GEORGIA 400 TRANSIT INITIATIVE

Additional Evaluation of HRT and BRT Impacts

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Metropolitan Atlanta Rapid Transit Authority

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Executive Summary

Introduction

The Metropolitan Atlanta Rapid Transit Authority (MARTA) is undertaking the Georgia 400 Corridor Transit Initiative to identify potential and feasible transit alternatives in the Georgia State Route 400 (GA 400) corridor. In 2011 MARTA initiated an Alternatives Analysis (AA), and in the late summer and fall of 2013, MARTA conducted Early Scoping activities to formally capture public and stakeholder feedback regarding transit in the corridor. During the AA evaluation and the public and stakeholder engagement, the GA 400 corridor from the North Springs Station to Windward Parkway emerged as the preferred alignment. The transit technologies to be evaluated further were identified as heavy rail transit (HRT), light rail transit (LRT), and bus rapid transit (BRT). Potential locations for new MARTA stations included interchanges along GA 400 at Northridge Road, Holcomb Bridge Road, Mansell Road, North Point Mall, Old Milton Parkway, and Windward Parkway.

MARTA added a second phase of Early Scoping in Summer 2014 in response to the public and stakeholders' desire for broader outreach in the study area and more opportunities to provide feedback. In addition, MARTA sponsored a statistically valid public opinion survey of employees and residents along the corridor was conducted, and held additional meetings with the public and local officials.

Strategy to Reach a Locally Preferred Alternative

Following the conclusion of the second phase of Early Scoping, MARTA conducted additional planning and engagement activities to inform the recommendation of a Locally Preferred Alternative (LPA). The focus of this current report is to present the results of the additional studies and the recommendation for the LPA. The activities accomplished between September and December 2014 are:

- MARTA convened a meeting of the Project Steering Committee (PSC) on September 10, 2014 to review the findings of Early Scoping Phase 2 and to begin to identify the recommendation of an LPA. During this meeting, MARTA and the PSC agreed that the LRT technology can be eliminated from further consideration. LRT would be less effective at serving the long-distance trip patterns within the corridor, and based on the preliminary New Starts analysis, the LRT technology would not be eligible for federal funding under the Federal Transit Administration's (FTA) New Starts program.

- MARTA conducted a high-level, pre-engineering analysis to inform the selection of a preferred technology between the remaining alternatives (HRT and BRT) and to refine the conceptual alignment and station locations based on additional criteria. The pre-engineering analysis included rough order-of-magnitude capital cost estimates, transportation and community impacts, and the identification of preliminary right-of-way (ROW) and property impacts.

- At the conclusion of the pre-engineering analysis, MARTA convened another meeting with the PSC, on November 19, 2014, to present the evaluation results and facilitate a discussion related to a preferred technology and alignment for the GA 400 corridor. The PSC engaged in dialogue surrounding the project schedule, implementation, and construction; ridership, costs, and revenue forecasts of the alternatives and planning aspects of the GDOT

Managed Lanes project. The PSC then shared their opinion on the LPA, which MARTA staff considered in presenting the recommendation of the LPA to the Board.

Pre-Engineering Analysis

Identification of Alternatives and Stations

During Early Scoping Phase 2, a group of residents from the Northridge Homeowners Association in the city of Sandy Springs, Georgia, voiced their concerns about the potentially detrimental impacts to residences and community facilities that could potentially occur if transit service was expanded along the east side of the GA 400 corridor. To address these concerns, and respond to public feedback regarding other potential alignments, seven potential alignment alternatives with varying alignment locations and technologies were identified for analysis.

- East Only HRT
- East Only BRT
- West Only HRT
- West Only BRT
- East-West-East HRT
- East-West-East BRT
- Center BRT within GDOT Managed Lanes (Center BRT)

The analysis also considered the potential impact of two Georgia Department of Transportation projects in the corridor. The first project, which is currently under design, will construct collector-distributor (CD) lanes along the GA 400 ROW from the I-285/GA 400 interchange to north of Spalding Drive. These lanes will parallel GA 400 generally within existing ROW and provide additional access that will relieve GA 400 of local access trips. The project is expected to be let to construction in December 2015.

The second GDOT project proposes managed lanes along GA 400 from just north of the I-285/GA 400 interchange to GA 20 in Forsyth County. Early coordination discussions with GDOT assumed that 40-60 feet of available ROW would remain after implementation of the managed lanes. It was initially agreed that MARTA would be able to utilize this ROW for transit operations. However, after further investigation, and based on GDOT's *2012 Georgia 400 Managed Lanes Feasibility Study*, it became apparent that little to no ROW would remain after GDOT implements the managed lanes in the corridor. Therefore, MARTA would need to acquire new ROW in which to house the transit expansion. The scope of GDOT's Managed Lanes project is anticipated to change in early 2015. Nonetheless, this preliminary engineering analysis assumed the latest 2012 GDOT assumptions for managed lanes for the corridor since that was the best and most recent information available.

The West Only alternatives require one crossover of GA 400, and the East-West-East alternatives require two crossovers. The crossover location for the West Only alternatives is south of Spaulding Road. In addition to the east to west crossover south of Spaulding Road, the East-West-East alternative required a second crossover location to get back to the east side of GA 400, north of the Chattahoochee River.

While the AA study examined six potential station locations, based on the results of Early Scoping Phase 2, the analysis examined five stations, based on input from the public and stakeholders:

- Northridge Road
- Holcomb Bridge Road
- Encore Parkway
- Old Milton Parkway
- Windward Parkway

As part of the current analysis, the Mansell Road and North Point Mall station locations were combined into the Encore Parkway location.

The analysis also looked at station types (i.e., at-grade, aerial, cut and cover), station area, parking demand and area, station footprints, and site selection.

Impact Analysis

The pre-engineering analysis examined impacts of each alternative including rough order-of-magnitude capital cost estimates, transportation and community impacts, and the identification of preliminary ROW and property impacts. Geographic Information Systems (GIS)-based analysis was applied to identify potential impacts to the existing GA 400 ROW, community facilities and residential properties, as well as programmed and planned roadway improvements. The individual measures of effectiveness that were used to generate the evaluation tables are listed below. While some of these measures relied on quantitative data, this evaluation should be viewed as a qualitative assessment, especially with respect to transportation impacts.

- Transportation Impacts
  - Station accessibility using existing transportation network
  - Impacts to transportation network surrounding station area
  - Percentage of population and jobs within a half-mile radius of interchange that are located on the same side of the corridor as the station
  - Proximity to attractors
  - Consistency with feedback from PSC and public meetings
  - Consistency with existing plans
- Environmental Impacts
  - Total number of displacements
  - Acres of directly impacted wetlands
  - Acres of directly impacted parklands
  - Level of direct and indirect impacts to community facilities
  - Environmental Justice Populations
- Capital Cost
  - Total estimated capital cost

In evaluating the impacts of the potential alignment alternatives, a “High Range” case and a “Low Range” case was developed for each alignment alternative with the exception of the Center BRT alternative. The High Range case has the transit alignment shifted just outside of the GA 400 ROW while the Low Range case has the alignment within the GA 400 ROW. Although the location of the alignments would be similar, for any given alignment alternative, the High Range scenario would incur substantially greater impacts to private property and community facilities due to the need to acquire new ROW outside of the existing GA 400

corridor. Given that the Center BRT alternative presupposes the existence of GDOT's managed lanes, impacts resulting from the widening of GA 400 to accommodate the managed lanes are accounted for in the Center BRT alternative. The other alternatives do not reflect the direct impacts that would occur as a result of GDOT's implementation of managed lanes. In other words, the implementation of GDOT managed lanes is considered as the No Build alternative for all High Range alignment alternatives except for Center BRT.

Key Evaluation Findings

Transportation Impacts

The Center BRT alternative had the best overall performance primarily due to its choice of station locations, followed closely by the East-West-East alignment alternatives. Two ideal station locations were identified by members of the public and the PSC – Northridge (west side) and Windward Parkway (east side). The North Fulton CID Blueprint 2.0 Short-Term Work Program also designated the west side of the Encore Parkway interchange as a designated future transit station site. While the East-West-East alignments would serve the west side Northridge and east side Windward Parkway stations, the Center BRT alignment alternative is the only option that would provide service to all three recommended station sites. The East-West-East alignment alternatives would utilize two of the recommended station sites – Northridge (west side) and Windward Parkway (east side).

In terms of the built environment, the East Only, West Only, and East-West-East alignment alternatives would provide proximate service to either Avalon/Gwinnett Technical College or the North Point activity center while the Center BRT alternative would not provide proximate access to either of the activity centers. The West Only alignment alternatives would provide the greatest level of proximate access to transit stations, serving 69% of corridor residents located within a half-mile of the station locations. The East-West-East alignment alternatives would provide proximate access to 60% of all jobs located within a half-mile of the station locations.

In terms of station accessibility and potential impacts to the surrounding transportation network, potential issues were identified at the following station sites: Northridge east side (lack of existing transportation network and unwanted by the community), Holcomb Bridge west side (multiple turning movements for ingress/egress), Encore Parkway east side (potential constraints due to small area between GA 400 and retail centers) and Old Milton Parkway west side (potential for large increase in traffic volumes due to Avalon and Gwinnett Technical College). The Center BRT alternative would avoid all of these sites while the East Only, West Only, and East-West-East alignments would each serve two of these problem station sites.

Environmental Impacts

The East-West-East BRT and East Only BRT alternatives had the best overall performance, followed closely by the East-West-East HRT alternative. The Center BRT alignment is the only alternative analyzed that received poor ratings for four of the five environmental impact elements due to the impacts of associated with the widening of GA 400. However, the Center BRT alternative would result in the fewest displacements (20) while the East-West-East BRT alternative would result in the most displacements (475). The West Only alignment alternatives received the strongest scores in terms of minimizing impacts to wetland areas while the East Only HRT alignment alternative would result in the largest area of directly impacted wetlands. In terms of impacts to parklands, the East Only alignment alternatives had a weaker performance than the West Only and East-West-East alignments because of the impacts at the Chattahoochee National Recreation Area and Don White Park. However, the Center BRT

alternative would cause the greatest impact to parklands, with direct impacts to a total of 2.30 acres of parklands within the Chattahoochee National Recreation Area. The East-West-East alignment alternatives received the strongest scores in terms of minimizing impacts to community facilities. This relatively low level of impact was driven by the use of the crossovers, with the east-to-west crossover avoiding impacts to local schools on the east side near Northridge Road and the west-to-east crossover avoiding impacts to two colleges located between Kimball Bridge Road and Old Milton Parkway (Gwinnett Technical College – Alpharetta campus and DeVry University – Alpharetta campus). Given that the majority of the minority, low-income and low-income minority Census tracts are located on the west side of the corridor, the East Only alignment alternatives minimized adverse impacts to EJ populations by not crossing over.

Capital Costs

A given alignment alternative's performance within the capital cost category was fundamentally influenced by its choice of technology. The BRT alternatives were substantially cheaper than the HRT alternatives. The Center BRT alternative had the lowest estimated capital cost primarily due to its use of guideway that would be cost-shared with GDOT. The East-West-East BRT alignment alternative had the highest capital cost of the BRT alternatives because of its use of crossover structures; however, it was only $6.5 million more than the East Only BRT alignment alternative which did not use any crossovers. The relatively small difference in total capital costs for the East Only and East-West-East BRT alternatives was driven by the East Only alignment's high takings costs. Despite not utilizing crossovers, the East Only HRT alignment alternative had the highest estimated capital cost of all alternatives analyzed due to its use of the more expensive heavy rail technology and the fact that its takings costs were substantially higher than all other HRT alternatives analyzed. The relative increase in takings costs for the East Only HRT was enough to outweigh the additional structural costs for the crossovers included in the West Only and East-West-East HRT alignment alternatives.

LPA Recommendation

PSC Recommendation

During the November 19th meeting, the consensus among attendees was that HRT should be the preferred technology. The rationale for selecting the HRT technology over the BRT technology is as follows:

- Funding that would be used to implement the initial BRT service could be utilized to fund a longer term, more permanent investment of transit in the GA 400 corridor.
- The GA 400 corridor is comprised of higher-income, choice riders who would likely not ride a bus.
- HRT ridership projections were higher than the BRT ridership projections, based on the August 2013 AA report, on file with MARTA. Ridership projections were not performed as part of the analysis in this preliminary engineering report.
- HRT is the only technology that would not impose a transfer penalty for people connecting from the existing heavy rail service.
- HRT would make use of infrastructure and vehicles that already exist and are in operation.

The PSC suggested that the East-West-East alignment is preferred as it is more favorable to local economic development and land use planning. The alignment would have two crossovers

– one south of Spalding Drive (east-to-west) and another north of Holcomb Bridge Road (west-to-east). The east-to-west crossover south of Spalding Drive would avoid impacts to the Northridge community and schools in the area. The PSC stated that the west-to-east crossover should be located north of Holcomb Bridge Road in order to avoid interfering with an upcoming redevelopment project located in the southeast quadrant of the Holcomb Bridge interchange. As this crossover location was not studied within this analysis and the East Only and East-West-East alignment alternatives presume a station within the southeast quadrant, additional analysis will occur during the DEIS to incorporate this change. Given that locating the crossover south of Holcomb Bridge Road would take advantage of an underground tunnel that would already be required for all HRT alignment alternatives, this change in crossover location is likely to increase the total capital cost.

While the PSC recommended HRT, they noted that, if the Draft Environmental Impact Statement (DEIS) requires the analysis of a lower-cost alternative, then the Center BRT within GDOT Managed Lanes should be considered. Otherwise, the PSC recommended that the BRT technology option not be carried forward.

The PSC also proposed that the actual station locations be incorporated into the LPA recommendation. New development is anticipated on some of the quadrants identified as potential station locations within this preliminary analysis. The PSC believes that it is imperative that MARTA indicate its preference of station locations in an expedited manner so that municipal officials can adequately respond to development proposals within the corridor.

Planning and External Relations Committee (PER) Recommendation

On January 8, 2015, MARTA staff presented the results of the additional technical studies and stakeholder input to the PER Committee of the MARTA Board. Based on a combination of technical analysis and public comment, the PER Committee adopted the staff recommendation on February 5, 2015:

- The LPA be studied in a future DEIS will consist of a heavy rail transit alternative (referred to as East-West-East HRT) that would be constructed on fixed guideway and cross to the west side of GA 400 north of North Springs Station and south of Spalding Drive. This alternative would have a second crossover north of the Chattahoochee River, which would be determined in the future DEIS.
- Given funding uncertainties, a BRT alternative operating on the East-West-East alignment will be studied (hereinafter referred to as East-West-East BRT). This alignment would be constructed in dedicated ROW in the same alignment as described above for East-West-East HRT.
- Given the potential for cost sharing and agency coordination, a BRT in a future GDOT managed lane project (hereinafter referred to as BRT in GDOT Managed Lanes) will be studied in the DEIS as a lower cost comparative alternative. A future agreement would need to be reached for MARTA to operate BRT in any future GDOT managed lane project within the Georgia 400 corridor.

The MARTA Board approved a resolution based the PER recommendation on March 5, 2015.

Rationale for Advancing East-West-East HRT as the LPA

Upon review of the results and key findings included in this preliminary engineering analysis, the East-West-East HRT alternative is the preferred option.

Unlike the other alignments, the East-West-East alignment would not impose any direct impacts to community facilities (schools, fire, police, etc.) proximate to the transit alignment because of its use of two crossovers. Every other alignment would generate direct impacts to at least two local schools or colleges. Although the East-West-East alignment's environmental justice impacts score was in the mid-range of the four alignments considered, it was only surpassed by the East Only alignment which would cause direct impacts to two elementary schools and one private college and would also have the highest takings costs of all alternatives analyzed. For both technologies, the East-West-East alignment was tied for the least amount of direct impacts to parklands within the GA 400 corridor and the HRT alternative was tied for the least amount of impact overall.

The East-West-East alignment would result in the highest number of displacements for the HRT and BRT technologies. However, aside from the Center BRT alternative, all High Range alignment alternatives would require the taking of hundreds of properties within the corridor since there would not be any remaining ROW available inside of GA 400. The East-West-East HRT alternative would result in 91 fewer displacements than the East-West-East BRT alternative. The East-West-East HRT alternative had the second lowest total value of takings among the non-managed lanes alternatives ($162.5 million).

In terms of transportation impacts, the East-West-East alignment scored favorably compared to the other alignment options with respect to providing proximate access to jobs surrounding the corridor; maintaining consistency with public and PSC feedback related to station locations (serves both Northridge west side and Windward Parkway east side); and providing proximate access to major attractors such as the North Point activity center. Additionally, this alignment would provide for adequate station accessibility using the existing transportation network and would have lower traffic impacts relative to the other alignments.

For each alignment, the cost of the HRT technology is substantially greater than the cost of the same alignment operating BRT technology. However, the PSC has stated its preference for HRT, emphasizing that if a transit investment is to be made at all within the corridor, then the project chosen should be able to consistently deliver benefits even decades into the future. The East-West-East HRT alternative performed well overall and, despite its use of two crossovers, this alignment alternative was within $10.5 million of the lowest cost HRT alternative. Given that one of the primary goals of the GA 400 project is to improve mobility and access in and along the corridor, the East-West-East HRT alignment alternative is preferred over the East-West-East BRT alignment alternative, despite the higher capital costs, because it would likely result in higher transit ridership and additional travel time savings, thereby potentially reducing the number of vehicular trips and enhancing non-motorized access within the corridor.

1 Introduction

1.1 Project Background

The Metropolitan Atlanta Rapid Transit Authority (MARTA) has undertaken the Georgia 400 Corridor Transit Initiative to identify potential and feasible transit alternatives in the Georgia State Route 400 (GA 400) corridor. The GA 400 corridor is the transportation spine of northern Fulton County and one of the fastest growing sub-regions in the metropolitan Atlanta region. The study corridor extends approximately 15 miles from the Perimeter Center area near the interchange of Interstate 285 (I-285) and GA 400 in the City of Sandy Springs, to McGinnis Ferry Road at the Forsyth County line.

In 2011, MARTA initiated the *GA 400 Transit Initiative Alternatives Analysis* to analyze the corridor based on current trends and conditions. In the late summer and fall of 2013, MARTA conducted Early Scoping activities to formally capture stakeholder and public feedback regarding transit in the corridor. During the AA evaluation and the public and stakeholder engagement, the GA 400 corridor from the North Springs Station to Windward Parkway emerged as the preferred alignment. The transit technologies to be evaluated further were identified as heavy rail transit (HRT), light rail transit (LRT), and bus rapid transit (BRT). Potential locations for new MARTA stations included interchanges along GA 400 at Northridge Road, Holcomb Bridge Road, Mansell Road, North Point Mall, Old Milton Parkway, and Windward Parkway.

Following the first phase of Early Scoping in 2013, MARTA commissioned a statistically valid public opinion survey through Kennesaw State University (KSU) to gather resident and employee opinions on future transit service characteristics and plans. Results of the KSU opinion survey, released in June 2014, revealed general support for transit expansion in the GA 400 corridor.

MARTA added a second phase of Early Scoping in 2014 in response to the public and stakeholders' desire for broader outreach in the study area and more opportunities to provide feedback. The Early Scoping Phase 2 period ran from June 23 to August 8, 2014. During this period, MARTA held three public meetings, six briefings with local officials, a Project Steering Committee (PSC) meeting, and several community meetings to gather input. The second phase of Early Scoping revealed substantial community support for the project but also concerns regarding community impacts of the potential alignments, particularly on the east side of GA 400 in the southern portion of the study corridor. The majority of public and stakeholder support was for HRT, but there was also interest in BRT or combined BRT with HRT as a phased option.

The Phase 1 and Phase 2 Early Scoping activities, as well as other engagement strategies and activities, are summarized in the project's *Early Scoping Report*, February 2015.

Figure 1-1 shows the location of the GA 400 Transit Initiative study area. This corridor draws commuters from throughout the region and is the origin point for many commuter trips bound for the City of Atlanta and Gwinnett and Cobb Counties. Rapid growth conditions have created high levels of traffic congestion on GA 400 and the few east-west arterials that cross the expressway.

In 2011, MARTA initiated the *GA 400 Transit Initiative Alternatives Analysis* to analyze the corridor based on current trends and conditions. In the late summer and fall of 2013, MARTA conducted Early Scoping activities to formally capture stakeholder and public feedback regarding transit in the corridor. During the AA evaluation and the public and stakeholder engagement, the GA 400 corridor from the North Springs Station to Windward Parkway emerged as the preferred alignment. The transit technologies to be evaluated further were identified as heavy rail transit (HRT), light rail transit (LRT), and bus rapid transit (BRT). Potential locations for new MARTA stations included interchanges along GA 400 at Northridge Road, Holcomb Bridge Road, Mansell Road, North Point Mall, Old Milton Parkway, and Windward Parkway.

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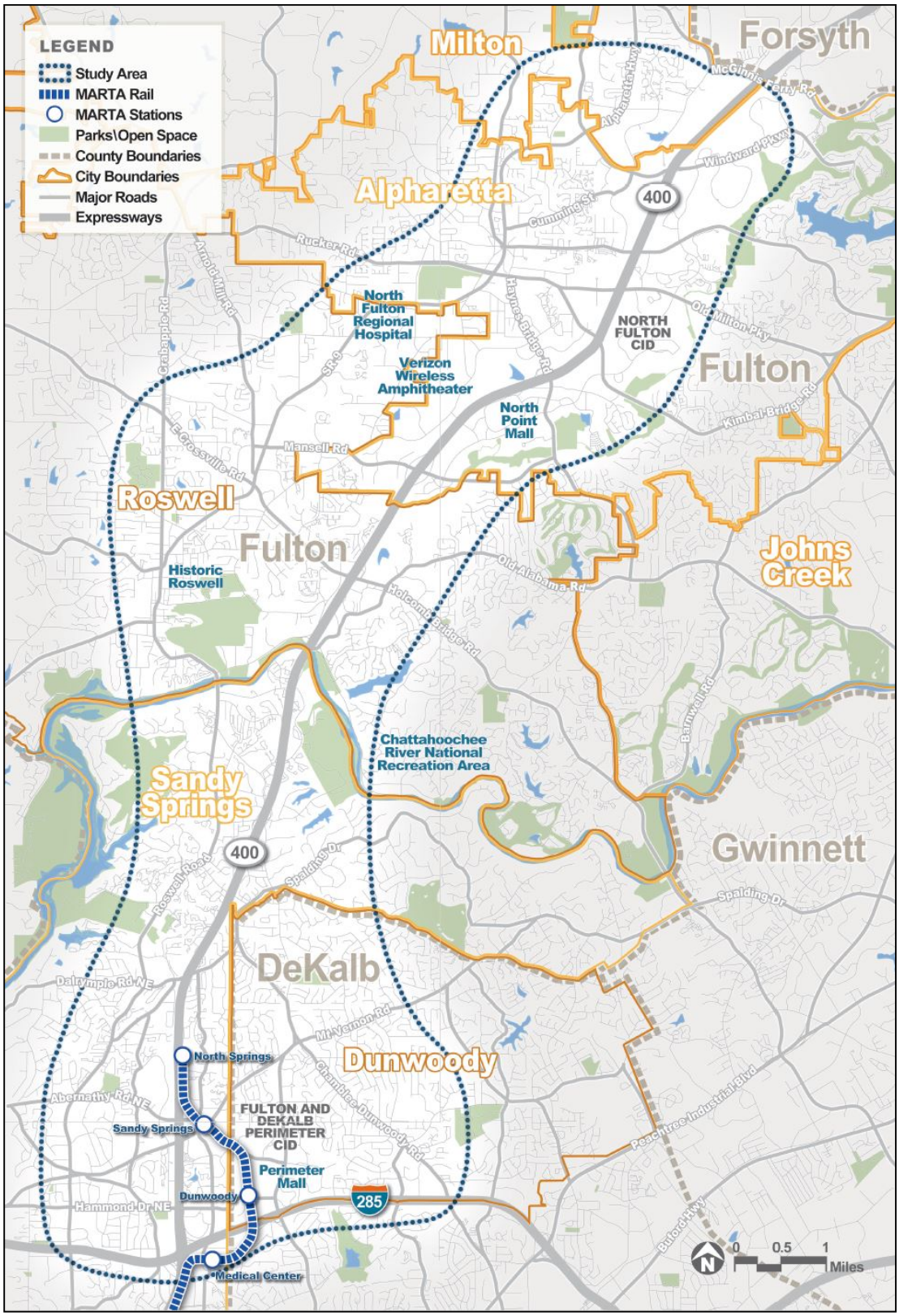
The Phase 1 and Phase 2 Early Scoping activities, as well as other engagement strategies and activities, are summarized in the project's *Early Scoping Report*, February 2015.

Figure 1-1. GA 400 Transit Initiative Study Area



Source: 2011 GA 400 Transit Initiative Alternatives Analysis (AA)

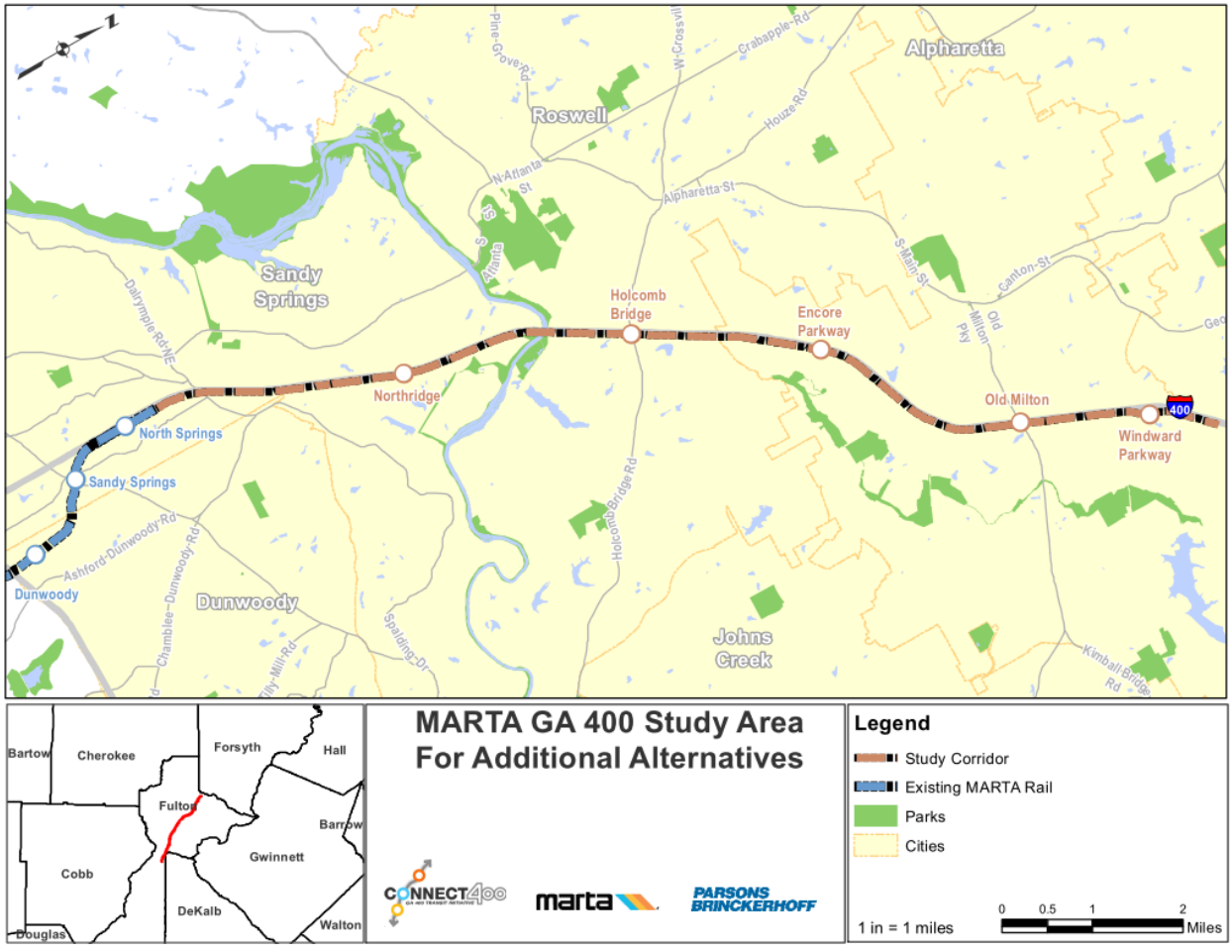
1.2 Additional Activities to Reach a Locally Preferred Alternative

Following the conclusion of Early Scoping Phase 2, MARTA developed a strategy to help inform a decision on the Locally Preferred Alternative (LPA) for further environmental evaluation.

Based on technical analysis as well as stakeholder and public input received from Early Scoping Phase 2, MARTA determined that the LRT technology should be dismissed from further consideration. The function of light rail is primarily to serve local, short-haul trips. Given that the proposed project is intended to provide for longer distance travel along a regional corridor, this technology has less practicality. Additionally, a preliminary evaluation of the project's eligibility for federal funding through the Federal Transit Administration's (FTA) New Starts Program revealed that LRT would not rank high enough to receive federal funding.

MARTA also determined the need for additional analysis in order to inform the selection a preferred technology between BRT and HRT, and to refine the conceptual alignment and station locations based on additional criteria. The additional analysis includes rough order-of-magnitude capital cost estimates, transportation and community impacts, and the identification of preliminary ROW and property impacts to inform the LPA recommendation. The revised study area for this analysis is included in Figure 1-2.

Figure 1-2. GA 400 Transit Initiative – Study Area for Additional HRT/BRT Analysis



MARTA convened a meeting of the PSC on September 10, 2014 to present a summary of the public input received during the Early Scoping Phase 2 public meetings and to receive input for the recommended transit technology, station locations, potential alignments and project phasing. While the discussion with the PSC did not result in a technology recommendation, the PSC members provided ample feedback related to potential transit technologies, alignments, crossovers, station locations, and project phasing. The PSC input was then used to develop the scope of alternatives analyzed within this conceptual engineering effort discussed in this report.

MARTA presented the results of the additional analysis for BRT and HRT to the PSC on November 19, 2014. The goal of the meeting was to develop consensus on a draft LPA that MARTA staff will recommend to the MARTA board for adoption in Winter 2015. After presenting the evaluation results of this preliminary analysis MARTA held a discussion related to the preferred technology. Members of the PSC unanimously agreed that, although BRT would be cheaper and faster to implement, constituents and local governments within the corridor would respond best to HRT. In addition to the technology decision, the PSC also concluded that the LPA should have two crossover points – an east-to-west transition in the southern portion of the corridor just south of Spalding Drive and a west-to-east transition north of Holcomb Bridge Road.

1.3 Organization of Report

This report is organized to provide the scope and objectives of the additional evaluation, importance of the analysis, methodology, impacts assessment, key findings and observations, and recommendations.

Chapter 1: Introduction– This chapter provides a background of the GA 400 Transit Initiative, identifies the additional activities to further evaluate the refined transit technologies, and summarizes the organization of the report.

Chapter 2: Stakeholder Input – This chapter details the results of the September 10 and November 19, 2014 PSC meetings.

Chapter 3: Elimination of LRT from Further Consideration

Chapter 4: Pre-Engineering Refinement of BRT and HRT Alternatives:

> Study Approach – This section outlines the overall approach used to generate the alignments and station types and locations used to assess the potential impacts of each alternative.
>
> Impacts Assessment – This section provides a qualitative and quantitative assessment of the potential environmental and transportation impacts associated with each alternative, as well as comparative cost estimates for each transit technology.

Chapter 5: Key Findings – This chapter discusses the major observations and findings of the impacts evaluation and the stakeholder input from the PSC meetings.

Chapter 6: Recommendation for the LPA – This chapter will present the recommendation for the LPA.

2 Stakeholder Input

After the close of Early Scoping Phase 2, MARTA held a PSC meeting on September 10, 2014 at the North Fulton Community Improvement District (CID) offices in the City of Alpharetta. A follow-up PSC meeting was held on November 19, 2014.

2.1 September 10, 2014 PSC Meeting

The September 10th meeting was attended by 21 people, including 12 members of the PSC and three staff representatives from MARTA. *Appendix A: Stakeholder Coordination* contains a summary of the meeting, a copy of the presentation, and aerial maps that note the feedback received for potential transit station locations and crossover points.

Key stakeholder themes noted at the September PSC meeting are listed below.

- Transit Technology
  - LRT can be eliminated from further consideration for two reasons. First, it would be less effective at serving the long-distance trip patterns within the corridor. Also, based on the preliminary New Starts analysis, the LRT technology would not be eligible for federal funding under FTA's New Starts program.
  - BRT would require a dedicated guideway to avoid existing congestion along GA 400 and realize travel time savings.
  - Support was shown for extending BRT service further south past the North Springs Station.
  - MARTA should coordinate with the Georgia Department of Transportation (GDOT) to potentially operate BRT in the proposed GDOT managed lanes.
  - HRT is the only technology that would not impose a transfer penalty for people connecting from the existing heavy rail service.
  - Regardless of technology, any new service would require a system of east-west feeder bus routes to carry people into the stations.
- Crossovers
  - Potential locations are south of Spalding Drive, south of Mansell Road, and north of Encore Parkway.
- Phasing
  - Phasing from BRT to HRT could result in substantial sunk costs depending on which alignment is chosen. While BRT could operate in future GDOT managed lanes, implementing HRT within managed lanes would not be advisable.
  - Prior to implementation, MARTA should provide enhanced bus service along the corridor to stimulate demand for the upcoming new service.
- Station Locations
  - The transportation network surrounding the station sites is likely to have an impact on ridership.
  - At Northridge Road, the City of Sandy Springs supports development of a station on the west side near Dunwoody Place in order to serve its planned redevelopment node.

- The North Point activity center should be served by a single station near North Point Mall or Encore Parkway.
- Direct access from GA 400 should be provided at the Windward Parkway station, as is the case at North Springs.
- The corridor is undergoing rapid development and land availability is decreasing. Station sites should be selected soon in order to avoid increased acquisition costs and to secure adequately sized and situated parcels.

2.2 November 19, 2014 PSC Meeting

The November 19th PSC meeting provided an opportunity for MARTA to gather additional feedback on the preliminary engineering alternatives that are the subject of this report. A draft of the report was reviewed by MARTA and the preliminary key findings and evaluation of alternatives were presented to the PSC for discussion. A total of 35 people attended the second meeting, including 26 members of the PSC and three staff representatives from MARTA. *Appendix A: Stakeholder Coordination* contains a summary of the meeting and a copy of the presentation on the results of the preliminary engineering evaluation.

Key stakeholder themes noted at the November PSC meeting are listed below.

- Transit Technology
  - HRT is the preferred technology for two primary reasons. First, high-income residents and choice riders in the GA 400 corridor are not likely to ride a bus. Second, the BRT option would impose a transfer penalty for people connecting at the North Springs Station.
  - BRT in shared GDOT Managed Lanes is unlikely to appeal to potential users; however, BRT in a dedicated lane would be relatively more attractive.
  - While BRT is a quicker and cheaper solution than HRT, it is not necessarily considered the most attractive technology to be selected for the corridor.
  - HRT is the logical technology since it capitalizes on the existing infrastructure and vehicles that already exist and in operation. HRT is also perceived as a more permanent transit investment in the corridor.
- Alignment
  - The East-West-East is preferred because it minimizes impacts to community facilities throughout the corridor.
  - The Center BRT might be adversely impacted by the need for pedestrians to cross the highway to reach the in-line stations.
- Crossovers
  - The east-to-west crossover should occur south of Spalding Drive in order to avoid impacts to local schools and residences on the east side of the corridor near Northridge Road.
  - The west-to-east crossover should occur north of Holcomb Bridge Road in order to avoid impacts to a proposed development project planned for the southeast quadrant of the GA 400 interchange at Holcomb Bridge Road in Roswell.
- Station Locations
  - The corridor is undergoing rapid development, and there is limited land available to be utilized as potential station locations.

- The LPA should designate station sites which would potentially avoid increased acquisition costs and provide adequately sized and situated parcels for transit station development. Formal designation would also assist local governments in responding to development proposals within the corridor.

3 Elimination of LRT from Further Consideration

MARTA's decision to eliminate LRT from further consideration was based on public and stakeholder input as well as a preliminary analysis of the potential for funding through the New Starts component of the FTA Capital Investment Grant Program.

3.1 Results of Preliminary New Starts Analysis

In Summer 2014, MARTA conducted a preliminary evaluation of the New Starts justification criteria for the GA 400 Transit Initiative. The detailed description of the study and its findings are contained in the August 2014 *Preliminary New Starts Evaluation* report, on file with MARTA.

Proposed New Starts investments must be evaluated and rated according to project justification and local financial commitment criteria set forth in the current federal transportation act, Moving Ahead for Progress in the 21st Century (MAP-21), in order to be considered for funding. MAP-21's project justification criteria include the following:

- Mobility Improvements
- Cost Effectiveness
- Congestion Relief
- Environmental Benefits
- Economic Development
- Land Use

MAP-21 also requires the FTA to examine the following when evaluating and rating local financial commitment:

- Current Financial Condition (of the project sponsor)
- Commitment of Capital and Operating Funding
- Reliability and Reasonability of the Project's Financial Plan (including the availability of local resources to recapitalize, maintain, and operate the overall existing and proposed public transportation system without requiring a reduction in existing services)

Each criterion is rated on a five-point scale, from Low (1) to High (5). Summary project justification and local financial commitment ratings are prepared and combined to arrive at an overall project rating. To qualify for funding, projects must achieve an overall project rating of at least **Medium** as well as receive at least **Medium** summary ratings for both project justification and local financial commitment. The FTA rounds up the summed and averaged ratings of each criterion, so that projects must exhibit a minimum numerical rating of 2.5 on the five-point scale.

Table 3-1 summarizes the overall Preliminary New Starts project justification ratings for the Georgia 400 technology alternatives. Based on existing data and the assumptions identified in this *Preliminary New Starts Evaluation* report, both the HRT and BRT alternatives earn a **Medium** rating for project justification and thus would be eligible for consideration by FTA for a New Starts grant agreement. LRT, on the other hand, rates only **Medium-Low**, which would make it ineligible for an FTA New Starts grant.

Table 3-1. Preliminary New Starts Justification Ratings, August 2014

Performance Measure	HRT	LRT	BRT
Mobility Improvements	Medium (3)	Medium-Low (2)	Medium-Low (2)
Cost Effectiveness	Medium (3)	Medium-Low (2)	Medium-High (4)
Congestion Relief	Medium (3)	Medium (3)	Medium (3)
Environmental Benefits	High (5)	Medium (3)	Medium (3)
Land Use	Medium-Low (2)	Medium-Low (2)	Medium-Low (2)
Economic Development	Medium-Low (2)	Medium-Low (2)	Medium-Low (2)
Sum and Average Score	18/6 = 3.0	14/6 = 2.33	16/6 = 2.67
Project Justification Rating	**Medium**	**Medium-Low**	**Medium**

The numerical values that support each rating are provided in Table 3-1 to present the relative strength of each alternative's rating. As the table indicates, HRT is a stronger **Medium** than BRT. As a "lesser" **Medium** rated project, the BRT alternative is somewhat vulnerable to changes in estimates of project costs and benefits should it be selected as the LPA. That said, BRT's significantly lower capital and operating cost may make it more competitive under FTA's measures for the New Starts Local Financial Commitment criterion.

Based on the data used in the August 2014 *Preliminary New Starts Evaluation*, the LRT alternative would not be eligible for a New Starts grant.

3.2 Public and Stakeholder Input

During both phases of Early Scoping, support was expressed for all three technologies (HRT, LRT and BRT), with HRT having the strongest level of support. Among the concerns expressed for LRT was its price and potential to receive federal funding.

As described in Chapter 2, the three technologies (HRT, LRT and BRT) were discussed with the PSC during the September 10, 2014 meeting, and the PSC expressed concern that LRT would be less effective at serving the long-distance trip patterns within the corridor. The PSC meeting resulted in a recommendation that LRT be dismissed from further consideration.

For the reasons described in this chapter, the LRT technology has been eliminated as a viable alternative. The results of further investigation of the HRT and BRT alternatives are presented in Chapter 4.

4 Evaluation of BRT and HRT Alternatives

This section outlines the overall approach used to generate the alignments and station types and locations used to assess the potential impacts of each alternative. The chapter also provides a qualitative and quantitative assessment of the potential environmental and transportation impacts associated with each alternative, as well as comparative cost estimates for each transit technology.

4.1 Study Approach

This section outlines the overall approach that was used to generate the alignments, station types and locations that were required to produce the sketch-level alternatives and assess the potential impacts of each alternative.

Figure 4-1 shows the individual steps taken and notes the type of input considered at each point within the process.

Figure 4-1. Overview of Preliminary Evaluation Process

Data Collection	• Acquire existing plans and data for eastern alignment
GIS Base Maps	• Map right of way, community facilities and land use in the area
Alignments	• Identify general locations for east and west alignments
Crossover Locations	• Determine possible crossover locations • Identify preferred crossover locations based on topography of alignments
Station Footprints	• Identify station and parking area requirements for possible station locations
Station Site Selection	• Identify parcels where station and parking can be placed
Finalize Alignments	• Identify total right of way required for each alignment
Assessment	• Assess environmental impacts for each alignment • Assess transportation impacts for each alignment • Estimate costs for each alignment

The remainder of this chapter consists of detailed descriptions for each of the steps seen above.

4.1.1 Data Collection and GIS Base Mapping

To develop a suite of alternative alignments and station locations along the GA 400 corridor, as well as cost estimates, a variety of documents and files created by MARTA, the Atlanta Regional Commission (ARC), GDOT, local governments within the study area, Fulton County, the US Census Bureau, and private companies, as well as documentation from the GA 400 Transit Initiative Alternatives Analysis (AA), was used as part of this preliminary evaluation. *Appendix B: Plans and Data Sources Used in the Preliminary Evaluation* contains a guide to the specific documents and data sources used to support this effort.

Geographic Information Systems (GIS)-based analysis was applied to identify potential impacts to the existing GA 400 ROW, community facilities and residential properties, as well as programmed and planned roadway improvements. This desktop analysis informed the selection of suitable corridor transit alignments and station locations. *Appendix B* has a complete listing of all shapefiles and data sources accessed to produce the base map and conduct spatial analyses for the corridor.

4.1.2 Development of Alternative Alignments

4.1.2.1 Alignments

During Early Scoping Phase 2, a group of residents from the Northridge Homeowners Association voiced their concerns about the potentially detrimental impacts to residences and community facilities that could potentially occur if transit service was expanded along the east side of the GA 400 corridor. To address these concerns, and respond to public feedback regarding other potential alignments, a total of seven potential alignment alternatives with varying alignment locations and technologies were identified for analysis.

- East Only HRT
- East Only BRT
- West Only HRT
- West Only BRT
- East-West-East HRT
- East-West-East BRT
- Center BRT within GDOT Managed Lanes (Center BRT)

4.1.2.2 GDOT Considerations

It should be noted that GDOT has two major projects planned within the study area that will likely impact MARTA's efforts in this corridor. The first project, which is currently under design, includes the construction of collector-distributor (CD) lanes along GA 400 from the I-285/GA 400 interchange to Spalding Drive. These lanes will parallel GA 400 generally within existing ROW and provide additional access that will relieve GA 400 of local access trips. The project is expected to be let to construction in December 2015. Therefore, the CD lanes are included in each alternative.

The second GDOT project proposes managed lanes along GA 400 from just north of the I-285/GA 400 interchange to GA 20 in Forsyth County. Early coordination discussions with GDOT assumed that 40-60 feet of available ROW would remain after implementation of the managed lanes. It was initially agreed that MARTA would be able to utilize this ROW for transit

operations. However, if the preferred alternative is implemented, little to no existing ROW would remain after GDOT implements the managed lanes in the corridor. Therefore, MARTA would need to acquire new ROW in which to house the transit expansion. While managed lanes within the GA 400 corridor are included within the *PLAN2040* Regional Transportation Plan (RTP), this project has been designated as Long-Range and is conceptual at this time. Timing for environmental and preliminary engineering efforts has not yet been determined.

Because the details of the managed lanes project are uncertain, this analysis uses two different development scenarios for all alignment alternatives except for Center BRT. The "Low Range" scenario reflects the impacts and costs that would result from the development of each alignment alternative within the GA 400 ROW (no managed lanes assumed). The "High Range" scenario reflects the incremental increase in impacts and costs that would result from the development of each alignment alternative in the absence of available GDOT ROW (managed lanes are assumed). The spatial difference between the actual alignments developed for the "High Range" and "Low Range" scenarios is relatively minor, as the "High Range" case simply moves the "Low Range" alignment to just outside of the project limits for the managed lanes. However, this shift results in an increase in the number of residents and businesses that would potentially be impacted by the transit project relative to the Low Range case. Thus, the costs related to acquiring land and compensating those displaced have increased.

4.1.2.3 Crossover Locations

The East Only HRT/BRT alignments and the Center BRT alignment would not make use of any crossovers to traverse the GA 400 corridor. The West Only HRT/BRT and East-West-East HRT/BRT alignments would require an aerial structure south of Spalding Drive. The flyover would allow the north bound transit service to move from the North Springs MARTA station on the east side of GA 400 over to the west side of the corridor prior to arriving at a new Northridge station.

Between the North Springs MARTA station and the Chattahoochee River, the east side of the GA 400 corridor is home to numerous single-family homes and two elementary schools that abut the roadway. Development along the west side of the corridor consists mainly of multi-family developments and commercial lots. Furthermore, a PSC member representing the City of Sandy Springs noted that, as part of the city's most recent comprehensive plan, the area on the west side of GA 400 served by Dunwoody Place has been designated as a redevelopment node that would potentially house high-density office buildings. The east side area of the corridor contains a stretch of protected neighborhoods. Thus, the first east-to-west crossover was strategically placed to minimize the level of impact to residential properties and community facilities on the east side of the corridor and also to help encourage the type of development desired by one of the stakeholder municipalities.

In addition to the east-west flyover south of Spalding Drive, three alternative locations for the west-to-east crossover locations north of the Chattahoochee River were studied as part of the development of the East-West-East alignments:

1. North of the Chattahoochee River and South of Holcomb Bridge Road
2. North of Holcomb Bridge Road and South of Mansell Road
3. North of Encore Parkway and South of Old Milton Parkway

MARTA determined that the west-to-east crossover should be placed north of the Chattahoochee River in order to avoid impacts to the Chattahoochee National Recreation Area, which is on the east side of GA 400 south of the river.

To assist in determining which one of the three potential crossovers to use, the elevation profiles for each segment of the corridor were reviewed and an inventory of existing roadway and structural elements was conducted. As one moves north past the Chattahoochee River, the natural topography of the corridor consists of a steep grade increase between the river and Holcomb Bridge Road. Since the natural slope exceeds the maximum grade constraints for heavy rail operations, all HRT alternatives would require the use of a tunnel from the river past Holcomb Bridge Road to support cost-effective aerial and at-grade station types at interchanges further north. Thus, a west-to-east crossover within the first option's segment would involve a transition below the actual roadway. The second and third crossover options would involve the construction of aerial support structures to facilitate the west-to-east transition over the GA 400 corridor. Given that the aerial supports required in options two and three are expensive and the fact that the first option would only add minimal cost to the construction of a tunnel that would already be required to support HRT operations, the crossover north of the Chattahoochee River and south of Holcomb Bridge Road was selected as the preferred west-to-east transition location for the East-West-East HRT alignment alternative. The same underground west-to-east crossover location was chosen for the East-West-East BRT alignment alternative in order to provide for reliable comparisons between the HRT and BRT versions of the East-West-East alignment.

4.1.2.4 Typical Sections

Once the general paths of the four base alignments were identified, a specific alignment for each of the seven alternatives was developed based on the operating needs of the proposed technology. Typical sections drawings and topographic data developed during the GA 400 Transit Initiative AA were used to develop the minimum width of the HRT or BRT alignment at any point along the corridor depending on the specific type of section proposed. Since all typical sections for BRT assumed that the guideway would be placed on the outside of the GA 400 corridor, a specific section was created for the Center BRT alignment alternative based on the At-grade section type for BRT used in the AA. While the Center BRT alternative would utilize GDOT's managed lanes for the majority of its guideway, the alignment alternative would require a minimum width of 38 feet on both sides of the managed lanes in order to pull-off and service at-grade or grade separated stations located within the GA 400 corridor. For each direction, the minimum width would accommodate an 8-foot wide BRT platform, two 12-foot travel lanes and a 6-foot shoulder to provide separation between the managed lanes and the transit line's ROW.

Table 4-1 summarizes the minimum ROW widths of various section types for the HRT and BRT technologies as identified in the AA Typical Sections drawings.

Table 4-1. Right-of-Way Requirements for HRT & BRT Section Types

Technology	Section Type	Required ROW	Page Number Reference within AA Typical Sections Drawings
HRT	Aerial	43' – 4"	1
	At-grade	48' – 0"	2
	Cut & Cover	58' – 6"	2
BRT	Aerial	52' – 0"	5
	At-grade	52' – 0"	4
	At-grade in Managed Lanes (Station)	38' – 0" (per direction)	N/A

Source: AA Typical Sections

Once the alignments were drafted, the shapefile for GDOT's planned CD lanes and the CAD file for the managed lanes were overlaid to ensure that none of the proposed alignments fell within the GDOT project limits.

4.1.3 Identification of Station Locations, Footprints and Typologies

The six locations listed below were initially considered as potential transit station locations based on the AA study:

- Northridge Road
- Holcomb Bridge Road
- Mansell Road (between Mansell Road and Encore Parkway)
- North Point (between Encore Parkway and Haynes Bridge Road)
- Old Milton Parkway
- Windward Parkway

At the July 2014 Early Scoping public meetings stakeholders consistently remarked that the Mansell Road and the North Point stations were too close together. Similar sentiments were voiced by members of the PSC during the September 10, 2014 meeting. Therefore, the previously proposed Mansell Road and North Point stations have been consolidated into one station near Encore Parkway and GA 400 for purposes of this analysis. Thus, the five stations considered within this preliminary analysis are listed below.

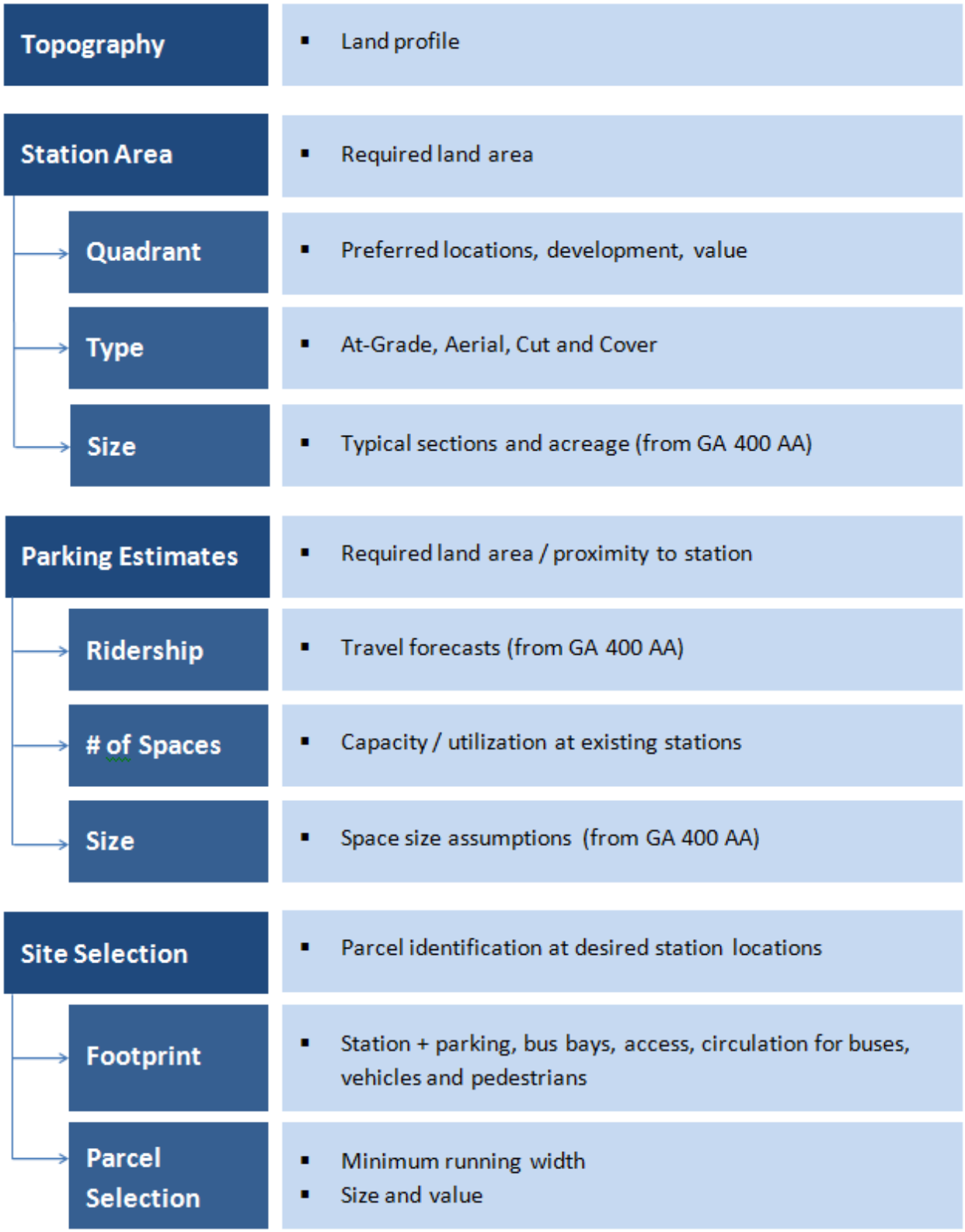
- Northridge Road
- Holcomb Bridge Road
- Encore Parkway
- Old Milton Parkway
- Windward Parkway

In order to identify recommended parcels that could potentially serve as transit station locations, analyses related to the station type, station area, future parking demands, parking area and overall station footprint area were conducted. Although the scope of this preliminary effort proposed the use of MARTA's Transit Oriented Development (TOD) Guidelines to develop typical station footprints based on the desired station types that were identified by stakeholders at the July 2014 public meetings, an alternative approach proved necessary for the current analysis, as explained below.

While the TOD Guidelines clearly communicate the desired scale of buildings and how developers should arrange land uses adjacent to the transit station, the document does not offer explicit guidance related to the actual size specifications of the transit station itself. Furthermore, the TOD Guidelines contain both minimum and maximum parking requirements for non-transit uses, as well as a discussion of how parking facilities should be situated in relation to the adjacent roadways and transit station. The guidelines do not, however, contain any standards or recommendations for the number of parking spaces that should be provided for transit riders at a given station type. Due to the guidelines' lack of specificity related to transit station design, the alternative approach described below was utilized to generate station footprints and identify potential transit station locations along the GA 400 corridor.

Figure 4-2 outlines the general process used to select the specific sites for future transit station locations. Additional details related to how the station footprints were developed and the considerations that went into determining the ultimate station location given a particular alternative alignment are provided following Figure 4-2.

Figure 4-2. Overview of Station Location Identification Process



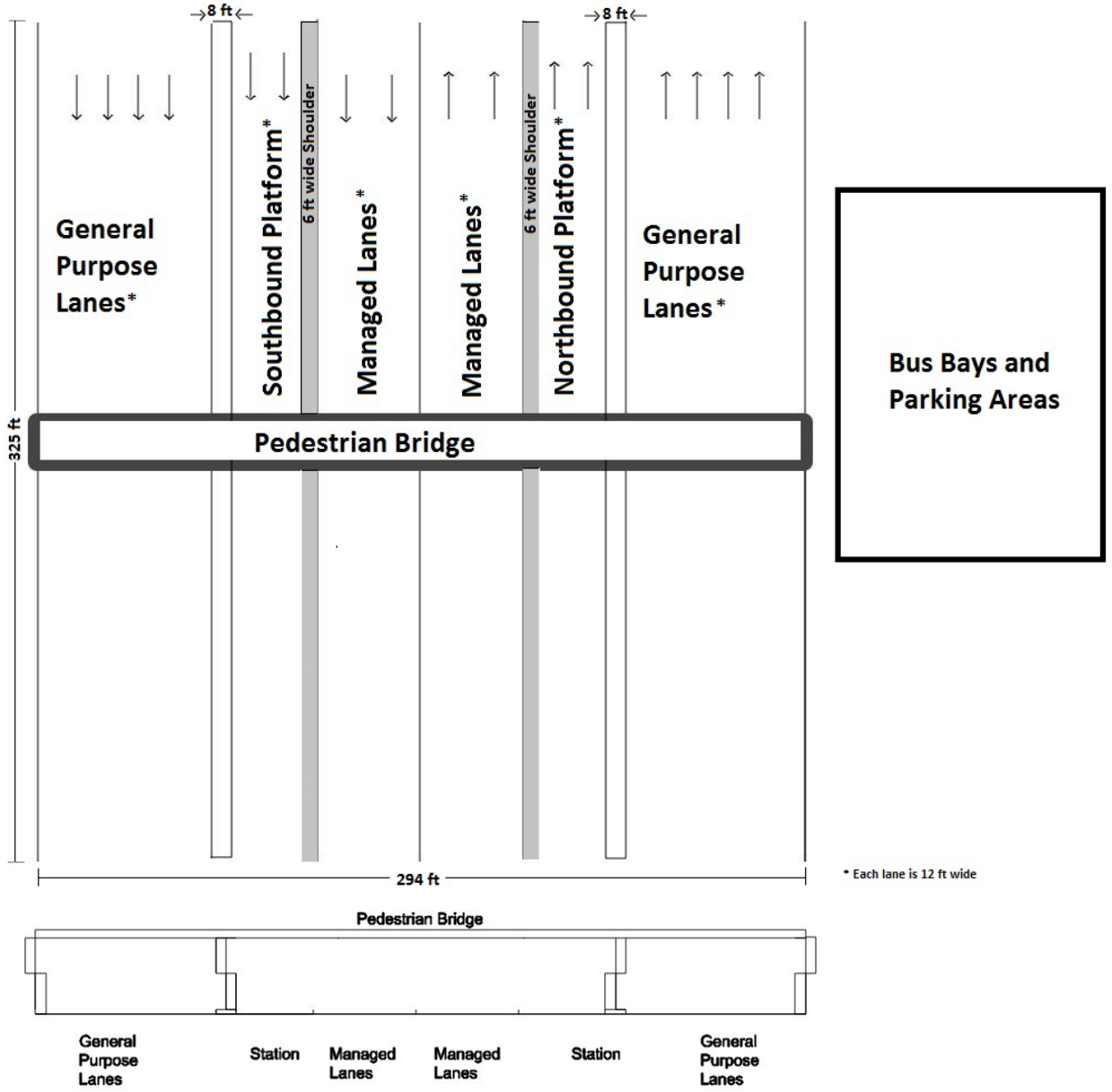
4.1.3.1 Station Type

To identify the station type for each proposed location and to determine the area required for each station, the team referenced topographic data, guidance from the PSC during the September 10th meeting, the AA typical sections assumptions for station types, and elements at existing MARTA stations. Aerial imagery of the existing Kensington and Indian Creek stations was used to derive unit area estimates for the bus bays and parking spaces. Bus facilities at both stations include ample covered waiting areas for passengers, six sawtooth bus bays and a turn-around loop. These elements should be sufficient to house the feeder bus operations that would be necessary to support a transit expansion along the corridor. To estimate the amount of land needed to provide parking at each station, a parking space unit area was derived based on the total number of spaces provided and the amount of land dedicated to parking across Kensington station's three surface parking lots. These unit area calculations informed the station area and parking area calculations discussed below.

The previous section provided an overview of how the alignment for each of the seven alternatives was developed based on the corridor's topographical profile. After the alignment was developed, quadrants that would potentially house transit stations were identified based on preferences expressed by PSC members and their jurisdictions. The station type (i.e. Aerial, At-grade, or Cut and Cover) was selected based on the difference between the quadrant's current elevation and the elevation of a particular alternative's transit alignment at that quadrant. It should be noted that this preliminary analysis assumed that the elevation profile for the west side of the corridor was identical to the elevation profile provided for the east side alignments investigated within the AA.

All Center BRT alternative stations would be constructed as At-grade station types with the transit guideway and platform located between the managed lanes and general purpose lanes in each direction of travel. Unlike the other alternatives, which would use one continuous area to house the transit guideway and platform for both directions of travel, the Center BRT option would require two separate boarding areas that would each house a transit guideway and platform to provide service in one direction of travel. A single parking area and one set of bus bays would be located outside of the GA 400 ROW. Passengers would reach either set of platforms from the bus bay/parking areas by using a pedestrian bridge that would carry them over the GA 400 ROW. Depending on their destination, passengers would then use one of two sets of escalators and elevators to access the northbound or southbound at-grade boarding areas. Figure 4-3 presents a conceptual layout of the Center BRT At-grade stations.

Figure 4-3: Center BRT At-grade in Managed Lanes Station Conceptual Layout



4.1.3.2 Station Area

In calculating the total area needed to construct the future transit stations (e.g. station footprint), a distinction has been made between areas that would be dedicated to transit station facilities (e.g. station area) and areas that would be used for parking (e.g. parking area). The station area consists of the land required to house the transit platforms and bus bays. Table 4-2 contains the assumptions used in calculating the station area that would be required to support transit operations at a given station type.

Table 4-2. Station Area Assumptions

Station Element	Acreage
Bus Bay (6 sawtooth bays)	1.5
Buffer Area	1.0
Cut and Cover HRT Station	1.0
Aerial or At-grade HRT Station	1.5
Center BRT within Managed Lanes At-grade Station	2.5

The Buffer Area station element was included at all aerial and at-grade stations, regardless of technology, as a contingency for site-specific issues, such as enhancing the interface between the station and the surrounding road network, mitigating stormwater impacts, etc.

In terms of BRT station areas, the AA typical sections for the BRT technology include an 8-foot platform located between the two transit guideways. Thus, a separate dedicated station area is not considered for the BRT alignment alternatives except for the Center BRT alternative. For the Center BRT alignment alternative, the 2.5-acre figure reflects the area required to house the At-grade in Managed Lanes station type described above, as well as a pull-off and merge lane that would allow the BRT service to safely transition in and out of the managed lanes. The 2.5-acre estimate reflects the fact that from the boundaries of the managed lanes, the construction of the At-grade Center BRT stations would require the realignment of the GA 400 general purpose lanes in both directions to accommodate the servicing of stops located between the managed lanes and general purpose lanes. Before reaching the in-line station platforms, the BRT vehicles would use a pull-off lane that would taper out to the right of the managed lane boundary (pushing the general purpose lanes further to the right) in order to provide an area in which the vehicles could safely decelerate as they approach the in-line BRT stations. Upon exiting the in-line station platforms, the BRT vehicles would use a merge lane that would taper back in to meet the boundary of the managed lanes in order to provide an area in which the vehicles could safely accelerate back into the managed lanes. The 2.5-acre figure should provide sufficient room to accommodate the elevators and escalators required to provide safe access to the BRT platforms from the bus bay and parking areas located on the other side of the general purpose lanes.

For the HRT station areas, the Cut and Cover and Aerial or At-grade station elements have been developed using figures from the AA Typical Sections (e.g. 58'-6" for maximum corridor width) and Alternative Plan and Profile documents (e.g. 600' for absolute minimum platform length). Based on the AA estimates the minimum acreage required to house the maximum HRT section width across the entire length of the platform is approximately 0.81 acre. It should be noted that the typical sections did not include space for an HRT platform. However, the 1-acre figure for the Cut and Cover HRT Station area is still a conservative estimate, as the remaining 0.19 acre could be used to house a central platform up to 14 feet in width. Additionally, parking or ingress/egress facilities at underground HRT stations could potentially use most of the at-grade land since only footprints for elevators and escalators would be required to facilitate access from the ground elevation to the underground platform. The 1.5-acre for Aerial and At-grade HRT stations was based on measurement of the platform areas of existing MARTA

stations that were either at-grade or elevated, including Buckhead (1.35 acres), Dunwoody and North Springs (1.00 acre), and provides yet another conservative estimate of station area.

In summary, with the exception of the Cut and Cover stations, all stations, regardless of technology, were assumed to require land sufficient to house a bus bay and a buffer area. Given that the typical sections include an 8-foot central platform built into the BRT corridor's width, the non-managed lanes BRT stations do not include room for a separate station area. However, if additional space at BRT stations is desired some of the buffer area could be utilized. The Aerial and At-grade HRT stations and the Center BRT At-grade station include a separate station area sufficient to contain the corridor width while providing excess area to potentially house other station elements like escalators and elevators. The Cut and Cover HRT stations do not include the buffer area because the majority of the at-grade land could be utilized for purposes other than housing platforms.

4.1.3.3 Parking Demand and Area

To properly forecast the number of spaces that will be needed at each proposed transit station, data related to the number of available spaces and the utilization of these spaces at existing MARTA rail stations was analyzed. The data used for this analysis were retrieved from the "Average Station Entries (FY 2013)" and "Average Parking Spaces & Utilization (FY 2013)" tables that appear on pages 5 and 6 of the *Customer Demographic Profile of MARTA Rail Stations – FY 2013* published by MARTA's Office of Research and Analysis in November 2013. The raw data is also attached to this document as part of *Appendix C: MARTA FY2013 Ridership and Parking Utilization Data*. The "Average Parking Spaces & Utilization (FY 2013)" table only included parking space counts and average utilization for the 23 rail stations that have more than 100 parking spaces. The process for developing parking needs estimates is outlined in the list below.

1. Derive systemwide parking provision rate (e.g. Spaces Available per Rider) based on existing parking facilities and FY 2013 ridership at stations with 100+ parking spaces.
2. Derive systemwide parking utilization rate (e.g. Spaces Used per Rider) based on the FY 2013 utilization of existing parking facilities and ridership at stations with parking facilities.
3. Gather AA ridership forecasts for the base year (2014) and the target year (2040) for each proposed station included within the two technology alternatives (BRT and HRT).
4. Calculate minimum number of spaces needed (e.g. Spaces Used) at each station for each technology alternative in the year 2040 based on FY 2013 systemwide parking utilization rate and 2040 ridership forecasts.
5. Calculate suggested number of spaces to be built (e.g. Spaces Provided) at each station for each technology alternative in the year 2040 based on FY 2013 systemwide parking provision rate and 2040 ridership forecasts.

According to the FY 2013 parking data, 17 of the 23 stations had a parking utilization rate below 50% and none of the stations experienced full utilization. Given that the Spaces Provided metric is based on the systemwide utilization rate, which is also less than 50%, the parking estimates developed should provide for conservative estimates of parking needs (e.g. there are likely to be spaces that are not used). *Appendix D: Projected Ridership, Parking Demands and Station Area Calculations* provides a more in-depth discussion of the process used to generate estimates of parking demand and suggested parking area.

4.1.3.4 Station Footprints

To determine which potential group of parcels would be used, an overall station footprint area was calculated based on Equation 1 below.

Equation 1. Station Footprint Area

$$Station\ Footprint\ Area = Station\ Area + Parking\ Area$$

Table 4-3 and Table 4-4 summarize the station elements included at each station for each technology, as well as estimates of the parking area, station area, and total station footprint area. For the Center BRT alignment alternative, the Station Area and thus the Total Station Footprint Area appearing in Table 4-4 would each increase by 1 acre in order to reflect the additional ROW required to accommodate stops in between the managed lanes and general purpose lanes.

In Table 4-3 it should be noted that at Northridge station two of the alternative alignments call for an Aerial station type while the East Only alternative alignment contemplates a Cut and Cover station type. Thus, depending on the station location, the total station footprint area varies. These calculations assume that all parking facilities would be built as surface parking lots with the exception of the station at Holcomb Bridge where parking would be housed within a three-story structured parking deck.

Table 4-3. Station Footprint Calculations for HRT Stations

STATION	PARKING AREA		STATION ELEMENT SUMMARY				STATION AREA			STATION FOOTPRINT AREA	
	Suggested Parking Area (Acres)	Suggested Parking Area (SQFT)	Includes Cut & Cover Station?	Includes Aerial or At-grade Station?	Includes Bus Bays?	Includes Buffer Area?	Station Area (Acres)	Station Area (SQFT)	Station Area Width if L=600'	Total Station Footprint Area (Acres)	Station Footprint Area Notes
Windward	7.67	334,257	No	Yes	Yes	Yes	4.0	174,240	290.40	11.67	Aerial Station + Bus Bay + Buffer
Old Milton	4.19	182,377	No	Yes	Yes	Yes	4.0	174,240	290.40	8.19	Aerial Station + Bus Bay + Buffer
Encore Pkwy	3.91	170,443	No	Yes	Yes	Yes	4.0	174,240	290.40	7.91	Aerial Station + Bus Bay + Buffer
Holcomb Bridge	2.89	125,948	Yes	No	Yes	No	2.5	108,900	181.50	5.39	Cut & Cover Station + Bus Bay + 3 Story Parking Deck
Northridge	4.79	208,486	No	Yes	Yes	No	4.0	174,240	290.40	8.79	Cut & Cover Station + Bus Bay
TOTAL	**23.45**	**1,021,511**	**1**	**4**	**5**	**3**	**18.5**	**805,860**		**41.95**	

"L" represents the total platform length and was assumed to serve as the total station length.

Table 4-4. Station Footprint Calculations for BRT Stations

STATION	PARKING AREA		STATION ELEMENT SUMMARY				STATION AREA			STATION FOOTPRINT AREA	
	Suggested Parking Area (Acres)	Suggested Parking Area (SQFT)	Includes Cut & Cover Station?	Includes Aerial or At-grade Station?	Includes Bus Bays?	Includes Buffer Area?	Station Area (Acres)	Station Area (SQFT)	Station Area Width if L=325'	Total Station Footprint Area (Acres)	Station Footprint Area Notes
Windward	4.52	197,102	No	No	Yes	Yes	2.5	108,900	335.08	7.02	Bus Bay + Buffer
Old Milton	4.40	191,466	No	No	Yes	Yes	2.5	108,900	335.08	6.90	Bus Bay + Buffer
Encore Pkwy	2.21	96,394	No	No	Yes	Yes	2.5	108,900	335.08	4.71	Bus Bay + Buffer
Holcomb Bridge	1.54	67,170	No	No	Yes	Yes	2.5	108,900	335.08	4.04	Bus Bay + Buffer + 3 Story Parking Deck
Northridge	2.16	94,099	No	No	Yes	Yes	2.5	108,900	335.08	4.66	Bus Bay + Buffer
TOTAL	**14.84**	**646,230**	**0**	**0**	**5**	**5**	**12.5**	**544,500**		**27.34**	

*** As right-of-way for BRT includes an eight foot platform, area for a separate station was not considered.**

"L" represents the total platform length and was assumed to serve as the total station length.

4.1.3.5 Site Selection

Once the desired station footprint area for each stop and technology was calculated, two quadrants at each of the GA 400 interchanges were selected for potential transit station development in order to support the analysis of multiple alignments and crossover locations. The following decision-making factors were used to support the selection of particular quadrants for future station footprints:

- Topographic constraints
- Presence of environmental resources
- Designation as a future transit station location within the North Fulton Community Improvement District's (CID) Blueprint 2.0 Short-Term Work Program
- Stakeholder input received at the September 10th PSC meeting

After the quadrants were selected, specific parcels were chosen to house the station and parking areas that compose the total station footprint area. In the case of the station area, the assumed footprint is represented by a rectangle, the length of which was dictated by the minimum platform running length required to support operations for the proposed technology (e.g. 600 feet for HRT and 325 feet for BRT). The width of the station footprint rectangle was the quotient of the estimated station area, which depended on the station type (e.g. Aerial, At-grade or Cut and Cover), divided by the minimum platform running length. As the geometry of the station area was held consistent (e.g. not tailored to specific parcel geometries), this method of placing uniform rectangles to represent stations on the parcel map should provide a conservative estimate of the land and capital required to house the station area element of the overall station footprints. Unlike the station area elements, which were constrained due to engineering considerations, the geometry of the parking area was varied based on the geometry of specific parcels of interest.

The considerations that were taken into account during the selection of specific sites to house the proposed station footprints are summarized as follows.

- Sufficient area to house the entire station area
- Ease of access and egress from adjacent street infrastructure
- Parcel price and size relative to adjacent properties
- Presence of environmental resources
- Stated preferences of attendees at the September 10th PSC meting

At all stations, except for the east side Encore Parkway stations and all of the Center BRT stations, both the station area and the parking area were placed within the same interchange quadrant. The station area and parking area were separated across two different interchange quadrants for the east side Encore Parkway alternative due to accessibility constraints caused by the narrow ROW between GA 400 and shopping centers east of the corridor (i.e. Mansell Crossing and North Point Mall) and the lack of access to the station location from roads other than Encore Parkway. The station area was divided for the stations within the Center BRT alignment alternative because the platforms would be placed in the center of GA 400 for proximity to the managed lanes, while the bus bays, as well as the parking area, would be located on one side of the corridor. Since the center BRT platforms were separated from the other station elements, the location of the bus bays and parking area at each station was based

on land availability, the presence of vacant land, and the overall costs associated with parcel acquisition.

Additionally, a conscious effort was made to limit the visual impact of parking facilities per the MARTA TOD Guidelines. The placement of the station relative to the parking area was arranged such that in the majority of cases the station holds the most prominent visual position, abutting the intersection of GA 400 and the station's major roadway. In cases where site constraints forced the parking to encroach along the major roadways, future station area planning could tailor the geometry of the parking facilities so as to better hide the spaces from view. All alternative alignments at every station, except for Holcomb Bridge, assumed the construction of surface parking lots. The presence of small parcels in both potential station quadrants and the high projected ridership necessitated that parking spaces at Holcomb Bridge be housed within a three-story parking structure.

4.2 Sketch-Level Plans of Alignment Alternatives

This section presents a brief one-page summary for each of the seven alignment alternatives to identify the crossovers, the proposed station types and the location of each station. A detailed comparison of each of these alignments will be provided in the Key Findings chapter. Table 4-5 provides an overview of the five station types proposed for each of the seven transit alternatives analyzed.

Table 4-5. Summary of Station Types by Alignment Alternative

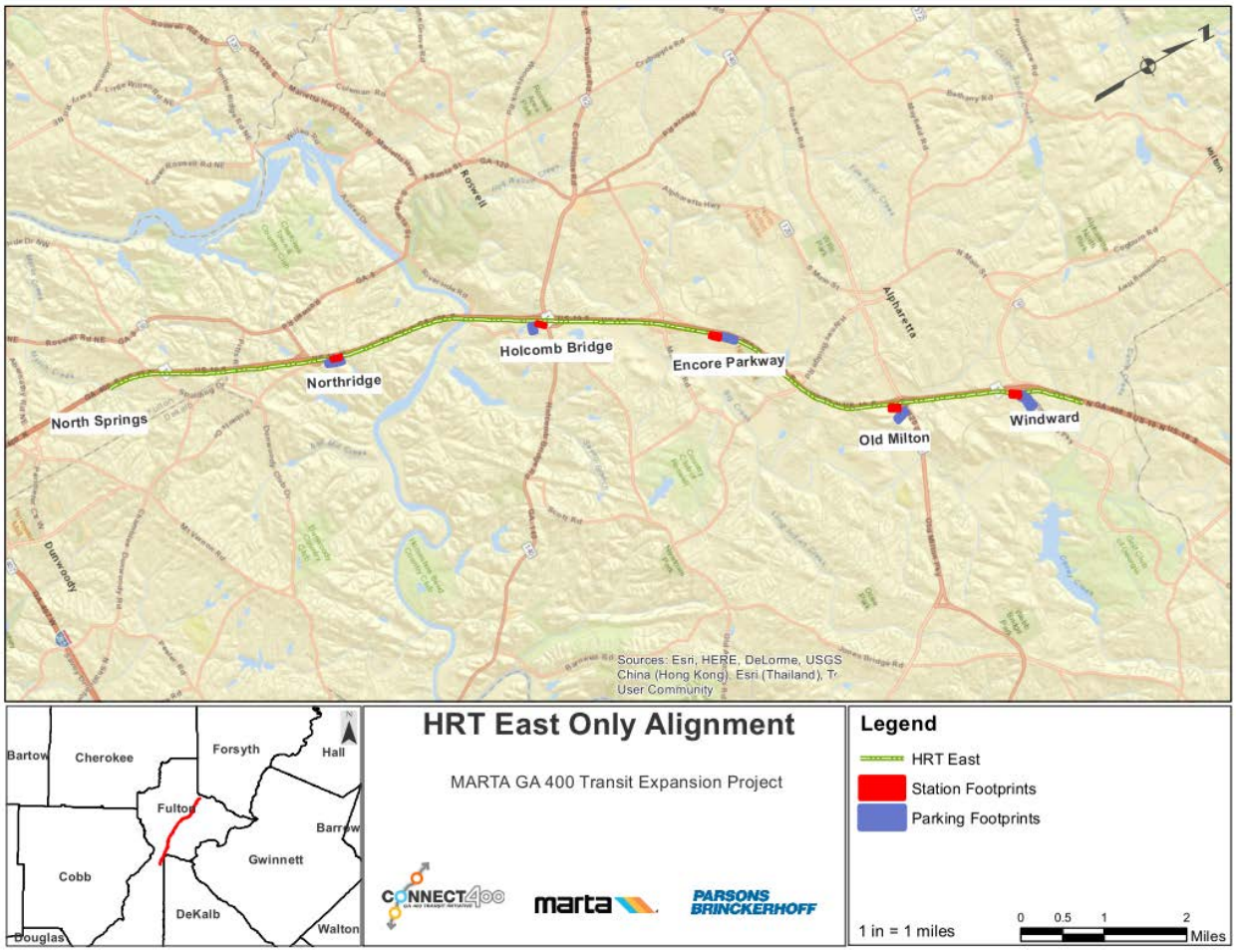
Technology	Alignment Alternative	Flyover South of Spalding Drive. (East to West)	Northridge	Crossover North of Chattahoochee and South of Holcomb Bridge (West to East)	Holcomb Bridge	Encore Parkway	Old Milton	Windward Parkway
HRT	East Only HRT		Cut & Cover		Cut & Cover	Aerial	Aerial	Aerial
	West Only HRT	X	Aerial		Cut & Cover	Aerial	Aerial	Aerial
	East-West-East HRT	X	Aerial	X	Cut & Cover	Aerial	Aerial	Aerial
BRT	East Only BRT		At-grade		At-grade	At-grade	At-grade	At-grade
	West Only BRT	X	At-grade		At-grade	At-grade	At-grade	At-grade
	East-West-East BRT	X	At-grade	X	At-grade	At-grade	At-grade	At-grade
	Center BRT within GDOT Managed Lanes		At-grade in Managed Lanes		At-grade in Managed Lanes	At-grade in Managed Lanes	At-grade in Managed Lanes	At-grade

A series of three cut sheets showing the location of each High Range case alignment, as well as station and parking locations, for the HRT technology, BRT technology, and Center BRT within GDOT Managed Lanes alternative can be found in *Appendix E: Alignment Cut Sheets*.

4.2.1 East Only HRT Alignment Alternative

The East Only HRT alignment alternative would extend the MARTA Red Line HRT service from its existing northern terminus at the North Springs Station to Windward Parkway in north Fulton County. This alternative would not require any crossovers to traverse the GA 400 ROW. All stations would be located on the east side of the GA 400 corridor. The first two stations, Northridge and Holcomb Bridge, would be constructed as underground cut and cover stations while the last three stations, Encore Parkway, Old Milton and Windward Parkway, would be constructed as aerial stations. An overview of the alignment alternative is presented in Figure 4-4.

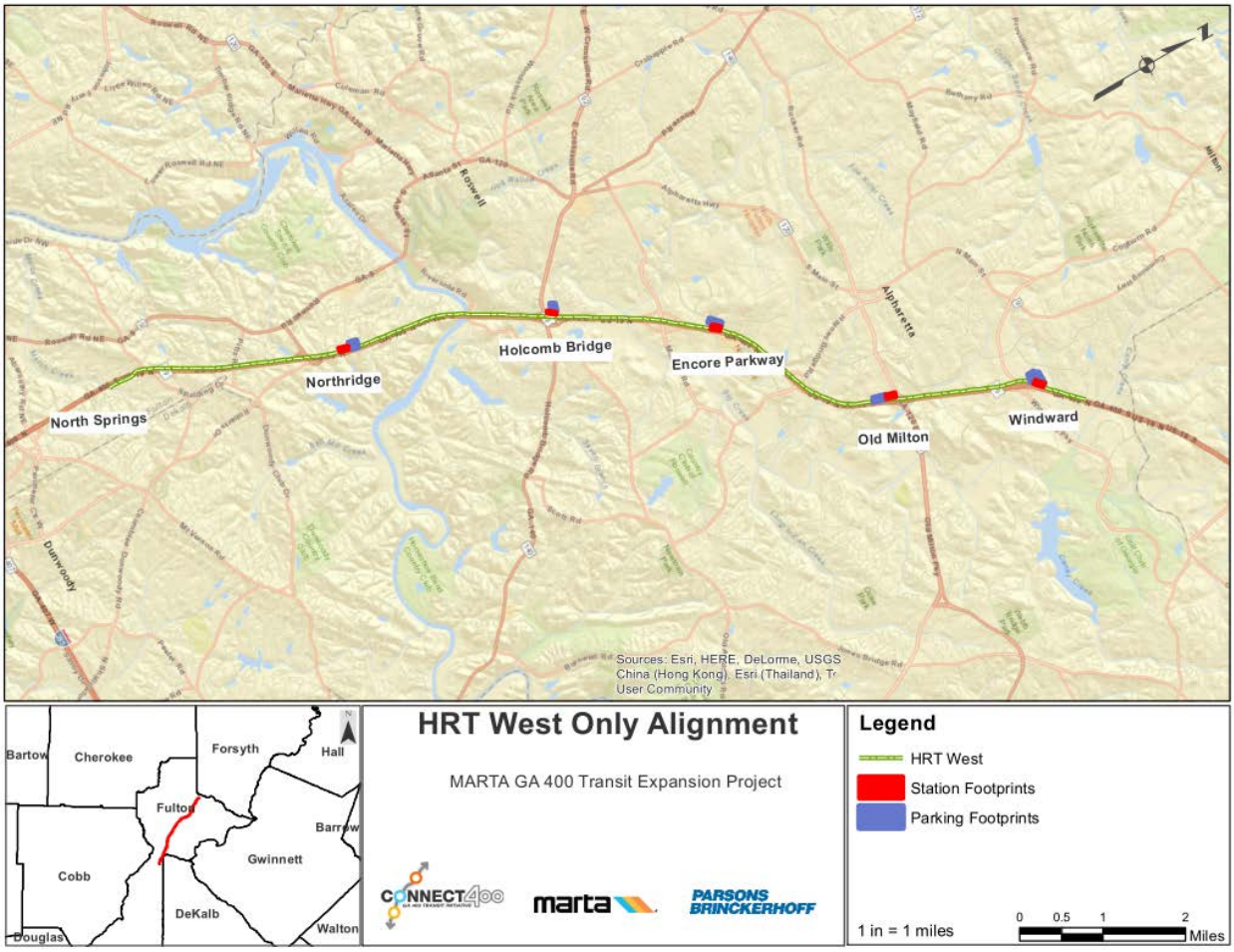
Figure 4-4. East Only HRT Alignment Alternative



4.2.2 West Only HRT Alignment Alternative

The West Only HRT alignment alternative would extend the MARTA Red Line HRT service from its existing northern terminus to Windward Parkway. To serve the west side of the GA 400 corridor, this alignment alternative would use an aerial structure to flyover the GA 400 corridor south of Spalding Drive and serve all stations on the west side of the GA 400 corridor. Except the Holcomb Bridge station, which would be constructed as a cut and cover station, all stations for the West Only HRT alignment alternative would be aerial stations. An overview of the West Only HRT Alignment Alternative is provided in Figure 4-5.

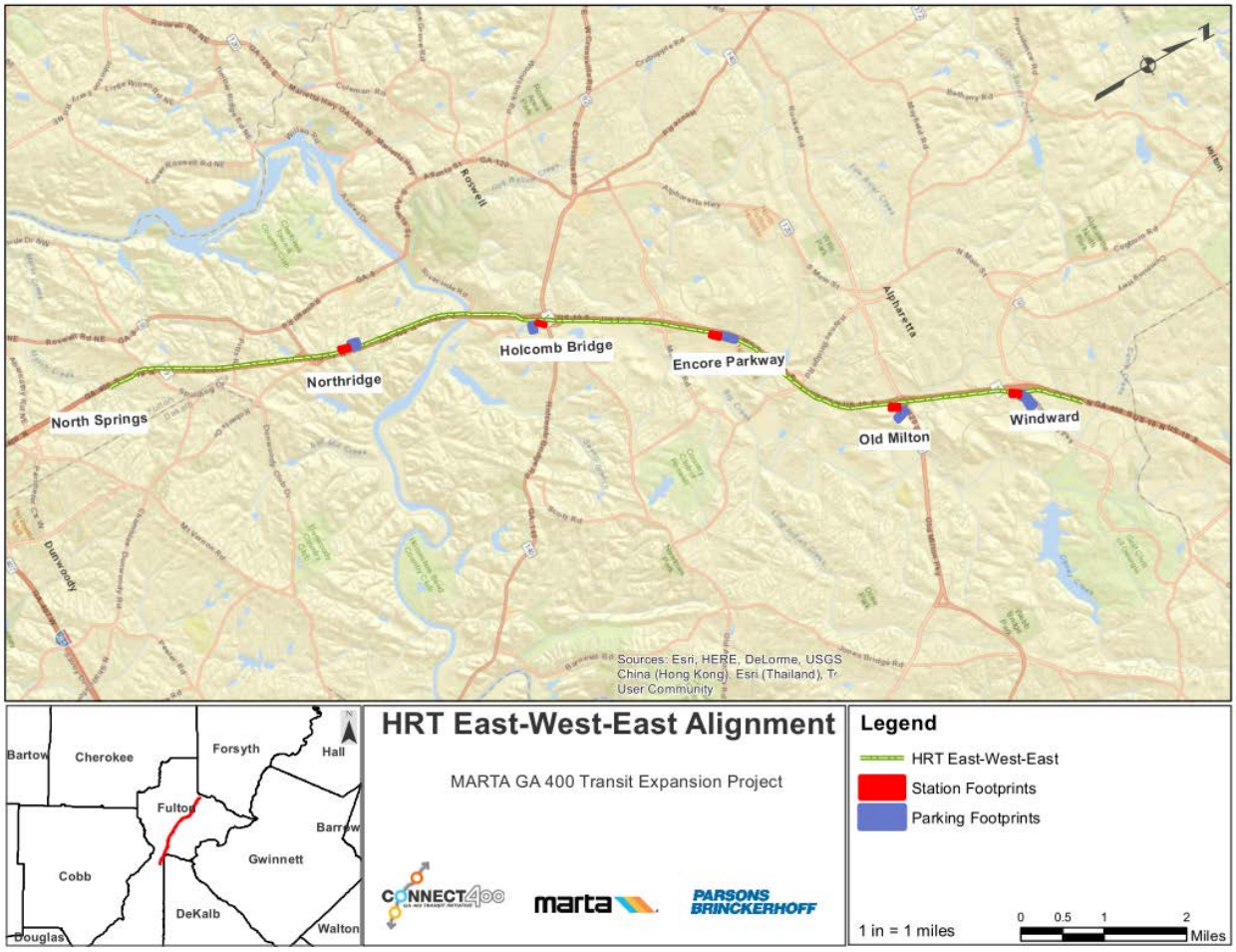
Figure 4-5. West Only HRT Alignment Alternative



4.2.3 East-West-East HRT Alignment Alternative

The East-West-East HRT alignment alternative would extend the MARTA Red Line HRT service from the North Springs Station to Windward Parkway. Unlike the previously discussed alignments, this alternative would require two crossovers. The first crossover would be identical to the east-to-west flyover used in the West Only alignment alternatives and would provide service to a station on the west side of the GA 400 interchange at Northridge Road. The second crossover, located north of the Chattahoochee River and south of Holcomb Bridge Road, would provide access to stations along the east side of GA 400 at Holcomb Bridge Road, Encore Parkway, Old Milton Parkway and Windward Parkway. As in the case of the West Only HRT alignment alternative, with the exception of Holcomb Bridge, all stations would be developed as aerial stations. The Holcomb Bridge station would be constructed as a cut and cover station. An overview of the East-West-East HRT alignment alternative is depicted in Figure 4-6.

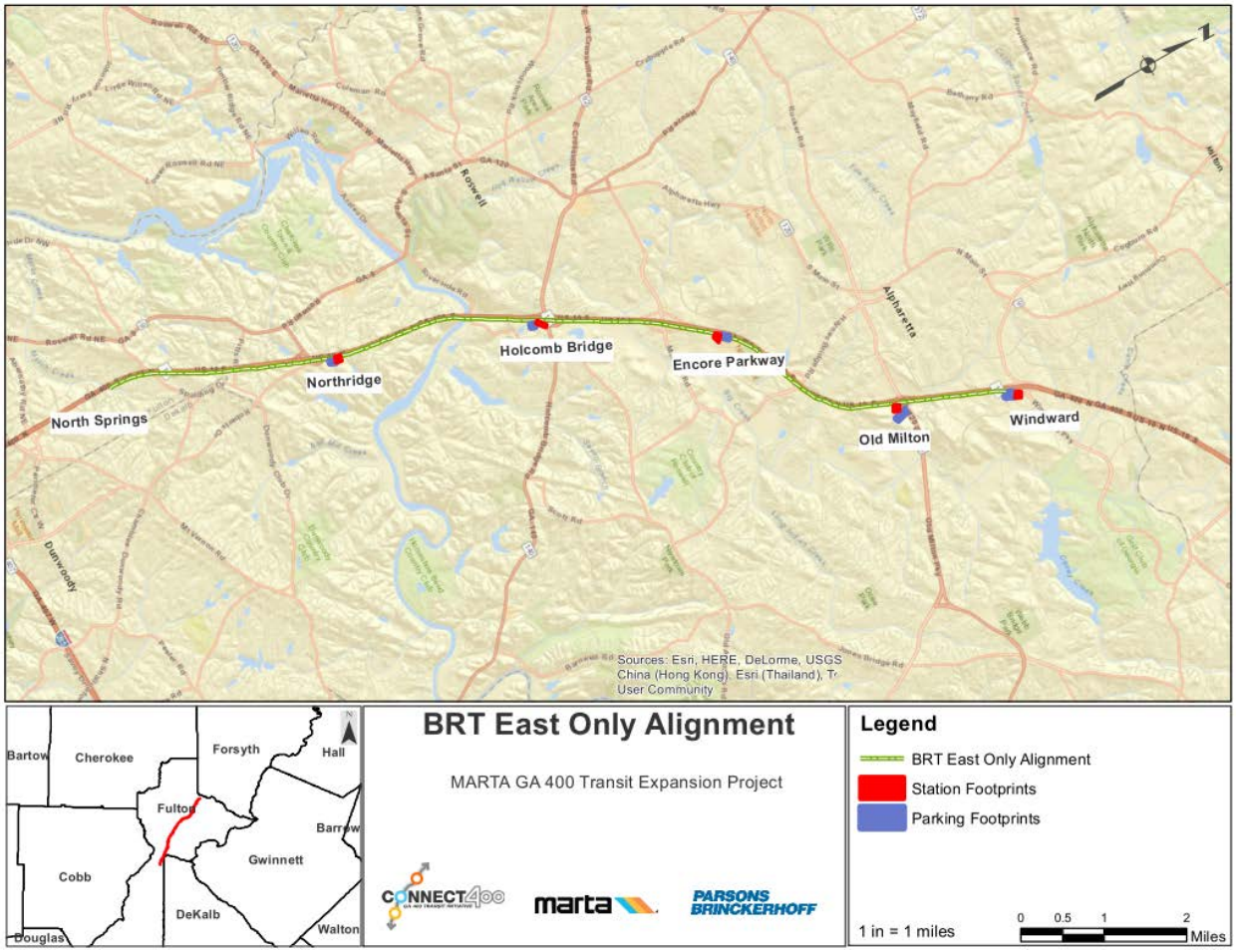
Figure 4-6. East-West-East HRT Alignment Alternative



4.2.4 East Only BRT Alignment Alternative

The East Only BRT alignment alternative would operate new BRT service between the MARTA Red Line's northern terminus at North Springs to Windward Parkway. As this alignment alternative would only operate on the east side, no crossovers are required. All five BRT stations would be constructed as at-grade stations on the east side of the GA 400 corridor. Figure 4-7 depicts an overview of the East Only BRT Alignment Alternative.

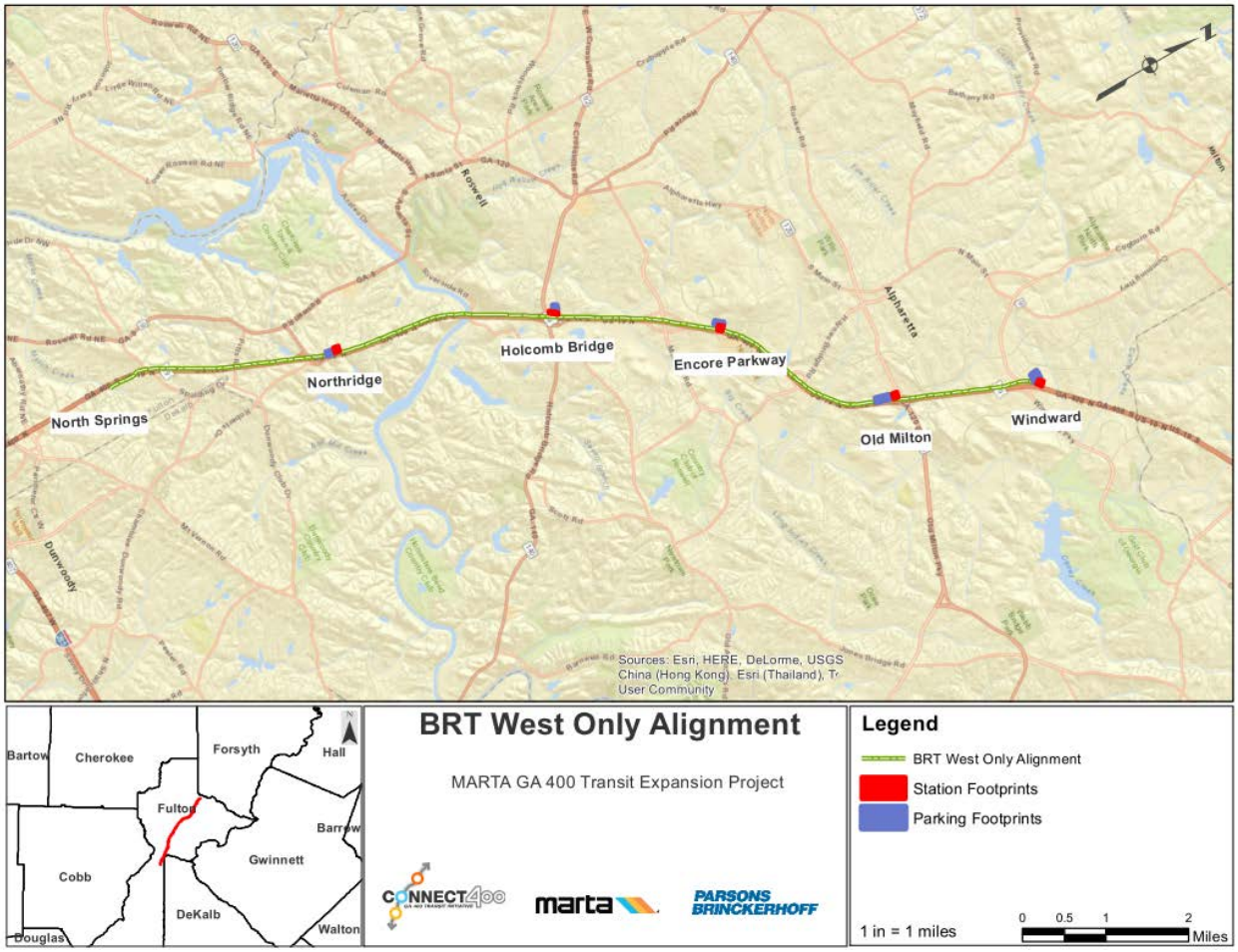
Figure 4-7. East Only BRT Alignment Alternative



4.2.5 West Only BRT Alignment Alternative

The West Only BRT alignment alternative would operate new BRT service between the MARTA Red Line's North Springs Station to Windward Parkway. As in the case of the West Only HRT alignment alternative, this alternative would employ an aerial structure to flyover the GA 400 corridor south of Spalding Drive and serve all stations on the west side of the GA 400 corridor. As in the case of the East Only BRT alignment alternative, all stations would be constructed as at-grade stations. Figure 4-8 presents an overview of the West Only BRT alignment alternative.

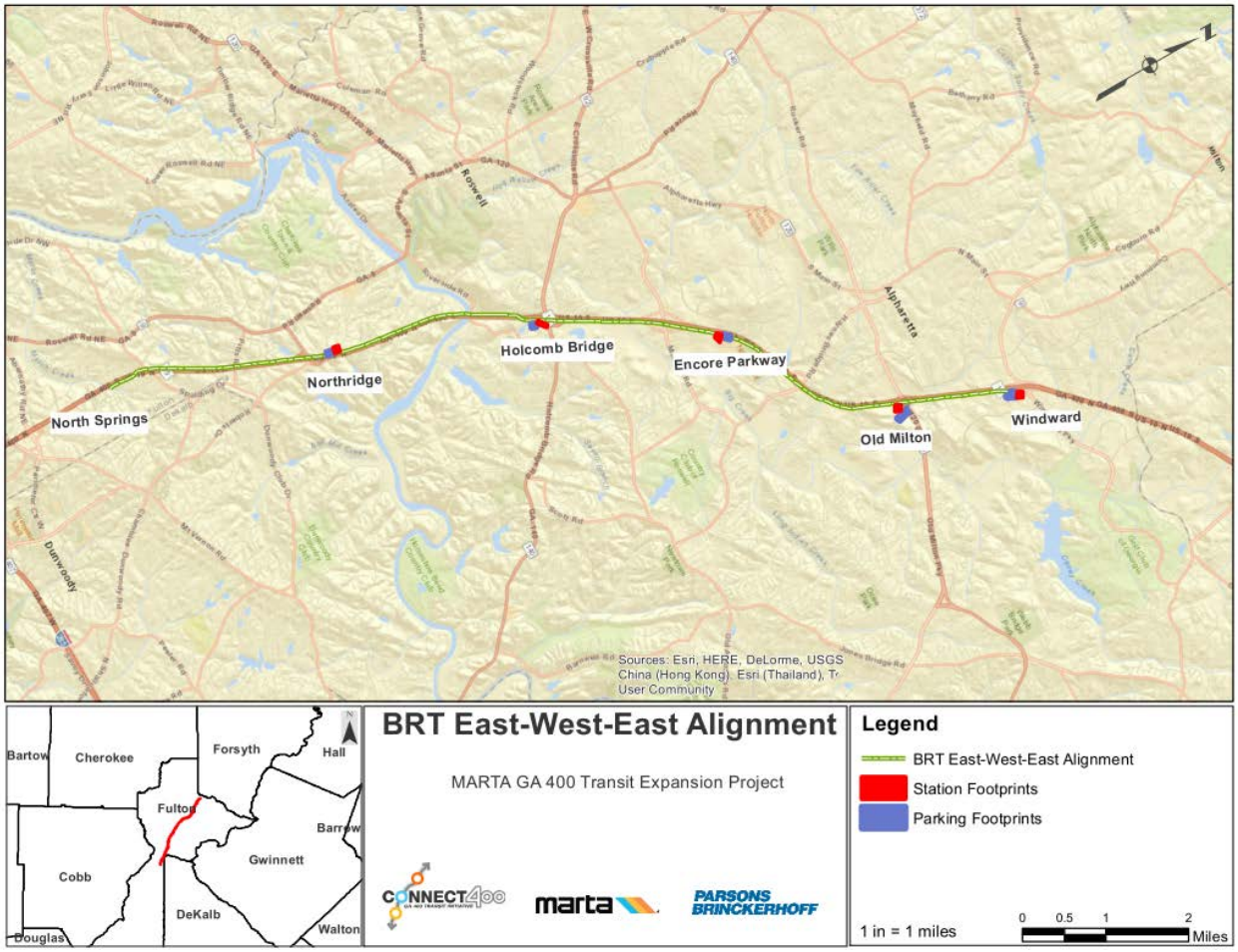
Figure 4-8. West Only BRT Alignment Alternative



4.2.6 East-West-East BRT Alignment Alternative

The East-West-East BRT alignment alternative would operate new BRT service between MARTA North Springs Station to Windward Parkway. The crossover locations would be the same as described previously for the East-West-East HRT alignment alternative. This alternative would serve a west side station at Northridge Road and all other stations would be constructed on the east side of GA 400. As in the case of the other BRT alignment alternatives, all stations would be constructed at-grade. Figure 4-9 provides an overview of the East-West-East BRT alignment alternative.

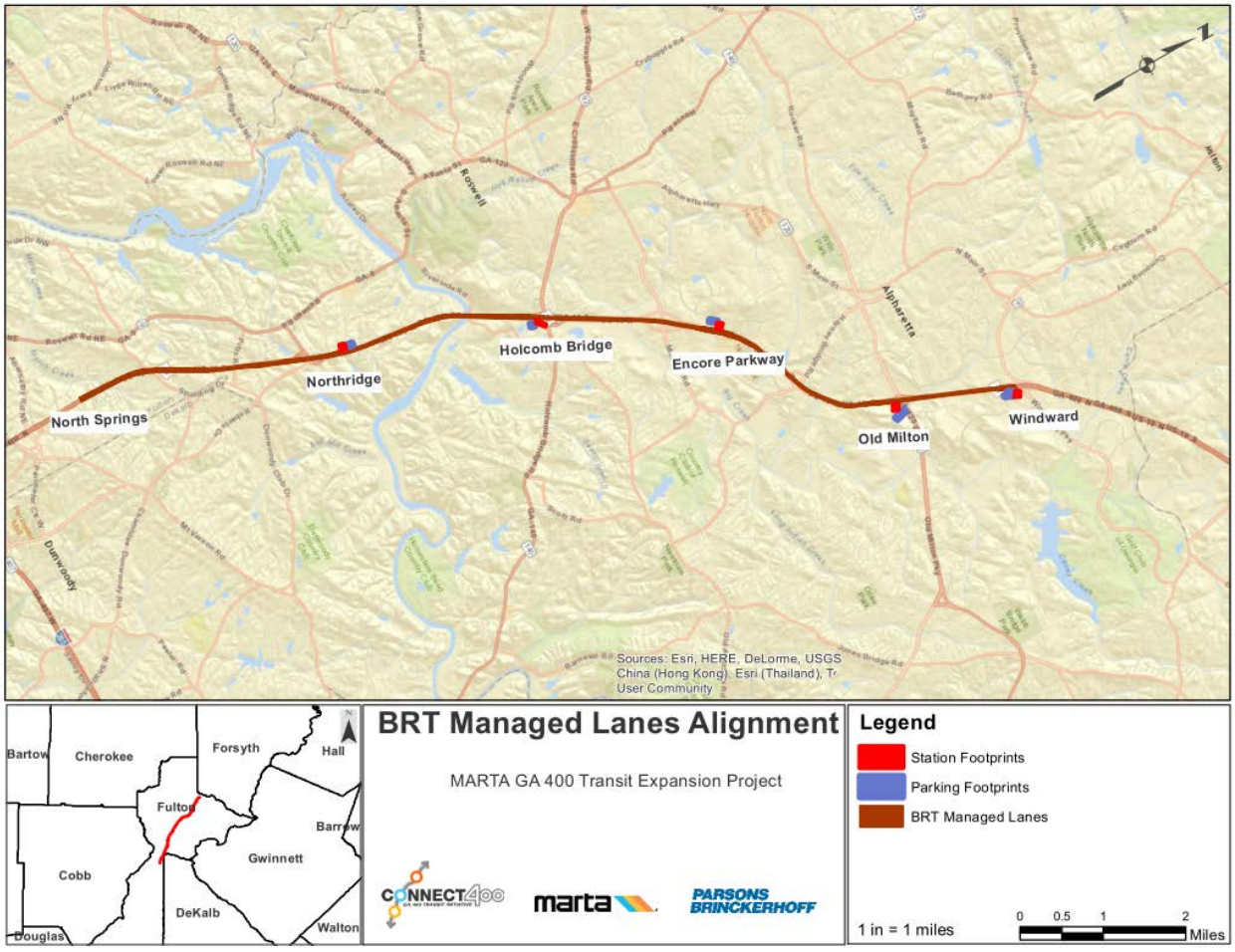
Figure 4-9. East-West-East BRT Alignment Alternative



4.2.7 Center BRT within Future GDOT Managed Lanes Alignment Alternative

The Center BRT alignment alternative would predominantly use GDOT's future managed lanes along the GA 400 corridor to operate new BRT service between the North Springs Station and Windward Parkway. Heading north from the North Springs Station, the BRT service would use the existing GA 400 on-ramp and merge into the managed lanes located on the outside of the general purpose lanes, before the managed lanes then merge to the center median in the vicinity of Northridge. At Windward Parkway, this alternative would make use of an aerial ramp to facilitate ingress/egress from the managed lanes into the station area. Except for the station at Windward Parkway, which would be configured similar to the other BRT stations noted above, all boarding areas would be placed in-line between the managed lanes and the general purpose lanes as seen in the conceptual layout in Figure 4-3. Unlike the other BRT alternatives, which would serve a single central platform for both directions of travel, the Center BRT alignment alternative would serve two at-grade platforms at each interchange; situated between the general purpose lanes and the managed lanes for each direction of travel. At the Northridge and Encore Parkway stations, the bus bay and parking areas would be located on the west side. At the Holcomb Bridge, Old Milton and Windward Parkway stations the bus bay and parking areas would be located on the east side. An overview of the Center BRT alignment alternative is presented in Figure 4-10.

Figure 4-10. Center BRT Operating within GDOT Managed Lanes Alignment Alternative



4.3 Impacts Assessment

This section describes the approach to evaluating impacts and the findings for each of the seven alignment alternatives. Each alignment alternative was evaluated based on environmental and community impacts, including transportation impacts. Order of magnitude capital costs estimates were also developed for comparative purposes.

In evaluating the impacts of these potential alignment alternatives, a "High Range" and a "Low Range" case was developed for each alignment alternative with the exception of the Center BRT alternative. The High Range case has the transit alignment shifted just outside of the GA 400 ROW while the "Low Range" case has the alignment within the GA 400 ROW. Although the location of the alignments would be similar, for any given alignment alternative, the High Range scenario would incur substantially greater impacts to private property and community facilities due to the need to acquire new ROW outside of the existing GA 400 corridor. Given that the Center BRT alternative presupposes the existence of GDOT's managed lanes, impacts resulting from the widening of GA 400 to accommodate the managed lanes are accounted for in the Center BRT alternative. However, all other alternatives do not reflect the direct impacts that would occur as a result of GDOT's implementation of managed lanes. In other words, the implementation of GDOT managed lanes is considered as the No Build alternative for all High Range alignment alternatives except for Center BRT.

4.3.1 Environmental Impacts

A pre-NEPA environmental screening was conducted for each conceptual alignment to identify potential costs and level of impacts. The environmental screening involved the use of GIS data sources to identify the community facilities and resources, parks and recreation areas, and wetlands; residential and business relocations and displacements; and potential Environmental Justice (low-income and/or minority) communities in proximity to each conceptual alignment. This section presents the results of the quantitative and qualitative analysis of the alignments with respect to these resources.

4.3.1.1 Community Facilities and Resources

The existing land use adjacent to the GA 400 corridor, and along each of the conceptual alignments, is primarily a mixture of residential and commercial development. The residential uses include suburban single-family homes with some apartment complexes. The commercial land uses consist of retail stores and office/business development. Small percentages of the land along the alignments are comprised of public/institutional and park and recreational uses.

Community facilities within one-quarter mile of each alignment were identified to determine the location and potential impacts on resources such as schools, places of worship, libraries, community centers, and emergency management facilities. In cases where a community facility was located just beyond the quarter-mile buffer, these facilities were incorporated into the analysis in order to account for potential indirect impacts to these properties. These facilities are shown in the maps contained within *Appendix E: Alignment Cut Sheets.* Three schools – The Davis Academy, Dunwoody Springs Elementary School, and Woodland Elementary School – are on the east side of GA 400 south of the Chattahoochee River. One school, Sandy Springs Middle School, is on the west side of the GA 400 corridor south of the Chattahoochee River. Three colleges are also in the study area: the upcoming Gwinnett Technical College – Alpharetta campus on Old Milton Parkway west of GA 400, the University of Phoenix – Atlanta Campus on Roberts Drive east of GA 400, and DeVry University – Alpharetta on Northwinds Parkway west of GA 400. In terms of emergency facilities, the Alpharetta Fire Department Station 1 and the Alpharetta Department of Public Safety Division Fire Station 1 are close to the

west side of GA 400 north of Old Milton Parkway while the Alpharetta Fire Department Station 3 and the Alpharetta Department of Public Safety Division Fire Station 3 are on the west side of GA 400 north of Encore Parkway. Table 4-6 summarizes the community facilities that were identified as being proximate to each of the seven alignment alternatives. A "Yes" in this table is only an indication of proximity and does not necessarily mean that a given facility would be directly impacted by an alignment alternative.

Table 4-6. Community Facilities Proximate to Alignment Alternatives

Facility Type	Facility Name	East Only HRT	West Only HRT	East-West-East HRT	East Only BRT	West Only BRT	East-West-East BRT	Center BRT within GDOT Managed Lanes
Schools	Sandy Springs Middle School	No	Yes	Yes	No	Yes	Yes	Yes
	Davis Academy (The)	Yes	No	No	Yes	No	No	Yes
	Dunwoody Springs Elementary School	Yes	No	No	Yes	No	No	Yes
	Woodland Elementary School	Yes	No	No	Yes	No	No	Yes
Colleges	Gwinnett Technical College - Alpharetta	No	Yes	No	No	Yes	No	Yes
	University of Phoenix - Atlanta Campus	Yes	No	No	Yes	No	No	Yes
	DeVry University - Alpharetta	No	Yes	No	No	Yes	No	Yes
Fire	Alpharetta Fire Department Station 3	No	Yes	No	No	Yes	No	Yes
	Alpharetta Fire Department Station 1 (Slightly farther than 0.25 miles)	No	Yes	No	No	Yes	No	Yes
EMS	Alpharetta Department of Public Safety Division Fire Station 3	No	Yes	No	No	Yes	No	Yes
	Alpharetta Department of Public Safety Division Fire Station 1 (Slightly farther than 0.25 miles)	No	Yes	No	No	Yes	No	Yes

The widening of GA 400 to accommodate the GDOT Managed Lanes project would cause the Center BRT alignment alternative to have the most potential impact to community facilities, assuming the advancement of the GA 400 Managed Lane Feasibility Study's preferred alternative. The Center BRT alternative would likely have a direct impact on Dunwoody Springs Elementary School, Woodland Elementary School, and the University of Phoenix – Atlanta campus, as well as a potential indirect impact to DeVry University – Alpharetta campus. The East Only alignments would cause direct impacts to Dunwoody Springs Elementary School and Woodland Elementary School, as well as a potential indirect impact to the University of Phoenix – Atlanta campus. The West Only alignments would directly impact the future Gwinnett Technical College – Alpharetta campus and the DeVry University – Alpharetta campus and potentially result in indirect impacts to Sandy Springs Middle School. The East-West-East alignments would not cause a direct impact to any community facilities but could potentially cause an indirect impact to Sandy Springs Middle School.

No additional community facilities are anticipated to be directly impacted by the alignments (e.g. relocated due to a proposed alignment alternative or station location); however, there could be indirect impacts on some of these resources. The proposed transit stations could increase traffic on the local road network in the vicinity of the schools, which could cause pedestrian and

bicycle safety concerns for school-aged children in the area. A qualitative analysis on the potential transportation impacts to these community facilities can be found in *Appendix F: Community Facilities Impacts Summary*.

4.3.1.2 Parks

Parks, recreation areas, and wildlife or waterfowl refuges are protected by Section 4(f) of the Transportation Act for federally funded transportation projects. To qualify as a park, recreation area, or refuge under the statute, a property must meet all of the following criteria:

- It must be publicly owned,
- It must be open to the public (except in certain cases for refuges),
- Its major purposes must be for park, recreation, or refuge activities, and
- It must be significant as a park, recreation area, or refuge as determined by the agency with jurisdiction.

Potential impacts to parks and recreational facilities, including Section 4(f) park and recreation facility properties, were included in this analysis. Effects on Section 4(f) resources are categorized as effects involving a "use" of such resources. A Section 4(f) use, as defined in 23 CFR 774.17, occurs:

- When land is permanently incorporated into a transportation facility;
- When there is a temporary occupancy of land that is adverse in terms of the statute's preservation purpose so determined by the criteria in 23 CFR 774.13(d)[1]; or
- When there is a constructive use of a Section 4(f) property as determined by the criteria in 23 CFR 774.15.

Three parks are within the study area. The Chattahoochee River National Recreation Area is under the jurisdiction of the National Park Service. The other two public parks, Don White Park and Riverside Park, fall under the jurisdiction of the City of Roswell. The maps contained within *Appendix E: Alignment Cut Sheets* illustrate the park and recreation areas located within one-quarter mile of each of the alternatives. All of these parks are located adjacent to the Chattahoochee River.

Parkland impacts were determined by calculating the park areas located within the proposed ROW limits for each of the alternatives. These areas ranged between 0.38 acres and 2.30 acres. Due to the widening that would be required to implement managed lanes on GA 400, the Center BRT would have the greatest impact on park lands in the corridor, affecting 2.30 acres within the Chattahoochee River National Recreation Area. Table 4-7 and Table 4-8 identify the specific parks that would be directly impacted by each alignment alternative and also provide the total area of impact for the HRT and BRT technologies, respectively.

[1] U.S. Office of the Federal Register, *Code of Federal Regulations,* http://www.gpo.gov/fdsys/pkg/CFR-2014-title23-vol1/pdf/CFR-2014-title23-vol1-sec774-13.pdf.

Table 4-7. Parkland Impacts by HRT Alignment Alternative

Facility Type	Facility Name	East Only HRT		West Only HRT		East-West-East HRT	
	Range	Low	High	Low	High	Low	High
Parks	Chattahoochee River National Recreation Area	Yes	Yes	Yes	Yes	Yes	Yes
	Don White Memorial Park	Yes	Yes	No	No	No	No
	Riverside Park	No	No	Yes	Yes	Yes	Yes
Total Direct Impacts to Parklands (acres)		0.46	0.79	0.38	0.38	0.38	0.38

Table 4-8. Parkland Impacts by BRT Alignment Alternative

Facility Type	Facility Name	East Only BRT		West Only BRT		East-West-East BRT		Center BRT within GDOT Managed Lanes
	Range	Low	High	Low	High	Low	High	Same
Parks	Chattahoochee River National Recreation Area	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Don White Memorial Park	No	Yes	No	No	No	No	No
	Riverside Park	No	No	Yes	Yes	Yes	Yes	No
Total Direct Impacts to Parklands (acres)		0.53	0.98	0.45	0.45	0.45	0.45	2.30

4.3.1.3 Wetlands

Wetlands are those areas that are inundated or saturated by surface or ground water. Wetlands generally include swamps, marshes, bogs, and other similar areas, and help regulate water levels within watersheds, improve water quality, reduce flood and storm damages, and provide important fish and wildlife habitat. Sections 401 and 404 of the Clean Water Act (CWA), as amended, regulate wetlands. Executive Order (EO) 11990 requires federal agencies to avoid and minimize, to the extent possible, the long-term and short-term adverse effects associated with the destruction or modification of wetlands.

GIS data sources were used to identify wetland areas located along each of the alignment options. *Appendix G: Wetlands Maps* shows the locations of these wetland areas. Wetland impacts were determined by calculating the wetland areas located between the proposed ROW limits for each of the alternatives. These impacted areas range between 0.04 acres and 0.55 acres, with the East Only HRT alternative having larger impact on wetlands in the corridor. Additional analysis would be needed beyond this screening to determine the actual linear feet of impact, if these impacts would be considered temporary or permanent due to the construction, and what permits, if any, would be required to implement the selected alternative alignment. However, since wetland impacts would be avoided, minimized, or mitigated by federal laws and regulations, it is unlikely that the function of notable wetland systems would deteriorate as a result of the implementation of any of the alignment options. Table 4-9 and Table 4-10 present the number of acres of wetlands that could be directly impacted by each of the alignment alternatives for the HRT and BRT technologies, respectively.

Table 4-9. Wetlands Impacts by HRT Alignment Alternative

Alignment	East Only HRT		West Only HRT		East-West-East HRT	
Range	Low	High	Low	High	Low	High
Total Direct Impact to Wetlands (acres)	0.56	0.57	0.04	0.03	0.54	0.49

Table 4-10. Wetlands Impacts by BRT Alignment Alternative

Alignment	East Only BRT		West Only BRT		East-West-East BRT		Center BRT within GDOT Managed Lanes
Range	Low	High	Low	High	Low	High	Same
Total Direct Impact to Wetlands (acres)	0.35	0.36	0.04	0.04	0.34	0.34	0.47

4.3.1.4 Displacements and Relocations

This section discusses the estimated property displacements and relocations for the proposed alignments. Acquisitions consist of both full and partial property acquisitions. Full acquisition occurs when the entire parcel is needed, including any buildings or improvements that may be present on the land. Loss of use of a property, including loss of access, can also lead to full acquisition and displacement. Partial acquisition occurs when only a portion of a parcel is required and does not result in displacement. The property acquisitions associated with the alignment alternatives are preliminary and subject to refinement during preliminary engineering and final design of the selected alternative.

To identify properties for potential acquisition, the ROW limits of the alignment alternatives were overlaid onto a parcel layer in GIS. This was approached as a two-tied process – first, potential acquisitions due to the alignment and next, potential acquisitions due to station and associated parking locations. Each of the parcels was evaluated to determine if the portion of the parcel within the boundaries of proposed ROW encompassed all or part of onsite buildings or structures. If so, the parcel was assumed to be a full acquisition. Loss of access was not deemed to be a major reason for a full acquisition, as the affected properties were adjacent to a limited access facility. However, for an occupied residential property, even if the alignment passes through an undeveloped portion of the parcel, it could have severe impact on the use of that property. To account for this impact, a full acquisition was recommended for any residential property sharing a portion of land with the proposed ROW. For other parcels, the analysis determined that the portion of the parcel within the proposed ROW was only undeveloped land. For these undeveloped parcels, the required acquisition was determined to be a partial acquisition.

A key issue to displacements is whether or not the property owner could continue to have use of the property as it was used prior to the property acquisition. If acquisition would require purchase of portions integral to the use of the property, then all of the property would be assumed to be acquired.

However, while estimating the potential displacements for station and parking facilities, a slightly different strategy was followed to account for the increased area requirements for those

facilities. Each of the parcels was evaluated to determine if the portion of the parcel within the boundaries of the proposed station and parking layouts encompassed all or part of onsite buildings or structures. If so, the parcel was assumed to be a full acquisition. Additionally, if a station or parking layout was on an undeveloped parcel, these parcels were also considered as full acquisitions. In the case of some occupied commercial parcels, it was observed that the expected impact is on the undeveloped part of the property. Additionally, these commercial establishments could benefit from the increased access and visibility their business would gain based on their proximity to a station location. In such a scenario, these properties were recommended for partial acquisition.

Table 4-11 and Table 4-12 present the number of residential, commercial, industrial, and other (tax-exempt) displacements required for each of the alternatives due to the alignments, proposed station locations, and the total number of displacements for the HRT and BRT technologies, respectively. The tables also provide the total value of takings (in Year of Expenditure dollars) that would be acquired for each alignment, including the cost of acquisition and the relocation expenses.

Table 4-11. Summary of Displacements by HRT Alignment Alternative

Alignment	East Only HRT		West Only HRT		East-West-East HRT	
Range	Low	High	Low	High	Low	High
Displacements Due to Presence of Transit Alignment	**7**	**273**	**0**	**307**	**1**	**379**
Residential Use	7	268	0	305	1	377
Commercial Use	0	3	0	2	0	2
Industrial Use	0	0	0	0	0	0
Other Use	0	2	0	0	0	0
Displacements Due to Development of Station	**1**	**5**	**6**	**9**	**2**	**5**
Residential Use	0	0	0	0	0	0
Commercial Use	1	2	5	7	1	2
Industrial Use	0	1	1	2	1	2
Other Use	0	2	0	0	0	1
Total Displacements	**8**	**278**	**6**	**316**	**3**	**384**
Residential Use	7	268	0	305	1	377
Commercial Use	1	5	5	9	1	4
Industrial Use	0	1	1	2	1	2
Other Use	0	4	0	0	0	1
Total Value of Takings ($X000)	**52,314**	**268,418**	**62,303**	**152,784**	**62,253**	**162,539**
Purchase or Lease of Real Estate	43,772	224,587	52,129	127,836	52,088	135,997
Relocation of Existing Households and Businesses	8,542	43,830	10,173	24,948	10,165	26,541

Table 4-12. Summary of Displacements by BRT Alignment Alternatives

Alignment	East Only BRT		West Only BRT		East-West-East BRT		Center BRT within GDOT Managed Lanes
Range	Low	High	Low	High	Low	High	Same
Displacements Due to Presence of Transit Alignment	**13**	**122**	**3**	**400**	**4**	**471**	**14**
Residential Use	13	117	3	398	4	469	13
Commercial Use	0	3	0	2	0	2	0
Industrial Use	0	0	0	0	0	0	1
Other Use	0	2	0	0	0	0	0
Displacements Due to Development of Station	**0**	**4**	**6**	**9**	**2**	**4**	**6**
Residential Use	0	0	0	0	0	0	0
Commercial Use	0	1	5	7	1	1	3
Industrial Use	0	1	1	2	1	2	2
Other Use	0	2	0	0	0	1	1
Total Displacements	**13**	**126**	**9**	**409**	**6**	**475**	**20**
Residential Use	13	117	3	398	4	469	13
Commercial Use	0	4	5	9	1	3	3
Industrial Use	0	1	1	2	1	2	3
Other Use	0	4	0	0	0	1	1
Total Value of Takings ($X000)	**65,656**	**244,210**	**48,519**	**171,979**	**53,800**	**172,791**	**42,790**
Purchase or Lease of Real Estate	54,716	203,518	40,434	143,322	44,836	144,000	35,660
Relocation of Existing Households and Businesses	10,940	40,692	8,085	28,656	8,965	28,792	7,130

For the High Range case, the East-West-East BRT alignment alternative would result in the greatest number of displacements (475 properties displaced), followed by the West Only BRT alignment alternative (409 properties displaced). The Center BRT alternative would result in the fewest displacements (20 properties displaced) because the majority of the transit alignment would be housed within the GDOT ROW. In terms of the total value of takings for the High Range case, the East Only HRT alignment alternative had the highest costs due to displacements at $268 million while the Center BRT alignment alternative had the lowest displacement costs at around $43 million. However, given that this is a preliminary analysis, the number of displacements and the values of the properties displaced are likely to change as the paths of the alignments and the locations of transit stations are further refined to incorporate additional engineering and planning considerations.

In the High Range case the majority of displacements would be due to the presence of the transit alignment rather than station development. Residential properties account for the bulk of the expected displacements due to the transit alignment. The development of stations would result in displacements to a handful of commercial and industrial properties but would not adversely impact any residential properties. The relative difference in the magnitude of displacements between the HRT and BRT technologies varies based on the alignment chosen,

as the East Only alignment had fewer displacements for BRT than HRT while the West Only and East-West-East alignments had fewer displacements for HRT than BRT.

In comparing the Low Range and High Range cases for each alignment alternative it is evident that the High Range's need to acquire new ROW outside of the GA 400 corridor would result in a dramatic increase in the number of residents and businesses that would be negatively impacted by the transit project relative to the Low Range case. Thus, the costs related to acquiring land and compensating those displaced would be substantially greater in the High Range case. Depending on the alignment, the increase in takings costs between the Low Range and High Range case ranges from $90 million for the West Only HRT alignment alternative to $216 million for the East Only HRT alignment alternative. These increase in takings costs account for 73% and 75% of the difference in costs between the Low Range and High Range estimates for the West Only HRT and East Only HRT alignment alternatives, respectively. If residential structures are acquired, then the owners or renters must relocate to new housing. If commercial buildings are acquired, the businesses must relocate to new commercial space. Replacement housing and relocation assistance would be provided to property owners, home owners or renters who would be displaced by property acquisition. Displaced commercial property owners and business owners would also receive assistance in finding new replacement commercial properties reasonably comparable to current properties or facilities.

It should be noted that, in terms of land requirements for stations, the ROW needs for the HRT stations would be greater than those of the BRT stations. Given that the BRT stations do not include separate room for a platform area, the HRT stations would require at least one additional acre of land relative to the BRT stations (see Table 4-3 and Table 4-4). Furthermore, due to the higher projected ridership levels for the HRT technology relative to the BRT technology, the HRT stations would require more land to house a greater number of parking spaces than would be needed for the BRT stations. Table 4-13 and Table 4-14 display the station footprint needs for the HRT and BRT alignment alternatives. The ROW costs, which are displayed in thousands of dollars, were calculated based on an average land value of $700,000 per acre that was retrieved from the ARC's Planning and Cost Estimation Tool for the "North Fulton" area.

Table 4-13. Summary of Station Footprint Needs for HRT Alternatives

ALTERNATIVE		East Only HRT		West Only HRT		East-West-East HRT	
STATION TYPE	*Unit Area*	*Count*	*Station Acreage*	*Count*	*Station Acreage*	*Count*	*Station Acreage*
Aerial	4.00	3	12.00	4	16.00	4	16.00
At-grade	4.00	0	0	0	0	0	0
Cut/Cover	2.50	2	5.00	1	2.50	1	2.50
TOTAL STATION AREA		17.00		18.50		18.50	
TOTA PARKING AREA		23.45		23.45		23.45	
TOTAL STATION FOOTPRINT AREA		**40.45**		**41.95**		**41.95**	
TOTAL STATION FOOTPRINT ROW COST ($X000)		**$28,315**		**$29,365**		**$29,365**	

Table 4-14. Summary of Station Footprint Needs for BRT Alternatives

ALTERNATIVE		East Only BRT		West Only BRT		East-West-East BRT		Center BRT within GDOT Managed Lanes	
STATION TYPE	*Unit Area*	*Count*	*Station Acreage*	*Count*	*Station Acreage*	*Count*	*Station Acreage*	*Count*	*Station Acreage*
At-grade	2.50	5	12.50	5	12.50	5	12.50	1	2.50
At-grade in Managed Lanes	5.00	0	0	0	0	0	0	4	20.00
TOTAL STATION AREA		12.50		12.50		12.50		22.50	
TOTAL PARKING AREA		14.84		14.84		14.84		14.84	
TOTAL STATION FOOTPRINT AREA		**27.34**		**27.34**		**27.34**		**37.34**	
TOTAL STATION FOOTPRINT ROW COST ($X000)		**$19,138**		**$19,138**		**$19,138**		**$26,138**	

In terms of land requirements for transit alignments, the ROW needs for the BRT alignments are greater than those of the HRT alignments. The BRT alignment alternatives predominantly use a section width of 52 feet. Although the HRT sections vary in width, the types most commonly used (at-grade and aerial) have widths that are slightly shorter than the BRT at-grade section type (see Table 4-1). Table 4-15 and Table 4-16 present the ROW needs for the HRT and BRT alignment alternatives. As in the case of the station footprint needs, the ROW costs in the table below are displayed in thousands and were calculated based on an average land value of $700,000 per acre that was retrieved from the ARC's Planning and Cost Estimation Tool for the "North Fulton" area.

Table 4-15. Summary of Alignment Needs for HRT Alternatives

ALTERNATIVE			East Only HRT		West Only HRT		East-West-East HRT	
SECTION TYPE	*Width*	*Linear Feet per Acre*	*ROW Length*	*ROW Acreage*	*ROW Length*	*ROW Acreage*	*ROW Length*	*ROW Acreage*
Aerial	43.33333	1005.231	45,308.06	45.07	45,613.12	45.38	45,465.48	45.23
At-grade	48	907.5	10,468.52	11.54	10,717.43	11.81	10,468.64	11.54
Cut/Cover	58.5	744.6154	8,636.30	11.60	8,632.71	11.59	8,708.73	11.70
TOTAL DIMENSIONS			**64,412.88**	**68.21**	**64,963.26**	**68.78**	**64,642.85**	**68.46**
TOTAL ALIGNMENT ROW COST ($X000)			**$47,744**		**$48,145**		**$47,922**	

Table 4-16. Summary of Alignment Needs for BRT Alternatives

ALTERNATIVE			East Only BRT		West Only BRT		East-West-East BRT		Center BRT within GDOT Managed Lanes	
SECTION TYPE	*Width*	*Linear Feet per Acre*	*ROW Length*	*ROW Acreage*	*ROW Length*	*ROW Acreage*	*ROW Length*	*ROW Acreage*	*ROW Length*	*ROW Acreage*
Aerial	52	837.6923	10,590.50	12.64	12,114.92	14.46	10,287.56	12.28		0
At-grade	52	837.6923	49,742.25	59.38	49,685.15	59.31	48,968.80	58.46	9,518.62	11.36
Cut/Cover	58.5	744.6154	0.00	0.00	0.00		1,311.41	1.76		0
TOTAL DIMENSIONS			**60,332.75**	**72.02**	**61,800.07**	**73.77**	**60,567.77**	**72.50**	**9,518.62**	**11.36**
TOTAL ALIGNMENT ROW COST ($X000)			**$50,416**		**$51,642**		**$50,749**		**$7,954**	

Thus, in terms of minimum area required, ROW needs for stations would be greater for the HRT technology while ROW needs for the transit alignment would be greater for the BRT technology.

However, the geometry of parcels varies and thus the actual land required will differ from the theoretical estimates in the tables above.

4.3.1.5 Environmental Justice

A preliminary Environmental Justice (EJ) analysis was conducted to identify communities that may be adversely impacted by the implementation of the GA 400 corridor transit initiative. The following section outlines the methodology used to analyze impacts to EJ populations.

EJ considerations have an essential role in the decision making process for federally-funded projects in communities with minority or low-income populations. EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires federal agencies to adopt strategies to address environmental justice concerns that may occur within the context of agency operations or as a result of federally-funded projects. The EO directs each federal agency to identify and address disproportionately high and adverse human health or environmental effects that may occur in minority or low-income communities. If disproportionate high and adverse impacts on these communities are identified, efforts must be made to avoid or mitigate the effects. This mandate requires two related assessments: whether a minority or low-income population is present within a project area, and if so, whether that population would suffer disproportionately high and adverse effects from the project. A disproportionately high and adverse effect on minority or low-income populations means an adverse effect that:

(1) is predominantly borne by a minority population and/or low-income population, or

(2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population.

The FTA Circular 4703.1, *Environmental Justice Policy Guidance for Federal Transit Recipients* (August, 2012), establishes policies and procedures for the FTA to use in complying with EO 12898. The preliminary EJ evaluation has been conducted according to these procedures.

The FTA C 4703.1 accepts the definition of a minority as a person who is:

- American Indian and Alaskan Native, which refers to people having origins in any of the original peoples of North and South America (including Central America) and who maintains tribal affiliation or community attachment;
- Asian, which refers to people having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam;
- Black or African American, which refers to people having origins in any of the Black racial groups of Africa;
- Hispanic or Latino, which includes persons of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race; or
- Native Hawaiian or Other Pacific Islander, which refers to people having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

The FTA circular directs the use of the US Department of Health and Human Services (HHS) poverty guidelines to define low-income populations. For FTA EJ purposes, low-income is

defined as the population within an area whose median household income, based on household size, is at or below the HHS poverty guidelines. Income data for the 2010 Census is estimated annually through the American Community Survey (ACS) in 1-year, 3-year, and 5-year rolling periods at the Census Tract level and above. The ACS data are compared to the HHS poverty guidelines to help determine where low-income populations may be located. The ACS is now current through 2012. Poverty guidelines released in January 2012 correlate to the ACS median household income data reported through the end of 2012. However, as ACS also provides estimates of population under the poverty threshold for each census tract, this estimate was used to calculate percentage of population below the poverty line. The ACS reporting period from 2008-2012 was used for this analysis. In addition to providing estimates for the population under poverty threshold, ACS also tabulates this data based on race. Based on definition of minority in FTA C 4703.1, a percentage of minority population living under poverty was also calculated for each Census tract.

In accordance with EO 12898, the conceptual alignments were developed to avoid disproportionate adverse effects to minority and low-income populations and communities. Minority or low-income communities are groups of minorities or low-income persons who live in reasonably close proximity to one another. Census 2010 and ACS data were referenced for economic and racial composition information along the alignments. However, for consistency among the Census geographies in this analysis, tracts intersecting the ROW for the alignments, station and parking layouts were selected for evaluation of race and income.

The first step in the EJ analysis process was to define the geographic boundaries of the impacted areas and the comparison area for each segment. For the purpose of this analysis, the potentially affected area for each segment was defined as those census tracts that are adjacent to any proposed alignment. The comparison area is defined as Fulton County.

The next step was to identify the presence of minority and/or low-income populations within the impacted areas. The EJ populations adjacent to the alignment alternatives were identified through the following steps:

1) Identify communities at the census tract level that are adjacent to the proposed alignments.
2) Obtain geographic data for these adjacent communities (at the census tract level).
3) Use analysis tools (graphs, charts and GIS software) to display the location of the census tracts that are considered EJ communities.

The FTA C 4703.1 suggests that a minority population may be present if the EJ population percentage of the affected area is “meaningfully greater” than the EJ population percentage in the comparison area. For this analysis, “meaningfully greater” is defined with respect to the Fulton County average for each respective EJ indicator as defined in Table 4-17.

Table 4-17. Average Environmental Justice Indicators for Fulton County

EJ Population	Fulton County Average
Minority	57.7%
Low Income (below poverty threshold)	16.8%
Minority Below Poverty Threshold	24.6%

The following process was used to determine whether any areas intersecting the alignments met the EJ threshold:

- Racial information was collected for each Census tract along each alignment. The racial data included the total population and the total minority population. From these raw numbers, the minority population percentage was determined.
- After the baseline population percentage was determined for comparison purposes, specific tracts meeting the EJ threshold were identified. The EJ threshold for further analysis is met in either of the following cases:
    - Census tracts where the minority population equals or exceeds 50 percent of the population in that Census tract
    - Census tracts where the percentage of the minority population is at least 10 percent higher than the Fulton County average minority population
- Percentage of population below poverty threshold was calculated based on ACS data. The EJ threshold was assumed to be met for all tracts in which the percentage of population below poverty was higher than the Fulton County average.
- Percentage of minority population below poverty threshold was calculated based on ACS data. The EJ threshold was assumed to be met for all tracts in which the percentage of minority population below poverty was higher than the Fulton County average.

Unlike the other elements included within this environmental impact assessment, the Environmental Justice screening did not make a distinction between "High Range" and "Low Range" impacts because the slight shift in alignment did not result in the identification of new Census tracts that could potentially be impacted. The following subsections summarize the EJ analysis evaluated for income and racial characteristics of persons along each alignment. Full-page maps denoting potential EJ census tracts can be found in *Appendix H: Environmental Justice Maps*.

East Only HRT and BRT Alignments

As shown in Table 4-18, there are 10 census tracts along the HRT and BRT East Only alignments. Of these 10 census tracts, one low-income community, two minority communities, and one low-income minority community were identified. Census Tract 101.18 has the highest percent in poverty (20 percent), the highest percent of minorities (69 percent), and the second highest percent of minorities in poverty (23 percent). Census Tract 116.11 was the only geographic area that surpassed the low-income minority EJ threshold.

Table 4-18. EJ Census Tracts – East Only Alignment

Tract	STFID	Population for Whom Poverty Status Was Determined	Poverty	Percent Below Poverty	Crosses Poverty Threshold	Minority for Whom Poverty Status Was Determined	Percent Minority	Crosses Minority Threshold	Minority Below Poverty	Percent Minority Below Poverty	Crosses Minority Below Poverty Line Threshold
116.17	13121011617	7110	222	3%	No	1492	21%	No	16	1%	No
116.11	13121011611	6480	945	15%	No	3160	49%	No	806	26%	Yes
101.06	13121010106	3950	463	12%	No	969	25%	No	175	18%	No
114.11	13121011411	6555	468	7%	No	1400	21%	No	119	9%	No
114.12	13121011412	8644	221	3%	No	2288	26%	No	84	4%	No
116.19	13121011619	7002	142	2%	No	3996	57%	Yes	35	1%	No
116.21	13121011621	6544	223	3%	No	2278	35%	No	136	6%	No
116.18	13121011618	4053	88	2%	No	1187	29%	No	0	0%	No
101.18	13121010118	5018	980	20%	Yes	3459	69%	Yes	790	23%	No
101.22	13121010122	5402	471	9%	No	2641	49%	No	340	13%	No

West Only HRT and BRT Alignments

As shown in Table 4-19, there are 11 census tracts along the HRT and BRT West Only alignments. Of these 11 census tracts, three low-income communities, five minority communities, and four low-income minority communities were identified. Census Tracts 101.19 and 114.20 cross all of the thresholds established in this EJ analysis. It should be noted that Census Tracts 116.16 and 101.17 had minority populations that were just under 50% and thus were not designated as having crossed the minority EJ threshold.

Table 4-19. EJ Census Tracts – West Only Alignment

Tract	STFID	Population for Whom Poverty Status Was Determined	Poverty	Percent Below Poverty	Crosses Poverty Threshold	Minority for Whom Poverty Status Was Determined	Percent Minority	Crosses Minority Threshold	Minority Below Poverty	Percent Minority Below Poverty	Crosses Minority Below Poverty Line Threshold
116.16	13121011616	4866	189	4%	No	2430	50%	No	134	6%	No
116.11	13121011611	6480	945	15%	No	3160	49%	No	806	26%	Yes
114.05	13121011405	7535	702	9%	No	4210	56%	Yes	534	13%	No
101.23	13121010123	4483	632	14%	No	2302	51%	Yes	570	25%	Yes
101.19	13121010119	5101	1424	28%	Yes	3571	70%	Yes	1264	35%	Yes
116.14	13121011614	13515	1359	10%	No	5690	42%	No	1026	18%	No
114.20	13121011420	7578	2044	27%	Yes	6511	86%	Yes	1794	28%	Yes
101.20	13121010120	2009	218	11%	No	922	46%	No	106	12%	No
101.17	13121010117	2872	290	10%	No	1424	50%	No	165	12%	No
101.18	13121010118	5018	980	20%	Yes	3459	69%	Yes	790	23%	No
101.22	13121010122	5402	471	9%	No	2641	49%	No	340	13%	No

East-West-East HRT and BRT Alignments

As shown in Table 4-20, there are 14 census tracts along the HRT and BRT East-West-East alignments. Of these 14 census tracts, two low-income communities, five minority communities, and three low-income minority communities were identified. Census Tract 101.19 has the highest percent of low-income population (28 percent), minority population (70 percent) and minorities below poverty (35 percent). It should be noted that Census Tract 101.17 had a minority population that was just below 50% and thus was not designated as having crossed the EJ minority threshold.

Table 4-20. EJ Census Tracts – East-West-East Alignment

Tract	STFID	Population for Whom Poverty Status Was Determined	Poverty	Percent Below Poverty	Crosses Poverty Threshold	Minority for Whom Poverty Status Was Determined	Percent Minority	Crosses Minority Threshold	Minority Below Poverty	Percent Minority Below Poverty	Crosses Minority Below Poverty Line Threshold
116.17	13121011617	7110	222	3%	No	1492	21%	No	16	1%	No
116.11	13121011611	6480	945	15%	No	3160	49%	No	806	26%	Yes
114.05	13121011405	7535	702	9%	No	4210	56%	Yes	534	13%	No
114.11	13121011411	6555	468	7%	No	1400	21%	No	119	9%	No
114.12	13121011412	8644	221	3%	No	2288	26%	No	84	4%	No
101.23	13121010123	4483	632	14%	No	2302	51%	Yes	570	25%	Yes
101.19	13121010119	5101	1424	28%	Yes	3571	70%	Yes	1264	35%	Yes
116.19	13121011619	7002	142	2%	No	3996	57%	Yes	35	1%	No
116.21	13121011621	6544	223	3%	No	2278	35%	No	136	6%	No
116.18	13121011618	4053	88	2%	No	1187	29%	No	0	0%	No
101.20	13121010120	2009	218	11%	No	922	46%	No	106	12%	No
101.17	13121010117	2872	290	10%	No	1424	50%	No	165	12%	No
101.18	13121010118	5018	980	20%	Yes	3459	69%	Yes	790	23%	No
101.22	13121010122	5402	471	9%	No	2641	49%	No	340	13%	No

Center BRT within GDOT Managed Lanes Alignment

As shown in Table 4-21, there are 17 census tracts along the Center Lane BRT alignment alternative. Of these 17 census tracts, three low-income communities, six minority communities, and four low-income minority communities were identified. Census Tract 114.20 has the highest percent of minority population (86 percent) and Census Tract 101.19 has the highest percent of low-income population (28 percent) and minorities below poverty (35 percent). Both of these tracts cross all of the thresholds established for this EJ analysis. Census Tract 116.16 and 101.17 had a minority population that was just below 50% and thus were not designated as having crossed the EJ minority threshold.

Table 4-21. EJ Census Tracts – Center BRT within GDOT Managed Lanes Alignment

Tract	STFID	Population for Whom Poverty Status Was Determined	Poverty	Percent Below Poverty	Crosses Poverty Threshold	Minority for Whom Poverty Status Was Determined	Percent Minority	Crosses Minority Threshold	Minority Below Poverty	Percent Minority Below Poverty	Crosses Minority Below Poverty Line Threshold
116.16	13121011616	4866	189	4%	No	2430	50%	No	134	6%	No
116.17	13121011617	7110	222	3%	No	1492	21%	No	16	1%	No
116.11	13121011611	6480	945	15%	No	3160	49%	No	806	26%	Yes
114.05	13121011405	7535	702	9%	No	4210	56%	Yes	534	13%	No
101.06	13121010106	3950	463	12%	No	969	25%	No	175	18%	No
114.11	13121011411	6555	468	7%	No	1400	21%	No	119	9%	No
114.12	13121011412	8644	221	3%	No	2288	27%	No	84	4%	No
101.23	13121010123	4483	632	14%	No	2302	51%	Yes	570	25%	Yes
101.19	13121010119	5101	1424	28%	Yes	3571	70%	Yes	1264	35%	Yes
116.19	13121011619	7002	142	2%	No	3996	57%	Yes	35	1%	No
116.21	13121011621	6544	223	3%	No	2278	35%	No	136	6%	No
116.18	13121011618	4053	88	2%	No	1187	29%	No	0	0%	No
114.20	13121011420	7578	2044	27%	Yes	6511	86%	Yes	1794	28%	Yes
101.20	13121010120	2009	218	11%	No	922	46%	No	106	12%	No
101.17	13121010117	2872	290	10%	No	1424	50%	No	165	12%	No
101.18	13121010118	5018	980	20%	Yes	3459	69%	Yes	790	23%	No
101.22	13121010122	5402	471	9%	No	2641	49%	No	340	13%	No

The study area for the EJ analysis consists of census tracts along the proposed BRT and HRT alignment alternatives. Minority and low-income populations within the study area were identified using data from the 2010 U.S. Census and the 2008-2012 ACS Five-Year Estimates. Census data were collected at the tract level and compared to county-level and state-level data. Based on which side of the corridor the alignment would be located, demographic and socioeconomic data were then gathered for each series of Census tracts. Table 4-22, Minority and Low-Income Population Averages in the GA 400 Project Corridor, shows the minority and low-income population averages along each of the alignment alternatives. Based on the data collected, the study area has a population of 60,758 residents for the East Only alignments; 64,859 residents for the West only alignments; 78,808 residents for the East-West-East alignments; and 95,202 residents for the Center BRT within GDOT Managed Lanes alignment. Low-income populations in the study area range between seven and 14 percent, depending on the alignment, compared to 17 percent for Fulton County and the State of Georgia. Minority populations in the study area range between 38 percent and 56 percent, depending on the alignment, compared to 58 percent for Fulton County and 43 percent for the State of Georgia. The percent of the population that is minority and below the poverty threshold in the study area ranges between 11 percent and 21 percent, depending on the alignment, compared to 25 percent for Fulton County and 26 percent for the State of Georgia.

Table 4-22. Minority and Low-Income Population Averages in the GA 400 Project Corridor

Study Area	Population for Whom Poverty Status Was Determined	Poverty	Percent Poverty	Minority for Whom Poverty Status Was Determined	Percent Minority	Minority in Poverty	Percent Minority in Poverty
East Only HRT	60,758	4,223	7%	22,870	38%	2,501	11%
West Only HRT	64,859	9,254	14%	36,320	56%	7,529	21%
East-West-East HRT	78,808	7,026	9%	34,330	44%	4,965	14%
East Only BRT	60,758	4,223	7%	22,870	38%	2,501	11%
West Only BRT	64,859	9,254	14%	36,320	56%	7,529	21%
East-West-East BRT	78,808	7,026	9%	34,330	44%	4,965	14%
Center BRT within GDOT Managed Lanes	95,202	9,722	10%	44,240	46%	7,068	16%
Fulton County	899,589	151,055	17%	519,359	58%	127,674	25%
DeKalb County	679,527	126,343	19%	472,393	70%	108,228	23%
Georgia	9,448,393	1,645,272	17%	4,027,455	43%	1,040,531	26%

In summary, all of the alignments have EJ populations residing in adjacent census tracts below the Fulton County average. While the net effect of implementing this project will likely be positive for low-income and minority residents and businesses in terms of providing additional accessibility and mobility options and investment opportunities to disadvantaged communities, efforts should be taken throughout the implementation of the project to mitigate adverse impacts to these communities and to include these communities in the planning process.

4.3.2 Transportation Impacts

A qualitative assessment of potential impacts to roadways surrounding the potential transit station locations and access to existing proximate land uses was conducted to determine the relative effects of locating a transit station on the east side or west side of a GA 400 interchange. This section presents the results of the qualitative analysis of station locations.

GIS transportation data and aerial imagery were used to identify existing roadway geometries and proximate land uses. To gauge pedestrian accessibility and the existing built environment at future station locations, the Walkscore walkability index was retrieved for each of the five GA 400 interchanges. Walkscore is a private company that has developed a large scale, public access walkability index to any address in the US as well as other countries. Based on the number of amenities within one mile of an address and the actual distance to these sites,

Walkscore assigns a numerical score for a given location and a higher score is correlated with a higher degree of walkability.

Future alignments, station layouts and ingress/egress points, traffic counts, signal timings, and field observations will be needed to conduct more detailed analyses along with signal warrants and roundabout analyses to properly assess future intersection designs. This qualitative station impact analysis incorporates the AA HRT ridership projections for each station because the HRT alternatives are projected to attract more riders than BRT. Given the higher ridership, the use of the HRT projections represent a worst case scenario in terms of traffic impacts. The walk and drive access maps for each station for BRT and HRT are shown in *Appendix I: Mode Access Maps* and illustrate the volume and origin of walk and vehicular trips projected for each station.

4.3.2.1 Northridge Station

The AA ridership forecasts for the east side HRT alternative projected 786 walk trips and 536 drive trips to the Northridge Road station, with the majority of the drive and walk trips originating in the neighborhoods west of the proposed station location. The only Average Daily Traffic (ADT) available for Northridge Road interchange (to the west) is 23,010. Aside from Northridge Road, Roberts Drive is the only major roadway on the east side of the Northridge Road interchange. Major roadways on the west side of the interchange include Dunwoody Place and Roswell Road. Immediate local development along the east side of GA 400 is dominated by single-family homes while west side development consists of higher density multi-family residential complexes, retail, and office complexes. The Walkscore for the interchange was determined to be 51, meaning that the area is somewhat walkable with some errands able to be accomplished on foot.

There is currently a lack of access to the proposed east side station site from existing roadways, and thus an east side station would require the construction of additional roadways to access the site. One option would be to construct a roadway that diverges to the east from the existing GA 400 northbound Northridge Road on-ramp. Ingress and egress to this site would be difficult with this alignment, as all traffic would have to enter the site via the GA 400 on-ramp. This routing would likely negatively impact on-ramp performance and cause additional delays and queuing on Northridge Road bridge, and would require consideration as how to safely facilitate pedestrian and bicycle ingress and egress. Additional access could be provided off of Huntingdon Trail Road, which currently serves single family housing, but this would require several takings. Of all potential transit station locations analyzed within the corridor, ingress/egress for this site, regardless of mode, would likely be the most challenging.

In terms of the west side station location, roadway infrastructure already exists that would provide for station ingress and egress and the northwest quadrant of the interchange has been identified by the City of Sandy Springs as a future redevelopment node within the municipality's comprehensive plan. The drive access map in *Appendix I* illustrates that most of the projected 536 vehicles would likely travel east and then north or south along Roswell Road and would most likely use Northridge Parkway or Northridge Road and Dunwoody Place to access the site. It is recommended that local jurisdictions encourage the use of Northridge Parkway, as opposed to Northridge Road, for access to the proposed site and maintain Northridge Road for access to GA 400.

The model also estimates that 786 trips to the station will occur on foot, with most of these trips originating from the housing developments on Hightower Trail. While the area has adequate sidewalk infrastructure, additional improvements such as the following could be made:

- Construct sidewalks on both sides of local streets
- Provide additional access to office complexes for pedestrians
- Install bicycle infrastructure surrounding the station
- Ensure that signal timings accommodate the additional pedestrian flows

4.3.2.2 Holcomb Bridge Station

The AA ridership forecasts for the east side HRT alternative projected 1137 walk trips and 943 drive trips to the Holcomb Bridge station. The ADT on the east side of the Holcomb Bridge interchange is 40,870 and major roadways include Market Boulevard, Old Alabama Road, Kings Lane and Raintree Drive. The ADT on the west side of the interchange is 59,630 and major roadways include Old Dogwood Road, Dogwood Road and Old Holcomb Bridge Road. Out of all the station interchanges analyzed, Holcomb Bridge Road is, by far, the most congested. On the east side local development includes multi-family units and a shopping center with a Publix while the west side is occupied by single-family condominiums, a shopping plaza and two small office towers. The Walkscore for the Holcomb Bridge Road interchange at GA 400 is 46, which reflects the fact that this area is somewhat car dependent.

On the east side of GA 400, the Roswell Early Off-Ramp project, planned for the southeast quadrant of the interchange, is in the design phase. As part of this project, a roundabout will be placed to the southeast of the existing hotel at this site, and thus any station areas plans would need to consider these planned improvements. In addition, a wetland currently exists to the south of the existing hotel site. As noted previously, Holcomb Bridge Road is already severely congested. If only 200 of the 943 car access trips generated occur in a single hour, delays would likely be incurred due to already high volume to capacity ratios. Vehicular access to the east side station would likely occur at Raintree Drive and Market Boulevard. Sidewalk and pedestrian infrastructure on the east side is adequate, but additional improvements to the signal timing and bicycle infrastructure should be considered given the 1,143 projected walking trips generated by the station.

If the station were located on the west side of GA 400, drivers would likely use Dogwood Road to access the proposed station site, as Old Dogwood Road/Grimes Bridge Road does not continue across Holcomb Bridge Road. Further analysis would be needed to determine if additional vehicular and bicycle capacity enhancements would be required to facilitate these higher volumes on Dogwood Road and left-turn capacity at the Roswell Summit Parkway at Holcomb Bridge Road intersection. It is recommended that local jurisdictions coordinate to promote ingress to the station via both Old Holcomb Bridge Road and Dogwood Road/Roswell Summit Parkway to reduce queuing at each intersection.

Given the additional trips the station is projected to generate, a signal warrant analysis would likely be needed at the Old Dogwood Road/Grimes Bridge Road and Old Dogwood Road/Old Holcomb Bridge Road intersections. Facilitating vehicular station ingress from eastbound Holcomb Bridge and station egress to eastbound Holcomb Bridge will be the critical movements at this site because of the respective required left-turn movements. On the west side of GA 400 sidewalk infrastructure is adequate but lacking on some roads, such as Old Holcomb Bridge Road. Given the projected 1,100+ walk trips, pedestrian and bicycle facilities surrounding the station would likely need to be improved. Ideally, the surrounding bicycle and pedestrian facilities would be improved to better accommodate non-motorized access to the station.

4.3.2.3 Encore Parkway Station

The AA ridership forecasts for the east side HRT alternative did not contemplate a station at Encore Parkway but instead considered a station at the Mansell Road interchange. To

calculate the projected access trips for Encore Parkway, 70% of the Mansell Station trips and 30% of the North Point Mall Station trips from the previous model run were summed to form the Encore Parkway access volumes. The 70-30 ridership split is based on the fact that congestion on GA 400 during the AM peak period is worse in the southbound direction and the assumption that, knowing this, the majority of passengers would travel further north away from their ultimate destination to potentially realize additional travel time savings. Thus, 70% of the ridership from the previous station location closest to the south (Mansell Road) and 30% of the boardings from the previous station closest to the north (North Point Mall) were combined to yield the Encore Parkway ridership estimates. This operation resulted in 1,074 walk trips and 372 drive trips to the proposed Encore Parkway Station site, and the station access maps in *Appendix I* indicate similar access volumes from both the east and west of GA 400. Major local roadways on the east side include North Point Center and North Point Parkway. Major roadways on the west side include Westside Parkway and Fanfare Way. ADT data was not available for the Encore Parkway interchange. It should be noted that the September 2012 North Point LCI Five-Year Update includes the widening of Encore Parkway to accommodate two to three additional lanes of traffic. The Walkscore for the Encore Parkway interchange at GA 400 is 31, indicating that the station would be fairly car dependent. However, North Point Mall, the Mansell Crossing shopping center, the Verizon Wireless Amphitheater, condominiums, and suburban office complexes are all within walking distance.

The proposed east side station location is unique in that the station and parking facilities would be separated by Encore Parkway due to space limitations. If the station and parking were to be separated, a pedestrian bridge over Encore Parkway is recommended. The planned widening of Encore Parkway should provide capacity sufficient to accommodate the 372 drive trips generated by the station. Pedestrian access to the station could be enhanced via an easement between the current Mattress Firm and Macy's Furniture Gallery stores within Mansell Crossing; however, this would conflict with current freight access and more extensive modifications would likely be needed for a successful implementation. If the east side location was selected, then upgrades would be needed to promote pedestrian and bicycle access from the station to the existing shopping centers to the east, and a signal warrant for the parking and station access would be needed on Encore Parkway once station locations are finalized.

The west side station location site has been designated as a future transit station location within the North Fulton CID's Blueprint 2.0 Short Term Work Program. Two points of vehicular access to the parking area of this station would be provided on Encore Parkway and Westside Parkway. Further analysis would be needed to determine signal warrants, but given the existing signal spacing on these two facilities, it is likely that any added signal would be located on Westside Parkway south of Encore Parkway. Additional right-in right-out access could be provided on Encore Parkway opposite the existing Fanfare Way intersection. Adequate sidewalk and pedestrian facilities currently exist, although additional bicycle facilities could be added for bike access to the immediate surrounding businesses and land uses.

4.3.2.4 Old Milton Parkway Station

The AA ridership forecasts for the east side HRT alternative assumed a station location at North Point Mall and not Old Milton Parkway. Thus, applying a similar split as noted above for Encore Parkway, the station access volumes were calculated by assuming that 70% of the former North Point Mall Station trips would comprise the station access volumes at the proposed Old Milton Parkway Station. This operation resulted in a projected 843 walk trips and 263 drive trips to the Old Milton Parkway station. The ADT on the east side of Old Milton Parkway interchange is 45,590 and major roadways include Morris Road, North Point Parkway and Preston Ridge Road. The ADT on the west side is 36,490 and major roadways include West side Parkway and Kimball Bridge Road. It should be noted that the North Fulton CID Blueprint 2.0 includes the

provision of multimodal improvements along Old Milton Parkway that would serve both potential station sites. The Walkscore for the Old Milton Parkway interchange at GA 400 is 29, with the Avalon development, planned Gwinnett Technical College site, Northside Hospital, and suburban office complexes all within walking distance of the proposed station locations.

The ideal way to accommodate ingress/egress at the east side location would be to modify the existing signal at Old Milton Parkway and Morris Road that provides access to the existing Shell gas station and Waffle House. Under this scenario, both parcels would likely be considered as takes. Access could also be provided from the east via North Point Parkway; however, this would provide less direct access to the station for those coming from west of GA 400 and would likely require the installation of an additional signal. There is also what appears to be a utility road on the east side of GA 400 south of the proposed site that would need to be investigated.

On the west side of GA 400, the southwest quadrant would be the preferred site for a future transit station as the selected parcel is currently being held for the development of a future Gwinnett Tech campus. Given the uncertainty with regard to how the current owners plan to develop the campus, it is not guaranteed that the station area would be adjacent to the parking area. However, ensuring the development of the site in such a way as to accommodate for bus and vehicular access would be critical to the feasibility of locating a station in the southwest quadrant. It should be noted that the North Fulton CID Blueprint 2.0 contemplates the extension of Northwinds Parkway on the western edge of the selected parcel. Critical movements for the station would be westbound lefts for station ingress and northbound lefts for station egress. Both of these movements would be accommodated by the recent addition of a signal at the Avalon development. If station and parking are both located on the west side, then models will need to take into account the projected demand of Gwinnett Tech employee/student arrivals and projected station arrivals during the AM peak.

4.3.2.5 Windward Parkway Station

The AA ridership forecasts for the east side HRT alternative projected 419 walk trips and 1,890 drive trips to the Windward Parkway station. The ADT on the east side of the Windward Parkway interchange is 27,320 and major roadways include North Point Parkway, Morris Road and Dryden Road. The ADT on the west side is 41,690 and major roadways include West side Parkway/Deerfield Parkway, Morris Road and Cumming Street. As this station would serve as the northernmost termini, it is expected that Windward Parkway will attract the highest number of drive trips, many of which will originate north of the station in Forsyth County and points beyond. Because of these higher volumes of drive trips, greater consideration was given to direct access to and from GA 400. The Walkscore for the Windward Parkway interchange at GA 400 is 51. Local development includes an existing MARTA Park and Ride lot, suburban office complexes, and higher density development including multiple shopping plazas and large-scale commercial office facilities on the west side of GA 400.

A station on the east side of GA 400 would leverage existing MARTA property at the Windward Park-and-Ride lot, but would likely require the purchase of the parcel abutting Windward Parkway to house the large volume of cars projected to access the facility. The southeast quadrant of the interchange was designated as a future transit station site in the North Fulton CID Blueprint 2.0 work program and the plan envisions a roadway improvement near Dryden Road, which currently serves the Park and Ride lot. The relatively high number of vehicles accessing that station projected by the model suggests that additional left-turn bay capacity would need to be evaluated at North Point Parkway and Dryden Road, as there is currently only storage for five vehicles. Furthermore, it is likely that the additional traffic generated by the transit station would necessitate a signal at this junction. Additional left-turn bay capacity may also be needed at North Point Parkway and Morris Road to facilitate ingress/egress from the

south side of the station. In order to access local businesses along North Point Parkway, bicycle and pedestrian improvements should be implemented throughout the immediate station area and sidewalks should be provided on both sides of the road.

Due to its presence on the east side, the construction of a dedicated ramp into the southeast quadrant of this interchange from GA 400 southbound would be cost-prohibitive. However, were the station and parking to be located farther north on the east side of GA 400, a flyover ramp, similar to what was constructed for the North Springs Station, would be more feasible and provide a direct connection for southbound vehicles to access the station, with local access provided via Edison Drive.

While a west side location would not leverage the existing park and ride lot and property, it would more easily facilitate a direct connection from GA 400. However, egress to northbound GA 400 would likely be more difficult on the west side, as the likely route from the station to GA 400 would require accessing Morris Road and then three consecutive left-turns (Deerfield Parkway, Windward Parkway, GA 400) to travel north. The existing signal at Deerfield Parkway / Morris Road Extension currently has two left-turn lanes and a west-to-north right-turn bay. Further analysis would be needed to determine if the existing left-turn bays have the capacity necessary to accommodate the significant volumes of automobiles and buses that would be leaving the station. The same analysis could also be applied to the Deerfield Parkway at Windward Parkway southbound left-turn movement. In terms of non-motorized access, bicycle facilities could be added along Morris Road to facilitate access to the office complexes in the more immediate vicinity.

4.3.3 Capital Cost Estimates

4.3.3.1 Methodology

In order to provide order-of-magnitude capital cost estimates for each of the seven alignment alternatives analyzed, the previous unit cost figures for the base year 2013, which were grouped in terms of FTA's 10 Standard Cost Categories, were utilized to calculate updated costs based on the new alignment alternatives developed in this preliminary engineering effort. *Appendix J: Cost Estimates Addendum* outlines the unit costs utilized and also provides detailed, full-page cost estimates for each alignment alternative.

In determining how to apply the unit costs to the alignment alternatives, a conscious effort was made to provide for a direct comparison between these preliminary cost estimates and the previous estimates developed within the AA. Cost categories for which the AA did not previously set aside funding and for which the current analysis does not designate funding include:

- Trackage Elements – including switches, turnouts, and vibration and noise dampening
- Joint Development
- Support Facilities, including an administration building, vehicle maintenance facility, yards, storage or maintenance of way
- Site Structures, including retaining and sound walls
- Traffic signals and crossing protection

To convert the base year 2013 dollars into Year of Expenditure (YOE) dollars, these cost estimates used the same ratio that was applied to each standard cost category within the AA. The assumed YOE is 2028.

All cost categories and design elements used the same assumptions for each technology as the previous AA estimates, aside from the differences outlined below. First, the cost of developing a three-story parking deck was incorporated into these estimates to reflect the space constraints noted at the Holcomb Bridge Road interchange with GA 400. Previous AA alternatives did not propose any multi-story parking structures. Next, the cost of constructing a bridge over the Chattahoochee River was explicitly included in the current estimates, as it was not readily apparent that this design element was incorporated into the previous cost estimates. Additionally, as the West Only and East-West-East alignments required the use of an aerial flyover south of Spalding Drive, the cost of this design element was incorporated into the current estimates. None of the alternatives within the AA proposed a transition to the west side of GA 400 and thus did not include costs related to flyovers within the previous estimates. Additionally, costs related to the second west-to-east underground crossover south of Holcomb Bridge Road were also accounted for in the East-West-East alignment costs. The Center BRT alternative required the inclusion of two new cost elements into the estimates – a flyover ramp providing access the east side station at Windward Parkway and pedestrian bridges to carry passengers over the GA 400 traffic and onto the BRT platforms. Finally, the AA estimates included costs to cover the procurement of 42 heavy rail vehicles and eight units of spare parts. The implementation of any of these alternative alignments would likely require the purchase of additional transit vehicles. As the level of procurement is dependent on the development of detailed operating plans, which is not included within the scope of this work, the costs of vehicle procurement have been excluded for all alternative alignments in order to provide for consistent comparison.

In terms of property takings, two sets of rules were applied based on whether the parcel would be taken for purposes of the alignment or a station location. For the alignment takings, parcels that would be impacted by the alignment and which currently appear vacant were considered as partial takes. Parcels that would be impacted by the alignment and which are currently occupied were considered as full takes. For the station takings, the majority of the parcels were considered as full takes. However, there were two commercial properties near Holcomb Bridge Road that were considered as partial takes as the station area would only encroach along the landscaped edges of these parcels. In terms of relocation costs, displacement costs were only paid to parcels that were considered as full takes. Based on previous AA cost estimates for each technology, the same ratio between the total value of land taken and the total amount paid for relocation expenses was applied to calculate the relocation expenses that would be awarded to the impacted property owners along each alignment alternative.

As the previous estimates had relatively low costs for category 60.01 (Purchase or Lease of Real Estate) given the current land values along the GA 400 corridor, an additional cost category, 60.03 (ROW Acquisition Cost), was included within these cost estimates. This item was calculated by determining the number of acres of land that would be taken based on each section type's running length (in linear feet) and its typical section width. The value of land was then generated for each section type by multiplying the total acreage devoted to the alignment by the ARC Planning and Cost Estimation Tool's figure for the average price of real estate in North Fulton (e.g. $700,000 per acre). The value listed under 60.03 reflects the estimated cost to acquire the ROW that would house the transit alignment and stations.

These preliminary engineering cost estimates include an unallocated contingency of 30% of the total constructions costs. The AA assumed an unallocated contingency of 5% of the total construction costs. The extra unallocated contingency was included based on industry experience in planning-level studies and should provide for cost estimates that are highly conservative.

4.3.3.2 Comparison of Costs for Alternative Alignments

Table 4-23 and Table 4-24 summarize the Low Range and High Range total capital costs (in 2028 YOE dollars) for each of the HRT and BRT alignment alternatives that were analyzed as part of this preliminary engineering effort. A summary discussion of the differences between these alignment alternatives is presented after the tables. *Appendix J: Cost Estimates Addendum* provides a summary and a complete listing of the unit costs that were utilized to prepare the cost estimates for each of the seven alignment alternatives analyzed in this report.

Table 4-23. Cost Estimate Summary for HRT Alternative Alignments

Alignment	East Only HRT		West Only HRT		East-West-East HRT	
Case	Low	High	Low	High	Low	High
Construction Subtotal (10-50)	$1,277,604,309	$1,278,364,942	$1,284,094,852	$1,285,626,008	$1,285,158,616	$1,285,670,722
60 ROW, LAND, EXISTING IMPROVEMENTS	$135,712,075	$351,852,715	$146,161,695	$236,920,277	$146,004,645	$246,284,505
80 PROFESSIONAL SERVICES (applies to Categories 10 - 50)	$283,014,237	$283,137,539	$284,664,986	$285,556,846	$284,183,937	$284,148,425
Subtotal (10 - 80)	$1,696,330,621	$1,913,355,197	$1,714,921,533	$1,808,103,131	$1,715,347,197	$1,816,103,652
90 UNALLOCATED CONTINGENCY (applies to Categories 10 - 80)	$463,207,536	$533,145,834	$468,851,102	$498,798,966	$468,921,374	$501,380,782
100 FINANCE CHARGES	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000
TOTAL PROJECT COST (10 - 100)	**$2,167,538,157**	**$2,454,501,031**	**$2,191,772,634**	**$2,314,902,096**	**$2,192,268,571**	**$2,325,484,434**

Table 4-24. Cost Estimate Summary for BRT Alternative Alignments

Alignment	East Only BRT		West Only BRT		East-West-East BRT		Center BRT within GDOT Managed Lanes
Case	Low	High	Low	High	Low	High	Same
Construction Subtotal (10 - 50)	$363,020,607	$340,415,682	$387,765,235	$370,100,440	$458,489,025	$419,495,454	$252,977,419
60 ROW, LAND, EXISTING IMPROVEMENTS	$160,209,887	$332,313,415	$143,308,891	$262,225,011	$148,951,619	$261,477,535	$56,689,862
80 PROFESSIONAL SERVICES (applies to Categories 10 - 50)	$99,009,368	$92,254,813	$99,256,083	$94,498,487	$99,337,929	$92,614,173	$96,977,052
Subtotal (10 - 80)	$622,239,862	$764,983,911	$630,330,209	$726,823,939	$706,778,574	$773,587,162	$406,644,334
90 UNALLOCATED CONTINGENCY (applies to Categories 10 - 80)	$177,730,524	$225,206,457	$178,833,163	$211,082,425	$199,031,974	$223,068,353	$115,519,279
100 FINANCE CHARGES	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000
TOTAL PROJECT COST (10 - 100)	**$807,970,386**	**$998,190,367**	**$817,163,371**	**$945,906,364**	**$913,810,547**	**$1,004,655,515**	**$530,163,613**

4.3.3.3 Comparison of Costs Relative to Previous AA Estimates

The Low Range preliminary engineering cost estimates for the East Only HRT and East Only BRT alignment alternatives are roughly 33% and 71% greater than the AA figures. While these are significant cost increases, the majority of the discrepancy is tied to the increase in unallocated contingency from 5% to 30%. When the unallocated contingency is held consistent at 5%, the Low Range cost estimates for the preliminary East Only HRT and East Only BRT alignment alternatives are only 9% and 39% greater than the AA estimates for a similar alignment. The relative cost increase for the East Only BRT alignment alternative can be attributed to substantial increases within category 60 (ROW, Land, and Existing Improvements) and a slight increase in total running length. The High Range estimates for the East Only HRT and East Only BRT alignment alternatives are approximately 50% and 111% greater than the previous AA estimates. The dramatic difference is a function of the increase in unallocated contingency, as well as the inclusion of additional ROW costs that result from having to acquire new land outside of the GA 400 ROW. If the unallocated contingency is held consistent, then the High Range costs for the East Only HRT and East Only BRT alignments are 23% and 71% higher than the AA estimates for similar alignment alternatives.

4.3.3.4 Factors Influencing Costs

Differences between cost estimates for each of the seven alignment alternatives were fundamentally influenced by the following factors:

- Section type running length
- Station locations
- Use of flyovers
- Use of existing ROW
- Choice of Technology

The section type running length reflects the type of guideway and trackage that will be used to carry the transit vehicle along its alignment. In terms of guideway, underground operations are the most costly, followed by aerial operations. Relative to at-grade operation, the unit costs for the guideway are orders of magnitude higher for underground tunnel and aerial section types (see Table J-1 in *Appendix J: Cost Estimates Addendum*). In terms of trackage for the HRT alternatives, at-grade section types assume Ballasted track while the aerial and underground tunnel section types use Direct Fixation track. The unit cost of Direct Fixation is 88% higher than the unit cost of Ballasted track. Thus, alignment alternatives that minimized underground and aerial operations had relatively lower capital costs.

The station location and its associated topographic profile determine the station type that will be developed at the interchange (e.g. aerial, at-grade, or underground), thereby influencing the amount of land that would need to be taken to house the station, as well as the need for escalators and elevators. In terms of station type costs, underground operations are the most costly, followed by aerial operations. Relative to an at-grade station, the unit costs for station development are substantially higher for the underground and aerial station types (see Table J-1 in *Appendix J: Cost Estimates Addendum*). In terms of land takings, the at-grade and aerial station types required an extra half acre of land relative to the underground station type. Depending on the geometry of the specific parcels that the station would occupy, the construction of at-grade or aerial station types would be relatively more expensive than building an underground station type in terms of land takings, as these station types included additional acreage for a buffer area. Elevators and escalators are required for all aerial, underground, or

Center BRT At-grade stations, which increases the overall capital costs by almost $1.9 million (in YOE dollars) per station. Thus, the alignment alternatives that minimized the construction of underground and aerial station types had relatively lower capital costs.

The use of flyovers increases the overall capital costs for alternatives using the West Only and East-West-East alignments. In each of the four alignment alternatives, the flyover south of Spalding Drive adds another $14.6 million (YOE dollars) worth of structural elements to the total capital costs in addition to the cost increases related to the use of Aerial guideway and Direct Fixation trackage for aerial section types. Thus, given identical station types and section type running lengths, the East Only alignment alternatives would be relatively cheaper than the alternatives using the West Only and East-West-East alignments. The underground crossover south of Holcomb Bridge Road adds another $287,000 (YOE) worth of structural elements for the East-West-East HRT alignment alternative and another $20.9 million (YOE) worth of structures for the East-West-East BRT alignment alternative. The substantial difference between the costs for the HRT and BRT alternatives using the East-West-East alignment was due to the fact that all HRT alternatives require the use of a tunnel section. Thus, in the HRT case only the incremental increase in tunnel length due to the west-to-east transition was considered. The East-West-East BRT alignment alternative was the only BRT alternative that required a tunnel section and thus the entire length of the tunnel was considered. The Center BRT alignment alternative also includes a $13.9 million aerial ramp to access the Windward Parkway station area from GA 400.

The use of existing ROW decreases the overall capital costs by avoiding increases in land acquisition and relocation expenses. Within Section 60 (ROW, Land and Existing Improvements) the High Range case's need to acquire new ROW outside of GA 400 results in a 159% increase in costs ($216 million) relative to the Low Range cost for the East Only HRT alignment alternative. In the case of the West Only HRT alignment alternative, the High Range cost is 62% ($90 million) greater than the Low Range cost for Section 60. Thus, the implementation of GDOT managed lanes could have a significant impact on the overall project cost. Additionally, given that the majority of the guideway for the Center BRT alternative would already be provided in the form of the GDOT's managed lanes, the Section 10 (Guideway & Track Elements) cost is reduced by 87% relative to the High Range East Only BRT alignment alternative because of the use of existing guideway.

The technology chosen dictates the level of investment required to carry the transit vehicle along its alignment. In terms of capital costs, this translates into higher costs for the HRT technology due to the need to construct additional elements, such as trackage, train control and signals, and traction power systems. In comparing the differences in cost between similar alignments, the estimated High Range cost increase for HRT relative to BRT is 146% for the East Only alignment, 145% for the West Only alignment and 132% for the East-West-East alignment. Thus, the choice of technology had the most profound effect in terms of differentiating overall costs between the seven alignment alternatives.

4.3.3.5 Comparison of Costs for BRT Alignment Alternatives

In terms of High Range total capital costs for the BRT alternatives, the Center BRT alternative was the least costly at roughly $530 million. The majority of the Center BRT alternative's ROW would be developed by GDOT and only minimal takings would be necessary to implement this alignment. By housing the transit alignment within the GA 400 ROW, this alternative avoided significant cost increases related to the acquisition of private property outside of the existing GA 400 ROW. Thus, this alternative experienced significant cost savings within the Section 10 (Guideway & Track Elements) and Section 60 (ROW, Land, and Existing Improvements) cost categories. The total capital cost estimate for the Center BRT alignment alternative was 12%

above the previous AA estimate for the East Only BRT alignment but was nearly 44% less than the next lowest cost alternative (West Only BRT).

The West Only BRT alignment alternative had an estimated capital cost of around $946 million and was the least costly of the non-managed lanes alternatives analyzed. Despite the use of the east-to-west crossover, the West Only BRT alternative was still less expensive than the East Only BRT alignment alternative because its Section 60 costs were $70 million lower. As a result of not crossing over, the East Only BRT alignment alternative had the shortest total running length which resulted in lower overall construction costs relative to the other non-managed lanes BRT alternatives. However, this alternative had the second highest takings costs of all alternatives analyzed and thus had a higher overall capital cost. The East Only BRT's takings costs were so large that the capital cost of the East-West-East BRT alignment alternative, which uses two crossovers, was only $6.5 million higher than the East Only alignment.

4.3.3.6 Comparison of Costs for HRT Alignment Alternatives

In terms of total capital costs for the High Range HRT alternatives, the West Only HRT alignment alternative was the least costly at approximately $2.315 billion. As all HRT alternatives used the same technology, the differences in costs between these alternatives were mainly due to differences in station locations, the use of flyovers, and the value of the land that would need to be acquired. The estimated High Range capital costs for the East-West-East and West Only HRT alignment alternatives only differed by roughly $10.5 million. This difference is attributed to the fact that the East-West-East alignment had a takings cost that was $10 million greater. Given that the East Only HRT alignment did not use any crossovers, it was expected that this alternative would have the lowest capital cost; however, this alternative had the highest estimated capital cost. Despite the savings in construction and structural costs, the East Only HRT alternative had the highest Section 60 costs ($352 million) of all alternatives analyzed and also included two expensive underground stations while all other HRT alternative only included one.

5 Summary of Key Findings

5.1 Summary of Impacts

Table 5-1 and Table 5-2 summarize each HRT and BRT alignment alternative's performance across three areas of concern – Transportation Impacts, Environmental Impacts and Capital Cost. The individual measures of effectiveness that were used to generate the evaluation tables are listed below. While some of these measures relied on quantitative data, this evaluation should be viewed as a qualitative assessment, especially with respect to transportation impacts. A series of detailed, text-based tables that explain the reasoning behind each of the numerical scores seen in the tables below is provided in *Appendix K: Impacts Summary*.

- Transportation Impacts
  - Station accessibility using existing transportation network
  - Impacts to transportation network surrounding station area
  - Percentage of population and jobs within a half-mile radius of interchange that are located on the same side of the corridor as the station
  - Proximity to attractors
  - Consistency with feedback from PSC and public meetings
  - Consistency with existing plans
- Environmental Impacts
  - Total number of displacements
  - Acres of directly impacted wetlands
  - Acres of directly impacted parklands
  - Level of direct and indirect impacts to community facilities
  - Environmental Justice Populations
- Capital Cost
  - Total estimated capital cost

It should be noted that a relative evaluation was performed for the Low Range case followed by a separate relative evaluation for the High Range case. A high numerical score (highlighted in red) represents relatively high levels of potential impact compared to the other alternatives while a low numerical score (highlighted in green) reflects an expected lower level of potential impact than those projected for the other alternatives. In general an alignment alternative's score within a given category remained the same in both cases, reflecting a similar level of impact in both cases relative to the other alternatives. Within the displacements and parklands impact categories, however, the scores for some alternatives varied between the two cases. This variation across the two cases reflects an increase (e.g. numerical score becomes higher) or decrease (e.g. numerical score becomes lower) in the alternative's level of impact within a given category relative to the impacts anticipated for the other alternatives.

Table 5-1. Summary of Preliminary Engineering for HRT Alternative Alignments

Area Of Concern	Element	East Only HRT		West Only HRT		East-West-East HRT	
	Case	Low	High	Low	High	Low	High
TRANSPORTATION IMPACTS	**Aggregate Transportation Impacts**	**2**	**2**	**1**	**1**	**0**	**0**
ENVIRONMENTAL IMPACTS	Displacements	1	1	0	1	0	2
	Wetlands	2	2	0	0	2	2
	Parklands	1	1	0	0	0	0
	Community Impacts	1	1	2	2	0	0
	Environmental Justice Impacts	0	0	2	2	1	1
	Aggregate Environmental Impacts	**1**	**1**	**1**	**1**	**0**	**1**
CAPITAL COST	**Total Estimated Capital Cost**	**2**	**2**	**2**	**2**	**2**	**2**
OVERALL AGGREGATE SCORE		**5**	**5**	**4**	**4**	**2**	**3**

Table 5-2. Summary of Preliminary Engineering for BRT Alignment Alternatives

Area Of Concern	Element	East Only BRT		West Only BRT		East-West-East BRT		Center BRT within GDOT Managed Lanes	
	Case	Low	High	Low	High	Low	High	Low	High
TRANSPORTATION IMPACTS	**Aggregate Transportation Impacts**	**2**	**2**	**1**	**1**	**0**	**0**	**0**	**0**
ENVIRONMENTAL IMPACTS	Displacements	2	1	1	2	0	2	2	0
	Wetlands	1	1	0	0	1	1	2	2
	Parklands	1	1	1	0	1	0	2	2
	Community Impacts	1	1	2	2	0	0	2	2
	Environmental Justice Impacts	0	0	2	2	1	1	2	2
	Aggregate Environmental Impacts	**1**	**0**	**1**	**1**	**0**	**0**	**2**	**2**
CAPITAL COST	**Total Estimated Capital Cost**	**1**	**1**	**1**	**1**	**1**	**2**	**0**	**0**
OVERALL AGGREGATE SCORE		**4**	**3**	**3**	**3**	**1**	**2**	**2**	**2**

5.2 Advantages and Disadvantages of Alignment Alternatives

This section discusses the relative strengths and weaknesses of each alignment alternative analyzed under the High Range impacts case.

5.2.1 East Only HRT

The East Only HRT alignment alternative performed well in terms of minimizing impacts to environmental justice populations within the GA 400 corridor. This alternative was tied for the lowest number of EJ census tracts potentially impacted, with potential adverse effects to one low-income community, two minority communities and one low-income minority community. The East Only HRT alternative had the highest impact to wetlands (0.57 acres) of any alignment alternative analyzed. For the remaining elements within the Environmental Screening category, the East Only HRT alternative received a medium score, as it would result in the third lowest number of displacements at 278 (268 residential, five commercial, one industrial and four other), direct impacts to 0.79 acres of parklands (Chattahoochee River National Recreation Area and Don White Memorial Park), and potential direct impacts to two local schools (Davis Academy, Dunwoody Springs Elementary School, Woodland Elementary School) and indirect impacts to one private college (University of Phoenix – Atlanta campus).

The East Only HRT alternative's differentiating weakness is related to the Transportation Impacts category. In terms of station accessibility and impacts to the surrounding transportation

network, this alternative underperformed at the east side stations at Northridge Road station and Encore Parkway. The east side Northridge Road station site currently lacks access to Northridge Road and the existing transportation network on the east side of GA 400 is minimal, as Northridge Road does not connect to points further east. The east side Encore Parkway site is located between the retail centers and the GA 400 corridor, thus creating a relatively constrained operating environment for transit, especially for the feeder buses. This alternative would serve the lowest percentage of residents (31%) and jobs (44%) within a half-mile of each station's interchange with GA 400. The East Only HRT alignment alternative did not perform well with respect to the Cost category, as it had the highest estimated capital cost of all alternatives analyzed.

This alternative serves neither a west side station at Northridge Road, which was identified as the preferred location by members of the public and the PSC, nor a west side station at Encore Parkway, which was designated as a future transit station site within the North Fulton Blueprint 2.0 Short-Term Work Program. Therefore, the East Only HRT alignment alternative did not perform well relative to maintaining consistency with existing plans and incorporating feedback from members of the public and the PSC. In terms of its overall aggregate score, the East Only HRT alignment alternative received a five and had the worst rating of the alignment alternatives analyzed.

5.2.2 West Only HRT

The West Only HRT alignment alternative performed well in terms of minimizing impacts to wetlands and parklands and received a medium score for its aggregate environmental impacts. The West Only HRT option also had the smallest total area of directly impacted wetlands at 0.03 acres. This alternative was tied for the smallest total area of impacted parklands at 0.38 acres, spread across the Chattahoochee River National Recreation Area and Riverside Park. This alignment alternative would result in 316 total displacements (305 residential, nine commercial, and two industrial)).

The West Only HRT alignment alternative received a medium rating for the Transportation Impacts category. Although this option would serve the highest percentage of residents within the corridor (69%) and a substantial proportion of total jobs (56%), the medium performance was mainly due to potential station ingress/egress issues for west side stations at Holcomb Bridge, Old Milton, and Windward Parkway. At Holcomb Bridge and Windward Parkway access into the station from the east side of GA 400 is hindered by the fact that passengers must travel west past the station site and then make three right-turns. Thus, in order to arrive back at the main arterial upon exiting the station, passengers would need to make three left-turns given the existing roadway network. At Old Milton Parkway, traffic on the west side of GA 400 at Old Milton Parkway is expected to increase substantially due to the development of Avalon and the future Gwinnett Technical College campus.

The West Only HRT alignment alternative scored poorly in terms of potential impacts to community facilities and EJ populations. This alternative was tied for the second worst score for community facilities impacts and would potentially cause direct impacts to two colleges (Gwinnett Technical College – Alpharetta campus and DeVry University – Alpharetta campus) and potential indirect impacts to Sandy Springs Middle School. The West Only HRT alternative had the second highest number of environmental justice communities that would potentially be impacted by a future transit expansion, including three low-income communities, five minority communities and four low-income minority communities. Additionally, the West Only HRT alignment alternative had the third highest estimated capital cost of the alternatives analyzed and thus did not perform well with respect to the Cost category. It should be noted, however, that this option had the lowest cost of all HRT alternatives analyzed. In terms of overall

aggregate score, the West Only HRT alignment alternative received a four and earned a medium rating.

5.2.3 East-West-East HRT

The East-West-East HRT alignment alternative performed well overall, especially with respect to the Transportation Impacts category. In terms of transportation impacts, the East-West-East HRT alternative would serve the highest proportion of proximate jobs (60%) and would reach 43% of the proximate population. Unlike the other HRT alignments, this alternative would provide service to a west side Northridge station and an east side Windward Parkway station, both of which are consistent with feedback gathered from the public and the PSC. Potential hindrances to station accessibility and impacts to the surrounding transportation network were identified at the east side Encore Parkway station site. As mentioned above for the East Only HRT alignment alternative, the available area between the GA 400 corridor and the rear of Mansell Crossing is minimal and thus transit operations could be constrained at this station location. The East-West-East HRT alternative received the best ratings of all HRT alternatives within the Transportation Impacts category.

Aside from the strong performance within the Transportation Impacts category, the East-West-East alternative's primary strength lies in its minimization of potential impacts to community facilities. The alternative was tied for the least amount of impacts to community resources, as only one local school (Sandy Springs Middle School) would be indirectly impacted by the transit alignment. Additionally, the East-West-East HRT alternative was tied for the least amount of direct impacts to parklands at 0.38 acres across the Chattahoochee River National Recreation Area and Riverside Park. In terms of impacts to EJ populations, the East-West-East HRT alternative would result in a medium-level of impact, potentially causing adverse impacts to two low-income communities, five minority communities and three low-income minority communities. This option had the second largest area of directly impacted wetlands (0.49 acres). In terms of displacements, this alternative would result in the third highest number of displacements with a total of 384 (377 residential, four commercial, two industrial and one other). The East-West-East HRT alignment alternative earned a medium ranking for its aggregate environmental impacts.

Like all other HRT alignment alternatives, the East-West-East HRT had relatively high capital costs compared to the BRT alternatives. However, this option was only $10.5 million more than the lowest cost HRT alignment alternative. In terms of overall aggregate score, the East-West-East HRT alignment alternative received a three and earned a medium ranking. This alternative performed the best overall out of the HRT alignment alternatives analyzed.

5.2.4 East Only BRT

The East Only BRT alignment alternative was the one of two alternatives analyzed that received a strong aggregate score within the Environmental Impacts category. This option's strength lies in its ability to minimize potential impacts to EJ populations. As with the East Only HRT alternative, this alignment would potentially generate adverse impacts to one low-income community, two minority communities and one low-income minority communities within the study area.

The East Only BRT alignment alternative received medium scores for the majority of the other Environmental Impacts metrics, as well as for the Cost category. This alternative would result in 126 displacements (117 residential, four commercial, one industrial and four other), which is the second lowest number of displacements among the alternatives analyzed.. This option would cause direct impacts to 0.36 acres of wetlands. This alignment would also result in the second most direct impacts to parklands with a total of 0.98 acres of parklands affected within the

Chattahoochee River National Recreation Area. This alternative would result in direct impacts to two local schools (Dunwoody Springs Elementary and Woodland Elementary) and potential indirect impacts to one private college (University of Phoenix – Atlanta). In terms of the Cost category, the East Only BRT alignment alternative had the third lowest estimated capital cost of all alternatives analyzed.

As was the case in the East Only HRT alignment alternative, the East Only BRT alternative's differentiating weakness is related to the Transportation Impacts category. In terms of station accessibility and impacts to the surrounding transportation network, this alternative underperformed at the east side stations at Northridge Road station and Encore Parkway. The east side Northridge Road station site currently lacks access to Northridge Road and the existing transportation network on the east side of GA 400 is minimal, as Northridge Road does not connect to points further east. The east side Encore Parkway site is located between the retail centers and the GA 400 corridor, thus creating a relatively constrained operating environment for transit, especially for the feeder buses. This alternative would serve the lowest percentage of residents (31%) and jobs (44%) within a half-mile of each station's interchange with GA 400. Additionally, as this alternative serves neither a west side station at Northridge Road, which was identified as the preferred location by members of the public and the PSC, nor a west side station at Encore Parkway, which was designated as a future transit station site within the North Fulton CID Blueprint 2.0 Short-Term Work Program, the East Only BRT alignment alternative did not perform well relative to maintaining consistency with existing plans and incorporating feedback from members of the public and the PSC. In terms of overall aggregate score, the East Only BRT alignment alternative received a three and earned a medium rating.

5.2.5 West Only BRT

The West Only BRT alignment alternative excelled with respect to its potential impacts to wetlands and parklands. In terms of wetlands impacts, this option had the second smallest total area of directly impacted wetlands at 0.04 acres. Additionally, the West Only BRT alternative would only impact a total of 0.45 acres of parklands at the Chattahoochee River National Recreation Area and Riverside Park.

Within the Transportation Impacts category, the West Only BRT alignment alternative received a medium rating. Despite the fact that this option would serve the highest percentage of residents within the corridor (69%) and a substantial proportion of total jobs (56%), the medium performance was mainly due to potential station ingress/egress issues for west side stations at Holcomb Bridge, Old Milton, and Windward Parkway. At Holcomb Bridge and Windward Parkway access into the station from the east side of GA 400 is hindered by the fact that passengers must travel west past the station site and then make three right-turns. Thus, in order to arrive back at the main arterial upon exiting the station, passengers would need to make three left-turns given the existing roadway network. At Old Milton Parkway, traffic on the west side of GA 400 at Old Milton Parkway is expected to increase substantially due to the development of Avalon and the future Gwinnett Technical College campus. This alternative also received a medium ranking for the Cost category, as it had the second lowest estimated capital cost.

Within the Environmental Impacts category, the West Only BRT alignment alternative received three poor ratings which is the second worst performance within this area of concern. Despite using roughly the same alignment as the West Only HRT alternative, this option would generate the second highest number of displacements, with a total of 409 parcels impacted (398 residential, nine commercial, and two industrial). The alternative was also tied for the second worst score for community facilities impacts, potentially causing direct impacts to two colleges

(Gwinnett Technical College – Alpharetta campus and DeVry University – Alpharetta campus) and indirect impacts to Sandy Springs Middle School. The West Only BRT alternative had the second highest number of EJ communities that would potentially be impacted by a future transit expansion, including three low-income communities, five minority communities and four low-income minority communities. In terms of overall aggregate score, the West Only BRT alignment alternative received a three and earned a medium rating.

5.2.6 East-West-East BRT

The East-West-East BRT alignment alternative was tied for the best aggregated score within the Transportation Impacts category and also fared well within the Environmental Impacts category. Unlike the East Only and West Only BRT alignments, this alternative alignment would adequately respond to public and PSC feedback by providing service to a Northridge west side station and a Windward Parkway east side station. This option would serve the highest proportion of proximate jobs (60%) and would reach 43% of the proximate population. It should be noted that potential hindrances to station accessibility and impacts to the surrounding transportation network were identified at the east side Encore Parkway station site. As stated previously, the available area between the GA 400 corridor and the rear of Mansell Crossing is minimal and thus feeder bus operations could be constrained at this station location.

In terms of the Environmental Impacts category, the East-West-East BRT alternative was one of two alternatives to receive a strong score for its aggregate environmental impacts. This option received strong ratings for its potential impacts to parklands and community facilities within the study area. This option would generate direct impacts to 0.45 acres of parklands at the Chattahoochee River National Recreation Area and Riverside Park. This alternative was tied for the least amount of impact to community facilities and would potentially cause direct impacts to one local school (Sandy Springs Middle School). The East-West-East BRT alternative received a medium rating for the wetlands and environmental justice impacts metrics. This option would cause direct impacts to 0.34 acres of wetlands and would potentially generate adverse impacts to two low-income communities, five minority communities and three low-income minority communities. In terms of displacements, this option received a poor score as it had the highest number of displacements among all of the alternatives analyzed. The East-West-East BRT alignment alternative would generate displacements at a total of 475 properties (469 residential, three commercial, two industrial and one other).

Within the Cost category, the East-West-East BRT alignment alternative received a poor rating. The estimated capital cost for this BRT alignment was just over one billion dollars which represents a substantial investment regardless of the technology chosen, but especially in terms of a bus expansion project. While this alternative had the highest capital cost of all BRT alternatives, the cost was still substantially lower than any of the HRT alternatives analyzed. In terms of overall aggregate score, the East-West-East BRT alignment alternative was tied for the best performance with a rating of two.

5.2.7 Center BRT within Future GDOT Managed Lanes

The Center BRT alignment alternative was the only option analyzed that performed well within both the Transportation Impacts and Cost categories. In terms of Transportation Impacts, this alternative's relative strength lies in its choice of station locations. The Center BRT alternative essentially follows the East-West-East alignment but serves a west side station at Encore Parkway. For the East-West-East alignment alternatives station accessibility and traffic impacts to surrounding roadways were noted at the east side Encore Parkway site. As the Center BRT option avoids the east side, this alternative performs even better than the East-West-East alignment alternatives. Additionally, the Center BRT alignment alternative was the only

alternative analyzed that would serve three station sites supported by the public, the PSC and existing plans within the study area – Northridge west side, Encore Parkway west side, and Windward Parkway east side. This alternative would directly serve 43% of the proximate population and 56% of the proximate jobs. However, this alternative would provide access to the North Point activity center, Avalon and the future Gwinnett Technical College campus that is relatively less proximate than any of the other alignment alternatives.

In terms of the Cost category, the Center BRT alignment alternative had the lowest estimated capital cost. As this alternative would primarily utilize ROW and lanes that would be cost-shared with GDOT, the Center BRT option stands to realize substantial cost reductions within Section 10 (Guideway and Track Elements) and Section 60 (ROW, Land, and Existing Improvements) relative to the other alignment alternatives.

The Center BRT alignment alternative was the only option analyzed that received poor scores in four out of the five elements included within the Environmental Impacts category and was also the only alternative analyzed that received a poor score for its aggregate environmental impacts. The relatively low scores were primarily a function of impacts related to the widening of GA 400 that would be required to introduce GDOT's managed lanes. The Center BRT alternative received a strong score for the displacements metric because the majority of its ROW needs would already be housed within the existing GDOT ROW and thus only minimal takings would be necessary to implement this alternative. This option would displace a total of 20 parcels (13 residential, three commercial, three industrial, and one other); which is orders of magnitude lower than the next least impactful alternative (East Only BRT with a total of 126 displacements). However, the Center BRT alternative received a poor score for its potential impacts to wetland areas, as it had the largest area of directly impacted wetlands (2.30 acres) and all of the impacts would occur at the Chattahoochee National Recreation Area. The alternative would result in the greatest amount of potential impact to community facilities. Direct impacts are anticipated at two local schools (Dunwoody Springs Elementary School and Woodland Elementary School) and one private college (University of Phoenix – Atlanta campus) and potential indirect impacts would occur at another private college (DeVry University – Alpharetta campus). Finally, this alternative would potentially result in the greatest amount of adverse impacts to environmental justice communities, affecting three low-income communities, six minority communities and four low-income minority communities. Despite its poor performance within the Environmental Impacts category, the Center BRT alignment alternative was tied for the best overall aggregate score with a rating of two.

5.3 Key Findings

This section presents key findings related to each of the three analysis categories in the evaluation above and also discusses general themes that emerged during the course of this preliminary engineering analysis.

5.3.1 Evaluation Findings

Within the **Transportation Impacts** analysis category, the Center BRT alternative had the best overall performance primarily due to its choice of station locations, followed closely by the East-West-East alignment alternatives. Two ideal station locations were identified by members of the public and the PSC – Northridge (west side) and Windward Parkway (east side). The North Fulton CID Blueprint 2.0 Short-Term Work Program also designated the west side of the Encore Parkway interchange as a designated future transit station site. While the East-West-East alignments would serve the west side Northridge and east side Windward Parkway stations, the Center BRT alignment alternative is the only option that would provide service to all three

recommended station sites. The East-West-East alignment alternatives would utilize two of the recommended station sites – Northridge (west side) and Windward Parkway (east side).

In terms of the built environment, the East Only, West Only, and East-West-East alignment alternatives would provide proximate service to either Avalon/Gwinnett Technical College or the North Point activity center while the Center BRT alternative would not provide proximate access to either of the activity centers. The West Only alignment alternatives would provide the greatest level of proximate access to transit stations, serving 69% of corridor residents located within a half-mile of the station locations. The East-West-East alignment alternatives would provide proximate access to 60% of all jobs located within a half-mile of the station locations.

In terms of station accessibility and potential impacts to the surrounding transportation network, potential issues were identified at the following station sites: Northridge east side (lack of existing transportation network), Holcomb Bridge west side (multiple turning movements for ingress/egress), Encore Parkway east side (potential constraints due to small area between GA 400 and retail centers) and Old Milton Parkway west side (potential for large increase in traffic volumes due to Avalon and Gwinnett Technical College). The Center BRT alternative would only serve one of these sites while the East Only, West Only, and East-West-East alignments would each serve two of these problem station sites.

For the **Environmental Impacts** category, the East-West-East BRT and East Only BRT alternatives had the best overall performance, followed closely by the East-West-East HRT alternative. The Center BRT alignment is the only alternative analyzed that received poor ratings for four of the five environmental impact elements due to the impacts of associated with the widening of GA 400. However, the Center BRT alternative would result in the fewest displacements (20) while the East-West-East BRT alternative would result in the most displacements (475). The West Only alignment alternatives received the strongest scores in terms of minimizing impacts to wetland areas while the East Only HRT alignment alternative would result in the largest area of directly impacted wetlands. In terms of impacts to parklands, the East Only alignment alternatives had a weaker performance than the West Only and East-West-East alignments because of the impacts at the Chattahoochee National Recreation Area and Don White Park. However, the Center BRT alternative would cause the greatest impact to parklands, with direct impacts to a total of 2.30 acres of parklands within the Chattahoochee National Recreation Area. The East-West-East alignment alternatives received the strongest scores in terms of minimizing impacts to community facilities. This relatively low level of impact was driven by the use of the crossovers, with the east-to-west crossover avoiding impacts to local schools on the east side near Northridge Road and the west-to-east crossover avoiding impacts to two colleges located between Kimball Bridge Road and Old Milton Parkway (Gwinnett Technical College – Alpharetta campus and DeVry Univesity – Alpharetta campus). Given that the majority of the minority, low-income, and low-income minority Census tracts are located on the west side of the corridor, the East Only alignment alternatives minimized adverse impacts to EJ populations by not crossing over.

As expected, a given alignment alternative's performance within the **Capital Cost** category was fundamentally influenced by its choice of technology. The BRT alternatives were substantially cheaper than the HRT alternatives. The Center BRT alternative had the lowest estimated capital cost primarily due to its use of guideway that would be cost-shared with GDOT. The East-West-East BRT alignment alternative had the highest capital cost of the BRT alternatives because of its use of crossover structures; however, it was only $6.5 million more than the East Only BRT alignment alternative which did not use any crossovers. The relatively small difference in total capital costs for the East Only and East-West-East BRT alternatives was driven by the East Only alignment's high takings costs. Despite not utilizing crossovers, the East Only HRT alignment alternative had the highest estimated capital cost of all alternatives analyzed due to

its use of the more expensive heavy rail technology and the fact that its takings costs were substantially higher than all other HRT alternatives analyzed. The relative increase in takings costs for the East Only HRT was enough to outweigh the additional structural costs for the crossovers included in the West Only and East-West-East HRT alignment alternatives.

5.3.2 General Findings

In comparing the itemized capital costs for the High Range East Only, West Only and East-West-East alignment alternatives, the cost of implementing a crossover accounts for a small percentage of the overall capital cost of the alignment alternative. The structural cost of the 0.24 mile east-to-west aerial flyover south of Spalding Drive was roughly $14.6 million (YOE dollars). While this increased the cost of structural components for the West Only and East-West-East alignments relative to the East Only alignment, this incremental increase accounted for less than 1% of the total estimated capital cost for both HRT alignment alternatives and around 1.5% of the total estimated capital cost for both BRT alignment alternatives.

As a result of the HRT technology's grade constraints, all HRT alignment alternatives would utilize an underground tunnel section to slowly increase elevation north of the Chattahoochee River and south of Holcomb Bridge Road. Therefore, to properly define the cost impact of using the west-to-east crossover for the HRT alignment alternatives, only the incremental increase in tunnel length between the West Only and East-West-East alignments (18 feet) was considered. The use of the underground west-to-east crossover south of Holcomb Bridge Road only increased the structural cost of the East-West-East HRT alignment by approximately $287,000 relative to the West Only HRT alignment alternative. Thus, the slight increase in tunnel length at Holcomb Bridge Road for the East-West-East HRT alignment alternative did not result in a substantial cost increase. When taken together, the structural costs for the east-to-west aerial and west-to-east underground crossovers account for around 1.5% ($14.8 million) of the total estimated capital cost for the East-West-East HRT alignment alternative.

As the grade requirements for the BRT technology are less constrained than those of HRT, only the East-West-East BRT alignment alternative included an underground tunnel section. Thus the incremental impact due to the west-to-east underground crossover for the BRT case considers the entire length of the tunnel (0.25 miles). The use of the underground west-to-east crossover increased the structural cost of the East-West-East BRT alignment by $20.9 million (YOE dollars) relative to the East Only and West Only BRT alignment alternatives. This increase in structural cost due to the second underground crossover accounts for 2% of the East-West-East BRT alignment alternative's total estimated capital cost. When taken together, the structural costs for the east-to-west aerial and west-to-east underground crossover account for around 3% ($35.5 million) of the total estimated capital cost for the East-West-East BRT alignment alternative.

In the Low Range case, for any given alignment, the BRT alternatives would cause a greater number of displacements than the HRT alternatives. This is primarily a function of the different section type widths used by the two different technologies. For all section types, BRT utilizes a standard 52-foot width that is substantially larger than all HRT section types with the exception of the underground tunnel. Thus, in general, BRT required slightly more room to operate on a given alignment than HRT. This resulted in greater ROW costs and additional residential displacements for the BRT alternatives relative to the HRT alternatives using similar alignments in the Low Range case.

For the High Range case, however, there was no discernible difference between the displacements generated by a given technology operating along the same alignment. This was because all alternatives would require substantial land takings due to the need to operate

outside of the existing GA 400 ROW and the fact that the geometry of the individual parcels that would be acquired varies based on which side of the corridor a particular alignment would operate. The High Range case's need to acquire new ROW outside of the GA 400 corridor would result in a dramatic increase in the number of residents and businesses that would be negatively impacted by the transit project relative to the Low Range case. Thus, the costs related to acquiring land and compensating those displaced would be substantially greater in the High Range case.

Depending on the alignment, the increase in takings costs between the Low Range and High Range case ranges from $90 million for the West Only HRT alignment alternative to $216 million for the East Only HRT alignment alternative. These increases in takings costs account for 73% and 75% of the difference in costs between the Low Range and High Range estimates for the West Only HRT and East Only HRT alignment alternatives, respectively. The costs related to takings for the High Range HRT alignment alternatives range from approximately 7% (West Only HRT) to 11% (East Only HRT) of the total estimated capital costs. For all alignments, the cost of takings is greater for the BRT technology than the HRT technology. The costs related to takings for the High Range BRT alignment alternatives range from 8% (Center BRT) to 24% (East Only BRT) of the total estimated capital cost.

In comparing the itemized capital costs for the High Range East Only, West Only and East-West-East HRT alignment alternatives, the cost of acquiring land and paying relocation expenses to residents and businesses comprised a greater percentage of the total estimated capital costs than the use of crossovers. The East Only HRT alternative, which did not use crossovers, was still $129 million more than the closest HRT alternative (East-West-East). Thus, for the HRT technology, the cost of crossing over should not be viewed as a limiting factor.

For the BRT alternatives, a similar trend was observed. The West Only BRT alignment alternative had a construction cost that was $30 million greater than the East Only alignment; however, the West Only alignment saved $70 million in takings cost relative to West Only. The West Only BRT alternative had a capital cost that was $52 million lower than the East Only alternative. Despite the fact that the construction cost for the East-West-East BRT alignment alternative was approximately $80 million more than the East Only BRT alternative, the total capital cost for the East-West-East BRT alternative was only $6.5 million higher than the East Only BRT alternative. However, as the PSC has recommended an alternative crossover location north of Holcomb Bridge Road, which would likely avoid the use of an expensive underground crossover, it is likely that in subsequent analyses the East-West-East BRT alternative would be less expensive than the East Only BRT alignment alternative.

Regardless of the alignment chosen or the technology operated, the feeder bus system that will be used to support this transit expansion would benefit heavily from the construction of a proximate bus maintenance facility within the corridor. Currently, buses operating within the study area must deadhead to Perry Garage for vehicle maintenance. As the distance between the Perry Garage and the North Springs MARTA station is roughly 15 miles, substantial resources could be saved by creating an additional service facility near GA 400.

For the BRT alignment alternatives, substantial alteration of the existing North Springs MARTA station would likely be required. The current station area is relatively constrained and introducing additional vehicles that are operating small headways would likely result in inefficient operations for the new BRT service and potential indirect impacts to local bus services.

6 Recommendation for the LPA

Early Scoping efforts, technical analysis, and stakeholder input compiled as a result of this preliminary evaluation have informed the recommendation for a preferred technology and alignment for the GA 400 corridor. This section presents a recommendation for the LPA based on the feedback received during the November PSC meeting and the findings and conclusions contained within this report.

6.1 PSC Recommendation

A meeting with the PSC was held on November 19, 2014 at the North Fulton CID offices in Alpharetta. The purpose of the meeting was to present the evaluation results summarized in this report and to facilitate a discussion related to a preferred technology and alignment for the GA 400 corridor. The PSC engaged in dialogue surrounding the project schedule, implementation, and construction; ridership, costs, and revenue forecasts of the alternatives; and planning aspects of the GDOT Managed Lanes project. The PSC then used this discussion to reach a consensus on technology and the alignment alternative.

The PSC members recommended HRT as the preferred technology. Despite the potentially lower costs, shorter implementation time, especially in the GDOT Managed Lanes, and enhanced flexibility of BRT, the PSC ultimately did not view this option any differently than the existing GRTA Xpress bus or MARTA bus services that operate in the corridor. At the September PSC meeting, the phasing from BRT to HRT was discussed with the BRT potentially operating in future GDOT Managed Lanes. However, there was consensus that a BRT to HRT phased approach might result in substantial sunk costs depending on the alignment alternative that was selected. At the November meeting, the PSC restated their desire to develop a plan for a long-term transit investment in the GA 400 corridor. The following list presents the rationale for selecting the HRT technology over the BRT technology.

- Funding that would be used to implement the initial BRT service could be utilized to fund a longer term, more permanent investment of transit in the GA 400 corridor.
- The GA 400 corridor is comprised of higher-income, choice riders who would likely not ride a bus.
- HRT ridership projections were higher than the BRT ridership projections.
- HRT is the only technology that would not impose a transfer penalty for people connecting from the existing heavy rail service.
- HRT would make use of infrastructure and vehicles that already exist and are in operation.

While the PSC suggested HRT, they noted that, if the DEIS requires the analysis of a lower-cost alternative, then the Center BRT within GDOT Managed Lanes should be considered. Otherwise, the PSC recommended that the BRT technology option not be carried forward.

Regarding alignment, the PSC suggested that the East-West-East alignment is preferred as it is more favorable to local economic development. The alignment would have two crossovers – one south of Spalding Drive (east-to-west) and another north of Holcomb Bridge Road (west-to-east). The east-to-west crossover south of Spalding Drive would avoid impacts to the Northridge community and schools in the area. The PSC stated that the west-to-east crossover should be located north of Holcomb Bridge Road in order to avoid interfering with an upcoming redevelopment project located in the southeast quadrant of the Holcomb Bridge interchange. As this crossover location was not studied within this analysis and the East Only and East-West-

East alignment alternatives presume a station within the southeast quadrant, additional analysis can occur during the DEIS to incorporate this change. Given that locating the crossover south of Holcomb Bridge Road would take advantage of an underground tunnel that would already be required for all HRT alignment alternatives, this change in crossover location is likely to increase the total capital cost.

The PSC also proposed that the actual station locations be incorporated into the LPA recommendation. During both meetings, multiple members of the PSC expressed anxiety over the limited availability of land that could be used for future transit station development. New development is anticipated on some of the quadrants identified as potential station locations within this preliminary analysis. The PSC believes that it is imperative that MARTA indicate its preference of station locations in an expedited manner so that municipal officials can adequately respond to development proposals within the corridor.

6.2 PER Recommendation for LPA

On January 8, 2015, MARTA staff presented the results of the additional technical studies and stakeholder input to the PER Committee of the MARTA Board. Based on a combination of technical analysis and public comments, the PER Committee adopted the staff recommendation:

- The LPA be studied in a future DEIS will consist of a heavy rail transit alternative (referred to as East-West-East HRT) that would be constructed on fixed guideway and cross to the west side of GA 400 north of North Springs Station and south of Spalding Drive. This alternative would have a second crossover north of the Chattahoochee River, which would be determined in the future DEIS.
- Given funding uncertainties, a BRT alternative operating on the East-West-East alignment will be studied (hereinafter referred to as East-West-East BRT). This alignment would be constructed in dedicated ROW in the same alignment as described above for East-West-East HRT.
- Given the potential for cost sharing and agency coordination, a BRT in a future GDOT managed lane project (hereinafter referred to as BRT in GDOT Managed Lanes) will be studied in the DEIS as a lower cost comparative alternative. A future agreement would need to be reached for MARTA to operate BRT in any future GDOT managed lane project within the Georgia 400 corridor.

A resolution with the PER recommendation will be presented to the MARTA Board on March 6, 2015 for approval.

6.3 Rationale for Advancing East-West-East HRT as the LPA

Upon review of the results and key findings included in this preliminary engineering analysis, the East-West-East HRT alternative is the preferred option. Unlike the other alignments, the East-West-East alignment would not impose any direct impacts to community facilities (schools, fire, police, etc.) proximate to the transit alignment because of its use of two crossovers. Every other alignment would generate direct impacts to at least two local schools or colleges. Although the East-West-East alignment's environmental justice impacts score was in the mid-range of the four alignments considered, it was only surpassed by the East Only alignment which would cause direct impacts to two elementary schools and one private college and would also have the highest takings costs of all alternatives analyzed. For both technologies, the East-West-East alignment was tied for the least amount of direct impacts to parklands within the GA 400 corridor and the HRT alternative was tied for the least amount of impact overall.

The East-West-East alignment would result in the highest number of displacements for the HRT and BRT technologies. However, aside from the Center BRT alternative, all High Range alignment alternatives would require the taking of hundreds of properties within the corridor, as there would not be any remaining ROW available inside of GA 400. The East-West-East HRT alternative would result in 91 fewer displacements than the East-West-East BRT alternative. The East-West-East HRT alternative had the second lowest total value of takings among the non-managed lanes alternatives ($162.5 million). Although the East-West-East HRT alignment alternative would result in the third largest area of directly impacted wetlands (0.49 acres), this would still be a relatively minor level of impact.

In terms of transportation impacts, the East-West-East alignment scored favorably compared to the other alignment options with respect to providing proximate access to jobs surrounding the corridor; maintaining consistency with public and PSC feedback related to station locations (serves both Northridge west side and Windward Parkway east side); and providing proximate access to major attractors such as the North Point activity center. Additionally, this alignment would provide for adequate station accessibility using the existing transportation network and would have lower traffic impacts relative to the other alignments.

For each alignment, the cost of the HRT technology is substantially greater than the cost of the same alignment operating BRT technology. If the costs estimated as part of this analysis are removed from the assessment of the alternatives, then the East-West-East HRT's overall aggregate score across the transportation impacts and environmental impacts assessed would only be surpassed by the East-West-East BRT alignment alternative. However, the PSC has stated its preference for HRT. Furthermore, the PSC has emphasized that if a transit investment is to be made at all within the corridor, then the project chosen should be able to consistently deliver benefits even decades into the future. The East-West-East HRT alternative performed well overall and, despite its use of two crossovers, this alignment alternative was within $10.5 million of the lowest cost HRT alternative. Given that one of the primary goals of the GA 400 project is to improve mobility and access in and along the corridor, the East-West-East HRT alignment alternative is preferred over the East-West-East BRT alignment alternative, despite the higher capital costs, because it would likely result in higher transit ridership and additional travel time savings, thereby potentially reducing the number of vehicular trips and enhancing non-motorized access within the corridor. Thus, the East-West-East HRT alignment alternative is recommended as the preferred technology and alignment for the GA 400 corridor.