CAPITAL COSTS
TECHNICAL REPORT

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ACRONYMS

DB	Design-Build Procurement Method
DBOM	Design-Build-Operate-Maintain Procurement Method
FEIS	Final Environmental Impact Statement
FTA	Federal Transit Administration
LPA	Locally Preferred Alternative
MTA	Maryland Transit Administration
P3	Public-Private Partnerships
PA	Preferred Alternative
PE	Preliminary Engineering
PMC	Program Management Consultant
PMO	Program Management Oversight
SCC	Standard Cost Category
SWM	Storm Water Management
YOE	Year-of-Expenditure

1. INTRODUCTION

The Maryland Transit Administration (MTA) previously prepared an Alternatives Analysis/Draft Environmental Impact Statement (AA/DEIS) to study a range of alternatives for addressing mobility and accessibility issues in the corridor between Bethesda and New Carrollton in Montgomery and Prince George's Counties, Maryland. The Purple Line project considered a range of alternatives to improve east-west transit mobility in the 16-mile corridor that connects several major activity centers at the following Metrorail stations: Bethesda, Silver Spring (both on the Red Line), College Park (Green Line), and New Carrollton (Orange Line) as well as the Takoma Park/Langley Park area and the University of Maryland (UMD).

Governor Martin O'Malley identified a Locally Preferred Alternative (LPA) on August 4, 2009 based on the information contained in the AA/DEIS and input from the public, the local jurisdictions, and elected officials. The phrase "Locally Preferred" reflects its selection by the local jurisdiction, in this case, the State of Maryland. On October 7, 2011, the Federal Transit Administration (FTA) granted permission for the Purple Line project to enter the Preliminary Engineering phase of the New Starts funding program process. MTA and FTA have prepared a Final Environmental Impact Statement (FEIS).

This document discusses the "Preferred Alternative" (PA) as defined in the FEIS. The Preferred Alternative includes refinements in project elements since the LPA and is the alternative that the MTA believes would fulfill its statutory mission and responsibilities considering economic, environmental, technical and other factors.

The Purple Line is a proposed 16-mile light rail transit line project located north and northeast of Washington, DC, inside the circumferential I-95/I-495 Capital Beltway. The project would include 21 stations and would operate 5:00 AM to 1:00 AM at 6, 10, and 12-minute headways during peak, off-peak, and fringe hours by 2040. Figure 1 shows the Preferred Alternative alignment, which includes the following stations:

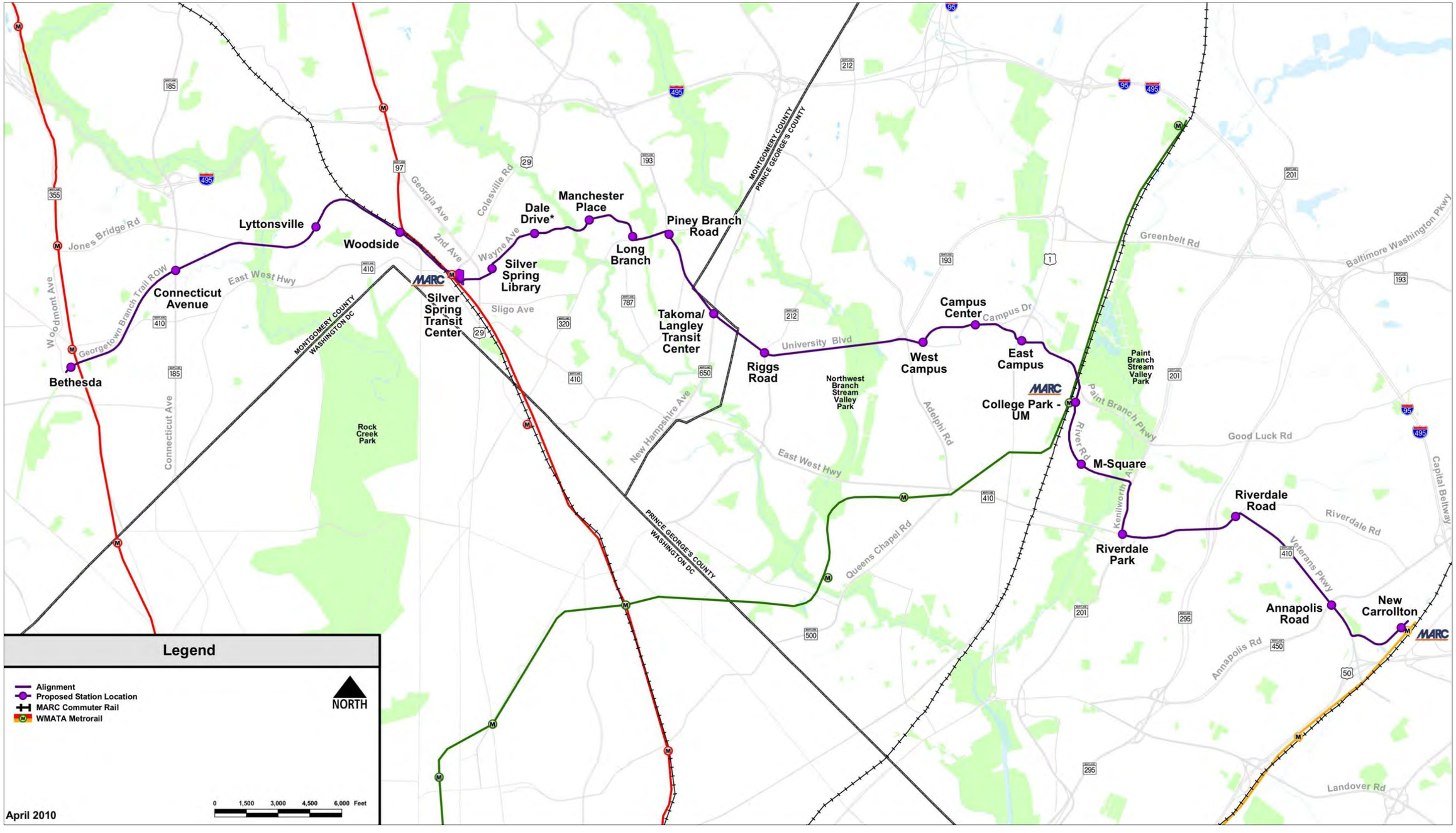
- Bethesda
- Chevy Chase Lake
- Lyttonsville
- Woodside/16th Street
- Silver Spring Transit Center
- Silver Spring Library
- Dale Drive
- Manchester Place
- Long Branch
- Piney Branch Road
- Takoma/Langley Transit Center
- Riggs Road
- Adelphi/West Campus
- Campus Center
- East Campus
- College Park Metro
- M Square
- Riverdale Park
- Beacon Heights
- Annapolis Road/Glenridge
- New Carrollton

The Purple Line generally would operate at-grade in dedicated travel lanes with some shared and some exclusive grade-separated operating environment. The Georgetown Branch right-of-way would be used between Silver Spring and Lyttonsville. No new Park-and-Ride facilities are proposed. Existing parking facilities at Bethesda, Silver Spring Transit Center, College Park/UMD Metro, and New Carrollton would serve the Purple Line.

1.1 Purpose of the Report

The purpose of this report is to document the cost estimating process and findings performed in support of the Purple Line project.

Figure 1: Preferred Alternative Alignment and Stations



2. COST ESTIMATING PROCESS

The Purple Line conceptual planning and design process provided the basis for the cost estimate and schedule and supported the MTA's Request to Enter Preliminary Engineering (PE) in mid-2011. At the time of the application to enter Preliminary Engineering, the Purple Line had a capital cost of $1.517 billion (calculated in 2010 dollars, not year-of-expenditure dollars) and a scheduled start of operations in December 2020. Escalated to 2012 dollars, the capital cost would be $1.657 billion.

On October 7, 2011, the Purple Line received FTA Permission to Enter PE. During PE, the MTA further defined the project's scope and requirements. This effort involved:

- Continued stakeholder and community engagement
- Continued facilities planning
- Further service/operations & maintenance planning, including establishment of initial systems requirements
- Development and application of PE-level design criteria
- Additional gathering of information on field conditions, especially subsurface information
- Further design development and constructability/maintenance of traffic assessments
- Identification of mitigation measures to address environmental, cultural and community impacts, including measure to comply with regulatory requirements for issues such as storm water management

Concurrently, the MTA updated the estimated capital cost and implementation schedule and established the priorities for resolving outstanding issues with project requirements.

On March 19, 2012, the MTA prepared an updated PA scope, capital cost estimate, and schedule estimate, which used the design, implementation schedule, and risk assessment at that time. These estimates incorporated changes in the unit costs and project quantities that had occurred since 2009. As part of this effort, the MTA undertook a value planning exercise that provided a venue for considering trade-offs among cost, transit service and operations, impacts, and schedule as a basis for design refinements and adjusting the cost and schedule estimates.

The estimating methodology for the capital cost at the Entry into PE was essentially the same for both the MTA's Baltimore Red Line and Purple Line projects.

To provide comparability for the two project estimates, the following unit cost assumptions or cost factors were considered in both project cost updating approaches:

- Vehicle and other associated unit costs
- Escalation through 2020 of 3.1 percent
- Agency costs
- Schedule based on traditional Design-Bid-Build approach

Information on unit cost and various other components was shared and checked for comparability where appropriate.

2.1 Purple Line Refinements

The PA for the Purple Line includes refinements that were made to the design following the announcement of the Locally Preferred Alternative in August 2009. These refinements reflect continued stakeholder input, further field information, an increase in the level of design, constructability assessments, updated unit costs, and a value planning exercise.

The following refinements to the Purple Line involved a multi-disciplinary team review of all major design and cost components of the project, with particular focus on the project requirements, impacts, and scope. Refinements focused on project design and the trade-offs among costs, service quality, and community and environmental impacts.

2.1.1 Project Scope

There have been no major changes to the scope of the project since the announcement of the Locally Preferred Alternative in August 2009. The project length, number of stations, and other major features and operating plans are essentially unchanged. However, the following refinements to the Purple Line were made in response to stakeholder requests to reduce impacts and property acquisition:

- Shift of Kenilworth Road alignment to roadway median
- Re-siting of Lyttonsville maintenance and storage facility away from adjacent communities
- Reconfiguration of Glenridge Maintenance Facility
- At-grade crossing of Adelphi Road at University Boulevard

The value planning exercise resulted in two additional refinements:

- At-grade crossing of Annapolis Road at Veterans Parkway
- Use of existing lanes along University Boulevard

These changes would reduce costs for the project and provide community benefits in terms of reduced property impacts, better urban design, and more convenient pedestrian access.

2.1.2 Project Cost

The refined Year of Expenditure (YOE) capital cost estimate is a rounded $2.2 billion. As the refined implementation schedule has not substantially changed construction cash flow, the start of construction or the start of operations, this increase in the YOE estimate is due to the underlying project estimate and not the result of increased cost escalation from a schedule or cash flow change.

As the Purple Line continues to develop, this estimate will be refined and is subject to adjustments which could cause the estimate to go up or down.

Section 3.0 contains the project description on which the cost estimate is based. Specific elements are subject to further refinement and adjustment as the proposed project develops.

2.1.3 Project Schedule

The refined implementation schedule has not substantially changed the start of construction and the start of operations scheduled for November/December 2020.

2.1.4 Project Delivery and Procurement Planning

To date, all cost and schedule estimates have been predicated on a conventional Design-Bid-Build procurement and delivery process. The State of Maryland has other options currently available including the Design-Build (DB) and Design-Build-Operate-Maintain (DBOM) procurement methods. The State of Maryland is examining Public-Private Partnerships (P3) and other financing options for use in delivery that could affect the cost and schedule of the project. These options are being considered for the Purple Line. A procurement methodology will be developed as the project moves forward.

3. PROJECT DESCRIPTION

The Purple Line project is 16.2 miles long with 14.7 miles of surface alignment, 0.5 mile of underground alignment, and 1.0 mile of aerial alignment.

3.1 Bethesda to Silver Spring Transit Center

This segment of the alignment is approximately 4.3 miles long, primarily in exclusive right-of-way (see Figure 2), with five stations (see Table 1). The alignment begins just east of Woodmont Avenue in downtown Bethesda and west of the new southern entrance to the Red Line's Bethesda Metrorail station. The Purple Line's Bethesda station would be located under the Apex Building on the west side of Wisconsin Avenue. West of the station, there would be an overrun track of not more than 100 feet. The alignment then continues primarily on surface alignment along the Montgomery County-owned former CSX Georgetown Branch right-of-way, crossing under East West Highway, and through the Columbia Country club. The alignment passes over Connecticut Avenue, with a station on the east side of Connecticut Avenue, and then under Jones Mill Road.

Figure 2: Bethesda to Silver Spring Transit Center



Table 1: Stations in Bethesda to Silver Spring Transit Center Segment

Station	Type	Platform Configuration
Bethesda	Under Building	Center
Connecticut Avenue	Aerial	Side
Lyttonsville	At-Grade	Center
Woodside	At-Grade	Side
Silver Spring Transit Center	Aerial	Center

The alignment continues east and crosses over Rock Creek on a new structure. Shortly after crossing Rock Creek, the alignment reaches the Lyttonsville Yard. The Lyttonsville station is located east of the Lyttonsville Yard. The alignment continues east, crossing Stewart Avenue at-grade, then turns to the southeast along the south side of the CSX Metropolitan Branch tracks. After crossing underneath the Talbot Avenue and 16th Street bridges, the alignment reaches the Woodside station. The alignment then passes underneath the Spring Street Bridge, gradually rising to cross over the CSX and Red Line Metrorail tracks and Colesville Road before entering the Silver Spring Transit Center station.

The project includes completing the paving and landscaping of the Capital Crescent Trail, providing a continuous trail between Bethesda and Silver Spring. The trail would have direct connections to the Metropolitan Branch Trail and Rock Creek Trail. The completion of the trail along the CSXT corridor, however, is contingent on agreement with CSXT on the use of their property on the north side of the CSXT tracks for the trail. If agreement is not reached by the time the Purple Line construction occurs, MTA would construct the trail from Bethesda to Talbot Avenue. From Talbot Avenue to Silver Spring an interim signed bike route on local streets would be used.

3.2 Silver Spring Transit Center to College Park Metro Station

This segment of the alignment is approximately 7.1 miles long, primarily in semi-exclusive right-of-way, with some mixed-traffic segments (see Figure 3), with 11 stations (see Table 2). The alignment exits the Silver Spring Transit Center station over the proposed Ripifant Street and enters Bonifant Street at-grade, where the Purple Line travels in a semi-exclusive alignment to a station at the new Montgomery County Silver Spring Library. It then continues at-grade, and in mixed traffic, along Wayne Avenue to a station at Dale Drive.

Figure 3: Silver Spring Transit Center to College Park Metro Station

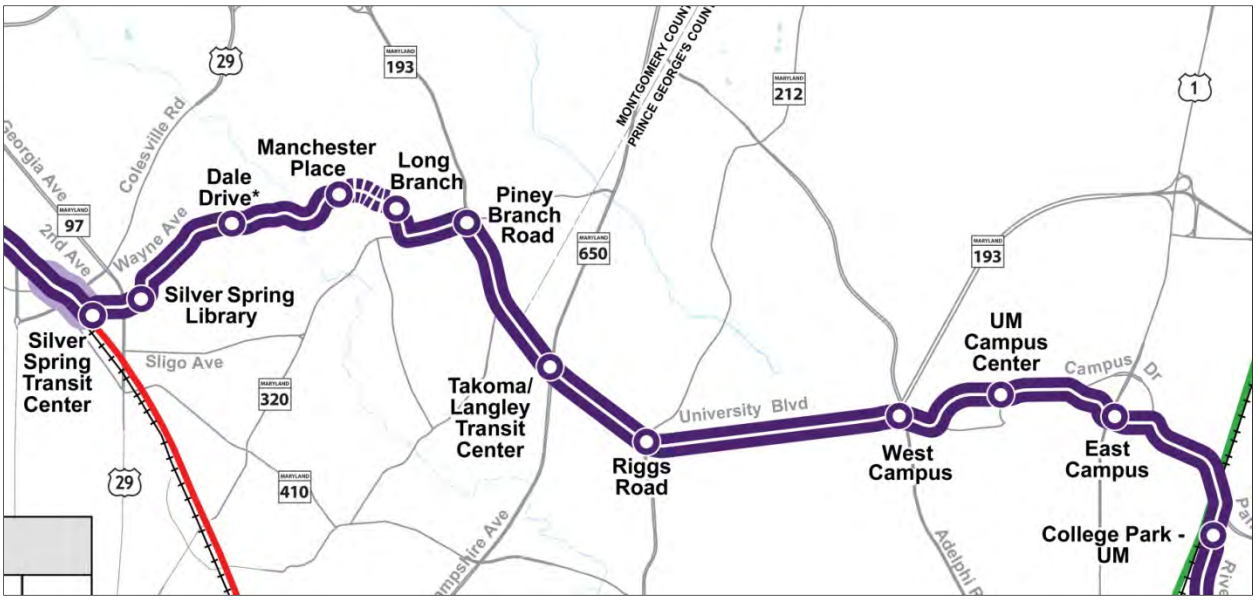


Table 2: Stations in Silver Spring Transit Center to College Park Metro Station Segment

Station	Type	Platform Configuration
Silver Spring Library	At-Grade	Side
Dale Drive	At-Grade	Center
Manchester Place	Tunnel	Side
Long Branch	At-Grade	Center
Piney Branch	At-Grade	Center
Takoma/Langley Transit Center	At-Grade	Center
Riggs Road	At-Grade	Center
West Campus	At-Grade	Center
Campus Center	At-Grade	Side
East Campus	At-Grade	Side
College Park Metro	At-Grade	Center

Shortly after crossing Sligo Creek, Sligo Creek Parkway and Manchester Road, the alignment operates in a semi-exclusive right-of-way before it enters an approximately ¼-mile-long tunnel under Plymouth Avenue, with a station just off Wayne Avenue between Manchester Road and Manchester Place. The alignment leaves the tunnel section in semi-exclusive right-of-way along the west side of Arliss Street, west of the Long Branch station. The alignment remains in semi-exclusive right-of-way along Piney Branch Road, then University Boulevard, passing through the Piney Branch Road, Takoma/Langley Transit Center, and Riggs Road stations. Just east of Tulane Drive, the alignment leaves the University Boulevard median and crosses eastbound University Boulevard and Adelphi Road at grade, and continues in the median of Campus Drive.

The West Campus station is on the south side of Campus Drive. The alignment leaves Campus Drive and turns onto Presidential Drive, into the University of Maryland (UMD). The Purple Line traverses at-grade through the center of UMD, in semi-exclusive right-of-way along the outside lanes of Presidential Drive and Union Drive. On Campus Drive, through the heart of campus, the Purple Line shares lanes with transit and university service vehicles only. The Campus Center station lies just west of the Campus Drive/ Union Lane/ Library Lane intersection.

At Regents Drive, the alignment leaves Campus Drive and travels in a short section of exclusive right-of-way, entering Rossborough Drive in semi-exclusive curb lanes on either side of the roadway. Just beyond Baltimore Avenue (US 1), the alignment passes the East Campus station. From Rossborough Drive, the alignment transitions to Paint Branch Parkway in mixed traffic operations. After crossing under the CSX and Metrorail Green Line tracks, the alignment turns south as it exits Paint Branch Parkway into the College Park Metro station.

3.3 College Park Metro Station to New Carrollton Station

This segment of the alignment is approximately 4.8 miles long, primarily in semi-exclusive and exclusive rights-of-way (see Figure 4), with five stations (see Table 3). The alignment exits College Park Metro station at grade, parallel to the CSX/MARC and Metrorail tracks, in an exclusive right-of-

way. The alignment shifts close to River Road and crosses Rivertech Court in a semi-exclusive right-of-way as it reaches the proposed M Square station. The alignment continues across Haig Drive in exclusive right-of-way along the south side of River Road, crossing over the Northeast Branch of the Anacostia River toward Kenilworth Avenue.

After crossing the southbound lanes of Kenilworth Avenue at River Road, the alignment turns to the south into the median of Kenilworth Avenue, still in semi-exclusive right-of-way. Just south of Rittenhouse Street, the alignment ascends on an aerial structure, turning east and crossing over the Kenilworth Avenue/ East West Highway intersection, to the south side of East West Highway, to the Riverdale Park station. The alignment then gradually returns to grade on the south side of Riverdale Road, again in semi-exclusive right-of-way, through several signalized intersections and crossing under the Baltimore-Washington Parkway eventually reaching the Beacon Heights station between 67th Avenue and 67th Place.

Figure 4: College Park Metro Station to New Carrollton Station



Table 3: Stations in College Park Metro Station to New Carrollton Station Segment

Station	Type	Platform Configuration
M Square/River Road	At-Grade	Side
Riverdale Park	Aerial	Side
Beacon Heights	At-Grade	Side
Annapolis Road	At-Grade	Side
New Carrollton	At-Grade	Center

After the alignment passes 67th Place, it turns to the southeast along the southwestern side of Veterans Parkway, running in more exclusive right-of-way as it approaches the Glenridge Maintenance Facility. Beyond the Glenridge Maintenance Facility, the alignment crosses Annapolis Road at grade,

with a station sited just east of the intersection of Veterans Parkway and Annapolis Road. The alignment continues at grade, remaining along the southwest side of Veterans Parkway. The alignment then crosses Veterans Parkway at grade at Ellin Road, with the eastbound track running along the south side of Ellin Road in a shared right-of-way, crossing both Hanson Oaks Drive and the PEPCO substation driveway at-grade and the westbound track along the north side of Ellin Road.

Beyond Emerson Place, the alignment turns off from Ellin Road and enters the New Carrollton Metro station at-grade, with passenger connections to the Metrorail Orange Line, the MARC Penn Line, and the AMTRAK Northeast Corridor.

3.4 Storage and Maintenance Facility Sites

The PA includes two Purple Line storage and maintenance facilities. Together, the two facilities would have the capacity to store and maintain the 55 vehicles required to operate the system. The use of two facilities is largely based on site availability as a single piece of real estate of sufficient size for all functions was not available.

The Lyttonsville Yard would be located at the western end of the alignment, just west of the proposed Lyttonsville station.

The Glenridge Maintenance Facility would be located at the eastern end of the alignment, off of Veterans Parkway and just west of the Annapolis Road station in Prince George's County. Access to the facility would be via Veterans Parkway, with the site situated on the south side of the Parkway.

Originally, both the Lyttonsville and Glenridge facility sites would have accommodated a portion of the light rail vehicle storage and some of the maintenance functions. During the refinement effort, the functions of both sites were adjusted so that the operations control center and most of the vehicle storage would occur at the Lyttonsville Yard, while the Glenridge Maintenance Facility would accommodate vehicle maintenance and maintenance-of-way functions.

The two facility sites would provide all administrative, operations, and maintenance functions required to operate and maintain the Purple Line infrastructure and vehicles.

3.5 Light Rail Vehicles

For the purposes of PE, the Purple Line project is basing its design and operations planning on the use of 70 percent low-floor light rail vehicles. The 70 percent low floor vehicle is the typical choice in modern light rail systems, especially in North America. Several potential vehicle types and manufactures exist, and a determination of the choice for the Purple Line fleet would be made during the future procurement process. These vehicles are typically 92 to 96-feet-long. The Purple Line alignment is limited to two-car train operations. The operating plan calls for 6-minute peak period headways and 10-minute headways in non-peak periods. The total fleet required is 55 vehicles.

3.6 Systems

3.6.1 Traction Power and Overhead Catenary

The Purple Line vehicles would be powered from an overhead contact system. The power would be provided by diode rectifier traction power substations located along the alignment at intervals that would support the operating headways for normal operation and also contingency operation if a substation is out of service. The yards would have substations to power the vehicles on the yard tracks and to provide power to the shop. The substations would be connected to the local utility and

transform the utility power to a nominal 750 volts DC. Power would be distributed to the vehicles from the substations by the overhead contact system comprised of a contact wire supported by a combination of messenger wire, hangers, poles, and attachments to structures. The 70 percent low floor light rail vehicles would collect the power through the use of a pantograph that would make contact with the contact wire as the vehicle traverses the alignment. The running rails would be used for the traction power return.

3.6.2 Train Control

The light rail vehicle's speed and route would be governed by an automatic train control system. In the areas of the line where the alignment is dedicated exclusively to the light rail and the train is able to operate at higher speed, the train control system would include an automatic train protection system that would enforce train separation. In the areas where the train is sharing the alignment with automobiles, the train control system would enforce the speed limits. The train control system would include a system that would be able to locate the light rail vehicle along the alignment and a method of interfacing with the automobile traffic light system to request a light rail phase. At some locations, railroad-style gates may be used which would be activated by the train control system. The train control system would be supervised from the control center which is currently programmed at the Lyttonsville yard. The train control system would be linked to the control center by a communications network that would be built along the alignment.

3.6.3 Communications

The communications network would provide a link between the stations, substations, and the control center. The communications network would enable the control center operators to supervise the movement of trains, monitor the traction power system, monitor the status of equipment along the light rail line, broadcast public address messages and text messages to the station platforms, and to view and record closed circuit television images from cameras along the alignment. Next-train arrival message signs would be located on the station platforms to provide information to the patrons. Cameras would be located on the station platforms and at other locations as an aid to operations and to enhance security. Station emergency phones would be provided for patron use and would be connected to the communications network. Blue light emergency telephones would be provided at substations, in tunnels, and on aerial structures, where appropriate.

The vehicles would accommodate voice and data communications from the control center and include public address and variable passenger information display capabilities. The MTA radio system would be extended to serve the entire Purple Line alignment and provide voice and data communications between the control center, the vehicles, and maintenance personnel.

3.6.4 Fare Collection

The Purple Line would use a barrier-free proof of payment system for fare collection. Ticket vending machines and ticket validators would be located on, or adjacent to, station platforms. Inspectors would spot-check passenger tickets on the trains. The fare collection equipment would be connected to the communications network and link to equipment that would allow processing of credit and debit cards and provide alarms if there are equipment problems.

3.7 Other Scope Elements

Along the Georgetown Branch right-of-way in Montgomery County, the Purple Line would accommodate the construction of the permanent Capital Crescent Trail. The trail construction itself is the responsibility of Montgomery County. At the Bethesda terminal station, Montgomery County is responsible for funding the construction of a new surface connection to the south end of the Bethesda Metro station. The Purple Line station design is integrated with this design and the associated Purple Line costs are included in the cost estimate. Similarly, the Purple Line has a station that would be located next to and connect with the planned Takoma-Langley Park Transit Center. This transit center would be funded separately and the Purple Line includes no costs for its implementation.

4. PROJECT COST

The YOE capital cost estimate is $2.2 billion. As the refined implementation schedule has not substantially changed construction cash flow, the start of construction, nor the start of operations, this increase in the YOE estimate is due to the underlying project estimate and not the result of increased cost escalation from a schedule or cash flow change.

Attachment A shows the Standard Cost Category (SCC) main worksheet summary. The principal driver of the capital cost changes were cost increases in major structures, vehicles, systems, and new Maryland storm water management (SWM) requirements. Specific items include:

- Plymouth Tunnel
  - Further soil borings and a constructability analysis required the shift from bored to (the more expensive) mined tunnel construction
- Silver Spring Transit Center – CSX/WMATA Crossing
  - Constructability analysis revealed restricted construction staging areas and site constraints (Metrorail power cable duct banks)
  - Longer bridge span over CSX/WMATA and more difficult construction increased the cost of the crossing and station
- Storm Water Management
  - Cost of facilities and additional right-of-way to meet new Maryland regulations
- Vehicles
  - Unit cost of vehicles increased by $1 million
  - Further operational analysis required two additional vehicles
  - System cost increasing exponentially industry-wide

Cost reductions were derived from stakeholder-driven refinements and internal refinement planning. A number of these items resulted in reduced property acquisition costs. Since the conceptual planning cost estimate in 2010, property acquisition YOE costs decreased as a result of reduced escalation. Cost reductions included:

- Shift of Kenilworth Road alignment to roadway median
- Re-siting of Lyttonsville Yard away from adjacent communities
- Modification of Glenridge Maintenance Facility configuration
- At-grade crossing of Adelphi Road at University Boulevard

Two changes resulted from the value planning exercise:

- At-grade crossing of Annapolis Road at Veterans Parkway
- Using existing lanes along University Boulevard
- Reprogramming of the functions at the Lyttonsville Yard and Glenridge Maintenance Facility

These changes would have major cost savings for the project while also providing community benefits in terms of reduced property impacts, better urban design, and more convenient pedestrian access.

4.1 Cost Estimating Methodology

The purpose of the capital cost refinement activities was to update the Purple Line conceptual planning cost estimate based on the most currently available quantities, drawings, and special considerations developed and provided by the design team. The refined cost estimate used historical cost data from similar projects, Maryland State Highway Administration bid tabs, special cost studies conducted for specific Purple Line project elements (e.g., Plymouth Tunnel, at-grade stations, etc.), and the estimating team's general industry knowledge and experience. The refined cost estimate also considered the refinement planning components listed above. The refined cost estimate carried forward those cost items whose requirements/scope had not substantially changed since the initiation of PE, and escalated the costs from first quarter 2010 to first quarter 2012 at a rate of 3.1 percent per year.

4.2 Basis of Cost Estimate/ Assumptions

Attachment B provides the basis of the cost estimate including assumptions for the project.

5. PROJECT SCHEDULE

The refined implementation schedule has not substantially changed the major milestones for the project including the start of construction and the start of operations anticipated in November/December 2020.

5.1 Preliminary Contract Areas and Packages

While the overall project schedule milestones have not changed, the final design and construction schedule was refined. More detailed assessment of potential contract packages was performed to reflect more detailed examination of mass balancing, constructability, and right-of-way access. Table 4 lists a preliminary set of contract areas that were used to aid the development of contract packages. Attachment C contains a description of the preliminary contract areas, and Attachment D contains the refined project implementation schedule based on these contract areas. These contract areas do not necessarily reflect a set of contract bid packages. Some of the contract areas may be combined or consolidated into a smaller number of contract bid packages recognizing the increased integration risk and procurement/administration cost associated with a large number of contracts. It is expected that a number of the civil contract areas would be likely candidates for combining as would some of the systems areas.

Table 4: Preliminary Contract Areas

Contract Areas		Contract Type
1	ROW Demolition (All Areas)	On-Call Contracts
2	Early Construction (Glenridge site work, Utilities, SWM)	Design-Bid-Build*
3	Early Construction (Advance Utilities, Public ROW)	Design-Bid-Build
4	Utilities, Roadway & SWM (Area 1)	Design-Bid-Build
5	Utilities, Roadway & SWM (Area 2)	Design-Bid-Build
6	Utilities, Roadway & SWM (Area 3)	Design-Bid-Build
7	Utilities, Roadway & SWM (Area 4)	Design-Bid-Build
8	Utilities, Roadway & SWM (Area 5)	Design-Bid-Build
9	Utilities, Roadway & SWM (Area 6)	Design-Bid-Build
10	Utilities, Roadway & SWM (Area 7)	Design-Bid-Build
11	Utilities, Roadway & SWM (Area 8)	Design-Bid-Build
12	Utilities, Roadway & SWM (Area 9)	Design-Bid-Build
13	Utilities, Roadway & SWM (Area 10)	Design-Bid-Build
14	Tunnel, Guideway, Track & Stations (Area 4)	Design-Bid-Build
15	Guideway, Structures, Track & Stations (Areas 1, 2, 3, 5)	Design-Bid-Build**
16	Guideway, Structures, Track & Stations (Areas 6, 7, 8, 9)	Design-Bid-Build**
17	Systems – Train Control/ Signals (All Areas)	Design-Bid-Build
18	Systems – OCS (All Areas)	Design-Bid-Build
19	Systems – TPSS (All Areas)	Design-Bid-Build
20	Systems – Communications (All Areas)	Design-Bid-Build
21	Systems – Traffic Integration (All Areas)	Design-Bid-Build
22	Yard and Shops (Areas 10, 11)	Design-Bid-Build
23	Fare Collection (Areas 1 thru 9)	Delivery & Installation
24	Vehicles	Supply

*To date, all cost and schedule estimates have been predicated on a conventional Design-Bid-Build procurement and delivery process. The State of Maryland has other options currently available including the Design-Build (DB) and Design-Build-Operate-Maintain (DBOM) procurement methods.

**Procurement of track elements including rail and special trackwork components may be combined to optimize economy of purchase.

6. PROJECT RISK

Over the course of the project development process, a multi-disciplinary risk identification and assessment process was followed. As some issues such as risks due to tunneling, utilities, railroad agreements, etc. were identified and vetted, the cost estimates were modified accordingly. The various contingency levels were confirmed to be adequate for the remaining risks identified.

6.1 Risk Evaluation

While many project requirement and scope issues have been confirmed or resolved during the PE design development to date, there are still risks that could potentially affect the project scope and requirements and, consequently, the capital cost and implementation schedule. These include potential changes due to:

- Resolution of outstanding project requirement issues
- Further design development based on additional field data, design, constructability reviews, and maintenance of traffic (MOT) coordination
- Outcome of the Record of Decision for the National Environmental Policy Act (NEPA) process and identified mitigation and permitting requirements and schedule
- Resulting agreements or Memoranda of Understanding, especially with CSX, University of Maryland, the Washington Metropolitan Area Transit Authority (WMATA), State Highway Administration, Prince George's County, Montgomery County, and the major utilities for right of way, easement, access, operating rights, and relocations
- Further cost refinements of real estate acquisition, relocation process, and resources
- Results of value engineering
- Establishment of project procurement methods
- Availability and/or delays in receiving capital funding at the federal and non-federal levels
- Changes in political support affecting previous decisions and schedule
- Stakeholder expectations in terms of changing project requirements and mitigation

6.2 Cost Contingency

The refined cost estimate includes allocated and unallocated contingencies.

6.2.1 Allocated Contingency

The MTA has applied contingencies to specific project cost elements defined by the FTA SCC. Allocated contingencies assign certain percentages, based on experience and FTA guidelines, to specific cost elements for different types of work with different risk profiles as defined in the SCC. Attachment A shows the allocated contingencies in the column entitled "Base Year Dollars Allocated Contingency." The allocated contingencies total approximately $299.4 million, which is approximately 20 percent of base year dollars without contingency.

6.2.2 Unallocated Contingency

Unallocated contingency is a percentage applied to the raw base cost aggregate to reflect the overall level of program design development and related overall risk of growth in project costs. The unallocated contingency is $67.7 million, which is approximately 5 percent of the base year dollars without contingency.

6.2.3 Total

The total contingency in the refined cost estimate is $367.1 million in base year dollars, which is approximately 25 percent of the base year dollars without contingency.

6.3 Schedule Contingency

The start date of the project schedule is October 7, 2011, the date of Entry into PE, with a completion date of November 16, 2020. There is approximately 6 months of contingency built-in into the schedule.

6.3.1 Secondary Mitigation

Secondary mitigation consists of a pre-planned series of actions which are triggered if events occur that result in depletion of the contingency. Secondary mitigation actions are planned to provide for substantial cost reductions, preferably without reduction in project scope. However, particularly in later phases of a project, it becomes increasingly difficult to provide secondary mitigation measures that result in the required cost savings without reductions in scope.

6.4 Provision of Secondary Mitigation

At this stage of PE, options include:

- Scope considerations
- Extent of “Green” track
- Storm water management “credit” for transit contribution to water quality
- Further design considerations
- Structural design of CSX/WMATA crossing
- Systems and communications
- Estimating considerations
- Contractor bid environment
- Real estate market
- Implementation considerations
- Accelerated implementation schedule
- Alternative delivery/implementation procurement

Because of the constraints imposed by the availability of storage and maintenance facility sites, there are limitations on using phasing or minimal operating segments as secondary mitigation options; although some possible deferral items could include:

- Reduction in the initial number of light rail vehicles purchased
- Deferred build-out of certain low volume stations
- Deferred build-out of certain maintenance and storage facilities, especially activities that could be performed off-site at existing facilities or contracted for long-term overhauls that would occur later in the project life cycle.

7. ATTACHMENTS

Attachment A: SCC Main Worksheet Summary

Attachment B: Basis of Cost Estimate

Attachment C: Description of Preliminary Contract Areas

Attachment D: Project Implementation Schedule

Attachment A: SCC Main Worksheet Summary

MAIN WORKSHEET - BUILD ALTERNATIVE (Rev.14, August 5, 2011)

Maryland Transit Administration — Today's Date **9/14/12**

Maryland National Capital Purple Line — Yr of Base Year $ 2012

FY 2014 Annual Report Submittal — Yr of Revenue Ops 2020

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**16.18**	274,797	64,540	**339,337**	**$20,979**	**32%**	**18%**	**401,548**
10.01 Guideway: At-grade exclusive right-of-way	4.03	26,969	6,742	33,711	$8,364			39,891
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	9.67	18,307	4,577	22,883	$2,366			27,078
10.03 Guideway: At-grade in mixed traffic	1.20	1,801	450	2,251	$1,876			2,664
10.04 Guideway: Aerial structure	0.71	64,899	16,225	81,124	$114,989			95,996
10.05 Guideway: Built-up fill	0.00	0	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0	0	0				0
10.07 Guideway: Underground tunnel	0.57	80,820	24,246	105,066	$184,486			124,328
10.08 Guideway: Retained cut or fill	0.00	0	0	0				0
10.09 Track: Direct fixation		5,801	870	6,671				7,894
10.10 Track: Embedded		27,953	4,193	32,146				38,039
10.11 Track: Ballasted		38,698	5,805	44,502				52,661
10.12 Track: Special (switches, turnouts)		8,543	1,281	9,824				11,626
10.13 Track: Vibration and noise dampening		1,008	151	1,159				1,371
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**20**	86,257	23,656	**109,913**	**$5,496**	**10%**	**6%**	**130,063**
20.01 At-grade station, stop, shelter, mall, terminal, platform	15.00	24,351	6,088	30,439	$2,029			36,019
20.02 Aerial station, stop, shelter, mall, terminal, platform	3.00	14,484	4,345	18,830	$6,277			22,282
20.03 Underground station, stop, shelter, mall, terminal, platform	2.00	17,414	5,224	22,638	$11,319			26,788
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0.00	0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		9,934	2,980	12,914				15,281
20.07 Elevators, escalators		20,074	5,018	25,092				29,692
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	16.18	82,545	20,636	**103,181**	**$6,379**	**10%**	**6%**	**120,225**
30.01 Administration Building: Office, sales, storage, revenue counting		0	0	0				0
30.02 Light Maintenance Facility		0	0	0				0
30.03 Heavy Maintenance Facility		50,416	12,604	63,020				73,430
30.04 Storage or Maintenance of Way Building		0	0	0				0
30.05 Yard and Yard Track		32,129	8,032	40,161				46,795
40 SITEWORK & SPECIAL CONDITIONS	16.18	241,992	68,070	**310,061**	**$19,169**	**29%**	**17%**	**366,905**
40.01 Demolition, Clearing, Earthwork		14,072	4,222	18,294				21,647
40.02 Site Utilities, Utility Relocation		107,894	32,368	140,262				165,976
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		4,767	1,430	6,197				7,333
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		5,634	1,690	7,324				8,666
40.05 Site structures including retaining walls, sound walls		39,932	9,983	49,914				59,065
40.06 Pedestrian / bike access and accommodation, landscaping		15,165	4,550	19,715				23,329
40.07 Automobile, bus, van accessways including roads, parking lots		50,620	12,655	63,275				74,876
40.08 Temporary Facilities and other indirect costs during construction		3,908	1,173	5,081				6,012
50 SYSTEMS	16.18	173,360	34,672	**208,032**	**$12,861**	**19%**	**11%**	**246,160**
50.01 Train control and signals		38,384	7,677	46,061				54,503
50.02 Traffic signals and crossing protection		15,149	3,030	18,179				21,510
50.03 Traction power supply: substations		41,909	8,382	50,291				59,508
50.04 Traction power distribution: catenary and third rail		33,528	6,706	40,233				47,607
50.05 Communications		24,000	4,800	28,800				34,078
50.06 Fare collection system and equipment		10,612	2,122	12,735				15,069
50.07 Central Control		9,778	1,956	11,734				13,885
Construction Subtotal (10 - 50)	16.18	858,951	211,574	**1,070,525**	**$66,183**	**100%**	**58%**	**1,264,902**
60 ROW, LAND, EXISTING IMPROVEMENTS	16.18	117,275	35,182	**152,457**	**$9,425**		**8%**	**160,838**
60.01 Purchase or lease of real estate		102,665	30,799	133,464				140,801
60.02 Relocation of existing households and businesses		14,610	4,383	18,993				20,037
70 VEHICLES (number)	**67**	228,350	11,418	**239,768**	**$3,579**		**13%**	**293,554**
70.01 Light Rail	55.00	220,000	11,000	231,000	$4,200			282,820
70.02 Heavy Rail	0.00	0	0	0				0
70.03 Commuter Rail	0.00	0	0	0				0
70.04 Bus	0.00	0	0	0				0
70.05 Other	0.00	0	0	0				0
70.06 Non-revenue vehicles	10.00	350	18	368	$37			450
70.07 Spare parts	2.00	8,000	400	8,400	$4,200			10,284
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	16.18	274,864	41,230	**316,094**	**$19,542**	**30%**	**17%**	**353,747**
80.01 Preliminary Engineering		47,929	7,853	55,783				62,427
80.02 Final Design		41,573	5,533	47,107				52,718
80.03 Project Management for Design and Construction		42,948	6,442	49,390				55,273
80.04 Construction Administration & Management		68,716	10,307	79,023				88,437
80.05 Professional Liability and other Non-Construction Insurance		17,179	2,577	19,756				22,109
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		25,769	3,865	29,634				33,164
80.07 Surveys, Testing, Investigation, Inspection		22,161	3,363	25,524				28,564
80.08 Start up		8,590	1,288	9,878				11,055
Subtotal (10 - 80)	16.18	1,479,440	299,404	**1,778,844**	**$109,974**		**96%**	**2,073,040**
90 UNALLOCATED CONTINGENCY				**67,692**			**4%**	**78,616**
Subtotal (10 - 90)	16.18			**1,846,536**	**$114,158**		**100%**	**2,151,656**
100 FINANCE CHARGES				**0**			**0%**	**0**
Total Project Cost (10 - 100)	16.18			**1,846,536**	**$114,158**		**100%**	**2,151,656**
Allocated Contingency as % of Base Yr Dollars w/o Contingency				20.24%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				4.58%				
Total Contingency as % of Base Yr Dollars w/o Contingency				24.81%				
Unallocated Contingency as % of Subtotal (10 - 80)				3.81%				
YOE Construction Cost per Mile (X000)								$78,200
YOE Total Project Cost per Mile Not Including Vehicles (X000)								$114,874
YOE Total Project Cost per Mile (X000)								$133,022

Attachment B: Purple Line Planning Cost Estimate Refinement Basis of Estimate

The purpose of this capital cost estimating refinement activity was to update the Purple Line planning estimate based on the most current available quantities, drawings and special considerations developed and provided by the design team. For cost items for which project requirements were further advanced, updated or changed, the estimating team based the pricing on historical cost data from similar projects as well as from Maryland State Highway Administration (SHA) bid tabs, special cost studies conducted for specific Purple Line Project elements (e.g., Plymouth Tunnel, at-grade stations etc.), and the estimating team's general industry knowledge and experience. Also incorporated into the planning estimate update are the value planning components listed above. For cost items whose requirements/ scope had not substantially changed since the initiation of PE, the planning estimate costs were carried forward in the update estimate (planning estimate was escalated from first quarter 2010 to first quarter 2012 at a rate of 3.1 percent per year. The following is the basis of estimate organized in FTA Standard Cost category (SCC) format:

SCC 10—Guideway

10.01 Guideway: Exclusive ROW

- Onsite Cut/fill, undercut excavation, offsite disposal of surplus excavated soil and undercut soils, fine grading. It is assumed that all onsite cut materials, with the exception of undercut, are suitable for re-use to satisfy onsite fill and backfill requirements. No special handling or treatments of soils is included (e.g. spreading, liming, stockpiling etc.)
- Select fill at MSE Wall construction is assumed to be gravel/recycled concrete aggregate.
- Sub-ballast for track bed along with track drainage. Drainage will consist of a single 8" diameter perforated pvc under-drain with cleanouts spaced at 500' centers.
- Mainline duct-bank consists of a single run, which includes 8- 4" pvc conduits encased in concrete with pull boxes at 300' centers.
- Sub-station duct-bank runs of 8-4" pvc conduits encased in concrete. An allowance of 100' of duct-bank and 1ea junction box per location has been carried at each Sub-Station Location.
- Erosion control, consisting of standard silt fence at either side of the guideway is assumed.

10.02 Guideway: Semi-Exclusive ROW

- Onsite Cut/fill activities, offsite disposal of surplus excavated soil and fine grading. It is assumed that all onsite cut materials are suitable for re-use to satisfy onsite fill and backfill requirements. No special handling or treatments of soils is included (e.g. spreading, liming, stockpiling etc.)
- Sub-ballast for track bed along with track drainage. Drainage will consist of a single 8" diameter perforate pvc under-drain with cleanouts spaced at 500' centers.

- Mainline duct-bank consists of a single run, which includes 8- 4" pvc conduits encased in concrete with pull boxes at 300' centers.
- Sub-station duct-bank runs of 8-4" pvc conduits encased in concrete. An allowance of 100' of duct-bank and 1ea junction box per location has been carried at each Sub-Station Location.
- Erosion control, consisting of standard silt fence at either side of the guideway has is assumed.

10.03 Guideway: Mixed Used ROW

- Onsite Cut/fill activities, offsite disposal of surplus excavated soil and fine grading. It is assumed that all onsite cut materials are suitable for re-use to satisfy onsite fill and backfill requirements. No special handling or treatments of soils is included (e.g. spreading, liming, stockpiling etc.)
- Sub-ballast for track bed along with track drainage. Drainage will consist of a single 8" diameter perforate pvc under-drain with cleanouts spaced at 500' centers.
- Mainline duct-bank consists of a single run, which includes 8- 4" pvc conduits encased in concrete with pull boxes at 300' centers.
- Sub-station duct-bank runs of 8-4" pvc conduits encased in concrete. An allowance of 100' of duct-bank and 1ea junction box per location has been carried at each Sub-Station Location.
- Erosion control, consisting of standard silt fence at either side of the guideway has is assumed.

10.04 Aerial Structures

- Structures included in this category are located at Connecticut Avenue, Rock Creek, Silver Spring Transit Center, University Boulevard, Anacostia River and Kenilworth Avenue.
- Foundations inclusive of Piles, structural excavation, porous backfill, Secant pile wall at Silver Spring Transit Center, temporary sheet piling at Anacostia River Structure.
- Sub-structure and super-structures including cast-in-place concrete abutments, walls, piers, parapet, decks, approach slabs and related reinforcing steel.
- Structural steel framing, segmental box girders (at SSTC only) and precast concrete beams, bearings and painting of structural steel.
- Service/safety walkways, railing/fencing, scuppers and downspouts and service/safety walkway lighting.

10.05 Guideway: Built-Up Fill—Not applicable to this project.

10.06 Guideway: Cut & Cover Tunnel (Adelphi Road)

- The guideway is at-grade at Adelphi Road. The portals and cut and cover portions of the Plymouth Tunnel are included in the total cost of the Tunnel in SCC 10.07.

10.07 Guideway: Underground Tunnel –

- Pricing for the Plymouth Tunnel was developed in a special cost study* where multiple options (A thru E) were explored and rough order of magnitude (ROM) pricing was developed. Option B

was used to the update estimate since this option, and includes both West and East side portals and cut and cover section as well as the mined portion of the tunnel. (* Plymouth Tunnel Study, PE Readiness Report Item SSC-11, April 6, 2012, Version 01)

- An allowance of $8 million for structural improvements/upgrades to existing buildings at the Bethesda "Tunnel" have been developed by the design team is included in this cost category as a separate line item.

10.08 Guideway: Retained Cut or Fill

- Excavation and backfill for wall leveling pad and a single 8" perforated pvc wall drain at the inside face of the wall. It is assumed that the excavated materials are suitable for use as backfill of the leveling pads as required.
- Concrete leveling pads include an assumed reinforcing steel allowance of 150lbs/cy.
- Precast concrete wall panels, strapping, copings and metal railings at tops of walls.

10.09 Track: Direct Fixation

- Direct fixation track design is uncertain at this time and may be either concrete base with concrete plinths or dual block system. Therefore, the DF track pricing is based on an average unit price allowance for both design approaches, per historical data for similar projects.

10.10 Track: Embedded

- Embedded track is utilized primarily at street crossings and where designated by the design team. Pricing assumes gravel base, precast base slab, 115RE rail with clips/fasteners, precast concrete top panels and backfill.

10.11 Track: Ballasted

- Ballast, precast concrete ties at 30" centers with inserts and e-clip fasteners and 115RE rail.
- Green Track- An allowance of $700 per Track Foot ($1,400 per Route Foot) is included in the estimate for the Ballasted Green Track. The design team is currently studying design options in conjunction with the Red Line Project. Detailed pricing will be developed as design progresses.

10.12 Track: Special

- Ballasted and Direct Fixation Turnouts, Crossovers, Double Crossovers and Pocket Track are included.

10.13 Track: Vibration and Noise Dampening

- Pricing from the escalated planning estimate is carried forward in the estimate update.

SCC 20—Stations

20.01 At-Grade Stations

- No quantities or specific scopes were provided for the stations; however, based on conceptual prototypical drawings 1 through 6 for at-grade center and side load platforms titled Station Canopy Scheme 16, dated February 13, 2012, we developed scope and quantity to the extent possible and priced the work based on historical data for similar stations on similar projects. Pricing will be adjusted as actual station design progresses and drawings, details and scope become available.

20.02 Aerial Stations

- Stations in this SCC include Connecticut Avenue, Silver Spring Transit Center (considered a "Signature Station") and Riverdale Park.
- No quantities or specific scopes were provided for the stations; however, based on input from the design team for aerial center and side load platform stations, we developed a ROM cost for each. The pricing is based on historical data for similar stations on similar projects. At the Silver Spring Transit Center Signature Station, an additional 25% of the total labor and equipment costs have been applied in order to capture costs for anticipated difficulty and special features due to the location of the work within a highly congested and active transit center. Pricing will be adjusted as actual station design progresses and drawings, details and scope become available.

20.03 Underground Stations-

- Stations in this SCC include Bethesda (underneath existing Apex Building) and Manchester Place (located in Plymouth Tunnel West Portal and Cut & Cover sections).
- No quantities or specific scopes were provided for the stations; however, an order of magnitude cost based on historical data for similar stations on similar project was developed. For Bethesda Station, it is assumed that the cost for any/all elevators, escalators and ancillary/utility/service areas not specifically noted in the estimate detail, will be by "others" under separate contract. Pricing will be adjusted as actual station design progresses and drawings, details and scope become available

20.04 Other Stations—Not applicable to this project

20.05 Joint Development

- The cost of the Capital Crescent Trail, and any related Bridges or structures, is by others and will not be applied to the Purple Line Costs.

20.06 Parking Garages

- Lyttonsville Yard Garage- No design is currently available for this structure- therefore pricing for the parking garage over Yard Tracks at Lyttonsville Yard is based on a per space allowance inclusive of stairs, elevators, lighting etc.

20.07 Elevators & Escalators

- Pricing for elevators and escalators of the size and travel distances provided, is based on historical data for similar units, including anticipated electrical connections. Pricing assumes and includes elevator hoist-way cladding and glazing systems.
- Bethesda Station elevators, escalators and any/all related equipment rooms, utilities, services are assumed by "others" under a separate contract.
- No work relating to MARC at Silver Spring elevators is included in this component estimate.

SCC 30—Support Facilities—Yards & Shops

30.01 Administration Building—Not applicable to this project

30.02Light Maintenance Facility—Not applicable to this project

30.03 Heavy Maintenance Facility

- Lyttonsville Yard now includes a 15,000 sf Operations Facility to be constructed directly on top of the parking garage over the tracks. An allowance of approximately $300 per SF is applied to the facility and includes full interior "fit-out" but does not include any of the equipment or special requirements for the Operations Centers (these costs are included in SCC 50 Systems). Detailed pricing will be developed as design and drawings are developed. Lyttonsville Yard also includes separate costs for one train wash facility at a location to be determined.
- Glenridge Shop of 114,605sf is based on conceptual drawings and the Purple Line Yard & Shops Concept Report, dated November 5, 2010. The pricing is based on historical data for similar facilities and is applied on a square footage basis, taking into consideration the equipment requirements noted in the report.

30.04 Storage & Maintenance of Way Building

- Costs for the Maintenance of Way building are included in cost category 30.03 since it is part of the Glenridge Shop facility.

30.05 Yard & Yard Track

- Clearing and grubbing, demolition and disposal of existing buildings, onsite cut/fill activities, offsite disposal of surplus excavated soil, import and place clean fill and fine grading. It is assumed that all onsite cut materials are suitable for re-use to satisfy onsite fill and backfill

requirements. No special handling or treatments of soils is included (e.g. spreading, liming, stockpiling etc.)

- Sub-ballast for track bed along with track drainage. Drainage will consist of a single 8" diameter perforate pvc under-drain with cleanouts spaced at 500' centers.
- Site storm drainage and Storm Water Management facilities, water, sewer, gas and electric.
- Ballasted trackwork, embedded trackwork at grade crossings, #6 and #8 ballasted turnouts.

SCC 40—Sitework & Special Conditions

40.01 Demolition, Clearing & Grubbing

- Pricing from the escalated planning estimate is carried forward in the estimate update.

40.02 Site Utilities, Relocations

- Pricing from the escalated planning estimate is carried forward in the estimate update. An additional $8 million dollars was applied to account for anticipated additional relocations and additional $55.9 million was added to account for further storm water management costs (these costs have not been approved/accepted by MDE, nor has there been any feedback or coordination). Both cost additions have been prepared, provided and incorporated into the estimate.

40.03 Hazardous Materials, Contaminated Soils

- Pricing from the escalated planning estimate is carried forward in the estimate update.

40.04 Environmental Mitigation

- Pricing from the escalated planning estimate is carried forward in the estimate update.

40.05 Site Walls

- Unit price allowance of $90/sf for Soldier pile and precast concrete lagging walls is included based on historical pricing for similar walls on similar projects. Detailed wall pricing will be developed as design details and plans for each wall are provided.
- Unit price allowance of $800/cy for cast-in-place concrete walls is included based on historical pricing for similar walls on similar projects. Detailed wall pricing will be developed as design details and plans for each wall are provided.

40.06 Pedestrian & Bicycle Access

- Pricing from the escalated planning estimate is carried forward in the estimate update. Assumes that any/all work related to pedestrian bridges is included.
- The Art-In-Transit cost carried in the planning estimate was calculated at 1% of Stations Costs. This cost is shown as a credit in the SCC 40.06 total, and the revised costs for the planning

estimate update were calculated at 0.5% of total construction costs (SCC 10-50) which is carried in the Project Summary section of the Planning Update Estimate. The FTA Guidelines call for Art-In-Transit call for the cost to be generally a minimum of 0.5% of construction costs, but not to exceed 5% of construction costs; so due primarily to the enormity of Purple Line construction costs, the 0.5% minimum for the Artwork allowance was applied.

40.07 Auto/Bus/Van Access, Roadways, Parking Lots

- Roadway bridges (complete from foundation through deck and railings) for the following: Jones Mill Road, Talbot Avenue, 16th Street, Spring Street, Wayne Avenue (based on SF allowance due to limited data available), BW Parkway and Lyttonsville Place.
- Roadway graded aggregate, hot mix asphalt paving, concrete curb and gutter, concrete ballast curb, concrete sidewalks and driveways, traffic barriers and related end treatments, detectable warning surface for curb ramps etc. Pricing for these elements of the project are based on quotes received directly from recognized local contractors and local knowledge.
- Allowances have been applied for the parking areas required over the proposed Plymouth Tunnel and at New Carrolton Station.

40.08 Temporary Facilities

- Pricing from the escalated planning estimate is carried forward in the estimate update.

SCC 50—Systems

50.01 Train Control &Crossing protection

- AF tracks circuits from Bethesda to Silver Spring Transit Center
- Embedded track using Train to Wayside Communication for traffic pre-emption and control of embedded interlockings.
- AF track circuits from College Park to New Carrollton
- Embedded switches at 4 locations / All other locations - mainline switches
- Wheel detectors at embedded interlocking for train detection
- Other interlockings to use PF track circuits for train detection.
- Material cost that have part numbers, are known 2011 list price, the rest of material pricing is based on 2009 pricing with 4%/year escalation.
- Signal Vender Engineering/Project management labor rates are estimated based on 2011 rates
- Cable cost estimate is based on 2011 Okonite quote
- Cable quantities are based on items 1, 2 and 3 above
- Both yards are similar to each other in qty. of tracks, switches, etc.
- Yard estimate of costs is based on cost estimates of similar yards in year 2010 and escalated to 2012.
- Shipping cost based on 4% of total signal vender material cost. (Typical range 3-5 percent)

50.02 Traffic Signals

- Traffic signals pricing is based on corridor wide signal and signal interconnect estimate prepared and provided by the design team.

50.03 Traction power: Sub-Stations

- Positive and negative feeder cables are as indicated in the System Simulation Report and Traction Power Design Criteria
- Substation site work includes drainage, foundation, grounding, site lighting
- As of this date no configuration for or agreement for the cost of electric services has been reached.
- As of this date all substation are assumed to have individual utility services. No sharing with passenger station has been planned at this time.
- Accommodation for future stray current consists of additional conduit stubbing out from TPSS to wayside.
- Linkage to communications backbone system consists of raceway necessary to reach wayside backbone.
- Tie switches at cross-overs are assumed to be included in the OCS estimate.
- Shipping to site is included in TPSS line item.

50.04 Traction Power: Overhead Catenary System (OCS) –

- Total double track open alignment of 15.91 route miles.
- Total double track alignment in tunnels of 0.27 route miles
- No OCS Pole Layout was available at time of estimate, therefore the following was assumed: Total pole count of 900 ea mainline, which is based on spacing of 140’ for center poles and with a 50% increase to account for the side poles on curves and crossovers and for double poles at pocket tracks and overlaps and 400ea total for yards.

50.05 Communications

- The estimate is based on the preliminary drawings and information. The current pricing is based on an allowance of $1.5M per mile and will be refined as design and criteria progress, and further quality control of the scope of work is performed.
- Material and equipment costs are based on vendor lists prices or data from similar projects.
- Conduits, duct banks, and manholes are included in the Civil Cost Estimate.
- The Cost Estimate does not include operations & maintenance, training, or spares.
- Assume there is no “Blue Light” Station for stations, only tunnel portion has “Blue Light Station”.
- Assume one service booth at each station. Telephone and Access control for the service booth is included, but the other cost and booth itself are not included.
- TPSS SCADA is included in Traction Power.
- Signaling SCADA PLCs are included.

- TPSS and Signal houses assumed to have a telephone, access control for 1 door, and connection to the CIB.
- A Theater for SCADA and train control is included and costs for this items in carried 50.07 OCC.
- Assume Radio System has two sites in the yards and switching points in the OCC. A lump sum for the Radio system is placed in the estimate till the actual system is defined.
- All CIB wayside cabling and conduit infrastructure, including communications equipment required for the TPSS and Signal houses is summarized in subsection 'Track'

50.06 Fare Collection

- Pricing is based on similar projects and is a order of magnitude level cost. No quantities/design drawings were available at this early stage of planning/design.

50.07 Central Control

- Pricing is based on similar projects and is a order of magnitude level cost. No quantities/design drawings were available at this early stage of planning/design.

SCC 60—ROW

60.01 Purchase/Lease of Real Estate

- The cost provided was $133,264,926, which was reduced to $95,664,926 to take into consideration the anticipated order of magnitude cost savings of $37.6m developed in the value planning cost savings effort. Also included in this cost category is a $7M allowance for additional SWM which was prepared, provided and incorporated into the estimate.

60.02 Relocations of Households & Businesses

- Cost for relocations totals $14,610,015.

SCC 70—Vehicles

70.01 Light Rail Vehicles

- Unit pricing of $4m for 55 each LRV's is based directly on the unit cost carried in the MTA Red Line project.

70.02 – 70.05—Heavy/Commuter Rail, Bus, Other —Not applicable to this project.

70.06 Non-Revenue Vehicles

- This category includes 10 each basic vehicles typical of a pick-up truck or similar, with base options package, for maintenance of way and systems, service calls, and service supervision.

70.07 Spare Parts

- Spare parts for the Light Rail Vehicles include the equivalent cost of two (2) additional Vehicles at the unit cost of $4m/each.

SCC 80—Soft Costs

80.01 Thru 80.08

- Soft cost percentages from the planning estimate were carried forward and applied to the update estimate and total 32%. See Attachment A soft cost items.

SCC 90 Unallocated Contingency

90—Unallocated Contingency

- A 5% unallocated contingency is applied to Cost Categories 10 thru 50 and a 2% unallocated contingency is applied to cost categories 60 thru 80. Allocated contingencies applied to the individual cost categories vary based on level of design and uncertainty of each individual SCC. A complete listing of the allocated and unallocated contingencies applied to each SCC can be found at the end of the estimate on sheet SCC 90.

Labor/Equipment/Materials/Subcontractors & Related Markups

- Labor rates used in the estimate are based on current Davis-Bacon Prevailing Wage Rates for Washington/Baltimore and their related fringes. Social Security and Federal/State Unemployment at 14.63% and Workers Compensation at 15% are applied to hourly wage rates.
- Equipment and related operation costs are based on historical cost data, which typically uses local equipment rental rates, U.S. Corps of Engineers Equipment and Operation cost data, Blue Book of Equipment Costs and RS Means.
- Materials are based on local vendor pricing to the extent possible, in conjunction with historical cost data, RS Means and Timberline cost databases as required.
- Subcontractor budgetary pricing is applied in the estimate for items where direct quotes from large, local, recognized contractors were able to be obtained.
- Project markups include 25% on direct labor, 5% on equipment/materials/subcontractors, 10% for general conditions and supervision, 5% for mobilization and 1.5% for surety. Sales tax at a rate of 6% is included in the estimate.

Inflation, Finance Charges

- The inflation rate applied to the project is 3.1% per year and is applied using the planning estimate approach in the FTA Inflation Summary Tab.
- No finance charges are carried in the estimate at this time.

Attachment C: Purple Line Preliminary Contract Areas

Area 1 (P-A)

Bethesda Metro Station (Sta. 300+00) to East of Jones Mill Road (Sta. 409+00)

- 2.0 miles of two-way dedicated surface and aerial transitway
- 2 stations (Bethesda Metro & Connecticut Ave.)
- Grade separated crossing over Connecticut Ave.
- Hiker/Biker trail, 1 underpass, and connections
- 2 under grade crossings of East-West Highway and Jones Mill Road
- 2 Columbia Country Club underpasses
- 1 Culvert at Conquelin Run

Area 2 (P-B)

East of Jones Mill Road (Sta. 409+00) to East of Lyttonsville Place (Sta. 449+00)

- 0.7 miles of two-way dedicated surface and aerial transitway
- Mass grading of Lyttonsville Yard and Shop
- 1 Rock Creek LRV Bridge
- 1 Rock Creek Pedestrian Bridge
- 1 CCT underpass
- Lyttonsville Utility Relocations
- 1 Lyttonsville Place Bridge
- Realignment of Brookville Road
- Hiker/Biker trail and connections

Area 3 (P-D)

East of Lyttonsville Place (Sta. 449+00) to West of Georgia Avenue (Sta. 539+00) – CSX Corridor

- 1.7 miles of two-way dedicated surface and aerial transitway
- 3 Stations (1 aerial - Silver Spring Transit Center (including demolition/replacement of MARC pedestrian bridge); and 2 at-grade – Lyttonsville and 16th St.)
- Hiker/Biker Trail and bridges (excluding portion from Talbot Avenue to Apple Avenue)
- Retaining Walls
- 1 aerial crossing of Colesville Road and CSX/WMATA (0.4 mi)
- 3 under grade crossings of Talbot Avenue, 16th Street, and Spring Street

Area 4 (P-E)

West of Georgia Avenue (Sta. 539+00) to University Boulevard – Rte. 193/Piney Branch Road – Rte. 320 (Sta. 722+00)

- 2.1 miles of two-way shared and dedicated surface and tunnel transitway
- 4 Stations (Silver spring Library, Dale Drive, Manchester Place, and Long Branch)
- 1 Tunnel (0.4 mi)
- 1 shared bridge on Wayne Ave.
- 1 Culvert at Long Branch
- Roadway reconstruction

Area 5 (P-F)

University Boulevard (Sta. 722+00) to west of West Campus Dr. Station (Sta. 871+00)

- 2.7 miles of two-way dedicated surface transitway
- 3 Stations (Piney Branch Rd., Tacoma-Langley TC, and Riggs Rd.)
- 1 at-grade crossing of Adelphi Rd and West Campus Dr.
- Roadway reconstruction
- Limit falls between end of Double Crossover and west end of W. Campus Dr. Station

Area 6 (P-G)

West of West Campus Dr. Station (Sta. 871+00) to Rossborough Lane (Sta. 937+00)

- 1.2 miles of two-way shared and dedicated surface transitway
- 3 Stations on UMD Campus (UMD West Campus, UMD Campus Center, & UMD East Campus).
- Roadway reconstruction

Area 7 (P-H)

Rossborough Lane (Sta. 937+00) to East of Haig Drive (Sta. 1040+50)

- 1.9 miles of two-way shared and dedicated surface transitway
- 2 Stations (College Park Metro, and River Rd.)
- 1 Crossing of Northwest Branch
- 2 at-grade crossings of University Boulevard and Adelphi Road
- Roadway reconstruction

Area 8 (P-I)

East of Haig Drive (Sta. 1040+50) to Veterans Parkway (Sta. 1136+00)

- 1.8 miles of two-way dedicated surface and aerial transitway
- 2 Stations (1 at-grade - Riverdale Rd. and 1 aerial – Riverdale Park)
- 1 aerial structure crossing of Kenilworth Avenue and East-West Highway
- 1 bridge on River Road over Northeast Branch of Anacostia River
- Under grade crossing of Baltimore-Washington Parkway
- Roadway reconstruction

Area 9 (P-J)

Veterans Parkway (Sta. 1136+00) to New Carrollton Station (1251+00)

- Mass grading of Glenridge Yard
- 2.1 miles of two-way dedicated surface transitway
- 2 Stations (Annapolis Rd. and New Carrollton Metro, including modifications to IRS pedestrian bridge and WMATA pedestrian tunnel)
- 1 at-grade crossing of Annapolis Road
- Retaining Walls

Area 10 (P-C)

Lyttonsville Yard and Shop

- Includes parking deck and centralized operations control center

Area 11 (P-K)

Glenridge Yard and Shop

Preliminary Contract Packages

Contract Areas		Contract Type
1	ROW Demolition (All Areas)	On-Call Contracts
2	Early Construction (Glenridge site work, Utilities, SWM)	Design-Bid-Build
3	Early Construction (Advance Utilities, Public ROW)	Design-Bid-Build
4	Utilities, Roadway & SWM (Area 1)	Design-Bid-Build
5	Utilities, Roadway & SWM (Area 2)	Design-Bid-Build
6	Utilities, Roadway & SWM (Area 3)	Design-Bid-Build
7	Utilities, Roadway & SWM (Area 4)	Design-Bid-Build
8	Utilities, Roadway & SWM (Area 5)	Design-Bid-Build
9	Utilities, Roadway & SWM (Area 6)	Design-Bid-Build
10	Utilities, Roadway & SWM (Area 7)	Design-Bid-Build
11	Utilities, Roadway & SWM (Area 8)	Design-Bid-Build
12	Utilities, Roadway & SWM (Area 9)	Design-Bid-Build
13	Utilities, Roadway & SWM (Area 10)	Design-Bid-Build
14	Tunnel, Guideway, Track & Stations (Area 4)	Design-Bid-Build
15	Guideway, Structures, Track & Stations (Areas 1, 2, 3, 5)*	Design-Bid-Build
16	Guideway, Structures, Track & Stations (Areas 6, 7, 8, 9)*	Design-Bid-Build
17	Systems – Train Control/ Signals (All Areas)	Design-Bid-Build
18	Systems – OCS (All Areas)	Design-Bid-Build
19	Systems – TPSS (All Areas)	Design-Bid-Build
20	Systems – Communications (All Areas)	Design-Bid-Build
21	Systems – Traffic Integration (All Areas)	Design-Bid-Build
22	Yard and Shops (Areas 10, 11)	Design-Bid-Build
23	Fare Collection (Areas 1 thru 9)	Delivery & Installation
24	Vehicles	Supply

*Procurement of track elements including running rail and special trackwork components may be combined to optimize economy of purchase.

PRELIMINARY - IN PROGRESS

PURPLE LINE - PROJECT IMPLEMENTATION SCHEDULE

ID	WBS	Task	Duration	Start	Finish
1		**FTA Milestones**			
2		FTA PE Approval			10/7/11
3		FTA Record of Decision			4/30/13
4		FTA FD Approval			7/1/13
5		FTA FFGA Approval			12/1/14
6		**Right-of-Way Acquisition & Relocation**	**39.2 mons**	**5/1/13**	**5/1/16**
7		Long Lead ROW parcels	39.25 mons	5/1/13	5/1/16
8		ROW Acquisition - Area 1 (P-A)	36 mons	5/1/13	2/1/16
9		ROW Acquisition - Area 2 (P-B)	36 mons	5/1/13	2/1/16
10		ROW Acquisition - Area 3 (P-D)	21.85 mons	6/1/14	2/1/16
11		ROW Acquisition - Area 4 (P-E)	36 mons	5/1/13	2/1/16
12		ROW Acquisition - Area 5 (P-F)	21.85 mons	6/1/14	2/1/16
13		ROW Acquisition - Area 6 (P-G)	25.1 mons	6/1/14	5/1/16
14		ROW Acquisition - Area 7 (P-H)	39.25 mons	5/1/13	5/1/16
15		ROW Acquisition - Area 8 (P-I)	39.25 mons	5/1/13	5/1/16
16		ROW Acquisition - Area 9 (P-J)	25.1 mons	6/1/14	5/1/16
17		ROW Acquisition - Area 10 (P-C Lyttonsville Yard)	25.1 mons	6/1/14	5/1/16
18		ROW Acquisition - Area 11 (P-K Glenridge Yard)	7.75 mons	5/1/13	12/3/13
19		**Engineering and Design/Prepare Bid Packages**	**82.95 mons**	**11/1/11**	**3/8/18**
20		**Complete PE**	**21.75 mons**	**11/1/11**	**6/30/13**
21		Complete Concept PE Submittal	10.95 mons	11/1/11	8/31/12
22		Complete PE Submittal	13.1 mons	7/1/12	6/30/13
23		**Pre-ROW Acquisition Activities**	**47.9 mons**	**7/1/12**	**3/1/16**
24		Property Surveys	42.5 mons	7/1/12	9/30/15
25		Phase 1 ESA's	40.2 mons	2/1/13	3/1/16
26		**Complete Design/Prepare Bid Packages - Early Construction Activities**	**10.85 mons**	**7/1/12**	**4/30/13**
27		Complete Design - Early Construction Activities	8.85 mons	7/1/12	3/4/13
28		Prep Bid Package - Glenridge - Clearing, Grubbing, Preliminary Site Work, Utilities	2.1 mons	3/4/13	4/30/13
29		Prep Bid Package - Advance Utilities - Public ROW	2.1 mons	3/4/13	4/30/13
30		**Complete Design/Prepare Bid Packages - Utilities, Roadway & SWM**	**11 mons**	**7/1/13**	**5/1/14**
31		Complete Design for Utility, Roadway and SWM Activities	8.95 mons	7/1/13	3/5/14
32		Prep Bid Package - Area 1 (P-A)	2 mons	12/10/13	2/1/14
33		Prep Bid Package - Area 2 (P-B)	2 mons	12/10/13	2/1/14
34		Prep Bid Package - Area 3 (P-D)	2 mons	12/10/13	2/1/14
35		Prep Bid Package - Area 4 (P-E)	2 mons	3/7/14	5/1/14
36		Prep Bid Package - Area 5 (P-F)	2 mons	3/7/14	5/1/14
37		Prep Bid Package - Area 6 (P-G)	2 mons	3/7/14	5/1/14
38		Prep Bid Package - Area 7 (P-H)	2 mons	3/7/14	5/1/14
39		Prep Bid Package - Area 8 (P-I)	2 mons	3/7/14	5/1/14
40		Prep Bid Package - Area 9 (P-J)	2 mons	3/7/14	5/1/14
41		Prep Bid Package - Area 10 (P-C Lyttonsville Yard)	2 mons	3/7/14	5/1/14
42		**Complete Design/Prepare Bid Packages - Tunnel, Guideway, Track and Stations**	**17.25 mons**	**7/1/13**	**10/23/14**
43		Complete Design for Guideway, Tunnel and Stations	15.1 mons	7/1/13	8/23/14
44		Prep Bid Package - Area 4 (P-E)	2.25 mons	8/23/14	10/23/14
45		**Complete Design/Prepare Bid Packages - Guideway,Structures, Track, and Stations**	**22.65 mons**	**7/1/13**	**3/24/15**
46		Complete Design for Guideway and Stations	20.7 mons	7/1/13	1/28/15



Purple Line -
Project Implementation Schedule
Date: 4/25/12

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress

PRELIMINARY - IN PROGRESS

PURPLE LINE - PROJECT IMPLEMENTATION SCHEDULE

ID	WBS	Task	Duration	Start	Finish
47		Prep Bid Packages - Areas 1, 2, 3, 5	2 mons	11/14/14	1/8/15
48		Prep Bid Packages - Areas 6 - 9	2 mons	1/28/15	3/24/15
49		**Complete Design/Prepare Bid Packages - Systems**	**39.3 mons**	**7/1/13**	**7/1/16**
50		Complete Design - Train Control / Signals	37.1 mons	7/1/13	5/1/16
51		Prep Bid Packages - Train Control / Signals- Areas 1 - 11	2.3 mons	5/1/16	7/1/16
52		Complete Design - OCS -	37.1 mons	7/1/13	5/1/16
53		Prep Bid Packages - OCS - Areas 1 - 11	2.3 mons	5/1/16	7/1/16
54		Complete Design - TPSS	37.1 mons	7/1/13	5/1/16
55		Prep Bid Packages - TPSS - Areas 1 - 11	2.3 mons	5/1/16	7/1/16
56		Complete Design - Communications	37.1 mons	7/1/13	5/1/16
57		Prep Bid Packages - Communications - Areas 1 - 11	2.3 mons	5/1/16	7/1/16
58		Complete Design - Traffic Integration Systems	37.1 mons	7/1/13	5/1/16
59		Prep Bid Packages - Traffic Integration Sys.- Areas 1 - 11	2.3 mons	5/1/16	7/1/16
60		**Complete Design/Prepare Bid Packages - Yards and Shops**	**27.3 mons**	**7/1/13**	**8/1/15**
61		Complete Design for Yards and Shops	25.35 mons	7/1/13	6/8/15
62		Prep Bid Package - Area 10	2.05 mons	6/8/15	8/1/15
63		Prep Bid Package - Area 11	2.05 mons	6/8/15	8/1/15
64		**Complete Fare Collection Design/Prepare Bid Packages**	**15.2 mons**	**1/8/17**	**3/8/18**
65		Complete Design for Fare Collection	13.1 mons	1/8/17	1/8/18
66		Prep Bid Packages - Areas 1 - 9	2 mons	1/13/18	3/8/18
67		**Complete Design/Prepare Bid Package - Vehicles**	**15.85 mons**	**10/1/14**	**12/17/15**
68		Complete design and specifications for Vehicles	13.9 mons	10/1/14	10/23/15
69		Prep Bid Package for Vehicles	2 mons	10/23/15	12/17/15
70		**Procurement**	**72.3 mons**	**5/1/13**	**11/13/18**
71		**ROW Demolition (On-Call Contracts)**	9 mons	5/1/13	1/7/14
72		**Early Construction Activities**	**9 mons**	**5/1/13**	**1/7/14**
73		Glenridge - Clearing, Grubbing, Preliminary Sitework, Utilities	9 mons	5/1/13	1/7/14
74		Advance Utilities - Public ROW	9 mons	5/1/13	1/7/14
75		**Utilities Roadway & SWM**	**12.2 mons**	**2/1/14**	**1/7/15**
76		Area 1 (P-A)	9 mons	2/1/14	10/9/14
77		Area 2 (P-B)	9 mons	2/1/14	10/9/14
78		Area 3 (P-D)	9 mons	2/1/14	10/9/14
79		Area 4 (P-E)	9 mons	5/1/14	1/7/15
80		Area 5 (P-F)	9 mons	5/1/14	1/7/15
81		Area 6 (P-G)	9 mons	5/1/14	1/7/15
82		Area 7 (P-H)	9 mons	5/1/14	1/7/15
83		Area 8 (P-I)	9 mons	5/1/14	1/7/15
84		Area 9 (P-J)	9 mons	5/1/14	1/7/15
85		Area 10 (P-C Lyttonsville Yard)	9 mons	5/1/14	1/7/15
86		**Tunnel, Guideway, Track and Stations**	**9 mons**	**10/23/14**	**7/1/15**
87		Area 4 (P-E)	9 mons	10/23/14	7/1/15
88		**Guideway, Structures, Track and Stations**	**11.65 mons**	**1/8/15**	**11/30/15**
89		Areas 1, 2, 3, 5	9 mons	1/8/15	9/16/15
90		Areas 6 - 9	9 mons	3/24/15	11/30/15
91		**Train Control / Signals**	**9 mons**	**7/1/16**	**3/9/17**
92		Areas 1 - 11	9 mons	7/1/16	3/9/17
93		**OCS**	**9 mons**	**7/1/16**	**3/9/17**
94		Areas 1 - 11	9 mons	7/1/16	3/9/17
95		**TPSS**	**9 mons**	**7/1/16**	**3/9/17**
96		Areas 1 - 11	9 mons	7/1/16	3/9/17
97		**Communications**	**9 mons**	**7/1/16**	**3/9/17**



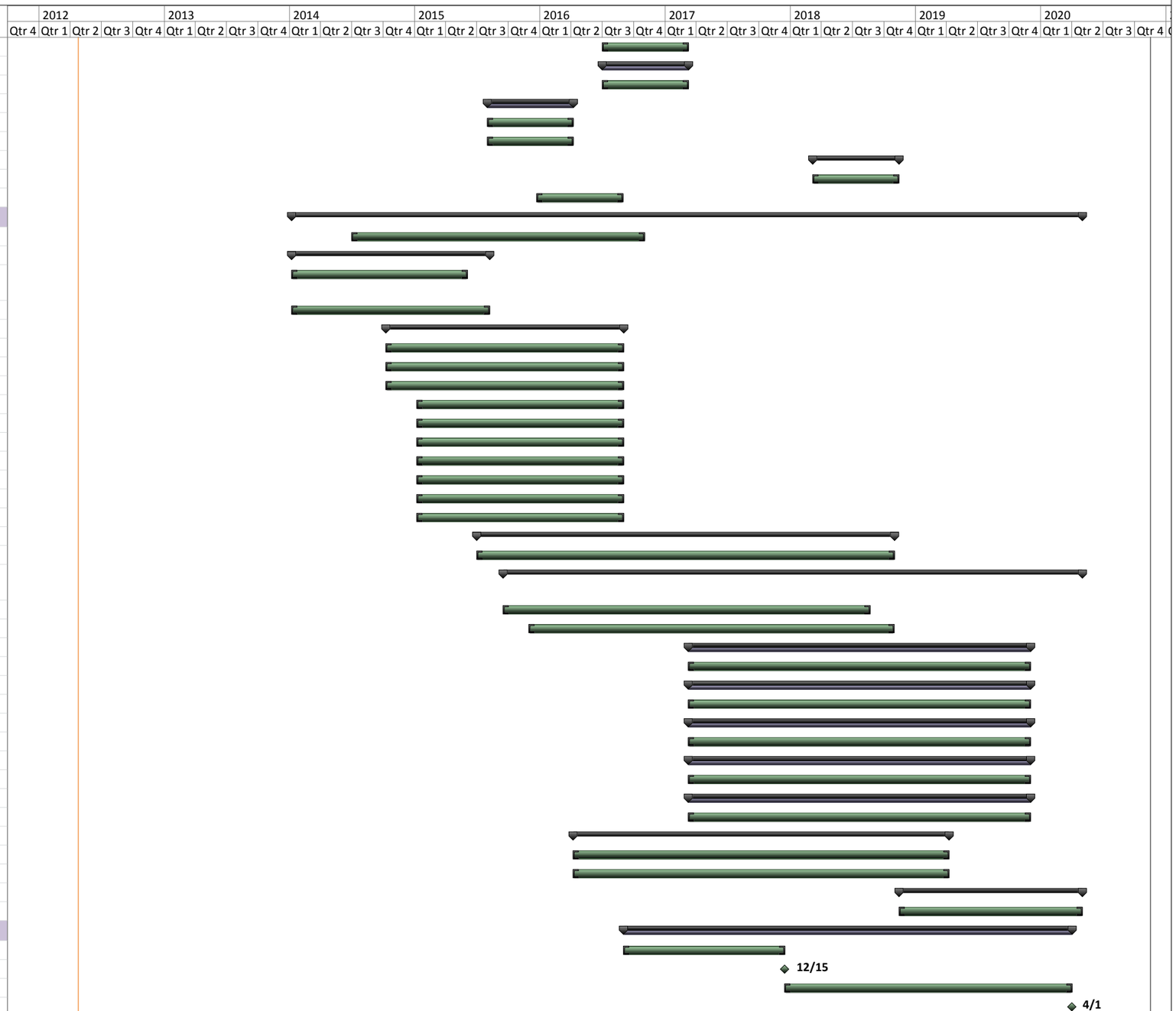
Purple Line -
Project Implementation Schedule
Date: 4/25/12

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress

PRELIMINARY - IN PROGRESS

PURPLE LINE - PROJECT IMPLEMENTATION SCHEDULE

ID	WBS	Task	Duration	Start	Finish
98		Areas 1 - 11	9 mons	7/1/16	3/9/17
99		**Traffic Integration Systems**	**9 mons**	**7/1/16**	**3/9/17**
100		Areas 1 - 11	9 mons	7/1/16	3/9/17
101		**Yards and Shops**	**9 mons**	**8/1/15**	**4/7/16**
102		Area 10	9 mons	8/1/15	4/7/16
103		Area 11	9 mons	8/1/15	4/7/16
104		**Fare Collection**	**9 mons**	**3/7/18**	**11/13/18**
105		Areas 1 - 9	9 mons	3/7/18	11/13/18
106		**Vehicle Procurement**	**9 mons**	**12/23/15**	**8/30/16**
107		**Construction**	**82.5 mons**	**1/7/14**	**5/1/20**
108		**ROW Demolition (On-Call Contracts)**	**30.55 mons**	**7/1/14**	**11/1/16**
109		**Early Construction Activities (Design-Bid-Build)**	**20.75 mons**	**1/7/14**	**8/7/15**
110		Glenridge - Clearing, Grubbing, Preliminary Sitework, Utilities	18.4 mons	1/7/14	6/3/15
111		Advance Utilities - Public ROW	20.75 mons	1/7/14	8/7/15
112		**Utilities, Roadway & SWM (Design-Bid-Build)**	**24.8 mons**	**10/9/14**	**9/1/16**
113		Area 1 (P-A)	24.8 mons	10/9/14	9/1/16
114		Area 2 (P-B)	24.8 mons	10/9/14	9/1/16
115		Area 3 (P-D)	24.8 mons	10/9/14	9/1/16
116		Area 4 (P-E)	21.6 mons	1/7/15	9/1/16
117		Area 5 (P-F)	21.6 mons	1/7/15	9/1/16
118		Area 6 (P-G)	21.6 mons	1/7/15	9/1/16
119		Area 7 (P-H)	21.6 mons	1/7/15	9/1/16
120		Area 8 (P-I)	21.6 mons	1/7/15	9/1/16
121		Area 9 (P-J)	21.6 mons	1/7/15	9/1/16
122		Area 10 (P-C Lyttonsville Yard)	21.6 mons	1/7/15	9/1/16
123		**Tunnel, Guideway, Track and Stations (Design-Bid-Build)**	**43.55 mons**	**7/1/15**	**10/31/18**
124		Area 4 (P-E)	43.55 mons	7/1/15	10/31/18
125		**Guideway, Structures, Track and Stations (Design-Bid-Build)**	**60.4 mons**	**9/16/15**	**5/1/20**
126		Areas 1, 2, 3, 5	38.25 mons	9/16/15	8/21/18
127		Areas 6 - 9	38.1 mons	11/30/15	10/30/18
128		**Train Control / Signals**	**35.65 mons**	**3/9/17**	**12/2/19**
129		Areas 1 -11	35.65 mons	3/9/17	12/2/19
130		**OCS**	**35.65 mons**	**3/9/17**	**12/2/19**
131		Areas 1 - 11	35.65 mons	3/9/17	12/2/19
132		**TPSS**	**35.65 mons**	**3/9/17**	**12/2/19**
133		Areas 1 - 11	35.65 mons	3/9/17	12/2/19
134		**Communications**	**35.65 mons**	**3/9/17**	**12/2/19**
135		Areas 1 - 11	35.65 mons	3/9/17	12/2/19
136		**Traffic Integration Systems**	**35.65 mons**	**3/9/17**	**12/2/19**
137		Areas 1 - 11	35.65 mons	3/9/17	12/2/19
138		**Yards and Shops (Design-Bid-Build)**	**39.15 mons**	**4/7/16**	**4/8/19**
139		Area 10	39.15 mons	4/7/16	4/8/19
140		Area 11	39.15 mons	4/7/16	4/8/19
141		**Fare Collection - (Delivery & Installation)**	**19.15 mons**	**11/14/18**	**5/1/20**
142		Areas 1 - 9	19.15 mons	11/14/18	5/1/20
143		**Vehicles**	**46.75 mons**	**9/1/16**	**4/1/20**
144		Engr / Set-Up & Assembly Set Up	16.85 mons	9/1/16	12/15/17
145		Initial car delivery	0 mons	12/15/17	12/15/17
146		Deliver Rail Cars to MTA	29.95 mons	12/15/17	4/1/20
147		Final car delivery	0 mons	4/1/20	4/1/20



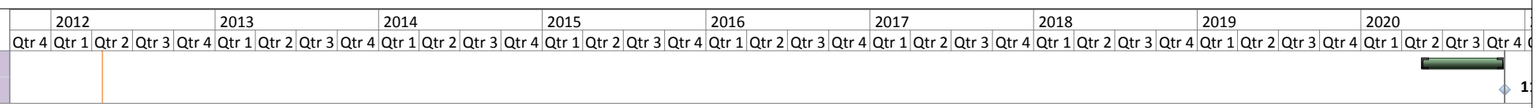
Purple Line -
Project Implementation Schedule
Date: 4/25/12

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Deadline
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Progress

PRELIMINARY - IN PROGRESS

PURPLE LINE - PROJECT IMPLEMENTATION SCHEDULE

ID	WBS	Task	Duration	Start	Finish
148		**Pre-Revenue Testing/Commissioning**	**6.6 mons**	**5/15/20**	**11/15/20**
149		**Revenue Operations Date**			**11/16/20**



Purple Line -
Project Implementation Schedule
Date: 4/25/12

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Deadline
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Progress