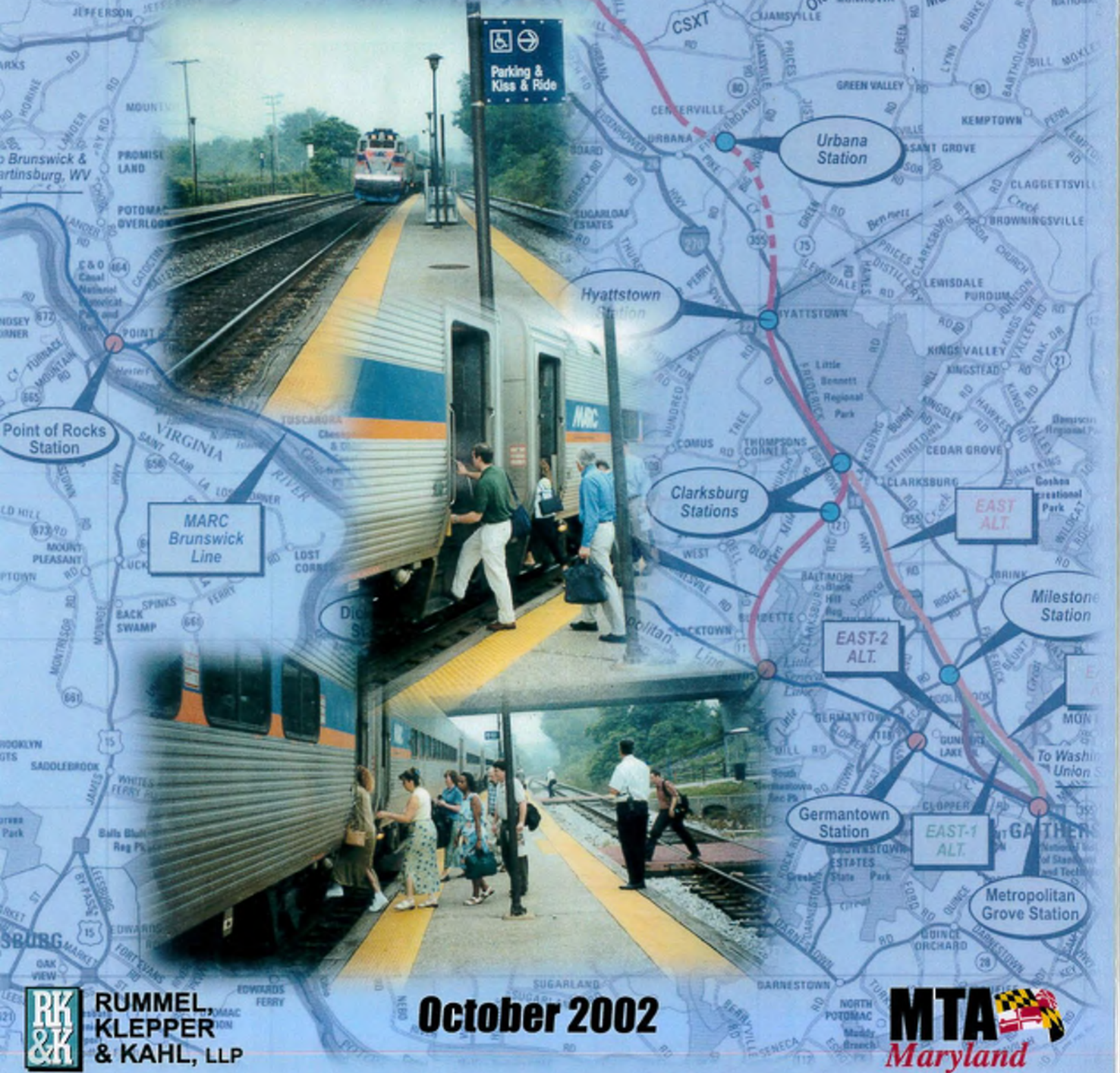


# I-270 COMMUTER RAIL FEASIBILITY STUDY

## DRAFT REPORT



**RUMMEL,  
KLEPPER  
& KAHL, LLP**

**October 2002**

**MTA**  
*Maryland*



# ***I-270 COMMUTER RAIL FEASIBILITY STUDY***

Prepared for

Maryland Transit Administration  
Maryland Department of Transportation

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**DRAFT**  
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## Summary

*This report summarizes the findings of the I-270 Commuter Rail Feasibility Study. The purpose of the feasibility study was to evaluate a commuter rail alignment (Alignment 3) presented in the I-270 Corridor Cities Transit Easement, Frederick County Extension Study dated March 1991. The Maryland Transit Administration (MTA) requested Rummel, Klepper & Kahl, LLP, to evaluate the alignment feasibility for engineering, environmental and cost considerations. In addition, the MTA requested a ridership analysis be prepared to forecast the potential ridership this alignment may generate within the corridor. This feasibility study reviewed the 1991 alignment, developed an alignment option near Urbana to avoid current development, extended the 1991 alignment from Clarksburg to connect with the CSX Metropolitan Line (existing MARC Brunswick Line service) at the existing Germantown MARC Station, prepared engineering criteria for evaluation purposes, identified environmental resources and preliminary resource impacts, and estimated capital costs. Following a draft report dated June 2001, the project team developed several alternative alignments from Clarksburg to the CSX Metropolitan Line connecting at the existing Metropolitan Grove MARC Station. Alignment feasibility conclusions are presented for consideration by MTA.*

*This report examines four alternatives: West, East, East-1, and East-2. All alternatives include Alignment 3 from the 1991 Study, with updates to meet the current engineering criteria and to avoid potential impacts on the new Urbana High School. At Clarksburg, the alternatives diverge: the West Alternative travels south across agricultural lands to meet the CSX Metropolitan Line (current MARC Brunswick Line service) at Boyds; the East alternatives parallel I-270 to meet the CSX Metropolitan Line at Metropolitan Grove. There are three East alternatives – East, East-1, and East-2.*

*The current I-270 Commuter Rail Feasibility Study has reviewed the 1991 Alignment 3, developed alignment options near Urbana to avoid current development, extended Alignment 3 from Clarksburg to connect with the CSX Metropolitan Line (existing MARC Brunswick Line service), prepared engineering criteria for evaluation purposes, identified environmental resources and preliminary resource impacts, and estimated capital costs. In particular, the current study developed four alternative alignments to provide Commuter Rail service between the City of Frederick and Washington Union Station: West, East, East-1, and East-2 Alternatives.*

*The current study includes preliminary conclusions regarding engineering feasibility, travel times and potential ridership, capital costs, environmental impacts, and the comparison of alternatives studied. A summary of the findings of the current study is presented in a table below.*



*Summary of Alternatives and Feasibility Study Findings*

Findings	Existing Service	Alternatives			
		West	East	East-1	East-2
Length of New Track (miles)	N/A	13.3	19.5	19.5	19.4
Number of Station Stops (from Frederick to Metropolitan Grove)	4	7	7	7	7
Number of New and Relocated Stations	N/A	3	5	5	4
Potential New Riders	N/A	490	455	455	455
Travel Time from Frederick to Washington Union Station (minutes)	95	95	95	95	95
Preliminary Environmental Impacts	N/A	LEAST	GREATEST		
Number of Bridges	N/A	6	22	22	24
Length of Bridges (linear feet)	N/A	8,300	7,500	7,500	8,600
Excavation Quantity (million cubic yards)	N/A	5.13	6.35	6.34	6.52
Fill Quantity (million cubic yards)	N/A	1.38	1.81	1.41	2.13
Total Project Cost (\$ Billions) <sup>1</sup>	N/A	\$ 844	\$ 965	\$ 1,261	\$ 1,006
Cost per Mile (\$ millions) <sup>2</sup>	N/A	\$ 63.24	\$ 49.46	\$ 64.58	\$ 51.89

<sup>1</sup> Total Project Cost includes base estimate subtotal, planning contingency, construction contingency, future changes and claims, consultant design fee, MTA design cost, construction inspection and CRS, MTA construction cost, right of way, right of way contingency, utilities, and agencies/force account. Total Project Cost was estimated using 2002 dollars and excludes escalation.

<sup>2</sup> Cost per Mile = Total Project Cost/Length of New Track

Overall, the current study indicates that, considering the nominal gain in ridership over the existing service (Frederick Extension and Brunswick Line) and the high capital investment per mile, the proposed I-270 Commuter Rail project does not represent a prudent investment of transportation funds at this time.

*The current study further indicates that the most effective means by which to encourage potential ridership for any Commuter Rail service between Frederick and Washington, D.C., is to encourage transit-oriented, concentrated development including both residential and employment-generating land uses in the I-270 corridor in both Frederick and Montgomery Counties. The lack of transit-oriented development, planning for such development, and the population densities associated with such development were the most limiting factors in the ridership forecast, resulting in a prediction of only 455 to 490 new riders over the existing service. If, in the future, development patterns shift towards a transit orientation, future forecasts may indicate a greater potential for ridership for*



*Commuter Rail service and warrant additional study and possible investment of transportation funds.*

*Finally, the current study indicates that the West Alternative may be the most overall feasible alternative of those identified to date, and it should be considered in any future study examining the possibility of Commuter Rail service between Frederick and Washington, D.C., in the I-270 corridor. However, all alternatives identified to date are feasible from an engineering standpoint.*

*Based on the results and conclusions of the current study, the next steps for the MTA should include the following:*

- 1. Continue to support transit-oriented development patterns (i.e., residential and employment land uses) around the identified station locations in both Frederick and Montgomery Counties.*
- 2. Conduct a locally sponsored (City of Frederick, Frederick County, and Montgomery County) transit alignment corridor preservation and mode alternatives study to locate the preferred alignment and station locations for the project. Consider reducing the number of stations for the preferred alignment in order to decrease travel time and increase potential ridership. Corridor preservation designation would make the right of way eligible for protective acquisition funding when or if development that would preclude the construction of the project was imminent.*
- 3. Conduct a new ridership forecast sensitivity analysis to evaluate the assumptions employed in the base ridership model, i.e., the I-270 build alternative, the CCT modal choice, the density of planned development, express train priority scheduling, increased track capacity on CSX's Metropolitan Line, and the number of proposed station stops.*
- 4. Preserve an alignment within the local master plans (City of Frederick, Frederick County, and Montgomery County) for Commuter Rail between Frederick and the CSX Metropolitan Line.*
- 5. Continue to promote staged transit system development in future regional long-range transportation plans.*



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**I-270 Commuter Rail  
Feasibility Study**



# **Feasibility Report**

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## I. Introduction

This report summarizes the findings of the I-270 Commuter Rail Feasibility Study. The purpose of the feasibility study was to evaluate a commuter rail alignment (Alignment 3) presented in the I-270 Corridor Cities Transit Easement, Frederick County Extension Study dated March 1991. The Maryland Transit Administration (MTA) requested Rummel, Klepper & Kahl, LLP, to evaluate the alignment feasibility for engineering, environmental and cost considerations. In addition, the MTA requested a ridership analysis be prepared to forecast the potential ridership this alignment may generate within the corridor. This feasibility study reviewed the 1991 alignment, developed an alignment option near Urbana to avoid current development, extended the 1991 alignment from Clarksburg to connect with the CSX Metropolitan Line (*existing MARC Brunswick Line service*) at the existing Germantown MARC Station, prepared engineering criteria for evaluation purposes, identified environmental resources and preliminarily quantified resource impacts, and estimated capital costs. *Following a draft report dated June 2001, the project team developed several alternative alignments from Clarksburg to the CSX Metropolitan Line connecting at the existing Metropolitan Grove MARC Station.* Alignment feasibility conclusions are presented for consideration by MTA.

*Text that was added or substantively changed after the June 2001 draft report of this study is highlighted with an italic font.*

## II. Background

The I-270 Commuter Rail Feasibility Study is the fourth effort to evaluate transit alignment feasibility for this highly trafficked corridor between Frederick County and Montgomery County, Maryland. The Maryland Department of Transportation (MDOT), through its two modal agencies, Maryland Transit Administration (MTA) and State Highway Administration (SHA), has been supporting project-planning activities in the corridor for many years. In addition, Montgomery and Frederick Counties have sponsored transportation planning studies and long-range master plan efforts to evaluate and preserve a corridor for transit use. Transit studies were initiated through the Washington Regional Rail program that was undertaken in the 1960s and resulted in the Washington Metrorail system operated by the Washington Metropolitan Area Transit Authority (WMATA).

The current study is based on and further develops four previous and current studies. Each of these studies is described below.

### **A. *Shady Grove to Metropolitan Grove Transit Alignment Study (1970)***

In 1970, a sketch planning study identified a preliminary location for an extension of the WMATA regional rail system. The preliminary alignment was adopted and designated in local land use plans during the 1970s. This adopted alignment was located from the current Shady Grove Metro Station to the existing Metropolitan Grove MARC Station along the CSX Metropolitan Line tracks.

### **B. *I-270 Corridor Cities Transit Easement Study (1990)***

In 1990, Montgomery County and the Maryland-National Capital Parks and Planning Commission (MNCPPC) sponsored the I-270 Corridor Cities Transit Easement Study. This study identified the potential transit alignments and viable transit modes for these alignments that would serve as the backbone of the Corridor Cities area transportation network. The Corridor Cities included Rockville, Gaithersburg, Germantown and Clarksburg, all of which are located in the central and up-county areas. The goal of the County and MNCPPC was to identify, for master plan purposes, a corridor that would be preserved by the governing land use master plan, provide an impetus for transit-oriented development clusters and densities, and guide other land use controls and goals. The study reviewed transit modes including heavy rail (Metro), commuter rail, light rail, and busway.

The result of this local effort was to recommend the preservation of two transit alignments in local master plans. One alignment, known as Alignment 1 and similar to the alignment recommended in the 1970 Study, consisted of either a heavy rail extension or a light rail/busway alignment from Shady Grove Metro Station to the Metropolitan Grove MARC Station along the CSX Metropolitan Line tracks. The second alignment, known as Alignment 8 or the Corridor Cities Transitway (CCT), consisted of a light rail/busway alignment from Shady Grove Metro to Clarksburg via the King Farm development, Great Seneca Highway, MD 124, I-270, Crystal Rock Drive and Observation Drive, ending in Clarksburg. The CCT was further developed with preliminary plan and profile engineering design in two phases: (I) Shady Grove Metro to Metropolitan Grove MARC Station and (II) Metropolitan Grove MARC Station to the Montgomery/Frederick County line.

### **C. *I-270 Corridor Cities Transit Easement, Frederick County Extension Study (1991)***

In 1991, Frederick County undertook an extension of the Montgomery County/MNCPPC 1990 study to identify a feasible alignment for transit between Clarksburg and Frederick. The basis in Montgomery County was to utilize the 1990 alignments (*Alignment 1 or*



CCT) while identifying possible alignment alternatives within Frederick County. Phase I of the 1991 Easement Study identified three base alignment alternatives (Alignment 1, 2 and 3) and six branch or crossover alignment alternatives (Options A through F). Phase II of the 1991 Easement Study concluded that all three alignment alternatives were feasible from an engineering standpoint. It was noted that Alignment 3 (Commuter Rail) would require additional construction cost studies, a specific engineering solution to crossing Bush Creek, and alignment identification for connecting Clarksburg to the CSX Metropolitan Line tracks.

#### ***D. Transportation Planning Context: I-270/US 15 Multi-Modal Corridor Study (current)***

Concurrent with the effort described here in the I-270 Commuter Rail Feasibility Study is a joint study effort by MTA and SHA. The study area extends from the Shady Grove Metro Station in Montgomery County along I-270 and US 15 to the US 15/Biggs Ford Road intersection. The study purpose is to investigate options that relieve congestion and improve safety conditions along the I-270/US 15 Corridor due to existing and projected growth within the Corridor. The jointly sponsored study includes representatives from federal, State, and local jurisdictions located within the study limits, including the City of Frederick and Frederick County. *Currently, the I-270/US 15 Study Team is in the draft Environmental Impact Statement (EIS) and preliminary engineering phase. The Public Hearings held in June 2002 presented the potential improvement options along the Corridor and the results of the draft EIS.*

The improvement options combine a variety of transportation modes and strategies. These include Transportation Systems Management/Transportation Demand Management strategies designed to improve operating efficiencies and manage the traffic demand on the transportation network, transit improvements ranging from increased bus service and new routes connecting to the CCT (light rail or bus rapid transit), and the preservation of a transit right of way along I-270 from MD 121 to MD 85 and then to downtown Frederick via the Frederick Branch. In addition to these transportation elements, highway improvements include HOV lane extensions to I-70, general purpose lane widening, collector-distributor lane extensions and interchange improvements.

Of particular note with respect to the I-270 Commuter Rail Feasibility Study is the determination by the I-270/US 15 Study Team that the CCT not be extended *north of the Comsat property (Clarksburg)*. This is due to the timeframe for which reasonably foreseeable actions would be funded for design, right of way acquisition, and construction of the project. It is important to note that the right of way was recommended for corridor preservation *north of Comsat (Clarksburg)* through the Frederick and Montgomery County Master Plan process. This designation would make the right of way eligible for protective acquisition funding when or if development that would preclude the transitway from being extended to Frederick was imminent.

The I-270/US 15 Study Team has conducted extensive travel demand forecasting for both highway traffic volumes and transit ridership within the corridor. The I-270/US 15 travel demand model serves as the base travel demand model for the I-270 Commuter Rail Feasibility Study.

### **E. Need for the I-270 Commuter Rail Feasibility Study (current)**

The I-270 Commuter Rail Feasibility Study is being undertaken to address local concerns regarding the engineering feasibility of Alignment 3 developed by the 1991 Transit Easement Study – Frederick County Extension. Local concerns have advocated the viability of a commuter rail alignment roughly parallel to I-270 from Frederick to Clarksburg as a more attractive alternative for I-270 Corridor commuters than the *existing Brunswick Line-Frederick Extension MARC service*. The existing service operates from Frederick to Washington Union Station via Point of Rocks utilizing the CSX Old Main Line and the CSX Metropolitan Line. Supporters of Alignment 3 cite its direct route and the proposed developments in the I-270 Corridor as the reasons for requesting MTA to undertake the update and review of the 1991 engineering feasibility study information.

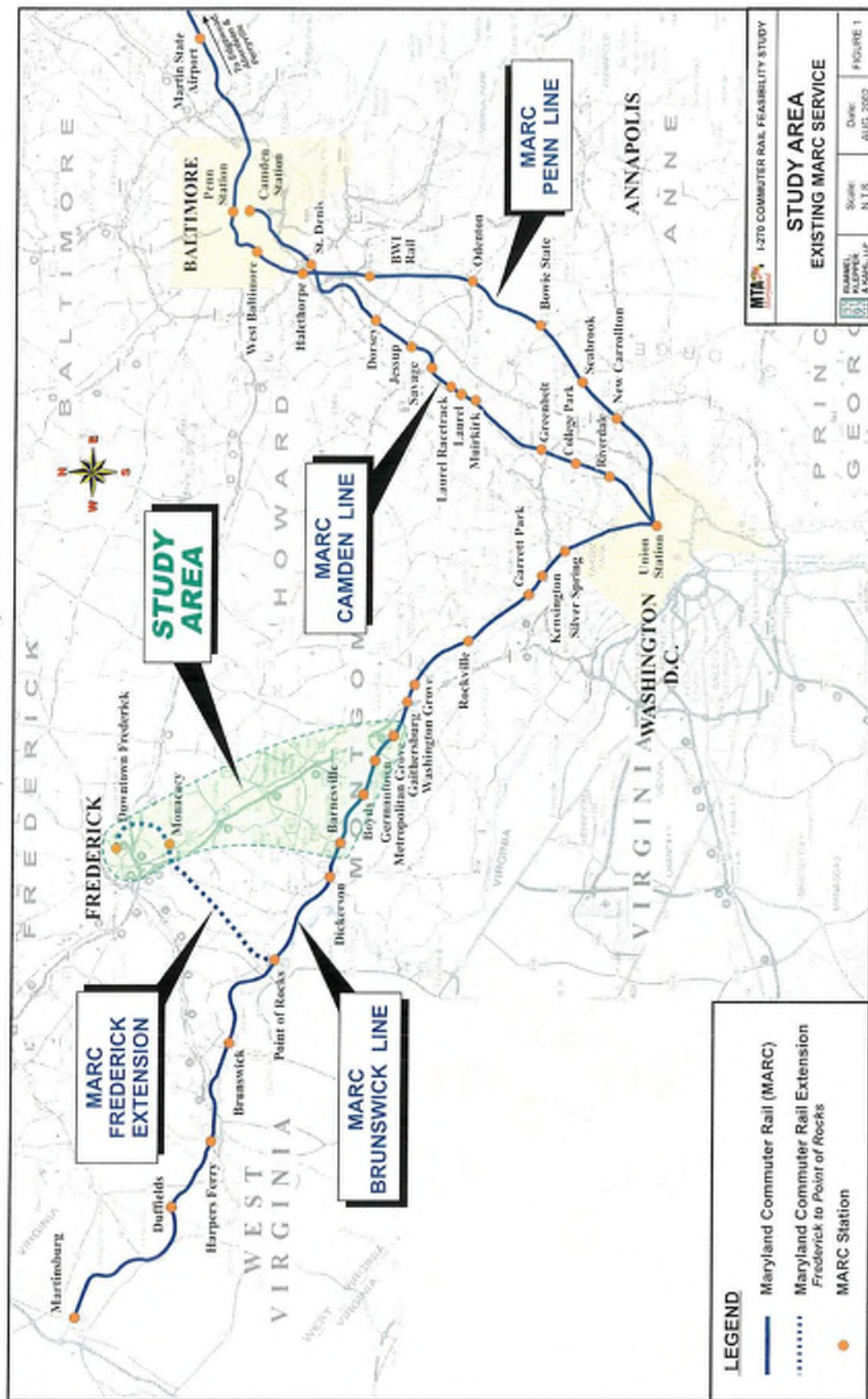
## **III. Study Area Description**

The study area for the current I-270 Commuter Rail Feasibility Study is illustrated in Figure 1. Frederick County and Montgomery County occupy the western portion of central Maryland. The area is the westernmost portion of the prime agricultural landscape of Maryland as the landform rises to meet the Appalachian Mountain foothills. The Catoctin Mountains and Parris Spring Ridge form two of the dominant geologic features that influenced the settlement of the two counties. As the early turnpikes and railroads began to take shape, the geologic features also greatly influenced the placement and character of today's transportation facilities.

### **A. Railroads**

The dominant railroad of the mid-Atlantic region was the Baltimore & Ohio (B&O) Railroad. On July 4, 1828, the B&O broke ground in its effort to build the first railroad in the United States. As the early engineers planned its route from Baltimore west to Ellicott City, the Potomac River, and the Appalachian Mountains beyond, it was recognized that topography would offer stiff challenges to constructing and operating a railroad. They settled on following the waterways that drained the piedmont east of the Appalachians. The alignment was determined to be the Patapsco River from Ellicott City to Mt. Airy.

Figure 1: Study Area with Existing MARC Service



At Mt. Airy, the route engineers identified Bush Creek, a west-flowing waterway, to lead the railroad to the Monocacy River and ultimately the Potomac River valley. One obstacle laid in their path at Mt. Airy: a low, steep ridge called Parrs Spring Ridge. Parrs Spring Ridge separates the Patapsco and Monocacy River watersheds and is part of a long, general divide running diagonally across the entire state.

The first railroad alignment in the United States, the B&O's line from Baltimore to Point of Rocks is known today as the CSX Old Main Line, a title capturing its historical importance in U.S. railroading history. *The CSX Old Main Line currently provides MARC service between Frederick Junction (south of the Monocacy MARC Station) and Point of Rocks.* In addition, the Frederick Branch, *from Frederick Junction to Downtown Frederick*, was the country's first branch line and opened downtown Frederick to rail service in 1831.

Further south of Frederick and much later in the B&O's history, the railroad realized the benefit of operating to Washington, D.C. Trains began operating from Baltimore to Washington in 1835. Later, as the railroad realized the curvilinear alignment between Baltimore and Frederick and the hazards of maintaining a railroad along the temperamental Patapsco River, the B&O explored rail alignments from Washington to Point of Rocks; *the result was the Metropolitan Line, opened in 1873.*

Ironically, in the context of this feasibility study, a review of railroad history reveals that while the B&O ignored the possibility of constructing a railroad branch between Washington and Frederick, a group of Washington and Montgomery County businessmen believed a railroad was needed. The Metropolitan Rail Road was formed in 1853 to construct a railroad from Georgetown to near Frederick Junction and then west towards Hagerstown via tunnels through both Catocin Mountain and South Mountain. In its simplest form, this alignment is similar to that of Alignment 3, under evaluation here. The Metropolitan Rail Road completed location surveys by 1854, and a small portion of the track bed was constructed in Bethesda. With a lack of corporate funding to build the expensive surveyed alignment, the Metropolitan sold its charter to the B&O, which was intent on maintaining regional control of its railroad market. The B&O constructed the Metropolitan Line to Point of Rocks, Brunswick, and Harpers Ferry, and encountered some of the identical topographic and geologic challenges encountered by the Old Main Line including Parrs Spring Ridge.

## **B. Interstate 270**

*During the nineteenth and early twentieth centuries, the main highway route between Frederick and Washington, D.C., was MD 355, variously known as the Georgetown Pike and Frederick Pike. In the mid-twentieth century, a more modern highway facility was constructed roughly parallel with the old MD 355, but on a straighter line between Frederick and Washington. This modern highway facility eventually became known as Interstate 270.*



The I-270 Corridor extends from the southern edge of the City of Frederick approximately 32 miles south to the Washington Capital Beltway (I-495). Interstate 270 serves as the primary roadway between Frederick County and Montgomery County. Traffic volumes along the highway have grown during the period from 1989 to 1998 at an astounding pace that has outstripped the ability of the highway to support additional traffic growth (Table 1). For example, traffic volumes at the Montgomery/Frederick County line have grown from 58,500 in 1989 to 68,350 in 1998 (I-270/US 15 Multi-Modal Corridor Study, February 2001 Workshop brochure). At this location, 2025 traffic projections show volumes of 128,900. Refer to Table 1 for additional traffic volumes at selected locations.

**Table 1: I-270 Corridor Traffic Volumes, Frederick and Montgomery Counties**

I-270 Segment	SHA ADT Maps	I-270/US 15 Multi- Modal Corridor Study		SHA ADT Maps	I-270/US 15 Multi- Modal Corridor Study	
	1987	1990	1998	2000	2020	2025
I-270 to MD 85	52,000	--	84,500	79,875	179,500	209,900
MD 85 to MD 80	53,350	--	71,250	72,775	139,900	156,700
MD 80 to MD 109	--	62,600	68,350	--	104,200	128,900
MD 109 to MD 121	48,000	--	70,400	65,250	101,200	132,900
MD 121 to Father Hurley Boulevard	52,874	--	75,000	--	138,300	174,600
Father Hurley Boulevard to MD 118	--	59,000	83,100	--	162,300	164,500
MD 118 to Middlebrook Road	--	--	119,600	94,450	175,000	186,100
Middlebrook Road to MD 124	--	113,400	119,600	129,903	223,800	241,100

Sources: State Highway Administration (SHA) 1987 and 2000 Average Daily Traffic (ADT) maps  
Traffic Data from I-270/US 15 Multi-Modal Corridor Study  
Traffic Forecasts from I-270/US 15 Multi-Modal Corridor Study: Combination Alternate A/Land Use Round 6.1 (2020)  
Traffic Forecasts from I-270/US 15 Multi-Modal Corridor Study: Combination Alternate 5A/Land Use Round 6.2 (2025)

### **C. Frederick County**

Frederick County is located in Central Maryland. The City of Frederick is the county seat and is approximately 40 miles from each of Baltimore and Washington, D.C. Founded in 1745, the City of Frederick (formerly Frederick Town) was settled in 1725 by colonists who wished to establish a new center for trading English products. Frederick

County has become a center of commercial, industrial, and agricultural businesses for central and western Maryland.

Frederick County grew steadily as Maryland was settled. Its growth has accelerated in the last two decades. Frederick County grew by approximately 30% during the period from 1990 to 2000, from approximately 150,000 to 195,000 people (Table 2). County population is forecast to increase by 56% between 2000 and 2025, surpassing 300,000 persons in 2025. The number of households is expected to increase by 62% between 2000 and 2025. Frederick County had more than 74,300 housing units with 2,644 new homes authorized for construction during 1999.

**Table 2: Frederick County Demographic Characteristics (in thousands)**

Demographic Characteristics	1990	2000	2005	2010	2015	2020	2025	% Change 1990-2025
Population	150	195	217	238	260	282	303	102%
No. of Households	52.6	70.6	79.4	88.2	97.1	105.9	114.7	118%

Source: Metropolitan Washington Council of Governments (MWCOG) Cooperative Round 6.2 Cooperative Forecasting (adopted April 2000).

In 1980, Frederick County contained 114,792 residents. Approximately 36% were located within the Frederick Planning Region. By 1990, 150,208 residents were located within the County and approximately 40% of the County's residents were living in the Frederick Planning Region. By contrast, the Urbana Planning Region was home for 7,605 residents in 1980 (approximately 6.6% of county population). By 1990, the region population grew to 9,341 residents (6.2% of county population). Table 3 lists the Frederick County and the Frederick and Urbana Planning Region population forecasts.

**Table 3: Frederick County Population Forecasts by Planning Region**

Planning Region	Population Forecasts		
	2000	2010	2020
Frederick County	194,900	238,300	281,700
Frederick	79,500	96,900	114,400
Urbana	11,100	15,200	19,300

Note: Population values rounded to nearest 100

Source: Frederick County Department of Planning and Zoning; Demographic and Development Data, March 2000

## D. Montgomery County

Montgomery County is located in Central Maryland. Rockville is the county seat and is approximately 44 miles from Baltimore and 17 miles from Washington, D.C. Founded in 1801, the City of Rockville was known by many other names during the 1700s. Growth was influenced beginning in 1873 when the B&O Railroad began daily trips to Washington (*see Railroads above*).

Montgomery County has also grown steadily over the last 200 years. Its growth has accelerated in the last two decades (Table 4). In 1980, Montgomery County contained 579,053 residents. Approximately 0.39 % was located within the Clarksburg planning area (comparison of 1977 and 1980 data). By 1990, 757,027 residents were located within the County and approximately 0.19% of the County's residents were living in the Clarksburg planning area (comparison of 1987 and 1990 data).

Montgomery County grew by approximately 13% during the period from 1990 to 2000, from approximately 757,000 to 855,000 people. County population is forecast to increase by 19% between 2000 and 2025, surpassing one million persons in 2025. The number of households is expected to increase by almost 27% between 2000 and 2025.

Table 4: Montgomery County Demographic Characteristics (in thousands)

Demographic Characteristics	1990	2000	2005	2010	2015	2020	2025	% Change 1990-2025
Population	757	855	910	945	975	1,000	1,020	35%
No. of Households	282.0	317.5	336.5	356.5	376.5	392.0	402.0	43%

Source: Metropolitan Washington Council of Governments (MWCOG) Cooperative Round 6.2 Cooperative Forecasting (adopted April 2000).

Another measure of population increases occurring within the Frederick and Montgomery County areas is to review the population forecasts for targeted areas. The Maryland State Highway Administration is currently sponsoring a land use expert panel to review the land use/transportation system relationship and its effect on providing adequate infrastructure. The panel has designed Forecast Zones based upon the Metropolitan Washington Council of Government's (MWCOG) Round 6.2 Transportation Analysis Zones (TAZs). The TAZs are small analysis areas formed by jurisdictional boundaries, major highways, and barriers to travel such as rivers. The Forecast Zones are large aggregate analysis areas comprised of several individual TAZs.

The Forecast Zones noted in Table 5 comprise the project area and are extracted from the larger I-270/US 15 Multi-Modal Corridor study area used by the Land Use Expert Panel and the DEIS secondary/cumulative effects analysis. Table 5 also highlights the estimated population and the percentage population increase for the period 2001 to 2025.

Table 5: Population in the I-270 Corridor for 1994, 2001 (Estimate), and 2025 (Forecast) by Forecast Zone

Forecast Zone	Zone Name	1994 Population	2001 Estimate	% Change 1994-2001	2025 Estimate	% Change 2001-2025
3	Walkersville	5,621	5,900	6%	10,800	83%
5	Frederick	62,351	75,200	21%	114,500	52%
8	Urbana	9,983	11,500	15%	20,800	81%
11	Hyattstown	2,203	2,300	5%	2,600	13%
15	Clarksburg	1,403	2,100	49%	30,200	1438%
17	Germantown	45,764	57,900	26%	69,700	20%
19	Gaithersburg	132,251	145,100	10%	178,200	23%
<b>Total</b>		<b>259,576</b>	<b>300,000</b>	<b>16%</b>	<b>426,800</b>	<b>42%</b>

Source: I-270/US 15 Expert Panel Briefing Book, State Highway Administration, January 2001.

## E. Environmental Features

The I-270 Commuter Rail Feasibility Study developed an environmental inventory using a geographical information system (GIS) to present the corridor environmental features. These displays are presented in Appendices C through F. The environmental data features were obtained via the Maryland GIS toolbox datasets available from the Maryland Departments of Natural Resources (DNR) and Housing and Community Development (DHCD) as well as other sources. The data are derived from the most recent update to the data files available at the beginning of the feasibility study. Appendices C through F contain the following information:

- Appendix C *illustrates* the corridor aquatic resources such as National Wetland Inventory wetland locations and classifications, DNR wetlands as recorded via field studies by others, wetlands of special concern as identified by the Maryland Department of the Environment (MDE), and 100-year floodplain boundaries as noted via the Federal Emergency Management Agency (FEMA) floodplain data.
- Appendix D *illustrates* the corridor terrestrial resources such as sensitive species areas, federal lands, DNR owned lands, county parks, private conservation areas and hydric soils.
- Appendix E *illustrates* the corridor socioeconomic and cultural resources such as racial profiles by census tracts, community facilities (schools, fire stations, police stations and libraries), hazardous materials regulated sites, archeological site presence, Maryland Inventory of Historic Places (MIHP) and National Register of Historic Places (NRHP) sites.



- Appendix F *illustrates* the corridor land use and commuter facilities such as residential, commercial, industrial, institutional, mining, open space, agriculture, forest, wetlands, barren land, park and ride lots and MARC stations.
- Appendix G *illustrates* the corridor smart growth programs such as the Maryland Environmental Trust lands, agricultural easements, Maryland Historical Trust easements, rural legacy lands, enterprise zones, designated neighborhoods, priority funding areas (PFAs) and subdivisions (new and approved).

In Frederick County, between the south side of the City of Frederick and the Montgomery/Frederick county line, Alignment 3 traverses primarily agricultural land. One exception is in the vicinity of Urbana where former agricultural lands are being developed as part of the Urbana residential development. *In Montgomery County, the alternatives variously traverse agricultural land (West Alternative) and developed areas (East Alternatives). The existing environmental resources that may be of concern in the context of this project – Streams and Rivers, Parks, and Historic Resources – are discussed below.*

## 1. Streams and Rivers

All of the surface waters in the study area are classified by the Maryland Department of the Environment (MDE) as Class I-P (water contact recreation, aquatic life, and water supply), Class-III (natural trout), or Class-IV (put-and-take trout). Table 6 indicates MDE designated uses for surface waters within the study areas. No classification data was located for Peter Pan Run.

Table 6: MDE Classifications for Surface Waters in the Study Area

Stream	County	Classification
Great Seneca Creek	Montgomery	Class I
Little Bennett Creek	Montgomery/Frederick	Class I
Bennett Creek	Frederick	Class I
Urbana Branch	Frederick	Class I
Monocacy River	Frederick	Class I
Quarry Branch	Frederick	Class I
Rock Creek	Frederick	Class III
Bush Creek	Frederick	Class III
Little Seneca Creek	Montgomery	Class IV

Notes: Class I Uses = water contact, recreation, aquatic life, and water supply  
Class III Use = natural trout waters  
Class IV Use = put and take trout

## 2. Parks

Numerous parks and recreational facilities are located along the I-270 Corridor, offering a diverse range of activities (Table 7). Some of the parks are undeveloped while others contain baseball, football and soccer fields, playgrounds, tennis and basketball courts, hiking trails, picnic tables, pavilions and ponds. Maintenance and ownership of these parks vary among the National Park Service, State of Maryland, MNCPPC and county and local municipalities.

**Table 7: Parks and Recreational Facilities in the I-270 Commuter Rail Study Area**

Name of Park	Amenities	Size (ac.)	Owner
Monocacy National Battlefield Park	Visitor Center, hiking trails. Additional trails planned in the future	1,647	National Park Service
Urbana Community Park	Pavilions, picnic tables, baseball, soccer fields, playground, tennis courts	20	Frederick County
Urbana Lake Fish Management Area	Undeveloped	70	MD DNR
Little Bennett Regional Park	Camping, picnic area, golf course	3,648	MNCPPC
Kings Park	Picnic facilities, playground, ball fields, football		MNCPPC
Clarksburg Park	Community building, playgrounds, basketball field	3.8	MNCPPC
Little Seneca Greenway	No current amenities-proposed trail		MNCPPC
Black Hill Regional Park	Playground, picnic areas, lake	1,855	MNCPPC
North Germantown Greenway	Under construction- Will have athletic field, playground, picnic area, basketball, trail	197	MNCPPC
Waters Landing Park	Tennis courts soccer field, playground, softball	11.68	MNCPPC
Germantown East Park	Undeveloped	8	MNCPPC
Gunners Lake Park	Football, softball, open shelter, playground, fishing pond	9	MNCPPC
Seneca Creek State Park	Biking, hiking, and riding trails; boating; skiing; fishing; canoeing; hunter; and playground	6,290	MD DNR
Great Seneca Park	Hiking trails	1,649	Montgomery County

Communities along the I-270 Corridor enjoy an abundance of parks and recreational facilities. As new residential and commercial development continues, community planners have requested that recreation areas be incorporated into their plans.

*Of the parks in the Corridor, the Monocacy National Battlefield, the Little Bennett Regional Park, and the Black Hill Regional Park are the largest and most developed. They are described below.*

*a. Monocacy National Battlefield*

The Monocacy National Battlefield Park, a 1,647-acre park owned by the National Park Service, is located south of Frederick from north of the CSX Old Main Line to south of the intersection of I-270 and Baker Valley Road. The battlefield is roughly bounded by MD 355 and the Monocacy River on the east and extends to just west of I-270 and to the Monocacy River on the west. The Monocacy River traverses the park from east to west, and I-270 bisects the park from north to south. Although the existing Frederick Extension is adjacent to battlefield property, environmental impact coordination was completed during the Frederick MARC service NEPA planning phase. *If planning for any of the current Commuter Rail services was further advanced, the MTA would be required to coordinate any new alignment with the National Park Service.*

*b. Little Bennett Regional Park*

Another large park in the study area is the Little Bennett Regional Park. It is situated in northern Montgomery County east of MD 355, near the Clarksburg/Hyattstown areas. Little Bennett is 3,648 acres of primarily undeveloped land, but a few amenities exist in the area consisting of picnic and camping areas and an 18-hole golf course. This facility is owned by the MNCPPC.

*c. Black Hill Regional Park*

Black Hill Regional Park is located in northern Montgomery County southwest of Clarksburg. The park contains over 1,855 acres. The park contains a Montgomery County reservoir, Seneca Lake. Amenities include fishing, boating, a nature center and equestrian trails.

### **3. Historic Resources**

Historic Resources – architectural and archaeological resources eligible or listed on the National Register of Historic Places – are located in the Study Area, although may not be directly impacted by the project alternatives. The resources are discussed individually below.

*a. The Monocacy National Battlefield Park*

The Monocacy National Battlefield was incorporated into the National Park System in 1973 and is a National Historic Landmark. The battlefield consists of 1,647 acres in

Frederick County. The site commemorates the location of the Battle of Monocacy, which took place in July 1864. (*See discussion regarding this resource as a park above.*)

*b. Frederick National Historic District*

The Frederick National Historic District is concentrated along Patrick and Market Streets in downtown Frederick. The district contains 19th and 20th century architectural styles located through varying commercial and residential areas.

*c. Urbana Historic District*

The Urbana Historic District is concentrated around and includes the original town limits north and west of the MD 355/MD 80 intersection. The district contains 19th and 20th century architectural styles.

*d. Hyattstown Historic District*

In March 1986 Hyattstown was designated a historic district on the Montgomery County Historic Preservation Master Plan. The Hyattstown district is located along MD 355 with the majority of the district designation based upon 19th and 20th century architectural styles. A portion of the district lies south of the MD 355/MD 109 intersection.

*e. Clarksburg Historic District*

The Clarksburg Historic District is concentrated around the 19th and 20th century homes that exhibit the architectural styles of this period. The district is primarily centered on the MD 355/MD 121 intersection.

*f. Archaeological Resources*

In addition to the historic districts, the environmental inventory identified other areas that contain the potential for cultural resources along the study alignment. These include the Montgomery County community of Boyds (near the intersection of MD 117 and MD 121) and in the Frederick County town of Urbana (in the vicinity of Urbana High School). The potential for archeological resources are generally identified along stream valleys and the study area contains many of these potential locations.

## ***F. Development Patterns***

Development patterns for the I-270 Corridor have shown a continuous northward expansion from Montgomery County while Frederick County has directed development to Urbana in the area south of the CSX Old Main Line railroad. This development expansion has included new homes, subdivisions, commercial and employment centers for new residents and businesses. All of these developments have been approved in

conformance with the local master plans. The master plans for the corridor identify targeted development areas that would be the location of future development such as Clarksburg and Urbana. The State of Maryland's Smart Growth Initiative has further focused local development to occur within areas already served by existing infrastructure systems (water, sewer, schools and roads). The future development patterns will continue to occur within the Clarksburg and Urbana areas according to the present master plans. It should be noted that the Frederick County Urbana Region Master Plan will be undergoing its regular update over the next few years. Dramatic shifts or alterations to the base development plans and densities for residential and employment centers are not anticipated at this time.

The study area for *all the alternatives from Frederick to Clarksburg* is primarily undeveloped, agricultural and forested land (See Appendix F). Noted exceptions occur at Urbana, Hyattstown and Clarksburg. The master plans for Frederick and Montgomery Counties outline land uses that would support development activities in the Clarksburg and Urbana areas. The Hyattstown area is not designated for development in the Montgomery County/ Clarksburg Master Plan.

*The study area for the West Alternative continues through primarily undeveloped, agricultural and forested lands south of Clarksburg to Boyds. The study area for the East Alternatives traverses developed areas in the immediate I-270 Corridor south of Clarksburg.*

Additionally, the Priority Funding Area (PFA) boundaries submitted to the Maryland Department of Planning also set the future development patterns for the study area. In Frederick County, *the alternatives pass* through the Frederick PFA, the Urbana PFA and just east of the Hyattstown (Frederick County) PFA. In Montgomery County, *the alternatives pass* through the Clarksburg PFA. In addition, *the West Alternative from Clarksburg to Boyds passes through* a rural legacy and designated neighborhood zone, areas designated to limit the adverse impacts of development sprawl and to provide financial assistance for neighborhoods respectively. Of special note, the Hyattstown area is not included in any Montgomery County priority funding areas.

## **IV. I-270 Commuter Rail Alternatives**

### **A. Engineering Requirements**

The 1991 Corridor Cities Transit Easement, Frederick County Extension Study focused on the topographic and natural constraints associated with the individual alignments proposed. At that time, the corridor between Clarksburg and Frederick was rural, with scattered housing, including several small communities located along the few major roadways and characterized by rolling to steep terrain. The commuter rail option discussed in the 1991 Study, Alignment 3, has the most restrictive geometric



requirements of the modes considered: minimum horizontal curve radii on the order of 1,000 feet; maximum grades of three percent (with maximum sustainable grades about one-half this level); station stop spacing averaging between five and ten miles. These constraints allow high-speed operation of commuter rail services, which are typically oriented to transporting commuters long distances to central business districts with a single downtown terminal.

The alternatives proposed in the current I-270 Commuter Rail Feasibility Study seek to replicate, as closely as possible, the commuter rail option of Alignment 3 from the 1991 Study. Design criteria were developed based on the following assumptions: a MARC-type passenger car powered by a diesel locomotive is the design vehicle; the proposed tracks will accommodate exclusively passenger service; and a minimum number of at-grade crossings is desirable. The design speed for this alignment is 50 MPH. The geometric requirements are as follows: tangent lengths between curves must be three times the design speed, thirty feet minimum; the minimum curve radius is 1,000 feet, with all curves spiraled to attain super-elevation; and the maximum allowable vertical grade is 2.50%.

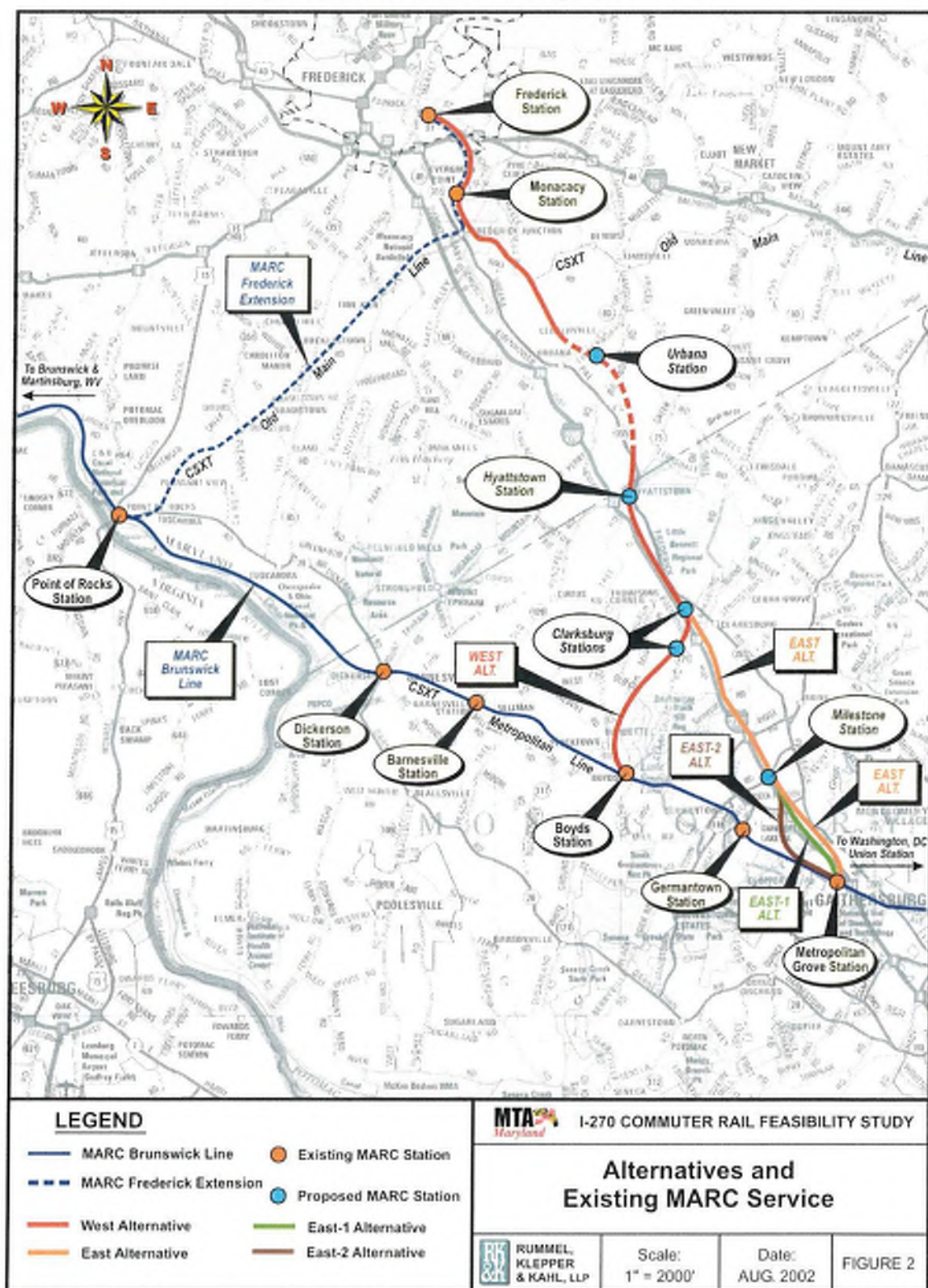
In several locations, the Alignment 3 from the 1991 Study violated the design criteria established for the current study. Horizontally, proper tangent lengths were placed between curves if the alignment did not vary too much from the 1991 alignment. In some cases, the 1991 curvature was held in order to keep the two alignments in the same vicinity.

The Alignment 3 profile provided in 1991 showed a proposed grade line that violated the current design criteria as well as the 1991 Study criteria. Where mapping is available, a new profile has been developed according to current criteria, while minimizing impacts as much as possible.

## **B. Description of Alternatives**

*The current I-270 Commuter Rail Feasibility Study examines four alternatives: West, East, East-1, and East-2. The four alternatives and the existing MARC Brunswick Line-Frederick Extension services are illustrated Figure 2. All alternatives include Alignment 3 from the 1991 Study, with updates to meet the current engineering criteria (See Engineering Requirements above) and to avoid potential impacts on the new Urbana High School (See Alignment 3 with Urbana Option below). At Clarksburg, the alternatives diverge: the West Alternative travels south across agricultural lands to meet the CSX Metropolitan Line (current MARC Brunswick Line service) at Boyds; the East alternatives parallel I-270 to meet the CSX Metropolitan Line at Metropolitan Grove. There are three East alternatives – East, East-1, and East-2. Each of the alternatives is described in detail below.*

Figure 2: Alternatives and Existing MARC Service



## **1. Alignment 3 with Urbana Option**

Alignment 3, originally identified and described in the 1991 Corridor Cities Transit Easement, Frederick County Extension Study, is a commuter rail alignment that originates in Clarksburg, crosses MD 355 at Hyattstown, and continues somewhat parallel with MD 355 to Urbana. The alignment continues northeast towards Ijamsville along Peter Pan Run, following the least difficult terrain. After crossing Ball Road, it connects with the existing CSX Old Main Line. The alignment then follows the railroad line west/northwest along Bush Creek, across the Monocacy River, and diverges at Frederick Junction to follow the existing MARC Frederick Extension. Alignment 3 is illustrated in Figure 3 and Appendix A (Sheet 3).

After the 1991 Study, a new Urbana High School was constructed on property that Alignment 3 traverses. Because it is not foreseeable that the community would accept a direct impact to the school by any future commuter rail facility, an Urbana Option was designed to avoid direct impacts on the school. The Urbana Option leaves Alignment 3 just south of Bennett Creek and heads northeasterly to cross MD 80 approximately 1 mile east of the MD 80-MD 355 Intersection. It then continues northwesterly through the Villages of Urbana, a housing development, in a way that minimizes impacts to existing and planned development in the area. It rejoins Alignment 3 after crossing Peter Pan Run near Ball Road and just south of Bush Creek. The Urbana Option and its relationship to the 1991 Alignment 3 are illustrated in Figure 4 and Appendix A (Sheet 3).

All of the alternatives considered in the current I-270 Commuter Rail Feasibility Study and described below include Alignment 3 with the Urbana Option.

## **2. West Alternative**

The West Alternative includes Alignment 3 with the Urbana Option, as described above. The alternative then extends south from Clarksburg, crossing I-270 and passing southwest of Seneca Lake. The alternative joins the existing CSX Metropolitan Line (existing MARC Brunswick Line service) at Boyds. The West Alternative is illustrated in Figure 5 and Appendices A and B.

Stations for the West Alternative are proposed at the following seven locations in the project area (north to south): Frederick (existing), Monocacy (existing), Urbana (proposed), Hyattstown (proposed), Clarksburg (proposed), Germantown (existing), and Metropolitan Grove (existing). (See Station Summaries below.) The West Alternative service will terminate at Washington Union Station.



Figure 3: Alignment 3 (1991)

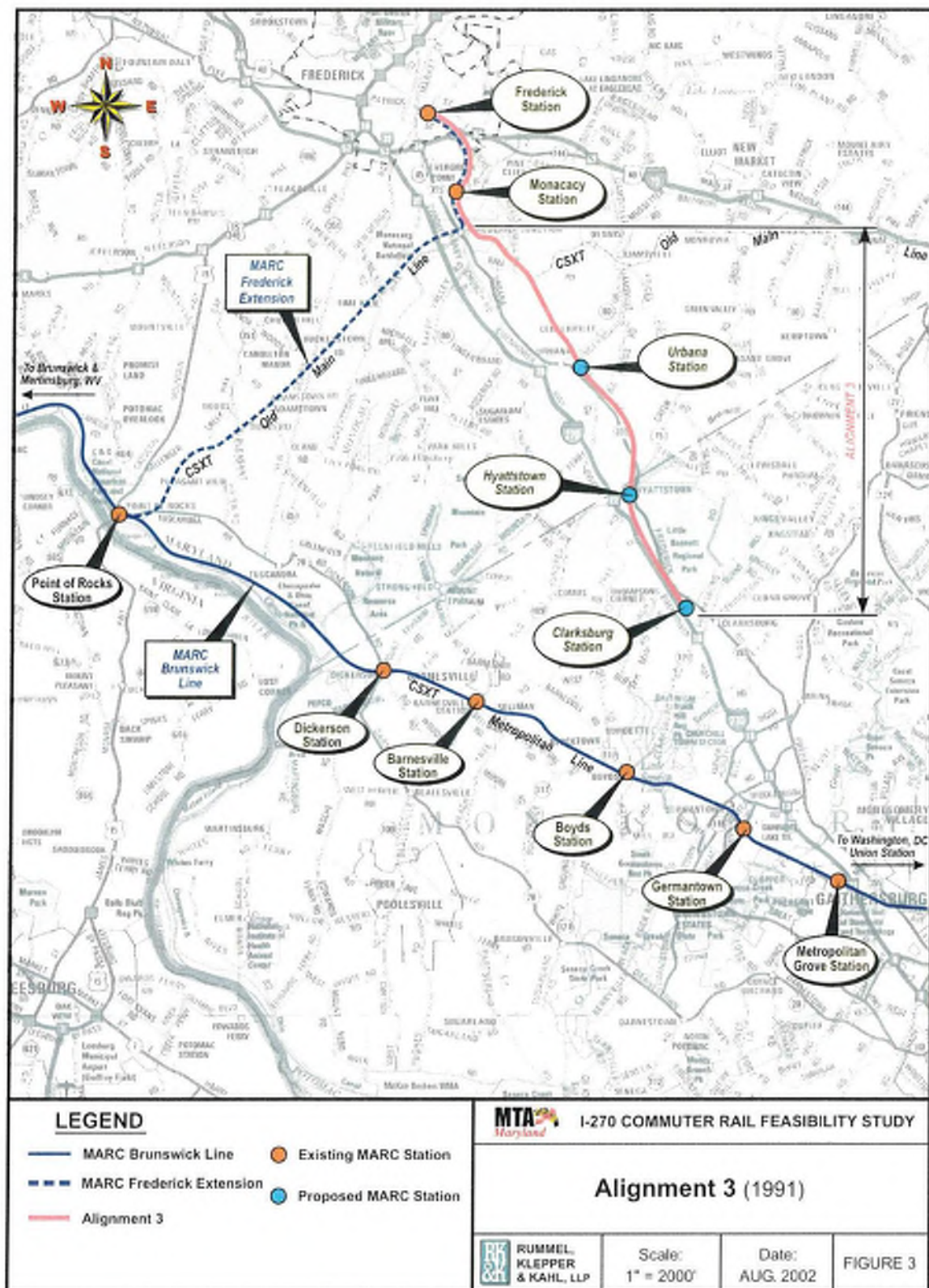




Figure 4: Alignment 3 (1991) with the Urbana Option

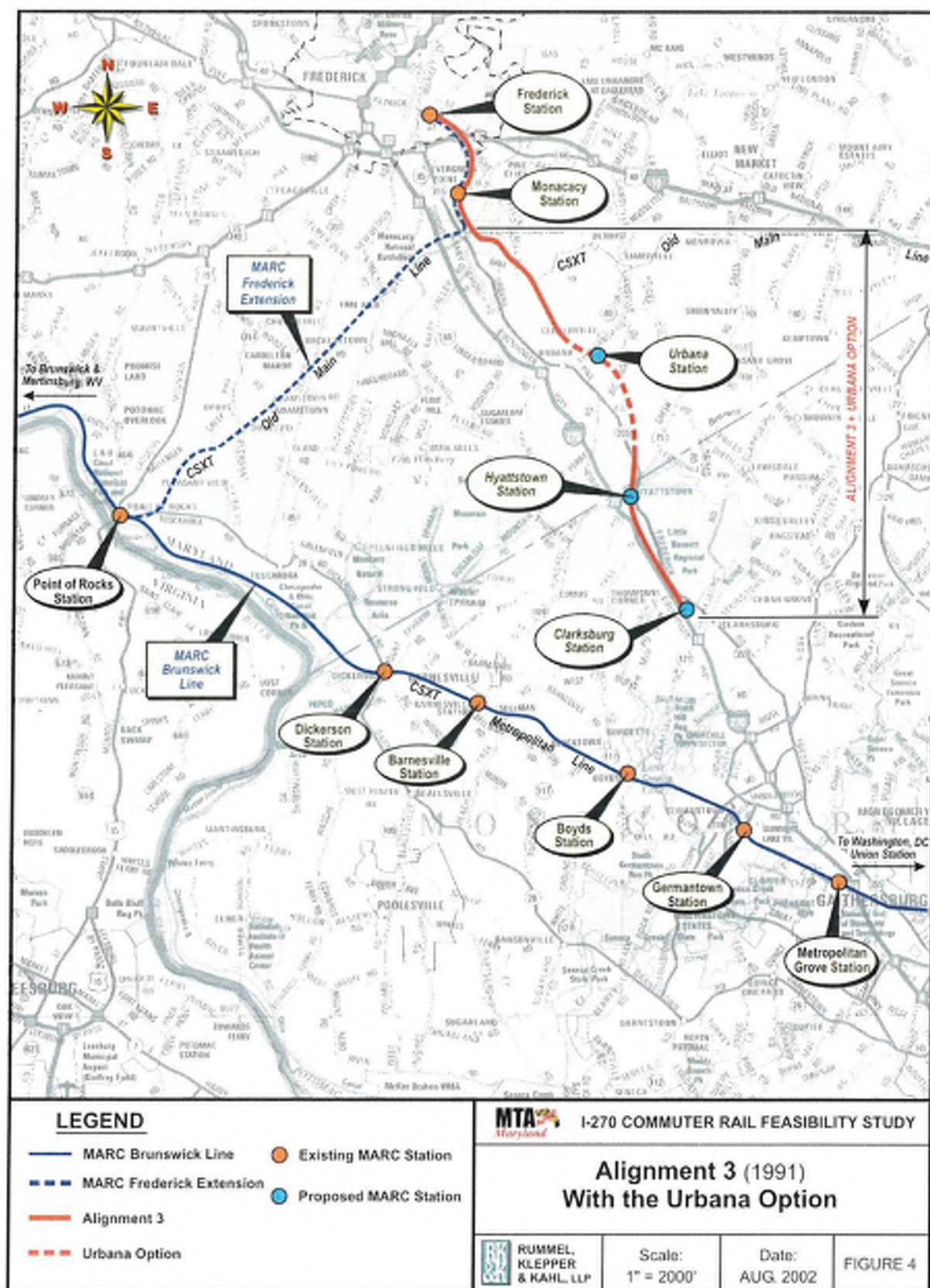
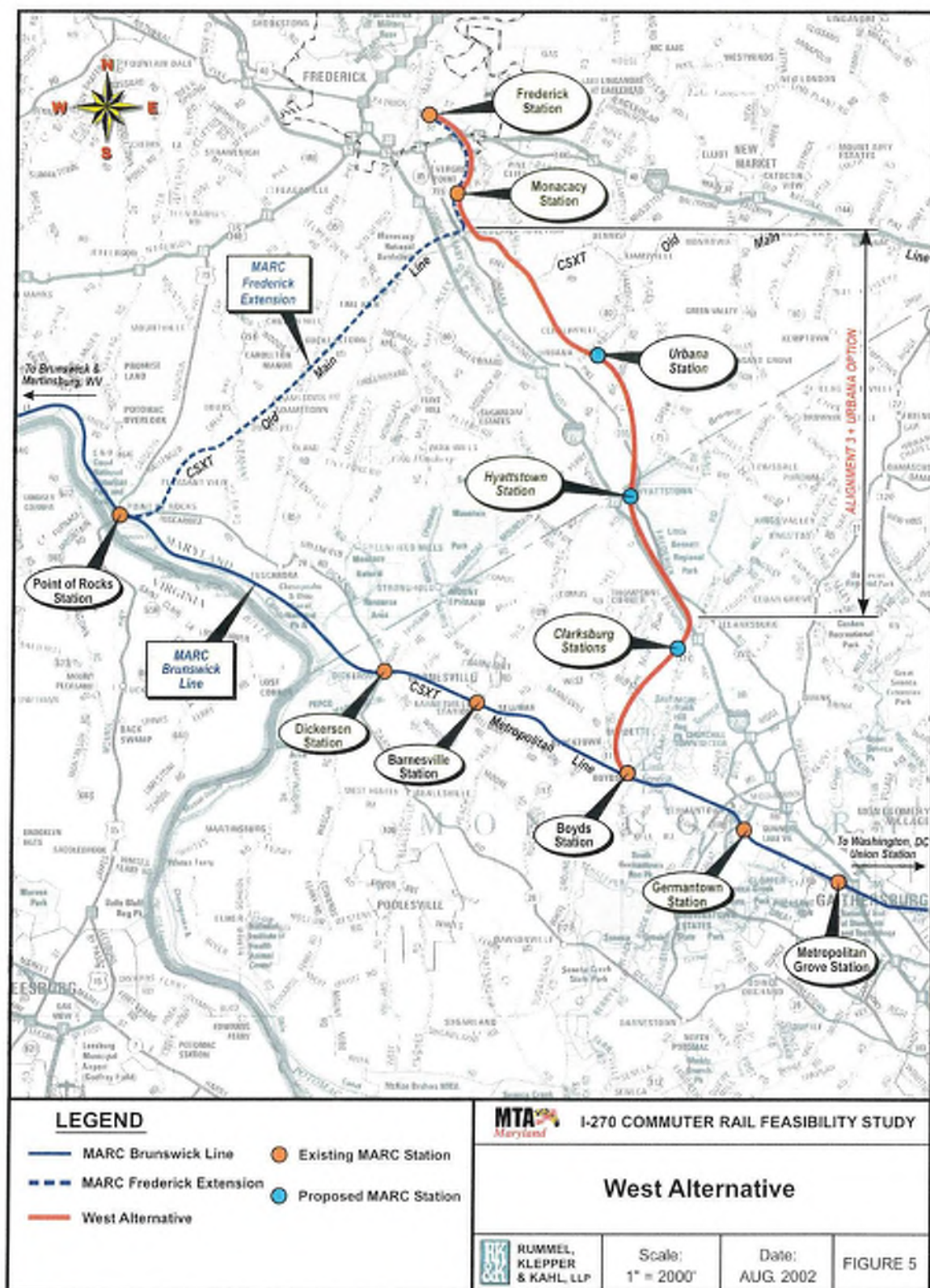




Figure 5: West Alternative





### **3. East Alternative**

*The East Alternative includes Alignment 3 with the Urbana Option, as described above. The alternative then extends south from Clarksburg along the east side of I-270. South of Middlebrook Road, the alternative proposes a substantial cut in the hillside supporting Staleybridge Road which will displace approximately 35 residences on the west side of Staleybridge Road. South of Watkins Mill Road, the alternative crosses I-270 on a large bridge structure on a skew. The alternative joins the existing CSX Metropolitan Line (existing MARC Brunswick Line service) just south of the existing Metropolitan Grove MARC Station near the line's intersection with MD 124. The East Alternative is illustrated in Figure 6 and Appendices A and B.*

*Stations for the East Alternative are proposed at the following seven locations in the project area (north to south): Frederick (existing), Monocacy (existing), Urbana (proposed), Hyattstown (proposed), Clarksburg (proposed), Milestone (existing), and Metropolitan Grove (relocated). (See Station Summaries below.) The East Alternative service will terminate at Washington Union Station.*

### **4. East-1 Alternative**

*The East-1 Alternative includes Alignment 3 with the Urbana Option, as described above. The alternative then extends south from Clarksburg along the east side of I-270. South of Middlebrook Road, the alternative proposes a structure on top of the proposed Collector-Distributor (C-D) lanes for I-270 in order to avoid the residences on Staleybridge Road. South of Watkins Mill Road, the alternative crosses I-270 on a large bridge structure on a skew. The alternative joins the existing CSX Metropolitan Line (existing MARC Brunswick Line service) just south of the existing Metropolitan Grove MARC Station near the line's intersection with MD 124. The East-2 Alternative is illustrated in Figure 7 and Appendices A and B.*

*Stations for the East-1 Alternative are proposed at the following seven locations in the project area (north to south): Frederick (existing), Monocacy (existing), Urbana (proposed), Hyattstown (proposed), Clarksburg (proposed), Milestone (existing), and Metropolitan Grove (relocated). (See Station Summaries below.) The East-1 Alternative service will terminate at Washington Union Station.*

Figure 6: East Alternative

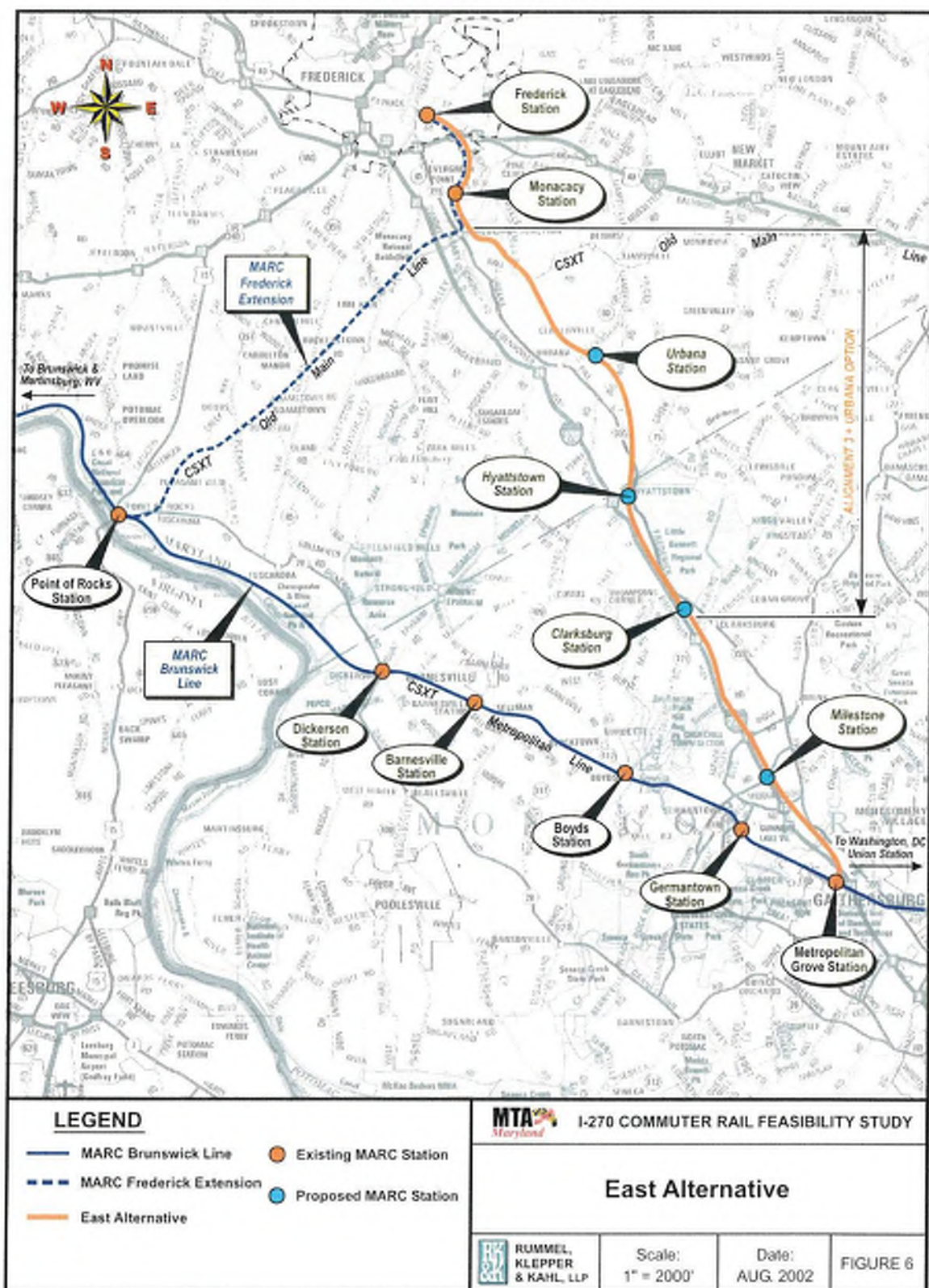
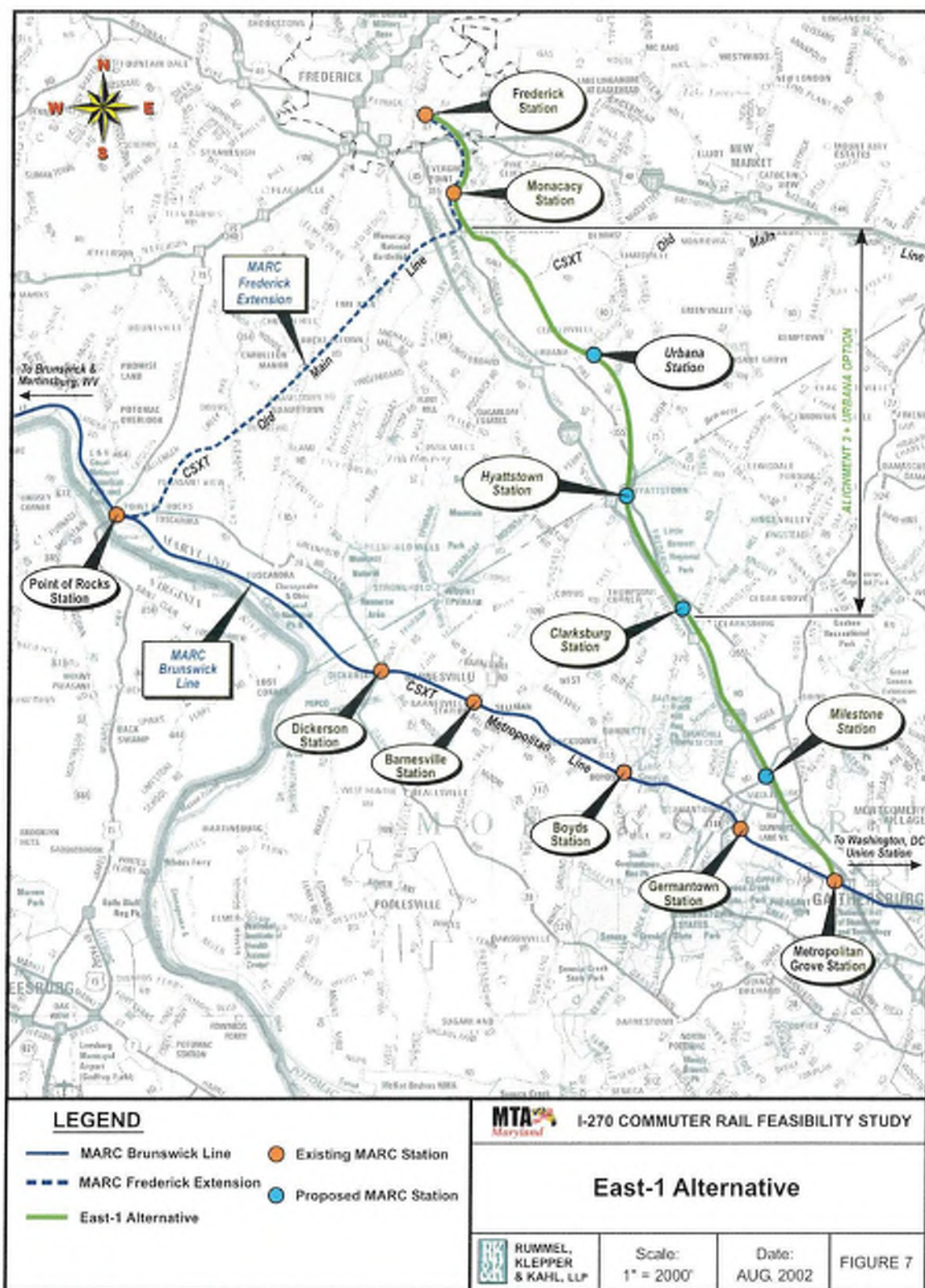




Figure 7: East-1 Alternative



## **5. East-2 Alternative**

*The East-2 Alternative includes Alignment 3 with the Urbana Option, as described above. The alternative then extends south from Clarksburg along the east side of I-270. South of Middlebrook Road, the alternative crosses I-270 on a large bridge structure on a skew to avoid the residences on Staleybridge Road. It follows parallel to the Corridor Cities Transitway (CCT) corridor. The alternative joins the existing CSX Metropolitan Line (existing MARC Brunswick Line service) just north of the existing Metropolitan Grove MARC Station. The East-2 Alternative is illustrated in Figure 8 and Appendices A and B.*

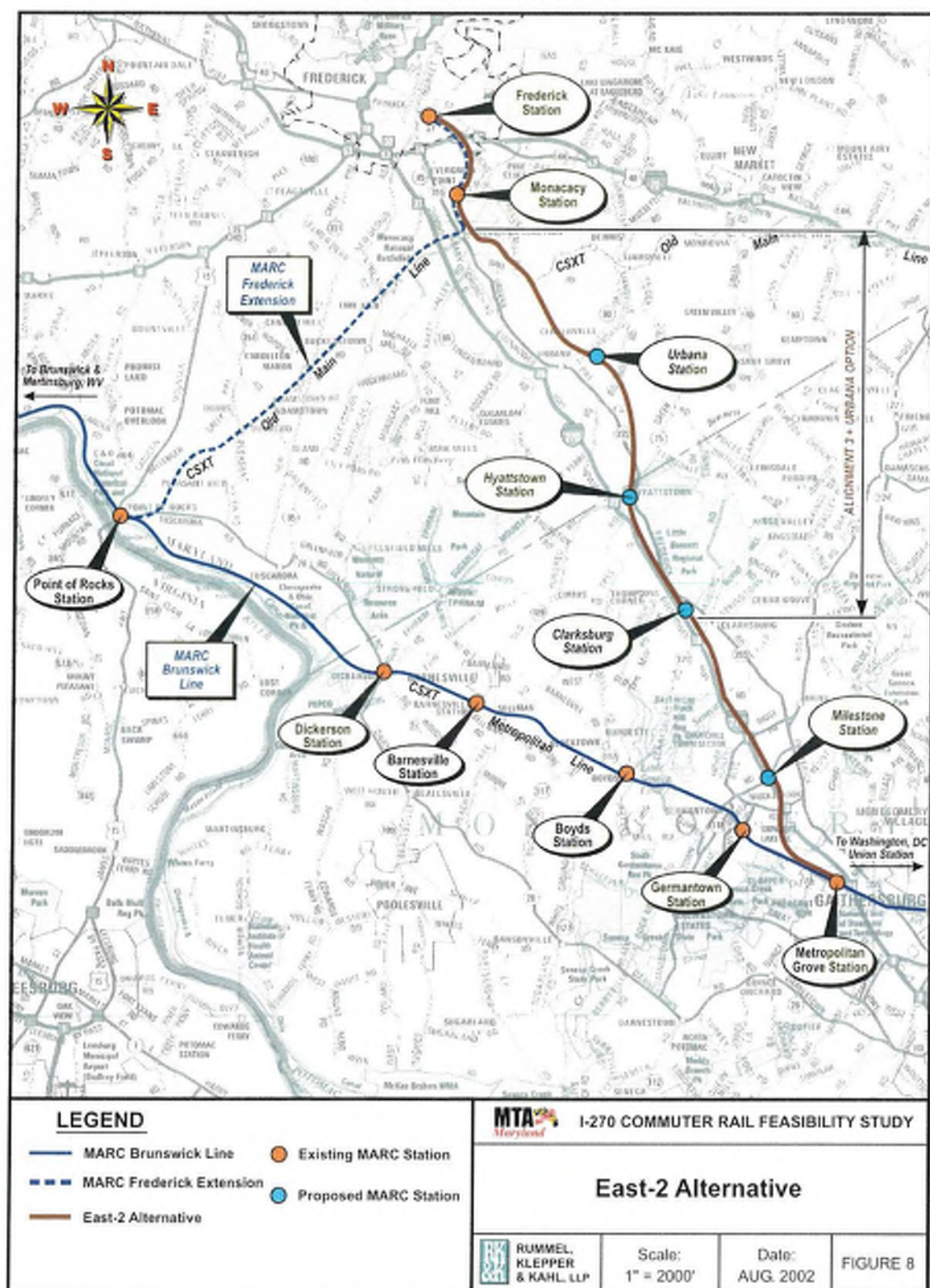
*Stations for the East-2 Alternative are proposed at the following seven locations in the project area (north to south): Frederick (existing), Monocacy (existing), Urbana (proposed), Hyattstown (proposed), Clarksburg (proposed), Milestone (existing), and Metropolitan Grove (existing). (See Station Summaries below.) The East-2 Alternative service will terminate at Washington Union Station.*

## **6. Station Summaries**

*Each of the alternatives identified for the current I-270 Commuter Rail Feasibility Study will utilize seven stations in the project area to transport passengers from downtown Frederick to Washington, D.C. The specific stations utilized by each alternative varies. (See Description of Alternatives above.) Table 8 summarizes the location and description of the existing and proposed stations for the proposed I-270 Commuter Rail Line. Table 9 compares the sequence of stations included in the existing MARC Brunswick Line – Frederick Extension service and the proposed alternatives.*



Figure 8: East-2 Alternative



**Table 8: Existing and Proposed Stations (North to South) for the Proposed I-270 Commuter Rail Line**

Station Name	Location	Existing/ Proposed	No. of Parking Spaces	Improvements Required	Multi-Modal Connectivity
Frederick	East Street, south of Carroll Creek	Existing	0	None	Walk-up; Bus Transfer Station
Monocacy	MD 355, east of Francis Scott Key Mall	Existing	850	None	Park and Ride
Urbana	MD 80 at Thompson Lane, one mile east of MD 355	Proposed	n/a <sup>5</sup>	New Station; Parking Lot; Tracks	Walk-up; Park and Ride
Hyattstown	MD 75 approximately 1/2 mile east of MD 355	Proposed	n/a <sup>5</sup>	New Station; Parking Lot; Tracks	Park and Ride
Clarksburg <sup>1</sup>	Whelan Lane, northwest of the I-270/MD 121 Interchange	Proposed	n/a <sup>5</sup>	New Station; Parking Lot; Tracks	Park and Ride
Clarksburg <sup>2</sup>	Current MD 121, northeast of I-270/MD 121 Interchange	Proposed	n/a <sup>5</sup>	New Station; Parking Lot; Tracks	Park and Ride
Milestone	MD 118, southeast of I-270/MD 118 Interchange	Proposed	n/a <sup>5</sup>	New Station; Parking Lot; Tracks	Park and Ride
Germantown	Mateny Hill Road, northeast of MD 117 and southeast of MD 124	Existing	729	None	Park and Ride
Metropolitan Grove <sup>3</sup>	Metropolitan Court, west of MD 117 and north of MD 118	Existing	343	None	Walk-up; Park and Ride; Bus Transfer Station; CCT Transfer
Metropolitan Grove <sup>4</sup>	MD 124, northwest of I-270/MD 124 Interchange	Relocated	n/a <sup>5</sup>	New Station; Parking Lot; Pedestrian Facilities	Walk-up; Park and Ride; Bus Transfer Station; CCT Transfer

Notes:

Clarksburg<sup>1</sup> = this station is proposed for the West Alternative.

Clarksburg<sup>2</sup> = this station is proposed for the East, East-1, and East-2 alternatives.

Metropolitan Grove<sup>3</sup> = this station is proposed for the West and East-2 alternatives.

Metropolitan Grove<sup>4</sup> = this station is proposed for the East and East-1 alternatives.

n/a<sup>5</sup> = Ridership forecast model assumed "unconstrained" parking at each proposed station. Future planning for stations will consider ridership and environmental constraints in determining number of parking spaces.



Table 9: Station Sequence (North to South) by Alternative

Station Name	Existing MARC Brunswick Line - Frederick Extension	Alternatives			
		West	East	East-1	East-2
Frederick	X	X	X	X	X
Monocacy	X	X	X	X	X
Urbana		X	X	X	X
Hyattstown		X	X	X	X
Clarksburg <sup>1</sup>		X			
Clarksburg <sup>2</sup>			X	X	X
Milestone			X	X	X
Germantown	X	X			
Metropolitan Grove <sup>3</sup>	X	X			X
Metropolitan Grove <sup>4</sup>			X	X	
Service Terminus: Washington Union Station					
No. of Stations	4	7	7	7	7

Notes:

- X = Station included in sequence
- Clarksburg<sup>1</sup> = this station is proposed for the West Alternative.
- Clarksburg<sup>2</sup> = this station is proposed for the East, East-1, and East-2 alternatives.
- Metropolitan Grove<sup>3</sup> = this station is proposed for the West and East-2 alternatives.
- Metropolitan Grove<sup>4</sup> = this station is proposed for the East and East-1 alternatives.

### C. Engineering: Plan, Profile, and Typical Section

The plans and typical sections of each of the alternatives are presented in Appendix A. The profiles of each of the alternatives are presented in Appendix B.

The proposed typical section for all alternatives consists of a 26-foot roadbed and a flat-bottom ditch with 2:1 side slopes (See Appendix H). The design is for a single track, but right of way would be reserved for double tracks. Due to the vertical grade restrictions, rolling terrain, and 2:1 side slopes specified, significant acreage will be required in order to allow the alignment to meet the existing ground. Because of the double track width needed and the difficulties of design in this terrain, the right of way required for the new line is significant (See Environmental Impacts below).

The East-1 Alternative varies the typical section by proposing a structure above the proposed Collector-Distributor (C-D) roads for I-270 to avoid direct impacts to Staleybridge Road and its residences.

*All of the alternatives require substantial earthwork and bridge structures. All alternatives will cross I-270 on a large bridge structure on a skew. All alternatives will cross over MD 355 and Little Bennett Creek south of MD 109 on a bridge structure. Because of large and steep hills, construction in the area between the I-270 Bridge and the MD 355/Little Bennett Creek bridge will require significant excavation and fill quantities, even though the vertical design criteria are maximized in the preliminary design through this area. An option to reduce earthwork that could be considered in future studies would be to construct tunnels in those areas with large amounts of excavation. All alternatives will cross over the Monocacy River on a widened CSX Old Main Line Bridge. The existing CSX Bridge was originally built for double track, but the single-track CSX line is currently centered on the bridge and clearance requirements do not permit a second track.*

#### **D. Ridership Forecast**

The current I-270 Commuter Rail Feasibility Study presents a forecast of commuter rail ridership for operating a comparable passenger service between the existing Frederick and Washington Union Stations. As described in the following section, the operating plan consists of four weekday commuter trains traveling from Frederick to Washington in the AM peak period and the reverse service in the PM peak period from Washington to Frederick.

Ridership forecasts are based on empirically validated travel demand models which seek to predict future travel patterns using land use, population, employment and transportation forecasts over a specified study area. For the purposes of the I-270 Commuter Rail Feasibility Study, the Metropolitan Washington Council of Government's (MWCOC) Regional Travel Demand Model is the basis for preparing and forecasting commuter rail ridership for this study.

##### **1. Model Employed and Assumption**

As discussed in Background above, the MTA and SHA are jointly sponsoring a multi-modal corridor study for I-270 and US 15 in Frederick and Montgomery County. The on-going I-270/US 15 Multi-Modal Corridor Study (I-270 Study) has developed and evaluated highway and transit alternatives using a set of hybrid MWCOC modeling approaches with specific variations to gauge the relative performance of these alternatives within the context of the model inputs and modeling procedures. The hybrid modeling approach assumed:

- Version I Model procedure for trip generation through traffic assignment.
- Specially developed 1674 zones highway and transit networks as inputs to mode choice and traffic assignment.
- Lane use Round 6.1 for Year 1990 validation run and Round 6.2 for Year 2025 forecasting runs.

The current I-270 Commuter Rail Feasibility Study utilized the identical modeling approach as used in the I-270 Study to develop the ridership forecasts. Utilizing this model ensures consistent results for the forecasts when compared to the I-270 Study.

The ridership forecasting process begins with the existing conditions, adds the forecasted baseline (future no-build), and then adds the build alternative (future build). For the purposes of the current study, the existing conditions are based on year 1990, which is the most recent year for which modeled outputs from the I-270 Study are available.

The future forecast year is year 2025, which is consistent with the MWCOG's horizon year to be utilized on long range transportation planning studies and is consistent with the I-270 Study. Two future scenarios were retrieved as baselines from the I-270 Study directly. The first one – Baseline I – is identical to the “2025 Baseline” scenario of the I-270 Study. The second one – Baseline II – is identical to the “2025 A-1 LRT” scenario of the I-270 Study. *For the build alternatives, the proposed West Alternative and East Alternatives service were individually added on top of the Baseline II scenario to replace the existing MARC Brunswick Line and Frederick Extension service. The mode choice model was rerun, and transit assignment was executed using the identical modeling procedure used in the I-270 Study to obtain the forecasted MARC ridership under these two Future Build scenarios. Because the East, East-1, and East-2 alternatives are very similar in length, number of stations, and other factors that aid in the forecasting of ridership, only the East Alternative was modeled, and its results are considered to characterize the potential ridership of the East-1 and East-2 alternatives. The ridership forecasting scenarios are summarized in Table 10.*

**Table 10: Ridership Forecasting Scenario Definitions**

Scenario	Year	Transportation Facilities Includes
Existing	1990	All facilities as they existed in 1990 (including MARC Brunswick Line service and I-270 configuration from I-70 to I-495)
Baseline I	2025	Existing Scenario + MARC Frederick Extension + Other regional transportation improvements included in the MWCOG model
Baseline II	2025	Baseline I + I-270 Study Combination Alternative A-1: LRT
Future Build-West	2025	Baseline I + West Alternative (in place of MARC Brunswick Line-Frederick Extension service)
Future Build-East	2025	Baseline I + East Alternative (in place of MARC Brunswick Line-Frederick Extension service)

For the Future Build scenarios, the assumptions for the operational characteristics of the proposed Frederick to Washington MARC services can be summarized as follows:

- *4 weekday one-way trains from Frederick to Washington Union Station will operate only during AM and PM peak periods.*
- *Seven stations will be included in the proposed service.*
- *Unlimited parking will be available at the stations included in the proposed service.*
- *The stopping pattern between the existing MARC Metropolitan Grove and Washington Union Stations is identical to that of the existing MARC Brunswick Line-Frederick Extension service (Trains P876 and P892).*
- *2 minutes will be the station dwell time.*
- *95 minutes will be the total run time of the proposed Frederick to Washington Union Station service (See Table 13).*

## 2. Results and Discussion

*The ridership forecast is summarized in Table 11. The ridership forecast indicates that ridership on both the existing Brunswick Line and the Frederick Extension will increase over the current year in the future. In 2025, when planned transportation improvements are taken into account (2025 Baseline II scenario), the existing services will attract a total of 5,850 riders: 5,105 on the Brunswick Line and 745 on the Frederick Extension.*

*In 2025, when the proposed I-270 Commuter Rail alternatives are added to Baseline II (2025 Future Build scenario), the West and East alternatives would attract additional riders – 810 and 750 riders, respectively – when compared to the existing Frederick Extension service. However, the alternatives would decrease the number of riders*

*utilizing the Brunswick Line service by approximately 6%. When these decreases on the Brunswick Line are considered along with the increases for Frederick service, the net gain in riders would be 490 for the West Alternative and 455 for the East Alternatives.*

*In addition to the decrease in riders on the Brunswick Line, the ridership forecast indicates that the number of riders on the Metro Red Line could also slightly decrease (less than 1% reduction).*

*When comparing the West Alternative and the East Alternative, the ridership forecast indicates that the existing Downtown Frederick MARC Station and the proposed Clarksburg Station would attract the largest numbers of riders. Together, these two stations account for approximately 70% of the riders for both alternative scenarios (56 – 59% at Frederick and 13-14% at Clarksburg). After these two stations, the proposed Hyattstown Station would attract the next largest number of riders, approximately 9% of the total. The remaining four stations, would attract relatively few riders, cumulatively comprising only 21% of the total, and averaging only 58 riders per station.*

Table 11: Summary of MARC Ridership for Various Scenarios

Station	1991		2025 Baseline I <sup>1</sup>		2025 Baseline II <sup>2</sup>		2025 Future Build <sup>3</sup>				2025 Future Build -- 2025 Baseline II			
	Observed <sup>4</sup>	Estimated <sup>5</sup>	Brunswick Line	Frederick Extension	Estimated <sup>6</sup>	Brunswick Line	Estimated <sup>6</sup>	Brunswick Line (to Germantown)	Estimated <sup>6</sup>	I-270 Line Via German-town - WEST ALT.	Differences	Brunswick Line (to Germantown)	Differences	I-270 Line Via Metro. Grove - EAST ALTS.
Downtown Frederick				945	710				875					170
Monocacy				55	35				40					5
Brunswick	700	120	555		370									
Point of Rocks	310	305	1,775		1,740				370					0
Dickerson	7	20	45		35				1,745					5
Barnesville	55	90	345		320				35					-5
Boyd's	5	0	675		180				320					-10
Urbana <sup>7</sup>									180					-10
Hyattstown <sup>7</sup>									70					70
Clark'sburg <sup>7</sup>									140					145
German-town	550	550	4,480		1,335				215					195
Milestone <sup>7</sup>									95					
Metro. Grove	160	90	1,000		470				1,070					40
Gaithersburg	330	255	975		550				50					55
Washington Grove	20	50	25		15				430					0
Rockville	90	15	70		65				540					0
<b>Total</b>	<b>2,227</b>	<b>1,495</b>	<b>9,945</b>	<b>1,000</b>	<b>5,105</b>	<b>745</b>	<b>4,785</b>	<b>1,555</b>	<b>4,810</b>	<b>1,495</b>	<b>-320</b>	<b>810</b>	<b>-295</b>	<b>750</b>
<b>Metro Red Line<sup>6</sup></b>														
Shady Grove	6,491	6,610		10,545	15,360				15,305					-85
Rockville	3,634	3,235		4,950	3,575				3,515					-60
<b>Total</b>	<b>10,125</b>	<b>9,845</b>		<b>15,495</b>	<b>18,935</b>				<b>18,820</b>					<b>-115</b>

<sup>1</sup> 2025 Baseline I = 2025 Baseline in the I-270/US 15 Multi-Modal Corridor Study  
<sup>2</sup> 2025 Baseline II = 2025 A-1 LRT in the I-270/US 15 Multi-Modal Corridor Study  
<sup>3</sup> 2025 Future Build = 2025 Baseline II -- Frederick Line + I-270 Line  
<sup>4</sup> Daily boarding numbers for 1991  
<sup>5</sup> Modeled HBW boardings (missing around 450 external trips in the model for Brunswick Station in 1990)  
<sup>6</sup> Modeled HBW boardings  
<sup>7</sup> Stations proposed by Future Build Alternatives



Table 12 presents context ridership data regarding other existing commuter rail systems in the United States. These data are provided for reader reference and informational purposes only.

**Table 12: Average Weekday Ridership of Existing Commuter Rail Systems**

Location	Operating Agency	Miles	No. of Stations	Average Weekday Ridership (thousands)
Baltimore, MD	Mass Transit of Maryland	373.4	40	22.2
Boston, MA	Massachusetts Bay Transportation Authority	710.2	119	131.2
Burlington, VT	Vermont Transportation Authority	25	3	n/a
Chicago, IL	METRA	940.4	227	286.6
Chicago, IL	Northern IN Commuter TD	179.8	18	12.8
Dallas, TX	Dallas Area Rapid Transit	13.7	3	4.3
Los Angeles, CA	Southern California RRA	768.6	46	30.0
Miami, FL	Tri-County Commuter Rail Authority	142.2	19	8.7
New Haven, CT	Connecticut DOT	101.2	8	1.2
New York, NY	MTA Long Island Rail Authority	638.2	124	368.7
New York, NY	MTA Metro-North Rail Railroad	535.4	106	258.6
New York, NY	New Jersey Transit Corporation	975.2	162	218.9
New York, NY	New Jersey Transit Corporation	144.4	14	6.1
Philadelphia, PA	Pennsylvania Department of Transportation	443.4	177	0.6
Philadelphia, PA	Southeastern Pennsylvania Transit	82.2	8	106.8
San Diego, CA	North County Transit District	153.6	35	4.3
San Francisco, CA	Peninsula Corridor JPB	172.0	9	31.4
San Jose, CA	Altamont Commuter Express	40.0	4	3.5
Seattle, WA	Sound Transit	3.5	3	1.2
Washington, DC	Virginia Railway Express	177.5	18	9.6

Source: National Transit Database 2000 Data ([www.ntdprogram.com/NTD/ntdhome.nsf](http://www.ntdprogram.com/NTD/ntdhome.nsf))

## **E. Operating Plan**

Several commuter rail operating issues must be addressed for the proposed alternatives; the number of trains per day and schedule, the available operating windows within CSX's freight timetables, the potential for reverse commute service, the storage of rolling stock, the existing MTA/CSX Operating Agreement, and fares. *Each of these issues is discussed in detail below.*

*The proposed alternatives conform to the established commuter rail design criteria, which allow for steeper grades than freight criteria. Therefore, the segments of the alternatives proposed on new location (non-freight right of way) are not suitable for freight traffic. However, both commuter rail and freight traffic would operate along existing freight right of way included in the alternatives (i.e., CSX Old Main Line near Frederick and CSX Metropolitan Line in Montgomery County and Washington, D.C.).*

### **1. Number of Trains per Day and Schedule**

*Based on discussions with MTA Operations staff, it is assumed that the proposed Frederick to Washington service will provide at a minimum the same number of passenger trains per peak period as used in the existing MARC Brunswick Line-Frederick Extension service. It is also assumed that the schedule of service for the proposed service will be similar to the existing MARC service.*

*As of April 28, 2002, the existing MARC service provides by three AM and three PM peak period, weekday trains. The travel times for the existing service are summarized in Table 13. The AM Peak trains depart Frederick Station at 5:17, 6:10, and 7:15 am. The PM Peak trains depart Washington Union Station at 4:00, 5:10, and 6:25 pm.*

*The West Alternative would travel 19.6 miles on new track, and the East Alternatives would travel 24.1 miles on new track. It is assumed that all alternatives will permit 50 MPH travel. All alternatives, and the existing service, require 95 minutes to travel from Frederick to Washington. The detailed calculations to prepare this travel time summary are presented in Appendix I.*

Table 13: Travel Times and Distance Summary by Alternative

Station	Existing		West Alternative		East Alternative <sup>6</sup>	
	Distance (miles)	Time to Next Station (minutes) <sup>5</sup>	Distance (miles)	Time to Next Station (minutes)	Distance (miles)	Time to Next Station (minutes)
Frederick	n/a	6	n/a	6	n/a	6
Monocacy	n/a	37	5.1	9	5.1	9
Urbana	--	--	3.0	7	3.0	7
Hyattstown	--	--	4.6	9	4.7	9
Clarksburg <sup>1</sup>	--	--	6.9	12	--	--
Clarksburg <sup>2</sup>	--	--	--	--	4.3	8
Milestone	--	--	--	--	3.9	8
Germantown	n/a	5	n/a	5	--	--
Metropolitan Grove <sup>3</sup>	n/a	47	n/a	47	--	--
Metropolitan Grove <sup>4</sup>	--	--	--	--	3.0	47
Washington Union Station	end of line	end of line	end of line	end of line	end of line	end of line
<b>Totals</b>	<b>n/a</b>	<b>95</b>	<b>19.6</b>	<b>95</b>	<b>24.1</b>	<b>95</b>

Notes:

Clarksburg<sup>1</sup> = this station is proposed for the West Alternative.

Clarksburg<sup>2</sup> = this station is proposed for the East, East-1, and East-2 alternatives.

Metropolitan Grove<sup>3</sup> = this station is proposed for the West and East-2 alternatives.

Metropolitan Grove<sup>4</sup> = this station is proposed for the East and East-1 alternatives.

<sup>5</sup> Existing travel times from Eastbound Brunswick MARC Schedule, effective April 28, 2002, Train P892.

<sup>6</sup> Apply to East-1 and East-2 Alternatives also.

## 2. Operating Windows within CSX's Freight Timetables

According to MARC Operations staff, operating windows could be made available on the CSX Old Main Line. However, new freight storage track would be required between Frederick Junction and West Reels (approximately 0.4 miles) to maintain the freight capacity, which would be displaced by new MARC routes. This would also introduce new impacts to CSX operating windows. In addition, new passing sidings may be required to avoid schedule and train conflicts.

In the case of the CSX Metropolitan Line, track capacity has been a lingering problem between CSX and MARC. CSX has consistently urged MARC and the State of Maryland to fund construction of a third track to accommodate any new MARC service on the Metropolitan Line, including the area around the Boyds Station.

*According to MTA Operations staff, only nine MARC trains are permitted along the CSX Metropolitan Line, and most of these trains are between Metropolitan Grove and Washington. The limited capacity indicates that service between Frederick and Washington would continue to be limited unless new track were to be constructed. Another alternative to avoid the limited capacity area would be to consider Frederick to Metropolitan Grove service that would require transfer to existing MARC Brunswick Line trains or another mode of transportation to reach destinations in Washington, D.C. This alternative, however, is out of the scope of this current feasibility study.*

### **3. Potential for Reverse Commute Service**

*In considering the feasibility for potential reverse commute service –in the direction of Washington Union Station to Frederick – this study examined some key factors that influence individuals to select transit over their single-occupancy vehicle (SOV) for their commute: the future (2025) level of service and travel times on I-270 (northbound during the AM Peak and southbound during the PM Peak) and the current (2000) demographic data and trends regarding population and employment in Frederick and Montgomery Counties.*

*The level of service data collected for the I-270/US 15 Multi-Modal Corridor Study indicates that traffic on I-270 in the future, regardless of which alternative for that project is selected and constructed, will be relatively free-flowing in the non-peak direction during peak hours. That is, northbound I-270 in the AM peak and southbound I-270 in the PM peak period will range from level of service A to D, with A representing free-flow conditions and D representing conditions in which the driver has limited room to maneuver (See Table 14). The more free-flowing (better) conditions are generally at locations in Montgomery County south of MD 121. The less free-flowing (worse) conditions are generally located in Frederick County, with the worst conditions between the MD 80 and MD 85 interchanges. Even with some limits on free-flow, the travel time between MD 124 (the interchange closest to the Metropolitan Grove MARC Station) and Jefferson Street in Frederick (the interchange closest to the Frederick Station) would be significantly shorter in an SOV than for the Commuter Rail: 28 minutes in the SOV's worst-case scenario (Alternative 4A/4B in the PM Peak) as compared to 47 minutes in the Commuter Rail's best-case scenario (East Alternative). With such a travel time advantage, it is most likely that reverse commuters wishing to travel from Montgomery County to Frederick would select SOV over Commuter Rail as their mode of transportation.*

**Table 14: Level of Service and Travel Times for Single Occupancy Vehicles on I-270 in Non-Peak Directions During AM and PM Peak Periods**

Interchange	Miles to Next Interchange	2025 Build Alternatives					
		3A/3B		4A/4B		5A/5B	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
MD 124	0.6	B	B	B	B	B	B
WATKINS MILL ROAD	1.9	A	B	A	B	A	B
MIDDLEBROOK ROAD	0.8	B	B	A	B	A	B
MD 118	1	B	B	B	B	A	B
FATHER HURLEY BOULEVARD	1.6	B	B	B	B	A	B
NEWCUT ROAD	1.1	B	C	B	C	B	C
MD 121	3.9	C	D	C	D	C	C
MD 109	1.2	C	D	C	D	C	C
MD 75	2.6	C	C	C	D	B	C
MD 80	5.1	C	D	D	D	C	C
MD 85	2.1	B	D	B	D	B	C
JEFFERSON STREET - Total	21.9						
Estimated Travel Time - SOV (minutes)		26	27	26	28	25	26
Estimated Travel Time - Commuter Rail (minutes)		47 - 48					

Assumptions: Non-Peak Direction during the AM Peak Period is Northbound I-270  
 Non-Peak Direction during the PM Peak Period is Southbound I-270  
 Posted Speed Limits are 55 mph in Montgomery County and 65 mph in Frederick County  
 If LOS = A, then average travel rate is 55 mph  
 If LOS = B, then average travel rate is 52 mph  
 If LOS = C, then average travel rate is 50 mph  
 If LOS = D, then average travel rate is 46 mph

Sources: LOS data from I-270/US 15 Multi-Modal Corridor Study Traffic Analysis  
 Speed-Flow Relationships from Civil Engineering Reference Manual

*In addition to the travel time advantage of SOVs for reverse commuters, current population and employment data and trends indicate that few individuals would choose to make this reverse commute. US Census 2000 data indicate that approximately 59% of individuals in Frederick and Montgomery Counties commute within their own county, and their mean commute time, if they do not work at home, is approximately 32-33 minutes (See Table 15). The occupations most highly represented in the residents of Frederick and Montgomery Counties are the same in rank, although different in proportion: (1) Management/Professional, (2) Sales and Office, and (3) Service occupations. However, the median income of residents of Montgomery County is approximately 19% higher than that of residents of Frederick County. At the same time, the cost to live (monthly mortgage or rent payments) in Montgomery County is approximately 24 to 26% higher than it is in Frederick County. These differentials*

indicate that individuals may choose to live in the lower cost area (Frederick) and work in the higher wage area (Montgomery). Conversely, most individuals would not select to live in the higher cost area (Montgomery) and work in the lower wage area (Frederick); therefore, it is clear that the demand for reverse commute Commuter Rail service would be limited, in large part, by these socio-economic conditions.

Table 15: US Census 2000 Demographic Data regarding Montgomery and Frederick Counties

Demographics	Montgomery County	Frederick County
Population	873,341	195,277
<b>Employment</b>		
Unemployed	3.2%	3.1%
Median Income	\$ 71,551	\$ 60,276
Most Common Occupations		
(1) Management/ Professional	56.6%	40.5%
(2) Sales and Office	22.0%	25.7%
(3) Service	11.5%	12.9%
Work Outside the County	41.3%	41.1%
Work Inside the County*	58.7%	58.9%
Mean Commute Time (minutes)	32.8%	31.9%
<b>Housing</b>		
Occupied Housing Units	324,565	70,060
Median Value	\$ 221,800	\$ 160,200
Median Mortgage/Month	\$ 1,634	\$ 1,321
Median Rent/Month	\$ 856	\$ 633

Source: U.S. Census Bureau Summary File 3 ([www.factfinder.census.gov](http://www.factfinder.census.gov), August 21, 2002)

*Because there is clearly no travel time advantage for reverse commuters and because the number of reverse commuters is clearly limited by economic factors, reverse commute Commuter Rail service is not considered feasible at this time. As economic conditions or highway congestion change in the future, it may be appropriate to reexamine the potential for reverse commute service.*

#### 4. Storage of Rolling Stock

The MTA constructed a passenger train storage yard facility south of Frederick along the Frederick Extension tracks. The storage yard has the capacity for storing four MARC train sets overnight (three train sets plus spare vehicles). These train sets would form the MARC train roster for the four AM and four PM peak period, weekday trains of the MARC Frederick service. The Brunswick MARC storage yard is able to store six train sets.

The Frederick MARC storage yard is unable to expand. Additional storage, if required, could be made available by constructing additional track parallel to the dual MARC tracks near the Monocacy Station. The MTA is currently conducting studies to address additional storage opportunities during the midday in Washington, D.C. This storage would be located near Amtrak's Ivy City Yard.

## **5. MTA/CSX Operating Agreement**

The MTA and CSX currently have a multi-year operating agreement by which CSX provides the MTA trackage rights to operate MARC trains over CSX-owned railroad rights of way. In past years, the operating agreement also included passenger coach and locomotive maintenance. Recently, the MTA and CSX exercised a new operating agreement to extend the trackage rights for MARC service. According to sources familiar with the operating agreement, the MTA has the right to operate up to nine peak period MARC trains along the CSX Metropolitan Line. The April 2002 MARC schedule indicates that MARC is currently operating its maximum number of trains according to the operating agreement.

In addition to providing trackage rights and operating windows to MARC trains, CSX provides the locomotive engineers and train conductors for each Brunswick Line train. Based on the operating agreement, CSX is required to provide train crews for the Frederick MARC service and for each of the potential new trains that MARC may initiate beyond its projected schedule. In addition, CSX train crews would not be limited to working on trains that operated only over CSX owned tracks, such that SCX crews would be available to work on the MARC service proposed as the West and East Alternatives.

## **6. Fares**

For this I-270 Commuter Rail Feasibility Study, it is assumed that the fares for the existing MARC Brunswick Line-Frederick Extension service would serve as the basis for the fares for the new proposed service. Table 16 lists the existing and proposed service fares and indicates the assumed equivalencies.



Table 16: Existing and Proposed Service Fares

Existing Service Station Name	Existing Fare to Washington Union Station	Proposed Fare to Washington Union Station	Proposed Service Station Name
Frederick	\$5.75	\$5.75	Frederick
Monocacy	\$5.75	\$5.75	Monocacy
Point of Rocks	\$5.75	\$5.75	Urbana
Point of Rocks	\$5.75	\$5.75	Hyattstown
Barnesville	\$5.00	\$5.00	Clarksburg
Boysds	\$5.00	\$5.00	Milestone
Germantown	\$4.00	\$4.00	Germantown
Metropolitan Grove	\$4.00	\$4.00	Metropolitan Grove

Source: Current fares from [www.mtmaryland.com](http://www.mtmaryland.com), August 13, 2002.

## F. Environmental Impacts

*The proposed alternatives would generate many impacts to environmental resources. The primary impact would be new right of way acquisition from property owners. The most notable right of way impact would be the displacement of approximately 35 residences as proposed by the East Alternative. In addition, the all proposed alternatives could directly impact several wetland areas, stream crossings, residential areas and some parkland. The estimated impacts to environmental resources for the alternatives are detailed in Table 17 (Montgomery County), Table 18(Frederick County), and Table 19 (Total Impacts).*

*The environmental impacts were calculated using the Maryland geographic information system (GIS) toolbox datasets available from the Maryland Departments of Natural Resources (DNR) and Housing and Community Development (DHCD) as well as other sources. The data are derived from the most recent update to the data files available at the beginning of the feasibility study. The centerline of the proposed alternatives with a 30-foot wide buffer was then overlain on the GIS datasets to determine the number of impacts and the areas of impact within the 30-foot wide buffer. This is a preliminary level of environmental impact evaluation, based primarily on quantity rather than quality, and prepared for the purpose of feasibility analysis. Detailed environmental impact evaluations may be needed if subsequent study of some or all of these alternatives is pursued in the future.*

*The total area within the buffer for each alternative gives an indication of the quantity of right of way that may be required. However, this area does not subtract any right of way that might be current CSX right of way. For this reason, it is expected all of the alternatives will need less right of way acreage than is in the buffer because all will use the CSX Old Main Line near Frederick.*

Table 17: I-270 Commuter Rail Environmental Impacts in Montgomery County, Maryland

Resources	WEST		EAST		EAST-1		EAST-2	
	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres
<b>Aquatic Resources</b>								
<b>DNR Wetlands</b>								
Palustrine	4	0.78	12	2.67	11	2.06	10	2.17
Riverine	1	0.07	3	0.14	2	0.14	2	0.17
<b>NWI Wetlands</b>								
Palustrine	1	0.07	6	1.22	6	0.91	5	1.07
Riverine	0	0.00	0	0.00	0	0.00	0	0.00
Special Concern Wetlands	0	0.00	0	0.00	0	0.00	0	0.00
100-Year Floodplain	1	0.85	2	2.03	2	1.93	2	2.74
<b>Terrestrial Resources</b>								
County Parks	3	11.58	5	9.28	5	9.57	4	5.46
DNR Lands	0	0.00	1	2.22	1	2.22	1	2.83
Federal Lands	0	0.00	0	0.00	0	0.00	0	0.00
Sensitive Species Project Review Area	0	0.00	1	4.38	1	4.38	1	4.38
Hydric Soils	5	10.21	5	5.07	5	5.09	7	5.94
Private Conservation	0	0.00	0	0.00	0	0.00	0	0.00
<b>Socio-Economic and Cultural Resources</b>								
MD Inventory of Historic Places	8	18.54	2	0.80	2	0.89	2	5.15
National Register of Historic Places	0	0.00	0	0.00	0	0.00	0	0.00
Archeological Sites	3	10.33	7	19.18	7	19.10	7	17.73
Fire, Police (within 500 feet)	1	Hyattstown Fire	1	Hyattstown Fire	1	Hyattstown Fire	1	Hyattstown Fire



Resources	WEST			EAST			EAST-1			EAST-2		
	No. of Occurrences	Acres	No. of Occurrences	No. of Occurrences	Acres	No. of Occurrences	No. of Occurrences	Acres	No. of Occurrences	No. of Occurrences	Acres	Acres
Libraries	0	--	0	0	--	0	0	--	0	0	--	--
Schools (within 500 feet)	1	--	0	0	--	0	0	--	0	0	--	--
<b>Land Use</b>												
Residential -- Low Density	4	1.67	2	2	1.67	2	2	1.67	3	3	2.02	2.02
Commercial	5	2.68	4	4	3.09	4	4	3.08	3	3	1.82	1.82
Industrial	2	3.25	4	4	5.98	4	4	5.99	3	3	4.07	4.07
Institutional	0	0.00	1	1	0.99	1	1	0.99	1	1	1.66	1.66
Open Urban Land	1	0.12	6	6	9.92	6	6	9.89	6	6	7.30	7.30
Agriculture	15	32.52	12	12	21.43	12	12	21.43	12	12	21.00	21.00
Forest	4	38.45	7	7	37.37	7	7	37.53	9	9	46.31	46.31
Subdivisions within 1500 feet (Frederick Co. Only)	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00
<b>Smart Growth Programs</b>												
Agriculture Easements	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00
Designated Neighborhoods	3	10.94	1	1	0.55	1	1	0.55	2	2	5.37	5.37
Enterprise Zones	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00
Environmental Trust Easements	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00
Historical Trust Easements	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0.00
Priority Funding Area	9	31.21	9	9	64.36	9	9	64.39	10	10	63.47	63.47
Rural Legacy/ Rural Village	6	5.56	2	2	0.55	2	2	0.55	2	2	0.55	0.55

Table 18: I-270 Commuter Rail Environmental Impacts in Frederick County, Maryland

Resources	WEST		EAST		EAST-1		EAST-2	
	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres
<b>Aquatic Resources</b>								
<b>DNR Wetlands</b>								
Palustrine	11	3.34	11	3.34	11	3.34	11	3.34
Riverine	2	0.56	2	0.56	2	0.56	2	0.56
<b>NWI Wetlands</b>								
Palustrine	5	2.66	5	2.66	5	2.66	5	2.66
Riverine	1	0.41	1	0.41	1	0.41	1	0.41
Special Concern Wetlands	0	0.00	0	0.00	0	0.00	0	0.00
100-Year Floodplain	6	4.43	6	4.43	6	4.43	6	4.43
<b>Terrestrial Resources</b>								
County Parks	2	1.93	2	1.93	2	1.93	2	1.93
DNR Lands	0	0.00	0	0.00	0	0.00	0	0.00
Federal Lands	1	1.70	1	1.70	1	1.70	1	1.70
Sensitive Species Project Review Area	0	0.00	0	0.00	0	0.00	0	0.00
Hydric Soils	2	7.81	2	7.81	2	7.81	2	7.81
Private Conservation	0	0.00	0	0.00	0	0.00	0	0.00
<b>Socio-Economic and Cultural Resources</b>								
MD Inventory of Historic Places	1	4.87	1	4.87	1	4.87	1	4.87
National Register of Historic Places	1	4.89	1	4.89	1	4.89	1	4.89
Archeological Sites	8	19.97	8	19.97	8	19.97	8	19.97
Fire, Police (within 500 feet)	0	--	0	--	0	--	0	--



Resources	WEST		EAST		EAST-1		EAST-2	
	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres
Libraries	0	--	0	--	0	--	0	--
Schools (within 500 feet)	0	--	0	--	0	--	0	--
<b>Land Use</b>								
Residential -- Low Density	4	1.49	4	1.49	4	1.49	4	1.49
Commercial	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00
Institutional	0	0.00	0	0.00	0	0.00	0	0.00
Open Urban Land	0	0.00	0	0.00	0	0.00	0	0.00
Agriculture	5	28.17	5	28.17	5	28.17	5	28.17
Forest	6	26.06	6	26.06	6	26.06	6	26.06
Subdivisions within 1500 feet (Frederick Co. Only)	2	--	2	--	2	--	2	--
<b>Smart Growth Programs</b>								
Agriculture Easements	0	0.00	0	0.00	0	0.00	0	0.00
Designated Neighborhoods	0	0.00	0	0.00	0	0.00	0	0.00
Enterprise Zones	0	0.00	0	0.00	0	0.00	0	0.00
Environmental Trust Easements	0	0.00	0	0.00	0	0.00	0	0.00
Historical Trust Easements	0	0.00	0	0.00	0	0.00	0	0.00
Priority Funding Area	2	8.43	2	8.43	2	8.43	2	8.43
Rural Legacy/ Rural Village	0	0.00	0	0.00	0	0.00	0	0.00



Table 19: I-270 Commuter Rail Total Environmental Impacts

Resource	WEST		EAST		EAST-1		EAST-2	
	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres
<b>Aquatic Resources</b>								
<b>DNR Wetlands</b>								
Palustrine	15	4.12	23	6.01	22	5.4	21	5.51
Riverine	3	0.63	5	0.70	4	0.7	4	0.73
<b>NWI Wetlands</b>								
Palustrine	6	2.73	11	3.88	11	3.57	10	3.73
Riverine	1	0.41	1	0.41	1	0.41	1	0.41
Special Concern Wetlands	0	0.00	0	0.00	0	0.00	0	0.00
100-Year Floodplain	7	5.28	8	6.46	8	6.36	8	7.17
<b>Terrestrial Resources</b>								
County Parks	5	13.51	7	11.21	7	11.5	6	7.39
DNR Lands	0	0.00	1	2.22	1	2.22	1	2.83
Federal Lands	1	1.70	1	1.70	1	1.70	1	1.70
Sensitive Species Project Review Area	0	0.00	1	4.38	1	4.38	1	4.38
Hydric Soils	7	18.02	7	12.88	7	12.90	9	13.75
Private Conservation	0	0.00	0	0.00	0	0.00	0	0.00
<b>Socio-Economic and Cultural Resources</b>								
MD Inventory of Historic Places	9	23.41	3	5.67	3	5.76	3	10.02
National Register of Historic Places	1	4.89	1	4.89	1	4.89	1	4.89
Archeological Sites	11	30.30	15	39.15	15	39.07	15	37.70
Fire, Police (within 500 feet)	1	Hyattstown Fire	1	Hyattstown Fire	1	Hyattstown Fire	1	Hyattstown Fire



Resource	WEST		EAST		EAST-1		EAST-2	
	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres	No. of Occurrences	Acres
Libraries	0	--	0	--	0	--	0	--
Schools (within 500 feet)	1	MLK Jr. MS	0	--	0	--	0	--
<b>Land Use</b>								
Residential - Low Density	8	5.82	6	3.16	6	3.16	7	3.51
Commercial	5	2.68	4	3.09	4	3.08	3	1.82
Industrial	2	3.25	4	5.98	4	5.99	3	4.07
Institutional	0	0.00	1	0.99	1	0.99	1	1.66
Open Urban Land	1	0.12	6	9.92	6	9.89	6	7.30
Agriculture	20	60.69	17	49.60	17	49.60	17	49.17
Forest	10	64.51	13	63.43	13	63.59	15	72.37
Subdivisions within 1500 feet (Frederick Co. Only)	2	--	2	--	2	--	2	--
<b>Smart Growth Programs</b>								
Agriculture Easements	0	0.00	0	0.00	0	0.00	0	0.00
Designated Neighborhoods	3	10.94	1	0.55	1	0.55	2	5.37
Enterprise Zones	0	0.00	0	0.00	0	0.00	0	0.00
Environmental Trust Easements	0	0.00	0	0.00	0	0.00	0	0.00
Historical Trust Easements	0	0.00	0	0.00	0	0.00	0	0.00
Priority Funding Area	11	39.64	11	72.79	11	72.82	12	71.90
Rural Legacy/ Rural Village	6	5.56	2	0.55	2	0.55	2	0.55

*In addition, it is expected that the West Alternative will require substantially less right of way acreage than is in the buffer because it will also use the CSX Metropolitan Line from Boyds to Metropolitan Grove. The total area within the buffer for each alternative is:*

- West Alternative = 137 acres total*
- East Alternative = 141 acres total*
- East-1 Alternative = 141 acres total*
- East-2 Alternative = 140 acres total*

*The environmental impact evaluation indicates that with regard to aquatic resources, the West Alternative has the smallest number of impacted resources and the smallest acreage of impacts of the alternatives studied. None of the alternatives impact Special Concern Wetlands. The aquatic resource impacts will generally consist of filling and grading activities during the construction phase, the construction of bridges, ramps, and retaining walls, and the construction of storm water management facilities in the immediate project area. Impacts will be minimized where possible, and otherwise mitigated through coordination and joint permitting efforts with the U.S. Corps of Engineers, Baltimore District; and the Maryland Department of the Environment.*

*The environmental impact evaluation indicates that with regard to terrestrial resources, the alternatives vary in their impacts. For example, the West Alternative has the smallest number of impacted County Parks, while the East-2 Alternative impacts the smallest area of County Parks. Similarly, the West, East, and East-1 Alternatives have the same number of impacted Hydric Soils areas, but the East-1 Alternative impacts the smallest area of Hydric Soils.*

*The environmental impact evaluation indicates that with regard to Socio-Economic and Cultural Resources, the alternatives have very similar impacts, with the exception of the East Alternative, which requires the displacement of approximately 35 residences. All alternatives will impact one historic resource (listed on the National Register of Historic Places), using the same area of that resource. All alternatives will be located within 500 feet of the Hyattstown Fire Station. None of the alternatives will impact any libraries.*

*The environmental impact evaluation indicates that with regard to Land Use, all of the alternatives will cross agricultural and forestland in Frederick County. All of the alternatives will be located within 1500 feet of two subdivisions in Frederick County. Once in Montgomery County, however, the East alternatives will use commercial and industrial land, while the West Alternative will use agricultural and forest land areas.*

*Finally, the environmental impact evaluation indicates that with regard to Smart Growth Programs, the alternatives have very similar impacts. None of the alternatives will impact agricultural easement properties, enterprise zones, environmental trust easement properties, or Maryland Historical Trust easement properties. The East and East-1 Alternatives have the smallest number of impacts and the smallest area of impact on designated neighborhoods. In addition, the East, East-1, and East-2 Alternatives have*



*the smallest number of impacts and the smallest area of impact on rural legacy/rural village properties.*

*While all of the proposed alternatives would generate impacts to environmental resources, there is no indication that any particular resource is so significant or that any particular impact is so severe as to prohibit the construction of the proposed project.*

*A review of the potential environmental impacts indicates that the West Alternative would cause the least impact because it proposes the shortest amount of new track and requires fewer new stations than the East alternatives. The East Alternative would cause the greatest environmental impacts because, in addition to requiring similar right of way related impacts as the East-1 and East-2 alternatives, it would also require the displacement of approximately 35 residences.*

## **G. Capital Costs**

A preliminary construction cost estimate has been prepared and is separated into neat construction cost and total project cost (See Appendix I). The neat construction cost elements include: mobilization, erosion and sediment control, clearing and grubbing, grading, drainage and storm water management, structures, track work, special track work, and signalization. In addition, the neat cost estimate adds planning (20%) and construction (30%) contingencies.

The total project cost is developed by adding cost provisions associated with future changes and claims (10%), design fees (10%), MTA Costs during design (2.5%), construction inspection (8%), required right of way, utility relocations and an agency force account. Costs are approximate due to mapping limitations at the time of this report.

The preliminary capital cost estimate for each of the alternatives is summarized in Table 20. The detail supporting this summary is presented in Appendix J.

Table 20: Preliminary Capital Cost Estimate Summary by Alternative

Cost Level/Item	Costs (in \$ millions) <sup>1</sup>			
	West Alternative	East Alternative	East-1 Alternative	East-2 Alternative
Length of New Track (miles)	13.35	19.51	19.53	19.39
Number of Bridges	6	22	22	24
Length of Bridges (linear feet)	8,300	7,500	7,500	8,600
Excavation Quantity (million cubic yards)	5.13	6.35	6.34	6.52
Fill Quantity (million cubic yards)	1.38	1.81	1.41	2.13
Base Estimate Subtotal (\$ millions)	\$ 303	\$ 356	\$ 485	\$ 374
Net Construction Cost <sup>2</sup> (\$ millions)	\$ 516	\$ 606	\$ 824	\$ 636
<b>Total Project Cost<sup>3</sup> (\$ millions)</b>	<b>\$ 844</b>	<b>\$ 965</b>	<b>\$ 1,261</b>	<b>\$ 1,006</b>
Preliminary Engineering (\$ millions)	\$ 64	\$ 76	\$ 103	\$ 79
Construction (\$ millions)	\$ 643	\$ 753	\$ 1,022	\$ 791
Right of Way (\$ millions)	\$ 137	\$ 136	\$ 136	\$ 136

<sup>1</sup> Complete project cost estimates presented in Appendix J.

<sup>2</sup> Net Construction Cost includes base estimate subtotal, planning contingency and construction contingency.

<sup>3</sup> Total Project Cost includes base estimate subtotal, planning contingency, construction contingency, future changes and claims, consultant design fee, MTA design cost, construction inspection and CRS, MTA construction cost, right of way, right of way contingency, utilities, and agencies/force account. Total Project Cost was estimated using 2002 dollars and excludes escalation.

Table 21 presents context cost data regarding other proposed commuter rail projects in the United States. The data were obtained from the National Transit Database from New Start Federal Transit Administration project summary forms. These data are provided for reader reference and informational purposes only.

Table 21: Proposed U.S. Commuter Rail Projects

Location	Length (miles)	Capital Costs (millions)	Capital Costs/Mile (millions)	Annual Operating Costs (millions)	Projected Ridership (average weekday boardings)	Operating Costs/ Passenger Mile
Dallas-Ft. Worth, TX	25.0	\$ 184.10	\$ 7.36	\$ 9.20	11,000	n/a
Ft. Lauderdale, FL	71.7	\$ 327.00	\$ 4.56	\$ 46.80	42,100	\$ 0.35
Tacoma-Seattle, WA	8.0	\$ 86.00	\$ 10.75	n/a	2,800	n/a
Chicago, IL (Central Kane Corridor)	8.0	\$ 142.10	\$ 17.76	\$ 6.73	3,900	\$ 0.22
Chicago, IL (Southwest Corridor)	11.0	\$ 218.70	\$ 19.88	\$ 7.80	7,600	\$ 0.23
Chicago, IL (North Central Corridor)	16.0	\$ 236.40	\$ 14.78	\$ 6.70	8,400	\$ 0.23
Atlanta-Griffin-Macon County, GA	102.0	\$163.12	\$ 1.60	n/a	n/a	n/a
Johnson Co./Kansas City (MO)	23.0	\$ 30.90	\$1.34	\$ 4.20	1,400-3,800	n/a
Nashville, TN (East Corridor Commuter Rail)	31.1	\$ 33.20	\$ 1.07	\$ 2.00	1,400	n/a
New York City (LIRR East Side Access)*	4.0	\$ 4,350.00	\$ 1,087.50	\$ 157.80	351,000	n/a
Raleigh, NC	34.7	\$ 754.70	\$ 21.75	\$ 28.40	17,600	\$ 0.44
<b>Average Proposed Project*</b>	<b>33.1</b>	<b>\$ 217.92</b>	<b>\$ 10.09</b>	<b>\$ 13.98</b>		<b>\$ 0.29</b>

Source: National Transit Database 2000 Data ([www.ntdprogram.com/NTD/ntdhome.nsf](http://www.ntdprogram.com/NTD/ntdhome.nsf))

\* Averages exclude the New York City LIRR East Side Access Project because its project description includes extensive tunneling.

## H. Operating Costs

Operating costs account for the cost of operating and maintaining the commuter rail service. As described in the Operations Plan section of this report, it is assumed the I-270 Commuter Rail service would consist of four AM and four PM peak period trains per weekday. Typical operating costs of MARC trains account for cost of fuel, train crews, maintenance, and CSX trackage rights. Estimated operating and maintenance costs have not been calculated for this report.

Table 21 above presents context cost data regarding other proposed commuter rail projects in the United States, including estimated operating costs for those projects. The data were obtained from the National Transit Database from New Start Federal Transit Administration project summary forms. These data are provided for reader reference and informational purposes only.

*proposed Commuter Rail project in the United States, with the exception of the LIRR East Side Access project in New York City.*

### **C. Environmental Impacts**

*The proposed alternatives would generate many impacts to environmental resources. The primary impact would be new right of way acquisition from property owners. The most notable right of way impact would be the displacement of approximately 35 residences as proposed by the East Alternative. In addition, all proposed alternatives could directly impact several wetland areas, stream crossings, residential areas and some parkland.*

*While all of the proposed alternatives would generate impacts to environmental resources, there is no indication that any particular resource is so significant or that any particular impact is so severe as to prohibit the construction of the proposed project.*

*A review of the potential environmental impacts indicates that the West Alternative would cause the least impact because it proposes the shortest amount of new track and requires fewer new stations than the East alternatives. The East Alternative would cause the greatest environmental impacts because, in addition to requiring similar right of way related impacts as the East-1 and East-2 alternatives, it would also require the displacement of approximately 35 residences.*

*Options to reduce the potential environmental impacts of some alternatives could be explored in the future. A cut and cover box could be employed in the East Alternative to minimize the displacement of residences, but the construction cost of the alternative would be increased by approximately \$100 million (a 10% increase over the current estimate). Also the new right of way required by the East-2 Alternative could be reduced by employing a deck over the CCT right of way, but the construction cost of the alternative would be increased by approximately \$100 million (a 10% increase over the current estimate). Other options to reduce impacts may also exist and could be developed and evaluated in future studies.*

### **D. Comparison of Alternatives**

*Of the four alternatives examined, no particular alternative has a travel time benefit. Further, the ridership forecasts for the four alternatives are roughly equivalent, although the West Alternative may attract approximately 45 additional riders over the East alternatives. The West Alternative also has the least environmental impacts and least total cost because it constructs the shortest amount of new track and requires fewer new stations than the East alternatives. Therefore, the West Alternative may be the most overall feasible alternative of those identified to date, and it should be considered in any future study examining the possibility of Commuter Rail service between Frederick and*

Washington, D.C., in the I-270 corridor. However, all alternatives identified to date are feasible from an engineering standpoint.

## **E. Recommendations for Next Steps**

*Based on the results and conclusions of the current study, the next steps for the MTA should include the following:*

- 1. Continue to support transit-oriented development patterns (i.e., residential and employment land uses) around the identified station locations in both Frederick and Montgomery Counties.*
- 2. Conduct a locally sponsored (City of Frederick, Frederick County, and Montgomery County) transit alignment corridor preservation and mode alternatives study to locate the preferred alignment and station locations for the project. Consider reducing the number of stations for the preferred alignment in order to decrease travel time and increase potential ridership. Corridor preservation designation would make the right of way eligible for protective acquisition funding when or if development that would preclude the construction of the project was imminent.*
- 3. Conduct a new ridership forecast sensitivity analysis to evaluate the assumptions employed in the base ridership model, i.e., the I-270 build alternative, the CCT modal choice, the density of planned development, express train priority scheduling, increased track capacity on CSX's Metropolitan Line, and the number of proposed station stops.*
- 4. Preserve an alignment within the local master plans (City of Frederick, Frederick County, and Montgomery County) for Commuter Rail between Frederick and the CSX Metropolitan Line.*
- 5. Continue to promote staged transit system development in future regional long-range transportation plans.*



# I-270 Commuter Rail Feasibility Study



## **Appendix A**

### *Alignment Maps*



**I-270 Commuter Rail  
Feasibility Study**



## **Appendix C**

### ***Environmental Aquatic Resources***

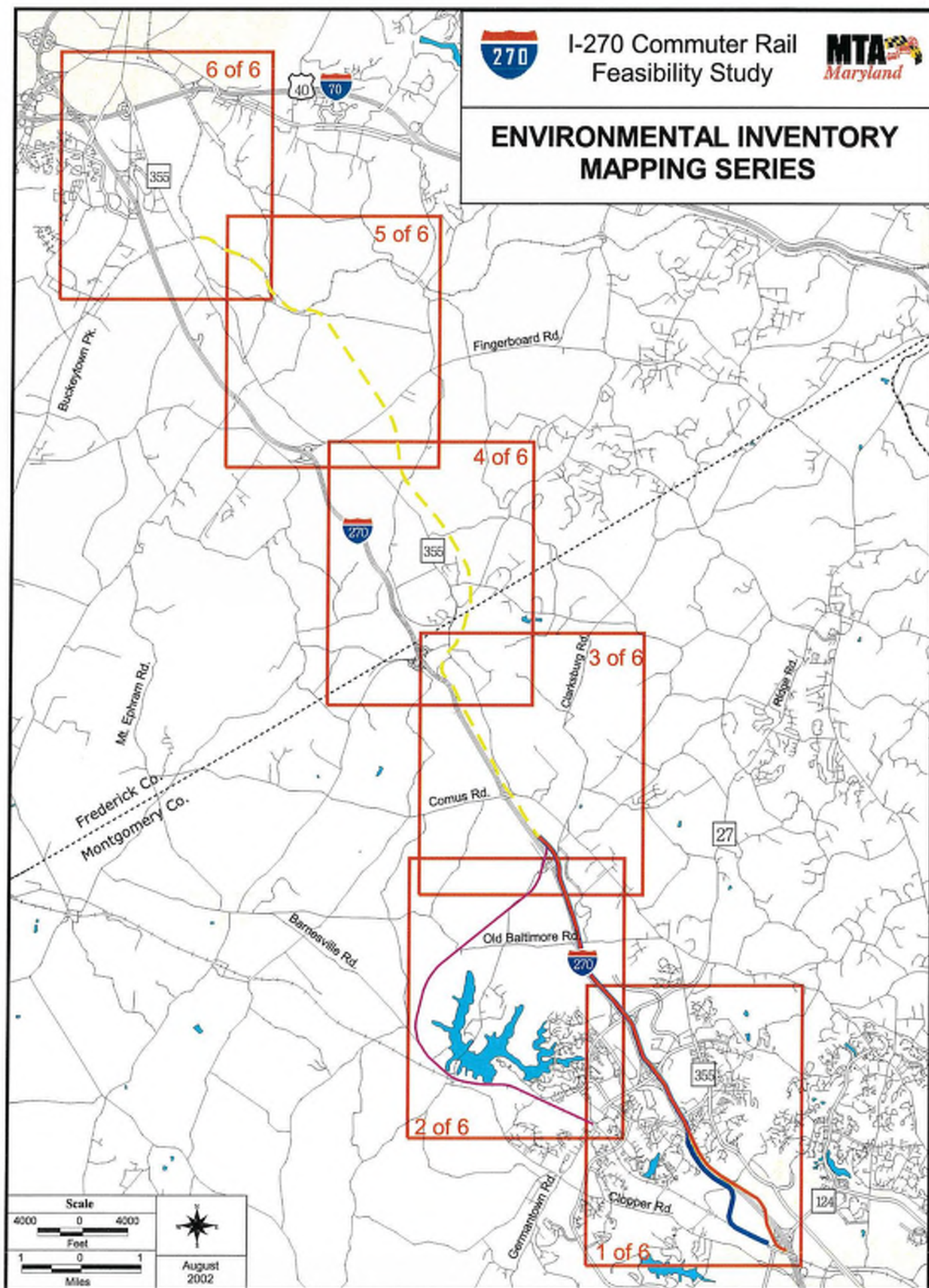




I-270 Commuter Rail  
Feasibility Study



**ENVIRONMENTAL INVENTORY  
MAPPING SERIES**





# I-270 Commuter Rail Feasibility Study



## ENVIRONMENTAL INVENTORY MAPPING SERIES



### LEGEND FOR BASEMAP INFORMATION

#### Alignments

-  East
-  East - 1
-  East - 2
-  West
-  Alignment 3 - Urbana Option

-  Sheets
-  Roads
-  County Boundary
-  City

### MISSING INFORMATION

-  Smart Growth Series - Forest Legacy
-  Smart Growth Series - Heritage Preservation & Tourism Zones
-  Terrestrial Resources Series - Forest Interior Dwelling Species





# I-270 Commuter Rail Feasibility Study



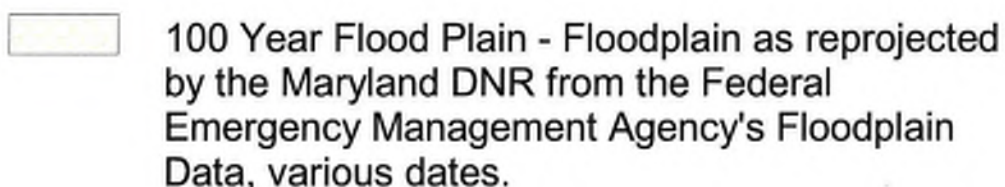
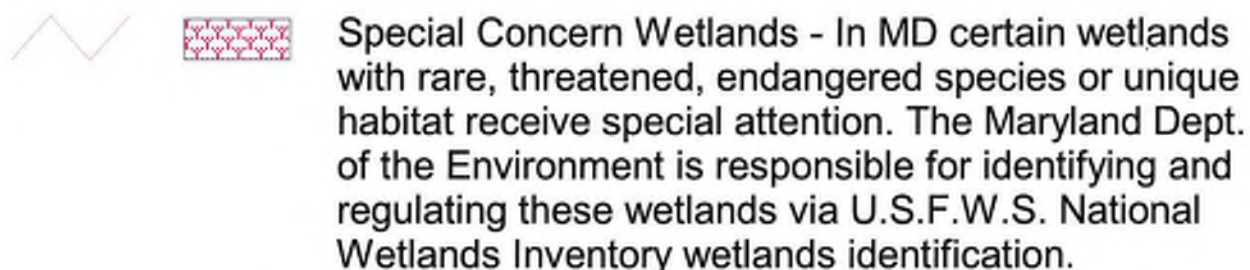
## ENVIRONMENTAL INVENTORY MAPPING SERIES

### Legend for MAP SERIES C - Environmental Aquatic Resources

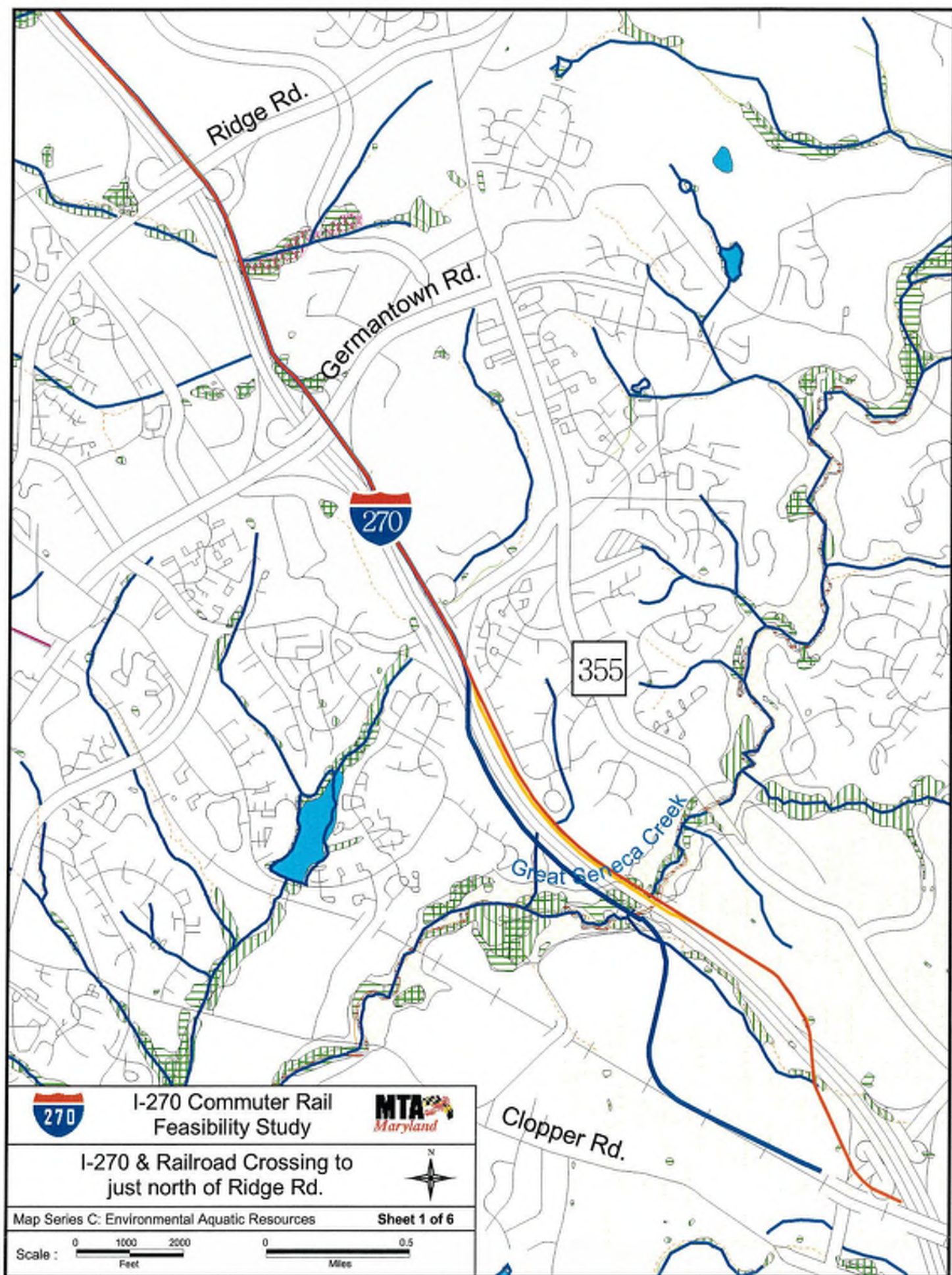
**NWI Wetlands** - Records of wetland locations and classifications as defined by U.S. Fish & Wildlife Service



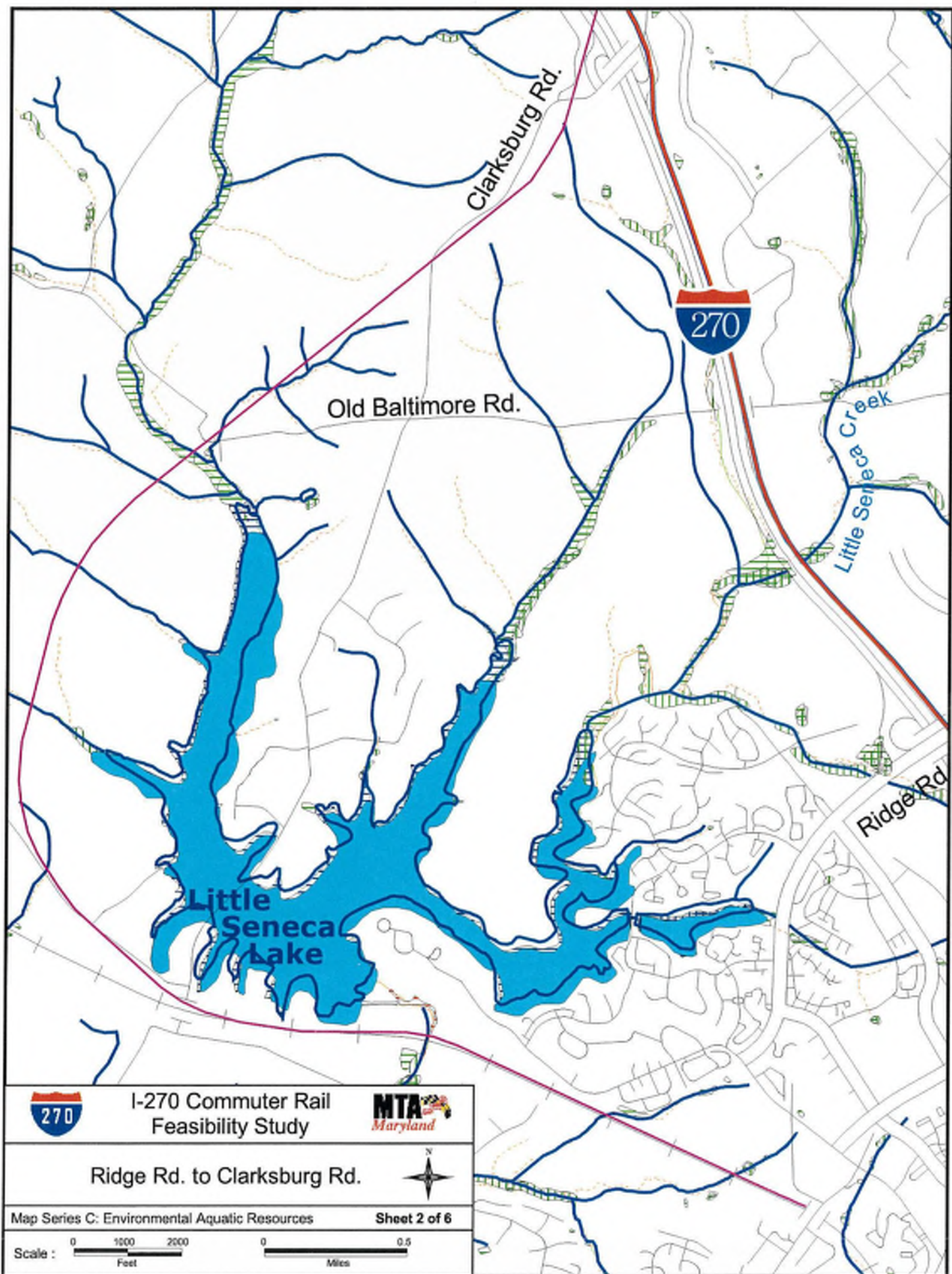
**DNR Wetlands** - MdDNR files are records of wetland location and classifications as defined by U.S. Fish & Wildlife Service.



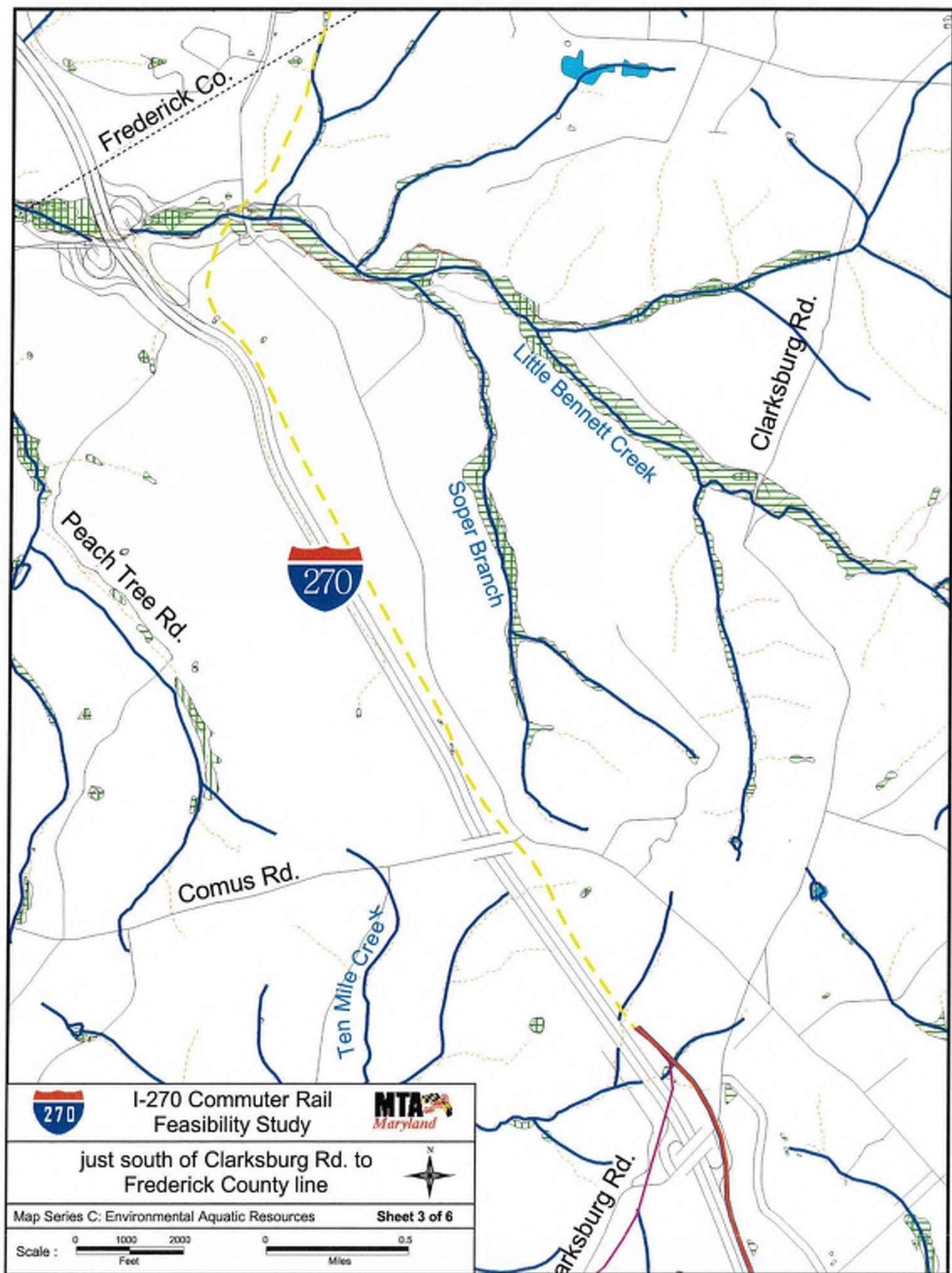




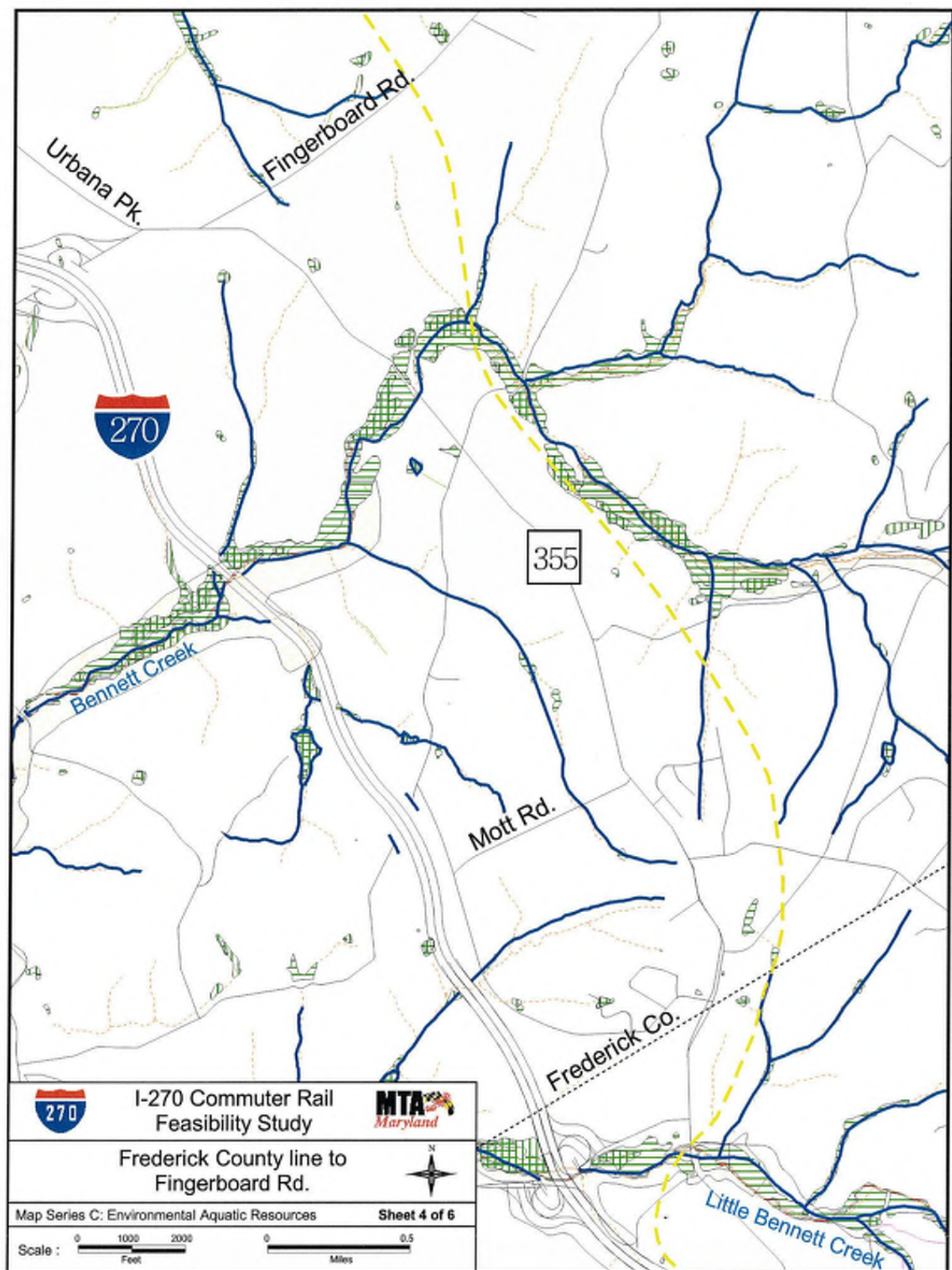
















I-270 Commuter Rail  
Feasibility Study



Fingerboard Rd. to  
north of Ball Rd.

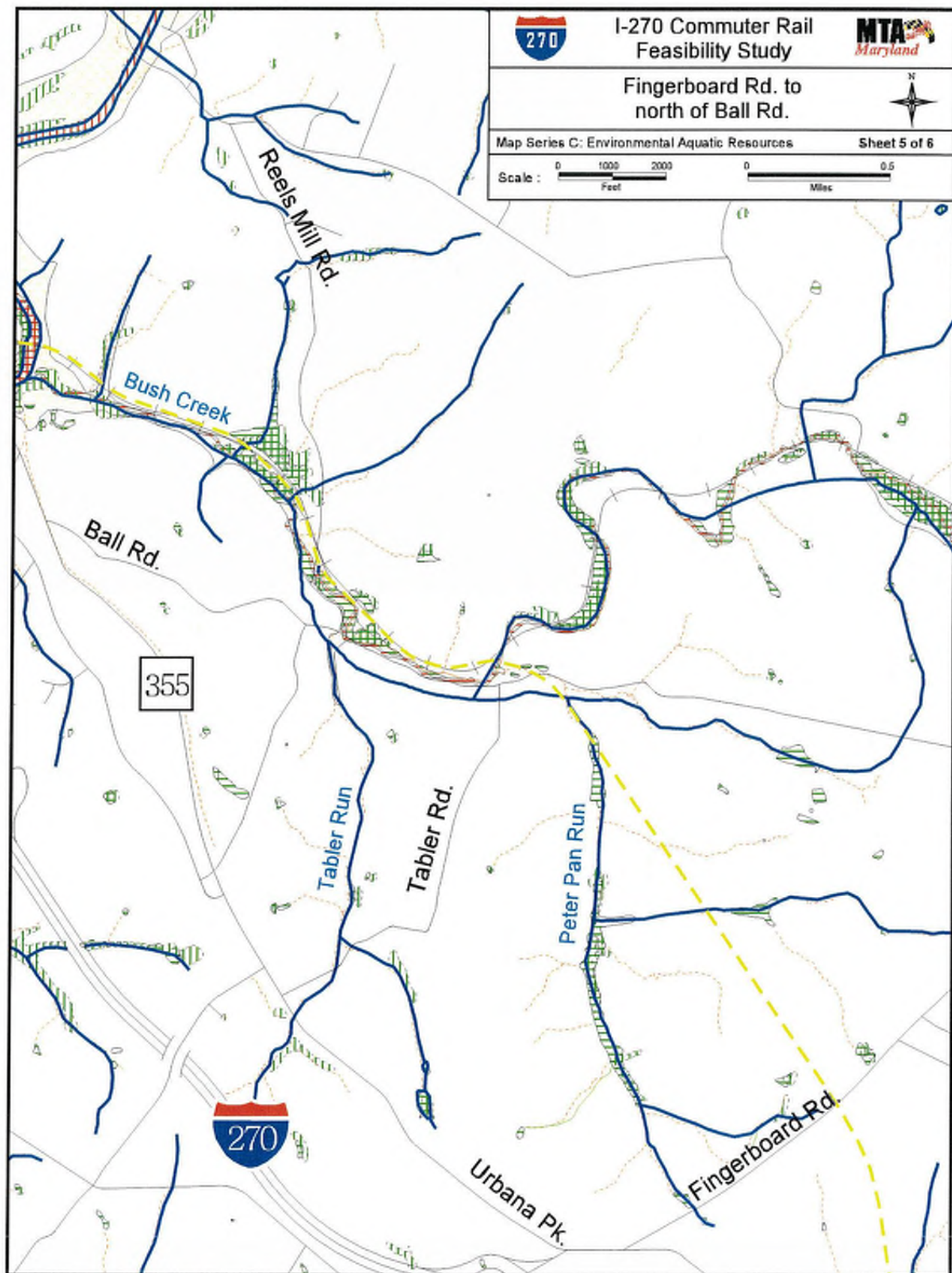


Map Series C: Environmental Aquatic Resources

Sheet 5 of 6

Scale : 0 1000 2000  
Feet

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Miles







I-270 Commuter Rail  
Feasibility Study



Ball Rd. to City of Frederick

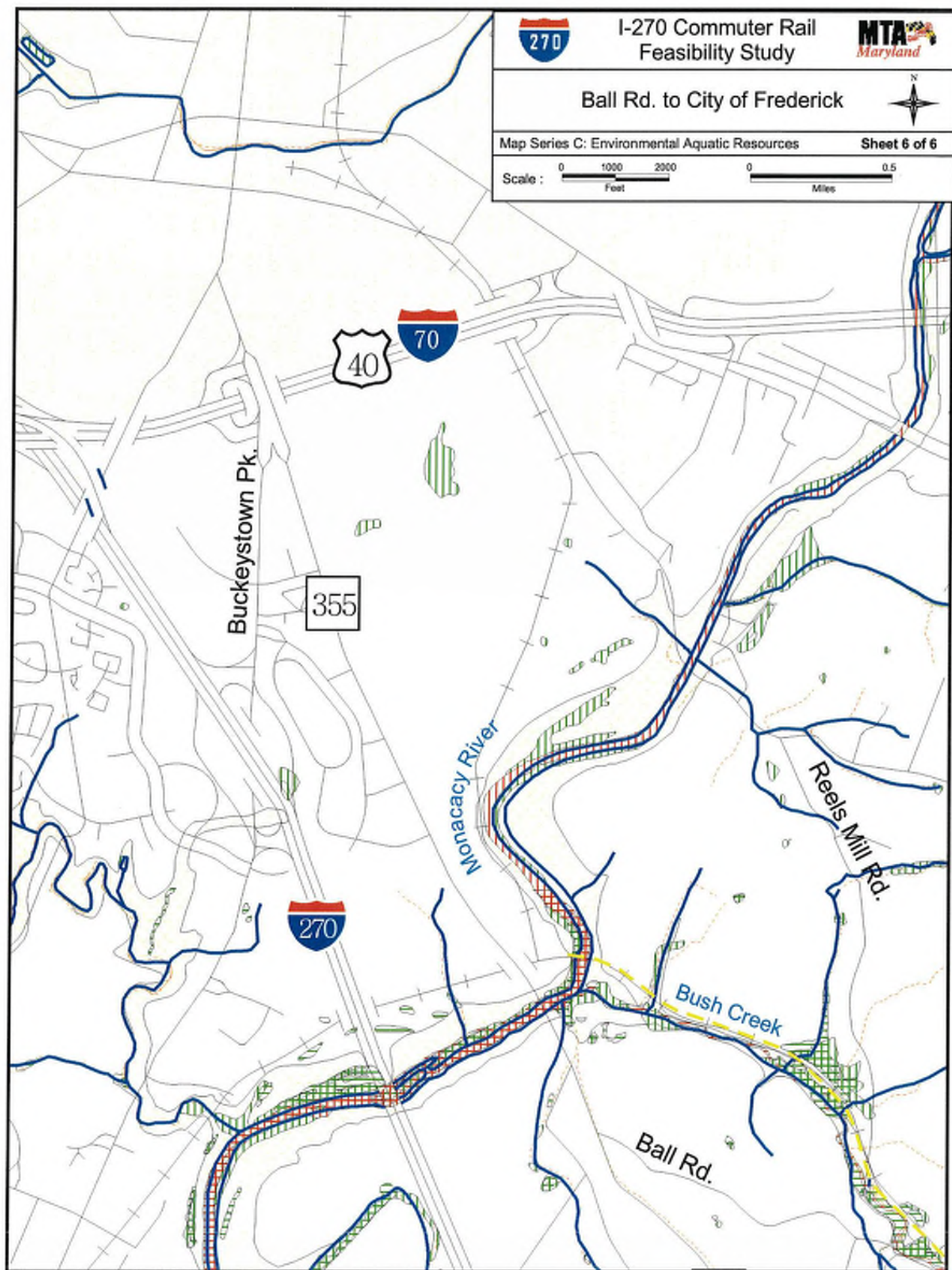


Map Series C: Environmental Aquatic Resources

Sheet 6 of 6

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Feet

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Miles





# I-270 Commuter Rail Feasibility Study



## **Appendix D**

### *Environmental Terrestrial Resources*





# I-270 Commuter Rail Feasibility Study



## ENVIRONMENTAL INVENTORY MAPPING SERIES

### Legend for MAP SERIES D - Environmental Terrestrial Resources



Sensitive Species Areas - Areas defined by MdDNR, Wildlife and Heritage Division, as being locations which have identified species of special concern (plant and animal). From MdDNR Technology toolbox, 1998.



Federal Lands - MdDNR reprojection of lands owned and/or operated by the U.S. Federal Government, 1998.



DNR Owned Lands - Lands owned by the State of Maryland as defined by MdDNR, including proposed/planned acquisitions; also includes land identified as being part of the State Park System of Maryland - 1994/2000.



County Parks - Areas defined by Montgomery and Frederick County as being owned by them for public recreation, reprojected by MdDNR, 1998.



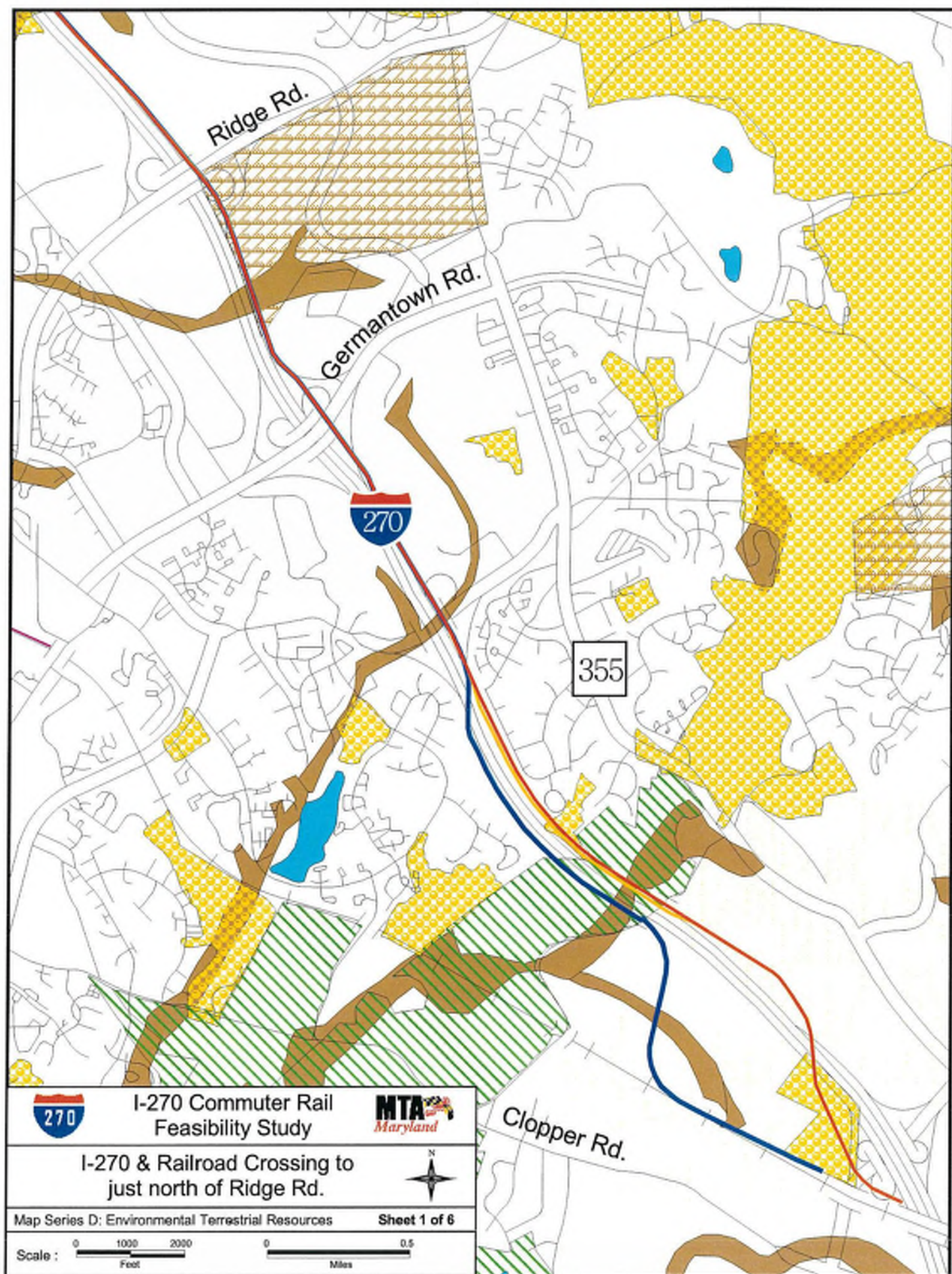
Private Conservation Area - areas that are privately held or owned identified by parcels' common name. Taken from the MdDNR Technology Toolbox, 1998.

### Soils

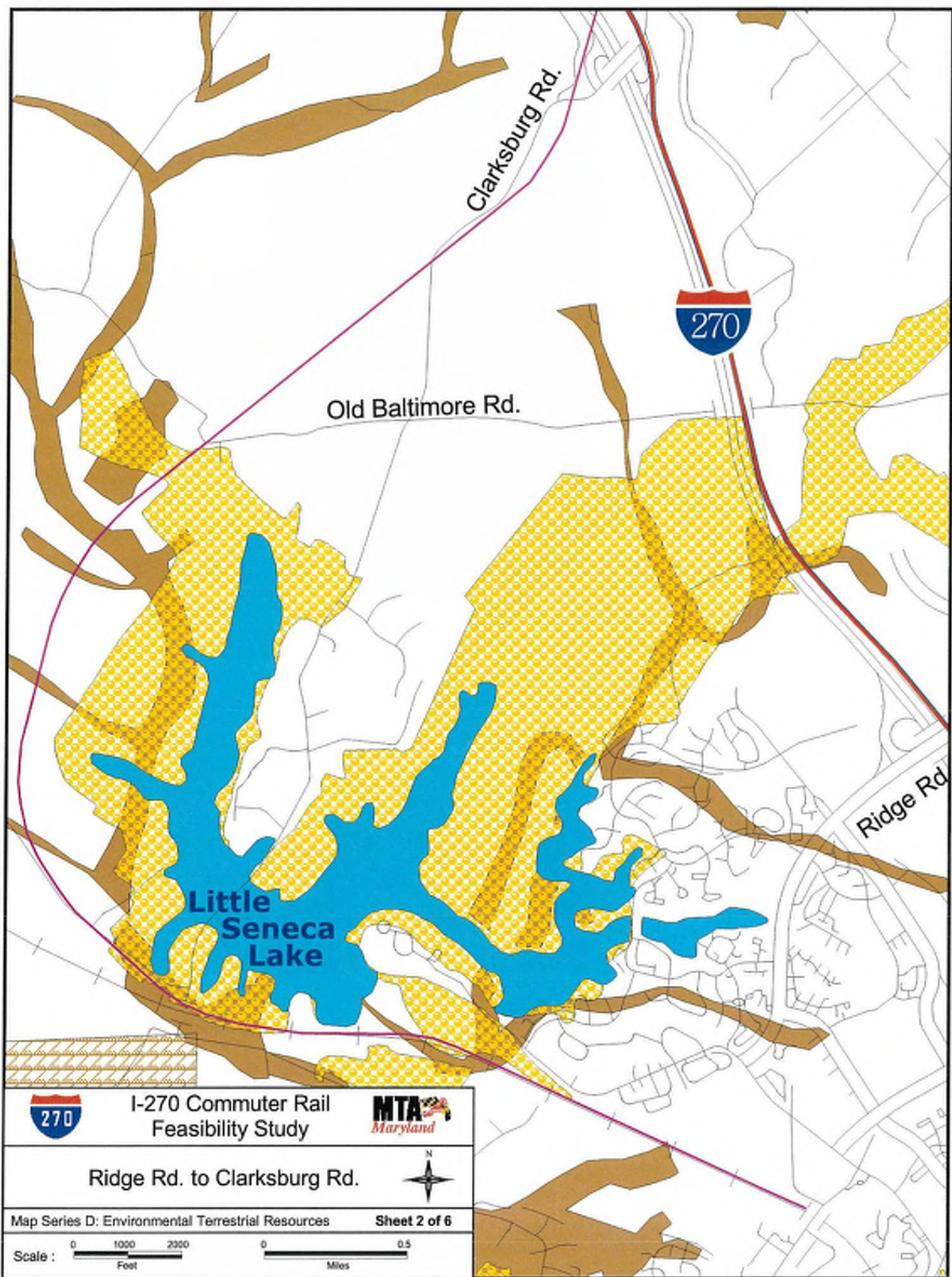


Hydric Soil - U.S. Department of Agriculture, National Resource Conservation Service provided data for hydric soils. 1998.

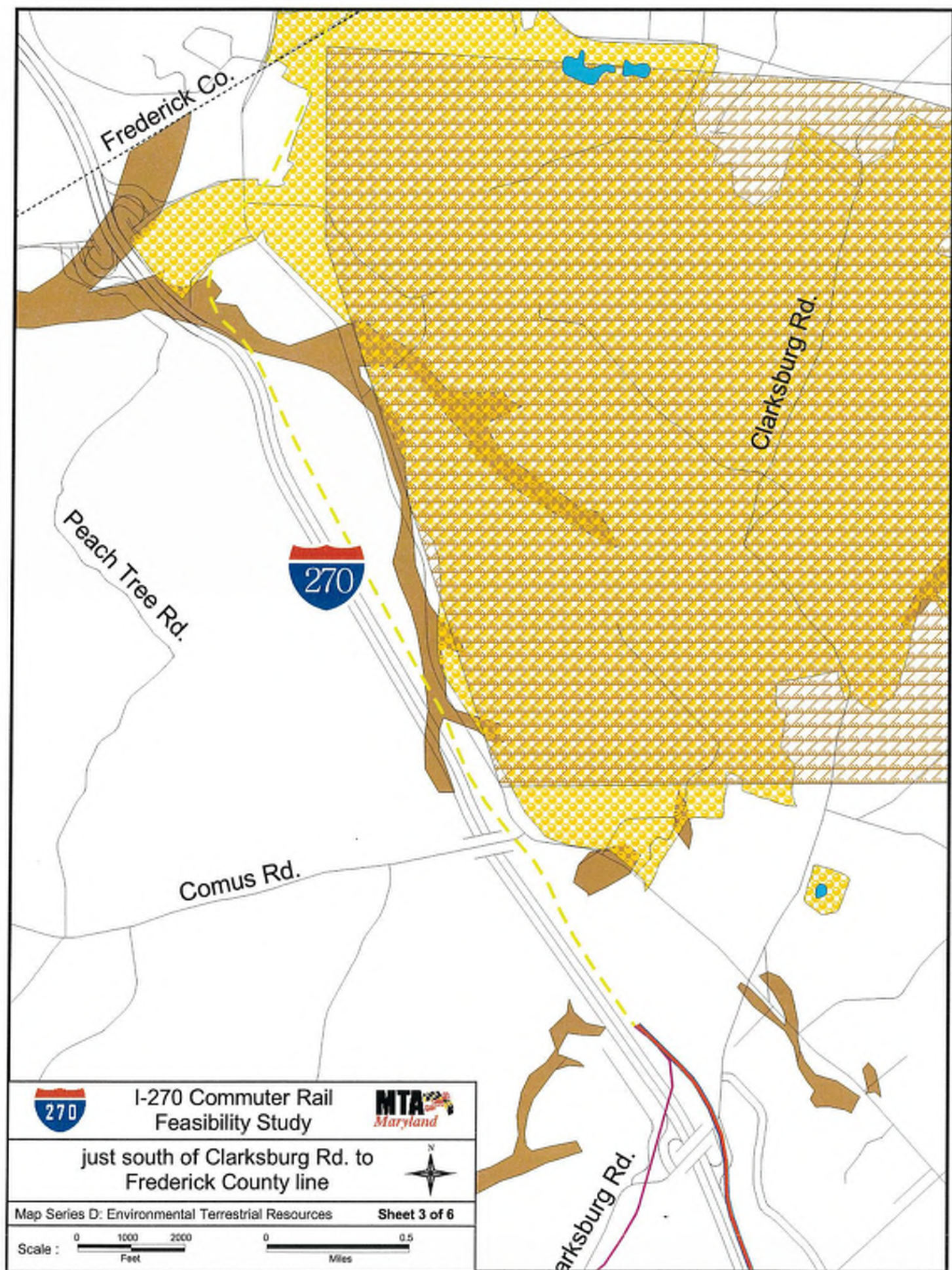




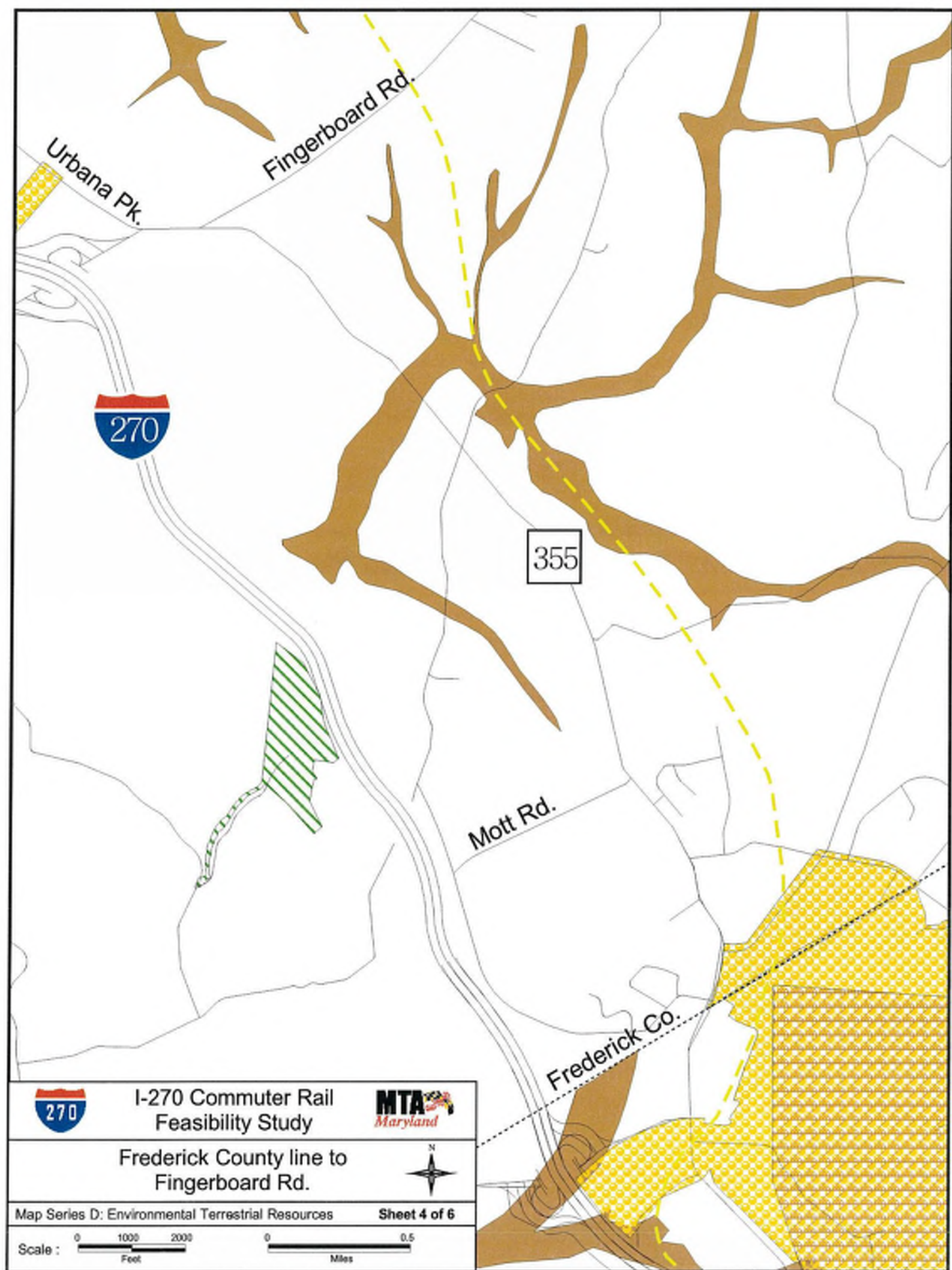
















I-270 Commuter Rail  
Feasibility Study



Fingerboard Rd. to  
north of Ball Rd.



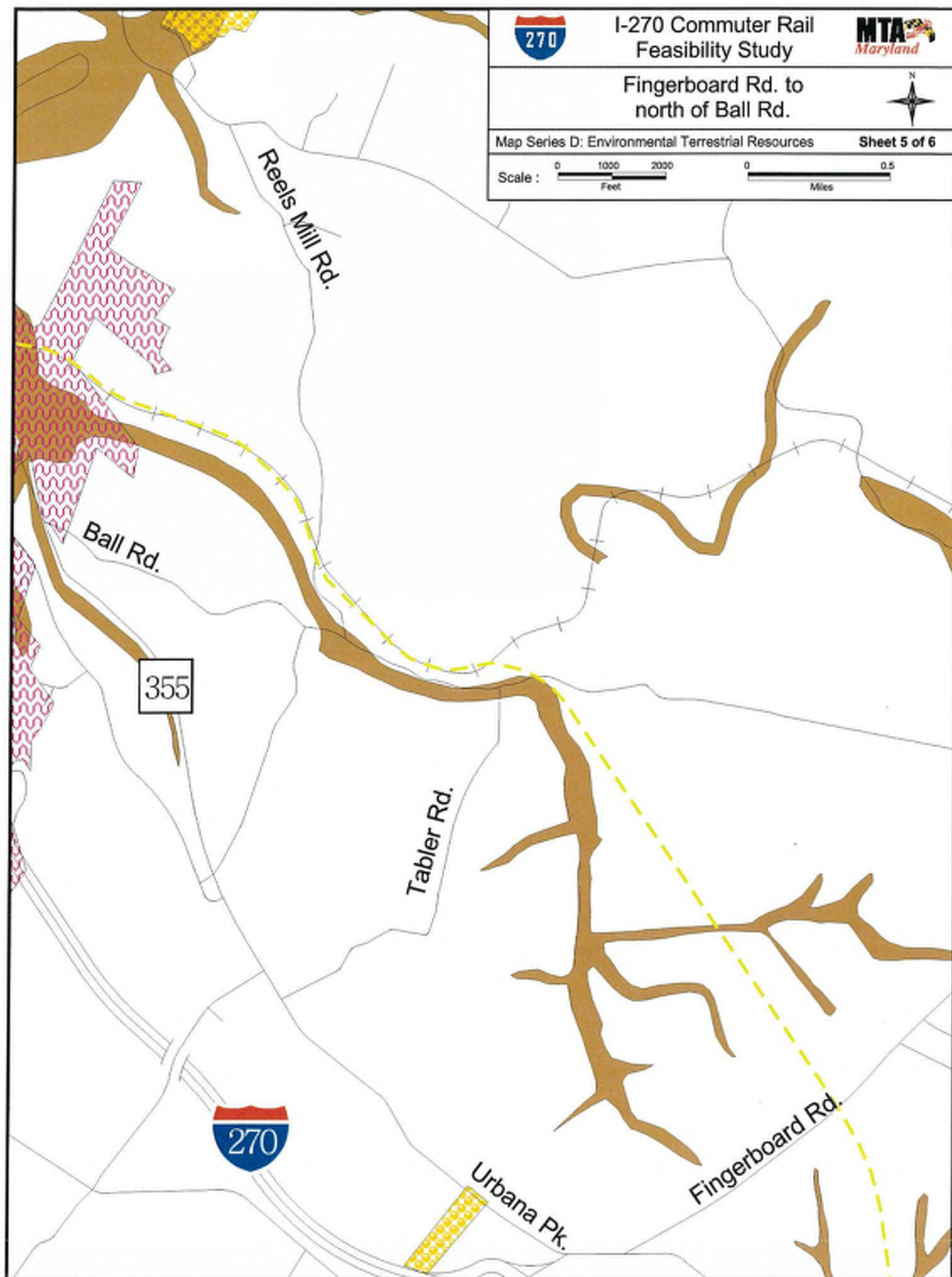
Map Series D: Environmental Terrestrial Resources

Sheet 5 of 6

Scale :

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Feet

0 0.5  
Miles







I-270 Commuter Rail  
Feasibility Study



Ball Rd. to City of Frederick



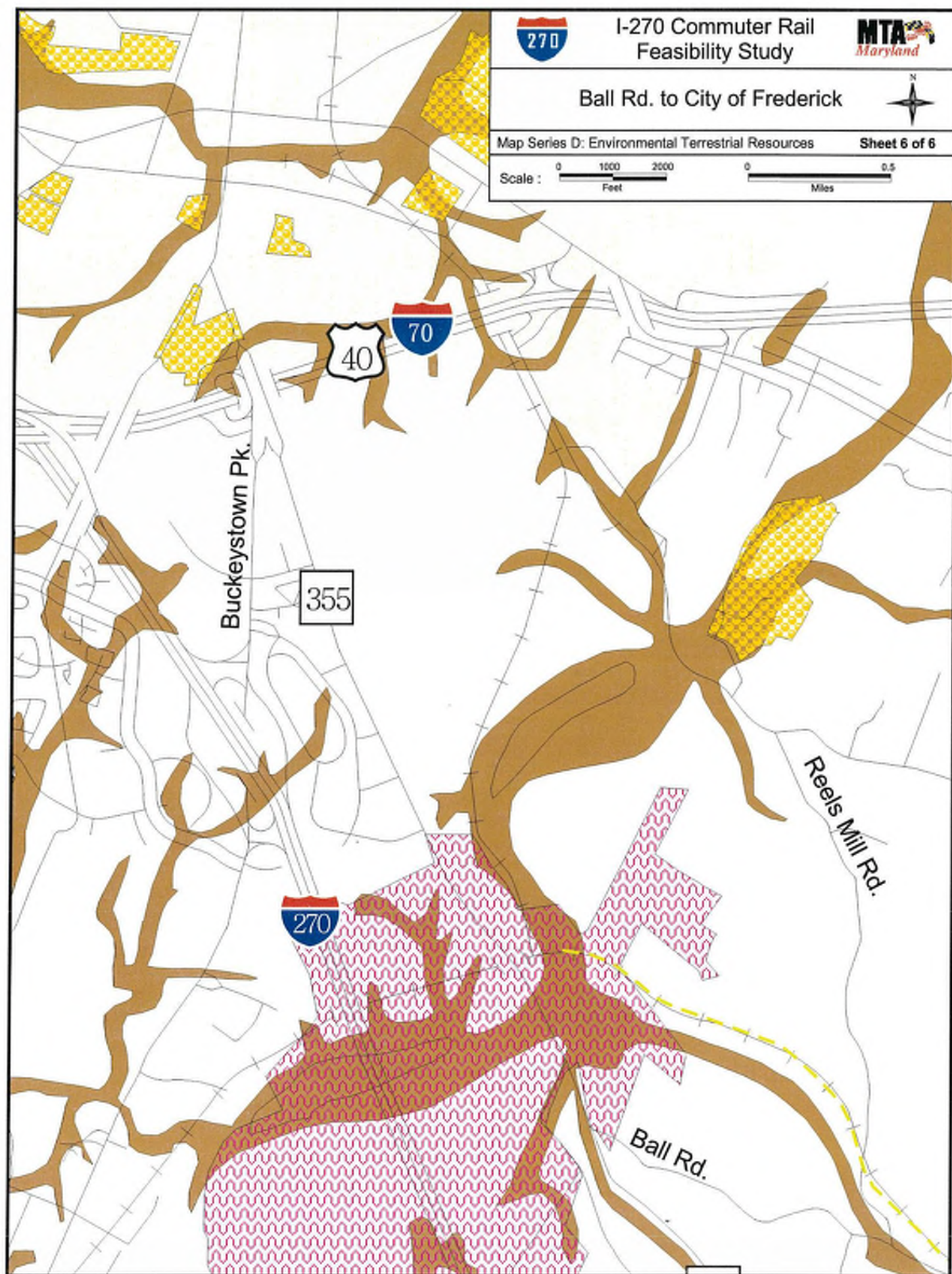
Map Series D: Environmental Terrestrial Resources

Sheet 6 of 6

Scale :

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Feet

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Miles





**I-270 Commuter Rail  
Feasibility Study**



## **Appendix E**

### ***Socio-Economic and Cultural Resources***





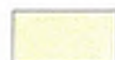
# I-270 Commuter Rail Feasibility Study



## ENVIRONMENTAL INVENTORY MAPPING SERIES

### Legend for MAP SERIES E - Socio-Economic and Cultural Resources

Racial Profiles - represented in pie chart format for each Census Tract. This information was obtained from the 1990 Census. Still waiting for data from the 2000 Census.



- percent White population per Census Tract.



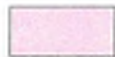
- percent African-American per Census Tract.



- percent American Indian\Eskimo per Census Tract



- percent Asian\Pacific Island per Census Tract.



- percent Hispanic per Census Tract



- percent other\not already listed per Census Tract.

### Points Of Interest



COLLEGE - names of colleges from the 1998 ADC mapping and 2000 Thomas Brothers Metro Washington D.C. book.



SECONDARY SCHOOL - names of secondary schools from the 1998 ADC Frederick mapbook & 2000 Thomas Brothers Metro Washington D.C. book.



PRIMARY SCHOOLS- names of primary schools from the 1998 ADC Frederick mapbook & 2000 Thomas Brothers metro Washington D.C. book.



FIRE STATIONS - stations listed in 1998 ADC Frederick mapbook & 2000 Thomas Brothers Metro Washington D.C. book.



POLICE STATIONS - stations listed in 1998 ADC Frederick mapbook and 2000 Thomas Brothers Metro Washington D.C. book.



LIBRARY - locations of libraries listed in 1998 ADC Frederick mapbook and 2000 Thomas Brothers Metro Washington D.C. book.



Archeological Site Presence- MHT listing of presence of recorded archaeological sites within a digitized grid - December 1997.



MD Inventory of Historic Places- depictions of approximate locations of historic structures, monuments, districts & other properties listed on the MD Inventory of Historic Properties maintained by MHT's Office of Research - October 1996.

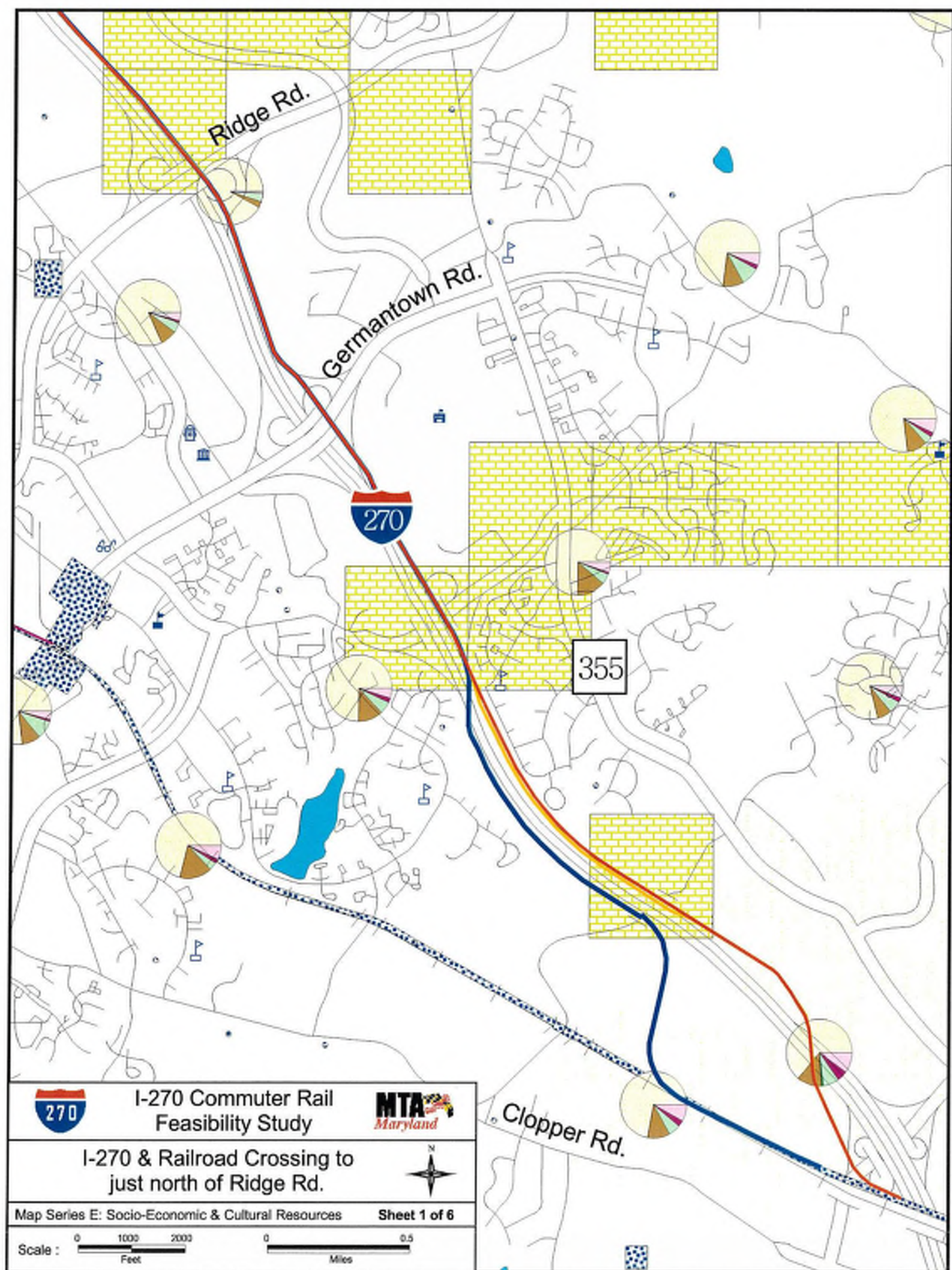


National Register of Historic Places- properties identified by the U.S. Dept. of the Interior as significant in American history and culture. October 1996.

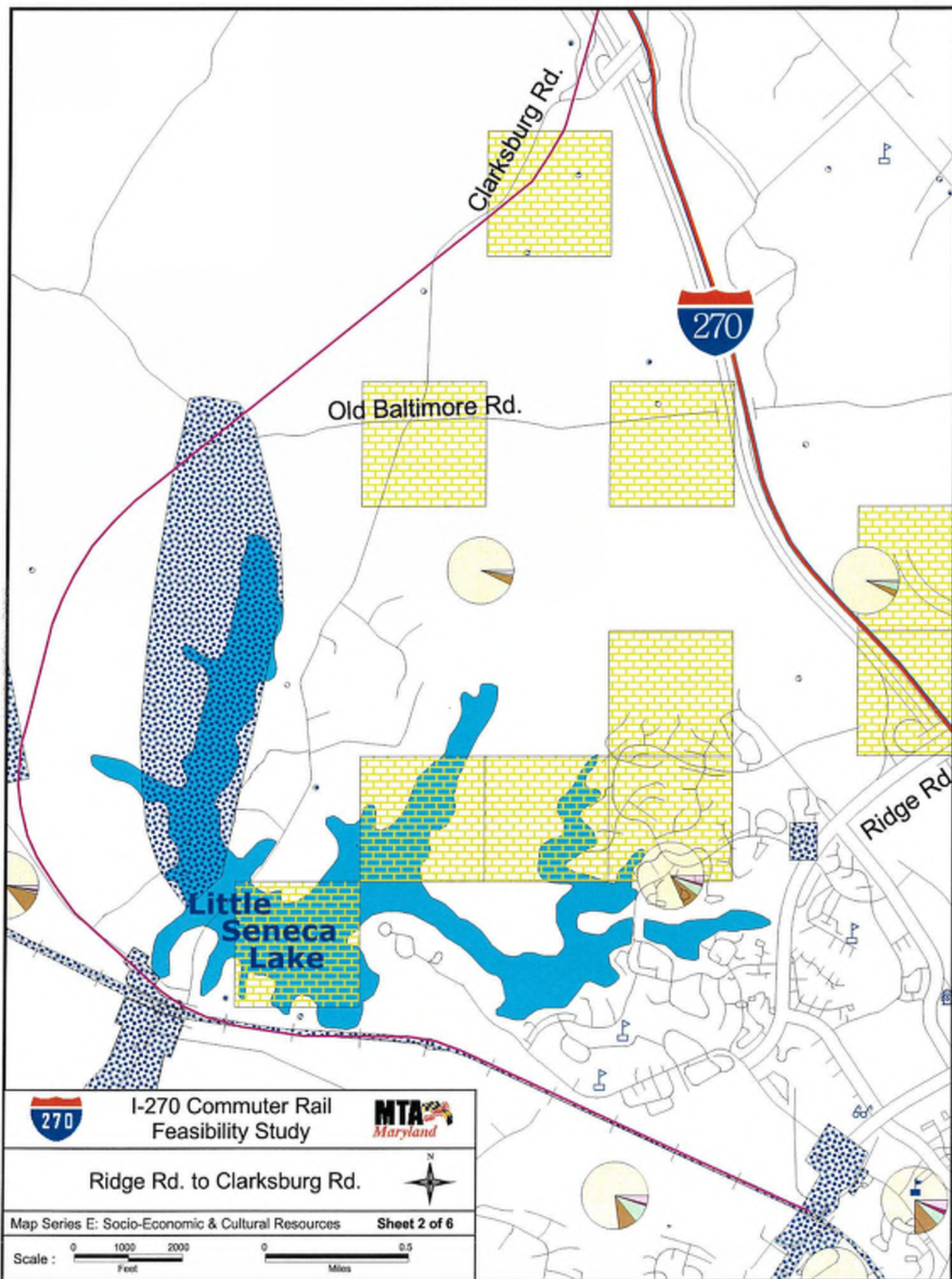


CERCLIS \ NPL - Superfund sites listed by the EPA, as of March 2000.

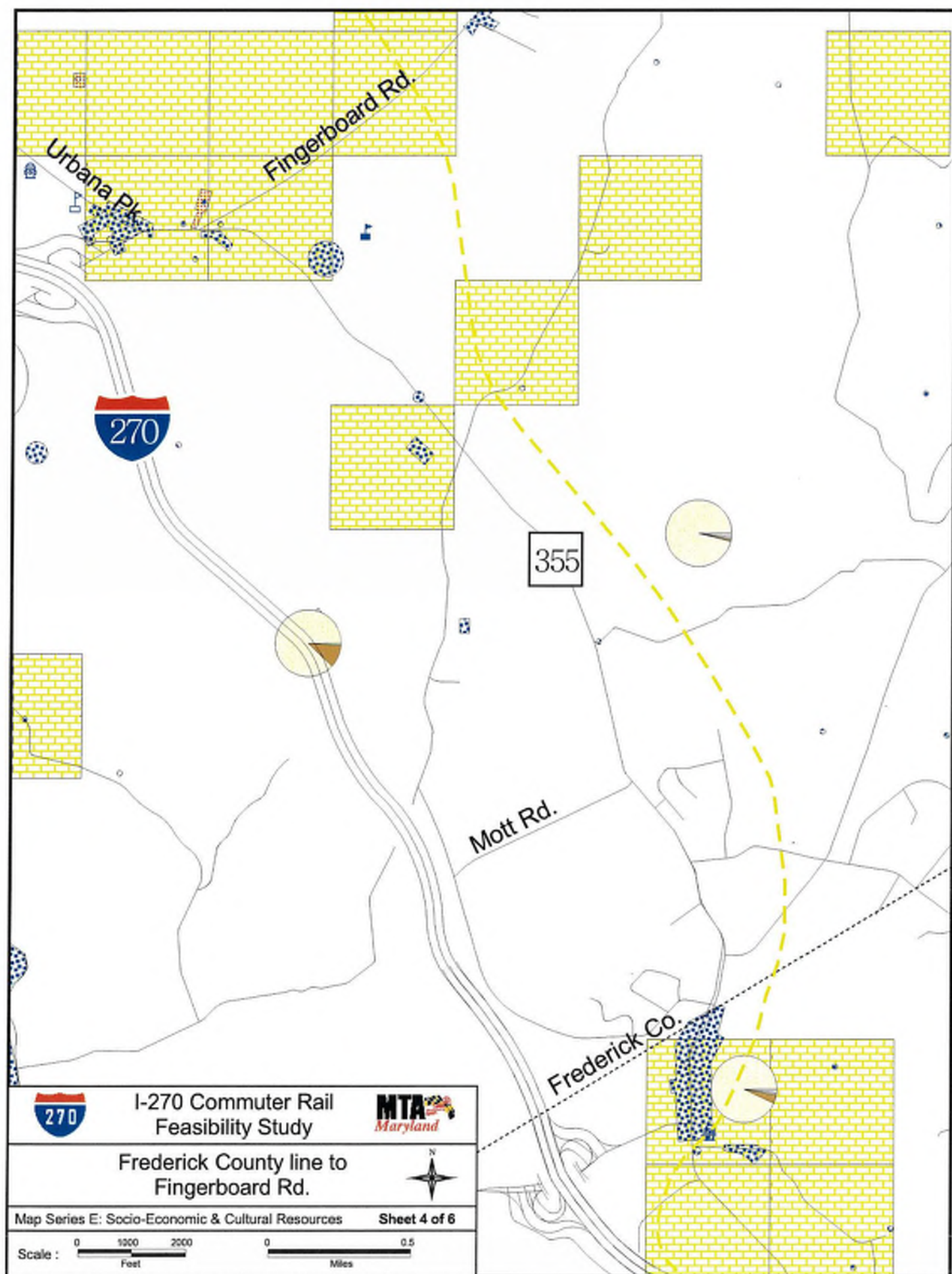














I-270 Commuter Rail  
Feasibility Study



Fingerboard Rd. to  
north of Ball Rd.



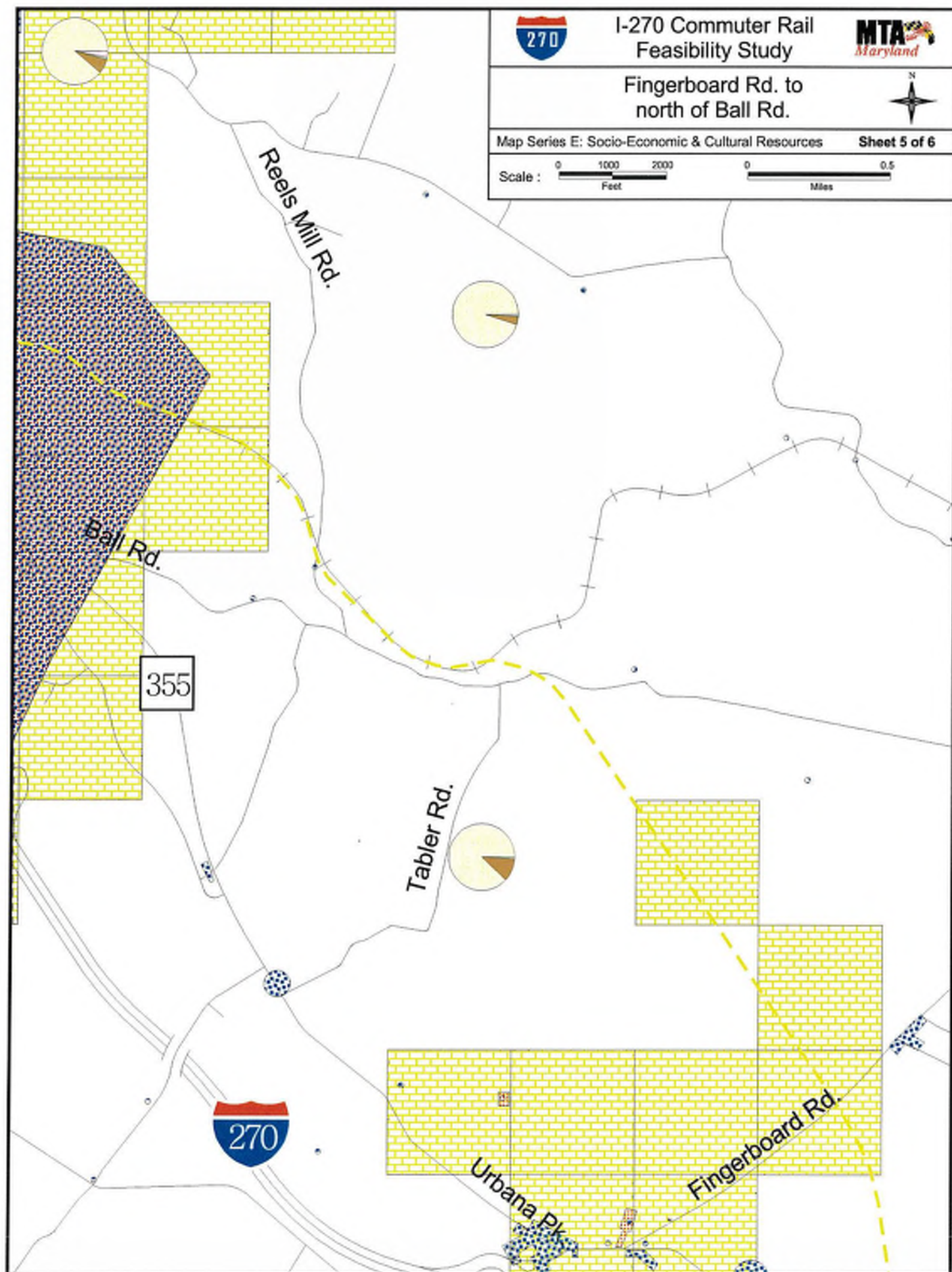
Map Series E: Socio-Economic & Cultural Resources

Sheet 5 of 6

Scale :

0 1000 2000  
Feet

0 0.5  
Miles







I-270 Commuter Rail  
Feasibility Study



Ball Rd. to City of Frederick

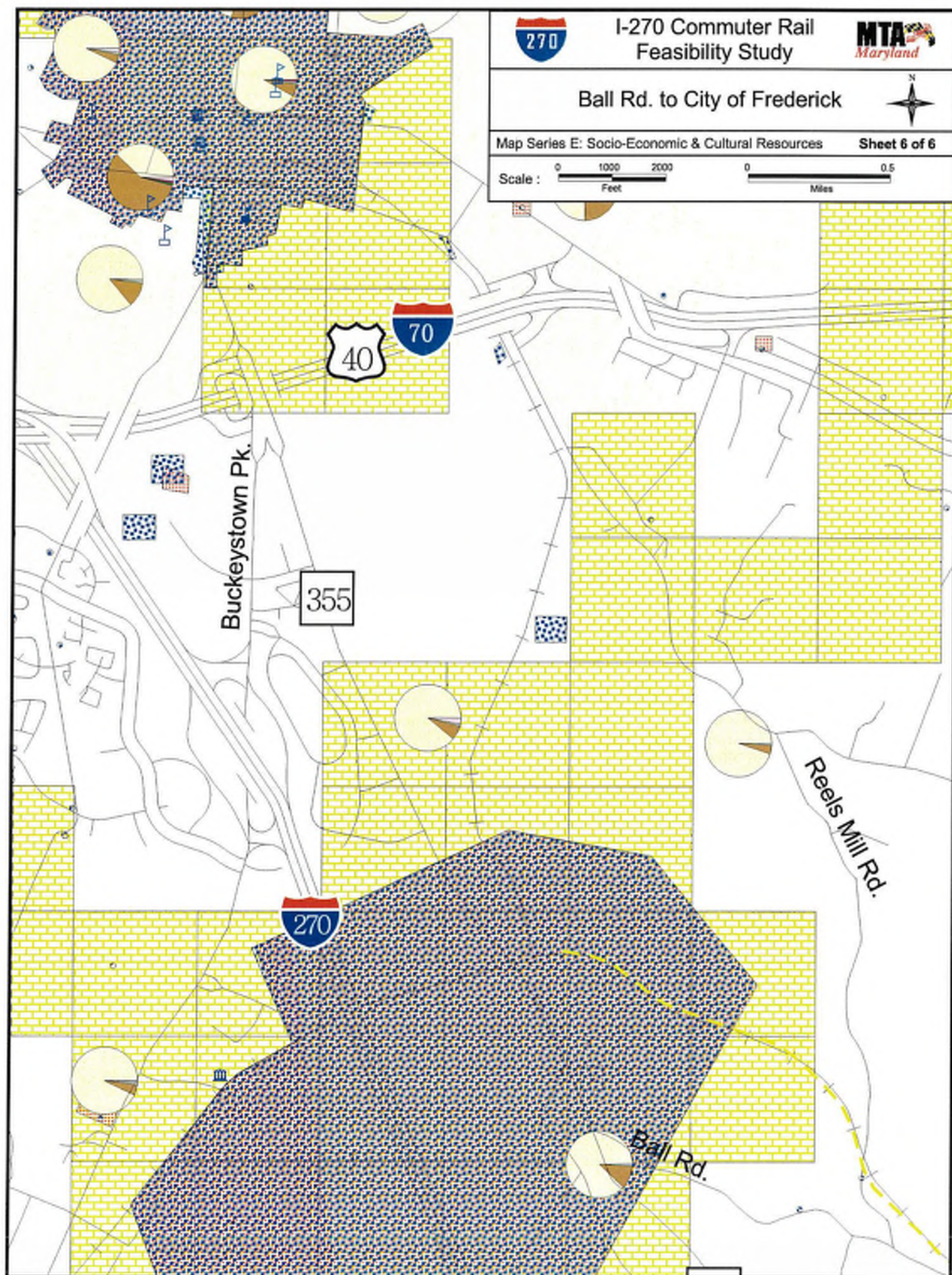


Map Series E: Socio-Economic & Cultural Resources

Sheet 6 of 6

Scale : 0 1000 2000  
Feet

0 0.5  
Miles





# Appendix F

## Land Use and Commuter Facilities



I-270 Commuter Rail  
Feasibility Study

















# I-270 Commuter Rail Feasibility Study



## ENVIRONMENTAL INVENTORY MAPPING SERIES

### Legend for MAP SERIES F- Land Use and Commuter Facilities

Land Use - the land use \ land cover classification scheme, Level 2 U.S.G.S., has been used to identify the predominant land use. In general, only land uses greater than 10 acres in size have been modified - Maryland Dept. of Planning, 1997.

	Residential - Low Density
	Residential - Medium Density
	Residential - High Density
	Commercial
	Industrial
	Institutional
	Mining
	Open Space
	Agriculture
	Forest
	Wetlands
	Barren Land

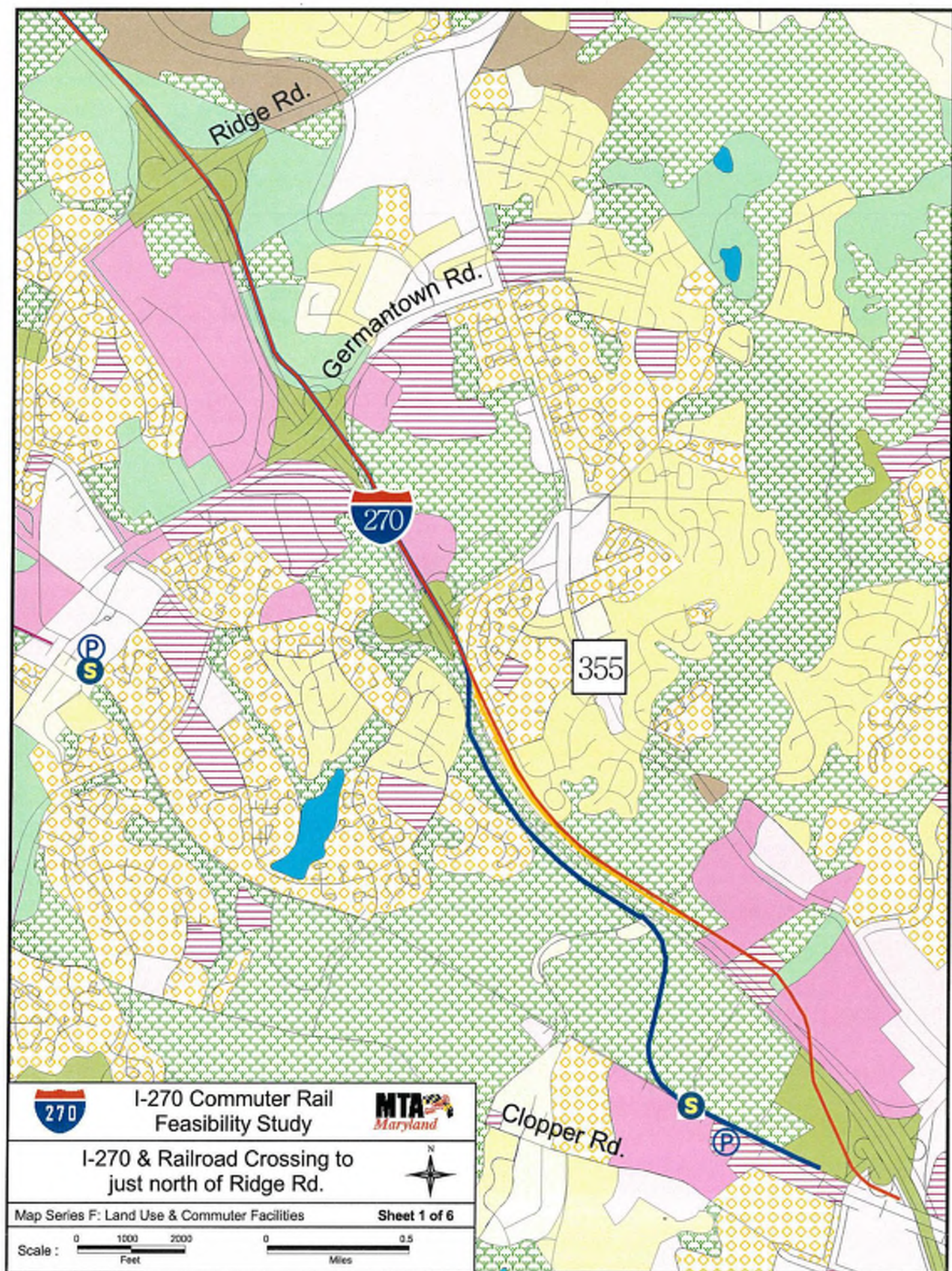


Park-N-Ride - MTA and SHA facilities from the 1998 ADC maps, 2000 Thomas Bros. Metro Washington D.C. book, and MTA 1999 Facilities Manual.

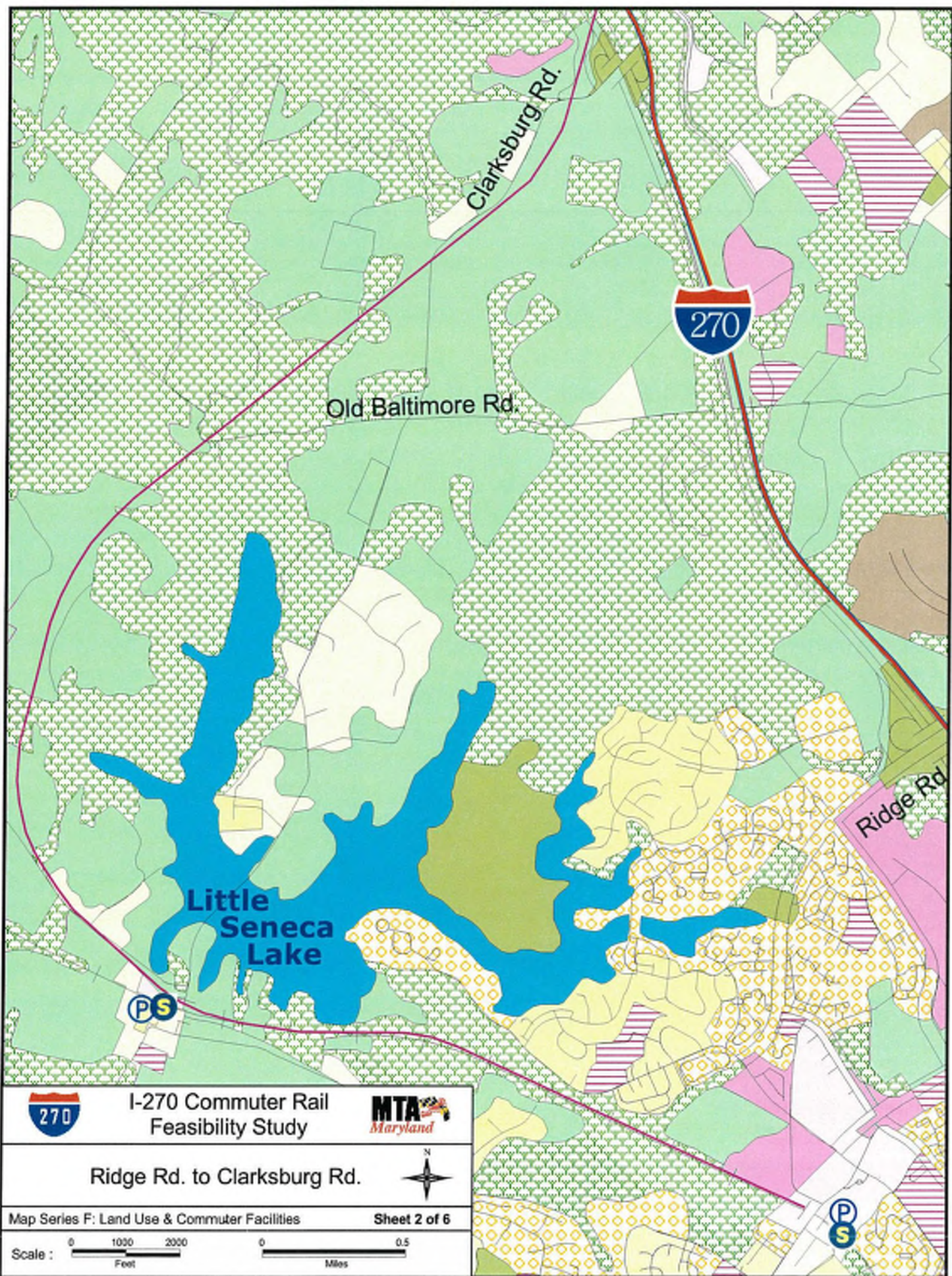


MARC Stations - rail stations as shown in the 1998 ADC maps, 2000 Thomas Bros. Metro Washington D.C. book, and MTA 1999 Facilities Manual.

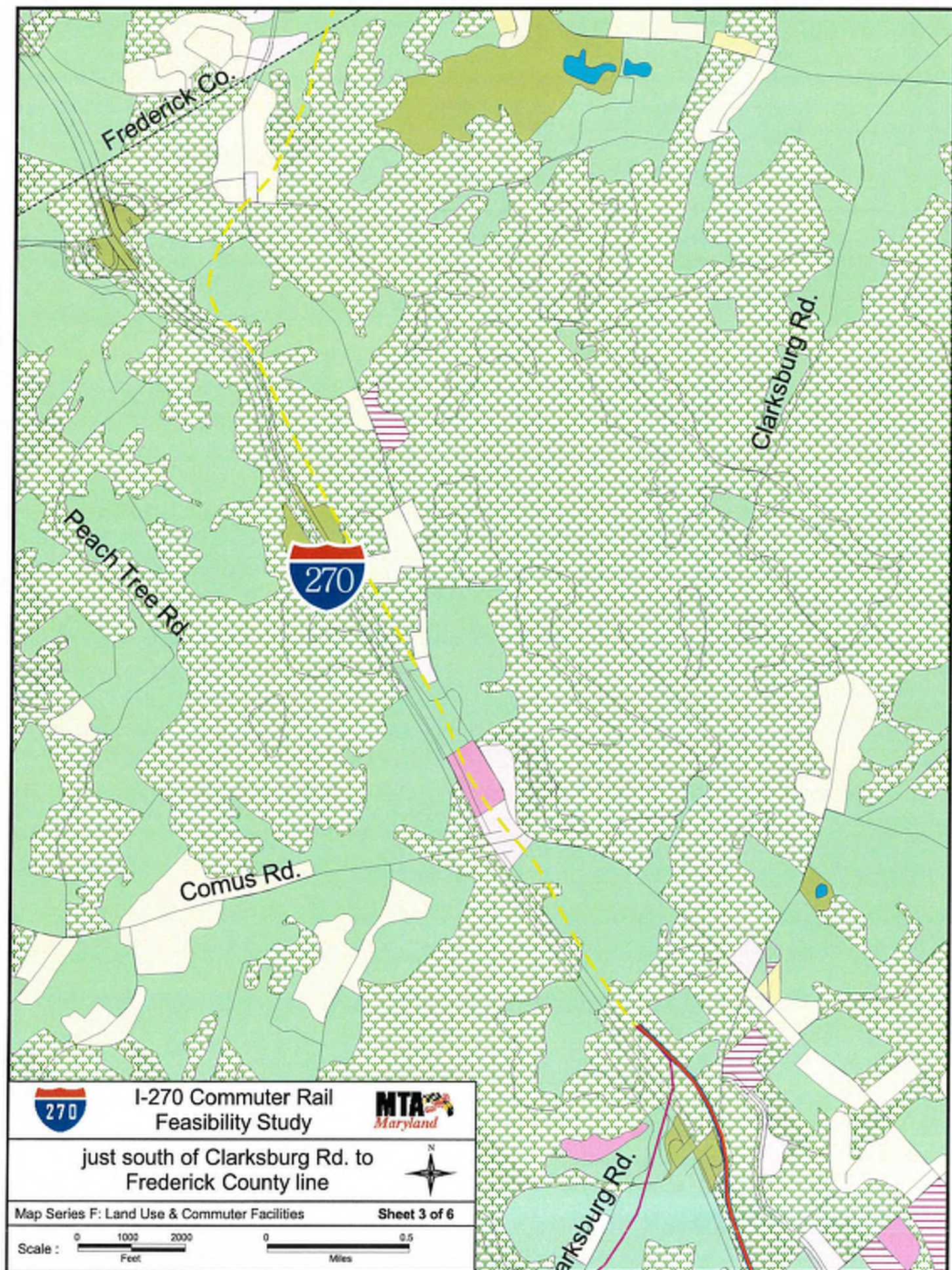




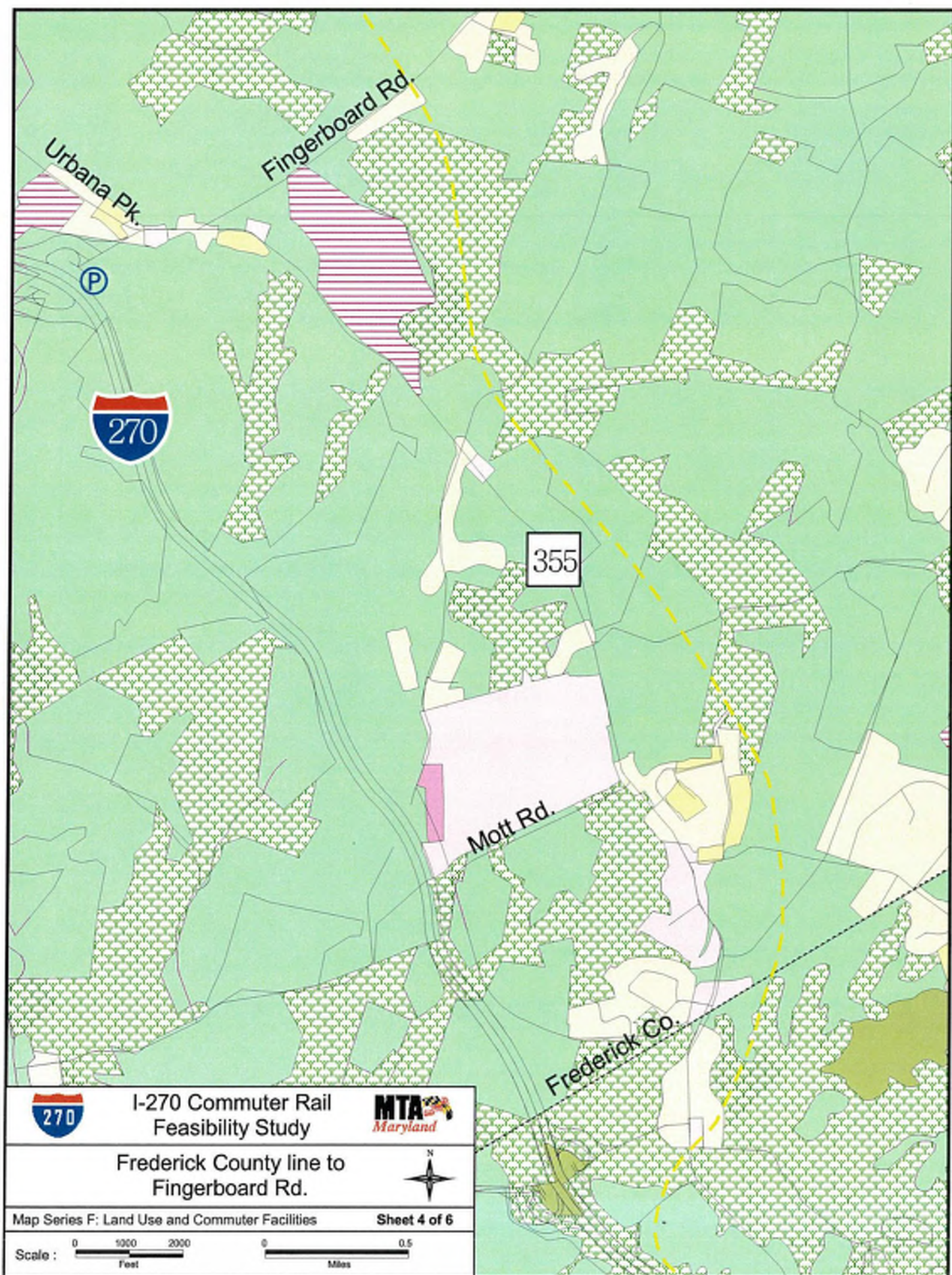
















I-270 Commuter Rail  
Feasibility Study



Fingerboard Rd. to  
north of Ball Rd.

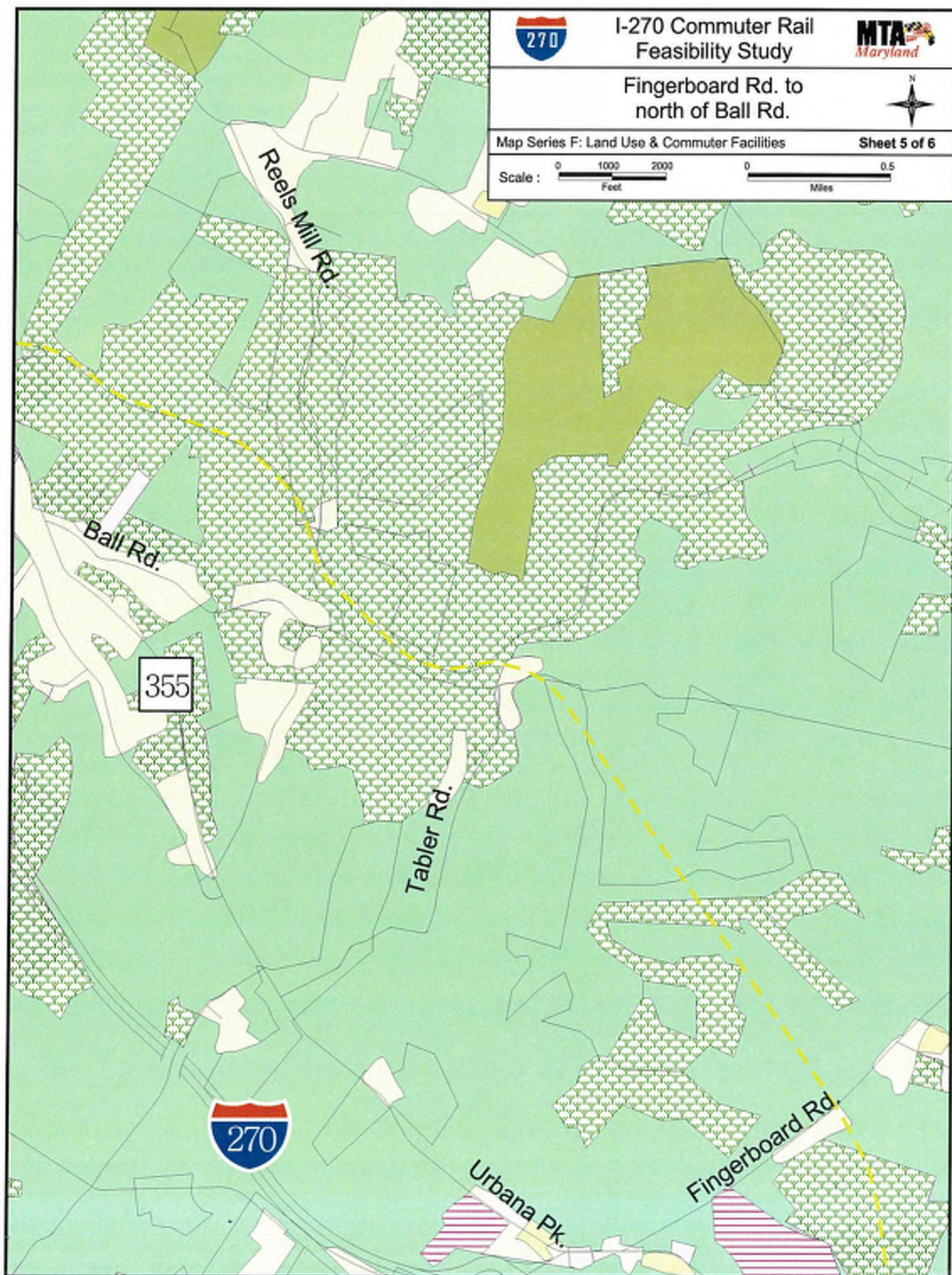


Map Series F: Land Use & Commuter Facilities

Sheet 5 of 6

Scale : 0 1000 2000  
Feet

0 0.5  
Miles







I-270 Commuter Rail  
Feasibility Study



Ball Rd. to City of Frederick

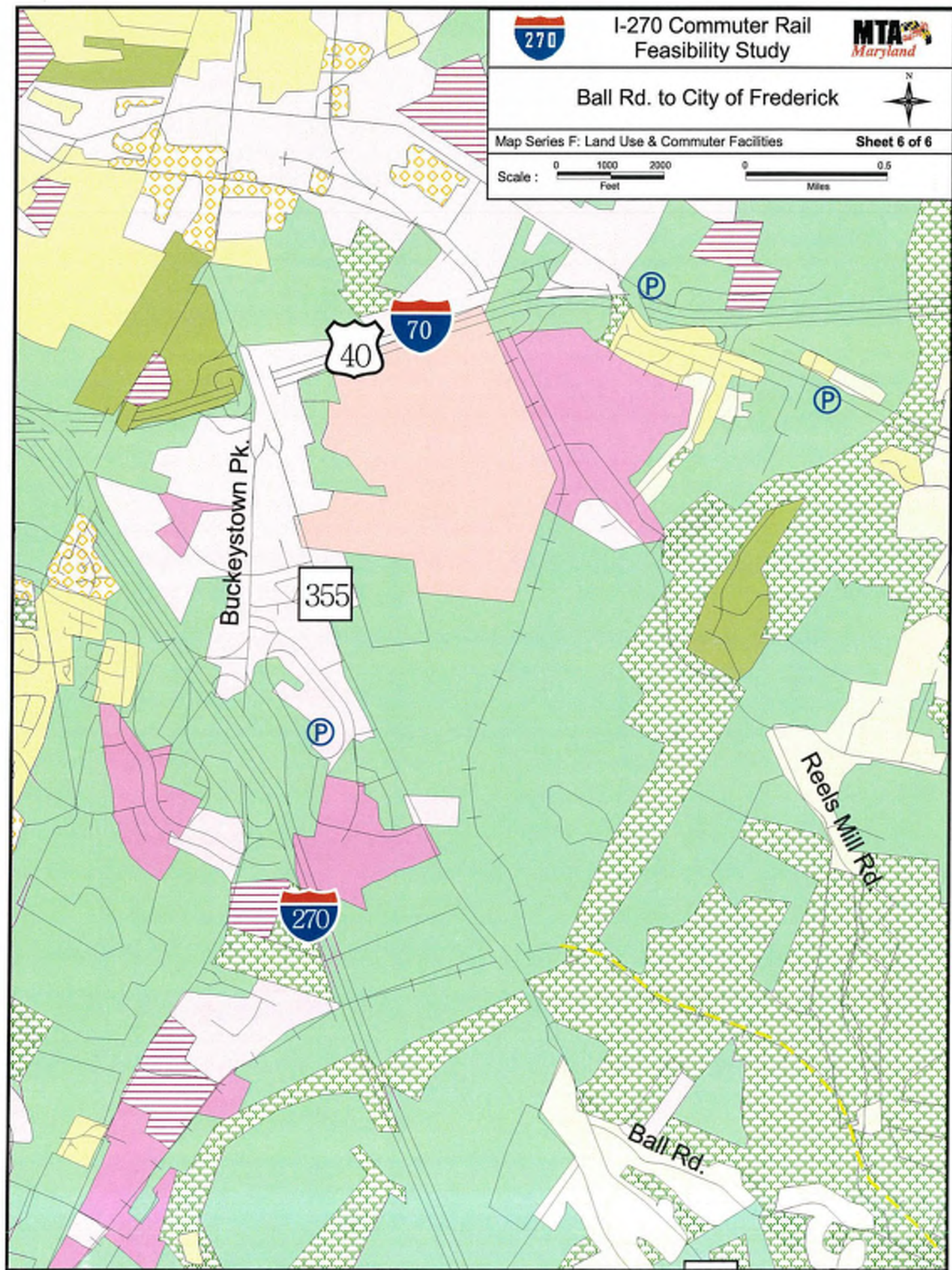


Map Series F: Land Use & Commuter Facilities

Sheet 6 of 6

Scale : 0 1000 2000  
Feet

0 0.5  
Miles





# Appendix G

## Smart Growth Programs



I-270 Commuter Rail  
Feasibility Study





# I-270 Commuter Rail Feasibility Study



## ENVIRONMENTAL INVENTORY MAPPING SERIES

### Legend for MAP SERIES G- Smart Growth Programs



MD Environmental Trust- lands defined by Maryland Environmental Trust as being within their care program - 1998.



Agricultural Easements - Maryland Department of Agriculture projection of lands currently protected by the Agriculture Easement or District program, 1998-2000.



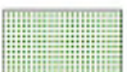
MD Historical Trust Easements - areas in which the landowner of properties individually listed on the National Register of Historic Places or located within locally certified or register listed historic districts have conveyed a perpetual historic easement to the Maryland Historic Trust - 1998.



Rural Legacy - areas that meet DNR's guidelines for a land preservation program specifically designed to limit the adverse impacts of sprawl on agricultural lands and natural resources. MD Department of Planning 1997.



Enterprise Zones - enterprise zones are designated areas in each Maryland county and Baltimore City for which special tax incentives are available to industrial and commercial businesses' that hire additional full time workers. Maryland Department of Planning, 1997



Designated Neighborhoods - areas in Maryland approved by the Dept. of Housing and Community Development for financial assistance. Maryland Department of Planning, 1997.

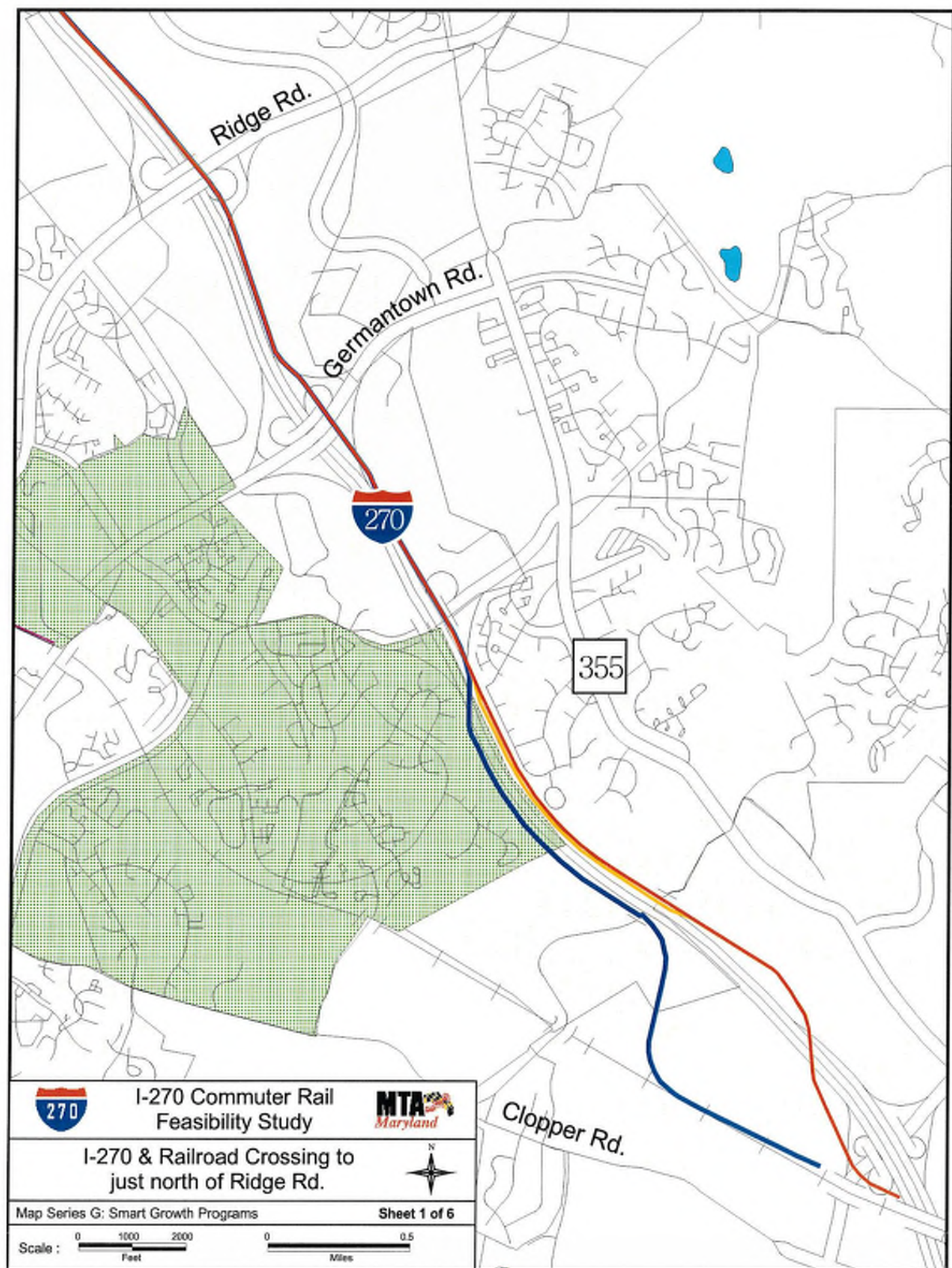


Priority Funding Areas - areas where the state and local governments want to target their efforts to encourage and support economic development and new growth. Maryland Department of Planning, 1997.

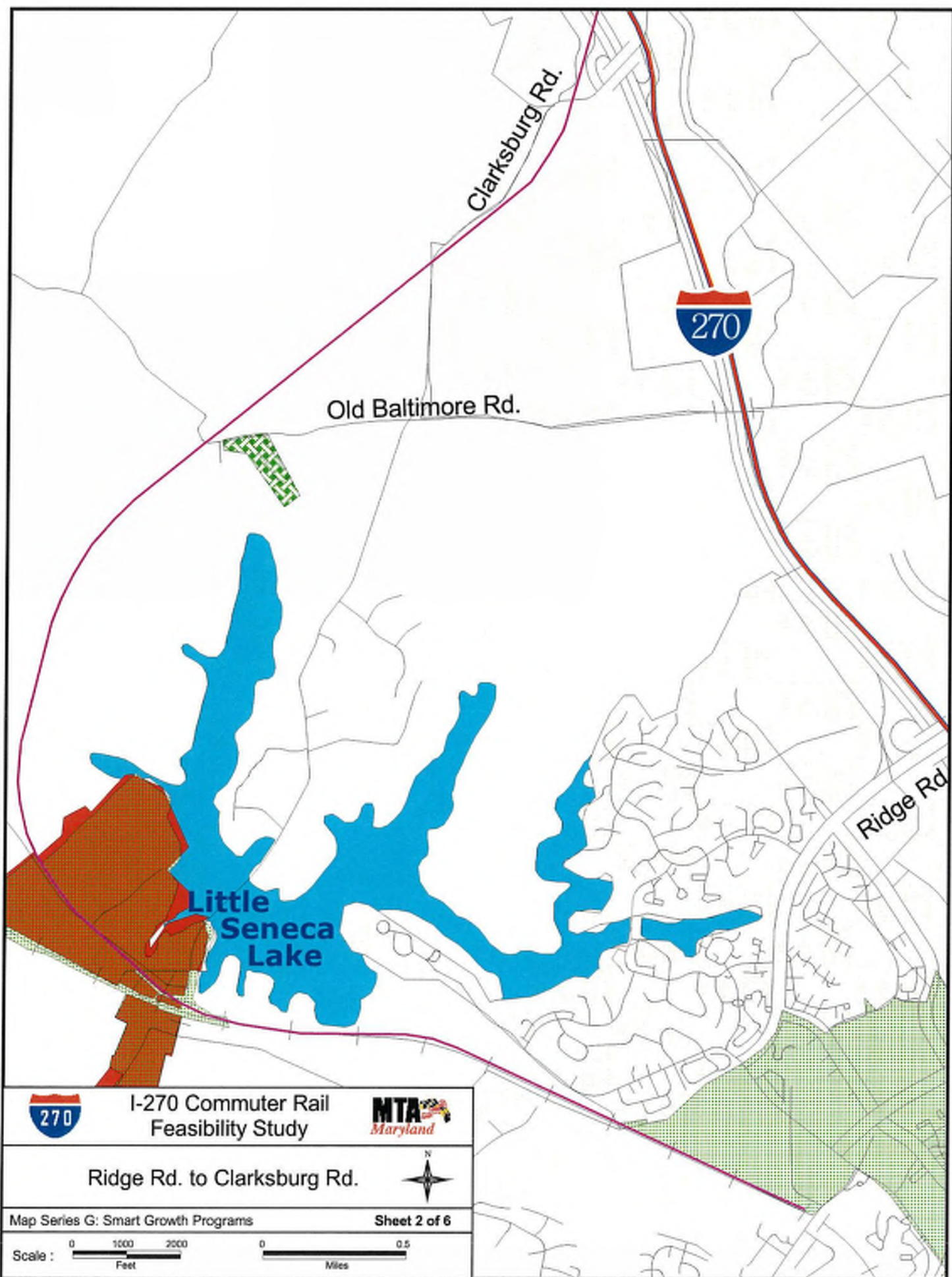


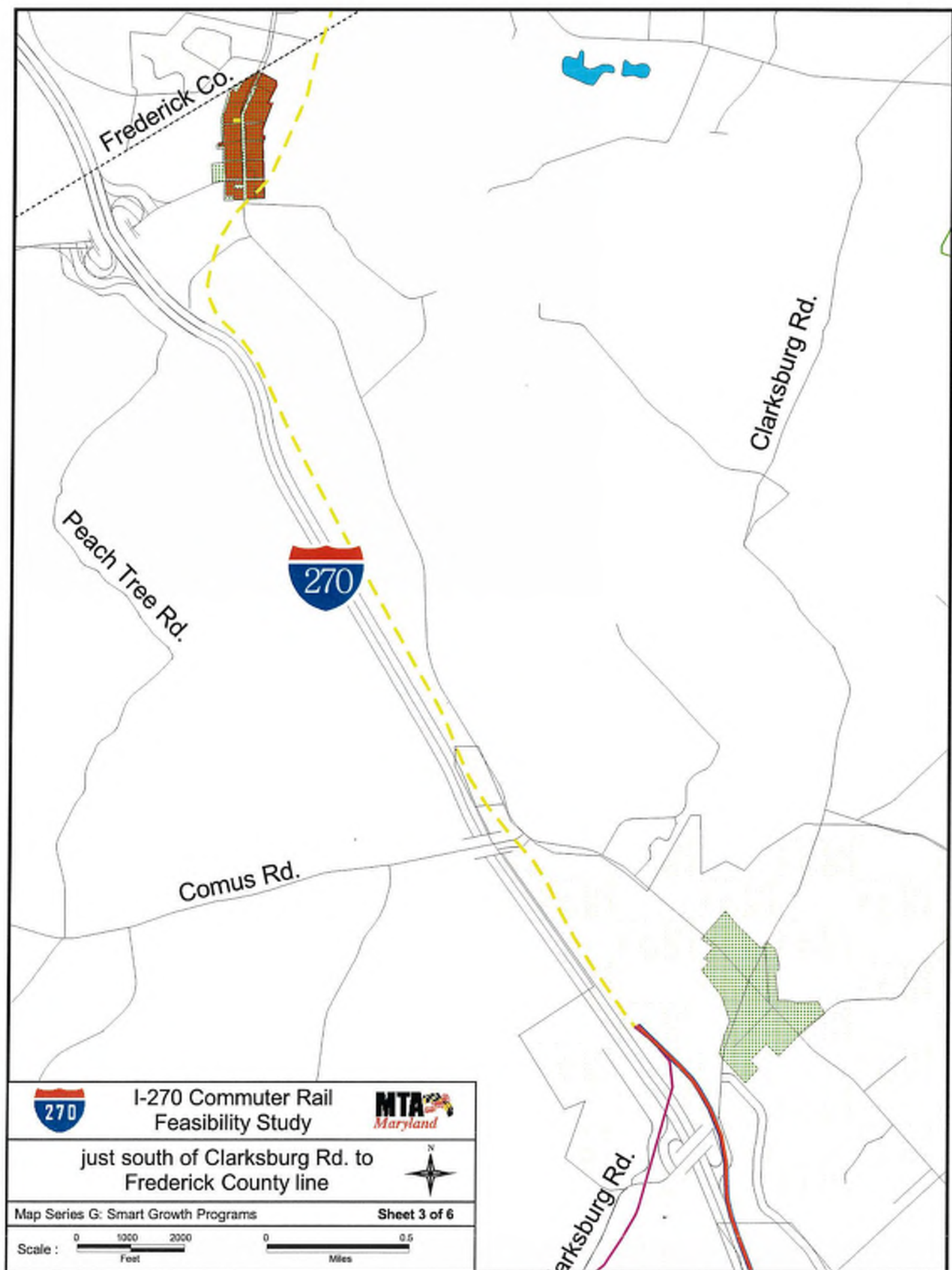
Subdivisions (New & Approved) - new subdivisions or developments obtained from Frederick County Department of Planning and Zoning, January 2001.



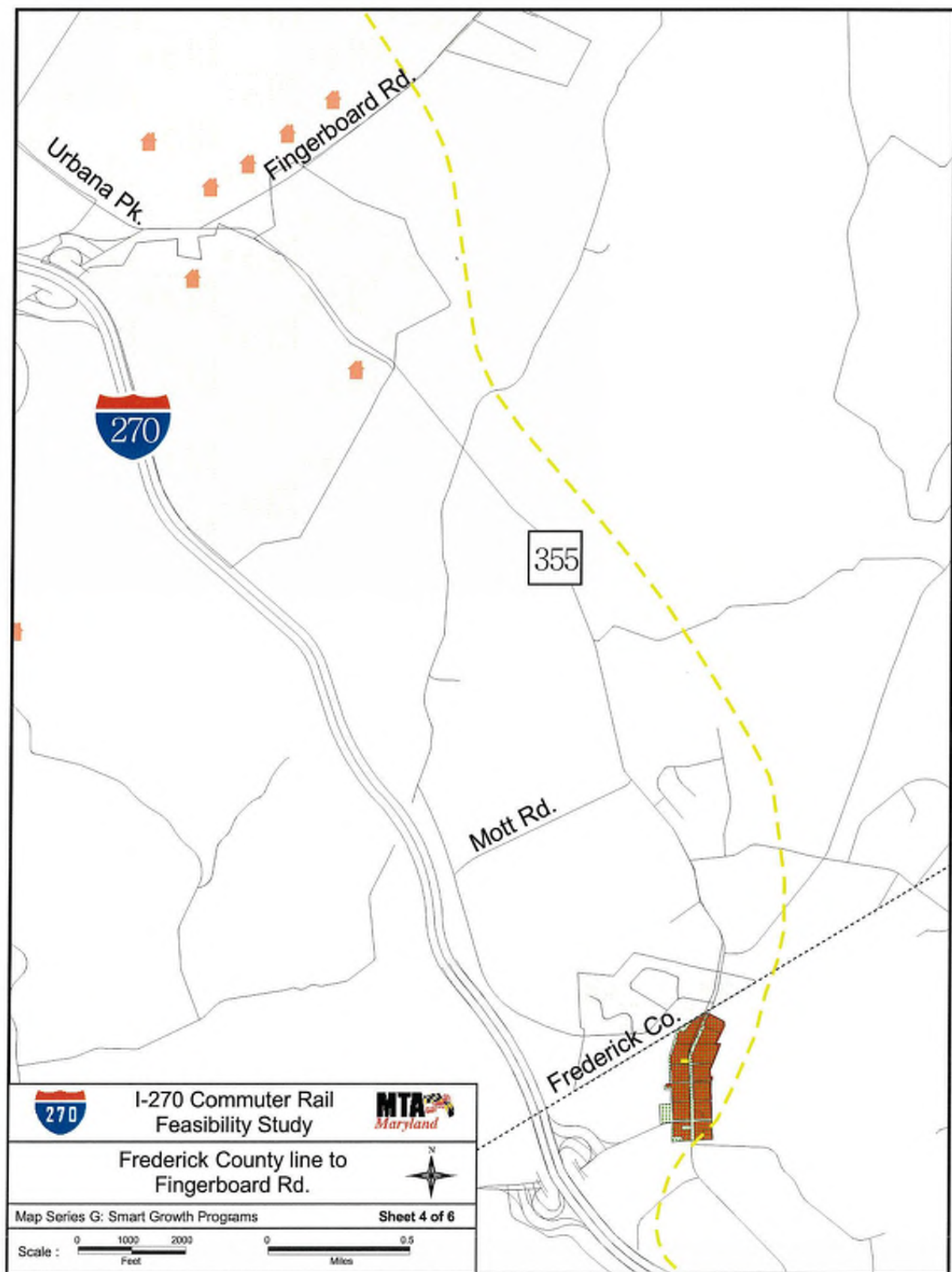














I-270 Commuter Rail  
Feasibility Study



Fingerboard Rd. to  
north of Ball Rd.



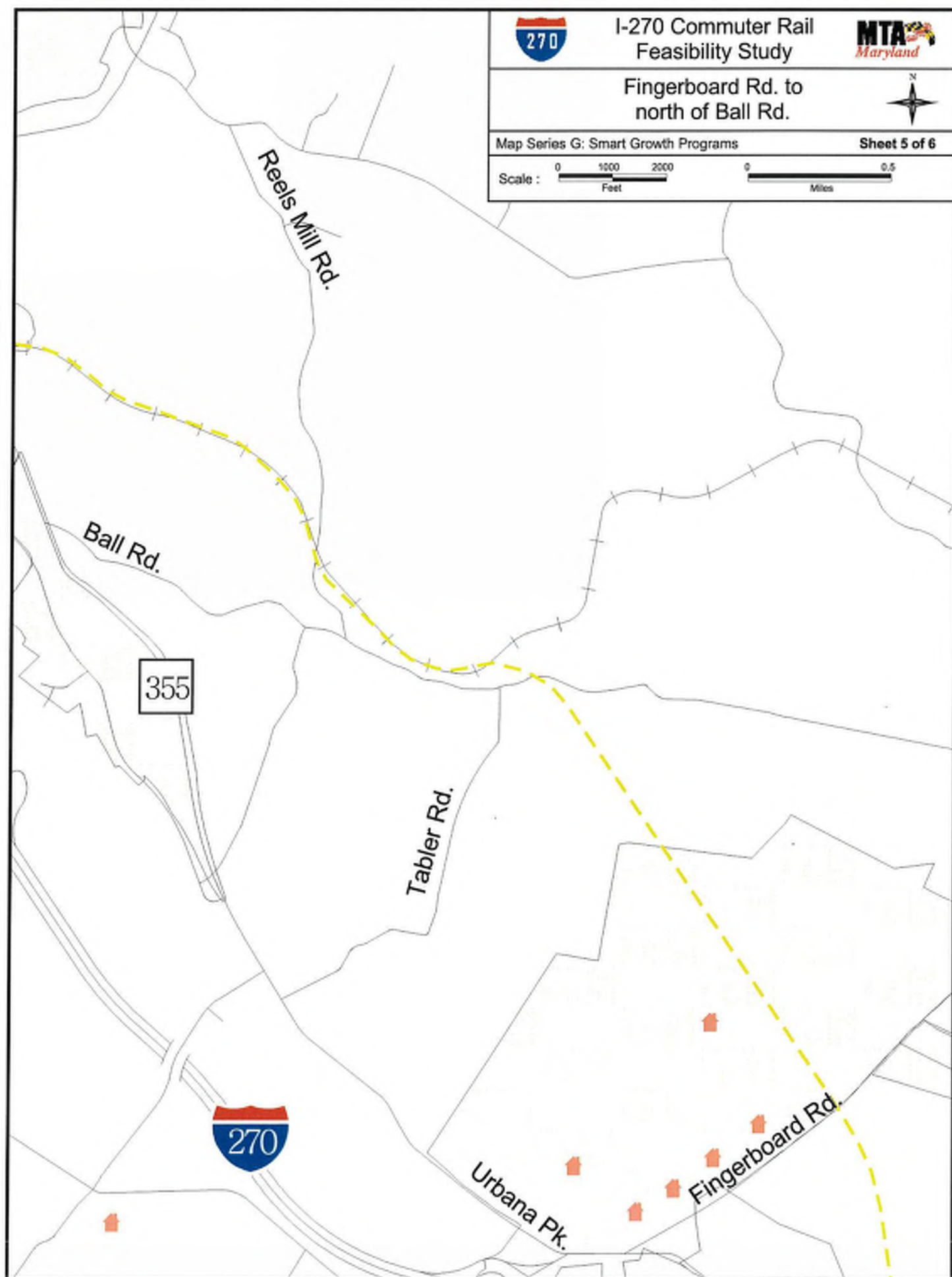
Map Series G: Smart Growth Programs

Sheet 5 of 6

Scale :

0 1000 2000  
Feet

0 0.5  
Miles





I-270 Commuter Rail  
Feasibility Study



Ball Rd. to City of Frederick



Map Series E: Smart Growth Programs

Sheet 6 of 6

Scale :

0 1000 2000  
Feet

0 0.5  
Miles





## MARC Commuter Rail Design Criteria

# Appendix H



I-270 Commuter Rail  
Feasibility Study



## **Appendix H   MARC Commuter Rail Assumptions and Design Criteria**

### ***Assumptions***

1. *Study Limits: Frederick Junction to CSX Metropolitan Line (existing MARC Brunswick Line service)*
2. Level of Design: Conceptual
3. Rail transit vehicle will be a MARC-type passenger car powered by a diesel locomotive.
4. Proposed tracks will accommodate exclusively passenger service – no freight.
5. Study corridor will accommodate a double track system.
6. At-grade crossings are allowable; however, this study seeks to minimize the number of at grade crossings.

### ***Design Criteria***

1. Design Speed = 50 mph
2. Horizontal Alignment:
  - a. Tangent lengths – between curves = 3 x design speed, 30' minimum
  - b. Curves – minimum radius = 1,000'; all curves spiraled to attain superelevation
3. Vertical Alignment: (A.R.E.M.A. Section 5-3-13)
  - a. Absolute Maximum Designed = 2.5%
  - b. Preferred Maximum Allowable = 1.5%
  - c.  $L = D/R$  Where  
 $L$  = Length in 100' Stations  
 $D$  = Algebraic Difference in Gradients  
 $R$  = Rate of Change per 100' Where  $R = 0.10$  for Sags;  $R = 0.20$  for Summits
4. Typical Section – based on Design Criteria developed for MARC to Frederick Project
  - a. Minimum Centerline to Centerline Track Spacing = 15'
  - b. Minimum Roadbed Width – Single Track = 26'
  - c. Study Right of Way Width = 60'

# Appendix I

## Travel Time Calculations



I-270 Commuter Rail  
Feasibility Study





## Appendix I Travel Time Calculations

### Assumptions:

1. Dwell time in each station = 2 minutes
2. Average travel rate = 50 mph
3. Existing service travel times derived from current timetables.
4. Calculations Assumptions:  
 $\text{Time} = (v - v_0)/a$   
 $\text{Distance } s = v_0 t + 1/2 a t^2$   
 Acceleration Factors:  $a = 0.394 \text{ mph/sec}$  (time) =  $0.578 \text{ ft/sec}^2$  (distance)  
 Deceleration Factors:  $a = 1.789 \text{ mph/sec}$  (time) =  $2.624 \text{ ft/sec}^2$  (distance)  
 To change speed from 0 to 50 mph, Time = **126.903553 seconds**  
 Distance = **4654.20392 feet**  
 To change speed from 50 to 0 mph, Time = **27.9485746 seconds**  
 Distance = **1024.72899 feet**  
 50 mph = **73.3333333 ft/sec**

### Existing MARC Brunswick Line-Frederick Extension Service:

Station	Distance to Next Station (ft.)	Dwell Time (sec.)	Acceleration (0 to 50 mph)		Top Speed (50 mph)		Deceleration (50 to 0 mph)		Travel Time to Next Station (min.)	Travel Time from Fred. Station (min.)
			Distance (ft.)	Time (sec.)	Distance (ft.)	Time (sec.)	Distance (ft.)	Time (sec.)		
Frederick	N/A	N/A	From Timetable Train P892						6.0	6.0
Monocacy	N/A	N/A							37.0	43.0
Germantown	N/A	N/A							5.0	48.0
Metropolitan Grove	N/A	N/A							47.0	95.0
Washington Union Station										
Time Totals		N/A		N/A		N/A		N/A	95.0	

### Proposed West Alternative Service:

Station	Distance to Next Station (ft.)	Dwell Time (sec.)	Acceleration (0 to 50 mph)		Top Speed (50 mph)		Deceleration (50 to 0 mph)		Travel Time to Next Station (min.)	Travel Time from Fred. Station (min.)
			Distance (ft.)	Time (sec.)	Distance (ft.)	Time (sec.)	Distance (ft.)	Time (sec.)		
Frederick	N/A	N/A			360.0*				6.0	6.0
Monocacy	27116.5	120.0	4654.2	126.9	21437.6	292.3	1024.7	27.9	9.5	15.5
Urbana	16000.0	120.0	1654.2	126.9	10321.1	140.7	1024.7	27.9	6.9	22.4
Hyattstown	24197.0	120.0	1654.2	126.9	18518.1	252.5	1024.7	27.9	8.8	31.2
Clarksburg	36375.0	120.0	1654.2	126.9	30696.1	418.6	1024.7	27.9	11.6	42.8
Germantown	N/A	N/A			300.0*				5.0	47.8
Metropolitan Grove	N/A	N/A			2820.0*				47.0	94.8
Washington Union Station										
Time Totals		480.0		507.6		4584.2		111.8	94.8	

\* From Timetable Train P892

FOR INFORMATION  
1-800-525-RAIL  
TTY INFORMATION  
1-410-539-3497

[illegible][illegible]

TRAIN NUMBER	AB	P874	P873	P891	P875	P877	P893	P879	P881	P885	P883	P885
CITY / AM - PM	DP	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM	PM
WASHINGTON	DP	1:45	3:35	4:00	4:25	4:55	5:10	5:30	5:57	6:25	6:45	7:55
UNION STATION	DP	1:58	3:40	4:13	4:38	5:08	5:23	5:43	6:10	6:38	6:58	7:49
SILVER SPRING	DP	12:03	3:53		4:44		5:30	5:45	6:10	6:44	7:03	7:53
KENNESING	DP	12:18					5:34	5:53	6:20		7:07	7:55
GARFIELD PARK	DP											
ROCKVILLE	DP	2:12	4:00	4:25	4:53	5:21	5:39	5:59	6:25	6:57	7:12	8:00
WASHINGTON GROVE	DP	12:17					5:44		6:32		7:17	8:05
GAITHERSBURG	DP	2:20	4:08	4:32	5:01	5:37	5:05	5:35	6:05	6:50	7:20	8:00
METROPOLITAN GROVE	DP	12:24	4:12	4:38	5:05	5:51	5:51	6:10	6:39	7:03	7:24	8:12
GERMANTOWN	DP	2:28	4:17	4:41	5:19	5:57	5:16	5:45	7:07		7:28	8:16
BOYDS	DP	12:32					4:50:2		6:40:0			8:20
BARNESVILLE	DP	12:38	4:25		15:19		15:00	1:0:25	4:55		47:37	8:25
DICKERSON	DP	12:41					4:51:1		4:53			8:28
PORT DEBOKKS	DP	12:51	14:36		15:31	5:47		1:0:38	17:06		17:47	18:41
MONGADY	DP									17:44		
FREDERICK	DP			15:13			1:0:30			7:50		
BRUSWICK MD	DP	3:03	4:53	5:24	5:50	15:02	5:46	6:50	7:21		17:58	9:57
HARRIS HERRYMAN	DP					16:12		7:40			18:18	
DUFFIELDS	DP					16:24		7:52			18:21	
MARTINSBURG WV	AP					16:44		7:40			6:44	

**FOR INFORMATION**  
**1-800-325-RAIL**

**CITY INFORMATION**  
**1-410-539-3497**

They play on the station's train will pick up passengers standing on platform and a minute to ensure. Trains will pick up passengers at platform and a minute to ensure. Trains will pick up passengers at platform and a minute to ensure. Trains will pick up passengers at platform and a minute to ensure.

Trade reserves and foreign investments at the station. From May 1940 to this station up to five thousands in advance of scheduled deliveries.

[illegible][illegible]

TRAIN NUMBER	MTWTFSS	AM	P870	P830	P872	P874	P892	P876	P878	P894	P893
CITY / AM - PM	DP	AM	AM	AM	AM	AM	AM	AM	AM	AM	AM
MATHEWSBURG, WV	DP				5:30						
DUFFIELDS	DP				5:48				5:51		
PAPERS FERRY, WV	DP				5:55				7:01		
BRUNSWICK, MD	DP	5:10		5:43	6:07			6:38	7:12		7:45
FREDERICK	DP		5:17				6:10			7:15	
MONDAY	DP		5:23				6:16			7:21	
POINT OF ROCKS	DP	5:20		5:53	6:18			6:40	7:22		7:55
DICKERSON	DP		5:48					6:50			8:03
BARNESVILLE	DP	5:51		6:03			6:41	7:00		7:49	8:08
BOYDS	DP		5:58					7:07			8:14
GERMANTOWN	DP	5:40	6:00	6:12	6:37	6:53		7:11	7:49	7:58	8:19
METROPOLITAN GROVE	DP	5:44	6:04	6:16	6:42	6:58		7:16	7:35	8:03	8:23
BATHESBURG	DP	5:39	6:08	6:20	6:47	7:03		7:21	7:51	8:08	8:28
WASHINGTON GROVE	DP			6:23				7:24			8:31
ROCKVILLE	DP	5:53	6:15	6:28	6:54		7:10	7:30	8:00	8:15	8:36
GARRETT PARK	DP	6:02					7:16	7:38			8:42
KENSINGTON	DP	6:05		6:35			7:20	7:40		8:22	8:46
SILVER SPRING	DP	6:11	6:26	6:41	7:05		7:25	7:46	8:11	8:28	8:53
WASHINGTON UNION STATION	AR	6:30	6:45	7:00	7:25		7:45	8:05	8:30	8:47	9:12



# Appendix J

## Capital Cost Estimates



I-270 Commuter Rail  
Feasibility Study



**PROJECT COST ESTIMATE <sup>1</sup>**

**Project Name: I-270 COMMUTER RAIL - WEST ALTERNATIVE**

**Description:** A Proposed Commuter Rail Alignment, connecting MARC Frederick Branch Extension and the Germantown MARC Station

Date Prepared: May 17, 2001 Date Revised: September 16, 2002

Project Phase: Planning

ID	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	BASE ESTIMATE:				
1	Preliminary (15% of items 2-12)		lump sum		\$ 37,324,810
2	Erosion and Sediment Control (2% of items 3-12)		lump sum		\$ 4,879,060
3	Excavation				
	Total Cut	5,126,216	cubic yards	\$ 12.00	\$ 61,514,592
	Total Fill	1,377,975	cubic yards	\$ 15.00	\$ 20,669,625
4	Drainage and Stormwater Management (15% of excavation and trackwork costs)		lump sum		\$ 13,998,132
5	Structural Work <sup>2</sup>				
	Aerial Structures (Commuter Rail bridge)	215,800	SF	\$ 430.00	\$ 92,794,000
	Aerial Structures (Highway bridge)	0	SF	\$ 150.00	\$ -
	Aerial Structures (Over proposed CD Road)	0	LF	\$ 20,000.00	\$ -
	Cut and Cover Box	0	LF	\$ 20,000.00	\$ -
6	Stations				
	Platforms	3	EA	\$ 500,000.00	\$ 1,500,000
	Parking <sup>3</sup>	600	per space	\$ 10,000.00	\$ 6,600,000
	Access		lump sum		\$ 250,000
7	Trackwork - Ballasted	67,619	TF	\$ 140.00	\$ 9,466,660
8	Trackwork - CSX Passing Siding	10,000	TF	\$ 140.00	\$ 1,400,000
9	Grade Crossings	6	EA	\$ 250,000.00	\$ 1,500,000
10	Special Trackwork				
	#20 Crossover	1	EA	\$ 180,000.00	\$ 180,000
	#20 Turnout	1	EA	\$ 90,000.00	\$ 90,000
11	Signalization		lump sum		\$ 13,990,000
12	Environmental Mitigation		lump sum		\$ 20,000,000
13	Sinkhole Mitigation (6% of items 1-12)				\$ 17,169,413
A	BASE ESTIMATE SUBTOTAL (Lines 1 thru 13)				\$ 303,326,292
B	PLANNING CONTINGENCY (40% of line A)				\$ 121,330,517
C	CONSTRUCTION CONTINGENCY (30% of line A)				\$ 90,997,888
D	ESCALATION FACTOR (0% per year of A+B to )				\$ -
	NEAT CONSTRUCTION COST (A+B+C+D)				\$ 515,654,696
E	FUTURE CHANGES AND CLAIMS (10% of lines A+B+C+D)				\$ 51,565,470
F	CONSULTANT DESIGN FEE (10% of lines A+B+C+D)				\$ 51,565,470
G	MTA DESIGN COST (2.5% of lines A+B+C+D)				\$ 12,891,367
H	CONSTRUCTION INSPECTION AND CRS (8% of lines A+B+C+D+E)				\$ 45,377,613
I	MTA CONSTRUCTION COST (3.5% of lines A+B+C+D+E)				\$ 19,852,706
J	RIGHT OF WAY (ROW)				
	Access and Drainage Easements	300	acres	\$ 350,000.00	\$ 105,000,000
	Additional Land Acquisition for Stations	12	acres	\$ 350,000.00	\$ 4,200,000
K	ROW CONTINGENCY (25% of line J)				\$ 27,300,000
L	ROW Escalation Contingency (0% per year of J+K to )				\$ -
M	UTILITIES				\$ 500,000
N	AGENCIES/FORCE ACCOUNT				\$ 10,000,000
	TOTAL PROJECT COST				\$ 843,907,322

<sup>1</sup> See Assumptions

<sup>2</sup> See list of structures

<sup>3</sup> Station - Parking: \$10,000 per space + 10% for Kiss and Ride and Bus Bays

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CTP	PE:	\$ 64,456,837
	CO:	\$ 642,950,485
	RW:	\$ 136,500,000

### PROJECT COST ESTIMATE <sup>1</sup>

Project Name: **I-270 COMMUTER RAIL - EAST ALTERNATIVE**

Description: A Proposed Commuter Rail Alignment, connecting MARC Frederick Branch Extension and the Germantown MARC Station

Date Prepared: September 16, 2002

Project Phase: Planning

ID	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	BASE ESTIMATE:				
1	Preliminary (15% of items 2-12)		lump sum		\$ 43,835,649
2	Erosion and Sediment Control (2% of Items 3-12)		lump sum		\$ 5,730,150
3	Excavation				
	Total Cut	6,347,158	cubic yards	\$ 12.00	\$ 76,165,896
	Total Fill	1,811,831	cubic yards	\$ 15.00	\$ 27,177,465
4	Drainage and Stormwater Management (15% of excavation and trackwork costs)		lump sum		\$ 17,701,110
5	Structural Work <sup>2</sup>				
	Aerial Structures (Commuter Rail bridge)	163,800	SF	\$ 430.00	\$ 70,434,000
	Aerial Structures (Highway bridge)	167,500	SF	\$ 150.00	\$ 25,125,000
	Aerial Structures (Over proposed CD Road)	0	LF	\$ 20,000.00	\$ -
	Cut and Cover Box	0	LF	\$ 20,000.00	\$ -
6	Stations				
	Platforms	6	EA	\$ 500,000.00	\$ 3,000,000
	Parking <sup>3</sup>	1,000	per space	\$ 10,000.00	\$ 11,000,000
	Access		lump sum		\$ 250,000
7	Trackwork - Ballasted	90,886	TF	\$ 140.00	\$ 12,724,040
8	Trackwork - CSX Passing Siding	10,000	TF	\$ 140.00	\$ 1,400,000
9	Grade Crossings	4	EA	\$ 250,000.00	\$ 1,000,000
10	Special Trackwork				
	#20 Crossover	2	EA	\$ 180,000.00	\$ 360,000
	#20 Turnout	2	EA	\$ 90,000.00	\$ 180,000
11	Signalization		lump sum		\$ 19,990,000
12	Environmental Mitigation		lump sum		\$ 20,000,000
13	Sinkhole Mitigation (6% of items 1-12)				\$ 20,164,399
A	BASE ESTIMATE SUBTOTAL (Lines 1 thru 13)				\$ 356,237,709
B	PLANNING CONTINGENCY (40% of line A)				\$ 142,495,084
C	CONSTRUCTION CONTINGENCY (30% of line A)				\$ 106,871,313
D	ESCALATION FACTOR (0% per year of A+B to )				\$ -
	NEAT CONSTRUCTION COST (A+B+C+D)				\$ 605,604,106
E	FUTURE CHANGES AND CLAIMS (10% of lines A+B+C+D)				\$ 60,560,411
F	CONSULTANT DESIGN FEE (10% of lines A+B+C+D)				\$ 60,560,411
G	MTA DESIGN COST (2.5% of lines A+B+C+D)				\$ 15,140,103
H	CONSTRUCTION INSPECTION AND CRS (8% of lines A+B+C+D+E)				\$ 53,293,161
I	MTA CONSTRUCTION COST (3.5% of lines A+B+C+D+E)				\$ 23,315,758
J	RIGHT OF WAY (ROW)				
	Access and Drainage Easements	291	acres	\$ 350,000.00	\$ 101,850,000
	Additional Land Acquisition for Stations	20	acres	\$ 350,000.00	\$ 7,000,000
K	ROW CONTINGENCY (25% of line J)				\$ 27,212,500
L	ROW Escalation Contingency (0% per year of J+K to )				\$ -
M	UTILITIES		lump sum		\$ 500,000
N	AGENCIES/FORCE ACCOUNT		lump sum		\$ 10,000,000
	TOTAL PROJECT COST				\$ 965,036,449

<sup>1</sup> See Assumptions

<sup>2</sup> See list of structures

<sup>3</sup> Station - Parking: \$10,000 per space + 10% for Kiss and Ride and Bus Bays

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CTP	PE:	\$ 75,700,513
	CO:	\$ 753,273,436
	RW:	\$ 136,062,500





Conceptual Cost Estimate for Bridge Structures

Project Name: I-270 COMMUTER RAIL - EAST ALTERNATIVE

Description: A Proposed Commuter Rail Alignment, connecting MARC Frederick Branch Extension and the Germantown MARC Station

Date Prepared: September 16, 2002

Project Phase: Planning

Bridge Description	Length (ft.)	Width (ft.)	Cost/SF	Total
Replacement Bridge over Monocacy River	1,400	26	\$ 430	\$ 15,652,000
Bridge from Sta. 790+00 to Sta. 800+00	1,000	26	\$ 430	\$ 11,180,000
Bridge from Sta. 459+00 to Sta. 470+00	1,100	26	\$ 430	\$ 12,298,000
Bridge from Sta. 109+14 to Sta. 109+83	200	26	\$ 430	\$ 2,236,000
Bridge from Sta. 131+82 to Sta. 136+39	1,200	26	\$ 430	\$ 13,416,000
Bridge from Sta. 147+48 to Sta. 149+12	350	26	\$ 430	\$ 3,913,000
Bridge from Sta. 173+50 to Sta. 181+50	200	26	\$ 430	\$ 2,236,000
Bridge from Sta. 240+36 to Sta. 240+77	300	26	\$ 430	\$ 3,354,000
Bridge from Sta. 243+61 to Sta. 244+85	350	26	\$ 430	\$ 3,913,000
Bridge from Sta. 249+85 to Sta. 250+21	200	26	\$ 430	\$ 2,236,000
Bridge from Sta. 279+41 to Sta. 280+04	100	150	\$ 150	\$ 2,250,000
Bridge from Sta. 284+81 to Sta. 286+19	200	200	\$ 150	\$ 6,000,000
Bridge from Sta. 291+34 to Sta. 292+40	150	150	\$ 150	\$ 3,375,000
Bridge from Sta. 326+54 to Sta. 326+38	100	100	\$ 150	\$ 1,500,000
Bridge from Sta. 332+07 to Sta. 332+31	50	75	\$ 150	\$ 562,500
Bridge from Sta. 337+88 to Sta. 339+35	200	200	\$ 150	\$ 6,000,000
Bridge from Sta. 346+18 to Sta. 346+56	50	75	\$ 150	\$ 562,500
Bridge from Sta. 410+89 to Sta. 411+40	50	50	\$ 150	\$ 375,000
Bridge from Sta. 419+85 to Sta. 420+64	100	150	\$ 150	\$ 2,250,000
Bridge from Sta. 424+02 to Sta. 424+22	50	50	\$ 150	\$ 375,000
Bridge from Sta. 432+99 to Sta. 433+41	50	50	\$ 150	\$ 375,000
Bridge from Sta. 482+15 to Sta. 482+78	100	100	\$ 150	\$ 1,500,000
<b>TOTAL</b>				<b>\$95,559,000</b>
Commuter Rail Bridges	163,800	sf	\$ 430	\$ 70,434,000
Highway Bridges	167,500	sf	\$ 150	\$ 25,125,000

Notes:

1. Costs do not include trackwork, signalization, or utilities
2. All costs are in 2002 dollars.
3. No contingencies are included in the costs.
4. Unit costs are derived from figures provided by SCXT and a previous rail bridge project.

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### PROJECT COST ESTIMATE <sup>1</sup>

Project Name: **I-270 COMMUTER RAIL - EAST-1 ALTERNATIVE**

Description: A Proposed Commuter Rail Alignment, connecting MARC Frederick Branch Extension and the Germantown MARC Station

Date Prepared: September 16, 2002

Project Phase: Planning

ID	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	BASE ESTIMATE:				
1	Preliminary (15% of items 2-12)		lump sum		\$ 59,665,087
2	Erosion and Sediment Control (2% of items 3-12)		lump sum		\$ 7,799,358
3	Excavation				
	Total Cut	6,344,614	cubic yards	\$ 12.00	\$ 76,135,368
	Total Fill	1,405,324	cubic yards	\$ 15.00	\$ 21,079,860
4	Drainage and Stormwater Management (15% of excavation and trackwork costs)		lump sum		\$ 16,782,898
5	Structural Work <sup>2</sup>				
	Aerial Structures (Commuter Rail bridge)	163,800	SF	\$ 430.00	\$ 70,434,000
	Aerial Structures (Highway bridge)	167,500	SF	\$ 150.00	\$ 25,125,000
	Aerial Structures (Over proposed CD Road)	5,524	LF	\$ 20,000.00	\$ 110,480,000
	Cut and Cover Box	0	LF	\$ 20,000.00	\$ -
6	Stations				
	Platforms	6	EA	\$ 500,000.00	\$ 3,000,000
	Parking <sup>3</sup>	1,000	per space	\$ 10,000.00	\$ 11,000,000
	Access		lump sum		\$ 250,000
7	Trackwork - Ballasted	90,934	TF	\$ 140.00	\$ 12,730,760
8	Trackwork - CSX Passing Siding	10,000	TF	\$ 140.00	\$ 1,400,000
9	Grade Crossings	4	EA	\$ 250,000.00	\$ 1,000,000
10	Special Trackwork				
	#20 Crossover	2	EA	\$ 180,000.00	\$ 360,000
	#20 Turnout	2	EA	\$ 90,000.00	\$ 180,000
11	Signalization		lump sum		\$ 20,010,000
12	Environmental Mitigation		lump sum		\$ 20,000,000
13	Sinkhole Mitigation (6% of items 1-12)				\$ 27,445,940
A	BASE ESTIMATE SUBTOTAL (Lines 1 thru 13)				\$ 484,878,270
B	PLANNING CONTINGENCY (40% of line A)				\$ 193,951,308
C	CONSTRUCTION CONTINGENCY (30% of line A)				\$ 145,463,481
D	ESCALATION FACTOR (0% per year of A+B to )				\$ -
	NEAT CONSTRUCTION COST (A+B+C+D)				\$ 824,293,060
E	FUTURE CHANGES AND CLAIMS (10% of lines A+B+C+D)				\$ 82,429,306
F	CONSULTANT DESIGN FEE (10% of lines A+B+C+D)				\$ 82,429,306
G	MTA DESIGN COST (2.5% of lines A+B+C+D)				\$ 20,607,326
H	CONSTRUCTION INSPECTION AND CRS (8% of lines A+B+C+D+E)				\$ 72,537,789
I	MTA CONSTRUCTION COST (3.5% of lines A+B+C+D+E)				\$ 31,735,283
J	RIGHT OF WAY (ROW)				
	Access and Drainage Easements	291	acres	\$ 350,000.00	\$ 101,850,000
	Additional Land Acquisition for Stations	20	acres	\$ 350,000.00	\$ 7,000,000
K	ROW CONTINGENCY (25% of line J)				\$ 27,212,500
L	ROW Escalation Contingency (0% per year of J+K to )				\$ -
M	UTILITIES				\$ 500,000
N	AGENCIES/FORCE ACCOUNT				\$ 10,000,000
	TOTAL PROJECT COST				\$ 1,260,594,570

<sup>1</sup> See Assumptions

<sup>2</sup> See list of structures

<sup>3</sup> Station - Parking: \$10,000 per space + 10% for Kiss and Ride and Bus Bays

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CTP	PE:	\$ 103,036,632
	CO:	\$ 1,021,495,438
	RW:	\$ 136,062,500

### PROJECT COST ESTIMATE <sup>1</sup>

Project Name: **I-270 COMMUTER RAIL - EAST-2 ALTERNATIVE**

Description: A Proposed Commuter Rail Alignment, connecting MARC Frederick Branch Extension and the Germanstown MARC Station

Date Prepared: September 16, 2002

Project Phase: Planning

ID	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	BASE ESTIMATE:				
1	Preliminary (15% of items 2-12)		lump sum		\$ 46,062,287
2	Erosion and Sediment Control (2% of items 3-12)		lump sum		\$ 6,021,214
3	Excavation				
	Total Cut	6,523,422	cubic yards	\$ 12.00	\$ 78,281,064
	Total Fill	2,128,751	cubic yards	\$ 15.00	\$ 31,931,265
4	Drainage and Stormwater Management (15% of excavation and trackwork costs)		lump sum		\$ 18,500,308
5	Structural Work <sup>2</sup>				
	Aerial Structures (Commuter Rail bridge)	188,500	SF	\$ 430.00	\$ 81,055,000
	Aerial Structures (Highway bridge)	175,000	SF	\$ 150.00	\$ 26,250,000
	Aerial Structures (Over proposed CD Road)	0	LF	\$ 20,000.00	\$ -
	Cut and Cover Box	0	LF	\$ 20,000.00	\$ -
6	Stations				
	Platforms	4	EA	\$ 500,000.00	\$ 2,000,000
	Parking <sup>3</sup>	800	per space	\$ 10,000.00	\$ 8,800,000
	Access		lump sum		\$ 250,000
7	Trackwork - Ballasted	79,879	TF	\$ 140.00	\$ 11,183,060
8	Trackwork - CSX Passing Siding	10,000	TF	\$ 140.00	\$ 1,400,000
9	Grade Crossings	4	EA	\$ 250,000.00	\$ 1,000,000
10	Special Trackwork				
	#20 Crossover	2	EA	\$ 180,000.00	\$ 360,000
	#20 Turnout	2	EA	\$ 90,000.00	\$ 180,000
11	Signalization		lump sum		\$ 19,870,000
12	Environmental Mitigation		lump sum		\$ 20,000,000
13	Sinkhole Mitigation (6% of items 1-12)				\$ 21,188,652
A	BASE ESTIMATE SUBTOTAL (Lines 1 thru 13)				\$ 374,332,850
B	PLANNING CONTINGENCY (40% of line A)				\$ 149,733,140
C	CONSTRUCTION CONTINGENCY (30% of line A)				\$ 112,299,855
D	ESCALATION FACTOR (0% per year of A+B to )				\$ -
	NEAT CONSTRUCTION COST (A+B+C+D)				\$ 636,365,845
E	FUTURE CHANGES AND CLAIMS (10% of lines A+B+C+D)				\$ 63,636,584
F	CONSULTANT DESIGN FEE (10% of lines A+B+C+D)				\$ 63,636,584
G	MTA DESIGN COST (2.5% of lines A+B+C+D)				\$ 15,909,146
H	CONSTRUCTION INSPECTION AND CRS (8% of lines A+B+C+D+E)				\$ 56,000,194
I	MTA CONSTRUCTION COST (3.5% of lines A+B+C+D+E)				\$ 24,500,085
J	RIGHT OF WAY (ROW)				
	Access and Drainage Easements	294	acres	\$ 350,000.00	\$ 102,900,000
	Additional Land Acquisition for Stations	16	acres	\$ 350,000.00	\$ 5,600,000
K	ROW CONTINGENCY (25% of line J)				\$ 27,125,000
L	ROW Escalation Contingency (0% per year of J+K to )				\$ -
M	UTILITIES		lump sum		\$ 500,000
N	AGENCIES/FORCE ACCOUNT		lump sum		\$ 10,000,000
	TOTAL PROJECT COST				\$ 1,066,173,439

<sup>1</sup> See Assumptions

<sup>2</sup> See list of structures

<sup>3</sup> Station - Parking: \$10,000 per space + 10% for Kiss and Ride and Bus Bays

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CTP	PE:	\$ 79,545,731
	CO:	\$ 791,002,709
	RW:	\$ 135,625,000



## PROJECT COST ESTIMATE

**Project Name: I-270 COMMUTER RAIL STUDY**

**Description:** A Proposed Commuter Rail Alignment, connecting Clarksburg II Station and the Metropolitan Grove Metro Station

**Date Prepared:** August 21, 2002

**Project Phase:** Planning

- 1) All items based on current conceptual project plans and experience from other recent relevant projects.
- 2) For description of structural items, see Structures worksheet for each alternative.
- 3) Stations - Parking: \$10,000 per space + 10% for Kiss & Ride and Bus Bays.
- 4) Trackwork - includes 136RE Rail, timber ties, ballast, subballast, and roadbed.
- 5) Signalization includes signalization for switches and along tracks. Assumes \$20,000 per switch, \$100,000 per grade crossing, and \$1,000,000 per mile new track.
- 6) Sinkhole Mitigation was developed for the portion of the current alternatives in Frederick County only.
- 7) Factors B through I, K and L provided by MTA.
- 8) Right of Way conceptually estimated based on property value medians as obtained from Maryland Department of Taxation and Assessments for properties adjacent to the proposed alignment. MTA provided escalation contingency factor.
- 9) Utilities cost provided by MTA.
- 10) Agencies/Force Account cost provided by MTA.
- 11) No new train sets need to be purchased.

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