Southeast Baltimore
COMPLETE STREETS PLAN

Baltimore City
Department of Transportation &
The Communities of Southeast Baltimore

ACKNOWLEDGMENTS

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Southeast Baltimore
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1. INTRODUCTION

What are Complete Streets and Why This Plan?

The term “Complete Streets” was first introduced in 2003 by advocates of bicycling and walking to give a name to the policies they were actively promoting. During the past decade, the design components which encompass complete streets have expanded to include the following goals:

- Are designed for people of all ages and physical abilities whether they walk, bicycle, ride transit, or drive
- Integrate connectivity and traffic calming with pedestrian-oriented site and building design to create safe and inviting places
- Connect people through everyday interaction
- Involve local people to share the responsibility for designing their streets
- Are inviting places with engaging architecture, street furniture, landscaping, and public art that reflect the diversity and cultures of the neighborhood
- Foster healthy commerce
- Strengthen and enhance neighborhoods as envisioned by community members without displacing current residents
- Encourage active and healthy lifestyles
- Integrate environmental stewardship, water management, energy conservation, and preservation of plant life

Since 2003, complete streets policies have steadily gained momentum as growing numbers of communities adopt complete street policies and modify their zoning ordinances to require complete streets.

Complete streets policies and legislation has been adopted by states, cities and transportation departments throughout the country. The U.S. Department of Transportation has also adopted a Complete Streets national policy. Many states and cities have passed Complete Streets legislation either as departmental mandates, resolutions, design guidelines, or legislation. State and local complete streets legislation often requires that new transportation projects accommodate all modes in order to provide a safe transportation system accessible to all demographic groups. As of the first quarter of 2012, according to the National Complete Streets Coalition 330 combined local and state jurisdictions have enacted or committed to Complete Streets policies. A full list of these can be found at: http://www.completestreets.org/complete-streets-fundamentals/complete-streets-atlas/

Southeast Baltimore is a diverse collection of neighborhoods spanning the edge of downtown to the eastern county line adjacent to Dundalk, from the Canton waterfront to the Northeast Market on Monument Street. While major population loss was seen in the last half of the 20th Century throughout Southeast Baltimore, between 2000 and 2010, the population grew in Fells Point, parts of Canton, Albemarle Square, and parts of Butcher’s Hill, indicating re-investment in this part of the city and the need to maintain momentum in improving southeast communities.

Streets make up about 15% of Baltimore’s total land area. By improving our streets and making them safer, inviting to all users, and more visually appealing, Baltimore City Department of Transportation can support neighborhood improvement efforts being led by local residents, non-profits and the private sector while also providing relatively low cost quality of life benefits.

The major employment anchor, Johns Hopkins Hospital, is a world renowned medical center with two campuses in Southeast Baltimore. Employing thousands of medical staff and support personnel, these campuses create an opportunity to attract new residents who work at the medical center and related research centers. During the last decade, the section of the city has also seen an influx of new commercial development, creating new opportunities for residents to work and shop near where they live. While the importance of new development cannot be overstated, the spaces between the buildings are equally important for creating great neighborhoods in the 21st century.

In 2008, Baltimore City Department of Transportation (BCDOT) completed the Southeast Transportation Plan in order to assess the transportation impact of new development projects in southeast Baltimore and analyze various infrastructure improvements. The recommendations which came from that plan included a number of large scale projects, including roadway capacity expansion, signal timing improvements, new bike lanes, traffic flow changes, and new bus and water taxi service. While many recommendations from the plan have already been implemented, the Southeast Baltimore Complete Streets Guide is targeted towards smaller, human-scaled and less costly improvements which can have a positive effect on the livability of Southeast Baltimore neighborhoods while creating vibrant and attractive public spaces.

Baltimore City Complete Streets Resolution

In 2010, the Baltimore City Council passed a Complete Streets Resolution, which in part stated:

> *Baltimore's streets provide the critical framework for current and future development while playing a major role in establishing the image and identity of the City. Recognizing this, City planners and transportation officials have made consistent efforts to improve the streetscape and make the City's transportation network responsive to the changing needs of our citizens. These efforts have included an expanded focus on measures to make streets more accessible to bicyclists and pedestrians.*
>
> *While these efforts have borne fruit, allowing Baltimore to rank above many southern and western cities in pedestrian safety, a recent study showed that Baltimore was still more dangerous for pedestrians than many peer cities in the Northeast and Midwest. In recognition of the fact that any effort to create more liveable neighborhoods in Baltimore must include further improvements to the streets that are such a critical component of public space, a more systematic approach to inviting all people to make use of the streets must be adopted.*
>
> *"Complete Streets" principles require that the needs of pedestrians, bicyclists, transit riders, and people of all abilities, as well as freight and motor vehicle users, be taken into account when designing and implementing changes to transportation networks. The systematic application of these principals to all transportation projects would create a comprehensive framework to open up all streets to the full range of diverse users present in Baltimore, by encouraging walking, bicycling, and transit use while promoting safe and contiguous routes for all street users.*

The entire resolution can be found in the Appendix at the end of this document.

The primary issues reviewed in the plan include:

Multi-modalism - How can we strike a balance between the need to maintain traffic flow and making streets more inviting for pedestrian, bicyclists, and transit users?

Green Streets/Beautification – Where can we add trees and new planting areas? How can we make our streets more attractive to encourage new residents and businesses to invest in our communities? How can we beautify our streets to improve property values and create a sense of place?

Traffic Calming –Which neighborhood roads act as highways for through traffic? How can we slow cars down without putting speed bumps everywhere?

Outdoor spaces/Shared spaces – Are there opportunities for pocket parks on neighborhood streets? Are there places where good design can encourage the sharing of space between automobiles, cyclists and pedestrians?

Urban Greenway/Wayfinding – How can we better connect the major community assets of southeast Baltimore through the use of visible cues and designated streets?

Parking – In what neighborhoods do parking shortages affect resident's quality of life? What are the ways we can better manage parking supply while reducing the need to drive or own a car? How can we integrate angled parking into complete street designs?

The Study Area and Public Planning Process

The Baltimore City Department of Transportation (BCDOT) contacted neighborhood association leaders throughout the southeast and requested that they help reach out to their communities in getting interested residents to serve on a complete streets workgroup. The committee represented neighborhoods throughout the study area and was instrumental in suggesting the complete streets ideas presented in this plan.

Four, 2-hour long workshops were held between December 2010 and March of 2011, resulting in numerous recommendations from committee members and other residents who relayed concerns through their neighborhood representatives between meetings. Meetings included case studies and concepts of the concepts presented in this plan, as well as extensive input from the community. Group discussions, question and answer sessions, SWOT analysis and open "mark up the map" opportunities contributed to most of the recommendations in the plan.

Workgroup Meetings (early 2011)

↓

Discussion of Concepts and Recommendations With Communities by Workgroup Members (throughout 2011)

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Draft of Southeast Complete Streets Plan Reviewed by Workgroup and Communities (mid-2011)

↓

Additional Comments Received and Incorporated into Plan (late 2011)

↓

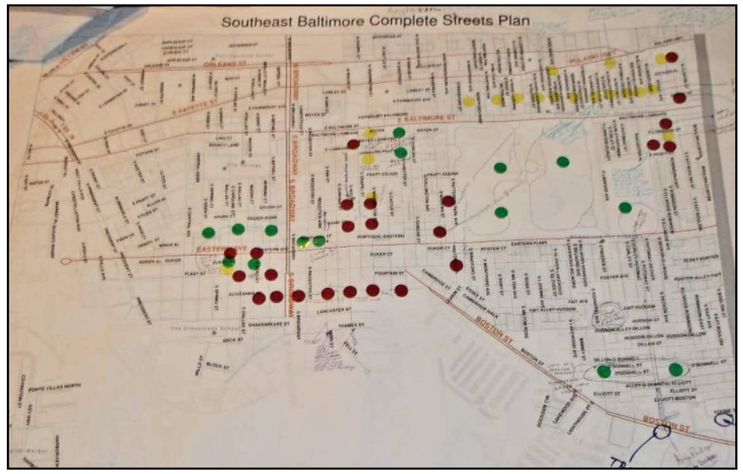
Final Plan (early 2012)

↓

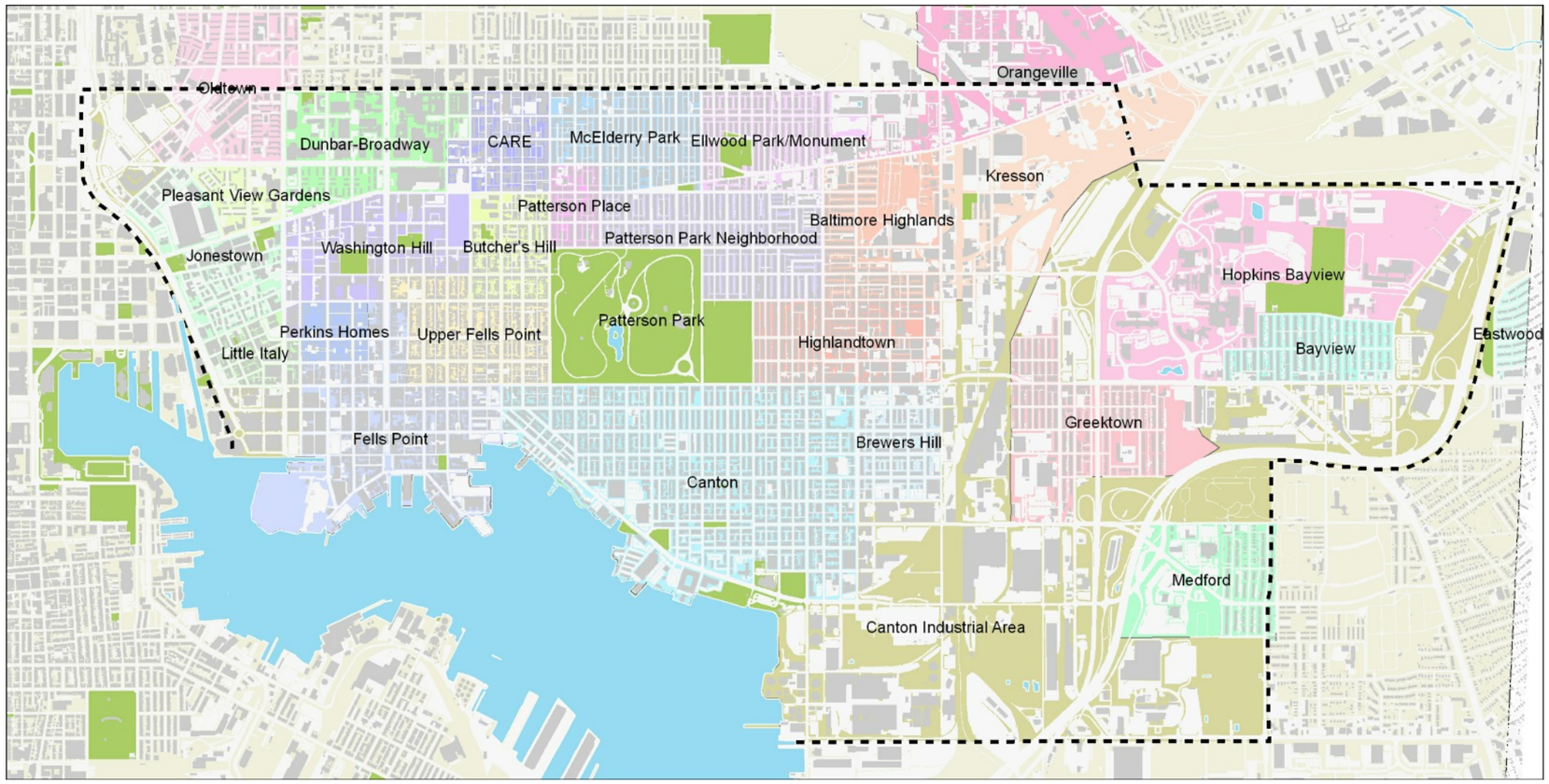
Implementation (2012 and following years)

The Southeast Baltimore Complete Streets Plan includes the following neighborhoods:

- Fells Point
- Canton
- Brewers Hill
- Little Italy
- Perkins Homes
- Upper Fells Point
- Patterson Park
- Highlandtown
- Jonestown
- Washington Hill
- Butcher's Hill
- Linwood
- McElderry Park
- Baltimore Highlands
- Greektown
- Riverside
- Medford
- O'Donnell Heights
- Broening Manor
- Graceland Park



Workgroup members provided numerous comments and color coded assets, problems and opportunities in Southeast Baltimore.



2. Existing Conditions and Challenges

Street Network

The street network in Southeast Baltimore consists of a regular “orthogonal” grid pattern developed in the late 19th and early 20th Centuries. The grid forms a pattern of small blocks, m any of which are bisected by alleys. Much of the development that occurred in Southeast Baltimore was to house workers and their families who sought opportunities working in the factories, mills, and shipyards along the waterfront. During this period, it was customary for workers to walk or take transit to their jobs. Most activities and destinations of daily life such as school, shopping, and places of worship were all reached on foot.

Arterial roadway example

Collector roadway example

Local street example

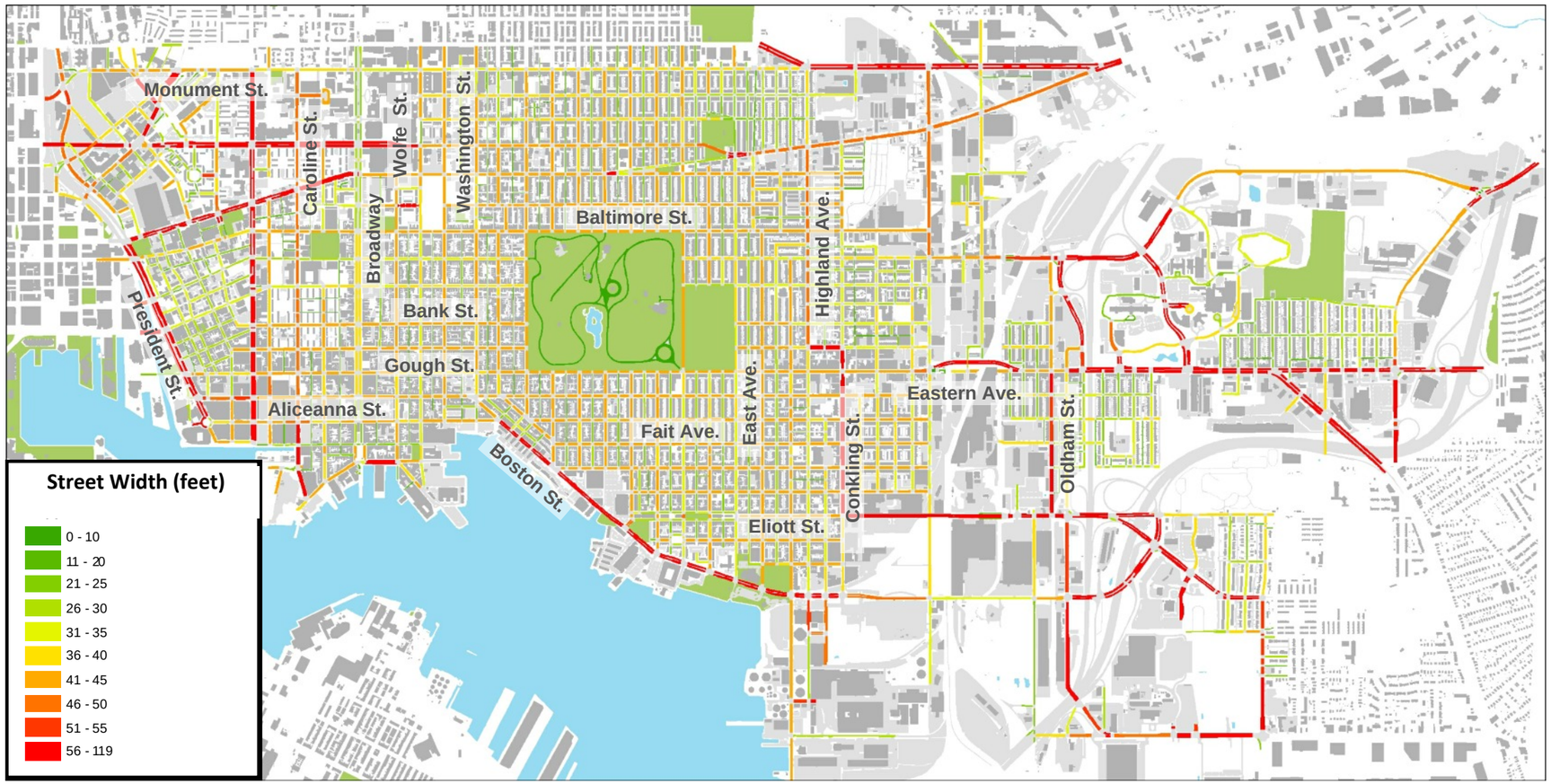
Many of these streets were developed as wide avenues, with the most prevalent street width being 42’. This allowed room for horse-drawn carts and street commerce to occur. Today, however, this network of broad avenues brings both challenges and opportunities with respect to making complete streets.

The straightness of the street grid and the liberal widths of many streets promote excessive vehicle speed. This is intimidating to non-drivers and has the unintended effect of discouraging pedestrians, cyclists, and transit patrons from using the streets.

On the other hand, there are also opportunities for reclaiming excess street width in ways that can enhance the pedestrian, cycling, and transit environment. These will be discussed in Section 3. In addition, the interconnected nature of the street grid, small block sizes, and presence of moderately dense development that is built to the sidewalk edge are all highly conducive characteristics to promoting pedestrian, cycling, and transit activity. This pattern creates a high degree of inter-connectivity and varied route choices. In short, Southeast has the right ingredients for complete streets.

The City currently uses the conventional functional roadway classifications for its roadways: arterials, collectors, and local streets. These terms were developed primarily with automobiles in mind. With the emergence of Complete Streets concepts, there is a growing recognition that these classifications are no longer adequate and that new terminology is needed which take into account the full spectrum of users of the street network. This will be discussed in Section 4 in greater detail.

In addition, the City still places a great deal of emphasis on roadway Level of Service (LOS) in attempts to minimize traffic congestion and guide investments in its transportation infrastruture. This has typically led to streets becoming auto-dominated. A good discussion of the consequences of the conventional LOS approach is included on page x in the appendix. Complete Streets concepts provide a more balanced approach in ensuring reasonable vehicular circulation but not at the expense of pther modes of transport.

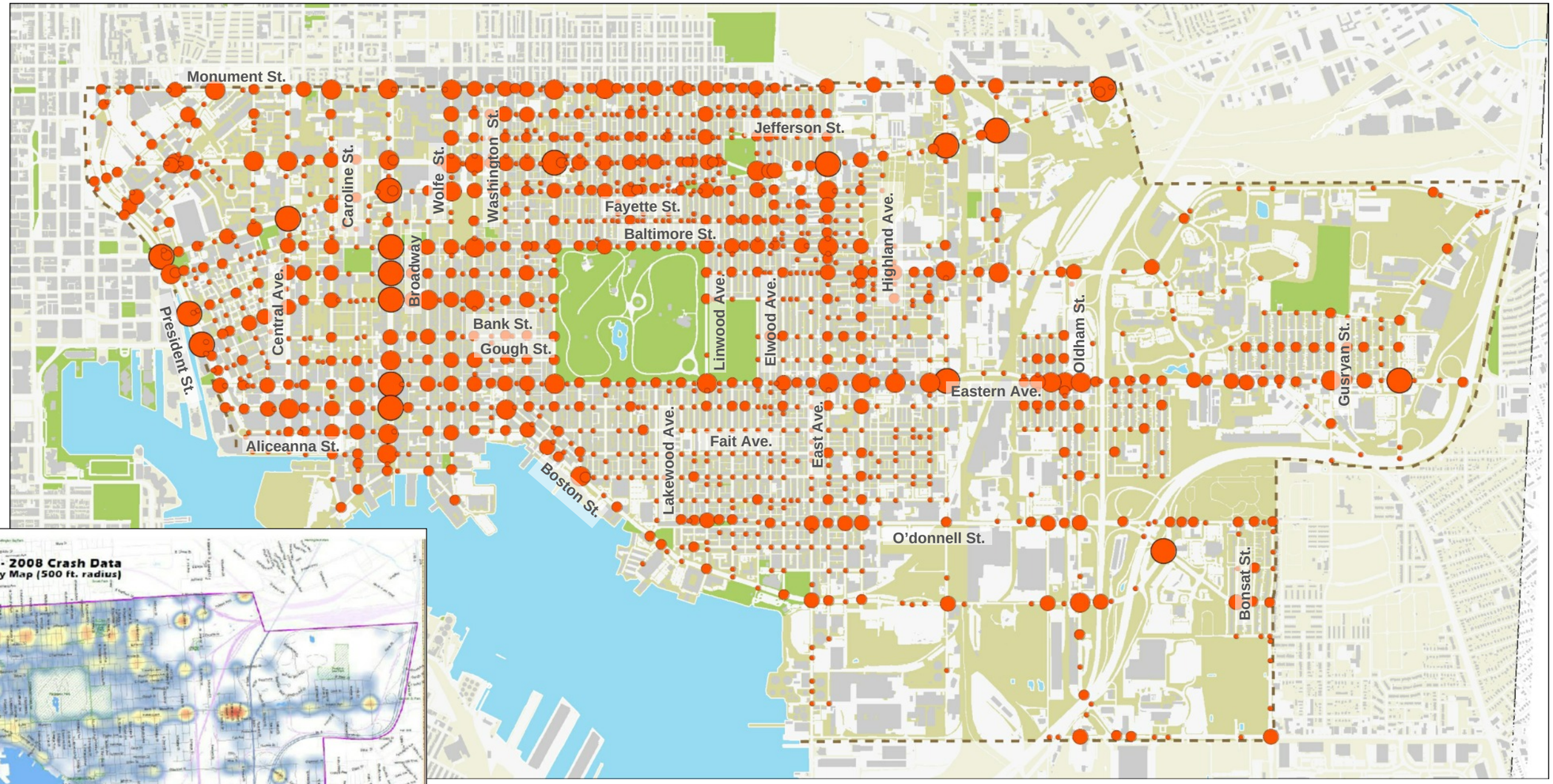


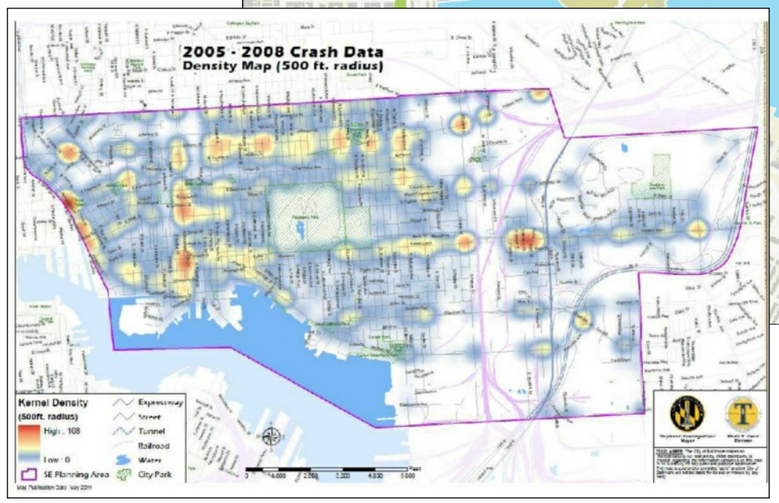
Automobile Accidents

Traffic accident data collected for the years between 2004 and 2008 show several hot spots in Southeast Baltimore. Eastern Ave., Broadway Ave., Orleans Street, and Pulaski Highway all show high crash rates, indicating a need for safety improvements and traffic calming on these streets.

Vehicle Crashes

- 1 - 5
- 6 - 14
- 15 - 26
- 27 - 42
- 43 - 69



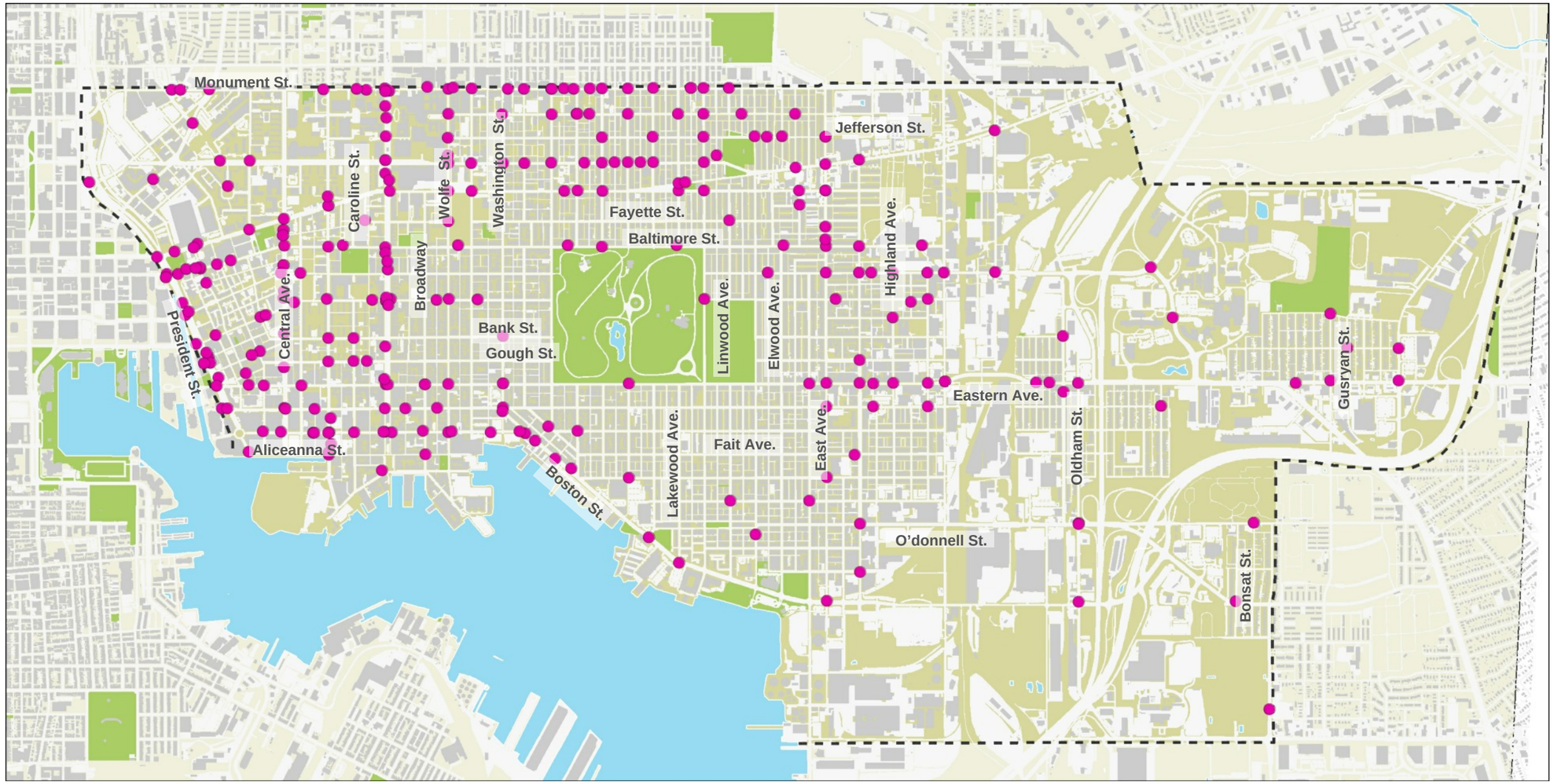


Bicycle and Pedestrian Accidents

Bicycle and pedestrian accident data collected between 2007 and 2010 show accident hot spots on arterials which carry high volumes of through traffic north of Patterson Park (Monument, Orleans, Fayettte), as well as major streets closer to downtown (President St., Central Ave, Broadway). Streets which carry slower, local traffic, like the area south of Patterson Park, see fewer accidents.

While major through streets need to accommodate high volumes of traffic, there is a particular need for increased pedestrian/bicyclist safety measures and traffic calming on these corridors.

Pedestrian and Bicyclist Crashes



Truck Routes

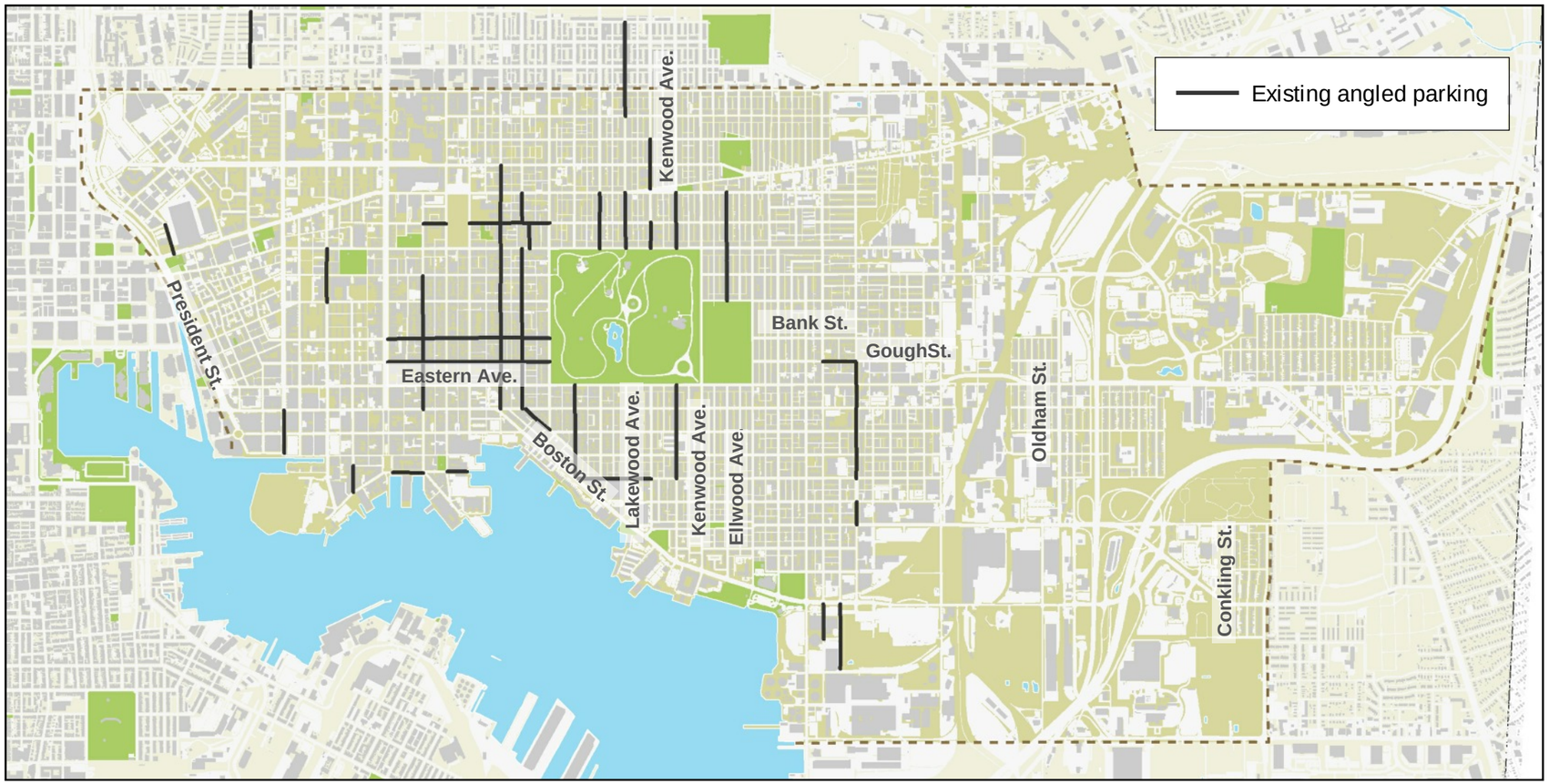
A truck route study was conducted by BCDOT in 2011 and will be finalized in 2012. Truck routes may influence where curb extensions, bicycle lanes, and other street infrastructure upgrades can be installed. For instance, bump outs on a street with heavy truck traffic will need to accommodate all possible truck turning movements safely. Colored and patterned crosswalks on truck routes will also need to be constructed with more durable material to accommodate heavier traffic. Angle parking or bike facilities may also not be possible on these routes. As of 2011, the major truck routes identified through Southeast Baltimore are Orleans Street and Boston Street.

Parking

Several neighborhoods within the southeast Baltimore study area have severe parking shortages. Historic neighborhoods throughout southeast Baltimore were not designed to accommodate 2 or 3 cars per household, and a lack of off-street parking compounds the parking shortage . Reducing the number of automobile trips per household by creating a more walkable and bicycle-friendly environment for local errands can reduce parking inconveniences.

Angle parking can also be included in complete street designs. Angle parking conversions in the Patterson Park neighborhood created a 40 to 50 percent increase in the number of parking spaces per block. Because conversions often require re-striping the street and sometimes converting two ways to one ways, there may be additional opportunities for greening and traffic calming on streets which have already been converted. As of 2011, a number of streets in the southeast have been converted to angle parking, increasing the number of spaces available to residents. Many of these streets have been converted from two way to one way operation, creating left over right of way which may serve as an opportunity for additional greening, bike lanes, or outdoor seating.

It should be noted however that, in and of itself, converting parallel on street parking to angled parking - particularly when it also requires conversion of two-way streets to one way streets (see Appendix D for more on this) - is not a complete street solution. In fact, these types of conversions run counter to the principles of complete streets because they often reinforce reliance on the automobile and discourage alternative modes of transport including biking, walking, and transit. However, this plan recognizes the current reality that in the near term, many residents place great importance on convenient access to their automobiles a s their primary means of mobility over other modes. While the goal of this plan is to help transform Southeast Baltimore over time to a place where alternative modes of travel will increasingly become the preferred form of urban mobility, it will also use any parking conversions as an opportunity to incorporate complete streets retrofits and minimize the adverse impacts that parking conversions can cause.



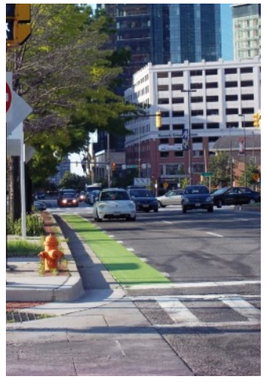
Bicycle Infrastructure

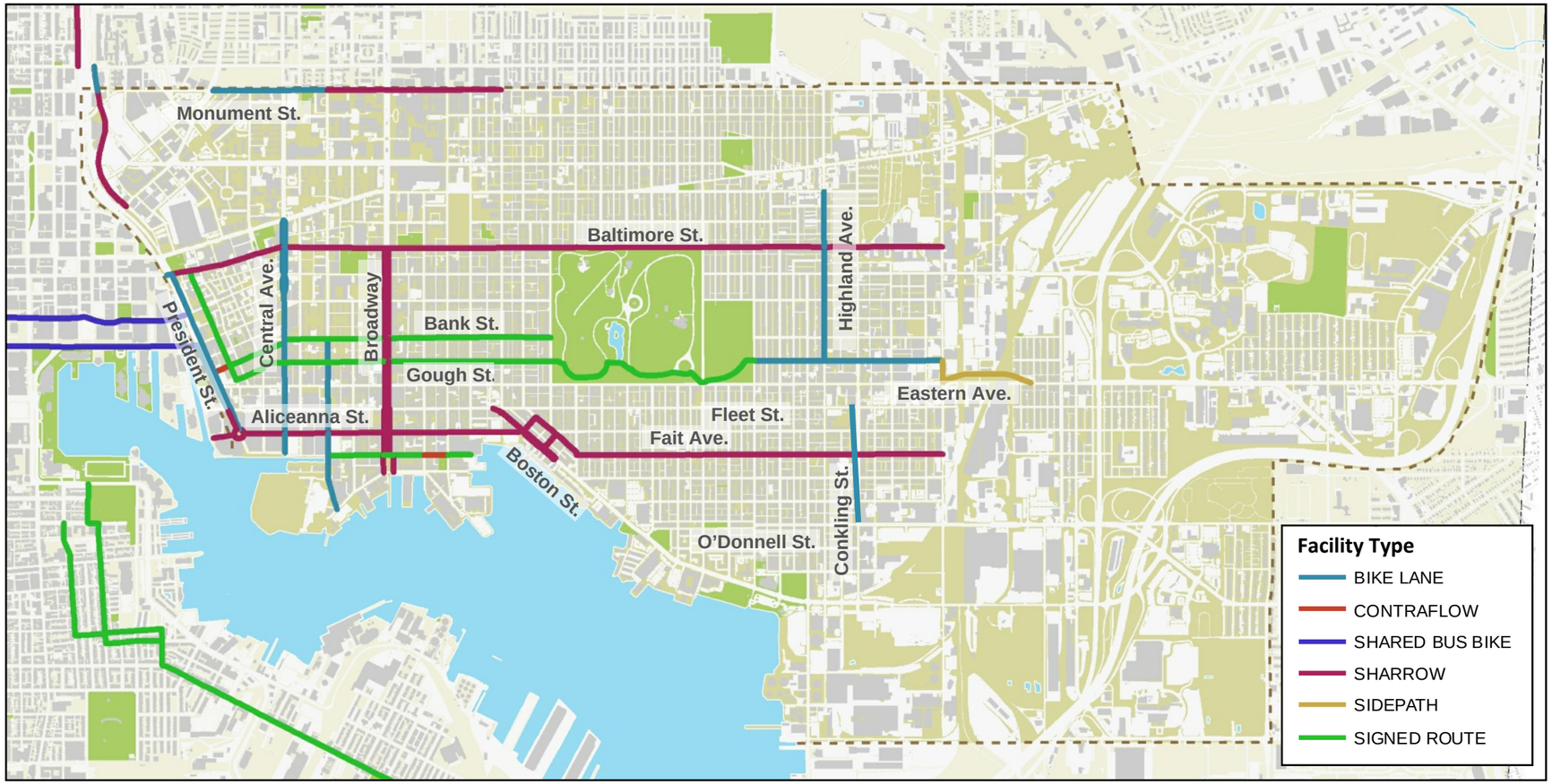
In 2008, the Department of Transportation began plans for developing the city's bicycle network in the southeast area of the city. The goal of the Southeast Bicycle Network was to establish bike lanes and routes connecting neighborhoods, parks and commercial centers across the southeast from Brewer's Hill to the Inner Harbor . The main improvements associated with the bike network included pavement markings (in the form of bike lanes and sharrows) and wayfinding signs indicating destination, distance and direction. The selection of streets for bike improvements was based on the 2006 Bicycle Master Plan and community input.

After a thorough feasibility study and community meetings, three major routes with community connectors were planned. The more northern bike routes followed Baltimore Street from President St to Haven St connecting Jonestown, Patterson Park and Highlandtown. The middle route utilized the one-way pairs of Bank & Gough Sts to connect Little Italy, Butcher's Hill, Patterson Park and Highlandtown. The more southern route followed Aliceanna St from the Waterfront Promenade to Boston St where the route diverted to Fait Avenue to Brewer's Hill.

In addition to the two routes, several connectors were created on Central Avenue, Caroline St, Lancaster St, and President Street connecting Little Italy, Harbor East, and Fells Point.

The Southeast Bicycle Network utilized innovative bicycle infrastructure to improve navigation by bicycle. A **contraflow bicycle lane** was installed on Lancaster St from Ann St to Wolfe St allowing westbound cyclists to divert from Aliceanna to quieter neighborhood streets to Fells Pt. By adding a **green treatment** to the President Street bike lanes improved the visibility of the bike facilities on this high traffic road. The Southeast Bicycle Network construction was completed in July 2011.





Pedestrian Network

Southeast Baltimore's street network were originailly developed with the pedestrian in mind. Accordingly, virtually all streets have generous sidewalks. Sidewalks in Southeast are typically between 8' and 16' wide, depending on the neighborhood and street type, with many being at least 10' wide. Most, if not all, sidewalk corners have been retrofitted with ADA compliant curb ramps to facilitate wheelshairs and strollers.

Many intersections in Southeast have at least basic crosswalks, with some having been upgraded over the years to brick or stamped decorative concrete. However, there are numerous intersections that do not have any crosswalks, and many which do have crosswalks with faded or missing paint markings.

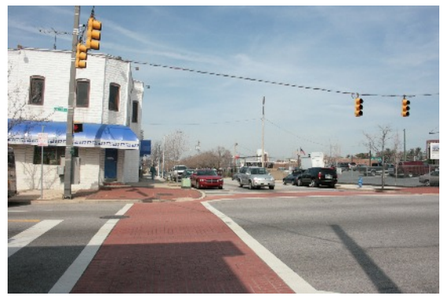
Harbor East, which consists of several new streets and infrastructure, provides a good model of pedestrian streetscape design.

Highlandtown resident walking dog

Good streetscape design in Harbor East

Typical 8-10' sidewalk conditions on neighborhood residential streets. Note curb ramps.

Faded crosswalk in Canton

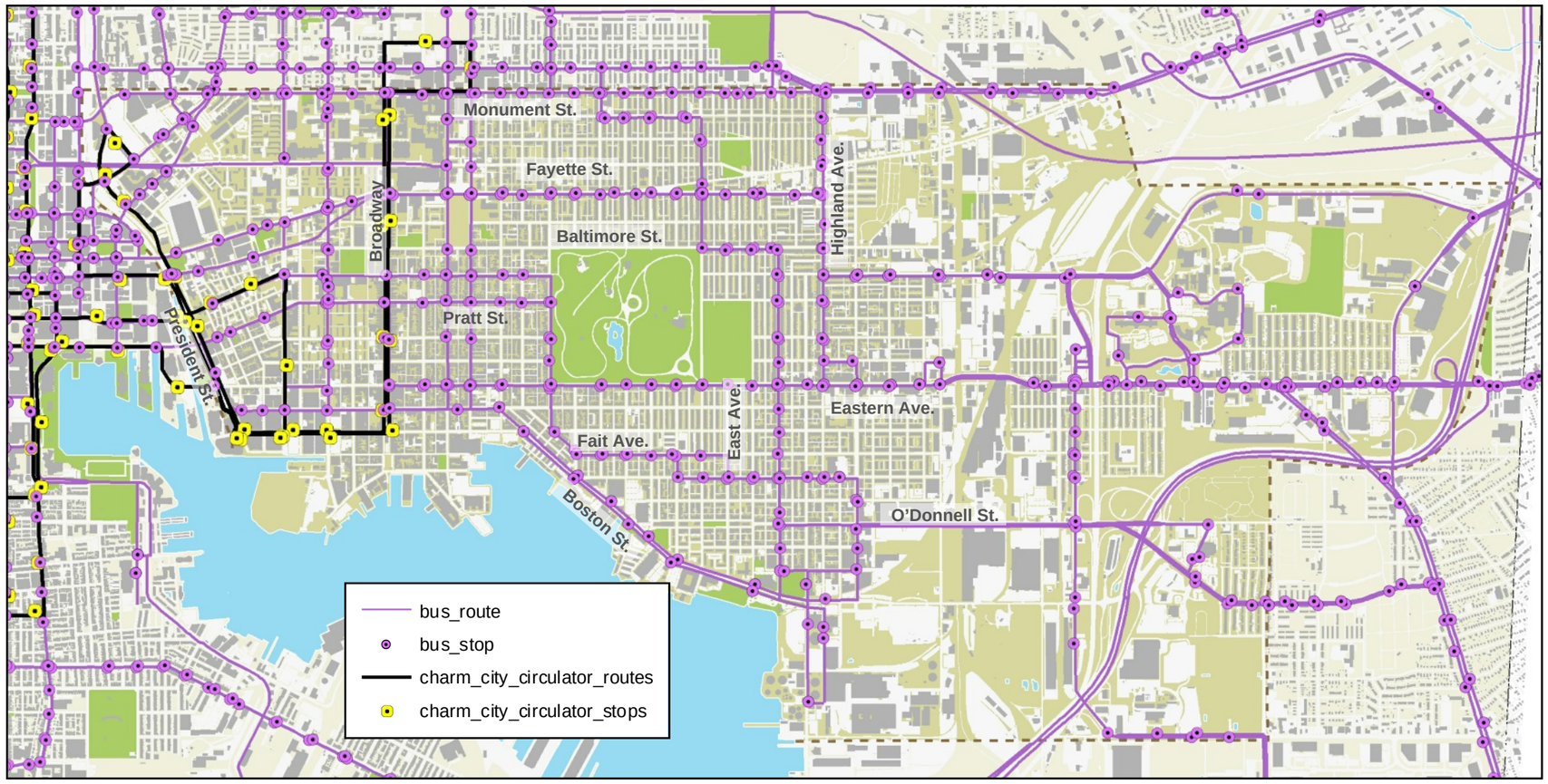


The full range of crosswalk conditions from no crosswalk (left) to basic crosswalk (center) to upgraded crosswalk (right)

Transit Network

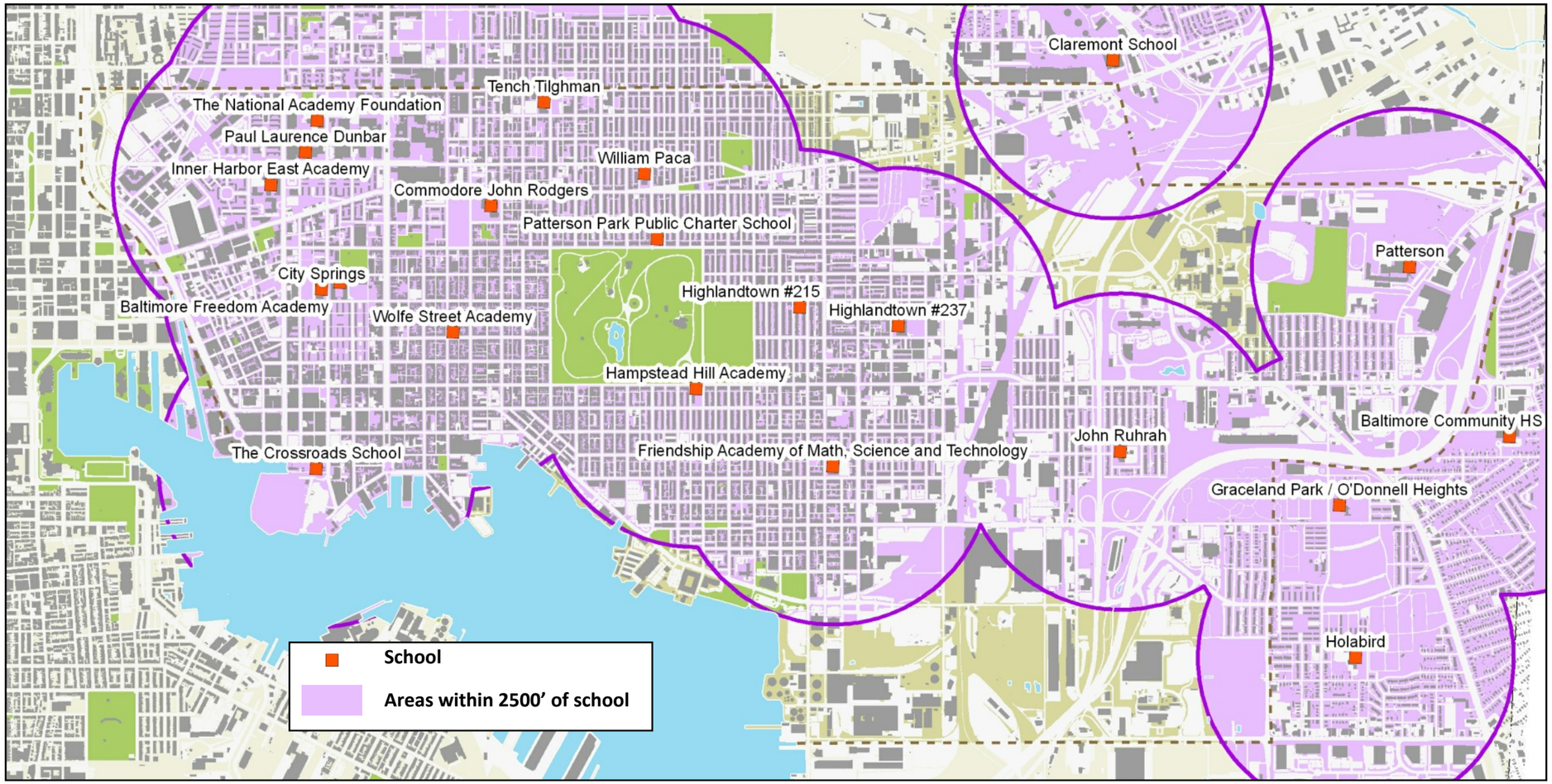
The southeast is well served by buses. No resident lives more than 5 blocks from a bus stop. Routes which serve this area and the number of daily weekday trips include:

Route Number	Line Name	Number of Weekday Trips
5	MONDAWMIN - CEDONIA	158
5X	MONDAWMIN - CEDONIA	7
7	MONDAWMIN - CANTON	70
8	LUTHERVILLE - UMTC	198
10	RT. 40/ROLLING - BULLNECK RD.	153
11	TOWSON LOOP - CANTON CROSSING	82
13	CANTON/FELLS POINT - WALBROOK	219
15	SECURITY MALL - OVERLEA/PERRY HALL	182
20	SECURITY SQUARE MALL - DUNDALK	132
21	FELLS POINT - CAREY & CUMBERLAND	72
22	BAYVIEW - MONDAWMIN	156
23	RT. 40 & ROLLING - FOX RIDGE	175
30	EDMONSON VILLAGE - BAYVIEW HOPSITAL	87
35	WHITEMARSH P&R - UMBC / BLIND IND.	124
40	SECURITY SQ. / MIDDLE RIVER.	153
46	PARADISE LOOP - DOWNTOWN - CEDONIA	48
47	WALBROOK JUNCTION - OVERLEA LOOP	32
48	TOWSON TOWN CENTER - UMD TRANSIT CTR	110
104	CROMWELL BRIDGE - JOHNS HOPKINS	2
120	WHITE MARSH - MONUMENT & RUTLAND	34
160	OLIVER BEACH/ESSEX- HOPKINS HOSPITAL	8
+		
METRO SUBWAY		249



Schools

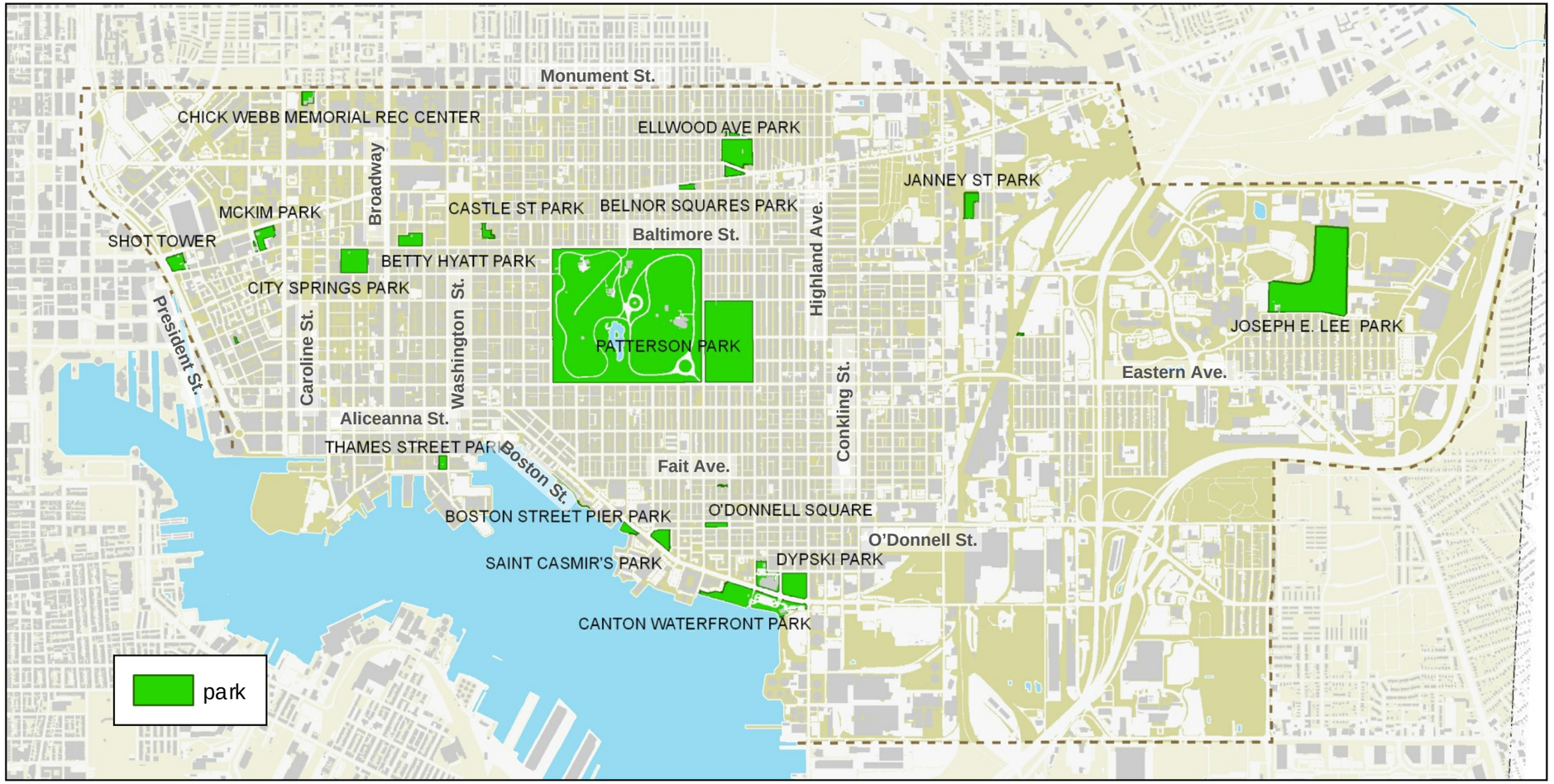
Southeast Baltimore has a large number of schools. About 70% of the southeast's roadway network is within 2500 feet of a school, creating a need for slower, more livable streets which are safe for children.



Parks and Open Space

Southeast Baltimore is unique in that it has a variety of parks for almost every kind of recreational activity. While no resident is further than a mile from a park, it's important that our streets serve as intuitive links between neighborhoods and recreational areas. Complete streets design can serve to increase park use by making these trips more accessible through alternate modes. Likewise, children who are not dependent on their parents for a car ride and who can safely travel by foot or by bike to a park are more likely to be physically active.

Complete streets designs can compliment southeast Baltimore's existing parks and encourage physical activity in adults and children.



Issues Identified: Community, staff analysis

Southeast Baltimore has many advantages which are conducive to complete streets: An interconnected network of streets and small blocks, a collection of historic neighborhoods with human scale architectural patterns, mixed use main streets, major employment centers, and an active waterfront within reach by walking, bicycle and transit.

The workgroup meetings also identified a number of key issues in the southeast which discourage street activity:

- Excessively wide streets in some areas, which discourage walking and promote higher traffic speeds.
- High speed traffic on streets including Eastern Ave., Orleans, Fayette and Boston Streets which make neighborhoods feel disconnected and reduce retail and residential rehabilitation potential.
- Unattractive streetscapes, in part due to lack of trees and landscaping on local neighborhood roads and near industrial properties throughout the southeast.
- A lack of visual wayfinding and gateways that reinforce the "disconnection" between southeastern neighborhoods and major community assets.
- A sense that walking, bicycling and transit were modes of "last resort" for many residents.

Residents also cited a lack of adequate on-street parking supply as an ongoing issue affecting quality of life for those who are dependent on driving.

The workgroup also identified the following additional problem areas:

Fayette Street – While categorized as a neighborhood connector, traffic speeds are often high and the street is an intimidating barrier between Patterson Park and McElderry neighborhoods. There are also major pedestrian attractors throughout the corridor, including parks and the Patterson Park Library. 4 auto travel lanes, lack of tree canopies, and poor sidewalk conditions also make this street problematic for communities.

Fayette Street adjacent to Enoch Pratt Library. Fast moving traffic.

Collington Ave. – A 42’ wide neighborhood residential street with no trees and high traffic speeds. Excessively wide and barren streets like these can be redesigned so they are more comfortable to live, walk and bike through.

Collington Ave - a 42' wide local street with a lack of trees.

Potomac Ave – A neighborhood residential street which has excess roadway width. Expanded sidewalks, a bicycle boulevard, or a planted median could create a more livable street and provide a better connection between Canton neighborhoods and the waterfront.

One way Potomac Street looking south to the Canton waterfront.

The intersection of Essex, Montford Streets – Due to angle parking conversions and the unique angle of the intersection, there is excess curb space and right of way for possible bump outs, public plazas, and stormater management.

The intersection of Essex and Montford in Canton with excessive asphalt.

3. Complete Streets Concepts

Complete Streets Concepts

Complete Streets components are often incremental in scope with the collective goal of expanding transportation options, improving safety, and making neighborhood streets "places" rather than simply a conduit for traffic. Complete street designs will be tailored to the specific characteristics of streets. A design that works for Orleans Street may not be appropriate for smaller residential streets like Linwood Ave. Designs must also be appropriate to their neighborhood context and to the modes expected on that corridor. For instance, a major bus corridor will not be appropriate for angle parking.

Complete Streets concepts go beyond the traditional approach of installing speed bumps on high speed streets. Slowing down traffic is only one goal of a more modern approach to creating streets which are places.

Curb extensions and median make crossing four-lane streets safer and more manageable. (Credit: Dan Burden)

Pedestrian Crossings

(Adapted from the Los Angeles County Model Design Maual for Living Streets)

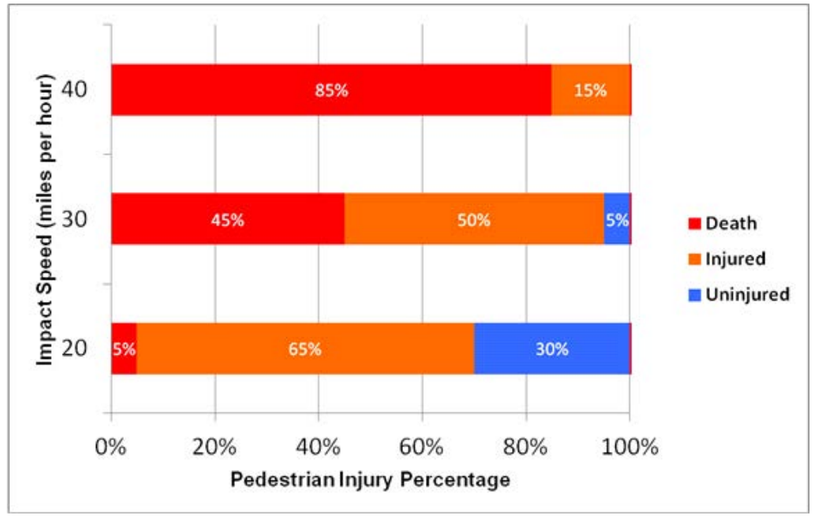
The following principles should be incorporated into every pedestrian crossing improvement:

- The safety of all street users, particularly more vulnerable groups, such as children, the elderly, and those with disabilities, and more vulnerable modes, such as walking and bicycling, must be considered when designing streets.
- Pedestrian crossings must meet accessibility standards and guidelines.
- Real and perceived safety must be considered when designing crosswalks—crossing must be "comfortable." A "safe" crossing that no one uses serves no purpose.
- Safety should not be compromised to accommodate traffic flow.
- Good crossings begin with appropriate speed. In general, urban arterials should be designed to a maximum of 30 mph or 35 mph (note: 30 mph is the optimal speed for moving motor vehicle traffic efficiently).
- Every crossing is different and should be selected and designed to fit its unique environment.

The following issues should also be considered when planning and designing crossings:

Design Speed

The application of design speed for living streets is philosophically different than for conventional transportation practices. The traditional engineering approach for setting design speed is to use as high a design speed as practical in order to expedite traffic flow. This has many negative effects. High design speeds discourage street life and greatly increase the frequency and severity of traffic accidents, especially those involving pedestrians and bicyclists. , Because high design speeds reduce pedestrian access, they degrade the social and retail life of a street and devalue the adjacent land. Local economies thrive on attracting people.



The goal for complete streets is to establish a design speed that creates a safer and more comfortable environment for motorists, pedestrians, and bicyclists. This approach also increases access to adjacent land, thereby increasing its value, and therefore is appropriate for the surrounding context. For complete streets, design speeds of 20 to 35 mph are desirable. Alleys and narrow roadways intended to function as shared spaces may have design speeds as low as 10 mph. Design speed does not determine nor predict exactly at what speed motorists will travel on a roadway segment; rather, it determines which design features are allowable (or mandated). Features associated with high-speed designs, such as large curb radii, straight and wide travel lanes, ample clear zones (no

on-street parking or street trees), guardrails, etc., degrade the walking experience and make it difficult to design living streets. In the end, the design of the road encourages high speeds and creates a vicious cycle. A slower design speed allows the use of features that enhance the walking environment, such as small curb radii, narrower sections, trees, on-street parking, curb extensions, and street furniture, which in turn slow traffic: a virtuous cycle.

Travel Lanes

Travel lane widths should be provided based on the context and desired speed for the area that the street is located in. In low speed urban environments, lane widths are typically measured to the curb face instead of the edge of the gutter pan. Consequently, when curb sections with gutter pans are used, the vehicle, bike, and parking lane all include the width of the gutter pan.

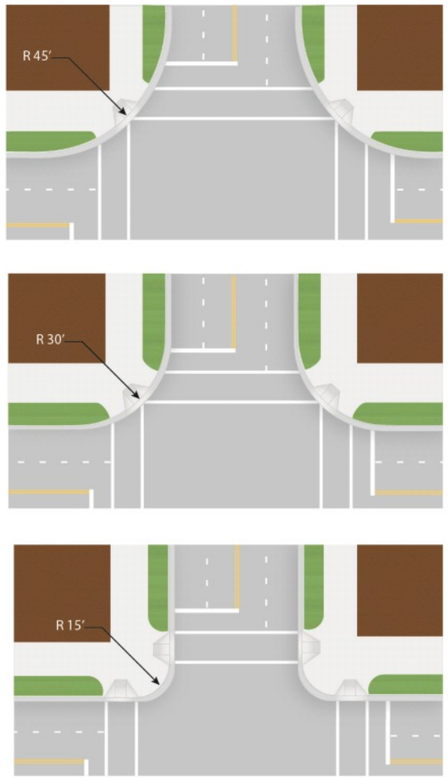
In order for drivers to understand how fast they should drive, lane widths have to create some level of driver discomfort when driving too fast. The presence of on-street parking is important in achieving the speeds When designated bike lanes or multi-lane configurations are used, there is more room for large vehicles, such as buses, to operate in, but car drivers will feel more comfortable driving faster than is desired.

Corner Radii

This intersection geometry feature has a significant impact on the comfort and safety of non-motorized users. Small corner radii provide the following benefits:

- Smaller, more pedestrian-scale intersections resulting in shorter crossing distances
- Slower vehicular turning speeds
- Reduced pedestrian crossing distance and crossing time
- *Better geometry for installing perpendicular ramps for both crosswalks at each corner*
- *Simpler, more appropriate crosswalk placement, in line with the approaching sidewalks*

When designing corner radii for complete streets, the default design vehicle should be the passenger (P) vehicle.. Larger design vehicles should be used only where they are known to regularly make turns at the intersection, and corner radii should be designed based on the larger design vehicle traveling at crawl speed. In addition, designers should consider the effect that bicycle lanes and on-street parking have on the effective radius, increasing the ease with which large vehicles can turn.



Tighter corner radii reduce crossing distance and slow turning traffic (Credit: Michele Weisbart)

Placemaking for Streets

In order to be places, streets must

- Augment and complement surrounding destinations, including other public spaces such as parks and plazas
- Reflect a community's identity
- Invite physical activity through allowing and encouraging active transportation and recreation
- Support social connectivity
- Promote social and economic equity
- Be as pleasant and accessible for staying as for going
- Prioritize the slowest users over the fastest
- Balance mobility and public space functions

Public plaza: Barcelona, Spain (Credit: Ryan Snyder)

So that people can

- Walk and stroll in comfort
- Sit down in nice, comfortable places, sheltered from the elements
- Meet and talk—by chance and by design
- Look at attractive things along the way
- See places that are interesting
- Feel safe in a public environment
- Enjoy other people around them
- And get where they need to go!

Human-scaled streets are an inducement to healthy lifestyles and economic resilience. Streets designed for people, rather than automobiles, promote neighborhoods that act as places rather than conduits for fast moving traffic.

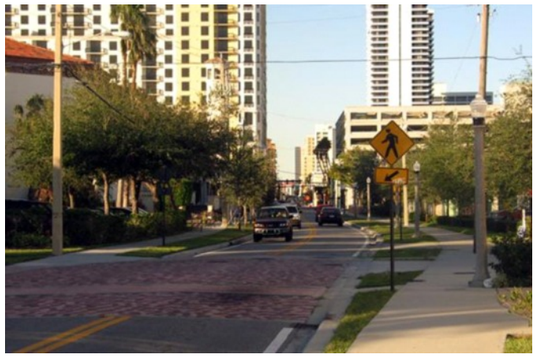
Traffic Calming 2.0

Instead of devices that simply slow traffic at spot locations (rumble strips, speed bumps/humps), a new generation of traffic calming designs, often known as "second generation" traffic calming, can change the environment of the street to discourage speeding throughout entire corridors and neighborhoods. Narrowing roadways, expanded tree canopies, textured roadway treatments, and the blending of pedestrian and automobile right of way can change the perception of a place from one dominated by traffic to a place which is comfortable for all modes and users.

Second generation traffic calming designs often overlap with other complete street concepts such as shared spaces, woonerfs, green streets, and expanded bike/pedestrian facilities, but traffic calming devices often included in complete street designs include:

- **Bumpouts** – Widening the sidewalk and reducing roadway width at intersections. Designs can also include additional vegetation and stormwater management facilities
- **Chicanes/Lateral Shifts** – Chicanes and lateral shifts are curb extensions installed in mid-block locations, and also act as roadway narrowing devices. Chicanes shift traffic alternately from side to side to slow traffic down along an entire block or multiple blocks.
- **Mini Roundabouts –** Small traffic circles, often on residential streets, which slow traffic through uncontrolled intersections. The circle can also be vegetated.
- **Textured Pavement –** Surface material on the roadway, often stamped asphalt or concrete with a decorative design and unique color which slows traffic and creates a more inviting environment for pedestrians.
- **Full and Half Street Closures –** Diverting traffic from residential streets to provide a safer environment for pedestrians and bicyclists while reducing through traffic. Diverters can consist of temporary planters or full landscaped areas which can be used as neighborhood parks and gathering places.
- **Raised Crosswalks –** Crosswalks which are flush with the sidewalk with a slight vertical shift from the roadway. Often colored and textured to provide visual cues for drivers.

Bump out example (source: kirklandwa.gov)



Raised Crosswalk example (source: LA County Living Streets Manual)

Shared Spaces/Woonerfs (Dutch for "Shared Space")

Traditional traffic engineering dictated that spaces for automobiles, pedestrians, bicycles and transit should be separated. Research and projects around the world have shown that deregulating streets and blurring the spaces dedicated to these modes can improve safety and enliven street life in neighborhoods. Expanding the public realm into what was previously space dedicated solely to automobiles can provide neighborhood benefits beyond traffic calming. While city governments can approve new shared spaces, the responsibility of maintaining, programming events, and determining the specific characteristics of the space should be left up to neighborhoods.

Woonerfs, originated in the Netherlands, are streets where pedestrians and cyclists have priority over automobiles. Design features often include textured pavement, lack of curbs (the sidewalk and street blend into each other), bollards, decorative paving, and trees/vegetation. They're often installed in commercial or mixed use districts on local roads as a way to encourage local businesses and create a social atmosphere on important neighborhood streets. Thousands of Woonerfs have been installed throughout Netherlands, Germany, Toronto, England, Boston, and Asheville, NC.

Shared street: Provincetown, MA (source: boston.com)

Green Streets

Many of the concepts already presented include vegetation, expansive tree plantings, and storm water quality benefits. Green elements can also be installed separately from traffic calming and shared space projects as a way to reduce cooling costs in the summer and beautify streets. Some greening components include:

- Trees
- Expanded tree pits
- Vegetative buffer between the sidewalk and the roadway
- Landscaped planters
- Movable concrete planters
- Planted bumpouts
- Rain gardens/storm water management facilities

The benefits of adding vegetation to city streets includes:

- Reduce polluted stormwater entering the Patapsco
- Improve pedestrian and bicycle safety
- Divert stormwater from the sewer system and reduce basement flooding, sewer backups and combined sewer overflows (CSOs) to the Patapsco River
- Reduce impervious surface so stormwater can

Portland, OR green street (source: hpigreen.com)

infiltrate to recharge groundwater and surface water
- Increase urban green space
- Improve air quality and reduce air temperatures
- Reduce demand on the city's sewer collection system and the cost of constructing expensive pipe Systems;
- Address requirements of federal and state regulations to protect public health and restore and protect watershed health

Native planting area (source: LA County Living Streets Manual)

Enhanced Bicycle Facilities

A comprehensive system of bike routes has already been planned for Southeast Baltimore, with many of the routes already installed in 2011. Additional signed and marked bike routes could be incorporated into complete street designs. Bicycle facilities which are often included in complete street designs include:

- **Traditional bike lanes**: Striped adjacent to parking lanes and 5' wide. Needs sufficient street width (usually more than 40' curb to curb) for two lane roads.
- **Bicycle Boulevards**: A low-speed, low-traffic street optimized for bicycles where cyclists are encouraged to ride with traffic. Often includes traffic calming devices. Usually bicycle boulevard are usually not wide enough to stripe full bike lanes.
- **Cycle Tracks**: Separated or protected bike lanes adjacent to the curb. Often accommodates bi-directional bike traffic if street is wide enough. A parking lane often serves as a buffer between the bike lanes and the auto traffic.

Cycle Track in New York City (source: nyc.gov)

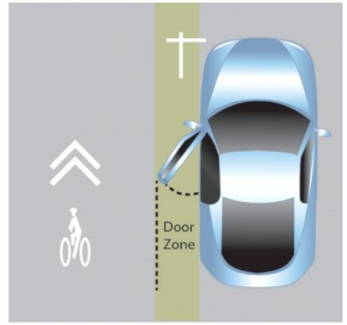
Portland Bicycle Boulevard (source: portland.gov)

Portland Bicycle Boulevard (source: portland.gov)

Left: Protected Bike Lane

Right: Sharrow and door zone buffer

(Source: Los Angeles Model Design Manual for Living Streets)



Enhanced Pedestrian Facilities

Accommodations which can improve safety and comfort for walkers include:

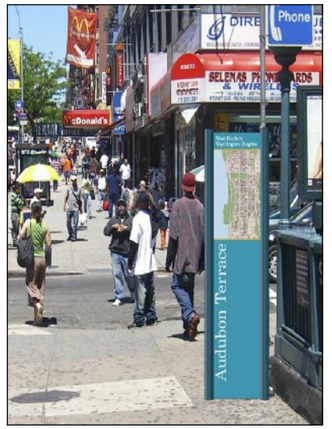
- Sidewalk widening for streets with high pedestrian volumes and commercial districts
- Signal timing which accommodates pedestrians with automatic and lengthened "walk" phases
- Extended red signals for automobile traffic to provide a protected walk phase for pedestrians
- Pedestrian countdown timers which display how much time is left to cross the street
- Additional lighting to create a sense of safety and encourage walking at night
- ADA compliant curb ramps to accommodate disabled populations
- Landscaping which creates attractive pedestrian spaces and which can also serve as a buffer between the roadway and pavement

Inviting streetscape (source: rctlma.org)

Urban Greenways/Way Finding

An urban greenway is a collection of streets which creates a continuous, multi-neighborhood walking path and which incorporates way finding signs, kiosks, historical markers and other information devices. These paths often link employment centers, commercial districts, parks, and other major community assets.

An urban greenway often involves minimal upgrades to streets in urban areas. The major component of the greenway is signage. Creating attractive, intuitive and educational way finding is imperative so that visitors and local residents alike can easily find their destination, learn about the neighborhood, or leisurely stroll along the designated route without getting lost. Visitor walking guides can also be created to encourage tourism in less traveled neighborhoods.



Wayfinding sign in New York city (source: studioiamge.com)

Enhanced Transit Facilities

Transit should be incorporated as an equal component of complete streets and not as an afterthought. Major transit improvements which can be applied to complete streets include:

Real time arrival kiosks – allows riders to see the arrival time of the next bus. Often combined with high quality bus shelters on major bus routes.

Real time arrival information at a London bus stop (Photo: King Huang Chung/Flickr)

Bus bump outs – Curb extensions at bus stops which allow boarding of passengers without the
bus having to pull out of the travel lane. Also allows more space for shelters, bike racks, greening and other amenities and easier access for the disabled.

A bus bump out in Chicago (Source: Streetsblog.org)

Connecting transit stations to neighborhoods – Way finding maps and signage at bus stops and rail stations can help orient travelers to the surrounding neighborhoods and help guide them to destinations.

Bus stop wayfinding kiosk (Source: Sky Kim)

Enhanced passenger waiting facilities – Investing in attractive street furniture and other amenities such as interesting shelters, seating, and public art can help to create a transit-friendly neighborhood character.

An appealing bus stop

One Way to Two Way Street conversions

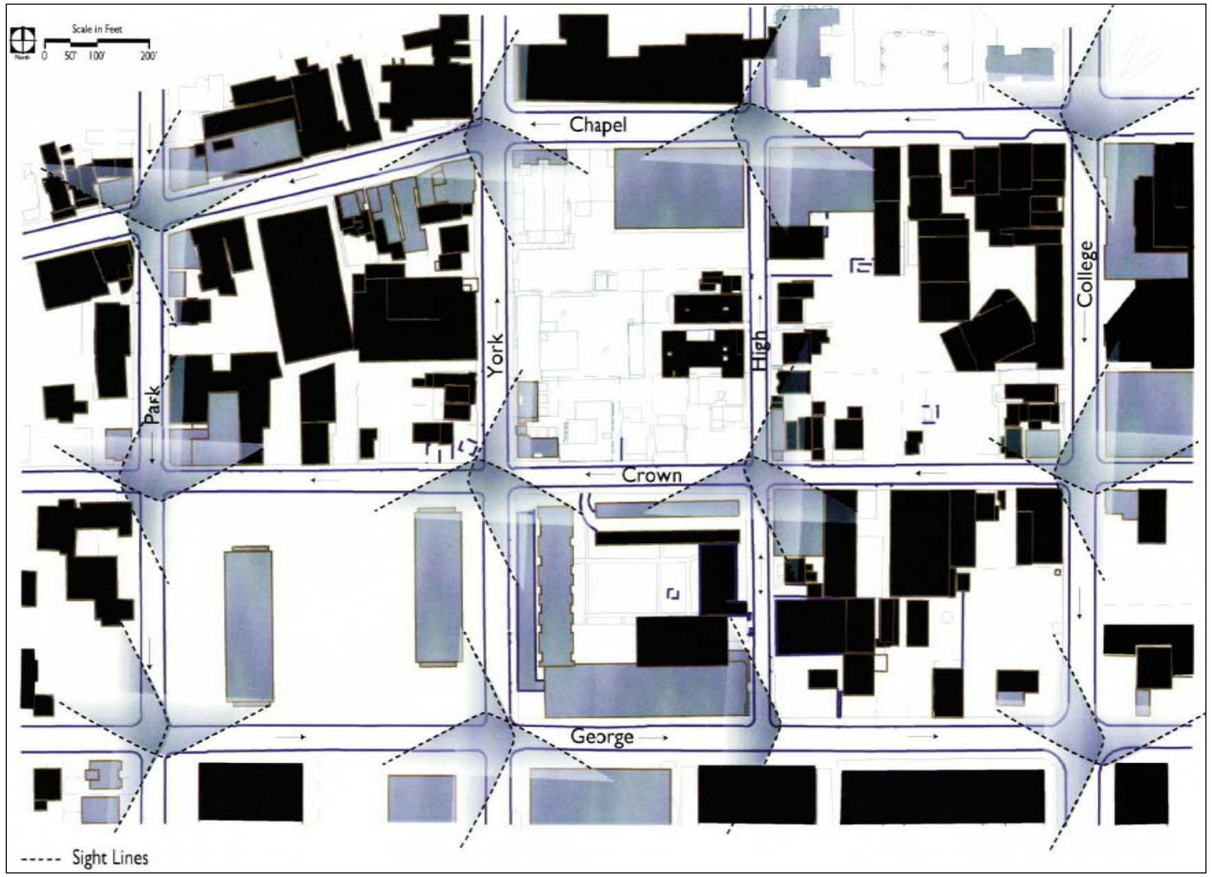
During the last half of the 20th century, there was a movement to convert streets in urban residential and commercial districts to one way operation. The rational for these conversions were often to expedite traffic flow between disconnected expressways and reduce delays. Recent research has shown that one way conversions in urban areas may actually increase traffic speeds, reduce storefront visibility, and reduce pedestrian and bicyclist safety[8]. In cities like Madison, WI, Cincinatti, OH, and Denver, one way streetshave been converted back to two way operation in order to support neighborhood retail, calm traffic, and simplify neighborhood circulation patterns.

In traffic engineering circles, the operational disadvantages associated with one-way streets are becoming increasingly recognized. The system often forces drivers to follow out-of-direction routes
to their destinations, causing an increase in both the number of turning movements required and vehicle miles of travel (VMT). The direct result of this recirculation is an increase in traffic volumes
on a given segment or intersection within a one-way system, with a corresponding degradation in air quality within the downtown.Signal progression can often be maintained on two-way streets to favor the peak direction movement during the morning and afternoon peak hours with minimal effect on through-vehicle
delay or the capacity of the network.

- Downtown Streets: Are We Strangling Ourselves on One-Way Networks?" Walker, Kulash, McHugh, TRB Circular E-C019

Anecdotal evidence from Baltimore community members also suggests that some one way streets act as barriers between neighborhoods while reducing business visibility.

Converting key streets in urban residential, commercial and mixed use districts supports the goal of creating more livable, multi-modal neighborhoods. While not every one way street is appropriate for conversion, strategic conversions should be assessed based on traffic speeds, street widths, adjacent land uses and pedestrian attractors (schools, parks, etc).



Store fronts not visible to motorists due to one way traffic flow (Source: Walker, Kulash, McHugh, "Downtown Streets: Are We Strangling Ourselves on one-Way Networks?")

Complete Streets Case Study: Lancaster Boulevard Lancaster, CA

In 2010, Lancaster Boulevard in Lancaster, CA underwent a dramatic transformation through a complete streetscape redesign. The new boulevard features new streets, sidewalks, street furniture, landscaping, public plazas, and includes a significant “road diet”.

Today, the street has become a major shopping, dining and entertainment destination. It is fast becoming a major center of community activity, with regular special events and a wide variety of businesses. This reconstruction project, based on complete streets principles, is a great example of public expenditures leading to private sector investment in communities.

The redesign of Lancaster Boulevard, a $10 million project, spurred $125 million in new private investment in Lancaster’s downtown, with 40 new businesses opening up near the project area and 800 new jobs created. Sales tax revenue grew by 26 percent, while the new street design significantly reduced traffic accidents in the area.

Lancaster Boulevard used to be a high speed, auto-centric road which maximized traffic throughput at the expense of local businesses and downtown communities. The complete streets project has converted the corridor into a unique place designed to support adjacent land uses by creating positive street activity, providing improved multi-modal access, and slowing down traffic to reasonable speeds.

Lancaster Boulevard 2007 (Source: Google Maps)

Christmas on the BLVD (Source: newlancasterblvd.com)

The street now provides economic, social and environmental benefits to nearby communities, and has helped revitalize downtown Lancaster, Ca.

Data Sources: It’s a Safe Decision: Complete Streets in California,

National Complete Streets Coalition and city of Lancaster website: http://www.cityoflancasterca.org/index.aspx?page=686

Lancaster Boulevard 2011 (Source: newlancasterblvd.com)

4. Plan Recommendations

Approach and Strategy

BCDOT has been working since 2008 to begin a complete streets transformation in Southeast Baltimore. This plan is a formalization of that process, particularly as a result of the passage of the Complete Streets Resolution passed by Baltimore City in 2010. The recommendations presented in this section represent a starting point for what BCDOT believes is possible to achieve in the near term (1-5 years). The plan acknowledges that fully implementing a network of complete streets will be an ongoing, long term endeavor.

Overarching objectives of the plan include the following:

- Better integration of travel modes
- Creation of multi-modal streets
- Reducing the need to drive
- Increasing the attractiveness of bike/walk/transit modes
- Improving water quality
- Improving quality of streetscapes
- Increasing traffic, bicycle, and pedestrian safety and usage
- Better management of on-street parking supply and demand

The approach herein identifies projects that can be phased in over the next several years which can occur based on available funding as well as the support of the communities in which the proposed changes would occur. BCDOT will be less inclined to implement a particular project without broad public support.

The proposed improvements and changes identified in this section are also not meant to be exhaustive or comprehensive, and additional projects or improvements may be identified as conditions evolve and/or resources permit. Staff is continuously investigating and analyzing new methods and seeking new opportunities to apply best practices, and will always consult with the communities affected to solicit feedback in advance of deciding whether to go forward and determine whether the ideas will be supported.

It is also important to note that the issue of on-street parking supply is one that must carefully managed. As noted earlier on page 14, converting parallel parking to angled parking, combined with converting two way streets to one way streets is generally not a desirable from a complete streets perspective . Alternative solutions should be sought whenever possible, but if such a conversion is unavoidable, complete streets retrofits should be included to the maximum extent possible as a prerequisite in order to mitigate the potential negative consequences that could create a less desirable environment for pedestrians, transit patrons, and cyclists.

The recommendations that follow in this section are broken down into the following headings:

- ***Application of new street typologies***
- ***Enhanced bicycle facilities***
- ***Enhanced pedestrian facilities***
- ***Traffic calming***
- ***Green streets***
- ***Urban greenway and wayfinding***
- ***One-way to two way street conversions***
- ***"Low impact" angle parking conversions with greening***
- ***Priority bus corridors***
- ***Integration with Red Line Light Rail plans***
- ***Sample Complete Streets Projects***

Street Typologies

The conventional functional classification that has been used for streets by the traffic engineering profession is no longer adequate for creating complete streets. New terminology and standards are needed in order to adequately apply complete street. New street typologies with a complete set of standards are being developed as part of Baltimore City's new Complete Streets Guide, currently under development. The following street typologies have been developed as part of this plan :

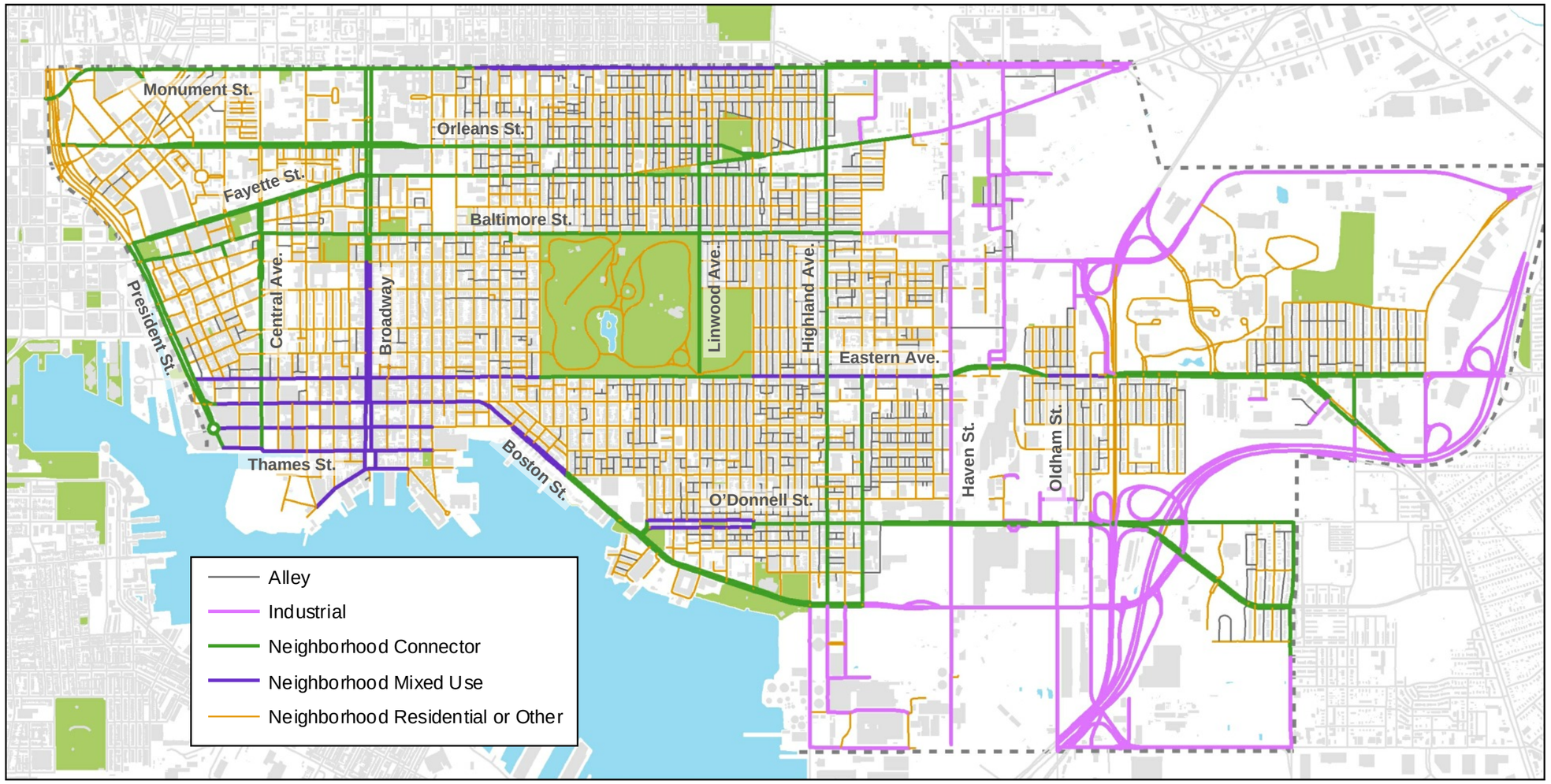
Neighborhood Mixed Use. Streets which have a variety of adjacent land uses and are often considered neighborhood "Main Streets". Neighborhood mixed use streets should accommodate a variety of modes, slow traffic speeds, and positive social activity. Examples: Monument Street, O'Donnell Square.

Neighborhood Connector. Streets which serve as the backbone of the neighborhood street network. While accommodating the most automobile traffic and often serving as truck and bus routes, they should also be designed for comfortable and safe walking, and provide sufficient greening and comfortable transit access. Examples: Orleans Street, Fayette Street, Central Ave.

Neighborhood Residential. Streets which are primarily residential. These corridors should have slow traffic speeds (15-20 mph) and encourage walking, biking and positive social activity. Examples: Fleet Street, Linwood Ave.

Industrial. Streets which primarily serve industrial uses and which can accommodate heavy truck traffic. This is the only street type which should primarily serve vehicular traffic. Example: Clinton Street., Haven Street.

Street Typology Map



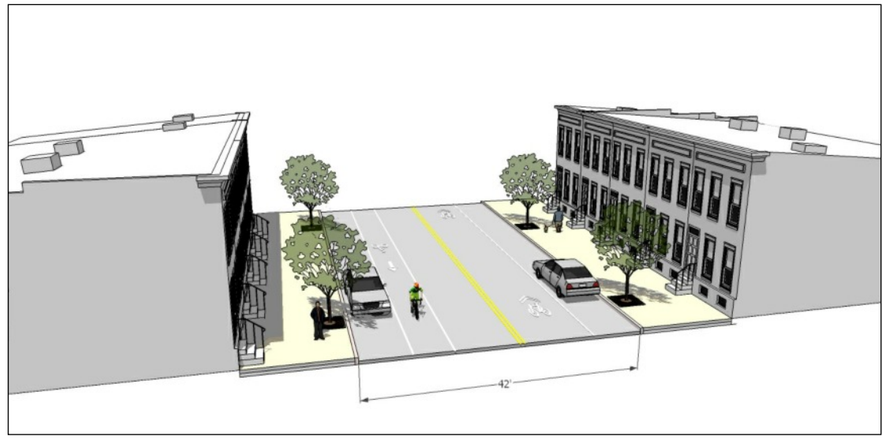
Street Typologies: Sample Application - 42’ wide street

The following illustrations show how various complete street retrofits can be applied to an existing 42’ wide street in ways that are appropriate for their context.

Existing Condition: 42’ Arterial

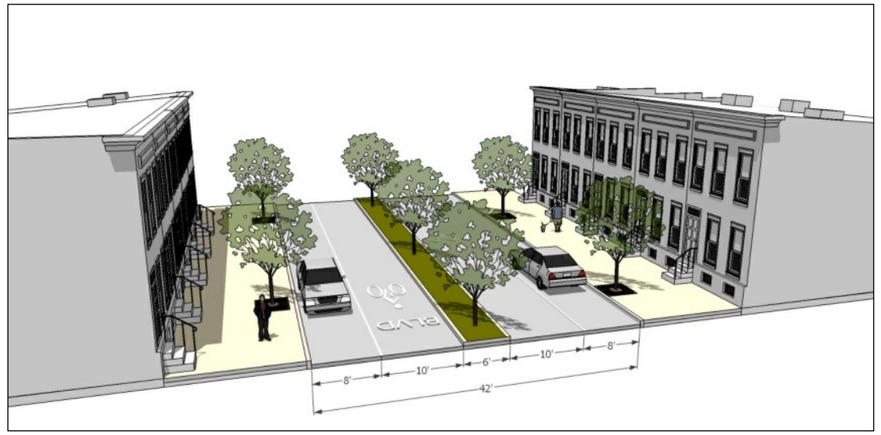
42’ Neighborhood Mixed Use Street. Two way operation with addition of sharrows and additional street trees.

Neighborhood Connector Street. Option A:Two way operation with addition of sharrow in the downhill direction, bike lane in uphilll dircetion and additional street trees.



Neighbornood Residential Street. Option B: One way operation with addition of angled parking, bike lane, and green street application with rain gardens.

Neighborhood Residential Street. Option C: Two way way operation with addition of bike boulevard, green street application with center planted median



Enhanced Bicycle Facilities

The Southeast Bicycle Network established the backbone of bike system which can be expanded on with the Southeast Complete Streets Plan. Establishing more bike facilities and routes on streets with low traffic volume and speeds is feasible to expand the bike network given the areas grid street patterns. Installing full 5' bike lanes with 2 solid white lines is preferred as bike lanes specifically signify where bikes should ride and cars should not. The use of 'sharrows' should only be used for wayfinding.

Transforming some residential streets into **bicycle boulevards** should also be considered. Bicycle boulevard candidate streets typically have less than 2,500 ADT and posted speed limits of 25 mph or less. While Fait Avenue through Canton has sharrows and wayfinding signs, converting to be more bike-friendly would include replacing 4-way stops with mini-circles, adding bike-friendly speed humps and traffic diverters to discourage through traffic.

Cycle Tracks are another bicycle improvement that can be explored. Cycle tracks are one or two-way bike lanes that are typically located against the curb with a striped buffer between the bike lane and vehicular travel lanes. Many cycle tracks incorporate parked vehicles against a striped buffer to further separate bike traffic from auto traffic.

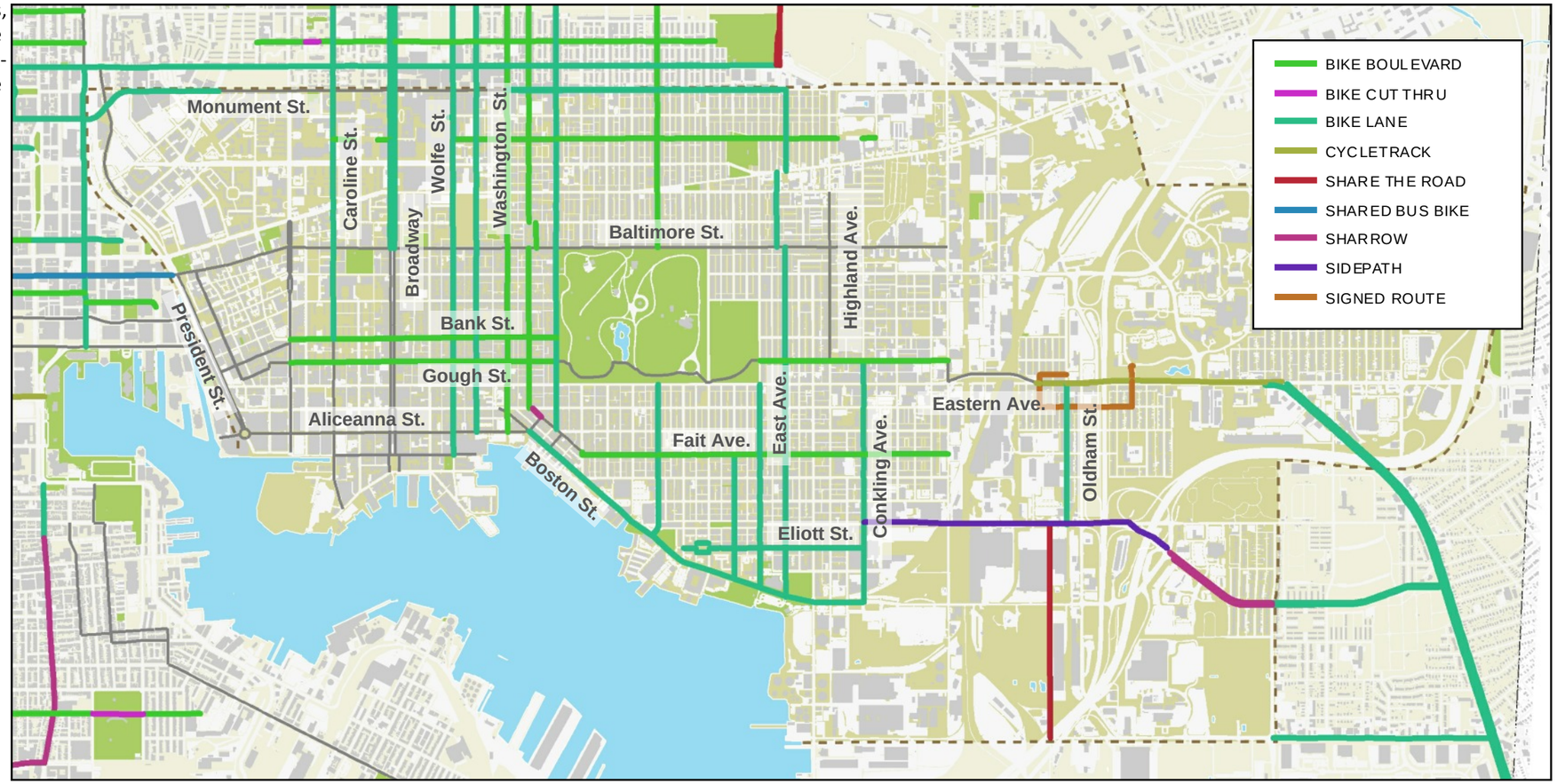
As of 2011, a substantial portion of the southeast Bike network has been completed. Remaining connections to be striped include:

- Elliot St.
- Potomac St. (possible cycle track)
- Ellwood St.
- Gough St.
- Bank St.

Bicycle lanes should be incorporated into complete streets designs for the corridors indicated on the bike map. While sharrows make up a large part of the bike network on Aliceanna and Fait Streets, full bike lanes are recommended where street width allows.

Bike lane to be added on Caroline St.

Gough St. (And Bank St.) To become Bicycle Boulevards



Enhanced Pedestrian Facilities

Although Southeast Baltimore already has a fully developed pedestrian network of sidewalks and public places, there are many opportunities to substantially improve the quality of those facilities. Over the last half centurly, as car dominated environments began to become the norm, the city became no exception. Many of the opportunities include retrofitting or restoring better pedestrian environments, while some include implementing innovative new solutions that did not previously exist, even in earlier eras before cars become ubiquitous.

Areas of improvement fall into the following categories:

- Sidewalk widening
- Intersection and streetscape improvements
- Outdoor seating & cafe space
- Shared space

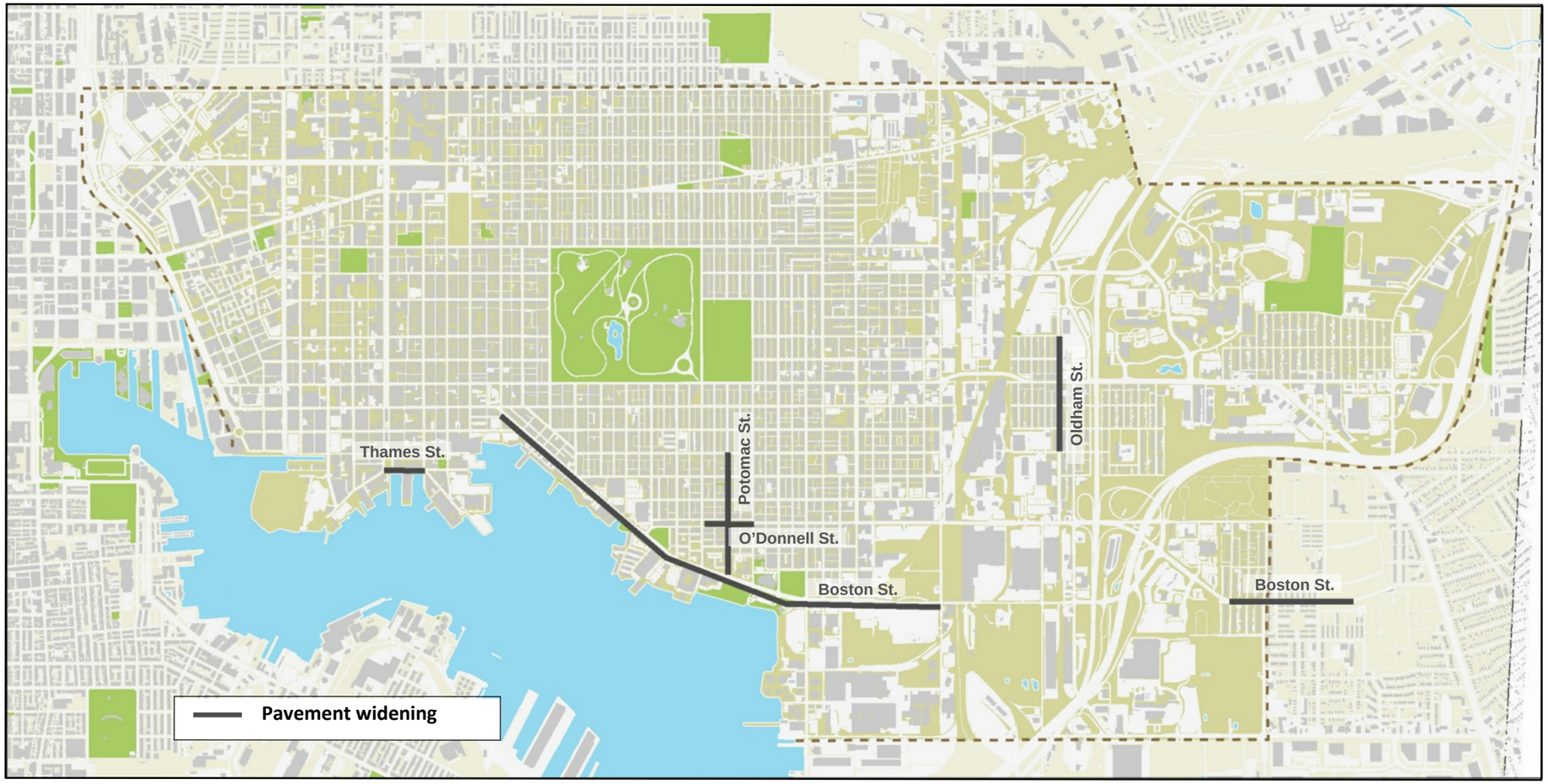
Each of the following are described as follows:

Sidewalk Widening

Boston Street, Oldham Street, Potomac Street, Thames Street and O'Donnell Square may be candidates for future sidewalk widening due to wide travel lanes and curb to curb widths. These streets are also activity centers with heavy pedestrian traffic or active commercial districts.

Sidewalks to be widened along Potomac St. In Canton

Sidewalks to be widened along Boston St. In O'Donnell Heights



Intersection and Streetscape Improvements

Various intersection improvements and other recommendations at the block level were identified by communities during the planning process. These outstanding issues may be incorporated into larger improvement projects.

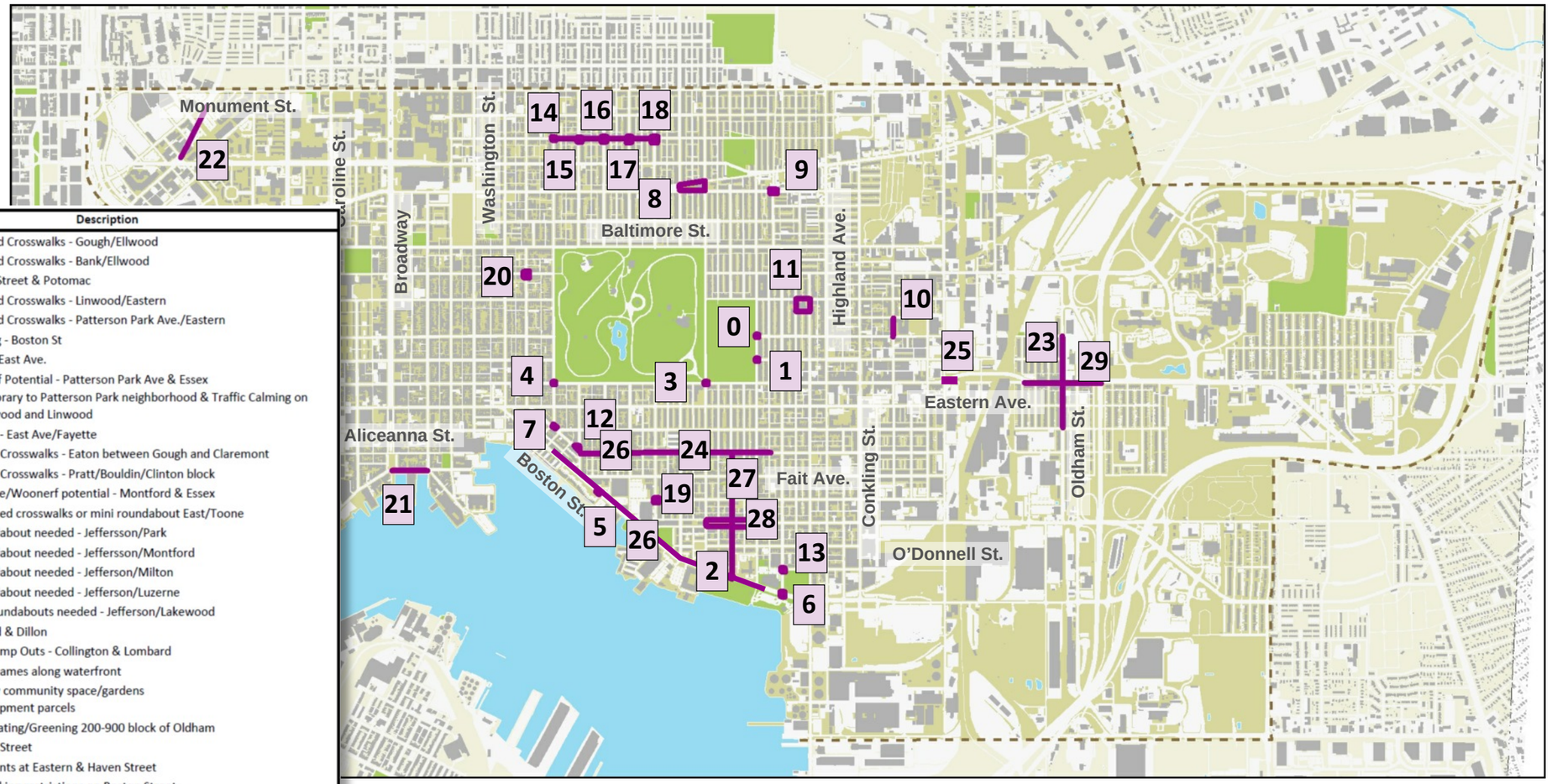
Intersection improvements may include installing new or upgraded crosswalks and/or curb extensions, potentially in conjunction with modifications to intersection geometrics in order to slow traffic and improve pedestrian comfort.

Streetscape projects would include installing new amenity packages such as street furniture, trash receptacles, civic art, pedestrian level lighting, textured sidewalk pavers, street trees, and native plantings.

O'Donnell St. at Potomac St.

Boston St. at Hudson St.

McElderry St. At Montford Ave.



Label	Description
0	Traffic Calming/Colored Crosswalks - Gough/Ellwood
1	Traffic Calming/Colored Crosswalks - Bank/Ellwood
2	Traffic Signal - Boston Street & Potomac
3	Traffic Calming/Colored Crosswalks - Linwood/Eastern
4	Traffic Calming/Colored Crosswalks - Patterson Park Ave./Eastern
5	Mid Block Ped Crossing - Boston St
6	Traffic Signal - Boston/East Ave.
7	Shared Space/Woonerf Potential - Patterson Park Ave & Essex
8	Better connect park/library to Patterson Park neighborhood & Traffic Calming on Fayette between Kenwood and Linwood
9	Beautification Needed - East Ave/Fayette
10	Traffic Calming/Raised Crosswalks - Eaton between Gough and Claremont
11	Traffic Calming/Raised Crosswalks - Pratt/Bouldin/Clinton block
12	Stop signs/shared space/Woonerf potential - Montford & Essex
13	3 way stop sign/restriped crosswalks or mini roundabout East/Toone
14	4 way stop/mini-roundabout needed - Jeffersson/Park
15	4 way stop/mini-roundabout needed - Jeffersson/Montford
16	4 way stop/mini-roundabout needed - Jefferson/Milton
17	4 way stop/mini-roundabout needed - Jefferson/Luzerne
18	4 way stops or mini-roundabouts needed - Jefferson/Lakewood
19	Bump Outs - Lakewood & Dillon
20	Stormwater Quality Bump Outs - Collington & Lombard
21	Widen sidewalks on Thames along waterfront
22	Close Ensor St. for new community space/gardens or to reconnect development parcels
23	Bumpouts/Outdoor seating/Greening 200-900 block of Oldham
24	Bike Boulevard on Fait Street
25	Pedestrian Improvements at Eastern & Haven Street
26	Remove peak hour parking restrictions on Boston Street
27	Cycle Track/Green Median on Potomac
28	Traffic Calming/Expanded Sidewalk or bike lanes around O'Donnell Sq.
29	Remove peak hour parking restrictions on Eastern Ave.

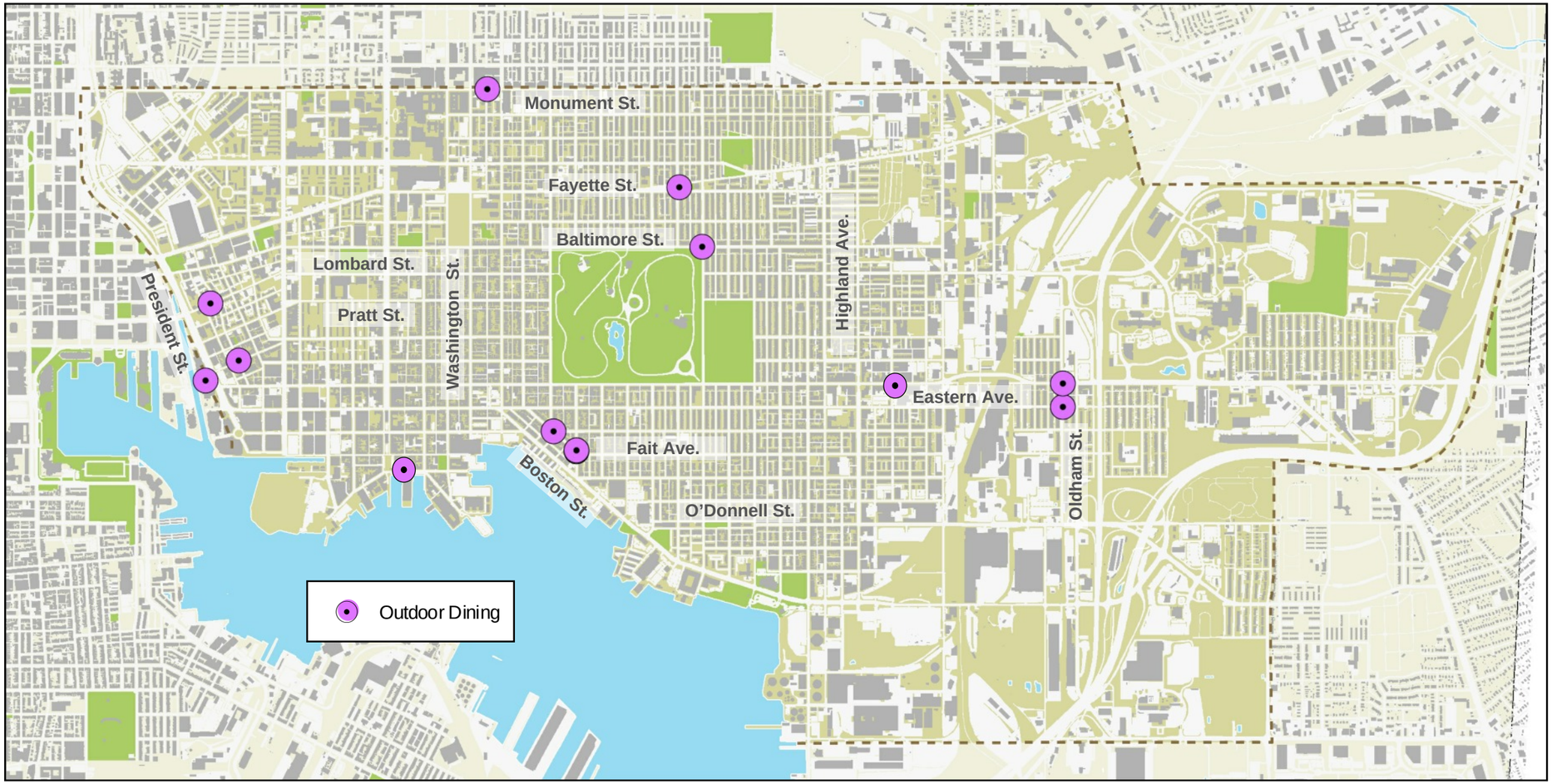
Outdoor Seating/Café Space on Public Property

Seating areas on public property can activate under-utilized street space, support local businesses and improve the perception of safety on city streets. Several locations have been identified where street furniture could be installed on public property with minimal modification to the existing street alignment.

Baltimore St. at Linwood Ave.

Fayette St. at Kenwood Ave.

Outdoor dining in Fells Point



Shared Spaces/Woonerfs

Shared spaces, as described in Section 3, are streets that are designed primarily for non-motorists, although vehicular traffic is allowable. Through traffic is discouraged but these streets are best suited for delivery trucks which need to make daily stops at restaurants and cafes. These environments are highly pedestrian and cyclist friendly, and vehicular traffic moves slowly - typically no faster than 5 or 10 mph. Traffic volumes are also very low.

In Southeast Baltimore, the best opportunity for creating this kind of environment - or Woonerf - is in Fells Point along Thames Street. Thames Street has wonderful historic buildings along its northern edge, facing waterfront. The street itself despite being very wide is already a slow-speed street because of its cobblestone surface. It currently serves double duty as a through street and as a parking lot with head-in parking on both sides. However, this has created a condition where high volumes of pedestrians, especially on weekends and in evenings, are relegated to the relatively narrow sidewalks.

If the section of Thames Street between Broadway and Ann Street in the heart of the Fells Point Waterfront around the Recreation Pier, was converted to a Woonerf, it could transform this place into a nationally and internationally renowned public place. The street could be redesigned to become more of a plaza that dramatically increases the opportunities for outdoor dining, strolling, and gathering.

Vehicles would still be allowed through, but parking would be significantly reduced or eliminated altogether. The loss of existing parking spaces would be mitigated by increased parking supply anticipated in the proposed Broadway Market redevelopment project, as well as by increasing bicycle parking and infrastructure, and improved transit service over time.

Existing conditions along Thames Street in Fells Point showing of inadequate sidewalk width and pedestrian amenities versus demand for pedestrian and dining space.

Nyhavn in Copenhagen, Denmark: Before Woonerf and today's postcard view with pedestrianized space

Recommended area for shared space design along Thames Street in Fells Point

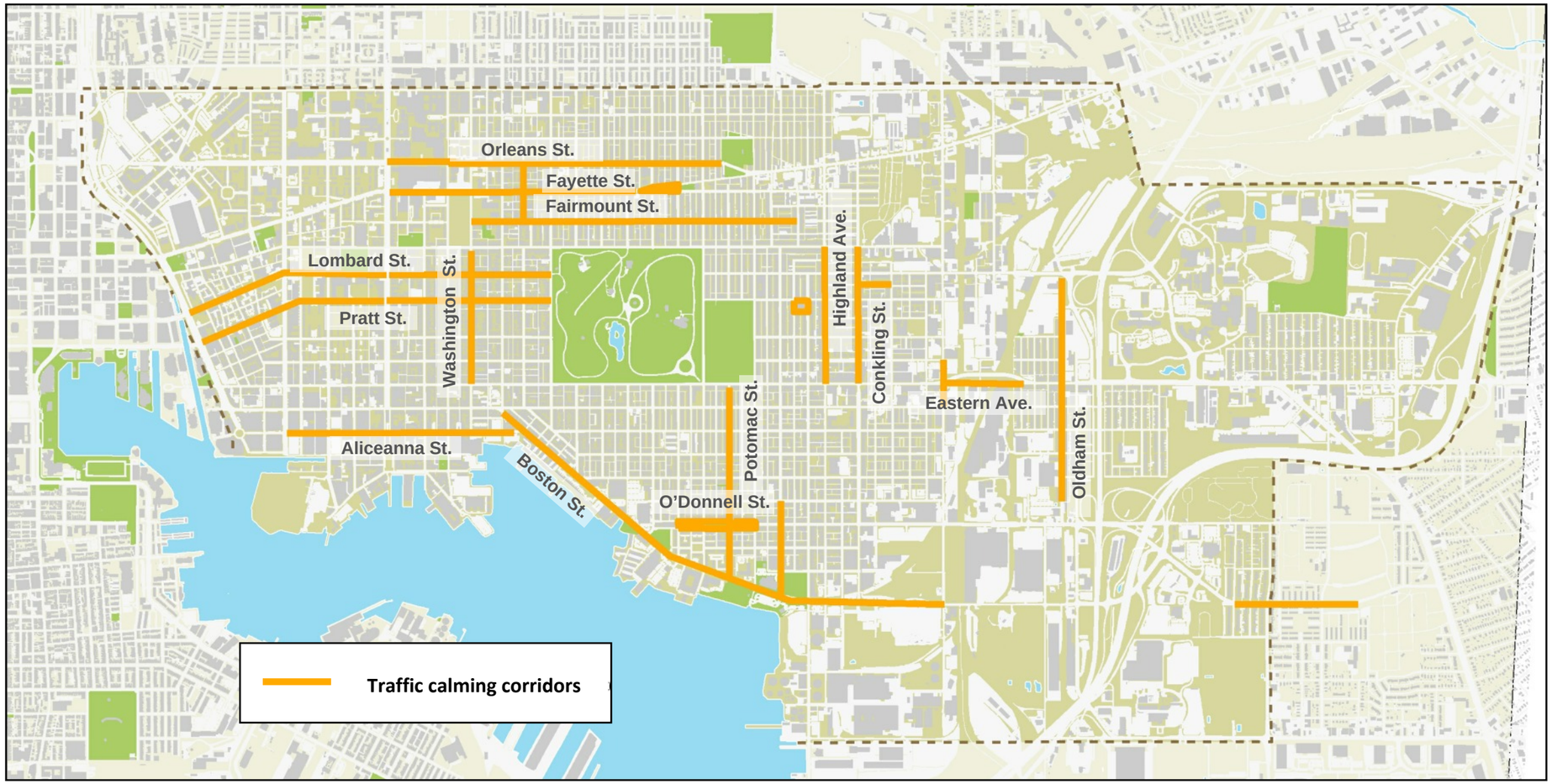
Traffic Calming 2.0

Major traffic calming was requested by workgroup members. Streets perceived as having the biggest speeding problem were Orleans Street, Fayette Street, Boston Street, and Lombard and Pratt west of Patterson Park. Traffic calming on local streets was requested by community members as well.

Traffic calming measures may include lane and/or lane width reductions, speed limit reductions, bump outs, diverters, chicanes, speed tables, or speed cameras.

Washington St. at Pratt St.

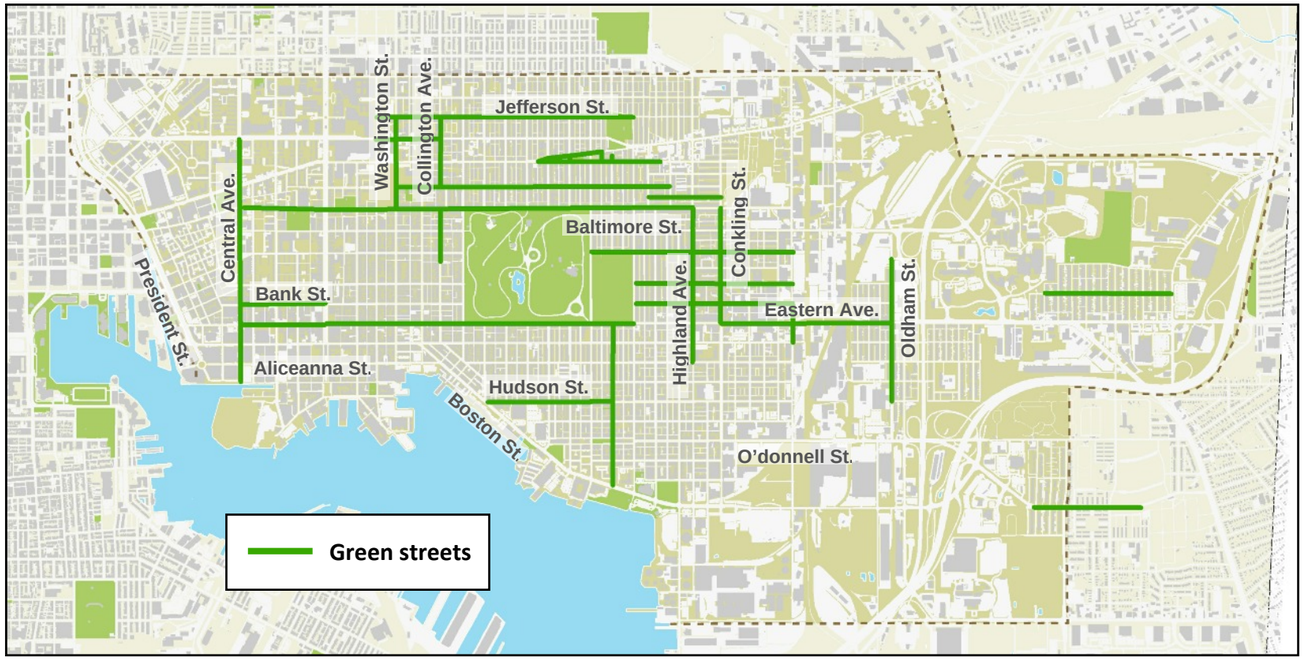
Lombard St. At Highland Ave.



Green Streets

Greening was discussed at length during workshop sessions. Major greening opportunities include Jefferson Street, Fairmount Ave., Eastern Ave., and other local and through streets throughout the study area.

Jefferson St. at Luzerne Ave.

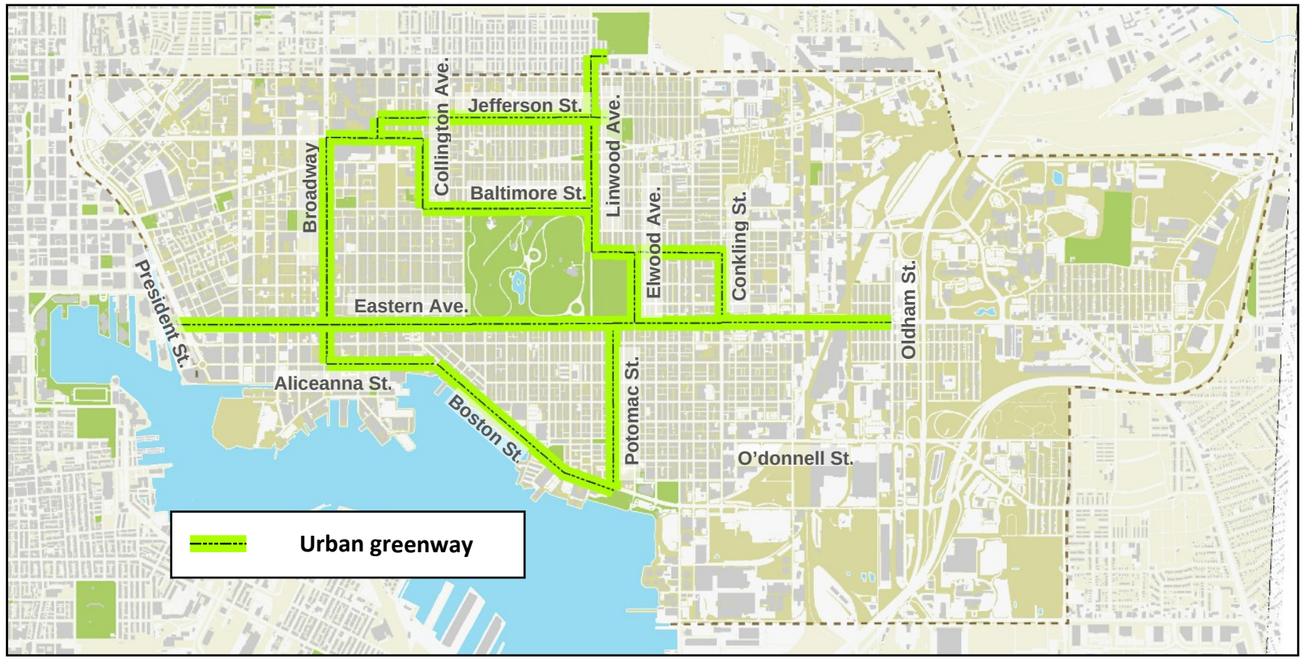


Southeast Urban Greenway

Frederick Law Olmstead, father of American landscape architecture, designed a system of connected parks and boulevards in Buffalo, New York which was modeled after Haussmann's urban designs in Paris. Southeast Baltimore's parks, employment centers and main streets could be connected in a similar fashion, expanding the accessibility of each place on the network while encouraging positive street activity.

A network of streets with way finding, landscaping, and trees could connect the Canton waterfront, Johns Hopkins Medical Center, Patterson Park, Fells Point, and other neighborhood assets. An urban greenway could also promote tourism in less visited areas in Southeast Baltimore while creating a safe and educational walking path.

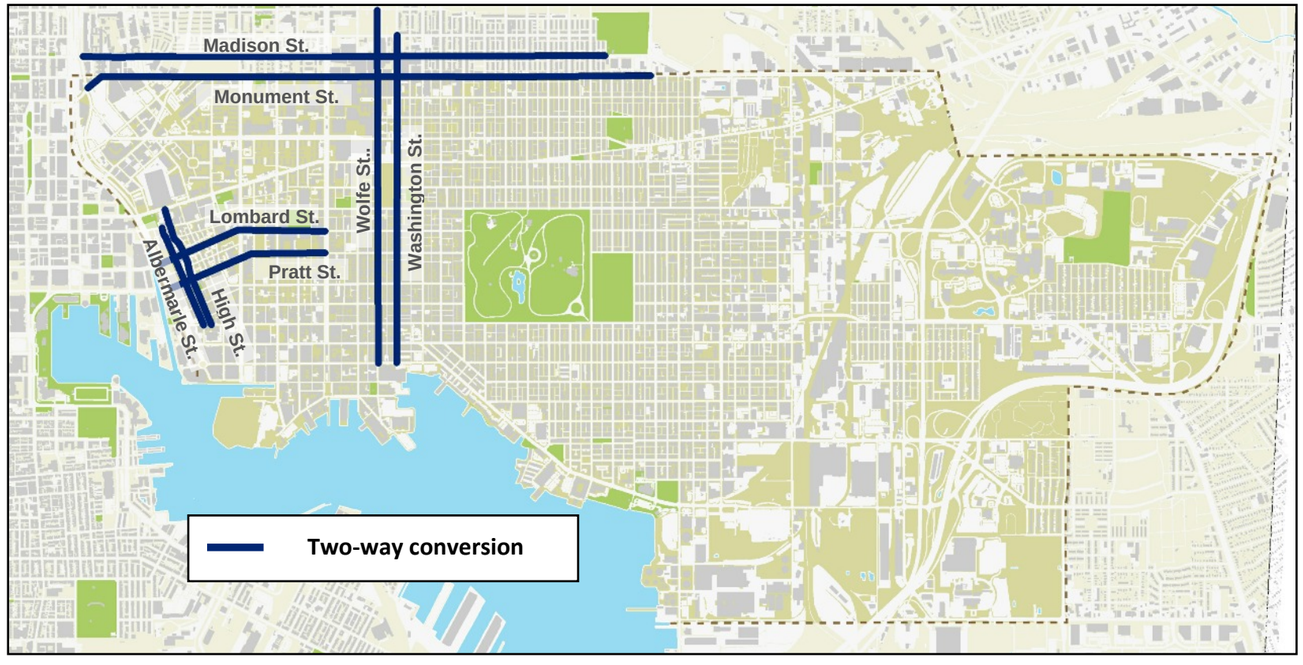
FairmaountAve. at Collington Ave.



One Way to Two Way Street Conversions

Research has shown two way streets slow traffic, provide better retail and commercial environments, promote neighborhood livability and simpler navigation for drivers and bicyclists. Major potential one way to two way conversions are indicated on the map

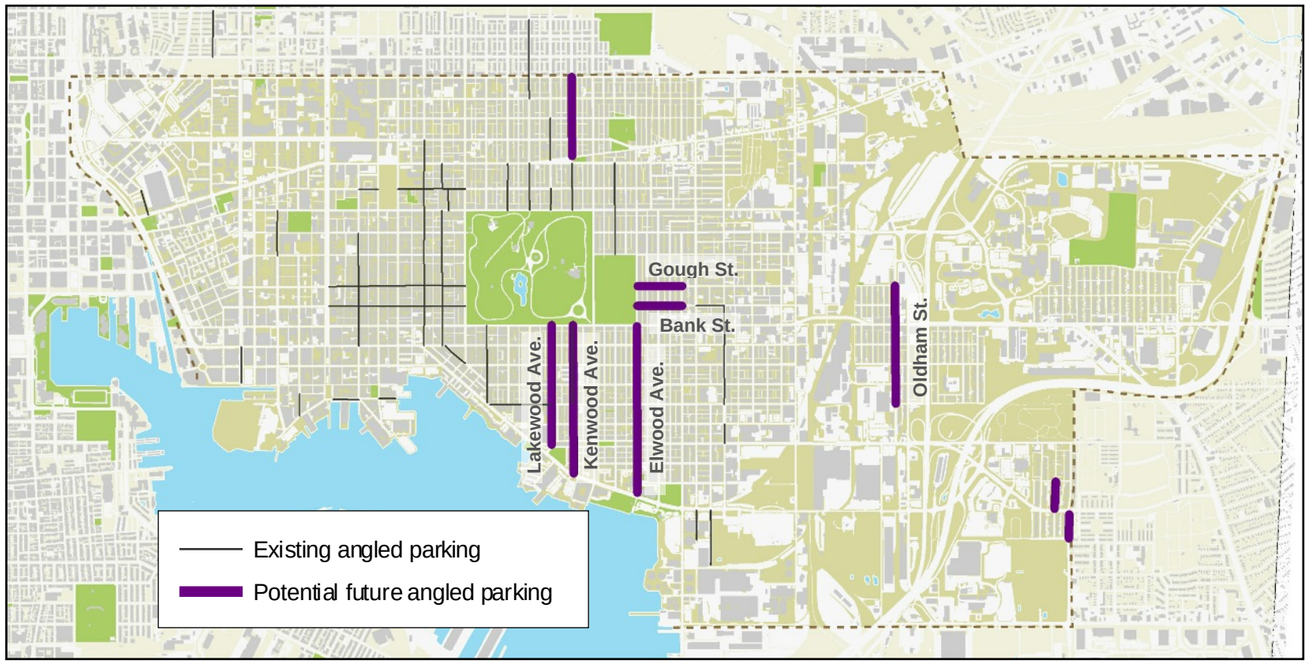
Wolfe St. at Gough St.



Low Impact Angle Parking Conversions

Low impact angle parking involves converting parallel parking to angle parking without changing the existing traffic flow of the street. These conversions also do not conflict with existing bus or truck routes.

Oldham St. at Foster Ave.



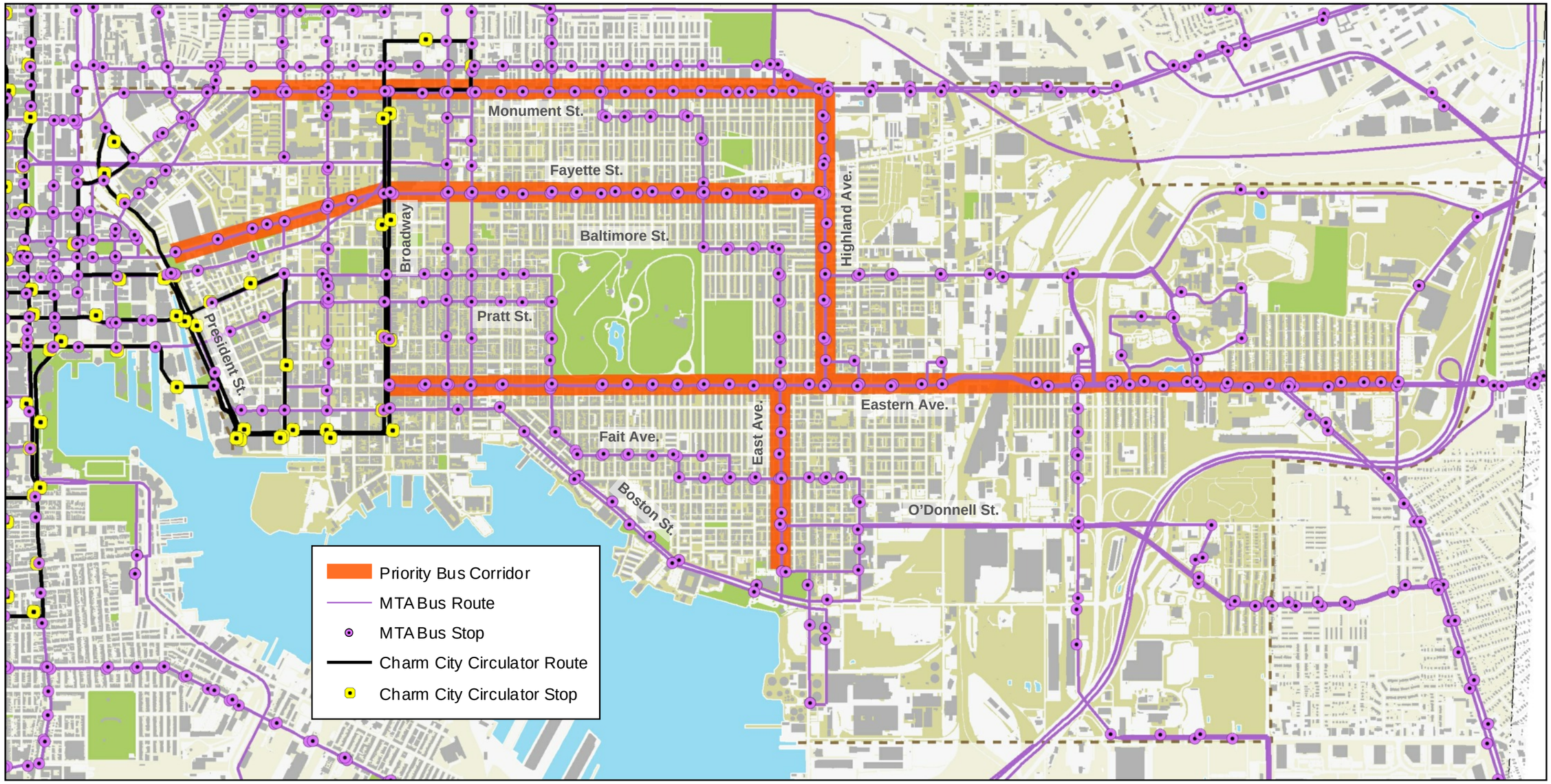
Priority Bus Corridors

These corridors were identified as priority bus routes by community members and through identification of overlapping bus routes. These streets are candidates for bus stop upgrades, including real time arrival kiosks, bus bumpouts, upgraded transit maps, and bus shelters, where appropriate.

Similar to truck routes, bus traffic will influence where curb extensions, angle parking, bike lanes, and landscape improvements can be installed. Major bus corridors may also be opportunities for real time arrival kiosks, bus bumpouts, and other aesthetic improvements that signal the importance of bus transit on these streets.

East Ave.

Monument St.



Integrate Complete Streets Design with Planned Red Line Light Rail

The Red Line, a proposed 14 mile light rail system between the Centers for Medicare and Medicaid Services complex in Baltimore County and the Johns Hopkins Bayview campus in Southeast Baltimore, will have a major impact within the study area. Complete streets improvements will be coordinated with the proposed station areas in order to link pedestrian, bicycle and bus facilities to new transit stations.

Complete Streets Sample Projects

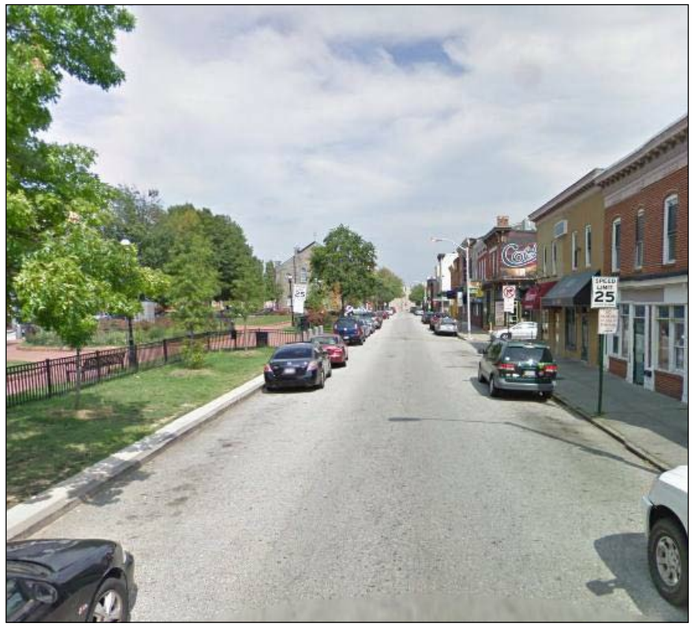
Though creating detailed concepts for all potential candidate streets in Southeast Baltimore is beyond the scope of this plan, a few select concepts illustrate the possibilities for converting existing streets into green, active places which can help local businesses and neighborhoods thrive. These designs can serve as examples for other neighborhood streets throughout the city.

Complete Streets Example 1: Concepts for O'Donnell Street

Though not immediately obvious as a high speed street, many citizens identified the area around O'Donnell Square as intimidating for pedestrians. The 30' curb to curb width of O'Donnell Street coupled with the single lane of traffic is an opportunity for either bike lanes/bumpouts, or perhaps sidewalk widening. Three alternatives for the street surrounding the park include:

- A 5' wide bike lane
- A 5' wide bike lane with bumpouts
- Sidewalk widening on opposite side of the park to create a better pedestrian space for local businesses.

The 30' curb to curb width of O'Donnell Street is an opportunity to add bike lanes, greening, and slow down traffic in order to encourage local businesses and help connect the park to surrounding neighborhoods.



Existing Condition

After: Bike Lane Added

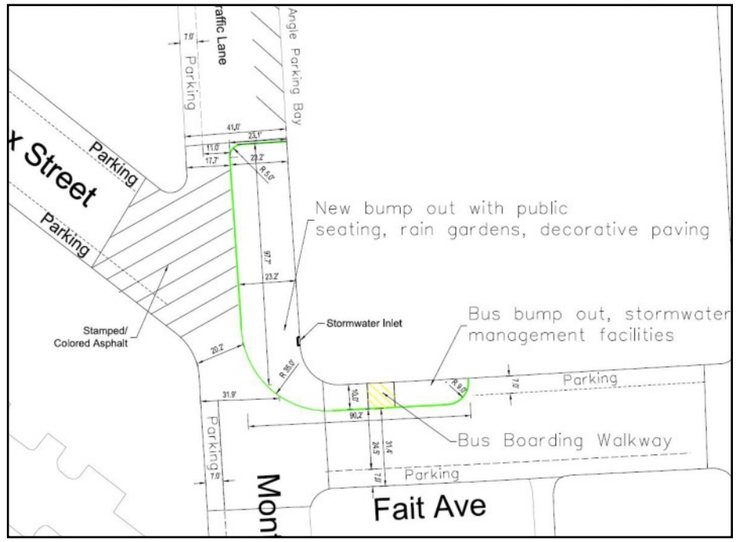
Complete Streets Example 2: Concept for intersection of Essex, Montford and Fait Ave

The community identified the intersection of Essex Street, Montford Ave and Fait Ave. as a barren place with a large underutilized area of asphalt. Since angle parking was striped on Montford, a large area of the street adjacent to the angle parking bay has the potential to become an active public space with seating, tables, stormwater management facilities, and other features which can become a focal point for the community.

A 23' wide extended bumpout could be installed adjacent to the angle parking bay and could also serve as a bus bump out on Fait Street.

Intersection of Essex and Montford in Canton

Before



Intersection of Montford, Fait and Essex in Canton. An extended bump out can create space for public seating, landscaping, and stormwater maangement facilties

After: Intersection modified with curb extension, special paver treatment in roadway, bio-retention planting areas, street tree, and bench seating.

Complete Streets Example 3: Concept for intersection of Essex, Patterson Park and Foster Ave: This example is similar to Example 2 and in the same general vicinity. By introducing bio-retention planting beds and street trees as part of new bump outs, the street environment can become more attractive to pedestrians and cyclists, while helping to reduce vehicle speeds.

CONCEPT PLAN

N

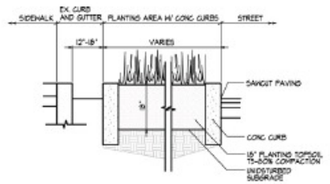
0 10 20 30 60

SCALE: 1" = 30'

LEGEND

CURB
GROUNDCOVER
SHRUB
TREE
COLORED ASPHALT
BOLLARDS

PLANT TYPES



TYPICAL PLANTING AREA CROSS SECTION

SCALE: 3/8"=1'-0"

QUANTITIES

PAVING REMOVAL	1,472 SF
NEW CURB	436 LF
PLANTING AREA	1,191 SF
PLANTING SOIL	66 CY

TRAFFIC & TRANSPORTATION ENGINEER:
SABRA, WANG & ASSOCIATES, INC.
1504 JOH AVENUE, SUITE 160
BALTIMORE, MD 21227 U.S.A.
TEL. 410.737.6664
FAX. 410.737.1774

LANDSCAPE ARCHITECT:
PELA DESIGN INC.
7400 YORK RD, STE 403
TOWSON, MD 21204
TEL. 410.296.3990
FAX.410.296.3998

ESSEX STREET AND S PATTERSON PARK AVENUE 1

Complete Streets Example 4: Concept for conversion of parallel parking to angled parking on S. Kenwood Ave. At Hudson St.: Conversion of parallel parking to angled parking is not itself part of the Complete Street toolkit, and in fact, can often make neighborhoods become less pedestrian friendly. However, when local pressure to increase parking supply does result in conversion to angled parking, it can be used an opportunity to reclaim parts of the street through innovative green street design to reduce stormwater runnof and increase shade.

CONCEPT PLAN

N

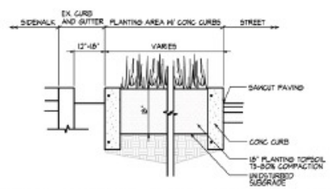
0 10 20 30 60

SCALE: 1" = 30'

LEGEND

CURB
GROUNDCOVER
SHRUB
TREE
COLORED ASPHALT
BOLLARDS

PLANT TYPES



TYPICAL PLANTING AREA CROSS SECTION

SCALE: 3/8"=1'-0"

QUANTITIES

PAVING REMOVAL	728 SF
NEW CURB	156 LF
PLANTING AREA	627 SF
PLANTING SOIL	35 CY

TRAFFIC & TRANSPORTATION ENGINEER:
SABRA, WANG & ASSOCIATES, INC.
1504 JOH AVENUE, SUITE 160
BALTIMORE, MD 21227 U.S.A.
TEL. 410.737.6664
FAX. 410.737.1774

LANDSCAPE ARCHITECT:
PELA DESIGN INC.
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TOWSON, MD 21204
TEL. 410.296.3990
FAX.410.296.3998

KENWOOD AVENUE AND HUDSON STREET

5. Implementation

Implementation/Phasing

The complete streets recommendations contained in this plan won't be built immediately. Baltimore City Department of Transportation and communities must prioritize projects according to funding availability and previously planned infrastructure projects (Red Line, Operation Orange Cone, other grant funded projects and community initiatives). Complete street components could be added to many projects already in the pipeline, creating low-cost opportunities to "piggyback" design elements which could meet the goals of this plan.

Implementation Plan

- ✓ **Short Term**
  - o Low cost complete streets components added to previously scheduled resurfacing projects
    - Eastern Ave.
  - o Various greening projects through city agencies, community groups, non-profits, and existing neighborhood plans
    - Patterson Park
    - McElderry Park
    - Butcher's Hill
  - o Traffic calming
    - Various schools, Patterson Park Enoch Pratt Library, Boston Street
  - o Additional angle parking conversions with possible greening components
    - Lakewood Ave.
    - Bank St.
    - Gough St.
    - Oldham St.
- ✓ **Mid Term**
  - o New public plazas or seating where right-of-way is available
    - Essex & Montford intersection
    - Columbus Park
    - Monument Street
  - o Sidewalk widening at strategic locations
    - Thames St.
    - Oldham St.
- ✓ **Long Term**
  - o Priority bus corridor upgrades
  - o Urban greenway
  - o Full, complete street reconstruction/streetscape on strategic streets

Project Type	Short Term	Mid Term	Long Term	Funding options
Greening/trees/vegetation Sidewalk	x	x		BCDOT, Rec and Parks, Parks and People, Grants, Community Groups
improvements/widening		x	x	BCDOT
Traffic Calming	x	x		BCDOT, Safe Routes to School
Bicycle Improvements	x	x		BCDOT, public-private partnerships
Full, complete street reconstruction/streetscapes			x	BCDOT
Priority Bus Corridor Upgrades			x	MTA, BCDOT
Urban Greenway			x	Grants, Community Groups

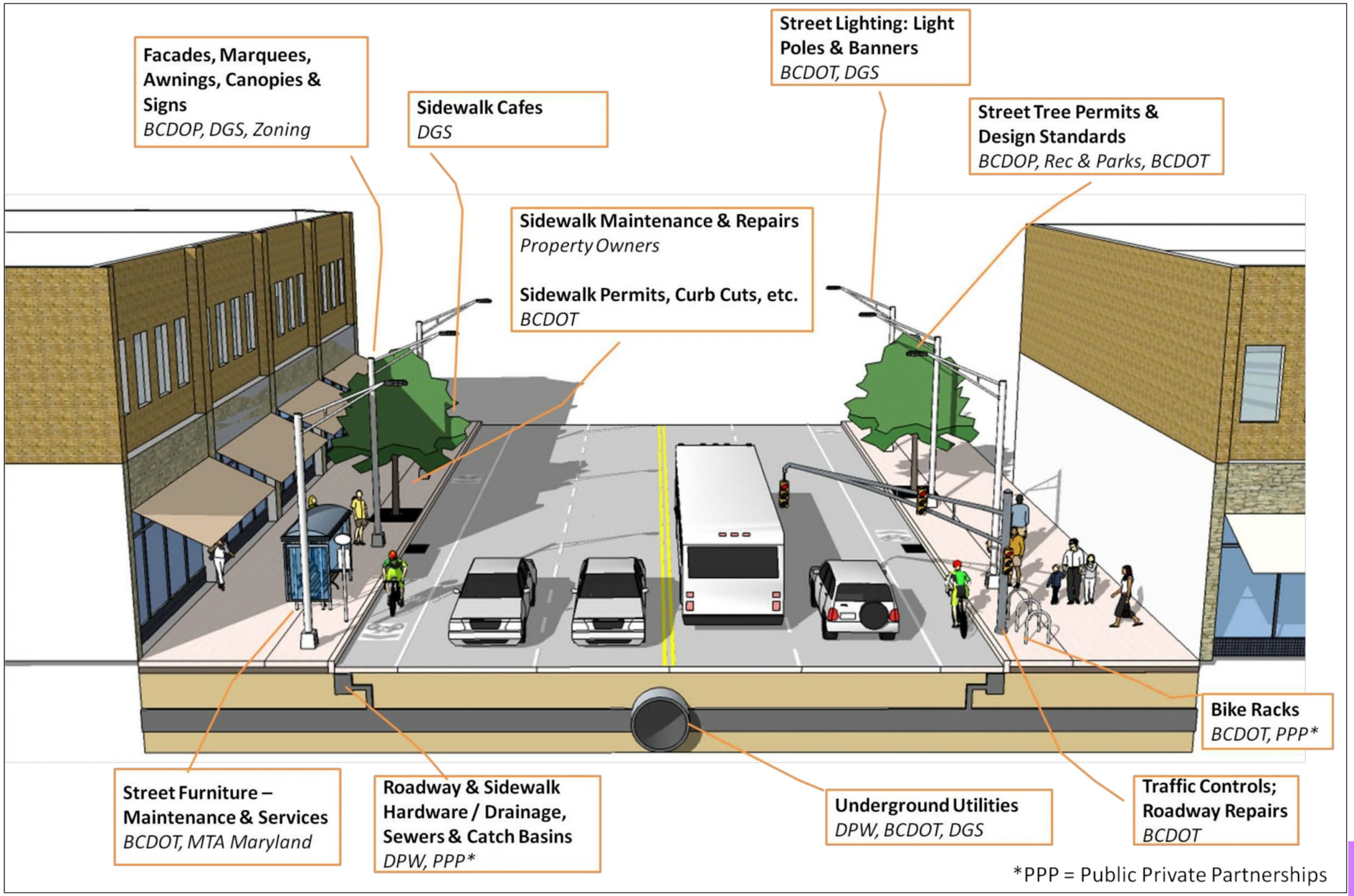
Maintenance

Keeping public spaces free from litter and maintaining plantings will be critical to the success of future complete streets projects and existing streets . For new projects that involve plantings and public spaces, a maintenance agreement, either with a local non-profit group or community association, will be developed with the community before construction begins.

Agency Responsibility

Because Baltimore streets have a plethora of agencies involved in maintenance and reconstruction, this graphic illustrates which agency is responsible for each street component. The acronyms are:

- **DGS**: Department of General Services
- **PPP**: Public/Private partnership
- **DPW**: Department of Public Works
- **BCDOT**: Baltimore City Department of Transportation
- **MTA**: Maryland Transit Administration
- **BCDOP:** Baltimore City Department of Planning



Street/Development Design Review Checklist

The following list can be used to by communities and city agencies to ensure new development and infrastructure projects accommodate complete street designs.

Context

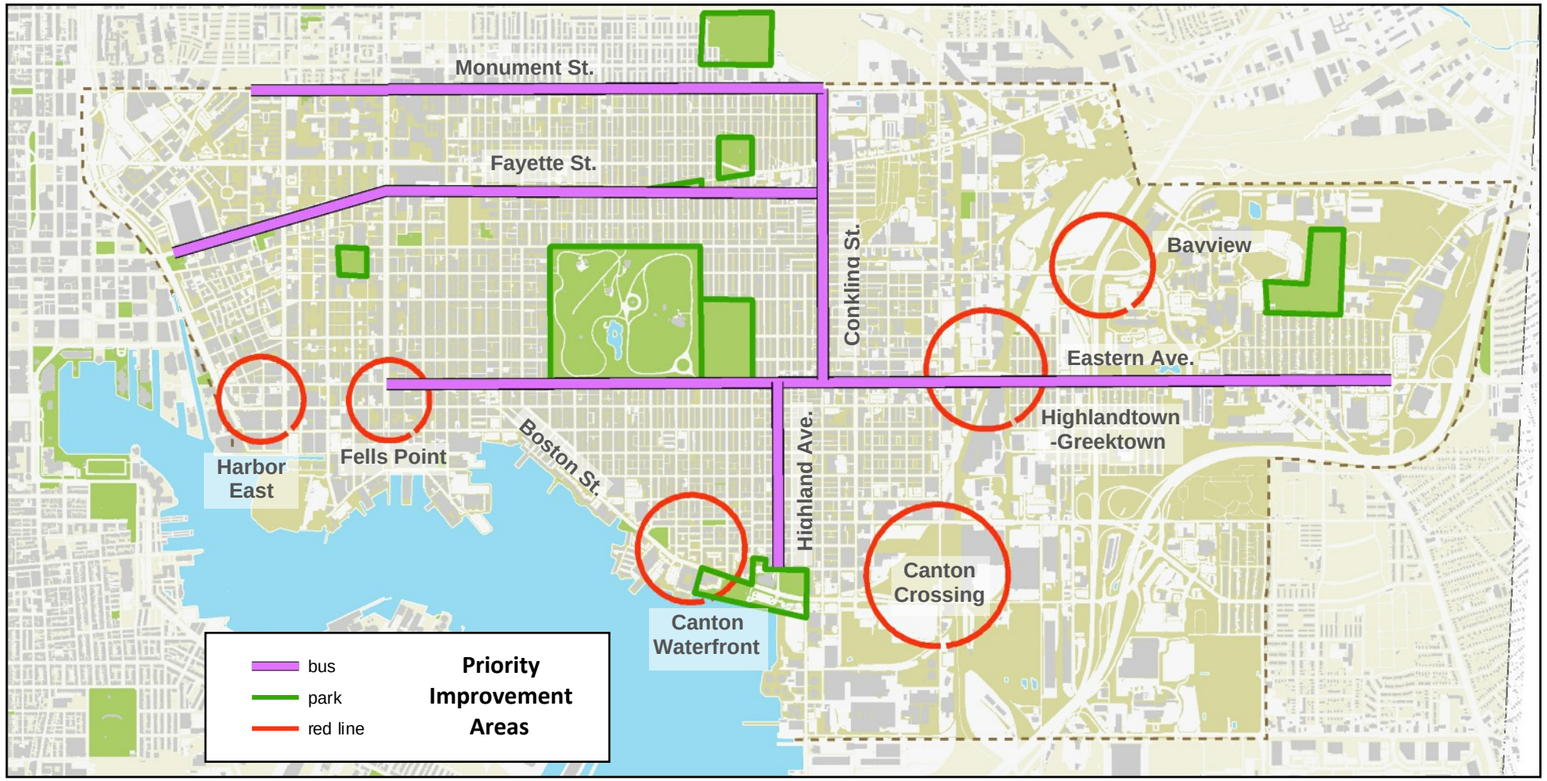
- ✓ **History and Character:** Describe history and character of project area and how proposed design responds to surrounding environment.
- ✓ **Land Use**: Describe predominant land uses and densities within project area.
- ✓ **Major Sites**: Describe major community assets, destinations and trip generators near the project area and how proposed design can support these.

Operations

- ✓ **Walking**: Describe existing walking conditions within project area, desired future conditions, and how design addresses walkability.
- ✓ **Bicycling**: Describe existing bicycling conditions within project area, desired future conditions, and how proposed design addresses bicycling conditions.
- ✓ **Motor Vehicles:** Describe existing vehicle conditions within project area, desired future conditions, and how proposed design addresses motor vehicle traffic
- ✓ **Transit:** Describe existing transit conditions within project area, desired future conditions, and how proposed design addresses transit users.
- ✓ **Trucks/Freight**: Describe existing freight conditions within project area, desired future conditions, and how proposed design accommodates freight.
- ✓ **Access:** Describe how the proposed design addresses needs of those with access or mobility requirements.
- ✓ **Public Space:** Describe existing public space conditions within project area and how proposed design affects public space and any new pedestrian seating.

Greening

- ✓ **Street Trees:** What is the existing street tree coverage? How can trees be included in the proposed design?
- ✓ **Green streets and plantings:** Describe existing planting areas and where new plantings can be included in design.
- ✓ **Stormwater Control**: Describe stormwater runoff conditions, and how stormwater could be managed in proposed design
- ✓ **Maintenance Partners:** Describe potential maintenance partners and level of commitment for planting areas and new public spaces.



Priority Improvement Areas

While there are many recommendations throughout the study area, not all of them can be constructed at once. It's necessary to prioritize improvements to create a more realistic implementation schedule. Areas where improvements should be targeted in the short and medium term are indicated on the map. These areas include schools, parks, the proposed urban greenway, priority bus corridors, and proposed Red Line stations.

Appendix

Appendix A: Baltimore City Complete Streets Resolution

Council Bill 09-0433

Adoption of a “Complete Streets” philosophy for transportation projects is especially advantageous in an urban area such as Baltimore where many people do not have regular access to a car. Ensuring that the needs of all citizens are met by applying “Complete Streets” principals principles across the board will improve access to communities throughout Baltimore, make the City more liveable, encourage healthy behaviors, and reduce negative environmental impacts city-wide.

SECTION 1. BE IT RESOLVED BY THE MAYOR AND CITY COUNCIL OF BALTIMORE, That the Department of Transportation and the Department of Planning are directed to plan for, design, and construct all new City transportation improvement projects to provide appropriate accommodations for pedestrians, bicyclists, transit riders, motorists, and persons of all abilities, while promoting safe operation for all users. This can be accomplished through the incorporation of construction elements such as special bus lanes, transit stops, improved pedestrian street crossings, median islands, accessible pedestrian signals, curb extensions, sidewalks, ADA compliant ramps, and bike lanes.

SECTION 2. AND BE IT FURTHER RESOLVED, That the Department of Transportation is directed to incorporate Complete Streets principals principles, as applicable and subject to State and federal laws and regulations, into all Department plans, manuals, rules, regulations, and programs.

SECTION 3. AND BE IT FURTHER RESOLVED, That the application of Complete Streets principals principles may be waived for a specific project if the Director of Transportation issues a documented exception concluding that application of Complete Streets principals principles would be contrary to public safety.

SECTION 4. AND BE IT FURTHER RESOLVED, That Complete Streets may be achieved through single projects or incrementally through a series of smaller improvements over time. It is the Mayor and City Council’s intent that all sources of transportation funding be drawn on to implement Complete Streets.

SECTION 5. AND BE IT FURTHER RESOLVED, That the Department of Transportation is directed to report to the Mayor and City Council annually, on the anniversary of the effective date of this Resolution, on the Department’s progress towards implementing Complete Streets throughout Baltimore. These reports must incorporate performance measures established to gauge how well streets are serving all users and include information such as crash data, uses of new projects by mode, complaints, the linear feet of sidewalk built, the number of ADA compliant ramps built, how many miles of bike lanes have been created, the number of exemptions from the application of Complete Streets principles that have been granted, and the number of, and yearly change in, overall paved lane miles.

SECTION 6. AND BE IT FURTHER RESOLVED, That this Resolution takes effect on the 30th day after the date it is enacted.

Appendix B: Levels of Service and Travel Projections: The Wrong Tools for Planning Our Streets?

by: Gary Toth

Project For Public Spaces

Would you use a rototiller to get rid of weeds in a flowerbed? Of course not. You might solve your immediate goal of uprooting the weeds — but oh, my, the collateral damage that you would do.

Yet when we try to eliminate congestion from our urban areas by using decades-old traffic engineering measures and models, we are essentially using a rototiller in a flowerbed. And it's time to acknowledge that the collateral damage has been too great.

First, an explanation of what I call the "deadly duo": travel projection models and Levels of Service (LOS) performance metrics.Travel projection models are computer programs that use assumptions about future growth in population, employment, and recreation to estimate how many new cars will be on roads 20 or 30 years into the future.

Models range from quite simplistic to incredibly complex and expensive. Simple models deal primarily with coarse movements of vehicles between cities, while complex models deal with the intricacies of what happens on the fine grid of urban areas. To be truly accurate, growth projection modeling can be expensive. Therefore, absent compelling reason to do otherwise, most growth projections tend to be done using less expensive techniques, which usually lead to overestimates.

Levels of Service (LOS) is a performance metric which flourished during the interstate- and freeway-building era that went from the 1950s to the 1990s. Using a scale of A to F, LOS attempts to create an objective formula to answer a subjective question: How much congestion are we willing to tolerate? As in grade school, "F" is a failing grade and "A" is perfect.

Engineers decided that LOS "C" was a good balance between overinvestment in perfection and underinvestment leading to congestion. In urban areas, a concession was made to accept LOS D, representing slightly more restricted but still free-flowing traffic. LOS is commonly (actually, almost always) calculated using travel projections for 20 to 30 years into the future.

Using basic traffic models and LOS C/D to plan and design the interstate system was a no-brainer in the 1950s, '60s and '70s. When deciding how many lanes to build on a freeway connecting major cities, a sensitivity of plus or minus 10,000 trips a day could be tolerated, and the incremental difference in cost to plow through undeveloped land was relatively insignificant.

Good approach, wrong setting

I'm not going to look back and quibble with the general philosophy of how the interstates and the associated high-speed freeways were planned and designed. On many levels, the approach made sense.

But it became increasingly less persuasive when applied to the rest of our road network. Unlike interstates and freeways, most roads exist not just to move traffic through the area, but also to serve the homes, businesses, and people along them. Yet in search of high LOS rankings, transportation professionals have widened streets, added lanes, removed on-street parking, limited crosswalks, and deployed other inappropriate strategies. In ridding our communities of the weeds of congestion, we have also pulled out the very plants that made our "gardens" worthwhile in the first place.

It's worth remembering, too, that not all congestion is bad. John Norquist, former Mayor of Milwaukee and current CEO and President of the Congress for New Urbanism, suggests that congestion is like cholesterol: there is a good kind and a bad kind.

What makes the prevailing situation even more troubling is that there are no comprehensive requirements dictating the use of either LOS or travel modeling in transportation planning and project design. The "Green Book" from the Association of American State Highway and Transportation Officials (AASHTO) (more formally known as "A Policy on Geometric Design of Highways and Streets") clearly states that these are guidelines to be applied with judgment — not mandates. So does the Federal Highway Administration's "Highway Capacity Manual."

The idea that we must rid our roads of any and all traffic congestion is, in fact, a self-imposed requirement. As Eric Jaffe wrote in an article for Atlantic Cities in December, 2011:

Although cities aren't required to abide LOS measures by law, over the years the measure hardened into convention. By the time cities recognized the need for balanced transportation systems, LOS was entrenched in the street engineering canon.

Worse yet, many designers size a road or intersection to be free-flowing for the worst hour of the day. Sized to accommodate cars during the highest peak hour, such streets will be "overdesigned" for the other 23 hours of the day and will always function poorly for the surrounding community.

If that isn't troubling enough, LOS is often calculated using traffic predicted 20 years into the future, even in urban settings. Until the forecasted growth materializes, the roadway will be overdesigned, even during the peak hour. Overdesigned roadways encourage motorists to drive at higher speeds, making them difficult to cross and unpleasant to walk along. This degrades public spaces between the edges of the road and the adjacent buildings, encourages people to drive short distances, and generally unravels a community's social fabric.

Let me repeat: Contrary to what you may hear, there is no national requirement or mandate to apply LOS standards and targets 20 years into the future for urban streets. This thinking is a remnant from 1960s era policy for the interstate system, and has erroneously been passed down from generation to generation.

There is no national requirement or mandate to apply LOS standards and targets 20 years into the future for urban streets.

So what are the right approaches?

Asking the simple question, “Do you want congestion reduced at a particular location?” is a question out of context. It’s like asking you whether you want to never be stung by a bee again. Of course, the answer will be yes. But what if I told you that to in order to never suffer a sting again, every plant within a several mile radius would have to be destroyed — and that you could never leave the area of destruction?

You would have a completely different answer, I’m sure.

The question that needs to be asked in urban settings is not whether you ever want to sit in congestion again. Who does? The question is whether you want to eliminate congestion on your Main Street 24 hours a day, 7 days a week, 365 days a year — knowing that the consequence would be a community with decimated economic and social value, increased reliance on car use, increased crashes, and, ultimately, more congestion.

Recognizing the need for balance, a number of entities are beginning to promote approaches sensitive to the context.

I was the New Jersey Department of Transportation’ s project manager for the “Smart Transportation Guide” (STG), adopted jointly by the state DOTs in Pennsylvania and New Jersey. The STG directs DOT designers to consider the tradeoffs between vehicular LOS and “local service.” It goes on to say that if the street in question is not critical to regional movement, that LOS E or F could be acceptable — and that designers may actually need to design to slow down cars.

The Institute of Transportation Engineers, an “international association of transportation professionals responsible for meeting mobility and safety needs” also promoted this concept in its landmark “Context Sensitive Solutions Guidelines for Urban Thoroughfares.” Florida DOT has adopted multimodal LOS standards, and cities like Charlotte, N.C., have elevated pedestrian and bicycle LOS to the level of that for automobiles. We have a long way to go, but the door is opening.

Creating balanced standards for roadway design will benefit transportation as well. In the Netherlands, the “Livable Streets” policy led to a remarkable improvement in safety on their roadways. They started in the 1970s with a crash rate 15 percent higher than in the U.S., and now have a crash rate 60 percent lower.

Design with the community in mind

It’s time for communities and transportation professionals alike to accept that we have been using the wrong tools for the wrong job. LOS and travel modeling may be effective when sizing and locating high-speed freeways, but are totally inappropriate in every other setting. If travel modeling with high rates of growth is used to make street decisions, your community may be doomed to a series of roadway widenings or intersection expansions. If vehicular LOS C or D performance measures are adopted as non-negotiable targets, major road construction will be heading your way.

Village, suburban and city streets need to be designed with the community in mind using the PPS principle of Streets as Places to create a vision for a great community and then plan your streets to support that vision.

Lets not be fooled by the appearance of science behind Levels of Service and Traffic Modeling. As I pointed out in an interview with Wayne Senville that was published in the November 2010 “Planning Commissioner’s Journal,” LOS standards are easy to understand — and that’s exactly what makes them so dangerous.

Appendix C: Additional Visualizations From Los Angeles County Model Design Manual for Living Streets

Series 1: **Existing**

Proposed Step 1

Proposed Step 2

Proposed Step 3

Series 2: **Existing**

Proposed

Series 3: **Existing**

Proposed

Series 4: **Existing**

Proposed

Appendix D: Downtown Streets: Are We Strangling Ourselves on One-Way Networks?

Downtown Streets: *Are We Strangling Ourselves on One-Way Networks?*

G. WADE WALKER
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33 East Pine Street
Orlando, FL 32801

ABSTRACT

As many communities are in the process of revitalizing their downtowns, a common issue is the prevalence of intricate and often confusing one-way street networks. This paper provides a comparison of one-way versus two-way street systems for downtowns and presents an evaluation methodology for considering two-way conversion. The analysis gives equal weight to all modes of travel and includes the non-regular visitor to downtown. Motorist analysis factors include mobility, vehicle miles of travel (VMT), number of turning movements, travel time, vehicle capacity, and parking supply. Pedestrian factors analyzed are number and severity of pedestrian/vehicle crossing conflicts. Direction and symmetry of routes comprise the transit analysis factors, and retail factors measure the visibility of street front locations.

INTRODUCTION

Ever since the explosion of automobile use that occurred after WWII, people have moved their residences further and further from downtown centers, out into new suburban communities. With this exodus came a daily travel ritual in which suburbanites in motor vehicles behave as tides do, placing a tremendous strain on the downtown street network. The historical response to this strain has been to improve the efficiency of moving vehicles into and out of the city at all costs, without considering other system users.

We now understand that downtowns that operate predominantly as a place of work and clear out in the evening are the ones most often struggling to foster new development and business ventures. The longstanding mantra to seek the greatest speed by which commuter motorists can flee the city has accelerated the downtown deterioration process. The sad results are streets congested with fast-moving automobiles and barren of lively pedestrian, cultural, or commercial activity after the mad evening exodus.

As many communities are in the process of revitalizing their downtowns, a common issue is the prevalence of intricate and often confusing one-way street networks. This legacy of one-way streets can be traced back to when the streets' sole mission was to move traffic into and out of the downtown employment center as quickly as possible. An emerging role of downtown as a cultural and entertainment center is now challenging the

embedded mindset that the primary purpose of streets is the unequivocal movement of commuter automobile traffic.

HOW WE GOT HERE: A BRIEF HISTORY OF ONE-WAY NETWORKS

One-way streets in downtowns were not an overnight occurrence; rather, their proliferation was the result of a series of events that occurred over a number of years. The development of one-way downtown networks can be traced through four very distinct periods of evolution.

The *Pre-Freeway Era* encompasses the time from prior to the development of the automobile to just after the conclusion of World War II. Cities were at the height of their development, and downtowns not only served as the seat of the local governments, but were also the hub of all social, civic, and cultural activity within the surrounding region. Downtown streets were home to not only motor vehicles, but also streetcars, trolleys, buses, and most importantly, people. Movement of each of these travel modes was equally balanced, with cars and pedestrians coexisting peacefully in a controlled, slow-speed environment. Retail business activity was at an all-time high, with most goods and services available in the core of the downtown.

It is important to note that during this era most downtown workers did not commute great distances; rather, most lived within 2 to 5 miles of their downtown jobs. Suburbs had not yet been invented, as the transportation facilities of the day did not support long commute distances. However, all this was about to change, in the name of progress.

America learned several important lessons during the course of World War II. Perhaps one of the most profound was the example that Nazi Germany provided through its impressive system of limited-access highways, by which expedient movement of troops and goods across the country was possible. With the passage of the Federal Highway Act of 1956, the *Freeway Proliferation Era* had begun.

The construction of the freeways did exactly many benefits for commerce; however, it also opened the door for downtown workers to move farther from their place of work. As downtown workers began to seek out less expensive, more desirable housing in the suburbs, the mode balance on downtown roadways that had been prevalent for many years began to shift toward facilitating the speedy entrance and exodus of commuters. Downtown streets began to be converted to one-way travel to facilitate this expedient movement into the city in the morning and out in the afternoon.

As downtown workers continued the flight to the suburbs, providers of goods and services soon followed. Small downtown shops were recreated in the suburbs as regional shopping malls, supermarkets, and discount stores. Workers no longer patronized the small shops downtown since they could fill their needs closer to home, often at lower prices. Many of the small, family-owned businesses that had been located downtown for years either moved to the suburbs with their market or succumbed to closure as the market dwindled.

This *Post-Freeway Era* reached its peak in the 1980s, when even traditional downtown corporate offices sought out the cheaper land in the suburbs. Many formerly strong downtowns were reduced to blighted, empty streets and boarded-up storefronts, devoid of life after 6 pm.

Downtowns have seen a resurgence, beginning in the 1990s, as communities began to rediscover the attraction of the downtown as a location. Most downtowns never lost the designation of the cultural and governmental hub of their community; however, the ability of the downtowns to adapt to a new role as entertainment centers has aided in their comeback during this, the *Reemerging Era*.

Many people are returning to downtowns as residents and workers now seek to escape the outlying suburbs and offi ce parks. Since most suburban developments rely on one or two major arterial roadways, the traffi c impacts associated with these areas have become much worse than ever imagined in the downtown, with its well-defi ned street network grid. As people return to downtown, there has been a plea for a rebalancing of downtown roadways, to make them safer and friendlier again for all modes of travel. It is in this context that many cities are contemplating the conversion of one-way streets to two-way travel.

CONFLICTING OPINIONS

The return of one-way downtown street networks to two-way travel is a relatively new phenomenon associated with downtown revitalizations. Opinions about the feasibility of two-way conversions vary widely, according to the interest group polled. Three of the most prevalent groups in communities that are investigating the possibility of two-way conversion are discussed in the following paragraphs.

A Traffi c Engineer's Perspective

For many years, traffi c engineers were mandated to " move as much traffi c as possible, as quickly as possible," often resulting in degradation of movement for other modes of travel. The unequivocal movement of the motor vehicle through a downtown network was of paramount concern; all other modes of travel took a back seat. Effectiveness of the network was measured by the amount of delay a motorist would encounter on a given street segment or intersection during either the morning or afternoon peak hours.

Given this context, one-way streets do make sense; the *Transportation and Traffi c Engineering Handbook* reports that the conversion to two-way operation generally increases capacity by about 10 to 20 percent. The case is also often made that one-way streets help facilitate good signal progression through a downtown network. One-way streets also offer the opportunity to control their traffi c fl ow at signalized intersection approaches by a single signal phase, freeing up green time for intersecting street movements. One-way streets also have fewer confl icting turning movements at their intersections, reducing the chance for a through vehicle to encounter a turning vehicle. Finally, curbside activity such as service vehicle loading and unloading is less disruptive to the traffi c fl ow on a one-way street, where only one travel lane is usually blocked by this activity.

In traffi c engineering circles, however, the operational disadvantages associated with one-way streets are becoming increasingly recognized. The system often forces drivers to follow out-of-direction routes to their destinations, causing an increase in both the number of turning movements required and vehicle miles of travel (VMT). The direct result of this recirculation is an increase in traffi c volumes on a given segment or intersection within a one-way system, with a corresponding degradation in air quality within the downtown.

Signal progression can often be maintained on two-way streets to favor the peak direction movement during the morning and afternoon peak hours with minimal effect on through-vehicle delay or the capacity of the network.

The User's Perspective

Another group with a vested interest in what happens to downtown one-way street networks is the users of those facilities. Users can be grouped into three general categories: the motorist, the transit rider, and the pedestrian. Each group views the street network in a different way, as discussed below.

Motorists

Motorists use the street network as a means for navigating the downtown to get to their destination. In most cases, a downtown motorist's destination is someplace to park the car, namely a garage, lot, or on-street parking space; upon parking, the motorist leaves the vehicle as a pedestrian to access the fi nal destination. It is well known that people attempt to park as close to their ultimate destination as possible, in an effort to minimize walking distance.

One-way streets do not pose a major inconvenience for commuters and regular visitors to the downtown; these motorists have learned the downtown network and know the " best route" to their destination. Rather, it is the occasional visitors to downtown who are often confused and disoriented on encountering a one-way street network. Often, these motorists are able to see their destination but are shunted away from it by the one-way streets. But these occasional users are in fact the customers that revitalized downtowns are trying to attract. If circulation in the downtown can be made easier by converting one-way streets, people in this target market segment may be better pleased with their overall downtown experience and become more regular downtown patrons.

Transit Patrons

A one-way street network exacts a similar toll on the downtown transit system and its users. In a one-way network, stops on the same route for opposite directions are forced to be located on two different streets. Again, the most affected users are the occasional downtown visitors, who are not familiar with the system. For instance, a visitor who is dropped off at a stop downtown on a one-way street may not realize that the transit stop for his return trip is actually located one block away on a different street. Regular transit users can even become victims of this system in sections of downtown with which they are not familiar. In a two-way system, transit stops for a particular route can be located across the street from each other, eliminating this confusing situation.

Pedestrians

As stated previously, at some point every downtown visitor becomes a pedestrian. Whether one arrives by private vehicle, taxi, or rail or bus transit, it becomes necessary at

some time to navigate the street system on foot. One-way streets present challenges to the pedestrian due to the speed and direction of adjacent vehicular traffi c and pedestrian expectations at intersections.

On a two-way street, pedestrians always have the choice of walking facing the oncoming traffi c or with their backs to it. This choice does not exist on a one-way street, where pedestrians moving in the same direction of the vehicular traffi c will always have adjacent traffi c coming behind them regardless of which side of the street they choose to walk on.

At intersections of two streets that are each two way, pedestrians have an expectation of potential vehicular conflicts with their path as they cross the intersection. This sequence reverses itself for the opposite movement across the intersection, for a total of two confl ict sequences that the pedestrian should expect. When a one-way street is included in the intersection, the number of potential conflict sequences increases dramatically. This phenomenon will be discussed in greater detail in the evaluation section of this paper. Suffice it to say, a pedestrian who is crossing an intersection of one-way streets must pay particular attention to the direction of both through and turning traffi c to avoid a confl ict.

It is also important to remember that a one-way street system always has a greater magnitude of vehicle turning movements compared to a two-way system. Any turning movement, regardless of street confi guration as one- or two-way, creates *exactly* the same potential for vehicle/pedestrian confl ict, namely, one legally turning vehicle crossing the path of one legally crossing pedestrian. Thus, aside from the complexity of confl ict sequences, there are simply more (typically 30–40%) vehicle/pedestrian confl icts within a one-way street network than in a comparable two-way system.

Downtown Community Perspective

Much attention recently has been given to downtown vitality and redevelopment efforts. One-way street conversions to two-way are part of a much bigger effort to make downtowns more livable and economically successful. City leaders, both political and business, are becoming increasingly concerned with the quality of the outdoor environment experienced by downtown visitors.

Some national chains are beginning to develop downtown locations, with an emphasis on service industries such as offi ce supplies, bookstores, and coffeehouses. In our experience, most of these retailers prefer the exposure and accessibility offered by a location on a two-way street. This fact is supported by examples such as Vine Street in Cincinnati, where 40% of businesses in this economically depressed downtown corridor closed after the street was converted from two-way to one-way.

As retail and entertainment activities begin to increase downtown, cities today are experiencing an infl ux of new downtown residents not seen in decades. Young professionals with no children, looking for an urban lifestyle, as well as "empty-nesters" who are tired of the big house and yard (with a corresponding big commute) are beginning to return to the housing areas within and immediately adjacent to downtown. For these people, livability is of paramount importance. As shown in Figure 1, large gains in overall livability can often be accomplished while exacting only a slight increase in vehicular delay.

The cost of living in downtown neighborhoods is relatively high compared to suburban neighborhoods. Downtown residents expect the high cost of living to be offset

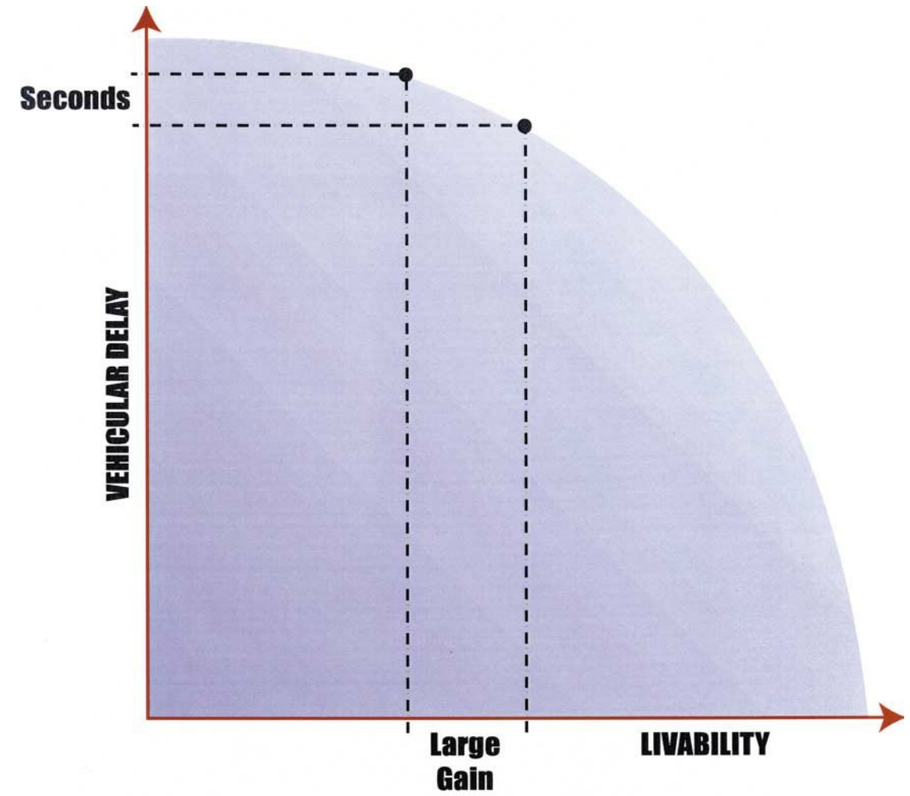

FIGURE 1 Livability index.

by better services, close proximity to public facilities such as parks, walkable streets, and being close to the center of activity. Being able to walk to these attractions is very important to urban residents.

A high level of auto accessibility in a downtown is more important to urban residents than access to regional roadways. By requiring less out-of-direction travel and fewer turning movements, a two-way street network is better for short trips to local establishments than a one-way street network. Livable streets benefi t all users of a downtown whether they are using transit, an automobile or walking.

ONE-WAY VERSUS TWO-WAY: EVALUATION MEASURES

In order to effectively evaluate the impacts and benefi ts of converting a given one-way street network to two-way travel, it is proposed that a combination of evaluation measures be used. As summarized in Figure 2, these measures include traditional travel service impacts such as capacity and vehicular delay, but also take into account livability issues within the downtown street network such as transit routing, pedestrian mobility

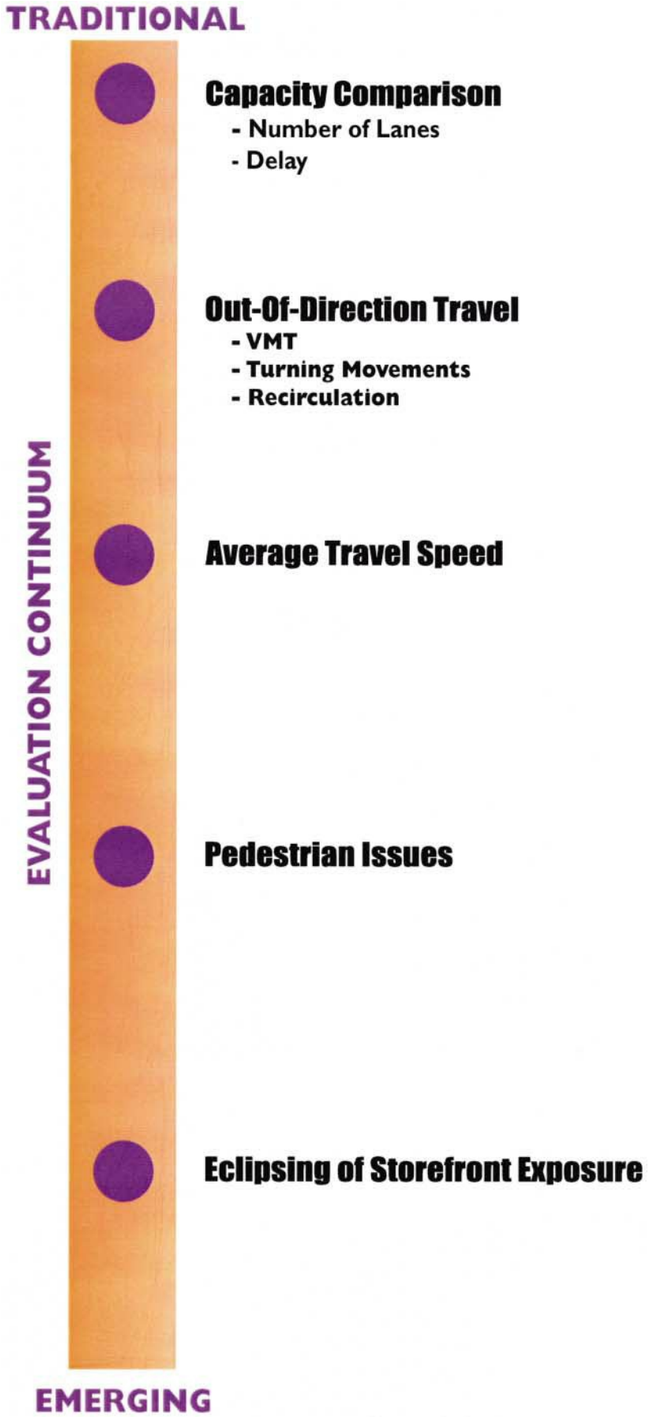

FIGURE 2 One-way vs. two-way measures of effectiveness.

and safety, and retail business street exposure. These measures are defi ned in detail within this section.

Network Capacity Comparison

The fi rst evaluation measure is a comparison of the total east-west and north-south street capacity for both the existing one-way and proposed two-way travel conditions. To make this comparison, traffi c counts on the street segments must be obtained for the a.m. and p.m. peak hours. These existing volumes must then be reassigned on the converted network to allow for the redistribution of traffi c that will occur when the one-way restriction on certain streets is lifted. This reassignment can be accomplished through the use of a manual reassignment for small street networks or by using a traffi c modeling software package for more detailed networks. Once a set of traffi c volumes has been established for both the one-way and two-way scenarios, screenlines can be established to account for all of the east-west and north-south lane capacity through the network. Capacity volume thresholds can then be established for the desired level-of service on the streets contained in the screenline. Since it is acknowledged that a one-way lane does have a slightly greater capacity that a corresponding two-way street, a 10–20 percent reduction in lane capacity is taken for the two-way facilities. Volume-to-capacity ratios (v/c) can then be established for each of the facilities along the screenline in both a one-way and two-way confi guration. Aggregated v/c' s can be obtained by summing the volumes and capacities for each travel direction, giving an indication of the total available system capacity in both the east-west and north-south travel corridors. An example of this application as used in New Haven, Connecticut, is illustrated in Figure 3.

Most downtowns have a well-developed street grid; this abundance of alternate routes is the inherent advantage that downtowns have over their competitors, suburban office and retail parks, where all traffic is generally forced onto the one or two available arterials. This corridor capacity approach assumes that as one facility begins to approach its capacity, some traffic will divert to other parallel, less-used facilities. This diversion begins to animate some of the downtown roadways that were previously forgotten in the one-way system, making them more visible and attractive for redevelopment.

Out-of-Direction Travel

As stated previously, one of the inherent disadvantages with one-way streets is that they force additional turning movements at the intersections caused by motorists who must travel "out-of-direction" to reach their destination. These additional turning movements increase the chance of a vehicular-pedestrian confl ict at any given intersection, and also result in a systemwide increase in VMT over a comparable two-way system due to the amount of recirculating traffi c.

The magnitude of these measures can be quickly estimated using the following approach. By choosing several downtown "portals," typically used entry and exit points from the downtown street network, and several major downtown "destinations," usually a high concentration of parking, supply, or offi ce use, vehicular paths can be traced from origin to destination and back assuming both a one-way and two-way street network. This

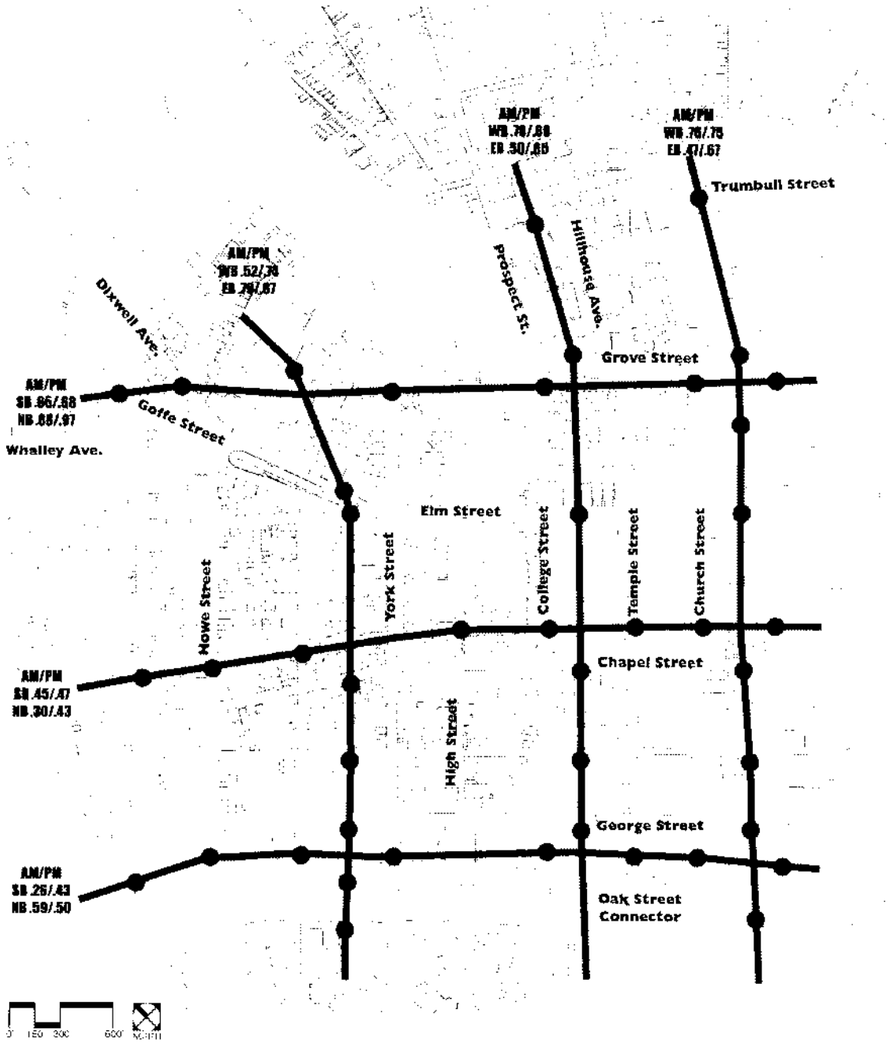

FIGURE 3 Screen lines and traffi c volumes New Haven, Conn. (proposed).

method will give a comparison of the number of turning movements and total travel distance for each street confi guration. Our experience shows that a one-way system usually yields approximately 120 to 160% of the turning movements when compared to a two-way system, and the travel distance between portal and destination is usually 20 to 50 percent greater in a one-way street system.

An additional measure of this comparison can be made by simulation modeling of both the one-way and two-way networks with TRAF-NETSIM. The simulation program would yield system VMTs and delays for each case, which could then be compared.

Travel Speed Comparison

It is true that overall average through-travel speeds are lower for a two-way street confi guration than for a one-way system. However, to achieve a rebalancing of the system, it is important to consider *all* users of the downtown street network, not just the through traveler. Slower vehicular speeds are safer for crossing pedestrians, as they allow longer gaps in the traffi c stream for crossing. Additionally, for those travelers with a destination downtown, accessibility and mobility are usually more important than through vehicular delay.

In most downtowns, the delay penalty will be small for the through traveler. For instance, a decrease in average arterial travel speed of fi ve miles per hour over a one-quarter mile segment of network yields an additional three minutes of travel time. This delay incurred by the through traveler must be weighed against the other objectives of the community to determine the acceptability of the impact.

Pedestrian Measures of Effectiveness

Pedestrian measures of effectiveness such as sidewalk capacity and pedestrian LOS will not be covered in this discussion since they do not pertain specifi cally to the one-way versus two-way argument. Concerns for downtown pedestrians with regard to one-way streets center on convenience, safety and the quality of the walking environment.

The convenience to pedestrians is a key element to the livability and vitality of a successful downtown. A prosperous downtown contains many more offerings of goods and services than a blighted one and is therefore far more attractive to the pedestrian.

The conventional wisdom has always assumed that one-way streets were safer and more comfortable for pedestrians to cross than two-way streets. Superfi cially, it would seem that crossing the single direction of traffi c on a one-way street is always preferable to crossing a two-way street.

As is often the case, the conventional wisdom is wrong. In fact, crossing a one-way street presents greater diffi culties to the pedestrian than crossing a two-way street. The explanation lies in the greater number of different vehicle/pedestrian confl ict sequences (hereinafter "confl ict sequences") that are encountered in crossing the one-way street. Any given confl ict sequence consists of: (1) the kind of turning movement that the vehicle is engaged in, (2) the direction (left-to-right or vice versa) in which the vehicle path intersects with the pedestrians and (3) the location of the vehicle with respect to the pedestrian's fi eld of view, at the beginning of the vehicle movement. Figure 4 illustrates the confl ict sequences for both one-way and two-way intersections.

There are only two possible sequences (sequences #1 and #2 in diagram) that pedestrians can encounter in crossing a two-way street. Regardless of what leg of the intersection they cross, they will never encounter other than these two conflict sequences. Further, these two sequences are closely related, essentially the mirror image of each other.

On one-way streets, by contrast, there are 16 different confl ict sequences that pedestrians can encounter, depending upon which leg of the intersection they are crossing. Further, these sequences vary widely in their component parts. For example, some sequences have only a single confl ict, while others have two or even three. Further, the

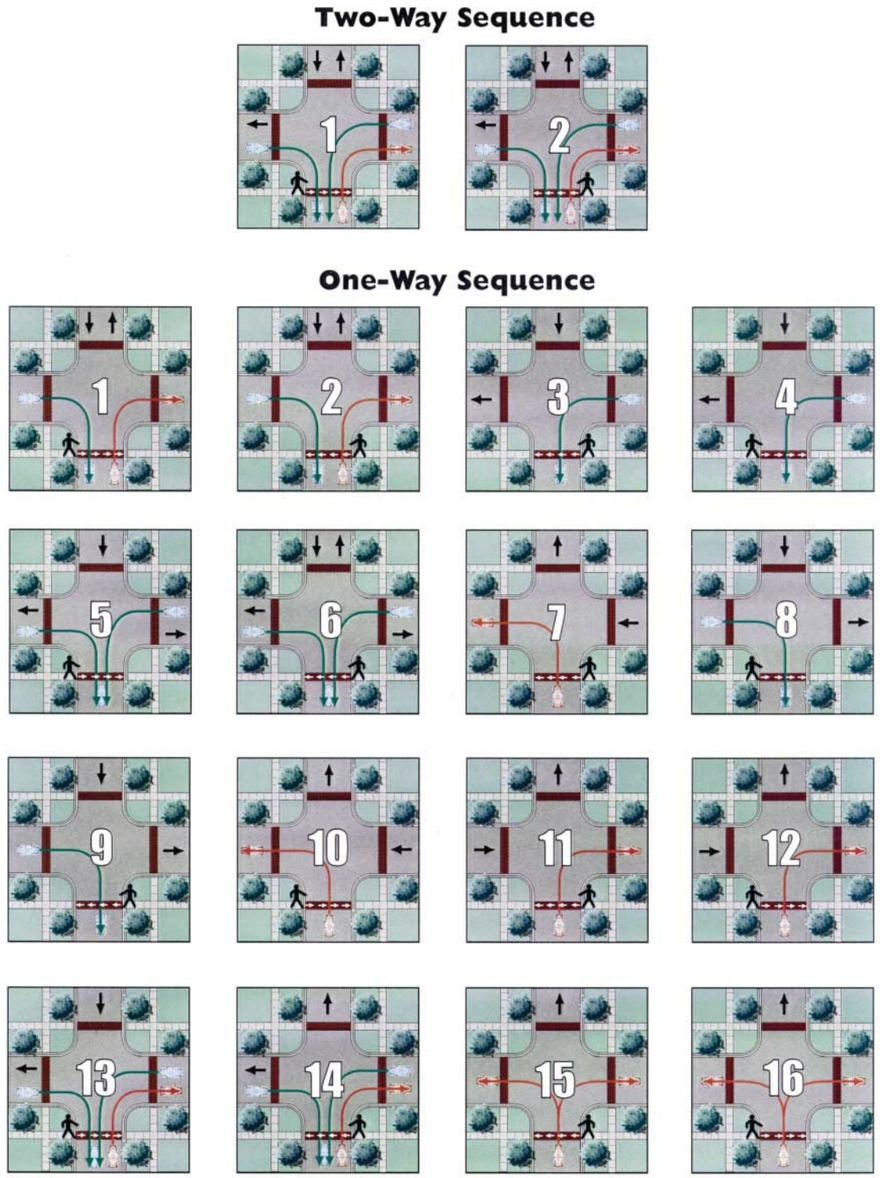

FIGURE 4 Sequence of conflicts created by one-way streets.

sequences involve a wide variety of directions of vehicle fl ow and pedestrian views of the vehicle. The conventional view of the safety of one-way street crossing usually focuses on crossing the upstream leg of the intersection, in which only a single turning movement is encountered (sequence #11 and #12 in the diagram). However, this situation comprises only 2 of the 16 possible confl ict sequences. The complexity and variety of the other 14 are typically overlooked when discussing the merits of one-way streets.

Eclipsing of Storefront Exposure

One-way streets have a negative impact on storefront exposure for those businesses highly dependent on pass-by traffic. As a vehicle stops at or enters an intersection the driver has excellent visibility of the storefronts on the far side of the cross street. On one-way street networks, precious storefront exposure is lost when one direction of travel is removed, causing one side of every cross street to be partially "eclipsed" from view, as illustrated in Figure 5. "Eclipsing" occurs on cross-street storefronts along the

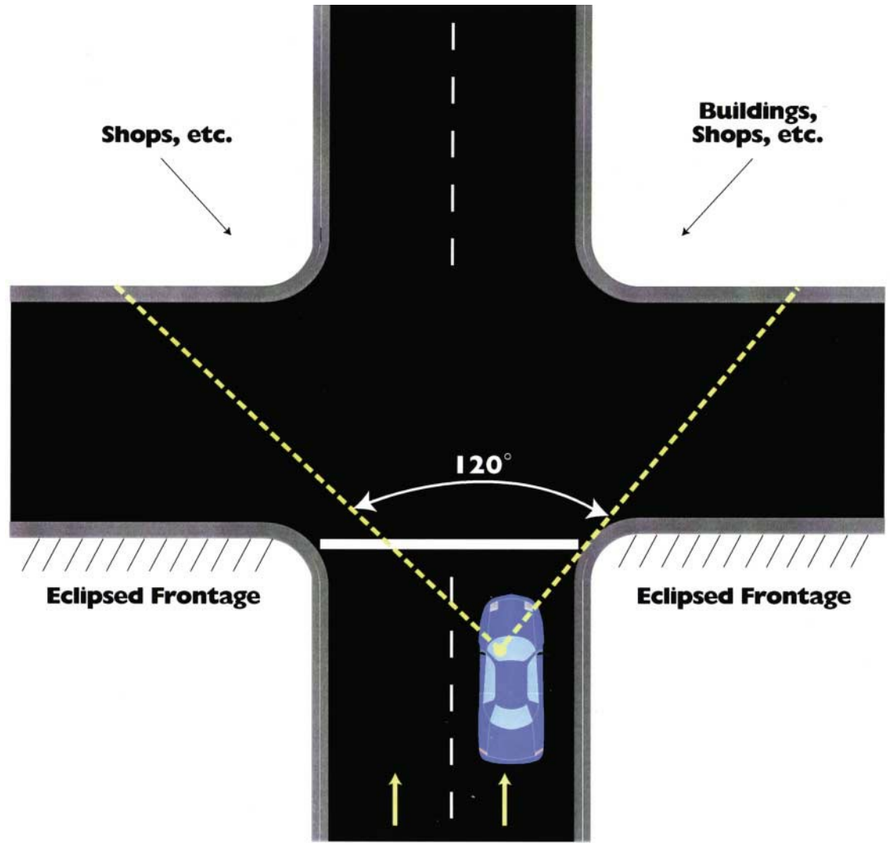

FIGURE 5 Retail eclipsing a diagrammatic summary.

nearside of the intersection relative to the direction of travel, and where downtown street networks contain many one-ways the accumulated negative impacts are significant. A methodology was developed to calculate the loss of exposure to first floor commercial property.

The quantity of eclipsed store frontage is a function of the quantity of one-way street approaches in the intersection, block perimeter size, building setback and street width.

As block perimeter size increases, assuming the store frontage eclipsed remains relatively constant, the percentage of impacted property decreases. The opposite is true when block perimeters decrease, exacting an unfair disadvantage to the downtown with a superior small-block size street grid. Building setback and street width combine to determine the storefront footage visible across the street from the corner to the range of sight limited by the glancing angle. The greater the sum distance from building setback to building setback on the cross street, the more the store frontage eclipsed. An application of the eclipsed frontage analysis is shown in Figure 6.

Once the evaluation measures have been quantified using the presented methodology, they can be summarized in a matrix similar to the one presented in Figure 7. In this way, a clear comparison is readily available for review by all interested parties.

GETTING IT DONE: NEXT STEPS

By carefully evaluating the results of an analysis using the methodology described above, a community can make a better-informed decision about converting one-way streets to two-way travel. Decision makers can weigh these quantitative criteria against the vision and goals a community has for its downtown and determine if the through-traffi c impacts are acceptable in gaining livability within the downtown. Once the decision is made to convert to two-way networks, several implementation strategies are available to make the transition as simple and cost-effective as possible.

Figure 8 graphically depicts fi ve options that can be used to implement a systemwide downtown network conversion from one-way to two-way streets. The strategies allow communities to undertake as much or as little conversion as they desire in each phase and provide a systematic approach to deal with specifi c fi nancial concerns or skeptics. As can be seen from Figure 9, a conversion plan as dramatic and far-reaching as the one recommended for New Haven, Connecticut, can entail signifi cant costs and time and is therefore a candidate for phasing.

Many communities are in the process of converting their one-way streets to two-way networks. Table 1 summarizes some of those communities as well as where they are in the process.

In conclusion, it is important to note that converting the street network from one-way to two-way will not by itself guarantee an immediate resurgence of growth and activity downtown. Most communities have come to this recommendation as a part of a greater vision or urban design plan for their downtown. The conversion of one-way streets is most often accompanied by other initiatives designed to attract additional downtown development or redevelopment and make downtown a more livable community.

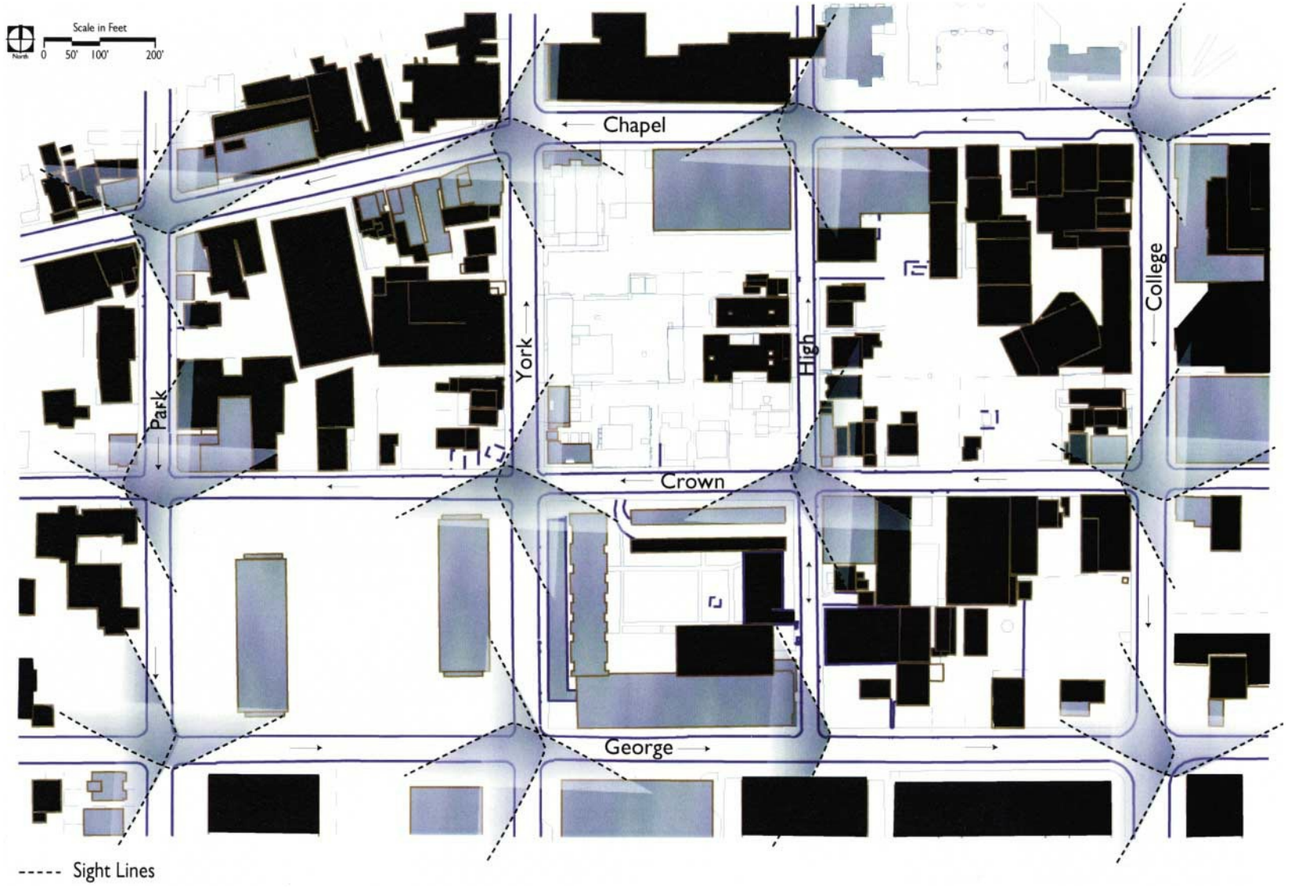

FIGURE 6 Retail/commercial properties eclipsed by one-way streets, New Haven, Conn.

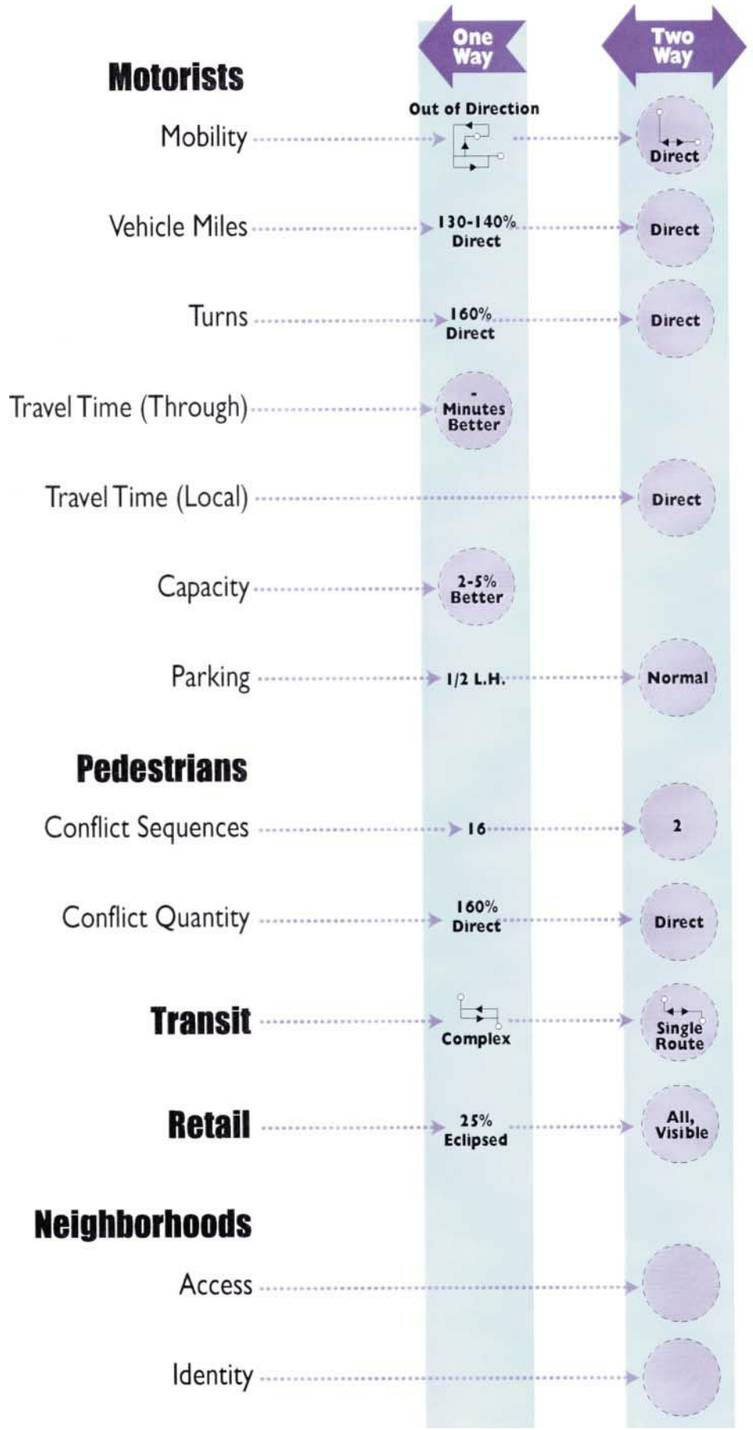

FIGURE 7 Sample evaluation matrix.

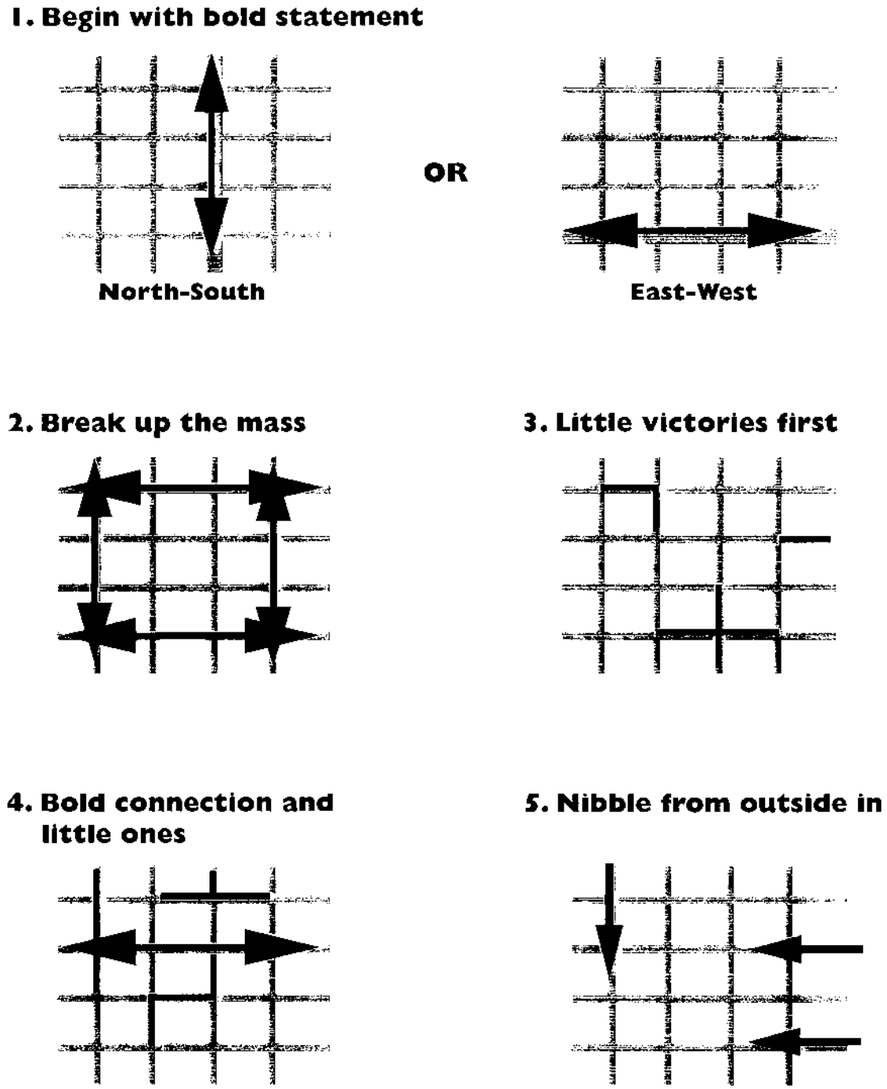

FIGURE 8 Strategies for restoring " two-ways" .

ACKNOWLEDGMENTS

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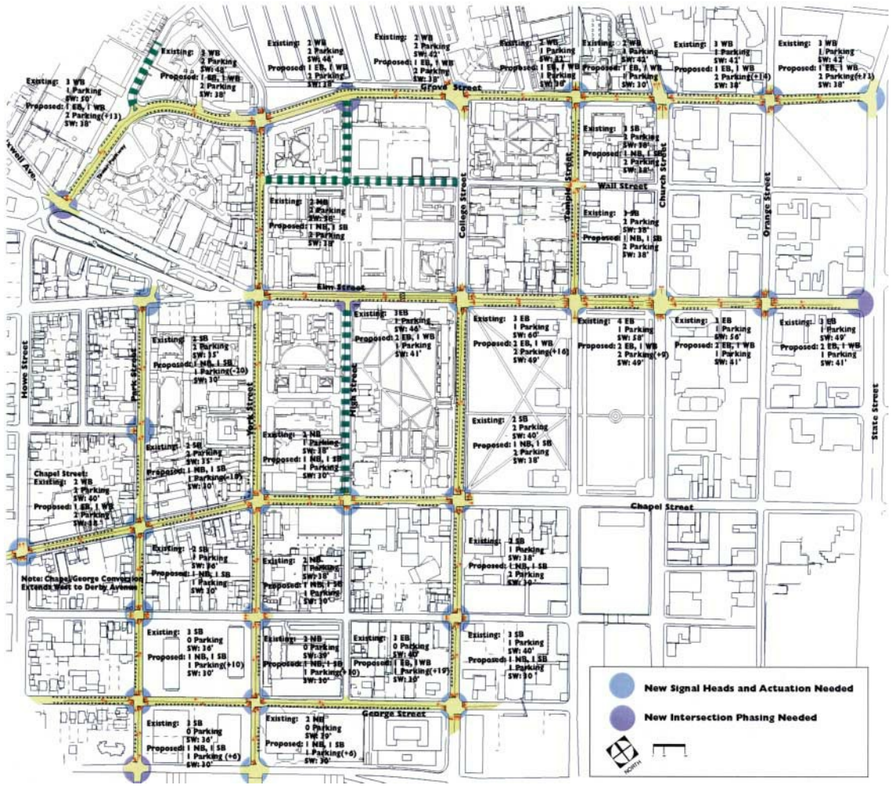

FIGURE 9 Sample conversion plan - New Haven, Conn.

TABLE 1 Communities Undertaking One-Way Conversions

City of	*Chief Supporters*	*Reasons for Conversion in*	*Current Stage*	*Primary*
Albuquerque, NM	City transit system and council	Create a pedestrian-friendly environment near a new intermodal facility and	City council will approve conversion this	Robert Dourte, Transportation
Berkeley, CA		Accommodate buses and bikes and reduce neighborhood	Final draft of conversion plan now in	Charles Deleuw, Traffic Engineering, (510) 644-
Cincinnati,	Local business community (Over-The-Rhine Chamber	Calming traffic and attract new neighborhood	A city council resolution has called for	Judith Osbourne, Over the Rhine Chamber of Commerce, (513)
Edmonton,	Business community activity	Increasing retail	A majority of one-way streets to be	Frank Perich, Transportation and
Norfolk, VA local	Planning office, residents, traffic engineering	Completion of boulevard system surrounding downtown and traffic calming in	Conversion of two streets to be complete	Brian Townsend, Planning,
Toledo, OH	Business and government leaders (Downtown	Create a pedestrian-and	Two streets were converted in 1997, and plans call for the	Joe Moran, Downtown ToledoVision, (419) 244-
Waukesha,	Traffic engineering department/ business	There is no longer a need for a	Several streets have been converted, and more on an ad hoc	Don Martinson, Southeastern WI Regional Planning

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