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Table of Contents

1. Introduction and Methodology 1-1
   1.1 Project History 1-1
   1.2 Project Purpose and Need 1-1
2. Existing Conditions 2-1
   2.1 Roadway Network 2-1
   2.2 Traffic Volumes 2-1
   2.3 Travel Time 2-20
   2.4 Levels of Service 2-20
3. Traffic Operations Impacts 3-1
4. Future No-Build Conditions 2035 4-1
   4.1 Roadway and Transit Network 4-1
   4.2 Traffic Volumes 4-2
   4.3 Travel Time 4-8
5. Preferred Alternative 5-1
   5.1 Long Term Operational Effects of Light Rail Transit (LRT) – Build Conditions 2035 5-1
   5.2 Operational Effects of Red Line Transit in Opening Year 2021 5-40
6. Temporary Construction Impacts 6-1
   6.1 Construction Phasing 6-1
   6.2 Construction Staging 6-1
   6.3 Haul Routes 6-1
   6.4 Effects on Traffic 6-2
   6.5 Effects on Public Transportation 6-12
   6.6 Effects on Parking 6-12
   6.7 Effects on Pedestrians/Bicycles 6-13
   6.8 Effects on Freight / Heavy Rail 6-13
   6.9 Effects on Air Travel 6-13
   6.10 Effects on Emergency Services 6-14
   6.11 Mitigation of Construction Related Impacts 6-14
7. Parking: Existing Conditions 7-1
   7.1 No-Build Conditions 7-18
   7.2 Build Conditions 7-18

Table 1: Number of Lanes along Roadways Affected by the Red Line 2-1
Table 2: Percentage of Heavy Trucks within the Project Study Corridor 2-2
Table 3: Average Daily Traffic for Roadways Affected By the Red Line Corridor 2-15
Table 4.1: AM Peak Hour Peak Direction Highest Volumes 2-15
Table 4.2: PM Peak Hour Peak Direction Highest Volumes 2-15
Table 5: Existing AM & PM Peak Period Travel Times 2-20
Table 6: Existing Levels of Service E and/or F 2-21
Table 7: Daily Vehicle Miles Traveled (VMT) 3-1
Table 8: Anticipated Mode Shift with the Red Line Project 3-1
Table 9: Existing, 2035 Average Daily Traffic, And Percent Growth 4-2
Table 10.1: Existing, 2035 AM Peak Hour Peak Direction Highest Volumes, and Percent Growth 4-2
Table 10.2: Existing, 2035 PM Peak Hour Peak Direction Highest Volumes, and Percent Growth 4-3
Table 11: Existing and 2035 No-Build Peak Periods Travel Times 4-8
Table 12: Existing and 2035 No-Build Levels of Service 4-9
Table 13: Existing, No-Build Levels of Service E or F 4-10
Table 14: Lane Use Modifications: No-Build Vs. Red Line LRT 5-1
Table 15: Existing, 2035 No-Build and Build Average Daily Traffic 5-8
Table 16.1: Existing, 2035 No-Build and Build AM Peak Hour Peak Direction Highest Volumes, and Percent Growth 5-9
Table 16.2: Existing, 2035 No-Build and Build AM Peak Hour Peak Direction Highest Volumes, and Percent Growth 5-9
Table 17: List of Intersections with Modification in Traffic Control Devices 5-21
Table 18: Existing, 2035 No-Build and 2035 Build Estimated Travel Time 5-22
Table 19: Existing, 2035 No-Build and 2035 Build Levels of Service 5-27
Table 20: Existing, 2035 No-Build and 2035 Build Levels of Service, E or F 5-31
Table 21: Number of Lanes in 2021 with the Red Line LRT 5-40
Table 22: Existing, 2035 No-Build, 2035 and 2021 Build Levels of Service 5-40
Table 23: Existing, 2035 No-Build, 2035 and 2021 Build Levels of Service E or F 5-42
Table 24: Haul Route Hourly Volume Summary 6-1
Table 25: Diversion Routes 6-3
Table 26: Construction-Related Impacts 6-4
Table 27: Long-Term Detour Routes 6-10
Table 28: 2016 Construction Year Levels Of Service 6-11
Table 29: Impacted Loading Zones during Construction 6-13
Table 30: Existing On-Street and Surface Parking Lot Spaces 7-1
Table 31: Park-And-Ride Impacts along the Red Line Corridor 7-1
Table 32: Parking Spaces to Be Eliminated or Displaced 7-20
Table 33: Permanent Impacts to Loading Zones 7-21

Figure 1: Preferred Alternative with Station Locations 1-2
Figures 2-5: Number of Lanes within the Project Study Corridor ..... 2-3 – 2-6
Figures 6-9: Signalized Intersections within the Project Study Corridor ..... 2-7 – 2-10
Figures 10-13: Average Daily Traffic within the Project Study Corridor ..... 2-11 – 2-14
Figures 14-17: AM (PM) Peak Hour Volumes ..... 2-16 – 2-19
Figures 18-21: Existing AM(PM) Travel Times ..... 2-18 – 2-25
Figures 22-25: AM Levels of Service ..... 2-26 – 2-29
Figures 26-29: PM Levels of Service ..... 2-30 – 2-33
Figures 30-33: 2035 No-Build Average Daily Traffic ..... 4-4 – 4-7
Figures 34-37: 2035 No-Build Peak Hour Volumes ..... 4-11 – 4-14
Figures 38-41: 2035 No-Build AM (PM) Travel Times ..... 4-15 – 4-18
Figures 42-45: 2035 No-Build AM Levels of Service ..... 4-19 – 4-22
Figures 46-49: 2035 No-Build PM Levels of Service ..... 4-23 – 4-26
Figure 50: Red Line Study Area Section Layout 5-3
Figures 51-54: Number of Lanes (2035 Build) ..... 5-4 – 5-7
Figures 55-58: 2035 Build Average Daily Traffic ..... 5-11 – 5-14
Figures 59-62: 2035 Build AM (PM) Peak Hour Volumes ..... 5-15 – 5-18
Figures 63-66: 2035 Build AM (PM) Travel Times ..... 5-23 – 5-26
Figures 67-70: 2035 Build AM Levels of Service ..... 5-32 – 5-35
Figures 71-74: 2035 Build PM Levels of Service ..... 5-36 – 5-39
Figures 75-78: 2021 Build AM Levels of Service ..... 5-44 – 5-47
Figures 79-82: 2021 Build PM Levels of Service ..... 5-48 – 5-51
Figures 83-86: Construction-Related Traffic Impacts (2016) ..... 6-6 – 6-9
Figures 87-90: Existing Conditions – Parking Space Availability & Restrictions ..... 7-2 – 7-5
Figures 91-94: Existing Conditions – Weekday Mid-Day Parking Space Utilization ..... 7-6 – 7-9
Figures 95-98: Existing Conditions – Weekday Evening Parking Space Utilization ..... 7-10 – 7-13
Figures 99-102: Existing Conditions – Weekend Mid-Day Parking Space Utilization ..... 7-14 – 7-17
Figures 103-106: 2035 Build Conditions – Parking Space Availability & Restrictions ..... 7-22 – 7-25

Appendix A: Travel Demand Forecasting Methodology & Delay, Volume, Level of Service Tables A-1
Appendix B: Figures of Staging Areas during Construction B-1
Appendix C: Figures of Haul Routes for Construction C-1
Appendix D: Detours during Construction D-1
Appendix E: Construction Impacts Summaries E-1
Appendix F: On-Street Parking Spaces Inventory F-1

1. Introduction and Methodology

This Traffic and Parking Technical Report presents the detailed analyses of the traffic operations and parking impacts due to the Red Line project. This report was prepared in support of the Project's Final Environmental Impact Statement (FEIS) and discusses the analyses of the traffic impacts along the Red Line project study corridor and in its vicinity under Existing (2011) year, No-Build 2035 (without Red Line in place), Build 2035 (with Red Line in place), Build 2021 (Initial Operating System or Opening Year) and 2016 Peak Construction Year.

East-west travel throughout the Baltimore City/County area is an important component of the overall movement of people to jobs, recreation, schools, and shopping throughout the region. This area is densely developed in most areas ranging from residential and office development in the downtown area to commercial, residential, office, and medical uses in the suburbs. The suburbs have one of the largest employers in the region - the Social Security Administration which is located in Woodlawn along I-70 just inside the I-695 Beltway. These uses generate many auto and transit trips.

Roadway capacity for east-west travel is somewhat limited in the Baltimore region today. Originally, I-70 was proposed to extend into the downtown area and two sections of the roadway were constructed. I-70 was constructed from the west to the MD 122 (Security Boulevard)/Cooks Lane area where the freeway was terminated in the late 1960's due to the impact it would have to the Leakin Park region. Within Baltimore City, a separate 1.5 mile section was built from Pulaski Street to Martin Luther King, Jr. Boulevard that could not be extended to the west. The lack of direct east-west connections requires dependence on arterial roadways to handle the growth in traffic volumes. These arterials tend to experience congestion at numerous signalized intersections due to the increase in regional developmental growth. However, there is a limited amount of additional capacity that can be provided due to right-of-way constraints in an area.

The congestion along the roadway system also has an impact on the Bus Transit system. Due to the increased amount of congestion on arterials, patrons that travel by bus cannot predict accurate travel times and cannot depend on the system due to the increase in the travel time. This discourages riders from using the system. It is anticipated that the proposed Red Line would solve this issue by providing an alternative method of travel in the east-west region. The western terminus of the Red Line would be along Security Boulevard at Center for Medicare and Medicaid Services (CMMS), west of Rolling Road. The line would traverse easterly approximately 14 miles until terminating at its eastern limit at the Bayview MARC station, just east of the I-895/ Lombard Street interchange. See **Figure 1** for study area map.

1.1 Project History

The *2002 Baltimore Regional Rail System Plan* recommended a 109-mile Regional Rail System with 66 new miles added to the existing 43 miles of Metro Subway and Light Rail lines. The finished system could have as many as 122 stations, including 68 new stations in addition to the 54 stations that exist now. The Red Line was identified as one of the priority projects for the Plan's implementation. In 2003, the FTA issued a Notice of Intent to prepare a Draft Environmental Impact Statement (DEIS), Scoping and Alternatives Development followed and based on public and agency input, the FTA and MTA developed a range of alternatives for consideration in the alternatives screening process. Between 2005 and 2007, the Federal Transit Administration (FTA) and Maryland Transit Administration (MTA) conducted an alternatives screening process, which was intended to identify a range of alternatives for detailed study in the Alternative Analysis/Draft Environmental Impact Statement (AA/DEIS). The 2009 AA/DEIS studied in detail four alternatives: No-Build, Transportation Systems Management, Bus Rapid Transit, and Light Rail Transit (LRT). The AA/DEIS was made available for public and agency review between October 3, 2009 and January 5, 2010. The AA/DEIS did not identify a Preferred Alternative; however, the FTA New Starts Process requires the local project sponsor to identify a Locally Preferred Alternative (LPA). In August 2009, the State of Maryland with consensus from Baltimore City and Baltimore County, identified a 14.5-mile light rail transit alignment from CMS to Bayview with tunnel alignments under Cooks Lane and through downtown from Martin Luther King, Jr. Boulevard to Boston Street. Since then, the MTA has conducted technical studies, refined the LPA, and continued the public involvement and agency coordination, including the Station Area Advisory Committees (SAACs). The results of these studies and definition of the Preferred Alternative are presented in the Final Environmental Impact Statement (FEIS) and supporting technical reports.

1.2 Project Purpose and Need

The purpose of the Red Line is to provide enhanced transit in an approximately 14-mile corridor of the Baltimore region, from the Centers for Medicare and Medicaid Services (CMS) and Social Security Administration on the west to the Johns Hopkins Bayview Medical Center on the east (Figure 1). The objectives of this transit project are to improve transportation choices for travelers in the Baltimore region, improve efficiency of the current transit system, and help address the region's air quality issues. The Red Line is also intended to encourage economic development and transit-oriented development at planned locations along the corridor. The FEIS for the Red Line examines potential solutions for addressing mobility issues within the east-west transit corridor.

The Baltimore region faces a number of challenges that support the need for addressing transportation improvements in the corridor, including:

- Current and future congestion and travel time,
- Mobility and access to major activity centers,
- Transportation choices for east-west commuting,
- Connectivity between transit modes,
- Community revitalization and development, and
- Air quality concerns.

Refer to Chapter 1 of the FEIS, Purpose and Need, for a detailed explanation of the study's proposed actions and transportation challenges in the Red Line project study corridor. Furthermore, Chapter 2 of the FEIS provides an evaluation of various options which were studied, including each one's ability to meet Purpose and Need, and the justification for selection of the Preferred Alternative.

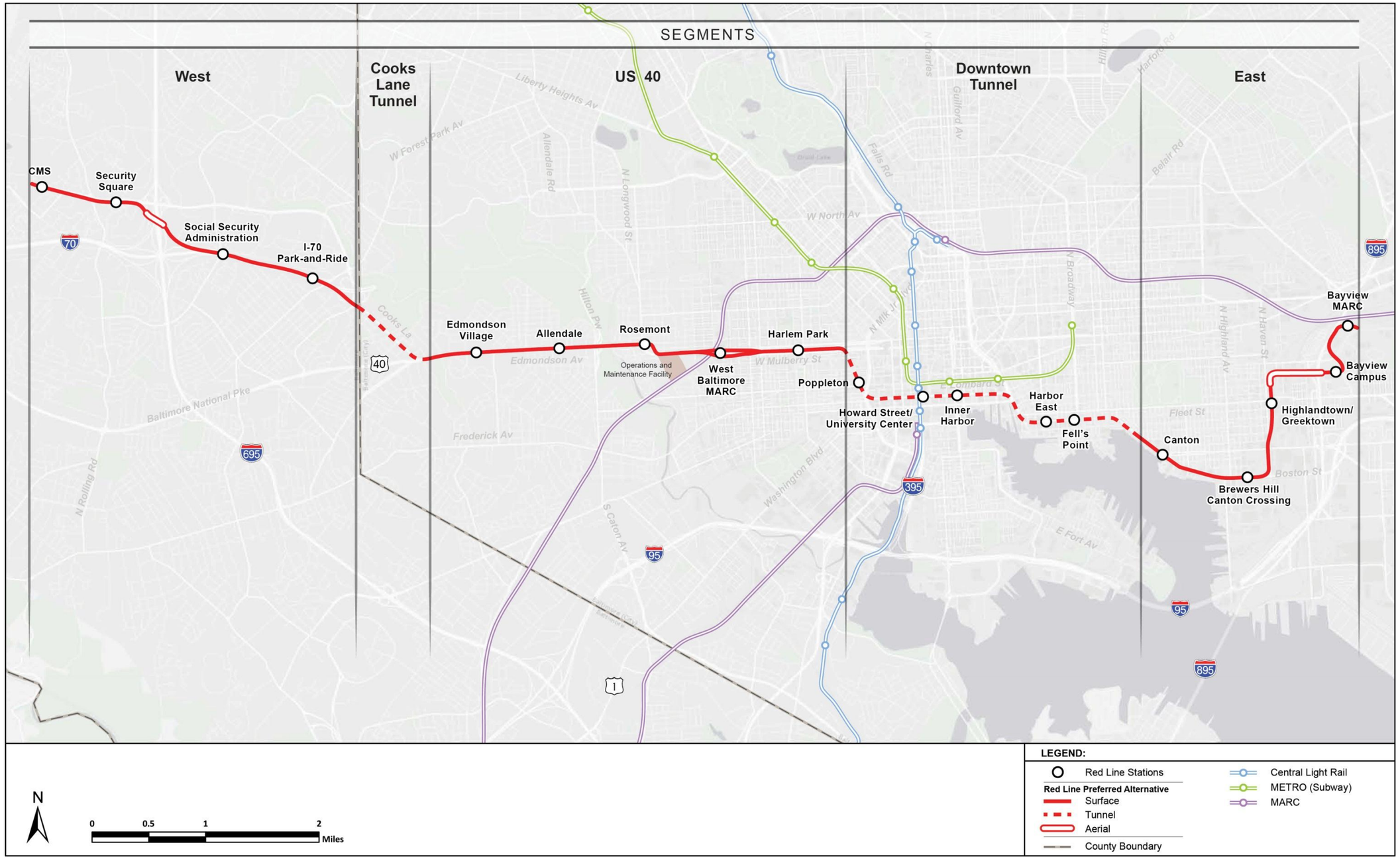

Figure 1: Preferred Alternative with Station Locations

2. Existing Conditions

The proposed Red Line alignment will traverse a wide range of conditions over the entire length of the project study corridor. These conditions relate to the roadway network such as number of lanes, traffic volumes, traffic operations, travel time, and the ability to park along the various sections of the roadway. The following sections describe the existing conditions within the project study corridor. The project study limits include Security Blvd. (MD 122), Cooks Lane, Edmondson Avenue from Cooks Lane to West Franklin Street, West Franklin Street from Edmondson Avenue to Martin Luther King Jr. Boulevard (MLK Jr. Blvd.), West Mulberry Street from West Franklin Street to MLK Jr. Blvd., MLK Jr. Blvd. from Mulberry Street to Lombard Street, North Fremont Avenue from West Mulberry Street to Baltimore Street, Lombard Street from MLK Jr. Blvd. to President Street, President Street from Lombard Street to Fleet Street, Fleet Street from President Street to Boston Street, Boston Street from Fleet Street to South Haven Street, and Bayview Boulevard from East Lombard Street to Eastern Avenue.

2.1 Roadway Network

There are numerous roadways that are located along the proposed alignment for the Red Line. These roadways have many different characteristics. The roadways range from freeways to local streets. The number of lanes on these roadways varies from two to six; parking is allowed on many of the roadways while prohibited on others. The total number of lanes for various roadways along the Red Line alignment and in its vicinity is shown in **Table 1**.

Lombard Street has five lanes west of Market Place

Table 1: Number of Lanes along Roadways Affected by the Red Line

Roadway	Figure Number	Total Number Of Travel Lanes	Two Way Or One Way
MD 122 (Security Blvd.)	2	4-6	Two Way
I-70	2	4-7	Two Way
Woodlawn Drive	2	4	Two Way
Ingleside Avenue	2	3-4	Two Way
Parallel Drive	2	3	Two Way
US 40 (Baltimore National Pike)	2	6	Two Way
Cooks Lane	2	2	Two Way
Edmondson Avenue	2,3	6	Two Way
Franklin Street	3,4	2-6	Two Way/One Way WB
Mulberry Street	3,4	2-3	One Way EB
N. Freemont Avenue	4	2	Two Way
Martin Luther King, Jr. Blvd.	4	6	Two Way
Lombard Street	4	3-6	One Way WB
President Street	4	6	Two Way
Fleet Street	4	2-4	Two Way
Boston Street	4,5	4	Two Way
Conkling Street	4,5	2	Two Way
Haven Street	5	2	Two Way
Bayview Boulevard	5	4	Two Way

Source: MTA 2012

Notes: The number of lanes along each section of roadway within the project study are shown on **Figures 2- 5**.

2.2 Traffic Volumes

Traffic counts were gathered from the Baltimore City Department of Transportation and the Maryland State Highway Administration's (MdSHA) Highway Information Services Division, including both turning movement counts (Data collectors monitoring the number of vehicles making lefts, rights and going through the intersection) and portable automatic counts (pneumatic tubes across the roadway). Additional intersection turning movement counts were obtained from signal network data that was provided by the Baltimore City Department of Transportation. This traffic count data was collected to update the AA/DEIS traffic information for intersections along and in the vicinity of the Red Line alignment in Baltimore City and Baltimore County. Additionally, this report includes both AM and PM peak hour volumes whereas the AA/DEIS included PM peak hour volumes only. The base existing conditions represent volumes from years 2010 and 2011. Some volumes older than 2010 were

adjusted to the year 2011. Also, vehicle classification tube counts were collected at various locations in February 2012 to determine heavy truck percentages along the Red Line project study corridor. The locations are listed in the **Table 2**.

Table 2: Daily Percentage of Heavy Trucks within the Project Study Corridor

Location	Heavy Trucks (Classes 5 to 13)
Security Boulevard, west of Lord Baltimore Drive	4.9%
Cooks Lane, south of Forest Park Avenue	2.3%
Edmondson Avenue, east of Athol Avenue	2.3%
US 40, east of Calhoun Street	3.1%
MLK Jr. Boulevard, south of Fayette Street	3.8%
Lombard Street, west of Howard Street	8.6%
I-83-0.1 MI, north of Fayette Street	2.9%
Fleet Street, west of Broadway	5.5%
Boston Street, east of Ellwood Avenue	3.6%
Lombard Street, west of Bayview Boulevard	8.7%

Source: MTA, 2012

It was observed that Lombard Street, west of Bayview Boulevard, had heaviest truck percentages in the Red Line project study corridor. Traffic volume data is one of the roadway characteristics that are used to determine the operational characteristics of a roadway. Traffic volumes are typically higher at signalized intersections as compared to unsignalized intersections. These are locations where the most congestion occurs. Several unsignalized intersections are located along the Red Line project study corridor, some of them that were modified either to a signal or the access was closed in Build conditions due to the Red Line were also studied. There are a total of 131 signalized intersections along the Red Line alignment that may be impacted by the project. These are shown in **Figures 6-9**.

The Average Daily Traffic (ADT) volumes the Red Line project study corridor were gathered from the MdSHA Highway Information Services Division's Traffic Volume Maps for Baltimore County and Baltimore City. Some ADT volumes were developed using data from portable traffic counts, the projection of intersection turning movement counts to 24-hour volumes, and volumes from the 2005 Baltimore Metropolitan Council's (BMC) travel forecasting data model.

The ADT volumes for the study area representing year 2011 are shown in **Figures 10-13**. ADT volumes for roadways affected by the Red Line project are shown in **Table 3**.

One of the highest volume roadways in the study area is Edmondson Avenue

A 1.5 mile section of I-70 was constructed just west of Martin Luther King, Jr. Boulevard. The remaining plans for the roadway were abandoned

Buses presently traverse through the Red Line project study corridor.
Here a bus along the No. 40 line is carrying patrons to suburban destinations

NUMBER OF LANES - EXISTING CONDITIONS (2011)

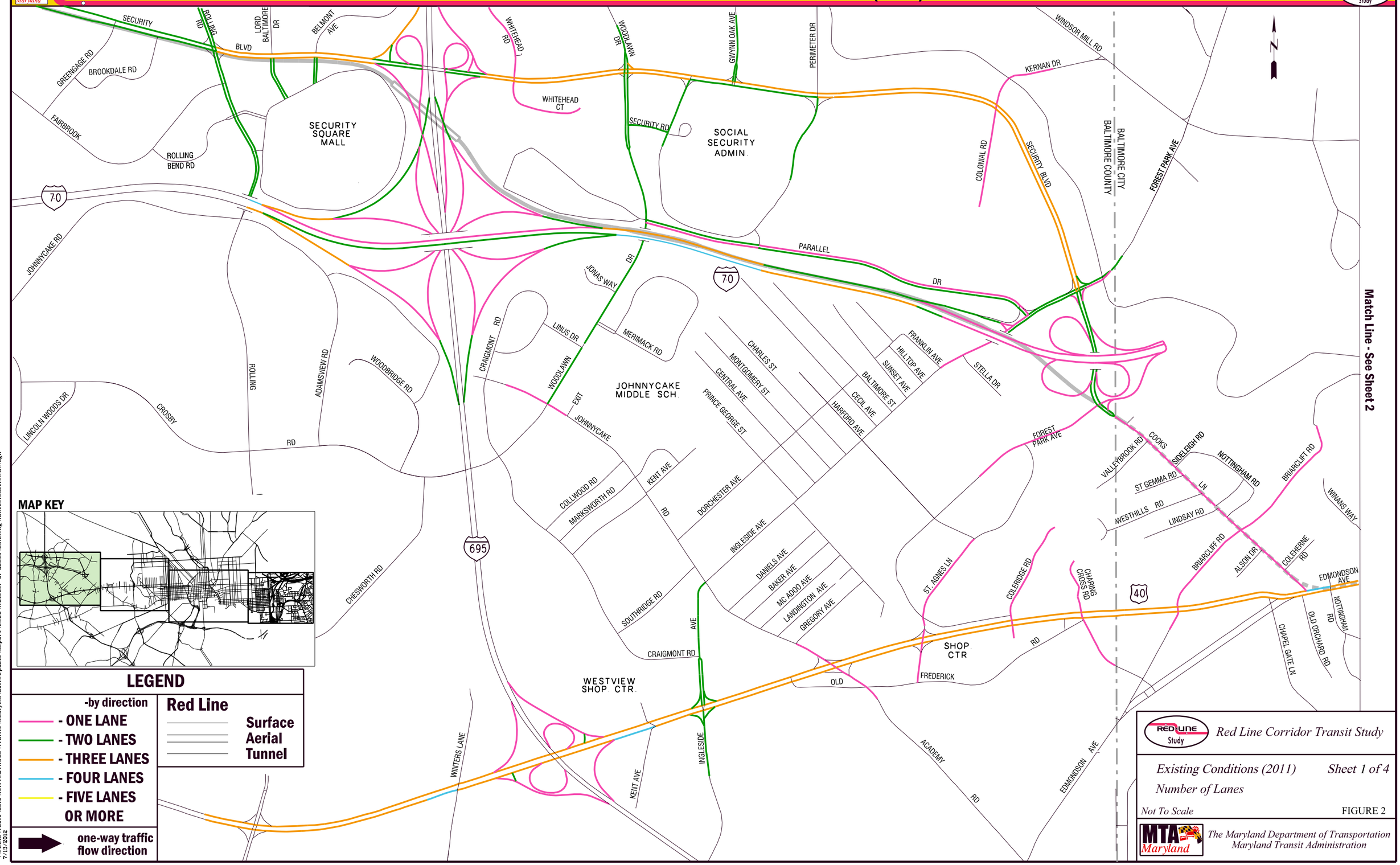

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FIGURE 2 - Existing Conditions (2011) Number of Lanes

NUMBER OF LANES - EXISTING CONDITIONS (2011)

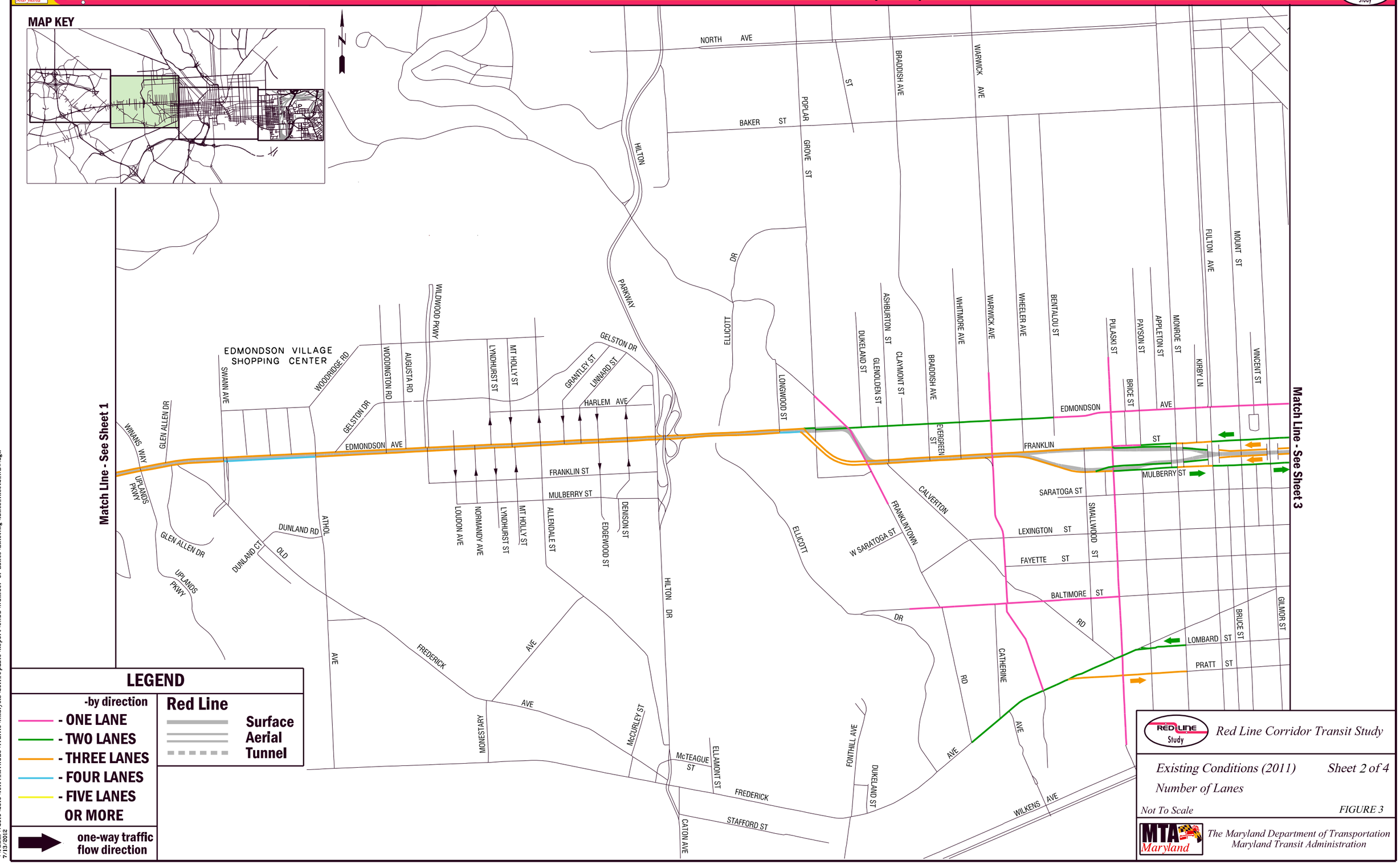

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FIGURE 3- Existing Conditions (2011) Number of Lanes

NUMBER OF LANES - EXISTING CONDITIONS (2011)

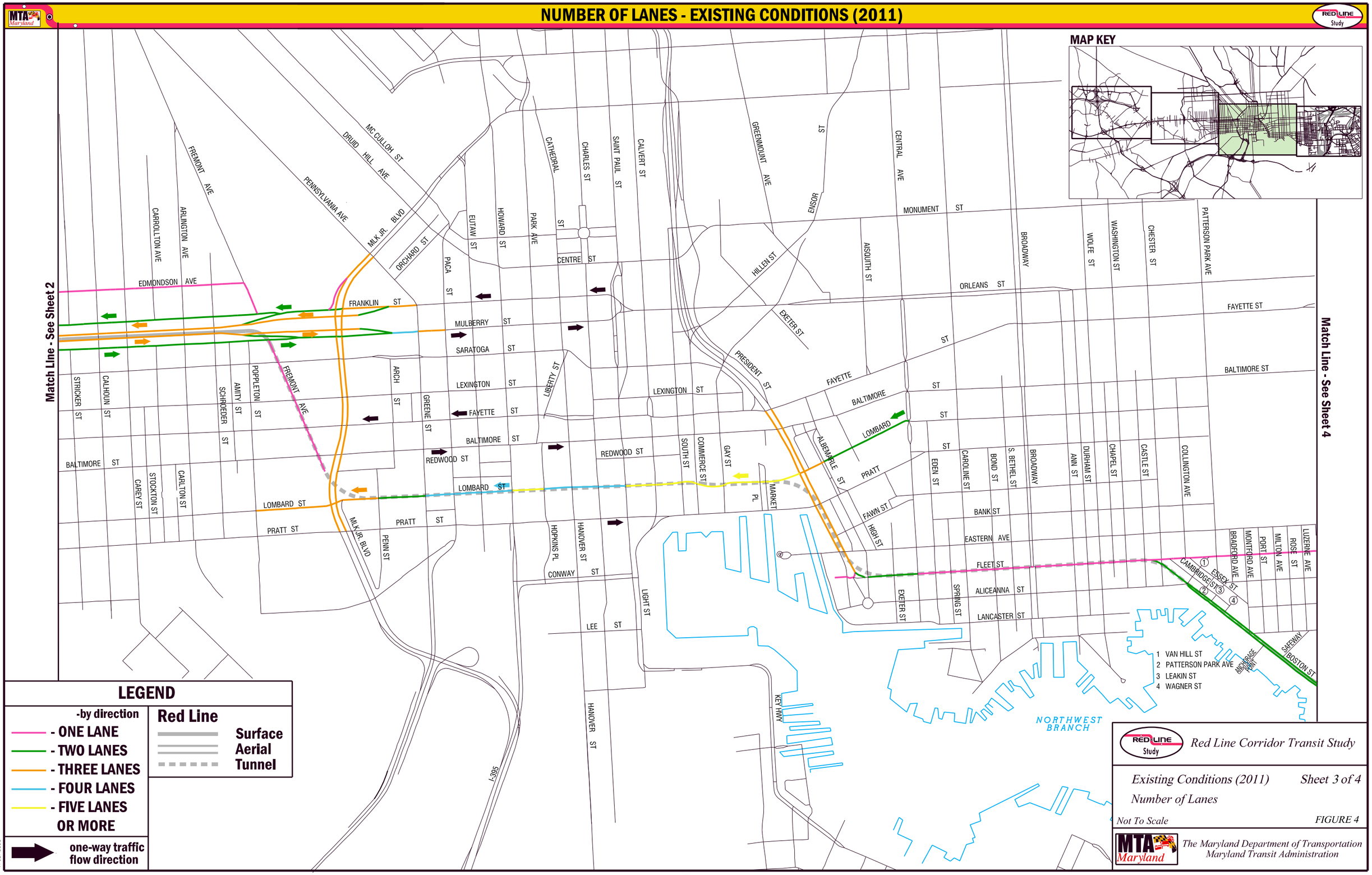

FIGURE 4 - Existing Conditions (2011) Number of Lanes

NUMBER OF LANES - EXISTING CONDITIONS (2011)

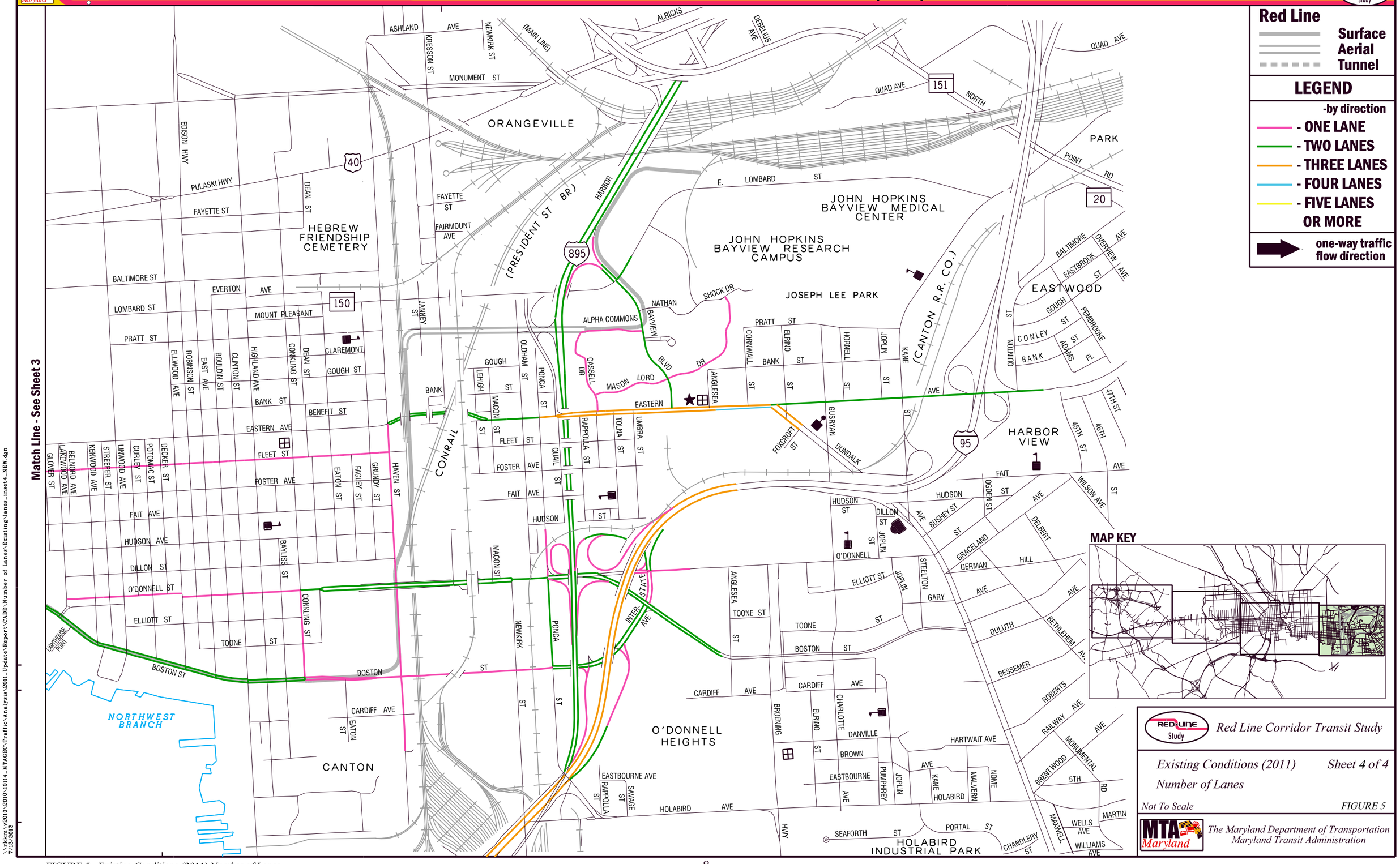

FIGURE 5 - Existing Conditions (2011) Number of Lanes

SIGNALIZED INTERSECTIONS - EXISTING CONDITIONS (2011)

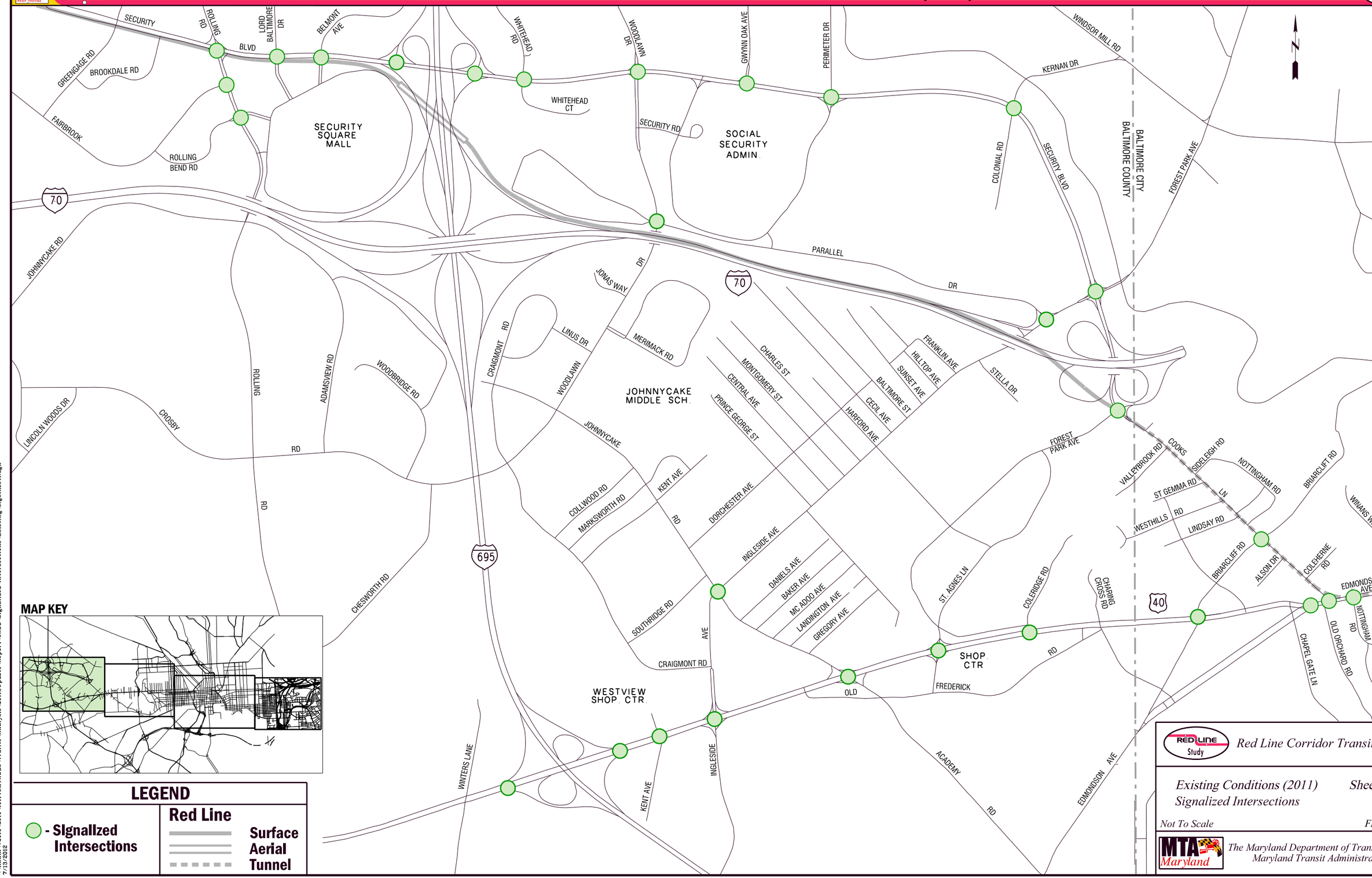

FIGURE 6 - Existing Conditions (2011) Signalized Intersections

SIGNALIZED INTERSECTIONS - EXISTING CONDITIONS (2011)

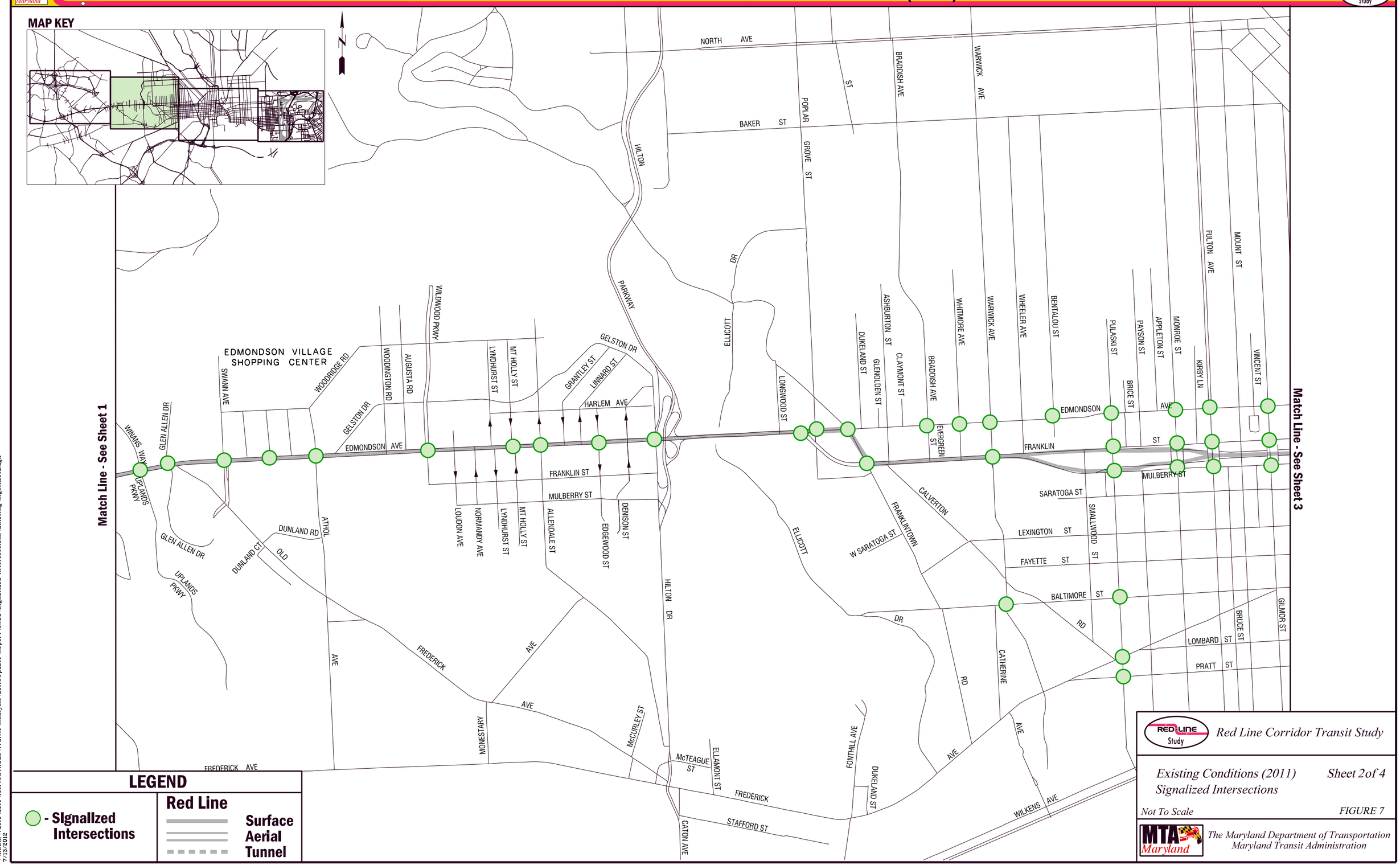

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FIGURE 7 - Existing Conditions (2011) Signalized Intersections

SIGNALIZED INTERSECTIONS - EXISTING CONDITIONS (2011)

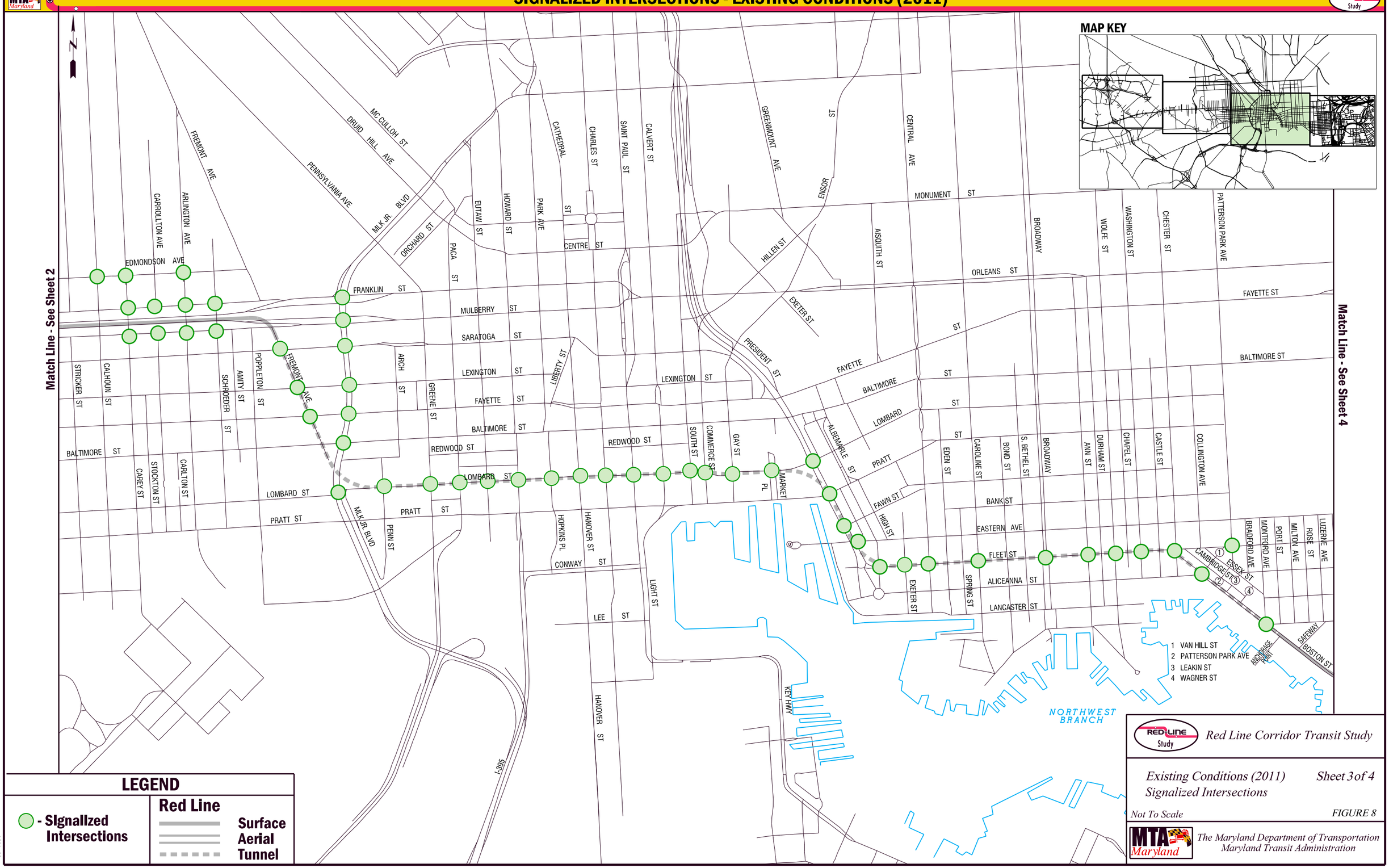

FIGURE 8- Existing Conditions (2011) Signalized Intersections

SIGNALIZED INTERSECTIONS - EXISTING CONDITIONS (2011)

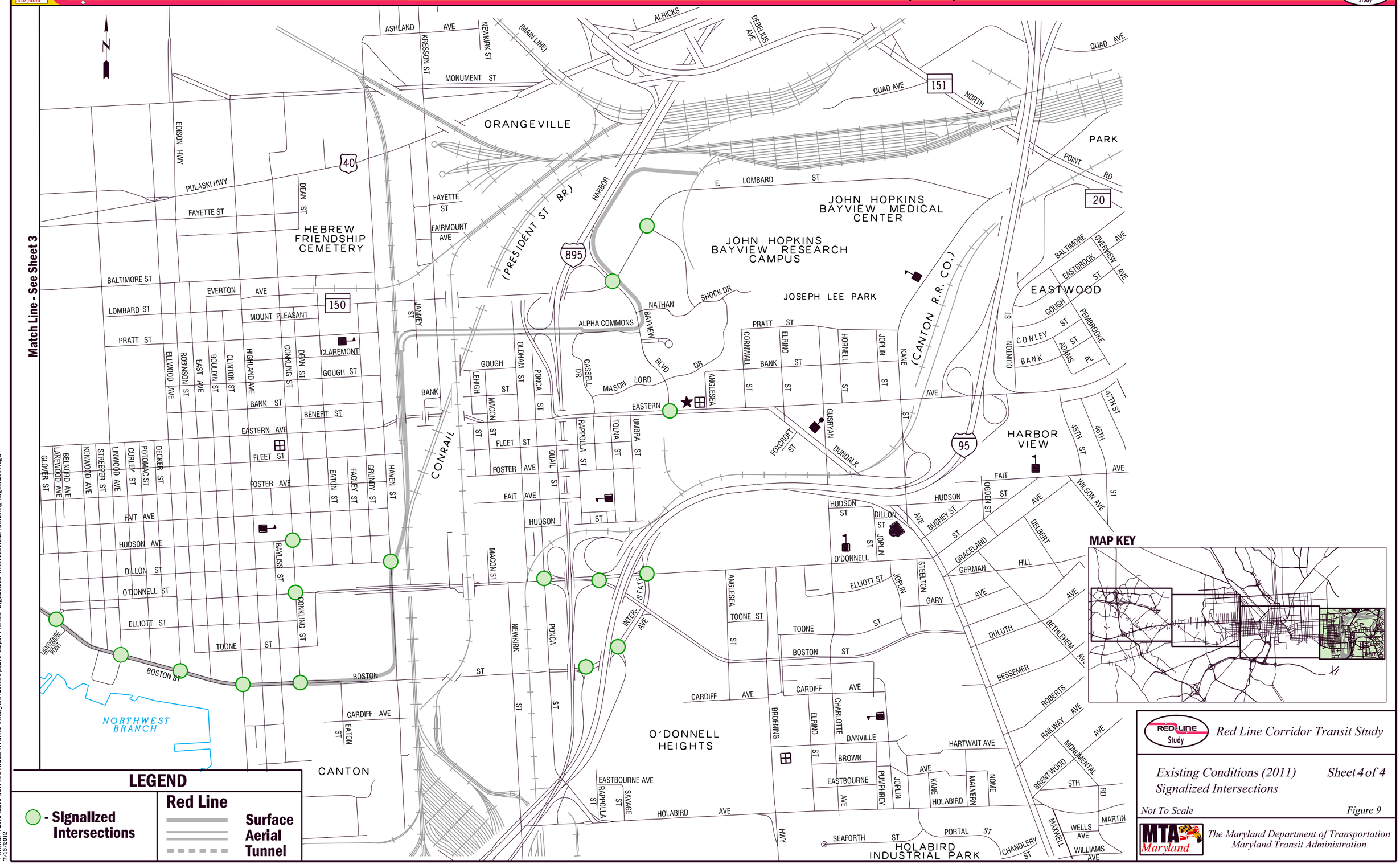

FIGURE 9 - Existing Conditions (2011) Signalized Intersections

AVERAGE DAILY TRAFFIC - EXISTING CONDITIONS (2011)

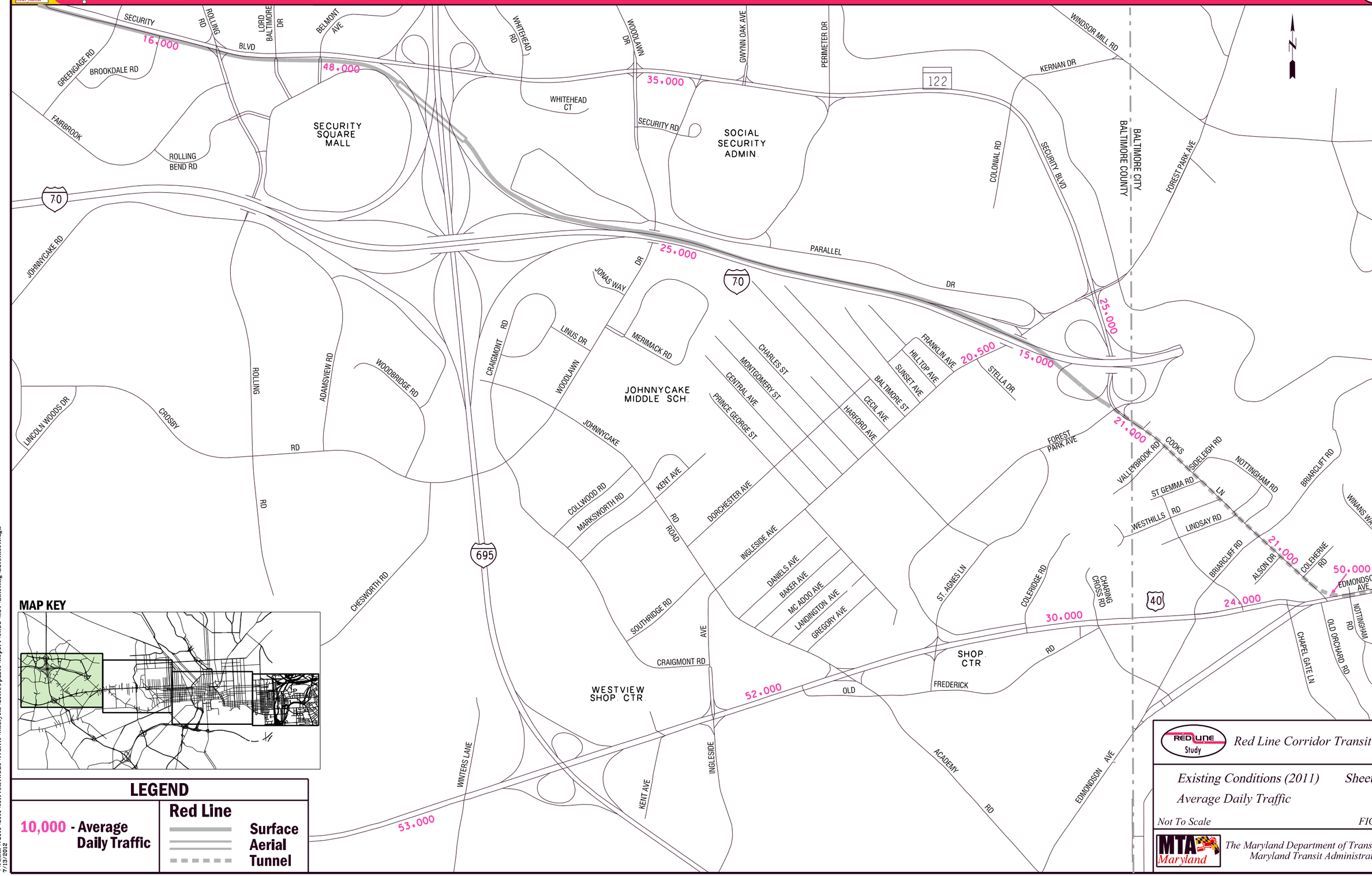

FIGURE 10 - Existing Conditions (2011) Average Daily Traffic

AVERAGE DAILY TRAFFIC - EXISTING CONDITIONS (2011)

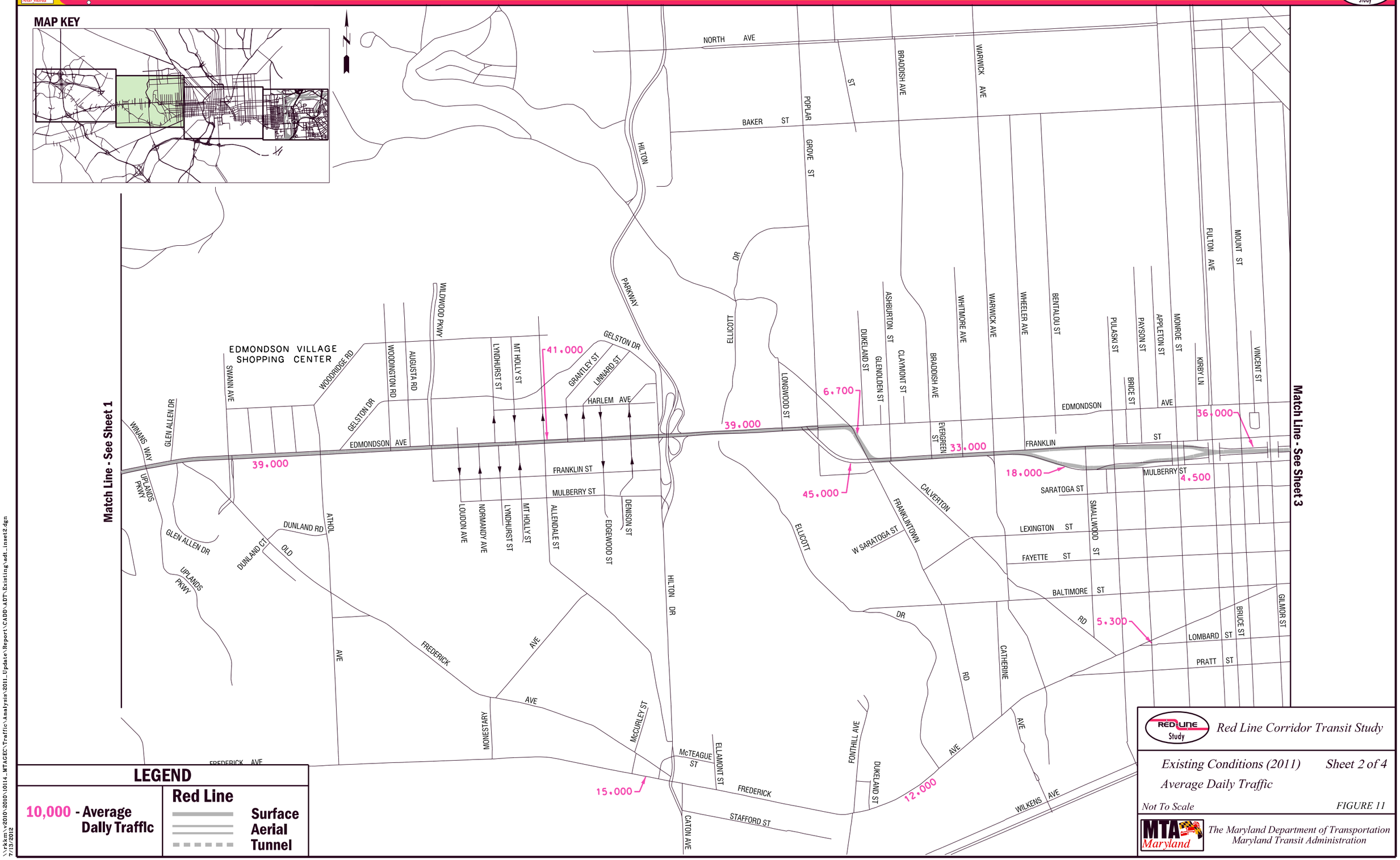

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FIGURE 11 - Existing Conditions (2011) Average Daily Traffic

AVERAGE DAILY TRAFFIC - EXISTING CONDITIONS (2011)

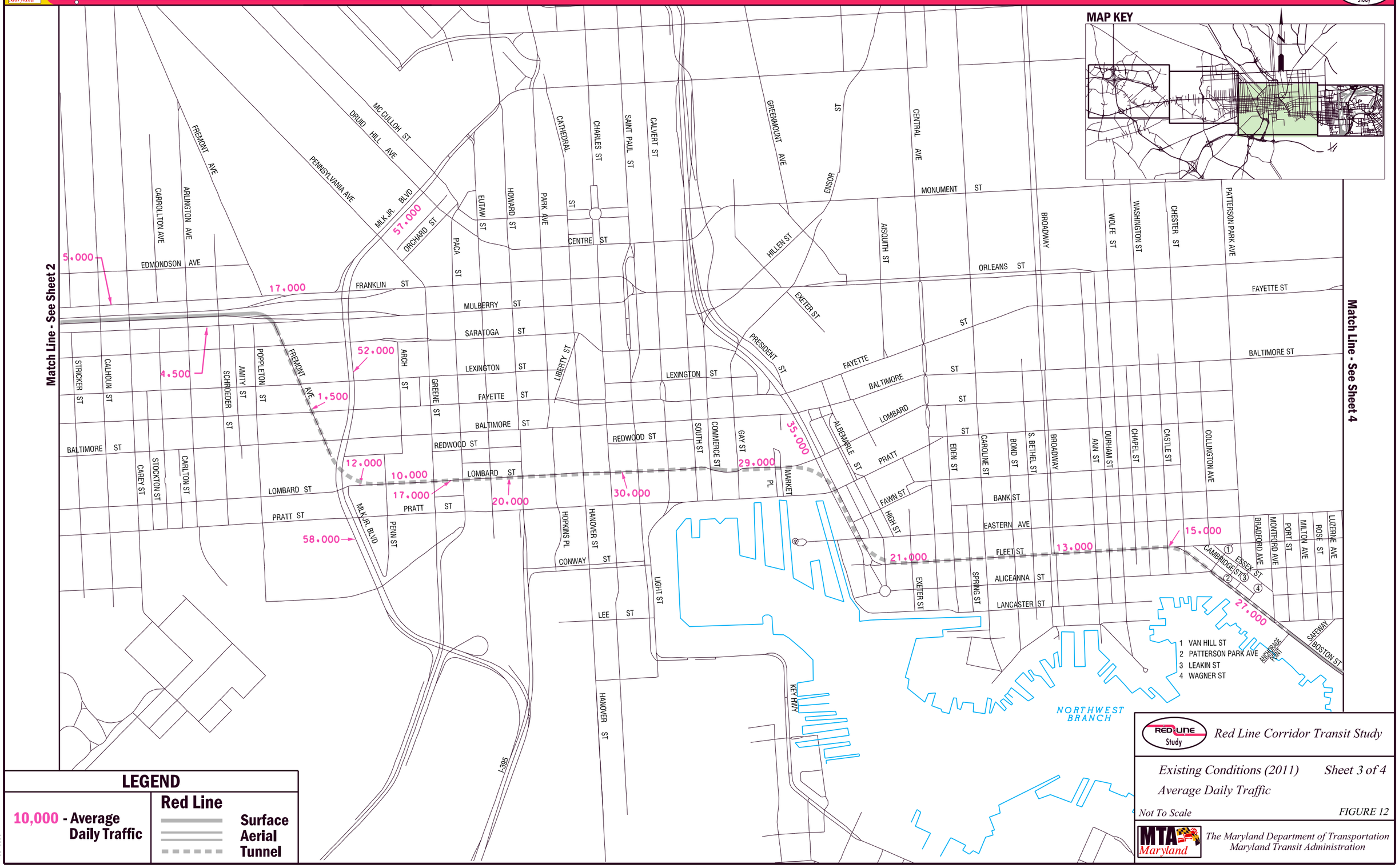

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FIGURE 12 - Existing Conditions (2011) Average Daily Traffic

AVERAGE DAILY TRAFFIC - EXISTING CONDITIONS (2011)

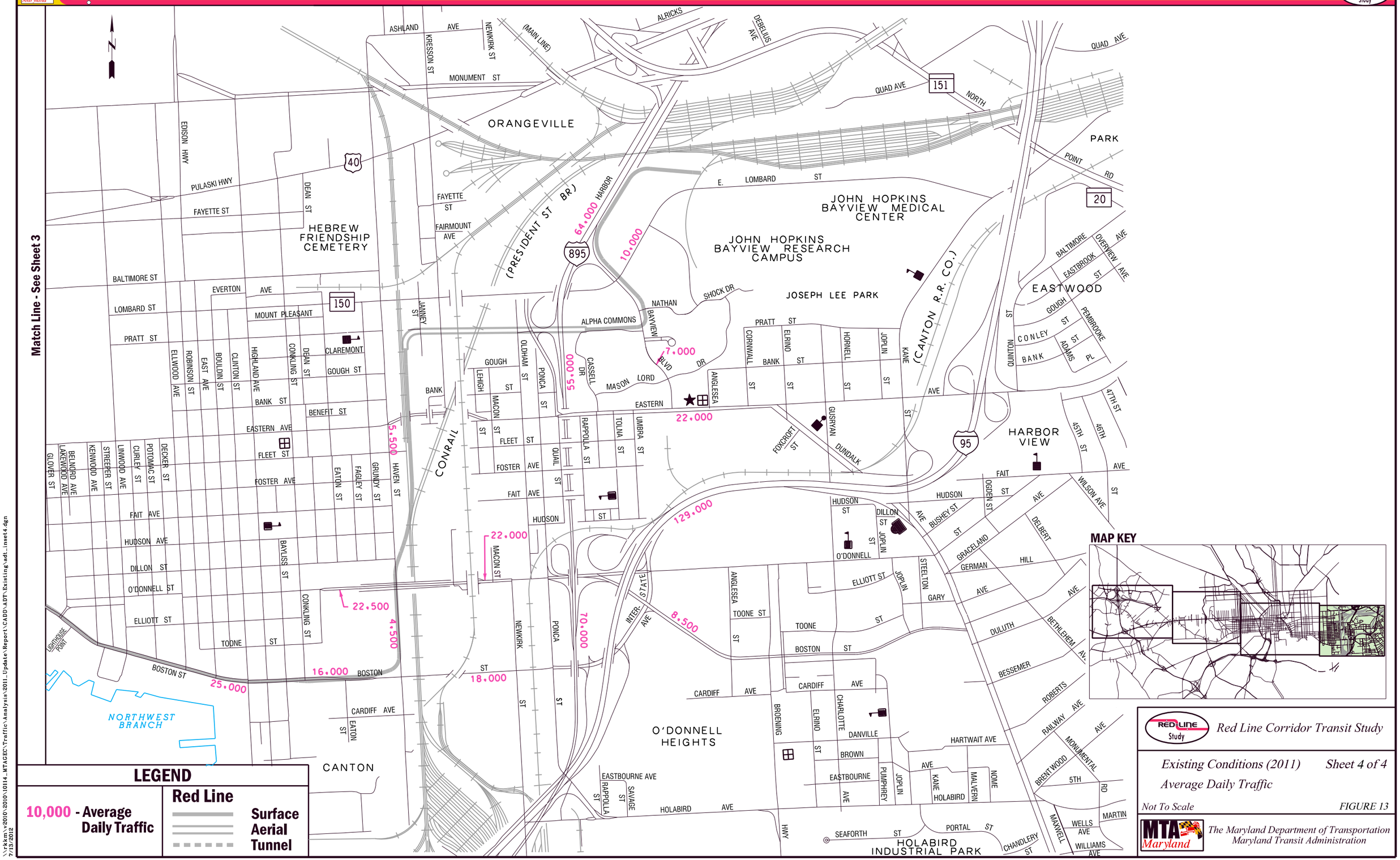


FIGURE 13 - Existing Conditions (2011) Average Daily Traffic

Table 3: Average Daily Traffic for Roadways Affected by the Red Line Project

Location	ADT
1-70, east of I-695	25,000
Security Boulevard, west of I-695 to Rolling Road	48,000
US 40, from Rolling Road to Cooks Lane	24,000 to 53,000
Edmondson Avenue, from Cooks Ln to Hilton Pkwy	39,000 to 50,000
Frederick Avenue, west of Hilton Drive	15,000
Franklin Street, east of Franklintown Road	33,000
Martin Luther King, Jr. Blvd., south of Pratt Street	58,000
Lombard Street, west of Greene Street	10,000
Lombard Street, east of Charles Street	30,000
Lombard Street, west of Market Place	29,000
President Street, north of Lombard Street	35,000
Fleet Street, east of President Street	21,000
Boston Street, north of Montford Avenue	27,000
Boston Street, east of Conkling Street	16,000
Interstate Avenue, east of I-95 ramps	8,500
O'Donnell Street, east of Conkling Street	22,500
Eastern Avenue, east of Bayview Blvd	22,000
Bayview Boulevard, south of Alpha Commons Drive	7,000

Source: MTA

The growth in traffic volumes throughout the Red Line project study corridor varies greatly with each individual roadway. For example, roadways such as Cooks Lane have seen virtually no growth in traffic volumes over the last 20 years, while other roadways such as Security Boulevard west of I-695 have grown by approximately 16,000 vehicles per day, or 40 percent, over the past 20 years.

The traffic volumes during AM and PM peak hours were developed based on counts performed in 2011 and also counts that were collected from different agencies within the project study corridor. The peak hours vary throughout the corridor and ranged between 7AM to 9AM for AM peak hour and 4PM to 6PM for PM peak hour. The peak hour traffic count data was balanced for adjacent signalized intersections to reflect the fact that counts were taken from different years and were adjusted to the year 2011. These peak hour volumes are shown in **Figures 14-17**. The highest volumes roadways in the AM and PM peak directions are shown in **Tables 4.1 and 4.2.**

Table 4.1: AM Peak Hour Peak Direction Highest Volumes

Location	AM Peak (Peak Direction)
Security Boulevard, from Rolling Road to I-695	1,940 (WB)
Rolling Road, south of Security Blvd.	1,295 (NB)
Security Boulevard, from I-695 to Woodlawn Drive	1,865 (EB)
Cooks Lane, east of Forest Park Ave.	955 (EB)
US 40, from Winters Lane to Cooks Lane	2,600 (EB)
Edmondson Avenue, from Cooks Lane to Franklin Street	2,625 (EB)
Franklin Street, from Edmondson Avenue to Pulaski Street	2,585 (EB)
Fleet Street, from Wolfe Street to Boston Street	855 (WB)
Boston Street, from Aliceanna Street to Conkling Street	1,510 (NB)
President Street Lombard St. to Fleet Street	920-2,225 (NB)
Lombard St., from MLK Jr. Blvd. to President St.	2,085 (WB)
MLK Jr. Blvd., from Mulberry St. to Lombard St.	2,555 (SB)
Bayview Boulevard, from Lombard St. to Eastern Ave.	280 (SB)

Source: Maryland State Highway Administration, Baltimore City, MTA

Table 4.2: PM Peak Hour Peak Direction Highest Volumes

Location	PM Peak (Peak Direction)
Security Boulevard, from Rolling Road to I-695	2,250 (EB)
Rolling Road, south of Security Boulevard	1,335 (NB)
Security Boulevard, from I-695 to Woodlawn Drive	1,905 (WB)
Cooks Lane, east of Forest Park Avenue	1,200 (WB)
US 40, from Winters Lane to Cooks Lane	2,475 (WB)
Edmondson Avenue, from Cooks Lane to Franklin Street	2,535 (WB)
Franklin Street, from Edmondson Avenue to Pulaski Street	1,885 (WB)
Fleet Street, from Wolfe Street to Boston Street	810 (EB)
Boston Street, from Aliceanna Street to Conkling Street	1,195 (SB)
President Street, from Lombard Street to Fleet Street	1,275-2,545 (NB)
Lombard St., from MLK Jr. Blvd. to President St.	2,345 (WB)
MLK Jr. Blvd., from Mulberry St. to Lombard St.	2,585 (NB)
Bayview Boulevard, from Lombard St. to Eastern Ave.	280 (SB)

Source: Maryland State Highway Administration, Baltimore City, Red Line GEC

AM(PM) PEAK HOUR VOLUMES - EXISTING CONDITIONS (2011)

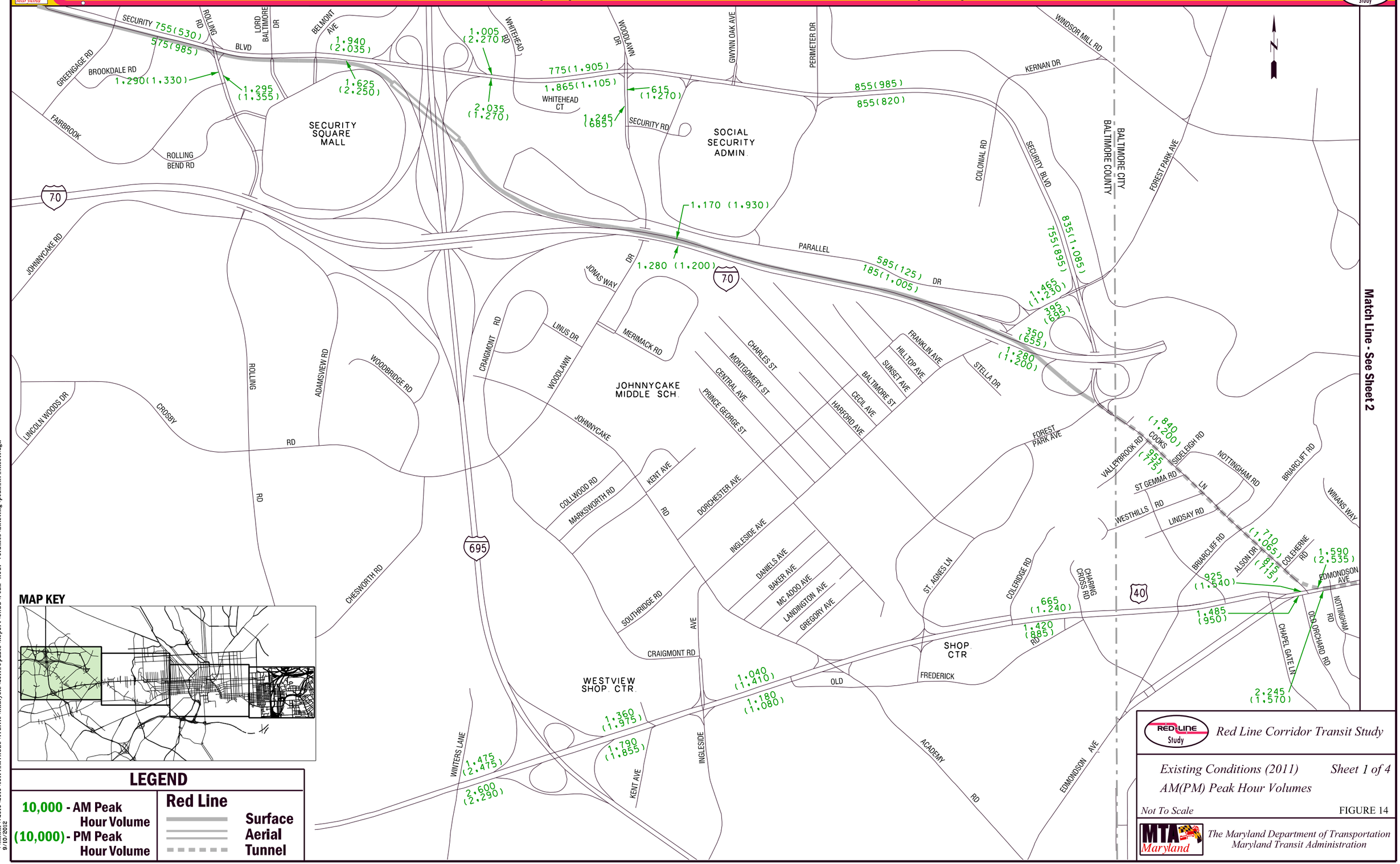


FIGURE 14 - Existing Conditions (2011) AM(PM) Peak Hour Volumes

AM(PM) PEAK HOUR VOLUMES - EXISTING CONDITIONS (2011)

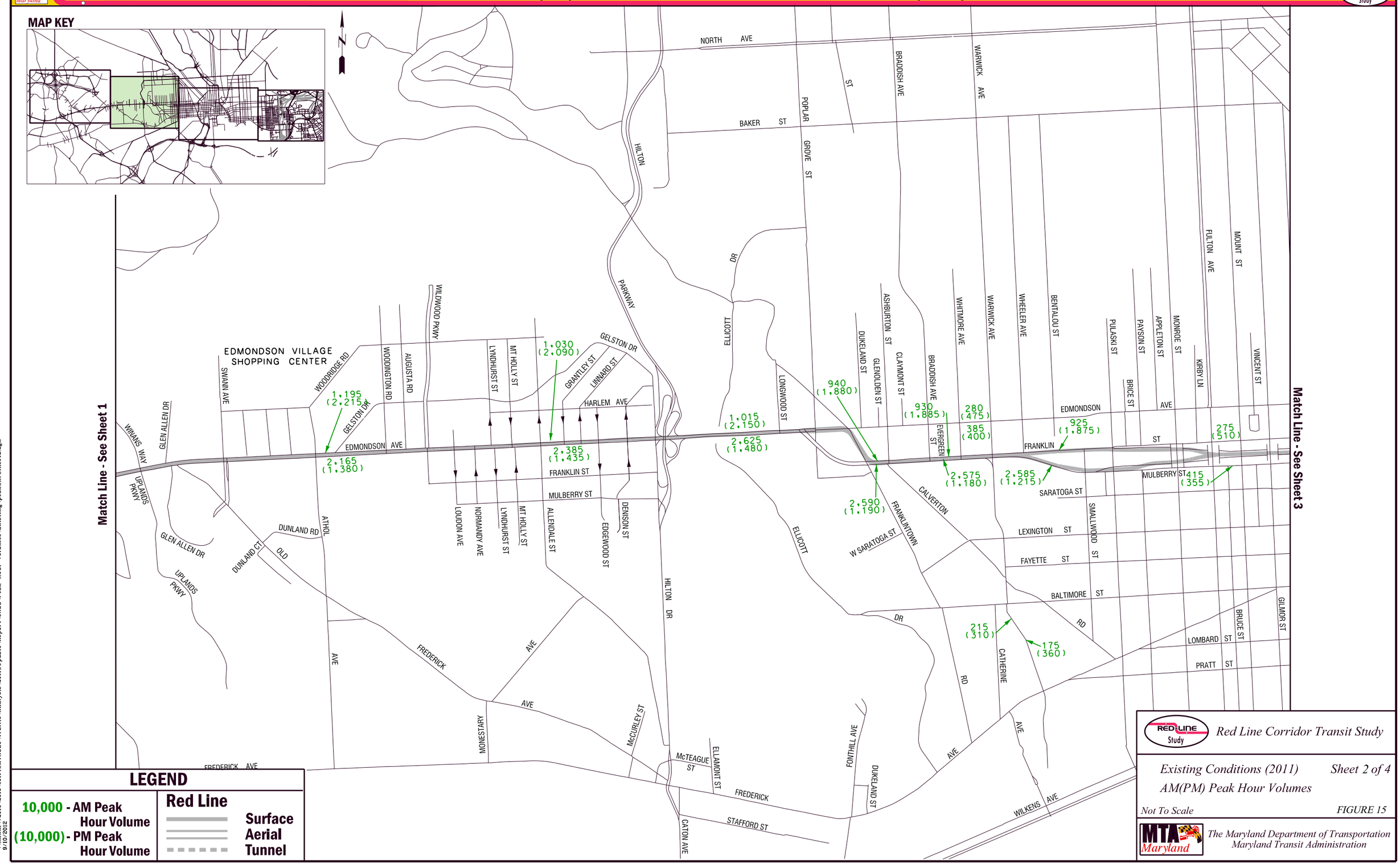


FIGURE 15 - Existing Conditions (2011) AM(PM) Peak Hour Volumes

AM(PM) PEAK HOUR VOLUMES - EXISTING CONDITIONS (2011)

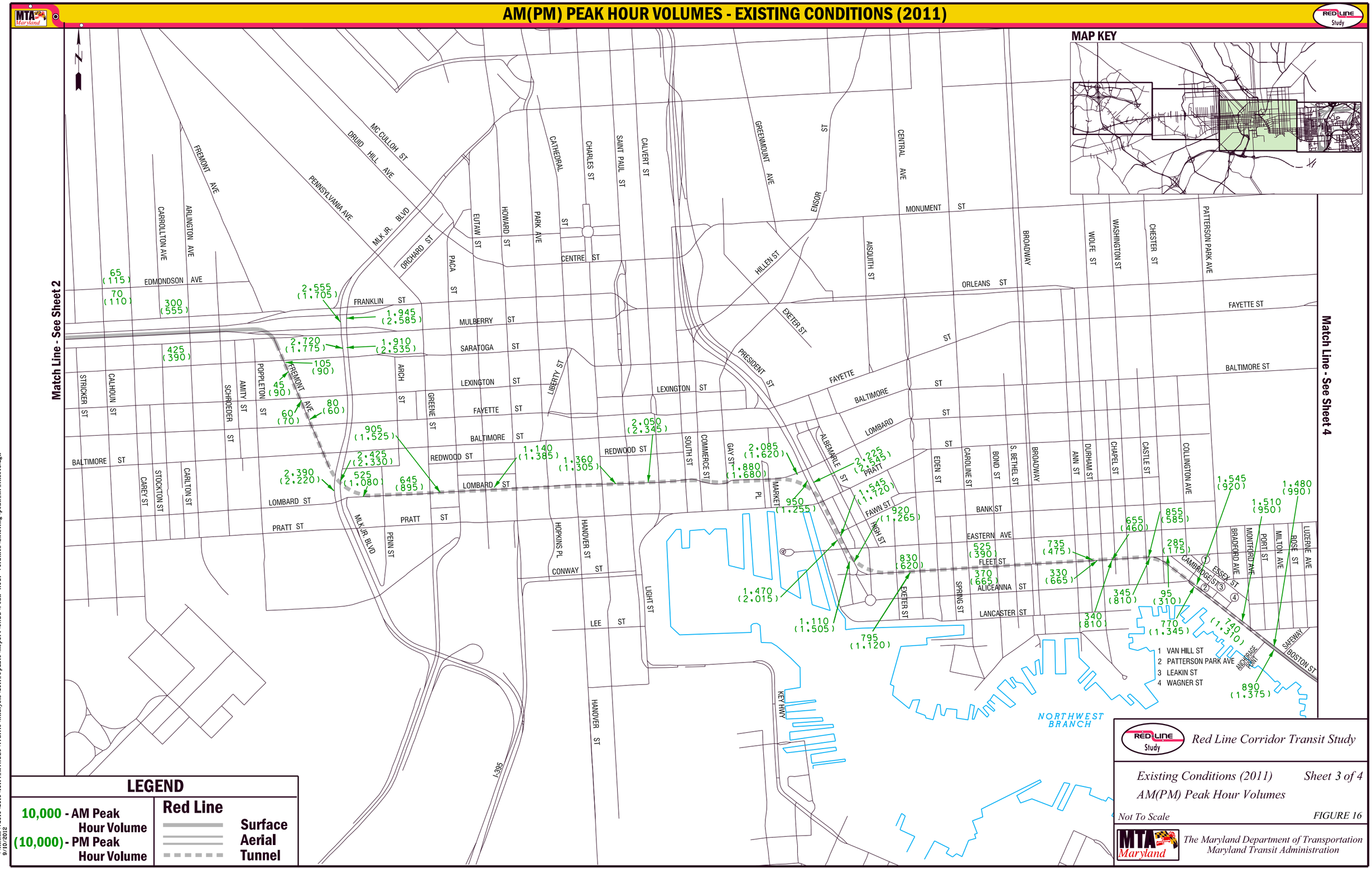


FIGURE 16 - Existing Conditions (2011) AM(PM) Peak Hour Volumes

AM(PM) PEAK HOUR VOLUMES - EXISTING CONDITIONS (2011)

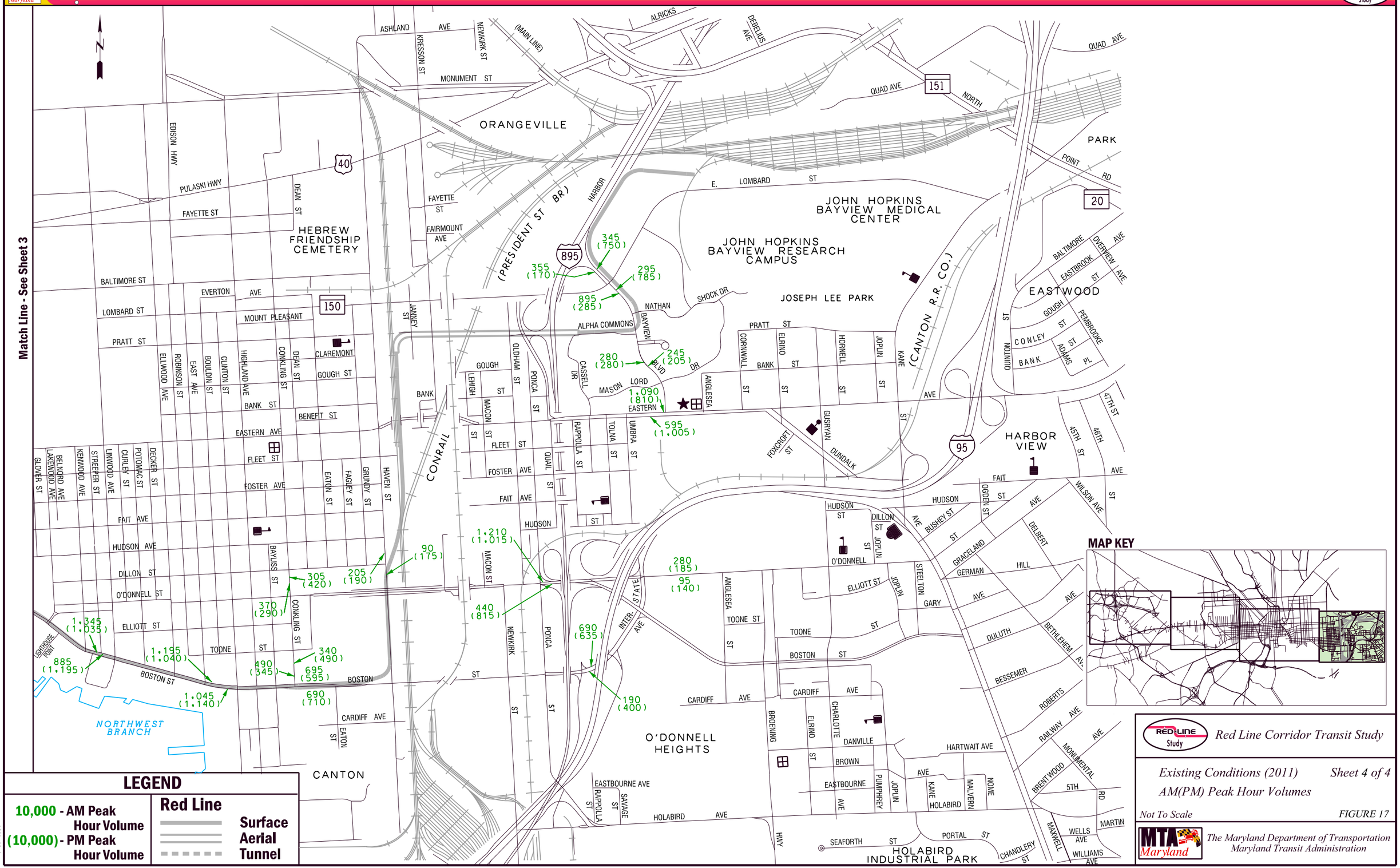


FIGURE 17 - Existing Conditions (2011) AM(PM) Peak Hour Volumes

2.3 Travel Time

One of the various measures of how well a roadway operates is the duration of time it takes to traverse a section of that roadway. This can be determined by conducting a travel time study. Travel time runs were performed during AM and PM peak periods between August 2011 and December 2011 for roadway segments along the Red Line alignment that also accounts for travel time delays incurred at intersections. Travel time runs along US 40 between Rolling Road and Cooks Lane were performed in February 2012. The travel time runs were conducted between 7am to 9am and 4pm to 6pm.

In order to equally compare existing and future data with and without the Red Line, traffic simulation models were developed for the entire project study corridor. The simulation software chosen to replicate the existing conditions was Synchro/SimTraffic Version 7 developed by Trafficware, Inc., which is software used within the traffic engineering industry for modeling traffic conditions. Existing traffic data was entered into the Synchro model including turning movement data at various intersections, lane configurations, traffic signal timings, and roadway geometrics. The simulation model travel time output was validated against the existing travel times measured in the field. Adjustments were made to calibrate the existing conditions model (within 10 percent variation). The field travel times for some segments are listed below in **Table 5**.

Table 5: Existing AM and PM Peak Period Travel Times

FROM/TO	EB/SB TRAVEL TIME[1] (min.)	WB/NB TRAVEL TIME[1] (min.)
Security Boulevard, from Greengage Road to Woodlawn Drive	3.8 (4.8)	4.7 (4.8)
I-70, from Woodlawn Drive to Ingleside Avenue	1.1 (1.1)	1.0 (1.0)
Parallel Drive, from Woodlawn Drive to Ingleside Avenue	2.5 (1.8)	1.6 (1.6)
Cooks Lane, from Forest Park Avenue to Edmondson Avenue	3.1 (2.2)	1.8 (1.8)
US 40, from I-695 Outer Loop to Cooks Lane	3.8 (5.8)	4.7 (5.5)
Edmondson Avenue, from Cooks Lane to Franklin Street	4.5 (5.8)	4.8 (5.3)
Franklin Street, from Edmondson Avenue to Pulaski Street	2.2 (2.3)	2.2 (2.1)
US 40, from Pulaski Street to MLK Jr. Blvd.	2.3 (3.2)	1.9 (3.4)
MLK Jr. Blvd., from US 40 to Lombard Street	1.8 (3.3)	2.5 (4.2)
Lombard Street, from MLK Jr. Blvd. to President Street	N/A	6.2 (7.4)
President Street, from Pratt Street to Fleet Street	1.0 (0.8)	3.3 (2.5)
Fleet Street, from President Street to Boston Street	3.9 (6.9)	3.9 (3.9)
Boston Street, from Fleet Street to Conkling Street	3.7 (4.6)	2.7 (4.8)

Notes: The field travel time during peak periods on each individual segment are shown in **Figures 18-21**.
Source: MTA, 2011; [1] AM (PM) peak hours

The travel time analysis for Existing conditions showed that congestion occurs within the Red Line project study corridor. Especially in the Downtown area, along Edmondson Avenue between Franklin Street and Cooks Lane (total travel time of 3.3 minutes, without congestion or signal delay while assuming a prevailing speed of 35mph since the posted speed limit is 30mph) and along Lombard St. between President Street and MLK Jr. Boulevard (total travel time of 2.1 minutes, without congestion or signal delay while assuming a prevailing speed of 35mph since the posted speed limit is 30mph).

Travel times are greatly influenced by the number of traffic controls in the corridor such as traffic signals and the amount of signal green time allocated to each particular street within the traffic signal cycle length (cycle length is defined as the total time required to service all competing traffic movements at a signalized intersection using a complete sequence of red, yellow and green light indications for each approach). In areas where a major street intersects a minor street carrying equal amount of traffic volume, the amount of signal green time needs to be split close to 50 percent for each roadway because traffic volumes are relatively similar. On the other hand, when the ratio of traffic volume is higher on the major street, the major roadway receives about 70 percent of the signal green time. Typically, cycle lengths range from 90-120 seconds. However, the Baltimore City signals are part of a traffic control system that operates on a 110-second cycle length. In Baltimore County, the majority of traffic signals along the Red Line project study corridor are operated by the Maryland State Highway Administration. The signals along Security Boulevard are in a coordinated signal system operating on 140-second cycle length.

2.4 Levels of Service

Levels of service (LOS) were defined per the Highway Capacity Manual (HCM), 2000 edition, to provide a quantitative measure to characterize operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six (6) LOS are defined for each type of facility. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each level of service represents a range of operating conditions and the driver's perception of those conditions. For signalized intersections, LOS is directly related to the average control delay per vehicle in seconds. The following exhibit tables from the HCM define the criteria:

Exhibit 16-2: LOS Criteria for Signalized Intersections

LOS	Control Delay per Vehicle (s/veh)
A	≤ 10
B	> 10-20
C	> 20-35
D	>35-55
E	>55-80
F	>80

Source: Highway Capacity Manual, 2000, Transportation Research Board

For unsignalized intersections, LOS is directly related to the computed control delay per vehicle for minor movements only. The following table from the HCM defines the criteria:

Exhibit 17-2: Los Criteria for Two-Way Stop-Controlled Intersections

LOS	Average Control Delay (s/veh)
A	0-10
B	> 10-15
C	> 15-25
D	>25-35
E	>35-50
F	>50

Source: Highway Capacity Manual, 2000, Transportation Research Board

All the signalized intersections within the Red Line alignment and in its vicinity were studied. Several unsignalized intersections that would be modified either to a signal or would have access closed/modified in the Build conditions due to the Red Line project were also studied. LOS's were determined for signalized and unsignalized intersections for AM and PM peak hours based on the Highway Capacity Manual (2000 edition) that is embedded in the Synchro 7 software. For unsignalized intersections, LOS for the worst side street approach was reported. A total of 144 intersections (125 signalized and 19 unsignalized) were analyzed in the Existing Conditions.

While the intersection LOS results include the effects of signal progression along the Red Line project study corridor, there are other potential issues such as excessive queuing, blocking, and system volatility that may result in periodic heavy congestion that may not be fully reflected in individual intersection LOS grades from the analysis results. The travel time analysis results may indicate heavy congestion along an entire corridor such as MD 122 (Security Boulevard) or Lombard Street while the reported intersection LOS for some intersections along the corridor may be better than expected.

According to the Maryland State Highway Administration's and Baltimore City's traffic engineering standards, any intersection that operates below a LOS D is considered to have operational deficiencies. Five (5) signalized intersections and three (3) unsignalized intersections during AM peak hour, ten (10) signalized intersections and four (4) unsignalized intersections during PM peak hour, operate below LOS D and/or worse within the project limits along the Red Line alignment. Table 6 below provides a list of all intersections that are currently operating at LOS E and/or LOS F during peak hours:

Table 6: Existing Levels of Service E and/or F

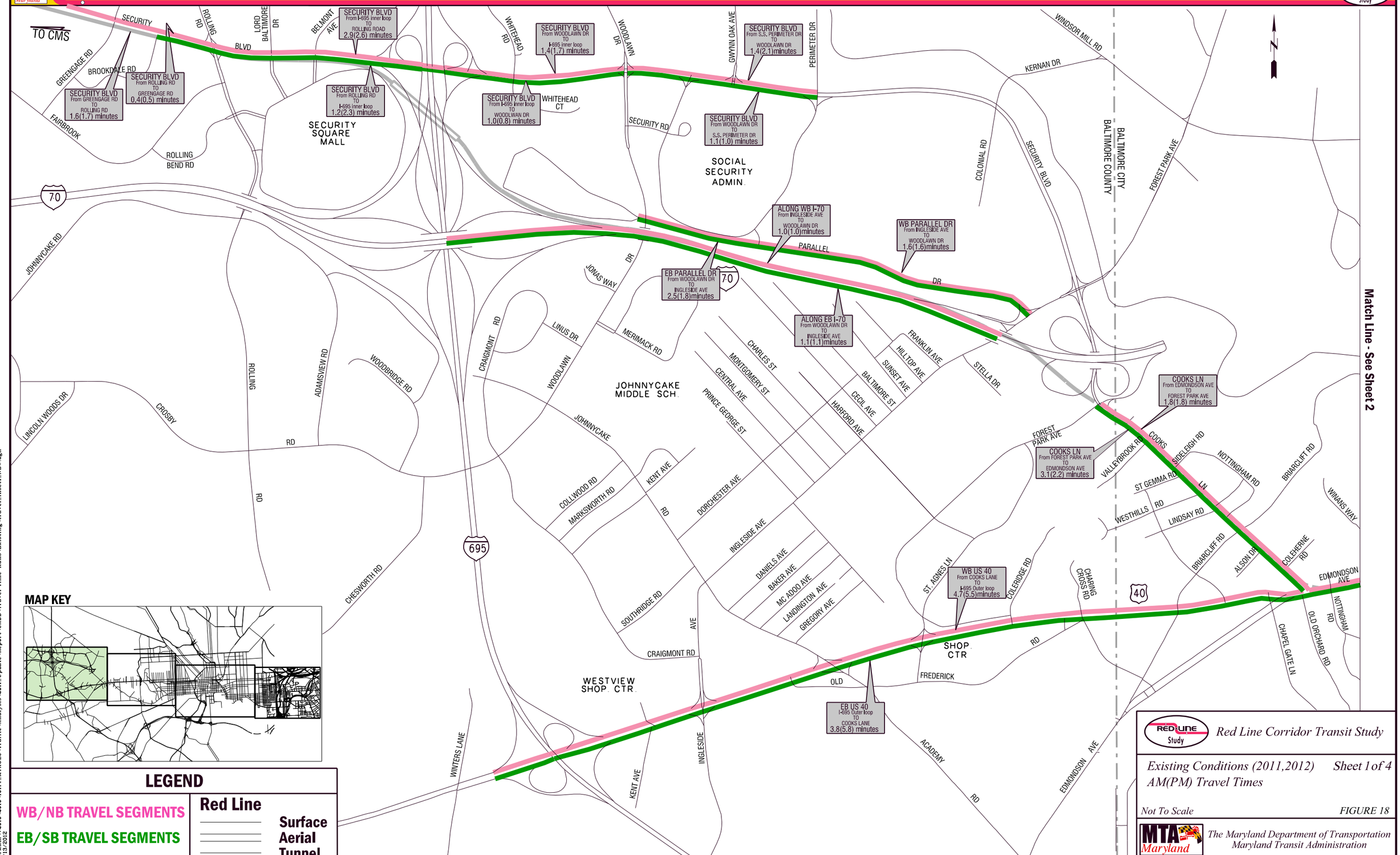
No.	Signalized Intersections	Existing	
		AM	PM
1	MD 122 (Security Boulevard) at Woodlawn Drive	D	E
2	MD 122 (Security Boulevard) at Ingleside Avenue	E	E
3	US 40 at Ingleside Avenue	D	E
4	Mulberry Street at Pulaski Street	E	C
5	MLK Jr. Boulevard at Mulberry Street	F	C
6	MLK Jr. Boulevard at Saratoga Street	E	D
7	MLK Jr. Boulevard at Baltimore Street	C	E
8	MLK Jr. Boulevard at Lombard Street	C	E
9	Lombard Street at Penn Street	B	E
10	Lombard Street at Hopkins Place	F	F
11	Lombard Street at Hanover Street	B	E
12	Lombard Street at St. Paul Street	C	F
13	Boston Street at Aliceanna Street	B	E
	Total – LOS E OR F	5	10

No.	Unsignalized Intersections	Existing	
		AM	PM
1	Security Boulevard at Greengage Rd	E	D
2	Parallel Drive at SSA Access	B	F
3	Edmondson Avenue at Denison Street	F	F
4	US 40 (Mulberry Street) at Smallwood Street	F	F
5	Boston Street at Leakin Street	D	F
	Total – LOS E OR F	3	4

Source: MTA, 2012

Approaching Woodlawn Drive along westbound MD 122 (Security Blvd.). Under existing conditions, the intersection operates at LOS D and LOS E during AM and PM peak hours, respectively.

AM (PM) TRAVEL TIMES - EXISTING CONDITIONS (2011, 2012)



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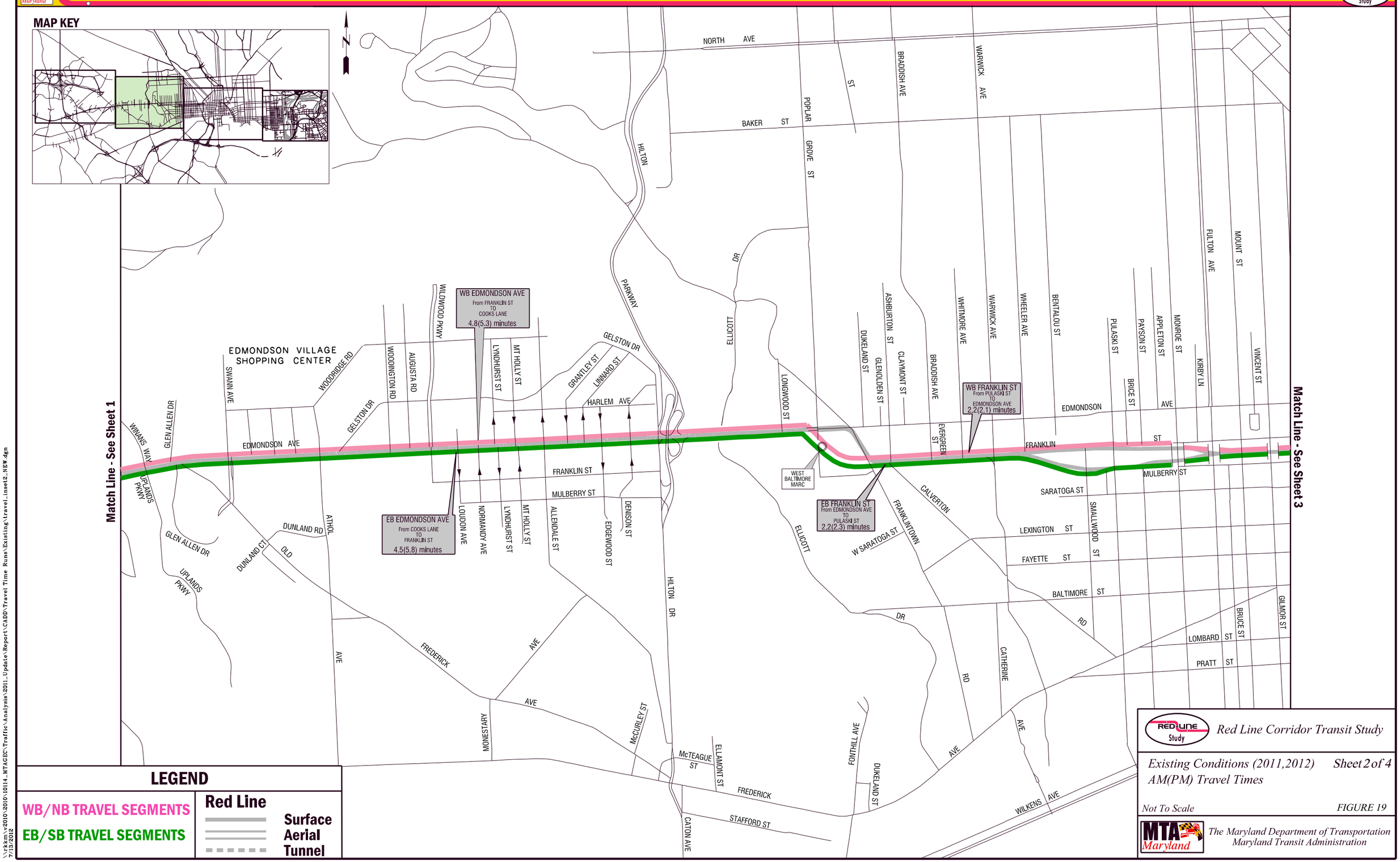
7/13/2012

FIGURE 18 - Existing Conditions (2011, 2012) AM(PM) Travel Times

AM (PM) TRAVEL TIMES - EXISTING CONDITIONS (2011, 2012)



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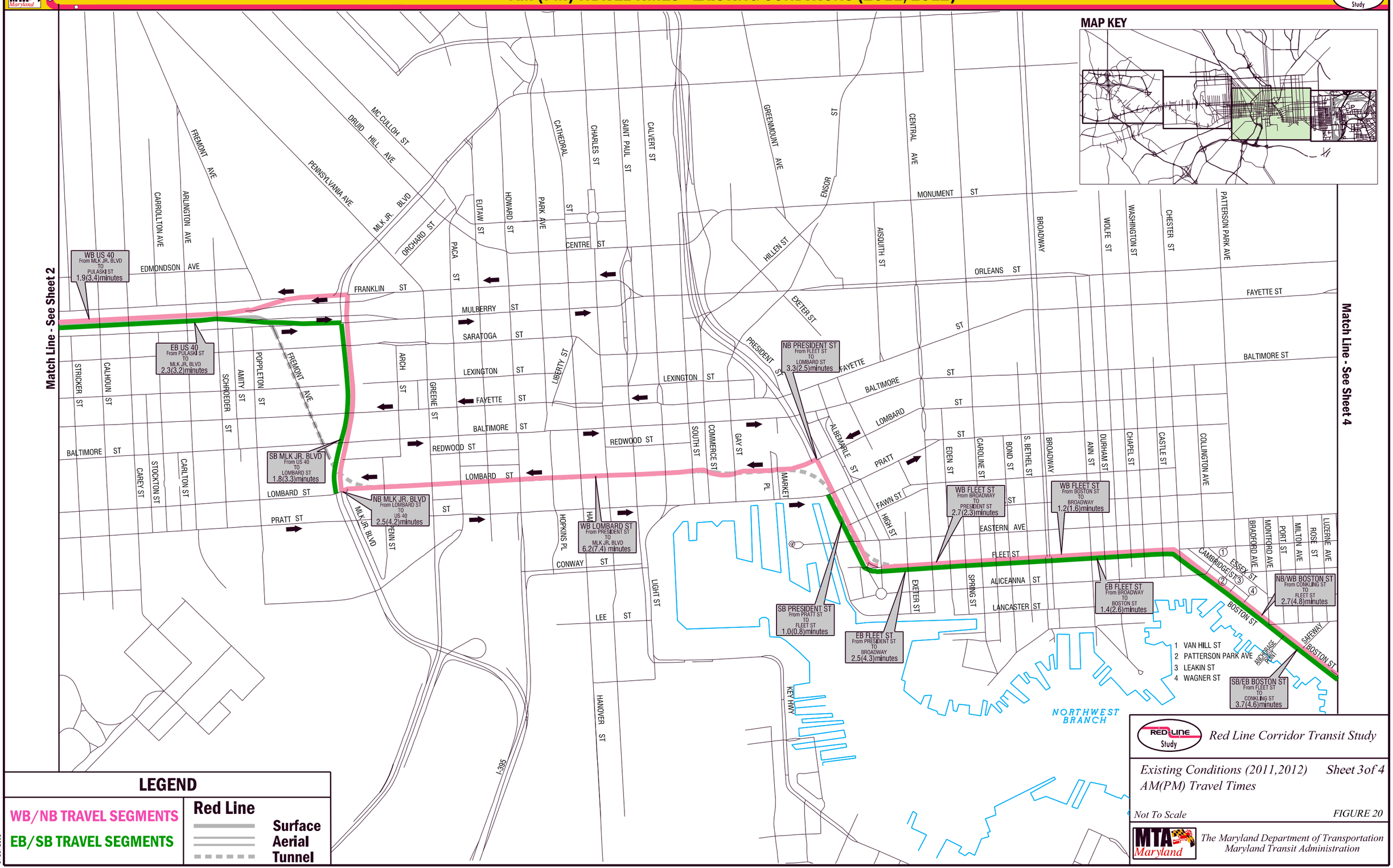
7/13/2012

FIGURE 19 - Existing Conditions (2011) AM(PM) Existing Travel Times

AM (PM) TRAVEL TIMES - EXISTING CONDITIONS (2011, 2012)



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9/25/2012

FIGURE 20 - Existing Conditions (2011, 2012) AM(PM) Travel Times

AM (PM) TRAVEL TIMES - EXISTING CONDITIONS (2011, 2012)

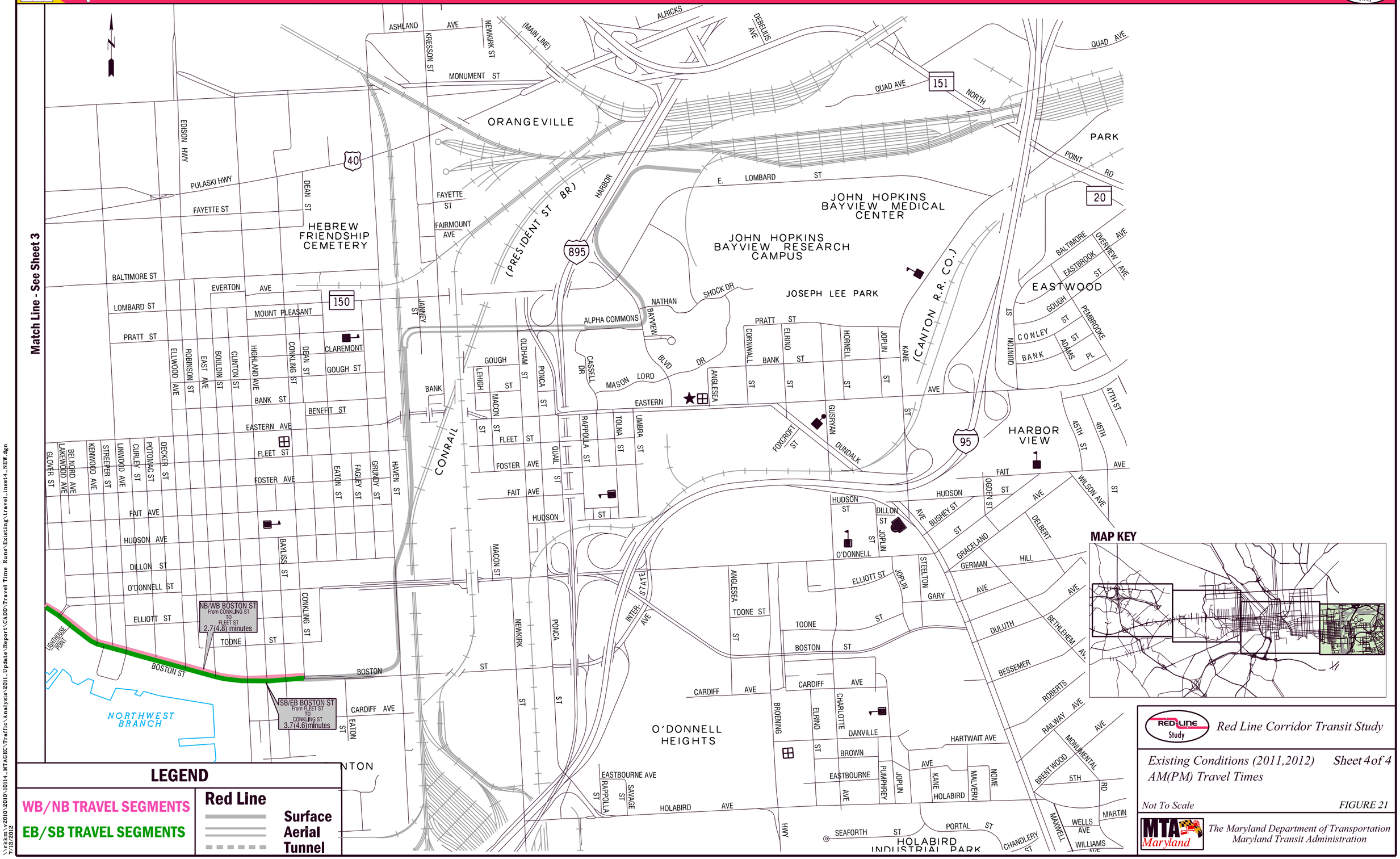
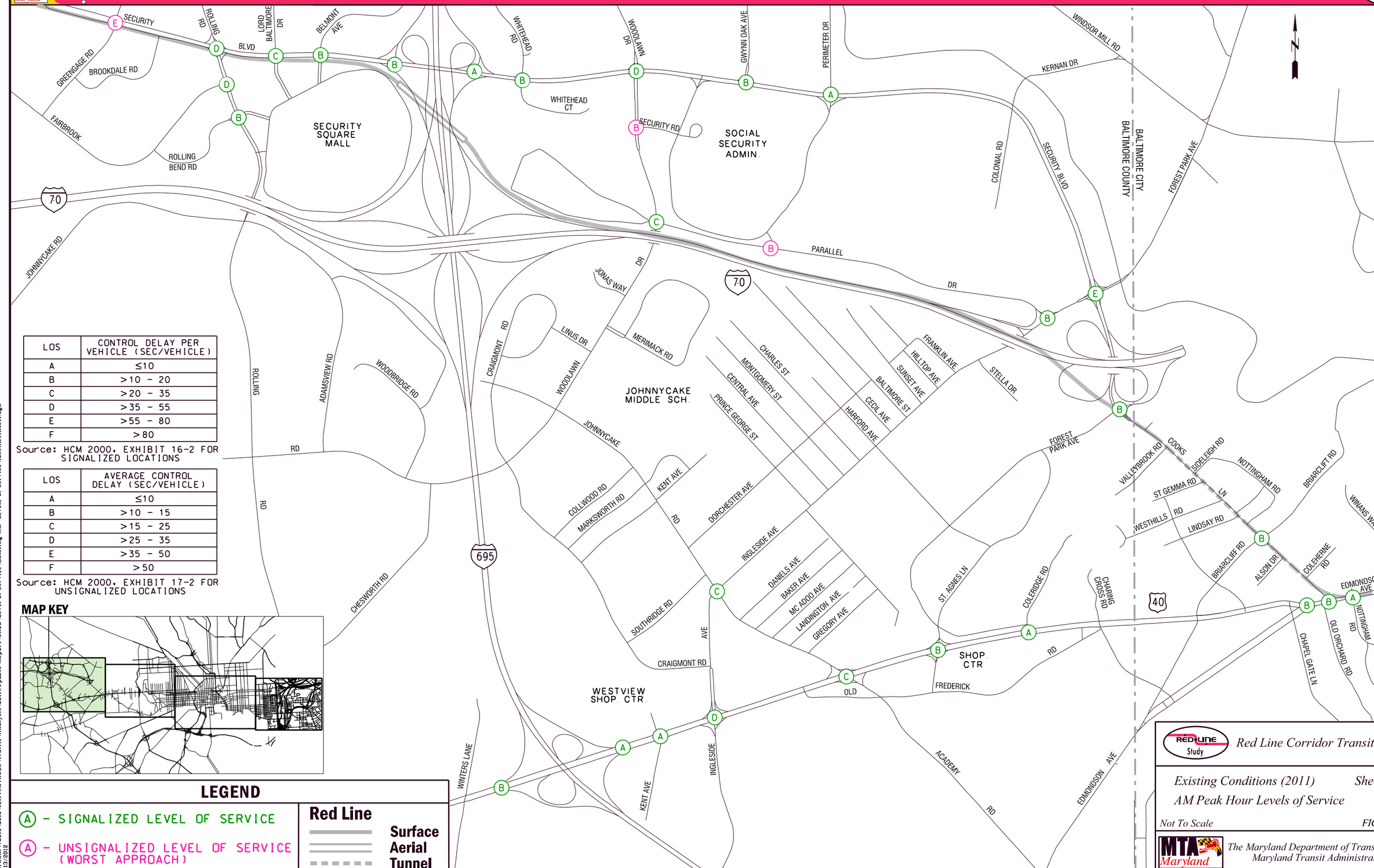


FIGURE 21 - Existing Conditions (2011, 2012) AM(PM) Travel Times

AM PEAK HOUR LEVELS OF SERVICE - EXISTING CONDITIONS (2011)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

MAP KEY

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface
Aerial
Tunnel

Red Line Corridor Transit Study

Existing Conditions (2011) *Sheet 1 of 4*

AM Peak Hour Levels of Service

Not To Scale *FIGURE 22*

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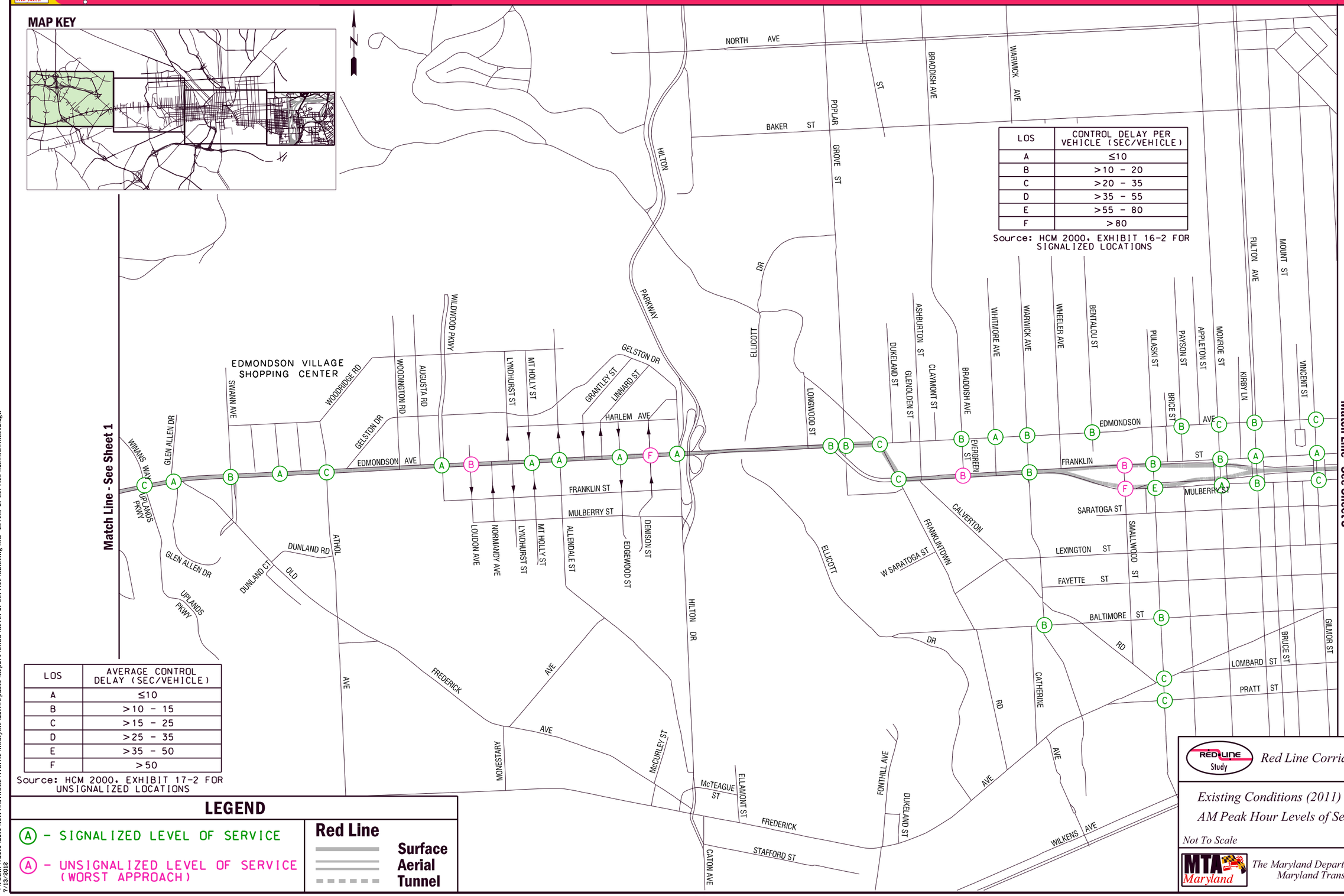
7/13/2012

FIGURE 22 - Existing Conditions (2011) Levels of Service - AM Peak Hour

AM PEAK HOUR LEVELS OF SERVICE - EXISTING CONDITIONS (2011)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface
Aerial
Tunnel

Red Line Corridor Transit Study

Existing Conditions (2011) — Sheet 2 of 4

AM Peak Hour Levels of Service

Not To Scale — FIGURE 23

The Maryland Department of Transportation
Maryland Transit Administration

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7/13/2012

FIGURE 23 - Existing Conditions (2011) Levels of Service - AM Peak Hour

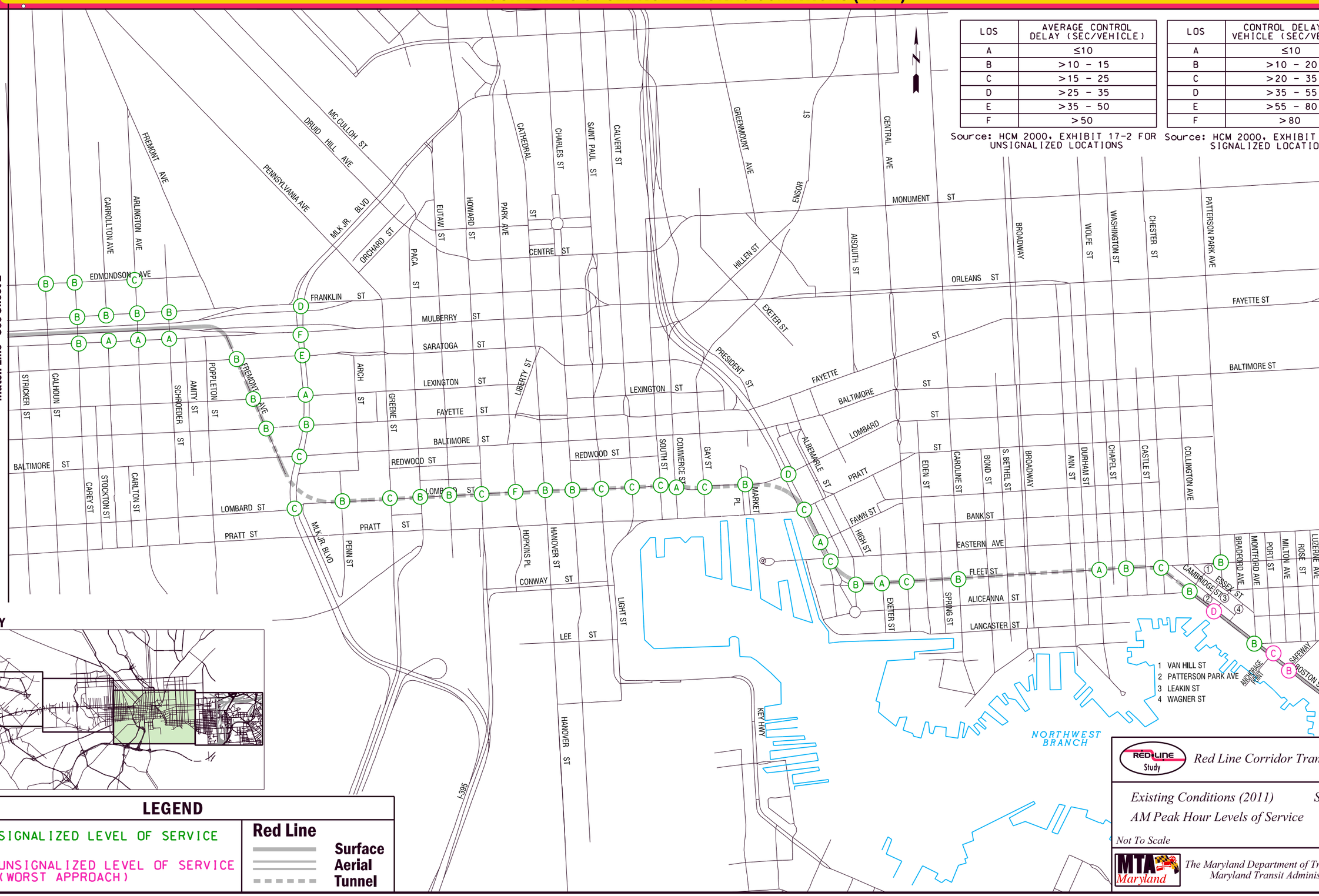
AM PEAK HOUR LEVELS OF SERVICE - EXISTING CONDITIONS (2011)

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS



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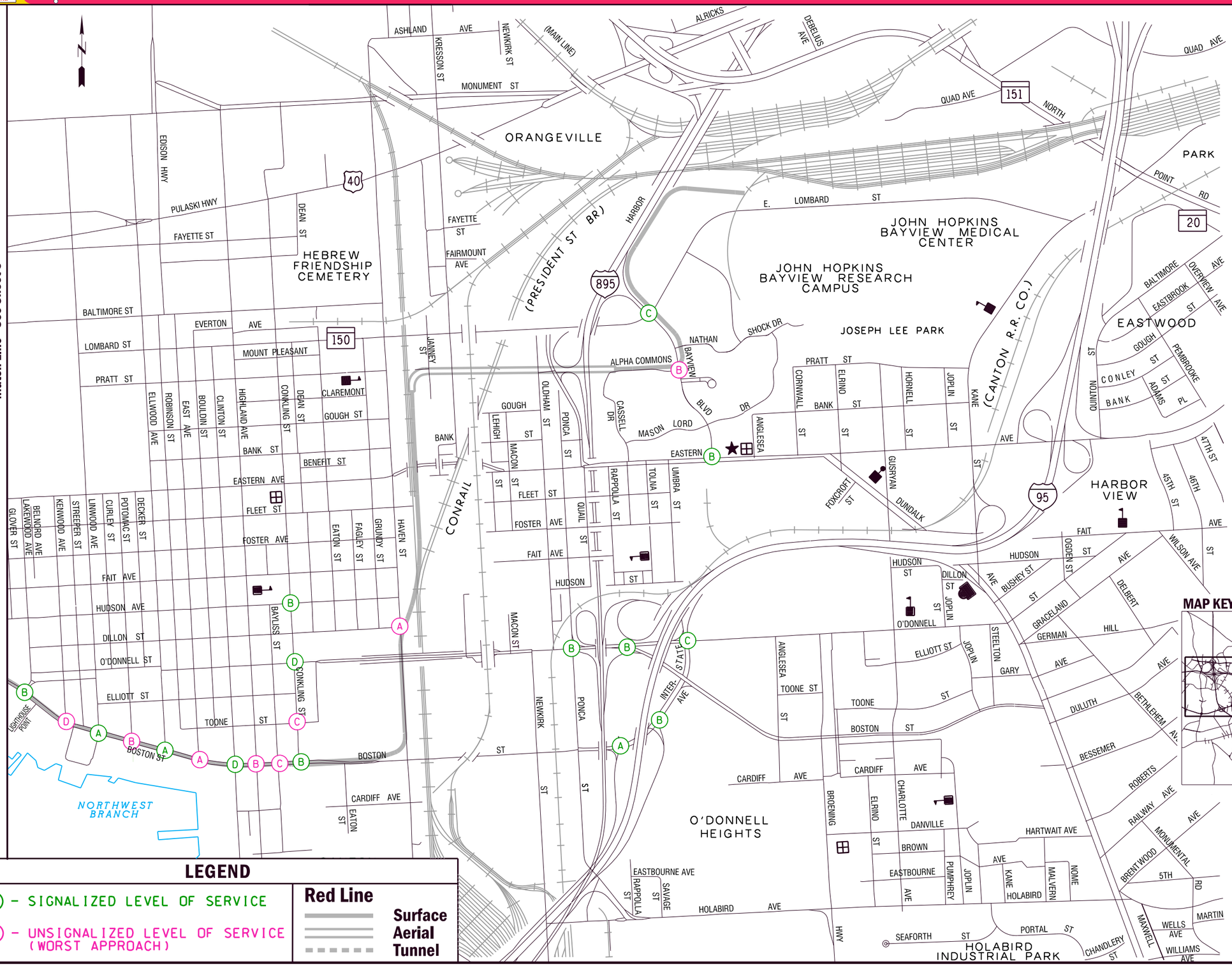
9/6/2012

FIGURE 24 - Existing Conditions (2011) Levels of Service - AM Peak Hour

AM PEAK HOUR LEVELS OF SERVICE - EXISTING CONDITIONS (2011)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

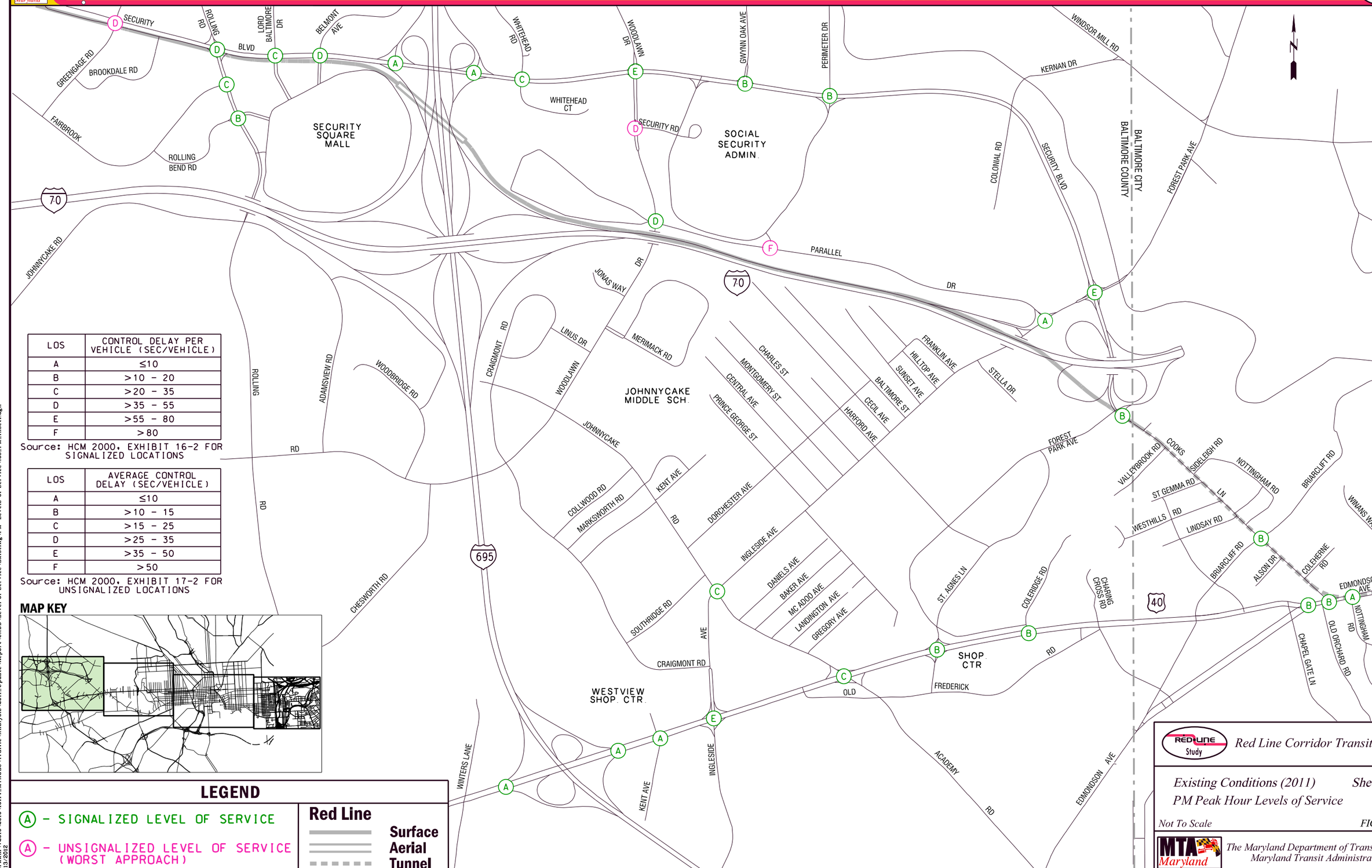
Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

FIGURE 25 - Existing Conditions (2011) Levels of Service - AM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - EXISTING CONDITIONS (2011)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

MAP KEY

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface
Aerial
Tunnel

Red Line Corridor Transit Study

Existing Conditions (2011) *Sheet 1 of 4*

PM Peak Hour Levels of Service

Not To Scale *FIGURE 26*

The Maryland Department of Transportation
Maryland Transit Administration

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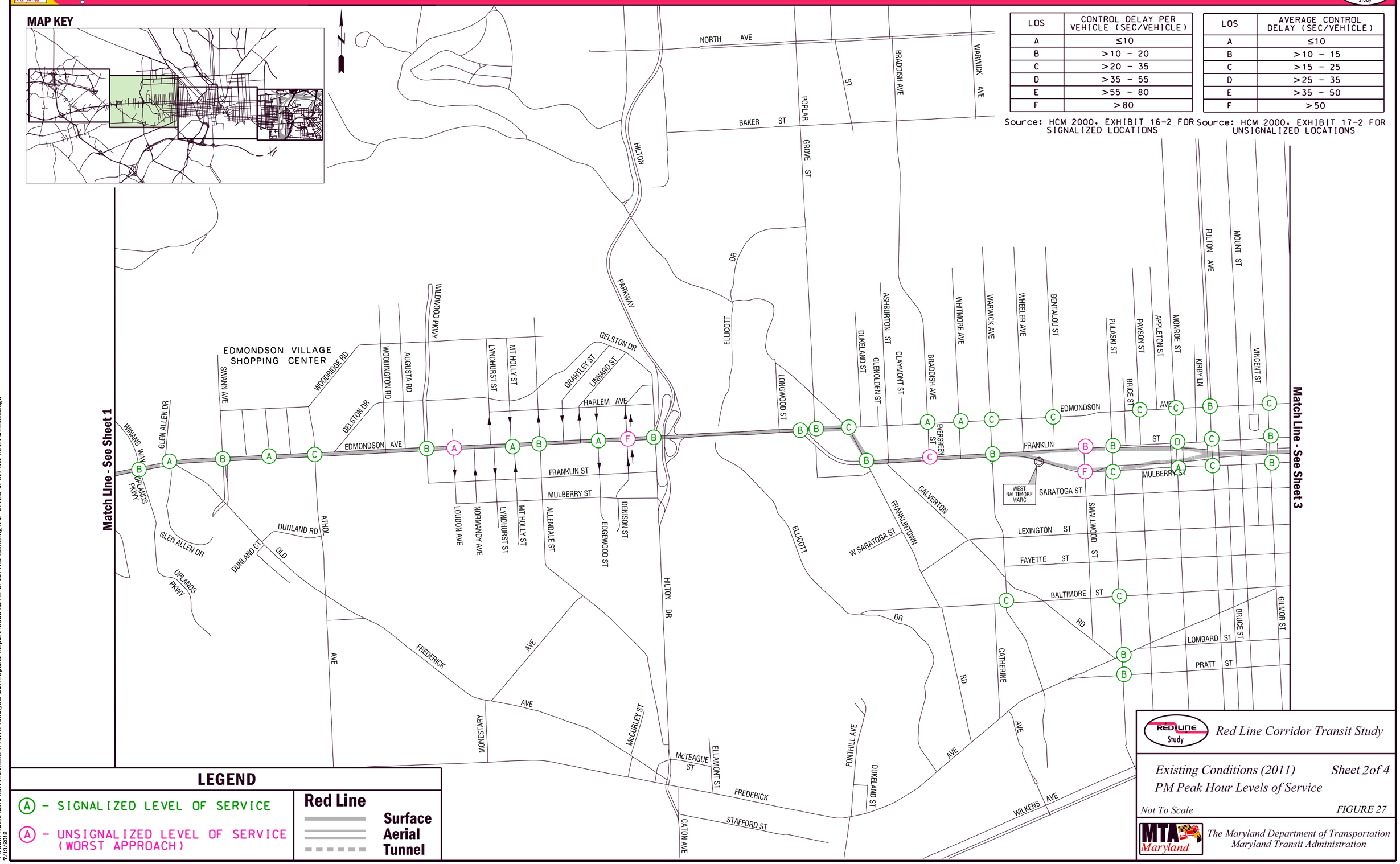
7/13/2012

FIGURE 26 - Existing Conditions (2011) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - EXISTING CONDITIONS (2011)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

Red Line Corridor Transit Study

Existing Conditions (2011) Sheet 2 of 4

PM Peak Hour Levels of Service

Not To Scale FIGURE 27

The Maryland Department of Transportation
Maryland Transit Administration

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7/13/2012

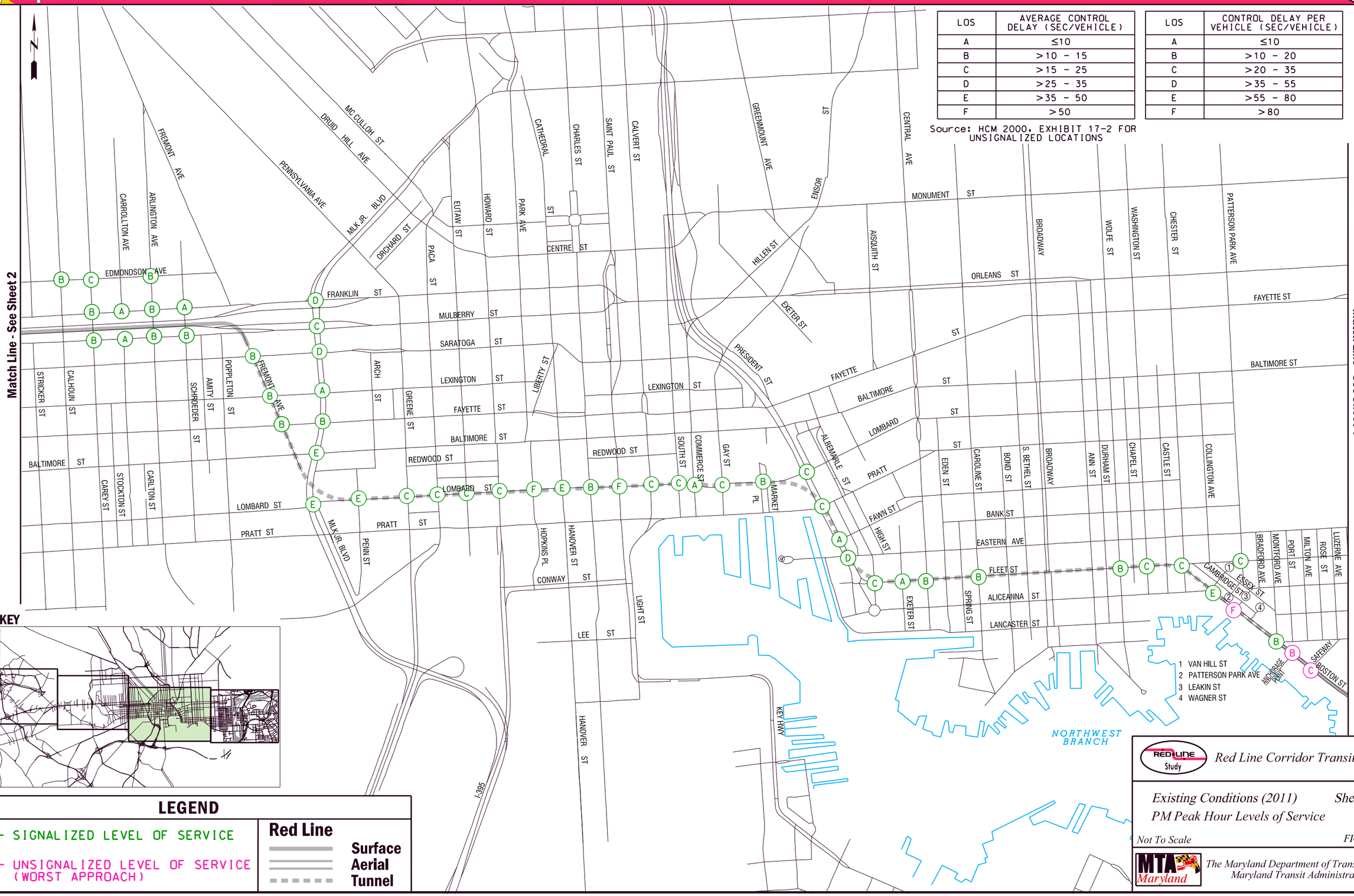
FIGURE 27 - Existing Conditions (2011) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - EXISTING CONDITIONS (2011)

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS



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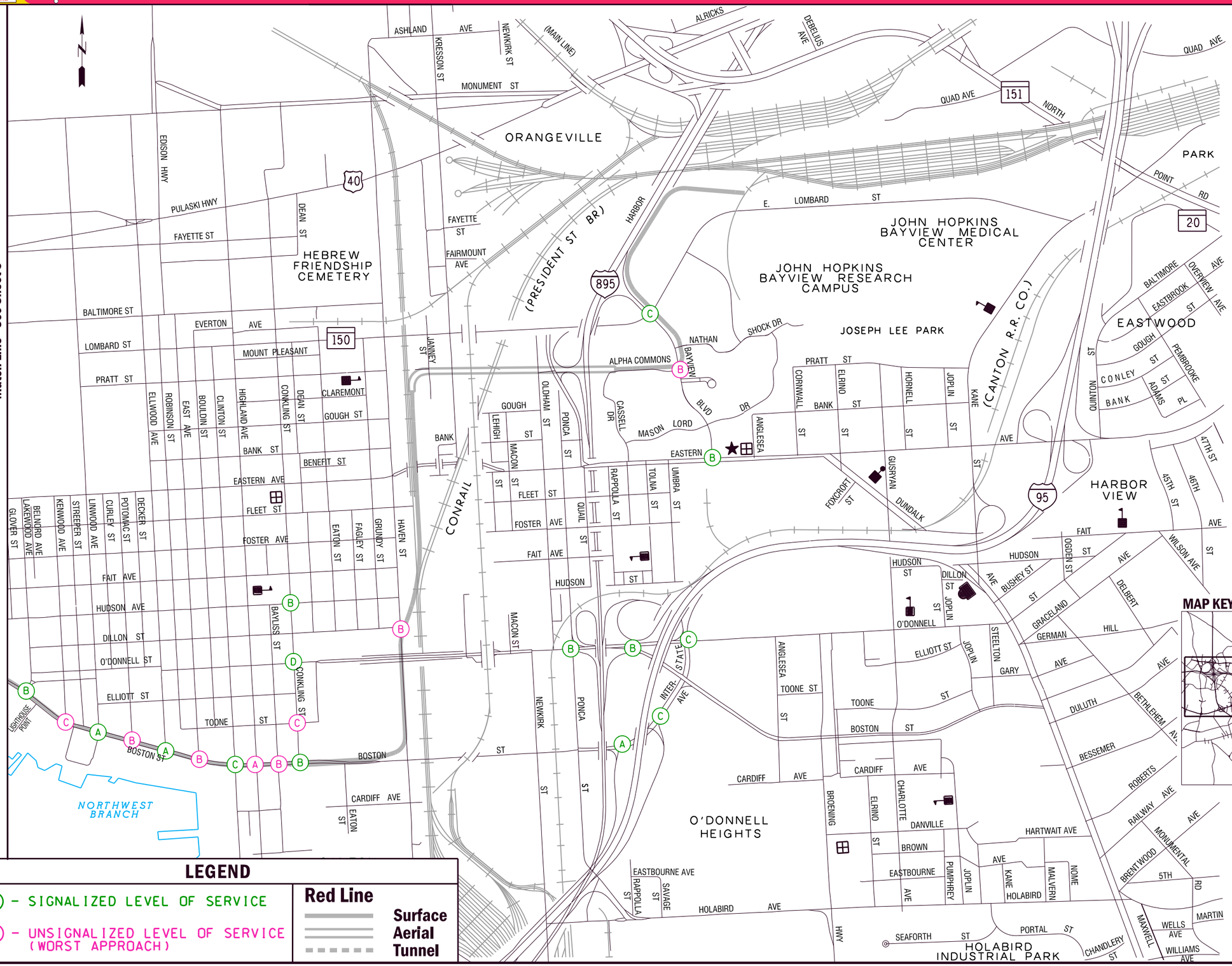
7/13/2012

FIGURE 28 - Existing Conditions (2011) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - EXISTING CONDITIONS (2011)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

MAP KEY

Red Line Corridor Transit Study

Existing Conditions (2011) Sheet 4 of 4

PM Peak Hour Levels of Service

Not To Scale FIGURE 29

The Maryland Department of Transportation
Maryland Transit Administration

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7/13/2012

FIGURE 29 - Existing Conditions (2011) Levels of Service - PM Peak Hour

3. Traffic Operations Impacts

The Red Line project results in three types of traffic operational impacts, including: Regional, Corridor, and Local impacts. These are discussed in broad terms in this chapter, and in more detail in **Chapter 4** (Future No-Build Conditions) and **Chapter 5** (Preferred Alternative).

3.1 Regional Impacts

Regional impact is a measure of the change in highway travel within the corridor, measured in Vehicles Miles Traveled (VMT). Regional is defined as the entire region covered by the Baltimore Metropolitan Organization, for which they track and measure VMT. This measure is calculated from the regional (Baltimore Metropolitan Council (BMC)) Travel Demand model's average weekday traffic volumes and link lengths, and was calculated for the entire BMC region for estimating the regional impacts. Average weekday regional VMT is forecast to increase from 32 million in 2011 to 36 million in 2035. The Preferred Alternative would result in slightly lower VMT than the No-Build (See **Table 7** below). While the expected differences would be small compared to regional total, their absolute values are significant. The full LRT would result in a daily savings of 77,000 VMT compared to No-Build alternative.

3.2 Corridor Impacts

Within the Red Line project study corridor, average weekday VMT was developed for the sub-region centered along the Red Line. The sub-region was defined by comparing the volume differences for the Build and No-Build models and assessing roadways with a change of about 10 percent or more. The sub-regional VMT for the Red Line project study corridor is forecast to increase from 3,759,000 in 2011 to 4,335,000 in 2035. As with the Regional reductions, the Preferred Alternative would result in slightly lower VMT than the No-Build (See **Table 7** below). The full LRT would result in a daily savings of 15,000 VMT compared to No-Build alternative. In addition to the VMT changes, the transit share mode shift was also investigated, using the regional travel demand model. **Table 8** presents the changes to the Auto, Bus and Transit mode shares (trips) as a result of the Red Line project.

Table 7: Daily Vehicle Miles Traveled (vmt)

Scenario	Regional Vehicle Miles Traveled (000's)	Corridor Vehicle Miles Traveled (000's)
Base Year (2011)	31,757	3,759
No-Build Alternative	36,482	4,335
Preferred Alternative	36,405	4,320

Table 8: Anticipated Mode Shift With the Red Line Project (In Trips)

Mode	No-Build Alternative	Preferred Alternative	Change in Trips
Auto	8,377,209	8,366,057	-11,152
Bus	365,487	346,565	-18,922
Transit	97,314	127,351	30,037

3.3 Localized Impacts

Localized traffic impact analysis examines specific streets and intersections to determine the effect of changes in traffic at those points. In this report, the key signalized and unsignalized intersections in the vicinity of the Red Line alignment and which would impact the Red Line have been analyzed for 2035 No-Build, 2035 Build and 2016 Construction Year.

4. Future No-Build Conditions – Year 2035

This section discusses the potential transportation impacts of the 2035 No-Build alternative. The future No-Build conditions consists of the existing road and transit network as well as planned and programmed improvements in the region's adopted and financially constrained long-range plan (*Plan It 2035)*, the Baltimore Region Transportation Improvement Program (TIP), and approved developer projects along the Red Line project study corridor. The methodology for developing the No-Build (and Build) forecasts for this project is provided in **Appendix A**.

4.1 Roadway and Transit Network

The roadway network assumed for the No-Build condition included any roadway improvements that are in the 2035 Baltimore Metropolitan Transportation Plan approved by the Baltimore Regional Transportation Board in November 2011, and also includes the approved land uses and developments along the Red Line project study corridor within this period. These improvements include both roadway and transit improvements. The improvements that would directly impact the Red Line project study corridor are:

- Security Boulevard Extension, existing terminus to Fairbrook Road
- West Baltimore MARC Station Improvements
- Uplands Development
- Boh'Donnell Connector
- Bayview MARC and Intermodal Station
- US 40 Edmondson Avenue Bridge expansion over Gwynns Falls/CSX Railroad

The Security Boulevard Extension project is being completed by Baltimore County and would extend Security Boulevard west of the existing terminus near the Centers for Medicare and Medicaid Services (CMS) complex. The West Baltimore MARC station expansion would connect Payson Street between Franklin Street and Mulberry Street and also relocate the US 40 ramps from Pulaski Street to Payson Street. The MARC station would also extend the existing parking lot. Details of the increase in the number of parking spaces are listed under the Parking section of this study. The Uplands development would add new access on Edmondson Avenue at its site. The Boh'Donnell Connector would divert traffic moving along Boston Street through the new connector onto O'Donnell Street to I-95. It is anticipated that a significant number of motorists along Boston Street east of Conkling Street that are traveling towards the I-95 ramps would divert onto the new Boh'Donnell connector to avoid the CSX at-grade rail crossing east of Haven Street on Boston Street. The Bayview MARC and Intermodal Station geometric improvements are still under review and not approved as of now. The US 40 Edmondson Avenue Bridge expansion over Gwynn Falls/CSX Railroad would be widening the bridge from 8 to 10 lanes.

4.2 Traffic Volumes

Travel demand forecasts were developed for the No-Build conditions. The forecasts were developed using the Baltimore Metropolitan Council's Model, modified to provide enhancements to the transit network. The socio-economic data associated with the model is Round 7C which was approved in November 2011 by the Baltimore Regional Transportation Board.

The travel demand forecasts were developed by first validating the base year model. Validation is the method by which the model parameters are adjusted to replicate actual existing year traffic and transit data. Once the model is calibrated, design year model runs are performed. These model runs include the projected changes to the number of jobs, households, population, labor force and other socio-economic characteristics for the region. In addition, changes to the roadway and transit network are included in the model. The models runs are then refined to take into account the variation between the base year model and the actual traffic volume data with the forecasted year model volume. Additional details can be found in the "Travel Demand Forecasting Results Report".

The projected 2035 No-build traffic volumes were developed for both the AM and PM peak hour and for the average daily traffic. The average daily traffic volumes are shown on **Figures 30-33**. The highest volume roadways from an average daily traffic standpoint in 2035 are anticipated to be similar to the highest volume roadways in 2011. **Table 9** shows the Existing (2011), and 2035 No-Build Average Daily Traffic (ADT) and percent growth.

Volumes along Martin Luther King Jr. Boulevard, Lombard Street (west of Greene St and east of Market Place), Boston Street (east of Conkling Street), Interstate Avenue (east of I-95 ramps), and Bayview Boulevard are anticipated to increase greater than 50 percent by 2035 when compared with the Existing 2011 ADT's. Bayview Boulevard south of Alpha Commons Drive would have the maximum increase of more than 100 percent in 2035. Martin Luther King Jr. Boulevard is anticipated to have the highest ADT increase of 29,500 vehicles by 2035. The only decrease in volume is anticipated along I-895 between Boston Street and north of Lombard Street.

The 2035 No-Build peak hour volumes were forecasted for all the roadways within the Red Line project study corridor. These volumes were used to analyze the traffic operations at intersections that were also studied under Existing conditions. The 2035 AM and PM peak hour directional traffic volumes for the Red Line study are shown later in the report on **Figures 34-37.** The highest volume roadways in the peak direction for AM and PM peak hours are shown in **Tables 10.1 and 10.2**.

The highest corridor volumes during the AM peak are projected for eastbound US 40, eastbound Edmondson Avenue, southbound Martin Luther King Jr. Boulevard and northbound President Street. They are anticipated to exceed over 2,500 vehicles in AM peak hour. The largest percent increases are expected to occur along I-70 (44%), Boston Street (49%) and Bayview Boulevard (75%). The highest corridor volumes during the PM peak are projected for westbound Security Blvd, westbound US 40, westbound Edmondson Avenue, and northbound Martin Luther King Jr. Boulevard. They are anticipated to exceed over 3,000 vehicles in PM peak hour. The largest increases are expected to occur along I-70 (44%), Boston Street (38%) and Bayview Boulevard (90%). In future scenarios, the AM peak direction along Rolling Road and Cooks Lane and the PM peak direction along Security Blvd is reversed when compared with the Existing conditions (shown in "Bold" font in the **Tables 10.1 and 10.2**).

Table 9: Existing and 2035 No-Build Average Daily Traffic, and Percent Growth

LOCATION	EXISTING	NO-BUILD	PERCENT GROWTH (+/- %)
1-70, east of I-695	25,000	34,500	+38%
Security Boulevard, west of I-695 to Rolling Road[1]	48,000	48,500	+1%
US 40, from Rolling Road to I-695	53,000	69,000	+30%
US 40, west of Cooks Lane	24,000	29,000	+21%
Edmondson Avenue, east of Swann Avenue	39,000	46,000	+18%
Frederick Avenue, west of Hilton Drive	15,000	17,000	+13%
Franklin St, east of Franklintown Road	33,000	40,000	+21%
MLK Jr. Boulevard, south of Pratt Street	58,000	87,500	+51%
Lombard Street, west of Greene Street	10,000	16,000	+60%
Lombard Street, east of Charles Street	30,000	34,500	+15%
Lombard Street, west of Market Place	29,000	47,000	+62%
President Street, north of Lombard Street	35,000	34,500	-1%
Fleet Street, east of President Street	21,000	23,000	+10%
Boston Street, north of Montford Avenue	27,000	36,000	+33%
Boston Street, east of Conkling Street	16,000	25,000	+56%
I-895, north of Boston Street	70,000	60,000	-14%
I-895, north of Lombard Street	64,000	60,000	-6%
Interstate Avenue, east of I-95 ramps	8,500	15,500	+82%
O'Donnell Street, east of Conkling Street	22,500	32,500	+44%
Eastern Avenue, east of Bayview Boulevard	22,000	22,500	+2%
Bayview Boulevard, south of Alpha Commons Dr.	7,000	19,500	+178%

[1]*Baltimore County Road Extension forecasts are under development. 2035 volumes subject to change. Source: Red Line General Engineering Consultant, 2012*

Table 10.1: Existing and 2035 No-Build AM Peak Hour Peak Direction Highest Volumes, and Percent Growth

Location	Existing	No-Build	Percent Growth (+/- %)
Security Boulevard, from Rolling Road to I-695	1,940 (WB)	2,150 (WB)	+11%
Rolling Road, south of Security Boulevard	1,295 (NB)	1,530 (SB), 1,210 (NB)	-7%[1]
Security Boulevard, from I-695 to Woodlawn Dr.	2,035 (EB)	2,225 (EB)	+9%
I-70, from Woodlawn Drive to I-70 P & R	1,280 (EB)	1,840 (EB)	+44%
Cooks Lane, east of Forest Park Avenue	955 (EB)	905 (WB), 880 (EB)	-8%[1]
US 40, from Winters Lane to Cooks Lane	2,600 (EB)	3,150 (EB)	+21%
Edmondson Ave., Cooks Ln. to Franklin Street	2,625 (EB)	2,935 (EB)	+12%
Franklin Street/Mulberry Street, Edmondson Ave. to Pulaski Street	2,590 (EB)	2,820 (EB)	+9%
MLK Jr. Boulevard, Mulberry Street to Lombard Street	2,720 (SB)	3,530 (SB)	+30%
Lombard Street, MLK Jr. Boulevard to President Street	2,085 (WB)	2,630 (WB)	+26%
President Street, from Lombard Street to Fleet Street	2,225 (NB)	2,670 (NB)	+20%
Fleet Street, from Wolfe Street to Boston Street	855 (WB)	1,060 (WB)	+24%
Boston Street, from Aliceanna Street to Conkling Street	1,545 (NB)	2,305 (NB)	+49%
Bayview Boulevard, from Lombard Street to Eastern Avenue	895 (SB)	1,570 (SB)	+75%

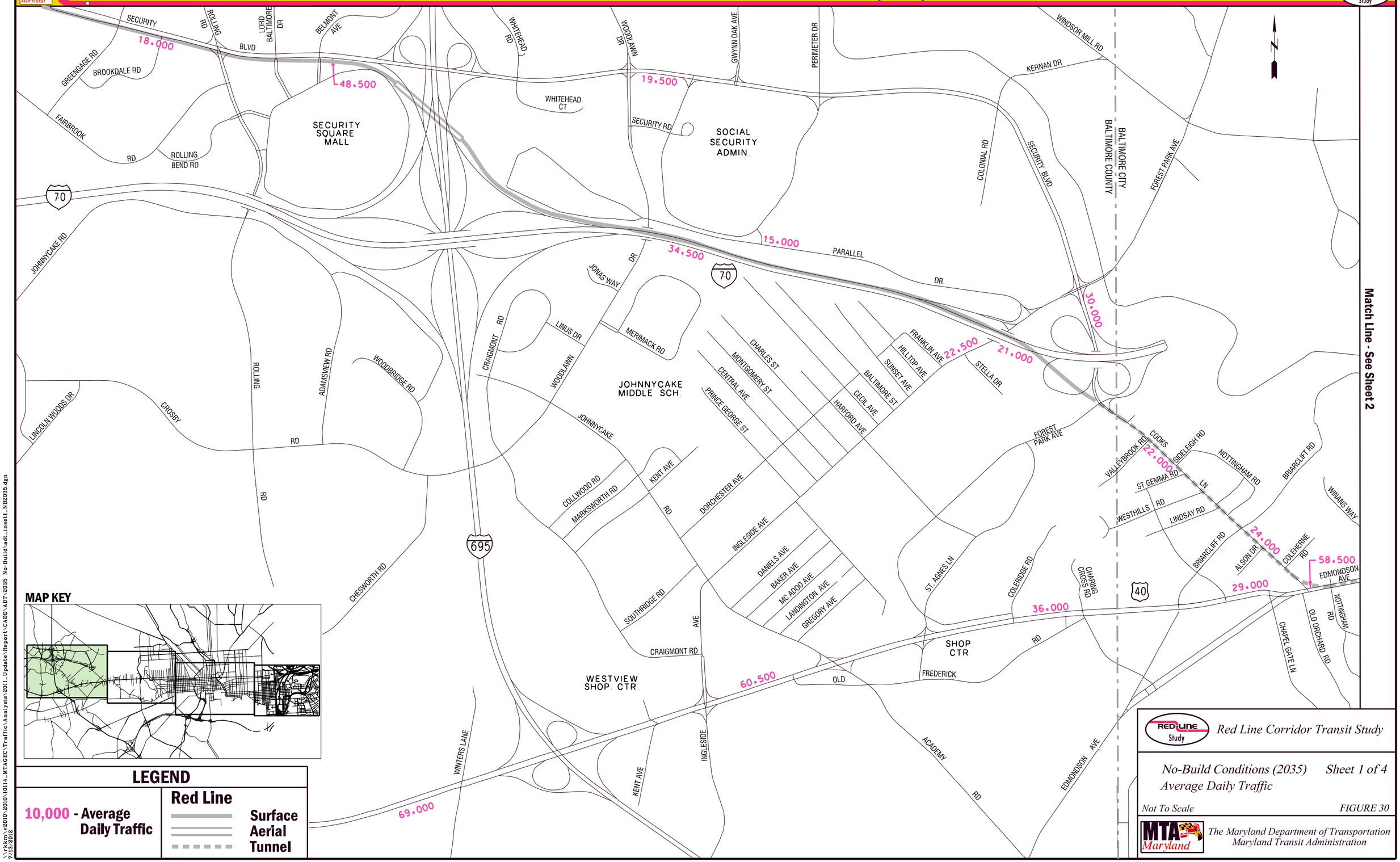
Source: MTA, 2012; [1] – peak direction is not the same,% growth calculated for same directional volume

Table 10.2: Existing and 2035 No-Build PM Peak Hour Peak Direction Highest Volumes, and Percent Growth

Location	Existing	No-Build	Percent Growth (+/- %)
Security Boulevard, from Rolling Road to I-695	2,250 (EB)	3,060 (WB), 2,550 (EB)	+13%[1]
Rolling Road, south of Security Boulevard	1,335 (NB)	1,585 (NB)	+19%
Security Boulevard, from I-695 to Woodlawn Dr.	2,270 (WB)	2,785 (WB)	+23%
I-70, from Woodlawn Drive to I-70 P & R	1,930 (WB)	2,770 (WB)	+44%
Cooks Lane, east of Forest Park Avenue	1,200 (WB)	1,165 (WB)	-3%
US 40, from Winters Lane to Cooks Lane	2,475 (WB)	3,250 (WB)	+31%
Edmondson Avenue, from Cooks Lane to Franklin Street	2,535 (WB)	3,120 (WB)	+23%
Franklin Street/Mulberry St, from Edmondson Avenue to Pulaski Street	1,885 (WB)	2,445 (WB)	+30%
MLK Jr. Boulevard, from Mulberry Street to Lombard Street	2,535 (NB)	3,590 (NB)	+42%
Lombard Street, from MLK Jr. Boulevard to President Street	2,345 (WB)	2,835 (WB)	+21%
President Street, from Lombard Street to Fleet Street	2,545 (NB)	2,965 (NB)	+16%
Fleet Street, from Wolfe Street to Boston Street	815 (EB)	1,025 (EB)	+26%
Boston Street, from Aliceanna Street to Conkling Street	1,375 (SB)	1,895 (SB)	+38%
Bayview Boulevard, from Lombard Street to Eastern Avenue	785 (NB)	1,495 (NB)	+90%

Source: MTA, 2012; [1] – peak direction is not the same,% growth calculated for same directional volume

AVERAGE DAILY TRAFFIC - NO-BUILD CONDITIONS (2035)



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7/13/2012

FIGURE 30 - No-Build Conditions (2035) Average Daily Traffic

AVERAGE DAILY TRAFFIC - NO-BUILD CONDITIONS (2035)

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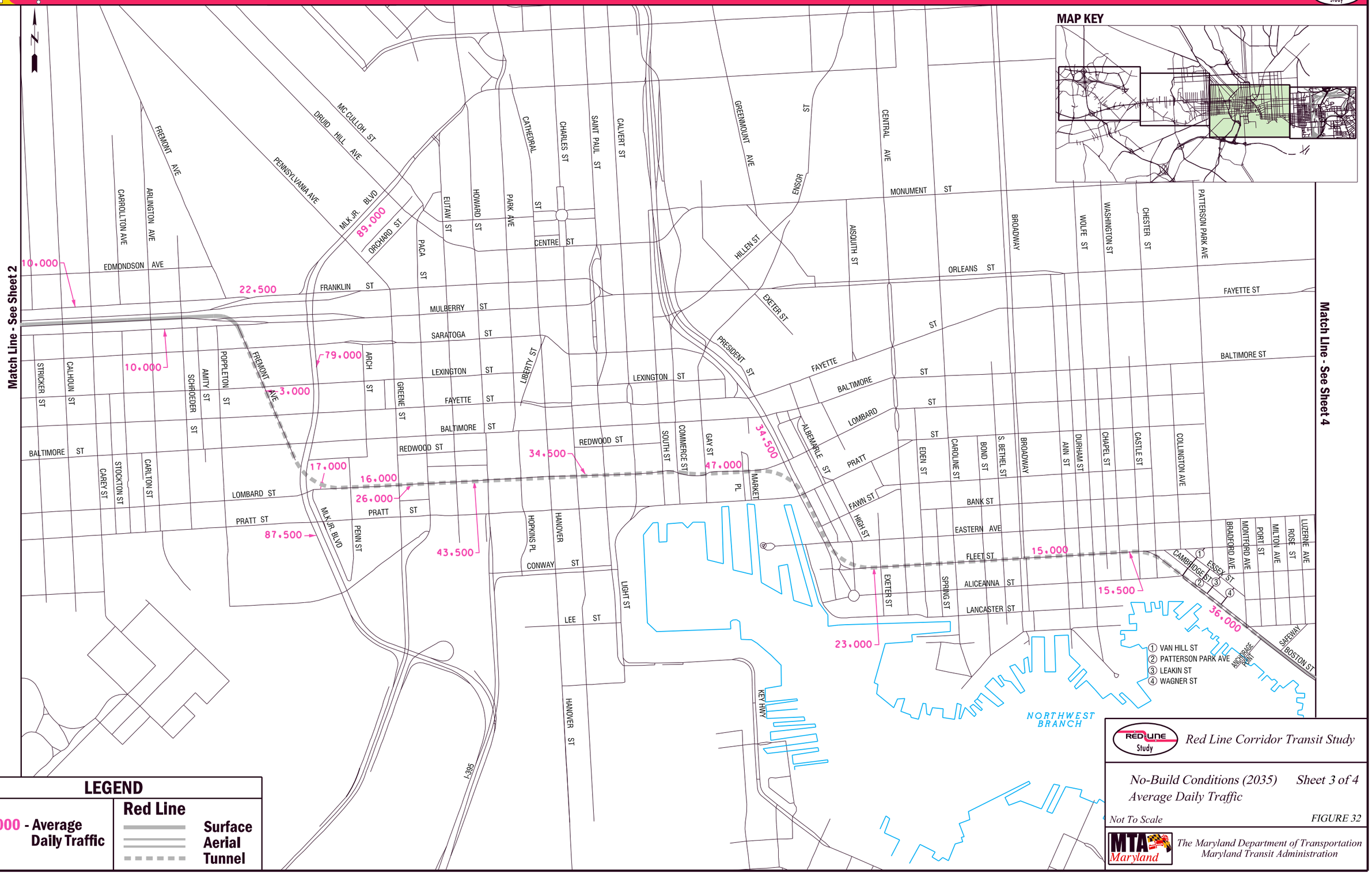
7/13/2012

FIGURE 31 - No-Build Conditions (2035) Average Daily Traffic

AVERAGE DAILY TRAFFIC - NO-BUILD CONDITIONS (2035)



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7/13/2012

FIGURE 32 - No-Build Conditions (2035) Average Daily Traffic

AVERAGE DAILY TRAFFIC - NO-BUILD CONDITIONS (2035)

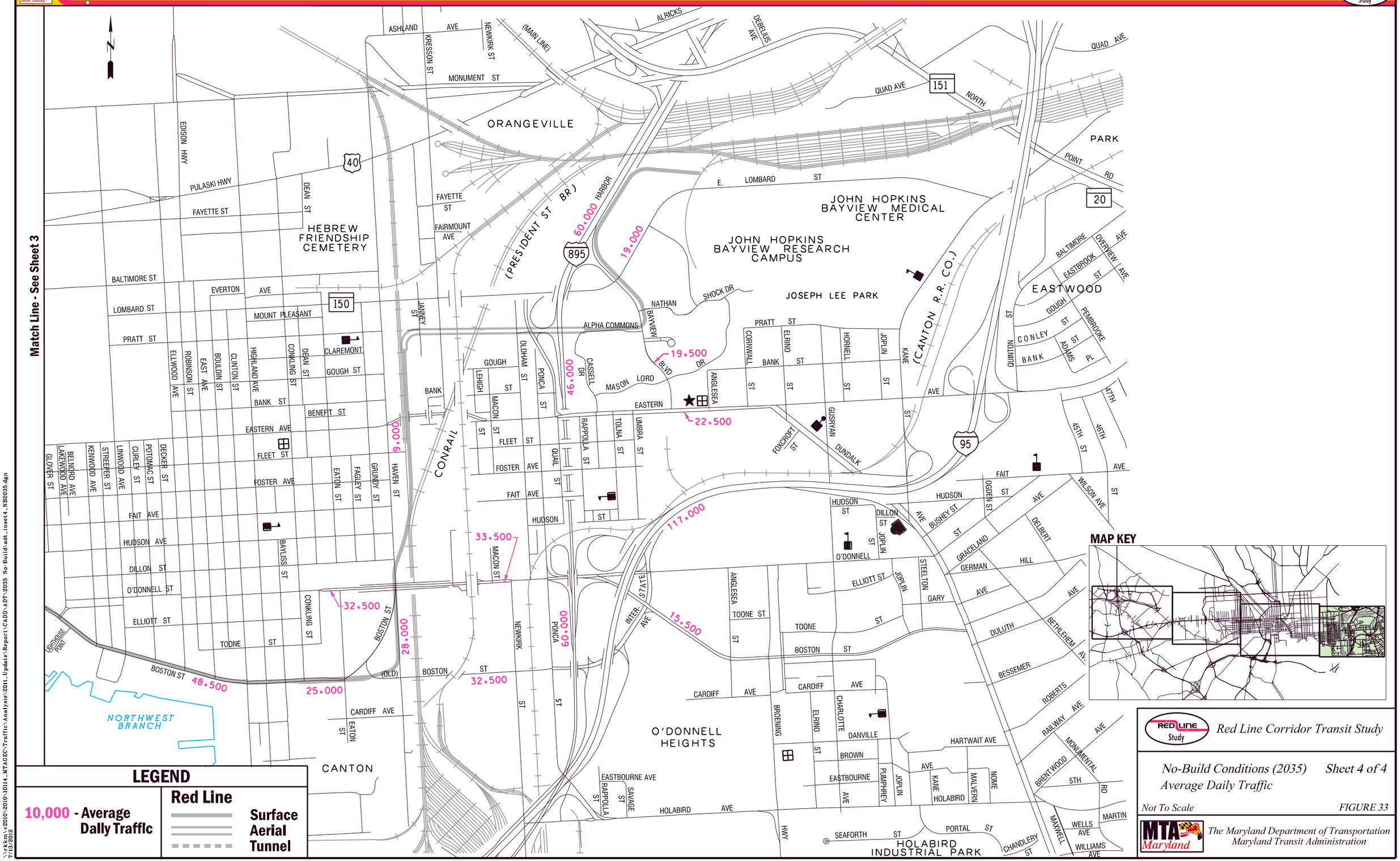


FIGURE 33 - No-Build Conditions (2035) Average Daily Traffic

4.3 Travel Time

One of the measures of effectiveness used to determine traffic operations is travel time. Travel time takes into account the average running speed for a motorist on a section of roadway plus the delay experienced by that motorist at interrupted traffic controls such as signalized intersections. As traffic volumes on a section of roadway increase, travel speeds decrease and travel times increase. Operational improvements such as interconnecting signals or adjusting signal timing may make the roadway operate more efficiently. Travel times give a relative comparison between today's operation and how the roadway is projected to operate in the year 2035.

Travel times were calculated for the 2035 No-Build conditions. The travel times were developed by using the Synchro/SimTraffic Version 7 models, with VISSIM Version 5.3 models used to test preemption intersection treatments. The models that were used to estimate future operational conditions were the ones which were formally validated to replicate the existing conditions. This was accomplished by inputting into the model the roadway condition information, including lane configurations, geometrics, signal timings and projected traffic volumes. The No-Build Synchro models used the same cycle lengths as the Existing Conditions models with 2035 No-Build volumes and optimized green times (splits) and signal timing offsets to regulate the progression of traffic along the coordinated system of signals. SimTraffic simulation runs were performed and travel times were calculated from the Arterial Reports.

Travel time results are shown in **Figures 38-41**. The results indicate that increases in travel times would occur throughout the Red Line project study corridor over the existing conditions due to regional traffic growth. These increases would range from relatively minor changes in the travel time (e.g., AM peak hour along Security Blvd between Greengage Rd and Woodlawn Drive) to more significant changes such as along Edmondson Avenue corridor between Cooks Lane and Franklin Street.

Eastbound Security Boulevard had an increase in travel time during PM peak hour from 4.8 to 11.1 minutes (+131%). Along westbound Edmondson Avenue, the AM peak hour travel time increased from 4.8 to 11.0 minutes (+129%) and along eastbound Franklin Street from Edmondson Avenue to Pulaski Street increased from 2.2 to 4.9 minutes (+123%). **Table 11** provides travel times for various segments along the Red Line project study corridor. Also shown in "Bold" font are the travel times that increased over 100 percent in No-Build year.

Table 11. Existing and 2035 No-Build Peak Periods Travel Times

From/To	Existing		No-Build		% Change	
	EB/SB	WB/NB	EB/SB	WB/NB	EB/SB	WB/NB
	Travel Time[1] (Min.)	Travel Time[1] (Min.)	Travel Time[1] (Min.)	Travel Time[1] (Min.)	Travel Time[1] (+/-)	Travel Time[1] (+/-)
Security Boulevard, from Greengage Road to Woodlawn Drive	3.8 (4.8)	4.7 (4.8)	4.9 (11.1)	5.4 (9.5)	+29 (+131)	+15 (+98)
Parallel Drive, from Woodlawn Drive to Ingleside Avenue	2.5 (1.8)	1.6 (1.6)	3.0 (3.5)	3.8 (3.7)	+20 (+94)	+138 (+131)
Cooks Lane., from Forest Park Avenue to Edmondson Avenue	3.1 (2.2)	1.8 (1.8)	2.7 (2.3)	2.0 (2.1)	-13 (+5)	+11 (+17)
US 40, from I-695 Outer Loop to Cooks Lane	3.8 (5.8)	4.7 (5.5)	4.5 (6.9)	5.9 (12.7)	+18 (+19)	+26 (+131)
Edmondson Avenue , from Cooks Lane to Franklin Street	4.5 (5.8)	4.8 (5.3)	7.4 (7.2)	11.0 (10.0)	+64 (+24)	+129 (+89)
Franklin Street, from Edmondson Avenue to Pulaski Street	2.2 (2.3)	2.2 (2.1)	4.9 (2.7)	2.9 (2.4)	+123 (+17)	+32 (+14)
MLK Jr. Boulevard, from US 40 to Lombard Street	1.8 (3.3)	2.5 (4.2)	4.4 (6.3)	3.2 (4.3)	+144 (+91)	+28 (+2)
Lombard Street, from MLK Jr. Boulevard to President Street	N/A	6.2 (7.4)	N/A	6.3 (9.2)	N/A	+2 (+24)
President Street, from Pratt Street to Fleet Street	1.0 (0.8)	3.3 (2.5)	0.8 (1.4)	8.0 (2.2)	-20 (+75)	+142 (-12)
Fleet Street, from President Street to Boston Street	3.9 (6.9)	3.9 (3.9)	3.7 (7.6)	7.3 (4.7)	-5 (+10)	+87 (+21)
Boston Street , from Fleet Street to Conkling Street	3.7 (4.6)	2.7 (4.8)	7.8 (6.0)	4.8 (4.6)	+111 (+30)	+78 (-4)

Source: MTA, 2012; [1] AM(PM) peak hours

4.3.1 Levels of Service

An additional measure of how well a roadway operates is Level of Service (LOS), defined in Chapter 2-Existing Conditions. Traffic analysis was performed for the 2035 No-Build conditions to determine levels of service. The analysis was performed by using the Synchro/Simtraffic Version 7.0 software program to report the Highway Capacity Manual (version 2000) level of service results. The roadway condition variables are the same as the ones used for the travel time analysis.

A total of 152 intersections (132 signalized and 20 unsignalized) were analyzed in the 2035 No-Build scenario. There would be eight new intersections (seven signalized and one unsignalized) that would be built by 2035 along the Red Line project study corridor even without the LRT built. These intersections were selected primarily based on the following four reasons (for comparison with 2035 Build conditions analysis):

1. Most critical locations as a result of LRT operations in the Build condition.
2. Intersection is either modified to a signal or an existing signal is removed in the Build condition.
3. Adjacent intersections within the Red Line alignment that may impact the LRT vehicle through the intersection.
4. Locations where the lane usage for side streets is either modified or access closed due to LRT vehicles operations on the mainline intersecting roadway.

The following traffic impacts are generally defined as "significant":

- Deterioration in intersection operations from LOS D or better to LOS E or F, deterioration from LOS E to LOS F, or significant deterioration in vehicle delays within LOS F; or
- Deterioration in intersection operations from LOS A or B to LOS D or worse (i.e., a change of at least two levels of service when the existing is operating at an optimal level.

Table 12 provides the total number of intersections that are operating at acceptable LOS (LOS D or better) and worse (LOS E or F) in the Existing and 2035 No-Build conditions.

Table 12: Existing and 2035 No-Build Levels of Service

Intersection Type	Number of Intersections	Existing[1]		No-Build[1]	
		Acceptable LOS (LOS D or Better)	LOS E or F	Acceptable LOS (LOS D or Better)	LOS E or F
Signalized	125/132	120 (115)	5 (10)	113 (106)	19 (26)
Unsignalized (worst approach)	19/20	16 (15)	3 (4)	12 (12)	8 (8)

Source: MTA, 2012
[1]AM(PM) peak hours

Table 13 provides a list of all intersections that have significant traffic impact according to the definitions provided above. The results of the 2035 No-Build analysis showed that the overall level of service would decrease over the Existing conditions throughout the entire corridor, as a result of traffic volume growth in the region between 2011 and 2035. A detailed analysis table with delay and volumes at studied intersections in both No-Build and Existing Conditions are included in **Appendix A.**

The levels of service (AM and PM) for all the studied intersections are shown in this report in **Figures 42-49.** It is anticipated that all intersections that are failing in Existing Conditions would continue to fail in the future No-Build conditions with improvements as listed in the *Plan It 2035*.

Following are the list of signalized and unsignalized intersections that operate at LOS E and/or LOS F in the 2035 No-Build condition during AM and/or PM peak hour (listed from west to east along the Red Line project study corridor):

<u>Signalized Intersections:</u>

- MD 122 (Security Boulevard) at Belmont Ave. – (E) during (PM) peak hour
- MD 122 (Security Boulevard) at Woodlawn Dr. – (F) during (PM) peak hour
- MD 122 (Security Boulevard) at Ingleside Ave. – E (E) during AM (PM) peak hour
- Johnnycake Rd at Ingleside Ave. – E (F) during AM (PM) peak hour
- US 40 at Ingleside Ave. – (F) during (PM) peak hour
- Franklin Street at Payson Street – (F) during (PM) peak hour
- MLK Jr. Boulevard at Franklin Street – F (F) during AM (PM) peak hour
- MLK Jr. Boulevard at Mulberry Street – F (F) during AM (PM) peak hour
- MLK Jr. Boulevard at Saratoga Street – F (F) during AM (PM) peak hour
- MLK Jr. Boulevard at Fayette Street – F (E) during AM (PM) peak hour
- MLK Jr. Boulevard at Baltimore Street – F (F) during AM (PM) peak hour
- MLK Jr. Boulevard at Lombard Street – F (F) during AM (PM) peak hour
- Lombard Street at Penn Street – (E) during (PM) peak hour
- Lombard Street at Greene Street – (F) during (PM) peak hour
- Lombard Street at Paca Street – (E) during (PM) peak hour
- Lombard Street at Hopkins Pl. – F (F) during AM (PM) peak hour
- Lombard Street at Hanover Street – E (E) during AM (PM) peak hour
- Lombard Street at St. Paul Street – (F) during (PM) peak hour
- Lombard Street at Calvert Street – (F) during (PM) peak hour
- Lombard Street at South Street – (E) during (PM) peak hour
- Lombard Street at President Street – E (E) during AM (PM) peak hour
- President Street at Eastern Avenue – (E) during (PM) peak hour
- Fleet Street at Caroline Street – E (E) during AM (PM) peak hour
- Boston Street at Aliceanna Street – (F) during (PM) peak hour
- Boston Street at Montford Avenue – E during AM peak hour
- Boston Street at Clinton Street – F during AM peak hour

- Boston Street at Conkling Street – E during AM peak hour
- Conkling Street at O'Donnell Street – F (F) during AM (PM) peak hour
- O'Donnell Street at New Boston Street (Boh'Donnell Connector) – E during AM peak hour
- O'Donnell Street at Interstate Ave. – E during AM peak hour
- Bayview Boulevard at Lombard Street – E (F) during AM (PM) peak hour

Unsignalized Intersections:

- Security Boulevard at Greengage Rd. – (E) during (PM) peak hour
- Woodlawn Drive at Security Road – (E) during (PM) peak hour
- Parallel Drive at SSA Access – (F) during (PM) peak hour
- Edmondson Ave. at Denison Street – F (F) during AM (PM) peak hour
- US 40 (Mulberry Street) at Smallwood Street – F (F) during AM (PM) peak hour
- Boston Street at Leakin Street – F (F) during AM (PM) peak hour
- Boston Street at Kenwood Avenue – F (F) during AM (PM) peak hour
- Boston Street at East Street – F during AM peak hour
- Boston Street at Baylis Street – F during AM peak hour
- Conkling Street at Toone Street – F during AM peak hour
- Bayview Boulevard at Alpha Commons Drive – F (F) during AM (PM) peak hour

Table 13: Existing and 2035 No-Build Levels of Service E or F

No.	Signalized Intersections	Existing		No-Build	
		AM	PM	AM	PM
1	MD 122 (Security Boulevard) at Belmont Avenue	B	D	C	E
2	MD 122 (Security Boulevard) at Woodlawn Drive	D	E	D	F
3	MD 122 (Security Boulevard) at Ingleside Avenue	E	E	E	E
4	Johnnycake Road at Ingleside Avenue	C	C	E	F
5	US 40 at Ingleside Avenue	D	E	D	F
6	Mulberry Street at Pulaski Street	E	C	B	C
7	Franklin Street at Payson Street	N/A[1]	N/A[1]	C	F
8	MLK Jr. Boulevard at Franklin Street	D	D	F	F
9	MLK Jr. Boulevard at Mulberry Street	F	C	F	F
10	MLK Jr. Boulevard at Saratoga Street	E	D	F	F
11	MLK Jr. Boulevard at Fayette Street	B	B	F	E
12	MLK Jr. Boulevard at Baltimore Street	C	E	F	F
13	MLK Jr. Boulevard at Lombard Street	C	E	F	F
14	Lombard Street at Penn Street	B	E	B	E
15	Lombard Street at Greene Street	C	C	C	F
16	Lombard Street at Paca Street	B	C	C	E
17	Lombard Street at Hopkins Place	F	F	F	F
18	Lombard Street at Hanover Street	B	E	E	E
19	Lombard Street at St. Paul Street	C	F	D	F
20	Lombard Street at Calvert Street	C	C	D	F
21	Lombard Street at South Street	C	C	C	E
22	Lombard Street at President Street	D	C	E	E
23	President Street at Eastern Avenue	C	D	D	E
24	Fleet Street at Caroline Street	B	B	E	E
25	Boston Street at Aliceanna Street	B	E	C	F
26	Boston Street at Montford Avenue	B	B	E	A
27	Boston Street at Clinton Street	D	C	F	C
28	Boston Street at Conkling Street	B	B	E	C
29	Conkling Street at O'Donnell Street	D	D	F	F
30	O'Donnell Street at New Boston Street (Boh'Donnell Connector)	N/A[2]	N/A[2]	E	D
31	O'Donnell Street at Interstate Avenue	C	C	E	C
32	Bayview Boulevard at Lombard Street	C	C	E	F
	Total – LOS E OR F	5	10	19	26

No.	Unsignalized Intersections	Existing		No-Build	
		AM	PM	AM	PM
1	Security Boulevard at Greengage Road	E	D	D	E
2	Woodlawn Drive at Security Road	B	D	B	E
3	Parallel Drive at SSA Access	B	F	C	F
4	Edmondson Avenue at Denison Street	F	F	F	F
5	US 40 (Mulberry Street) at Smallwood Street	F	F	F	F
6	Boston Street at Leakin Street	D	F	F	F
7	Boston Street at Kenwood Avenue	D	C	F	F
8	Boston Street at East Street	A	B	F	D
9	Boston Street at Baylis Street	C	B	F	B
10	Conkling Street at Toone Street	C	C	F	C
11	Bayview Boulevard at Alpha Commons Drive	B	B	F	F
	Total – LOS E OR F	3	4	8	8

Note: [1] Unsignalized in Existing conditions and HCM Synchro results not available for the intersection layout; [2] Intersection does not exist today;
Formatting: No-Build conditions were compared to Existing conditions. Red – LOS worsens; Green – LOS improves; Black – No change in LOS;
Bold text – LOS E or F

Source: MTA, 2012

AM(PM) PEAK HOUR VOLUMES - NO-BUILD CONDITIONS (2035)

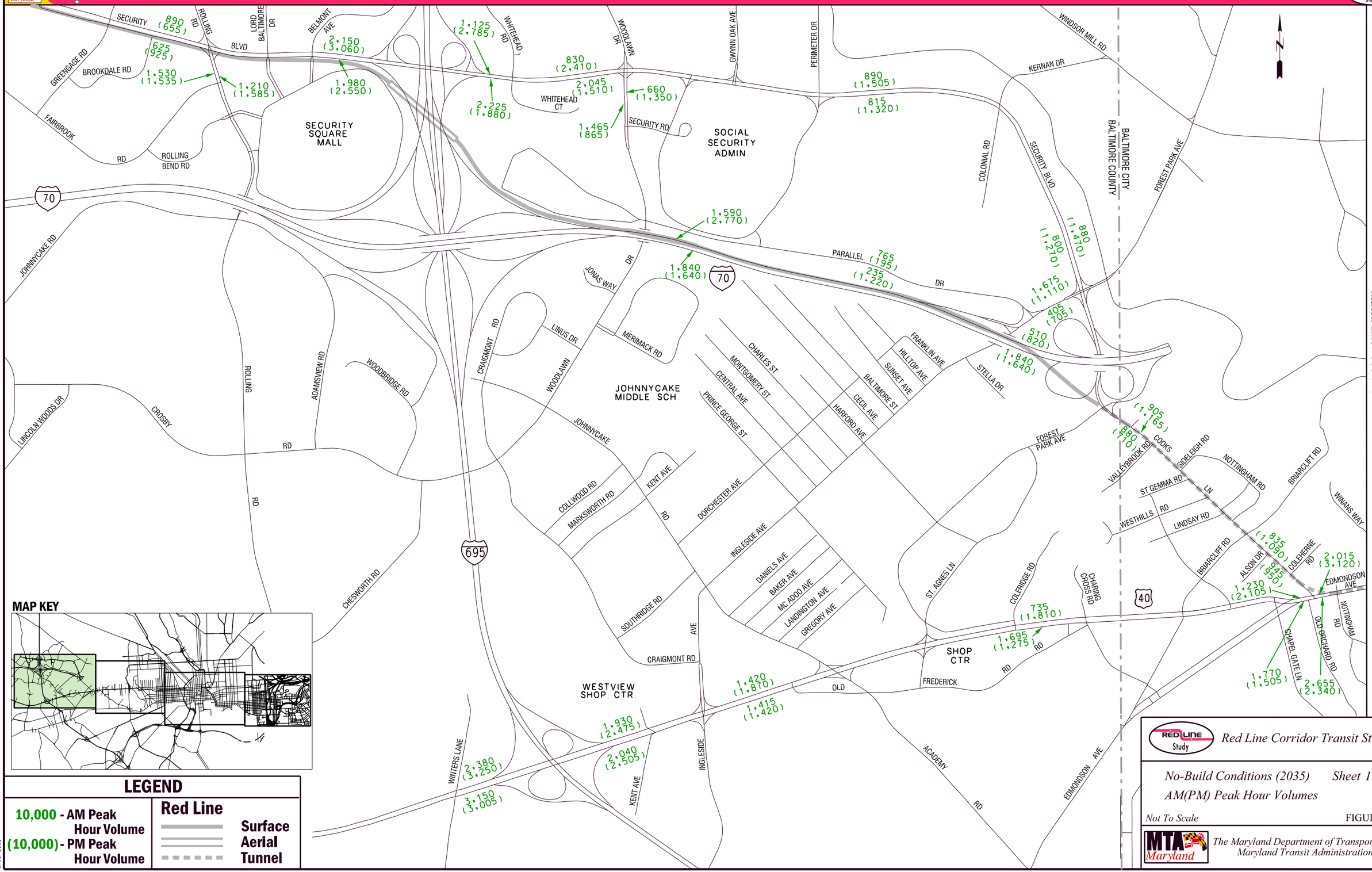


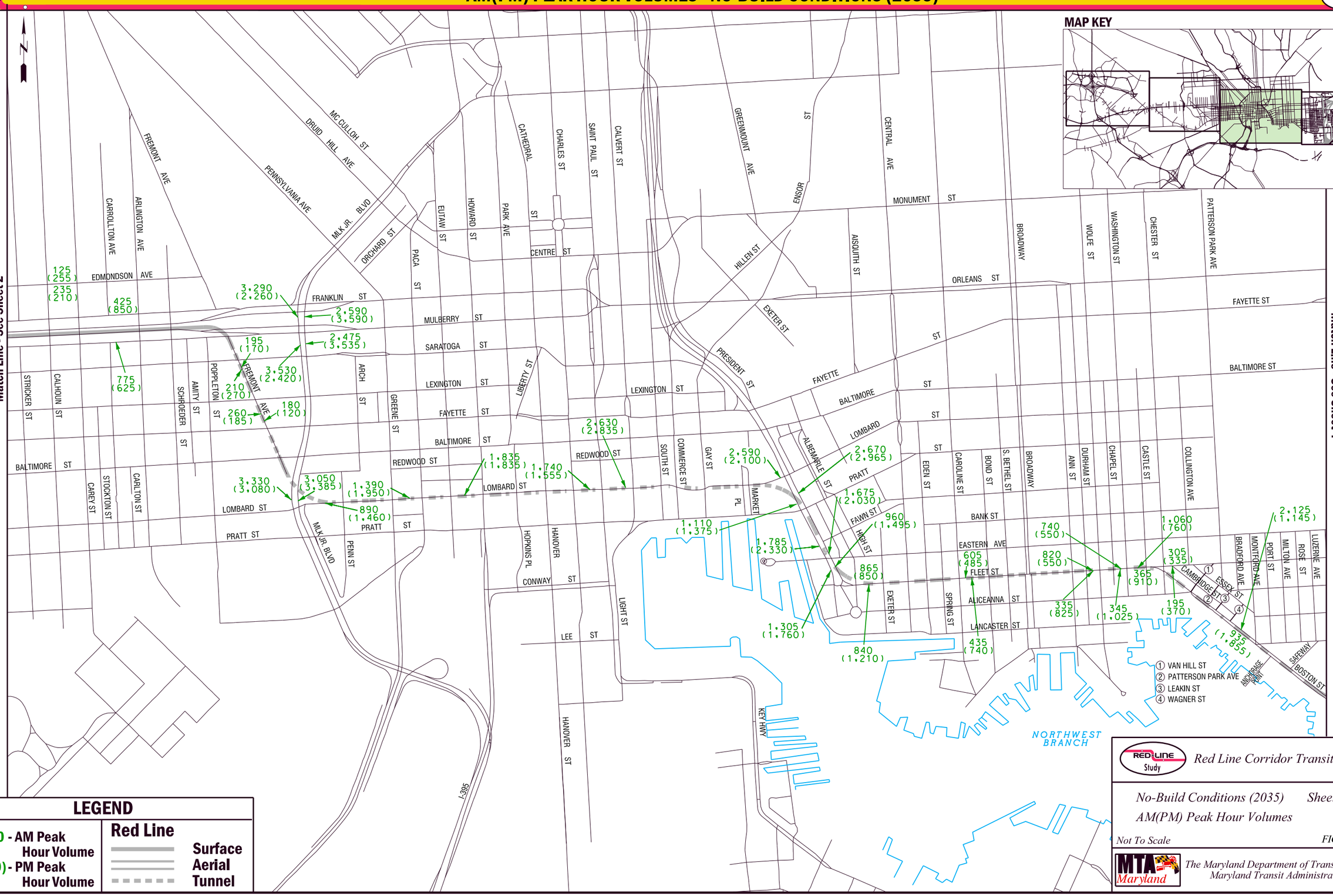
FIGURE 34 - No-Build Conditions (2035) AM(PM) Peak Hour Volumes

AM(PM) PEAK HOUR VOLUMES - NO-BUILD CONDITIONS (2035)

\\Rkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Peak Hour Volumes\2035 No-Build\peak_hr_inset2_NB2035.dgn
9/10/2012

FIGURE 35 - No-Build Conditions (2035) AM(PM) Peak Hour Volumes

AM(PM) PEAK HOUR VOLUMES - NO-BUILD CONDITIONS (2035)



LEGEND

10,000 - AM Peak Hour Volume	Red Line
(10,000) - PM Peak Hour Volume	Surface / Aerial / Tunnel

Red Line Corridor Transit Study

No-Build Conditions (2035) — Sheet 3 of 4

AM(PM) Peak Hour Volumes

Not To Scale — FIGURE 36

The Maryland Department of Transportation
Maryland Transit Administration

\\Rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Peak Hour Volumes\2035 No-Build\peak_hr_inset3_NB2035.dgn
9/10/2012

FIGURE 36 - No-Build Conditions (2035) AM(PM) Peak Hour Volumes

AM(PM) PEAK HOUR VOLUMES - NO-BUILD CONDITIONS (2035)

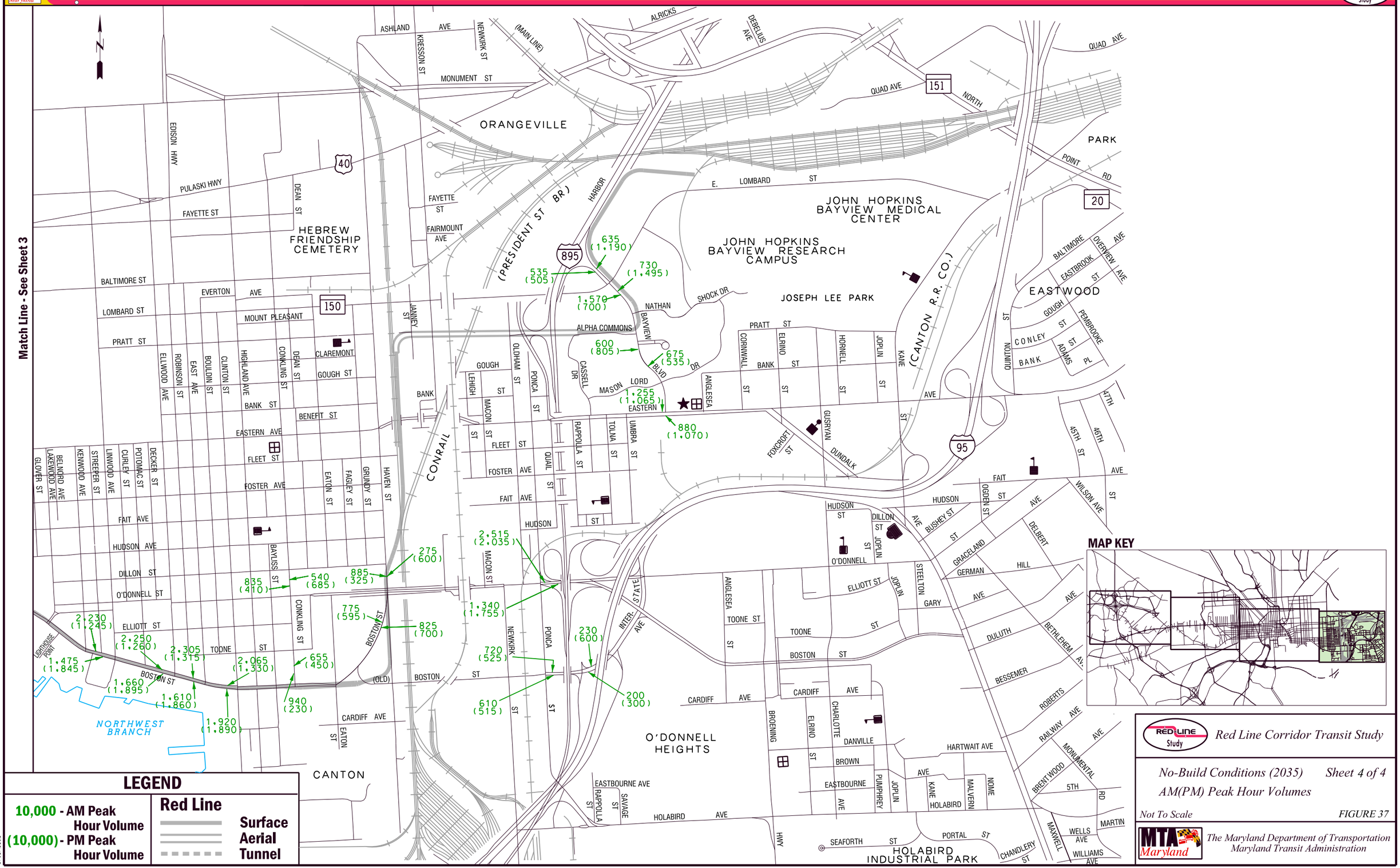


FIGURE 37 - No-Build Conditions (2035) AM(PM) Peak Hour Volumes

AM (PM) TRAVEL TIMES - NO BUILD (2035)

MTA Maryland

RED LINE Study

TO CMS

SECURITY BLVD
From GREENGAGE RD
TO
ROLLING RD
1.9(2.8) minutes

SECURITY BLVD
From ROLLING RD
TO
GREENGAGE RD
0.5(0.4) minutes

SECURITY BLVD
From ROLLING RD
TO
I-695 Inner loop
1.8(6.9) minutes

SECURITY BLVD
From I-695 Inner loop
TO
ROLLING RD
3.6(3.3) minutes

SECURITY BLVD
From I-695 Inner loop
TO
WOODLAWN DR
1.2(1.4) minutes

SECURITY BLVD
From WOODLAWN DR
TO
I-695 Inner loop
1.3(5.8) minutes

SECURITY BLVD
From WOODLAWN DR
TO
S.S. PERIMETER DR
1.1(1.6) minutes

SECURITY BLVD
From S.S. PERIMETER DR
TO
WOODLAWN DR
1.4(7.0)minutes

SECURITY BLVD
From S.S. PERIMETER DR
TO
FOREST PARK AVE
3.2(3.3)minutes

SECURITY BLVD
From FOREST PARK AVE
TO
S.S.PERIMETER DR
3.7(5.3)minutes

WB PARALLEL DR
From INGLESIDE AVE
TO
WOODLAWN DR
3.8(3.7)minutes

EB PARALLEL DR
From WOODLAWN DR
TO
INGLESIDE AVE
3.0(3.5)minutes

COOKS LN
From EDMONDSON AVE
TO
FOREST PARK AVE
2.0(2.1) minutes

COOKS LN
From FOREST PARK AVE
TO
EDMONDSON AVE
2.7(2.3) minutes

WB US 40
From COOKS LANE
TO
I-695 Outer loop
5.9(12.7)minutes

EB US 40
From I-695 Outer loop
TO
COOKS LANE
4.5(6.9) minutes

SECURITY SQUARE MALL

SOCIAL SECURITY ADMIN.

JOHNNYCAKE MIDDLE SCH.

WESTVIEW SHOP. CTR.

SHOP CTR

BALTIMORE CITY
BALTIMORE COUNTY

Match Line - See Sheet 2

MAP KEY

LEGEND

WB/NB TRAVEL SEGMENTS	Red Line
EB/SB TRAVEL SEGMENTS	Surface
	Aerial
	Tunnel

Red Line Corridor Transit Study

No-Build Conditions (2035)
AM(PM) Travel Times

Sheet 1 of 4

Not To Scale

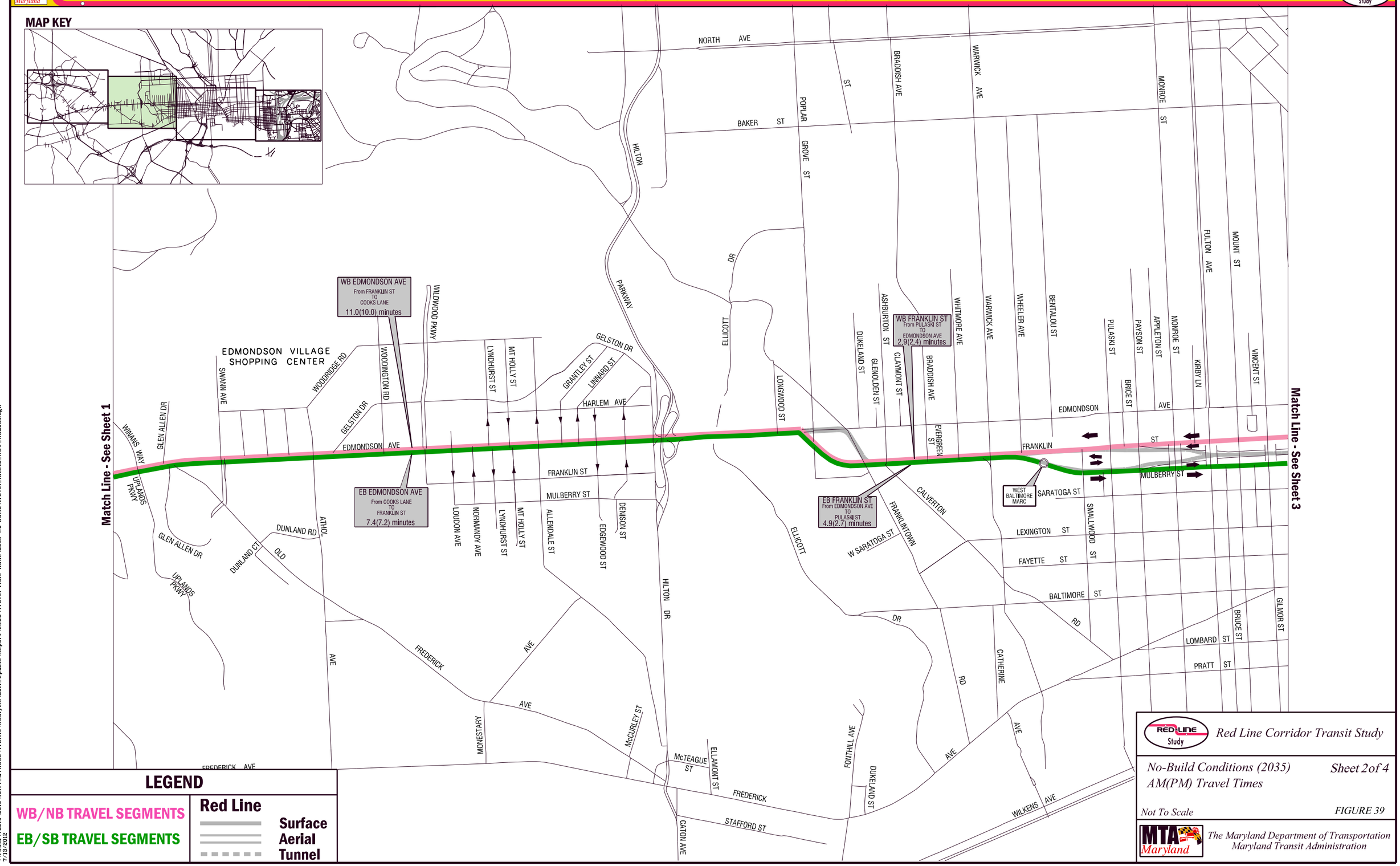
FIGURE 38

The Maryland Department of Transportation
Maryland Transit Administration

\\rkm\v2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Travel Time Runs\2035 No-Build\travel_inset1_NEW_NB2035.dgn
7/13/2012

FIGURE 38 - No-Build Conditions (2035) AM(PM) Travel Times

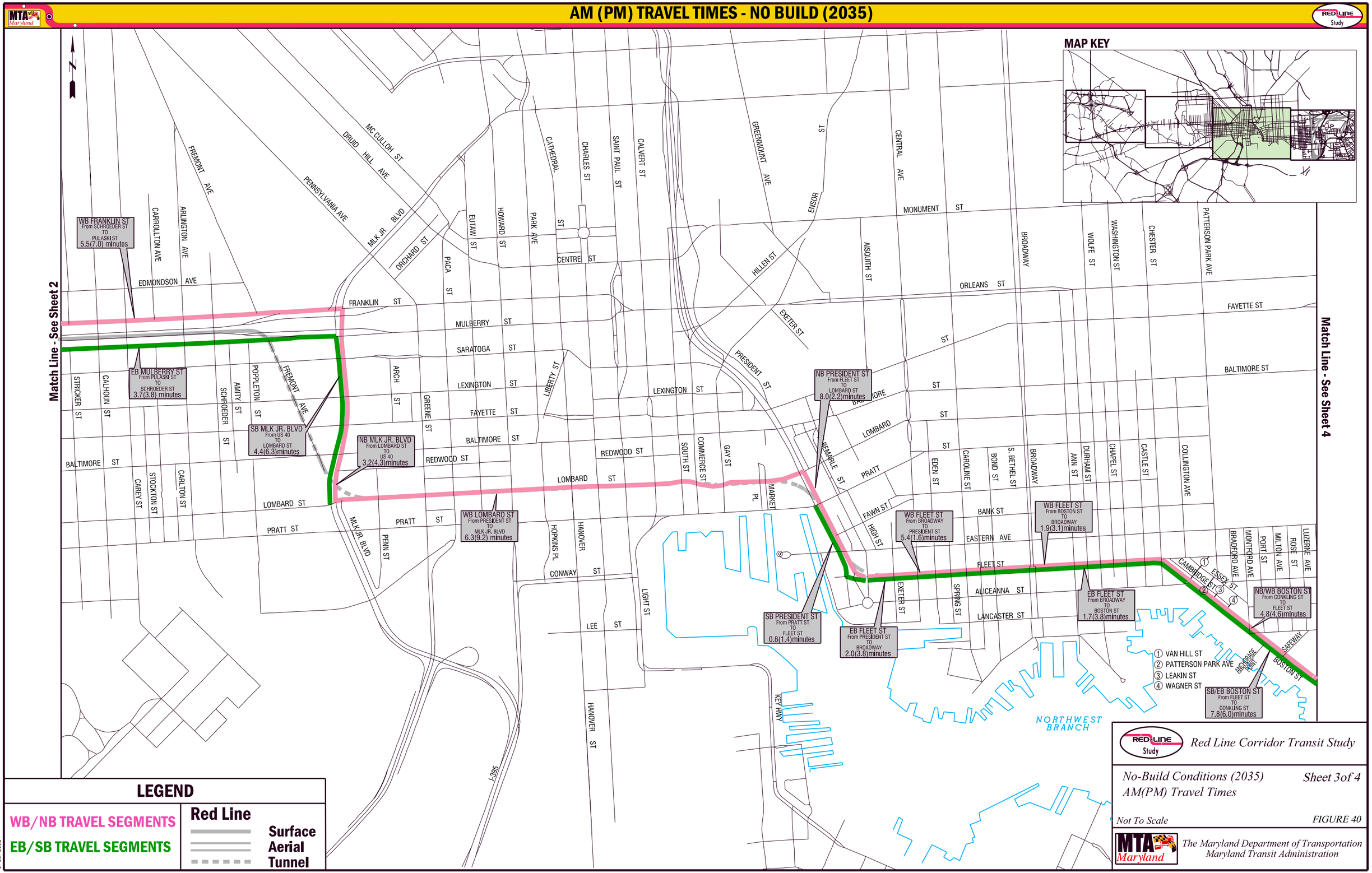
AM (PM) TRAVEL TIMES - NO BUILD (2035)



\\rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Travel Time Runs\2035 No-Build\travel_inset2_NBW_NB2035.dgn
7/13/2012

FIGURE 39 - No-Build Conditions (2035) AM(PM) Travel Times

AM (PM) TRAVEL TIMES - NO BUILD (2035)



\\Rkcm\v2010\10114_MTAGRC\Traffic\Analysis\2011_Update\Report\CADD\Travel Time Runs\2035 No-Build\travel_inset3_NEW_NB2035.dgn
9/25/2012

FIGURE 40 - No-Build Conditions (2035) AM(PM) Travel Times

AM (PM) TRAVEL TIMES - NO BUILD (2035)

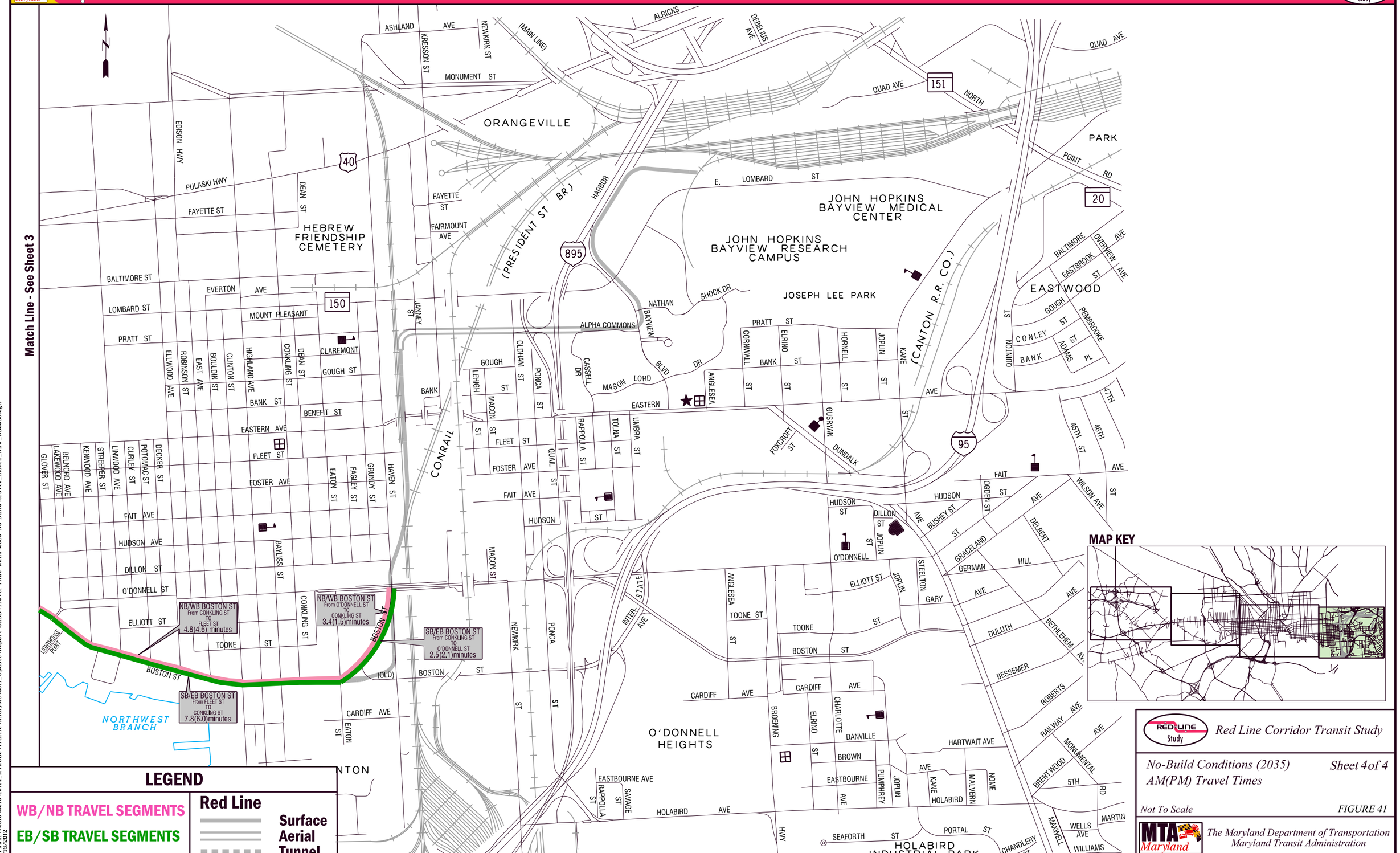
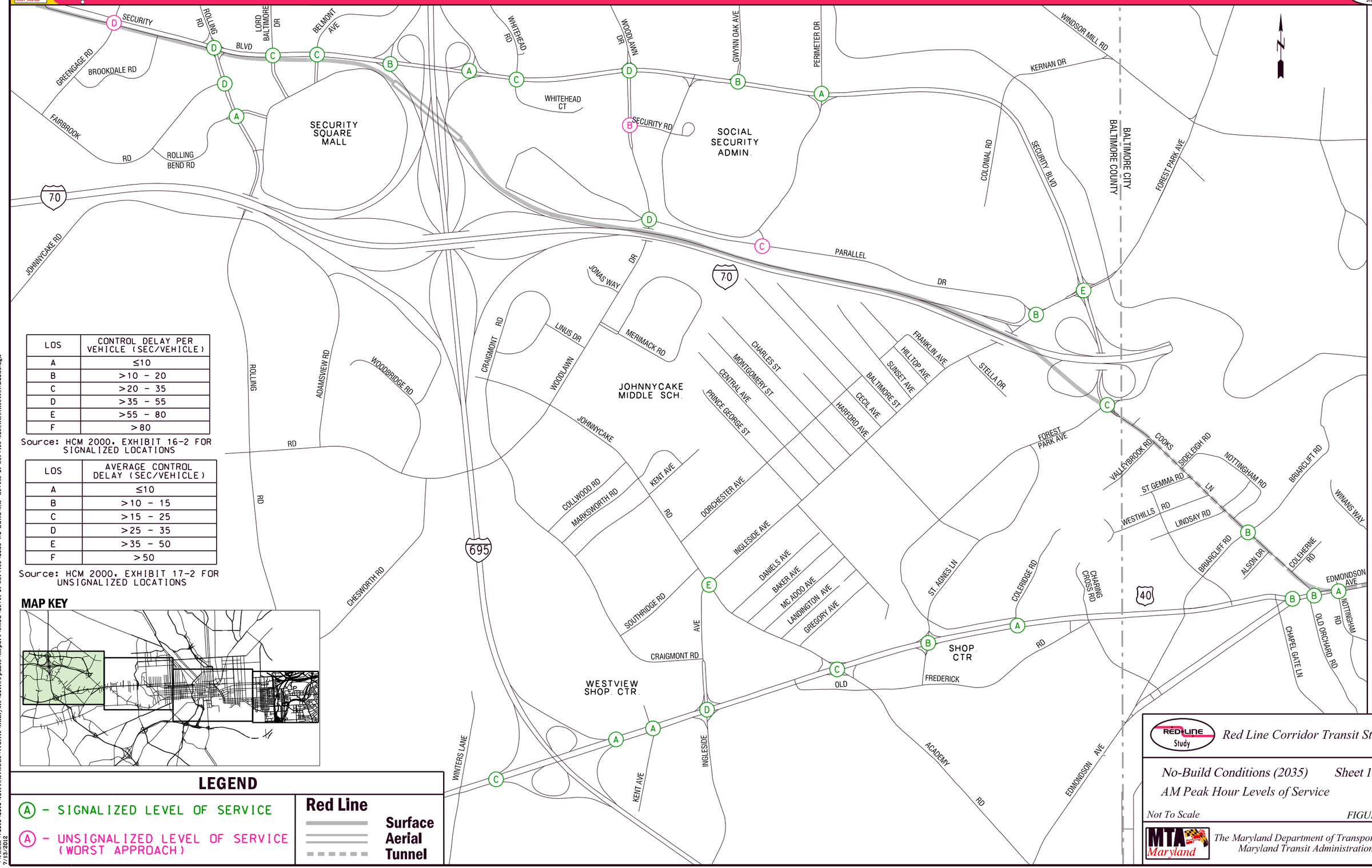


FIGURE 41 - No-Build Conditions (2035) AM(PM) Peak Hour Volumes

AM PEAK HOUR LEVELS OF SERVICE - NO-BUILD CONDITIONS (2035)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

MAP KEY

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface
Aerial
Tunnel

Red Line Corridor Transit Study

No-Build Conditions (2035) Sheet 1 of 4

AM Peak Hour Levels of Service

Not To Scale FIGURE 42

The Maryland Department of Transportation
Maryland Transit Administration

\\rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 No-Build\AM Levels of Service\los_AM_inset1_NB2035.dgn
7/13/2012

FIGURE 42 - No-Build (2035) Levels of Service - AM Peak Hour

AM PEAK HOUR LEVELS OF SERVICE - NO-BUILD CONDITIONS (2035)

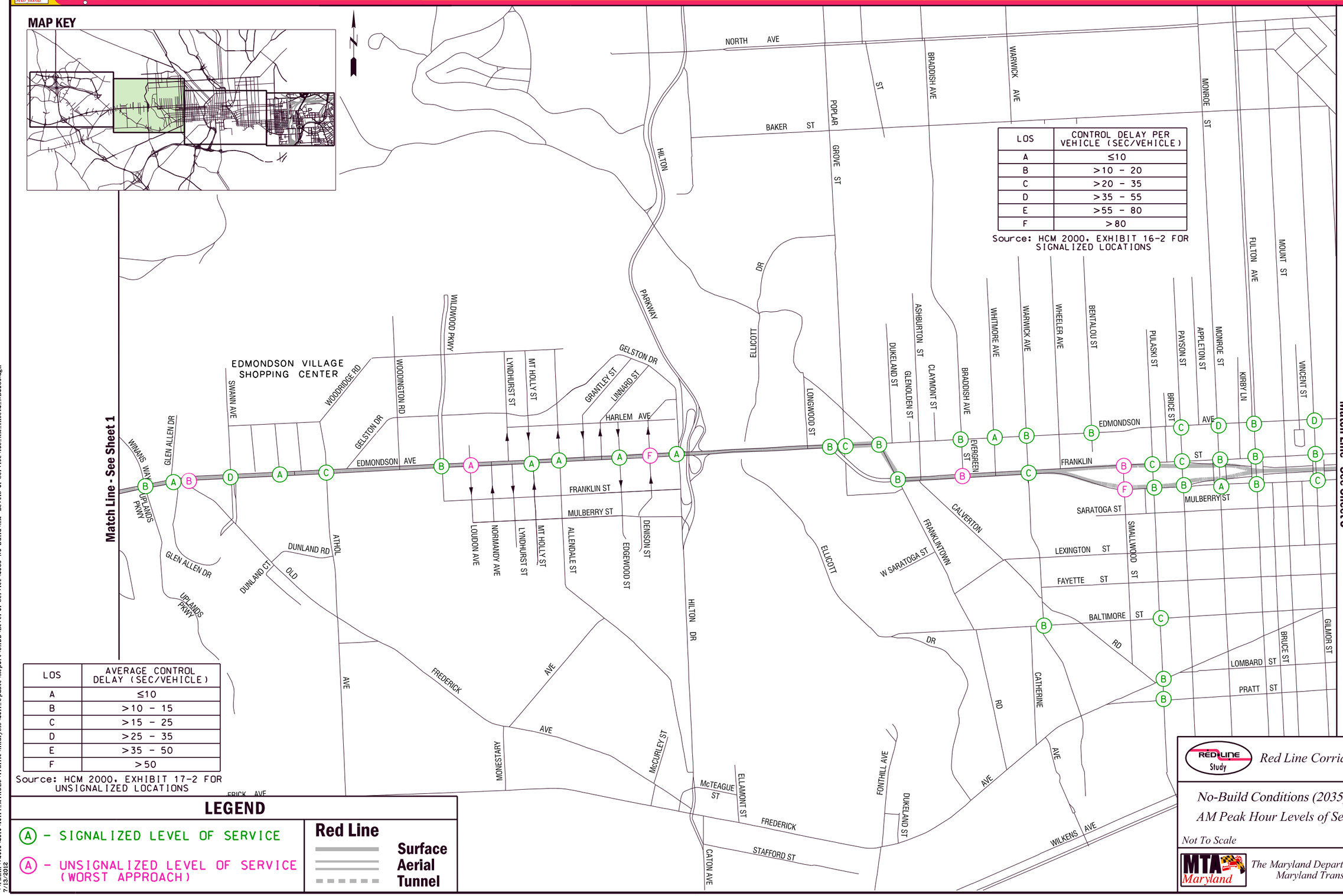


FIGURE 43 - No-Build (2035) Levels of Service - AM Peak Hour

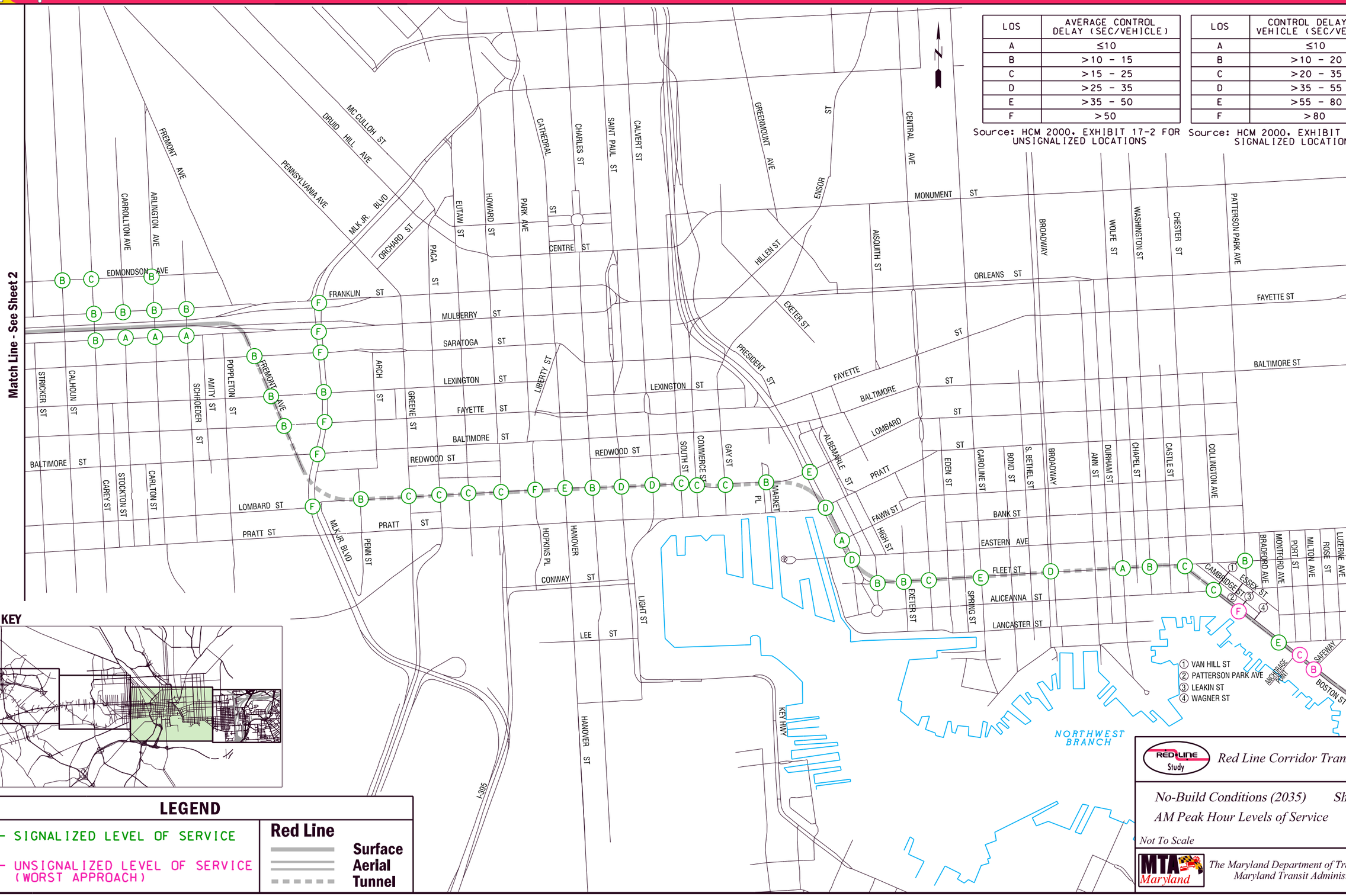
AM PEAK HOUR LEVELS OF SERVICE - NO-BUILD CONDITIONS (2035)

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS



Red Line Corridor Transit Study

No-Build Conditions (2035) Sheet 3 of 4

AM Peak Hour Levels of Service

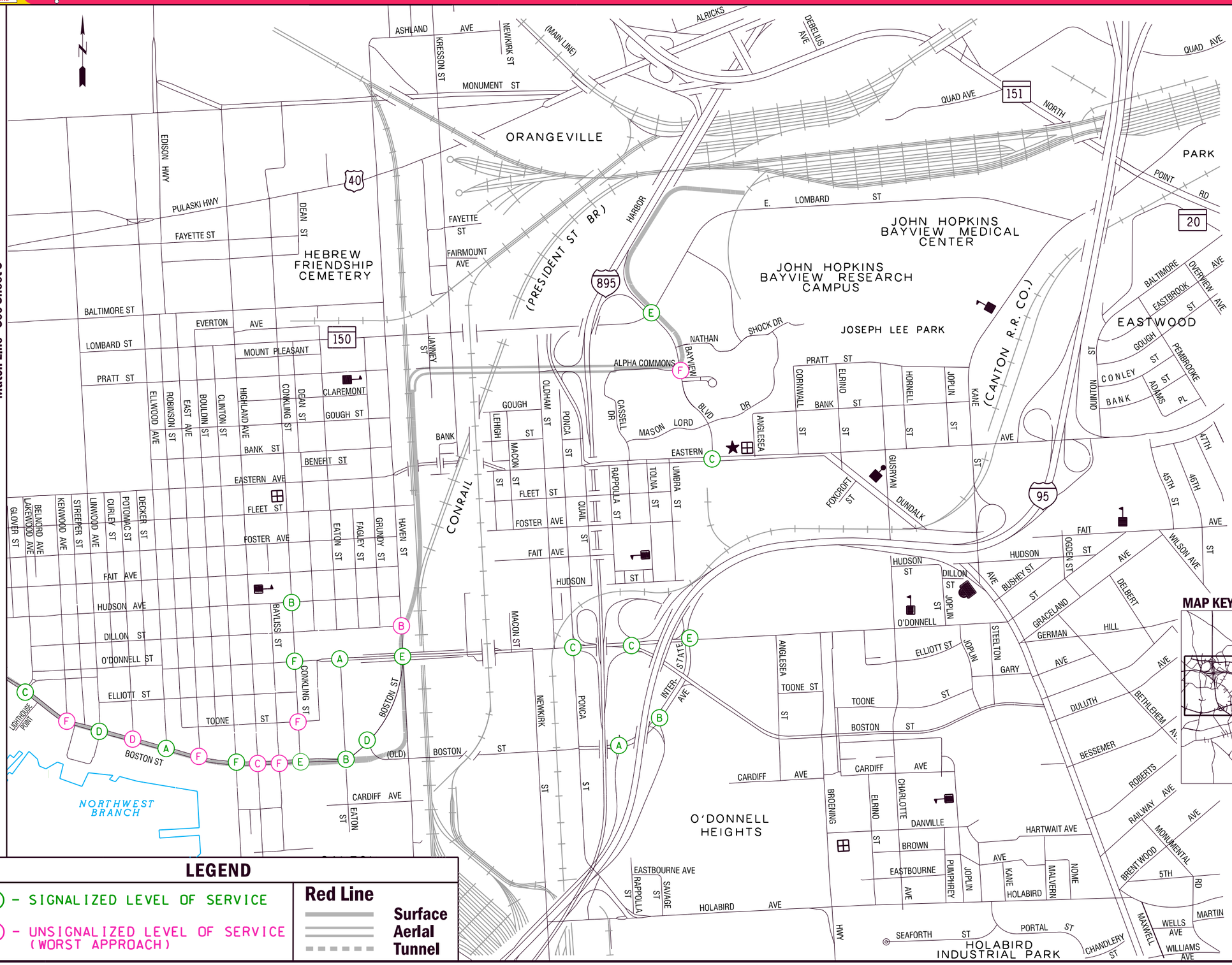
Not To Scale FIGURE 44

The Maryland Department of Transportation
Maryland Transit Administration

\\rkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 No Build\AM Levels of Service\los_AM_inset3_NB2035.dgn
7/13/2012

FIGURE 44 - No-Build (2035) Levels of Service - AM Peak Hour

AM PEAK HOUR LEVELS OF SERVICE - NO-BUILD CONDITIONS (2035)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface
Aerial
Tunnel

MAP KEY

Red Line Corridor Transit Study

No-Build Conditions (2035) — Sheet 4 of 4

AM Peak Hour Levels of Service

Not To Scale — FIGURE 45

The Maryland Department of Transportation
Maryland Transit Administration

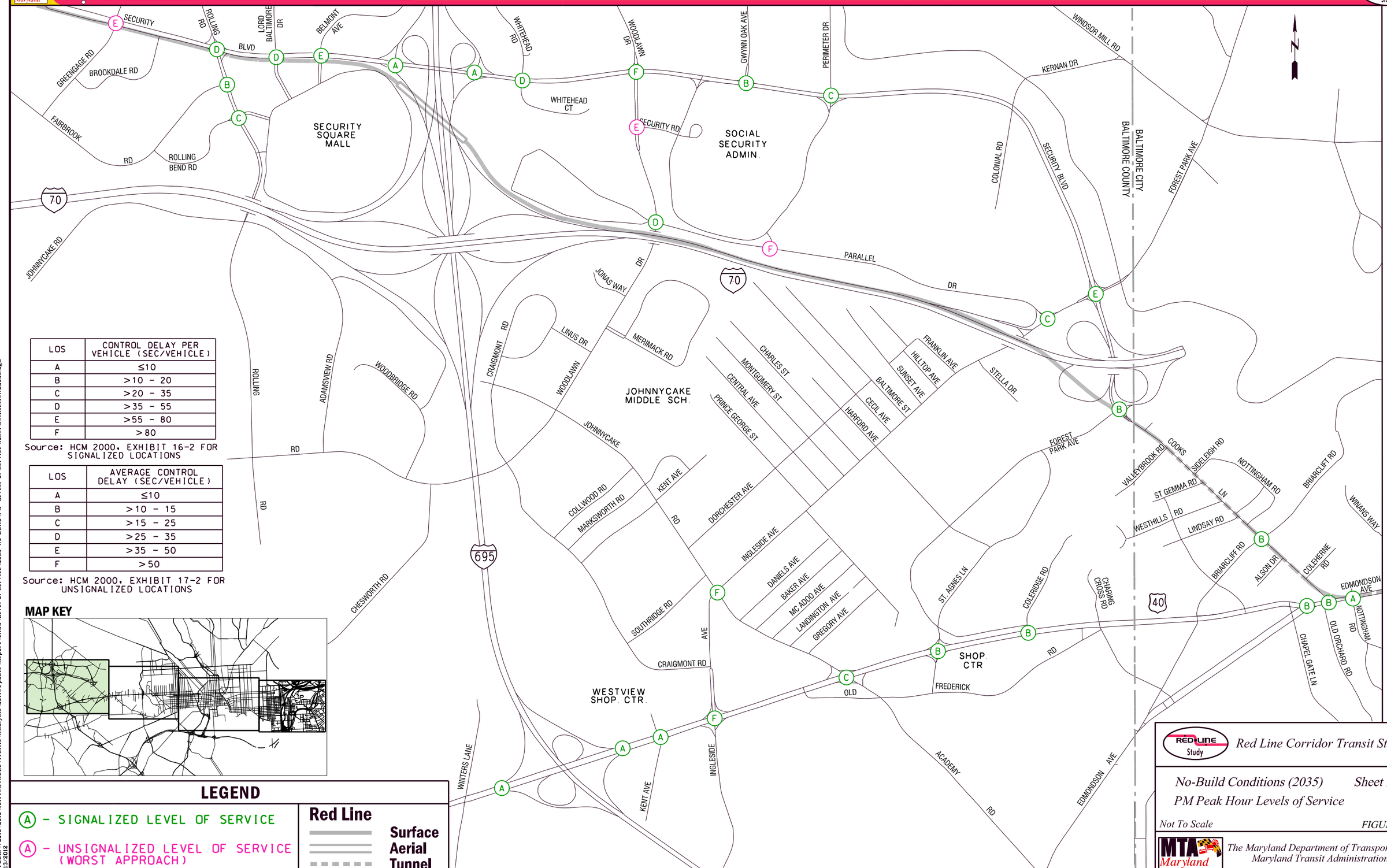
\\rkkm\v2010\2010\10114_MTACBC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 No-Build\AM Levels of Service\los_AM_Inset4_NB2035.dgn
7/13/2012

FIGURE 45 - No-Build (2035) Levels of Service - AM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - NO BUILD CONDITIONS (2035)

MTA Maryland

RED LINE Study



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

MAP KEY

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface

Aerial

Tunnel

Match Line - See Sheet 2

RED LINE Study — *Red Line Corridor Transit Study*

No-Build Conditions (2035) — *Sheet 1 of 4*

PM Peak Hour Levels of Service

Not To Scale — *FIGURE 46*

MTA Maryland — *The Maryland Department of Transportation*
Maryland Transit Administration

\\rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 No-Build\PM Levels of Service\los_PM_inset1_NB2035.dgn
7/13/2012

FIGURE 46 - No-Build (2035) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - NO BUILD CONDITIONS (2035)

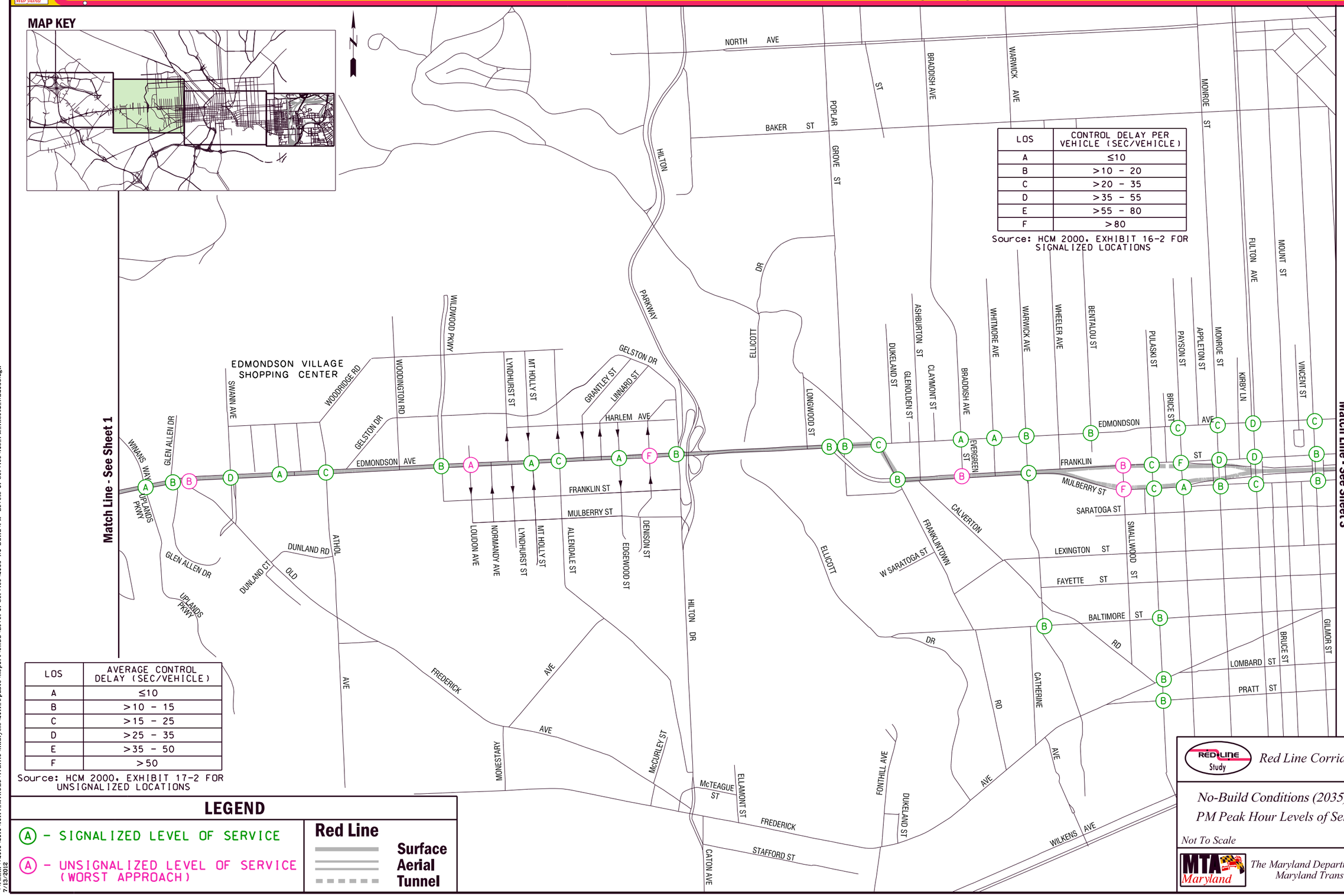


FIGURE 47 - No-Build (2035) Levels of Service - PM Peak Hour

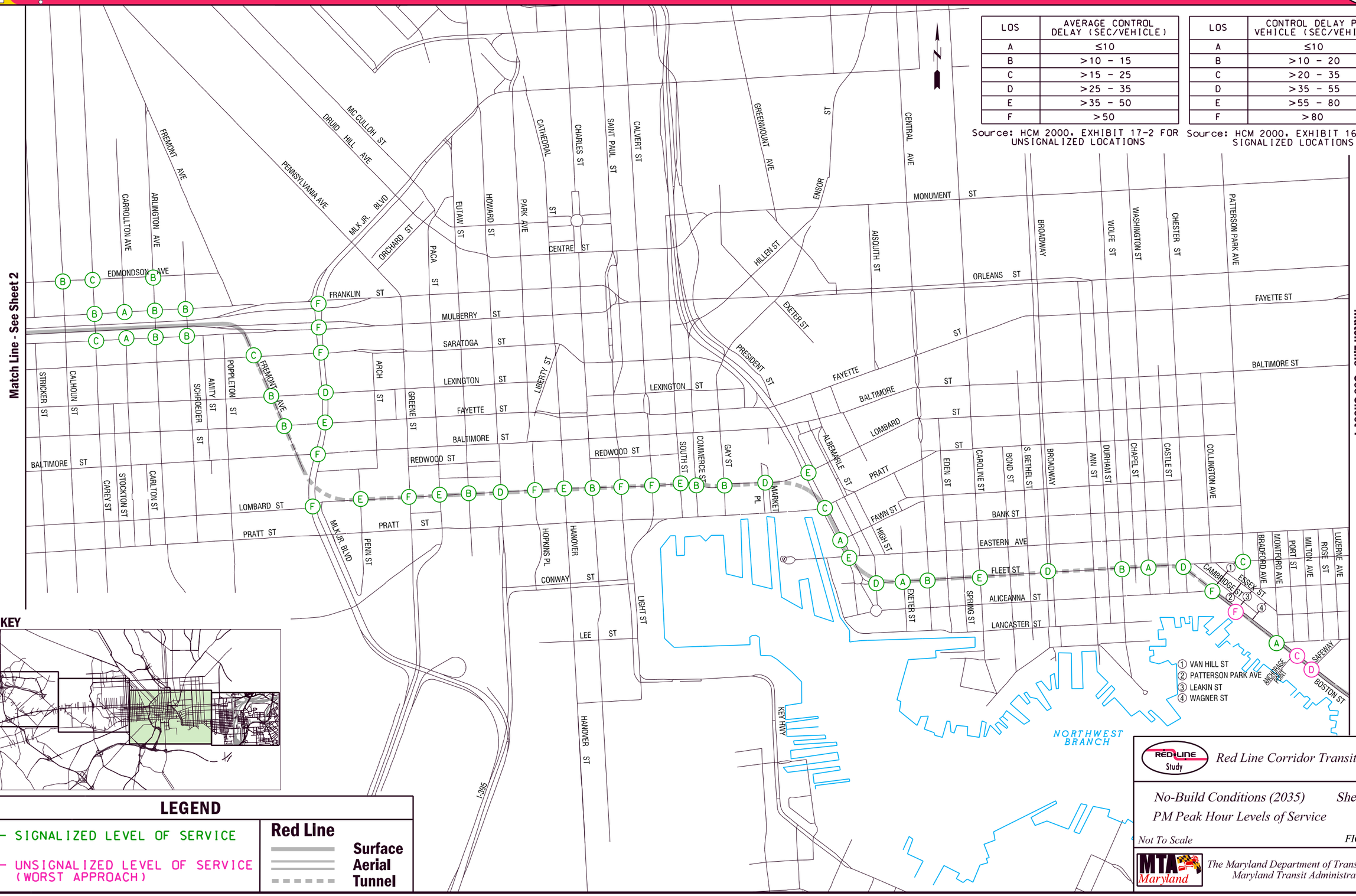
PM PEAK HOUR LEVELS OF SERVICE - NO BUILD CONDITIONS (2035)

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

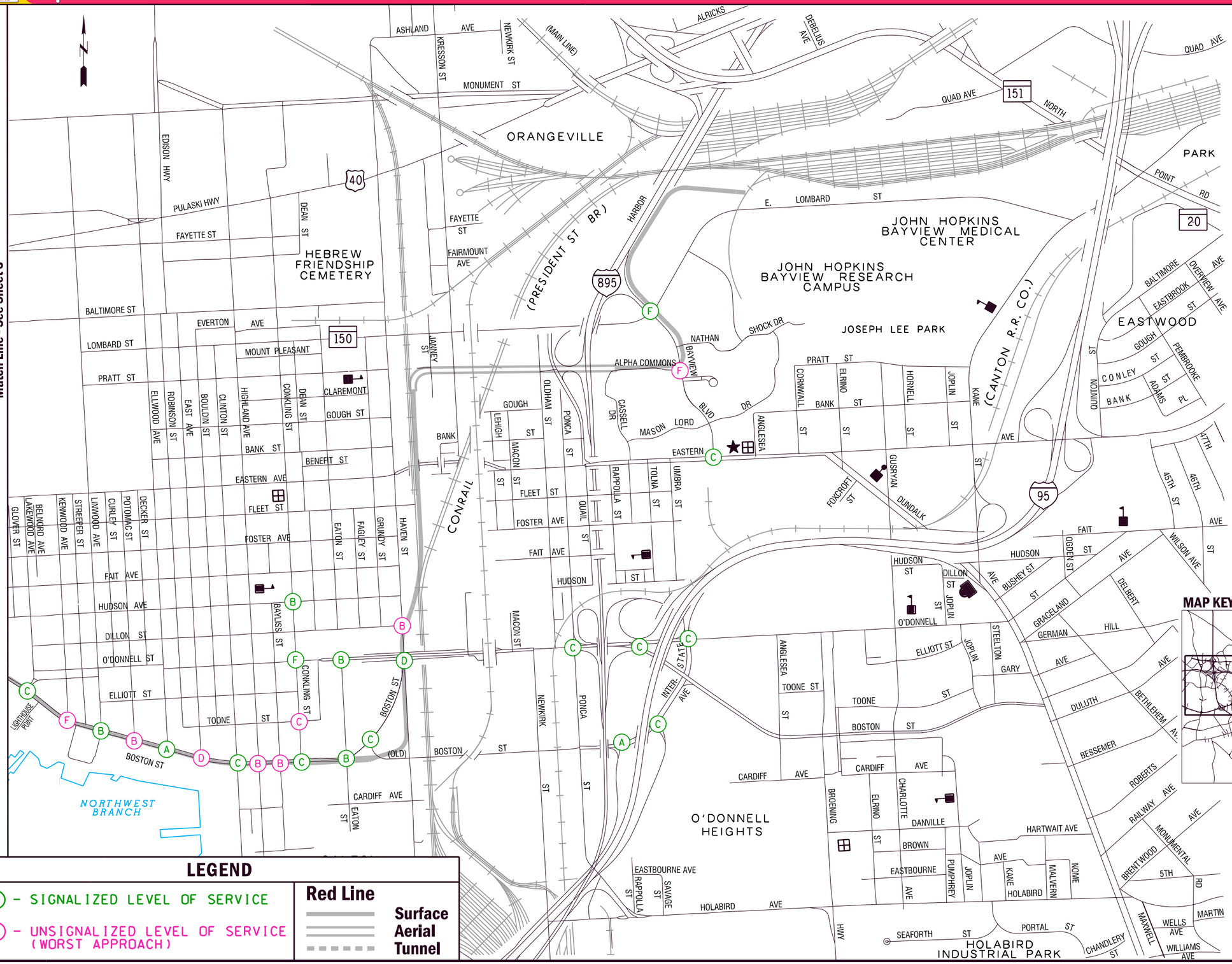
Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS



\\Rkem\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 No-Build\PM Levels of Service\los_PM_inset3_NB2035.dgn
9/26/2012

FIGURE 48 - No-Build (2035) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - NO BUILD CONDITIONS (2035)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface
Aerial
Tunnel

MAP KEY

Red Line Corridor Transit Study

No-Build Conditions (2035) Sheet 4 of 4

PM Peak Hour Levels of Service

Not To Scale FIGURE 49

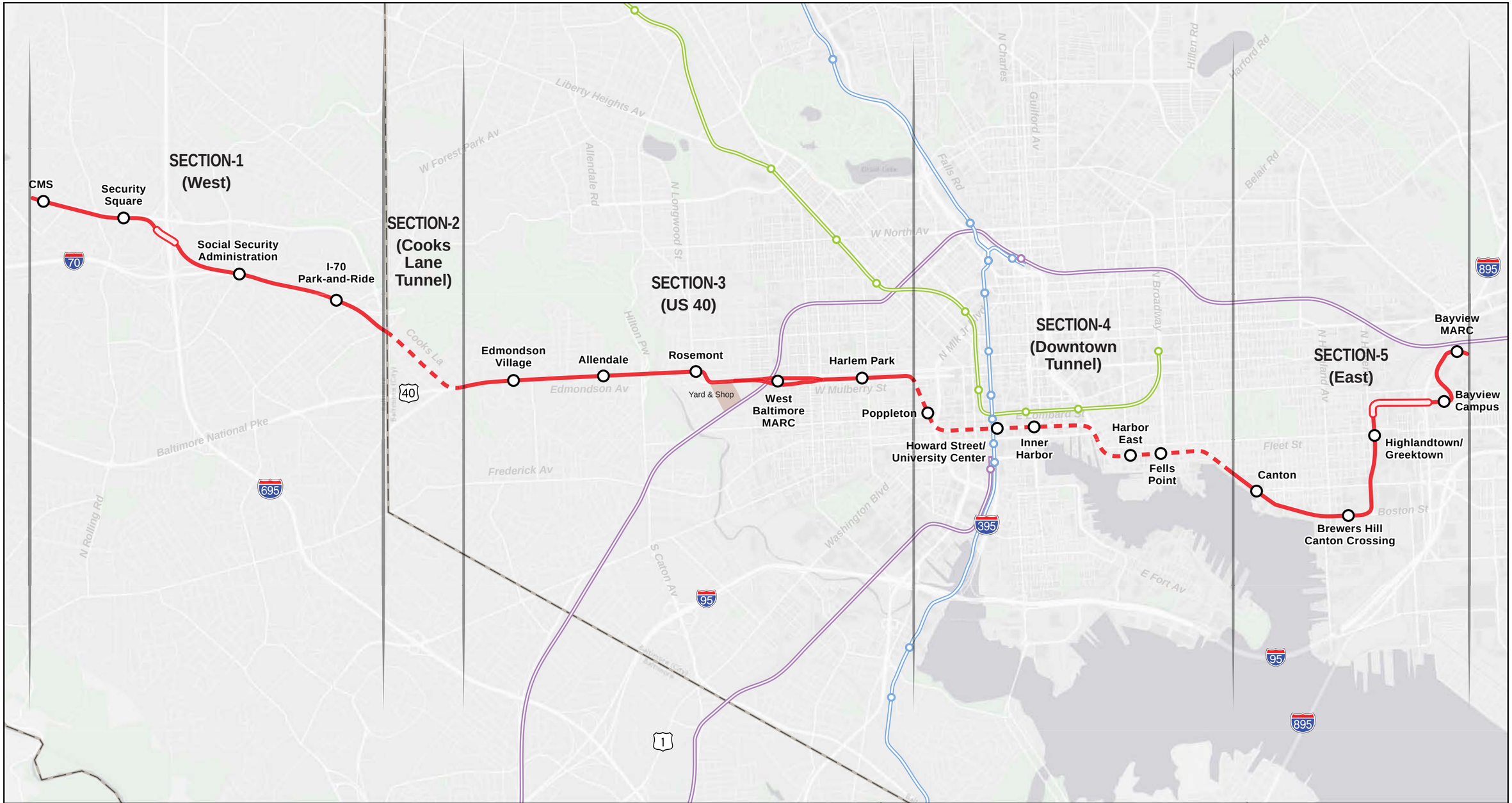
The Maryland Department of Transportation
Maryland Transit Administration

\\rkkm\v2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 No-Build\PM Levels of Service\los_PM_inset4_NB2035.dgn
7/13/2012

FIGURE 49 - No-Build (2035) Levels of Service - PM Peak Hour

Table 14: Number of Lanes: 2035 No-Build VS Build (Continued)

Section	Geographic Limits	Surface, Tunnel or Aerial	LRT Alignment Description	2035 No-Build Number of Lanes	Proposed 2035 Number of Lanes	Change
2	Edmondson Avenue from Cooks Lane to Glen Allen Drive	Tunnel	Underground tunnel from Cooks Lane to Glen Allen Drive.	3EB 3WB	2EB 2WB	-1EB -1WB
3	Edmondson Avenue from Glen Allen Drive to Franklintown Road	Surface	Dedicated transit in the median that would reduce one lane in each direction.	3EB 3WB	2EB 2WB	-1EB -1WB
	Franklintown Road from Edmondson Avenue to Franklin Street	Surface	Dedicated transit in the median.	1EB 1WB	1EB 1WB	No Change
	Franklin Street from Franklintown Road to Wheeler Avenue	Surface	Dedicated transit in the median that would reduce one lane in each direction.	3EB 3WB	2EB 2WB	-1EB -1WB
	Franklin Street/Mulberry Street from Wheeler Avenue to Pulaski Street	Surface	Eastbound: Dedicated transit on the north side of Mulberry Street.	3EB	2EB	-1EB
			Westbound: Dedicated transit on the south side of Franklin Street.	3WB	2WB	-1WB
	Franklin Street/Mulberry Street from Pulaski Street to Fulton Avenue	Surface	Eastbound: Dedicated transit on the north side of Mulberry Street approaching the US 40 "ditch section".	2 to 3EB	2 to 1 EB	No Change to -2EB
			Westbound: Dedicated transit on the south side of Franklin Street continuing from US 40 "ditch section".	3 to 2WB	3 to 1WB	-1WB
	US 40 from Fulton Avenue to Carey Street	Surface	Dedicated transit in the median. Eastbound travel lanes are reduced by one from Fulton Avenue to Carey Street.	3EB	2EB	-1EB
			Westbound total number of lanes remain the same.	3WB	3WB	No Change
	US 40 from Carey Street to N. Fremont Avenue	Surface	Dedicated transit in the median and the total number of travel lanes remain the same.	3EB 3WB	3EB 3WB	No Change
4	N. Fremont Avenue from US 40 to Martin Luther King Jr. Boulevard	Tunnel	Underground tunnel with no impact on travel lanes.	1EB 1WB	1EB 1WB	No Change
	Lombard Street from MLK Jr. Boulevard to President Street	Tunnel	Underground tunnel with no impact on travel lanes and parking.	5 to 4 to 2 WB	5 to 4 to 2 WB	No Change
	President Street from Lombard Street to Fleet Street	Tunnel	Underground tunnel with no impact to travel lanes and parking.	3NB 3SB	3NB 3SB	No Change
	Fleet Street from President Street to Chester Street/Boston Street	Tunnel	Underground tunnel with no impact to travel lanes.	1EB 1WB	1EB 1WB	No Change
5	Boston Street from Chester Street to Montford Avenue	Tunnel	Underground tunnel with no impact on travel lanes.	2EB 2WB	2EB 2WB	No Change
	Boston Street from Montford Avenue to S. Haven St/Future New Boston Street	Surface	Dedicated transit in the median. This would require reducing one travel lane in each direction along Boston Street.	2EB 2WB	1EB 1WB	-1EB -1WB
	S. Haven Street from Future Old Boston Street to Dillon St.	Surface	Dedicated transit on west side of Haven Street from Old Boston Street to Dillon Street.	1EB 1WB	1EB 1WB	No Change
	S. Haven Street from Dillon Street to Pratt St.	Surface	Dedicated transit in the median on east side of Haven Street from Dillon Street to Pratt Street. No change in travel lanes.	N/A	N/A	No Change
	Elevated structure from S. Janney Street to Future Cassell Drive	Aerial	Aerial transit structure over S. Janney St., S. Kresson St., CSX and Norfolk rail lines, Oldham St., Ponca St., and I-895 to reach Future Cassell Drive. No change in travel lanes.	N/A	N/A	No Change
	Bayview Boulevard from Alpha Commons Drive to Bayview MARC Station	Surface	Dedicated transit on east side of Bayview Blvd from Alpha Commons Drive to Bayview MARC station with no change in travel lanes.	2NB 2SB	2NB 2SB	No Change



N

0 0.5 1 2 Miles

LEGEND:

- Red Line Stations
- **Red Line Alignment**
  - Surface
  - Tunnel
  - Aerial
- County Boundary
- Light Rail
- METRO (Subway)
- MARC

MTA Maryland

BALTIMORE RED LINE

Figure 50

Red Line Study Section Layout

NUMBER OF LANES - BUILD CONDITIONS (2035)

MTA Maryland

RED LINE Study

SECURITY BLVD
ROLLING RD
LORD BALTIMORE DR
BELMONT AVE
WHITEHEAD RD
WOODLAWN DR
GWYNN OAK AVE
PERIMETER DR
WINDSOR MILL RD
KERNAN DR
GREENGAGE RD
BROOKDALE RD
FAIRBROOK RD
ROLLING BEND RD
WHITEHEAD CT
SECURITY RD
SECURITY SQUARE MALL
SOCIAL SECURITY ADMIN.
COLONIAL RD
SECURITY BLVD
BALTIMORE CITY
BALTIMORE COUNTY
FOREST PARK AVE
70
JOHNNYCAKE RD
PARALLEL
DR
JONAS WAY
DR
70
LINUS DR
MERIMACK RD
CRAIGMONT RD
WOODLAWN
EXIT
JOHNNYCAKE
JOHNNYCAKE MIDDLE SCH.
CHARLES ST
MONTGOMERY ST
CENTRAL AVE
PRINCE GEORGE ST
BALTIMORE ST
CECIL AVE
HARFORD AVE
FRANKLIN AVE
HILLTOP AVE
SUNSET AVE
STELLA DR
LINCOLN WOODS DR
CROSBY RD
ROLLING RD
ADAMSVIEW RD
WOODBRIDGE RD
COLLWOOD RD
MARKSWORTH RD
KENT AVE
RD
DORCHESTER AVE
INGLESIDE AVE
DANIELS AVE
BAKER AVE
MC ADOO AVE
LANDINGTON AVE
GREGORY AVE
SOUTHRIDGE RD
CHESWORTH RD
695
FOREST PARK AVE
VALLEYBROOK RD
COOKS LN
SIDELEIGH RD
NOTTINGHAM RD
BRIARCLIFF RD
ST GEMMA RD
WESTHILLS RD
LINDSAY RD
WINANS WAY
BRIARCLIFF RD
ALSON DR
COLEHERNE RD
EDMONDSON AVE
NOTTINGHAM RD
OLD ORCHARD RD
CHAPEL GATE LN
ST. AGNES LN
COLERIDGE RD
CHARING CROSS RD
40
SHOP CTR
RD
FREDERICK
OLD
ACADEMY RD
EDMONDSON AVE
AVE
CRAIGMONT RD
WESTVIEW SHOP. CTR.
WINTERS LANE
KENT AVE
INGLESIDE

Match Line - See Sheet 2

N

MAP KEY

LEGEND

-by direction

- ONE LANE
- TWO LANES
- THREE LANES
- FOUR LANES
- FIVE LANES OR MORE

one-way traffic flow direction

Red Line

Surface
Aerial
Tunnel

RED LINE Study — *Red Line Corridor Transit Study*

Build Conditions (2035) — *Sheet 1 of 4*
Number of Lanes

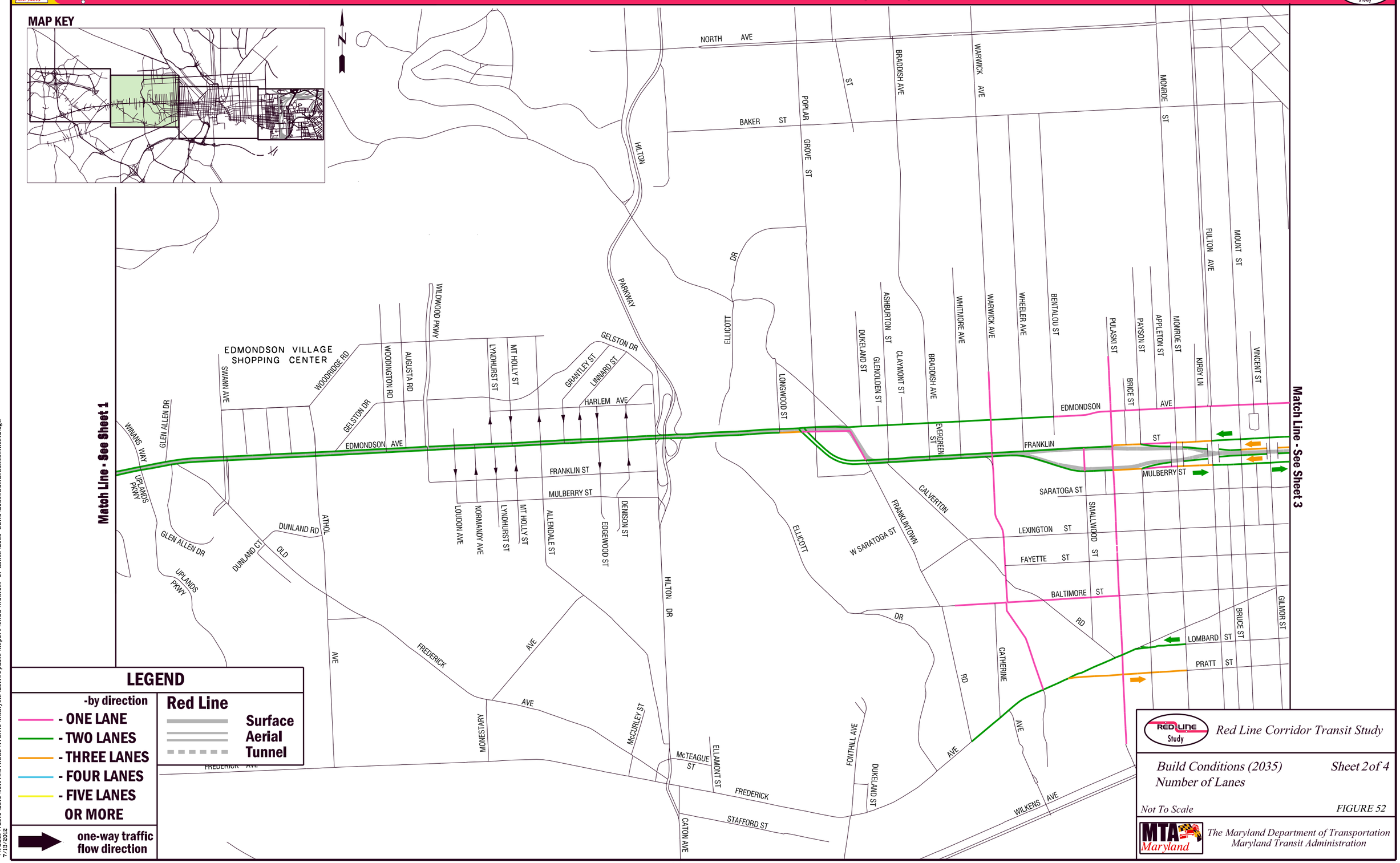
Not To Scale — *FIGURE 51*

MTA Maryland — *The Maryland Department of Transportation*
Maryland Transit Administration

\\rkbm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Number of Lanes\2035_Build\2035_Build_Lanes_inset1.dgn
7/13/2012

FIGURE 51 - Build Conditions (2035) Number of Lanes

NUMBER OF LANES - BUILD CONDITIONS (2035)



\\rkkm\v2010\2010\10114_MTAGBC\Traffic\Analysis\2011_Update\Report\CADD\Number of Lanes\2035 Build\2035_Build_Lanes_inset2.dgn
7/13/2012

FIGURE 52- Build Conditions (2035) Number of Lanes

NUMBER OF LANES - BUILD CONDITIONS (2035)

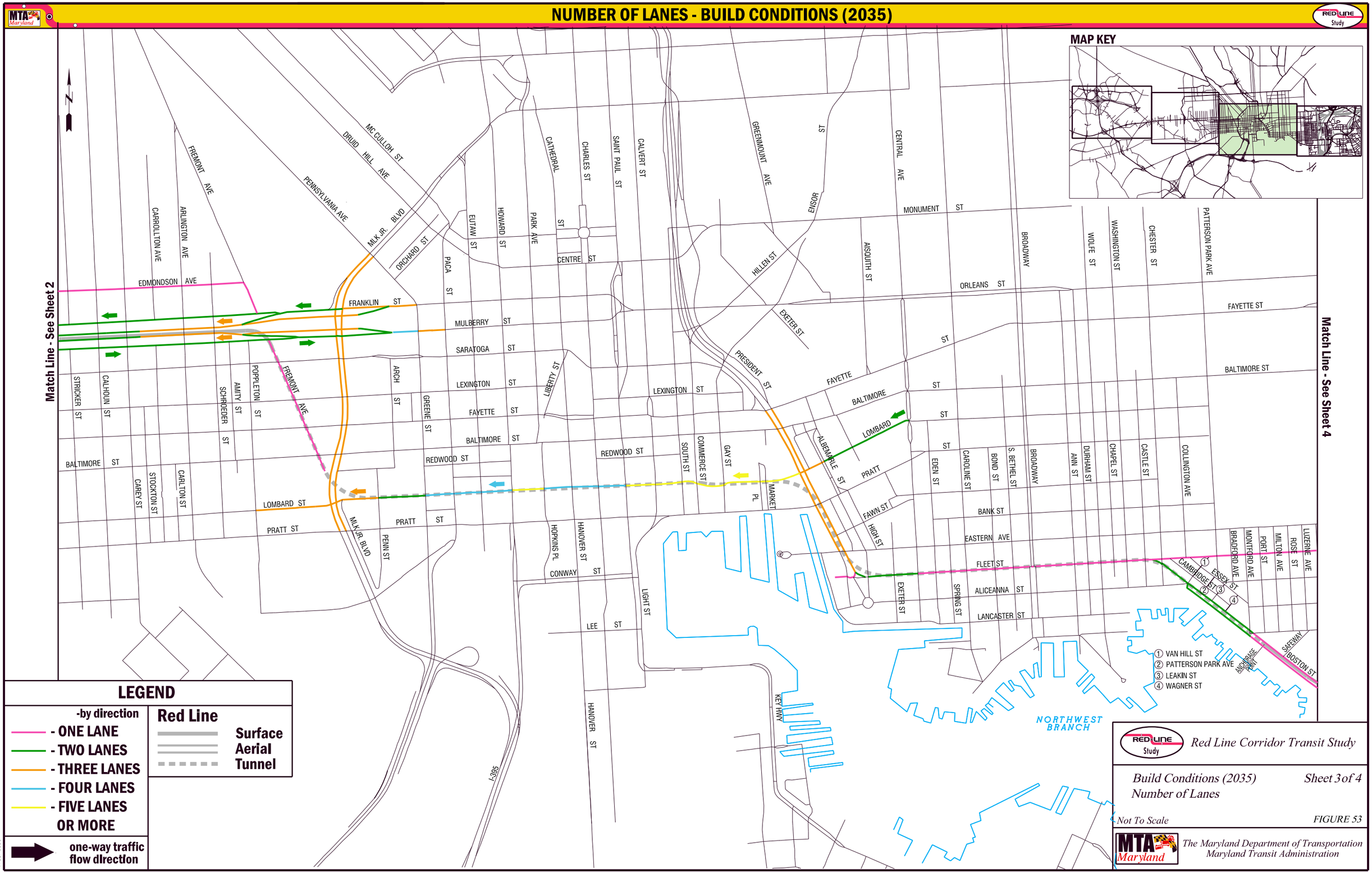


FIGURE 53 - Build Conditions (2035) Number of Lanes

NUMBER OF LANES - BUILD CONDITIONS (2035)

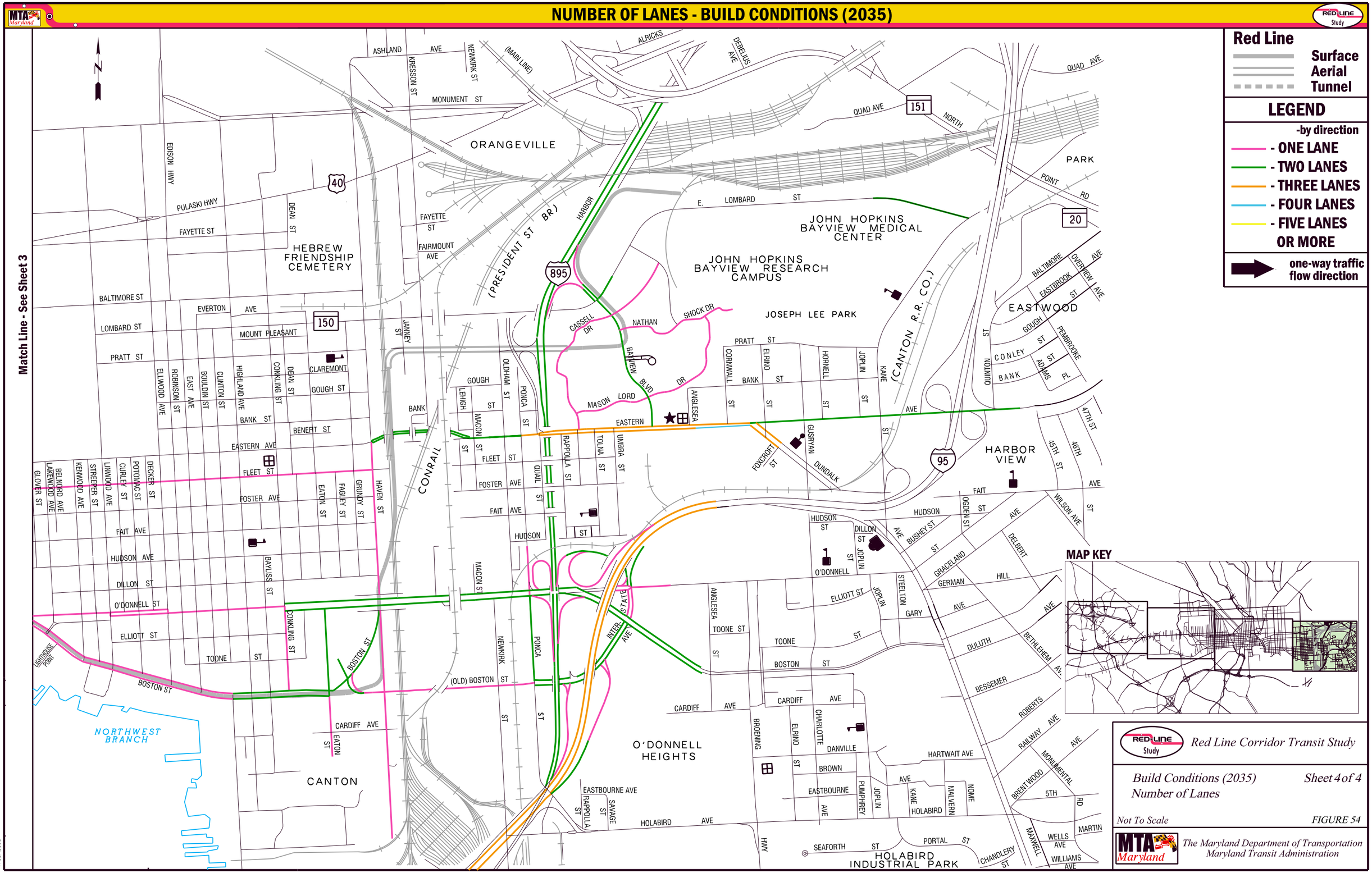


FIGURE 54 - Build Conditions (2035) Number of Lanes

5. Preferred Alternative

5.1 Long-Term Operational Effects of Light Rail Transit (LRT) - Build Conditions 2035

It is anticipated that the Preferred Alternative of Light Rail Transit (LRT) will be constructed and in service by 2021. This section studies the long-term operational effects of Red Line transit as per the design year 2035 to roadways in its vicinity and along the Red Line alignment.

LRT is an electric railway system characterized by its ability to operate single cars or small trains on ground level, on aerial structures, and in tunnels. LRT can operate in mixed traffic or on a separate right of way. The alignment for the Preferred Alternative, broken down by Sections, is shown on **Figure 50**. This section covers the long-term (2035) operational effects because of Light Rail Transit and opening year 2021 interaction of LRT along the Red Line corridors.

5.1.1 Roadway and Transit Network

Building the Red Line transit system would require that changes be made to a number of roadways along the Red Line project study corridor. This would allow for transit to operate in exclusive guide way and thereby provide a time advantage to transit vehicles. Besides reducing the number of traffic lanes, street patterns may be modified in a number of other ways, including: regulating new turn restrictions, closing some accesses, and removing or installing new traffic signals at several intersections along the Red Line alignment where the LRT crosses high volume side streets. The roadway network assumed for Build conditions includes all network improvements listed under No-Build conditions. In addition, the Build conditions also include the following changes to be implemented as part of the Red Line project:

- New I-70 Park-and-Ride
- Security Square Mall Park-and-Ride
- Operations and Maintenance Facility at Edmondson Avenue
- Canton Crossing Park-and-Ride
- Bayview Campus Park-and-Ride

For the most part, the number of traffic lanes with the Red Line construction is not anticipated to remain the same as the Existing or No-Build conditions. To construct the Red Line with minimal property impacts along the corridors, the number of traffic lanes must be reduced. The roadways, which would experience a reduction because of the allocation of exclusive lanes for the Red Line, are:

- Security Boulevard
- I-70
- Edmondson Avenue
- West Franklin Street
- Franklintown Road
- US 40, depressed freeway section
- Boston Street

Additionally, Alpha Commons Drive would be closed and access to the existing buildings would be from Cassell Drive and Bayview Boulevard. The number of traffic lanes to be provided with the Red Line is shown on **Figures 51-54**. **Table 14** lists the lane use changes and also provides details on the Red Line alignment at ground-level, tunnel and aerial structure sections:

Table 14: Number of Lanes: 2035 No-Build vs. Build

Section	Geographic Limits	Surface, Tunnel or Aerial	LRT Alignment Description	2035 No-Build Number of Lanes	2035 Build Number of Lanes	Change
1	Security Boulevard from CMS to Rolling Road	Surface	Dedicated transit on south side of Security Blvd, 2 traffic lanes eastbound and westbound, in each direction.	2EB 2WB	2EB 2WB	No change
	Security Boulevard from Rolling Road to Lord Baltimore Drive	Surface	Dedicated transit on south side of Security Blvd, 2 traffic lanes eastbound and 3 traffic lanes westbound.	3EB 3WB	2EB 3WB	-1EB
	Security Boulevard from Lord Baltimore Drive to I-695 Ramps	Surface	Dedicated transit on south side of Security Boulevard, 3 traffic lanes, eastbound and westbound, in each direction.	3EB 3WB	3EB 3WB	No change
	Over and across I-695 Lanes/Ramps	Aerial	Aerial transit structure across I-695 ramps.	N/A	N/A	No change
	I-70 Ramps	Surface	Dedicated transit on north-side of westbound I-70 off-ramps onto I-695 and south side of Social Security Administration's west side of Parking lot.	2EB 3 to 1WB	2 to 3EB 3 to 1WB	+1EB
	I-70	Surface	Dedicated transit on north side of I-70 from Woodlawn Drive to Parallel Drive/SSA Connector.	4EB 3WB	3EB 3WB	-1EB
	I-70	Surface	Dedicated transit on north side of I-70 from Parallel Drive/SSA Connector to Forest Park Avenue/Cooks Lane.	3 to 1EB 1 to 2WB	1EB 1 to 2WB	-2EB No Change WB
2	Cooks Lane from Forest Park Avenue to Edmondson Avenue	Tunnel	Underground transit system from Forest Park Avenue to Edmondson Avenue.	1EB 1WB	1EB 1WB	No Change

5.1.2 Traffic Volumes

Travel demand forecasts were developed for the Preferred Alternative that included the mitigation measures that would occur because of Red Line project. The travel demand forecasts were developed through the use of the Baltimore Metropolitan Council's regional model for the year 2035. A full discussion of the Travel Demand Methodology is provided in Appendix A. Modifications were made to the model to reflect the Red Line project. These changes were not only limited to the transit network to reflect the differences between the Existing, No-Build and Build conditions but also to the roadway network.

The travel demand forecasts were developed for all roadways in the study area. In general, it was observed that the Red Line decreased traffic volumes on most roadways (Ex: Edmondson Avenue, Boston Street, Bayview Boulevard) and increased volumes on a few roadways (Ex: I-70) when compared with the No-Build conditions. The decrease in auto trips is caused by diversions from auto by patrons that would have driven their vehicles who would now choose the Red Line LRT for their trip, and in some locations because of diversion as a result of the reduction in the number of lanes.

The average daily traffic volumes are shown on **Figures 55-58**. The highest volume roadways from an average daily traffic standpoint in 2035 Build conditions are different than the highest volume roadways without Red Line LRT. **Table 15** shows the Existing (2011), 2035 No-Build and Build Average Daily Traffic (ADT) and percent growth.

Table 15: Existing, 2035 No-Build and Build Average Daily Traffic

Location	(1) Existing	(2) No-Build	% Growth (1) & (2)	(3) Build	% Growth (2) & (3)
1-70, East of I-695	25,000	34,500	+38%	45,000	+30%
Security Boulevard-W of I-695 to Rolling Rd.	48,000	48,500	+1%	48,500	0%
US 40 from Rolling Road to Cooks Lane	24,000 to 53,000	29,000 to 69,000	+21% to +30%	25,500 to 67,500	-2% to - 12%
Edmondson Avenue from Cooks Ln to Hilton Pkwy	39,000 to 50,000	46,000 to 58,500	+18% to +17%	38,500 to 49,500	-16%
Frederick Avenue west of Hilton Dr	15,000	17,000	+13%	17,500	+3%
Franklin St, east of Franklintown Road	33,000	40,000	+21%	33,500	-16%
Martin Luther King, Jr. Boulevard, S of Pratt St.	58,000	87,500	+51%	87,000	-1%
Lombard Street, west of Greene St.	10,000	16,000	+60%	15,500	-3%
Lombard Street, east of Charles St.	30,000	34,500	+15%	34,500	0%
Lombard Street, west of Market Pl.	29,000	47,000	+62%	46,500	-1%
President Street, north of Lombard St.	35,000	34,500	-1%	36,000	+4%
Fleet Street, east of President Street	21,000	23,000	+10%	24,500	+7%
Boston Street, north of Montford Avenue	27,000	36,000	+33%	33,000	-8%
Boston Street, east of Conkling St.	16,000	25,000	+56%	20,000	-20%
Interstate Ave, east of I-95 ramps	8,500	15,500	+82%	15,500	0%
O'Donnell Street, east of Conkling Street	22,500	32,500	+44%	31,000	-5%
Eastern Avenue, east of Bayview Blvd	22,000	22,500	+2%	22,500	0%
Bayview Blvd, south of Alpha Commons Drive	7,000	19,500	+178%	12,500	-36%

Source: Red Line General Engineering Consultant, 2012

With the Red Line, Martin Luther King, Jr. Boulevard, Lombard Street (west of Greene St and west of Market Place), Boston Street (east of Conkling Street), Interstate Avenue (east of I-95 ramps) and Bayview Blvd are anticipated to grow by more than 50 percent in 2035 when compared with the Existing 2011 ADT's. Interstate Avenue and Bayview Boulevard (South of Alpha Commons Drive) would have the largest increases under No-Build conditions.

Based on the Build year forecast, it is anticipated that with the Red Line, the total number of vehicles on all roadways within the vicinity of the Red Line alignment is generally less than No-Build conditions. The travel demand model predicts that some of the motorists on these roadways would either ride LRT or take alternate routes to avoid delays because of the LRT along various routes. For example, along Boston Street, the Build volumes would be 20 percent less than the No-Build volumes, with the addition of the Red Line and the reduction in total number of lanes from four (4) to two (2) lanes to accommodate LRT track.

I-70 (+30%) and Fleet Street (+7%) would have an increase in ADT in the Build condition versus No-Build, whereas most of the other roadways within the Red Line alignment such as Edmondson Avenue, Franklin Street, Boston Street and Bayview Boulevard are anticipated to have lower ADT's. The 2035 Build AM and PM peak hour directional traffic volumes along the Red Line project study corridor are shown on **Figures 59-62**. The highest volume roadways in the peak direction for AM and PM peak hours are shown in **Tables 16.1 and 16.2.**

Table 16.1: Existing, 2035 No-Build and Build Am Peak Hour Peak Direction Highest Volumes, and Percent Growth

Location	Existing	(1) No-Build	(2) Build	Growth (1) & (2)
Security Boulevard-Rolling Road to I-695	1,940 (WB)	2,150 (WB)	2,395 (WB)	+11%
Rolling Road-South of Security Boulevard	1,295 (NB)	1,530 (SB), 1,210 (NB)	1,455 (SB)	-5%
Security Boulevard-I-695 to Woodlawn Drive	2,035 (EB)	2,225 (EB)	2,210 (EB)	-1%
I-70-Woodlawn Drive to I-70 P & R	1,280 (EB)	1,840 (EB)	1,650 (EB)	-10%
Cooks Lane-East of Forest Park Avenue	955 (EB)	905 (WB), 880 (EB)	1,005 (EB)	+14%[1]
US 40- Winters Lane to Cooks Lane	2,600 (EB)	3,150 (EB)	3,015 (EB)	-4%
Edmondson Avenue-Cooks Lane to Franklin St.	2,625 (EB)	2,935 (EB)	2,375 (EB)	-19%
Franklin St/Mulberry St.-Edmondson Avenue to Pulaski St.	2,590 (EB)	2,820 (EB)	2,285 (EB)	-19%
Martin Luther King, Jr. Boulevard-Mulberry Street to Lombard St.	2,720 (SB)	3,530 (SB)	3,595 (SB)	+2%
Lombard St.-Martin Luther King Jr. Boulevard to President St.	2,085 (WB)	2,630 (WB)	2,680 (WB)	+2%
President St.-Lombard Street to Fleet St.	2,225 (NB)	2,670 (NB)	2,690 (NB)	+1%
Fleet St.-Wolfe Street to Boston Street	855 (WB)	1,060 (WB)	920 (WB)	-13%
Boston Street-Aliceanna Street to Conkling Street	1,545 (NB)	2,305 (NB), 1,920 (SB)	1,575 (SB)	-18%1
Bayview Boulevard-Lombard Street to Eastern Avenue	895 (SB)	1,570 (SB)	1,490 (SB)	-5%

Source: MTA, 2011-2012; [1] – peak direction is not the same, % growth calculated for same directional volume as noted in Build column

The highest reduction in volume during the AM peak hour is projected to be along northbound Boston Street, a reduction of more than 1,000 vehicles in the 2035 Build conditions when compared with 2035 No-Build conditions. The largest percent decrease is along Boston Street (2,305 to 1,255 vehicles in the northbound direction and 1,920 to 1,575 vehicles in the southbound direction). However, some roadways such as Security Boulevard between Rolling Road and I-695 and Cooks Lane would have an increase in volume of more than 10 percent. (Refer to **Figures 59-62).**

The largest reduction in traffic volumes during the PM peak hour is projected to be along southbound Boston Street, westbound Cooks Lane, westbound Edmondson Avenue and westbound Franklin Street. They are anticipated to decrease over 500 vehicles in PM peak hour in the Build versus No-Build condition. The largest percent decreases are along Boston Street (-39%), Cooks lane (-23%), Edmondson Avenue (-19%) and Franklin Street (-21%). However, the PM peak hour direction of Fleet Street is anticipated to have an increase in volume versus AM peak hour that has a decrease in volume in Build conditions. The AM and PM peak hour directions would remain the same in Build conditions as 2035 No-Build conditions, except Cooks Lane and Boston Street (shown in "Bold" font in **Table 16.1 and Table 16.2**).

Table 16.2: Existing, 2035 No-Build and Build Pm Peak Hour Peak Direction Highest Volumes, and Percent Growth

Location	Existing	(1) No-Build	(2) Build	Growth (1) & (2)
Security Boulevard-Rolling Road to I-695	2,250 (EB)	3,060 (WB), 2,550 (EB)	3,010 (WB)	-2%
Rolling Road-South of Security Boulevard	1,335 (NB)	1,585 (NB)	1,515 (NB)	-4%
Security Boulevard-I-695 to Woodlawn Drive	2,270 (WB)	2,785 (WB)	2,160 (WB)	-10%
I-70- Woodlawn Drive to I-70 P & R	1,930 (WB)	2,770 (WB)	2,655 (WB)	-4%
Cooks Lane-East of Forest Park Avenue	1,200 (WB)	1,165 (WB)	895 (WB)	-23%
US 40- Winters Lane to Cooks Lane	2,475 (WB)	3,250 (WB)	3,045 (WB)	-6%
Edmondson Avenue-Cooks Lane to Franklin Street	2,535 (WB)	3,120 (WB)	2,535 (WB)	-19%
Franklin Street/Mulberry Street-Edmondson Avenue to Pulaski Street	1,885 (WB)	2,445 (WB)	1,930 (WB)	-21%
Martin Luther King, Jr. Boulevard-Mulberry Street to Lombard Street	2,535 (NB)	3,590 (NB)	3,555 (NB)	-1%
Lombard Street-Martin Luther King Jr. Boulevard to President Street	2,345 (WB)	2,835 (WB)	2,735 (WB)	-4%
President Street-Lombard Street to Fleet Street	2,545 (NB)	2,965 (NB)	2,925 (NB)	-1%
Fleet Street-Wolfe Street to Boston Street	815 (EB)	1,025 (EB)	1,210 (EB)	+18%
Boston Street-Aliceanna Street to Conkling Street	1,375 (SB)	1,895 (SB)	1,160 (SB)	-39%
Bayview Boulevard-Lombard Street to Eastern Avenue	785 (NB)	1,495 (NB)	1,325 (NB)	-11%

Source: MTA, 2011-2012; [1] – peak direction is not the same, % growth calculated for same directional volume as noted in Build column

5.1.3 Traffic Diversions On Boston Street

To accommodate the Red Line transit way in the median of Boston Street without compromising the livability of the community, the City has recommended that the Boston Street roadway configuration be reduced from two lanes per direction to one lane per direction from Montford/Hudson Street to Conkling Street. By reducing the number of lanes, the sidewalk widths can be preserved, as well as on-street parking areas, landscaping, and a bike lane.

The Baltimore Metropolitan Council (BMC) travel demand model was used to project future traffic along Boston Street, with and without the Red Line project and reduction of lanes on Boston Street. The model was coded with the 2035 land use forecasts for the Baltimore region, and includes all roadway and transit improvements approved to be constructed within this time frame. For the 2035 No-Build conditions, about 2,000 vehicles are expected in the peak hour/peak direction along Boston Street. For the 2035 Build conditions, this volume is reduced to about 1,300 in the peak hour/peak direction near the Montford/Hudson Street intersection. Therefore, about 700 vehicles (35%) in the peak hour/peak direction are expected to divert from Boston Street with this modification.

With the Red Line transit improvements, some motorists along Boston Street would now use the Red Line instead of their auto to travel to/from the downtown and other locations, including the two transit stops proposed for Boston Street. This results in a diversion of about 150 to 200 vehicles to the Red Line transit in the peak hour/peak direction.

The BMC travel demand model also shows that about 400 vehicles would divert from Boston Street to Eastern Avenue and Fleet Street, because of the one lane per direction capacity constraints on Boston Street. The remaining 100 to 150 vehicles would divert to other local and regional roads, such as Monument Street, I-895, and local roadways within the Canton area.

Because no one roadway receives more than a few hundred diverted vehicles from Boston Street, the traffic operations models do not show a significant impact because of the elimination of one lane per direction on Boston Street. Although Boston Street is an arterial, it is part of a City-wide grid system with other choices available to motorists. The Red Line transit project would offer yet another choice to commuters and residents in the Boston Street corridor.

AVERAGE DAILY TRAFFIC - BUILD CONDITIONS (2035)

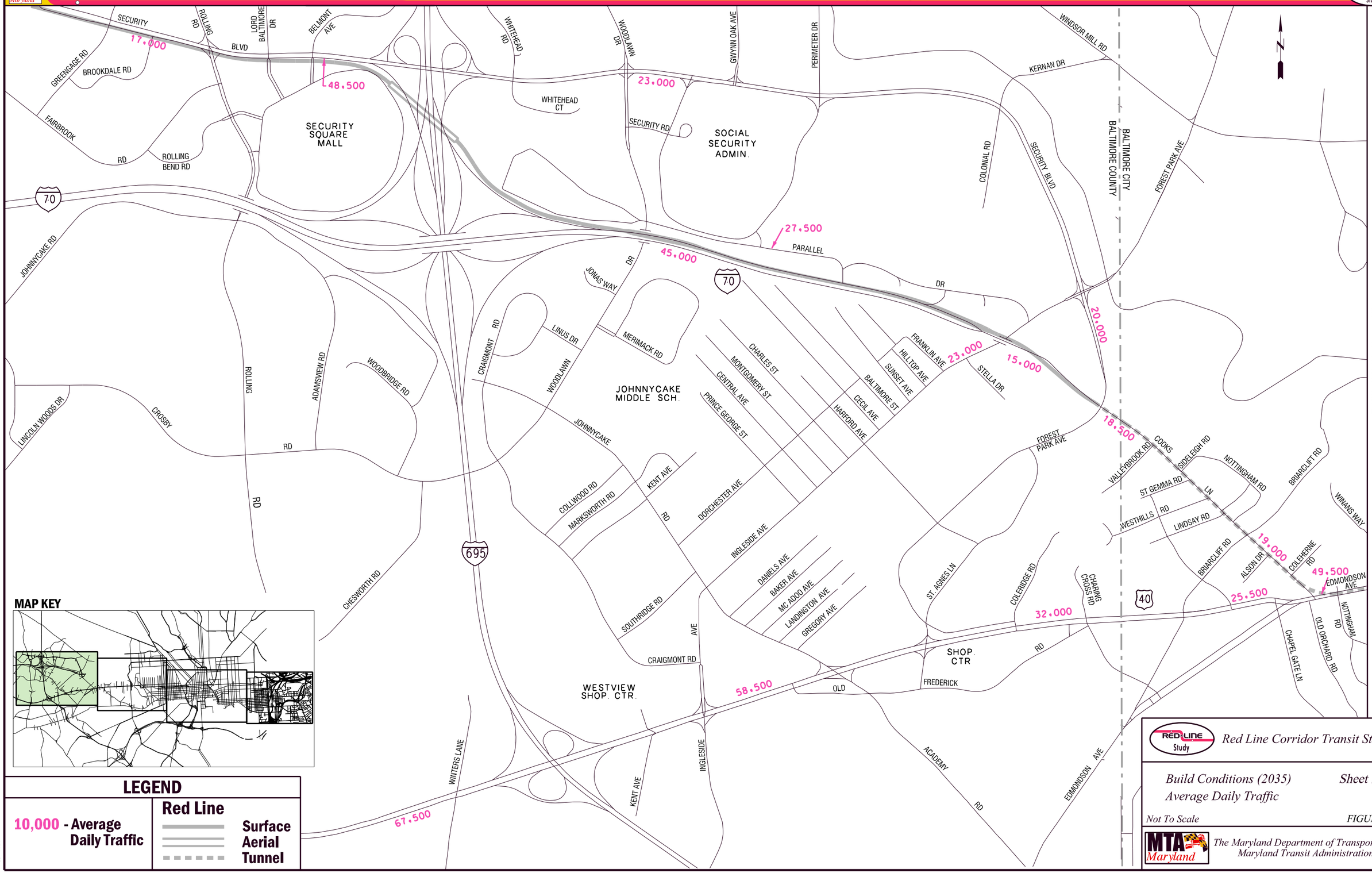


FIGURE 55 - Build Conditions (2035) Average Daily Traffic

AVERAGE DAILY TRAFFIC - BUILD CONDITIONS (2035)

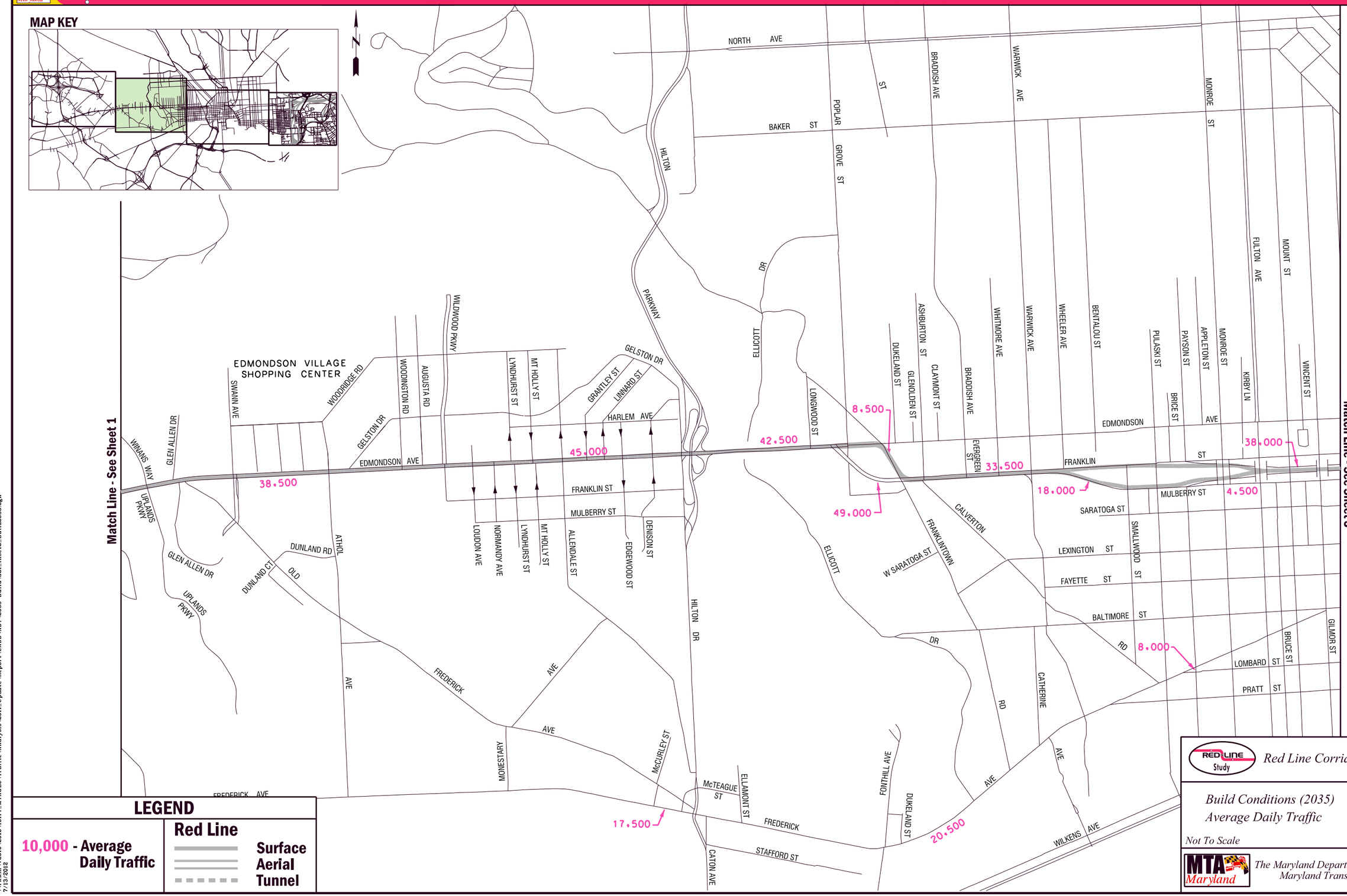


FIGURE 56 -Build Conditions (2035) Average Daily Traffic

AVERAGE DAILY TRAFFIC - BUILD CONDITIONS (2035)

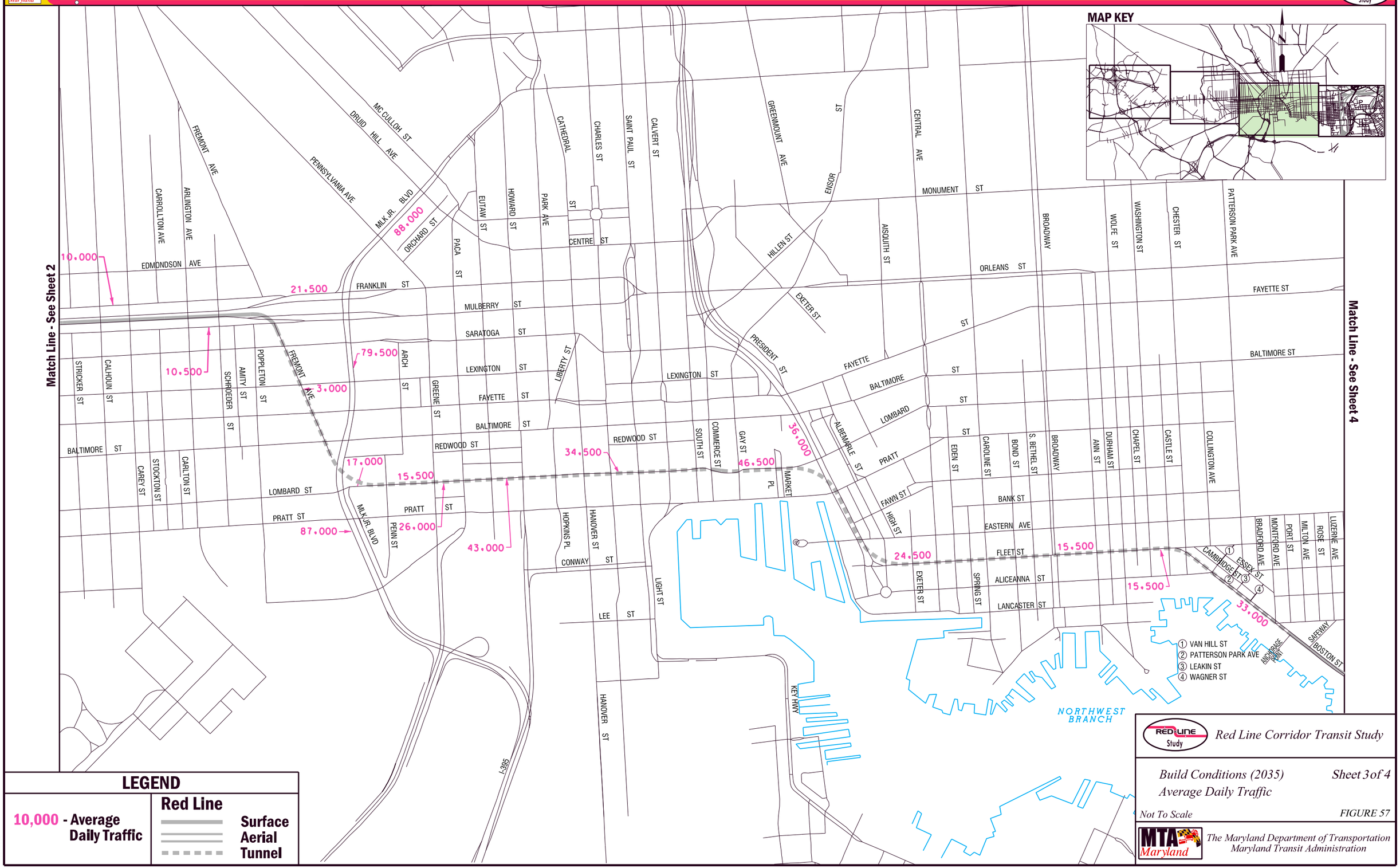


FIGURE 57 - Build Conditions (2035) Average Daily Traffic

AVERAGE DAILY TRAFFIC - BUILD CONDITIONS (2035)

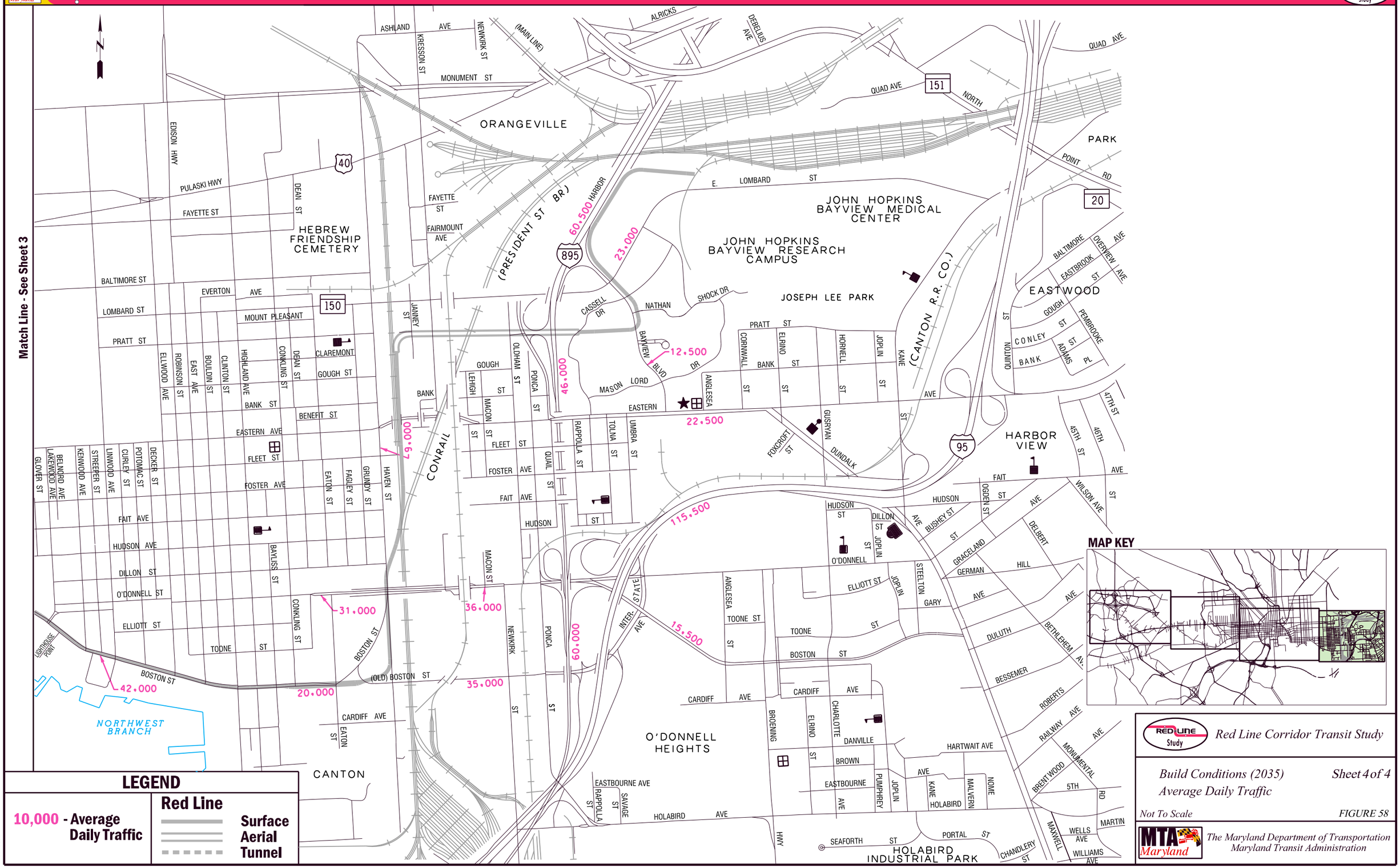
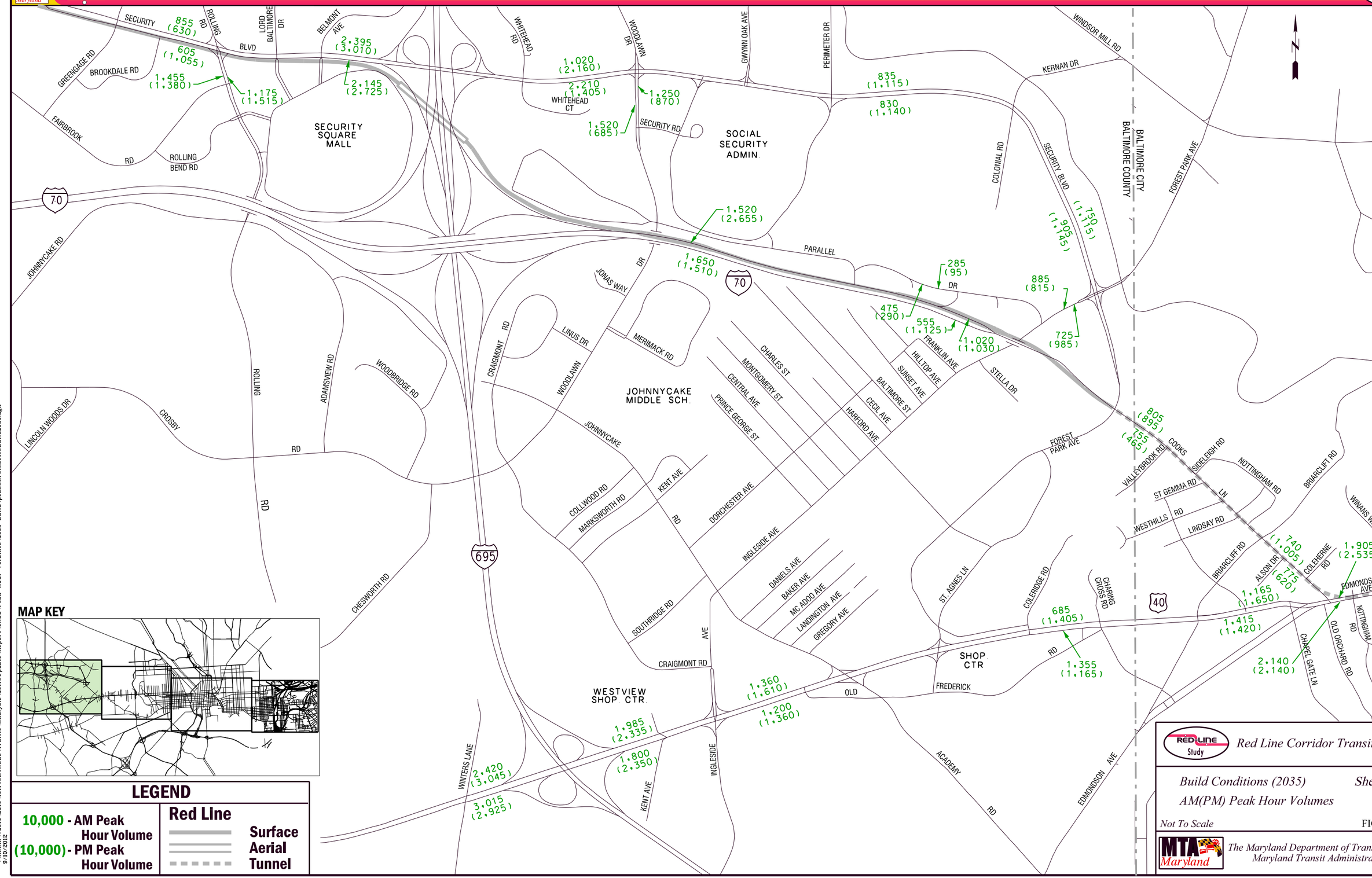


FIGURE 58 - Build Conditions (2035) Average Daily Traffic

AM(PM) PEAK HOUR VOLUMES - BUILD CONDITIONS (2035)



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9/10/2012

FIGURE 59 - Build Conditions (2035) AM(PM) Peak Hour Volumes

AM(PM) PEAK HOUR VOLUMES - BUILD CONDITIONS (2035)

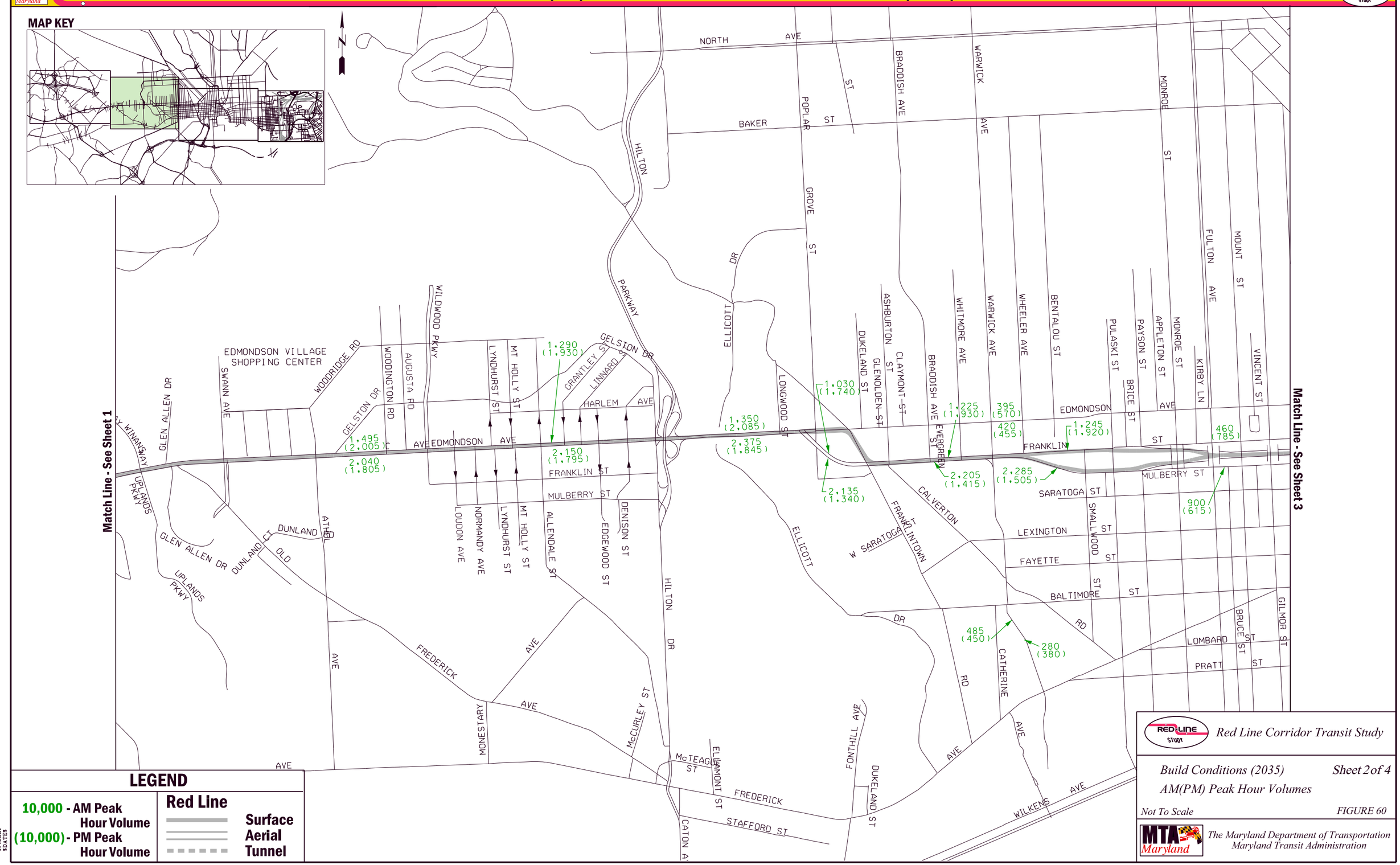


FIGURE 60 - Build Conditions (2035) AM(PM) Peak Hour Volumes

AM(PM) PEAK HOUR VOLUMES - BUILD CONDITIONS (2035)

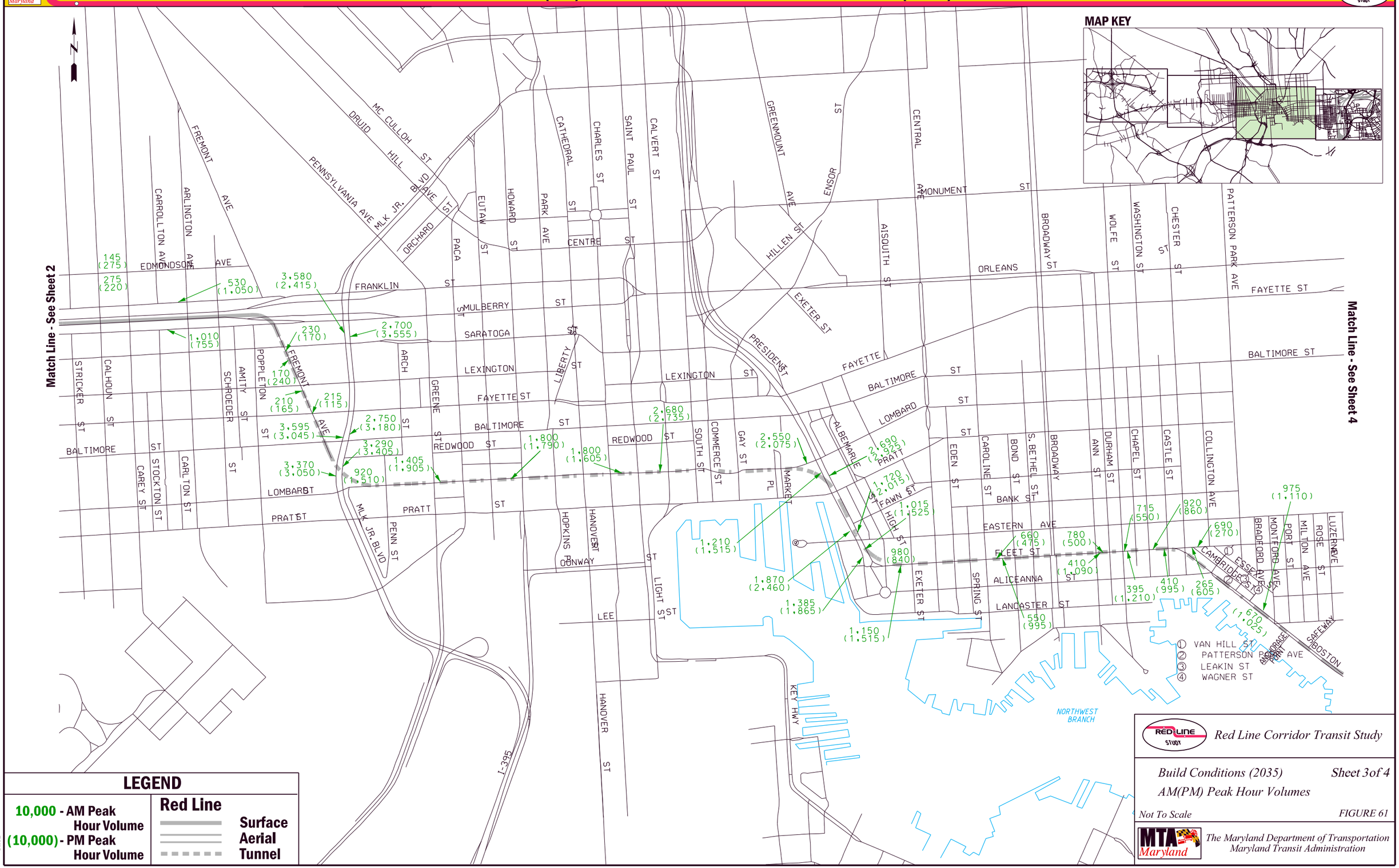


FIGURE 61 - Build Conditions (2035) AM(PM) Peak Hour Volumes

AM(PM) PEAK HOUR VOLUMES - BUILD CONDITIONS (2035)

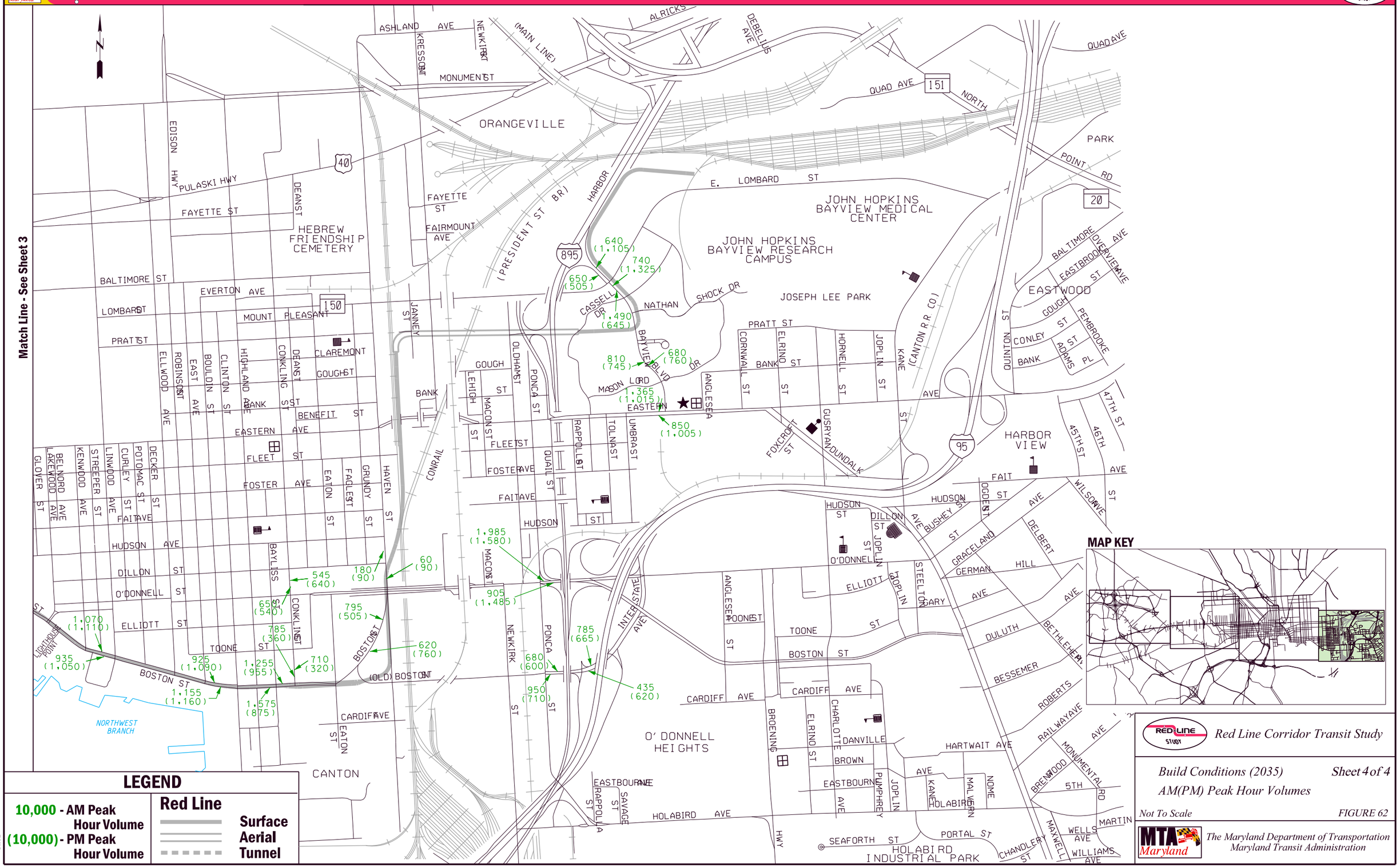


FIGURE 62 - Build Conditions (2011) AM(PM) Peak Hour Volumes

5.1.4 Travel Time

Auto travel times were calculated for the 2035 Build conditions to provide a relative comparison between today's operation and operations in future with and without the Red Line LRT. Similar to Existing conditions analysis and 2035 No-Build analysis, travel times were developed by using the Synchro/SimTraffic Version 7 models. For locations with preemption signal treatment, the VISSIM Version 5.3 model was also used.

Signalized intersections along the Red Line project study corridor operate with either priority or preemption signal control for the LRT vehicle. Most intersections along the corridor would operate with priority for the LRT vehicle. With priority signal treatment, signal controllers can be programmed to adjust the phase serving the LRT vehicle movement to avoid or reduce signal delay. If the approach of an LRT vehicle is detected toward the end of the phase serving its passage through the intersection, that phase can be extended to provide enough time for the LRT to clear the intersection. If an approach is detected shortly before the phase would normally begin, it can be slightly advanced to eliminate the need for the LRT vehicle to stop at the intersection. In both situations, the time shift is modest (10 seconds, or less) and should not seriously impact the general progression of traffic on the roadway. Accordingly, priority signal treatment for the LRT operation is not reflected in the Synchro model results.

Preemption of intersection signal control by the LRT vehicle is proposed at a few locations along the corridor. For this type of control, the approach of the LRT vehicle triggers the controller to force the end of the current phase and initiate the phase which favors the LRT. The LRT vehicle would not stop at these signals, but should always arrive on the green phase for its movement. Since LRT operations with preemption are noticeably more disruptive to normal signal operations, VISSIM was used to analyze preemption intersections instead of Synchro. VISSIM is a powerful tool to analyze this type of signal treatment, since both the transit vehicle and the autos and pedestrians can be coded in the model. The following intersections were analyzed using VISSIM models:

- Edmondson Avenue at Franklin Street
- Poplar Grove Street at Edmondson Avenue
- Edmondson Avenue at Franklintown Road
- Franklintown Road at Franklin Street
- Nathan Shock Drive at Bayview Boulevard
- NIH Driveway or Cassell Drive at Bayview Boulevard
- Lombard Street at Bayview Boulevard

Synchro models were developed to estimate the future 2035 Build year travel times. This was accomplished by inputting into the model the new roadway conditions with Red Line LRT, including lane configurations, geometrics, signal timings and projected traffic volumes. Traffic signal operations from the Existing conditions were modified at various intersections with the Red Line LRT in place.

At a few locations, signalized intersections were converted to stop controlled intersections with left turn restrictions, to reduce conflict points with the Red Line alignment in the median. Similarly, some currently unsignalized intersections would be signalized to accommodate a shift in traffic patterns or to provide pedestrian crossing accommodations. Signal timing splits and offsets were optimized to regulate the progression of traffic along the coordinated system of signals. Pedestrian phasing and timings were modified for future conditions to accommodate revised crosswalk lengths.

Table 17 provides the list of intersections along the Red Line alignment with modifications to the existing traffic control devices. SimTraffic simulation runs were performed and travel times were obtained from the Arterial Reports. The travel times were calculated for the entire length of the Red Line project study corridor from Center for Medicare and Medicaid Services (CMS) at Security Boulevard intersection to Conkling Street at Boston Street for each alternative that includes Existing, 2035 No-Build and 2035 Build conditions. The auto travel time comparison table for the Existing conditions, 2035 No-Build and Build years is shown in **Table 18**.

The results for the travel time model runs during 2035 Build conditions are shown on **Figures 63-66.** Similar to 2035 No-Build conditions, it is anticipated, that the Red Line would increase auto travel times along the study corridor roadways when compared with the Existing Conditions, because of the regional growth. When comparing No-Build to Build conditions i.e. when Red Line LRT is built, it is anticipated that there would be a decrease in auto travel times along some of the studied corridor roadways, because of the decrease in volumes from No-Build to Build conditions, and an increase in auto travel times on some roadways, because of a reduction in roadway capacity as a result of the Red Line project. Comparison between No-Build and Build auto travel times showed that decreases in travel time by 50 percent or more are expected to occur during the AM peak hour along:

- Martin Luther King, Jr. Boulevard (MLK Jr. Boulevard) (-61% in southbound direction)
- President Street between Pratt Street and Fleet Street (-50% in northbound direction)

An increase in travel time by 50 percent or more is expected to occur during the AM peak hour along:

- President Street between Pratt Street and Fleet Street (+175% in southbound direction)

During PM peak hour, decreases in travel time by 50 percent or more is not anticipated to occur along the Red Line corridor. However, increases in travel time by 50 percent or more is anticipated to occur along various corridors because of the shift in travel patterns that include:

- Parallel Drive between Woodlawn Drive to Ingleside Avenue (+143% in westbound direction) which may have been a result of changes in travel patterns along Parallel Drive because of the relocation of I-70 Park-and-ride the new I-70 alignment.
- Franklin Street between Edmondson Avenue to Pulaski Street (+58% in westbound direction)
- President Street between Pratt Street to Fleet Street (+55% in westbound direction)

Table 17: List of Intersections with Modification in Traffic Control Devices

Section No.	Location	Existing	Build	Pre-Emption
1	Greengage Road at Security Boulevard	Stop	Traffic Signal	No
	Brookdale Road at Security Boulevard	Stop	Traffic Signal	No
	Kennicott Road/Shopping Center at Security Boulevard	Stop	Traffic Signal	No
	New I-70/SSA Access Road	Does not Exist	Traffic Signal Flashers & Gates	No
	Parallel Drive at Park-and-Ride Access	Does not Exist	Stop	N/A
	New I-70 at Park-and-Ride Access	Does not Exist	Flashers & Gates	No
2 & 4	No modifications			
3	Glen Allen Drive at Edmondson Avenue	Traffic Signal	Stop	N/A
	Edmondson Shopping Center at Edmondson Avenue	Traffic Signal	Stop	N/A
	Edmondson Village Station Platform Access	Does not Exist	Pedestrian Signal	No
	Loudon Avenue at Edmondson Avenue	Stop	Traffic Signal	No
	Mt. Holly Street at Edmondson Avenue	Traffic Signal	Pedestrian Signal	No
	Edgewood Street at Edmondson Avenue	Traffic Signal	Pedestrian Signal	No
	Denison Street at Edmondson Avenue	Stop	Traffic Signal	No
	Franklin Street at west track connector to Calverton Yard (EB lanes only)	Does not Exist	Flashers & Gates	Yes
	Franklin Street at east track connector to Calverton Yard (EB lanes only)	Does not Exist	Flashers & Gates	Yes
	Evergreen Avenue at Franklin Street	Stop	Pedestrian Signal	No
	Smallwood Street at Mulberry Street (EB track)	Stop	Traffic Signal	No
	Smallwood Street at Franklin Street (WB track)	Stop	Traffic Signal	No
	Payson Street at Mulberry Street (EB track)	Stop	Traffic Signal	No
	Payson Street at Franklin Street (WB track)	Stop	Traffic Signal	No
5	Safeway Driveway at Boston Street	Stop	Traffic Signal	No
	Lakewood Avenue at Boston Street	Stop	Traffic Signal	No
	Kenwood Avenue at Boston Street	Stop	Traffic Signal	No
	Potomac Avenue at Boston Street	Traffic Signal	Pedestrian Signal	No
	Ellwood Street at Boston Street	Traffic Signal	Stop	N/A
	East Avenue at Boston Street	Stop	Traffic Signal	No
	Eaton Street at Boston Street	Does not Exist	Traffic Signal	No
	Relocated Boston Street at Boh'donnell Connector	Does not Exist	Traffic Signal	No
	Haven Street south of Dillon Street	Stop	Flashers & Gates	Yes
	Cassell Drive Crossing	Does not Exist	Flashers & Gates	Yes
	Bayview Boulevard at Alpha Commons Transitway	Does not Exist	Flashers & Gates	Yes
	Nathan Shock Drive at Bayview Boulevard	Stop	Traffic Signal & Gates	Yes
	NIH driveway / Cassell Drive at Bayview Boulevard	Stop	Traffic Signal & Gates	Yes
	Lombard Street at Bayview Boulevard	Traffic Signal	Traffic Signal & Gates	Yes

Table 18: Existing, 2035 No-Build and Build Estimated Peak Hour Travel Times in Minutes [1]

From/To	Existing		(1) No-Build		(2) Build		% Change (1) & (2)	
	EB/SB	WB/NB	EB/SB	WB/NB	EB/SB	WB/NB	EB/SB	WB/NB
Security Boulevard, from Greengage Road to Woodlawn Drive	3.8 (4.8)	4.7 (4.8)	4.9 (11.1)	5.4 (9.5)	5.1 (9.5)	5.0 (11.6)	+4 (-14)	-7 (+22)
Parallel Drive, from Woodlawn Drive to Ingleside Ave	2.5 (1.8)	1.6 (1.6)	3.0 (3.5)	3.8 (3.7)	3.1 (3.6)	4.1 (9.0)	+3 (+3)	+8 (+143)
Cooks Lane, from Forest Park Avenue to Edmondson Ave	3.1 (2.2)	1.8 (1.8)	2.7 (2.3)	2.0 (2.1)	2.5 (2.1)	1.8 (1.8)	-7 (-9)	-10 (-14)
US 40, from I-695 Outer Loop to Cooks Lane	3.8 (5.8)	4.7 (5.5)	4.5 (6.9)	5.9 (12.7)	4.3 (6.4)	6.1 (8.6)	-4 (-7)	+3 (-32)
Edmondson Avenue, from Cooks Lane to Franklin Street	4.5 (5.8)	4.8 (5.3)	7.4 (7.2)	11.0 (10.0)	10.8 (9.6)	7.0 (9.8)	+46 (+33)	-36 (-2)
Franklin Street, from Edmondson Avenue to Pulaski Street	2.2 (2.3)	2.2 (2.1)	4.9 (2.7)	2.9 (2.4)	3.6 (3.0)	3.2 (3.8)	-27 (+11)	+10 (+58)
MLK Jr. Boulevard, from US 40 to Lombard Street	1.8 (3.3)	2.5 (4.2)	4.4 (6.3)	3.2 (4.3)	1.7 (5.9)	4.6 (3.6)	-61 (-6)	+44 (-16)
Lombard Street, from MLK Jr. Boulevard to President Street	N/A	6.2 (7.4)	N/A	6.3 (9.2)	N/A	8.7 (10.3)	N/A	+38 (+12)
President Street, from Pratt Street to Fleet Street	1.0 (0.8)	3.3 (2.5)	0.8 (1.4)	8.0 (2.2)	2.2 (2.0)	4.0 (3.4)	+175 (+43)	-50 (+55)
Fleet Street, from President Street to Boston Street	3.9 (6.9)	3.9 (3.9)	3.7 (7.6)	7.3 (4.7)	3.6 (7.8)	4.2 (3.5)	-3 (+3)	-42 (-26)
Boston Street, from Fleet Street to Conkling Street	3.7 (4.6)	2.7 (4.8)	7.8 (6.0)	4.8 (4.6)	9.1 (6.8)	4.5 (5.1)	+17 (+13)	-6 (+11)

Source: MTA, 2011-2012; [1] AM(PM) peak hours

AM (PM) TRAVEL TIMES - BUILD CONDITIONS (2035)

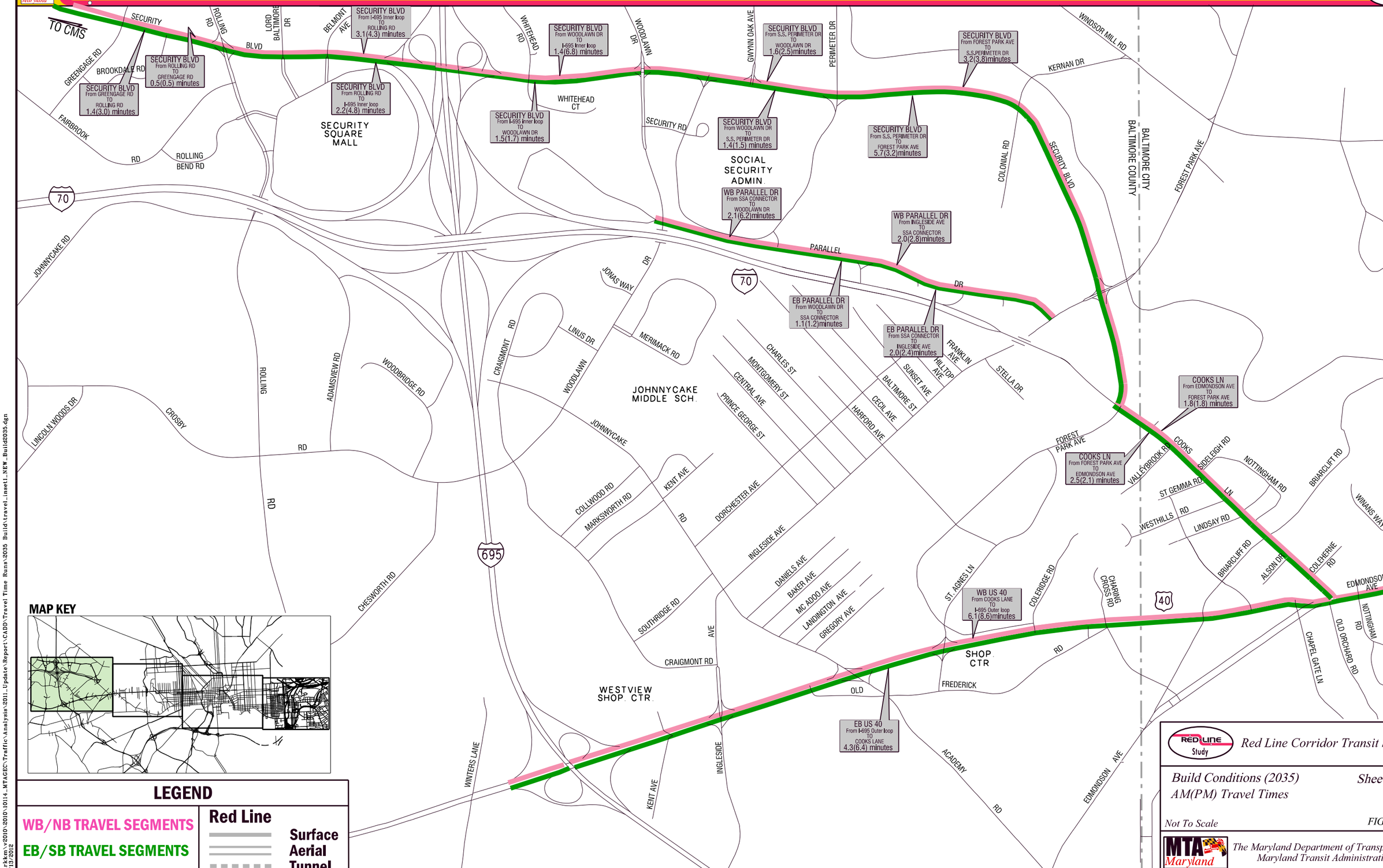
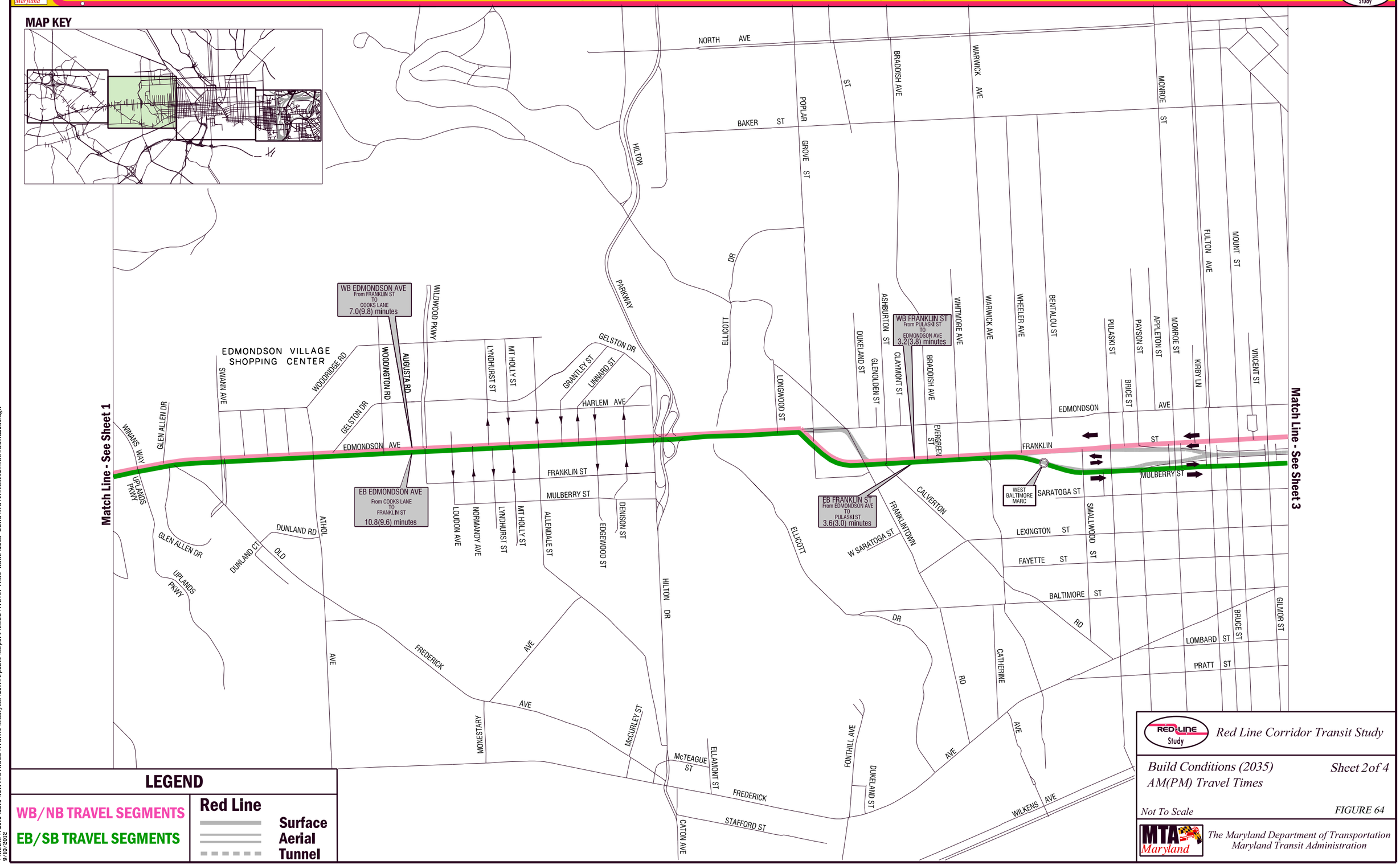


FIGURE 63 - Build Conditions (2035) AM(PM) Travel Times

AM (PM) TRAVEL TIMES - BUILD CONDITIONS (2035)



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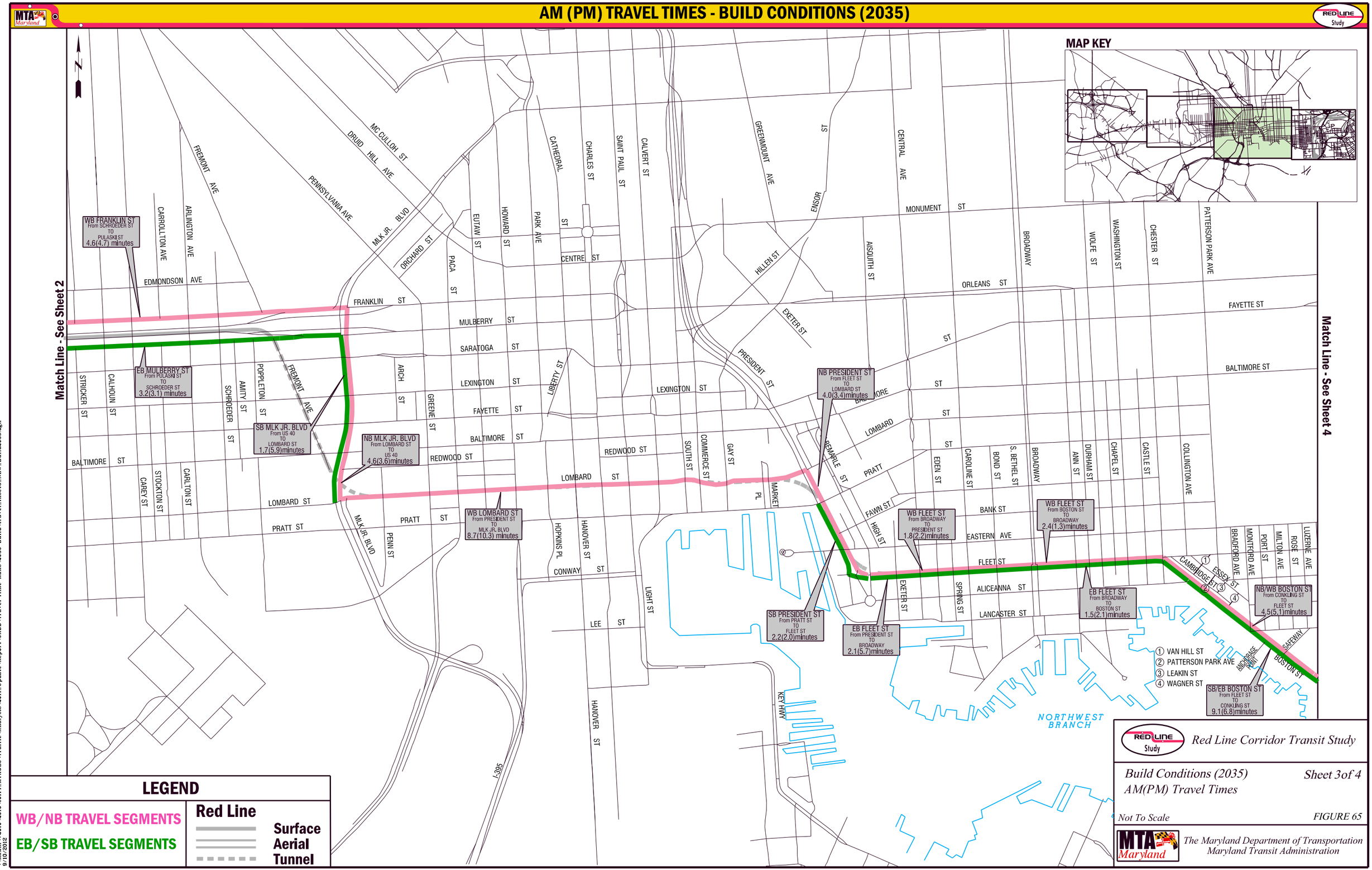
9/10/2012

FIGURE 64 - Build Conditions (2035) AM(PM) Travel Times

AM (PM) TRAVEL TIMES - BUILD CONDITIONS (2035)



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9/10/2012

FIGURE 65 - Build Conditions (2035) AM(PM) Travel Times

AM (PM) TRAVEL TIMES - BUILD CONDITIONS (2035)

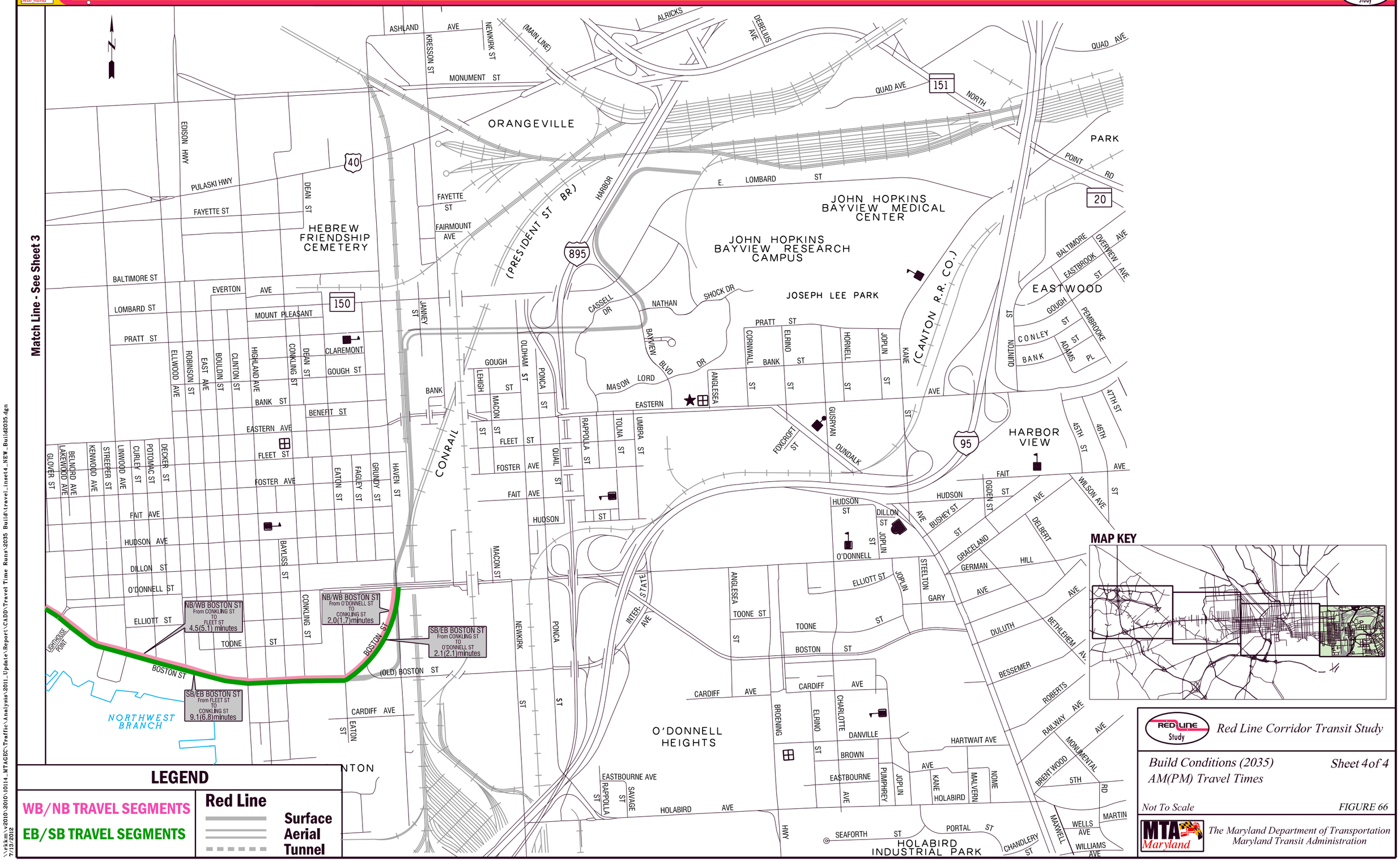


FIGURE 66 - Build Conditions (2035) AM(PM) Peak Hour Volumes

5.1.5 Levels of Service

The measurement of the traffic operations at an intersection is another method of comparing the various alternatives and design options. The levels of service (LOS), as defined in Chapter 2-Existing Conditions, were calculated using the Synchro/SimTraffic Version 7 software program to report the Highway Capacity Manual (version 2000) level of service results, with VISSIM Version 5.3 models used to test preemption intersection treatments. The roadway condition variables are the same as the ones used for the travel time analysis. A total of 156 intersections (143 signalized and 13 unsignalized) were analyzed in the 2035 Build condition. There is an increase in the number of signalized intersections in Build conditions (versus the No-Build condition) since some intersections were converted from stop control to signal control (see **Table 17** for the list of intersections). Similar to No-Build conditions, the following traffic impacts were considered as "significant":

1. Deterioration in intersection operations from marginally acceptable LOS "D" to unacceptable LOS E or F, deterioration from LOS E to LOS F, or significant deterioration in vehicle delays within LOS F; or

2. Deterioration in intersection operations from acceptable LOS A or B to LOS D or worse (i.e., a change of at least two levels of service when the existing is operating at an optimal level.

In addition to the above, any intersection that has an improved Level of Service (LOS) in Build conditions versus No-Build conditions such as an intersection that no longer operates at LOS E or F, was also considered to be a significant improvement.

Table 19 provides the total number of intersections that are operating at LOS E or F in the Existing, 2035 No-Build and Build conditions.

Table 19: Number of Intersections with Los E or F (Existing, 2035 No-Build and Build)

Intersection Type	Number of Intersections[1]	Existing[2]	No-Build[2]	Build[2]
Signalized	125/132/143	5 (10)	19 (26)	14 (25)
Unsignalized (worst approach)	19/20/13	3 (4)	8 (8)	3 (3)
Totals	144/152/156	8 (14)	27 (34)	17 (28)

Notes: [1] Existing/No-Build/Build number of intersections
[2] AM (PM) peak hours
Source: MTA, 2011-2012

The total number of failing intersections is reduced between the No-Build and Build conditions. Table 20 provides a list of intersections that have significant traffic impacts according to the definitions provided above. The results of the 2035 No-Build and Build analysis showed that the overall LOS would worsen from the Existing conditions throughout the entire corridor, as a result of traffic volume growth in the region between 2011 and 2035. However, when compared with No-Build conditions, 2035 Build conditions would have improved LOS at some locations because of the decrease in volumes along the Red Line project study corridor. A detailed analysis table with delay and volumes at studied intersections for Existing, No-Build and Build Conditions is provided in Appendix A.

The LOS (during AM and PM peak hours) along the Red Line alignment for the studied intersections is shown on **Figures 67-74.** It is anticipated that most of the intersections that are failing in the Existing Conditions would continue to fail in the future 2035 Build conditions except the following signalized intersections:

- PM LOS of Security Boulevard at Woodlawn Drive (From E to D)
- AM (PM) LOS of Security Boulevard at Ingleside Avenue (From E (E) to D (D))
- AM LOS of Mulberry St at Pulaski Street (From E to C)
- AM LOS of Lombard St at Hopkins Place (From F to C)
- PM LOS of Boston Street at Aliceanna Street (From E to B)

A few unsignalized intersections that would be converted to signalized intersections (as listed in **Table 17**) in the Build year are estimated to have improved LOS when compared to the Existing and No-Build conditions. Below is a list of Signalized and Unsignalized intersections that have traffic impacts that are considered to be significant. The list also shows the changes in LOS from 2035 No-Build to Build conditions.

<u>Signalized Intersections:</u>

<u>Section 1</u>

- MD 122 (Security Boulevard) at Rolling Road – From (D) to (E) during (PM) peak hour
- MD 122 (Security Boulevard) at Woodlawn Drive – From (F) to (D) during (PM) peak hour
- MD 122 (Security Boulevard) at Ingleside Avenue – From E (E) to D (D) during AM (PM) peak hour
- Woodlawn Drive at Parallel Drive – From (D) to (E) during (PM) peak hour

<u>Section 2</u>

- Johnnycake Road at Ingleside Avenue – From E to D during AM peak hour

<u>Section 3</u>

- Edmondson Avenue at Winans Way – From B (A) to D (C) during AM (PM) peak hour
- Edmondson Avenue at Swann Avenue – From D to B during AM peak hour
- Edmondson Avenue at Edmondson Shopping Center – From (A) to (C) during (PM) peak hour (Converted from signalized to unsignalized intersection in Build conditions)
- Edmondson Avenue at Wildwood Parkway – From B (B) to D (D) during AM (PM) peak hour

- Edmondson Avenue at Allendale Street – From A to C during AM peak hour
- Edmondson Avenue at Hilton Drive – From A to D during AM peak hour
- US 40 (Franklin Street) at Franklintown Road – B (B) to E (E) during AM (PM) peak hour (Build Conditions were modeled in VISSIM)
- US 40 (Franklin Street) at Warwick Road – From C to E during AM peak hour
- Edmondson Avenue at Franklintown Road – From B (C) to D (E) during (PM) peak hour (Build Conditions were modeled in VISSIM)
- Edmondson Avenue at Bentalou Street – From (B) to (D) during (PM) peak hour
- Edmondson Avenue at Payson Street – From C (C) to A (A) during AM (PM) peak hour
- Franklin Street at Payson Street – From (F) to (E) during (PM) peak hour
- Franklin Street at Monroe Street – From (D) to (B) during (PM) peak hour
- Franklin Street at Fulton Street – From (D) to (A) during (PM) peak hour

Section 4

- MLK Jr. Boulevard at Franklin Street – From F (F) to E (better F) during AM (PM) peak hour
- MLK Jr. Boulevard at Saratoga Street – From F (F) to worse F (worse F) during AM (PM) peak hour
- MLK Jr. Boulevard at Fayette Street – From F to E during AM peak hour
- MLK Jr. Boulevard at Baltimore Street – From F (F) to better F (worse F) during AM (PM) peak hour
- MLK Jr. Boulevard at Lombard Street – From F (F) to D (worse F) during AM (PM) peak hour
- Lombard Street at Penn Street – From (E) to (F) during (PM) peak hour
- Lombard Street at Greene Street – From (F) to worse (F) during (PM) peak hour
- Lombard Street at Paca Street – From (E) to (D) during (PM) peak hour
- Lombard Street at Hopkins Place – From F (F) to C (better F) during AM (PM) peak hour
- Lombard Street at Hanover Street – From E to B during AM peak hour
- Lombard Street at Light Street – From D (F) to E (better F) during AM (PM) peak hour
- Lombard Street at Calvert Street – From D (F) to C (better F) during AM (PM) peak hour
- Lombard Street at South Street – From (E) to (D) during (PM) peak hour
- Lombard Street at Commerce Street – From C to A during AM peak hour
- Fleet Street at Caroline Street – From E (E) to B (C) during AM (PM) peak hour

Section 5

- Boston Street at Aliceanna Street – From (F) to (B) during (PM) peak hour
- Boston Street at Montford Avenue – From E to D during AM peak hour
- Boston Street at Ellwood Avenue – From (A) to (D) during (PM) peak hour (Converted from signalized to unsignalized in Build conditions)
- Boston Street at Clinton Street – From F to E during AM peak hour
- Boston Street at Future Old Boston Street – From D (C) to E (E) during AM (PM) peak hour
- Conkling Street at O'Donnell Street – From F (F) to better F (better F) during AM (PM) peak hour
- O'Donnell Street at New Boston Street (Boh'Donnell Connector) – From E to D during AM peak hour
- O'Donnell Street at Interstate Avenue – From E to D during AM peak hour
- O'Donnell Street at I-895 ramps – From (C) to (A) during (PM) peak hour
- Bayview Boulevard/I-895 ramps at Lombard Street – From E (F) to F (better F) during AM (PM) peak hour (Build Conditions were modeled in VISSIM)

Unsignalized Intersections:

Section 1

- Security Boulevard at Greengage Road – From D (E) to B (C) during AM (PM) peak hour as it is converted to a signalized intersection in Build year
- Parallel Drive at SSA Access – From C (F) to F (worse F) during AM (PM) peak hour

Section 3

- US 40 (Edmondson Avenue) at Denison Street – From F (F) to A (B) during AM (PM) peak hour as it is converted to a signalized intersection in Build year
- US 40 (Mulberry Street) at Smallwood Street – From F (F) to A (B) during AM (PM) peak hour as it is converted to a signalized intersection in Build year

Section 5

- Boston Street at Leakin Street – From F to better F during AM peak hour

- Boston Street at Safeway Shopping Center entrance – From (D) to (A) during (PM) peak hour as it is converted to a signalized intersection in Build year
- Boston Street at Kenwood Avenue – From F (F) to D (D) during AM (PM) peak hour as it is converted to a signalized intersection in Build year
- Boston Street at East Street – From F to C during AM peak hour as it is converted to a signalized intersection in Build year
- Boston Street at Bayliss Street – From F to B during AM peak hour
- Bayview Boulevard at Alpha Commons Drive – F (F) during AM (PM) peak hour in Build Conditions. This intersection would be closed and traffic is diverted to the new signalized intersection at Cassell Drive that improved to C (D) during AM (PM) peak

Table 20: Existing, 2035 No-Build and Build with Significant Peak Hour Level of Service Changes

No.	Section No.	Signalized Intersections	Existing		No-Build		Build	
			AM	PM	AM	PM	AM	PM
1	Section 1	MD 122 (Security Boulevard) at Rolling Road	D	D	D	D	D	E
2		MD 122 (Security Boulevard) at Belmont Avenue	B	D	C	E	D	E
3		MD 122 (Security Boulevard) at Woodlawn Drive	D	E	D	F	D	D
4		MD 122 (Security Boulevard) at Ingleside Avenue	E	E	E	E	D	D
5		Woodlawn Drive at Parallel Drive	C	D	D	D	D	E
6		Parallel Drive at Ingleside Avenue	B	A	B	C	B	B
7	Section 2	Johnnycake Road at Ingleside Avenue	C	C	E	F	D	F
8		US 40 at Ingleside Avenue	D	E	D	F	D	F
9	Section 3	Edmondson Avenue at Winans Way	C	B	B	A	D	C
10		Edmondson Avenue at Swann Avenue	B	B	D	D	B	D
11		Edmondson Avenue at Edmondson Shopping Center	A	A	A	A	B[3]	C[3]
12		Edmondson Avenue at Wildwood Parkway	A	B	B	B	D	D
13		Edmondson Avenue at Allendale Street	A	B	A	C	C	D
14		Edmondson Avenue at Hilton Drive	A	B	A	B	D	B
15		US 40 (Franklin Street) at Franklintown Road	C	B	B	B	E[4]	E[4]
16		US 40 (Franklin Street) at Warwick Road	B	B	C	C	E	C
17		Edmondson Avenue at Franklintown Road	C	C	B	C	D[4]	E[4]
18		Edmondson Avenue at Bentalou Street	B	C	B	B	C	D
19		Edmondson Avenue at Payson Street	B	C	C	C	A	A
20		Edmondson Avenue at Fulton Avenue	B	B	B	D	B	D
21		Mulberry Street at Pulaski Street	E	C	B	C	C	C
22		Franklin Street at Payson Street	N/A[1]	N/A[1]	C	F	D	E
23		Franklin Street at Monroe Street	B	D	B	D	A	B
24		Franklin Street at Fulton Avenue	A	C	B	D	A	A
25	Section 4	MLK Jr. Boulevard at Franklin Street	D	D	F	F	E	F
26		MLK Jr. Boulevard at Mulberry Street	F	C	F	F	F	F
27		MLK Jr. Boulevard at Saratoga Street	E	D	F	F	F	F
28		MLK Jr. Boulevard at Lexington Street	A	A	B	D	B	C
29		MLK Jr. Boulevard at Fayette Street	B	B	F	E	E	E
31		MLK Jr. Boulevard at Baltimore Street	C	E	F	F	F	F
32		MLK Jr. Boulevard at Lombard Street	C	E	F	F	D	F
33		Lombard Street at Penn Street	B	E	B	E	B	F
34		Lombard Street at Greene Street	C	C	C	F	D	F
35		Lombard Street at Paca Street	B	C	C	E	B	D
36		Lombard Street at Hopkins Place	F	F	F	F	C	F
37		Lombard Street at Hanover Street	B	E	E	E	B	E
38		Lombard Street at St. Paul Street/Light Street	C	F	D	F	E	F
39		Lombard Street at Calvert Street	C	C	D	F	C	F
40		Lombard Street at South Street	C	C	C	E	C	D
41		Lombard Street at Commerce Street	A	A	C	B	A	B
42		Lombard Street at Market Place	B	B	B	D	C	C

Table 20: Existing, 2035 No-Build and Build with Significant Peak Hour Level of Service Changes

No.	Section No.	Signalized Intersections	Existing		No-Build		Build	
			AM	PM	AM	PM	AM	PM
43	Section 4	Lombard Street at President Street	D	C	E	E	E	E
44		President Street at Eastern Avenue	C	D	D	E	C	E
45		Fleet Street at Caroline Street	B	B	E	E	B	C
46		Fleet Street at Washington Street	B	C	B	A	A	B
47	Section 5	Boston Street at Aliceanna Street	B	E	C	F	B	B
48		Boston Street at Montford Avenue	B	B	E	A	D	A
49		Boston Street at Linwood Avenue	A	A	D	B	D	C
50		Boston Street at Ellwood Avenue	A	A	A	A	A[3]	D[3]
51		Boston Street at Clinton Street	D	C	F	C	E	D
52		Boston Street at Conkling Street	B	B	E	C	E	D
53		Boston Street at Future Old Boston Street	N/A[2]	N/A[2]	D	C	E	E
54		Conkling Street at O'Donnell Street	D	D	F	F	F	F
55		O'Donnell Street at New Boston Street (Boh'Donnell Connector)	N/A[2]	N/A[2]	E	D	D	D
56		O'Donnell Street at Interstate Avenue	C	C	E	C	D	C
57		O'Donnell Street at I-895 Southbound Ramp	B	B	C	C	B	A
58		Bayview Boulevard at Lombard Street	C	C	E	F	F[4]	F[4]
		Total – LOS E OR F	5	10	19	26	14	25

Notes: [1]Unsignalized in Existing conditions, Synchro HCM output does not exist; [2]Intersection does not exist; [3]Unsignalized in Build Conditions; [4]Modeled in VISSIM for LRT preemption

No.	Section No.	Unsignalized Intersections	Existing		No-Build		Build	
			AM	PM	AM	PM	AM	PM
1	Section 1	Security Boulevard at Greengage Road	E	D	D	E	B[1]	C[1]
2		Woodlawn Drive at Security Road	B	D	B	E	B	E
3		Parallel Drive at SSA Access	B	F	C	F	F	F
4	Section 3	Edmondson Avenue at Denison Street	F	F	F	F	A[1]	B[1]
5		US 40 (Mulberry Street) at Smallwood Street	F	F	F	F	A[1]	B[1]
6	Section 5	Boston Street at Leakin Street	D	F	F	F	F	F
7		Boston Street at Safeway Shopping Center Entrance	B	C	B	D	A[1]	A[1]
8		Boston Street at Kenwood Avenue	D	C	F	F	D[1]	D[1]
9		Boston Street at East Street	A	B	F	D	C[1]	C[1]
10		Boston Street at Potomac Street	B	B	D	B	D[1]	C[1]
11		Boston Street at Bayliss Street	C	B	F	B	B	B
12		Conkling Street at Toone Street	C	C	F	C	F	C
13		Bayview Boulevard at Alpha Commons Drive	B	B	F	F	N/A [2]	
		Total – LOS E OR F	3	4	8	8	3	3

Notes: [1]Signalized Intersection with LOS D or better; [2]Intersection does not exist in Build Conditions

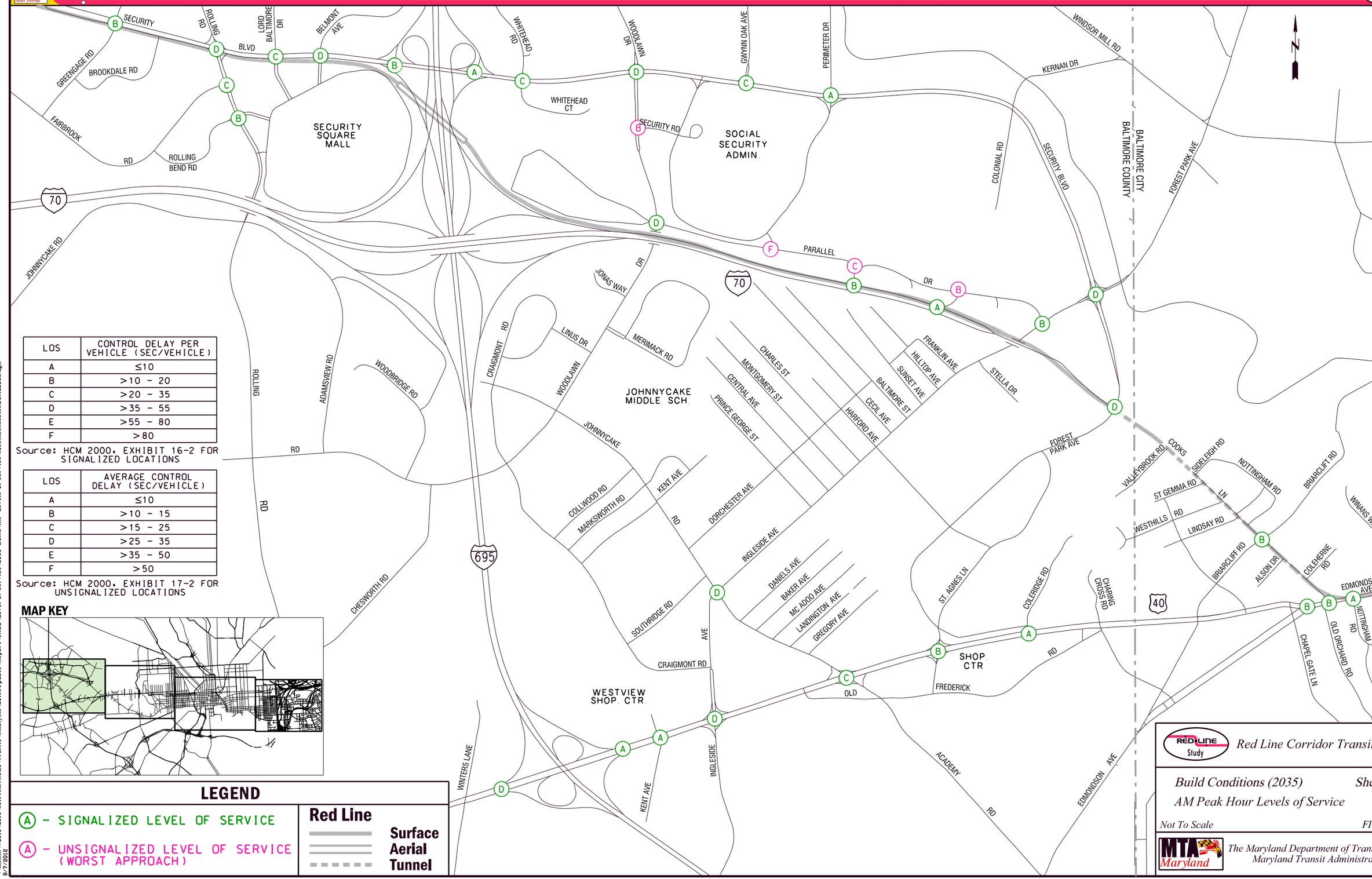
Formatting: No-Build conditions were compared to Existing conditions. Build conditions were compared to No-Build conditions. Red – LOS worsens; Green – LOS improves; Black – No change in LOS; Bold text – LOS E or F

Source: MTA, 2011-2012

AM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2035)

MTA Maryland

RED LINE Study



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

MAP KEY

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface

Aerial

Tunnel

Match Line - See Sheet 2

RED LINE Study — *Red Line Corridor Transit Study*

Build Conditions (2035) — *Sheet 1of 4*

AM Peak Hour Levels of Service

Not To Scale — *FIGURE 67*

MTA Maryland — *The Maryland Department of Transportation Maryland Transit Administration*

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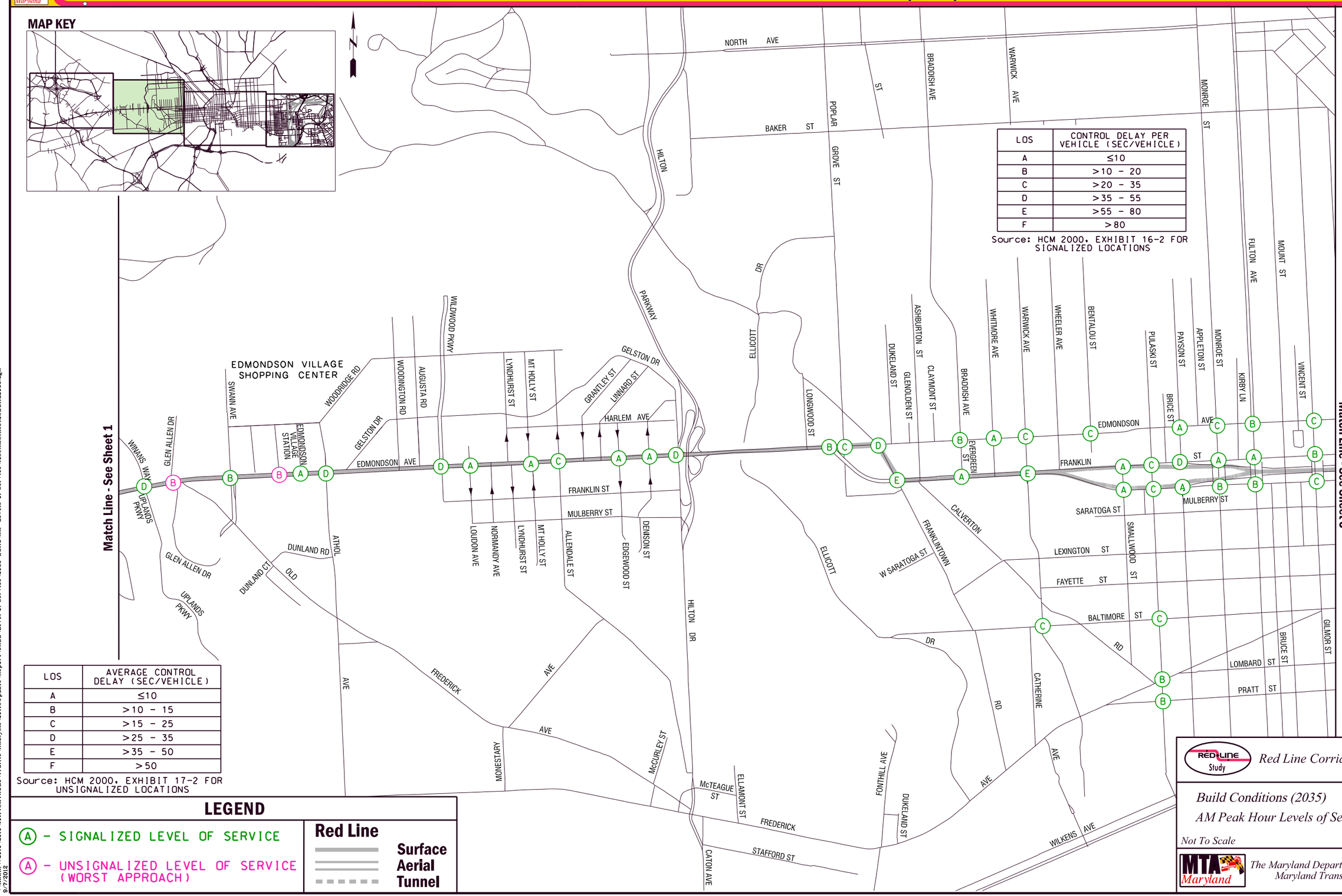
9/7/2012

FIGURE 67 - Build Conditions (2035) Level of Service - AM Peak Hour

AM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2035)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface

Aerial

Tunnel

Red Line Corridor Transit Study

Build Conditions (2035) — Sheet 2 of 4

AM Peak Hour Levels of Service

Not To Scale — FIGURE 68

The Maryland Department of Transportation
Maryland Transit Administration

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9/7/2012

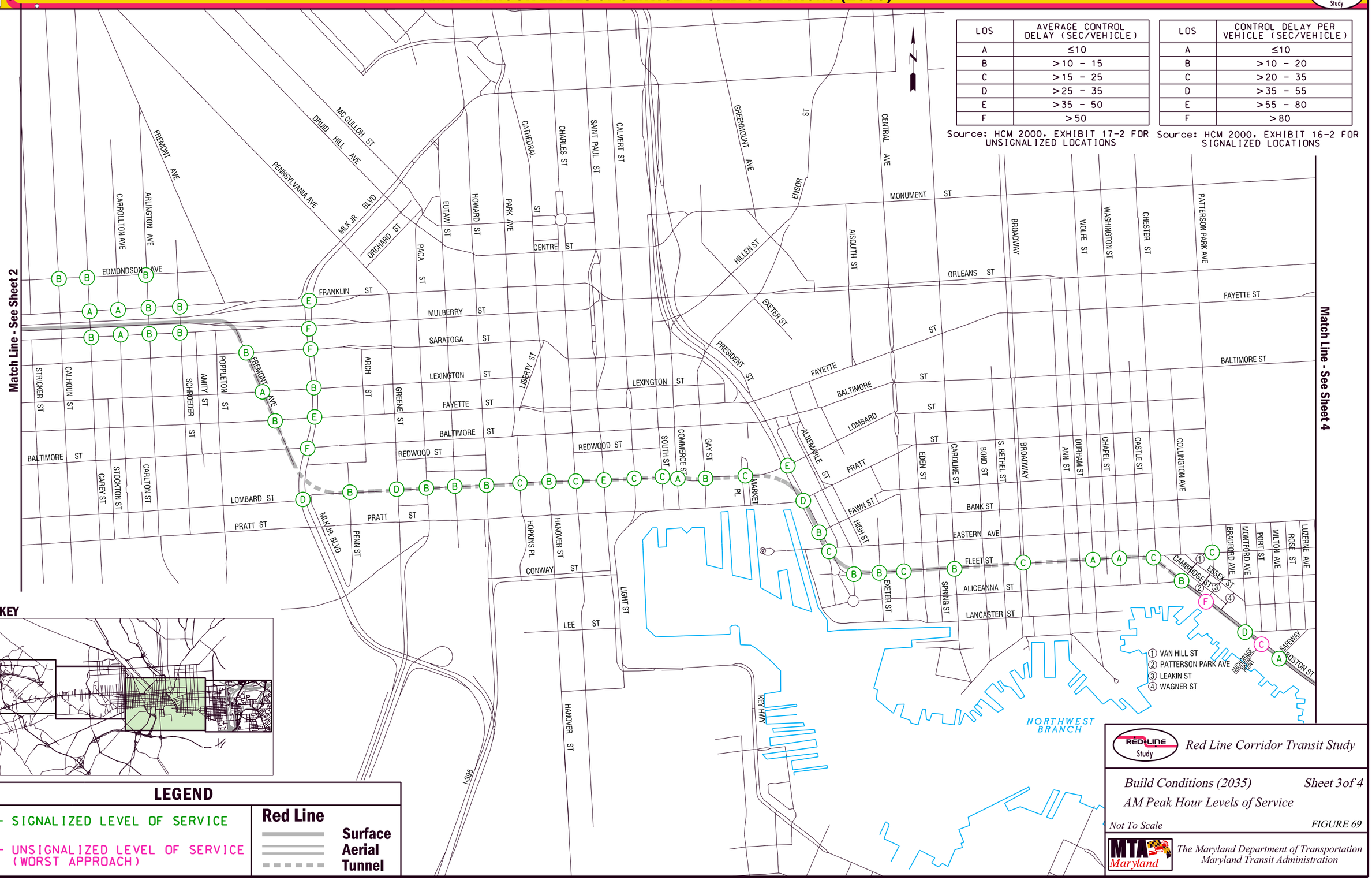
AM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2035)

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS



Red Line Corridor Transit Study

Build Conditions (2035) Sheet 3 of 4

AM Peak Hour Levels of Service

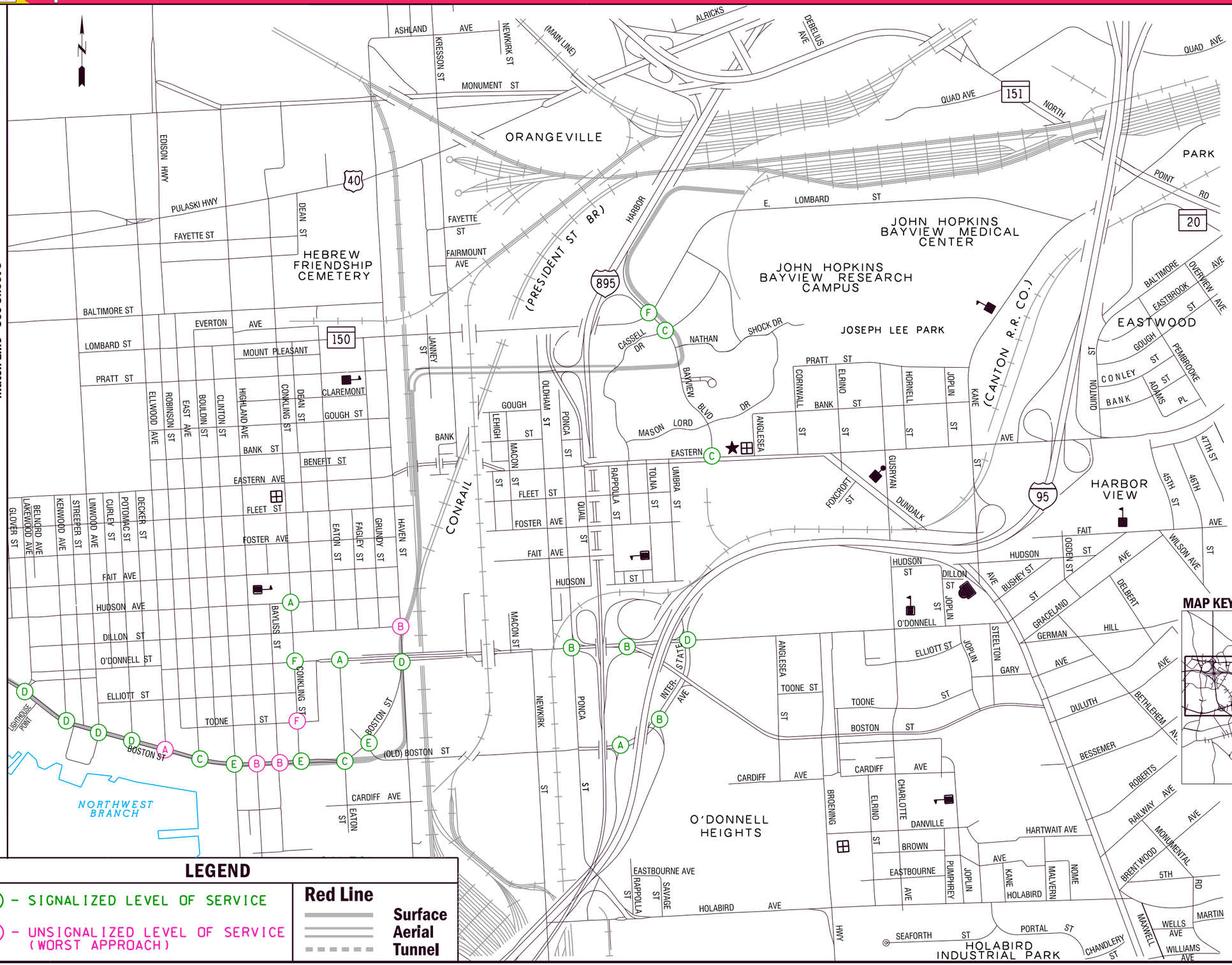
Not To Scale FIGURE 69

The Maryland Department of Transportation
Maryland Transit Administration

\\Rkm\v2010\10114_MTAGBC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 Build\AM Levels of Service\los_AM_inset3_Build2035.dgn
9/12/2012

FIGURE 69 - Build Conditions (2035) Level of Service - AM Peak Hour

AM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2035)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

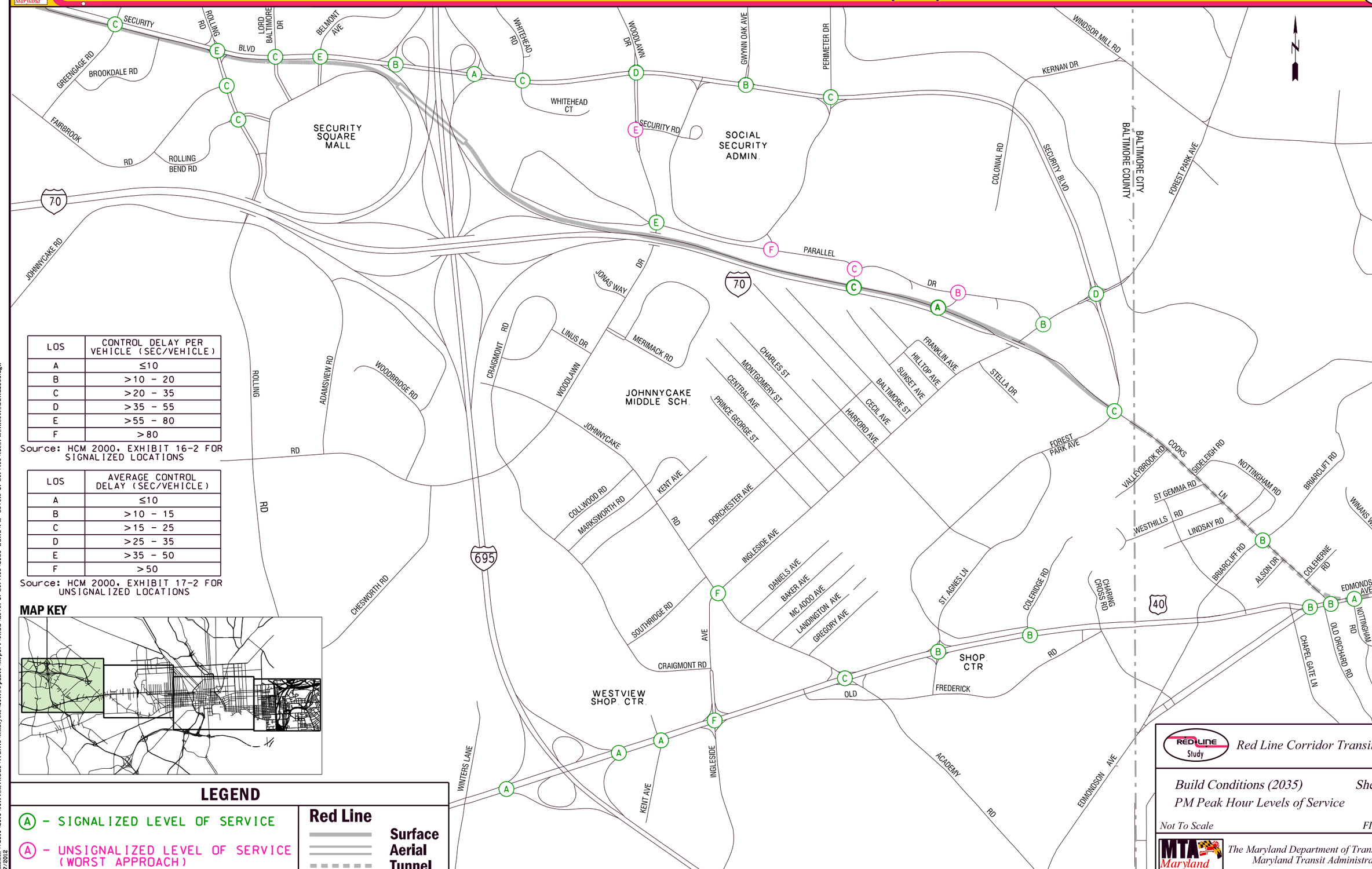
Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

FIGURE 70 - Build Conditions (2035) Level of Service - AM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2035)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

MAP KEY

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface

Aerial

Tunnel

Match Line - See Sheet 2

Red Line Corridor Transit Study

Build Conditions (2035) *Sheet 1 of 4*

PM Peak Hour Levels of Service

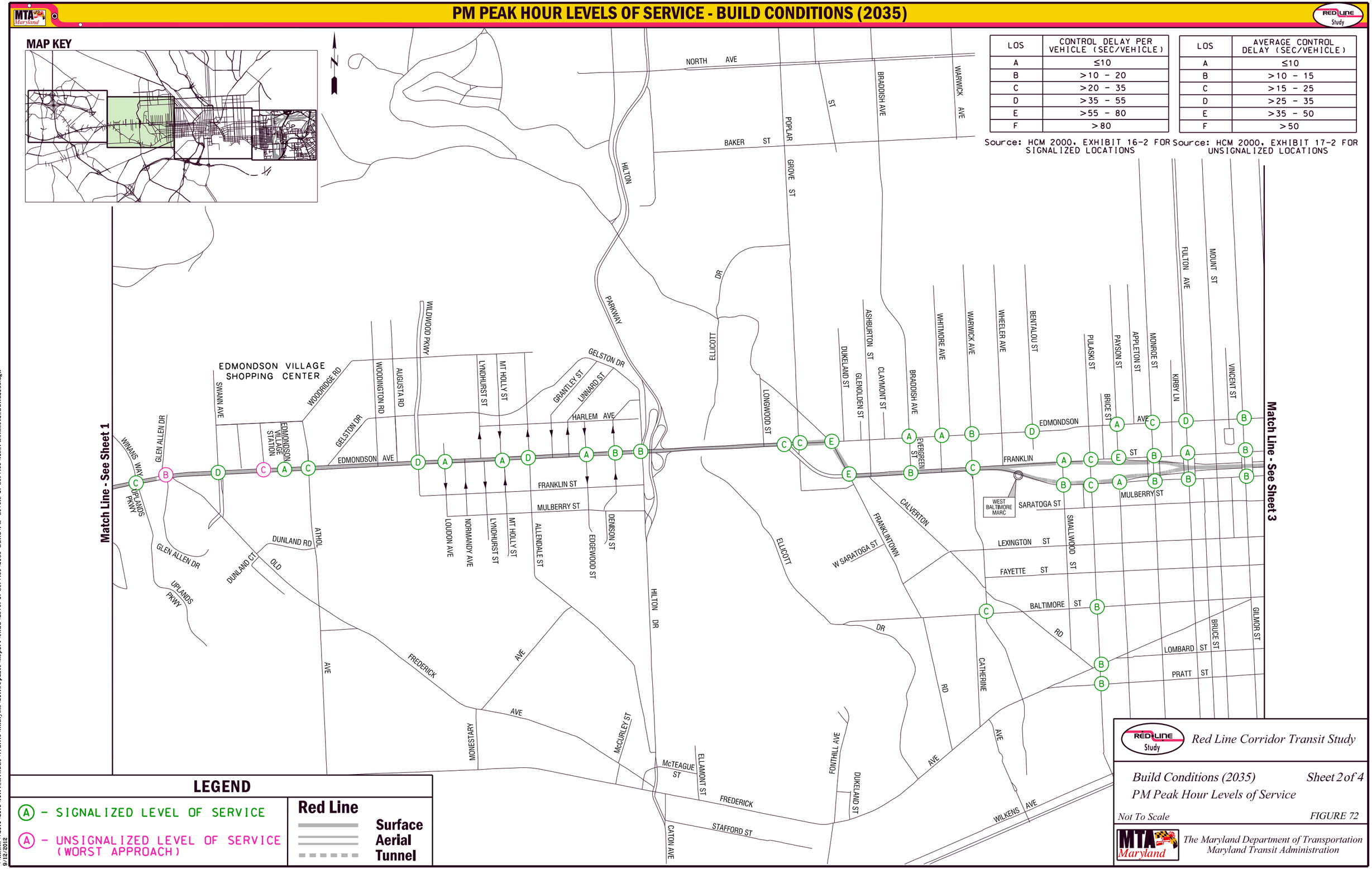
Not To Scale *FIGURE 71*

The Maryland Department of Transportation
Maryland Transit Administration

\\Rkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 Build\PM Levels of Service\los_PM_inset1_Build2035.dgn
9/7/2012

FIGURE 71 - Build Conditions (2035) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2035)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface

Aerial

Tunnel

Red Line Corridor Transit Study

Build Conditions (2035) — Sheet 2 of 4

PM Peak Hour Levels of Service

Not To Scale — FIGURE 72

The Maryland Department of Transportation
Maryland Transit Administration

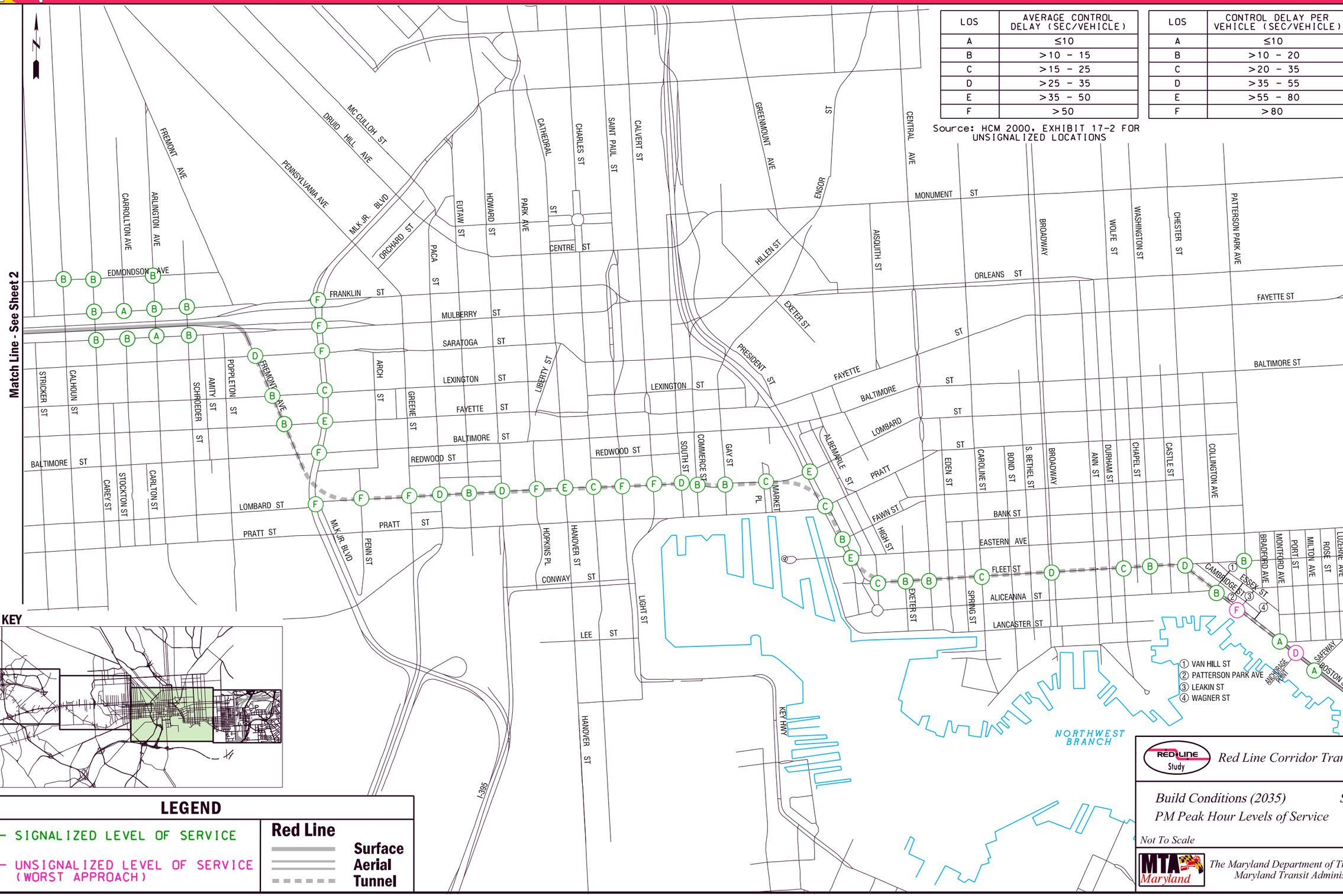
\\Rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 Build\PM Levels of Service\los_PM_inset2_Build2035.dgn
9/12/2012

PM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2035)

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

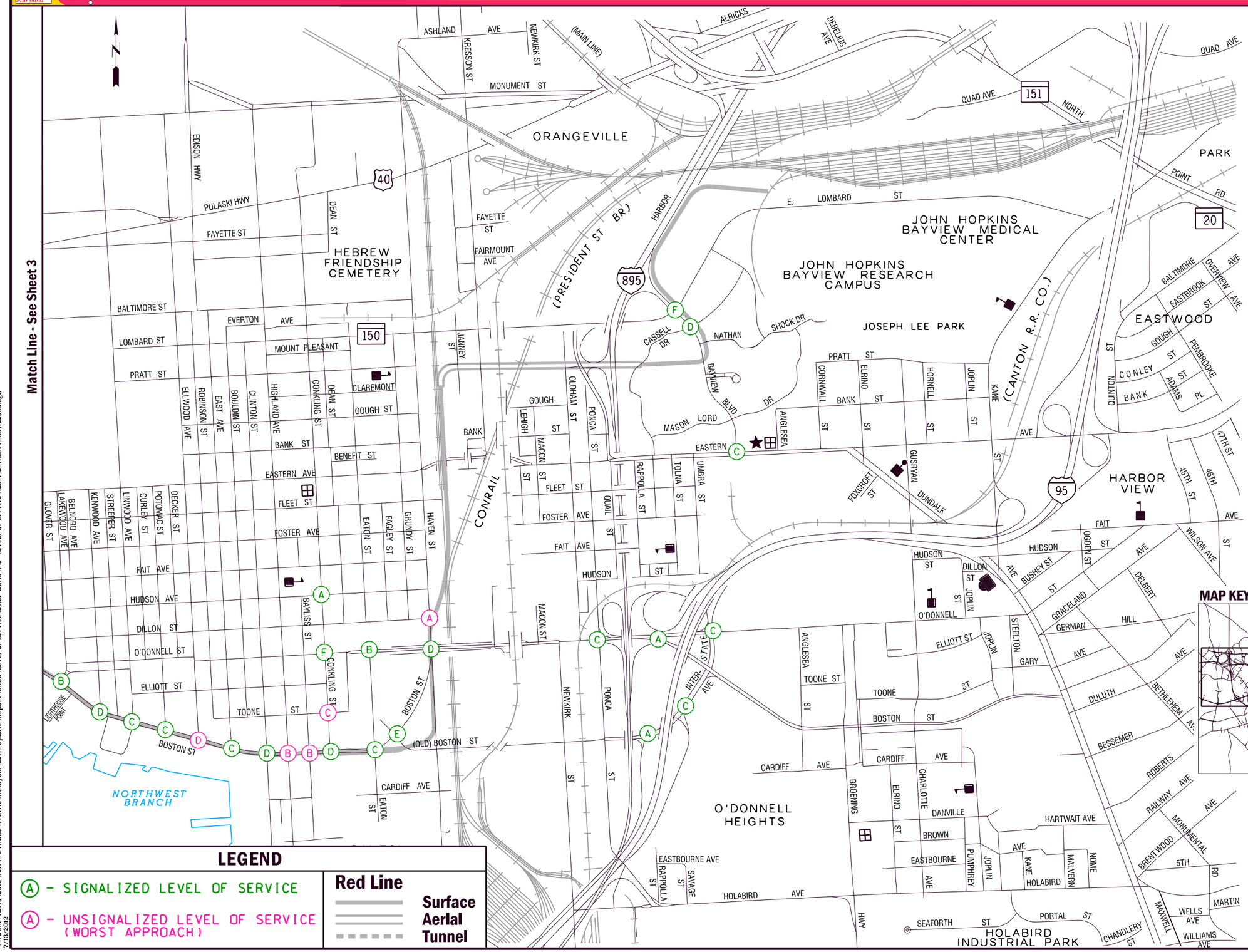
Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS



\\Rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2035 Build\PM Levels of Service\los_PM_inset3_Build2035.dgn
9/12/2012

FIGURE 73 - Build Conditions (2035) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2035)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface
Aerial
Tunnel

Red Line Corridor Transit Study

Build Conditions (2035)
PM Peak Hour Levels of Service

Sheet 4 of 4

Not To Scale

FIGURE 74

The Maryland Department of Transportation
Maryland Transit Administration

\\rkkm\v2010\10114_MTAGEC\Traffic Analysis\2011_Update\Report\CADD\Level of Service\2035 Build\PM Levels of Service\los_PM_inset4_Build2035.dgn
7/13/2012

FIGURE 74 - Build Conditions (2035) Levels of Service - PM Peak Hour

5.2 Operational Effects of Red Line Light Rail Transit (LRT) In Opening Year 2021

It is anticipated that the Red Line Light Rail Transit (LRT) will be built and open to service in 2021 year. The proposed Red Line Light Rail Transit alignment is shown on **Figure 50**. The Red Line LRT will have 19 stations along the corridor and will be aligned to travel on surface track ways, through underground tunnels, and also on elevated aerial structures.

The total number of traffic lanes in the initial operating year of Red Line LRT in 2021 is the same as during the future 2035 Build year. The **Table 21** lists the total number of lanes along Red Line alignment. The number of traffic lanes in 2021 for each section of roadway along the Red Line path is shown on **Figures 51-54**.

Table 21: Number of Traffic Lanes in 2021 with the Red Line LRT

Roadway	Figure Number	Total Number Of Travel Lanes	Two Way Or One Way
MD 122 (Security Boulevard)	51	4-6	Two Way
I-70	51	2-6	Two Way
Woodlawn Drive	51	4	Two Way
Ingleside Avenue	51	3-4	Two Way
Parallel Drive	51	3-4	Two Way
US 40 (Baltimore National Pike)	51	6	Two Way
Cooks Lane	51	2	Two Way
Edmondson Avenue	52,53	4	Two Way
Franklin Street	53,54	2-6	Two Way/One Way WB
Mulberry Street	53,54	2-3	One Way EB
US 40	53,54	4-6	Two Way
N. Freemont Avenue	54	2	Two Way
Martin Luther King, Jr. Boulevard	54	6	Two Way
Lombard Street	54	3-6	One Way WB
President Street	54	6	Two Way
Fleet Street	54	2-4	Two Way
Boston Street	54,55	2-4	Two Way
Conkling Street	55	2	Two Way
New Boston Street	55	4	Two Way
Eaton Street	55	2-4	Two Way
Haven Street	55	2	Two Way
Bayview Boulevard	55	4	Two Way

Source: MTA, 2012

Opening year was evaluated for potential traffic impacts along the studied corridors similar to Existing, No-Build and Build conditions. It is anticipated that there would be less reduction in auto-trips to transit than in the 2035 Build conditions alternative, because there is less growth between 2011 and 2021 than 2011 and 2035. The traffic impacts along all sections for opening year are anticipated to be similar to 2035 Build conditions. All intersections that were studied under 2035 Build alternative were also studied for the opening year 2021.

Similar to 2035 Build year, a total of 156 intersections (143 signalized and 13 unsignalized) were analyzed to determine the Highway Capacity Manual (version 2000) Levels of Service (LOS) by using the Synchro/SimTraffic Version 7 models. The models that were used to estimate and analyze the Preferred Alternative were the ones that were used to estimate opening year with newer volumes. These models had to be optimized for signal timing (splits and offsets) to regulate traffic progression for the coordinated network along various sections of the Red Line project study corridor. However, the cycle lengths and phasing for signals remained the same as the 2035 Build alternative. The definition of "significant" traffic impact of opening year at intersections is the same used for the 2035 Build alternative.

Table 22 provides the total number of intersections that are operating at LOS E or F for all scenarios including Existing, 2035 No-Build, 2035 Build and 2021 opening year.

Table 22: Number of Intersections with LOS E or F (Existing, 2035 No-Build and LOS)

Intersection Type	Total Number of Intersections[1]	Existing[2]	No-Build[2]	Build[2]	Opening Year[2]
Signalized	125/132/143/143	5 (10)	19 (26)	14 (25)	6 (19)
Unsignalized (worst approach)	19/20/13/13	3 (4)	8 (8)	3 (3)	1 (2)
Totals	144/152/156/156	8 (14)	26 (34)	17 (28)	7 (21)

Notes: [1] Existing/No-Build/Build/Opening Year
[2] AM (PM) peak hours
Source: MTA, 2011-2012;

It is anticipated that the total number of failing intersections in 2021 opening year would be less than the 2035 Build year. Detailed analysis table with delay and volumes at studied intersections for the opening year are contained in **Appendix A**.

The LOS (AM and PM peak hours) along the Red Line alignment from the studied intersections are shown in the report in **Figures 75-82**. Similar to 2035 Build year, in the opening year, it is anticipated that most of the failing intersections (LOS E or F) in the Existing Conditions would continue to fail. However there are fewer intersections that are estimated to fail in the opening year versus the Build 2035 year. Following are the list of signalized and unsignalized intersections that are expected to fail (LOS E or F) in the opening year 2021. **Table 23** shows the failing intersections (LOS E or F) under all scenarios (Existing, No-Build, Build and Opening Year).

Signalized Intersections:

Section 1

- Woodlawn Drive at Parallel Drive – (E) during (PM) peak hour

Section 2

- US 40 at Ingleside Avenue – (E) during (PM) peak hour

Section 3

- US 40 (Edmondson Avenue) at Winans Way – E during AM peak hour
- US 40 (Edmondson Avenue) at Swann Avenue – (E) during (PM) peak hour
- US 40 (Edmondson Avenue) at Woodridge Road – (E) during (PM) peak hour
- US 40 (Franklin Street) at Franklintown Road – E during AM peak hour
- Franklin Street at Payson Street – (E) during (PM) peak hour

Section 4

- MLK Jr. Boulevard at Franklin Street – (E) during (PM) peak hour
- MLK Jr. Boulevard at Mulberry Street – F (E) during AM (PM) peak hour
- MLK Jr. Boulevard at Saratoga Street – E (E) during AM (PM) peak hour
- MLK Jr. Boulevard at Baltimore Street – (F) during (PM) peak hour
- MLK Jr. Boulevard at Lombard Street – (F) during (PM) peak hour
- Lombard Street at Greene Street – (E) during (PM) peak hour
- Lombard Street at Hopkins Place – (F) during (PM) peak hour
- Lombard Street at Hanover Street – (F) during (PM) peak hour
- Lombard Street at St. Paul/Light Street – (F) during (PM) peak hour
- Lombard Street at Calvert Street – (E) during (PM) peak hour

Section 5

- Boston Street at Kenwood Street – (E) during (PM) peak hour
- Boston Street at Clinton Street – E (E) during AM(PM) peak hour
- Boston Street at Old Boston Street – (E) during (PM) peak hour
- Conkling Street at O'Donnell Street – F (F) during AM (PM) peak hour

Unsignalized Intersections:

Section 1

- Woodlawn Drive at Security Road – (F) during (PM) peak hour
- Parallel Drive at SSA Access – (F) during (PM) peak hour

Section 5

- Boston Street at Leakin Street – F during AM peak hour

Table 23: Existing, 2035 No-Build, 2035 Build and 2021 Opening Year with Significant Peak Hour Level of Service Changes

No.	Section No.	Signalized Intersections	Existing		No-Build		Build		Opening Year	
			AM	PM	AM	PM	AM	PM	AM	PM
1	Section 1	MD 122 (Security Boulevard) at Rolling Road	D	D	D	D	D	E	D	D
2		MD 122 (Security Boulevard) at Belmont Avenue	B	D	C	E	D	E	C	D
3		MD 122 (Security Boulevard) at Woodlawn Drive	D	E	D	F	D	D	D	D
4		MD 122 (Security Boulevard) at Ingleside Ave	E	E	E	E	D	D	D	D
5		Woodlawn Drive at Parallel Drive	C	D	D	D	D	E	D	E
6		Ingleside Avenue at Parallel Drive	B	A	B	C	B	B	A	B
7	Section 2	Johnnycake Rd at Ingleside Avenue	C	C	E	F	D	F	C	D
8		US 40 at Ingleside Avenue	D	E	D	F	D	F	D	E
9	Section 3	Edmondson Avenue at Winans Way	C	B	B	A	D	C	E	D
10		Edmondson Avenue at Swann Avenue	B	B	D	D	B	D	B	E
11		Edmondson Avenue at Woodridge Road	C	C	C	C	D	C	D	E
12		Edmondson Avenue at Wildwood Pkwy.	A	B	B	B	D	D	C	C
13		Edmondson Avenue at Allendale Street	A	B	A	C	C	D	D	C
14		Edmondson Avenue at Hilton Drive	A	B	A	B	D	B	B	B
15		Edmondson Avenue at Bentalou Street	B	C	B	B	C	D	C	C
16		US 40 (Franklin St) at Franklintown Rd	C	B	B	B	E [4]	E [4]	E	C
17		US 40 (Franklin St) at Warwick Rd	B	B	C	C	E	C	C	C
18		Edmondson Avenue at Franklintown Rd	C	C	B	C	D [4]	E [4]	C	D
19		Mulberry St at Pulaski Street	E	C	B	C	C	C	C	C
20		Franklin Street at Payson Street	N/A [1]	N/A [1]	C	F	D	E	C	E
21		Edmondson Avenue at Payson Street	B	C	C	C	A	A	A	A
22		Edmondson Avenue at Fulton Avenue	B	B	B	D	B	D	A	B
23		Franklin Street at Monroe Street	B	D	B	D	A	B	A	B
24		Franklin Street at Fulton Avenue	A	C	B	D	A	A	A	B
25	Section 4	MLK Jr. Boulevard at Franklin Street	D	D	F	F	E	F	D	E
26		MLK Jr. Boulevard at Mulberry Street	F	C	F	F	F	F	F	E
27		MLK Jr. Boulevard at Saratoga Street	E	D	F	F	F	F	E	E
28		MLK Jr. Boulevard at Fayette Street	B	B	F	E	E	E	B	C
29		MLK Jr. Boulevard at Lexington Street	A	A	B	D	B	C	A	A
30		MLK Jr. Boulevard at Baltimore Street	C	E	F	F	F	F	C	F
31		MLK Jr. Boulevard at Lombard Street	C	E	F	F	D	F	B	F
32		Lombard Street at Penn Street	B	E	B	E	B	F	B	D
33		Lombard Street at Greene Street	C	C	C	F	D	F	C	E
34		Lombard Street at Paca Street	B	C	C	E	B	D	B	C
35		Lombard Street at Hopkins Pl.	F	F	F	F	C	F	C	F
36		Lombard Street at Hanover Street	B	E	E	E	B	E	B	F
37		Lombard Street at St. Paul Street	C	F	D	F	E	F	D	F
38		Lombard Street at Calvert Street	C	C	D	F	C	F	C	E
39		Lombard Street at South Street	C	C	C	E	C	D	B	C
40		Lombard Street at Commerce Street	A	A	C	B	A	B	A	A
41		Lombard Street at Market Pl.	B	B	B	D	C	C	B	C

Table 23: Existing, 2035 No-Build, 2035 Build and 2021 Opening Year with Significant Peak Hour Level of Service Changes

No.	Section No.	Signalized Intersections	Existing		No-Build		Build		Opening Year	
			AM	PM	AM	PM	AM	PM	AM	PM
42	Section 4	Lombard Street at President Street	D	C	E	E	E	E	D	D
43		President Street at Eastern Avenue	C	D	D	E	C	E	D	D
44		Fleet Street at Caroline Street	B	B	E	E	B	C	B	B
45		Fleet Street at Washington Street	B	C	B	A	A	B	A	B
46	Section 5	Boston Street at Aliceanna Street	B	E	C	F	B	B	B	B
47		Boston Street at Montford Avenue	B	B	E	A	D	A	D	B
48		Boston Street at Kenwood Avenue	N/A [1]	N/A [1]	N/A [1]	N/A [1]	D	D	D	E
49		Boston Street at Linwood Avenue	A	A	D	B	D	C	C	D
50		Boston Street at Potomac Street	N/A [1]	N/A [1]	N/A [1]	N/A [1]	D	C	B	C
51		Boston Street at Clinton Street	D	C	F	C	E	D	E	E
52		Boston Street at Conkling Street	B	B	E	C	E	D	B	B
53		Boston Street at Old Boston Street	N/A [2]	N/A [2]	D	C	E	E	D	E
54		Conkling Street at O'Donnell Street	D	D	F	F	F	F	F	F
55		O'Donnell Street at Boh'Donnell (New Boston)	N/A [2]	N/A [2]	E	D	D	D	D	D
56		O'Donnell Street at Interstate Avenue	C	C	E	C	D	C	D	B
57		O'Donnell Street at I-895 SB Ramp	B	B	C	C	B	A	B	B
58		Bayview Boulevard at Alpha Commons Transitway	N/A [2]	N/A [2]	N/A [2]	N/A [2]	B [4]	C [4]	A	A
59		Bayview Boulevard at Cassell Drive	N/A [2]	N/A [2]	N/A [2]	N/A [2]	C [4]	D [4]	A	C
60		Bayview Boulevard at Lombard Street	C	C	E	F	F[4]	F [4]	D	C
		Total – LOS E OR F	5	10	19	26	14	25	6	19

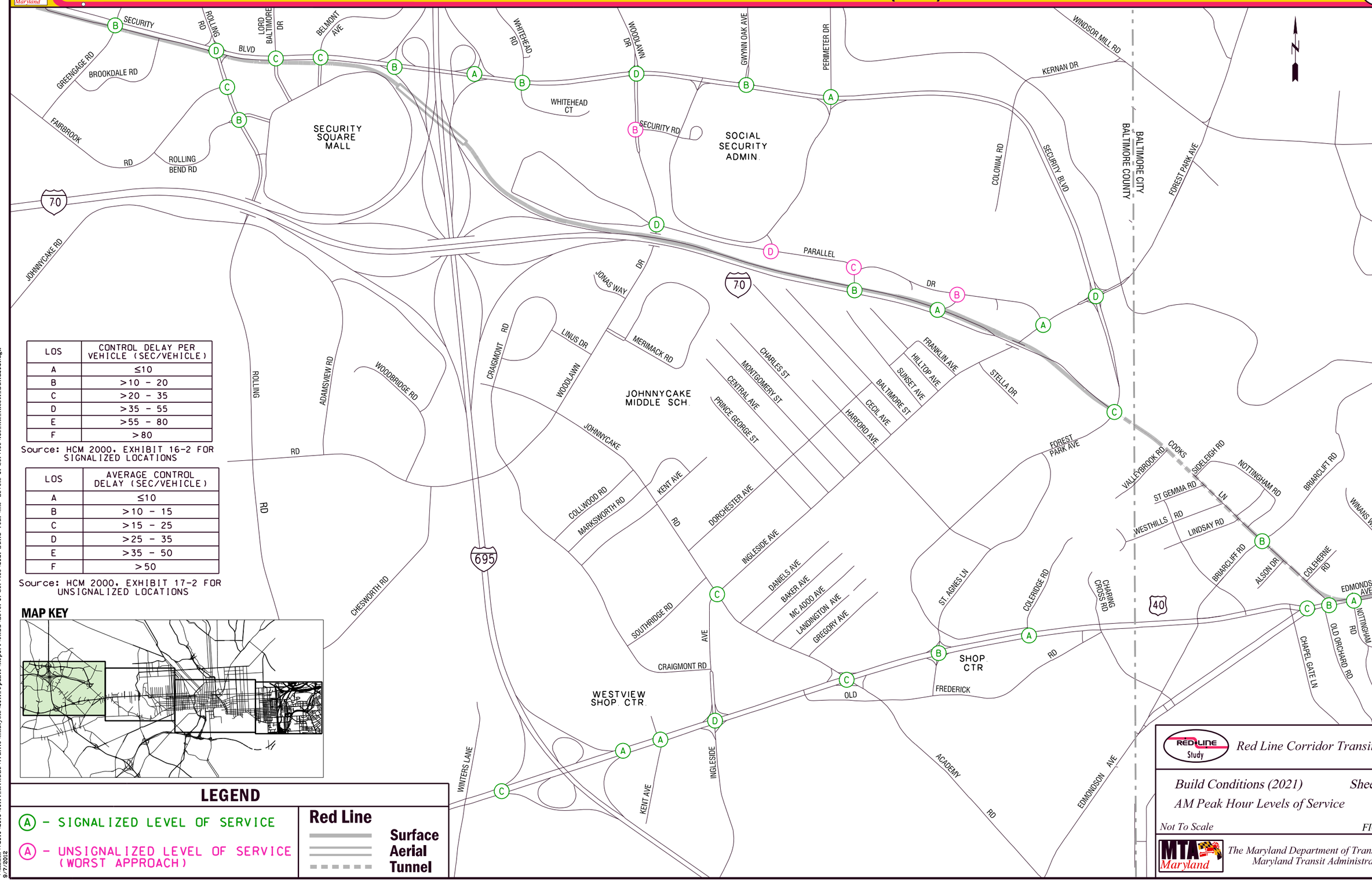
Notes: [1]Unsignalized in Existing conditions; [2]Intersection does not exist today; [3]New intersection layout; [4]Modeled in VISSIM for LRT preemption

No.	Section No.	Unsignalized Intersections	Existing		No-Build		Build		Opening Year	
			AM	PM	AM	PM	AM	PM	AM	PM
1	Section 1	Security Boulevard at Greengage Rd	E	D	D	E	B[1]	C[1]	B[1]	B[1]
2		Woodlawn Drive at Security Rd	B	D	B	E	B	E	B	F
3		Parallel Drive at SSA Access	B	F	C	F	F	F	D	F
4	Section 3	Edmondson Avenue at Denison St	F	F	F	F	A[1]	B[1]	A[1]	A[1]
5		US 40 (Mulberry Street) at Smallwood Street	F	F	F	F	A[1]	B[1]	A[1]	B[1]
6	Section 5	Boston Street at Leakin Street	D	F	F	F	F	F	F	D
7		Boston Street at Kenwood Avenue	D	C	F	F	D[1]	D[1]	N/A [2]	
8		Boston Street at East Avenue	A	B	F	D	C[1]	C[1]	B[1]	C[1]
9		Boston Street at Bayliss Street	C	B	F	B	B	B	B	A
10		Conkling Street at Toone St	C	C	F	C	F	C	B	B
11		Bayview Boulevard at Alpha Commons Dr	B	B	F	F	N/A [3]		N/A [3]	
		Total – LOS E OR F	3	4	8	8	3	3	1	2

Notes: [1]Signalized Intersection with LOS D or better; [2]Signalized Intersection LOS E or F; [3]Intersection does not exist in Build Conditions Formatting: No-Build and Opening Year conditions were compared to Existing conditions. Build conditions were compared to No-Build conditions. Red – LOS worsens; Green – LOS improves; Black – No change in LOS; Bold text – LOS E or F

Source: MTA, 2011-2012

AM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2021)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

MAP KEY

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line
Surface
Aerial
Tunnel

Match Line - See Sheet 2

Red Line Corridor Transit Study

Build Conditions (2021) Sheet 1 of 4

AM Peak Hour Levels of Service

Not To Scale FIGURE 75

The Maryland Department of Transportation
Maryland Transit Administration

\\Rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2021 Build Year\AM Levels of Service\los_AM_inset1_Build2021.dgn
9/7/2012

FIGURE 75 - Build Conditions (2021) Levels of Service - AM Peak Hour

AM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2021)

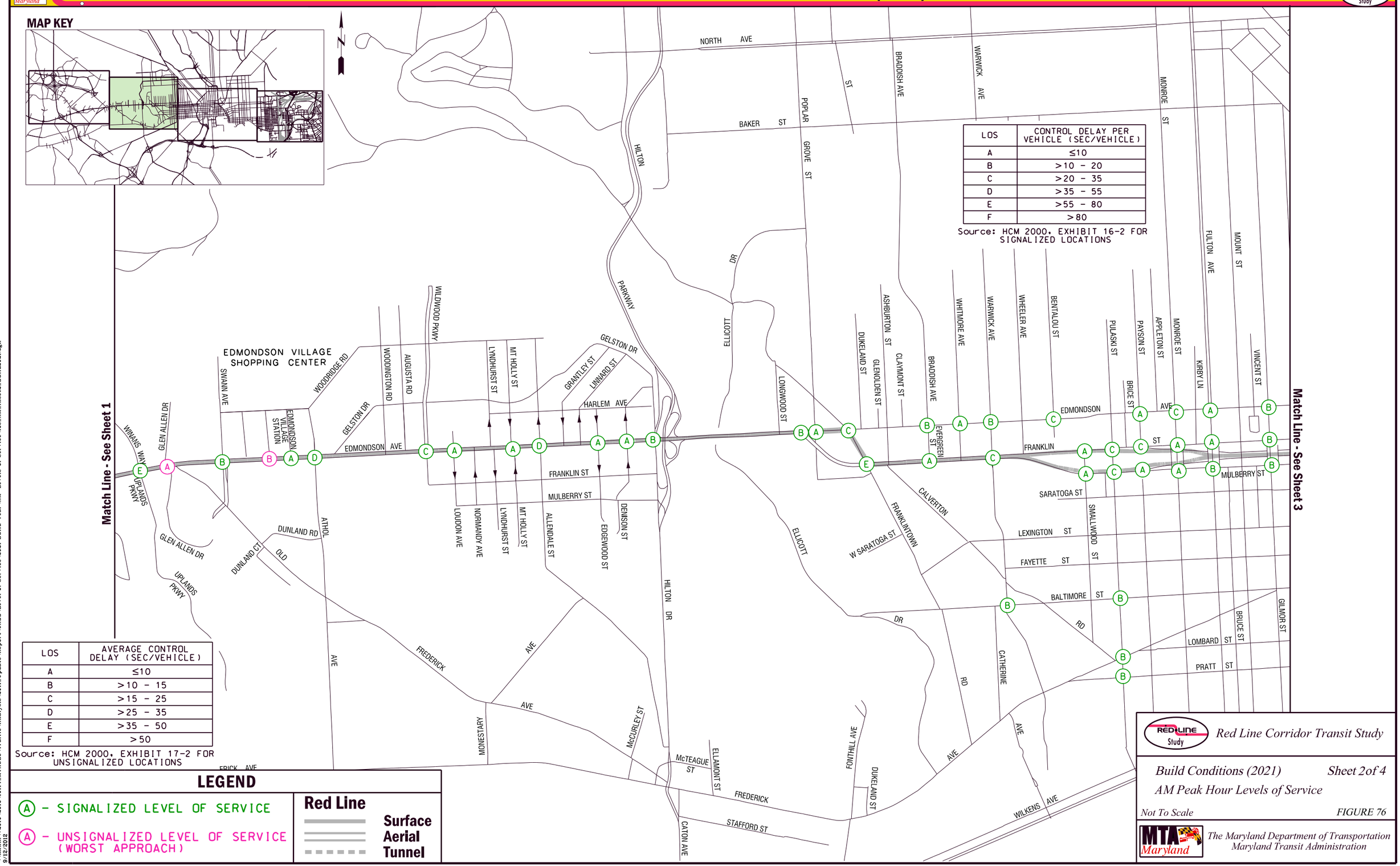


FIGURE 76 - Build Conditions (2021) Levels of Service - AM Peak Hour

AM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2021)

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

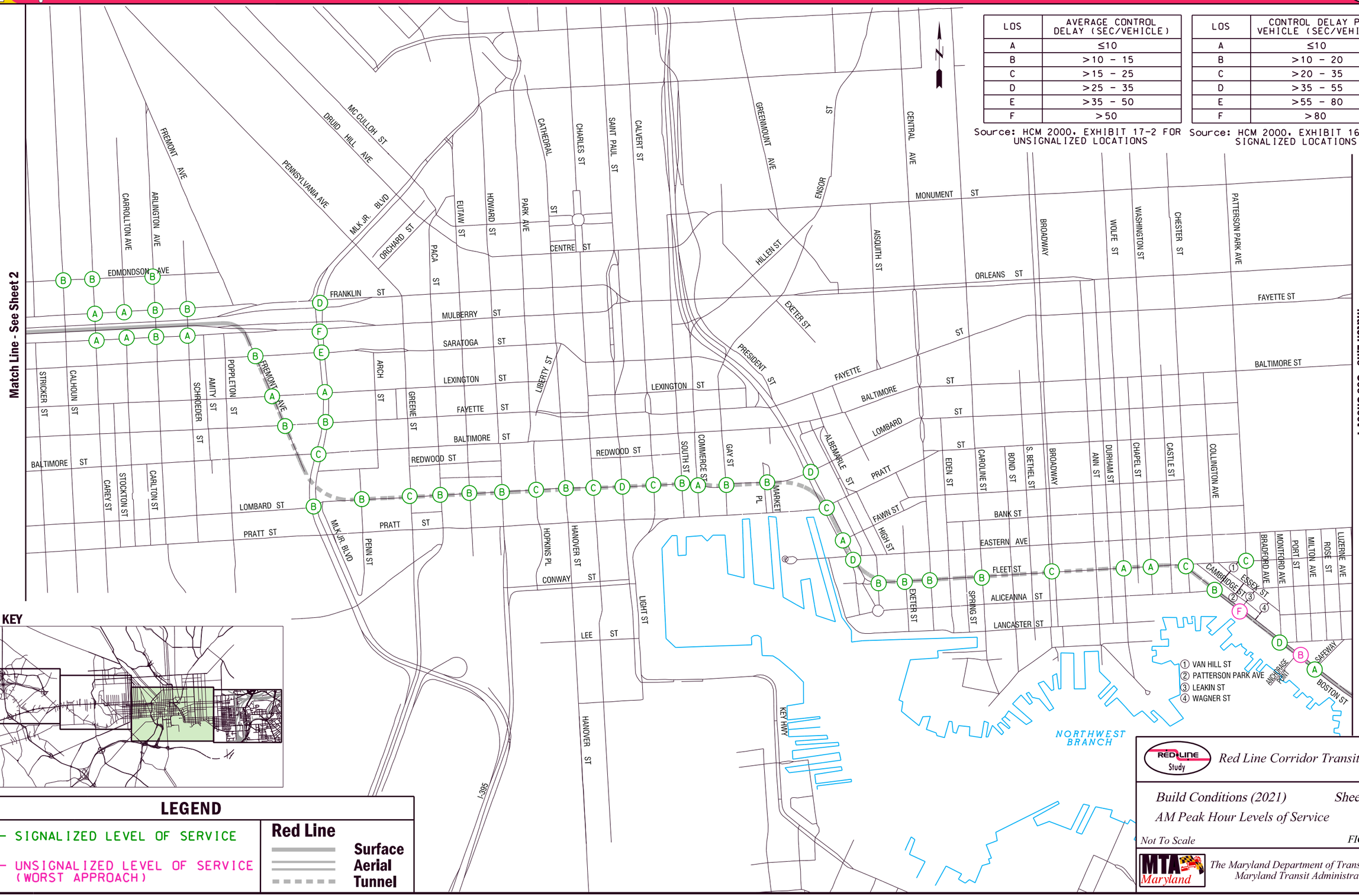
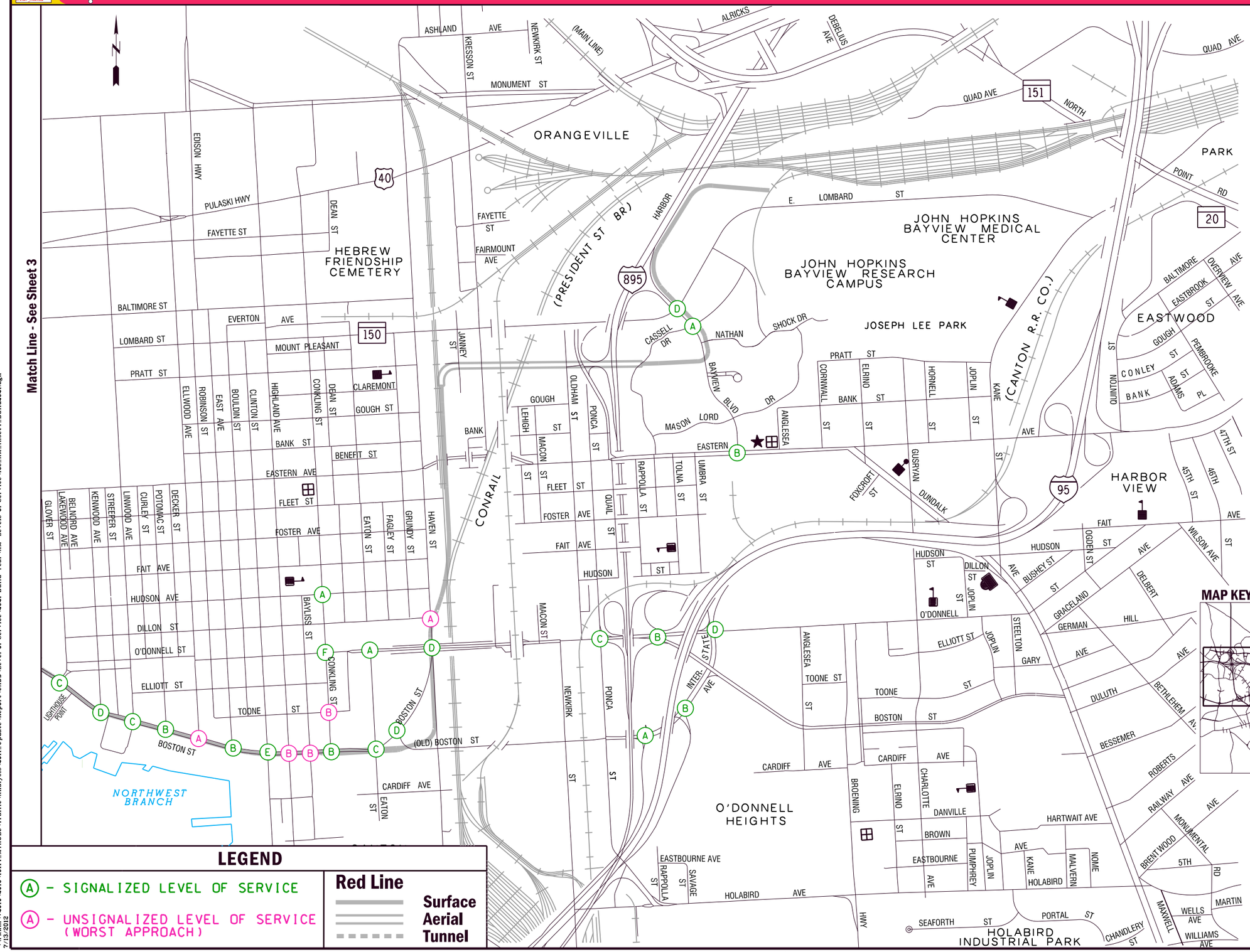


FIGURE 77 - Build Conditions (2021) Levels of Service - AM Peak Hour

AM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2021)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

Red Line Corridor Transit Study

Build Conditions (2021) — Sheet 4 of 4

AM Peak Hour Levels of Service

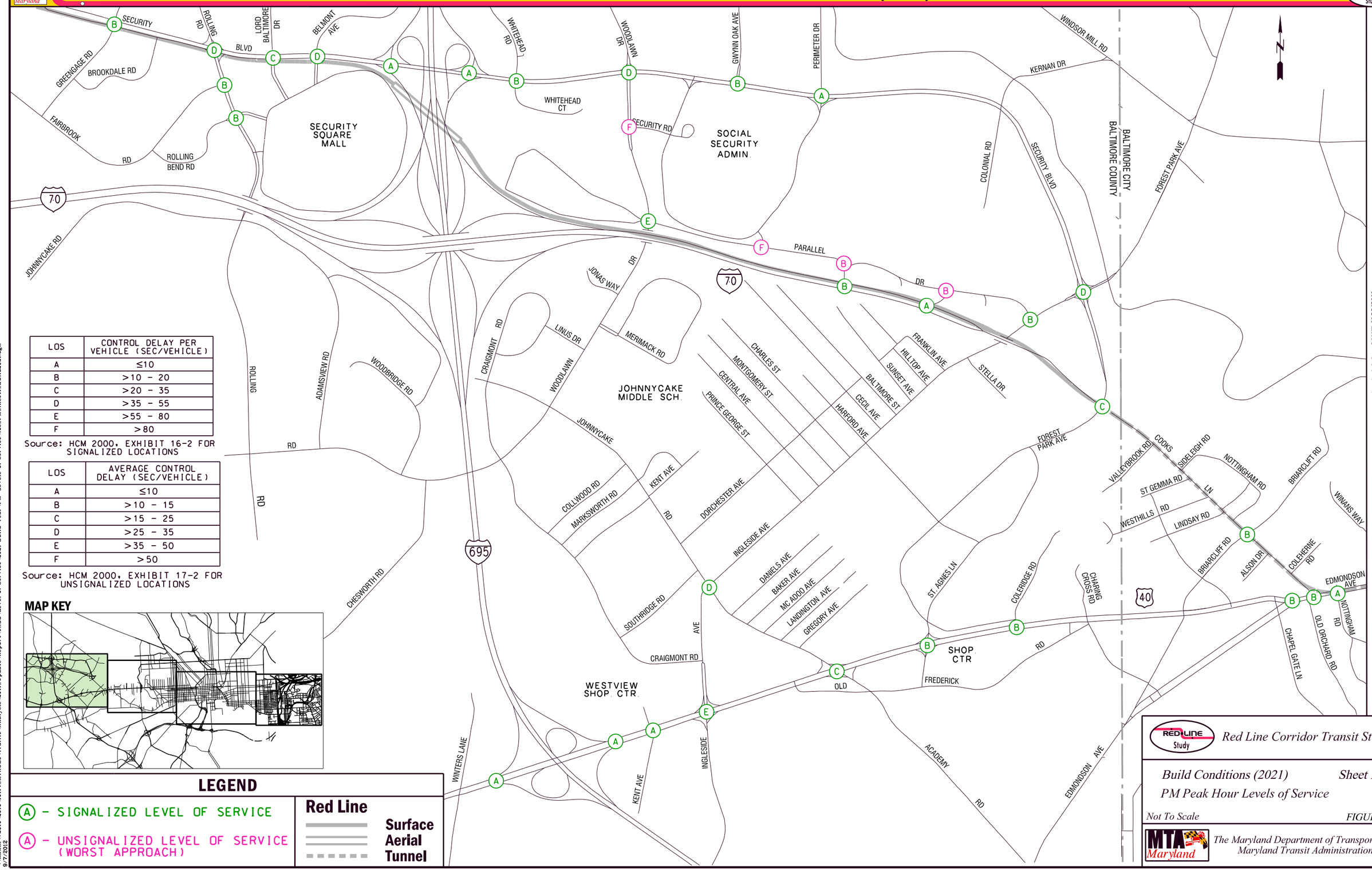
Not To Scale — FIGURE 78

The Maryland Department of Transportation
Maryland Transit Administration

\\rkkm\v2010\10114_MTAGEC\Traffic Analysis\2011_Update\Report\CADD\Level of Service\2021 Build Year\AM Levels of Service\los_AM_inset4_Build2021.dgn
7/13/2012

FIGURE 78 - Build Conditions (2021) Levels of Service - AM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2021)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

MAP KEY

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface
Aerial
Tunnel

Red Line Corridor Transit Study

Build Conditions (2021) *Sheet 1 of 4*

PM Peak Hour Levels of Service

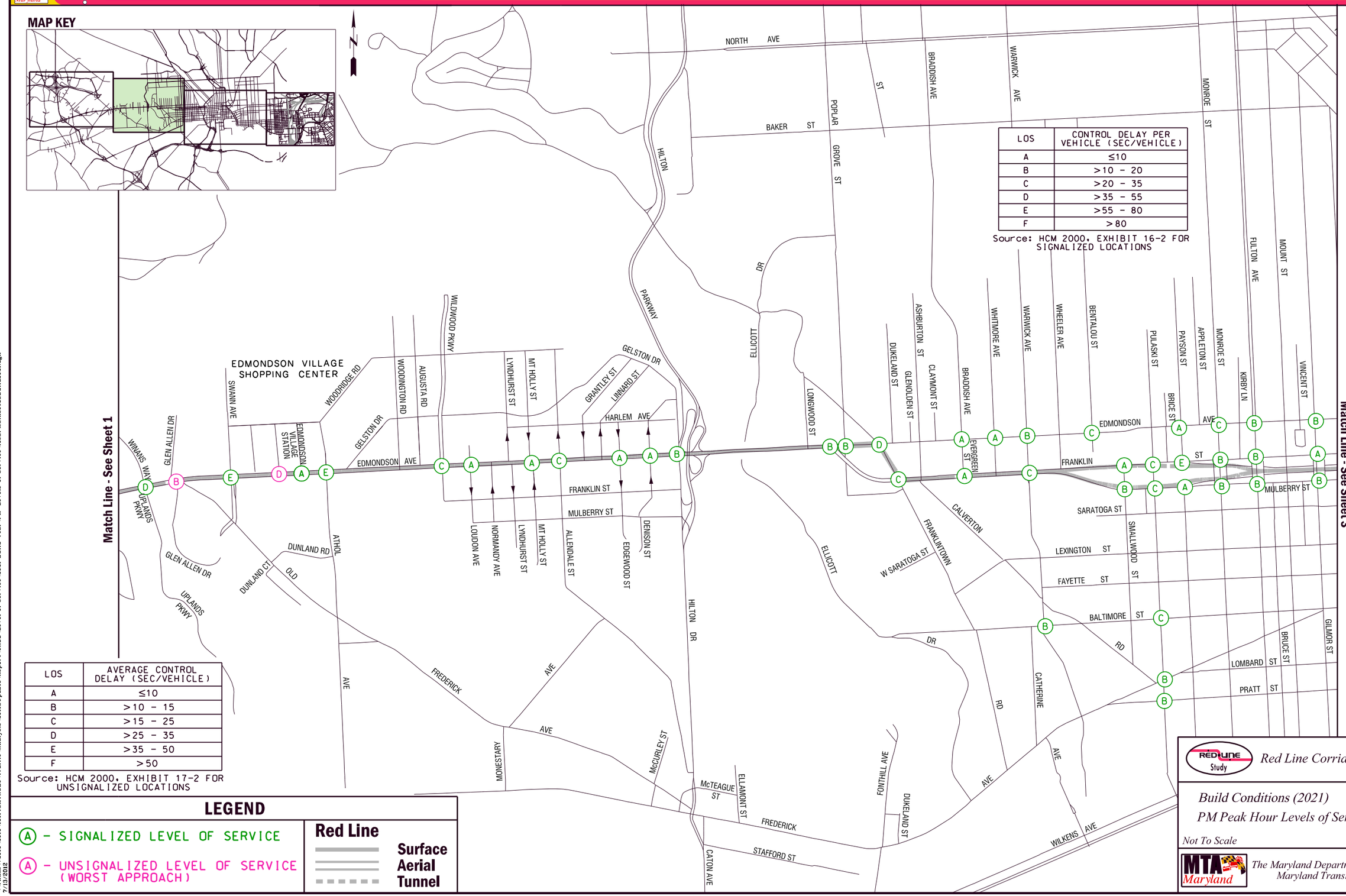
Not To Scale *FIGURE 79*

The Maryland Department of Transportation
Maryland Transit Administration

\\Rkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2021 Build Year\PM Levels of Service\los_PM_inset1_Build2021.dgn
9/7/2012

FIGURE 79 Build Conditions (2021) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2021)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LEGEND

(A) - SIGNALIZED LEVEL OF SERVICE

(A) - UNSIGNALIZED LEVEL OF SERVICE (WORST APPROACH)

Red Line

Surface
Aerial
Tunnel

Red Line Corridor Transit Study

Build Conditions (2021) — Sheet 2 of 4

PM Peak Hour Levels of Service

Not To Scale — FIGURE 80

The Maryland Department of Transportation
Maryland Transit Administration

\\rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2021 Build Year\PM Levels of Service\los_PM_inset2_Build.dgn
7/13/2012

FIGURE 80 Build Conditions (2021) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2021)

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

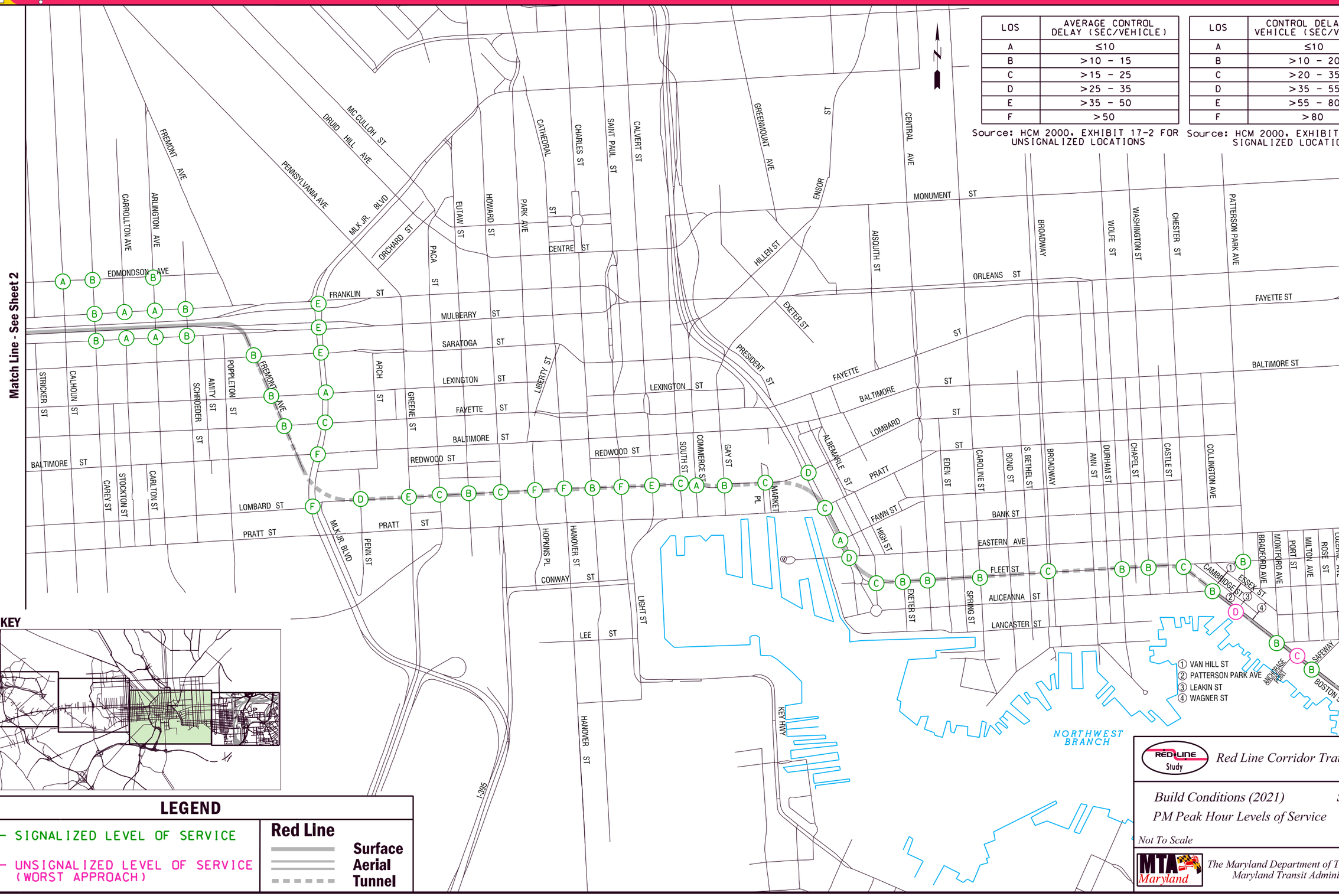
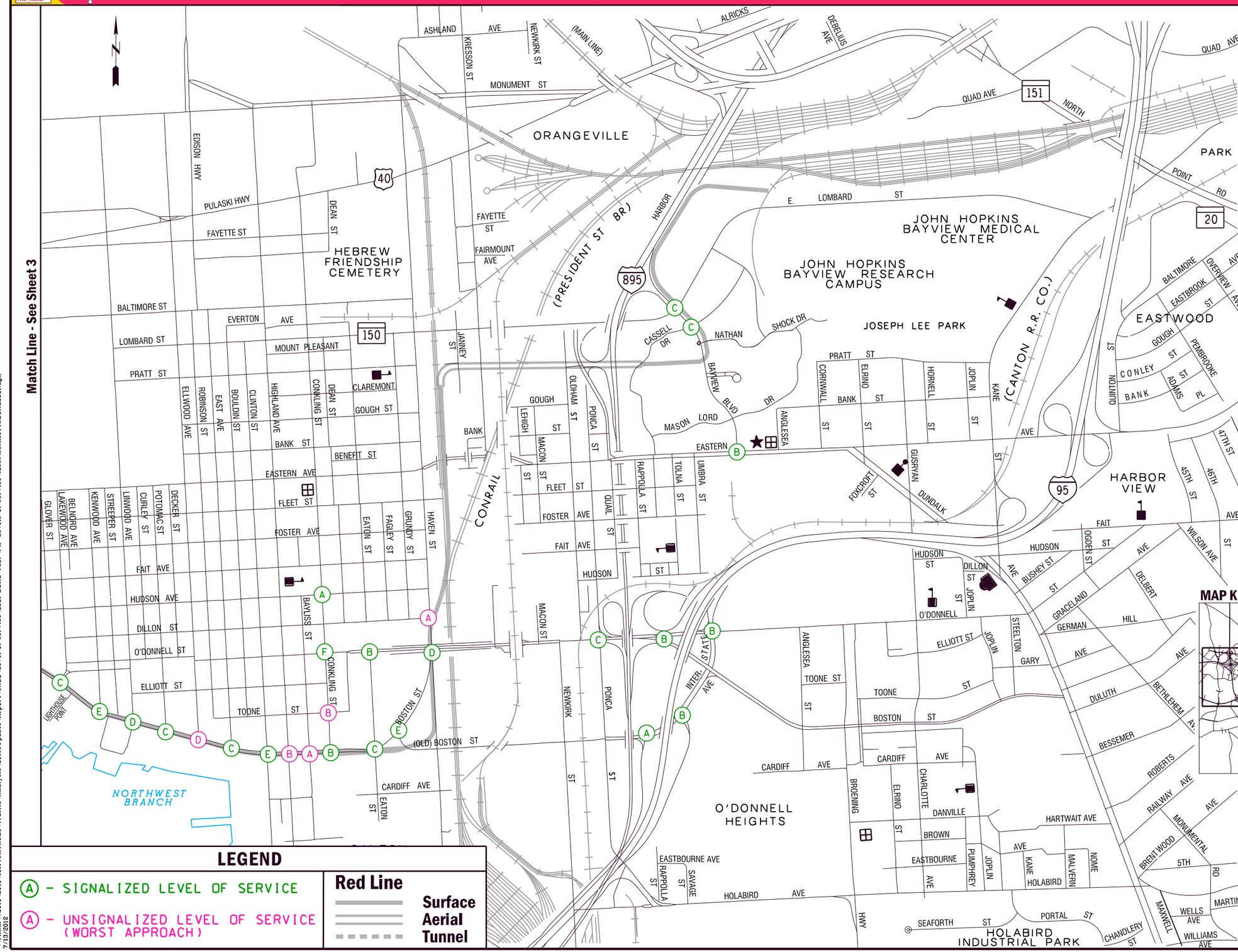


FIGURE 81 Build Conditions (2021) Levels of Service - PM Peak Hour

PM PEAK HOUR LEVELS OF SERVICE - BUILD CONDITIONS (2021)



LOS	CONTROL DELAY PER VEHICLE (SEC/VEHICLE)
A	≤10
B	>10 - 20
C	>20 - 35
D	>35 - 55
E	>55 - 80
F	>80

Source: HCM 2000, EXHIBIT 16-2 FOR SIGNALIZED LOCATIONS

LOS	AVERAGE CONTROL DELAY (SEC/VEHICLE)
A	≤10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: HCM 2000, EXHIBIT 17-2 FOR UNSIGNALIZED LOCATIONS

Red Line Corridor Transit Study

Build Conditions (2021) — Sheet 4 of 4

PM Peak Hour Levels of Service

Not To Scale — FIGURE 82

The Maryland Department of Transportation
Maryland Transit Administration

\\rkkm\v2010\2010\0114_MTACBC\Traffic\Analysis\2011_Update\Report\CADD\Level of Service\2021 Build Year\PM Levels of Service\los_PM_inset4_Build2021.dgn
7/13/2012

FIGURE 82 Build Conditions (2021) Levels of Service - PM Peak Hour

6. Construction Impacts

Because of the magnitude of this project and the urban context in which the construction would take place, there are several modes of transportation that would be affected during construction. These effects are estimated to occur between 2014 and 2021 at various times and locations in the project study corridor. The following section discusses the anticipated construction impacts and the efforts that would be taken to mitigate these impacts.

6.1 Construction Phasing

Construction of the Preferred Alternative would involve subsurface and at-grade construction along the project study corridor. Construction of the surface-running sections of the Preferred Alternative would be accomplished through construction phases that can be generally outlined as follows:

- Relocation of existing utilities
- Removal of existing surface features within the right-of-way or between the curbs
- Excavation and construction of new subsurface features required for both the LRT system and the adjacent roadway including drainage conduits and various electrical duct banks
- Construction of new track, stations, traction power and roadway facilities
- Installation of all above ground system facilities

Construction of the tunnels, tunnel portals, underground stations and ventilation facilities for the Preferred Alternative would occur in a densely developed urban environment; thus, greater construction sequencing detail would be required to reduce the impacts throughout the duration of the construction of the project. The general construction process and methods likely to be used to construct the tunnel portals, underground stations, and ventilation facilities can be found in FEIS Chapter 3. Impacts for construction of these elements are typically limited to the areas surrounding the tunnel portals and stations.

6.2 Construction Staging

The construction of this project requires the use of several staging areas (also known as “lay down areas”) by the contractor to store equipment and materials and to facilitate the tunnel boring process and other construction activities. Proposed staging areas along the project study corridor have been selected for FEIS analysis purposes in locations that help minimize the impact of materials and equipment intruding into surrounding residential or commercial areas.

For the most part, these staging areas would be confined to areas that do not currently serve vehicle, bicycle or pedestrian traffic. In some cases, however, staging area locations would use existing parking lots and roadway facilities. The final size and location of the construction staging areas would be determined in Final Design and by the construction contractor. Additional construction and staging areas defined by the contractor would be reviewed and approved by the FTA and MTA. Upon completion of work, staging areas would be restored to a condition equal to or better than existing conditions, as appropriate.

Figures showing conceptual locations of staging areas throughout the project study corridor are included in **Appendix B**.

6.3 Haul Routes

Haul routes for construction traffic have been determined for subsurface construction, as the underground work is anticipated to generate the most truck traffic. The following construction activities within the tunnel portal locations and the proposed underground station and ventilation facility locations would require daily truck traffic: delivery of equipment, concrete, tunnel lining segments and removal of excavated spoils (muck). Each haul route was determined based on the shortest path to the Interstate system. In addition, traffic and community impacts were considered when identifying suggested haul routes. Figures in **Appendix C** illustrate the haul routes for the launch/receiving pits for each of the two tunnel sections and for all of the proposed underground stations within the Downtown Tunnel. **Table 24** illustrates the anticipated hourly construction truck volumes for the peak construction year of 2016 for the Cooks Lane tunnel in Section 2 and the Downtown tunnel in Section 4. Trucking would be permitted on Weekdays and Saturdays for 15 hours a day between 7 AM and 10 PM. On Sundays, trucking (light-duty deliveries) would be permitted for 8 hours a day between 8 AM and 4 PM.

Table 24: Haul Route Hourly Volume Summary

Construction Site	Section	Location	Hourly Volumes			
			Haul Trucks		Material Trucks	
			In	Out	In	Out
Western Portal / TBM Launch Pit	2	I-70 Loop Ramp (southwest quadrant of interchange)	6	6	12	12
Eastern Launch Pit / TBM Receiving Pit	2	Edmondson Avenue area of Brookwood Road and the Winans Way/Uplands Parkway intersection	2	2	2	2
Western Portal	4	Median of US Route 40	10	10	20	20
Poppleton Station	4	Northeast corner of Fremont and West Baltimore Streets	4	4	4	4
Howard Street / University Center Station	4	Northeast corner of Lombard and Howard Streets	4	4	4	4
Inner Harbor Station	4	Northeast corner of Lombard and Light Streets	4	4	4	4
Harbor East Station	4	Southeast corner of Fleet and Central Streets	4	4	4	4
Fell’s Point Station	4	Broadway and Fleet Street	4	4	4	4
Eastern Portal	4	Middle of Boston Street between South Montford Avenue / Hudson Street	4	4	4	4

6.4 Effects on Traffic

Construction of the Preferred Alternative would result in temporary short-term impacts to local and regional transportation operations. These impacts could potentially include lane closures, temporary signals, temporary roadway closures, detours, and disruption of traffic during peak and nonpeak times. Potential outcomes of these impacts could result in the temporary intrusion of through traffic into local neighborhoods because of congestion and/or detours, disruption of access by motorized and non-motorized modes to local businesses, and the temporary loss of on-street parking.

There would be additional congestion and delays in areas of street closures, including adjacent parallel streets and cross-streets. Access to local businesses through existing or temporary driveways would be provided where possible; however, there may be some times where access cannot be maintained. Other accommodations would be explored for these locations. In these cases, other accommodations would be arranged with the property owner.

The following section discusses the temporary traffic impacts associated with construction of the Preferred Alternative.

6.4.1 Lane Closures and Turning Movement Restrictions

Lane closures and turn movement restrictions are anticipated throughout the project study corridor during construction, along the following corridors:

- **Security Boulevard:** Lane closures are anticipated throughout the corridor for various construction activities. Lane closures along Security Boulevard would be primarily during off-peak hours. However, certain stages of construction may require lane closures in both peak and off-peak hours for several weeks. Turn bays would be maintained to the extent possible during peak hours.
- **I-695:** Shoulder closures are anticipated on I-695 for the construction of bridge foundations, piers, pier caps and abutments. Lane closures, if needed, would occur during off-peak hours. Short duration, overnight roadway closures are anticipated for erection of steel beams (refer to “Girder Erection” in Section C, Roadway Closures).
- **I-70:** The Preferred Alternative on I-70 would modify existing I-70 from an interstate into a boulevard with a curbed median. During construction, the number of through lanes on I-70 from I-695 to Security Boulevard would be reduced from the existing condition to the ultimate section.
- **Cooks Lane:** Temporary lane closures would be required near the west end of Cooks Lane tunnel for utility relocations. Additionally, temporary lane closures would be required for the reconstruction of the intersection of Cooks Lane, Forest Park Avenue, and Security Boulevard to tie into the relocated I-70.
- **Cooks Lane Tunnel East Portal:** Construction of the cut-and-cover tunnel and retained cut structure would require reducing the number of through lanes on Edmondson Avenue from three lanes to two lanes in each direction. Traffic would be shifted to either side of the road to construct the Receiving Pit where the tunnel boring machine would be extracted from underground. Left turns from Edmondson Avenue and side-street through and left turns would be restricted at Brookwood Road, Winans Way/Uplands Parkway, and Glen Allen Drive.
- **Edmondson Avenue:** Edmondson Avenue would be reduced to its ultimate number of through lanes, from three to two through lanes, for the duration of construction. In general, left-turn movements would be restricted throughout the corridor. Left-turn bays would be provided at key intersections to maintain access to commercial and residential properties.
- **West Franklin Street:** West Franklin Street would be reduced from three lanes to one lane under the Amtrak bridge to accommodate utility relocations for approximately nine months. A signed detour route would be implemented during this lane reduction to direct vehicles to parallel routes, such as Edmondson Avenue. Potential detour routes associated with this lane reduction are shown in **Appendix D**.
- **Lombard Street at Howard Street / University Center Station:** Construction of the station structures and ancillary buildings would require the closure of three lanes and one sidewalk along Lombard Street between Howard Street and Hopkins Place in two distinct phases. Two lanes and one sidewalk would be maintained throughout construction. Temporary closure of Lombard Street during off-peak hours would be required for the installation of temporary decking beams. Two lanes of Lombard Street east of Hopkins Place adjacent to the construction site would also be closed to provide additional staging area for the contractor. Both sidewalks would be maintained in this area.
- **Lombard Street at Inner Harbor Station:** Construction of the station structure and ancillary building would require the closure of three lanes and one sidewalk along Lombard Street between Light Street and Calvert Street in two distinct phases. Three lanes and one sidewalk would be maintained throughout construction. Temporary closure of Lombard Street during off-peak hours would be required for the installation of temporary decking beams. Two lanes of Lombard Street east of Calvert Street adjacent to the construction site would also be closed to provide additional staging area for the contractor. Both sidewalks would be maintained in this area.
- **Fleet Street at Harbor East Station:** Construction of the station structure and ancillary building would require the closure of two lanes and one sidewalk along Fleet Street between Central Avenue and Spring Street in two distinct phases. Two lanes and one sidewalk would be maintained throughout construction. Temporary closure of Fleet Street during off-peak hours would be required for the installation of temporary decking beams. South Eden Street, both north and south of Fleet Street would be closed at Fleet Street and operate as “dead end” streets for the duration of station construction.
- **Fleet Street at Fell’s Point Station:** Construction of the station structure and ancillary building would require the closure of two lanes and one sidewalk along Fleet Street between Bethel Street and Broadway Street in two distinct phases. Two lanes and one sidewalk would be maintained throughout construction. Temporary closure of Fleet Street during off-peak hours would be required for the installation of temporary decking beams. The median of Broadway north of Fleet Street would be closed for the duration of station construction to facilitate the station entrance construction and a staging area for the contractor. The intersection of Fleet

Street and Broadway would be staged in multiple construction phases in order to install the temporary decking system. One lane of traffic would be maintained on both southbound and northbound Broadway during construction.

- **Downtown Tunnel East Portal:** Construction of the cut-and-cover and retained cut structure would require a significant amount of space for construction activities. Options would be explored for maintaining one lane of traffic in each direction on Boston Street through construction of a temporary roadway in the area directly south of the cut-and-cover section (from west of Montford to east of Hudson); however, a complete roadway closure in this area may be required (refer to Section C, Roadway Closures for more details). It is anticipated that two lanes of traffic, one in each direction, would be maintained in the retained cut section to the east of the cut-and-cover section. Turn movements would be restricted in these areas. Options to provide access to local residences and businesses would be explored.
- **Boston Street:** Boston Street would be reduced to its ultimate number of through traffic lanes, from two lanes to one lane, throughout the duration of construction. In general, left-turn movements would be restricted throughout the corridor. Left-turn bays would be provided at key intersections to maintain access to commercial and residential properties.
- **Haven Street:** Haven Street would operate in a reversible, one-lane configuration during several stages of construction for grade crossing construction. A temporary traffic signal would be used to control traffic. During this configuration, Dillon Street would be closed at Haven Street and traffic detoured to the local traffic network.
- **Eastern Avenue:** In order to rehabilitate the existing railroad bridge over Eastern Avenue, it would be necessary to combine traffic on a single side of divided Eastern Avenue. Lane closures would also be required to construct the plaza and bus stops at the intersection with Haven Street. There are no existing bus stops at this location, so bus traffic would be handled with general traffic. Pedestrian traffic would need to be maintained carefully to keep access to both sidewalks through the depressed section of Eastern Avenue.
- **I-895:** Shoulder closures are anticipated on I-895 for the construction of bridge foundations, piers, pier caps and abutments. Lane closures, if needed, would occur during off-peak hours. Short duration, overnight roadway closures are anticipated for erection of steel beams (refer to "Girder Erection" in Section C, Roadway Closures).
- **Bayview Boulevard:** Off-peak lane closures are anticipated for construction of the Preferred Alternative along Bayview Boulevard.

Some drivers may use diversion routes to avoid congestion because of lane closures and turn movement restrictions. The anticipated diversion routes which are expected to capture overflow traffic from congested work zones are identified in **Table 25.**

A comprehensive list of anticipated lane closures in the project study area during peak periods is included in **Table 26**. In addition to the lane closures listed in this table, temporary off-peak lane closures may be needed for some work activities.

Table 25: Potential Diversion Routes

Work Zone	Diversion Routes (not detour routes)
Edmondson Ave (west of Hilton Pkwy)	▪ Frederick Ave
Franklin St (east of Hilton Pkwy)	▪ Edmondson Ave ▪ Baltimore St ▪ Pratt St
US 40 (grade-separated section)	▪ Franklin St (WB) ▪ Mulberry St (EB)
Lombard St	▪ Fayette St
Boston St	▪ Eastern Ave ▪ Fleet St ▪ O'Donnell St

6.4.2 Grade Crossing Construction

Maintenance of traffic plans would address the construction of grade crossings. It is anticipated that minor intersections would be closed for approximately two weeks for grade crossing construction. These closures would restrict turn movements from the mainline and turn and through movements on the side streets. Consideration would be given to longitudinal staging of work such that adjacent intersections are not closed during the same time period. Traffic would be detoured to appropriate alternate routes on the local street network during these closures.

Major intersections, such as Rolling Road at Security Boulevard, Boston Street at Future Old Boston Street and Lombard Street at Bayview Boulevard, would not be closed during grade crossing construction because of the potential for significant traffic disruption at these locations and lack of sufficient alternate routes. Grade crossing construction would be phased at these intersections using temporary lane closures. Lane closures may occur during peak and off-peak hours for grade crossing construction at major intersections.

Construction of the grade crossing at Nathan Shock Drive would be extensively coordinated with Johns Hopkins since it is the primary access to the Emergency Room for ambulances. Alternatives would be explored to maintain access to the Emergency Room, including the construction of a temporary roadway.

Table 26: Construction-Related Traffic Impacts

Street Segment								Effects			
Location Code	On	From	To	Existing Number of Lanes		Number of Lanes During Construction		Turn Movement Restrictions	Loss of Off-Street Parking	Loss of On-Street Parking Spaces	Sidewalk Impacts
				EB/NB	WB/SB	EB/NB	WB/SB				
Section 1											
1	Security Blvd	CMS Entrance	Brookdale Rd	2	2	1	2 [B]	No [A]	None	N/A	South side
2	Security Blvd	Brookdale Rd	Rolling Rd	2	2	2	2 [B]	No [A]	67	N/A	North and South sides
3	Security Blvd	Rolling Rd	Lord Baltimore Drive	3	3	2	3 [B]	No [A]	23	N/A	South side
4	Security Blvd	Lord Baltimore Drive	Belmont Ave	3	3	3	3 [B]	No [A]	244	N/A	South side
5	I-695	Security Blvd	I-70	3	3	3	3	No	26	N/A	N/A
6	I-70	I-695	Security Blvd/Cooks Ln	3	3	3 [C]	3 [C]	No	386	N/A	N/A
7	Parallel Drive	Woodlawn Drive	West of Perimeter Drive	1	2	1	2	No	None	N/A	No Impacts
8	Parallel Drive	West of Perimeter Drive	Ingleside Ave	2	1	2	1	No	None	N/A	North side
9	Ingleside Ave	I-70	Security Blvd	2	2	2	2	No	None	N/A	West side
10	Security Blvd	Forest Park Ave	Cooks Ln	1	1	1	1	No	None	N/A	N/A
Section 2											
11	Security Blvd	I-70	Forest Park Ave	2	2	2	2	No	N/A	0	N/A
12	Cooks Lane	Forest Park Ave	Edmondson Ave	1	1	1	1	No	N/A	0	No Impacts
13	US 40 (Edmondson Ave)	Cooks Ln	East of Glenn Allen Drive	3	3	2	2	Yes	N/A	47	North and South sides
Section 3											
14	US 40 (Edmondson Ave)	East of Glenn Allen Drive	Franklintown Road	3	3	2	2	Yes	None	340	North and South sides
15	Franklintown Road	US 40 (Edmondson Ave)	US 40 (Franklin Street)	1	1	1	1	Yes	45	5	West and East sides
16	Franklintown Road	US 40 (Franklin Street)	Saratoga Street	1	1	1	1	No	None	22	No Impacts
17	US 40 (Franklin St)	Franklintown Rd	Warwick Ave	3	3	2	2	Yes	None	N/A	North and South sides
18	WB US 40 (Franklin St)	Warwick Ave	Pulaski St	-	3	-	2	No	27	46	North and South sides
19	Edmondson Avenue	Bentalou St	Fulton Ave	1	1	1	1	No	None	108	No Impacts
20	WB US 40 (expressway corridor)	Pulaski St	N. Mount St	-	2	-	2	No	None	N/A	South side
21	EB US 40 (Mulberry St)	Warwick Ave	Smallwood St	3	-	2	-	No	None	N/A	North and South sides
22	EB US 40 (Mulberry St)	Smallwood St	Payson St	2	-	2	-	No	None	N/A	North side
23	EB US 40 (expressway corridor)	Payson St	N. Mount St	2	-	2	-	No	None	N/A	N/A
24	US 40 (expressway corridor)	N. Mount St	Fremont Ave	3	3	0 [D]	0 [D]	N/A	None	N/A	N/A

[A] In general, existing left and right-turn movements would be maintained during the peak hours on Security Blvd. Some phases of construction may require some turn-lane reductions during peak and off-peak hours for short durations (2-3 weeks)
[B] Short duration (2-3 week) lane reconfigurations may be required on westbound Security Blvd during some phases of construction. In general, westbound lanes on Security Blvd would be maintained in their current configuration.
[C] I-70 would be reduced to its ultimate lane configuration during construction (3 lanes eastbound and westbound between I-695 and Parallel Drive; 1 lane eastbound and 2 lanes westbound between Parallel Drive and the park-and-ride exit; 1 lane in each direction between the park-and-ride exit and Cooks Ln)
[D] Closure of EB US 40 and WB US 40 in the expressway corridor is proposed for portal construction (see Segment 4) for the downtown tunnel (approx. 3 years).

Street Segment								Effects			
Location Code	On	From	To	Existing Number of Lanes		Number of Lanes During Construction		Turn Movement Restrictions	Loss of Off-Street Parking	Loss of On-Street Parking Spaces	Sidewalk Impacts
				EB/NB	WB/SB	EB/NB	WB/SB				
Section 4											
25	US 40 (expressway corridor)	Pulaski St	N. Greene St	3	3	0[E]	0[E]	N/A	None	N/A	N/A
26	Mulberry	Poppleton St	East of Fremont Ave	2	-	0[F]	-	No	None	3	No Impacts
27	Fremont Ave	Mulberry St	Fayette St	1	1	1	1	No	None	13	East and West sides
28	Fremont Ave	Fayette St	Baltimore St	1	1	0[G]	0[G]	Yes	None	14	East and West sides
29	Fayette St	Fremont Ave	MLK Blvd	-	2	-	2	No	None	0	North and South sides
30	Lombard St	Howard St	Hopkins Pl	-	5	-	2	Yes	888	N/A	North and South sides
31	Lombard St	Hopkins Pl	Hanover St	-	5	-	3	Yes	None	N/A	No Impacts
32	Lombard St	Light St	Calvert St	-	6	-	3	Yes	None	N/A	North and South sides
33	Lombard St	Calvert St	South St	-	6	-	3	Yes	None	0	South side
34	Light St	Lombard St	Baltimore St	-	5	-	2	Yes	None	14	West side
35	Fleet St	Exeter St	Caroline St	1	1	1	1	N/A	None	55	North and South sides
36	Fleet St	Bethel St	Broadway	1	1	1	1	N/A	25	29	North and South sides
37	Boston St	West of Montford Ave	Driveway (Starbucks)	2	2	0[H]	0[H]	Yes	None	58	No Impacts
38	Broadway	Fleet St	Eastern Ave	2	2	1	1	Yes	None	24	North and South sides
Section 5											
39	Boston St	West of Montford Ave	Driveway (Starbucks)	2	2	0	0	Yes	None	58	North and South sides
40	Boston St	Safeway Driveway	Conkling St	2	2	1	1	Yes	17	181	North and South sides
41	Boston St[L]	Conkling St	Future Old Boston	2	2	1	1	Yes	None	N/A	N/A
42	Haven St	Future Old Boston	Hudson St	1	1	1[J]	0	Yes	86	5	N/A
43	Dillon St	Grundy St	Haven St	1	1	0[K]	0[K]	N/A	None	0	N/A
44	Eastern Ave	Haven St	Janney St	2	2	2	2	No	None	N/A	No Impacts
45	Alpha Commons Drive	Future Cassell Drive	Bayview Blvd	1	1	0	0	N/A	52	N/A	North and South sides
46	Bayview Blvd	Alpha Commons Drive	Lombard St	2	2	2	2	Yes	52	N/A	East and West sides

[E] Close EB and WB US 40 (expressway corridor) for approx. 3 years during portal construction and tunnel boring operations.
[F] Close EB Mulberry between Poppleton St and east of Fremont St to complete cut-and-cover operations. EB US 40 would remain open during this phase of construction.
[G] Close Fremont Ave between Fayette and Baltimore for approx. 3-4 years.
[H] Potential closure of Boston St from west of Montford to East of Hudson (approx. 12 months). Under the closure scenario, local traffic access only would be provided to the Anchorage Marina. Options for maintaining one lane of traffic in each direction would be explored. It is anticipated that one lane of traffic in each direction would be maintained in the retained cut section from east of Hudson St to immediately east of the Starbucks Driveway Entrance. Turning movements would be restricted.
[J] Haven St would operate in a reversible, one-lane configuration for several stages of construction. Temporary signals would be installed for traffic control.
[K] Dillon St would be closed at Haven Street (~3 months). Local traffic would be able to access Dillon St by taking Hudson to Grundy to Dillon.
[L] Roadway improvements on Boston Street from Baylis Street to Future Old Boston would be constructed under a separate contract.

CONSTRUCTION-RELATED TRAFFIC IMPACTS (2016)

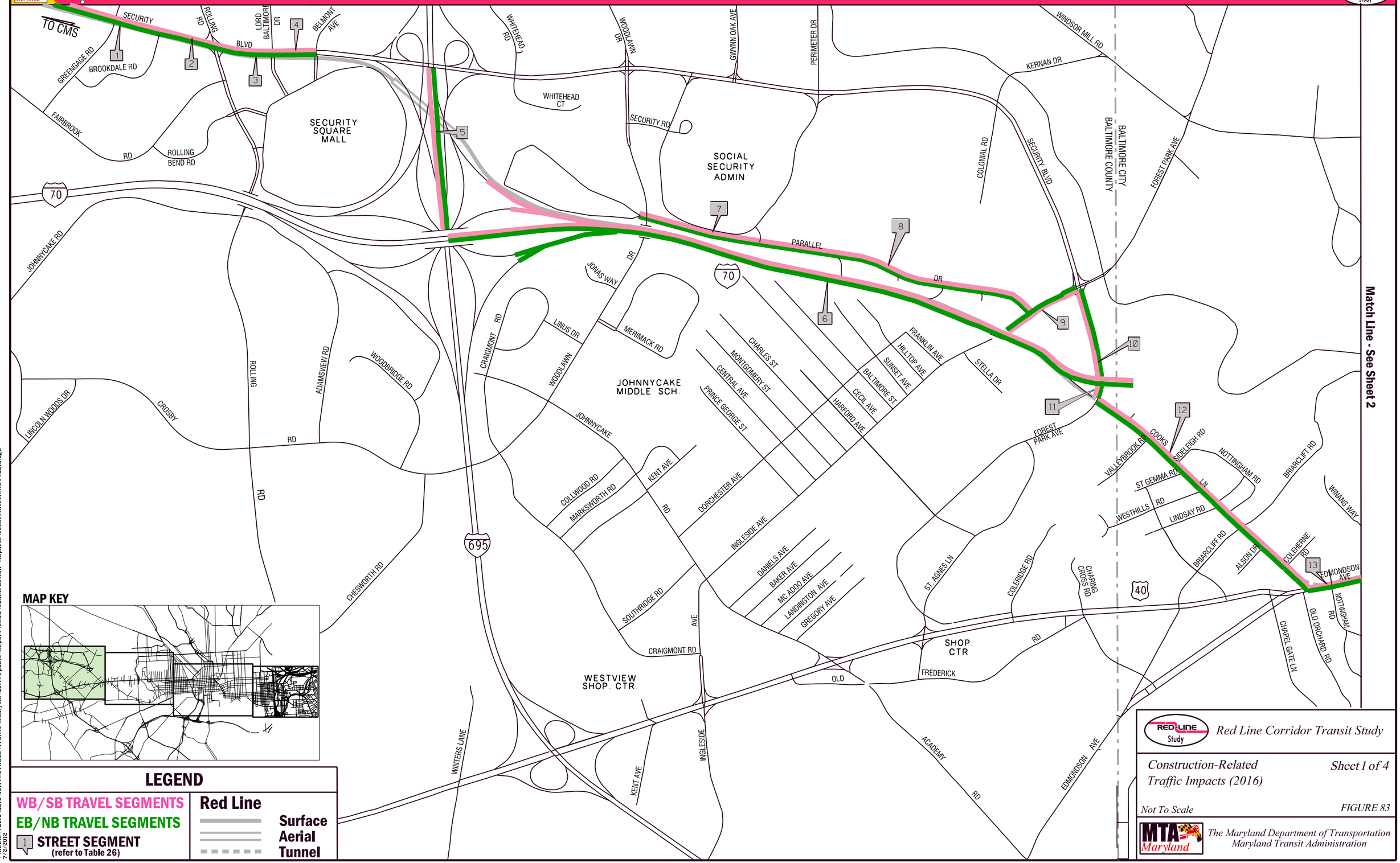


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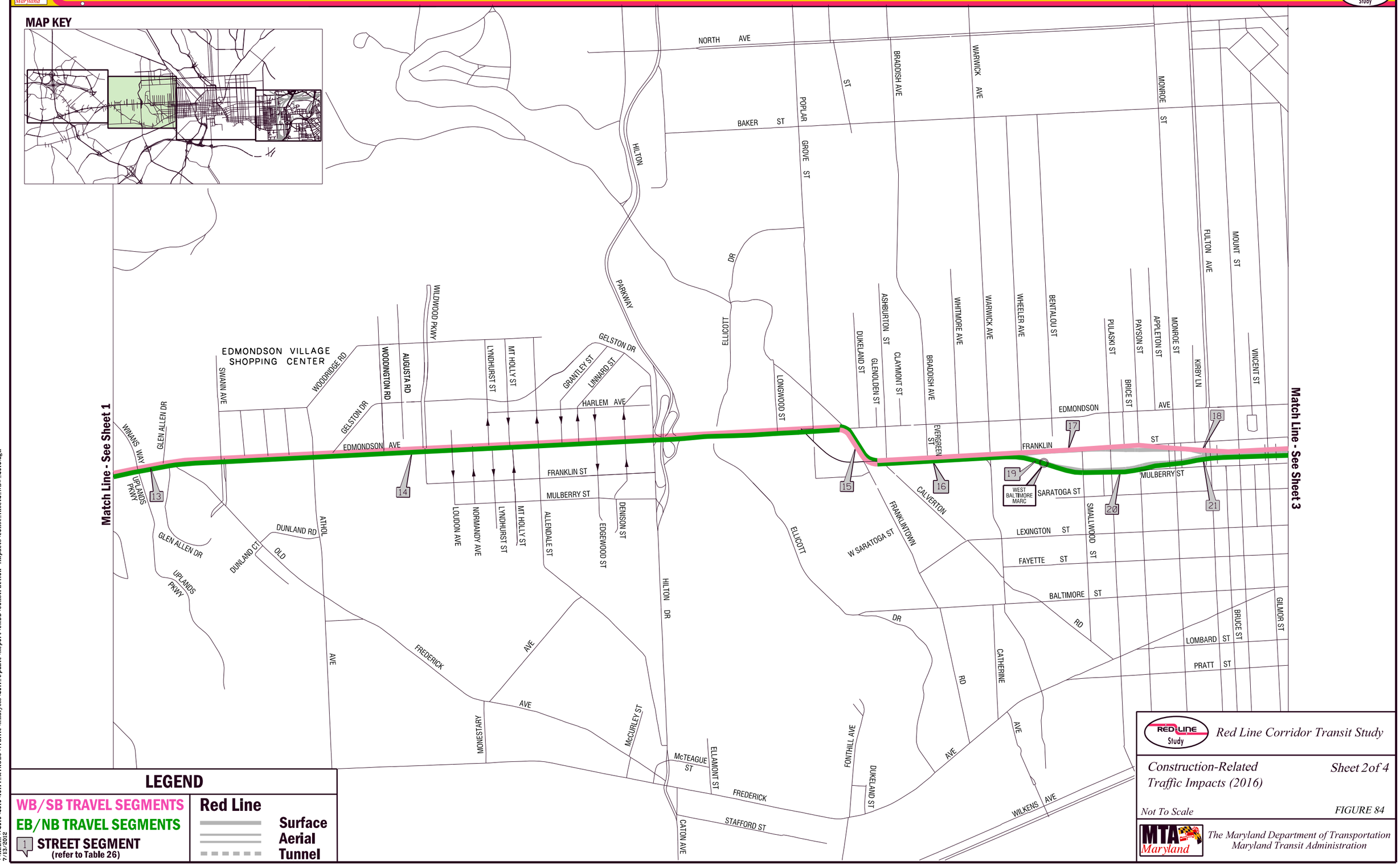
FIGURE 83 - Construction-Related Traffic Impacts (2016)

CONSTRUCTION-RELATED TRAFFIC IMPACTS (2016)



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7/13/2012

FIGURE 84 - Construction-Related Traffic Impacts (2016)

CONSTRUCTION-RELATED TRAFFIC IMPACTS (2016)

MTA Maryland

RED LINE Study

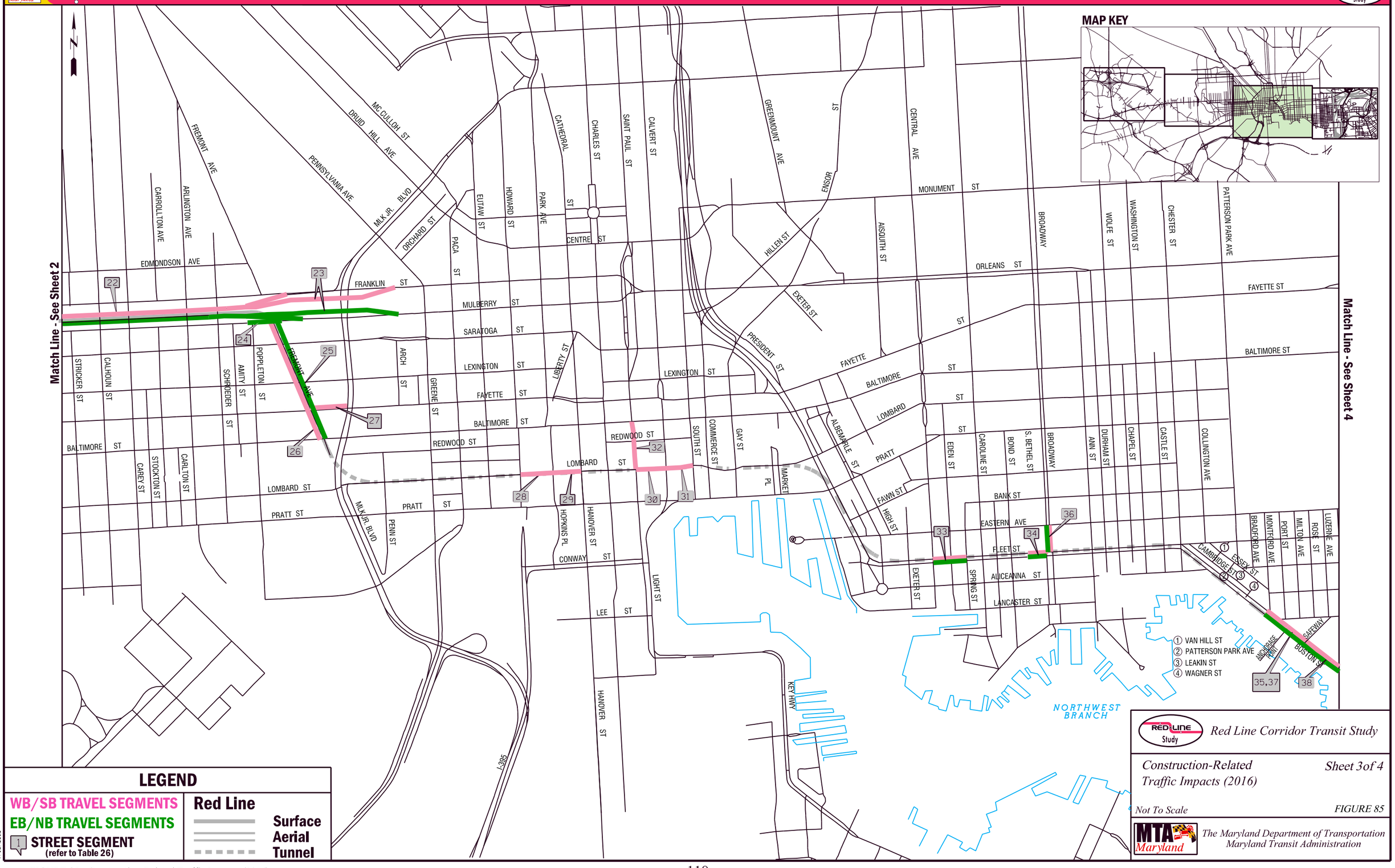

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FIGURE 85 - Construction-Related Traffic Impacts (2016)

CONSTRUCTION-RELATED TRAFFIC IMPACTS (2016)

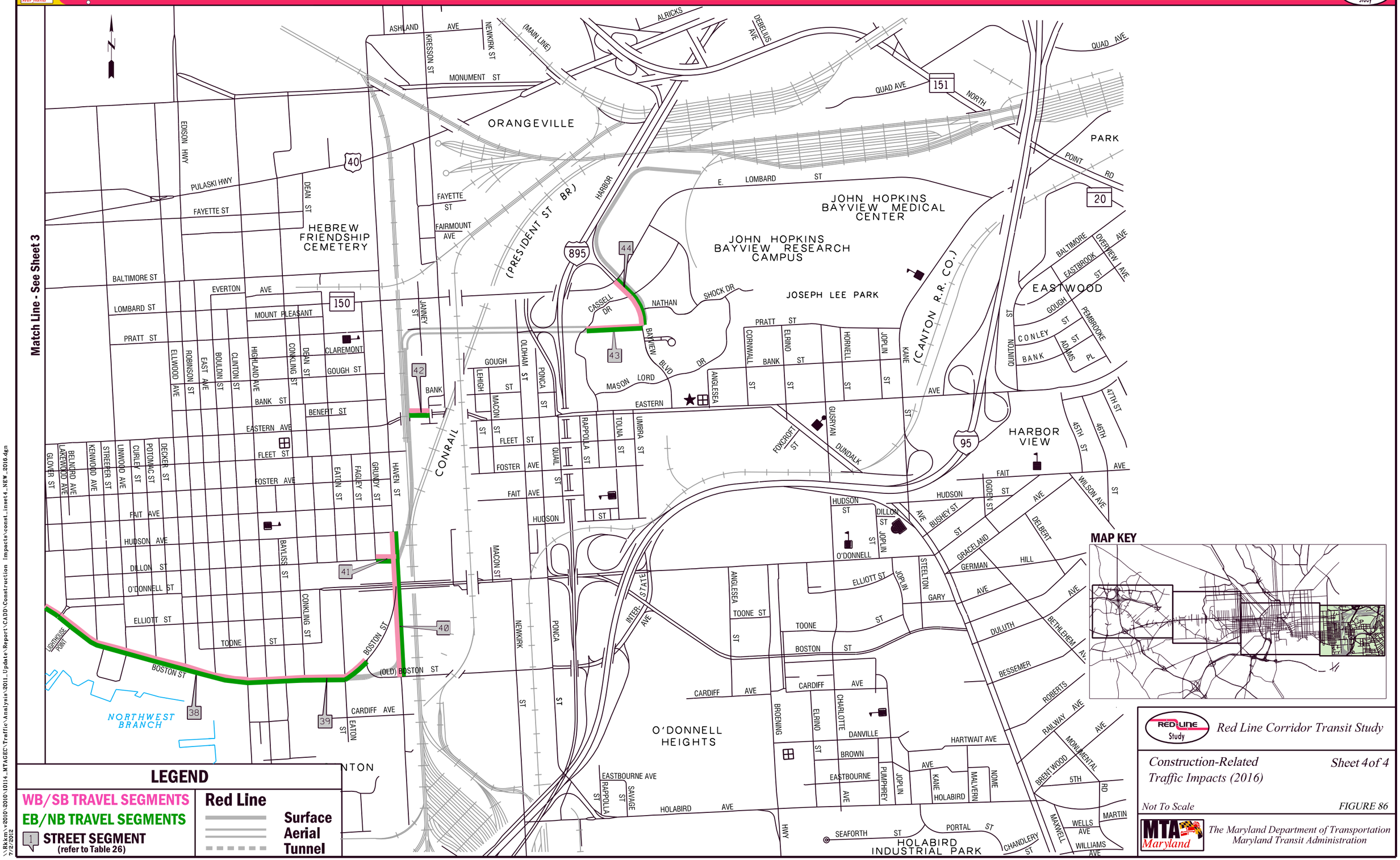

FIGURE 86 - Construction-Related Traffic Impacts (2016)

6.4.3 Roadway Closures

Maintenance of traffic options would be limited in areas where open-cut and cut-and-cover activities are undertaken. Cut-and-cover activities would occur at the tunnel portal, station and ventilation facility areas. Because of limited right-of-way and space requirements for equipment and storage, roadway closures are anticipated at several locations. Additionally, short duration, overnight roadway closures may be required for some construction activities, such as erecting girders. Significant roadway closures are anticipated for construction of the following:

- **Security Boulevard / I-70 / Cooks Lane / Forest Park Avenue Intersection:** A temporary overnight closure is anticipated to shift traffic from the existing intersection to the relocated intersection under the Preferred Alternative. Local traffic would be diverted using the local street network.
- **Cooks Lane Tunnel West Portal:** Construction of the running tunnels by tunnel boring machines and the retained cut structure would require the closure of the loop ramp from southbound Security Boulevard to westbound I-70 throughout the duration of tunnel construction and permanently as this loop ramp would be ultimately removed in the Preferred Alternative.
- **Downtown Tunnel West Portal:** Construction of the cut-and-cover tunnel would require the temporary closure of eastbound Mulberry Street for 10 – 12 months. Through traffic would be diverted to the US 40 Expressway. Local traffic would be diverted using the local street network. Additionally, construction of the running tunnels by tunnel boring machines and the retained cut structure would require the closure of the entire US 40 Expressway. This closure is anticipated to be in place for approximately 3 years. Traffic would be diverted to the one-way pair of Mulberry and Franklin Streets. The closure of Mulberry Street and the US 40 Expressway would not occur concurrently.
- **Poppleton Station:** Construction of the station structure and ancillary building would require the temporary closure of Fremont Avenue between Baltimore Street and Fayette Street. This closure is anticipated to be in place for 3 – 4 years. Local traffic would be diverted using the local street network.
- **Downtown Tunnel East Portal:** Construction of the cut-and-cover tunnel may require the closure of Boston Street from west of the intersection with Montford Avenue to immediately east of the intersection with Hudson Street. This full closure may be necessary because of the transitioning nature of the cut-and-cover tunnel with respect to remaining areas available for travel lanes. If needed, the closure is anticipated to be in place for approximately 1 year. Through traffic would be diverted away using parallel main roadways, such as Eastern Avenue and Fleet Street, with a return to Boston Street via Lakewood Avenue and Kenwood Avenue. Local traffic would be diverted using the local street network. Local access only would be provided through the work area to Anchorage Marina.
- **Alpha Commons Drive**: Alpha Commons Drive would be closed during construction and permanently, as the Preferred Alternative would be placed in Alpha Commons Drive's current location. This concept is included in the on-going master planning process by the campus. Traffic would be shifted to Future Cassell Drive, which is to be constructed by Johns Hopkins.
- **Girder Erection:** For erection or removal of bridge girders, temporary closures of I-695, Security Boulevard, Janney St, Kresson St, CSX Rail, Norfolk Southern Rail, Oldham St, Ponca St, and I-895 would be required. It is anticipated these closures would be short duration and occur over night.
- **Cut-and-Cover Decking System:** The entire width of Lombard Street and Fleet Street would need to be closed for several hours per night over a series of nights at the station locations and on the roadway blocks to either side of the station to install full-length decking beams and a decking system at each station structure.

Long-term detour routes for roadway closures associated with construction of the Preferred Alternative are listed in **Table 27**. Visual representations of these detour routes are shown in **Appendix D**.

Table 27: Long-Term Detour Routes during Construction

Location	Roadway Closure	Closure Span	Potential Detour Routes
Cooks Lane Tunnel West Portal	Loop ramp from SB Security Blvd to WB I-70	Entire Ramp	Security Blvd, left to ramp opposite N Forest Park Ave
Downtown Tunnel West Portal	Mulberry Street (EB)	Poppleton St to East of Fremont Ave	▪ US 40 Expressway (EB) ▪ Mulberry St to Poppleton St to Saratoga St to Fremont Ave or Martin Luther King Blvd
Downtown Tunnel West Portal	US 40 Expressway (EB and WB)	Pulaski St to N Greene St	▪ Mulberry St (EB) ▪ Franklin St (WB)
Poppleton Station	Fremont Ave	Fayette St to Baltimore St	▪ Fayette St to Poppleton St to Baltimore St ▪ Baltimore St to Martin Luther King Jr. Blvd to Fayette St ▪ Local access on Fairmount Ave and driveways
Downtown Tunnel East Portal	Boston St	West of Montford Ave to East of Hudson Street	▪ Eastern Ave/Fleet Street to Lakewood Avenue ▪ Kenwood Street to Eastern Ave/Fleet Street ▪ To points further east: Eastern Ave/Fleet St to Conkling Street to O'Donnell St or Boston Street ▪ Mainline left turns maintained during all but short-duration closures at the following intersections: ◦ WB (U-turn) Boston Street at Lakewood Avenue ◦ EB Boston Street at Kenwood Street ◦ WB Boston Street at Kenwood Street ◦ WB Boston Street at Clinton Street ◦ EB Boston Street at Conkling Street ▪ Local access only provided through work area to Anchorage Marina

Location	Roadway Closure	Closure Span	Potential Detour Routes
Dillon St Grade Crossing	Dillon St at Haven St	Gundy St to Haven St	Hudson Street to Gundy Street
Alpha Commons Drive	Alpha Commons Drive	Entire Road	Future Cassell Drive (to be constructed by others)

In addition other minor local roadways would be closed and detoured during construction of the grade crossing through those intersections. These closures would be limited to a few weeks and would be coordinated with the local communities during the development of maintenance of traffic plans and transportation management plans for the project.

6.4.4 Levels of Service

To understand the impacts of the lane reductions and closures during construction, levels of service at key intersections in the project study corridor were calculated for an assumed peak construction year of 2016. The levels of service (LOS), as defined in Chapter 2-Existing Conditions, were calculated using the Synchro/Sims Traffic Version 7.0 software program to report the Highway Capacity Manual (version 2000) level of service results.

Results of the 2035 No-Build traffic operational analysis along the project study corridor and affected diversion routes were reviewed to determine the key intersections to review for the 2016 No-Build and 2016 construction year operational analysis. Additionally, the anticipated construction staging and maintenance of traffic was reviewed to determine potential locations for constrained traffic operations during construction. Constrained operations are defined as any location where fewer through or turn lanes are provided during construction than are provided in the existing condition, and for a significant length of time (i.e. longer than 1 to 2 months). Key intersections were defined as those that may exceed intersection capacity in the No-Build conditions or would be constrained because of construction activities. A total of 66 key intersections were identified as listed in Table A-9 in Appendix A.

Operational analyses of the key intersections along the corridor were performed with the 2016 Construction Year traffic forecasts to test the locations with and without constrained operations. To perform the constrained analysis, it was necessary to manually reroute traffic at some locations. For example, at locations where turn lanes are removed, traffic was reassigned to adjacent/nearby intersections. A list of turn movement restrictions assumed in the analysis can be found in the summary sheets for each section in **Appendix E**.

Synchro models were developed to estimate both the 2016 No-Build and 2016 construction year conditions. The 2016 No-Build conditions were developed by inputting into the existing models new roadway conditions without construction in the year 2016 including the lane configurations, signal timings and projected traffic volumes. The 2016 Construction year conditions were also modeled by inputting into the models the new roadway conditions during construction, including lane configurations, geometrics, truck percentages increase because of the addition of haul trucks, signal timings and projected traffic volumes. Traffic signal operations from the Existing Conditions were modified at various intersections to improve the traffic operations. Green times and offsets were optimized to regulate the progression of traffic along the coordinated system of signals. Pedestrian phasing and timings were modified to replicate the construction year conditions based on the width of the roadway and pedestrian speeds.

Since the number of trucks is relatively small in relation to the overall traffic on these roadways, the construction truck traffic is not expected to have a significant impact on traffic operations. For the key intersections in the study area, the addition of the construction trucks does not lower the level of service for most intersections. At the intersections which do experience a reduction in level of service, the added delay per vehicle because of the additional construction truck traffic is very small (less than 5 seconds). These locations and delays are as follows:

- Security Blvd. at Forest Park Avenue: From B to C during PM peak hour, 2.3 seconds of delay added.
- MLK Jr. Blvd. at Fayette Street: From B to C during AM peak hour, 2.9 seconds of delay added.
- Boston Street at Potomac Street: From A to B during AM peak hour, 4.3 seconds of delay added.
- Boston Street at East Avenue: From D to E during PM peak hour, 4.0 seconds of delay added.
- Boston Street at Clinton Street: From C to D during AM peak hour, 2.3 seconds of delay added.

Table 28 contains a list of intersections with a level of service E or F during Existing Conditions, 2016 No-Build and Construction Year including haul truck volume. Lombard Street shows the most deterioration in level of service because of the lane closure restrictions associated with the cut-and-cover construction for the station boxes. Because of the detour associated with the closure of Boston Street, the intersection of Eastern Avenue at Patterson Park Avenue and Boston Street at East Street also see deterioration in the level of service. The level of service and intersection delays reported for each key intersection analyzed during the 2016 No-Build and 2016 Construction Year can be found in **Table A-9** in **Appendix A**.

Table 28: 2016 Construction Year Levels Of Service
(For Intersections with Los E or F during Existing Conditions or Construction Year)

No.	Section	Signalized Intersections	Existing		2016 No-Build		2016 Construction	
			AM	PM	AM	PM	AM	PM
1	1	MD 122 (Security Blvd.) at Woodlawn Drive	D	**E**	C	D	C	D
2	1	MD 122 (Security Blvd.) at Ingleside	**E**	**E**	D	**E**	D	**E**
3	2	US 40 at Ingleside Avenue	D	**E**	D	**E**	D	**E**
4	3	US 40 at Swann Avenue	B	B	B	**F**	**A**	C
5	3	W. Mulberry St at Gilmor St	C	B	C	B	**E**	B

No.	Section	Signalized Intersections	Existing		2016 No-Build		2016 Construction	
			AM	PM	AM	PM	AM	PM
6	3	W. Mulberry St at Carey St	B	B	B	B	**E**	B
7	3	W. Mulberry St at Arlington St	A	B	A	B	**F**	A
8	3	W. Mulberry St at Pulaski St	**E**	C	B	B	C	C
9	4	Mulberry St at MLK Blvd	**F**	C	**F**	**E**	**F**	**F**
10	4	MLK Blvd. at Saratoga St	**E**	D	D	D	**F**	**E**
11	4	MLK Blvd at Baltimore St	C	**E**	D	D	D	**F**
12	4	Lombard St at MLK Blvd	C	**E**	B	**F**	C	**F**
13	4	Lombard St at Penn St	B	**E**	B	**E**	B	D
14	4	Lombard St at Greene St	C	C	D	D	C	**F**
15	4	Lombard St at Howard St	C	C	C	**F**	B	**F**
16	4	Lombard St at Hopkins Pl	**F**	**F**	**F**	**F**	**F**	**F**
17	4	Lombard St at Hanover St	B	**E**	C	**F**	B	D
18	4	Lombard St at Light Street	C	**F**	C	**F**	**F**	**F**
19	4	Lombard St at Calvert St	C	C	C	D	C	**F**
20	5	Boston St at Aliceanna St	B	**E**	B	D	C	D
21	5	Boston St at East St	A[1]	B[1]	B[1]	B[1]	B	**E**
22	5	Boston St at Clinton St	D	C	**E**	D	D	D
23	5	Eastern Ave at Patterson Park Ave	C	C	**E**	C	**F**	**E**
24	5	O'Donnell St at Conkling St	D	D	**F**	**F**	**F**	**E**
		Total – LOS E OR F	**5**	**10**	**5**	**11**	**9**	**14**

Notes: [1]Unsignalized Intersection worst approach LOS

6.5 Effects on Public Transportation

Local area transit would be affected by lane closures and restrictions within the construction corridor. Bus routes would generally be maintained but could be temporarily diverted or relocated to provide reliable service near areas where construction activities would take place. A plan would be developed during Final Design for relocating bus routes and stops as needed throughout construction.

Bus stops could also be temporarily relocated, particularly if the street's right lane is closed for construction. If relocation of a bus stop is necessary, the temporary stop would provide adequate access measures for pedestrians. For bus stops maintained in construction areas, pedestrian storage/refuge areas would be provided such that persons waiting for buses are not standing in the road or work area.

6.6 Effects on Parking

Numerous on-street parking spaces are located on roadways that would parallel and intersect the proposed construction corridor. A discussion on existing, no-build and build parking conditions can be found in Chapter 7. There would be no impacts to existing on-street parking areas along the proposed alignment during the construction along Security Boulevard and I-70 or the construction of the Cooks Lane tunnel. All on-street parking along the alignment of the Preferred Alternative would be lost during the construction of the following at-grade sections: Edmondson Avenue, Franklintown Road, Franklin Street, Mulberry Street, Boston Street and Haven Street. All parking in the proposed station and tunnel portal construction areas within the Downtown Tunnel corridor would be eliminated during construction. **Table 26** identifies the locations where on-street parking would be temporarily unavailable at various points along the proposed construction corridor.

The MTA is working collaboratively with the Baltimore City to identify parking mitigation strategies on a block-by-block basis for parking that would be lost along Edmondson Avenue and Boston Street. Additionally, consideration would be given to longitudinal phasing of work along these streets to stagger the parking reductions.

Certain off-street parking areas would also be affected by construction activities. During construction of Section 1, access to the park-and-ride facility at the eastern terminus of I-70 would be maintained until a new park-and-ride facility is constructed. There are several off-street parking lots serving retail uses along the southern side of Security Boulevard between Brookdale Road and Belmont Avenue. It is possible that some off-street parking spaces adjacent to Security Boulevard would temporarily be affected during construction. Additionally, several parking spaces in the SSA surface lot adjacent to the westbound I-70 ramp to northbound I-695 may need to be closed during construction.

In Section 4, the Arena garage and some surface parking would be impacted during construction. The Arena garage, located at the corner of Lombard and Howard streets would be closed during construction of the station at this location, approximately 2 years. In addition, access to the small parking lot adjacent to the Bank of America on the corner of Broadway Street and Fleet Street would be restricted during underground station construction. It is anticipated that the large parking lot adjacent to this Bank of America would be used for construction staging, also resulting in a loss of parking at this location.

In Section 5, there is an 86-space surface parking lot adjacent to Ponca Street and the loop ramp to southbound I-895 that has been identified as a potential construction staging area. This lot would be impacted for a duration of about two years.

There would also be impacts to truck and passenger loading zones during construction of the Preferred Alternative. **Table 29** lists the locations and regulations of existing loading zones that would be eliminated during construction. The location of these loading zones is presented on **Figures 87-90** in Chapter VII, Parking. Mitigation efforts such as loading zone alternatives and temporary accommodations would be assessed during Final Design.

Table 29: Impacted Loading Zones during Construction

Road Name	Block (West to East)	Location	Zone Type	Existing Regulations
US 40 (WB) (Edmondson Ave)	Walnut Avenue to N. Woodington Road	Front of Edmondson Village Medical Center, Mid-block	Passenger Loading	20 Min Parking 24 hours/7 days
Light Street (NB)	Redwood Street to Lombard Street	Front of Residence Inn	Passenger Loading	10 Min Parking 6:00p-11:00p (M-Sa)
Lombard Street (WB)	Light Street to Calvert Street	Front of Brookshire Suites	Passenger Loading	10 Min Parking 9:00a-3:00p,6:30p-11p (M-F) 8:00a-11:00p (Sa-Su)
Fleet Street (EB)	S Eden Street to S Spring Street	East Side of block	Passenger Loading	15 min Parking 7:00a-4:00p (M-F)
Fleet Street (WB)	S Spring Street to S Caroline Street	Front of Fell's Fulton, East Side of block	Truck Loading	8:00a-6:00p (M-Sa)
Broadway Street (NB)	Fleet Street to Eastern Ave	Front of Carolina's Tex Mex, North Side of block	Passenger Loading	10 min Parking 5:00p-1:00a (M-Sa)
Broadway Street (SB)	Eastern Ave to Fleet Street	Front of Love Zone/Ritz Cabaret, North Side of block	Passenger Loading	10 Min Parking 6:00p-12:00a (Th-Sa)
Fleet Street (WB)	S Broadway Street to S Regester Street	Front of Another Period in Time and Super Linens, Mid-block	Truck Loading	7:00a-6:00p (M-Sa)
Boston Street (EB)	Hudson Street to S Lakewood Ave	Front of Anchorage Towers	Truck/ Passenger Loading	24 hours/7 days
Boston Street (EB)	S Linwood Ave to S Potomac Street	Front of Canton Cove Apartments, Mid-block	Passenger Loading	5 Min Parking, 24 hours/7 days

6.7 Effects on Pedestrians / Bicycles

Access to existing bicycle and pedestrian facilities would be maintained during all phases of construction to the greatest extent possible. However, some activities may require disruptions to sidewalks or crosswalks. Warning and/or notification signs of modification to bicycle and pedestrian facilities during construction would be provided. Temporary sidewalks may be used in some areas with limited right-of-way, such as along Edmondson Avenue.

Proposed pedestrian detours would be submitted to the local traffic engineering authorities (Baltimore City Department of Transportation, Baltimore County Department of Public Works, and Maryland State Highway Administration) for review and approval. Proper deterrents, such as barriers or fencing, would be placed to prevent access (shortcuts) through the construction area. In some cases, a through sidewalk would be maintained on one side of the street only, unless property access is required.

During construction of the stations for the Downtown Tunnel, temporary sidewalk connections to local business and storefront entries would be provided as needed; at some locations, however, there would be periods when access cannot be provided. Other accommodations would be explored with the property owners for these locations during Final Design.

6.8 Effects on Freight / Heavy Rail

Extensive coordination would be required with Norfolk Southern and Canton Railroad during construction activities east of Haven Street. It is assumed that the Canton Railroad switching lead would be removed from service at the start of construction, allowing its physical removal. However, construction activities would require a flagger from Norfolk Southern to proceed safely. No physical incursion on active Norfolk Southern tracks would be necessary. Once within the rail ROW, it is assumed that no freight rail activities would be present, so no maintenance of traffic in relation to freight rail would be necessary.

Through the Greektown Viaduct aerial section, maintenance of traffic would involve temporary closures of railways below the alignment. Flagger operations would need to be coordinated with both Norfolk Southern and CSX for the crossings of their tracks.

6.9 Effects on Air Travel

Construction of the Preferred Alternative may have temporary effects on air travel because of short-term obstructions (e.g. cranes) in the airspace. There are no local airports in the area that would be affected by the construction of the Preferred Alternative. Helipad locations for hospitals and other services within the project corridor would be identified and coordination with the Federal Aviation Administration would occur during the Final Design phase of the project.

6.10 Effects on Emergency Services

There are several emergency service providers located in the project study area, as identified in FEIS Chapter 5, Section 5.2 "Demographics, Neighborhoods, and Community Facilities." Coordination with these emergency service providers would occur during Final Design and construction to identify any impacts to their services and potential mitigation measures.

6.11 Mitigation of Construction-Related Impacts

General mitigation measures would be implemented along the affected roadways and sidewalks throughout the project study corridor. Of these measures, the most common would be traffic signal timing modifications at existing signalized intersections, the installation of temporary traffic signals at existing unsignalized intersections, short-term detours of vehicle, bicycle and pedestrian traffic and public relations, among others. A Maintenance of Traffic (MOT) plan and Transportation Management Plan (TMP) would be developed for the different construction phases to minimize effects to the traveling public.

6.11.1 Maintenance of Traffic Plan

The Maintenance of Traffic (MOT) plan would address the effects on streets and highways, transit, businesses, residences, pedestrians and bicycles. The MOT plan would address roadway closures and turn lane restrictions for streets and intersections identified in **Table 26**. Specific mitigation would be developed during Final Design to determine maximum number of lanes closed during peak traffic hours, maintenance and removal of traffic control devices, efficient traffic rerouting measures, and scheduling of construction activities within the roadways for times other than peak traffic periods.

All construction specifications, MOT plans, and mitigation measures must be approved by the local traffic engineering authorities (Baltimore City Department of Transportation, Baltimore County Department of Public Works, and Maryland State Highway Administration) prior to construction.

6.11.2 Transportation Management Plan

A Transportation Management Plan (TMP) would include site-specific traffic control measures and would be developed in conjunction with Final Design of the Preferred Alternative. The key objectives of this plan would be to minimize impacts to mobility while maintaining safety. The mitigation measures required by the city/county for roadway access and traffic control would also apply to disruption of area businesses, schools, and other community facilities. Permits would be acquired by project contractors from the appropriate city offices for roadway disruptions and blockages.

The MOT Plan and the TMP would be developed concurrently for different construction phases to minimize effects to the traveling public. The following is a list of potential mitigation strategies that may be included in the TMP:

- **Traffic Mitigation:** Optimization of signal timing, including modifications to cycle lengths and splits, would be implemented to improve traffic progression and reduce delay. Where feasible, temporary lane closures would occur during off-peak hours to minimize effects on commuter traffic.
- **Traffic Mitigation on Diversion Routes:** The need for traffic mitigation on detour and/or diversion routes would be assessed during Final Design. Mitigation strategies to be investigated include temporary parking restrictions, lane modifications, and signal re-timing.
- **Pedestrian and Bicycle Mitigation:** During construction, temporary sidewalks and/or pathways would be provided to replace any sidewalks and/or trails adjacent to the project that are affected by construction. Pedestrian detours would be signed according to the *Manual on Uniform Traffic Control Devices* (MUTCD). Bicyclists would be notified through signage and public notice that bike lanes are detoured. Other temporary disruption to bicycle facilities would be managed according to the MOT developed during Final Design.
- **Parking Mitigation:** Where existing parking is disrupted by construction, signs would be posted directing drivers to nearby parking locations. The public would be kept aware of upcoming work locations and parking disruptions though a project website. The City would consider options for providing alternative parking, such as constructing parking pads behind homes. Coordination with stakeholders and businesses affected by the loss of loading zones would be completed to identify alternate or temporary loading areas.
- **Transit Mitigation:** Some bus stops may need to be closed temporarily or relocated. Affected transit stops would be temporarily relocated to the nearest possible location on the same transit route without interfering with the construction process. Americans with Disabilities Act (ADA) access and signage for bus stops would be maintained throughout construction. Extensive coordination with the MTA would be required during Final Design to identify appropriate mitigation strategies.
- **Emergency Services:** During Final Design and construction, coordination with emergency service providers would be required to identify impacts and potential mitigation measures for any effected emergency service routes.
- **Public Outreach:** A comprehensive public outreach program would be developed to inform local residents and businesses of potential delays and impacts to the local street network because of construction. For example, in cases of roadway blockages, neighboring property owners/operators would be notified and provided with descriptions of alternative routes.

7. Parking: Existing Conditions

A very important characteristic of the urban environment is the ability of motorists to park their vehicles on streets. Residents like on-street parking in front of their homes to have a short walk to their homes; businesses prefer easy access to allow pass-by motorists to readily stop at their stores and at schools drop-offs and pick-up takes place. All of this requires availability of close parking for an extended period of time during the day.

There are many different types of parking restrictions along streets of Baltimore City and the County such as truck loading and unloading areas, peak period restrictions, No Stopping and No Parking Anytime. In addition, many spaces are metered and by permit only while others are free of charge. Parking spaces were inventoried along the proposed Red Line alignment in November 2011 and it was found that the majority of on-street parking in the Baltimore City is located in the Downtown area along Edmondson Ave and in the Fell's Point/Canton area. In Baltimore County, parking is allowed along MD 122 (Security Boulevard) adjacent to the Social Security Administration.

The number of on-street parking spaces available along a roadway is dependent on the length of the block, parking restrictions and the type of parking allowed (parallel, angle, or head-in). It was observed that most blocks in the Fell's Point area have permit restrictions to accommodate approximately ten parking spaces (including both sides of the street). In unmarked areas, the number of parking spaces were determined from the eligible length of a roadway (calculated by subtracting distances for fire hydrants and bus stops, (when present) from the total block length). This length was divided by 22 feet (average car length plus buffer) for parallel parking and by 12.7 feet for angle parking (average car width plus buffer). The unmarked parking space calculations accounted for gaps that drivers leave in front of their vehicles when parked and the non-ideal arrangement of vehicles when they occupy more than one space.

The locations with the largest number of on-street parking spaces are listed below:

- Cooks Lane between Briar Clift Rd to Edmondson Avenue
- Edmondson Avenue, Hilton Parkway to Wildwood Parkway
- Mulberry Street, Payson Street to Fremont Avenue
- Franklin Street, Payson Street to Fremont Avenue
- Fleet Street, Exeter Street to Chester Street
- Boston Street, Hudson Avenue to Conkling Street

The available parking spaces and utilizations during weekday and weekend periods were inventoried in November 2011 and January 2012 for all the on-street and surface parking lots that would be impacted by the Red Line alignment. Weekend data was inventoried on Saturdays between 10AM and 2PM and weekday data was inventoried on Tuesdays between 10AM to 2PM and between 6PM and 8PM. Weekday evening utilization was also inventoried, but was found to be lower than the Saturday mid-day utilization reported in this report. No adverse weather or traffic conditions were present during these inventories.

Available on-street and surface (Off-Street) parking lots spaces and restrictions along the Red Line alignment path are shown on **Figures 87-90.** A summary of the available parking spaces within the Red Line alignment is provided in the **Table 30** below.

Table 30: Existing On-Street and Surface Parking Lot Spaces

Sections	On-Street Parking	Surface (Off-Street) Parking
Section 1 - Security Boulevard, I-70	0	2,768
Section 2 - Cooks Lane Tunnel Corridor	233	0
Section 3 - US 40	739	325
Section 4 - Downtown Tunnel Corridor	682	210
Section 5 - Boston St, Haven St, and Bayview Boulevard	311	1,858

The weekday mid-day parking space utilization data is shown on **Figures 91-94** and the weekday evening parking utilization data is shown on **Figures 95-98**. The weekend parking utilization data is shown on **Figures 99-102**. Refer to **Appendix F** for a matrix of existing parking and parking impacts due to the Red Line project.

Parking is allowed along Cooks Lane

PARKING SPACE AVAILABILITY AND RESTRICTIONS - EXISTING CONDITIONS (2011)

MTA Maryland

RED LINE Study

CMS

SECURITY BLVD

ROLLING RD

LORD BALTIMORE DR

BELMONT AVE

WHITEHEAD RD

WOODLAWN DR

GWYNN OAK AVE

PERIMETER DR

WINDSOR MILL RD

KERNAN DR

GREENGAGE RD

BROOKDALE RD

FAIRBROOK

ROLLING BEND RD

SECURITY SQUARE MALL

296 P

325 P

278 P

558 P

169 P

85 P

812 P

WHITEHEAD CT

SECURITY RD

SOCIAL SECURITY ADMIN.

28

COLONIAL RD

SECURITY BLVD

BALTIMORE CITY

BALTIMORE COUNTY

FOREST PARK AVE

245 P

7-0

JOHNNYCAKE RD

PARALLEL DR

JONAS WAY DR

LINUS DR

MERIMACK RD

CRAIGMONT RD

WOODLAWN

JOHNNYCAKE MIDDLE SCH.

JOHNNYCAKE RD

CHARLES ST

MONTGOMERY ST

CENTRAL AVE

PRINCE GEORGE ST

BALTIMORE ST

CECIL AVE

HARFORD AVE

SUNSET AVE

HILLTOP AVE

FRANKLIN AVE

STELLA DR

FOREST PARK AVE

LINCOLN WOODS DR

CROSBY RD

ROLLING RD

ADAMSVIEW RD

WOODBRIDGE RD

COLLWOOD RD

MARKSWORTH RD

KENT AVE RD

DORCHESTER AVE

INGLESIDE AVE

DANIELS AVE

BAKER AVE

MC ADOO AVE

LANDINGTON AVE

GREGORY AVE

SOUTHRIDGE RD

CHESWORTH RD

695

40

ST. AGNES LN

COLERIDGE RD

CHARING CROSS RD

VALLEYBROOK RD

COOKS LN

BELEIGH RD

ST GEMMA RD

WESTHILLS RD

LINDSAY RD

NOTTINGHAM RD

BRIARCLIFF RD

BRIARCLIFF RD

ALSON DR

COLEHERNE RD

EDMONDSON AVE

WINANS WAY

CHAPEL GATE LN

OLD ORCHARD RD

NOTTINGHAM RD

SHOP CTR

FREDERICK RD

OLD

WESTVIEW SHOP. CTR.

CRAIGMONT RD

WINTERS LANE

KENT AVE

INGLESIDE AVE

ACADEMY RD

EDMONDSON AVE

8 28 36 27 22 13 6 8 14 15 28 13 7 13

N

Match Line - See Sheet 2

MAP KEY

LEGEND

P	SURFACE PARKING LOT
	PARKING ALLOWED
	NO STOPPING/NO PARKING ANYTIME
	BUS STOP
	PULL IN PARKING
	NARROW STREET/NO ROOM TO PARK
	HANDICAP PARKING
	RESTRICTED PARKING
	LOADING (PASSENGER/TRUCK)
XXX	AVAILABLE PARKING SPACES

Red Line

- Surface
- Aerial
- Tunnel

RED LINE Study — *Red Line Corridor Transit Study*

Existing Conditions (2011) — *Sheet 1 of 4*

Parking Space Availability & Restrictions

Not To Scale — *FIGURE 87*

MTA Maryland — *The Maryland Department of Transportation*
Maryland Transit Administration

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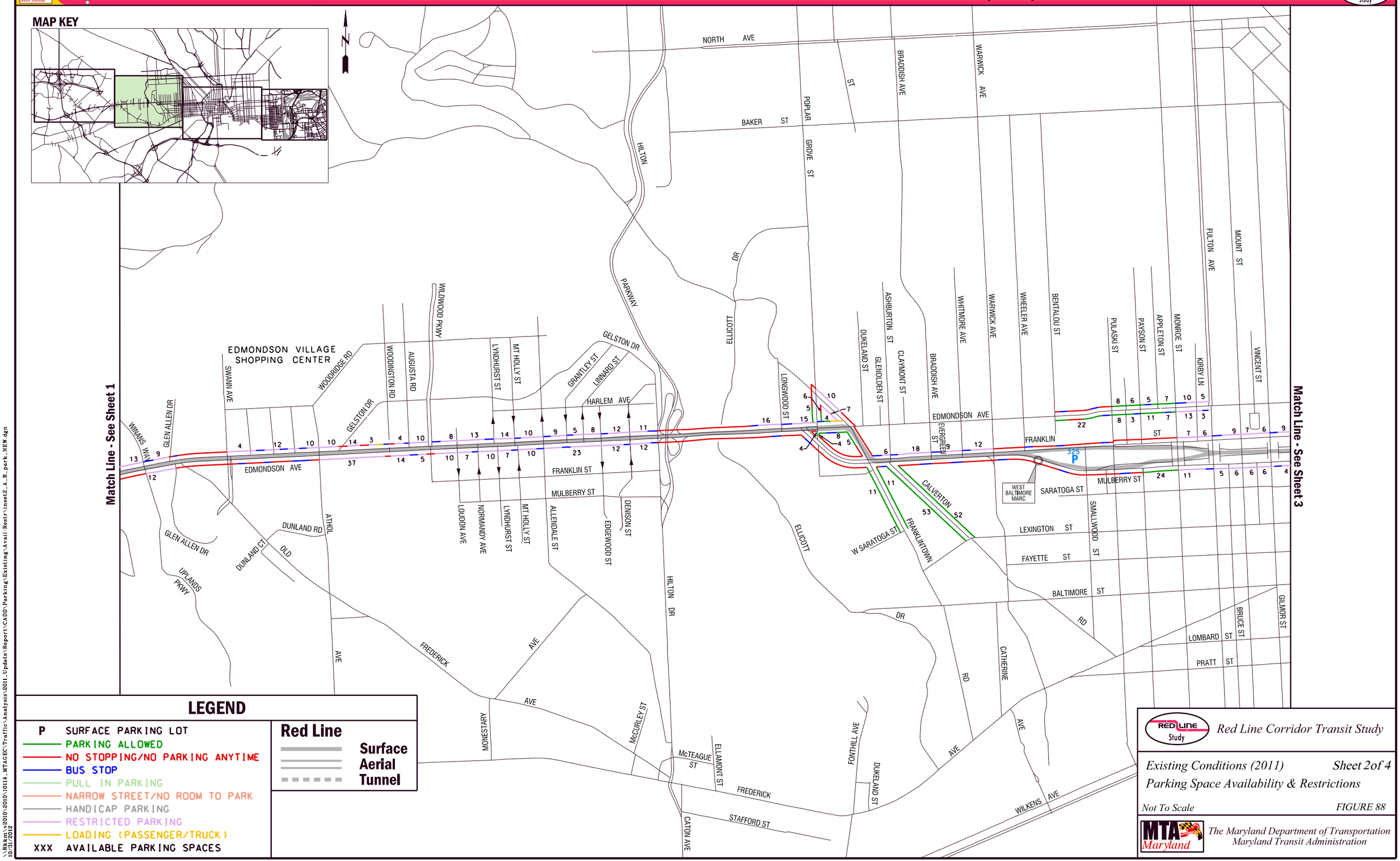
7/13/2012

FIGURE 87 - Existing Conditions (2011) Parking Space Availability and Restrictions

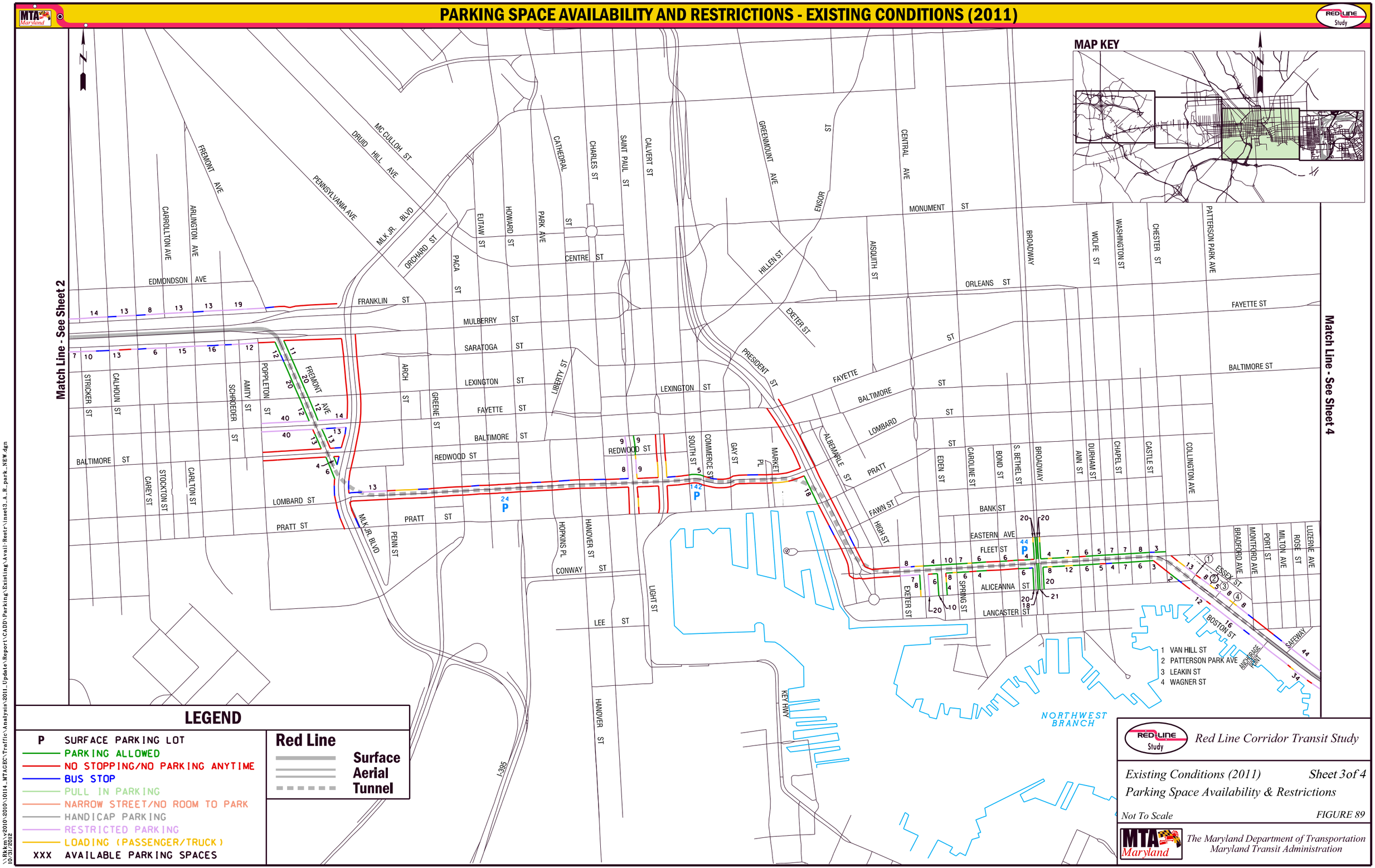
PARKING SPACE AVAILABILITY AND RESTRICTIONS - EXISTING CONDITIONS (2011)



\\Rkm\v2010\2010\0114_MTAGBC\Traffic\Analysis\2011_Update\Report\CADD\Parking\Existing\Avail-Restr\inset2_A_R_park_NEW.dgn
10/31/2012

FIGURE 88- Existing Conditions (2011) Parking Space Availability and Restrictions

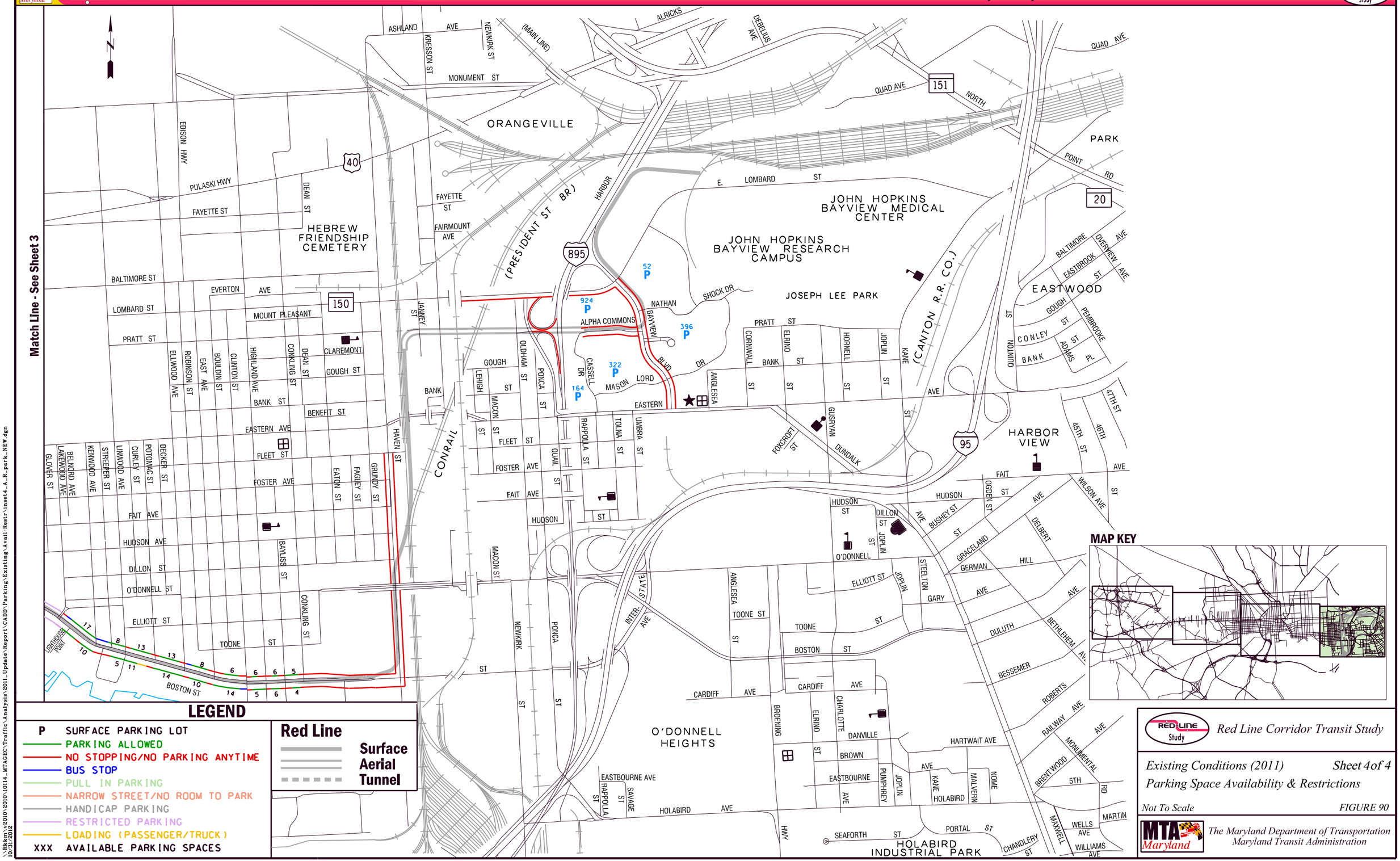
PARKING SPACE AVAILABILITY AND RESTRICTIONS - EXISTING CONDITIONS (2011)



\\Rkm\v2010\10114_MTACBC\Traffic\Analysis\2011_Update\Report\CADD\Parking\Existing\Avail-Restr\inset3_A_R_park_NEW.dgn
10/31/2012

FIGURE 89 - Existing Conditions (2011) Parking Space Availability and Restrictions

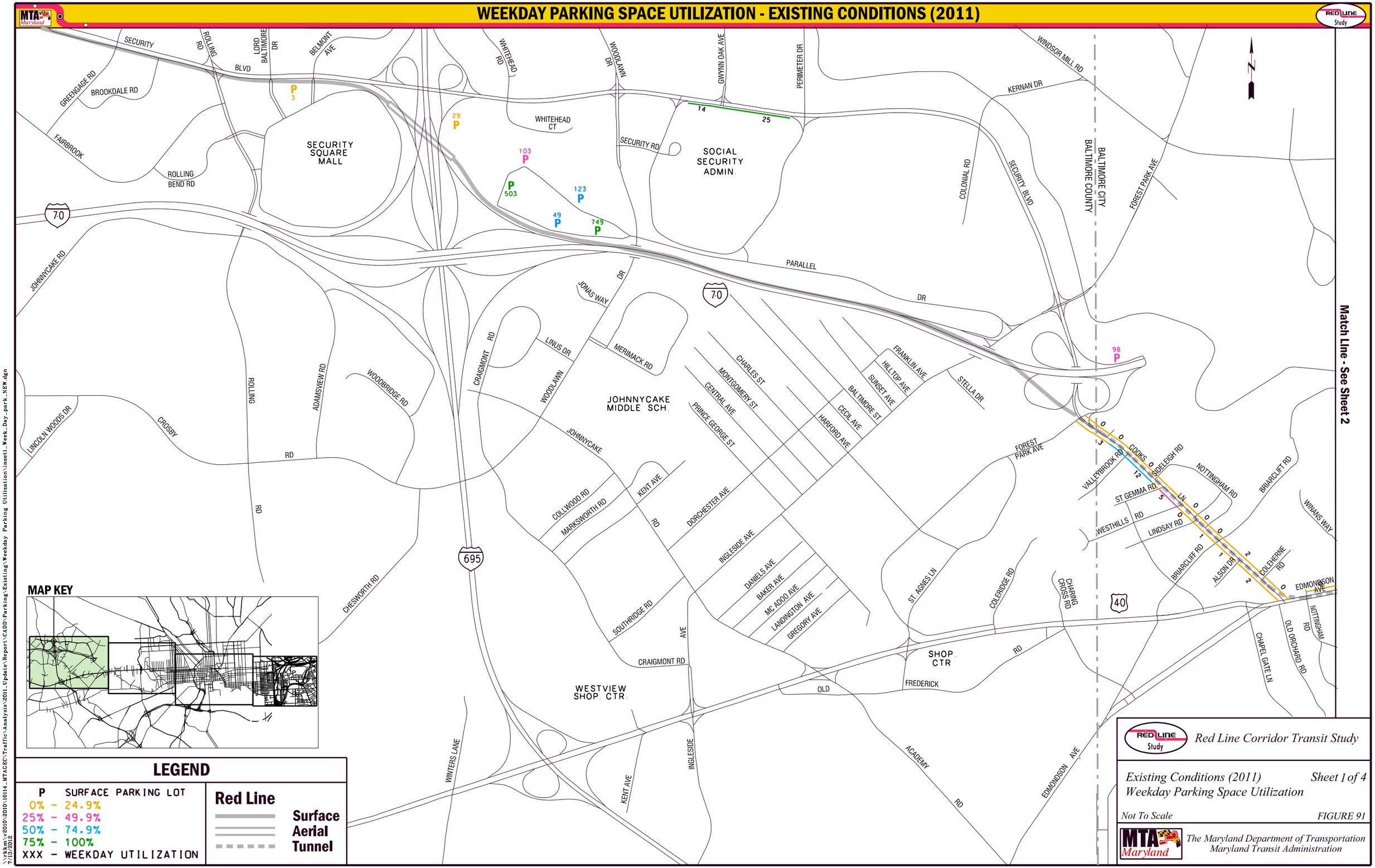
PARKING SPACE AVAILABILITY AND RESTRICTIONS - EXISTING CONDITIONS (2011)



\\Rkmj\v2010\2010\0114_MTAGBC\Traffic\Analysis\2011_Update\Report\CADD\Parking\Existing\Avail-Rest\inset4_A_R_park_NEW.dgn
10/31/2012

FIGURE 90 - Existing Conditions (2011) Parking Space Availability and Restrictions

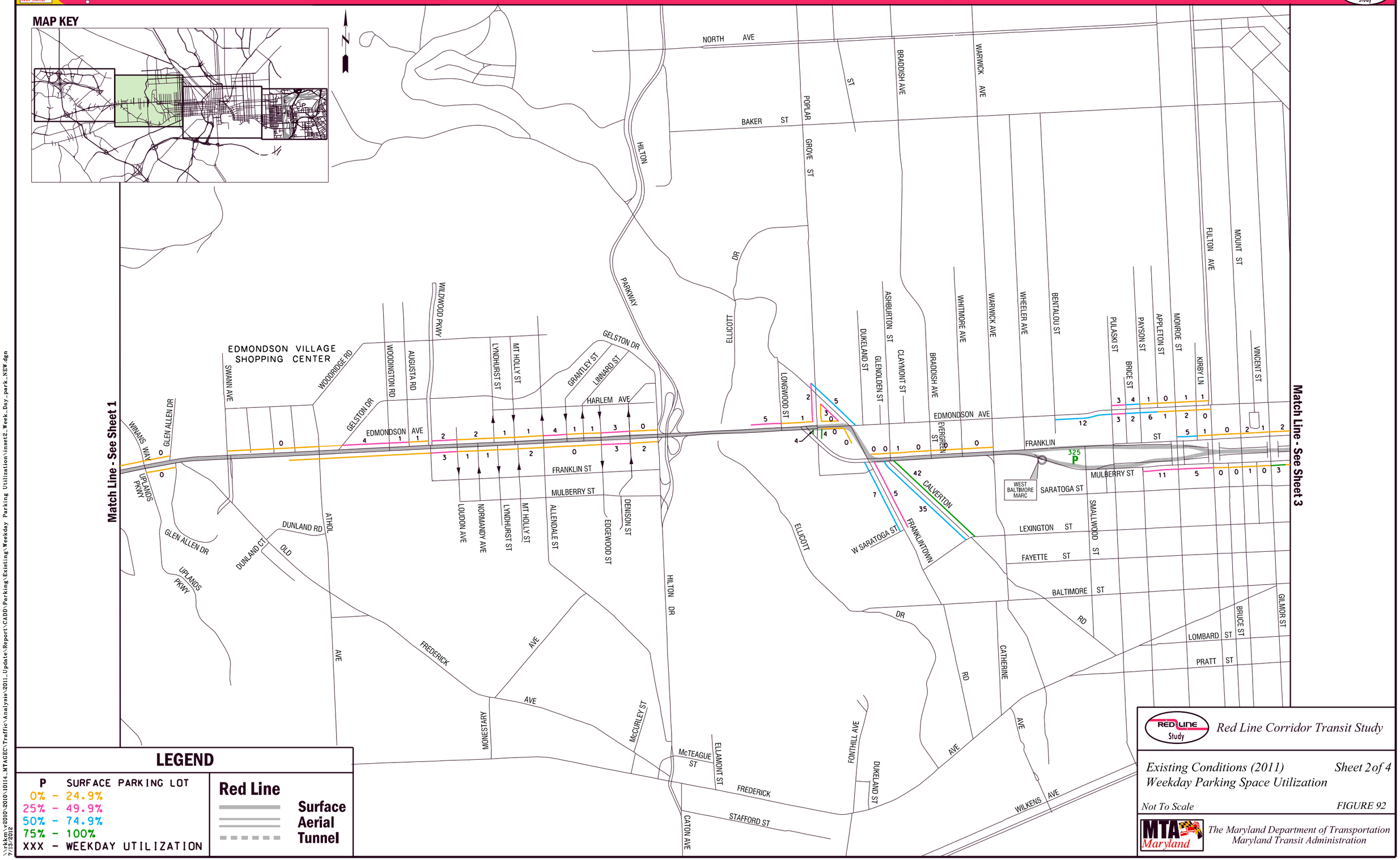
WEEKDAY PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)



\\rkkm\v2010\10114_MTAGBC\Traffic\Analysis\2011_Update\Report\CADD\Parking\Existing\Weekday Parking Utilization\inset1_Week_Day_park_NEW.dgn
7/13/2012

FIGURE 91 - Existing Conditions (2011) Weekday Parking Space Utilization

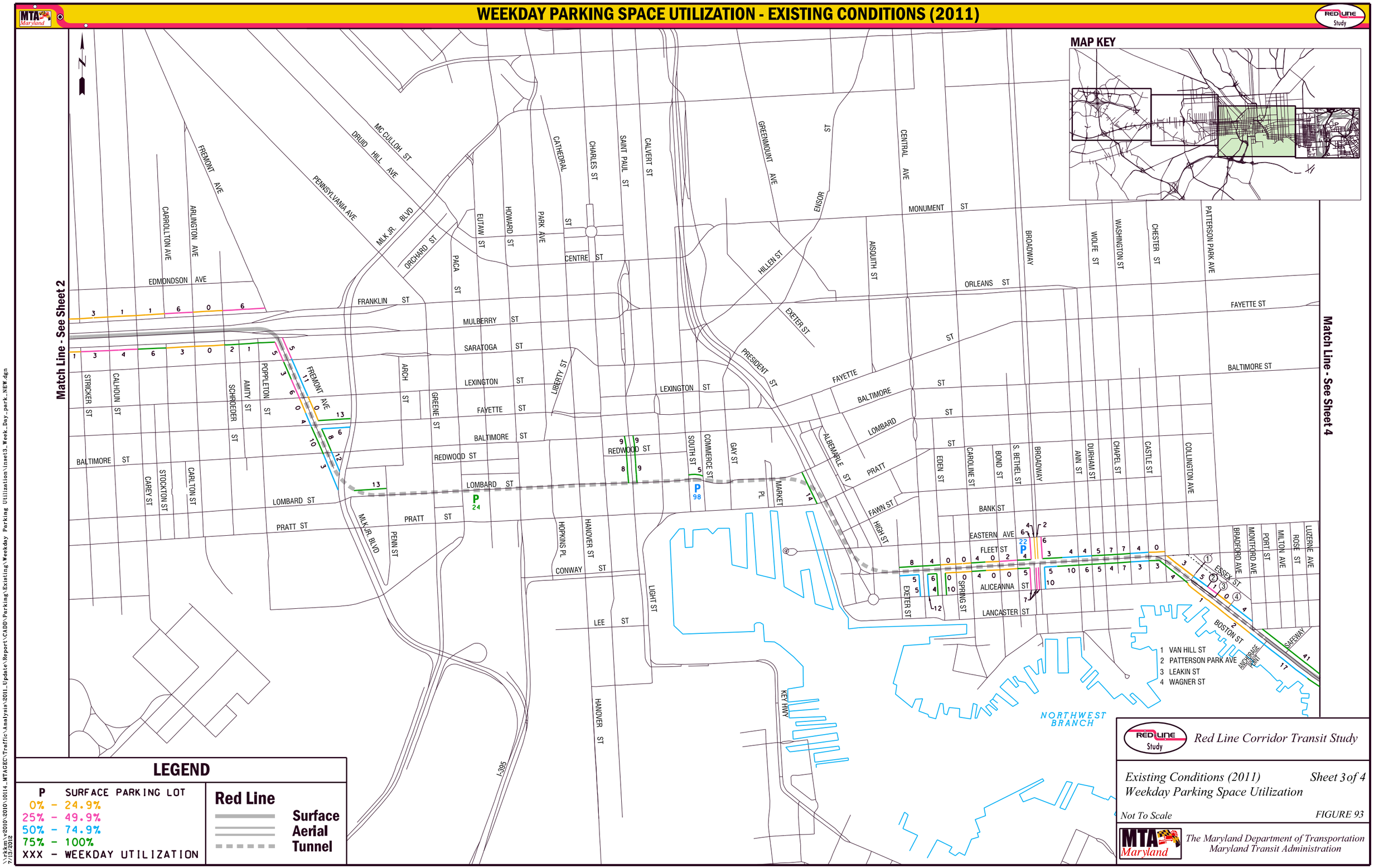
WEEKDAY PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)



\\rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Parking\Existing\Weekday Parking Utilization\inset2_Week_Day_park_NEW.dgn
7/13/2012

FIGURE 92 - Existing Conditions (2011) Weekday Parking Space Utilization

WEEKDAY PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)



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7/13/2012

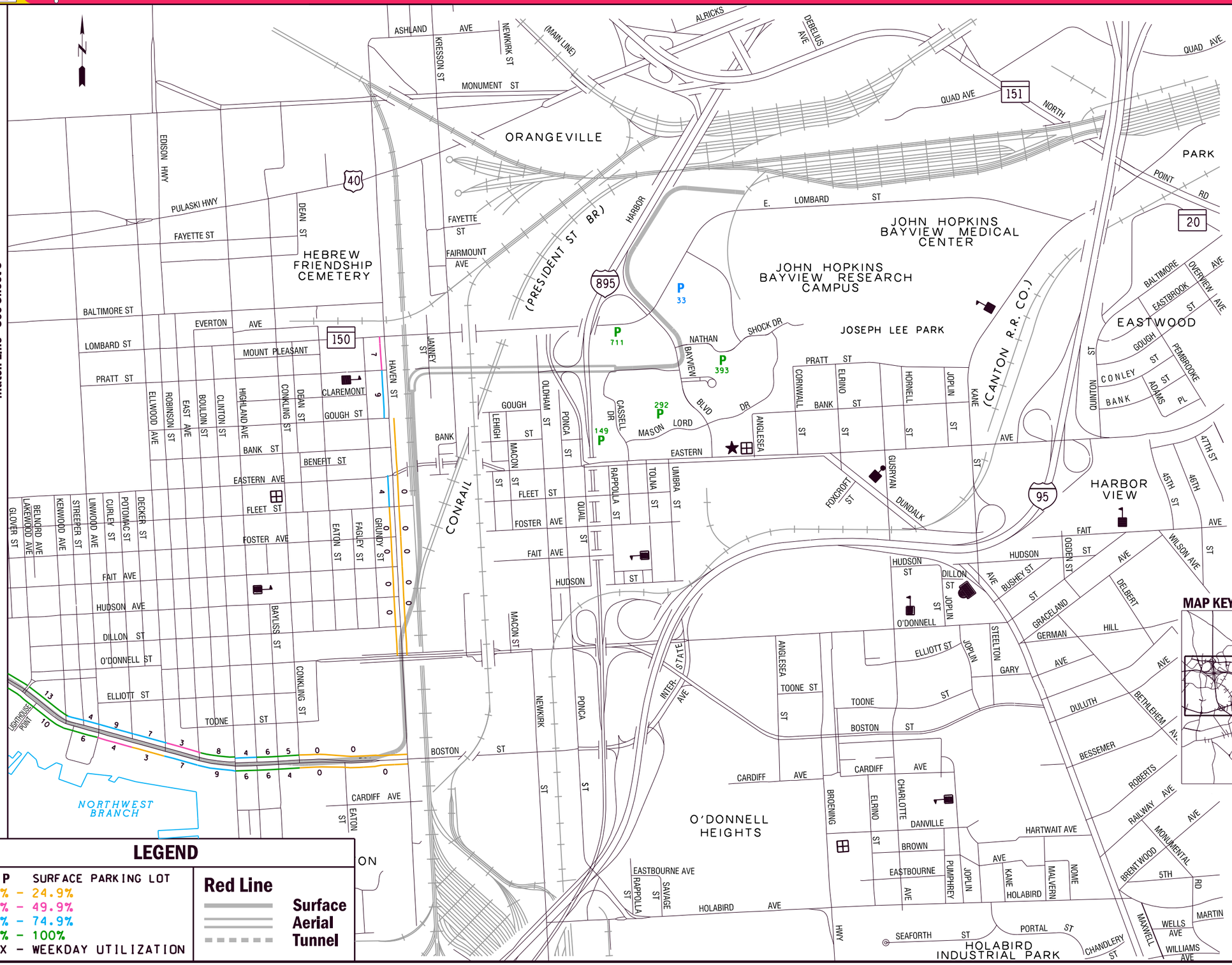
FIGURE 93 - Existing Conditions (2011) Weekday Parking Space Utilization

WEEKDAY PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)

MTA Maryland

RED LINE Study

Match Line - See Sheet 3



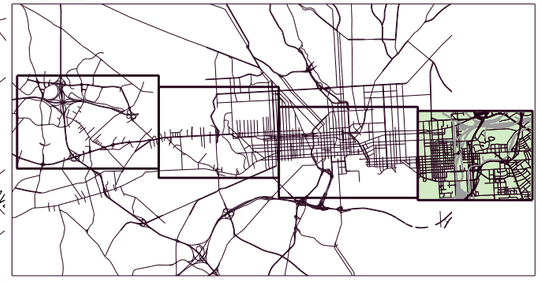
LEGEND

P	SURFACE PARKING LOT
0% - 24.9%	
25% - 49.9%	
50% - 74.9%	
75% - 100%	
XXX	WEEKDAY UTILIZATION

Red Line

- Surface
- Aerial
- Tunnel

MAP KEY



RED LINE Study — *Red Line Corridor Transit Study*

Existing Conditions (2011) — *Sheet 4 of 4*

Weekday Parking Space Utilization

Not To Scale — *FIGURE 94*

MTA Maryland — *The Maryland Department of Transportation*
Maryland Transit Administration

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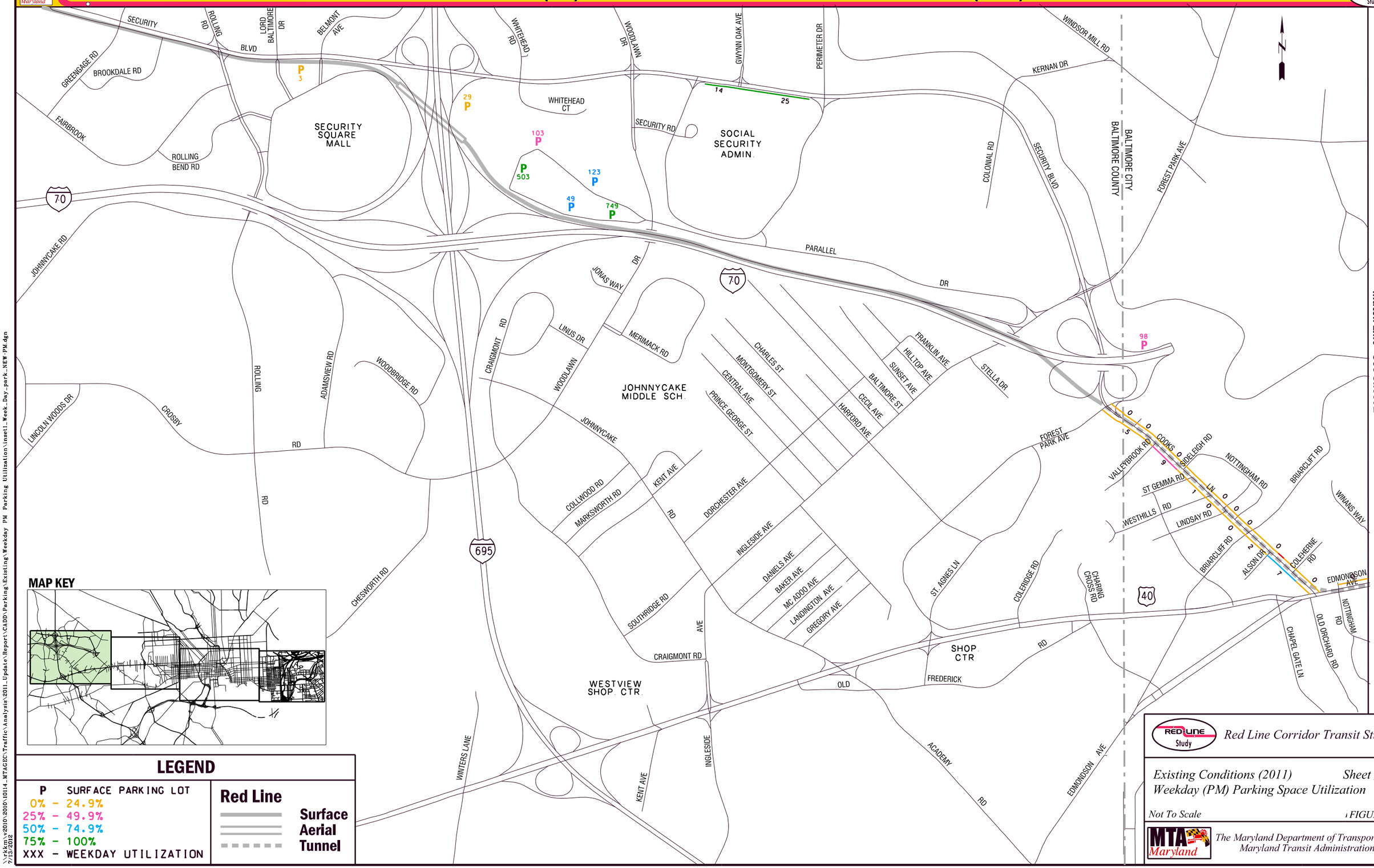
7/13/2012

FIGURE 94 - Existing Conditions (2011) Weekday Parking Space Utilization

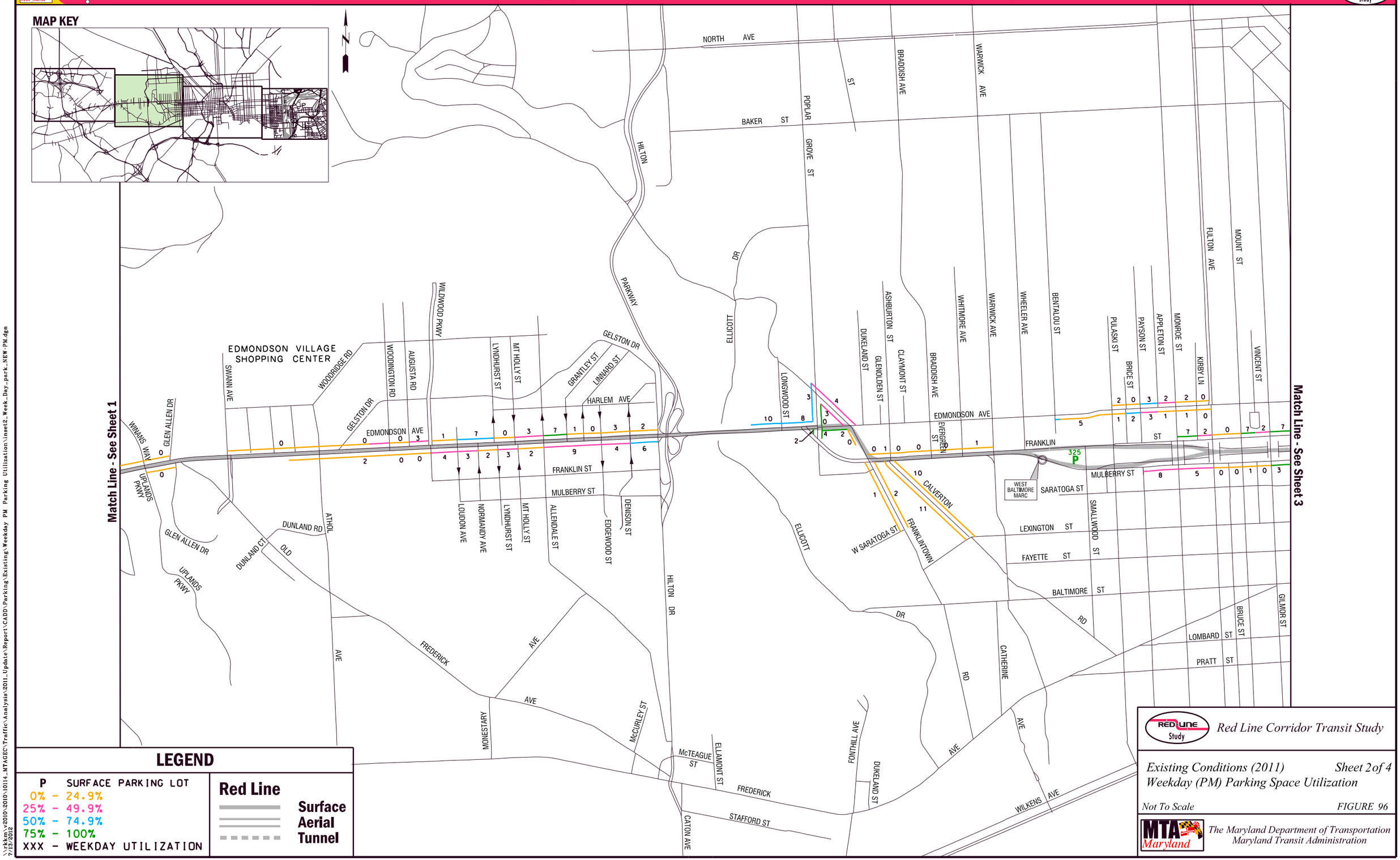
WEEKDAY (PM) PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)



\\rkcm\v2010\2010\10114_MTAGBC\Traffic\Analysis\2011_Update\Report\CADD\Parking\Existing\Weekday PM Parking Utilization\inset1_Week_Day_park_NEW-PM.dgn
7/13/2012

FIGURE 95 - Existing Conditions (2011) Weekday (PM) Parking Space Utilization

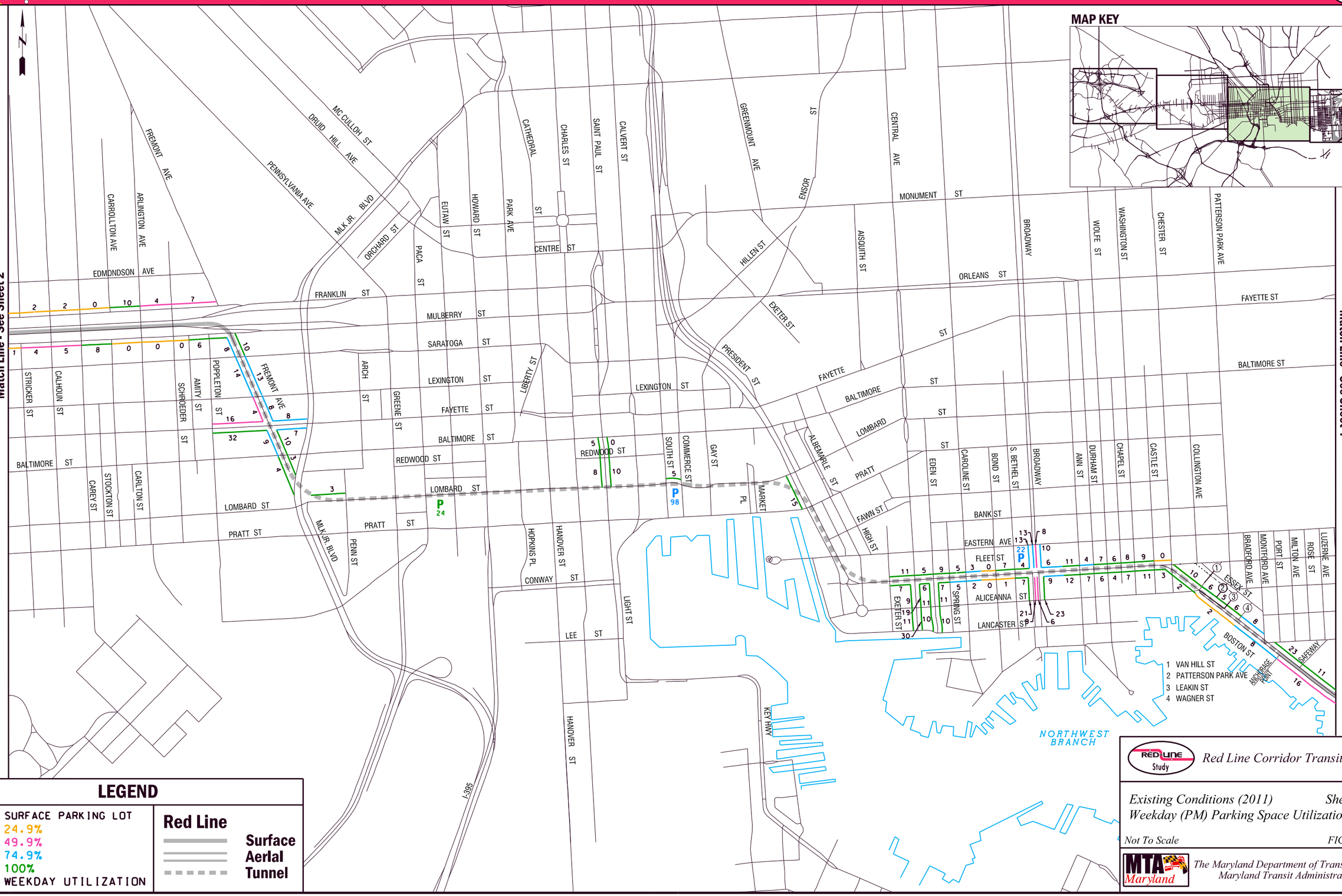
WEEKDAY (PM) PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)



\\rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Parking\Existing\Weekday PM Parking Utilization\inset2_Week_Day_park_NEW-PM.dgn
7/13/2012

FIGURE 96 - Existing Conditions (2011) Weekday (PM) Parking Space Utilization

WEEKDAY (PM) PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)



\\rkkm\v2010\2010\10114_MTAGEC\Traffic\Analysis\2011_Update\Report\CADD\Parking\Existing\Weekday PM Parking Utilization\inset3_Week_Day-park_NEW-PM.dgn
7/13/2012

FIGURE 97 - Existing Conditions (2011) Weekday (PM) Parking Space Utilization

WEEKDAY (PM) PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)

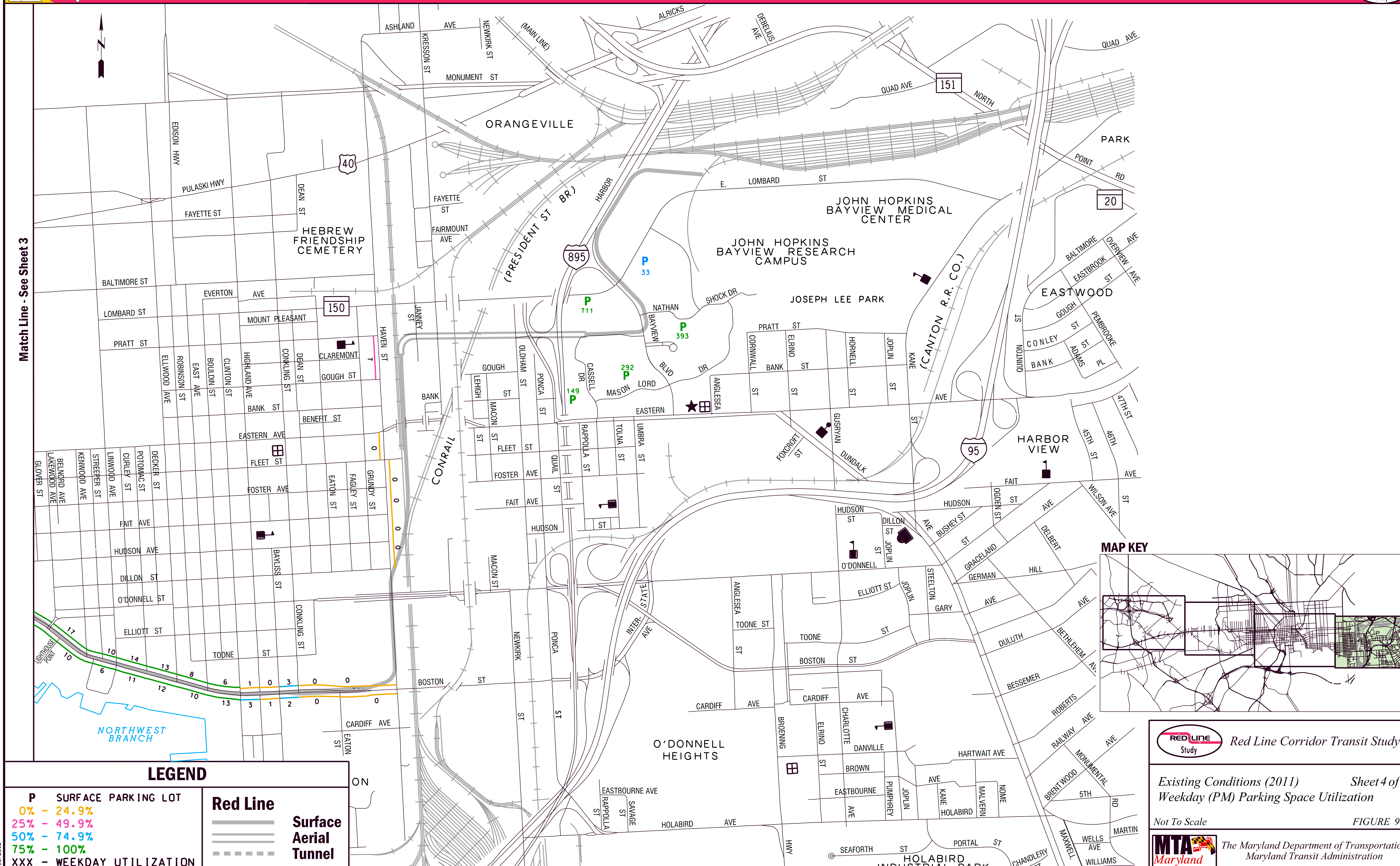


FIGURE 98 - Existing Conditions (2011) Weekday (PM) Parking Space Utilization

WEEKEND PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)

MTA Maryland

RED LINE Study

SECURITY BLVD
ROLLING RD
LORD BALTIMORE DR
BELMONT AVE
WHITEHEAD RD
WOODLAWN DR
GWYNN OAK AVE
PERIMETER DR
WINDSOR MILL RD
KERNAN DR
GREENGAGE RD
BROOKDALE RD
FAIRBROOK
ROLLING BEND RD
SECURITY SQUARE MALL
WHITEHEAD CT
SECURITY RD
SOCIAL SECURITY ADMIN.
COLONIAL RD
SECURITY BLVD
BALTIMORE CITY
BALTIMORE COUNTY
FOREST PARK AVE
N
7-0
JOHNNYCAKE RD
PARALLEL DR
JONAS WAY DR
LINUS DR
MERIMACK RD
CRAIGMONT RD
WOODLAWN
JOHNNYCAKE MIDDLE SCH.
CHARLES ST
MONTGOMERY ST
CENTRAL AVE
PRINCE GEORGE ST
BALTIMORE ST
CECIL AVE
HARFORD AVE
FRANKLIN AVE
HILLTOP AVE
SUNSET AVE
STELLA DR
LINCOLN WOODS DR
CROSBY RD
ROLLING RD
ADAMSVIEW RD
WOODBRIDGE RD
JOHNNYCAKE RD
COLLWOOD RD
MARKSWORTH RD
KENT AVE
DORCHESTER AVE
INGLESIDE AVE
DANIELS AVE
BAKER AVE
MC ADOO AVE
LANDINGTON AVE
GREGORY AVE
SOUTHRIDGE RD
CHESNORTH RD
695
CRAIGMONT RD
WESTVIEW SHOP. CTR.
WINTERS LANE
KENT AVE
INGLESIDE AVE
OLD FREDERICK RD
SHOP. CTR.
ACADEMY RD
EDMONDSON AVE
ST. AGNES LN
COLERIDGE RD
CHARING CROSS RD
40
FOREST PARK AVE
VALLEYBROOK RD
COOKS LN
SIDELEIGH RD
NOTTINGHAM RD
BRIARCLIFF RD
ST GEMMA RD
WESTHILLS RD
LINDSAY RD
BRIARCLIFF RD
ALSON DR
COLEHERNE RD
EDMONDSON AVE
WINANS WAY
NOTTINGHAM RD
OLD ORCHARD RD
CHAPEL GATE LN

Match Line - See Sheet 2

MAP KEY

LEGEND

P	SURFACE PARKING LOT
0% - 24.9%	
25% - 49.9%	
50% - 74.9%	
75% - 100%	
XXX - WEEKDAY UTILIZATION	

Red Line

- Surface
- Aerial
- Tunnel

RED LINE Study — *Red Line Corridor Transit Study*

Existing Conditions (2011) — *Sheet 1 of 4*
Weekend Parking Space Utilization

Not To Scale — *Figure 99*

MTA Maryland — *The Maryland Department of Transportation*
Maryland Transit Administration

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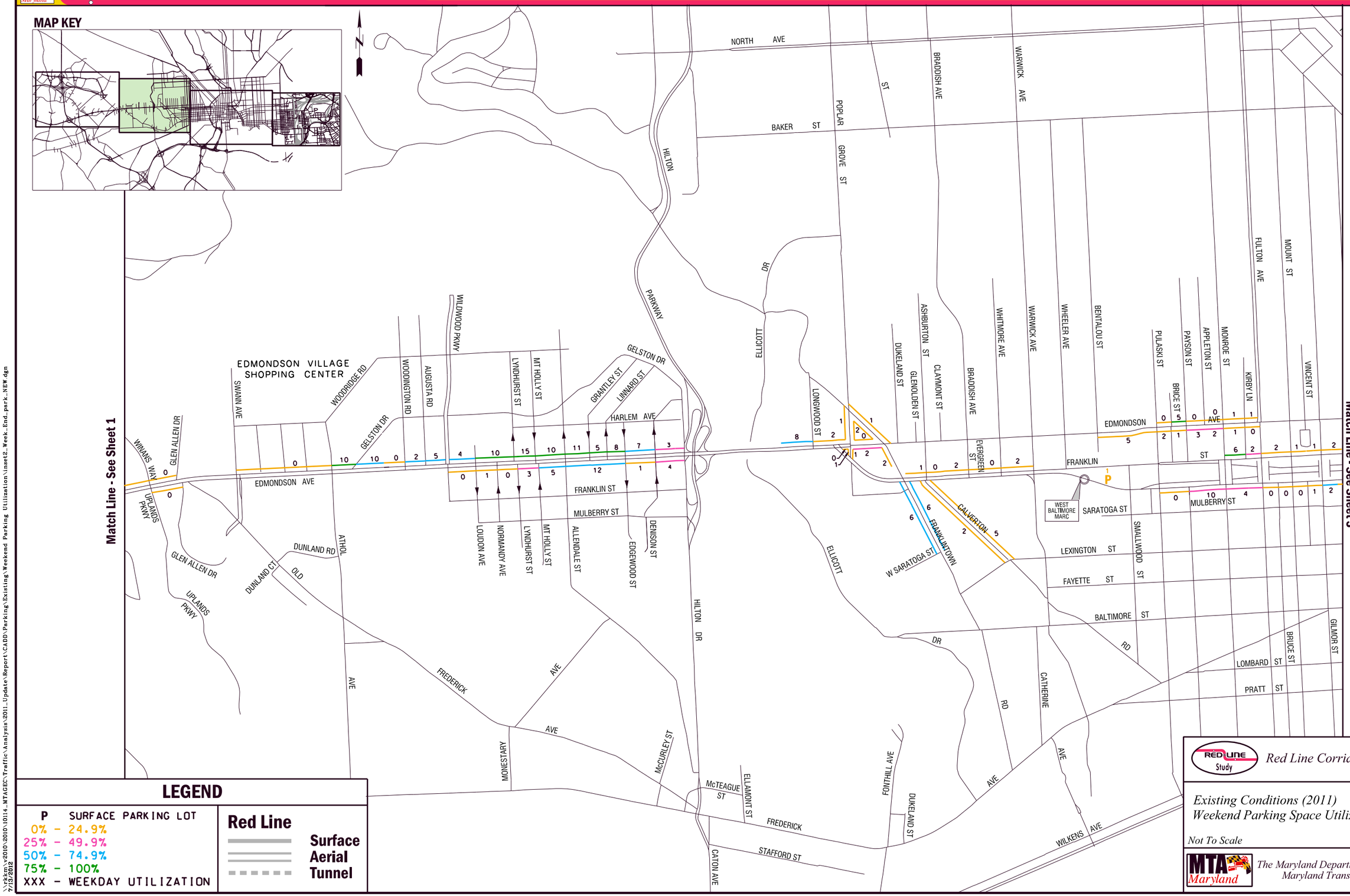
7/13/2012

FIGURE 99 - Existing Conditions (2011) Weekend Parking Space Utilization

WEEKEND PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)



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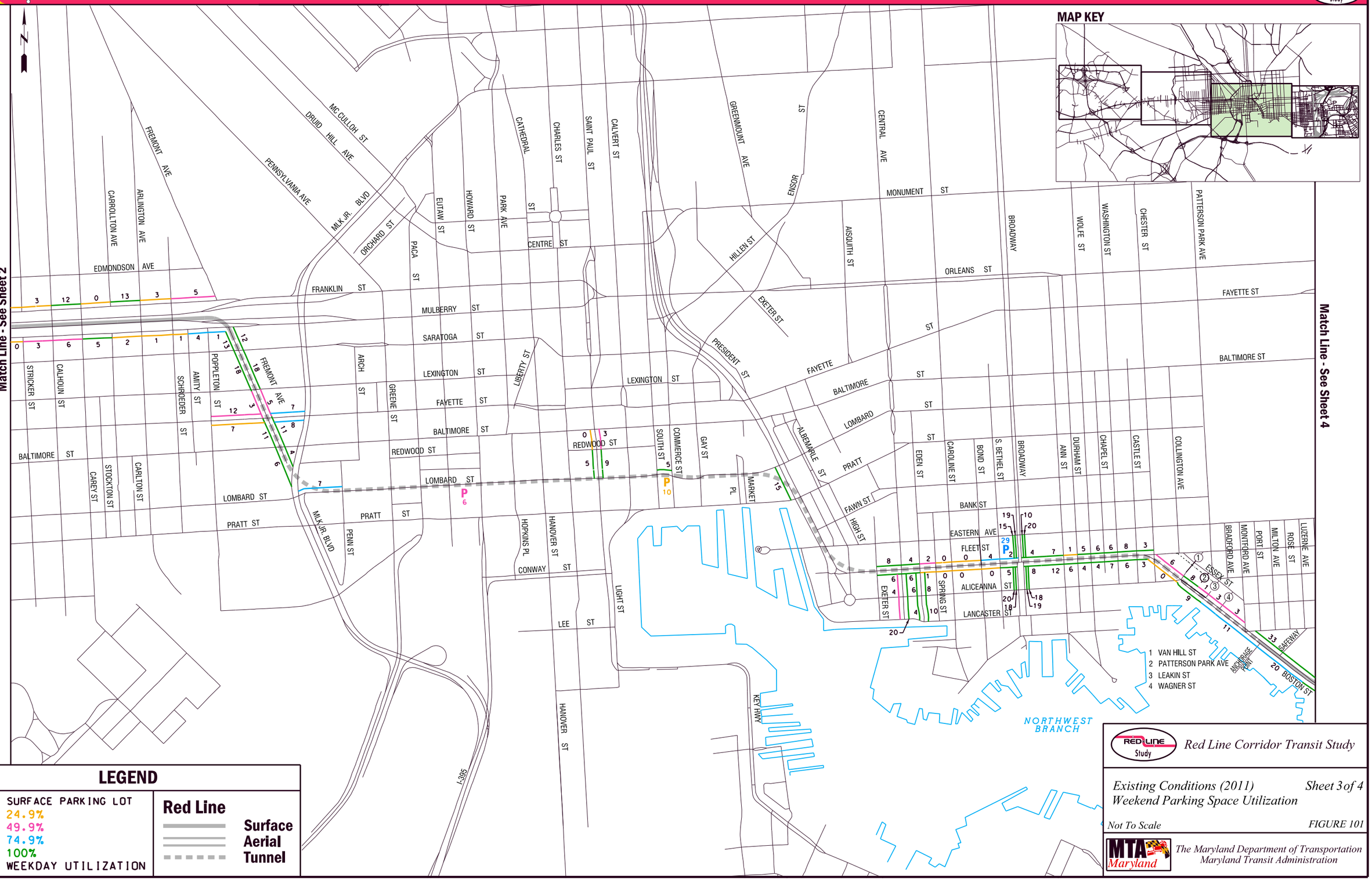
7/13/2012

FIGURE 100 - Existing Conditions (2011) Weekend Parking Space Utilization

WEEKEND PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)



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7/13/2012

FIGURE 101 - Existing Conditions (2011) Weekend Parking Space Utilization

WEEKEND PARKING SPACE UTILIZATION - EXISTING CONDITIONS (2011)

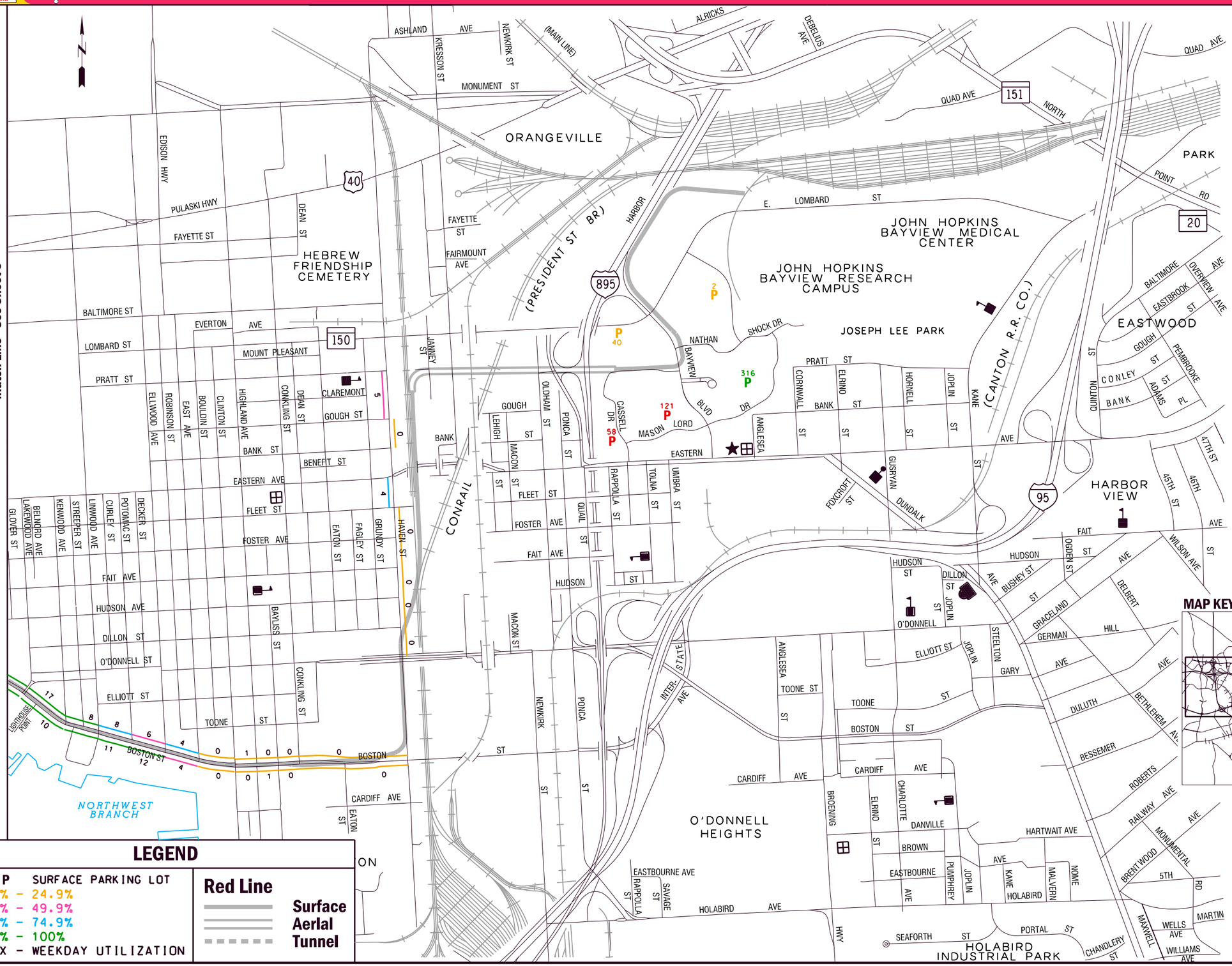

FIGURE 102 - Existing Conditions (2011) Weekend Parking Space Utilization

An analysis was performed for the utilization of parking spaces in proximity to the spaces being removed to determine the impact of this parking loss, including those parked vehicles which could be relocated to adjacent open spaces. The study considered not just the actual number of parking spaces lost due to the project, but the number of vehicles currently using those parking spaces and whether adjacent parking is available to fill that need. An assumption was made that if parking was available one adjacent block to either side of the spaces that were being eliminated, motorists would be able to utilize those spaces instead. This approach is consistent with guidance from the Institute of Transportation Engineers and the Urban Land Institute regarding reasonable walking distances for most trip types.

7.1 2035 No-Build Conditions

For the purpose of this study, it was assumed that there are no parking impacts to the current on-street parking spaces in 2035 future without the Red Line project as per the *PlanIt* 2035 transportation plan. All of the on-street parking spaces that were inventoried in the Existing Conditions remain in the 2035 No-Build conditions. However, the surface parking lots at the existing West Baltimore MARC and the proposed Bayview MARC station would be expanded by others and would be completed before the opening year for the Red Line (2021).

According to the West Baltimore MARC expansion study, it is expected that the total number of parking spaces at the station would increase from 325 to 660 parking spaces. Construction of the station parking lot would be completed by 2015. The future parking lot at Bayview MARC station is anticipated to have 650 parking spaces. It should be noted that the Bayview MARC station expansion study is in progress. Construction of the station parking lot would be completed by 2018.

7.2 2035 Build Conditions

One of the impacts of the Red Line project is the loss of parking spaces in some areas to accommodate the Red Line track area. Many residents and business owners desire to have parking spaces as close to home or commercial establishments as possible. This allows for ease of access to their site.

The implementation of the Red Line LRT will require the elimination of 741 parking spaces along the corridor, and would provide 1,134 new parking spaces at park-and-ride facilities. Approximately, 400 vehicles which are currently parking in the eliminated spaces could be accommodated nearby (relocated to the adjacent blocks), leaving 380 vehicles which cannot be accommodated and would be displaced by the project. The locations where parking displacement are the greatest include:

- Social Security West parking lot adjacent to I-70 (30 vehicles eliminated)
- Edmondson Avenue from Cooks Lane to Franklintown Road (58 vehicles eliminated)
- Calverton Street due to Red Line yard and shop (105 spaces eliminated)
- Boston Street from Chester Street to Conkling Street (126 vehicles eliminated)

For locations with parking displacements, the MTA is working collaboratively with the Baltimore City and property owners to identify parking mitigation strategies for parking that would be permanently lost along the limits of the Red Line corridor. Coordination with stakeholders and businesses affected by the loss of parking and loading zones would be undertaken during final design.

7.2.1 On-Street Parking

The number of parking spaces eliminated due to the Red Line would have varying impacts to the residents and businesses in the project study corridor. This would be partially determined by the proximity of the remaining spaces on any given street in the area.

From the parking inventory, the maximum number of vehicles parked along a block was recorded on weekdays and weekends. In addition, analysis was performed on the number of open spaces in proximity to the spaces being removed. An assumption was made that if open parking spaces were available one block to either side of the spaces that were being eliminated, motorists would be able to utilize those adjacent spaces instead.

For example, all vehicles utilizing the parking spaces being eliminated along Franklin Street can be accommodated in open/available parking spaces along adjacent blocks. Conversely, vehicles utilizing eliminated spaces along Edmondson Avenue would not find enough spaces in the adjacent blocks to accommodate the loss (based on current utilization patterns). **Table 32** illustrates the number of on-street parking spaces being eliminated, and the number of vehicles *displaced outside of the three block area* (the impacted block plus one block on either side), based on the maximum parking that was observed during the parking study. Because peak parking occurred in the evening or during the weekend, no distinction was made between peak hours restricted and non-restricted parking spaces in the analysis.

7.2.2 Off-Street Parking

In addition to the on-street parking impacts identified above, there would be some off-street (surface lot and garage) parking impacts along the corridor. These locations are also provided in **Table 32**.

The 888-space Arena Garage on Lombard Street would be impacted by the project. The Howard Street/ University Center Station would impact a portion of each floor of the garage for ventilation shafts for this underground station, displacing about 30 spaces per floor for a total of 120 spaces (14% reduction).

As part of the Red Line project, additional parking facilities are proposed to provide parking for Red Line and other transit users along the Corridor. These parking facilities include an expanded park-and-ride lot adjacent to the Security Square Mall, relocation and expansion of the existing I-70 park-and-ride lot, and a new park-and-ride lot in Canton along Boston Street, adjacent to the Brewer's Hill/Canton Crossing station. **Table 31** provides the existing and the proposed number of parking spaces at each of these facilities.

Figures 103- 106 show the parking spaces retained with the Red Line project.

In addition to regular parking spaces, special reserved areas are part of the overall parking arrangement. These special areas include truck loading zones, passenger loading zones and reserved handicapped parking spaces.

Table 31: Park-And-Ride Impacts along the Red Line Corridor

Facility	Existing Spaces	Proposed Spaces
Security Square Park-and-Ride	296	375
I-70 Park-and-Ride	245	700
Canton Crossing Park-and-Ride	0	600

7.2.3 Truck Loading Zones (TLZs)

There are 12 truck loading zones along the proposed Red Line alignment, and most are found in Downtown and Fell's Point. TLZs are specialized parking spaces for commercial vehicles making deliveries/pick-up that may be available for loading operations full time or for limited hours of the day. Where time-of-day restrictions for TLZs are present, the hours normally correspond with those placed on other parking spaces along a section of street.

For example, if parking is not permitted during peak hours along a certain street, then loading would not be permitted during those hours.

Two truck loading zones would be eliminated along the alignment of the Red Line – on Boston Street, north of Luzerne Avenue, and on Edmondson Avenue between Poplar Grove Street and Franklintown Road. These loading zones are not being replaced by the project, but Baltimore City would work with adjacent property owners to evaluate options to accommodate additional parking and loading zones as a separate effort.

7.2.4 Passenger Loading Zones (PLZs)

There are seven passenger loading zones along the proposed Red Line alignment. PLZs have been designated by the City at the request of public and private businesses that administer services to customers, patients or clients that need ready access. This occurs usually where there is no available on-street or off-street parking in close proximity. Parking is permitted at PLZs for 5 to 15 minutes only to allow for drop-off and/or pick-up of persons visiting the facility. Locations for PLZs include health clinics, day care centers, libraries or markets. PLZs are always installed in compliance with existing peak hour restrictions on that street.

One passenger loading zone would be eliminated along the alignment of the Red Line – on the west side of Boston Street, north of Luzerne Avenue (also designated as a truck loading zone).

7.2.5 Reserved Handicapped Parking Space (RHPS)

RHPS requests are investigated, reviewed and approved by the Parking Authority of Baltimore City. Citizens requesting this privilege must provide a medical verification of their disability. Upon review and acceptance of a request, signing that designates the space is installed and the reserved parking space is established legally. This ensures that a vehicle displaying the proper handicapped license or Hang Tag has the legal right to park in that designated space. The approving agency would not allow RHPS on a street that has a morning or evening peak hour parking restriction as it would be detrimental to the success of the peak hour restriction. Rear or side street alternatives are offered in these situations.

There are no permanently designated handicapped parking spaces which would be eliminated due to the Red Line project. **Table 33** illustrates the effect on loading zones in the corridor.

Table 32: Parking Spaces to Be Permanently Eliminated or Displaced

Segment No.	Geographic Limits	Surface or Tunnel	Description	Off-Street Parking Impacts *(+ gained or – lost)*	On-Street Parking Impacts *(+ gained or – lost)*	Spaces Eliminated/ Displaced
1	Security Boulevard from CMS to I-695	Surface	Dedicated transit on south side of Security Boulevard	-1 space at former Super Fresh store, +79 spaces at new Park & Ride between Lord Baltimore and Belmont Ave	None	1
1	I-695 to Woodlawn Drive	Surface	Dedicated transit alignment transitioning from Security Blvd. to north of I-70	-30 private parking spaces for SSA West. Total required by lease = 2130, Build condition = 2100 spaces	None	30
1	Woodlawn Drive to west of the I-70 Park-and-Ride	Surface	Dedicated transit on north side of I-70	None	None	None
1	I-70 Park and Ride to west of Cooks Lane	Surface	Surface parking lot facility at the terminus of I-70. Parking to be replaced with new Park-and-Ride lot between Parallel Drive and I-70.	+455 spaces (Old lot = 245 spaces; New lot = 700 spaces)	None	None
2	Cooks Lane to US 40	Tunnel	Cooks Lane tunnel to a portal in median of US 40/Edmondson Avenue	None	None	None
3	US 40/Edmondson Avenue from Cooks Lane to Franklintown Road	Surface	Dedicated transit in median, 2 traffic lanes in each direction w/ dedicated parking on both sides at some locations.	-3 spaces at Bank of America, -11 at Inner City Crab/Seafood, -10 at Lion of the Tribe Judah Daycare (All along Franklintown Road)	-214 spaces along Edmondson Avenue. Most spaces can be accommodated with other spaces nearby.	58
3	US 40/Franklin Street from Franklintown Road to W Baltimore MARC	Surface	Dedicated transit in median, 2 traffic lanes in each direction w/ dedicated parking on both sides at some locations.	-27 spaces in MARC Lot A, +335 spaces in MARC Park-and Ride expansion lot (by others)	-17 spaces along Franklin Street, Parking is available nearby to replace these spaces, -105 spaces on Calverton Street due to Red Line Operations and Maintenance Facility	132
3	US 40 from W Baltimore MARC to Fremont Avenue	Surface/ Tunnel	Dedicated transit in median of US 40 to a portal to Fremont Avenue tunnel	None	None	None
4	Fremont Avenue from US 40 to Lombard Street	Tunnel	Downtown Tunnel	None	-13 spaces. Parking is available nearby to replace these spaces.	None
4	Lombard Street from Martin Luther King Jr. Boulevard to President Street	Tunnel	Downtown Tunnel	-120 spaces at Arena Garage. Parking is available nearby to replace these spaces.	None	None
4	President Street from Lombard Street to Fleet Street	Tunnel	Downtown Tunnel	None	None	None
4	Fleet Street/Boston St from President Street to Montford Ave	Tunnel	Downtown Tunnel	None	-6 spaces. Parking is available nearby to replace some of these spaces.	4
4	Broadway (Median) from Fleet Street to Eastern Ave	Tunnel	Downtown Tunnel	None	-1 space. Parking is available nearby.	None
5	Boston Streets from Montford Ave to Conkling Street	Tunnel	Dedicated transit in the median, one traffic lane in each direction with dedicated parking at some locations	-6 at Safeway Lot, -22 at Baltimore City Parking Lot -13 at Canton Crossing II, -13 at Merritt Athletic Club +600 at Canton Crossing Park-and-Ride lot	-72 spaces along Boston Street. The Red Line project is not replacing these spaces, but parking would be addressed by the City, as needed.	126
5	Haven Street from Boston Street to Gough Street	Surface/ Elevated	Dedicated transit along Haven Street and elevated structure to Bayview Boulevard	-29 at Monumental Supply	None	29
5	Bayview MARC Station to Bayview Medical Center	Surface	Alignment on new right-of-way to Bayview Drive, dedicated transit on east side of Bayview Boulevard and I-895	+ 650 spaces generated at the Bayview Park-and-Ride lot (by others); - 91 spaces at Bayview/NIH lots	None	None
	Total Impacts			741 spaces removed by the project; 1,134 spaces added by the project; 985 spaces added by others;		380 vehicles displaced by the project

Table 33: Permanent Impacts to Loading Zones

Geographic Limits	Surface or Tunnel	Description	Effects on Loading Zones
Security Boulevard from CMS to Rolling Road	Surface	Dedicated transit on south side of Security Boulevard	No loading zones in this segment
Security Boulevard from Rolling Road to I-695	Surface	Dedicated transit on south side of Security Boulevard	No loading zones in this segment
I-695 to Woodlawn Drive	Surface	Dedicated transit alignment transitioning from Security Blvd. to north of I-70	No loading zones in this segment
Woodlawn Drive to west of the I-70 Park-and-Ride	Surface	Dedicated transit on north side of I-70	No loading zones in this segment
I-70 Park and Ride to west of Cooks Lane	Surface	Surface parking lot facility at the terminus of I-70. Parking to be replaced with new Park-and-Ride lot between Parallel Drive and I-70.	No loading zones in this segment
Cooks Lane to US 40	Tunnel	Cooks Lane tunnel to a portal in median of US 40/Edmondson Avenue	No impacts to loading zones
US 40/Edmondson Avenue from Cooks Lane to Franklintown Road	Surface	Dedicated transit in median, 2 traffic lanes in each direction w/ dedicated parking on both sides	There is one truck loading zone in this segment on the north side of Edmondson Avenue between Poplar Grove Street and Franklintown Road that would be eliminated and one passenger loading zone between Walnut Avenue and Woodington Road that would not be affected
US 40/Franklin Street from Franklintown Road to W Baltimore MARC	Surface	Dedicated transit in median, 2 traffic lanes in each direction w/ dedicated parking on both sides	No loading zones in this segment
US 40 from W Baltimore MARC to Fremont Avenue	Surface/ Tunnel	Dedicated transit in median of US 40 to a portal to Fremont Avenue tunnel	No loading zones in this segment
Fremont Avenue from US 40 to Lombard Street	Tunnel	Fremont Avenue Tunnel	No loading zones in this segment
Lombard Street from Martin Luther King Jr. Boulevard to President Street	Tunnel	Lombard Street Tunnel	No impacts to loading zones
President Street from Lombard Street to Fleet Street	Tunnel	President Street Tunnel	No impacts to loading zones
Fleet Street from President Street to Chester Street	Tunnel	Fleet Street Tunnel	No impacts to loading zones
Fleet/Boston Streets from Chester Street to Conkling Street	Tunnel	Fleet Street tunnel to a portal in median of Boston Street	One shared truck and passenger loading zone, on the west side of Boston Street, north of Luzerne Avenue – would be eliminated.
Conkling Street to Norfolk-Southern-Canton Railroad	Surface	Boston Street to west of Haven Street and along abandoned N-S railroad right-of-way	No loading zones in this segment
Bayview MARC Station to Bayview Medical Center	Surface	Alignment on new right-of-way to Bayview Drive, dedicated transit on east side of Bayview Boulevard and I-895	No loading zones in this segment

PARKING SPACE AVAILABILITY AND RESTRICTIONS - BUILD CONDITIONS (2035)

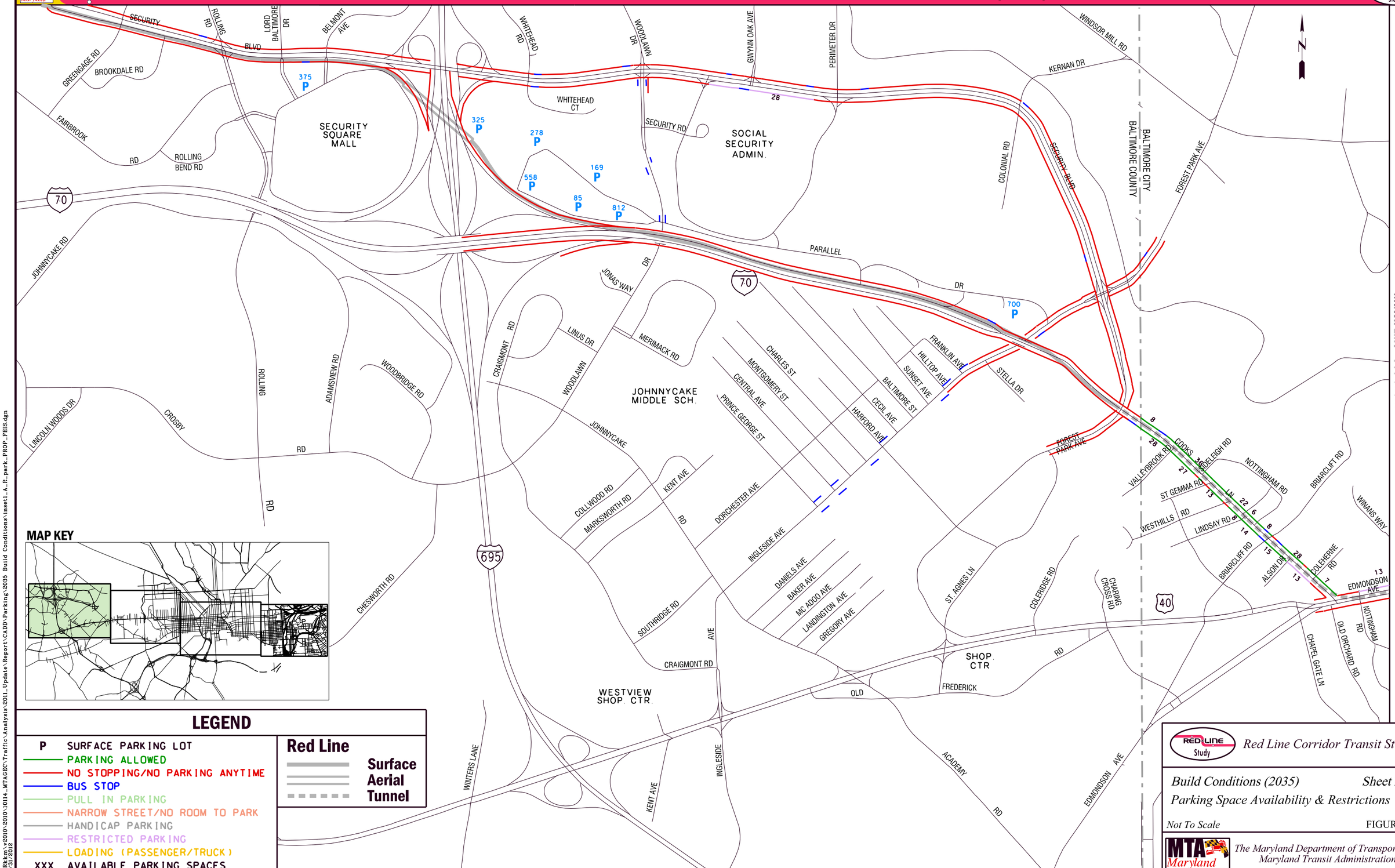

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FIGURE 103- Build Conditions (2035) Parking Space Availability and Restrictions

PARKING SPACE AVAILABILITY AND RESTRICTIONS - BUILD CONDITIONS (2035)

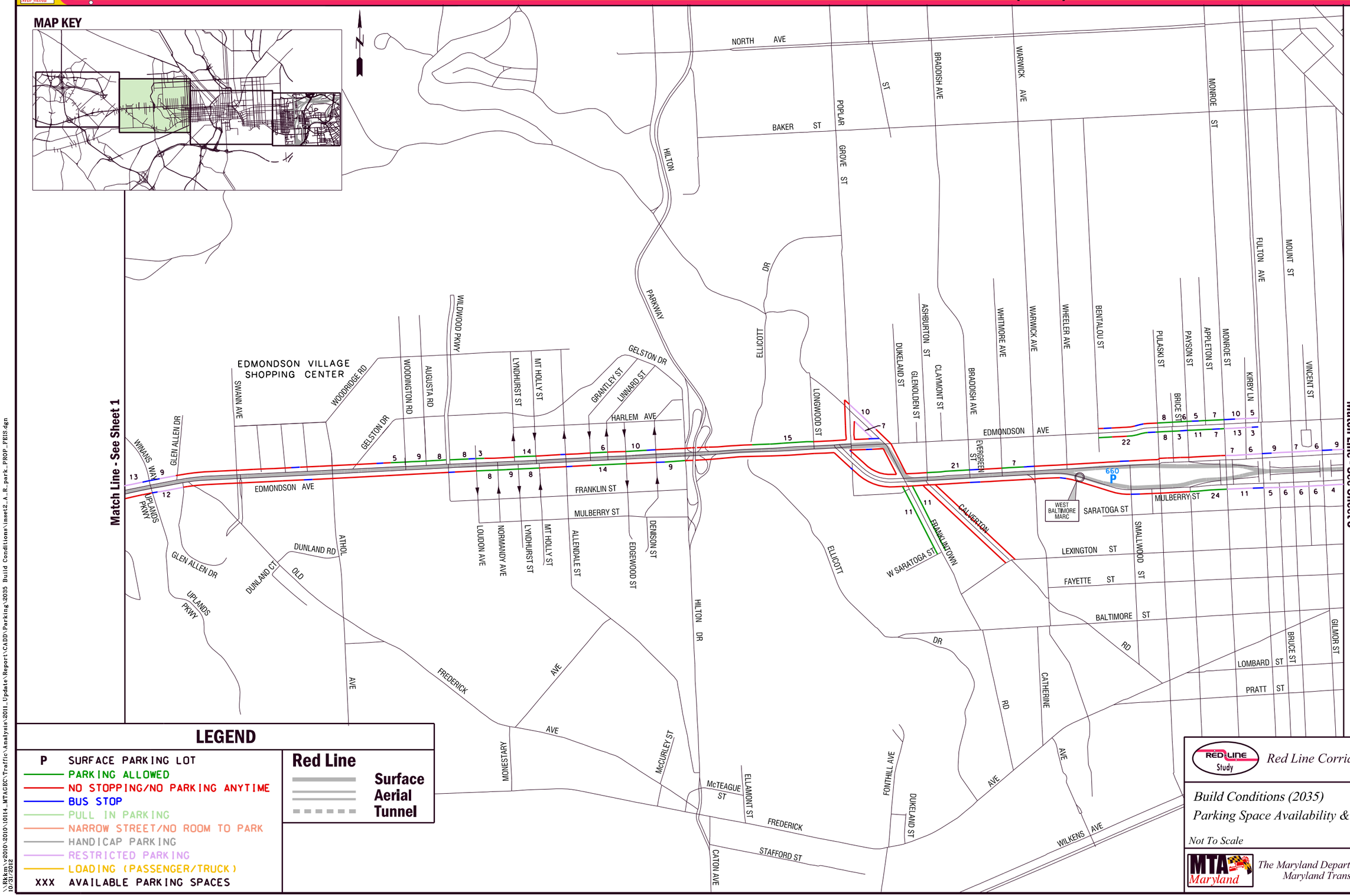

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FIGURE 104- Build Conditions (2035) Parking Space Availability and Restrictions

PARKING SPACE AVAILABILITY AND RESTRICTIONS - BUILD CONDITIONS (2035)

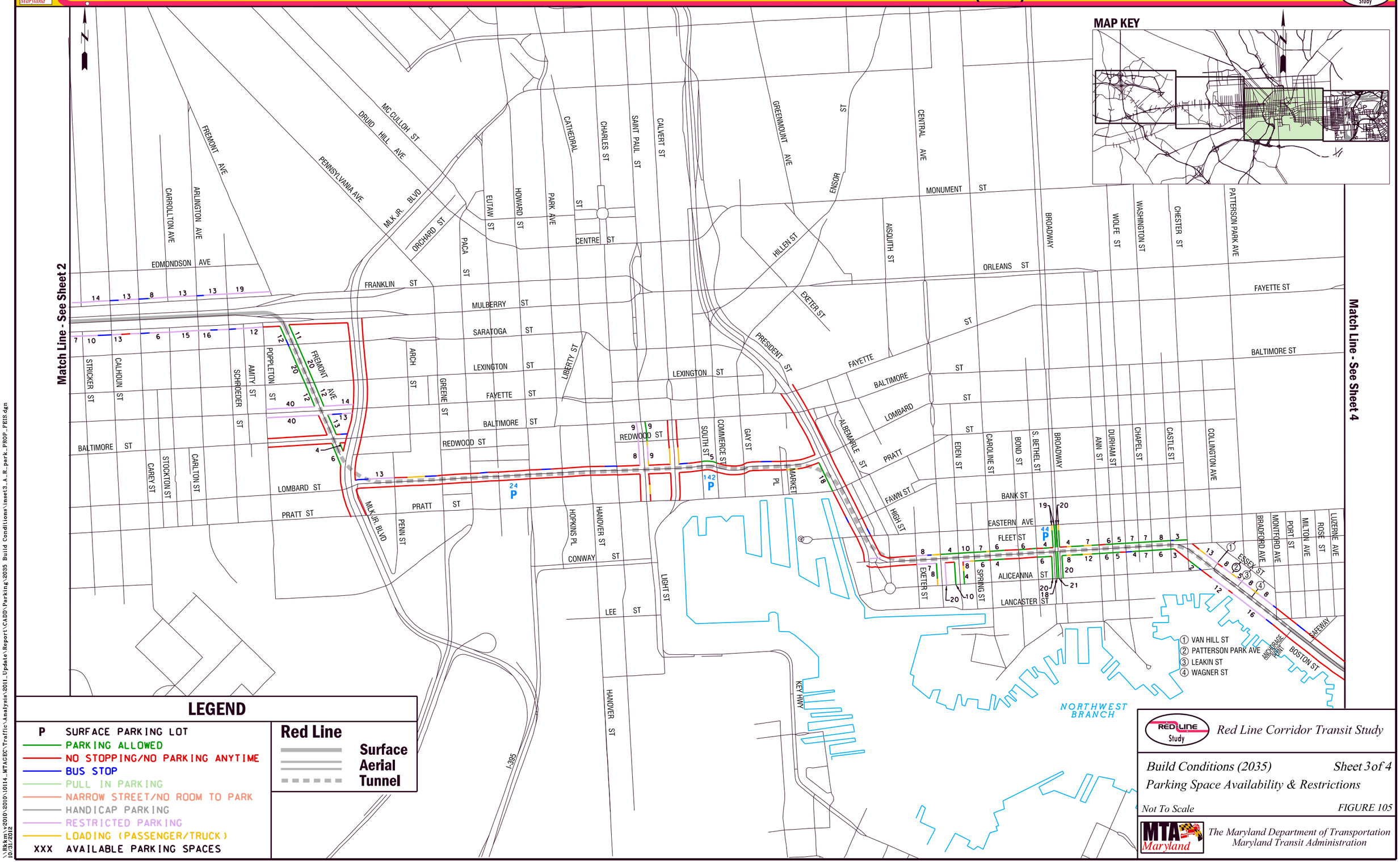

FIGURE 105- Build Conditions (2035) Parking Space Availability and Restrictions

PARKING SPACE AVAILABILITY AND RESTRICTIONS - BUILD CONDITIONS (2035)

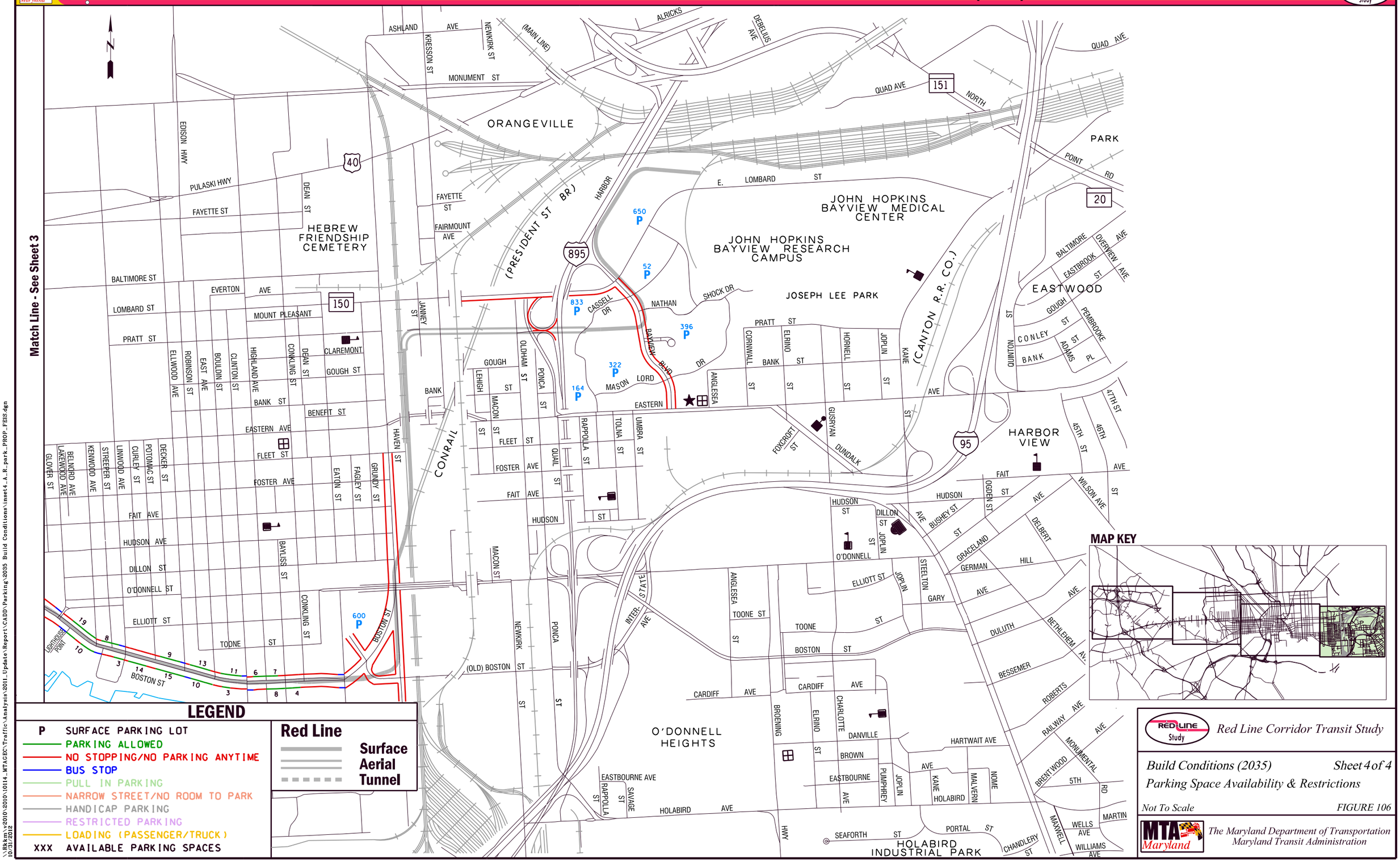

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FIGURE 106 - Build Conditions (2035) Parking Space Availability and Restrictions