantic Avenue. Meanwhile, as traffic operation improvements allow Atlantic to carry and store peak hour traffic more efficiently, traffic pressure on parallel Living and Community Streets like Pacific Street, Dean Street, Bergen Street, Livingston Street, and Schermerhorn Street will decrease. This will create an opportunity to introduce new physical treatments that slow travel speeds and discourage through traffic on the Living and Community Streets.

Improvements in the Atlantic Avenue corridor include the traffic calming strategies for:

- Atlantic Avenue
- Pacific/Dean/Bergen Streets
- Schermerhorn Street

- Livingston Street

7.5.1.2 Brooklyn Heights north-south corridor

Building on the improved east-west operations on Atlantic Avenue, a Travel Street, Phase 1 continues to reduce through traffic impacts and improve conditions for non-motorized street users on the Living Streets that run north-south across Atlantic Avenue west of Court Street. Many of these improvements would begin as far south as Hamilton Avenue, improving conditions on both sides of Atlantic Avenue, but the primary operational focus will be to slow traffic and discourage through travel north of Atlantic Avenue.

Improvements in the Brooklyn Heights corridor include the traffic calming strategies for:

- Hicks Street
- Henry Street
- Clinton Street
- Hamilton Avenue
- Court Street/Cadman Plaza West
- Old Fulton Street
- Furman Street
- Joralemon Street
- Montague Street
- Jay Street
- Adams Street

7.5.2 Phase 2

Phase 2 complements the work completed in Phase 1 by extending traffic calming improvements to the north-south Court/Smith Streets corridor through Cobble Hill. The approximate total cost of Phase 2 is expected to range between $1.5 million and $2.5 million.

7.5.2.1 Cobble Hill north-south corridor

Phase 2 aims to rationalize traffic and transit operations and to improve conditions for pedestrians, cyclists, bus riders, and motorists along Smith and Court Streets and the intersecting Living Streets in Cobble Hill. When combined with the actions undertaken in Phase 1, this phase will prevent traffic discouraged from using the north-south streets west of Court Street (Hicks, Henry, and Clinton Streets) from simply diverting to Court and Smith Streets.

Improvements in the Cobble Hill corridor include the traffic calming strategies for:

- Court Street
- Smith Street
- Columbia/Van Brunt Streets
- Union Street

- 3rd Street
- Baltic/Wyckoff Streets

7.5.3 Phase 3

Phase 3 focuses on improving street management within and east of the Downtown Brooklyn Central Business District (CBD). The centerpieces of this phase are traffic management measures to improve the operations of Flatbush Avenue and physical measures that will reinforce the neighborhood character of Fort Greene's Living and Community Streets. The approximate total cost of Phase 3 is expected to range between $2 million and $3.3 million.

7.5.3.1 Fort Greene east-west corridor

Phase 3 will improve pedestrian conditions and bus operating conditions on the east-west avenues through Fort Greene. This phase will also slow traffic traveling crosstown on the north-south Living Streets, reducing the volume and impact of through traffic on residential areas.

Improvements in the Fort Greene corridor include the traffic calming strategies for:

- Myrtle Avenue
- DeKalb Avenue
- Lafayette Avenue
- Fulton Street
- Ashland Place
- Other Fort Greene Streets

7.5.3.2 Flatbush Avenue and the Central Business District

Phase 3 will introduce operational improvements and physical measures along Flatbush Avenue and Tillary Street to make traffic flow and queue more efficiently, reducing drivers' temptation to use adjacent Living and Community Streets to access Manhattan and the Downtown Brooklyn CBD. The strategies for Flatbush Avenue specifically address it role as a safe, efficient vehicular gateway to MetroTech and the entire Brooklyn CBD, while still reaping substantial benefits for pedestrians to travel along and across the avenue.

Improvements in the Central Business District (CBD) include the traffic calming strategies for:

- Flatbush Avenue
- Willoughby Street
- Tillary Street

7.5.4 Phase 4

Phase 4 addresses the traffic management and safety issues in the north-south corridor formed by two Travel Streets, 3rd and 4th Avenues. The approximate total cost of Phase 4 is expected to range between $1.7 million and $2.8 million.

7.5.4.1 3rd/4th Avenue corridor

Phase 4 will allow 3rd and 4th Avenues to continue their role as Travel Streets, distributing regional trips into the study area. This phase also introduces physical measures that will improve pedestrian safety and crossing conditions along the avenues.

Improvements in the 3rd/4th Avenue corridor include the traffic calming strategies for:

- 3rd Ave
- 4th Ave

7.5.5 Costs by phase

Table 7.6 summarizes an estimated cost range for each implementation phase of the Downtown Brooklyn Traffic Calming strategy. Unit costs and assumptions are described in *Section 7.4.*

Table 7.6 Summary of cost estimates, by implementation phase

Phase	Corridor locations	Cost estimate (millions)		
		Low end	Midpoint	High end
1	Atlantic Avenue, Brooklyn Heights	$ 1.9	$ 2.5	$ 3.2
2	Cobble Hill	$ 1.5	$ 2.0	$ 2.5
3	Fort Greene, CBD	$ 2.0	$ 2.7	$ 3.3
4	3rd and 4th Aves	$ 1.7	$ 2.2	$ 2.8
Total		**$ 7.0**	**$ 9.4**	**$ 11.7**

Note: Columns may not sum due to rounding

7.6 Ideas Considered But Not Advanced

A great deal of investigation and analysis effort was expended on ideas that ultimately did not find their way into the final strategy. This effort was not without value, of course, and is reported here in order that the value is not lost. All of the measures presented in this section were considered seriously and only dismissed if the community expressed its dislike, or if analysis showed that the measure's impacts on safety and traffic movement were too great.

7.6.1 Flatbush Avenue/Atlantic Avenue/4th Avenue

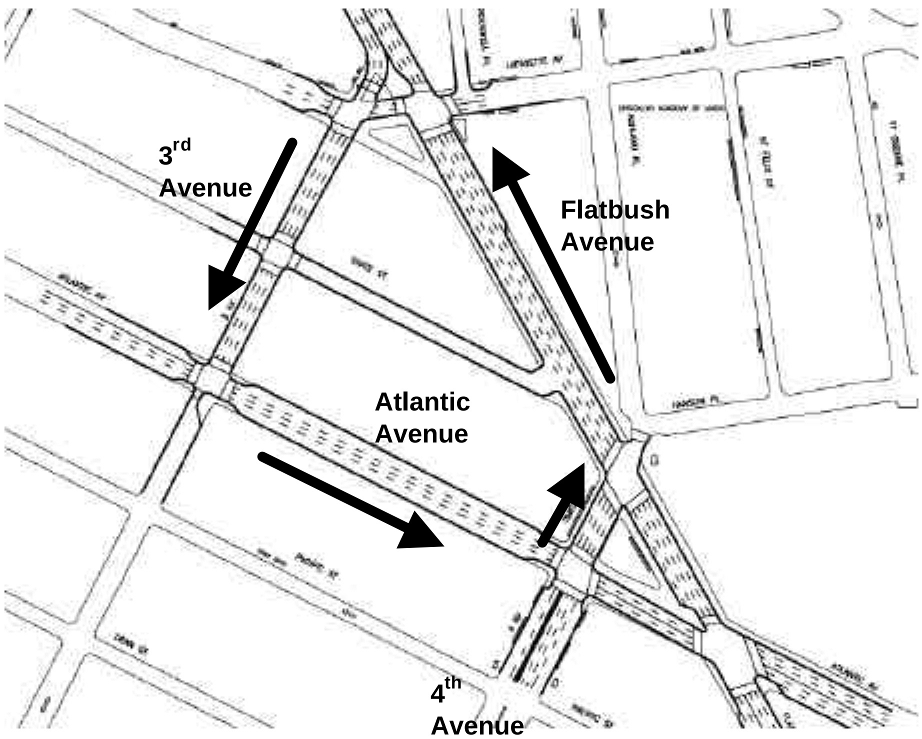
Section 7.3 contains a discussion of how this location was identified as one that required further attention beyond the duration of this study. This reflects the project team's inability to find a traffic calming solution to its problems only after a substantial amount of analytical effort. It is likely that the intersection can be made to operate more effectively, but only through more substantial construction activity than fits comfortably under the heading of traffic calming.

The intersection of Flatbush Avenue, Atlantic Avenue and 4th Avenue routinely experiences substantial congestion, which extends west to include the intersection of 3rd Avenue and Atlantic Avenue. These intersections, together with the congested intersection of Schermerhorn Street and Flatbush Avenue provide a major traffic bottleneck whose effect is felt over a wide area. Clearly, the traffic congestion at this location could be addressed through substantial road construction.

However, the focus of this traffic calming investigation was on managing traffic better and innovatively.

The focus was on implementation of a gyratory, a traffic control technique used with great success elsewhere in the world. This involved creating a traffic loop running one-way counter clockwise southbound on 3rd Avenue from Flatbush Avenue to Atlantic Avenue, eastbound on Atlantic Avenue to 4th Avenue, northbound on 4th Avenue to Flatbush Avenue and northwest on Flatbush Avenue to 3rd Avenue. The scheme is illustrated in *Figure 7.12*.

Figure 7.12 Gyratory proposal for Atlantic, Flatbush, Third, and Fourth Avenues. Though it would reduce conflicts and improve traffic flow, this plan is impossible, without taking land for additional road space.



This proposal built on the idea that an effective means of reducing congestion at individual locations is to reduce the number of conflicting traffic movements. At present, each of these intersections is configured to allow almost all movements. This provides desirable flexibility for drivers to travel exactly where they want through the congested area, but with the substantial impacts of traffic congestion and an unpleasant street environment. The Gyratory option suggested that it might be possible to sacrifice some of the movement flexibility, in return for a congestion reduction, as well as an improvement in street conditions and reduction in road width. Since it had the potential to benefit all street users, the Gyratory option was investigated seriously here.

In this option, traffic northbound on 4th Avenue and westbound on Atlantic Avenue heading for Flatbush Avenue would not have to deviate from its current route, but would experience less congestion than currently in the morning peak because of the reduced conflicts at the intersections of Flatbush Avenue and Atlantic Avenue and Flatbush Avenue and 4th Avenue. Traffic currently heading for Atlantic Avenue west of the area from 4th Avenue and Atlantic Avenue east of the area could do so by traveling northwest on Flatbush Avenue and then south on 3rd Avenue, or (more desirably) could divert to Flatbush Avenue northwest. Traffic heading north on 3rd Avenue would need to travel counter clockwise around the gyratory in order to reach either Flatbush Avenue northwest or Atlantic Avenue west; while circuitous, the movement from 3rd Avenue south to Atlantic Avenue west is currently banned, therefore this scheme provides greater connectivity between what are designated as two truck routes than currently exists.

Traffic traveling away from Brooklyn's downtown likewise would experience a mix of greater convenience and slight deviation. All traffic traveling southeast on Flatbush Avenue would deviate south on 3rd Avenue to Atlantic Avenue, generally east on Atlantic Avenue and from there either to Atlantic Avenue east, Flatbush Avenue southeast or 4th Avenue south. Traffic traveling east on Atlantic Avenue could reach Atlantic Avenue east, Flatbush Avenue southeast, 3rd Avenue south and 4th Avenue south without deviation and with fewer conflicting traffic movements than at present.

The northbound and westbound traffic streams described above generally benefit strongly from this scheme, particularly in the morning peak commuter period. By virtue of the slightly circuitous route required to reach Atlantic Avenue west, this major shopping street may be somewhat protected from westbound through traffic.

The proposal's major flaw occurs in the evening commuter peak period at the Atlantic Avenue/3rd Avenue intersection, where there is simply not enough current road space to accommodate evening commuter peak traffic. To store evening peak volumes, land acquisition for road widening would be required. Given the focus on improvements to the area's traffic that do not rely on major property acquisition, this innovation had to be abandoned. Notwithstanding this, it is felt that the scheme has some merit and offers a possible means of dealing with the chronic traffic congestion in this area at the same time as offering means to reduce road widths and create the potential for pedestrian presence in what is currently an unpleasant pedestrian area. Apart from the road space problems at the Atlantic Avenue/3rd Avenue intersection, substantial opportunities presented themselves to reclaim road space, simplify traffic movements and improve the street environment. Current (2000) and Gyratory conditions are described in *Table 7.6*.

Table 7.7 Comparison of current traffic conditions at Flatbush-Atlantic-Fourth Avenue intersection with conditions under the proposed gyratory

Intersection	Existing (2000)				With Gyratory			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	LOS	*Int. Delay*	*LOS*	*Int. Delay*	*LOS*	*Int. Delay*	*LOS*	*Int. Delay*
Flatbush Ave – Fourth Ave	C	26.3 sec	C	20.0 sec	C	29.8 sec	C	26.3 sec
Flatbush Ave – Atlantic Ave	C	23.4 sec	C	29.2 sec	C	23.4 sec	C	28.9 sec
Atlantic Ave – Fourth Ave	D	49.7 sec	D	43.4 sec	E	60.8 sec	D	50.7 sec

Source: Traffic volumes from 330 Jay Street EIS

In the long term, it is recommended that this option be explored further as part of the ongoing studies of this area recommended in *Section 7.3*.

7.6.2 Flatbush Avenue/Schermerhorn Street/3rd Avenue realignment

Besides experiencing chronic congestion, the intersection of Schermerhorn Street with Flatbush and 3rd Avenues is unwelcoming for pedestrians. An attempt was made to reorganize the street space, and improve throughput, by banning left turns from 3rd Avenue to Schermerhorn Street, changing signal timings, and expanding the traffic island by closing the slip ramp between Schermerhorn Street and Flatbush Avenue. However, while some of these measures would improve pedestrian crossing conditions, no amount of realignment can increase the capacity of this intersection, short of actually acquiring more property for road space. Since acquiring property is beyond the scope of traffic calming, and since the junction of two Travel Streets needs to be managed with traffic throughput in mind, this option was not pursued. Such a plan may be possible in the context of the EDC/Department of City Planning's Downtown Brooklyn Redevelopment Plan.

7.6.3 State Street reversal

Residents of State Street between Court and Hoyt Streets are concerned that redevelopment of the Municipal Parking Garage site will increase traffic on their blocks. They voiced that State Street, which is one-way eastbound, suffers from as much traffic intrusion in the evening peak as streets that parallel Atlantic Avenue to the south (Pacific, Dean, and Bergen Streets). They suggested reversing the direction of State Street for one block to prevent this intrusion.

Such a reversal is not recommended for two reasons:

- Such a reversal would reduce the permeability of the Boerum Hill grid, frustrating drivers unfamiliar with the area, and
- The scheme would place additional traffic onto already congested intersections like Smith Street and Atlantic Avenue, Hoyt Street and Atlantic Avenue, and 3rd Avenue and Schermerhorn Street. Additional traffic would be forced to take circuitous routes on State Street and adjacent streets, including Atlantic Avenue, Hoyt Street, Bond Street, Court Street, Smith Street and 3rd Avenue.

Notwithstanding these concerns, some attention should be given to mitigating the traffic impacts of the garage site redevelopment during that project's planning process.

7.6.4 Two-way Court Street

Converting Court Street to two-way operation was suggested as a way of making the street less useful for commuters and more useful for local circulation and non-drivers. However, Court Street is not a Living Street, and the presence of traffic is not something to be avoided at all costs. Indeed, as noted elsewhere, many successful shopping streets in New York carry high traffic volumes. Since making Court Street two-way would reduce southbound capacity in the study area, it would lead to further intrusion into Living Streets like Henry, Nevins and Hoyt Streets. Moreover, a two-way scheme would do nothing to improve the operations of buses on Court Street – an issue that is addressed by the suggested bus bulbs.

8. IMPLEMENTATION

8.1 Building Support

There is nothing magic about traffic calming. It is merely an approach to managing streets by acknowledging the needs of all users of the great store of public space contained between property lines (primarily roadways and sidewalks). Just as this approach recognizes and accommodates the needs of those who live and work and shop and play on the City's streets, so it also recognizes the need to accommodate motorized traffic adequately. Drivers of cars and other motorized vehicles are legitimate users of streets, but they are not the only users. This idea, perhaps not articulated in exactly this way, underpins the community groundswell that created the Downtown Brooklyn Traffic Calming Study.

When thought of as a rational sharing of limited space among all users rather than as a battle between cars and pedestrians, it is hard to disagree with the idea of traffic calming. It is important to maintain this concept. Traffic calming does not represent a radical new approach to managing streets, but a more balanced one – an approach that reflects a clearer perception of broad community objectives. Promoting the debate over traffic calming in these terms is an important element underpinning continued and expanded support for implementation of Downtown Brooklyn's Traffic Calming program and development of similar projects elsewhere in the City. This project has helped to break down some of the barriers of distrust that were erected many years ago and that have provided the framework for conflict ever since. It would be easy but counterproductive for stakeholders to raise these barriers again.

Of course, it would be inaccurate to imply that the Downtown Brooklyn Traffic Calming study has created a harmonious environment of uniform agreement. In spite of extensive community involvement with the project, some people feel disenfranchised; others feel the project has not met their aspirations. So there is plenty of work to do both in engaging those people who think in this way and in refining and developing the details of the strategy to more broadly meet the community's needs.

A key element of continuing progress, however, is that people continue to embrace the idea of change. As has been shown through the course of this study, change is not necessarily threatening and it is only through change that improvements to the urban environment can occur.

8.2 Expanding the Envelope

Some stakeholders have criticized the actions identified in this study for not going far enough, for not representing the radical change that they had hoped for.Yet it must be recognized that change inevitably is slow and proceeds by increments. A review of the different ways in which streets are managed in other countries or in other parts of the United States shows that these differences were not created instantaneously, but came about either because of a difference in the initial philosophy of street management or because of a program of change that has lasted a number of years. Nowhere has a city changed its street management approach radically and overnight and nowhere has such a change occurred in the absence of broad community support. Implementation of sophisticated traffic management schemes elsewhere has in almost all cases followed a long period of development of support, understanding and sophistication in use of the road system.

Brooklyn is no different. New York City has gone some way in the process of improving its management of traffic to meet broader community needs and this process will continue. However, it is unrealistic to expect that the city's first areawide traffic calming plan can immediately change the street environment in a radical way. This report outlines a strategy that delivers important benefits in relation to the livability of the study area and that is achievable over a short time period. Some parts of it may be regarded initially as challenging; however, it should be possible over time to implement the strategy in its entirety with the support of all stakeholders.

To do so, it will be necessary to continue the education process begun as part of this strategy development process and to harness the support of all stakeholders in gradually developing the strategy until it is achieved.

8.3 Maintaining Enthusiasm

It is also important that active steps be taken to maintain the enthusiasm generated through the course of this project. Many traffic calming programs around the world have foundered as focus has been lost and enthusiasm waned. In general, programs that are directed and supported work better than those that are not.The best means of maintaining drive in implementing this traffic calming program must be determined by the community and NYCDOT. A small joint committee with a representative from each of NYCDOT, the office of the Brooklyn Borough President, and Community Boards 2, 6, and 8 could adopt responsibility for ensuring that implementation proceeds. Such a committee could be charged with:

- setting and monitoring implementation targets;
- ensuring that implementation proceeds in accordance with the implementation program;
- monitoring the effects of the program;
- refining the program as knowledge accumulates;
- publiciz ing progress;
- making progress on the difficult issues identified in *Section 7.3;* and
- reinvigorating the process periodically.