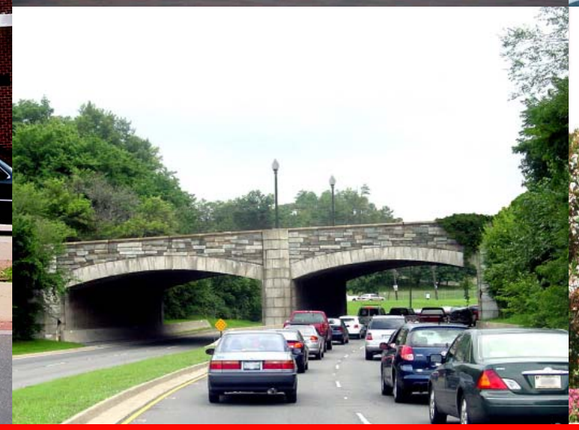
Anacostia Waterfront

Transportation Architecture Design Guidelines



District of Columbia
District Department of Transportation

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Transportation Architecture Design Guidelines

Introduction

1

1. Introduction

Figure 1.1 (opposite page): Anacostia Waterfront Area Map

Figure 1.2 (below): Criteria for Design Guidelines

A. Waterfront access

B. Neighborhood identity

C Anacostia Waterfront Area integration with monumental core

Overview

The Anacostia Waterfront Initiative (AWI) promises to revitalize the Anacostia Waterfront Area by creating a hub of economic development and bringing thousands of new jobs, residents and visitors. The financial investments, new federal buildings, new baseball stadium, planned housing and mixed-use developments, together with the multi-modal transportation network servicing this area, call attention to the value of this urban waterfront and mandate economic and quality-of-life improvements. Each phase of development holds the potential to improve the Anacostia River by incorporating Low Impact Development (LID) stormwater management technologies and Best Management Practices (BMPs). Development can integrate communities, east and west of the River, by providing better and safe access to the River and improving mobility across, and around it. Additionally, revitalization projects can physically and visually unite the neglected Anacostia waterfront area with existing District of Columbia (the District) infrastructure and its monumental core, only blocks away.

The success of the AWI effort depends on addressing accessibility and mobility issues of the area and improving the health of the River. Although counterintuitive, these aims can be accomplished simultaneously. Methods to minimize or reverse the current urban impact on the River can be achieved through sustainable transportation design guidelines. Such guidelines will help to restore the River's vitality and minimize the environmental burden often associated with development. Traditionally, improving a transportation system means improving driving conditions for the automobile through increased vehicle speeds and roadway capacity. These traditional, yet limited solutions have imposed significant financial, social and environmental costs on the AWI area. Creating a sustainable transportation system within more socially and economically vibrant communities requires shifting focus to the mobility of people, instead of their cars. Improving transit accessibility and designing an active public realm, in which people can easily and safely walk or bike for most routine trips, lessens the need for travel by automobile. The result is fewer automobile trips - safety, congestion and air quality improve.

Sustainable transportation systems also rely on the coordination of land use and transportation planning, the integration and enhancement of the historic, scenic and natural environment, and the guidance of community values. In essence, a sustainable transportation system relies on the criteria defined in the AWI Framework Plan. The District Department of Transportation (DDOT) has initiated this sustainable transportation plan to address redevelopment, rehabilitation and enhancement of all major thoroughfares, streets and corridors - accomplishing the AWI Framework Plan's goals. This initiative has led to this document, the Anacostia Waterfront Transportation Architecture Design Guidelines, a document that catalogues design guidelines for transportation related elements in the public realm. These design guidelines have been developed to emphasize:

A. Environmental stewardship

B. Waterfront access

C. Safe pedestrian, bike and transit friendly rights-of-way

D. Neighborhood character and

E. Integration with the monumental core and the Capitol.

The Guidelines represent a holistic approach to improve the region's transportation system. Facilitating the movement of people to and through the region via transit, light rail, bike and pedestrian trails, and automobiles in the most efficient, yet pleasant way possible. The Guidelines prescribe an infrastructure to support the economic and environmental health of the region.

A

B

C

1.1 Intent of the Guidelines

The Guidelines should primarily provide the District's planners, engineers, consultants, private developers and non-profit groups with guidance to efficiently and effectively develop projects that achieve the goals defined subsequently in Section 1.2 this guidance is consistent with or exceeds the District's policies and standards and enables users to easily incorporate distinctive AWI area features within the public realm. The Guidelines are intended to:

- Benefit a variety of users. The contents appear as a pictorial presentation of options with less text and many references to other technical manuals and plans, including references to information that is germane to the Guidelines itself. It is more than just a list of technical standards generally used by the engineering community. More information and engineering details can be found in the list of additional resources (see Appendix A5).
- Ensure all stakeholders use the same information and standards for all transportation related projects in the Anacostia Waterfront,
- Be easily accessible,
- Be uniformly updated, as needed,
- Provide users with options to most effectively integrate goals and LID into their design, and
- Facilitate the coordination of all transportation architecture projects.

Although referenced, it is not the intent of the Guidelines to provide design engineering standards. Rather the Guidelines focus on the treatment and aesthetic design of all public rights-of-way in the Anacostia Waterfront area.

1.2 Goals and Objectives

Develop A Sustainable Transportation Network

Coordinating transportation planning with land use and environmental planning ensures the creation of more livable communities, more commuter options and the foundation for economic growth and longevity. Sustainability is incorporated into the overall design of the DDOT right-of-way, through improved stormwater management techniques, reduced energy consumption, use of reclaimed/recycled products, introduction of recycling bins, increased commuter options, enhanced landscaping, and incorporation of park roads and river access.

Integrate Public Rights-of-Way in the Entire City Fabric

Visually and physically linking the AWI area with the District calls attention to this forgotten urban watershed. Using common District transportation architecture elements, such as furnishings and signage, creates an immediate visual link to the rest of the City. Coordinating materials used on sidewalks and roadways provides an obvious physical connection, while landscaping techniques can subtly and perceptually link the Anacostia Waterfront to the City. The Anacostia Waterfront area will once again be recognized as a resource that offers economic and social benefits.

Develop AWI Specific Guidelines

The District can exploit the unprecedented redevelopment potential and the public right-of-way improvements to develop safe, contextual and environmentally sensitive transportation architecture design guidelines specific to the waterfront. The District can set a precedent for urban revitalization in sensitive environments, proving development can positively impact the surrounding ecosystem.

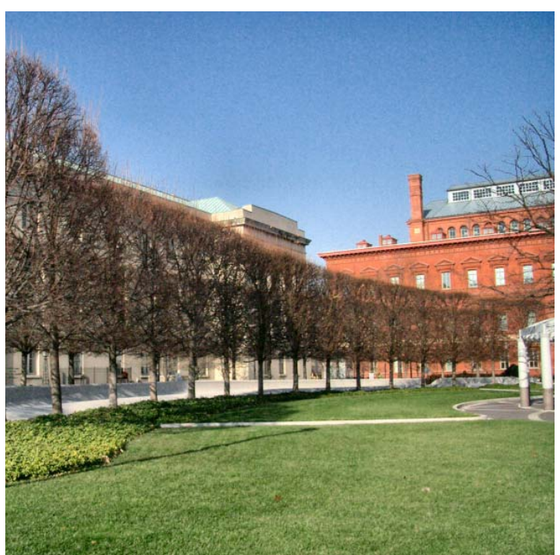
Figure 1.3 (below, left to right): Goals of the Guidelines

A. and B. Integrate AWI public right-of-way treatment with the rest of the city

C. LID techniques, AWI area-wide standards

D. Emphasize the history and uniqueness of the Anacostia Watershed Area

A



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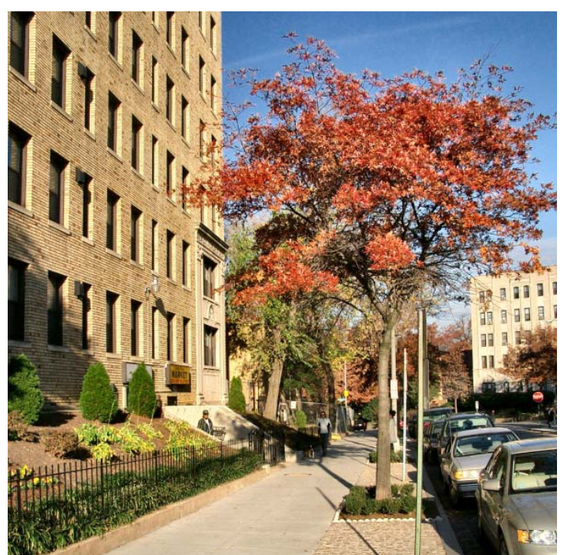

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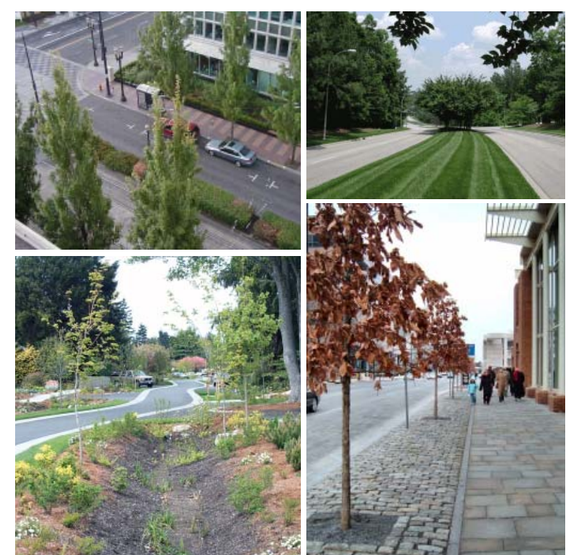


D

Minimize Environmental Impacts on Ecosystem by Integrating LID Strategies

LID practices are incorporated into the overall design of the DDOT right-of-way and are integrally treated as part of the aesthetic and environmental foundation of the AWI transportation plans. These decentralized stormwater management techniques reduce runoff volume, control peak runoff rates, filter and treat pollutants, reduce pollutant loads and are considered in every appropriate element within the DDOT right-of-way. This not only meets regulatory requirements, but also creates community assets that define the appearance and character of the Anacostia Waterfront area.

LID options cited in the Guidelines provide various stormwater management tools to meet the goals and objectives of the Chesapeake Bay 2000 Agreement, the DC Municipal Separate Storm Sewer System (MS4) permit, and the Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP). These strategies also help determine the location, selection and size of appropriate techniques to achieve the most environmentally efficient protection, restoration, and implementation plan for the Anacostia Waterfront area. Integrated LID strategies can:

- Minimize stormwater runoff,
- Improve water quality,
- Reduce erosion downstream,
- Maximize on-site water loss to evapotranspiration and infiltration,
- Control non-point source pollutants transported off-site during frequent storms, and
- Reduce wastewater treatment plant overflows into the River.

These strategies come in response to growing concern for increasing lifecycle costs and maintenance burdens of traditional stormwater infrastructure. As part of a holistic approach, landscape design and ecological restoration also reduce the heat island effect, restore wildlife habitats, and add visual interest to the disturbed and polluted urban environment.

Emphasize History & Uniqueness of Anacostia Watershed Areas

In order to emphasize the natural beauty of the Anacostia Waterfront, the history of its people, and the proximity to many of the District of Columbia's monuments; strategic geographic locations, special corridors and other public rights-of-way are identified. These areas provide opportunities to implement unique design guidelines for transportation elements. Such areas are referred to as "Special Areas" in the Guidelines.

Additionally, public artwork can be integrated in public works projects. Integrating art into a wide range of transportation elements and open spaces creates an attractive and memorable public realm and enriches the quality of life of residents, workers and visitors. Celebrating the area's heritage, civic pride and creativeness through public art also enhances the local, regional and national image of the Anacostia Waterfront area.

Opportunities to incorporate art in the public rights-of-way are per DDOT's recommendation on a project-by-project basis. Public arts projects can involve local artists, local institutions and the community in the planning and design process. Potential funding for art projects includes, but is not limited to District of Columbia Commission on Arts and Humanities, Washington Metropolitan Transit Authority, Local Main Streets, Private Developers, Business Improvement Districts, and private developers and businesses.

1.3 Implementation Area

The implementation area, or geographical boundary in which transportation architecture design guidelines are enforced, (Figure 1.1) extends from the Washington Channel on the western boundary to approximately the District line on the eastern boundary. The boundaries that parallel the River outline the surrounding neighborhoods and generally include the Southeast neighborhood and Southeast Federal Center, the Southwest Waterfront and surrounding neighborhoods including Buzzard Point, Anacostia Park and the Poplar Point area, the Anacostia Park on both sides of the River, RFK Stadium and the Arboretum.

1.4 Geographic Areas of Exclusion

It is not the intent of the Guidelines to set precedents for the facilities owned and maintained by the National Park Service, General Services Administration and Department of Defense. However, the Guidelines are intended to coordinate with and complement the respective standards of these agencies.

1.5 Limitations of the Guidelines

Transportation architecture, as detailed in the Guidelines, focus on transportation related elements within the public realm. These components, typically identified as the elements within the public right-of-way, are implemented and/or maintained by the District. The buildings, facades and their associated land uses fall within the private realm and are not addressed. However, the Guidelines account for their relationship and compatibility with the transportation architecture. Similarly, engineering design, which is critical for stipulating the dimensional palette of the public realm, is only provided to accommodate the application of architectural elements.

The Guidelines relate exclusively and uniquely to the AWI area and provide references to many existing District standards to facilitate the users' complete understanding of architectural

and engineering standards in the District. Other transportation elements, not covered in the Guidelines can be referenced in other standards or documents, as listed in the Appendix A5. The list is not meant to be all-inclusive as other documents may be available.

Engineering standards are provided in detail in other engineering documents. Roadway design is specific to each roadway, dictated by right-of-way width, functional classification, and other physical features affecting the design. Before applying architectural elements, a roadway "template" should be established to determine the limits of architectural application. District Manuals instrumental to establishing an engineering template can be found in Appendix A5.

A number of engineering considerations assist in the identification and placement of architectural elements. Speed, volume, and capacity determine the functional classification of roadways. In turn, each roadway classification has specific engineering design standards. Considerations related to engineering design include:

Lane Width
Shoulder Width
Parking Stipulations
Cross Slope
Horizontal Alignment
Superelevation
Horizontal Clearance
Grade
Sight Distance
Structural Capacity
On/Off-Street Bike Lane

Although this list may not be all-inclusive, it highlights a close working relationship between architectural and engineering staff to identify architectural elements.

Beyond physical engineering, other considerations have to be made in conjunction with other agencies in the District of Columbia. For example, the Washington Metropolitan Area Transit Authority should provide transit usage and future plans for new transit, including fixed-guideway transit. Existing and planned utilities should be considered so that architectural improvements do not impede utility work, and more importantly, utility work can be completed without degrading the architectural elements.

Architectural considerations represent one layer of roadway improvements that have to complete the surrounding physical environment, while meeting safety and engineering standards of roadway design. The Guidelines serve to define architectural options that can then be applied to specific roadway projects throughout the Anacostia Waterfront area.

1.6 Guidelines Organization

The Guidelines are organized by the sequential steps a user takes to access the information required of any public right-of-way project and uncover information to guide project design. The Guidelines contain AWI-specific design guidance for specific items associated with each architectural element of the project. Each Guidelines section represents a step in the process of defining a project's transportation architectural elements and their design requirements. Following these steps, the Guidelines ensure that project(s) (1) integrate public right-of-way in the AWI area with the rest of the city, (2) incorporate better environmental, safety and aesthetic guidelines, and (3) include unique design guidelines pertinent to "Special Areas".

This chapter (Chapter 1) outlines the goals, objectives and intent, while clearly demonstrating the AWI area's economic, cultural and environmental significance. It briefly discusses the various criteria (adopted from the Framework Plan) that have shaped the development of guidelines for AWI-wide elements and guidelines for unique Special Area elements. Finally, Chapter 1 explains how to find the information needed.

The next two chapters provide the means to select guidelines. Chapter 2 includes a map of the Special Areas within AWI. The user can determine if any proposed project is within a Special Area. If it is, more unique guidelines govern design.

Chapter 3 presents the land use that characterizes the study area and defines the functionality of the streets in the AWI area roadway network. The type of development is dictated by location (its roads and area type). The roadway functional classification system and area type qualify what design guidelines are used for the architectural elements of the project.

Chapter 4 presents the design guidelines using a catalog of items that pertain to specific architectural elements. This chapter also includes a selection matrix that keys on information presented in Chapters 2 and 3, for both AWI-area-wide items and AWI "Special Area" items. The matrix is a summary table

Area Type
- Residential
- Mixed-Use

Functional Classification with District & AWI area Standards
- Interstate
- Freeway
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Alley

Special Areas with Unique Elements
- Greenway
- Symbolic Corridor
- Designated Transit Corridor
- Special Segment
- River Crossing
- Waterfront Access Segment
- Waterfront Promenade
- Park Road

Implementation Area

Figure 1.4 (opposite page): Guidelines Organization

Figure 1.5 (below): Flowchart showing how to use the Guidelines

that directs the user to the appropriate item that complies with the AWI design guidance. The items for the elements of a project are found by cross-referencing an element with a roadway functional/land use classifications or special area designations.

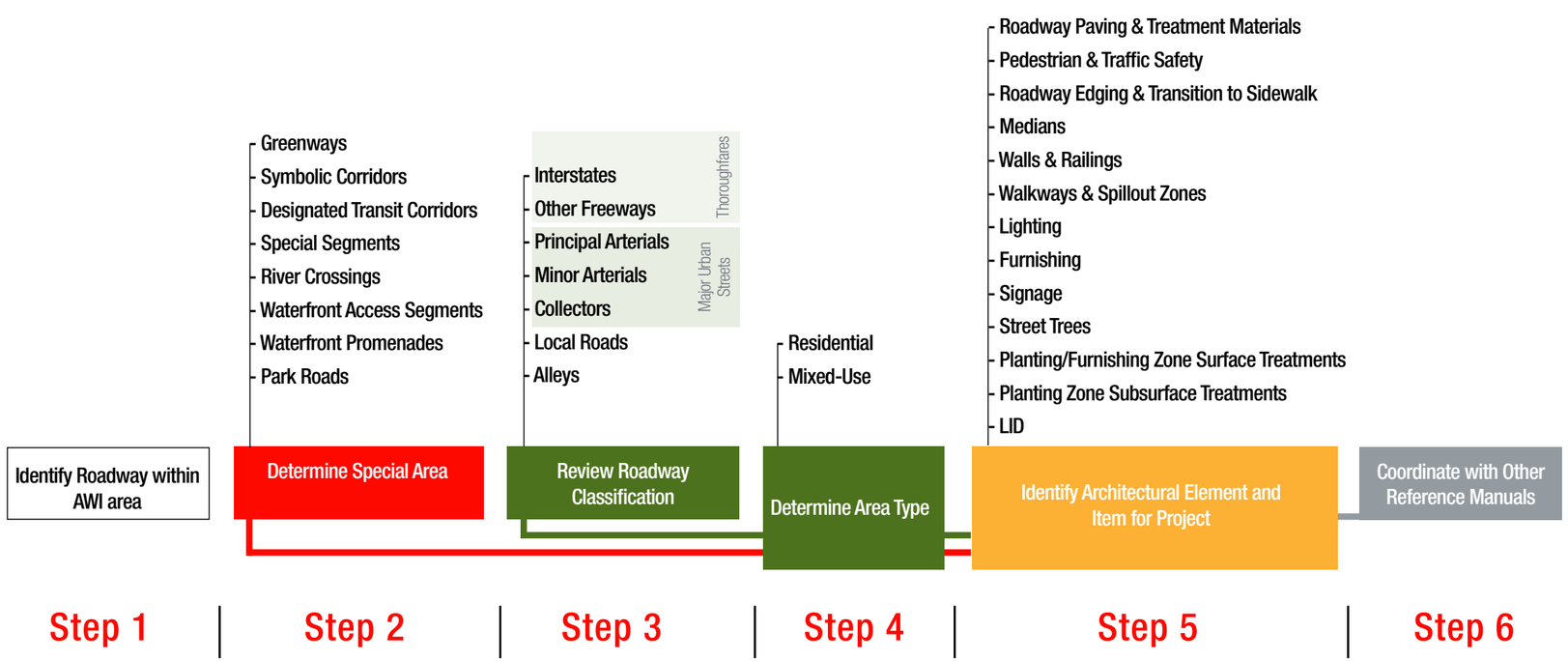
Chapter 5 presents LID options and technologies prescribed for the AWI area. The selection of viable options involves the same "cross-referencing" method as described above. This chapter also includes a comprehensive discussion of LID selection and implementation philosophy, separating strategies into structural and non-structural practice.

Chapter 6 is a companion chapter to Chapter 4 and contains design details and other information associated with item information that is unique to the Guidelines, and not present in other technical documents and plans.

1.7 How to Use the Guidelines

Use the following 6 steps and accompanying flowchart (Figure 1.5) to navigate through the Guidelines.

1. Locate project in the Anacostia Waterfront area map (Figure 1.1) and determine if it is inside the implementation area boundaries.
2. Locate the project in the "Special Area" map (Figure 2.0.1) to determine if it is designated as a Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront Promenade, or Park Road. If it is located in a Special Area, unique guidelines apply.
3. If the project is not in a designated "Special Area", locate the project in the Roadway Classification map (Figure 3.0.1) to determine the functional classification of the street(s) associated with the project. This map is color-coded by functional classification to define the roads as interstate, freeway, principle arterial, minor arterial, collector, local road or alley. Because roadway classes differ in functionality, safety concerns, and physical design constraints, each class mandates a different set of design guidelines.
4. Locate the project in the current zoning map (www.dcoz.dc.gov/info/map.shtm) to determine if it lies in a residential setting or mixed-use area. In the Guidelines, all areas not solely residential are designated as mixed-use. Area type imposes another layer of criteria and defines the land use character. Thus guidelines for the architectural elements distinguish a residential roadway from a mixed-use roadway, even if located along the same corridor.
5. Locate architectural elements required for the project in the selection matrix (Table 4.1) at the beginning of Chapter 4. If Step 2 reveals that the project is in a Special Area classification, move to the appropriate column to find the additional guidance required. Otherwise, find the column that represents the functional class and area type (Steps 3 & 4) The matrix cells that correspond to the element rows are either blank or contain an "X". Those cells that contain an "X" indicate items specific to the subject architectural element for which guidance can be found in Chapter 4. Item flysheets in Chapter 4 either uniquely define guidelines and/or reference to technical manuals currently used by the District. If guidelines are uniquely defined, a reference to Chapter 6 will be present. Table 5.1 "LID Selection Matrix" is used in the same way as Table 4.1, the exception being that Table 5.1 points to LID options that are described in Chapter 5.
6. If necessary, find additional information in the guideliness and/or plans referenced in the item flysheets located in Chapter 4.



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Transportation Architecture Design Guidelines

Special Areas

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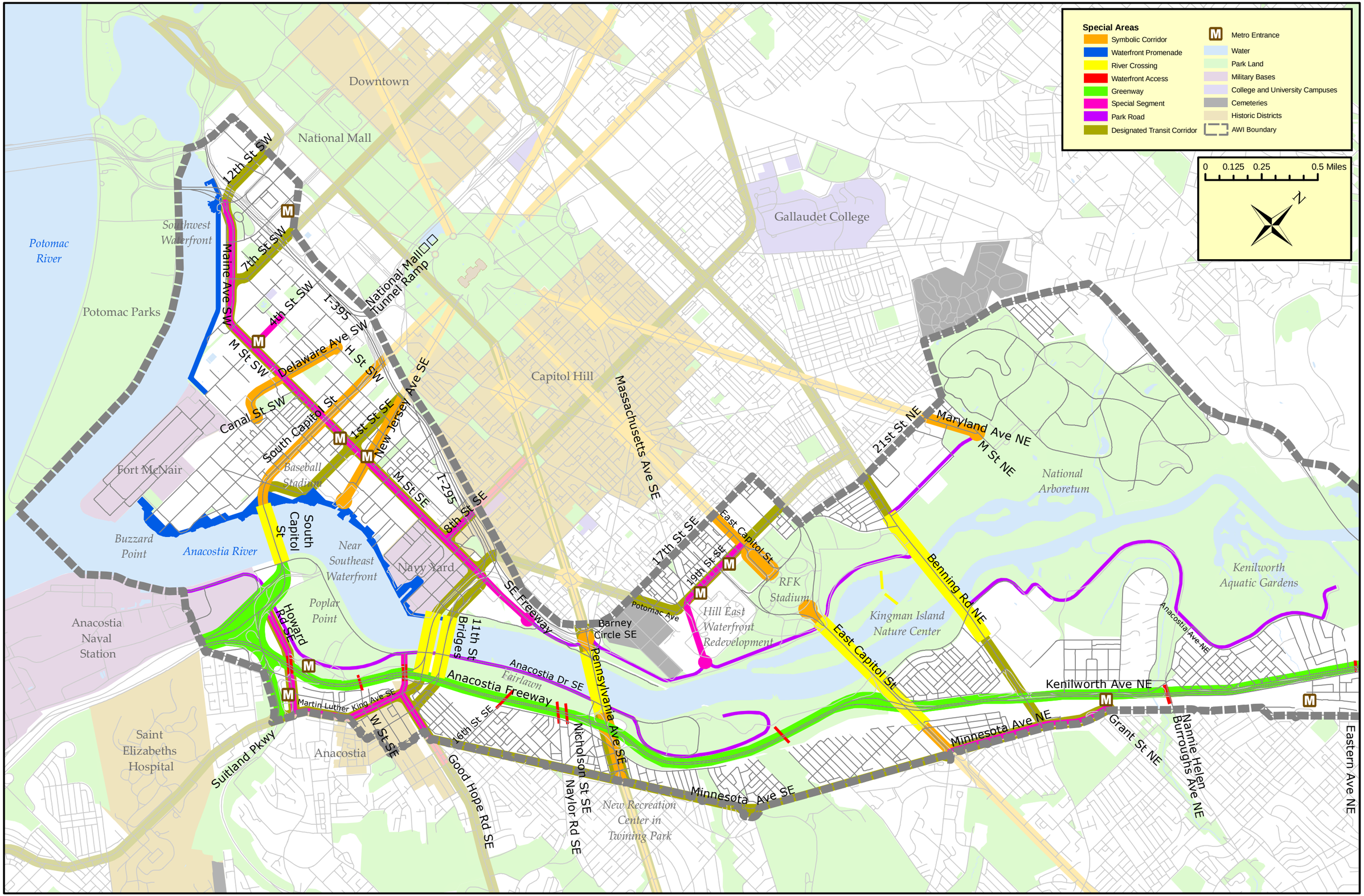

Special Areas
Symbolic Corridor
Waterfront Promenade
River Crossing
Waterfront Access
Greenway
Special Segment
Park Road
Designated Transit Corridor
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
N
Downtown
National Mall
Gallaudet College
Potomac River
Southwest Waterfront
Potomac Parks
Capitol Hill
Fort McNair
Buzzard Point
Anacostia River
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
Fairlawn
Hill East Waterfront Redevelopment
RFK Stadium
Kingman Island Nature Center
National Arboretum
Kenilworth Aquatic Gardens
New Recreation Center in Twining Park
Baseball Stadium
12th St SW
7th St SW
4th St SW
Maine Ave SW
M St SW
Delaware Ave SW
H St SW
I-395
National Mall Tunnel Ramp
Canal St SW
South Capitol St
1st St SE
New Jersey Ave SE
M St SE
I-295
8th St SE
Massachusetts Ave SE
21st St NE
Maryland Ave NE
M St NE
17th St SE
19th St SE
East Capitol St
Potomac Ave
Barney Circle SE
SE Freeway
11th St Bridges
Anacostia Dr SE
Anacostia Freeway
Pennsylvania Ave SE
Benning Rd NE
Anacostia Ave NE
Kenilworth Ave NE
Minnesota Ave NE
Grant St NE
Nannie Helen Burroughs Ave NE
Eastern Ave NE
Minnesota Ave SE
Nicholson St SE
Naylor Rd SE
Good Hope Rd SE
16th St SE
W St SE
Martin Luther King Ave SE
Howard Rd SE
Suitland Pkwy

2. Special Areas

Figure 2.0.1 (opposite page): Map of Special Areas in AWI Area

Overview

Specific corridors in the Anacostia Waterfront area require additional attention due to their relationship with regional connectors, the District, the waterfront, and neighborhood destinations. These corridors are categorized into eight Special Areas:

1. Greenways
2. Symbolic Corridors
3. Designated Transit Corridors
4. Special Segments
5. River Crossings
6. Waterfront Access Segments
7. Waterfront Promenades
8. Park Roads

The previous work for the Anacostia Waterfront Initiative and the collective communities' vision defined the goals of the Framework Plan. These goals have guided the development of a set of criteria that determine the specific geographical locations where unique transportation architectural design guidelines should be applied. Unique guidelines should be applied where elements can:

1. Promote environmental stewardship of the waterfront area;
2. Integrate the AWI area and the Monumental Core;
3. Promote pedestrian, bike, transit friendly rights-of-way, and enhance overall safety;
4. Increase access to the waterfront and emphasize river crossings; and
5. Enhance identity of neighborhoods and local destinations.

The transportation design guidelines developed for the roadway functional classifications in Chapter 3, primarily serve to unify the rights-of-way within the AWI area and coordinate them with the rest of the District. However, these guidelines do not completely address the needs of special areas. They do not cater to the unique urban design, context sensitivity and future local access transportation goals of the District.

Given the limitations of the functional classification design guidelines, more context specific overlays are needed, through which AWI specific design guidelines may be applied. This chapter contains a set of Special Area overlays that complement the District roadway functional classifications, to:

- Better address the urban design and broader transportation goals set forth in the Framework Plan and other preceding studies, and
- Develop a cohesive public realm sensitive to the diverse environs of the Anacostia Waterfront area.

The Special Area Corridors will meet these criteria as described in the following pages 2-4 through 2-6:

2.0.1 Greenways

The design guidelines in this overlay should complement the guidelines developed for the network of thoroughfares (interstates and other freeways) in the Anacostia Area.

The primary criteria satisfied by this overlay are environmental stewardship and expanded neighborhood access to the waterfront.

2.0.2 Symbolic Corridors

The design guidelines in this overlay should guide "L'Enfant Avenues" in the area, which are located on axis with the Capitol.

This overlay serves to integrate the Anacostia Waterfront Area with the Monumental Core.

2.0.3 Designated Transit Corridors

The design guidelines in this overlay should guide the routes designated for enhanced transit. These corridors may serve a streetcar, a light rail transit or a bus rapid transit system.

This overlay primarily functions to encourage a multi-modal transportation system by creating pedestrian, bike, and transit friendly rights-of-way.

Even when stormwater alone enters the river, it includes an array of urban contaminants from streets and other paved surfaces.
(Pg. 26, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

In urban areas, most rainwater is not absorbed. Instead, it runs over vast expanses of paving into storm sewers and from there to streams and rivers.
(Pg. 26, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

During significant rainfall, stormwater from city streets overwhelms the capacity of the combined sewer system, and the excess Combined Sewer Overflow (CSO).
(Pg.26, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

The highways must be transformed because they create a physical and visual barrier to the waterfront and adjacent neighborhoods.
(Pg. 37, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

L'Enfant wanted his fledgling capital to make a powerful symbolic statement, so he designated a city of broad avenues and imposing public spaces that radiate outward from the "President's House" and the "Congress House" like spokes on a wheel…….
(Pg. 13, Extending the Legacy, National Capital Planning Commission)

…….L'Enfant recognized that grandeur is never enough. So where his sweeping boulevards intersected the grid of local streets, he created circles and squares and proposed for them monuments and statues to symbolize the joining of federal and state interests…….
(Pg. 14, Extending the Legacy, National Capital Planning Commission)

……the plan allows the restoration of major L'Enfant thoroughfares, including Maryland, Virginia and Delaware Avenues and South Capitol Street.
(Pg. 14, Extending the Legacy, National Capital Planning Commission)

The Capitol should be the symbolic center of Washington and the Monumental Core.
(Pg. 63, Extending the Legacy, National Capital Planning Commission)

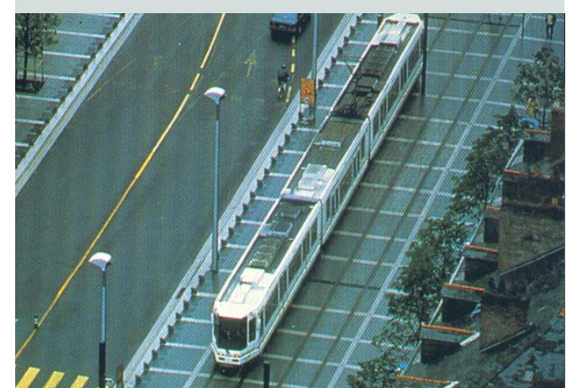
People need places along the waterfront where they can live and visit unencumbered by cars.
(Pg. 45, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

Public transit is inadequate near the waterfront, especially in light of new development rapidly occurring along the river corridor.
(Pg. 40, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

Light rail is a state-of-the-art strategy in Washington's efforts to reduce auto congestion and pollution.
(Pg. 43, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

Safe and convenient paths from neighborhoods to employment centers will increase use of alternative modes of transportation, such as walking and bicycling.
(Pg. 40, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

By keeping commuters off the highways and streets near the river, it will help reduce traffic congestion, pollution, and noise impacts on neighborhoods.
(Pg. 40, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***



2.0.4 Special Segments

The design guidelines in this overlay should complement the streets, which are significant to the area neighborhoods by virtue of their "Main Street" designation, neighborhood commercial zone or the presence of historic and/or cultural attractions.

This overlay serves to enhance the identity of the neighborhoods and local destinations.

The historic and cultural endowments of these neighborhoods (existing neighborhoods along the river) provide a critical armature guiding future improvements, which can be designed to showcase the history and build on the cultural wealth.
(Pg. 97, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

Other new cultural enhancements should be directed solely at the neighborhoods around the river, sited in them, and focused on celebrating the cultural heritage of these historic districts.
(Pg. 97, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

Neighborhoods along the river have distinct assets. They are important repositories of our city's and nation's history.
(Pg. 97, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

2.0.5 River Crossings

The design guidelines in this overlay should guide the design of the multi-modal bridges that span the Anacostia River.

The primary criterion that they will satisfy is to increase public access to the waterfront, connect communities and create gateways to the District.

Seven bridges currently cross the river – an insufficient number given the density of the city and region. Most of the bridges are burdened by highway traffic. They do not conveniently conduct neighborhood traffic back and forth across the river, and they offer the pedestrian a harrowing experience.
(Pg.46, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

The existing bridges that cross the Anacostia River must be redesigned to serve as great works of urban infrastructure. Reducing the traffic load on existing bridges and avenues is critical for urban design improvements, park access, and economic growth in the area; indeed, for residents' quality of life.
(Pg. 47, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

2.0.6 Waterfront Access Segments

The design guidelines in this overlay pertain to those roadways which should connect neighborhoods on the eastern bank of the Anacostia to the waterfront, bypassing the barrier created by Kenilworth Avenue, Anacostia Parkway, and I-295.

The primary criterion satisfied by this overlay is improved direct access to the waterfront from nearby neighborhoods.

Only three miles separate Poplar Point from the National Arboretum, for example, yet over city streets this distance more than doubles, requiring the negotiation of freeway ramps and heavy traffic with the aid of very few signs.
(Pg. 72, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

Pedestrians have few convenient routes to the river or continuous trails along the waterfront.
(Pg. 37, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

More than 50,000 people live within a 10-minute walk of the Anacostia River, but there are no sidewalks to take them there. Highways, contaminated lands, and chain-link fences come between the residents of Washington and their river.
(Pg. 98, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

More aggressive advertising and direct pedestrian connections to the Riverwalk will increase the attractiveness of these facilities.
(Pg. 40, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

2.0.7 Waterfront Promenades

The design guidelines in this overlay shape the character of the transportation facilities along the banks of the Southwest and near Southeast Waterfronts.

The overlay satisfies three criteria: (1) increased waterfront access, (2) the creation of a vibrant and sustainable waterfront, which respects and complements its abutting land uses, and (3) enhanced neighborhood identity.

2.0.8 Park Roads

The design guidelines in this overlay guide the development of the park roads.

This overlay satisfies several criteria, including environmental stewardship and sustainable development, improved waterfront access, enhanced neighborhood identity, promotion of multi-modalism, and integration into the Monumental Core.

The following sections discuss each special area overlay with the general intent, general right-of-way design strategies, and special design requirements.

The reference items and LID options discussed in Chapter 2 are presented in the selection matrices at the start of Chapter 4 - Items for Architectural Elements and Chapter 5 - LID and described in detail within these chapters.

Waterfront destinations must be connected by a system of trails, paths, and open spaces, and be accessible from adjoining streets and neighborhoods.
(Pg 90, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

The waterfront must be not only continuous, but also gracious and beautiful, and it must offer moments of extraordinary experience – new views and places that live up to the planning traditions of Washington, D.C.
(Pg 90, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

The waterfront must provide graceful settings for telling the stories of the nation, of Washington, and its people.
(Pg 91, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003)

Through this access system (Park Road) the full scope and potential of the River Park as a national resource will be realized.
(Pg. 73, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

Neighborhood residents and park visitors can be helped by a continuous system that connects all elements of the River Parks, comprising a park road, the Riverwalk trail, water-based transit, and comprehensive signage systems to serve motorists and pedestrians.
(Pg. 72, Anacostia Waterfront Framework Plan, DC Office of Planning, 2003***)***

Greenways 2.1

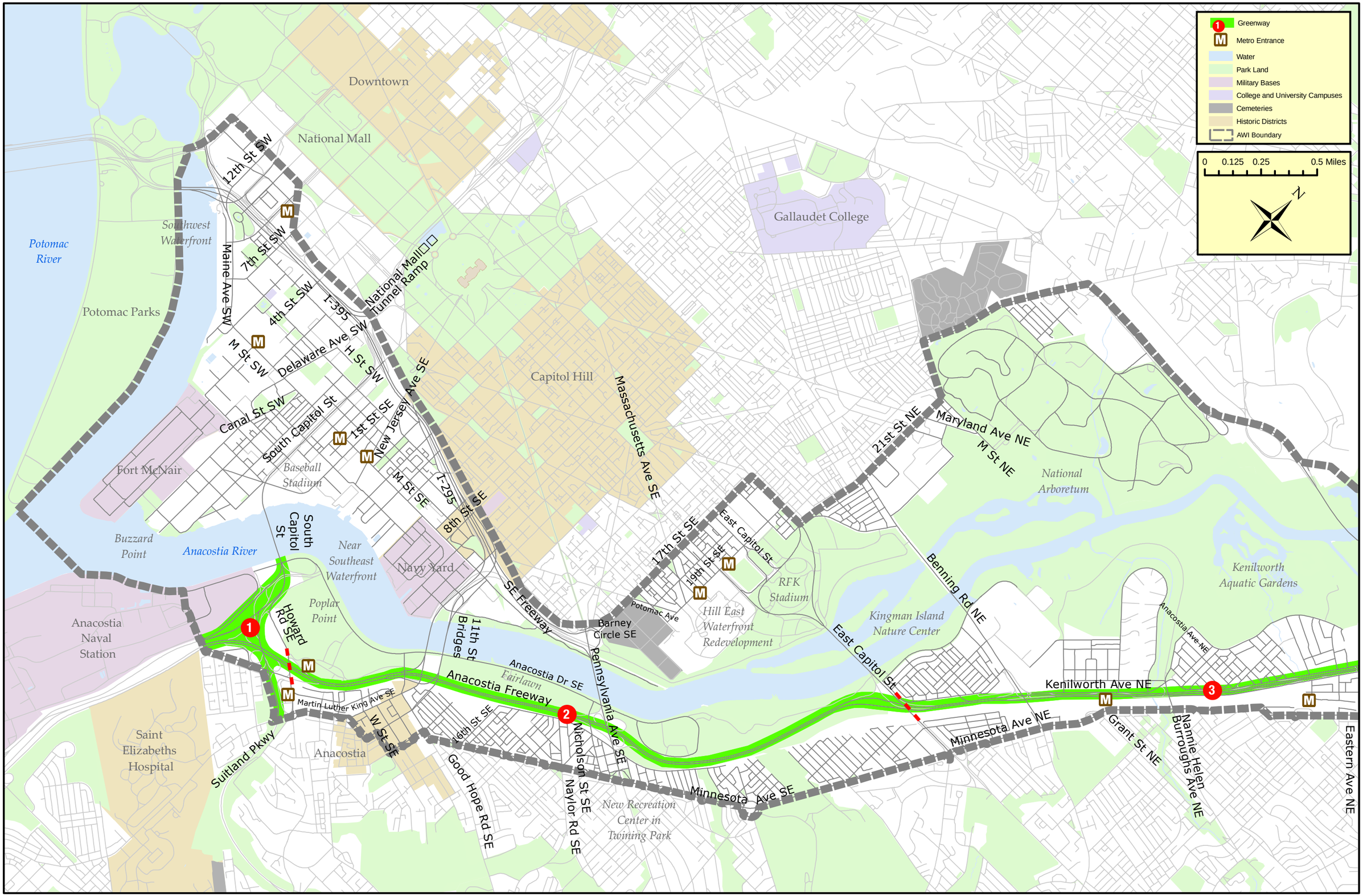

Greenway
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
N
Downtown
National Mall
Gallaudet College
Potomac River
Southwest Waterfront
Potomac Parks
Capitol Hill
Fort McNair
Baseball Stadium
Buzzard Point
Anacostia River
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
Fairlawn
New Recreation Center in Twining Park
Hill East Waterfront Redevelopment
RFK Stadium
Kingman Island Nature Center
National Arboretum
Kenilworth Aquatic Gardens
12th St SW
7th St SW
4th St SW
Maine Ave SW
M St SW
Delaware Ave SW
H St SW
I-395
National Mall Tunnel Ramp
Canal St SW
South Capitol St
1st St SE
New Jersey Ave SE
M St SE
I-295
8th St SE
Massachusetts Ave SE
21st St NE
Maryland Ave NE
M St NE
East Capitol St
17th St SE
19th St SE
Potomac Ave
Barney Circle SE
SE Freeway
11th St Bridges
Pennsylvania Ave SE
Anacostia Dr SE
Anacostia Freeway
Martin Luther King Ave SE
W St SE
16th St SE
Nicholson St SE
Naylor Rd SE
Good Hope Rd SE
Minnesota Ave SE
Howard Rd SE
Suitland Pkwy
Benning Rd NE
Kenilworth Ave NE
Minnesota Ave NE
Grant St NE
Nannie Helen Burroughs Ave NE
Eastern Ave NE
Anacostia Ave NE
1
2
3

Figure 2.1.1 (opposite page): Map of Greenways in AWI Area

2.1 Greenways

2.1.1 Introduction

This Greenway designation includes the major regional connectors serving the Anacostia Waterfront area. Current roadway alignment, poor aesthetics and the amount of non-point source pollution stemming from these roadways contribute negatively to the surrounding area. Realigning, integrating, and aesthetically enhancing these connectors to complement the "Washingtonian Parkway" system would provide many benefits and address many regional concerns.

Primarily, realigning the existing regional connectors can help eliminate inconvenient and/or unsafe access to the waterfront. This is especially significant for neighborhoods on the east side of the River, where the at-grade freeway system and railroad tracks have estranged them from the water for decades.

Secondly, visually unifying Greenways with the Washington Parkway system immediately alerts motorists that they are traveling in the District.

Lastly, including landscaping and other aesthetic treatment of the crossroads not only beautifies the District's roadway system, but also its neighborhoods. Landscaping, in addition to roadway realignment, can greatly improve the local quality of life through reducing negative visual, audible, and environmental impacts. Roadway re-configuration with the incorporation of LID strategies can attenuate most of the non-point source pollutants entering the Anacostia River from these roads.

The District has identified several thoroughfares (Table 2.1.1) within the AWI area to be transformed into Greenways.

Table 2.1.1 Greenways

#	Corridor	Limits
1	Suitland Parkway	South Capitol Street Bridge - AWI Boundary
2	Anacostia Freeway & I-295	Howard Road SE - East Capitol Street
3	Kenilworth Avenue NE	East Capitol Street - Eastern Avenue NE

Kenilworth Avenue, Anacostia Freeway, and I-295 parallel the eastern banks of the Anacostia River. At present, these roads pose significant barriers to riverfront access. The surrounding environment is similar to that along a typical highway, providing a major physical divide between the eastern neighborhoods of the Anacostia River and the District.

Suitland Parkway, a major roadway that leads to South Capitol Street, is used by visiting dignitaries to access the National Capitol. As South Capitol Street is redeveloped, this important regional link should be designed to reflect a proper entry-point to the District.

Figure 2.1.2: Suggested Right-of-Way Treatment of Greenway

2.1.2 General Intent of the Public Right-of-Way Design

"Greenway" is a special area designation, which imposes guidelines that aim to:

- Enhance the thoroughfare right-of-way design, through the application of specific transportation architecture elements that encourage safe and easy access to the waterfront from the adjacent neighborhoods; and
- Transform the character of existing highways and other freeways into a "Washington Greenway" system, similar to the Baltimore-Washington Parkway.

Despite passing through a variety of neighborhoods, Greenway design guidelines should create a consistent appearance along these major roads, reinforcing their connectedness within the AWI area and to the District. Creating a visually cohesive driving environment, much like the District's other parkways, ensures an easily navigable, safe roadway for motorists. All guidelines for signage and illumination levels should adhere to DDOT, American Association of State Highway and Transportation Officials (AASHTO), and Manual on Uniform Traffic Control Devices (MUTCD) requirements.

Where these roads pass in close proximity to neighborhoods, they should be depressed, if possible, or be given deliberate landscape and other treatments to mitigate noise and other adverse impacts.

The following guidelines outline the basic design parameters for the future Greenways in the AWI area.

1. Change roadway profile to restore city street grid and extend it to the waterfront

Future work on the Greenway right-of-way should focus on the restoration of the City street grid and extend it to the River to provide easy and safe access to scenic and recreational attractions. Four alternative methods to re-establish the city grid are presented in order of preference.

The first alternative (Figure A) represents the preferred solution. Segments of the freeway that run through the neighborhoods are completely depressed to allow local streets and parks to extend to the Riverfront, physically and visually. This method not only minimizes the visual and noise impacts on the adjacent neighborhoods, but also facilitates at-grade pedestrian, bicycle, and vehicular crossings.

The second alternative (Figure B) does not require depressing the freeway completely. Instead, overpasses with gentle slopes, connect the neighborhood with the waterfront. Use of evergreens, high shrubs, and other landscape treatments create a barrier to minimize the visual and noise impacts.

The third alternative, as shown in Figure C, elevates the freeway over the local streets to allow the existing city grid to be maintained, with minimal interruption. This method allows safe local street level access under the freeway to connecting neighborhoods.

The fourth and least preferred option (Figure D) requires the freeway to be maintained at the existing grade. In this case the design of pedestrian and bicycle overpasses is crucial in providing adequate and convenient connections to the waterfront from neighborhoods. Refer to Section 2.6 - Waterfront Access Segments for the overpass design guidelines. Use of evergreens, high shrubs and other landscape treatments can minimize the visual and noise impacts.

Figure 2.1.3 (below): Random Ashlar on Embarkment Wall

Figure 2.1.4: Roadway Profile

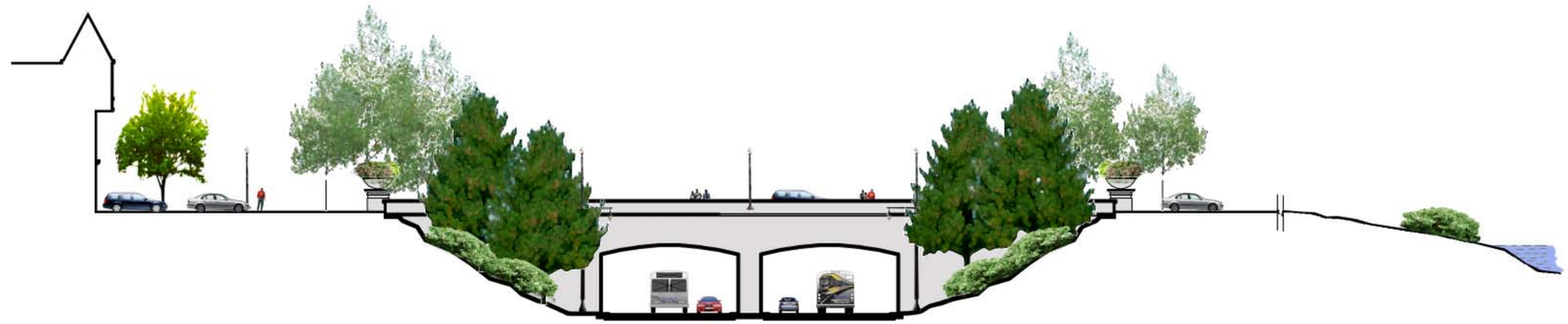
A. Depressed Freeway

B. Semi Depressed Freeway

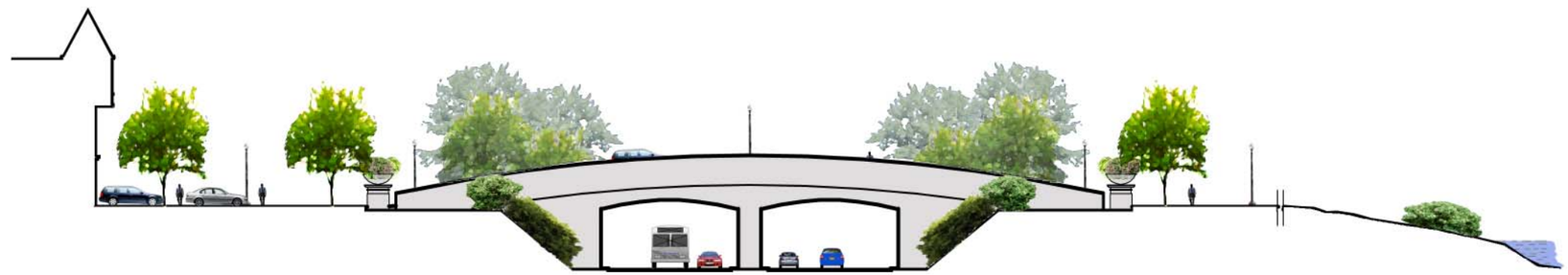
C. Elevated Freeway over Local Road

D. Freeway at Existing Grade with Pedestrian Bridge

A

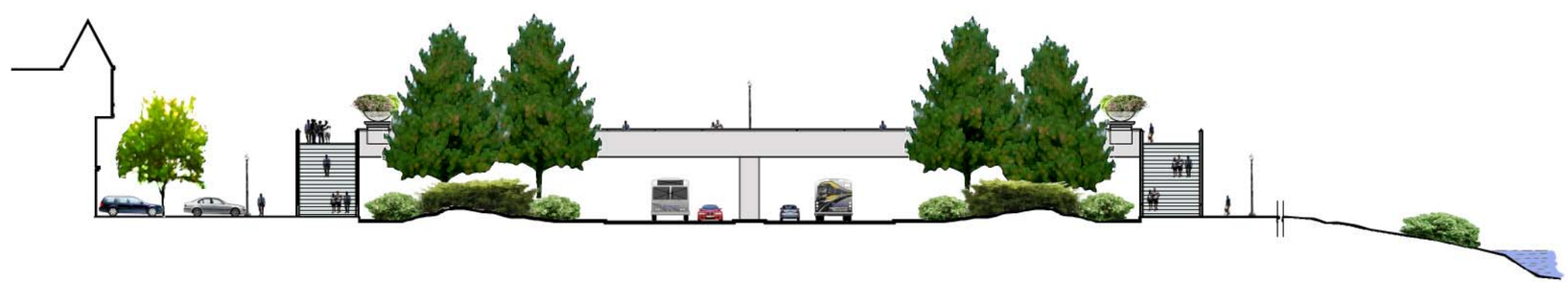


B



C

D



2. Introduce architectural treatment in the tradition of Washingtonian Parkways

The Washingtonian Parkways are distinct from other roadways in the District and are defined by restricted access, no cross traffic, broad rights-of-way, fully visually and grade-separated driving lanes, contrasting tones of pavements, and visual as well as physical connections to scenic and recreational attractions. The following transportation architecture elements are unique to the Greenways.

Wall Cladding

Site walls, bridge structures, and any other significant vertical surfaces should incorporate rustic stonewalls resembling the Random Ashlar walls along the Baltimore-Washington Parkway. Where appropriate, artwork should be integrated to reference the unique character of the neighborhoods and the waterfront area.

Median Main Zone

Barrier walls clad in a Random Ashlar pattern should provide an uninterrupted characteristic border along the limited setback areas. The wall height should vary based on site conditions and can be terraced to suit landform conditions.

Fixtures

Since Greenways are designed for vehicular traffic, only roadway lights should be installed on Greenways. Lighting should reinforce the Greenway's linear character and provide safety throughout the corridor, especially for underpasses and bridges. Per District standards, the Decorative Pendant light should be used and should be located 3 feet from the roadway curb. The recommended color for the light post is black, to match other Parkway design elements

Figure 2.1.5: Washington Parkway Treatment

A. Typical Greenway Treatment with Decorative Pendant Light and Low Stone Wall

B. Random Ashlar on Massachusetts Avenue Bridge over Rock Creek Parkway

A

B

Figure 2.1.6: Suggested Landscape Treatment along Greenways

3. Soften urban roadway character through landscape applications

The right-of-way design should minimize the extent of paved surface in keeping with sustainable development goals and to enhance the Greenway driving experience, and reduce visual impacts on neighborhoods and physical impacts on the River. This can be achieved, in part, by incorporating Low Impact Development (LID) technologies. The following applications should be considered, at a minimum, in the design of Greenways:

Integrate Landscaping and LID

Landscaped medians, freeway setbacks, and interchanges can be designed to include stormwater management and LID strategies. Berms and plantings should be incorporated into the landscape design to contain the negative visual and auditory impacts of the freeway, as well as direct views towards attractive features. Plantings for buffer areas should consist mainly of native plant material, which are able to naturalize an area and provide an ecologically sustainable habitat for flora and fauna. Landscaping elements should also be encouraged to conceal any obtrusive utilities.

Prioritize the Use of Natural Groundcover in Clear Zones

Using natural groundcover rather than the conventional paved shoulder slows and improves stormwater runoff. The optimal approach to minimize paved surfaces is to replace shoulders with more green, pervious clear zones. These clear zones allow use of a continuous clear grass strip, as per DDOT standards, for emergency vehicles and vehicles seeking assistance.

Appropriate unit pavers, shoulders or breakdown lanes, where required, should be made pervious without compromising the safety of the vehicles and drivers.

Landscaping as Barrier Walls

Visual and sound barrier walls, where feasible, should be replaced with evergreen trees. A dense natural vegetation buffer comprised chiefly of native plant material should be planted to screen the Greenway from abutting neighborhoods and create a continuous pleasant driving experience.

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Symbolic Corridors 2.2

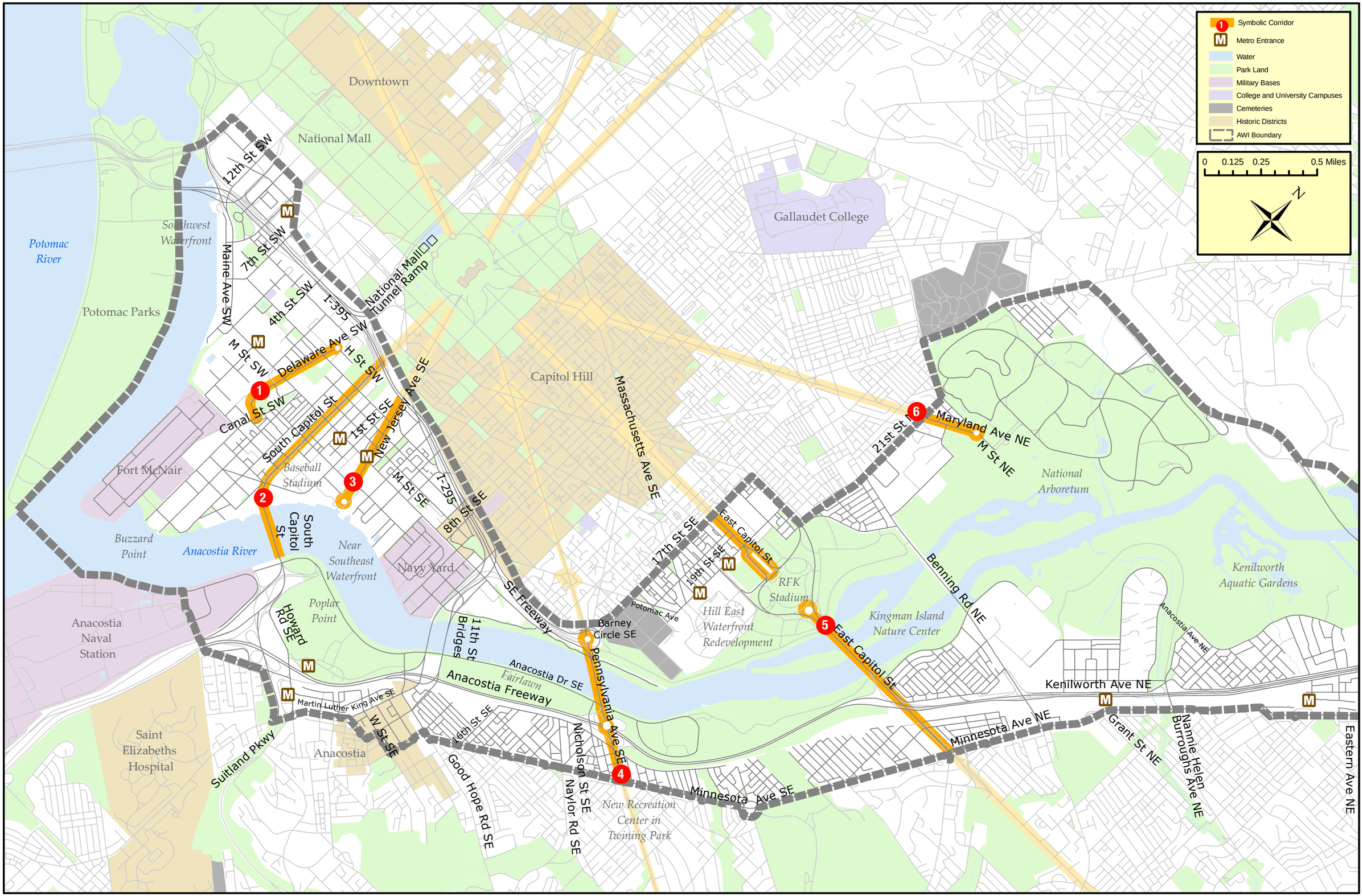
Symbolic Corridor
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
N
Downtown
National Mall
Gallaudet College
Potomac River
Southwest Waterfront
Potomac Parks
Capitol Hill
Fort McNair
Baseball Stadium
Buzzard Point
Anacostia River
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
Fairlawn
Hill East Waterfront Redevelopment
RFK Stadium
Kingman Island Nature Center
National Arboretum
Kenilworth Aquatic Gardens
New Recreation Center in Twining Park
12th St SW
7th St SW
4th St SW
Maine Ave SW
M St SW
Delaware Ave SW
H St SW
I-395
National Mall Tunnel Ramp
Canal St SW
South Capitol St
1st St SE
New Jersey Ave SE
M St SE
I-295
8th St SE
Massachusetts Ave SE
21st St NE
Maryland Ave NE
M St NE
East Capitol St
17th St SE
19th St SE
Potomac Ave
SE Freeway
Barney Circle SE
Pennsylvania Ave SE
11th St Bridges
Anacostia Dr SE
Anacostia Freeway
Martin Luther King Ave SE
W St SE
16th St SE
Nicholson St SE
Naylor Rd SE
Good Hope Rd SE
Howard Rd SE
Suitland Pkwy
South Capitol St
Minnesota Ave SE
Minnesota Ave NE
Benning Rd NE
Kenilworth Ave NE
Anacostia Ave NE
Grant St NE
Nannie Helen Burroughs Ave NE
Eastern Ave NE
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Figure 2.2.1 (opposite page): Map of Symbolic Corridors in AWI Area

Locations for future monuments are indicated with a bulb-like shape in the adjacent map as described by the NCPC study for future monuments and memorials.

2.2 Symbolic Corridors

2.2.1 Introduction

Symbolic Corridor designation directly refers to planning initiatives in the District that focus on visually and physically integrating the AWI area with the Monumental Core.

Chief among these initiatives is the National Capitol Planning Commission's (NCPC) "Extending the Legacy" and "The Anacostia Waterfront Framework Plan". Three key themes from this vision specifically relate to the AWI area:

1. Building on the historic L'Enfant and McMillan plans, which are the foundation of modern Washington, DC;
2. Unifying the City and the Monumental Core, with the Capitol at the center; and
3. Using new memorials, museums and other public buildings to stimulate economic development.

Based on these themes, several streets are designated as Symbolic Corridors, as listed in Table 2.2.1.

Table 2.2.1: Symbolic Corridors

#	Corridor	Limits
1	Delaware Avenue SW	H Street SW - Canal Street SW
2	South Capitol Street	I-295 - Suitland Parkway
3	New Jersey Avenue SE	I-295 - Waterfront
4	Pennsylvania Avenue SE	Barney Circle SE - Minnesota Avenue SE
5	East Capitol Street	17th Street SE - Minnesota Avenue SE
6	Maryland Avenue NE	21st Street NE - M Street NE

All such Symbolic Corridors are L'Enfant Avenues; they are on axis with the Capitol. In the future, these corridors are planned to become a part of "higher" street systems linking the monuments dispersed along the Anacostia River with the Monumental Core; integrating communities on both sides of the River; and providing a "connection" to the District from outlying regions.

Figure 3.2.2 (below):

A. Rendering of Maryland Avenue (source: Extending the Legacy Plan, NCPC)

B. Pennsylvania Avenue, NW

C. Rendering of South Capitol (source: Extending the Legacy Plan, NCPC)

A

B

C

2.2.2 General Intent of the Public Right-of-Way Design

The L'Enfant Avenues listed in Table 2.2.1 convey their historical significance having distinct physical characteristics and visual ties to the Capitol. Therefore, the design guidelines for these streets are driven primarily by aesthetic concerns.

The intent of the public realm design is to respond to these factors and create a cohesive public domain that:

- Integrates the AWI area with the Monumental Core;
- Enhances view sheds to the Capitol;
- Highlights the significance of these Corridors in the District; and
- Creates a memorable experience for visitors.

Since the Avenues pass through a variety of neighborhoods, the selection of guidelines should be mindful of the context of specific segments. The future design of several of the proposed new developments in the Anacostia Waterfront Area may be contemporary in nature. At the same time the character of traditional neighborhoods should be reinforced. Whether a project is contemporary or traditional in design, the design guidelines presented in this document offer flexibility to design a project that reflects the character of its neighborhood, providing elements that are distinctively traditional or characteristically contemporary.

Transitions between traditional and new developments should be given special consideration with regard to material, fixtures, and other critical elements. Utilizing certain critical elements throughout the Symbolic Corridor establishes continuity throughout the roadways. Examples of critical elements include sidewalk paving materials for the walkway zone and spill zone and light fixtures.

Where Transit Corridors coincide with Symbolic Corridors, the following should incorporate the guidelines for Designated Transit Corridors:

- Light fixtures
- Trees
- Roadway paving at intersections
- Roadway paving along transit lanes

The following design guidelines outline basic parameters, which users of these Guidelines should address while developing projects along Symbolic Corridors.

1. Visually and physically integrate the Avenues with other corridors in the Monumental Core

The "Extending the Legacy" Plan's intent to re-center the City and the Monumental Core on the Capitol and the Anacostia Waterfront Framework Plan's stated goal to integrate areas on either side of the River, are both well served by creating an environment with consistency along the corridors and with the Monumental Core. The Avenues thus present the opportunity to integrate Federal and District goals.

Sidewalk Materials, Furnishing & Planting Zones

Due to their ubiquitous nature, sidewalks present a significant opportunity to visually integrate the L'Enfant Avenues in the area with streets in the Monumental Core. Sidewalks can create seamless physical connections between the core and the AWI area for pedestrians. The following design elements should be used.

Exposed aggregate concrete of color and finish similar to those found in the Monumental Core should be used on Symbolic Corridor sidewalks. The sidewalks should be cast with grooves and other details at appropriate intervals, so as to scale down their perceptual width.

Figure 2.2.3: Sidewalk Design Elements

A. Exposed Aggregate Concrete Sidewalk

B. Concrete ADA Ramp with Truncated Domes

C. Unit Pavers along Furnishing Zone of the Sidewalk

A

B

C

Figure 2.2.4: Vertical Elements

A. Granite Wall along Underpass

B. Decorative Planter Edging/Seating/Public Art

C. Typical Granite Bench

In the Furnishing/Planting zone, pervious unit pavers of color consistent with exposed aggregate concrete should be used. In residential areas, planting strips should replace the unit pavers in the furnishing zones.

Vertical Surfaces & Railings

Since the L'Enfant Avenues are intended to generate high volumes of pedestrian traffic, high life cycle materials should be used for aesthetic appeal and durability in an urban environment. In addition, the higher level of investment in the finish of these elements is justified in their role as extensions of the Monumental Core. These surfaces include elements such as retaining walls, benches, and metal railings.

Metal railings should be mounted either to the curb or onto a low parapet wall built of the materials prescribed above. Railings should be painted to match the Green Patina color used on other bridges in the District. In cases where the specific design of railings warrants a different treatment, such finishes may be chosen in consultation with the concerned DDOT authorities.

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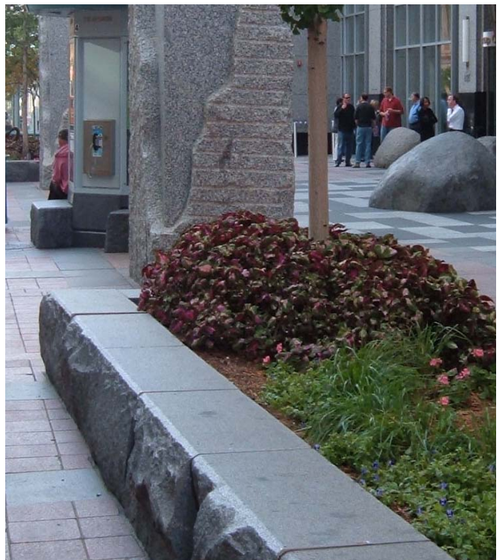

C

2. Emphasize view shed to the US Capitol & scale of Avenues

View sheds from Symbolic Corridors to the US Capitol instantly create a sense of place and visually connect the adjoining neighborhoods with the Monumental Core. These view sheds should be enhanced through the use of trees and streetlights.

These L'Enfant Avenues have wide rights-of-way and are centered on the Capitol, the building that visually dominates the District skyline. Thus, specific attention should be paid to the issue of scale and proportion in the selection and design of streetscape and landscape elements.

Street Trees and Subsurface Treatments

Trees provide a strong "street edge" which can enhance the view by providing a consistent border along the curbs and giving these streets a "boulevard"-like feel. To ensure a large canopy, large shade trees, which complement the width of the right-of-way, should be used. Planting areas should be as large as possible and should incorporate contiguous root zones to allow tree roots to grow unimpeded.

The preference is to not plant trees in a median. However, where the width of a median indicates planting, such as along Pennsylvania Avenue, trees should be smaller and of a flowering variety.

Trees should be located in such a way that they can provide a sense of safety for pedestrians from vehicular traffic, without visually disengaging the pedestrian and vehicular realm from the retail storefronts. This can be accomplished by planting high branching shade trees and relatively low growing understory plantings along the sidewalks.

If a double row of trees is used, it should be located so as to reinforce the importance of the Symbolic Corridor. It should be arranged in convenient ways to foster the smooth movement of traffic.

Figure 2.2.5: Street Trees Planting Option

A. Large Shade Trees along Sidewalk

B. Large Shade Trees/Sidewalk with Flowering Trees in the Median

C. Double Rows of Shade Trees

D. East Capitol Street

E. Street Trees Define Street Edge (Champs Elysées

F. Double Row of Trees along Pennsylvania Avenue NW

A

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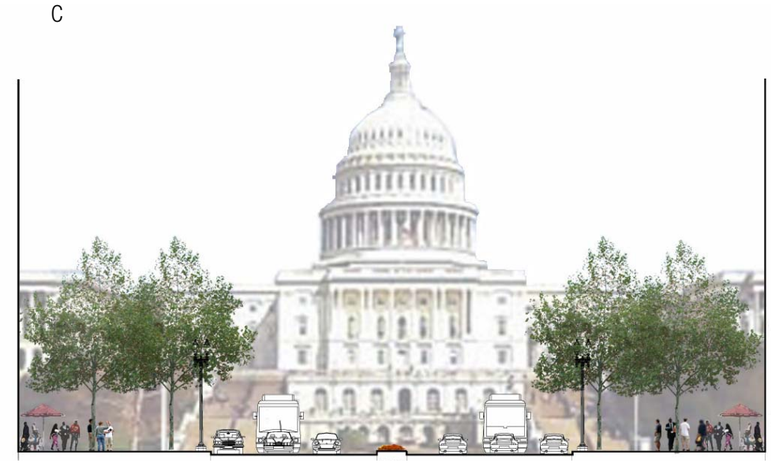
C



D

E

F

Figure 2.2.6: Streetlights and Public Spaces

A. Streetlight Defining Street Edge

B. Standard Washington Globe Twin 20

C. Lincoln Park - Example of Traffic Island Designed to Include Public Space and Commemorative Feature

Fixtures

The height and configuration of streetlights should also enhance views to the Capitol. In order to complement the wide right-of-way and frame the view of the Capitol, the Twin 20 streetlight should be used. The length and form of the bracket for the fixture should be designed to create a frame-like element along the curb that defines the views.

A fixture that has a distinct form, and is mounted at a height that complements the surrounding buildings, should be used.

The average illumination levels should be higher than on other streets, to complement the nighttime activities envisioned for these corridors. Diffused lighting from street lights, placed at appropriate intervals, should be used to minimize glare and balance the spill light from the buildings. Particular care should be given to lighting levels at intersections since these streets have wide rights-of-way and pedestrians are likely to cross streets as they shop or move from one destination to another.

3. Develop memorable places for commemorative art

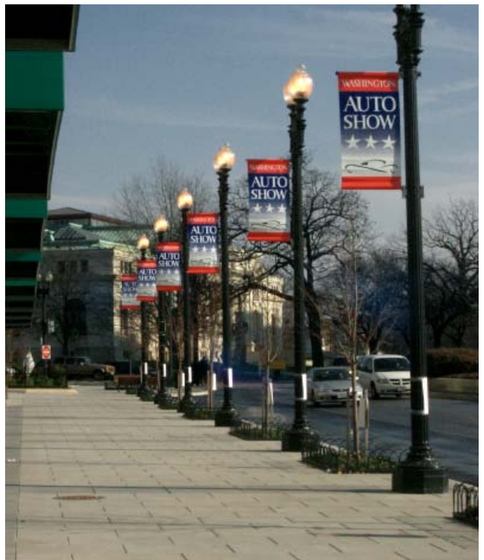
Similar to streets in the Monumental Core, these avenues could be locations where the national image is reinforced, where federal, international and district agencies occupy space. In short, these corridors are part of the District's "living room".

With the planned location of several monuments, museums, and other public buildings in the AWI area, many of the 20 million visitors to the District will leave with the image and "feel" of these streetscapes captured in their memories as part of their District experience. It is therefore important to include art in the form of sculptures, inscriptions, and other textual and pictorial references at appropriate locations.

Where these streets meet the Waterfront, space should be allocated in the form of a plaza or intersection for sculptures, fountains or other forms of public art. Similarly, traffic islands, at points where Symbolic Corridors transition into River Crossings, should be designed to receive such art.

Intersections, medians, smaller parks, and other traffic circles offer other locations where the installation of commemorative art should be considered. These places should be easily accessible to pedestrians.

A



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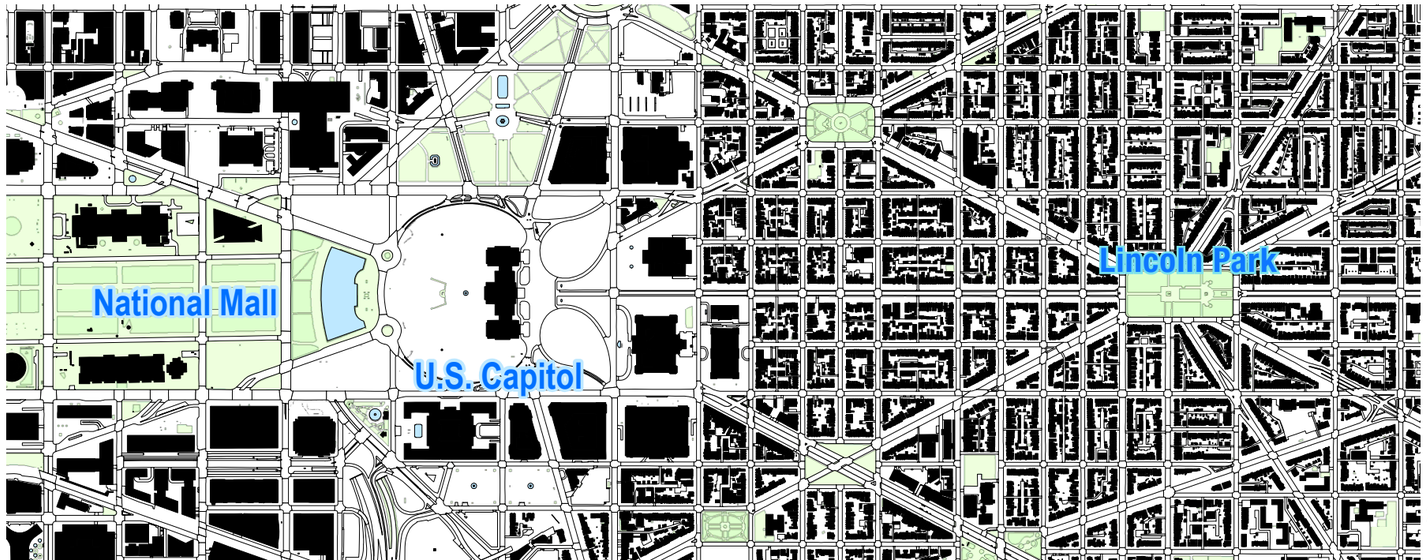

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Designated Transit Corridors 2.3

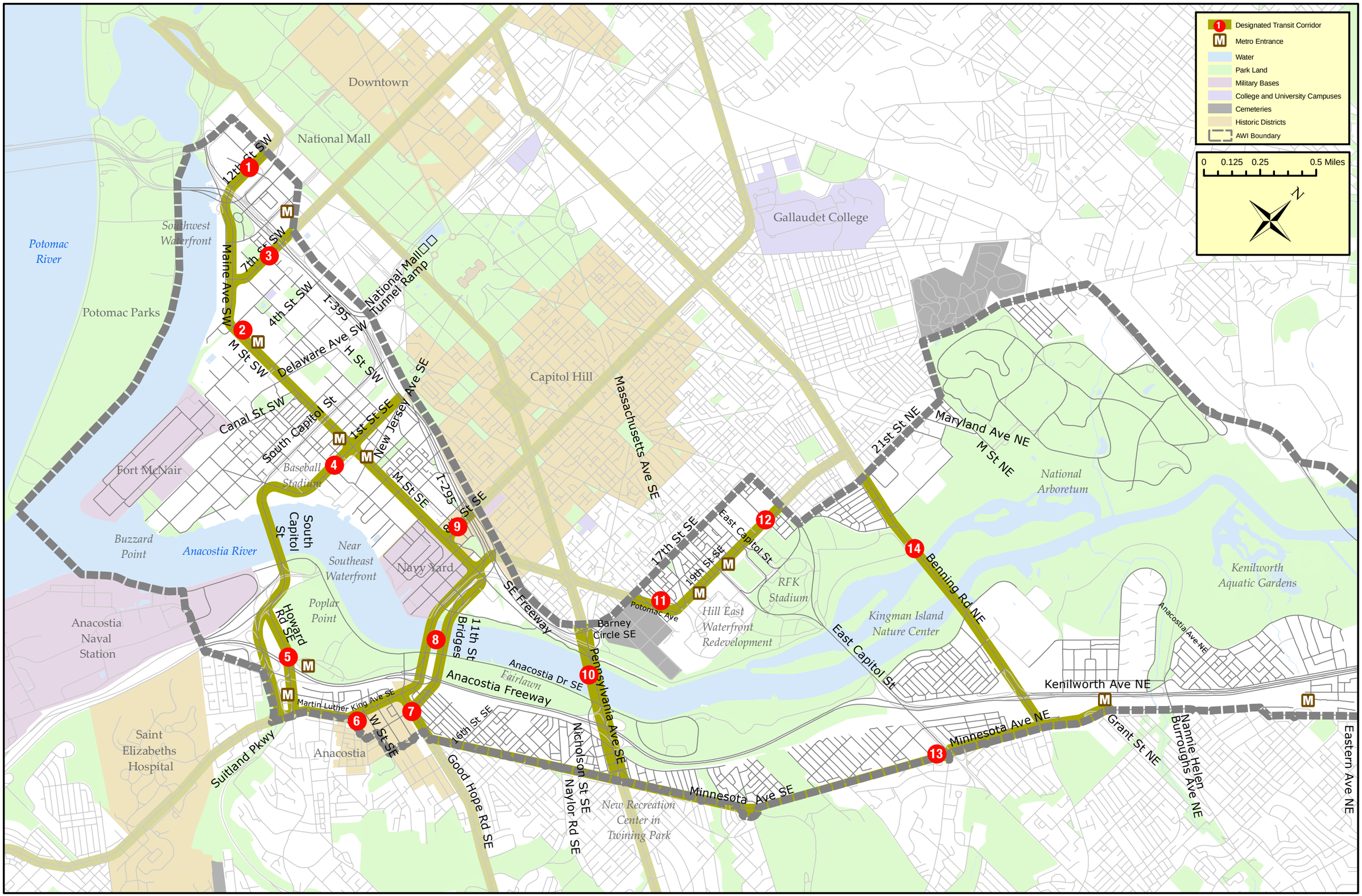
Designated Transit Corridor
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
N
Downtown
National Mall
Gallaudet College
Potomac River
Southwest Waterfront
Potomac Parks
Capitol Hill
Fort McNair
Buzzard Point
Anacostia River
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
Fairlawn
Hill East Waterfront Redevelopment
RFK Stadium
Kingman Island Nature Center
National Arboretum
Kenilworth Aquatic Gardens
New Recreation Center in Twining Park
12th St SW
7th St SW
Maine Ave SW
4th St SW
I-395
National Mall Tunnel Ramp
Delaware Ave SW
M St SW
H St SW
Canal St SW
South Capitol St
1st St SE
New Jersey Ave SE
M St SE
I-295
Massachusetts Ave SE
21st St NE
Maryland Ave NE
M St NE
17th St SE
East Capitol St
19th St SE
Potomac Ave
Benning Rd NE
SE Freeway
Barney Circle SE
11th St Bridges
Anacostia Dr SE
Anacostia Freeway
Pennsylvania Ave SE
Martin Luther King Ave SE
W St SE
16th St SE
Nicholson St SE
Naylor Rd SE
Good Hope Rd SE
Minnesota Ave SE
Minnesota Ave NE
Kenilworth Ave NE
Grant St NE
Nannie Helen Burroughs Ave NE
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Figure 2.3.1 (opposite page): Map of Designated Transit Corridor in AWI Area

Figure 3.3.2 (below): Enhanced Transit

A. Streetcar

B. Light Rapid Transit (LRT)

C. Bus Rapid Transit (BRT)

Should a Designated Transit Corridor coincide with a Special Segment (Section 2.4) it should adhere to all the unique architecture transportation design guidelines for the former.

Design development is still underway for the streetcar to be utilized on Designated Transit Corridors. The following section describes and illustrates conceptual designs, based on available information, for the proposed integration of the streetcar within the public realm.

2.3 Designated Transit Corridors

2.3.1 Introduction

The Mass Transit Administration of DDOT, in partnership with Washington Metropolitan Area Transit Authority (WMATA), conducted a comprehensive study of future recommended transit services, the District of Columbia Alternatives Analysis (DCAA), to support the development of a system of high-capacity, high quality, multi-modal, surface transit throughout the District. The plan consists of over 30 miles of premium transit in the form of streetcar and bus rapid transit (BRT), rapid bus services (MetroExtra) on several priority corridors, and enhancements to existing local bus services city-wide by the year 2030. Improving the transit system simultaneously improves traffic mobility, air quality, and neighborhood vitality. In addition, enhanced local and regional accessibility makes the area more attractive to prospective new development. The development and design of these corridors are part of the Anacostia Waterfront Framework Plan to make the Anacostia area a safe, accessible public resource for all to enjoy.

Several corridors identified in the DCAA are within the AWI area and include those listed in Table 2.3.1. Some of the priority corridors within the AWI area were identified as priority streetcar corridors in the DCAA and include Martin Luther King, Jr. Boulevard, SE, Maine Avenue and M Street SW and SE. Their selection for premium transit modes was based on existing and forecasted transit ridership; its selection by the City for increased economic development via such programs as the Anacostia Waterfront Initiative and Great Streets; and its connectivity to existing Metrorail and Metrobus Service. As major arterials in the AWI area, these corridors will be an integral link in the city's future network of streetcar services, which will first begin operation with the demonstration of streetcars on the Anacostia Streetcar Project in Southeast, Washington. For the purposes of the Guidelines, these transit corridors are referred to as Designated Transit Corridors.

The alignment of premium transit, such as streetcar and BRT on these corridors in the AWI area will be evaluated in greater detail within the context of system connectivity, support of local land uses, neighborhood integration (physical and social), public safety, and community support.

The intent of this special area is to increase overall safety, while simultaneously managing multiple modes of transportation. Such efforts should result in improved overall livability of the mixed-use neighborhood, increased pedestrian activity and facilitated bicycle and transit users. It should be noted that exclusive transit corridors, such as Starter Lines, are not impacted by the guidelines included in this document.

Table 2.3.1

#	Corridors	Limits
1	12th Street SW	C Street SW - I-395
2	Maine Avenue SW and M Street SW & SE	I-395 - 11th Street Bridge
3	7th Street SW	E Street SW - Maine Avenue SW
4	1st Street SW/South Capitol Street	I-295 - Martin Luther King Jr. Avenue SE (via Suitland Parkway)
5	Howard Road SE	Suitland Parkway - Martin Luther King Jr. Avenue SE
6	Martin Luther King Jr. Avenue SE	Suitland Parkway - Good Hope Road SE
7	Good Hope Road SE	Martin Luther King Jr. Avenue SE - Minnesota Avenue SE
8	11th Street Bridges	M Street SE - Good Hope Road SE
9	8th Street SE	I-295 - M Street SE
10	Pennsylvania Avenue SE	Barney Circle SE - Minnesota Avenue SE
11	Potomac Avenue SE	17th Street SE - 19th Street NE
12	19th Street SE	Massachusetts Avenue SE- C Street NE
13	Minnesota Avenue	Good Hope Road SE - Minnesota Avenue Metro Station
14	Benning Road NE	21st Street NE - Minnesota Avenue NE

A

B

C

The Maine Avenue, M Street and 8th Street, SE corridors have new developments planned and/or under construction and should become better integrated with connections to larger roadway system of the area. Transit facilities in these areas are instrumental in providing access to developments on the southeast and southwest waterfronts.

Martin Luther King Jr. Avenue, Howard Road, and Good Hope Road are connected to the Historic Anacostia Area. Improved transit facilities are expected to encourage access to the neighborhood retail and cultural facilities and to other residential uses. These streets' proximity to the Anacostia Metro and transit facilities will encourage Transit Oriented Development (TOD). Similarly, 19th Street, SE forms an important link between the Capitol Hill Area to the north and the proposed Hill East Waterfront development to its south. Expanded transit options will encourage the development in Hill East, provide access to the Riverfront, and enhance access to Capitol Hill.

Benning Road is also an important regional connector, which today caters primarily to automobile traffic. The inclusion of a transit option along this important connector addresses the Framework Plan's initiative to re-create this major arterial as a great boulevard.

2.3.2 General Intent of the Public Right-of-Way Design

The public right-of-way should be designed to provide:

- Safe and pedestrian/transit-friendly public space;
- A vibrant environment that encourages people to benefit from the many resources offered in a mixed-use setting;
- Interest in and awareness of transit; and
- A sense of connectedness to the AWI area and the rest of the District.

It is not the intent of this section to recommend alignments for or types of enhanced transit systems. WMATA, the DDOT transit coordinator, should be contacted for more information on the transit alignments along specific corridors.

The Guidelines cater to typical streetscape configurations for enhanced transit systems. The important elements for which guidance specific to this designation have been developed include:

- Sidewalks
- Safety at critical roadway crossings
- Landscaping
- Street lighting
- Paving (vehicle, transit and bike lanes, intersections)

In all cases where Designated Transit Corridors coincide with other special area designations, the requirements for the elements mentioned above should subscribe to the guidelines specified in this section.

The transition between traditional and new developments should be given special consideration with regard to materials and street furnishings. Continuity should be promoted by using certain critical elements, such as sidewalk paving materials for Walkway and Spill Out Zones and light fixtures, consistently throughout the Corridor.

Regardless of the enhanced transit alignment, the following design guidelines outline the basic parameters, which should be addressed while developing project(s) along Designated Transit Corridors.

1. Dedicate generous sidewalk areas for pedestrian and transit-based activities

The safety, comfort and convenience of pedestrians, bicyclists and, transit riders guide the right-of-way design. Given the intent of this special area, a generous width should be allocated for the sidewalk within the public right-of-way, without compromising the roadway capacity and efficient movement of transit vehicles. During the planning process, adequate due diligence should be given to maximizing the sidewalk width.

Figure 2.3.3: Generous Sidewalk Space Allocation

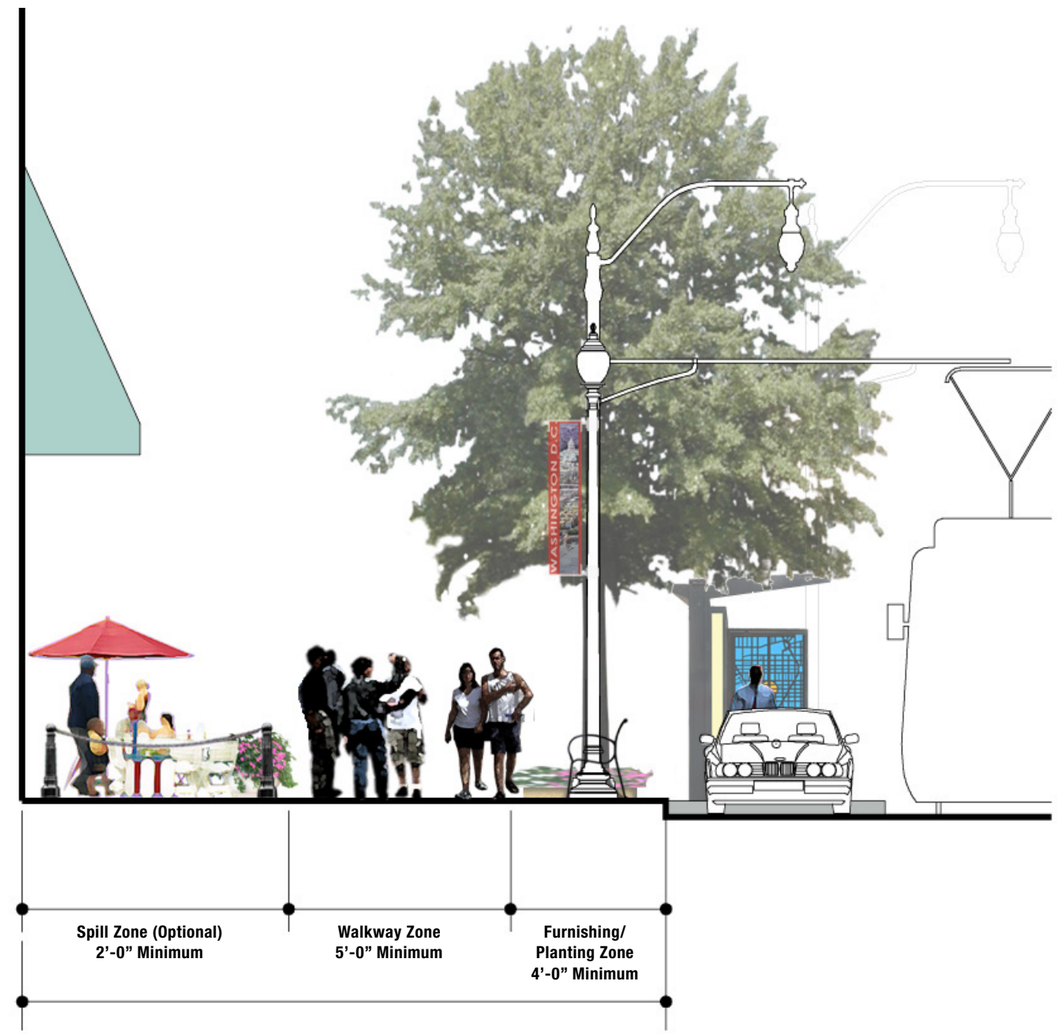


Figure 2.3.4: Selection of Street Trees

A. Regional Shade Trees to Provide Clear Visibility of Storefronts

B. Use of Columnar Shade Trees Exclusively in Case of Fixed Rail Transit along Street Curb or Medians

C. Example of Columnar Street Trees, Portland, OR

D. Portland LRT Running along the Curb

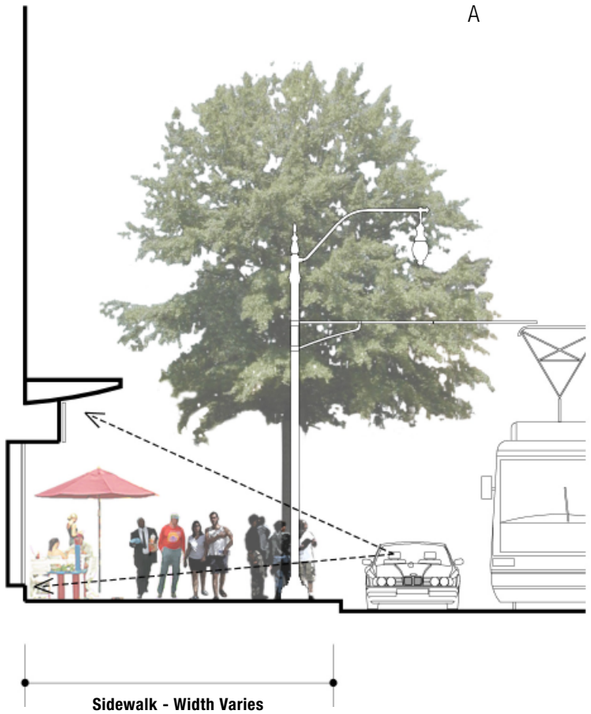
E. Streetcar Lane along the Median

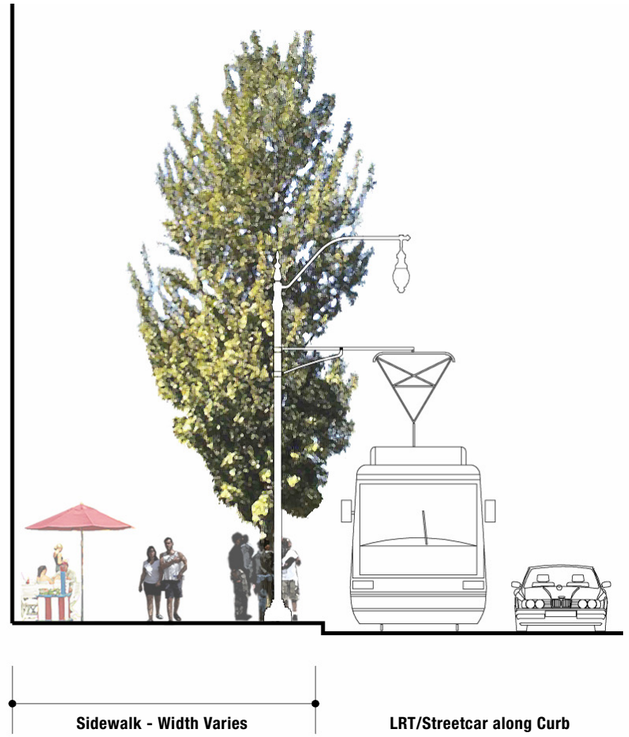
At a minimum, sidewalks should be wide enough to accommodate:

- A 5-foot wide Walkway Zone for pedestrian circulation;
- A 4-foot wide Furnishing/Planting Zone for various street furnishings and landscape elements. Where appropriate, LID could be incorporated into the design of Furnishing/Planting Zone; and
- A minimum of 2-foot wide Spill Out Zone for outdoor displays, when possible. For sidewalk cafés and other establishments, a minimum width of 4 feet is required; the maximum width should not exceed 50% of the sidewalk width. Barriers such as safety posts and planter boxes should be permitted along Spill Out Zones more than 2-feet wide. Upon DDOT approval, business owners, the Business Improvement District, and/or Main Street organizations should install planter boxes.

Sidewalks along these transit corridors should be constructed with the paving material dictated by the adjacent roadway's functional classification, area type and/or other Special Area designation. However, in Symbolic Corridors or Historic Districts sidewalks should be paved with exposed concrete aggregate or standard brick, respectively.

A





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2. Enhance corridor aesthetics & usability with landscaping

The landscape design is important in rendering these corridors as attractive and safe public spaces for pedestrians and transit riders. Shade tree species should be selected to provide adequate shade and sense of enclosure for the pedestrians, create a uniform appearance, and reduce storm water runoff. Selection should also provide clear visibility of storefronts and business signage, as shown in Figure A on the previous page.

Street Trees

Trees pose a potential conflict with the Overhead Contact System (OCS) used by streetcars and LRT running along the roadway curb. The use of columnar shade trees along the sidewalk and medians addresses this issue. Flowering trees should be used in public areas (other than sidewalks) to accent plazas, traffic islands and pocket parks within this special area.

Vegetation

The sidewalk should be further embellished with understory plantings, such as ornamental grasses, groundcover, perennials and shrubs, as required to physically demarcate pedestrian areas from roadways. Additionally, understory plantings and add color and smell - aiding in the design of an attractive public realm.

3. Integrate artwork in street furnishings

Highly visible, selective streetscape elements should incorporate artwork into their design. Art makes pedestrian travel engaging and enjoyable, and enhances public awareness and interest in riding public transit. These elements can have direct or indirect relationship with transit.

Bike Racks

Bike racks should be generously provided at convenient locations and should be designed as works of public art. Custom designs for bike racks should not compromise convenience and usability.

Seating

Seating should also be provided. It should capture and integrate the distinct and unique character of the community by coordinating with the design and style of the other transportation architecture elements in the area. Design and dimensions of such seating should be user friendly for children, adults and the elderly.

Signage

Attachments to the standard street signs as approved by DDOT can be incorporated only on intersection lights to enhance the neighborhood identity.

Safety Posts

Safety posts should be used, where appropriate to protect pedestrians.

Figure 2.3.5: Integrated Artwork

A. Custom Bike Racks, Pittsburgh, PA

B. Seating as Public Art, Los Angeles, CA

C. Example of Street Sign Attachment

A

B

C

Figure 2.3.6: Standard Streetlights along Designated Transit Corridor

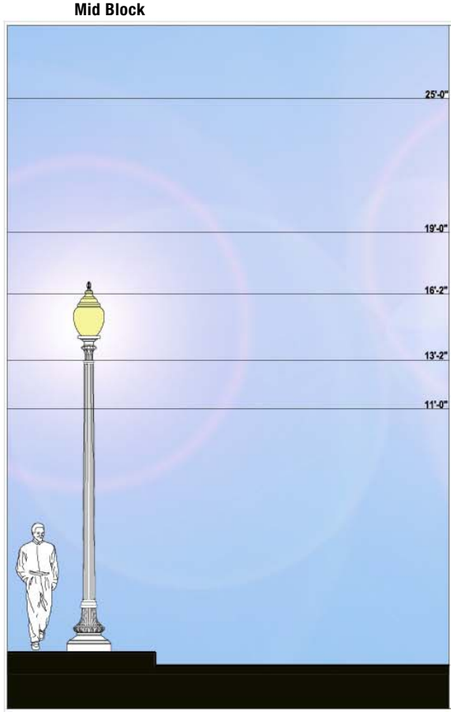
4. Enhance pedestrian, transit, and vehicle lighting strategies

The streetlight system along the Designated Transit Corridors, especially with LRT, should not only illuminate sidewalks and roadways, but also not obstruct the OCS. The unwanted alternative would be sidewalks cluttered with catenary poles, which can impede pedestrian circulation. Depending on the context of these corridors, streetlights should be selected to complement the feel of the neighborhoods

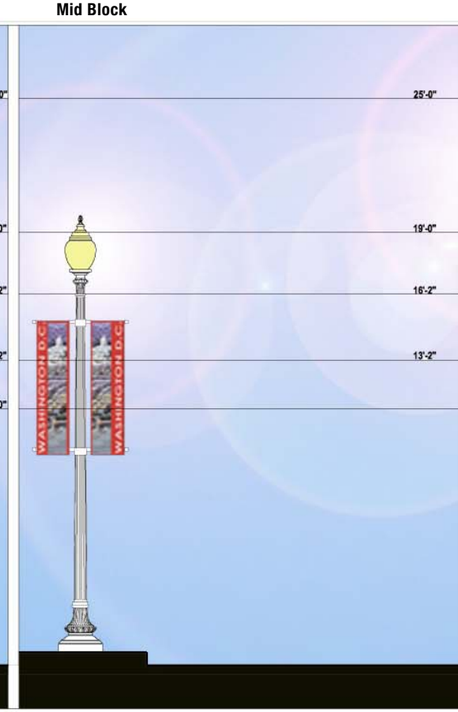
Fixtures

Lighting should include a combination of the Decorative Teardrop Pendant light and the #16, #18, or Twin 20 Washington Globe. Decorative Pendants should illuminate intersections and sidewalks at a maximum of 132' intervals. The #16, #18 or Twin 20 Washington Globe fixtures should be used between two Teardrop Pendant lights to illuminate the sidewalk area. The average illumination level should be in accordance with the District Grand Streetlight Plan. The range of available fixtures is shown in Figure 2.3.6; a typical right-of-way treatment is depicted in Figure 2.3.7 (next page).

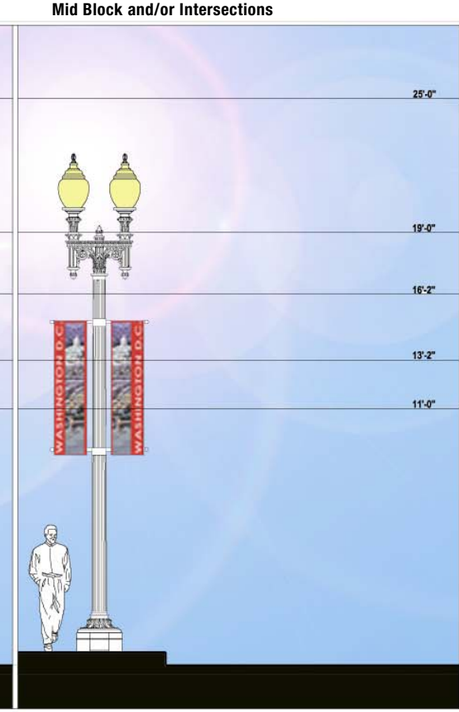
#16 Washington Globe - Mid Block



#18 Washington Globe - Mid Block



Twin 20 Washington Globe - Mid Block and/or Intersections



Decorative Pendant - Mid Block and/or Intersections

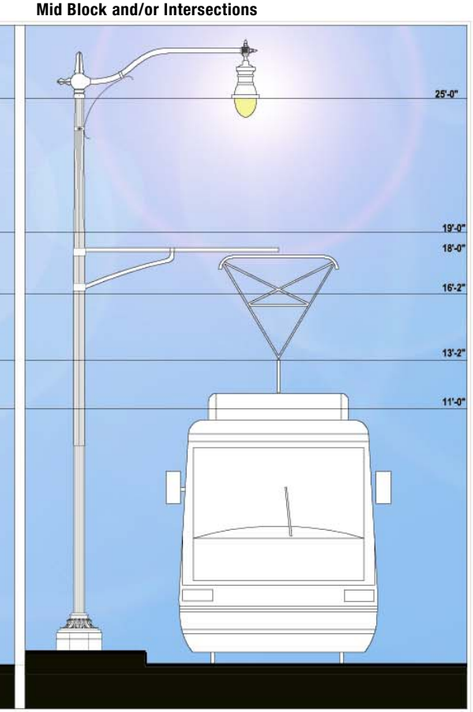


Figure 2.3.7: Illustration Showing the Street Right-of-Way in Traditional Neighborhoods

5. Highlight transit and bicycle lanes surface treatment

Surface treatments provide a way to make motorists aware and decrease conflicts with bicyclist and transit vehicles. Currently there is no guidance regarding transit lane surface treatment. Future guidelines will address the surface treatment of transit lanes. Factors to consider include the function of the transit lane – shared or exclusive, different colors, textures, and materials to alert drivers to the potential presence of other users, increase pedestrian safety, and aesthetically enhance the roadway with the combination of different textures. The respective designated lanes should be highlighted in the following manner.

Bicycle Lanes

On all designated bicycle lanes along these corridors, bicycle symbols, directional arrows and striping should be applied to to stress the safety of bikers, subject to DDOT approval. Areas designated as conflict zones by DDOT should be demarcated with partially colored epoxy coated surfaces and dashed lines to warn bicyclists, pedestrians, and drivers about the areas of conflict.

6. Provide for safety and place making at critical intersections

Due to the multi-modal nature of these corridors, providing adequate safety and smooth circulation for the mix of transportation modes is crucial at "special intersections". A special intersection is selected only if it:

1. Includes transfer venues for various modes of transit;
2. Has large automobile turning movements;
3. Contains a high volume of pedestrian activities;
4. Provides access to important land uses; and
5. Is an important node for community-based services.

Given the high activity level, the design and treatment of these intersections should create a sense of place and an identity for the neighborhood it serves. Bulbouts, along with their sidewalk treatment and color and the paving for intersections and crosswalks are key elements that collectively define a special intersection.

Sidewalk Extension (Bulbout)

Bulbouts should be permitted at a special intersection provided they are intended to accommodate transit shelters, standalone public artwork, and reduced crossing distance for pedestrians. Bulbouts also allow for more sidewalk space to accommodate other street level activities.

The sidewalk treatment of bulbouts should consist of the same paving material as the adjacent sidewalk to maintain continuity and consistency. However, the paving pattern could be different to signify importance and highlight transit stop locations. The patterns may be achieved through the use of different paving materials. An artist may be deployed on a project-by-project basis to design unique patterns to reflect the neighborhood character. DDOT and the community should approve the design and type of paving materials.

Figure 2.3.8: Special Intersection Elements

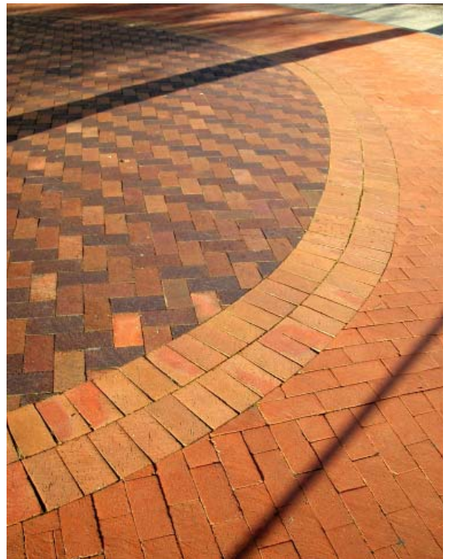
A. Bulbout

B. Example of Special Paving Pattern

C Typical Streetcar Stop, Portland, OR

A

B



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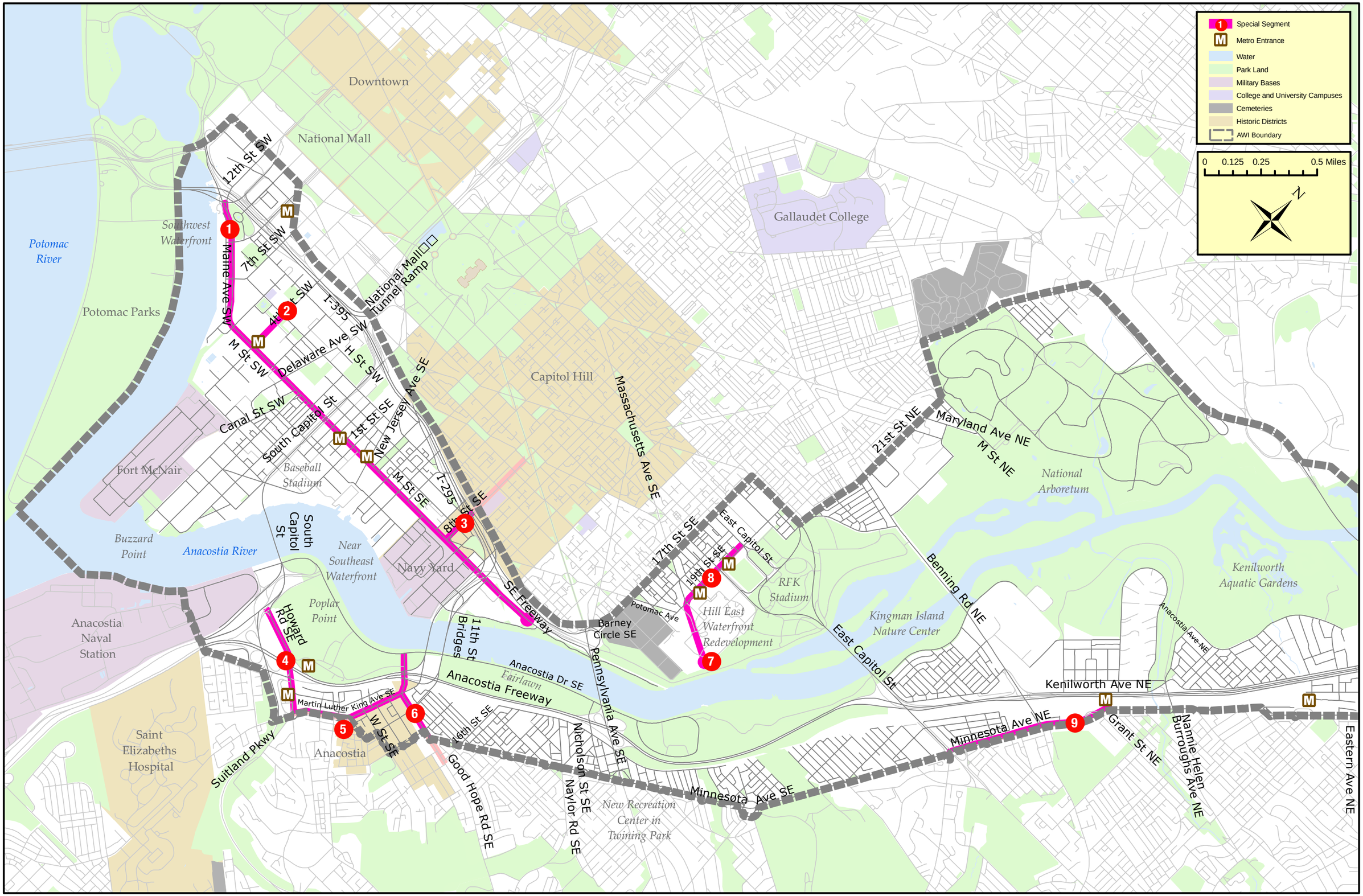
Special Segments 2.4


Special Segment
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
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National Mall
Gallaudet College
Potomac River
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Potomac Parks
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Figure 2.4.1 (opposite page): Map of Special Segments in AWI Area

Should a Special Segment coincide with a Designated Transit Corridor (Section 2.3) it should adhere to all the unique architecture transportation design guidelines for the latter in addition to the guidelines specific to the Special Segments.

2.4 Special Segments

2.4.1 Introduction

Special Segments play a key role within the Anacostia Area in creating a physical environment reflective of local neighborhood identity. They offer vibrant, mixed-use places for communities to gather. Special segments celebrate the nearby cultural, historic, and other significant destinations.

The selection of special segments has been chosen based primarily on their function as neighborhood commercial streets and their potential Main Street designations. Streets such as 18th Street, NW in Adams Morgan, U Street, NW, and newly improved 8th Street, SE, are noteworthy precedents. These corridors exemplify vibrant mixed-use neighborhoods with diverse public amenities, including restaurants, shops, cultural venues, and art galleries, amongst other destinations.

Figure 2.4.1 (left) and Table 2.4.1 delineate these Special Segments.

Table 2.4.1 Special Segments

#	Corridor	Limits
1	Maine Avenue SW & M Street SW & SE	I-395 - Water Street SE
2	4th Street SW	I Street SW - M Street SW
3	8th Street SE	I-295 - M Street SE
4	Howard Road SE	Suitland Parkway - Martin Luther King Jr. Avenue SE
5	Martin Luther King Jr. Avenue, SE	Howard Road SE - Good Hope Road SE
6	Good Hope Road SE	Anacostia Drive SE - Minnesota Avenue SE
7	Massachusetts Avenue SE	19th Street SE - Waterfront
8	19th Street SE	East Capitol Street - Massachusetts Avenue SE
9	Minnesota Avenue SE	East Capitol Street - Grant Street SE

2.4.2 General Intent of the Public Right-of-Way Design

Neighborhood commercial streets under this designation could be located in traditional neighborhoods, historic districts, or in underutilized areas with high development potential. Given the nature of the diverse environments, design guidelines should be flexible enough to respond to a variety of specific contexts. Additionally, the design of transportation elements should complement entertainment, commerce and cultural events of the area.

The following design guidelines outline basic parameters for elements unique to a Special Segment, which users of the Guidelines should address in project development.

A

B

C

Figure 2.4.2: Example of Special Segment Elements

A. Main Street Banners

B. Integrated Art on Railing in Neighborhood Commercial Street, Ann Arbor, MI

C. Unique Elements Define Character of the Area, Chinatown, Washington, DC

1. Establish neighborhood identity and sense of place

Given the activity level, the design and treatment of these mixed-use corridors should create a sense of place and reflect the identity of the neighborhood they serve. The following transportation architecture elements are uniquely customized designs that may be integrated with artwork. The special attention to detail may attract and encourage broader investments and expand local business opportunities. Integrated public art strengthens the neighborhoods identity and also creates a memorable and pleasant experience for residents and visitors. Local artists may be commissioned to design selected elements including seating, street sign attachments, and neighborhood identifiers, trash receptacles, and tree grates. DDOT and other community stakeholders should approve materials, designs, and dimensions.

Seating

The design and dimensions of the seating should be user friendly for children, adults and seniors. It should be located in a highly visible location and engage the passerby.

Neighborhood Identifiers

Neighborhood identifiers could be custom designed and placed along the public right-of-way at key locations that are highly visible. These elements might be integrated with streetlights or be a standalone feature along the public right-of-way.

Temporary Banners

Banners should be changeable to accommodate special events or other themes, so the opportunity exists to replace them when necessary. Typically, business owners or residents' associations initiate such events locally. In most cases, DDOT will not fund the banners; however, they will install them.

Figure 2.4.3: Opportunities for Public Art

A. Seating

B. Bike Rack/Public Art

C. Neighborhood Identifier

D. Banners Mounted on Streetlight Post

A

B

C

D

Trash Receptacles

Trash receptacles should have custom designed plaques and/or decals, providing opportunities for local businesses to advertise.

"Stand Alone" Art Work

Local artists may be commissioned to design an art piece to be installed within public rights-of-way, such as wide sidewalk areas, public play areas, and parks. DDOT and other stakeholders should approve the artwork. Funding for artwork could include contributions from, but not limited to, DDOT, WMATA, DCAH and local businesses.

Figure 2.4.4: Other Opportunities for Public Art

A. Custom Design Plaque Attachments on Trash Receptacles

B. Standalone Public Art

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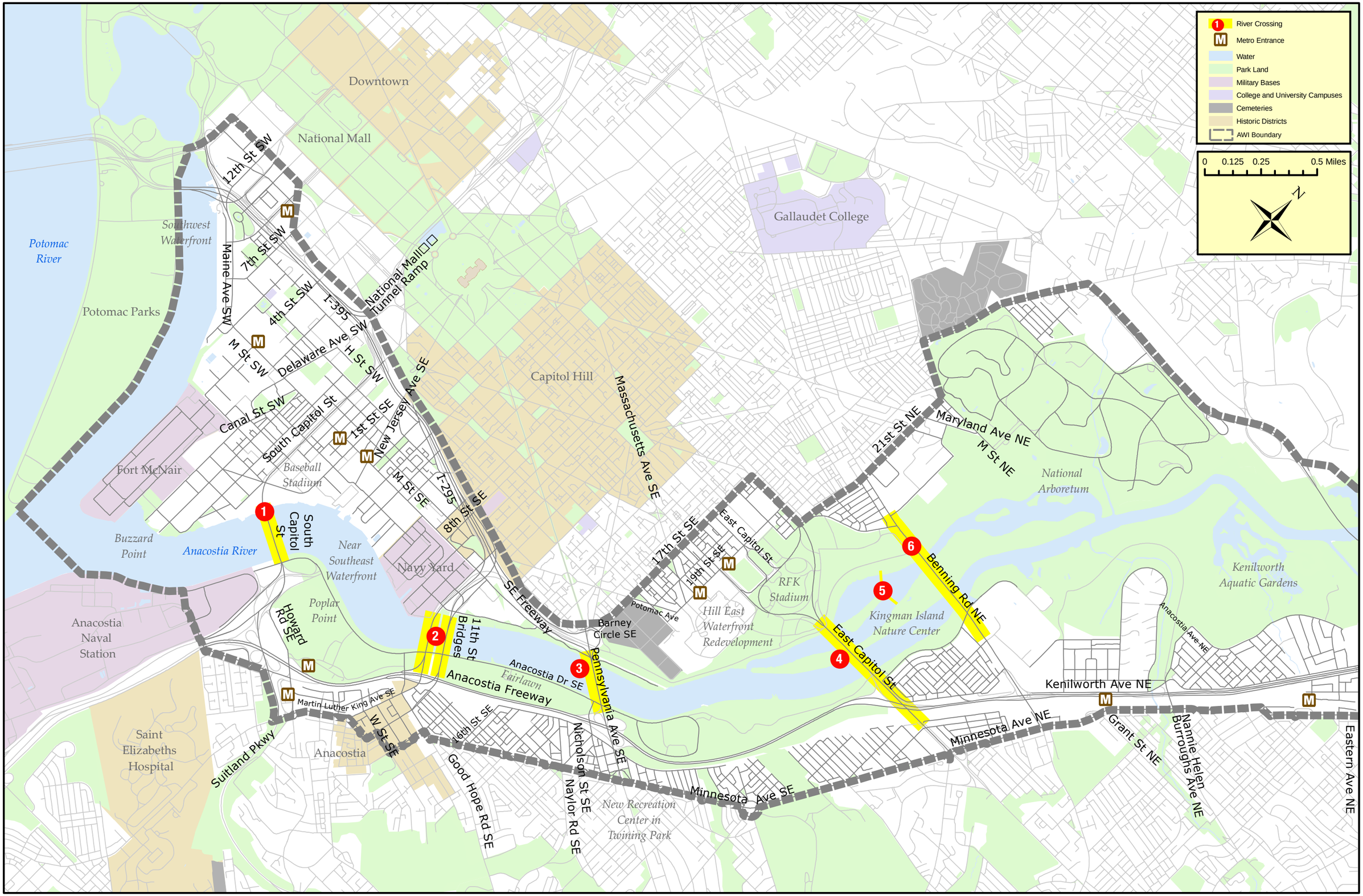
River Crossings 2.5


River Crossing
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Park Land
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College and University Campuses
Cemeteries
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Baseball Stadium
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Grant St NE
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Figure 2.5.1 (opposite page): Map of River Crossings in AWI Area

The 14th Street and New York Ave bridges though within of the AWI area are not included in River Crossings guidance as they are controlled by the Federal Highway Administration (FHWA)

Figure 2.5.2 (below):

A. Memorial Bridge, Washington, DC

B. Key Bridge, Washington, DC

C. Zakim Bridge, Boston, MA

D. Alamillo Bridge, Seville, Spain

2.5 River Crossings

2.5.1 Introduction

Existing bridges over the Anacostia River are designed primarily as part of a regional roadway network to serve automobiles entering the city. At present, these bridges are not welcoming or safe for pedestrians. Sidewalks are narrow and not well illuminated. Except in a few instances, the bridge approach rights-of-way have not been leveraged to provide much of the sought after waterfront access. Additionally, the high bridge elevation and/or poor intersection design of bridge approaches inhibit pedestrian/bicycle access to and from adjoining neighborhoods across the River.

The River Crossings include all the multi-modal bridge crossings of the Anacostia River that, in the future, present opportunities to provide the public with "great" river crossings that safely connect communities and integrate communities in adjacent neighborhoods.

The map on the facing page delineates the River Crossings.

Table 2.5.1

#	River Crossings	Function
1	South Capitol Street (Frederick Douglas Memorial Bridge)	Multi-modal
2	11th Street bridges	Multi-modal
3	Pennsylvania Avenue SE (Sousa Bridge)	Multi-modal
4	East Capitol Street (Whitney Young Memorial Bridge)	Multi-modal
5	Kingman Island Bridge	Pedestrian
6	Benning Road NE (Benning Bridge)	Multi-modal

2.5.2 General Intent of the Public Right-of-Way Design

Most of the bridges identified in Table 2.5.1 need substantial renovation or replacement. The opportunity exists to reconstruct the rights-of-way such that they provide:

- A pleasant and comfortable environment for pedestrians and bikers, to foster connections between neighborhoods across the Anacostia; and
- A distinct sense of entry to the District, underlining their role as major connectors.

The District has many precedents of traditional bridges, which provide both amenities. Similarly, other contemporary bridges within the United States and elsewhere have also successfully incorporated these twin roles.

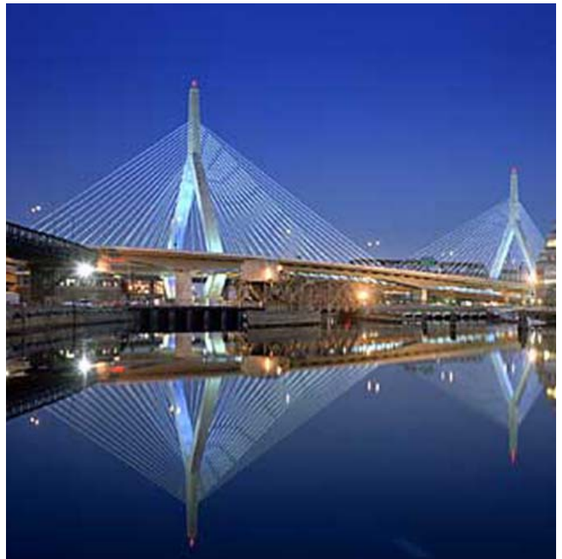
The Guidelines assume that the bridge design is part of an urban infrastructure project and has a "life" of its own. It would go through the design and planning process, involving the impacted communities and stakeholders, such as DC Office of Planning (DCOP), National Capital Planning Commission (NCPC), Commission of Fine Arts (CFA), Federal Highway Administration (FHWA) and others who would influence the bridge architecture. Therefore, it is not the intention of this special area to prescribe an architecture vocabulary or style for the bridges. This special area only requires the following basic functional considerations (performance standards) that address accessibility, mobility, and character.

A River Crossing consists of a bridge approach, entry points, and a bridge deck. Collectively, these features define the overall accessibility, sense of arrival and character and may necessitate significant levels of public investment. Future

A

B

C



D

River Crossings should be designed based on the following guidelines.

1. Create convenient, safe and inviting bridge approaches for all transportation modes

A well-designed bridge approach addresses multi-modal access to the bridge and also to the waterfront from surrounding neighborhoods. In order to adequately negotiate the vehicular, transit and/or pedestrian/bicycle access to and from approaching streets, waterfront and limited access highways, the bridge approach should consider the following:

- Minimal elevation changes in order to increase pedestrian comfort and usability. Bridge approach profiles should be designed to maintain at-grade conditions where possible. The approach should meet ADA requirements.
- Provide grand access to the waterfront, similar to the Memorial Bridge, mainly for pedestrians and bikes, and when feasible, for vehicles. Integration with the Riverwalk system is envisioned in the Anacostia Waterfront Framework Plan. The design of waterfront access within the bridge right-of-way should address ADA requirements and encourage various waterfront activities and public gathering.

Rotaries

Resolve pedestrian-vehicular conflicts from approaching streets through the use of roundabouts, which are common in Washington's street system. The roundabouts could also act as a transitional space between the different transportation elements (mainly street lights, roadway and sidewalk paving, and wall cladding) used along approaching streets and the bridge deck. Additionally, larger roundabouts, especially along Symbolic Corridors, should be considered to provide venues for commemorative features and memorials.

Limited access freeways should be depressed under roundabouts when feasible to enhance pedestrian and bicycle access. Many River Crossings identified in Table 2.5.1 provide such opportunities. Under such circumstances, the exit and entrance ramps to the freeway should be integrated with the bridge approach.

Landscaping

Enhance rights-of-way with landscaping to incorporate LID technologies. The incorporation of more plantings will naturally improve the water quality and quantity leaving the roadway. Planting materials such as shrubs and evergreens at bridge approaches should be used to complement the waterfront environment and enhance views.

Figure 2.5.3: Bridge Approach Treatment

A. Grand Steps Leading to the Waterfront (Memorial Bridge)

B. Traffic Rotaries as Transitional Areas to Resolve Vehicle and Pedestrian Conflicts

A

B

Figure 2.5.4: Gateway Elements

A. Gateway Sculpture, Memorial Bridge, Washington, DC

B. Gateway Sculpture, Taft Bridge, Washington, DC

C. Gateway Sculpture in Paris

D. Zakim Bridge Structure Designed as Gateway Element, Boston, MA

2. Create urban landmarks

River Crossings are symbolic, figurative and physical bridges that connect the neighborhoods physically separated by the Anacostia River. Additionally, they are "gateways" to the Nations Capital. The bridge entrances therefore, should celebrate their role as landmarks by incorporating gateway elements. Depending on the type of bridge structure, the bridge entrances should include either:

- Decorative elements with commemorative sculptures as shown on the Memorial Bridge (Figure A), the Taft Bridge over the Rock Creek Parkway (Figure B) and the Gateway Sculpture in Paris (Figure C); or
- Large-scale structural elements as shown on the Zakim Bridge in Boston (Figure D) to mark the entrances and create a "sense of arrival".

These threshold elements should be illuminated nightly (with LED or solar powered lighting) to animate waterfront activities and provide visual markers for visitors and residents.

3. Create bridge decks as destinations for pedestrians and cyclists

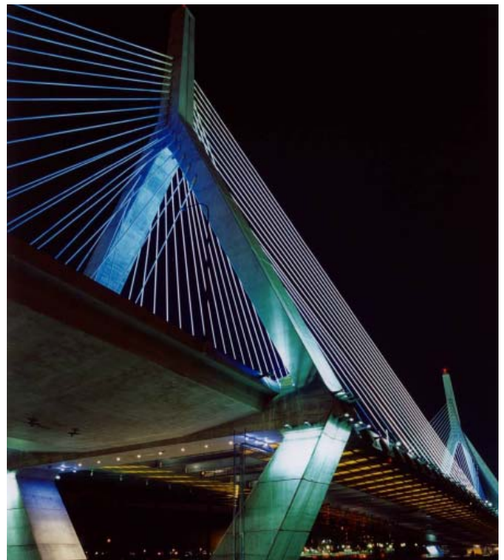
The bridge deck, or main body of the bridge, is often designed solely for the purpose of circulation, missing the opportunity to include space for public activities. Future Anacostia River Crossings should incorporate the features described on the following pages (2-44 through 2-45).:

A

B

C

D



Pedestrian & Traffic Safety

Lower vehicular speeds should be mandated where possible to promote pedestrian and bicycle safety.

Walkways

Allocating at least 10-feet of clear space to create a wide sidewalk area provides generous, uninhibited, dual lanes for pedestrian/bicycle circulation (Figure A). Wide sidewalks provide opportunities to integrate seating (Figure C) and overlook areas (Figure B) within the non-vehicular right-of-way. The sidewalk material along the bridges should be consistent with the approaching streets, unless approved otherwise by DDOT.

Curbs & Gutters

The sidewalk should be raised 9-inches from the roadway pavement.

Vehicular and Pedestrian Railings

Safe, round-the-clock access to and across the bridges should be addressed with adequate bridge lighting integrated into metal railings to illuminate pedestrian and roadway areas (Figure D).

Additionally, an illuminated bridge deck (Figure E) can provide the backdrop to the waterfront and river-walk during the evening. Accent lighting could be used to highlight architectural features and to enhance safe passage at stairs, ramps and pedestrian underpasses.

Figure 2.5.5: Example of Bridge Elements

A. Wide Sidewalks

B. Area for Overlook

C. Integrated Seating

D. Integrated Lighting along Edgewall

E. Illuminated Bridge Deck

A

B

C

D

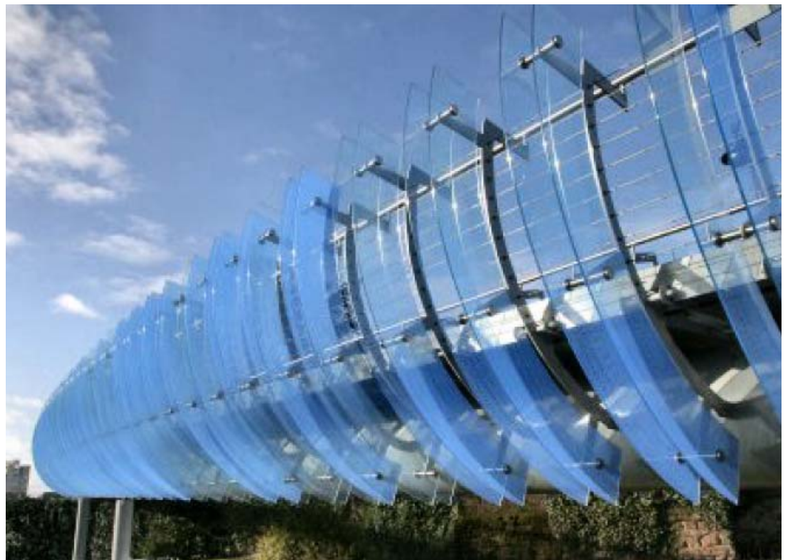
E

Figure 2.5.6: Examples of Bridges with Transparent Railings

In addition, the sidewalk could be protected from vehicular areas using a standard curb rail. In order to provide a clear view of the River, and the waterfront areas for drivers and pedestrians, the use of Jersey barriers or high metal railings along the curb are discouraged.

Clearly delineated rest areas for pedestrians/bicyclists to observe events and other interesting views and other furnishings that provide pedestrians with opportunities for rest and repose should be installed along bridges. Benches may be freestanding or integral components of the bridge design.

Custom designs such as transparent edge-wall railings may be installed upon DDOT approval to provide users with unrestricted visual access to the waterfront and river. It is recommended that the railing, whether independent or integrated into the structure, be designed to minimize the sectional dimensions of balusters and increase the spacing between them. While adhering to ADA and other safety requirements, the baluster spacing could be in-filled with transparent materials such as glass.



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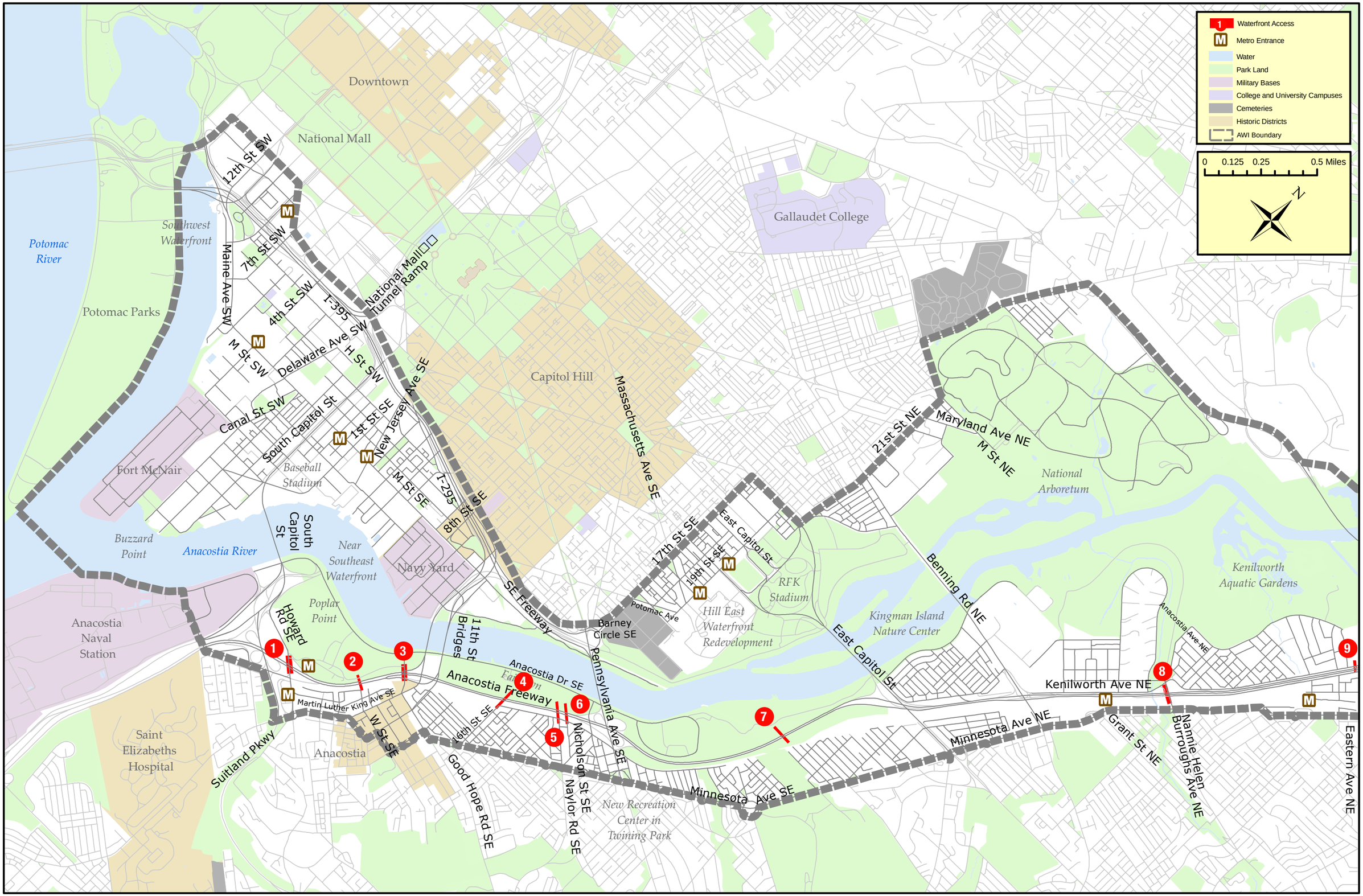
Waterfront Access Segments 2.6


Waterfront Access
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
N
Downtown
National Mall
Gallaudet College
Potomac River
Southwest Waterfront
Potomac Parks
Capitol Hill
Fort McNair
Baseball Stadium
Buzzard Point
Anacostia River
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
National Arboretum
RFK Stadium
Hill East Waterfront Redevelopment
Kingman Island Nature Center
Kenilworth Aquatic Gardens
New Recreation Center in Twining Park
12th St SW
7th St SW
4th St SW
Maine Ave SW
I-395
National Mall Tunnel Ramp
Delaware Ave SW
M St SW
H St SW
Canal St SW
South Capitol St
1st St SE
New Jersey Ave SE
M St SE
I-295
8th St SE
Massachusetts Ave SE
21st St NE
Maryland Ave NE
M St NE
17th St SE
19th St SE
East Capitol St
Benning Rd NE
Potomac Ave
Barney Circle SE
SE Freeway
11th St Bridges
Howard Rd SE
Anacostia Dr SE
Anacostia Freeway
Martin Luther King Ave SE
W St SE
16th St SE
Nicholson St SE
Naylor Rd SE
Good Hope Rd SE
Pennsylvania Ave SE
Minnesota Ave SE
Minnesota Ave NE
Kenilworth Ave NE
Anacostia Ave NE
Grant St NE
Nannie Helen Burroughs Ave NE
Eastern Ave NE
Suitland Pkwy
1
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9

Figure 2.6.1 (opposite page): Map of Waterfront Access Segments in AWI Area

2.6 Waterfront Access Segments

2.6.1 Introduction

The ability to access the waterfront significantly influences the success of the goals of the Anacostia Waterfront Initiative. While the implementation of the Near Southeast Urban Design Framework, the AWI Southwest Waterfront Vision and other initiatives address the promenades along the western bank of the River, much of the eastern bank is cut off from adjoining neighborhoods by the Anacostia Parkway, and I-295. Recommendations made in Greenways, Section 2.1 and in the Anacostia Waterfront Framework Plan call for a redesigned environment for these roadways to substantially improve and increase access to the waterfront.

The Waterfront Access Segments designation delineates specific guidelines for the design of those at-grade, elevated or depressed segments of neighboring streets, which may extend across the highway after the recommendations have been implemented.

Nearly all existing connections from the neighborhoods to the River and its parks are accidental. Consequently, these routes are inconvenient and not safe. Any future public right-of-way improvements should be viewed as an opportunity to reconnect neighborhoods to the River. Streets supporting automobile use could connect to park roads, from which motorists can access parking areas. Pedestrians and bike routes traversing through these corridors could link into the Riverwalk and the local neighborhood streets.

The proposed Waterfront Access Segments will allow visitors and residents to enjoy river views, participate in activities and experience convenient access to the waterfront network and National Parks throughout the District. These re-invigorated communities are more likely to feel a sense of connectedness, ownership and pride with the River and the area. The map on the facing page and Table 2.6.1 identifies potential Waterfront Access Segments.

Table 2.6.1. Proposed Waterfront Access Segments*

#	Waterfront Access Segment
1	Howard Road SE
2	W Street SE
3	Good Hope Road SE
4	16th Street SE
5	Naylor Road SE
6	Nicholson Street SE
7	New Crossing (future)
8	Nannie Helen Burroughs Avenue NE
9	Eastern Avenue NE

*Potential Waterfront Access Segments are not limited to this list. A more detailed study should be conducted to define the segment roadway type – multi-modal, pedestrian, at-grade bridge, land bridge or underpass.

2.6.2 General Intent of the Public Right-of-Way Design

There are four types of Waterfront Access Segments, including a pedestrian overpass, a multi-modal overpass, a land bridge and a multi-modal underpass. Each extends neighborhood streets over or under a freeway to the waterfront and call for high levels of public investment. They are described below in preferential aesthetic order.

- **Pedestrian Overpasses** span over freeways. They should include right-of-way segments dedicated exclusively to pedestrian and bicycle circulation. These pedestrian overpasses should serve to integrate the Anacostia Riverwalk system with neighborhood streets.
- **The Multi-Modal Overpass** should be an un-enclosed bridge system over freeways along which pedestrians and bicyclists share the right-of-way with local vehicular traffic. These overpass segments are intended to connect to park roads, from which motorists approaching via the neighborhood streets can access the parking areas for the various recreational amenities on the waterfront. The roadway alignment and treatment should promote a lower traffic speed of 25 mph or less.
- **Land Bridge** should also be designed as an overpass system over freeways to connect neighborhood open spaces to the Anacostia Park. These overpasses are typically much wider than multi-modal bridges and include active and/or passive open space and provide bicycle and vehicular access.
- **Multi-Modal Underpasses** offer the least preferred alternative for Waterfront Access Segments. They are a necessary means to connect neighborhoods with the waterfront area by crossing under an elevated freeway system. The design of these underpasses should adequately address pedestrian safety, security and comfort issues.

Selection of the type of bridge and underpasses should be determined during the project planning stage. Adequate consideration should be given to community needs, physical constraints, and construction costs. Regardless of type, the Waterfront Access Segments should generally provide unique, attractive and safe walking/biking environments and, if necessary, vehicular access to the waterfront.

Figure 2.6.2: Different Types of Waterfront Access Segments

A. Example of Overpass

B. Example of Land Bridge

C. Example of At-Grade Underpass

Figure 2.6.3 (opposite page): Pedestrian Accessibility

A. At-Grade Overpass

B. Overpass with Mild Slope (ADA Accessible)

C. At-Grade Underpass

D. Pedestrian Bridge

A

B

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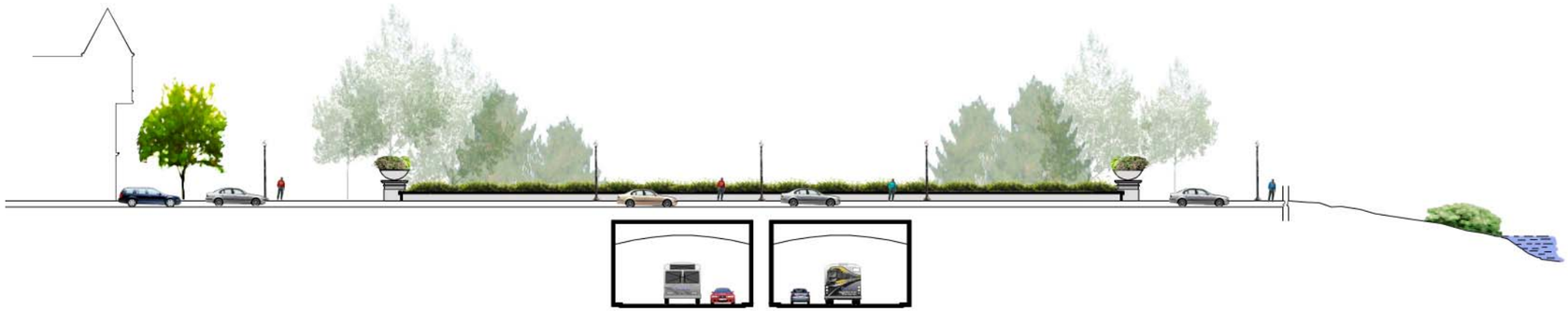

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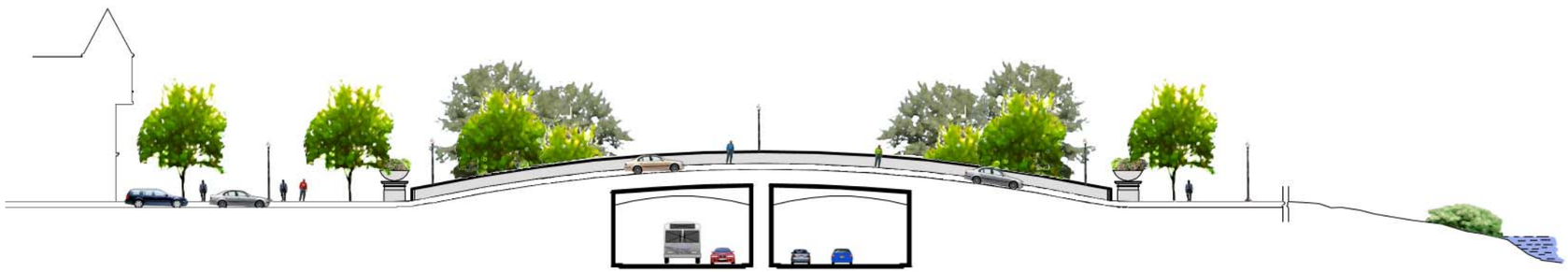

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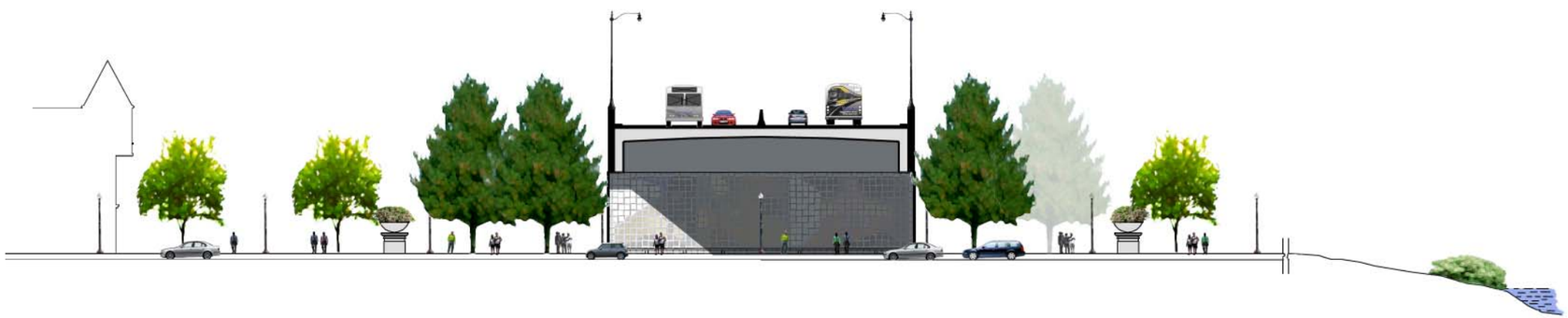

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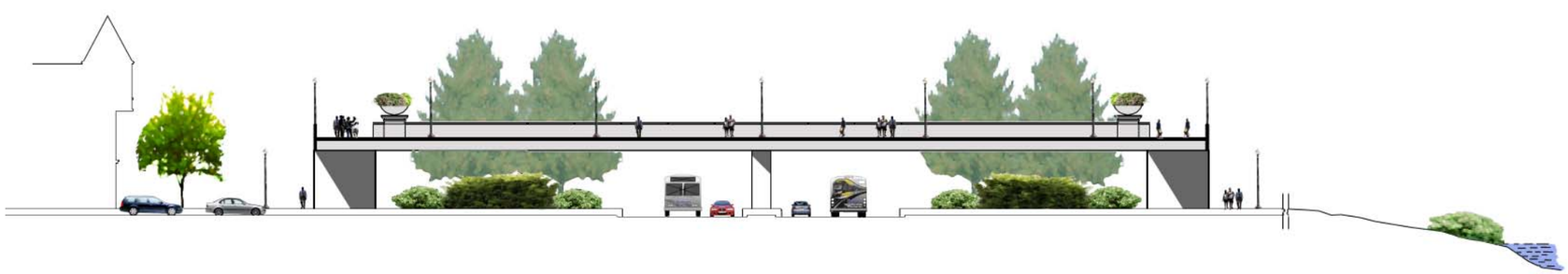

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1. Enhance pedestrian environment & accessibility

Elevation change of bridges/underpasses

In order to increase pedestrian comfort and usability, the profile of overpasses/underpasses should be designed to maintain at-grade conditions where possible, especially along depressed segments of the freeway system. When at-grade overpasses are not feasible, above-grade overpasses/underpasses will be acceptable. In this case, the height of the overpass, or depth of the underpass should be minimized to reduce the length and simplify the alignment of pedestrian and bicycle ramps. All bridges and approaches should meet ADA requirements.

Walkways

Generous pedestrian sidewalks and bike lanes should be provided when feasible. The pedestrian overpasses should be at least 15-feet wide (clear) to incorporate adequate right-of-way for uninhibited, dual lane pedestrian/bicycle circulation. These wide sidewalks provide opportunities to integrate seating and overlook areas in the right-of-way design.

Curbs, Gutters & Railings

In the case of multi-modal overpasses and underpasses, the sidewalk, when feasible, should be at least 10-feet wide (clear), and raised 9-inches from the roadway pavement. In addition, the sidewalk should be protected from vehicular areas using a standard curb rail.

Landscaping

Landscaping should be used to enhance the right-of-way aesthetics and usability. Pedestrian and land bridges are recommended to include landscaping along the external bridge-wall to visually integrate the overpass environment with the waterfront park system and enhance views. Moreover, adequate use of shrubs and perennials could eliminate the need for high safety railings and fencing, which are often perceived as unattractive and visually oppressive.

Fixtures

Lighting in pedestrian areas should be emphasized. Depending on the type of overpass or underpass, pedestrian scale lighting should be the #16 or #18 upright pole fixture. Lighting should be selected to complement the overpass or underpass design and promote round-the-clock access. The pedestrian overpass should incorporate streetlights along the edge wall, whereas multi-modal overpasses or underpasses should incorporate lighting along the curb railing. Stairs, ramps, corners and underpasses should be adequately illuminated to enhance public safety.

A

B

Figure 2.6.4: Landscape Treatments

A. Section Through Pedestrian Overpass

B. Section Through Multi-Modal Overpass

C. Section Through Land Bridge

Figure 2.6.5: Design Elements

A. Neighborhood-Scale Gateway Element

B. Suggested Landscape Treatment of Waterfront Access Segment Entrances

C. Random Ashlar Wall Cladding over Greenways

D. Custom Design Metal Railing

2. Highlight entrances and approaches

Entrance treatment of overpasses and underpasses are important design elements that will create a sense of arrival while also cautioning pedestrians and bicyclists. The entrances and approaches should include neighborhood-scale gateway elements, which might provide opportunities to incorporate public art and public gathering space.

Signage

Additionally, wayfinding and interpretive signs, where appropriate, should be installed to identify points of interest and provide users with clear information as to where the overpass or underpass is leading.

Walls

Waterfront Access Segment design should always complement the character of the freeway system running above or below it. Because the facades on overpasses are most visible from the freeway, the selection of its cladding material should be compatible with the respective freeway architecture.

Wall treatment should be determined on a case by case basis and approved by DDOT. Architectural compatibility within each corridor should be emphasized.

Public Art in the form of murals may be incorporated on the surface of walls. Where possible, murals may be cast on vertical concrete surfaces. This should be coordinated with the infrastructure project early in the design process, so that room can be made in advance of construction.

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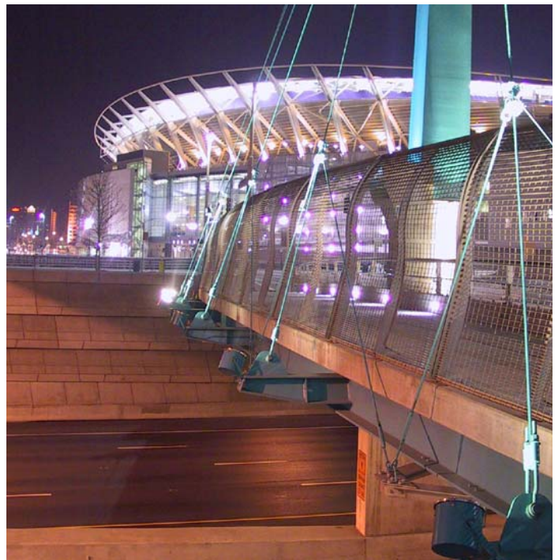

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Waterfront Promenades 2.7

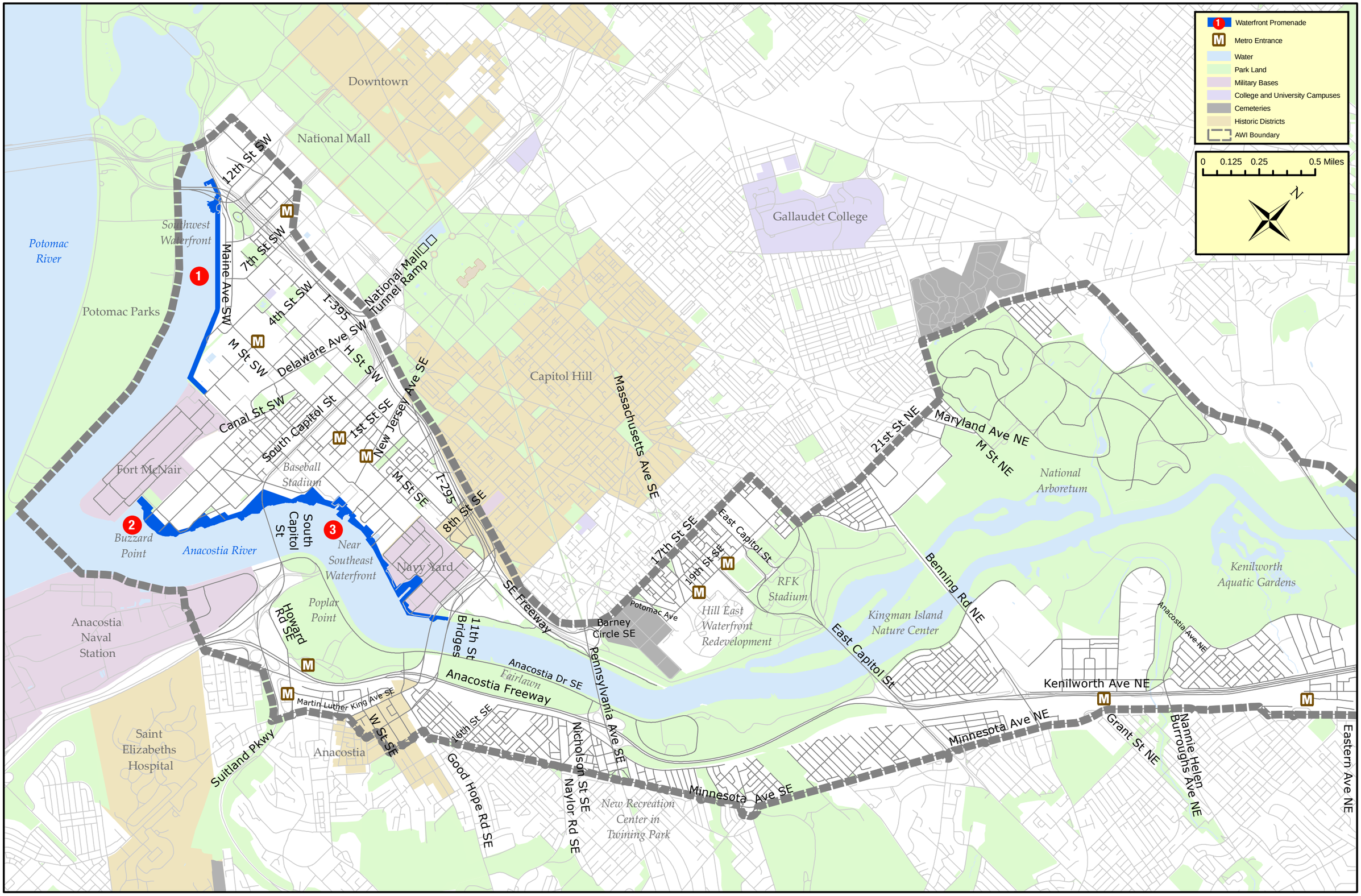

Waterfront Promenade
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
N
Downtown
National Mall
Gallaudet College
Potomac River
Southwest Waterfront
Potomac Parks
Capitol Hill
Fort McNair
Buzzard Point
Anacostia River
Baseball Stadium
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
Fairlawn
Hill East Waterfront Redevelopment
RFK Stadium
Kingman Island Nature Center
National Arboretum
Kenilworth Aquatic Gardens
New Recreation Center in Twining Park
12th St SW
7th St SW
4th St SW
Maine Ave SW
M St SW
Delaware Ave SW
H St SW
I-395
National Mall Tunnel Ramp
Canal St SW
South Capitol St
1st St SE
New Jersey Ave SE
M St SE
I-295
8th St SE
Massachusetts Ave SE
21st St NE
Maryland Ave NE
M St NE
17th St SE
19th St SE
East Capitol St
Benning Rd NE
SE Freeway
Potomac Ave
Barney Circle SE
11th St Bridges
Anacostia Dr SE
Anacostia Freeway
Pennsylvania Ave SE
Howard Rd SE
Martin Luther King Ave SE
W St SE
16th St SE
Suitland Pkwy
Good Hope Rd SE
Nicholson St SE
Naylor Rd SE
Minnesota Ave SE
Minnesota Ave NE
Kenilworth Ave NE
Grant St NE
Nannie Helen Burroughs Ave NE
Anacostia Ave NE
Eastern Ave NE

Figure 2.7.1 (opposite page): Map of Waterfront Promenades in AWI Area

Figure 2.7.2 (below): Sample Promenade Conditions

A. Active Condition - Mostly Hardscape, Artist's Rendering of Waterfront Promenade (Anacostia Waterfront Framework Plan)

B. Active/Passive Condition, Artist's Rendering of Waterfront Promenade (Anacostia Waterfront Framework Plan)

C. Waterfront Promenade, East Boston

D. Waterfront Promenade, Montreal

2.7 Waterfront Promenades

2.7.1 Introduction

As a part of the District's initiative to revitalize the Anacostia Area, the waterfront will be restored to provide civic spaces, parks, cultural venues, monuments and linkages to existing and new neighborhoods. In light of NCPC's Legacy Plan recommendation, a re-developed waterfront will also accommodate appropriate settings for monuments and memorials. The integration of monuments along the waterfront is envisioned to create a rich cultural character for the neighborhoods, attracting a variety of economic development opportunities.

The remarkably diverse river landscape that will constitute the future Anacostia River waterfront will generate a wide range of riverfront experiences from most actively urban (Southwest Waterfront, Buzzard Point and Near Southeast Waterfront) to mostly pastoral (the Upper Reaches of the River including the National Arboretum, Kenilworth Aquatic Gardens and Langston Golf Course).

The urban riverfront is referred to as the "Waterfront Promenades" in this document. This special area designation pertains exclusively to sections of the waterfront that abut the most active development areas and generally include harder surface treatment, constructed by development corporations or private developers. The guidelines of this special area may not be applicable to the natural or landscaped sections of the Riverfront or those areas within the National Park Services purview.

Table 2.7.1 Proposed Waterfront Promenades

#	Promenades	Location
1	Southwest Waterfront	Washington Marina (Fish Market) - P Street SW
2	Buzzard Point Waterfront	Buzzard Point
3	Near Southeast Waterfront	Buzzard Point - 11th Street bridges

Design teams, in consultation with DDOT and other stakeholders, should confirm AWI recommendations throughout the design process.

2.7.2 General Intent of the Public Right-of-Way Design

The intent of the guidelines developed for this special area is to shape an urban waterfront promenade that not only complements the abutting activities, but also unifies it with the waterfront system. The design of promenades should encourage visitors and residents to enjoy river views, participate in land and water based activities and experience a variety of public amenities. The magnitude of the new developments, combined with an increased number of users, requires the design of promenades to restore, enhance and protect the waterfront environment.

Promenades necessitate significant levels of public investment in the design of public realm anchors, special intersections and connections. As a pedestrian-oriented waterfront conduit, promenades should be designed to support an attractive, easily accessible, clearly marked and safe environment. Street end plazas, market squares, parks, piers, and walkways will take root along the waterfront. While the parks will help to break up and soften the massing of new developments, the widening of the promenade will provide generous space for pedestrian and bicycle activity and outdoor seating. The promenade design should also support the environmental goals of the AWI to eliminate pollution, control run-off, restore streams and wetlands, and promote water-based activities.

The guidelines presented in this section are intended to:

- Restore the edge conditions and control runoff;
- Develop rights-of-way to accommodate diverse activities in a safe environment; and
- Develop a unified and coherent waterfront.

A

B

C

D

1. Develop the right-of-way to accommodate diverse activities in a safe environment

The Waterfront Promenade is an integral part of the comprehensive 20-mile Riverwalk system, which grants access to both "active" and "passive" recreation opportunities. Therefore, it is imperative that the right-of-way design of the Waterfront Promenade safely accommodates the commuting and recreational needs of the pedestrian, cyclist, skater, and wheelchair user.

Generally, a 60-foot minimum building setback from the River's edge should be established to provide designated space for "active" and "passive" activities. Often these designated spaces run parallel to each other along the waterfront and are separated by a landscaped buffer.

Walkway & Paving

A designated "passive" area, not less than 10-feet wide, should be created close enough to the shoreline to allow visitors to sit, enjoy the view, or take a leisurely stroll while seeing, hearing and smelling the water (Figure 2.7.3 B). The recommended surface treatment of this area is unit pavers that are intended to provide sense of scale and warmth for leisurely activities and discourage active recreation.

The "active" area, not less than 10-feet wide, is also known as a designated multi-purpose trail used by skaters, cyclists, and joggers (Figure 2.7.3 A). The recommended surface treatment of this area includes asphalt pavement with lane markings. This material is often used by National Park Services along trails.

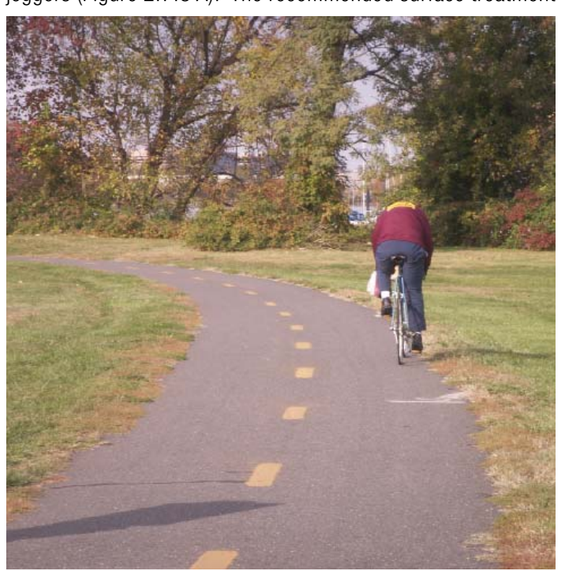
Numerous pedestrian crossings should occur regularly across the promenade to allow users to move from the development area to the water's edge.

Railings, Furnishing, Lighting & Signage

The passive area (Figure 2.7.3 C) should incorporate seating and trash receptacles opposite the water's edge, leaving adequate space for circulation. The edge treatment could include pedestrian scale lighting, safety posts, railings and interpretive signage to support nighttime activities, enhance overall safety, and inform users.

The active area could face the development zone (Figure 2.7.3 D), which will accommodate uses, such as outdoor restaurant seating and walking. The transition between the development zone and active area should be distinct through the use of landscape elements, such as plantings, seating walls and/or safety posts. Some sections of the promenade, especially Buzzard Point, may have space constraints to include separated active and passive areas. In such a case, the promenade right-of-way may only cater for passive activities (Figure 2.7.3 E).

A



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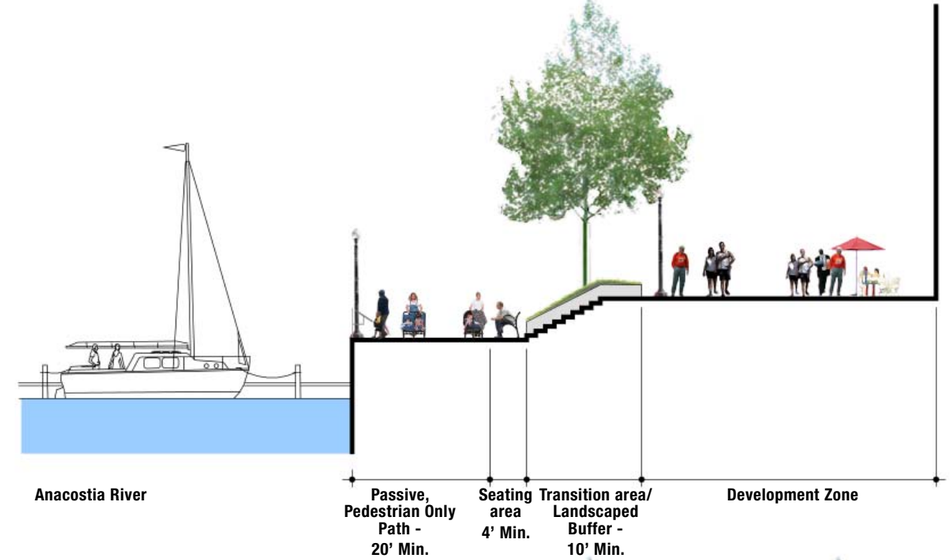

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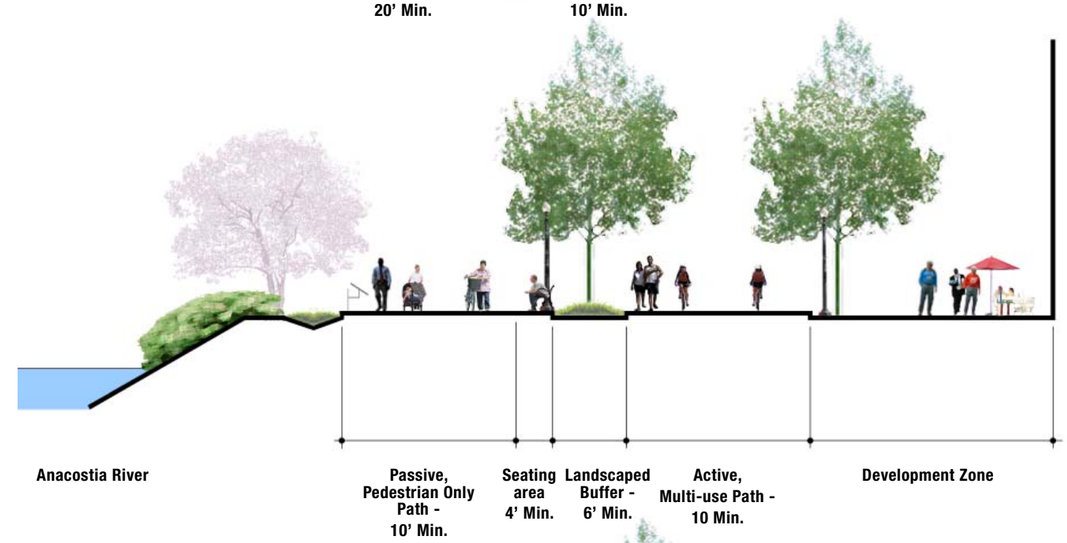

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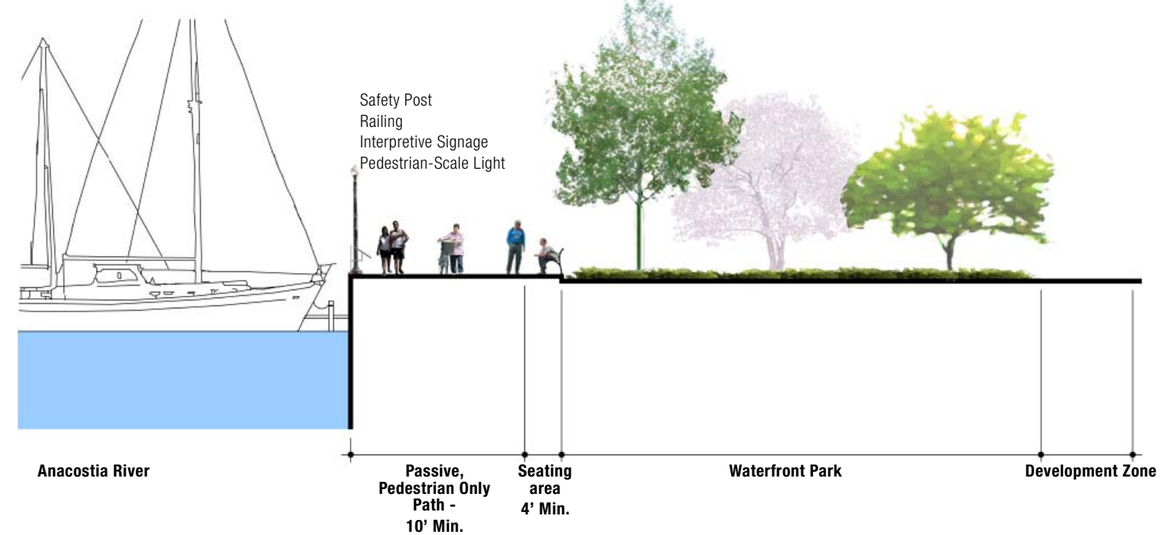


Figure 2.7.3 (opposite page):

A. Active Recreation Area

B. Passive Recreation Area

C. Concept Section along the Southwest Waterfront Promenade

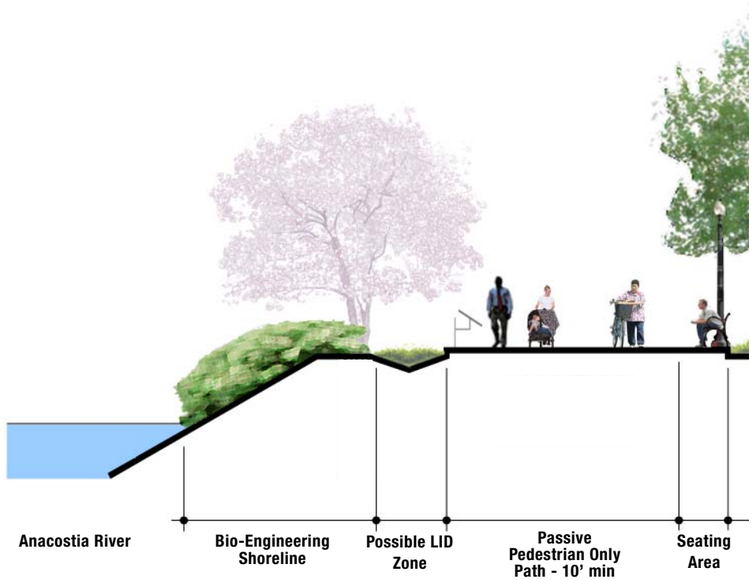
D. Concept Section along the Near Southeast Waterfront Promenade

E. Concept Section along Buzzard Point Waterfront Promenade

Figure 2.7.4 (below): Edge Treatment and Controlled Runoff

A. Riparian Edge

B. Seawall with Underground LID BMPs



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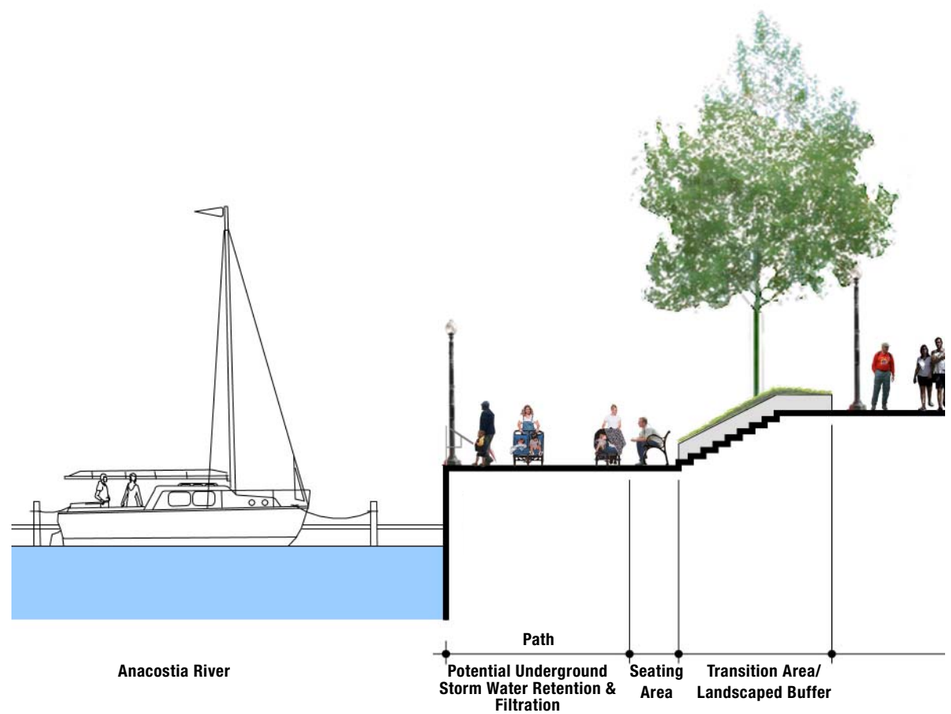

B

2. Restore edge conditions and control runoff

Landscaping

The landscaped buffer zone (Figure 2.7.3 D) has a minimum width of six feet. It should separate the two paths and include LID techniques, shade trees, and pedestrian scale lights when required.

Improved water quality and restored natural habitats will attract more people to the River. In order to restore the Anacostia River, the promenade should be designed to address the retention and filtration of runoff. Where possible, the natural hydrology will be re-established to reduce the effects of sedimentation, erosion and runoff. Areas along the trails and paths should include LID practices and restoration measures to recreate and restore marshes and riparian edges to help control surface runoff and absorb pollutants before reaching the River (Figure 2.7.4 A). In addition, these conditions also benefit the wildlife habitat.

Where the location and density of the development does not allow for surface water treatment, below-grade storm retention and filtration systems should be installed within the promenade rights-of-way (Figure 2.7.4 B). As part of the environmental remediation, Best Management Practices (BMP) should be used for the urban shoreline.

3. Develop a unified and coherent waterfront

The treatment for this special area should help in unifying the diverse waterfront environment. Specific elements such as pedestrian scale lighting, safety posts, benches, interpretive signage, neighborhood identifiers, and railings should collectively create and reinforce a unique waterfront identity and complement the newer developments. The Navy Yard promenade, due to its historic designation, may be treated using traditional style elements.

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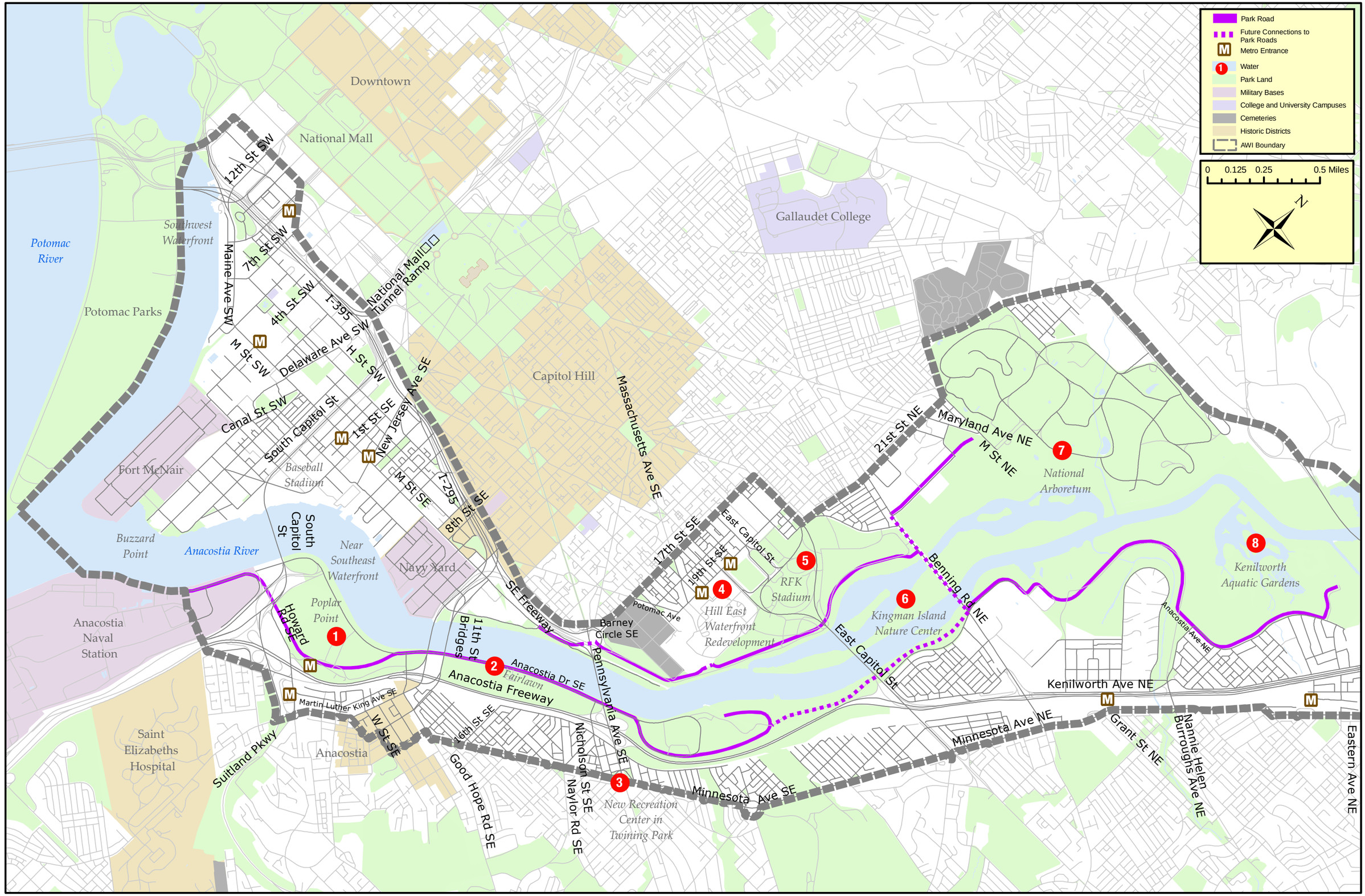
Park Roads 2.8


Park Road
Future Connections to Park Roads
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
N
Downtown
National Mall
Gallaudet College
Potomac River
Southwest Waterfront
Potomac Parks
Capitol Hill
Fort McNair
Baseball Stadium
Buzzard Point
Anacostia River
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
Fairlawn
Hill East Waterfront Redevelopment
RFK Stadium
Kingman Island Nature Center
National Arboretum
Kenilworth Aquatic Gardens
New Recreation Center in Twining Park
12th St SW
7th St SW
Maine Ave SW
4th St SW
I-395
National Mall Tunnel Ramp
M St SW
Delaware Ave SW
H St SW
Canal St SW
South Capitol St
1st St SE
New Jersey Ave SE
M St SE
I-295
8th St SE
Massachusetts Ave SE
17th St SE
19th St SE
East Capitol St
21st St NE
Maryland Ave NE
M St NE
Benning Rd NE
SE Freeway
Potomac Ave
Barney Circle SE
11th St Bridges
Anacostia Dr SE
Anacostia Freeway
Pennsylvania Ave SE
Howard Rd SE
Martin Luther King Ave SE
W St SE
Suitland Pkwy
16th St SE
Good Hope Rd SE
Nicholson St SE
Naylor Rd SE
Minnesota Ave SE
Kenilworth Ave NE
Anacostia Ave NE
Minnesota Ave NE
Grant St NE
Nannie Helen Burroughs Ave NE
Eastern Ave NE
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8

Figure 2.8.1 (opposite page): Map of Park Roads in AWI Area

Figure 2.8.2 (below):

A. Riparian Edge along the Anacostia River

B. Kenilworth Aquatic Gardens

C. Typical Park Road Treatment (Memorial Drive in Cambridge, Massachusetts)

2.8 Park Roads

2.8.1 Introduction

In order to unify the parks, which spread over 1,800 acres of open space along the Anacostia River, as called out for in the Anacostia Framework Plan, a physical link should first be provided. Several park roads will establish this link for vehicular access to major destinations and neighborhoods along the waterfront. It will also create access to the 20 miles of interconnected riverfront trails and bikeways and divert traffic from the local neighborhoods. The development and design of the park roads are intended to make the area a more accessible, green, and safe public resource for all to enjoy.

The park roads will pass through old and new developments with the goal of creating a sense of continuity throughout the area. One will begin on the north side of the River at the intersection of M Street SE and Water Street SE and will run parallel to the River toward the National Arboretum, crossing over to Kingman Island and the Kenilworth Aquatic Gardens (Figure B). On the south side of the River, another will follow along Anacostia Drive SE, passing the Poplar Point Development area, and ending at the AWI boundary.

The Map in Figure 2.8.1 and Table 2.8.1 define the major destinations and the neighborhoods through which the park roads will run.

Table 2.8.1 Major Destinations Connected by the Park Road

#	Destination Name
1	Poplar Point Cultural Park
2	Fairlawn
3	New Recreation Center in Twining Park
4	Hill East Waterfront Redevelopment
5	RFK Stadium
6	Kingman Island Nature Center
7	National Arboretum
8	Kenilworth Aquatic Gardens

2.8.2 General Intent of the Public Right-of-Way Design

The park roads will traverse the Anacostia area linking all the discrete and disjointed areas that are currently not easily accessible. The design of these roads should not only facilitate navigation for pedestrians, motorists, and others, but also smoothly integrate the surroundings without compromising the natural environment along the Anacostia River. Therefore, the public right-of-way (ROW) along this special area should be designed to:

- Create a safe environment for pedestrians, cyclists, and motorists crossing and traveling along the park roads;
- Maintain the natural character through roadway design;
- Preserve and enhance river views; and
- Create a sense of continuity throughout the Anacostia Park System.

It is not the intent of the Guidelines to recommend alignments for the park roads. DDOT should be contacted for more information on the potential road alignments. Where park roads coincide with other special areas such as in Hill East Waterfront and Poplar Point, the unique design guidelines associated with other special areas should be applied.

The following design guidelines outline basic parameters, which the users of these guidelines should address while developing project(s) along the park roads.

A

B

C

1. Create a safe environment for pedestrians, cyclists, and motorists

The park roads run between neighborhoods and the Riverwalk and are primarily designed for low speed vehicular traffic to access the Anacostia Park System. With the aim of decreasing the vehicular speed, the park road travel lanes should consist of two 10-foot wide lanes.

Vehicular parking should be located along a selected portion of the roadway edge adjacent to the waterfront. This location avoids pedestrian/vehicular conflicts and ensures an unobstructed view of the waterfront. Some examples of parking configurations are shown below in Figures 2.8.4 A-C. Parking may be located on the other side only when suggested parking is infeasible. In such a case, parking areas should be identified with signage and traffic markings.

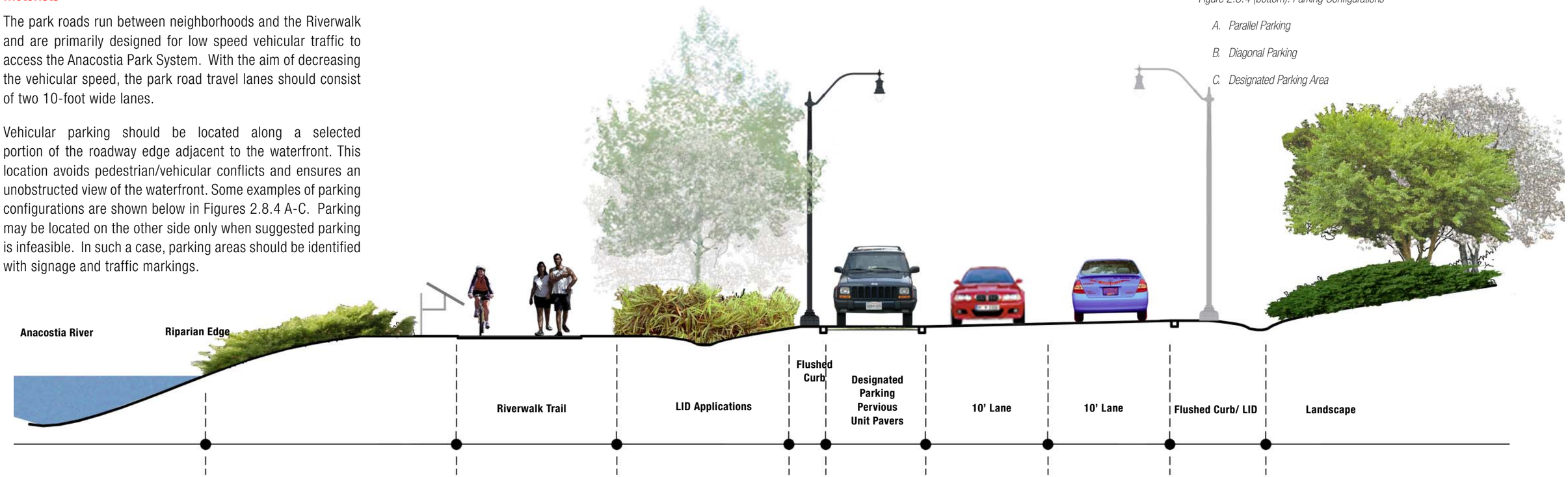
Figure 2.8.3 (top): Typical Cross Section of Park Road

Figure 2.8.4 (bottom): Parking Configurations

A. Parallel Parking

B. Diagonal Parking

C. Designated Parking Area



A

B

C

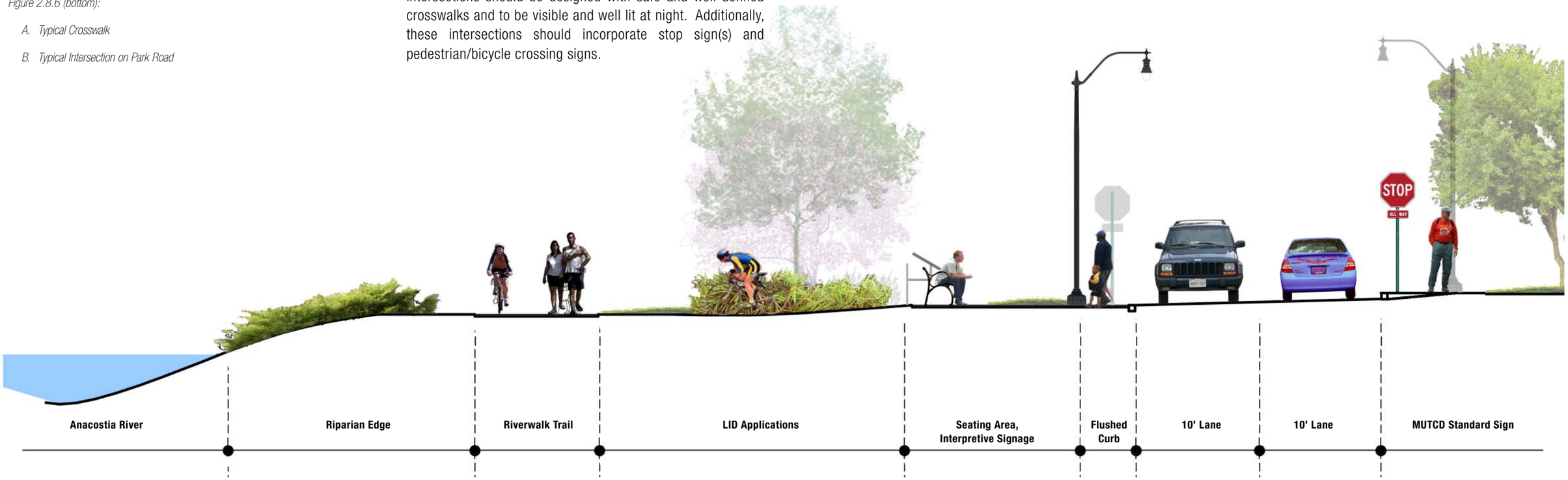
Figure 2.8.5 (top): Typical Cross Section of Park Road Intersection

Figure 2.8.6 (bottom):

A. Typical Crosswalk

B. Typical Intersection on Park Road

Where neighborhood streets meet the Park Road, busy intersections should be designed with safe and well-defined crosswalks and to be visible and well lit at night. Additionally, these intersections should incorporate stop sign(s) and pedestrian/bicycle crossing signs.



A

B

2. Preserve and enhance waterfront character and its wildlife habitat

Because the Anacostia River and park lands inherit a diverse wildlife population, the design of park roads should include measures to protect, preserve or restore their natural habitat while re-establishing and enhancing a waterfront for all users to experience and enjoy.

The roadway alignment and elevation change should be designed in a manner that is least disruptive environmentally. It is recommended that the Park Road follow the existing roadways within the waterfront area. Where infeasible, the alignment should follow the natural contours of the parkland to minimize grading.

Moreover, the roadway should be intentionally designed to meander through the various waterfront attractions. This slows vehicular speeds and provides drivers with scenic views of the River and its wildlife habitat.

Designated Parking Lanes

Parking along the park roads should be paved with pervious unit pavers with a minimum of 50% porosity to reduce direct stormwater runoff and the amount of impervious surface. Other LID practices, such as bioswales, bioretention, etc. should be integrated in strategic areas in the right-of-way to capture surface runoff from the park roads.

Curbs & Gutters

Curbs can be flush with the roadway to naturally filter runoff onto the shoulder and buffered setbacks or into various other LID areas.

3. Create a sense of continuity throughout the Anacostia Park System

In order to easily guide the traveler along the park roads and through the different bordering neighborhoods, it is essential to create a sense of unity with the elements chosen specifically for this special area.

Furnishings & Signage

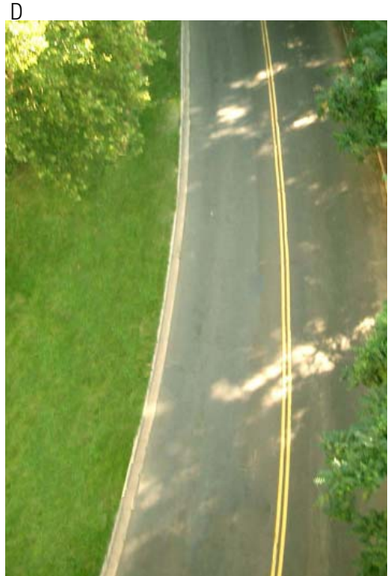
Three elements that should run consistently through this special area include lighted safety posts, seating, and signage.

A

B

C

D



E

Figure 2.8.7 (left):

A. Turf Paver

B. Eco I Pavers for Parking Area

C. Flushed Curb

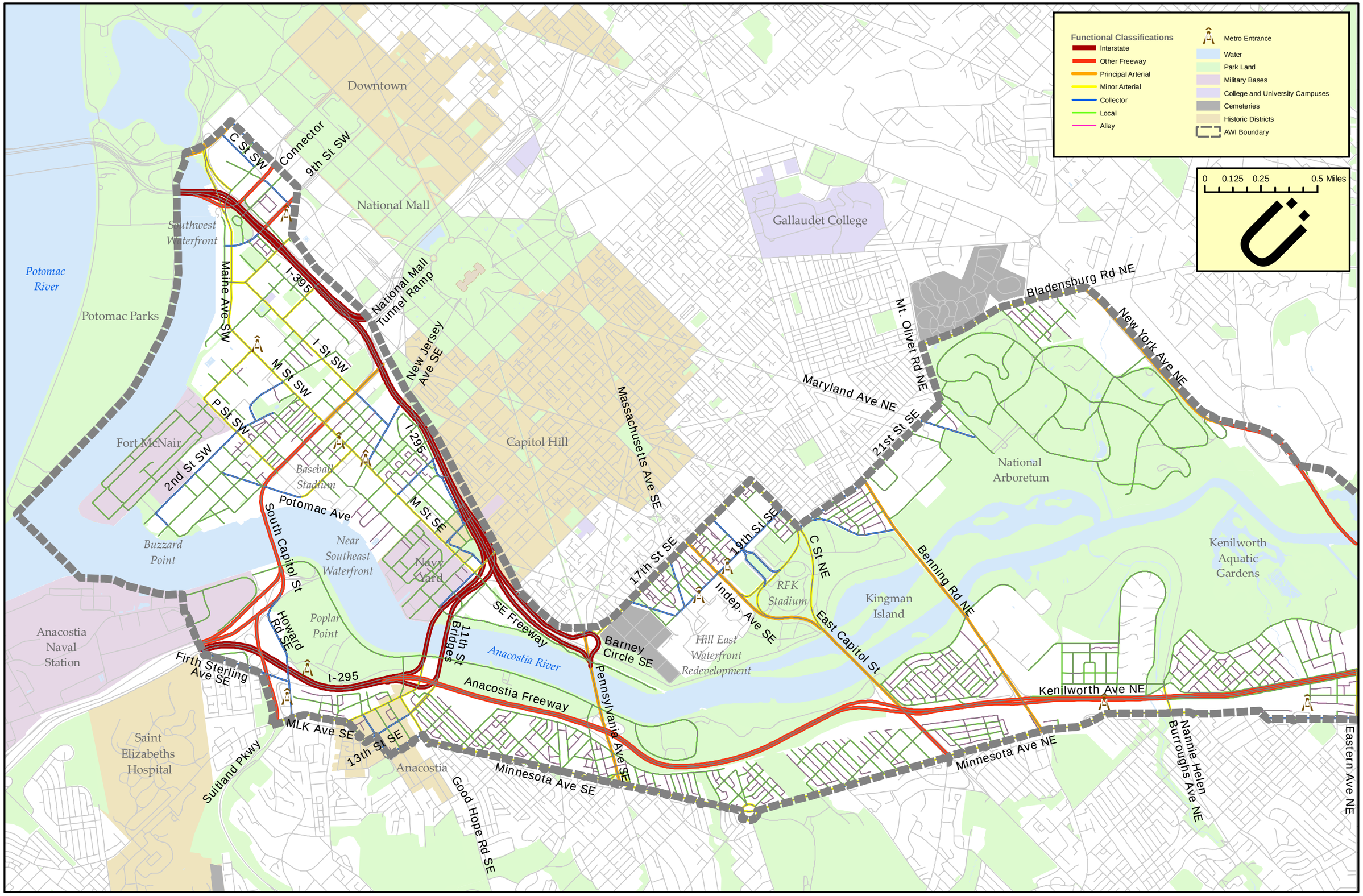
D. Typical Park Road

E. Bioswale as LID Application

Transportation Architecture Design Guidelines

Functional Classification

3


Functional Classifications
Interstate
Other Freeway
Principal Arterial
Minor Arterial
Collector
Local
Alley
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
Downtown
National Mall
Gallaudet College
Southwest Waterfront
Potomac River
Potomac Parks
Fort McNair
Capitol Hill
Baseball Stadium
Buzzard Point
Near Southeast Waterfront
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Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
Anacostia River
Hill East Waterfront Redevelopment
RFK Stadium
Kingman Island
National Arboretum
Kenilworth Aquatic Gardens
C St SW
Connector
9th St SW
Maine Ave SW
I-395
National Mall Tunnel Ramp
New Jersey Ave SE
I St SW
M St SW
P St SW
2nd St SW
I-295
Potomac Ave
South Capitol St
M St SE
Howard Rd SE
Firth Sterling Ave SE
MLK Ave SE
13th St SE
Suitland Pkwy
Massachusetts Ave SE
17th St SE
19th St SE
Indep. Ave SE
SE Freeway
11th St Bridges
Barney Circle SE
Pennsylvania Ave SE
Anacostia Freeway
Minnesota Ave SE
Good Hope Rd SE
Maryland Ave NE
Mt. Olivet Rd NE
21st St SE
C St NE
East Capitol St
Bladensburg Rd NE
New York Ave NE
Benning Rd NE
Kenilworth Ave NE
Minnesota Ave NE
Nannie Helen Burroughs Ave NE
Eastern Ave NE

3. Functional Classification and Area Type

Figure 3.0.1 (opposite page): Map of Roadway Functional Classifications in AWI Area

The list of and plan for various roadway functional classifications have been developed per the Year 2004 DDOT Roadway Classification. The classifications are subject to change and therefore, it is recommended that DDOT be consulted to ascertain the current classification for the related project(s). The limits of the roadways reflect the boundaries within the AWI area. Application of the standards beyond the AWI area is recommended to integrate the overall public realm.

Overview

The Transportation Architecture Design Guidelines document is intended for application in the District's Anacostia Waterfront area. While recognizing that each roadway is unique, the following discussion on the classification of streets is useful to differentiate a roadway type or functional class relative to the complete network of streets in the area. Design guidelines vary according to how a road functions.

This section describes and provides baseline design guidelines for the architectural elements that define each roadway functional class. These guidelines comprise of a combination of existing District standards for each roadway and new guidelines that have been developed to achieve the goals set forth by the Anacostia Waterfront Framework Plan. Guidelines are enumerated by Item's options that apply to architectural elements and are catalogued in Chapter 4 and 5.

Purpose

The purpose of this section is to encourage the creation of public right-of-ways that are physically and visually integrated with the rest of the city. Moreover, the Guidelines are designed to allow different modes of travel to co-exist, connect seamlessly, and reinforce each other in order to develop a balanced and efficient transportation system.

The Guidelines also address fundamental quality of life issues such as safety, connectivity to work and home, access to transportation options, and environmental stewardship to create a clean and comfortable public environment. Existing District standards and newly developed guidelines and their associated elements, will be applied area wide, for the following associated items:

- Drainage Volume & Intensity (Improved Water Quality)
- Bike Lanes
- Crosswalks
- Bus Stop Pads
- Furnishings (seating, trash receptacles, bicycle racks, access covers)
- Landscaping (tree planting, planting zone surface and sub-surface treatments)

Use of these Items will result in consistent baseline public right-of-way designs that can be adjusted in response to opportunities and constraints presented by the local context for each roadway.

Functional Classification

DDOT maintains a *Roadway Functional Classification System* to catalogue roadways based on common characteristics and use. The 2004 District functional classification hierarchy ranges from interstates to alleys, as seen in Figure 3.0.1, and in Figure 3.0.2.

1. Interstate
2. Highway and other Freeway
3. Principal Arterial
4. Minor Arterial
5. Collector
6. Local
7. Alley

Interstates and arterials mainly serve travel mobility needs, whereas local streets and alleys primarily provide property access. These seven functional classes work together to form a roadway network, which serves local, city and regional travel needs.

The classification of the Districts roads, or their segments, should account for a variety of factors. The roadway categories are primarily defined by automobile and truck volumes and land use access. Categories also reflect pedestrian, bicycle, and transit characteristics. Additional factors that influence the roadway hierarchy include:

- Density and type of adjoining land uses;
- Scale and character of public environment;
- Connections to activity nodes; and
- Linkages to overall street/highway network.

The study area map in Figure 3.0.1 is color coded by roadway functional classification. This map enables designers, engineers and other users to identify the functional classification of their project's corridor and cross-reference it with architectural elements to which design guidelines and their associated Items apply.

Each roadway performs differently and is experienced differently by its users. However, with regard to their transportation architectural design, several functional classes are experienced or perceived by users in a similar fashion and thus, can be grouped together accordingly, as seen in the table below:

Functional Group	Functional Classification
Thoroughfare	Interstate, Highway, Expressway
Major Urban Street	Principal Arterial, Minor Arterial, Collector
Local	Local Road
Alley	Alleyway

This grouping better reflects the application of design guidelines. The design guidelines for thoroughfares support and improve

Figure 3.0.2 (below): Examples of Various Roadway Classifications

A. Interstate
B. Highway/Other Freeway/Expressway
C. Principal Arterial
D. Minor Arterial/Collector
E Local Road
F. Alley

A

B

C

D

E

F

access control and the driving experience to and from the city core. Major urban roads comprise most of the District's roadway network. The guidelines focus on connecting the AWI roadway system to the city, facilitating multi-modalism and offering a pedestrian friendly environment. The design guidelines for local roads focus on enhancing access to residential and commercial activities. Alleys are primarily service roads, and the guidelines reflect improved functionality. Where possible, guidelines for all functional classifications incorporate LID options.

Area Type

In the Guidelines two area types, Residential and Mixed-Use, apply to all roadway functional classifications. All areas zoned exclusively as Residential Districts (R-1, R-2, R-3, etc.) under the current ordinance are delineated as "Residential Areas". Similarly, all other land uses (C-1, CR, M, W-1, etc.) are "Mixed-Use Areas". It is mandatory to reference the current District zoning ordinance (www.dcoz.dc.gov/info/map.shtm). Area type becomes integral to applying the guidelines to reflect the character of the intended land use. The guidelines distinguish a residential roadway from a mixed-use roadway, reinforcing and providing compatibility with adjoining land uses.

Residential Areas

Residential areas include housing types, ranging from detached homes to high-rise apartment structures, in low- to high-density settings. The AWI area has an uncommonly broad range of residential uses, providing some unique opportunities to create architectural compatibility among the different housing types. Growth and development of residential areas cannot neglect the safety, health and comfort of those who will reside there. Residential areas should be convenient to educational, commercial, industrial and public facilities and serviced by a clean, safe and attractive roadway system that respects privacy. Design guidelines have been developed to preserve and revitalize residential neighborhoods, and new guidelines have been introduced to complement the image, character and safety of the neighborhoods.

Mixed-Use Areas

In the Guidelines, all areas not solely residential are designated as mixed-use. Mixed-use areas provide locations where employment, commercial, industrial and residential uses are developed and coordinated to function together. Several key features distinguish these areas, including the integration of employment, commercial and residential land uses in a compact urban form, higher development densities, pedestrian-orientation, and public transit accessibility. Mixed-use areas foster community interaction by providing gathering places focused on community-oriented activities. Differences in design guidelines will be most noticeable in traffic calming techniques, sidewalk material treatment, lighting, furnishing, and landscaping.

The following sections describe the design guidelines for each functional classification group and area type and illustrate how the design intent of each right-of-way grouping contributes to achieving the overall goals of the Anacostia Waterfront Framework Plan.

The reference items and LID options discussed in Chapter 3 are presented in the selection matrices at the start of Chapter 4 - Items for Architectural Elements and Chapter 5 - LID and described in detail within these chapters.

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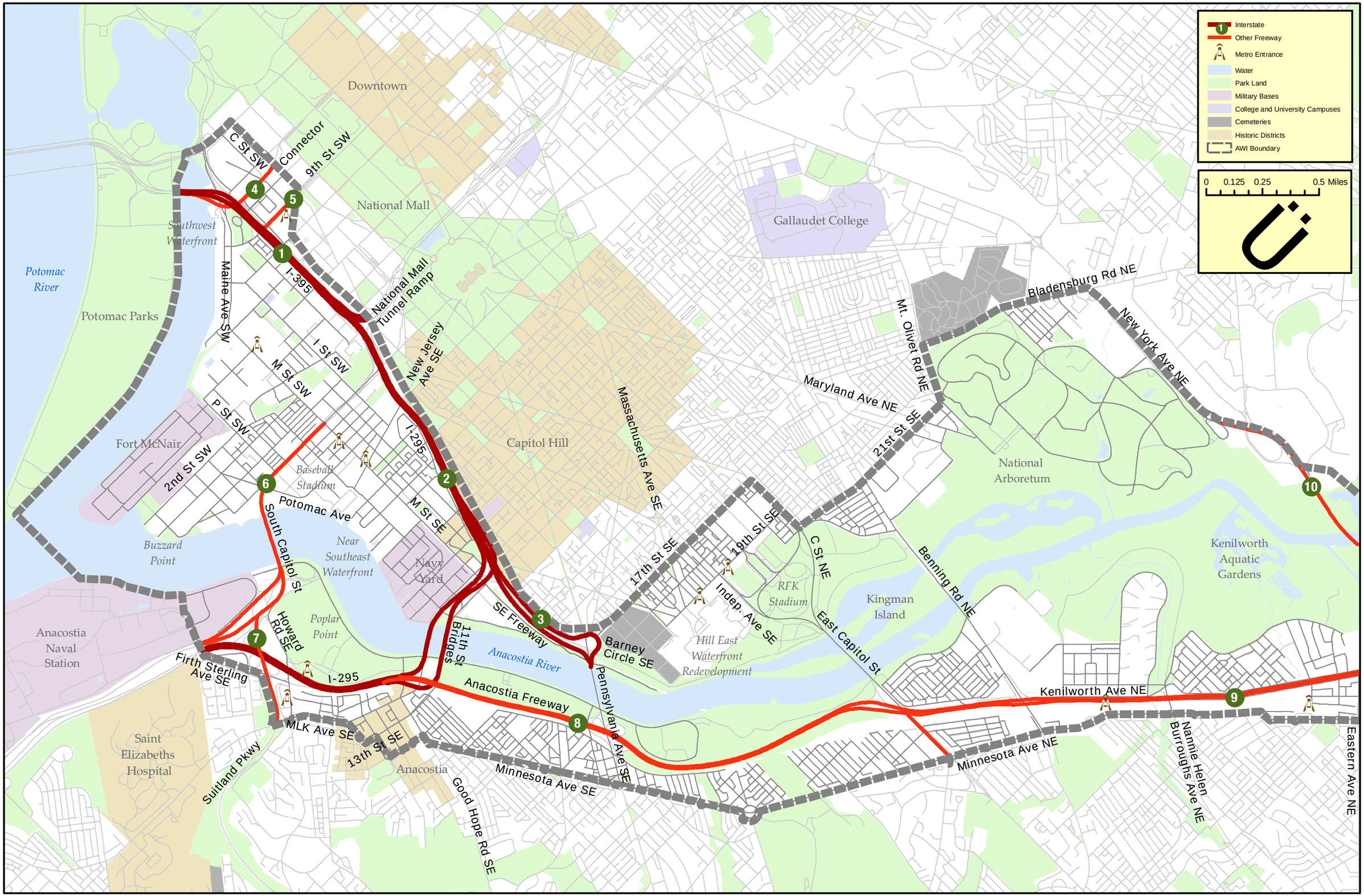
Thoroughfares 3.1

Interstates

Other Freeways


Interstate
Other Freeway
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
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National Mall
Gallaudet College
Potomac River
Southwest Waterfront
Potomac Parks
Fort McNair
Capitol Hill
Baseball Stadium
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Kingman Island
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C St SW
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I-395
National Mall Tunnel Ramp
Maine Ave SW
I St SW
M St SW
P St SW
2nd St SW
New Jersey Ave SE
I-295
Potomac Ave
M St SE
South Capitol St
Howard Rd SE
Firth Sterling Ave SE
MLK Ave SE
13th St SE
Suitland Pkwy
Good Hope Rd SE
Minnesota Ave SE
Massachusetts Ave SE
SE Freeway
11th St Bridges
Anacostia Freeway
Barney Circle SE
Pennsylvania Ave SE
17th St SE
19th St SE
Indep. Ave SE
C St NE
East Capitol St
Maryland Ave NE
21st St SE
Mt. Olivet Rd NE
Bladensburg Rd NE
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Minnesota Ave NE
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Figure 3.1.1 (opposite page): Map of Thoroughfares in AWI Area

The list of and plan for various roadway functional classifications have been developed per the Year 2004 DDOT Roadway Classification. The classifications are subject to changes and therefore, it is recommended that DDOT be consulted to ascertain the current classification for the related project(s). The limits of the roadways reflect the boundaries within the AWI area. Application of the standards beyond the AWI area is recommended to integrate the overall public realm.

3.1 Thoroughfares: Interstates and Other Freeways

3.1.1 Overview

Thoroughfare is a functional classification group that includes interstates and other freeways/expressways. They are designed to support traffic movements over long distances and provide extremely limited direct access to adjacent land uses. Many are high capacity routes that connect large volumes of traffic entering and leaving the downtown core to the regional beltway system. Vehicle trips using this system could be interregional, intercity and intracity. Thoroughfares in the AWI area serve as major access roads from Maryland and Virginia to and through the District. Similarly, they provide express travel north-south through the area.

Physical impediments, such as medians or concrete barrier rails separate all opposing traffic movements. Cross streets are grade separated. Access to and from interstates is limited to directional ramps designed and spaced to provide a minimal speed differential for maneuvering traffic. Shoulders and medians are minimal, making for uncomfortably tight travel under cross streets and pedestrian overpasses. Expressways permit at-grade interchanges at widely spaced intervals. Closer spacing is allowed if no reasonable alternate access to the roadway network exists and may be restricted to right in and right out. High volume intersections typically require an interchange.

Three interstates and seven other freeways/expressways have been designated as thoroughfares in the Anacostia Study Area, as shown in Figure 3.1.1 and Table 3.1.1. The three major interstates traversing the AWI area include I-295, I-395 and the SE/SW Freeway. The most prominent expressway is Kenilworth Avenue. This urban expressway contains numerous egress-and access-ramps to/from local streets, some accessing Kenilworth Avenue in the center median.

Table 3.1.1 AWI Thoroughfares

#	Street	Limits
INTERSTATES		
1	I-395	AWI Boundary - National Mall Tunnel Ramp
2	I-295	I-395 - AWI Boundary
3	Southeast Freeway	I-295 - Barney Circle SE
FREEWAYS/EXPRESSWAYS		
4	Connector	12th Street SW - I-395
5	9th Street SW	Virginia Avenue SW - I-395
6	South Capitol Street *	M Street SW - Firth Sterling Avenue SE
7	Suitland Parkway	S. Capitol Street SE - Martin Luther King Jr. Avenue SE
8	Anacostia Freeway	I-295 - Benning Road NE
9	Kenilworth Avenue NE	Benning Road NE - MD boundary
10	New York Avenue NE	36th Place NE - Anacostia River

* At time of publication, this part of South Capital Street is classified as a Freeway. DDOT to reclassify as Principal Arterial in the future.

3.1.2 General Intent of the Public Right-of-Way Design

Currently the thoroughfares create a physical barrier between neighborhoods and the waterfront.

Design guidelines should be imposed on thoroughfares to:

- Primarily, minimize this barrier effect;
- Promote environmental stewardship, create a sustainable development and reduce the urban impact on the River by incorporating LID options in medians and roadside clear zones;
- Create a more pleasant driving experience;
- Optimize, enhance, and protect view sheds of the monuments and waterfront; and
- Improve safety through the enhancement of certain existing District Standard transportation elements.

3.1.3 Transportation Architecture Design Guidelines for Thoroughfare Elements

All transportation engineering, including roadway engineering and signage, along interstates and freeways should be designed per existing District and AASHTO *Greenbook* standards and guidelines. However, some areas will require additional treatment specified under Chapter 2: Special Areas – Greenway and/or River Crossing. The list of elements discussed in the subsequent pages presents the design guidelines, enumerated by the items and options in Chapters 4 and 5, that pertain to the right-of-way design of thoroughfares.

Rather than discuss each element in isolation, the following design guidelines are organized by the "zones" that comprise thoroughfare public right-of-way:

- Roadway
- Median

Roadway

Roadway guidelines focus on vehicular travel lanes, surface treatment, curb and gutter, and wall cladding and railings.

Vehicular Travel Lanes

Roadways should be paved in asphalt. Bridges and underpasses should be concrete. Permeable asphalt and permeable concrete may be substituted as LID strategies, but are most commonly and successfully used in shoulders and residual pavements.

Traffic Safety

Rumble strips should be installed along the edges of travel lanes to provide a visible and audible alert to drivers.

Curbs & Gutters

Curbs and gutters will not be installed on interstates. Follow DDOT standard for edge treatment.

Wall Cladding

Pre-cast architectural concrete or cast-in-place concrete should be used on trench walls, retaining walls and other vertical surfaces as required, depending on the context of the thoroughfare. The cladding design should incorporate texture, banding, score lines and construction joints to provide scale and rhythm to the appearance of large wall sections. Wall cladding and railings along major thoroughfares may incorporate public art.

Railings

Railings should be integrated into structural walls for safety purposes. No chain link fences should be permitted. Composite metal or independent metal railings can be used along bridges and overpasses on elevated and depressed thoroughfares.

Fixtures

The Teardrop Pendant Fixture should be placed at strategic locations, as approved by DDOT, to enhance visibility during nighttime and/or poor weather conditions. Upward scatter or night sky pollution should be avoided.

Lights should be staggered or opposite from each other. The recommended average illumination for DC's major thoroughfares is 1.3-foot candles.

Median

Roadway medians enhance the overall safety of the thoroughfare and can provide aesthetic and environmental value. Medians and setbacks can include landscaping. Well designed and maintained landscapes improve the quality of the urban environment, especially along thoroughfares with large paved areas.

Main Zone

A Main Zone can be hardscaped or treated with landscape depending on its width, as prescribed in Table 3.1.2. Softscaped medians should incorporate LID options, such as bioretention cells, tree planting or infiltration practices as feasible.

Table 3.1.2

Main Zone Median Widths	Treatment*
Less than 4'-0	Barrier, hardscape
4'-0" - 6'-0"	Lawns, understory planting
6'-0" - 10'-0"	Lawns, understory planting, columnar shade or ornamental tree
10'-0" – 16'-0"	Lawns, understory planting, ornamental tree, shade tree
16'-0" and wider	Lawns, understory planting, double rows of ornamental trees/shade trees

* Tree species selection to be approved by Urban Forestry Administration

Figure 3.1.2 (below): Chapter 4 - Items for Architectural Elements

A. Precast Architectural Concrete Cladding along Trench Wall

B. Metal Railing along Sousa Bridge

C. Lighting along Interstate

D. Trees along Thoroughfares

A

B

C

D

Figure 3.1.3 (below): Chapter 4 - Items for Architectural Elements

A. Landscape Median along At-Grade Thoroughfare

B. Street Trees along Depressed Freeway

C. Landscape and Tree Buffers used as LID Strategy along George Washington Parkway

D. Bioswale (LID) Technique along Freeway Clear Zone

Street Trees

Trees can be damaged or killed through various construction activities. Protecting existing trees during construction activities increases the likelihood of survival, preserves existing tree stands, maintains the existing overhead canopy and urban wildlife and aids stormwater management. Street tree plantings are desirable urban design elements, which provide beauty, shade, and wildlife habitat, define the roadway edge and act as visual and noise barriers. Additionally, they soften the roadway environment, improve air quality and reduce the urban heat island effect. Species, such as evergreens should be selected for thoroughfares to provide a year-round buffer and to mitigate the noise and unsightly conditions of roadways.

Vegetation - Chapter 4 - Items for Architectural Elements Chapter 4 - Items for Architectural Elements 11.1(1)

Planting on medians and roadsides can include lawns, ornamental grasses, groundcover, shrubs and perennials. Such plantings add aesthetic value to the thoroughfare, reduce stormwater runoff and provide visual relief. Special attention should be given to the edge treatment between depressed thoroughfares and the frontage road. Understory planting should be installed to avoid chain link fences or other fencing mechanisms on trench walls in such locations.

Low Impact Development (LID) - Chapter 5

LID offers a system of stormwater engineering and design controls establishing size, storage capacity, discharge and infiltration rates. LID minimizes hydrologic problems by replicating the natural hydrology of a site through a series of small-scale distributed areas, thus minimizing storm water runoff from a site, improving water quality and reducing erosion problems down stream. LID strategies can be incorporated into the majority of the design elements presented in this document. LID strategies for thoroughfares are listed in Table 3.1.3:

Table 3.1.3 LID Opportunities*

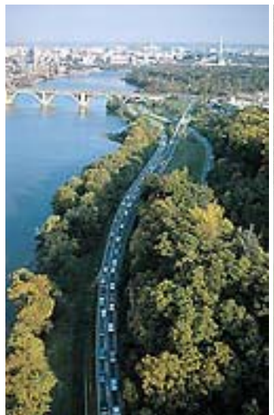
Clear Zone	Median
Conservation Option 1	Conservation Option 1
Planting Vegetation Option 2	Planting Vegetation Option 2
Reforestation Option 3	Reforestation Option 3
Disconnectivity Option 4	Disconnectivity Option 4
Soil Amendments Option 8	Soil Amendments Option 8
Permeable Concrete Option 5	Inlet Controls Option 9
Infiltration Trench Option 12	Gutter Filters Option 11
Surface Sand Filter Option 13	Infiltration Trench Option 12
Vegetated Filter Strip Option 14	Surface Sand Filter Option 13
Bioswale Option 15	Vegetated Filter Strip Option 14
Bioslope Option 16	Bioslope Option 16
Bioretention Cell Option 17	Bioretention Cell Option 17

*LID options detailed in Chapter 5

A

B

C



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Major Urban Streets 3.2

Principal Arterials
Minor Arterials
Collectors

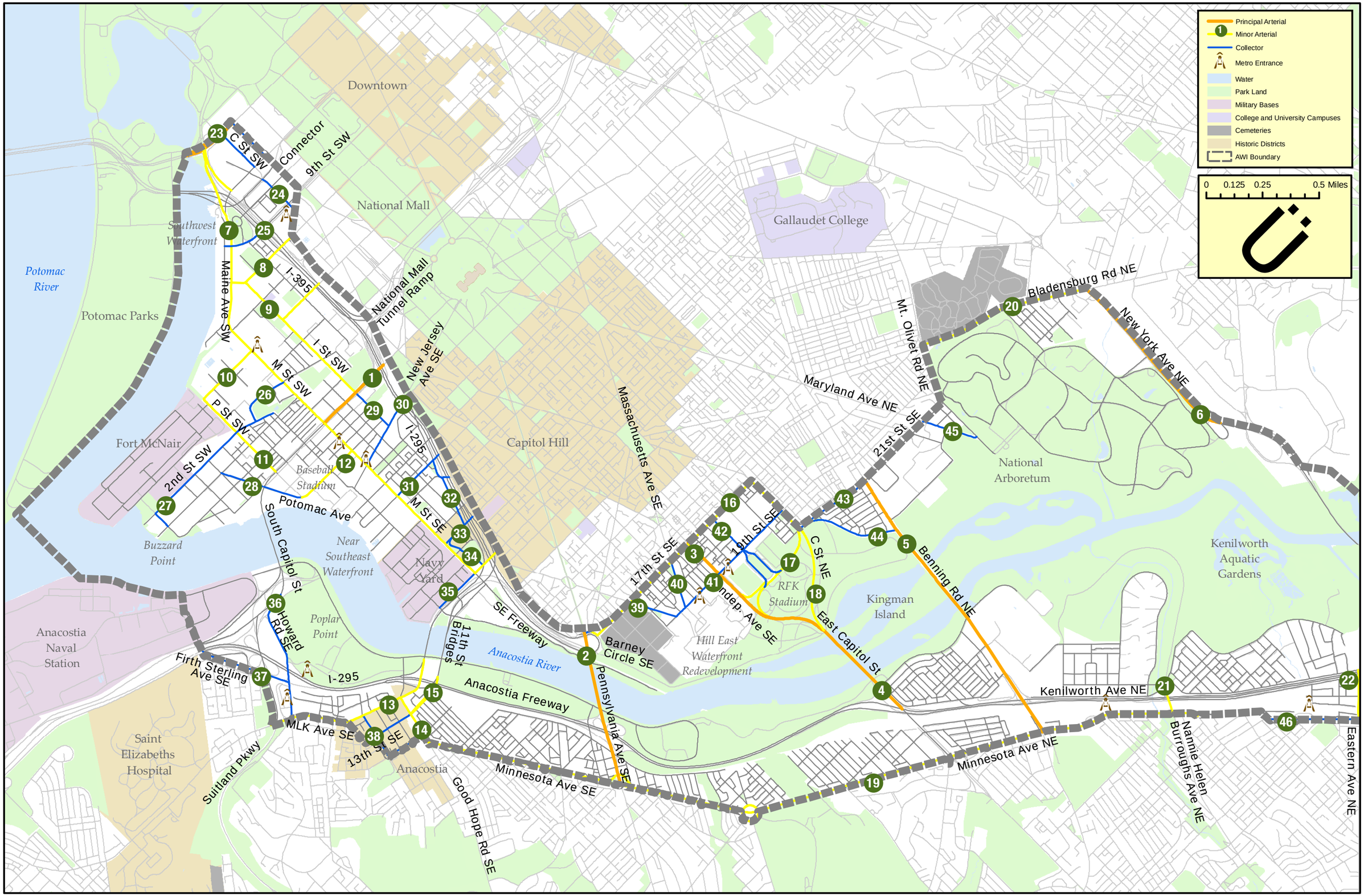
Principal Arterial
Minor Arterial
Collector
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
Downtown
National Mall
Gallaudet College
Southwest Waterfront
Potomac River
Potomac Parks
Fort McNair
Baseball Stadium
Capitol Hill
Massachusetts Ave SE
Buzzard Point
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia River
Anacostia
Hill East Waterfront Redevelopment
RFK Stadium
Kingman Island
National Arboretum
Kenilworth Aquatic Gardens
C St SW
Connector
9th St SW
Maine Ave SW
I-395
National Mall Tunnel Ramp
New Jersey Ave SE
I St SW
M St SW
P St SW
2nd St SW
Potomac Ave
South Capitol St
M St SE
I-295
Howard Rd SE
Firth Sterling Ave SE
11th St Bridges
SE Freeway
Anacostia Freeway
Barney Circle SE
Pennsylvania Ave SE
MLK Ave SE
13th St SE
Suitland Pkwy
Minnesota Ave SE
Good Hope Rd SE
17th St SE
19th St SE
Indep. Ave SE
C St NE
East Capitol St
Maryland Ave NE
21st St SE
Mt. Olivet Rd NE
Bladensburg Rd NE
New York Ave NE
Benning Rd NE
Kenilworth Ave NE
Minnesota Ave NE
Nannie Helen Burroughs Ave NE
Eastern Ave NE

Figure 3.2.1 (opposite page): Map of Major Urban Streets in AWI Area

Consult DDOT & DC Office of Planning (DCOP) to determine functional classification of any roadway in new neighborhoods, such as Hill East Waterfront, Poplar Point, Southeast Federal Center, Southeast Marina, Buzzard Point, South Capitol Street, and M Street Corridor areas.

The list of and plan for various roadway functional classifications have been developed per the Year 2004 DDOT Roadway Classification. The classifications are subject to changes and therefore, it is recommended that DDOT be consulted to ascertain the current classification for the related project(s). The limits of the roadways reflect the boundaries within the AWI area. Application of the standards beyond the AWI area is recommended to integrate the overall public realm.

Table 3.2.1: Urban Streets per Roadway Classification Type

#	Street	Limits
PRINCIPAL ARTERIALS		
1	South Capitol Street	I-295 - M Street
2	Pennsylvania Avenue SE	Barney Circle SE - Minnesota Avenue NE
3	Independence Avenue SE	17th Street NE – East Capitol Street
4	East Capitol Street	RFK Stadium - Kenilworth Avenue NE
5	Benning Road NE	21st Street NE - Minnesota Avenue NE
6	New York Avenue NE	Bladensburg Road NE - 36th Place NE
MINOR ARTERIALS		
7	Maine Avenue SW & M Street SW & SE	I-395 – 11th Street Bridges
8	7th Street SW	D Street SW - Maine Avenue SW
9	I (Eye) Street SW	7th Street SW - South Capitol Street
10	4th Street SW	E Street SW – P Street SW
11	P Street SW	4th Street SW – South Capitol Street SW
12	1st Street SE	M Street SE - Potomac Avenue SE
13	MLK Jr. Avenue SE	Howard Road SE – 11th Street SE
14	Good Hope Road SE	MLK Jr. Avenue SE - Minnesota Avenue SE
15	13th Street SE	Good Hope Road SE - 11th Street Bridges
16	17th Street	Barney Circle SE - C Street NE
17	22nd Street	C Street NE – East Capitol Street and Independence Avenue SE
18	C Street NE	17th Street NE - East Capitol Street
19	Minnesota Avenue	Good Hope Road SE - Sheriff Road NE
20	Bladensburg Road NE	Mt. Olivet Road NE - New York Avenue NE
21	Nannie Helen Burroughs Avenue NE	Kenilworth Terrace NE – Minnesota Avenue NE
22	Eastern Avenue NE	Kenilworth Avenue NE - Minnesota Avenue NE

Table 3.2.1 (continued): Urban Streets per Roadway Classification Type

#	Street	Limits
COLLECTORS		
23	C Street SW	14th Street SW – 12th Street SW
24	D Street SW	12th Street SW – 7th Street SW
25	9th Street SW	I-395 - Maine Street SW
26	Delaware Avenue SW	M Street SW – Canal Street SW
27	Canal Street / 2nd Street SW	N Street SW – V Street SW
28	Potomac Avenue SW	1st Street SW - 1st Street SE
29	I Street SE	S. Capitol Street – New Jersey Avenue SE
30	New Jersey Avenue SE	I-295 – M Street SE
31	4th Street SE	I-295 - M Street SE
32	Virginia Avenue SE	4th Street SE – 8th Street SE
33	8th Street SE	Virginia Avenue SE – M Street SE
34	Potomac Avenue SE	8th Street SE – 11th Street SE
35	11th Street SE	M Street SE - O Street SE
36	Howard Road SE	South Capitol Street - MLK Jr. Avenue SE
37	Firth Sterling Avenue SE	South Capitol Street – Howard Road SE
38	W Street SE & 13th Street SE	MLK Jr. Avenue SE - Good Hope Road SE
39	Potomac Avenue SE	17th Street SE -18th Street SE
40	Massachusetts Avenue SE	17th Street SE – 19th Street SE
41	19th Street	Potomac Avenue SE - C Street NE
42	East Capitol Street	17th Street - 22nd Street
43	21st Street NE	Oklahoma Avenue NE – Benning Road NE
44	Oklahoma Avenue NE	C Street NE – Benning Road NE
45	Maryland Avenue NE	21st Street NE – M Street NE
46	Minnesota Avenue NE	44th Street NE- Eastern Avenue NE

3.2 Major Urban Streets

3.2.1 Overview

Major Urban Streets are present on a citywide basis to provide secondary traffic movement and connect local streets with the larger highway systems. Speeds are moderate, typically 25-40 mph, unless posted otherwise. Traffic volume and capacity depend upon signalization factors (timing and synchronization), the number of through and turning lanes, driveways, and the volume of buses and trucks in the traffic flow. The Major Urban Streets designation encompasses three roadway classifications: Principal Arterials, Minor Arterials and Collectors.

Principal Arterials

Principal arterials link major urban areas such as business districts, industrial sites, commercial centers, residential areas, and other activity centers. Principal arterials serve cars, trucks, transit, and pedestrians and may incorporate bike lanes. Sidewalks and roadways vary in width, depending on allocations and the width of public right-of-way.

Minor Arterials

With two or more lanes, minor arterials interconnect with and augment the principal arterials and provide for trips of moderate length at a lower level of travel mobility. They are commonly located along neighborhood borders and collect traffic from residential areas to channel vehicles to the principal arterial system. Minor arterials may serve local bus routes and provide intercity and intracity connections.

While minor arterials provide more direct access to abutting property than principal arterials, this function is secondary to providing through traffic movements. Minor arterials can be considered major city streets for urban activity, as exhibited by roadways like M Street, SE and SW and Martin Luther King Jr. Avenue, SE. Minor arterials are generally given the traffic movement right-of-way over local streets and typically have traffic signals at intersections with locals and collectors.

Collectors

Their primary function is to move traffic from the local street system to the arterial system. When collectors intersect with arterials, traffic signals generally control traffic. Intersections with local streets are usually under stop sign control with collectors having the right-of-way. Collectors carry moderate to heavy volumes of traffic through the District and connect directly or lead to connections with I-395 and I-295. Few are significant enough to serve as Snow Emergency Routes.

More significant collectors provide service to the District arterials and other attractions. Less significant collectors serve as important intracity travel corridors. These collectors are interlinked with major collectors and serve the remaining smaller communities. The system of urban collectors provides service access and traffic circulation within residential neighborhoods and mixed-use areas.

According to the Year 2004 DDOT Roadway Classification, the AWI area roadway system includes 22 arterials and 24 collectors, shown in Figure 3.2.1 and described in Table 3.2.1. Four of the principal arterials are major river crossings; three approach the Capitol; and six serve as major truck and Snow and Emergency Routes. These streets carry heavy volumes of traffic in and out of the District and connect with I-395 and I-295. Within the AWI area, no minor arterial or collector is a major river crossing. However, most approach the Capitol and/or serve as major Snow and Emergency Routes.

3.2.2 General Intent of the Public Right-of-Way Design

The purpose of implementing design standards on major urban streets is to:

- Integrate public right-of-way treatment of these streets with similarly classified streets in other parts of the city;
- Promote environmental stewardship and reduce impact on the River by incorporating LID options within the public rights-of-way;

- Improve safety through the enhancement of certain existing District Standard transportation elements;
- Develop a pedestrian-, bicyclist- and transit rider-friendly street system and provide opportunities for diverse street activities;
- Encourage the creation of an urban environment where different modes of travel can co-exist, connect seamlessly, and reinforce each other to develop a balanced and efficient transportation system.

3.2.3 Transportation Architecture Design Guidelines for Major Urban Street Elements

All transportation engineering, including roadway geometry, alignment, and elevations, and traffic signage and controls along major urban streets should be designed per existing District/AASHTO *Greenbook* standards and guidelines unless otherwise specified in the subsequent chapters or under Chapter 2: Special Areas.

Rather than discuss each mode and their respective elements in isolation, the following design guidelines are organized by the "zones" that comprise the Major Urban Street public right-of-way:

- Roadway
- Intersection
- Median
- Sidewalk

Roadway

Roadway standards focus on paving applications, curb and gutter, and driveway entrances.

Vehicular Travel Lanes

Roadways should be paved in asphalt. In the case of bridges and underpasses, the roadway should be integrally colored concrete, closely matching asphalt approaches. Permeable asphalt and permeable concrete may be substituted as a LID strategy.

Bus Stop Pad

A concrete pad is required where buses stop, to accommodate the additional weight of buses and counter the vibrations they cause on the sidewalk. Concrete should be colored to closely match the asphalt in the travel lanes.

Bike Lanes

Lanes should be continuous to the extent possible. On all designated bicycle lanes, bicycle symbols, directional arrows and striping should be applied to asphalt. Drain grate crossings should be bicycle-safe and flush with the pavement. Areas designated as conflict zones by DDOT should be demarcated with partially colored epoxy coated surfaces and dashed lines to warn bicyclists, pedestrians, and drivers.

Designated Parking Lanes

Curbside parking is desirable in neighborhoods or mixed-use districts and should be maximized. Designated/permanent parking lanes should be clearly defined through the application of materials like unit pavers, as approved by DDOT. Darker unit pavers matching the color of the asphalt should be installed to reduce the visibility of stains and tire marks. Permanent parking lanes should be marked and signed to indicate handicap parking or loading zones.

Curbs and Gutter

Curbs demarcate the transition between roadways and sidewalks. Gutters channel surface runoff to culverts and other drainage systems. Major urban streets in the AWI area should have stone curbs with brick gutters, which is consistent with other parts of the District.

Figure 3.2.2 (below): Roadway Design Elements

A. Standard Asphalt Paving

B. Integrally Colored Concrete Bus Pad

C. Unit Pavers on Designated Parking Lane

A

B

C

Figure 3.2.3 (below): Intersection Design Elements

A. Standard "Piano Stripped" Crosswalk

B Sidewalk Extension

C Typical Metal Railing

Alley and Driveway Entrances

Curb cuts across the sidewalk should be minimized in number and located so as not to conflict with sidewalk activity. However, curb cuts sometimes provide essential vehicular access to building drop-off areas, parking garages, and service entrances. Vehicle driveways crossing the sidewalk should be designed level with and of the same material as the sidewalk. Where grade differences at sidewalk crossings are unavoidable, ramps should be provided to transition between the roadway and sidewalk levels. Vehicle ramps should be constructed of poured-in-place concrete.

Intersection

Major urban street crossings are primarily 4-way or "+" intersections with a few "T" intersections. Where more than four roadways converge, traffic rotaries, circles or traffic islands could resolve roadway geometry constraints, reduce conflicts among different modes and provide opportunities to incorporate parks, LID options and/or public art. The following transportation elements should be incorporated into the intersection design:

Wheelchair/Bicycle Ramp

Ramps provide a safe means of access to crosswalks for persons with disabilities, bicycles, and/or pedestrians with push carts, strollers, etc. Concrete should be the standard material for all ramps. Colored concrete may be used upon DDOT's approval on project basis to enhance the visibility of ramps. All accessible curb ramps should include truncated domes to assist visually impaired persons.

Crosswalks

Crosswalks should be at least 15' wide and aligned with the approaching sidewalk (up to 20' to allow for ramp accommodation). Crosswalk design should be in compliance with current ADA standards.

Mid-block crosswalks should only be considered in special situations, (heavy pedestrian use, long blocks, etc). For safety reasons, mid-block crossings should not be considered if they could interfere with the queue area of another intersection or if sight distance is sub-standard. Parking should be prohibited at mid-block crossing areas. All mid-block crossings require advance (150' linear distance) vehicular signing per DDOT Standard signage requirements.

Sidewalk Extensions (Bulbouts)

Bulbouts installed at intersections improve visibility between vehicles and pedestrians and reduce crosswalk distances for pedestrians. Bulbout design should consider traffic and pedestrian volume, traffic directional flow and roadway geometry. Bus stops on bulbouts should be considered if the curb lane is a parking lane. Bulbouts should be paved with the same material as the adjacent sidewalk.

Rotaries

Rotaries are large, raised, circular islands in the middle of major intersections, around which all oncoming vehicles should travel until reaching a destination street, where they can choose to turn off. Rotaries are designed to steady traffic flows, improve safety conditions, and reduce the number of conflict points.

Wall Cladding

Precast or poured-in-place architectural concrete, limestone or brick can be used on retaining walls and other vertical surfaces.

Railings

Railings should be integrated into structural walls for safety purposes. Composite metal, independent metal, integrated metal railings or metal curb barriers can be used along bridges and overpasses on elevated Major Urban Streets for vehicular safety. Standard integrated metal railings, and independent railings (limestone or metal), can be used along the external face of bridges and overpasses for pedestrian safety.

A

B

C

Median

Medians should be installed for beautification or if pedestrian and vehicular safety concerns exist. Medians vary in width and may be treated in numerous ways. The following standards define the treatment for the four basic areas of the median.

Main Zone

The Main Zone is the body of the median between the intersection Approach Zones on major urban streets. On a project basis, medians may be curb height or raised to discourage illegal pedestrian crossing. Depending on the median width, the following treatments are recommended as seen in Table 3.2.2.

Table 3.2.2. Median Treatments

Main Zone Median Width	Treatments*
Less than 4'-0"	Hardscape
4'-0" - 6'-0"	Lawns, understory planting, columnar tree
6'-0" - 10'-0"	Lawns, understory planting, columnar, shade, or ornamental tree
10'-0" - 16'-0	Lawns, understory planting, ornamental tree, shade tree (for medians only)
16'-0" and wider	Lawns, understory planting, double row of ornamental/ shade trees

*Tree species selection to be approved by Urban Forestry Administration

Approach Zone

This includes the stretch of median that approaches the intersection to the crosswalk. Treatment should be hardscape only as per guidelines.

Refuge Zone

The refuge area, located midway along the crosswalk, is recommended as a safe standing or waiting place for pedestrians as traffic flows through the intersection. Medians wider than 6 feet should include refuge area for pedestrians, especially along wide roadways. To promote ADA accessibility and ease of pedestrian circulation, the refuge area should be level with the roadway and paved with material that complements nearby pedestrian areas.

Protection Zone

The front of the refuge area provides for pedestrian safety from oncoming traffic. It serves as a physical cue to alert drivers of potential pedestrian activity and also a place to install traffic signals and signs. The protection area could be flush with the roadway, in which case safety posts or bollards should be installed to safeguard pedestrians.

Sidewalk

Major Urban Streets are not only vehicular corridors that provide for the transport of goods, services and people from one destination to another, but are places to gather, window shop, stroll or sit at a sidewalk café. Adequate sidewalk width infused with street trees, furnishings and streetlights is crucial to promote these pedestrian activities throughout the day or evening.

Figure 3.2.4 (below): Median and Sidewalk Design Elements:

A. Landscaped Main Zone

B. Raised Main Zone with Trees

C. London Pavers Sidewalk with Unit Paver along Furnishing Zone

A

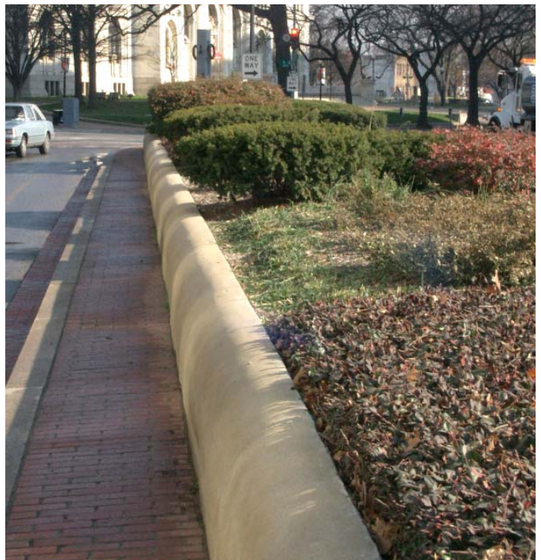

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Figure 3.2.5 (below): Sidewalk Design Elements

A. Brick Sidewalk, including Spill Out Zone, Walkway Zone, and Furnishing/Planting Zone

B. Concrete Sidewalk with Unit Pavers in Furnishing/Planting Zone

C. Planting Strip along Standard Concrete Sidewalk in Residential Area

Sidewalk widths vary depending on the public right-of-way and allocation of space to different modes of transportation. In order to establish a safe, accessible pedestrian realm, sidewalks along major urban streets should be composed of three zones:

1. Spill Out Zone (only in Mixed Use Area),
2. Walkway Zone,
3. Furnishing/Planting Zone

These zones should be treated as described below.

Priority 1: The Walkway Zone of the sidewalk is given highest priority because it should provide continuous and unobstructed walking space. This zone is designated for clear pedestrian circulation and should be at least 5 feet wide to address ADA requirements.

Priority 2: If a sidewalk is wider than 5 feet, a Furnishing/Planting Zone should be incorporated to house streetlights, trees, furnishings and other landscape elements in mixed-use areas. In residential areas, the Planting Zone should only include street trees and understory plantings. The recommended minimum width for the Furnishing/Planting Zone is 4 feet.

Priority 3: If the minimum width requirements have been met for the Walkway Zone and Furnishing/Planting Zone, the remaining width could accommodate sidewalk cafés, outdoor displays and/or other uses in mixed-use zones. The Spill Out Zone should have a minimum width of 2 feet, or 4 feet if sidewalk cafés are to be incorporated into the design.

Sidewalk Material Combination

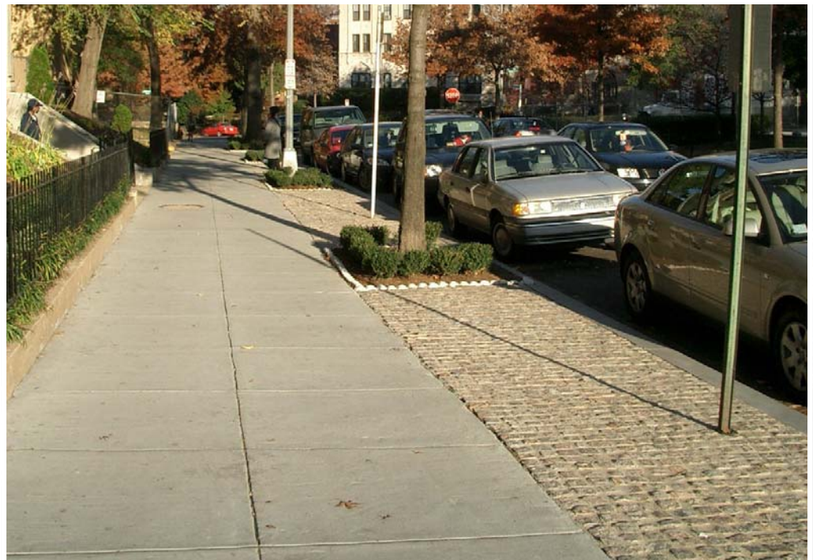
Table 3.2.3 represents the combination of materials to be considered in the 3 zones of a typical sidewalk:

Table 3.2.3 Sidewalk Material Combinations

Zones/ Area Types	Spill-Out	Walkway	Furnishing/ Planting
General Mixed-Use *Guidelines*	Poured in Place Concrete or Pressed Concrete Unit Pavers	Poured in Place Concrete or Pressed Concrete Unit Pavers	Planting Strip or Hardscape
General Residential	N/A	Poured in Place Concrete	Planting Strip or Hardscape
Historic Mixed-Use	Brick, or others as approved by DDOT	Brick, or others as approved by DDOT	Hardscape to match the color of material in the walkway zone
Historic Residential	N/A	Brick Pavement, or others as approved by DDOT	Planting Strip or Hardscape

A

B



C

Street Lighting

Street lighting along the sidewalk's furnishing zone should be installed to enhance the safety of vehicles and pedestrians and to promote the evening use of streets. Moreover, streetlights should be placed at regular intervals to define the street edge and demarcate sidewalks from roadway areas. Upon approval from DDOT, streetlights may be installed along medians to meet the required illumination levels, especially along a wide public right-of-way.

Lighting fixtures should respect a human scale and adequately illuminate the sidewalk and other pedestrian areas. Upward scatter or night sky pollution should be avoided by installing prismatic globes with cut-offs as prescribed in the Grand Street Light Plan (DDOT).

To define the street edge and enhance view sheds along major urban streets, light poles should be placed opposite each other across the street. In mixed-use areas with designated curbside parking, streetlights should be coordinated with the parking spaces and street trees and placed at 44 foot intervals.

The recommended average illumination for DC's major urban streets is presented in table 3.2.4

Table 3.2.4 District Recommended Average Illumination

Functional Class	Recommended Illumination (foot candle)	
	Residential	Mixed-Use
Principal Arterial	0.6	1.1
Minor Arterial	0.6	1.0
Collector	0.5	0.7

Source: Grand Street Light Plan (DDOT)

Fixtures

Existing District lighting options, including the #16, #18, or Twin 20 fixtures should be installed depending on the public right-of-way and average illumination requirements.

Generally, Twin 20 fixtures are recommended for L'Enfant Avenues and other equally wide streets, subject to DDOT approval. All other streets, depending on right-of-way widths, should use either Upright Pole #16 or Upright Pole #18. All intersection lighting, with exception of L'Enfant Avenues should use the standard decorative pendant fixture.

Figure 3.2.6 (below): Street Lighting Design Elements

A. A Major Urban Street with Night Time Activity

B. Washington Globe #18 Series along Sidewalk

C. Washington Globe Twin 20

A

B

C

Figure 3.2.7 (below): Street Furnishings

A. Standard Traditional Trash Receptacle with Bench

B. Standard Inverted "U" Bike Rack

C. DC Wayfinding Sign

Furnishings

Street furnishings such as benches, trash receptacles, bike racks, access covers, safety posts, parking meters and bus shelters enhance the pedestrian environment, making it more enjoyable to pass through and use. Street furniture should be installed to encourage sidewalk activities such as shopping, eating, reading, transit use, and sitting. Items should be located exclusively in the furnishing/planting zone, typically in mixed-use areas. As an exception, furnishing may also be located in residential areas.

Seating

Traditional or contemporary seating options, depending on the street context, should be provided for pedestrians and other users.

Trash Receptacles/Recycle Bin

Traditional or contemporary trash receptacles (with lids), depending on the street context, should be installed widely throughout highly visible public rights-of-way to discourage littering and promote recycling. Receptacles should be provided in close proximity to bus shelters, seating areas, intersections, and food and beverage establishments.

Bicycle Racks

The standard inverted "U" shaped bicycle racks should be appropriately spaced and located to facilitate access while not blocking bus stops, sidewalks, pedestrian crossings, access to parked vehicles and/or other facilities.

Access Covers

All access covers located on the sidewalks should incorporate an AWI specific design, which will help define the area's unique identity.

Safety Posts

Traditional or contemporary safety posts, depending on the street context, could be installed in a median's Protection Zone to protect pedestrians from oncoming traffic and to distinguish the Spill Out Zone from the Walkway Zone.

Wayfinding Signs

Wayfinding signage should be installed along the public right-of-way to provide an interesting and memorable experience, aid visitors and heighten general awareness. The signage content and graphic design should be developed per DDOT Wayfinding Signage Program standards in consultation with DDOT and the District of Columbia Commission on the Arts and Humanities (DCCAH).

A

B

C

Landscaping

Landscaping along major urban streets is a desirable way to improve the overall vibrancy of the public right-of-way and quality of life. Landscaping standards include planting and protection of trees along with understory planting and root area treatment.

Street Trees and Subsurface Treatments

Healthy urban trees promote safety, health and tranquility. Street trees reduce the heat island effect, define the street edge, provide shade, reduce stormwater runoff and heating and cooling costs, improve air quality and buffer vehicular noise. Therefore, the selection of appropriate tree species, tree spacing, and protection is a crucial component of overall public right-of-way design.

Existing Tree Protection

Existing trees can be damaged or killed through various construction activities. Protecting existing trees during construction increases the likelihood of survival, preserves existing tree stands, maintains the existing overhead canopy and urban wildlife, and aids stormwater management.

Tree Planting

Shade trees should complement the scale of the right-of-way, strengthen the line of sight, and create a coherent appearance. All trees should be installed in the sidewalk's furnishing/planting zone and sufficiently wide medians. The spacing of street trees along designated parking lanes should be coordinated with curbside parking and streetlights at 40 foot intervals on-center. In other areas, spacing should be maximum 50 feet and minimum 30 feet.

Tree Species

All trees along the sidewalk should be shade trees selected to complement sidewalk and roadway widths. Flowering trees may only be planted on medians or at other residual spaces, such as traffic islands or parks and only with prior DDOT approval. All species should be selected from the District Urban Forestry Administration (UFA) recommended species list.

Planting Space

The growth and life span of urban trees is shortened due to the environmental stress of an urban setting. Stress on urban trees includes air pollution, lack of fertile soils, poor drainage and vandalism. The Furnishing/Planting Zone should provide a 4' wide contiguous underground root zone, between the curb and Walkway Zone, to encourage the uninterrupted growth of tree roots. This zone may be less than 4' only if the entire sidewalk is less than 8' wide. Planting conditions should be integrated with LID strategies to reduce stormwater runoff from and improve the growth conditions for roots.

Figure 3.2.8 (below): Landscape Elements

A. Street Edges Defined by Street Trees (Champs Elysées, Paris)

B. Martin Luther King, Jr. Avenue SE (Main Street) Shaded with healthy Street Trees

A

B

Figure 3.2.9 (below): Root Zone Surface Treatment

A. Mulch around Tree

B. Tree Root Zone Protected with Pervious Unit Pavers

C. Lawn along Planting Zone in Residential Area

Soil Mix

Tree roots require a planting medium that provides air, water, and minerals. The proper planting soil mix is essential for the health of trees in an urban environment.

Mulch

Placing mulch around plantings conserves soil moisture, reduces soil erosion, water loss and weed competition. Mulch also improves soil structure, reduces soil compaction and moderates soil temperature.

Vegetation

Understory plantings include shrubs, ornamental grasses, groundcover and perennials. Such plantings add aesthetic value to the streetscape, reduce stormwater runoff, and provide visual and physical barriers between pedestrians and motorists.

Unit Pavers

Permeable pavements provide a safe, accessible surface for pedestrian foot traffic while allowing water runoff to infiltrate into the Furnishing/Planting Zone's contiguous root zone.

Turf Areas

Lawns include any surface treatment related to turf grasses. Lawns are located along residential streets.

A

B

C

Low Impact Development (LID)

Urban development increases impervious surfaces with roofs, streets, parking lots, and sidewalks, thereby reducing natural storm water infiltration. This leads to changes in the storm drainage pattern including the increased likelihood of flooding, decreased supply of groundwater, increased erosion and sedimentation, and increased rates of chemical pollutants from street and roadway runoff. LID offers a system of engineering and design controls establishing size, storage capacity, discharge, and infiltration rates. LID minimizes hydrologic problems by replicating the natural hydrology of a site through a series of small-scale distributed areas, thus minimizing storm water runoff from a site, improving water quality and reducing erosion problems downstream. LID strategies can be incorporated into the majority of public right-of-way zones as shown in Table 3.2.5.

Table 3.2.5 LID Opportunity *

Furnishing/ Planting Zone	Roadway	Median
Conservation *Option 1*	Permeable Concrete *Option 5*	Planting Vegetation *Option 2*
Planting Vegetation *Option 2*	Permeable Asphalt *Option 6*	Disconnectivity *Option 4*
Disconnectivity *Option 4*	Permeable Unit Pavers *Option 7*	Soil Amendment *Option 8*
Soil Amendment *Option 8*	Gutter Filters *Optiwon 11*	Inlet Controls *Option 9*
Permeable Unit Pavers *Option 7*	Infiltration Trench *Option 12*	Gutter Filters *Option 11*
Underground Storage Chamber *Option 10*		Infiltration Trench *Option 12*
Gutter Filters *Option 11*		Surface Sand Filter *Option 13*
Infiltration Trench *Option 12*		Vegetated Filter Strip *Option 14*
Bioretention Cell *Option 17*		Bioswale *Option 15*
		Bioslope *Option 16*
		Bioretention Cell *Option 17*

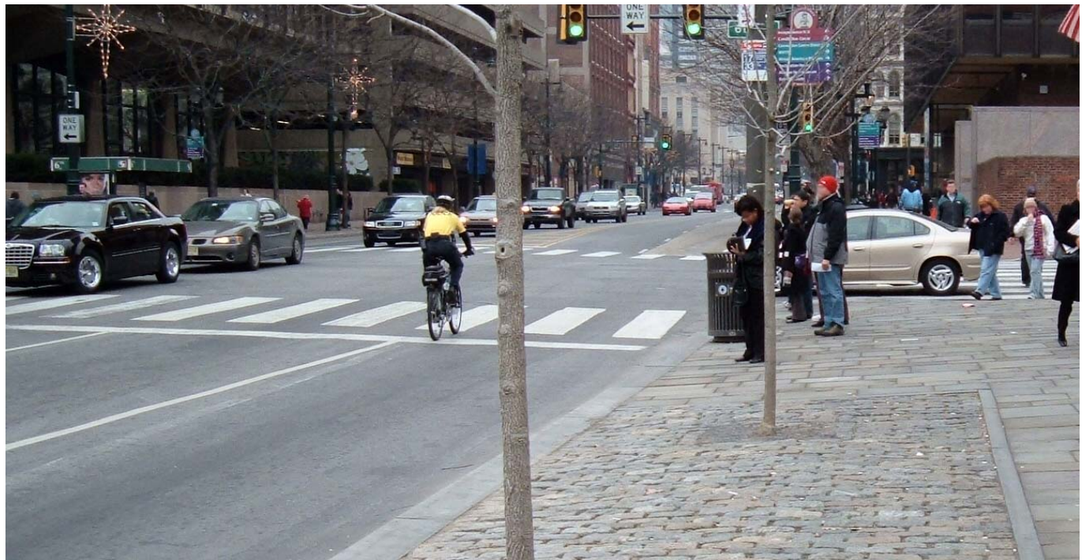
** LID options detailed in Chapter 5*

Figure 3.2.10 (below): LID Design Elements

A. Unit Pavers to Facilitate Continuous Tree Zone in Mixed-Use Area

B. Suggested Treatment of Designated Parking Lane and Furnishing Zone

A



B

Local Roads 3.3

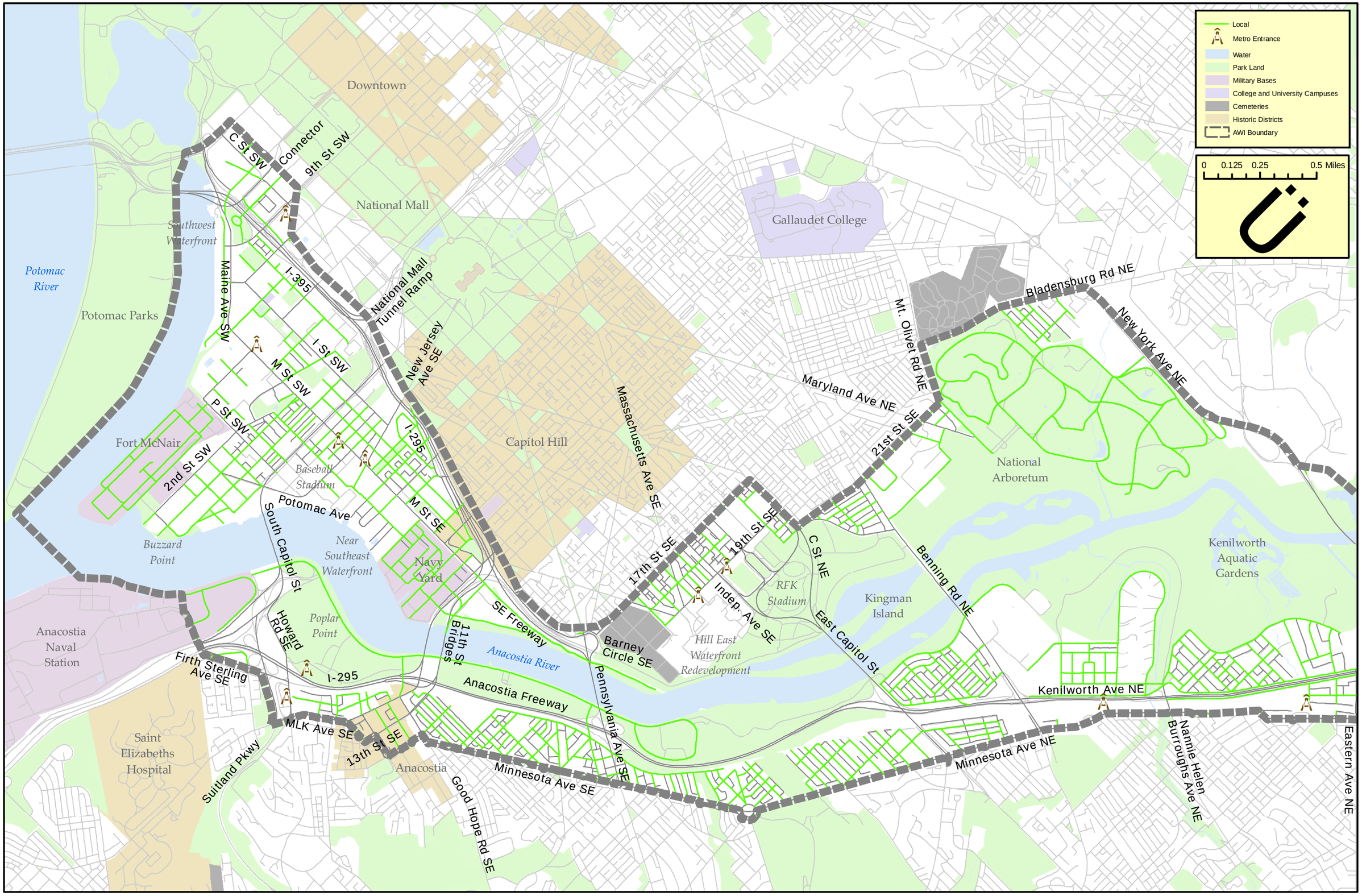

Local
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
Downtown
National Mall
Gallaudet College
Southwest Waterfront
Potomac River
Potomac Parks
Fort McNair
Capitol Hill
National Arboretum
Kenilworth Aquatic Gardens
Baseball Stadium
Buzzard Point
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
Anacostia River
RFK Stadium
Kingman Island
Hill East Waterfront Redevelopment
Barney Circle SE
C St SW
Connector
9th St SW
Maine Ave SW
I-395
National Mall Tunnel Ramp
I St SW
M St SW
P St SW
2nd St SW
New Jersey Ave SE
I-295
M St SE
Potomac Ave
South Capitol St
Howard Rd SE
Firth Sterling Ave SE
MLK Ave SE
13th St SE
Suitland Pkwy
Massachusetts Ave SE
SE Freeway
11th St Bridges
Anacostia Freeway
Pennsylvania Ave SE
Minnesota Ave SE
Good Hope Rd SE
17th St SE
19th St SE
Indep. Ave SE
C St NE
East Capitol St
Benning Rd NE
Mt. Olivet Rd NE
Maryland Ave NE
21st St SE
Bladensburg Rd NE
New York Ave NE
Kenilworth Ave NE
Minnesota Ave NE
Nannie Helen Burroughs Ave NE
Eastern Ave NE

Figure 3.3.1 (opposite page): Map of Local Roads in AWI Area

The list of and plan for various roadway functional classifications have been developed per the Year 2004 DDOT Roadway Classification. The classifications are subject to changes and therefore, it is recommended that DDOT be consulted to ascertain the current classification for the related project(s). The limits of the roadways reflect the boundaries within the AWI area. Application of the standards beyond the AWI area is recommended to integrate the overall public realm.

3.3 Local Roads

3.3.1 Overview

Urban local roads, generally characterized by low traffic volumes and speeds, primarily provide direct access to adjacent uses. These streets are usually not wider than two lanes with curbside parking, offer the lowest level of mobility and usually contain no bus routes. Traffic calming elements are frequently used to discourage through traffic. In a residential setting, driveways are freely permitted and intersections of local streets are often uncontrolled. Stop signs are usually installed where traffic control is required, such as at intersections with collector streets.

Local Roads within the AWI area are shown in Figure 3.3.1 and are too numerous to list within this document.

3.3.2 General Intent of Public Right-of-Way Design

The purposes of imposing design standards on local roads are to:

- Develop a pedestrian-, bicycle-, and transit-friendly street system and provide opportunities for street activities;
- Address fundamental quality of life issues: safe and pedestrian-friendly streets, maximized parking, continuous sidewalks, and a clean and pleasant public environment;
- Promote environmental stewardship and reduce impact on nearby rivers by incorporating LID options within the public rights-of-way; and
- Increase the number of trees and the amount of landscaping to reduce the urban heat island effect and calm traffic.

3.3.3 Transportation Architecture Design Guidelines for Local Road Elements

All transportation engineering, including roadway engineering and signage, along local roads should be designed as per existing District and AASHTO *Greenbook* standards and guidelines. However, some areas will require additional treatment as specified under Chapter 2: Special Areas Classification. The following discussion of local road elements illustrates guidelines presented in this document that pertain to the right-of-way design.

Rather than discuss each mode and their respective elements in isolation, the following design guidelines are organized by the "zones" that comprise the Local Road public right-of-way:

- Roadway
- Intersection
- Sidewalk

Roadway

Roadway standards focus on paving applications, curb and gutter treatment and driveway entrances, and traffic and pedestrian safety.

Vehicular Travel Lanes

Roadways should be paved in asphalt. Bridges and underpasses should be concrete.

Bike Lanes

Bike lanes should be continuous to the maximum extent feasible. Where there are designated bicycle lanes, bicycle symbols, directional arrows and striping should be applied to asphalt. Drain grate crossings should be bicycle-safe and flush with the pavement.

Areas designated as conflict zones by DDOT should be demarcated with partially colored epoxy coated surfaces and dashed lines to warn bicyclists, pedestrians, and drivers.

A

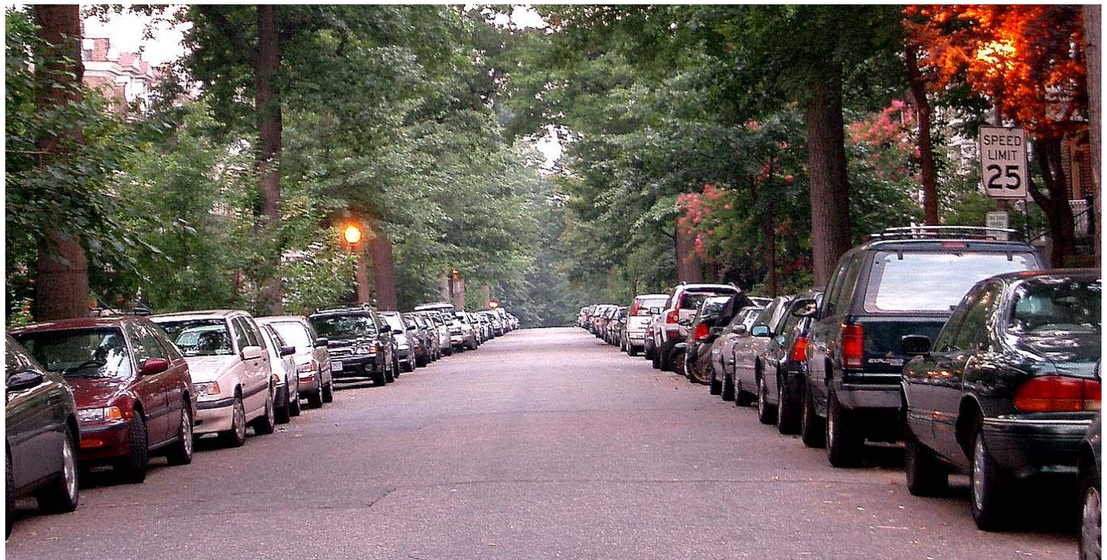


Figure 3.3.2 Asphalt Paving on a Typical Local Street

Designated Parking Lanes

Parking lanes are desirable in neighborhoods or mixed-use districts and should be maximized. Designated parking lanes should be clearly defined. Distinctive materials like unit pavers should be used to achieve this. Where handicap parking or loading zones are provided, they should be well marked by signs. Unit pavers should complement the color of the asphalt.

Curbs and Gutter

Curbs demarcate the transition between roadways and sidewalks. Gutters channel surface runoff to culverts and other drainage systems. Local roads in the AWI area should have concrete curbs with concrete gutters, consistent with other parts of the District.

Traffic Diversions

Physical obstacles such as chicanes and diverters redirect traffic, eliminate cut-through traffic, conflicting traffic movements, and reduce pedestrian crossing distance.

Alley and Driveway Entrances

Where vehicles cross over a pedestrian sidewalk, the driveway design should be level with and of the same material as the sidewalk. Vehicle ramps should be poured-in-place concrete. The number of curb cuts across the sidewalk should be minimized and located so as not to conflict with sidewalk activity.

Intersection

Local road crossings are primarily 4-way or "+" intersections with a few "T" intersections. When more than four roadways converge, circles or traffic islands could resolve roadway geometry constraints, reduce conflicts among different modes and provide opportunities to incorporate parks, LID options and/or public art.

Wheelchair/Bicycle Ramp

Ramps provide persons with disabilities and other pedestrians with push carts, or strollers a safe means of accessing crosswalks. Accessible curb ramps should accommodate two ramps at each corner and be aligned with the crosswalks. Concrete may be colored to complement the material of the adjoining sidewalk. Use of truncated domes will serve as warning strips and assist visually impaired persons. The baseline standard materials for ramps include poured-in-place concrete.

Crosswalks

Well-marked crosswalks should accompany all sides of intersections with local roads. Crosswalks should be at least 15' wide and aligned with the approaching sidewalk (up to 20' to allow for ramp accommodation). Crosswalk design should be in compliance with current ADA standards. Depending on the location, "piano" striped crosswalks may be preferred.

Raised Pavement

Raised pavement may be used reduce vehicular speeds at intersections and vehicle-pedestrian conflict points. Raised pavement, when required, may be installed to cover the entire intersection to increase the visibility for pedestrians.

Sidewalk Extensions

Bulbouts may be installed at intersections to improve visibility between moving vehicles and pedestrians and to reduce crossing distances for pedestrians. Bulbout design should consider traffic and pedestrian volume, traffic directional flow and roadway geometry. Bus stops on bulbouts should be considered if the curb lane is a parking lane. Where there is a parking lane, the bulbout should be 2' narrower than the parking lane (extending to no more than 6' into the street). They should be paved with the same material as the adjacent sidewalk.

Chokers effectively reduce speeds, traffic volume, and pedestrian crossing distance. Impacts on parking and driveway access should be minimized.

Rotaries

Small scale rotaries or traffic islands are designed for intersections that handle less volume and slow traffic. They caution drivers to proceed carefully and provide an opportunity for landscaping and other enhancements.

Wall Cladding

Precast architectural concrete, limestone or brick can be used on retaining walls and other vertical surfaces.

Figure 3.3.3 (bottom): Rotary and Curb Cut Elements

A. Typical Roundabout Design Treatment

B. Typical Concrete Curb Cut

A

B

Figure 3.3.4 (below): Sidewalk and Furnishings

A. Standard Concrete Sidewalk in Residential Area

B. (top) #16 Washington Globe Light

A

B

Sidewalk

Curb radii and sidewalk width should be designed to create spacious sidewalk comers, which reasonably accommodate the requirements of all expected users of the street system. Where appropriate and when recommended through the public process, wider sidewalks should be encouraged in mixed-use areas to accommodate furnishings and plantings.

Sidewalk widths will vary depending on the public right-of-way and allocation of space to the different modes of transportation. In order to establish a safe, accessible and comfortable pedestrian realm, sidewalks along local roads should be composed of three zones:

1. Spill Out Zone (only in Mixed Use areas)
2. Walkway Zone
3. Furnishing/Planting Zone

The sidewalk zones will be treated in the following manner:

Priority 1: The Walkway Zone is the section of sidewalk that given highest priority because it should provide continuous and unobstructed walking space. This zone is designated for clear pedestrian circulation and should be at least 5 feet wide to incorporate ADA requirements.

Priority 2: If wider than 5', a Furnishing/Planting Zone should be incorporated for streetlights, trees, furnishings and other landscape elements in mixed-use areas. The recommended optimal width for the Furnishing/Planting Zone is 4 feet.

Priority 3: If the minimum widths have been met for the Walkway Zone and Furnishing/Planting Zone, the remaining width may accommodate sidewalk cafés, outdoor displays or other uses. The Spill Out Zone should have a minimum width of 2 feet, 4 feet if sidewalk cafés are anticipated in a location.

Sidewalk Material Combination

Table 3.3.1 represents the combination of materials to be considered in the three zones of a sidewalk.

Table 3.3.1 Sidewalk Material Combinations

Zones	Spill-Out	Walkway	Furnishing/ Planting
General Mixed-Use	Poured in Place Concrete or Pressed Concrete Unit Pavers	Poured in Place Concrete or Pressed Concrete Unit Pavers	Planting Strip or Unit Pavers
General Residential	N/A	Poured in Place Concrete or Pressed Concrete Unit Pavers	Planting Strip or Unit Pavers
Historic Mixed-Use	Brick, or others approved by DDOT	Brick, or others approved by DDOT	Unit Pavers to match the color of material in the walkway zone
Historic Residential	N/A	Brick Pavement, or others approved by DDOT	Planting Strip or Unit Pavers

Street Lighting

Fixtures

Lighting should be provided to enhance safety for vehicles and pedestrians and to promote the use of streets in the evenings. Lighting fixtures should respect human scale and be adequate for roadway safety. Upward scatter or night sky pollution should be avoided.

Lights should be spaced opposite from each other in mixed-use areas and staggered from each other in residential areas. The recommended average maintained luminance for DC's local streets is 0.4-foot candles in residential areas and 0.6-foot candles for mixed-use areas. For more information, refer to the DC standard in the Grand Street Light Plan.

Existing District lighting options include Upright Pole #16 and Upright Pole #18. When required, the decorative pendant could be installed at intersections.

Furnishings

Street furnishings such as benches, trash receptacles, bike racks, access covers, safety posts, parking meters and bus shelters enhance the pedestrian environment, making it more enjoyable to pass through as well as to use. Street furnishings should be installed to encourage sidewalk activities such as shopping, eating, reading, transit use and/or sitting. They should be located exclusively in the furnishing/planting zone, and typically be in mixed-use areas. As an exception, furnishing may also be located in residential areas.

Seating

Seating should be provided for pedestrian respite. Traditional and contemporary design depends on the street context.

Trash Receptacles/Recycle Bin

Traditional or contemporary trash receptacles (with lids), depending on the street context, should be installed widely throughout highly visible public rights-of-way to discourage littering and promote recycling. Trash receptacles should be provided in close proximity to bus shelters, seating areas, intersections, and food and beverage establishments.

Bicycle Racks

The standard inverted "U" shaped bicycle racks should be appropriately spaced and located to facilitate access while not blocking bus stops, sidewalks, pedestrian crossings, access to parked vehicles and other facilities.

Access Covers

All access covers located on the sidewalks should incorporate an AWI specific design, which will help define the area's unique identity.

Safety Posts

Safety posts should be installed to protect pedestrians from oncoming traffic and to distinguish spill out zones (with sidewalk cafes) from the walkway zone. Traditional or contemporary options depend on the street context.

Wayfinding Signs

Wayfinding signage should be installed along public rights-of-

way to provide interesting and memorable experiences, and heighten general awareness. The signage content and graphic design should be developed per DDOT Wayfinding Signage Program Standards in consultation with DDOT and DCCAH.

Landscaping

Well-designed and maintained landscapes improve the quality of life in an urban environment.

Street Trees and Subsurface Treatments

Existing Tree Protection

Existing trees can be damaged or killed through various construction activities. Protecting existing trees during construction activities increases their likelihood of survival, preserves existing tree stands, maintains the existing overhead canopy and urban wildlife, and aids stormwater management.

Tree Planting

Street trees are desirable urban design elements, which provide beauty, shade and wildlife habitat while defining the street edge and improving quality of life. Street trees promote safety, health and tranquility and can also reduce the heat island effect, reduce stormwater runoff, and buffer city noise. Shade trees should complement the scale of the right-of-way, strengthen the line of sight, and create a coherent appearance. For more information about tree species, refer to the UFA list and the District Arborist.

Planting Space

The growth and life span of urban trees is shortened due to environmental stress of the urban setting. Stress on urban trees includes air pollution, lack of fertile soils, poor drainage and vandalism. The furnishing/planting zone should provide a 4‘ wide contiguous underground root zone along the street block between the curb and walkway zone to encourage the uninterrupted growth of tree roots. This zone may be less than 4’ only if the entire sidewalk is less than 8’ wide. Planting conditions should be integrated with LID strategies to reduce stormwater runoff and improve the conditions for root growth.

Soil Mix

Tree roots require a planting medium that provides air, water, and minerals. The proper design of a planting soil mix is essential for the health of trees in an urban environment.

Surface Treatments

Mulch

Placing mulch around plantings conserves soil moisture, reduces soil erosion, water loss and weed competition. Mulch also improves soil structure, reduces soil compaction and moderates soil temperature.

Vegetation

Understory plantings include ornamental grasses, groundcover, shrubs and perennials. Such plantings add aesthetic value to the streetscape, reduce stormwater runoff, and provide visual and physical barriers between pedestrians and motorists.

Unit Pavers

Permeable pavements provide a safe, accessible surface for pedestrian foot traffic while allowing water runoff to infiltrate into the furnishing/planting zone’s contiguous root zone.

Turf Areas

Lawns should include any surface treatment related to turf grasses. Lawns are located in residential areas.

Low Impact Development (LID)

Urban development increases impervious surfaces with streets, parking lots, and sidewalks, thereby reducing natural storm water infiltration. This leads to changes in the storm drainage pattern including the increased likelihood of flooding, decreased supply of groundwater, increased erosion and sedimentation, and increased rates of chemical pollutants from street and roadway runoff. LID offers a system of engineering and design controls establishing size, storage capacity, discharge and infiltration rates. LID minimizes hydrologic problems by replicating the natural hydrology of a site through a series of small-scale distributed areas, thus minimizing storm water runoff from a site improving water quality and reducing erosion problems down stream. LID strategies can be incorporated into the majority of public right-of-way zones as shown in Table 3.3.2.

Table 3.3.2 LID Opportunities *

Furnishing/Planting Zone	Roadway
Conservation *Option 1*	Disconnectivity *Option 4*
Planting Vegetation *Option 2*	Permeable Concrete *Option 5*
Disconnectivity *Option 4*	Permeable Asphalt Option 6
Soil Amendment *Option 8*	Permeable Unit Pavers *Option 7*
Permeable Unit Pavers *Option 7*	Gutter Filters *Option 11*
Bioretention Cell *Option 17*	

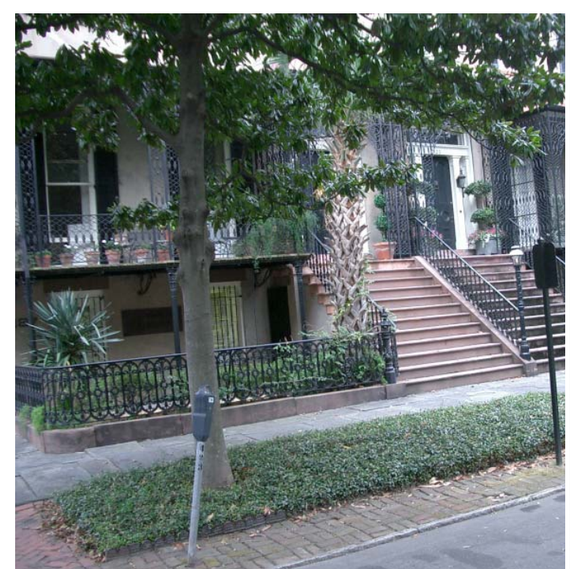
* Reference Chapter 5 for details or options.

Figure 3.3.5 (below): LID Elements

A. Typical Treatment of Contiguous Tree Root Zone in Residential Area

B. Standard Treatment of Underground System

A



B

Alleys 3.4

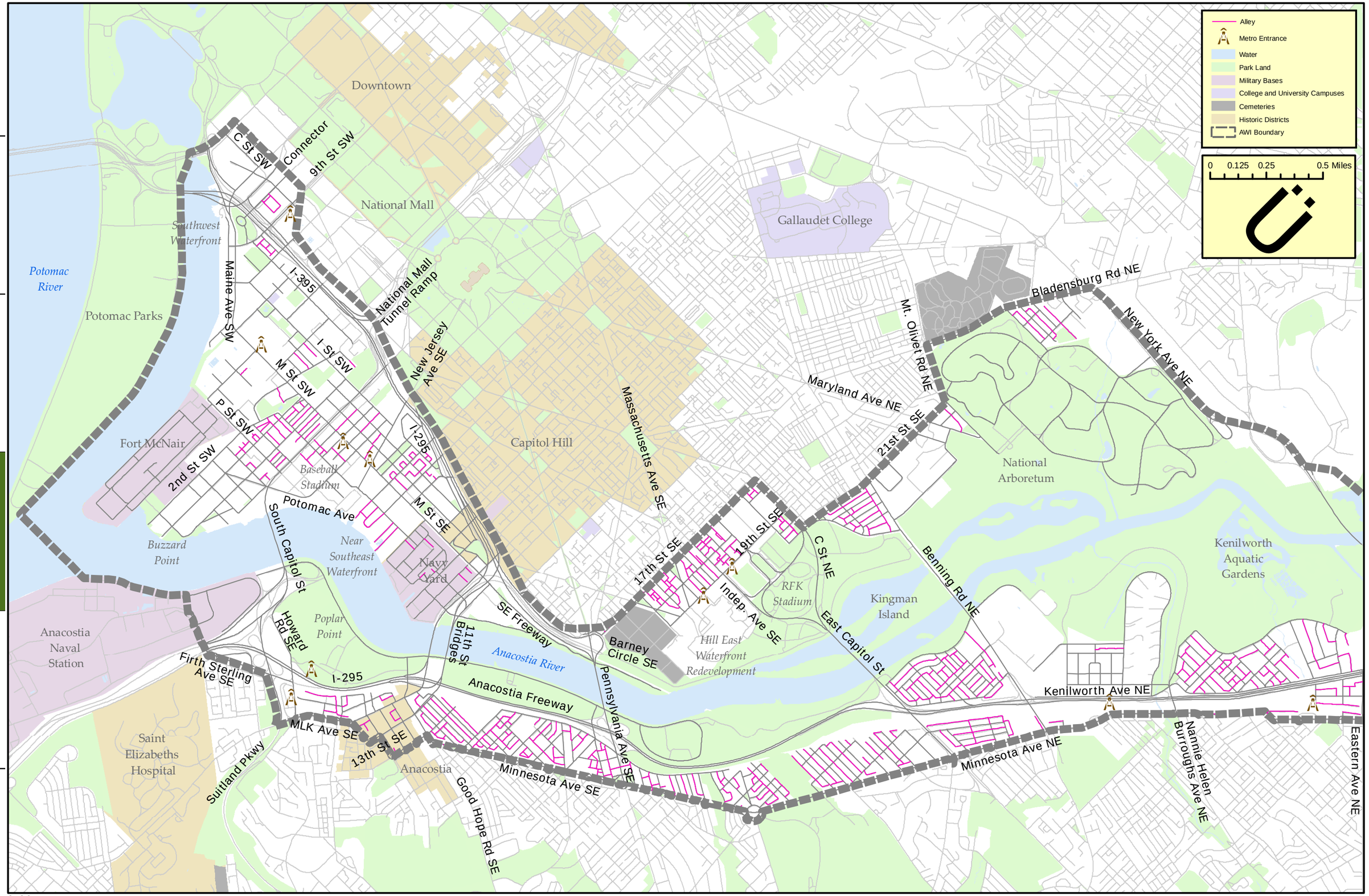

Alley
Metro Entrance
Water
Park Land
Military Bases
College and University Campuses
Cemeteries
Historic Districts
AWI Boundary
0 0.125 0.25 0.5 Miles
Downtown
National Mall
Gallaudet College
Potomac River
Southwest Waterfront
Potomac Parks
Fort McNair
Baseball Stadium
Capitol Hill
Massachusetts Ave SE
National Arboretum
Buzzard Point
Near Southeast Waterfront
Navy Yard
Poplar Point
Anacostia Naval Station
Saint Elizabeths Hospital
Anacostia
Anacostia River
Hill East Waterfront Redevelopment
RFK Stadium
Kingman Island
Kenilworth Aquatic Gardens
C St SW
Connector
9th St SW
Maine Ave SW
I-395
National Mall Tunnel Ramp
I St SW
M St SW
P St SW
New Jersey Ave SE
I-295
2nd St SW
Potomac Ave
M St SE
South Capitol St
Howard Rd SE
Firth Sterling Ave SE
11th St Bridges
SE Freeway
Anacostia Freeway
Barney Circle SE
Pennsylvania Ave SE
MLK Ave SE
13th St SE
Suitland Pkwy
Good Hope Rd SE
Minnesota Ave SE
17th St SE
19th St SE
Indep. Ave SE
C St NE
East Capitol St
Maryland Ave NE
Mt. Olivet Rd NE
21st St SE
Bladensburg Rd NE
New York Ave NE
Benning Rd NE
Kenilworth Ave NE
Minnesota Ave NE
Nannie Helen Burroughs Ave NE
Eastern Ave NE

Figure 3.4.1 (opposite page): Map of Alleys in AWI Area

The list of and plan for various roadway functional classifications have been developed per the Year 2004 DDOT Roadway Classification. The classifications are subject to changes and therefore, it is recommended that DDOT be consulted to ascertain the current classification for the related project(s). The limits of the roadways reflect the boundaries within the AWI area. Application of the standards beyond the AWI area is recommended to integrate the overall public realm.

3.4 Alleys

3.4.1 Overview

Alleys usually run between or behind buildings to allow for commercial delivery, waste collection, rear access for emergency vehicles and parking. They offer the lowest level of mobility with speeds of 15 mph or less. Stop signs are usually installed where traffic conflicts may occur.

3.4.2 General Intent of Public Right-of-Way Design

The purposes of implementing design standards on alleyways are to:

- Create a shared urban space where pedestrians, bicyclists, and autos can safely co-exist;
- Incorporate LID options such as paving and landscaping to aid stormwater management and decrease the amount of impervious surface thus reducing the direct runoff of pollutants, toxins and sediment into the Anacostia River; and
- Create a sense of place without compromising roadway functionality.

3.4.3 Transportation Architecture Design Guidelines for Alley Elements

All transportation engineering, including roadway engineering and signage should be designed as per existing District/ AASHTO *Greenbook* standards and guidelines. The following list of elements presents the design guidelines that pertain to the right-of-way design of Alleys and how each will collectively determine the overall Alley character.

Rather than discuss each mode and their respective elements in isolation, the following design standards are organized by the "zones" within the Alley public right-of-way:

- Roadway
- Intersection

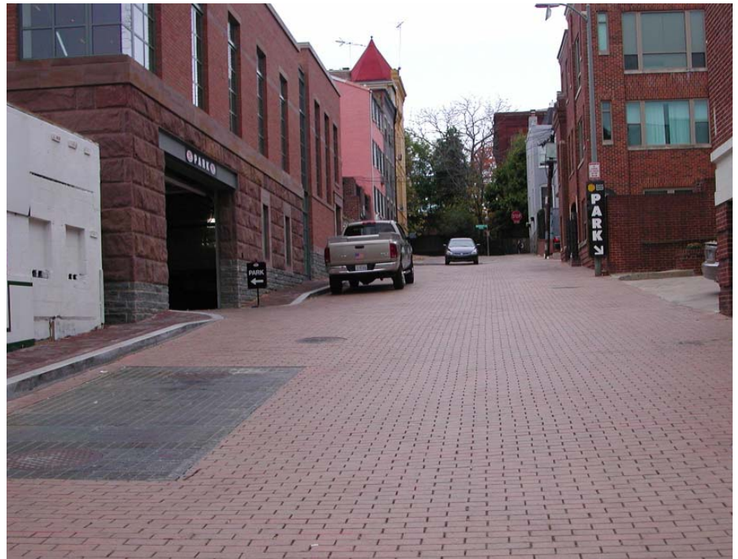
Roadway

Roadway standards focus on paving applications, curb and gutter treatment and traffic and pedestrian safety.

Vehicular Travel Lanes

Roadways should be paved in asphalt or concrete. Alleys in historic areas should be paved in brick unless specified otherwise by DDOT, State Historic Preservation Office (SHPO) or the community. Unless historically paved in brick, an alley can also be paved in comparable permeable unit pavers.

A



B

Figure 3.4.2 (right): Alley Paving

A. Standard Brick Paving in Historic Alleys

B. Alley Paved with Various Materials and Certain Drainage System

Alley and Driveway Entrances

Where vehicles cross over a pedestrian sidewalk, the alley driveway design should be level with and of the same material as the sidewalk. Vehicle ramps should be poured-in-place concrete.

Intersection

Fixtures

Lighting should be provided to enhance safety for vehicles and pedestrians and to promote the use of alleys in the evenings. Lighting fixtures should be adequate for roadway safety. Upward scatter or night sky pollution should be avoided. The existing Teardrop Pendant Light should be spaced staggered from each other in mixed-use and in residential areas. The recommended average maintained luminance for DC's alleys is 0.3-foot candles in residential areas and 0.5-foot candles for mixed-use areas. The existing District lighting option is the standard cobra fixture.

Furnishings

To a limited extent, street furnishings such as trash receptacles, bike racks, access covers and safety posts, may be installed in alleys to enhance the safety and environment for pedestrian activity. Furnishing should be located in wider areas so as not to impede vehicular movement and access.

Trash Receptacles/Recycle Bin

Traditional or contemporary trash receptacles (with lids), depending on the street context, should be installed widely throughout highly visible public rights-of-way to discourage littering and promote recycling. Trash receptacles should be provided in close proximity to seating areas, intersections and fast food stores.

Bicycle Racks

The standard inverted "U" shaped bicycle racks should be appropriately spaced and located to facilitate access while not blocking sidewalks, access to parked vehicles, and other alley facilities.

Access Covers

Access covers located on the sidewalks may incorporate an AWI specific design, which will help define the area's unique identity.

Low Impact Development (LID)

Urban development increases impervious surfaces thereby reducing natural storm water infiltration. This leads to changes in the storm drainage pattern including the increased likelihood of flooding, decreased supply of groundwater, increased erosion and sedimentation, and increased rates of chemical pollutants from street and roadway runoff. LID offers a system of engineering and design controls establishing size, storage capacity, discharge and infiltration rates. LID minimizes hydrologic problems by replicating the natural hydrology of a site through a series of small-scale distributed areas, thus minimizing stormwater runoff, improving water quality and reducing erosion problems downstream. LID strategies can be incorporated into the majority of public right-of-way zones as shown in Table 3.4.2.

Table 3.4.2 LID Opportunities *

Furnishing/Planting Zone	Roadway
Conservation *Option 1*	Permeable Concrete *Option 5*
Planting Vegetation *Option 2*	Permeable Asphalt *Option 6*
Disconnectivity *Option 4*	Permeable Unit Pavers *Option 7*
Permeable Unit Pavers *Option 7*	Gutter Filters *Option 11*
Inlet Controls *Option 9*	

* Reference Chapter 5 for details or options.

Figure 3.4.3 (below): Anacostia Elements

A. Standard Inverted "U" Bike Rack

B. Standard Safety Post

A

B

Transportation Architecture Design Guidelines

Items for Architectural Elements

4

1. Introduction

Overview

This chapter provides guidance associated with the application of transportation-related urban architectural elements in the delineated Anacostia Waterfront area. It constitutes STEP 5, the principal part of this manual as described in Chapter 1.7 and depicted in the flowchart below (Figure 4.1)

Elements are functional parts of the overall urban landscape, such as a lighting fixtures, walkways, or signs. Specific guidance for an element is cataloged as an "item" in this chapter. An item can provide guidance as to the physical configuration or materials that comprise an element; or can specify tolerances, dimensions, or appropriate maintenance procedures. Items in this chapter are grouped into 12 sections of related elements. For instance, Section 8, "Furnishing", provides guidance for elements present in the furnishing zone. Elements addressed in this section include seating, trash receptacles and bicycle racks. Items in this section provide guidance as to preferred configuration, dimensions, and function of these elements in the Anacostia Waterfront implementation area.

The sequence of the 12 sections is as follows:

1. Roadway Paving and Treatment Materials
2. Pedestrian and Traffic Safety
3. Roadway Edging and T n to Sidewalk
4. Medians
5. Walls and Railings
6. Walkway and Spillout Zones
7. Lighting
8. Furnishing
9. Signage
10. Street Trees
11. Planting/Furnishing Zone - Surface Treatments
12. Planting Zone - Subsurface Treatments

As outlined in the previous chapters, guidance can vary with roadway function and land use character (zoning), and this is true for elements as well. Parking lanes are not present on interstates or throughfares. Likewise, "spill-out" zones are not present in residential areas. Figures 4.2 and 4.3 illustrate this variation, as well as providing a summary of items catalogued in this chapter.

Table 4.1 "Element Selection Matrix" summarizes all elements and items contained in this chapter and how they relate to the "Special Area Designations" and "Roadway Functional Classifications" as discussed in Chapters 2 and 3.

The matrices provide design guidance by listing the item number for any element (row), given the context indicated in the table columns. The item number points to guideline "flysheets" that either uniquely define guidelines and/or reference technical manuals currently used by the District. If guidelines are uniquely defined by the Manual, a reference to Chapter 6 will be present.

Within Chapter 4 each item has either a red border for elements unique to the AWI Manual with specific guidelines presented in Chapter 6 or a blue box for elements that are covered in the standard DDOT specifications and/or drawings Some items have a green box - Are elements that provide an LID opportunity. Some items also have additional references to specific design guidelines or standards to facilitate the design process.

Figure 4.1: Flowchart showing how to use the Manual (see Chapter 1.7 for description)

Thoroughfares

Elements and Items

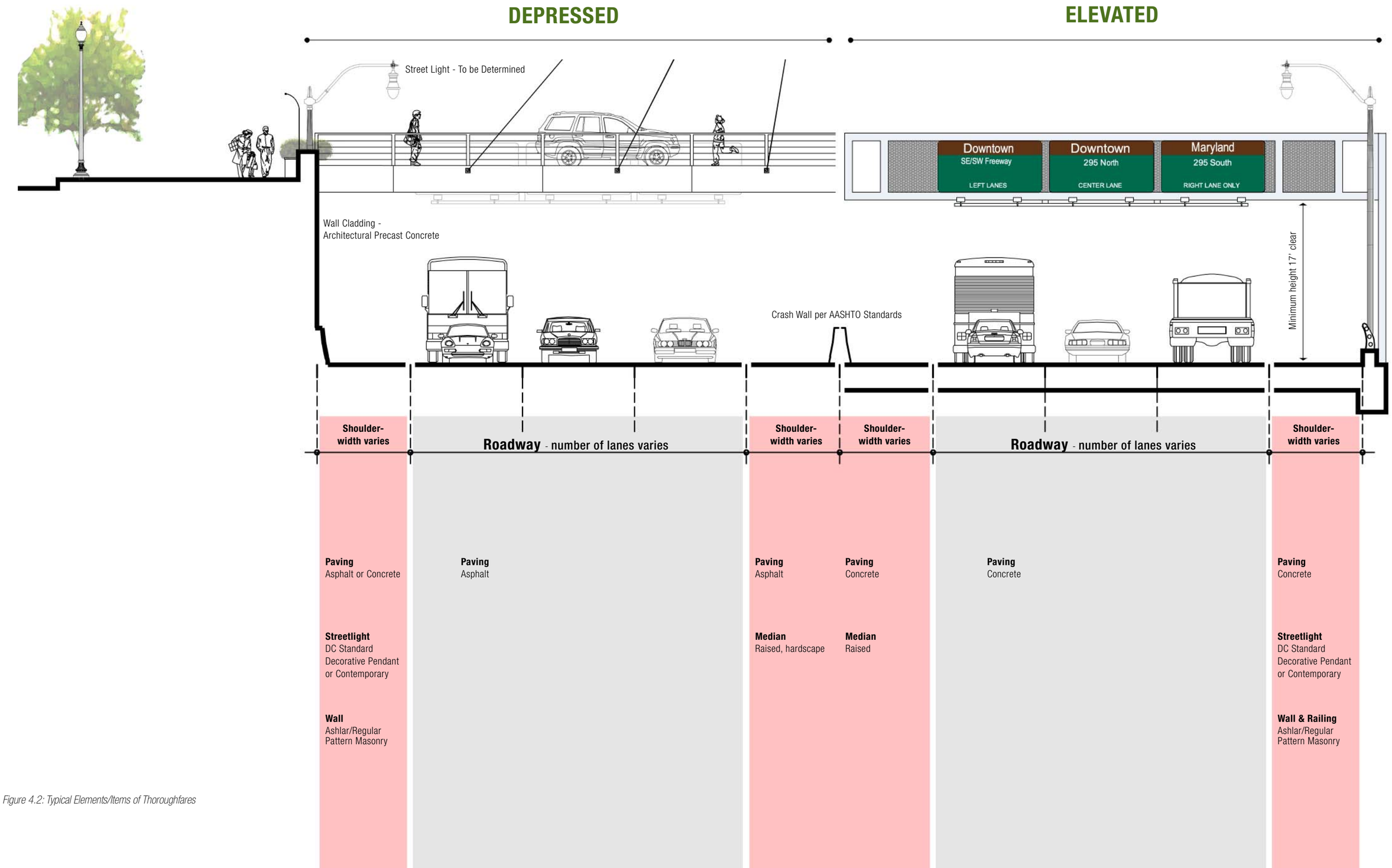


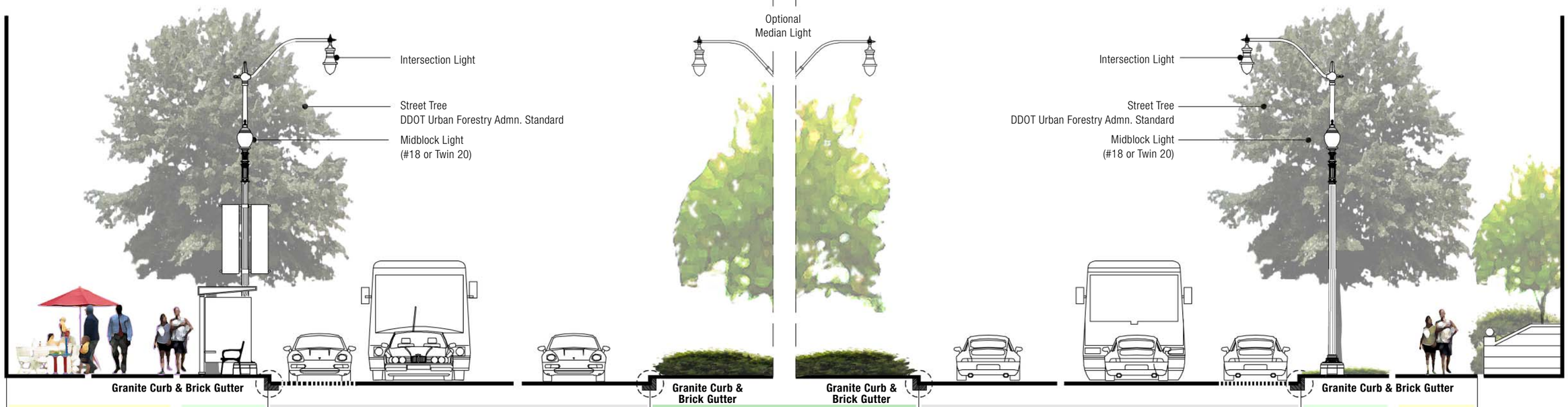
Figure 4.2: Typical Elements/Items of Thoroughfares

Major Urban Streets & Local Roads

Elements and Items

MIXED USE

RESIDENTIAL



Sidewalk- width varies

Spill Zone (min. 2'-0"l) — Priority 3

Paving
Concrete or Brick (Historic only)

Furnishings
Safety Posts
Seating & Planter boxes provided by businesses

Walkway Zone Minimum 5'-0" — Priority 1

Paving
Concrete or Brick (Historic only)

Furnishings
Access Cover

Furnishing/ Planting Zone Minimum 4'0" — Priority 2

Surface Treatments
Unit Paver to match sidewalk color

Fixtures
#18 and/or
Twin 20
Teardrop Pendant

Furnishings
Seating
Trash Bin
Bike Rack
Safety Posts

Landscaping
Street Trees
Understory
Planting
Mulch
Contiguous Tree Root Zone

Signage
Wayfinding
Street Attachments

Roadway - number of lanes varies

Paving
Bridges/Underpass - Concrete/Asphalt
Bus Stop Pads - Integrally colored concrete to match roadway paving
Bike Lane - Painted Lane Markings
Designated Parking Lane - Unit Pavers
Crosswalk - Regular or Thermo plastic "piano striping"

Pedestrian & Traffic Safety
Sidewalk Extension
Traffic Diversion
Rotary

Curb & Gutter
Granite Curb
Brick Gutter
Curb Cuts & Driveways - Concrete ramps, contiguous sidewalk finish
ADA Ramps - Concrete ramps with truncated dome

Other Construction
Wall Cladding - Ashlar/Regular Pattern Masonry

Median (optional) - width varies

-MAJOR URBAN STREETS ONLY-

Main Zone
Hardscape and softscape treatments

Refuge Zone
Crosswalk to be continued (ADA Accessible, Minimum 4' wide)

Protection Zone
Safety posts
Planter boxes less than 3' in height

Curb & Gutter
Granite curb
Brick Gutter
Curb cuts & driveways - concrete ramps, contiguous sidewalk finish
ADA Ramps - Concrete ramps with truncated dome

Roadway - number of lanes varies

Paving
Bridges/Underpass - Asphalt or concrete
Bus Stop Pads - Integrally colored concrete to match roadway paving
Bike Lane - Painted Lane Markings
Designated Parking Lane - Unit pavers
Crosswalk - Regular or Thermo plastic "piano striping"

Pedestrian & Traffic Safety
Sidewalk Extension
Traffic Diversion
Rotary

Curb & Gutter
Granite Curb
Brick Gutter
Curb Cuts & Driveways - Concrete ramps, contiguous sidewalk finish
ADA Ramps - Concrete ramps with truncated dome

Other Construction
Wall Cladding - Ashlar/Regular Pattern Masonry

Sidewalk- width varies

Furnishing/ Planting Zone Minimum 4'0" — Priority 2

Surface Treatments
Understory Planting
Unit Pavers
Turf Area

Fixtures
#18 and/or Twin 20
Teardrop Pendant

Furnishings
Trash Bin
Bike Rack
Safety Posts

Landscaping & LID
Street Trees
Understory
Planting
Planter Edging
Mulch
Contiguous Tree Root Zone

Walkway Zone Minimum 5'-0" — Priority 1

Paving
Concrete or Brick (Historic only)

Furnishings
Access Cover

Figure 4.3: Typical Elements/ Items of Major Urban Streets and Local Roads

Element Selection Matrix

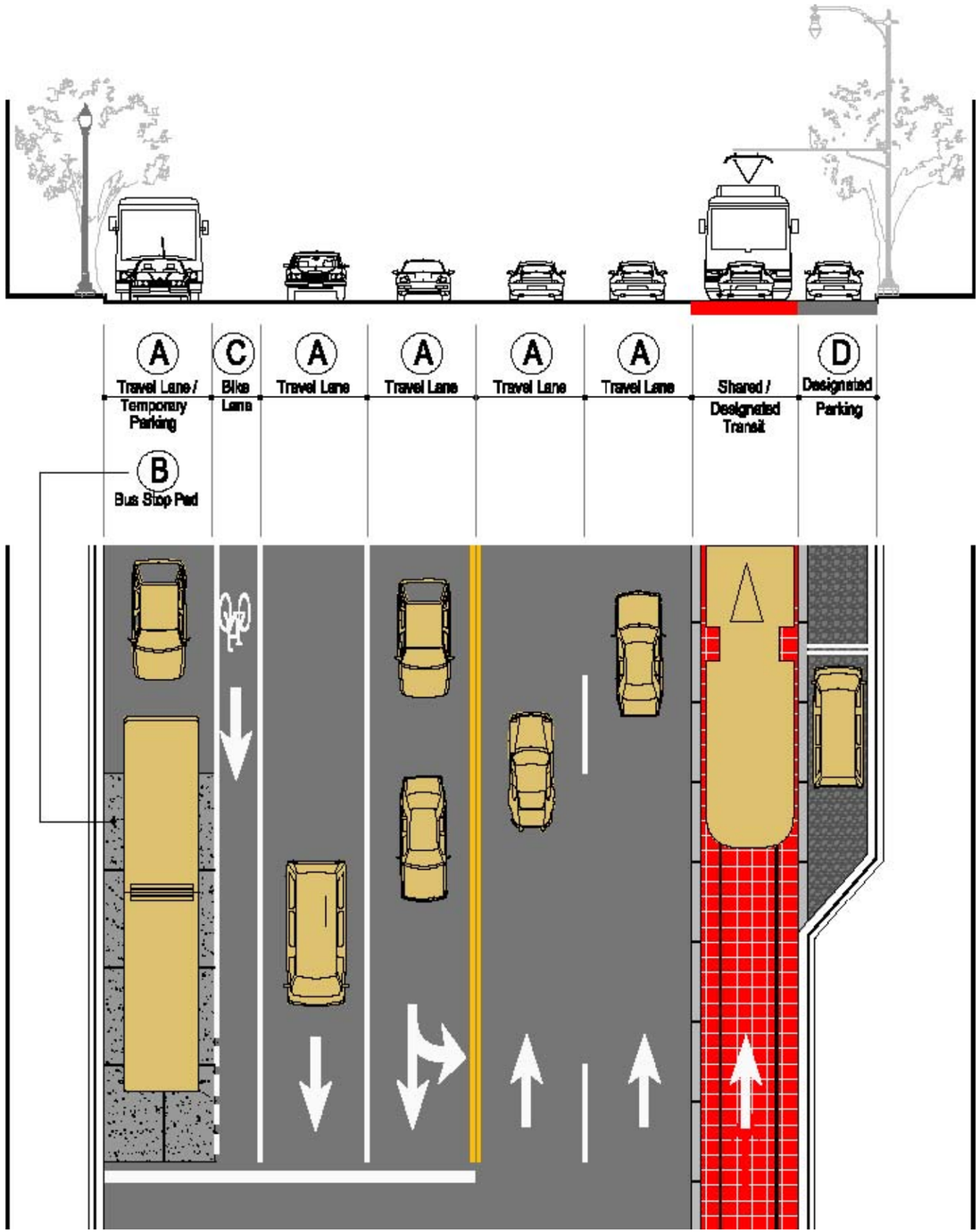
Anacostia Waterfront Transportation Architecture Design Guidelines			Roadway Functional Classification												Special Area Designation									
					Major Urban Roads						Locals		Alleys		Greenway	Symbolic Corridor		Designated Transit Corridor	Special Segments	River Crossing	Waterfront Access Segment		Waterfront Promenade	Park Road
					Principal Arterial		Minor Arterial		Collector		Local Roads		Alleyways											
			Interstate	Other Freeways	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Mixed-Use	Residential	Mixed-Use	Mixed-Use	Mixed-Use	Mixed-Use	Residential	Mixed-Use	Mixed-Use
1. ROADWAY PAVING & TREATMENT MATERIALS																								
1.1 Vehicular Travel Lanes	1.1(1)	Asphalt	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
	1.1(2)	Integrally Colored Concrete on Bridges	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
	1.1(3)	Unit Pavers											X	X										
1.2 Bus Stop Pads	1.2(1)	Integrally Colored Concrete			X	X	X	X	X	X	X	X				X	X	X	X					
1.3 Bike Lanes	1.3(1)	Painted Lane Markings			X	X	X	X	X	X	X	X				X		X	X					
1.4 Designated Parking Lanes	1.4(1)	Unit Pavers			X	X	X	X	X	X	X	X	X	X		X		X	X					X
1.5 Crosswalks	1.5(1)	Regular Striping			X	X	X	X	X	X	X	X				X	X	X	X	X	X	X		
	1.5(2)	Piano / Ladder Bar Striping			X	X	X	X	X	X	X	X				X	X	X	X	X	X	X		
2. PEDESTRIAN & TRAFFIC SAFETY																								
2.1 Surface Treatments	2.1(1)	Rumble Strips	X	X											X									
2.2 Raised Pavements	2.2(1)	Raised Intersections/ Crosswalks					X	X	X	X	X	X												
	2.2(2)	Road Humps						X		X		X												
2.3 Sidewalk Extensions	2.3(1)	Bulbouts			X	X	X	X	X	X	X	X						X		X				
	2.3(2)	Chokers									X	X												
2.4 Traffic Diversions	2.4(1)	Chicanes									X	X												
	2.4(2)	Diverters					X	X	X	X	X	X												
2.5 Rotaries	2.5(1)	Roundabouts			X	X	X	X	X	X						X	X			X				
	2.5(2)	Traffic Islands					X	X	X	X	X	X												
3. ROADWAY EDGING & TRANSITION TO SIDEWALK																								
3.1 Curb and Gutter	3.1(1)	Stone Curb with Brick Gutter			X	X	X	X	X	X						X	X	X	X					
	3.1(2)	Bridge Stone Curb with Brick Gutter			X	X	X	X	X	X						X	X	X	X	X	X	X		
	3.1(3)	Concrete Flush Curb													X									X
3.2 Wheelchair / Bicycle Ramp	3.2(1)	Poured in Place Concrete			X	X	X	X	X	X	X	X				X	X	X	X					X
3.3 Alley and Driveway Entrance	3.3(1)	Poured in Place Concrete			X	X	X	X	X	X	X	X	X	X		X	X	X	X					X
4. MEDIANS																								
4.1 Main Zone	4.1(1)	Hardscape			X	X	X	X	X	X						X	X	X	X					
	4.1(2)	Barrier Walls	X	X											X									
	4.1(3)	Raised with Plantings	X	X	X	X	X	X	X	X						X	X	X	X					
	4.1(4)	Softscape	X	X	X	X	X	X	X	X					X	X	X	X	X					
4.2 Approach Zone	4.2(1)	Hardscape			X	X	X	X	X	X						X		X	X					
4.3 Refuge Zone	4.3(1)	Hardscape			X	X	X	X	X	X	X	X	X	X		X		X	X					
4.4 Protection Zone	4.4(1)	Hardscape			X	X	X	X	X	X						X		X	X					
5. WALLS AND RAILINGS																								
5.1 Wall Cladding	5.1(1)	Ashlar/Regular Pattern Masonry	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X
5.2 Vehicular Railings	5.2(1)	Composite Railings	X	X											X					X	X	X		
	5.2(2)	Composite Railings			X	X	X	X	X	X	X	X								X	X	X		
	5.2(3)	Independent Metal Railings	X	X	X	X	X	X	X	X	X	X			X									
	5.2(4)	Integrated Metal Railings			X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X
	5.2(5)	Independent Metal Barriers			X	X	X	X	X	X	X	X				X	X	X	X	X				
5.3 Pedestrian Railings	5.3(1)	Standard Metal/Traditional Concrete Railings			X	X	X	X	X	X						X	X	X	X	X	X	X	X	X
6. WALKWAY & SPILLOUT ZONES																								
6.1 Walkways	6.1(1)	Poured in Place Concrete			X	X	X	X	X	X	X	X	X	X						X	X	X		
	6.1(2)	Pressed Concrete Unit Pavers			X	X	X	X	X	X	X	X	X	X		X	X	X					X	
	6.1(3)	Exposed Aggregate Concrete														X	X	X	X	X	X	X		
	6.1(4)	Brick			X	X	X	X	X	X	X	X	X	X									X	X
	6.1(5)	Asphalt																					X	
6.2 Plazas	6.2(1)	Special Pedestrian Paving			X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
7. LIGHTING																								
7.1 Fixtures	7.1(1)	Upright Pole #14																					X	
	7.1(2)	Upright Pole #16			X	X	X	X	X	X	X	X						X			X	X	X	X
	7.1(3)	Upright Pole #18			X	X	X	X	X	X	X	X						X	X		X	X	X	X
	7.1(4)	Upright Pole Twin 20			X	X	X	X	X	X						X	X	X	X	X				
	7.1(5)	Teardrop Pendant	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
8. FURNISHING																								
8.1 Seating	8.1(1)	Traditional Bench			X		X		X		X					X			X				X	X
	8.1(2)	Contemporary Bench			X		X		X		X					X		X	X				X	X
	8.1(3)	Granite														X		X	X				X	
	8.1(4)	Public Art																X	X				X	
8.2 Trash Receptacles / Recycle Bins	8.2(1)	Traditional Trash Receptacle			X	X	X	X	X	X	X	X	X	X		X			X				X	X
	8.2(2)	Contemporary Trash Receptacle			X	X	X	X	X	X	X	X	X	X		X		X	X				X	X
	8.2(3)	Contemporary Recycle Bin			X	X	X	X	X	X	X	X	X	X		X		X	X				X	X
8.3 Bicycle Racks	8.3(1)	Inverted U-Shape			X		X		X		X		X			X		X	X				X	
	8.3(2)	X-Type																X	X				X	
	8.3(3)	Public Art																X	X				X	
8.4 Utility Access Covers	8.4(1)	Public Art			X	X	X	X	X	X	X	X	X	X		X	X	X	X					

Table 4.1:
Element Selection Matrix

Element Selection Matrix Continued

Anacostia Waterfront Transportation Architecture Design Guidelines			Roadway Functional Classification												Special Area Designation									
					Major Urban Roads						Locals		Alleys		Greenway	Symbolic Corridor		Designated Transit Corridor	Special Segments	River Crossing	Waterfront Access Segment		Waterfront Promenade	Park Road
			Interstate	Other Freeways	Principal Arterial		Minor Arterial		Collector		Local Roads		Alleyways											
					Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Mixed-Use	Residential	Mixed-Use	Mixed-Use	Mixed-Use	Mixed-Use	Residential	Mixed-Use	Mixed-Use
8.5 Safety Posts	8.5(1)	Traditional			X		X		X		X					X			X				X	
	8.5(2)	Contemporary			X		X		X		X					X		X	X				X	
	8.5(3)	Contemporary with Light																X					X	
	8.5(4)	Contemporary-Granite														X		X	X				X	
9. SIGNAGE																								
9.1 Standalone Signs	9.1(1)	Wayfinding			X	X	X	X	X	X	X	X				X		X	X		X	X	X	
9.2 Street Attachments	9.2(1)	Neighborhood Identifiers																X	X				X	
	9.2(2)	Temporary Banners														X	X	X	X	X	X	X	X	
10. STREET TREES																								
10.1 Tree Protection	10.1(1)	Existing Trees	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10.2 Tree Planting	10.2(1)	Typical Trees	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10.3 Tree Species	10.3(1)	General Trees Species	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	10.3(2)	Symbolic Corridor Trees														X	X							
	10.3(3)	Columnar Trees																X						
	10.3(4)	Waterfront Trees																			X	X	X	X
	10.3(5)	Evergreen Trees	X	X											X									X
	10.3(6)	Ornamental Trees													X	X	X	X	X				X	X
11. PLANTING/FURNISHING ZONE - SURFACE TREATMENTS																								
11.1 Vegetation	11.1(1)	Understory Plantings	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	X	X	X
11.2 Unit Pavers	11.2(1)	Cobblestone			X	X	X	X	X	X	X	X	X	X		X	X	X	X					
	11.2(2)	Tumble Finish Concrete Pavers			X	X	X	X	X	X	X	X	X	X				X						
	11.2(3)	Brick			X	X	X	X	X	X	X	X	X	X					X					
	11.2(4)	Permeable Interlocking Pavers			X	X	X	X	X	X	X	X	X	X										
11.3 Turf Areas	11.3(1)	Lawn	X	X		X		X		X		X			X								X	X
11.4 Mulch	11.4(1)	Pine Fines	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X				X	X
12. PLANTING ZONE - SUBSURFACE TREATMENTS																								
12.1 Increase Planting Space	12.1(1)	Contiguous Root Area with Pavers			X		X		X		X					X	X	X	X					
	12.1(2)	Contiguous Root Area with Lawn				X		X		X		X											X	X
12.2 Soil Mix	12.2(1)	Planting Soil Mix	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X

Table 4.1 (continued):
Element Selection Matrix



Section 1: Roadway Paving and Treatment Materials

ELEMENT	ITEM	MAP REFERENCE
1.1 Vehicular Travel Lanes		**A**
	1.1.1) Asphalt	
	1.1(2) Rubberized Asphalt	
	1.1(3) Integrally Colored Concrete on Bridges	
	1.1(4) Unit Pavers	
1.2 Bus Stop Pads		**B**
	1.2(1) Integrally Colored Concrete	
1.3 Bike Lanes		**C**
	1.3(1) Painted Lane Markings	
1.4 Designated Parking Lanes		**D**
	1.4(1) Unit Pavers	
1.5 Crosswalks		
	1.5(1) Regular Striping	
	1.5(2) Piano/Ladder Bar Striping	

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Section 1: Roadway Paving & Treatment Materials

Element:	Vehicular Travel Lanes	**Reference:**	1.1(1)
Item:	Asphalt		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Travel lanes, bike lanes, shared transit lanes, parking lanes (unless designated as 24-hour parking lanes)		

Purpose

Due to greater friction and lower installation costs, the use of asphalt in lieu of concrete or other materials, like unit pavers, is recommended for all roadways in the Anacostia Waterfront Area. Its flexibility, resistance to ice formation and capability to buffer noise make asphalt preferable over concrete.

Application

Functional and/or technical requirements may necessitate the use of concrete or another material. However, unless otherwise noted, asphalt should be used on all travel lanes, bike lanes, and shared transit lanes. Asphalt should also be used on parking lanes unless they are designated as 24-hour parking lanes in which case permeable pavment me be appropriate.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Option 6

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 402

Element:	Vehicular Travel Lanes	**Reference:**	1.1(2)
Item:	Integrally Colored Concrete on Bridges		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing	**Area Type:**	Mixed-Use & Residential
Location:	Along river crossings, bridges, underpasses and special intersections as approved by DDOT.		

Purpose

At bridges and other locations per DDOT requirements, concrete pavement should be used for roadway surfaces. Concrete prohibits water from seeping into bridge reinforcements.

Application

- At bridges and other locations per DDOT requirements, concrete pavement should be used for roadway surfaces.
- Integrally colored concrete should be used to match closely the color of asphalt on adjoining segments of the roadway, as approved by DDOT.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 703.21, 814.06

Element:	Vehicular Travel Lanes	**Reference:**	1.1(3)
Item:	Unit Pavers		
Classification:	Alley	**Area Type:**	Mixed-Use & Residential
Location:	Historic Districts		

Purpose

Changes in pavement color and texture in special areas and special intersections add visual interest and attractiveness. The vibration felt while driving over textured pavement slows traffic and provides safer pedestrian crossings. Surface treatment can also differentiate a street from a sidewalk or a parking lane.

Application

- **Restrictions:**
  - Textured pavement should not be used where noise is a consideration in residential areas, on bike lanes or in crosswalks. The use of textured pavement should be reviewed and approved by DDOT before being implemented.
- **Color:** Salmon/Charcoal Blend
- **Size:** 6 x 9

Reference

- ASTM C 936-01 “Standard Specification for Solid Concrete Interlocking Paving Units” or latest update.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Option 7

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 608.04, 806.02

Refer to Chapter 6 Item 3b. for additional information on proposed guideline.

Element:	Bus Stop Pads	**Reference:**	1.2(1)
Item:	Integrally Colored Concrete		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Curb side travel lanes		

Purpose

Where buses make stops, a concrete pad is required to accommodate the additional weight of the buses. The concrete for bus stop pads should be integrally colored to closely match the asphalt paved surface in the adjoining lanes and to hide oil and other leaked fluid stains.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Sections 501.02, 601.01, 814.06

Element:	Bike Lanes	**Reference:**	1.3(1)
Item:	Painted Lane Markings		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Curb side travel lanes		

Purpose

Currently, the District aims to increase bike ridership to supplement other transit options. The District of Columbia Bicycle Master Plan increases the number of bike lanes on city roads. To ensure maximum usage of this transportation option, bike lanes on city streets should be marked by white lines and a bicyclist printed graphic on the pavement.

All dimensions, striping, and graphics in pavements should meet the requirements in the District of Columbia Bicycle Master Plan and the DDOT Bicycle Facility Design Guide. Colorized surface may be used in locations where a conflict point is identified. DDOT approval for colorized surface is required.

Reference

- DDOT Bicycle Facility Design Guide page 22 for details.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 616.12

Element:	Designated Parking Lanes	**Reference:**	1.4(1)
Item:	Unit Pavers		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Curbside designated parking lanes		

Purpose

Designated parking lanes should be clearly defined. Distinctive materials, such as unit pavers, can be used to achieve this. A change in material between travel lanes and parking lanes visually reduces the roadway width. Color of pavers for Designated Parking Lanes should comply with the latest laws and regulations of the Americans with Disabilities Act. Installation should be coordinated with utilities to avoid conflicts.

Application

- **Restriction:** Restricted parking lanes that become travel lanes during peak hours should not be given this treatment.
- **Color**: Salmon/charcoal blend.
- **Size:** 6" x 9"

Reference

- Unit pavers should be used in accordance with ASTM C 936-01 "Standard Specification for Solid Concrete Interlocking Paving Units".

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 806.02

Refer to Chapter 6 Item 3b. for additional information on proposed guideline.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Option 7

Element:	Crosswalks	**Reference:**	1.5(1)
Item:	Regular Striping (non-high visibility)		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment	**Area Type:**	Mixed-Use & Residential
Location:	All intersections		

Purpose

Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops. They also serve to alert road users of a pedestrian crossing point across roadways not controlled by highway traffic signals or STOP signs. At non-intersection locations, they legally establish the crosswalk.

Application

Crosswalk markings promote pedestrian safety and should be used at all intersections, unless otherwise stated. All dimensions, striping and graphics in pavement should meet the requirements in the Manual of Uniform Traffic Control Devices (MUTCD) and the following to meet DDOT guidelines.

- Crosswalks should be 15-foot wide unless otherwise noted.
- Crosswalk (transverse) lines should be 6-inches wide.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 616.12

Element:	Crosswalks	**Reference:**	1.5(2)
Item:	Piano / Ladder Bar Striping		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment	**Area Type:**	Mixed-Use & Residential
Location:	Uncontrolled intersections and/or near schools, metro stations, and playgrounds, controlled intersections with high pedestrian activity.		

Purpose

The "Piano" type crosswalk is conventional, recognizable, and highly visible. It instinctively alerts motorists to expect pedestrians and should be used at locations where substantial numbers of pedestrians cross without other traffic control devices, at locations where physical conditions are such that added visibility of the crosswalk is desired, or at places where a pedestrian crosswalk might not be expected.

Application

All dimensions, striping and graphics in pavement should meet the requirements in the Manual of Uniform Traffic Control Devices (MUTCD) and the following to meet DDOT guidelines.

- Crosswalks should be 15-foot wide unless otherwise noted.
- Crosswalk (transverse) lines should be 6-inches wide.
- Longitudinal lines: 2-foot wide white stripes with 2-foot spacing.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 616.12

Section 2: Pedestrian and Traffic Safety

ELEMENT	ITEM
2.1 Surface Treatments	
	2.1(1) Rumble Strips
2.2 Raised Pavements	
	2.2(1) Raised Intersections/Crosswalks
	2.2(2) Road Humps
2.3 Sidewalk Extensions	
	2.3(1) Bulbouts
	2.3(2) Chokers
2.4 Traffic Diversions	
	2.4(1) Chicanes
	2.4(2) Diverters
2.5 Rotaries	
	2.5(1) Roundabouts
	2.5(2) Traffic Islands

Element:	Surface Treatments	**Reference:**	2.1(1)
Item:	Rumble Strips		
Classification:	Interstate, Freeway, Greenway	**Area Type:**	Mixed-Use
Location:	Road shoulders or centerlines		

Purpose

Pavement placed perpendicular to the direction of travel creates a change in road surface texture to visibly and audibly alert drivers to stay in travel lane. Shoulder Rumble Strips (SRS), placed on the shoulders just beyond the travel lane way warn drivers of entering a roadway section not intended for routine traffic use. Centerline Rumble Strips (CRS), placed on centerline of undivided highways, warn drivers of leaving intended lane of travel. The two most common rumble strip designs are milled and rolled. The differences are in the installation procedure and shape, which affects the amount of noise and vibration produced.

Applications

- **Restrictions:** Rumble strips should not be implemented in neighborhoods because of the noise created. Nor should they be used in bike lanes. Design should be reviewed and approved by DDOT before being implemented in the District.
- **Emergency Response Issues:** Rumble strips are preferred by many fire department/emergency response agencies over many other traffic calming measures as throughput is not reduced.
- **Color:** Custom as approved by DDOT and WMATA on a project-to-project basis.
- **Construction Requirements:**
  - Milled SRS can be placed on either new or existing asphalt or Portland Cement Concrete (PCC). Milled SRS is made with a machine that cuts a smooth groove in the shoulder. A SRS pattern results when SRS are repeated at regular intervals. The pavement surface is modified allowing a vehicle's tires to drop to create high vibrational and auditory stimuli.
  - Rolled SRS are pressed into freshly laid asphalt pavement. Depressions in hot pavement are made with a roller having steel pipes welded to a drum. Rolled SRS are rounded or V-shaped and produce low auditory and vibrational stimuli.
- **Dimensions:** SRS's transverse and longitudinal widths, spacing and depth can be modified to vary the amount of vibration and auditory stimuli produced.

AWI Specific Guideline -

Refer to Chapter 6 Item 2a. for information on proposed guideline.

Element:	Raised Pavements	**Reference:**	2.2(1)
Item:	Raised Intersections/Crosswalks		
Classification:	Minor Arterial, Collector, Local	**Area Type:**	Mixed-Use & Residential
Location:	Intersection in mixed-use areas with high pedestrian activity, areas where other traffic calming measures would be unacceptable because they take away scarce parking spaces. Not applicable to designated emergency routes.		

Purpose

Flat raised pavement covers the entire intersection, with ramps on all approaches and often with brick or other textured materials on the flat section. Raised intersections increase visibility of and for pedestrians and therefore reduce through movement speeds at intersections and vehicle-pedestrian conflicts. Intersections rise to the same level as sidewalks. All crosswalks are required to have a 6-inch wide white edge lines (thermoplastic reflective tape) on the outside edge of the decorative textured crosswalk.

Application

Raised intersections work well with curb extensions and textured crosswalks. They are often part of an area wide traffic-calming scheme involving both intersecting streets. The use of raised intersections should be reviewed and approved by DDOT before being implemented in the District.

- **Restrictions:**
  - Because raised intersections are expensive to construct and maintain they should only be part of special area designs.
  - Raised intersections should not be used in residential neighborhoods due to the noise from accelerating and decelerating vehicles.
  - A minimum 1% slope is required for drainage.
  - Raised intersections should not be permitted if roadway capacity is reduced, except on local streets, or if the Level of Service drops below “D”.
- **Emergency Response Issues:** Raised intersections should not be implemented along emergency routes as they can slow emergency vehicles to approximately 15 mph.

Design should provide storm drainage modifications and should include bollards to define edge of roadway and gentle slopes on ramps.

- **Material:** Textured pavement, unit pavers, concrete, asphalt, as approved by DDOT on a per project basis.
- **Dimensions:** Same dimensions as the intersecting roadways with a gentle ramp slope.
- **Signage:** Not necessarily required.
- **Maintenance:** Maintenance crews should pay special attention during snow removal.

Reference

- DDOT Design Guidelines for Traffic Calming Measures for Residential Streets in the District of Columbia, July 2005.

AWI Specific Guideline -

Refer to Chapter 6 Item 2b. for additional information on proposed guideline.

Element:	Raised Pavements	**Reference:**	2.2(2)
Item:	Road Humps		
Classification:	Minor Arterial, Collector, Local	**Area Type:**	Residential
Location:	Main roads through residential areas		

Purpose

Rounded mounds slow speeds to 15-20 mph without driver discomfort. They are placed at frequent, designated intervals based on street dimensions to minimize acceleration between them. Speed humps are typically long enough for the entire wheelbase of a passenger car to rest on top. They work well in combination with textured crosswalks, curb extensions, and curb radius reductions and can include a crosswalk.

Application

- **Restrictions:** The width of the humps may be restricted to allow the curb drainage to flow appropriately. Speed humps are not recommended for use along bus routes due to potential discomfort to bus passengers. Width of the humps may be restricted to allow the curb drainage to flow appropriately. Speed humps should not be placed over manholes, junction chambers, watergates etc. Engineer to modify design and location to accomodate field conditions (eg. drainage) while conforming to DDOT standards. Speed hump design should be reviewed and approved by DDOT before being implemented in the District.
- **Emergency Response Issues:** Generally fire trucks experience a 3-second delay per hump. Humps should be designed to minimize delay of emergency vehicles.
- **Material:** Asphalt
- **Dimensions:** Approximately 3" high, 10-12' long, or other as approved by DDOT.
- **Signage:** Speed humps should be highlighted with clear markings to alert approaching drivers.
  - Paint words and symbols directly on the street.
  - Change the texture of the street surface.
  - Use signage ("Hump" instead of "Bump").
  - Signs and markings should be in accordance with "MUTCD."
- **Maintenance:** Maintenance crews should be aware of rumble strips during snow removal.
- **Option:** Speed tables: (flat top speed humps, trapezoidal humps, speed platforms, raised crosswalks, raised crossings). Long, raised humps with flat section in the middle and ramps on the ends; can be constructed with brick or other textured materials on flat section. They are the same width as the street and rise to meet grade of the sidewalk, providing safe and comfortable crossings for walkers, wheelchairs (greater access for snow clearance than road humps). Crossings occur where drivers decrease speed. Speed tables are generally located mid block.

Reference

- DDOT Design Guidelines for Traffic Calming Measures for Residential Streets in the District of Columbia, July 2005.

Element:	Sidewalk Extensions	**Reference:**	2.3(1)
Item:	Bulbouts		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Designated Transit Corridor	**Area Type:**	Mixed-Use & Residential
Location:	Mixed-use: high traffic corridor, shared transit lanes and/or designated curbside parking; Residential: speed control		

Purpose

An extension of a curb in the form of a bulb, usually at an intersection, perceptually narrows vehicular path and discourages fast turns. Bulbouts can function as entry points to a corridor or block and deflect through traffic at corners. They prevent vehicles from passing other vehicles that are turning or illegally parking near intersections, and offer pedestrians safety features like refuge areas to shorten crossing distance; define curbside parking bays; space for amenities, and enhancements or landscaping.

Application

Design should minimize bicycle/auto conflicts at intersections without hindering turning movements of wider fire/emergency trucks.

- **Restrictions:** Bulbouts should not be permitted if roadway capacity is reduced, except on local streets, or if the Level of Service drops below "D". They should be used to eliminate exclusive right-turn lanes. Only traffic calming measures reviewed by and approved by DDOT should be implemented in the District.
- **Emergency Response Issues:** Design should accommodate emergency vehicles.
- **Material:** Consistent with adjoining sidewalk, as specified in Sidewalks - Section 6.1. Use of non-permeable surface should be maximized.
- **Dimensions:** Parking capacity should be optimized. On busy or wide streets, sidewalks should be extended into the street from one or more sides, usually 6'-8' from existing curb. The radius of the curb extension depends on the width of the travel lane, but should allow large vehicles/trucks to turn without encroaching into the opposing travel lane. Curb extensions should have a 45 degree taper to reinforce the edge line. Typical design guidelines follow below.
- **Plantings:** Trees should not be planted because of sight distance interference, although low plantings are permitted.
- **Signage:** If bike lanes exist, proper signage should be installed to warn bicyclists of narrowing.
- **Option**: Sidewalk Widening or Lane Redesignation: Reallocate space from roadway for non-motor-vehicle uses. Nine feet can safely accommodate traffic. If a corridor does not serve as an emergency route, lanes can be redesignated as bus, streetcar or other transit lanes. Traffic lanes can be transformed into bicycle lanes.

Reference

- DDOT Design Guidelines for Traffic Calming Measures for Residential Streets in the District of Columbia, July 2005.

Design Guidelines

Intersection		Top Back of Curb Radius
Bulbout Lane	Perpendicular Lane	
12'	12'	40'
12'	14'	32'
12'	16'	26'
14'	12'	37'
14'	14'	35'
14'	16'	24'

Element:	Sidewalk Extensions	**Reference:**	2.3(2)
Item:	Chokers		
Classification:	Local	**Area Type:**	Mixed-Use & Residential
Location:	Mid-block or intersection of low volume roads in areas with substantial speed problems but no on-street parking shortage or on main roads through small communities.		

Purpose

Curb extensions at mid-block or intersection corners that narrow streets by extending the sidewalk or widening the planting strip. The narrowed streets effectively reduce speeds, traffic volume and pedestrian crossing distance. Chokers should provide an opportunity for landscaping. Impacts on parking and driveway access should be minimized.

Application

- **Restrictions:** Chokers should not be permitted if roadway capacity is reduced, except on local streets, or if Level of Service drops below "D". Engineer to modify design and location to accomodate field conditions (eg. drainage) while conforming to DDOT standards. Only pedestrian safety measures reviewed and approved by DDOT should be implemented in the District.
- **Emergency Response Issues:** Design should accommodate passage of emergency vehicles.

Chokers work well with other traffic calming measures. They should be designed to increase pedestrian visibility and minimize the necessity for bicyclists to merge with vehicular traffic. Space should be provided between the choker and original curb line to not interrupt storm drainage flow and bicycle paths.

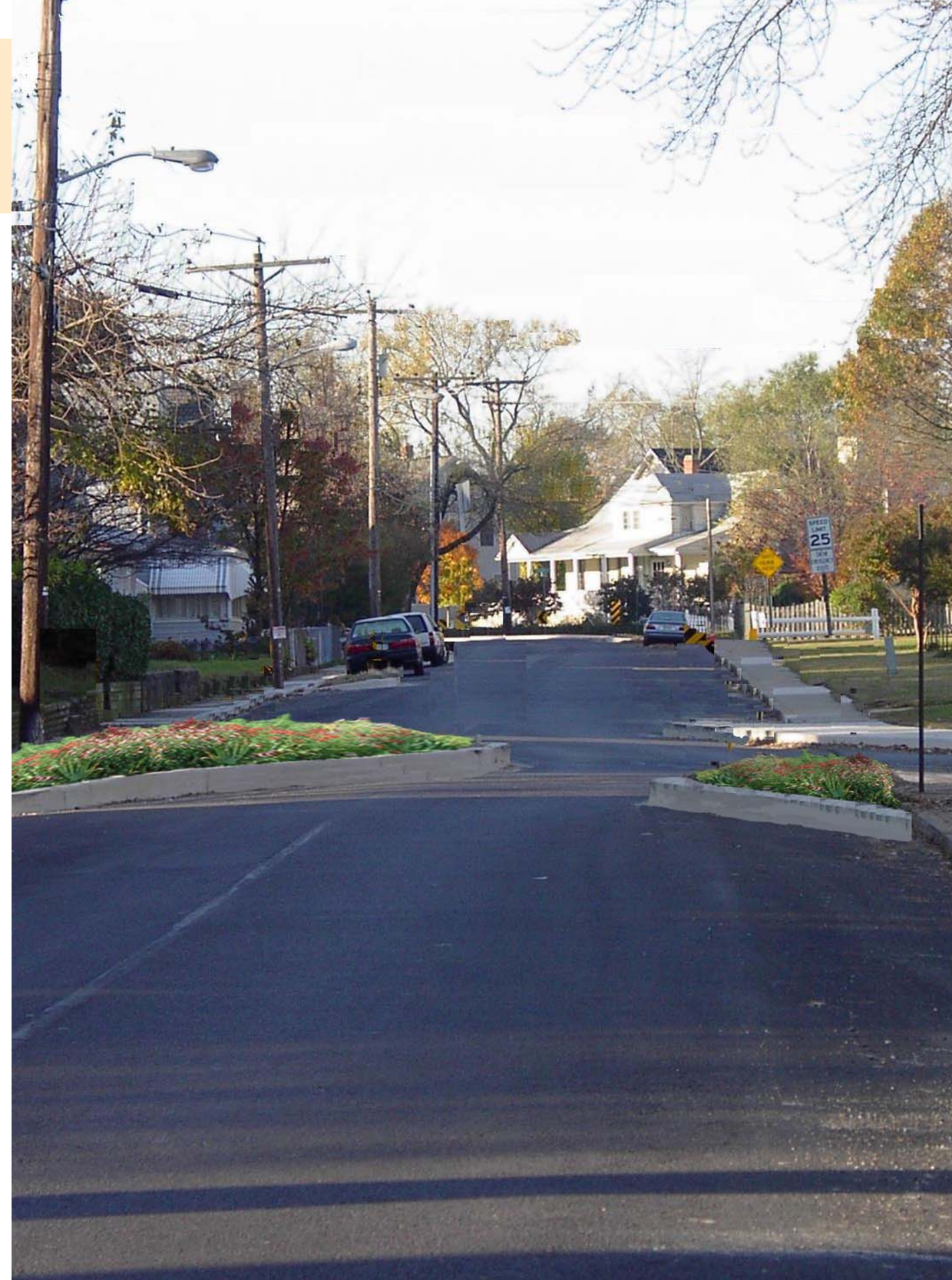
- **Material:** Consistent with adjoining sidewalk, as specified in Walkways-Section 6.1 or landscaping elements, as in Planting/ Furnishing Zone-Surface Treatments - Section 11, and Medians-Section 4. Permeable surface should be used when possible, refer to LID-Chapter 5.
- **Dimensions:** Typically designed to narrow road to 20' for 2-way traffic; typically avoid use of widths 13'–17'. The dimensions should be determined on a project-by-project basis.
- **Signage:** Vertical delineators, bollards or object markers make chokers visible to snowplow operators. Regulatory signs should be implemented for 1- lane chokers. Signs and markings should be in accordance with "MUTCD."
- **Plantings:** Trees should not be planted, although low plantings are permitted. Refer to Landscaping-Section 11.

Reference

- DDOT Design Guidelines for Traffic Calming Measures for Residential Streets in the District of Columbia, July 2005.

AWI Specific Guideline -

Refer to Chapter 6 Item 2d. for information on proposed guideline.



Element:	Traffic Diversions	**Reference:**	2.4(1)
Item:	Chicanes		
Classification:	Local	**Area Type:**	Mixed-Use & Residential
Location:	Mid-block only on streets carrying less than 3,500 vehicles per day, 2-lane, 2-way streets or 1-lane, 1-way street		

Purpose

A series of narrowings or curb extensions that alternate from one side of the street to the other, in serpentine curves. The undulating path interrupts any clear view ahead and compels drivers to slow down. The design also reduces traffic volume and collisions, but does not impact emergency vehicles. Chicanes can be formed using sculptures, plantings and/or parking to enhance the street's appearance and function. Chicanes provide the opportunity for landscaping.

Application

They should be used in a series of at least 3 curb extensions. Diagonal and parallel parking can be alternated to create a chicane effect. The use of chicanes should be reviewed and approved by DDOT before being implemented in the District. Sidewalks may follow the curb of the chicane.

- **Restrictions:** Chicanes should not be implemented if parking is limited, driveway access is impacted or if opposing travel lanes have unequal volumes of traffic. They should not be permitted if the Level of Service drops below "D". Only pedestrian safety measures reviewed and approved by DDOT should be implemented in the District.
- **Emergency Response Issues:** Typically prefer 2-lane chicanes to speed humps. Parking restrictions nearby should be strictly enforced so as not to interfere with emergency or transit movement. Design should always accommodate emergency vehicles.
- **Material:** Chicanes should be formed using sculptures, plantings, parking and/or center islands.
- **Dimensions:** Shifts in alignment of at least 1 lane width, deflection angles of at least 45 degrees and center islands should prevent drivers from taking a straight line through feature.
- **Signage:** Vertical delineators, bollards or object markers to make chicanes visible to snowplow operators. Regulatory signs should be implemented for 1-lane chicanes. Signs and markings should be in accordance with "MUTCD."
- **Plantings:** Deflection angles and center islands can incorporate landscaping. Trees should not be planted, although low plantings are permitted. Refer to Planting/Furnishing Zone-Surface Treatments - Section 11.

Reference

- DDOT Design Guidelines for Traffic Calming Measures for Residential Streets in the District of Columbia, July 2005.
- Traffic Diversion - Chicanes Drawings for additional detail.

AWI Specific Guideline -

Refer to Chapter 6 Item 2e. for additional information on proposed guideline.

Element:	Traffic Diversions	**Reference:**	2.4(2)
Item:	Diverters		
Classification:	Minor Arterial, Collector, Local	**Area Type:**	Mixed-Use & Residential
Location:	Diverters should be considered on arterials and local streets. Full closures should be implemented only on locals with volumes up to 3,000 ADT. Diverters should not be installed on transit streets.		

Purpose

Physical barriers redirect traffic heading to roadways more capable of processing traffic load. Diverters eliminate cut-through traffic and conflicting traffic movements and reduce pedestrian crossing distance. Diverters are designed to reduce vehicle overload on residential streets overrun by through traffic looking for shortcuts. To be an effective tool and not just displace congestion, diverters should be integrated into the overall design scheme. Diverters should be designed to comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Restrictions:** Diverters should be implemented in areas where restricted access to neighborhoods by residents can be tolerated. The use of diverters should be reviewed and approved by DDOT before being implemented.
- **Emergency Response Issues:** Diverters should not be used on primary emergency or fire response routes. Traversable diverters should be implemented if emergency vehicle access and response are affected.

Mountable diverters should be designed and installed to provide for emergency vehicle access and allow pedestrians and bicyclists to cross over.

- **Material:** See Medians-Section 4 and Planting/Furnishing Zone-Surface Treatments - Section 11.
- **Dimensions:** Determined on a project-by-project basis.
- **Signage:** Signage should be used to guide traffic unless it can be avoided through the use of vertical indicators.
- **Plantings:** Diverters can incorporate landscaping. Refer to Planting/Furnishing Zone-Surface Treatments - Section 11
- **Option:** Diverters Types:
  - Full Closure: 4-8' barriers placed across the entire width of a street to completely close the street to through traffic.
  - Half Closure: restrict traffic in 1 direction to prevent entrance to a street, but permit traffic to pass in the other direction.
  - Diagonal Diverters: cross entire intersection creating 2 unconnected streets that turn sharply away from one another.
  - Forced Turn Island: (pictured) are islands on approaches to an intersection that block certain movements.

Reference

- DDOT Design Guidelines for Traffic Calming Measures for Residential Streets in the District of Columbia, July 2005.

Element:	Rotaries	**Reference:**	2.5(1)
Item:	Roundabouts		
Classification:	Principal Arterial, Minor Arterial, Collector, Symbolic Corridor, River Crossing	**Area Type:**	Mixed-Use & Residential
Location:	Roundabouts should be considered at intersections on high and low volume streets. Roundabouts can be constructed in series on a local street.		

Purpose

Roundabouts are large, raised, circular islands in the middle of major intersections, around which all oncoming vehicles should travel until reaching a destination street, where they then turn off. They are designed to steady traffic flows, improve safety conditions, and reduce the number of conflict points. Roundabouts allow for community activity in residential areas, landscaping or other enhancements such as fountains, artwork, sculpture or Low Impact Development.

Application

- **Restrictions:** Roundabouts should not be implemented where parking is limited and should provide for bicycle safety. The design of roundabouts should be reviewed and approved by DDOT before being implemented in the District.
- **Emergency Response Issues:** Roundabouts can restrict emergency or transit vehicle movement if vehicles are parked illegally near the circle. To accommodate emergency response issues, the design should include a sloping ramp around the perimeter of the raised island to maneuver around the continuous curve while maintaining reduced speed.

Design Guidelines: On the approach to roundabout, the design should consider narrowed streets and the installation of crosswalks to slow oncoming vehicles and provide pedestrians a safe, obvious opportunity to cross. The design should include a sloping ramp around the perimeter of the raised island for buses, trucks and other large vehicles to maneuver the continuous curve while maintaining reduced speed.

- **Material:** Landscaped when possible; refer to Planting/Furnishing Zone-Surface Treatments - Section 11. Roundabouts can also be hardscaped; refer to Medians-Section 4.
- **Dimensions:** The center island radius should be determined by the designer and approved by the District on a project-by-project basis. The circulatory roadway width should be less than 26'. Concrete truck aprons with minimum width of 6' should be provided on center island perimeter. Roundabouts should have a 2% cross slope away from the central island. General guidelines for designing a roundabout are in the table below.
- **Signage:** Powered traffic signals should not necessarily be required, but traffic controls should be used.
- **Plantings:** Diverters can incorporate landscaping. Refer to Planting/Furnishing Zone-Surface Treatments - Section 11.

Public Art Opportunities: Sculpture, fountains, and/or commemorative features, as approved by DDOT on a per project basis.

Reference

- DDOT Design Guidelines for Traffic Calming Measures for Residential Streets in the District of Columbia, July 2005.
- MUTCD, 2003 Section 3B.24

Low Impact Development (LID) Opportunity

- Refer to Chapter 5.

  Options 1, 2, 3, 4, 8, 9, 12, 13, 14, 15, 16, 17

Element: Rotaries **Reference:** 2.5(2)

Item: Traffic Islands

Classification: Minor Arterial, Collector, Local **Area Type:** Mixed-Use & Residential

Location: Intersections of local streets with high pedestrian or left-turn volumes, local streets where the Average Daily Traffic volumes do not exceed 3,500.

Purpose

Small-scale rotaries are designed for intersections that handle less volume to slow traffic from a wide street into a smaller local street. Traffic islands require drivers to slow to a speed to comfortably maneuver in a counterclockwise manner around the circular island. They caution drivers to proceed carefully and provide an opportunity for landscape or other enhancements.

Application

If sustained lowered speeds are desired, traffic islands should be designed in a series of traffic calming measures. Design should provide for bicyclist safety.

- **Restrictions:** The design of traffic islands should be reviewed and approved by DDOT before being implemented in the District.
- **Emergency Response Issues:** Traffic islands can restrict emergency or transit vehicle movement if vehicles are parked illegally near the circle.
- **Material:** Traffic islands can be hardscaped or landscaped. Refer to Medians-Section 4.
- **Signage:** Powered traffic control devices should not necessarily be required.
- **Plantings:** Traffic islands can incorporate landscaping.
- **Option:** Traffic islands can be mountable and/or landscaped.

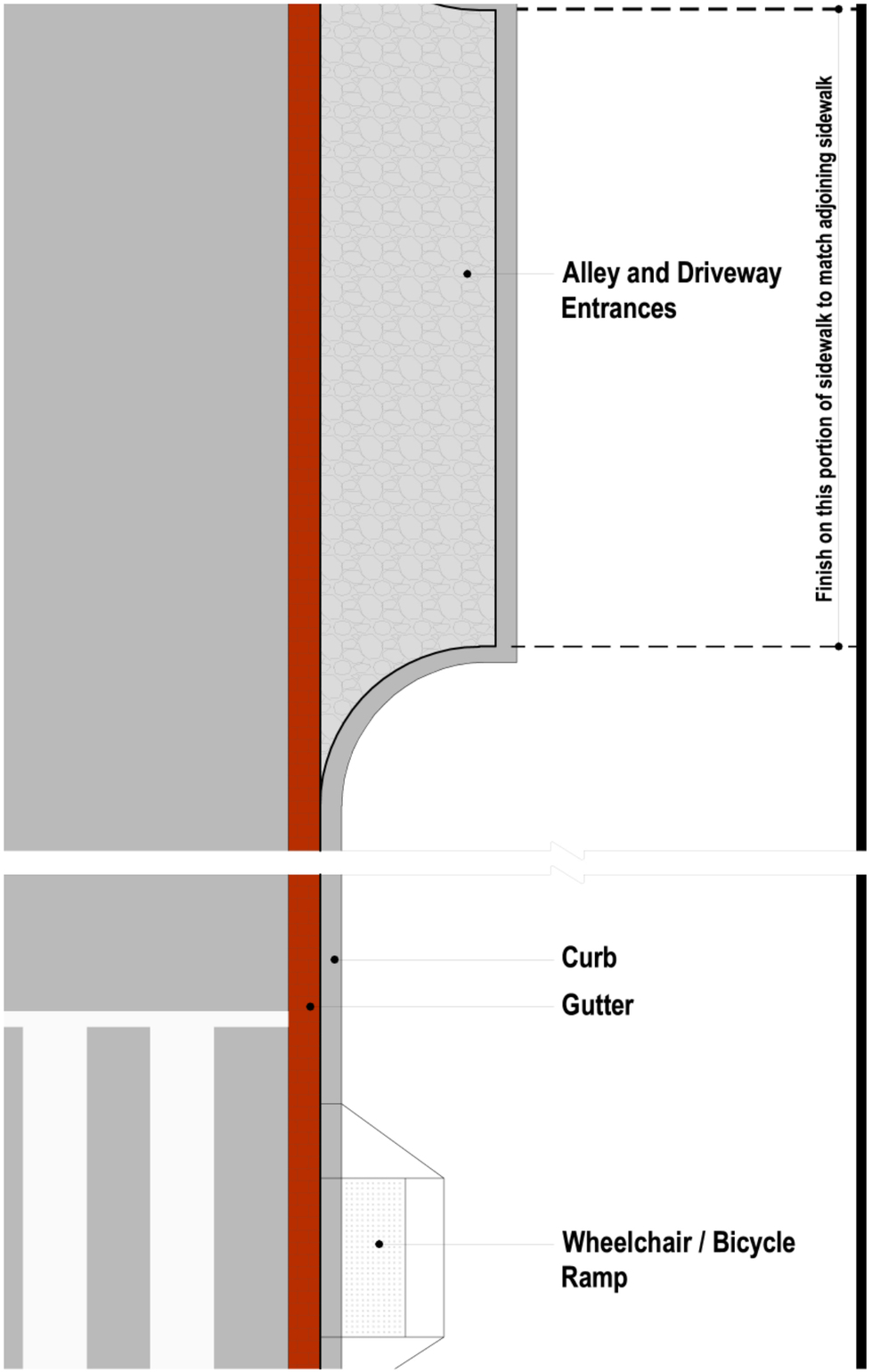
Reference

- MUTCD, 2003 Section 3A.01 for marking requirements.

Custom as approved by DDOT on a project basis.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Option 5, 6, 7, 17



Section 3: Roadway Edging and Transition to Sidewalk

ELEMENT	ITEM
3.1 Curb and Gutter	
	3.1(1) Stone Curb with Brick Gutter
	3.1(2) Bridge Stone Curb with Brick Gutter
	3.1(3) Concrete Flush Curb and Gutter
3.2 Wheelchair / Bicycle Ramps	
	3.2(1) Poured in Place Concrete
3.3 Alley and Driveway Entrances	
	3.3(1) Poured in Place Concrete

Element:	Curb and Gutter	**Reference:**	3.1(1)
Item:	Stone Curb with Brick Gutter		
Classification:	Principal Arterial, Minor Arterial, Collector, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	All roadways		

Purpose

Curbs define the transition between the roadway and sidewalk. Gutters convey stormwater to drainage inlets. Consistent with the usage of materials in the District, all urban streets should be edged with 7" stone curbs and brick gutters. All curbs at or near wheelchair/bicycle ramps should comply with the Americans with Disabilities Act.

Application

- **Curb Height:** 7" for roadways
- **Gutter Width:** 1' wide
- **Options:**
  - Special Segments / Symbolic Corridors: Inscribe the curb with anecdotes that celebrate the area's historic, environmental, or unique character.
  - Temporary: Asphalt curbs should be used only for temporary construction or repairs.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 609.02, 609.07
- Drawing 609.04

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 4, 9, 11

Element:	Curb and Gutter	**Reference:**	3.1(2)
Item:	Bridge Stone Curb with Brick Gutter		
Classification:	Principal Arterial, Minor Arterial, Collector, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment	**Area Type:**	Mixed-Use & Residential
Location:	Bridges		

Purpose

Curbs define the transition between the roadway and sidewalk. Gutters convey stormwater to inlets. Consistent with the usage of materials in the District, all bridges should be edged with 9" high stone curbs and brick gutters. All curbs at or near wheelchair/bicycle ramps should comply with the Americans with Disabilities Act.

Application

- **Curb Height:** 9" for bridges
- **Gutter Width:** 1' wide
- **Options:**
  - Symbolic Corridors / Special Segments: Inscribe the curb with anecdotes that celebrate the area's historic, environmental, or unique character.
  - Temporary: Asphalt curbs should be used only for temporary construction or repairs.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 609.02, 609.07
- Drawing 609.04

Element:	Curb and Gutter	**Reference:**	3.1(3)
Item:	Concrete Flush Curb		
Classification:	Greenway, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Along the length of roadway		

Purpose

This curb defines the transition between the paved roadway and clear zone. Flush curbs allow water to drain directly off the roadway, reducing the sheet flow generated from typical curbed gutters. To further manage stormwater runoff, the shoulder or clear zone can be incorporated with low impact development practice(s). Flush curbs also eliminate the need and cost of typical roadway drains, manholes and pipes, thus eliminating the need for culverts. All curbs at or near wheelchair/bicycle ramps should comply with the Americans with Disabilities Act.

Application

- **Curb Material:** Concrete
- **Curb Height:** 0”
- **Curb Width:** 1’
- **Curb Depth below finished grading:** As required.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 609.01

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 4, 9, 11

Section 3: Roadway Edging & Transition to Sidewalk

Element:	Wheelchair / Bicycle Ramp	**Reference:**	3.2(1)
Item:	Poured in Place Concrete		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	All intersections requiring crosswalks.		

Purpose

Accessible curb ramps provide persons with disabilities and other pedestrians with push carts, strollers, etc., a safe means of access to crosswalks. A dark grey tactile warning strip, as shown in the adjoining photograph, assists visually impaired persons.

Application

Typically intersections require two ramps at each corner, one for each direction of travel. All the ramps to be located at the corner center of a sidewalk should be pre-approved by the Traffic Safety Division. Wheelchair/bicycle ramps should comply with the latest laws and regulations of the Americans with Disabilities Act.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 609.04
- Drawing 609.06

Element:	Alley and Driveway Entrance	**Reference:**	3.3(1)
Item:	Poured in Place Concrete		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	At curb cuts which allow access to facilities located off the public right of way.		

Purpose

Curb cuts with driveway ramps are used to allow vehicular access to building driveways, parking garages, alleys and other facilities from the public right-of-way.

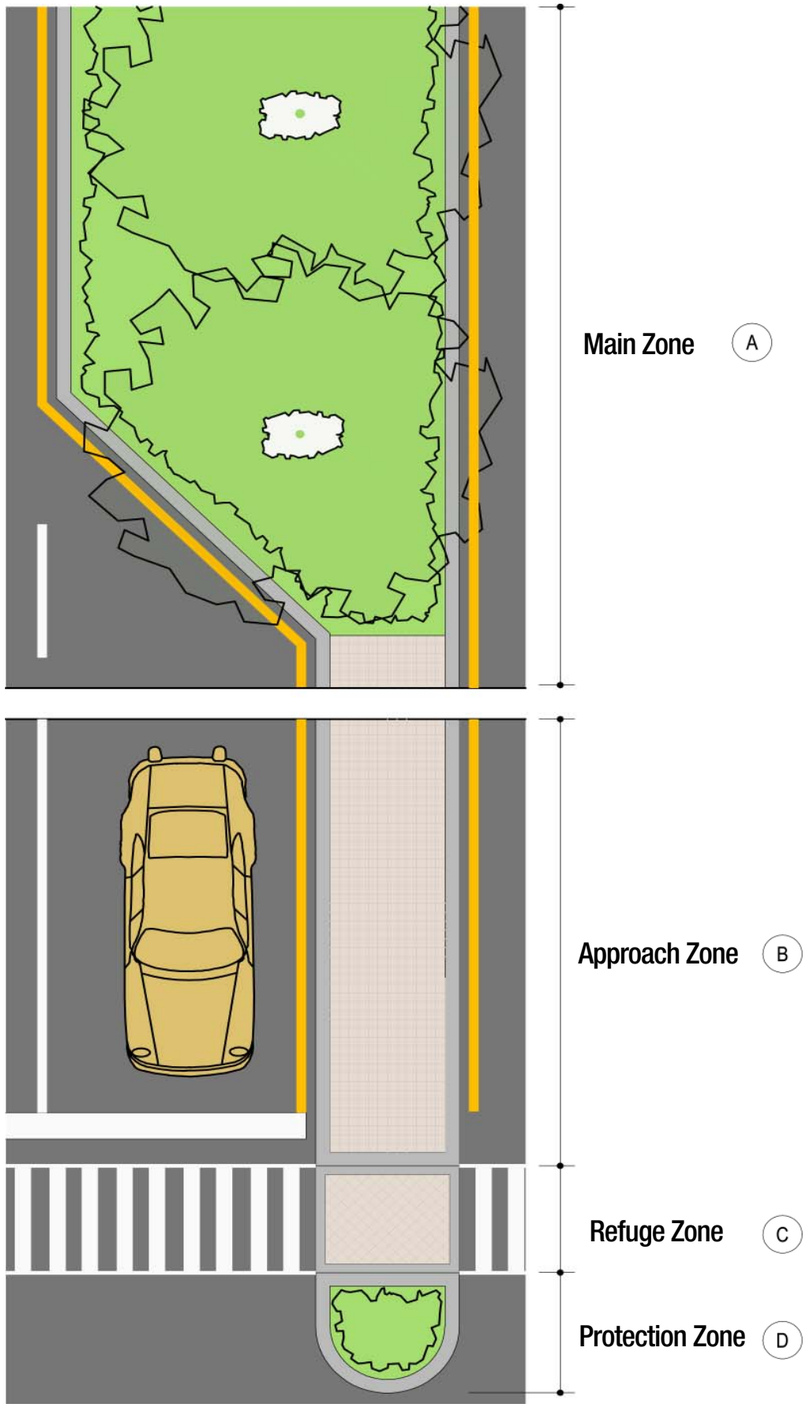
Application

If any driveway is wider than 25', then a 6' wide pedestrian island should be provided within driveways.

- **Orientation:**
  - All driveways should be perpendicular to the curb line.
  - All driveways should be flushed with the grade of the sidewalk till it reaches the flare.
- **Placement:** No driveway entrances should be constructed closer than 60' to an intersection (DC Standard).
- **Material:** Care should be taken to ensure that the material on the sidewalk, where the driveway intersects, is consistent with the adjoining portions of the sidewalk.
  - Ramp: Constructed with poured-in-place concrete, consistent with District Standards.
  - Driveway on Sidewalk: Consistent with adjoining sidewalk.
  - Gutter: At ramp base, material should be consistent with gutter material used along street.
  - Junction: Between ramp and sidewalk, a granite/concrete curb separator should be used to delineate sidewalk from ramp.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 504, 801, 83
- Drawings 504.01



Section 4: Medians

ELEMENT	ITEM	MAP REFERENCE
4.1 Main Zone		**A**
	4.1(1) Hardscape	
	4.1(2) Barrier Walls	
	4.1(3) Raised with Plantings	
	4.1(4) Softscape	
4.2 Approach Zone		**B**
	4.2(1) Hardscape	
4.3 Refuge Zone		**C**
	4.3(1) Hardscape	
4.4 Protection Zone		**D**
	4.4(1) Hardscape	

Element:	Main Zone	**Reference:**	4.1(1)
Item:	Hardscape		
Classification:	Principal Arterial, Minor Arterial, Collector, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Medians less than 4'-0" wide.		

Purpose

Narrow roadway medians can separate opposing vehicular traffic. Architectural treatments can provide a durable and attractive alternative for medians that function as visual, sound and safety barriers.

Application

Narrow medians less than 4'-0" in width are suitable for hardscape surfaces. Fencing may be necessary and should be approved by DDOT on a project-to-project basis. Materials selection for median Main Zone, Approach Zone and Protection Zone should be complementary.

- **Material:**
  - Concrete Pavers: Solid interlocking paving units to resist freezing and thawing when tested according to ASTM C 67, and be made from normal-weight aggregates.
  - Cobblestone
- **Color:**
  - To match sidewalk furnishing zone paving.

Reference

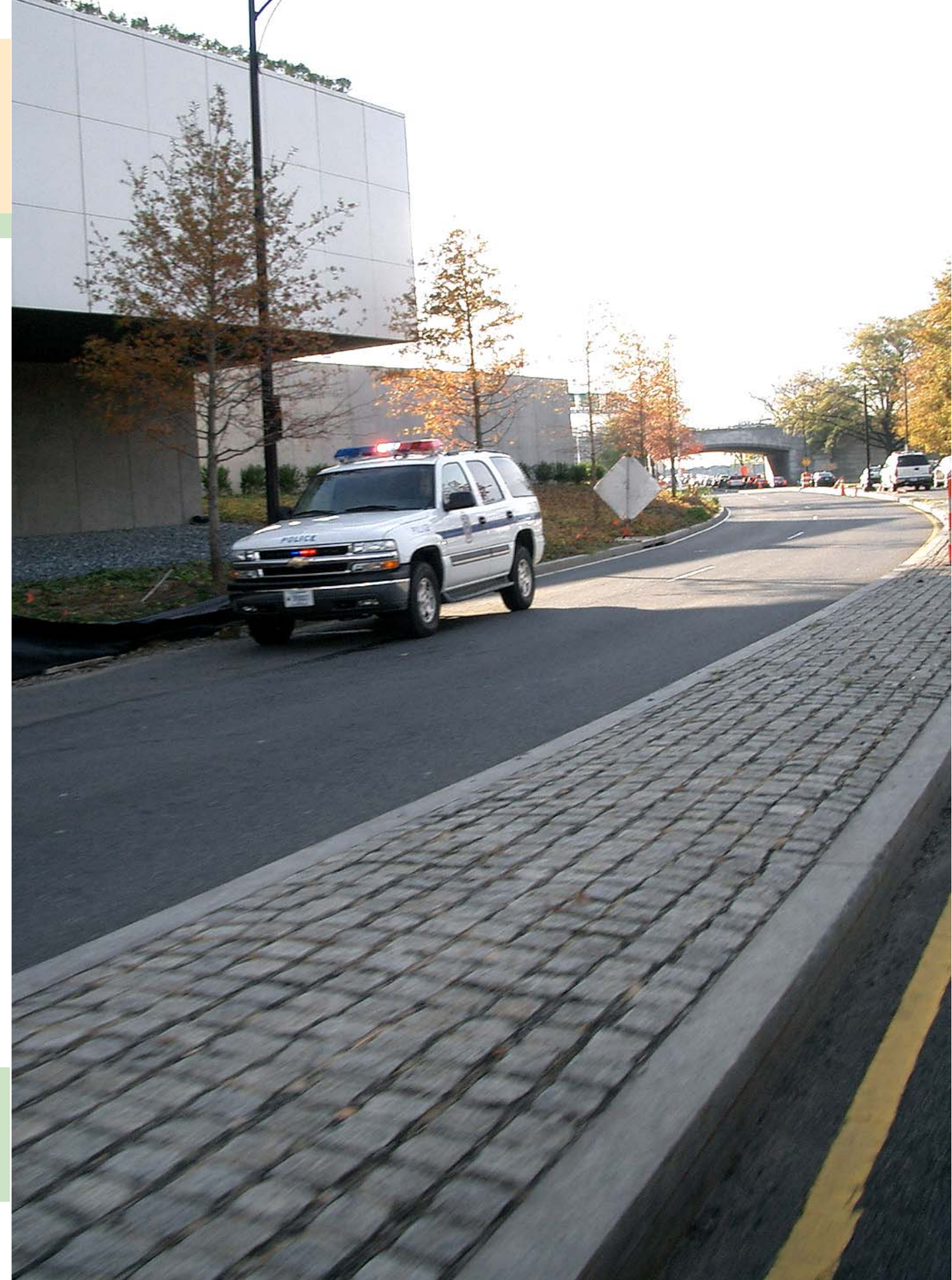
- ASTM C 936-01 "Standard Specification for Solid Concrete Interlocking Paving Units" and the attached material sheet.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 806, Drawing 601.02

Refer to Chapter 6 Item 3a. and 3b. for additional information on proposed guideline.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 4, 5, 6, 7, 10, 12, 13, 15, 17



Element:	Main Zone	**Reference:**	4.1(2)
Item:	Barrier Walls		
Classification:	Interstate, Freeway, Greenway	**Area Type:**	Mixed-Use & Residential
Location:	Medians less than 4'-0" wide.		

Purpose

Raised barrier walls on highway medians can serve as a visual shield to oncoming traffic and enhance safety on high-speed roadways.

Application

F-shape barriers may be used on freeway bridges when approved by the Chief Transportation Engineer. Higher median barriers may also be justified to reduce headlight glare.

Restrictions: Should meet AASHTO requirements for safety and crash standards**.** Exposed aggregate and other rough surface finishes should be avoided. Preferably, concrete safety barriers should be adjacent to a paved surface so that the wheels cannot dig into the soil and cause the vehicle to overturn.

- **Height:**
  - The standard height for F-shape barriers is 32".
  - 42" barriers on bridges carrying high volumes of truck traffic, may be justified with approval from DDOT
- **Crash:**
  - Every type of barrier used on District bridges should have passed crash tests accepted by the Federal Highway Administration.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 614.01
- Drawing No. 614

Element:	Main Zone	**Reference:**	4.1(3)
Item:	Raised with Plantings		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Medians more than 4'-0" wide		

Purpose

Raised planters in roadway medians can control pedestrian and vehicular circulation, as well as protect plants and trees from harmful pollutants from the roadway surface. Materials selection for median Main Zone, Approach Zone and Protection Zone should be complementary. Medians can also provide the space to implement Low Impact Development strategies.

Application

Suitability of planting material corresponds to median width:

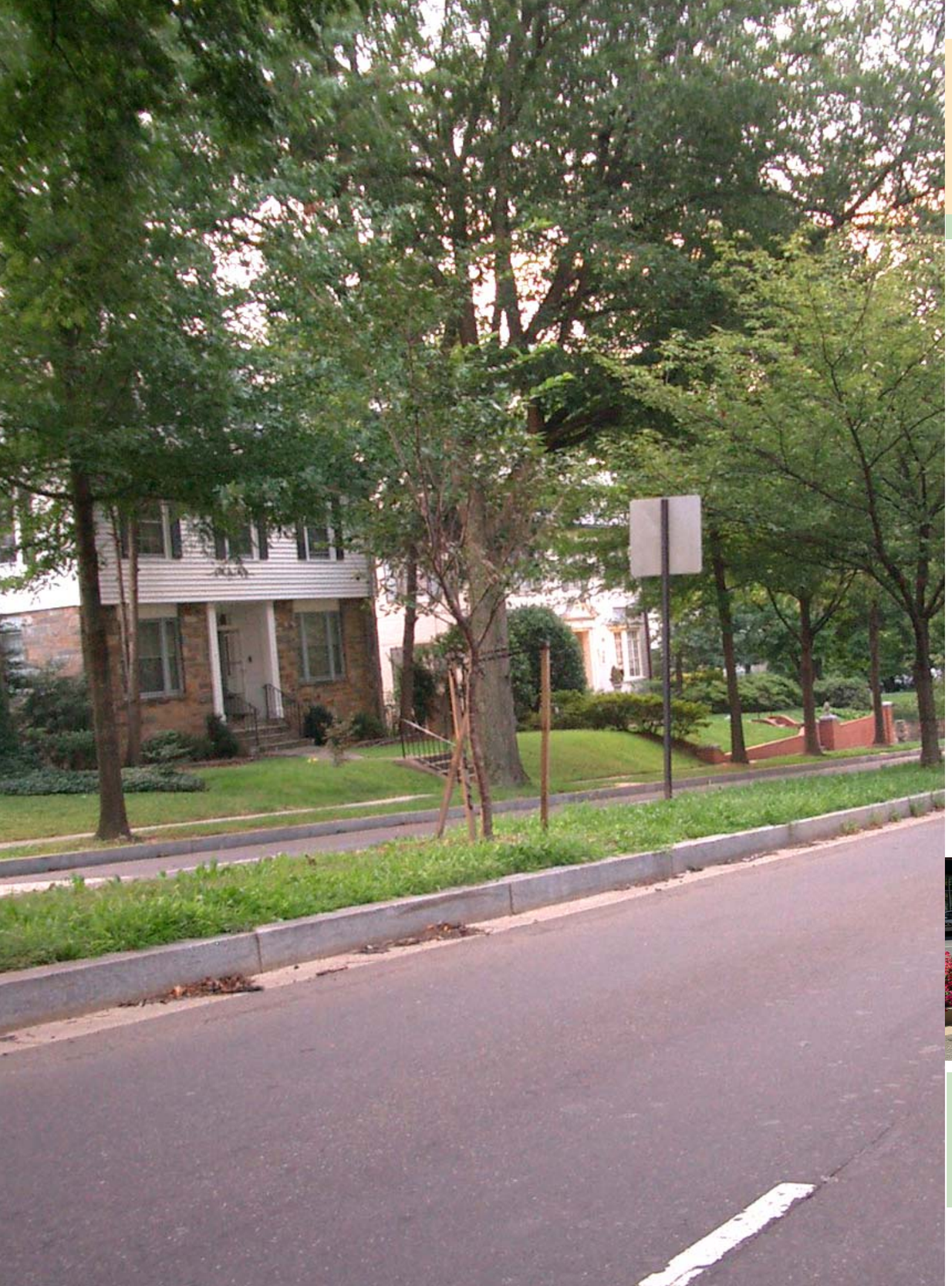
Median Widths	Planting Type
4'-0" and 6'-0"	Understory planting, columnar tree, shade tree
6'-0" and wider	Understory planting, columnar tree, shade tree, ornamental tree

Species: Refer to Sections 10 and 11 for tree species and planting/furnishing zone-surface treatment recommendations. Any tree planting in raised planters should be evaluated by DDOT for branching height and line of sight.

Height: The height of planter boxes should be evaluated by DDOT for branching height and line of sight.

Option: Understory plantings may be used near crosswalks and major intersections for color interest and textural enhancement.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 609.01



Element:	Main Zone	**Reference:**	4.1(4)
Item:	Softscape		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Medians more than 4'-0" wide		

Purpose

Roadway medians can control pedestrian circulation, enhance safety and protect plants and trees from harmful pollutants from the roadway surface. Materials selection for median Main Zone, Approach Zone and Protection Zone should be complementary. Medians can also provide the space to implement Low Impact Development strategies.

Application

The width of the median should determine the type of planting or softscape. Understory plantings may be used near crosswalks and major intersections for color interest and textural enhancement.

- Suitability of planting material corresponds to median width:

Median Widths	Planting Type
4'-0" - 6'-0"	Lawns, understory planting, columnar tree
6'-0" - 10'-0"	Lawns, understory planting, columnar shade or ornamental tree
10'-0" - 16'-0"	Lawns, understory planting, ornamental tree, shade tree
16'-0" and wider	Lawns, understory planting, double row of ornamental trees/shade trees

Floral color display may be installed by others as approved by DDOT.

Species: Refer to Sections 10 and 11 for tree species and planting/furnishing zone-surface treatment recommendations.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 1, 2, 3, 8, 14, 15, 16, 17

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Drawing 601.02

Element:	Approach Zone	**Reference:**	4.2(1)
Item:	Hardscape		
Classification:	Principal Arterial, Minor Arterial, Collector, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Medians less than 4'-0" wide.		

Purpose

Median approach zones indicate a change in traffic circulation.

Application

A medians Main Zone may narrow as it reaches an intersection. Materials selection for median Main Zone, Approach Zone and Protection Zone should be complementary.

- **Material:**
  - Concrete Pavers: Solid interlocking paving units to resist freezing and thawing when tested according to ASTM C 67, and be made from normal-weight aggregates.
  - Cobblestone
- **Color:**
  - To match sidewalk furnishing zone paving.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 806, Drawing 601.02

Refer to Chapter 6 Item 3a and 3b. for additional information on proposed guideline.

Element:	Refuge Zone	**Reference:**	4.3(1)
Item:	Hardscape		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Area between the approach zone and the protection zone at pedestrian crosswalk.		

Purpose

Refuge areas provide a safe place for pedestrians to stand or wait within the median.

Application

Surface treatment should meet ADA requirements and complement median and sidewalk hardscape.

- **Material:**
  - Concrete Pavers: Solid interlocking paving units to resist freezing and thawing when tested according to ASTM C 67, and be made from normal-weight aggregates.
- **Color:**
  - To match sidewalk furnishing zone paving.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 806, Drawing 601.02

Refer to Chapter 6 Item 3b. for additional information on proposed guideline.

Element:	Protection Zone	**Reference:**	4.4(1)
Item:	Hardscape		
Classification:	Principal Arterial, Minor Arterial, Collector, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Area at the end of a median if a refuge zone is present.		

Purpose

Protection zones in medians provide a physical safety barrier for pedestrians waiting in the refuge zone. Materials selection for median Main Zone, Approach Zone and Protection Zone should be complementary.

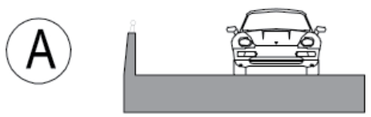
Application

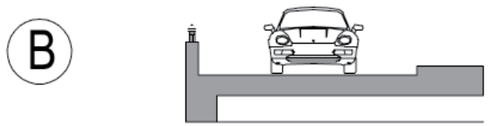
Surface treatment should complement median and sidewalk hardscape. Some protection zones may include bollards covered in Section 8.5 Safety Posts.

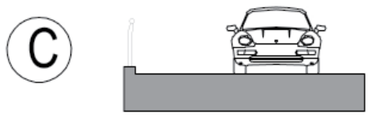
- **Material:**
  - Concrete Pavers: Solid interlocking paving units to resist freezing and thawing when tested according to ASTM C 67, and be made from normal-weight aggregates.
  - Cobblestone
- **Color:**
  - To match sidewalk furnishing zone paving.

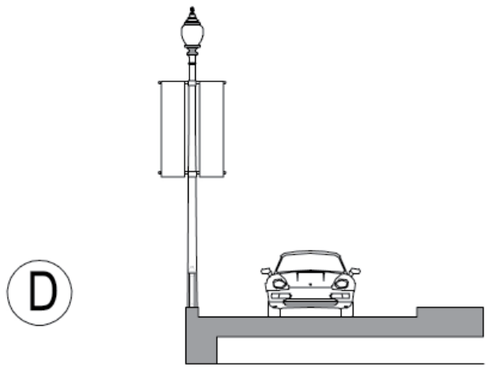
AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 806, Drawing 601.02

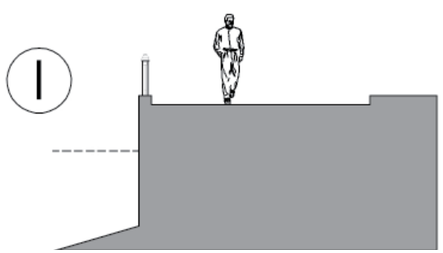
Refer to Chapter 6 Item 3a. and 3b. for additional information on proposed guideline.











Section 5: Walls and Railings

ELEMENT	ITEM		MAP REFERENCE
5.1 Wall Cladding			
	5.1(1)	Ashlar/Regular Pattern Masonry	
5.2 Vehicular Railings			
	5.2(1)	Composite Railings	A
	5.2(2)	Composite Railings	B
	5.2(3)	Independent Metal Railings	C
	5.2(4)	Integrated Metal Railings	D
	5.2(5)	Independent Metal Barriers	E
5.3 Pedestrian Railings			
	5.3(1)	Standard Metal/Traditional Concrete Railing	F - I

Element:	Wall Cladding	**Reference:**	5.1(1)
Item:	Ashlar/Regular Pattern Masonry		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Retaining walls and other vertical surfaces which require cladding material		

Purpose

Cladding on walls at underpasses and on planter boxes, parapets and other vertical elements is an important visual element of the transportation infrastructure. Materials and styles should be chosen to complement its character and context. For example, symbolic corridors are high visibility streets leading directly to the US Capitol. Granite along these corridors impose a stately quality and solidity. to reinforce their import and significance. Greenways are distinctive within the District's roadway system; the use of Ashlar cladding along retaining walls along the Anacostia Area's highways and greenways integrates these roads into the larger "Washingtonian Greenway" system. Limestone, relatively inexpensive compared to granite, is used on streets with wide rights-of-way that are not classified as Symbolic Corridors, but that do require treatment with dense materials. Limestone has been used on other District streets as a base for public sculptures, parapet walls and other vertical surfaces. Its use on the Anacostia corridors will visually integrate the area with the District.

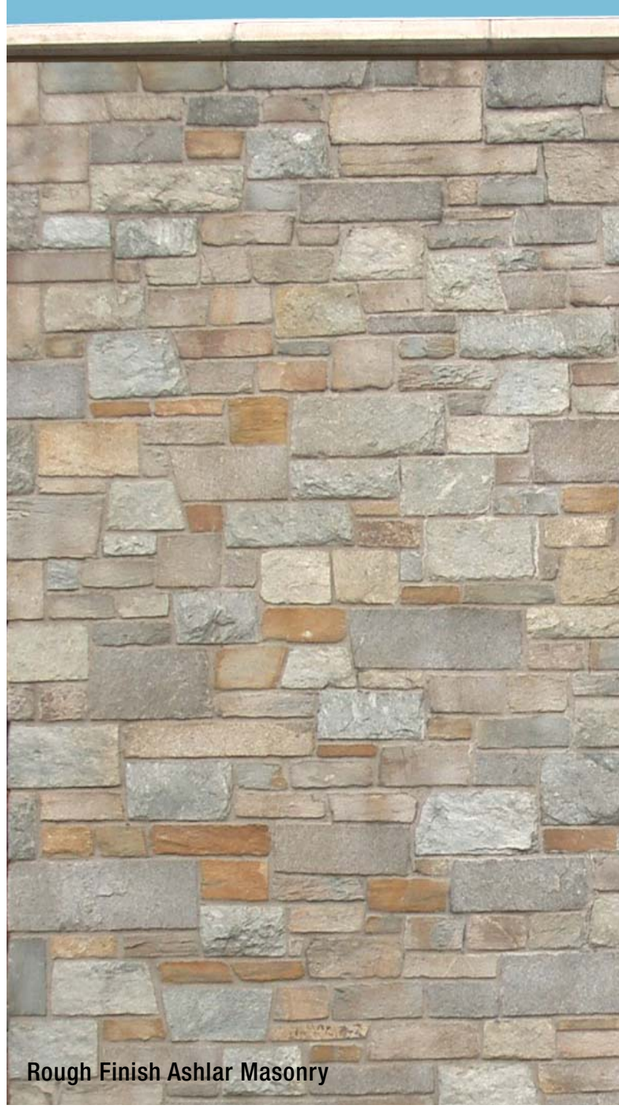
Application

All barriers and safety devices that will be clad should adhere to DDOT Standards.

- **Materials:** Natural, high life-cycle materials, resistant to urban wear and tear.
  - Granite
  - Sandstone
  - Quartzite
  - Gneiss
  - Limestone
- **Stone Selection Criteria:**
  - Color
  - Grade
  - Compatibility
  - Porosity
  - Hardness
- **Back-up Structure:**
  - Poured concrete.
  - Pre-cast concrete, or as required.
- **Pattern:** Random, regular or broken coursed Ashlar.
- **Maintenance:** Surface should be coated (finished) to allow easy removal of paint and other graffiti material.
- **Option:** Public Art features and seating may be incorporated

Note: Alternative materials include precast or poured in place architectural concrete and brick, as approved by DDOT

Regular Pattern Masonry



Rough Finish Ashlar Masonry

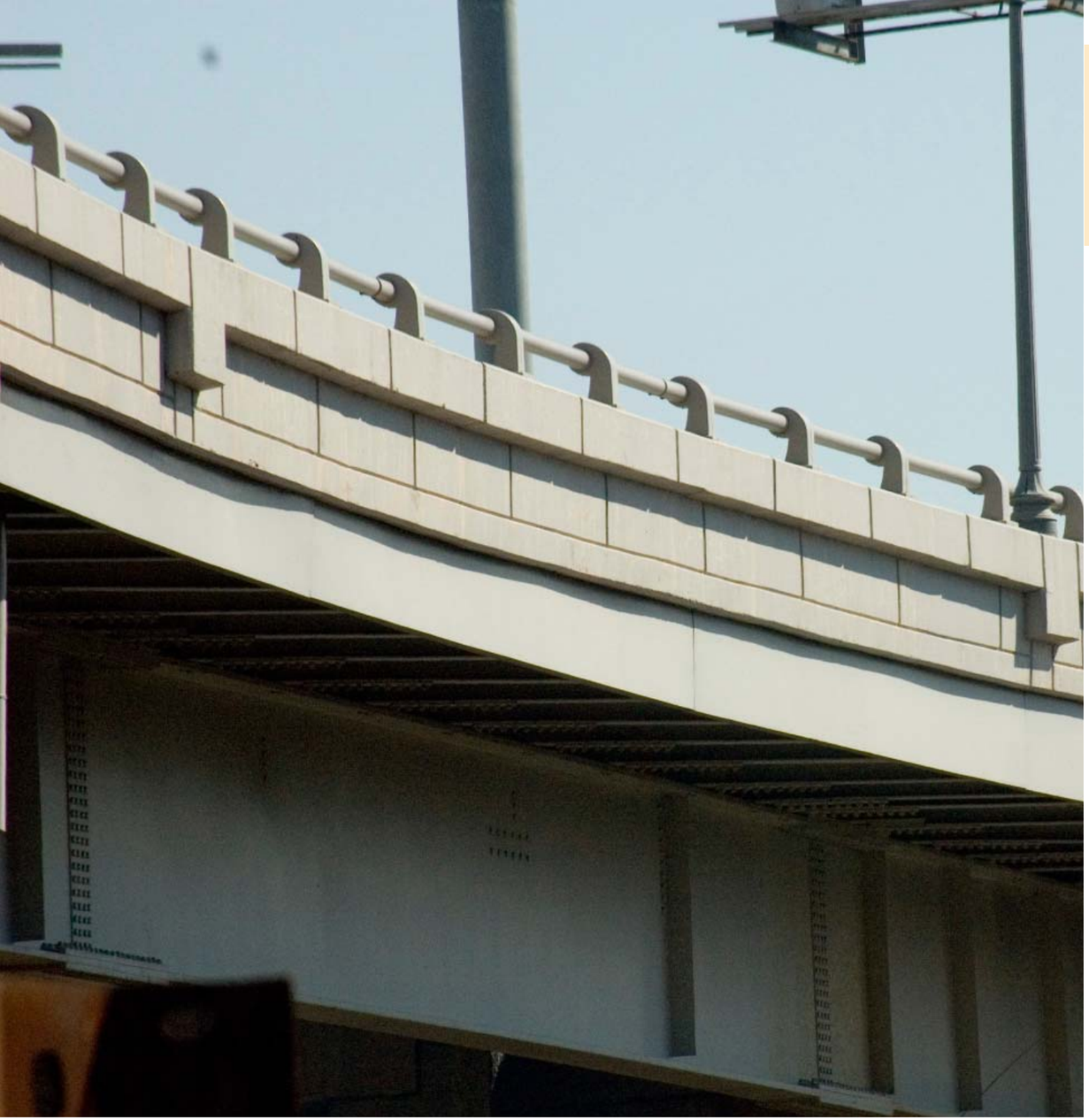
Architectural Finish Ashlar Masonry

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 708
- Specification Section 703 (Poured-in-place concrete)
- Specification Section 806.1 (Brick)

AWI Specific Guideline-

Refer to Chapter 6 item 1b. for information on precast architectural concrete guideline. Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2005 - Section 703. for information on formed lined concrete guideline.



Element:	Vehicular Railings	**Reference:**	5.2(1)
Item:	Composite Railings		
Classification:	Interstate, Freeway, Greenway, River Crossing, Waterfront Access Segment	**Area Type:**	Mixed-Use & Residential
Location:	Along bridges and overpasses		

Purpose

On elevated interstates and other freeways, a Standard DDOT railing integrated with a parapet wall may be used. Composite metal railings include railings that are part of a concrete or masonry structure to meet safety requirements

Specific designs for railings should be created by the designer and should adhere to DDOT Standards for safety and crash tests requirements.

Application

- **Material:**
  - Aluminum
  - Steel
- **Dimensions:** As approved by DDOT on a project by project basis.
- **Color:** Red, Black, Patina Green, as approved by DDOT
- **Finish:**
  - Anodized aluminum
  - Painted aluminum
  - Painted steel
- **Joints:** 1” expansion joints between lengths of railing.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 709

Element:	Vehicular Railings	**Reference:**	5.2(2)
Item:	Composite Railings	**Area Type:**	Mixed-Use & Residential
Classification:	Principal Arterial, Minor Arterial, Collector, Local, River Crossing, Waterfront Access Segment		
Location:	Along bridges and overpasses		

Purpose

Composite metal railings include railings that are part of a concrete or masonry structure to meet safety requirements. Urban roadways requiring metal railings may be integrated with concrete/masonry parapets and other masonry structures as required by DDOT. Railings in urban areas should also provide safety for pedestrians.

Specific designs for railings should be created by the designer but should adhere to DDOT standards for safety and crash tests requirements. Railings should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Material:**
  - Aluminum
  - Steel
- **Dimensions:** As approved by DDOT on a project by project basis.
- **Finish:**
  - Anodized aluminum
  - Painted aluminum
  - Painted steel
- **Color:** Custom, as approved by DDOT.
- **Joints:** 1" expansion joints between lengths of railing.
- **Color:** Red, Black, Patina Green, as approved by DDOT.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 709

Element:	Vehicular Railings	**Reference:**	5.2(3)
Item:	Independent Metal Railings		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Greenway	**Area Type:**	Mixed-Use & Residential
Location:	Along bridges and overpasses		

Purpose

Independent metal railings include railings that are mounted to a structure and provide most of the safety barrier.

Specific designs for railings should be created by the designer and should adhere to DDOT Standards for safety and crash tests requirements. Railings should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Material:** Metal, integrated.
  - Aluminum
  - Steel
- **Dimensions:** As approved by DDOT on a project by project basis.
- **Finish:**
  - Anodized aluminum
  - Painted aluminum
  - Painted steel
- **Color:** Red, Black, Patina Green, as approved by DDOT.
- **Joints:** 1” expansion joints between lengths of railing.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 709

Element:	Vehicular Railings	**Reference:**	5.2(4)
Item:	Integrated Metal Railings		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Along bridges and overpasses		

Purpose

Integrated Metal Railing include railings that are integrated with site features such as lights , signs, artwork, etc

Specific designs for railings should be created by the designer but should adhere to DDOT standards for safety and crash tests requirements. Railings should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Material:**
  - Aluminum
  - Steel
- **Dimensions:** As approved by DDOT on a project by project basis.
- **Finish:**
  - Anodized aluminum
  - Painted aluminum
  - Painted steel
- **Color:** Red, Black, Patina Green, as approved by DDOT.
- **Joints:** 1" expansion joints between lengths of railing.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 709

Element:	Vehicular Railings	**Reference:**	5.2(5)
Item:	Independent Metal Barriers		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing	**Area Type:**	Mixed-Use & Residential
Location:	On curbs along bridges with pedestrian/bike paths, on greenways along medians and other places with insufficient space for walls.		

Purpose

As the District enhances multi-modal transportation, a right-of-way will increasingly be shared among its users, including vehicles, pedestrians, bikers and/or transit. Along corridors where pedestrians and bikers travel on sidewalks or paths adjacent to fast moving vehicular traffic, curb barriers can be installed to separate the types of travel lanes to ensure safety and comfort for all users.

Specific designs for railings should be created by the designer but should adhere to DDOT Standards for safety and crash tests requirements. Railings should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Material:**
  - Steel
- **Dimensions:** As approved by DDOT on a project by project basis.
- **Finish:** Painted steel.
- **Color:** Custom color.
- **Joints:** 1” expansion joints between lengths of railing.

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 709

Element:	Pedestrian Railings	**Reference:**	5.3(1)
Item:	Standard Metal/Traditional Concrete Railings		
Classification:	Principal Arterial, Minor Arterial, Collector, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Along the external face of bridges, overpasses, and along waterfronts for pedestrian safety.		

Purpose

In areas where pedestrians and bikers travel on sidewalks or paths on bridges or along waterfronts, pedestrian railings should be used to ensure their safety and comfort. Railings may be integrated with parapet walls, to provide vertical surfaces for public art, and integrated seating.

Specific designs for railings should be created by the designer but should adhere to DDOT standards for safety and crash tests requirements. Unique and innovative railing designs are encouraged with the overall goal of complementing the surrounding developments and creating a memorable experience for the residents and visitors of Washington DC. For example, traditional railings should blend into the monumental core of Washington DC. Along waterfronts, independent, open-designed railings that are not mounted on parapet walls allow an unimpeded view of the waterfront. Since these railings will be in close view of pedestrians, care should be given to details and finish. Railings should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Material:**
  - Aluminum
  - Steel
  - Precast Concrete
  - Metal/Timber/Plexi Glass Combinations
- **Dimension, Color, Finish:** As approved by DDOT on a project by project basis.
- **Options:**
  - Artwork, lighting, and other interesting features can be incorporated into the design.
  - Railings may incorporate additional fencing to prevent missiles from being thrown from overpass structures.

Example of Standard Metal Railing

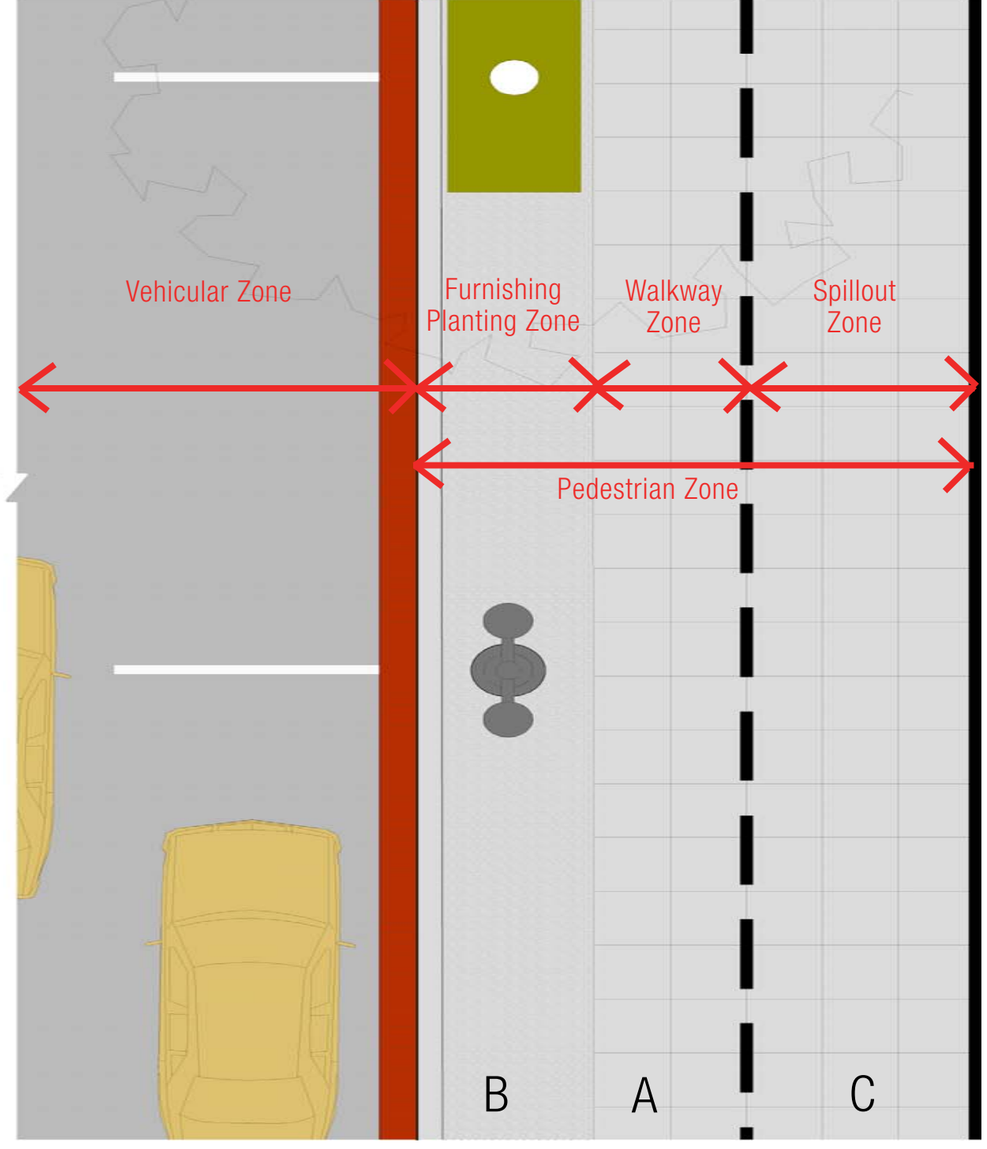
District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 709

AWI Specific Guideline-

Refer to Chapter 6 item 1b. for information on traditional independent concrete railing guideline.

Example of Traditional Independent Concrete Railing



The Pedestrian Zone is made up of three zones:

A) Priority 1- Walkway Zone - Minimum Width 5'0"

B) Priority 2 - Furnishing/Planting Zone - Minimum Width 4'-0", Preferred Width 6'0" (Refer to Section 11)

C) Priority 3 - Spill Out Zone - Minimum Width 2'0'

If space is limited and there is no room for all three zones priority will be given to the walkway zone. The minimum width of a walkway is 5' and the minimum width of a furnishing planting zone is 4'. Therefore typical pedestrian zones narrower than 9' cannot accommodate both a Furnishing/Planting Zone and a Walkway Zone. The Walkway Zone should be clear of all vertical elements such as signs, lights, trees, above ground utility boxes, etc. Those features should be placed in the Furnishing/ Planting Zone. The Spill Out Zone is an area which can be occupied by businesses to extend their services.

Section 6: Walkway and Spillout Zones

ELEMENT	ITEM
6.1 Walkways	
	6.1(1) Poured in Place Concrete
	6.1(2) Pressed Concrete Unit Pavers
	6.1(3) Exposed Aggregate Concrete
	6.1(4) Brick
	6.1(5) Asphalt
6.2 Plazas	
	6.2(1) Special Pedestrian Paving

Items

Element:	Walkway	**Reference:**	6.1(1)
Item:	Poured in Place Concrete		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, River Crossing, Waterfront Access Segment	**Area Type:**	Mixed-Use & Residential
Location:	All sidewalks along non-historic streets.		

Purpose

In order to visually integrate the area with the rest of the District, the sidewalks will be finished, per District's standards, with poured-in-place concrete. Panel size and other treatment are at the discretion of the designer and the relevant DDOT authorities.

Application

Concrete pavement should be used at a minimum in sidewalks. When room is available, a furnishing/planting zone is provided between the sidewalk and the roadway curb.

- **Color:** Grey

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 608.01
- Drawing No. 608.01

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Option 5

Element:	Walkway	**Reference:**	6.1(2)
Item:	Pressed Concrete Unit Pavers		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Waterfront Promenade	**Area Type:**	Mixed-Use & Residential
Location:	Option for all sidewalks		

Purpose

As an alternative to poured-in-place concrete, several streets in the District's downtown use pressed concrete pavers commonly known as London Pavers. The use of this material provides another tool to visually integrating areas with the downtown District.

Application

This material should be used in walkway and spill out zones in mixed-use areas only.

- **Manufacturer and Product:** Nitterhouse or Approved Equal

  Size: 24" x 36"

  Color: Light grey (PG 7)

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 608.04, 806.02
- Drawing No. 608.03

Element:	Walkway	**Reference:**	6.1(3)
Item:	Exposed Aggregate Concrete		
Classification:	Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment	**Area Type:**	Mixed-Use & Residential
Location:	All sidewalks		

Purpose

Exposed aggregate closely matches the material imagined in the original 1902 design of the Monumental Core. The Monumental Core attracts many visitors – tourists as well as residents and commuters. A stated goal of the Anacostia Waterfront Framework plan is to integrate the Monumental Core with the Anacostia area. In addition, the Legacy Plan proposes the addition of several monuments to be located outside the Monumental Core, specifically along its waterfronts. In order to reinforce the connection to the Monumental Core and to highlight the L'Enfant Avenues, sidewalks along Symbolic Corridors should be of Exposed Aggregate Concrete, a material similar to that on sidewalks throughout the Monumental Core.

Application

Exposed aggregate concrete should be used in areas classified as Symbolic Corridors. Designers and the relevant DDOT authorities may upgrade this minimum standard. All exposed aggregate pavement mock ups should be approved by DDOT before final placement of the finished work is completed.

AWI Specific Guideline -

Refer to Chapter 6 Item 1c. for information on proposed guideline.

Element:	Walkway	**Reference:**	6.1(4)
Item:	Brick		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Waterfront Promenade, Park Road	**Area Type:**	Mixed Use & Residential
Location:	Only within Historic Districts and along Waterfront Promenade, and Park Road		

Purpose

In addition to brick sidewalks along corridors in mixed-use areas, incorporating brick in residential area sidewalks ensure that Historic Areas have a coherent identity. Brick paving in sidewalks is used throughout the District in historic areas. This material may blend in well with existing buildings or with proposed buildings that try to mimic the historic character of an area.

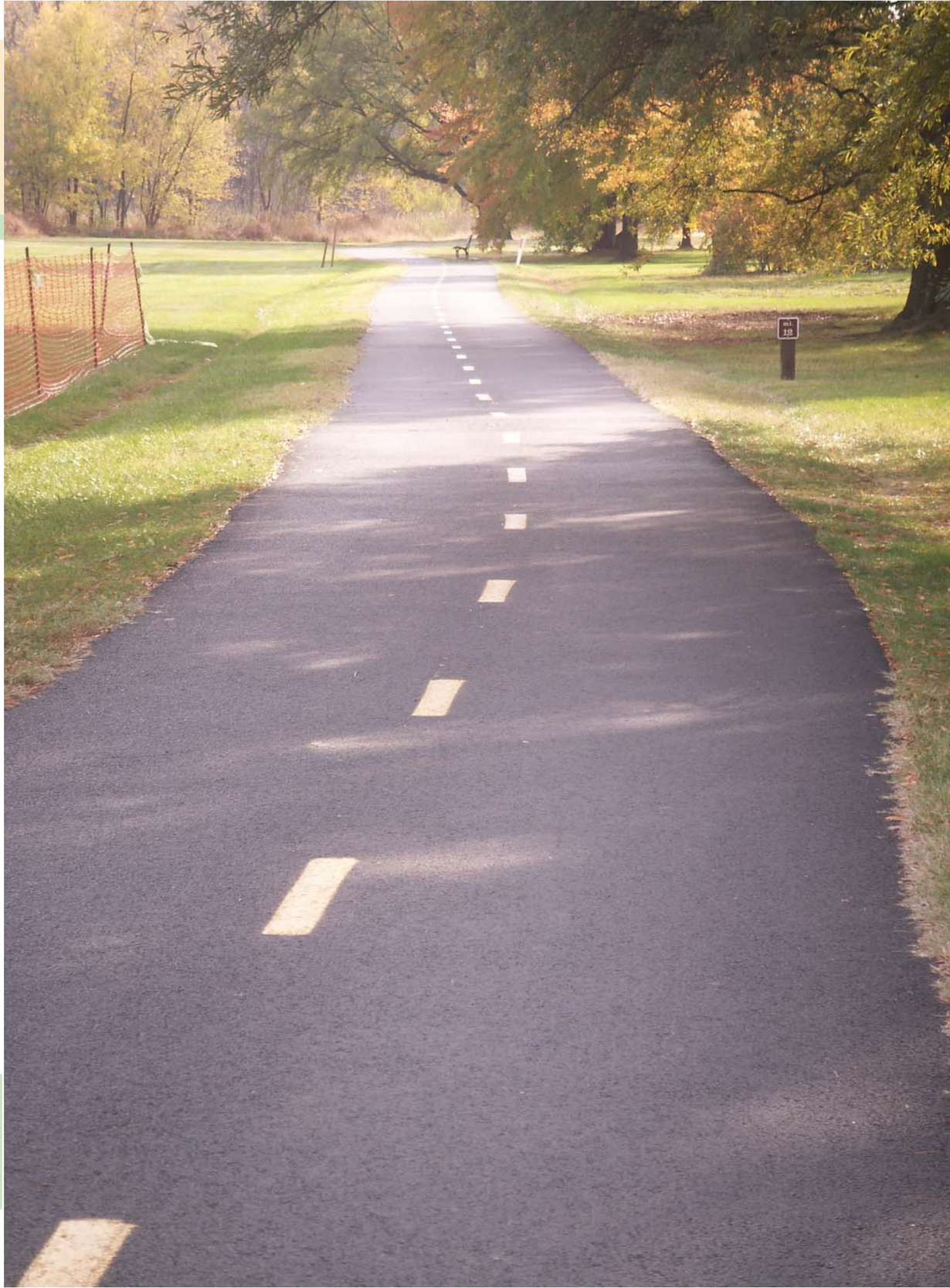
District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 608.04
- Drawing No. 608.04

Element:	Walkway	**Reference:**	6.1(5)
Item:	Asphalt		
Classification:	Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Used for designated multi-use trail		

Purpose

A stated goal of the Anacostia Waterfront Framework plan is to create a lively waterfront, which allows for a variety of recreational activities. Biking, jogging and other activities are part of this "lively waterfront". Asphalt is a material that is conducive to such activities and should be used along paths designated to bicyclists, joggers, and other pedestrians. If applicable, dimensions, striping, and graphics in pavements should be coordinated with requirements stated in the District of Columbia Bicycle Master Plan and the DDOT Bicycle Facility Design Guide.

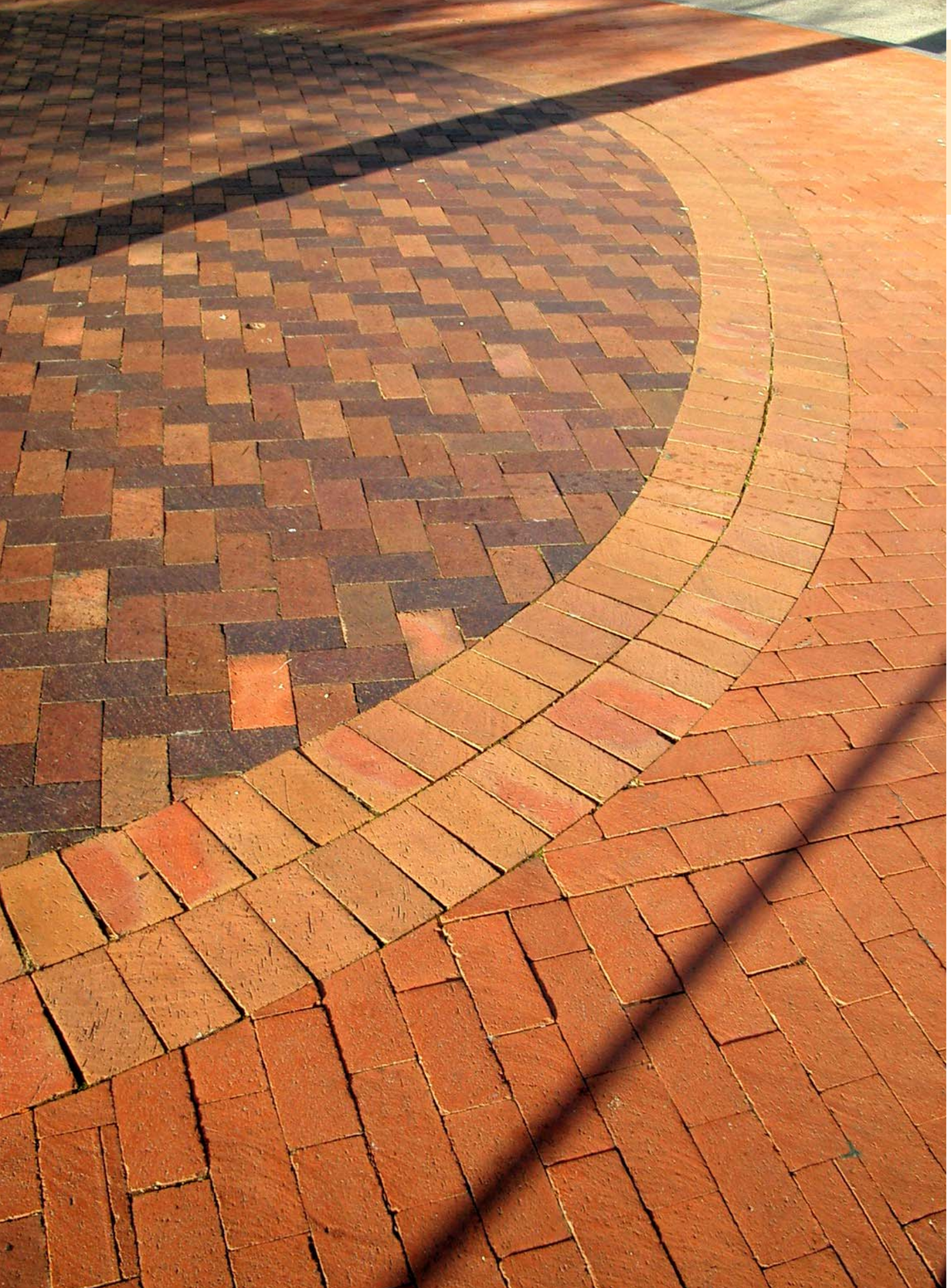


District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 608.03

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Option 6



Element:	Plazas	**Reference:**	6.2(1)
Item:	Special Pedestrian Paving		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use
Location:	Exclusively in pedestrian plazas at intersections where transit shelters are located.		

Purpose

Public open spaces where the gathering of people is encouraged, as decided by DDOT, may be treated with Special Pedestrian Paving. Furthermore, increasing public transit ridership is a goal of the District. Therefore, the public realm along transit corridors and/or any other surface transit can be highlighted with the use of colored unit pavers laid in specific patterns. Concrete unit pavers can also be used to highlight those intersections where transit shelters are located.

Materials may include a combination of unit pavers, brick, or exposed concrete depending upon the sidewalk materials used in nearby areas. Installation should be coordinated with utilities to avoid conflicts.

Custom as approved by DDOT on a project basis.

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Section 7: Lighting

ELEMENT	ITEM	
7.1 Fixtures		
	7.1(1)	Upright Pole #14
	7.1(2)	Upright Pole #16
	7.1(3)	Upright Pole #18
	7.1(4)	Upright Pole Twin 20
	7.1(5)	Teardrop Pendant

Element:	Fixtures	**Reference:**	7.1(1)
Item:	Upright Pole #14		
Classification:	Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Mid-block, plazas, pedestrian areas, and parks		

Purpose

Upright Pole #14 light fixtures provide illumination for pedestrian and vehicular safety at mid blocks, and the areas between intersections. The low pole height is intended to provide a safe pedestrian environment and should be considered in plazas, parks and other pedestrian areas. The Washington Globe will unify the lighting in Anacostia with historic DC.

Application

Not recommended for intersection lighting.

Where possible, minimize impact on off-site areas and minimize conditions to sky glow by using technology that reflects light downward or towards an intended surface to be illuminated.

Reference

- District of Columbia Streetlight Policy and Design Guidelines

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 618.01
- Drawing No. 618.01

Element:	Fixtures	**Reference:**	7.1(2)
Item:	Upright Pole #16		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Designated Transit Corridor, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Mid-block, plazas, pedestrian areas, and parks.		

Purpose

Upright Pole #16 light fixtures provide illumination for pedestrian and vehicular safety at mid blocks, and the areas between intersections. The mid pole height is suitable for both pedestrian and vehicular illumination and should be considered for plaza and parks where these meet roadways. The Washington Globe will unify the lighting in Anacostia with historic DC.

Application

Not recommended for intersection lighting.

Where possible, minimize impact on off-site areas and minimize conditions to sky glow by using technology that reflects light downward or towards an intended surface to be illuminated.

Reference

- District of Columbia Streetlight Policy and Design Guidelines

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 618.01
- Drawing No. 618.01

Element:	Fixtures	**Reference:**	7.1(3)
Item:	Upright Pole #18		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Designated Transit Corridor, Special Segment, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Mid-block		

Purpose

Upright Pole #18 light fixtures provide illumination for pedestrian and vehicular safety at mid blocks, and the areas between intersections. The Washington Globe will unify the lighting in Anacostia with historic DC.

Application

Not recommended for intersection lighting.

Where possible, minimize impact on off-site areas and minimize conditions to sky glow by using technology that reflects light downward or towards an intended surface to be illuminated.

Reference

- District of Columbia Streetlight Policy and Design Guidelines

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 618.01
- Drawing No. 618.01

Element:	Fixtures	**Reference:**	7.1(4)
Item:	Upright Pole Twin 20		
Classification:	Principal Arterial, Minor Arterial, Collector, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing	**Area Type:**	Mixed-Use & Residential
Location:	Mid-block and intersections		

Purpose

Twin 20 light fixtures provide quality lighting at mid-block and may be used instead of the Teardrop Pendant at intersection locations for pedestrian and vehicular safety. The Washington Globe will unify the lighting in Anacostia with historic DC.

Application

Where possible, minimize impact on off-site areas and minimize conditions to sky glow by using technology that reflects light downward or towards an intended surface to be illuminated.

- Orientation of lamp arms should be parallel to curb.

Reference

- District of Columbia Streetlight Policy and Design Guidelines

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 618.01
- Drawing No. 618.02

Element:	Fixtures	**Reference:**	7.1(5)
Item:	Teardrop Pendant		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Intersections and mid-block		

Purpose

The teardrop pendant provides lighting at intersections for pedestrian and vehicular safety. Teardrop Pendant may also be used at mid blocks if required by DDOT. This light is a DC Standard and will unify Anacostia with historic DC.

Application

On Designated Transit Corridors that pass through traditional neighborhoods, the fixture should be used in mid-block locations to provide support for Overhead Contact System (OCS) wires for Streetcars.

Where possible, minimize impact on off-site areas and minimize conditions to sky glow by using technology that reflects light downward or towards an intended surface to be illuminated.

- **Light Post Color:**
  - Black
- Orientation of lamp arm should be perpendicular to curb.
- **Option:** Double Arm

Reference

- District of Columbia Streetlight Policy and Design Guidelines

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 618.01
- Drawing No. 618.03

Section 8: Furnishing

ELEMENT	ITEM
8.1 Seating	
	8.1(1) Traditional Bench
	8.1(2) Contemporary Bench
	8.1(3) Granite
	8.1(4) Public Art
8.2 Trash Receptacles / Recycle Bins	
	8.2(1) Traditional Trash Receptacle
	8.2(2) Contemporary Trash Receptacle
	8.2(3) Contemporary Recycle Bin
8.3 Bicycle Racks	
	8.3(1) Inverted U-Shape
	8.3(2) X-Type
	8.3(3) Public Art
8.4 Utility Access Covers	
	8.4(1) Public Art
8.5 Safety Posts	
	8.5(1) Traditional
	8.5(2) Contemporary
	8.5(3) Contemporary with Light
	8.5(4) Contemporary Granite

Element:	Seating	**Reference:**	8.1(1)
Item:	Traditional Bench		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use
Location:	Public spaces in traditional neighborhoods and historic districts.		

Purpose

Fixed seating or benches should be installed along the public right-of-way to provide a resting place for pedestrians. Traditional style seating or benches should be installed in Traditional Neighborhoods and Historic Districts. Benches will be located on highly visible and utilized public right-of-ways including but not limited to transit stops, public parks and plazas, and critical intersections.

Application

- **Material:** Aluminum
- **Placement:** Minimum 2 feet from the curb (District Standard).
- **Dimension:** 6-foot length
- **Color:** Black
- **Options**
  - Placement of center arms at equal intervals upon DDOT approval.

AWI Specific Guideline -

Refer to Chapter 6 Item 3e. for information on proposed guideline.

Element:	Seating	**Reference:**	8.1(2)
Item:	Contemporary Bench		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use
Location:	Public spaces in contemporary development areas.		

Purpose

Fixed seating or benches should be installed along public rights-of-way to provide a resting place for the pedestrians. Contemporary style seating or benches should be installed along the contemporary development spines. The benches will be installed along highly visible and utilized corridors, including but not limited to transit stops, public parks and plazas, and critical intersections.

Application

- **Placement:** 2 feet from the curb (District Standard).
- **Dimension:** 6-foot length with center arm placed at equal intervals.
- **Color:** Black or Grey for all metal components (to be determined on a project by project basis).
- **Options:**
  - Arm Rest: Benches less than 6-feet long may omit a center arm, as approved by DDOT per project. Optional arm rests for all unit seats with backs and can fit between seats or at the end of the run of seats.
  - Configuration: Unit seating could be configured in straight or curved runs. Supports could be surfaced mounted or imbedded.
  - Back Rest: If required, benches may be backless when approved by DDOT per project.

AWI Specific Guideline -

Refer to Chapter 6 Item 3f. for information on proposed guideline.

Element:	Seating	**Reference:**	8.1(3)
Item:	Granite		
Classification:	Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Public spaces including sidewalks, plazas, and parks.		

Purpose

Granite seating should be installed along public rights-of-way to provide a resting place for pedestrians. This seating option may be installed throughout traditional neighborhoods, historic districts and/or along contemporary development spines. The benches should be installed per the following standards along highly visible and utilized public rights-of-way, such as, but not limited to, public parks and plazas.

Application

- **Placement:** 2 feet from the curb (District Standard); should not impede pedestrian circulation.
- **Dimension:**
  - Height: 1 foot minimum - 2 feet maximum
  - Width: 8-12 inches
- **Material:** Granite.
- **Options:**
  - Type: Plaques and other form of engraved anecdotes may be incorporated.
  - Color: Provide sample of granite colors and finish for approval by DDOT.

Custom as approved by DDOT on a project basis.

Example of Granite Seating

Element:	Seating	**Reference:**	8.1(4)
Item:	Public Art		
Classification:	Designated Transit Corridor, Special Segment, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	High visibility areas such as plazas, parks, bulbouts, transit stops.		

Example of Public Art as Seating

Purpose

Integrated art seating or benches should be installed along public rights-of-way to provide a resting place for pedestrians. This seating option may be installed along the traditional neighborhoods, historic districts and along contemporary development areas. The benches should be installed per the following standards along highly visible and utilized public rights-of-way, including but not limited to transit stops, public parks and plazas, and critical intersections.

District-chosen artist should collaborate with area stakeholders and the community to develop a design that captures and integrates the distinct and unique character of community. All integrated artwork projects should meet the approval of resident consensus and DDOT.

Application

- **Placement:** 2 feet from the curb (District Standard); should not impede pedestrian circulation.
- **Dimension:**
  - Height: 1 foot minimum- 2 feet maximum
  - Width: 8-12 inches to allow seating but discourage sleeping.
- **Material:** High durability and/or recycled materials as approved by DDOT.
- **Options:**
  - Type: Anecdotes, plaques and other form insets may be incorporated.

Custom as approved by DDOT on a project basis.

Element:	Trash Receptacles / Recycle Bins	**Reference:**	8.2(1)
Item:	Traditional Trash Receptacle		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Traditional and historic neighborhoods - adjacent to bus shelters, seating, intersections, other public areas as required.		

Purpose

Trash receptacles should be installed along public rights-of-way. Receptacles should be installed along highly visible and utilized locations, including but not limited to transit stops, public parks and plazas, and critical intersections.

Application

- **Installation:** Per District Standards (refer to Downtown Streetscape Regulation).
- **Capacity:** 36 Gallons (136 Liters)
- **Color:** Black
- **Option:**
  - Lock: Lockable latch available as per manufacturers recommendations.
  - Custom plaques or decals:
    - Steel plaques in various sizes and pressure sensitive vinyl outdoor decals, affixed to plaque.
    - Local Business, CDCs, Main Street could affix anecdotes, custom plaques and decals to advertise businesses or announce events.

AWI Specific Guideline -

Refer to Chapter 6 Item 3g. for information on proposed guideline.

Element:	Trash Receptacles / Recycle Bins	**Reference:**	8.2(2)
Item:	Contemporary Trash Receptacle		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Contemporary development spine - adjacent to bus shelters, seating, intersections, other public areas as required.		

Purpose

Contemporary trash receptacles should be installed along public right-of-way within contemporary development areas.

Application

- **Capacity:** 36 Gallons
- **Placement:** Minimum 2 feet from curb.
- **Color:** Black or grey for all metal components to match adjacent furniture.
- **Option:**
  - Lock: Lockable latch available as per manufacturers recommendations.
  - Custom plaques or decals:
    - Steel plaques in various sizes and pressure sensitive vinyl outdoor decals, affixed to plaque.
    - Local Business, CDCs, Main Street could affix anecdotes, custom plaques and decals to advertise businesses or announce events.

AWI Specific Guideline -

Refer to Chapter 6 Item 3h. for information on proposed guideline.

Element:	Trash Receptacles / Recycle Bins	**Reference:**	8.2(3)
Item:	Contemporary Recycle Bin		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Traditional and historic neighborhoods - adjacent to bus shelters, seating, intersections, other public areas as required.		

Purpose

Contemporary recycle bins should be installed along public right-of-way within contemporary development areas.

Application

- **Capacity:** 36 Gallons
- **Placement:** Minimum 2 feet from curb
- **Color:** Black or grey for all metal components to match adjacent furniture.
- **Option:**
  - Lock: Lockable latch available as per manufacturers recommendations.
  - Custom plaques or decals:
    - Steel plaques in various sizes and pressure sensitive vinyl outdoor decals, affixed to plaque.
    - Local Business, CDCs, Main Street could affix anecdotes, custom plaques and decals to advertise businesses or announce events.

Items

AWI Specific Guideline -

Refer to Chapter 6 Item 3h. for information on proposed guideline.

Element:	Bicycle Racks	**Reference:**	8.3(1)
Item:	Inverted “U” Shape		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Near transit stops, coffee shops, shopping centers, libraries, parks, and other public facilities.		

Purpose

High security bike racks allow cyclists to lock their bikes with most bike locks. Where required or where space permits, multiple bike racks should be provided and placed diagonally to save space along the pedestrian walkway. Frequent and consistent placement encourages bike trips.

Application

- **Placement:**
  - Location: Visible and prominent, preferably adjacent to the entrance of a building.
  - Restriction: Not blocking entrance or inhibiting pedestrian flow.
  - Spacing: Each loop should be placed 30 inches apart.
  - Distance from curb: Minimum of 2 feet
- **Dimension:** Length - 21 inches or 30 inches
- **Capacity:** 2 bicycles minimum
- **Mounting:** Embedded
- **Color:** Black, or as approved by DDOT on a project basis.

Reference

- DDOT Bicycle Facility Design Guide

Optional

AWI Specific Guideline -

Refer to Chapter 6 Item 3i. for information on proposed guideline.

Element:	Bicycle Racks	**Reference:**	8.3(2)
Item:	X-Type		
Classification:	Designated Transit Corridor, Special Segment, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Along designated bike lanes integrated with tree boxes.		

Purpose

The X-type rack is a high security bike rack for cyclists that also provides protection for street trees. It accommodates a variety of locks.

Application

- **Placement:** Around street trees, where space is permissible.
- **Dimension (size):**
  - Footprint: Specified in whole feet (i.e. 2' x 2', 4' x 4')
  - Height: A 4' x 4' footprint is 2'-6" above ground.
- **Material:** (steel)
  - 1 ½" schedule 40 steel pipe, 1 7/8" outer diameter or
  - 2" schedule 40 steel pipe, 2 3/8" outer diameter.
- **Capacity:** Provides parking on 3 sides of the tree pit (3 sided rack).
- **Mounting:** (base) Available with flanges that accommodate three drive screws, or without flanges (to be sunk into concrete footings).
- **Color:** Black

AWI Specific Guideline -

Refer to Chapter 6 Item 3j. for information on proposed guideline.

Element:	Bicycle Racks	**Reference:**	8.3(3)
Item:	Public Art		
Classification:	Designated Transit Corridor, Special Segment, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	High visibility public spaces including sidewalks near designated bike routes and transit stops.		

Example of Bike Racks as Public Art

Purpose

A high security bike rack allows the cyclists to lock a bike with most bike locks. Bike racks as part of public art should serve to reflect the area or neighborhood's identity as well as enhance the overall streetscape and promote bike trips. Local artists can be commissioned to create one-of-a-kind bike rack sculptures to be placed in the public right-of-way in various locations in the special areas of the AWI. In addition to being functional, they can provide original art for the enjoyment of the general public.

Custom as approved by DDOT on a project basis.

Element:	Utility Access Covers	**Reference:**	8.4(1)
Item:	Public Art		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Sidewalks ONLY		

Purpose

Access Covers function to cover manholes on sidewalks. The custom designed access covers enhance the sense of identity of a place with the signature feature of the area displayed in the design of its surface. The signature feature will incorporate geographical and/or environmental references.

Application

- Restriction:
  - Applies only to DDOT owned manholes.
  - Covers with perforations should not be used for sewer manholes.
  - Custom utility access covers should not be used on roadways.
- **Placement:** The utility access covers should be placed exclusively on sidewalks.
- **Design:**
  - The design should be approved by DDOT, CFA, NCPC, and the relevant utility companies.
  - Access covers should have grooves to provide traction in all kinds of weather.
  - Covers may be designed with geographical or environmental references.
- **Dimensions:** Should meet existing functional dimensions.
- **Material:** Access covers should meet all relevant existing functional requirements and standards.

Example of
Anacostia Utility Cover
(designs will vary)

Example of Utility Cover

Custom as approved by DDOT on a project basis.

Element:	Safety Posts	**Reference:**	8.5(1)
Item:	Traditional		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Special Segment, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Along waterfront and required areas approved by DDOT.		

Purpose

Safety posts should be installed along public rights-of-way for the safety of pedestrians. The posts should be installed per District Standards along rights-of-way, including but not limited to waterfronts, medians with pedestrian refuge areas, and bulbouts. Where required, the posts should be removable to allow the passage of emergency vehicles. Size and spacing of safety posts should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Placement:** minimum of 2 ft. from the curb (District Standard).
- **Dimension:**
  - Height: 3’- 3”
  - Base: 10”
- **Material:** Ductile iron ASTM A536, Class 80-55-06.
- **Mounting:** Permanent or removable (determined per project).
- **Color/Finish:**
  - Semi-Gloss Black or approved equal.
- **Options:**
  - Chain: Bollards connected with chains may be installed to demarcate green areas, park areas, water edges, and edges of public areas.

AWI Specific Guideline -

Refer to Chapter 6 Item 3k. for additional information on proposed guideline.

Element:	Safety Posts	**Reference:**	8.5(2)
Item:	Contemporary		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Along waterfront and required areas approved by DDOT.		

Purpose

Safety Posts should be installed along public rights-of-way to provide security for pedestrians and buildings. The posts should be installed per District standards along rights-of-way, including but not limited to waterfronts, medians with pedestrian refuge areas, and bulbouts. Where required, the posts should be removable to allow the passage of emergency vehicles. Where appropriate, posts should be designed to provide seating. Size and spacing of safety posts should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Placement from curb:** 2 ft. (District Standard).
- **Dimension:**
  - Height: 38 3/8”
  - Diameter: 4” to 6 1/8”
- **Material:** Heavy duty stainless steel.
  - Mounting: Permanent or removable, determined per project.
  - Color/Finish: Stainless steel.
  - Finish: Satin polished or bright polished.

AWI Specific Guideline -

Refer to Chapter 6 Item 3I. for information on proposed guideline.

Element:	Safety Posts	**Reference:**	8.5(3)
Item:	Contemporary With Light		
Classification:	Designated Transit Corridor, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Along waterfront and required areas approved by DDOT.		

Purpose

Safety Posts should be installed along public rights-of-way to provide security for pedestrians and buildings. The posts should be installed per District Standards along rights-of-way, including but not limited to waterfronts, medians with pedestrian refuge areas, and bulbouts. Where required, the posts should be removable to allow passage of emergency vehicles. Size and spacing of safety posts should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Placement: minimum of** 2 ft. (District Standard).
- **Dimension:**
  - Height: 38 3/8”
  - Diameter: 6 1/8”
- **Lamp Enclosure:** Machined stainless steel top housing assembly removable in one piece for relamping. Secured by three (3) -socket head stainless steel screws threaded into stainless steel inserts. Clear 3.16” thick borosilicate glass with passivated stainless steel cone reflector and top down light reflector. Fully gasketed using high temperature silicone rubber O-rings.
- **Electrical:** Lamp holders are G12, bi-pin porcelain with nickel-plated contacts supplied with 200°C high temperature leads, rated 4 KV. Ballasts are located on an upright bracket attached to the anchor base and are available in 120V or 277V, HPF - specify.
- **Mounting:** Permanent or removable (determined on project basis).
- **Material/Finish:** Stainless steel.

AWI Specific Guideline -

Refer to Chapter 6 Item 3m. for information on proposed guideline.

Element:	Safety Post	**Reference:**	8.5(4)
Item:	Contemporary-Granite		
Classification:	Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Along waterfront and required areas approved by DDOT.		

Purpose

Safety posts should be installed along public rights-of-way to provide security for pedestrians and buildings. The posts should be installed per District Standards along rights-of-way such as, but not limited to, waterfronts, plazas, and sidewalks in front of buildings. Posts with chains may be installed to demarcate green areas, park areas, water edges, and edges of public spaces. Where appropriate, posts should be designed to provide seating. Size and spacing of safety posts should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Placement:** District Standards, along rights-of-way such as waterfronts.
- **Dimension:**

  Cubical: 3 ft. tall, 1 ft. wide base.

  Spherical: 2 ft. diameter

  Cylindrical: 3 ft. height, 1 ft. diameter.
- **Material:** Granite.
- **Mounting:** Permanent or removable.
- **Color/Finish:** Varies; chosen on project basis and should be approved by DDOT.
- **Options:**
  - Chains: Bollards can also be linked with a connective chain system.

Custom as approved by DDOT on a project basis.

Section 9: Signage

ELEMENT	ITEM
9.1 Standalone Signs	
	9.1(1) Wayfinding
9.2 Street Attachments	
	9.2(1) Neighborhood Identifiers
	9.2(2) Temporary Banners

Element:	Standalone Signs	**Reference:**	9.1(1)
Item:	Wayfinding		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Waterfront Access Segment	**Area Type:**	Mixed-use & Residential
Location:	Traditional and contemporary development spines.		

Purpose

Wayfinding signage should be installed along public right-of-ways to provide interesting and memorable experiences, heighten general awareness, and orientate visitors. The signage content should be developed per the DDOT Wayfinding Signage Program in consultation with DDOT, DCAH, CFA and NCPC. Size and spacing of signs should comply with the latest laws and regulations of the Americans with Disabilities Act.

Application

- **Placement:** Minimum 2 feet from the curb.
- **Product:** Standard DC Wayfinding Signage System.

Reference

- DDOT Wayfinding Signage Program, March 8, 2004, Construction Document Set.

Items

Custom as approved by DDOT on a project basis.

Element:	Street Attachments	**Reference:**	9.2(1)
Item:	Neighborhood Identifiers		
Classification:	Designated Transit Corridor, Special Segment, Waterfront Promenade	**Area Type:**	Mixed-Use
Location:	Traditional and contemporary development spines.		

Purpose

Neighborhood Identifiers create a positive image, enhance the neighborhood identity and add to the vibrancy of the public right-of-way. They should connect both existing and proposed features, as well as guide visitors through the District corridors in a pleasant sequence. This may include street attachments such as permanent banners. DDOT should be responsible for the installation and maintenance but not for the funding.

Application

- **Restrictions:** Attachments should not be installed concurrently with Temporary Banners (9.2.(2)).
- **Placement:** Installed by DDOT on the streetlight posts per District standard mounting requirements.
- **Design:** The design should include perforations to reduce wind loading.
- **Material:**
  - Aluminum
  - Brass
  - Copper
  - Other light, weather resistant metals as approved by DDOT.
- **Color:** Match street light posts; or other as approved by DDOT.
- **Options:**
  - Hanging system hardware:
    - No rust cast aluminum base.
    - If applicable, cantilevered fiberglass arms should be designed at an angle to hold identifiers taut and reduce wind load on attachements and utility poles by allowing wind to pour off of outer edges.
    - The rods should be easily removed.
    - Stainless steel banding should be provided with the bracket set.

Custom as approved by DDOT on a project basis.

Element:	Street Attachments	**Reference:**	9.2(2)
Item:	Temporary Banners		
Classification:	Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront Promenade	**Area Type:**	Mixed-Use & Residential
Location:	Traditional and contemporary development spines, intersections, and wide multi-lane crossings.		

Purpose

Temporary banners increase the positive image, enhance identity and add vibrancy of the public right-of-way. In addition, temporary banners may also advertise events, upon DDOT approval. Funding, installation, and maintenance for the banners should be the sole responsibility of local Main Streets, BIDs, and/or local businesses.

Application

- **Restrictions:** Attachments should not be installed concurrently with Neighborhood Identifiers (9.2.(1)).
- **Standard Placement:** Removable banners should be mounted on streetlight posts per District standard mounting height.
- **Standard Dimension:** District standard .
- **Material:**
  - Vinyl
  - Tyvek
  - Polyethylene
  - Nylon
  - Polyester
  - Others as approved by DDOT.
- **Color:** To be determined on project basis.
- **Options:**
  - Hanging system hardware:
    - No rust cast aluminum base.
    - Cantilevered fiberglass arms should be designed at an angle to hold banners taut and reduce the wind load on banners and utility poles by allowing wind to pour off of outer edges of the banner.
    - The rods should be easily removed.
    - Stainless steel banding should be provided with the bracket set.

Custom as approved by DDOT on a project basis.

Section 10: Street Trees

ELEMENT	ITEM
10.1 Tree Protection	
	10.1(1) Existing Trees
10.2 Tree Planting	
	10.2(1) Typical Trees
10.3 Tree Species	
	10.3(1) General Tree Species
	10.3(2) Symbolic Corridor Trees
	10.3(3) Columnar Trees
	10.3(4) Waterfront Trees
	10.3(5) Evergreen Trees
	10.3(6) Ornamental Trees

Element:	Tree Protection	**Reference:**	10.1(1)
Item:	Existing Trees		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Sidewalks, medians, green spaces		

Purpose

Trees can be damaged or killed through various construction activities. Protecting trees during construction increases the likelihood of survival, preserves existing tree stands, maintains existing overhead canopy, urban wildlife, and aids stormwater management.

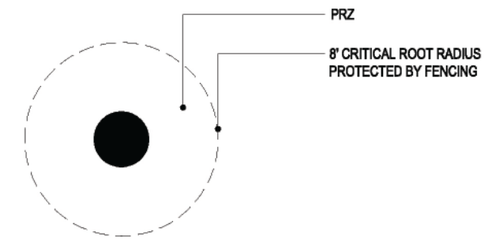
Approximately 90-95% of a tree's root system is in the top 3 feet of soil, and more than half is in the top 1 foot. Construction activities should be avoided in areas near trees.

Application

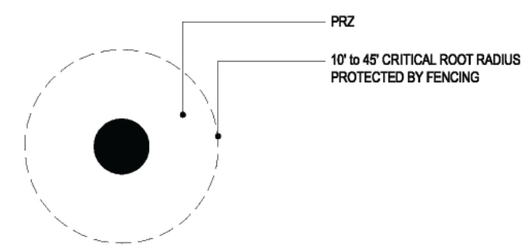
- **Determine Protection Zone:** Protect as much area beyond tree's dripline as possible. If possible, do not disturb the Protected Root Zone (PRZ). Calculate critical root radius (CRR) by measuring the tree's diameter (dbh) 4.5 feet above the ground, in inches. Each inch of dbh equates to 1-1.5 feet of CRR.
- **Tree Protection Plan:** Take the following steps for a successful Tree Protection Plan:

1. Mark construction zone boundaries at edge of protected root zone.
2. Select trees to be saved. Note how each tree fits into the landscape. If PRZ falls inside construction zone, seriously consider changing original design, adding protective measures or removing tree before construction.
3. Protect trees intended to be saved. Develop a map with the location of trees to be protected and the safest route for access to the building zone.
4. Install bright orange polypropylene fencing and post "Off Limits" signs at CRR of trees to be saved. Stockpiled materials, heavy machinery and excessive foot traffic damage soil structure and reduce soil pore space so should not be placed close to the tree.
5. Prepare trees for construction disturbance. Prune branches that are dead, diseased, hazardous or detrimental to natural form.
6. Monitor the construction process. Visit the site regularly and inspect trees. Should damage occur, take action as soon as possible. Water trees throughout construction process.

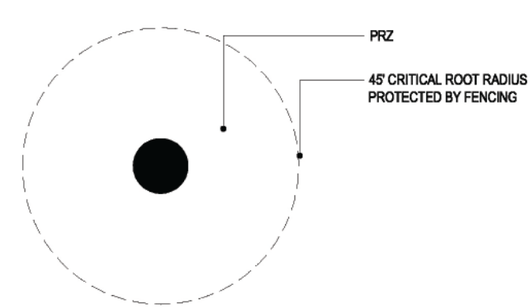
TREE WITH DIAMETER BREAST HEIGHT (DBH) LESS THAN 8"



TREE WITH DBH BETWEEN 8" AND 20"



SPECIMEN TREE -TREES WITH DBH GREATER THAN 20"



AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.07, 611.08

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 1, 8

Element:	Tree Planting	**Reference:**	10.2(1)
Item:	Typical Trees		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront	**Area Type:**	Mixed-Use & Residential
Location:	Promenade, Park Road		

Purpose

Street tree plantings are desirable urban design elements, which provide beauty, shade, wildlife habitat, and define the street edge and improve quality of life. It is important to provide suitable conditions for tree growth. Tree planting practices should be monitored regularly to ensure survival of trees.

Application

- **Separation distances for trees:** Should be in accordance with DDOT Design & Engineering Manual and the Urban Forestry Administration Guidelines. Trees along roadway will typically be planted between light poles. Depending on spacing, at least one or two trees will be placed between light poles.
- **Irrigation:** Per DDOT Standard
- **Planting Schedule:** September 30th - April 30th
- **Dimensions:** Refer to Tree Box Matrix for dimensioning guidelines.
  - Size of trees at planting: Minimum 2.5” caliper.
  - Pedestrian Clearance: 8’ from finish grade to lowest branch.
  - Refer to Tree Box Matrix for dimensioning guidelines.

Typical tree protection for tree planting areas to be used after the placement of planting soil and throughout the duration of tree planting during construction.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5.

  Options 1, 2, 3, 8, 14, 15, 16, 17

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02

Refer to Chapter 6 Item 1a. and 2i. for additional information on proposed guideline.

Element:	Tree Species	**Reference:**	10.3(1)
Item:	General Tree Species		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Sidewalks, medians, roadside setbacks, pocket parks, traffic triangles and residual spaces.		

Purpose

Street tree plantings are desirable urban design elements, which provide beauty, shade, wildlife habitat, and define the street edge and improve quality of life. Proper species selection is crucial for survival. Urban conditions limit the number of trees suitable for planting. Urban trees should be able to tolerate fluctuating hydraulic conditions and meet the following general requirements:

- **General Application Selection Criteria**
  - Non-invasive
  - Disease resistant
  - Tolerate urban conditions
  - Require minimum maintenance
- **Species Selection**
  - Diversification of species is encouraged throughout any landscape designs.
  - Landscape architect should propose selected tree species to Urban Forestry Administration (DDOT-UFA). DDOT-UFA to approve or modify suggestions. Confirm species selection with UFA 30 days prior to plant delivery to the site.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02

Element:	Tree Species	**Reference:**	10.3(2)
Item:	Symbolic Corridor Trees		
Classification:	Symbolic Corridor	**Area Type:**	Mixed-Use & Residential
Location:	Sidewalks, medians, roadside setbacks, pocket parks, traffic triangles and residual spaces.		

Purpose

Street trees create a ceremonial experience, reduce the heat island effect, define the street edge, provide shade, reduce stormwater runoff, and buffer city noise. In addition, street trees create a canopy for cars and people. Shade trees should complement the scale of the right-of-way, strengthen the line of sight, and create a coherent appearance.

Application

- **Restrictions:** Shade trees should not be used where known overhead utility conflicts exist.

All planting design and separation distances for trees should be in accordance with DDOT Design & Engineering Manual and the Urban Forestry Administration Guidelines.

- **General Application Selection Criteria:**
  - Non-invasive
  - Disease resistant
  - Tolerate urban conditions
  - Require minimum maintenance
- **Selection Criteria: (In addition to general requirements)**
  - Create a striking appearance at maturity
  - Provide seasonal visual interest
  - Create overhead canopy
- **Species Selection:**
  - Existing trees in Symbolic Corridors: American Elm, Willow Oak, London Planetree, Golden Raintree, Japanese Zelkova, Chinese Elm, Red Oak, Thornless Honey Locust
  - Diversification of species is encouraged throughout any landscape designs.
  - Landscape architect should propose selected tree species to Urban Forestry Administration (DDOT-UFA). DDOT-UFA to approve or modify suggestions. Confirm species selection with UFA 30 days prior to plant delivery to the site.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02

Element:	Tree Species	**Reference:**	10.3(3)
Item:	Columnar Trees		
Classification:	Designated Transit Corridor	**Area Type:**	Mixed-Use & Residential
Location:	Along curbline of sidewalks and medians with adjacent transit/ streetcar lanes.		

Purpose

The narrow branching habit of columnar trees prevents overhead wire conflicts. Their uniform appearance can define the street edge, create separation, and reduce stormwater runoff.

Application

Columnar shade trees should be installed within 10 feet from the centerline of the transit lane, so as not to interfere with overhead wires directly over the transit lanes.

- **Restrictions:**
  - Do not plant columnar shade trees directly under overhead utility wires.

All planting design and separation distances for trees should be in accordance with DDOT Design & Engineering Manual and the Urban Forestry Administration Guidelines.

- **General Application Selection Criteria:**
  - Non-invasive
  - Disease resistant
  - Tolerate urban conditions
  - Require minimum maintenance
- **Selection Criteria: (In addition to general requirements)**
  - Be columnar shaped
  - Create visual interest when planted in groups
- **Species Selection:**
  - Diversification of species is encouraged throughout any landscape designs.
  - Landscape architect should propose selected tree species to Urban Forestry Administration (DDOT-UFA). DDOT-UFA to approve or modify suggestions. Confirm species selection with UFA 30 days prior to plant delivery to the site.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02

Element:	Tree Species	**Reference:**	10.3(4)
Item:	Waterfront Trees		
Classification:	Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Urban areas along waterfronts		

Purpose

Shade street trees along Waterfront Promenades should create an edge between the waterfront and adjacent land uses. In addition, the shade trees will reduce the heat island effect, provide wildlife habitats, and reduce stormwater runoff.

Application

- **Restrictions:** Allow for views through the treeline; no planting near known existing overhead utility conflicts.

All planting design and separation distances for trees should be in accordance with DDOT Design & Engineering Manual and the Urban Forestry Administration Guidelines.

- **General Application Selection Criteria:**
  - Non-invasive
  - Disease resistant
  - Tolerate urban conditions
  - Require minimum maintenance
- **Selection Criteria: (In addition to general requirements)**
  - Tolerate high wind and flood conditions
  - Create visual seasonal interest
  - Have naturally high branching habit
  - Provide excellent wildlife habitat
- **Species Selection:**
  - Diversification of species is encouraged throughout any landscape designs.
  - Landscape architect should propose selected tree species to Urban Forestry Administration (DDOT-UFA). DDOT-UFA to approve or modify suggestions. Confirm species selection with UFA 30 days prior to plant delivery to the site.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02

Element:	Tree Species	**Reference:**	10.3(5)
Item:	Evergreen Trees		
Classification:	Interstate, Freeway, Greenway, Park Road	**Area Type:**	Mixed-Use
Location:	Roadway setbacks		

Purpose

Evergreen trees provide visual and noise buffers for neighborhoods next to busy roadways. Evergreen trees can also serve as gateways.

Application

All planting design and separation distances for trees should be in accordance with DDOT Design & Engineering Manual and the Urban Forestry Administration Guidelines.

- Evergreen tree species should be used along with other plantings adaptive to the roadside environment. Interstates, freeways and parkways should be seen as linear greenway corridors able to provide a habitat for urban wildlife.
- **General Application Selection Criteria:**
  - Non-invasive
  - Disease resistant
  - Tolerate urban conditions
  - Require minimum maintenance
- **Selection Criteria: (In addition to general requirements)**
  - Tolerate high wind and flood conditions
  - Provide screening
  - Provide excellent wildlife habitat
- **Species Selection:**
  - Diversification of species is encouraged throughout any landscape designs.
  - Landscape architect should propose selected tree species to Urban Forestry Administration (DDOT-UFA). DDOT-UFA to approve or modify suggestions. Confirm species selection with UFA 30 days prior to plant delivery to the site.
- **Dimensions:**
  - Size: The size of trees at planting should have a minimum 8'-10' height.

Pine Trees along Sunrise Highway, California

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02

Element:	Tree Species	**Reference:**	10.3(6)
Item:	Ornamental Trees		
Classification:	Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Greenspaces, medians, traffic islands, residual spaces and along sidewalks with overhead wire conflicts.		

Purpose

Healthy urban ornamental trees promote safety, health and tranquility. Ornamental trees create a ceremonial experience, define the street edge, reduce stormwater runoff, buffer city noise, strengthen the line of sight, and create a uniform and coherent appearance. In addition, ornamental trees provide visual seasonal interest and fragrance during various times of the year.

Application

All planting design and separation distances for trees should be in accordance with DDOT Design & Engineering Manual and the Urban Forestry Administration Guidelines, except as noted below. Any trees planted more than 10 feet from the centerline of the transit lane may refer to the standard Urban Forestry Administration plant list.

- **General Application Selection Criteria:**
  - Non-invasive
  - Disease resistant
  - Tolerate urban conditions
  - Require minimum maintenance
- **Selection Criteria:** In addition to general requirements proposed trees along Symbolic Corridors should:
  - Provide seasonal visual interest
- **Species Selection:**
  - Diversification of species is encouraged throughout any landscape designs.
  - Landscape architect should propose selected tree species to Urban Forestry Administration (DDOT-UFA). DDOT-UFA to approve or modify suggestions. Confirm species selection with UFA 30 days prior to plant delivery to the site.
  - Existing ornamental trees within the project area: Crape Myrtle and Kwansan Cherry
- **Dimensions**
  - Size of trees at planting: Minimum 2.0” caliper.
  - Pedestrian Clearance: 8’ to lowest branch.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02

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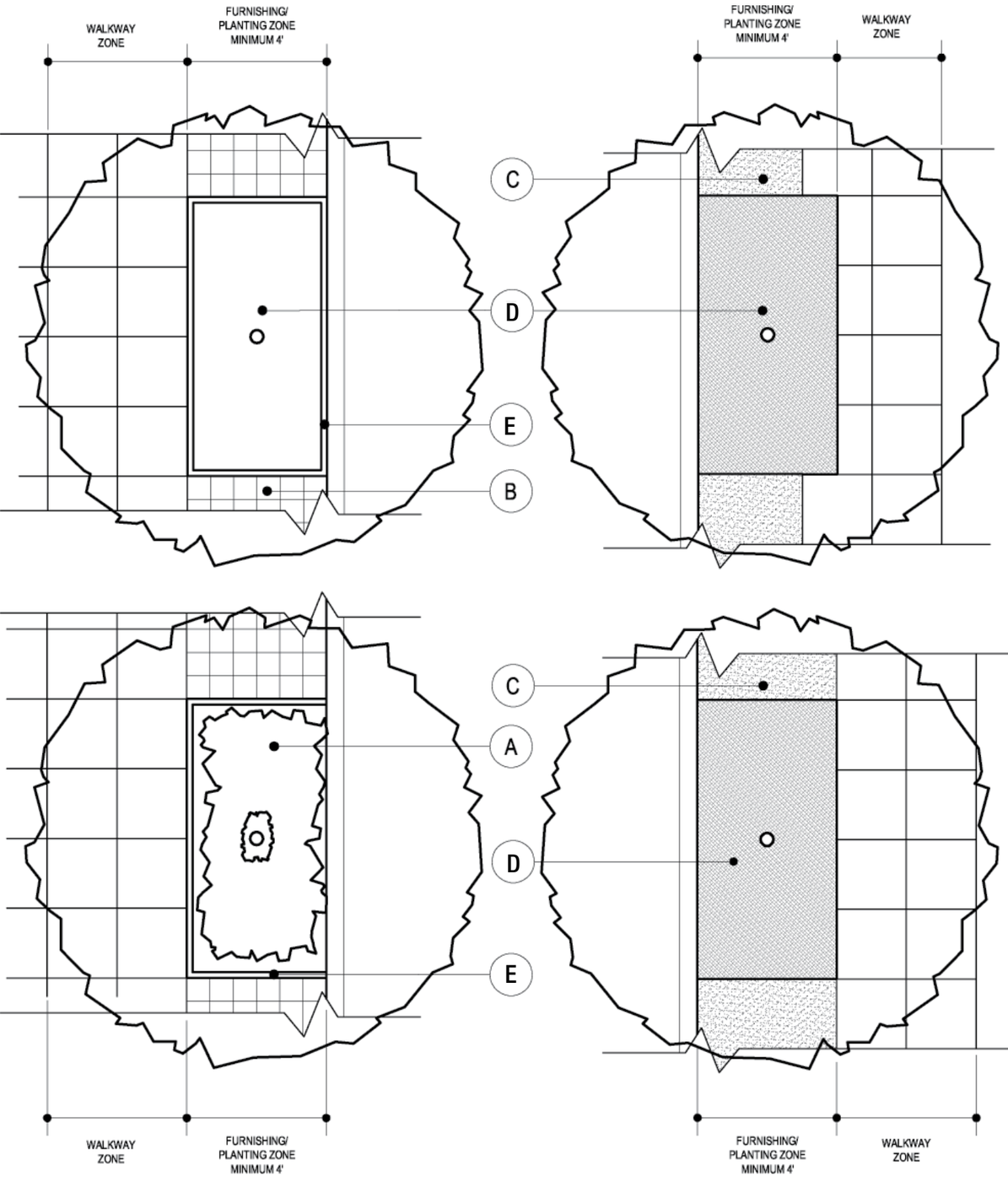


E : Planter Edging, not part of guidelines

Section 11: Planting / Furnishing Zone – Surface Treatments

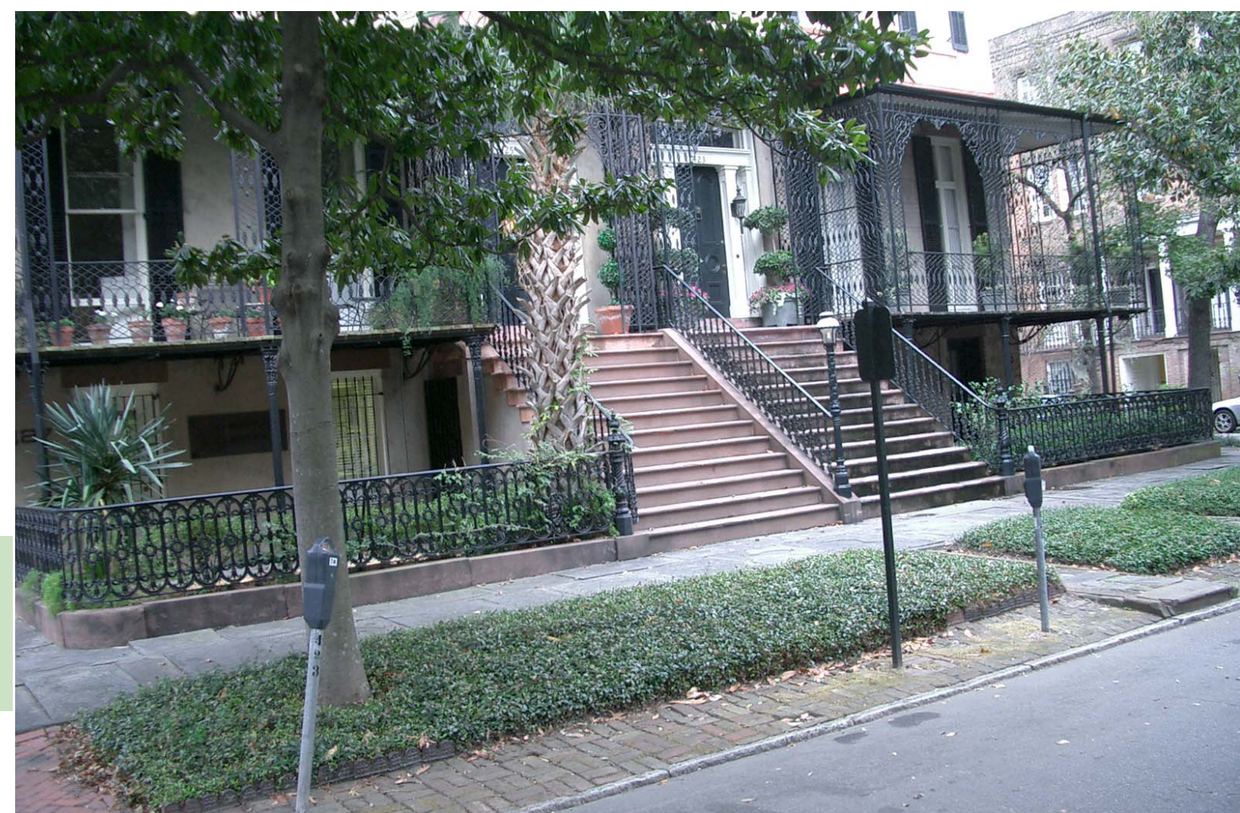
ELEMENT	ITEM	MAP REFERENCE
11.1 Vegetation		**A**
	11.1(1) Understory Planting	
11.2 Unit Pavers		**B**
	11.2(1) Cobblestone	
	11.2(2) Tumble Finish Concrete Pavers	
	11.2(3) Brick	
	11.2(4) Permeable Interlocking Pavers	
11.3 Turf Areas		**C**
	11.3(1) Lawn	
11.4 Mulch		**D**
	11.4(1) Pine Fines	

Element:	Vegetation	**Reference:**	11.1(1)
Item:	Understory Plantings		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Designated Transit Corridor, Special Segment, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Use & Residential
Location:	Sidewalks, medians, green spaces, roadway setbacks		

Purpose

Understory plantings should include, but are not limited to ornamental grasses, groundcover, shrubs, and perennials. Such plantings add aesthetic value to the streetscape, reduce stormwater runoff, and provide visual and physical barriers for pedestrians and motorists. Understory plantings also help create a neighborhood identity.

All planting design and separation distances should be in accordance with DDOT Design & Engineering Manual.



AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02

Refer to Chapter 6 Item 2j. for additional information on proposed guideline.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 2, 8, 14, 15, 16, 17

Element:	Unit Pavers	**Reference:**	11.2(1)
Item:	Cobblestone		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Furnishing/planting zone		

Purpose

Unit Pavers set over the contiguous root zone maximize the planting soil area allowing for better root growth. Using cobblestone in the Furnishing/Planting Zone promotes stormwater percolation and discourages pedestrians from walking over the planting zone, therefore reducing the possibility for compaction.

Application

- **Color:** Light gray or as determined by DDOT on a project by project basis from the manufacturer's standard colors.

reducing the possibility for compaction.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 1, 2, 7

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 806

Refer to Chapter 6 Item 2k. and 3a. for additional information on proposed guideline.

Element:	Unit Pavers	**Reference:**	11.2(2)
Item:	Tumble Finish Concrete Pavers		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Designated Transit Corridor	**Area Type:**	Mixed-Use & Residential
Location:	Furnishing/planting zone		

Purpose

Unit Pavers set over the contiguous root zone in the furnishing/planting zone provide a walking surface and promote improved root growth by maximizing the planting soil area. Concrete pavers are less expensive than cobblestone, but may not be suitable on high visibility projects.

Application

- **Color:** Salmon/Charcoal Blend
- **Size:** 6 x 6

Reference

- ASTM C936-01 “Standard Specification for Solid Concrete Interlocking Paving Units” or latest update.

Image for color only.

Salmon/Charcoal Blend

Items

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 806.02

Refer to Chapter 6 Item 2l. and 3b. for additional information on proposed guideline.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 1, 2

Element:	Unit Pavers	**Reference:**	11.2(3)
Item:	Brick		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Special Segment	**Area Type:**	Mixed-Use & Residential
Location:	Furnishing/planting zone		

Purpose

Unit Pavers set over the contiguous root zone in the furnishing/planting zone provide a walking surface and promote improved root growth by maximizing the planting soil area. Brick in the Furnishing/Planting Zone should only be used in historic districts.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 1, 2

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 806.01

Refer to Chapter 6 Item 2m. for additional information on proposed guideline.

Element: Unit Pavers

Item: Permeable Interlocking Pavers

Classification: Principal Arterial, Minor Arterial, Collector, Local, Alley

Location: Furnishing/planting zone

Reference: 11.2(4)

Area Type: Mixed-Use & Residential

Purpose

Unit Pavers set over the contiguous root zone in the furnishing/planting zone provide a walking surface and promote improved root growth by maximizing the planting soil area. Gaps between pavers allow for stormwater percolation. Set pavers over #9 stone and fill gaps with #9 stone. Install pavers as evenly as possible in order to provide a walking surface. The pavers may not be considered handicap accessible.

Application

- **Color:** to be approved by DDOT

Reference

- ASTM C936-01 “Standard Specification for Solid Concrete Interlocking Paving Units” or latest update.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 806.02

Refer to Chapter 6 Item 3c. and 3d. for additional information on proposed guideline.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 2, 7

Element:	Turf Areas	**Reference:**	11.3(1)
Item:	Lawn		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Waterfront Promenade, Greenway, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Along sidewalks and green spaces		

Purpose

Turf areas provide continuous root zone in the furnishing/planting zone and promote improved root growth by maximizing the planting soil area. Lawns should include any surface treatment related to turf grasses.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 1, 2, 8

District of Columbia DOT Standard Specifications and Standard Drawings for Highways and Structures 2007:

- Specification Section 823

Element:	Mulch	**Reference:**	11.4(1)
Item:	Pine Fines		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Sidewalks, medians and green spaces		

Purpose

Placing mulch around plantings conserves soil moisture, reduces soil erosion, water loss, and weed competition. Mulch also improves soil structure and reduces soil compaction. Mulching also moderates soil temperature.

Application

- **Quality:**
  - High quality pine fines mulch.
  - Free of debris and foreign matter.
- **Age:** Aged for a minimum of 6 months and no longer than two years.
- **Size:** Shredded to a uniform size.
- **Proper Spreading Method:**
  - Depth: Place a 2.5-inch thick layer of mulch around the tree.
  - Mulch Radius: The entire tree pit area or three times as wide as the tree rootball- whichever is greater. Do not place mulch up to the tree trunk, provide 2" clear area around trunk.
  - Timing: Place mulch after initial watering and fertilizing, and one week after tree installation.
  - Spread mulch annually.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02 and 823.04

Section 12: Planting Zone – Subsurface Treatments

ELEMENT	ITEM
12.1 Increase Planting Space	
	12.1(1) Contiguous Root Area with Pavers
	12.1(2) Contiguous Root Area with Lawn
12.2 Soil Mix	
	12.2(1) Planting Soil Mix

Element:	Increase Planting Space	**Reference:**	12.1(1)
Item:	Contiguous Root Area with Pavers		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Symbolic Corridor, Designated Transit Corridor, Special Segment,	**Area Type:**	Mixed-Used & Residential
Location:	Furnishing/planting zone within the sidewalk.		

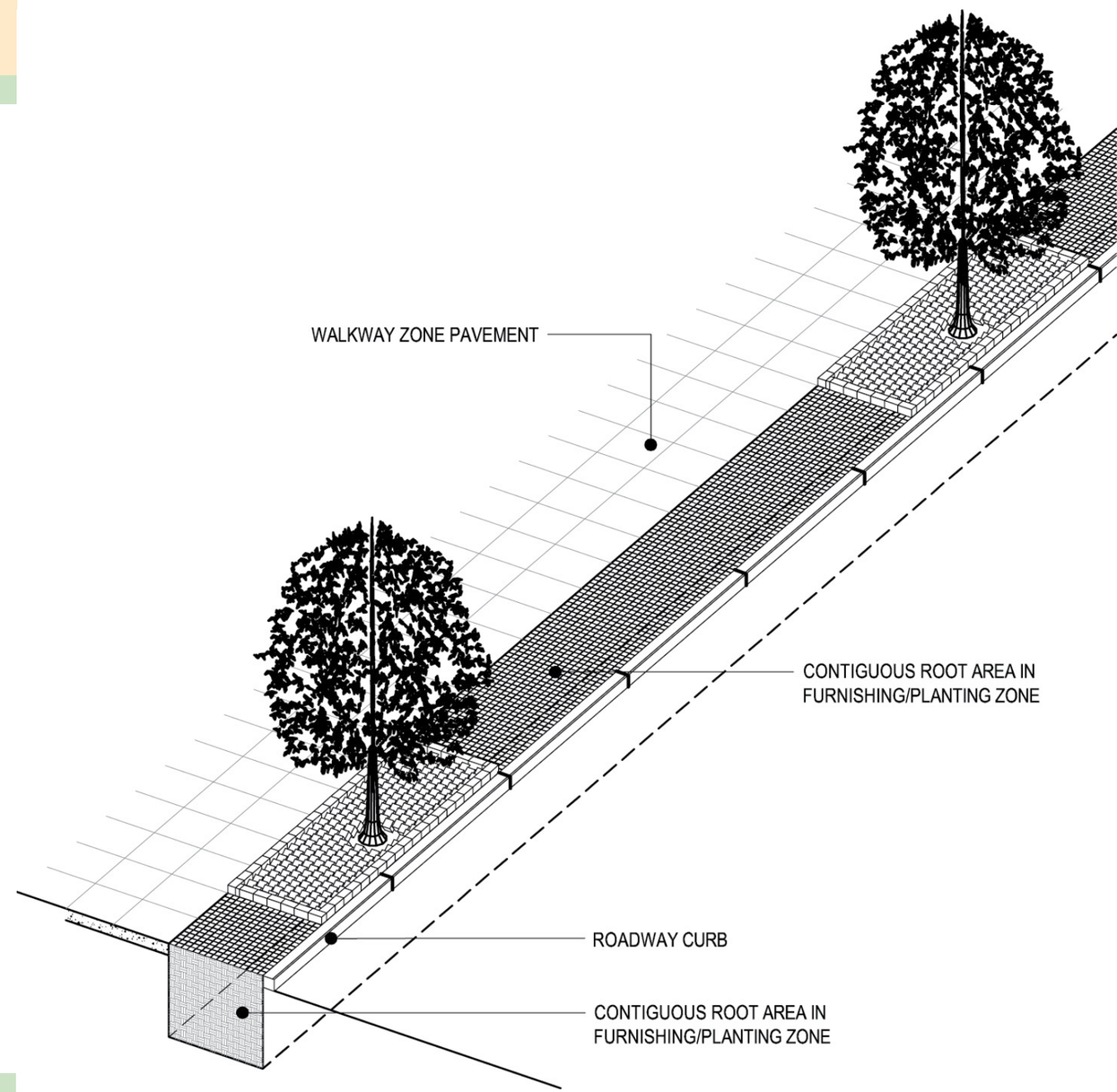
Purpose

The growth and life span of urban trees is shortened due to the increased environmental stress in an urban setting. Stress on urban trees includes air pollution, lack of fertile soils, poor drainage and vandalism. A contiguous root area allows drainage in the planting zone.

Application

The Furnishing/Planting Zone should provide a 4'-0" or 6'-0" wide contiguous underground root zone depending on the total width of the sidewalk between the curbline and the pedestrian clear zone to maximize the volume of soil and encourage the uninterrupted growth of tree roots. Furnishing/Planting Zone may be less than 4'-0" only if the entire sidewalk width is less than 8'-0". In general, provide 750 cubic feet of planting soil per tree.

- In addition to a contiguous root area, the following options are encouraged to provide better growing conditions for trees:
  - Option 1: Aeration Strip under sidewalk
  - Option 2: Structural Soil under sidewalk
  - Option 3: Spanning sidewalk (and Structural Cell)
- **Restriction:**
  - Trees should not be planted in sidewalks less than 6'6" wide.
- **Option:**
  - Sidewalks 8'0" or wider: Modifications to pavements on walkway zone may be optional when sidewalks are 8'0" or wider.

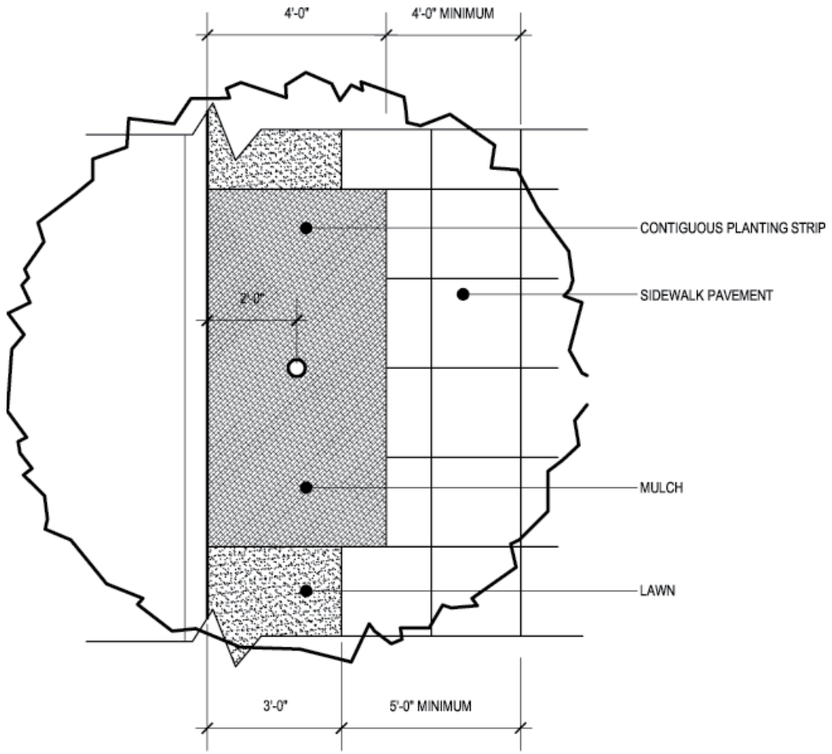


AWI Specific Guideline -

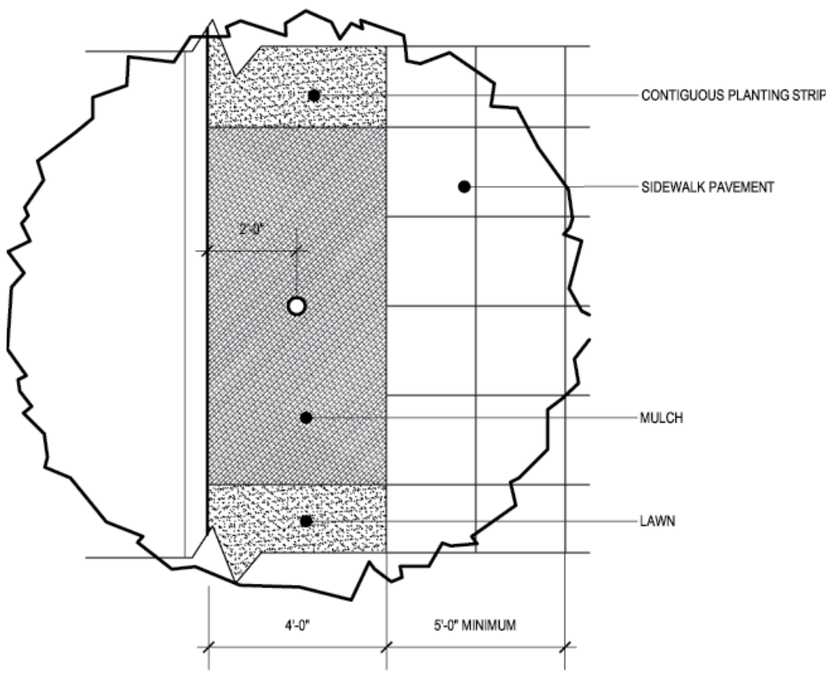
Refer to Chapter 6 Item 2o., 2q., and 2r. for information on proposed guideline.

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Option 2



Section A: SIDEWALK 7'-0" TO 8'-0" IN WIDTH



Section B: SIDEWALKS 9'-O" WIDE OR WIDER

Section 12: Planting Zone - Subsurface Treatments

Element:	Increase Planting Space	**Reference:**	12.1(2)
Item:	Contiguous Root Area with Lawn		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Sidewalks		

Purpose

The Furnishing/Planting Zone should provide a 4'-0" or 6'-0" wide contiguous underground root zone depending on the total width of the sidewalk between the curbline and the pedestrian zone to encourage the uninterrupted growth of tree roots. Furnishing/Planting Zone may be less than 4'-0" only if the entire sidewalk width is less than 8'-0". Planting conditions should be integrated with Low Impact Development strategies to reduce the stormwater runoff from the site and to improve the growing conditions for roots.

Application

- **Restrictions:**
  - Trees should not be planted in sidewalks less than 7'-0" wide unless approved by DDOT on a project by project basis.
- **Dimension Criteria:**
  - Section A: Trees in sidewalks between 7'0" – 8'0".
  - Section B: Trees in sidewalks 9'-0" wide or wider.
- In addition to a contiguous root area, the following options are encouraged to provide better growing conditions for trees:
  - Option 1: Aeration Strip under sidewalk
  - Option 2: Structural Soil under sidewalk
  - Option 3: Spanning sidewalk (Structural Cell)

Low Impact Development (LID) Opportunity

- Refer to Chapter 5. Options 2

AWI Specific Guideline -

Refer to Chapter 6 Item 2o., 2q., and 2r. for additional information on proposed guideline.

Element:	Soil Mix	**Reference:**	12.2(1)
Item:	Planting Soil Mix		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	All planting zones		

Purpose

Tree roots require air, water and minerals in planting medium for growth. The proper design of a planting soil mix is essential for the health of trees in the urban environment.

Application

- **Restrictions:**
  - Free of plants and roots, debris and other extraneous matter.
  - Uncontaminated by salt water, foreign matter, and substances harmful to plant growth.

Planting soil mix should be a manufactured product from a commercial processing facility specializing in the production of manufactured soils. Manufacturer should provide a physical sample of soil mix and a soil analysis report for approval before transporting soil to the site.

  - Ingredients: Soils should be manufactured from sands, peat moss, and biosolids.
- **Organic Content:** 4.0 – 6.0%
- **pH Level:** 5 - 6.5
- **Gravel Content:** 12.5%
- **USDA Soil Textural Classification:**
  - Loamy Sand: 10-15% Clay, 20-30% Silt, 70-80% Sand.
  - Sandy Loam: 15-20% Clay, 30-50% Silt, 50-70% Sand.
- **Electrical Conductivity:** (EC) of a 1:2 soil-water suspension should be equal to or less than 1.0 million ohms/cm.
- **Amendments:** Soil should be amended to counteract soil deficiencies by adding Mycorrhyzal fungus tablets, acidulants, ground limestone, organic compost, peat moss, sand, bone meal, gypsum, and fertilizers on a project-to-project basis.

AWI Specific Guideline - Refer to DDOT Standard Specifications and Standard Drawings for Highways and Structures 2007 - Specification Section 611.02 and 823

Low Impact Development (LID) Opportunity

- Refer to Chapter 5.

  Options 1, 2, 3, 8, 12, 14, 15, 16, 17

Transportation Architecture Design Guidelines

Low Impact Development (LID)

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LID

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Low Impact Development (LID)

Introduction

Non-Structural Approach	Option 1	Conservation
	Option 2	Planting Vegetation
	Option 3	Reforestation
	Option 4	Disconnectivity
Structural Approach	Option 5	Permeable Concrete
	Option 6	Permeable Asphalt
	Option 7	Permeable Unit Pavers
	Option 8	Soil Amendments
	Option 9	Inlet Controls
	Option 10	Underground Storage Chamber
	Option 11	Gutter Filters
	Option 12	Infiltration Trench
	Option 13	Surface Sand Filter
	Option 14	Vegetated Filter Strip
	Option 15	Bioswale
	Option 16	Bioslope
	Option 17	Bioretention Cell

5. Low Impact Development (LID) - Introduction

The District of Columbia's approach to stormwater management is similar to the approach used in the majority of urban areas. Stormwater hits the vast impervious surface of the District and flows rapidly out of sight through a series of buried pipes and deposits into the Potomac River or the Anacostia River. This traditional approach to stormwater management has led to two fundamental problems for the District:

1) Discharge of stormwater is not replicating the natural system.

Stormwater is controlled by three factors in a natural environment – infiltration, runoff, and evaporation. The urban environment's introduction of impervious surfaces, which include rooftops, roadways, sidewalks, compacted greenfields, and other surfaces, alters the balance between the three factors. Therefore, the majority of the stormwater becomes runoff carrying debris and pollutants to our streams, rivers, and pond. The impervious surfaces prevent infiltration that provides the natural removal of pollutants and the replenishment of the local groundwater supply. Furthermore, the impervious surfaces prevent the retention of stormwater that encourages the transference of water through evaporation or evapotranspiration.

2) Current stormwater management is based on a conveyance system.

Traditional stormwater design practices have been based on removing water from the site as fast as possible in order to maintain a dry site. This design philosophy is very functional and dominates all aspects of site design. It includes the fast conveyance of stormwater, as well as the collection of stormwater in one place, typically an out of sight water collection facility. The traditional approach to stormwater management emphasizes detention and mechanical purification systems over retention and filtration. The solutions are driven by preparation for large storm events and are typically characterized by large grass-covered basins that rarely fill and contribute to the export of pollutants downstream.

A Different Stormwater Management Approach

In order to solve the problems created by conventional stormwater management, a different thought process and approach to site design needs to be implemented. Rather than focusing on the large storm event, practitioners need to optimize management of small and frequent storms while also implementing control mechanisms for large storms. It is important to maintain groundwater recharge at or near natural levels and preserve existing hydrologic assets wherever possible. This may include employing systems of distributed small Low Impact Development (LID) devices at the site level, while also having regional LID at the watershed level. A combination of these various stormwater treatment techniques can be broadly categorized as LID. LID is a multi-functional "customized" approach to stormwater management and environmental protection that can be integrated into any watershed planning and site design philosophy. The LID approach attempts to replicate the natural system and retain the appropriate balance between evaporation, infiltration, and runoff. The overall goal is to achieve post-development conditions that strive to approach watershed hydrologic functions. LID practices should be viewed as an evolving approach to stormwater management and sustainable development.

Educational Barrier

Although LID is an evolving approach to stormwater management it should be noted that there still exists a considerable amount of resistance to the new practices. Often there is a lack of design data and methods to fully support a complete conversion to a new stormwater management system. This prevents implementation of several LID practices on a large scale. To that end, this chapter can be treated as an introductory educational supplement. It provides a discussion of current LID approaches and offers an up to date overview of the methods, applications, and effectiveness. Work in this field continues to move foreward and this should be viewed only as a starting point when considering site design in the Anacostia Waterfront area.

LID Strategies

This chapter of the Anacostia Waterfront Transportation Architecture Design Guidelines focuses on 18 LID strategies. The strategies can be divided into two approaches – structural and non-structural. Non-structural approaches are broad concepts that encompass several issues and can be implemented at a policy level. Structural approaches are specific devices that can be applied in a site design alone or in conjunction with other LID devices. Applying several LID devices in combination allows for the most effective stormwater management within a site. Several LID practices to be considered in future studies include:

- Cisterns
- Strategic Grading
- Site Finger Printing
- Long Flow Paths
- Tree/Shrub Depression
- Turf Depression
- Landscape Islands Storage
- Rooftop Detention/Retention
- Shoulder Vegetation
- Maintain Drainage Patterns
- Roof Leader Disconnection
- Parking Lot/Street Storage
- Smaller Culverts, Pipes & Inlets
- Alternative Surfaces
- Surface Roughness Technology
- Catch Basins/Seepage Pits
- Sidewalk Storage
- Eliminate Curb and Gutter
- Maximize Sheet Flow
- Pollution Prevention

Natural Components of Vegetated LID Devices

Many of the structural LID devices are composed of vegetation planting. These vegetative devices require the right mix of natural components, such as soil, mulch, plant species, and micro organism species. If the devices are constructed correctly they can create habitats and valuable green spaces for communities. The natural components include:

Soil Bed Characteristics: Soil should be permeable enough to allow runoff to filter through the media, while also having characteristics suitable to promote and sustain healthy vegetation. Soils are also responsible for the nutrient pollutant uptake (nitrogen and phosphorus) through absorption and microbial activities. The soils should therefore balance soil chemistry and physical properties to support biotic communities above and below ground.

Plant Material Selection: Plant material selection should include native plants to the extent that it remains practical. In addition, the plant material selection should be based on the environmental conditions of the three zones in a vegetative stormwater structure: the Lowest Zone, the Middle Zone, and the Outer or Highest Zone. Each zone simulates a hydrological and biological condition in nature. By creating a diverse, dense plant cover, vegetative stormwater management facilities will be able to treat stormwater runoff and withstand urban stresses from insects, disease, drought, temperature, wind and solar exposure.

Plant Material selection also needs to take the local Hardiness Zone into consideration. Hardiness Zones are based on historical annual minimum temperatures recorded in an area. It is best to recommend plants known to thrive in specific hardiness zones. Certain site factors can create microclimates, which would allow the growth of plants not necessarily hardy to a zone. Intense heat in the summer time may also affect the survival of a plant and should be considered when selecting plant material.

Plant Material Placement: As stated earlier, the three zones mimic natural conditions. The Lowest Zone supports plant species adapted to standing and fluctuating water levels. The Middle Zone supports plants that like drier soil conditions, but can still tolerate occasional inundation by water. The Outer or Highest Zone supports plants adapted to drier conditions. The goal of the system is to create a natural looking plant layout that maintains the optimal condition for plant establishment and growth.

Unfortunately, availability of plant material and costs often create problems during the construction stage. Plant material procurement should be made well in advance of the planned installation. In order to realize the vision of a sustainable landscape environment for the site, several goals for plant procurement should be considered:

- Provision and installation of high quality trees, shrubs, ground covers, and herbaceous perennials within the project area.
- Provision of plant materials in the correct species, quantities and sizes in order to ensure plant material survival within the site.
- Provision of plant material on schedule, so as to not delay the substantial completion dates for the overall construction projects.

Utilizing a Grow and Install Contract is one option to secure proper plant material. These plants may be installed following the initial site planting and help initiate the natural succession process, which will eventually create a dynamic self-sustainable landscape environment. The contractor's responsibility may include working with a nursery to grow the required plant material for a required period of time. In smaller scale projects it may be appropriate to acquire the appropriate plant material through nurseries that specialize in providing native plants.

A dynamic ecosystem is made up of a vast diversity of plant life. Many native plants forming the Mid Atlantic ecosystem are difficult to find in the commercial nursery industry. A Grow and Install Contract will ensure the availability of plant material, reduce the likelihood of plant installation delays, and help maintain the anticipated sequence of construction. A Grow and Install contract should also reduce the overall cost of plant material. Plant mortality rates are also reduced because a known source of plant material is readily available. Dead plants are also replaced by the installer during the specified contract period. An additional benefit of the Grow and Install Contract is that rejected and overstocked rare native plant material will become available for other projects.

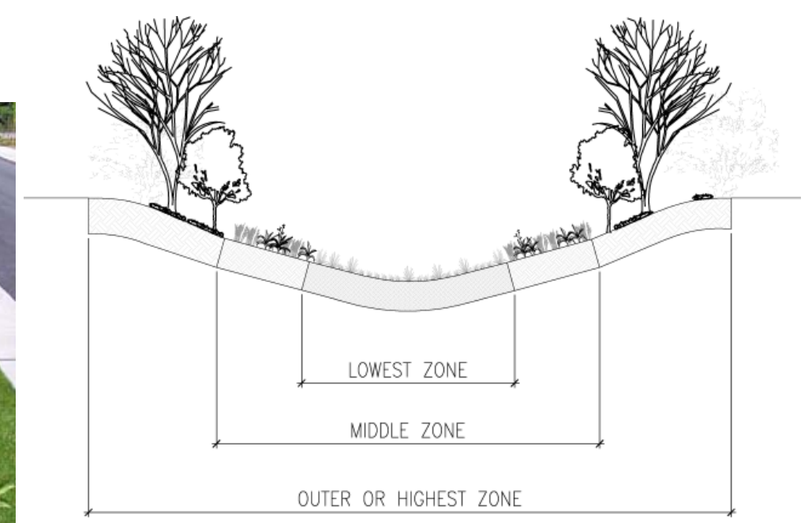
The practitioner should also follow these planting design considerations when planning vegetative LID devices.

- Identify existing and proposed utilities before placement of plants.
- Do not specify toxic, invasive, or disease prone plant material.
- Consider pedestrian traffic and personal safety.
- Specify native plant material.
- Select appropriate vegetation based on the three zones discussed above.
- Plan layout should be random.
- Create wildlife community, providing sources of food and shelter.
- Aesthetics and visual characteristics should be prime consideration.

In addition, the practitioner should be aware of the following issues throughout the design and implementation process for vegetative LID devices:

- Sequence of construction
- Contractor's responsibility
- Planting Schedule and Specifications
- Immediate Maintenance for a period of 3 months
- Warranty for a period of 1 year
- Long term Maintenance

LID - Vegetative Devices



PLANT MATERIAL PLACEMENT

Limitations of Vegetated LID Devices

- Vegetative LID devices usually treat a relatively small drainage area of a few acres, depending on land use and soil type. Large areas should be divided and treated using multiple LID devices.
- Most vegetative LID devices are impractical in areas with steep topography.
- A thick vegetative cover is needed for these practices to function properly. Grass should not be mowed too short.
- Vegetative LID devices should be used carefully in areas of high pollutant concentrations such as industrial sites. If used, they should be part of a "treatment train" that includes other LID treatments.
- Vegetative LID devices can be subject to channelization, if erosive velocity is exceeded.
- Soil compaction can reduce infiltration capacity.

Maintenance of Vegetated LID Devices

- Inspect on a semi-annual basis; additional inspections should be scheduled during the first few months to make sure that the vegetation in the LID device becomes adequately established. Inspections should assess slope integrity , soil moisture, vegetative health, soil stability, compaction erosion, ponding and sedimentation.
- If grass, mow at least once a year, but do not cut grass shorter than the design flow depth because the effectiveness of the vegetation in reducing flow velocity and pollutant removal may be reduced. Grass cuttings should be removed from the vegetative LID device and composted. Reseed periodically to maintain dense turf.
- If grass, remove the accumulated sediment when it is 3" deep or higher than the turf, to minimize potential concentrated flows and sediment re-suspension.
- Maintenance of LID devices is similar to the routine maintenance of any landscaped area. When plants native to the area are used, need of fertilizer, pesticide, and water is minimized. Prune and replace damaged or dead plant material, mulch annually and irrigate only as necessary to prevent vegetation from dying.
- The application of fertilizers and pesticides should be minimal and only of last resort. Exercise caution during the application of fertilizers and pesticides in and around the LID device to prevent the possibility of surface and groundwater contamination.
- As plants mature in LID device, landscaping management requirements are lessened. Typical aspects of LID device maintenance include sediment and debris removal from the system, replacement of dead plant material, regulation of soil pH, repair of eroded areas, re-mulching, unclogging of underdrain, and repair of overflow structure repair.
- Prevent off-street parking or other activities that can cause rutting or soil compaction.

Cost of Vegetated LID Devices

Vegetated LID devices typically cost less to construct than curbs and gutters or underground stormwater conveyance pipes. The cost of construction will depend on local conditions and management objectives. As with any stormwater management structure the owners should provide a budget for ongoing maintenance such as regular mowing.

Permeable Pavements

The proper utilization of pervious pavements is a recognized Best Management Practice by the U.S. Environmental Protection Agency (EPA) for providing first flush pollution control and storm water runoff. As regulations further limit storm water runoff, it is becoming more expensive for municipalities to develop real estate, due to the size and expense of necessary drainage systems. Pervious pavements reduce the runoff from paved areas, which reduce the need for separate storm water retention facilities and allow the use of smaller capacity storm sewers. This allows municipalities to develop a larger area of available land at a lower cost. Pervious pavements can allow water to infiltrate the soil over large areas, thus facilitating recharge of local groundwater supplies. Pervious pavement has a considerable life-span when properly installed and maintained.

LID Integration

LID can be successful on several levels. It achieves cumulative impacts, promotes uniform distribution of stormwater, encourages resources conservation, attains economic sustainability on a small scale, and fosters property owner responsibility through a vested interest in property values.

However, LID should not be viewed as a single tool when approaching sustainable site design. It should be integrated into an overall design process when attempting to achieve sustainable development. A comprehensive approach to sustainable stormwater management can be attained by combining additional practices with LID techniques. Some of the practices overlap with LID concepts. For example, impervious surfaces are inevitable in highly developed urban areas. However, reducing the amount of impervious surfaces is possible through careful consideration during the initial planning stages of development. The disconnection of impervious areas is also a characteristic of several LID devices. Strategies to reduce the amount of impervious surfaces include:

- Minimize street widths.
- Promote cluster development.
- Install permeable pavements.
- Implement roof runoff management measures.
- Reduce directly connected impervious areas.
- Roughen impermeable surfaces.
- Plant open spaces with proper plant species.
- Direct runoff from impervious areas across vegetated areas.
- Minimize the use of lined channels and storm sewers.

LID Streetscape (SEA Project, Seattle)

Traditional Streetscape

Anacostia Waterfront Transportation Architecture Design Guidelines

This manual presents conceptual elements of LID that could be implemented within the Washington, D.C. landscape. The toolbox includes non-structural and structural concepts.

Non-structural concepts involve practices that can manage stormwater without constructing structural devices. Non-structural management concepts can include planning level decisions during site design before ground is broken or contours are graded. Non-structural management also involves the placement of design concepts and site practices to minimize the introduction of pollutants to stormwater, maximize the protection of highly permeable soils, protection of sensitive or otherwise desirable natural areas, and the development of monitoring practices to track the effectiveness of the stormwater management practices and maintenance programs to keep the practices as effective as practicable. Structural practices include the application of manmade materials like permeable pavers and filter boxes as well as reconfiguration of natural spaces like vegetated swales, vegetated filter strips, and bioretention facilities.

The manual provides enough visual and technical information to make an educated decision on LID practices that could successfully be implemented along transportation corridors. Detailed design calculations are generally not included. After the selection of LID practice, other engineering design documents should be consulted to develop detailed designs for review and approval by the permitting agencies.

The 17 Primary LID Strategies in this Manual

This chapter will now focus on the 17 primary LID strategies. These strategies satisfy three general components of an LID approach. These include: vegetation, routing and structural elements. When selecting an LID option all three components should be considered. Along with an overview of each strategy, applications, required maintenance, and stormwater management effectiveness are also discussed. Stormwater management effectiveness is a qualitative ranking that can be used as a general guide to evaluate and select LID practices. LID effectiveness was evaluated against the following stormwater management objectives: volume, frequency, duration, peak discharge, and water quality. It should be noted that the specific drainage characteristics of any device (drainage area, land use, soils conditions, and existing runoff patterns) have significant influence in its performance. The criteria used for the evaluation are as follows:

- *Volume:* LID's ability to reduce annual runoff volume by retention, infiltration, plant uptake, or secondary uses, such as irrigation, to minimize or eliminate runoff from the site. Volume reduction contributes to the control of frequency, duration, peak discharge, and water quality.
- *Frequency:* LID's ability to reduce the rate of recurrence of runoff from the site. Typically there are 50 to 70 rainfall events in the Metro area, with an average annual depth of rainfall of about 40 inches. Many of these storm events produce only a fraction of an inch of rainfall. The metric is in preventing runoff from these smaller events.
- *Duration:* LID's ability to control the length of time runoff leaves the drainage area. Increased duration and energy of water leaving the drainage area can erode downstream channels and cause downstream capacity problems in storm drain pipes.
- *Peak Discharge:* LID's ability to control the peak rate of discharge from the site and the capacity of downstream channels, storm drainpipes, and combined sewer pipes, and minimize downstream erosion in open channels. Peak discharge is controlled by storing and slowly releasing the water without significantly reducing runoff volume.
- *Water Quality*: LID's ability to reduce volume of typical pollutants generated by roads and urban land uses by retention, settling, filtering, or plant uptake.

Stormwater Management Expected Effectiveness* Summary Table

Reference	LID Management Practice	Strategy	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 1	Conservation	V	⦿	⦿	⦿	⦿	⦿
Option 2	Planting Vegetation	V	⦿	⦿	⦿	⦿	⦿
Option 3	Reforestation	V	⦿	●	●	⦿	⦿
Option 4	Disconnectivity	R	⦿	⦿	⦿	⦿	⦿
Option 5	Permeable Concrete	R, S	⦿	●	⦿	●	●
Option 6	Permeable Asphalt	R, S	⦿	●	⦿	●	●
Option 7	Permeable Unit Pavers	R, S	⦿	●	⦿	●	●
Option 8	Soil Amendments	S	⦿	⦿	⦿	⦿	⦿
Option 9	Inlet Controls	R, S	○	○	○	○	⦿
Option 10	Underground Storage Chamber	R, S	⦿	●	⦿	●	⦿
Option 11	Gutter Filters	R, S	○	○	○	⦿	●
Option 12	Infiltration Trench	R, S	○	●	●	⦿	●
Option 13	Surface Sand Filter	R, S	○	⦿	⦿	⦿	●
Option 14	Vegetated Filter Strip	V, R, S	⦿	⦿	⦿	⦿	⦿
Option 15	Bioswale	V, R, S	⦿	⦿	⦿	⦿	●
Option 16	Bioslope	V, R, S	⦿	⦿	⦿	⦿	●
Option 17	Bioretention Cell	V, R, S	⦿	●	⦿	⦿	●
Strategy Abbreviation Key:		V = Vegetation, R = Routing, S = Structure					
Effectiveness Key:			● High	⦿ Medium	○ Low	Blank = No Impact	

* Disclaimer: Effectivness will vary based on site specific conditions

Overview

This chapter provides LID guidance associated with the application of transportation-related urban architectural elements outlined in Chapter 4. Elements with Green Boxes within Chapter 4 highlight LID opportunities that are described in detail within this chapter

LID Selection Matrix

Anacostia Waterfront Transportation Architecture Design Guidelines			Roadway Functional Classification												Special Area Designation									
					Major Urban Roads						Locals		Alleys		Greenway	Symbolic Corridor		Designated Transit Corridor	Special Segments	River Crossing	Waterfront Access Segment		Waterfront Promenade	Park Road
					Principal Arterial		Minor Arterial		Collector		Local Roads		Alleyways											
			Interstate	Other Freeways	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Residential	Mixed-Use	Mixed-Use	Residential	Mixed Use	Mixed Use	Mixed Use	Mixed Use	Residential	Mixed Use	Mixed Use
LOW IMPACT DEVELOPMENT (LID)																								
NON-STRUCTURAL APPROACH	OPTION 1	Conservation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	OPTION 2	Planting Vegetation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
	OPTION 3	Reforestation	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X				X	X
	OPTION 4	Disconnectivity	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
STRUCTURAL APPROACH	OPTION 5	Permeable Concrete	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X
	OPTION 6	Permeable Asphalt	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X
	OPTION 7	Permeable Unit Pavers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X
	OPTION 8	Soil Amendments	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X				X	X
	OPTION 9	Inlet Controls	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
	OPTION 10	Underground Storage Chamber	X	X	X	X	X	X	X	X					X	X	X	X	X					
	OPTION 11	Gutter Filters			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
	OPTION 12	Infiltration Trench	X	X	X	X	X	X	X	X					X								X	X
	OPTION 13	Surface Sand Filter	X	X	X	X	X	X	X	X					X									
	OPTION 14	Vegetated Filter Strip	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X				X	X
	OPTION 15	Bioswale	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X				X	X
	OPTION 16	Bioslope	X	X	X	X	X	X	X	X					X	X	X	X	X				X	X
	OPTION 17	Bioretention Cell	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X				X	X

Table 5.1:
LID Selection Matrix

Representation of Bioretention Cell - Portland, Oregon

Element:	Non-Structural Approach	**Reference:**	Option 1
Item:	Conservation		
Classification:	Interstate, Freeway, Principal Arterial, Collector, Minor Arterial, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, River Crossing, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Policy		

Frankfurt City Forest

Remaining green spaces in urban environments tend to be located in areas that are difficult to develop or vacant places where trees have been allowed to grow naturally. These green space pockets are valuable for their ability to improve air quality, reduce stormwater, temper local climate, conserve energy, and create habitat for flora and fauna.

Unfortunately, lack of maintenance and stress from nearby activities make urban green spaces susceptible to pest outbreaks, disease, and drought, while also being subject to clearing, excessive dumping of trash and rubble, and compaction and erosion from pedestrian and vehicular traffic.

Policies for conservation of green spaces include:

- Protect urban forests and existing forest canopy in large tracts of land.
- Prevent tree losses during development and redevelopment.
- Maintain as many trees along roadways as possible.
- Implement a credit system providing incentives to developers, designers, and builders to conserve green spaces and tree stands.

Required Maintenance: Develop an ongoing management program for urban forestry which would include:

- Controlling invasive plants
- Removing diseased trees

Applications:

- Thoroughfare: Throughout and whenever possible.
- Major Urban Street: Throughout and whenever possible.
- Local: Throughout and whenever possible.
- Alley: Throughout and whenever possible.

Stormwater Management Effectiveness:

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 1	Conservation	⦿	⦿	⦿	⦿	⦿

Element:	Non-Structural Approach	**Reference:**	Option 2
Item:	Planting Vegetation		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Policy		

Beyond aesthetics and emotional well-being, trees and vegetation perform important functions that protect and enhance city dwellers' health and property. To encourage tree planting in storm water treatment practices, guidance should be provided to developers and agencies on selecting appropriate species, identifying areas suitable for plantings, and making any necessary modifications to the design or planting environment.

Trees and vegetation provide the following benefits to urban living:

- Improve air quality
- Temper local climate
- Conserve energy
- Benefit the economy
- Create habitat for plants and animals
- Improve health by reducing stress in people
- Serve as screens
- Promote community pride
- Reduce stormwater runoff and erosion – precipitation is caught by tree canopies and increases the likelihood of evapotranspiration. This interception lessens the force of storms and reduces runoff and erosion – approximately 100,000 gallons of rainfall per year are intercepted by 100 mature trees. Roots of trees are extensive and hold large areas of soil stabilizing hillsides and riparian zones. Additionally, deep rooted vegetation, such as Switchgrass, and dense planting will also effectively intercept rainfall. Decaying leaves form an organic layer on the ground that allows water to percolate into the soil reducing runoff and soil erosion.

Required Maintenance: Develop an ongoing management program for urban forestry which would include:

- Watering, Pest Control, Pruning and Mulching

Applications:

- Thoroughfare: Throughout and whenever possible.
- Major Urban Street: Throughout and whenever possible.
- Local: Throughout and whenever possible.
- Alley: Throughout and whenever possible.

Stormwater Management Effectiveness: Integrating trees into urban transportation corridors increases green infrastructure while providing aesthetic benefits. Healthy urban tree canopies are estimated to reduce urban runoff volume 4 to 8% and peak storm runoff 10 to 20%.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 2	Planting Vegetation	⦿	⦿	⦿	⦿	⦿

Element:	Non-Structural Approach	**Reference:**	Option 3
Item:	Reforestation		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Policy		

A planned reforestation effort is possible in publicly owned lands because of the large size of parcels and the ownership of land. These include highway cloverleafs and buffers, parks, schools, roadside green spaces, vacant lands, steam corridors, and utility corridors. Natural regeneration is a passive method of reforesting a site that entails restricting mowing by posting signs or installing fencing to restrict access and allowing trees to regenerate naturally. Natural regeneration is a low-cost, low-effort way to reforest a site, but can take a long time to show results. Active reforesting public lands and right of ways throughout a watershed is a more labor intensive way to create a forest, but allows for a more controlled green space. Prior to reforesting a site, a detailed assessment should be made of the soils and site conditions to determine what type of trees and plants are appropriate on site, along with identifying any planting constraints.

Policies for reforestation include:

- Restore forest fragments
- Plant trees during development and redevelopment
- Reforest public land
- Promote the reforestation of private lands
- Install a natural regeneration plan
- Install an active reforestation plan
- Use phytoremediation as a technique to remove contamination from the soil and water
- Reforestation programs offer great community engagement opportunities
- Create conservation easement programs

Required Maintenance: Develop an ongoing management program for urban forestry which would include:

- Watering, Monitoring, Protection against Vandalism

Applications:

- Thoroughfare: Throughout and whenever possible.
- Major Urban Street: Throughout and whenever possible.
- Local: Throughout and whenever possible.
- Alley: Throughout and whenever possible.

Stormwater Management Effectiveness: Healthy urban tree canopies are estimated to reduce urban runoff volume 4-8% and peak storm runoff 10-20%.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 3	Reforestation	⦿	●	●	⦿	⦿

Element:	Non-Structural Approach	**Reference:**	Option 4
Item:	The Concept of Disconnectivity		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Policy		

Purpose: There is a wide-range of stormwater runoff disconnection techniques that can be used to accomplish multiple community goals. This includes the greening of urban areas by breaking up large expanses of pavements. Vegetated areas can be enhanced by directing runoff to landscaped areas through routing by sheet flow, trenches, curb cuts, and other methods as appropriate. Rainwater harvesting can be used for irrigation or other non-potable uses. Downspout disconnection can be used to reduce the volume of runoff that enters the combined or separate sewer systems. Slopes should not be too steep and depressions should not be too deep to force a fence enclosure around the low impact development device. Existing utility lines should be located and avoided or relocated. Coordination with proposed utility lines is required to properly design the low impact development device.

Required Maintenance: Varies

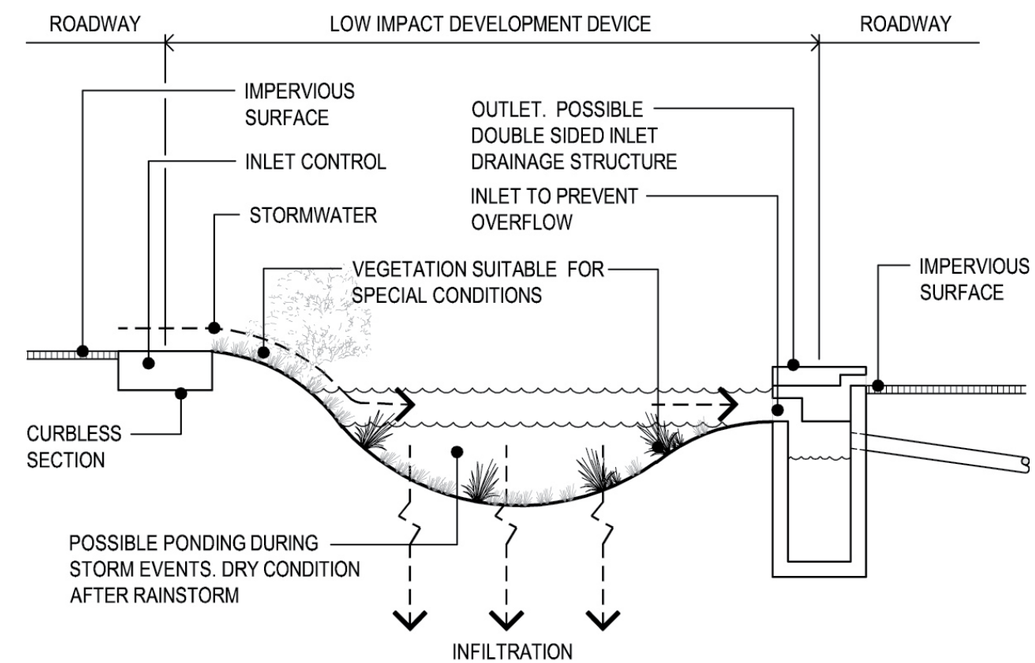
Applications:

- Thoroughfare: Throughout and whenever possible.
- Major Urban Street: Throughout and whenever possible.
- Local: Throughout and whenever possible.
- Alley: Throughout and whenever possible.

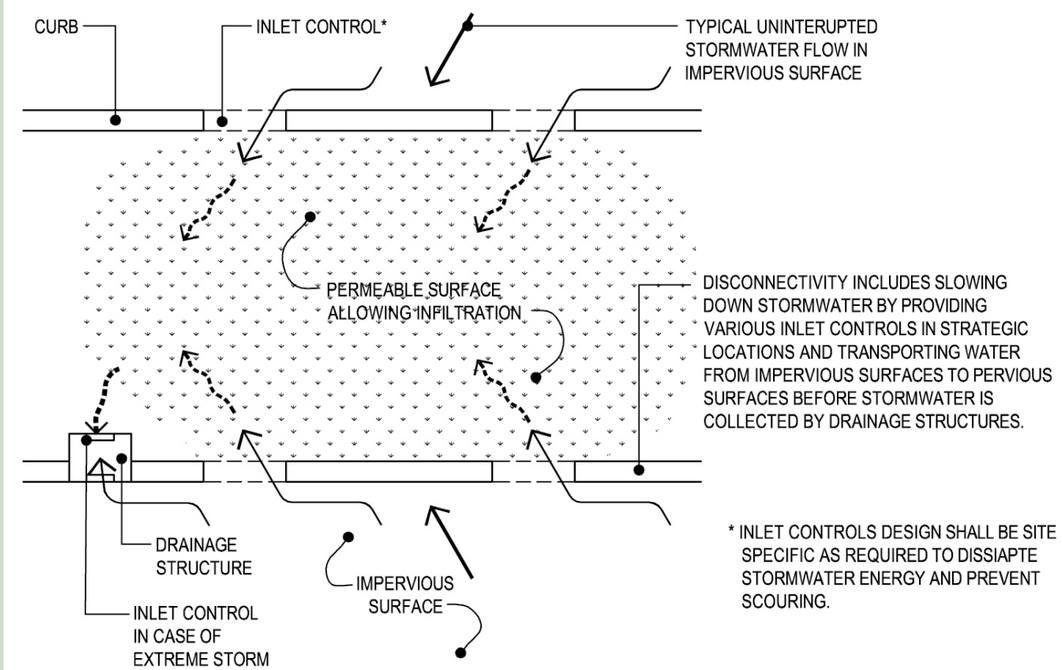
Stormwater Management Effectiveness: Estimated removal efficiencies.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 4	Disconnectivity	⦿	⦿	⦿	⦿	⦿

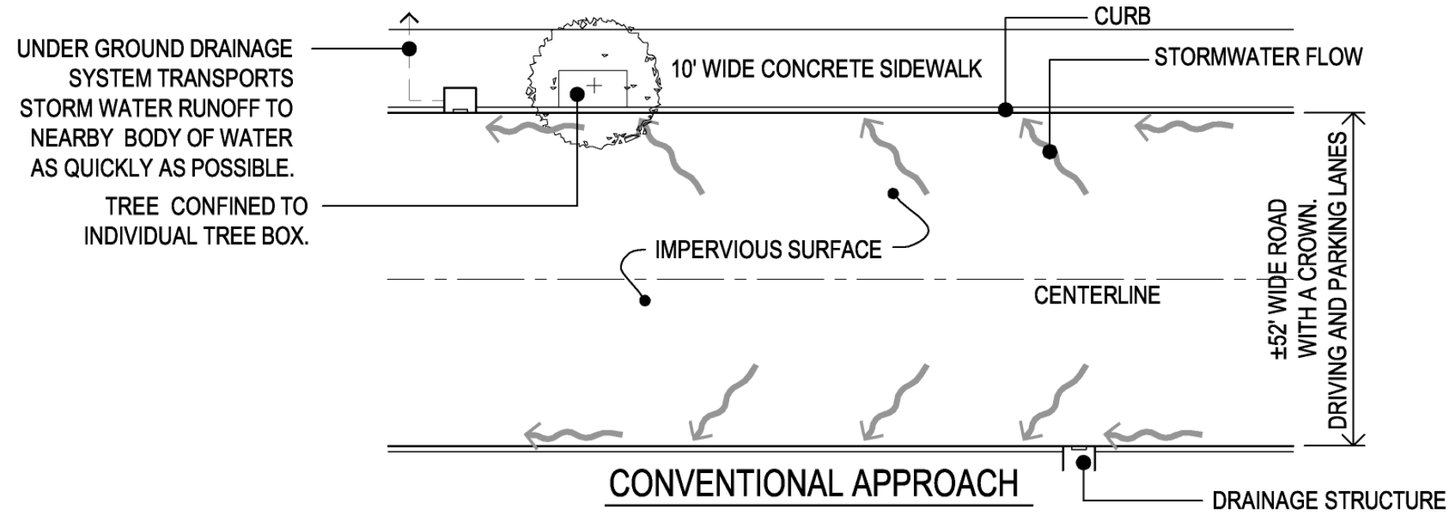
Note: The benefits of disconnectivity are greatly reduced or negligible when impervious surfaces cover more than 35% of an area.



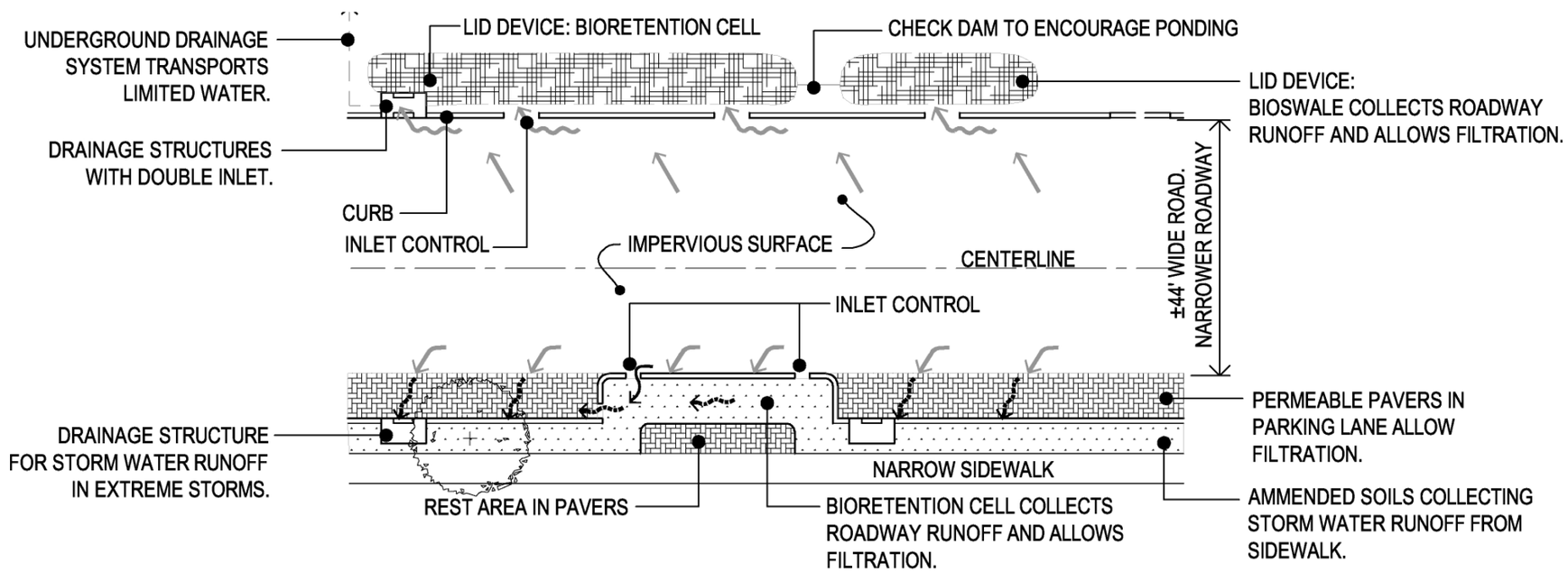
CONCEPT OF DISCONNECTIVITY - SECTION



CONCEPT OF DISCONNECTIVITY - PLAN



CONVENTIONAL APPROACH



THE LID APPROACH

CONCEPT OF DISCONNECTIVITY

Item:	The Concept of Disconnectivity
Reference:	Option 4

Element:	Structural Approach	**Reference:**	Option 5
Item:	Permeable Concrete		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Parking areas, sidewalks, and alleys		

Permeable concrete, constructed with larger pea gravel and a lower water: cement ratio for a pebbled, open surface allows water to flow through voids in the aggregate and infiltrate into the underlying subbase. Permeable concrete encourages stormwater infiltration, filters and traps pollutants, improves the quality of runoff and the receiving waterway, and may provide significant underground stormwater storage if sufficient subbase depth is provided. The depth and material of the subbase depends on the existing soils and the infiltration desired. Permeable concrete disperses flow, recharges groundwater and reduces the footprint of a site's impervious area. Underdrains may be included in the design of the permeable concrete pavement to offset impervious subbases. The size of the underdrain is determined by the desired flow rate. Requires sweeping to maintain infiltration rate.

Required Maintenance:

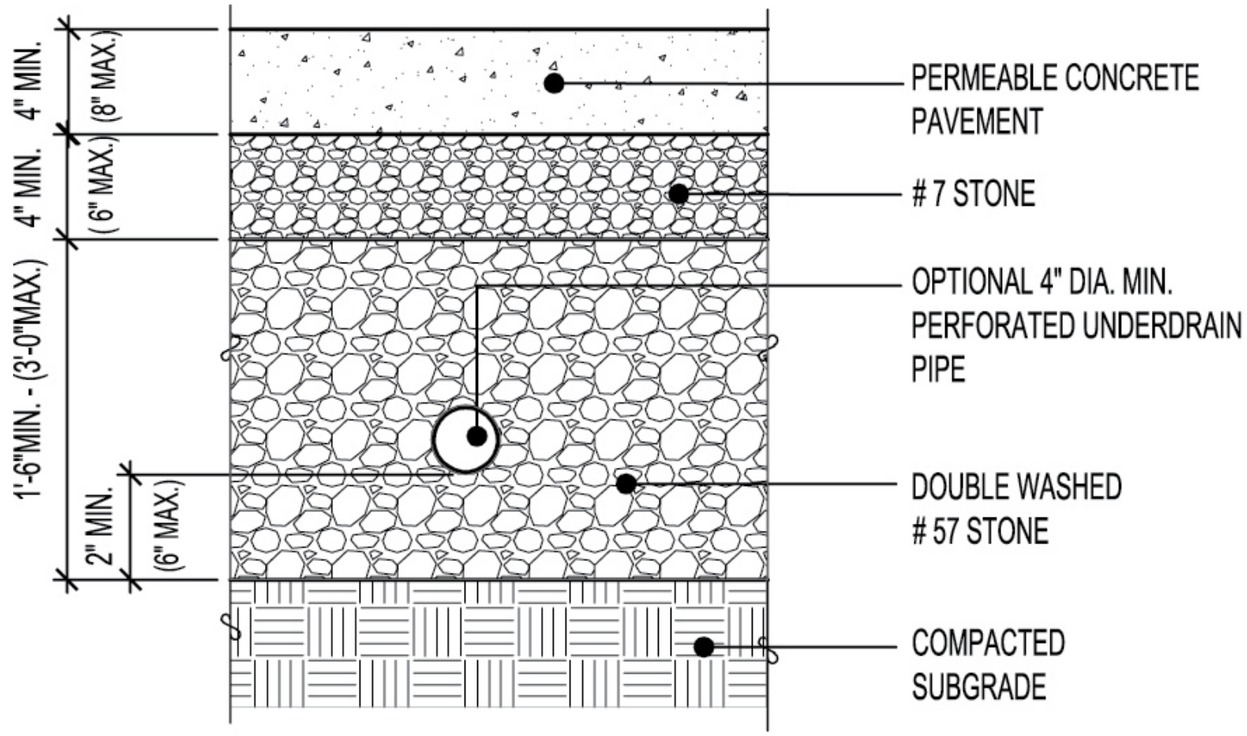
- Vacuum pavement twice annually to prevent clogging within the voids.
- Maintain planted areas adjacent to pavement.
- Promptly remove any soil deposited on pavement.
- Do not store mulch or soil and do not allow construction staging on unprotected pavement.
- Regular street sweeping on shoulder areas will prevent road debris from clogging concrete.
- Inlets draining to the subsurface bed should be cleaned twice annually.
- Do not seal coat surface during repairs.
- Snow/Ice Removal: A lower level of winter maintenance is required for pervious pavements in comparison with standard pavements. However, do not use abrasives such as sand or cinders on the pervious pavement site. Salt can be applied but environmentally sensitive deicers are recommended. Snow plowing should also be done with care.

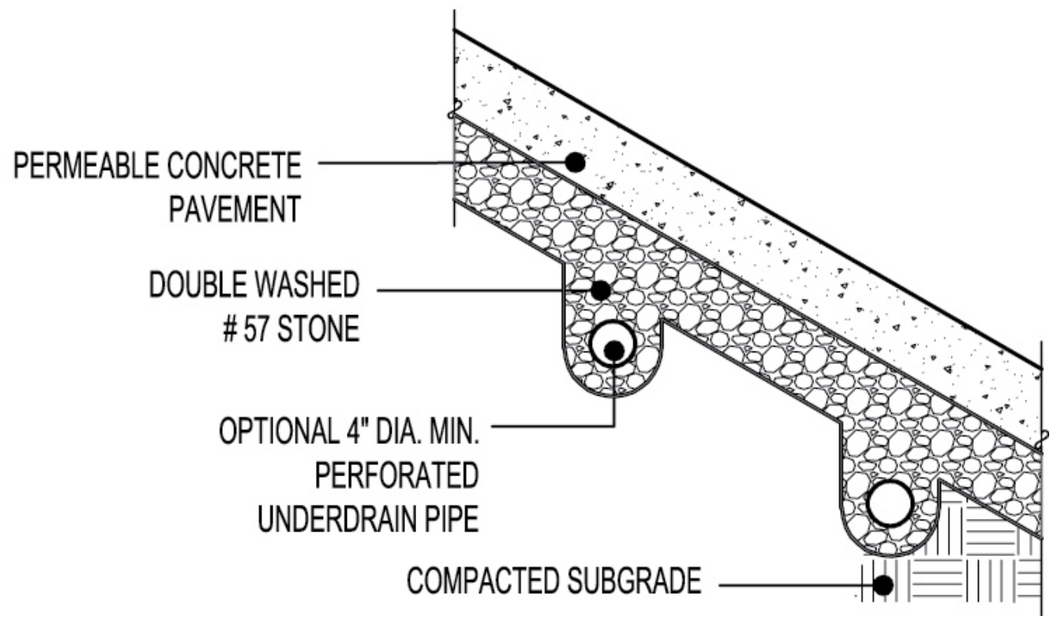
Applications:

- Thoroughfare: Permeable concrete can be located in medians or on periphery of road systems and parking lanes as offline or online stormwater systems.
- Major Urban Street: Permeable concrete can be incorporated in parking lanes and sidewalks.
- Local: Permeable concrete can be incorporated in parking lanes and sidewalks.
- Alley: Surface treatment in alleys.

Stormwater Management Effectiveness:

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 5	Permeable Concrete	⦿	●	⦿	●	●





Item: Permeable Concrete

Reference: Option 5

Element:	Structural Approach	**Reference:**	Option 6
Item:	Permeable Asphalt		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, sidewalk planting zone		

Purpose: Permeable asphalt lacks most of the fine material found in conventional pavements and allows water to flow through voids in the aggregate and infiltrate into the underlying subbase. Runoff from asphalt and adjacent impervious areas slowly passes through the gravel layer. Permeable asphalt encourages stormwater infiltration, filters and traps pollutants, improves the quality of runoff and the receiving waterway and may provide significant underground stormwater storage if sufficient subbase depth is provided. Permeable asphalt disperses flow, recharges groundwater and reduces the footprint of a site's impervious area.

In addition, the total cost of permeable asphalt does not cost more than conventional pavement. The open-graded asphalt cost is close to the cost of conventional asphalt. The underlying stone subbase is usually more expensive than conventional compacted subbase, however, the cost difference is offset when taking into account the savings from the reduced number of stormwater pipes and inlets. When adding this to the cost savings provided by detention basin elimination, porous pavement can be considered a cost-effective design solution.

Required Maintenance:

- Porous asphalt surfaces should be vacuumed twice annually with an industrial vacuum sweeper.
- Never apply sealant or grit to the asphalt surface.
- Prevent mud and/or large amounts of soil from washing onto the asphalt surface.
- Salt can be used as a deicer but sand is prohibited.

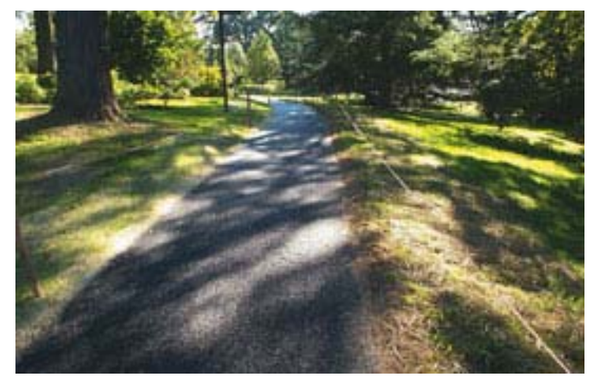
Applications:

- Thoroughfare: Permeable asphalt can installed along roadway shoulders.
- Major Urban Street: Permeable asphalt can installed in parking lanes.
- Local: Permeable asphalt can installed in parking lanes.
- Alleys: Surface treatment in alleys.

Stormwater Management Effectiveness:

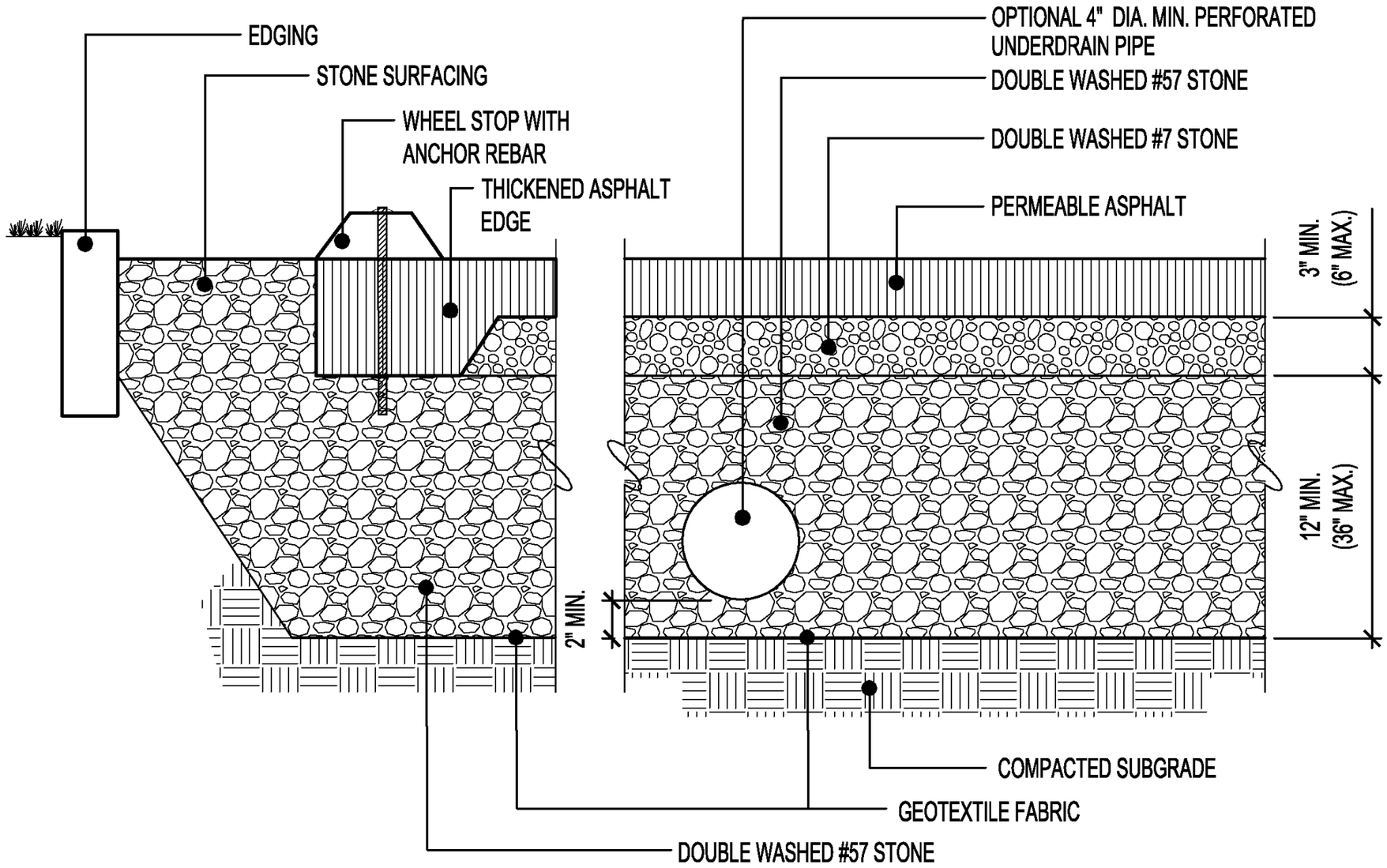
Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 6	Permeable Asphalt	⦿	●	⦿	●	●

Siemens Corporate Offices, PA - One of the oldest large porous pavement systems in US. Twenty years after installation the site continues to function well and has not been repaved. Porous Asphalt shown in the foreground. Cahill Associates



Swarthmore College, Philadelphia, PA - Pervious asphalt walkway. - Cahill Associates

City of West Hollywood - Spaulding Avenue Municipal Parking Lot Cahill Associates



PERMEABLE ASPHALT SECTION

Item:	Permeable Asphalt
Reference:	Option 6

Element:	Low Impact Development (LID)	**Reference:**	Option 7
Item:	Permeable Unit Pavers		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, sidewalk planting zone		

Permeable unit paver systems are concrete blocks or stones with spaces or gaps between them allowing stormwater to flow through and into an underground stone storage area or a tree planting area. The permeable pavers can be used to treat roadway or sidewalk runoff. The paver system allows stormwater infiltration into the subsurface gravel base, encourages infiltration into subsoils that filter and trap pollutants improving the quality of runoff and the receiving waterway, and may provide significant underground stormwater storage if sufficient subbase depth is provided. In tree planting situations permeable pavers allow water to enter the tree root zone providing an essential water supply for trees.

Permeable paver blocks essentially function as an infiltration and retention area that can accommodate pedestrians, vehicular parking, and traffic. The combination of functions offers the following benefits:

- Promotes tree survival by providing air and water to roots.
- Durable, high-strength, low-absorption concrete units resist freeze-thaw and heaving.
- Reduces micro-climatic temperatures and contributes to urban heat island reduction.
- Immediately ready for traffic (no waiting days for curing).

Required Maintenance: Street sweeping should be performed on paver areas regularly to remove debris that clog joint filtering material. Some joint filtering material will most likely have to be replaced and compacted periodically.

Applications:

- Thoroughfare: The permeable pavers can be located in medians or on periphery of road systems as offline or online stormwater systems.
- Major Urban Street: Permeable pavers can be incorporated into the parking areas and sidewalk planting zones.
- Local: Permeable pavers can be incorporated into the parking areas and sidewalk planting zones.
- Alley: Surface treatment in alleys.

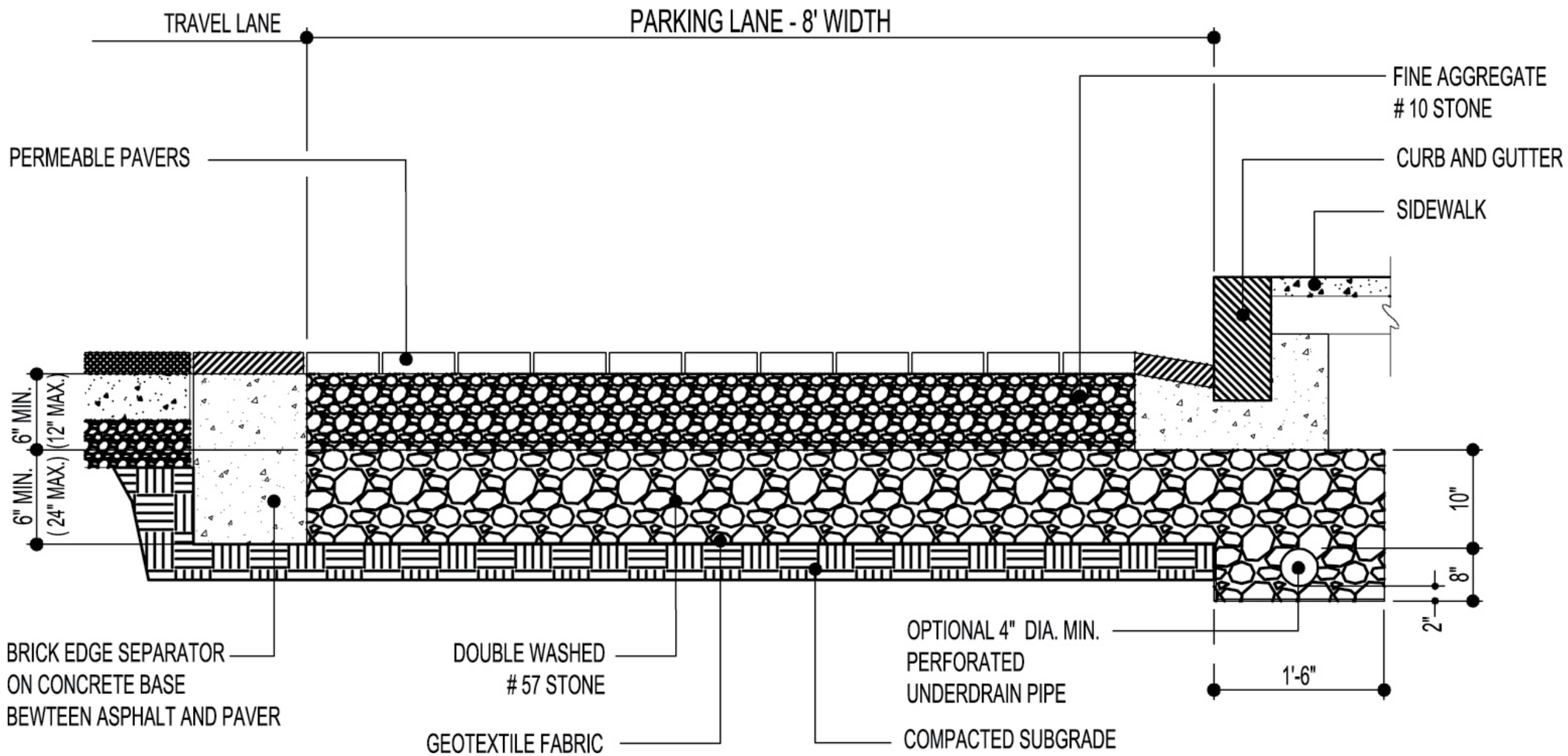
Stormwater Management Effectiveness:

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 7	Permeable Pavers	⦿	●	⦿	●	●

Permeable pavers in planting areas. Cobblestones allow water to pass into the underground planting zone.

Permeable pavers in roadway areas. Interlocking pavers can allow water to pass through openings created by the paver shape.

Permeable pavers in roadway areas and/or breakdown areas. Joints can be filled with aggregate for infiltration or with topsoil and grass for microclimatic cooling.



Item: Permeable Pavers

Reference: Option 7

Element:	Structural Approach	**Reference:**	Option 8
Item:	Soil Amendments		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, sidewalk planting zone, green spaces		

Soil amendments are any substance that enhances and helps promote plant growth in urban areas. Soil amending achieves pollutant removals through a number of physical, chemical, and biological mechanisms. It also enhances the quality of green space by improving soil conditions and allowing for more robust vegetative growth. Chemical properties of the soil, such as soil fertility and pH, may be altered by amendments. Physical properties such as soil structure, porosity, and water-holding capacity can also be improved by amendments. This results in healthier green spaces that require less reliance on chemicals and soil characteristics that do not constrain root growth.

Amendments that will make soils more suitable for plant growth include aeration, composting, establishing and maintaining a mulch topping, and adding organic matter or lime. Organic soil amendments such as composted sludge, composted animal manure, composted leaves, and composted yardwaste are common solutions for improving soil physical characteristics. Other organic amendments which also have proven benefits include sphagnum peat and bark soil conditioners. Bark soil conditioners should consisit of mostly bark and uncomposted wood chips and sawdust are not recommended as soil amendments. Organic amendments will increase aeration and porosity in heavy clay soils while increasing water retention in sandy soils. Other benefits of soil amendments include increasing the soil's infiltration capacity and adding storage volume which will reduce the amount of stormwater leaving the site. Avoid adding sand to fine silt or clay soils because compaction will result.

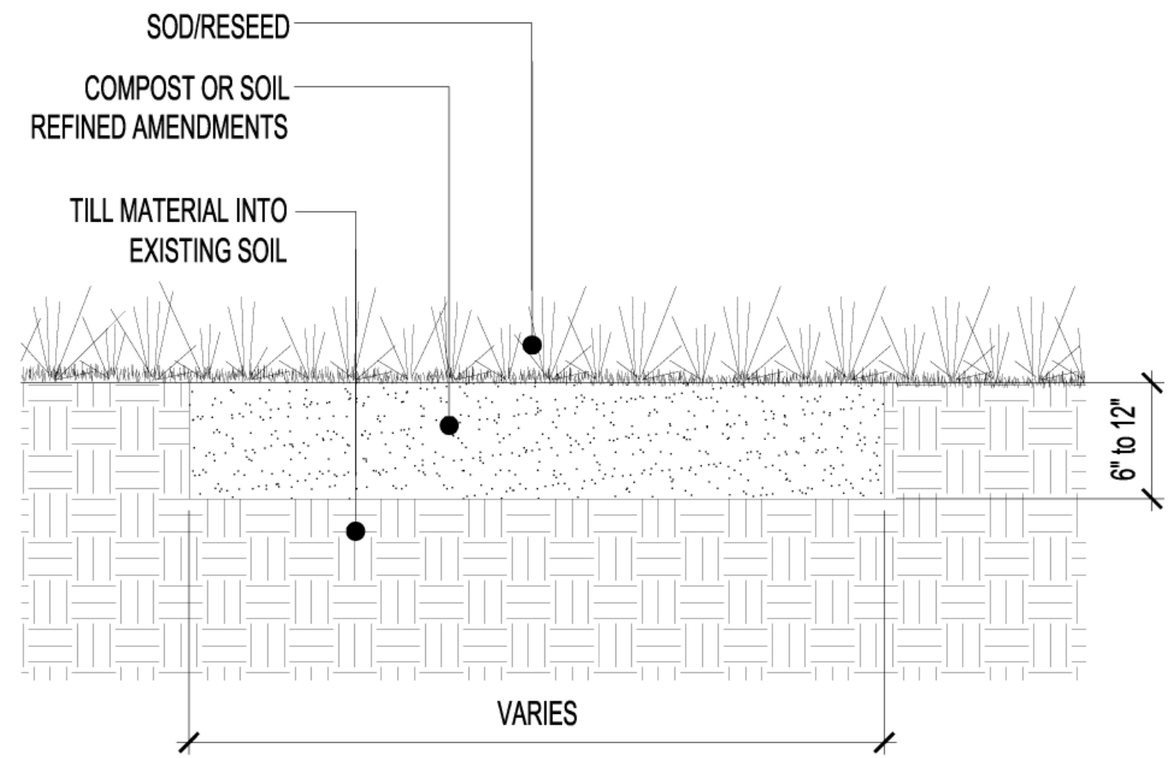
Required Maintenance: Reductions in amended soil infiltration capacity typically result from compaction or extensive root matting of groundcovers, such as grasses. Extensive mechanical aeration may restore infiltration capacity. If not, organic amendments should be disked into the soil for a depth of several inches and the site should be restabilized.

Applications:

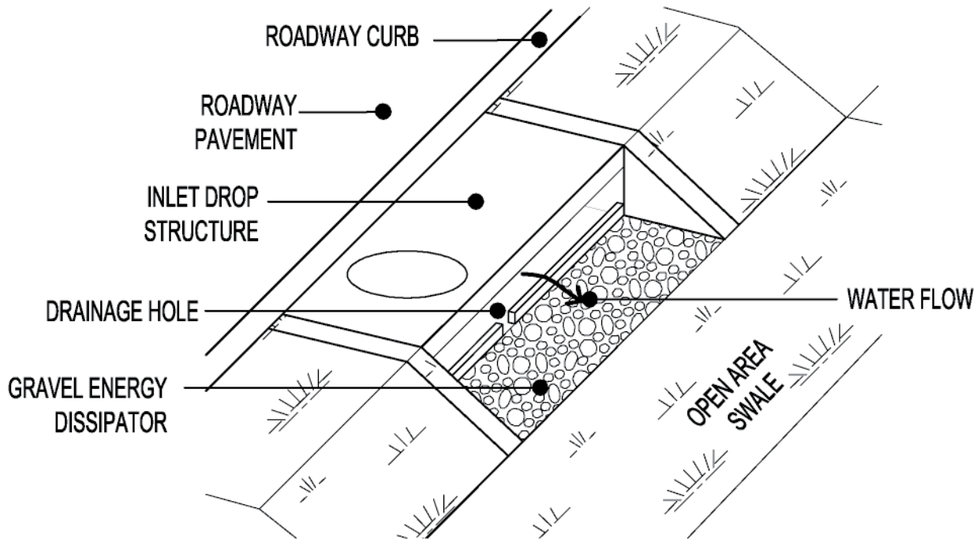
- Thoroughfare: Soil amendments can be used in medians, roadway setbacks, and green spaces.
- Major Urban Street: Soil amendments can be used in tree planters and landscape locations dictated by streetscape design.
- Local: Soil amendments can be used in tree planters and landscape locations dictated by streetscape design.
- Alley: N/A.

Stormwater Management Effectiveness: The increased water retention of compost-amended soils significantly lowers surface runoff volumes when compared to typical compacted urban soils. Additionally, compost materials are less prone to erosion than topsoil or compacted subsoil. The combination of decreased runoff volumes and decreased erosion provide water quality benefit by limiting pollutant mass loading from individual storm events.

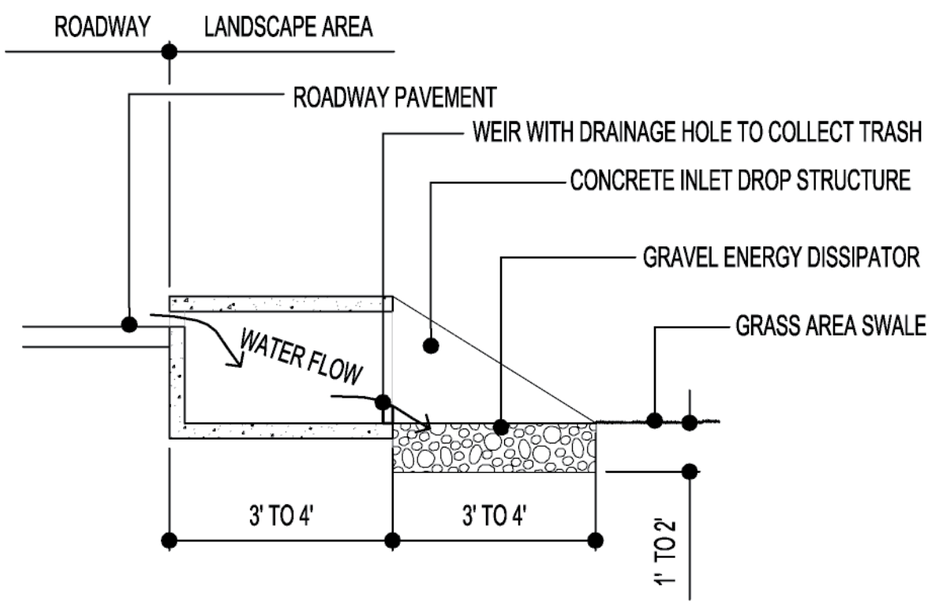
Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 8	Soil Amendments	⦿	⦿	⦿	⦿	⦿



Element:	Structural Approach	**Reference:**	Option 9
Item:	Inlet Controls		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Alley, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, sidewalk planting zone		



AXONOMETRIC



SECTION

Inlet controls are subsurface controls that are not visually apparent to the community. Inlet controls are devices and designs that prevent sediment, oils, floatable trash, and debris from being transmitted further along the storm drain system. Examples include catch basins to capture sediment, outlet pipe hoods to trap oil and floatables, hydrodynamic separators, curb cuts, energy dissipators and other site specific methods. They potentially reduce maintenance costs for existing stormwater infrastructure.

Required Maintenance:

- Cleaning
- Sweeping
- Monitoring

Applications:

- Thoroughfare: These can be located in medians or on periphery of road systems as offline or online stormwater systems.
- Major Urban Street: Facilities can be incorporated into streetscape design and tree boxes.
- Local: Facilities can be located in grass strips or other landscape areas.
- Alley: Facilities can be incorporated into landscaped areas.

Stormwater Management Effectiveness: The impact of inlet controls on overall non-point source water quality is low and highly dependent upon routine maintenance, which has the largest influence on the effectiveness of debris and pollutant removal.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 9	Inlet Controls	○	○	○	○	◉

Element:	Structural Approach	**Reference:**	Option 10
Item:	Underground Storage Chamber		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment.	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, sidewalk, parking lanes		

Underground storage chambers can be used to reduce the flow of runoff into combined and separate drainage systems. Typically, storage chambers are manufactured structures constructed of a variety of durable, site appropriate materials. Underground storage chambers collect and conserve roadway runoff for future water reuse such as irrigation, or simply conserve water to recharge the water table. These are low-cost water conservation devices that reduce runoff volume and, for very small storm events, function to delay and reduce peak runoff flow rates. These devices are generally used in parking lots. Special attention should be given within the public Right-of Way.

Required Maintenance: Develop an inspection and maintenance program which would include:

- Vacuuming
- Cleaning

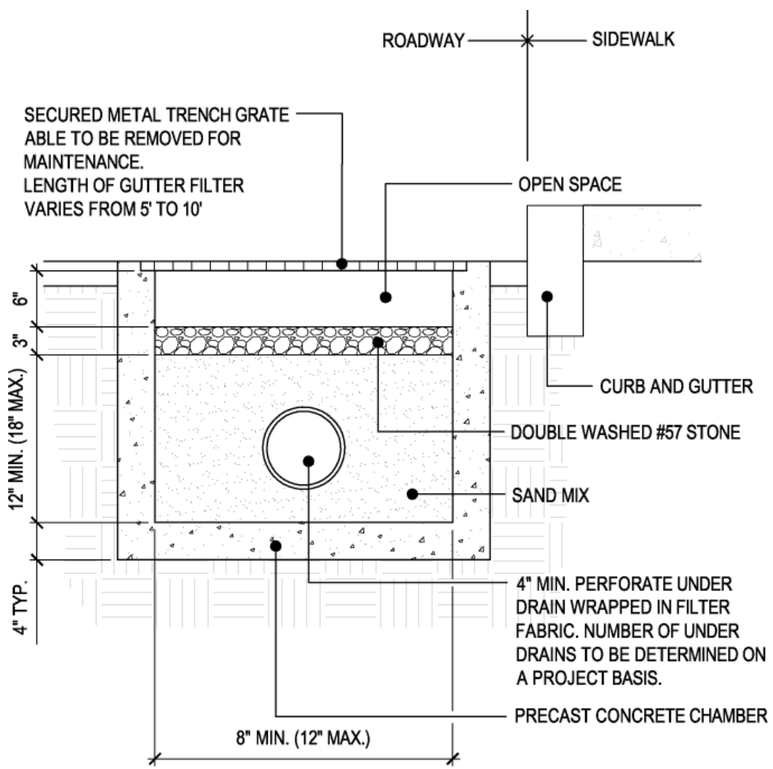
Applications:

- Thoroughfare: These can be located in medians.
- Major Urban Street: Facilities can be incorporated into streetscape design.
- Local: Facilities can be incorporated into streetscape design.
- Alley: N/A.

Stormwater Management Effectiveness: Modest water quality improvements will be gained by using underground storage chambers to harvest water for reuse, therefore reducing the volume of stormwater available to convey pollutants. Additional benefits include the reduction in potable water supply costs.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 10	Underground Storage Chamber	⦿	●	⦿	●	⦿

Element:	Structural Approach	**Reference:**	Option 11
Item:	Gutter Filters		
Classification:	Principal Arterial, Minor Arterial, Collector, Local, Alley, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Access Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Along curb on parking lanes		



GUTTER FILTER - SECTION

Gutter filters can be easily and quickly installed in urban areas in order to provide water quality benefits. Gutter filters are pre-cast concrete gutter vaults containing gravel, finer (typically sand) filter media and an underdrain. The gutter filters capture trash and other debris capable of passing through the surface grate and remove suspended solids and other pollutants. In addition, gutter filters improve the quality of stormwater runoff and, consequently, the receiving waterway. Grates can be designed as aesthetic components of artwork. Gutter filters are also designed for fast filtration. The velocity of flow needs to be slow, otherwise the gravel and sand will mix and damage the system.

Required Maintenance:

- Trash removal
- Monitor for ponding
- Replace gravel and sand as necessary

Applications:

- Thoroughfare: N/A
- Major Urban Street: Gutter filters can be located in parking lanes.
- Local: Gutter filters can be located in parking lanes.
- Alley: Gutter filters can be integrated into alley design.

Stormwater Management Effectiveness: Gutter filters provide extremely efficient removal of gross particulate matter typical of urban transportation corridors.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 11	Gutter Filters	○	○	○	⦿	●

Element:	Structural Approach	**Reference:**	Option 12
Item:	Infiltration Trench		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Greenway, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, sidewalks		

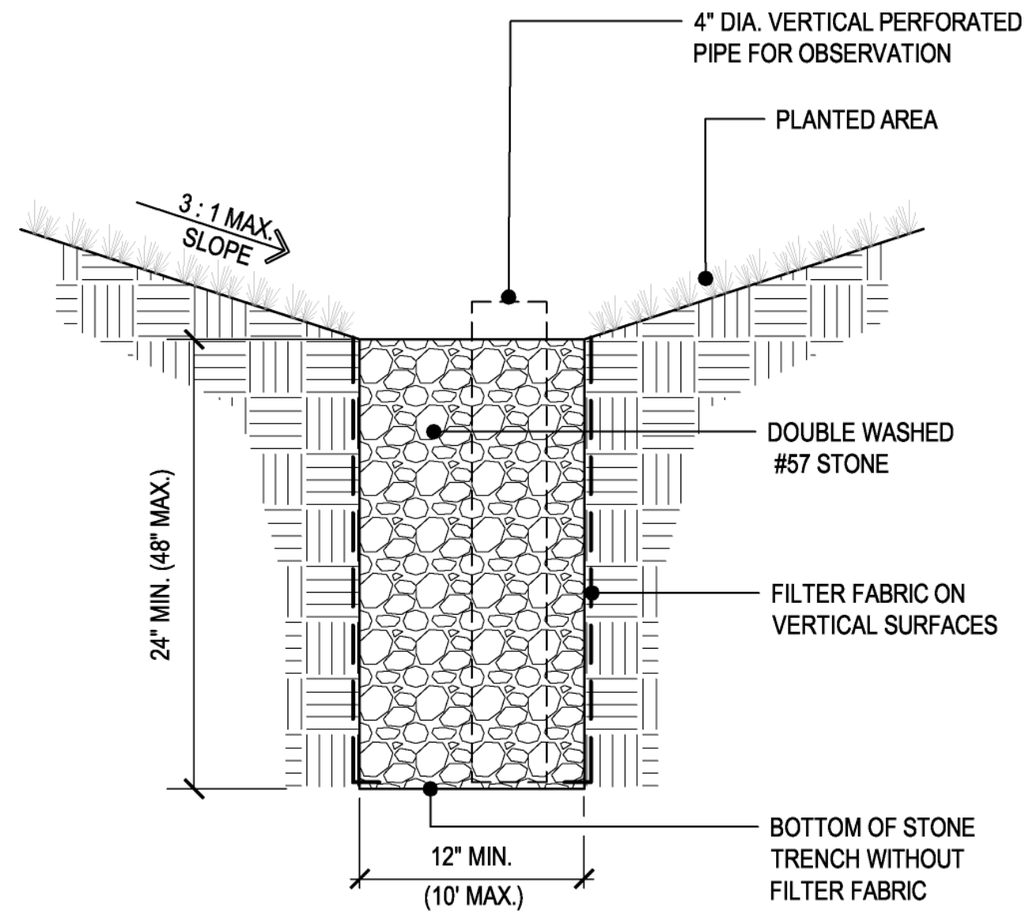
Infiltration trenches have flat surface areas that can be integrated into the landscape. They can be designed with vegetative screening or decorative gravel surfaces in order to minimize the visual impact of the facility. An infiltration trench, excavated and lined with filter fabric and backfilled with stone, encourages stormwater infiltration into subsurface soils and consequently decreases stormwater volume from entering the collection system. In addition, an infiltration trench can improve water quality by removing suspended solids, particulates, coliform bacteria, and some soluble metals and nutrients from stormwater.

Applications:

- Thoroughfare: These can be located in medians or on periphery of road systems as offline or online stormwater systems.
- Major Urban Street: As site conditions allow
- Local: As site conditions allow
- Alley: As site conditions allow

Stormwater Management Effectiveness: Installation in urban areas should account for interference with existing infrastructure and the soil infiltration capacity, which tends to be poor in urban environments.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 12	Infiltration Trench	○	●	●	⦿	●

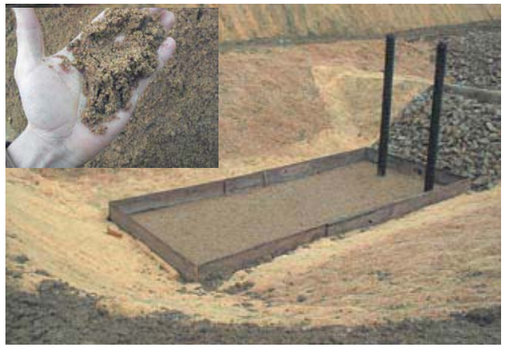


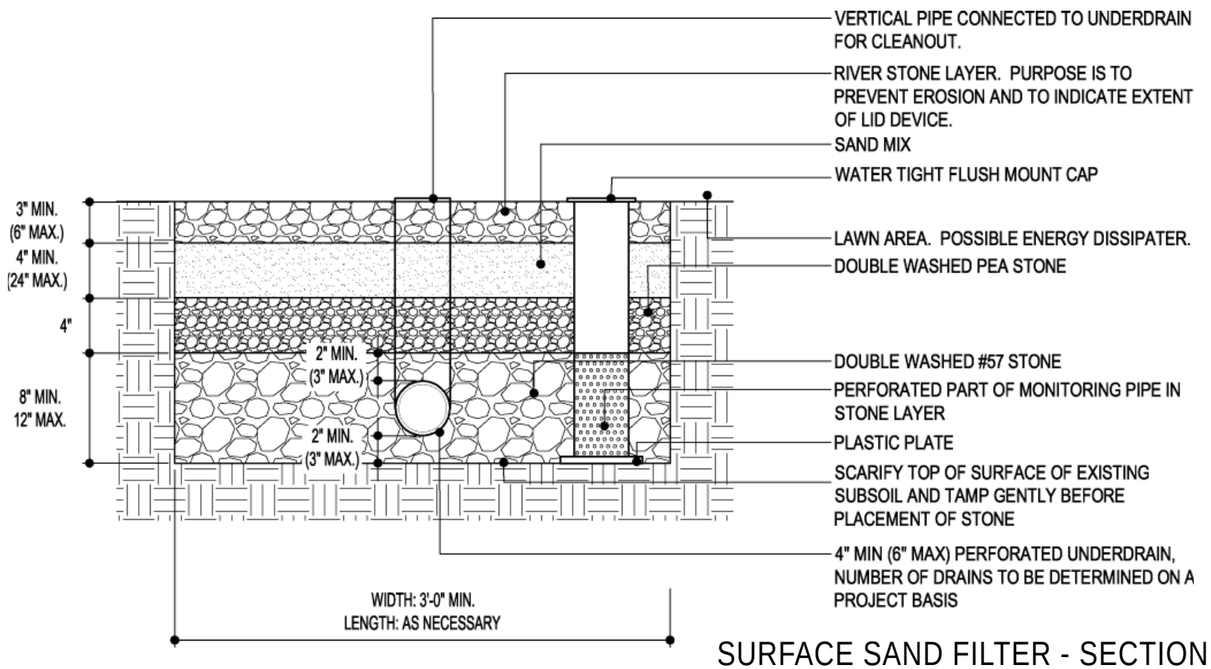
INFILTRATION TRENCH - SECTION

Element:	Structural Approach	**Reference:**	Option 13
Item:	Surface Sand Filter		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector Greenway	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback		

Surface Sand Filter - Georgia Stormwater Management Manual

The coarse sand used in this surface sand filter (left) provides physical and chemical water quality treatment. Erosion control matting protects the treatment after installation (right) until surrounding slopes are vegetated. UNH Stormwater Center





SURFACE SAND FILTER - SECTION

Purpose: Sand filters can be integrated into the urban landscape as an aesthetic amenity. The sand filters can also be installed with vegetation or other landscaping components in order to have minimal visual impact. Requires frequent inspection and cleaning to maintain efficiency.

Required Maintenance: Cleanout and monitoring.

Applications:

- Thoroughfare: Surface sand filters can be placed areas bordered by guardrails or other protected areas.
- Major Urban Street: As site conditions allow
- Local: As site conditions allow
- Alley: As site conditions allow

Stormwater Management Effectiveness: Sand filters can greatly reduce concentrations of sediment, fecal coliform, and Biochemical Oxygen Demand (BOD). They are less effective at removing nutrients and metals and are not intended to control the peak discharge rate or runoff volume.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 13	Surface Sand Filter	○	⦿	⦿	⦿	●

Element:	Structural Approach	**Reference:**	Option 14
Item:	Vegetative Filter Strip		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector Local, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, sidewalk planting zone		

Vegetative filter systems are areas of dense permanent vegetation with a uniform gentle slope. They may be constructed with check dams, flow spreaders or energy dissipators to reduce the speed of the water flow. Vegetative filters provides water quality pretreatment between impervious surfaces and other stormwater management devices.

Besides providing runoff prevention and runoff treatment, vegetative filter systems reduce the frequency of discharge and retain water through infiltration and evapotranspiration.

Check dams, flow spreaders, and energy dissipators should be the length of the filter and made of durable stones and rocks – recycled concrete may be used if aesthetically pleasing. Vegetative filters should be planted with trees, shrubs, groundcovers, grasses, and perennials that can withstand fluctuating environmental conditions.

Required Maintenance:

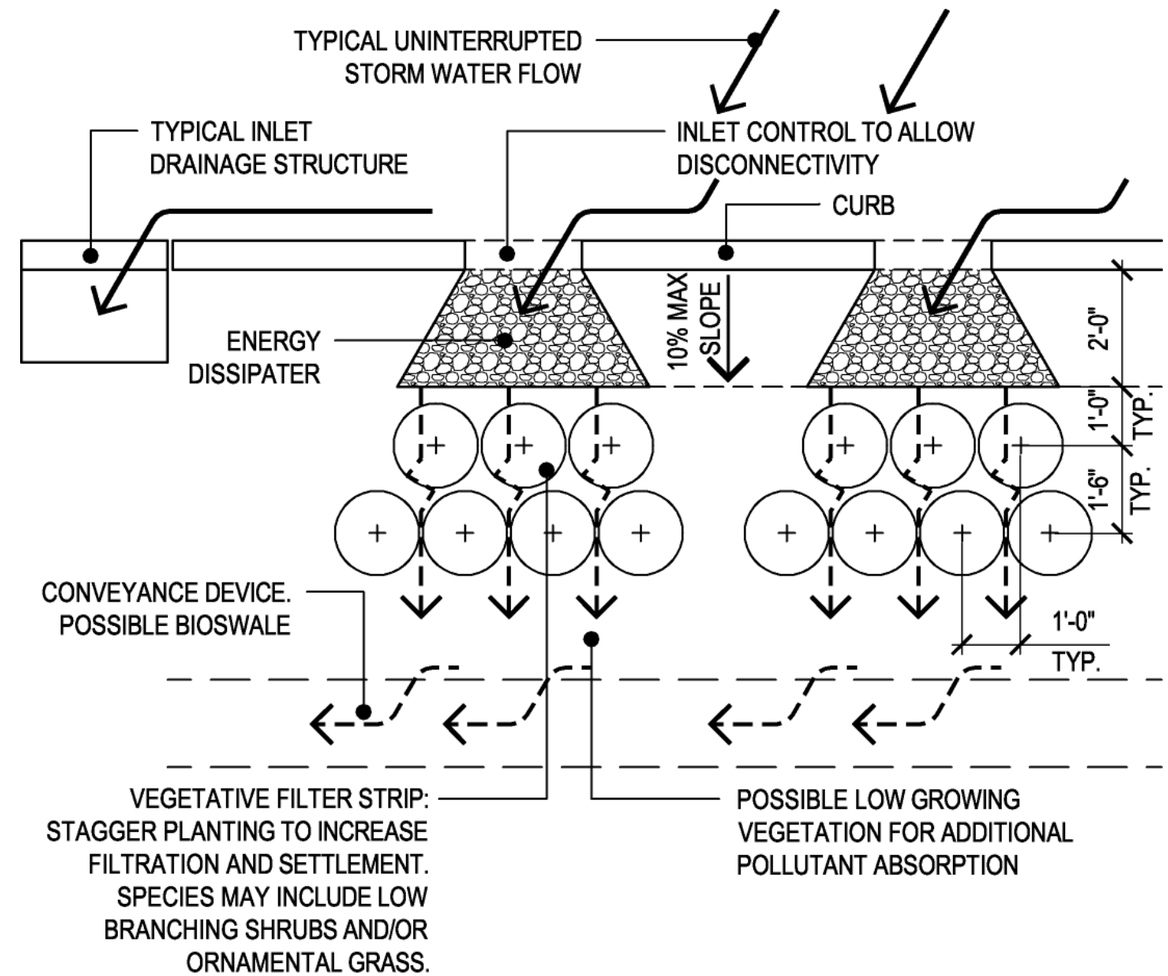
- Trash removal
- Weeding and removal of invasive plants
- Periodic removal of sediments around vegetation
- Replacement of dead vegetation

Applications:

- Thoroughfare: These can be located in medians, roadway setbacks, or in green spaces.
- Major Urban Street: Facilities can be incorporated into streetscape design.
- Local: Facilities can be incorporated into streetscape design.
- Alley: N/A.

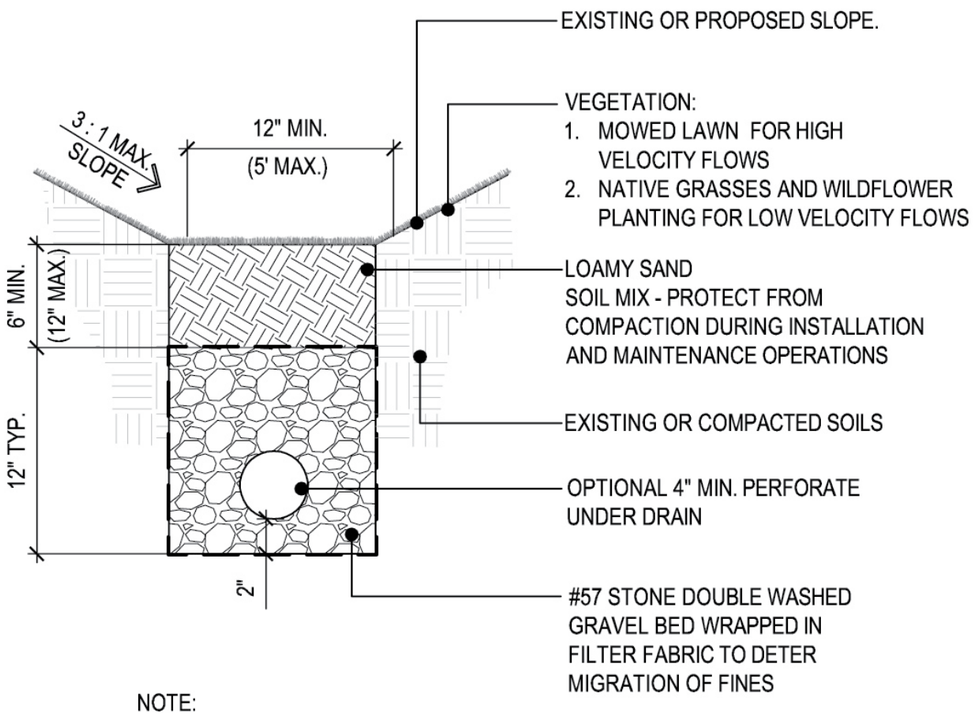
Stormwater Management Effectiveness: Increased effectiveness with runoff contact time and vegetation density. A vegetated filter strip can reduce TSS by 50%, total phosphorus by 20%, total nitrogen by 20%, and heavy metals by 40%. Filter strips are also designed to intercept and trap coarse sediment.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 14	Vegetated Filter Strip	⦿	⦿	⦿	⦿	⦿



VEGETATIVE FILTER STRIP

Element:	Structural Approach	**Reference:**	Option 15
Item:	Bioswale		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, green spaces		



NOTE:
CHECK DAMS MAY ALSO BE USED TO PROMOTE EXTENDED RETENTION AND FILTRATION, DEPENDING ON SITE CONDITIONS.

BIOSWALE SECTION

Bioswales mimic the appearance of natural stream channels. Bioswales are broad, shallow, vegetated channels that convey and infiltrate stormwater runoff. They are designed to reduce stormwater volume through infiltration, improve water quality through infiltration and vegetative filtering, and reduce runoff velocity by increasing flow path lengths and channel roughness.

Required Maintenance:

- Trash removal
- Weeding and removal of invasive plants
- Periodic removal of sediments around vegetation
- Replacement of dead vegetation

Applications:

- Thoroughfare: These can be located in medians, roadway setbacks, or in green spaces.
- Major Urban Street: Facilities can be incorporated into streetscape design.
- Local: Facilities can be incorporated into streetscape design.
- Alley: N/A.

Stormwater Management Effectiveness: Estimated removal efficiencies are 80% for TSS, 50% for phosphorus and nitrogen, and 40% for metals.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 15	Bioswale	⦿	⦿	⦿	⦿	●

Element:	Structural Approach	**Reference:**	Option 16
Item:	Bioslope		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, green spaces		

Bioslopes expand the amount of open vegetated areas in the urban environment. Bioslopes, modified filter strips with a special soil, improve water quality, reduce the runoff volume, and reduce the tendency for erosion to occur. They can be incorporated into standard fill slopes in the roadway cross-section and resemble a basic grass filter strip when completed. Bioslopes can potentially reduce maintenance costs for the existing stormwater infrastructure. Systems require periodic aeration and possible incorporation of amendments, such as topsoil or compost, to maintain infiltration capacity.

Required Maintenance:

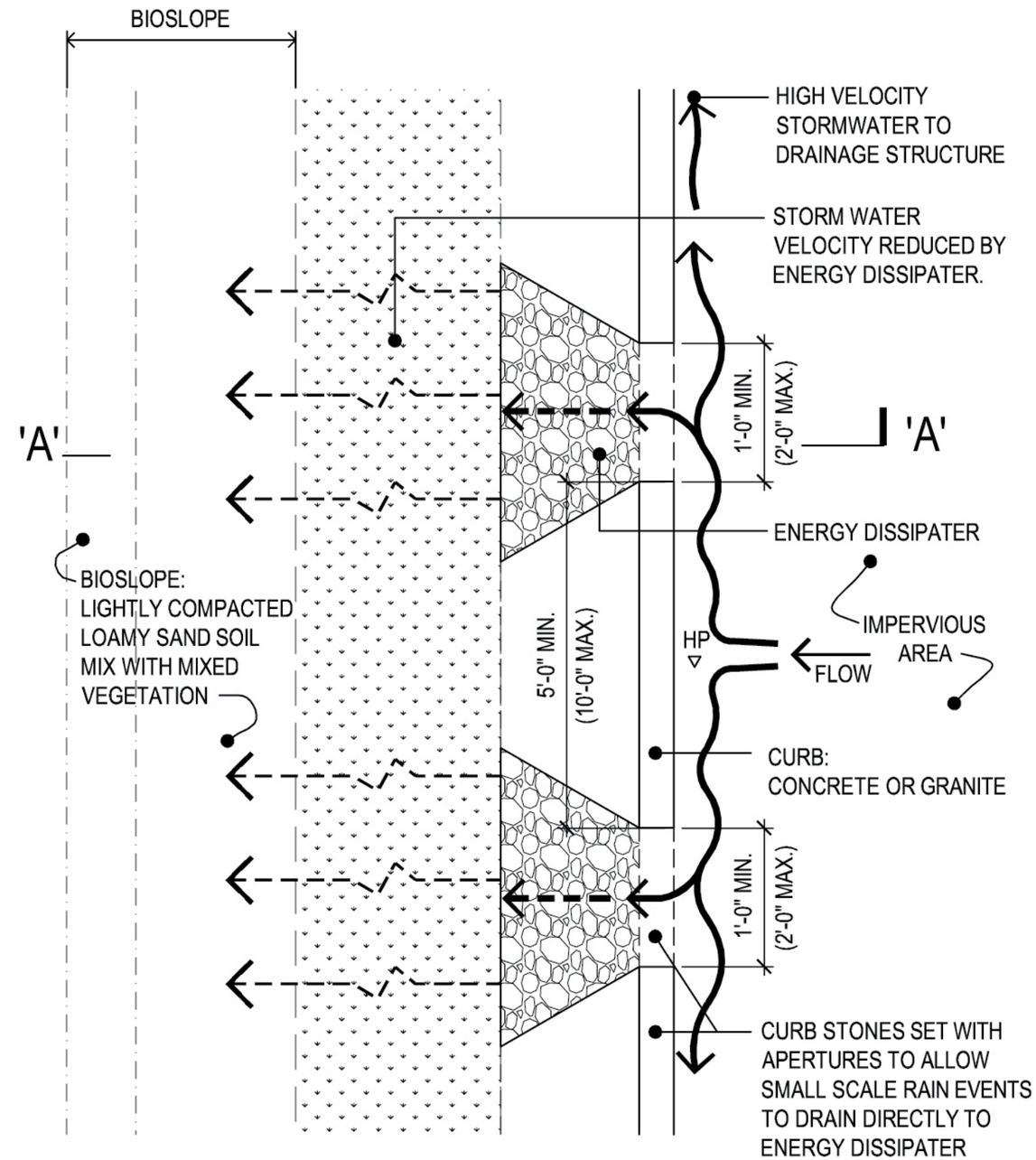
- Trash removal
- Weeding and removal of invasive plants
- Periodic removal of sediments around vegetation
- Replacement of dead vegetation

Applications:

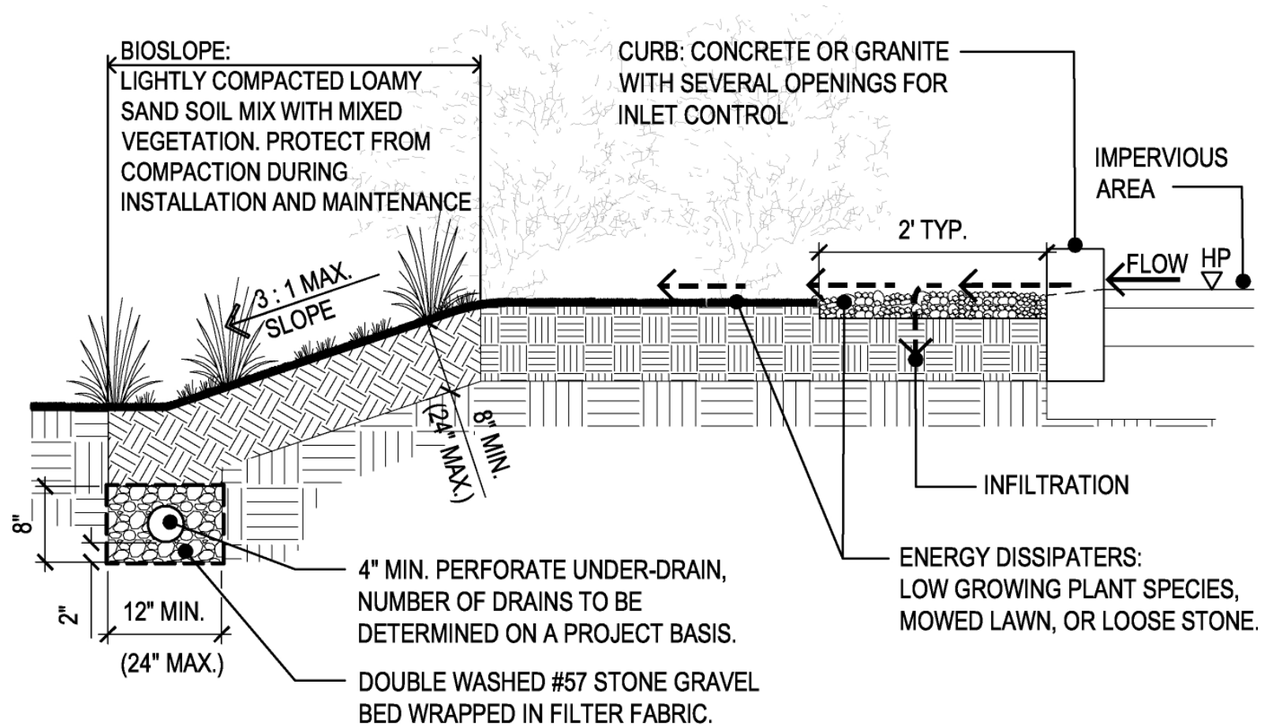
- Thoroughfare: These can be located in medians, roadway setbacks, and green spaces.
- Major Urban Street: These can be located along roadway setbacks.
- Local: N/A.
- Alley: N/A.

Stormwater Management Effectiveness: Bioslopes are highly effective at removing roadway sediment and heavy metals, with removal rates of 84% or greater. The ecology mix has a high infiltration rate, allowing runoff from small to medium storms to filter through the soil.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 16	Bioslope	⦿	⦿	⦿	⦿	●



BIOSLOPE PLAN



BIOSLOPE - SECTION 'A-A'

Item:	Bioslope
Reference:	Option 16

Element:	Structural Approach	**Reference:**	Option 17
Item:	Bioretention Cell		
Classification:	Interstate, Freeway, Principal Arterial, Minor Arterial, Collector, Local, Greenway, Symbolic Corridor, Designated Transit Corridor, Special Segment, Waterfront Promenade, Park Road	**Area Type:**	Mixed-Used & Residential
Location:	Unpaved median, roadway setback, sidewalk planting zone, green spaces		

Bioretention Cell in Greenspace.

Bioretention cells are small scale soil and plant-based devices located in shallow depressions. The bioretention cells remove pollutants and control runoff volume and peak rates through a variety of physical, biological, and chemical treatment processes. The primary elements of a bioretention cell are vegetation that can withstand fluctuations in soil moisture and temporary ponding, a highly permeable engineered soil media, a gravel layer, and an underdrain that is connected to the main storm drain system. Bioretention cells improve water quality for small, frequently occurring storms by filtering stormwater runoff through the soil media, biological and chemical reactions in the soil and root zone, plant uptake, and infiltration into the lower soil layers. In addition, bioretention cells can contribute to neighborhood and roadway beautification, habitat creation, reduce heat island effects, and can potentially reduce maintenance costs for existing stormwater infrastructure. To this end, bioretention cells can enhance the livability of the urban environment and may increase property values by beautifying open spaces.

Required Maintenance:

- Trash removal
- Weeding and removal of invasive plants
- Periodic removal of sediments around vegetation
- Replacement of dead vegetation

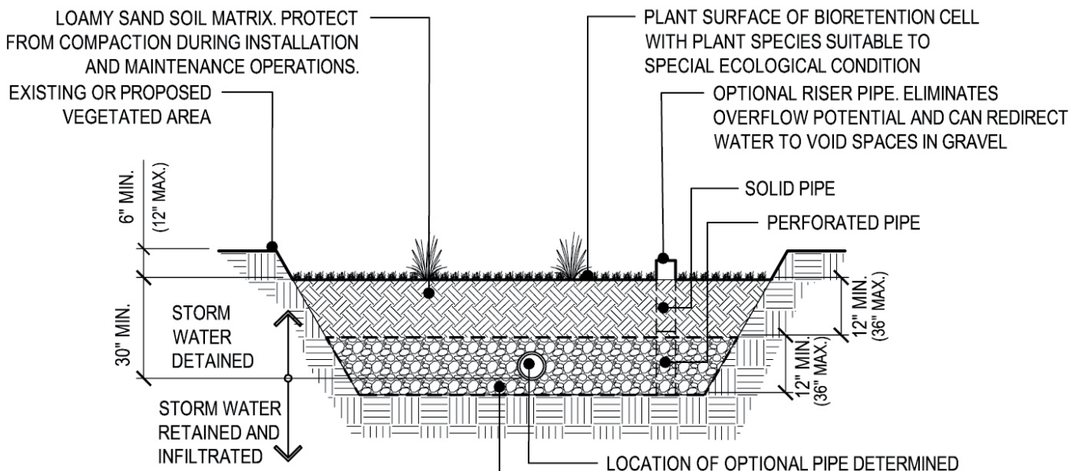
Applications:

- Thoroughfare: Bioretention cells can be incorporated along the side of roadways, curb extensions, and adjacent public space.
- Major Urban Street: Bioretention cells can be incorporated into the sidewalk planting zone or roadway edges.
- Local: Bioretention cells can be incorporated into the sidewalk planting zone.
- Alley: N/A.

Stormwater Management Effectiveness: Bioretention cells are especially useful for treating the “first flush” of stormwater. They can remove 75-95% of common urban pollutants.

Reference	LID Management Practice	Volume	Frequency	Duration	Peak Discharge	Water Quality
Option 17	Bioretention Cell	⦿	●	⦿	⦿	●

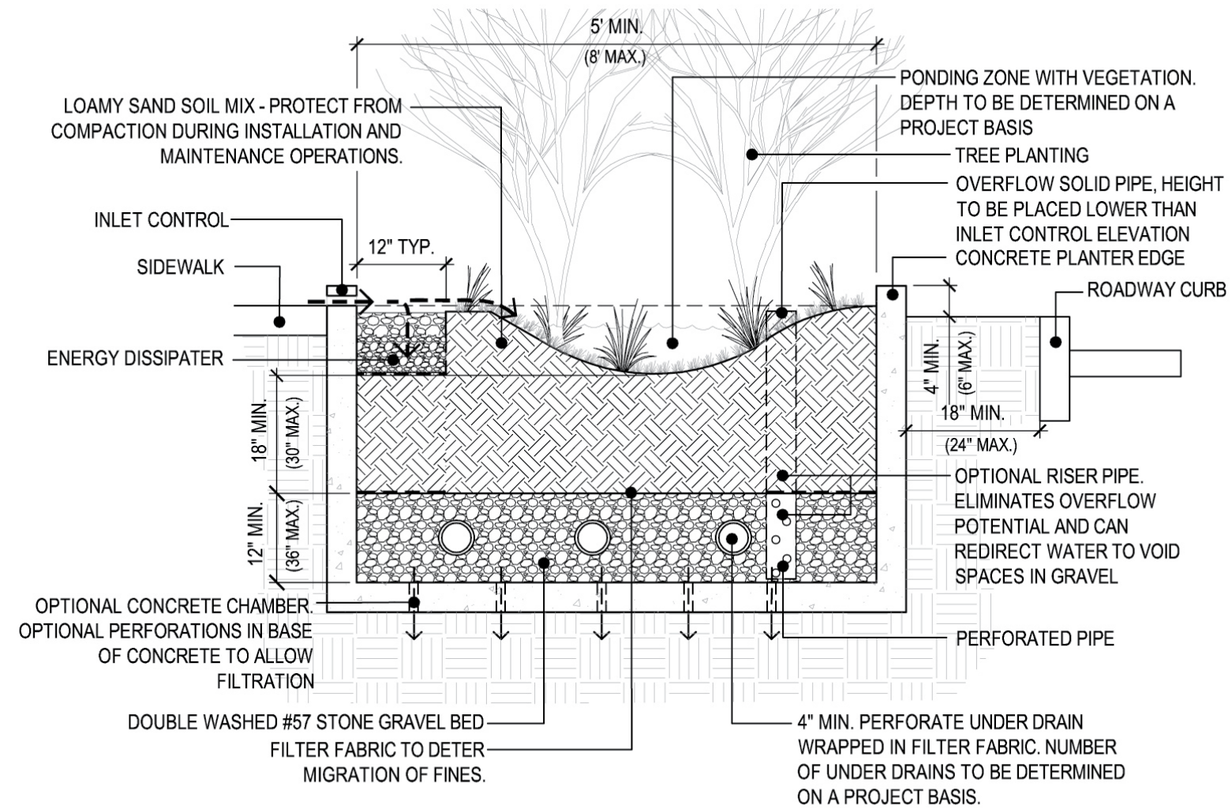
Urban Bioretention Cell - Portland, Oregon 12 Street SW Green Streets Project.



NOTES:

1. SIZE OF BIORETENTION CELL MAY BE CONSTRAINED BY : UTILITIES LOCATIONS
   : SOIL CONDITIONS / TYPE
   : CONTAMINATED SOILS
   : GROUND WATER
2. SITE LOCATIONS WILL DETERMINE EXTENT OF RETENTION, INFILTRATION , DETENTION AND WATER QUALITY CONTROL.

BIORETENTION CELL SECTION



URBAN BIORETENTION CELL SECTION

Item:	Bioretention Cell
Reference:	Option 17

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Transportation Architecture Design Guidelines

Item Appendix

6

6
Item Appendix

ELEMENT	ITEM	
1. GUIDELINES	a.	Typical Tree Planting Guidelines
	b.	Precast Architecture Concrete
	c.	Exposed Aggregate Concrete Pavement
2. DRAWINGS	a.	Rumble Strips
	b.	Raised Intersection
	c.	NOT USED
	d.	Chokers
	e.	Chicanes
	f.	NOT USED
	g.	NOT USED
	h.	NOT USED
	i.	Typical Tree Planting
	j.	Understory Planting
	k.	Cobblestones on Planting Zone
	l.	Tumble Finish Concrete Pavers on Planting Zone
	m.	Brick on Planting Zone
	n.	Stone Edging with Metal Railing
	o.	Increase Planting Space - Contiguous Root Area with Pavers
	p.	Increase Planting Space - Contiguous Root Area with Lawn
	q.	Increase Planting Space - Contiguous Root Area. Option 1 and Option 2
	r.	Increase Planting Space - Contiguous Root Area. Option 3

ELEMENT	ITEM	
3. DETAILS / TECHNICAL GUIDELINES	a.	Cobblestone Pavers
	b.	Tumble Finish Concrete Pavers
	c.	Permeable Interlocking Pavers
	d.	NOT USED
	e.	Traditional Bench
	f.	Contemporary Bench
	g.	Traditional Trash Receptacle
	h.	Contemporary Trash Receptacle and Recycling Bin
	i.	Inverted ‘U’ Shape Bicycle Rack
	j.	X-type Bicycle Rack
	k.	Traditional Safety Post
	l.	Contemporary Safety Post
	m.	Contemporary Light Safety Post
	n.	NOT USED
	o.	Increase Planting Space - Contiguous Root Area. Option 3 Framed Substructure for Tree Planting
	p.	Epoxy Coating

TREE PLANTING GUIDELINES

(A) DESCRIPTION. Work consists of furnishing, delivering, planting and/or transplanting trees, shrubs, vines and ground cover, plants of types and sizes indicated on the plans and as directed, including all excavation and planting operations, plant establishment operations, disposal of waste and other incidentals needed to complete planting work.

This work shall be performed by a qualified landscape contractor who shall be approved by the Chief Engineer prior to start of work under this item. All work done under this item shall be inspected and approved by DDOT.

(B) MATERIALS. The following apply:
Plants – Plants are defined as trees, shrubs, vines, and plants of all descriptions.

(1) QUALITY.

a. Plant materials that are weak or which have been cut back from larger graded to meet certain specified requirements will be rejected. All plants shall be freely dug; no heeled-in plants from cold storage will be permitted.

Prior to starting work, the Contractor shall submit, in writing to the Chief Engineer, an itemized list of sources of all plant items to be used in the contract.

The Owner reserves the right to inspect the plant material in the nursery prior of transportation to the project site. Trees shall be sealed. Cost for inspection and sealing of plant material shall be borne by the Contractor. The Contractor shall bear all costs associated with meals, lodging and transportation, i.e., air fare, auto rental, parking and tolls. Daily lodging and meal expenses not to exceed per diem limits allowed under DC Government regulations.

Approval of plants at the nursery shall not be construed as final acceptance of the material. The plan material will be inspected again at arrival of the project and after installation.

b. All plants shall be first-class representatives of their normal species or varieties unless otherwise specified. Unless otherwise specified, all plants shall be nursery grown stock that have been transplanted or root-trimmed 2 or more times, according to the kind and size of plants. Furnished plant materials shall be certified by State or Federal Department of Agriculture to be free from disease or infestation.

The branch system shall be normal development and free from disfiguring knots, sun-scald, injuries, abrasions of the bark, dead or dry wood, broken terminal growth, insect eggs and infestations, or other objectionable disfigurements. Trees shall have reasonably straight stems and shall be well branched and symmetrical per their natural habits of growth.

Minimum tree size shall be 2 to 2-1/2 inch caliper, 6 to 8 feet in height.
Specimen shall mean an exceptionally heavy, symmetrical tightly knit plant, so trained and favored in its development and appearance, as to be unquestionably superior in form, number of branches, compactness and symmetry.

(2) PLANT NAMES. All scientific and common plant names shall be per "Standardized Plant Names", as adopted by the American joint Committee on Horticultural Nomenclature.

All plants delivered shall be true to name and legibly tagged with the names and sizes of materials.

(3) PLANT GRADING STANDARDS. Grading of plants, including Balled and Burlapped Specifications, Bare Root Specifications, Nursery, Collected, Container Grown and Seedling Stock shall be per "USA Standard for Nursery Stock", as approved by the American Association of Nursery-men, Inc., latest edition (ANSI Z60.1).

(4) BALLED AND BURLAPPED PLANTS. Balled and burlapped (B&B) plants shall be dug so as to retain as many fibrous roots as practicable, and shall come from soil which will form a firm ball. The soil in the ball shall be the original and undisturbed soil in which the plant has been grown. The plant shall be dug, wrapped, transported, and handled in such manner that the soil in the ball will not be loosened to cause stripping of the small and fine feeding roots, or cause the soil to drop away from such roots.

(5) CONTAINER-GROWN STOCK. Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.

(6) PLANTING SOIL MIX. The Contractor shall provide soil free of plants and roots, debris and other extraneous matter in sufficient quantities to meet the design of the Drawings. Ingredients used to meet requirements shall include items listed in Section (14) SOIL CONDITIONERS in this specification. Soil mix shall meet the following requirements:

Organic Content: 4.0% to 6.0%
pH Level: 5 to 6.5
Electrical Conductivity: (EC@) of a 1:2
USDA Textural Classification: Sandy Loam
15 – 20% clay,
30 – 50% silt,
50 – 70% sand.

(7) BIOSOIL MIX. The Contractor shall provide soil free of plants and roots, debris and other extraneous matter in sufficient quantities to meet the design of the Drawings. Soil mix shall meet the following requirements:

pH Level: 5 to 6.5
Electrical Conductivity: (EC@) of a 1:2
Clay: 5% – 10%
Silt: 5% – 15%
Sand: 55% – 65%%
Organic Content: 15% - 20%

1a. **Item**: Typical Tree Planting Guidelines
Reference: Chapter 4: 10.2(1)

(8) **STAKES.** If called out in Drawings - 822.12(D). Malleable iron, arrow-shaped anchors, or oak stakes, as approved by the Chief Engineer, may be used. Chain loc must be attached to the top of stakes that have been driven into the ground and will provide protection for the tree.

(9) **ANTIDESICCANT.** Antidesiccant, for retarding excessive loss of plant moisture and inhibiting wilt, shall be an approved emulsion which will provide a film over plant surfaces permeable enough to permit transpiration. Antidesiccant shall be used only after approval.

(10) **EXAMINATION OF CONDITIONS.** The Contractor and any Sub-Contractor responsible for the execution of the Work of this Section shall review the subgrades and verify that the subgrades have been prepared as required prior to proceeding with the spreading of planting soil.

Carefully review the requirements of percolation testing, compaction, slope and absence of debris of the subgrade prior to spreading of planting soil.

(11) **QUALIFICATION OF PERSONNEL.** The work of this Section shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years experience. Submit proof that the landscape contracting firm meets this requirement. Foreman and Crew Leader shall remain on the project on a consistent basis from the beginning of planting through provisional acceptance.

(12) **FIELD ADJUSTMENT.** Prior to installation of trees, locate trees by flagging or staking in areas as shown in Drawings and request the acceptance from the Chief Engineer. Prior to installation of shrubs and perennials, locate shrubs and perennials in the field as shown in Drawings and request the acceptance from the Chief Engineer.

(13) **TANBARK, HARDWOOD, AND ROOTBARK MULCH.** Mulch shall be medium grade and free of matter injurious to plant growth.

(14) SOIL CONDITIONERS

a. **MICROPORE FERTILIZER RELEASE PACKETS.** Micropore fertilizer release packets shall be used during the planting in accordance with packet manufacturer's instructions, or as specified. Each packet shall be sealed in a polyethylene laminated envelope and shall contain a minimum soluable fertilizer analysis of 16 percent nitrogen, 8 percent phosphorus and 16 percent potash. Packets shall be 4 ounces, 8 year release packages as approved by the Chief Engineer.

b. **PEAT MOSS.** 823.06(A)

c. **MANURE.** Either green manures or animal manures may be used to improve soil composition. Animal manure is feces or excrement of plant-eating mammals and poultry - or plant material which has been used as bedding for animals and thus is heavily contaminated with their feces and urine. Green manures are crops grown for the express purpose of plowing them under or leguminous crops, such as clover.

d. **COMPOSTED SLUDGE.** Composted municipal sewage sludge may be mixed to soil mix, one (1) part sludge to five (5) parts topsoil, such that the remaining mix has a pH of not more than 6.5.

e. **LEAF MOLD.** Leaf mold shall be decomposed leaves, thoroughly composted, free of plastic and any other trash or debris.

f. **GYPSUM.** Shall be agricultural grade gypsum, 23% available calcium and 18% sulfur, mixed into planting soil at a rate of 40 to 120lbs per 1000 sq ft.

g. **MYCORRHIZAL FUNGAL INOCULANT FOR NEW PLANTING.** Mycorrhizal Fungal Inoculant shall be 3 ounce packets or tablets of live spores. Each packet or tablet of inoculant shall be one year old of less. Mycorrhizal fungal inoculant shall be manufactured by Plant Health Care Inc. (800) 421-9051, JRM 1(800)962-4010, DieHard (800) 628-6373, or approved equal.

(15) **WATER.** The Contractor shall be responsible for furnish his/her own supply of water to the site at no extra cost. All plant materials or beds injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be potable. Contractor shall not assume that any existing irrigation system on site will be available or in working order. Contractor shall obtain any necessary permits and written approvals from the client to use a municipal water source to water the plant material. Provide water schedule, as part of the maintenance plan, upon completion of planting. Notify the Chief Engineer 24 hours before watering plant material if there is any deviation from watering schedule.

(16) **SOIL TESTING AND RECOMMENDATIONS.** The Contractor shall provide a one cubic foot representative sample per each 500 cubic yard proposed stockpile of planting soil for testing. All stockpile sampling shall be per ASTM D 75 and Appendixes for securing samples from stockpiles. Stockpiles shall be separated into a maximum 500 cubic yard piles and labeled in the field with a numbering system referenced in all soil samples and test results. Stockpiles shall be manufactured sufficiently in advance of testing so that pH, organic content, and carbon/nitrogen ratio have stabilized. Additionally, the Contractor shall provide one cubic foot representative samples selected from on-site stockpiles of delivered planting soil for testing after it has been amended to confirm that delivered and amended material meets specifications.

Testing: Contractor shall deliver all samples to testing laboratories and shall have the testing report sent directly to the Chief Engineer. Perform all tests for gradation, organic content, soil chemistry, cation exchange capacity, and pH by a qualified Soil Testing Laboratory specializing in the testing of soils for fertilization of turf and plantings. Testing reports shall include the following tests and recommendations. Report shall indicate whether or not the material meets the required specifications and any proposed recommendation for amending the soil to meet specifications.

a. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by H2O2. To facilitate review and approval of sieve analysis, provide a computer generated gradation curve from the Soil & Plant Tissue Laboratory.

1a.	**Item**:	Typical Tree Planting Guidelines
	Reference:	Chapter 4: 10.2(1)

b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples minus #10 material shall be oven-dried to a constant weight at a temperature of 450 degrees Fahrenheit.

c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Lead, Zinc, Cadmium, Copper, Soluble Salts, and pH and buffer pH. A Conductivity Meter shall be used to measure Soluble Salts in 1:2 soil/water (v/v). Except where otherwise noted, nutrient tests shall be for available nutrients.

d. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish lawn and planting work as specified.

e. Percolation Tests: Submit results of percolation tests per specification requirements.

(17) UNDERDRAIN. PVC Perforated Pipe wrapped in filter fabric.

(C) CONSTRUCTION REQUIREMENTS.

(1) PLANTING SEASONS. Unless otherwise directed in writing, planting shall be done during the following seasons:

Deciduous Plants – October 15 to May 1 and September 1 to November 15
Evergreen Plants – March 15 to June 1 and September 15 to December 1
No planting shall be done in frozen or snow covered ground or when the soil is in an unsatisfactory condition for planting.

(2) DELIVERY AND INSPECTION. The Contractor shall notify the Chief Engineer not less than 2 days in advance of plant delivery. All plants shall be available for inspection before being dug. The Contractor shall furnish the Chief Engineer complete information concerning plant source of supply. At the option of the Chief Engineer, a certified Arborist will accompany the inspector.

Only trees from the District Department of Transportation's street tree list shall be selected. All trees and a representative sample of shrubs shall be sealed. Transportation for inspection and sealing shall be furnished by the Contractor as part of work. All plants shall comply with state and federal laws controlling inspection for plant diseases and insect infestations, and the Contractor shall deliver to the Chief Engineer all required inspection certificates. All shipments shall include a plant list giving detailed descriptions of the plants and the date of shipment.

(3) SUBSTITUTIONS. When specified plants are not available at time of planting, the Contractor shall submit written evidence from at least 3 competent sources that specified plants are unavailable. If substitution is approved, plant items in the contract which are similar in size and type and which will perform the intended function shall be used at the respective contract price. If existing plant items are not appropriate and if the Chief Engineer and Contractor can mutually agree on a suitable substitution at the same contract unit price or less, the substitution will be approved.

(4) PROTECTION AND TEMPORARY STORAGE. The Contractor shall keep all plants moist and protected from drying out. Protection shall include the time when plants are in transit, in temporary storage or on the project awaiting planting. Plants will be inspected by the Chief Engineer at the project site and approved prior to planting.

Plants failing to meet specifications, showing signs of improper handling or arriving with broken seals, broken or loose balls, inadequate protection for tops or roots, shriveled, dry or with damaged roots will be rejected. Rejected plants shall be immediately removed from the site and replaced. Care shall be taken in handling plants to prevent injury to branches or roots. The solidity of balled and burlapped plants shall be carefully preserved.

Plants delivered but not scheduled for immediate planting shall be protected as follows:

Bare root plants shall be separated, roots properly spread and puddled in with moist topsoil into a heeling-in trench.

Balled and burlapped (B&B) plants shall have the earth balls covered with sawdust, wood chips or other suitable material and kept in a moist condition.

(5) PLANT CARE AND TRANSPORTATION. Special precautions shall be taken to avoid any unnecessary injury to, or removal of fibrous roots. Each species or variety shall be handled and packed in the approved manner for that plant, with proper regard to the soil and climate conditions and the time that will be consumed in transit or delivery. All precautions that are customary in good trade practice shall be taken to ensure arrival of plants at their destination in good condition for successful growth.

All plants which are required to be balled and bur lapped prior to shipment are designated B&B. B&B plants shall be lifted so as to retain as many fibrous roots as possible. The burlap shall be firmly held in place by careful wrapping with stout cord or wire.

Plant material budding into leaf or new soft growth at time of digging shall be sprayed with a wilt preventive, anti-desiccant spray material before delivery and preferably before digging.

All shipments shall be accompanied by an invoice furnished to the Chief Engineer giving detailed descriptions of the plant materials, the date of shipment, a certification that all plants in leaf, including all evergreens, have been sprayed with an approved wilt preventive spray material and any other pertinent information. Upon receipt of nursery stock at the project site, the Contractor shall notify the Chief Engineer.

Plant materials shall not be planted until they have been inspected and approved by the Chief Engineer at the receiving site. Any plant material, which does not meet the specifications for quality herein stated or shows improper handling or arrives on the site in an unsatisfactory condition, will be rejected. Materials arriving with broken seals, broken or loose balls, insufficient protection of roots or tops, shoveled, dry or insufficiently developed roots, or roots which are weak and thin, damaged, defective or which do not comply with specifications will be rejected. All rejected plants shall be immediately removed and disposed of by the

1a. **Item**: Typical Tree Planting Guidelines
Reference: Chapter 4: 10.2(1)

Contractor and approved nursery stock of like variety, size, age, etc., shall be furnished by him/her without additional expense to the District. Provisional acceptance of all plant materials will be given only after materials are planted and after meeting all requirements prescribed herein.

All plants heeled-in shall be properly maintained by the Contractor until planted.

The balls of B&B plants shall, if not immediately planted after delivery and inspection, be adequately protected by covering until removed for planting in a manner appropriate to prevailing conditions and in accordance with accepted horticultural practice. Care shall be taken in handling plants to prevent injuries to the branches or roots of plants. The solidity of the ball of B&B plants shall be carefully preserved. Handling of the plant by parts other than the ball shall be cause for rejection of such plant.

(6) **FIELD LAYOUT.** Plan arrangements on the planting sheets are approximate, Final locations, facing and/or orientation of all trees shall be directed by the Chief Engineer. The Contractor shall make any change in the location of proposed plantings as may be directed, without additional expense to the District.

(7) **PROTECTION OF DELIVERED PLANTING SOIL AND BIOSOILS.** Soil delivered to the site shall be protected from erosion at all times. Materials shall be spread immediately. Otherwise, materials that set on site for more than 24 hours shall be covered with tarpaulin or other soil erosion system acceptable to the Project Engineer and surrounded by silt fence.

(8) **PLANT PIT AND TREE EXCAVATION.** Tree pits shall be a continuous tree pit as shown in the drawings or directed by the Chief Engineer.

Where trees are to be installed contiguous to underground utility lines, the Contractor shall have a representative from each applicable utility company stake-out in the field the exact location of the utility conduits and appurtenances before tree pits are dug.

The Contractor shall not excavate any closer than eight (8) inches to the back face of curbs. Excess PC foundation for PCC or granite curb or sidewalk which protrudes into the planting pit shall be carefully chipped and removed by the Contractor to allow proper placement of tree ball. No additional compensation will be allowed.

Plant pits shall be backfilled immediately with the mixed specified soil mix. The soil mix ingredients shall have been previously delivered and mixed at an approved mixing site before use at tree pit locations to amend existing soil and use for backfilling.

Under no circumstances shall any plant pit remain open overnight unless it is properly barricaded. Backfill shall be firmly tamped throughout the entire pit area so that excessive setting will not occur.

If any tree pits are found to be low due to insufficient backfilling and/or setting, the Engineer shall be notified of such locations and shall immediately make each tree pit safe.

Failure to comply with above requests shall be authorization for the District to make each tree pit safe by barricading or placing topsoil in the low areas. The entire cost of such work shall be deducted from any monies due to the Contractor. If monies are not sufficient, the Contractor will be billed the additional amount.

Any damage to existing grass areas shall be acceptably repaired, as required by the Chief Engineer, at no expense to the District.

(9) **SETTING PLANTS.** Care shall be taken during backfilling, tamping and watering to avoid damage to roots and to prohibit air pockets. Any root bruised or broken before or during planting shall be pruned immediately to sound tissue with a clean cut.

Watering shall mean full and thorough saturation of all backfill in the pits on the date the plants are planted. Water shall be applied only by open-end hose at very low pressure. In no case shall hoses from tank trucks be laid across ramps, roadways or other pavements.

(10) **FILLING AND COMPACTION.** Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Subgrade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the Contract Documents. Provide a written report to the Chief Engineer that the subgrade has been placed to the required elevations and that the subgrade drains water at the rates specified under the required percolation tests specified before placement of the planting soil is completed. Perform no work of placing and spreading planting soil until elevations have been confirmed and a written report has been accepted by the Chief Engineer.

Clear the subgrade of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Such construction debris, trash, rubble and foreign material shall be removed from the site and disposed of in a legal manner. Fill any over excavation with approved fill and compact to the required subgrade compaction levels.

Do not proceed with the installation of planting soil until all utility work in the area has been installed.

Protect adjacent walls, walks and utilities from damage or staining by the topsoil. Use 0.5-inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.

(11) **PERCOLATION TESTING.** Perform percolation tests on existing subgrade soils or placed fill prior to placing and spreading planting soil. Perform percolation testing of subgrade soil or placed fills to determine whether or not the subgrade will drain properly. Perform percolation tests as specified below:

Percolation Tests: Compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The soil in each lift should feel firm to the foot in all areas and make only slight heel prints. At completion of soil installation, the soil should offer a firm, even resistance when

a soil sampling tube is inserted from lift to lift. After the placement of each lift, perform percolation tests to determine if the soil has been over compacted. Perform the following percolation test procedure:

a. Dig a hole in the installed soil that is a minimum of 4 inches in diameter. Do not penetrate through the lift being tested.

b. Fill the hole with water and let it drain completely. Immediately refill the hole with water and measure the rate of fall in the water level.

c. In the event that the water drains at a rate less than one inch per hour, till the soil to a depth required to break the over compaction.

d. Perform a minimum of one soil percolation test per 10,000 square feet or one soil percolation test every 100 feet apart in planting areas along the roadway.

In the event percolation testing indicates that existing subgrades or placed fills have been over compacted and will not drain, the contractor shall loosen these to the original subgrade soil levels or at levels as determined by the Chief Engineer. These areas shall be ripped or loosened by mechanical means and recompacted to reach desired effect. Under no circumstances shall wheeled vehicles be driven over subgrade soil, placed fills or planting soils that have been shown to percolate.

Perform sufficient percolation tests in areas of poorly draining or compacted subgrade soil or compacted placed to ensure that these underlying soils drain. Likewise, perform sufficient percolation tests after ripping and loosening to ensure that the soils are no longer too compact to drain.

(12) **SOIL COMPACTION.** During the compaction process, all depressions caused by settlement or rolling shall be filled with additional soil and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.

The Contractor shall install soil in successive horizontal lifts no thicker than 6 inches to the desired compaction as described in this Section. The Contractor shall install the soil at a higher level to anticipate any reduction of soil volume due to settling, erosion, decomposition, and other similar processes during the warranty period. The Chief Engineer may ensure that the full 6 inches of planting soil are obtained by digging holes in the soil at the same frequency as for compaction testing.

Movement of equipment: Select equipment and otherwise phase the installation of the soil and placed fills to ensure that wheeled equipment does not travel over subgrade soil, placed fills, ordinary borrow or already installed soil. Movement of tracked equipment over said soils will be reviewed and considered for approval by the Chief Engineer. If it is determined by the Chief Engineer that wheeled equipment must travel over already installed soil, provide a written description of sequencing of work that ensures that compacted soil is loosened and uncompacted as the work progresses or place a one-inch thick steel plate over the length and width of any travel way to cover soils and protect it from compaction.

(13) **FINE GRADING.** Immediately prior to dumping and spreading the planting soil, the subgrade shall be cleaned of all stones greater than 1 1/2 inches and all debris or rubbish. Such material shall be removed from the site, not raked to the edges and buried. Any local concentration or piles of spilled stone must be removed from areas or evenly distributed on site. Notify the Chief Engineer that the subgrade soil has been cleaned and request his/her attendance on site to review and approve subgrade conditions prior to spreading planting soil.

(14) **FERTILIZING.** During the next planting season following spring or fall planting, all plants shall be fertilized once at the rate specified by the manufacturer for the size of plant.

(15) **WATERING.** All plants shall be thoroughly watered during and immediately after planting and at such intervals during the plant establishment period as needed. Water shall not contain elements toxic to plant life. At each watering the soil around the plants shall be thoroughly saturated.

(16) **UNDERDRAIN.** Installation of the continuous PVC perforated pipe shall be placed at the bottom of the planting bed

(17) **STAKING.** No guying of trees will be permitted. Staking must be installed with chain loc attached to the stakes.

(18) **PRUNING.** Pruning shall be done before or immediately after planting to remove damaged or broken branches. All pruning shall be done by experienced personnel with properly conditioned equipment and in keeping with accepted horticultural practice. Trees with pruned terminal leaders will be rejected.

(19) **MULCHING.** Mulch shall be placed over all pit and saucer areas of individual trees, shrubs and over the entire area of plant beds to 2 to 3 inch depth within 3 days after planting. Mulch shall not touch the bark of the tree.

(20) **RESTORATION AND CLEAN-UP**

a. The Contractor shall notify the Chief Engineer where work will be performed on a daily basis, prior to commencing each day's work. Should difficulty arise in excavation of tree pits to necessitate changing tree pit locations, abandoned locations shall be protected from conditions and secured. Such changes will be determined by the Project Engineer and be made at not cost to the District.

b. Excess and waste material shall be removed daily. When planting in an area has been completed, the area shall be thoroughly cleaned up. Where existing grass areas have been damaged or scarred during planting operations, the Contractor shall restore disturbed areas to their original condition as directed as part of work. The Contractor shall clean up all debris and leave the project in an acceptable condition.

1a. **Item**: Typical Tree Planting Guidelines
Reference: Chapter 4: 10.2(1)

(21) **MAINTENANCE.** Maintenance shall begin immediately after each plant is planted. The official maintenance period will commence upon the completion of all planting and shall continue for ninety (90) days minimum. Maintenance period may carry over to the non-growing season depending on the time of planting and weather conditions.

Contractor shall submit a maintenance plan to the Chief Engineer.

Maintenance shall include watering of planted areas, weeding, mulching, removal of dead material, resetting plants to proper grades on upright position, edging, repairs of washouts and gullies, repairs to protecting fences spraying for insect pests and disease and all other necessary works of maintenance.

All plants during the maintenance period shall be watered at lease twice each week unless adequate rainfall has been determined by the Chief Engineer. At each watering the soil around each tree or shrub shall be thoroughly saturated. If sufficient moisture is retained in the soil, as determined by the Chief Engineer, the required watering may be reduced. Contractor shall submit a maintenance plan to the Chief Engineer before the completion of maintenance of plant material.

Planting beds and individual plant pits shall be kept free of weeds and mulch shall be replaced as required to maintain the required depth of mulch. Beds and individual pits shall be neat in appearance and maintained to the lines originally laid out.

Plants that die during the maintenance period shall be replaced as directed by the Chief Engineer.

(22) **PROVISIONAL ACCEPTANCE.** Upon completion of the maintenance period, the Contractor shall request in writing that the Owner formally inspect the planting work and award Provisional Acceptance.

If plant material and workmanship are acceptable, written notice will be given by the Owner stating that the work has received provisional acceptance, and that the guarantee period has commenced from the date of provisional acceptance.

If a number of plants are sickly or dead at the time of inspection, or if in the Owner's opinion, workmanship is unacceptable, written notice will be given by the Owner in the form of a punch list, which itemizes necessary planting replacements and/or other deficiencies to be corrected. All dead and unsatisfactory plants shall be removed promptly from the project site, and shall be planted in the same numbers. Provisional Acceptance of the planting work shall be established by the Owner in writing, following the completion of all maintenance work requirements as specified herein and following the correction of all punch list deficiencies.

(23) **GUARANTEE PERIOD & REPLACEMENTS.** The acceptability of plants furnished and planted will be determined at the end of a two (2) year guarantee period during which the Contractor shall employ all practicable means to preserve the plants in a healthy growing condition. Care during this period shall include watering, cultivating, pruning, repair and adjustment of stakes, and other standard proper care as directed. Plants, saucers, and beds shall be kept weed free. Remulch as necessary to maintain mulch depth as shown. The Contractor shall be responsible for removal of stakes and chain locks at the end of the 2 year guarantee period.

Dead and unsatisfactory plants as directed shall be promptly removed from the project. An inspection by the Contractor and the Chief Engineer will be held 30 days before the start of the planting season to determine plant acceptability and number of replacements. During the next planting season following completion of actual spring or fall planting, all dead and unsatisfactory plants shall be replaced in kind and size with live healthy plants installed per specifications at the Contractor's expense.

Alternate or substituted varieties of plants shall be used only if approved. A final inspection of all plants will be held after the replacement planting has been completed.

If the Contractor fails within 10 days to satisfactorily care for and replace plants as needed or ordered, the District may proceed with labor, equipment, and material to perform the work, with the cost of such work charged to the Contractor.

The Contractor will not be responsible for theft or damage to plants by vehicles or vandalism following completion and approval of the construction portion of planting.

1a. **Item**: Typical Tree Planting Guidelines
Reference: Chapter 4: 10.2(1)

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1a. **Item**: NOT USED
Reference: NOT USED

PRECAST CONCRETE PANELS

The work under this section includes the furnishing and installation of precast concrete panels to the concrete retaining wall in the plaza as shown in the Drawings.

SUBMITTALS

WORKING DRAWINGS

The Contractor shall prepare and submit to the Chief Engineer working drawings showing the individual units in position, their face dimensions, designating marks, and such other detail drawings as are necessary to properly form and set the work. The drawings shall show all anchors, cramps and dowels.

SAMPLES AND SAMPLE WALL

(1) **VERTICAL CONCRETE UNIT SAMPLES AND CAPSTONES.** Before proceeding with the work, the contractor shall submit for approval by the Chief Engineer samples of prestressed concrete units proposed for use in the work. All units in the work shall be within the color range defined by the approved samples. The samples shall have a face size of at least 6 by 6 inches.

(2) **SAMPLE WALL.** The contractor will be required to construct a sample wall of the designated class or classes of prestressed concrete units, laid up in mortar and pointed, for approval of the Chief Engineer. Each sample shall show examples of the specified unit finishes, quality of the workmanship in dressing the units and placing them, and pointing of the beads and joints, and shall be sufficient area to illustrate the distribution of both the coloring and the unit size. The sample wall shall contain at least one edge dressed to show a representative corner. The top shall be dressed to show how the units will abut the wall. Upon approval of such a sample by the Chief Engineer, it shall become the standard for that class or classes of pressed concrete units in the entire work. The size of unit sample wall shall be decided upon by the Chief Engineer.

(3) **PAYMENT.** At the option of the Contractor, this wall may be constructed in place as part of the prestressed concrete unit called for in the contract documents and if approved, the sample wall shall become part of the completed work and will be paid for as specified herein for the designated class or classes of units.

QUALITY ASSURANCE

INSTALLER QUALIFICATIONS: A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect panels.

INSTALLER QUALIFICATIONS: A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project before erection of precast concrete and who can produce an Erectors' Post-Audit Declaration.

FABRICATOR QUALIFICATIONS: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

DESIGN STANDARDS: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

QUALITY-CONTROL STANDARD: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

DELIVERY, STORAGE, AND HANDLING

Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground.

Support units during shipment on nonstaining shock-absorbing material.

Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

Place stored units so identification marks are clearly visible, and units can be inspected.

Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.

Lift and support units only at designated points shown on Shop Drawings.

MOLD MATERIALS

Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

CONCRETE MATERIALS

Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.

1b. **Item**: Precast Architecture Concrete
Reference: Chapter 4: 5.1(1) 5.3(1)

SUPPLEMENTARY CEMENTITIOUS MATERIALS:

1. Metakaolin Admixture: ASTM C 618, Class N.
2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

NORMAL-WEIGHT AGGREGATES: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

COLORING ADMIXTURE: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

WATER: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

AIR-ENTRAINING ADMIXTURE: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

CHEMICAL ADMIXTURES: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
2. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

GROUT MATERIALS

SAND-CEMENT GROUT: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

NONMETALLIC, NONSHRINK GROUT: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

EPOXY-RESIN GROUT: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

CONCRETE MIXTURES

Prepare design mixtures for each type of precast concrete required.

Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

NORMAL-WEIGHT CONCRETE MIXTURES: Proportion face and backup mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

WATER ABSORPTION: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

MOLD FABRICATION

MOLDS: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.

FABRICATION TOLERANCES

Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items shown in the Drawings.

FINISHES

Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved panels.

1b. **Item**: Precast Architecture Concrete
Reference: Chapter 4: 5.1(1) 5.3(1)

SOURCE QUALITY CONTROL

QUALITY-CONTROL TESTING: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

EXAMINATION

Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance.

Proceed with installation only after unsatisfactory conditions have been corrected.

Do not install precast concrete units until supporting cast-in-place structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is complete.

INSTALLATION

Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inches.

Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

WELDING: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
4. Remove, reweld, or repair incomplete and defective welds.

At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

GROUTING CONNECTIONS: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

ERECTION TOLERANCES

Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

FIELD QUALITY CONTROL

SPECIAL INSPECTIONS: Engage a qualified special inspector to perform the following special inspections and prepare reports:

1. Erection of precast concrete members.

Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

Testing agency will report test results promptly and in writing to Contractor.

Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

1b.	**Item**:	Precast Architecture Concrete
	Reference:	Chapter 4: 5.1(1) 5.3(1)

REPAIRS

Repair architectural precast concrete units if permitted by Owner. The Owner reserves the right to reject repaired units that do not comply with requirements.

Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

CLEANING

Clean surfaces of precast concrete units exposed to view.

Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

1b. **Item**: Precast Architecture Concrete
Reference: Chapter 4: 5.1(1) 5.3(1)

EXPOSED AGGREGATE SIDEWALK

A. **DESCRIPTION.** Work consists of an Exposed Aggregate Sidewalk composed of Portland Cement Concrete proportioned, mixed, and constructed on a prepared base course. The concrete shall be 5 inches thick and placed on a 4-inch compacted sand layer at locations as shown on design plans or as directed by District of Columbia Department of Transportation (DDOT). The sidewalk shall be constructed in one course to the thickness specified. Reinforcement or load transfer devices will not be required unless otherwise specified.

B. **MATERIALS.** The following materials shall meet the requirements of the applicable standards in the DDOT Standard Specifications and Standard Drawings for Highways and Structures.

(1) Portland cement – Section 801

(2) Aggregate – Section 803

(3) Admixtures – Section 814

(4) Water – Section 822

C. **COMPOSITION.** The proportions for the materials for concrete, as developed by Aggregate Industries, Inc.(AI), shall be as shown below. The source of the materials shall be as specified or approved equal. The following sources provide the color and consistency required by DDOT for the construction of this sidewalk.

Material	Source	Amount (Per cu yd)
Cement, lbs	Type I/II, ASTM C150	658
Coarse Aggregate, lbs	AI #8, ASTM C33	2150
Fine Aggregate, lbs	AI Sand, ASTM C33	776
Water, lbs	275	
Water Reducer, oz	SIKA Type A (Plastocrete 161)	20
Air Entrainment Agent, oz	SIKA (AEA-14)	4
Slump (in)		4 +/- 1

D. **SUBMITTALS.** At the discretion of DDOT, a mock up panel may be constructed which demonstrates typical joints, surface finish, texture and standard of workmanship. The mock up panel will be reviewed and approved by DDOT. Work shall not proceed until the mock panel has been approved. Acceptable mock up panels that are within the limits of the proposed work may be left in place with the approval of DDOT. Once the mock up panel is approved, it shall be the Contractor's responsibility to match the mock up panel in all subsequent work specific to a design plan. The contractor shall submit proposed concrete mix designs for approval at least 10 days prior to starting work.

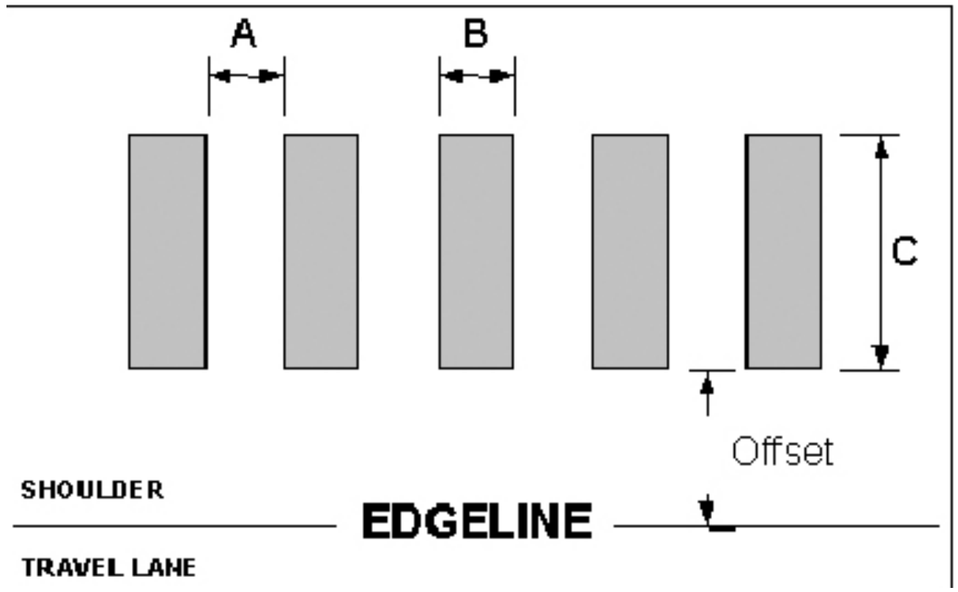
E. **CONSTRUCTION REQUIREMENTS.** Construction requirements for placing concrete shall be accordance with paragraph 608.01(C) with the following modifications.

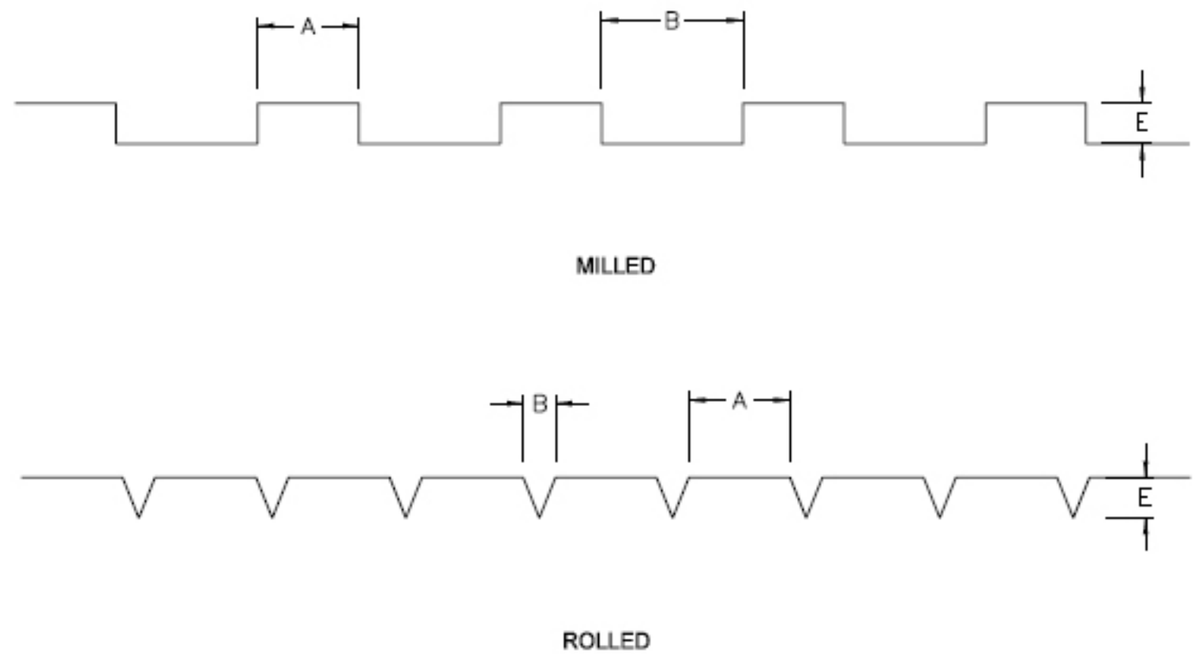
(1) Follow Specifications 608.01(E)2.

(2) Color-Buff

F. **MEASURE AND PAYMENT.** The measure and payment shall be the 5" Exposed Concrete Sidewalk and base course shall be in accordance with paragraph 608.01(G).

1c. **Item**: Exposed Aggregate Concrete Pavement
Reference: Chapter 4: 6.1(4)



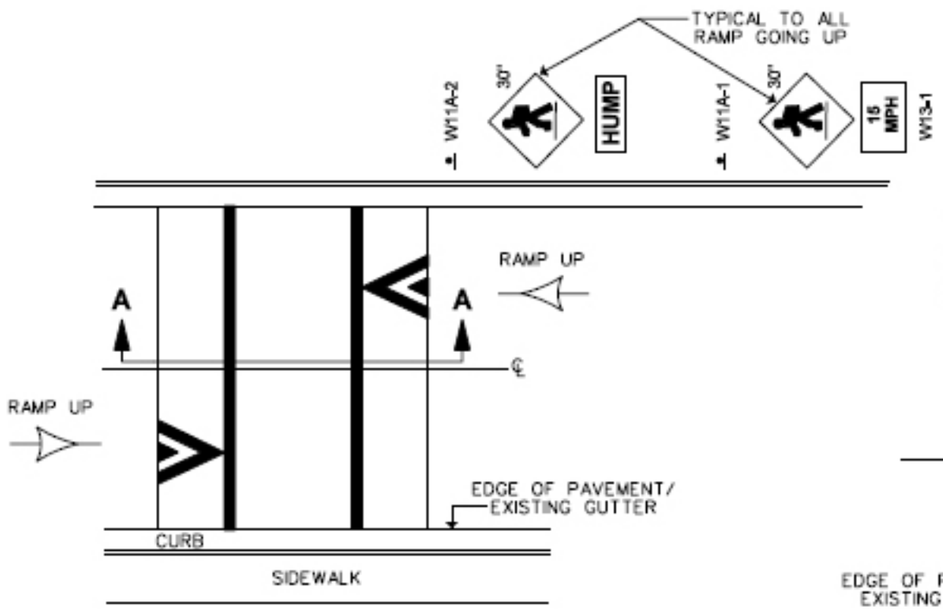


The following section shows the layout of a typical SRS:

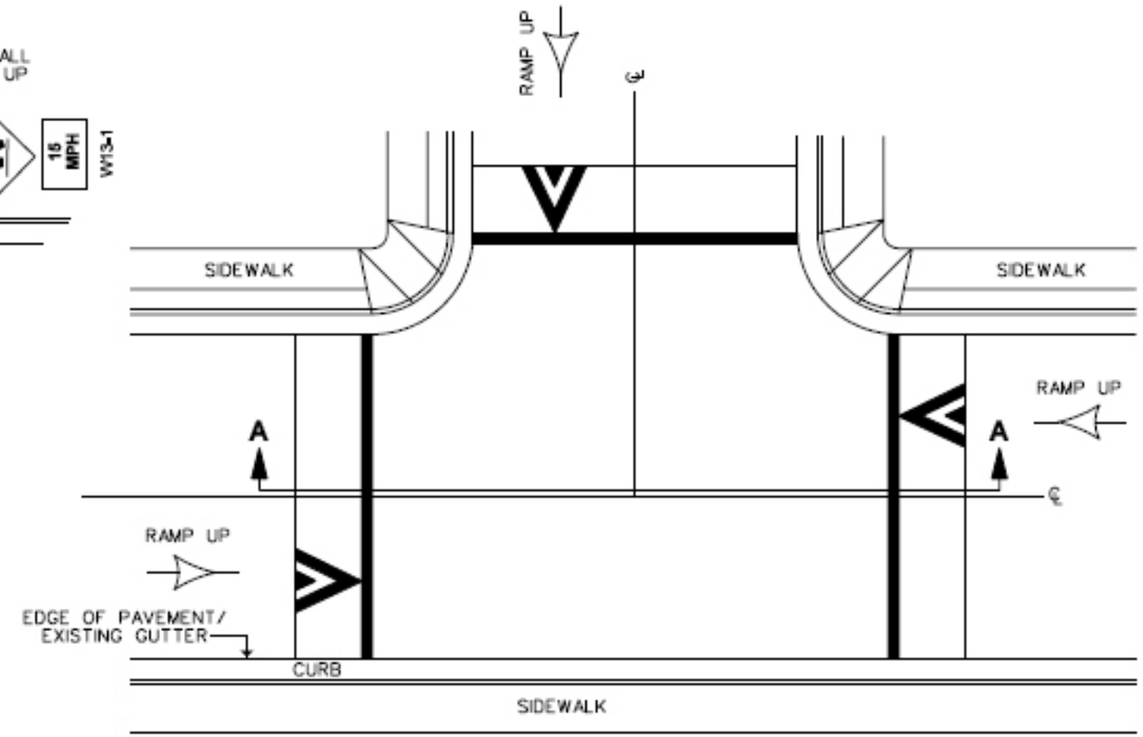
Dimensions	Measurement	Milled (in.)	Rolled (in.)
A	Repeat Pattern	approx. 5.1	approx. 5.1
B	Longitudinal Width	7.1	1.6
C	Transverse Width	15.8	15.8
D	Tire Drop	0.5	0.03
E	Depth	0.5	1.3

LONGITUDINAL SECTION
SHOULDER OR CENTERLINE RUMBLE STRIP

2a. **Item:** Rumble Strip
Reference: Chapter 4: 2.1(1)

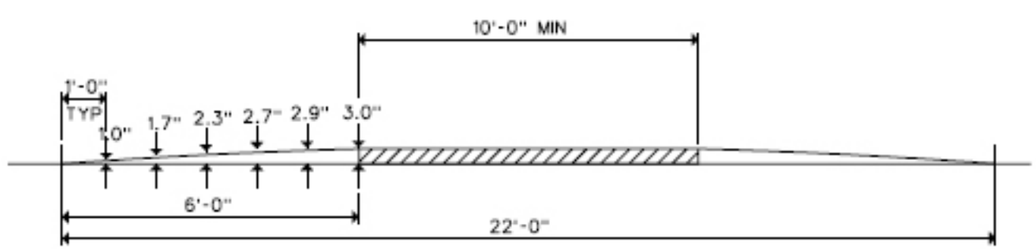


RAISED CROSSWALK



RAISED INTERSECTION

PLAN VIEW



CROSS SECTION A- A FOR SPEED HUMP

SIGNAGE REFERENCE NUMBER IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

RAISED CROSSWALK & INTERSECTION

2b.

Item: Raised Intersections

Reference: Chapter 4: 2.2(1)

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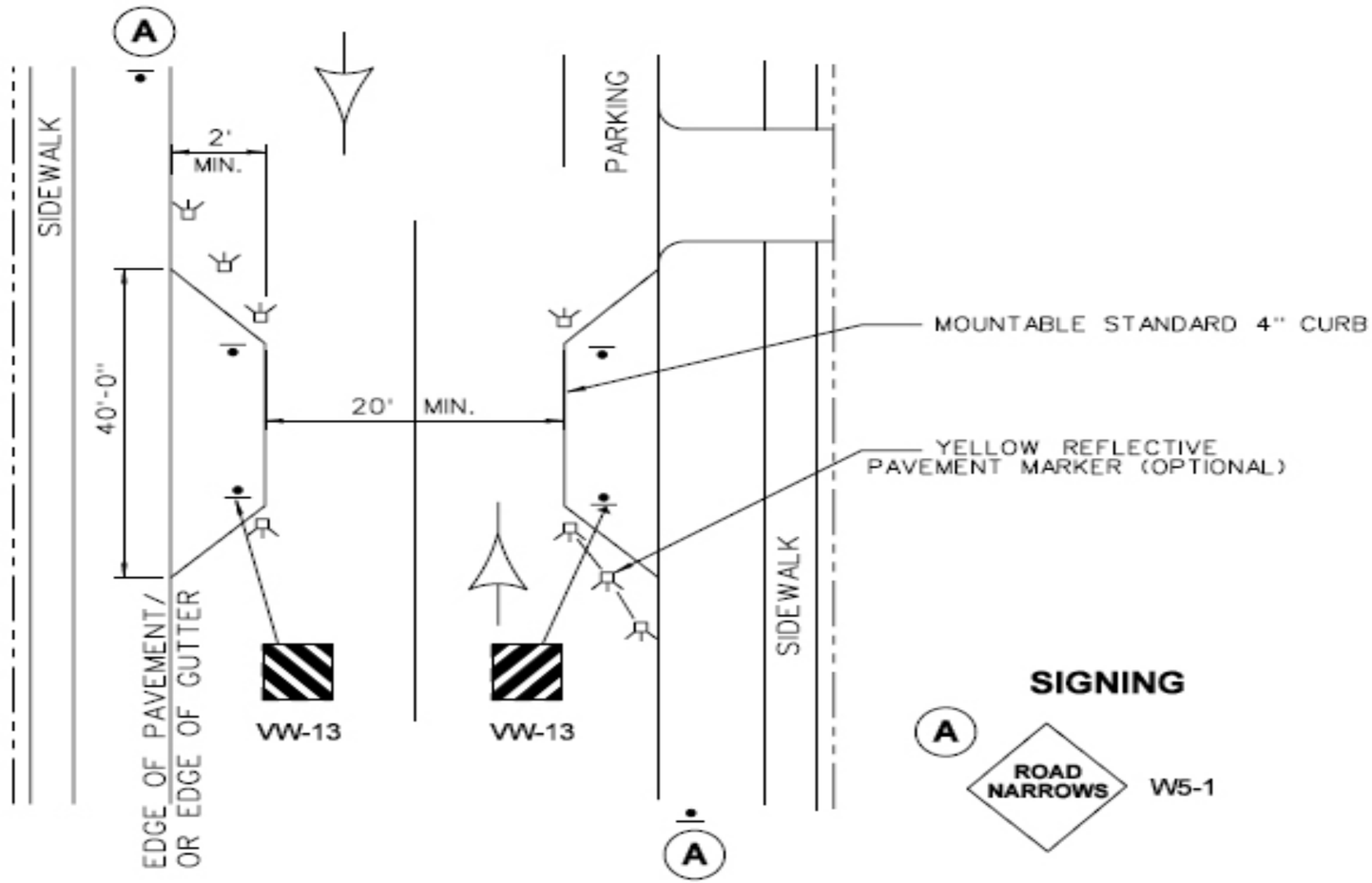
2c. **Item**: NOT USED
Reference: NOT USED



SIGNING

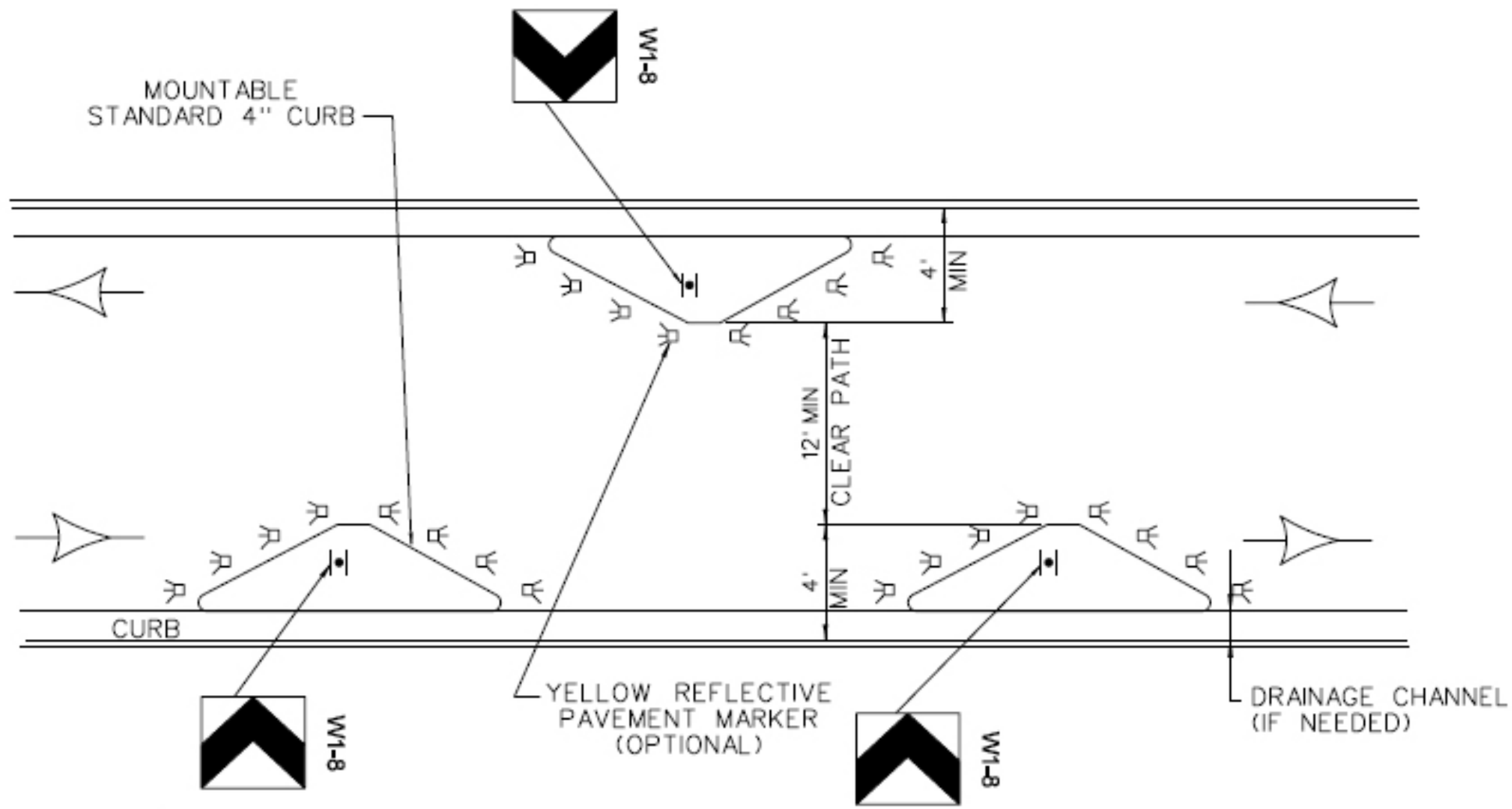
SIGNAGE REFERENCE NUMBER IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

CHOKERS

2d.

Item: Chokers

Reference: Chapter 4: 2.3(2)



ADVANCE SIGNING

SIGNAGE REFERENCE NUMBER IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

CHICANES

2e. **Item:** Chicanes
Reference: Chapter 4: 2.4(1)

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2f. **Item:** NOT USED
Reference: NOT USED

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2g. **Item:** NOT USED
Reference: NOT USED

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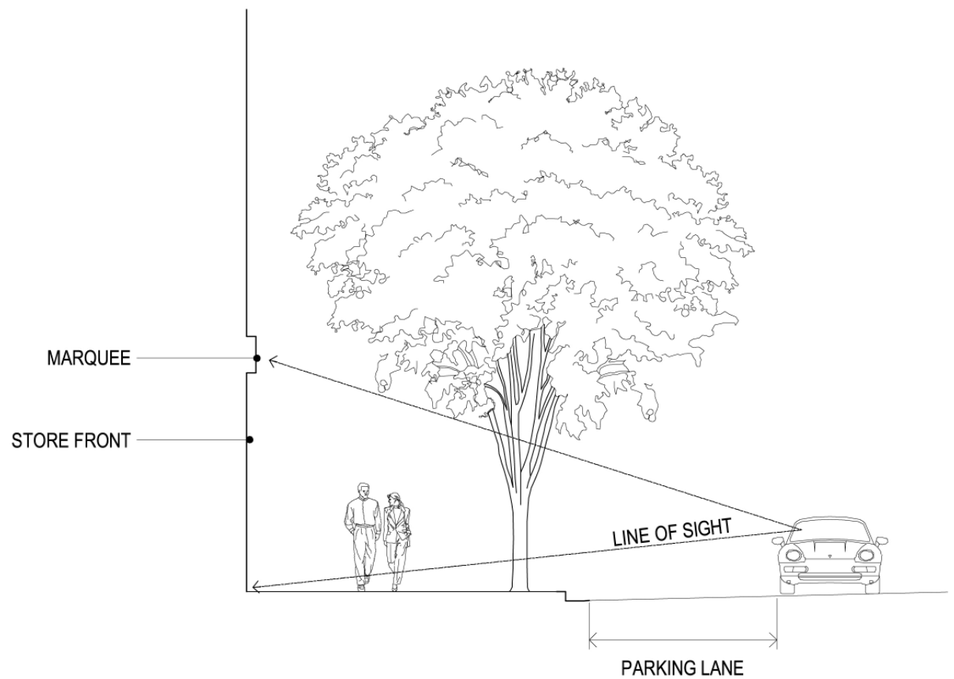
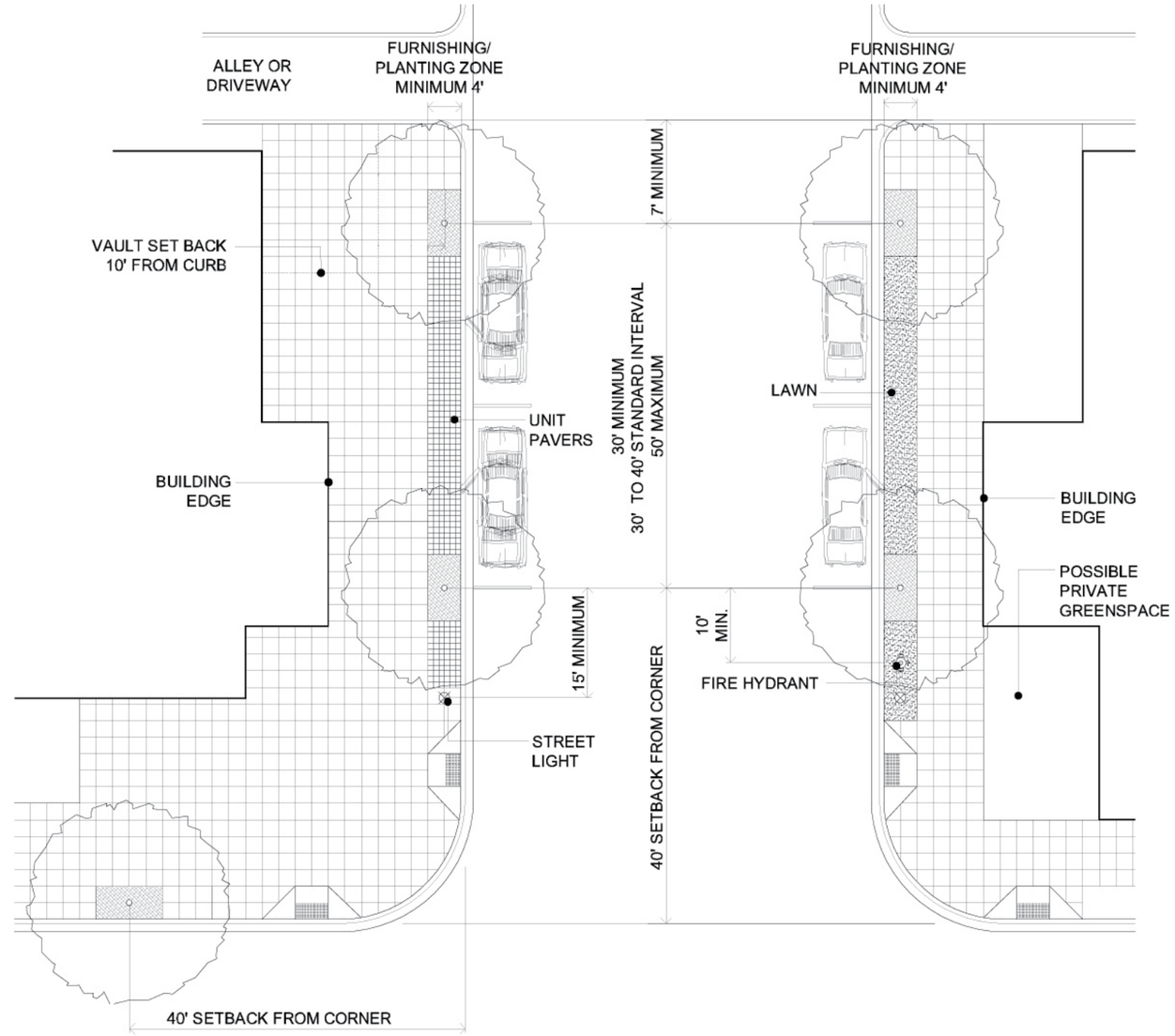
2h. **Item**: NOT USED
Reference: NOT USED



MIXED USE SECTION

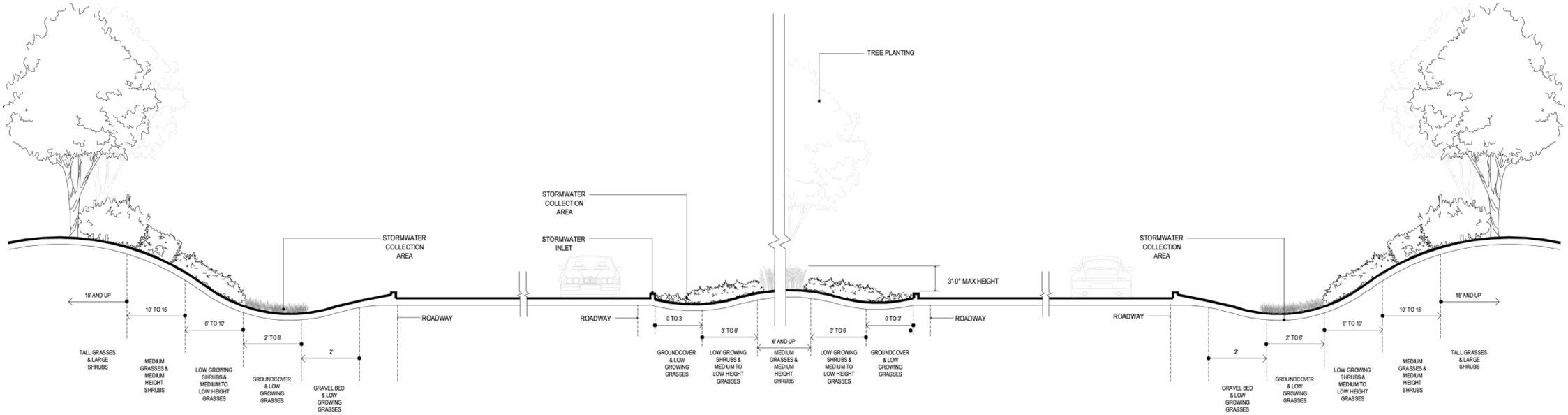


TYPICAL STREETSCAPE LAYOUT PLAN

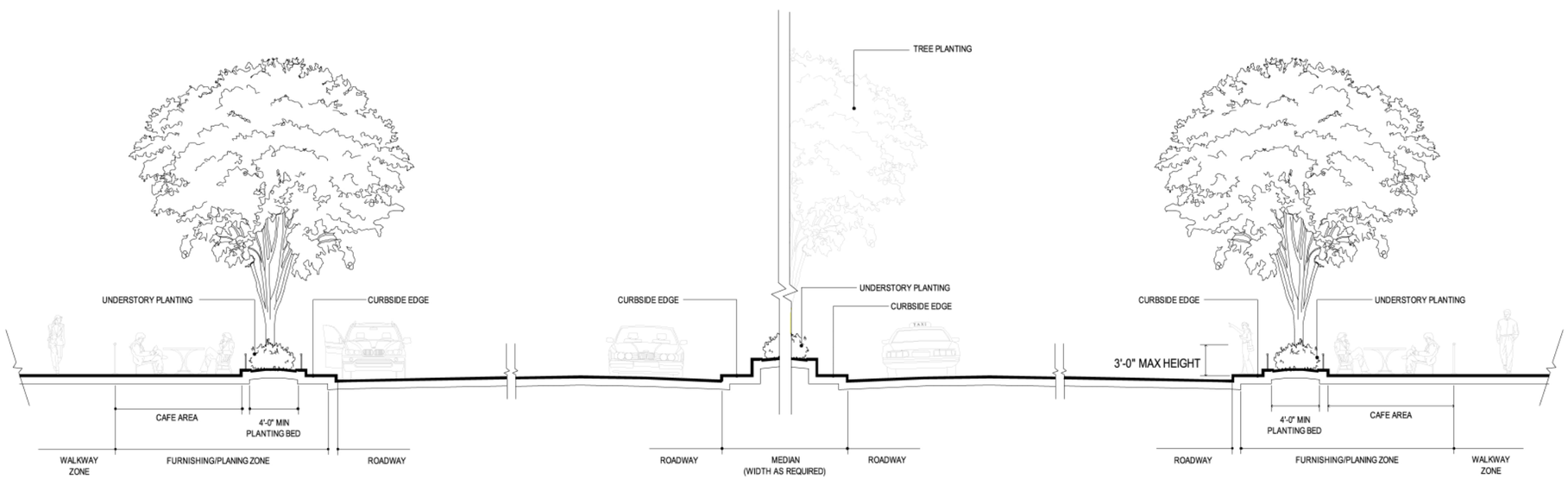
2i.

Item: Typical Tree Planting

Reference: Chapter 4: 10.2(1)



UNDERSTORY PLANTINGS CONDITIONS ALONG THOROUGHFARES (INTERSTATES AND OTHER HIGHWAYS)

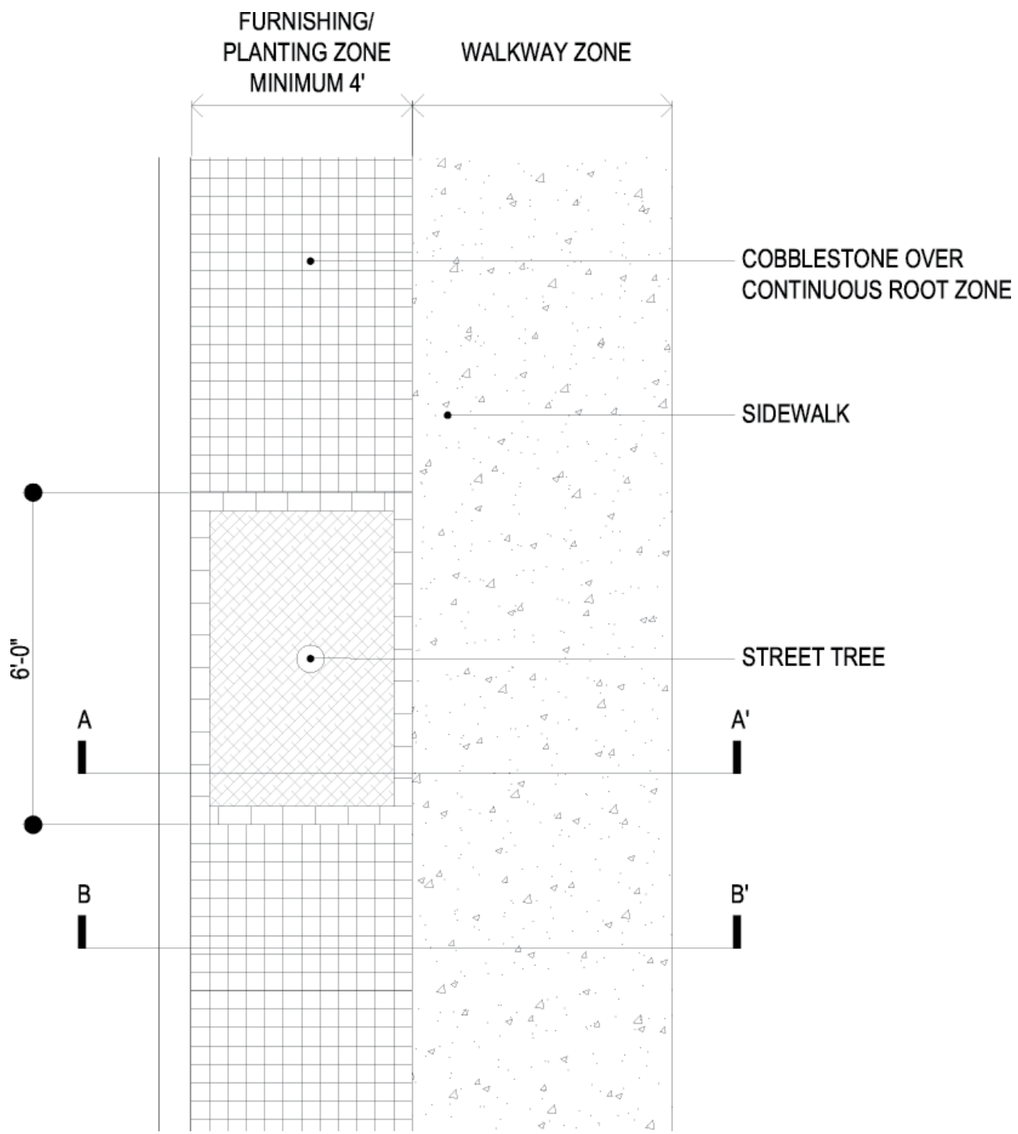


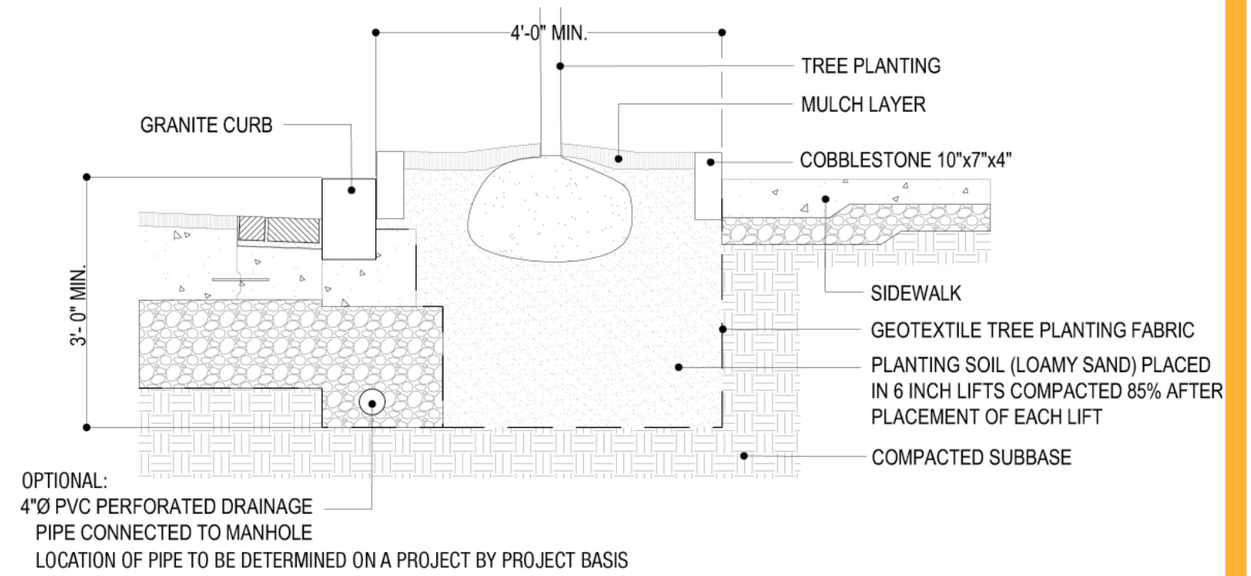
UNDERSTORY PLANTINGS IN MAJOR URBAN STREETS

2j.

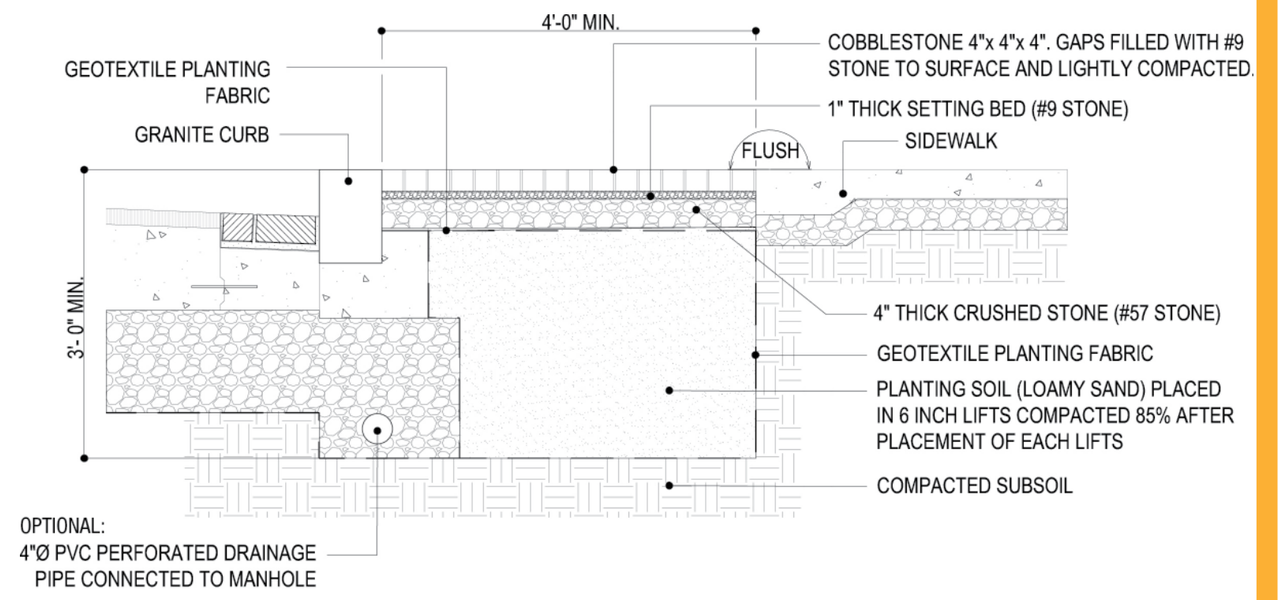
Item: Understory Plantings

Reference: Chapter 4: 11.1(1)



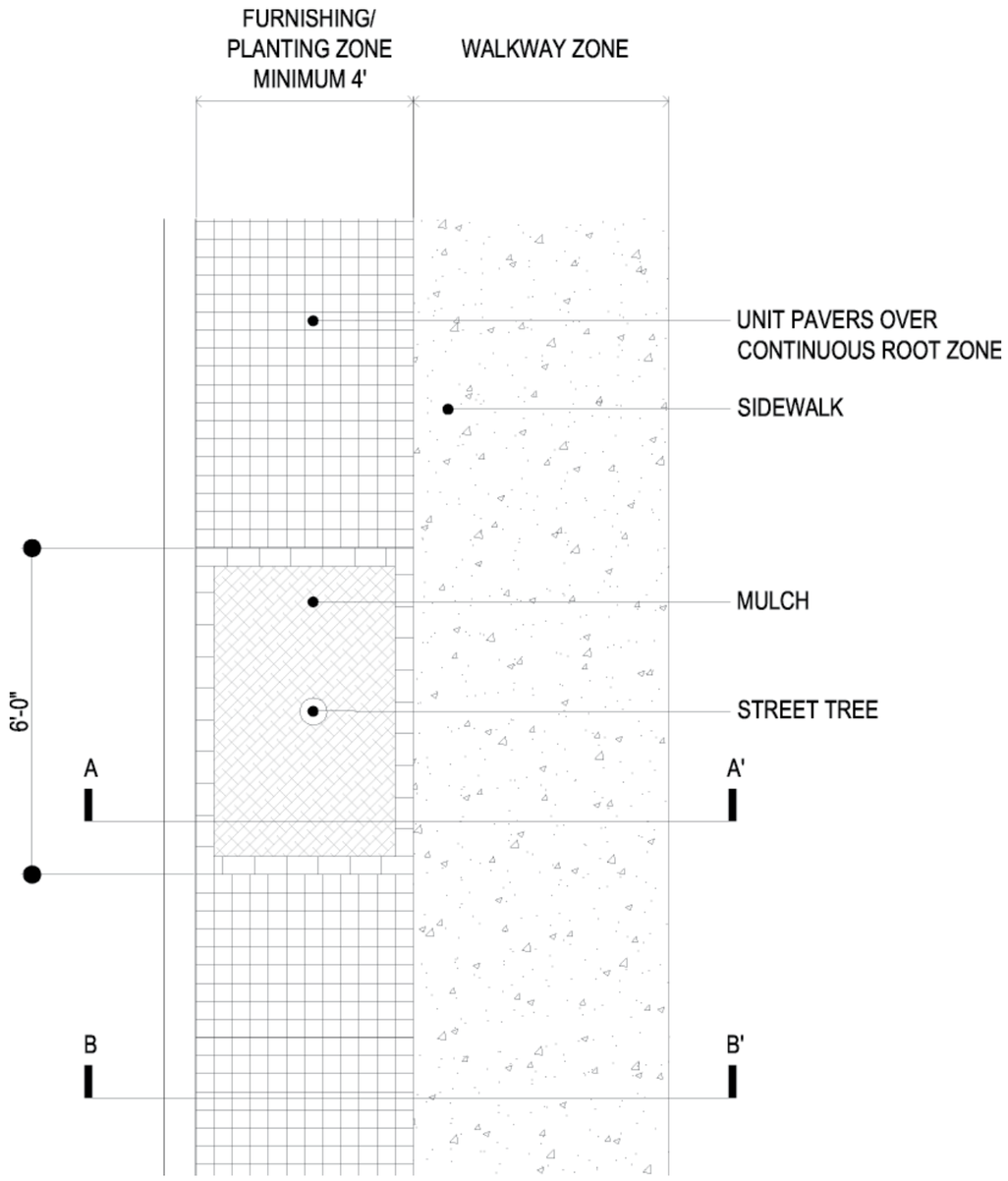


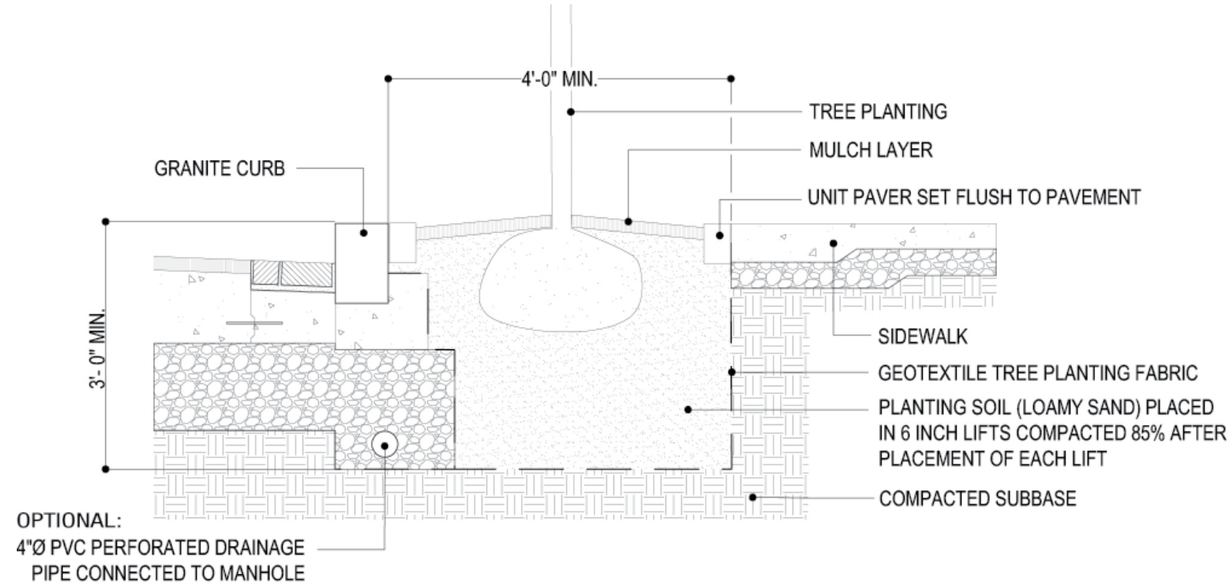
SECTION A-A'



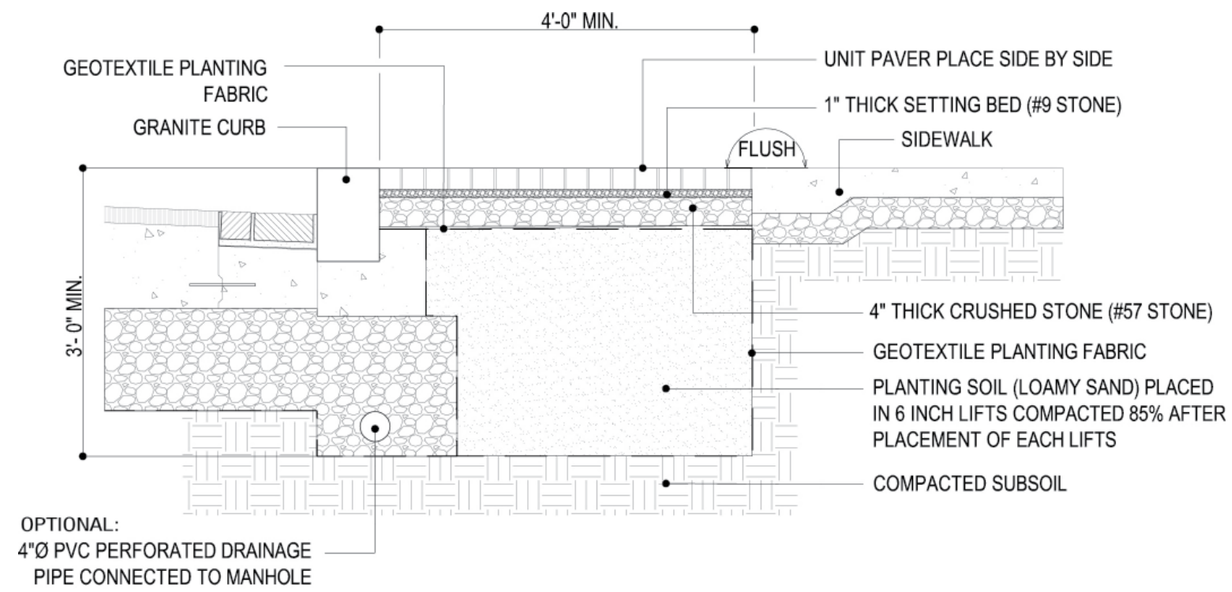
SECTION B-B'

2k. **Item:** Cobblestones on Planting Zone
Reference: Chapter 4: 11.2(1)



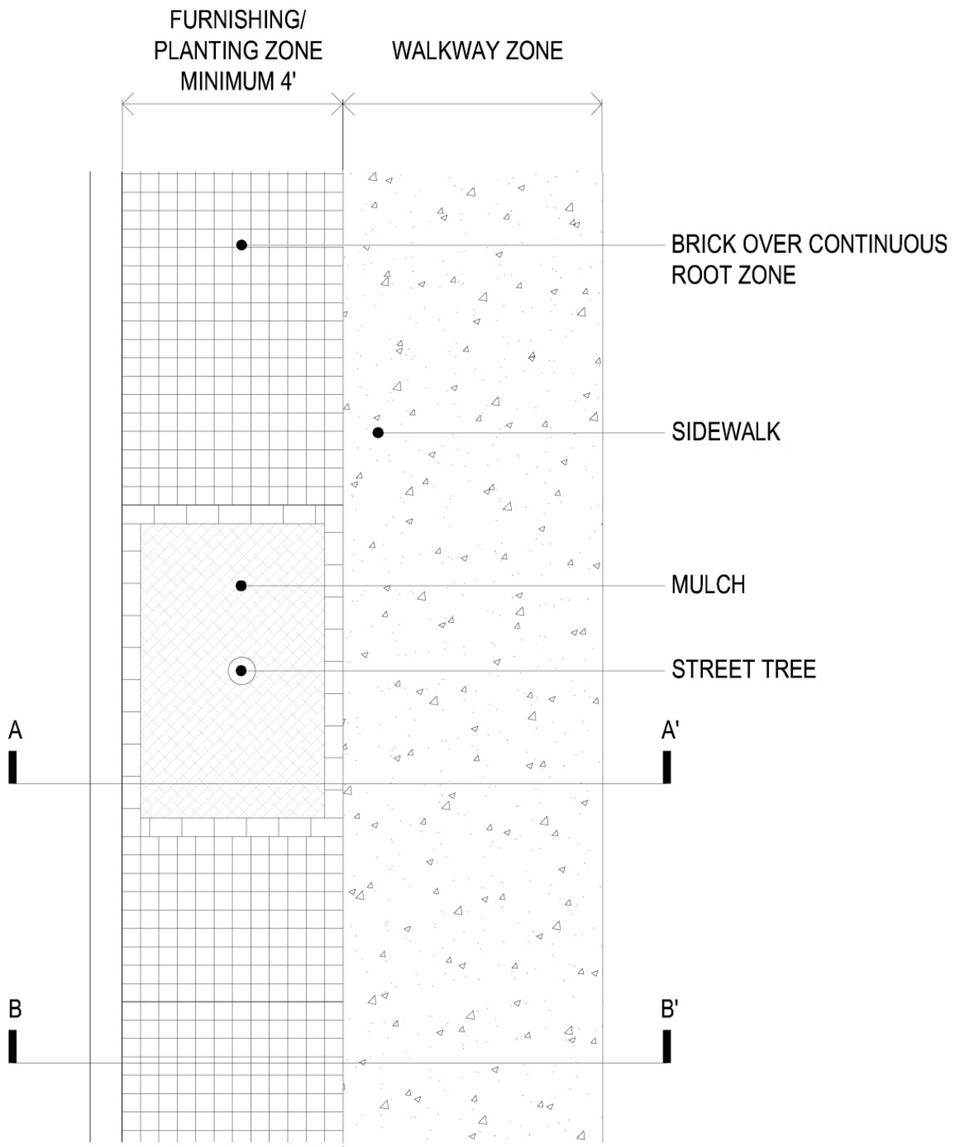


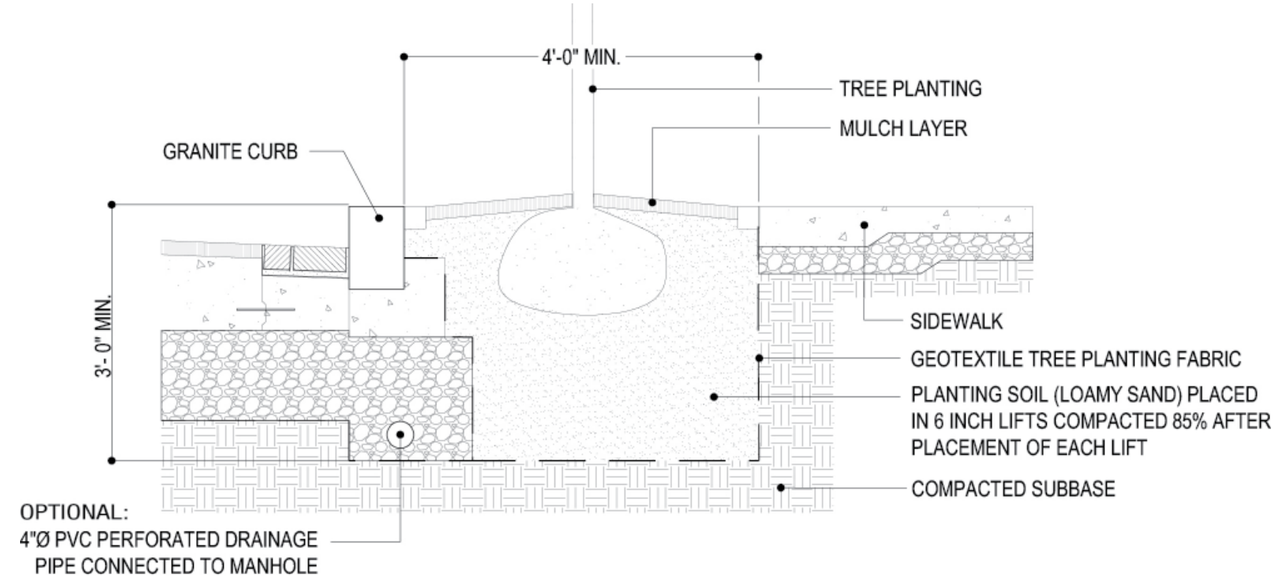
SECTION A-A'



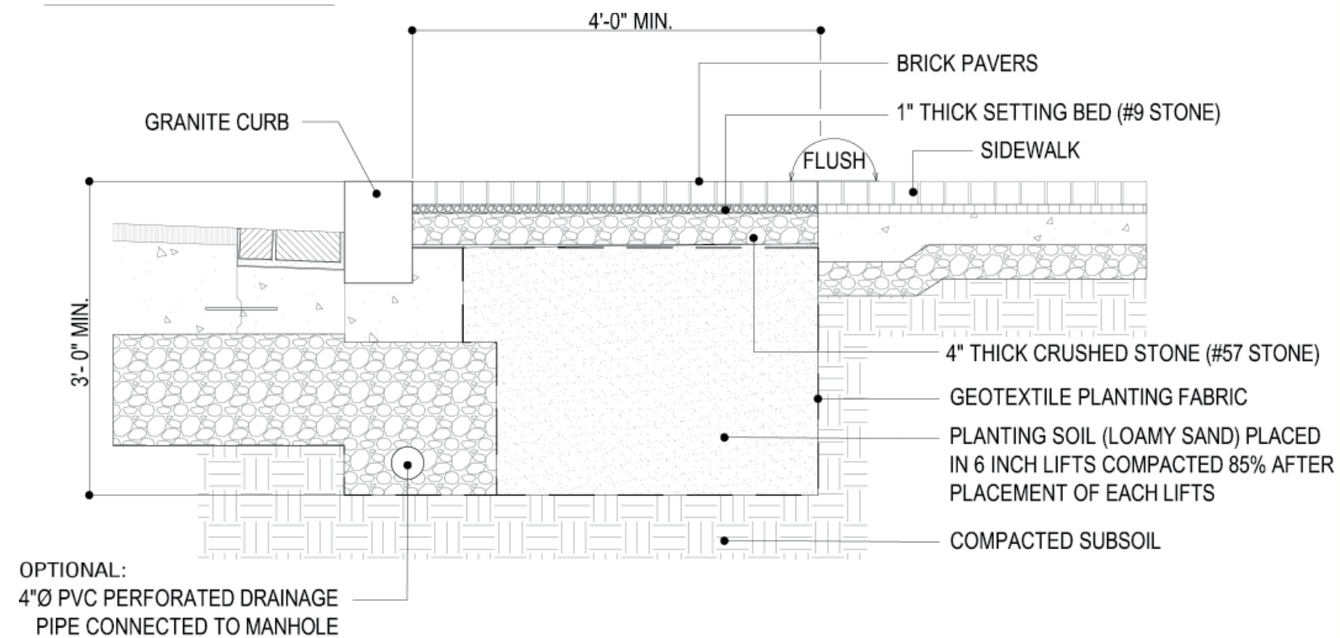
SECTION B-B'

21. **Item:** Tumble Finish Concrete Pavers on Planting Zone
Reference: Chapter 4: 11.2(2)





SECTION A-A'

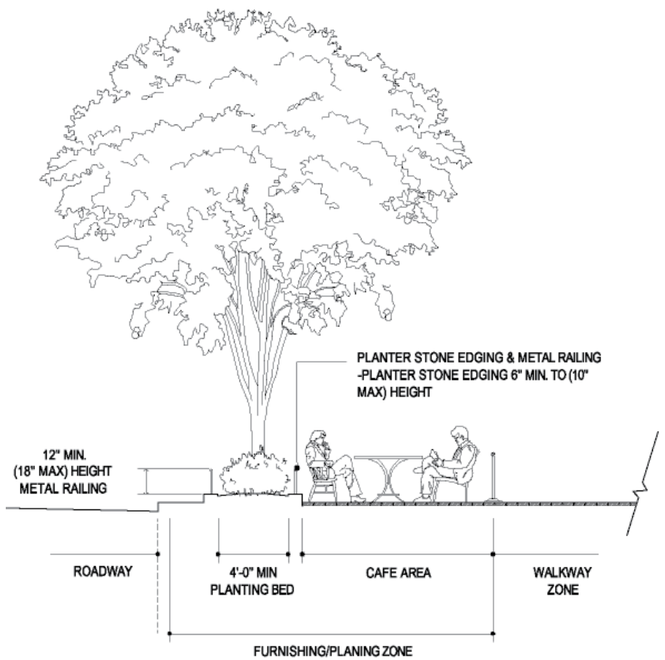


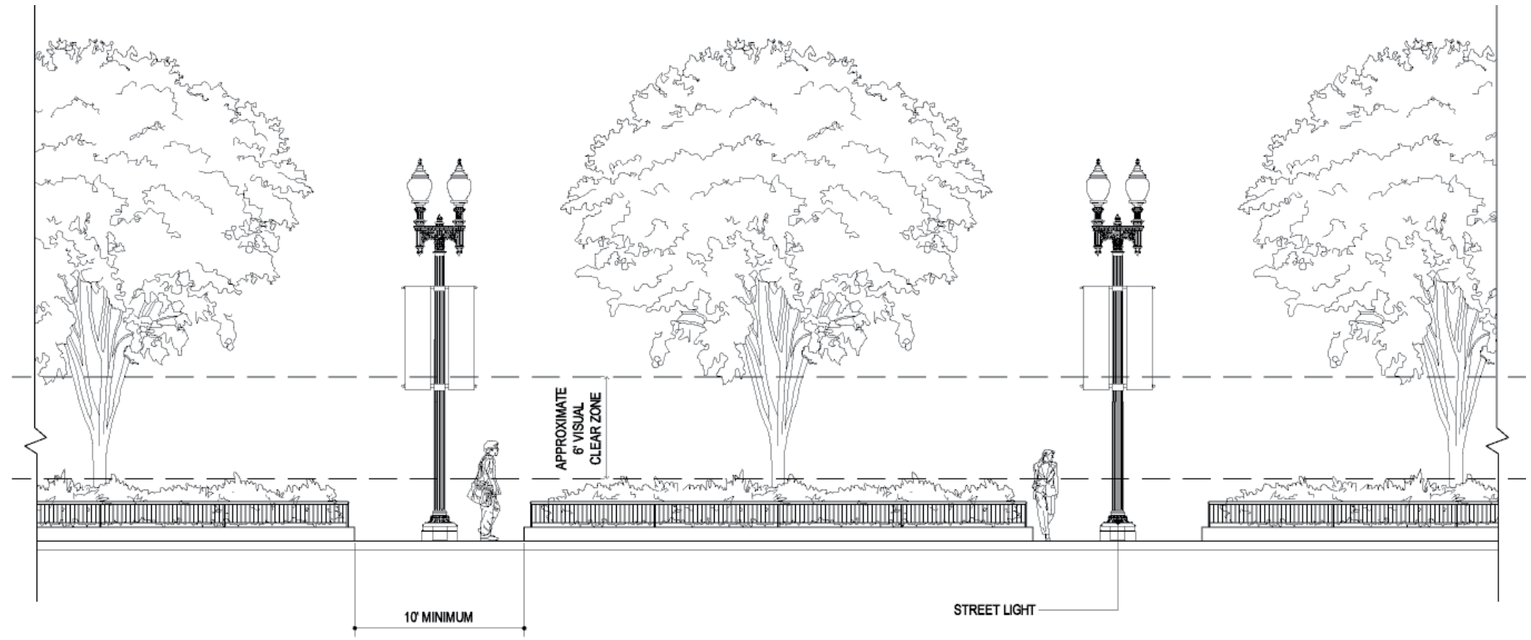
SECTION B-B'

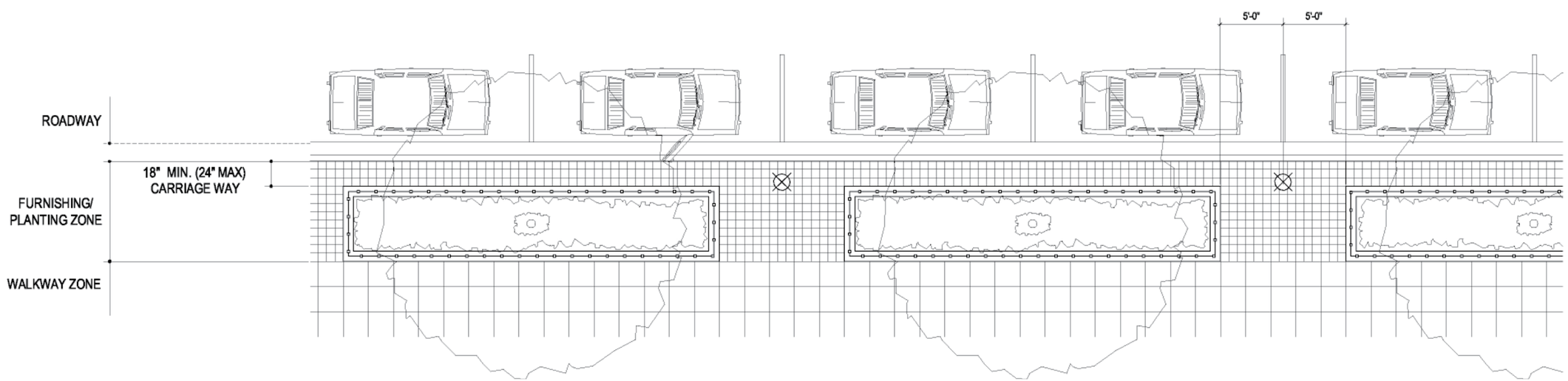
2m.

Item: Brick on Planting Zone

Reference: Chapter 4: 11.2(3)

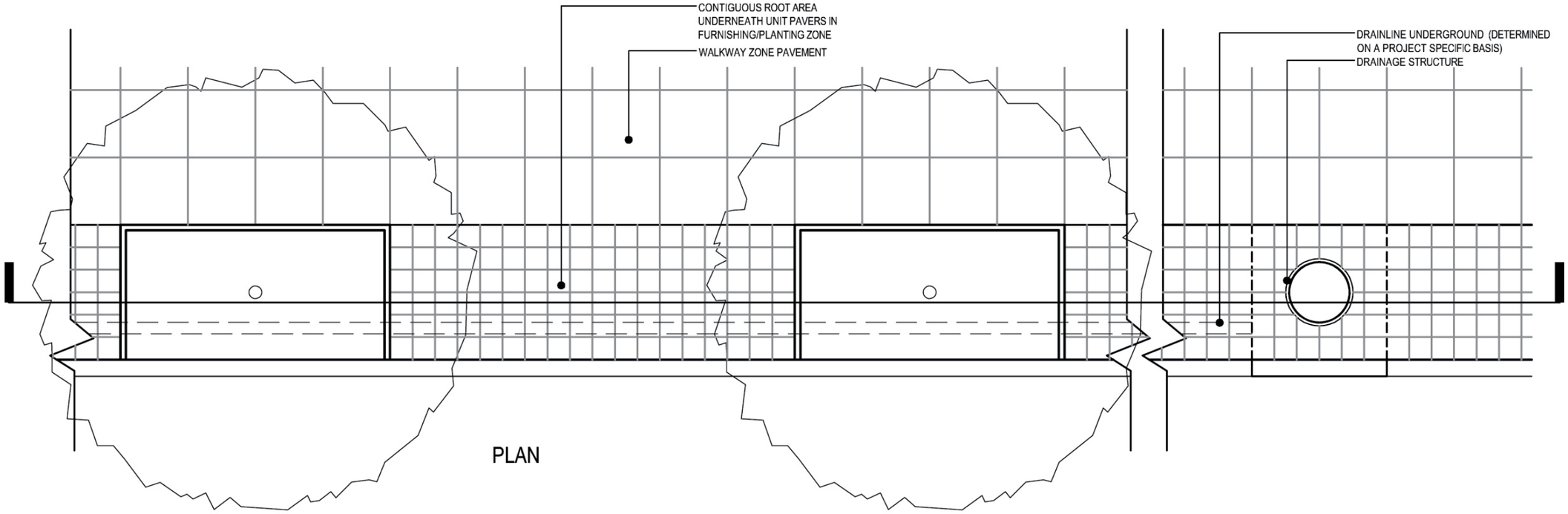




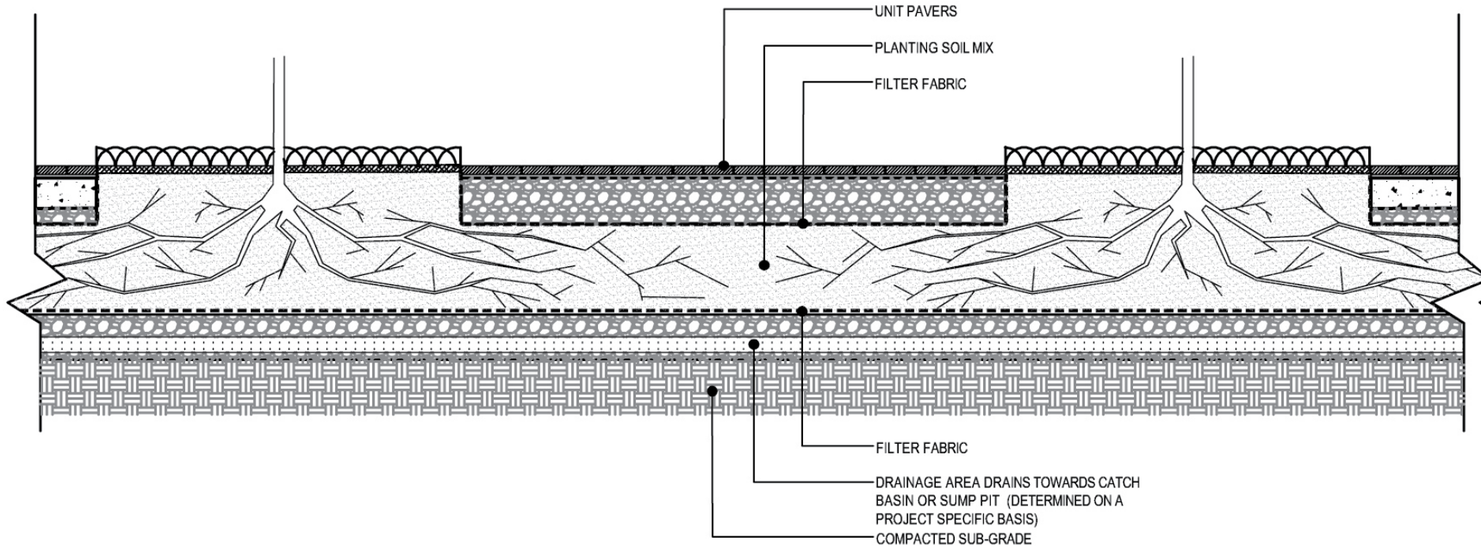


2n. **Item**: Stone Edging with Metal Railing

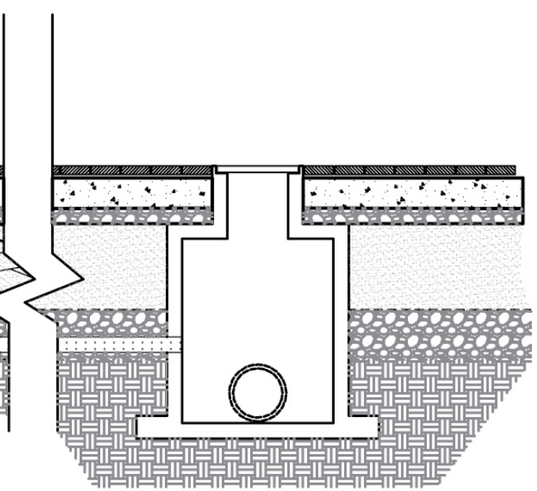
Reference: Chapter 4: 11.4(3)



PLAN

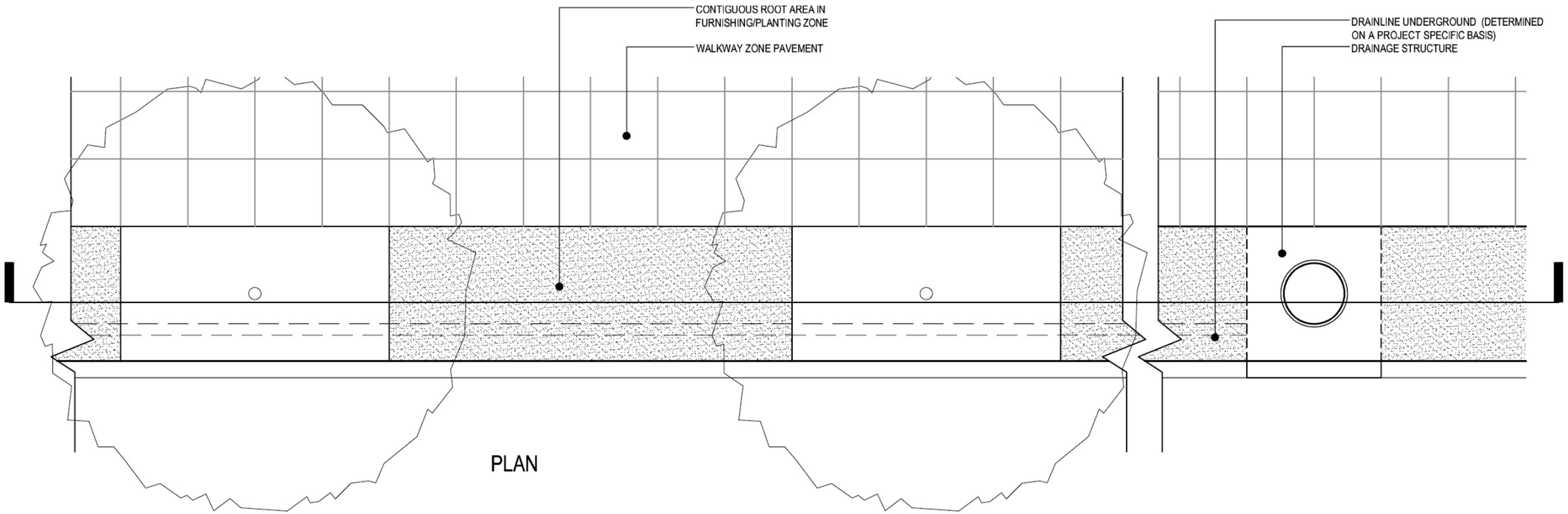


SECTION

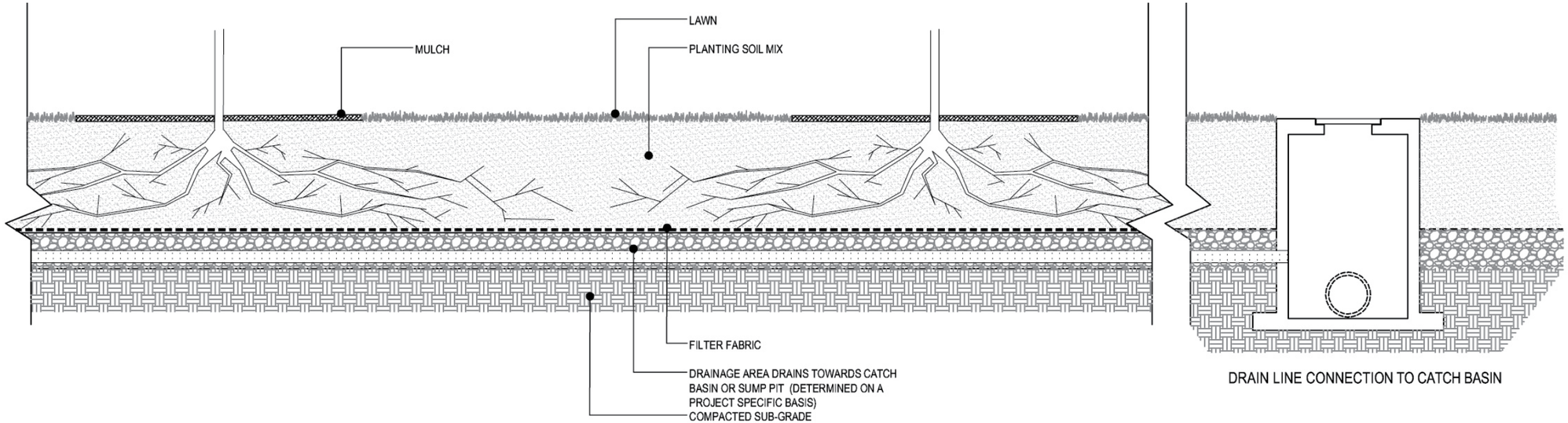


DRAIN LINE CONNECTION TO CATCH BASIN

2o.	**Item**:	Increase Planting Space – Contiguous Root Area
	Reference:	Chapter 4: 12.1(1)



PLAN



SECTION

DRAIN LINE CONNECTION TO CATCH BASIN

2p. **Item:** Increase Planting Space - Contiguous Root Area

Reference: Chapter 4: 12.1(2)

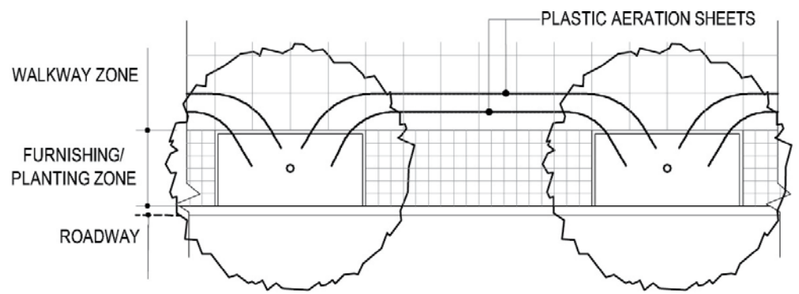
Modifications to Walkway Zone Pavement

Option 1: Aeration Strip Under Sidewalk

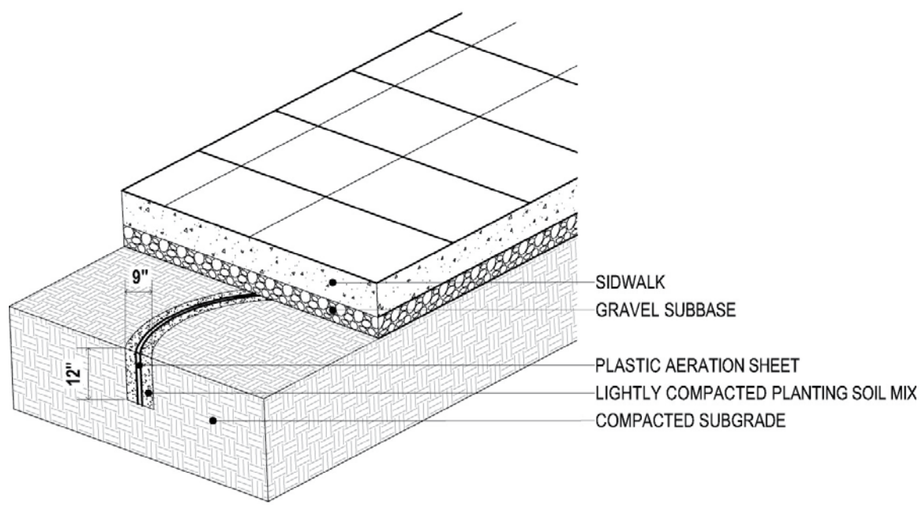
Purpose: Trees in Symbolic Corridors and Designated Transit Corridors are a significant sidewalk element and further define the separation between sidewalk and roadway. In order for trees in these corridors to grow to a mature status, growing conditions in these corridors should provide maximum space for root growth and therefore increase the water absorption. Aeration strips are installed as part of the subsurface setting bed. The purpose for using aeration strips is to maximize the root zone.

Applications:

- Install plastic sheets vertically under the sidewalk. 2 plastic sheets preferred, 1 plastic sheet minimum.
- Place plastic sheet in center of 9" wide trench. Back fill trench on both sides of plastic sheet with planting soil.



PLAN



CROSS SECTION

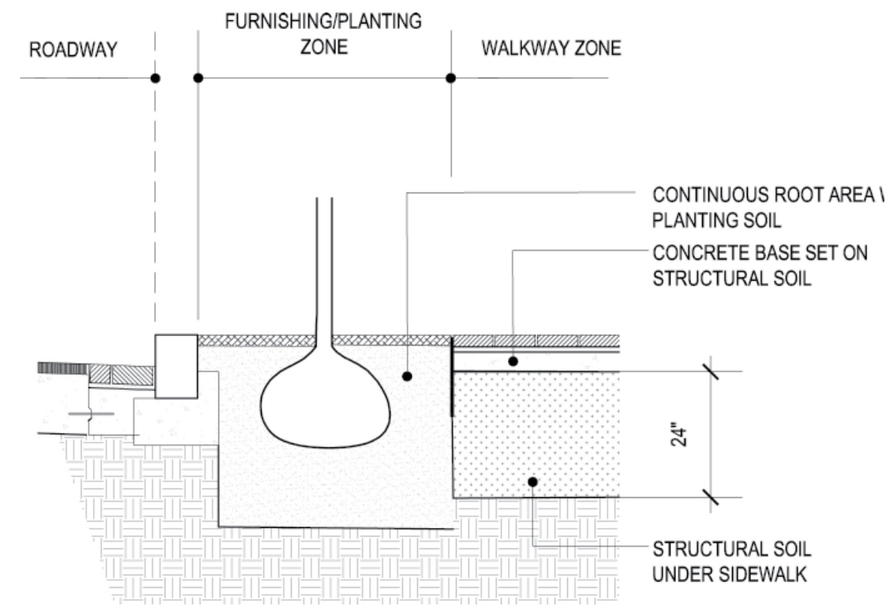
Modification to Walkway Zone Pavement

Option 2: Structural Soil Under Sidewalk

Purpose: Trees in Symbolic Corridors and Designated Transit Corridors are a significant sidewalk element and further define the separation between sidewalk and roadway. In order for trees in these corridors to grow to a mature status, growing conditions in these corridors should provide maximum space for root growth and therefore increase the water absorption. Structural soil provides a penetrable root volume and a load-bearing surface for sidewalk pavement on the Walkway Zone. The purpose for using structural soil is to maximize the root zone under the sidewalk.

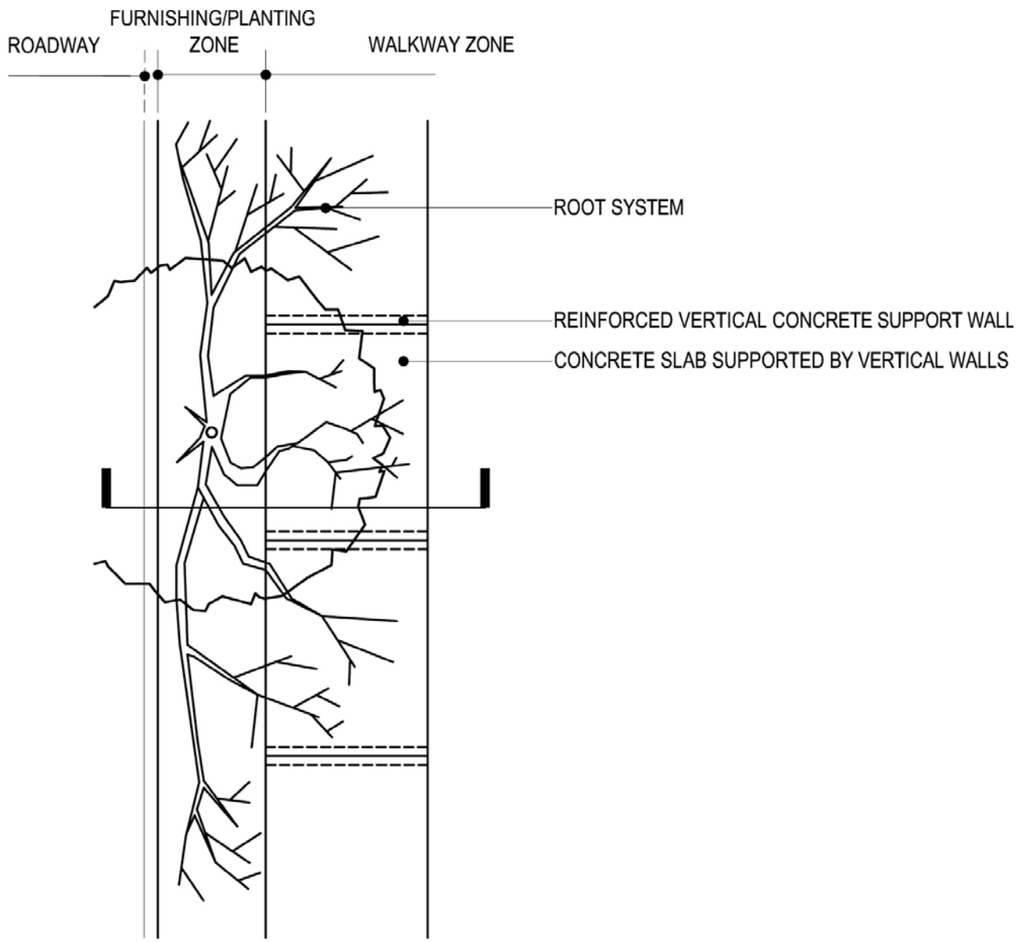
Application: Modifications to walkway zone pavement may be standard applications for sidewalks 6'6" or wider up to 8'0". They can optionally be applied to sidewalks 8'0" or wider.

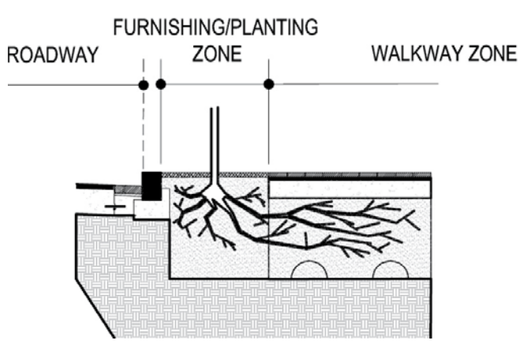
- **Pavement Subbase:** Structural soil CU-Soil (or industry equivalent) should be utilized under the adjoining sidewalk in lieu of a standard granular pavement subbase.
- **Material:** Typically, angular crushed stone (80 percent), clay soil (20 percent) and hydrogel. Limestone gravel should not be used.
- **Subbase Depth:** Determined on a project-to-project basis.



2q. **Item:** Increase Planting Space – Contiguous Root Area

Reference: Chapter 4: 12.1(1) Option 1 and Option 2





Modifications to Walkway Zone Pavement

Option 3: Spanning Sidewalk and Structural Cell

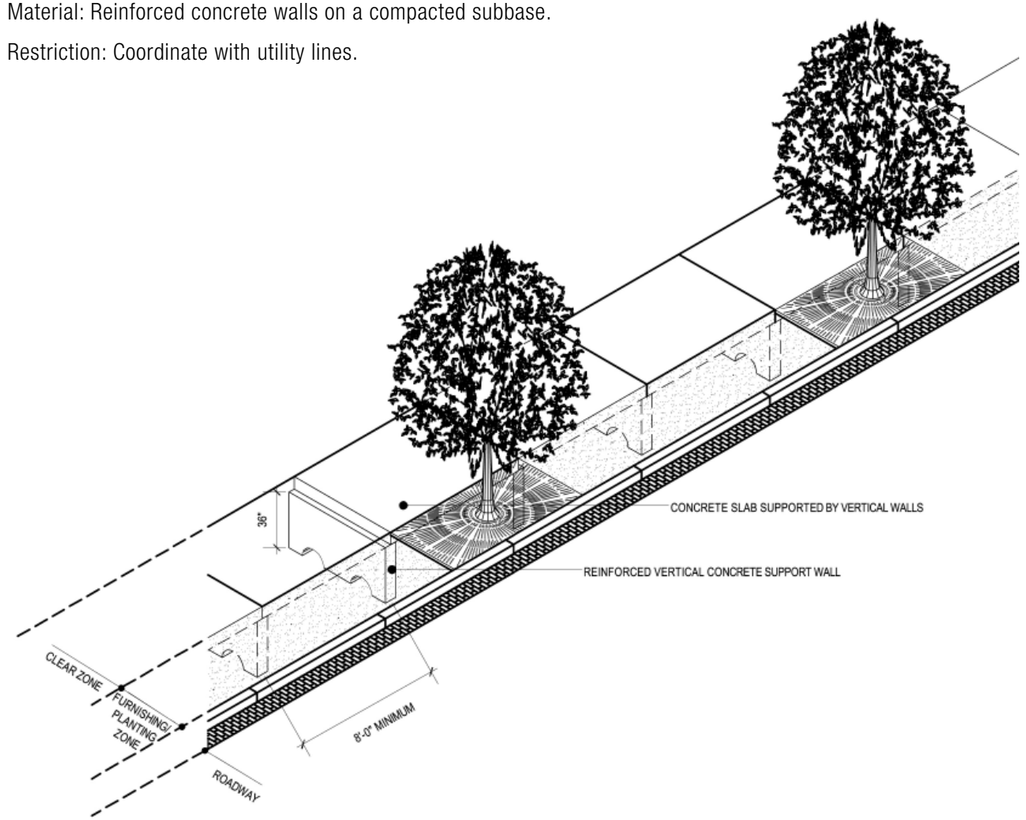
Purpose: Trees in Symbolic Corridors and Designated Transit Corridors are significant sidewalk elements and further separate sidewalks from roadways. In order for trees in these corridors to grow to a mature status, growing conditions should provide maximum space for root growth. Spanning sidewalks are raised platforms supported by two vertical structures preventing the compaction of the planting medium below the pavement. Spanning sidewalks prevents soil compaction, provides additional planting soil, and maximizes the root zone ensuring a better growing condition for urban trees and therefore increases water absorption.

Application: Modifications to walkway zone pavement may be standard applications for sidewalks. They can optionally be applied to sidewalks 8'0" or wider.

Final design of the system shall be done on a project-to-project basis.

Concrete Supporting Walls:

- Vertical Walls: may be 8" wide.
- Material: Reinforced concrete walls on a compacted subbase.
- Restriction: Coordinate with utility lines.



2r. **Item:** Increase Planting Space – Contiguous Root Area
Reference: Chapter 4: 12.1(1) Option 3

TECHNICAL GUIDELINES

Cobblestones:

INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. A block splitter may be used. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

QUALITY ASSURANCE

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

DELIVERY, STORAGE AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

PAVERS

A. Rough-Stone Pavers: Rectangular tumbled paving stones, with faces and edges, made from granite complying with ASTM C 615.

Granite Color and Grain: Light gray with fine grain.

Thickness: 4 inches plus or minus ½ inch

Face Size: 4 by 4 inches plus or minus ½ inch and 7 x 10 inches plus or minus ½ inch.

AGGREGATE SUBBASE - MATERIALS

A. Fine Aggregate #10 Stone (Non-washed) Depth to be determined on a project by project basis

B. Coarse Aggregate #67 Stone (Double Washed) Depth to be determined on a project by project basis.

3a. **Item**: Cobblestone Pavers

Reference: Chapter 4: 3.3(2) 4.1(1)

Tumble Finish Concrete Pavers

TECHNICAL GUIDELINES

INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. A block splitter may be used. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

QUALITY ASSURANCE

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

DELIVERY, STORAGE AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

PAVERS

A. Concrete Pavers: Solid interlocking paver units complying with ASTM C 936 and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates.

Thickness: 2 3/8 inches

Face Size and Shape: 6 x 6 inches, 6 x 9 inches.

Finish: Tumble

AGGREGATE SUBBASE - MATERIALS

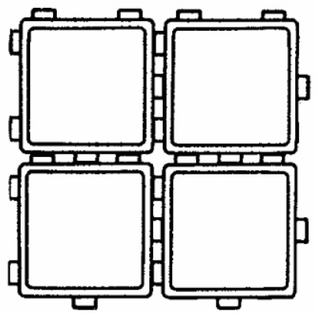
A. Fine Aggregate #10 Stone (Non-washed) Depth to be determined on a project by project basis

B. Coarse Aggregate #67 Stone (Double Washed) Depth to be determined on a project by project basis.

3b. **Item**: Tumble Finish Concrete Pavers

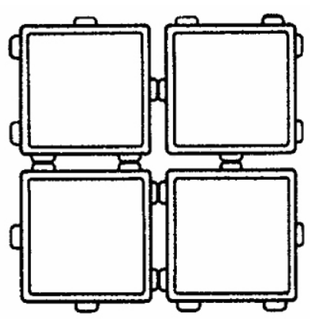
Reference: Chapter 4: 1.1(4) 1.4(1) 1.5(1) 3.3(2) 4.1(1)

For water drainage:



Installed in closed assembly with spacer on stone. Joints filled with gravel. Ideal for mechanized installation.

For turf growth:



With larger joints - spacer on spacer - filled with a soil-gravel mix.

TECHNICAL GUIDELINES

INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. A block splitter may be used. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

QUALITY ASSURANCE

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

DELIVERY, STORAGE AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

PAVERS

Concrete Pavers: Solid interlocking paver units complying with ASTM C 936 and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates.

Thickness: 3 inches

Face Size and Shape: 3 x 7¾ inches square with six ½ inch concrete tabs

Finish: Smooth Finish

AGGREGATE SUBBASE - MATERIALS

A. Fine Aggregate #10 Stone (Non-washed) Depth to be determined on a project by project basis.

B. Coarse Aggregate #67 Stone (Double Washed) Depth to be determined on a project by project basis.

C. Optional Drainline: 4 inch minimum diameter slotted underdrain with threaded end cap with a minimum of 2 inches of stone above and below the pipe.

3c. **Item**: Permeable Interlocking Pavers
Reference: Chapter 4: 11.2(4) 1.4(1)

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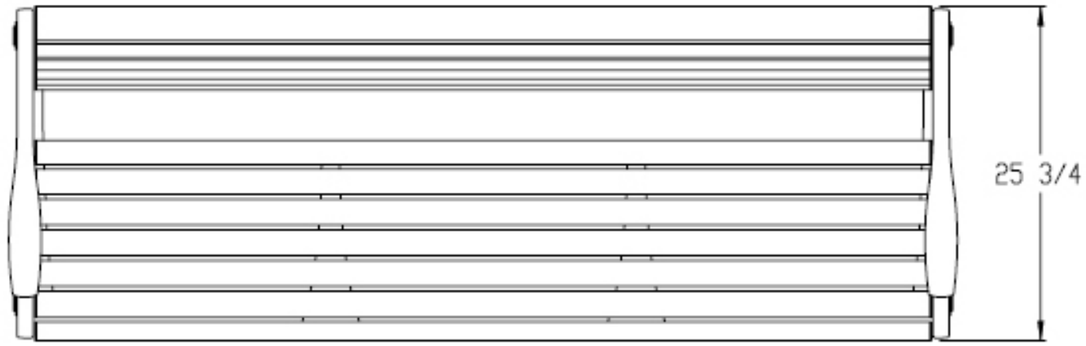
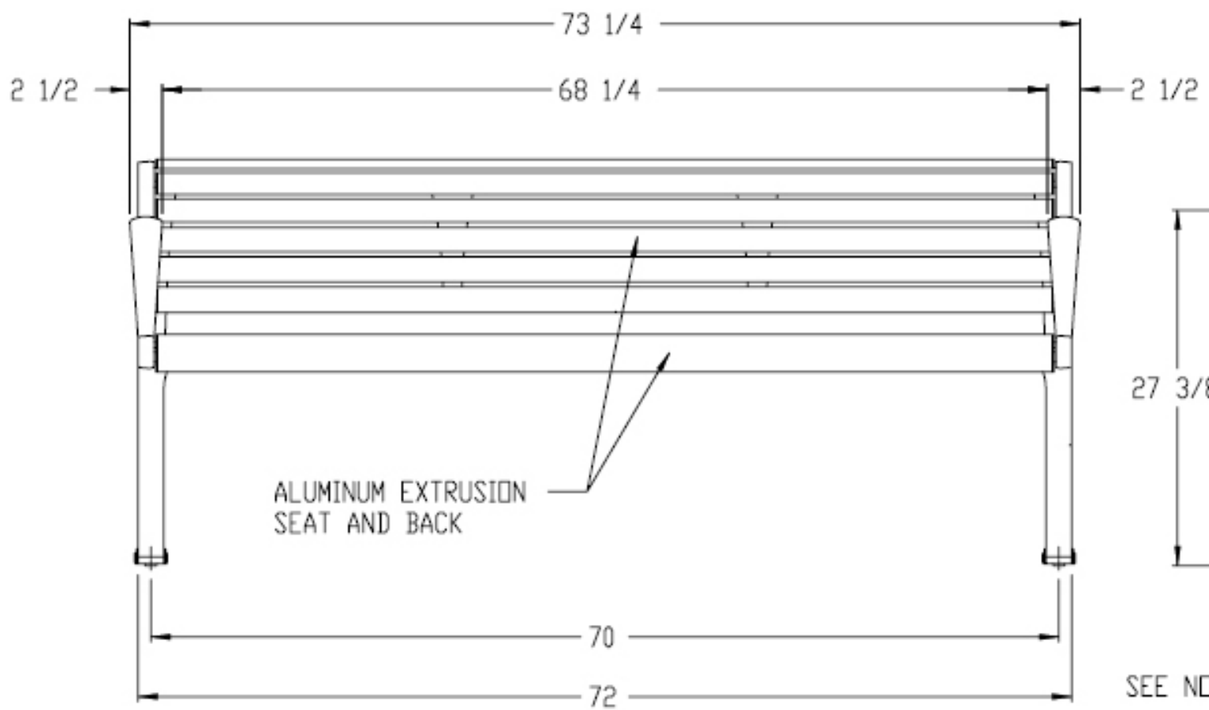
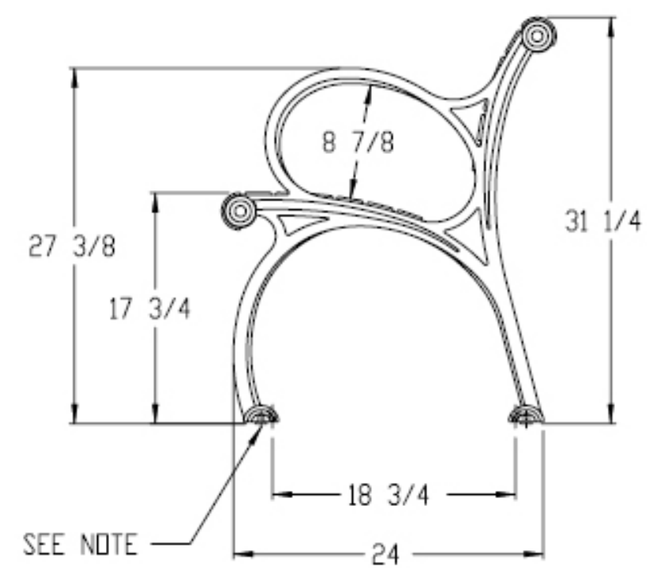
3d. **Item**: NOT USED
Reference: NOT USED



NOTE:
FREESTANDING OR SURFACE MOUNT OPTIONS. CORROSION-RESISTANT ANCHORING HARDWARE SUPPLIED BY OTHERS. ?ø? 13/32" HOLES WITH COUNTERBORE PROVIDED FOR SOCKET HEAD CAP SCREWS.





3e. **Item:** Traditional Bench
Reference: Chapter 4: 8.1(1)

GENERAL PRODUCT TECHNICAL DATA

A. All surfaces and welded joins shall be free of manufacturing imperfections.

B. Welders & machine operators must be certified.

C. Finish shall be three phase Pangard II finish

D. Product must pass ASTM and BIFMA testing standards

E. Manufacturer warrants its products to be free from defects in material and/or workmanship for a period of three years from the date of invoice.

F. Submit full shop drawings and manufactures product data.

G. Provide full size samples of each product for approval.

H. Manufacturer has been manufacturing the specified products or ones very similar in style and material for at least two years.

PRODUCT NAME

Site and Street Furniture Seating:

Products are supported by the following manufacturer's qualifications and must be considered when any product is being considered as an equal substitute. These qualifications must be pre-approved prior to the bid opening and accompanied with complete documentation.

A. Manufacturer to provide products supported with complete engineering drawings and design patents.

B. Manufacturer to be able to fill orders within a 40-day schedule.

C. Welders and machine operators are certified.

PRODUCT DESCRIPTION

This product must pass ASTM, BIFMA, or industry standards. Specifications are subject to change without notice.

Basic Use: For heavy use, public space seating requirements. Can be used indoors or outdoors.

Composition and materials:

Frame: End supports with integral armrests and optional center arm or center strap for 96" bench only, are sand-cast aluminum. Leg section is 1-1/2" x 2" oval shape. Seat straps and back straps are sand-cast aluminum. End supports are connected by two A36 steel channels 1-1/2" x 9/16" x 3/16" fastened with black oxide finished stainless steel cap screws.

Seat and Back Panels: Solid stock wooden molded boards with eased edges or extruded aluminum boards are nominal 1.25" thick. Molded or extruded aluminum face boards conceal steel channels. Each board is fastened with at least four black oxide finished stainless steel screws. Individual components can be replaced with ordinary tools.

Sizes, Mounting Options, Finishes, Colors:

Sizes: Nominal size is 25" deep x 32" high x 73-1/4" and 97-1/4"long.

Mounting Options: Shipped with freestanding glides, which may be removed for surface mounting.

Finishes: Finish on metal is Pangard II® finishing process that includes a rust inhibitor and topcoat finish of thermosetting polyester powdercoat that is U.V., chip and flake resistant.

Colors: Available in a selection of standard colors. Optional and custom colors available for an upcharge.

TECHNICAL DATA

Recycled Content: The aluminum benches have a recycled material content of 35% or greater. The post consumer content is 19% or greater and the pre consumer content is 16% or greater.

All benches are 100% recyclable.

Finishes: The following are test results for

Pangard II® polyester powdercoat.

Gloss according to Garner 60 deg. ASTM D 523: 80-90

Cross hatch adhesion ASTM

D 3359 method B: pass 100%

Mandrel bending test

ASTM D 522: 1/8"/3 mm

Erichsen cupping

ISO 1520: 5/16"/8 mm

Impression hardness

according to Buchholz

ISO 2215: 95

Impact test ASTM D 2794-90:

1/10" distortion up to 160 in/lb

Pencil hardness ASTM

D 3363-74: 2H (min.)

Drill mill tests: ok

Saltspray Resistance 1500 hr test, ASTM B 117:

max. undercutting 1/16"/1 mm

Humidity Resistance 1500 hr test, ASTM D 2247-68:

max. blisters 1/16"/1 mm

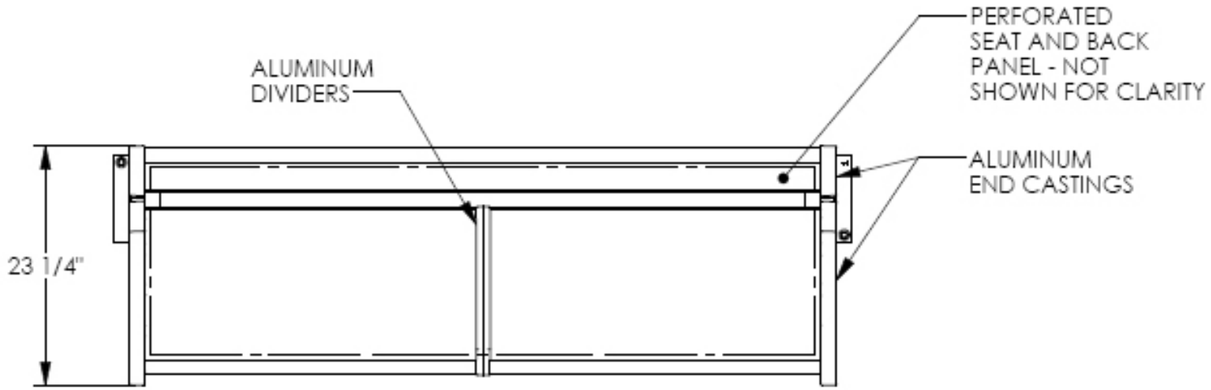
INSTALLATION

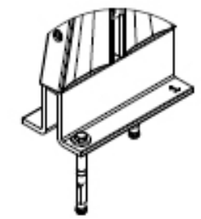
Benches are shipped assembled. Installation is to be done by customer or his agent in accordance with specifications of customer's architect or planner. Corrosion-resistant anchor bolts for surface mount option furnished by others.

MAINTENANCE

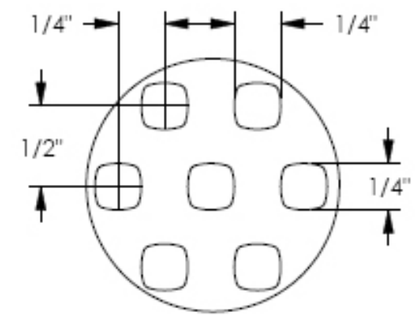
For outdoor use simply rinse and wipe clean using mild cleaners. Scratches and gouges can be repaired by sanding, then repainting with a touch up kit from manufacturer.

3e. **Item**: Traditional Bench
Reference: Chapter 4: 8.1(1)

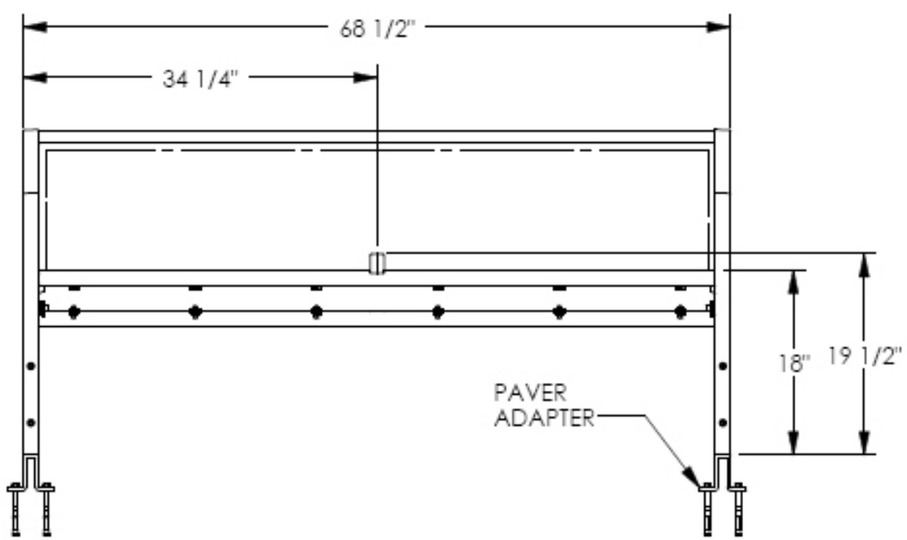


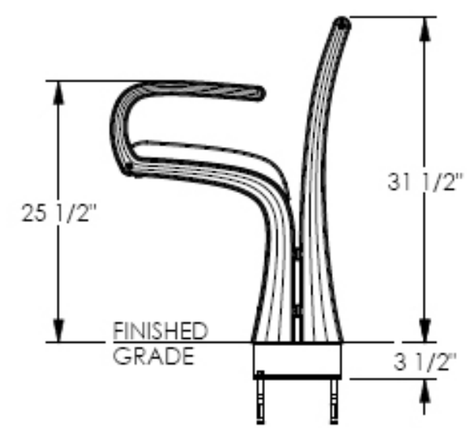


PAVER ADAPTER DETAIL



PERFORATED PANEL DETAIL





3f. **Item:** Contemporary Bench
Reference: Chapter 4: 8.1(2)

Any proposed substitutes or as equals must be pre-approved prior to the bid opening

And accompanied with complete engineering drawings, design patent, and comply with the following manufacturing specifications:

GENERAL PRODUCT TECHNICAL DATA

A. All surfaces and welded joins shall be free of manufacturing imperfections.

B. Welders & machine operators must be certified.

C. Finish shall be three phase Pangard II finish

D. Product must pass ASTM and BIFMA testing standards

E. Manufacturer warrants its products to be free from defects in material and/or workmanship for a period of three years from the date of invoice.

F. Submit full shop drawings and manufactures product data.

G. Provide full size samples of each product for approval.

H. Manufacturer has been manufacturing the specified products or ones very similar in style and material for at least two years.

PRODUCT NAME

Site and Street Furniture Seating: Bench

Products are to be supported by the following manufacturer's qualifications and must be considered when any product is being considered as an equal substitute. These qualifications must be pre-approved prior to the bid opening and accompanied with complete documentation.

A. Products are to be supported with complete engineering drawings and design patents.

B. Welders and machine operators are certified.

PRODUCT DESCRIPTION

This product must pass ASTM, BIFMA, or industry standards. Specifications are subject to change without notice.

Basic Use: For heavy use, public space seating requirements. Product can be used indoors or outdoors.

Composition and Materials:

Supports: End supports are type 319 ASTM B 26 aluminum sand castings.

Frame: Front seat rail is 1.5" OD x .120" wall normalized 4130 welded steel tubing with type 304 ASTM A 276 stainless steel threaded inserts welded inside each end. Rear seat rail is 1.5" OD x .120" wall ASTM A 513 type 1 steel tubing. Seat panel connections are .250" x .75" x .80" type 304 ASTM A 276 stainless steel flat bar welded to rails. Upper and lower back rails are 6061-T6 or 6005A-T5 ASTM B 211 aluminum extrusions. Upper rail is 1.375" dia.; lower rail is .875" dia.

Seat and Back Panels: Seat panel is .120" thick ASTM A 1011 hot rolled pickled and oiled com-mercial steel type B perforated and formed. Seat panel connections are .188" x 1" x 1.5" type 304 ASTM A 276 stainless steel flat bar welded to panel. Back panel is .125" thick 3003-H14 ASTM B 209 aluminum sheet perforated and formed. Back panel is welded to back rails.

Surface Mount Hardware: Plates are .375" thick 6061-T6511 ASTM B 221 aluminum flat bar. Anchors are 1/2" x 4 3/4" stainless steel sleeve anchors.

Embedded anchor rod: 3/8"-16 x 5 1/8 type 304 stainless steel.

Paver Adapters: Paver adapters allow surface mounting to underlying concrete slab. Adapters are 6061-T6 or 6005A-T5 ASTM B 211 aluminum extrusions 3.50" high x 4.50" wide. Adapter for backed bench is 8.52" long; adapter for backless bench is 4.25" long.

Seat Dividers: Optional seat dividers are type 319 ASTM B 26 aluminum sand castings.

Fasteners: All threaded fasteners are stainless steel. Seat dividers are attached with stainless screws and nylon shoulder and flat washers to protect the seat panel finish.

Sizes: All benches are 68 1/2" long.

Backed benches: Depth without arms 22 1/4", with arms 23 1/4". Height surface mounted 32", embedded 31 1/2".

Mounting Options: May be embedded or surface mounted.

WARNING: Installation instructions require mounting directly to concrete. Improper anchoring may cause the bench to tip over which could harm occupants.

Finishes: Finish on metal is Pangard II® finishing process that includes a rust inhibitor and top coat finish of thermosetting polyester powdercoat that is U.V., chip and flake resistant.

Colors: Available in a selection of standard colors. Optional and custom colors are available for an up charge.

TECHNICAL DATA

Recycled Content: The backed benches have a recycled material content of 60% or greater. The post consumer content is 36% or greater and the pre consumer content is 24% or greater.

Benches are 100% recyclable.

Finishes: The following are test results for Pangard II® polyester powder coat:

Gloss according to Garner 60 deg. ASTM D 523: 80-90

Cross hatch adhesion, ASTM

D 3359 method B: pass 100%

Mandrel bending test

ASTM D 522: 1/8"/3 mm

Erichsen cupping

ISO 1520: 5/16"/8 mm

Impression hardness

according to Buchholz

ISO 2215: 95

Impact test ASTM D 2794-90: 1/10" distortion up to 160 in/lb

Pencil hardness

ASTM D 3363-74: 2H (min.)

Drill mill tests: ok

Salt spray resistance 1500 hr test, ASTM B 117: max. undercutting 1/16"/1 mm

Humidity resistance 1500 hr test, ASTM D 2247-68: max. blisters 1/16"/1 mm

3f. **Item**: Contemporary Bench
Reference: Chapter 4: 8.1(2)

TECHNICAL GUIDELINES

INSTALLATION

Benches are shipped assembled. Installation is to be done by customer or his agent in accordance with specifications of customer's architect or planner. Bench must be installed on a level concrete base at least 5" thick for surface mounting and at least 4-1/2" thick for embedding.

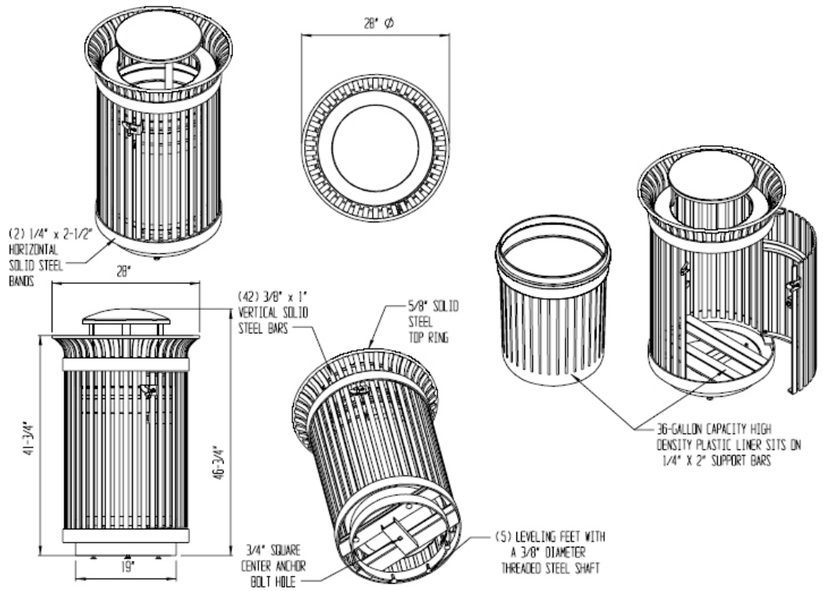
MAINTENANCE

For outdoor use, no care is required. For indoor use, occasional dusting may be done. Steam cleaning is not recommended. Scratches and chips can be repaired by sanding, then repainting with a touch up kit from the manufacturer. Surface mount bolts should be checked periodically and tightened if required.

3f.

Item: Contemporary Bench

Reference: Chapter 4: 8.1(2)



TECHNICAL GUIDELINES

PRODUCT DESCRIPTION

Trash receptacles to be side-door access with flared or tulip-shaped design

Materials of Construction:

Steel shall be domestic, US produced steel

Vertical steel bars shall be made from minimum 3/8”-thick solid steel

Horizontal steel bands shall be made from ¼”-thick steel

Top ring shall be minimum of 5/8”-diameter solid round steel

Opening: Opening for trash disposal to be a minimum of 17 3/4” and maximum of 19 ¾” in diameter so as to only receive hand held litter

Door: Trash receptacles to be side-door access with flared or tulip-shaped design, shall open and close freely without rubbing against frame of receptacle.

Hinges shall be precision-aligned and made with stainless steel pivot pins and Oilite bronze bearings and accompanying Oilite washers.

The vertical steel bars on door must have sufficient horizontal support to prevent any flexing or distortion of vertical steel bars on door.

Rubber bumper shall be affixed on door to absorb any impact from closing of door.

Height of Receptacle: Height shall not exceed 43” above finished grade

Latch: Latch shall be made from a minimum of 3/16”-thick steel and designed to prevent any bending or distortion when door is closed

Latching finger shall be attached with a stainless steel bolt and an Oilite bronze bearing so that it doesn’t bind in any weather and doesn’t wear during repeated use.

Latch shall be designed to have a gravity return so it automatically returns to original position when door is open and closed

Latch shall be located just below horizontal steel band near the top of receptacle to allow for easy access.

Powder Coat Type and Thickness: All fabricated metal components are steel shotblasted, etched, phosphatized, preheated, and electrostatically powder-coated with T.G.I.C. polyester powder coatings. Products are fully cleaned and pretreated, preheated and coated while hot to fill crevices and build film coating. Coated parts are then fully cured to coating manufacturer’s specifications. The thickness of the resulting finish coat averages 9 mils.

After coating, the cooled product shall have a non-yellowing joint sealer hand applied in a thin bead at every weld joint, vertical or horizontal. The sealer is to be non-silicone material which remains flexible for a period of four weeks to seep into crevices and fill voids which may be exposed during shipping and handling. The sealer is to be UV resistant and have long-term resistance to weathering, cracking, and discoloration.

Liner: Liner capacity shall be made from high-strength polyethelene and have a minimum capacity of 35 gallons and maximum capacity of 37 gallons.

Liner dimensions to be 28” tall with a top diameter of 22” and a bottom diameter of 19” so they can be interchangeable with existing liners used by Department of Public Works and Department of Parks and Recreation.

Liner shall have a hand-hold-recess all the way around the top circumference and hand-holds molded into the bottom for easy handling

Liner color shall be black or dark gray.

Leveling Feet: Receptacle shall have a minimum of five leveling feet

Leveling feet must be nylon or rubber tipped to prevent wear

Leveling feet must be adjustable by hand with access from the underside of receptacle.

Bottom Steel Plate: Bottom steel plate shall be made from a minimum 16 gauge zinc-electroplate steel and shall be powder coated after fabrication

Bottom steel plate shall be flush with bottom of door to allow liner to easily slide out of receptacle without lifting over bottom horizontal steel band.

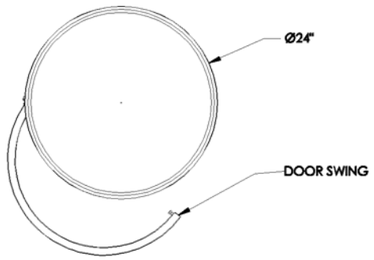
Bottom steel plate shall be attached to bottom of receptacle with a removable bolt in order to allow for easy and continual access

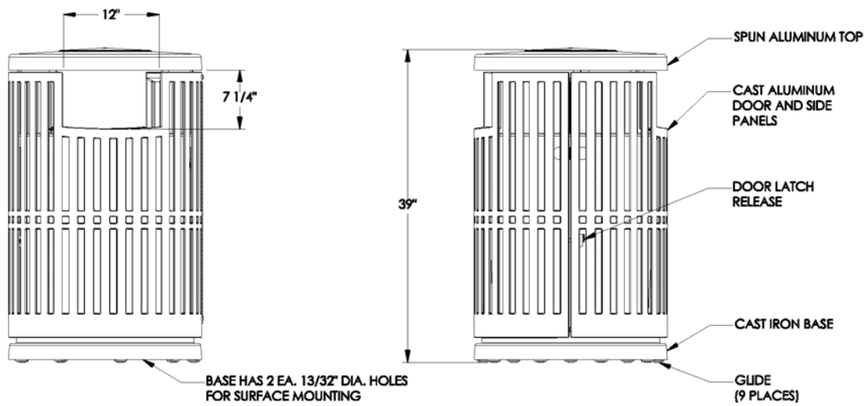
Three Hole Anchor Assembly: Three-hole anchor assembly to have three ¾”-square holes spaced 6” apart from each other.

Anchor assembly shall be designed to allow sufficient clearance for typical anchor bolts for standard construction.

3g. **Item**: Traditional Trash Receptacle

Reference: Chapter 4: 8.2(1)





TECHNICAL GUIDELINES

PRODUCT NAME

Site and Street Furniture

Litter Receptacle

PRODUCT DESCRIPTION

This product must pass ASTM, BIFMA, or industry standards. Specifications are subject to change without notice.

Basic Use: For heavy use, public space litter requirements, which can be used indoors or outdoors.

Composition and materials:

Base: Constructed of ASTM A 536 Grade 65-45-12 ductile cast iron.

Back and Door Panels: Two stainless steel hinges connect the cast 319 aluminum body and door. Latch, lock cam and lock plate are stainless steel. Optional lock is keyed with 2 brass keys.

Lid: Two lid styles are formed of .100" thickness spun 1100-0 aluminum. The lid bracket for all styles is a 1" x 1" x 1/4" standard aluminum angle.

Sand Pan and cable: Sand pan is 11" in diameter, and made of spun steel. Security cable is constructed of 1/16" nylon coated 24" stainless steel wire rope, and eye fittings.

Optional Logo Band with Decal:

3" wide x 3/8" thick - 6061 aluminum extrusion welded to the back panel and door.

Decal: 2-1/2" tall x 20" long exterior grade vinyl – customer to supply artwork for decal.

Optional Recycle Litters –

Top Opening Units only:

Two 8" wide x 6" tall x 1/8"" thick – 3003 or 5052 aluminum plates are welded to the back panel and door.

Decals: Two 5" tall x 7" long exterior grade vinyl with - "Aluminum Cans" or "Plastic Bottles" recycling logo.

The lid is formed of .100" thickness spun aluminum, with a single 5" diameter opening.

Liners: Receptacle liners are formed of Black polyethylene.

36 gallons for side opening unit.

Fasteners: Receptacle components are assembled with stainless steel fasteners. The ash pan cable is attached with aluminum blind rivets.

SIZES, MOUNTING OPTIONS, FINISHES, COLORS:

Size: Side opening unit nominal size is 24"dia. x 39"h with a capacity of 36 gallons.

Mounting Options: Shipped with freestanding glides. Holes for surface mounting are provided in the base.

Options: Sand pan insert for side opening unit includes cable.

Keyed lock for security.

Finishes: Finish on metal is Pangard II® finishing process that includes a rust inhibitor and topcoat finish of thermosetting polyester powdercoat that is U.V., chip and flake resistant.

Colors: Available in a selection of standard colors. Optional and custom colors available for an upcharge.

TECHNICAL DATA

Recycled Content: The litter receptacles have a recycled material content of 61% or greater. The post consumer content of the litter is 37% or greater and the pre consumer content is 24% or greater.

The receptacles are 100% recyclable.

Finishes: The following are test results for, Pangard II polyester powdercoat.

Gloss according to Garner 60 deg. ASTM D 523: 80-90

Cross hatch adhesion ASTM

D 3359 method B: pass 100%

Mandrel bending test

ASTM D 522: 1/8"/3 mm

3h. **Item**: Contemporary Trash Receptacle and Recycling Bin
Reference: Chapter 4: 8.2(2) 8.2(3)

Erichsen cupping

ISO 1520: 5/16”/8 mm

Impression hardness

according to Buchholz

ISO 2815: 95

Impact test ASTM D 2794-90:

1/10” distortion up to 160 in/lb

Pencil hardness ASTM

D 3363074: 2H (min.)

Drill mill tests: ok

Saltspray Resistance 1500 hr test, ASTM B 117:

max. undercutting 1/16”/1 mm

Humidity Resistance 1500 hr test, ASTM D 2247-68:

max. blisters 1/16”/1 mm

INSTALLATION

No assembly is necessary for litter receptacles. Units may be surface mounted using holes in the base. Installation is to be done by customer or his agent in accordance with specifications of customer’s architect or planner. Corrosion-resistant anchor bolts for surface mount option furnished by others.

MAINTENANCE

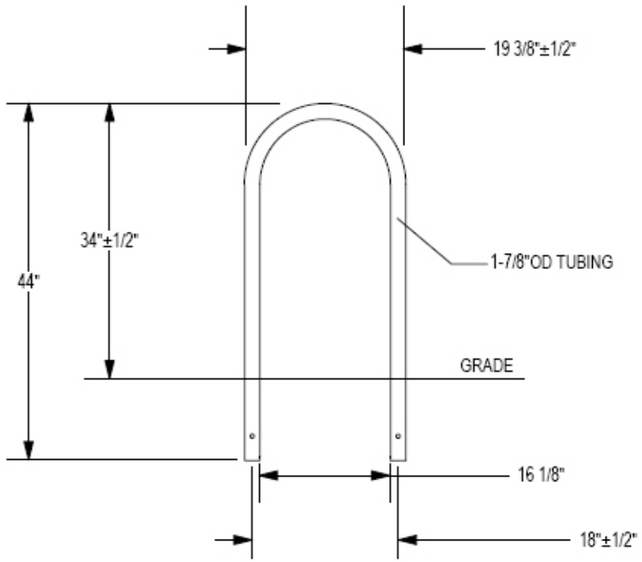
Rinse and wipe clean using mild cleaners. Scratches and gouges can be repaired by sanding, then repainting with a touch up kit from the manufacturer.

3h.

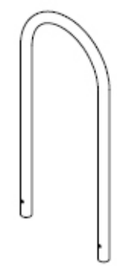
Item: Contemporary Trash Receptacle and Recycling Bin

Reference: Chapter 4: 8.2(2) 8.2(3)

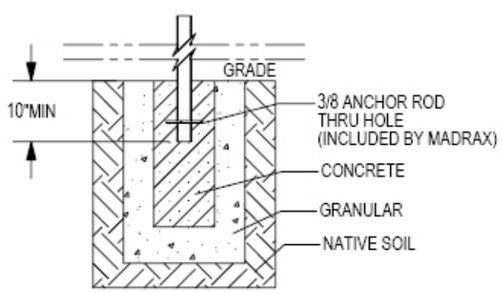
TECHNICAL GUIDELINES



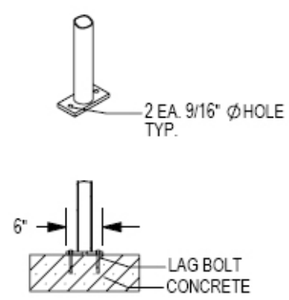
ELEVATION VIEW



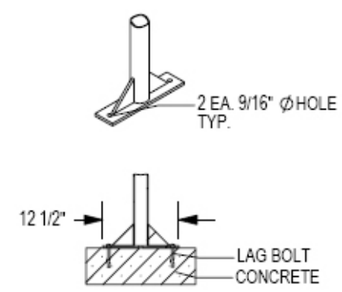
CHECK DESIRED MOUNT ☐



☐ IN GROUND MOUNT (IG)



☐ SURFACE FLANGE MOUNT (SF)



☐ SURFACE GUSSET MOUNT (SG)

MATERIALS

U-shaped bicycle racks shall be made of 2⅜" schedule 40 galvanized steel pipe. Steel pipe pieces should be welded together to form one piece before shipped from manufacturer. Dimensions shall be as shown in the contract drawings. Powder coating shall be color black.

CONSTRUCTION REQUIREMENTS

Installation of bicycle rack should proceed after landscaping and paving have been completed.

Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended by manufacturer. Clean holes with non-shrink, nonmetallic grout or anchoring cement, with top smoothed and shaped to shed water.

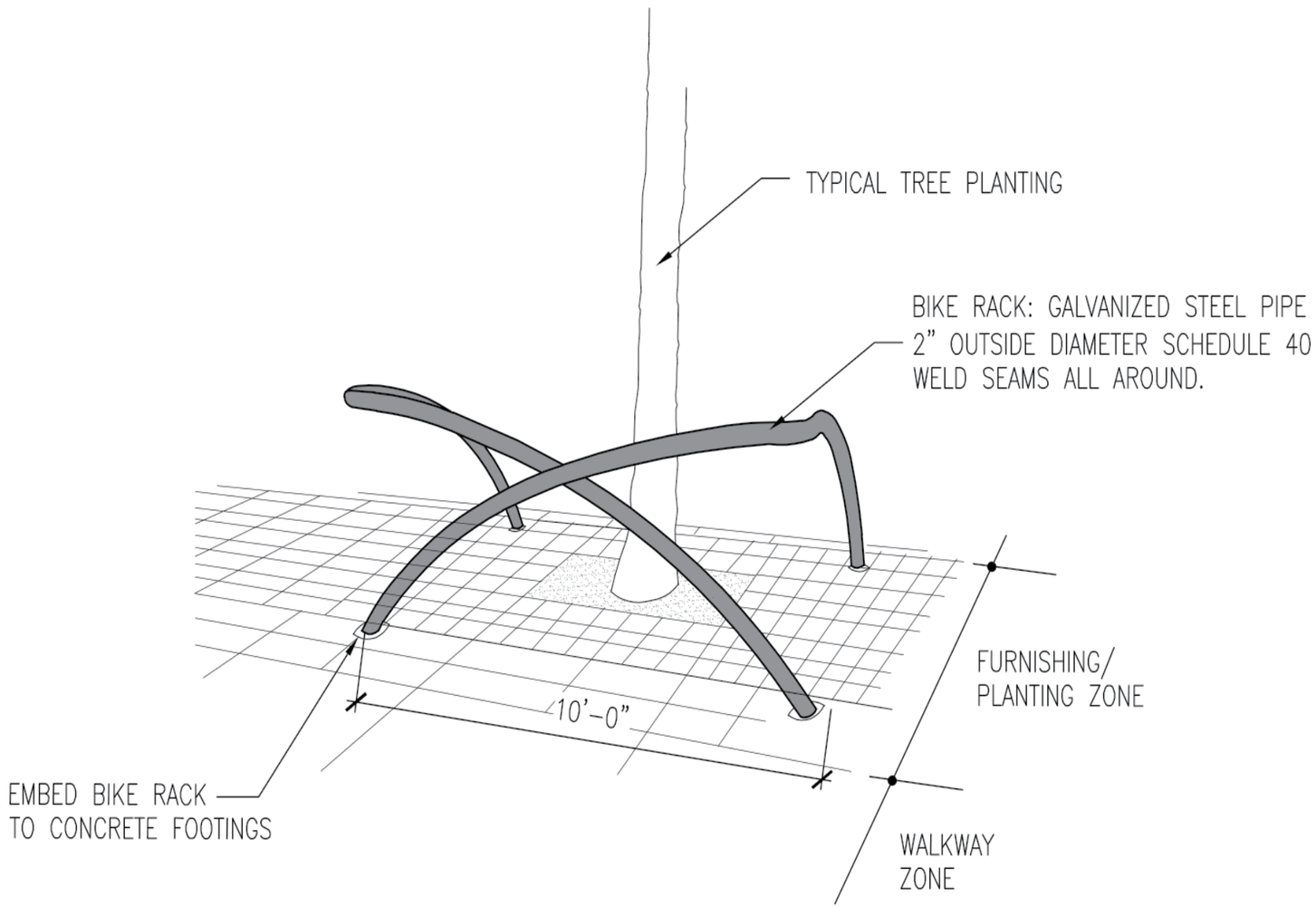
Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, metallic grout or anchoring cement, with top smoothed and shaped to shed water.

After completing site and street furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

3i.

Item: Inverted "U" Shape Bicycle Rack

Reference: Chapter 4: 8.3(1)



INSTALLATION, GENERAL

Post Settings: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended by manufacturer and ¾ inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's instructions, with top smoothed and shaped to shed water. Concrete Pavers: Solid interlocking paver units complying with ASTM C 936 and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates.

SIZE

Fit any specified footprint in whole feet (i.e. 2' x 2', 4' x 4') 4' x 4' footprint is 2'6" above ground.

Pipe Diameter: 1½" schedule 40 pipe 1⅞" outer diameter or 2" schedule 40 pipe, 2⅜" outer diameter.

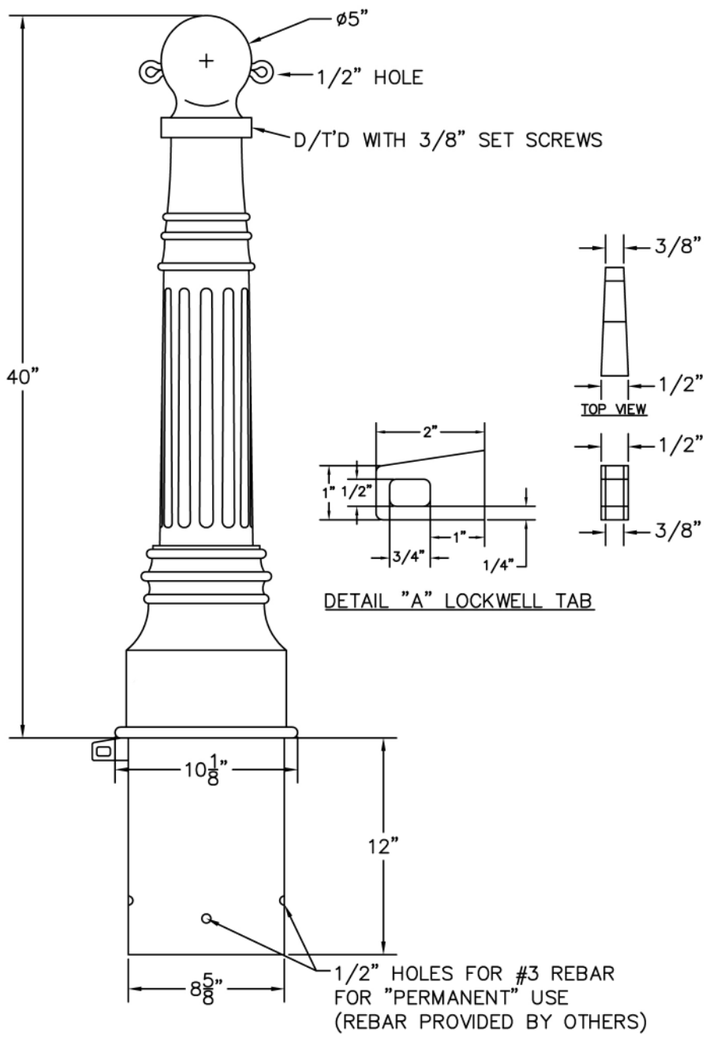
Base: With flanges accommodate three drive screws, or without flanges (to be sunk into concrete footings).

Finish: Black.

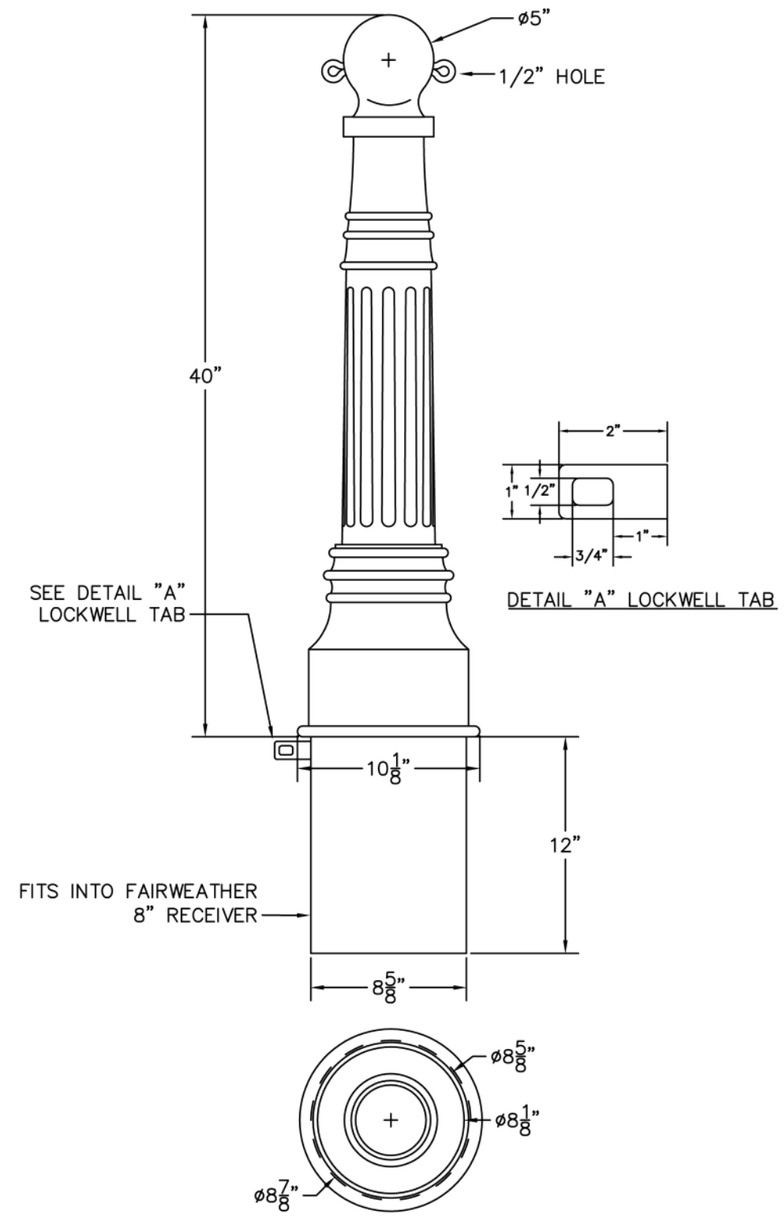
3j.

Item: X-Type Bicycle Rack

Reference: Chapter 4: 8.3(2)



PERMANENT BOLLARD



REMOVEABLE BOLLARD

TECHNICAL GUIDELINES

DESIGN GUIDELINES

Source Limitations: Obtain posts through one source from a single manufacturer.

Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with ASTM B 26/B 26M (Castings).

Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

INSTALLATION GUIDELINES

Examination: Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

Install site furnishings level, plumb, true, and securely anchored or positioned at locations indicated on Drawings.

Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings.

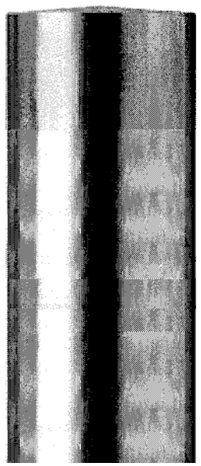
Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts.

Cleaning: After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

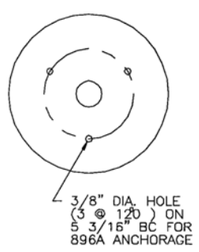
3k.

Item: Traditional Safety Posts

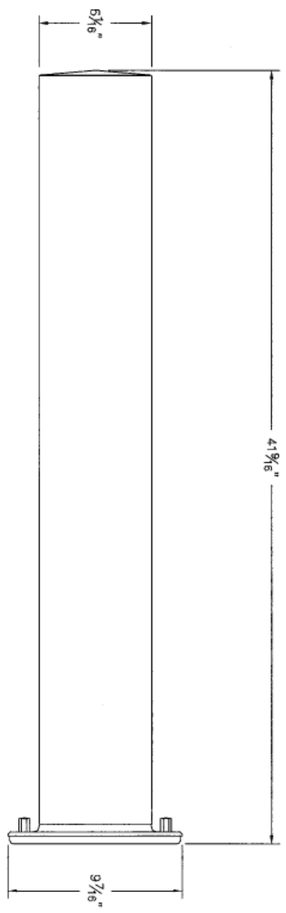
Reference: Chapter 4: 8.5(1)



TOP FINISH



BASE DETAIL



ELEVATION

TECHNICAL GUIDELINES

DESIGN GUIDELINES

Post Construction: Seamless stainless steel tubing, 1/8" wall thickness with machined top housing and base, internally welded into an assembly.

Anchor base: Heavy stainless steel with threaded SS studs which accept stainless steel hex cap nuts.

Finish: #4 satin stainless steel.

INSTALLATION GUIDELINES

Install bollard slightly elevated when located in planting areas to avoid prolonged submerging during heavy rains and irrigation.

Install anchorage system in concrete pad as directed by manufacturer.

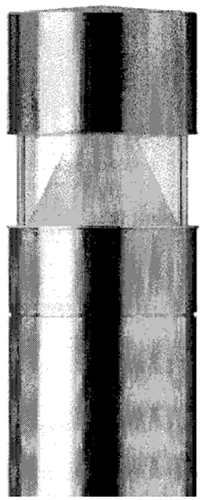
MAINTENANCE GUIDELINES

Stainless steel requires regular cleaning and maintenance to maintain it's luster and to prevent tarnishing or the appearance of rust like stains.

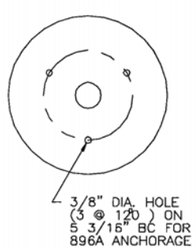
3I.

Item: Contemporary Safety Posts

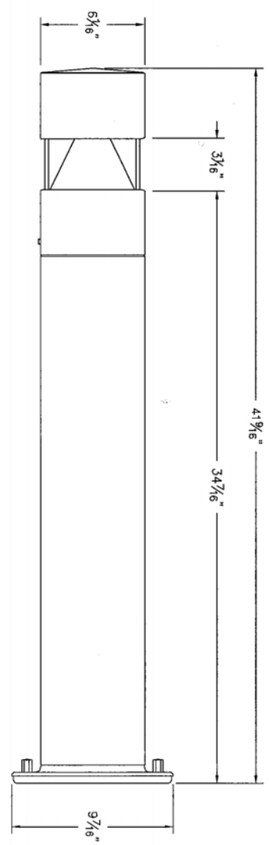
Reference: Chapter 4: 8.5(2)



TOP FINISH



BASE DETAIL



ELEVATION

DESIGN GUIDELINES:

Post Construction: Seamless stainless steel tubing, 1/8" wall thickness with machined top housing and base, internally welded into an assembly.

Lamp enclusure: Machined stainless steel top housing assembly removable in one piece for relamping. Secured the socket head stainless steel screws threaded into stainless steel inserts. Clear 3/16" thick borosilicate glass with passivated stainless steel cone reflector and top downlight reflector. Fully gasketed using high temperature silicone rubber O:rings.

Electrical: Lampholders are G12, bi:pin porcelain with nickel plated contacts supplied with 200 degrees celcius high temperature leads, rated 4 KV. Ballasts are located on anupright bracket attached to the anchor base and are available in 120 V or 277V, HPF: specify.

Anchor base: Heavy stainless steel with threaded SS studs which accept stainless steel hex cap nuts.

Finish: #4 satin stainless steel.

INSTALLATION GUIDELINES

A. Meet National Electric Code requirements for conduits and/or raceways construction.

B. Contractor must provide the means to bring electical supply to the bollard in accordance with local code. A 3" conduit hole for conduit entry is available in the bollard for power access.

C. Install bollard slightly elevated when located in planting areas to avoid prolonged submerging during heavy rains and irrigation.

D. Install anchorage system in concrete pad as directed by manufacturer.

MAINTENANCE GUIDELINES

Disassemble bollard top with glass. Clean dirt and deposits from the luminaire and glass using only solvent:free cleaners. Relamp and replace gasket if damaged. Reassemble glass and bollard top.

Stainless steel requires regular cleaning and maintenance to maintain it's luster and to prevent tarnishing or the appearance of rust like stains.

3m. **Item**: Contemporary Light Safety Posts
Reference: Chapter 4: 8.5(3)

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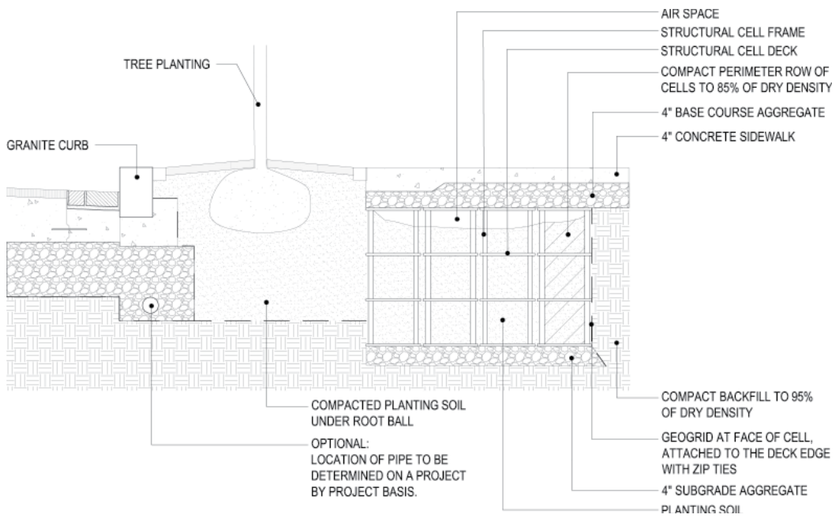
3n. **Item**: NOT USED
Reference: NOT USED



DESIGN INTENT

A modular structural cells system for trees plantings supports traffic loads while providing uncompacted soil volumes for large tree growth and on-site stormwater management. This modular framework provides unlimeted access to healthy soil, a critical component of tree growth in urban environments.

DESIGN GUIDELINES

Material specification: 30% Fiberglass Reinforced, chemically-coupled homopolymer polypropylene. Meets AASHTO H-20 loading standards.

The modular structural cell system shall provide approximately 92% void capacity. Void space shall be filled with planting soil and provide space for utilities, support paving, and other infrastructures.

Deck Dimension: Length-48 inches, Width-24 inches, Height-2 inches

Material for deck:

1. Steel reinforceing tube shall be galvanized steel tube inserted in the channel on the underside of the deck to increase the rigidity and loading capacity of the deck.
2. Deck shall be the top member of the structural cell assembly.
3. Tab shall be connector clips molded into the underside of the deck to secure the deck to the frame.
4. Cup shall be the depression molded into the underside of the deck or frame, which received the post of the frame below.

Frame Dimension: Length-48 inches, Width-24 inches, Height-16 inches.

Material for frame:

1. Post shall be the vertical member or column of the structural cell frame unit that transfers paving loads vertically downward.
2. Beam shall be the horizontal bars connecting the posts at the base of the frame.
3. Frame shall be the base member of the cell assembly which includes the post and the beam.

INSTALLATION GUIDELINES

Hold a preconstruction meeting before trees are brought to the site and determine grades required. Compact and level aggregate layer so that modular structural cell system can be placed firmly in place. Install planting soil in the modular structural cell system voids as each layer of cells is installed. Install pavement as shown in the drawings before trees are planted.

30. **Item**: Increase Planting Space – Contiguous Root Area
Reference: Framed Substructure for Tree Planting
Chapter 4: 12.1 (1) Option 3

TECHNICAL GUIDELINES

DESCRIPTION

A highly durable, specialist hand or machine applied colored skid resistant surface treatment, consisting of a thermosetting modified epoxy/amine binder which is usually pigmented and dressed with natural colored or pigmented aggregate, typically calcined bauxite or granite. It provides a well textured surface typically 5mm thick for the standard road grade and 2-3mm thick for the pedestrian grade. The system can be readily applied to asphalt, macadam and concrete surfaces providing the latter is suitably primed.

INSTALLATION, GENERAL

The road surface shall be examined for texture, and if necessary, the texture depth measured by the sand patch method to determine the spread rate of binder: It shall be clean, dry and free from dust, laitance, and foreign matter. If this is not the case, the surface shall be treated through a combination of cleaning with water/detergent solution followed by flushing water and dried using a hot compressed air lance. Unless otherwise directed by the Engineer, all existing road markings, ironwork and studs shall be suitably masked. Application shall only be carried out at a road surface temperature above 5˚C

For machine application, the two components (A & B) are warmed to below 50˚C, loaded into separate feeder tanks on the spray machine and maintained at 55˚C ± 5˚C. These components are automatically proportioned to the correct ratio (50:50 ± 5% by weight) and mixed. The mixed components (binder) is then sprayed onto the road surface at a minimum coverage rate of 1.35 kg/m_ which may be increased on more rugous surfaces to ensure adequate coverage.

3p.

Item: Epoxy Coating

Reference: Chapter 4: 1.3(1)

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Transportation Architecture Design Guidelines

Appendices and Glossary

7

Appendices and Glossary

A1 Anacostia Transportation Architecture Design Guidelines Acknowledgements

Client

District Department of Transportation (DDOT)

Emeka C. Moneme, Director

Technical Advisory Committee

Anacostia Waterfront Initiative (AWI)

Department of Energy (DOE)

District of Columbia Department of Health (DOH)

District of Columbia Department of the Environment (DCDOE)

District of Columbia Office of Planing (OP)

District of Columbia Water and Sewer Authority (DC WASA)

Federal Highway Administration (FHWA)

National Caital Planning Commission (NCPC)

National Park Service (NPS)

*re*StORE DC

U.S. Commission of Fine Arts (CFA)

U.S. Environmental Protection Agency (EPA)

Washington Metropolitan Area Transit Authority (WMATA)

Prime Consultant

Michael Baker Jr., Inc.

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Chan Krieger & Associates (Anacostia Waterfront Framework Plan)

Howard S. Decker, FAIA (Architecture)

Center for Low Impact Development (Concept LID)

A2 Glossary

Access Cover: Function to cover manholes on sidewalks and streets.

Accessible Curb Ramps: Provide a safe means of access to crosswalks for persons with disabilities and other pedestrians with push carts, strollers, etc.

Aeration Strips: Installed as part of the walkway pavement subsurface setting bed to maximize a tree's root zone.

Alley: A narrow roadway, generally between buildings.

Americans with Disabilities Act (ADA): Federal legislation passed in 1990 that prohibits discrimination on the basis of disability. Further requires all transportation facilities should be accessible.

Area Type: Landuse classification system. Roadway classifications are further categorized into two area types–Residential and Mixed Use. These categories reflect the existing zoning and travel conditions in the Anacostia Waterfront area.

Arterial: A major thoroughfare that is vital for moving people and goods; feeds into the interstate and freeway systems.

Anacostia Waterfront Initiative (AWI): A partnership between the District, its citizens and the Federal government to revitalize the Anacostia Waterfront.

Anacostia Transportation Architecture Design Guidelines:

AWI Framework Plan: A vision for the Anacostia Waterfront to reconnect diverse neighborhoods to the river and along the river with the Anacostia Riverwalk and Trail, expand access to the river for recreation with new and improved parks and facilities, make the Anacostia waterfront a place people will soon enjoy and revisit, and reintroduce the river to the community.

Banners: Interchangeable banners on light poles or banner poles for events, such as farmer's markets, neighborhood concerts, festive seasons, and other functions.

Best Management Practices (BMPs): Under the stormwater management program, new development that requires the management of stormwater runoff should construct a best management practice. These structures include infiltration, flow attenuation, retention, extended detention, detention, and underground storage.

Bike Lane: A portion of a roadway designated by striping, signing, color, and pavement markings for the preferential or exclusive use of bicyclists.

Bioretention: Small landscaped basins intended to provide water quality management by filtering stormwater runoff before release into storm drain systems.

Bioslope: Also known as ecology embankments, these modified filter strips contain a special soil called an ecology mix to improve water quality and reduce runoff volume. Designed to overcome the shortcomings of basic grass filter strips, which have a tendency to develop rills from erosion, they can be incorporated into standard highway embankment fill slopes and resemble a basic grass filter strip when completed.

Bioswale: Broad, shouldow channels designed to convey and infiltrate stormwater runoff are vegetated along the bottom and sides of the channel, with side vegetation at a height greater than the maximum design stormwater volume. Swales reduce stormwater volume through infiltration, improve water quality through infiltration and vegetative filtering, and reduce runoff velocity by increasing flow path lengths and channel roughness.

Bridges Management System (BMS): Process for analyzing existing conditions and identifying future needs with respect to bridges; required for the National Highway System (NHS) as a part of ISTEA; the extent to which the remaining public bridges are included in the process is left to the discretion of state and local officials.

Buffer Area: Area separating two incompatible types of development or a development and sensitive natural resource.

Bulbout: Curb extensions at intersections that reduce the roadway width from curb to curb. They "pedestrianize" intersections by shortening crossing distances for pedestrians and drawing attention to pedestrians via raised peninsulas. They also tighten the curb radii at the corners, reducing the speeds of turning vehicles.

Bus Stop Pad: Where buses make stops, a concrete pad is required to accommodate the additional weight of the buses and to counter the vibrations they cause on the sidewalk. The concrete for bus stop pads should be integrally colored to closely match the asphalt paved surface in the adjoining lanes.

Bus: A transit mode comprised of rubber tired passenger vehicles operating on fixed routes and schedules over roadways. Vehicles are powered by diesel, gasoline, battery or alternative fuel engines contained within the vehicle.

Capacity: Rate of vehicular or person flow that can be expected to cross a point on a lane or roadway during a specific period.

Central Business District (CBD): The area of a community with the most concentrated commercial and business development.

Charrette: Meeting to resolve a problem or issue. Within a specified time limit, participants work together intensely to reach a resolution.

Chicane: Curb extensions that alternate from one side of the street to the other, forming S-shaped curves. They can be created by alternating on-street parking, either diagonal or parallel, between one side of the street and the other. Each parking bay can be created either by re-striping the roadway or by installing raised, landscaping islands at the ends of each parking bay.

Choker: Curb extensions at mid-block locations that narrow a street by widening the sidewalk or planting strip. If marked as crosswalks, they are also known as safe crosses. Two-lane chokers leave the street cross section with 2 lanes narrower

than the normal cross section. One-lane chokers narrow the width to allow travel in only 1 direction at a time, operating similarly to 1-lane bridges.

Cladding: The covering forming the outer surface of a wall.

Collector: Intended to balance access and mobility considerations by serving through movement as well as access to land. Connect traffic on highways and arterials to local streets and adjacent land.

Commuter Rail: Mode of transportation utilizing a multi-car system along an existing rail corridor (mainly, freight lines). Usually connects cities and does not have many stops. Runs along or next to existing freight lines. The trains typically reach speeds of 80-90 mph and connect suburban metropolitan areas to an urban core.

Conservation: Protection of natural features in the urban environment to prevent the increase of stormwater volumes downstream.

Contiguous Root Zone: A continuous soil trench between sidewalks and roadway curbs designed to improve street tree growing conditions.

Controlled Access Rights-of-Way (ROW): Lanes restricted for at least a portion of the day for use by transit vehicles and other high occupancy vehicles (HOV's). Use of controlled access lanes may also be permitted for vehicles preparing to turn. The restriction should be sufficiently enforced so that 95% of the vehicles using the lanes during the restricted period are authorized to use them.

Corridor: A broad geographical area of land that follows a general direction of flow or connects major sources of trips. It may contain a number of streets, highways, transit lines, and routes. It generally follows an interstate, freeway or major roadway.

Crosswalk: A marked path across an intersection indicating where pedestrians can cross the road.

Curb Cut: Ramps at sidewalk-street intersections that permit wheelchairs to easily negotiate those intersections.

DC BID: With 8,200 members, the Downtown DC Business Improvement District (BID) is a 110-block neighborhood where property owners tax themselves to make their community cleaner, safer, and more vibrant. The tax is used by the BID to purchase services and capital improvements that supplement those provided by the city. Cooperation is among property owners, businesses, and communities' management programs (Safety, Maintenance, Marketing, Physical Improvements, Transportation, Homeless Services, Raves & Reviews).

Designated Parking Lane: Roadway lane used exclusively for parking.

Designated Transit Corridor: Corridors used by transit. When transit is not present, pedestrians and bicyclists are permitted. These corridors provide a safe, pedestrian/transit friendly and vibrant environment that encourages people to use transit as well as take advantage of the many resources offered in a mixed-use setting.

Disconnectivity: In urban areas, drainage from transportation corridors is commonly connected and routed to a stormwater or combined sewer system. The significant runoff from roads contributes large stormwater volumes to wastewater conveyance and infrastructure systems. Disconnection is the process of decoupling roadways from urban water conveyance systems and redirecting runoff onto pervious surfaces, most commonly vegetated areas. This process reduces the amount of directly connected impervious areas in a drainage area.

Diverter: Barriers placed diagonally across an intersection, blocking certain movements. Full street closures are barriers placed across a street to completely close it to through-traffic, usually with only sidewalks open. Half closures are barriers that block travel in one direction for a short distance on otherwise 2-way streets. Diagonal diverters, barriers placed diagonally across an intersection, block through movements and create 2 separate, L-shaped streets. Like half closures, diagonal diverters are often staggered to create circuitous routes through the neighborhood, discouraging non-local traffic while maintaining access for local residents.

Ecosystem: The complex of a community of organisms and its environment functioning as an ecological unit.

Element Code: Numerical cross-reference of the Transportation Architecture Design Standard.

Element Item: An element subcategory.

Element: An AWI Transportation Architecture component of the public realm for which design standards have been developed. AWI Transportation Architecture Design elements include Paving, Marking, Curbs and Gutters, Medians, Sidewalks, Lighting, Landscaping, Signage, Other Construction, and LID. The design standards presented in these guidelines relate exclusively to the unique standards created solely for the Anacostia Waterfront area and the modified District standards customized for the AWI area. The guidelines provides references to the many existing District standards to facilitate the users' research. The other transportation elements not included in the guidelines should be referenced to other manuals of standards or guidelines, as specified.

Environmental Protection Agency (EPA): A federal agency responsible for dealing with national environmental issues.

Epoxy Coated Binder: A color epoxy binder coating dressed with calcined bauxite for an excellent durable and skid resistant surface used in designated bicycle lanes and transit lanes.

Exclusive Rights-of-Way (ROW): Roadways or other ROW reserved at all times for transit use and/or other high occupancy vehicles. The restriction should be sufficiently enforced so that 95% of vehicles using the ROW are authorized to use it. (See also Controlled Access ROW)

Exposed Aggregate: A surface created by using an acid wash on the surface of a concrete slab to eat away the cement film at the surface and expose the faces of decorative pebbles that

were used in the concrete batch. The pebbles are usually very dense and are now surrounded by relatively porous concrete.

Expressway: A divided highway facility usually having two or more lanes for the exclusive use of traffic in each direction and partial control of access.

Facility: The means by which a transportation mode is provided. For example, a sidewalk is a facility as is an HOV lane.

Flexible Funding: Unlike funding that flows only to highways or only to transit by a rigid formula, this is money that can be invested on a range of transportation projects.

Filter Strips: Vegetated filter strips are bands of dense, permanent vegetation with a uniform slope, primarily designed to provide water quality pretreatment between an impervious area and another BMP. Filter strips are important components of a BMP treatment train. Both runoff prevention and runoff treatment are provided and cause a reduction in the frequency of discharges. Infiltration and evapotranspiration are the means by which water is retained.

Freeway: A divided highway having two or more lanes for the exclusive use of traffic in each direction and full control of access. The freeway is intended to provide complete "uninterrupted" flow.

Frontage Road: A roadway that parallels a major transportation facility such as an interstate. It serves to collect and distribute traffic along the major facility without impeding flow along the interstate.

Functional Classification: Streets provide two distinct functions: mobility (through movement) and access to land. A hierarchical ranking based on the degree of mobility and access that a street provides. AWI streets are classified as interstates, freeways, arterials, collectors, local streets, and alleys. The classification describes the character of service the street or highway is intended to provide.

Furnishing/Planting Zone: Section of the sidewalk that contains furnishings such as bike racks, trash receptacles, transit stops, and seating. Trees and other landscaping elements will also be housed in this zone, enhancing the corridor with adequate shade and a sense of enclosure for pedestrians. The Furnishing/Planting Zone is generally 4'-0" but may be less than 4'-0" only if the entire sidewalk width is less than 8'-0".

Geographic Area of Exclusion: Facilities owned and maintained by the National Park Services, General Services Administration and National Military.

Grade: The slope (ratio of change in elevation to change in distance) of a roadway typically given in percent. For example, a 2% grade represents 2' of elevation change over a 100' distance.

Grade Crossings: An intersection of highway roads, railroad tracks, or designated transit rail tracks that run either parallel or across mixed traffic situations with motor vehicles, light rail, commuter rail, heavy rail, trolleybus or pedestrian traffic.

Greenspace: Open spaces, parks or greenbelts intended for community use.

Greenway: A divided highway having two or more lanes for the exclusive use of traffic in each direction and full control of access. Designed to minimize the curbside built environment and focus on natural surroundings. The greenway is intended to provide complete "uninterrupted" flow.

Guideway: A travel way, separated from other transportation modes that supports a form of transit. An example would be a road to be used only by a trolley or a bus or a rail lane for heavy trail.

Gutter Filters: Pre-cast concrete gutter vaults containing gravel and finer (typically sand) filter media and an underdrain installed below grade at the curb line. A void space above the filter material captures trash and other debris that passes through the surface grate while the gravel and sand filter media remove suspended solids and other pollutants. Filtered stormwater is conveyed by the underdrain from the gutter filter to the stormwater collection system. Gutter filters may be a stand-alone BMP or used in concert with other measures as part of a stormwater control strategy.

Historic Districts: Over 30 neighborhoods that vividly illustrate the District of Columbia's history and physical make up. LeDroit Park, Capital Park, Strivers' Section, Cleveland Park, Takoma Park, Massachusetts Avenue, Anacostia, and Georgetown are among the many historic districts spread throughout the city. Established for a wide variety of reasons, they may be significant as sites, historic events or outstanding examples of architectural design and workmanship; they may be monumental or simple; they may be commercial or residential. They all have a special quality worth preserving. Reflect pride in the character of neighborhoods and a desire on the part of neighborhoods and the city to protect their assets. An important planning tool for the city, a way to improve quality of life and ensure new development enhances the historic character and scale of a neighborhood.

Impervious Surface: Ground surfaces such as cement, asphalt, packed clay or rock through which water cannot penetrate; this leads to increases in the amount and velocity of runoff and corresponds to increases in soil erosion and nutrient transport.

Implementation Area: Geographical boundary in which transportation architecture design standards are enforced that extends from the Washington Channel on the west to approximately the District line on the east. The boundaries that parallel the river reflect the surrounding neighborhoods, but generally include the Southeast neighborhood and Southeast Federal Center, the Southwest Waterfront and the surrounding neighborhoods including Buzzard Point, Anacostia Park and the Poplar Point area, the Anacostia Park on both sides of the river, RFK Stadium and the Arboretum.

Infiltration: Water that seeps into the ground and recharges the groundwater. The infiltration rate or how quickly water enters the ground depends on soil type. Sandy soils infiltrate more quickly than gravelly soils. Infiltration can be used as a BMP within a trench or a basin. The practicability of infiltration depends on groundwater elevations, depth to bedrock and infiltration rate.

Infiltration Rate: The quantity of water that can enter the soil in a specified time interval.

Infiltration Trench: An excavated trench lined with filter fabric and backfilled with stone. These systems encourage stormwater infiltration into subsurface soils and work well in space-limited applications. They remove suspended solids, particulates, coliform bacteria, and some soluble metals and nutrients from stormwater. Because of the potential for clogging, these systems should not be located in areas of high sediment loading or infrequent street cleaning.

Inlet Controls: Inlet controls consist of designs and devices that prevent sediment, oils, floatable trash and debris from being transmitted further along the storm drain system. Typical inlet controls include catch basins to capture sediment, outlet pipe hoods to trap oil and floatables, and hydrodynamic separators (flow-through inlet devices with a settling or separation unit to remove sediments and other stormwater pollutants). An inlet control device may be used by itself or with other BMPs as part of an overall stormwater control strategy.

Interchange: A grade-separated intersection with ramps to connect the roadways.

Intercity: Transportation between two cities.

Intermodal: Interconnectivity between various types (modes) of transportation.

Intermodal Surface Transportation Efficiency Act (ISTEA): Landmark federal legislation signed into law in 1991 made broad changes in the way transportation decisions are made by emphasizing diversity and balance of modes as well as the preservation of existing systems and construction of new facilities. The law expired in 1997, but much of the program is carried forward by the subsequently enabled TEA-21.

Interpretive Sign: Type of signage that provides a description of a monument, historical event or natural landscape.

Intersection: The area where two or more roadways cross, where vehicles may come in conflict. They may be at-grade or grade separated.

Intersection Approach Zone: The section of the median within the vicinity of the intersection. It can be hardscaped, landscaped or created with raised planter boxes.

Interstate: A divided arterial highway for through traffic with full or partial control of access and grade separations at major intersections.

Land Bridge: An overpass system over freeways, connecting neighborhood open spaces to parks. These overpasses are typically much wider than multi-modal bridges and include active and/or passive open space along with bicycle and vehicular access.

Land Use: The types, extent, distribution, and intensity of current and future socioeconomic uses of land in a given area.

Level of Service (LOS): A qualitative measure describing operational conditions of vehicular traffic and motorists' perceptions of those conditions. For example LOS A is free flow, B is stable flow; C is stable flow but at the beginning of congestion, D is high density but stable flow, E is at capacity level, and F is stop and go.

Light Rail Transit (LRT): An electric rail system which has single cars or short trains. Passengers board at track or car floor level.

Limitation of Standard: The ATADS reference to all transportation related elements (with the exception of Bridge and Tunnel design) within the public realm. These components, typically identified as the elements within the public right-of-way, are implemented and/or maintained by the District. This guidelines account for their relationship and compatibility with the transportation architecture standards.

Livable Centers Initiative (LCI): Investment policy studies for activity and town centers. The primary focus of these studies is to encourage increased development, mixed-uses and connectivity at the activity and town center level as one alternative to standard suburban or strip development.

Load Zone: A type of on-street space usually in front of or near businesses and apartment buildings that allows short-term use for loading and unloading passengers or delivery. Parking is not allowed in load zones, and violation of the terms of the load zone is enforced, or in some cases, vehicles are towed.

Local Street: Those streets whose principal function is to provide direct access to abutting land, feed higher order roadways, and provide direct access with little or no through traffic.

Low Impact Development (LID): Strategies and techniques integral to the aesthetic and environmental foundation of the AWI transportation plan. These decentralized stormwater management controls that reduce runoff volume, control peak runoff rates, filter and treat pollutants, and reduce pollutant loads are considered for use in every appropriate functional component within the DDOT ROW. LID is not mandated.

Luminary: Any body that gives off light.

Median: The area that divides traffic moving in opposite directions on a single roadway.

Metropolitan Planning Organization (MPO): A federally required planning body responsible for transportation planning and project selection in its region.

Minor Arterials: Streets linking cities and larger towns in rural areas in distributing trips to small geographic areas in urban areas (not penetrating identifiable neighborhoods).

Mixed-Use Development: A development that allows multiple compatible uses to be in close proximity to one another in order to minimize transportation infrastructure impacts and to create a compact, efficient neighborhood; single family, multifamily, commercial, and industrial uses are located within a reasonable proximity to each other.

Mode: A particular form of travel - e.g., walking, traveling by automobile, traveling by bus, traveling by train.

Mode Split: The proportion of total person trips using various specified modes of transportation.

Monumental Core: The large triangle anchored by the Capitol, the Washington Monument, and the White House. This triangle, carefully oriented to the topography of the low-lying basin in which the federal city was built, provides the basis of the L'Enfant plan and all subsequent modifications.

Mountable Curb: Curbs that allow vehicles to leave the roadway and drive into the median or clear zone, in cases of emergency only. Use is restricted to emergency vehicles and authorized personnel.

Multi-modal: The availability of multiple transportation options, especially within a system or corridor. A concept embraced in ISTEA, a multimodal approach to transportation planning focuses on the most efficient way of getting people or goods from place to place, be it by truck, train, bicycle, automobile, airplane, bus, boat, foot or even computer modem.

Multi-modal Overpass: Unenclosed bridge system over freeways along which pedestrians and bicyclists share the ROW with local vehicular traffic. These overpass segments supporting automobile use are intended to connect to the park road without compromising pedestrian access. Motorists approaching from the neighborhood streets could reach parking areas serving various recreational amenities at waterfronts. The roadway alignment and treatment will promote speeds of 25 mph or less.

Multi-modal Underpass: The least preferred alternative for waterfront access to connect neighborhoods with the waterfront area crossing under the elevated freeway system. Have been known to compromise pedestrian safety, security and comfort issues.

National Highway System (NHS): Includes the interstate system, and other routes identified as having strategic defense characteristics as well as routes providing access to major ports, airports, public transportation, intermodal transportation facilities, and routes of particular importance to local governments.

National Park Service (NPS): Bureau of the U.S. Dept. of the Interior established in 1916 to oversee the administration of 40 national parks and monuments under the charge of the department. NPS now comprises some 380 areas of scenic, historic, or scientific interest totaling more than 84 million acres. The units are classified into natural, historical, recreational, and cultural groupings to facilitate park management and to identify areas by their prominent characteristics.

Nationwide Personal Transportation Study (NPTS): A transportation study, periodically undertaken by the Bureau of Census, which looks at travel patterns and frequency, transit use, and other travel characteristics at a national level.

National Transportation System (NTS): Elements and facilities from aviation, highways, railroads, ports and waterways, pipelines and public transportation which play an important role in meeting national transportation needs. Used to provide a policy framework to evaluate impacts and effectiveness of federal laws and regulations, to plan federal infrastructure investments, and to evaluate service levels. Currently being developed by the U.S. Department of Transportation.

Network: System of roadways that work together to provide mobility throughout a region.

Non-Motorized Travel: Travel accomplished by cycling or walking.

Opposite Lighting: The placement of light poles so that they are directly across the street from each other.

Greenway: Network of roads that are visually integrated as the "Washingtonian Greenway" system. Distinct from other roadways in that they are defined by restricted access into and out of the system, the elimination of cross traffic, a broad ROW, fully separated driving lanes at different elevations, generously banked curves, crisp sunken roadways defined by mountable curbs, contrasting tones of pavements, and visual as well as physical connections to scenic and recreational attractions, both on parkways and in adjacent park lands.

Pavement Management System (PMS): A systematic process utilized by state agencies and MPOs to analyze and summarize pavement information for use in selecting and implementing cost-effective pavement construction, rehabilitation, and maintenance programs. Required for roads in the National Highway System (NHS) as a part of ISTEA; the extent to which the remaining public roads are included in the process is left to the discretion of state and local officials. Criteria found in 23 CFR 500.201-.209.

Pedestrian: Any person not using a motorized vehicle or other non-motorized form of transportation.

Pedestrian Overpass: Spanning over freeways, they include ROW segments dedicated exclusively to pedestrian and bicycle circulation.

Permanent Neighborhood Identifiers: Signs designed as permanent attachments to poles to represent the most important aspects of a neighborhood. They may be thematically modeled to address aspects of a neighborhood's history.

Permeable Asphalt: Asphalt lacking most of the fine material found in conventional pavements, allowing water to flow through voids in the aggregate and infiltrate into the underlying sub-base. A layer of clean, uniformly graded gravel lies beneath the pavement, and geotextile separates this stone bed from the soil below. Runoff from the paved surface and adjacent impervious areas slowly passes through the gravel layer, which

may also serve as a storage area. Permeable asphalt has the same structural properties as conventional asphalt.

Permeable Concrete: Concrete constructed with larger pea gravel and a lower water-to-cement ratio to achieve a pebbled, open surface. The modest design variation allows water to flow through voids in the aggregate and infiltrate into the underlying subbase. A layer of clean, uniformly graded gravel lies beneath the concrete, and geotextile separates this stone bed from the soil below. Runoff from the concrete surface and adjacent impervious areas slowly passes through the gravel layer, which may also serve as a storage area. Permeable concrete has the same structural properties as conventional concrete.

Permeable Concrete Unit Paver: Rigid blocks containing drainage voids for passing runoff to the subsurface, where the water is further conveyed through base materials to the storm drain system. They have spaces or gaps between them to allow stormwater to flow through and into an underground stone storage area. The block systems should be installed and located in parking areas along the travel lane. They can be used to treat roadway runoff as well as runoff from sidewalk areas. These systems should not be located in areas of high sediment loads or where there is infrequent street cleaning.

Pervious Material: Material that allows passage of water through interstices into a stormwater management system.

Planter Edging: Sidewalk elements that can direct a pedestrian's travel path, prevent soil compaction, and help define a space.

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Pervious Material: Material that allows passage of water through interstices into a stormwater management system.

Planter Edging: Sidewalk elements that can direct a pedestrian's travel path, prevent soil compaction, and help define a space.

Principal Arterial: Major streets, many with multi-lane or interstate design, serving high-volume traffic corridor movements that connect major generators of travel.

Promenade: A public area along the waterfront set aside as a pedestrian walk and gathering place.

Protection Zone: The section of the median that provides pedestrian safety from vehicular traffic. Protection zones serve as physical cues that alert drivers of potential pedestrian activity.

Public Art: Artwork integrated into public works projects and in a wide range of transportation elements and open spaces to create an attractive and memorable public realm and enrich the quality of life of residents, workers and visitors. Public art celebrates area heritage, civic pride and creativeness, relates to the natural landscape, cultural and historic character, and/or is incorporated into special areas to win community support by building sense of place and identity for communities and neighborhoods. Public works projects involve local artists, local institutions and the community in the planning and design process.

Public Involvement: The process of involving the public in the early stages of the transportation planning process through completion. Through meaningful consideration and input from interested citizens, needs from all modes of the public transportation system become a shared mission with technical planning staff and policy makers. For the transportation community, involving the public in planning and project development poses a major challenge.

Public Transportation: (1) Bus: intercity buses, mass transit systems, and shuttle buses available to the general public. (2) Commuter Trains: commuter trains and passenger trains other than elevated trains and subways; local and commuter train service, but not intercity service by Amtrak. (3) Streetcar/ Trolley: trolleys, streetcars, and cable cars. (4) Elevated Rail/ Subway: elevated and subway trains in a city.

Railing: Vehicular or pedestrian barriers incorporated into barrier walls to separate vehicles and pedestrians.

Raised Crosswalks: Speed Tables outfitted with crosswalk markings and signage to channelize pedestrian crossings, providing pedestrians with a level street crossing. By raising the level of the crossing, pedestrians are more visible to approaching motorists.

Raised Intersections: Flat raised areas covering entire intersections with ramps on all approaches and often with brick or other textured materials on the flat section. Raised intersections increase visibility of and for pedestrians and therefore reduce through movement speeds at intersection and vehicle-pedestrian conflicts. Intersections rise to the same level as sidewalks.

Raised Pavement Markers (RPMs): Lane line delineators that can replace or be used in conjunction with painted lane lines. Raised reflective pavement markers capture light from oncoming headlights and reflect it back to drivers for guidance at night and in weather with poor visibility. Reflective markers placed on the roadways are visible only to drivers. They are nicknamed "cats' eyes" because of how they appear to drivers on the darkened roadways.

Reforestation: Planting young trees and shrubs in an effort to increase and renew forest cover in an attempt to improve the water holding capacity of an area.

Refuge Area: A gap fitted in a raised island along the centerline of a street allows pedestrians to walk through at a crosswalk. They provide a safe place for pedestrians to stand or wait while vehicular traffic travels trough the pedestrian path of travel.

Residential: A type of landuse that provides various forms of housing, ranging from detached homes to high-rise apartment structures, in low to high-density settings.

Restricted Parking/Regulated Parking: A type of on-street parking where people are restricted in the amount of time they can park during certain times of day.

Right-of-Way (ROW): Is an area that usually holds the public utilities (both overhead and underground) and acts as a buffer between transportation infrastructure and private property.

River Crossing: Bridges that safely connect communities and are integrated with the life of adjacent neighborhoods.

Roadway Surface Type: The predominant material used to construct the roadway surface (e.g. concrete, asphalt, dirt).

Rotary: Barriers placed in the middle of an intersection, directing all traffic in the same circular direction.

Roundabout: Large, raised, circular islands in the middle of major intersections, around which all oncoming vehicles should travel until reaching a destination street. Unlike traffic circles, roundabouts are used on higher volume streets to allocate for additional capacity between competing movements. These rotaries steady traffic, improve safety conditions, and reduce the number of conflict points and angle collisions. They allow community activity in residential areas, landscaping or other enhancements such as fountains, artwork, sculpture or low impact development options.

Rumble Strip: Pavement placed perpendicular to the direction of travel creates a change in texture in the road surface to visibly and audibly warn drivers to stay in travel lane. Shoulder rumble strips are placed on the shoulders just beyond the travel lane to warn drivers of entering a roadway section not intended for routine traffic use. Centerline rumble strips placed on centerline of undivided highways warn drivers of leaving the intended lane of travel. The two most common rumble strip designs are milled and rolled. Differences are in installation procedure and shape, which affects the amount of noise and vibration produced.

Safety Post (Bollard): A strong 3' tall and approximately 6" wide vertical structure installed along a public ROW that provides security for pedestrians and buildings. Posts may be used along waterfronts, on medians with pedestrian refuge areas, and on bulbouts. Posts can be permanent or removable to allow passage of emergency vehicles.

Sand Filter: A flow-through system designed to improve water quality for impervious drainage areas. It consists of one or more chambers to settle and filter pollutants. A sand filter occupies a small footprint compared to its drainage area. It is not intended to detain water for any significant period of time.

Sense of Place: The constructed and natural landmarks and social and economic surroundings that cause someone to identify with a particular place or community.

Set Back: Minimum distance a building, structure, or activity can be separated from a designated feature such as a waterway.

Shoulder: Outermost portion of the roadway used to accommodate stopped vehicles for emergency use.

Shared Lane: Roadway lane used by more than one mode of transportation.

Sight Distance: The length of roadway visible to the driver.

Single Occupant Vehicle (SOV): A vehicle with one occupant, the driver.

Soil Amendments: Additives that make soil more suitable for the growth of plants and increase water retention capabilities. Use is conditional on compatibility with existing vegetation. Soil amendments increase a soil's infiltration capacity, adding storage volume to a site and reducing the total volume of runoff.

Spanning Sidewalks: Spanning sidewalks are raised platforms supported by 2 vertical structures, which prevent the compaction of the planting medium below the pavement. They prevent soil compaction, provide additional planting soil, and maximize the root zone ensuring a better growing condition for urban trees and therefore increase water holding capacity.

Special Area: Overlays used in conjunction with the District roadway classifications to better address the urban design and broader transportation goals set forth in the Framework Plan and other preceding studies, and to develop a cohesive public realm that is sensitive to the diverse environs of the Anacostia Waterfront area. The following five criteria determine the specific geographical locations: (1) promote environmental stewardship of the watershed; (2) increase access to the waterfront; (3) promote pedestrian, bike, transit friendly ROW and enhance overall safety; (4) enhance identity in neighborhoods and local destinations; and (5) integrate AWI area and the Monumental Core with the Capitol at the center.

Special Intersection: An intersection along the streetcar corridor that (1) includes transfer venues for various modes of transit; (2) has large automobile turning movements; (3) contains a high volume of pedestrian circulation; (4) provides access to important land uses; and/or (5) is an important place for community interaction.

Special Segment: A Special Area used to establish a place for its communities to come together and create a unique physical environment. These segments affect Study Area neighborhoods by enhancing identity and the presence of

cultural and other significant destinations. These segments have been chosen based on their (1) designation as Main Streets; (2) role as neighborhood commercial streets; (3) proximity to places of cultural/historic destinations; (4) strategic location within clusters of neighborhoods, which allows for greatest accessibility to a wide range of people and ties various neighborhoods together; (5) presence of transit facilities; and (6) presence of significant points of entry to or departure from neighborhoods.

Speed Hump: Rounded raised areas, 3-4" high, placed across the roadway, generally 10-14' long, making them distinct from shorter "speed bumps" found in many parking lots. The profile of a speed hump can be circular, parabolic, or sinusoidal. They are often tapered as they reach the curb on each end to allow unimpeded drainage.

Speed Table: Flat-topped speed humps often constructed with brick or other textured materials on the flat section. Speed tables are typically long enough for the entire wheelbase of a passenger car to rest on the flat section. Their long flat fields give speed tables higher design speeds than speed humps. The brick or other textured materials improve the appearance of speed tables, draw attention to them, and may enhance safety and speed-reduction.

Spill Out Zone: If the dimensional criteria for the Walkway Zone and the Furnishing/Planting Zone have been met, the remaining portion of the sidewalk can be used by restaurants and other establishments for business related purposes. Barriers such as planters can be used to demarcate the zone and enhance the streetscape.

Staggered Lighting: A type of lighting placement, such that lights are not directly across from each other.

Stormwater Runoff: Water that flows over land during a rainstorm. Water is either absorbed by trees and plants, infiltrates into the ground or flows overland. The portion of the water that flows overland is stormwater runoff. In a meadow or forest, water moves slowly across the land and most is infiltrated into the ground or absorbed by the tree foliage. On a developed property water is no longer able to flow slowly across land, infiltrate into the ground or absorb into trees. More water moved across the surface of the land at a faster speed, directly into the river.

Street Sign Attachment: Metal panel mounted under the street sign to express specific graphic or textual messages relevant to the surrounding community. These street sign attachments may call out the name of a neighborhood, or a special designation (e.g., historic district, cultural district or Business Improvement District).

Street Trees: Urban street trees can be incorporated into a stormwater management strategy to reduce runoff. Tree canopy intercepts rainfall, allowing it to evaporate to the atmosphere, reducing the amount of runoff generated by storm events. In instances where pervious area surrounds the trees, root zone uptake also diminishes stormwater generation and removes pollutants.

Structural Soil: Soil that provides a penetrable root volume and a load-bearing surface for sidewalk pavement in the Walkway Zone. Used to maximize the root zone.

Symbolic Corridor: A special area designation directly referencing other planning initiatives in the District. The focus is on integrating the Monumental Core visually and physically with the rest of the fabric of the District.

Technical Advisory Committee (TAC): A standing committee that provides advice on plans or actions typically comprised of public sector planners, engineers and other staff members (not general citizens).

Textured and Colored Pavement: Stamped pavement or alternate paving materials that create an uneven surface for vehicles to traverse. It may be used to emphasize either an entire intersection, a pedestrian crossing or along entire street blocks.

Through Lane: Roadway lanes that are not turning lanes, exit, or entrance ramps.

Transit-Oriented Development (TOD): A mixed-use community or neighborhood designed to encourage transit use and pedestrian activity.

Transportation Control Measure (TCM): A strategy to reduce driving or to smooth traffic flows in order to cut auto emissions and air pollution. Examples include HOV lanes, new or increased transit service, or carpool and vanpool programs.

Traffic Calming: The combination of physical measures that reduce the negative effects of motor vehicle use and improve conditions for non-motorized street users. Measures include speed humps, speed tables, reducing the number of travel lanes or reducing travel lane width through sidewalk extensions or by striping for bikes and pedestrians, traffic islands, roundabouts and curving streets. Traffic calming makes residential streets safer and slows motorized traffic.

Traffic Circle: Barriers placed in the middle of an intersection, directing all traffic in the same counterclockwise direction. Traffic circles are raised islands, usually larger than roundabouts. They are good for calming intersections, especially within neighborhoods, where large vehicle traffic is not a major concern but speeds, volumes, and safety are problems.

Traffic Island: Raised islands located along the centerline of a roadway that narrow the street width. These small-scale rotaries are designed for intersections that handle less volume. They slow traffic from a wide street into a smaller local street. Traffic islands require drivers to slow to a speed to comfortably maneuver in a counterclockwise manner. Traffic islands slow traffic in neighborhoods, remind drivers to proceed carefully, reduce the number of angle collisions, and offer an opportunity for community activity in residential areas, where citizens can landscape or add other enhancements.

Tree Box Filter: Concrete boxes filled with bioretention soil and installed below grade at the curb line. A standard street tree is planted in the box, which resembles a curbside planter. They are located upstream of a standard curb inlet. For low to moderate flows, stormwater enters through the tree box's inlet, filters through the soil, and exits through an underdrain into the

storm drain. For high flows, stormwater bypasses the tree box filter, if full, and flows directly to the downstream curb inlet.

Tree Grate: Metal grate that covers the area of the tree box to provide protection of the immediate surface of the tree planting area from soil compaction. Tree grates also provide an accessible clear path of travel on narrow urban sidewalks.

Tree Protection: Trees can be damaged or killed through various construction activities. Protecting trees during construction activities increases the likelihood of survival, preserves existing tree stands, maintains existing overhead canopy, urban wildlife, and aids stormwater management.

Truncated Domes: Detectable warning devices used on walkway surfaces and curb ramps to warn visually impaired persons of abrupt grade changes and hazardous vehicular areas.

Underground Cistern: Manufactured tanks or built underground storage areas constructed of a variety of durable, site appropriate materials. Cisterns can be implemented without the use of pumping devices, instead relying on gravity flow. These are low-cost water conservation devices that reduce runoff volume and, for very small storm events, function to delay and reduce peak runoff flow rates.

Understory: Plantings such as ornamental grasses, groundcover, shrubs, and perennials that add aesthetic value to the streetscape, reduce stormwater runoff, provide visual and physical barriers for pedestrians and motorists and also help create a neighborhood identity.

Urban Heat Island Effect: The additional heating of air over a city as the result of the replacement of vegetated surfaces with those composed of asphalt, concrete, rooftops and other man-made materials. These materials store much of the sun's energy, producing a dome of elevated air temperatures up to 10°F greater over city compared to air temperatures over adjacent rural areas. Light colored rooftops and lighter colored pavement can help to dissipate heat by reflecting sunlight, and tree planting can further help modify the city's temperature through shading and evapotranspiration.

Urbanized Area (UZA or UA): As defined by the Bureau of Census, an area with a population of at least 50,000; generally consists of a central city and the surrounding suburbs; boundaries do not necessarily coincide with existing political jurisdictional boundaries.

Variable Parking Lane: Parking lane that is not available during peak travel periods and used as a travel lane.

Vehicle Miles Traveled (VMT): Measure of travel activity for highways; computed by multiplying the number of vehicles by the miles traveled on any given roadway segment, route or highway over the specified time period (usually a day). Often used as a measure of effectiveness for strategies to reduce miles traveled.

Walkway Zone: Dedicated to pedestrian traffic, this segment of the sidewalk cross section is at least 4' wide. Whenever possible, low impact development (LID) should be incorporated into the design of pavement layout and design, which will include pervious concrete and pervious unit pavers.

Waterfront Access Segment: Connections from the neighborhoods to the river and its parks that allow visitors and residents to enjoy river views, to participate in activities and experiences, and to gain convenient access to the Waterfront network and National Parks throughout the District.

Watershed: The area where precipitation drains to a single body of water such as a river, wetland, or lake.

A3 Acronyms

AASHTO: American Association of State Highway Transportation Officials

ADA: Americans with Disabilities Act

ATADS: Anacostia Transportation Architecture Design Standards

BMP: Best Management Practices

BMS: Bridges Management System

CAAA: Clean Air Act Amendments of 1990

CFA: Commission of Fine Arts

CFR: Code of Federal Regulations

CMAQ: Congestion Mitigation and Air Quality Improvement Program

CMS: Congestion Management System

DC DPW: District Department of Public Works

DC BID: Business Improvement District

EPA: Environmental Protection Agency

FHWA: Federal Highway Administration

FTA: Federal Transit Administration;

DDOT: District Department of Transportation

HCM: Highway Capacity Manual

HCS: Highway Capacity Software

HOV: High Occupancy Vehicle

HPMS: Highway Performance Monitoring System

MOA: Interagency Memorandum of Agreement

ISTEA: Intermodal Surface Transportation Efficiency Act of 1991

ITS: Intelligent Transportation System

LCI: Livable Center Initiative

LID: Low Impact Development

LOS: Level of Service

LRT: Light Rail Transit

METRO: Metropolitan Transit Authority

MPO: Metropolitan Planning Organization

MUTCD: Manual on Uniform Traffic Control Devices

NAAQS: National Ambient Air Quality Standards

NCPC: National Capitol Planning Commission

NEPA: National Environmental Policy Act of 1969

NHS: National Highway System

NPDES: National Pollutant Discharge Elimination System

NPS: National Park Service

NPTS: National Personal Transportation Study

NTS: National Transportation System

OCS: Overhead Contact System

PE: Preliminary Engineering

PMS: Pavement Management System

ROW: Right-of-Way

RPM: Raised Pavement Markers

RSAS: Regional Strategic Arterial System

SHPO: State Historic Preservation Office

SOV: Single Occupant Vehicle

SRS: Shoulder Rumble Strip

TAC: Technical Advisory Committee

TAG: Technical Advisory Group

TCM: Transportation Control Measures

TOD: Transit Oriented Development

TPPA: Transportation Policy & Planning Administration

TSA: Traffic Service Administration

UFA: Urban Forestry

WASA: Washington Area Sewer Authority

WMATA: Washington Metropolitan Transit Authority

Sources: Bureau of Transportation Statistics, State Highway Administration

A4 Illustrations

Page	Acknowledgement
Cover	
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A5 Additional Resources

Manuals, Guidelines and Standards

Design and Engineering Manual (DRAFT), D.C. Department of Transportation, 2004.

District of Columbia Bicycle Facility Design Guide (DRAFT), D.C. Department of Transportation, 2005.

District of Columbia Design Guidelines for Traffic Calming Measures, D.C. Department of Transportation, 2005.

District of Columbia Standard Specifications and Standard Drawings for Highways and Structures, D.C. Department of Transportation, 2007.

District of Columbia Streetlight Grand Plan (DRAFT), D.C. Department of Transportation, 2004.

District of Columbia Streetlight Policy and Design Guidelines, D.C. Department of Transportation, 2005

District of Columbia Wayfinfing Signage Program, Construction Document Set, D.C. Department of Transportation, 2004.

Downtown Streetscape Regulations, D.C. Department of Public Works, 2000.

Geometric Design of Highways and Streets, American Association of State Highways and Transportation Officials, 2001.

The Manual on Uniform Traffic Control Devices (MUTCD), AASHTO.

District Urban Forestry Guidelines.

UFA Recommended Street Tree List.

Plans

- District of Columbia Bicycle Master Plan, DDOT.
- Evacuation/Event Routes Map, DDOT.
- Anacostia Waterfront Framework Plan.

Additional resources are currently in development for the determination of architectural and engineering standards that were not available at the time of this printing. These resources represent national documents to better develop specific standards for different roadway classifications. The soon to be completed resources include:

Institute of Transportation Engineers - Urban Street Design Handbook.

National Highway and Traffic Safety Administration - Highway Safety Manual.

Texas Transportation Institute - Guidelines for Context Sensitive Design for Urban Streets.

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