



APPENDIX C

Transportation Supporting Information



Memorandum

■
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St. Paul, Minnesota
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Date: November 6, 2013

To: File

From: JoNette Kuhnau, PE (MN), PTOE

Subject: Connect Cobb Corridor At-Grade BRT Analysis

The purpose of this memorandum is to summarize the evaluation of the feasibility of at-grade transitway operations in support of the Connect Cobb Corridor Environmental Assessment. The background of the evaluation, assumptions, operations results, and recommendations are described in the following sections.

Background

The Locally Preferred Alternative (LPA) for the Connect Cobb project was identified in the Alternatives Analysis finalized in December 2012. See **Appendix A** for map of the LPA. The Alternatives Analysis included grade separation of the transitway alignment above the roadway intersection at the following 10 locations along the alignment (listed from north to south):

1. US 41 (Cobb Parkway) at McCollum Parkway/Cobb International Boulevard
2. US 41 (Cobb Parkway) at Ernest Barrett Parkway
3. US 41 (Cobb Parkway) at N. Marietta Parkway/SR 120
4. US 41 (Cobb Parkway) at Roswell Road/SR 120
5. US 41 (Cobb Parkway) at S. Marietta Parkway/SR 120
6. US 41 (Cobb Parkway) at Windy Hill Road
7. US 41 (Cobb Parkway) at Cumberland Boulevard/Windy Ridge Parkway
8. Cumberland Boulevard at Spring Road
9. Cumberland Boulevard at Cumberland Parkway/Mall Driveway
10. US 41/Northside Drive at 17th Street

The proposed grade separations identified in the Alternatives Analysis were based on a screening level of assessment of existing traffic operations and forecast traffic volumes. The project is now in the Environmental Assessment phase, and a more detailed evaluation was completed to verify whether the intersections should continue to be proposed as grade separations or whether at-grade intersections would be operationally feasible, based on potential benefit as well as potential cost.

Assumptions

The Alternatives Analysis documents an expected vehicular traffic growth rate of 1.6 percent per year to 2040 (equivalent to 56 percent growth over the forecast horizon) based on the ARC Plan 2040 Travel Demand Model. The existing PM peak hour traffic volumes on Cobb Pkwy and intersecting roadways are shown in **Table 1**, along with the estimated hourly roadway capacities, and forecast PM peak hour volumes based on the 1.6 percent growth rate.

Since the roadways in the study area would not be able to deliver these forecast volumes to the intersections, an alternative approach to the future traffic volumes was considered. Other studies in the project area and recent trends in traffic volumes would suggest that a 1.0 percent per year growth rate (equivalent to 32 percent growth over the forecast horizon) may be more realistic, and the resulting 2040 forecast volumes using this growth rate are also shown in the last column of **Table 1**. Volumes that are approaching capacity (volume/capacity ratio of 0.88-1.00) are shaded orange, and volumes that are over the roadway capacity are shaded red.

Note that for the remainder of this memorandum, the scenario using the 1.6 percent per year growth rate will be referred to as the “High Growth” scenario, and the scenario using the 1.0 percent per year growth rate will be referred to as the “Medium Growth” scenario.

Table 1. Existing and Forecast PM Peak Hour Traffic Volumes

Roadway Segment	Existing (2012) PM Peak Hour Volume	Planned Future Roadway Geometry	Estimated Future Peak Hour Capacity ¹	Forecast 2040 PM Peak Hour Volume – High Growth Scenario	Forecast 2040 PM Peak Hour Volume – Medium Growth Scenario
US 41 (Cobb Pkwy)					
McCollum Pkwy/ Cobb International Blvd to N. Marietta Pkwy/SR 120	2,440	4-lane divided	3,220	3,810	3,220
N. Marietta Pkwy/SR 120 to S. Marietta Pkwy/SR 120	2,270	4-lane divided	3,220	3,540	3,000
S. Marietta Pkwy to Windy Hill Rd	2,780	6-lane divided	4,880	4,340	3,670

¹ Source: Florida DOT Quality/Level of Service Handbook. Capacity estimates for Urbanized areas.

Roadway Segment	Existing (2012) PM Peak Hour Volume	Planned Future Roadway Geometry	Estimated Future Peak Hour Capacity ¹	Forecast 2040 PM Peak Hour Volume – High Growth Scenario	Forecast 2040 PM Peak Hour Volume – Medium Growth Scenario
Windy Hill Rd to Windy Ridge Pkwy	2,900	6-lane divided	4,880	4,520	3,830
McCullum Pkwy	1,270	4-lane divided	2,900	1,980	1,680
Cobb International Blvd	300	4-lane undivided	2,750	470	400
Barrett Pkwy	2,140	5-lane divided	3,650	3,340	2,820
N. Marietta Pkwy/ SR 120	1,470	4-lane undivided	3,060	2,290	1,940
Roswell Road/ SR 120					
East of Cobb Pkwy	1,390	5-lane undivided	3,460	2,170	1,830
West of Cobb Pkwy	980	2-lane undivided	1,480	1,530	1,290
S. Marietta Pkwy/ SR 120	1,650	6-lane divided	4,880	2,570	2,180
Windy Hill Road	2,400	4-lane undivided	2,750	3,740	3,170
Cumberland Blvd/ Windy Ridge Pkwy	1,360	4-lane divided	2,900	2,120	1,800
Cumberland Blvd	2,080	4-lane divided	2,900	3,240	2,750
Spring Rd	2,580	5-lane undivided	3,460	4,020	3,410
Cumberland Pkwy	670	4-lane undivided	2,750	1,050	880
Mall Driveway	2,050	4-lane divided	2,900	3,200	2,710
US 41/Northside Dr	2,940	4-lane divided	3,220	4,590	3,880
17 th St	1,580	4-lane divided	2,900	2,460	2,090

The volumes in Table 1 indicate that without significant capacity improvements, which are not currently planned or programmed, many of the roadways and intersections in the study area would not be able to accommodate the High Forecast traffic volumes to the intersections being analyzed during the peak hour. Therefore the analysis of the High Growth scenarios may not be representative of what would be expected in the 2040 conditions, since the forecast volumes would not be able to reach the analysis intersections. Therefore, in order to evaluate the potential range of operations under varying growth scenarios as well as assess the feasibility of the forecast traffic volumes and need for grade separation of the transitway, traffic analysis was conducted for both the High Growth and Medium Growth scenarios.

Due to the preliminary nature of the transitway alternatives at this phase of the project development, a number of other assumptions were also made in the analysis as documented in the following.

Analysis Intersections

Five representative intersections were initially selected for the analysis:

- US 41 (Cobb Parkway) at Roswell Road/SR 120
- US 41 (Cobb Parkway) at S. Marietta Parkway/SR 120
- US 41 (Cobb Parkway) at Windy Hill Road
- US 41 (Cobb Parkway) at Cumberland Boulevard
- Cumberland Boulevard at Spring Road

The proposed geometric layouts for the five intersections analyzed are provided in **Appendix B**.

Modeling Scenarios

- All analysis was completed in VISSIM because of the software's ability to specifically model transit operations, including transit schedule, station stops, and traffic signal preemption.
- Six scenarios were modeled for each intersection:
 - 2012 No Build – Geometrics as shown in the attached figures, existing PM peak hour turning movement volumes, and existing traffic signal phasing.
 - 2012 Build – Geometrics as shown in the attached figures and existing PM peak hour turning movement volumes. Transitway crosses the intersection at-grade with preemption, i.e., the transit vehicles are always given a green signal phase and do not stop at the intersection. Only Preemption operations were modeled for the Build conditions, as this would produce the greatest transit benefit and allow the BRT system to operate similarly to the grade-separated option.

- 2040 No Build Medium Growth – Geometrics as shown in the attached figures, 2040 forecast PM peak hour turning movement volumes based on 1.0 percent per year growth, and existing traffic signal phasing.
- 2040 No Build High Growth – Geometrics as shown in the attached figures, 2040 forecast PM peak hour turning movement volumes based on 1.6 percent per year growth, and existing traffic signal phasing.
- 2040 Build Medium Growth – Geometrics as shown in the attached figures and 2040 forecast PM peak hour turning movement volumes based on 1.0 percent per year growth. Transitway crosses the intersection at-grade with preemption.
- 2040 Build High Growth – Geometrics as shown in the attached figures and 2040 forecast PM peak hour turning movement volumes based on 1.6 percent per year growth. Transitway crosses the intersection at-grade with preemption.
- Only PM peak hour was modeled, based on availability of existing (2012) turning movement count data.

Traffic Signal Operations

- In the Build scenarios, all mainline left-turn movements that turn from parallel to the guideway across the guideway must have protected-only phasing due to the conflict with the through transit vehicles.
- 2012 and 2040 signal timings were based on the existing phasing and timings provided by Pond and Company from existing Synchro files, with left-turn phasing changed to protected-only where necessary.
- Transit signal priority was assumed to consist of early green and extended green to serve the transit phase. No phase omits were assumed. Transit signal priority was not modeled as part of these scenarios, but could be considered in the future.
- The preemption operations assume that the transitway phase will also operate concurrently with the compatible through movements.
- The transitway crossings were assumed to be controlled by the signals only, without use of automatic gates.
- Roadway speed limits were assumed to be the same as existing conditions.

Transit Operations

- The transit assumptions were based on the information contained in Table 5-11 of the Alternatives Analysis for Alternative 4b (Bus Rapid Transit).
 - Maximum transitway speed of 35 mph.
 - Transit headways of 8 minutes in each direction.

Geometrics

- The geometrics as shown in **Appendix B** were used for the future year modeling.
- At several locations, the initial round of Build scenario modeling using the geometrics as shown in Appendix B resulted in poor operations with BRT operating at-grade. Therefore, additional improvements, such as turn lanes, were

identified at these intersections, and further modeling was conducted to determine if these capacity improvements could be implemented to avoid the need for grade separation. The geometric improvements included as part of the Build Improved scenario are proposed on a conceptual level only. Further analysis and evaluation would be needed before these improvements are incorporated into the project, and therefore the potential improvements in this scenario have not been included in the exhibits shown in Appendix B. These improvements were modeled only for the Build Improved scenario and are as follows:

- US 41 (Cobb Parkway) at Roswell Road/SR 120
 - Construct second northbound left-turn lane along Cobb Parkway
 - Construct second receiving lane along the Roswell Road westbound leg departing intersection for approximately 500 feet
 - Construct exclusive westbound right-turn lane and reconfigure Roswell Road approach as: right-turn lane, through lane, dual left-turn lanes
- US 41 (Cobb Parkway) at Cumberland Boulevard/Windy Ridge Parkway
 - Construct second northbound left-turn lane along Cobb Parkway
 - Construct second westbound left-turn lane along Windy Ridge Parkway
- Cumberland Boulevard at Spring Road
 - Increase northbound left-turn lane storage along Cumberland Boulevard to 500 feet
 - Increase southbound left-turn lane storage along Cumberland Boulevard to 250 feet
 - Construct second eastbound left-turn lane along Spring Road

Results

VISSIM software was used to analyze the five intersections for each of the scenarios because of its ability to model traffic and transit operations. The results for each of the analysis scenarios are presented in **Table 2**. The results reflect the average of 10 one-hour runs.

The standard used for mitigation of traffic operations impacts is to mitigate to LOS D, or to the No Build LOS if the intersection operates at LOS E or LOS F in the No Build conditions.

It should be noted that the US 41 (Cobb Parkway)/Windy Hill Road intersection is planned to be reconstructed (by others) as a grade-separated interchange prior to 2040. Therefore, capacity improvement measures, such as turn lanes, have not been analyzed for this location.

Localized intersection capacity improvements, such as turn lanes, were not analyzed for the High Growth scenario. Even with these improvements, there would not be sufficient capacity on the approach roadways to allow the forecast traffic volumes to be delivered to the intersection from the upstream roadways and intersections. Additional geometric and operational improvements would need to be explored to maintain the No Build LOS with an at-grade transitway, if the High Growth forecast is to be used as the basis for the design.

Table 2. PM Peak Hour Operations Results

Intersection	Intersection Level of Service						
	Existing (2012)		2040 High Growth Scenario		2040 Medium Growth Scenario		
	No Build	Build	No Build	Build	No Build	Build	Build Improved
US 41 (Cobb Parkway) at Roswell Rd/SR 120	D	D	F	F	D	F	D*
US 41 (Cobb Parkway) at S. Marietta Parkway/SR 120	D	D	D	E	D	D	D
US 41 (Cobb Parkway) at Windy Hill Road	D	E	F	F	E	F	F
Cumberland Boulevard at Spring Road	D	D*	F	F	E	F	E*
US 41 (Cobb Parkway) at Windy Ridge Parkway/Cumberland Boulevard	D	D	F	F	D	F	D*

* With additional capacity improvements as listed in previous section.

Findings

The High Growth scenario does not appear to produce reasonable forecasts for the peak hour, as significant mainline capacity improvements would be needed to deliver these volumes of traffic to the intersections in question. Therefore, it is recommended that the Medium Growth peak hour volumes be used for evaluating traffic and transit operations along the corridor, unless major highway capacity improvements are planned and programmed independently of this project.

The operations analysis shows that under the Medium Growth scenario, it would be feasible to design an at-grade intersection at a number of the locations currently identified for grade separation, although some of the at-grade intersections may require turn lane and other minor capacity improvements. The potential level of improvements to allow for acceptable at-grade operations have been shown in **Table 3**. They have been categorized as High, Medium, or Low based on the LOS of the intersections that were modeled, the 2040 forecast intersection entering volumes for the PM peak hour, the volume/capacity ratio of the intersection, and the type of transitway crossing.

The three intersections identified in the High category would be most likely to require major infrastructure improvements within the 2040 planning horizon, which could include grade separation. Additional analysis would be needed at the US 41 (Cobb Parkway)/Ernest Barrett Parkway and US 41/Northside Drive/17th Street intersections to determine the type of improvements necessary to mitigate the intersection to LOS D or to the No Build LOS. The intersections identified in the Low and Medium categories are expected to require lower levels of improvements, if any, which could include turn lanes, approach lane reconfiguration, or signal phasing changes. With the exception of diagonal crossings of the transitway through an intersection, the elimination of transit preemption, or a change from transit priority to no transit advantage, could also be potential future measures used to mitigate the impacts of the at-grade transitway. Additional analysis would be needed in later phases of the project to determine the preferred signal operation and types of turn lane improvements potentially needed at each signalized intersection in the corridor to provide for safe and efficient at-grade operation of the transitway.

Table 3. Potential Intersection Improvements

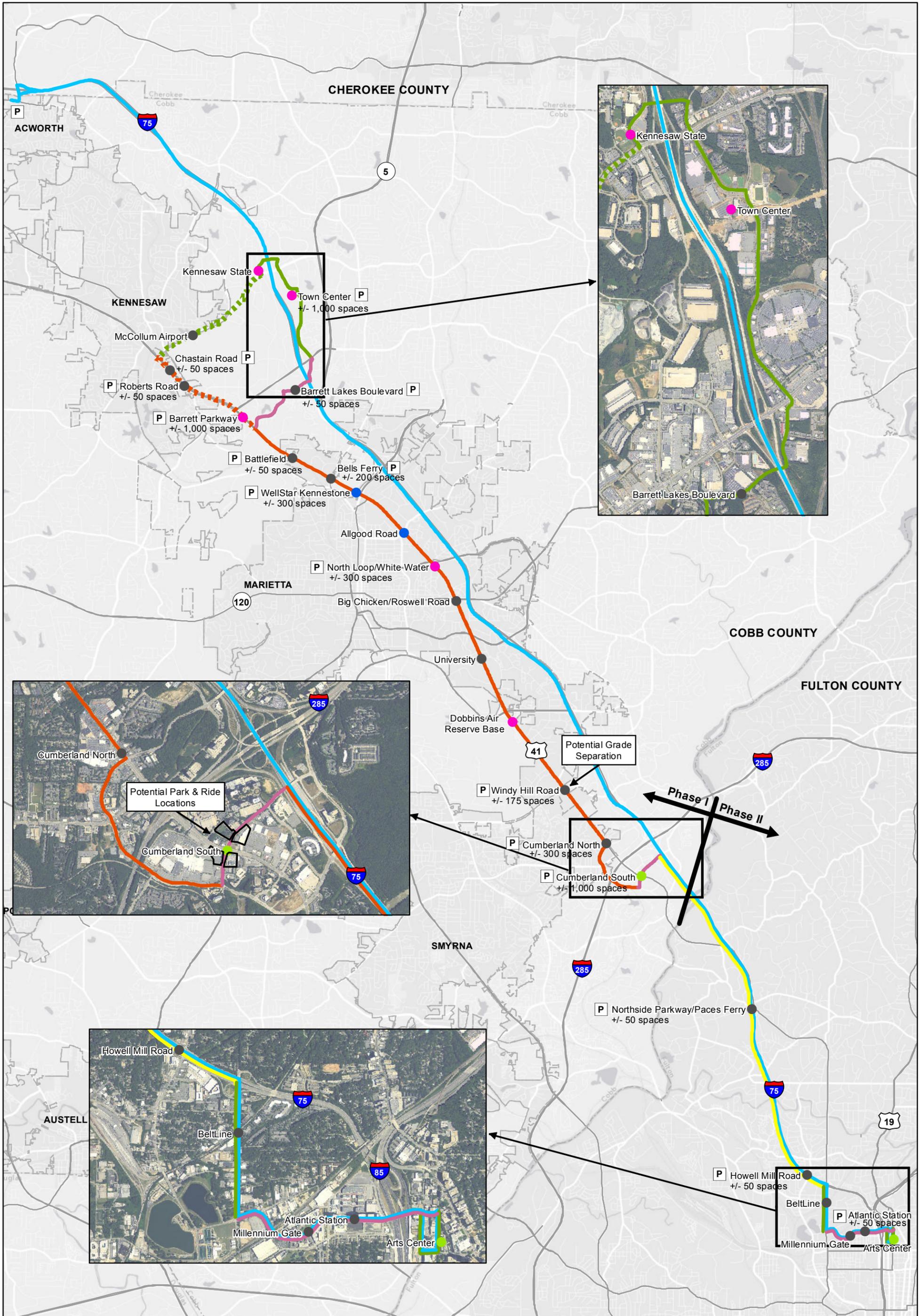
Location	2040 PM Peak Entering Volume – Medium Growth		Guideway Alignment/ Crossing	Level/Priority for Improvements
	Total Volume (vehicles/hour)	Estimated Volume/ Capacity Ratio		
US 41 (Cobb Parkway) at McCollum Parkway/Cobb International Boulevard	4,600	0.75	Diagonal through intersection	Low/ Medium
US 41 (Cobb Parkway) at Ernest Barrett Parkway	5,800	0.85	Center Median Running	High*
US 41 (Cobb Parkway) at N. Marietta Parkway/SR 120	4,800	0.70	Center Median Running	Low
US 41 (Cobb Parkway) at Roswell Road/SR 120 [†]	4,500	0.80	Center Median Running	Medium
US 41 (Cobb Parkway) at S. Marietta Parkway/SR 120 [†]	4,800	0.75	Center Median Running	Low
US 41 (Cobb Parkway) at Windy Hill Road	6,000	0.80	Center Median Running	High*
US 41 (Cobb Parkway) at Cumberland Boulevard/Windy Ridge Parkway	5,300	0.70	Diagonal through Intersection	Low/ Medium
Cumberland Boulevard at Spring Road [†]	5,000	0.90	Center Median Running	Medium/ High
Cumberland Boulevard at Cumberland Parkway/Mall Driveway	4,100	0.70	Center Median Running	Low
US 41/Northside Drive at 17th Street	5,500	0.90	Diagonal through Intersection	High*

Notes:

[†] Turn lane improvements needed if BRT operating at-grade, as noted previously in this document.

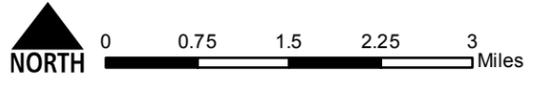
* Likely requires significant infrastructure improvements, which could include additional through lanes or grade separation.

APPENDIX A - Locally Preferred Alternative



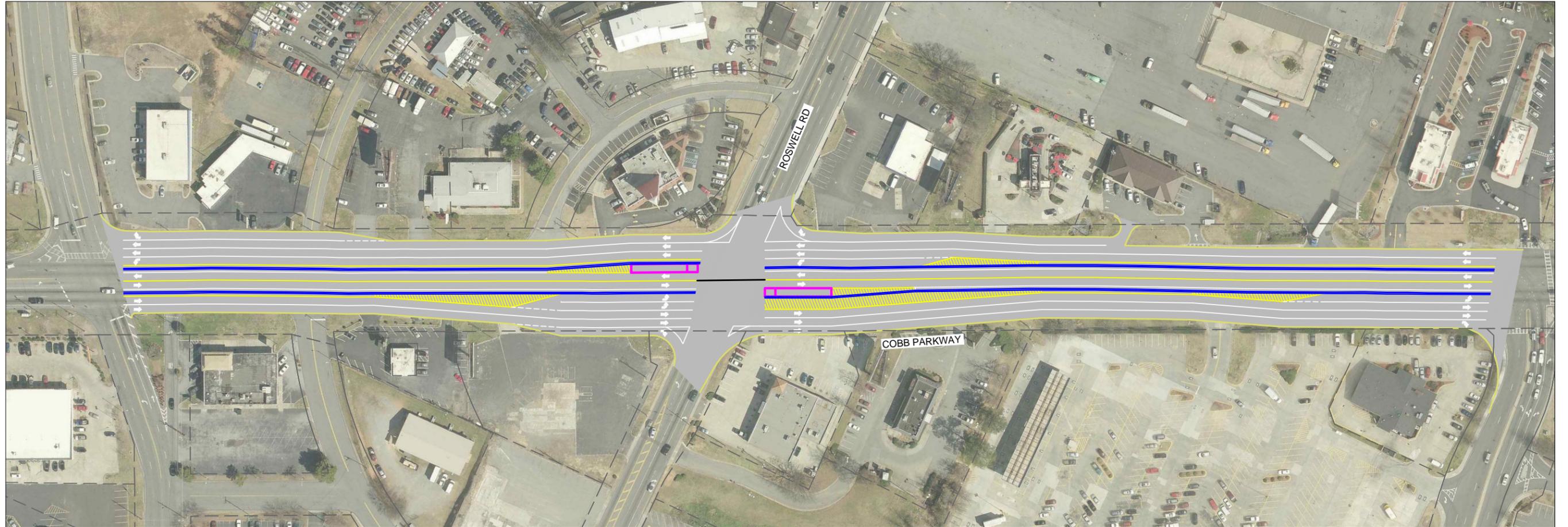
Locally Preferred Alternative

- Legend**
- Express Service
 - BRT - Mixed Traffic
 - - - Alternate Alignment - Mixed Traffic
 - Dedicated BRT - Center Running
 - - - Alternate Alignment - Dedicated BRT
 - Dedicated BRT - Side Running
 - HOV Lanes
- Station Type**
- P Park & Ride
 - Neighborhood
 - Village
 - Transit-Oriented Development
 - Commuter



APPENDIX **B** – PROPOSED INTERSECTION GEOMETRICS

- 1) US 41 (Cobb Parkway) at Roswell Road/SR 120
- 2) US 41 (Cobb Parkway) at S. Marietta Parkway/SR 120
- 3) US 41 (Cobb Parkway) at Windy Hill Road
- 4) US 41 (Cobb Parkway) at Cumberland Boulevard
- 5) Cumberland Boulevard at Spring Road



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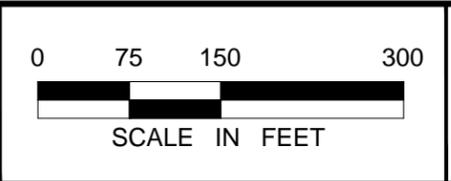
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THE BILTMORE, SUITE 601
ATLANTA, GA 30308
TEL. NO. (404)-419-8700



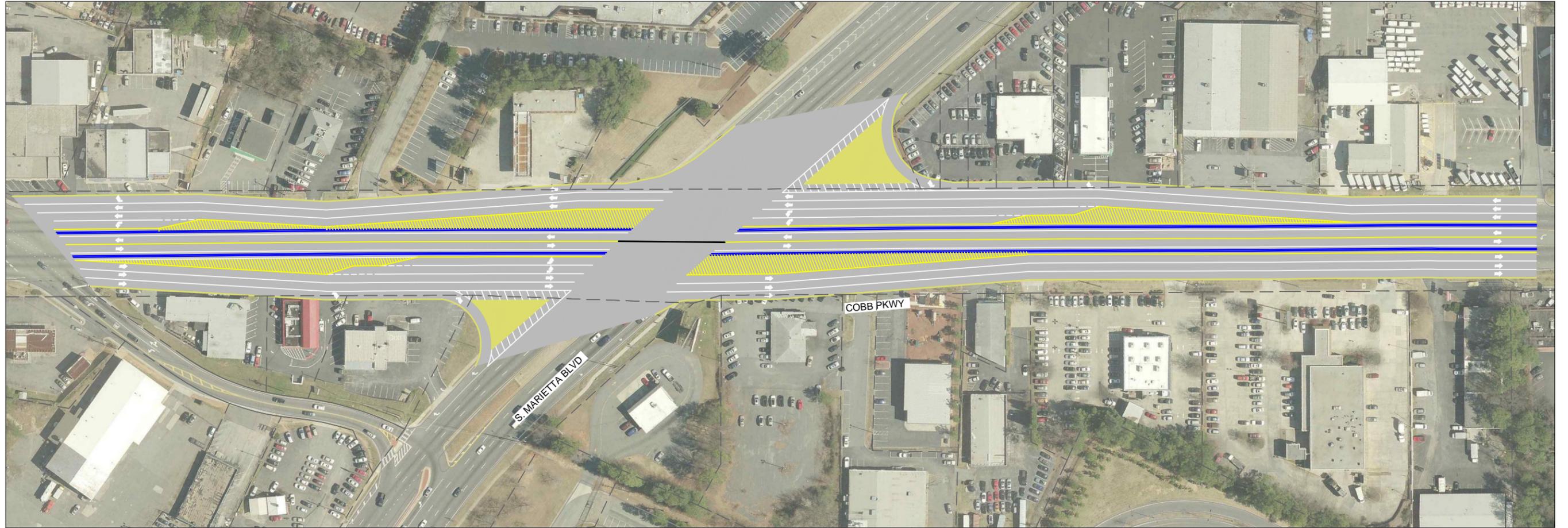
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Cobb**
Northwest Transit Corridor
Environmental Assessment



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CONNECT COBB
NORTHWEST TRANSIT CORRIDOR
ENVIRONMENTAL ASSESSMENT

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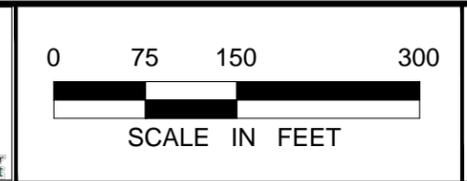
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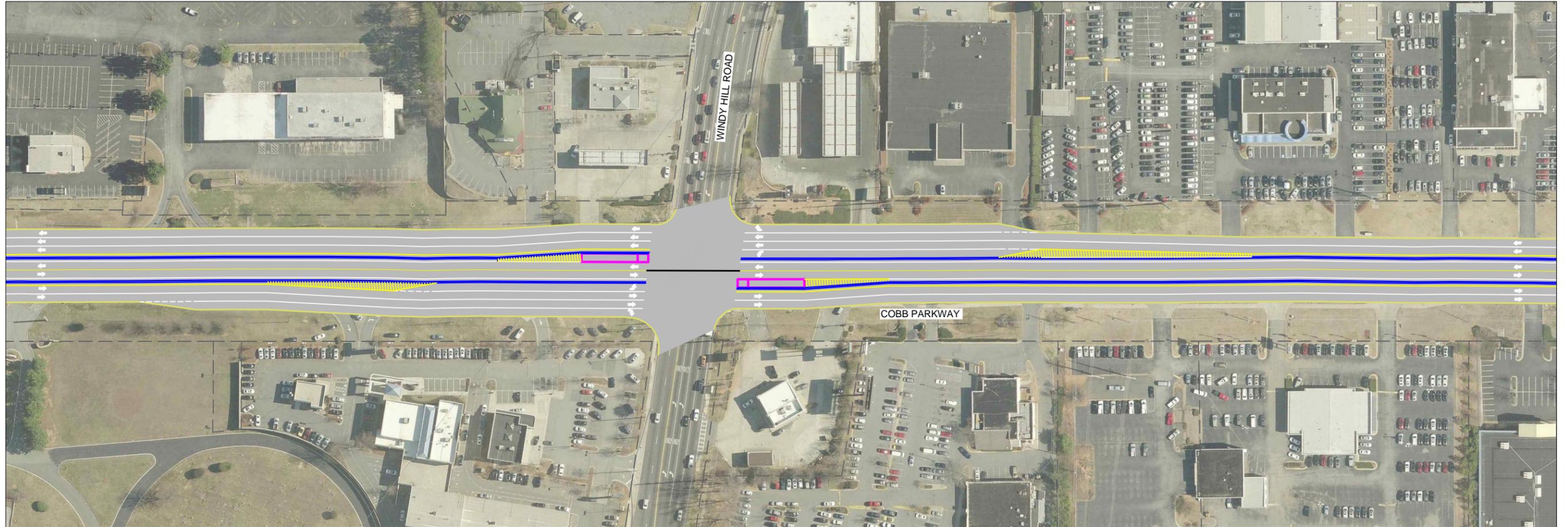


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 S. MARIETTA PKWY & COBB PKWY
 PROPOSED INTERSECTION DESIGN

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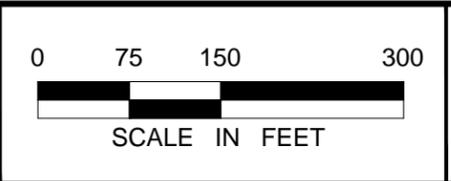
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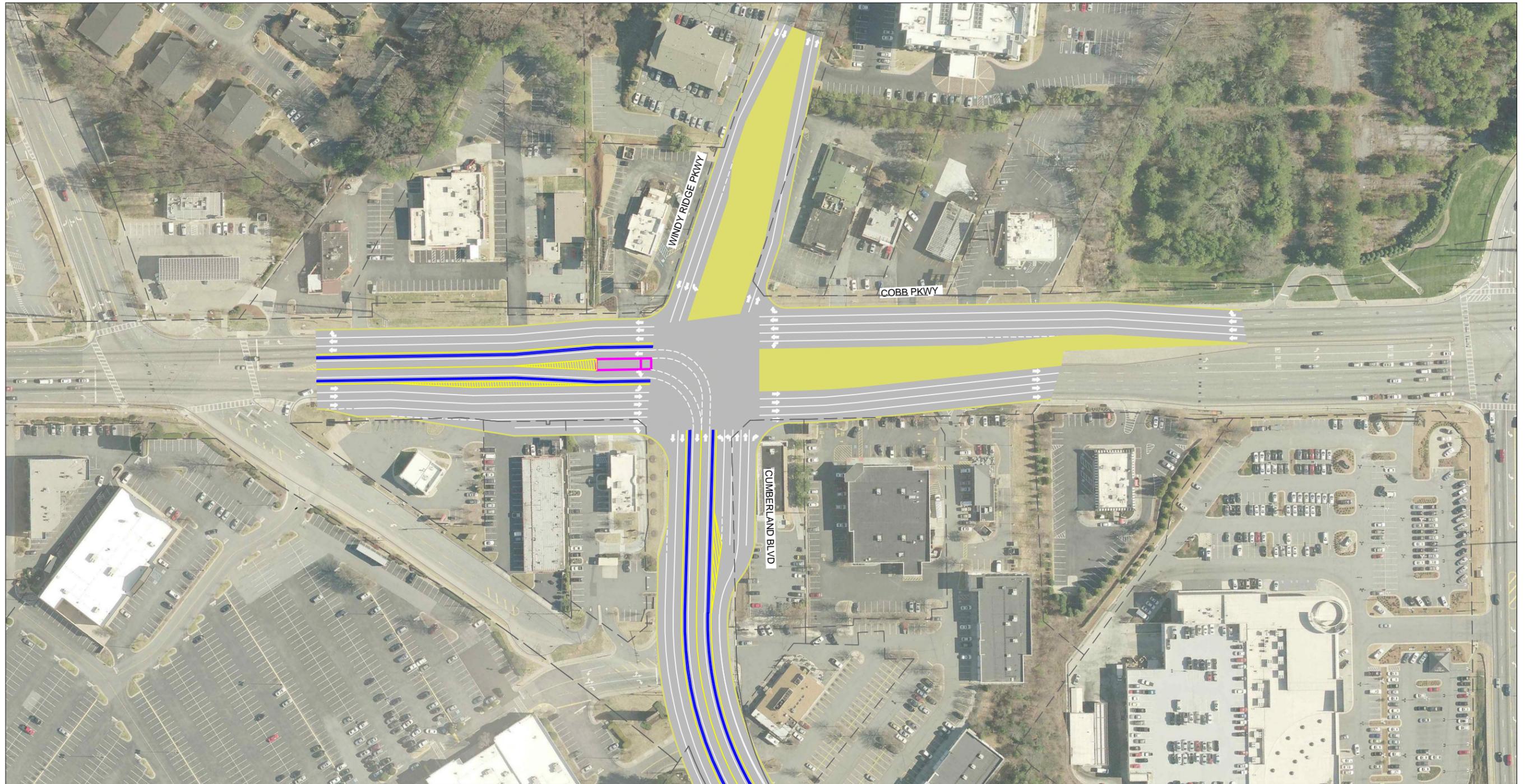
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Northwest Transit Corridor
Environmental Assessment



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NORTHWEST TRANSIT CORRIDOR
ENVIRONMENTAL ASSESSMENT

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PROPOSED INTERSECTION DESIGN

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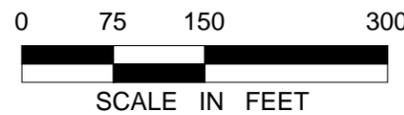


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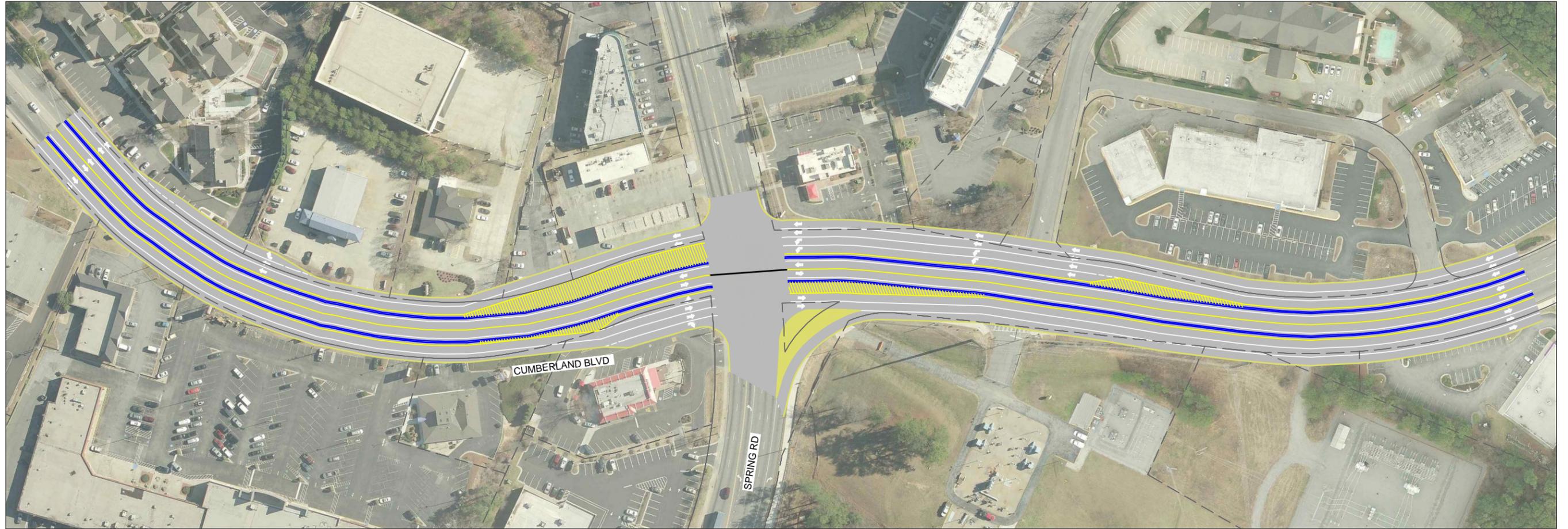


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 CUMBERLAND BLVD / WINDY RIDGE PKWY & COBB PKWY
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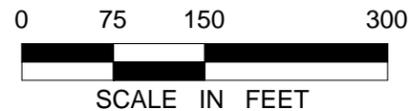


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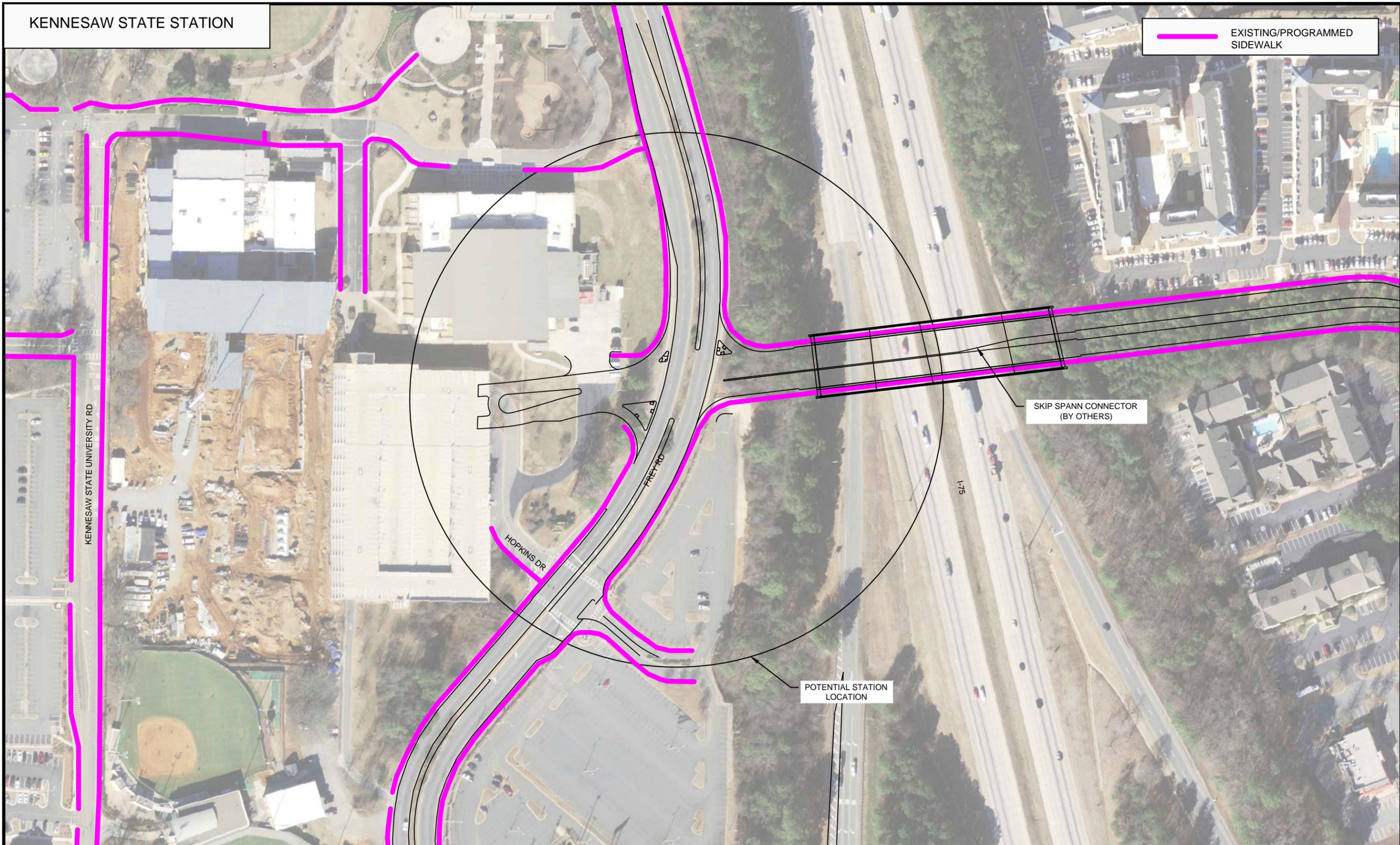
COBB & FULTON COUNTY
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NORTHWEST TRANSIT CORRIDOR
ENVIRONMENTAL ASSESSMENT

CUMBERLAND BLVD & SPRING RD
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KENNESAW STATE STATION

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SIDEWALK



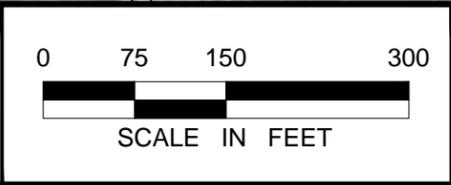
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Connect Cobb

 Northwest Transit Corridor
 Environmental Assessment

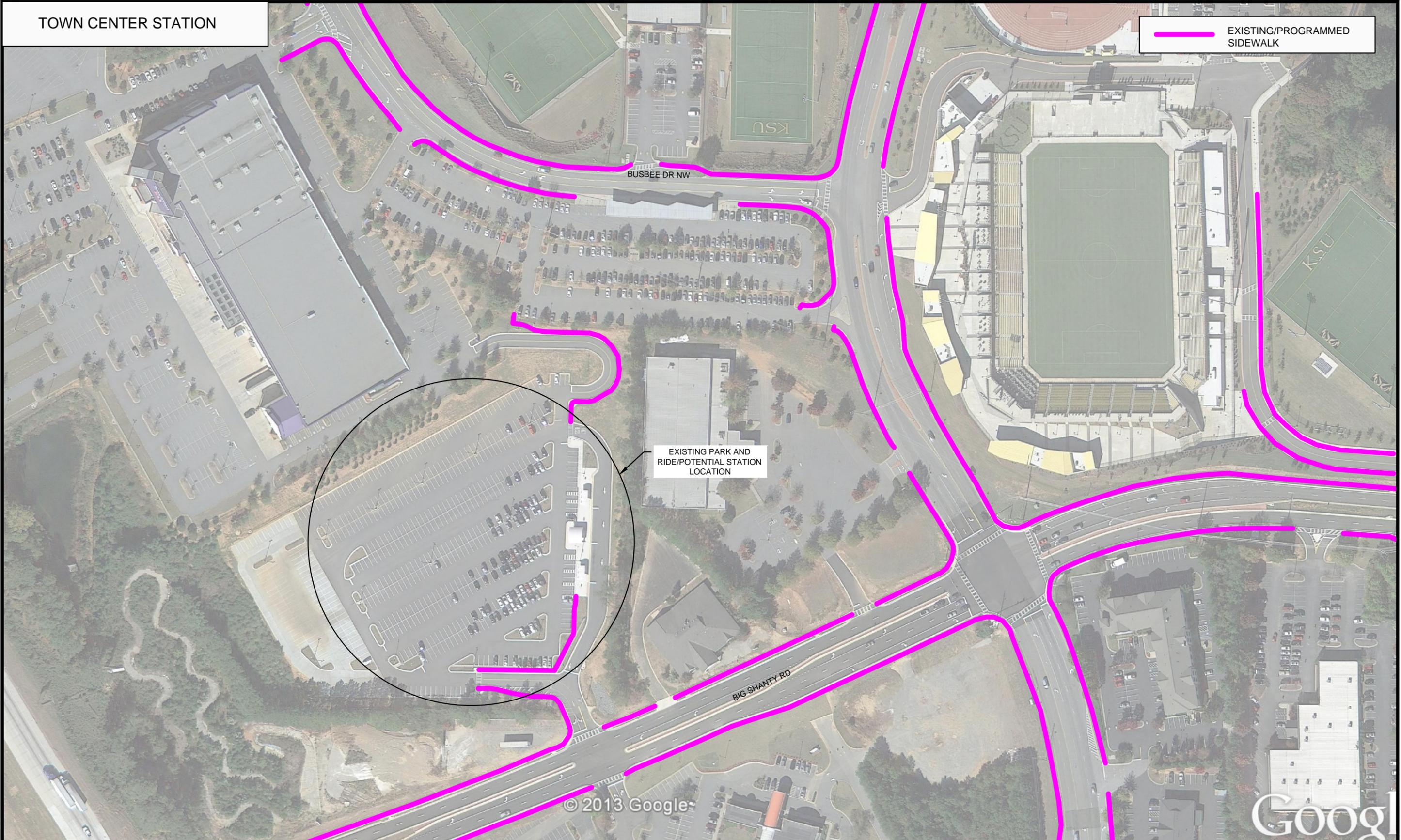


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 NORTHWEST TRANSIT CORRIDOR
 ENVIRONMENTAL ASSESSMENT
 EXISTING PEDESTRIAN ACCESS LAYOUTS

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TOWN CENTER STATION

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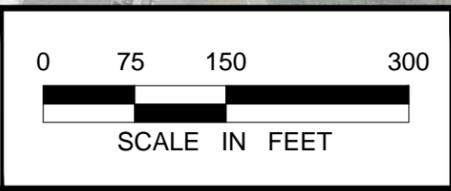
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 Environmental Assessment

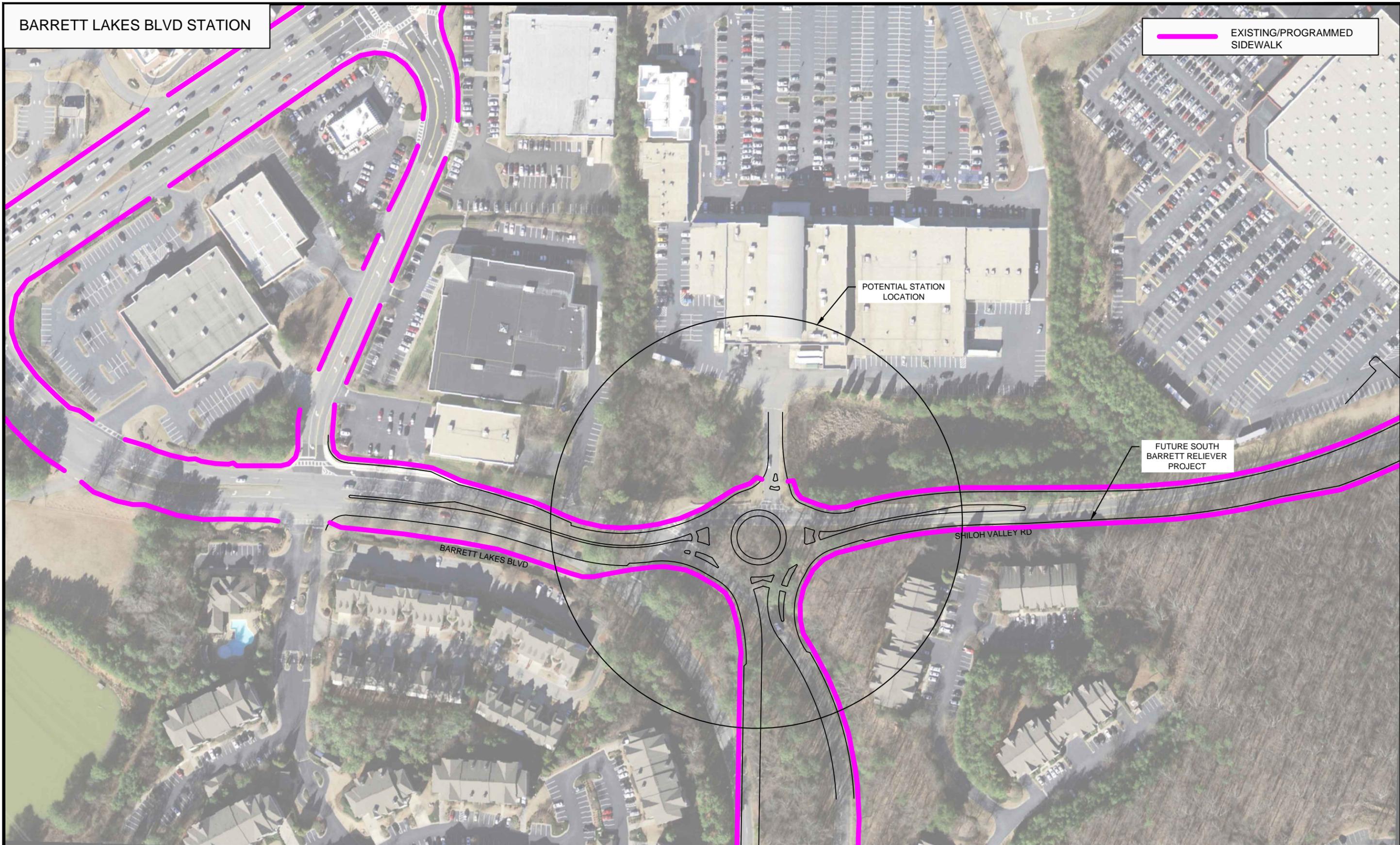


COBB & FULTON COUNTY
 CONNECT COBB
 NORTHWEST TRANSIT CORRIDOR
 ENVIRONMENTAL ASSESSMENT
 EXISTING PEDESTRIAN ACCESS LAYOUTS

SHEET NO.
2
 15

BARRETT LAKES BLVD STATION

EXISTING/PROGRAMMED
SIDEWALK



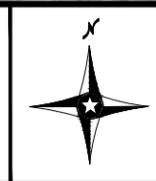
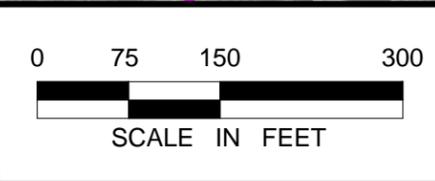
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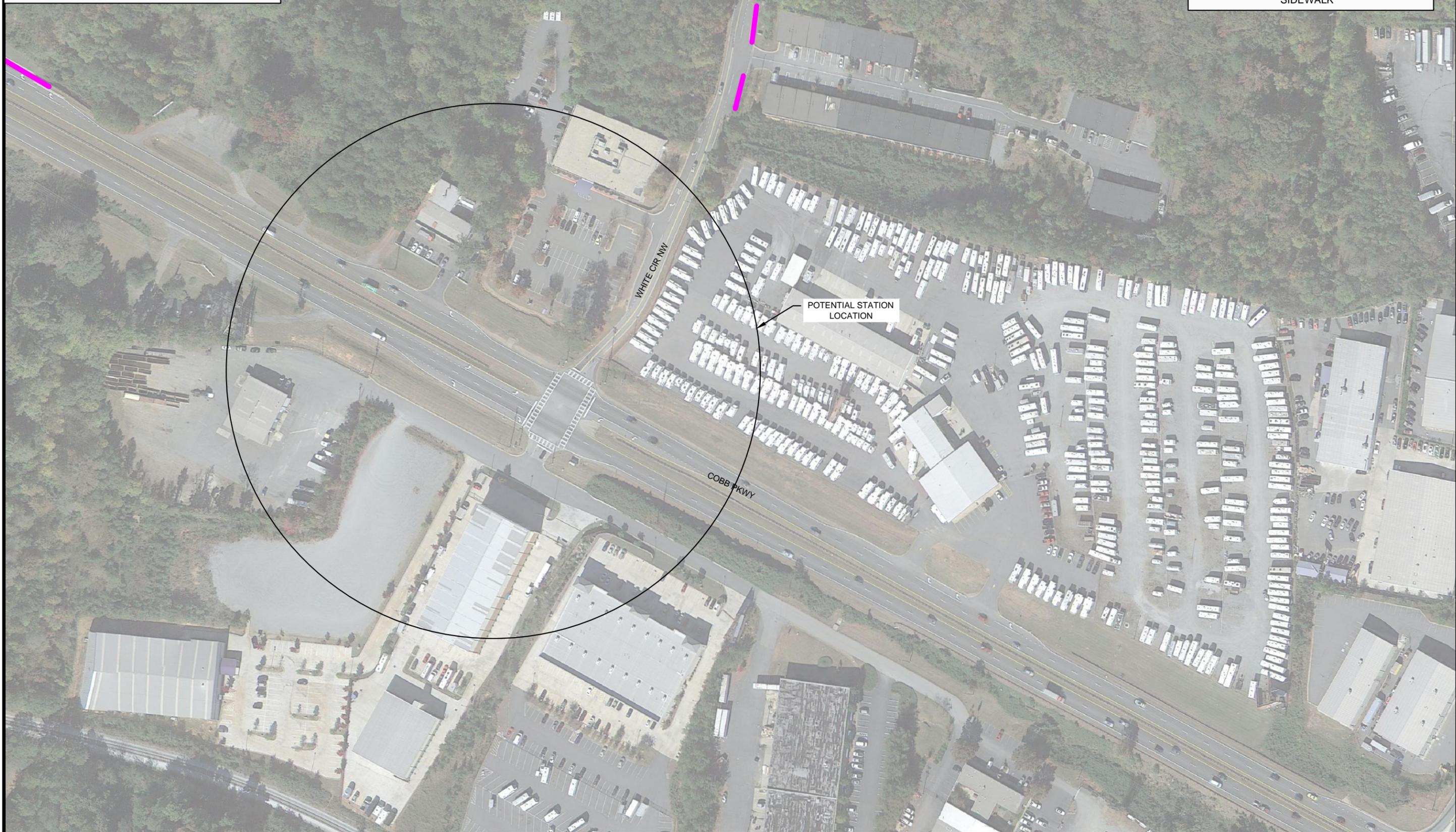


COBB & FULTON COUNTY
 CONNECT COBB
 NORTHWEST TRANSIT CORRIDOR
 ENVIRONMENTAL ASSESSMENT
 EXISTING PEDESTRIAN ACCESS LAYOUTS

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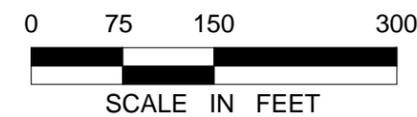
WHITE CIRCLE STATION

EXISTING/PROGRAMMED
SIDEWALK



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 THE BILTMORE, SUITE 601
 ATLANTA, GA 30308
 TEL. NO. (404)-419-8700

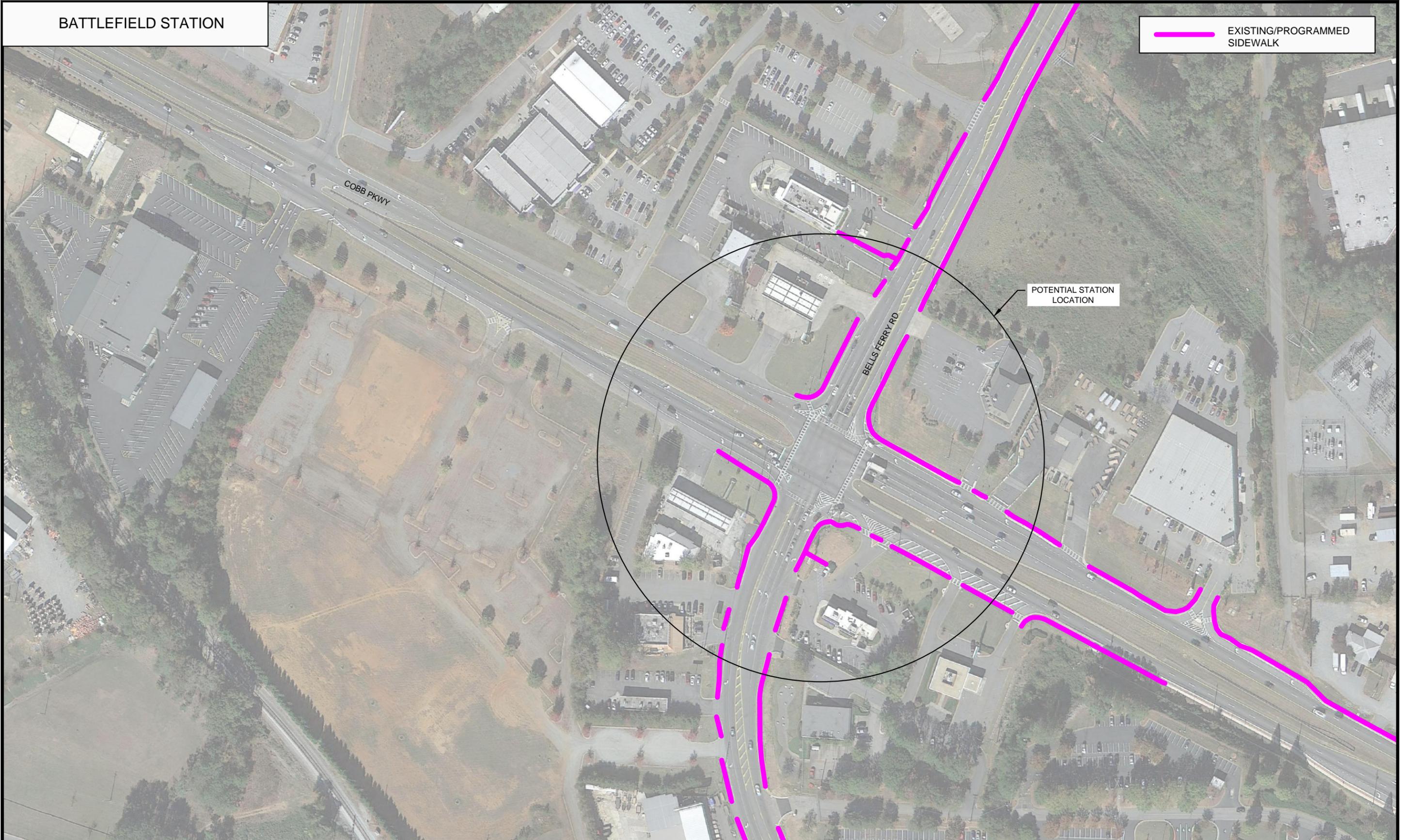


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 ENVIRONMENTAL ASSESSMENT
 EXISTING PEDESTRIAN ACCESS LAYOUTS

SHEET NO.
4
15

BATTLEFIELD STATION

EXISTING/PROGRAMMED
SIDEWALK



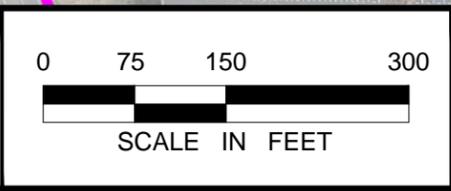
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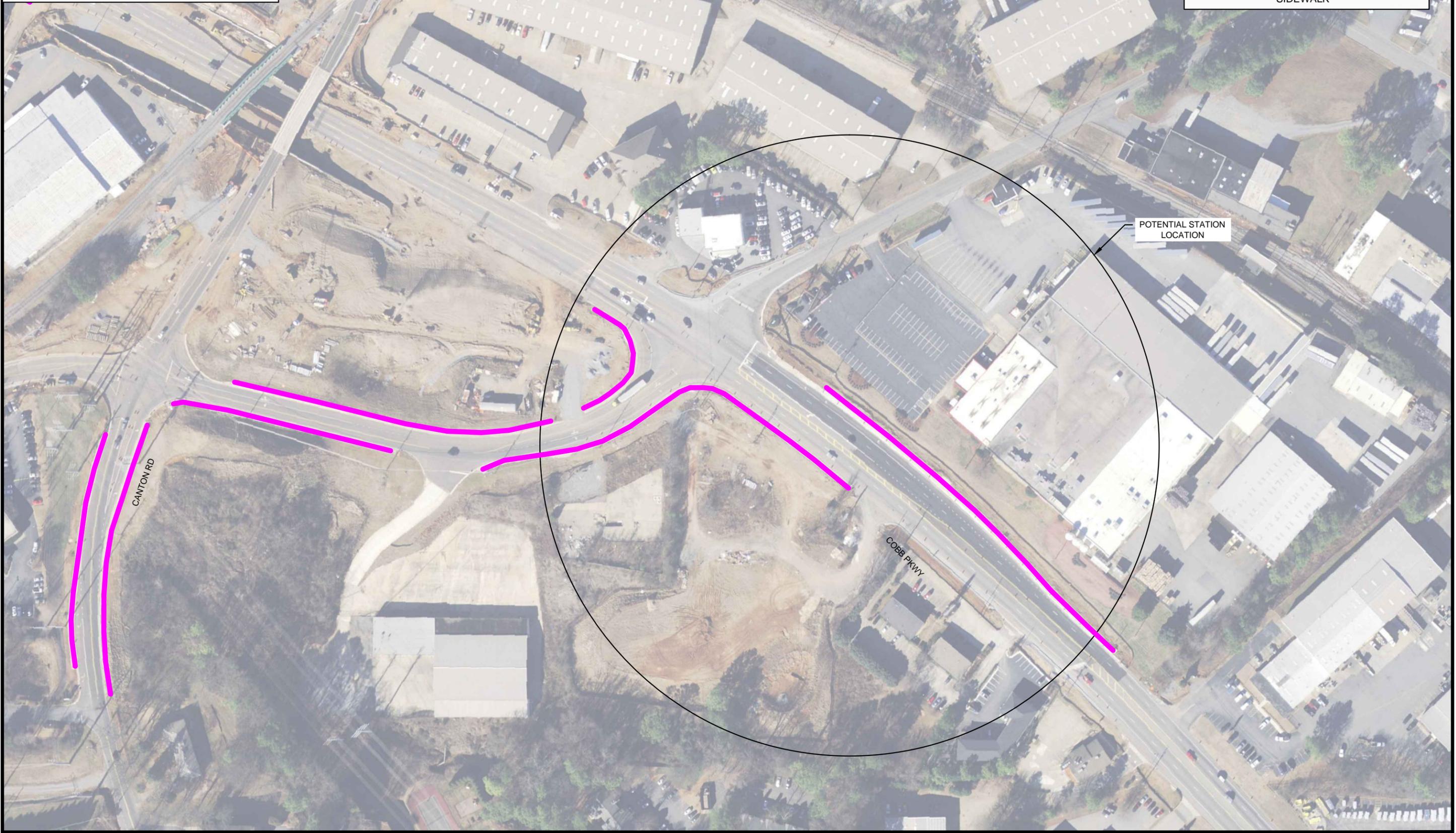


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SHEET NO.
5
15

WELLSTAR KENNESTONE
STATION

EXISTING/PROGRAMMED
SIDEWALK



POTENTIAL STATION
LOCATION

CANTON RD

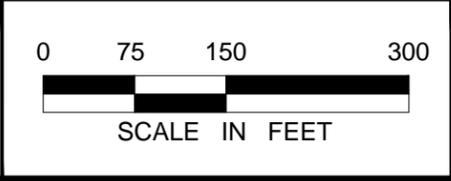
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SHEET NO.
6
15

ALLGOOD RD STATION

EXISTING/PROGRAMMED
SIDEWALK



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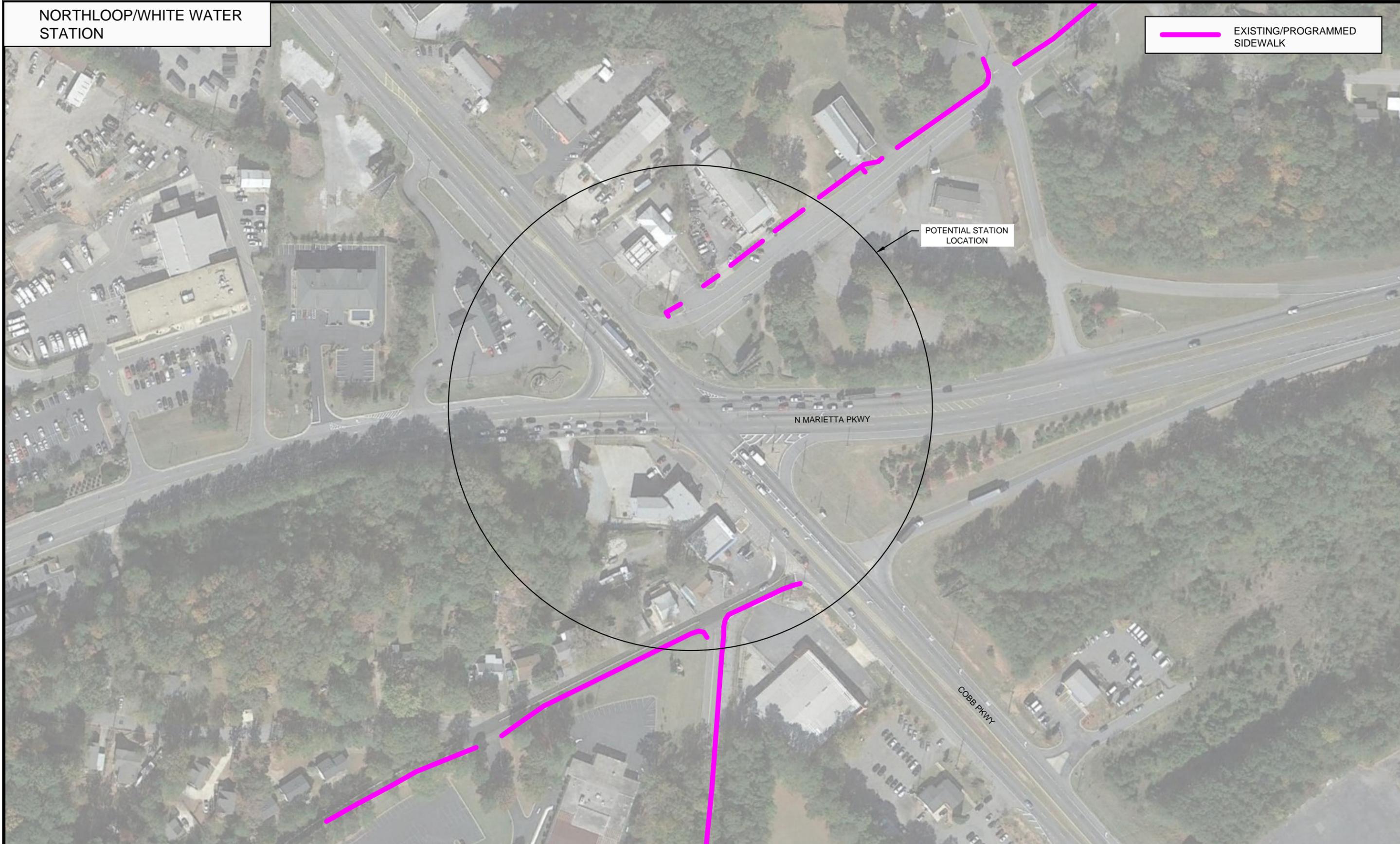


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SHEET NO.
7
15

NORTHLLOOP/WHITE WATER
STATION

EXISTING/PROGRAMMED
SIDEWALK



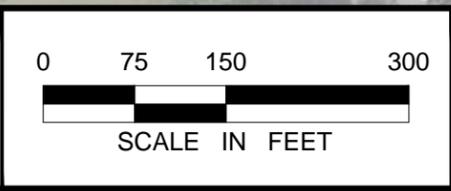
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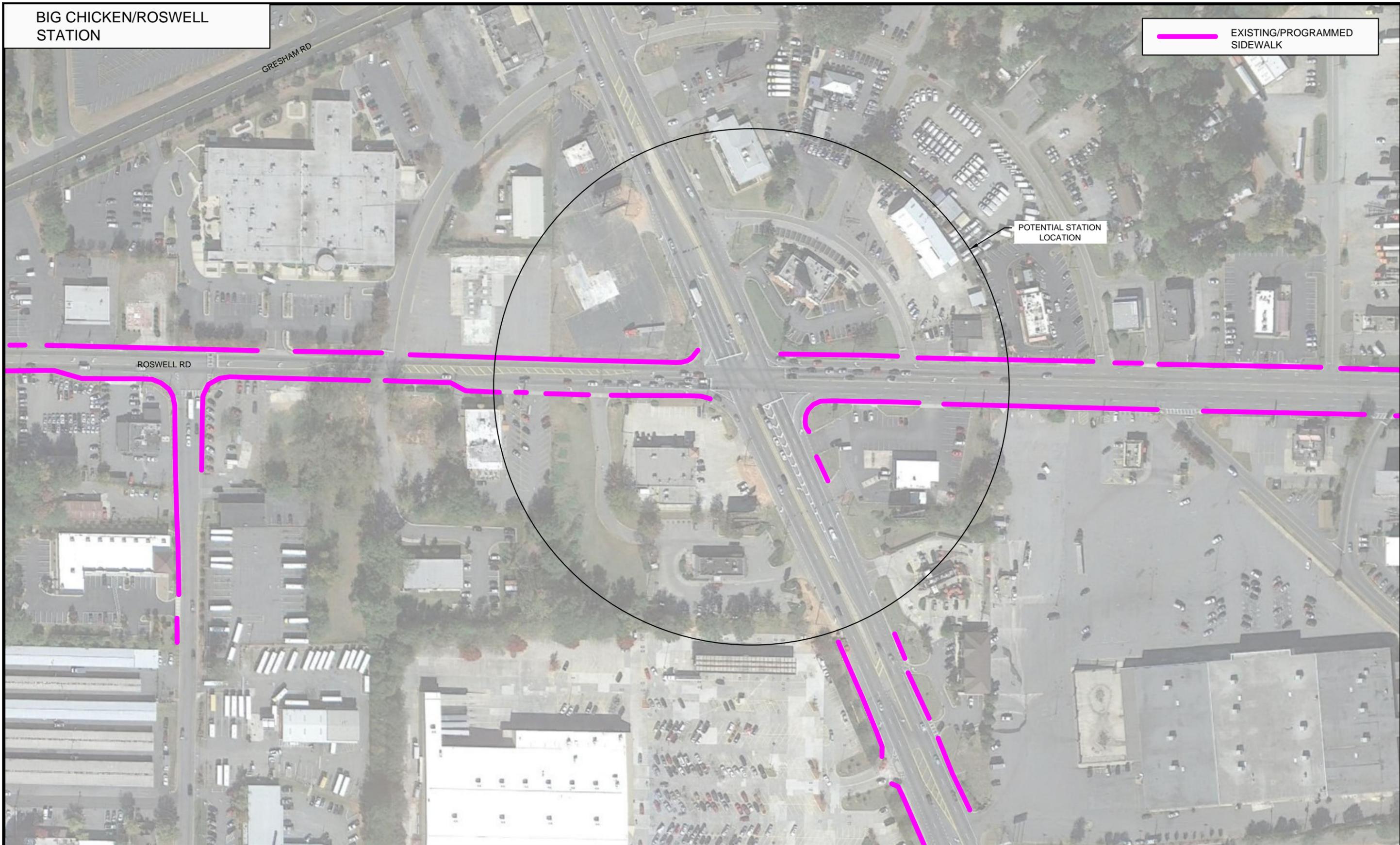


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SHEET NO.
8
15

BIG CHICKEN/ROSWELL STATION

EXISTING/PROGRAMMED
SIDEWALK



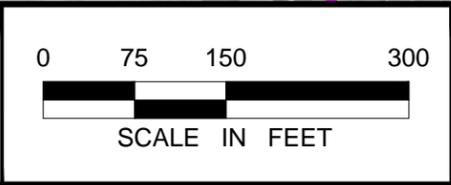
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SHEET NO.
9
15

UNIVERSITY STATION

EXISTING/PROGRAMMED
SIDEWALK



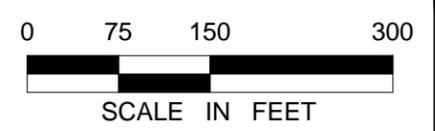
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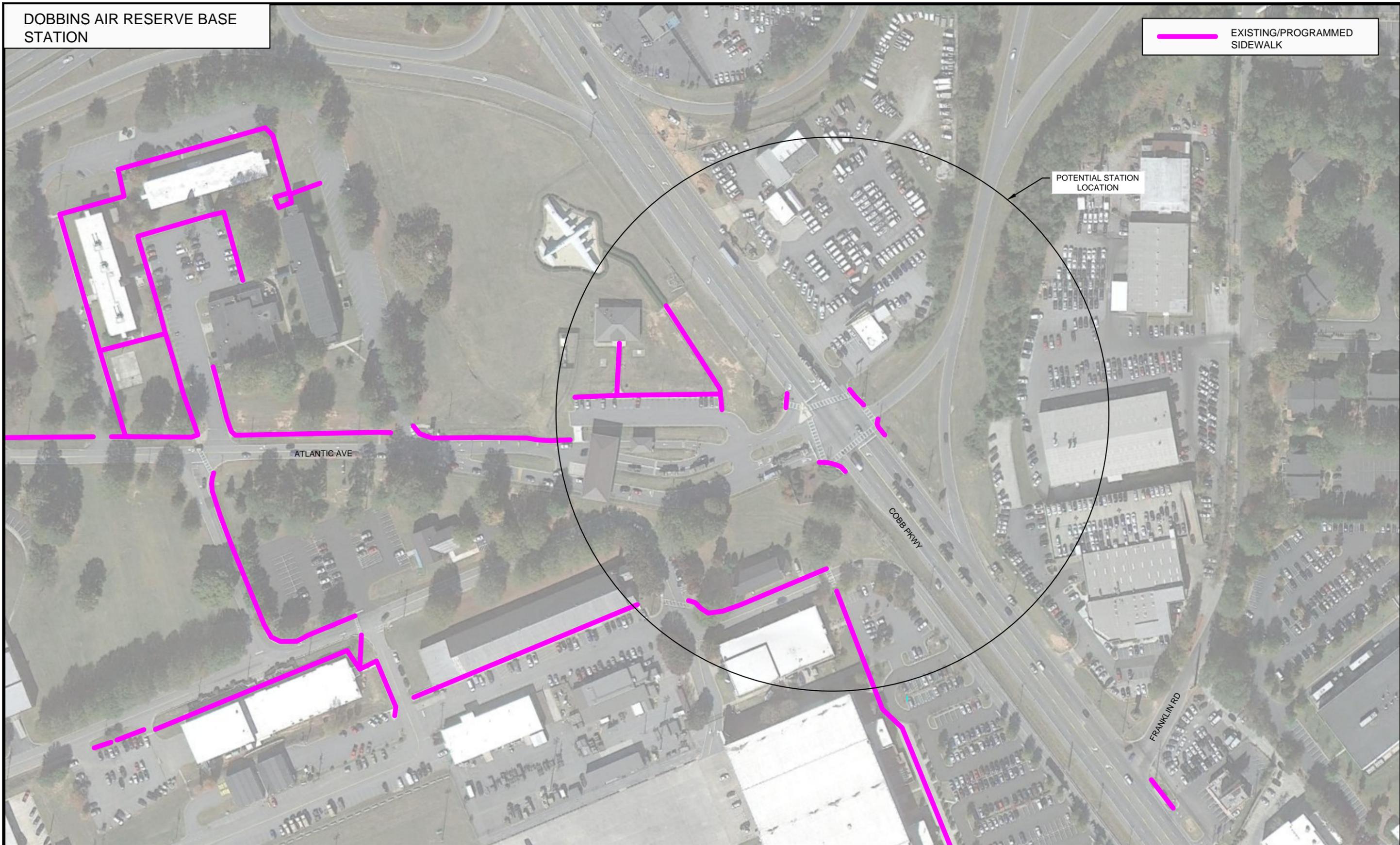


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SHEET NO.
10
15

DOBBINS AIR RESERVE BASE
STATION

EXISTING/PROGRAMMED
SIDEWALK



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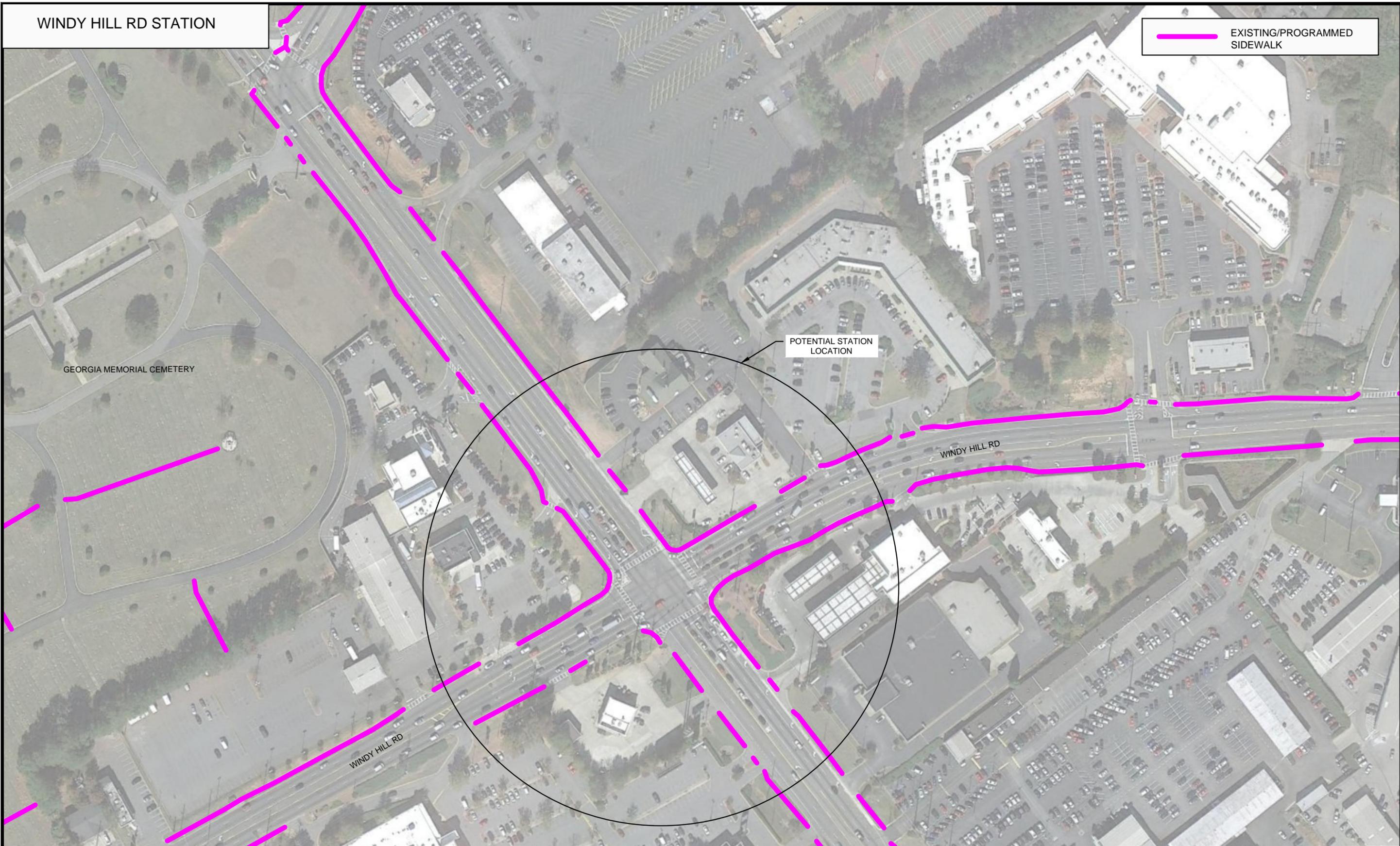


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 ENVIRONMENTAL ASSESSMENT
 EXISTING PEDESTRIAN ACCESS LAYOUTS

SHEET NO.
11
15

WINDY HILL RD STATION

EXISTING/PROGRAMMED
SIDEWALK



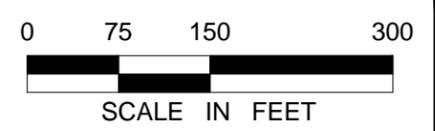
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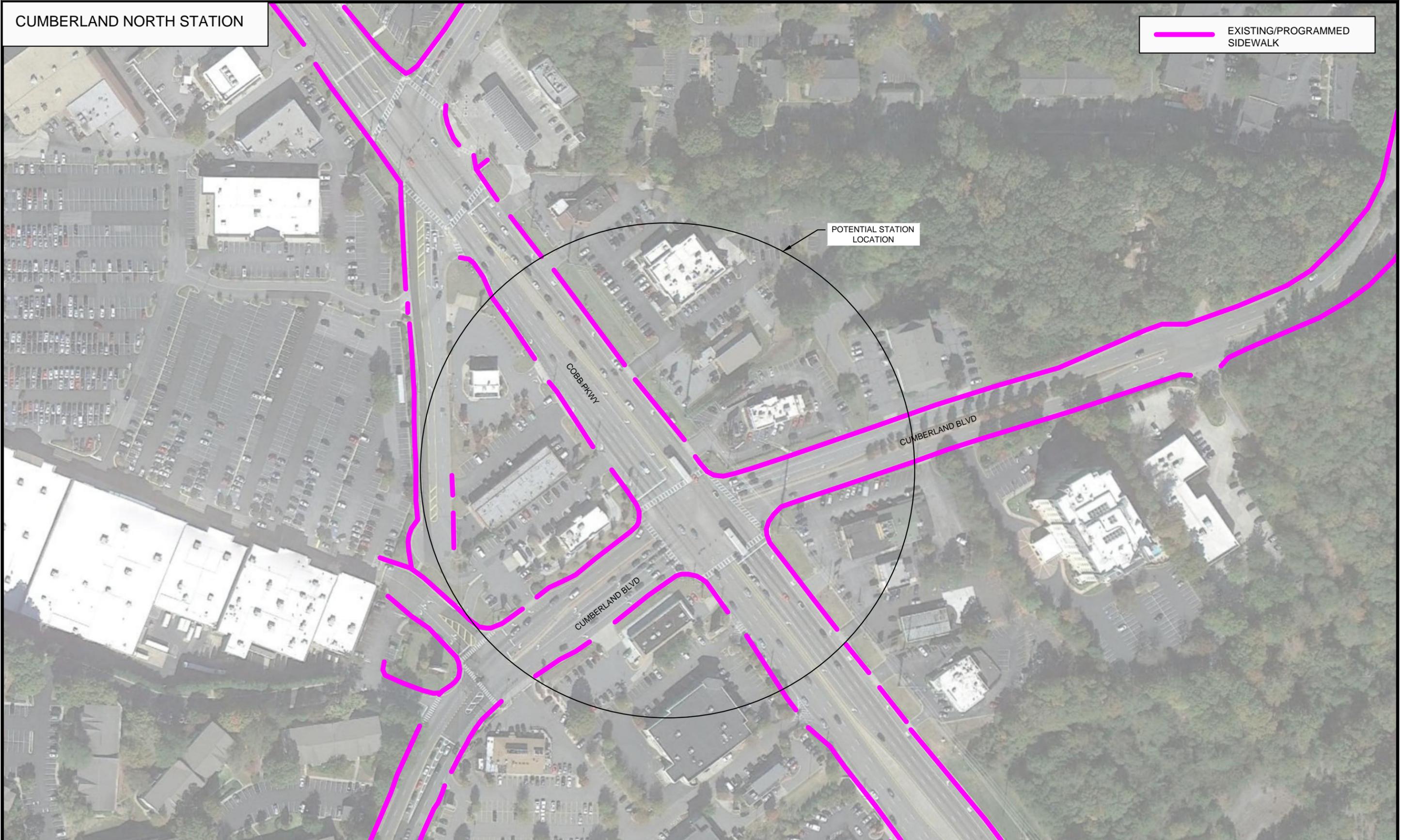


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SHEET NO.
12
15

CUMBERLAND NORTH STATION

EXISTING/PROGRAMMED
SIDEWALK

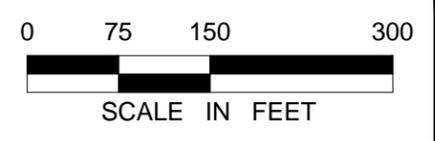


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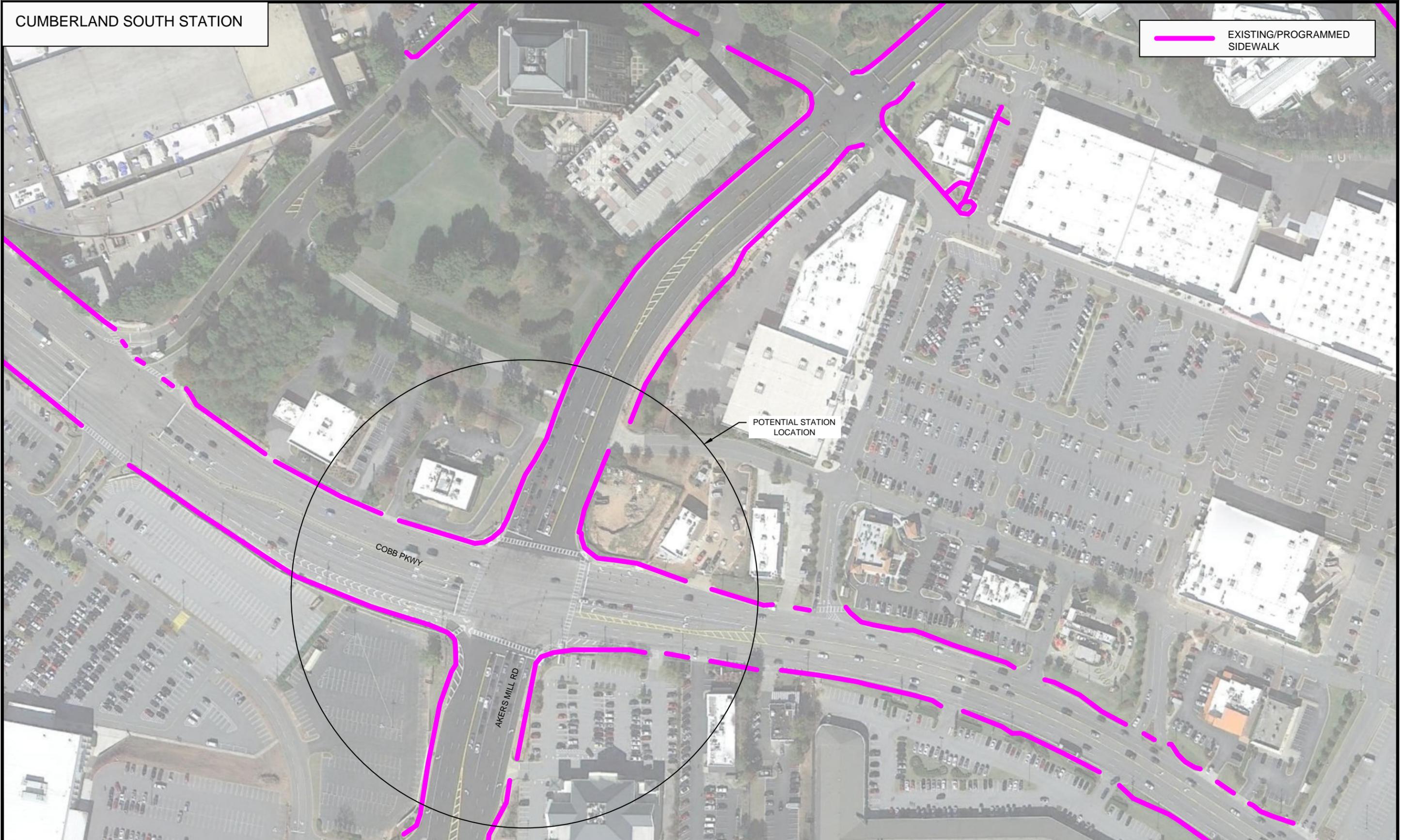


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SHEET NO.
13
15

CUMBERLAND SOUTH STATION

EXISTING/PROGRAMMED
SIDEWALK



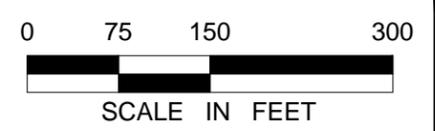
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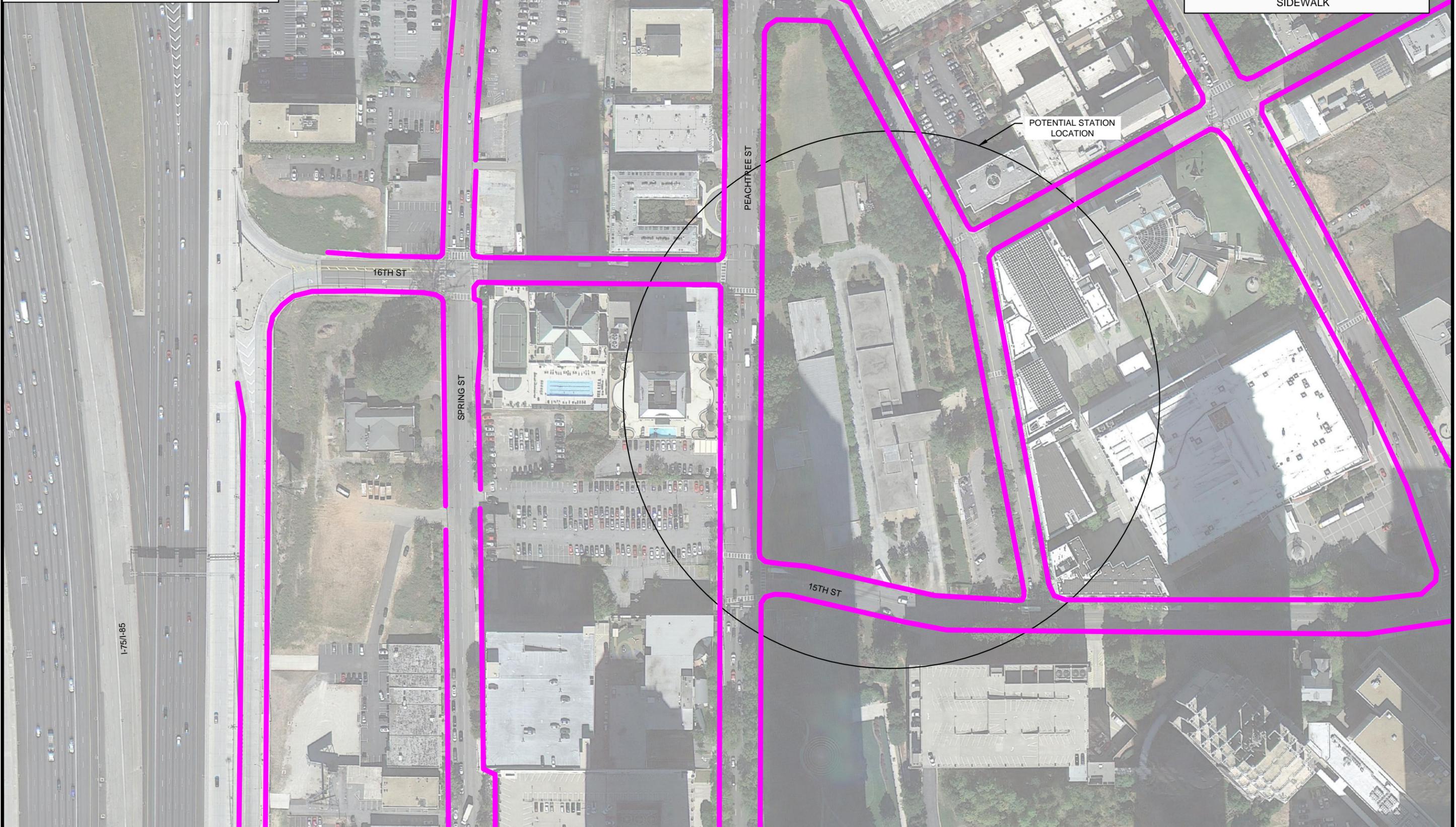


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SHEET NO.
14
15

ARTS CENTER STATION

EXISTING/PROGRAMMED
SIDEWALK



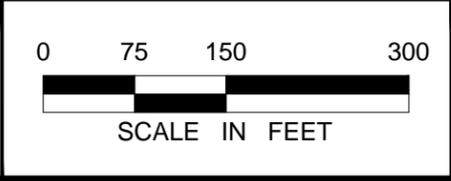
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SHEET NO.
15
15