2. Alternatives Considered

2.1 Introduction

Various transit alternatives have been studied in the I-270 corridor for decades. This chapter explains the Project history of the alternatives relevant to the CCT Project that have been considered for transit in the I-270 corridor. In May 2012, the State of Maryland identified LPA of BRT based on an alternatives analysis included in prior NEPA documents. Following the identification of the LPA, the MDOT MTA prepared this Environmental Assessment and preliminary engineering of the current nine-mile CCT Project from the Metropolitan Grove MARC Station to the Shady Grove Metro Station. This chapter summarizes the previous alternatives analyzed and describes the No-Build and Build Alternatives that are analyzed in this EA. This chapter includes the following sections:

2.2 Project History

What does the term transitway mean?
Throughout this EA document, **transitway** is used to describe the horizontal and vertical location of the BRT route proposed in the Build Alternative.

Transportation studies for a transitway along the I-270 corridor have been conducted since the 1970s. **Figure 2-1** summarizes the NEPA Project history and major milestones that have occurred with the CCT Project. Early studies were initiated when the WMATA completed a sketch study in 1970 to identify the preliminary location for a Shady Grove to Metropolitan Grove transit alignment. In 1990, the MDOT Statewide Commuter Assistance Study identified multi-modal roadway and transit needs within the corridor. Also in 1990, Montgomery County and the Maryland-National Capital Park and Planning Commission (M-NCPPC) completed the I-270 Corridor Cities Transit Easement Study, which identified alternative transit alignments. In the mid-1990s, the MDOT Maryland State Highway Administration (SHA) and MDOT MTA initiated the I-270/US 15 Multi-Modal Corridor Study to consolidate roadway and transit studies.

In May 2002, the FHWA and FTA published a Draft Environmental Impact Statement (DEIS) for the I-270/US 15 Multi-Modal Corridor Study for public review and comment. The DEIS evaluated the impacts of 35 miles of highway improvements along the I-270/US 15 corridor and a 15-mile CCT for either BRT or light rail transit (LRT). Nine CCT alternatives were analyzed. (Refer to **Section 2.3.1** for additional information on the alternatives considered in the 2002 DEIS.)

In May 2009, the FHWA and FTA circulated an Alternatives Analysis / Environmental Assessment (AA/EA) that analyzed new highway alternatives, reviewed the previously studied CCT transit alternatives, and analyzed six additional CCT alternatives. (Refer to **Section 2.3.2** for additional information on the alternatives considered in the 2009 AA/EA.)

In November 2010, the MDOT MTA completed a Supplemental Environmental Assessment (SEA) to provide a more detailed environmental and engineering analysis on new CCT alternatives to better serve the proposed developments of Crown Farm, Life Sciences Center, and Kentlands. (Refer to **Section 2.3.3** for additional information on the alternatives considered in the 2010 SEA.)

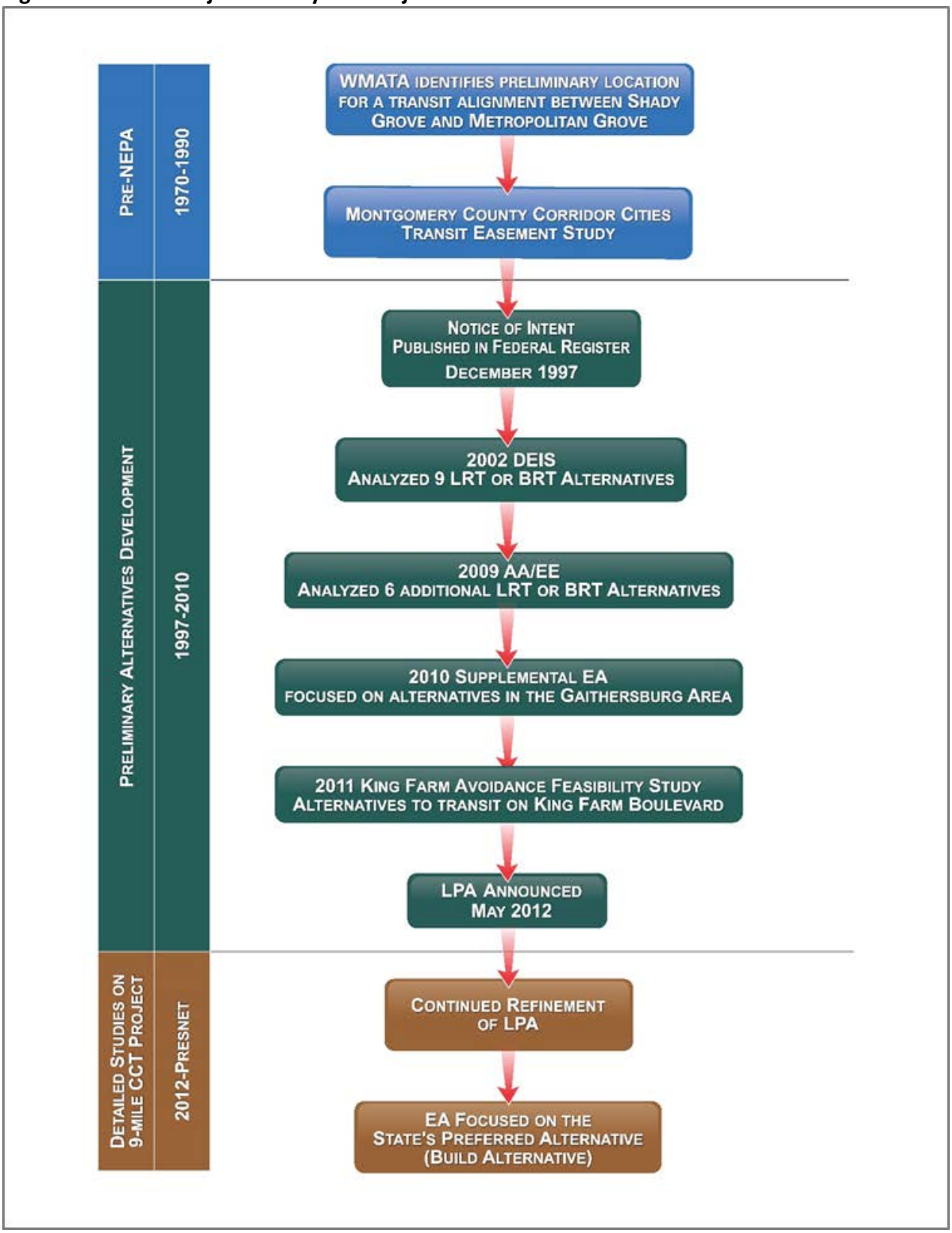
In December 2011, FHWA and FTA jointly concurred that the CCT had an independent utility from the highway components of the I-270/US 15 Multi-Modal Corridor Study and the CCT could proceed with NEPA compliance separate from the highway alternatives of the Multi-Modal Corridor Study. (Refer to **Appendix A** for a copy of this letter.)

In June 2011, the MDOT MTA studied the feasibility of alternative routes for the CCT alignment between the Shady Grove Metrorail Station and the proposed Crown Farm Station. The study was initiated following comments received at a December 2010 Open House / Public Hearing and a request by the City of Rockville to study two alternative CCT alignments operating along I-370 and Shady Grove Road instead of along King Farm Boulevard.

In May 2012, the State of Maryland announced the LPA for the CCT corridor. The State's LPA identified a BRT service that would extend the Shady Grove Metro Station to COMSAT for a total of 16 miles. The State's announcement separated the 16-mile corridor into two phases. This EA focuses on the southern nine-mile portion of the CCT alignment that extends from the Metropolitan Grove MARC Station to the Shady Grove Metro Station. (Refer to **Section 2.4** for additional information on the LPA.) The FTA and MDOT MTA are proceeding with preliminary design of this nine-mile portion of the CCT. For this Project, a funding source has not been identified to include a future extension from the Shady Grove Metro Station to COMSAT.

On February 7, 2014, FTA determined that the probable class of action pursuant to NEPA for the CCT project is an Environmental Assessment. Funding for final design and construction, including right-of-way acquisition for the CCT, has been deferred until FY 2023. Lower than expected fuel prices and gas tax collection resulted in a shortfall of $746 million in overall MDOT revenue for state transportation projects. Of the $746 million shortfall, approximately $78 million was deferred, which had previously been allocated to fund CCT final design and right-of-way acquisition. If funding for the CCT becomes available via increased gas tax revenue, private interests, county or city funds, the CCT may move forward on finalizing the EA, updating design, and entry into FTA's Capital Investment Grant Program, prior to FY 2023.

Figure 2-1: NEPA Project History and Major Milestones



2.3 Alternatives from Previous Studies

Alternatives for a transitway in the Project corridor were presented in each of the documents listed in **Table 2-1**. The descriptions presented in this section summarize the transit alternatives presented in each document.

Table 2-1: Alternatives Considered in Previous Studies

Document	Alternative	Description of Transit Component
2002 DEIS	1: No-Build Alternative	No transit or road improvements on the I-270/US 15 corridor
	2: Transportation System Management (TSM)/ Transportation Demand Management (TDM) Alternative	New bus service operating on local roads and serving stops similar to the CCT Stations
	3A: Master Plan High-Occupancy Vehicle (HOV)/LRT	Double-track LRT system
	3B: Master Plan HOV/BRT	Exclusive paved BRT transitway
	4A: Master Plan General-Purpose Lane with LRT	Double-track LRT system
	4B: Master Plan General- Purpose with BRT	Exclusive paved BRT transitway
	5A: Enhanced Master Plan HOV/ General-Purpose Lane with LRT	Double-track LRT system
	5B: Enhanced Master Plan HOV/ General-Purpose Lane with BRT	Exclusive paved BRT transitway
	5C: Enhanced Master Plan HOV/ General-Purpose Lane/ Premium Bus Alternative	Premium bus service on existing and proposed HOV lanes on I-270
2009 AA/EA	6.1: No-Build Transit	Existing transit service in the corridor and any programmed improvements
	6.2: Transit TSM	New bus service operating on local roads and serving stops similar to the CCT Stations
	6A: Enhanced Master Plan ETL with LRT	Includes express toll lanes (ETLs) instead of HOV lanes as the managed lane highway component and either LRT or BRT
	6B: Enhanced Master Plan ETL with BRT	
	7A: Enhanced Master Plan 2ETL with LRT	
	7B: Enhanced Master Plan 2ETL with BRT	
2010 SEA	Alignment S1: Crown Farm	Alignment modification to better serve new development
	Alignment S2 and S2c: Life Sciences Center	Alignments to serve the Belward Campus
	Alignment S3: Kentlands	Shifts alignment from one side of Great Seneca Highway to the other side to serve the Kentlands Shopping Center
King Farm Avoidance Feasibility Study	24 alternatives initially considered; 18 retained	Exclusive and shared lanes on various alignments between Shady Grove and Crown Farm Stations

The current LPA is based on the original 2002 DEIS alignment; 2010 SEA modifications at Crown Farm (S1), LSC/Belward (S2/S2c) and Kentlands (S3); and the Metropolitan Grove O&M Facility. Additional recent refinements to the LPA are discussed in **Section 2.4.2**.

2.3.1 Alternatives from the I-270/US 15 Multi-Modal Corridor Study DEIS, May 2002

The CCT was a transit component of the I-270/US 15 Multi-Modal Corridor Study. The discussion in this section focuses on the transit component of the I-270/US 15 Study. At that time, the CCT alignment was approximately 13.5 miles from the Shady Grove Metro Station in the south to the COMSAT facility in the north. This alignment, with subsequent modifications and refinements described in this section and **Section 2.4.2**, ultimately served as the basis of the LPA. The alternatives included the review of 18 CCT Station locations. Each alternative included an I-270 highway and a CCT transit component with multiple alignments. The alternatives considered in the 2002 DEIS are listed in **Table 2-1**.

Alternate 1: No-Build Alternate – Included elements adopted from the MWCOG 1997 CLRP with MARC commuter rail service from Point of Rocks in Frederick County to the City of Frederick and no major capacity improvements on I-270 or US 15.

The No-Build Alternative proposed no new BRT transitway in the study area corridor and represented the future conditions of transportation facilities and service in 2035 if the CCT were not built. Under the No-Build Alternative, travelers in the area would continue to rely on existing roadways, bus service, and rail stations as they are currently configured with no substantial changes. This alternative did not meet the Project's Purpose and Need, but served as a baseline for comparison of the proposed build alternatives. It was therefore carried forward throughout all subsequent studies.

Alternate 2: TSM/TDM Alternate – TSM measures included: increased and improved bus service within the corridor; integrated bus service and feeder/distributor service; enhanced feeder bus service to Metro and MARC Stations; and interactive transit information at major employment centers.

TDM measures included: additional park-and-ride spaces throughout the corridor; enhanced rideshare and vanpool programs; improved pedestrian access to the Shady Grove Metro and MARC Stations; completion of CLRP Bicycle Elements to provide for a fully-linked system throughout corridor; improved regional telecommuting program; and flexible work hours.

Common to Alternates 3A/B, 4A/B, and 5A/B/C[1] –

- Same TSM/TDM components as Alternative 2;
- Highway component with general-purpose, HOV and Collector -Distributor lanes, proposed/improved interchanges;
- LRT or BRT on the CCT; and

[1] The O&M Facility is included in all alternatives studied, with the exception of Alternative 5C.

- O&M Facility – a yard/shop facility that provides storage and maintenance facilities where transit vehicles are inspected, repaired, cleaned, and stored.

For the LRT option, a CCT rail yard would have been required for maintenance of track and vehicles and storage of up to 50 light rail vehicles. A CCT yard/shop facility would also be needed for BRT maintenance, possibly requiring additional storage capacity relative to the LRT option. A yard/shop or O&M Facility was considered in the following 15 approximate locations:

- Shady Grove Metro Station (3 of 5 individual sites retained for detailed study);
- Metropolitan Grove (3 of 6 individual sites retained for detailed study); and
- COMSAT (2 of 4 individual sites retained for detailed study).

Alternate 3A: Master Plan HOV/LRT Alternate – This LRT Alternate would include a double-tracked system, with track centers spaced approximately 14 feet apart, and an overall typical section width of between 50 to 75 feet. The right-of-way would also include an overhead catenary system. Bikeway and pedestrian access, as called for in the county master plans, would be provided along the transitway alignment under this alternative.

Alternate 3B: Master Plan HOV/BRT Alternate – This BRT Alternate would operate exclusively on a paved roadway, in two general formats: BRT service along the CCT and smaller feeder buses, which circulate through neighborhoods before using the transitway. BRT components included vehicles with low floors and multiple doors, and pre-paid fare collection. The CCT roadway would be one 12-foot lane in each direction, with a typical section of 45 to 70 feet. Bikeway and pedestrian access, as called for in the county master plans, would also be provided under this BRT alternative.

Alternate 4A: Master Plan General-Purpose/ LRT Alternate – The proposed transit component, O&M considerations, and cost were the same as described in Alternative 3A. The highway component included general-purpose lanes in place of the HOV lanes proposed under 3A/3B.

Alternate 4B: Master Plan General-Purpose/ BRT Alternate – The proposed transit component, O&M considerations, and cost were the same as described in Alternative 3B. The highway component included general-purpose lanes in place of the HOV lanes proposed in Alternates 3A and 3B.

Alternate 5A: Enhanced Master Plan HOV/ General-Purpose Lane/ LRT Alternate – The proposed transit component, maintenance yard considerations, and cost were the same as described in Alternative 3A. The highway component included one additional general-purpose lane in each direction in addition to the HOV lanes proposed in Alternates 3A and 3B.

Alternate 5B: Enhanced Master Plan HOV/ General-Purpose Lane/ BRT Alternate – The proposed transit component, maintenance yard considerations, and cost were the same as described in Alternative 3B. The highway component included one additional general-purpose lane in each direction in addition to the HOV lanes proposed in Alternates 3A and 3B.

Alternate 5C: Enhanced Master Plan HOV/ General-Purpose/ Premium Bus Alternate – Premium Bus service was considered at major activity centers and on the existing and proposed HOV lanes on I-270, including slip ramps for exclusive bus/HOV access from the HOV lanes to proposed intermodal stations. Express bus service would be provided along the I-270 HOV lanes in addition to an extended feeder bus system. It was assumed that premium bus service would be operated by a contractor, and this alternate would not require an O&M Facility. The highway component included one additional general-purpose lane in each direction in addition to the HOV lanes proposed in Alternates 3A and 3B.

2.3.2 Alternatives from the I-270/US 15 Multi-Modal Corridor Study AA/EA, May 2009

The May 2009 AA/EA served as a companion to the DEIS issued in 2002. New alternatives were examined to the same level of environmental review as the alternatives presented in the 2002 DEIS. The AA/EA was prepared in response to a decision made in 2004 to study two additional highway alternatives that included ETLs. The CCT followed the same 2002 DEIS alignment: 13.5 miles from the Shady Grove Metro Station in the south to the COMSAT facility in the north, which has ultimately served as the basis of the LPA (with subsequent modifications and refinements discussed in this section and **Section 2.4.2**). This alignment included 17 stations, as one was eliminated when Montgomery County approved a development that would preclude the previously identified site's use as a station. The alternatives included two transit mode components. The "A" represented LRT and the "B" represented BRT. The alternatives considered in the AA/EA are listed in **Table 2-1**.

The technical report completed by MDOT MTA in 2007, *Corridor Cities Transitway Operations and Maintenance Facilities Alternatives Development and Analysis*, analyzed the costs and service benefits associated with five O&M sites retained from the 15 presented in the 2002 DEIS. These were further analyzed for their environmental impacts and transportation benefits in the 2009 AA/EA. The evaluated sites included two Shady Grove area sites, two Metropolitan Grove area sites, and one COMSAT area site.

The transit components of the alternatives included in the AA/EA are described as follows:

Alternative 6.1: No-Build Transit – The No-Build Transit Alternative consisted of the continuation of existing transit services in the corridor and any improvements programmed in the fiscally constrained long-range transportation plan for the metropolitan Washington region.

Alternative 6.2: Transit TSM – The Transit TSM Alternative measures included: new bus service operating on local roads and serving stops comparable to CCT transit stations; new stations, park-and-ride facilities, and limited stop bus service between the Shady Grove Metrorail Station and COMSAT; Premium Bus service from Frederick County to major activity centers; enhanced feeder bus service to Metrorail and MARC Stations; and interactive transit information at major employment centers in the corridor.

Common to Alternatives 6A/B and 7A/B – Alternatives 6A/B and 7A/B include ETLs instead of HOV lanes as the managed lane component, plus the LRT or BRT transit mode on the CCT as the

transit component. These alternatives also included a dedicated transitway and all transit measures described in Alternative 6.2: Transit TSM.

2.3.3 Alternatives from the Supplemental Environmental Assessment, November 2010

The November 2010 SEA focused on a smaller subset area of the CCT corridor in the Gaithersburg area to consider three development areas under consideration for more direct service by the CCT. The SEA served as a companion to the 2002 DEIS and 2009 AA/EA. Three development areas identified from east to west included: Crown Farm, LSC, and Kentlands. The SEA analyzed the engineering and environmental impacts of three proposed modifications to the 2002 DEIS CCT alignment and new station locations to better serve these development areas, and two additional O&M Facility sites in the vicinities of COMSAT and Metropolitan Grove. The CCT alignments studied varied from 14 to 16 miles from the Shady Grove Metrorail Station in Rockville, Maryland to a terminus just south of Clarksburg, Maryland at the COMSAT facility. The CCT alignment modifications considered in the SEA are listed in **Table 2-1**. The SEA also included modified stations and O&M Facility locations.

Each of the alignment modifications and corresponding station modifications, with subsequent refinements as discussed in **Section 2.4.2**, were ultimately incorporated into the LPA.

Alignment Modifications from the DEIS

Alignment S1: Crown Farm – Alignment S1 shifted the CCT alignment to travel through Crown Farm along Decoverly Drive. The modification was proposed to better serve new development at the Crown Farm property (currently under construction), located within the City of Gaithersburg along Fields Road and Omega Drive.

Alignments S2 and S2c: Life Sciences Center – S2 and S2c were developed to better serve the LSC, a major expansion of the Shady Grove LSC, by diverting the alignment south from Great Seneca Highway and Decoverly Drive through Belward Farm and the LSC.

Alignment S2c was a slight variation of S2. Alignment S2 turned west from Broschart Road at a point between Blackwell Road and Medical Center Drive. Alignment S2c turned west on Medical Center Drive.

Alignment S3: Kentlands – This modification would shift the CCT alignment from one side of Great Seneca Highway to the other side to directly serve a proposed redevelopment of a shopping center to a mixed-use, transit-oriented destination located adjacent to the Kentlands.

Stations Modified from the DEIS

Alignment S1 – The Crown Farm Station and park-and-ride lot replaced the Washingtonian station.

Alignment S2 –

- Proposed stations included: LSC Central Station on Broschart Road; LSC West Station and park-and-ride lot on the Public Safety and Training Academy (PSTA) site; and LSC Belward on the Belward Campus.
- DANAC Station was relocated from Decoverly Drive to Diamondback Drive.
- Decoverly Station was eliminated.

Alignment S2c -

- Proposed stations included: LSC Central on Broschart Road; LSC West Station and park-and-ride lot on the PSTA site; and LSC Belward on the Belward Campus.
- DANAC Station was relocated from Decoverly Drive to Diamondback Drive.
- Decoverly Station was eliminated.

Alignment S3 -

- Proposed station: Kentlands at the Kentlands Square Shopping Center.
- Quince Orchard Station was eliminated.

O&M Facility Location Options

The LRT and BRT transit alternatives each required an O&M Facility. Two of the five locations studied in the AA/EA were included. These two sites were considered the most advantageous based on the analysis in the 2009 AA/EA and the supporting 2007 O&M Facility study.

- **Observation Drive O&M Facility –**This location is in the vicinity of the CCT northern terminus near COMSAT, and would be suitable only for BRT.
- **Metropolitan Grove O&M Facility –** This location would be suitable for either BRT or LRT alternatives. It is situated adjacent to the proposed Metropolitan Grove Station on land currently used as a police vehicle impound lot. This location is included as part of the LPA.

2.3.4 Alignments from the King Farm Avoidance Feasibility Study, June 2011

At the December 2010 hearing for the SEA, local residents of the King Farm community voiced concern about the proposed CCT alignment traversing through their neighborhood. Key issues raised included: the loss of the King Farm Boulevard landscaped median, street closures across King Farm Boulevard, the schedule and number of transit vehicles traveling through the community, transit vehicle-generated noise, pedestrian and vehicular travel pattern disruption, and aesthetic issues of locating the CCT along King Farm Boulevard. In response to these concerns, the MDOT MTA developed the *King Farm Feasibility Study, Full Report* (June 2011). The results of this study are summarized below and the report is available on the Project website.

The study limits extended from the Shady Grove Metrorail Station and continued to the proposed Crown Farm Station using either I-270 or Shady Grove Road as the primary alignment route. A total of 24 initial BRT and/or LRT alignments and typical section alternatives within the feasibility study limits were considered based on the CCT service concept, the potential for exclusive right-of-way (side-street running or median), and dedicated or shared lane operations. An engineering screening analysis was performed and the number of initial alignment and typical section alternatives were reduced to 18 potential alternatives.

The following 18 alternatives were studied:

- 1A: King Farm Boulevard Master Plan [median] Alignment (BRT or LRT, exclusive, at-grade)
- 2A-1: LRT or BRT exclusive at-grade lanes from the east side of Shady Grove Metrorail Station via Metro Access Road along the south side of Shady Grove Road to Crown Farm Station
- 2A-2: LRT or BRT exclusive aerial lanes from the east side of Shady Grove Metrorail Station via Metro Access Road in the median of Shady Grove Road to Crown Farm Station
- 2A-3: LRT or BRT exclusive at-grade lanes from the east side of Shady Grove Metrorail Station via Metro Access Road in the median of Shady Grove Road to Crown Farm Station
- 2B-1: LRT or BRT exclusive at-grade lanes from the west side of Shady Grove Metrorail Station along east side of MD 355 to south side of Shady Grove Road to Crown Farm Station
- 2B-2: LRT or BRT exclusive aerial lanes from the west side of Shady Grove Metrorail Station along east side of MD 355 to median of Shady Grove Road to Crown Farm Station
- 2B-3: LRT or BRT exclusive at-grade lanes from the west side of Shady Grove Metrorail Station along east side of MD 355 to median of Shady Grove Road to Crown Farm Station
- 2B-4: LRT or BRT exclusive at-grade lanes from the west side of Shady Grove Metrorail Station along median of MD 355 to median of Shady Grove Road to Crown Farm Station
- 2B-5: LRT or BRT shared lanes from the west side of Shady Grove Metrorail Station to MD 355 to Shady Grove Road to Crown Farm Station
- 2C-1: LRT or BRT exclusive at-grade lanes from the east side of Shady Grove Metrorail Station along Crabbs Branch Way to south side of Shady Grove Road to Crown Farm Station
- 2C-2: LRT or BRT exclusive aerial lanes from the east side of Shady Grove Metrorail Station along Crabbs Branch Way to south side of Shady Grove Road to Crown Farm Station
- 2C-3: LRT or BRT exclusive at-grade lanes from the east side of Shady Grove Metrorail Station along Crabbs Branch Way to median of Shady Grove Road to Crown Farm Station
- 2D-1: LRT or BRT exclusive at-grade lanes from the east side of Shady Grove Metrorail Station north along CSX right-of-way to south side of Shady Grove Road and to Crown Farm Station
- 2D-2: LRT or BRT exclusive aerial lanes from the east side of Shady Grove Metrorail Station north along CSX right-of-way to south side of Shady Grove Road and to Crown Farm Station
- 3A-1: BRT exclusive at-grade lanes from the east side of Shady Grove Metrorail Station in median of I-370 to Crown Farm Station

- 3A-2: BRT shared lanes from the east side of Shady Grove Metrorail Station along I-370 to Crown Farm Station
- 3B-1: BRT exclusive at-grade lanes from the west side of Shady Grove Metrorail Station via east side of MD 355 to I-370 to Crown Farm Station
- 3B-2: BRT shared lanes from the west side of Shady Grove Metrorail Station via MD 355 to I-370 to Crown Farm Station

MDOT MTA completed an analysis of these alignment options in comparison to the Master Plan alignment along the median of King Farm Boulevard. The Master Plan alignment (Alternative 1A) along King Farm Boulevard has been included in the City of Rockville master plans for over two decades and was preserved by the developers of King Farm in the community's design. For that reason, the alignment would result in minimal impacts to the human and natural environment, support the economic development goals of Montgomery County, and provide an economically and environmentally sustainable transportation option for connecting activity centers within Montgomery County. Additionally, as part of the goal to enhance mobility, the MDOT MTA intends to maximize transit performance quality whenever feasible, thus avoiding designs that would operate transit in mixed traffic or cross busy streets that could erode travel times and the reliability of service. Upon careful consideration of the analysis results, MDOT MTA determined that none of the 17 alignment modifications studied to avoid transit operations on King Farm Boulevard warrant further consideration in future phases of Project development. The Master Plan alignment in the median was therefore retained as part of the LPA.

2.4 Identification and Refinement of the Locally Preferred Alternative

In May 2012, the State of Maryland announced the LPA for the CCT. The 2012 LPA included BRT on a 15-mile corridor from the Shady Grove Metrorail Station to the COMSAT facility near Clarksburg in Montgomery County, including 16 stations. The LPA is based on the original 2002 DEIS alignment; 2010 SEA modifications at Crown Farm (S1), LSC/Belward (S2/S2c) and Kentlands (S3); and the Metropolitan Grove O&M Facility. Additional recent refinements to the LPA are discussed in **Section 2.4.2**. An O&M Facility site was also identified near the Metropolitan Grove MARC Station. The LPA announcement designated a nine-mile section between Shady Grove and Metropolitan Grove as the priority for Project development and construction, and is the focus of this EA document.

2.4.1 Rationale for Selecting the LPA

In selecting the LPA, the State made several important decisions: selecting BRT as the mode for the Project; identifying an alignment; prioritizing Phase I from Metropolitan Grove to Shady Grove; and locating the O&M Facility. The State's rationale for selecting the LPA is summarized below. For additional details, refer to **Appendix A** for the Briefing Memorandum (April 2012) and LPA Press Release Announcement (May 2012).

Mode

BRT was recommended as the transit mode for the CCT. The BRT would operate on an exclusive and dedicated right-of-way with grade separation at key roadway crossings and at-grade crossings at minor streets. BRT was selected for the CCT given its comparable ridership

performance and O&M costs, combined with substantially reduced capital costs compared with LRT. The 2010 SEA estimated that LRT, along what is now the LPA alignment, would result in capital cost nearly twice that of BRT. This significant increase in capital cost for LRT would result in only around 17 percent increase in estimated ridership relative to BRT. Furthermore, BRT is considered suitable for this corridor because it offers the flexibility for buses to directly serve surrounding communities as opposed to a fixed rail scenario with LRT. The surrounding land uses are less dense than other parts of Montgomery County, which warrants greater flexibility in operations with buses.

Alignment

The LPA alignment was based on various master plans in Montgomery County. The selection of the LPA solidifies the continuation of corridor preservation in those plans. The LPA alignment includes the Master Plan alignment with modifications through Crown Farm, LSC, and Kentlands. The selection of the LPA alignment was largely based on its ability to serve high ridership areas, as well as MDOT MTA's current understanding of issues raised during the public involvement process, including the public hearings held in conjunction with the completion of the I-270/US 15 Multimodal Corridor Study DEIS, the I-270/US 15 Multimodal Corridor Study AA/EA, and the Corridor Cities Transitway SEA. The 2010 SEA estimated that inclusion of the alignment modifications at Crown Farm, LSC, and Kentlands would increase ridership by around 40 percent relative to the original Master Plan alignment, while only increasing capital costs by around 15 percent.

Phasing

The LPA was recommended to be built in two phases: Phase I from Shady Grove to Metropolitan Grove and Phase II from Metropolitan Grove to COMSAT. The phasing recommendation was based on the existing planned development around the transitway alignment, which has occurred along the Phase I portion of the corridor. Montgomery County has focused development around most of the station areas between Shady Grove and Metropolitan Grove for many years. Densities are lower and some areas are not yet developed north of Metropolitan Grove.

Operations and Maintenance Facility

The LPA's recommended O&M Facility site is situated just south of the Metropolitan Grove station adjacent to the Montgomery County vehicle impound lot. Through the analysis presented in the previous studies outlined in **Section 2.3**, the list of 15 potential O&M Facility sites was gradually narrowed down to two sites: the LPA site at Metropolitan Grove and the Observation Drive site near the COMSAT facility. These two sites were carried forward from previous studies as the most advantageous to transit operations with the least environmental and community impacts. The Metropolitan Grove site, selected for the LPA, is suitably located in the Phase I section of the Project on a large parcel of undeveloped land adjacent to I-270.

2.4.2 LPA Refinement

The MDOT MTA has continued to refine the LPA since May 2012. These refinements were made based on additional engineering, stakeholder and public input, additional station planning, and additional environmental analysis. As the focus of this EA, these refinements have been incorporated into the Build Alternative that is described in **Section 2.5**.

The first refinement was the incorporation of an additional service into the LPA. This service, the CCT Service via USG, was developed to serve the USG campus and the surrounding community. The USG service would operate along the CCT dedicated transitway, then divert into mixed traffic to serve two stations: the USG station and the Traville Gateway Drive Station. **Section 2.5** describes the operation of the USG service in more detail.

Another refinement was the removal of alignment through the Belward Campus property which resulted from coordination with the FTA. The Build Alternative avoids the use of the Belward property by operating on a shared alignment on Muddy Branch Road and Darnestown Road.

Additional refinements to the LPA were also made subsequent to the preparation of two reports by MDOT MTA: the A*lternatives Analysis Report for Commercial Property Owners Coalition*, (April 2014) and the *Mission Hills Alternatives Report* (May 2014). A summary of each report is included below which highlights the recommendations from these reports that were incorporated into the current Build Alternative analyzed in this EA. The CPOC and Mission Hills Reports are available on the Project website, www.cctmaryland.com.

Commercial Property Owners Coalition Study

A group of businesses, institutional, and academic interests near the CCT, called the Commercial Property Owners Coalition (CPOC), commissioned a study to review the CCT LPA alignment and suggested alternative alignments. The suggested changes from their study sought to defer a portion of the high cost improvements and advance the construction and system opening operation to support economic development. The *Alternatives Analysis Report for Commercial Property Owners Coalition* (April 2014) summarizes the studies completed by the MDOT MTA for five segments of the CCT as discussed with the CPOC: CSX Corridor and Quince Orchard Road (MD 124), Great Seneca Highway (MD 119), Muddy Branch Road, Key West Avenue (MD 28) at Johns Hopkins Drive, and Key West Avenue at Broschart Road/Diamondback Drive. The modifications to the LPA adopted into the current Build Alternative include the following:

- From the proposed Metropolitan Grove Station, the transitway would be located along the south side of the CSX tracks, turn south and travel along the west side of Quince Orchard Road, cross Firstfield Road at-grade, rise on structure to span over Clopper Road/West Diamond Avenue and Quince Orchard Road, and then return to grade and travel along the east side of Quince Orchard Road.

- The transitway would travel on the east side of Broschart Road and cross diagonally at-grade through the first intersection south of Key West Avenue, then continue on the west side of Broschart Road, crossing under Key West Avenue via a tunnel parallel to Broschart Road/Diamondback Drive.

Mission Hills Study

On December 3, 2013, members of the MDOT MTA met with residents of Mission Hills to discuss their concerns about the transitway, its location relative to their homes, and vehicular access to their community. Residents expressed concern that the addition of the transitway, along with the existing congestion on Muddy Branch Road, would make it difficult to exit the community during morning and afternoon peak travel times. Mission Drive is the only access point to the Mission Hills community of 52 homes.

The MDOT MTA studied alternatives that would address these concerns. The *Mission Hills Alternatives Report* (May 2014) summarizes the studies that have been completed by the MDOT MTA for the CCT: along Muddy Branch Road and Belward Campus Drive. Five options were considered in the study. Option 1 would provide four travel lanes on Muddy Branch Road with the transitway in the median. The community supported this option when the results were presented at a community meeting on May 20, 2014.

Muddy Branch Avenue and Belward Farm

During preliminary design in support of this EA document, an alignment was considered in the median of Muddy Branch Road and through the Belward Campus. This alignment would have crossed southbound Muddy Branch Road at the intersection with Great Seneca Highway, continuing south in the median of Muddy Branch Road to the intersection of Muddy Branch Road, Midsommer Drive, and proposed Belward Campus Drive. Belward Campus Drive is a proposed roadway that would travel through the Belward Farm development connecting Muddy Branch Road to Johns Hopkins Drive. The CCT alignment would then have crossed from the median of Muddy Branch Road onto Belward Campus Drive and continued traveling east in the median of Belward Campus Drive for the entire length. A LSC Belward Station was proposed along Belward Campus Drive in the middle of the development. The alignment would then have turned south onto Johns Hopkins Drive and continue in the median of the roadway to the intersection with Key West Avenue crossing Key West Avenue and entering the PSTA property.

This alignment through the Belward Farm Campus was not accepted by the FTA during their review of the Draft Section 4(f) Analysis, which was part of the analysis completed in support of this EA document. The Ward/ Belward Farm is a historic property consisting of an approximately 107-acre farmstead and is eligible for listing on the National Register of Historic Places. The property is owned by Johns Hopkins University and is slated for development as part of the Johns Hopkins Belward Campus Expansion Project, which would convert the property to a mixed-use research campus.

Because the Belward property is historic, it is also subject to Section 4(f) of the US Department of Transportation Act, 49 U.S.C. 303(c) and FTA's Section 4(f) regulations in 23 CFR 774. Section 4(f) is a Federal Law that protects publicly-owned parks, recreation areas, wildlife and/or waterfowl refuges, or any significant historic sites, whether privately or publicly owned. Section 4(f) requirements apply to all transportation projects that require funding or other approvals by the USDOT. As a USDOT agency, FTA must comply with Section 4(f). FTA cannot approve a transportation project that uses a Section 4(f) property, unless:

- The FTA determines that there is no feasible and prudent avoidance alternative to the use of land from the property, and the action includes all possible planning to minimize harm to the property resulting from such use (23 CFR 774.3(a)); or
- The FTA determines that the use of Section 4(f) property, including any measures to minimize harm (such as avoidance, minimization, mitigation, or enhancements measures) committed to by the applicant, will have a *de minimis* impact on the property (23 CFR 774.3(b)).

In the case of the Belward Campus alignment, FTA determined that there was a feasible and prudent alternative which avoided use of the Belward Campus property. Therefore, this alignment was dropped from further consideration. The Build Alternative avoids the Belward property by operating on a shared alignment on Muddy Branch Road and Darnestown Road (**Section 2.5.2** describes the Build Alternative).

2.5 Alternatives Evaluated in the EA

2.5.1 No-Build Alternative

The No-Build Alternative proposes no new BRT transitway in the study area corridor and represents the future conditions of transportation facilities and service in 2035 if the CCT Project is not built. This alternative provides a baseline by which the environmental impacts of the Build Alternative are compared.

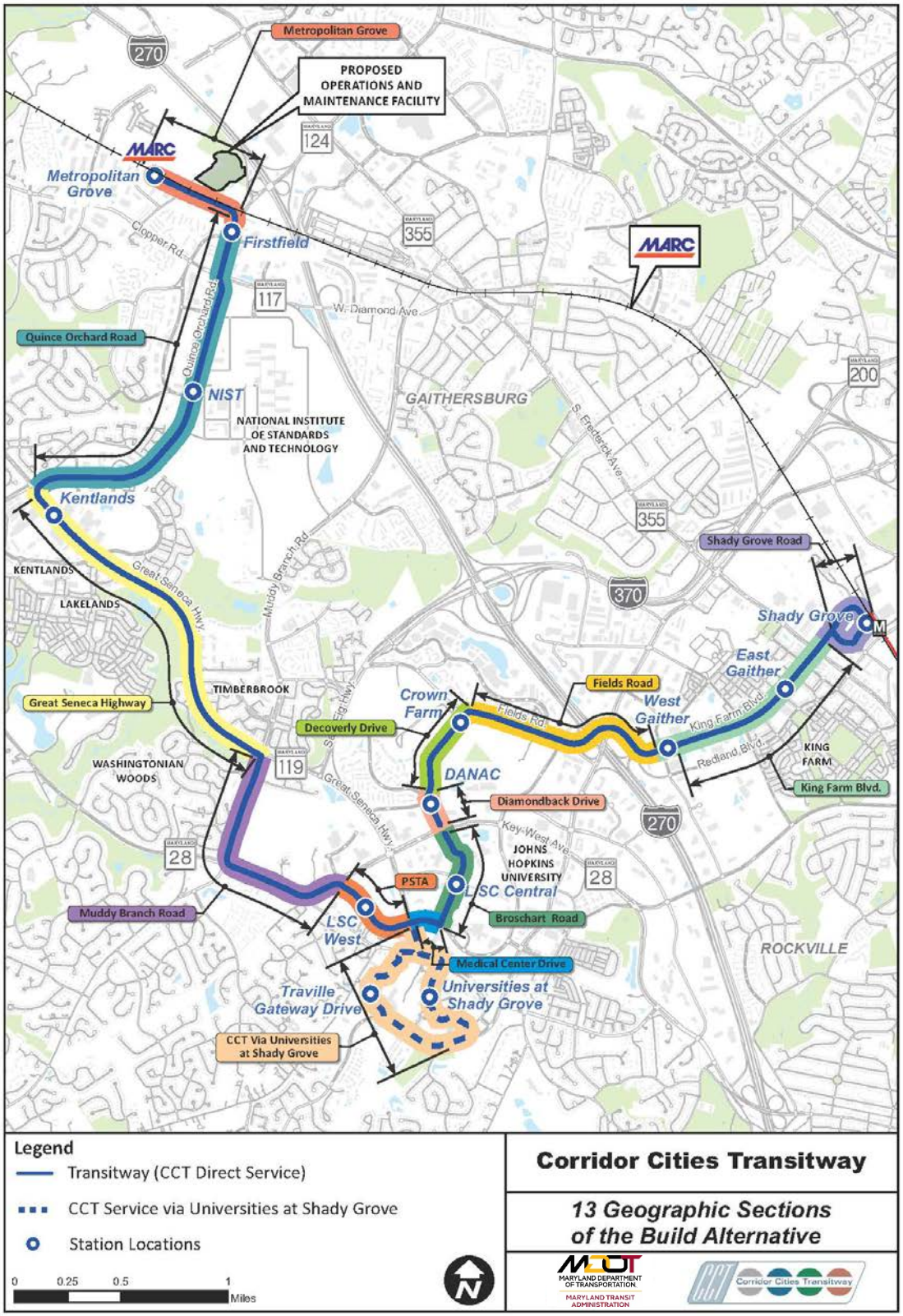
The No-Build Alternative assumes the existing highway and transit network, as well as planned and programmed (committed) transportation improvements that are included in the CLRP prepared by the National Capital Region Transportation Planning Board, with the exception of any proposed improvements associated with the CCT. The No-Build Alternative assumes the transit service levels, highway networks and traffic volumes, and forecasted demographics for the year 2035 from the CLRP without the CCT.

Under the No-Build Alternative, travelers in the area would continue to rely on existing and programmed roadways, bus service, and rail stations as they are currently configured with no substantial changes. The No-Build Alternative represents a continued investment in regional and local transportation projects, but does not address the Project's Purpose and Need.

2.5.2 Build Alternative

The Build Alternative consists of the LPA announced in May 2012 and the LPA refinements described in **Section 2.4.2.** The transitway would travel adjacent to or in the median of existing and proposed roadways for the majority of the alignment. The term **transitway** is used to describe the horizontal and vertical location of the BRT route proposed in the Build Alternative. The Build Alternative also includes 13 stations and an O&M Facility. The Build Alternative is based on 13 geographic sections starting at the northern terminus (Metropolitan Grove Station) and traveling generally south and east to the southern terminus (Shady Grove Station). Refer to **Figure 2-2** for an overview of the Project's 13 geographic sections. Refer to **Appendix E** for detailed engineering plans of the Build Alternative.

Figure 2-2: Station Locations and Geographic Sections of the Build Alternative



The majority of the transitway would be 26 feet wide, with one 13-foot lane per direction, including the gutter. In areas with horizontal curves tighter than a 500-foot radius, the transitway width would be widened to 30 feet, with one 15-foot lane per direction. In general, the alignment maximizes the area for stormwater management bioretention facilities on one or both sides of the alignment, where feasible.

2.5.3 Stations

The Build Alternative would include 13 stations: Metropolitan Grove, Firstfield, NIST, Kentlands, LSC West, Traville Gateway Drive, USG, LSC Central, DANAC, Crown Farm, West Gaither, East Gaither, and Shady Grove. The station locations are shown in **Figure 2-2**. Refer to **Figures 2-3 to 2-5** for illustrative renderings of prototypical stations. **Figure 2-3** illustrates the platform prototype, and **Figures 2-4** and **2-5** shows station examples. The extent, size, and location of station elements will be determined during the design phase based on current ridership projections.

All the stations, with the exception of the Traville Gateway Drive and USG Stations, would be equipped with a variety of amenities, including: trash and recycling receptacles, benches, emergency phones, ticket vending machines, map display cases, variable message signs, bike storage, and wind screens (**Figure 2-3**). Station signage would be branded to have a recognizable theme and logos. The signage would be integrated with the architecture and will meet Americans with Disabilities Act guidelines.

Three types of platform configurations are proposed for the CCT Stations: median platforms, side platforms, and aerial platforms. The platforms would be 14 inches high (above the adjacent transitway) and would contain slip-resistant coating and two-foot-wide detectable warning strips. All platforms would have an average canopy coverage of 60 percent of the platform area with a ten-foot clearance beneath. The median platform stations would be 18 feet wide, side platforms would be 12 feet wide, and aerial platforms would be 27 feet wide. All the stations would be 65 feet long with the exception of the terminus stations, and Kentlands, Crown Farm, and Gaither West Stations, which would be 125 feet long to serve anticipated ridership needs. At the 65-foot stations, additional space would be accommodated for expansion to 125 feet in the future, should ridership demands increase.

Figure 2-3: Station Platform Concept

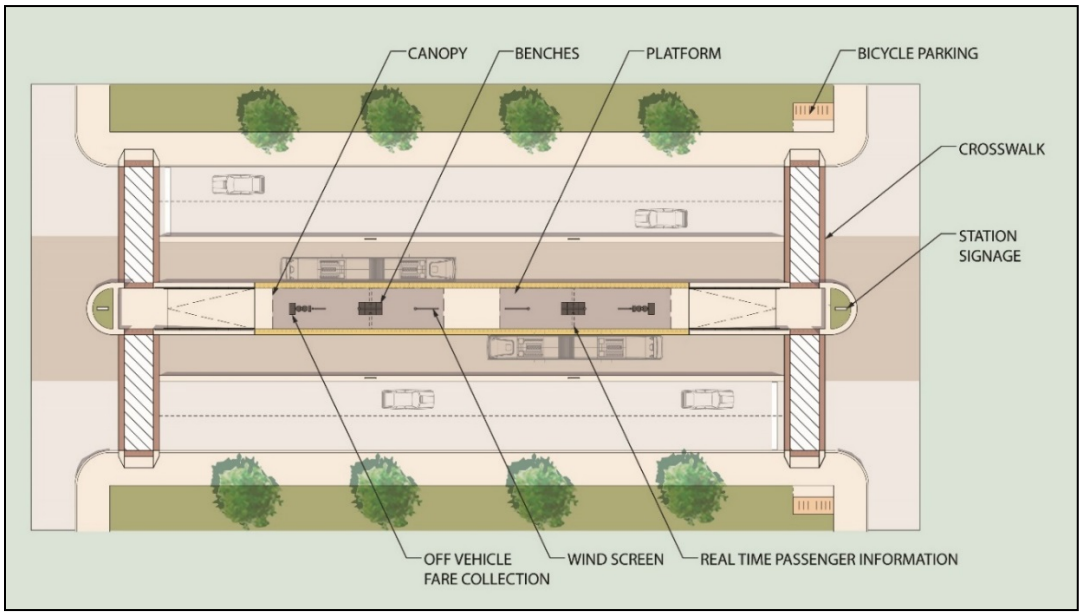


Figure 2-4: Representative Views of a Median Platform, East Gaither Station

Figure 2-5: Representative Views of the Aerial Platform, Kentlands Station

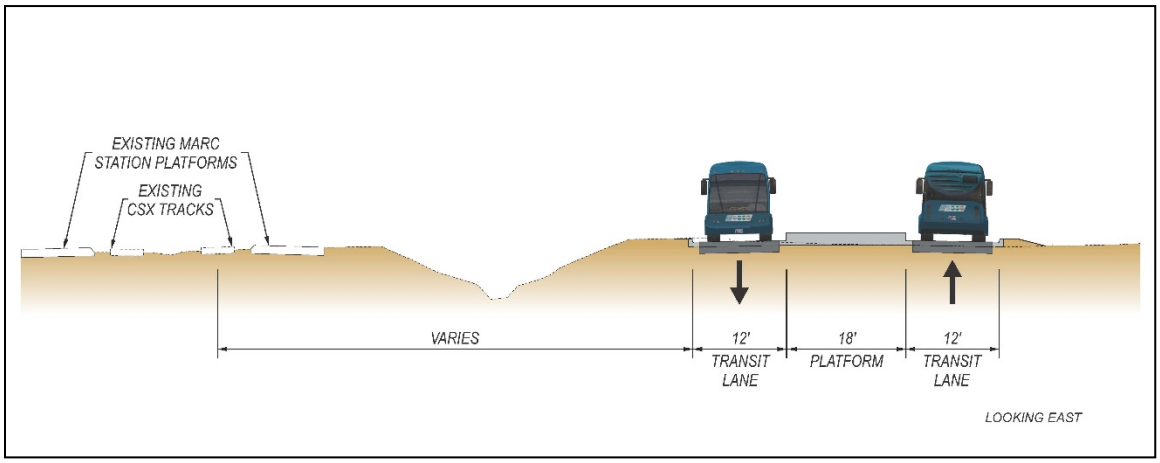
2.5.4 Alignment

Metropolitan Grove

The Build Alternative alignment would begin at the existing Metropolitan Grove MARC Station and would be located on the south side of the existing CSX tracks, which are also used by MARC (**Appendix E, Sheets 1-3**). The northern-most terminus station for the CCT Project would be the Metropolitan Grove Station, which would have a median platform. The existing parking lot at the MARC Station would be reconfigured to better serve the needs to both services. To maintain the CCT vehicles, an O&M Facility would be located near the Metropolitan Grove MARC Station as described in **Section 2.6.4**. The Build Alternative would travel east, parallel to the MARC tracks, and would turn south at Quince Orchard Road. Firstfield Station would be a median platform in the northwest corner of the intersection of Quince Orchard Road and Firstfield Road. Sidewalk would be provided between Quince Orchard Road and the platform to provide improved pedestrian access to the station. The alignment would continue at-grade across Firstfield Road, rise onto a bridge section to cross over Clopper Road, and then cross over Quince Orchard Road, just south of Clopper Road. The Build Alternative would return to grade on the east side of Quince Orchard Road near North Drive.

The lane widths would vary between 13 feet and 17 feet on the bridge section over Clopper Road and Quince Orchard Road to provide adequate horizontal sight distance. **Figure 2-6** presents a typical section of the Build Alternative at-grade between Metropolitan Grove Station and Quince Orchard Road.

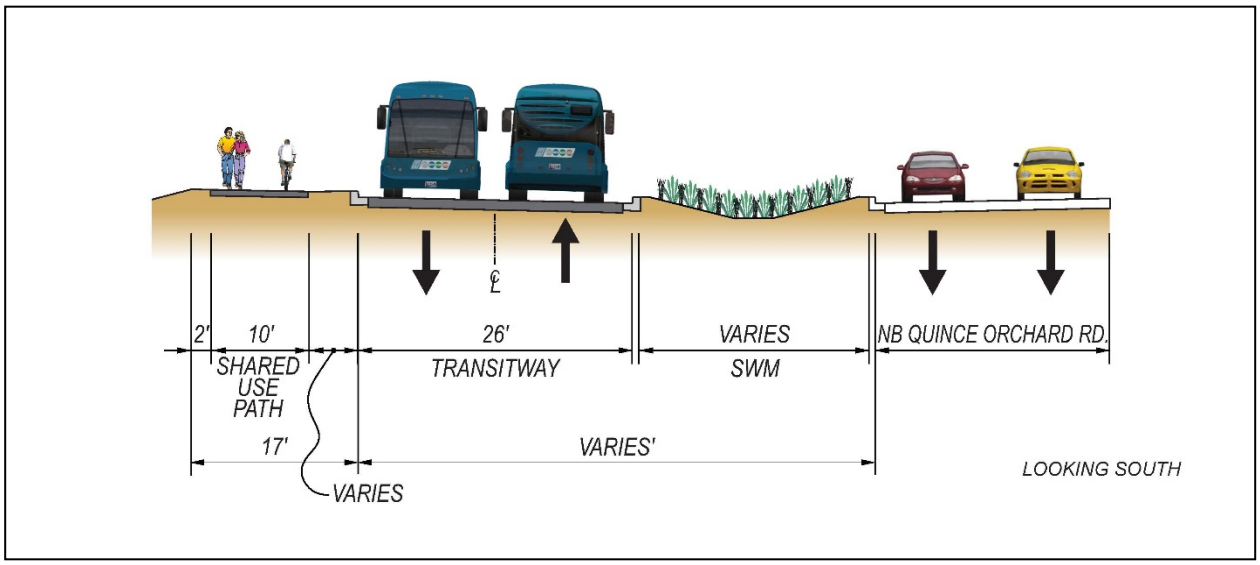
Figure 2-6: CCT Typical Section at Metropolitan Grove Station



Quince Orchard Road

The Build Alternative alignment would continue traveling south, parallel to and on the east side of Quince Orchard Road, at approximately the same elevation as the roadway (**Appendix E, Sheets 3-6**). A median platform station would be proposed northeast of the intersection of Quince Orchard Road and Quince Orchard Boulevard, near a proposed entrance to the NIST campus that would be constructed as part of this Project. The Build Alternative would continue south along Quince Orchard Road and cross Twin Lakes Drive and Orchard Ridge Drive. The Build Alternative would include a shared-use path on the east side. This shared-use path would replace an existing path (planned to be constructed by SHA) impacted by the Build Alternative. **Figure 2-7** provides a typical section along Quince Orchard Road.

Figure 2-7: CCT Typical Section Along Quince Orchard Road



Great Seneca Highway

South of the Orchard Ridge Drive intersection, the Build Alternative would rise on retaining walls to cross over Great Seneca Highway on a bridge structure. The alignment would turn south and continue on the west side of Great Seneca Highway (**Appendix E, Sheet 6**). The aerial platform at Kentlands Station would be located on structure west of Main Street (**Figure 2-5**). The Build Alternative would cross over Main Street on a bridge structure and return to the elevation of Great Seneca Highway on retaining walls. It would cross Kentlands Boulevard at-grade, and would continue parallel to and at the same elevation of Great Seneca Highway between Kentlands Boulevard and Lakelands Drive. South of Lakelands Drive, the Build Alternative would span the Muddy Branch stream on a new bridge, parallel to the existing bridge on Great Seneca Highway. The alignment would continue south on the west side of Great Seneca Highway to the intersection with Muddy Branch Road (**Appendix E, Sheets 6-9**).

In order to address concerns raised by the residents of the Washingtonian Woods community in the vicinity of Upshire Circle and Hillside Lake Terrace, the CCT was shifted closer to Great Seneca Highway, separating the transitway from the southbound travel lanes of Great Seneca Highway with a traffic barrier. This would allow the CCT to be moved ten feet further away from the Washingtonian Woods community.

Figure 2-8 provides a typical section along Great Seneca Highway between Main Street and Lakelands Drive. **Figure 2-9** provides a typical section along Great Seneca Highway in the vicinity of Upshire Circle. The lane widths would vary between 12 and 19 feet wide on the bridge over Great Seneca Highway to provide adequate horizontal sight distance. A ten-foot-wide shared-use path would be reconstructed east of the Build Alternative adjacent to Quince Orchard Road. A ten-foot-wide shared-use path would be constructed between Great Seneca Highway and the CCT from Quince Orchard Drive and Main Street and a five-foot-wide sidewalk would be reconstructed from Main Street to Lakelands Drive.

Figure 2-8: CCT Typical Section Along Great Seneca Highway

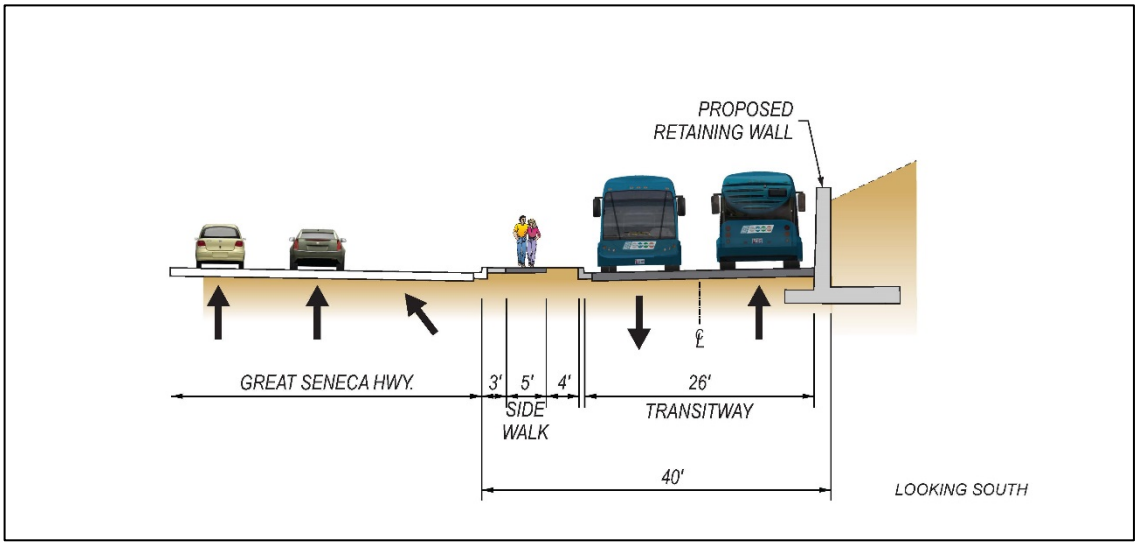
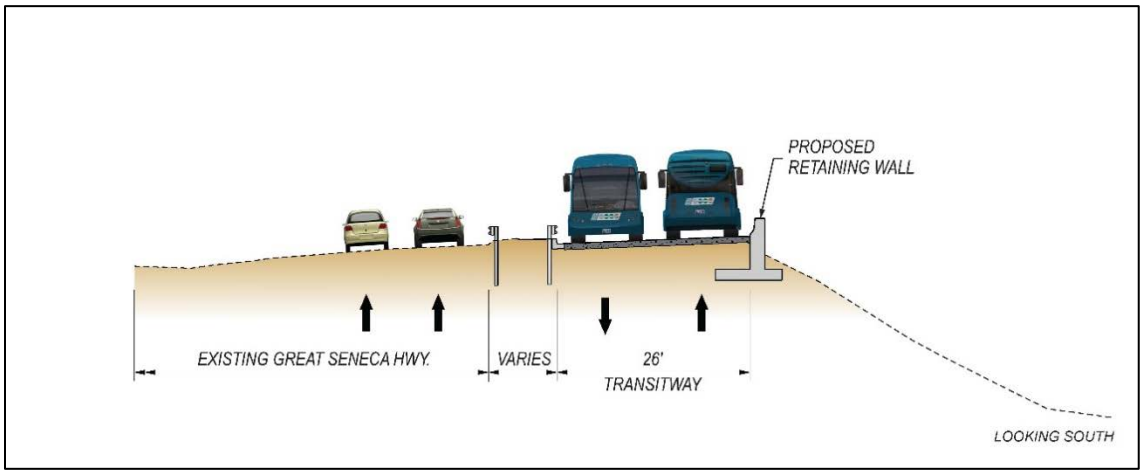


Figure 2-9: CCT Typical Section Along Great Seneca Highway near Upshire Circle



Muddy Branch Road

Once the CCT turns off of Great Seneca Highway onto Muddy Branch Road, it would transition into and operate in mixed traffic on Muddy Branch Road and Darnestown Road until it enters into the PSTA property.

Public Safety Training Academy

The Build Alternative alignment would cross Key West Avenue and enter the PSTA property on a proposed roadway that would continue through the site (**Appendix E, Sheets 10-11**). The PSTA site is currently being redeveloped. the Build Alternative would be located in the median of the proposed main roadway through the development. The LSC West Station would be located in the middle of the development.

CCT Service via Universities at Shady Grove

The CCT Service via USG would operate along the dedicated transitway of the Build Alternative, stopping at all stations, but it would divert off the dedicated transitway to serve two additional stations. The Build Alternative would leave the dedicated transitway at the intersection of Medical Center Drive and Great Seneca Highway and operate in mixed traffic continuing south on Great Seneca Highway (**Appendix E, Sheet 18**). The buses would turn east (left) along Darnestown Road and continue in mixed traffic. They would then turn south (right) onto Traville Gateway Drive (east portion). The Build Alternative would stop at the USG Station and then continue along Traville Gateway Drive. The Build Alternative alignment would turn east (left) along a proposed (new) connector road that would pass through the east side of the campus and connect to Shady Grove Road. The alignment would then turn west (right) onto Shady Grove Road and operate in mixed traffic, turning back onto Traville Gateway Drive (west portion) and stop at the Traville Gateway Drive Station near the office complex. The Build Alternative would continue to operate in mixed traffic along Traville Gateway Drive, turn east (right) onto Darnestown Road, and then north (left) onto Great Seneca Highway to return to the dedicated alignment of the Build Alternative.

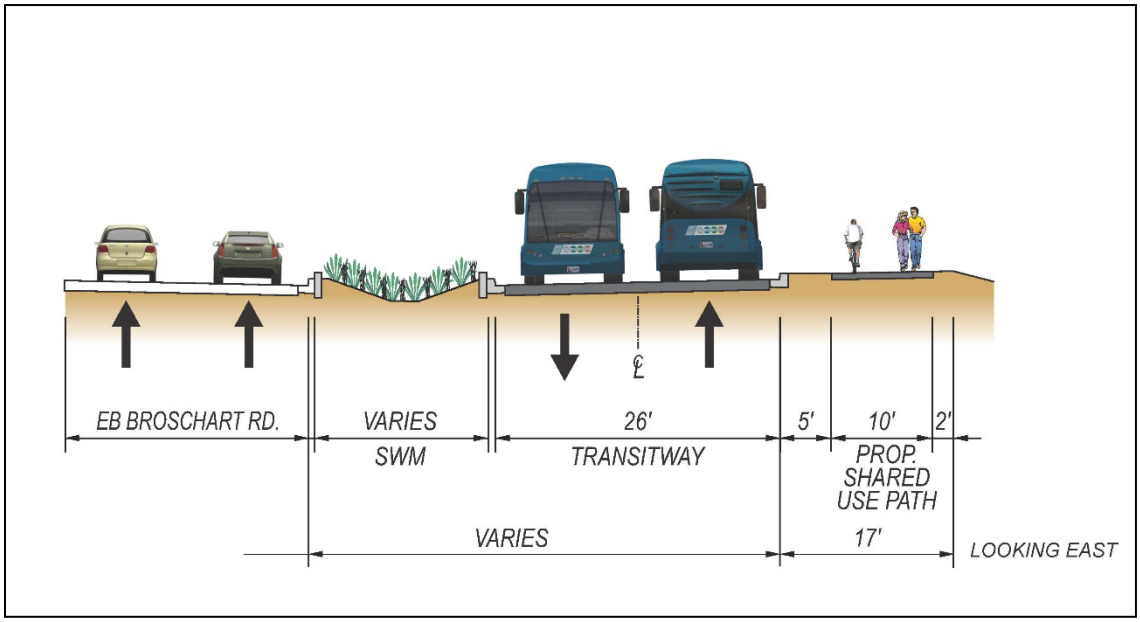
Medical Center Drive

The Build Alternative alignment would continue east along Medical Center Drive at the intersection with Great Seneca Highway (**Appendix E, Sheet 11**). It would travel in the median to the intersection with Broschart Road. A seven-foot-wide cycle track with a six-foot-wide buffer and a six-foot-wide sidewalk would be constructed on the south side of Medical Center Drive.

Broschart Road

The Build Alternative alignment would cross the intersection of Broschart Road and Medical Center Way and travel along the east side of Broschart Road to Blackwell Road (**Appendix E, Sheet 11**). The Build Alternative would then cross Broschart Road diagonally and continue along the west side to Key West Avenue (**Appendix E, Sheet 12**). The Build Alternative would then cross Key West Avenue at-grade. The median platform LSC Central Station would be located along Broschart Road south of Blackwell Road. **Figure 2-10** shows the typical section and the ten-foot-wide shared-use path that would be constructed on the east side of the transitway.

Figure 2-10: CCT Typical Section Along Broschart Road



Diamondback Drive

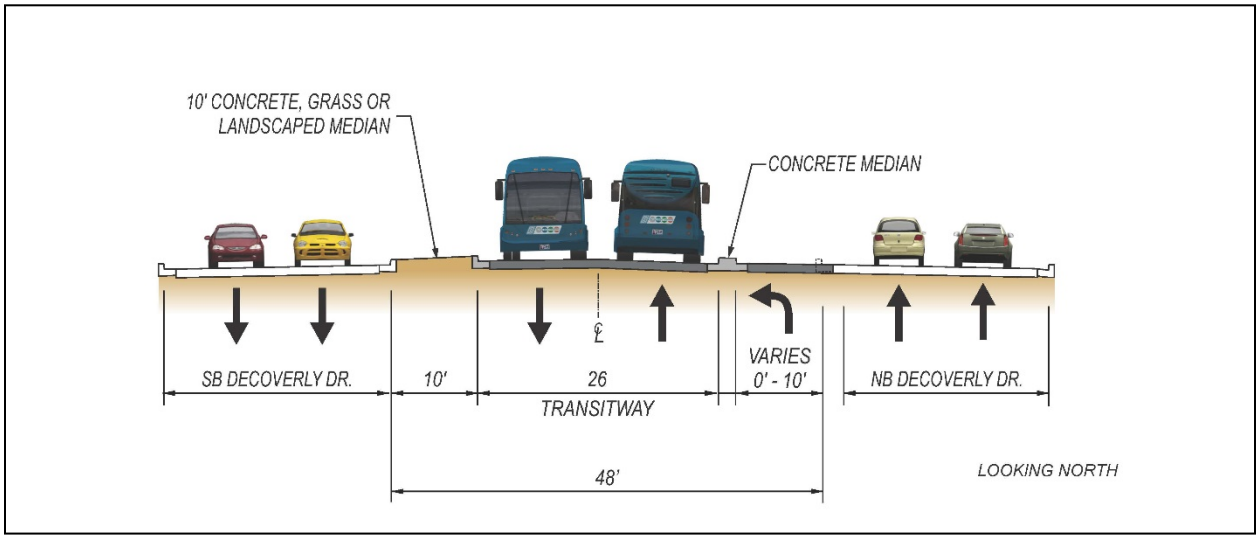
The Build Alternative alignment would cross Key West Avenue at-grade and continue along the west side of Diamondback Drive to Decoverly Drive (**Appendix E, Sheet 12**). The DANAC Station would include two side platforms and would be located along Diamondback Road just south of the intersection with Decoverly Drive. A retaining wall and sidewalk would be located between the transitway and Diamondback Drive. A shared-use path would be located between the outbound platform and the proposed DANAC development.

Decoverly Drive

The Build Alternative alignment would cross the intersection of Diamondback Drive and Decoverly Drive and continue in the median of Decoverly Drive to Fields Road through the Crown Farm development (**Appendix E, Sheets 12-13**). The Crown Farm Station would be located just south of the intersection with Fields Road. **Figure 2-11** shows the typical section with varying

width concrete, grass, or landscaped medians separating the transitway from the adjacent travel lanes. A seven-foot-wide cycle track with a six-foot-wide buffer and a ten-foot-wide shared-use path would be constructed on the east side of Decoverly Drive, south of Crown Park Drive.

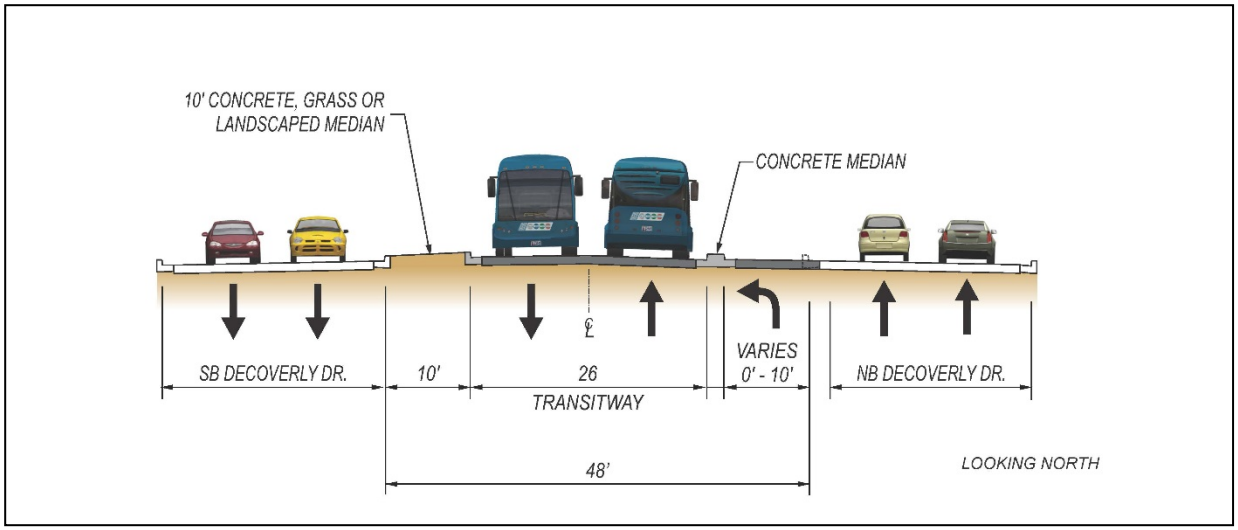
Figure 2-11: CCT Typical Section Along Decoverly Drive north of Crown Park Drive



Fields Road

The Build Alternative alignment would cross the intersection of Decoverly Drive and Fields Road, and continue in the proposed median of Fields Road. It would cross Washingtonian Boulevard and the I-270 exit ramp intersection with Fields Road at-grade, the would rise onto a bridge structure that would carry the transitway and a ten-foot-wide shared-use path over I-270 and Shady Grove Road (**Appendix E, Sheets 13-15**). After crossing over Shady Grove Road, the Build Alternative would return to grade near the roundabout at the west end of King Farm Boulevard. **Figure 2-12** shows the typical section rising on retaining walls prior to the bridge crossing over I-270.

Figure 2-12: Typical Section Along Fields Road



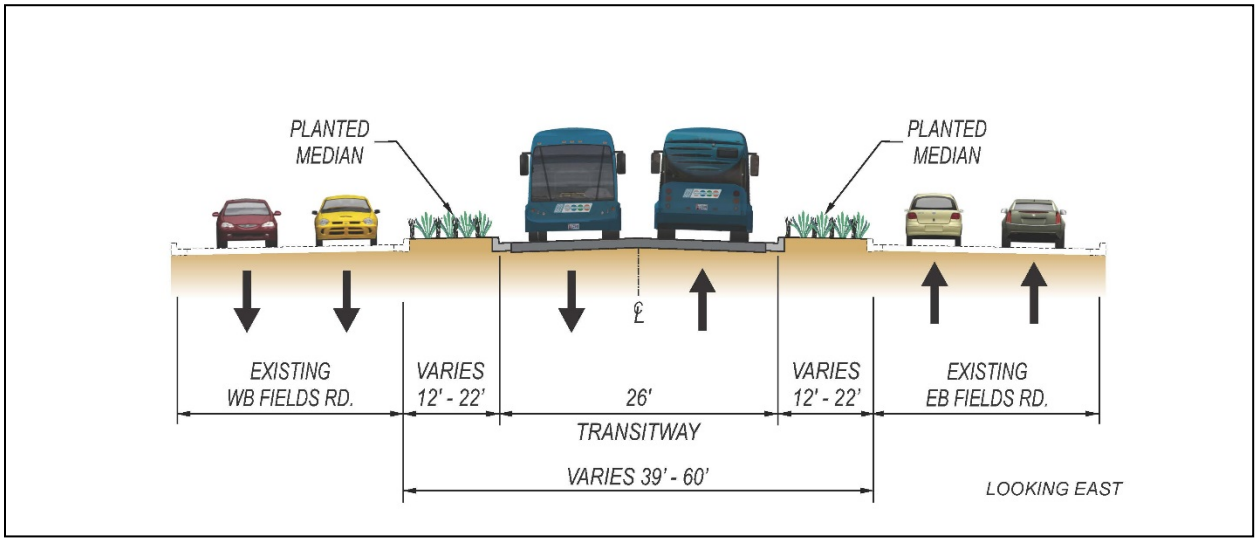
King Farm Boulevard

The Build Alternative alignment would continue along King Farm Boulevard east to MD 355 on lanes adjacent to the median and reserved for transitway use (**Appendix E, Sheets 15-16**). King Farm Boulevard was constructed as part of the greater King Farm development and was designed with a 52-foot-wide median intended to accommodate the future construction of the transitway. **Figure 2-13** shows the typical section of the transitway along King Farm Boulevard.

The standard typical section would not apply for this segment. The Build Alternative would consist of 13-foot-wide lanes located on either side of a narrowed existing median. The lanes would be adjacent to the existing King Farm Boulevard roadway with a concrete median separating the transitway near stations. The existing median would be narrowed to 26 feet and accommodate stormwater management facilities and green space.

Two median platform stations would be located along King Farm Boulevard: the West Gaither Station would be east of Piccard Drive and the East Gaither Station would be east of Pleasant Drive.

Figure 2-13: Typical Section Along King Farm Boulevard



Shady Grove Metro Access Road

The Build Alternative alignment would cross MD 355 and continue eastbound in mixed traffic along the Shady Grove Metro Access Road to enter the eastern terminus station–the Shady Grove Station, which would be located adjacent to the Shady Grove Metro Station (**Appendix E, Sheet 17**). East of the Access Road, the Build Alternative would utilize the existing ring road around the existing parking lot at the station. Westbound CCT buses exiting the Shady Grove Station would travel in mixed traffic along the Shady Grove Access Road. A sidewalk would be constructed on the west side of the Access Road and a ten-foot-wide shared-use trail would be constructed on both sides of the Access Road with three-foot buffers to separate them from the roadway.

2.6 Operations

2.6.1 Operations Plan

Two CCT routes would operate along the transitway: CCT Direct Service and CCT via USG. The CCT Direct Service route would operate between the Shady Grove and Metropolitan Grove Stations of the CCT, stopping at every station along the transitway. The CCT Service via USG will operate along the transitway, stopping at all stations, but will divert off the transitway to serve two additional stations.

The CCT Direct Service would operate on five-minute headways during peak periods, six minutes during mid-day and ten-minute headways during off-peak periods. The one-way travel time from Shady Grove to Metropolitan Grove would be approximately 42 minutes.

The CCT via USG would also operate along the CCT transitway between Metropolitan Grove and Shady Grove, but would provide additional local service to two activity centers: USG Station and Traville Gateway Drive Station. This service would operate on 15-minute headways during peak periods and 30-minute headways during off-peak periods. The one-way travel time for CCT service via USG would be approximately 46 minutes.

All CCT service would operate seven days per week. The hours of operation would be consistent with WMATA's Red Line Metrorail service for weekday and weekend service. Metrorail service begins at 5 am on weekdays and 7 am on weekends, and ends at 12 am on Sunday through Thursday or 3 am on Friday and Saturday. The projected ridership on the CCT in 2035 is 30,429 trips per day.

The estimated annual operations and maintenance costs for the CCT for the year 2035 operations is $23.5 million (2014 dollars). This projected operations and maintenance cost is for the total CCT service, both CCT Direct Service and CCT via USG Service.

CCT service would be integrated into the surrounding transit network. Some local bus service would continue to operate along streets adjacent to the CCT transitway to serve local bus stops and surrounding neighborhoods and businesses. Ride On routes would be re-routed to terminate at a CCT Station allowing passengers to easily transfer from local buses to the CCT.

Generally, MARC and WMATA Metrorail service would operate the same as existing service with the Build Alternative. Some changes may be made to existing MDOT MTA and WMATA services to provide timely connections to the CCT service and to utilize the CCT transitway. Transit schedules would be modified and local bus stops may be added to drop passengers off closer to the new CCT Stations.

As the Project continues to proceed through more detailed design, the proposed bus operations plan will be adjusted. Continuous refinements to the bus operations plan are anticipated until opening day of the CCT.

2.6.2 Parking

Parking for the CCT Project would be provided at five stations: Shady Grove, Crown Farm, LSC West, Kentlands, and Metropolitan Grove. Parking needs for the CCT transitway were identified based on the number of patrons accessing the CCT by automobile, but excluding other modes such as MARC. At this time, no additional parking spaces would be added at the Shady Grove Station for CCT patrons.

Based on 2035 ridership projections, the Build Alternative assumes the following number of parking spaces would be needed at these park-and-ride facilities:

- Metropolitan Grove Station: 260 spaces
- Kentlands Station: 240 spaces
- LSC West Station: 325 spaces
- Crown Farm Station: 430 spaces

2.6.3 System Elements

Vehicles

The proposed vehicle for the new CCT BRT service would be a 60-foot articulated vehicle, which would accommodate up to 90 passengers. The vehicle would be branded with a particular color and logo scheme, pending the final branding of the CCT. The CCT vehicles would have low floors enabling level boarding from the platform which would reduce boarding time and provide more comfortable and convenient access relative to standard buses for people with disabilities. Diesel-electric hybrid buses, which emit fewer pollutants than diesel buses, are planned for the CCT articulated vehicles. This technology has been applied in numerous local bus and BRT systems throughout the US.

The CCT vehicles would have several Intelligent Transportation Systems (ITS) components to facilitate operation, enhance passenger security, and improve passenger information. These components could include an automatic vehicle location system, real-time passenger information, and closed-circuit television cameras.

Fare Collection

A fare policy system for the CCT would be developed as Project development continues and as the future operating agency for the CCT is confirmed. At this time, a single fare is assumed, regardless of distance traveled or the time of day the CCT trip is taken, with integration into the regional fare system relative to smart card technology (or future adopted technologies) and mode-to-mode transfers. Off-board fare collection is intended, with on-board proof-of-payment, which would allow for all-door boarding. Cash also may be accepted in the final fare collection scheme.

With off-board fare collection, ticket vending machines would be provided at each CCT Station, along with ticket validation machines. Smart card readers would also be provided on the BRT vehicles. If cash is to be allowed, then a fare box would be provided at the front door of the vehicle.

2.6.4 Operations and Maintenance (O&M) Facility

An O&M Facility for the CCT would be required to store, maintain, and dispatch buses. The proposed O&M Facility location for the CCT is along Metropolitan Grove Road, southeast of Metropolitan Grove Station (**Appendix E, Sheet 2**). The majority of the proposed site consists of a heavily wooded area owned by the City of Gaithersburg and various parcels used to store truck trailers.

The O&M Facility design would accommodate administrative functions with a two-story Administration and Operations building. The site would also accommodate vehicle parking and service areas for bus storage and service vehicles. The maintenance features would include a bus service area with a wash-and-fuel lane, a chassis wash, and bypass and support spaces, and a bus maintenance facility with five bays, one pit bay, shops, and support spaces.

2.7 Construction Methods and Assumptions

MDOT MTA anticipates construction of the Build Alternatives for the CCT to take three to four years. The time to construct each Project area would differ based on the type of elements in the area, site characteristics, weather, structural design, and other factors, such as the relationship among the construction elements.

Construction activities are likely to begin simultaneously at several locations within the study area corridor to accommodate activities requiring lengthy construction times, such as structures. The time necessary for each activity would vary depending upon factors such as work hours, traffic restrictions, and contractors' means and methods. Other factors would include the number and type of utilities requiring relocation and the location and conditions of nearby surface and subsurface structures.

Typically, surface and above-ground construction activities would occur five days a week, eight hours per day. There would be instances when certain construction activities could take place during weekends or at night to minimize impacts to traffic.

A general discussion of the level and type of construction methods, assumptions, and anticipated impacts are presented in this section. These assumptions are based on the current 30 percent preliminary engineering design. Detailed design and construction information will continue to be developed as the Project advances and the construction contract delivery methods are identified.

Construction of the Build Alternative would involve the creation of a new travel surface for the BRT for the majority of the alignment. This could result in disruption and impacts to sidewalk areas and in some cases, properties adjacent to the transitway. Sidewalk and curb adjustments or reconstruction could be required to reduce or eliminate right-of-way needs. Ancillary construction could include: underground utility relocation and/or reconstruction; curb and sidewalk reconstruction; construction of new or modified storm drain systems; manhole structure repairs, cover adjustments, or relocations; roadway surface milling and repaving; temporary lane closures for construction and/or staging areas; and pavement marking/signage installation.

Temporary arrangements for pedestrian and vehicle access would be made with neighboring business owners and residents, where appropriate. Advanced warning for lane closures or detours would be provided and would adhere to state guidelines for temporary traffic control during construction.

Detailed discussions of the potential environmental effects that may be associated with construction activities and recommended measures to mitigate or minimize such effects are identified in **Chapter 3** of this EA document.

The following discussion describes the anticipated construction impacts of the Build Alternative based on the 30 percent design by ten areas, as listed in **Table 2-2**.

Table 2-2: Summary of Construction Activities by Construction Area

Construction Area	Limits & Length	Affected Roadways	Special Features
1	Metropolitan Grove MARC Station to Quince Orchard / Clopper Road Intersection	• Quince Orchard Blvd Crossing Roads / Signal Mod • Firstfield Rd • Metropolitan Grove Rd	• Metropolitan Grove MARC Train Facility • SHA facility • Metropolitan Grove Station • Firstfield Station
2	Quince Orchard /Clopper Road to Orchard Ridge Drive	• Quince Orchard Road Crossing Roads / Signal Mod • Clopper Road • North Drive • NIST Entrance Road • South Drive • Twin Lakes Drive • Orchard Ridge Drive	• NIST Station • Kentlands Station • Structure over Quince Orchard Blvd and Clopper Road
3	Orchard Ridge Drive / Great Seneca Highway to Muddy Branch Road	• Great Seneca Hwy • Muddy Branch Road • Kentlands Blvd • Lakelands Drive • Midsummer Drive	• Structure over Great Seneca Highway • Structure over Muddy Branch
4	Medical Center Drive extended from Key West Blvd. to Great Seneca Highway	• Medical Center Drive Crossing Roads/Signal Mod • Great Seneca Hwy • Key West Ave • Johns Hopkins Drive	• PSTA Site • LSC West Station
5	Medical Center Drive from Great Seneca Highway to past Broschart Road to Key West at Decoverly Drive	• Medical Center Drive • Broschart Road • Diamondback Drive Crossing Roads/Signal Mod • Medical Center Way • Blackwell Road • Key West Ave • Decoverly Drive	• LSC West Station • LSC Central Station • DANAC Station
6	Diamondback Drive and Decoverly Drive from Key West to Fields Road	• Decoverly Drive • Fields Rd Crossing Roads/Signal Mod • Diamondback Drive • Skyhill Way • Crown Park Ave • Hendrix Ave	• Crown Farm Station

Construction Area	Limits & Length	Affected Roadways	Special Features
		•	
7	Fields Road from Decoverly Drive	• Washingtonian Blvd Crossing Roads/Signal Mod Winners Drive Marathon Circle Case Street	•
8	I-270 Mainline and Ramps		• Structure 4: Bridge over I-270
9	King Farm Blvd	• King Farm Blvd Crossing Roads/Signal Mod • Sheraton Entrance • Piccard Drive • Central & eastern Ingleside entrance • Gaither Rd • Reserve Champion Drive • Crestfield Drive • Pleasant Drive • Grand Champion Drive • Elmcroft Blvd • MD 355	• West Gaither Station • East Gaither Station
10	Shady Grove Metro Station	• King Farm Blvd • Somerville Drive Crossing Roads / Signal Mod • MD 355	• Shady Grove Metro Station • Shady Grove Station

2.7.1 Construction Area 1

The alignment is along the south side of the CSX and MARC tracks and the west side of Quince Orchard Road. The transitway would be constructed outside the CSX right-of-way and would not affect rail operations. At the Metropolitan Grove MARC Station, the CCT Station would be constructed in the existing MARC parking lot. Parking could be temporarily impacted during construction but would still be accessible to MARC riders. Access to the MARC platform would be maintained at all times.

The CCT alignment would cross Metropolitan Grove Road, SHA Maintenance Facility, and Firstfield Road. Minor construction would be required on the cross roads; however, access will be maintained. The construction of the Firstfield Station would not further impact traffic, pedestrians, bicyclists, or the neighborhoods.

Sidewalks along the west side of Quince Orchard Boulevard would be temporarily closed during construction. Pedestrians, including residents at Orchard Pond Apartments, would be detoured to use the sidewalk along the east side of Orchard Ridge Drive.

2.7.2 Construction Area 2

The CCT would be on structure over Clopper Road and Quince Orchard Road, and then would run along the east side of Quince Orchard Road, south of Clopper Road. The CCT would be constructed outside the existing roadway and would not affect roadway operations. The majority

of the construction would occur outside the existing roadways; however, temporary road closures could be required when placing the structure over the roadway.

The CCT alignment crosses four access roads along the NIST property: North Drive, Sound Road, access drive to substation, and South Drive. The existing access and gates at North Drive and Sound Road would be closed. A new access and gate would be provided on the east leg of the Quince Orchard Boulevard / Quince Orchard Road intersection by connecting to the service drive. The NIST Station would be constructed adjacent to the new gate and would not further impact traffic, pedestrians, bicyclists, or the neighborhoods. North Drive and Sound Road would remain open while the new access road and gate are being constructed. The access road to the substation and South Drive would remain open during and after construction.

Minor construction would be required at the Twin Lakes Drive and Orchard Ridge Drive crossings; however, access would be maintained during construction.

Sidewalks along east side of Quince Orchard Boulevard would be temporarily closed during construction. Pedestrians, would be detoured to use the sidewalk along the west side of Quince Orchard Road.

2.7.3 Construction Area 3

The CCT alignment would turn from Quince Orchard Road to the west side of Great Seneca Highway on structure and would be constructed outside the existing roadway. However, temporary road closures could be required when placing the structure over the roadway. The Kentlands Station would be elevated above the adjacent shopping center parking lot. A portion of the parking lot would be closed during construction but the majority of the parking spaces would be maintained once the construction is complete.

The CCT alignment will cross Main Street, Kentlands Boulevard, and Lakelands Road. Minor construction would be required on the cross roads; however, access would be maintained. The structure over Muddy Branch would be constructed from the elevation of Great Seneca Highway to minimize impacts to Muddy Branch and the park.

The construction of the northbound left-turn lane would be constructed within the median of Muddy Branch Road with minimal traffic impacts.

The existing sidewalk along the west side of Great Seneca Highway from Quince Orchard Road to Lakelands Drive would be temporarily closed during construction. Pedestrians, including residents from Kentlands and Lakelands, will be detoured to use the sidewalk along the east side of Great Seneca Highway.

The residents of Washingtonian Woods and the Vistas would experience temporary construction impacts including noise, vibration, and changes in viewsheds.

2.7.4 Construction Area 4

The CCT alignment would travel through the soon-to-be vacant Montgomery County PSTA property and would not disturb adjacent properties. Vehicular access to the entrance of the PSTA at 9710 Great Seneca Highway would be temporarily limited, but access to the property during construction would still be provided. At the intersection of Medical Center Drive extended and Great Seneca Highway, the access from the government office building would be temporarily impacted during construction, but access would be provided at all times.

2.7.5 Construction Area 5

The CCT alignment would be constructed in the median of Medical Center Drive requiring the eastbound lanes to be reconstructed to the south. Eastbound traffic on Medical Center Drive would be minimally impacted during construction because the new travel lanes would be constructed outside the roadway and then traffic would be shifted to the new lanes. All travel lanes would remain open while the CCT is being constructed in the median.

No construction impacts or changes in access are anticipated at the Katherine Thomas School since the CCT and eastbound roadway construction are on the opposite side of Medical Center Drive.

Once the CCT alignment turns onto the east side of Broschart Road, it would be outside the existing roadway. At Blackwell Road, the alignment crosses to the west side of Broschart, completely outside the roadway. Through this section, the CCT alignment crosses Medical Center Way, two driveways to the Shady Grove Adventist Hospital parking lot, and a driveway to an office building. The two driveways to Shady Grove Adventist Hospital would be closed during and after construction; however, access would be provided via Medical Center Way and Blackwell Road.

The LSC Central Station would be constructed outside the roadway and would result in minimal traffic impacts. Sidewalks along the east side of Broschart Road will be temporarily closed during construction. Pedestrians will be detoured to use the sidewalk along the west side of Broschart Road.

2.7.6 Construction Area 6

The CCT alignment would continue across Key West Avenue on the west side of Diamondback Drive. Minor construction would be required to cross this road; however, access would be maintained. The DANAC Station would be constructed outside of the roadway adjacent to the parking garage. The station would require the closing of an existing access drive on the west side of Diamondback Drive; however, the redevelopment of this site would accommodate access elsewhere.

The impacted sidewalk on the west side of Diamondback Drive would be replaced with a new sidewalk and shared-use path between the transitway and Diamondback Drive. During construction, pedestrians and bicyclists would be redirected to the sidewalk on the east side of Diamondback Drive.

The CCT alignment continues across Diamondback Drive to the median of Decoverly Drive. Construction would take place on all four legs of the intersection and could result in a temporary reduction in lanes; however, access will be maintained at all times. From Diamondback Drive to just north of Skyhill Way, the northbound travel lanes and a shared-use path would be constructed on the east side to allow for a wider median for the construction of the CCT alignment. During and after construction, Skyhill Way and Steinbeck Avenue would be limited to right-in/right-out access points at Decoverly Drive. Access to Crown Park Avenue and Hendrix Avenue would be temporarily impacted during construction; however, access would be maintained.

The Crown Farm Station would be constructed in the median of Decoverly Drive and would result in minimal traffic impacts.

2.7.7 Construction Area 7

The CCT alignment would cross Fields Road at an existing traffic signal from the median of Decoverly Drive to the median of Fields Road. There would be limited impacts to traffic at this intersection. The CCT alignment would continue in the median of Fields Road. Winner Drive, Marathon Circle, and Case Street will remain right-in\right-out only from Fields Road. The CCT would cross through the intersection at Washingtonian Boulevard at an existing traffic signal and have minor impacts to traffic during construction.

2.7.8 Construction Area 8

The CCT alignment would stay in the median of Fields Road up to the new signal at Omega Drive, then it would continue east on a new structure over Shady Grove Road and I-270 mainline/ramps. It would tie down to existing ground at the west end of King Farm Boulevard. Temporary, off-peak road closures on Shady Grove and I-270 could be required when placing the structures over the roadway. A shared-use trail would be constructed adjacent to the transitway on the same structure.

2.7.9 Construction Area 9

The CCT alignment would continue in the median of King Farm Boulevard. The following cross streets would remain open, but traffic signals would be added or modified: Piccard Drive, central and east Ingleside entrances, Gaither Road, Reserve Champion Drive, Pleasant Drive, Grand Champion Drive, and MD 355. Access to these streets would temporarily be impacted during construction; however, access would be maintained. Cross streets Crestfield Drive and Elmcroft Boulevard would be modified to be right-in\right-out only. Access to the Sheraton Hotel driveway west of Piccard Drive would be temporarily impacted during construction; however, access would be maintained at all times.

Because the CCT would be in the median of King Farm Boulevard, there are no construction impacts anticipated to the sidewalks or at the stations.

2.7.10 Construction Area 10

The CCT alignment would operate in mixed traffic on King Farm Boulevard east of MD 355 and through the Shady Grove Metro Station. The roadway would be widened to the east to accommodate turn lanes onto MD 355 and Sommerville Drive. MDOT MTA would maintain access to the Metro Station during construction for local and commuter buses, kiss-and-ride, and parking for Metro. Close and careful coordination would take place with WMATA on the construction phasing at the Shady Grove Station.

2.7.11 Transportation Management Plan

A Draft Transportation Management Plan (TMP) has been developed based on the 30 percent design plans, in accordance with the MDOT SHA Guidelines for Development, Implementation, and Assessment of TMPs for major projects. The Draft TMP for the CCT Project was prepared to serve the mobility and safety needs of road users, highway workers, businesses, and the community that may be affected by the construction of the Project. The Draft TMP details work zone impact management strategies, including maintenance of traffic and public information, outreach strategies, and incident management during construction. It includes a Traffic Control Plan following guidance from SHA and federal standards, and addresses construction sequencing, traffic safety, and traffic control throughout the work zone. The TMP is a "living document" that will be continually updated during later stages of the Project, including detailed design and construction.

The MDOT MTA, in coordination with its contractor, would be responsible for the plan's Public Information and Outreach program, which is intended to inform motorists, residents, businesses, schools, emergency service and delivery providers, and the public regarding temporary changes to traffic patterns and detours. Changes in traffic, bicycle, and pedestrian routes would be announced in the print and electronic media. Appropriate lines of communication would be maintained with emergency service providers throughout construction regarding current and upcoming construction activities, potential issues, and planned route changes. Pedestrian access to adjacent properties and access to adjacent parking facilities would be maintained during construction. Whenever existing movements cannot be maintained, alternate routing would be designated with appropriate signing.

2.8 Capital Cost Estimate

2.8.1 Methodology

The Project definition of the Build Alternative that forms the basis of the capital cost estimate is defined and described in this chapter of the EA and the associated engineering plans that are included in **Appendix E**. The capital cost estimate includes all costs associated with the development of the CCT. The capital cost estimate is organized and formatted per the FTA Standard Cost Categories (SCC) for the estimate of capital costs. These categories, with a brief explanation of each are as follows:

- Category 10 – Guideway: Elements in this category include the construction of the transitway itself in three separate delineations: at-grade semi-exclusive, aerial structure, retained cut, and fill.

- Category 20 – Stations: Elements include all work associated with stations such as the platform itself, station amenities, parking areas for stations, and elevators and escalators, if needed.

- Category 30 – Bus Maintenance Facility: Elements include all requirements to store and maintain the fleet of buses for CCT operations including Maintenance and Administration buildings and exterior site improvements.

- Category 40 – Sitework: Elements include demolition; clearing; earthwork; site utilities and utility replacement; stormwater management; hazardous materials and groundwater treatment; environmental mitigation; reforestation; site structures, such as noise walls and retaining walls; pedestrian and bicycle facilities and access; landscaping; art in transit; and vehicular access needs.

- Category 50 – Systems: Elements include traffic signals (new or modified), transit signal priority, corridor signage, communications equipment, fare collection equipment, and operational equipment.

- Category 60 – Right-of –Way: Cost elements include the purchase of private right-of-way needed for the project, as well as relocation costs. Costs are not included for either publicly-owned right-of-way or private right-of-way dedicated to the CCT.

- Category 70 – Vehicles: The cost to purchase 39 new articulated buses for the CCT and associated spare parts.

- Category 80 – Professional Services: Elements include design engineering, project management and engineering during construction, construction administration and management, liability insurance, legal, permits, fees for other agencies, testing and inspection, and project start-up costs.

- Category 90 – Unallocated Contingency: Budget set aside for unknown conditions or project changes.

Costs for the nine categories above were developed based on quantities and unit costs developed in the 30 percent engineering effort. To date, allocated contingencies were included for all cost items, consistent with the level of detail accomplished in each category. Costs were initially calculated in 2016 dollars, the best available unit cost data. Costs were then escalated to Year of Expenditure (YOE) dollars. The YOE dollars are escalated from 2016 dollars to an estimated mid-point of construction at a three percent per year escalation rate. For the YOE estimate, the mid-point of construction was assumed to be 2019. If the Project were to be constructed on a different schedule, the YOE capital costs would need to be adjusted accordingly.

2.8.2 Cost Estimate

The capital cost estimate for the CCT in 2016 dollars is $698 Million. The YOE capital cost estimate is $776 Million. The breakdown by FTA SCC is provided in **Table 2-3**.

Table 2-3: Project Cost Estimate in 2016 and YOE Dollars by FTA Standard Cost Categories

FTA Standard Cost Category	2016 Dollars (in millions)	Year of Expenditure Dollars (in millions)
Category 10 – Guideway	$123	$136
Category 20 – Stations	$61	$68
Category 30 – Bus Maintenance Facility	$70	$77
Category 40 – Sitework	$162	$180
Category 50 – Systems	$21	$23
Category 60 – Right-of-Way	$69	$76
Category 70 – Vehicles	$50	$59
Category 80 – Professional Services	$115	$128
Category 90 – Unallocated Contingency	$27	$29
TOTAL	**$718**	**$776**