Appendix 10.1

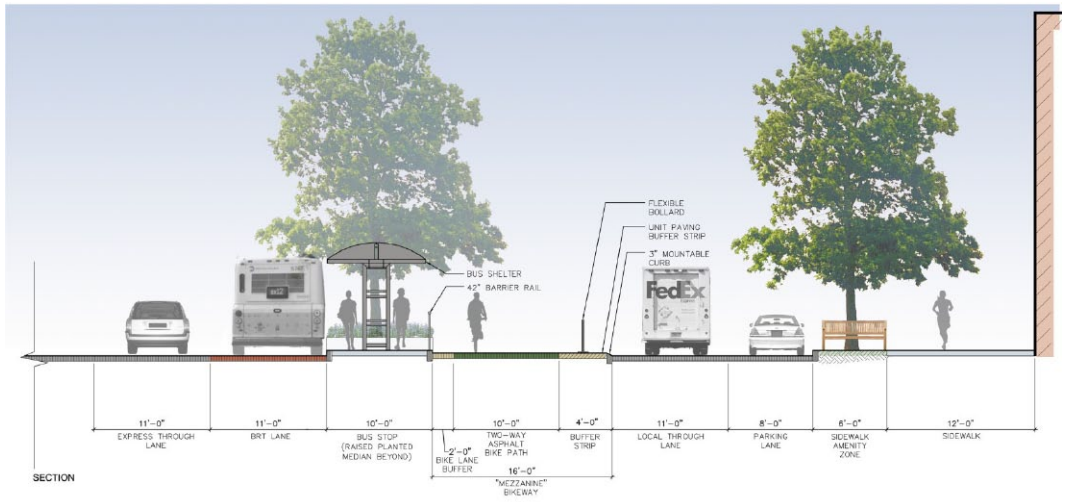
Urban Design Principles and Guidelines

Appendix 10.1

Urban Design Principles and Guidelines

FOR

The Route 440 and Routes 1&9T bouleva rd and Complete Street in Jersey City



ROUTE 440
BOULEVARD CONCEPT
BUS STOP SECTION DETAIL

May 2011

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ACKNOWLEDGEMENTS

City of Jersey City

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These Design Guidelines were prepared as a companion to the Jersey City Route 440/Routes 1 & 9T Multi-Use Urban Boulevard and Through Truck Diversion Concept Development Study prepared by Jacobs Engineering Corporation for the City of Jersey City, NJ.

The Design Guidelines provide principles and concepts that will guide the transformation of Route 440 and Routes 1 & 9T into an attractive gateway into Jersey City and a vital boulevard that accommodates all users of the roadway including through and local vehicles, pedestrians, transit riders and bicyclists.

Prepared by The RBA Group, Jacobs Engineering and the City of Jersey City.

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TABLE OF CONTENTS

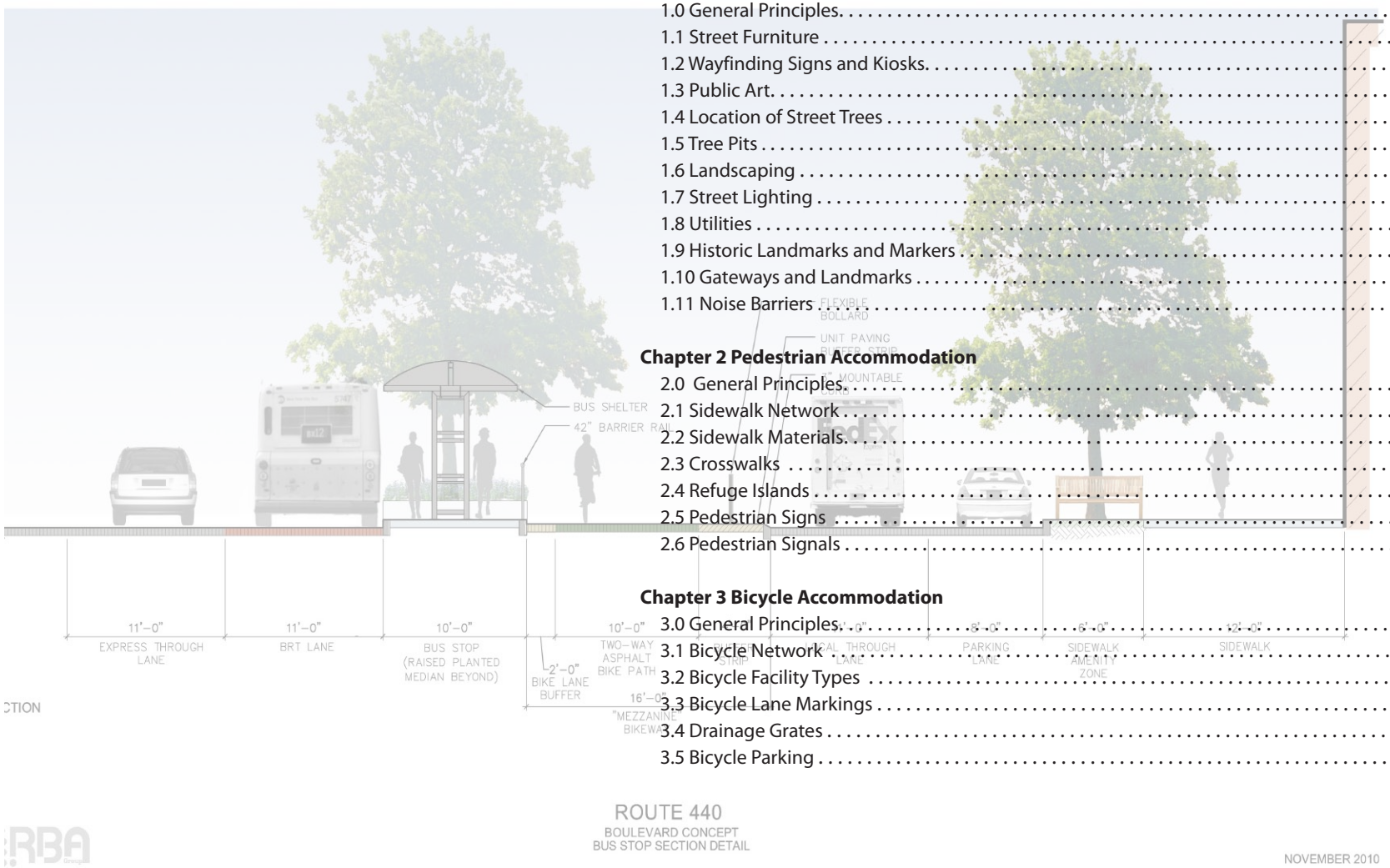
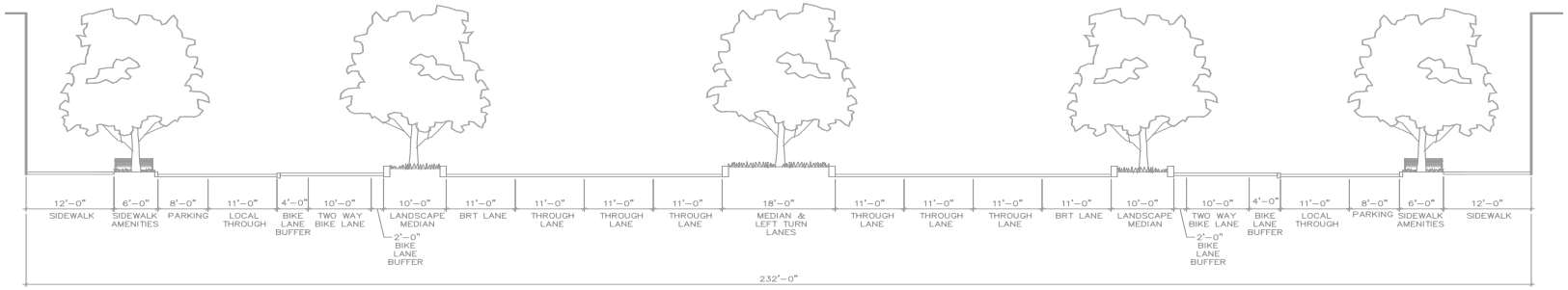


TABLE OF CONTENTS



SECTION

The Project Area

The Route 440/Routes 1&9T corridor to be reconstructed as a multi-use urban boulevard is a north-south land service facility within the Western Waterfront of the City of Jersey City. The Route 440 / Routes 1&9T corridor in Jersey City extends approximately 3.4 miles through the length of Jersey City's Western Waterfront from its northern intersection with NJ Route 7 to the border with the City of Bayonne. Within Bayonne, the corridor extends an additional 0.5 miles southward along Route 440 to Richard A. Rutkowski Park. The corridor is not homogeneous along its length; the existing character of the corridor varies greatly, and there is much variation in the vision and plans for different sections of the corridor. Additionally, various constraints, both physical and environmental, exist and are unique to specific portions of the corridor. Accordingly, the configuration of the Locally Preferred Alternative (LPA) improvements vary along the length of the corridor and consist of seven distinct sections.

Future Growth in Jersey City and the Route 440 Corridor

The 2009 Circulation Element of the Jersey City Master Plan provides a blueprint vision for Jersey City through the year 2050 that sets the stage for the next four decades of growth and development. The Circulation Element anticipates the creation of over 80,000 additional residential dwelling units and nearly 10 million square feet of new commercial office and retail space by the year 2050. It also articulates the links between growth, the anticipated changes in neighborhoods and city character, and local and regional transportation needs. While extensive growth is anticipated citywide, nearly 25 percent of the residential growth and extensive commercial and institutional growth is expected to be located in the Western Waterfront area of Jersey City along the Route 440/Routes 1 & 9T corridor. The Circulation Element anticipates the following six major growth areas within the Western Waterfront, as follows:

- **Bayfront**
- **K-mart Site**
- **Hudson Mall**
- **Route 440 Northeast**
- **Route 440 Southeast**
- **Hackensack River Edge**

In its current configuration and function, the Route 440/Routes 1&9T corridor is incapable of safely and efficiently accommodating the future travel demands that will be placed upon it by ongoing and anticipated redevelopment and growth. The corridor is characterized by a number of existing geometric and operational features and deficiencies, including depressed curbs and limited control of adjacent parking, overhead utilities, lack of bicycle and pedestrian facilities, heavy truck traffic, obstructed or non-existent sidewalks, and lack of safe bicycle and pedestrian crossings. Without appropriate and sufficient infrastructure to accommodate all users, traffic congestion and other constraints to mobility caused by the physical characteristics of the highway will negatively impact the quality of life for residents, workers, and visitors, and will deter continuing redevelopment activity. Key components of the planned corridor improvements include extension of the Hudson Bergen Light Rail (HBLR) to the west side of Route 440, Bus Rapid Transit (BRT) facilities and service, and bicycle and pedestrian facilities. These features are critical to achieving the low auto-utilization rates that are anticipated by the Concept Development study modeling. Construction of the multi-modal infrastructure is a necessary pre-condition to achieving the scale of development that is anticipated by the Circulation Element of the Master Plan.

"A Boulevard and Complete Street for Route 440 and Routes 1&9T in Jersey City"

Tree-lined public space
(Photo: Flickr.com / nautical2k - Josh Jackson)

A boulevard designed for multiple users
(Photo: NYCBikeMaps.com)

The vision for Route 440 and Routes 1&9T in Jersey City is to transform a single-use highway corridor into a multi-use facility that efficiently accommodates through movements of motor vehicles, and also creates a traffic calmed yet vibrant, attractive,tree-lined "Main Street" with shops and restaurants, as well as public space for people to travel, socialize, and recreate. Where streets were once the center of public life, public policies in the latter half of the twentieth century relegated these public corridors solely to the efficient movement of vehicular traffic. Amenities such as sidewalks, benches, and pedestrian-scale lighting—as well as aesthetic considerations for a sense of place—were removed from typical street designs. Additionally, the never-ending downward spiral of road widening, induced traffic and congestion, and more road widening, simply results in increases in traffic congestion and has negative impacts to local communities through which they pass. A better approach is to balance the desire to go "through" a place with the desire to go "to" a place. The local context must be considered, and roadways should respect the character of the community and its current and planned land uses. Within the last decade, however, the old policies are being reversed. With Smart Growth and Complete Streets policies in place, communities are now taking back their streets and populating them with the vibrant sounds, movement, and passages of human life.

The inspiration for the Route 440 and Routes 1&9T Boulevard and Complete Street comes from the great streets of the world that meld mobility and community life. The success of transforming Route 440 and Routes 1&9T will involve attention to details, provisions for multiple users, and a comprehensive plan and unified theme to direct the ultimate build-out of the corridor.

The Jersey City Route 440/Routes 1&9T Multi-Use Urban Boulevard and Through Truck Diversion Concept Development Study provides the overall concept plan for the transformation of the roadway. These Design Guidelines are a supplement to the study, providing an overview of the design concepts and examples of material types and styles that are appropriate to the vision of the Locally Preferred Alternative. Additional guidelines and detailed design concepts will be formulated as the concept moves forward.

"What Makes a Great Street?"

Great streets are a prerequisite of a great city. The success of a street is defined by the success of the pedestrian experience.

- Prioritization of pedestrian continuity
- Easy access for all people
- Links to destinations
- Safe and easy crossings
- Sidewalks accommodate pedestrian and consumer activity comfortably
- Multiple transportation options
- An abundance of uses and activities
- Ground floors are welcoming to passers-by
- A mix of restaurants, stores, and services
- A sense of place is conveyed through materials, design and legibility
- Local and cultural identity is apparent
- Good seating, lighting, trees, and other amenities
- Clear signage with local information
- Sociability
- People are inclined to gather
- Sense of pride and ownership
- Presence of children and seniors

A boulevard in Paris
(Photo: Wikimedia Commons / Palagret)

Outdoor dining along the street
(Photo: The RBA Group)

Designing for the Context

The Route 440 and Routes 1&9T boulevard and complete street travels through 3.9 miles of existing, changing and expanding neighborhoods of residential, commercial and industrial uses between Richard A. Rutkowski Park in the City of Bayonne and the intersection with NJ Route 7 / Newark Avenue. The streetscape should be designed to reflect these changing place types and the needs of the immediate neighborhood.

LPA Section A: Waterfront Walkway and Bayonne Connection is the southernmost portion of the corridor, running from the intersection of Mina Drive in Jersey City to the northern edge of Richard A. Rutkowski Park in the City of Bayonne. The future roadway cross section and configuration within this section remains as it exists today, with two travel lanes in each direction separated by a grass median. Improvements along this section consist of new walkway and bike path along the waterfront on the southbound side of the street. The waterfront walkway and bike path include a total of 22-feet of paved area width. Varying paving materials are utilized to delineate ten feet for bicyclists, ten feet for pedestrians and a two-foot wide buffer separating the bicycle and pedestrian use areas. The pedestrian area adjacent to the waters edge includes benches and other amenities installed to create an attractive public space for access and enjoyment of the waterfront.

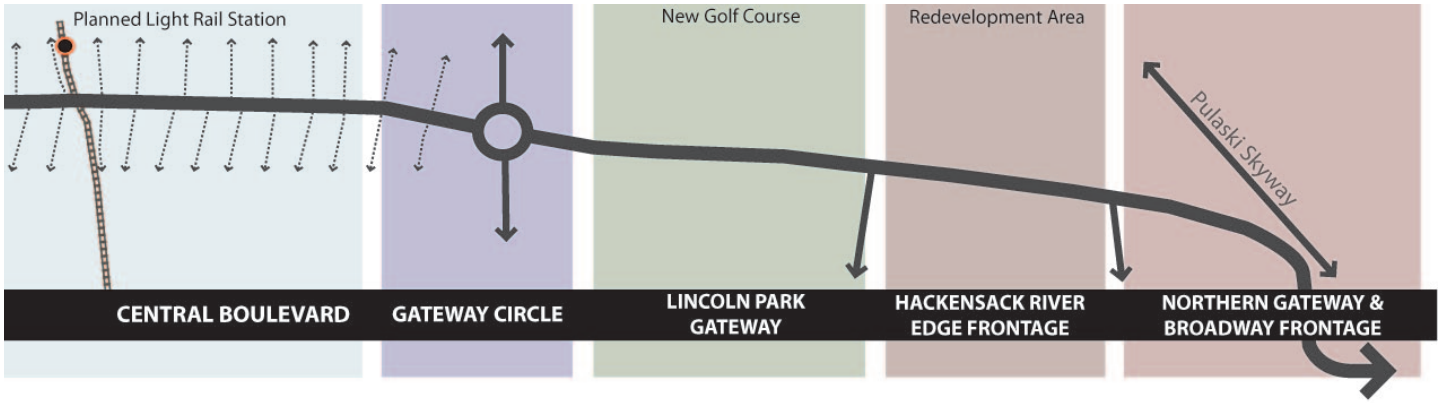
Renderings of the Bayfront Redevelopment Area (A. Nelesson Associates)

Designing for the Context

Section B: Southern Gateway - Country Village Frontage marks the beginning of the transition from the existing roadway configuration to the boulevard and complete street envisioned in the LPA. This section includes Route 440 from a point immediately south of the intersection with Mina Drive to a point midway between the intersections with Suburbia Court and Society Hill Drive. The existing roadway in this section sits within a 102-foot wide right of way. Significant constraints exist along both sides of the roadway limiting the width available to construct improvements. Newark Bay abuts right-of-way along the western side, while an established residential community of one and two family detached homes, called Country Village, abuts the eastern side. These constraints present unique challenges to integrating design features to protect and enhance livability within the existing residential community, while efficiently accommodating traffic flows and providing bicycle and pedestrian connections to the waterfront.

The landscape strips along both sides of the roadway form the Southern Green Corridor Gateway and define the southern entrance to the Western Waterfront. A raised planter separates the southbound roadway from a shared use waterfront esplanade. The raised planter is constructed to a height of 20-inches and planted with trees with a dense canopy and dense mix of shrubs, providing a safety buffer and a visual screen of the roadway from the waterfront esplanade.

A traffic circle can function as both a traffic calming device and a local landmark
(Photo: OLIN Studio)

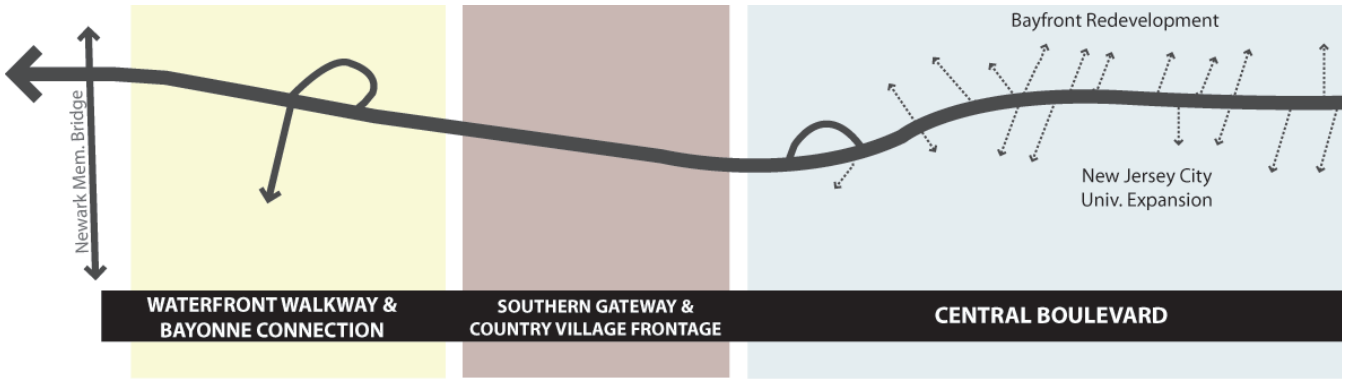


Designing for the Context

LPA Section C: Central Boulevard comprises the corridor from Society Hill Drive to just south of Communipaw Avenue. The majority of the future residential, commercial and institutional development in the Western Waterfront is planned to occur along this section of the corridor. Accordingly, this section of the corridor will experience not only the highest level of transportation demand, but also the greatest variety in the types of demands including through traffic (including heavy trucks traveling through the Western Waterfront), local neighborhood access and circulation, bus rapid transit service, access to public transit facilities, bicycle and pedestrian circulation and on-street parking in support of retail and commercial development. These demands are accommodated in a manner that is sustainable, encourages economic development and supports livability and quality of life.

LPA Section D: Gateway Circle includes perhaps the most unique feature along the corridor. This section generally covers the intersection of Route 440/Routes 1&9T with Lincoln Highway and Communipaw Avenue. As the junction of the two primary roadways in the Western Waterfront, this intersection experiences higher traffic volumes than any other intersection along the corridor. Maintaining efficient traffic flow through this junction is critical to avoiding congestion that could spill back and negatively impact mobility along the entire corridor.

The LPA for this section includes an at-grade signalized intersection to accommodate all through and right turn movements, and an elevated traffic circle above the intersection to accommodate all left turn movements. The center of the traffic circle is filled in to provide approximately 1.6 acres of new public space. The surface of the traffic circle and the public space in the center is approximately twenty five and one-half feet above the surface of the at-grade roadway beneath the circle. This elevation difference is required to provide adequate vertical clearance for trucks to pass beneath the circle vehicles (minimum of 16-feet, 6 inches), five feet placement of traffic signal heads at the at-grade intersection beneath the circle, and approximately four feet for structural elements supporting the public space.



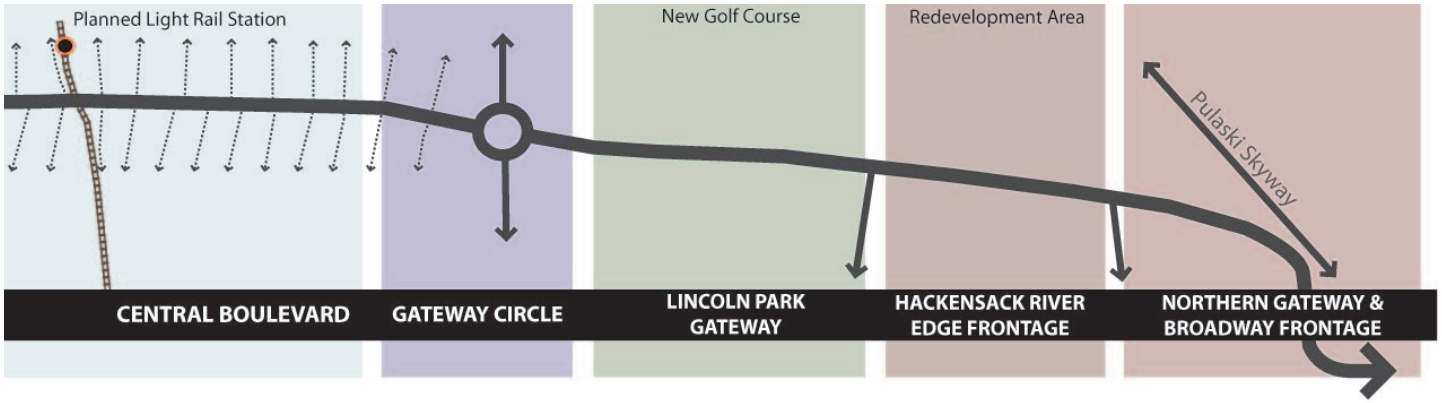
Designing for the Context

LPA Section E: Lincoln Park Gateway extends from just north of the intersection of Route 440/Routes 1&9T with Communipaw Avenue to Duncan Avenue. This is the most dimensionally constrained section along the corridor due to the existence of Lincoln Park, abutting both the northbound and southbound sides of the roadway. Lincoln Park is part of the Hudson County park system. There appears to be case law that says that county parks commission lands may not be conveyed for non-recreational uses. Sidewalks, bike paths and landscaping are deemed to be supportive of and consistent with recreational uses within Lincoln Park, and therefore construction of these features within Lincoln Park is permitted.

The Lincoln Park section has a constrained width of 60 feet. It is therefore not possible to incorporate significant landscaping within the right of way and still maintain the number of lanes necessary to accommodate future roadway traffic demand. However, the western side of the street in this section is already filled with large trees within the Lincoln Park property. The addition of smaller ornamental trees and shrubs interspersed with the existing trees would enhance the aesthetic appeal of this area without interfering with the existing mature trees.

LPA Section F: Hackensack River Edge Frontage abuts the Hackensack River Edge Growth Area, and runs between Duncan Avenue and Sip Avenue. It accommodates through traffic, local traffic, a critical Bus Rapid Transit link between the central boulevard section and the Journal Square Transportation Center, pedestrians and bicyclists. It also provides bicycle and pedestrian linkage between the planned Marion Greenway, Lincoln Park and points south.

This section is constrained along the eastern edge by the Holy Name Cemetery and along the western edge by the planned PJP landfill cap and berm. Potential changes in alignment of the southern end are constrained by Lincoln Park and a retaining wall that is being constructed as part of golf course construction on the south side of Duncan Avenue. Along the western side of the corridor, potential development scenarios may include nearly 900,000 square foot high cube warehouse or approximately 327,000 square feet of big box retail space.

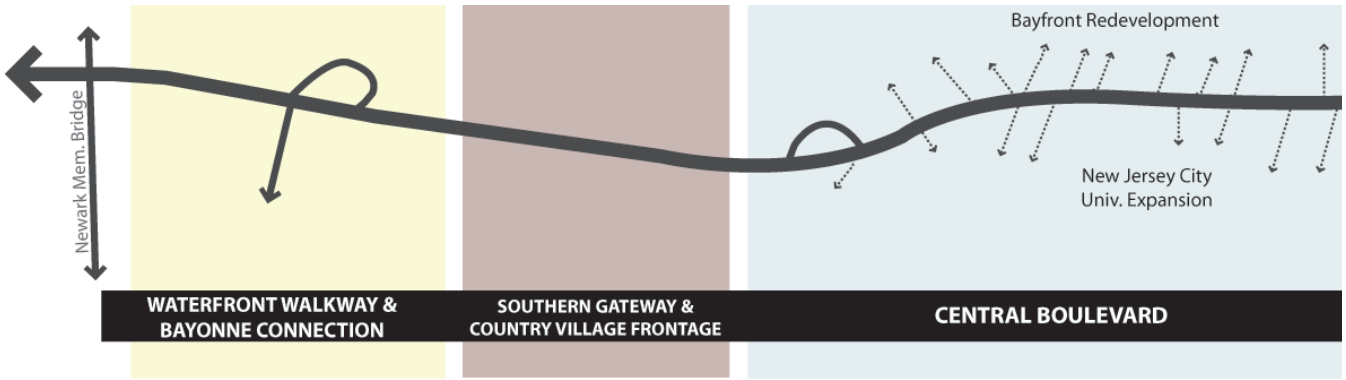


Designing for the Context

LPA Section G: Northern Gateway and Broadway Frontage. The corridor continues northward for a short distance north of Sip Avenue before curving to the east and becoming Broadway. After a short distance, the roadway curves back to the north, passing beneath the Conrail railroad embankment. Immediately upon passing under the embankment, the roadway intersects with NJ Route 7 / Newark Avenue, the northern terminus of the study corridor .

This section posed a number of challenges including constraints presented by the public housing complex along the eastern side of the roadway, tight horizontal curves and the need to maintain access to Broadway west of the corridor which provides access to the Pulaski Skyway. While minimal space is available for extensive widening of the corridor, intersection enhancements, upgrade of the traffic signal system and integration of landscaping, bicycle and pedestrian accommodations will significantly improve the operations and aesthetics of this section of the corridor.

Beyond simply accommodating the future vehicular travel demand, an overarching objective of the *Route 440/Routes 1&9T Multi-Use Urban Boulevard and Through Truck Diversion Study* is the identification of a program of corridor improvements to support the creation of livable communities in the Western Waterfront. A livable community is one in which all of the diverse mobility needs—both transportation and recreational—of the populations that reside in, work in or visit a community are met in a safe, attractive manner, offering a variety of options in modes of transportation. Today's livable communities are transit-rich, integrating pedestrian and bicycle facilities with roadway, bus and rail opportunities in an attractive, sustainable environment.



General Principles

The vision of the Boulevard and Complete Street is a safe, multi-modal corridor that accommodates all users: regional traffic, commuters, local traffic, tourists, pedestrians, and bicyclists. The boulevard and complete street also support and interconnect adjoining growth areas, livable communities and place types, including Lincoln Park, the planned Bayfront Redevelopment project, commercial and industrial uses, a proposed light rail station, and New Jersey City University facilities. To address these multiple purposes, the corridor must include strategically placed street furniture, wayfinding signs and other pedestrian amenities to provide a safe, comfortable and legible environment. Green gateway areas consisting of landscaped strips, a planted tree canopy, raised planters and a dense mix of shrubs help define transitions in the roadway corridor.

The ultimate form and function of the boulevard and complete street will recognize all users and place types. The preferred streetscape design is one that is of a contemporary style, yet inspired by the age, density, and industrial heritage of the corridor and surrounding community. The integrity of the design should reflect the values of the community and its residents.

Guidelines

1.1 Street Furniture

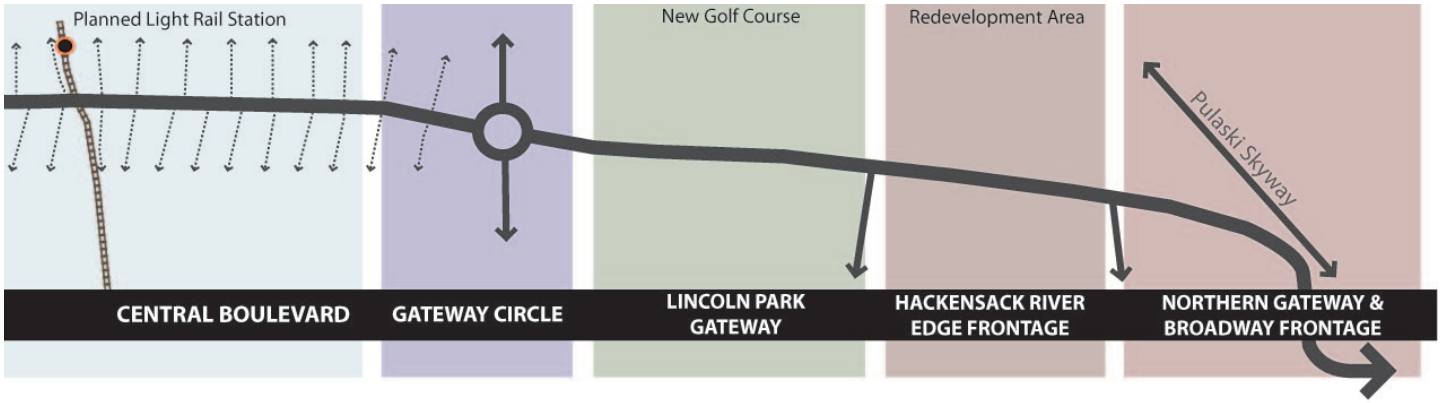
Benches should be provided to allow for people to gather, rest and generally take in their surroundings. Benches should be placed in areas of heavy pedestrian traffic and/or areas of special interest. The placement of the benches should be visible and convenient to encourage pedestrian use but not impede the flow of pedestrian travel. The design and materials used should depend on the surrounding land uses, landscape, and intended users. Benches should suit the community's character and/or be incorporated into public art projects.

Trash receptacles should be placed on each street corner and mid-block at high-traffic pedestrian areas. Trash receptacles should be placed along streets in unobtrusive locations. The installation of recycling containers and self-compacting/self-composting trash receptacles should be considered.

The Waterfront Walkway, Southern Gateway, Central Boulevard and Gateway Circle sections of Route 440 should have street furniture.

Bench
(Photo: Doug Greenfeld)

Trash Receptacle
(Photo: Victor Stanley, Inc.)

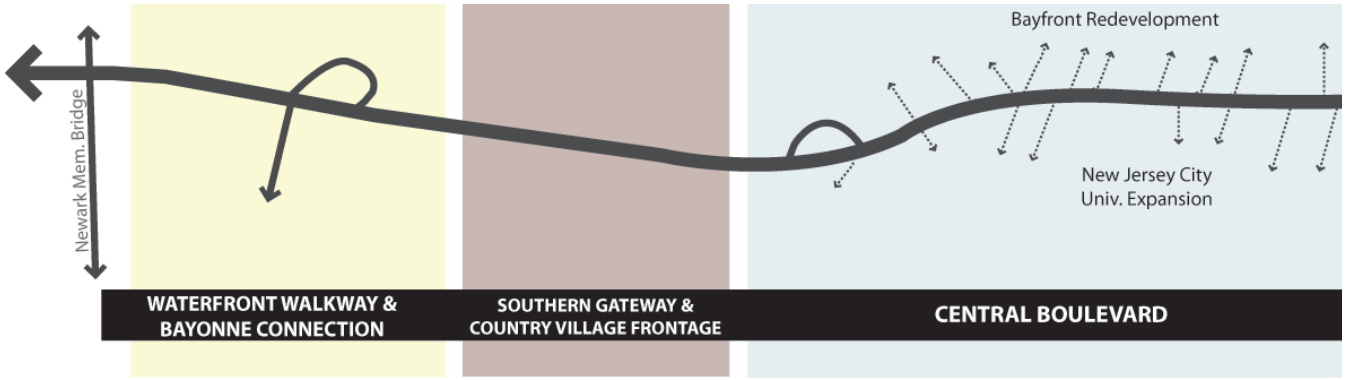


1.2 Wayfinding Signs and Kiosks

Wayfinding elements, interpretive signs and kiosks provide useful information about destination spots and public places including parks, historic, and cultural sites. Such signs should be located along the length of Route 440 and 1&9T Boulevard as part of a comprehensive plan for street furniture. Special care should be taken so that the size and design of the signs contribute to the streetscape character and do not overwhelm the pedestrian scale.

Traditional style kiosks
(Photo: Doug Greenfeld)

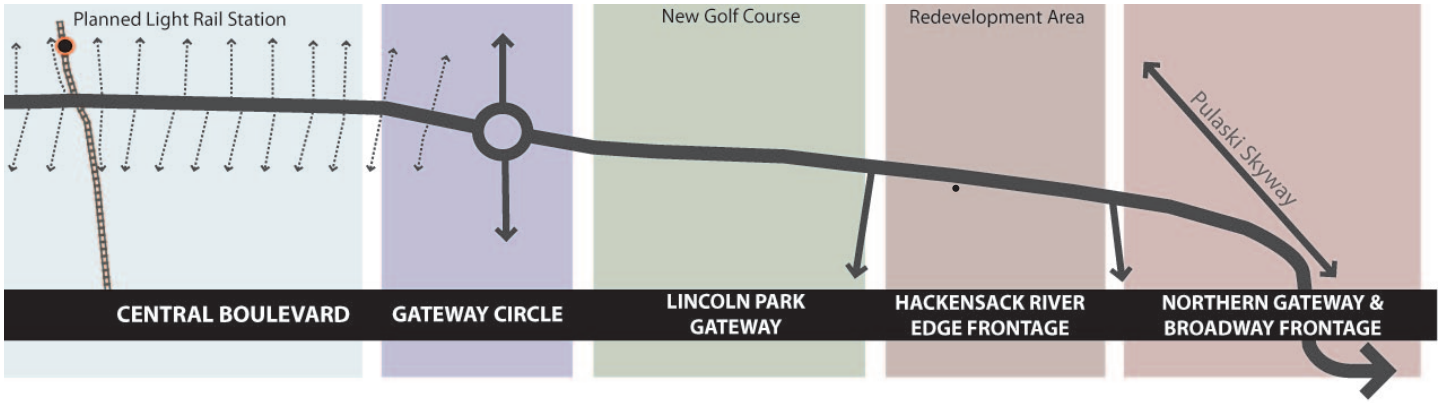
Wayfinding Sign
(Photo: The RBA Group)



1.3 Public Art

Public art should be provided for the Route 440 Boulevard—specifically within the Central Boulevard, Gateway Circle, Southern Gateway, and Waterfront Walkway sections—to highlight place types and enhance the cultural and historic significance of the community. Public art can include traditional sculpture designs or more unique or playful designs such as a painted bench or chair and painted utility boxes or manhole covers. Small artistic gestures can create place markers, such as art or signage embedded in the curb or sidewalk, offering visual relief as well as indicating parking zones and fire zones. Public art proposals should be reviewed by an arts committee against previously adopted criteria prior to contract and installation.

Examples of public art (Photos: TriMet (left), Wikimedia Commons / Emersb)

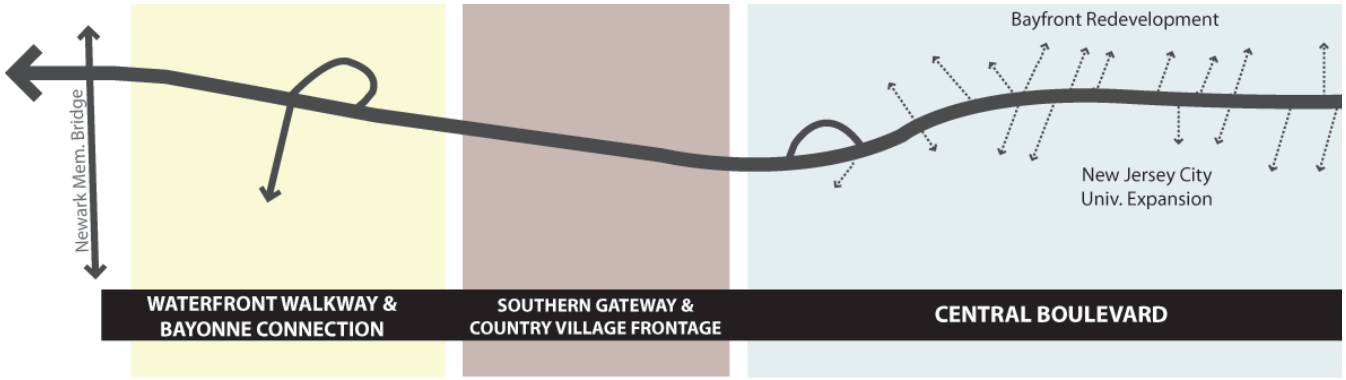


Key criteria for evaluating public art

1. Artistic merit (inherent quality of the work itself);
2. Compatibility in scale, material, form and content of the work with the surrounding area;
3. Relationship to the City's current collection;
4. Relationship to the historic and cultural context of the corridor and community;
5. Structural and surface soundness, including inherent resistance to theft, vandalism, weathering, excessive maintenance or repair costs, and safety considerations or factors that may bear on public liability;
6. Feasibility, professional experience and likelihood of implementation; and,
7. Proposed plan and schedule for short- and long-term maintenance that would also address the fiscal impact, including staffing.

Photo: Flickr / Mike Desisto

Photo: Doug Greenfeld



1.4 Location of Street Trees

Street trees should be planted at regular intervals throughout the corridor as a means of providing aesthetic, environmental, and economic benefits. Trees provide shade for the pedestrian and cyclists, function as a traffic calming measure, provide buffers between vehicular and pedestrian traffic, reduce the urban heat island effect, and provide an aesthetic backdrop to the corridor. Placement of street trees in raised planters prevents vehicular collisions with street trees. Tree canopies should be dense in pedestrian-oriented areas and popular destinations or unique place types.

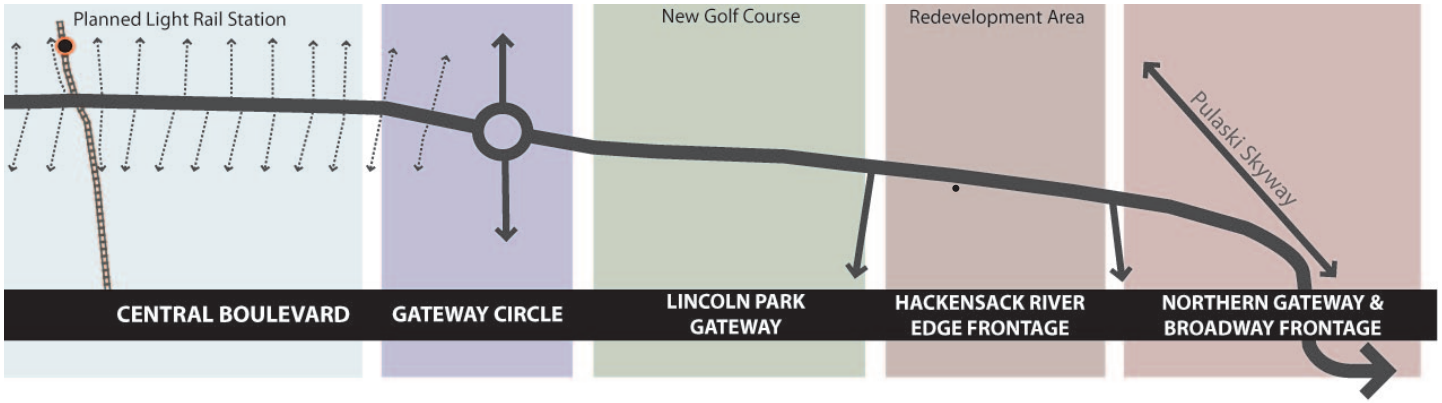
In addition to creation of a green canopy of trees throughout the varied sections of the corridor, key locations for street tree planting are in the vicinity of the northern, southern and western gateway areas. Strategic tree plantings at gateways provide overall benefits as well as define transitions between the existing roadway environs and the urban boulevard.

1.5 Tree Pits

Planting design and maintenance of urban street trees must address environmental challenges related to soil conditions, drainage and root exposure. There are ways to maximize exposed soil and allow more water and air to reach tree roots, including using porous pavers over root zones, placing concrete pavers on a 6" thick bed of clean crushed stone, or using structural soil—an engineered mix of load-bearing rock and organic soil—under the pavement between tree pits. Connected tree pits give trees more space and air and should be used wherever possible to improve tree health and longevity. In areas of heavy pedestrian volumes, the trench of connected tree pits can be bridged by sidewalk slabs supported either by structural soil or a subsurface frame system to increase soil volume. Where trees are not within raised planters, tree grates shall be used due to anticipated high pedestrian volumes and limited sidewalk space.

Tree-lined Street
(Photo: The RBA Group)

Tree pit with grate
(Photo: The RBA Group)



1.6 Landscaping, Plants, Shrubs, and Trees

Landscaping elements should be used along the corridor to infuse color, shape and texture into the streetscape. Landscaping should be provided around transit stops and to separate pedestrians from vehicles. At gateway areas, landscaping elements augment the green canopy of street trees and help define transitions between the existing roadway conditions and the urban boulevard. Supplemental hanging planters, planting beds, and large containers can be used to display flowers and shrubs. Landscaping beds that are not in raised planters should be edged by curbing to avoid runoff of dirt and mulch. Plantings on roadway medians should be contained in raised planters constructed of charcoal gray tinted concrete. In appropriate locations, the planters should be of sufficient height to also function as a seating wall. The plantings should be hardy and drought tolerant and should consist of dense woody shrubs placed close together to discourage mid-block cut-through pedestrian traffic.

Large deciduous canopy trees should be planted along both sidewalks and in both minor medians at between 25 and 30 feet on-center throughout the Central Boulevard section. The canopy trees in the minor medians should be under-planted with durable draught resistant shrubs such as *rosa rugosa* or equivalent.

The 18 foot wide center median should have a specialized custom planting design developed for it that has all three conventional layers of planting—canopy trees, flowering understory trees and flowering shrubs and ground cover. Both the minor and center medians should be constructed with automatic pop-up irrigation controls and under drainage.

Raised planter
(Photo: Doug Greenfeld)

Hanging planters
(Photo: Flickr / OldOnliner)

Median planting design
(Photo: The RBA Group)

1.7 Street Lighting

Street lighting should be provided to illuminate the road for vehicular travel and to brighten and define walkways for pedestrians. Lighting should be designed and installed to NJDOT standards along most of the corridor. Within the Central Boulevard section, lighting along sidewalks should be installed on lower-height poles in styles that complement street furniture. Lighting poles should be located at major intersections to increase the motorist's line of sight. Light-emitting diode (LED) bulbs or solar powered lights can be used for energy and maintenance efficiency. Pedestrian-scale lighting should be positioned 12-15 feet above sidewalks. Pedestrian-scale lighting should be designed in a coordinated fashion consistent with the context of the corridor.

1.8 Utilities

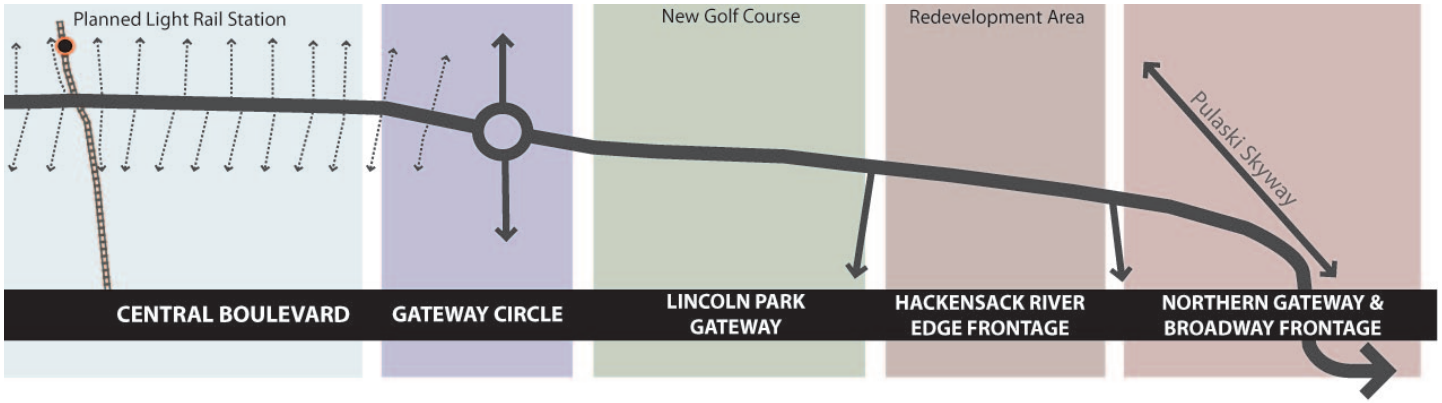
Above-ground electrical, cable, telephone and other wired utilities should be relocated and buried underground. Utility poles should be removed. Electrical boxes and other necessary utility boxes should be placed underground. Where utility boxes are visible, they may be landscaped or used for public art to blend into the environment.

1.9 Historic Landmarks & Markers

Signs should be placed in the vicinity of historic places or objects to commemorate the importance of the site. There are numerous buildings, landmarks and districts that are either listed on the State and National Registers of Historic Places or deemed eligible (or possibly eligible) for listing. At a minimum, signs should be placed to signify historic resources that are either already listed or are deemed eligible for listing in the Registers. The Morris Canal is of particular significance because of its historic role in the commercial development of Jersey City and the region as it transported coal to and from Pennsylvania, and supported general commerce at numerous destinations. Although the Canal has since been buried, the right-of-way remains of historical significance. The Morris Canal is listed in the New Jersey and National Registers of Historic Places. Other historic resources should be evaluated as redevlopment occurs. An inventory of historic resources along the corridor is available in the Appendix of the Jersey City Route 440/Routes 1&9T Multi-Use Urban Boulevard and Through Truck Diversion Concept Development Study.

Examples of pedestrian-scale street lighting (Photos: Doug Greenfeld)

Examples of historic markers
(Photos: HMdb.org / Craig Swain (left); Doug Greenfeld (right))



1.10 Gateways and Landmarks

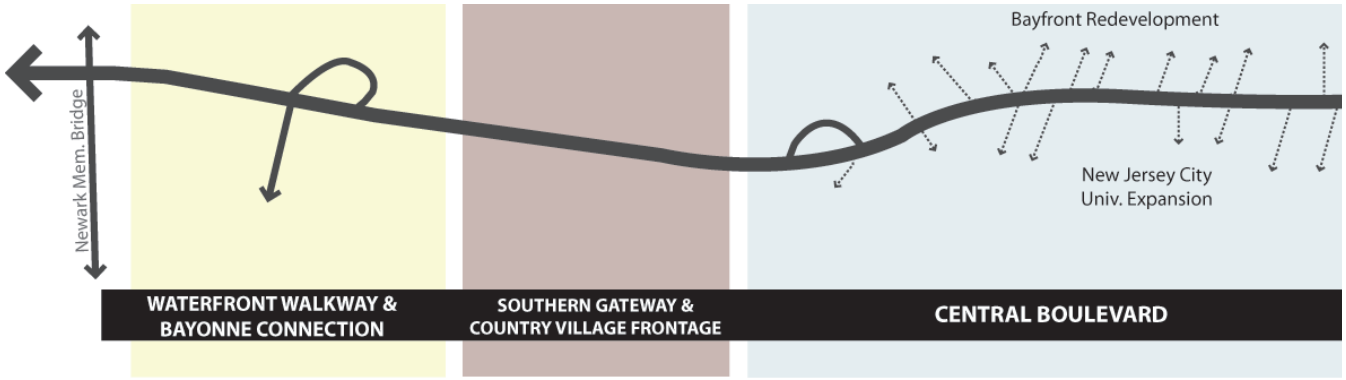
Gateways should be provided along the corridor to punctuate the entry to the new place types. The northern, southern and western entrances to the boulevard and complete street should include heavily landscaped entries. Large canopy species of street trees will be planted close together and as close to the edges of the road as practical along the northerly, southerly and westerly approaches to the project area. When these trees mature they will form a distinct canopy of green arching over the edges of the roadway that will distinguish the Western Waterfront from the areas that neighbor it to the North, South and West. In addition, ground level plantings of flowering perennial shrubs and grasses should accompany the trees adding color and life to the ground plane. Additionally, the proposed traffic circle over the intersection with Communipaw Avenue offers an opportunity to provide a landmark gateway for people approaching the proposed new neighborhoods from the East, West and North. The sidewalks around the circle and the interior 1.6 acre park can include landscaping, street trees and/or public art to create a memorable landmark.

1.11 Noise Mitigation

Reduced noise levels are critical to the creation of livable communities. The LPA integrates design features that serve to mitigate traffic noise and create a quiet, calm outer edge along the boulevard and complete street. Noise will be limited by the lowering of the speed limit along the corridor to 30 mph, widening of the overall traveled way and changes in the local traffic patterns. Traffic noise is further buffered by the dense landscaping within the medians, the height of the raised planters and the row of vehicles utilizing the on-street parking. An additional factor that may affect traffic noise is the choice of pavement materials. Rutgers Center for Advanced Infrastructure and Transportation is working with NJDOT on their Quiet Pavement Pilot Program to study the effects different types of pavement have on traffic noise. These are ongoing studies, with no clear recommendations made at this time. Use of Quiet Pavement materials in the construction of the corridor would serve to further reduce noise levels. Selection of the most appropriate pavement materials will be made as part of the preliminary engineering phase of project development.

The above measures, as well as anticipated changes to the vehicle mix, should result in noise that is at acceptable levels in the pedestrian areas along the calm edges. However, in the event that the truck volumes exceed anticipated levels, additional noise mitigation measures of transparent, low rise noise barriers (e.g. polycarbonate materials) may be installed within the landscaped areas of the minor medians, which retain sightlines across the boulevard and do not interfere with the landscaping. When a fence is used as both a visual buffer and noise buffer along residential areas, it should also be designed to be compatible with the streetscape and environment.

A landscaped gateway to the Western Waterfront from the west (before and after). In the central boulevard, landscaping and elevated planted medians will help mitigate noise from cars and trucks. (Photos: The RBA Group)



General Principles

The boulevard and complete street is a community public space that should be designed to provide a positive pedestrian experience. A safe, comfortable and attractive network of walkways should provide continuous routes between destinations, including homes, schools, shopping areas, public services, recreational opportunities and mass transit. Commercial activities such as dining and vending may be permitted on the sidewalk when they do not interfere with safety and accessibility.

All walkways should minimize potential conflicts with vehicular traffic, surface irregularities and intruding objects so that pedestrians can enjoy the full use of the public space. Street crossings should be designed to safely accommodate pedestrians with varied capabilities. Pedestrian refuge areas, decorative cross-walks and traffic signage help to increase the public's safety at street crossings.

Guidelines

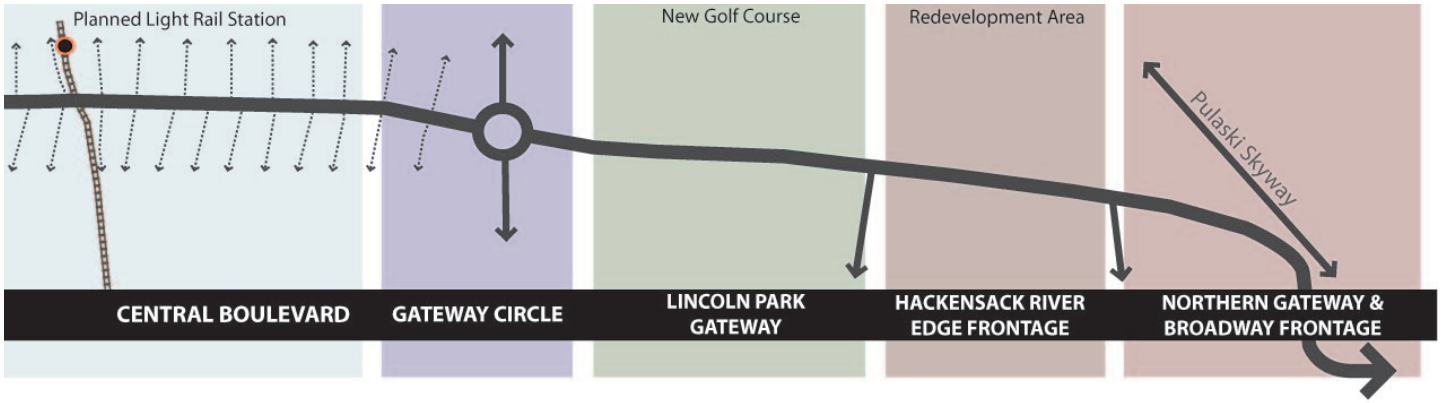
2.1 Sidewalk Network

The LPA incorporates a continuous network of sidewalks along the entire Route 440 and Routes 1&9T boulevard and complete street corridor. The sidewalks provide pedestrian access between all neighborhoods, transit stops and destinations along the corridor. Sidewalks along the central section of the corridor include 12-feet of clear width to accommodate the large volumes of pedestrian activity in this section, as well as to provide space for outdoor café seating and other activities associated with the retail and restaurant uses anticipated to be constructed on the first floors of the future neighborhoods. Narrower width sidewalks are provided along the north and south ends of the corridor that are further from the center of activity and do not front directly along planned new vertical development. Pedestrian staging areas 10-feet in width are provided within the minor medians serving the BRT stations.

2.2 Sidewalk Materials

Sidewalks on the boulevard and complete street should be constructed with a firm and durable surface such as concrete. Dark tinted concrete visually enhances sidewalk and emphasizes urban character in areas with greatest commercial and retail density. Joints should be scored to imitate saw-cutting to simulate hewn blocks of stone. Charcoal gray tinted concrete can be mixed with light-colored pebble-sized aggregate to create a texture and more natural appearance; Exposed aggregate reduces the urban heat island effect by increasing reflectivity and camouflages dirt and gum. Tinted concrete can also be treated with silicon carbide to add sparkle and increase slip resistance of the surface. However excessive texturing can be problematic to those using canes, crutches or walkers or those in wheelchairs or with diminished visual acuity.

Examples of active sidewalks
(Photos: The RBA Group (top); Sean Meehan (bottom))



2.3 Crosswalks

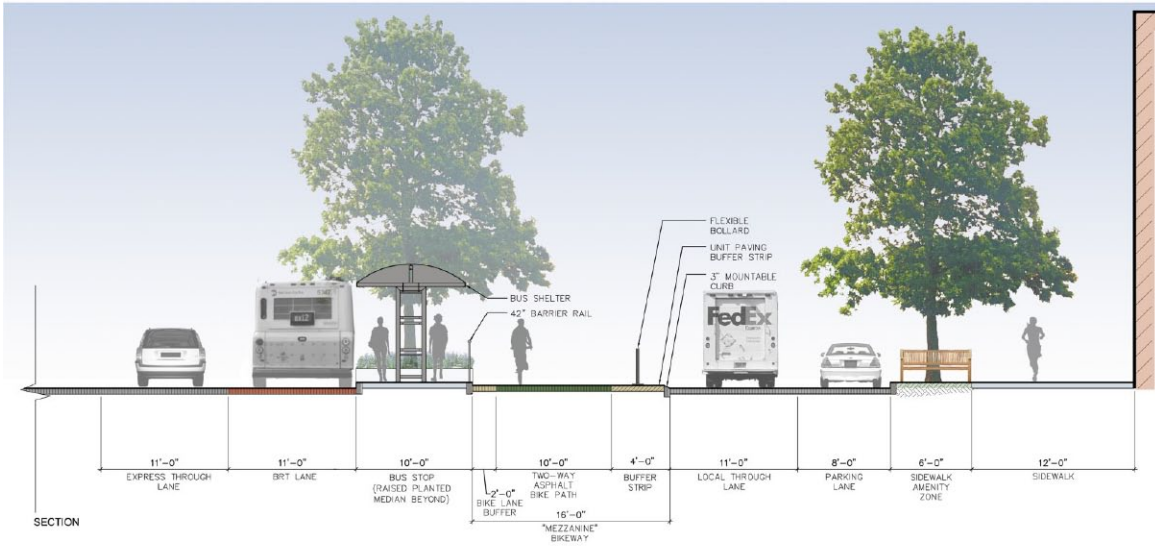
Crosswalks make pedestrian actions more predictable for motorists and indicate proper locations for pedestrians to cross. The design of crosswalks along the boulevard and complete street corridor should be consistent and utilize materials and color that are compatible with the planned streetscape. Crosswalks may have patterns or be constructed from materials that further increase their visibility or add character to a neighborhood. Crosswalk materials must be durable under heavy traffic conditions. High visibility vehicle stop lines should be placed in the vehicular lanes outside of the crosswalk area. Elevated crosswalks with long vehicular ramps should be used at the unsignalized intersections of the side streets with the frontage road.

Examples of textured materials to be used in all crosswalks
(Photos: Doug Greenfeld (left & right); The RBA Group (center))

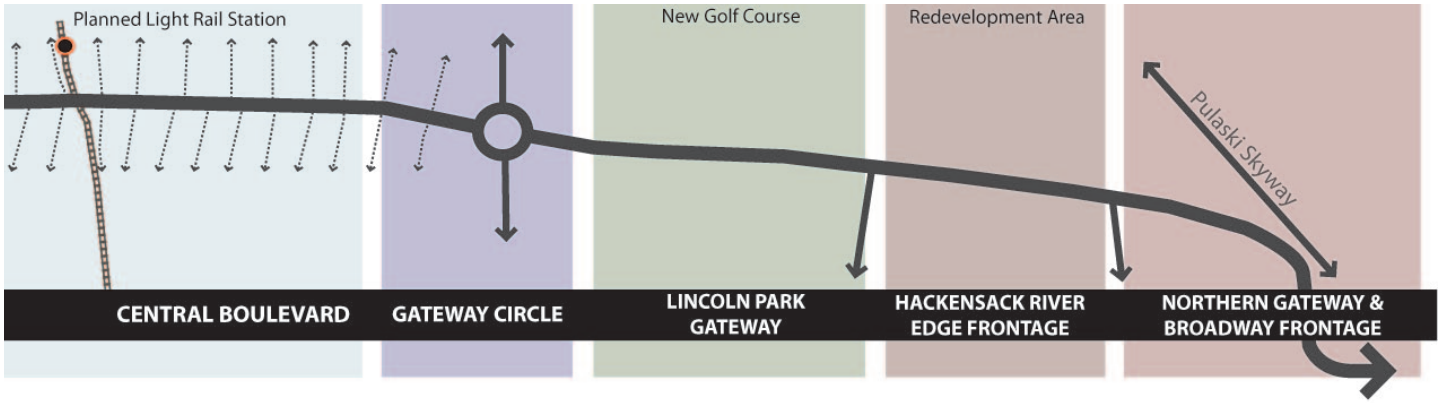
2.4 Refuge Islands

A pedestrian refuge island, also known as a median refuge area or pedestrian island, is a raised island placed in the street at an intersection or midblock to provide pedestrians with a place to wait, protected from traffic, for a suitable gap in motor vehicle traffic or a new green signal to complete their crossing. The Route 440 and Routes 1&9T boulevard and complete street design includes medians along most of the corridor, which will provide refuge areas for pedestrians to wait to cross the street if needed. Curb ramps or "cut-throughs" should be provided on these islands or medians to accommodate mobility-challenged pedestrians.

Median refuge island
(Photo: NACTO Urban Bikeway Design Guide, modified by The RBA Group)



The Central Boulevard calm edge cross-section that includes a raised planter median between the Bus Rapid Transit Lane and the two directional bike path. (Image: The RBA Group)



2.5 Pedestrian Signs

Pedestrian warning signs and regulatory signs help provide both motorists and pedestrians with information about where to expect—and how to manage—potential conflicts at crossing locations without signals. The signs are an efficient means of informing motorists well in advance of crosswalks. Stop-for-Pedestrian Crossing signs may be used to remind road users of laws regarding right of way at unsignalized pedestrian crossings.

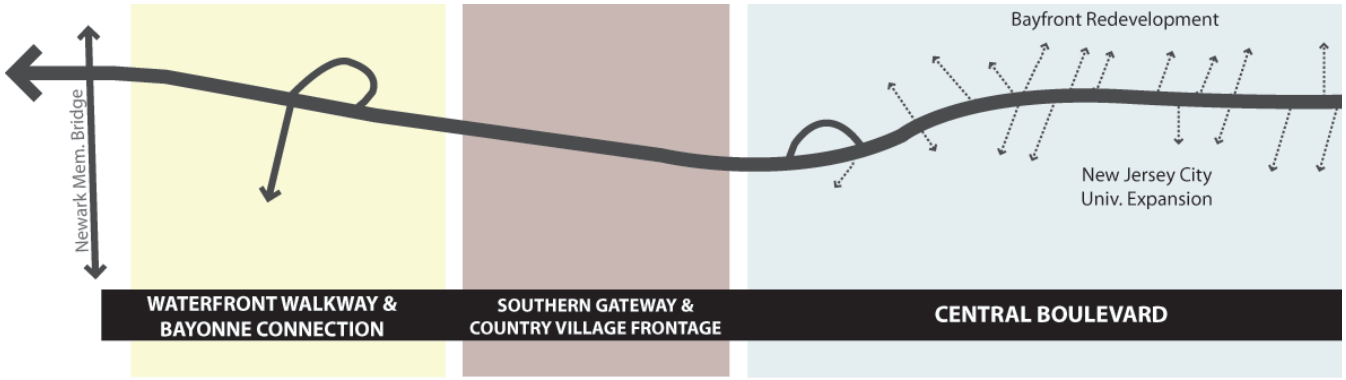
A pedestrian countdown signal

Universal street sign for pedestrian crossing
(Photo: MUTCD)

2.6 Pedestrian Signals

Pedestrian signals should be installed at signalized intersections to notify pedestrians when it is safe to cross. They can be timed in a variety of ways and should have countdown timers to indicate time remaining in the crossing phase, as well as time remaining in the no-crossing phase. A countdown signal is a pedestrian signal head with a numerical display that informs pedestrians of the number of seconds remaining in the pedestrian clearance interval. Due to a combination of the high volume of vehicular traffic, the expected pedestrian traffic, and the width of the roadway, a countdown signal is recommended at every signalized intersection. The HAWK (High-intensity Activated Crosswalk) signal is a combination of a flashing beacon and traffic signal used at marked crosswalks. Unless activated, the HAWK signal remains dark. When pedestrians wish to cross, they push a button, and a traffic signal flashes yellow, then solid yellow, then red to drivers. Pedestrians receive a walk signal. The drivers' signal then switches to flashing red, which means proceed when safe. The pedestrians' signal changes to a countdown 'don't walk' signal. HAWK signals should be used in the Southern Gateway section at four pedestrian crossing locations, which are deliniated in the Locally Preferred Alternative.

A HAWK signal (High-intensity Activated Crosswalk)
(Photo: FHWA)



General Principles

The Jersey City Master Plan Circulation Element asserts that the City will be served by a multi-modal transportation system and that Jersey City's roadway network will not only accommodate motor vehicle traffic but also provide safe and efficient accommodations for bicyclists and a system of off-road paths that complements the City's parks and open spaces. These bicycle facilities form a network that provides a means for recreational travel and social interaction as well as "green" transportation options to access destinations throughout the City. In keeping with the Master Plan's vision, bicycle travel should be encouraged and accommodated along the boulevard and complete street. Appropriate bicycle accommodations must be provided to integrate the bicycle facilities in the corridor with the broader network of bike facilities throughout the City.

Guidelines

3.1 Bicycle Network

Bicycle facilities are provided along the boulevard and complete street with connections that link neighborhoods, shops, businesses, parks, transit stops and the East Coast Greenway.

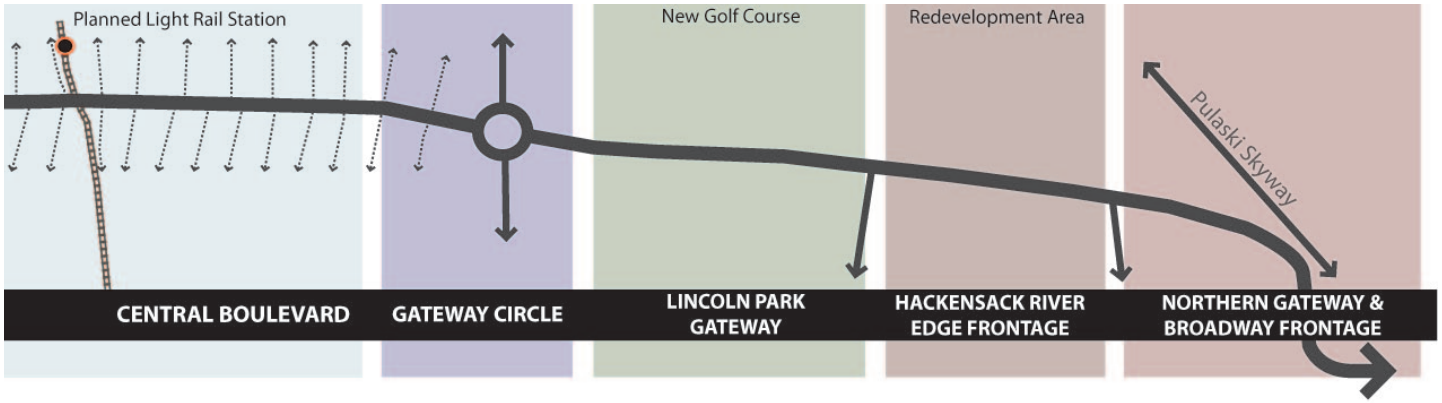
All of the bicycle facilities along the corridor are bike paths separated from motor vehicle traffic. Bicycle facilities located within the local cross streets are bike lanes on new streets and shared use by bicycles and motor vehicles on existing streets.

Within the Central Boulevard section, dedicated two-way bicycle paths are incorporated into both of the minor medians. These paths provide a 12-foot wide riding surface with buffers along both edges. Adjacent to the elevated planters within the minor medians, a two-foot wide paved buffer is provided. A four-foot wide paved buffer is provided between the bicycle path and the local travel lane. Mountable curbing allows access by maintenance vehicles as needed, and also allows emergency vehicles use of the buffer and bicycle path to drive around any obstruction on the local travel lanes that may occur.

Along the Southern Gateway and the Bayonne Connection sections, the bike path is incorporated into 22-foot wide shared use waterfront esplanade between the roadway and the Newark Bay.

Separated bicycle paths
(Photo: The RBA Group)

Along the remaining section of the corridor, bicycle paths continue to be segregated from the vehicle travel lanes, but vary in width from eight to 10 feet.



3.2 Bicycle Facility Types

Bicycle facility design should be guided by AASHTO and MUTCD requirements. The primary bicycle accommodation proposed for the corridor consists of dual, bi-directional buffered bicycle paths that run much of the length of the corridor. Other facility types such as bicycle lanes will be required to complement these facilities, particularly on intersecting streets.

Separated Bike Paths. Bicycle facilities separated either horizontally or vertically from the motor vehicle traffic. Horizontal separation can be achieved by striping out areas, planting strips, medians, bollards, pavement treatments, etc., or by placing the bicycle facility to the right of the automobile parking area. Vertical separation may be achieved by locating the bicycle facility on pavement raised above the roadway. Buffered bicycle facilities require special care to address potential traffic conflicts at intersections. Separate bicycle signals are integrated with the main signal controller, permitting east-west bicycle crossings of the boulevard and complete street with the direction of traffic.

Guide Signs for Bicycle Facilities

Bike Lane. A portion of a roadway that is designated by pavement markings and, in some cases, signs for exclusive or preferential bicyclist use. Bicycle lanes are typically provided in pairs, or one for each direction of travel.

Shared Lane. A lane of a travelled way open to shared use by bicycle and motor vehicle use. Shared lanes apply primarily to side streets within the study corridor and can, where appropriate or necessary, include "Share the Lane" or "Bicyclist Allowed Full Use of Lane" signs or shared lane markings.

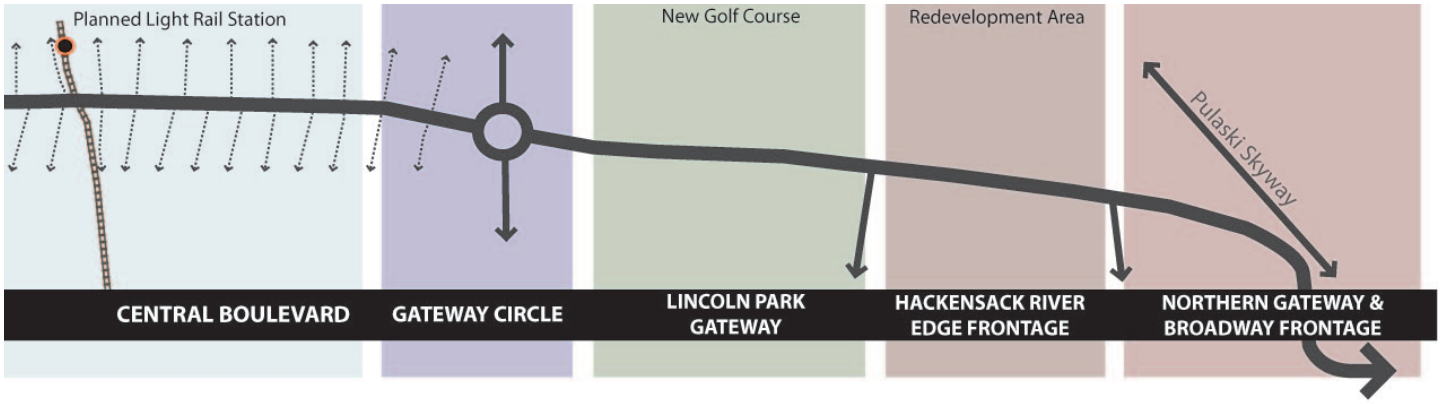
3.3 Bicycle Lane Markings

Bike Box. A designated marked area at a signalized intersection located ahead of the stop bar used by motor vehicles that allows bicycle traffic to queue up in front of motor vehicle traffic. Bike boxes increase the visibility of bicyclists and enable them to enter the intersection before motor vehicles.

Bike Box
(Photo: Flickr / Greg Raisman)

Bicycle lanes with parallel parking
(Photo: Google Streetview)

Bicycle Signal Head
(Photo: Doug Greenfeld)



3.4 Drainage Grates

Drainage grates with openings running parallel to the curb can catch or deflect narrow bicycle wheels causing a crash. Care must be taken to ensure drainage grates are bicycle safe, with openings small enough to prevent a bicycle wheel from falling into the slots of the grate. Another way to avoid drainage grate problems is to eliminate them entirely with the use of inlets in the curb face. This may require more inlets per mile to handle bypass flow.

3.5 Bicycle Parking

Safe and secure bicycle parking can encourage more travelers to bicycle instead of drive. Similar to vehicle parking, bicycle parking can be provided based on the estimated amount of time that the space will be used by the user. This can be broken down into two general categories: short-term parking and long-term parking.

Short- term parking facilities can be used at locations where it is expected that the user will be using the space for the length of a typical errand (2 hours or less). In these instances, bicycle racks provide easy access and are typically easy to locate.

Long-term parking facilities are appropriate at locations where the user will be parking for longer periods such as all day, overnight, or a series of days. For this type of parking, sheltered racks, lockers and rooms or cages with controlled access are more appropriate and offer protection from the elements. Some form of long-term bicycle parking is appropriate for the bus rapid transit shelters along the Route 440/ Routes 1&9T Boulevard and for the area of the planned light rail station. Recommendations contained in the Association of Bicycle Professional's Bicycle Parking Guidelines, 2nd Edition, pertaining to specific policies, equipment selection, site planning and maintenance should be followed.

Long-term bicycle parking with bicycle lockers
(Photo: Wikimedia Commons / Bryce Nesbitt)

Short-term bicycle parking (racks)
(Photos: Forms + Surfaces (left); Treehugger.com / Lloyd Alter (right))

General Principles

The vision of the boulevard and complete street is to turn the auto-oriented highway into a tree-lined, pedestrian and bicycle-friendly, multi-use urban corridor. To safely accommodate these multiple users of the road, physical design measures, or traffic calming, should be used. Traffic calming measures can be categorized into volume control or speed control measures and are custom-tailored to each road corridor.

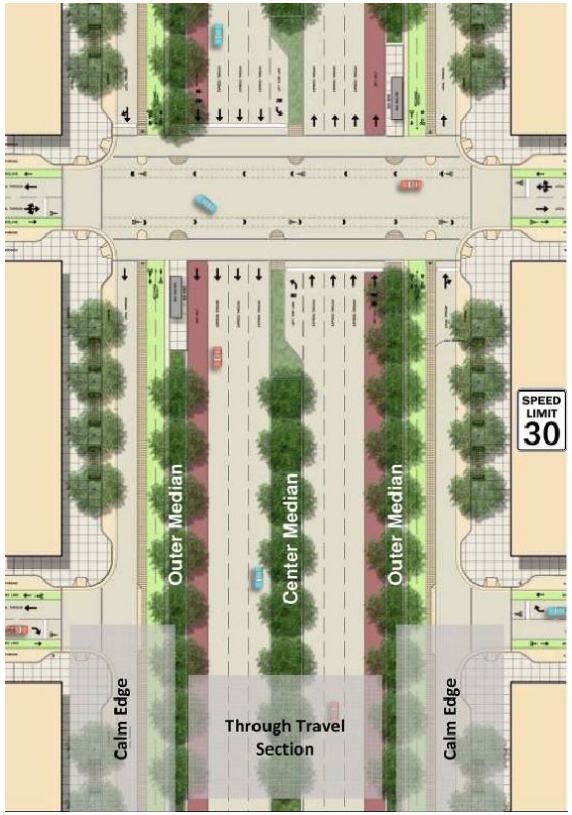
Traffic calming measures can reduce vehicular speeds, divert traffic away from pedestrian areas such as the calm edges of the Central Boulevard and create safer pedestrian crossings. The Locally Preferred Alternative provides a combination of traffic calming measures to reduce noise and to balance the volume of traffic with pedestrian and bicycle use.

Guidelines

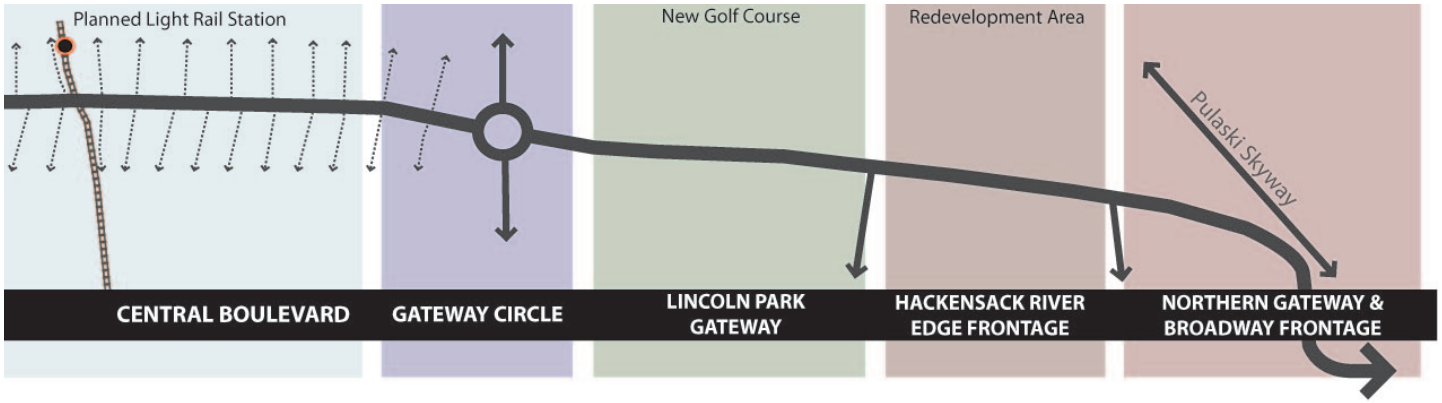
4.1 Medians and Boulevards

Tree-lined raised medians are a key organizing element of the Route 440 and Routes 1&9T boulevard and complete street concept. The purpose of the medians from a traffic engineering perspective is to separate opposing traffic flows. With the existing and projected volumes of trucks, cars, pedestrians and cyclists sharing the corridor, the raised planter median serves an important safety function for protecting the public. It provides a refuge area for pedestrians crossing the street and deters mid-block pedestrian crossings. The raised planters also support trees and extensive landscaping that mitigate noise, reduce stormwater runoff, and create an attractive public realm. Trees are an important design element that serve both as a traffic-calming measure and as streetscape enhancements alerting travelers that they have arrived in a special place. Median dimensions are specified by the cross sections for the Locally Preferred Alternative (Attachment B).

'Barrier curbs' are another form of a raised median. Typically they are made of concrete. However, decorative barrier curbs that complement the local environment are also available. A decorative barrier curb is proposed for the Southern Gateway section of the corridor.



A plan view of the Central Boulevard section
(Image: The RBA Group)



4.0 TRAFFIC CALMING

Examples of curb extensions
(Photos: Doug Greenfeld (top); Wikimedia Commons / Andrew Bossi)

4.2 Curb Extensions

Curb extensions refer to any horizontal extension of the sidewalk into the street. They are also commonly known as neck downs, curb bulbs, sidewalk flares, traffic throttles, and bulb-outs. Curb extensions are used in the corridor at intersections wherever there is a parking lane. The benefits of curb extensions include:

- Reduced motor vehicle speeds
- More public space for sidewalk furniture and bicycle racks
- Fewer vehicles blocking the crosswalk area
- Better visibility between pedestrians and drivers
- Less exposure for pedestrians due to shorter crossing distances, and shorter wait times for vehicles that are stopped for pedestrians.

Curb extensions will be important in the Central Boulevard section where there is on-street parking and a large volume of projected pedestrian traffic.

4.3 Curb Radius

Curb radii should be designed to be as small as possible considering all intersection users, rather than designing for the largest possible vehicle. Large turning radii allow vehicles to turn at high speeds and increase pedestrian crossing distance. Both factors reduce pedestrian safety and comfort. Reducing curb radii slows down turning traffic and shortens pedestrian crossing distances, and can provide space for additional streetscape amenities such as bicycle parking.

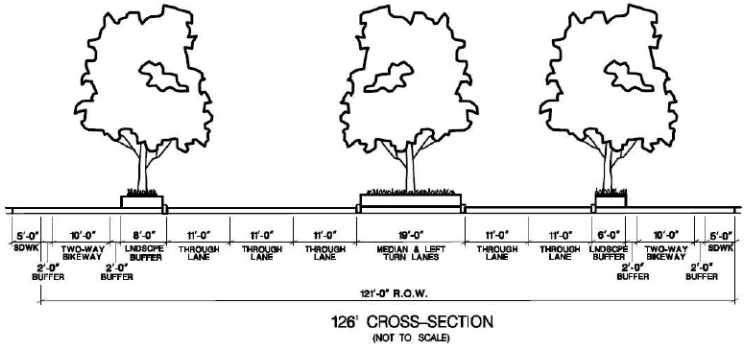
The LPA incorporates a 25 foot radius curb at intersection corners, striking a balance between vehicular and pedestrian needs, and allowing the ADA depressed curbs to be properly aligned with the crosswalks.

Plan view of typical curb extension in the Central Boulevard.

4.4 Narrow Travel Lanes

Narrow lanes have the effect of slowing down operating speeds. They also shorten the distance for pedestrians to cross the road. The boulevard and complete street concept design provides 11 foot wide travel lanes.

Use of the 11-foot lanes creates the potential for large vehicles turning right from the cross streets onto the local lanes to encroach into the buffer space between the local lane and the bike path within the median. This possibility requires that the buffer and the mountable curb be constructed with a solid foundation capable of supporting infrequent loading by heavy vehicles. This will also support the potential use of the buffer and the bike lanes by maintenance vehicles or emergency vehicles seeking to bypass a blockage of the local travel lanes.



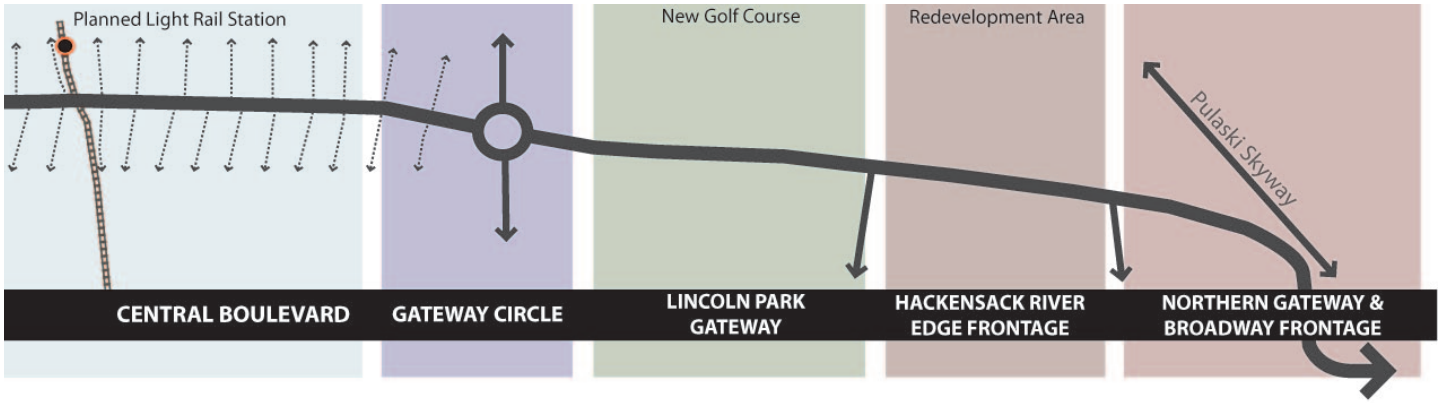
Northern Gateway and Broadway Frontage section

4.5 On-Street Parking

On-street parking slows traffic speed, mitigates noise, increases safety for pedestrians and reduces the severity of crashes. Cars parked on the street act as a buffer between pedestrians and moving traffic. On-street parking is incorporated along the local lanes for the length of the Central Boulevard section. The on-street parking not only supports a calm outer edge to the corridor, but serves the short term parking demand of the first floor retail and restaurant uses envisioned to be constructed along the corridor. On-street parking spaces should be eight feet wide.

Parking lane pavement treatment should be a material and color that is different from that of the adjacent travel lane to add to the perception of a narrow travel lane and thereby contribute to the traffic calming effect.

Example of on-street parking lane
(Photo: Doug Greenfeld)



4.6 Decorative Pavement Treatments

The use of decorative road materials can be used to slow vehicle movement with its raised and slightly rough surface. Examples of suitable, durable materials include brick, colored concrete and stamped asphalt. Textured pavement has been successfully applied at crosswalks to identify a pedestrian area. It can also be used as a traffic calming technique to increase safety and encourage walking in residential or commercial areas. Decorative pavement materials are recommended for all crosswalks along the Route 440 and Routes 1&9T corridor to provide both a safe and attractive crossing.

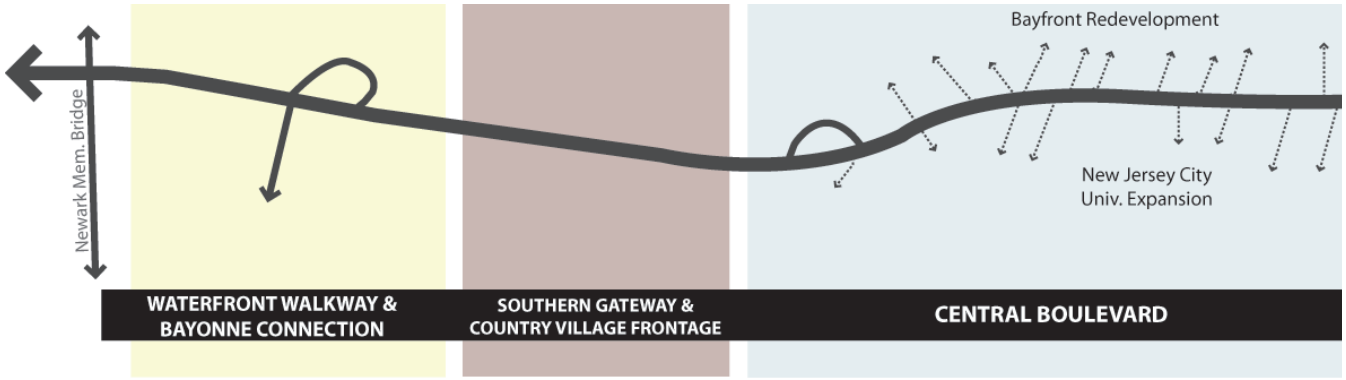
4.7 Turn Islands and Right-Hand Turns

This type of traffic calming measure provides a physical diversion in the path of an oncoming vehicle forcing it to make a turn. By guiding the turning and through traffic at intersections, traffic volumes can be effectively controlled. Turn islands are used at the at-grade intersection of Route 440 and Communipaw Avenue beneath the Gateway Circle. Turn islands are also used at the non-signalized intersections of the side streets with the frontage road. Right turn on red movements should be prohibited in all pedestrian areas. When large vehicles turn right on red, but are unable to advance due to queuing, the crosswalk is blocked, which creates a safety hazard.

4.8 Traffic Calming for Nearby Local Streets

Neighborhood traffic calming is a combination of measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users. This includes reducing traffic (volume control) and lowering traffic speeds (speed control). Examples of traffic calming often used on side streets and within neighborhoods include: mini traffic circles, raised crosswalks and intersections, lane narrowing, and chicanes. The Circulation Element of the Jersey City Master Plan provides for a range of traffic calming measures that may be utilized, depending on the situation. Though not directly applicable to the Route 440 and Routes 1&9T boulevard and complete street, itself, these measures may be appropriate on local cross streets in adjacent neighborhoods.

Raised crossing at channelized right turn lane
(Photo: Flickr / Richard Drdul)



5.0 TRANSIT ACCOMMODATIONS

General Principles

The Route 440 and Route 1&9T boulevard and complete street has been designed to accommodate Bus Rapid Transit (BRT) from Society Hill Drive to Journal Square via Sip Avenue, and a new Light Rail Transit (LRT) crossing. Infrastructure, streetscape amenities and safety features should be provided to assure a safe and comfortable mode of travel for transit riders. BRT "super stops" should be designed to enliven the streetscape and provide a comfortable setting for transit riders.

Guidelines

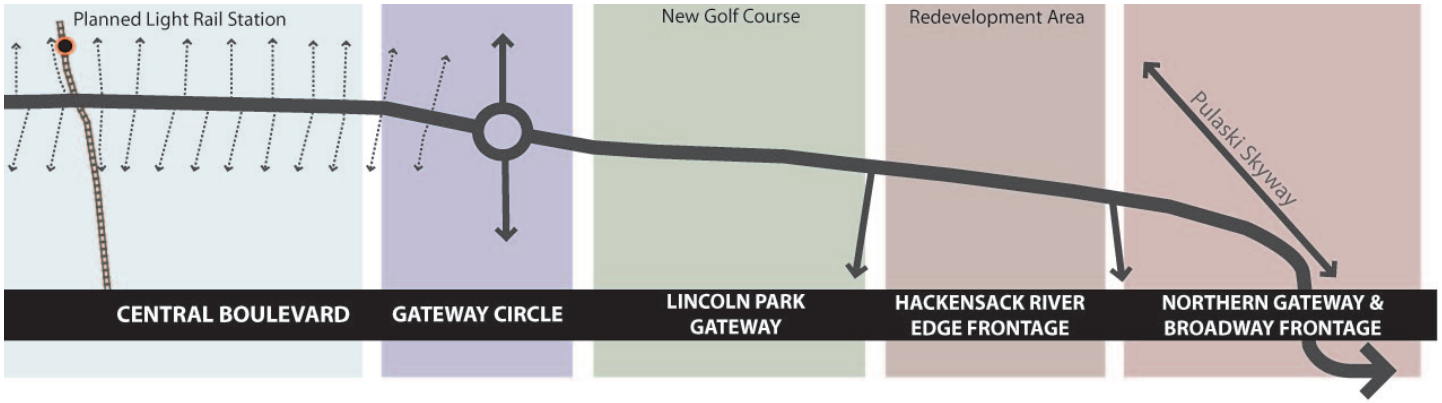
5.1 BRT Station Locations

New station stops should be located along Route 440 and Routes 1&9T in the vicinity of existing and/or pending rider- generating places, and are shown on the overall concept plan. The Locally Preferred Alternative includes stations along the corridor at the following locations:

- Eastbound and Westbound sides of Sip Avenue east of Routes 1&9T
- Northbound and Southbound sides of Routes 1&9T north of Duncan Avenue
- Southbound side of Route 440 at:
  - South side of Williams Ave
  - South side of Stegman Blvd
  - South side of Kellogg Street
- Northbound side of Route 440 at:
  - North side of Ege Ave
  - North side of Stegman Blvd
  - North side of Kellogg Street
- Eastbound side of Society Hill Dr west of Route 440

Example of a BRT station
(Photo: Flickr / LA Wad)

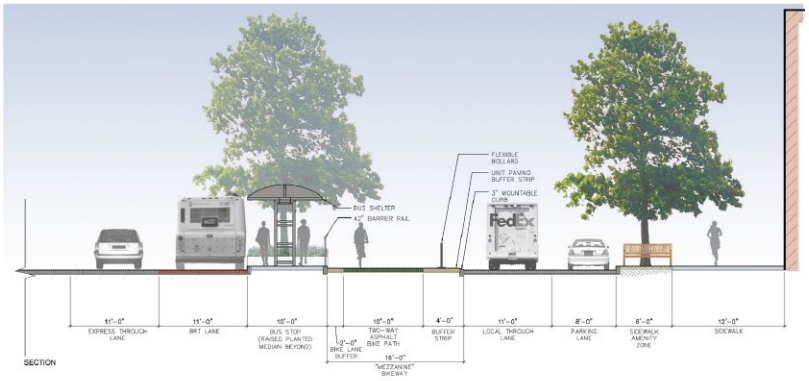
Example of a BRT station amenity
(Photo: Flickr / Viriyinay)



5.2 Designing the BRT Station

BRT stations should be designed to be convenient and attractive for transit riders and complement the character of the streetscape. Benches, leaning rails, lighting, heated areas, and ADA accommodations are essential for catering to people of all ages and mobility. Landscaping and public art create an attractive and interesting environment for both riders and travelers along the road. Systems maps, ticket vending machines, bicycle racks, and trash cans, and BRT branding should be provided at all stops. Pre-ticketing machines and multiple bus entrances are important for faster boarding. Radiant snow melt systems ensure ongoing station accessibility for all users. The BRT branding on both the stations and buses will help to distinguish this unique bus service from other conventional buses. A shelter with transparent sides is encourage to provide security in both the day and evening. The surface surrounding the station should include granite or other high quality materials on the sidewalk and a concrete pad in the bus lane for durability.

Example of BRT stations (Photos: Michael King (left); Flickr / Chris Phan - functoruser)



Route 440 Boulevard Concept Plan with a BRT lane (Image: The RBA Group)

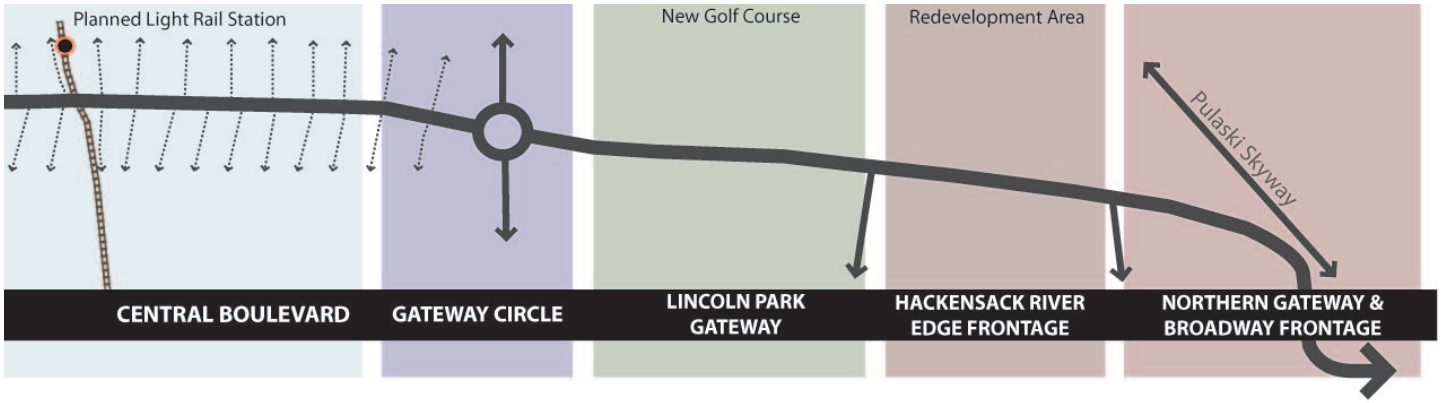
5.3 BRT Lanes

The boulevard and complete street design provides an exclusive bus lane to maximize the efficiency of service. Dedicated BRT lanes are provided in both directions along Route 440 between Society Hill Drive and Williams Avenue, and along the northbound side of Routes 1&9T between Duncan Avenue and Sip Avenue. Within the Central Section, the BRT lanes are located alongside the general traffic through travel lanes adjacent to the minor medians. Additionally, City of Jersey City Journal Square Redevelopment Plan ordinance states that Sip Avenue should be configured to include bus priority treatment, possibly as a single reversible lane, so that the BRT vehicles are not delayed by general traffic. It also states that Pavonia, Summit and Sip Avenues should incorporate bus priority treatments to accommodate BRT vehicles departing the Journal Square Transportation Center for the Western Waterfront via Sip Avenue.

Example of colored pavement bus lane markings
(Photo: J. Wandres, The RBA Group)

5.4 BRT Lane Markings

Enhanced road markings increase the visibility of bus lanes or busways. Colored pavement with the traditional white "Bus Only" marking can be considered for bus lanes that operate twelve or more hours of the day. The color treatment will end where motorists need to enter the bus lane to make the next available right turn.



5.0 TRANSIT ACCOMMODATIONS

Bicycle racks near bus shelter stops
(Photo: PedBikeImages.org / Brown)

Bike rack installed on a NJTransit bus
(Photo: Wikimedia Commons / Adam E Moreira)

5.5 BRT Signs

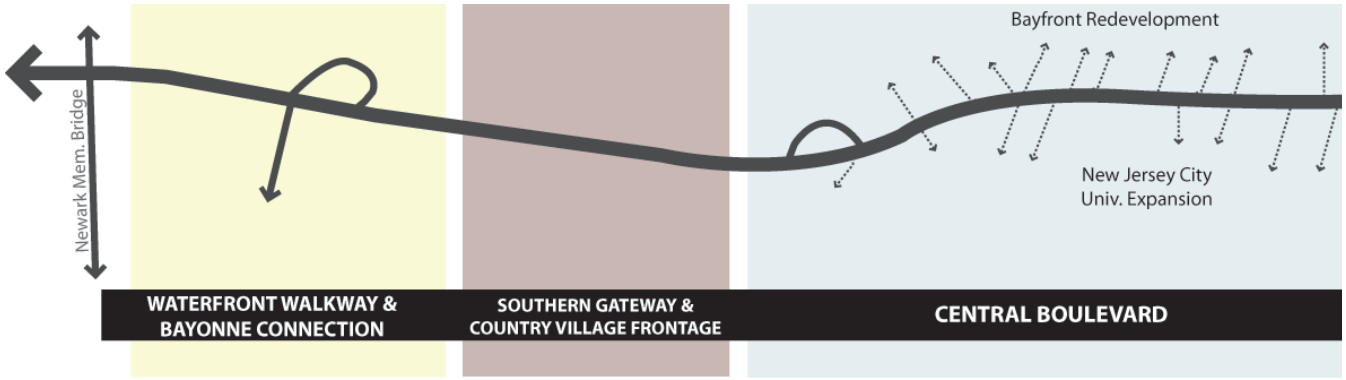
Bus only signs should indicate prohibition to general traffic. At a minimum, this should include at least one sign per block, positioned for high visibility for motorists. Additionally, overhead signs can be located along the corridor to create additional bus lane visibility. Additional sign(s) should be placed at the station stop to identify the station. The signs should be compatible with the overall design of the station.

5.6 BRT Station Accessibility

All BRT stations should be handicapped accessible and designed in compliance with the American Disabilities Act (ADA) requirements. Textural changes in the loading pad alert the visually impaired passenger and pedestrian of its location.

5.7 Connecting Transportation Modes

Bicyclists frequently ride public transit because of either physical barriers in the bike routes, long distances, inclement weather or other conditions. Short and long term bicycle parking should be provided near all BRT station stops. In addition, racks should be physically placed on transit vehicles to permit and encourage multi-modal travel.



General Principles

Green streets provide natural vegetation to improve the physical and visual conditions of the roadway and environment. Rain gardens and vegetative strips collect stormwater from the streets and filter it through the ground before sending it to surface and ground water bodies.

Trees "green" the streets by providing shade in the warmer seasons and by minimizing the urban heat island effect. Trees also absorb air contaminants and serve as a buffer between pedestrians and vehicles. The combined use of trees, planters and other types of vegetation provides an attractive streetscape setting and helps protect and separate pedestrians, bicyclists and vehicular traffic.

Guidelines

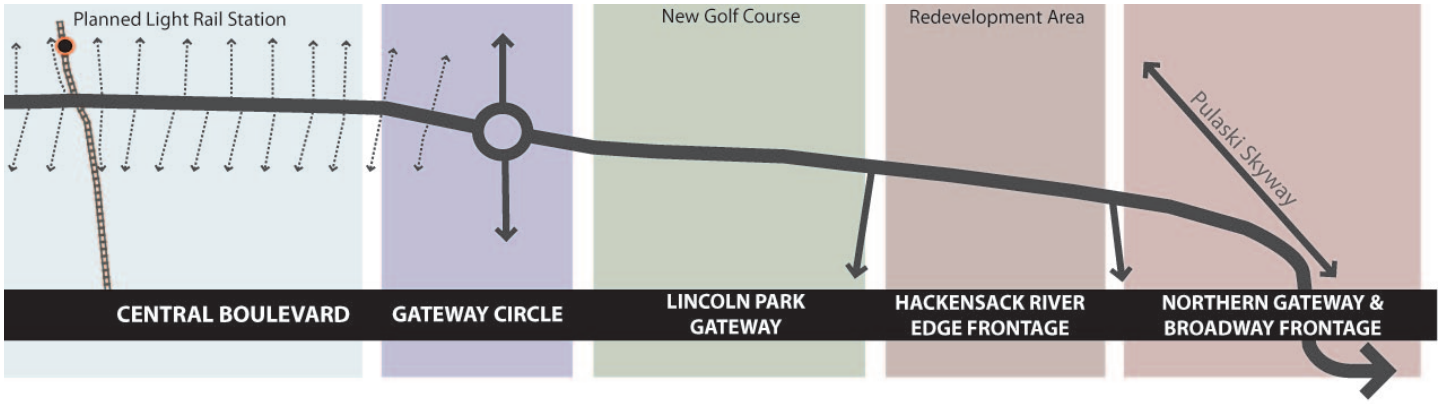
6.1 Rain Gardens and Vegetative Strips

Rain gardens and median strips filter stormwater runoff through the vegetation and soil and should be included as part of the streetscape design. Vegetative species should be wet tolerant and recommended for these types of environments.

6.2 Street Trees

Street trees provide shade, improve air quality, provide habitats and reduce the urban heat island effect. Street trees should be planted at regular intervals in all of the landscaped areas that are incorporated into the design concept. For trees that are used in stormwater collections areas, the species should be able to tolerate "wet feet" (see also Chapter 1 regarding street trees).

Example of rain garden
(Photo: The RBA Group)



6.3 Reduce Impervious Coverage

Impervious surfaces within the concept design of the boulevard and complete street are kept to the minimum necessary for safe traveling. Stormwater runoff can be reduced by using porous pavement in appropriate locations. Porous pavement may be used for areas under bicycle lanes and other low-traffic areas. Green vegetated roofs on new buildings should also be encouraged to reduce stormwater runoff.

Example of porous pavers
(Photo: The RBA Group)

Example of a vegetative strip
(Photo: The RBA Group)

Environmental Sustainability Strategies

1. Green Highways
2. Roadway Alignment
3. Materials & Resources
4. Stormwater Management
5. Energy & Environmental Control

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1. Green Highways

Planning and design of transportation infrastructure must consider the potential social and environmental impacts of the final product. Road construction not only requires extensive use of materials, but the finished product often takes up significant space, the occupation and use of which may result in impact to the environment. Roads can have significant impact on the environment through material usage, construction activities, day to day operation and maintenance. By considering sustainability throughout the planning, design and construction process, roadways can be made to serve their primary mobility purpose while protecting natural systems.

The concept of "Green Highways" is a relatively recent concept for the planning and design of roadways that integrate both functionality and ecological sustainability. A "Green Highway" may be defined as a roadway that is planned, designed and constructed following a process that integrates and achieves the required transportation functionality along with a high level of environmental sustainability. An ecologically conscious approach is used through out the planning, design, and the construction process. This process is intended to foster implementation of transportation infrastructure improvements that serve the intended mobility purpose, but incorporate additional features, systems and amenities that reduce environmental impacts, lower life cycle costs and offer societal benefits in support of livability.

The Green Highways Partnership (GHP) is an alliance of Federal Highway Administration (FHWA), U.S. Environmental Protection Agency (EPA), and other Federal and State transportation and environmental agencies and industry partners to encourage environmentally friendly road construction. Guidelines provided by GHP for the planning, design and construction of a Green Highway include:

- Identification and avoidance/protection of historic and cultural landmark
- Identification and avoidance/protection of critical resource areas
- Reuse of existing transportation infrastructure to the extent possible
- Use of innovative, natural methods to reduce impervious cover, reduce runoff and enhance recharge and water quality
- Provide multi-modal transportation opportunities to promote use of public transportation
- Utilize recycled materials to reduce waste and energy consumption required to construct the infrastructure
- Control spread of invasive plant species and promote the growth of native species
- Restoration of natural drainage paths to protect wetlands and stream channels
- Encourage smart growth by integrating and guiding future growth and capacity building with ecological constraints

Similar to a building, a roadway represents a point source environmental impact with respect to the cross section of the roadway. In addition, roadways represent linear impacts as they traverse different geographic regions with varying characteristics and sensitivities. Accordingly, environmental impacts associated with a new or reconstructed roadway are more complex and potentially affect larger geographic areas as opposed to buildings. Issues associated with the planning and design of a sustainable roadway may be grouped into the following categories:

Roadway Alignment - Careful consideration of the alternative roadway alignments is key in the planning and design of a new or reconstructed roadway that reduces environmental impacts to the environment.

Materials & Resources – Choice of materials and processes for the construction and maintenance of the roadway corridor can reduce the impacts to the environment associated with the materials extraction, preparation, transportation and application process. These impacts may extend far beyond the area along the roadway corridor as materials may be produced in distant locations requiring transportation over long distances from the point of production to the point of use.

Stormwater Management - Construction of a new or reconstructed roadway holds the potential to increase impervious cover, affecting stormwater runoff, recharge and quality.

Energy & Environmental Control - Consideration of the management, operation and maintenance of the roadway corridor and associated amenities during the planning and design process is key in the reduction of the potential impacts to people and wildlife related to such issues as light, noise, air quality and heat island effect.

Construction Activities - The construction process and the manner in which activities are not only conducted but staged holds the potential to create impacts related to equipment emissions, fuel consumption, noise, water pollution and transportation mobility during construction.

2. Roadway Alignment

Implementation of improvements to the Route 440/Routes 1&9T corridor that best serve the project purpose and need and meet the goals and objectives for creation of a multi-modal urban boulevard will include construction and roadway expansion beyond the bounds of the existing right of way. Planning of the alignment of the future roadway included consideration of both horizontal and vertical placement, both of which were significant factors in the development of corridor alternatives and selection of the Locally Preferred Alternative. This represents the first step in the "Green Highways" planning process and support for sustainability.

Identification of the preferred horizontal alignment was based in large measure on the findings of the environmental constraints inventory (Section 4 - Existing Constraints, Resources and Design Considerations). This screening-level investigation of known and presumed environmental and civic/social features presented in the study area investigation included identification of:

- Locations of known contaminated parcels
- Areas of known groundwater contamination
- Delineation of the 100 year floodplain, base flood elevation and known flood levels
- Wetlands
- Designated parks, open space and Green Acres encumbered parcels
- Civic features such as schools, public housing, religious institutions and cemeteries
- Cultural and historic resources
- Significant physical infrastructure

Through the planning process, alternative alignments were identified and evaluated based upon their potential impacts to the identified environmental constraints. The horizontal alignment of the LPA (Section 8 – Locally Preferred Alternative) was developed to meet the future transportation mobility needs of corridor while minimizing the potential impacts to civic and environmental features in the study area. A number of the alternatives developed sought to reuse the existing transportation infrastructure to the greatest extent possible. This consideration was applied not only to the development of improvement alternatives along the corridor, but in association with the identification of through truck diversion alternatives that leveraged and built upon existing and planned roadway, bridge and rail infrastructure in the region (Section 6.5 – Through truck Diversion Alternatives)

The vertical alignment of the alternatives considered not only geometric considerations and the operational characteristics of the vehicles that will travel along the corridor, but the potential implications of global climate change. In the mapping of the environmental constraints, the 100 year floodplain was delineated along with the identification of areas that have experienced flooding in the past. The base flood elevation along the corridor was determined to be approximately 9 feet above mean sea level. One potential implication of global climate change is an increase in the elevation of the 100 year floodplain. As a means of ensuring that the future roadway will remain above the floodplain, the LPA includes recommendation for elevation of the roadway corridor.

Along the central section of the corridor, the LPA recommends that the roadway be constructed at an elevation of 14± feet. This height was identified to serve additional purposes beyond raising the roadway above the 100-year floodplain. The property along the eastern side of Route 440 north of Kellogg Street was capped with fill during the construction of the Home Depot. This capping was undertaken as an environmental remediation measure, with the NJDEP issuing a letter of No Further Action required. Elevation of the central section of the corridor to 14± will eliminate the need for excavation and further environmental disturbance resulting from the construction of the local streets incorporated into the LPA in this section. Future development along the corridor would include modification of the property grades and elevation to integrate with this elevated roadway as well.

3. Materials & Resources

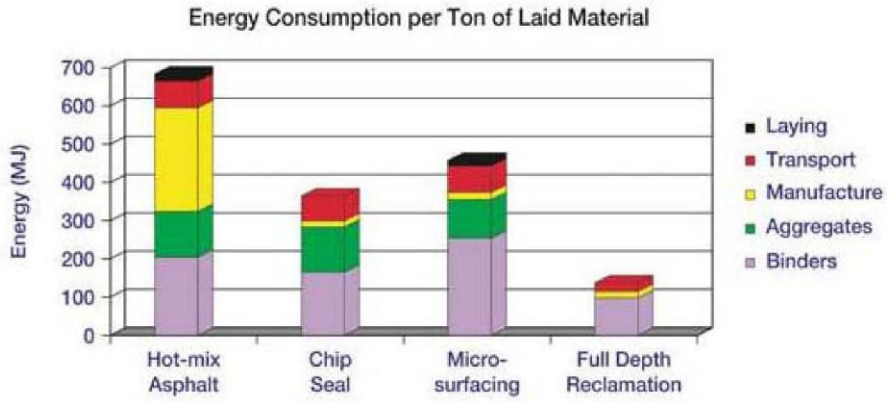
There are a number of environmental considerations in the selection of materials for use in the construction of the roadway corridor. Conserving natural resources is a primary objective of Green Highways and sustainable design and construction. Making use of materials in an efficient manner to improve sustainability is especially applicable on roadway construction projects which can consume significant quantities of materials, and consume significant resources during the material extraction, preparation, transportation and application process. Selection of the appropriate materials will be a significant consideration in the future designs of the corridor.

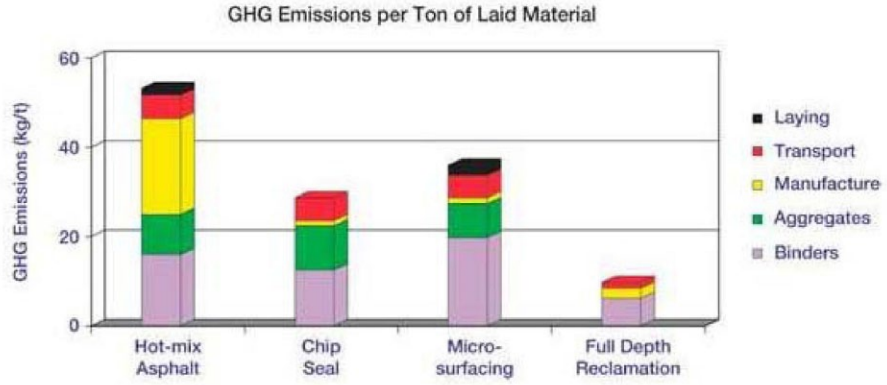
Solid Waste Generation in varying Roadway Material Types - By way of example, studies have been conducted comparing the waste created during the life cycle of continuously reinforced concrete (CRC) roadways and asphalt concrete (AC) roadways. This assessment looked at the waste generated from extraction of raw materials through the disposal of materials at the end of the roadway life cycle. For both types of materials, the amount of byproduct and disposable waste created during the installation process was found to be negligible. The both roadway types, waste products are primarily generated at the end of

the roadway life cycle. For a CRC roadway, waste generated at the end of the roadway life cycle accounts for approximately 53 percent of the total amount of waste generated over the roadway's entire life cycle. For AC roadways, end of life cycle waste accounts for approximately 59 percent of the total waste generated by use of this material. These findings suggest the use of recycled materials in the construction of the roadway would be a benefit to the environment and support sustainability.

Pavement management - Materials used to repair and construct streets have an impact on both short and long term maintenance costs and the useful life of the roadway. Consideration of the processes to be employed during the routine maintenance and resurfacing activities that are required for every roadway is needed in the selection of materials during the design process. Significant energy reduction may be achieved through implementation of a full-depth reclamation process for periodic resurfacing of the roadway as opposed to the more traditional hot-mix overlay process.

Full-Depth Reclamation is a cost effective and environmentally process for resurfacing. It is a pavement rehabilitation technique that mills and reutilizes the full depth of the pavement section as well as a portion of the underlying materials. The milled materials are blended with an asphalt emulsion, reinstalled and rolled in place. This process maximizes reuse of existing material, reduced waste and results in minimal disruption to traffic flows. The following figures compare the energy requirements and greenhouse gas emissions associated with varying pavement management techniques.





4. Stormwater Management

Stormwater management is a significant consideration in the design and management of a roadway corridor. The amount of impervious surface introduced into the environment through the construction of a roadway can have a significant impact on stormwater runoff. How this runoff is collected and managed can have a significant effect on living organisms and their habitat. Collection and conveyance systems of sufficient capacity to eliminate the formation of standing water that could disrupt the movement of people and vehicles along the corridor are a base requirement in the design of the corridor. However, careful consideration in the selection of materials and application of stormwater best management practices during the design process can serve to minimize the intensity of stormwater runoff and facilitate groundwater recharge and water quality.

Stormwater runoff is the result of all forms of precipitation that falls on any surfaces such as paved streets and parking lots, sidewalks and rooftops and landscaped areas. All surfaces, from paved areas to grass meadows produce some level of runoff. The more impervious the surface, the greater the runoff. Allowing runoff to enter area waterways and aquifers untreated impacts in the environment due to changes in quantity and quality of water flows. These impacts can alter natural habitats, geological conditions and increase pollution levels in water bodies.

Reduction in infiltration - Impervious areas reduce infiltration, or the process of precipitation seeping into the ground and contributing to aquifer recharge. This can adversely impact the water table, and cause small streams, wetlands to dry up harming these and other aquatic habitats.

Increased surface runoff – Areas with significant impervious cover can create faster and irregular runoff rates during and after a rain event. Increased runoff rates can result in more rapid and higher peak stream flows which contribute to bank erosion, increased sediments transport and destruction of aquatic habitat.

Water Pollution - As water runs off any impervious surface it picks up and transports materials on the ground such as oil, grease, fertilizers and pesticides, soil, trash and animal waste. In addition to surface pollutants, rain can also contain airborne pollutants. Allowing this runoff to flow directly into streams untreated impacts aquatic habitat.

Roadways typically represent large areas of impervious cover, especially when considering the adjacent sidewalk and bike path amenities incorporated into the LPA. Most of the pollution from a roadway is not a direct result of the roadway itself, but a result of the activities taking place along the corridor.

A number of measures can be integrated into the design of the corridor to address runoff source control as well as low control and runoff treatment.

Source control relates primarily to activities that occur along the roadway related to its day to day use as well as maintenance operations. Removal of a source of runoff borne pollutants eliminates the need to treat the pollutant. Measures such as ensuring comprehensive and regular street sweeping activities will reduce the amount of debris and trash that is conveyed by stormwater runoff into catch basins or directly into streams and waterways. Providing and regularly empting waste receptacles for use by people populating the sidewalks and bike paths will serve to minimize the volume of trash that could be conveyed by stormwater runoff. This would have an added benefit of enhancing the aesthetic environment by helping to maintain a clean and attractive public realm.

Maintenance activities, particularly activities such as snow removal and ice control during winter months, dust control during maintenance and repair activities, and the use of fertilizers and pesticides for maintenance of landscaped areas can all represent sources of pollution that may be conveyed by stormwater runoff. Development and adherence to practices and programs that would reduce or eliminate the introduction of pollutants into the environment should be developed as part of the routine maintenance program to manage the corridor.

Flow control and treatment management practices are intended to remove pollutants picked up and transported by stormwater. A variety of techniques are available and in use today to treat runoff. Aside from collecting and conveying all stormwater runoff to a treatment facility, localized measures are available and should be incorporated into the design of the corridor. These measures include design elements such as:

- Infiltration ponds, trenches and vaults
- Natural and engineered dispersion systems
- Biofiltration such as vegetated filter strips, swales and embankments
- Detention/treatment ponds and engineered retention vessels.

NCHRP Report 565 – Evaluation of Best Management Practices for Highway Runoff Control details a range of strategies and practices that should be considered during the design phase of corridor development.

5. Energy & Environmental Control

A number of measures intended to enhance sustainability of the environment along the corridor were incorporated into the development of the LPA. These elements include design features to encourage walking, bicycling and use of public transit (section 7 – Alternatives Assessment), minimize noise (section 12.3) and sustain air quality (section 12.5). Additional elements that should be addressed in the design of the corridor include consideration of light pollution, and heat island effect.

The American National Standard Institute's Practice for Roadway Lighting (ANSI/IESNA RP-8-00) provides guidance in the design of roadway lighting. In the design process, selection of lighting design should be carried out to optimize the placement of light fixtures to reduce the width of beam spread and reduce the use of electric energy that is required for the lighting system while providing adequate visibility to ensure public safety. Use of cutoff or full-cutoff luminaires should be considered to limit light pollution.

Heat Island Effect - Temperatures in urban areas can be several degrees higher than surrounding rural areas, a phenomenon referred to as the urban heat island (UHI) effect. This is generally due to the reduction of natural vegetation and the absorption and radiation of solar energy by constructed surfaces. Studies and simulations performed for 10 large cities in the U.S. indicate an average UHI effect of 2°C, compared to surrounding rural areas. The main impacts of this temperature increase are:

- Create additional need of energy use (air conditioning) in dense urban areas
- Increase air pollution in urban areas
- Contribute to adverse impact of human health and comfort measures

Pavement areas are large contributors to the urban heat island effect, as they comprise a large percentage of surface coverage in urban areas. Solar energy is absorbed by the pavement surface and stored as heat in the pavement, radiating this heat during the day and during the night back into the air as well as heating storm water that reaches the pavement surface.

Cool pavements are designed to reduce the absorption of the suns energy and radiate less heat to the surrounding environment. Selection of paving materials for sidewalks and bike paths that reflect solar energy and absorb less heat will lessen the effect of the roadway and its contribution to the urban heat island effect. In addition, materials that absorb and hold less heat have longer lifetimes due to reduced thermal stresses. More durable paving materials translate to reduced maintenance costs in addition to reduced environmental impacts related to maintenance operations.

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Locally Preferred Alternative (LPA)
Plans & Sections

Section B – Southern Gateway and Country Village Frontage

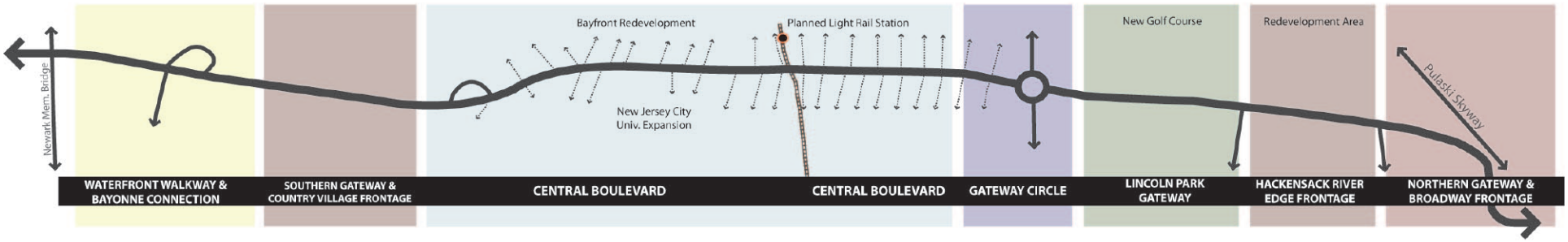
Section C – Central Boulevard

Section D – Gateway Circle

Section E – Lincoln Park Gateway

Section F – Hackensack River Edge Frontage

Section G – Northern Gateway and Broadway Frontage



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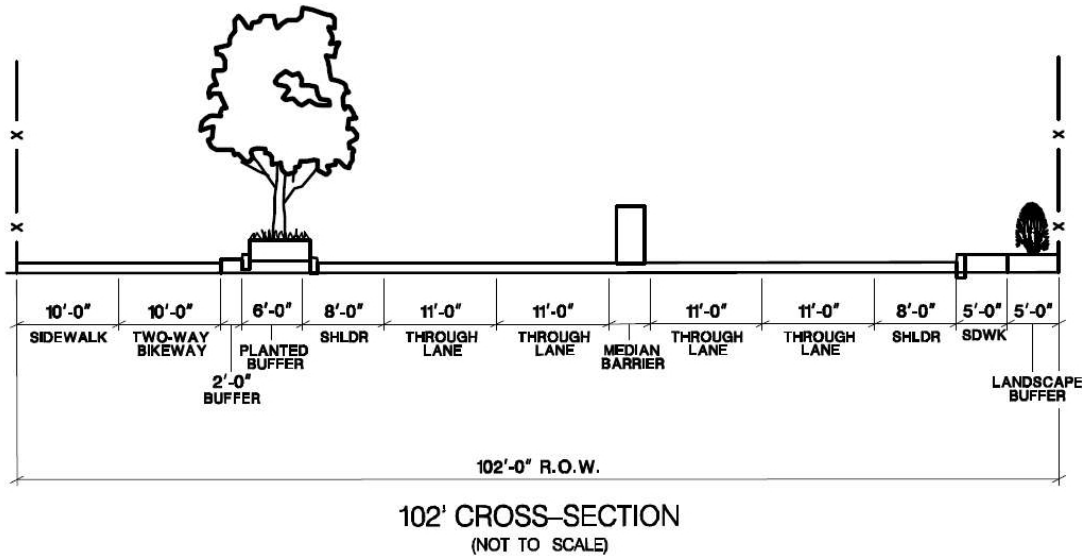

102' CROSS–SECTION
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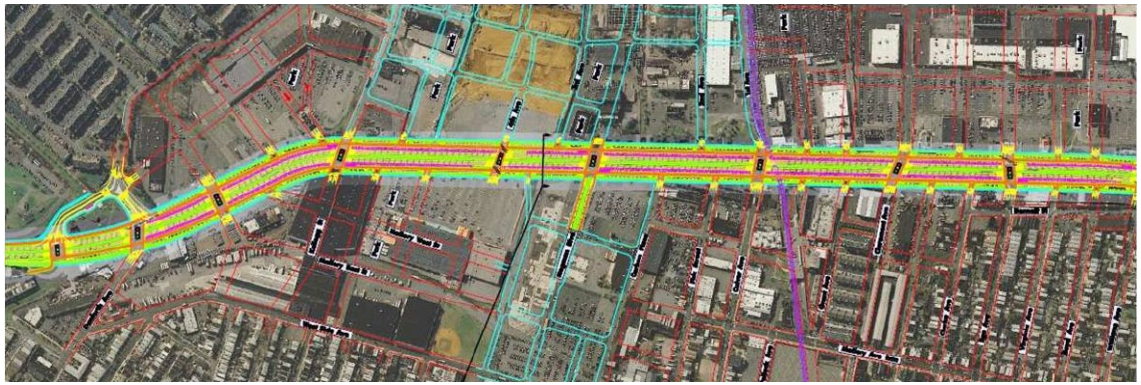
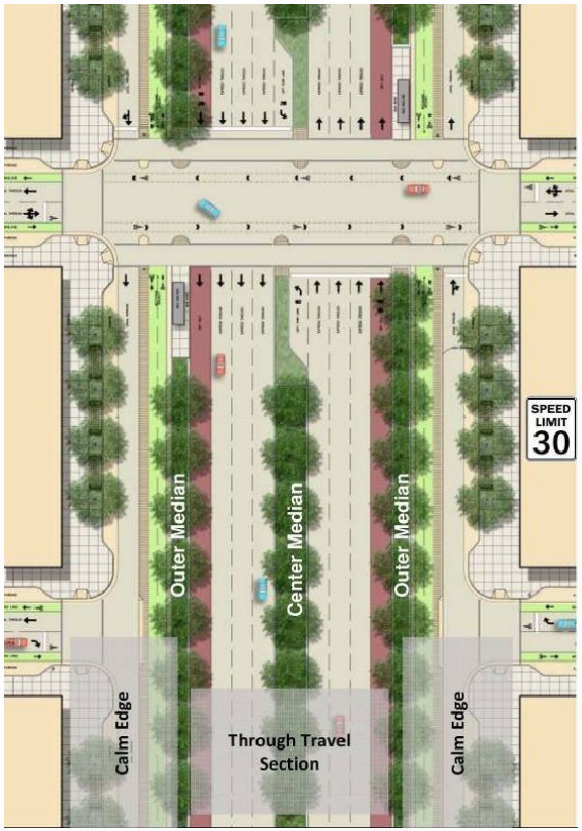
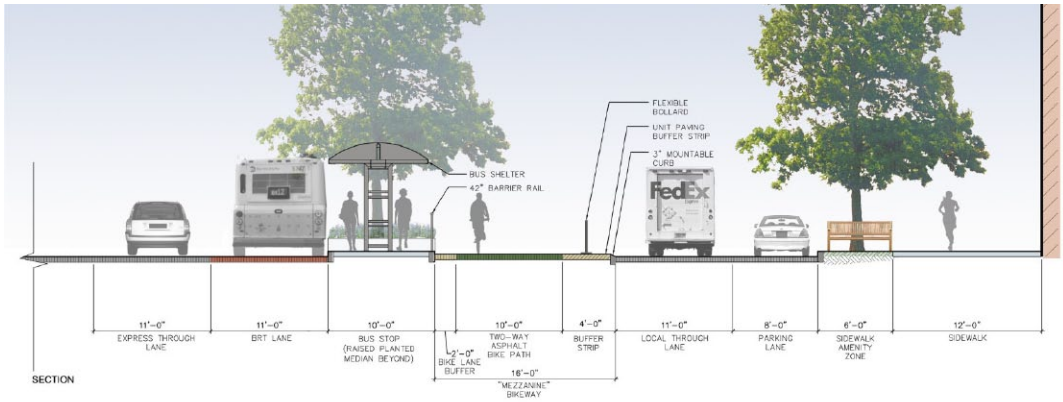
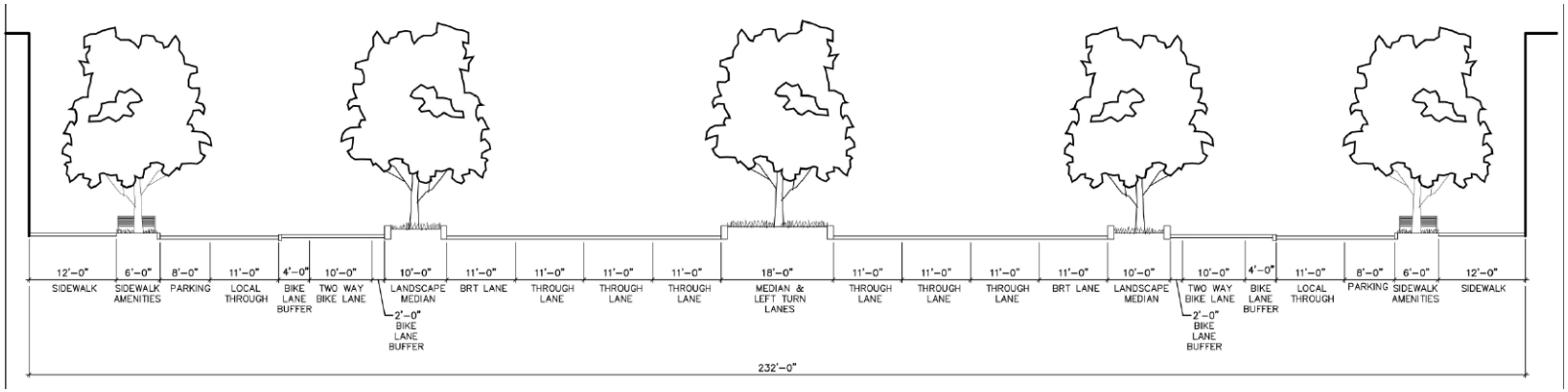
Section B – Southern Gateway and Country Village Frontage

Attachment B - LPA Plans & Sections



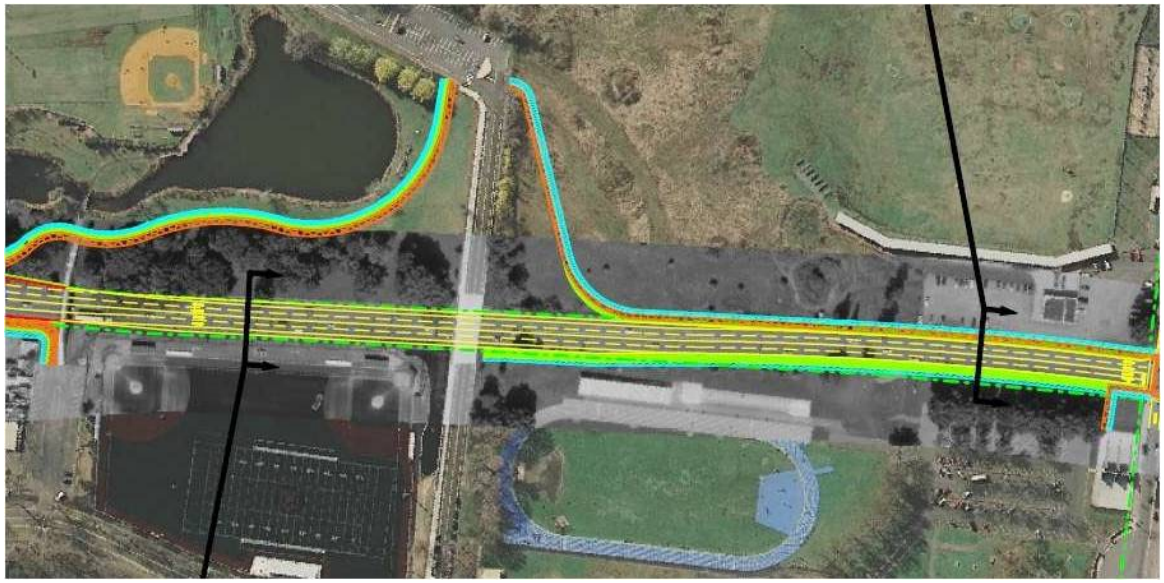


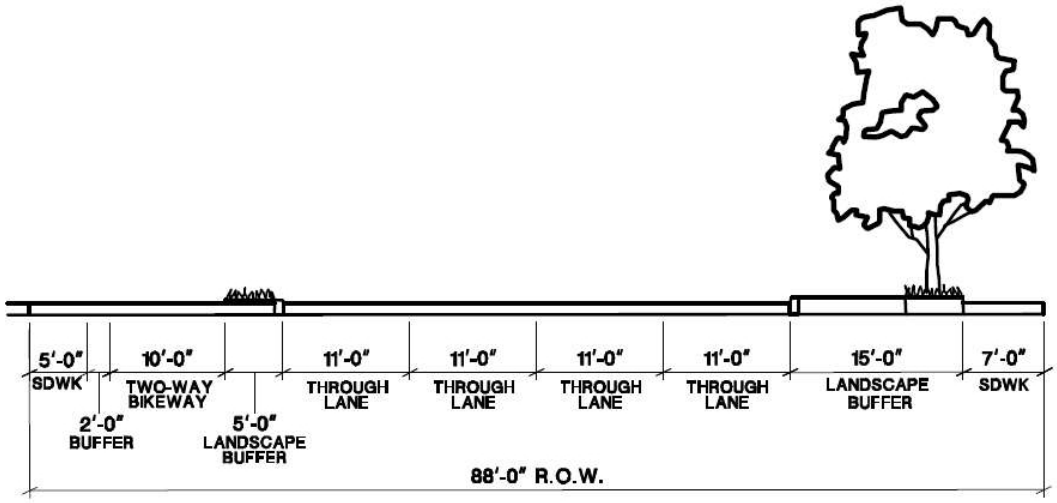




Section C – Central Boulevard

Section D – Gateway Circle





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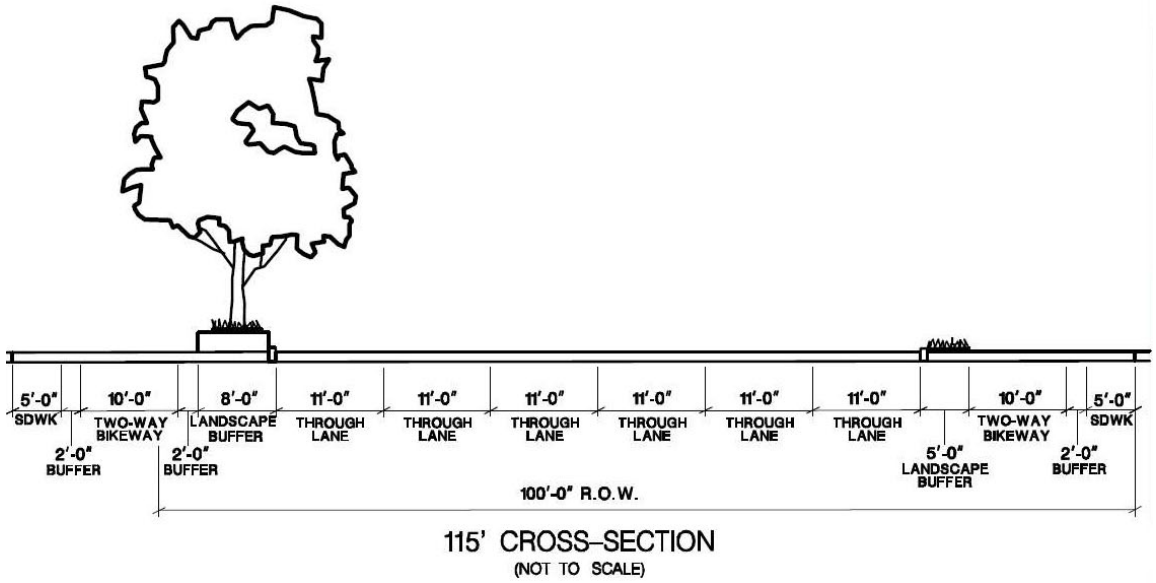
Section E – Lincoln Park Gateway



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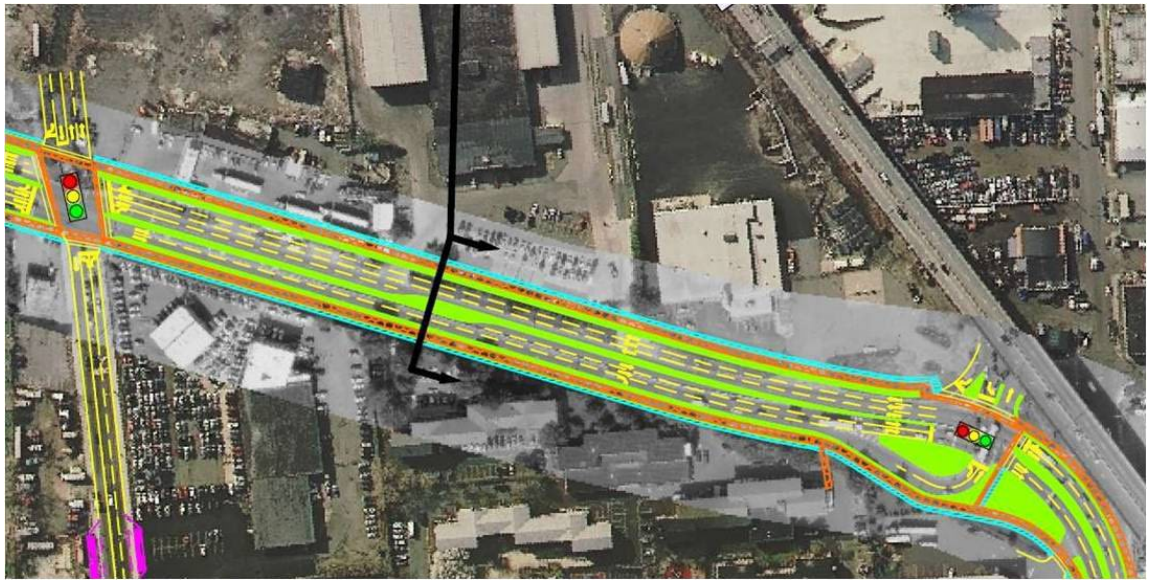
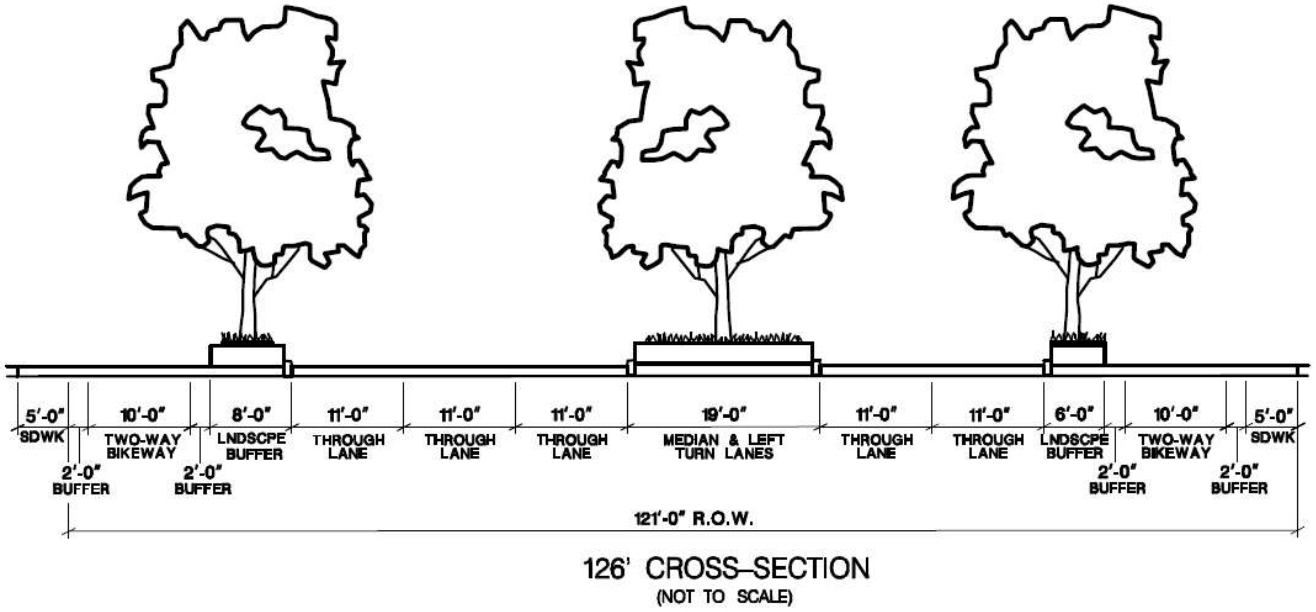
Section F – Hackensack River Edge Frontage





126' CROSS–SECTION
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Section G – Northern Gateway and Broadway Frontage