RAILROAD REALIGNMENT FEASIBILITY STUDY
NATIONAL CAPITAL PLANNING COMMISSION

Freight Railroad Realignment Feasibility Study Summary

April 2007

NCPC

District Department of Transportation

"Since September 11, 2001, the Metropolitan Washington Council of Governments has worked with government, private sector, and community leaders to ensure the safety and security of the Washington area. This study is an important first step to begin a dialogue on this sensitive issue."

David Robertson
Executive Director, COG

"I was relieved to finally get hazmat protection through the House but the NCPC options are far away the best long term recommendations for the region."

Eleanor Holmes Norton
Congresswoman (D-DC)

Freight Railroad Realignment Feasibility Study Summary

The potential threat of an attack on rail lines transporting hazardous materials through the nation's capital was the impetus behind a nine-month study that explored viable alternative routes for transporting freight by rail. The study, a joint effort between the District Department of Transportation (DDOT) and the National Capital Planning Commission (NCPC), was funded by a $1 million grant from the Department of Homeland Security's Urban Area Security Initiative Program.

NCPC took the lead in conducting the study by virtue of its role as the federal government's central planning agency in the National Capital Region. Local and state jurisdictions in the capital area supported the study, including the following agencies:

- Maryland Department of Transportation
- Virginia Department of Rail and Public Transportation
- Office of the Mayor, District of Columbia
- Metropolitan Washington Council of Governments
- City Council of the District of Columbia

The current north-south freight rail line that runs through the District extends seven miles from Alexandria, Virginia to Hyattsville, Maryland. (See **Figure 1**). It transports freight and hazardous cargo past an estimated 100 thousand federal employees and within four blocks of the U.S. Capitol. Each year more than 22.4 million tons of freight passes over these tracks, which also accommodate more than 100 million passengers.

Seven Routes Studied

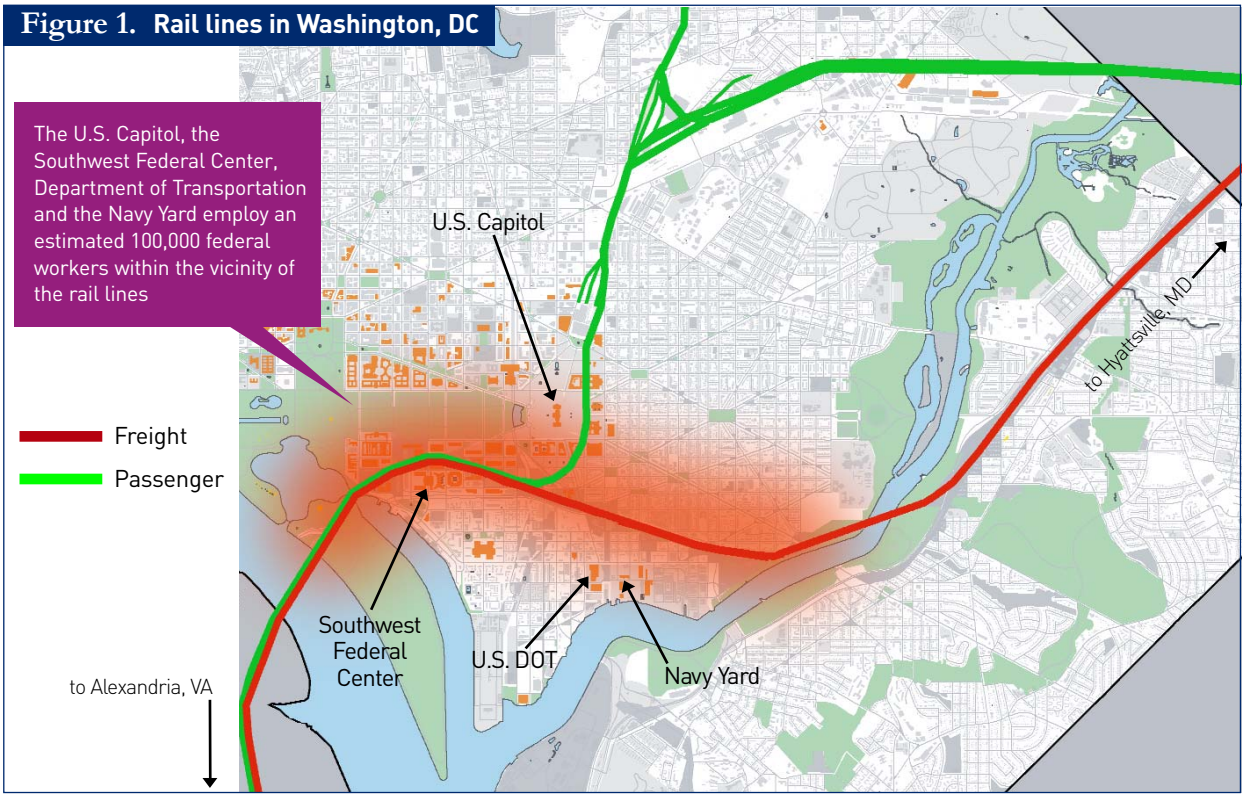
The study initially identified seven alternative corridors (**See Figure 2**). Many factors were studied, including location of population and employment centers, topographical and environmental issues, potential Potomac River rail crossing locations, and redevelopment opportunities offered by new alignments and adjacent lands. Based on the initial analysis, three corridors were selected for further study.

The primary focus of this effort was to eliminate the security risk triggered by the rail line's proximity to high profile targets in the nation's capital. In addition to eliminating the security risk, a freight rail realignment would also improve public access to the Anacostia River; accommodate state of the art railroad infrastructure; and support the anticipated growth of passenger and freight traffic in the Washington, DC region of the East Coast rail corridor.

Three Lines Identified

An initial benefit/cost analysis was performed on three of the seven alternative corridors that were studied. The three alternatives consist of various combinations of existing railroad right-of-way, government land and private land. (**See Figure 3**).

Figure 1. Rail lines in Washington, DC



RAILROAD REALIGNMENT FEASIBILITY STUDY
NATIONAL CAPITAL PLANNING COMMISSION

The DC Tunnel alignment would follow the existing line to Potomac Yard in South Arlington where it would go into an eight-mile secure tunnel beneath the District. It would emerge near the District/Maryland border and connect with the existing route for CSX south-northeast freight traffic.

The Indian Head and Dahlgren alignments, 69 miles and 93 miles respectively, would provide an eastern bypass around the District including a new Potomac River railroad bridge that makes use of the existing Pope's Creek Branch paralleling U.S. Route 301.

Significant Costs Associated with All Three Routes

Preliminary construction cost estimates are $5.3 billion for the DC Tunnel alternative, $4.3 billion for the Indian Head alternative, and $4.7 billion for the Dahlgren alternative.

The Indian Head alternative would have the lowest capital cost and the best benefit/cost ratio. Both Indian Head and Dahlgren alternatives would perform better on these measures than the DC Tunnel alternative.

All three routes would reduce proximity of hazardous freight traffic to dense population and employment centers.

Additional Benefits Identified

In addition to addressing the security threat, any realignment alternative also would improve capacity and efficiency of commuter and Amtrak services along the East Coast, as well as safety and mobility on regional roadways. Each alternative would eliminate freight rail bottlenecks in DC, thereby improving rail capacity and efficiency. All of the alignments also would create redevelopment opportunities in the District of Columbia.

Costs and Benefits

	Goal	Measure	DC Tunnel	Indian Head	Dahlgren	Existing
BENEFIT/COST	Maximize benefits and minimize capital costs	Capital Cost ($ billion)	$4.7-5.3	$3.2-4.2	$3.5-4.7	
		Benefit/Cost Ratio*	1.72	2.41	2.19	
SECURITY	Minimize proximity to population and employment concentrations	Residents within 800 feet of rail alignment in 2030	75,368	34,146	26,061	95,000
		Employees within 800 feet of rail alignment in 2030	104,697	16,963	14,873	174,000

*A benefit/cost ratio of 1.0 is considered the threshold of economically justified projects

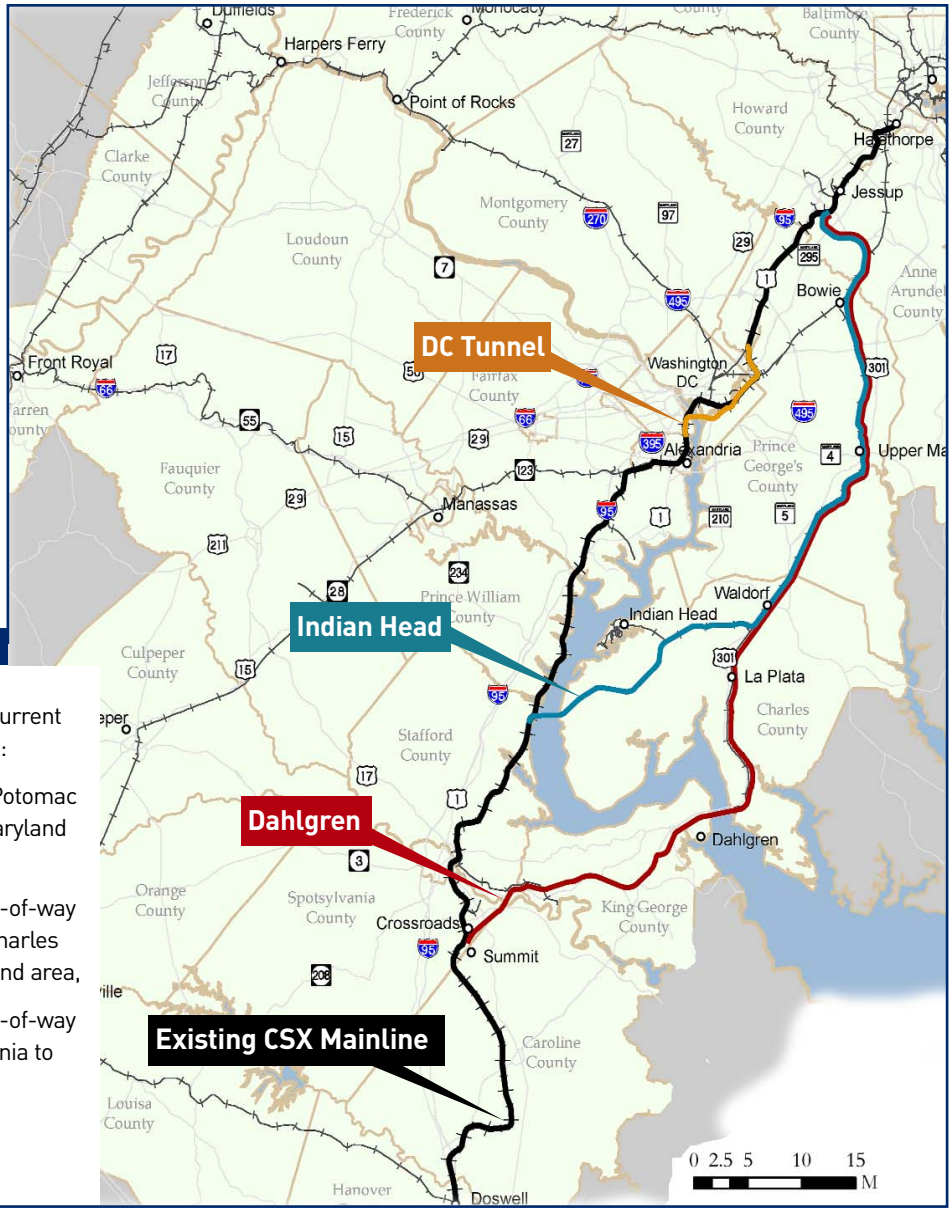


Figure 3. Three Rail Alternatives

Three viable options that were evaluated for realigning current freight traffic by rail through the National Capital Region:

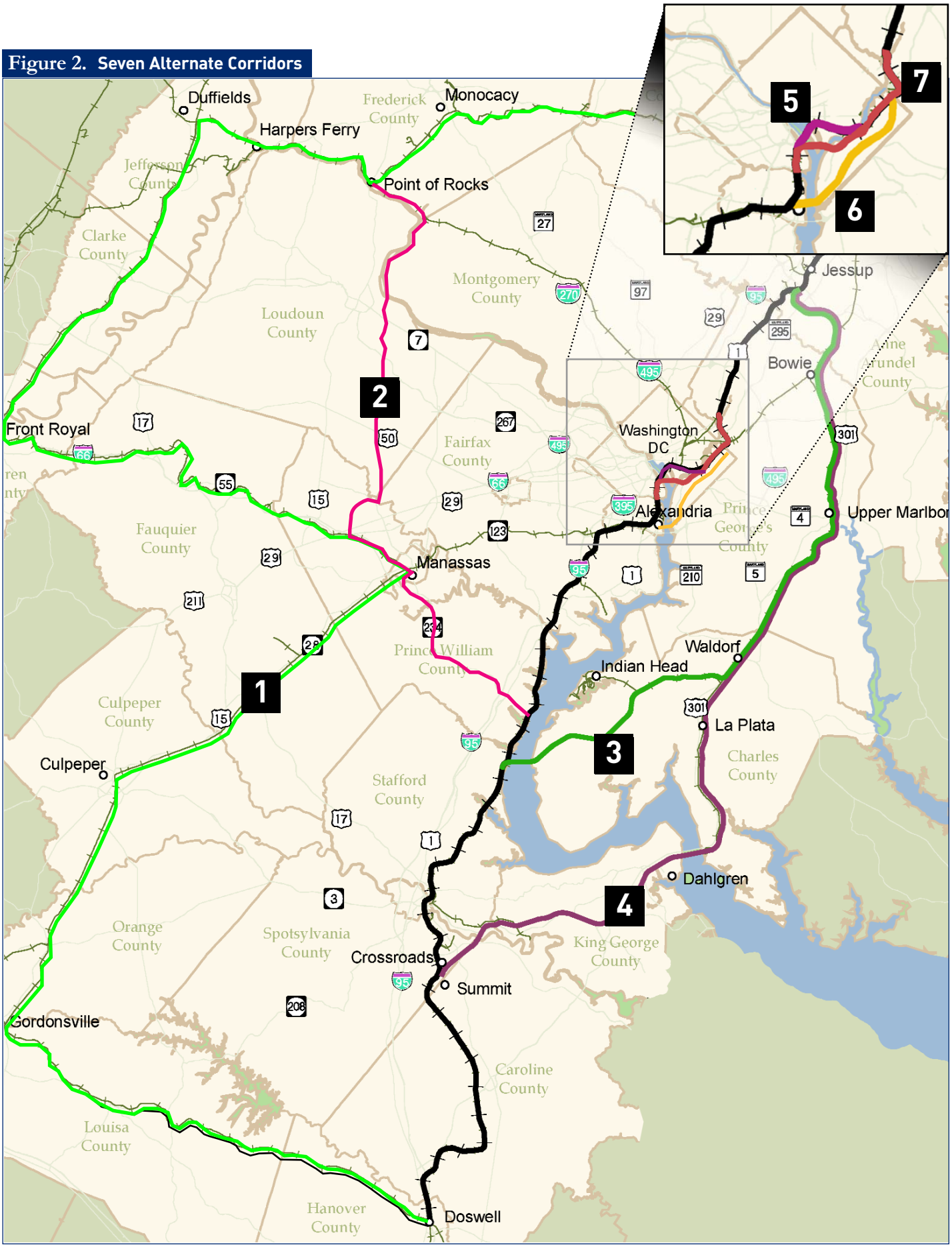
DC TUNNEL Tunnel under the Potomac River from Potomac Yard in Alexandria through DC to the Maryland border east of the Anacostia River,

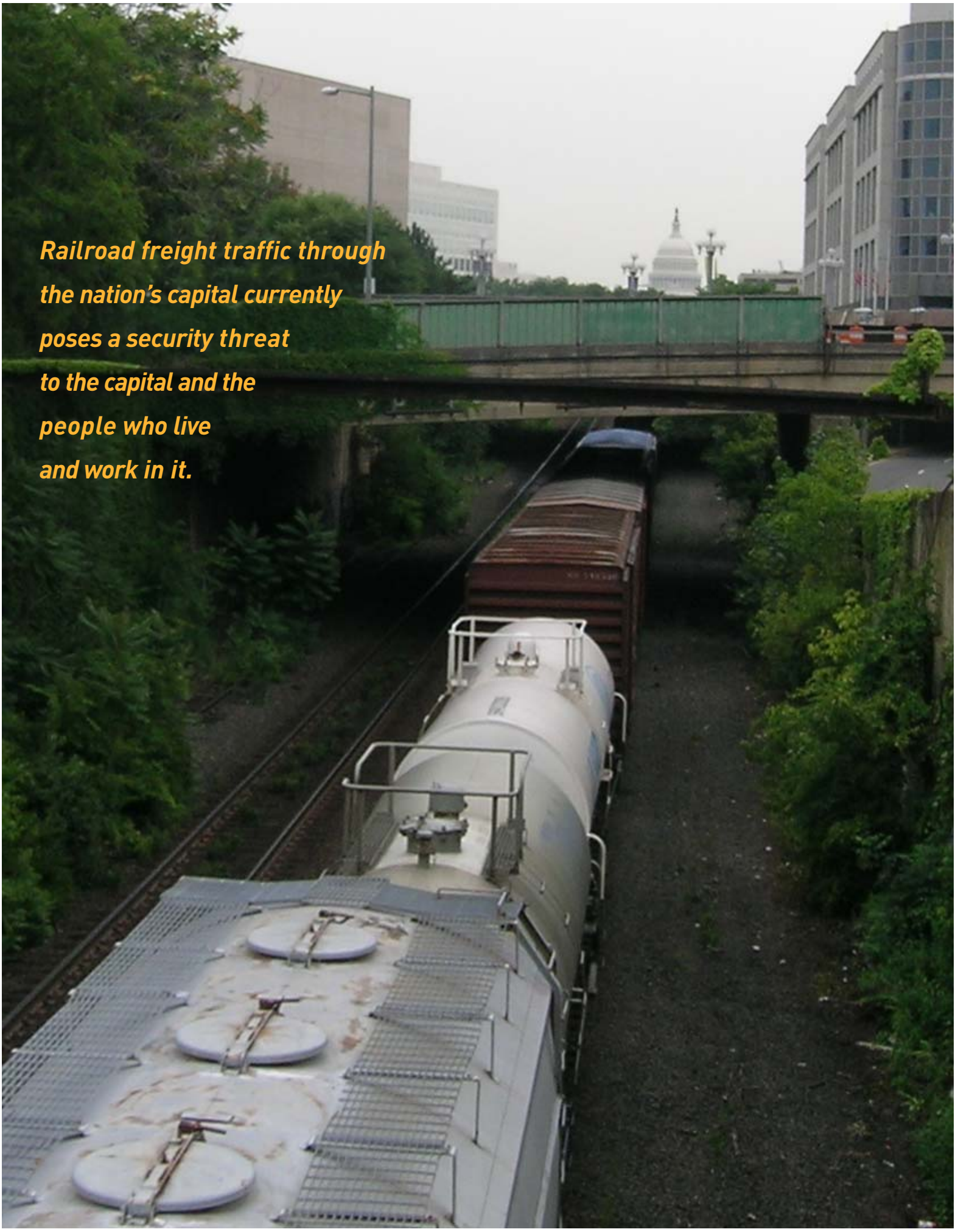
INDIAN HEAD New alignment and improved CSX right-of-way running from the Indian Head area in Charles County, Maryland to the Jessup, Maryland area,

DAHLGREN New alignment and improved CSX right-of-way running from the Dahlgren area of Virginia to the Jessup, Maryland area.

Existing CSX Mainline Studied

Figure 2. Seven Alternate Corridors





Railroad freight traffic through the nation's capital currently poses a security threat to the capital and the people who live and work in it.

Freight Railroad Realignment Feasibility Study Summary

Beyond this Report

Realigning freight railroad traffic in the National Capital Region is a challenging issue. More detailed analysis is required to determine necessary costs and to weigh public benefits that would be derived from required expenditures.

Further analysis will require a funding strategy developed through a cooperative multi-jurisdictional approach that considers the complex issues each jurisdiction must face, including further analysis of costs, benefits, and implementation strategies.

Next steps must include identifying adequate funding for compliance with the National Environmental Policy Act and preparing an Environmental Impact Statement. Most importantly, public input will be important at each step in this lengthy process.

NATIONAL CAPITAL PLANNING COMMISSION

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The National Capital Planning Commission is the federal government's planning agency in the District of Columbia and surrounding counties in Maryland and Virginia. The Commission provides overall planning guidance for federal land and buildings in the region. It also reviews the design of federal construction projects, oversees long-range planning for future development, and monitors capital investment by federal agencies.

DISTRICT DEPARTMENT OF TRANSPORTATION

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The District of Columbia government's Department of Transportation's (DDOT) mission is to enhance the quality of life for District residents and visitors by ensuring that people, goods, and information move efficiently and safely, with minimal adverse impacts on residents and the environment. DDOT manages and maintains transportation infrastructure.

Executive Summary

RAILROAD REALIGNMENT FEASIBILITY STUDY

Issues

A mainline railroad carries freight trains through the Monumental Core of Washington, DC. The rail line's location and configuration cause significant problems:

- Proximity to the seat of the federal government and national symbolic sites creates serious security concerns.
- Outdated railroad infrastructure impairs railroad operations and constrains the movement of goods and people along the East Coast.
- Alignment of the railroad within historic street rights-of-way and through parks, employment areas, and neighborhoods disrupts the fabric of the nation's capital.

The rail line's location in the heart of Washington is shown in Figure ES-1. The line slices through the Southwest Federal Center, the location of twelve federal-agency headquarters buildings; runs within four blocks of the United States Capitol; and travels through densely populated residential neighborhoods.

The line's location raises security concerns because railroads carry hazardous materials. Railroads are a safe method of transport, but hazardous materials on this rail line would be a tempting target for attack because the line is in the Monumental Core. An attack here could have dramatic effects:

- Significant loss of life. An attack would jeopardize the lives of many federal

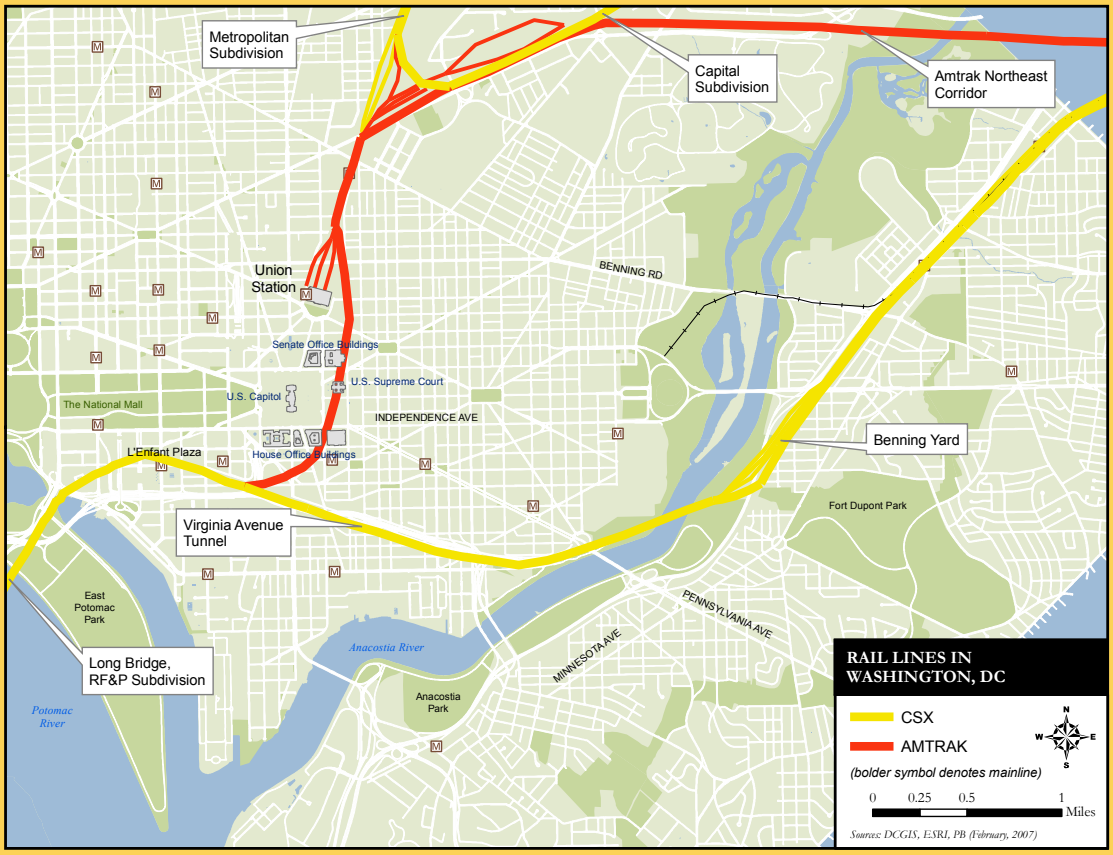

Figure ES-1. Washington, DC Railroads

employees, elected officials, and nearby residents—more than 100,000 federal employees work within a half-mile of the line, and more than 54,000 people live in this same area within Washington, DC.

- Large economic losses. An attack could damage not only the rail line but also adjacent government offices and public facilities. Crippling the rail line would inhibit regional commerce, and wrecking buildings would interfere with the operation of government.
- Damage to national iconic structures. An attack would strike at Washington's Monumental Core, the symbolic center of the nation's governance. The result would register powerfully in the public consciousness.

Substantial efforts have been expended over the past few years to increase security in Washington, DC. Barriers have been installed to reduce the threat of intrusion on buildings and public places. Truck movements and parking have been restricted. Monitoring and public awareness have increased. Yet this rail line continues to carry freight through the Monumental Core, where hazardous materials could provide the means for an attack.

The outdated design of the rail line hampers interstate commerce and regional mobility because it is a bottleneck in railroad operations along the East Coast. The Long Bridge, the only rail crossing of the Potomac River within 70 miles of Washington, DC, is a major choke point because it carries only two tracks. The Virginia Avenue tunnel has only a single-track, and its limited clearance prevents the operation of double-stack container trains, which carry high-value, time-sensitive commodities elsewhere in the nation's rail system. The line is single-tracked in places, requiring trains to idle while waiting for clearance, not only reducing their efficiency but also increasing opportunities for trains to be attacked. South and west of Union Station, this line also carries Amtrak and Virginia Railway Express service, so freight and passenger trains must share limited track capacity, creating more delays and reducing reliability for freight and passenger service alike. These problems are not the only ones that affect railroad operations along the East Coast, but they must be solved to allow the freight rail system to achieve its full potential. Previous efforts by the I-95 Corridor Coalition identified needed improvements to the entire mid-Atlantic corridor network including the Washington, DC region; realigning the CSX freight railroad from the District's core would complement these efforts.

Finally, the line intrudes upon Washington's civic spaces, parks, and neighborhoods. In the Monumental Core and through the Capitol Hill neighborhood, the rail line breaks the city's street grid by occupying rights-of-way designated for Maryland and Virginia Avenues in the historic L'Enfant Plan for the Capital City. Bridge structures that carry the rail line block vistas of the Capitol. The rail line bisects Anacostia Park, the focus of restoration efforts by the National Park Service and others through the Anacostia Waterfront Initiative.

Executive Summary

Study Objectives

In response to these issues, the National Capital Planning Commission and the District of Columbia Department of Transportation partnered to conduct this study to determine the feasibility of relocating the freight rail line as a long-term solution to rail-related security issues. The identification and analysis of alternative railroad alignments in the study was guided by these objectives:

1. Mitigate security concerns related to the proximity of the current system to the Monumental Core of Washington, DC and the U.S. Capitol.
2. Eliminate the impediments to public access of the Anacostia River created by the current alignment.
3. Accommodate state-of-the-art railroad infrastructure.
4. Accommodate the expansion of the passenger and freight capacity within Washington, DC region of the East Coast rail corridor.

Study Approach and Methods

Realigning freight railroad operations through the Washington, DC region would address the security concerns related to transporting hazardous materials through the Monumental Core. In search of locations for a new alignment, the study collected and reviewed extensive information on existing rail lines, highways, and utility rights-of-way. Data on environmental characteristics, land uses, and locations of population and employment were compiled. Railroad facilities, shown in Figure ES-2, operations; commodity flows; and freight customer locations were reviewed to create an understanding of the possibilities for modifying railroad services. Security factors were considered. A geographic information system database was created to organize this information and to allow its evaluation.

Characteristics of the region and the existing railroads were used to identify a comprehensive set of potential railroad corridors. Potential corridors were selected to avoid the Washington, DC core, connect with the existing regional rail network, maximize the use of potentially available right-of-way, and avoid known major obstacles. The potential corridors were to the east and west of the region and through its center.

A two-step screening process shown in Figure ES-3 identified three viable alignment alternatives from among the potential corridors. The evaluation process applied security, rail operations, engineering, and environmental considerations in successively greater detail. The three alternatives studied in more detail, designated DC Tunnel, Indian Head, and Dahlgren, are shown in Figure ES-4. The three viable alternatives are generalized alignments that include various combinations

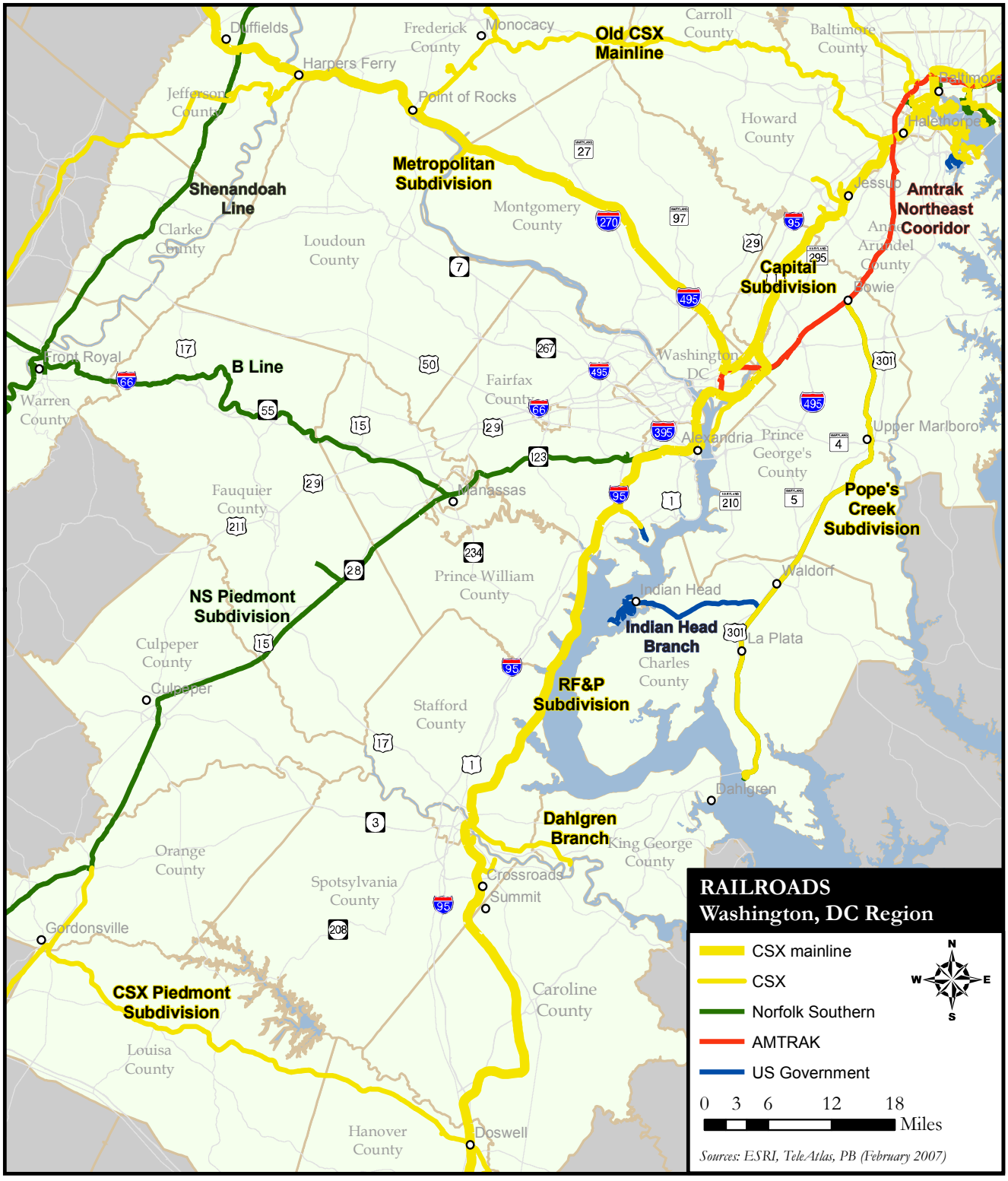

Figure ES-2. Regional Railroads

of existing railroad right-of-way, government land, and private land. The DC Tunnel alignment would follow the existing RF&P Subdivision to Potomac Yard in South Arlington, where it would go into a nine-mile long secure tunnel beneath the District. It would emerge around the District-Maryland border and connect with the existing route for CSX south-northeast freight traffic. Both the Indian Head and Dahlgren alignments would provide an eastern bypass around the District including a new Potomac River railroad bridge and the utilization of the existing Pope's Creek Branch, which parallels U.S. Route 301.

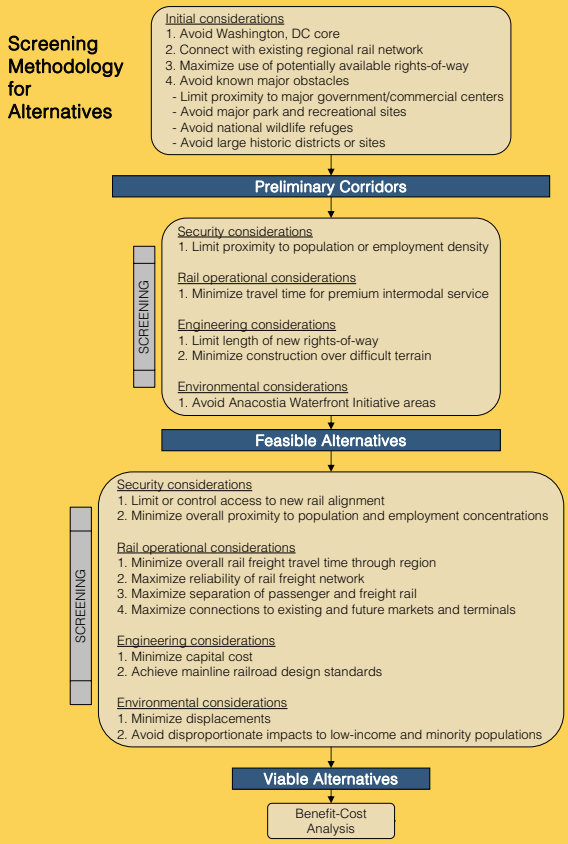

Figure ES-3. Alternative Development Process

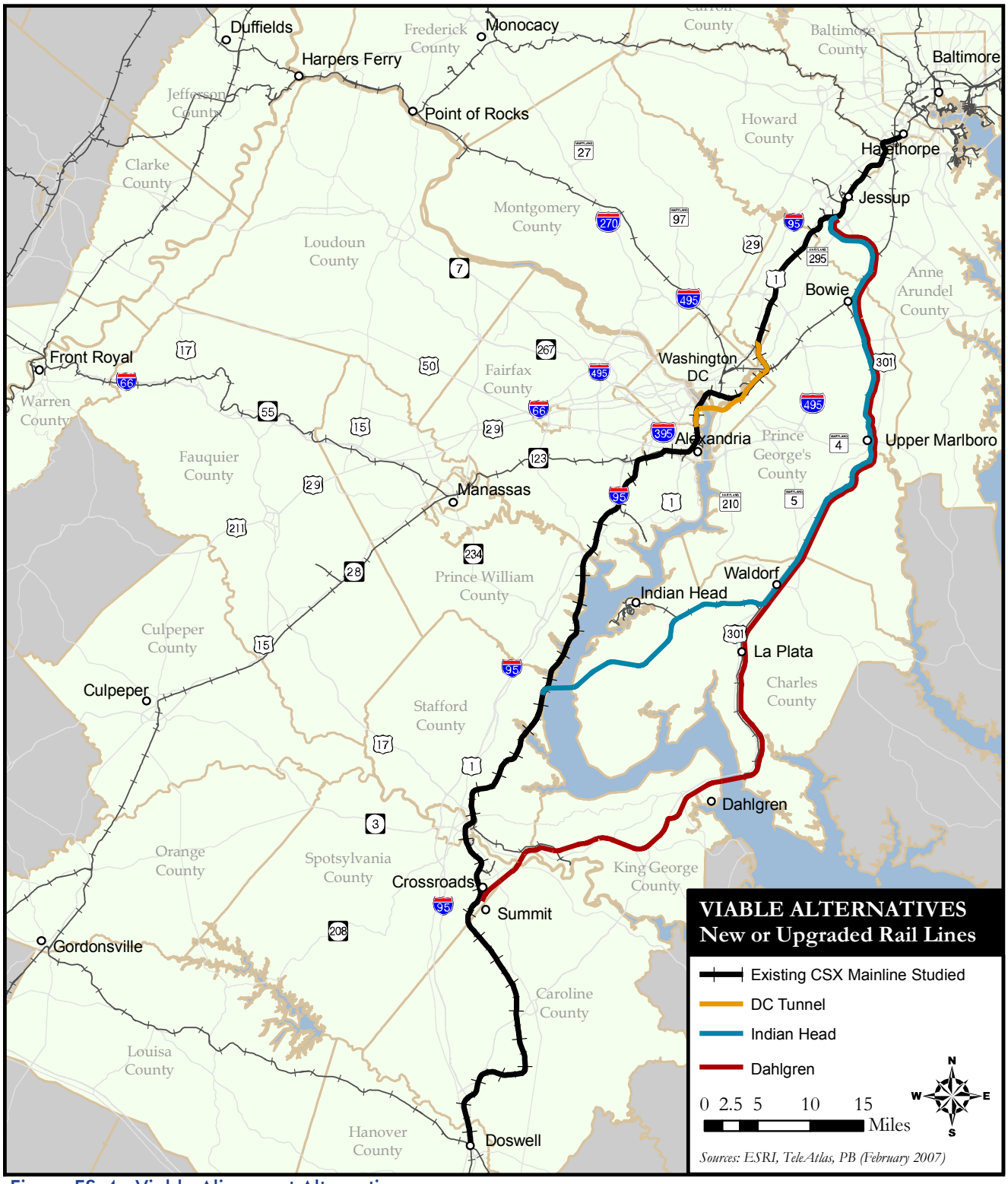

Figure ES-4. Viable Alignment Alternatives

Analysis

A benefit-cost analysis was performed on the three viable alternatives identified in the study. The analysis measured the potential benefits accruing to various public- and private-sector beneficiaries over a 40-year period and compared them with the investment costs associated with the railroad realignment alternatives.

Two categories of benefits were estimated for each alternative alignment, transportation-related benefits and real estate benefits. Because the rail line in this study is one segment in a larger freight railroad network, transportation-related benefits were estimated and a benefit cost analysis was done for two scenarios, railroad realignment in the Washington, DC region only and railroad improvements throughout the mid-Atlantic corridor. The second scenario reflected other improvements previously defined in the Mid-Atlantic Railroad Operations Study that would be necessary to remove freight rail bottlenecks and allow improved railroad operations through the corridor. Transportation-related benefits included railroad time and cost savings for both freight and passenger services, freight shipper benefits, reduced supply chain and logistics costs, and highway user and highway system benefits resulting from diversion of freight from trucks to rail.

Relocating this freight rail line to an alternative alignment away from the Monumental Core would allow the present right-of-way to be redeveloped in ways compatible with the surrounding areas. The potential for such redevelopment was assessed through both a technical analysis and a review by a panel organized by the Urban Land Institute. In locations where the existing rail line would be removed, two real estate dynamics would come into play. One is the (re)development that would be possible on and adjacent to the rail right-of-way. The other real estate-related consequence is an increase in property values in the areas adjacent to the rail right-of-way resulting from an improved physical environment. To understand the market dynamics shaping growth in areas adjacent to the existing alignment, a study of existing conditions was conducted. The analysis found that development would likely occur east of the Anacostia River on and adjacent to the right-of-way as well as in the two Metrorail stations located in this segment: Deanwood and Minnesota Avenue. The value of this redevelopment and the increases in property values were estimated over a 40-year period.

Ranges of capital cost estimates for the railroad realignment alternatives were prepared. Although they are order-of-magnitude estimates because the alternative alignments were defined at a conceptual level of detail, they are sufficient for comparisons among alternatives. To be conservative, the high estimate in each range was used in the analysis.

All alternatives and all scenarios yielded benefit-cost ratios that are well in excess of 1.0, the threshold level for economically justifiable projects. Benefit-cost ratios are shown in Table ES-1. The results of the benefit-cost analysis, along with other security and environmental considerations, were used to compare the alternatives to identify their relative merits.

Benefit-Cost Ratio: The Indian Head alternative would have the lowest capital cost and the best benefit-cost ratio; both the Indian Head and Dahlgren alternatives would perform better on these measures than the DC Tunnel alternative. In spite of their greater length of new construction, the Indian Head and Dahlgren alternatives would

Table ES-1. Comparison of Alternatives

Evaluation Factor			Outcome			
Category	Goal	Measure	DC Tunnel	Indian Head	Dahlgren	Existing
Benefit-Cost	Maximize benefits and minimize capital costs	Capital Cost ($ billion)	5.3	4.3	4.7	-
		Ranking	3	1	2	-
		Benefit / Cost *	1.72	2.41	2.19	-
		Ranking	3	1	2	-
Security	Minimize proximity to population and employment concentrations within potential plume area	Number of 2030 residential population within 800 feet of alternative rail alignment	75,368	34,146	26,061	94,741
		Ranking	3	2	1	-
		Number of 2030 employees within 800 feet of alternative rail alignment	104,697	16,963	14,873	173,831
		Ranking	3	2	1	-
Environmental	Avoid disproportionate impacts to low-income and minority populations	Percent of population below poverty level within 800 feet of alternative rail alignment	7.3	5.0	4.8	10.6
		Ranking	3	2	1	-
		Percent of population that is a minority within 800 feet of alternative rail alignment	46.9	42.1	43.4	55.1
		Ranking	3	1	2	-

avoid the need for expensive tunneling and provide greater benefits to passenger railroad operations.

Security: All the alternatives would reduce the security threat to the Washington region by removing freight trains from the Monumental Core. In addition, all alternatives would improve security by reducing the number of people living close to the alignment compared to the existing rail line, as shown in Figure ES-5. The reduction for the Indian Head and Dahlgren alignments would be dramatic, dropping by fully two-thirds. The reduction in the number of nearby jobs would be even more stark—greater than 90 percent.

Environmental Considerations: The Indian Head and Dahlgren alignments would cut in half the proportion of the population near the rail alignment that is below the poverty level, a better performance than the DC Tunnel alternative. The Indian Head and Dahlgren alignments would also provide a greater reduction in the proportion of the population that is in minority groups; the DC Tunnel alternative would be similar to the existing conditions because so much of the existing line would remain in use.

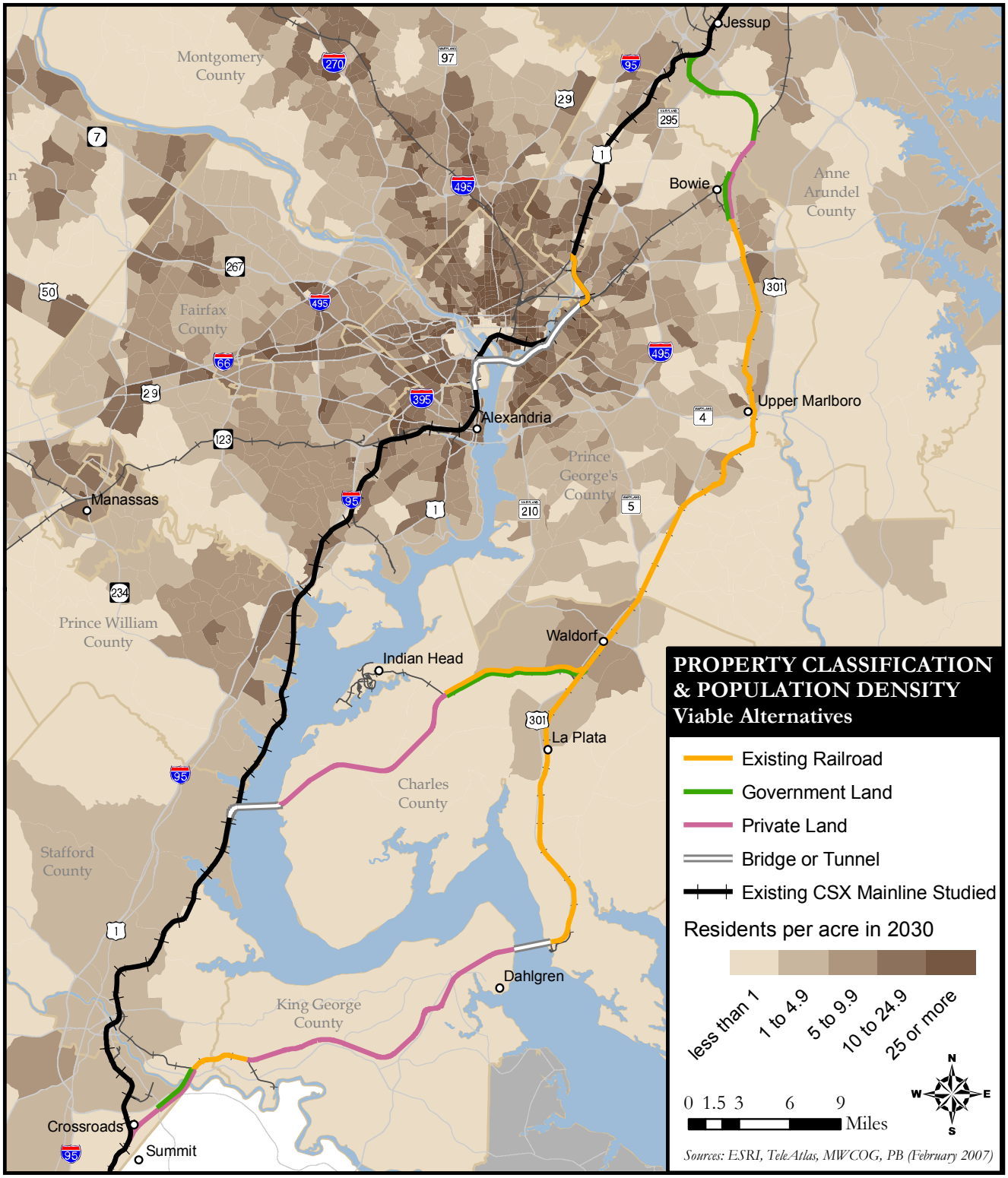

Figure ES-5. Property Classification and Population Density

Results of the Feasibility Study

The analysis in this study produced a set of conclusions that can assist decisions about moving ahead with a project to relocate freight rail service away from Washington's Monumental Core. These conclusions help define steps that would be necessary to initiate a railroad realignment project.

Conclusions

The present location of the freight railroad in Washington's Monumental Core creates security concerns

The line's proximity to the U.S. Capitol, the National Mall, federal offices, and populous neighborhoods makes it an attractive target for attack because the consequences would be dramatic. Hazardous materials on a freight train could provide the means for an attack.

There are viable alternative railroad alignments that would allow freight trains to be removed from the Monumental Core

A rail line on any of these alternative alignments would connect with the existing railroad network, comply with engineering standards, and operate as an effective component of the nation's freight transportation system. None of these alignments would provide a simple solution—building a railroad on any of them would be a major undertaking. While all the viable alternatives identified in the study would include existing rail lines, some of these lines would need to be upgraded and new railroad segments would need to be built. All would require a new Potomac River crossing either in a tunnel or on a bridge.

Railroad realignment would improve security

Railroad realignment would reduce the threat of attack on the Washington, DC region by the removing freight trains from the Monumental Core. A freight train on some other alignment would be a much less attractive target because it would not be near the iconic structures of the nation's capital, and the consequences of an attack, while still potentially serious, would be far more limited. The probability of an attack cannot be known, so the degree of improvement cannot be measured, but railroad realignment would reduce the threat, not simply relocate it.

Railroad realignment could create new railroad facilities that would fit appropriately in their setting

A tunnel alignment would separate the railroad entirely from its surroundings. At-grade rail segments would include new grade separations and design characteristics that would respect nearby development. Freight trains on any of the alternative alignments would be near places where fewer people live and work than the existing line. All the viable alternatives would meet environmental justice objectives better than the existing railroad.

Railroad realignment would improve the freight railroad system

Realignment would increase railroad capacity and eliminate major choke points. A realignment project would provide for increased railroad operating speed and reliability, increasing rail transportation's competitiveness and attracting greater volumes of freight. Transporting freight by rail would create savings for the highway network through reduced truck volumes.

Railroad realignment would also improve passenger rail service

Because both passenger and freight trains share the existing rail line, both would benefit from a project that would increase railroad capacity. More capacity would reduce conflicts between different types of trains, allowing higher speeds and greater reliability for passenger service. Separating freight and passenger services onto separate tracks would provide the greatest benefits by removing

conflicts between train types entirely.

The transportation benefits of a railroad realignment project would be greater if it were combined with other mid-Atlantic railroad improvements

Solving operating problems would require railroad improvements throughout the mid-Atlantic corridor. The Mid-Atlantic Railroad Operations Study identified 71 needed railroad infrastructure and information-system projects. A railroad realignment project in the Washington, DC region would be more effective if it were combined with other projects elsewhere. Similarly, improvements in other areas, such as improving the Howard Street tunnel in Baltimore, would be more effective if a realignment project were built in the Washington, DC region.

Railroad realignment would remove a barrier within the nation's capital

Removing the existing freight railroad would enhance the unity of the Monumental Core. Neighborhood access to the Anacostia River would be improved, and Anacostia Park would no longer be divided. Parts of the city's street network could be restored to the intent of the historic L'Enfant Plan for the Nation's Capital.

Railroad realignment would allow for redevelopment of the existing right-of-way

Some of the vacated right-of-way could be redeveloped in mixed-use extensions of adjacent neighborhoods. The opportunities for redevelopment are in neighborhoods east of the Anacostia River.

The benefits of railroad realignment would be greater than the costs

A realignment project on any of the three viable alternative alignments identified in this study would produce benefits that would exceed project costs. Even without accounting for the value of the most important benefit—security improvement, which this study did not attempt to quantify—the benefit-cost analysis showed that a realignment project is worth doing. Capturing some of these benefits could help to pay realignment project costs.

Developing a railroad realignment project would require further planning

This study analyzed the characteristics of the region and the railroad at a broad, conceptual level because it was a first step in determining project feasibility. More detailed planning would be needed to define the characteristics of a project. A financial plan should identify funding sources and strategies to cover project costs. The preferred alternative alignment should be selected and specific location and design decisions made.

Next Steps

The security threat, railroad operations constraints, and community impacts created by the existing rail line will exist until a railroad realignment project is completed. Planning, design, and construction would take at least ten years. Beginning a railroad realignment project and completing it as quickly as possible would reduce the duration of the present problems and hasten the realization of project benefits. During the period of project development, short-term improvements should also be made to address railroad security and operational issues.

Short-Term Improvements

Significant attention is of course already paid to both security concerns and railroad operations in the Washington, DC region. This study identified a program of short-term improvements that would supplement present practices. These short-term improvements are described in Appendix B, which is in a separate report volume.

Operational improvements would be intended to keep trains moving, since this would not only increase rail line capacity but also enhance security, and to enable traffic growth in both freight and passenger services. Operational improvements could include additional inspection tracks, additional wheel-defect detectors, additional track and signal maintenance, continued reviews of train scheduling and dispatching, and increased freight operating speeds. Security improvements could include enhanced security and maintenance where trains stop, memorandums of agreement between railroad companies and law-enforcement units, a security-awareness campaign, and additional regional drills and training.

Though the short-term improvements could reduce the security risk, minimize the effects of a security incident, and improve railroad reliability and capacity, they would not solve the major capacity and security problems. Freight railroad capacity would still be constrained by the Virginia Avenue tunnel, passenger and freight rail service would continue to share the same alignment, and the freight railroad could continue to carry hazmats alongside federal office buildings and the U.S. Capitol.

Funding

The large investment needed for a railroad realignment project makes the identification of funding a crucial step in project development. Efforts to develop a funding plan should begin early, as the ability to build a project will hinge upon the availability of adequate funds.

Project funding should reflect the distribution of project benefits. The security benefits would justify substantial project funding. The greatest benefits quantified in this study are real estate benefits that would accrue within Washington, DC; some means to capture a part of this value for use in railroad realignment funding would be appropriate. Transportation-related benefits are more widely distributed; some national funding sources may be appropriate because some of the transportation benefits would be realized outside the Washington, DC region. Railroad participation in project funding would be appropriate because the improved infrastructure would create railroad operating benefits.

Project funding would likely involve a mix of federal grants, innovative financing tools, and public-private partnership mechanisms similar to those used in other large railroad projects, such as the Alameda Corridor project in Southern California and the CREATE project in the Chicago area. A railroad realignment project in the Washington, DC region may also have real estate value-capture and security funding components. The ability to leverage the various benefits and identify appropriate financing mechanisms for this realignment project should be thoroughly evaluated in the development of a comprehensive funding plan.

Organization

A key step in project development would be the definition of the organizational structure with responsibility for project implementation. The scale of a new freight railroad would likely exceed the authority of any existing single entity, so some new entity or organizational structure would be needed. Depending upon the alignment alternative, new construction might occur in multiple jurisdictions. There would be both public- and private-sector benefits of railroad realignment, so both should be represented in implementation.

The organizational structure should be identified early in project development so that the entities

that will have responsibility for construction will have a voice in project planning. The organization should also be related to project funding so that the sources of funds are appropriately represented in project decisions.

Planning

Project development would require more-detailed planning. This planning should be conducted through the preparation of an environmental impact statement (EIS). An EIS is required for a major federal action that would significantly affect the human environment. A railroad realignment project would likely involve the federal government and would meet this test. An EIS would be a logical next step in planning, as it would be a systematic analysis of a wide range of characteristics of a project and its setting, would support the selection of an alternative and other project decisions, and would provide opportunities to involve a wide range of interested stakeholders.

Because a realignment project would affect many people and organizations, planning should be an open process with ample opportunity to share information and guide decisions. The affected local, regional, and federal agencies and private companies must participate in planning, and the public in affected parts of the region must be involved.

Interregional Coordination

Railroad improvements in the Washington, DC region must be viewed as part of a comprehensive East Coast railroad improvement program. The issues addressed in this study—security threats, constraints on railroad operations, and impacts in urban areas—affect other locations as well. Significant improvements in railroad operations would be possible only if obsolete infrastructure is modernized along the entire railroad corridor.

Both organizational structure and funding decisions in the Washington, DC region should not be made in isolation. Institutional responsibilities for project implementation in the Washington, DC region should be compatible with similar responsibilities in other locations to ensure coordinated project development. Funding decisions must be coordinated because the cost of needed railroad improvement along the East Coast is large. Funding commitments in one area must not preclude investments in others. The Mid-Atlantic Railroad Operations Study set a precedent for such interregional coordination by bringing together a consortium of federal agencies, states, and railroads to address needed railroad improvements. A railroad realignment project in the Washington, DC region should follow that precedent.

Study Management and Coordination

The study was managed jointly by the District of Columbia Department of Transportation and the National Capital Planning Commission. Funding for the study was provided by an Urban Area Security Initiative grant from the U.S. Department of Homeland Security.

The conduct of the study was coordinated through three groups that represented the broad set of interests that would be affected by a new railroad alignment:

- The NCPC Interagency Security Task Force reviewed the study's security implications.
- The Railroad Working Group, created specifically for the purpose of this study, included representatives of federal, state, regional, and local government agencies with responsibilities that would be affected by a new railroad alignment:
  - ◊ Federal Railroad Administration
  - ◊ Transportation Security Administration
  - ◊ Maryland Department of Transportation
  - ◊ Virginia Department of Rail and Public Transportation
  - ◊ Virginia Railway Express
  - ◊ District of Columbia Department of Planning
  - ◊ District Department of Transportation
  - ◊ Metropolitan Washington Council of Governments
- The Railroad Owner/Operators Group included CSX Transportation, which owns the existing rail line, Norfolk Southern Railroad, and Amtrak, all of whose operations would be affected.

A consultant team of PB, Cambridge Systematics, and Basile Baumann Prost performed the technical analysis.

Section 1
Study Purpose and Approach

Issues

A mainline railroad carries freight trains through the Monumental Core of Washington, DC. The rail line's location and configuration cause significant problems:

- Proximity to the seat of the federal government and national symbolic sites creates serious security concerns because of the transport of hazardous materials.
- Outdated railroad infrastructure impairs railroad operations and constrains the movement of goods and people along the East Coast.
- Alignment of the railroad within historic street rights-of-way and through parks, employment areas, and neighborhoods disrupts the fabric of the nation's capital.

The rail line's location in the heart of Washington is shown in Figure 1-1. The line slices through the Southwest Federal Center, the location of twelve federal-agency headquarters buildings; runs within four blocks of the United States Capitol; and travels through densely populated residential neighborhoods.

The line's location raises security concerns because railroads carry hazardous materials. Railroads are a safe method of transport, but hazardous materials on this rail line would be a tempting target for attack because the line is in the Monumental Core. An attack here could have dramatic effects:

- Significant loss of life. An attack would jeopardize the lives of many federal employees, elected officials, and nearby residents—more than 100,000 federal employees work within a half-mile of the line, and more than 54,000 people live in this same area within Washington, DC.
- Large economic losses. An attack could damage not only the rail line but also adjacent government offices and public facilities. Crippling the rail line would inhibit regional commerce, and wrecking buildings would interfere with the operation of government.
- Damage to national iconic structures. An attack would strike at Washington's Monumental Core, the symbolic center of the nation's governance.

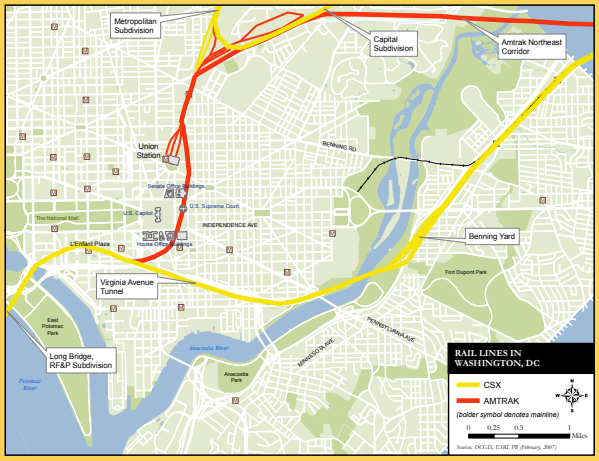

Figure 1-1. Washington, DC Railroads

Hazardous materials could provide the means for an attack, but it is the line's location that could make an attack effective.

Figure 1-2. Freight Tanker Car in front of U.S. Capitol (Sierra Club)

Study Purpose and Approach

The result would register powerfully in the public consciousness.

Substantial efforts have been expended over the past few years to increase security in Washington, DC. Barriers have been installed to reduce the threat of intrusion on buildings and public places. Truck movements and parking have been restricted. Monitoring and public awareness have increased. Yet this rail line continues to carry freight through the Monumental Core, where hazardous materials could provide the means for an attack.

The outdated design of the rail line hampers interstate commerce and regional mobility because it is a bottleneck in railroad operations along the East Coast. The Long Bridge, the only rail crossing of the Potomac River within 70 miles of Washington, DC, is a major choke point because it carries only two tracks. The Virginia Avenue tunnel has only a single-track, and its limited clearance prevents the operation of double-stack container trains, which carry high-value, time-sensitive commodities elsewhere in the nation's rail system. The line is single-tracked in places, requiring trains to idle while waiting for clearance, not only reducing their efficiency but also increasing opportunities for trains to be attacked. South and west of Union Station, this line also carries Amtrak and Virginia Railway Express service, so freight and passenger trains must share limited track capacity, creating more delays and reducing reliability for freight and passenger service alike. These problems are not the only ones that affect railroad operations along the East Coast, but they must be solved to allow the railroad system to meet increasing demands for freight and passenger service.

Finally, the line intrudes upon Washington's civic spaces, parks, and neighborhoods. In the Monumental Core and through the Capitol Hill neighborhood, the rail line breaks the city's street grid by occupying rights-of-way designated for Maryland and Virginia Avenues in the historic L'Enfant Plan for the Capital City. Bridge structures that carry the rail line block vistas of the Capitol. The rail line bisects Anacostia Park, the focus of restoration efforts by the National Park Service and others through the Anacostia Waterfront Initiative. In short, the rail line is an industrial land use that is incompatible with the activities and development that surround it. Its effects harm not only the region's residents but also visitors because it degrades their experience of the nation's capital.

Study Objectives

In response to these issues, the National Capital Planning Commission and the District of Columbia Department of Transportation partnered to conduct this study to determine the feasibility of relocating the freight rail line as a long-term solution to rail-related security issues. The identification and analysis of alternative railroad alignments in the study were guided by these objectives:

1. Mitigate security concerns related to the proximity of the current system to the Monumental Core of Washington, DC and the U.S. Capitol.
2. Eliminate the impediments to public access of the Anacostia River created by the current alignment.
3. Accommodate state-of-the-art railroad infrastructure.
4. Accommodate the expansion of the passenger and freight capacity within Washington, DC region of the East Coast rail corridor.

Historic and Planning Context

Development of the rail line in this study began in the 19th Century. The existing rail line combines segments of earlier lines built by several companies at different times.

Railroads first came to Washington in 1835 when The Baltimore & Ohio Railroad (B&O) opened a line from Baltimore. The planned but mostly unbuilt L'Enfant Plan street system offered railroad companies attractive opportunities for straight rights-of-way to carry the new tracks.

Study Purpose and Approach

The B&O had exclusive rights to provide service to Washington, but the B&O's archrival, the Pennsylvania Railroad (PRR), was able to reach Washington by acquiring the Baltimore and Potomac Railroad (B&P) in 1867. The B&P had been chartered in 1853 with the intention of linking the port and industry of Baltimore with the agricultural lands in southern Charles County, Maryland. The B&P line was to be built from Baltimore to the southwest as far as Bowie, then along the alignment of what is now the Pope's Creek Branch rail line, parallel to what is now U.S. 301, until it reached Pope's Creek near the mouth of the Potomac.

Taking advantage of a provision in the B&P charter that allowed the railroad to build branch lines up to 20 miles long in any direction from the main line, the B&P's new owners immediately started construction of a "branch line" from Bowie to Washington. This alignment was basically the same as what is now the Amtrak main line as far as Landover. From there south, the alignment was part of the rail line in this study, swinging around the east side of the city through the Benning area, crossing the Anacostia River, and approaching the city center from the southeast. The line opened for passenger and freight service in July 1872.

In 1862 tracks had been laid on the all-wood Long Bridge across the Potomac River, near the site of the present Long Bridge. Congress gave the PRR the rights to use the Long Bridge in 1870. To remain competitive, the B&O built a branch line from Hyattsville to connect with the PRR at Benning, creating another segment of the rail line in this study, and negotiated with the PRR for use of the Long Bridge. In 1904 the present double-track, 13-span steel Long Bridge replaced the single-track wooden bridge.

The railroad main lines have not changed much in the past hundred years, but the corporate structures that operate the railroads have changed considerably. In 1963 the Chesapeake and Ohio took control of the B&O, eventually becoming CSX Transportation. The PRR merged with the New York Central in

Figure 1-3. Vision for the Monumental Core

The basic strategy is to replace obsolete structures with improvements that benefit large areas of the District, coordinating these efforts whenever possible to coincide with the District's plans for rebuilding neighborhoods or reclaiming the waterfront. The goal is not only to improve movement through the city, but also to allow the city to grow from within.

Study Purpose and Approach

1968, but by 1970 the newly formed Penn Central was in bankruptcy. The Railroad Revitalization and Regulatory Reform Act of 1976 folded the Penn Central and five other bankrupt railroads into a new corporation, the Consolidated Rail Corporation (Conrail). In 1999 CSX Transportation and Norfolk Southern Corporation acquired the Conrail lines and absorbed them into their systems. CSX Transportation now owns the rail line in this study, including a segment acquired from Conrail.

Several current plans and recent studies address the rail line and its surroundings:

The most specific proposal for modifying the rail line is in *Extending the Legacy, Planning America's Capital for the 21st Century*, the National Capital Planning Commission's 1997 vision plan for accommodating growth and change in the nation's capital. The plan's central theme is a redefinition of Washington's Monumental Core to refocus on the Capitol, encompass nearby areas, and connect to the city's waterfront. The plan envisions placing the rail line in a tunnel as part of an effort to reduce the barriers in the Monumental Core:

> Removing the antiquated rail line along Maryland and Virginia Avenues and relocating freight and passenger trains to a new tunnel under the Potomac River will eliminate many disruptive barriers, including the aging rail bridge over the Anacostia. This new tunnel would run from just south of National Airport to Anacostia, with a passenger spur continuing on to Union Station.
>
> The basic strategy is to replace obsolete structures with improvements that benefit large areas of the District, coordinating these efforts whenever possible to coincide with the District's plans for rebuilding neighborhoods or reclaiming the waterfront. The goal is not only to improve movement through the city, but also to allow the city to grow from within. Relocating antiquated rail lines and burying divisive freeways will create hundreds of acres of developable land that the District needs to compete with the suburbs. Having choice building sites in the heart of the city—near public transit and within walking distance of museums, stores and restaurants—could be the urban opportunity that many corporations and government agencies are looking for.
>
> *-NCPC, Extending The Legacy*

The *Anacostia Waterfront Initiative Framework Plan*, published in September 2003, is a guide to reclaiming the river, the waterfront, and its surrounding neighborhoods. The Anacostia Waterfront Initiative is a joint effort of 20 federal and local agencies to unify diverse waterfront areas in the District of Columbia into a cohesive and attractive mixture of recreational, residential, and commercial uses. The Anacostia Waterfront Initiative seeks to create environmental, transportation, parks, cultural, and neighborhood improvements across 4.4 square miles along the Anacostia River.

The Framework Plan cites with approval NCPC's recommendation to relocate the railroad, noting, "The Legacy Plan of the National Capital Planning Commission (NCPC) recommends that the main line be relocated, providing a valuable corridor for alternative modes of local transportation, eliminating substantial barriers to the river, and opening up potential development sites."

The Mid-Atlantic Rail Operations Study (MAROPS) was undertaken because growth in transportation volumes is causing capacity and congestion problems that are eroding the productivity of the transportation system. The study also addressed the need for closely controlled commodity flows and redundant transportation infrastructure to ensure national security and public safety. MAROPS was the joint effort of five states: New Jersey, Pennsylvania, Delaware, Maryland, and Virginia; the I-95 Corridor Coalition; and three railroads: Amtrak, CSX Transportation, and Norfolk Southern. The first study phase was completed in April 2002, and a second phase is now underway.

Study Purpose and Approach

MAROPS examined the deteriorating performance of the mid-Atlantic highway, aviation, and rail systems, and focused on improvements to the rail system. The study identified opportunities to better utilize the region's existing rail assets, formulated a program of systemwide rail investments, and recommended a public-private partnership to fund and implement the improvements. MAROPS found the mid-Atlantic rail system to be constrained by significant choke points and recommended 71 railroad infrastructure and information system improvements to relieve them, at a cost of $6.2 billion.

Within Washington, DC, MAROPS identified the Virginia Avenue tunnel as a choke point and proposed reconstructing it as part of a near-term improvement program. The study recommended construction of additional tracks to eliminate conflicts between CSX and passenger trains. Because of the need for increased bridge capacity across the Potomac River, MAROPS recommended the construction of a new rail bridge over the Potomac River adjacent to the existing CSX Long Bridge and the addition of third and fourth mainline tracks feeding into the new bridge.

MAROPS identified significant public benefits from the proposed improvements across the mid-Atlantic region, including expanded capacity for passenger rail services; improved freight services at competitive rates for shippers; reduced pressure on highway capacity by shifting some growth in goods movement to rail; enhanced safety, reliability, and emergency response; greater ability to recover from freight service disruptions; and improved capability to support military mobilization.

As in Washington, freight and passenger rail operations in Baltimore are constrained by antiquated infrastructure, including a series of tunnels built in the late 1800s that reduce speed and capacity for CSX, Amtrak, MARC, and NS. In 2001, a CSX train carrying chemicals derailed and ignited a fire within the Howard Street Tunnel that raged for six days. The fire snarled East Coast freight and passenger rail traffic and highlighted the vulnerability of Baltimore's aged infrastructure to safety and security incidents. Recognizing the need to upgrade rail facilities in the region, the Maryland Department of Transportation (MDOT) and the Federal Railroad Administration (FRA) commissioned a major study to identify alternative rail alignments through Baltimore. The Baltimore Regional Rail Corridor Study (BRRCS) suggested improvements that included new tunnels beneath the City of Baltimore and alternate alignments that would bypass the city. Improvements would enhance rail operations on the entire East Coast rail network by increasing speed, safety, and capacity, including adequate clearance for double-stack containers. The State of Maryland continues to examine the Baltimore alternatives and is moving forward with additional study activities leading to a final alignment selection and construction.

Study Approach and Methods

Addressing the security concerns related to transportating hazardous materials through the Monumental Core requires a new freight railroad alignment. In search of locations for a new alignment, the study collected and reviewed extensive information on existing rail lines, highways, and utility rights-of-way. Data on environmental characteristics, land uses, and locations of population and employment were compiled. Railroad facilities, operations, commodity flows, and freight customer locations were reviewed to create an understanding of the possibilities for modifying railroad services. Security factors were considered, including the locations and capabilities of present first responders. A geographic information system database was created to organize this information and to allow its evaluation.

Relocating this freight rail line to an alternative alignment away from the Monumental Core would allow the present right-of-way to be redeveloped in ways compatible with the surrounding areas. Redevelopment would heal the tear in the urban fabric the railroad now creates, create new development opportunities and open space, and produce revenue.

The potential for such redevelopment was assessed through both a technical analysis and a review by a panel organized by the Urban Land Institute.

Potential alternative alignments were defined and general construction costs and railroad operating characteristics were estimated for each. Through the comparison of the characteristics of the alignments three were determined to be viable alternatives.

A benefit-cost analysis was performed on the three viable alternatives to compare their advantages and disadvantages. The results, along with other security and environmental considerations, were used to rank the alternatives, indicating their relative merits. Finally, the next steps in the development of a new alignment were listed as a guide to moving forward.

Study Management and Coordination

The study was managed jointly by the District of Columbia Department of Transportation and the National Capital Planning Commission. Funding for the study was provided by an Urban Area Security Initiative grant from the U.S. Department of Homeland Security. Letters from stakeholder agencies in support of the grant application are in Appendix A, which is in a separate report volume.

The conduct of the study was coordinated through three groups that represented the broad set of interests that would be affected by a new railroad alignment:

- The NCPC Interagency Security Task Force, a subset of the National Capital Planning Commission, reviewed the study's security implications.
- The Railroad Working Group, created specifically for the purpose of this study, included representatives of federal, state, regional, and local government agencies with responsibilities that would be affected by a new railroad alignment:
  - ◊ Federal Railroad Administration
  - ◊ Transportation Security Administration
  - ◊ Maryland Department of Transportation
  - ◊ Virginia Department of Rail and Public Transportation
  - ◊ Virginia Railway Express
  - ◊ District of Columbia Office of Planning
  - ◊ District Department of Transportation
  - ◊ Metropolitan Washington Council of Governments
- The Railroad Owner/Operators Group included CSX Transportation, which owns the existing rail line, Norfolk Southern Railroad, and Amtrak, all of whose operations would be affected.

A consultant team of PB, Cambridge Systematics, and Basile Baumann Prost performed the technical analysis.

Section 2
Railroad and Regional Characteristics

As a first step in developing freight railroad realignment alternatives, this study analyzed various regional characteristics that relate to the project goals. The functional and operational characteristics of the railroad, its security considerations, the markets that it serves, and regional environmental, social, and emergency response characteristics are all important factors. Their analysis in the study led to the identification of several potential alternative corridors.

Railroad Characteristics

The study identified the key characteristics and issues of the railroad network through the Washington, DC region including major travel routes, choke points, and existing and future traffic levels.

Train Types

Within the broad categories of passenger and freight, there are several types of trains operated on the railroad network—each with its distinctive market niche, operational characteristics, and performance measures.

Passenger Trains

Passenger trains carry people, baggage, and small package express shipments. Within this broad definition, there are four different types of trains for different traveling needs, all of which can be found in the study area. The general measures of a passenger train's success are ridership and on-time performance. On-time performance is a measure of schedule adherence against a standard deviation or tolerance. The types of passenger trains are:

High-speed trains

These trains are built for speed, operate between major cities in corridors up to 500 miles long, and are intended to be competitive with travel by automobile and, in some cases, air. Within the Northeast Corridor between Washington, DC and Boston, Amtrak's Acela Express achieves speeds as high as 150 miles per hour on fixed-length trains that carry up to 300 people. Hourly service is provided between Washington and New York. The Amtrak Northeast Corridor currently is the only operating high-speed corridor in the United States, although the U.S. Department of Transportation has designated other emerging corridors nationwide. One such corridor, Washington to Charlotte, includes the CSX mainline right-of-way between Washington and Richmond.

Regional trains

These standard Amtrak trains operate at lower speeds and with more frequent stops. They generally consist of a locomotive and however many passenger coaches are required for the passenger load. The customer payload may vary from 200 to 1,000 people depending on train size. The regional trains in the northeast are intended to be a reasonable alternative to long-distance automobile travel via I-95. Amtrak operates hourly regional service on the Northeast Corridor north of the District.

Approximately five regional round trip trains per day are extended south from Washington to either Richmond or Newport News, VA via the CSX north-south Line.

Long-distance trains

These are Amtrak trains with a trip length of 500 miles or more that generally offer once-a-day, every-day service to distant cities. They are generally outfitted with feature cars such as sleepers, diners, and lounges in addition to coaches. One long-distance train, the Auto Train, operates from Lorton, Virginia to Sanford, Florida and offers auto-rack cars so people can travel with their automobiles. These trains offer people comfort and a measure of enjoyment as a trade-off for speed and convenience and generally carry about 200 people per trip. Other Amtrak long distance trains run from New York via Washington to Florida and New Orleans, and from Washington to Chicago.

Commuter trains

These short-distance trains generally run on a route that is 60 miles or less and primarily serve commuters. These trains offer speed, convenience, and cost saving over driving. During rush hours, they generally operate with 20- to 50-minute headways and make multiple

stops. The Washington, DC region has two commuter rail operators that share a common terminus at Washington Union Station: the Virginia Railway Express (VRE) and the Maryland Rail Commuter (MARC) service. VRE and MARC trains are hauled by locomotives and consist of between three and eight passenger coaches. Generally, commuter trains are sized to accommodate their anticipated peak load and carry from 200 to 1,100 passengers.

Freight Trains

Freight trains carry trailers or containers including mail; automobiles and other vehicles; lumber; agricultural products; other general cargo that can be solid, liquid, or gas; aggregates; phosphates; and minerals such as coal, coke, or iron ore. There are four categories of freight trains based on the type of freight carried. The success of a freight operation is generally measured commercially by the revenue associated with the train and its contribution to overhead and profit. Operationally, success is measured by velocity, an indication of how fast freight moves through a given territory or terminal. The types of freight trains are:

Intermodal freight

These are time-sensitive shipments loaded in trailers or containers. Intermodal trains generally contain higher-value merchandise but, irrespective of the cargo's monetary value, intermodal freight is always time-sensitive. In some cases, the term intermodal also includes automobiles loaded in special automobile rack cars. Intermodal trains are generally price-competitive and service-competitive with long-haul trucks. Intermodal trains are always accorded the highest dispatching priority among freight trains. Moreover, they often are assigned a speed differential greater than ordinary freight, equal to or less than passenger trains.

Merchandise freight

This is general cargo and some containers that are accorded a lower priority than intermodal freight but higher than mineral freight or local freight. There is generally no speed differential associated with these trains and they move at ordinary freight train speeds. Merchandise freight is the class of train that is most likely to contain cars carrying hazardous materials (hazmats) in bulk. Some of these trains may be classified as "expedited freight" and receive a higher dispatching priority than ordinary merchandise trains.

Mineral freight

Mineral freight consists of coal, coke, ore, stone, clay, or grain and the empty return of the equipment. When mineral freight is combined with ordinary freight in merchandise trains, the proportion of mineral cars to general cargo determines the classification. A train with more than 25 percent of its cars loaded with mineral commodities is classified as a mineral freight. Mineral freights often operate at a slower speed than ordinary freight and they are usually given the lowest priority of revenue freight trains.

Local freight

Whereas the three previous categories of trains generally operate as through trains between major terminals, local freight trains primarily pick up and drop off blocks of cars or individual cars at industries located along the rail line. These trains are based at local rail yards and operate in windows between through trains. Because they spend a lot of time switching cars, these trains tend to consume a considerable amount of line capacity.

Non-revenue freight

These are work, wire, and wreck trains used for repairs and maintenance along the line and do not carry revenue shipments. Also included in this category are trips to and from local yards made by helper engines, which are required in some areas to assist trains on relatively steep grades.

Functional Configuration

The rail network in the study area, shown in Figure 2-1, comprises main lines and several branch lines owned and operated by two freight railroads—CSX and Norfolk Southern—as well as Amtrak.

CSX

The CSX freight routes through the District function

Railroad and Regional Characteristics

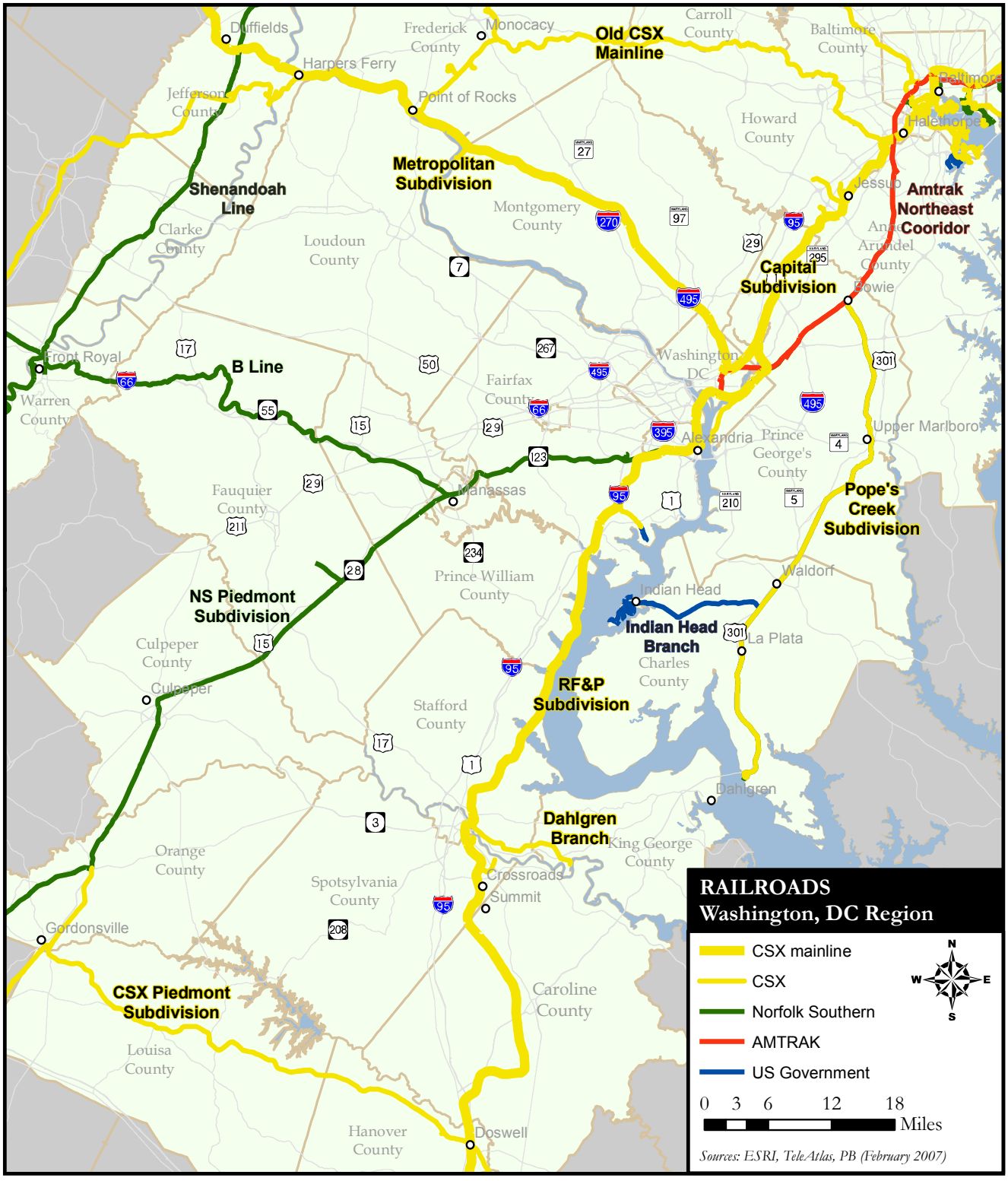

Figure 2-1. Regional Railroads

Railroad and Regional Characteristics

like two interstate rail highways (north-south and east-west) that come together at Hyattsville, Maryland, northeast of the District's border. Nearly all the freight traffic on these interstate rail highways is through, or overhead, traffic. That means that the freight neither originates nor terminates in the District, but it transits the District on its way to its destination. Both CSX's north-south and east-west main lines come close to the U.S. Capitol and Washington's Monumental Core. The north-south line is the subject of this study.

From a freight marketing and commodity flow standpoint, the CSX main lines through the District are part of a seamless rail network that links New York and the East Coast with the South, and Philadelphia and Baltimore with the West. While these CSX lines are major freight corridors, they are also commuter rail corridors, serving four of the five commuter lines emanating from Washington Union Station. Two of the lines carry the MARC service, a division of the Maryland Transit Administration. The CSX line to the south is common to both the Fredericksburg Line and the Manassas Line of the VRE, which is a partnership of the Northern Virginia Transportation Commission and the Potomac and Rappahannock Transportation Commission. At Alexandria, the Manassas Line diverts from CSX and operates on the Norfolk Southern tracks while the Fredericksburg Line continues south on the CSX main line. These lines together serve

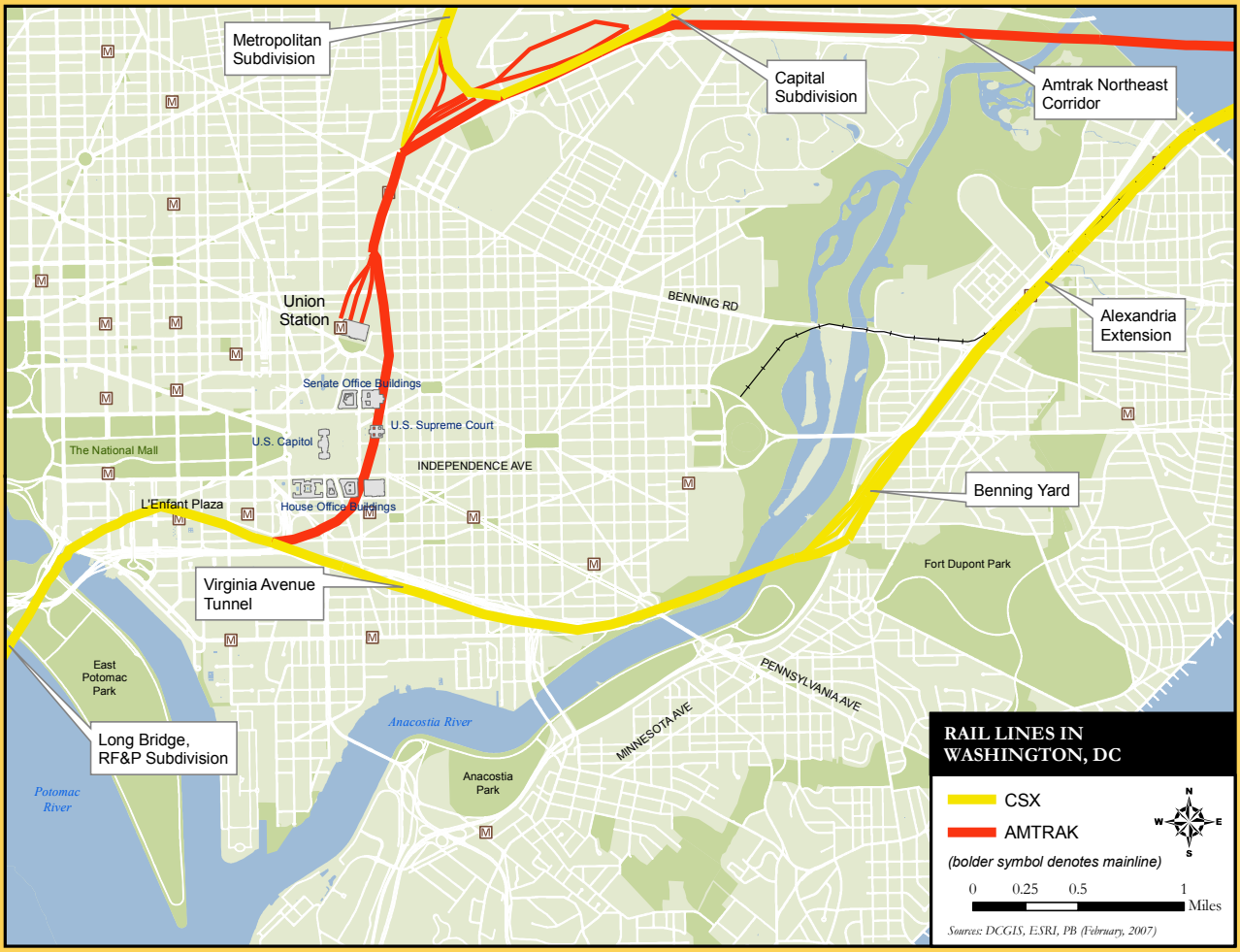

Figure 2-2. Washington, DC Railroads

Railroad and Regional Characteristics

approximately 15,000 passenger trips each weekday. Most VRE passengers commute to and from work in the District, Crystal City, or Alexandria, Virginia. Based on surveys by the commuter agencies, between 50 and 60 percent of their riders are government employees.

The CSX north-south main line from the Potomac River to Fredericksburg and Richmond is the former Richmond, Fredericksburg & Potomac (RF&P) Railroad (now RF&P Subdivision) which has linked the North and South under various ownerships since post-Civil War reconstruction. While it is a key corridor for north-south freight, the RF&P carries a significant number of passenger trains. As shown in Figure 2-2, north of Virginia Avenue, SW (Control Point (CP) Virginia in the railroad timetables) in Washington, DC, the line splits. The passenger trains go northeast to Union Station via the First Street tunnel and the freight trains continue through the 3,600-foot-long Virginia Avenue tunnel, across the Anacostia River to BenningYard, and then north to join the CSX east-west line at JD Tower in Hyattsville, Maryland.

The Virginia Avenue tunnel is an important geographic feature of the freight line. The tunnel restricts both horizontal and vertical dimensions of loads, exactly as Baltimore's B&P Tunnel on the Amtrak Line and the CSX Howard Street tunnel restrict load dimensions to the north. Essentially, rail cars are limited to a dimension identified as Plate C in the Official Railway Equipment Register. This means that double-stack container trains (Plate H) cannot fit through either the Baltimore or Washington tunnels.

Most of the line between CP Virginia and Hyattsville is relatively slow-speed (25 mph) with some intervals of single track. The single-track segments through the Virginia Avenue tunnel and at the north end of the branch near Hyattsville create a bottleneck for the current freight operation.

The territory has fixed signals along the right-of-way that control the movement of trains. The

Figure 2-3. RF&P Subdivision through Fredericksburg

The CSX north-south line from the Potomac River to Fredericksburg and Richmond is the RF&P Subdivision. While it is a key corridor for north-south freight, the RF&P carries a significant number of passenger trains.

Railroad and Regional Characteristics

RF&P Subdivision and the right-of-way between the Long Bridge and CP Virginia is equipped with a supplementary signal system with cab signals as a further safety feature. Cab signals give the crew in the locomotive cab a constant signal indication, supplementing the information conveyed by the fixed signals.

The east-west route is the former Baltimore & Ohio Railroad (B&O). This route was originally intended for fast passenger service from Baltimore and Washington to Chicago and St. Louis. Though the intercity passenger market had decreased well before Amtrak was formed, and the B&O merged with other railroads to become CSX, the route remains an important freight link between the port of Baltimore and the Midwest. The original route, the first railroad line in the country, is appropriately referred to as the Old Main Line. As shown in Figure 2-1, it generally heads westward from Baltimore but follows meandering river valleys and has only a single track in many places. CSX has upgraded and improved this line over the past decade, but its slower speeds and restricted clearances through its five tunnels make it a secondary route.

Instead of the Old Main Line, the fastest, highest-capacity east-west route for CSX actually goes through Washington, DC. Operationally, this primary east-west route is divided in two segments: the Capital Subdivision from Baltimore to Washington and the Metropolitan Subdivision from Washington to Brunswick, Maryland, with the break occurring near Union Station at F Tower, located at the point where 9th Street, NE crosses over the railroad right-of-way. The route is shown in Figure 2-1.

The east-west route carries more tonnage than the north-south route. There are significant numbers of both passenger and freight trains on both legs of the east-west route. Two different MARC commuter routes share tracks with CSX freights—the Brunswick Line to the Potomac Valley and the Camden Line to Baltimore. The Metropolitan Subdivision also has one daily Amtrak train, the Capitol Limited, which operates between Washington and Chicago.

Definitions

Bottleneck - A section of a highway or rail network that experiences operational problems such as congestion. Bottlenecks may result from factors such as reduced roadway width or steep freeway grades that can slow trucks.

Commodity - An item that is traded in commerce. The term usually implies an undifferentiated product competing primarily on price and availability.

Container - A "box"" typically 10 to 40 feet long, which is used primarily for ocean freight shipment. For travel to and from ports, containers are loaded onto truck chassis' or on railroad flatcars.

Double-stack - Railcar movement of containers stacked two high.

Hazardous Material - A substance or material which the Department of Transportation has determined to be capable of posing a risk to health, safety, and property when stored or transported in commerce.

Source: Federal Highway Administration, Office of Freight Management and Operations

Railroad and Regional Characteristics

While the vast majority of CSX's main lines in Virginia and Maryland are double-track, the operation of passenger trains introduces a significant challenge to the freight operation because of the speed differential between passenger and freight trains and the frequent need to hold freight trains on the main line because of single-track bottlenecks off the corridor—both of which consume precious line capacity and contribute to delays for both the passenger and freight services.

During the hours that passenger trains operate, two of the three CSX main lines (the Metropolitan and RF&P Subdivisions) are effectively operated as two single-track railroads side by side, one track for passenger trains, one track for freight, rather than as an integrated double-track system of mixed passenger and freight. The MARC and VRE commuter trains on these lines operate almost exclusively in one direction—toward Washington in the morning and away from Washington in the evening. The higher-speed passenger trains absorb the capacity of one of the two tracks. The second track is used by CSX to operate its freight trains in both directions, as if the line were single-tracked. In the case of the VRE Fredericksburg service operating on the RF&P, which is part of the CSX line under study, this division of the tracks by type of service is further reinforced because VRE's station platforms are all located on the easternmost track south of Alexandria, restricting the commuter trains to this track.

On the CSX Capital Subdivision, MARC operates commuter trains in both directions during the peak periods—to and from both Washington and Baltimore—so this line operates with freight trains intermingled among the passenger trains.

The freight realignment alternatives considered in this study have the potential to divert freight traffic away from these shared-use lines feeding Washington, DC–freeing up capacity that potentially could be used to run more passenger service, and to run the service more reliably. The greatest potential for diversion is on the RF&P Subdivision in Virginia, which is on the freight line under study. Portions of the Capital Subdivision in Maryland also could significantly benefit from diverted freight traffic.

Norfolk Southern (NS)

Norfolk Southern, like CSX, operates a north-south freight thoroughfare linking the South with Baltimore, Philadelphia, and New York. NS owns no track in Washington, DC. Their access to and through Washington is via tracks owned by CSX or Amtrak. Although NS has trackage rights through Washington, DC, the usual NS freight routing is more circuitous, bypassing Washington, DC to the west.

The most direct multiple-track route from the South runs from Washington to the New York area via the Amtrak Main Line from Union Station via Baltimore, Wilmington, and Philadelphia. NS does not generally exercise their trackage rights over this line because the frequent passenger train service—a combination of Acela Express, Regional, long-distance and commuter rail—does not leave many paths for freight trains, except for a window between 10:00 p.m. and 6:00 a.m., when passenger service is much less frequent. Similarly, the frequent CSX freight service and the MARC commuter service discourage NS from exercising their trackage rights over the CSX line from Washington to Baltimore and Philadelphia.

As shown in Figure 2-1, NS routes freight from the South (Georgia and the Carolinas) via Charlottesville, Virginia to Manassas, Virginia via the Piedmont Main Line, then from Manassas to Front Royal, Virginia via the single-track, un-signaled B-Line, then via the Hagerstown Line, parallel to Interstate 81 to Hagerstown, Maryland and subsequently on to Harrisburg, Pennsylvania. From Harrisburg, the freight is routed along different NS lines to Baltimore, Wilmington, Philadelphia, and the Jersey Coast. Most of these lines are either single-track or composed of alternating single- and double-track sections.

This NS main line has far fewer passenger trains than the CSX routes in Virginia and Maryland. VRE shares a short portion of the line between Manassas and its terminal station and yard at Broad Run. Between

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Manassas and Alexandria, where it joins the CSX RF&P Subdivision, there are relatively few NS freight trains and the line is double-track. As on the RF&P, during the commuter peak periods VRE uses one of the tracks while the second track is available for freight trains operating in either direction, though, unlike the Fredericksburg Line, there are some reverse-peak commuter trains.

One intercity passenger train operates in each direction along the NS line from Alexandria to Atlanta, Georgia and beyond.

Amtrak and Commuter Rail

Amtrak plays an important role in Washington area railroad operations. Union Station, located at 60 Massachusetts Ave, NE, is the southern terminus of Amtrak's Northeast Corridor with Acela Express arriving or departing every hour from 5:00 a.m. to 11:00 p.m. Similarly, Amtrak regional service arrives or departs at least once every hour throughout the day and night. Eighteen daily Amtrak trains travel through the District on the RF&P Subdivision on their way between Boston/New York and Richmond/Newport News or points further south. A daily train operates between New York, Atlanta and New Orleans via the NS Piedmont Subdivision from Alexandria and a tri-weekly New York-Chicago train, the Cardinal, operates on the same NS line as far as Orange, VA.

In addition to the intercity trains, the facilities at Union Station—the Washington Terminal—also handles and dispatches the MARC and VRE commuter trains. Most of these trains operate during the weekday morning and evening commuter peak periods. Washington Terminal includes Union Station, various train storage yards and maintenance shops, and the four sets of tracks leading into Union Station–from the Long Bridge and CSX RF&P Subdivision to the south, from the CSX Metropolitan Subdivision to the west, and from the CSX Capital Subdivision and Amtrak Northeast Corridor to the north. The terminal and its facilities are owned and operated by Amtrak. CSX owns a double-track segment of railroad that directly connects the Metropolitan and Capital

Figure 2-4. Long Bridge

Figure 2-5. Virginia Avenue Tunnel

Railroad and Regional Characteristics

Subdivisions, creating its east-west mainline route that passes through the middle of Washington Terminal.

The Amtrak line between Washington and New York is the busiest passenger corridor in the Western Hemisphere and is a working, high-speed (135 mph) passenger line. Freight service using the corridor has declined considerably over the last 20 years because of capacity and safety issues. The frequent passenger service, which currently is denser than at any time in history, consumes a great deal of the line's capacity. Because of the enormous speed differential between passenger trains (100 to 135 mph) and freight trains (50 mph or less), there are few slots available on the corridor for freight trains during daylight hours. Freight traffic, therefore, generally is restricted to the hours between 10:00 p.m. and 6:00 a.m.

The Amtrak Northeast Corridor, shown in Figures 2-1 and 2-3, is an electrified railroad (11,000 V AC), with power supplied from a catenary system of suspended overhead wires. The tracks are generally signaled in both directions, and cab signals linked to speed control in the locomotive give the train engineer a constant representation of the signal indication. The system also enforces speed limits and restrictions.

Physical Characteristics

Each existing line within the study area has unique characteristics and operating challenges reflecting its location, history, and present use.

CSX Main Line, South Leg

The CSX main line network in the region has three legs or segments that radiate in three directions from Hyattsville, Maryland, just north of Washington, DC, at a rail junction known as JD. These are shown in Figure 2-6. The CSX RF&P Subdivision is the primary segment of the CSX main line under study, as it runs through the District's Monumental Core. Other segments under study include the Alexandria Extension, the Landover Subdivision, and the Capital Subdivision.

The southern leg of the network crosses the Anacostia River twice and the Potomac River once on its way to Richmond, Virginia and includes the portion of the rail line that passes closest to the U.S. Capitol and other federal buildings in Southwest Washington, DC. It combines three distinct railroad subdivisions:

- The Alexandria Extension is a single-track line approximately six miles long with 25 to 30 mph maximum speeds that runs from Hyattsville to near the Virginia Avenue Tunnel in Southeast Washington, DC.
- The Landover Subdivision is approximately 5.4 miles long with 25 mph speeds. This line connects the CSX north-south route, the RF&P Subdivision, with the Amtrak Northeast Corridor at Landover and includes the freight yard at Benning. The route provides a physical connection for freight trains through the District, avoiding Union Station.
- The third and longest segment is the RF&P Subdivision, which runs from the Anacostia River Bridge and includes the Virginia Avenue Tunnel and the Long Bridge across the Potomac River. It extends to Richmond, VA. Between Arlington and Alexandria, the line has three main tracks. South of Alexandria, it is essentially double track, with sections of triple track planned. The RF&P

Railroad and Regional Characteristics

Subdivision is signaled in both directions, with cab signals with 60 mph freight speeds in some locations.

Key constraints on the south leg of CSX's main line include:

- Virginia Avenue tunnel: single-track, restricted vertical clearance
- Long Bridge: double-track, with one track fully utilized by commuter and Amtrak trains during weekday peak periods
- Alexandria Extension: single- and double-track segments
- Quantico Creek Bridge: currently single-track, but being expanded to a three-track capability

CSX Main Line, West Leg

Heading westward from the junction at JD (Hyattsville), the CSX main line runs for 2.5 miles towards Washington as the southernmost portion of the Capital Subdivision, as shown in Figure 2-6, then turns northwestward when the line reaches Washington Terminal. From Washington, the line, called the Metropolitan Subdivision, runs through Silver Spring and Rockville, Maryland toward Brunswick, Maryland and Harper's Ferry, West Virginia. A portion of this route passes through Northeast and Northwest Washington, DC. The line

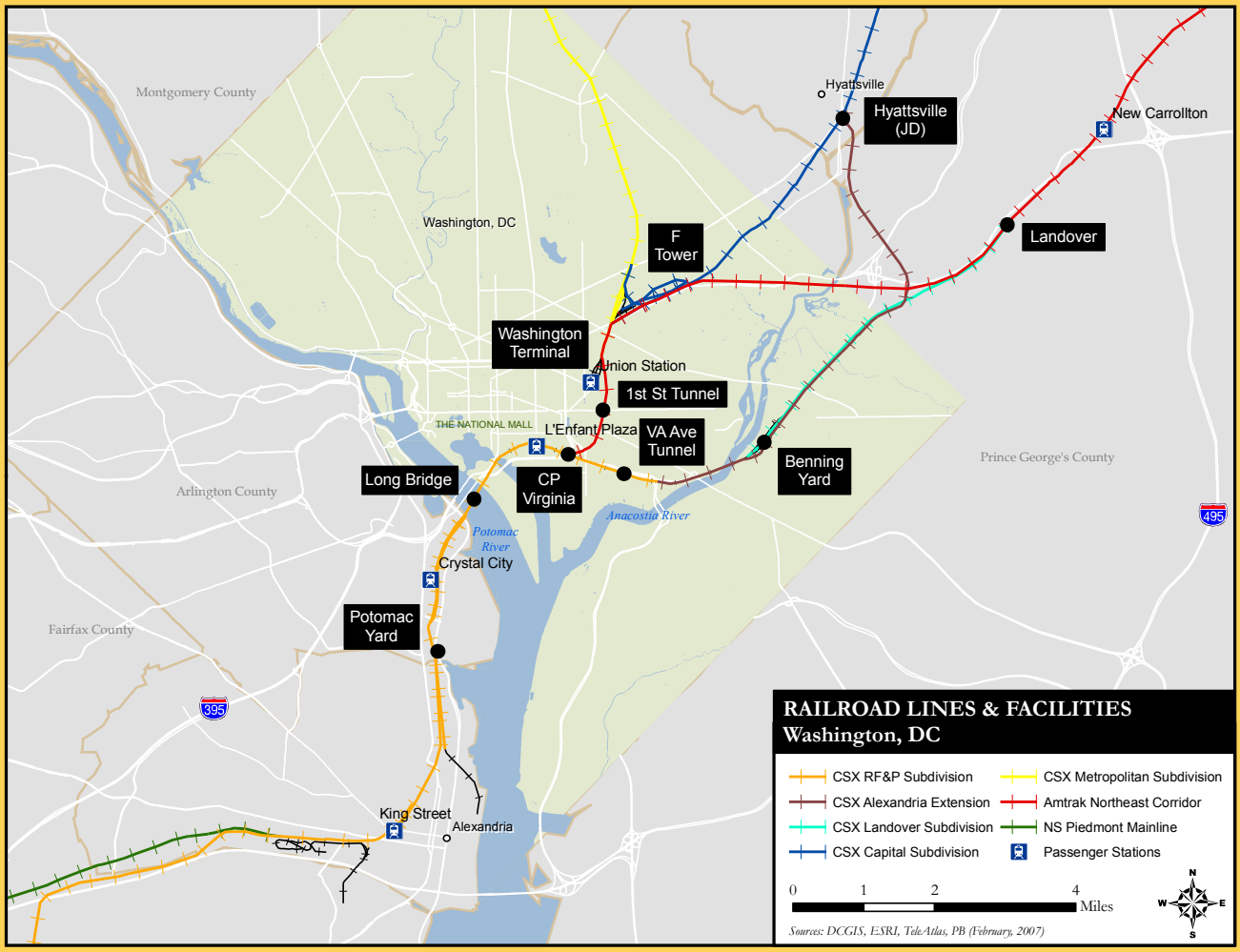

Figure 2-6. Washington, DC Area Railroad Segments

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is fully double-tracked. Heading westward, the line generally follows the Potomac River.

Key constraints on this route include:

- At-grade junctions at Washington, DC, which permit MARC commuter trains from Baltimore and Brunswick to access Washington Union Station. These junctions are known as F (Capital Subdivision) and QN (Metropolitan Subdivision).
- Portion of Metropolitan Subdivision between Washington and Silver Spring where the two main tracks are separated by the Washington Metrorail Red Line in the center of the right-of-way. The speed limit on this segment is restricted to 30 mph for freight trains because of the proximity of Metrorail, and the constrained right-of-way width makes the creation of additional track capacity difficult.
- Barnesville Hill, a significant grade for eastward trains ascending from the Potomac River valley, which limits the speed of freight trains and requires the addition of helper engines on certain trains. The substantial difference in speed between passenger and freight trains in this segment can cause congestion during the commuter peak periods.
- Brunswick, the terminal point for several MARC commuter trains and is the site of a MARC overnight storage and maintenance facility as well as a freight yard and crew change point for CSX.

CSX Main Line, Northeast Leg

The Capital Subdivision of CSX is the primary rail freight route between Washington, DC and Baltimore. The line is double track for approximately 28 miles from JD (Hyattsville) to Halethorpe, Maryland, where it connects with the Old Main Line and becomes a three-track line entering the Baltimore Terminal area. The Baltimore Terminal is the CSX line from Halethorpe, Maryland to near the eastern Baltimore boundary, including the Howard Street Tunnel and CSX's Bay View Yard.

While the line itself has significant capacity, congestion on the line is generated by capacity constraints within the Baltimore Terminal to the north (most notably the single-track Howard Street tunnel through downtown Baltimore) and on the single-track Alexandria Extension to the south. The inter-mingling of CSX freight and MARC commuter trains operating in both directions during the weekday peak periods is another factor contributing to congestion on this line. The CSX yard at Jessup also creates a constraint when freight trains working the yard occupy main line tracks for considerable periods of time. Clearance restrictions through both the Virginia Avenue tunnel and Howard Street tunnel preclude the operation of double-stack freight trains through the Mid-Atlantic corridor.

CSX Old Main Line

The Old Main Line, as its names suggests, is the original route of the B&O Railroad from the Baltimore area to the west. The line connects with the east-west mainline (Metropolitan Subdivision) at Point of Rocks, Maryland, and with the Washington-Baltimore mainline (Capital Subdivision) at Halethorpe. In Figure 2-1, this route appears to offer a short cut between Baltimore and Brunswick, Maryland, bypassing Washington, DC and the busy commuter lines. However, the line follows stream valleys and has many curves that limit the speed that trains can achieve. As a result, the route actually takes longer to navigate than the Metropolitan and Capital Subdivisions for intermodal and merchandise freight trains. Therefore, CSX prefers to operate most of its trains via Washington.

The Old Main Line is a single-track line with five intermediate passing sidings. The Old Main Line also passes through five tunnels, which have been single-tracked to achieve the maximum possible vertical clearance. The tunnels are both a physical constraint for vertical clearance and an operating constraint because of horizontal clearance. This line cannot accommodate double-stack freights in its current state.

Unit coal trains use this route because this traffic is less time-sensitive than intermodal traffic. The Old Main Line also offers a capacity safety valve—an alternative routing for trains between Baltimore and

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the West at times when the Capital and Metropolitan Subdivisions are congested or blocked.

At Point of Rocks, east of Brunswick, Maryland where the Old Main Line meets the Metropolitan Subdivision, there is a full wye connection that permits train movements in any direction. The eastern end of the Old Main Line at Relay, Maryland, in west Baltimore has a connection only in the Baltimore direction.

CSX Pope's Creek Branch

As shown in Figure 2-1, the Pope's Creek Branch is a single-track, un-signaled branch line that roughly parallels U.S. Route 301 in Prince George's and Charles Counties, Maryland. This line was owned and operated by Conrail and was acquired by CSX from Conrail. The primary purpose of the line is to provide coal to two power plants owned by Mirant Energy, at Chalk Point on the Patuxent River in Prince George's County, and at Morgantown on the Potomac River in Charles County. Approximately four to six freight trains travel this branch per week.

The only mainline access to the Pope's Creek Branch is from the Amtrak Northeast Corridor at Bowie, Maryland. The line has two passing sidings, one at the north end of the branch at Bowie and the other in the vicinity of Waldorf, Maryland.

The line is relatively flat and straight with two one-percent grades for southbound trains. There are 47 grade crossings along the whole length of the line from "Bowie" to "Pope." Upgrading the line to mainline standards would entail double-tracking, installation of signals, and extensive grade-crossing eliminations. The route runs alongside the built-up portions of several communities, with both residential and commercial development alongside the right-of-way. The most prominent towns along the line are Bowie, Upper Marlboro, Waldorf, St. Charles, and La Plata.

Definitions

Siding - A very short branch off a main railway line with only one point leading onto it. Sidings are used to allow faster trains to pass slower ones or to conduct maintenance.

Unit Train - A train of a specified number of rail-cars handling a single commodity type that remain as a unit for a designated destination or until a change in routing is made.

Wye - A track arrangement with three switches and three legs, used to turn equipment or to access another rail line from either direction at a junction.

Source: Federal Highway Administration, Office of Freight Management and Operations

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Norfolk Southern North-South Main Line

The north-south NS mainline route in Virginia and Maryland connects with other NS lines in Lynchburg, Virginia and Harrisburg, Pennsylvania. The route bypasses Washington, DC to the west and uses portions of what were historically three different railroads:

- Piedmont Mainline: historically a double-track railroad, the line now has alternating ten-mile segments of single and double track.
- B Line: the mainline route now diverges at Manassas and follows the 50-mile long B Line to Front Royal, Virginia. This route was built initially as a minor branch line. It is single track, lacks a signal system, and is relatively circuitous and slow.
- Shenandoah Line: predominantly a single-track line with sidings for approximately 60 miles between Front Royal, Virginia and Hagerstown, Maryland.

As the level of traffic grows on this route, the number and length of double-track sections will need to increase along the entire line. The B Line, with its limited speed, single track, short and infrequent passing sidings, and lack of signals and centralized traffic control, is the major capacity constraint and barrier to traffic growth on this line.

Norfolk Southern Manassas-Alexandria Branch

This segment comprises the northern end of the Norfolk Southern Piedmont main line. The line is fully double-tracked, primarily to accommodate VRE commuter service. VRE station platforms are located only on the southernmost track, which restricts VRE service to this track. VRE operates primarily eastbound towards Washington in the morning peak and westbound in the evening peak.

Amtrak Northeast Corridor

The Northeast Corridor is the primary passenger rail route linking Washington, Baltimore, Philadelphia, New York, and Boston. Though Amtrak service continues south of the District, it uses lines owned by others. Between Washington and Baltimore, the number of tracks varies from two to four, with three tracks as the most common configuration (normally two operating northbound and one southbound). The line is electrified with an overhead catenary system. Freight traffic on the corridor is minimal, although both NS and CSX have trackage rights over portions of the line.

Key bottlenecks on this route include:

- Lack of a southbound express track between Baltimore and Washington (northbound direction has both express and local tracks between New Carrollton and West Baltimore)
- First Street Tunnel, Washington: two-track line with limited overhead clearance
- Washington (NY Avenue) to Landover: two-track line
- B&P Tunnel/West Baltimore to Baltimore: two-track line with limited vertical clearances. Restricted to cars of Plate C Dimensions or less.

Operational Characteristics and Railroad Facilities

The terminals and yards located in or adjacent to the District are shown in Figure 2-6.

Terminals

Washington, DC is not a major terminal location for rail freight. Most freight trains run through the Washington area without stopping to pick up and drop off cars or change train crews. Major terminal and yard facilities for CSX are located at Baltimore to the north, Cumberland to the west, and Richmond to the south. NS has major terminals at Harrisburg, Pennsylvania and Spencer Yard in Linwood, North Carolina, as well as several yards within the study area, described below.

Washington is a major terminal for passenger operations and the southern end of Northeast Corridor electrification and Amtrak-owned rail lines. Washington Terminal is owned and operated by Amtrak; MARC and VRE are effectively tenants of Amtrak and have executed agreements with Amtrak that enable them to use facilities within the terminal.

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The terminal has connections to four different rail lines:

- CSX RF&P Line to the south, at CP Virginia near the south portal of the First Street Tunnel
- CSX Metropolitan Subdivision and Capital Subdivision, each accessed via track connections from C Interlocking north of Union Station.
- Amtrak Northeast Corridor, which connects to the terminal just north of the New York Avenue Bridge over the rail right-of-way.

Rail Yards and Equipment Maintenance/ Storage Locations

The passenger and freight rail yards, maintenance, and storage locations related to the study area are discussed below. The number of sets, or combination of passenger locomotives and cars, is listed for each passenger facility. The sets are made up at each yard and eventually dispatched as a train.

Passenger

Virginia Railway Express commuter trains are stored, cleaned, inspected and serviced overnight at two locations:

- Crossroads (south of Fredericksburg, on the CSX RF&P line), 6 sets
- Broad Run (west of Manassas, on the NS Piedmont mainline), 5 sets

MARC stores trains overnight at four locations:

- Baltimore Penn Station (on the Amtrak Northeast Corridor), 6 sets
- Riverside, Baltimore, 5 sets
- Frederick (MARC), 3 sets
- Brunswick (MARC) 4 sets
- Martinsburg, WV, 2 sets

The facilities at Brunswick and Riverside are on CSX-owned land adjacent to freight yard facilities. MARC diesel locomotives are maintained at Riverside. Limited coach maintenance is performed at both locations. The yard and shop at Frederick are relatively new facilities owned by the Maryland Transit Administration. Baltimore Penn Station has minimal facilities for equipment maintenance and is used primarily for overnight storage, cleaning and inspection of equipment.

Both commuter railroads store trains during the midday period at Washington Terminal. VRE uses several tracks in the Ivy City Coach Yard. MARC currently stores trains at the platform in Washington Union Station but is planning to construct its own storage yard adjacent to the Coach Yard.

Amtrak has a major maintenance facility at Ivy City in Washington Terminal. Amtrak stores and maintains its own Northeast Corridor equipment at this location and also performs maintenance for both MARC and VRE. VRE's diesel locomotives and MARC's electric locomotives are maintained by Amtrak at Ivy City.

CSX

CSX has yard facilities at the following locations:

- Benning Yard, Washington, DC: primarily used for staging coal train movements to the power plants along the Pope's Creek Branch
- Baltimore Terminal: three major yards within the terminal, supplemented by several minor yard facilities:
  - ◊ Curtis Bay: south side of Baltimore harbor, primarily serving coal and other bulk unit trains, including the coal export terminal
  - ◊ Locust Point: south side of Baltimore harbor, serving general cargo traffic
  - ◊ Bay View: north side of Baltimore harbor, serving the Baltimore container port, roll-on roll-off terminal and general cargo
- Jessup Yard: facility for off-loading of automobiles, and origin point for local trains operating on the Capital and Metropolitan Subdivisions and Alexandria Extension
- Brunswick Yard: origin point for local trains operating on the Metropolitan Subdivision
- Acca Yard, Richmond, Virginia: origin point for local trains operating on the RF&P Subdivision

Norfolk Southern (NS)

NS has yard facilities at the following locations:

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- Manassas Yard, Virginia: located at the junction of the Piedmont mainline and the B Line, this yard is the origin point for local trains operating on both lines in the study area, as well as a daily merchandise train that operates over the B Line and Shenandoah Line.
- Linwood Yard, North Carolina: this is a major classification yard for freight from the Carolinas and Georgia destined for the Northeast.

NS also has a major yard in Baltimore, serving the Port of Baltimore. It is located near the CSX yard at Bay View and is accessed from the north via the Amtrak Northeast Corridor and the Port Road Branch, an NS line that follows the Susquehanna River between Perryville, Maryland and Harrisburg, Pennsylvania.

Although the trackage rights are infrequently used, NS also has access to Baltimore, Wilmington, and Philadelphia via either the Amtrak Northeast Corridor from Washington or the CSX line from Washington to Philadelphia.

Current and Future Traffic Levels

Figure 2-7 shows the present and projected traffic levels for intercity, commuter, and freight rail traffic through the study area. The future year numbers represent 2012-2015 planned or projected traffic levels based on CSX data and passenger railroad plans. The RF&P Subdivision, the primary CSX line being studied, presently carries 62 trains per day. Within five years, intercity traffic on this line is expected to

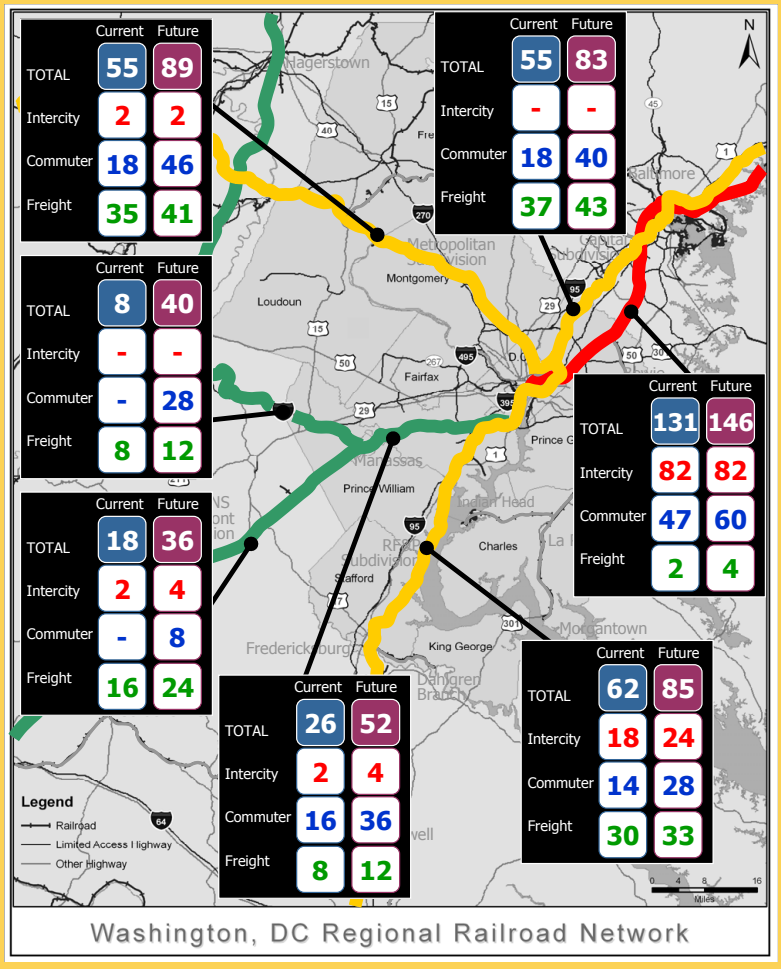

Figure 2-7. Current and Future Traffic Levels
Source: CSX, Amtrak, VRE, and MARC

Railroad and Regional Characteristics

increase by 33 percent, commuter by 100 percent, and freight by 10 percent.

The current railroad is both physically and operationally constrained. Without investment to increase the capacity of existing rail infrastructure, the ability of these rail lines to attract and successfully accommodate future growth in both freight and passenger traffic will be limited. The operating railroads and the commuter authorities in Maryland and Virginia recognize this and have embarked on a program of capacity improvements, which CSX and NS will construct and the states will underwrite.

The committed capacity improvements address and ameliorate the 2002 levels of service, but traffic has grown to the point where the additional capacity has already been consumed and a next round of capacity improvements is necessary. For long-range planning, and to account for the increase in capacity that a Washington freight realignment could provide, additional potential future traffic would need to be allowed for—including increased diversion of freight in the I-95 and I-85 corridors from truck to rail.

Both MARC and VRE are projected to double their current ridership levels by 2025. As passenger traffic grows, the number of trains operated also will increase. Projected increases in intercity passenger traffic on the RF&P were identified in the Washington-Richmond corridor plan of 1999. Future commuter train volumes depend on negotiations between the commuter authority and the operating railroad.

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Railroad Security Considerations

A security risk assessment consists of three primary components: threats, vulnerabilities, and consequences. Although all hazmats on the rail line are a concern, the transport of toxic inhalation hazard (TIH) materials and their potential impact on dense population and economic centers warrant the greatest attention.

Threats

A threat is any intentional circumstance or event with the potential to cause loss of, or damage to, an asset or death and/or injury to people. The U.S. Department of Transportation (USDOT) has found that both national and international terrorist groups have typically targeted large gatherings or dense population centers with the hope of disrupting the mobility and economic vitality of communities. They have sought to cause a large number of casualties and inflict severe damage to historical or landmark sites, high-value assets, transportation systems, and economic centers.

Within the Washington, DC region, freight and passenger railroad operations face a spectrum of threats. These threats include:

- Using improvised explosive devices (IEDs), vehicle-borne explosive devices (VBIEDs), and other explosive devices to perpetrate catastrophic structural damage to rail infrastructure, including overpasses and interlockings, to impact freight distribution;
- Disrupting Amtrak, MARC, or VRE passenger rail operations by causing the release of TIH cargo from a rail tank car within the rail alignment;
- Causing catastrophic injury and death in densely populated areas of the Washington, DC region at mass gatherings or large-scale events, such as 4th of July celebrations on the National Mall, by causing the release of TIH cargo;
- Disrupting government and business centers and/or vital utility structures within the Washington, DC region through the release of TIH cargo;
- Destroying well-known national icons, historic landmarks, and other significant targets such as the U.S. Capitol by causing flammable or explosive cargo to ignite; and
- Combining any or all of the above.

Railroad infrastructure within the Washington, DC region makes for an attractive terrorist target because it transports hazardous materials close to iconic structures, dense populations, and economic centers. The existing CSX mainline passes through the Southwest Federal Center where more than 77,000 employees work daily. Most of these employees work in federal buildings including the Department of Agriculture, Department of Energy, Department of Transportation, and Department of Education. The existing CSX mainline is also located less than one-half mile from the U.S. Capitol, which is not only a large office building but also a key national symbol.

Even before the 9/11 attacks, the FBI had placed the Washington, DC region at the top of its potential terrorist target list because of its iconic status as the symbol and seat of American power and the potential consequences of an attack, which include disrupting/destroying federal government operations and its associated leaders. Terrorists could consider an attack against any target with in the Washington, DC region to be an attack against the United States.

Terrorists typically evolve their tactics to improve the success of their attacks. It is probable that terrorists have considered using rail tank cars loaded with hazmat as a weapon to cause mass casualties. A similar tactic was recently used when terrorists used chlorine truck bombs to cause mass casualties in Iraq.

Vulnerability

The vulnerability of an area or target is assessed by analyzing terrorist weapons and their delivery methods. The most popular weapons currently used by terrorists are the IED and the VBIED. Though either of these weapons can cause significant damage and injury by itself, they can also be used to rupture a freight car with a toxic or explosive cargo, resulting in catastrophic consequences. The rupture of a tank car

Railroad and Regional Characteristics

containing TIH cargo at a critical location, by either an intentional derailment or a direct attack to the rail tank car, could possibly cause many of the threats previously discussed. Accidental freight derailments involving TIH cargo have proven lethal in the past. On January 6, 2005, an NS freight train missed a switch and crashed into a locomotive stored on a spur track in Graniteville, SC. The collision caused a tank car with 90 tons of chlorine to rupture. Nine people died as a result of chlorine inhalation and more than 550 people sought medical assistance.

Another type of attack is the sabotage of railroad infrastructure. In 1995, the criminal tampering of a freight rail track in Arizona caused an Amtrak passenger train derailment that resulted in the loss of life. This type of intentional sabotage could cause train derailment within the District's Monumental Core, in turn causing loss of life and damage to iconic structures.

To assess the vulnerability of a target, elements such as access, detection, interdiction,[1] and security protective countermeasures are considered. Any vulnerability identified within those elements may be mitigated through implementation of the appropriate countermeasure. These countermeasures can include physical barriers (i.e. fences, locked gates, etc.) to deny or deter entry to an area, technological sensors/ intrusion detectors, visible security patrols, security cameras to detect unauthorized intrusions, and emergency response plans and training.

This study included a high-level inspection of key rail alignment points within the Washington, DC metropolitan area. The inspection found several vulnerabilities:

- Fences and gates needing maintenance
- Lack of physical pedestrian and vehicles barriers to the railroad
- Lack of security patrols
- Lack of enforcement of parking and trespassing violations
- Poor area lighting, lack of appropriate signage
- Insufficient public awareness/public involvement
- Track areas that are hidden in remote locations without any type of alarm, CCTV, or detection sensor systems

Another vulnerability found was the stopping and holding of freight trains in unprotected areas. Because of railroad traffic bottlenecks approaching and within the District, freight trains regularly sit and wait for congestion to clear in locations such as Crystal City, Anacostia, and Northeast DC. This issue is discussed in Appendix B.

Consequence

Consequence is the effect of a terrorist attack in terms of casualties, economic loss, political impact, and psychological damage. The consequence of an attack in the Washington, DC region includes the disruption of government at the local, state and federal levels. This consequence of stopping/ disrupting the functions of the U.S. Capitol and other federal government agencies would be catastrophic not only to the region, but to the entire United States and its international allies. Reducing vulnerabilities and improving response and recovery will reduce consequence.

The consequence of the rupture of a hazmat rail tank car containing TIH cargo in the Washington, DC region has been previously analyzed by others. This scientific computer analysis using simulation technology showed that if a TIH such as chlorine were released in the District during a major public event, a several-square-mile area could be covered and 100,000 people could be put at serious and lethal health risk within the first 30 minutes.[2] The consequences of such an attack would depend on atmospheric conditions, the amount of TIH cargo released, and the population within the release area, among other considerations. These consequences from a TIH release—massive

1 Interdiction is a tactical operation used to divert, disrupt, delay, or destroy a terrorist action before it can be used against a target.

2 Presentation of Dr. Jay Boris, U.S. Naval Research Laboratory, to D.C. Council, October 6, 2003.

death and injury, economic loss, psychological and political impact, and attacking an icon—are the ultimate goals of terrorists.

Installation of New Security Measures on the Rail Line

In response to the security risks to the rail line in this study, the U.S. Department of Homeland Security is undertaking the National Capital Region Rail Pilot Project (NCRRPP), a test-bed project using technology to create a virtual security boundary for the rail line.

The boundary will consist of two elements, a virtual fence surrounding the rail line and virtual gates installed at each entry to the rail corridor. Monitoring and surveillance equipment, including security lighting, infrared intrusion detectors, fixed cameras, pan/tilt/zoom cameras, and radio frequency identification transmitters/receivers, will be mounted on poles at the tracks to provide intelligent video surveillance of the rail line as well as detection, identification, and distinction between unauthorized and authorized personnel. The virtual gates will be designed to provide advance notification of train traffic approaching the line with identification signal recognition as well as early detection equipment for radioactive materials, chemical agents, and toxic industrial chemicals. The system will be designed to allow around-the-clock monitoring of real-time streaming video and data from CSX's and Amtrak's police communication centers and from other law-enforcement command centers. The system's design will allow additional technologies to be incorporated as they become available.

The NCRRPP will increase the level of surveillance and monitoring of the rail line, but it will not completely remove security concerns. The NCRRPP will not prevent access to the rail line.

Regional Freight Markets

The Washington, DC region generates a limited amount of freight-rail traffic and relies heavily on truck transportation to deliver and ship goods. This is due to several factors, including:

- The region's economic composition, which is predominantly service and government oriented;
- The absence of major manufacturing or transportation facilities (i.e. port, rail terminal); and
- The ability for trucks serve the region's needs from distribution centers on the periphery of the metropolitan area or from nearby states.

Unlike Baltimore, which has a maritime port, there are no major freight-generating facilities for rail traffic in the Washington, DC region. Instead, the region's freight-rail demand is primarily related to the consumption of goods and energy (inbound) and the generation of waste materials (outbound). Overall, freight-rail tonnage originating or terminating in the District and its suburbs is a small percentage of the total tonnage moving on the region's rail system. Most traffic in the region—and especially on the rail line under study—is traffic moving through the region as it is shipped between other states; this is also called overhead traffic.

In order to quantify the freight-rail shipments in the District and on the CSX line under study, the following freight market overview draws from the Carload Waybill Sample Data obtained from the U.S. Surface Transportation Board. This data set is a stratified sample of carload waybills obtained from railroads that provides information on commodities, origin, termination, and rail carrier(s). For purposes of this study, local traffic is traffic originating, terminating, or moving solely within the District.

The focus of this study was the north-south freight movements through the District. Rail freight movement between Richmond and points west is lower in magnitude and has lower future growth potential than north-south freight, primarily because good alternate rail routings exist for the south-to-west traffic.

Railroad and Regional Characteristics

Traffic Description

In 2005, more than 22.4 million tons of freight traveled north-south on the rail line under study.[3] This total included more than 97,940 local inbound tons, 112,332 local outbound tons, no "internal" tons traveling solely within the District, and 22.2 million through-traffic tons.[4] Figure 2-8 shows the distribution of the inbound, outbound, and through shares of the District's total freight rail tonnage for 2005. In percentages, inbound accounted for 0.5 percent, outbound was 0.4 percent, and through traffic accounted for 99.1 percent.

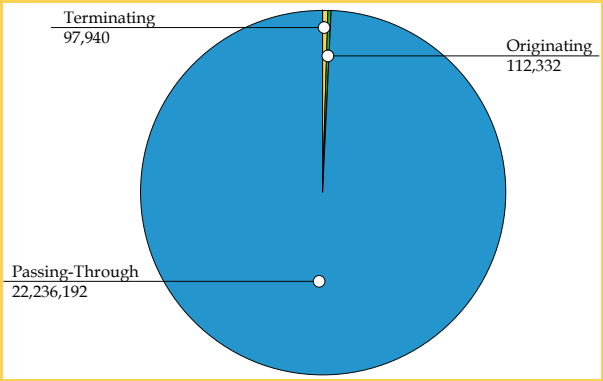


Figure 2-8. DC Freight Rail Tonnage (2005)

The District's 2005 rail freight traffic consisted of 251,689 carloads and 116,800 intermodal units (trailers and containers) in 2005.[5] Figure 2-9 illustrates the share of carload versus intermodal freight rail movements in the District. Thirty-two percent of all unit movements were intermodal. Of the local inbound and outbound traffic, there were 2,264 carloads and no intermodal units.

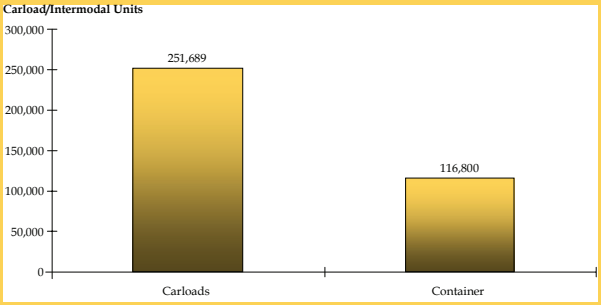


Figure 2-9. DC Rail Carloads and Intermodal Movements (2005)

Figure 2-10 displays the ten top origin and destination rail movements through the District by state pairs. With nearly 1.5 million tons in 2005, South Carolina-Pennsylvania was the top state pair moving cargo through the District, representing 6.5 percent of the total through tonnage. Traffic moving between Illinois and North Carolina comprised 4.2 percent of freight movements, and traffic moving between West Virginia and Virginia totaled 2.8 percent of the total freight movements. Of the local inbound and outbound moves, traffic between West Virginia and the District

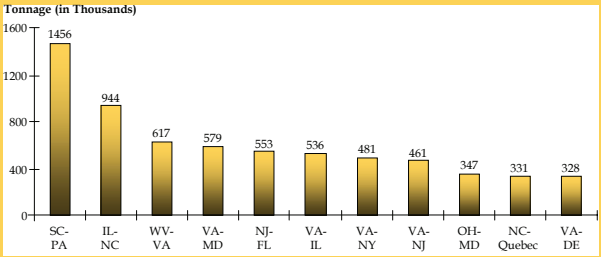


Figure 2-10. DC Rail Movements - Top 10 Origin and Destination Pairs (2005)

3 This section uses the 2005 Surface Transportation Board Carload Waybill Sample. For the purpose of this study, DC rail traffic is considered any traffic moving north-south through in the District of Columbia.

4 Terminology used in this report. "Inbound" is interstate traffic terminating in DC. "Outbound" is interstate traffic originating in DC. "Local" is DC intrastate traffic. "Through" is traffic neither originating nor terminating in DC, but passing through the State. "Origins" include both outbound and local. "Terminations" include both inbound and local.

5 Carload total excludes cars hauling intermodal units.

was heaviest. Table 2-1 shows the top District inbound or outbound origin and destination pairs.

The commodities listed in Figure 2-11 represent the highest tonnage commodity groups moving through the District. Coal movements are dominant, comprising 17 percent of the total tonnage in 2005. Waste or scrap materials follows at 13 percent; pulp, paper, or allied products at 11 percent; chemical or allied products at 9 percent; and food or kindred products at 8 percent.

Of the local traffic, waste or scrap materials comprise all of the outbound District traffic. Coal destined for the Capitol Power Plant, waste or scrap material, electrical machinery, equipment or supplies, and transportation equipment are all commodities traveling inbound. Table 2-2 shows the percentage of all inbound District traffic by commodity type.

Of the commodities moving through the District, 1,686,085 tons are considered hazmat, representing approximately eight percent of the total tonnage. Nationally, approximately 0.3 percent of hazmat shipments by rail are toxic substances—such as chlorine gas—that would pose inhalation risks if released.[6]

Market Analysis

When assessing the implications of alternative rail alignments through the study area, it is important to understand both the current market for freight rail shipments as well as how that market could change as a result of relocating the rail. This section describes the existing market for rail freight in the District as well as future trends and opportunities that may influence that market.

Existing Market Conditions

Although the vast majority of freight rail movements within the District consist of overhead traffic and

6 Testimony of Edward Hamberger, American Association of Railroads, Hearing Before the U.S. House of Representatives Committee on Transportation and Infrastructure, Subcommittee Railroads

Table 2-1. Washington, DC Top Trading Partners (Annual Carloads)

Trading Partner	Number of Carloads
West Virginia	720
Virginia	716
New Jersey	296
Delaware	132
Massachusetts	120
North Carolina	120
Florida	80
Maryland	40
New York	40

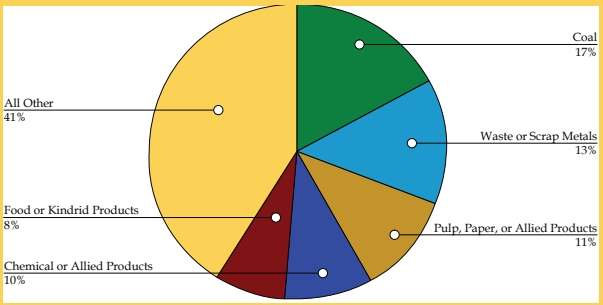


Figure 2-11. Top Commodities by Tonnage Moving Through DC (2005)

Table 2-2. Percent of Total DC Inbound Freight Rail Commodities

Coal	64%
Waste or Scrap Materials	27%
Electrical Machinery, Equipment or Supplies	5%
Transportation Equipment	4%

Railroad and Regional Characteristics

freight rail plays a small role in the overall freight transportation system within DC, it is critical in the movement of two primary market segments:

- **Coal**, which is used by the U.S. Capitol Power Plant. This plant is fed primarily by coal and entering the District from the south.
- **Warehousing and distribution services**, for various bulk commodities including wood and paper products. Distribution centers primarily feed the region's construction activities.

The limited existing market for freight rail destinations in the District is not surprising, as the regional economy consists primarily of service-related industries and government. These industries have limited rail freight transportation needs.

Recognizing the limited market for rail service that currently exists in the District, there are several other sectors of the local economy that could potentially be served by rail, particularly the manufacturing, transportation/utility, and wholesale trade industries. Table 2-3 shows the contribution of these three sectors to the economy of the District, as well as the percentage of each sector's contribution to the gross regional product (GRP) that is spent on transportation. These three industry sectors—manufacturing, transportation/utility, and wholesale trade—are transportation-intensive industries. They rely heavily on the transportation system to carry goods related to their businesses. If freight rail offered a more desirable transportation option than the current transportation options available, some businesses in these sectors could potentially shift their transport mode from truck to rail.

Retail is an important sector because it is the end point of the logistics chain. The location of warehouse/distribution facilities serving importers and exporters is critical in determining traffic patterns. Large shippers like Wal-Mart and Target, for example, receive import containers through ports and typically dray them by truck to warehouse/distribution centers; orders to local stores or secondary distribution centers are filled from these primary centers. Several of the

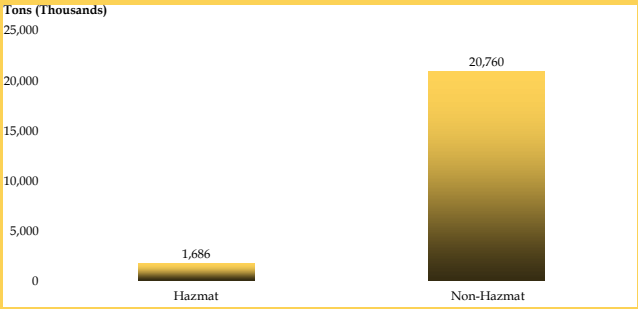


Figure 2-12. Hazardous Material Rail Movements (2005)

Table 2-3. Transportation-Intensive Industries Contribution to GRP and Transportation Costs

Industry	Contribution to GRP 1997 (in $ millions)	Contribution to GRP 2004 (in $ millions)	Transportation Costs as a Percent of Annual Output
Manufacturing	246	232	3.2%
Transportation/ Utility	817	1,150	7.1%
Wholesale Trade	545	715	4.7%

Source: U.S. Bureau of Economic Analysis & Bureau of Transportation Statistics (Transportation Satellite Accounts)

Railroad and Regional Characteristics

individual establishments in these industry sectors are located adjacent to the existing freight rail mainline. Figures 2-13, 2-14, 2-15, and 2-16 show the locations of manufacturing, transportation/utility, wholesale trade, and retail establishments with more than 25 employees that are close to the rail mainline. The map is only an indicator of potential rail shippers; only a small percentage of those located on the line ship by rail.

Railroad and Regional Characteristics

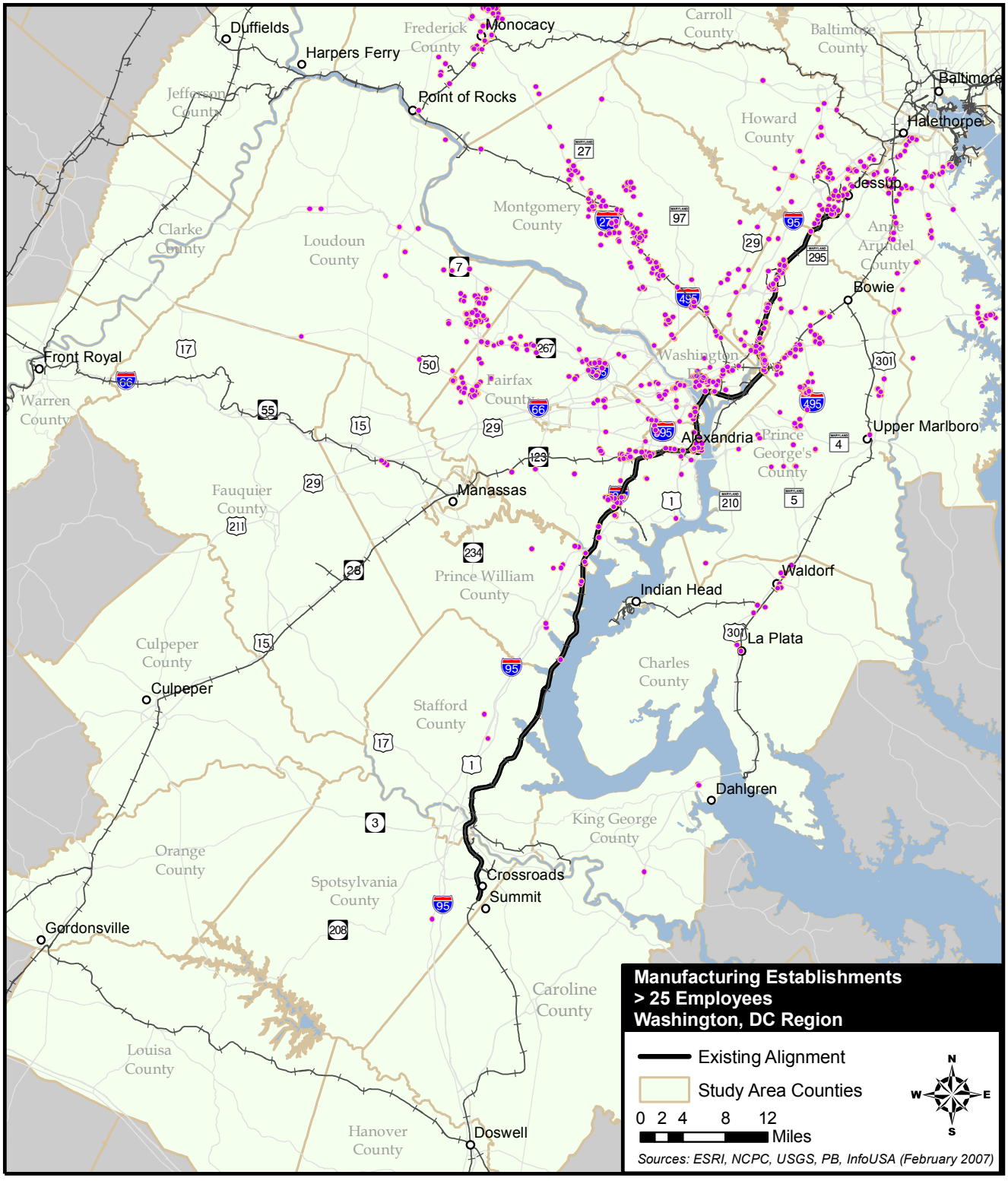


Figure 2-13. Manufacturing Establishments > 25 Employees

Railroad and Regional Characteristics

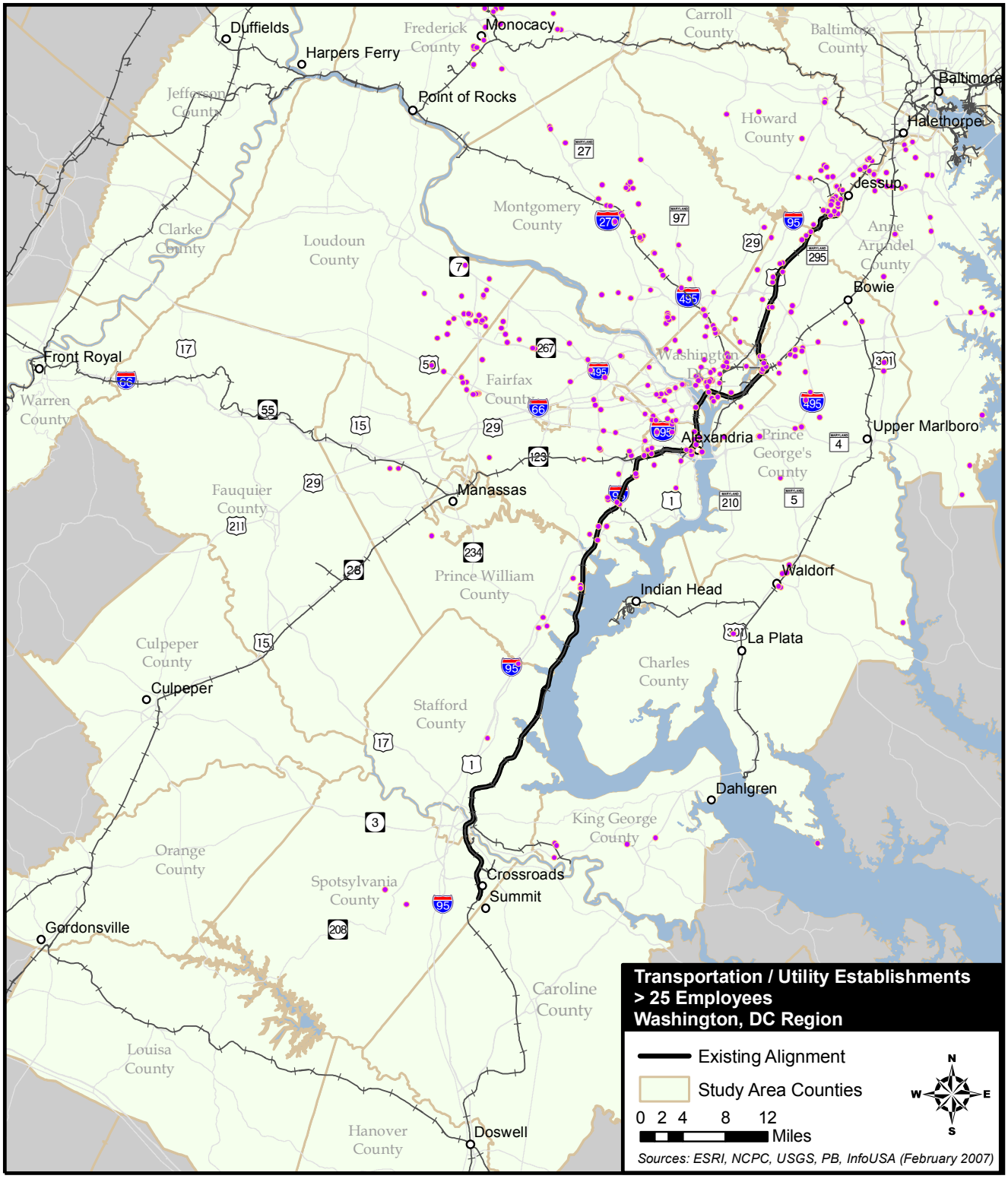


Figure 2-14. Transportation/Utility Establishments > 25 Employees

Railroad and Regional Characteristics

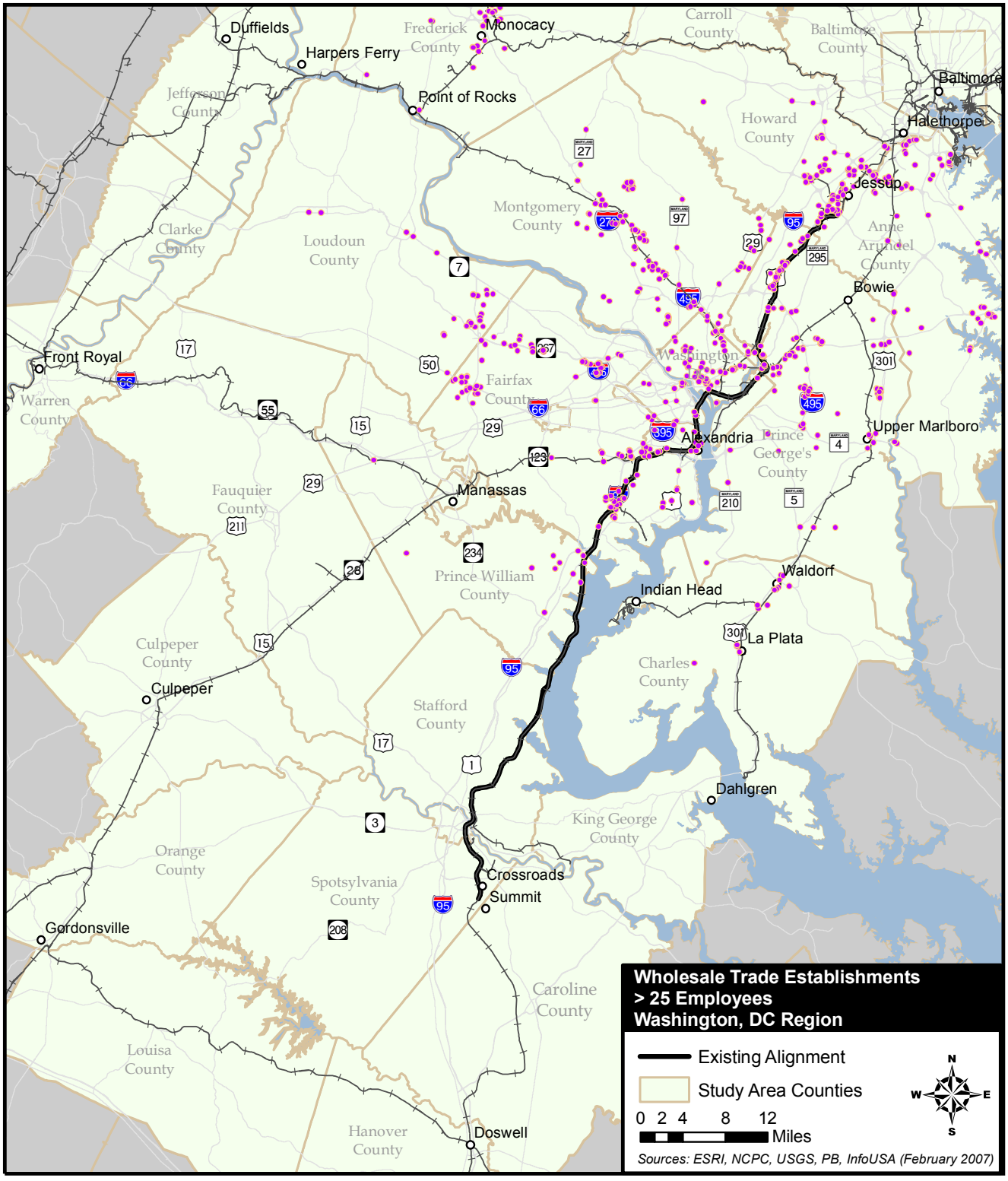


Figure 2-15. Wholesale Trade Establishments > 25 Employees

Railroad and Regional Characteristics

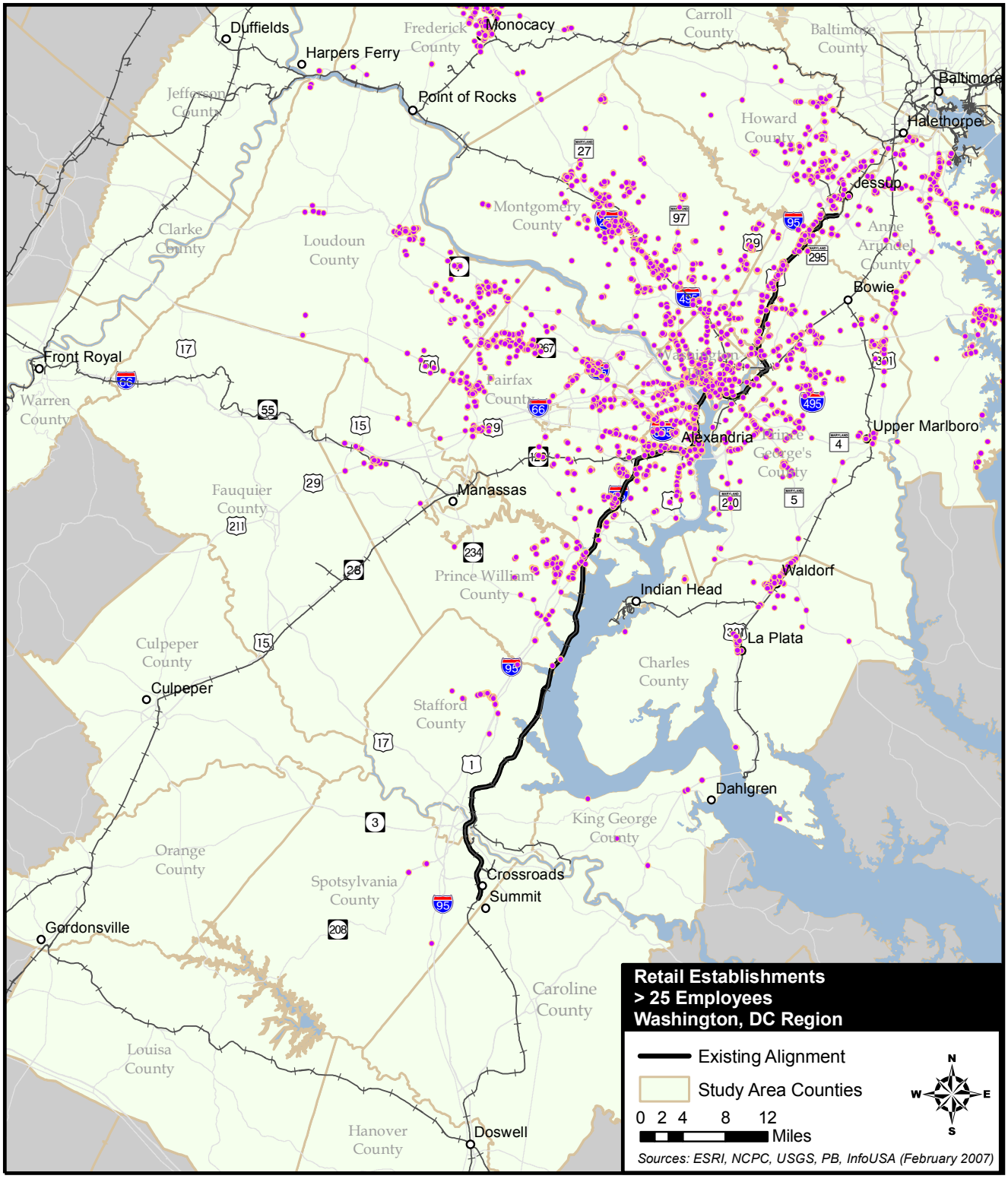


Figure 2-16. Retail Establishments > 25 Employees

Railroad and Regional Characteristics

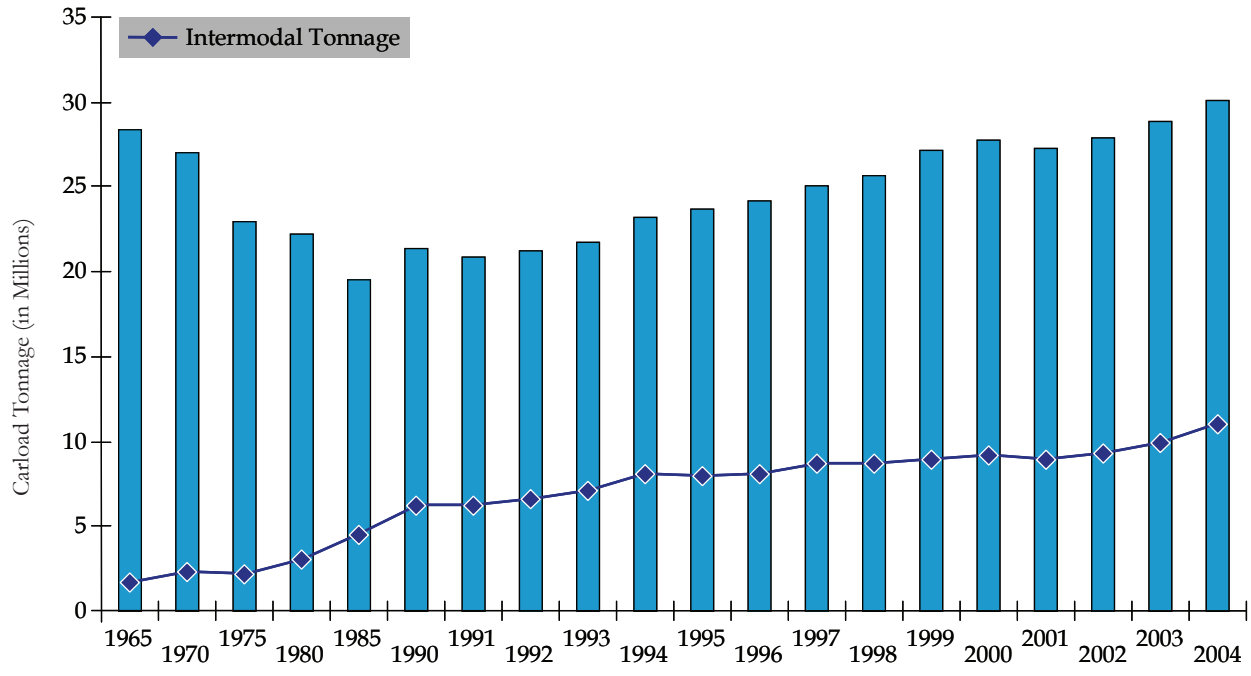
Future Market Opportunities

Forecasts suggest that coal shipments to region's coal-fired power plants will be the most important local market commodity for the railroads in both the near and long terms. Many of the railroads' existing coal contracts are long-term, which provides the railroads with some degree of assurance of both current and future volumes of coal traffic. In addition, there are two other key trends that will impact the type and volume of freight rail traffic serving the District: growth in intermodal traffic and regional population growth.

Class I railroads regionally and nationally are seeing significant changes in their overall traffic mix. Although both carload and unit train traffic continue to be important contributors to the revenue of the Class I railroads, particularly in the Washington, DC region with its significant volumes of coal, the Class Is are handling increasing volumes of intermodal and auto carrier traffic. Figure 2-17 shows that growth in intermodal traffic has greatly outpaced growth in carload traffic (560 percent to 6 percent growth since 1965, respectively) and currently is the primary revenue generator for the Class I railroads.

Class I railroads nationally and in the mid-Atlantic region will continue to focus on intermodal traffic. It is anticipated that railroads will likely choose to allocate capacity to intermodal shipments at the expense of other, less-profitable traffic, in order to boost revenue. As the railroads continue to focus on serving intermodal traffic, future service for local customers of non-coal carload traffic may become more limited.

Currently, intermodal rail traffic bound for the District is routed to intermodal facilities in Pennsylvania, Maryland, and New Jersey and shipped into the region by truck. Because of the distances involved, drayage



Source: AAR.

Figure 2-17. Growth in Intermodal Traffic

Railroad and Regional Characteristics

operators can make only a handful of shipments per day, driving up costs for regional shippers, receivers, and consumers and contributing to congestion along the region's highways.

Developing a more accessible intermodal rail facility to serve the region's growing freight demand would improve the overall efficiency of the supply and distribution chain, allowing the railroads to capture additional market share; reducing costs for regional shippers, receivers, and consumers; and attracting additional industries (and jobs) to surrounding areas. The region's population growth is fueling demand for freight service to retail establishments as well as regional warehouses and distribution centers.

Table 2-4 shows that overall national freight demand is expected to grow from 14 billion to 27 billion tons across all modes. Despite the growth in overall freight traffic, rail's mode share is expected to decline from approximately 13.3 percent in 2002 to approximately 12.9 percent in 2035. Although rail is expected to retain its current market share for traditionally rail-served commodities (i.e., higher weight/lower value goods), these commodities are not forecasted to grow as rapidly as the commodities that are predominantly handled by truck or air.

The overall growth rates for freight shipments in the Washington, DC region shown in Table 2-5 are expected to be much higher than the national average, according to the Federal Highway Administration Office of Freight Management and Operations, though the overall volumes will be much lower. Localized growth rates were derived from several national and metropolitan sources and, in the case of a small geographic region like the District, may not accurately reflect local conditions.

A more realistic estimate of rail freight traffic is provided by the Virginia State Rail Plan[7] and the

Table 2-4. National Freight Growth by Mode, 2002-2035 (millions of tons)

	Truck	Rail	Air	Water	Total
2002	11,539	1,879	10	701	14,129
2035	22,814	3,525	27	1,041	27,407
Growth Rate	97.7%	87.6%	170%	48.5%	94.0%

Source: FHWA, Office of Freight Management and Operations

Table 2-5. Freight Growth by Mode in DC Metropolitan Area, 2002-2035 (millions of tons)

	Truck	Rail	Air	Water	Total
2002	11.6	<0.3	<0.3	1.2	13.2
2035	45.4	<0.3	<0.5	5	51.0
Growth Rate	291%	-	66.6%	316%	286%

Source: FHWA, Office of Freight Management and Operations

Table 2-6. High and Low Growth Rates for DC Freight Rail Shipments, 2002-2035[6]

	2005 Tons	2035 Tons
Low Growth (1% annual)		
Local Traffic (DC Inbound and Outbound)	210,272	283,415
Overhead Traffic	22,236,192	29,971,027
High Growth (2.5% annual)		
Local Traffic (DC Inbound and Outbound)	210,272	441,060
Overhead Traffic	22,236,192	46,641,915

7 *The Virginia State Rail Plan: A Multimodal Strategy to Meet the Commonwealth's Passenger and Freight Transportation Needs Through 2025*. Virginia Department of Rail and Public Transport. June 2004.

Railroad and Regional Characteristics

Maryland Multimodal Freight Profile,[8] both of which provide estimates of freight rail growth that more effectively account for local conditions. Using these resources as a guide, high and low growth scenarios were developed. Table 2-6 shows the anticipated change in rail freight traffic within the Washington, DC region under both scenarios.

This study assumed the average annual intermodal and general merchandise growth rates are 3.01 percent and 1.07 percent, respectively. These are the same freight rail growth rates as in the 2002 Mid-Atlantic Rail Operations Study (MAROPS).

Market Conclusions

Ultimately, the Washington, DC region is a "through zone" for goods transported by rail, meaning goods move through the District but do not typically have their origination or destination in it. A review of regional land use maps shows that the industry types most likely to use rail are clustered along the existing alignment. However, it is unlikely that the District's local rail market will see anything more than modest growth at best. A realignment alternative should not affect the one percent of rail traffic that does have its origin or destination in the District. Regardless of any alignment alternative selected, it is expected that accommodations can be made to ensure current District shippers and receivers do not lose rail service.

Outside of local benefits and impacts, there may be larger regional and national benefits that accrue from realigning the CSX freight railroad. For example, opportunities may exist for the development of an intermodal rail facility within the study area. An intermodal facility, where freight could be transferred from rail to truck and then distributed to regional localities, could be developed under any alignment alternative. The location and utilization of rail intermodal terminals can attract rail traffic and spur economic development while deemphasizing truck traffic.

Regardless of any new facilities, national rail market growth will be significant in the future, and it could be accelerated by projects, like the rail realignment in this study and other MAROPS recommendations, that would allow for a substantial increase in capacity along the entire Northeast Corridor. For example, any rail project along the Northeast Corridor that allows for double-stack trains will ultimately move the entire Northeast rail system one step closer to being more efficient and able to carry more goods. If railroads are able to increase the amount of goods they carry, due to improved infrastructure that allows them to increase capacity and capture a larger segment of the future freight market, this translates into significant

Definitions

Class I Carrier - A classification of regulated carriers based upon annual operating revenues. Motor carrier of property: greater than or equal to $5 million: Railroads: greater than or equal to $50 million. Motor carriers of passengers: greater than or equal to $3 million.

Drayage - Transporting of rail or ocean freight by truck to an intermediate or final destination; typically a charge for pickup/delivery of goods moving short distances (e.g., from marine terminal to warehouse).

Shipper - Party that tenders goods for transportation.Source: Federal Highway Administration, Office of Freight Management and Operations

Supply Chain - Starting with unprocessed raw materials and ending with final customer using the finished goods.

Warehouse - Storage place for products. Principal warehouse activities include receipt of product, storage, shipment and order picking.

Source: Federal Highway Administration, Office of Freight Management and Operations

8 *Maryland Multimodal Freight Profile (Draft Report)*. Cambridge Systematics. October 2005.

transportation benefits for shippers, receivers, and the general public.

Baseline Environmental and Social Characteristics

The environmental and social characteristics of the Washington, DC region are reflective of an area with a rich history, a nearby major estuary, a strong economy, and a prominent defense industry. To analyze this mix, a geographic information system database was developed that included the major features of the natural and built environment as well as the transportation network. A broad scan was done to identify the major constraints and opportunities for a new freight railroad alignment through the region.

For the purposes of this study, the region comprises the study-area jurisdictions shown in Figure 2-18, which spans from Frederick and Carroll Counties in Maryland to the north, Anne Arundel County in Maryland to the east, Hanover County in Virginia to the south, and Warren County in Virginia to the west. This is larger than the Metropolitan Washington Council of Governments (MWCOG) planning area. The study area evolved over the life of the project as potential freight railroad corridors were identified and screened.

Environmental Features

The consideration of major environmental features at the early stages of a project can help ensure a context-sensitive and efficient solution. If the federal government were to be involved in a freight railroad realignment project, future steps would include a formal environmental review process in compliance with the National Environmental Policy Act (NEPA), which would document potential environmental impacts and identify mitigation measures. In the current study, information on major and available environmental features such as wetlands, parks, recreational areas, fish and wildlife refuges, historic sites was collected and reviewed. These are shown in Figure 2-19.

Natural and Recreational Features

Many parks, recreational facilities, and fish and wildlife refuges are located in the Washington, DC region. The federal government owns many of these facilities, but smaller state and regional parks are also present. Notable parkland, recreational sites, and refuges designated by the U.S. Fish and Wildlife Service are:

- The area around Fort Belvoir includes Mason Neck State Park, Mason Neck National Wildlife Refuge, Pohick Bay Regional Park, Piscataway Park, Occoquan Bay National Wildlife Refuge, and Featherstone National Wildlife Refuge. Not only are these parks and refuges large, they front the Potomac River and nearby bays and are surrounded by wetlands.
- Prince William Forest Park, owned by the National Park Service, is a large park bounded by I-95 and Marine Corps Base, Quantico.
- Aquia-Po Beach Park is a locally owned riverfront park with marina facilities.
- Leesylvania State Park, south of Woodbridge and east of Prince William Forest Park, is along the Potomac River. The existing CSX Mainline runs through the park.
- The CSX Mainline runs through East Potomac Park and Anacostia Park in the District, both owned by the National Park Service.

A realigned freight railroad should avoid major parks, recreation sites, and refuges. Section 4(f) of the Department of Transportation Act of 1966 applies to U.S. DOT actions that may affect publicly owned public parks and recreation sites and wildlife and waterfowl refuges. The U.S. DOT will approve an action that requires the use of Section 4(f) resources only if there is no other prudent and feasible alternative.

This study also inventoried available wetlands and floodplain data; however, major impacts to these features were considered avoidable with any railroad realignment alternative.

Railroad and Regional Characteristics

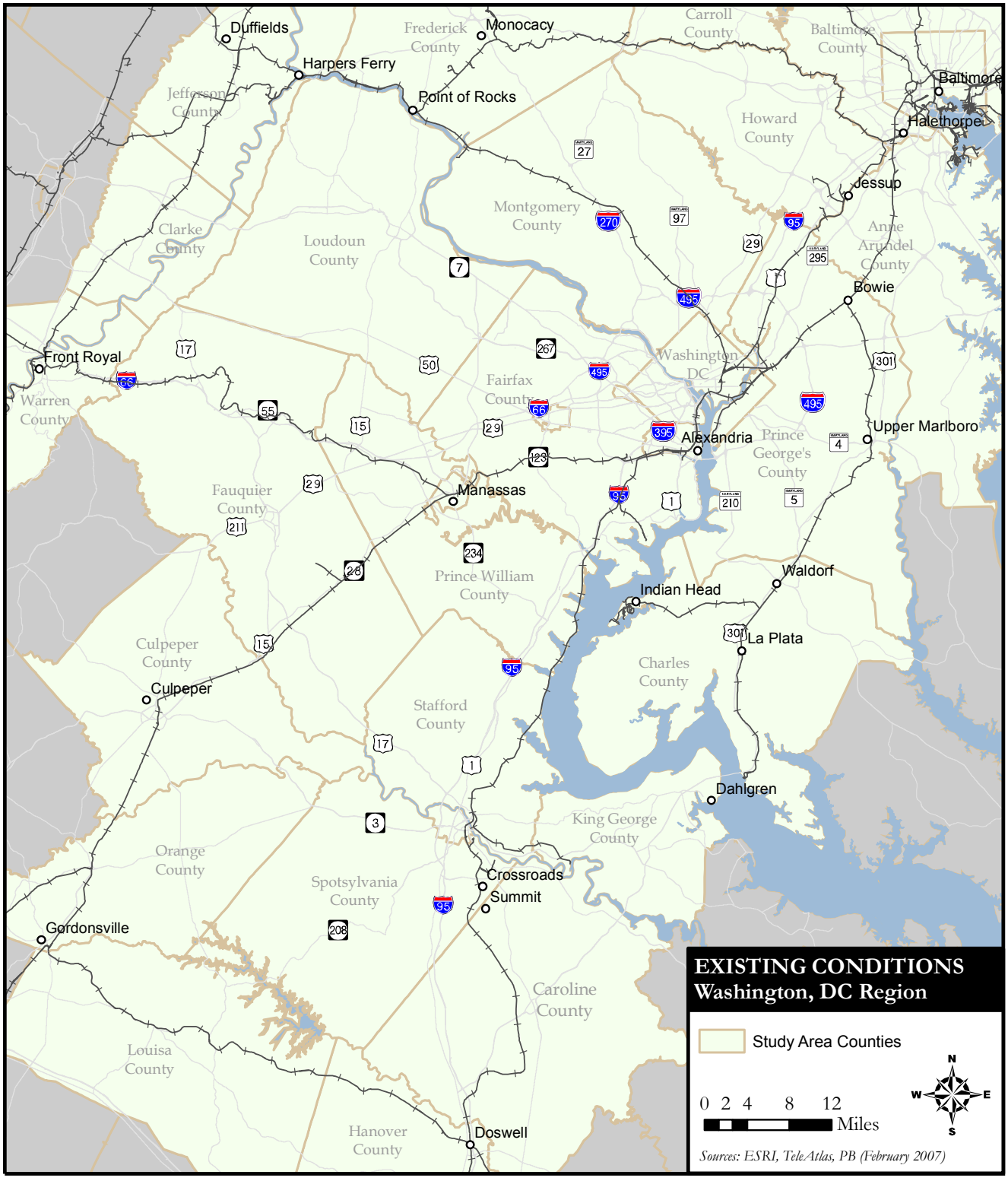


Figure 2-18. Study Area

Railroad and Regional Characteristics

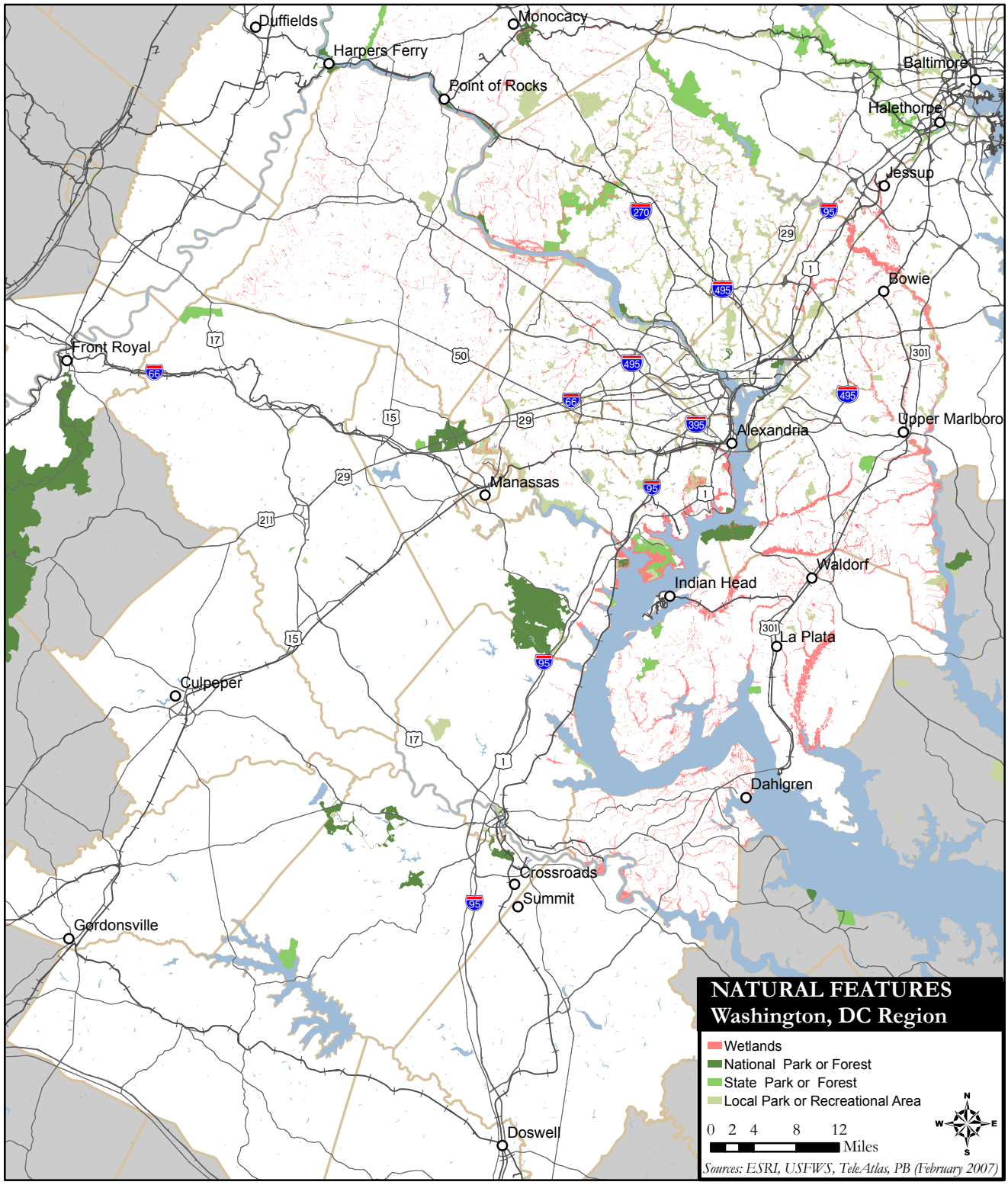


Figure 2-19. Study Area - Natural Features

Railroad and Regional Characteristics

Historic Sites

The Washington, DC area is filled with historic sites and districts related to the evolution of the city and federal government. Mount Vernon is located south of Alexandria on the west shore of the Potomac River. Piscataway Park, owned by the National Park Service and located across the river from Mount Vernon, ensures that the view from Mount Vernon remains similar to what it was when George Washington lived there. Any significant new infrastructure, including a freight railroad, should avoid the Mount Vernon area or viewshed.

The existing CSX railroad runs through the Fredericksburg Downtown Historic District, just west of the Old & Historic Alexandria District, and along historic areas in the District. There are many individual historic properties located throughout the region, and impacts to these could be avoided or mitigated during future project development stages.

Section 106 of the National Historic Preservation Act regulates federal actions that may have an adverse effect upon historic properties. Viable railroad alignment alternatives should avoid historic properties or districts.

Environmental Justice

Another important consideration is environmental justice, which helps to ensure social equity in major proposed actions. Any project financed with federal funds must comply with a 1994 Presidential Order stating that:

> Each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
>
> *-Executive Order 12898*

Data from the U.S. Census Bureau was reviewed to understand the regional distribution of minority and low-income populations. The study used this data to analyze the alignment alternatives in later project steps; this is discussed in Section 3 of this report.

Social Conditions

A realigned freight railroad should ideally avoid intensely settled areas due to community disruption, the cost of construction in such areas, and the security risk associated with proximity to a large population.

Development Patterns

In general, residential population in the region radiates out from the District with gaps for rivers and strips of agricultural land. The densest residential development is concentrated inside the Capital Beltway (I-495), in the western and southern parts of Fairfax County, to the west of I-95 in Prince William County, and along I-270 in Montgomery County. Other moderately dense residential areas include Manassas in Virginia and Frederick, Waldorf, and Columbia in Maryland.

More concentrated than residential settlement patterns, regional employment is densest in the District and its suburbs to the north and west. Figure 2-21 shows that the largest areas of dense employment in the region are Downtown Washington, DC and Tysons Corner and Reston in Fairfax County. Other employment centers include Bethesda, Silver Spring, and Rockville in Montgomery County, Crystal City, Rosslyn, Ballston, and the Pentagon in Arlington County, and Old Town Alexandria.

The most-rural counties—with the fewest residents and employees per acre—include King George, Jefferson, Clarke, Warren, Fauquier, Culpeper, Orange, Louisa, Hanover, and Caroline Counties in Virginia, and Charles and Carroll Counties in Maryland.

Land Use

The generalized land use information in Figure 2-22, compiled by the United States Geological Survey, shows that, like population and employment distribution, commercial, urban, and residential land uses are concentrated in and around the Capital Beltway. Data was not available for the outer portions

Railroad and Regional Characteristics

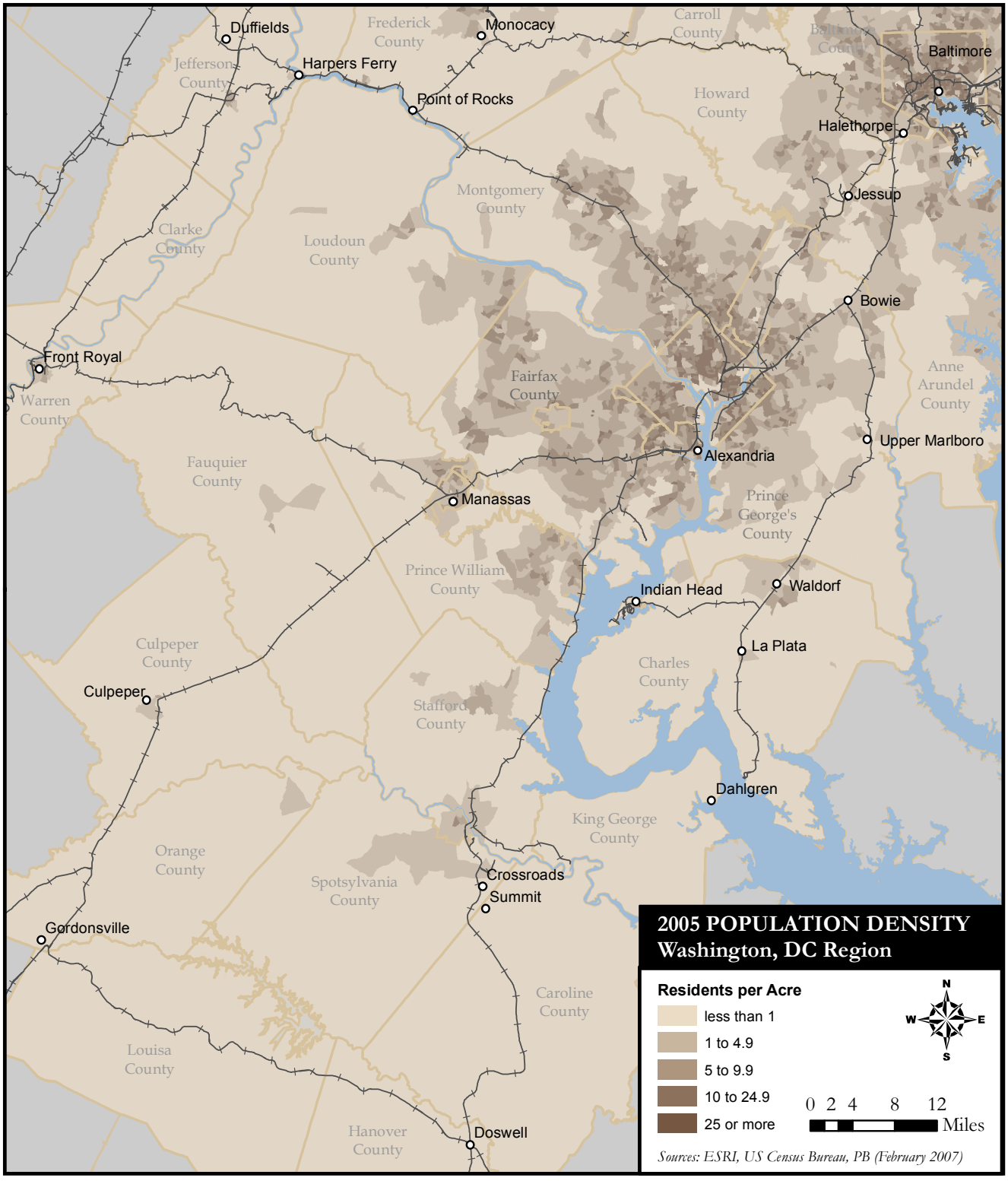


Figure 2-20. Existing Population Density

Railroad and Regional Characteristics

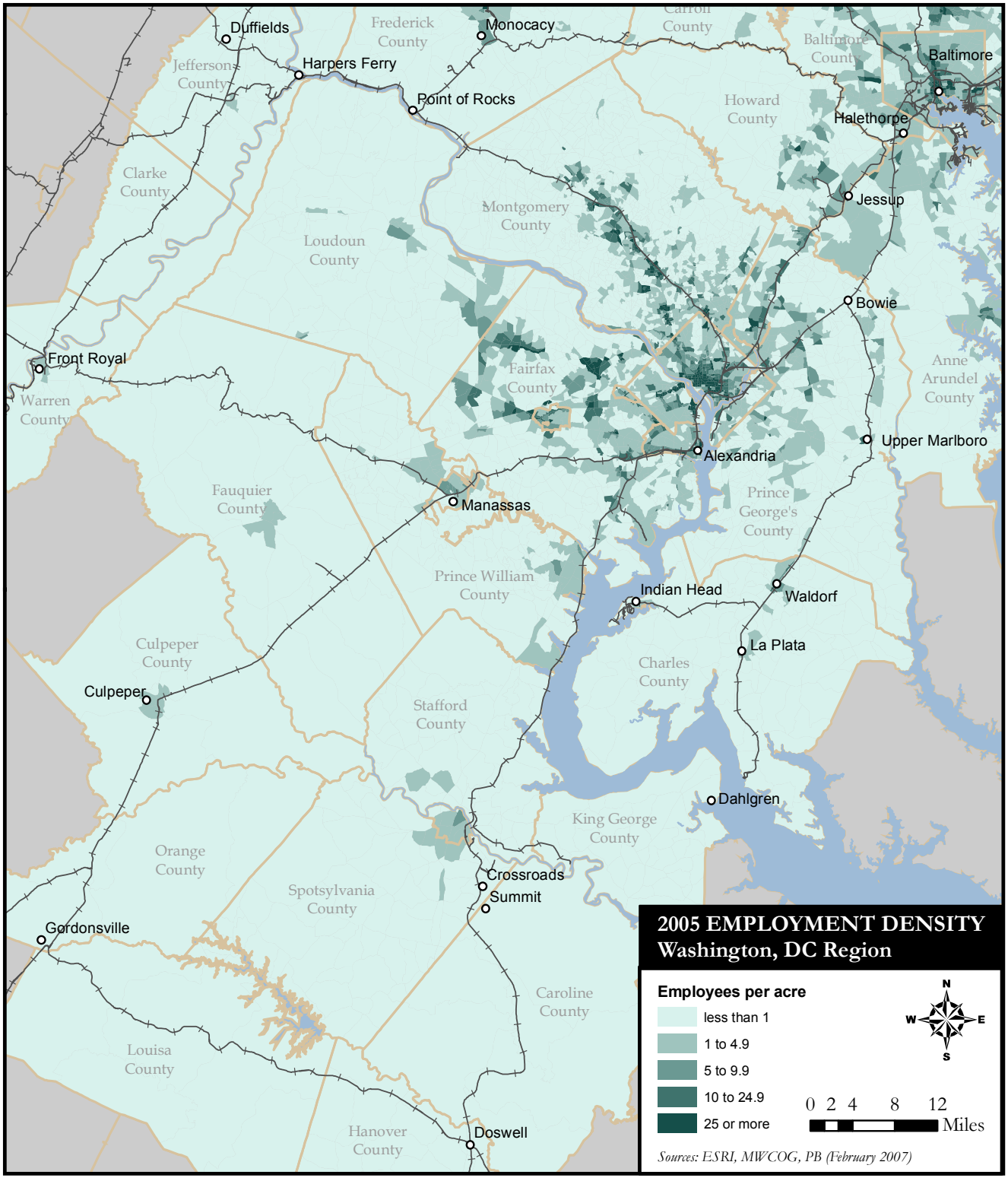


Figure 2-21. Existing Employment Density

Railroad and Regional Characteristics

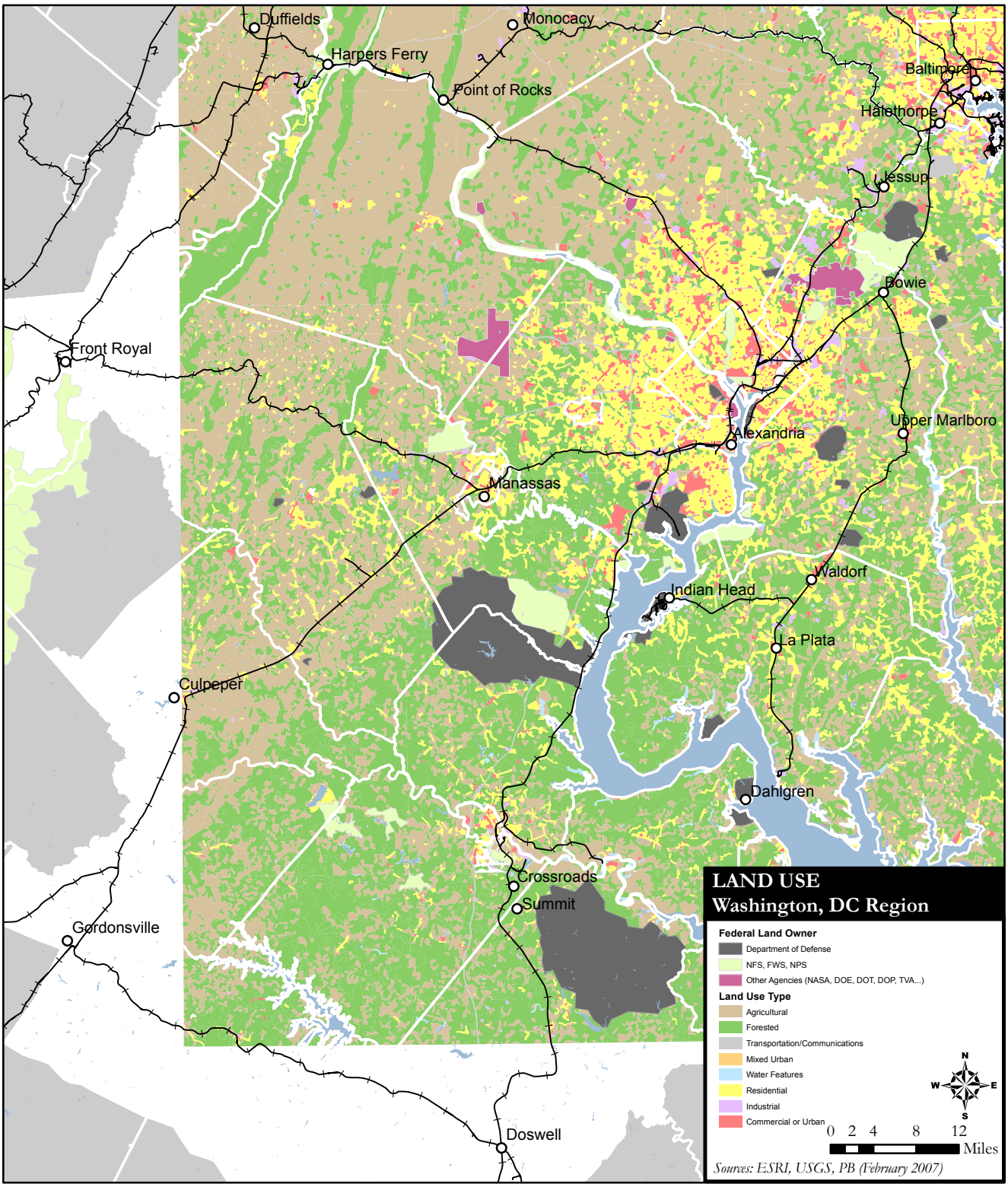


Figure 2-22. Study Area Land Use

Railroad and Regional Characteristics

of the study area.

Present transportation and communication land uses could provide potential locations for new transportation facilities because this land may already be publicly owned, avoiding the need to acquire private land. A new freight railroad alignment could minimize cost and disruption by co-locating with a utility or transportation corridor. USGS and individual county land use data identified four potential corridors of transportation and communication land uses:

- A utility corridor running east-west through King George County, presently used by power lines.
- A corridor near Dulles International Airport through Montgomery, Loudoun, and Prince William Counties that has been considered for a highway in the past.
- The Maryland State Route 32 segment and power line right-of-way that runs between the Amtrak Northeast Corridor and the CSX Mainline near the Pope's Creek Branch.
- The Maryland State Route 32 segment that runs between Jessup and the CSX Old Main Line.

Military Installations

As the seat of the federal government, the Washington region is home to many important defense installations. As shown in Figure 2-22, the existing CSX freight railroad passes through or close to the Pentagon, Fort Belvoir, and Marine Corps Base, Quantico.

Due to the number of military installations in the region, a realigned railroad would most likely pass near at least one facility. Other nearby facilities include Fort Meade and Naval Surface Warfare Center, Indian Head Division in Maryland, Fort A.P. Hill, Naval Surface Warfare Center, Dahlgren Division in Virginia, and Bolling Air Force Base in the District.

Fort Meade is home to one of the nation's largest army installations as well as the National Security Agency/Central Security Service (NSA/CSS), one of the nation's most important intelligence agencies. Because of the 2005 Base Realignment and Closure

Figure 2-23. Utility Corridor Near Bowie

Present transportation and communication land uses could provide potential locations for new transportation facilities because this land may already be publicly owned, avoiding the need to acquire private land.

(BRAC) recommendations, approximately 5,000 additional employees and 5,000 family members will be relocated to Fort Meade by 2010. To the south, Fort Belvoir faces an even larger change; the BRAC moves will add approximately 22,000 employees by 2011.

Some of the nearby military installations contain inactive rail spurs that, under certain circumstances, could be part of a new freight railroad alignment. Such a spur runs from the Potomac River at Indian Head east to the CSX Pope's Creek Branch. Similarly, a government-owned railroad runs southeast through Fort Belvoir from the CSX mainline. Though the study intended to avoid sensitive military installations, it recognized that some might actually offer a safe and direct railroad right-of-way.

Emergency Response Capabilities

Emergency responders perform specific tasks that assist people, protect property, and help recover from a disaster. They can perform many tasks related to the safety and security of railroad infrastructure including:

- Controlling access to railroad infrastructure by enforcing parking restrictions and patrolling the alignment (police and sheriff departments)
- Becoming involved in public awareness campaigns related to railroad security (police and sheriff departments)
- Helping recover from a TIH release or other explosion on the railroad network by stopping hazmat flow, treating victims, and/or managing evacuations (fire, police, and sheriff departments, EMS, and hospitals)

The location and preparedness of the Washington, DC region's emergency responders has a direct effect on the safety and security of the region. Therefore, the study inventoried the emergency response capabilities along the existing and possible future freight rail lines. Figure 2-24 shows their locations. This inventory showed that all the emergency responders in the Washington, DC region meet emergency planning and training requirements.

Training

Training affects how an emergency responder performs during an incident. There are five levels of hazmat training for responders to a hazardous materials spill or leak: awareness, operations, technician, specialist, and on-scene incident commander. All fire and emergency medical service departments and law enforcement personnel in the Washington, DC region are trained to the Awareness Level, which is knowing how to identify and report a hazmat incident. All fire department and emergency medical personnel receive additional training, which qualifies them to function at the Operations Level. At the Operations Level, first responders are able to apply defensive measures to confine or divert the flow of a hazardous material. Within the study region, several fire and emergency medical service departments operate hazmat units that have personnel trained to the Technical Level, which allows the employment of offensive measures to stop a spill or leak at its source. Three hazmat units trained personnel to the Specialist Level, while only one fire and emergency medical service department has trained personnel to the on-scene incident commander level.

Because of mutual aid agreements as members of MWCOG or because of their location within the Washington, DC region, local jurisdictions' fire departments and emergency medical services are able to request resources personnel with advanced training that may not be available within their own department. For example, Virginia, through the Virginia Department of Emergency Management (VDOEM), has partnered with hazmat units from fire and emergency medical service departments throughout the state to form Regional Hazardous Material Response Teams (RHMRT). When activated through mutual aid agreements, the teams provide all the municipalities within their designated region with hazmat response capabilities and state-level VDOEM resources. The Northern Virginia RHMRT is the City of Alexandria's Fire Department. Should a release be beyond their technical capability, additional technical assistance is available from private-industry experts and state and federal governments, if requested.

Railroad and Regional Characteristics

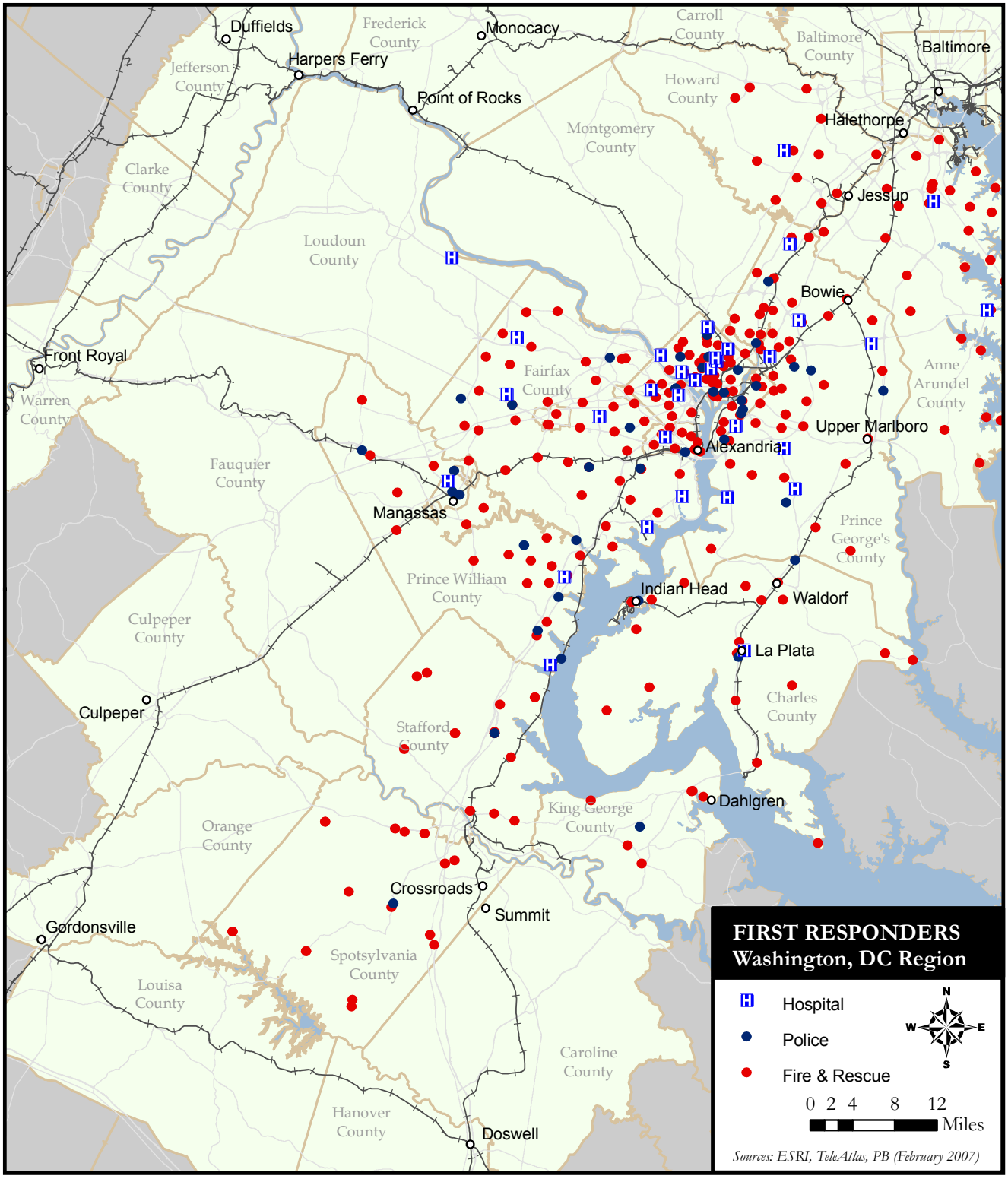


Figure 2-24. Locations of First Responders

Railroad and Regional Characteristics

Emergency Response Regulations

In general, Occupational Safety and Health Administration (OSHA) regulations do not extend to state or local governments. However, the provisions of the OSHA regulations may extend to state and local government employees if legislated at the state level. Virginia and Maryland require hazmat teams to comply with the provisions of 29 CFR 1910.120: Hazardous Materials Operations. Although the District of Columbia Fire Department does not fall under OSHA regulations, they fall under the provisions of EPA 40 CFR 311, Section 126(f) of the Superfund Amendments Reauthorization Act of 1986. These requirements are identical to those of OSHA.

Regulations at 29 CFR 1910.120 establish procedures and requirements for emergency response to a hazardous materials incident. They require:

- Development of an emergency response plan and implementation of special procedures, including an incident command system
- Emergency responders to be competent in the duties and functions that they are expected to perform
- Chemical protective clothing and equipment that meet minim requirement and are properly used and maintained
- Removal and disposal of hazardous material after the emergency response is completed

While OSHA regulations provide standards that must be met, the National Fire Protection Association (NFPA) 472, Standard on Professional Competence of Responders to Hazardous Material Incidents, details the specific knowledge that first responders must have to be considered competent to provide varying levels of response to a hazmat incident.

The Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) establishes requirements for federal, state, and local governments and industry regarding emergency planning and Community Right-to-Know reporting on hazardous and toxic chemicals. Governments are required to develop emergency response plans that:

- Identify facilities and transportation routes of extremely hazardous substances
- Describe emergency response procedures
- Designate a community coordinator to implement the plan
- Outline emergency notification procedures
- Describe how to determine the probable affected area and population by releases
- Describe local emergency equipment and facility and the persons responsible for them
- Outline evacuation plans
- Provide a training program for emergency responder, including schedules
- Provide methods and schedule for exercising emergency response plans

Because all of jurisdictions and state and local emergency responders within the study area fall under emergency planning requirements of EPCRA and the training provisions of OSHA or the EPA, no realignment route would have a particular advantage over another from an emergency response viewpoint. Therefore, emergency response capability was not a factor used to develop or evaluate potential railroad realignments.

Identification of Potential Railroad Corridors

As the first step in identifying potential rail corridors that bypass the Washington, DC Monumental Core, the study examined existing railroad rights-of-way in the region as well as highway and utility corridors that could potentially accommodate a rail line. Corridors that have been the subject of past or ongoing transportation system improvements also were considered. Based on the existing characteristics and issues previously identified in this section, a comprehensive set of potential corridors for realigning the freight railroad were developed.

The study examined the locations and conditions of the railroads in and around the Washington, DC region and how they are used by CSX, NS, Amtrak, and commuter services. Each potential corridor had to connect CSX routes in Richmond, Virginia and Baltimore, Maryland, bypassing the District's Monumental Core.

Some of the existing rail alignments are suitable for mainline freight traffic with relatively little additional investment. Many of these alignments, however, would require significant upgrading and/or expansion to meet mainline design standards—such as converting from a single-track to a double-track configuration, straightening curves, increasing vertical clearances, and eliminating roadway grade crossings.

The identification of potential railroad corridors also included the consideration of freight terminals, yards, and security, environmental, and social considerations. Some of these factors were used more in later stages of the study to screen and refine alternative alignments. As a starting point, Figure 2-25 shows major environmental and social constraints and opportunities within the potential corridors.

The potential railroad route segments were organized into three basic corridors in which a new freight line could be developed. These include:

- Western corridors, entailing a crossing of the Potomac River upstream (west) of Washington, DC.
- Central corridors, generally following the existing CSX freight main line, except for rerouting around the Washington, DC Monumental Core via a new crossing of the Potomac River in the vicinity of Alexandria and Arlington, Virginia.
- Eastern corridors, entailing a new rail crossing of the Potomac River downstream (southeast) of Washington, DC and Alexandria and tying into the existing CSX Pope's Creek Branch line.

Each corridor would provide a possible route for north-south and west-south CSX freight traffic.

Western Corridors

The western corridors would involve crossing the Potomac River in one of two ways: either using the existing NS railroad bridge south of Hagerstown, Maryland, or via a new bridge crossing between Loudoun/Fairfax Counties in Virginia and Montgomery County, Maryland. Either option would intercept the east-west CSX main line in Maryland, providing connections to the west and eastward to Baltimore for CSX freight traffic.

The western possibilities include several existing railroad segments as well as potential new railroad rights-of-way. It is possible to develop a western corridor route that entirely uses existing rail lines. Such a route would be less difficult to implement that those involving acquisition of new right-of-way, but the resulting route would be long and circuitous. Other western corridor routes could be more direct, but these would require new railroad rights-of-way in Prince William, Fairfax and Loudoun Counties in Virginia, and Montgomery and/or Howard Counties in Maryland.

Western Existing—CSX Piedmont Subdivision

This segment of existing railroad is part of a CSX-owned branch line that connects Richmond and Charlottesville, Virginia. The segment of interest to

Railroad and Regional Characteristics

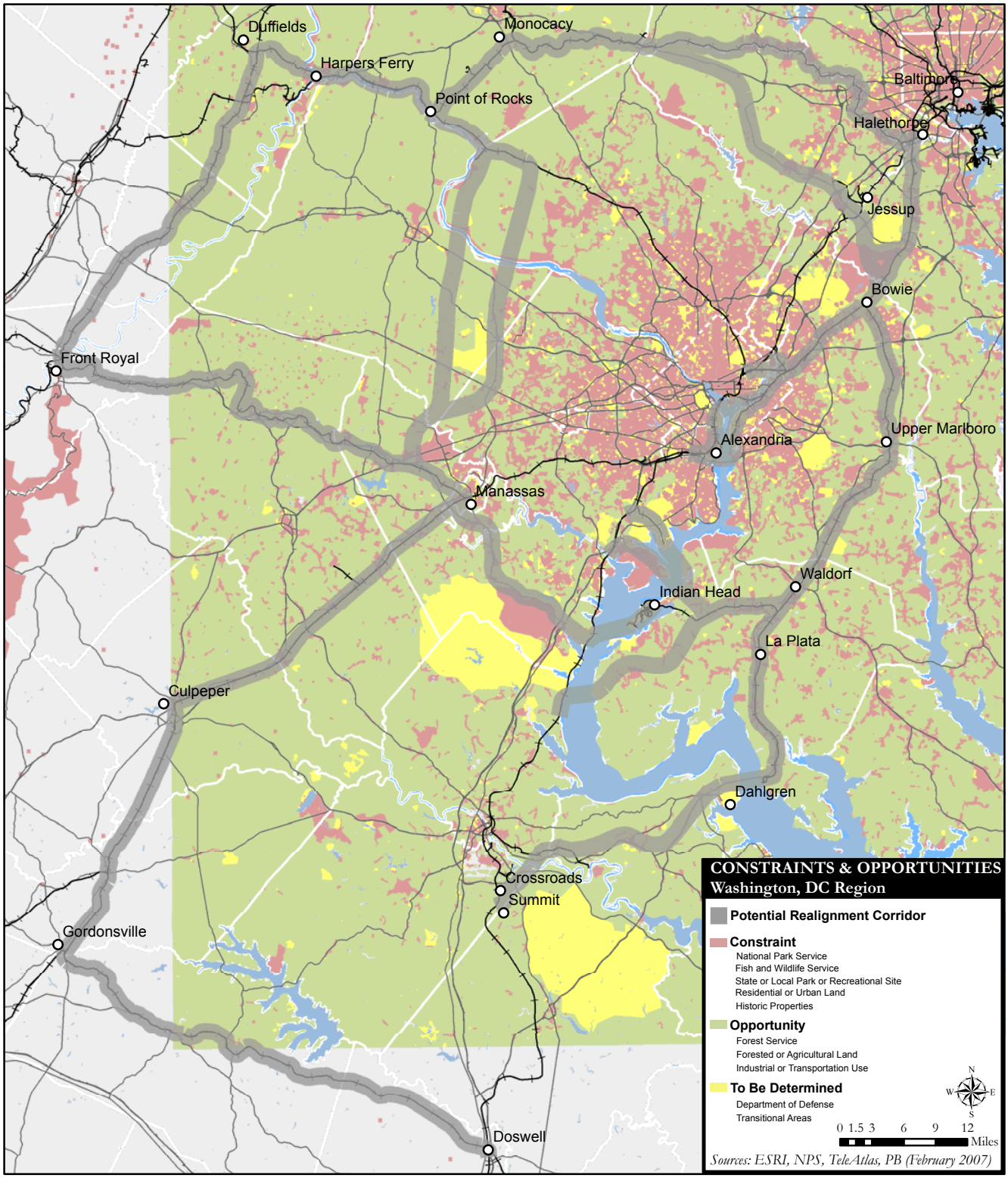


Figure 2-25. Realignment Constraints and Opportunities

Railroad and Regional Characteristics

this study starts at a junction with the CSX RF&P Subdivision at Doswell and runs westward for 50 miles to Gordonsville. From the rail junction at Gordonsville, the route would head northward an additional 9.1 miles to Orange, Virginia, where the CSX Piedmont Subdivision connects with the NS Piedmont mainline. To be usable as a freight mainline, the CSX Piedmont Subdivision would require installation of railroad signaling and would need to be expanded from a single-track to a double-track configuration. The line passes through the middle of several towns, including Mineral, Louisa, Gordonsville and Orange, where the railroad would require either grade separation or improved grade-crossing protection.

Western Existing—NS Piedmont Division Mainline

The NS north-south mainline between Orange and Manassas, Virginia offers a route to the west of and roughly parallel to the CSX RF&P Subdivision. This segment is 52 miles long and was originally was double track for its entire length, although the existing configuration contains approximately 28 miles of single track. This alignment is relatively straight and flat, and it is equipped with modern railroad signaling and traffic control. Major highway crossings are grade-separated, though several minor streets cross the rail line at grade crossings. The largest town the line runs through is Culpeper, Virginia. Reinstalling double track on this segment would increase the capacity of the line sufficiently to allow its use for both NS and CSX through traffic.

Western Existing—NS B Line

The 50-mile long railroad between Manassas and Front Royal was built in 1854 as a minor branch line to serve the local industries and farms in the Shenandoah Valley. Known as the B Line, it was never intended for passenger traffic or dense mainline freight operations. As a result of railroad mergers and the increasing difficulty of moving freight trains through Washington and on Amtrak's Northeast Corridor, NS now operates most of its north-south through freight trains via the B Line. The present physical characteristics of the rail line pose several significant obstacles to expansion of freight service and the introduction of passenger service:

- The line is single track, which restricts the capacity of the line
- The line is unsignalled or "dark," which restricts both speed and capacity
- The line is slow speed, with a maximum authorized speed of 45 mph and slower speed limits at locations with sharp curves
- There are 15 at-grade roadway crossings between Manassas and Haymarket, which increase exposure for grade crossing accidents as train movements increase. The most problematic of these are the sharply skewed crossing of U.S. Route 29 at Gainesville and the crossing of Nokesville Road (State Route 28) west of Manassas, both of which are proposed for elimination but not fully funded.
- Existing right-of-way is too narrow to accommodate a multiple-track railroad

At its eastern end, the B Line passes through one of the fastest-growing suburban areas of the Washington, DC region. As a result of this growth, the easternmost 11 miles of the B Line have been targeted by VRE and Prince William County for an expansion of commuter rail to the communities of Gainesville and Haymarket. The VRE project would invest approximately $100 million or more to extend the NS signal and traffic control system and double-track this section of the B Line. This project currently is entering a phase of conceptual engineering and environmental feasibility analysis. The western section of the B Line traverses hilly terrain that would make full double-tracking expensive and difficult to accomplish.

Western Existing—NS Shenandoah Line

From Front Royal (Riverton Jct.), the NS north-south mainline continues northward on the Shenandoah Line. The predominantly single-track line passes through the towns of Berryville and Charles Town, West Virginia. The NS Shenandoah Line crosses the CSX east-west mainline (Cumberland Subdivision) at Shenandoah Jct., 36 miles north of Front Royal. A track connection used to exist between the two

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railroads at this location, but the tracks were recently removed and the connection has been eliminated. The track connection would need to be restored or reconstructed on a new alignment to enable CSX freight trains using the western bypass corridor to move onto the CSX mainline in either an eastbound or westbound direction at this location.

Western New—Prince William County

A direct rail link between the CSX RF&P Subdivision near Dumfries, Virginia and the NS mainline at Manassas provides an alternative western corridor routing to the CSX Piedmont Subdivision and the NS Piedmont Mainline previously described. This alignment would contain a new double-track railroad on new right-of-way. The alignment generally lies within Prince William County and follows the path of VA Route 234. The highway, which is the major arterial linking the western and eastern halves of Prince William County, has been widened in segments and is planned for further widening in the future. Over the past several years, transit has been proposed in this corridor. Presumably, a railroad right-of-way could be created in the corridor that meets railroad engineering criteria for curves and grades. Property would need to be acquired for this right-of-way, which would likely affect multiple subdivisions and development projects along the corridor.

The alignment would be approximately 20 miles long and would shorten the rail trip between Doswell and Manassas by about 20 miles. However, this alignment would be both difficult and expensive to construct. This new railroad would skirt north of Prince William Forest Park, traversing difficult terrain that would increase the cost of railroad development on a per-mile basis. In addition, the new railroad would pass through urban, mostly low-density residential areas that would likely require other railroad infrastructure such as walls and fencing for public safety and security, mitigation of impacts, and grade-separated road crossings.

Western New—Loudoun, Fairfax and Montgomery Counties

A second potential new rail corridor west of the District was identified that would link Manassas, Virginia and Point of Rocks, Maryland. The potential corridor would entail a new crossing of the Potomac River east of Point of Rocks. As with the previous alignment segment, this route would require construction of a new rail line on new right-of-way, at a relatively high cost compared with the expansion of existing rail rights-of-way. Though this general corridor has been considered for highway construction in the past, there are no active plans for highway development nor any major rights-of-way reserved for transportation facilities.

As an alternative for using the B Line, Shenandoah Line, and CSX South Leg in the two corridor alternatives described above, a new railroad between the B Line just west of Manassas and the CSX Metropolitan Subdivision east of its junction with the Old Main Line could be constructed. The new double-track railroad would go around the Manassas National Battlefield Park to the west and follow a north-south alignment that could run along either side of Dulles International Airport. The required new railroad bridge across the Potomac River would cross over the C&O Canal Park, which parallels the river. The new railroad line though Loudoun County, Fairfax County, and Montgomery County would cross urban areas, increasing the cost of construction. AA railroad on this alignment would also require walls, fencing, grade-separated roadway crossings, and other provisions for public safety and freight security and to reduce community impacts.

Old Main Line Expansion

The Old Main Line is a direct route for connecting any of the possible western corridors to the existing CSX mainline at Baltimore. The alternative corridors previously described end at the junction of the CSX West Leg and the Old Main Line. In order for CSX south-northeast and west-northeast freight traffic to reach Baltimore without having to go through northeast Washington, DC, all the western corridor

alternatives would include expansion of the Old Main Line involving conversion of its single track to a full double-track configuration. To improve travel time through this corridor, vertical and horizontal alignments would have to be adjusted. In addition, the line would be made to accommodate double-stack trains to meet intermodal freight requirements. Expanding the Old Main Line so that it can accommodate all CSX south-northeast and west-northeast freight traffic would be extremely expensive, comparable to developing a new railroad.

Howard County Overland Route

As an alternative to expanding the entire length of the Old Main Line, a new double-track railroad could be built from the Old Main Line in Mount Airy, Maryland to the Capital Subdivision in Jessup, the location of a major car unloading facility for auto carrier trains. From Jessup, this alternative corridor would utilize the Capital Subdivision to Baltimore. As for all the new railroad corridors described above, developing a new railroad through Howard County would be comparatively expensive because of hilly or difficult terrain and because of urban development along portions of the alignment.

Central Corridors

The central corridors are clustered in Alexandria, Arlington, and Southwest and Southeast Washington, DC. They provide alternative connections between the CSX RF&P Subdivision to the south and the CSX Alexandria Extension to the north, which joins the CSX east-west mainline at Hyattsville, Maryland. Each of these alignments would allow the removal of rail freight traffic from the Long Bridge, the Virginia Avenue tunnel, and the rail line passing through the Southwest federal district of Washington, DC.

Central Yards

This alternative central corridor would provide a secure, double-track railroad tunnel that would extend from Potomac Yard in Arlington to the vicinity of Benning Yard in Northeast Washington, DC. The tunnel would pass beneath the north end of Reagan National Airport and the cross the Potomac and Anacostia Rivers, reaching the east bank south of Poplar Point. This crossing would run south of the potential locations for a future utility tunnel to control combined sewer overflows. The freight line would remain in a secure tunnel on the east bank of the river and proceed northward, generally following the alignment of the Shepherd Industrial Track and DC Route 295 (Kenilworth Avenue), passing beneath the Washington Metro Green Line tunnel as it approaches the Anacostia Station. The northerly tunnel portal could be located within the CSX Benning Yard, or the line could continue in tunnel to the DC-MD line to permit development at the Benning Yard site. This alternative would be costly but would provide for a secure freight railroad passage underneath the most populated area of the region.

Central Alexandria North

This alternative central corridor would diverge from the RF&P Subdivision on the north side of Alexandria and utilize the right-of-way of the Slater's Lane Branch, which is a single-track industrial spur that runs eastward to the Potomac River. Similar to Central Yards, this corridor would cross the George Washington Memorial Parkway and pass beneath the Potomac River in a tunnel, surfacing on the east side of the river within the right-of-way of the Shepherd Industrial Track. Because the Shepherd Industrial Track right-of-way appears not to be available for use, new right-of-way would need to be created to provide for a double-track railroad along the east bank of the Potomac and Anacostia Rivers to Benning Yard, the point at which the industrial track joins the CSX mainline. The tunnel in this alternative would be substantially shorter than in the first alternative, and therefore, much less costly. However, the new railroad through a largely urban area would substantially increase the cost and impacts in this alternative.

Central Alexandria South

The third central corridor would provide a double-track branch from the NS Seminary Yard, passing to the south of the new commercial development along Duke Street and generally following the right-of-way of Interstate 95/495 to a crossing of the Potomac

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River via tunnel or bridge parallel to the Woodrow Wilson Bridge. Despite the extensive redevelopment of the highway corridor to support the reconstruction of the Woodrow Wilson Bridge and widening of the highway, there is no readily available right-of-way within which a rail line could be constructed, resulting in the likelihood that tunnel construction would be required in this corridor. On the east side of the river, the corridor would surface at or connect with a new double-track railroad running along east side of the Anacostia River to Benning Yard. Recent development on the west side of the river and planned development along the east side of the river make the creation of new railroad right-of-way problematic in this area. The cost implications of this alternative would be similar to Central Alexandria North, but it would be more costly if a tunnel option were selected.

Eastern Corridors

All the eastern alternative corridors would utilize and require expansion of the CSX Pope's Creek Branch. Unlike the western corridor alternatives, there is no option in which an entire alternative corridor would utilize existing railroad right-of-way segments. All eastern alternative corridors would require some construction of new railroad on new right-of-way.

Pope's Creek Branch

The principal opportunity for a new rail freight main line bypassing the District to the east is presented is on the existing Pope's Creek Branch, which runs in a north-south direction from a junction with the Amtrak Northeast Corridor at Bowie, Maryland to the Potomac River at Morgantown, Maryland for 46 miles. The rail line roughly parallels U.S. Route 301; its southern terminus is immediately adjacent to the toll plaza for the Harry W. Nice Memorial Bridge, at the Morgantown power plant of Mirant Energy. The existing line is single track and does not have a signal system. The Pope's Creek Branch passes through or adjacent to several towns and urbanized areas in Charles and Prince George's Counties including La Plata, Waldorf, St. Charles, Upper Marlboro, and Bowie. Several main highways cross the line on bridges, but there are still many existing grade crossings. The line has relatively gentle grades and is relatively straight for most of its length.

For this line to be usable for main line freight traffic, it would need to be double-tracked, equipped with a modern signal and rail traffic control system, and grade-separated to a greater degree than at present. This incremental investment in an existing rail line, however, would be much less expensive per mile than the construction of a new double-track railroad on an entirely new right-of-way. In some locations, the addition of a second main track could be accomplished within the existing railroad right-of-way. In other locations, acquisition of property along the rail line may be required to widen the right-of-way sufficiently to accommodate a second track. Investment in security fencing and/or walls, along with roadway grade separations, would be undertaken to provide security for the railroad and to help buffer the railroad from neighboring development, particularly in urbanized areas. Two railroad branch lines connect with the Pope's Creek Branch. A rail spur heads east from Brandywine Jct., just north of Waldorf, to serve the Mirant Energy coal-fired power plant at Chalk Point. A second rail spur, the Indian Head Branch, heads westward from a point in between Waldorf and La Plata towards the U.S. Naval Surface Warfare Center at Indian Head.

Indian Head Branch

The Indian Head rail spur heads westward from the Pope's Creek Branch, at MP 34.1 between Waldorf and La Plata, for approximately 12 miles to the U.S. Naval Surface Warfare Center at Indian Head, on the east bank of the Potomac River. The right-of-way and single track rail line are owned by the U.S. Government. Based upon visual inspection in 2006, the line appears to be inactive and wide enough for the addition of a second track. The line runs through mostly rural land, and the western two miles run through the military installation. There are approximately 12 grade crossings along the route. The branch line crosses U.S. 301 at grade just west of its junction with the Pope's Creek Branch. The existing junction is not configured to permit direct train

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service between Indian Head and the Pope's Creek Branch to the north. Therefore, a short stretch of new alignment, with a grade-separated crossing of U.S. 301, would be needed to create a through freight mainline route.

Eastern Dahlgren

The Dahlgren alignment is one of two possible eastern corridor alternatives that would connect the Pope's Creek Branch with the CSX RF&P Subdivision. This corridor utilizes the full length of the Pope's Creek Branch, crosses the Potomac River adjacent to the Harry W. Nice Memorial Bridge, and requires a largely new rail right-of-way in King George and Spotsylvania Counties. This alignment diverges from the RF&P near a point known as Summit, approximately 8 miles south of Fredericksburg and approximately one mile south of the VRE Crossroads Yard. From this location, a new double-track rail freight line would be constructed heading in a northeasterly direction for approximately six miles to a crossing of the Rappahannock River near the town of New Post. Most of the right-of-way southwest of the Rappahannock would follow an electric utility corridor.

Upon crossing the Rappahannock River, the alignment would utilize four miles of an existing CSX branch line, the Dahlgren Branch, which serves a cogeneration plant and industrial park in King George County. The line would be double-tracked, and major roadway crossings would be grade-separated. This branch line used to run all the way to the Potomac River, serving the Naval facility at Dahlgren. The eastern portion was recently abandoned and converted into the Dahlgren Railroad Heritage Trail. The heritage trail is privately owned and is accessible to the public by permit. The new rail right-of-way would parallel the trail for approximately four miles and then diverge onto a new and more direct alignment roughly paralleling VA Route 3 and U.S. Route 301 for the remaining 16 miles to the Potomac River.

A new double-track railroad trestle would cross the Potomac River parallel to the existing Harry W. Nice Memorial Bridge, which would connect the new railroad in King George's county with the southern terminus of Pope's Creek Branch. The railroad trestle would have a movable bridge, most likely a lift span, at the point where the rail line crosses the main river channel. A fixed span would not be possible due to requirements for bridge height and railroad grades.

The total length of the Dahlgren corridor in Virginia is approximately 30 miles, six of which follow the utility right-of-way, four miles utilize the active portion of the Dahlgren Branch, four miles parallel the abandoned portion of the Dahlgren Branch that now have been converted to a trail, and the remaining 16 miles are on a new alignment approximately parallel to VA Route 3 and U.S. Route 301.

Eastern Indian Head Corridors

The study identified a set of possible corridor options that would cross the Potomac River further north than Dahlgren and tie into the Indian Head Branch, which then would connect with the Pope's Creek Branch at Waldorf. These options all entail new rail right-of-way construction in Charles County, Maryland, but they minimize the extent of new rail construction on the west side of the river, since the RF&P line runs close to the river in this area. These options retain through freight traffic over a greater portion of the RF&P Subdivision but reduce the total mileage of required rail line upgrades and new railroad. The alternative alignments are described below, from south to north. They all entail a trestle and movable bridge crossing of the river.

Southern Alignment—Arkendale Crossing

From a location south of Quantico, Virginia, near Widewater and Arkendale, a new double-track railroad bridge would branch from the RF&P Subdivision and cross the Potomac River. From the east side of the river, a new double-track railroad would be oriented in a southwest-northeast alignment and run for approximately seven miles through predominantly rural parts of Charles County over rolling terrain, to a connection with the Indian Head Branch east of the Naval Surface Warfare Center.

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Possum Point Crossing

This crossing would span from the north side of Quantico, near the Possum Point power plant, east to within the limits of the Naval Surface Warfare Center, connecting with the Indian Head Branch. While physically feasible, the mainline freight railroad would be located within the military installation.

Mason Neck Crossing

Another option would cross the river at Mason Neck, largely through parkland, from the RF&P Line. The river crossing would be somewhat longer than other Indian Head options. On the east bank, a new two-mile long rail alignment would be constructed to meet the Indian Head Branch midway between Indian Head and Waldorf. This overall rail route would be approximately 12 miles longer that the southernmost route.

Northern Alignment—Fort Belvoir Crossing

The most northerly crossing location considered was at Fort Belvoir, which has a military rail spur from the RF&P Line through the military base. Though physically feasible, this alignment would traverse a growing military installation. This corridor is also near and visible from Mount Vernon.

New Freight Right-of-Way, Bowie to Jessup

At Bowie, the northern end of the Pope's Creek Branch connects to the Amtrak Northeast Corridor. In order for the Pope's Creek Branch to be useful as a freight main line, the line would need to connect with the CSX Capital Subdivision. The potential eastern corridors assume such a connection.

To avoid the need to reconstruct bridges and take property in the historic village of Bowie, the proposed right-of-way would bypass Bowie by utilizing two miles of an electric utility corridor to provide a more direct connection between the Pope's Creek Branch and the Northeast Corridor right-of-way. The double-track freight line would meet and run parallel with the Amtrak Northeast Corridor from the vicinity of the Bowie State MARC station to a point in between where the Corridor crosses the Patuxent and Little Patuxent Rivers. Freight trains on the new freight line would not utilize the existing Amtrak tracks, but instead would be on new dedicated tracks within or parallel to the right-of-way.

A rail siding and single-track connection would be constructed between the freight line and the Amtrak line near Bowie State to permit NS or CSX freight trains to utilize the freight bypass route around the District and then switch to the Northeast Corridor. This would preserve both railroads' trackage rights on the Corridor, even though the primary freight route is expected to continue to be via the CSX Capital Subdivision.

As the Amtrak line dips in elevation to cross the two river valleys, the freight line would remain at a higher elevation on a viaduct structure and cross over the Amtrak line. The freight line then would head westward in the direction of Jessup, on a new right-of-way over land that is federally owned and part of the Patuxent National Wildlife Refuge. Issues associated with the potential impact of railroad construction and operation in the wildlife refuge would need to be analyzed and addressed. The railroad could possibly follow a utility line that crosses the refuge. A more northerly alternative alignment would run approximately parallel to MD Route 32, along the southern edge of Fort George G. Meade. Before an optimal alignment for this section railroad could be developed, more information would need to be acquired on the development plans for this portion of the fort.

The new rail alignment would cross MD Route 295 near its interchange with MD Route 198 and join the CSX Capital Subdivision at Savage, Maryland, just south of the CSX automobile yard facility at Jessup. A full "wye" connection would be built at Savage to permit freight trains from the freight bypass line to operate either northward towards Baltimore or westward via Washington, DC and the CSX Metropolitan Subdivision.

Section 3
Development of Alternative Railroad Alignments

This study used evaluation criteria applied in a multi-step screening process to better understand the universe of potential corridors and to assess which alternatives might be the most viable alternatives that address security, railroad operations, engineering, and environmental considerations. The Railroad Working Group, the NCPC Interagency Security Task Force, and the Railroad Owners/Operators Group were an integral part of this process. During 10 meetings throughout the study, these stakeholders helped to shape the alternative development process and outcome.

In the first step in the screening process, several mandatory factors were applied to the universe of potential alignments to combine them into seven preliminary corridors that would provide alternative rail freight routes from north of Richmond to the north side of the District. Next, qualitative screening criteria were applied to the corridors to identify those that were more feasible alternatives. Finally, more-detailed quantitative screening factors were applied to these alternatives to generate alternatives that appeared most viable. These alternatives were then evaluated for how they responded to the project goals.

In each step of alternative development, the minimum possible number of criteria were applied that were necessary to distinguish among the alternatives and address the project goals.

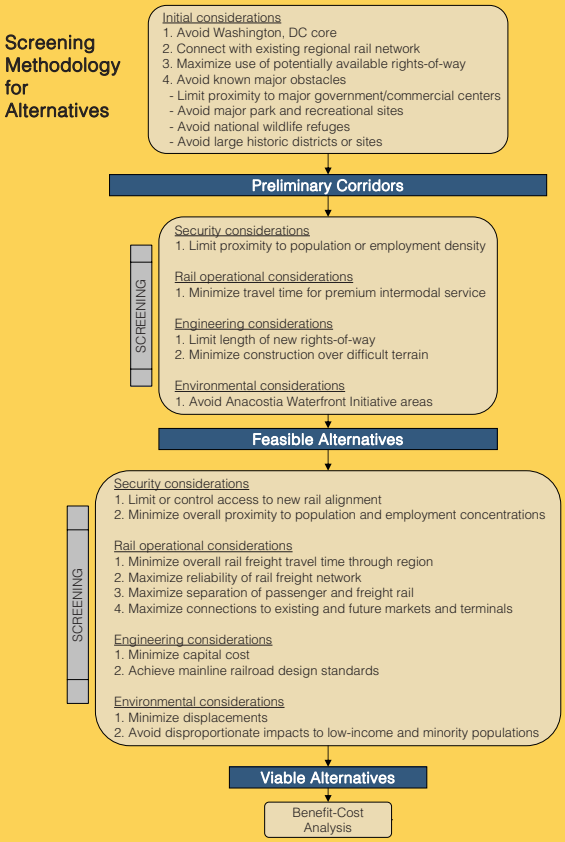

Figure 3-1. Alternative Development Process

Figure 3-2. Railroad near U.S. Capitol

Development of Preliminary Corridors

To further analyze the set of potential alignment corridors described in the previous section, several initial factors were considered. Because these were considered the most critical in responding to the project goals and developing reasonable alternative alignments, all of these criteria were mandatory. If a potential corridor did not meet one of the criteria, it was viewed as being not as feasible as the other alternatives.

Development of Alternative Railroad Alignments

The first criterion was to a**void the Washington, DC Monumental and Central Business District Core**. By doing so, a corridor would meet the project goal of increasing security of the Monumental Core and the U.S. Capitol as well as the goal of increasing access to the Anacostia River. Iconic structures such as the White House and the U.S. Capitol, shown in Figure 3-2, are potential terrorist targets; removing the freight railroad from their vicinity would inherently decrease the risk of a freight railroad-related incident.

To maintain efficient commerce and the convenient movement of goods and people, the second criterion was that the corridors **connect with the existing regional rail network** in a direct way, providing a route for north-south rail freight traffic to bypass the existing route through the District's core.

The third criterion was to **maximize use of potentially available rights-of-way.** This would include existing active or abandoned railroad rights-of-way, existing or planned highway corridors, and existing or planned utility corridors. Collocating infrastructure in this manner typically allows for cost savings and construction simplicity, and tends to minimize the extent of residential and commercial property acquisition, community disruption, and effects on environmental resources.

The final criterion was to **avoid known major obstacles** such as government and commercial centers, major parks and recreation sites, national wildlife refuges, and large historic districts or sites.

Most of the corridor segments identified in the previous section met the mandatory criteria and were incorporated into one or more of the preliminary corridors, with a few exceptions. Three of the four possible eastern crossing options near Indian Head were not explored further because they did not avoid known major obstacles. The option with a Potomac River crossing at Possum Point presented significant challenges because it would run through the middle of the Naval Surface Warfare Center, Indian Head Division, on the east side of the Potomac River.

The option with a river crossing at Ft. Belvoir was not explored further because it, too, would require traversing a major military installation and could be within the viewshed of Mount Vernon. The option with a river crossing at Mason Neck was deemed undesirable, since this would have passed through or in close proximity to a riverfront area clustered with parks, wildlife refuges, protected views, and wetland. The southernmost option near Indian Head, with a river crossing near Arkendale, south of the Marine Base at Quantico, was retained for further study because it satisfied all of the mandatory criteria.

Within Maryland, the potential corridor segment between Jessup and Frederick in the MD Route 32 and I-70 corridor was eliminated from further consideration. Development in the corridor has already claimed much of the potential right-of-way that was initially identified for this alignment. Instead, the option that would include upgrading the Old Main Line was retained for further study, since it would minimize new rights-of-way and provide an east-west route for freight traffic bypassing the main CSX east-west route via the Capital and Metropolitan Subdivisions. It would also avoid a portion of the east-west route that lies near the Washington, DC monumental core.

Between the north end of the Pope's Creek Branch at Bowie and the CSX mainline at Halethorpe, only one of two potential routes was retained for further study. The route paralleling the Amtrak Northeast Corridor from Bowie to Halethorpe was eliminated from further consideration, since it would not provide a connection to the existing CSX yard at Jessup and would include a greater amount of new rail line construction. The option of constructing a new freight right-of-way between Bowie and Jessup was retained.

In summary, the application of the mandatory criteria resulted in the identification of seven preliminary corridors, shown in Figure 3-3. These included two corridors that would follow a westerly route around the District, three that generally follow the existing

Development of Alternative Railroad Alignments

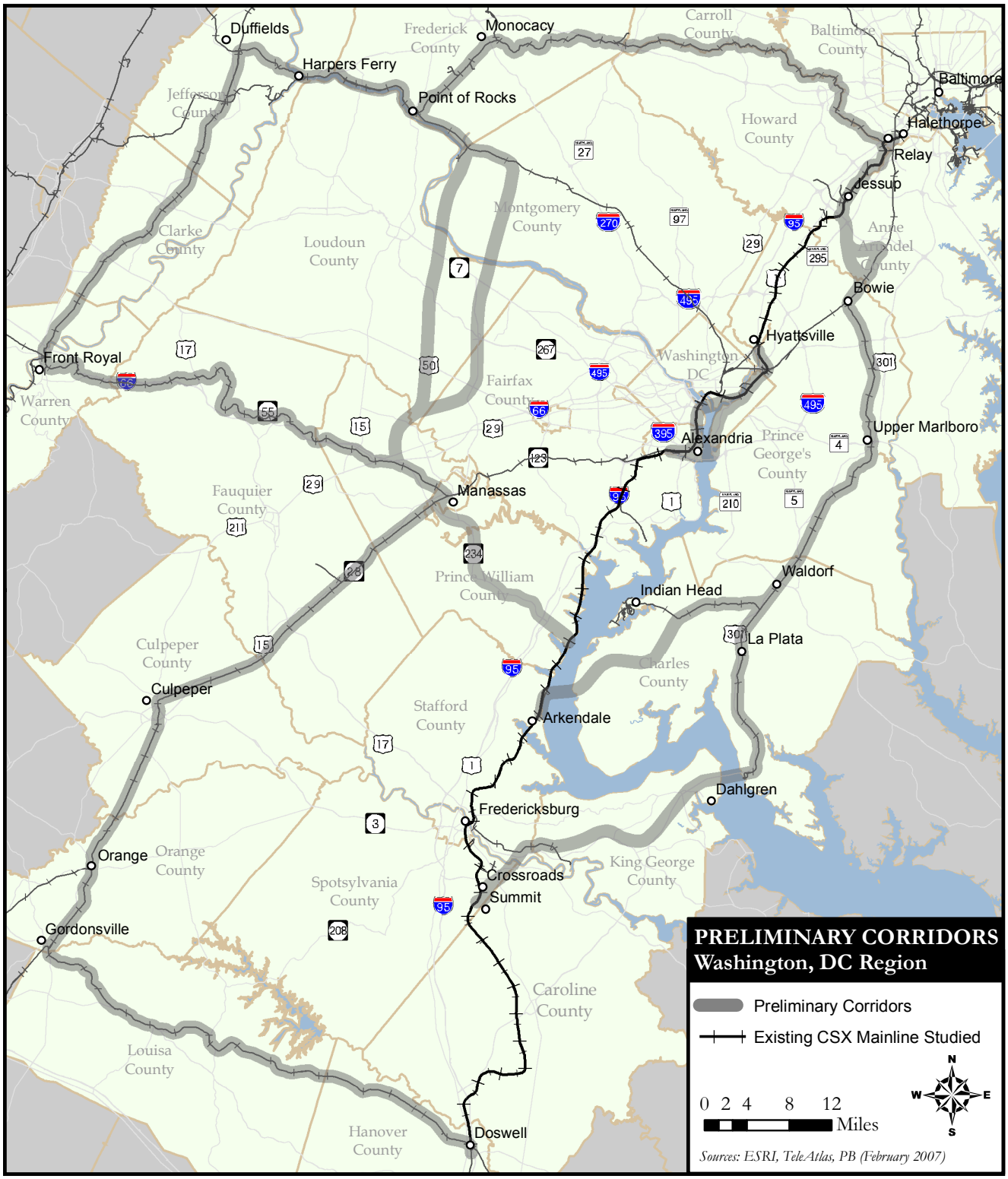

Figure 3-3. Preliminary Corridors

Development of Alternative Railroad Alignments

railroad right-of-way except for differences at the Potomac River crossing near the District, and two corridors that take an easterly route around the District using the CSX Pope's Creek Branch.

Western Corridors:
- Existing railroad
- New right-of-way

Central Corridors:
- Rail yards tunnel
- Alexandria north crossing
- Alexandria south crossing

Eastern Corridors:
- Indian Head
- Dahlgren

Development of Feasible Alternatives

The seven preliminary corridors were screened down to four feasible alternative alignments using qualitative criteria. Unlike the initial considerations in the first step, the criteria were not mandatory, but simply a way to rate and compare the corridors in four categories—security, railroad operations, railroad operations, engineering, and environmental characteristics.

Security

Because this stage of screening used qualitative criteria, the security factor used was to **limit proximity to population and employment density**. Terrorists look to impact lives and disrupt commerce in a visible manner; thus, the feasible alternative alignments should minimize their exposure to areas with security risks.

The Western Existing corridor would run through the rural counties on the west side of the Washington, DC region and therefore, would have the lowest proximity to population and employment density. The Western New, Eastern Indian Head, and Eastern Dahlgren corridors would have medium exposure; they would travel through medium-density residential areas such as Sterling, Centreville, Chantilly, Dale City, La Plata, Waldorf, and Bowie but avoid the higher-density areas close to the District. The three central corridors, Central Yards, Central Alexandria North, and Central Alexandria South, would all run relatively close to concentrations of dense residential population and employment such as Old Town Alexandria, Potomac Yard, and developing areas east of the Anacostia River.

Railroad Operations

Because time-sensitive intermodal is the highest priority type of freight, the study focused on **minimizing travel time for premium intermodal freight service**, particularly in the north-south corridor between Richmond and Baltimore.

The intermodal freight rail travel time would be

Development of Alternative Railroad Alignments

highest for both western corridors, as they would entail a major detour to the west around the Washington, DC region. In addition, the topography of the region would handicap the western corridors, since both of these routes would require trains to ascend and descend across the Blue Ridge and other significant ridgelines that form part of the Appalachian mountain chain. The western routes would add several hours of running time for CSX north-south freight trains. Conversely, all of the central and eastern corridors would have comparable and relatively low intermodal freight travel times, as they would retain the general orientation of the current alignment.

Engineering

An inherent project consideration was to minimize capital cost. To do so, the study sought to **avoid difficult** terrain by limiting proposed construction in urbanized areas with its higher cost, community disruption, and potential for controversy. In addition, construction through hilly terrain was considered undesirable for cost and engineering feasibility reasons. Any new freight railroad would be required to meet railroad engineering standards, which limit vertical grades to no more than one percent.

In addition, the study sought to **limit the length of new rights-of-way** required for the realigned freight railroad for the same reasons as the above criterion.

The Western Existing and Central Yards corridors would require the least amounts of new rights-of-way, whereas the Western New would require the most. The difficulty of construction was also determined to be least with the Western Existing corridor, as it would use all existing rights-of-way and run through predominately rural areas. Some of the existing railroad lines it would use would need significant upgrade, as they traverse hilly or mountainous terrain in Virginia and Maryland; however, there are many parts of the corridor that are relatively flat. The difficulty of construction would be highest with the Western New, Central Alexandria North, and Central Alexandria South corridors because of their proximately to developed areas.

Environmental Characteristics

To open up access to the Anacostia River and to avoid adverse effects on the District's Anacostia Waterfront Initiative (AWI) plans, the criterion was to **avoid the AWI areas**. All the preliminary corridors were found to have minimal or no impact to AWI areas except for the Central Alexandria North and Central Alexandria South corridors. Both corridors would cross the Potomac River and run above-ground along the Anacostia River, parallel to the Shepherd Industrial Track. Introducing a new barrier, a freight railroad, to this area would limit the District's opportunities to reunite divided communities.

Though it was not a specific screening criterion, the available National Wetlands Inventory data was reviewed at this stage of the study. The Western New corridor would require construction of a new railroad through or close to a cluster of wetlands along the Potomac River north of Dulles International Airport.

Results

After consultation with the Railroad Working Group, the NCPC Interagency Security Task Force, and the Railroad Owners/Operators Group, the Western New corridor was dropped from further consideration due to its high travel time for north-south intermodal freight service, its extensive required construction through difficult terrain, and its need for substantial property acquisition for new railroad rights-of-way. The Western Existing corridor was retained because it would follow existing railroad rights-of-way for its entire length, avoid AWI areas, and limit proximity to population and employment density.

The Central Alexandria North and Central Alexandria South corridors were dropped from further study due to their proximity to population and employment density, their need for new right-of-way acquisition in heavily urbanized areas, and their potential effect on AWI development areas. The Central Yards alternative would minimize these effects by providing a tunnel between two existing railroad rights-of-way and,

Development of Alternative Railroad Alignments

therefore, was retained. These results are shown in Table 3-1.

The project stakeholders agreed to carry the remaining four feasible alternatives forward for more detailed analysis. The feasible alternatives, which were renamed to be more specific alignments, are shown in Figure 3-4 and listed below.

- Western
- DC Tunnel
- Indian Head
- Dahlgren

Development of Viable Alternatives

Finally, the four feasible alternatives were evaluated based on a quantitative set of screening criteria that revealed more detail on their security, rail operations, engineering, and environmental characteristics. Again, these criteria were not mandatory, but a means to compare the alternatives.

Security and Safety

To evaluate the security risks of each freight railroad alignment alternative, a security risk assessment was incorporated into the screening criteria. The assessment included consideration of threats, vulnerabilities, and consequences. Because railroads carry toxic inhalation hazard (TIH) materials, their potential impacts on dense population and economic centers were a particular concern. This study used chlorine as the type of TIH, since it is the TIH cargo most frequently carried by rail.

Two security criteria were used to assess the risk of each alternative:

1. **Limit or control access to new rail alignment.** This was measured by the length of each alternative rail alignment within 3,700 feet of a freeway or interstate. The U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives cites the

Table 3-1. Development of Feasible Alternatives

	Security	Rail Operations	Engineering		Environmental	
PRELIMINARY CORRIDOR	proximity to population density	intermodal travel time	length of new right-of-way	difficulty of construction	impact to AWI areas	**SCREENING RESULT**
Western Existing	low	high	low	low	low	**Advance**
Western New	medium	high	high	high	low	**Drop**
Central Yards	high	low	low	medium	low	**Advance**
Central Alexandria North	high	low	medium	high	high	**Drop**
Central Alexandria South	high	low	medium	high	high	**Drop**
Eastern Indian Head	medium	low	medium	medium	low	**Advance**
Eastern Dahlgren	medium	low	medium	medium	low	**Advance**

Development of Alternative Railroad Alignments

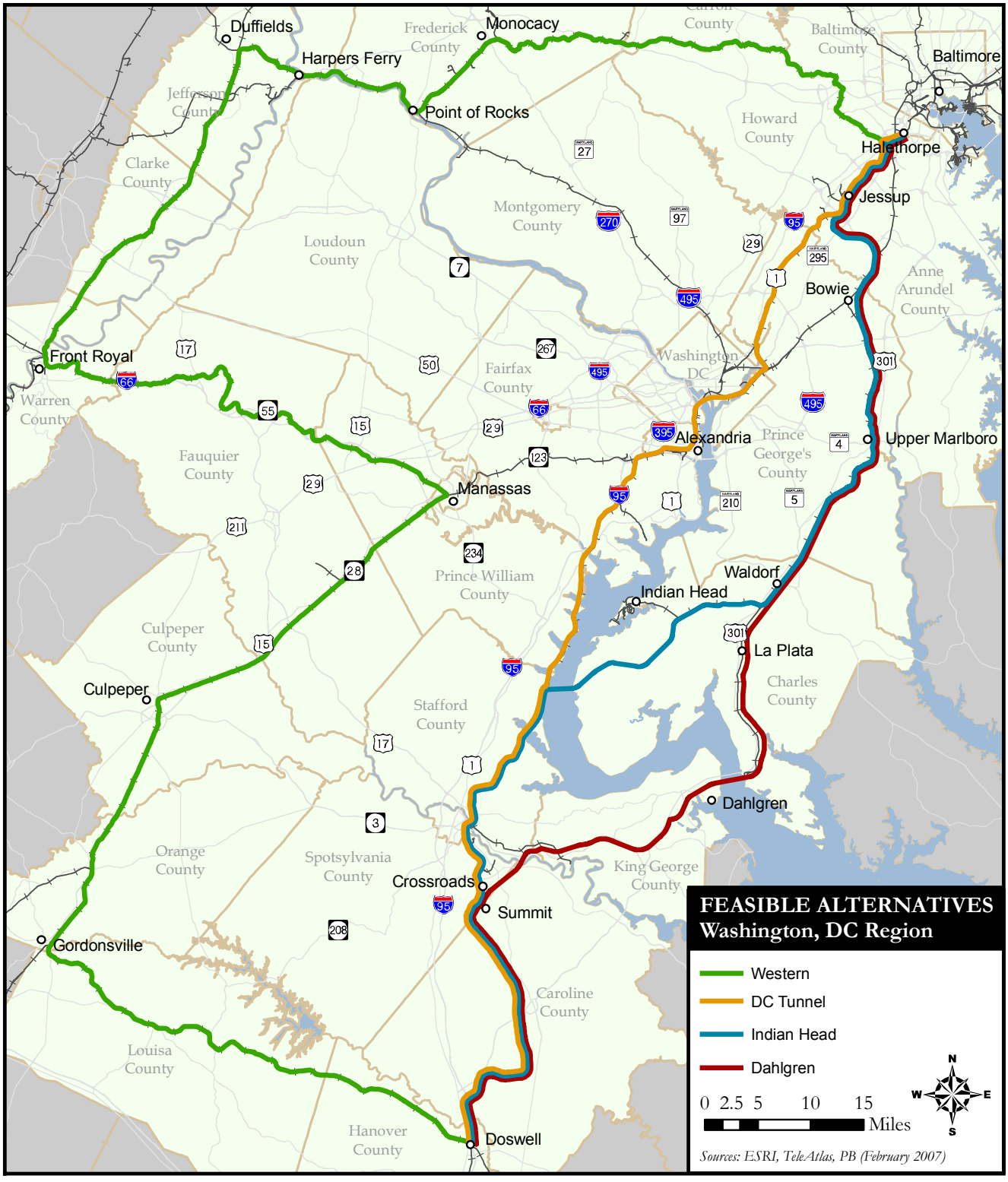

Figure 3-4. Feasible Alternatives

Development of Alternative Railroad Alignments

potential for structures within this range to sustain damage from a small truck or cargo van explosion and recommends this distance to be the minimum evacuation distance. A high level of access to the railroad alignment means a greater chance for a train with TIH cargo to be damaged by such a blast.

2. **Minimize overall proximity to population and employment concentrations.** The study measured the amount of residential population, number of total jobs, and number of federal government jobs within 800 feet of an alternative rail alignment. The U.S. Department of Transportation uses this distance as the initial isolation area, or hot zone, for a major hazmat spill, including a chlorine release from a tanker-car. This criterion responds to not only security—protecting from terrorist attacks—but also the safety concerns from an accidental derailment.

The alternatives that would have the least highway access are the Indian Head and DC Tunnel alignments. Their short length is one reason they would be more secure, for there would be less distance over which highways could be close by. The Western alternative would have the greatest highway access and so was considered least secure by this measure.

The Indian Head and Dahlgren alignments would have the fewest residents, approximately 20,000, within the immediate isolation distance. The Western alternative would be similar. Even though the portion of the DC Tunnel alternative in the District's core would be encased in a secure tunnel in which a TIH release could be contained, the above-ground portion would still pass through dense areas along parts of the existing alignment. Therefore, this alternative would have a much higher number of nearby residents, approximately 54,000. Within those same limits, the existing CSX railroad travels close to approximately 61,000 residents.

Figure 3-5 shows the distribution of federal employment in the region. Of the four feasible alternatives, the one with the lowest number of both total and federal jobs within the initial isolation distance would be the Western alternative. This result is expected, as this alignment completely bypasses the District and its immediate suburbs. Also expected, the DC Tunnel alignment would have the highest number of both total and federal jobs within the same distance. While approximately 15,000 federal government jobs would be within 800 feet of the DC Tunnel alignment, approximately 46,000 are within this distance of the existing railroad.

Railroad Operations

One of the project goals was to expand the passenger and freight capacity within the Washington, DC region of the East Coast rail corridor. This study assumed that the entire length of each alternative alignment would be built or upgraded to be state-of-the-art double-track, double-stack railroad. Therefore, each of the feasible alternatives would meet the basic objectives of increasing railroad capacity to permit free-flowing freight operations and eliminating the clearance barriers to double-stack intermodal service.

With the goal of **minimizing overall rail freight travel time through the region**, this study measured the north-south intermodal rail freight travel time and the average speed through the Washington, DC region, from north of Richmond (Doswell, Virginia) to just south of Baltimore (Halethorpe, Maryland). For a realignment alternative to maintain the efficiency of the railroad system, its travel time must generally meet or be less than that of the present route.

Another important result of relocating the CSX freight railroad from the District would be to remove freight trains from the tracks that Amtrak and Virginia Railway Express (VRE) use. Conflicts with CSX trains are often the cited cause of VRE service delays. If freight and passenger trains continue to share the same tracks through this corridor, VRE's and Amtrak's ability to expand passenger service is limited. To **maximize separate of passenger and freight rail**, this study measured passenger railroad capacity by the number of route-miles carrying only passengers.

Development of Alternative Railroad Alignments

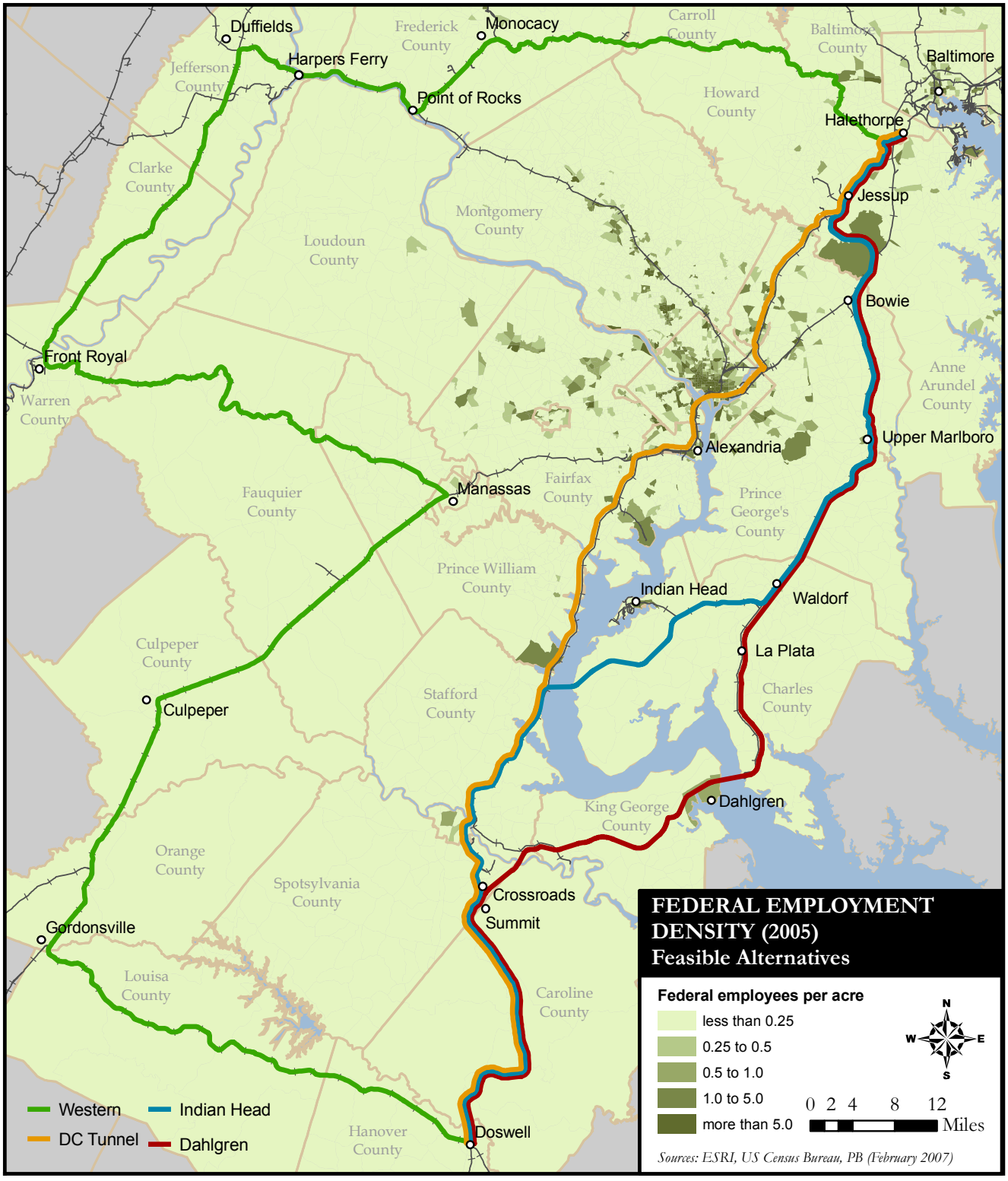

Figure 3-5. Federal Employment in the Region

Development of Alternative Railroad Alignments

The Western alternative alignment would have the highest intermodal travel time. This is partly because it is the longest route. In addition, it would travel on the existing B Line from Manassas to Front Royal, which has speed restrictions because of its curves. The Western alternative alignment's average speed through the region would be 25 mph, compared to the existing average speed of 36 mph. This travel speed would be unacceptable to the freight railroad industry. In addition, the reliability of its service would be low because of its long route and increased exposure to delay. However, because it would divert from the CSX railroad at Doswell, the Western route would offer the maximum separation of passenger and freight rail, approximately 90 miles.

The DC Tunnel alignment would only divert from the existing CSX-owned rail line, shared by freight, commuter, and Amtrak trains, for the portion of the line that would travel under the Potomac and Anacostia Rivers and avoid the District's monumental core. Therefore, it would offer the least passenger-freight railroad separation. The travel time of this alternative would be comparable to the existing railroad. This alternative would retain the basic traffic pattern as the existing alignment and offer the best connectivity to existing freight customers.

Both the Dahlgren and Indian Head alignments would offer the lowest intermodal travel times through the region, with travel speeds of approximately 45 mph. Although their alignments would be slightly longer than the existing, either would be an upgraded, fully double-tracked route that would reduce passenger-freight train interference and allow overhead freight trains to operate through the region unimpeded and with minimal delays.

The Dahlgren alternative would remove overhead freight traffic from the entire 60-mile long VRE Fredericksburg Line. Amtrak service in the Richmond-Washington corridor would share tracks with freight trains for only 48 percent of the 107-mile route. The Indian Head alternative would entail slightly more shared track usage between passenger and freight traffic. The first 21 miles of track south of Fredericksburg, north of the VRE yard, would be shared by VRE, Amtrak, and freight trains. Approximately 33 percent of the Richmond-Washington route would be passenger-only.

During the evaluation process, the study created two variations on the Western alternative: one that would divert all CSX through freight traffic onto the Western route, and one that would divert only merchandise freight trains carrying hazardous materials onto the Western route, while CSX intermodal and other time-sensitive trains would continue to operate via the existing CSX right-of-way. The former would require major upgrades to the Western route such that it would meet double-track mainline standards, and the latter would require a much lower level of investment in track and right-of-way upgrades due to its lower traffic levels and lower-priority movements. Both options were included in the quantitative evaluation.

The stakeholders found the option that would split intermodal and merchandise freight railroad traffic to be unacceptable due to its failure to separate passenger and freight traffic, its failure to measurably improve average freight travel speed, its failure to reduce congestion and train interference delays, and its effect on the AWI development areas. However, following the Railroad Working Group's suggestion, the study considered this option as a short-term security solution. This scenario is discussed further in Appendix B.

Engineering

This study drafted each alternative alignment in a very preliminary manner to ensure that all could meet railroad design standards. Initial order-of-magnitude cost estimates were prepared for these preliminary alignment definitions. This was the first step at comparing costs among the alternatives; a more refined cost estimate is presented in the benefit-cost discussion. The engineering criterion used in this step was to **minimize the capital cost of the alternatives**. Though all alternatives would be costly, this provided a means for early comparison.

Development of Alternative Railroad Alignments

The Western alternative, built out to freight mainline standards with double-track, double-stack capacity, was estimated to be the most costly because it would include upgrading a large number of railroad route-miles. The Indian Head alternative was estimated to be the least costly of the alternatives being considered, in part because it is the shortest above-ground alignment.

Environmental Characteristics

The study considered various environmental factors as part of the initial considerations and first screening step. In this step, key environmental considerations were quantified. These included minimizing community impacts, ensuring environmental justice, and responding to the District's urban design and development goals.

The environmental criteria used include:

1. **Minimize displacements**. The application of this criterion would help reduce the impact of a relocated freight railroad on a community. This was measured by the number of route-miles of new and/or widened right-of-way for each alternative. The length of new right-of-way is the best available measure at this stage of the project since a new right-of-way would most likely result in displacements of some type. The most accurate way to assess displacements is to inventory the parcels affected by the railroad right-of-way; however, at the feasibility level of analysis, this information is not yet available.
2. **Avoid disproportionate impacts to low-income and minority populations**. This study evaluated environmental justice by measuring the percentage of population below the poverty level and the percentage of population that is an ethnic and/or racial minority within 800 feet of an alternative railroad alignment. The buffer distance that was used not only accounts for the immediate isolation area after a chlorine spill, but also the additional noise that a freight railroad would introduce.
3. **Avoid AWI areas**. This study measured the intrusion on riverfront-related development areas by the number of route-miles of freight railroad

Figure 3-6. Pope's Creek Branch, Upper Marlboro

Figure 3-7. Pope's Creek Branch, Waldorf

Figure 3-8. Pope's Creek Branch, La Plata

Development of Alternative Railroad Alignments

in the AWI project area for each alternative. Though this study used a similar criterion in previous screening steps, at this stage it was quantified. The criterion responds not only to approved urban design and development plans but also to the desire to provide the public benefits of opening access to the Anacostia River waterfront.

These criteria are sufficient to guide analysis at this stage of the project; however, more detailed environmental analysis is required for future project steps such as an environmental impact statement.

The DC Tunnel alignment would have the least amount of displacements because it would largely use the existing CSX right-of-way. By the measure used here, the Dahlgren alignment could have the greatest amount of displacements, as it includes widening the Pope's Creek Branch to be a double-track railroad. However, at this stage of project development when property boundaries are unknown, this measure should be used with caution. This study developed a generalized conceptual alignment, but a future engineered alignment might include one or more bypasses or other mitigation measures to minimize displacements where necessary.

Of the four alternatives, the Dahlgren and Indian Head alignments would run through the lowest percentage of low-income population; only 4.5 percent of the nearby population is below the poverty level, compared to the existing alignment at 10 percent. However, there are pockets of greater poverty near La Plata and Waldorf. Because the DC Tunnel alignment would run through low-income neighborhoods in the Southeast quadrant of the District—east of Benning Yard, where it is aboveground—approximately 9 percent of the nearby population would be below poverty level.

The Western alignment is the alternative with the lowest proportion of minority populations. This is demonstrated in Figure 3-10, which shows the highest concentrations of minority populations generally on the east side of the Washington, DC region. Like the previous measure, the DC Tunnel alignment would have the highest proportion of nearby minority populations, approximately 52 percent, which is similar to the existing alignment. The Indian Head and Dahlgren alignments would run near a population that is approximately 40 percent minority.

By these measures, the Western, Indian Head, and Dahlgren alignments would best meet environmental justice objectives.

The only alternative that includes a freight railroad alignment through the AWI project area would be the DC Tunnel alignment, with less than one route-mile of aboveground railroad along Kenilworth Avenue east of the Anacostia River. The existing railroad runs through approximately five miles of the AWI project area.

Results

The evaluation of the four feasible alternatives is shown in Table 3-2. After consultation with the Railroad Working Group, the Western alternative was dropped from further study due to its high north-south intermodal freight travel time, its high capital cost, and its high security and safety risk with regard to highway access and proximity to residential population. The alternative did not perform as well as the other three alternatives when measured with the study criteria, but it could be studied further in future project steps.

The Western Split Traffic variation would involve no displacements and would be relatively low in cost; however, it would significantly affect the AWI project area because the existing CSX railroad would remain. This, along with its poor to moderate rail operations performance, its failure to achieve state-of-the-art rail system improvements, and the increased exposure of the long route to safety incidents, resulted in a decision to drop this option from further consideration as a long-term solution. This study considered this operational scenario as a short-term improvement, however, which is discussed in Appendix B.

Development of Alternative Railroad Alignments

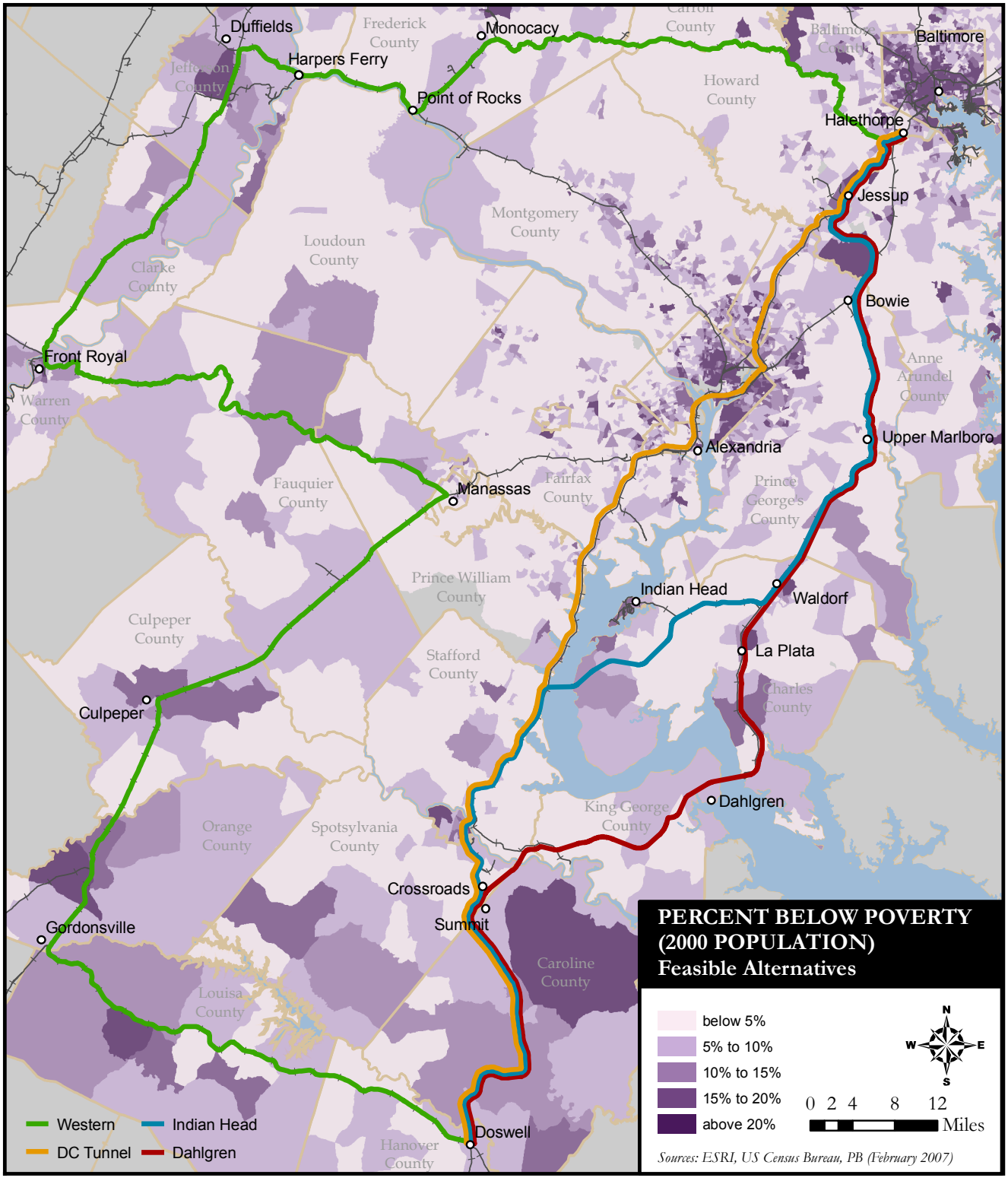

Figure 3-9. Distribution of Low-Income Population

Development of Alternative Railroad Alignments

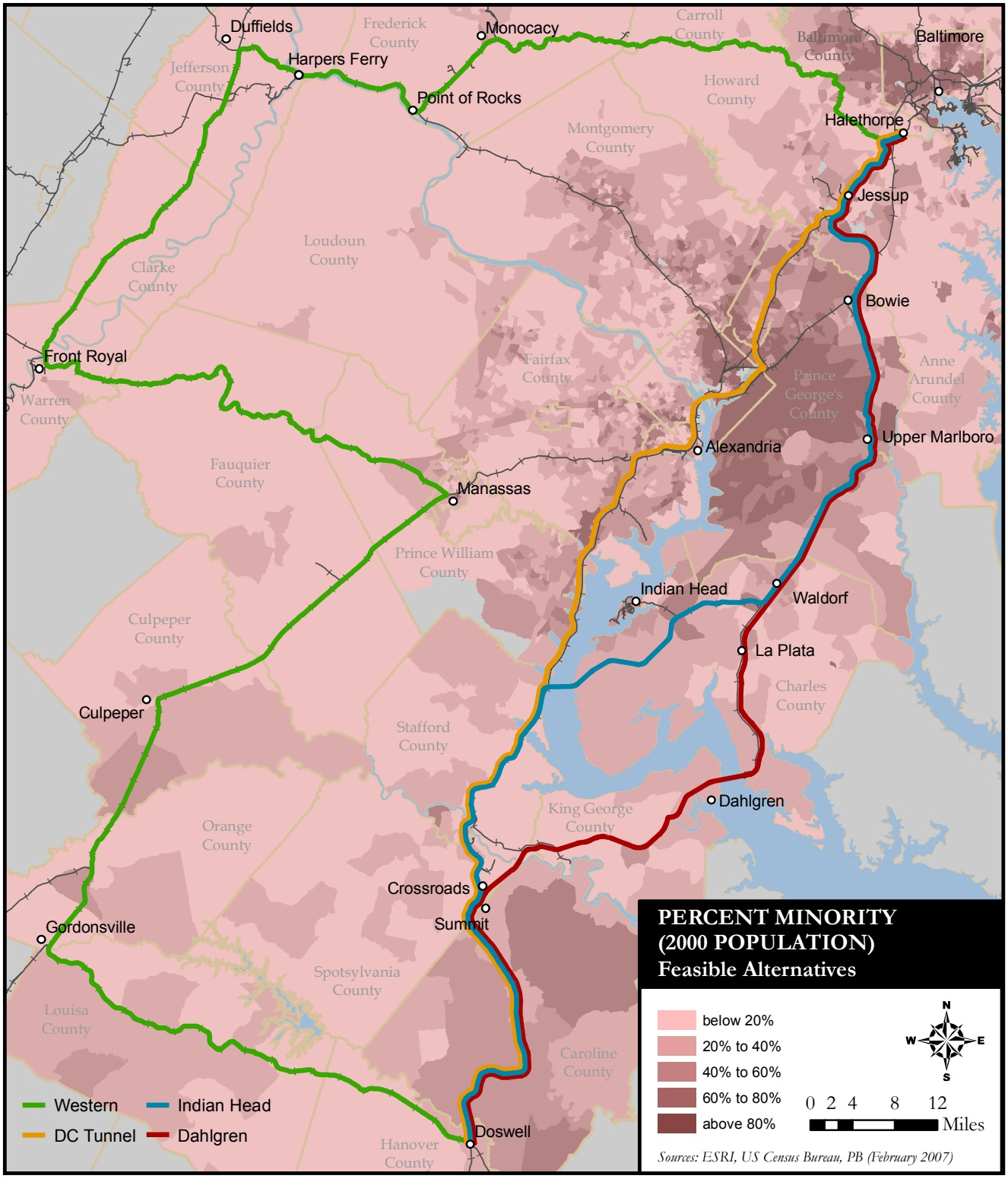

Figure 3-10. Distribution of Minority Population

Development of Alternative Railroad Alignments

Stakeholders from the Railroad Working Group, the NCPC Interagency Security Task Force, and Railroad Owners/Operators Group participated in the development of the three viable alternatives. These alternatives—DC Tunnel, Indian Head, and Dahlgren—were carried forward for the benefit-cost analysis and final evaluation.

To avoid affecting the AWI project area and to better meet environmental justice and security objectives, the DC Tunnel alignment was refined in the next step of this study. The tunnel was extended east to the vicinity of the District-Maryland border.

Table 3-2. Development of Viable Alternatives

Evaluation Factor			Outcome					
Category	Goal	Measure	Western		DC Tunnel	Indian Head	Dahlgren	Existing
			Full Diversion	Split Traffic				
Rail Operations	*Minimize overall rail freight travel time through region*	Intermodal rail freight travel time from Doswell to Halethorpe	11' 30"	7' 30"	3' 20"	2' 55"	3' 05"	3' 30"
		Average speed (mph)	25	38	38	45	43	36
	Maximize separation of passenger and freight rail	Number of rail route-miles carrying only passengers	90	0	5	39	59	0
Engineering	*Minimize capital cost*	Rail freight bypass cost based upon rough initial estimates	Highest	Low	High	Medium	Medium	Low
Security	*Limit or control access to freight rail line*	Length of alternative rail alignment within 3,700 feet of freeway and interstate network (miles)	160.2	160.2	66.7	47.4	80.3	71.2
	Minimize proximity to population and employment concentrations within potential hot zone	Number of people in 2005 within 800 feet of alternative rail alignment	23,230	23,230	53,940	20,783	18,022	60,614
	Minimize proximity to population and employment concentrations within potential hot zone	Number of total jobs in 2005 within 800 feet of alternative rail alignment	12,322	12,322	69,046	14,603	14,213	117,202
	Minimize proximity to population and employment concentrations within potential hot zone	Number of federal government jobs in 2005 within 800 feet of alternative rail alignment	404	404	15,496	1,658	2,035	45,816
Environmental	*Minimize displacements*	Route-miles of new and/or widened right-of-way	13	0	6	26	34	N.A.
	Avoid disproportionate impacts to low-income and minority populations	Percent of population below poverty level within 800 feet of alternative rail alignment	6.6	6.6	8.7	4.6	4.4	10.0
		Percent of population that is an ethnic and/or racial minority within 800 feet of alternative rail alignment	19.9	19.9	52.4	40.0	40.5	53.3
	Avoid Anacostia Waterfront Initiative Areas	Route-miles of freight railroad in AWI area	0	4.7	0.8	0	0	4.7
RESULT			Drop	Drop	**Advance**	**Advance**	**Advance**	

Section 4
Evaluation of Alternative Alignments

Description of Viable Alternatives

This study evaluated three viable alternatives, which are shown in Figure 4-1. These alternatives are generalized alignments. In the next stage of project development, which would be environmental documentation in conformance with the National Environmental Policy Act, these alignments and possibly others would be defined in more detail. The viable alternative alignments described, however, provided a sound basis for preliminary analysis and project planning.

All of the alternatives include the physical removal of the CSX freight railroad between the point where passenger rail diverges near 2nd Street SW and the District-Maryland border near Kenilworth Avenue. This study assumed that a railroad spur between 2nd Street SW and the Capitol Power Plant would be maintained.

All of the alternatives include a new aboveground or underground crossing of the Potomac River. The details of these crossings, including required clearances and structure types, should be analyzed and designed in future project efforts.

DC Tunnel

This alternative would connect the RF&P Subdivision on the west with the Alexandria Extension east of the District. The alignment would follow the existing RF&P Subdivision to Potomac Yard in South Arlington, where it would go into a nine-mile long twin-bore tunnel beneath the District. It would emerge around the District-Maryland border and connect with the existing route for CSX south-northeast freight traffic. The construction and operation of the tunnel would include security features.

The tunnel would accommodate a double-track, double-stack railroad. This alignment would require upgrading approximately four miles of the existing Alexandria Extension to double track. Depending on its exact alignment, the tunnel would pass beneath or near Reagan National Airport, the Potomac and Anacostia Rivers, the underground Metrorail Green Line, and a future utility tunnel designed to control combined-sewer overflows.

In this alternative, freight railroad traffic would be removed from the existing railroad between the area near Four Mile Run and Potomac Yard in Arlington and just south of Jessup, Maryland.

Indian Head

This alignment would follow the existing RF&P Subdivision to the Arkendale, Virginia area just south of Marine Corps Base, Quantico and cross the Potomac River on a double-track 2.5-mile-long railroad bridge. On the east side of the river, a new double-track railroad would run northeast to connect with the Indian Head Branch. The route would connect with the Pope's Creek Branch and travel north where it would parallel the Amtrak Northeast Corridor to around Odenton, Maryland. A new double-track railroad would be built somewhere between the Patuxent River and MD Route 32 to join the Amtrak Northeast Corridor and the CSX Capital Subdivision. As shown in Table 4-1 and Figure 4-2, this route would include approximately 35 miles of existing railroad right-of-way, 14 miles of government property, and 17 miles of privately owned land.

This alternative would require expansion of the Indian Head Branch and the Pope's Creek Branch to double-track railroads. The Pope's Creek Branch portion of the alignment could include noise walls, security fencing, and the grade-separation of major roadways where appropriate. This study assumed construction of a new line that would generally leave the Pope's Creek Branch near Collington, bridge the Amtrak Northeast Corridor north of Bowie, and follow an alignment near MD Route 32 to connect with the CSX Capital Subdivision near the south end of Jessup Yard. Much of the land between Bowie and Jessup is federally owned, and more detailed analysis and coordination would be required to identify the exact alignment of this connection.

Evaluation of Alternative Alignments

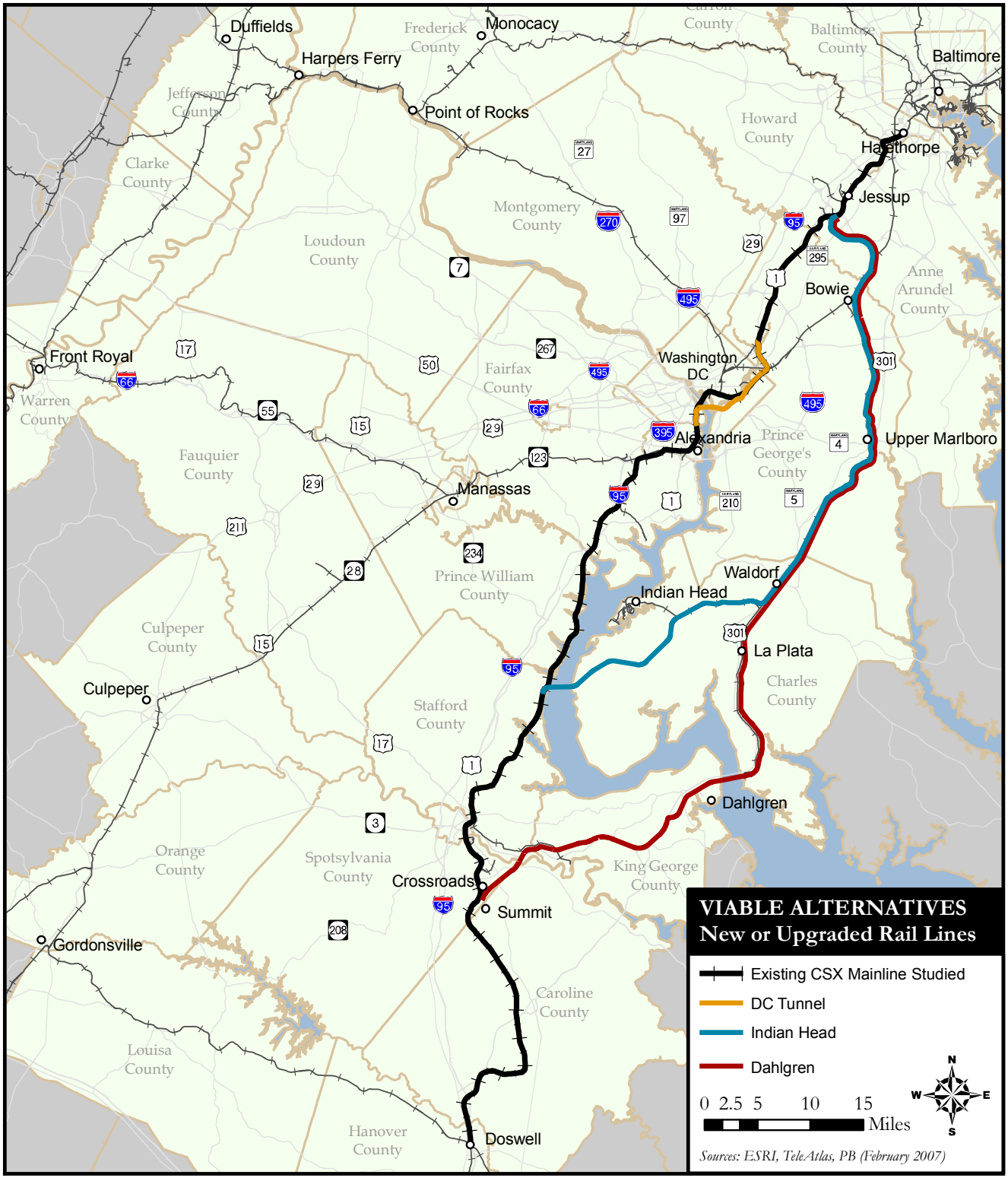

Figure 4-1. Viable Alternatives

Evaluation of Alternative Alignments

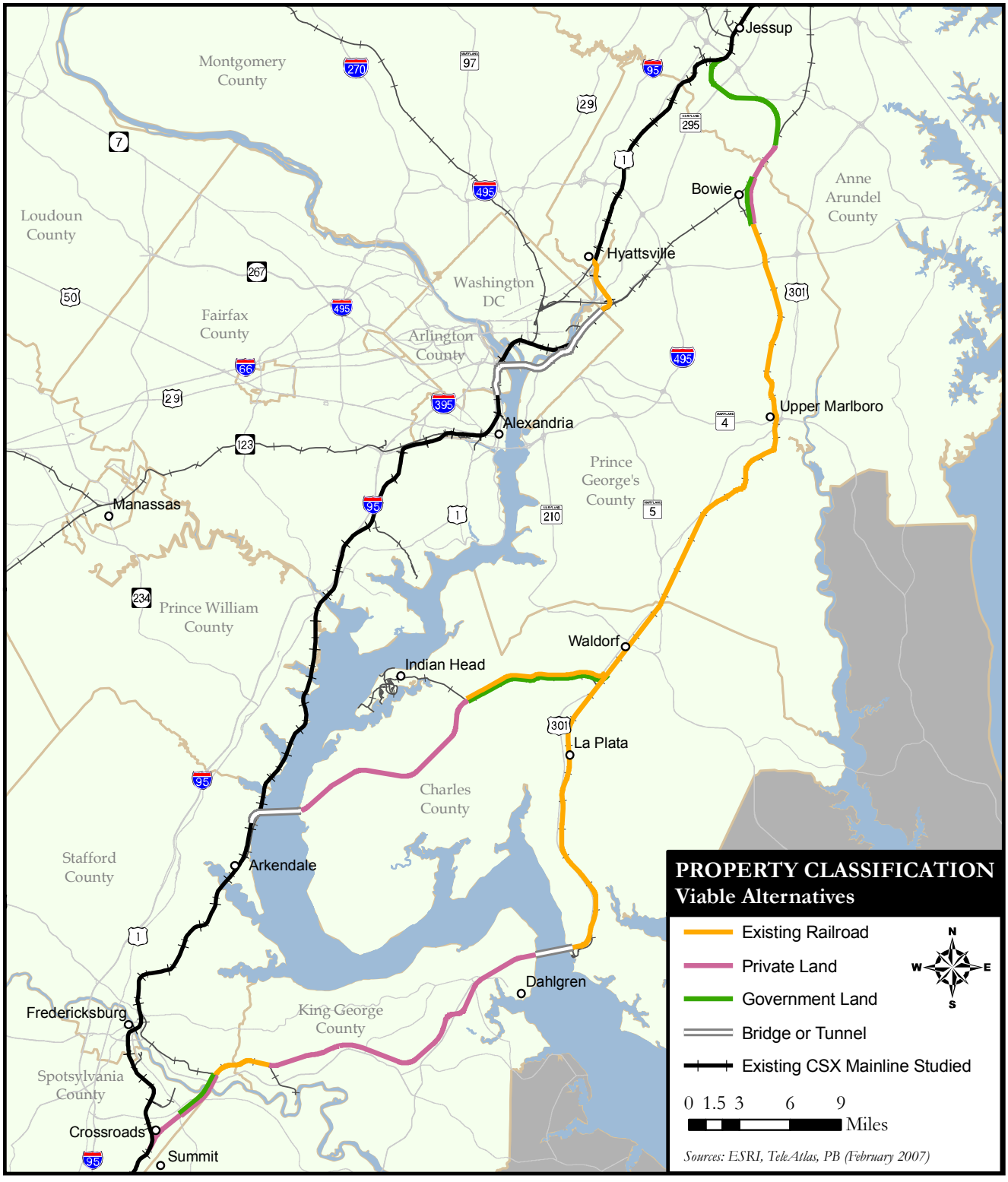

Figure 4-2. Right-of-Way Classification of Viable Alternatives

Evaluation of Alternative Alignments

In this alternative, north-south freight railroad traffic would be removed from the existing railroad between the Arkendale, Virginia area and just south of Jessup, Maryland.

Dahlgren

Similar to the Indian Head alignment, this alternative would connect the RF&P Subdivision to the Pope's Creek Branch. The new alignment would diverge from the RF&P just south of Fredericksburg where a new double-track railroad would traverse King George County. Following an existing utility corridor right-of-way, the new railroad would cross the Rappahannock River and connect with the abandoned Dahlgren Railroad, which would be restored to a functioning double-track railroad. The railroad would then parallel the recently completed Dahlgren Railroad Heritage Trail for a short distance before establishing new right-of-way that would partially follow U.S. 301 to the Potomac River.

At the Potomac River, a new two-mile-long railroad drawbridge would be constructed near the existing U.S. Route 301 bridge, which would connect the new railroad in King George County with the southern terminus of Pope's Creek Branch. From this point north, the alternative would follow the same route as the Indian Head alignment. Similar to the Indian Head alignment, this alternative would require the upgrade and enhancement of the Pope's Creek Branch.

In this alternative, north-south freight railroad traffic would be removed from the existing railroad between Crossroads, Virginia and just south of Jessup, Maryland.

Table 4-1. Right-of-Way Breakdown of Viable Alternatives

Property Classification (route-miles*)		DC Tunnel	Indian Head	Dahlgren
Existing Railroad	DC	-	-	-
	MD	4	35	49
	VA	-	-	4
	TOTAL	**4**	**35**	**53**
Government Land	DC	-	-	-
	MD	-	14	9
	VA	-	-	2
	TOTAL	**-**	**14**	**11**
Private Land	DC	-	-	-
	MD	-	17	3
	VA	-	-	24
	TOTAL	**-**	**17**	**27**
Bridge/Tunnel	**TOTAL**	**9**	**3**	**2**
TOTAL		**13**	**69**	**93**

*Note: Route-miles listed are rough estimates based on conceptual alternative alignments and field observations

Benefit-Cost Analysis

The benefit-cost analysis measured the potential benefits accruing to various public- and private-sector beneficiaries over a 40-year period and compared them with the investment costs associated with the railroad realignment alternatives. The 40-year period is typical of benefit-cost analyses of rail investments and reflects the approximate average live cycle of railroad infrastructure. After 40 years, most assets would be fully depreciated. Extending the analysis to a longer period would add increasingly smaller increments to the present value of benefits because of the compounding effects of the discount rate.

The benefit-cost results, while important, are not the exclusive or necessarily the most important decision criterion. Other factors were also considered in the overall project evaluation.

Benefit-Cost Analysis Methodology

The benefit-cost analysis includes only those benefits that can be accurately and reliably expressed in monetary terms. Accordingly, two major categories of benefits were estimated for each alternative alignment: 1) transportation-related benefits (for example, increased efficiencies for shippers and highway savings due to diversion of freight from trucks to rail), and 2) real estate benefits. The total benefits in the formal benefit-cost analysis are the sum of these two categories. Impacts that cannot be expressed monetarily with reasonable reliability, such as security, were addressed separately in the study.

Security benefits are not included in the benefit-cost analysis even though they are the primary objective of railroad realignment because estimates of the monetary value of security benefits are unreliable. Assumptions about the types and probabilities of security-related events are hypothetical suppositions not based on empirical evidence, experience, or data. Moreover, there is disagreement among economists regarding the economic cost of loss of life. Other security-related costs, such as the political, psychological, and long-term economic costs associated with the disruption of the federal government and damage or destruction of iconic structures of national significance are essentially unknown, although they are undoubtedly highly significant. These economic impacts were clearly demonstrated after the 9/11 attacks on the World Trade Center and would undoubtedly be repeated. Including security benefits in the overall equation would likely increase the benefit-cost ratios of all alternatives substantially.

Benefit-Cost Scenarios

The rail line in this study is one segment in the much larger north-south freight railroad network extending through the eastern United States from New England to the Southeast. Removing other bottlenecks in this network in addition to those in the Washington, DC region would provide greater benefits than Washington, DC region realignment only, especially by allowing the operation of double-stack intermodal trains. Because of this, two scenarios were analyzed, one reflecting only the transportation benefits to be achieved from railroad realignment in the Washington, DC region and a second reflecting the larger benefits that could be realized if additional bottlenecks were removed over a broader area, such as the Howard Street tunnel in Baltimore. Accordingly, transportation-related benefits were estimated for two basic scenarios and the benefit-cost analysis was done for each scenario:

- **Railroad realignment in the Washington, DC region only**: The resulting benefits are only those that could be realized as a result of the railroad realignment in the Washington, DC region. This scenario would produce limited transportation-related benefits because other railroad bottlenecks on the mid-Atlantic corridor would continue to constrain railroad operations. However, some improvements could be achieved.
- **Railroad improvements throughout the mid-Atlantic corridor**: Benefits are expanded to include the effects in the Washington, DC region of railroad realignment in the region plus major improvements elsewhere on the north-south freight rail corridor. In general, these

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other corridor improvements were identified in the Mid-Atlantic Railroad Operations Study (MAROPS). MAROPS defined a wide range of needed improvements throughout the mid-Atlantic corridor that would eliminate freight rail bottlenecks resulting from bridge and tunnel clearance restrictions, lack of mainline capacity, and service restrictions resulting from shared rights-of-way with passenger trains. Estimated benefits in this scenario were approximated where necessary to include only the share of total corridor-wide benefits that would be realized within the Washington, DC region. This approximation was accomplished by apportioning the total corridor benefits to the Washington, DC region based on the share of freight travel occurring on the Washington, DC segment of the entire corridor analyzed in MAROPS.

The estimated real estate benefits were the same in both scenarios. The costs were also the same in both scenarios and included only the costs of the railroad

Table 4-2. Benefit Categories Applied to Alternatives

Benefit Category	Washington, DC Region Realignment Only			With Other Mid-Atlantic Corridor Improvements		
	DC Tunnel	Indian Head	Dahlgren	DC Tunnel	Indian Head	Dahlgren
Freight shipper savings Rail operator savings, shipper cost savings and benefits of improved competitive access	No	No	No	Yes	Yes	Yes
Highway user savings Travel time and VOC savings from truck diversion	No	No	No	Yes: auto and truck	Yes: auto and truck	Yes: auto and truck
Highway system benefits Improved safety, emissions, and highway maintenance reductions from truck diversion; highway construction cost savings from rail realignment	Minimal	Minimal	Minimal	Yes	Yes	Yes
Rail user benefits VRE passenger time savings and reliability benefits; Amtrak passenger time savings	No	Yes: travel time and reliability	Yes: travel time and reliability	No	Yes: travel time and reliability	Yes: travel time and reliability
New real estate development East of the River development only	Yes	Yes	Yes	Yes	Yes	Yes
Value increase due to removal of rail line Reflects price gradient increases around Metro stations.	Yes	Yes	Yes	Yes	Yes	Yes
User value of improved access to waterfront parkland "Imputed" value per park visit; does not include "option" value of non-users	Yes, but minimal	Yes, but minimal	Yes, but minimal	Yes, but minimal	Yes, but minimal	Yes, but minimal

realignment in the Washington, DC region. This definition of benefits and costs provided a consistent basis for the analysis in both scenarios.

Table 4-2 summarizes the economic benefits considered in this study organized by benefit categories. Some economic benefits do not apply in some cases because of an alternative's physical and operational characteristics. For example, the "Rail user benefits" category does not apply to the DC Tunnel alignment because that alternative would not separate freight and passenger rail service south of the District.

Benefit-Cost Analysis Assumptions

Project Schedule

The assumed schedule for project development, implementation, and use is in Figure 4-3. This schedule defined the years in which costs would be incurred and benefits realized. Assumptions related to the schedule were:

- The project development process—planning, environmental analysis, engineering design, and construction—could be completed in approximately 10 years, which is aggressive for a project of such magnitude and complexity, but not unrealistic. The realigned railroad was assumed to enter service in 2017.
- The discounted present value analysis extended through the year 2057. This represents 40 years of operating experience and a 40-year benefit stream as well.
- Construction costs were assumed to be expended at a level rate over a five-year period beginning in 2012. For discounting purposes, 2012 was thus assumed to represent Year 1. Costs would be incurred over a five-year period before any project benefits would be assumed to begin. Deferral of project benefits for five years results in a substantial discounting of benefits.

This aggressive schedule assumes that tow critical aspects of a project could be quickly defined. One is the responsibility for project implementation. Some entity or entities must have powers necessary

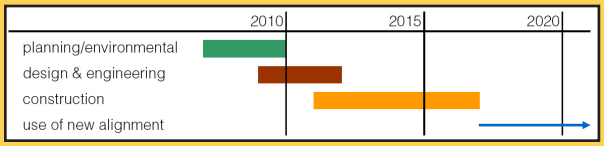

Figure 4-3. Project Development Schedule

Table 4-3. Alternative Alignment Time Differences

	Run Time	
	General Merchandise	Premium Intermodal
Existing	3' 30"	2' 55"
DC Tunnel	2' 50"	2' 50"
Indian Head	2' 59"	2' 59"
Dahlgren	3' 07"	3' 07"

The DC Tunnel alignment would reduce freight railroad travel times through the Washington, DC region and thus would result in modest time and cost savings for rail carriers. The eastern alignments would produce slightly longer routes but higher travel speeds for general merchandise trains resulting from the separation of freight and passenger rail.

to carry out the steps in project development as well as the ability to involve the appropriate stakeholders, both public- and private-sector. This authority must be clearly defined early in project development to avoid delays. The other aspect is funding. Adequate resources must be assured on a timely basis to support project costs.

The project development schedule is important because the security risks created by the present alignment would persist for a long time. Security risks would not be fully reduced until a railroad realignment project is completed and in operation. This fact underscores the urgency of beginning and completing a project as quickly as possible.

Discount Rates

Discount rates were assumed as follows:

- Transportation-related benefits were discounted at a real discount rate of 3.25 percent. This represents a consensus discount rate utilized in recent transportation benefit-cost studies and project evaluation guidelines. The current US Office of Management and Budget guideline for federally funded projects is a 3.0 percent real discount rate (OMB Circular No. 94 -Appendix C, 2006; the current AASHTO guideline is 3.5 percent (A Manual of User Benefit Analysis for Highways, 2nd ed.)
- Real estate benefits were discounted at 5 percent—a higher discount rate than transportation-related benefits—to reflect the higher risk associated with real estate investment and the typically higher hurdle rates that real estate developers seek in the market. Because of the substantial public component to the benefits associate with redevelopment in the city, the rate is not as high as a full private-sector developer hurdle rate.

Transportation-Related Benefits

Several types of measurable transportation-related benefits would be generated by the various railroad realignment alternatives, including travel time savings for freight rail, passenger rail riders, and highway users. Other benefits are explained below, including the methodology and assumptions used to estimate each benefit category. The methodologies and assumptions used for the transportation-related benefits were adapted from recent rail benefit studies in the mid-Atlantic region. These studies include the *Mid-Atlantic Rail Operations Study: Interim Benefits Assessment*, developed for the I-95 Corridor Coalition (2004), the *Guide to Quantifying the Economic Impacts of Federal Investments in Large-Scale Freight Transportation Projects*, developed for the U.S. DOT (2006), and the *Baltimore Freight Rail Bypass Study*, developed for the Maryland DOT (2005).

Travel time impacts for existing freight rail

Each of the three alternatives would affect freight railroad travel time. Travel time impacts for existing freight rail were estimated using: 1) a rail network simulation model, 2) federal Surface Transportation Board carload waybill sample data for the Washington, DC rail corridor, and 3) estimates of average carload costs per hour for intermodal and all other freight rail merchandise. The waybill data was used to estimate the number of intermodal and general merchandise carloads traveling through the Washington, DC rail corridor. The total volume of carloads in 2005 was 368,489 with 32 percent intermodal rail. Based on the MAROPS,[1] the projected annual average growth rate is 3 percent for intermodal rail volumes and 1.1 percent for general merchandise. Based on data provided by CSX, hourly carload costs were estimated to be $23.81 for intermodal and $15.96 for general merchandise.

The DC Tunnel alignment would reduce freight railroad travel times through the Washington, DC

1 It is worth noting that MAROPS was sponsored by CSX Transportation, Norfolk Southern, and Amtrak, and all three rail operators participated in the data and assumptions used in the benefits analysis.

region, creating modest time and costs savings for rail carriers. The Indian Head and Dahlgren alignments would produce slightly longer routes but higher travel speeds for general merchandise trains resulting from the separation of freight and passenger rail. Because the Indian Head and Dahlgren alignments would allow for trains to run without delay, this analysis assumed the same travel time for general merchandise and premium or intermodal trains. As a result, premium intermodal traffic would have a small increase in cost due to the longer route. This would be largely offset, however, by the large time savings general merchandise freight would have shifting from an existing run time of 3 hours 30 minutes to a shorter run time of 2 hours 59 minutes for Indian Head or 3 hours 7 minutes for Dahlgren.

Shipper cost savings of freight rail

Improving the performance and capacity of the rail system can lead to higher volumes of freight moving by rail rather than trucks. Because shipping by rail is less expensive on a cents-per-ton-mile basis than shipping by truck, shippers and receivers of freight benefit through lower costs. This benefit would accrue only in the scenarios with other mid-Atlantic corridor railroad improvements, as other improvements would be needed to allow long-distance shipment of double-stack containers.

The methodology to estimate this effect used the ratio of carloads passing through the Washington, DC rail corridor compared to total carloads examined in MAROPS (8 percent), which allowed the derivation of estimates of both tons diverted to rail and reductions in truck VMT. Based on the shipping pattern (origins and destinations and average distance) of rail from the waybill sample, the resulting increase in ton miles shipped via rail (compared to a scenario without other mid-Atlantic railroad improvements) can be estimated. Applying the MAROPS differential in cost per ton mile shipped by rail ($0.045) versus truck ($0.08) to the increase in freight rail shipments resulted in an estimate of shipper cost savings.

Shipper cost savings would benefit all three alignments equally. The cumulative savings to freight shippers over the 40-year analysis period from 2017 to 2057 was estimated to be $618,199,988.

Reduced supply chain and logistics costs

The ultimate beneficiaries of reduced shipping costs would be the businesses that ship and receive goods by rail. Recent research by the U.S. DOT and FHWA documents how companies can leverage "1st order" direct transportation-related benefits into additional cost savings and market share by restructuring their distribution and supply chain processes to produce, ship, and receive goods.

The recently published U.S. DOT freight economic impact guidebook describes the benefits of reduced transportation costs as: 1) greater supply network reach, 2) reduction in the number of plants or distribution centers to serve a market, and 3) a reduction in inventory from the use of smaller shipment sizes for the same price. Parameters estimated from a large sample of empirical, quantitative business case studies show that a ten percent reduction in freight transportation costs can lead to a four to seven percent additional supply chain benefit. The actual benefit amount varies based on the industry mix and supply chains affected. This methodology was applied in the Baltimore freight rail bypass case study as part of the U.S. DOT freight economics guidebook and resulted in additional supply chain benefits that equaled 63.25 percent of the 1st-order shipper cost savings. Since the industry mix and supply chain logistics of freight shippers and receivers using the Washington, DC rail corridor is similar to those in Baltimore, that estimate was applied to the rail transportation cost impacts estimated for each alternative in this study.

Supply chain benefits are based directly on the freight rail operator's savings. Therefore, the supply chain savings are in direct proportion to the savings the freight rail operators would receive.

Highway benefits from reduced truck volumes

Increasing freight capacity provides the opportunity for freight to be transported via railroad instead of

truck. To the extent that the Washington, DC rail realignment led to higher volumes of freight moving by rail instead of by truck in the future, truck vehicle miles of travel (VMT) would be reduced. These benefits would accrue only in the scenarios with other mid-Atlantic corridor railroad improvements, which provide additional premium intermodal capacity by allowing for long-distance shipment of double-stack containers.

For this analysis, highway-related benefits stem entirely from the estimation of increased freight rail volumes and thus lower truck VMT on the highway system (primarily in the mid-Atlantic region). Based on the number of additional carloads, truck VMT was estimated to decrease by 128.1 million by 2025. The reduction in future truck VMT would have two measurable impacts.

First, it would relieve future traffic congestion and improve travel performance for the trucks and autos that remain on the highway system. These benefits were quantified using a ratio of truck VMT reduction compared to the full MAROPS program of benefits. The resulting reductions in travel time and delay were further segmented and monetized into trucks, on-the-clock business auto trips, and non-business auto trips. The original MAROPS estimated these benefits by simulating a reduction in truck VMT through FHWA's Highway Economic Requirements System (HERS) model to quantify the highway efficiency benefits to remaining highway travelers. The cumulative highway benefits would accrue equally to the three alignment alternatives, providing $1,341,716,594 to auto and truck highway users between 2017 and 2057.

The second impact category is a number of secondary effects related to reduced truck miles traveled such as reduced polluting air emissions, reduced wear and tear on highway facilities and consequently reduced future pavement maintenance costs, and safety increases with fewer trucks resulting in fewer accidents. Based on a combination of data from the FHWA and the Baltimore Freight Rail Bypass Study, the following parameters were used to estimate these secondary effects:

- Air pollution emissions: $0.045 per truck VMT
- Highway maintenance savings: $0.20 per truck VMT
- Safety savings: $0.115 per truck VMT

Overall highway system benefits would also accrue equally to the three alignment alternatives, providing $1,635,961,051 between 2017 and 2057.

Improved passenger rail travel times and reliability

For the Indian Head and Dahlgren alignment alternatives, separating freight and passenger rail services traveling through Virginia and into downtown Washington, DC would lead to improved Virginia Railway Express and Amtrak performance. Improved performance would be realized through both reduced average travel times and improved on-time performance providing benefits to commuter and other passenger rail riders.

Travel-time savings and on-time performance improvements were estimated using a rail simulation model, which provided general estimates of running times. The travel time for a passenger rail trip from Fredericksburg to the District was estimated to achieve an 11 percent reduction in journey time from the present 90 minute schedule. Three elements make up this schedule reduction. Fewer freight trains open up the possibility of operating some skip stop or express train service instead of all trains making all stops. Second, there is limited opportunity for increased speeds—80 mph instead of 70 mph. Finally, the biggest savings comes with the confidence of trimming the schedules' recovery time or make-up time because the freight trains are somewhere else for all or part of the trip.

On-time performance was estimated to be improved from 80 percent to 95 percent. This is almost entirely the result of reducing or eliminating freight trains. The improvement in on-time performance led to the estimate of a reduction of delay of six minutes per trip. To estimate aggregate time savings, average daily ridership on VRE (7,750 in FY2006) was multiplied

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by the time savings and converted to annual estimates based on the number of work days per year and the portion of the route a rider used. The aggregate time savings for all riders over the course during a year add up to a significant amount of time. These travel time savings were converted into monetary terms using values of time used by the Virginia DRPT for business and personal travel ($37.55 and $16.97 calculated in 2005 dollars, respectively). To be conservative, most of the travel was assumed to be for personal, in most cases commute, trip purposes with 20 percent for on-the-clock business trips. VRE passenger rail benefits were estimated to grow with VRE ridership projections of 3.3 percent average annual growth on the Fredericksburg and Manassas lines.

Amtrak trains should also experience improvements in travel time and on-time performance. A similar methodology to the VRE benefits was applied to Amtrak, with a few key differences: 1) average daily ridership on affected Amtrak service is lower (4,965 in 2006), 2) the average value of time was reduced to reflect the primarily personal nature of travel ($18.00 per hour), and 3) Amtrak's estimate of annual average ridership growth of 4.8 percent on the Richmond-to-Washington, DC service was applied to grow benefits over time.

Another important benefit of improved travel time, reliability, and capacity is the ability of commuter rail to absorb a greater share of commute trips in the VRE corridors, especially on the Fredericksburg Line. While this induced demand effect was not measured for this study, the resulting improvement in VRE service from the Indian Head and Dahlgren alignments has the potential to attract commuters at a faster rate than highway travel.

Cumulative savings to the Indian Head and Dahlgren alignments would be equal, resulting in $188,951,468 in travel time saving and $1,240,682,041 in reliability savings between 2017 and 2057.

Table 4-4. Summary of Benefits* (2017-2057) $2006

	DC Tunnel	Indian Head	Dahlgren
With Other Corridor Mid-Atlantic Improvements	$4,284,465,657	$7,288,362,602	$7,176,596,767
Without Other Corridor Mid-Atlantic Improvements	$297,576,531	$3,330,147,3476	$ 3,189,707,641

* Benefits in Table 4-4 are not discounted.

All three rail realignment alternatives would produce significant transportation-related benefits for the region and the nation. Ultimately, Indian Head would be likely to produce slightly greater transportation-related benefits.

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Transportation-Related Benefits Summary

All three rail realignment alternatives would produce significant transportation-related benefits for the region and the nation. The Indian Head alternative would generate the most transportation-related benefits, followed closely by the Dahlgren alternative. Both alignments fared well in the transportation-related benefits analysis, largely because of the travel time and reliability savings they would provide passenger rail service. Ultimately, the Indian Head alignment would be likely to produce slightly greater transportation-related benefits than the Dahlgren alignment because it would be shorter in distance and therefore has a shorter run time.

Geographic Distribution of Transportation-Related Benefits

The benefits to shippers and receivers would be geographically distributed. The benefit-cost analysis identified this geographic distribution from two perspectives:

- Regional benefits: Washington, DC, Maryland, and Virginia
- National benefits: summation of regional benefits and rest of the U.S.

The assumption is that benefits accrue at the origin and destination of trips, not simply the location of transportation improvements. Estimates of the origin-destination pattern of freight and passenger trips affected by alternative alignments were used to allocate benefits to the regional and rest-of-the-U.S. geographies using a simplified 50-50 split between origins and destinations. Except for the passenger rail benefits, all other benefit concepts were allocated to regions based on analysis of the origin-destination pattern of rail shipments in the waybill data sample. The data reveals that 25 percent of the freight shipments are directly related to origins and destinations within the DC-MD-VA region, while 75 percent accrue to other parts of the United States. Given the long-distance nature of most freight rail shipments, this result is not unexpected. Of the 25 percent of the regional benefits, the District of Columbia would receive 1 percent of the regional

Table 4-5. Public/Private/Geographic Breakdown of Benefits* $2006

With Other Mid-Atlantic Corridor Improvements

Public Benefit	DC Tunnel	Indian Head	Dahlgren
DC, MD, VA	$667,519,015	$3,023,849,876	$3,023,849,876
DC	$8,345,877	$8,345,877	$8,345,877
MD	$261,612,277	$261,612,277	$261,612,277
VA	$397,560,861	$2,685,260,727	$2,685,260,727
Rest of USA	$2,002,577,044	$2,775,859,691	$2,775,859,691

Private Benefits	DC Tunnel	Indian Head	Dahlgren
DC, MD, VA	$356,787,932	$346,465,818	$337,290,606
DC	$4,460,859	$4,331,803	$4,217,087
MD	$139,831,377	$135,785,962	$132,190,037
VA	$212,495,696	$206,348,053	$200,883,482
Rest of USA	$1,257,601,666	$1,142,187,216	$1,039,596,594

TOTAL	**$4,284,465,657**	**$7,288,362,602**	**$7,176,596,767**

Without Other Mid-Atlantic Corridor Improvements

Public Benefits	DC Tunnel	Indian Head	Dahlgren
DC, MD, VA	$-	$2,356,330,862	$2,356,330,862
DC	$-	$-	$-
MD	$-	$-	$-
VA	$-	$2,356,330,862	$2,356,330,862
Rest of USA	$-	$773,302,647	$773,302,647

Private Benefits	DC Tunnel	Indian Head	Dahlgren
DC, MD, VA	$27,584,666	$17,262,551	$8,087,339
DC	$344,886	$215,831	$101,115
MD	$10,810,909	$6,765,493	$3,169,568
VA	$16,428,870	$10,281,227	$4,816,656
Rest of USA	$269,991,866	$154,577,416	$51,986,794

TOTAL	**$297,576,531**	**$3,301,473,476**	**$3,189,707,642**

* Benefits in Table 4-5 are not discounted.

benefits, Maryland would receive 39 percent, and Virginia would receive 60 percent. The District would reap very little of the transportation-related benefits because most of the rail traffic is passing through, not originating or terminating. Benefit concepts such as highway congestion relief and reduced accidents and pavement costs can be fittingly attributed to the geographies based on freight shipment patterns since these benefits occur due to reductions in truck VMT that would not have occurred throughout the broader mid-Atlantic region without rail improvements. Passenger rail benefits, which are largely commuter trips on VRE are primarily allocated to the region, and even more specifically, Virginia.

Public and Private Benefits

- Benefits would also be distributed to both public and private recipients. Understanding this distribution is particularly important for freight transportation projects for at least two reasons: 1) freight activity by its nature directly affects the costs and efficiency of business-related travel and trade and 2) freight transportation facilities, such as rail lines, are often at least partially owned and maintained by private-sector transportation firms and providers. Consequently, the benefits analysis identified separate estimates of public and private benefits. For purposes of this analysis, private benefits are those that most directly relate to private rail carriers and the shippers and receivers of goods:
- Freight rail travel time impacts
- Freight rail shipper cost savings
- Truck and on-the-clock auto highway travel efficiency benefits (reduced delay)
- Public benefits accrue to either personal, non-business travel (across a large number of people) or society in general (e.g., air emissions) and include:
- Passenger rail travel time savings (VRE and Amtrak)
- Non-business auto travel efficiency benefits
- Highway system benefits—safety, emissions, and pavement maintenance

Transportation-Related Benefit Results

The results of the transportation-related benefit analysis reveal several important conclusions:

- The private sector benefits most when other corridor improvements are made.
- The public benefits most from the Indian Head and Dahlgren alternative alignments because of passenger rail savings.
- Of the regional public benefits, the majority accrue to Virginia.
- Of the regional private benefits, the breakdown is 1 percent to the District of Columbia, 39 percent to Maryland, and 60 percent to Virginia.

DC Tunnel with Washington, DC region realignment only

This alternative would produce the least cumulative transportation-related benefits, resulting in an estimated $297,576,531 between 2017 and 2057. All the benefits would accrue to the private sector; the public sector would receive no benefit. The private benefits would be a result of reduced freight travel times, benefiting the rail service providers and shippers. Of the private benefits, the majority, 91 percent, would be allocated to the rest of the United States.

DC Tunnel with other mid-Atlantic corridor railroad improvements

When additional corridor improvements are added to the DC Tunnel alternative the transportation-related benefits would drastically increase. The private benefits would increase from $297,576,531 to $1,614,389,598, with the majority, 90 percent, still being allocated to the rest of the United States. The public benefits would total $2,670,076,059 and would all be due to reduced truck VMT.

Indian Head with Washington, DC region realignment only

In this alternative, the public benefits of $3,129,633,509 would be nearly 18 times greater than the private benefits of $171,839,967. All of the public benefits would be due to passenger rail savings, which would be allocated either to the rest of the United States or to Virginia. Maryland and the District of

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Columbia would receive no public benefit from this alternative. The private benefits would be a result of higher train speeds and ultimately a total travel time savings.

Indian Head with other mid-Atlantic corridor railroad improvements

When additional corridor improvements are added to the Indian Head alternative, the transportation-related benefits would increase 121 percent. The public benefit of $ 5,799,709,567 would continue to outweigh the private benefits of $1,488,653,034. However, the difference between the public and private benefits drastically decreases. The increased private benefits would be a result of greater shipper cost savings and reduced truck VMT.

Dahlgren with Washington, DC region realignment only

In this alternative, the public benefit of $3,129,633,509 would be nearly 52 times greater than the private benefit of $60,074,133. All the public benefits would be due to passenger rail savings, which are allocated either to the rest of the United States or to Virginia. Maryland and Virginia would receive no public benefit from this alternative. The private benefits would be a result of higher train speeds and ultimately a total travel time savings.

Dahlgren with other mid-Atlantic corridor railroad improvements

When additional corridor improvements are added to the Indian Head alternative, the transportation-related benefits would increase 125 percent. The public benefits of $ 5,799,709,567 would continue to outweigh the private benefits of $1,376,887,200. However, the difference between the public and private benefits would drastically decrease. The increased private benefits would be a result of greater shipper cost savings and reduced truck VMT.

Real Estate Benefits

The freight railroad realignment would allow the redevelopment of parts of the existing railroad right-of-way within the District. This redevelopment would create real estate benefits, including potential increases in property value.

The real estate analysis assumed the existing railroad right-of-way would be vacated between the divergence of the Amtrak line to Union Station and the District-Maryland line, except for a spur that would allow continued coal deliveries to the Capitol Power Plant. The removal of the rail line holds significant implications related to property value and opportunities for new land development.

Real Estate Methodology

In the locations where the rail line would be removed, two real estate dynamics would come into play. One is (re)development that will be possible on and adjacent to the vacated rail right-of-way. The other real estate-related consequence is an increase in property values in the areas adjacent to the rail right-of-way resulting from an improved physical environment—the removal of a significant barrier and improved connections, the construction of new development on and adjacent to the vacated rail right-of-way, the creation of potential new amenities such as roadways, green space, and transit. These two dynamics would create new property value within the District of Columbia that would not otherwise be generated should the rail line remain.

To understand the market dynamics shaping growth in areas adjacent to the existing alignment, a study of existing conditions was conducted. The development history, land use and building stock, property ownership, zoning, and transportation network were evaluated within each section. Demographic conditions within the Washington, DC region, within the District, and within the specific study areas were also evaluated. Finally, current activities affecting the individual study areas, including economic trends, land use and infrastructure planning efforts, and real estate development activity were evaluated. This study is in Appendix C, which is in a separate report volume.

Evaluation of Alternative Alignments

To aid in understanding of the opportunities and challenges of redevelopment in the corridor, the National Capital Planning Commission and the District Department of Transportation sponsored an Urban Land Institute Fellows Panel on December 11-13, 2006. The panel brought together four respected real estate and development experts to review conditions in the corridor and recommend development-related actions. The panel's recommendations are described in a separate report. Similar panels could be convened in the future to understand the development impacts to areas around any new alignment.

The analysis measured real estate benefits of freight railroad realignment by estimating the following impacts:

- Projected long-term (re)development in square feet of new development and associated new market value (cumulative and annual).
- Projected potential increase in property values in the areas adjacent to the vacated rail right-of-way and the new development market values.

While real estate impacts to areas where a new alignment may go need to be analyzed, it was beyond the scope of this study to assess these impacts. This type of analysis, which would include having a specific railroad alignment and adjacent property data, would

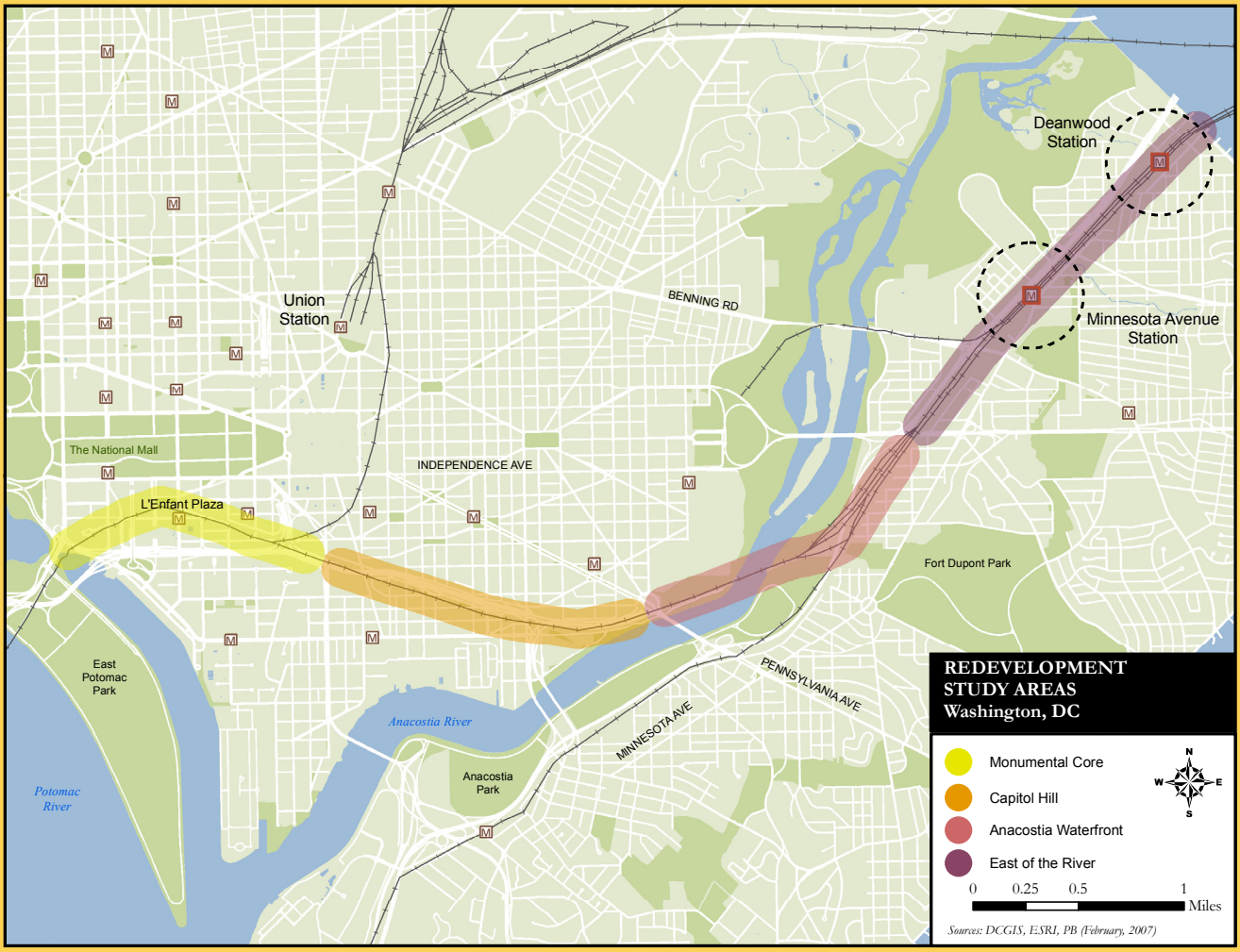


Figure 4-4. Real Estate Study Areas

be appropriate once the project becomes more defined.

Real Estate Assumptions

Several assumptions were used to calculate the benefits resulting from the real estate impacts.

Development was assumed to be generated over a 40-year period, beginning in 2017 (the year the rail line was assumed to be removed) and extending to 2057. The 40-year period is consistent with the overall benefit-cost analysis framework—the discounted present value of benefits must assume uniformity across all benefit categories to arrive at a correct benefit-cost result. The 40-year period was also regarded as a reasonable build-out period for new development.

Development was assumed to be, on average, evenly distributed over this 40-year time period. Multiple factors, including the segment's historically low market share of the District of Columbia as a whole combined with improving market conditions and approaching build-out in the city's traditional markets, do not support the creation of a detailed projected absorption trend. As a result, an average annual absorption was applied to avoid the need for assumptions about how and when absorption will occur in the East of the River segment. This absorption rate was tested to establish its reasonableness given current and anticipated real estate development trends, existing conditions in this area, and plans for growth.

The analysis includes the monetary benefits resulting from new development only in the East of the River segment. The real estate analysis addressed both the Monumental Core and East of the River segments, but development within the Monumental Core is not dependent upon railroad realignment. A proposed deck over the existing rail line in the Monumental Core would allow development independent of railroad realignment. Thus, development in the Monumental Core is not included in the benefit-cost analysis.

Table 4-6. Moderate Development Scenario

Net New Floor Area Ratio (FAR) Assumptions* Redevelopment Properties - Moderate Redevelopment Scenario			
Location	0-350 ft	350 – 800 ft	800 – 1500 ft
Vacated Rail Bed	0.5	No change	No change
Minnesota Avenue Metrorail Station	3	1.5	No change
Deanwood Avenue Metrorail Station	1	0.5	No change

*Geographic zones based on the following assumptions: redevelopment most likely to occur within 350 feet (approximately equivalent to one city block) of rail line or 0.25 mile radius (walking distance) around Metrorail stations.

Table 4-7. Land Use Mix Assumptions

Land Use Mix Assumptions East of the River			
Location	Residential	Retail	Office
Minnesota Avenue	75%	20%	5%
Minnesota Avenue Metrorail Station	65%	10%	25%
Deanwood Metrorail Station	65%	10%	25%

- Based on land use mix in proposed and planned projects in the East of the River segment

Figure 4-5. Recent Decking Over Present Railroad

Evaluation of Alternative Alignments

Both moderate and major redevelopment scenarios were developed in the study. The moderate scenario was used for the allocation of benefits in the benefit-cost analysis.

All of the dollar amounts in Table 4-10 are presented in undiscounted, 2005 constant dollars. A three percent per year increase in real property values was applied, reflecting historic real property value increases over inflation during stable market periods. The rapid escalations in property values witnessed over the past three years were not considered in establishing the increase rate.

Real Estate Impacts

Development in the East of the River segment would likely occur on and adjacent to the vacated railroad right-of-way as well as around the two Metrorail stations located in this segment: Deanwood and Minnesota Avenue.

Using these floor-area-ratio assumptions, new square footage of development was calculated based on existing land areas and assumed floor-area ratios. Based on current and projected land use patterns, the following land use mix distributions were applied to determine total square footage by retail, residential, and office land use.[2]

Total redevelopment in gross square footage for the entire 40-year time period beginning in 2017 is depicted in Table 4-8.

Assuming average annual absorption, this development potential yields $35.2 million per year in new market value over a 40-year period.[3]

2 A complete discussion of the East of the River development potential and assumptions is in Appendix C.

3 This calculation uses 2007 constant dollars and does not include a likely 3% annual real estate real value increase beyond general price increases.
Retail market values = $350/SF, residential market values - $225/SF, office market values = $300/SF and are figures utilized by the District for economic and fiscal evaluations. The appendix includes a detailed presentation of the East of the River development potential.

Table 4-8. Cumulative Development with Moderate Development

Cumulative Development in Gross Square Footage East of the River (2017-2057)	
	Moderate
Office	1,067,004
Retail	457,348
Residential	4,234,216
TOTAL	**5,758,568**

Table 4-9. Value Increase Gradient

Assumptions: Value Increased Related to Freight Rail Removal Freight Rail Estimated Real Estate Impacts	
Distance from Freight Rail Line	**Associated Value Increase***
0-500 Feet	10%
500-800 Feet	6%
800-1500 Feet	4%
1500-2500 Feet	2%

1) Based on findings of five studies that analyzed the value premium associated with amenity creation (e.g. parks, greenways, boulevards, etc.)

Evaluation of Alternative Alignments

Increases in Assessed Values

In addition to estimating total redevelopment potential, the impact of the rail realignment was evaluated by calculating the total increase in values that would result from the rail line removal. These impacts were calculated by:

1) applying a value increase gradient, diminishing as distance from the rail line increases, and
2) adjusting assessed values for estimated redevelopment potential.

The assumptions regarding value increases by distance from the with freight rail line are identified in Table 4-9.

This increase in value was projected as a one-time adjustment occurring in response to the railroad realignment.

In a No-Change scenario, real estate values were assumed to increase at three percent per year in real dollar increases (beyond general price level changes), reflecting historic real property value increases. In the Moderate Redevelopment scenario, in which the rail line is removed and a moderate level of development occurs, real estate values would increase at the three percent per year real dollar increase in addition to the following two factors:

1. a one-time premium adjustment responsive to the rail line relocation, and
2. 40-year absorption of new market value resulting from new development.

The annual difference in value between the Moderate Redevelopment scenario and the No-Change scenario is presented in Table 4-10.

Regional Development Possibilities

Though this study did not include the identification of specific development opportunities outside of the District, it did generally consider the possibility for railroad-related development in those counties that would be most affected by the viable alternatives. The key elements of these counties' comprehensive or general plans, as they relate to a proposed freight railroad alignment, are summarized. These opportunities should be studied in more detail in future project steps.

Charles County, Maryland

On the outskirts of Washington, DC, Charles County is experiencing significant residential growth pressures. The county anticipates an increase of 20,000 office jobs between 2000 and 2025. The Charles County Comprehensive Plan intends to concentrate 75 percent of all development within the northwestern portion

Table 4-10. Real Estate Benefits for Selected Years

Real Estate Benefits Net New Value of Rail Line Relocation (2017 - 2057)	2005 Observed	2010 Projected	2020 Projected	2030 Projected	2040 Projected	2050 Projected	2057 Projected
Rail Relocation with Moderate New Development (billions)	$5.065	$5.872	$8.406	$11.980	$17.018	$24.106	$30.558
No Change (billions)	$5.065	$5.872	$7.892	$10.607	$14.254	$19.157	$23.561
Net New Value (billions)	$0	$0	$0.513	$1.373	$27.640	$49.488	$6.997

(1) Assumes 2005 Constant Dollars

(2) Incorporates annual 3% real property value increase

(3) Includes one-time property value increase in 2017 (year of rail line removal)

(4) Includes 40-year straight line absorption of moderate development market value starting in 2017

of the county and the towns of Indian Head and La Plata.

The county's intention is to concentrate office development in Waldorf, White Plains, and the area adjacent to the Harry W. Nice Memorial Bridge. Though the county has determined that the majority of its waterfront areas are undevelopable, it considers the area around the Nice Bridge suitable for development. The Indian Head and Dahlgren alternative alignments pass through or close to all of these areas.

The county plan's transportation section discusses the U.S. 301 corridor, which parallels the Pope's Creek Branch. Notable transportation elements of the plan include:

- Opposition to the conversion of U.S. 301 through Waldorf into a limited-access freeway because of the physical divide it would create.
- Preservation of right-of-way for a U.S. 301 bypass around Waldorf. Both the Indian Head and Dahlgren alignments would make use of the current railroad right-of-way directly adjacent to U.S. 301 in this area.
- Light rail or bus rapid transit running along the U.S. 301 corridor between Waldorf and La Plata. The county anticipates building this transit line no earlier than 2015 and proposes the acquisition of rights-of-way in preparation.

Charles County and the project sponsors should coordinate on development possibilities associated with the Indian Head and Dahlgren alignments. The key issues of concern are coordinating any future U.S. 301 bypass with a future railroad, and coordinating the development of railroad alternatives so that they minimize impacts to the surrounding communities and maximize the benefit of new office or industrial development.

To minimize community impacts, mitigation tools such as noise walls, depressing the railroad below grade, and/or creating a railroad bypass could be used where appropriate. These elements have been included in the cost estimates for these alternatives. Accordingly, the benefit-cost analysis took explicit account of noise and other impacts.

Prince George's County, Maryland

The *Prince George's County Approved General Plan* divides the county into three regions; they are, from west to east, the Developed, Developing, and Rural Tiers. Both the Indian Head and Dahlgren alignments would pass through the Developing Tier and small portions of the Rural Tier. The county expects that the majority of all development from 2002 to 2027 will occur in the Developing Tier. In general, the county envisions a shift to become a greater employment center within the region.

The only designated development centers along the Indian Head/Dahlgren alignment are Bowie, designated a Regional Center, with residential densities greater than or equal to eight dwelling units per acre, and the area north of Waldorf at the Charles County line, which is designated a Community Center, with residential densities ranging from four to 30 dwelling units per acre.

One of Prince George's County's environmental priorities is reducing transportation-related noise volumes in residential areas to levels between 45 and 65 dBA. If a freight railroad were to be built close to homes, noise walls or other suitable mitigation measure would be included.

Anne Arundel County

The Indian Head/Dahlgren alignment would run through mostly industrially zoned areas in the county, with the exception of the medium- to high-density residential Odenton and Maryland City. Both alignments could enhance industrial development in the county.

King George County, Virginia

King George County, with 2030 population projected to be less than 30,000, is one of the most rural jurisdictions in the project study area. The Dahlgren alignment would pass near the most populated areas in King George County, Courthouse and Dahlgren. The

Evaluation of Alternative Alignments

King George Comprehensive Plan identifies the Dahlgren area as one of the only sites for redevelopment in the county; however, development intensity is limited by the Chesapeake Bay Preservation Area Overlay Zoning District. The Dahlgren alternative could enhance manufacturing or office development opportunities in and around Courthouse and Dahlgren.

Costs

Capital cost estimates for the railroad realignment alternatives are shown in Table 4-11. Because these estimates are based on conceptual alignments rather than detailed designs, they are order-of-magnitude costs and should be considered conceptual cost estimates. The estimates are sufficient to allow comparisons among the alternatives of their capital cost requirements.

High and low ranges of estimates were developed for each alternative reflecting the uncertainties in conceptual estimates. The high estimates include a higher contingency factor and assume more expensive structural solutions at waterway and roadway crossings, and higher allowances for property acquisition and noise walls. To be conservative, the benefit-cost analysis used the high cost estimate for each alternative.

The methodology used in preparing these conceptual costs estimates used accepted railroad industry techniques and is in accordance with current federal guidelines for estimating capital costs. The methodology is based on a "bottom up" estimating approach. Facility elements were grouped into major capital cost categories: guideway and track, systems, site work, and right-of-way property acquisition. The capital costs were determined in 2006 dollars.

Table 4-11. Conceptual Capital Costs of Alternatives

$s in millions	DC Tunnel		Indian Head		Dahlgren	
	Low	High	Low	High	Low	High
Bypass Alignment						
Railroad Infrastructure						
At-grade	$14	$15	$228	$221	$335	$330
Deep Retained Cut	$231	$456	$298	$829	$330	$911
Tunnel	$3,806	$3,952	$ -	$ -	$ -	$ -
Potomac River Bridge	$ -	$ -	$388	$403	$381	$395
Interlockings & Sidings	$41	$43	$145	$150	$171	$177
Subtotal	*$4,092*	$4,466	*$1,059*	*$1,604*	*$1,217*	*$1,813*
Structures	$361	$484	$1,099	$1,532	$1,275	$1,756
Civil & Utilities	$42	$44	$344	$397	$439	$456
Right-of-Way, Security, Mitigation	$52	$72	$513	$563	$387	$447
Subtotal -- Bypass Alignment*	$4,500	$5,100	$3,000	$4,100	$3,300	$4,500
Old Main Line Improvements	$150	$150	$150	$150	$150	$150
CSX Piedmont Sub Improvements	$50	$50	$50	$50	$50	$50
Capital Cost	$4,700	$5,300	$3,200	$4,300	$3,500	$4,700

* Totals are rounded

Evaluation of Alternative Alignments

The unit costs were derived from historical data from comparable railroad projects, including labor, temporary and permanent materials, equipment, and contractor's profit and overhead. The references and historical bid cost records were adjusted to comparable quantities, site conditions, and similar type of construction. Design and construction contingencies, as well as engineering and construction management allowances, are included separately as add-ons to the cost estimates. They are:

Design and Construction Contingency

A design contingency of 20 to 25 percent was included to account for unforeseen items or large quantity differences which would affect the unit prices. The lower contingency was used for the low range of the cost estimates presented. This contingency reflects the degree of risk associated with the level of engineering data available in defining the items in each category. A construction contingency of 10 percent was included to account for changes in scope and site conditions that occur during actual construction activity. A total of 30 to 35 percent allowance was applied to the construction cost estimate for each item.

Engineering and Construction Management

The engineering and management add-on includes the cost for preliminary engineering, final design, construction management and inspection services, and administrative services required to implement the selected corridor alternative. The allowance for track, structures, systems, and civil work is 20 percent. The allowance for right-of-way acquisition is 10 percent. A total of 30 percent allowance was applied to the construction cost estimate for each item. Owner's administration costs and project insurance have not been developed or applied to this estimate.

Guideway and Track

Guideway construction costs for the alternative alignments were arrived at by estimating the number of route-miles to be constructed using various standard railroad construction techniques. Per-route-mile construction costs were developed for each technique based on established unit costs of materials, labor, and equipment necessary for each. The total guideway costs of each alternative alignment are the sum of the estimated miles required of each construction technique multiplied by its respective per-mile costs. Costs for certain guideway items, such as undergrade bridges and portal transitions, which are typically installed in segments much shorter than one mile, were calculated on a per-each basis.

Systems

The systems costs of each alignment consist of three primary fixtures: interlockings, highway grade crossings, and the fiber-optic lines necessary for train control and communications. Costs for interlockings and grade crossings were calculated on a per-each basis, while the cost for fiber-optics was calculated per route-mile.

Site Work and Mitigation

Site work consists of those construction activities required to make the right-of-way suitable for the installation of new guideways, such as land clearing and demolition, erosion and sediment control, and utilities relocation. Also included are certain mitigation items, such as the construction of noise barrier walls that will lessen the impact of the finished right-of-way on sensitive neighboring land uses. The cost figures for items in the site work category were calculated on a per-mile basis, with the exception of overhead highway bridges, which were calculated on a per-each basis.

Right-of-Way Property Acquisition

Fee simple property acquisition was assumed to be required to obtain a minimum 64-foot-wide right-of-way in each alternative alignment corridor. The property area required for each alternative was calculated in acres of existing private, railroad-owned, and governmental property required. The unit cost of this item was based on assumed values of properties located within urban areas and rural areas, measured in acres.

Evaluation of Alternative Alignments

Benefit-Cost Analysis Results

All alternatives and all scenarios yield benefit-cost ratios that are well in excess of 1.0, the threshold level for economically justifiable projects. Benefit-cost ratios, shown in Table 4-12, are highest for the Indian Head alternative; the Dahlgren and DC Tunnel alternatives follow in that order. These are general benefit-cost ratios and they do not take into account the benefit of reducing the security risk of moving hazardous freight through the heart of the federal establishment. Further, they do not take into account potential benefits or costs to areas around any new rail alignment.

Real estate development-related benefits are a majority of the monetized project benefits, ranging from about two-thirds of the benefits in the scenarios that include other corridor improvements to more than 90 percent for the scenario with the Washington, DC region realignment only. The real estate and development benefits on their own justify the railroad realignment project, even when other corridor improvements are not taken into consideration, and for each of the alternatives. These benefits can be leveraged to help pay for construction of a new alignment.

While transportation-related benefits comprise a minority of the total benefits and would not in and of themselves justify any of the alternatives, it should

Table 4-12. DC Rail Benefit-Cost Analysis

	DC TUNNEL		INDIAN HEAD		DAHLGREN	
	with other Mid-Atlantic corridor improvements	without other Mid-Atlantic corridor improvements	with other Mid-Atlantic corridor improvements	without other Mid-Atlantic corridor improvements	with other Mid-Atlantic corridor improvements	without other Mid-Atlantic corridor improvements
$s in millions						
TOTAL COSTS	5,300	5,300	4,300	4,300	4,700	4,700
TOTAL COSTS (PV)	5,133	5,133	4,165	4,165	4,541	4,541
TOTAL PV: $ - MEASUREABLE BENEFITS (NOT INCLUDING SECURITY)	8,841	7,058	10,032	8,249	9,953	8,200
% CONTRIBUTION TO MEASURED BENEFITS						
RR Time and Cost Savings	0.9%	1.1%	0.5%	0.5%	0.1%	0.2%
Freight Rail Shipper Savings	3.0%	0.0%	2.7%	0.0%	2.7%	0.0%
Supply Chain/Logistics Savings	2.5%	0.7%	2.0%	0.4%	1.8%	0.2%
Highway Benefits (includes Kenilworth Ave. Savings)	15.2%	0.7%	13.4%	0.6%	13.5%	0.6%
Passenger Rail Benefits	0.0%	0.0%	12.1%	14.7%	11.9%	14.7%
Real Estate Development	77.8%	97.4%	68.5%	83.4%	69.1%	83.9%
NET PRESENT VALUE	3,707	1,925	5,867	4,084	5,412	3,659
BENEFIT-COST RATIO	**1.72**	**1.37**	**2.41**	**1.98**	**2.19**	**1.81**

be noted that the benefits to shippers and highway users (including safety and environmental benefits) have been prorated in this analysis to capture only the benefits within the Washington, D.C. metropolitan area. This means that a substantial share of the total societal benefits have been extracted from this analysis. With the other corridor improvements in place, shipper and highway-system benefits would be extensive throughout the Northeast Corridor and would greatly exceed the volume of transportation-related benefits included in this benefit-cost analysis.

Evaluation of Alternative Alignments

Comparison of Alternatives

The results of the analyses in study provide the basis for some comparisons among the alternative alignments. Comparisons were made on a relatively small number of measures that were selected to describe some of the alternatives' most important relative characteristics. These comparisons were made as a way to understand how each alternative performs under different criteria and do not imply a preferred alignment.

Capital cost was one factor. The sheer scale of a realignment project would impose large construction and facilities costs. The conceptual cost estimates generated in this study provide the basis for comparing the alternatives on this measure.

The benefit-cost analysis results provided another useful measure. The benefit-cost analysis included multiple factors including railroad time and cost savings for both freight and passenger service, freight shipper benefits, reduced supply chain and logistics costs, highway user and system benefits resulting from diversion of freight from trucks to rail, and increased property values due to the removal of the rail line. This single measure conveys a considerable amount of information.

Because not everything can be measured monetarily, other factors must also be considered. To address non-monetary factors, the comparison drew upon information generated in the screening that led to the three viable alternatives. Information in the four screening categories—security, railroad operations, engineering, and environmental considerations—was applied where it would assist the comparison.

Security characteristics were compared. All the alternatives would improve security by removing freight railroad operations from the Monumental Core and reducing its attractiveness as a target. But there would be differences among the alternatives. While the probability of an attack and the severity of its consequences cannot be predicted, the number of people who would potentially be exposed to an attack can be measured. The comparison took into account the number of people forecasted to live within 800 feet of each alternative alignment in 2030, shown in Figure 4-6. It also considered the number of jobs in 2030 within this same distance, shown in Figure 4-7.

Railroad operations factors such as time savings and reliability were already taken into account in the benefit-cost analysis, so no additional railroad operations measures were compared.

Engineering factors were also already taken into account through the conceptual cost estimates. The definition of the viable alternatives included sufficient engineering analysis to ensure they all could be built to meet railroad standards. If an alternative would require greater effort or more-complicated design solutions to achieve these standards, this effort would be reflected in higher capital costs.

Environmental considerations were compared. Detailed information on environmental impacts cannot be defined in conceptual planning, so direct environmental comparisons of alternatives must wait for a full environmental impact statement later in project development. Defining and screening the alternatives did respect environmental concerns where possible by avoiding parks, recreation sites, refuges, and the Anacostia Waterfront Initiative area, so some major concerns should have been avoided. Although the direct environmental impacts of a realigned rail line cannot yet be measured, the environmental justice implications—the proportions of the population that would be exposed to any impacts that are low-income or minority—can be measured and were compared.

Table 4-13, which also includes the existing railroad alignment, displays the comparison. The values shown for all alternatives reflect the same project length from near Crossroads, Virginia to near Jessup, Maryland, so the values can be compared.

Benefit-Cost Ratio: The Indian Head alternative would have the lowest capital cost and the best

Evaluation of Alternative Alignments

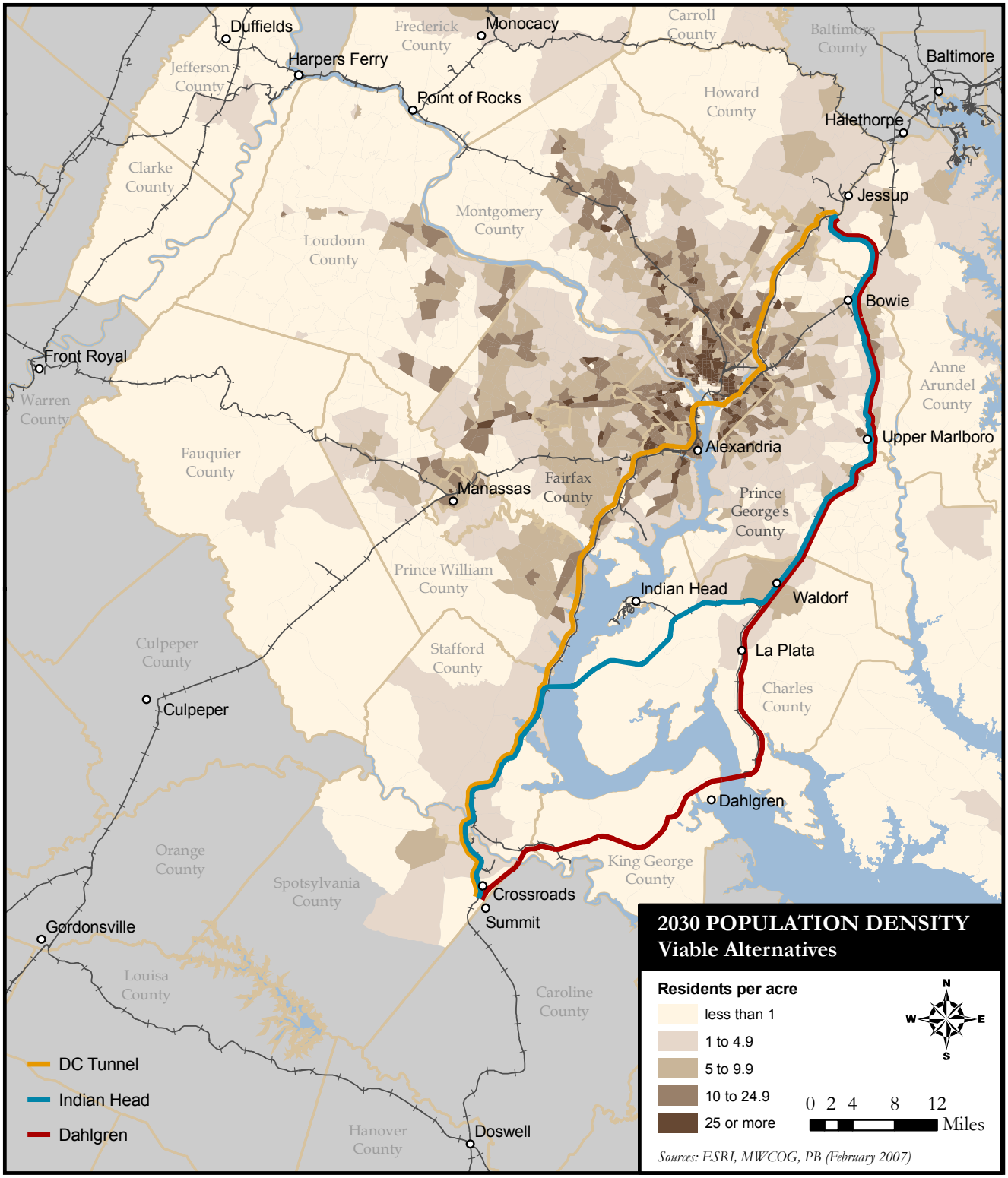


Figure 4-6. Proximity of Viable Alternatives to Future Population

Evaluation of Alternative Alignments

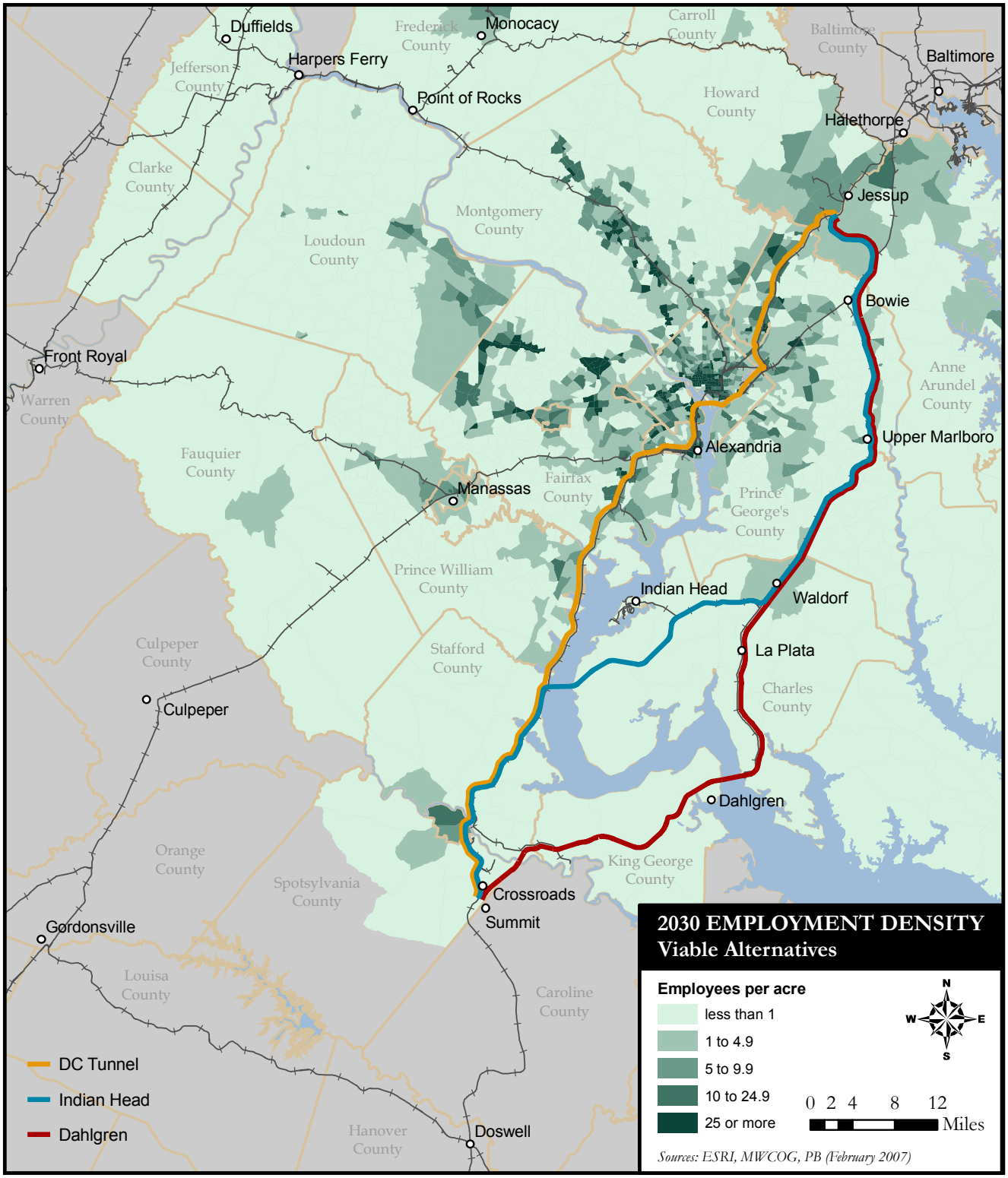


Figure 4-7. Proximity of Viable Alternatives to Future Employment

Evaluation of Alternative Alignments

Table 4-13. Comparison of Alternatives

Evaluation Factor			Outcome			
Category	Goal	Measure	DC Tunnel	Indian Head	Dahlgren	Existing
Benefit-Cost	Maximize benefits and minimize capital costs	Capital Cost ($ billion)	5.3	4.3	4.7	-
		Ranking	3	1	2	-
		Benefit / Cost *	1.72	2.41	2.19	-
		Ranking	3	1	2	-
Security	Minimize proximity to population and employment concentrations within potential plume area	Number of 2030 residential population within 800 feet of alternative rail alignment	75,368	34,146	26,061	94,741
		Ranking	3	2	1	-
		Number of 2030 employees within 800 feet of alternative rail alignment	104,697	16,963	14,873	173,831
		Ranking	3	2	1	-
Environmental	Avoid disproportionate impacts to low-income and minority populations	Percent of population below poverty level within 800 feet of alternative rail alignment	7.3	5.0	4.8	10.6
		Ranking	3	2	1	-
		Percent of population that is a minority within 800 feet of alternative rail alignment	46.9	42.1	43.4	55.1
		Ranking	3	1	2	-

* Benefit/cost ratio reflects scenario with other mid-Atlantic corridor improvements.

benefit-cost ratio; both the Indian Head and Dahlgren alternatives would perform better on these measures than the DC Tunnel alternative. In spite of their greater length of new construction, the Indian Head and Dahlgren alternatives would avoid the need for expensive tunneling and provide greater benefits to passenger railroad operations.

Security: All the alternatives would reduce the security threat to the Washington region by removing freight trains from the Monumental Core. In addition, all alternatives would improve security by reducing the number of people living close to the alignment compared to the existing rail line. The reduction for the Indian Head and Dahlgren alignments would be dramatic, dropping by fully two-thirds. The reduction in the number of nearby jobs would be even more stark—greater than 90 percent.

Environmental Considerations: The Indian Head and Dahlgren alignments would cut in half the proportion of the population near the rail alignment that is below the poverty level, a better performance than the DC Tunnel alternative. The Indian Head and Dahlgren alignments would also provide a greater reduction in the proportion of the population that is in minority groups; the DC Tunnel alternative would be similar to the existing conditions because so much of the existing line would remain in use.

Results of the Feasibility Study

This analysis in this study produced a set of conclusions that can assist decisions about moving ahead with a project to relocate freight rail service away from Washington's Monumental Core. These conclusions help define steps that would be necessary to initiate a railroad realignment project.

Conclusions

The present location of the freight railroad in Washington's Monumental Core creates security concerns

The line's proximity to the U.S. Capitol, the National Mall, federal offices, and populous neighborhoods makes it an attractive target for attack because the consequences would be dramatic. Hazardous materials on a freight train could provide the means for an attack.

There are viable alternative railroad alignments that would allow freight trains to be removed from the Monumental Core

A rail line on any of these alternative alignments would connect with the existing railroad network, comply with engineering standards, and operate as an effective component of the nation's freight transportation system. None of these alignments would provide a simple solution—building a railroad on any of them would be a major undertaking. While all the viable alternatives identified in the study would include existing rail lines, some of these lines would need to be upgraded and new railroad segments would need to be built. All would require a new Potomac River crossing either in a tunnel or on a bridge.

Railroad realignment would improve security

Railroad realignment would reduce the threat of attack on the Washington, DC region by the removing freight trains from the Monumental Core. A freight train on some other alignment would be a much less attractive target because it would not be near the iconic structures of the nation's capital, and the consequences of an attack, while still potentially serious, would be far more limited. The probability of an attack cannot be known, so the degree of

Figure 5-1. Present Security Concerns

Railroad realignment would reduce the threat of attack on the Washington, DC region by the removing freight trains from the Monumental Core. A freight train on some other alignment would be a much less attractive target because it would not be near the iconic structures of the nation's capital, and the consequences of an attack, while still potentially serious, would be far more limited.

Findings

improvement cannot be measured, but railroad realignment would reduce the threat, not simply relocate it.

Railroad realignment could create new railroad facilities that would fit appropriately in their setting

A tunnel alignment would separate the railroad entirely from its surroundings. At-grade rail segments would include new grade separations and design characteristics that would respect nearby development. Freight trains on any of the alternative alignments would be near places where fewer people live and work than the existing line. All the viable alternatives would meet environmental justice objectives better than the existing railroad.

Railroad realignment would improve the freight railroad system

Realignment would increase railroad capacity and eliminate major choke points. A realignment project would provide for increased railroad operating speed and reliability, increasing rail transportation's competitiveness and attracting greater volumes of freight. Transporting freight by rail would create savings for the highway network through reduced truck volumes.

Railroad realignment would also improve passenger rail service

Because both passenger and freight trains share the existing rail line, both would benefit from a project that would increase railroad capacity. More capacity would reduce conflicts between different types of trains, allowing higher speeds and greater reliability for passenger service. Separating freight and passenger services onto separate tracks would provide the greatest benefits by removing conflicts between train types entirely.

The transportation benefits of a railroad realignment project would be greater if it were combined with other mid-Atlantic railroad improvements

Solving operating problems would require railroad improvements throughout the mid-Atlantic corridor. The Mid-Atlantic Railroad Operations Study identified 71 needed railroad infrastructure and information-system projects. A railroad realignment project in the Washington, DC region would be more effective if it were combined with other projects elsewhere. Similarly, improvements in other areas, such as improving the Howard Street tunnel in Baltimore, would be more effective if a realignment project were built in the Washington, DC region.

Railroad realignment would remove a barrier within the nation's capital

Removing the existing freight railroad would enhance the unity of the Monumental Core. Neighborhood access to the Anacostia River would be improved, and Anacostia Park would no longer be divided. Parts of the city's street network could be restored to the intent of the historic L'Enfant Plan for the Nation's Capital.

Railroad realignment would allow for redevelopment of the existing right-of-way

Some of the vacated right-of-way could be redeveloped in mixed-use extensions of adjacent neighborhoods. The opportunities for redevelopment are in neighborhoods east of the Anacostia River.

The benefits of railroad realignment would be greater than the costs

A realignment project on any of the three viable alternative alignments identified in this study would produce benefits that would exceed project costs. Even without accounting for the value of the most important benefit—security improvement, which this study did not attempt to quantify—the benefit-cost analysis showed that a realignment project is worth doing. Capturing some of these benefits could help to pay realignment project costs.

Developing a railroad realignment project would require further planning

This study analyzed the characteristics of the region and the railroad at a broad, conceptual level because it was a first step in determining project feasibility. More detailed planning would be needed to define the characteristics of a project. A financial plan should identify funding sources and strategies to cover project costs. The preferred alternative alignment should be

selected and specific location and design decisions made.

Next Steps

The security threat, railroad operations constraints, and community impacts created by the existing rail line will exist until a railroad realignment project is completed. Planning, design, and construction would take at least ten years. Beginning a railroad realignment project and completing it as quickly as possible would reduce the duration of the present problems and hasten the realization of project benefits. During the period of project development, short-term improvements should also be made to address railroad security and operational issues.

Short-Term Improvements

Significant attention is of course already paid to both security concerns and railroad operations in the Washington, DC region. This study identified a program of short-term improvements that would supplement present practices. These short-term improvements are described in Appendix A, which is in a separate report volume.

Operational improvements would be intended to keep trains moving, since this would not only increase rail line capacity but also enhance security, and to enable traffic growth in both freight and passenger services. Operational improvements could include additional inspection tracks, additional wheel-defect detectors, additional track and signal maintenance, continued reviews of train scheduling and dispatching, and increased freight operating speeds. Security improvements could include enhanced security and maintenance where trains stop, memorandums of agreement between railroad companies and law-enforcement units, a security-awareness campaign, and additional regional drills and training.

Though the short-term improvements could reduce the security risk, minimize the effects of a security incident, and improve railroad reliability and capacity, they would not solve the major capacity and security problems. Freight railroad capacity would still be constrained by the Virginia Avenue tunnel, passenger and freight rail service would continue to share the same alignment, and the freight railroad carrying hazmats would continue to run alongside federal office buildings and the U.S. Capitol.

Funding

The large investment needed for a railroad realignment project makes the identification of funding a crucial step in project development. Efforts to develop a funding plan should be the next step in project development, as the ability to build a project will hinge upon the availability of adequate funds.

Project funding should reflect the distribution of project benefits. The security benefits would justify substantial project funding. The greatest benefits quantified in this study are real estate benefits that would accrue within Washington, DC; some means to capture a part of this value for use in railroad realignment funding would be appropriate. Transportation-related benefits are more widely distributed; some national funding sources may be appropriate because some of the transportation benefits would be realized outside the Washington, DC region. Railroad participation in project funding would be appropriate because the improved infrastructure would create railroad operating benefits.

Project funding would likely involve a mix of federal grants, innovative financing tools, and public-private partnership mechanisms similar to those used in other large railroad projects, such as the Alameda Corridor project in Southern California and the CREATE project in the Chicago area. A railroad realignment project in the Washington, DC region may also have real estate value-capture and security funding components. The applicability of these and other financing mechanisms to a realignment project should be thoroughly evaluated in the development of a comprehensive funding plan.

Organization

A key step in project development would be the definition of the organizational structure with responsibility for project implementation. The scale of a new freight railroad would likely exceed the authority of any existing single entity, so some new entity or organizational structure would be needed. Depending upon the alignment alternative, new construction might occur in multiple jurisdictions. There would be both public- and private-sector benefits of railroad realignment, so both should be represented in implementation.

The organizational structure should be identified early in project development so that the entities that will have responsibility for construction will have a voice in project planning. The organization should also be related to project funding so that the sources of funds are appropriately represented in project decisions.

Planning

Project development would require more-detailed planning. This planning should be conducted through the preparation of an environmental impact statement (EIS). An EIS is required for a major federal action that would significantly affect the human environment. A railroad realignment project would likely involve the federal government and would meet this test. An EIS would be a logical next step in planning, as it would be a systematic analysis of a wide range of characteristics of a project and its setting, would support the selection of an alternative and other project decisions, and would provide opportunities to involve a wide range of interested stakeholders.

An alignment alternative must be selected, including possible variations on the ones analyzed in this study. The physical characteristics of the rail line and related structures on the selected alignment must be defined, along with the impacts of construction and railroad operations. Appropriate measures to mitigate impacts, including grade separations, noise barriers, and other enhancements, must be designed. Costs must be estimated in more detail.

Because a realignment project would affect many people and organizations, planning should be an open process with ample opportunity to share information and guide decisions. The affected local, regional, and federal agencies and private companies must participate in planning, and the public in affected parts of the region must be involved.

An EIS for a project of this size, potential impacts, and number of affected people would take two to three years and could cost more than $5 million.

Interregional Coordination

Railroad improvements in the Washington, DC region must be viewed as part of a comprehensive East Coast railroad improvement program. The issues addressed in this study—security threats, constraints on railroad operations, and impacts in urban areas—affect other locations as well. Significant improvements in railroad operations would be possible only if obsolete infrastructure is modernized along the entire railroad corridor.

Both organizational structure and funding decisions in the Washington, DC region should not be made in isolation. Institutional responsibilities for project implementation in the Washington, DC region should be compatible with similar responsibilities in other locations to ensure coordinated project development. Funding decisions must be coordinated because the cost of needed railroad improvement along the East Coast is large. Funding commitments in one area must not preclude investments in others. The Mid-Atlantic Railroad Operations Study set a precedent for such interregional coordination by bringing together a consortium of federal agencies, states, and railroads to address needed railroad improvements. A railroad realignment project in the Washington, DC region should follow that precedent.

RAILROAD REALIGNMENT FEASIBILITY STUDY

Freight Railroad Realignment Feasibility Study

Securing freight rail transportation in the National Capital Region

Appendices

April 2007

NCPC

District Department of Transportation

Appendix A
Support Letters

Funding for the Freight Railroad Realignment Feasibility Study was provided by an Urban Area Security Initiative grant from the U.S. Department of Homeland Security. The grant application and the scope of work that detailed areas of study and methods of coordination were supported by the following stakeholders:

- The State of Maryland Department of Transportation
- The Commonwealth of Virginia, Department of Rail and Public Transit
- Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board
- District Department of Transportation
- Council of the District of Columbia

This appendix contains copies of the letters of support.

Support Letters

Maryland Department of Transportation
The Secretary's Office

Robert L. Ehrlich, Jr.
Governor
Michael S. Steele
Lt. Governor
Robert L. Flanagan
Secretary
Trent M. Kittleman
Deputy Secretary

September 27, 2004

Patricia Gallagher, AICP
Executive Director
National Capital Planning Commission
401 9th Street, NW Suite 500
Washington DC, 20004

Dear Patricia Gallagher:

This letter is to express support from the Maryland Department of Transportation for the National Capital Planning Commission's effort to study the relocation of the existing seven mile stretch of CSX rail line within the District of Columbia. We realize the need to address security concerns related to the proximity of the current system to the core of Washington D.C. and the U.S. Capitol. This rail line also presents a barrier to vital economic development and transportation opportunities for Nation's Capital and the State of Maryland. Further, the line's Potomac River Bridge is shared among passenger and freight services and is the only crossing of the Potomac River within 70 miles of Washington DC. This has caused this bridge to become a major choke point for rail traffic within the East Coast corridor. Clearly, a study of the relocation of this rail line is a "win-win" proposition as it would develop solutions to this choke point, and present opportunities to expand critical freight and passenger services along the east coast.

We agree with the National Capital Planning Commission's assessment of the federal and national interests in this effort, and as such, we strongly believe that this effort should be led by the federal government. The National Capital Planning Commission has demonstrated through its outreach and coordination that it is the appropriate agency to lead and coordinate an alternative rail alignment study, and we support and stand ready to participate in such a study once funding has been identified. We look forward to working with you, your staff, and our other critical planning partners on this important and timely effort.

Sincerely,

Marsha J. Kaiser, Director
Office of Planning and Capital Programming

Support Letters

COMMONWEALTH of VIRGINIA

KAREN J. RAE
DIRECTOR

DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION
1313 EAST MAIN STREET, SUITE 300
P.O. BOX 590
RICHMOND, VA 23218-0590

(804) 786-4440
FAX (804) 786-7286
VIRGINIA RELAY CENTER
1-800-828-1120 (TDD)

September 27, 2004

Patricia Gallagher, AICP
Executive Director
National Capital Planning Commission
401 9th Street, NW Suite 500
Washington DC, 20004

Dear Ms. Gallagher:

I am writing to express my support for the National Capital Planning Commission's effort to study the active seven mile stretch of CSX rail line within the District of Columbia. We understand that there is increasing concern about the potential security threat created by the movement of hazardous materials on this corridor. This rail line is critical to the movement of passengers and freight along the east coast. It is expected the demand for passenger rail service, including intercity service provided by Amtrak, and commuter service provided by Virginia Railway Express, will increase. We expect that the NCPC study will look at a variety of options related to both passenger and freight rail, and will define alternatives that address both types of rail service.

The Virginia Department of Rail and Public Transportation has reviewed the National Capital Planning Commission's assessment of the federal and national interests in this effort, and as such, we believe that this effort should be led by the federal government. The National Capital Planning Commission has demonstrated through its outreach and coordination that it is the appropriate agency to lead and coordinate the study, and we are willing to participate where appropriate. We look forward to working with you, your staff, and our other critical planning partners on this important and timely effort.

Sincerely,

Alan C. Tobias
Manager of Passenger Rail Programs

Support Letters

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS

Local governments working together for a better metropolitan region

November 17, 2004

District of Columbia
Bowie
College Park
Frederick County
Gaithersburg
Greenbelt
Montgomery County
Prince George's County
Rockville
Takoma Park
Alexandria
Arlington County
Fairfax
Fairfax County
Falls Church
Loudoun County
Manassas
Manassas Park
Prince William County

Patricia Gallagher, AICP
Executive Director
National Capital Planning Commission
401 9th Street, N.W. – Suite 500
Washington, DC 20004

Dear Ms. Gallagher:

This letter is to express the support of the National Capital Region Transportation Planning Board (TPB) for the National Capital Planning Commission's effort to study the relocation of the active seven-mile stretch of CSX rail line within the District of Columbia. The Board recognizes the need to address the security concerns created by the movement of hazardous materials on this corridor. This rail line is critical to the movement of passengers and freight along the east coast, and the demand for passenger commuter rail service, in particular, is expected to increase steadily.

As the rail line goes through several jurisdictions outside of the District of Columbia, the impacts of any relocation of this stretch or of further changing the operations of the railroads to divert hazardous materials from the District core area must be assessed for the entire region. In addition to the movement of hazardous materials, certain chemicals sitting in cars on tracks can endanger neighborhoods and government buildings throughout the region. The Board supports a study to address these concerns and identify ways to ensure the safe operation of critical freight and passenger services in the region. This study should identify feasible options with specific costs and sources of funding for implementation as quickly as possible.

The TPB has reviewed the Commission's assessment of the federal and national interests in this effort, and concurs that the Commission has demonstrated through its outreach and coordination that it is the appropriate agency to lead and coordinate an alternative rail alignment study. The TPB looks forward to working with the Commission and our other planning partners on this important and timely effort.

Sincerely,

Christopher Zimmerman
Chairman
National Capital Region Transportation Planning Board

777 North Capitol Street, N.E. Suite 300 Washington, D.C. 20002-4290
Telephone (202) 962-3200 Fax (202) 962-3201 TDD (202) 962-3213 Internet http://www.mwcog.org

Support Letters

November 8, 2004

Mr. John V. Cogbill, III
Chairman
National Capital Planning Commission
401 9th Street, NW, Suite 500
Washington DC, 20004

Dear Chairman Cogbill:

On behalf of Mayor Anthony Williams, I am expressing the District of Columbia's support for the National Capital Planning Commission's (NCPC's) study of relocation alternatives for the CSX rail line within the District of Columbia.

Recently, this rail line has been identified as a potential security concern to the District and the nation because a variety of dangerous freight, including hazardous materials, travels this line through the heart of the nation's capital, adjacent to the U.S. Capitol, federal agency offices and museums, and thousands of District residents, workers, and tourists. In addition, this stretch of rail line has been identified as a choke point for rail freight along the east coast. Finally, this rail line is a physical barrier that complicates economic, residential and recreational development opportunities for the District, including efforts to revitalize the Anacostia Waterfront. Relocation of this rail line would not only eliminate a serious security threat, but it would also provide opportunities to improve rail transportation (and national economic competitiveness) and restore the beauty of historic areas of the nation's capital.

Due to the extent that national security and federal interstate commerce issues are involved, NCPC is the appropriate agency to lead an alternative rail alignment study. For these same reasons, the District suggests that the federal government appropriate funding to NCPC to conduct this study and that this appropriation will not replace any existing or planned appropriation for the District of Columbia. In particular, this project should be funded from the Homeland Security, Defense or Transportation appropriations. DDOT staff has already worked with NCPC staff on this issue and NCPC has demonstrated its ability to contact and involve the multitude of federal, state and local stakeholders.

The District of Columbia looks forward to continuing our work with NCPC and our other planning partners on this important and timely effort.

Sincerely,

Dan Tangherlini
Director

cc: Mayor Williams
Andrew Altman
Council of the District of Columbia

2000 14th Street, N.W., Washington, D.C. 20009 (202) 673-6813

Support Letters

COUNCIL OF THE DISTRICT OF COLUMBIA

WASHINGTON, D. C. 20004

LINDA W. CROPP
Chairman

October 18, 2004

NCPC File No. 6473
Primary Stat.
Due Date

Comm

		DE	
CHAIRMAN			AR
EXEC DIR			COO
OPA			PRPD
GEN COUNSEL			PPID
SECRETARIAT			UDPR
ADMIN			TDAD

Mr. John V. Cogbill, III
Chairman
National Capital Planning Commission
401 9th Street, NW Suite 500
Washington DC, 20004

Dear Chairman Cogbill:

I am writing to express my support for the National Capital Planning Commission's effort to study relocation alternatives for the active seven mile stretch of CSX rail line within the District of Columbia.

This rail line presents a critical security concern to the District because it transports a wide variety of dangerous freight, including hazardous materials, through the heart of the nation's capital, adjacent to iconic national symbols such as the U.S. Capitol, and to thousands of District residents, Federal office employees, and tourists. Furthermore, the rail line presents a barrier to vital economic development and transportation opportunities for the District, including efforts to revitalize the Anacostia Waterfront. Relocation of this rail line would not only eliminate a potential security threat, but it would also provide opportunities to correct critical infrastructure problems, improve rail transportation along the east coast, and restore the beauty of historic areas of the nation's capital.

The National Capital Planning Commission has demonstrated through its outreach and coordination that it is the appropriate agency to lead, and to coordinate with the District Department of Transportation, an alternative rail alignment study, once Federal funding has been identified that is beyond existing Federal funding allocated to the District. We look forward to working with you, your staff, and our other critical planning partners on this important and timely effort.

Sincerely,

Linda W. Cropp
Chairman

cc: Councilmembers
Mayor

Appendix B
Short-Term Improvements

Because realigning the Washington, DC freight railroad would take years to implement, this study also investigated possible short-term improvements to the existing railroad to improve security and railroad operations. These short-term improvements are operational and capacity programs that CSX could accomplish in a relatively short amount of time. These improvements do not extend to major infrastructure investments such as a new Potomac River crossing or the replacement of the Virginia Avenue Tunnel, thus, they would not eliminate all the capacity and security issues.

Objectives and Assumptions

The objectives of the short-term improvements are to:

- Enhance security,
- Achieve greater reliability for all train service, and
- Increase rail line capacity.

The short-term improvement investments must be compatible with the ultimate relocation of the rail freight main lines. In addition, both operational and capacity short-term improvements should:

- Keep freight trains moving. Freight railroads use velocity as a measure of operating performance. Velocity is the average speed of a train from one point to another, or the distance between two points divided by the actual time it takes a train to operate between those points. Maintaining a high velocity and keeping freight trains moving not only improves rail line capacity but also enhances security. A terrorist would have a more difficult time attacking a moving train than a stopped or stationary train.

- Enable traffic growth. This growth should apply to both freight and passenger traffic. Improved reliability is of paramount importance to achieving traffic growth. The present operational practices and infrastructure constrain velocity and cause delay, thereby inhibiting growth.

The Current Operation

The main lines through Washington, DC are among the busiest mixed-use (passenger-commuter-freight) rail lines in the eastern United States. While the District does not produce or receive a significant amount of freight rail traffic, for the past 150 years the city has stood as a crossroads for north-south and east-west trunk lines. The train movements through the area are significant. Figure B-1 illustrates both the current and projected train volumes on the principal lines passing through Washington.[1]

The current CSX infrastructure on the north-south route is essentially a two-track railroad between Richmond and Baltimore with portions of single track on either side of the Anacostia River in Washington, DC and Prince George's County. Considering the commuter operations north of Washington and south of Washington, the CSX railroad is operationally like two single track railroads side by side during commuter train hours with one track used for passenger trains and the other track for freight. This occurs because the different speeds and stopping patterns of freight and passenger trains make fleeting the trains—running passenger and freight one behind the other—impractical. The different speeds of the various types of trains also make dispatching the railroad a challenge. Generally, slower freight trains stop and wait for faster trains to run, reducing the velocity of the line. In some cases, freight trains wait for slower trains because the frequent stops make commuter trains the slowest trains on the line, despite a passenger train's ability to achieve a higher maximum authorized speed.

With few places to hold trains or stage them in order to advance the freights between passenger train schedules, a security issue is created because trains stop and wait. With the passenger trains on the line, train dispatchers must be careful in moving the freight trains to avoid passenger train delay. That means, in the current operation, that all but the highest priority freight trains stop and wait.

1 The future volumes shown are for 2012-2015. Future commuter train volumes depend on negotiation with the operating railroad.

Short-Term Improvements

The current holding locations for freight are shown in Figure B-2.

Operational Reliability

The reliability of passenger trains and expedited intermodal freight trains is reasonably good, but other freights tend to be delayed on the average from an hour to an hour and a half through the area. Hazardous material (hazmat) tank cars are generally located on these lower-priority trains.

This study ran a model to simulate reliability performance statistics. The 2001 Actual results were based on data obtained from CSX on a specific two-week period in 2001, considered a typical operating environment. The 2001 with Committed Projects used the same 2001 actual train data, but the trains were run over enhanced infrastructure agreed upon in a Memoranda of Understanding between CSX, Maryland, and Virginia. The 2007 results used the same enhanced infrastructure but raised the passenger and freight train levels to 2007 projected railroad traffic levels.

With additional infrastructure, the 2001 train performance showed a notable improvement from the actual. With additional infrastructure and 2007 traffic levels, the reliability would be similar to 2001 actual. In other words, additional trains had consumed the additional capacity. In addition, the delay per 100 train miles (TM) for Other Freight was considerably more. These results show that at best, the committed projects will maintain present reliability levels, and at worst, will result in a 14 percent increase in Other Freight—the type of trains that hazmats run on—delays.

Current Security Operations

An analysis of recent terrorist attacks in the world and current intelligence shows that terrorists conduct a great deal of operational pre-planning. This includes observing transportation operations, taking surveillance photographs, making videos and drawings, and using the internet to gather as much

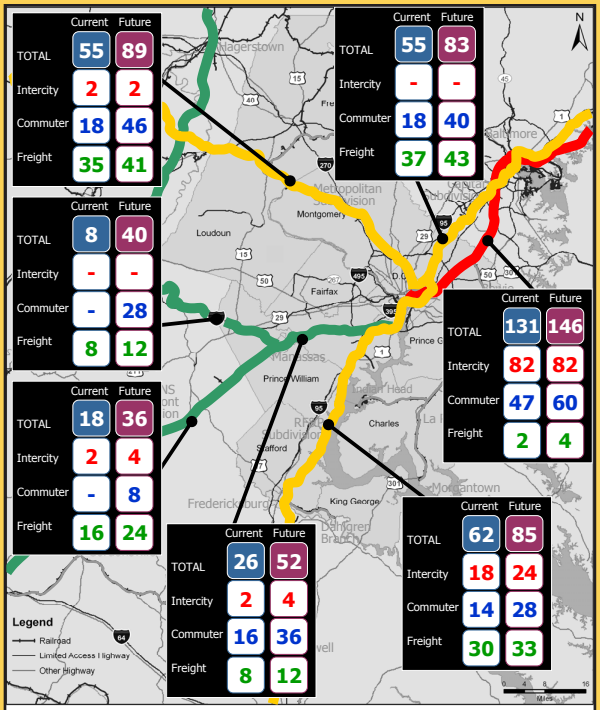


Figure B-1. Current and Projected Train Volumes
Source: CSX, Amtrak, VRE, MARC

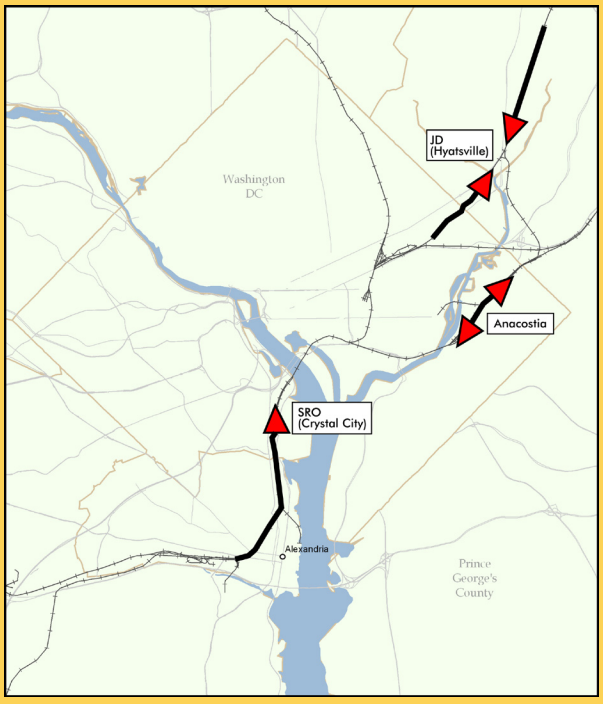


Figure B-2. Current Train Holding Locations

Short-Term Improvements

information as possible about their target. Terrorists make observations of physical structures as well as work and response patterns of employees, passengers and law enforcement personnel, attempting to identify all aspects of security of their intended targets.

Analysis and intelligence sources report that terrorist groups are less likely to attack a target if they believe that their probability for success is low. Two of the leading reasons for terrorists canceling an attack are (1) after surveillance and operational pre-planning, they determine the target is too well protected, and (2) their plans have been discovered by law enforcement or other authorities.

Thus, identifying locations where a terrorist could cause a hazmat-filled tank car carrying a toxic inhalation hazard (TIH) to rupture helps to prioritize security resources. The critical locations are:

- Railroad infrastructure, such as bridges, overpasses, interlockings, and switches, may be sabotaged by a terrorist, causing train derailment and the rupture of a tank car carrying TIH cargo.
- Sidings where TIH cargo is temporarily stored to serve customers are the most vulnerable locations for a direct attack because the tank cars are stationary, access to tankers is unrestricted, and security patrols and surveillance of the tankers are presently minimal to non-existent. Attempting to target and attack a moving tank car would be much more challenging.
- Locations where railroad infrastructure and sidings are adjacent to major population and business centers, hospitals, schools, government offices, national or historic icons, utility hubs, and other transportation centers are the most critical. Such a situation exists on the current rail alignment, where trains are held in Crystal City, Anacostia, and Hyattsville, and where the existing rail line runs through the District.

A terrorist could derail a train hauling TIH cargo with a vehicle-borne improvised explosive device (VBIED). Strategically parked next to the railroad right-of-way (ROW) or under an overpass, a truck similar to one

Table B-1. Operational Reliability Simulation Results

	2001 Actual	2001 with Committed Short-Term Projects	2007
Intermodal Avg. Delay (Mins/100 TM)	13.3	11.6	13.7
Other Freight Avg. Delay (Mins/100 TM	39.4	33.7	44.8
Commuter On-Time Performance	87%	90%	87%

Figure B-3. Illegally Parked Truck Under Overpass

used in the Murrah Building attack in Oklahoma City or the first World Trade Center bombings could derail a train and rupture tank cars. Security assessments should identify exposed areas where a VBIED could cause catastrophic consequences. Those areas should be secured from truck traffic, or rigorously patrolled by local law enforcement if the latter is not possible. The use of active or passive anti-ram vehicle barriers, such as concrete walls, Jersey Barriers, fixed bollards, and restraining cable,[2] that create stand-off distances against VBIEDs is one means of reducing that threat; strictly enforcing "no parking, no standing" zones is another.

During this study, vehicles were observed to be parked in critical areas, such as under a railroad bridge with clearly visible "no parking" signs at the location.

The Department of Homeland Security's Infrastructure Protection group (DHS/IP) has been working with several Washington, DC region jurisdictions (including Fairfax County, VA; Arlington County, VA; Prince George's County, MD; Montgomery County, MD; and the District of Columbia) to help secure the Washington, DC region freight rail system. Technologies that have been employed in the area include intrusion detection and virtual fence systems. Additionally, DHS/IP has been developing "best practices" and training for emergency responders and hazmat teams, as well as identifying the best Personal Protective Equipment to be used for responding to and recovering from a TIH agent release. These initiatives significantly increase the security of the region and should continue.

Emergency Response Capabilities

Fire, police, and sheriff departments and hospitals all have roles in emergency response. Separately, each category of emergency responders performs specific tasks that assist people, protect property, and help recover from a disaster. Under emergency conditions, emergency responders integrate resources to provide their capabilities to local or regional emergencies, such as hazmat spills, mass casualties, or area-wide evacuations. Typically, the first responders to a hazmat spill or release are fire, law enforcement and emergency medical service departments. They operate from mobile and fixed locations throughout the Washington, DC region and are trained to serve the community's public safety needs. Hospitals and emergency care centers play a support role, as they manage care following initial treatment by first responders.

Across the Washington, DC region, the movement of rail tank cars containing unknown quantities of hazardous industrial chemicals increases the potential hazards encountered by emergency responders. Under these circumstances, the derailment of a train moving hazmat cargo, or the malfunction or willful sabotage to tank car hatches, seals, or valves may cause the cargo to leak, spill, or discharge into the environment and surrounding communities. Although emergency responders are not provided with advance information about the types or quantities of hazardous cargo transiting their jurisdictions, they know that hazards exist through placarding and experience with hazmat emergencies. They have prepared hazmat incident management, command, and operations plans for hazmat releases. They conduct emergency preparedness drills, typically with railroads and state and federal governments. In the event a release is beyond their technical capability, additional technical assistance is available from private-industry experts. Additionally, state and federal governments provide added resources, as requested.

In the study region, six fire and emergency medical service departments operate hazmat response units. These units have personnel trained to the hazmat technician and above levels. At the technician level, trained personnel can approach the point of release to stop the flow of hazmat from its source (e.g., tank, container, etc). Several departments within the region have personnel specially trained in rail tank car firefighting techniques, structures, and nomenclature. All jurisdictions with emergency response agencies are signatories to mutual assistance agreements that

2 FEMA 426, Risk Management Series Reference Manual, para 2.4.3 Anti-Ram Barriers

support local, regional, and state-level responses to incidents involving rail tank cars carrying hazardous cargo.

Numerous emergency responders in the Washington, DC region, listed in Table B-2, provided information for this study. Those that did not do so cited operational security concerns about the protection of sensitive information.

Incident Management

Incident management implements recovery operations by coordinating and unifying tasks, assets, and people. All fire and emergency medical service departments and police and sheriff agencies in the study region use the National Incident Management System (NIMS) model to manage emergency incidents, including incidents involving rail tank cars carrying hazardous cargo. Specifically, an incident commander (IC) from the fire and emergency medical service department manages on-site operations; a unified incident management team (police and sheriff agencies, public affairs, engineers, etc.) sets up position near the accident site to collectively provide support to recovery operations. Hospitals and emergency care centers, however, manage incidents independent of incident site management. For example, they coordinate and synchronize patient flow from the incident site to receiving medical facility, but once patients are received at a facility; care is managed by the facility's staff. Using the NIMS model for incident management is an effective recovery operations tool.

Mutual Aid Agreements

Mutual aid agreements provide emergency responders with increased operational capabilities that they otherwise may not possess. Several fire and emergency medical service departments have the resources to deploy offensive measures to seal hazmat source points, whereas other departments without the capability to deploy offensive measures must rely on mutual aid agreements with other jurisdictions

Table B-2. Sources of Emergency Responce Information

Fire	Police/Sheriff	Hospital
• Prince William County, VA - Dept. of Fire & Rescue • Stafford County, VA - Fire, Rescue & Emergency Services Dept. • Arlington County, VA - Fire Dept. • City of Alexandria, VA - Fire Dept. • Prince George's County, MD - Fire & EMS Dept. • Ann Arundel County, MD - Fire Dept. • Charles County, MD - Dept. of Emergency Services • Washington, DC - Fire & Emergency Medical Services • Virginia Depatment of Emergency Management	• Prince William County, VA - Sheriff's Office • Prince William County, VA - Police Dept. • Stafford County, VA - Sheriff's Office • Arlington County, VA - Police Dept. • City of Manassas, VA - Police Dept. • City of Manassas Park, VA - Police Dept. • Charles County, MD - Sheriff's Office • Prince George's County, MD - Sheriff's Office • Ann Arundel County, MD - Police Dept. • Washington, DC - Metropolitan Police Dept.	• Northen Virginia Hospital Alliance • Maryland Institute for Emergency Medical Services Systems (MIEMSS) • Virginia Department of Health, Emergency Preparedness & Response Programs, Hospitals Coordinator

to manage such incidents. All fire and emergency medical service department jurisdictions in the study region have mutual aid agreements with other local municipalities, as members of the Council of Governments, or because of their location within a region. Further, some fire and emergency medical service departments have automatic aid agreements in force with other departments to respond to specific types of incidents e.g., hazmat. This means that two fire and emergency medical service departments will automatically respond to an incident under the terms of their agreement. Whether mutual aid or automatic aid agreements are in force, all fire and emergency medical services benefit from the increased operational capabilities that agreements provide.

Virginia has instituted a regional hazmat team concept to support hazmat incidents in multiple jurisdictions. Specifically, the Virginia Department of Emergency Management (VDOEM) has partnered with hazmat units from fire and emergency medical service departments throughout the state to serve as collateral duty Regional Hazardous Material Response Teams (RHMRT). When activated through mutual aid agreements, the teams provide all the municipalities within their designated region with hazmat response capabilities and state-level VDOEM resources. The Northern Virginia RHMRT is the City of Alexandria's Fire Department. The City of Fredericksburg Fire Department is the RHMRT for the Fredericksburg region.

Training

Beyond the basic professional training level, emergency professionals responding to railroad hazmat incidents require advanced and specialized training. To be prepared, training in the advanced levels of hazmat, personal protection equipment, and rail tank car firefighting are essential to the mounting of an effective response to rail tank car incidents.

In the study region, all fire and emergency medical service departments and police and sheriff agencies comply with Occupational Safety and Health Administration (OSHA) standards for emergency responder hazmat training. In order of increased responsibilities, the five levels are awareness, operations, technician, specialist, and on-scene incident commander. All fire and emergency medical service departments and police and sheriff agencies in the region conduct one or more of the hazmat levels training sessions annually.

Hazmat training is one type of important training available to emergency responders. All fire and emergency medical service departments and police and sheriff agency personnel are trained to the awareness level in the Washington, DC region. At this level, personnel know how to report a hazmat incident. At the operations level, personnel can deploy defensive measures to the hazmat incident i.e., damming or diverting the flow to contain the spread of hazmats without coming in contact with it. Police and sheriff agency personnel are not trained at this level of response, but all fire and emergency medical service department personnel are. Also, in the study region, several fire and emergency medical service departments and police sheriff agencies train personnel to the technician level. A technician deploys offensive actions to approach the point of release to stop the flow of hazmats by plugging or patching holes, capping or closing shut-off valves, etc at its point of source. Several technician level personnel are also trained in rail car nomenclature and fire fighting tactics, whereas police and sheriff agencies that train to the technician level apply their training to criminal investigations of rogue chemical laboratories and forensics crime scene processing.

Only three fire and emergency medical service departments have trained personnel to the specialist level. The police and sheriff agencies do not train to this level. Specialists are required to have more working knowledge about hazmats than those trained to the technician level. Only one fire and emergency medical service department has trained personnel to the on-scene incident commander level. Their duties are previously listed.

Also, PPE training and equipment are essential

elements to protect emergency responders from contact with hazmats. All fire and emergency medical service departments and police and sheriff agencies personnel are trained in the OSHA PPE ensemble guidelines. Each ensemble provides a different level of protection and is rated in descending order of protection as Level A, B, C, and D. The fire and emergency medical service departments with hazmat units provide Level A and B ensembles for their personnel, while several police and sheriff agencies provide Level C ensembles to their personnel.

Further, fire and emergency medical service responders trained in special rail tank car firefighting techniques are important to managing rail tank car incidents because of their experience. Fire and emergency medical service responders receive in-service rail tank car firefighting training scheduled by their departments. Several departments have firefighters who are specially trained in rail tank car structures, nomenclature, and specific firefighting techniques. Also, the freight rail companies that operate in the region as well as several off-site private enterprise emergency preparedness training organizations offer specialized rail tank car training. This training, coupled with hazmat training, provides a base line capability for fire and emergency medical service departments responding to rail tank car incidents.

Operations

Fire and emergency medical service departments.

Holistic and effective responses to incidents involving rail tank cars carrying hazmat include contingency preparedness, incident management, and operational planning. Within the study region, there are six separate fire and emergency medical service departments that operate hazmat units. These units are staffed by personnel who are trained to the Technician level and above. They have developed plans, policies, and procedures to respond to incidents that involve rail tank cars carrying hazardous cargo. For instance, at the onset of an incident involving rail tank cars carrying hazmat, it is for the emergency responders to know the types and locations of hazardous cargo within a specific train set. Therefore, through strategic planning, a communication bridge between the freight rail's 24-7 emergency operations center and hazmat communication centers is established to provide the on-scene commander and hazmat unit with the critical information necessary to deploy an effective response and recovery operation.

Many factors influence the level of support deployed to a hazmat incident site. Fire and emergency medical service departments' hazmat units have established predetermined responses to hazmat incidents; however, the IC may increase or decrease the levels of support depending on factors associated with the incident. Hazmat units have outlined the numbers of personnel, apparatus, and equipment that should be deployed to a hazmat incident. For example, as many as 12 to 15 personnel, along with supporting apparatus and equipment, may be deployed to a hazmat incident site. The initial response team may include a Chief (Command Staff), Safety Officer, Emergency Medical Services Supervisor and staff, Hazmat Technicians and fire fighters. Also, supporting apparatus such as an engine, truck, and rescue along with light & air, foam, and hazmat support units may be deployed, along with responders to the incident site.

Police and Sheriff Agencies

Police and sheriff agencies operational plans address several phases of their response to hazmat incidents. Initially, hazmat incidents are treated as crime scenes until such time as they are declared non-criminal in nature. They are responsible for securing the scene, gathering evidence, and searching for and apprehending perpetrators. They control area entry and keep unsuspecting residents from the incident site, provide direct support to the functions of the IC, and support the incident management team during hazmat incidents. Also, they provide law enforcement services, such as site perimeter cordon, traffic management around the incident site, and assisting with an area evacuation, if required. They are the link to state and local law enforcement agencies.

Short-Term Improvements

Hospitals and emergency care centers

Personnel injured at a hazmat incident site or from the effects of released hazmat require transportation to a treatment site and care. In the study region, hospitals and emergency care centers have organized their emergency planning to respond to such a need. In Virginia, hospitals and emergency care center emergency planning is organized by regions and under the coordination of Regional Healthcare Coordination Centers (RHCC). These centers are strategically located throughout the state to assist hospitals and emergency care centers with emergency management during a disaster. Among other things, the RHCCs direct ambulances from the incident site to a designated medical facility, and coordinate requests for additional staff, pharmaceuticals, general supplies, or equipment to meet the medical facility's emergent demands. The Northern region RHCC, located in Falls Church, encompasses the Northern Virginia region and operates on a stand-by status until activated.

Hospitals and emergency care centers in Maryland are also organized into regions and in the early stages of coordinating their regional emergency planning efforts. The hospitals and emergency care centers in Howard, Anne Arundel, Prince George's, and Charles counties are carved into two hospital regions and coordinate their emergency planning with the other facilities in their region and county. They have the capabilities to either network through internet databases, email, phones, and/or communicate through two-way radio systems to communicate emergent conditions or make requests for emergency support from other facilities. In the same counties, all patient logistics are centrally coordinated through the state's Emergency Medical Resource Center (EMRC). It operates 24-7 and coordinates and communicates the transport of patients by ambulance to a designated medical facility for treatment. A second state-funded EMRC is under construction. When operational, it will provide patient logistics support to a wider area of the state.

Hospitals and emergency care centers in the Washington, DC region have access to specific internet-based systems and network databases that enable them to notify other facilities of emergent incidents, exchange information, and request medical resources. Specifically, in Montgomery County, Maryland, all hospitals, ambulance, fire, and police are connected to a dedicated 800 MHz radio system. This system enables county emergency responders to coordinate and manage their emergency incidents. Finally, the Northern RHCC in Virginia coordinates with its regional medical facilities, and several surrounding county emergency management organizations, through either unsecured or secured landline, voice-over-internet protocol, or satellite phones, as well as through shortwave and 800 MHz radio systems.

Short-Term Improvements

Field visits were made and data was collected along the current freight rail alignment to assess opportunities for short-term improvements. Based on this data, the study identified several actions that could reduce the possibility of a terrorist incident, minimize the effects of an attack to railroad infrastructures, and improve railroad reliability and capacity.

The short-term improvements discussed in this appendix fall into two categories:

- Operational improvements are changes to day-to-day practices, policies, and methods that improve rail security and reliability, such as training, security patrols, and train scheduling.
- Capacity improvements include infrastructure and equipment changes that would improve capacity while also improving rail security and reliability.

Operational Improvements

The following operations measures can enhance the security and reliability of freight traffic through the area. All of the measures listed would keep freight moving and allow for traffic growth.

Build Additional Inspection Tracks

Freight cars, including tank cars, are generally inspected at the beginning of their run and when they are switched into freight trains. These inspections are important because while some equipment failures are quick and catastrophic, many are gradual. A trained equipment maintenance employee can detect equipment irregularities that may indicative of a pending failure.

Given the through-traffic nature of the rail freight in the Washington, DC area, few freight trains are made up in the area; freight cars are inspected 50 or more miles away. However, because trains are often held on either side of Washington due to schedule delays, there is an opportunity to build inspection tracks as long, secure signaled, passing sidings where maintenance and security staff could inspect the train. These inspection tracks could be built on the Metropolitan Subdivision for trains coming from the west, on the Capital Subdivision for trains coming from the east, and on the RF&P Subdivision for trains coming from the south.

The inspection tracks described would be the railroad equivalent of truck weighing and inspection stations that are on major highways, usually close to state borders. To be effective without compounding delay, these tracks must be purpose-built, secured facilities known as "Safe Havens." The Safe Havens should be areas that may be easily secured and away from mainline tracks.

The drawback of this recommendation is that it is labor intensive to put several pair of eyes on a freight train, and even in the best of circumstances, the implementation of such a plan will cause some delay. However, manual inspections will reduce the probability of having a car failure on a train that carries hazmat through a High Threat Urban Area (HTUA).

Install Wheel Defect Detectors

The electronic version of manual inspection is defect detection. This technology eliminates the need for manual labor and train stoppages. Presently, defect detectors for hot journal and dragging equipment are located along the main lines at 10 to 15 mile intervals. These detectors guard against two of the most common causes of train accidents and equipment failures: failed journals—the journal is where the axles are housed in the trucks—and dragging equipment. When it is dragged through a switch, a large piece of dragging equipment often causes a train accident.

The location of defect detectors on the CSX main lines is shown in Figure B-4. The Norfolk Southern and Amtrak have also installed and maintained defect detectors on their lines.

There are no defect detectors in the Washington, DC area for the train wheels themselves, even though defective wheels cause significant accidents. The wheels can crack or even shatter under movement.

Short-Term Improvements

Adding wheel defect detectors for trains approaching the District could identify defective wheels and enable that car to be removed from the train. CSX would also need to provide a safe, multi-track siding for the car to be removed.

Purchasing, installing, and maintaining additional defect detectors would involve a capital and operating cost.

Additional Track and Signal Maintenance

An effective track and signal maintenance program will reduce incidence of derailments. However, the human side of defect detectors is to have maintenance of way, signal maintainers, and maintenance of equipment employees on hand 24-7. These employees do not usually prevent a breakdown of trains and infrastructure, but their presence ensures a quick response and usually a more rapid resolution of the problem. It may not always be possible to prevent a track, signal, or equipment failure, but it is possible to mitigate the effects of those failures by having qualified people on duty. This type of maintenance presently occurs, but it should be increased. The disadvantage of this recommendation is that labor can be costly and the dedicated staff required for these operations can be difficult to obtain.

Review Train Scheduling and Dispatching

Railroad management continually reviews train operations and delays to improve performance. The operating elements that need constant review are blocking instructions, schedules, and priorities of trains. CSX calls the blocking strategies—which cars are forwarded on which trains, a function of car-type, destination, and priority—the One Plan. The One Plan's goal is to move freight as expeditiously as possible and to switch the trains as few times as possible.

This plan should have continued attention and frequent review to ensure that it is most effective. In particular, CSX should seek to switch hazmat trains as few times as possible. The fewer times a car is switched, the less likely a train will be idle during

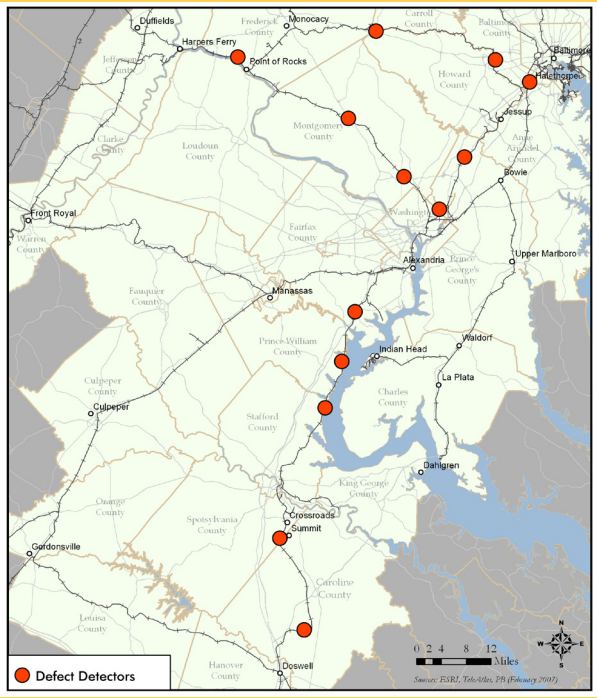


Figure B-4. Defect Detector Locations

Short-Term Improvements

the process, and the less likely a hazmat car will be ruptured by accident during the switching move.

Raise Freight Operating Speeds and Install Automatic Train Control

Freight train operating speeds on the Metropolitan Subdivision between QN Tower and Georgetown Junction, on the Alexandria Extension, and approaching the wye at JD Tower at Hyattsville are below the maximum allowable speeds. Though these tracks are maintained at Class IV levels, meaning they can accommodate freight speeds up to 60 mph, they operate as low as 30 mph due to a policy decision. Raising the operating speed to Class IV would decrease the time it takes to get through the area.

Though not a short-term improvement, Automatic Train Control (ATC) could also increase train speeds and enhance safety. This feature would allow faster train speeds and would instantly alert train operators of a disruption to the track circuitry. ATC should be installed on the CSX lines north of Washington, similar to how it is on the RF&P Subdivision south of Washington. However, this is a more expensive, longer-term project.

Enhance Security and Maintenance where Trains Stop

It is easier to strike a stationary target than one that is moving. Trains that are detained for (1) other train movements to pass, (2) loading or unloading freight, or (3) left on sidings for delivery need to be protected.

The locations where trains idle, as well as sidings that may be used to store TIH, should be identified and the following actions should be taken in these areas:

- Increase security patrols
- Install and/or maintain fencing and other barriers
- Remove excessive vegetation and foliage
- Install lighting
- Use CCTV with intelligent video detection software and integrated with intrusion detection technologies where possible

Fencing, gates, and lighting deter terrorists from carrying out attack. These types of hardware increase the possibility of a criminal or terrorist being detected and delay their time to get to a target. A well-maintained fence and locked gate can delay the terrorist, increasing time for their detection, as well as giving law enforcement more time for response. In addition, excessive vegetation and foliage overgrowth around a railroad creates camouflage and cover for would-be criminals and terrorists to move about undetected as well as creating areas for planting improvised explosive devices (IEDs) or staging equipment to be later used by terrorists.

Local law enforcement should be made aware of stationary trains within their respective areas, whether they are planned stops or unexpected delays.

Develop Interagency and Inter-Jurisdictional Agreements

Strong inter-agency/inter-jurisdictional memorandums of agreement (MOA) are critical to protecting a rail environment. They define the coordinated responses and respective responsibilities to both threats and incidents, the sharing of resources and sharing of information, which includes coordination of communications. Some of the local jurisdiction hazmat units in the Washington, DC region have established MOAs. However, there are no such agreements in the region that include railroad companies and law enforcement units. These types of MOAs should be developed. Rail agencies and companies must have the support of local law enforcement for patrols and security checks, timely responses to reports of suspicious incidents and intrusion alarm activations, as well as investigations of suspicious incidents and responses to actual incidents. Law enforcement units agencies can also enforce “no parking” and “no standing” restrictions in critical locations. In addition, all information from these reports and responses must be centralized for the best analysis. The sharing of information, the timely responses to suspicious activity reports and intrusion alarms, the analysis of this information at a central office, and the coordinated regional response to an

attack are critical in protecting assets from terrorism. This is best supported in formal, well-constructed MOAs.

The timely response and timely sharing of information is most important today, in light of recent attacks by terrorists where numerous targets were struck simultaneously or nearly so. One isolated suspicious incident may be meaningless, but identified and connected with similar incidents in different areas occurring at the same time may indicate a "dry run" or be an actual attack. The intelligence community has advised that terrorists have conducted "dry runs" in the past prior to actual attacks, in part to gauge security force responses. The London and Madrid train bombings are just a few of examples of simultaneous attacks. Only by timely responses and timely sharing of that information will there be a chance to deter, or minimize an attack. A "dry run" detected greatly reduces the possibility of an actual attack of the same target.

Develop a Security Awareness Campaign

Local governments and law enforcement agencies should support programs such as, "See Something, Say Something"[3] campaigns where private citizens are encouraged to report unusual or suspicious railroad activity to law enforcement. This could be done by identifying and recruiting volunteer civic groups and clubs that may, by the nature of their activities, be at a location near the railroad and have an opportunity to observe suspicious behavior. Government employees and students should be made aware of these programs and asked to participate. Existing programs such as "Transit Watch"[4] and the New York City Police Department's civilian report programs are excellent sources for any municipality or agency to glean ideas for their own program, including literature, posters, and reporting protocols.

Again, the intelligence community reports that historically, terrorists conduct surveillances, sometimes well in advance of their planned attacks, and that the discovery of terrorist surveillances by law enforcement in the recent past has caused the terrorists to abandon some of their intended targets, opting for other targets where their plans remained undetected.

This study recommends developing a security awareness campaign that includes freight railroads. Citizens would report unusual activity to a railroad or other hotline, where the suspicious activity is then investigated and analyzed.

Conduct Regional Drills and Training

Response to a threat or incident is more successful when the participants, especially from different jurisdictions, know one another instead of meeting for the first time during a real situation. Conducting inter-agency drills with the actual persons who will be involved in an event is the best way to prepare for an emergency. Emergency drills are held in the Washington, DC region, but not on a regional level or with all entities that would be involved in a railroad incident.

There is a great deal of training aids available from the federal government on the National Incident Management System (NIMS)[5]; appropriate personnel within each jurisdiction should become certified for their role during an event.

Training and drills should be regularly scheduled, and should include multi-agency participants. Most drills, especially regional ones, should be well publicized. Terrorists are aware of large-scale drills, and the intelligence community believes that these drills will deter them from attacking. Being well-equipped, trained, and drilled is the best way to mitigate any situation.

In addition, an important part of a successful drill is the critique and follow-up actions. A successful drill identifies the weaknesses in a response. These weaknesses should be addressed at the critique, changes made to the emergency plan, and then tested

3 http://www.mta.info/mta/security/seesomething.htm
4 http://transit-safety.volpe.dot.gov/security/Transit-Watch/
5 http://training.fema.gov/

again. Unbiased, outside observers are the best means for fair, constructive critiques.

Finally, first responders and hazmat teams should be properly equipped and have the most current training available.

Strategies Considered but Not Recommended

The study explored the possibility of consolidating the hazmat traveling through the area into a single train or a few trains. This would enable the shipments to be guarded and observed more intensively. In fact, railroads have tried this tactic before.

Such a suggestion, however, runs contrary to the idea of keeping freight moving because railcars sit longer in classification yards up and downstream.[6] Another major flaw in this strategy is that if a hazmat train derails intentionally or accidentally, the result could be catastrophic due to the large concentration of hazmat affected.

This strategy is not recommended because the security risks outweigh the potential benefits.

Capacity Improvements

The states typically address railroad capacity improvements on an ongoing basis as part of a program to increase commuter service and service reliability. Railroads, in general, have limited resources to commit to capital projects. CSX and Norfolk Southern (NS), with an over-15,000-mile system, have a backlog of urgent capital priorities.

In the Washington, DC area, CSX has already identified a number of projects that would reduce the single-track segments and create some three-track segments in joint freight-passenger territory, both in Maryland and Virginia. CSX has already completed construction that converted the Benning Yard area to double-track, eliminating one of the area's bottlenecks. There is now double track from M Street (the mouth of Virginia Avenue Tunnel) to Chesapeake Jct just west of the District line.

Figure B-5 depicts the Committed Capacity Improvements funded by Maryland and Virginia.

Progress is being made on these projects to eliminate bottlenecks and facilitate the movement of freight and passenger trains. These projects should be complete by 2010.

The next priority capacity improvements, as shown in Figure B-6, have already been identified through separate study.

These improvements continue to reduce the bottlenecks in Maryland and Virginia. None of these projects would prevent the relocation of the freight line away from Washington, DC, and each of the improvements would have some residual benefit to the passenger operation if the freights were relocated.

In addition to implementing the Committed Capacity Improvements, this study recommends additional crossovers and improved signaling. This would reduce headways between trains, thereby increasing the line capacity.

Strategies Considered but Not Recommended

This study considered a short-term strategy that would reroute the hazmat trains along an existing alignment west of Washington, DC. In this option, hazmat trains would follow the Western Existing alignment identified in Section 3 of this report, while priority intermodal trains would follow the existing CSX mainline. This was considered as a short-term strategy because it would require modest capital improvements. This study found the strategy unsuitable for the long term, however, as it would limit Anacostia River waterfront improvements and related urban development.

With this short-term strategy, there are selected

6 Association of American Railroads, January 2006, "HazMat Transport: Mandatory Rerouting and Pre-Notification."

Short-Term Improvements

improvements that both CSX and NS would need to undertake in order to make this operationally viable. CSX would need to make improvements on the Old Main Line to accommodate double stacks and improve signaling. The limiting factors for double-stacks on the Old Main Line are all bridges and tunnels. Because of clearance considerations, some of the Main Line would need to remain single track.

If CSX were to reach the NS line via Doswell and Gordonsville or Charlottesville, there would need to be an effort to upgrade the existing Piedmont Subdivision, now leased to the Buckingham Branch Railroad. If the connection were to be made at Charlottesville, then a new connection would need to be constructed in the northeast quadrant of the CSX-NS crossing at the Charlottesville passenger station. The NS main line and the B Line would require additional double tracking, and the B-Line would need to be signaled.

Because hazmat cars are not clustered together on trains, all but priority intermodal and passenger service would be rerouted onto the Western Existing alignment. This route would be significantly longer than the existing CSX main line route, making it less competitive. In addition, hazmat trains would be rerouted onto a longer, less modern railroad network, increasing the risk of derailment and a TIH release.

This strategy is not recommended because it would be uncompetitive and circuitous, using slower, secondary main lines. The circuitous routing would increase exposure to a potential accident or incident by prolonging transit times, which is contrary to the goal of keeping trains moving.

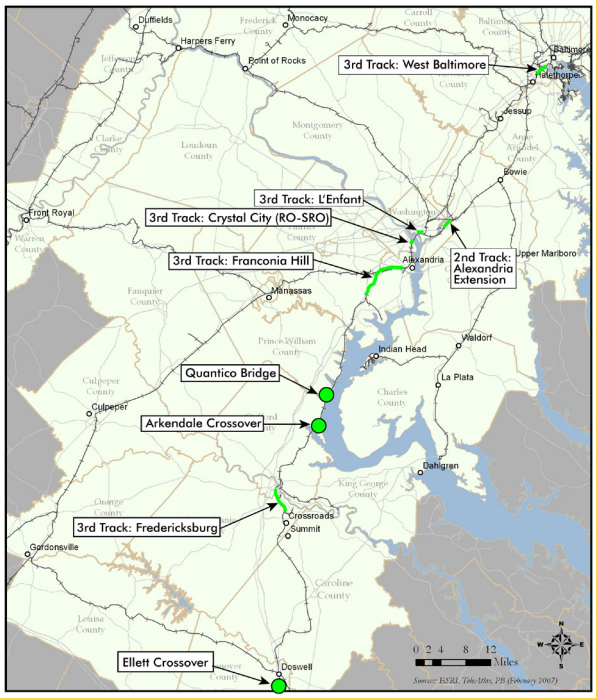


Figure B-5. Committed Capacity Investments

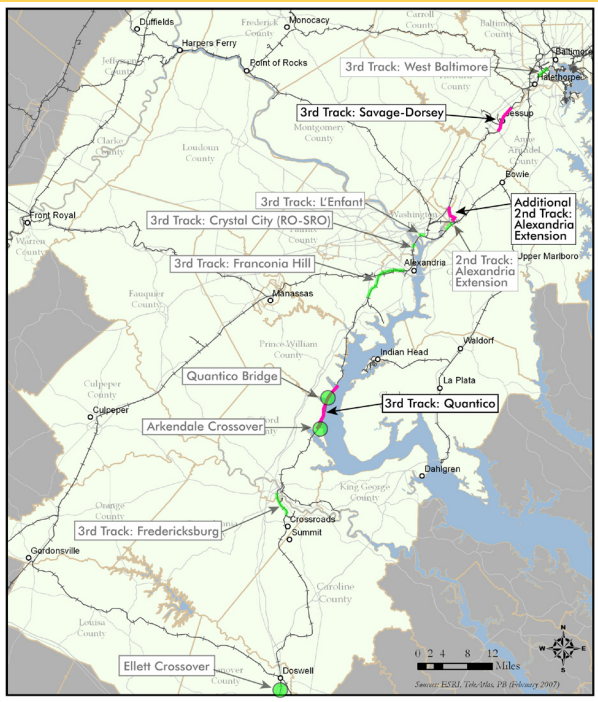


Figure B-6. Next Priority Capacity Investments

Conclusions

The operations and security environment of existing freight railroad need improvement. Hazmat trains are delayed over an hour through the Washington, DC region. Due to capacity and operational constraints, these trains stop near concentrations of employment and residential population and pose a security risk. In addition, the Washington, DC region lacks comprehensive inter-jurisdictional and interagency programs and agreements that would enhance terrorism detection and emergency response if an incident did occur.

Though one of the assumptions of this analysis was to keep freight trains moving, no set of short-term improvements can substantially increase train velocity. The short-term capacity improvements identified allow freight to be moved in increments rather than waiting for an uninterrupted slot across the whole territory, as is often the case now. Freight trains presently sit in HTUAs because that is where the sidings are. The effect of the short-term improvements would be that trains sit for less time and, in many cases, farther away from the HTUA. Having more and better places to sit enables trains of all types to keep moving.

By creating a layered approach to security, there are several initiatives that could mitigate the terrorist threat to rail freight in the Washington, DC region. These range from depriving a terrorist of a target, to deterrence and delay, and include detection and response.

Though the short-term improvements identified could reduce the security risk, minimize the effects of a security incident, and improve railroad reliability and capacity, they would not solve the major capacity and security problems. Freight railroad capacity would still be constrained by the Virginia Avenue Tunnel, passenger and freight rail would continue to share the same alignment, and the freight railroad carrying hazmat would continue to run alongside federal office buildings and the U.S. Capitol.

Short-Term Improvements

Table B-3. Summary of Short-Term Security Improvements

Threat	Protective Countermeasures
IED placed on track to damage a tank car carrying TIH by exploding car or causing derailment that would result in ruptured car	• Surveillance cameras • Sensors • Maintain fencing, lock gates • Low-cut, well maintained landscaping • Security lighting • Security patrols • Publicized drills • Support public awareness programs like "Transit Watch"
Sabotage to cause derailment resulting in ruptured tank car carrying TIH	• Surveillance cameras • Sensors • Fences, locked gates • Low-cut, well maintained landscaping • •Security lighting • Security patrols • Publicized drills • Employee awareness training • Patrols/inspections of ROW • Support public awareness programs like "Transit Watch"
VBIED placed under RR tunnel/ overpass or near ROW to cause derailment resulting in ruptured tanker carrying TIH	• Post "no parking" "no-standing" signs at all critical locations with strict enforcement • Support public awareness programs like "Transit Watch" • Local law enforcement patrols of streets near critical railroad structures

Appendix C
Market Conditions and Development Opportunities

A study of existing conditions near the rail line through the District of Columbia was undertaken in order to understand the potential for new development on and adjacent to the freight rail alignment.

The development history, land use and building stock, property ownership, zoning, and transportation network were evaluated. Demographic conditions within the Washington, DC metropolitan region, within the District of Columbia, and within specific study areas were also studied. Finally, current activities affecting individual study areas, including economic trends, land use and infrastructure planning efforts, and real estate development activity were evaluated.

This study of existing conditions identifies locations where development activity may occur proximate to the existing railroad alignment. Using this evaluation as a guide, development opportunities directly attributable to the relocation of the rail line were established and quantified for incorporation in the feasibility study benefit-cost analysis.

Segment Definitions

For the purposes of this study, the alignment was separated into four segments, shown in Figure C-1.

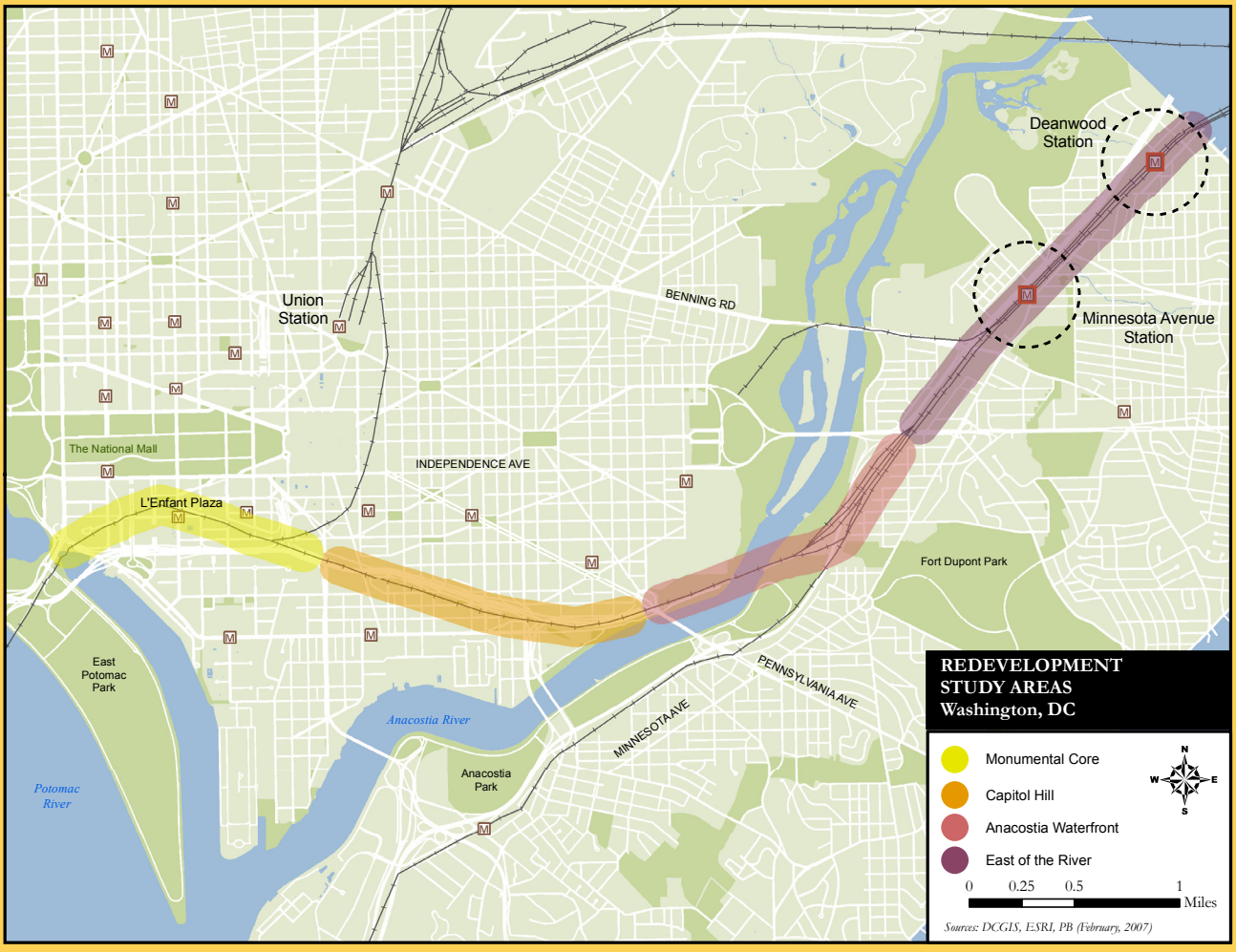


Figure C-1. Real Estate Study Areas

Market Conditions and Development Opportunities

The Monumental Core Segment

The Monumental Core Segment extends from the Potomac River to South Capitol Street and is 1.81 miles long. The segment study area begins on the southeastern banks of East Potomac Park and passes at an elevated grade over the island and the Tidal Basin parallel to the northbound I-395 lanes. The line then passes over Maine Avenue, SE before running under Maryland Avenue, SW. The line emerges at 12th Street, SW and cuts through the federal district in a northeasterly direction passing under 11th Street, SW and L'Enfant Plaza and then above grade over 9th Street, SW.

At this point, the line turns to the southeast and passes above grade parallel to Virginia Avenue, SW over 7th Street, SW; 6th Street, SW; 4th Street, SW; and 3rd Street, SW. It then passes over the I-395 and I-295 interchange while also separating from the passenger line that turns to the north toward Union Station. The line meets up with the eastbound Southeast-Southwest Freeway and passes over South Capitol Street.

The Capitol Hill Neighborhood Segment

The Capitol Hill Neighborhood Segment begins at South Capitol Street and ends where the rail line emerges at grade at the intersection of L Street and 11th Street, SE. It is 1.01 miles long. In this segment, the line starts at South Capitol Street and follows the southbound lanes of the Southeast-Southwest Freeway until the line descends underground after New Jersey Avenue, SE. It then follows Virginia Avenue, SE and the Southeast-Southwest Freeway. It crosses under 2nd Street through 10th Street, SE and the 11th Street Bridges and then emerges at the intersection of L Street and 11th Street, SE.

The Anacostia Waterfront Segment

The Anacostia Waterfront Segment covers the portion of the alignment that emerges from underground at the intersection of L Street and 11th Street, SE south of the Southeast Freeway and extends to the eastern bank of the Anacostia River where it crosses over East Capitol Street. This segment is 2.58 miles long.

It begins where the line emerges from an underground tunnel at the intersection of L Street and 11th Street, SE and runs at-grade parallel to the Southeast Freeway north of M Street, SE. Once it passes under Pennsylvania Avenue, it runs parallel to M Street, SE until it crosses the Anacostia River south of Kingman Island. The line then traverses the eastern bank of the Anacostia River at grade until it enters Benning Yard south of E Street, SE. The line then proceeds at grade in a northeasterly direction parallel and adjacent to the DC-295 northbound lanes, forming the "dead end" barrier to E Street, SE; Ely Place, SE; D Street, SE; Dubois Place, SE; C Street, SE; Croffut Place, SE; B Street, SE; and A Street, SE. The line then passes over East Capitol Street.

The East of the River Segment

The East of the River Segment extends from East Capitol Street to Eastern Avenue. This segment is 1.46 miles long. This segment begins where the line descends to grade after crossing over East Capitol Street. The line runs parallel to the DC-295 northbound lanes and is also adjacent to the western side of 35th Street, NE. It passes under Benning Road and then meets up with the Metrorail Orange Line south of the Minnesota Avenue station near the intersection of Minnesota Avenue and Nash Street, NE. It runs parallel and adjacent to the DC-295 northbound lanes and also adjacent to the western side of Minnesota Avenue, NE. The line then crosses over Nannie Helen Burroughs Avenue, NE and stays on a northeasterly course until it passes over Eastern Avenue and out of the District of Columbia.

Market Conditions and Development Opportunities

Description of the Segment Study Areas

Development opportunities are affected by the development history and physical character of the areas surrounding each segment of the existing alignment.

The Monumental Core Segment Study Area

The Monumental Core Segment extends from the Potomac River to South Capitol Street. This segment cuts through a study area that extends from Independence Avenue on the north to the Southeast-Southwest Freeway on the south and from the Potomac River on the west to South Capitol Street on the east. This study area is called the Southwest Employment District and is one of four designated areas within the District of Columbia's Southwest quadrant. Southwest is the District of Columbia's smallest quadrant and often considered a neighborhood unto itself.

Figure C-2. Monumental Core Segment Study Area

Development History

The rail line in this part of the city dates back to 1870 when Congress approved the Baltimore & Potomac RR (B&P) entering Washington via a bridge across the Anacostia River, a tunnel under Virginia Avenue, SE from 11th to 8th Street, and tracks on Virginia Ave to 6th Street, SW. There was a location for its station on the National Mall at 6th and B Streets, NW (today's Constitution Ave). The Baltimore & Potomac station was built on the present-day site of the National Gallery of Art. Today's freight-only Virginia Avenue trackage was the original freight and passenger mainline until Union Station's opening.

The line now cuts through the heart of the Southwest Employment District, the city's federal employment center, before crossing over South Capitol Street and descending underground through the Virginia Avenue tunnel east of New Jersey Avenue, SE. As part of the Southwest quadrant, the Urban Renewal movement of the 1950s most prominently shaped the development

Market Conditions and Development Opportunities

history of the Southwest Employment District.

After the Civil War, the Southwest Waterfront became a neighborhood for the poorer classes of Washingtonians. Although it had a thriving commercial district with grocery stores, shops, a movie theater, as well as a few large and elaborate houses, most of the neighborhood was made up of poorly constructed and impoverished dwellings.

In the 1950s, city planners working with the U.S. Congress decided that Southwest should undergo a significant urban renewal—in this case, meaning that the city would declare eminent domain over all land south of the National Mall (except Bolling Air Force Base and Fort McNair); evict virtually all of its residents and businesses; destroy all streets, buildings, and landscapes; and start again from scratch. Only a few buildings were left intact, and the Southeast-Southwest Freeway was constructed where F Street, SW, had once been. Prominent buildings that were constructed soon after the clearing took place include the Robert C. Weaver Federal Building, the Department of Housing and Urban Development Headquarters located at 451 7th Street, SW (1968), and the Hubert Humphrey 200 Independence Avenue, SW (1977).

Land Use and Building Stock

As evident from its name, the Southwest Employment District largely comprises federal office buildings around 10 stories in height. The building heights in this area are particularly influenced by the 1910 legislation mandating that no new building may be more than 20 feet taller than the width of the street in front of it. There are a few hotels scattered throughout this area, including the recently completed Mandarin Oriental Hotel located at the intersection of Maryland Avenue and 13th Street, SW and adjacent to the rail line, and the Residence Inn at 333 E Street, SW. All of the buildings, except for the historic St. Dominic Catholic Church at 630 E Street, SW, were built after the 1960s urban renewal, and federal office buildings dominate the area.

Property Ownership

The study area that surrounds the rail line in the Monumental Core Segment represents one of the largest concentrations of federal offices in the entire study area. These include the Department of Transportation headquarters, the Department of Health and Human Services headquarters, the Voice of America, and the Department of Housing and Urban Development headquarters. Each of these departments—in addition to several others—takes up an entire city block.

There are also a number of parcels held in private ownership. Republic Properties owns 9.8 acres adjacent to the existing alignment. This includes the Portals project, which incorporates the Mandarin Oriental Hotel (See Recent Development Activity Section). Of the 9.8 acres held by this owner, 2.6 acres are vacant and located adjacent to the rail line.

Zoning

The zoning in this section is almost exclusively C-3-C (Commercial). This category applies to the entire area between 14th Street, NW on the west, I-395 and South Capitol Street on the east, Independence Avenue on the north, the Southeast-Southwest Freeway on the south. This category permits matter-of-right development for major business and employment centers of medium/high density development, including office/retail, housing, and mixed uses. Allowable lot coverage is 100 percent, the minimum floor-area ratio (FAR) is 6.5, and the maximum FAR is 8.0. Maximum allowable height is 90 feet.

The other category represented in the Monumental Core Segment study area is W-1. This zone extends along the waterfront from the 14th Street Bridges to B Street, SW. This zone permits matter-of-right low-density residential, commercial, and certain light industrial development in waterfront areas. Allowable lot coverage is 80 percent, and the minimum FAR is 1.0 with a maximum FAR of 2.5. Nonresidential uses are limited to an FAR of 1.0. The maximum number of stories is 3, and the maximum building height is 40 feet.

Market Conditions and Development Opportunities

Across the Washington Channel lies East Potomac Park, which is federally owned and unzoned.

Transportation

The transportation network surrounding the Monumental Core Segment is a tangled network of regional and local expressways and local roads.

The elevated Southeast-Southwest Freeway, built in the 1960s, makes up the southern boundary of the Southwest Employment District. Providing a local function, the freeway conveys thousands of employees to their offices in various inner-city employment centers. The freeway also serves a regional function by serving as a "cut through" through the District of Columbia for drivers traveling from and to Prince George's County and points north and east from and to the Northern Virginia suburbs and points south and west. By using the freeway, regional drivers can avoid the circuitous route that the Beltway offers and instead connect with I-295 and I-395.

In addition to the Southeast-Southwest Freeway, the Monumental Core Segment study area is served by the local Southwest quadrant street grid. The area also provides access to the I-395 tunnel, which passes under the Mall and emerges at New York Avenue in the Northeast quadrant.

The Monumental Core Segment is also served by several Metrorail stations. The Federal Center Southwest station is located at 401 3rd Street, SW, and L'Enfant Plaza station is located at 600 Maryland Avenue, SW. The Smithsonian station is located nearby at 1200 Independence Avenue, SW.

The Capitol Hill Neighborhood Segment Study Area

The Capitol Hill Neighborhood Segment begins at South Capitol Street and ends where the rail line emerges at grade at the intersection of L Street and 11th Street, SE. This segment is adjacent to a study area extending from E Street, SE on the north to the Anacostia River on the south and from South Capitol Street on the west to the 11th Street Bridges on the

Figure C-3. Capitol Hill Neighborhood Segment Study Area

Market Conditions and Development Opportunities

south. The portion of the study area north of the Southeast-Southwest Freeway is in Capitol Hill and the portion south of the freeway is referred to as "Near Southeast."[1]

Development History

The study area surrounding the Capitol Hill Neighborhood Segment is one of the most historic parts of the District of Columbia. Its origins date back to the construction of the Capitol in the 1790s and the installation of the Navy Yard at 9th and M Streets, SE in 1798. These two institutions represented two of the fledging capital city's largest employers and stimulated the development of the Capitol Hill community. North of the freeway is still known as the historic Capitol Hill neighborhood. The predominantly residential community is filled with historic 18th and 19th century homes. At one point this was a struggling area suffering from the same urban plight as cities across the country. However, the portion of Capitol Hill within the study area has experienced a revitalization over the past several decades as people have begun to move back into the city and restore the old homes.

South of the freeway, long separated both physically and socially by the Southeast-Southwest Freeway, may still be considered as part of Capitol Hill but is now more commonly known as Near Southeast. Closer to the waterfront, this portion of the study area has always had a more industrial character. It is also closer to the Navy Yard, originally a shipbuilding center, then an ordnance plant, and now an administrative center for the Navy. By 1944, the Navy Yard had expanded to stretch from 11th Street, SE to First Street, SE and from M Street, SE to the Anacostia River, covering 78 acres and employing 10,800 people.

By the mid-1990s plans had been drafted to convert a former weapons manufacturing facility adjacent to the Navy Yard into a new waterfront neighborhood. This area is known traditionally as the Southeast Federal Center and will be home to the 1.7-million-square-foot U.S. Department of Transportation headquarters as well as additional mixed-use development.

Another component of the Near Southeast neighborhood that has strongly influenced its character is the Capper-Carrollsburg residential neighborhood. To the north of the Navy Yard on the other side of M Street, the 20-acre Capper-Carrollsburg public housing community encompasses 13 city blocks. The Carrollsburg Apartments were completed in 1941 and the 612-unit Arthur Capper Dwellings were completed in 1958. Consistent with public housing across the country, these neighborhoods fell into disrepair within 20 years of their debut. The Arthur Capper Dwellings were eventually converted into a low-income senior living residence and then demolished in 2000. HUD awarded a HOPE VI grant to the DC Housing Authority to assist with the redevelopment of this neighborhood as a 1,500-unit mixed-income community.

Land Use and Building Stock

As is evident from its development history, Near Southeast includes a wide range of land uses and construction quality. Uses include the relatively low-density residential Capper-Carrollsburg neighborhood, the Marine Barracks adjacent to 8th Street, SE, the 8th Street shopping and entertainment commercial corridor extending south from the Capitol Hill neighborhood, Class A office space at Southeast Federal Center and adjacent to the Navy Yard Metrorail station, and industrial uses ranging from the Verizon plant north of the freeway to a school-bus parking lot and more intensive activities south of the freeway.

In addition to this diversity of uses, the newly emerging Baseball District at South Capitol and M Street, SE represents another defining component of Near Southeast. The DC Nationals Baseball Stadium broke ground in 2006. Its completion will introduce a large-scale entertainment use to be complemented by a vibrant mix of additional commercial and residential development projects, discussed in more detail in the following section on current activities affecting the study area.

1 The submarket name for "Near Southeast" provided in the Anacostia Waterfront Initiative Framework Plan.

Market Conditions and Development Opportunities

Property Ownership

The Capitol Hill Neighborhood Segment includes a wide variety of property owners. North of the freeway, the majority of property is residential and owned by private individuals. South of the freeway, a sizeable portion of the land between the Southeast-Southwest Freeway, the Anacostia River, South Capitol Street, and the 11th Street Bridges belongs to the federal government. These areas include the Marine Barracks, the Navy Yard, and Southeast Federal Center. The District of Columbia is also a significant property owner in Near Southeast. The Capper-Carollsburg development is a 20-acre holding, and the future park known as Canal Blocks between 1st Street and 3rd Street, SE is a federal reservation under District jurisdiction. The DC Water and Sewer Authority also owns property in Near Southeast. This is an area largely surrounded by Southeast Federal Center. It includes a stretch of the waterfront, a historic beaux-arts style pumping station at the terminus of New Jersey Avenue, and additional facilities and administrative space.

Zoning

There is a mix of zoning categories in this study area. Between South Capitol Street and 2nd Street north of M Street, SE, the zoning is C-3-C (Commercial) south of the freeway and C-M-1 (Commercial/Light Manufacturing) north of the freeway. The C-3-C category permits matter-of-right development for major business and employment centers of medium/high density development, including office/retail, housing, and mixed uses. Allowable lot coverage is 100 percent, the minimum floor-area ratio (FAR) is 6.5, and the maximum FAR is 8.0. Maximum allowable height is 90 feet. C-M-1 permits development of low bulk commercial and light manufacturing uses. Percent lot coverage is not specified, the minimum FAR is not specified, and the maximum FAR is 3.0. Maximum stories are 3, and the maximum building height is 40 feet.

Between 2nd Street and 7th Street, SE, north of M Street, SE the zoning is predominantly R-4 (Residential) and R-5-B, with a few blocks unzoned north of the freeway between 2nd and 4th Streets, SE. The R-4 zone permits matter-of-right development of single-family residential uses (including detached, semi-detached, and row dwellings and flats), churches, and public schools. The minimum lot width is 18 feet and the minimum lot area is 1,800. Maximum lot coverage is 60 percent, and the maximum and minimum FAR are not specified. The maximum number of stories is 3, and the maximum building height is 40 feet. The R-5-B zone permits matter-of-right moderate development of general residential uses, including single-family dwellings, flats, and apartment buildings. Maximum lot coverage is 60 percent, the minimum FAR is not specified, and the maximum FAR is 1.8. Maximum number of stories is 4, and the maximum building height is 50 feet.

Between the 7th Street and the 9th Street Bridges north of M Street, SE, the zoning is C-2-A north of the freeway and C-3-A south of the freeway. The C-2-A (Commercial) zone permits low-density development for retail, office, and residential uses. The maximum lot coverage is 60 percent, the minimum FAR is 1.5, and the maximum FAR is 2.5. The maximum nonresidential FAR is 1.5. The maximum number of stories is 4, and the maximum building height is 50 feet. The C-3-A zone permits matter-of-right development for major retail and office uses. The maximum lot coverage is 75 percent, the minimum FAR is 2.5, and the maximum FAR is 4.0. The maximum nonresidential FAR is 2.5. The maximum number of stories is 5.5, and the maximum building height is 65 feet.

Between the 9th and 11th Street Bridges north of M Street, SE, the zoning is C-M-1south of the freeway and R-5-B north of the freeway.

Transportation

Compared to the neighborhoods surrounding the Anacostia Waterfront and East of the River Segments of the rail alignment, the neighborhoods surrounding the Capitol Hill Neighborhood Segment enjoy relatively convenient transportation access. As with the Monumental Core Segment, the Southeast-Southwest

Freeway represents the most prominent regional transportation route. Its elevated position parallel to Virginia Avenue, SE forms a boundary between Near Southeast and Capitol Hill but provides convenient access to the area from points south. South Capitol Street also provides access to the areas, particularly from the Northwest quadrant of the District of Columbia and from Wards 7 and 8 by crossing the Frederick Douglass Memorial Bridge. In addition to regional roads, Near Southeast and Capitol Hill can also be accessed using the local road network, which passes under the Southeast-Southwest Freeway at several points.

The Capitol Hill Neighborhood Segment study area is also accessible via Metrorail. Near Southeast is served by the Navy Yard station at 200 M Street, SE.

The Anacostia Waterfront Segment Study Area

The Anacostia Waterfront Segment extends from where the line emerges from the tunnel at the intersection of L Street and Water Street, SE to the eastern bank of the Anacostia waterfront where it crosses over East Capitol Street.

Development History

The first site that this portion of the alignment passes by is the East M Street/Washington Gas Site. Historically used for industrial purposes, this section of the Anacostia waterfront was the location of a Washington Gas Company tank farm. The 9-acre site was purchased by Florida-based Lincoln Properties in 2001 for redevelopment as a Class A office complex as well as a hotel and a marina. The first phase of the project has been completed, resulting in Maritime Plaza I, a $30-million investment with 200,000 square feet of office space housing tenants Northrop Grumman and General Dynamics. An additional 500,000 square feet of office space and a 200- to 250-room hotel are proposed in the next two phases of the project.

East of Maritime Plaza, the alignment runs parallel to M Street, SE and south along the southern border of

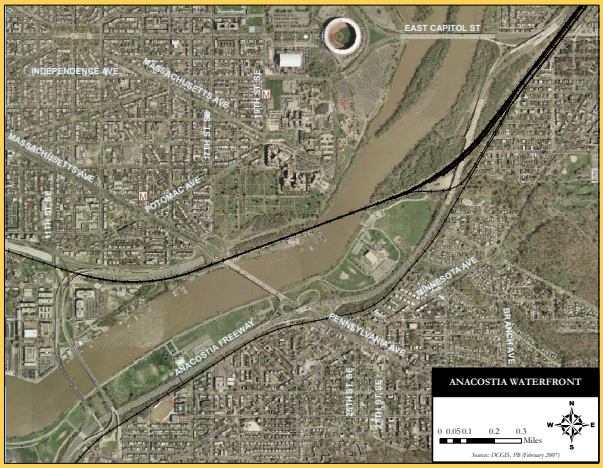


Figure C-4. Anacostia Waterfront Segment Study Area

the Congressional Cemetery, which was established in 1807 as the official resting place for Members of Congress.

On the east side of the Anacostia River, the alignment passes at-grade through a portion of Anacostia Park, a National Park Service park, before crossing under DC-295 and forming a western border to the neighborhoods of Fairlawn, Randle Highlands, Dupont Park, and Twining. Prior to the turn of the 20th Century, this area consisted of only a few settlements, many created by free African-Americans who moved to the North after the Civil War. It was not until the 1920s that scattered residential subdivisions began to develop. An urban community finally emerged in the 1940s as a result of new government jobs created by World War II.

The Anacostia Waterfront Segment is also characterized by the presence of Fort Dupont Park, the second largest park in the District after Rock Creek Park, encompassing 376 acres. Its main entrance is located on Minnesota Avenue between Pennsylvania Avenue and Benning Road. Fort Dupont was one of the forts that formed a ring of defense around the capital city during the Civil War. In 1930, the National Capital Planning Commission acquired the old fort and surrounding land for recreation and an 18-hole golf course was constructed. As the city grew, golf gave way in 1970 to a sports complex along Ely Place that now includes tennis and basketball courts, athletic fields, and a softball diamond. An indoor ice rink offers skating all winter.

Land Use and Building Stock

On the west side of the Anacostia River, the alignment passes through the Maritime Plaza industrial land that has recently been redeveloped as a commercial complex with office space and proposed hotel and marina uses. Open space along the waterfront is also prominent as well as boat launches and docks. There are several docks used by local recreational groups and individuals for kayaking, canoeing, and other river-based recreational activities. The recently established Anacostia Community Boathouse is currently the only facility on the Anacostia River for sculling and hosts an increasing number of local high school teams. North of the marina uses is Congressional Cemetery, the national resting place for senators and representatives. The cemetery abuts the DC Central Detention Facility at 1901 D Street, SE. The current facility was opened in 1976 and has a capacity of 2,498 inmates.

On the east side of the river, the alignment passes through the passive parkland adjacent to the waterfront and then Benning Yard. Benning Yard is approximately 2.4 miles long and anywhere from six to nine tracks wide (including Metrorail) stretching from the east end of the Anacostia River Bridge to a point near the Deanwood Metrorail station. It forms a western border for relatively low-density, privately owned, multifamily and single-family attached residential uses. Buffering single-family attached homes, several multistory residential complexes are also located adjacent to the rail line.

Zoning

The Anacostia Waterfront Segment study area includes several different zoning categories. Between the 11th Street Bridges and adjacent to DC-295, the zoning is C-M-1 (Commercial/Light Manufacturing). C-M-1 permits development of low bulk commercial and light manufacturing uses. Percent lot coverage is not specified, the minimum FAR is not specified, and the maximum FAR is 3.0. Maximum stories are 3, and the maximum building height is 40 feet.

West of 12th Street, SE and north of M Street, SE, the zoning is M (Industrial). The M category permits general industrial uses. The maximum FAR is 6.0 and the minimum FAR is unspecified. The maximum building height is 90 feet, and the maximum number of stories is 8. It then reverts to C-M-1 after 13th Street, SE.

East of the river, the waterfront property is unzoned. The property under the railroad tracks or immediately adjacent to the tracks is C-M-1 (Commercial/Light Manufacturing). C-M-1 permits development of low

bulk commercial and light manufacturing uses. Percent lot coverage is not specified, the minimum FAR is not specified, and the maximum FAR is 3.0. Maximum stories are 3, and the maximum building height is 40 feet.

The neighborhoods to the east of the railroad tracks are zoned R-5-A (Residential). R-5-A permits matter-of-right development of single-family residential uses for detached and semi-detached dwellings. Through special approval, low-density development of general residential uses including row houses, flats, and apartments is permitted. The maximum lot coverage is 40 percent, the maximum FAR is 0.9, and the minimum FAR is unspecified. The maximum building stores is 3, and the maximum height is 40 feet.

Transportation

The west side of the Anacostia River in the Anacostia Waterfront Segment study area has limited transportation access. The waterfront is served by the local street network, which passes under the Southeast-Southwest Freeway from the north on a limited number of through streets. Passing under the tangled 11th Street Bridges network on M Street is also required. The Southeast-Southwest Freeway provides access to the local street network from two exits, but only coming from the west. Eastbound travelers are required to follow an even more circuitous route to access this stretch of the west side of the Anacostia Waterfront.

The District of Columbia Department of Transportation is currently planning the reconstruction of the 11th Street Bridges. The present alignment scenarios provide for separate local and regional travel connections. The local conduit will facilitate connections to the local street network while the regional travel conduit will bypass the local street network. By separating the two flows, local and regional connections will be improved at this chokepoint and waterfront access will also be enhanced.

The east side of the Anacostia River within this segment also has limited access. The waterfront in this section is obstructed by DC-295 as well as the freight railroad alignment. There is no way for the residents of the adjacent neighborhoods to enter Anacostia Park in this segment. To enter the park one must find one of only a few connections under DC-295 with Anacostia Avenue, the only road that travels north-south through the park.

The Anacostia Waterfront Initiative Framework Plan calls for improving access to the waterfront in several locations by enhancing existing connections under DC-295 or by depressing DC-295 so that at-grade crossings can be constructed. In the parts of the Anacostia Waterfront Segment where access is impeded by the freight rail line, the only possible strategy to improve the connections is to remove the rail line completely.

The East of the River Segment Study Area

The East of the River Segment extends from East Capitol Street to Eastern Avenue. The study area includes portions of River Terrace, Mayfair, Eastland Gardens, Kenilworth, Benning, Central Northeast, and Deanwood.

Development History

The development history of the area surrounding the freight rail line in this segment of the alignment is similar to the history of the Anacostia Waterfront Segment study area. This portion of the District was undeveloped until after the Civil War when a few scattered settlements began to take root. Free African Americans moving north after the Civil War represented one of the most prominent groups to settle in the part of the District of Columbia.

Deanwood is one of these early settlements in the northeastern corner of the District of Columbia. Its founding was directly related to the development of the rail line. In 1871, the Southern Maryland Railroad Company laid its tracks close to the Old Bladensburg-Piscataway Road and built a station near the Sheriff farm. Three daughters of Levi Sheriff divided part of

their family farm into three subdivisions. Whittingham, a triangular parcel, was bounded by railroad tracks on the west, Sheriff Road on the south, and present-day 45th Street on the east. A subdivision named Lincoln (today known as Lincoln Heights) was platted near the farm's south edge. Burrville, just east of the ridge, completed the trio. These subdivisions were all loosely tied by the name Deanwood. By 1893, a few houses dotted each subdivision and the lots along Sheriff Road.

Its distance from the central city kept Deanwood a semi-rural area until after World War II. It was not until the 1950s that the city government provided services such as paved streets, sewers, and some sidewalks. Also during this time, the government began to build low-cost housing, including housing for returning veterans. Town houses, duplexes, triplexes, and garden apartments have dominated the area's residential development since 1950.

As in the Anacostia Waterfront Segment, the East of the River Segment is also characterized by a park, which dates back to the establishment of the ring of defense forts around Washington, DC during the civil war. Fort Mahan Park is located between Minnesota Avenue and 42nd Street, NE, north of Benning Road and south of Hayes Street, NE.

Land Use & Building Stock

The East of the River Segment is characterized primarily by multifamily and single-family attached residential dwellings, neighborhood-serving shopping centers, and light industrial uses.

Between East Capitol Street and Benning Road, multifamily and single family attached residential uses follow an urban street grid and represent the dominant use. On the east side of DC-295 lies East River Park Shopping Center, one of the biggest shopping destinations in the area. This shopping center is located south of Benning Road between the railroad tracks and 40th Street, NE. East River Park Shopping Center was redeveloped through a partnership between the Marshall Heights Community

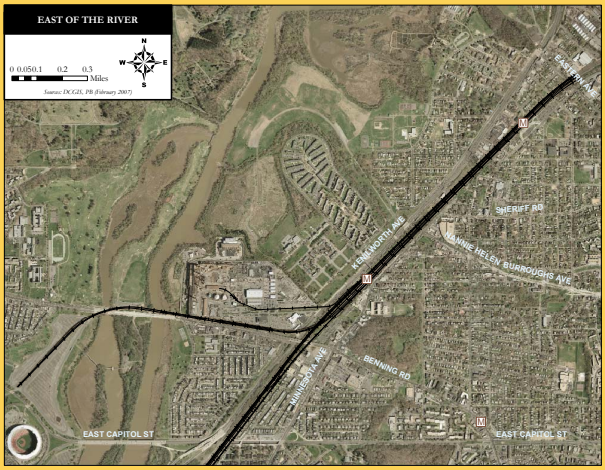


Figure C-5. East of the River Segment Study Area

Market Conditions and Development Opportunities

Development Organization (MHCDO) and The Jenco Group. The 155,000-square-foot shopping center is home to Safeway, CVS, Citibank, Wachovia, Bank of America, and a host of small retailers that provide goods and services to customers who live in or commute through the area.

On the west side of DC-295, there is a 2.78-acre commercial vehicle storage and distribution facility directly south of Benning Road.

Between Benning Road and Nannie Helen Burroughs Avenue, NE, the development pattern continues to be fairly low-density in character, with dominant uses including disjointed commercial uses along Minnesota Avenue, and single-family homes and multifamily residential buildings. Directly north of Benning Road and between the rail line and Minnesota Avenue, the Minnesota Avenue Metrorail station surface parking lot and kiss-and-ride and an undeveloped parcel are situated on more than 8 acres.

On the west side of DC-295, the Potomac Electric Power Company (PEPCO) plant extends from Benning Road to Foote Street, NE covering 77.5 acres. Extending north from the PEPCO plant to the Kenilworth Aquatic Gardens, Kenilworth Park offers 180 acres of open area. Kenilworth Aquatic Gardens is the only National Park Service site devoted to the display of aquatic plants. It is a 14-acre site and now the only location where the public can experience the once-widespread marshes of the Anacostia River.

North of Nannie Helen Burroughs Avenue on the east side of DC-295, the land use pattern is predominantly light industrial. The National Distribution Company of DC occupies a 3.27-acre site at the intersection of Nannie Helen Burroughs Avenue and Minnesota Avenue, NE. Two additional owners occupy another 60,000 square feet adjacent to the distribution facility. Moving north, the land uses include junkyards, commercial vehicle storage, garages, and equipment rental and storage facilities, particularly on the property located between DC-295 and the rail line. The East of the River Segment includes the approximately five-acre Deanwood Metrorail station and the kiss-and-ride and surface parking lot east of the rail line.

On the west side of DC-295 west of Kenilworth Avenue, the land use pattern is predominantly single-family attached and detached residential. A four-story apartment building was recently completed directly adjacent to the freeway between Foote Street and Hayes Street, NE.

Zoning

In the East of the River Segment study area, the property under and immediately adjacent to the railroad tracks is C-M-1 (Commercial/Light Manufacturing) between East Capitol Street and Benning Road. This category permits development of low bulk commercial and light manufacturing uses. Percent lot coverage is not specified, the minimum FAR is not specified, and the maximum FAR is 3.0. Maximum stories are 3, and the maximum building height is 40 feet.

North of Benning Road and south of Hayes Street, the property under and immediately adjacent to the railroad tracks is zoned C-3-A (Commerical). This zone permits matter-of-right development for major retail and office uses. The maximum lot coverage is 75 percent, the minimum FAR is 2.5, and the maximum FAR is 4.0. The maximum nonresidential FAR is 2.5. The maximum number of stories is 5.5, and the maximum building height is 65 feet.

After Hayes Street, NE, the property under and immediately adjacent to the tracks reverts to C-M-1 (Commercial/Light Manufacturing). In the last two blocks before the alignment passes out of the District, the property under and immediately adjacent to the tracks on the east side is R-5-A (Residential) and on the west side is R-2. R-5-A permits matter-of-right development of single-family residential uses for detached and semi-detached dwellings. With special approval, low-density development of general residential uses including row houses, flats, and apartments is permitted. The maximum lot coverage

Market Conditions and Development Opportunities

is 40 percent, the maximum FAR is 0.9, and the minimum FAR is unspecified. The maximum building stories is 3, and the maximum height is 40 feet. In an R-2 zone, single-family residential uses for detached and semi-detached dwelling units are permitted as matter-of-right. The maximum building height is 40 feet, and the maximum number of stories is 3.

West of the freeway, there is a small strip of property between Foote Street and J Street, NE zoned C-2-B. This zone permits matter-of-right medium-density development, including office, retail, housing, and mixed uses. The maximum lot coverage is 80 percent, the minimum FAR is 1.5, and the maximum FAR is 3.5. The maximum number of stories is 5.5, and the maximum building height is 65 feet.

South of Clay Place, NE, the residential area abutting the rail corridor is zoned R-5-A (Residential).

On the west side of the freeway south of Benning Road, the area is zoned R-3 (Residential). This zone permits matter-of-right development of single-family residential uses (including detached, semi-detached, and row dwellings and flats), churches, and public schools. The minimum lot width is 20 feet and the minimum lot area is 2,000. Maximum lot coverage is 60 percent, and the maximum and minimum FAR are not specified. The maximum number of stories is 3, and the maximum building height is 40 feet.

Property Ownership

The residential dwellings, shopping centers, and industrial uses are owned for the most part by private individuals and holding companies. Parkland is owned primarily by the National Park Service, with a few pocket parks in the ownership of the District of Columbia. There are several surface parking lots immediately adjacent to the rail line in the ownership of the District of Columbia. WMATA owns approximately 5 acres on the east side of the rail line for the Minnesota Avenue Metrorail station kiss-and-ride and surface parking lot. PEPCO holds 77 acres north of Benning Road.

Transportation

The primary transportation route in the East of the River Segment is DC-295. This freeway provides regional access for adjacent neighborhoods as well as the metropolitan area while severely constraining local east-west movement through the Northeast quadrant of Washington, DC. In the East of the River Segment, a 1.5-mile stretch, East Capitol Street, Benning Road and Nannie Helen Burroughs Avenue are the only roads that cross over DC-295. Eastern Avenue crosses under DC-295.

In addition to the local and regional road network, this segment is served by two Metrorail stations. The Minnesota Avenue Metrorail station is located at 4000 Minnesota Avenue, SE, and the Deanwood Metrorail station is located at 4720 Minnesota Avenue, SE.

Demographics and Economic Conditions

Regional and City Population Growth Trends

According to Metropolitan Washington Council of Governments projections, the population in the District of Columbia and inner suburbs, which includes the County of Arlington, City of Alexandria, City of Falls Church, City of Fairfax, Fairfax County, Prince Georges County, Montgomery County, and Rockville, is projected to grow from 3.7 million in 2005 to 4 million in 2010, an increase of 8 percent. The number of households is expected to increase from 1.5 million in 2005 to 1.6 million households in 2010, an increase of 96,900 households over the 5-year period, or 19,390 new households per year.

Between 2005 and 2030, the region is projected to grow by 1 million people, from 3.7 million to 4.7 million. Households are expected to increase from 1.5 million to 1.8 million, an increase of 388,000 households over the next 25 years.
As presented in Table C-1, in the District of Columbia, the population is projected to grow from 577,500 in 2005 to 608,700 in 2010, an increase of 5.4 percent. The number of households is expected to increase from 252,000 to 265,300 in 2010, an increase of 13,300 over the next five-year period, or 2,660 households per year.

Between 2005 and 2030, the District of Columbia is projected to grow by 156,300 people, from 577,500 to 733,800. Table C-2 shows that households are expected to increase from 252,000 to 318,700, an increase of 66,700 households over the next 25 years.

Study-Area Trends

Population Growth

Population growth trends in the individual study areas were determined using growth projections developed by the Metropolitan Washington Council of Governments for transportation analysis zones (TAZ). TAZs abutting the freight rail line were grouped according to segment. As presented in Table C-3, in 2005, the total population in all of the segments' study area TAZs was 30,364, or 5 percent of the District of Columbia population. By 2030, the segments' study area population is projected to increase to 52,687, and increase of 73 percent over the 25 year period or 892

Table C-1. Summary of Intermediate Population Forecasts (Thousands)

Jurisdiction	2005	2010	2030	% Change 2005-2010	% Change 2005-2030
District of Columbia	577.5	608.7	733.8	5.4%	27.1%
Region	3780.1	4005.7	467476	6.0%	23.7%

Source: Metropolitan Washington Council of Governments Round 7.0a Cooperative Forecasts

Table C-2. Summary of Intermediate Household Forecasts (Thousands)

Jurisdiction	2005	2010	2030	% Change 2005-2010	% Change 2005-2030
District of Columbia	252	265.3	318.7	5.3%	26.5%
Region	1456.7	1553.6	1844.7	6.7%	26.6%

Source: Metropolitan Washington Council of Governments Round 7.0a Cooperative Forecasts

people per year. By 2030, the segments' study area population is projected to increase to 7 percent of the District of Columbia population.

The Monumental Core Segment includes eight TAZs. Consistent with its character as a primarily employment-based district, this study area has the smallest population and lowest population density of all the segment study areas. In 2005, this segment accounts for 0.9 percent of the total population in all of the segment study areas. Between 2005 and 2030, the population is expected to increase from 277 to 908, an increase of 631 people or 25 people per year. The overwhelming share of this growth is projected to occur between 2005 and 2010 when the population is expected to increase by over 200 percent. By 2030, the Monumental Core Segment study area population is projected to represent 1.7 percent of the total population in all the segment study areas.

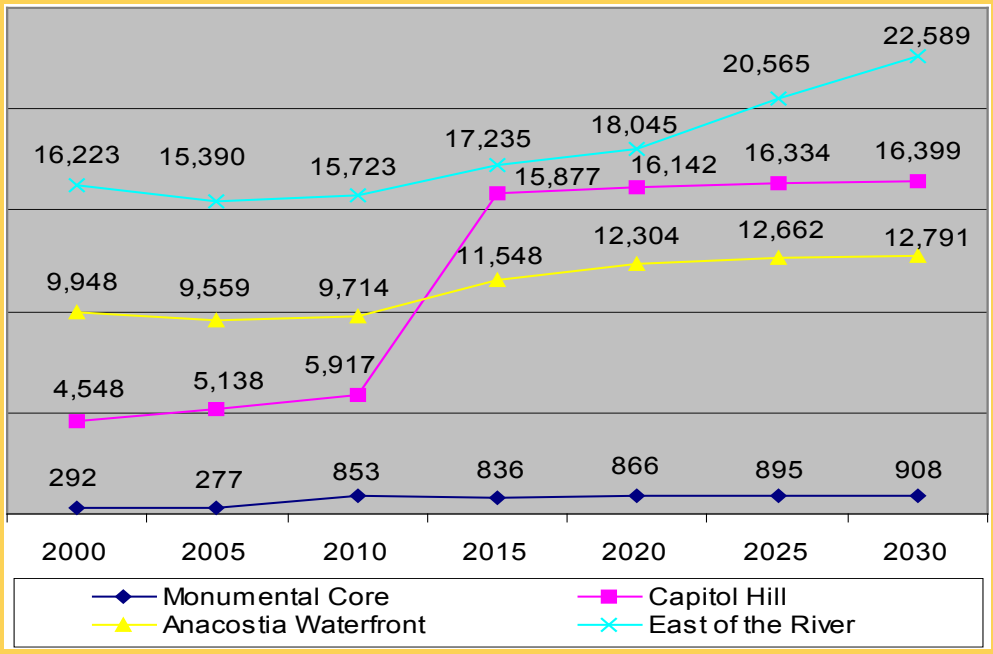
The Capitol Hill Neighborhood Segment includes seven TAZs. This segment study area has the second lowest population with a 2005 count of 5,138 residents; however, the population density in 2005 is

Table C-3. Segment Study Areas Population Growth (2005-2030)

	Segment Study Areas	District of Columbia	Segment Study Areas as % of District of Columbia
2005	30,364	577,500	5%
2030	52,687	733,800	7%

Source: Metropolitan Washington Council of Governments

Figure C-6. Segment Study Areas Population Growth Trends (2005-2030)



Source: Metropolitan Washington Council of Governments Round 7.0 Cooperative Forecats

Market Conditions and Development Opportunities

the highest of all segment study areas. This study area has a significant number of public housing residents. South of the freeway in Near Southeast, Capper-Carrollsburg included 700 units and is currently being redevelopment as Capitol Quarters, a HOPE VI-sponsored revitalization to include 700 public housing units as well as an additional 600 market-rate units. Carroll Apartments (401 M Street, SE) and Arthur Capper Senior (601 L Street, SE) still stand and include an additional 357 units of subsidized housing for senior citizens.

Between 2010 and 2015, this study area's population is projected to increase by 168 percent. It is expected to grow by a rate of 33 percent per year and become the second most populous study area with a total population of 15,877 residents. Over the 25-year period, this study area is projected to grow from 5,138 residents to 16,399, an increase of 11,261 residents or 450 residents per year.

The Anacostia Waterfront Segment has the second most populous study area with 9,559 residents in 2005. In this study area, the large majority of the residential population is located east of the river; however, there is a portion of the alignment west of the river that abuts Capitol Hill. Within this area, most of the land use is single-family detached residential, yet there are two garden-style public housing complexes. One is the 208-unit Potomac Gardens Family located south of Pennsylvania Avenue at 1225 G Street, SE. The other is the 158-unit Hopkins Apartments at 1000 12th Street, SE.

East of the river in the Anacostia Waterfront Segment study area, there are also two public housing complexes. One is Stoddert Terrace, located at Anacostia Road, SE and Ridge Road, SE. The other is Fort Dupont Dwellings and Fort Dupont Addition, comprising 120 units, also located at Anacostia Road and Ridge Road, SE.

This study area is expected to experience modest growth through 2010 and then increase by almost 20 percent by 2015 to 11,548 residents. Nevertheless, its population will be overtaken by the rapid growth projected to occur in the Capitol Hill Neighborhood Segment and become the third most populous area by 2015. By 2030, this segment is projected to reach a population of 12,791.
With 16,223 residents in 2005, the East of the River Segment study area is the most populous area. There are two public housing projects. Kenilworth Courts and Parkside Addition are garden-style apartment

Table C-4. Population Growth Trends Percentage Change (2005-2030)

Segment	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030
Monumental Core	-5.1%	207.9%	-2.0%	3.6%	3.3%	1.5%
Capitol Hill Neighborhood	13.0%	15.2%	168.3%	1.7%	1.2%	0.4%
Anacostia Waterfront	-3.9%	1.6%	18.9%	6.5%	2.9%	1.0%
East of the River	-5.1%	2.2%	9.6%	4.7%	14.0%	9.8%

Source: Metropolitan Washington Council of Governments

Table C-5. Population Density Growth Trends (Population/Acre) (2005-2030)

Segment	2000	2005	2010	2015	2020	2025	2030
Monumental Core	0.9	0.8	2.5	205	2.6	2.7	2.7
Capitol Hill Neighborhood	10.3	11.6	13.4	35.9	36.5	37.0	37.1
Anacostia Waterfront	9.2	8.9	9.0	10.7	11.4	11.7	11.9
East of the River	8.7	8.2	8.4	9.2	9.6	11.01	12.1

Source: Metropolitan Washington Council of Governments

complexes located between Kenilworth and Eastern Avenues, NE.

This study area is projected to remain the most populous through 2030 experiencing steady population growth of approximately 1.5 percent per year reaching 2,589 residents by 2030. In contrast with the Capitol Hill Neighborhood Segment study area, the area projected to become the second most populous area after the East of the River Segment study area, the East of the River Segment has a relatively low population density, only 8.2 residents per acre in 2005. In contrast with the Capitol Hill Neighborhood Segment study area, which is projected to reach a population density of 37 people per acre, the East of the River Segment will maintain a relatively low population density with a projected density of 12.1 people per acre in 2030.

Population by Age

The Anacostia Waterfront Segment and the East of the River Segment study areas are relatively similar in age. The Anacostia Waterfront Segment study area represents a rather traditional age distribution, with the largest shares of the population between 25 and 54 and representation tapering off in the older and younger cohorts. The East of the River Segment study area demonstrates a rather evenly distributed age breakdown, with no single cohort representing more than 15 percent of the total population.

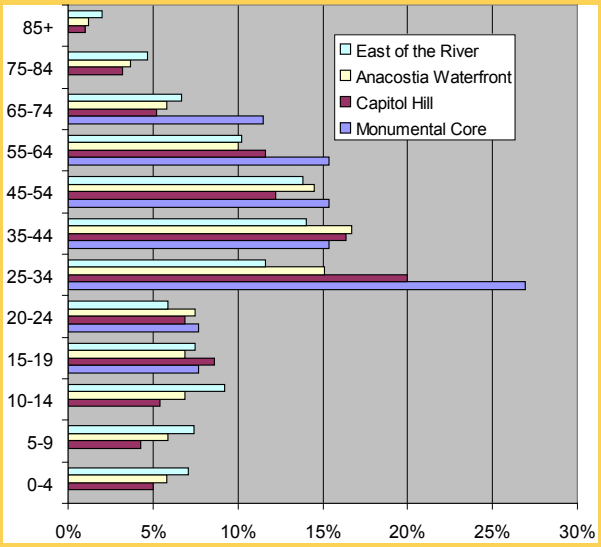
The median age of the population varies by study area and is reflected in the age distribution for each area. The Monumental Core Segment study area is significantly older than the other study areas, by as much as five years. More than 25 percent of the population is between 35 and 44, and at least 15 percent of the population is found in the 35–44, 45–54, and 55–64 cohorts, respectively. The Capitol Hill Neighborhood Segment study area is the youngest study area. As is the same in the Monumental Core Segment study area, the 25–34 cohort is largest in this area, yet there is also representation in the 0–4, 5–9, and 10–14 cohorts.

Table C-6. Median Age (2006)

Segment	Age
Monumental Core	40.0
Capitol Hill Neighborhood	34.9
Anacostia Waterfront	36.2
East of the River	36.1
District of Columbia	35.7

Source: ESRI Business Information Solutions

Figure C-7. Age Distribution by Segment (2006)



Source: ESRI Business Information Solutions, 2006

Market Conditions and Development Opportunities

Household Characteristics

Household growth trends for each study area are consistent with population growth trends. The most populous area is the East of the River Segment study area, followed by the Anacostia Waterfront Segment study area, the Capitol Hill Neighborhood Segment study area, and the Monumental Core Segment study area.

Study-area household size is projected to remain relatively similar through 2030. The Monumental Core Segment and Capitol Hill Neighborhood Segment study areas will have the smallest house hold size, catering mostly to singles and couples in multifamily residential buildings. The East of the River Segment also has a moderate household size—on par with the District of Columbia household size. The Anacostia Waterfront Segment has the largest household size by far, more than 30 percent higher than the District's average household size. This statistic is expected to fall slightly, likely as a result of the national trend toward smaller households as well as an expectation that this study area will experience higher-density residential development.

Education Levels

Each segment study area demonstrates significantly different education levels. In the Monumental Core Segment study area, the large majority of the population has earned a bachelor's degree or professional level degree. The Capitol Hill Neighborhood Segment study area also demonstrates relatively high education levels, with 47 percent of the population earning at least a bachelor's degree. However, in this study area, there is also a degree of extremely low educational attainment, as 7.5 percent of the population has less than a 9th grade education. In contrast with the Monumental Core Segment and two study areas, the Anacostia Waterfront Segment and the East of the River Segment study areas demonstrate significantly lower educational attainment

Table C-7. Household Growth Trends (Population/Acre) (2005-2030)

Segment	2000	2005	2010	2015	2020	2025	2030
Monumental Core	140	134	398	391	404	416	423
Capitol Hill Neighborhood	2,220	2,498	2,860	7,484	7,584	7,670	7,703
Anacostia Waterfront	3,196	3,044	3,110	3,853	4,185	4,328	4,384
East of the River	6,814	6,490	6,629	7,361	7,696	8,767	9,647

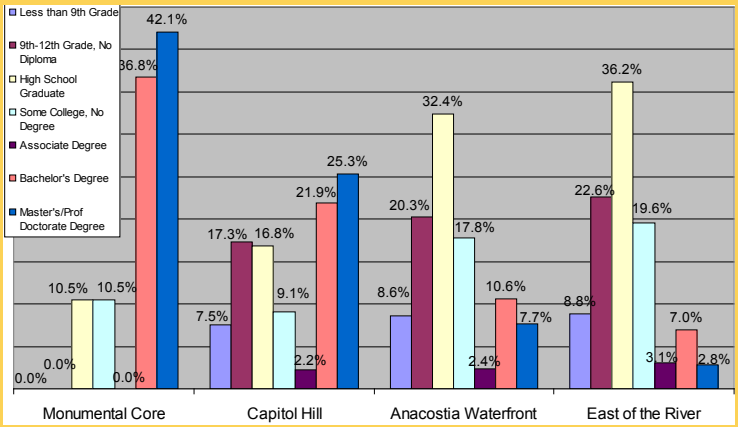
Source: Metropolitan Washington Council of Governments

Table C-8. Household Size

Segment	2005	2030
Monumental Core	2.1	2.1
Capitol Hill Neighborhood	2	2.1
Anacostia Waterfront	3.1	2.9
East of the River	2.4	2.3
District of Columbia	2.3	2.3

Source: Metropolitan Washington Council of Governments, BBP Associates

Figure C-8. Educational Attainment Levels by Segment Study Area (2006)



Source: ESRI Business Information Solutions, US Census

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levels. In these areas, only small percentages of the population have earned an associate degree or higher. High school graduates make up the largest shares of the population in these study areas, and more than 8 percent of the population in each area has less than a 9th grade education.

Income

Consistent with education levels, the median income levels are much higher in the Monumental Core Segment and the Capitol Hill Neighborhood Segment study areas than in the Anacostia Waterfront Segment and the East of the River Segment study areas.

In the Monumental Core Segment and the Capitol Hill Neighborhood Segment study areas, income levels are significantly higher than the District of Columbia median income level, and income levels are projected to grow by more than 20 percent over the next five years, more than 4 or 5 percent per year. In contrast, the East of the River Segment study area median income is lower than the District of Columbia median income. The Anacostia Waterfront Segment and the East of the River Segment study areas are projected to grow by 15 and 13 percent over the next five years. Incomes in these two study areas are projected to grow slower than the average annual rate of inflation (3 percent), thus implying that residents in these areas will have even less earning power in five years than they do now.

Economic Conditions

The Anacostia River represents a sharp dividing line both in terms of geographic separation between the east and west sides of the river and in economic conditions. In the Monumental Core Segment and two study areas, economic conditions historically have been bolstered by the federal government's presence and the thousands of jobs required to support its operations. In sharp contrast, the Anacostia Waterfront Segment and four study areas have never held strong employment centers, representing instead low-density residential communities with scattered neighborhood-serving retail.

Employment Growth

Consistent with the illustration above, the size of the daytime population varies significantly by study area. In 2005, the Monumental Core Segment study area had 69,508 employees, representing 72 percent of total employment in all the study areas and 9 percent of total District of Columbia employment. This level of employment is expected to remain relatively constant through 2030, reflecting the built-out character of this area.

The Capitol Hill Neighborhood Segment study area has far fewer employees than The Monumental Core Segment, representing only 2 percent of the District's total employment in 2005. The majority of these employees are located now in the Navy Yard. Despite its modest representation currently, employment is expected to grow at a rapid pace, increasing by more than 300 percent between 2005 and 2030 when it is projected to reach almost 35,000 employees.

Table C-9. Median Income by Segment Study Area (2006-2011)

Segment	2006	2011	% Change 2006-2011
Monumental Core	$65,822	$84,511	28%
Capitol Hill Neighborhood	$48,852	$59,387	22%
Anacostia Waterfront	$38,374	$44,035	15%
East of the River	$32,855	$37,106	13%
District of Columbia	$36,352	$44,724	23%

Source: ESRI Business Information Solutions, U.S. Census

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The Anacostia Waterfront Segment and East of the River Segment study areas demonstrate the lowest employment levels of all four study areas. With 7,574 jobs in the Anacostia Waterfront Segment and the East of the River Segment study areas combined, these areas represent only 2 percent of total District employment.

In terms of employment growth, the Anacostia Waterfront Segment study area is projected to perform far better than the East of the River Segment study area. The Anacostia Waterfront Segment study area is projected to increase by 2,500 jobs between 2005 and 2030, or 100 jobs per year. Meanwhile, the East of the River Segment study area employment levels are projected to remain static, increasing by only 300 jobs between 2005 and 2030.

Unemployment Levels

Consistent with other economic characteristics, unemployment levels vary by study area and reflect the opportunities for employment and socioeconomic status of the resident population. The Monumental Core Segment study area residents demonstrate a relatively low unemployment rate, lower than the employment rate for the District as a whole. This rate is projected to remain relatively low through 2011.

In the Capitol Hill Neighborhood Segment and The Anacostia Waterfront Segment study areas, the unemployment rates are elevated above the District's unemployment rate and are projected to fall slightly by 2011. The East of the River Segment study area demonstrates the worst employment conditions,

Table C-10. Total Employment by Segment Study Area (2006)

Segment	# of Employees	Employment Density	% of Study Areas (96,270)	% of District of Columbia (744,998)
Monumental Core	69,508	207	72%	9%
Capitol Hill Neighborhood	11,636	26	12%	2%
Anacostia Waterfront	7,574	7	8%	1%
East of the River	5,547	3	6%	1%

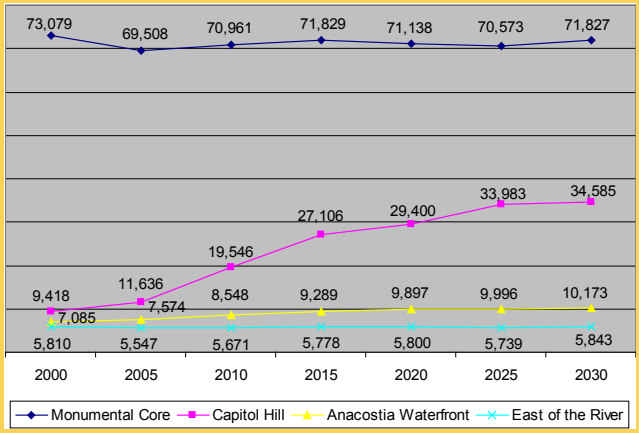
Source: Metropolitan Washington Councilof Governemnts 7.0 Employment Forecast by TAZ

Table C-11. Unemployment Rate by Segment Study Area (2006-2011)

Segment	2006	2011
Monumental Core	5.60%	5.20%
Capitol Hill Neighborhood	13.50%	12.90%
Anacostia Waterfront	16.40%	15.80%
East of the River	20.20%	19.40%
District of Columbia	10.1%	9.7%

Source: ESRI Business Information Solutions, U.S. Census

Figure C-9. Employment Growth by Segment Study Area (2000-2030)



Source: Metropolitan Washington Councilof Governemnts 7.0 Employment Forecast by TAZ

estimated at 20 percent in 2006.

Major Employers and Employment Types

There are several major employers in each study area that define the workforce. In the Monumental Core Segment, the dominant employer is the federal government, and departmental buildings largely make up the built environment. Departments included in this study area include the Department of Health and Human Services, the Department of Energy, the Department of Housing and Urban Development, Voice of America, the Federal Aviation Administration, the U.S. International Trade Commission, and the Department of Education. The majority of the employment opportunities in this study area is office-based and is within the administrative support or public administration industry clusters.

In the Capitol Hill Neighborhood Segment study area, two of the largest employers are the U.S. Navy and the U.S Coast Guard. Once completed, the U.S. Department of Transportation headquarters will also represent a significant source of employment, as will the retail and entertainment uses in the Baseball District. The majority of the employment opportunities in this study area is also office-based and is within the administrative support or public administration industry clusters.

Major employers in the Anacostia Waterfront Segment study area are Northrop Grumman and General Dynamics in the 200,000 square feet of office space at Maritime Plaza on the west side of the river. The DC Central Detention Facility is also a major employer, charged with overseeing an inmate population that can reach as high as 2,500. Other employment opportunities are in the retail and service industries.

In the East of the River Segment study area, portions of major employment sites include the PEPCO facility north of Benning Road, the U.S. Postal Service distribution center south of Benning Road, the 155,000 square foot East River Park Shopping Center on the east side of DC-295 north of Clay Place, NE, and the National Distribution Company of DC at the intersection of Nannie Helen Burroughs Avenue and Minnesota Avenue, NE. There are few office-based, professional employment opportunities in this study area. The majority are within the construction, manufacturing, wholesale trade, retail trade, and transportation/utilities industries.

Current Activities Affecting the Segment Study Areas

Regional Economic Trends and Development Patterns

The Washington, D.C. metropolitan area through which the freight rail line passes has experienced healthy economic growth over the past several years and is expected to continue growing at a strong pace.

Economic Growth

As the location of numerous federal government contractors as a well as a large proportion of the federal government workforce, the northern Virginia and Maryland suburbs share a close relationship with the District of Columbia. Core sectors of the economy in the Washington, D.C. metropolitan region include the federal government, technology, the building industry, international business, and the hospitality sector. These sectors have and are expected to continue to experience strong growth.

As a result of continuing growth in the job market, the region is expected to grow by an average of 65,000 people per year through 2030.[2] The majority of this growth will occur in the inner suburbs, yet the outer suburbs are projected to grow at the fastest pace.

Many of the new residents in the inner and outer suburbs will commute to the District of Columbia for work. The District will continue to have the largest number of jobs in 2030 and represent 20 percent of total regional employment. As described in the Economic Conditions section, the District is projected to add 114,300 new jobs by 2030, an increase of 15 percent from 2005. However, job growth in the inner and outer suburbs will occur at an even faster rate. Collectively, the inner suburbs will add the largest share of new jobs by 2030—an estimated 629,000 new positions. Fairfax County, Virginia, is projected to add over 244,000 new jobs by 2030, followed by Prince George's County with an additional 186,000 and

2 Metropolitan Washington Council of Governments 7.0a Forecasts. Region comprises central suburbs, inner suburbs and outer suburbs. The central and inner suburbs are: Virginia—Arlington County, City of Alexandria, Fairfax County, City of Falls Church, City of Fairfax; Maryland—Montgomery County, Prince George's County. The outer suburbs are: Virginia—Loudoun County, Prince William County, Stafford County, City of Manassas, City of Manassas Park; Maryland—Frederick County, Calvert County, Charles County.

Table C-12. Core Sectors of the Economy, Washington Metro Area

		Annual Growth Rates		
GRP $ Billions		Average	Actual	Estimated
2004	Sectors	1995-2000	2004	2005
$107.0	Federal Government	4.0%	10.0%	9.0%
$48.0	Technology	12.0%	12.0%	10.0%
$20.2	Building Industry	6.0%	3.0%	6.0%
$16.7	International Business	3.0%	2.8%	3.0%
$6.7	Hospitality	2.0%	7.6%	4.0%

Source: Dr. Stephen Fuller, Delta Associates, January 2006

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Montgomery County with over 170,000.[3]

Real Estate Market Growth and Development Patterns

As a result of the strong regional population and employment growth, the inner and outer suburbs are also experiencing growth in their real estate markets. In the office market, job growth at over 86,900 net new jobs caused the regional vacancy level to fall from 9.2 percent in 2004 to 7.9 percent. It also spurred absorption of 7.6 million square feet of office space in 2005, down from the more than 10 million square feet absorbed in 2004 yet still the third highest absorption level in the nation. Northern Virginia led this absorption with 4,586,000 square feet of space, followed by the District of Columbia and then suburban Maryland.

Asking rental rates have increased slightly in each market area since the first quarter, rising between $0.25 in suburban Maryland to over a $1.09 in the District of Columbia. The District of Columbia's rental rates are far higher than Northern Virginia, reflecting the premium paid for space in the regional employment core. Northern Virginia's rates are higher than suburban Maryland's rates likely as a result of the Class A space located in emerging market areas such as Reston and Route 28 South in Fairfax County.

In contrast with the office market, the housing market has cooled since 2005 consistent with the national trend. At the end of 2005, the pipeline of unsold condominiums in the region was over 51,000 and continuing to climb. The pipeline was particularly high in Prince George's County, Maryland. The slower pace of absorption led many builders to postpone plans to start new construction, and the availability of new condominiums has fallen off in the District of Columbia, Alexandria, and Arlington. The median price for a condominium was $302,486 in November 2005, and the price per square foot for new condominiums at the end of 2005 is presented in Table C-13.

The number of new housing starts in single-family construction has also dropped off, and this slowdown combined with the deceleration in the condominium market has led to a strengthening in the apartment market. In 2005, absorption totaled more than 5,200 Class A units, representing the third-highest absorption level in the nation. As a result of the stronger demand, vacancy rates have decreased and

3 Metropolitan Washington Council of Governments 7.0a Forecast

Table C-13. New Condominium Prices Inside the Beltway (Year End 2005)

Market	Price/Square Ft.
Northern Virginia	$445
Suburban Maryland	$290
District of Columbia	$530

Source: Delta Associates, January 2006

Table C-14. Direct Space Net Absorption (2005)

Market	Space Absorbed (in 000s)
Northern Virginia	4,586
Suburban Maryland	1,365
District of Columbia	1,559
Total	7,550

Source: "Trendlines" 2006

Table C-15. Asking Rental Rates (2006 Second Quarter)

Market	Average Asking Rental Rate
Northern Virginia	$29.28
Suburban Maryland	$25.94
District of Columbia	$41.97

Source: "Trendlines" 2006

Table C-16. New Condominium Prices Inside the Beltway (Year End 2005)

Market	Price/Square Foot
Northern Virginia	$445
Suburban Maryland	$290
District of Columbia	$530

Source: Delta Associates, January 2006

rents have increased. In the District of Columbia, rents reached $2.50 per square foot for Class A, high-rise apartments.

As a result of the high levels of regional residential and employment growth, the retail sector continues to flourish and respond to the strong demand. Metro-wide vacancy levels remain chronically low and hit 2.9 percent at year-end 2005. Furthermore, rental rates at grocery-anchored centers spiked 22.7 percent in 2005 reaching a Metro-wide average of $30.19 per square foot a year-end.

The arrival of mixed-use developments featuring retail as a significant component in both suburban and urban locations represents one of the most intriguing trends to impact the region. In addition to the Baseball Stadium District in Near Southeast, regional projects of note include National Harbor in Prince George's County, Maryland, a 300-acre mixed use power center on the Potomac River to feature office, hotel, retail, and residential. The retail component will include 1 million square feet of retail, dining, and entertainment. The project expects to deliver in mid-2008. Another project featuring mixed-use development is The Village at Leesburg in Loudoun County, Virginia. This project, planned by KSI Services, is a mixed-use project on a 15-acre site in Leesburg, approximately 50 minutes outside of Washington, DC. The site will include 440,000 square feet of retail. Tenants signed at the end of 2005 included Wegman's, a high-end grocer; Barnes and Noble; Talbots; and Arhaus Furniture.

District of Columbia Development Patterns and Trends

The Washington, DC real estate market is one of the most prolific urban areas for new investment in the nation. Increased federal spending and positive job growth have fueled the local economy and created strong demand for new office space, hotels, residential development, and urban amenities including upscale retail destinations as well as neighborhood-serving stores and restaurants. The economic recovery since September 11 has also contributed to the District's real estate market, as increased tourism has provided its own share of new demand for hotels and retail.

These factors, as well as the region's population growth and robust economy, have spurred the construction of 23.5 million square feet of new office space, 21,639 new residential dwellings, 4,342 new hotel rooms (7 million square feet), and 2.2 million square feet of new retail space since the beginning of 2001.

Market Conditions and Development Opportunities

Office Sector

Real estate development has been most active in the northwest quadrant of Washington, DC over the past five to six years. Six traditional office submarkets have been defined to include East End, West End, Capitol Hill, CBD, Uptown, and Georgetown. However, over the past several years, development has been consistently moving east into new areas of the District in response to escalating land costs and land scarcity in the traditional market areas. As a result, six emerging office markets have been defined. These emerging markets are the NoMa Corridor (North of Massachusetts, Ave, NE), Southeast Federal Center, South Capitol Street, Southwest Waterfront, Petworth, and St. Elizabeths.[4] Some of the largest leases and expansive construction projects are taking place in these areas, such as the delivery of the 384,000 square foot Republican Square in the NoMa market, the expansion of the Coast Guard into 120,000 square feet at 1900 Half Street, SW, and the construction of 2.1 million square feet at the new baseball stadium location on South Capitol Street.

Housing Sector

Residential construction in the District has also been strong. In the Southeast portion of the city alone, 3,407 new residential units in 27 new projects have been delivered since 2000. A national boom in condominium construction contributed significantly to this new construction and represents a significant share of the production. As an illustration, sales of new condominium units in the third quarter of 2005 in Washington, DC were 3,152 new units, an increase of 22 percent from quarterly sales in the third quarter of 2004.

The national slowdown in the housing market has stabilized market conditions and cooled the condominium boom, yet this has only paved the way for a new rise in apartment construction. The region's stabilized vacancy rate for investment grade (Class A and B) apartments declined to 1.4 percent. This is by far the lowest vacancy rate of any metro area in the nation (the national rate is 5.6 percent). Meanwhile, net absorption, at 5,066 Class A and B apartments over the past 12 months (20 units per month), is at its highest level in five years.

As housing demand has increased over the past five years and neighborhoods such as Capitol Hill and Dupont Circle have become expensive for development and potential buyers, opportunities to develop new condominiums and townhouses have emerged in transitional areas such as NoMa and Northeast. The completion of the New York Avenue Metrorail station has provided this area with transportation options that are attractive to developers and potential buyers. In addition, the revitalization of the H Street Corridor has begun to indicate that this corridor will re-emerge as a new shopping and entertainment district. The renovation of the Atlas Theater and the opening of the H Street Playhouse are two recent improvements along this corridor.

New residential development will also be sparked by the Anacostia Waterfront Corporation's efforts to revitalize the Southwest and Southeast waterfronts. A master developer was recently selected to bring up to 2 million square feet of development to the Southwest waterfront on land that is now mostly parking lots and concrete buildings. As called for in the Extending the Legacy plan as well as the Anacostia Waterfront Initiative Framework Plan, Poplar Point on the Southeast waterfront is also undergoing large-scale planning efforts to plan for mixed-use development. Recently completed projects east of the river include the 85,000-square-foot Townes at Hillsdale, a 65-unit affordable town home project, and the 188,000-square-foot Dupont Commons, 147 affordable single family town homes on a former public housing site.

Hospitality Sector

In the hospitality sector, several major projects have delivered over the past five to six years. This includes several projects within the Monumental Core Segment and the Capitol Hill Neighborhood Segment study areas: the Mandarin Oriental Hotel, a $144-million,

4 The office submarket nomenclature and definitions are used by leading real estate market firms such as CB Richard Ellis and Delta Associates.

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nine-story, 400-room hotel overlooking the Tidal Basin at 1330 Maryland Avenue, SW; Capitol Hill Towers, a $105-million mixed use project incorporating a 344-unit luxury cooperative tower (128 units) with a 200-room Courtyard by Marriott located at 1000 New Jersey Avenue, SE; and a 13-story, 233 suite Residence Inn by Marriott at 333 E Street, SW. These projects are particularly significant for their location in emerging market areas where office submarkets have only recently taken hold.

However, overall, development in the hospitality sector has proceeded at a slower pace than the office and residential sectors. Despite strong tourism statistics (17 million visitors to the District in 2005), the office sector and particularly the residential condominium sector have been much more stable and profitable projects than hotels. Looking forward, strong demand from suburban employment centers for new hotels combined with a shorter lead time on new construction projects and cheaper land costs may make the Washington suburbs more attractive destinations for the hospitality sector than the District itself. The Gaylord National Resort and Convention Center represents one of these competing projects. Located on the banks of the Potomac River in Prince George's County, the facility will have over 1,500 rooms, extensive meeting space, as well as plentiful amenities including retail destinations, entertainment venues, and ample parking.

Retail Sector

The retail sector is also expanding in the District of Columbia. The rise in high-end residential construction, strong tourism and visitor statistics, and office employment expected to increase by 5,500 per year through 2030, have created confidence that the District of Columbia is a profitable retail environment. This is evidenced by the construction of new retail centers like Gallery Place and Tivoli Square as well as the introduction and success of Whole Foods, Home Depot, Best Buy, and The Container Store.

As office and residential construction expands eastward, plans for retail development has followed. This is evident in the proposals for Skyland Shopping Center, a 250,000 square foot shopping center expected to be completed in 2007 at the intersection of Good Hope at Naylor and Alabama, SE; the Washington Gateway, a planned 412,550-square-foot destination retail center to be located on New York Avenue at South Dakota Avenue on the southern edge of the 176-acre Ft. Lincoln New Town; and the Abdo Development project at the intersection of New York Avenue and Bladensburg Road, NE which proposes 200,000 square feet to front on New York Avenue. The Southwest waterfront and Poplar Point are also planned to include retail.

Recent Planning Efforts

The freight rail line spans several distinct market areas within the District of Columbia. The Monumental Core Segment and the Capitol Hill Neighborhood Segment are located within the Federal Employment District and Near Southeast market areas. The Federal Employment District is characterized by longstanding real estate market strength, and Near Southeast is demonstrating an emerging vitality. In contrast, The Anacostia Waterfront Segment and the East of the River Segment have not yet realized the high levels of real estate development activity that the areas west of the Anacostia River have experienced.

Recent planning efforts recognize the differences between the market conditions east and west of the river, and plans including the Anacostia Waterfront Initiative Framework Plan, the Department of Transportation's Great Streets Initiative and other transportation plans, the National Capital Planning Commission's Extending the Legacy, and the Freight Railroad Realignment Feasibility Study have developed visions and implementation strategies that respond to these market realities. These plans address current market opportunities while creating the conditions appropriate for new development in the future.

Plan Summaries

The Anacostia Waterfront Initiative (AWI) is a movement coordinated by the District of Columbia Office of Planning to produce the Anacostia

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Waterfront Initiative Framework Plan, a guide to the revitalization of the Anacostia Waterfront. This plan targets five specific areas along the east and west side of the river for concentrated planning and revitalization efforts.

Extending the Legacy, Planning America's Capital for the 21st Century, is the National Capital Planning Commission's 1997 vision plan for accommodating growth and change in the nation's capital. The plan's central theme is a redefinition of Washington's Monumental Core to refocus on the Capitol, encompass nearby areas, and connect to the city's waterfront.

The District of Columbia Department of Transportation's Great Streets Initiative focuses on six major corridors in the District of Columbia. The purpose is to increase local neighborhood livability and economic development by improving the physical, economic, and safety conditions of the corridors and create a new environment that invites private investment and neighborhood pride. This initiative is a multidisciplinary approach to corridor improvement, comprising public-realm investments, strategic land use plans, public safety strategies, and economic development assistance.

The Kenilworth Avenue Corridor Study is the third of three projects by the District Department of Transportation (DDOT) to look at transportation improvements within the context of the AWI Framework Plan. The study has three goals: 1) providing a safer, more pedestrian-friendly atmosphere; 2) creating a more-urban setting for Kenilworth Avenue; and 3) improving access for local neighborhoods.

The area extends from Pennsylvania Avenue in the south to Eastern Avenue in the north and includes both sides of the Anacostia River as far as the Benning Road crossing. It includes the Upper Anacostia Crossings of East Capitol Street and Benning Road and a new proposed crossing at Massachusetts Avenue. The eastern limits roughly parallel Minnesota Avenue and include the Minnesota Avenue and Deanwood Metrorail stations. On the west bank of the river the limits include the extension of River Road from Barney Circle and the Reservation 13 Road to Benning Road. Neighborhoods included in the study are Fort Dupont, Greenway, River Terrace, Mayfair, Eastland Gardens, Deanwood, and Kenilworth.

Major roads included in the study area are Kenilworth Avenue, Minnesota Avenue, Pennsylvania Avenue, Massachusetts Avenue, East Capitol Street, Benning Road, Nannie Helen Burroughs Avenue, and Eastern Avenue.

The Ward 7 Waterfront Plan is another plan tied to the AWI Framework Plan. One of the initiatives of the AWC is to sponsor area-specific master plans along sections of the river. In April 2006, the AWC convened a meeting of a Steering Committee of Northern Ward 7 residents and stakeholders to introduce the idea of a plan for the area and to establish a timetable for completion. Then, in July 2006, the AWC commissioned Urban Design Associates (UDA) to develop the Northern Ward 7 Waterfront Plan. The plan addresses the planning process, data analysis, urban design and development principles, frameworks, initiative areas, and implementation and phasing. The neighborhoods incorporated into this planning process are Mayfair Mansion, Parkside, Eastland Gardens, and Kenilworth Courts.

Other plans include provisions that specifically target the freight rail alignment segment study areas.

The Monumental Core Segment Study Area

Extending the Legacy and the Anacostia Waterfront Initiative Framework Plan have specific plans for the Monumental Core Segment of the railroad alignment as well as the surrounding study area. In Extending the Legacy, Washington D.C.'s monumental core is no longer encumbered by the freight rail alignment. Furthermore, South Capitol Street is redeveloped as a

Market Conditions and Development Opportunities

"new southern gateway to Central Washington" with a vibrant mix of residential and commercial uses.

Plans are also under development for the continuation of a deck over Maryland Avenue. This opportunity will be presented in NCPC's Framework Plan, an implementation strategy stemming from the vision established in Extending the Legacy. The decking of Maryland Avenue will allow for development of the 2.6 acres of vacant land owned by Republic Properties adjacent to Maryland Avenue and 14th Street, NW.

In the AWI Framework Plan, a portion of the Monumental Core Segment study area is designated as a target area—the South Capitol Street Gateway. The plan also designates the Southwest Waterfront as a target area, an opportunity area located close to the Monumental Core Segment study area.

As described on the District of Columbia Office of Planning's website, the South Capitol Street Gateway Target Area represents a combination of several planning efforts. "The District of Columbia Department of Transportation (DDOT), an AWI partner, is conducting a study to promote commercial, recreational and residential activities and to improve pedestrian and vehicular access on South Capitol Street and the Frederick Douglass Bridge between Independence Avenue and the Suitland Parkway, and on New Jersey Avenue between Independence Avenue and M Street Southeast. Meanwhile, the South Capitol Street Urban Design Study is joint effort completed in January 2003 by the National Capital Planning Commission and the DC Office of Planning. This study proposes principles and three urban design scenarios to suggest a range of design directions for the revitalization of the South Capitol Street Corridor."

The website also provides this summary of the AWI Southwest Waterfront target area: "The Southwest Waterfront Plan is a redevelopment framework for nearly 50 acres of waterfront in the Southwest quadrant of Washington. The plan envisions replacing parking lots and underutilized streets with a mix of public plazas, cultural venues, restaurants, shops and residences to create a vibrant neighborhood and regional waterfront destination. The proposed uses include more than 2 million square feet of new construction including 14 acres of new parks along the waterfront—three times the existing open space."

The Capitol Hill Neighborhood Segment Study Area

The study area surrounding the Capitol Hill Neighborhood Segment of the freight rail line has also been the subject of several recent planning studies, including the AWI Framework Plan and Extending the Legacy.

The AWI Framework Plan includes Near Southeast as one of its five target areas. The plan calls for Near Southeast to represent "one of America's largest waterfront transformations, with at least 40 percent of its land area currently subject to redevelopment." The plan calls for Near Southeast to be "an active, transit-oriented neighborhood combining mixed-income housing, offices and waterfront destinations." The Capper-Carrollsburg Hope VI project will provide over 700 units of affordable housing. Meanwhile, the Washington Navy Yard and the U.S. Department of Transportation headquarters will host over 18,000 workers and foster new private-sector jobs. Canal Blocks Park will lead to a great waterfront park at Southeast Federal Center, providing neighborhood access to the river for the first time in over 100 years.

In Extending the Legacy, Near Southeast is also presented as an opportunity to produce a world-class waterfront destination. It is also envisioned as a Class A office market. The plan projects that the redevelopment of the Southeast Federal Center and Washington Navy Yard will generate 15,000 new jobs and reinforce the surge of economic activity revitalizing Near Southeast.

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The Anacostia Waterfront Segment Study Area

This study area is the subject of numerous planning efforts. The most significant planning efforts to impact this segment of the study area are Extending the Legacy, the AWI Framework Plan and the Great Streets Initiative.

As in the Monumental Core Segment and Capitol Hill Neighborhood Segment, Extending the Legacy envisions a waterfront without the freight rail alignment. In this vision, access to the waterfront east of Water Street, SE is restored. The Congressional Cemetery lawn sweeps down to the waterfront and is uninterrupted by the freight rail line. Extending the Legacy calls for the creation of a "network of parks, playing fields, marinas, and other attractions that enrich urban life." The plan adds, "Some stretches will be quiet and pastoral, perfect for walks or picnics, while others will support festivals, concerts, and other urban activities."

The AWI Framework Plan identifies the challenge that the CSX rail line represents to improving access to the waterfront and improving the waterfront parkland.

The plan calls for a number of park improvements related to the creation of the Riverwalk at different points along the waterfront. The plan states, "Between Congressional Cemetery and Barney Circle, a natural habitat area an extension of Hill East Meadows will border the river and be accessible via the Riverwalk. Between the 11th Street Bridges and the CSX rail line rowers and boaters will enjoy better access to enhanced facilities with the construction of Park Road and the Riverwalk along Boathouse Row."

In addition, two of the AWI Framework Plan's five target areas are located on the east side of the river in the Anacostia Waterfront Segment: Near Southeast and the East of the River Gateways. As in Extending the Legacy, the AWI Framework Plan calls for improved access to the waterfront for the adjacent neighborhoods. In Near Southeast, the framework plan calls for "Proposed gateway parks and public open spaces [that] will celebrate the points where M Street reaches the water at either end."

The AWI also recognizes the importance of the Maritime Plaza development. The AWI Framework Plan states: "The Maritime Plaza site should include a mix of uses in addition to the existing office space. The substantial parking requirements on the site should be carefully integrated with the site plan, and new and existing office buildings should include street-level retail to both cater to employees and to the growing residential population in the Near Southeast. The public spaces, view corridors, and orientation of buildings on this site should reflect the site's special location overlooking the Anacostia River, and the terminus of Virginia Avenue should be celebrated by an active mix of uses on all sides."

Finally, the AWI plan calls for improvements to the Randle Circle Gateway. The Anacostia Freeway and the CSX railroad tracks currently impair access from the Twining neighborhood to the Anacostia parkland. The plan calls for the following:

> A continuous park road will connect Massachusetts Avenue from the new Hill East neighborhood to Randle Circle on the east side, creating access between a new state-of-the-art Aquatic Recreation Center on the east side of the river and Hill East Meadows park on the west side of the river. Daylighting the Fort Davis, Pope Branch, and Fort Dupont streams will create green-landscaped trails from the surrounding neighborhoods to the waterfront.

Another planning effort impacting the Anacostia Waterfront Segment is the Great Streets Initiative. Pennsylvania Avenue, SE from the Sousa Bridge to Southern Avenue is one of the Great Streets, and the District Department of Transportation (DDOT) began investing its $100-million budget in public realm improvements on segments of Benning Road, NE; H Street, NE; Pennsylvania Avenue, SE (east of the Anacostia River); Martin Luther King Jr. Avenue, SE;

and South Capitol Street in FY 2006.

An additional AWI effort that impacts the Anacostia Waterfront Segment study area is the Kenilworth Avenue Corridor Study. Within the Anacostia Waterfront Segment, several improvements are identified, and they are recommended for short-term, mid-term, or long-term implementation. From Pennsylvania Avenue to East Capitol Street, landscaping improvements, maintenance, roadway lighting, and signage are recommended to enhance the parkway setting in the near term. In the long term, improvements are recommended to Park Road in Anacostia Park. Also in the near term, a pedestrian bridge is recommended to extend Massachusetts Avenue to the Kingman and Heritage Islands. Further, the plan looks to address public access across I-295 to the Anacostia waterfront.

The East of the River Segment Study Area

This study area has also been the subject of several recent planning efforts, including, the Anacostia Waterfront Initiative Framework Plan, the Ward 7 Waterfront Plan, and the Great Streets Initiative.

The AWI Framework Plan identifies the Kingman and Heritage Islands as one of its target areas. The plan focuses on the restoration of the islands and the tidal marsh in Kingman Lake, but improving connectivity on the east and west side of the river is identified as an important goal. The AWI Plan calls for a 300-foot woodland buffer for the area north of the CSX line on the east side of the Anacostia River. A 150-foot riparian buffer consisting of native-material mixed meadow is recommended for the area between the river and the river trail, except at key areas such as boat landings. Planting selected for the meadow should allow for visual access to the water from the Anacostia Riverwalk. A woodland buffer with a minimum of 60 feet is proposed for both sides of the Anacostia Freeway.

In the Kenilworth study, several improvements are identified for the East of the River segment study area. In the short term, these include a strengthened landscape buffer between the CSX railroad and Kenilworth Avenue and between Kenilworth Avenue and the adjacent neighborhoods, roadway lighting and improved signage. At the overpass to East Capitol Street, a realignment of the horizontal realignment of Kenilworth Avenue to increase open space at Anacostia Park is recommended for the near term. In the long term, reconstruction of the East Capitol Street Bridge, the Benning Road Bridge, and the Eastern Avenue Bridge are identified to improve connectivity and pedestrian and vehicular safety.

Finally, the Great Streets Initiative identifies H Street, NE and Benning Road, NE from North Capitol Street to Southern Avenue as one of the six corridors designated to receive targeted public and private investment over the next three years. Public resources will be targeted to catalyze private reinvestment and redevelopment along these corridors.

Recent Development Activity

In response to healthy market conditions and consistent with planning efforts, the freight railroad realignment segment study areas have experienced significant development activity over the past several years. Since 2001, the District of Columbia has gained 23.5 million square feet of new office space, 21,639 new residential dwellings, 4,342 new hotel rooms (7 million square feet), and 2.2 million square feet of new retail space in new construction. The segment study areas have contributed to this new construction. During the three years 2004 through 2006, completed office construction totaled over 3 million square feet, completed residential construction resulted in 777 new units, completed hotel construction produced 204 new rooms, and new retail construction totaled 15,000 square feet.

The Monumental Core Segment

Development activity in the Monumental Core Segment study area is illustrative of the strong commercial real estate market in the District of Columbia. This area is largely built out, yet the last remaining under-utilized parcels are now being developed. Developers are seeking to maximize

Table C-17. Completed Office Development Projects (2004-2006)

Monumental Core Segment

Project	Location	Office Sq. Ft.	Targeted Delivery	Submarlet
Capitol Gallery Expansion	600 Maryland Ave., SW	210,000	2006	Capitol Hill
One Patriots Plaza	395 E. St., SW	300,000	2005	Capitol Hill
The Portals Phase III	1201 Maryland Ave., SW	500,000	2006	Capitol Hill
Potomac Center II	500 12th St., SW	520,000	2005	Capitol Hill
Total		1,530,000		

Source: Washington, DC Economic Partnership

Table C-18. Office Development Projects Under Construction (As of November 2006)

Monumental Core Segment

Project	Location	Office Sq. Ft.	Delivery	Submarlet
Capital View	425 3rd St., SW	225,473	2007	Capitol Hill

Source: Washington, DC Economic Partnership

Table C-19. Planned/Proposed Office Development Projects (As of November 2006)

Monumental Core Segment

Project	Location	Office Sq. Ft.	Submarket
L'Enfant Plaza Redevelopment	950 L'Enfant Plaza, SW	704,319	Capitol Hill
Three Patriot Plaza	355 E St., SW	384,000	Capitol Hill
Two Patriots Plaza	375 E St., SW	323,000	Capitol Hill
Total		1,411,319	

Source: Washington, DC Economic Partnership

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development potential allowable within the existing physical design constraints—the Southeast-Southwest Freeway and the freight railroad alignment.

Office Sector

Since 2004, more than 1,500,000 square feet of new office space has been completed, representing the most active market sector in the Monumental Core Segment study area. This includes two of the top ten office projects in the District of Columbia (in terms of total square footage), Potomac Center II and The Portals Phase III.

The Portals Phase III is located at 1201 Maryland Avenue, SW and directly abuts the freight rail tunnel that the alignment passes through after crossing the Potomac River. Republic Properties Corporation was the developer and total project costs are estimated at $150 million. This ten-story building is the third phase of a five-phase project. It includes 6,800 square feet of retail as well as the Mandarin Oriental Hotel. The entire project will total over 2.5 million square feet of office space when all five phases are completed.

In addition to completed office space, over 225,000 square feet of office space is currently under construction at the Capitol View project on 3rd Street, SW. This project is expected to be completed in 2007. There is also almost 1,500,000 square feet of office space planned or proposed.

One of the most notable projects is the L'Enfant Plaza Redevelopment. JBG Companies purchased portions of two office buildings, the Lowes L'Enfant Plaza Hotel and an underground retail promenade. It is expected to invest millions for improvements to the office buildings, National Children's Museum, and hotel exteriors over the next ten years. There are plans for about 900,000 sq. ft. of new construction, and this will include 240 residential units and over 100,000 square feet of retail space in addition to the 700,000 square feet of new office space.

Residential Sector

Consistent with its historic character as a predominantly employment-based area, the Monumental Core Segment study area has generated residential development interest at a slower pace than office space development.

The only new residential construction proposed for this study area is 260 units proposed as a portion of the 900,000 square feet of new development at L'Enfant Plaza.

Retail Sector

As with the rest of the city, new retail development in the Monumental Core Segment study area has typically taken the form of supportive retail, representing only a small component of a larger mixed use or office

Table C-20. Planned/Proposed Residential Projects (As of November 2006)
Monumental Core Segment

Project	Location	Units	Neighborhood
L'Enfant Plaza Redevelopment	950 L'Enfant Plaza, SW	260	Capitol Hill

Source: Washington, DC Economic Partnership

Table C-21. Completed Retail Projects (2004-2006)
Monumental Core Segment

Project	Location	Retail Sq. Ft.	Completion Date
Port Phase III, The	1201 Maryland Ave., SW	6,800	2006

Source: Washington, DC Economic Partnership

space development project.

The 6,800 square feet of retail space in The Portals Phase III is indicative of this market trend. The retail represents an amenity for the office tenants and hotel guests rather than a destination unto itself.

An additional 6,800 square feet of retail space is under construction, yet this retail will serve the same supportive function as the rest of the ground-level retail found in this segment study area. The retail proposed for the L'Enfant Plaza Redevelopment—over 100,000 square feet—is a departure from the current retail development pattern. If constructed as proposed, the retail component of L'Enfant Plaza will serve to attract more than the area's employees. Located directly on a Metrorail line, the new retail could draw tourists from across Independence Avenue visiting the Smithsonian Institution as well as other area visitors and residents.

The Capitol Hill Neighborhood Segment

The Capitol Hill Neighborhood Segment study area represents of one of the most active real estate markets in the District of Columbia. Over 4,500,000 square feet of office space, 7,100 residential units, 500 hotel rooms, and 600,000 square feet of retail space are completed, under construction, planned, or proposed for this market area. A number of planning efforts, including the AWI Framework Plan and Extending the Legacy, laid the groundwork for this section of the city to become a vibrant, new urban destination, to include employment centers, pedestrian friendly residential neighborhoods, convenience and destination retail corridors, and entertainment venues.

According to the Washington Post, "much of the development has been spurred by the Naval Sea Systems Command's move from Crystal City to the Navy Yard on the Southwest waterfront as part of a 2001 round of military base closings. Once the command was there, government contractors who worked for it and wanted to be near its headquarters encouraged office development along the M Street SE corridor, which runs from the Navy Yard west to South Capitol Street."

In addition to the Navy Yard, one of the most prominent development activities in this segment study area is the construction of the new baseball stadium. Groundbreaking occurred in 2006, and this 965,000 square feet project alone has catalyzed significant new development activity in the surrounding area. The redevelopment of the Capper-Carrollsburg neighborhoods and the construction of the Department of Transportation headquarters have also given investors and real estate developers a great deal of confidence that this area is ripe for revitalization.

Table C-22. Retail Projects Under Construction (As of November 2006)

Monumental Core Segment

Project	Location	Retail Sq. Ft.	Target Delivery
Capitol View	425 3rd St., SW	6,861	2007

Source: Washington, DC Economic Partnership

Table C-23. Retail Projects Planned and Proposed (As of November 2006)

Monumental Core Segment

Project	Location	Retail Sq. Ft.
L'Enfant Plaza Redevelopment	950 L'Enfant Plaza, SW	190,000

Source: Washington, DC Economic Partnership

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These development catalysts, combined with low land costs relative to the more developed areas in the city's other, more-established submarkets, have attracted significant investment with much more activity expected over the next 10 to 20 years.

Office Sector

Development activity in the office sector has led the way for revitalization in the Capitol Hill Neighborhood Segment study area. Over 1.5 million square feet of office space is under construction, and almost 3 million square feet is planned or proposed.

The U.S. Department of Transportation headquarters project is the most notable project, demonstrating the impact that federal government real estate requirements have on the District of Columbia real estate market and land use pattern. Developed by JBG Companies, this project will feature two buildings located on 11 acres in the Southeast Federal Center market area. The development is the largest federal government construction undertaking since the Pentagon.

Table C-24. Office Development Projects Under Construction (As of November 2006)
Capitol Hill Neighborhood Segment

Project	Location	Office Sq. Ft.	Delivery	Submarket
Dept. of Transportation Headquarters	1200 New Jersey Ave., SE	1,350,000	2006	Southeast Federal Center
20 M Street	20 M St., SE	180,633	2007	Southeast Federal Center
Total		1,530,633		

Source: Washington, DC Economic Partnership

Table C-25. Planned/Proposed Office Development Projects (As of November 2006)
Capitol Hill Neighborhood Segment

Project	Location	Office Sq. Ft.	Submarket
Southeast Federal Center	New Jersey Ave. & M St., SE	1,800,000	Southeast Federal Center
Ballpark District Phase I	E of Half St. between M & N Sts., SE	295,000	Southeast Federal Center
100 M Street	100 M St., SE	225,000	Southeast Federal Center
Admiral, The	801 Virginia ave., SE	4,747	Southeast Federal Center
600 M Street	600 M St., SE	470,000	Southeast Federal Center
Federal Gateway II	250 M Street, SE	187,000	Southeast Federal Center
Total		2,981,747	

Source: Washington, DC Economic Partnership

Table C-26. Completed Residential Projects (2004-2006)
Capitol Hill Neighborhood Segment

Project	Location	Units	Completion Date	Neighborhood
Capitol Hill Towers	1200 New Jersey Ave., SE	344	2006	Southeast Federal Center

Source: Washington, DC Economic Partnership

Market Conditions and Development Opportunities

Table C-27. Residential Projects Under Construction (As of November 2006)
Capitol Hill Neighborhood Segment

Project	Location	Units	Completion Date	Neighborhoods
Arthur Capper-Carrolsburg Senior Homes	900 5th St., SE	162	2006	Southeast Federal Center
Arthur Capper-Carrolsburg Senior Homes	4th & M Sts., SE	138	2007	Southeast Federal Center
Total		300		

Source: Washington, DC Economic Partnership

Table C-28. Planned and Proposed Residential Projects (As of November 2006)
Capitol Hill Neighborhood Segment

Project	Location	Units	Neighborhood
Southeast Federal Center	New Jersey Ave. & M St., SE	2,700	Southeast Federal Center
Arthur Capper-Carrolsburg Dwellings	7th St. & Virginia Ave., SE	1,313	Southeast Federal Center
Ballpark District Phase I	Half St. between M & N Sts., SE	375	Southeast Federal Center
Ballpark District on Site Development	Half & N Sts., SE	600	Southeast Federal Center
Square 0699N Phase 1	1st & L Sts., SE	250	Southeast Federal Center
Jefferson at New Jersey Avenue	909 New Jersey Ave., SE	238	Southeast Federal Center
Admiral, The	801 Virginia Ave., SE	17	Southeast Federal Center
Ballpark Waterfront Development	1st & O Sts., SE	474	South Capitol Waterfront
Jefferson at 100 Eye Street	100 I St., SE	246	Southeast Federal Center
1100 First Street	1100 First St., SE	266	Southeast Federal Center
Total		2,981,747	Southeast Federal Center

Source: Washington, DC Economic Partnership

In addition to projects under construction, there are large-scale plans for new employment centers in this study area. On the 42-acre Southeast Federal Center site, 1.8 million square feet of office space is proposed. This site will also include residential, retail, and entertainment and cultural venues. The development is a multi-phased project projected to take 10 to 20 years to be fully built out.

Residential Sector

The residential sector in the Capitol Hill Neighborhood Segment study area has been slower to pick up speed than the office sector. However, over 600 units are completed or under construction, and over 6,000 units are planned or proposed.

Capitol Hill Towers was the first new residential project to deliver in the Capitol Hill Neighborhood Segment study area. It is located across from the Department of Transportation headquarters and one block from the Navy Yard. This project was innovative for its use of tax-increment financing to support the construction costs and its collocation with a 204-room Courtyard by Marriott Hotel. The typical one-bedroom quoted sales price is $259,000.

In addition to over 600 units under construction and completed, over 6000 units are planned or proposed. A large share of these units is proposed for Southeast Federal Center and the Capper-Carrollsburg Dwellings. The 1,313 units planned for this neighborhood will replace the 700 public housing units for net new construction of approximately 600 units. The 1,313 units will be a mix of market rate and subsidized

apartments and condominiums.

The Ballpark District will also include a significant number of residential units. Almost 1,500 units are proposed to be located on site or within close proximity.

Hospitality Sector

This market sector includes both hotels and entertainment venues.

The Capitol Hill Towers is the first hotel to be competed in this segment study area. Finished in 2006, this hotel offers a best available rate of $109 for a weekend stay in December, consistent with the rates offered at the other two Courtyard by Marriott hotels in the District of Columbia (Embassy Row and Convention Center in the Northwest quadrant).

The baseball stadium will be an anchor for this community. It is expected to catalyze investment and result in construction of over 1,500 residential units, 300,000 square feet of office space, a new hotel, and over 200,000 square feet of retail space either on-site or close to the stadium.

Table C-29. Completed Hospitality Projects (2004-2006)
Capitol Hill Neighborhood Segment

Project	Location	Rooms	Completion Date
Capitol Hill Towers	100 New Jersey Ave., SE	204	2006

Source: Washington, DC Economic Partnership

Table C-30. Hospitality Projects Under Construction (As of November 2006)
Capitol Hill Neighborhood Segment

Project	Location	Hospitality Sq. Ft.	Target Delivery
Baseball Stadium	South Capitol & N Sts., SE	965,000	2008

Source: Washington, DC Economic Partnership

Table C-31. Hospitality Projects Planned and Proposed (As of November 2006)
Capitol Hill Neighborhood Segment

Project	Location	Rooms
Ballpark District Phase I	E of Half St., between M & N Sts., SE	120
Ballpark District On Site Development	Half & N Sts., SE	180
Total		300

Source: Washington, DC Economic Partnership

Table C-32. Completed Retail Projects (2004-2006)
Capitol Hill Neighborhood Segment

Project	Location	Retail Sq. Ft.	Completion Date
Capitol Hill Towers	1000 New Jersey Ave., SE	9,000	2006

Source: Washington, DC Economic Partnership

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Retail Sector

As in the Monumental Core Segment study area, retail development in the Capitol Hill Neighborhood Segment study area has largely been a small component of office projects. However, with the arrival of the baseball stadium and the concentration of entertainment and cultural venues proposed for this area, destination retail is planned as an integral element of this community. The construction of over 4.5 million square feet of office space and more than 7,000 residential units will also support larger scale retail, representing a formidable source of demand unto itself.

Capitol Hill Towers is the first project within the past three years to have new retail space, and the 9,000 square feet of space serves the same function as supportive retail space in the Monumental Core Segment study area. The retail in this project represents an amenity for the hotel guests and tower residents.

The retail projects under construction are already demonstrating the shift toward retail as a more-prominent component of mixed-use projects. The DOT headquarters retail was designed in such a way so as to have a neighborhood orientation and serve area residents as well as employees. The baseball stadium, as well as a predominantly office-based project at 20 M Street, SE, also includes retail space.

Table C-33. Retail Projects Under Constuction (As of November 2006)
Capitol Hill Neighborhood Segment

Project	Location	Retail Sq. Ft.	Target Delivery
Department of Transportation Headquarters	1200 New Jersey Ave., SE	22,300	2006
Baseball Stadium	South Capitol & N Sts., SE	35,000	2008
20 M Street	20 M St., SE	10,000	2007
Total		67,300	

Source: Washington, DC Economic Partnership

Table C-34. Retail Projects Planned and Proposed (As of November 2006)
Capitol Hill Neighborhood Segment

Project	Location	Retail Sq. Ft.
Southeast Federal Center	New Jersey Ave. & M St., SE	250,000
Arthur Capper-Carrolsburg Dwellings	7th St. & Virginia Ave., SE	51,000
Ballpark District Phase I	Half St. between M & N Sts., SE	50,000
Ballpark District on Site Development	Half & N Sts., SE	25,000
Jefferson at New Jersey Avenue	909 New Jersey Ave., SE	6,000
100 M Street	100 M St., SE	15,000
Admiral, The	801 Virginia Ave., SE	3,216
Ballpark District Waterfront Development	1st & O Sts., SE	80,000
600 M Stret	600 M St., SE	15,000
Federal Gateway II	250 M St., SE	13,000
Total		508,216

Source: Washington, DC Economic Partnership

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The Anacostia Waterfront Segment

Consistent with the characterization provided of the Anacostia Waterfront Segment and the East of the River Segment study areas, development activity in the Anacostia Waterfront Segment has not seen the traction witnessed in the Monumental Core Segment and the Capitol Hill Neighborhood Segment study areas. Economic and market performance east of the Anacostia River has not provided investors or developers with the same level of confidence that market demand will support large scale real estate investment led by the private sector. Much of the new development that has been realized is the result of public-sector incentives and investment and initiatives led by community development corporations and institutions. Nevertheless, these public and quasi-private interventions have produced positive results and represent the basis for private-sector investment once market conditions change. Furthermore, planning efforts including the Anacostia Waterfront Initiative Framework Plan, have prepared the framework for ideal development patterns when the market responds.

Office Sector

The Anacostia Waterfront Segment study area does not include any traditional or emerging office submarkets and does not currently represent a destination for new office space. However, the Anacostia Waterfront Corporation does have plans to create a new office submarket on the west side of the Anacostia River adjacent to RFK Stadium.

The Anacostia Waterfront Initiative Framework Plan has targeted the areas adjacent to RFK Stadium on the west side of the river, including the District of Columbia Central Detention Facility and DC Armory, as the location for a new urban community. Also known as Reservation 13, plans for this area stem from the upcoming transfer of this federally owned land to the District of Columbia. When the transfer occurs, the District will have authority to redevelop blighted areas and maximize the opportunities for commercial and residential construction on this waterfront site.

Residential Sector

The residential sector in the Anacostia Waterfront

Table C-35. Planned/Proposed Office Development Projects (As of November 2006)
Anacostia Waterfront Segment

Project	Location	Sq. Ft.	Submarket
Hill East Waterfront	Independence Ave. & 19th St., SE	3,200,000	RFK Stadium

Source: Washington, DC Economic Partnership

Table C-36. Completed Residential Projects (2004-2006)
Anacostia Waterfront Segment

Project	Location	Units	Completion Date	Neighborhood
The Escalade	526 13th St., SE	12	2005	Capitol Hill
Providence Square Town Home Condominiums	15th St. & Kentucky Ave., SE	12	2006	Capitol Hill
Dupont Commons	B St. & Ridge Rd., SE	147	2004	Deanwood
Total		171		

Source: Washington, DC Economic Partnership

Table C-37. Planned and Proposed Residential Projects (As of November 2006)
Anacostia Waterfront Segment

Project	Location	Units	Neighborhood
Thorton Row	1220 Pennsylvania Ave., SE	46	Capitol Hill
Hill East Waterfront	Independence Ave. & 19th St., SE	1,000	RFK Stadium
Total		1,046	

Source: Washington, DC Economic Partnership

Table C-38. Retail Projects Planned and Proposed (As of November 2006)
Anacostia Waterfront Segment

Project	Location	Retail Sq. Ft.
Hill East Waterfront	Independence Ave. & 19th St., SE	35,200

Source: Washington, DC Economic Partnership

Table C-39. Planned/Proposed Office Development Projects (As of November 2006)
East of the River Segment

Project	Location	Sq. Ft.	Submarket
Parkside Mixed-Use Development	Kemilworth Ave. & Hayes St., NE	500,000	Deanwood

Source: Washington, DC Economic Partnership

Segment study area has seen the most activity over the past three years.

Two small-scale projects have been completed on the west side of the Anacostia River in the eastern portion of Capitol Hill. On the east side of the Anacostia River, Dupont Commons is a new development of 147 affordable single-family town homes on a former public housing site. The project was a partnership of the District of Columbia, Enterprise Homes, and the Washington Interfaith Network. All town homes include three bedrooms and offer 1,280 square feet of finished space on two floors. This project is located just south of East Capitol Street and right off of Minnesota Avenue.

Also on the west side of the Anacostia River, two additional residential projects are proposed. This includes a small-scale project at 1220 Pennsylvania Avenue, SE, and 1,000 units at Hill East Waterfront—the planned target area on the west side of the Anacostia River led by the Anacostia Waterfront Corporation.

Retail Sector

There have been no new retail projects in the Anacostia Waterfront Segment study area in the past three years. The Hill East Waterfront community is proposed to include 35,200 square feet of retail.

The East of the River Segment

Similar to The Anacostia Waterfront Segment, the area surrounding the East of the River Segment has not experienced significant development activity in the past three years. Economic and market conditions have not warranted large-scale real estate investment and redevelopment. However, in contrast with the east side of the river in the Anacostia Waterfront Segment study area, the east side of the river in the East of the River Segment study area represents a target area for redevelopment in the Anacostia Waterfront Initiative Framework Plan. As a result, development activity is planned for the waterfront neighborhoods in a way that has not been contemplated south of East Capitol Street on the east side of river. In addition, the neighborhoods within the East of the River Segment study area fall under the care of the Marshall Heights Development Corporation, a community development

corporation that has taken initiative for stimulating economic development in the area. As a result of this organization's active involvement, several development projects have been brought to fruition that might not have occurred otherwise.

Office Sector

The office sector has not seen any activity in the past three years. However, the Parkside mixed-use project is proposed for construction in a prominent location within the study area. It is hoped that this project will catalyze additional reinvestment.

The Parkside development is being developed as a partnership between the Marshall Heights Community Development Organization, (MHCDO), Bank of America Community Development Corporation, and Lano International. The development team spent the last year meeting with the community, city officials and design professionals to create a unique destination for Ward 7. Located on the west side of DC-295, the 26-acre project will be located within a quarter mile of the Minnesota Avenue Metrorail station and will be built entirely on vacant land. Unique for Ward 7, Parkside will have a mix of housing, office, and neighborhood-serving retail. Twenty percent of the new units will be affordable.

Another office project that is hoped to catalyze additional development is the construction of a new District of Columbia government center at the Minnesota Avenue Metrorail station. Situated on 9.2 acres, the first phase of this project will include a 225,000-square-foot office building for the Department of Employment Services and a 125,000-square-foot office building for the Department of Human Services. A new WMATA parking garage, to include 365 replacement spaces for Metro and 112 additional spaces for District use will also be built. A site for the future location of an additional 360,000 SF private office building will be reserved.

Residential Sector

As in the Anacostia Waterfront Segment study area, the residential sector in the East of the River Segment study area is witnessing the most development activity of all the sectors.

Lotus Square is a four-story, 285-unit residential building that offers new two- and three-bedroom apartments.

Table C-40. Residential Projects Under Construction (2004-2006)
East of the River Segment

Project	Location	Units	Completion Date	Neighborhood
Lotus Square	800 Kenilworth Ter., NE	285	2006	Deanwood

Source: Washington, DC Economic Partnership

Table C-41. Planned and Proposed Residential Projects (As of November 2006)
East of the River Segment

Project	Location	Units	Neighborhood
Parkside Mixed-Use Development	Kenilworth Ave. & Hayes St., NE	1,500	Deanwood
Eastgate Senior Homes	3600 B St., SE	100	Deanwood/ Marshall Heights
Total		1,600	

Source: Washington, DC Economic Partnership

Market Conditions and Development Opportunities

Located directly off of DC-295, the project is nearly complete and has been leasing units since June. A two-bedroom unit leases for $1,219 includes utilities and there is limited availability for the remaining units.

There are also two projects proposed for this study area. The Parkside mixed-use project presented in the Office Sector is proposed to include 1,500 units. Eastgate Senior Homes include 100 units for rent; 75 units will serve public housing residents and 25 units will serve low income seniors at 60 percent AMI and below at tax credit rent levels. The developer team is Henson Development Company, the DC Housing Authority, and A&R Development Corporation.

Hospitality Sector

There are no hotels planned for the East of the River Segment study area; however, the Deanwood Recreation Center is planned for the community.

This development will be a state-of-the-art co-location construction project. The project will be a 42,000 square foot community center with a recreation center, a library, a childcare center, and an indoor pool. Construction is scheduled to begin in 2006 with a completion date of late 2007 or early 2008

Retail Sector

The retail planned for this study area is included in the Parkside development project.

Located on the west side of DC-295, the project will include 30,000 square feet of retail space.

Development Opportunities

In response to ongoing real estate market conditions and consistent with District and federal planning efforts, the freight railroad segment study areas have experienced significant development activity over the past several years. Plans for these areas, combined with approaching build-out in the District's traditional activity centers, indicate that growth additions could be focused in the Monumental Core and particularly in emerging areas such as the Capitol Hill Neighborhood and East of the River segments.

Several of these development opportunities are planned for locations immediately adjacent to the rail line and could be influenced by public investments. This includes activity in the Monumental Core and in the East of the River segment.

Overview

In the Monumental Core, one of the most significant opportunities is the decking of Maryland Avenue and development of adjacent property. The opportunity presented along Maryland Avenue represents significant development. The vacant land area covers

Table C-42. Hospitality Projects Planned and Proposed (As of November 2006)
East of the River Segment

Project	Location	Hospitality Sq. Ft.
Deanwood Recreation Center	1300 49th St., NE	42,000

Source: Washington, DC Economic Partnership

Table C-43. Retail Projects Planned and Proposed (As of November 2006)
East of the River Segment

Project	Location	Retail Sq. Ft.
Parkside Mixed-Use Development	Kenilworth Ave. & Hayes St., NE	30,000

Source: Washington, DC Economic Partnership

2.6 acres and 1.1 million SF of buildable space at a 10 FAR. At $550/SF, (market value/SF based on current sales prices for new construction in downtown), this project could add $605 million (in 2007 $) of gross new property value to the District of Columbia.

The decking of Maryland Avenue could take place regardless of whether or not the freight rail line is removed. The passenger line would remain, so a deck would still be required to allow development. Although removal of the freight line might help to accelerate the investment, the decking is independent from the freight rail realignment. As a result, the real estate benefits in the Monumental Core Segment were not included in this study's benefit-cost analysis.

In the East of the River Segment, transit-oriented development is planned for the areas surrounding the Minnesota Avenue and Deanwood Metrorail stations. In addition, infill development on Minnesota Avenue—introducing new commercial uses and residential units—is also planned. While these are planned projects, there is no indication that these projects will move forward without significant infrastructure investments and improvements in this area. One of the key infrastructure investments to spur market growth, enhance access, reduce barriers, and change market perceptions will be removal of the freight railroad line. As a result of this relationship, the East of the River (re)development potential is considered directly attributable to the freight railroad realignment and included in the study's benefit-cost analysis.

East of the River Development Potential

This development in the East of the River segment will likely occur on and adjacent to the vacated rail bed as well as around the two Metrorail stations located in this segment, the Deanwood and Minnesota Avenue stations. These two station areas are significantly impacted by the barrier and lack connectivity resulting from the existing rail line and rail yard.

The land area included in this analysis is presented in Table C-44.

Two scenarios for the redevelopment potential were developed. One scenario assumes major development and the second scenario assumes more moderate levels of development.

Development Assumptions

The redevelopment scenarios are based on the District's plans for the Northeast quadrant, defined most recently in the 2006 Comprehensive Plan Revision. As traditional market areas approach build out, the District is seeking to position the areas surrounding Metrorail stations east of the Anacostia River as receptors for new growth. The areas surrounding the Deanwood and Minnesota Avenue Metrorail stations include many stable, low-density residential communities. There are opportunities for infill development that have not yet received real estate market attention.

In the area surrounding the Minnesota Avenue Metrorail station, the District is planning to encourage a moderate level of density, established for this analysis at a maximum FAR of 3.0. This is reflective of the desire to transform the Minnesota Avenue station into a new activity center for the far northeast sections of the District. While this represents an increase over existing densities it is compatible with the character of the surrounding area. This FAR is consistent with the FAR proposed for the District of Columbia project at the Minnesota Avenue Metrorail station (2.2 FAR) and the Parkside project proposed for Kenilworth and Hayes Street, NE (3.0 FAR).

In the moderate-development scenario, this level of density was assumed to be achieved within 350 feet of the Metrorail station but then decline to a 1.5 FAR comparable with the adjacent existing residential neighborhoods between 350 and 800 feet. Beyond the 800-foot "walk shed," limited significant new development or redevelopment was anticipated to occur. In the major development scenario, a 3.0 FAR was assumed within a 350-foot radius, then decline to a 2.0 FAR within a 350-to-800-foot ring, and then decline to a 1.0 FAR within an 800-to-1,500-foot ring.

Market Conditions and Development Opportunities

Figure C-10. East of the River Study Area

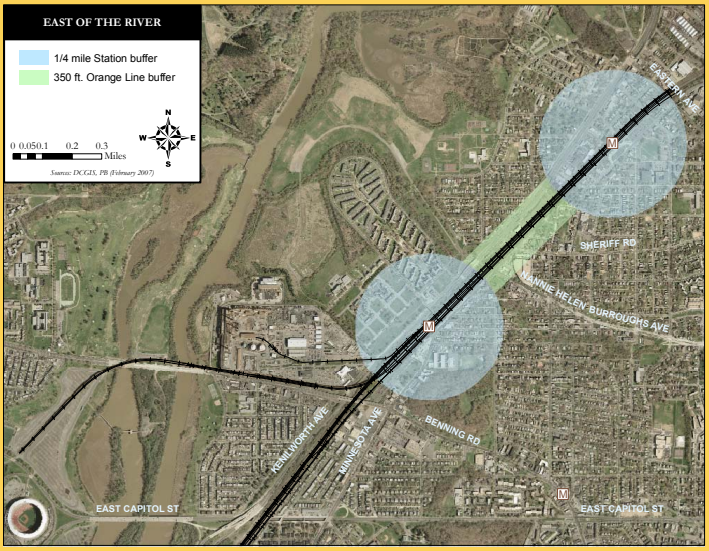

Table C-44. East of the River Development Potential Land Area

Location	Acres
Minnesota Avenue	29
Minesota Avenue Metro Station*	52
Deanwood Avenue Metrorail Station	129

*Minnesota Avenue Metrorail station area includes significant amount of land that is not available for development, including DC-295 and Fort Mahan Park

Table C-45. Net New Floor Area Ratio (FAR) Assumptions*

Redevelopment Properties - Moderate Redevelopment Scenario

Location	0-350 Ft.	350-800 Ft.	800-1500 Ft.
Vacated Rail Bed	0.5	No Change	No Change
Minesota Avenue Metro Station*	3	1.5	No Change
Deanwood Avenue Metrorail Station	1	0.5	No Change

*Geographic zones based on the following assumptions: redevelopment most likely to occur within 350 feet (approximately equivalent to one city block) of rail line or 0.25 mile radius (walking distance) around Metrorail stations.

Table C-46. Net New Floor Area Ratio (FAR) Assumptions*

Redevelopment Properties - Major Redevelopment Scenario

Location	0-350 Ft.	350-800 Ft.	800-1500 Ft.
Vacated Rail Bed	0.9	No Change	No Change
Minesota Avenue Metro Station*	3	2	1
Deanwood Avenue Metrorail Station	1	0.7	0.4

*Geographic zones based on the following assumptions: redevelopment most likely to occur within 350 feet (approximately equivalent to one city block) of rail line or 0.25 mile radius (walking distance) around Metrorail stations.

Market Conditions and Development Opportunities

In the area surrounding the Deanwood Metrorail station, the District is planning to encourage a more modest level of density, established for this analysis at a maximum of 1.0 FAR. This is significantly less than is planned for the Minnesota Avenue Metrorail station. The lower level of development is consistent with the low-density, single-family residential character of the surrounding neighborhood.

In the major development scenario, development was assumed at a 1.0 FAR within a 350-foot radius of the Metrorail station, then decline to a 0.7 FAR within a 350-to-800-foot ring from the station, and then decline further to a 0.4 FAR within an 800-to-1,500-foot ring from the station. In the moderate development scenario, development was assumed to decline to a 0.5 FAR within a 350-to-800-foot ring from the station with no change in density anticipated beyond 800 feet from the station.
Along the vacated rail bed between the 0.25 mile buffers of the Metrorail stations, new development was envisioned for the vacated rail bed, the industrial land located directly to the west, and the adjacent Minnesota Avenue corridor. Minnesota Avenue has long experienced disinvestment, and the District is looking to attract new infill development to this corridor. Plans for creating extending Minnesota Avenue where it currently breaks between Sheriff Road, NE and Meade Street, NE are under study.

The zoning for Minnesota Avenue in this section of the corridor is predominantly R-5, which allows a maximum FAR of 0.9. The District intends to maintain this zoning category for the corridor. As a result, the major development scenario assumed maximum development at a 0.9 FAR. The moderate development scenario reduced this development level to 0.5 FAR.

For the benefit-cost analysis, the moderate development scenario was selected. This scenario was selected because it makes the more conservative assumption that the existing residential neighborhood density will be preserved over the next fifty years and that the area will largely maintain its profile as a lower-density, primarily residential community. Furthermore, this scenario takes into account that build out of the more traditional activity centers will likely need to occur before major construction and absorption starts to take place in the East of the River segment.

Development Projections

Using the moderate development scenario FAR assumptions, new square footage of development was calculated based on existing land areas and assumed floor area ratios. Based on current and projected land use patterns, the following land use mix distributions were applied to determine total square footage by retail, residential, office, and hotel land use.

The land use mix assumptions were based on planned and proposed development projects as well as the development visions defined in the 2006 Comprehensive Plan Revision. The land use mix assumptions for the Minnesota Avenue corridor were based on development plans for Minnesota Avenue. The land use mix for the Metrorail stations (residential 75 percent, retail 5 percent, office 20 percent) were based on planned and proposed development projects, including the proposed Parkside project, the recently completed Lotus Square residential project, and the Minnesota Avenue Metrorail station office complex.

Table C-48 presents cumulative redevelopment in gross square footage for the entire 40-year time period beginning in 2017.

To test the reasonableness of the development projections, the East of the River annual development potential over the 2017–2057 time period was compared to projected annual absorption levels for the "Center City" (an area approximately five times larger than the Monumental Core Segment) for 2007 through 2011. These absorption projections were developed by considering past annual trends as well as evaluating the prospects for near-term deliveries. These projections also reflect input from major stakeholders and other near- and long-term projections by third parties. This work effort was being conducted by

Market Conditions and Development Opportunities

Office of Planning, the Washington, DC Economic Development Partnership, and sub-area business improvement districts (BID) as part of the Center City Action Agenda planning process.

Table C-49 depicts the findings. The projected annual absorption for the Center City is estimated between 4.7 and 6 million square feet of new space; in comparison, the annual delivery projected for the 2017–2057 time period is between 145,000 and 230,000 square feet in the East of the River Segment.

The annual development projections for East of the River represent between 1 and 7 percent (by sector) of the projected annual delivery in the downtown core. These statistics represents a reasonable share of Center City development activity, given the smaller size of the East of the River study area and the plans for a significantly lower-density, predominantly residential profile east of the Anacostia River.

Table C-47. Land Use Mix Assumptions

East of the River

Location	Residential	Retail	Office
Minnesota Avenue	75%	20%	5%
Minesota Avenue Metro Station	65%	10%	25%
Deanwood Metrorail Station	65%	10%	25%

Based on land use mix in proposed and planned projects in the East of the River segment.

Table C-48. Cumulative Development in Gross Square Footage

East of the River (2017-2057)

	Moderate	Major
Office	1,067,004	1,682,639
Retail	457,348	763,735
Residential	4,234,216	6,729,211
Total	**5,758,568**	**9,175,585**

Table C-49. Comparable Estimated Absorption in Gross Square Feet

East of the River

	Center City*		East of the River			
	Moderate	Major	Moderate	% of DC	Major	% of DC
Office	2,500,000	3,000,000	26,675	1%	42,066	1%
Retail	250,000	350,000	11,434	5%	19,093	5%
Residential	1,800,000	2,400,000	105,855	6%	168,230	7%
Total	**4,716,000**	**5,950,000**	**143,964**	**3%**	**229,390**	**4%**

* Absorption estimates for downtown Washington, DC are based on:

1. Office - a range of leading industry projections, downtown stakeholder assessments of employment growth and office space demand, historic trends, and Washington, DC Economic Partnership compilation of pipeline projects.
2. Residential - leading industry projections, estimated residential growth induced by growth in employment resulting from office space development, and stakeholder assessments of residential growth.
3. Retail - based on estimated supportable retail growth implicit in residential, office, and hotel development projections, the application of understood relationships between retail and other land uses, and assumptions regarding the character of projected retail.
4. Hotel - based on downtown stakeholder assessment of hotel growth, the application of understood relationships between hotels and other land uses, understanding of financial and regional competition issues, historic development trends, and the Washington, DC Economic Partnership compilation of pipeline projects.

Development Impacts

Based on constant annual absorption, this development potential would yield $35.2 million per year in new market value over a 40-year period.[5] In addition to new market value, this development potential would also generate fiscal and economic impacts for the District.

The development projections represent an addition of 1,372 retail jobs and 4,268 office jobs in the moderate development scenario. The payroll of office employees and retail employees working in the study area would be $310 million and $35 million (in 2007 $) annually. The income of households living in the study are will be approximately $294 million annually (in 2007 $).

5 This calculation uses 2007 constant dollars and does not include a likely 3 percent annual real estate real value increase beyond general price increases. Retail market values = $350/SF, residential market values - $225/SF, office market values = $300/SF and are figures utilized by the District for economic and fiscal evaluations. The appendix includes a detailed presentation of the East of the River development potential.

Table C-50. Annual New Market Value (2007 Constant $)

East of the River (2017-2057)

	East of the River Moderate Scenario
Office	$8,002,527
Retail	$3,430,111
Residential	$23,817,464
Total	**$35,250,102**

Table C-51. Jobs Income

Total Employment & Households Associated with New Development (2017-2057)

	East of the River	
	Moderate	Major
Office Employees	4,268	6,731
Retail Employees	1,372	2,291
Residential Employee	296	471
Total Employment	**5,936**	**9,493**
Households	4,234	6,729

1. Jobs per 1,000 Square Feet: Office=4, Residential=0.07, Retail=3
2. Assumes 1 household = 1,000 SF of residential space

Total Income Associated with New Development (2017-2057)

	East of the River	
	Moderate	Major
At Place Office Employee Payroll	$310,416,970	$489,520,159
At Place Retail Employee Payroll	$35,269,769	$58,89,694
At Place Residential Income		
At Place Residential Employee Income	$10,191,546	$16,196,875
Residential Household Income	$293,595,288	$466,596,773
Total	**$345,686,739**	**$548,417,853**

1. Average Annual Income per Employee: Office=$72,731, Retail=$25,706, Residential=$24,385
2. Average Annual Income per Household = $69,339

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