Appendix A
Design Guidelines

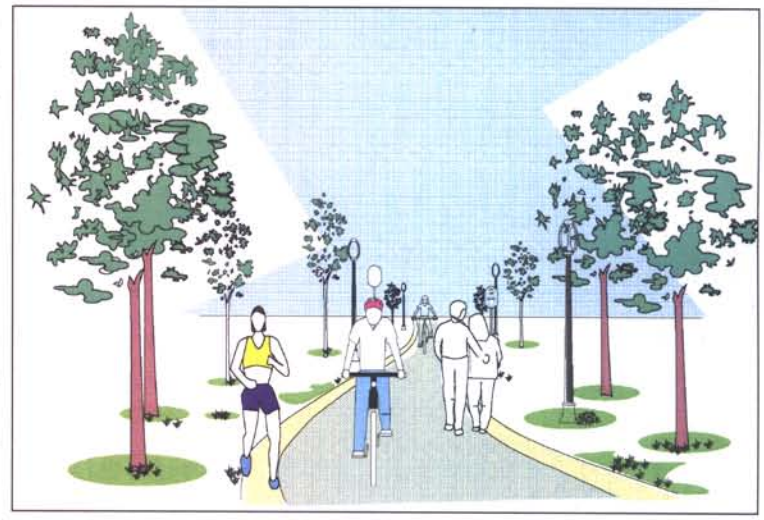
Greenway Facilities Classification

Greenways in New York City are classified by type:

Class 1: Multi-Use Trail

A multi-use trail is separated from the roadway and delineated by pavement markings and regulatory signage. Trails are usually shared by multiple users, including cyclists, pedestrians, joggers, in-line skaters, and wheelchairs. Typical widths are 12 to 16 feet.

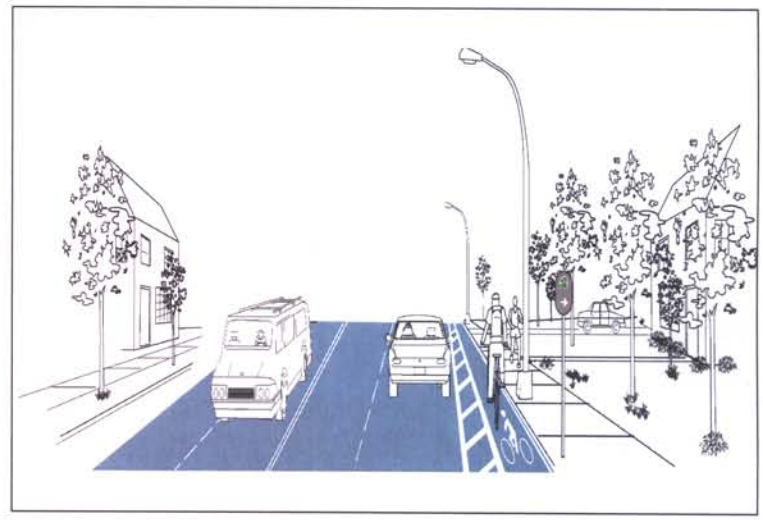
Dual carriage-way trails separate foot and wheel traffic. At trail and roadway intersections the design treatment should include bollards and landscaping to prevent access to the trail by motorized vehicles, except for maintenance and emergency vehicles.



Class 1: Multi-Use Trail

Class 2: On-Street Bicycle Lane

A bicycle lane is part of the roadway and delineated by pavement markings and regulatory signage. The lane is usually next to the curb parking lane, but may also be adjacent to the curb where parking is prohibited. The lane is usually separated from motorized traffic by a striped buffer. A sidewalk complements a bike lane to form a greenway for multiple users. The typical width of a striped bike lane is five feet, with a four- to five-foot striped buffer.



Class 2: On-Street Bicycle Lane

Class 3: Signed or Bicycle Route

A signed route has informational signage only, typically located at each block along the route. Bicyclists share the roadbed with motorized vehicles without special delineation. A signed route is typically located on lightly-traveled streets, neighborhood streets, or where space conditions do not allow the striping of a separate bike lane. A signed route also provides information directing users to bicycle lanes or multi-use trails.

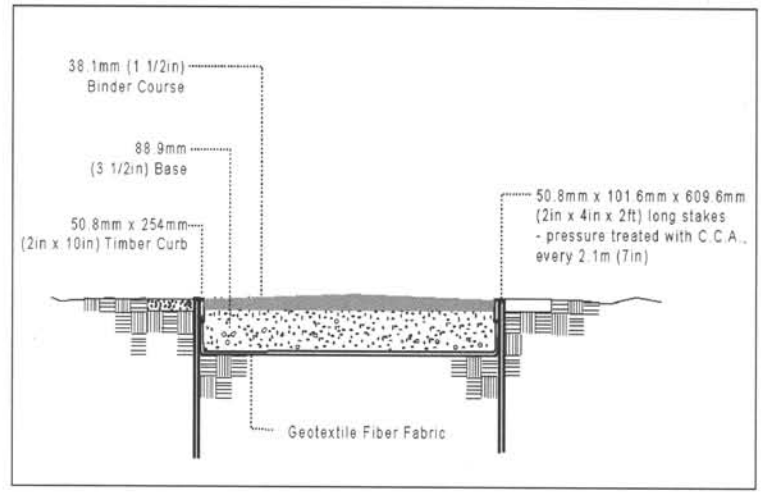
Class 3: Signed or Bicycle Route

Trail Design - Materials

Depending on space conditions and environmental aspects a choice of trail materials is available. The two most common materials are discussed below.

Asphalt Trail:

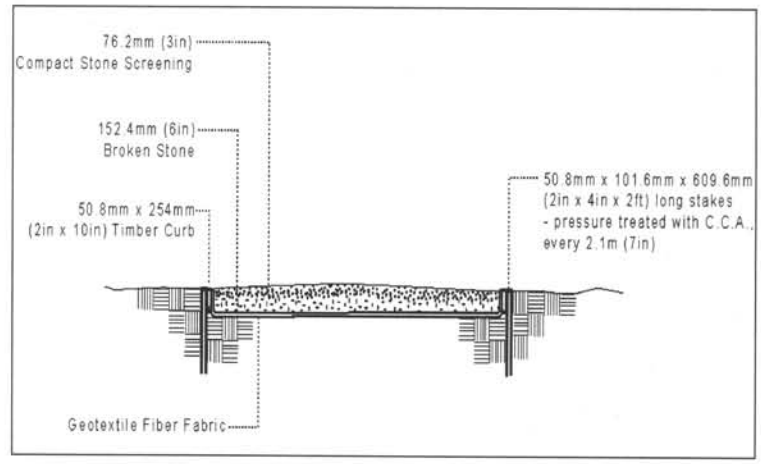
The standard material used for trails consists of hot rolled asphalt with a crushed stone clear zone. An alternative is to use concrete plates, which is more expensive to construct but provides longer durability. Trail widths may vary depending on space availability. The typical design for a two-way multi-use trail is 12 feet with a one-inch timber edge. According to the American Association of State Highway and Transportation Officials (AASHTO), the minimum width for two-way bicycle travel is eight feet.



Asphalt Trail Cross-Section

Crushed Stone Trail:

The crushed stone or chipped wood trail design is often used in environmentally-sensitive areas. Trail width may vary depending on the environmental sensitivity of the natural landscape. Design standards are the same as for asphalt trails. If bicycle travel has to be excluded for environmental reasons, trail width may be less than eight feet.

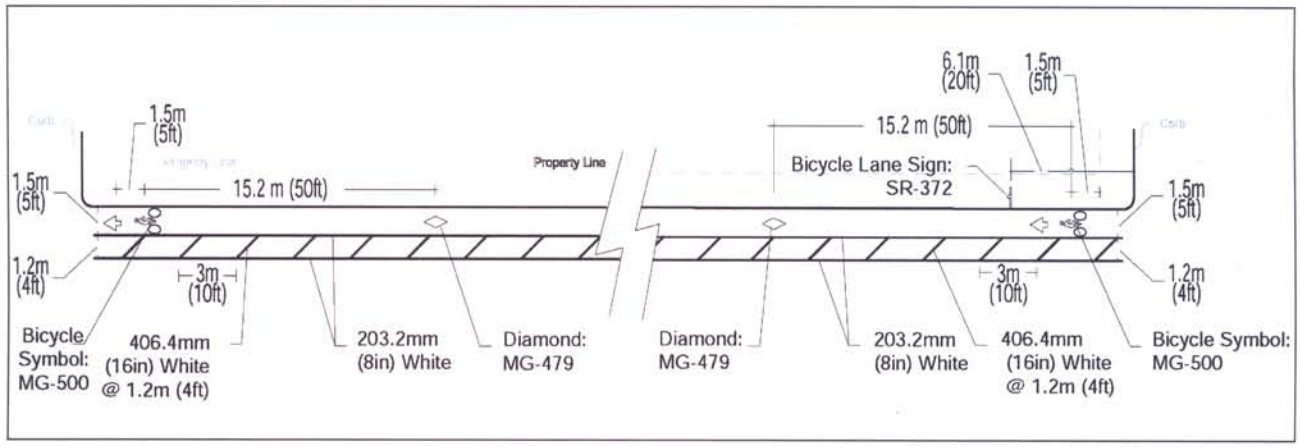


Crushed Stone Trail Cross-Section

Typical Details

Bicycle Lanes:

A bicycle lane is used to channelize one-way bicycle travel. The design may vary depending on roadway width and traffic conditions. According to AASHTO the minimum width for bicycle lanes is five feet; in several U.S. cities four-foot bike lanes may be found. A bike lane may be accompanied by a striped buffer zone to provide additional space separating the bicyles from the automobile lane and increase the visibility of the bicycle lane. The width of the buffer zone depends on the available roadway space. Two feet is the minimum, the typical width is four to five feet. Bicycle symbols and diamonds further identify the lane.

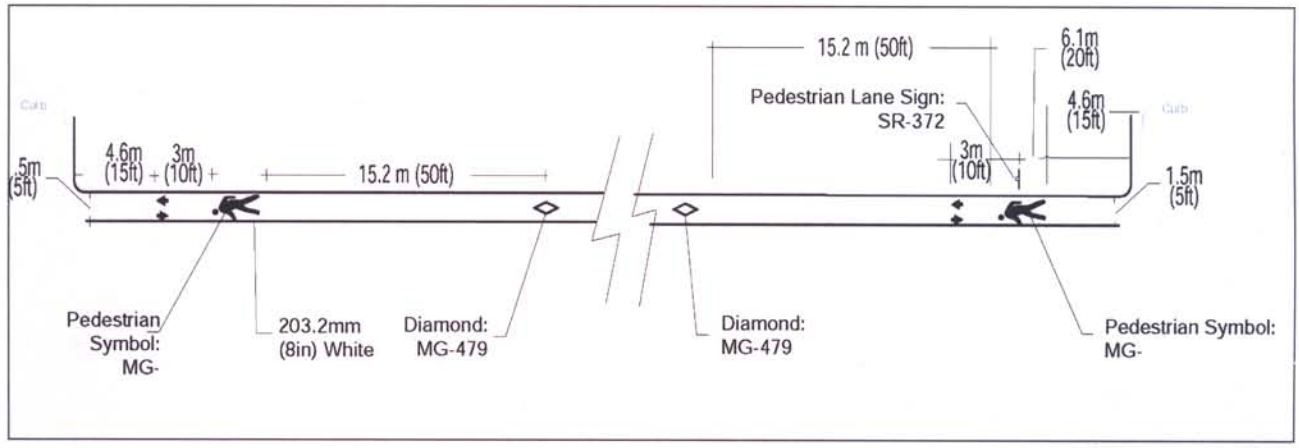


Typical Bike Lane Design

Pedestrian Lanes:

The use of pedestrian lanes in a greenway route development is an infrequent recommendation. With a lack of sidewalks, the obvious solution would be to build sidewalks along properties lacking them. However, sidewalk construction costs must be incurred by the property owner. Pedestrian lanes, a less costly alternative, may temporarily allow for safe pedestrian circulation.

Pedestrian lanes are most suitable on roads that may safely accommodate a pedestrian lane and two-way traffic. These roads usally carry low vehicular volumes and are wide enough to delineate a pedestrian lane.

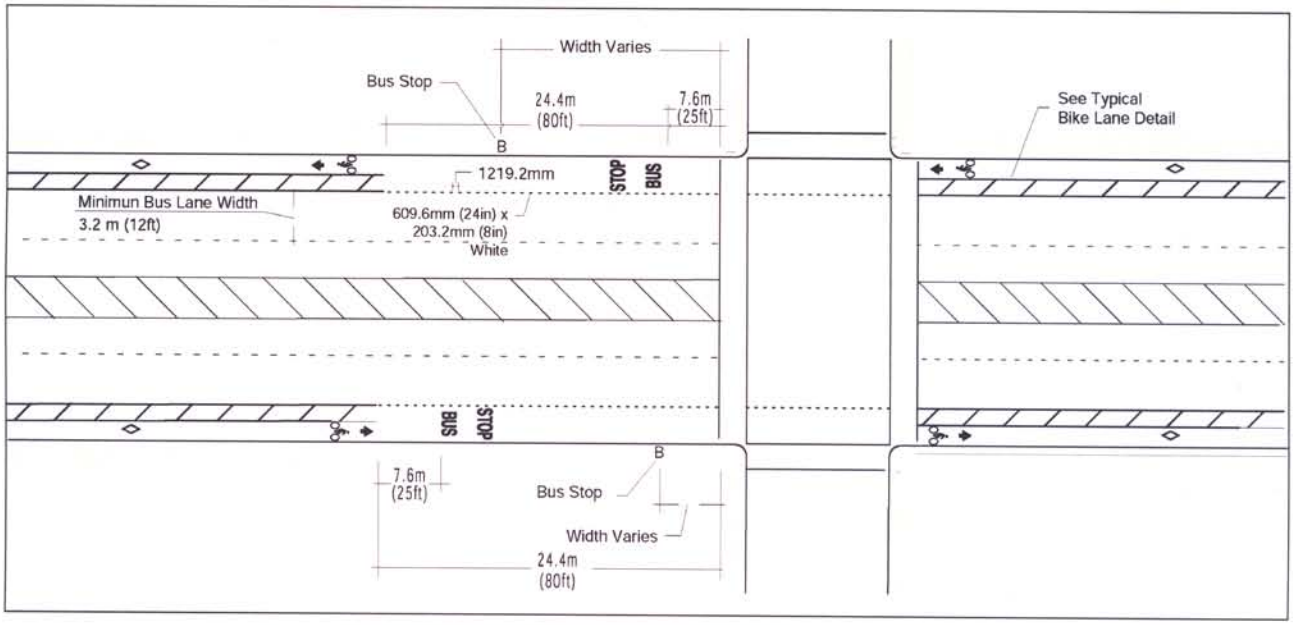


Typical Pedestrian Lane Design

Bus and Bike Interface:

The design for the convergence of a bus and a bike lane includes signage and pavement markings, warning both bus driver and cyclist in advance of the convergence area.

At a bus stop the bike lane is typically discontinued for approximately 80 feet. Bikes and buses share the same roadspace. Regular striping of the bike lane continues past the bus stop.

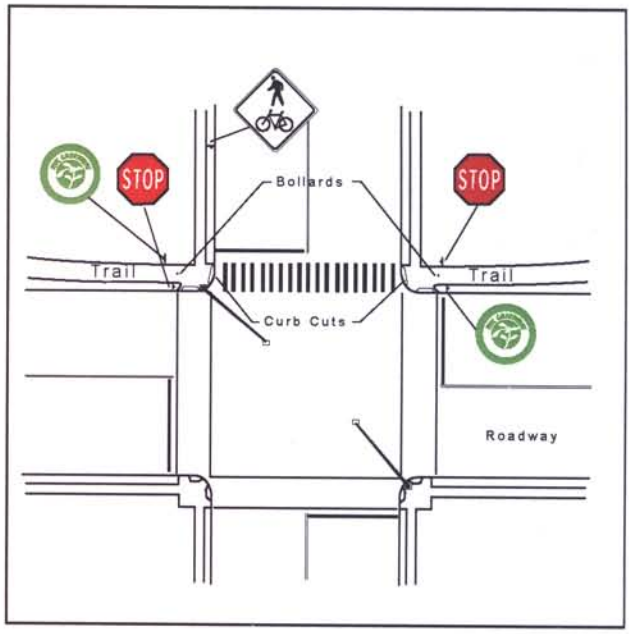


Bus and Bike Lane Interface

Trail and Roadway Interface

The design of a trail and roadway interface is extremely important in greenway or trail development. AASHTO provides design guidelines as shown in the diagrams and also recommends the following:

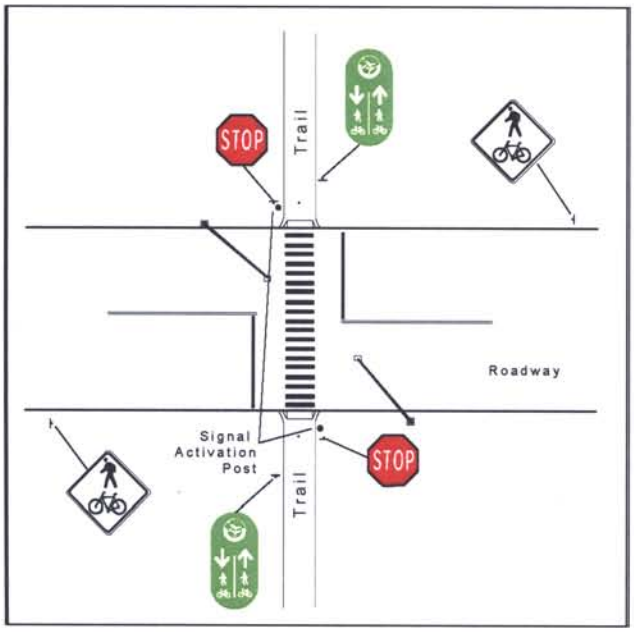
- Traffic controls (signals, stop signs, etc.) should be located so that motorists and cyclists are not confused by which controls apply to them.
- When a path terminates at an existing road, the path should be safely integrated into the existing system of roadways.
- Path intersections and approaches should be on relatively flat grades; stopping sight distances at intersections should be checked and adequate warning should be provided.
- Ramps and curb cuts at intersections should be the same width as paths, providing a smooth transition between the path and roadway.



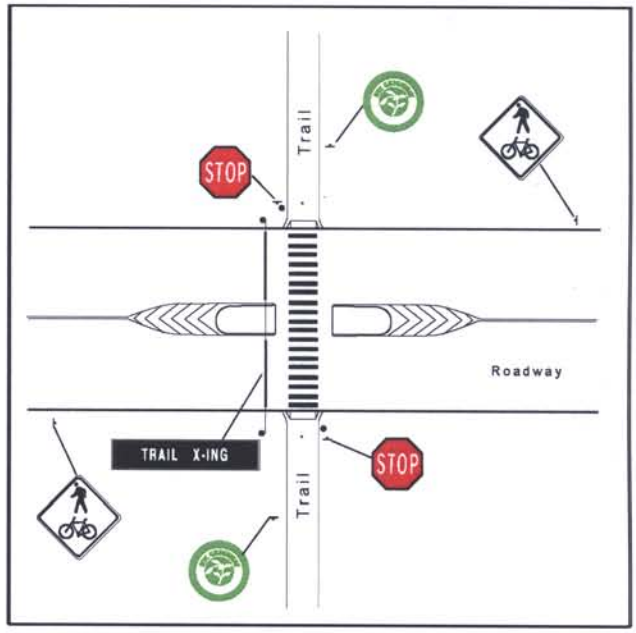
A: Trail Crossing at Signalized Intersection

Some typical design elements include warning and regulatory signage, located in advance of the junction. Where roadway crossings occur, traffic signals may be used. If the crossing occurs at a timed, signalized intersection, trail users cross with the green phase (see figure A).

When a trail crosses mid-block, there are two possible design treatments, depending upon the roadway's vehicular volume. The first design treatment for a roadway with modest vehicular volumes uses a traffic signal, activated by trail users only. This allows for continuous vehicular travel, until a trail user needs to cross (see figure B). The second design treatment, for a roadway with higher vehicular volumes, utilizes traffic islands for refuge while crossing (see figure C). High visibility pavement markings demarcate the crossing.



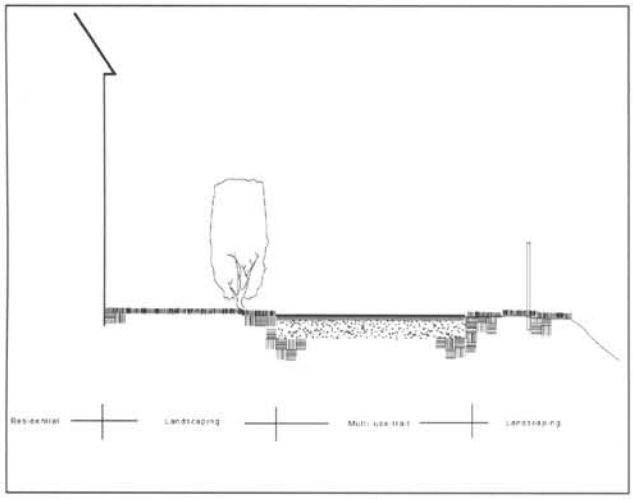
B: Mid-Block Trail Crossing with Signalization on Demand



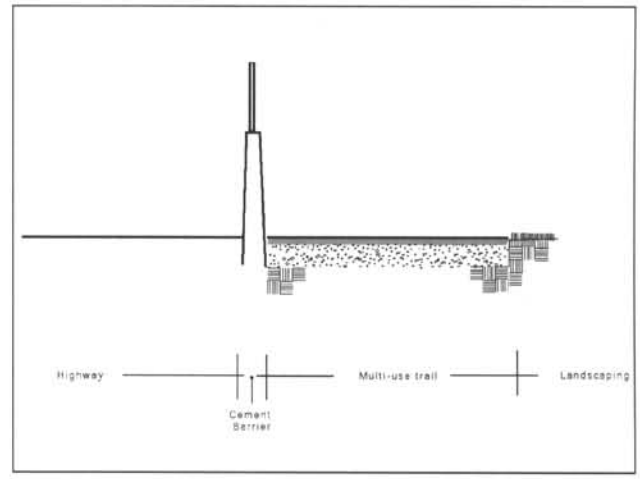
C: Mid-Block Trail Crossing with Signage

Trail/Lane Buffers

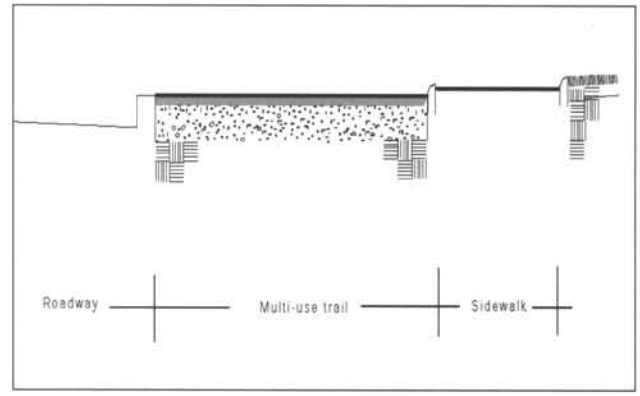
Designs to safely separate different travel modes include a combination of signage, pavement markings, and in some instances fences or landscaped medians to accommodate and separate users. A few examples and design measures are illustrated in the following figures.



Buffer between Trail and Residential Property



Physical buffer between Trail and Highway



Separation between Trail and Sidewalk

Appendix B Implementation/Cost Estimates

Given the overall length and cost of the entire 17-mile greenway, construction will occur incrementally. Potential funding sources include the TEA-21 CMAQ and Enhancement Programs, elected officials' discretionary funds, and existing agencies' capital projects.

Implementing agencies, such as the New York State Department of Transportation and New York City departments of Transportation and Parks and Recreation, would be guided by the Master Plan to construct, where possible, portions of the greenway as part of existing capital projects. In addition, segments of the greenway should be implemented within residential and commercial developments, in consultation with New York City Department of City Planning's Staten Island Office and Staten Island Community District Three. Coordinating the development of the greenway route with future construction projects would significantly reduce trail construction cost.

Typical construction of the greenway will involve general site work, such as clearing, grading, protection of trees, installation of signage, bollards, site furniture, and plant materials. Topographic surveys are also needed.

The cost estimates are given by route segment. Hylan Boulevard has been calculated separately and will be discussed first. Potential implementors are identified for each segment.

The preliminary cost of the South Shore and West Shore Greenway is $8.2 million.

Hylan Boulevard/Luten Avenue

Cost $213,314
Length: 11.8 miles
Potential Implementors: NYC DOT

Stripe bicycle lanes and shared bike/parking lanes on Hylan Boulevard as described, as well as on Luten Avenue. Estimate includes pavement markings and signage. Implementation may be funded through proposed Bicycle Network Implementation Congestion Mitigation and Air Quality (CMAQ) projects.

Segment A

Great Kills Park:

Cost: $986,822
Length: 1.61 miles
Potential Implementors: NYC DPR and National Park Service

These estimates include the construction of multi-use trails within Great Kills Park to provide connections with the Amundsen Trail and the South Beach extension.

Great Kills Park to Crescent Beach Park:

Cost: $1,513,345
Length: 0.62 miles
Potential Implementors: NYC DOT, NYC DPR, the National Park Service, developers of the proposed assisted-care center and the residential development between Cleveland and Wiman avenues.

This portion includes the construction and installation of a new bicycle and pedestrian bridge, connecting Great Kills Park to Mansion Avenue, via a new trail within Mansion Avenue's unbuilt right-of-way. Mansion Avenue, between Fairlawn Avenue and Hillside Terrace, would be improved with sidewalks, landscaping and greenway signage. Tennyson Drive would also be improved with sidewalks from Hillside Terrace to Cleveland Avenue.

Between Cleveland and Wiman avenues the potential exists for immediate trail construction as part of the development of an assisted-care facility and a residential development. However, plans for the de-

velopments have progressed. It needs to be determined if coordination is still possible. The section would include crushed stone and asphalt trails, fencing, signage, and landscaping.

Segment B

Crescent Beach Park to Mayberry Promenade:

Cost: $55,211
Length: 0.15 miles
Potential Implementors: NYC DOT, NYC DPR

This section encompasses the area between Wiman and Arden avenues and includes the construction of new trails and signed routes. Trail construction within Crescent Beach Park should be coordinated with design and improvements of the park. Between Tennyson Drive and Wakefield Road greenway implementation also consists of improvements to the land parcel [formerly a Designated Open Space (DOS) site] newly incorporated into Crescent Beach Park for passive recreation, including crushed stone paths, seating and an informational kiosk. Greenway signs would be installed between Wakefield Road and Arden Avenue.

Mayberry Promenade to Barclay Avenue:

Cost: $163,054
Length: 0.22 miles
Potential Implementors: NYC DOT, NYC DPR, and the Army Corps of Engineers.

The cost estimates include the construction of the multi-use trail between Arden Avenue and Holdridge Avenue using Ocean Driveway and Bayview Terrace. The Bayview Terrace right-of-way, between Harold Avenue and Peare Place, requires a title search; shoreline stabilization and roadway improvements are required at the intersection of Harold Avenue and Ocean Driveway.

Segment C

Bloomingdale Park to Lemon Creek Park and spur between segments C and G:

Cost: $5,376
Length: 1.48 miles
Potential Implementors: NYC DOT

This estimate includes the signed route connecting Bloomingdale Park to Lemon Creek Park and Wolfe's Pond Park. It also includes the spur from segment G back to the waterfront along Maguire, Amboy and Woodvail avenues.

Segment D

Lemon Creek Park to Page Avenue:

The recommendations for this segment do not require any striping or construction of any trails or paths. The route uses existing paths within the Mount Loretto Property. Street-end improvements to Page Avenue are included in the cost estimates for segment E, since this segment includes other streets with similar improvements.

The signage needed for segment D is very minimal, and its cost is therefore not specified.

Segment E

Page Avenue to Nassau Place:

Cost: $456,727
Length: 2.7 mi
Potential Implementors: NYC DOT, NYC DPR, and residential developers

Implementation of greenway facilities identified in segment E include installation of greenway signage for the signed routes, and the creation of scenic lookout points at the termini of Page, Bedell and Joline avenues; the construction of the Conference House Park perimeter signed route; and a multi-use trail, using the rights-of-way of Billop Avenue, Surf Avenue, and Saterlee Street.

Segment F

Nassau Place to Bloomingdale Road:

Cost: $1,489,321
Length: 3.17 miles
Potential Implementors: NYS and NYC DOT, commercial and residential developers.

The cost estimate includes the implementation of bike lanes on Richmond Valley Road, Page Avenue, Boscombe Avenue and Tyrellan Avenue. Along Veterans Road West, the construction of a multi-use trail is included between Tyrellan Avenue and Bloomingdale Road. The estimate includes the segment soon to be developed in conjunction with the Bricktown Centre shopping mall. The developer committed to construct the greenway within the site, along its service road. This will reduce the length to be built by about 1900 feet and will lower the segment's estimated cost.

Segment G

West Shore Expressway, Veterans Memorial Road, Bloomingdale Road, Foster Avenue:

Cost: $3,300,241
Length: 2.4 miles
Potential Implementors: NYC DOT, NYC DPR, and residential developers.

The estimate includes the implementation of the greenway facilities east of the West Shore Expressway. The following ongoing plans and proposals could include construction of the greenway:

Recreational facility improvements to Bloomingdale Park, Department of Environmental Protection sewer and water main installation, and the residential development of Maguire Estates. The developer for Maguire Estates has agreed to construct the multi-use trail within Maguire Avenue's right-of-way, as specified by the Department of City Planning. This will reduce the estimated cost of the segment's greenway.

Appendix C
Zoning Resolution

Special South Richmond Development District (Excerpts)

Zoning Resolution Article X: Special Purpose Districts
Chapter 7: Special South Richmond Development District

107-01 Definitions (9/9/99):
Arterial
Development
Designated Open Space
Open Space Network
Park
Waterfront Esplanade:

> A pedestrian way to be provided for the public use within the open space network along the Raritan Bay waterfront, as show on the District Plan.

107-06 District Plan (5/22/86):
The District Plan [...] shows the open space network, designated open space, park streets, waterfront esplanade, and building setback lines. [...] Appendix A [...] incorporated as an integral part of the provision of this chapter.

107-20 District Plan Elements (8/18/83):
All land in the open space network as shown on the District Plan, except public parks, is subject to the provisions of this Section.

107-21 Modification of Designated Open Space (8/18/83):
The City Planning Commission may adjust the boundaries of a designated open space on a zoning lot provided that such adjustment will not place the new boundary closer than 60 feet to a watercourse. As a condition for such adjustment in the boundaries, the Commission shall find that:
(d) such adjustment shall:

> (2) not preclude the continuity to the designated open space or the public pedestrian way or the waterfront esplanade; and [...]

107-22 Designated Open Space (9/11/75):
Any development or site alteration on a zoning lot which contains designated open space as shown on the District Plan, shall require certification by the City Planning Commission that:
(c) where required by the Commission, as indicated on the District plan, that the applicant has complied with Section 107-23 (Waterfront Esplanade).

107-23 Waterfront Esplanade (6/30/89)
When a zoning lot containing a portion of the waterfront esplanade, as shown on the District Plan, is developed, the location and design of the waterfront esplanade shall be certified by the City Planning Commission and its development shall conform to the guidelines and standards established by the Department of City Planning in consultation with the Department of Transportation and the Department of Parks and Recreation.

The waterfront esplanade shall be built and maintained by the owner [...].

The waterfront esplanade shall be either built at the same time that the zoning lot is developed or the Commission may allow the owner to comply with Section 107-24 (Performance Bond).

107-24 Performance Bond (9/11/75)
When the development of the required improvement is to be delayed for a period not to exceed 5 years from the date of the City Planning Commission certification, the owner of the zoning lot shall, prior to obtaining any certificate of occupancy, provide to the Comptroller of the City of New York a performance bond or City securities to ensure the future development of either the waterfront esplanade or the public pedestrian way.

Appendix D
A Brief History of Staten Island

Staten Island is the most geographically separate and economically homogeneous of the five boroughs. It encompasses 60 square miles and resembles an elongated diamond with a length of 13.9 miles between St. George and Tottenville, and a width of 7.3 miles between Howland Hook and Fort Wadsworth. It is the least populous and least densely populated of the five boroughs, containing approximately five percent of the city's population. Today, Staten Island remains a largely residential borough with the highest proportion of one-family and owner-occupied housing in the city.

By the sixteenth century the Raritan and Lenape Indians inhabited the island. In 1524, Giovanni da Verrazano was the first European settler to anchor his ship in the Outer Bay and sail through the Narrows. By 1609, a Dutch exploration by Henry Hudson established a trading post, and named the island Staaten Eylandt for the Netherlands. In 1661 the first permanent settlement of the island was located at Oude Dorp along South Beach, by the Dutch Woolons and Huguenot families. Twenty-two years later, when the colonies were divided into counties, Staten Island became the County of Richmond, in honor of James (brother of Charles II, in Yorkshire). Between 1698 and 1771, Staten Island's population grew from 727 to 2,847, as settlement occurred along most of the coast and interior valleys. The island's commerce included farming, fishing, shipping, piloting, maritime trade, the milling of flour and lumber, and trades such as blacksmithing and cooperage.

The construction of the Staten Island Rapid Transit rail line in 1860 triggered development along the rail corridor and its stations. Suburban communities were developed at Westerleigh and New Dorp, and waterfront amusement parks and seaside resorts were constructed at Midland and South beaches, and Oakwood and Hugenot, respectively. The city's industrial elite developed estates on the island's inland hills. In 1906, the borough's civic center moved from Richmondtown to St. George. By 1901, 67 percent of the borough's 116,000 inhabitants were concentrated along the western and northern shores.

The borough's industrial development thrived along the shores of Arthur Kill and Kill Van Kull. Industrial uses along the south shore, today commonly known as South Richmond, included maritime-related businesses, produce shipment, and steel and brick manufacturers in the Tottenville and Charleston neighborhoods. S.S. White Dental Works, the largest manufacturer of dental equipment in the world, was located at Prince's Bay.

By the early 1930s, the Outerbridge Crossing, Goethals and Bayonne bridges, and a new local span over Fresh Kills, opened to improve commercial access to the island. During the Depression, and until the end of World War II, the borough's population rose slowly.

America's involvement in World War II revived port activity and manufacturing on the island. In 1946, New York City Parks Commissioner Robert Moses developed the Staten Island and West Shore Expressway and the Richmond Parkway. By the 1950s and 1960s, suburban development in the island's southern section increased rapidly as the automobile gained importance. The Verrazano Narrows Bridge, opened in 1964, further spurred population growth. While the 1970s were a period of population decline for the city's four other boroughs, Staten Island experienced continued population growth. By 1975, the City Planning Commission, recognizing the borough's rapid growth and the desire to retain its natural environments, created the Special South Richmond Development District (SSRDD) to establish land use control through zoning practices.

According to the 1980 census, the borough's population was 352,029, a gain of almost 20 percent for the decade. The 1990 census revealed the population grew by 7.7 percent to 378,977. In South Richmond's Community Districts, the population jumped 73.2 percent, from 73,300 to 129,956, between 1970 and 1990. During the 1980s and 1990s, 22,000 units were added to the island's housing stock.

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