GEORGIA TRANSPORTATION PARTNERS

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December 22, 2006

Mr. Darryl VanMeter
Asst. State Urban Design Engineer
Georgia Department of Transportation
No. 2 Capitol Square, S.W.
Atlanta, Georgia 30334

Subject: Georgia Department of Transportation Contract No. TOURDPPI060072
Northwest Corridor Project
Draft Constructability Report

Dear Mr. VanMeter:

Georgia Transportation Partners is pleased to submit a draft version of the NWC Constructability Report, a deliverable of Services Order No. 1: This Report is an overview of our planned approach for constructing the HOV, TOL and BRT improvements envisioned for the I-75 and I-575 corridors.

This submission of the report is a draft version of text for your review without the drawings, sketches, details and many photos that will accompany the final version.

Should you have any questions regarding this subject, please do not hesitate to contact me at (678) 247-2553 or Steve Curtis at (678) 247-2589.

Sincerely,

E. S. Smith
Project Director

ESS:dmn

Enclosures: As stated

25226-G16-GCX-00001

Contract No. TOURDPPI060072
Project No. CSNHS-0008-00(256)
P.I. No. 0008256
Services Order No. 1

Constructability Report

For the Development Phase

(Draft Submission)

Prepared by:

GTP GEORGIA TRANSPORTATION PARTNERS

Submitted to:

DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA

December 22, 2006

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1 – Overview

This Constructability Report provides an overview of the planned construction approach, work methods, and materials selection for the Northwest Corridor Project. The object of the NWC Project is to develop, design, and build managed lanes for High Occupancy (HOV) vehicles, Truck-only lanes (TOL), and Bus Rapid Transit (BRT) in the I-75/I-575 corridor. The Project boundaries extend along I-75 northward from I-285 to Hickory Grove Rd. and along I-575 from the AAI-75/I575 interchange northward to Sixes Rd.

There are approximately 215 lane miles of existing highway to replace and approximately 134 lane miles of new highway to construct. Over 50 percent of the 41 existing bridges within the project limits require total replacement. Over 80 percent need some work, either replacement or widening. There are almost 40 new bridges to construct: several are elevated viaduct structures over ¾ mile in length. All of the work is to be performed in close proximity to up to 13 lanes of heavily congested highway traffic.

To facilitate the planning process, the project has been broken into 6 segments, organized geographically. The bases for limits/content of each segment were cost, length of alignment, location, nature and type of work, number of bridges, and degree of construction difficulty. This breakdown has determined the organization for all aspects of project planning and execution processes including the schedule, estimate and staffing plans. The following **Section 2** discusses the breakdown of the segments and the general approach to the construction of each segment.

This report will also cover the sequencing of construction and provide details on which elements are considered to be especially schedule critical. **Section 3** details early construction activities that will have an impact on the start of construction and the overall construction schedule for the NWC Project, including those items considered to be prerequisites for start of construction including utility relocation, right-of-way acquisition, and geotechnical exploration. Early critical path construction activities will also be discussed such as the overhead bridge work.

Section 4 highlights logistical aspects of the construction process including staging and construction laydown areas including possible locations for field offices.

Section 5 provides detailed discussions of the construction process by segment, broken down by highway and bridge elements, sub-segments, and stages, providing additional information for these especially complex construction elements. The section also provides information on construction sequencing, the interdependency of highway and bridge work, methods and options, heavy crane lifts, design considerations, and value engineering opportunities. This section also discusses the various risks and required accommodations specific to each segment.

The Bus Rapid Transit (BRT) system includes dedicated entry/exit ramps, a bus maintenance and storage facility, and five (5) BRT stations with associated parking facilities located at proposed interchanges along I-75. The constriction approach for this system and related stations/facilities is covered in **Section 6**.

Preliminary material selection information, based upon preliminary design work and GDOT standard specifications/details, is included in **Section 7**.

While early construction activities relating to utility relocation are covered in Section 3, detailed utility information, including the identification and management of the utility relocation process, is included in **Section 8**.

Finally, because the majority of work associated with the NWC Project will be performed in close proximity to the large volumes of traffic on I-75, I-575, and I-285, **Section 9** provides a discussion on the Traffic Incident Management (TIM) Program. This includes information on traffic control devices and procedures that will be put in place during construction to mitigate the possibility of traffic incidents.

2 – Construction Segments and General Approach

2.1 Construction Segment Breakdown

The NWC Project has been divided into segments, organized geographically, in order to facilitate the planning process and overall project organization. This provides structure, not only for this Constructability Report, but also for the estimate, the schedule, and staffing plans. The basis for limits/content of each segment was cost, length of alignment, location, nature and type of work, number of bridges, and degree of construction difficulty.

The segments are delineated as follows and shown on *Figure 2-1. NWC Construction Segments* below.

- I-75 bridges and highway
  - Segment 1: Start to Station 235+00
  - Segment 2: Station 235+00 to Station 495+00
  - Segment 3: Station 495+00 to Station 670+00
  - Segment 4: Station 670+00 to End
- I-575 bridges and highway
  - Segment 5: I-575 Station 80+00 to End
- Segment 6: BRT Stations

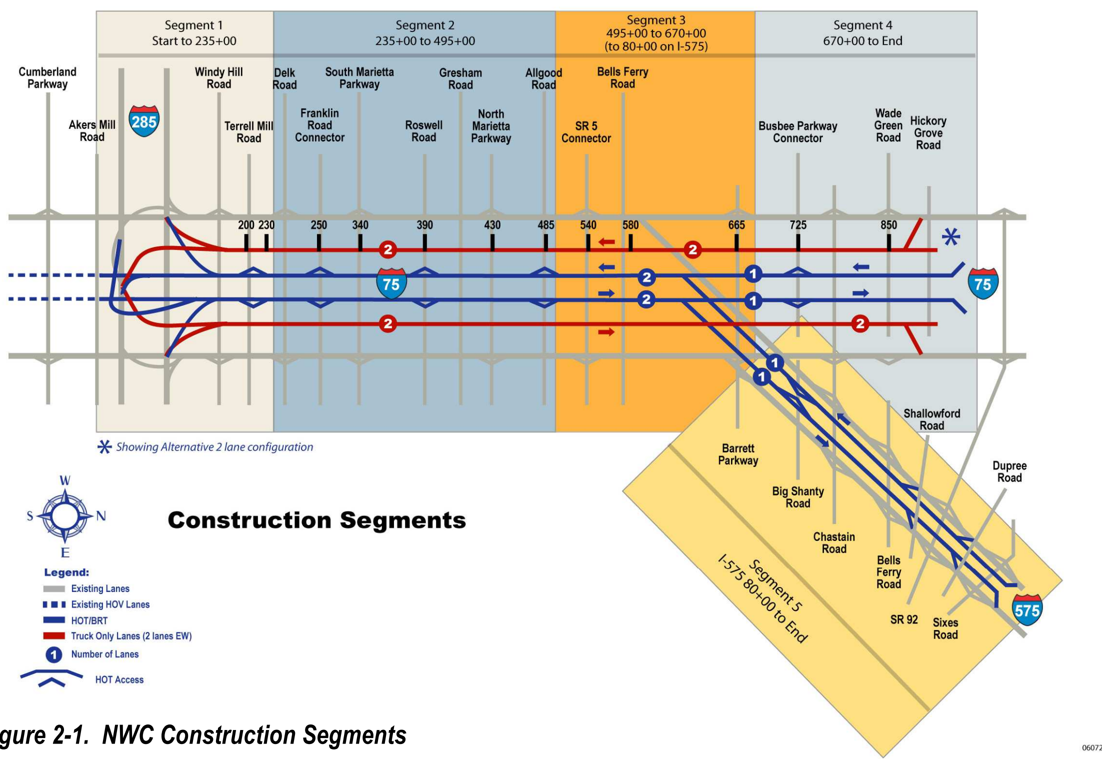

Figure 2-1. NWC Construction Segments

The scope of each is as follows:

2.1.1 Segment 1 (Start to Station 235+00)

Segment 1 starts at the southern limits of the NWC Project, just south of Akers Mill Rd. and extends to Station 235+00, which is approximately 1,200 ft. south of Delk Rd. This includes approximately 4.5 miles of I-75. It also includes the work extending along I-285 in both the Eastbound (EB) and Westbound (WB) directions for the new access ramps such as a HOV /TOL ramp and new bridge structure along I-285 WB over Cobb Parkway. There is work associated with the NWC Project as far west as the Cumberland Parkway (Hargrove Rd.) crossing and railroad crossing of I-285.

The I-75/I-285 Interchange dominates Segment 1. There are 15 new bridge structures needed to accommodate all the HOV and TOL access requirements and to incorporate them into the existing interchange. Almost two-thirds of the work at the I-75/I-285 Interchange is new bridge structures, the remainder being at grade highway work. Except for some substructure work on a few, the existing bridges within the interchange area remain unchanged. This includes the Windy Ridge Parkway Bridge over I-75 and the bridges on I-285.

North of the Windy Ridge Parkway Bridge within Segment 1 are two (2) additional existing bridges. They are the Windy Hill Rd. Bridge, an overhead bridge and the Terrell Mill Rd. Bridge, an underpass or mainline bridge. Both bridges must be replaced at higher grades and involve staging the work.

2.1.2 Segment 2 (Station 235+00 to Station 495+00)

Segment 2 represents close to 5 miles of the I-75 alignment, starting 1,200 ft. south of Delk Rd. at Station 235+00 and ending 1,000 ft. north of Allgood Rd. at Station 495+00. The existing I-75 highway within this segment has up to 13 mainline travel lanes, representing the heaviest traffic volumes on the project. The number of existing lanes translates into number of new lanes that are rebuilt in a new alignment. The project is adding two (2) HOV and two (2) TOL lanes in each direction and increasing shoulder widths where required. As an example of the size of the undertaking, just north of Delk Rd. the existing alignment width of approximately 180 ft. will be increased to 370 ft.

There are 3 proposed new bridges and 7 existing bridges in Segment 2. All of the existing bridges must be replaced or widened. One (1) of the proposed bridges is an HOV/bus access bridge across I-75 SB for access to the Franklin BRT Station. The other two (2) proposed bridges are HOV flyovers to allow HOV access just south of Allgood Rd.

Four (4) of the 7 existing bridges are overhead bridges, all requiring staged, full replacement at a different grade than the existing bridge. They are the bridges at Delk Rd., South Marietta Parkway, Gresham Rd., and Allgood Rd. The remaining three (3) existing bridges are underpass or mainline bridges requiring widening or replacement and include the I-75 bridges over Banberry Rd., Roswell Rd., and North Marietta Parkway.

2.1.3 Segment 3 (Station 495+00 to Station 670+00)

Segment 3 includes just over 5 miles of alignment, ¾ mile of which is the beginning of I-575. The majority is on I-75 and includes the I-75/I-575 Interchange. The segment starts 1,000 ft. north of Allgood Rd. and ends on I-75 at a point just north of Barrett Parkway. The majority of this segment has the same added scope as Segment 2, two (2) HOV and two (2) TOL lanes, in each direction. The two (2) HOV lanes in each direction separate at the I-575 Interchange, becoming one (1) lane in each direction on I-575 and one (1) lane in each direction continuing north on I-75. Both TOL lanes in each direction continue north on I-75 past the I-575 Interchange, but do not continue on I-575. There are TOL flyovers that land next to I-575 and merge with existing traffic.

There are 4 proposed new bridges and 7 existing bridges in Segment 3. All of the existing bridges must be replaced or widened. The 4 proposed bridges are all associated with the I-75/I-575 Interchange area and all cross over I-75. There are two (2) HOV and two (2) TOL proposed bridge structures, one (1) each for the NB traffic and one (1) each for the SB traffic.

Four (4) of the 7 existing bridges are overhead bridges, all requiring staged, full replacement at a different grade than the existing bridge. They are the bridges at the Georgia NE Railroad, Canton Rd., the SR-5 Connector, and the existing I-575 ramp to I-75 SB. The remaining three (3) existing bridges are underpass or mainline bridges requiring widening or replacement and include the I-75 bridges over Dickson Rd., Bells Ferry Rd., and Barrett Parkway.

2.1.4 Segment 4 (Station 670+00 to End)

Segment 4 includes approximately six (6) miles of alignment, but the last 1-1/3 miles is past Hickory Grove Rd. and is where the HOV lanes merge with existing traffic on the left lane side and the TOL lanes flyover to the outside and also merge with existing, but on the right lane side. The segment starts at a point just north of Barrett Parkway on I-75 and continues to the northern limit of the project just south of Woodstock Rd. In this segment, the added scope is one (1) HOV and two (2) TOL lanes in each direction. Existing I-75 travel lanes in this segment are down to three (3) lanes in each direction and there is an existing median area for the majority of this segment.

There are 2 proposed new bridges and six (6) existing bridges in Segment 4. All but one (1) of the six (6) existing bridges must be replaced or widened. The Wade Green Rd. Bridge may remain as is. As mentioned above, the two (2) proposed bridges are flyovers to position the TOL lanes on the outside of the alignment for merging with existing I-75 traffic and occur north of Hickory Grove Rd.

Three (3) of the six (6) existing bridges are overhead bridges, all requiring staged, full replacement, one (1) at a different grade than the existing bridge. They are the bridges at Chastain Rd., Shiloh Rd., and Hickory Grove Rd. The remaining two (2) existing bridges are underpass or mainline bridges requiring widening or replacement and include the I-75 bridges over Noonday Creek and Frey Rd.

2.1.5 Segment 5 (I-575 Station 80+00 to End)

Segment 5 represents all of the bridge and highway work associated with I-575, except for the first ¾ mile that is included with the I-75/I-575 Interchange in Segment 3. The segment starts at I-575 Station 80+00, just northeast of the interchange and continues to the project limits on I-575 at Sixes Rd. It is approximately 11 miles long. There are two (2) existing lanes in each direction with a wide median. The project is adding one (1) HOV lane, plus wider shoulders in each direction on the inside of the alignment.

Of the 15 existing bridges within the segment, 5 of them can remain as is and include the overhead bridges at Chastain Rd., Booth Rd., SR-92, Rope Mill Rd., and Sixes Rd.

Another 5 are underpass or mainline bridges that need to be widened with new bridge structure. They are the I-575 bridges over Barrett Parkway, Noonday Creek (south), Noonday Creek (north), Town Lake Parkway, and Little River.

Three (3) more I-575 mainline bridges must be rebuilt entirely. They are the I-575 bridges over Big Shanty Rd., Bells Ferry Rd., and Hawkins Store Rd.

The remaining two (2) bridges are overhead bridges including Shallowford Rd. and Dupree Rd. that will need to be re-built.

At three (3) locations, a structure is built to allow HOV access to cross roads. The first one (1) is Big Shanty Rd., which passes under I-575 requiring HOV ramps down to Big Shanty. The other two (2), Shallowford Rd. and Dupree Rd. are overhead bridges, so HOV ramps from I-575 are to be built up to the cross road.

2.1.6 Segment 6 – BRT Stations and Maintenance Facility

There are five (5) bus rapid transit (BRT) Stations proposed along the I-75 corridor. To support BRT operations, a maintenance facility is also included in the scope of Segment 6. Starting from south to north, the BRT structures are;

- <u>Cumberland BRT Station:</u> Located directly south of Akers Mill Rd. and consists of three (3) structures; a “ U-shaped “ platform located over I-75 NB and SB with nine (9) bus bays in each leg, a pedestrian bridge over I-75 SB, and a 4 level parking structure located west of I-75 and south of the Performing Arts Center. The pedestrian bridge connects with the bus bay platform via a tower of elevator/stairs and continues to the other leg of the bus bay platform via a second tower of elevator stairs.

- Terrell Mill BRT Station: Located in the median of I-75 adjacent to and north of Terrell Mill Rd. It is supported on a bridge structure that is 2,300 ft. long and 105 ft. wide. HOV access lanes connecting Terrell Mill Rd. with I-75 above, passes under the station. An at-grade parking lot on the west side of I-75 SB is connected to the BRT Station by a pedestrian bridge passing over I-75 SB. Presently, an elevator/stair tower on the BRT station side is required.
- Franklin BRT Station: Located on the west side of I-75 SB about halfway between Delk Rd. and South Marietta Parkway. It is proposed as an elevated platform with a kiss and ride, a parking area for waiting cars, taxis, and shuttles. There will be bus bays and HOV/BRT access west to Franklin Rd. and east over I-75 SB to ramps located in the I-75 median for access to the proposed I-75 HOV lanes.
- Marietta BRT Station: Located in the median of I-75 adjacent to and north of Roswell Rd. It is proposed as a platform for 10 bus bays built on an embankment filled structure with access ramps down to Roswell Rd. on each side. Elevators and a pedestrian bridge arrangement provide access across I-75 SB to a 5 level parking garage located just west of Chert Rd.
- Town Center BRT Station: Located south of Chastain Rd. on the east side of I-75 between I-75 and Busbee Parkway. The bus bays are on an elevated platform with a kiss and ride area for waiting cars, taxis, and shuttles below. It is next to a 5 level parking garage and is connected to I-75 to the west via an elevated roadway and bridge across I-75 NB. There is local access to Busbee Drive and Big Shanty Rd. (extended) to the east.
- Maintenance Facility: Located off of West Townpark Parkway, approximately a half mile southwest of the I-75/Chastain Rd. interchange. It is presently planned as a 40,000 SF structure with bus bays, shops, parts storage, and operations/maintenance office space. There is a surface parking lot for buses and cars as well as a fuel island and bus wash.

2.2 GENERAL CONSTRUCTION APPROACH

This report is structured to discuss the constructability of the work of the NWC Project utilizing a segment by segment approach. Many issues are common to all five (5) bridge and highway segments. As a result, this section addresses those issues common to all segments, while Section 5 of this report details issues more specific to each segment.

2.2.1 Access/Traffic/MOT

A large portion of the work will require lane closures on I-75 during non-peak hours. Traffic restrictions for lane takings on I-75 mainline are anticipated to be as follows;

I-75 NB

- Single lane taking—not allowed between 1pm and 8:30pm
- Double lane taking-- not allowed between 6am and 9pm. nine (9)-hour window OK
- Three (3) or more lane taking—not allowed 5am to 11pm. six (6)-hour window OK

I-75 SB

- Single lane takings—not allowed between 5am and 11am
- Double lane takings-not allowed between 5am and 8pm. nine (9)-hour window OK
- Three (3) or more lane taking-not allowed 5am to 11pm. six (6)-hour window OK

The above restrictions are assumptions only for planning purposes based on similar GDOT Projects in the area. Specific restrictions will be established upon approval of submitted engineered and stamped traffic plans prior to start of construction. In instances where highway traffic must be shifted or detoured, a 12 ft. lane width is maintained.

On cross roadways such as Delk Rd. or Windy Hill Rd., the bridge staging is based on temporary lane widths of 11 ft. To optimize the staging, shoulders are minimal and sidewalks are not maintained on overpass bridges during construction. Many existing overpass bridges have wide shoulders which informally serve as a sidewalk, but they are not raised, striped or contiguous with sidewalks at either side. On underpass or mainline bridges where the cross roadway underneath has existing sidewalks, efforts will be made to maintain them on one side. Because the spans for the mainline bridge overhead are usually as long as or longer than existing spans, maintaining existing sidewalks during construction should be possible.

For highway MOT staging, the location of the new I-75 centerline in relation to the existing traffic centerline has a significant influence on options available for highway staging. Other factors were the existing bridges and existing grades on the outside of the existing alignment. The outside is where additional right of way is required to accommodate the widened alignment. The term “outside” in this report means west of existing SB and east of existing NB. The term “inside” in this report means the median side, which is west of NB and east of SB.

For highway work, the use of temporary jersey barriers will be extensive since every phase in each section must have the existing NB and SB mainline lined with temporary barriers while construction is being performed next to traffic or if there is a pavement elevation drop off. Pavement markings are considered essential for all temporary lane configurations on the highways. All shifts in alignment, other than a nightly lane taking (barrels), will be re-striped often temporarily. The length of time planned for a traffic shift and existing surface, asphalt or concrete, will dictate whether tape, paint, or thermoplastic is warranted. It will be the responsibility of construction to maintain lane markings. Old striping will be eradicated by means that does not cause asphalt unraveling. If black paint to hide old striping is used for short term stages, it will be maintained.

2.2.2 Engineering Basis for Report

- <u>I-75 and I-575 Bridge Matrices</u>: At this early stage of feasibility investigation, bridge concepts were not developed for every bridge. Four (4) I-75 bridges were chosen as “clusters“, explained below, and conceptual plans or sketches were developed. Information for the remainder of the I-75 bridges, including the proposed new bridges can be found on a series of bridge standard drawings and the I-75 Bridge Matrix which contains an extensive amount of conceptual design information on every existing bridge and every proposed new bridge associated with I-75 and I-285. The existing bridge data includes bridge dimensions, beam types, clearance, sidewalks, spans, latest bridge rating, etc. For all proposed new bridge structures and replacement bridge structures the information includes, but is not limited to, length and number of piles, substructure types, number, dimensions, and reinforcement, superstructure beam type, spacing and length, deck dimensions and reinforcement, and MSE wall requirements. A “Summary of Quantities” section totals every quantity from linear ft. of driven steel pile to linear ft. of barrier. Every bridge has an assigned number from 1 to 107.

  On the I-75 Bridge Matrix, under the heading “Proposed Bridge”, is a column heading “Bridge Type“, which is used in conjunction with standard bridge type detail drawings provided. The bridge types listed number over 20, but there are major categories. S stands for steel, P for prestressed concrete, H for HOV and interchange type, and BR for braided ramps. A number indicates the number of spans. The standard drawings provide bridge details including rebar, barriers, diaphragms, end walls, end beams, utility supports, and sidewalk and parapet details.

  It must be pointed out that the design information presented in the matrix is conceptual in nature based on available information and subject to change. Only conceptual design has been performed and there have been no geotechnical exploratory borings to confirm the foundation types assumed in the matrix.

  A similar I-575 Bridge Matrix was also prepared for the 15 existing bridges in Segment 5, the I-575 portion of the NWC Project. The information provided in the I-575 matrix is as extensive as the I-75 matrix. For the I-575 bridges, conceptual drawings or sketches were prepared for every one (1) of the I-575 bridges, which require replacement or widening. This numbers 10 of the 15 existing bridges. Every bridge has a plan view and cross sections, which aid in understanding the scope of work and staging required to complete the work. For the four (4) I-575 “cluster“ bridges selected, additional elevation views were provided. As with I-75, the same caveat applies in that the design information presented in the matrix is conceptual in nature, based on available information and subject to change.

- Bridge Construction Categories: Existing bridges within the NWC Project limits were categorized in regard to their existing type and in regard to what rework is anticipated at this point in the project. Existing bridge types are simply one (1) of two (2) types. "UE" indicates the crossing road to pass under the mainline. These are also commonly referred to as mainline bridges. The "E" indicates "existing" as opposed to the proposed new structures. "OE" indicates the crossing road to be an "existing overpass" bridge, over the mainline highway, I-75 or I-575.

  The following construction categories were used to classify the existing bridges within the NWC Project limits according to the amount of rework required. The first category indicates no work required and the existing bridge can remain as is. The next two (2) categories are for UE bridges and the last four (4) are for OE bridges. Category 2A for UE bridges and category 5A for OE bridges represent the most work.

  - **Category 1**—No work required to existing structure. Examples are OE bridges like Windy Ridge or OE bridges on I-575 where the added HOV lanes can pass beside the center pier.
  - **Category 2—**UEs where separate bridge structures for HOV and/or TOL can be built without affecting existing, adjacent structure other than minor edge work.
  - **Category 2A**—UEs where bridge condition or cross roadway grades warrant mainline Bridge replacement.
  - **Category 3—**OEs with designed replacement bridge in new alignment thereby simplifying staging. Examples are Allgood and I-575 ramp over I-75.
  - **Category 4—**OEs where main spans can remain but all other spans must be replaced and/or added to.
  - **Category 5—**OEs where the entire structure must be replaced in same alignment and grade, usually due to existing pier interference.
  - **Category 5A—**OEs where entire structure must be replaced but at a different grade thereby creating more stages.

  The above categories can be seen on both the I-75 and I-575 Bridge matrices as well as in *Appendix A, NWC Bridges—Reworking Existing and Proposed*.

- Bridge Clusters: Given the large number of bridges, both existing and proposed, within the project limits, decisions on which bridges should be selected for more detailed review were made. Cluster bridges were selected based on being representative of other similar bridges and for the challenges they present. In this manner, the additional issues and costs associated with the cluster bridges can be applied to other similar bridges. MOT issues and associated costs and staging issues and associated costs are examples of this application and approach. For I-75, four (4) cluster bridges were selected, one (1) for each of the four (4) I-75 construction segments. Drawings were prepared for each of the clusters and include the I-75 cluster bridges at Terrell Mill Rd., Delk Rd., SR-5, and Chastain Rd.

  In a similar manner, four (4) cluster bridges were chosen in Segment 5, the I-575 segment. They are the bridges at Big Shanty Rd., Bells Ferry Rd., Dupree Rd., and Little River. For these four (4) locations, additional drawings showing elevation views were prepared.

  Within this report, for each segment, the cluster bridge is discussed in detail.

- Alternative 2 vs. Alternative 1: The Alternative 2 alignment and bridge drawings were used as the basis of this report. With Alternative 2 alignment, the TOL lanes are on the inside of the I-75 alignment as opposed to Alternative 1 alignment which has the TOL lanes on the outside of the alignment. The I-575 work is the same under each Alternative.

  An I-75 Bridge matrix was prepared for Alternative 1 as well as four (4) bridge cluster drawings for Alternative 1. If Alternative 1 cluster drawings are compared to Alternative 2 cluster drawings, the following differences can be noted. For the I-75 Bridge over Terrell Mill Rd. there are only minor dimensional differences in stage widths. For the 3 overhead cluster bridges, the spans in Alternative 1 are always longer spans resulting in usually a lesser number of spans. Alternative 1 cluster drawings usually indicate heavier members for the longer spans. For example, for Delk Rd. Bridge, Alternative 1 calls for steel plate girders since there are 160 ft. spans, whereas Alternative 2 uses 72" bulb tees since the maximum span is 120 ft. Both the Chastain Rd. Bridge and SR-5 Bridge have longer spans, less or equal number of spans, and heavier beams. However, the staging dimensions and staging approach for these 3 bridges are identical for Alternative 1 and Alternative 2.

The Alternative 1 alignment results in considerably more new bridge structure, an estimated 4.1 million square ft. compared to 3.1 million square ft. of bridge for Alternative 2. This is due to the need for braided ramps where the exit/entrance ramps cross the TOL lanes on the outside of the alignment. In Alternative 2, the TOL lanes are on the inside so the exit/entrance ramps can simply merge with mainline without a crossing. The South Marietta Parkway interchange is a good example of this situation. In Alternative 2, there are approximately 65,000 SF of new bridge structure. In Alternative 1 there is approximate 200,000 SF of new bridge structure, the difference being the 4 braided ramp bridge structures for TOL crossings with the exit/entrance ramps. From the southern limit of the project up to just south of Delk Rd. the bridge quantities for each alternative are identical.

2.2.3 Construction Methods – Highways

The general approach to constructing the highway portions of work in the first 5 segments is described in this section.

As mentioned in the staging section, there will be a need at times for temporary roadways to be built, for the mainline traffic and for temporary routing of exit and entrance ramps at intersections. An assumed pavement section of 7” of asphalt over 10” of compacted, graded aggregate was selected.

For the permanent I-75 mainline, a 12” reinforced concrete slab is planned. It is anticipated the slab will be reinforced with one (1) layer of longitudinal # 6 rebar at 5” on centers with # 4 rebar at 3’ on center. A GDOT Class 1 mix, a 4,000 psi mix, is likely. Control joints will be sawcut and the surface will be sealed. Adjacent placements will be doweled together. Most of the concrete slab sections will be placed with a dual lane slip form placer and a dual lane slip form paving machine capable of placing slabs up to 26’ (two (2) lanes) in width. It requires an overhang distance of 3’ minimum on each side. This must be accounted for in staging new work next to existing traffic. Another crew will use a Gomaco/CMI Placer and a single lane slip form paving machine for 12’ wide (single lane) placements. An accelerated mix will be available to allow traffic utilization within 6-10 hours, if needed.

To expedite the work, it is expected that the single rebar mat required and described above, will be resistance welded at an on site facility, into mats, which can be trucked, crane handled, and placed in sections up to 11’ by 66’. Concrete lug anchors will be required at each bridge approach slab.

On site batch plants will be set up and utilized for all field concrete placements. Tentative plans are to set up three (3) plants to cover the project. Possible locations include the current Archer Western batch plant site at Wade Green Rd., the SR-92 infield, and the Cumberland BRT parking facility site.

The 12” concrete roadway slab will be bedded with a 3” layer of asphaltic 19 mm base, placed over 12” of compacted, graded aggregate base (GAB). Materials for backfilling in structural and non-structural areas will follow standard GDOT specification requirements.

Heavy highway construction equipment used for excavation, backfilling, and grading will include mid to large sized crawler excavators, tri-axle dump trucks, D-6 to D-8 size dozers, Cat 850 size compactors, motor graders, water trucks, spreader Boxes.

There is extensive cuts and fills along the widened alignment. At this early stage of design, fill areas are shown to be MSE wall. Excavation or cut areas are assumed at this early stage of design to be supported by soil nailing.

Removal of old striping will likely be done by mechanical abrasion or high-pressure water blast. It is important to not remove too deep such that the existing asphalt starts to unravel. Temporary barriers will be pinned or otherwise joined.

2.2.4 Construction Risks

Construction risks which apply to all five (5) bridge and highway segments will be discussed in this section.

The close proximity of the work to up to 13 lanes of highway traffic and up to 8 lanes of secondary road traffic potentially poses safety risks to the workers and general public. All safe practices must be employed. These include concrete barrier protection for workers within a work zone. No loads will be lifted over traffic. Lifts adjacent to traffic must be made with consideration of swing radius and rotating equipment. Pile driving and heavy structural element lifts pose the greatest risks. Traffic will be detoured as required to preclude lifting over traffic and to provide safe buffer zones. Much of the work is over or adjacent to I-75.

Almost all the overhead bridges must be completed before traffic can be shifted per the highway MOT plans described herein. Then for each traffic shift adjacent roadway work, mainline bridge work, and in some cases the staged highway work or bridge work in the adjacent section, must all be complete before traffic can be shifted and the next stage of the highway MOT plan can be started. A delay in one (1) area can translate to a delay to the critical path of the project schedule.

Within the NWC Project, there are a significant number of utility relocations of varying complexity and scope required for this project. Section 8 of this report contains more detailed information on utilities. Of particular note are the Georgia. Power transmission towers and crossings in several locations including Delk Rd. which will be on the critical path of the schedule. Utilities along the highway, utilities under the highway, and utilities supported on the underside of existing bridges all represent risk. Close coordination and cooperation with the utility companies will be necessary to avoid costly delays. Much of the relocation, such as those related to bridge work, will need to be done at a certain stage of construction and cannot be done early. In other cases on the bridge work, utilities will need to be relocated twice. In these cases the section of bridge first demolished is supporting the utility so there is no new bridge section yet in place to hold the relocated utility.

Other utilities include the lighting and fiber optic cable lines related to existing highway operations that must be temporarily replaced and relocated to support highway operations.

An additional risk for the highway work is the risk of differing site conditions in the form of rock or obstructions. Related to this is the risk of environmental hazards uncovered during excavation or foundation work particularly in areas of ROW takings where a history of usage may have led to a hazardous condition.

Another environmental risk is wetlands mitigation. Obtaining and following the conservation order of conditions without experiencing delays, fines, or stop work orders is a risk. Within the project limits there are several rivers/creeks, many which cross and recross, that will require this to be addressed including Rottenwood Creek, Sope Creek, Noonday Creek, and Little River.

2.2.5 Value Engineering

The known opportunities for highway work are generic to all five (5) segments and are included in this section. Currently, the constructability options related to highway work fall into one (1) of the following categories:

- Shoulder Width modifications/reductions both permanent and during construction. Both drainage and ROW are affected by this subject. One (1) initiative would widen the inside shoulders to minimize drainage inlet requirements.
- Barriers: One (1) possibility is combining the HOV and TOL within one (1) set of divider barriers and using buffer zones, rumble strips, or plastic poles to separate HOV and TOL. Variations of this include combining and reducing the number of lanes, thus reducing the overall cross section required. Another possibility is the use of moveable barriers which can be an advantage long term for future HOV lane expansion but also can affect highway drainage. Both of these barriers opportunities can be of added benefit during the highway MOT staging.
- Reinforcement used in the concrete roadway slab. The reinforcement presently planned for is one (1) layer of longitudinal # 6 rebar at 5” on centers with transverse # 4 rebar at 3’ centers. This could be revised to # 7 rebar at 7” for longitudinals and #5 rebar at 54” for transverse reinforcement.

- Roadway Cross section Possibilities include modifying thicknesses of the structural section in part to reflect reduced truck traffic on HOV and general purpose lanes. Another is the recycling of existing asphalt as a base for new pavement section.

There are some common opportunities for the bridge work. By using grade 50 ksi steel for the driven foundation, an increased capacity can result in a reduction in the number of piles. Related to this is the use of larger piles for increased capacity and a similar reduction. Presently the conceptual design reflects HP 14X73.

Alternative foundation types for both the bridge work and the BRT stations will be investigated.

The use of steel diaphragms for precast girders in lieu of concrete cast in place diaphragms is an opportunity.

3 – Early Construction Packages

This section will explore potential pre-construction and/or early construction activities that will have an impact on the start of construction and the overall construction schedule for the NWC Project. The first three (3) activities are usually prerequisites for start of construction and include utility relocation, right-of-way acquisition, and geotechnical exploration. Early critical path construction activities will also be discussed such as the overhead bridge work.

3.1 Utility Relocation

The Design Services Agreement (DSA) outlines the many steps required before utilities will physically be relocated in support of NWC Project construction activities. At the present time the subsurface utility engineering (SUE), quality level B, of the I-75 and I-575 corridors is complete.

To have the utility relocation drawings ready for construction following the GDOT procedures, there are four (4) required steps. The first is preparation of existing utility drawings based on the SUE performed, to be distributed to GDOT, and from GDOT to the various affected privately, publicly, or cooperatively owned utility companies. GDOT will request the companies to mark-up the plans to identify, existing, abandoned, relocated, or added utilities.

The second step involves preparation of preliminary utility plans, incorporating the above existing information and identifying the disposition of all existing utilities, for example, " to be removed", " to be adjusted", " to be relocated", etc.

The third step involves preparation of costing plans for utility relocation of reimbursable utilities. Reimbursable utilities fall outside the existing GDOT ROW for existing highway alignment.

The fourth step occurs after NTP for Design-Build and involves preparation of final utility relocation plans for reimbursable utilities. These plans can be used for construction. Plans for non-reimbursable utilities will be done by the utility companies at their expense. However, as is the case for reimbursable utilities, the review, coordination and dissemination of comments to be incorporated are all necessary to ensure utility company specification requirements and NWC Project requirements for infrastructure locations are both met.

On a parallel path with drawing development is the development of utility agreements for the NWC Project. There are some existing utility agreements between GDOT and the major utility companies. Where possible, the existing agreements will be supplemented with addenda to cover the NWC Project work. New agreements will be drafted as applicable. Utilities within the NWC Project limits include but are not limited to the Northeast Georgia Railroad, Adelphia Cable, Cobb County Water and Sewer, Georgia Power, Comcast Communications, Atlanta Gas and Light, Cobb EMC, MEAG Power, Marietta Power, Colonial Pipeline Company (petroleum lines), City of Marietta , Bellsouth, Cobb County DOT, Cherokee County Water, MCI , Georgia Department of Transportation.

Once drawings and agreements are in place, the relocation of non-reimbursable utilities by the utility companies will require close coordination and expediting on the part of GTP to ensure timely response and availability of utility company forces and/or subcontractors. There may be occasions where it is more efficient for all parties to have certain aspects of the installation, such as a duct bank, performed by GTP. The cost incurred can be tracked and credited to the utility co. agreement, often called a force account. It is anticipated that each utility will have both reimbursable and non-reimbursable relocations addressed within the utility agreement.

For the reimbursable relocations, once drawings and agreements are in place, early construction packages can be assembled. For some utilities, like water and sewer, GTP will likely perform the work. For other relocations, like power and telephone, GTP may install the duct banks but the utility pulls cable and makes terminations. Under this scenario, the utility company would be reimbursed under the force account agreement. Other specialty work, like gas, might be subcontracted out to a subcontractor approved by the utility company. These decisions will be made after coordination with

GDOT and the utility companies. In many locations, this work must be started expeditiously to support the construction of the new infrastructure.

3.2 Right of Way (ROW)

Early identification of ROW requirements and initiation of the ROW acquisition process is typically a critical project schedule activity. Many design features are required to be sufficiently complete in order to identify the ROW impacts such as roadway geometry, maintenance of traffic requirements, permanent and temporary utility relocations, utility easement identification, and grading/drainage requirements.

Other factors including borings designed to assess existing environmental conditions in suspect parcels should be performed early. After evaluation of the results, environmental remediation required prior to ROW taking, such as soil remediation needs to be expedited. Soil remediation is a prerequisite to ROW taking. Other remediation, such as building materials including asbestos, is usually performed after the ROW taking.

During the Design-Build phase, after ROW takings are accomplished, any identified environmental remediation work associated with existing building materials, such as asbestos, will be an early construction package and must be expedited. This work is a prerequisite to demolition of buildings where this condition is identified. Furthermore it is important to have in place an emergency response subcontract which is on call for unidentified/unexpected environmental conditions requiring remediation whether associated with subsurface conditions or existing building materials. This will avoid costly delays in the field.

Once environmental remediation is completed for any given structure, demolition is the next step. An early construction package for demolition of required structures is recommended.

3.3 Geotechnical Investigation

A thorough geotechnical field exploration and analysis will be required before development of the Costing Plans, a prerequisite activity for NWC Project Design/Build phase. Completion of a significant portion of the field investigations and preparation of the associated reports will be required: Existing Pavement Evaluation and Pavement Design, Soil Survey, Bridge Foundation Investigation (BFI), and Retaining Wall Investigation following GDOT guidelines will be required.

The geotechnical field exploration, analysis and report preparation for the I-575 portion of the NWC Project is scheduled to begin in January 2007and have a duration of 6 months. The I-75 portion follows, forecast to be completed in Spring 2008.

3.4 Early Critical Path Work

To get started with the bridge and highway work in Segments 1 through 5, the pre-requisite activities discussed above are significant. Segment 5 is less complex and less encumbered by overhead bridge work. In segments 1 through 4, the overhead bridge work must be completed before highway work can progress past an initial phase of highway work.

Each of the first four (4) segments has between one (1) and four (4) existing overhead bridges that must be rebuilt before any highway shifting per the MOT Plan can take place. Although highway work on phase 1 of each segment can be worked concurrent with the overhead bridge work, the overhead bridge work will be the critical path in each of these segments. It is not until new piers in locations consistent with the new alignment are completed and existing bridge piers are demolished that construction can go to a phase 2 of the Highway MOT Plan.

For Segment 1, the early critical path of the schedule is the rebuilding of the Windy Hill Rd. Bridge and two (2) related bridges, new Windy Hill Rd. bridge over Interstate North Parkway and the rebuilding of the Windy Hill Rd. bridge over Rottenwood Creek. This work is performed in stage 1A through 1E described in section 5.1.1.2 of this report.

For Segment 2, the early critical path of the schedule is the rebuilding of the Delk Rd. Bridge and the South Marietta Parkway Bridge. Both are comparable in size and duration required. Two (2) other existing overhead bridges in Segment 2 will also be rebuilt before construction can go to phase 2 of the Highway MOT plan with traffic shifted. The Delk Rd. bridge work cannot start without the relocation of the large electric transmission tower, presently situated in the southeast quadrant. This may prove to be the Segment 2 critical path, through the utility relocation plans, utility agreements and transmission tower relocation, through Delk Rd. bridge replacement.

For Segment 3, the early critical path of the schedule is the rebuilding of the SR-5 Connector Bridge. But before the construction can go to phase 2 of the Highway MOT plan, with traffic shifted, the other three (3) existing overhead bridges must also be rebuilt. The SR-5 Bridge has the most scope and bridge stages, so it will likely be on the critical path.

For Segment 4, the early critical path of the schedule is the rebuilding of the Chastain Rd. Bridge, having more scope than the other two (2) existing overhead bridges requiring to be rebuilt. All must be completed before traffic shifting per the Highway MOT Plan described in section 5.4.1.2 of this report.

4 – Staging and Laydown Areas

The purpose of this section is to identify the needs and adequacy of available land along the alignment for staging and construction laydown areas. Included in this discussion will be possible locations for field offices. This report will address staging/laydown areas and field office locations, segment by segment, south to north. Segment 6, BRT stations, will be included in the geographical segments for bridge and highway, segments 1 through 5. For colored aerial maps, see *Appendix B entitled Staging and Laydown Area Locations*.

Staging areas are required to stage the work, meaning assembling, fabricating, and organizing materials needed for an upcoming installation. For example, tractor trailers loaded with bridge beams to install that night will require a staging area. Often, forms are assembled or custom made in a staging area. Shops such as carpenter shops can be part of a staging area or part of the field office complex. Staging areas are usually adjacent to or a part of a laydown area. The term laydown usually denotes storage of materials and equipment.

For the NWC Project, laydown will be required for form storage, bridge beams, rebar, equipment storage, MOT supplies such as cones and barrels, excavated material stockpiles, backfill and grading material stockpiles, BRT architectural finish materials, drain pipe, conduit, MSE blocks and straps, and any other bulk commodity.

The first choice for staging/laydown areas is GDOT controlled areas within the existing highway ROW, adjacent to the work. Since there are very limited median areas in Segments 1, 2, and 3, the first choices in these areas are limited to cross road interchange areas and BRT sites.

Field offices will consist of a trailer complex for superintendents, field engineers, administrative, and QC personnel. It is anticipated that there will be one (1) field office per segment. Requirements for field offices include water, electric, and sewer if available. Proximity to the segment work is desired. Often times the complex will be next to or part of a staging/laydown area. Trailers for craft “change houses” are often included. Toilet and wash up facilities are located here in addition to tool sheds for storage and control of small tools. Subcontractors will also be placing trailers in these complexes.

As noted in section 2.2.3 of this report, the plan is to locate three (3) concrete batch plants to cover the Project. Possible locations include the current Archer Western batch plant site at Wade Green Rd., the SR-92 infield, and the proposed Cumberland BRT parking facility site.

4.1 Segment 1 Staging/Laydown

Starting at the south end of the NWC Project, at the Cumberland BRT site, until full highway closures are required, the two (2) idle ramps on the east side of I-75 provide an excellent, accessible staging/ laydown area. Once the end of the idle ramps need to be reworked to accommodate the full I-75 NBD closure detours, the area just further north off the end of the idle ramps can be graded and used for staging/laydown area. This is the triangular shaped area bounded by I-75, I-285, and the NB to EB ramp. Another area is the wide I-75 median just north of Akers Mill Rd., the site intended for the NBD HOV ramps. Construction of the NB HOV ramps may be delayed to accommodate BRT station construction. A third possible area is the land just east of the Cumberland station and east of Overton Parkway, assuming development of the area is not forthcoming.

Moving north into the I-75/I-285 Interchange area, some of the available space has existing steep contours not conducive to staging/laydown use and some will have new bridge structures crossing through it. At this point, it appears the following areas within the interchange will be useful for staging/laydown. See *Appendix B*.

- In the southeast quadrant of the interchange, the triangular area bounded by I-75, I-285, and the WB to SB ramp, including the area within the cloverleaf. This is the counterpart of the area suggested above for Cumberland BRT work.
- In the northwest quadrant, two (2) areas exist. Both are bounded by I-75, I-285 C-D, and the ramp from SB to EB. The two (2) areas straddle the ramps from Windy Hill Rd. and SB to WB.

- In the northeast quadrant, the area bounded by I-75, I-285 C-D, and the EB to NB ramp. This includes the area within the cloverleaf.
- Just north of Windy Hill Rd. and east of I-75 is an area where the project will be adding two (2) elevated bridge structures with piers over 100' high due to the existing terrain. This low, dished out area is the location of an existing sewer station but the surrounding area could be used for staging/laydown. This also might be an appropriate location for a field office complex since access is from local roadways, not highway ramps.

For the Windy Hill Rd. Bridge construction which will need to be performed early in the project and there are three (3) adjacent areas that can be used for staging/laydown. They are three (3) of the four (4) triangular areas bounded by I-75, Windy Hill Rd. and the exit/entrance ramps. The only one (1) not suitable is the one (1) in the southeast quadrant due to grade issues. Inside the cloverleaf in the northwest quadrant, grade issues may also be an issue.

Regarding laydown areas in the Terrell Mill Rd. Bridge area, the Venture Homes building and parking lot area represent a viable laydown area for all stages of bridge construction and is convenient to the work. Through access for InfoMart must be maintained. Another possibility is to delay the BRT parking lot construction and use the existing parking lot. Remaining possibilities are very limited median area and remote laydown.

4.2 SEGMENT 2 STAGING/LAYDOWN

For the Delk Rd. Bridge construction, the northeast quadrant of the existing Delk Rd. interchange provides the best opportunity for staging/laydown. The inside of the cloverleaf ramp and the triangular shaped area formed by the on ramp from Delk. Rd. to I-75 NB will be adequate for the bridge construction.

Concurrent with the Delk Rd. Bridge construction, there are the other three (3) overhead bridges in Segment 2 needing to be rebuilt early in the project. They are the bridges at South Marietta Parkway, Gresham Rd. and Allgood Rd. For these bridges, the existing interchange areas at South Marietta Parkway and North Marietta Parkway can be used. Highway work in phase 1 of the MOT will also be working concurrently with the overhead bridge work. The interchange areas mentioned can be shared for this highway work. In addition other possibilities exist including the Marietta BRT Station parking structure location next to Chert Rd. The parking structure construction could be delayed. Another is the proposed I-75 SB alignment in the area of Banberry Rd. and Roswell Rd. which extends considerably to the west due to the I-75 alignment shift and widened alignment. While roadway work will need to be working concurrent with bridge work, particularly for the category 2 and 2A bridges, there should be areas available within the alignment for staging/laydown. Remote laydown is another possibility.

The Franklin BRT station that is located within the Segment 2 area will be west of I-75 on a new road coming from Franklin Rd. It is a raised platform without a parking garage structure. The area directly around the planned structure is planned to be used for staging/laydown.

For a field office complex, since this area is highly developed, renting space locally may be the easiest solution. Two (2) other possibilities are the Motel 6 site, proposed for ROW taking and demolition, located next to Delk Rd. and the Marietta BRT Station parking structure location, near Chert Rd.

4.3 SEGMENT 3 STAGING/LAYDOWN

Segment 3 has the advantage of two (2) sizeable existing interchange areas, one (1) at SR-5 and the other at Barrett Parkway. A third area that can be used for staging/laydown is the existing I-75/I-575 Interchange area but much of this area and some of the Barrett Parkway will be taken up by the new alignment construction.

The cloverleaf areas at SR-5 are large and conveniently located to support SR-5 bridge work as well as the Georgia NE RR Bridge work and Canton Rd. Bridge work just south of SR-5. All three (3) bridges must be rebuilt in the early stages of the project, concurrent with the start of highway work in phase 1 of the Highway MOT Plan.

If adequate area is not available between the three (3) interchange areas and the widened alignment, then remote laydown areas will have to be pursued.

For a field office location one (1) possibility is space in the buildings planned for ROW taking and demolition on Atlanta Industrial Drive., east of I-75, between Allgood Rd. and the Canton Rd. The west end of a building within the alignment can be demolished, the building closed in, and used for an office until the end of the project when the remainder would be demolished. The parking lot would serve as a staging/laydown area.

4.4 SEGMENT 4 STAGING/LAYDOWN

For Segment 4 staging/laydown area, there is an existing 40 ft. wide median available on I-75. The width doubles further north in the vicinity of Wade Green Rd. In addition, the large triangle shaped areas bordered by the Chastain Rd. on/off ramps are also available and conveniently located.

Further north, at the Wade Green Rd. interchange, the triangular shaped areas bordered by the on/off ramps also provide a sizeable area for staging/laydown. One (1) other possibility is the Town Center BRT site location and adjacent land. If construction of the station's parking facility is delayed, this area is available.

The proposed site for the Town Center BRT station may also be a location for a Segment 4 field office complex. It is the site of a building since demolished so water and electric should be available in the immediate vicinity. The Chastain Rd. interchange is just north of the site so access to I-75 is nearby.

4.5 SEGMENT 5 STAGING/LAYDOWN

For Segment 5 staging/laydown areas, the existing grassy wide median on I-575 provides an excellent area for most MOT Plan stage 1 work. Exceptions are the Big Shanty Bridge work which requires early building of the HOV access ramps and the two (2) bridges requiring stage 1 on the inside first. The staging sequence for I-575 roadway work is basically work the outside of the alignment first and then shift traffic onto this completed work for stage 2. The one (1) exception as mentioned earlier occurs in the one (1) mile area of Bells Ferry Rd. and Hawkins Store Rd. This zone will require crossovers and be done the opposite of the other 80-90% of I-575.

By stage 2 of the Highway MOT Plan, almost all areas are working the median, filling it in with roadway or bridge work. At each of the 6 exits within the I-575 Project limits, there exists four (4) large triangular shaped areas formed by the on/off ramps. These 6 interchanges are evenly spaced along the 11 miles of I-575 project scope and do not require any additional ROW takings since they are controlled by GDOT. They could be used as staging/laydown areas for bridge work and roadway work.

One (1) possibility for a field office complex for Segment 5 is to combine it with a complex for Segment 4 at the Town Center BRT station location described above. Access to I-575 is nearby via George Busbee Parkway and Chastain Rd.

5 – Bridges and Highways

The project has been broken into 5 geographical segments, as illustrated in *Figure 5-1. Construction Segment Plan*. The following sections outline the general approach and methodology for the highway and bridge construction effort for each segment.

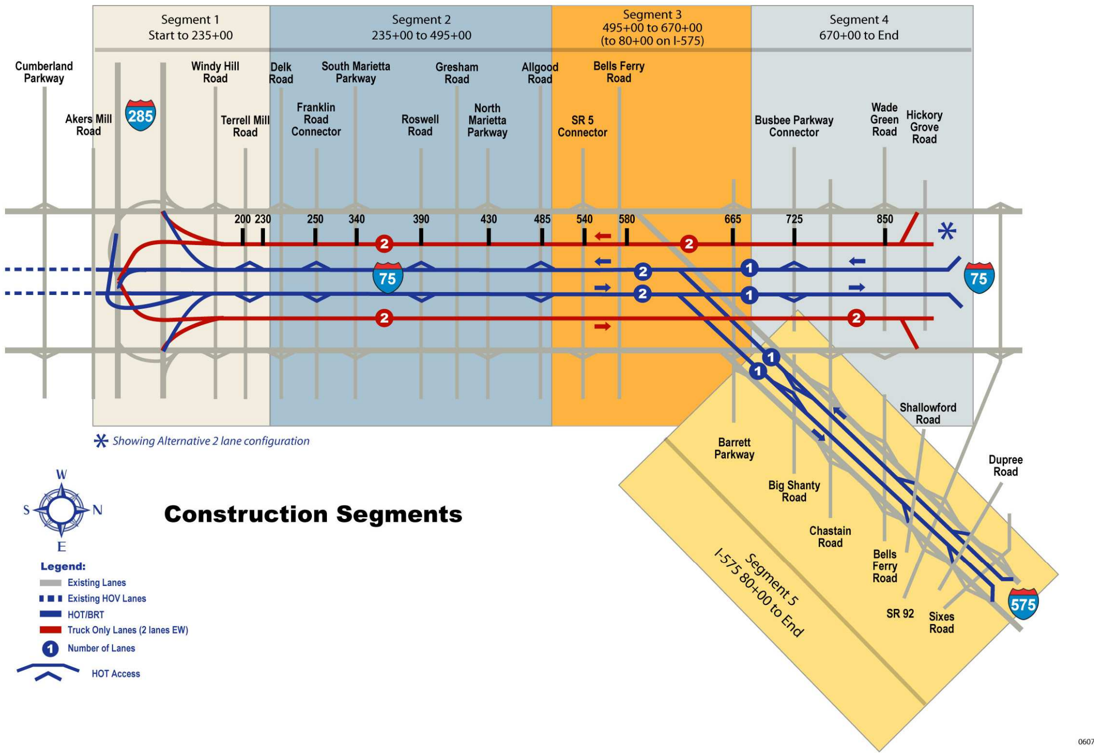

Figure 5-1. Construction Segment Plan

5.1 Segment 1

Segment 1 originates at the southern limit of the NWC Project, just south of Akers Mill Rd. and extends to Station 235+00, which is approximately 1200 ft. south of Delk Rd. This segment includes the work extending along I-285 in both the Eastbound (EB) and Westbound (WB) directions for the new access ramps.

Key Construction Elements

- **The I-75/I-285 Interchange:** There are 15 new bridge structures needed to accommodate all the HOV and TOL access requirements at the interchange and to rework the existing interchange movements. Almost two-thirds of the work at the I-75 / I-285 Interchange is new bridge structure, the remainder is at-grade highway work. Except for some bridge substructure work on a few, the existing bridges within the Interchange area can remain as is. This includes the Windy Ridge Parkway bridge over I-75 and the bridges on I-285. Some bridges, like the I-285 bridge over Cobb Parkway, need to be widened with a new, separate structure.
- **North of the I-75 / I-285 Interchange area:** The Windy Ridge Parkway bridge can remain as is (Category 1). See Section 2.2.2 for Construction category definitions. The second is Windy Hill Rd., an overhead bridge (OE). The third one is Terrell Mill Rd., an underpass or mainline bridge (UE). Both of these last two (2) bridges must be replaced at a different grade from existing and involve staging the work. The Terrell Mill Rd. bridge was chosen as a "Cluster Bridge"[1] for which a conceptual design was completed. This section of the Constructability Report will address the

[1] Cluster Bridges are representative of other similar bridges and are usually also chosen for the challenges they present.

construction of the Segment 1 cluster bridge, Terrell Mill Rd. Bridge, in detail but also discuss constructability issues on the other Segment 1 bridges as well as highway issues, using the Alternate 2 design. It should be noted that drawings were not prepared for the non-cluster Segment 1 bridges. The constructability issues are derived from the I-75 Bridge matrix prepared and from field inspection and photos taken.

- **Terrell Mill Rd. Area:** HOV access is provided at the cluster bridge location. The Terrell Mill BRT Station will be located within the median area on a raised platform with the HOV access lanes sweeping beneath the station. Terrell Mill Rd. is ascending from underneath I-75 in both directions and is particularly steep for a distance in the west direction. There is also a driveway from Terrell Mill Rd. heading north on the east side of I-75 which services Venture Homes and InfoMart.
- **Windy Hill Rd. Bridge over I-75:** This bridge will be rebuilt at a higher grade with new pier locations before any traffic shifts related to the Interchange can take place. It will likely be done in three (3) stages with existing traffic capacity maintained by shifting the Windy Hill Rd. centerline to the north. There are two (2) other bridges required to be worked on Windy Hill Rd. The first one (1), just east of the Windy Hill Rd. Bridge over I-75, will allow Interstate North to pass under Windy Hill Rd. The second will be a replacement and raising of the existing bridge over Rottenwood Creek, further east on Windy Hill Rd. The entire Windy Hill roadway will have to be substantially raised, creating staging challenges.

- Within the Interchange area, there will be HOV and TOL ramps entering and exiting. The single HOV lane from Akers Mill Rd. merges with the general lanes of I-75 NB before the joining the HOV lane from I-285 on the inside of the alignment. Heading north, it is not until just prior to Terrell Mill Rd. that all HOV and TOL lanes have swept into their proposed alignment on the inside of the general lanes. Additional detail on lane alignment and alternatives are included in Section 5.2.

Most of the fifteen new bridge structures needed for the I-75 / I-575 Interchange area are 160 ft. spans, utilizing steel plate girders supported by hammerhead bents, cantilevered bents and single or double straddle bents. The remaining are lesser spans, utilizing pre-stressed concrete bulb tees. The long span of 160 ft. was chosen to minimize the number of bents required in this critical interchange area. Further north, just before the Terrell Mill Rd. bridge, there is an additional proposed bridge, a NB TOL flyover I-75 NB, landing on the inside of the alignment next to the HOV lanes. This would also require 160 ft. spans and plate girders.

5.1.1 Access/Traffic/MOT/Staging and Sequencing

5.1.1.1 Bridges

Terrell Mill Rd. Bridge: The biggest challenge under the Alternate 2 design is maintaining access to the driveway on the east side. This driveway heads north and will still need to service the InfoMart business in the final design configuration. Under Alternate 1, only the ft.print of the Truck only lanes (TOL) displaced the driveway in its present configuration. The solution for Alternate 1 is to elevate the TOL on a bridge structure over the driveway. However for Alternate 2 this solution is not cost effective since it would require elevating a minimum of 8 lanes of traffic, not just the 2 TOL lanes. One (1) solution for Alternate 2 presently being investigated includes lowering the driveway and re-routing it after 150 ft. or so to turn right out from under the alignment and follow the bank of Rottenwood Creek. Another solution would be to design a new driveway starting on the east side of Rottenwood Creek including a bridge for the driveway over Rottenwood Creek. The possibility of finding a route for a new driveway approaching InfoMart from an existing roadway to the north was investigated in the field. However the land north and east of InfoMart is occupied by residential apartment complexes. No practical route was evident.

The planned staging for this work is to build new highway structures on the outside of existing NB and SB I-75 travel lanes and then place existing traffic on the new structure while work continues on the inside, building the remainder of HOV/TOL/GPL (general purpose lanes) structures for SB and NB, as well as the BRT station and HOV access ramps down to Terrell Mill Rd. This staging is presently shown on the cluster bridge drawings.

Setting the 72" bulb tees over Terrell Mill Rd. and building safe, redundant work platforms attached to the bottom flanges, will require night work and full closure of Terrell Mill Rd. The nighttime detour for closing this portion of Terrell Mill Rd. will be to route traffic via Powers Ferry Rd. to Windy Hill Rd. to Cobb Parkway.

Driving steel piles and possibly steel sheeting directly adjacent to existing travel lanes will require lane closures within the fall radius of the piles used. Presently the I-75 Bridge Matrix calls for 20 ft. long steel piles and may only require 2 lanes to be temporarily closed. Similar GDOT projects are being restricted to 9pm to 6am for I-75 NB and 8pm to 5am for I-75 SB for double lane takings. Since the new span length is 140 ft., the foundation and substructure work is far enough away from the Terrell Mill travel lanes that traffic impacts for this work are limited to access and egress. Access in and out of the work zone in all stages will require additional safety precautions such as police details due to the site location, at the bottom of a hill in each direction, with limited sight distance.

Windy Hill Road Bridge: Since the existing Windy Ridge Parkway Bridge and the existing I-75 and I-285 Bridges can essentially remain as is, the only other existing bridge in Segment 1 is the Windy Hill Bridge over I-75 which will be rebuilt similar to the Delk Rd. Bridge (*see Section 5.2*) and the Chastain Rd. Bridge (*see Section 5.4*), both of which are OE, category 5A cluster bridges. A three (3) stage plan is anticipated with a permanent Windy Hill Rd. centerline shift to the north. Because of the complexity involved and the proximity to the I-75 / I-285 Interchange, a detailed staging plan narrative has been prepared. Refer to stages 1A through 1F in *Appendix C, NWC Interchange MOT Staging Plan*. This plan integrates Interstate North Parkway and Leland Drive, as well as I-75, with Windy Hill Rd. The fact that the new bridge will be at least 3 ft. higher than the existing bridge complicates intermediate stages where traffic would be on both structures. In summary, a detour for local traffic is built for Interstate North Parkway and Leland Drive traffic which diverts local traffic away from the existing intersection with Windy Hill in order for Windy Hill to be reconstructed.

A temporary entrance ramp for I-75 NB and a temporary exit ramp from I-75 NB will be constructed. This, again, will divert traffic away from the existing intersection(s) with Windy Hill allowing new intersections (at much higher elevations) to be reconstructed. Interstate North Parkway is closed for a time. A temporary ramp WB to I-75 SB is constructed at the west end.

The bridge is described in the staging plan as being rebuilt in three (3) stages, north edge built first, then the middle portion with WB traffic (3 lanes) on new bridge and EB traffic (4 lanes) on existing bridge, and third stage builds the south edge while both WB and EB traffic (7 lanes) is on new bridge. Except for off peak lane closures, existing traffic capacity on Windy Hill Rd. is maintained using 11 ft. wide lanes and no sidewalks. I-75 NB needs to be shifted 24 ft.-30 ft. east on temporary pavement for an intermediate bent construction. In addition, both NB and SB I-75, will need to be closed and detoured for overhead demolition, setting new bridge beams, and some superstructure work activities until a protective underdeck and edge protection can be installed. The detour for I-75 will utilize the exit and entrance ramps at the Windy Hill Rd. interchange to circumvent the overhead work requiring the closure. In stage 1B the NB exiting traffic must turn right on Windy Hill Rd. and then U turn to gain access to WB or the NB entrance ramp. During I-75 NB closures, this will have to be short circuited by use of temporary ramps. The I-75 SB detour allows traffic to get right back on I-75 SB after traveling a short distance on Windy Hill Rd. EB.

The work at Windy Hill Rd. is really three (3) bridges since a new bridge is needed for the Interstate North Parkway to go under Windy Hill Rd. and a new bridge is needed over Rottenwood Creek at the bottom of the hill just east of I-75. Windy Hill Rd. itself must be raised up to 25 ft.-30 ft., particularly at the Rottenwood Creek crossing. The new profile does not tie into existing grade until a point approximately 1000 ft. east of the Rottenwood Creek Bridge. This will create a challenge to stage Windy Hill Rd. traffic since new sections, done in coordination with work on all three (3) bridges, will be considerably higher than any traffic left on existing sections of Windy Hill Rd. Although this roadway staging along this portion of Windy Hill Rd. has not been worked out, it is expected that Windy Hill Rd. will have to be overbuilt to the north to provide enough roadway to maintain existing traffic capacity during Construction.

The construction of the Windy Hill Rd. Bridge has been determined to be a prerequisite for any traffic shifts related to construction in the I-75 / I-285 Interchange area.

I-75/I-285 Interchange Area: To identify and minimize traffic impacts on construction of the 15 new bridge structures in the I-75 / I-285 Interchange, *Appendix D, entitled NWC Segment 1 Constructability Matrix* which tabulates number and type of bents and spans for each structure was prepared. It tabulates bents and spans that are located in presently unimpeded areas, areas that with only access and egress impacts to existing traffic, the work could be performed today. For the spans it also adds in spans that could be set with only closure of ramps or secondary roads, not I-75 or I-285. Because of the careful planning by the designers, two-thirds of the bents and half the spans are in clear areas. Adding in the spans crossing ramps and secondary roads gets the spans also up to two-thirds. It also rates staging degree of difficulty for each bridge structure. Typically, the most difficult structures to construct are those that are designed with supports where existing mainline traffic exists. The Staging for this work will be discussed in the next section, the Highway section.

To erect bridge structures over I-75 or I-285, mainline closures and detours will be necessary. Due to the steel girder design, there are field splices on every span, usually at the quarter points, requiring time to fit up and install as part of a nightly traffic shutdown. Three (3) of the new bridge structures, 4B, 4C, and 5A all must cross both I-285, I-285 C-D, and I-75. Refer to *Appendix D,* entitled *NWC Segment 1 Constructability Matrix* for bridge descriptions. In general, the detours for I-285 WB crossings will take advantage of the dual nature of two (2) existing highways, I-285 WB and I-285 C-D, using one (1) when crossing the other. However, this scenario would not work for one (1) traffic move, traffic exiting NB to WB. Instead, this traffic would exit at Cumberland Blvd. and access I-285 WB via Cobb Parkway. Bridge structures 4A and 4C also cross I-285 EB, the collector road.

For I-285 EB crossings, the I-285 EB collector highway will be used and vice versa for the collector road crossings. There is one (1) traffic move, the SB from Windy Hill Rd. ramp to I-285 EB, that would require a different detour. This traffic presently exits on a cloverleaf ramp which joins the I-285 EB collector. One (1) solution would be to stay on I-75 SB to exit at Cumberland Blvd. and reverse direction to NB, then exit immediately for I-285 EB.

Bridges 4B, 4C (twice), 4D, and 5A all cross I-75, primarily on the NB side. The I-75 SB detour could be to send traffic to I-285 WB, exit at Cobb Parkway, to Cumberland Blvd., back on I-75 SB. For a NB detour, one (1) possibility would be to exit at Cumberland Blvd., which turns into Interstate North Parkway, and get back on I-75 NB at the Windy Hill Rd. intersection. Other crossings of lesser roadways like ramps and secondary roads will be necessary that may result in temporary ramp bypasses or closures.

Further north where the new NB TOL flyover over I-75 NB, the construction for this flyover may be done coincidental with the highway stages to avoid lifting of plate girder beams over the highway.

5.1.1.2 Highways

The purpose of this section is to summarize the key elements of the MOT plan[2] and to discuss the constructability issues associated with this plan. The basic approach to the staging process is to build new infrastructure working from west to east to eventually create room in the middle for new TOL and HOV ramps to land. As each piece is completed and traffic can be shifted westward, the next piece can be constructed in the corridor made available. One (1) innovative aspect of the staging is to temporarily use newly built SB TOL ramps to I-285 for mainline traffic during stage 5 and 6. The building and shifting traffic westward continues until in the final stages, there is room to land the new HOV ramps in between I-75 NB and SB. The staging described in the MOT plan for completion of the I-75 / I-285 Interchange is on the critical schedule path for the project. Other work, like the NB TOL ramps, are independent of this sequencing and can be built even earlier than what is shown in the Staging Plan.

- **Stage 1**: Includes the I-75/I-575 Interchange area, and represents the most complex staging on the NWC Project. For this reason, a detailed MOT plan was prepared for stage 1 at this early stage of the NWC Project and is included in *Appendix C*. Additional discussion on the staging approach to the I-75/I-575 Interchange is included in Section 5.1.1.1.

[2] Section 5.1.1.2 addresses stages 2 through 7; stage 1 (Windy Hill Rd. Bridge) is addressed in more detail in Section 5.1.1.1

- **Stage 2**: Once the Windy Hill Rd. Bridge is replaced in stage 1, stage 2 for the highway elements can start. The stage 2 critical path focus is on construction of the SB on ramp to I-75 from Windy Hill Rd., located in the northwest corner of the interchange area. The northern portion of the ramp will be constructed in its final and ultimate position while the balance will consist of a temporary connection to the existing entrance ramp. The tie-in point is the northern abutment of an existing braided bridge over the existing I-75 SB exit ramp to I-285. The tie-in to the existing ramp from Windy Hill Rd. will have to be done under traffic conditions. The horizontal alignment of the temporary entrance ramp will be such that additional southbound ramps can be constructed over it in subsequent stages to their final and ultimate positions. The I-75 SB exit ramp for Windy Hill Rd. is also worked in this stage.

  The balance of Interstate North Parkway will be completed in this stage. This includes the portion through the existing parking lot at the Marriott and the portion under the new Windy Hill Rd. Bridge and heading north. At three (3) locations this roadway must be tied into existing roadway under traffic conditions or weekend closures.

- **Stage 3**: Now that the SB on ramp to I-75 from Windy Hill Rd. can be moved onto the ramp built in stage 2, the corridor is available to work on I-75 SB new alignment and the I-75 SB exit ramp to I-285. The critical path focus for this stage is on these roadways. I-75 SB and the SB to I-285 exit ramp are able to be built in their final alignment from north of the Windy Hill Rd. Bridge to a point approximately 1350 ft. south of the Windy Hill Rd. Bridge. From there temporary roadway is constructed to allow each to tie into existing roadway. Tie-ins can be constructed under traffic conditions, with lane takings as required. To support the critical work in this stage, existing I-75 SB must first be shifted up to 30 ft. towards the existing median onto temporary roadway.

  Part of this stage is non critical work, including the construction of the NB TOL lanes coming from I-285 EB and WB. As discussed in Section 5.1.2.1 of this report, there are four (4) straddle bents and one (1) cantilever pier that must be constructed over four (4) existing exit ramp travel lanes as part of this TOL elevated ramp work.

- **Stage 4**: With stage 3 complete, I-75 SB and SB exit ramp traffic can be shifted westward to the new alignments creating space once again for new construction. The critical path work for this stage is the construction, in their entirety, of the SB TOL ramps to I-285 EB and WB. As mentioned earlier, since much of the work on these ramps is unimpeded, a significant portion of these TOL ramps could be built earlier.

  Two (2) other ramps are to be pursued in this stage. One (1) is the new SB entrance ramp from Windy Hill to I-285 WB. It can be built in its ultimate and final position down to the Windy Ridge Parkway Bridge. The other is a significant portion of the new SB HOV exit ramps and bridges to I-285 WB.

- **Stage 5**: At this stage, all I-75 SB to I-285 EB and WB traffic is now sent, via a left side exit, up the just completed TOL ramp. Because a two (2) lane TOL ramp is being used for 3 lanes of mainline traffic, the resultant available shoulder on each side of the ramp is 2 ft. This assumes 12 ft. lanes on the exit ramp. In a similar fashion, where the TOL was designed for one (1) lane, there will be two (2) lanes of mainline traffic, resulting in 2 ft. shoulders each side also.

  Once again the shifting of traffic creates available space for the next stage of construction. In this stage, three (3) ramps are worked on but the first two (2) must be done in a certain order. The first that must be completed is the ramp from Windy Hill Rd. to I-285 WB. Once completed, traffic must be shifted onto it. The second ramp, Windy Hill Rd. to I-75 SB (and eventually to I-285 EB) can then be completed. This sequence is necessary because of an at grade crossing conflict. The third ramp worked in part in this stage is the HOV ramp I-75 SB to I-285.

  The first ramp, Windy Hill to I-285 WB is tied into the existing ramp at a skewed angle making it a lengthy tie in. Since both are at grade ramps, some temporary shifting and construction under traffic will be necessary to avoid closures. The second ramp's tie in to I-75 can be done without traffic impact. Upstream, this ramp does have two (2) straddle bents to be constructed over ramp traffic. The issues described in Section 5.1.2.1 of this report regarding straddle bents over traffic apply here.

- **Stage 6**: With the two (2) ramps constructed in stage 5 in service, a corridor opens up and the next critical path activity can commence. This is the completion of I-75 SB and the SB exit ramps to both I-285 EB and WB. Meanwhile the area immediately east of and adjacent to I-75 NB is worked so I-75 NB can be placed in the new alignment.

The tie-ins for the mainline and the SB ramps require detailed planning. The SB mainline tie-in overlaps all lanes of the existing I-75 SB so it must be done under traffic conditions in stages, lane by lane, with attention to grade differences if any. The I-75 SB exit ramp to I-285 WB ties into the ramp from Windy Hill Rd. and should not be difficult but the tie in for the SB ramp to I-285 EB will require staging with a temporary ramp. Fortunately the area of tie-in is before the elevated portion of the existing ramp, so a temporary ramp at grade beside the existing ramp is feasible.

The NB and SB sides of I-75 are worked to place them more to the outside of their existing alignment, opening up the inside or median area just enough for the stage 7 final activities.

- **Stage 7**: Once I-75 traffic, both NB and SB, are in the new alignment, the middle area is available for the balance of all NB and SB HOV ramps. The area is available for construction but very tight. This final stage may represent the most difficult work of all seven (7) stages.

  The NB HOV ramps have no less than 10 spans to set over I-75 NB or directly adjacent to I-75 NB. The SB HOV ramps also have approximately 10 spans to set either over I-75 SB, over various ramps, or directly adjacent to I-75 SB. In addition to the elevated structure, the at-grade HOV lanes in each direction must be constructed in a fairly tight median area extending beyond Windy Hill Rd. to the north.

  At the completion of stage 7, the I-75/I-575 Interchange area in Segment 1 is complete. The Segment 1 highway work north of the interchange, past the Terrell Mill Rd. bridge must be staged in coordination with Segment 2 and the Delk Rd. bridge area. Both the Terrell Mill Bridge and the first section of Segment 2 are planned to be built outside areas first. Also, the areas just north of the interchange can be worked outside areas first. The only restraint is the prerequisite of completing both the Windy Hill Rd. and the Delk Rd. bridges first so that the new piers are aligned for the new highway alignment.

5.1.2 Construction Methods

5.1.2.1 Bridges

Terrell Mill Rd. Bridge: The conceptual design calls for a single span of 140 ft. utilizing 72” bulb tees. Each 140 ft. long beam weighs 56 tons. Because of the excessive length, two (2) cranes, one (1) at each end, will be used to pick these off of a trailer parked on I-75 and place them into position. Taking half the weight, adding 10 percent safety factor for rigging and 50 percent conservative factor for a dual pick, yields 46 tons for each crane. The outermost bulb tees present the biggest challenge. If benches are cut into areas behind the end bents, the radius could be reduced to 80 ft. for the outermost beams. This would require a pair of the largest of truck cranes like Grove GMK 7550‘s or equal if truck cranes are used or a pair of 300 ton crawlers like the Manitowac 2250’s, if crawler cranes are used. If detailed calculations and an approved heavy lift procedure are utilized, the 50 percent conservative guideline can be reduced so that the load for each crane could be reduced to approximately 34 tons. Then the size of cranes required could be the equivalent of Grove GMK 6350’s if truck cranes are used or Manitowac 999’s if crawlers are used. Given the location, crawler cranes may be more practical for the duration of the bridge work. Truck cranes, although economical for limited heavy picks, do require placement in a stationary required position and then the loading of counterweights. If placed in a travel lane, counterweight loading and unloading can take away up to 4 hours from limited night time closure periods. In addition, the largest truck cranes like the Grove GMK 7550 are difficult to locate and rent for specific lifts.

The construction sequence as described above requires building the outside infrastructure, shifting traffic, and then working on the inside to complete. In stage 1 for both NB and SB, the new outside infrastructure will be over 5 ft. higher than the existing roadway. This will require temporary sheeting or mechanically stabilized earth (MSE) walls as shown on the drawings. The discussion of wall construction is included in Section 6.2 – BRT Stations – Terrell Mill. One (1) option is to over-excavate the area once traffic is moved onto completed stage 1 construction on the outside. This could require about 70 ft. on NB side and 100 ft. on SB side for placement of the MSE wall straps.

While this approach of installing the MSE wall first is time consuming, it allows for all subsequent work to proceed in an unrestricted manner. In the course of over-excavation, rock may be encountered, which will need to be worked to be integral with the MSE wall above it.

Another option, if opening the highway in the new alignment is schedule critical, is to only build what is required to complete the highway alignment, then proceed with HOV access ramps and BRT Station. While not recommended, this is an option requiring other types of support of excavation (SOE). Currently, it is recommended to construct the MSE wall, forming the sides of the HOV access ramps down to Terrell Mill Rd. at the beginning of stage 2 construction, by over-excavating under the proposed alignment layout.

Windy Hill Rd. Bridge: The other existing Segment 1 bridge requiring extensive work is the Windy Hill Rd. bridge. While bridge drawings have not yet been prepared for this non-cluster bridge, the construction approach is expected to be similar to Delk Rd. in Segment 2. See Section 5.2. Because of the excavation cut required on the eastern and western ends of the new and longer bridge, temporary shoring may be required. This will likely consist of driven soldier piles with lagging installed as excavation proceeds. Soil nailing or other means will be used in the deeper cuts. The purpose of this shoring is to support the portion of the old approach being used for traffic while work continues on the new section. The end abutment walls will likely be MSE walls. This requires cutting the slope back further for the MSE straps. The MSE wall would be backfilled after pile driving for the abutment foundation. This cycle is repeated at the beginning of each stage. Vertical slip joints in the MSE wall will be used at the intersection of each stage.

For substructure work, new foundations, ft.ings, columns, and pier caps, lane takings at night will be needed for the new center pier. To construct the new center pier, approximately 80 ft. of temporary barrier will be adjusted each night on each SB and NB side to provide protection to the workers and equipment. Barrels will be used to transition traffic away from the center median work zone. It is likely that two (2) lanes in each direction will be unavailable to traffic during a 9 hour window. At the end of each night shift, the barrels will be picked up and the temporary barrier is moved against the center median barrier with a temporary side attenuator. Since center median barrier must be demolished for the new work, these temporary barriers provide center median protection to the public during the day.

The Windy Hill Bridge will require spans of 95 ft., 155 ft., and 160 ft. using steel plate girders @ 400 lbs. per ft. This bridge is likely to be designed as a continuous support with splices at the quarter points, one (1) member could be 120 ft. long to lift in place and splice over the highway. The design resulting in the largest loads would be simple supported with a maximum span of 160 ft. If spliced together at the side of the highway prior to lifting, the weight would be approximately 32 tons, requiring a dual pick due to the length. However, by using the same approach as described above, would yields weights of approximately 26 tons each. As a result, pair of medium sized truck cranes like the Grove GMK 5275 or equal could handle this load at a radius of 80 ft. The key will be the ability to position the trailer with the beams in an angled position for the lifts. The 160 ft. span is on the east end and falls predominately in a grassy area, so work zone crawlers could take the lift on one (1) end.

I-75/I-285 Interchange Area: The 15 new bridges are unique to the NWC Project. Besides the substantial heights, the types of substructure, cantilever bents, straddle bents, and even a double straddle bent is unique only to this section of the project. Foundations are assumed to be steel pile supported, from 12 to 32 piles per ft.ing, all approximately 20 ft. long. The substructure, as identified in the NWC Segment 1 Constructability matrix, *Appendix D*, shows five (5) types of substructures. Drawing BI285-2-005 shows these types, the hammerhead, cantilever, straddle bent, double straddle bent, and end bent. The hammerhead is the most common, typically 14 ft. by 10 ft., but rises to very high heights, up to 126 ft. high. Self jacking forms will likely be used for these structures.

Placing concrete also presents challenges. Larger concrete pumpers with a vertical range of 126 ft. or higher will be used. If conventional concrete pumpers have difficulty with this height, the upper lift of concrete will be placed by concrete bucket, lifted by crawler crane. Working from such heights presents safety and access challenges. Access for craft personnel will be by ladder and man-basket. It is anticipated that placement rate and placement height restrictions will be imposed based on form strength and design concerns relative to concrete shrinkage. The design limit on height of one (1) placement is anticipated to be in the 35 ft.-40 ft. range.

Substructure will need to be built over existing travel lanes. As one (1) example, for Bridge 4A, there are four (4) straddle bents and one (1) cantilever over the existing four (4) lane exit ramp from I-285 WB to I-75 NB. To build a straddle bent over active traffic requires large temporary steel beams to carry the weight of formwork, rebar, and wet concrete. In addition, there are vertical clearance requirements, usually 17 ft. minimum', so that the depth of temporary beams chosen must maintain this clearance. Setting the beams and constructing a work deck will require ramp closures and/or lane closures. Rebar picks and concrete placement will have to be done at night, while taking some of the four (4) lanes. Another alternative approach used for straddle bents over roadways is using high sided trusses adjacent to the cap. Alternatively, the straddle beam could be designed to be placed in two (2) lifts, the first is post tensioned and used to take the load of the second placement.

The NWC Segment 1 Constructability Matrix, *Appendix D*, shows that much of the work, two-thirds of the bents and half the spans can be set without starting the major traffic staging described in NWC Interchange MOT Staging Plan, *Appendix C*. The only traffic impact from this unimpeded work is access and egress from highway ramps.

For Segment 1, due to the high overhead work and rough terrain, it is recommended larger crawler cranes in the 300 ton class, with 300 ft. of boom be used. A Manitowoc model 2250 is an example. Temporary roadways will be needed to be made as the cranes travel along with the work. The most common lifts will be to set the steel plate girders called for in the Bridge Matrix. The typical span is 160 ft. using steel plate girders with weights varying from 400 to 650 lbs. per ft. The majority are 650 lbs. per ft. It is planned to design these as continuously supported over 3-4 spans. This places the splice locations at the quarter points resulting in over 70 percent of the steel girder lifts being 80 ft. in length and the remainder 120 ft. in length. At 650 lbs. per ft., the vast majority of lifts will be 26 tons. Adding 10 percent for rigging and a 10 percent safety factor yields 31 tons. A 300 ton Crawler like the Manitowoc 2250 can safely lift this at a radius up to 120 ft. and with the boom length and height required to set the highest picks (up to 126 ft.). For the 120 ft. section member lengths, the safe load is 46 tons and a 90 ft. radius for the crawler. By positioning the crawler close to the existing roadways, the vast majority of lifts including highway crossings can be made because of the radius capacity of the crawler. The only locations where truck cranes will be needed is where an overhead structure, existing or that in process of construction, obstructs the crawler's ability to boom up for the pick or where the ramps land in the middle of existing or staged highway, such as bridges 4A, 4C, 5C, and 5D.

Relocating crawler cranes across existing ramps requires protection such as steel plates or heavy layers of plywood to prevent damage to the existing roadway.

The locations where PSC beams are called out in the I-75 Bridge Matrix, use BT 72's at 140 ft. spans. This is the same lift, 56 tons, and beams as the Terrell Mill Rd. Bridge discussed previously in this section of the report. The conclusion was a pair of heavy truck cranes or 200 ton class crawlers. Since these locations are adjacent to existing roadways, truck cranes are an option.

5.1.2.2 Highways

A discussion of highway construction methods common to all bridge and highway segments is included in Section 2.2.

For concrete deliveries in Segment 1, it is anticipated that the vast majority of concrete would be batched at the proposed batch plant location at the Cumberland BRT parking facility site. For larger placements the other two (2) proposed batch plants may be called upon. Additional information on construction methods is included in Section 2.2.3 of this report.

There is extensive cuts and fills along the widened alignment. In the Interchange area, the new alignment for I-75 SB requires an extensive cut south of Windy Ridge Parkway through an existing, retained fill area. At this early stage of design, fill areas are shown to be retained by MSE wall. There is a large quantity of MSE walls in Segment 1 compared to other segments. Excavation or cut areas are assumed at this early stage to be supported by soil nailing. The amount of concrete roadway paving in Segment 1 is less than other segments due to the disproportionate amount of bridge structure that comprises Segment 1 associated with the I-75/I-285 Interchange.

5.1.3 Construction Risks

A discussion of construction risks is included Section 2.2.4 of this report for risks common to all bridge and highway segments.

Bridges: Utility relocation and the required prompt response by the utility companies poses a risk to schedule and therefore cost. The bridge work at Windy Hill Rd. will affect several utilities. It is reported that gas and water lines are supported under the existing bridge. There are transmission towers and transmission lines adjacent to and just south of the existing bridge that may be affected by the proposed Windy Hill Rd. bridge. Within Windy Hill Rd. in particular on the east side where the roadway must be raised, there are sanitary, water, gas, and electric lines which will need to be relocated.

There are environmental risks with the close proximity of Rottenwood Creek with a crossing of Windy Hill Rd. and near Terrell Mill Rd., there is the possibility that a new driveway/bridge over the creek.

One (1) safety concern is beam tipping with the long and deep section steel girders. If a single beam set on its bearings is allowed to tip onto its side, due to wind loads or other causes, it is likely to be unstable in the weak axis direction and will deflect substantially to the point of being a major hazard to the traveling public. One (1) approach is to have a comprehensive system of cable tie-offs implemented after every lift in conjunction with installing the permanent steel bracing between beams. Another is to lift the beams in tied together pairs. For a single pick with the same 300 ton crawler, the maximum radius would now be 70 ft. (compared to 120 ft.) for the 80 ft. long sections and only 50 ft. (compared to 90 ft.) for the 120 ft. long sections. A dual pick for the 120 ft. sections with two (2) 300 ton Crawlers will get this back up to the 70 ft.-80 ft. range.

Highways: Utility relocation and the required prompt response by the Utility Companies pose a risk to schedule and therefore cost. Besides the electric transmission lines crossing just south of Windy Hill Rd, within Segment 1 there are telephone, gas, sanitary and water lines that may require relocation. Within the existing alignment are the lighting and fiber optic cable lines related to existing Highway operations that must be temporarily replaced and relocated to support Highway operations.

5.1.4 Value Engineering

Bridges: Opportunities for savings exist in the solution to the Infomart driveway issue near Terrell Mill Rd. See Section 5.1.1.1 of this report for a discussion of this issue.

Another opportunity exists in the typical beam span and beam type presently called out on the I-75 Bridge Matrix. For the 15 Segment 1 proposed bridges within the interchange area, a span of 160 ft. was chosen for over 80 percent of the spans. This span is too large for the largest PSC members, such as the BT 72 and given the high cost of steel, other options will be explored. One (1) would be utilizing shorter spans with PSC members, which is already called out on the Bridge Matrix for about 18 percent of the new spans within the interchange. Both bridge 4B and 5E use some 140 ft. spans with BT 72's and the use of these could be expanded.

Another option is the use of segmental concrete. Segmental concrete has proven to be an economical approach to projects with large quantities of elevated highway structure. For this type of construction, two (2) different methods are employed. One (1) utilizes an overhead gantry, with the structure designed for balanced cantilever erection. The other utilizes temporary beams, which can be launched ahead, and is designed for span by span, simple supported erection. Curved alignments are more difficult but can be done. Because of the very high elevations of some of the piers (up to 126 ft.) an overhead gantry with balanced cantilever erection would be worth investigating. The deciding factor for this the substantial initial investment in the overhead gantry which could cost millions. Once operational, it is an excellent method for this type of construction.

With piers up to 126 ft. in height in the I-75 / I-575 Interchange area, there are opportunities for value engineering the size and type of pier structures, particularly the hammerhead piers. Presently most are called out as 14 ft. by 10 ft. rectangular cross sections on the I-75 Bridge Matrix. Other possibilities include a two (2) column frame type, hollow cross sections, and even precast, post tensioned columns.

Alternate foundation types such as drilled shafts or large capacity precast piles will be also investigated.

Highways: See Section 2.2.5 of this report for a discussion of Value Engineering opportunities common to all Highway segments.

Replacement of I-75 SB and NB asphalt surface in the area between I-285 C-D and Windy Ridge Parkway should be reviewed as a cost saving opportunity. To perform the work would require a drawn out process of lane by lane replacement for a total area that is not large, but is very difficult to work.

A value engineering opportunity specific to Segment 1 concerns HOV access to Terrell Mill Rd. Presently the conceptual design calls for HOV access to Terrell Mill Rd. via ramps under the Terrell Mill Rd. BRT station. This creates a tunnel situation in excess of 2,000 ft. for the HOV access ramps. An alternate approach should be considered to eliminate the tunnel and associated tunnel requirements.

5.2 SEGMENT 2

This section of the Constructability Report addresses the Segment 2 bridges and highway. Segment 2 is 4.9 miles long, starting 1200 ft. south of Delk Rd. at Station 235+00 and ending 1000 ft. north of Allgood Rd. at Station 495+00.

Key Construction Elements

- **General:** There are 3 proposed new bridges and 7 existing bridges in Segment 2. All of the existing bridges must be replaced or widened. One (1) of these 7 existing bridges was chosen as a cluster bridge for which a conceptual design was completed. The cluster bridge for Segment 2 is the Delk Rd. Bridge. This section of the Constructability Report will address the Segment 2 cluster bridge in detail, and also discuss constructability issues on the other Segment 2 bridges as well as highway issues. The constructability issues for non cluster bridges are derived solely from the I-75 Bridge Matrix prepared and from field inspection and photos taken.
- **Delk Rd. Bridge:** As shown on the bridge drawings issued to date, construction will take place in 3 stages. In order to stage the construction and maintain the same level of traffic capacity on Delk Rd., the centerline of Delk Rd. will be permanently shifted approximately 41 ft. to the south. The first stage, over 64 ft. wide, built to the south provides a surface for all eastbound traffic (3 lanes) during stage 2. Completion of the 33 ft. wide stage 2 allows all traffic (8 lanes) to be placed on stage 1 and 2 during stage 3 Construction. Stage 3 is the last 23 ft. wide section, along the north edge. Existing shoulder areas and walkways are not planned to be maintained during the staged construction. The new Delk Rd. Bridge will be the same width as the existing bridge and will include 8 ft. sidewalks in both directions and a raised median.
- **Other Segment 2 Bridges**: Of the 7 existing bridges, two (2) are similar to the cluster bridge, Delk Rd., in that they are overpass bridges requiring replacement at a different grade. They are labeled a category 5A on the I-75 Bridge Matrix and on the matrix found in *Appendix A*, NWC Bridges—Reworking existing and proposed. See Section 2.2.2 for definition of Construction categories. The two (2) bridges are the South Marietta Parkway Bridge and the Gresham Rd. Bridge. There is one (1) other existing overpass bridge in segment 2, Allgood Rd. This bridge will be replaced with a new bridge in a different ft.print location, so that traffic can be placed on the new bridge once completed without intermediate staging on Allgood Rd. This is given a category 3 on the I-75 Bridge Matrix.

  That leaves 3 mainline or underpass bridges, Banberry Rd., Roswell Rd., and North Marietta Parkway. The Banberry Rd. Bridge must be replaced in its entirety (category 2A) while North

Marietta Parkway can be left in place but widened to accommodate the new alignment (category 2). The Roswell Rd. Bridge (category 2) needs a section removed (less than 10 percent) but the existing can remain and it is widened out to 300 ft. since it is the location of the Marietta BRT Station and the HOV access ramps down to Roswell Rd.

One (1) of the three (3) proposed bridges is the connector needed over I-75 SB for HOV and bus access to the proposed Franklin BRT Station located just west of I-75. The other two (2) proposed bridges are HOV flyovers located between North Marietta Parkway and Allgood Rd. The flyovers are from the inside to the outside to allow an HOV exit / entrance from mainline traffic at this location.

- Highway: The scope of the NWC Project maintains the same number of existing travel lanes on I-75. The existing highway in Segment 2 starts at Station 235 with 6 lanes in both the southbound (SB) and northbound (NB) directions. At Station 235 there are also separate exit and entrance ramps associated with the Delk Rd. interchange. Heading northward, once the Delk Rd. exit and entrance ramps have merged with I-75, there are 7 existing lanes NB and 6 existing lanes SB. This number continues until just north of South Marietta Parkway, also know as the south 120 loop, when the mainline drops to 5 travel lanes in both NB and SB directions.

  The scope of the NWC Project in Segment 2 includes adding two (2) High Occupancy Vehicle (HOV) lanes and two (2) truck-only lanes (TOL) in both the NB and SB directions on I-75. The Alternate 1 alignment as developed by Parsons Brinkerhoff (PB) has the TOL lanes on the outside of the general purpose lanes while the Alternate 2 alignment as developed by the Georgia Transit Partners (GTP) team has the TOL lanes on the inside of the general purpose lanes along with the HOV lanes which are directly adjacent to the center median. Cross sections of the lane configurations for the two (2) alternates are included in *Figures 5.2 and 5.3* below.

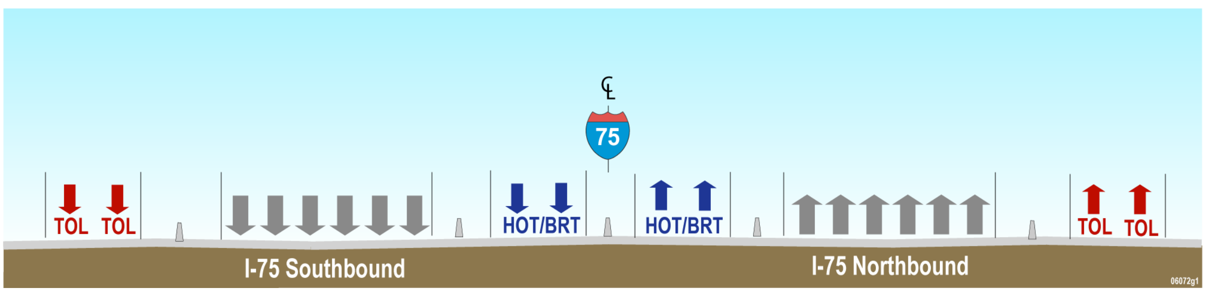

Figure 5-2. Alternate 1 Lane Configuration

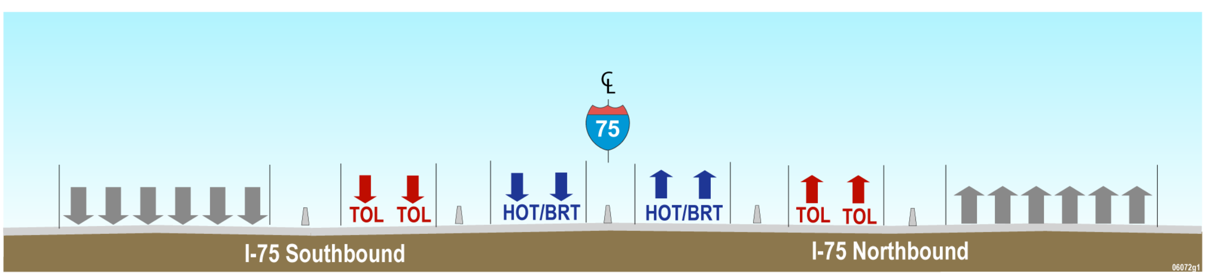

Figure 5-3. Alternate 2 Lane Configuration

In addition to the added lanes just described, there will be widened shoulders on mainline and wide shoulders on the added HOV and TOL lanes. To use the highway just north of Delk Rd. as an example, the existing alignment width of approximately 180’ will be increased to approximately 370’, which is more than double. This Constructability Report will address Alternate 2 with Section 2.2.2 identifying differences with Alternate 1.

5.2.1 Access/Traffic/MOT/Staging and Sequencing

5.2.1.1 Bridges

Delk Rd. Bridge: Delk Rd. has 6 travel lanes and 2 WB to SB turn lanes for a total of 8 lanes across the existing bridge. During construction the sidewalks will not be maintained and eight (8) 11 ft. wide temporary lanes are planned during all stages.

As described previously, the Delk Rd. bridge cluster drawings show 3 stages of construction. The first stage 1 construction activities will require off peak lane closures. This is in order to demolish the existing north sidewalk and the median to facilitate the traffic shift of Delk Rd. traffic to the north. Soldier pile driving for stage 1 temporary support of excavation (SOE) at each end of the bridge is required during off peak or nights. Once the Delk Rd. traffic is shifted, a 28 ft. wide strip of Delk Rd. must be demolished to accommodate stage 1 construction. This can be done in one (1) of two (2) ways. Either sawcutting sections along beam lines and removing large segments or a shield can be installed below the steel beams and the deck demolished first and then beams are lifted out. In either case while demolition work is ongoing, I-75 mainline traffic must be detoured. While the northbound span is worked, one (1) or two (2) left lanes southbound would be taken for safety reasons. The detour for I-75 NB would be to send traffic up the exit ramp for Delk Rd. eastbound, crossing Delk Rd. through the existing island cut and down the ramp back onto I-75 NB. Depending on the Delk Rd. traffic counts for off peak, early morning hours, Delk Rd. may have to be detoured/closed. The detour for I-75 SB will flow easier as traffic is sent up the Delk Rd. off ramp, straight through the existing traffic light and back down the I-75 SB on ramp. This I-75 detour arrangement will have to be repeated for all 3 stages of demolition and for all 3 stages of new beam setting and some superstructure work, until edge protection and temporary underdeck is installed. Police details will direct traffic at the Delk Rd. crossing if Delk Rd. is not closed.

New foundations, ft.ings, columns, and pier caps lane takings at night will be needed for the new center pier and for the new pier between TOL and mainline. In the immediate vicinity of Delk Rd., I-75 consists of 6 lanes in both NB and SB directions plus a NB exit ramp. To use the new center pier construction as an example, approximately 80 ft. of temporary barrier will be adjusted each night on each SB and NB side to provide protection to the workers and equipment. Barrels will be used to transition traffic away from the center median work zone. It is likely that two (2) lanes in each direction will be unavailable during a 9 hour window. At the end of each night shift, barrels are picked up and the temporary barrier is moved against the center median barrier with a temporary side attenuator. Since center median barrier must be demolished for the new work, these temporary barriers provide center median protection to the Public during the day.

Traffic restrictions for lane takings on I-75 mainline are described in Section 2.2.1 of this report.

The MOT challenge for travel lanes on Delk Rd. is the 4 ft. raise in grade for the new bridge. Once stage 1 is completed, all EB Delk Rd. traffic is on the new bridge structure which is 4 ft. higher than the old bridge. Delk Rd. EB traffic wanting to turn left for the I-75 NB on ramp will have 200 ft. to transition down to old grade. That is a 2 percent grade and should not be an issue. More challenging is the westbound Delk traffic turning left to the I-75 SB on-ramp. Traffic would have to cross the temporary transition ramp created for the traffic using the new and 4 ft. higher bridge section. This requires moving the I-75 SB on ramp further west. Also, the traffic which just exited I-75 SB and wants to travel eastbound on Delk Rd. has a similar issue. The permanent design location for ramps intersecting Delk Rd. is about 100 ft. west. This would create a 4 percent grade temporary ramp up onto the new Delk Rd. Bridge. Temporary ramp locations further west may be necessary. However, the advantage of using the permanent SB ramp alignments and building all west side ramps first as permanent is that the cost of temporary ramps is saved and the one (1) set of traffic lights controlling the Delk Rd./SB ramps intersection could be moved just once. The challenge just described is repeated during stage 3 construction with the same traffic moves needing to be accommodated given the grade difference.

Other Segment 2 Bridges: Of the two (2) Category 5A bridges similar to Delk Rd., South Marietta Parkway has a similar level of traffic with 8 lanes on the overhead bridge. The Gresham Rd. Bridge has only 4 lanes total.

The South Marietta intersection with I-75 has two (2) cloverleaves whereas Delk Rd. has only one (1). The difference is eastbound to northbound. Marietta Parkway uses a cloverleaf while Delk Rd. relies on traffic turning left onto the northbound ramp. These differences aside, the preliminary plan for the South Marietta Bridge is to rebuild it in three (3) stages with a permanent centerline shift to the south. This is the same basic plan as Delk Rd. Both bridges are being raised 3.5 ft. to 4 ft. creating transitioning issues in stage 2 for traffic turning from one (1) grade to another, as discussed above. Both bridges will be 5 spans with the longest span in the 120 ft.-125 ft. range. Both use 72 " bulb tees with similar requirements for the heavy lifts. It is safe to say that all traffic issues discussed above are also directly applicable to the South Marietta Bridge reconstruction. For I-75 closures during demolition, beam setting, and some other superstructure activities, the detour would be the quick off and on route, using the existing ramps at the South Marietta Parkway interchange.

The Gresham Rd. Bridge, with 4 lanes of cross traffic, is also planned as 3 stage construction with a permanent centerline shift but it is a candidate for full closure during construction. If shutdown for the duration of construction, a period less than one (1) year, the detour would be Woolco Dr. to Roswell Rd. a distance of about 3/8 of a mile. However, even with a long term closure of Gresham Rd., there still remains the need to close I-75, one (1) direction at a time at certain critical operations. These operations are demolition of existing bridge, erection of new bridge beams, and some superstructure related activities. The detour for this would be the SR-120 Loop, using both the South Marietta and North Marietta exits. Intermediate bent substructure work on I-75 would be planned as described above for Delk Rd.

The Allgood Rd. Bridge is planned to be rebuilt north of and directly adjacent to its present alignment with realigned approaches on each end. The relocation is enough to allow the new Allgood Rd. Bridge to be built in it's entirety before the existing bridge is demolished. For critical demolition and superstructure construction activities over I-75, the SB or NB will need to be closed at approved off peak hours. The detour would utilize North Marietta Parkway, N. Cobb Parkway, and SR-5.

For the three (3) mainline bridges needing work, there will likely be two (2) stages of construction, coincidental with the two (2) stages for the Roadway work. For I-75 Bridges over Banberry Rd. and Roswell Rd., the preliminary roadway staging plan calls for building the new SB portion first and then building NB in the next two (2) stages with a need for temporary NB roadway. This staging is necessary due to the 100' shift to the west of the new I-75 centerline in this area. For the I-75 Bridge over North Marietta Parkway, the preliminary staging follows a more standard approach; build both outside portions of new alignment, shift traffic and build the inside.

For traffic impacts to the three (3) cross roads, only one (1) of the three (3), North Marietta Parkway presently has a center pier. The new design calls for the elimination of the center pier with a center span of 100'. As a result, for all three (3) bridges the new foundation and substructure work can be done off to the side of the existing cross roads with only single lane takings at times.

For North Marietta Parkway center abutment demolition, setting bridge members on all three (3), and other superstructure work where Safety dictates it, the cross roads will have to be closed. Fortunately, Cobb Parkway runs close to I-75 in the area of all bridges and can be used as a conduit for the traffic detours.

The three (3) proposed new bridges in Segment 2 will all cross over I-75, one (1) for the Franklin Rd. HOV/BRT access over I-75 SB, and two (2) for HOV flyovers to the outside. For the Franklin Rd. Connector critical work over the highway, I-75 SB traffic can be detoured at South Marietta Parkway to Franklin Rd. to Delk Rd. For the two (2) HOV flyovers, the I-75 detours would be the same as for Allgood Rd. described above.

5.2.1.2 Highways

For purposes of developing a staging/MOT plan for Segment 2, the segment was subdivided into six (6) smaller subsegments, with the sixth one continuing into Segment 3. The delineations were made due to the relation of the proposed I-75 centerline for Alternate 2 to the existing I-75 centerline. In some subsegments the new centerline drifts to the west as much as 100 ft. and in one (1) sub-segment the new centerline drifts to the east up to 65 ft. In others they are collinear. The location of the new I-75 centerline in relation to the existing traffic centerline has a great bearing on options available for highway staging. Other factors are the existing bridges and existing grades on the outside of the existing alignment. The outside is where additional right of way is required to accommodate the widened alignment. As described in Section 2.2.1, the term, “outside” in this Report means west of existing SB and east of existing NB. Temporary barriers will be used extensively in each phase to provide protection to the traveling public and to protect the workers. Temporary striping will be used in each phase to delineate travel lanes.

The six (6) subsegments as discussed below in order from south to north;

- **Station 250+00 to 271+00:** For this first sub-segment of about 2 / 3 of a mile, the new I-75 centerline will be the same as the existing I-75 centerline. This covers the area just south and north of the Delk Rd. Bridge discussed in detail above. Because the locations of the existing piers for the existing Delk Rd. Bridge interfere with the new alignment, it will be necessary to construct the new Delk Rd. Bridge before any highway traffic can be shifted. This is based on the premise that it will be unacceptable to have piers even temporarily, splitting a series of mainline travel lanes. However while the Delk Rd. Bridge is under construction, work can be ongoing on the first phase of highway staging.

  Phase 1 of the Highway Staging/MOT is to construct the outside areas first. These are the areas east of existing I-75 NB and west of existing I-75 SB which will become the new mainline travel lanes in each direction. See Staging Typical Section A (Sta. 235 to 271), found in *Appendix E*, Segment 2 MOT Staging Drawings. This station is just north of Delk Rd. As it depicts, work is completed to the outside in phase 1. After the Delk Rd. Bridge is completed, the remaining work to the outside including new ramps for Delk Rd. is completed and then traffic can be shifted to the outside, to the new roadway surface. The 85 ft.-90 ft. of roadway surface provided in phase 2 is adequate for the 6 lanes of existing traffic in both NB and SB directions. During phase 2, the HOV and TOL lanes are constructed. Divider barriers between HOV and TOL and between TOL and mainline are also constructed in addition to new median barrier. As shown, in the Staging Typical Section A drawing, phase 3 is ready for the new permanent alignment.
- **Station 271+00 to 300+00:** The next sub-segment is complicated by two (2) new factors, first a substantial I-75 centerline shift of 80 ft. to the west. Secondly this is the area where NB has 7 existing lanes and SB has 6 existing lanes. This capacity must be maintained during all phases. In addition, this area has up to 20 ft. fills on the new SB side. MSE retaining walls will be required along the outside of the alignment, particularly along the SB side. The only bridge in this sub-segment is the proposed Franklin HOV Access Bridge.

  As shown on Staging Typical Section C (Sta. 271 to 300), found in *Appendix E*, the work is planned in 4 phases. In phase 1, traffic is left in the existing alignment and the work is to construct the new SB mainline including fill and retaining walls. In phase 2, SB traffic is placed on the west side or outside of the new SB alignment. NB traffic is shifted about 10 ft. to the east and the work underway is temporary in nature. Existing SB travel lanes are excavated out so that a temporary widening of NB, at the same grade as NB, can take place. This enables in phase 3 the NB traffic to be shifted west, creating enough room to build the new NB alignment. As shown with the 100 ft. width, there is enough room for the required 7 lanes of NB traffic. After phase 3 is completed, the NB traffic can be shifted onto the east side of the new I-75 NB alignment. This opens up the middle of the alignment in phase 4 so that SB and NB proposed lanes for HOV and TOL can be constructed as well as the remaining portion of NB mainline.

  Regarding the transition from the first sub-segment to the second sub-segment, in phase 1 of each they will blend well together since traffic is left close to today’s alignment. At phase 2, the previous sub-segment moved NB and SB traffic to the outside. In this sub-segment, SB is likewise shifted but NB is left close to today’s alignment requiring a transition. During phase 3 this transition will be more pronounced. In this sub-segment, the NB traffic is moved even further west across today’s centerline while NB in the previous sub-segment is to the outside, to the east. To avoid a more than 100 ft. transition, phase 2 of the first sub-section (minus divider barriers) may have to be completed before phase 3 of this sub-segment can be commenced. This will allow a less severe transition since NB traffic in the first sub-segment could be moved westward across the future HOV / TOL lanes.

Since the proposed HOV Access Bridge is over the SB lanes, the work on the bridge abutments and MSE wall supported access ramps in the median area should start with phase 2 of this sub-segment.

- **Station 300+00 to 340+00**: For this sub-segment, the I-75 centerlines are back to being common for existing and new. There are fills up to 25 ft. on the SB side and MSE retaining walls to be built up to 18 ft. high. At the beginning of this section there are 7 lanes NB and 6 lanes SB but by Station 315, the ramps for the South Marietta exit have transitioned away, taking 2 lanes NB and one (1) lane SB, so 5 lanes each direction continue north to the end of this section.

  Since the South Marietta Bridge is an overhead bridge (OE), with existing piers in the proposed travel lanes of both NB and SB, the bridge must be built before any traffic shifts are executed.

  As shown on Staging Typical Section A (Sta. 300 to 340), found in *Appendix E*, there are 3 phases similar to the first sub-segment. Work is performed for the new highway on the outside first and leaving traffic fairly close to where it is today. During phase 2, traffic has been shifted to the far outside on the newly completed highway while work continues on both NB and SB HOV lanes, TOL lanes, and the mainline. Separation barriers between HOV and TOL and between TOL and mainline are also constructed in addition to new median barrier. Phase 3 is ready for the new traffic alignment after re-striping the mainline in each direction.

  As far as transitioning traffic between this sub-segment and the previous one (1), there is the same issue as previously described. The NB travel lanes in phase 2 and particularly in phase 3 of the second section shift westward over 100 ft. They are 100 ft. off the alignment described here in phase 2. So as mentioned previously, the solution may be that phase 2 of this section (minus divider barriers) also must be completed before phase 3 of the second section can commence. This will allow a less severe transition since NB traffic in this sub-segment could be moved westward.

- **Station 340+00 to 423+00:** The new I-75 centerline in this section drifts to the west up to slightly over 100 ft. from the existing I-75 centerline. In addition, there are grade changes of up to 5 ft. On the SB side there are fills and MSE retaining walls up to 35 ft. high. Also, at Station 390 there will be a center median BRT station, the Marietta Station, located near Roswell Rd. The station will be supported by an MSE wall enclosed embankment approximately 50 ft. high with HOV access lanes down to Roswell Rd. on either side. To accommodate this, the MOT Plan calls for temporary fill, walls, and roadways to be used on the NB side.

  The Banberry Rd. Bridge is a underpass or mainline Bridge (UE) which is being replaced and relocated. The Roswell Rd. Bridge is a UE bridge which is being widened. Both can be staged to be consistent with the highway MOT Plan. The Gresham Rd. Bridge is an overhead bridge (OE). This OE Bridge is presently an exception to the rule that all OE Bridges must be built first. The proposed center pier location for the Gresham Rd. Bridge falls within the existing NB travel lanes. There are two (2) solutions to this issue. One (1) would be to close Gresham Rd. and demolish the existing bridge. The new bridge would be built as the highway MOT staging allows. The detour would not be too onerous and was mentioned in the bridge section. Using Roswell Rd., Woolco Dr., and So. Cobb Parkway would only be about 3/8 of a mile detour. The second solution would be to utilize a temporary bridge. Presently there is no Gresham Rd. centerline shift planned, so a temporary bridge would be required full length. If a centerline shift is designed, it may be possible to only need a temporary bridge for half by using the existing bridge during staging.

  The staging in the sub-segment calls for four (4) phases. In phase 1, the traffic remains close to existing while work commences on the permanent SB side which now extends approximately 255 ft. west of the existing I-75 alignment. The staging is very similar to that shown on a previous tagging drawings. See Staging Typical Section C (Sta. 271 to 300), found in Appendix E. The centerline shift and BRT station are the cause for this large shift. The SB mainline plus SB HOV through lanes and SB TOL can all be built in this phase. Meanwhile on the NB side, work can start on the outside with fills and MSE walls but the NB pavement placed in this phase is temporary. This is so that it can match the grade and slope of existing NB. In phase 2, SB traffic is placed on the outside of the permanent SB alignment and NB traffic is shifted to the outside on a temporary surface. Work can now start on the station median area at Roswell Rd., and the inside portion of the new NB alignment. The fact that it is at a higher grade by approximately 5 ft. requires a temporary wall next to traffic to retain the fill for the new section. In phase 3, traffic is shifted to the just completed, inside portion of the new NB alignment so that work can start on raising the outside NB area approximately 5 ft. from the existing grade to the new grade and alignment. In phase 4, NB traffic will be shifted back toward the outside in the permanent alignment and the divider barriers for HOV and TOL can be constructed. During phase 2, 3, and 4, work can continue on the SB side and the BRT station without any further traffic shifts affecting SB traffic.

Regarding continuity with the preceding sub-segment, the SB side works well since both schemes send the SB traffic to the outside in phase 2. For the NB traffic, there is a transition issue in phase 3 of this section when NB traffic is located half on the existing SB side while the preceding section has NB traffic on the outside. To solve this, the HOV and TOL divider barriers in the previous section on the NB side could be delayed so NB traffic could make a gradual transition over to this section's phase 3 alignment, traveling on future HOV and TOL roadway.

Station 423+00 to 455+00: For this sub-segment, the I-75 centerlines are back to being common for existing and new. There are fills up to 28 ft. on both the NB and SB side and MSE retaining walls to be built up to 28 ft. high. Although there are exit and entrance ramps from the North Marietta exit, these lanes merge into and do not add to the existing 5 lanes in each direction which continue in this sub-segment.

There is one (1) existing bridge in this sub-segment. Since the North Marietta Bridge is an Underpass or Mainline Bridge (UE), the bridge can be staged with the Highway MOT.

As shown on Staging Typical Section A (Sta. 430), found in *Appendix E*, there are 3 phases similar to the first sub-segment. Work is performed to build the new highway on the outside first and leaving traffic fairly close to where it is today. During phase 2, traffic has been shifted to the far outside on the newly completed highway while work continues on both NB and SB HOV lanes, TOL lanes, and the mainline. Separation barriers between HOV and TOL and between TOL and mainline are also constructed in addition to new median barrier. Phase 3 is ready for the new traffic alignment after re-striping mainline in each direction.

Regarding continuity with the preceding sub-segment, the SB side works well since both schemes send the SB traffic to the outside in phase 2. For the NB traffic there is a transition issue in phase 3 of the previous section when NB traffic is located half on the existing SB side while this section has NB traffic on the outside. To solve this, the HOV and TOL divider barriers in this section on the NB side could be delayed so NB traffic could make a gradual transition over from the previous section's phase 3 alignment, across the future HOV and TOL lanes. As described, it is the mirror image of the transitional issue described in the previous section.

- **Station 455+00 to 525+00:** While this section of the I-75 Highway MOT Plan extends 3000 ft. into Segment 3, the majority of it occurs in Segment 2 and is discussed here. In this section the new I-75 centerline drifts east of the existing I-75 centerline for the only time. The centerline shift to the east is up to 65 ft. The 5 lanes in both NB and SB directions continue throughout this section. There are minor fills up to 10' on the NB side.

  There is only one (1) existing bridge in this section. It is an overhead bridge (OE), the Allgood Rd. Bridge, with the new ft.print of the bridge in a different location than the existing bridge. It is just north and parallel to the existing bridge. The northern edge of the existing bridge must be trimmed back. Presently the new center pier falls in the existing NB lanes and the pier between SB TOL and SB mainline falls in the existing SB lanes. The solution here may be a combination of using a temporary bridge and putting in temporary tie-back walls at the existing end bents to create room to stage traffic. The SB side issue can be solved by creating room at the existing sloped end abutment by installing a vertical tieback wall and creating enough room for the SB mainline traffic in the new alignment. While the new span for the proposed NB mainline falls off of the existing roadway and can be built, it is likely a temporary bridge will be needed for the eastern two (2) spans to maintain traffic on Allgood Rd.

  There are also two (2) proposed flyovers which allow the HOV lanes to get to the outside of the alignment and merge with the mainline travel lanes with access to upcoming exits for NB and entrance ramps for SB. If a different alternative is pursued which creates an interchange at Allgood Rd., these two (2) flyovers will not be needed. The work on these flyovers including foundation and substructure work can be coordinated with the highway MOT.

The cross section drawing for this section, Staging Typical Section D (Sta. 455 to 525), found in *Appendix E*, is actually taken north of Segment 2 but represents the plan in this section. As shown, there are a minimum of four (4) phases. In phase 1, traffic remains where it is today while work starts on the outside of new NB. A portion wide enough to handle NB traffic in the next stage is constructed in the permanent alignment and grade. In phase 2, with NB traffic shifted onto the outside, work can start in the middle, but must be done as temporary work. This is due to the fact that in the next phase the SB traffic will be shifted onto this center portion and the permanent grade and cross elevations are not conducive to SB mainline traffic. In phase 3, the SB traffic is shifted into the center onto a temporary roadway. This allows the SB side to be constructed in the permanent condition. In phase 4, with SB traffic shifted to the outside, the entire center portion is reworked from temporary to the permanent grade, cross slopes, and with the concrete surface. All HOV and TOL divider barriers should also be built in this phase with minor traffic shifts.

Regarding the transition from the previous segment to this one (1), phase 2 for each is consistent since all traffic is to the outside. However in phase 3 of this section, the SB traffic is shifted to the east on a temporary surface beyond the new centerline. Meanwhile the SB traffic in the previous section is to the west, on the outside of the new alignment. To mitigate this, phase 2 of the previous section may have to be complete (leaving off HOV and TOL divider barriers) before phase 3 of this section is started. This will allow the SB traffic to be shifted east in the previous section towards the proposed phase 3 alignment of this section described here.

5.2.2 Construction Methods

5.2.2.1 Bridges

Delk Rd. Bridge: The Bridge Matrix assumes foundations for the new intermediate piers to be steel piles, approximately 20 ft. long. This will require double lane takings on either side within the fall radius of the piles during nighttime lane takings described above.

Because of the extensive excavation cut required on the eastern and western ends of the new bridges, temporary shoring is called for in the bridge drawings. This will likely consist of driven soldier piles with lagging installed as excavation proceeds. Soil nailing or other methods will be used in the deeper cuts. The purpose of this shoring is to support the portion of the old approach being used for traffic while work continues on the new section. The abutment walls are called out as MSE walls. This requires cutting the slope back further for the MSE straps. The MSE wall would be backfilled after pile driving for the end bent foundations. The end abutments can then be placed. This cycle is repeated at the beginning of each stage. Slip joints in the MSE wall will be used at the vertical line between stages.

The bridge drawings indicate a construction option to put in an additional row of temporary shoring should it be decided to retain the use of the remaining portion of the existing bridge during stage 3 Construction. The temporary shoring allows the approaches to be maintained.

The bridge drawings call for 72 “ bulb tees to span up to 120 ft. Fortunately the two (2) spans over existing I-75 traffic are both 94.5 ft. This is a 38 ton pick increased to 45 tons using a 10 percent rigging weight and 10 percent additional safety factor if a single pick. Because of the length of 94.5 ft., utilizing two (2) cranes would the probable approach. PSC beams must be handled carefully and are designed as end supported only. As a double pick, taking half the 38 tons and adding 10 percent for rigging and a very conservative 50 percent for a double pick, yields about 31 tons. If calculations are used with an approved a heavy lift procedure, this load would likely be reduced to 25 tons each. Two (2) Grove GMK 5275 truck cranes or equal could handle the 31 tons at 70 ft. radius. They could be brought in early in outside lane takings, loaded with their counterweights and be ready for the highway closure when a trailer with the beams is driven down the center lane. They could then off-loaded by the truck cranes and beams set in place, setting from north to south for stage 1. This will work for stage 1 and stage 3 superstructure. Once a protective deck is attached to the lower flange of the beams, and adequate fall protection and other safety measures are in place, work could continue on the stay in place forms, deck rebar, and deck concrete. Work along the edges must be done at night with coordinated lane takings.

Stage 2 beam setting is more difficult since it is in the middle of Delk Rd. traffic in both EB and WB directions. For stage 2, Delk Rd. will have to be closed, if it is not already closed due to detoured I-75 traffic. Setting the beams for stage 2 from I-75 will also require a longer crane reach since the beams to set are being placed between two (2) structures. For this reason, stage 2 beams should be set from Delk Rd. while Delk Rd. is closed. Each Grove GMK 5275 could be positioned on new stage 1 bridge over a pier, while the beams are brought in onto the old Delk Rd. bridge.

The two (2) outside spans of 118 ft. and 120 ft. are not over existing traffic but are in the new work zones created after excavation of existing approaches. It is likely a crawler cranes will be positioned in each of these work zones to support all lifting requirements and can be used to assist in setting the 72 " bulb tees beams also. For the double picks, a medium sized truck crane can be positioned along the shoulder of the existing highway.

Other Segment 2 Bridges: For the two (2) other Category 5A Bridges in Segment 2, South Marietta Parkway and Gresham Rd., both will have intermediate piers similar to Delk Rd. Their staging will be similar to the Delk Rd. Bridge and require temporary shoring in stages. They also both have very heavy lifts over I-75 for new bridge beams. South Marietta will use 72 " bulb tees like Delk Rd. with a longest span of 125 ft. As with Delk Rd. the longest span falls outside of today's traffic alignment, to the east, allowing Crawler cranes in the work zone to be utilized. For the heavy lifts over I-75, the spans, beams and requirements are as described above for Delk Rd.

The proposed Gresham Rd. Bridge calls for two (2) long spans of 165 ft. over I-75 NB and SB traffic. The bridge members will be steel plate girders weighing about 400 lbs. per ft. That would put total weight at 33 tons after the entire length is spliced together on flatbeds parked next to I-75. If attempted as one (1) lift of the 165 ft. member, the flatbeds would be driven out onto I-75 and angled so that a truck crane could pick the center abutment end at a radius of 75 ft. and set it. A crawler crane in the work zone could pick the other end at a larger radius and swing that end in place. A Grove GMK 527 or equal and a 200 ton crawler crane on the other end could handle this. Truck cranes while advantageous to drive out onto the highway must be set in place, loaded with counter weights (1-2 hours), and not moved during the lift. Closure time is also needed to remove counter weights. Since almost half of the length will be extending to the side of today's highway alignment, there is an option to install this in two (2) sections, splicing over a temporary shoring tower built on the side of the highway. This would reduce crane needs for the lift over I-75. Substructure work for Gresham Rd. Bridge is similar to Delk Rd. but with one (1) less intermediate pier.

The new bridge at Allgood Rd. has similar heavy lift requirements as Delk Rd. with two (2) 125 ft. spans of 72 " bulb tees. Once again, these are to the outside so these can be done in the off road work zone. The lifts over I-75 are 90 ft., similar to Delk Rd.'s 94.5 ft.

For the three (3) mainline bridges, Banberry Rd., Roswell Rd., and North Marietta Parkway, the largest lift is 105 ft. long PSC BT 54's for Roswell Rd. Each PSC beam would weigh 36 tons. A medium Truck crane like the Grove GMK 5275 or equal with the proper lifting frame can handle this at a radius of 55 ft. when parked on closed Roswell Rd. However it is likely two (2) cranes will be used as a dual pick due to the length. This would result in smaller cranes. Or cranes in the work zone on each end of the new bridge could be used. As mentioned earlier the new substructure work can be off roadway for all three (3) bridges since the center pier for North Marietta Parkway is being eliminated. It is anticipated that demolition of existing will allow unlimited overhead clearance for all new foundation (driven steel piles) and substructure work.

The three (3) proposed bridges in Segment 2 will all cross over I-75, one (1) for the Franklin Rd. HOV / Bus access, and two (2) for HOV flyover to the outside. The two (2) flyovers are designated on the Bridge Matrix as 5-8 spans of 160 ft., utilizing steel plate girders. This is identical to the majority of the proposed bridge structures in Segment 1. For each there will be a span over I-75 NB or SB. The challenges described above for Gresham Rd. will also be present for these lifts. These structures also use steel plate girders but they are also 400 lbs. per ft., not the 650 lbs. per ft. used on other bridges. However because these spans will be at an angle to I-75, there is not the advantage of a large portion of the span being off the highway.

5.2.2.2 Highways

See Section 2.2.3 of this report for a discussion of highway construction methods common to all Bridge and Highway segments.

For concrete deliveries in Segment 2, it is anticipated that the majority of concrete would be batched at the proposed batch plant location at the Cumberland BRT parking facility site. See Section 2.2.3 of this report. However for concrete placements in the northern end of Segment 2, given traffic conditions, the proposed batch plants at Wade Green Rd. or SR-92 may be utilized.

There are extensive cuts and fills along the widened alignment. At this early stage of design, fill areas are shown to be retained by MSE wall. Segment 2 has a large quantity of MSE wall but not as much as Segment 1. Segment 2 does have a very large quantity of Sound Wall as well as embankment. Excavation or cut areas are assumed at this early stage of design to be supported by Soil Nailing.

5.2.3 Construction Risks

See Section 2.2.4 of this report for a discussion of Construction risks common to all bridge and highway segments.

Delk Rd. Bridge: Utilities pose a potential risk to schedule and therefore cost. Presently there is a 6" gas line, an 8"water line as well as duct bank of 18 telephone conduits being supported under the existing bridge. They are located along the south edge and therefore are in the first stage of demolition. Since there is no new structure at that point, they will have to be moved to a temporary support location on the existing bridge and later moved a second time to a permanent supported location. On the north side of the bridge, there is an electric line and possibly traffic signal lines. Utility company cooperation and timely support are critical so as to not delay subsequent stages of bridge construction.

Before any meaningful work can commence, the very large electric support tower located in the southeast quadrant, very close to the existing bridge, must be re-located. This tower is carrying multi-high voltage lines and represents a major piece of work for the power company.

Other Segment 2 Bridges: The Gresham Rd. Bridge also requires utility company relocation of a large electric support tower presently located in the southeast quadrant and carries the same risks to the schedule and cost.

Other bridges with utilities supported and requiring timely response from the utility companies are South Marietta Parkway (electric and possibly waterline), Gresham Rd. (gas line and telephone lines), and Allgood Rd. (waterline and gas line).

The South Marietta Parkway Bridge and Gresham Rd. Bridge must also be completed prior to any staging shift in I-75 traffic. The work on Banberry Rd. Bridge, Roswell Rd. Bridge, and North Marietta Parkway Bridge must all be coordinated closely with the roadway work to support staging shifts in traffic. These are schedule risks due to the interdependent nature of the schedule.

The Gresham Rd. bridge will utilize 165 ft. long steel girders. The steel plate girders will have a long time (schedule risk) and need to be fabricated at a GDOT approved metal fabricator and be fabrication shop inspected. Of particular importance is a requirement to have all spliced members be trial joined in the shop to ensure proper fit up.

Highways: The highway work carries the same safety risk to the general public and to the workers due to the close proximity of the work to up to 13 lanes of general traffic within this Segment.

Utility relocation and the required prompt response by the utility companies present a potential risk to schedule and therefore cost. Of particular note are the Ga. Power transmission crossings in several locations, the sanitary lines crossing under the existing highway, and various gas, water, and telephone lines along the ROW which need to be relocated. In addition to this are the lighting and fiber optic cable lines related to existing highway operations that must be temporarily replaced and relocated to support highway operations.

5.2.4 Value Engineering

Delk Rd. Bridge: There is an alternate staging plan that has been developed. It only shifts the permanent centerline of Delk Rd. 20'-11", but requires 4 stages instead of the 3 described above. This option will be investigated further and is also tied to approval of final Delk Rd. alignment.

Under the Alternate 1 Alignment with truck lanes on the outside, there is an option to tunnel jack a concrete box under the west approach. The lane spacing under this alignment is conducive to this approach. The jacked box would accommodate the two (2) SB truck lanes. The east side wall of the concrete box could then serve as an abutment. Should Alternate 1 be pursued, this option can be investigated further.

Other Segment 2 Bridges: The Allgood Rd. Bridge replacement and the two (2) HOV flyovers described herein are tied together in that they represent an option of not having an HOV interchange at Allgood Rd. If an HOV interchange is designed for Allgood Rd. the two (2) flyovers totaling over 2,000 ft. in length are not required. And the Allgood Rd. Bridge is about 20 percent smaller. However additional HOV access ramps with extensive MSE retaining walls would be required in the middle. This will be investigated in detail and is also contingent on preferred alternative.

Highways: See Section 2.2.5 of this report for a discussion of value engineering opportunities common to all highway segments.

5.3 SEGMENT 3

This section of the Constructability Report will address the Segment 3 bridge and highway work. Segment 3 extends from station 495+00 to 670+00 on I-75 and on I-575 from I-75 to station 80+00

Key Construction Elements

- The scope of the NWC Project in Segment 3 includes adding two (2) High Occupancy Vehicle (HOV) lanes and two (2) Truck only lanes (TOL) in both the NB and SB directions on I-75. The various alternates are described in Section 5.2 Segment 2.
- There are 4 new proposed bridges and 7 existing bridges in Segment 3. All of the existing bridges must be replaced or widened. One (1) of the 7 existing bridges was chosen as a cluster bridge for which a preliminary design was completed. The Cluster Bridge for Segment 3 is the SR-5 Bridge. This section of the Constructability Report will address the Cluster Bridge in detail but also discuss constructability issues on the other Segment 3 Bridges. The constructability issues for the non cluster bridges are derived solely from the I-75 Bridge Matrix prepared and from field inspection and photos taken.

SR-5 Bridges: The SR-5 Bridges are two (2) separate bridges, eastbound and westbound over I-75. SR-5 both eastbound and westbound consists of two (2) travel lanes and one (1) on/off merging lane. The existing interchange at this location is one (1) cloverleaf shy of the typical four (4) cloverleaf array for highway interchanges. The exception is eastbound (EB) to I-75 northbound (NB). This ramp sweeps south of the interchange, across I-75 in a wide sweeping arc outside of the cloverleaf arrangement and joins with I-75 NB. The existence of this ramp will be instrumental in the planned staging for these bridge reconstructions. It provides a natural bypass in the eastbound direction with temporary ramp work. As shown on the SR-5 Bridge drawings, the planned staging consists of first replacing this ramp so as to accommodate three (3) lanes of eastbound SR-5 traffic. Then while utilizing the new ramp as an eastbound SR-5 bypass, the new SR-5 EB Bridge is re-constructed. Once this is complete, westbound SR-5 traffic is placed on the newly constructed eastbound SR-5 Bridge while keeping eastbound SR-5 traffic (3 lanes) on the bypass ramp. Once westbound SR-5 Bridge is complete, traffic can be switched to the permanent configuration.

Other Segment 3 Bridges: Of the remaining 6 existing bridges in Segment 3, half are overpass bridges (OE) and half are mainline or underpass bridges (UE). Of the three (3) overpass bridges, the

Georgia NE Railroad Bridge and the I-575 to I-75 SB Ramp Bridge are planned as replacements in different ft.print locations. They are labeled as Construction Category 3 in *Appendix A*, NWC Bridges—Reworking existing and proposed. The RR Bridge would require new approaches at each end. The third overpass bridge, the Canton Rd. Bridge, will be rebuilt similar to the Delk Rd. Bridge and other overpass bridges requiring replacement at a different grade. The centerline of Canton Rd. (category 5A) would be permanently shifted 9’ to the north so that staging during construction can maintain the two (2) lanes of traffic.

Of the three (3) mainline bridges, two (2) are widened in place. They are Dickson Rd. Bridge and the Barrett Parkway Bridge and are labeled as Category 2 in *Appendix A*. The third one (1) is the Bells Ferry Rd. Bridge which must be replaced in its entirety, at a slightly higher grade. It is labeled as a Category 2A. The low bridge rating for the Bells Ferry Rd. Bridge requires it to be replaced as well.

At the I-75 / I-575 Interchange, there are 4 proposed new flyover structures. There are separate ramps for TOL and HOV, both in the NB direction and SB direction, to tie into I-575. The TOL ramps end on I-575 whereas the HOV lanes continue north on I-575 as single lanes.

Highways: The existing highway in Segment 3 starts at Station 495+00 with 5 lanes in both the southbound (SB) and northbound (NB) directions. Heading northward, there are 5 existing lanes NB and 5 existing lanes SB. This number continues until just north of SR 5 when the mainline increases to 6 travel lanes in both NB and SB directions at Station 562+00. The 6 travel lanes in each direction continue northward to Station 635+00 where the number of NB and SB lanes varies between 3 and 4 to Station 670+00. The limits of construction on I-575 for this Segment are Stations 35+00 to 80+00. The I-575 section I s modified to include only one (1) HOV lane with shoulders in each direction. The traffic shifts across adjoining subsegments will require detailed coordination and scheduling to minimize crossovers or large shifts in the east and west direction of the NB and SB lanes.

5.3.1 Access/Traffic/MOT/Staging and Sequencing

5.3.1.1 Bridges

SR-5 Bridges: To support the Staging Plan briefly outlined above, several temporary ramps must be built to facilitate all existing traffic moves. To allow construction of the SR-5 EB Bridge to start, a temporary ramp must be built to enable SR-5 EB traffic (3 lanes) to exit the ramp to I-75 NB and continue eastbound on SR-5. The existing grades indicate this can be readily accomplished.

Later, when work is to start on the new SR-5 WB Bridge, a temporary roadway is required to send the WB traffic (3 lanes) over to the EB side. After crossing the new EB bridge, the traffic is sent back over to the WB side. In addition, I-75 SB traffic that is intending to go east on SR-5 will travel on a temporary ramp that will reverse direction and merge with the traffic on the bypass ramp described above. To meet minimum radius criteria, this temporary ramp may have to be routed back up onto SR-5 EB. This is possible since SR-5 EB traffic is on the bypass ramp. Overall the staging plan for SR-5 traffic addresses all traffic needs and allows each of the SR-5 Bridges to be built in their entirety without bridge staging.

Traffic on I-75 below consists of 5 lanes in each direction. See Section 2.2.1 for anticipated traffic restrictions on I-75 lane takings.

One (1) aspect which will help facilitate construction is the existing 12 ft.-14 ft. inside or median shoulder in each direction. However one (1) design aspect that complicates staging is the I-75 centerline shift in this area. It is 90 ft.-95 ft. in this area due to the proximity of the I-75/I-575 Interchange. To mitigate this, the new center piers are located in the existing I-75 NB right shoulder. The new pier between TOL and mainline SB falls in the existing centerline median area, although it is located about 8 ft.-10 ft. to the east of the existing I-75 centerline. Night shift work zones will be set up using temporary barrier to protect the workers while taking an additional lane in each direction. At end of each shift, the temporary barriers are set against the median with an attenuator to protect the public. The existing median barrier must be demolished to install the new center abutment, so the temporary barriers serve as a median barrier. The new pier to the outside of mainline SB falls in the existing right travel lane. This work will require a temporary shift of mainline SB away from this work and towards the east.

In order to construct certain aspects of the eastern 3 spans of each SR-5 Bridge, I-75 mainline traffic will be detoured. One (1) option that could be used is to have NB traffic take the SR-5 exit, sending them east on SR-5. With a temporary U turn constructed, the traffic could be sent westbound on SR-5 and back onto I-75 NB via the on ramp. SR-5 would need to be shut down to maintain I-75 traffic. This would have to be done on the lowest volume hours, probably 2am to 5am with Saturday night into Sunday morning yielding a longer window. Each of the 6 spans has 7 AASHTO Type III beams to set. The night closures would also be utilized to set in place a protective deck on the lower flanges.

Demolition of the existing bridges will require similar closures and must be carefully planned so as to ensure the remaining structure at the end of a shift is in a stable condition.

Other Segment 3 Bridges: The replacement Georgia NE RR Bridge is intended to be built directly adjacent to the existing RR bridge. Presently there are 5-6 trains a day using this RR line. A weekend shutdown will be needed to make the tie-ins at each end when the new RR bridge is complete. The new piers for the RR bridge will be in similar locations as described above for the SR-5 Bridge, with the pier between new I-75 SB and SB TOL offset, located about 8' from edge of an existing travel lane. The new centerline pier between HOV lanes falls in the middle of the existing far right lane on NB. To build this, the NB lanes will need to be shifted west onto the wide shoulder area near the median. The same approach to the work as SR-5 will be used to construct the substructure, given traffic limitations. The RR bridge piers have a large number of approximately 20 ft. long piles, presently shown on the Bridge Matrix, which will require double lane takings at night. The I-75 detour for beam setting, demolition, and some superstructure work is the same as Allgood Rd. in Segment 2, namely North Marietta Parkway, N. Cobb Parkway, and SR-5.

Canton Rd. only has two (2) travel lanes, which will be maintained during the replacement of the Canton Rd. Bridge. New pier locations line up similar to SR-5 described above with one (1) exception. The pier between TOL NB and NB mainline falls squarely on the existing exit ramp from I-75 NB to SR-5 EB. The exit ramp will need to be re-aligned to miss the location of the proposed pier. The I-75 detour for critical overhead work is the same as the RR bridge.

The ft.print for the proposed ramp from I-575 SB to I-75 SB is in a new location. At the point where the new ramp crosses the existing ramp, the plan is to span the new ramp over the existing and then further down the ramps the new ramp can be tied into the existing when both are at grade. The piers for the new ramp are all off the present I-75 travel lanes with one (1) critical pier located in the existing median of I-75. At this location, there are wide median shoulders which will facilitate construction. The traffic requirements to construct this pier are similar to what was described above for SR-5. For the demolition of the existing bridge, plate girder picks and some superstructure work, I-75 traffic must be detoured. The I-575 and Barrett Parkway detour will work for all aspects with the existing I-575 to I-75 SB ramp carrying the detoured traffic. The location where the new ramp crosses over the existing ramp is west of the existing I-75 alignment, so mainline traffic need not be detoured. For setting beams on this one (1) span, the existing ramp is closed and I-575 traffic exits at the I-575 exit to Barrett Parkway. Once the new ramp is completed and traffic transferred onto it, the existing ramp can be demolished with the same detour approach as described above.

The three (3) mainline bridges, Dickson Rd., Bells Ferry Rd. , and Barrett Parkway, will be staged with the roadway work, presently planned in this area as a 3-4 stage operation with work on the outside of the alignment first. While Dickson Rd. and Bells Ferry have only two (2) lanes of traffic, Barrett Parkway is well-traveled with 7-8 lanes including turn lanes. By temporarily eliminating the sidewalks on each roadway, the substructure for both Dickson Rd. and Bells Ferry can completed without impact to each cross road. There are existing center piers on the median on Barrett Parkway. The Bridge Matrix indicates the widening to match the existing spans on each of the three (3) Bridges.

To construct the new portion of the center pier along the centerline of Barrett Parkway, it is recommended to shift both eastbound and westbound Parkway traffic to the outside by eliminating the sidewalk as well as narrowing travel lanes to 11 ft. This could result in a center work zone of about 12 ft. in width. This would be set up with temporary barriers and temporary attenuators and be used to construct the new pile foundations, ft.ings, columns, and pier caps at each of the 3 required locations. After the center bents are constructed, traffic can be restored to the pre-Construction alignment for the superstructure work. While the Barrett Parkway Bridge is planned in 2 stages, outside work first, then inside (I-75 median area) work next, it is prudent to get all the substructure work done at the same time with only two (2) traffic shifts on Barrett Parkway.

Crossroad detours for the three (3) mainline bridges will be required for demolition, beam setting and for some superstructure work. For closures of Dickson Rd. and Bells Ferry Rd. the detour would be SR-5, N. Cobb Parkway, and Barrett Parkway. For Barrett Parkway closures, the detour would be I-575 and Chastain Rd.

The 4 proposed new TOL and HOV flyovers at the I-75 / I-575 Interchange must be built while maintaining I-75 traffic. At least 5 of the proposed pier locations for the HOV ramps fall in existing I-75 travel lanes. For this reason, they cannot be built until the I-75 traffic has been shifted to the outside in the new alignment. One (1) of the four (4) ramps, a braided ramp taking TOL traffic over new I-75 NB alignment, falls outside of the existing alignment so it can be built early with minimal impact to existing traffic. The piers for the other TOL ramp, from I-575 to I-75 SB, can be built in stages. The piers near the new NB alignment will be built early and the ones near the centerline and west of centerline will be built after the mainline traffic shift to the outside and will mitigate impacts to existing traffic.

For superstructure work, except for the braided ramp previously mentioned, the other three (3) are plate girder designs with longest spans of 180 ft., 200 ft. and 210 ft. due to the skewed layout. Each of the beam picks over I-75 NB and I-75 SB will require that side of the highway to close. The detour would be to use I-575 and Barrett Parkway. The northbound detour traffic gets off at the I-575 ramp before the lift zone. The southbound detour traffic gets back on I-75 SB via the existing I-575 to I-75 SB ramp which avoids the lift zone except for one (1) situation. The proposed TOL from I-575 to I-75 SB spans over this existing ramp so it must be closed for one (1) span. Since closing this ramp means detouring I-575 SB, as well as I-75 SB, a better sequence may have to be developed. One (1) possibility would be to erect the span over the proposed I-575 to I-75 SB ramp first and then after it is opened, erect the span over the existing I-575 to I-75 SB ramp, since traffic will have been removed from this location at that point. Since the proposed ramp is for future TOL traffic, it does not affect existing flows.

Another sequencing option to avoid most of the heavy picks over existing I-75 is to build the spans on the outside of the alignment complete before I-75 traffic is switched to the outside. Once the traffic is switched, the spans over today's I-75 alignment can be built in the median area work zone without detouring traffic.

5.3.1.2 Highways

For purposes of developing a staging/MOT Plan for Segment 3, it was sub-divided into five (5) smaller subsegments, with the first continuing on from Segment 2 and the fifth continuing into Segment 4. The delineations were made due to the relation of the proposed I-75 centerline for Alternate 2 to the existing I-75 centerline. In some subsegments the new centerline drifts to the west or east as much as 100 ft. and remains in the same location for 2 subsegments. The location of the new I-75 centerline in relation to the existing traffic centerline naturally has a great bearing on options available for highway staging. Other factors were the existing bridges and existing grades on the outside of the existing alignment.

The five (5) subsegments are discussed below, in order from south to north;

- **Station 495+00 to 525+00:** For this first sub-segment (Typical Section – 510+00) of about 1/2 of a mile, the new I-75 centerline will be located between 55 ft. to 65 ft. east of the existing I-75 centerline. This covers the area north of Allgood Road towards the SR 5 exit. See Staging Typical Section D for Station 510, found in *Appendix F*.

  Phase 1 of the highway staging/MOT is to construct the NB outside areas (the areas east of existing I-75 NB) first, while NB traffic will uses 5 inside lanes. The 92 ft.-115 ft. of roadway surface provided in phase 1 is adequate for the 5 lanes of existing traffic in both NB and SB directions. During phase 2, temporary asphalt will be placed behind two (2) sets of barriers that delineate traffic in both directions from the work zone. The work included in phase 3 is the construction of the SB lanes, while traffic is shifted east with 100 ft. (NB) and 120 ft. (SB) of roadway surface provided. Phase 4 consists of the construction of the interior lanes (approximately 60 ft. on either side of the new centerline) and other finishes. Barriers will be used between HOV and TOL and between TOL and GPL for traffic separation. Barriers are also constructed in addition to new median barrier as required and allowed by phasing. The issues associated with the Allgood Rd. Bridge located just south of this sub-segment are discussed in Section 5.2.1.2 of this report as part of the Highway MOT Plan. The only existing bridge located in this sub section is Georgia NE RR Bridge. It is an overhead bridge to be replaced and as such must be rebuilt before the traffic shifting described above. The location of the new center pier will interfere with stage 3 SB traffic as shown on the MOT cross section at Sta. 510. This issue can be solved as follows. The difference between the existing I-75 centerline and the proposed I-75 centerline at the RR Bridge (Sta. 524) is approximately 75 ft. since it has moved from the 55 ft. indicated on the cross section at Sta. 510. This allows the SB traffic is phase 3 to be placed just west of the new centerline pier for the RR Bridge.

- **Station 525+00 to 562+00 (Typical Section – 530+00):** The next sub-segment is complicated by the fact that the centerline shifts up to 100 ft. to the east and the large excavation and MSE wall construction required along the NB shoulder. Generally, this sub-segment will be completed in 4 phases in the same manner as the preceding sub-segment. See Staging Typical Section D for Station 530, found in *Appendix F*. There are three (3) existing bridges within this sub-segment. The first two (2), the Canton Rd. bridge and SR-5 bridge are overhead bridges which must be built first. The new piers for the SR-5 Bridge are located such that no conflicts are seen for the MOT staging described herein although the new center pier is close to the existing NB exit lane. The Canton Rd. Bridge center pier appears to interfere with stage 3 SB traffic as shown on the MOT cross section at Sta. 530. This can be solved by allowing the phase 3 SB traffic to be placed just west of the new centerline pier for Canton Rd. There should still be adequate room to perform the SB work to support phase 4.

  The third bridge is the Dickson Rd. Bridge and since it is to be widened can be coordinated with the Highway work.

- **Station 562+00 to 582+00 (Typical Section – 575+00):** For this sub-segment, the I-75 centerlines are back to being common for existing and new. Roadway fills range from 27 ft. on the SB side to 35 ft. high on the NB. There are 6 lanes in both the NB and SB direction in this sub-segment. See Staging Typical Section B for Station 575, found in *Appendix F*.

  Phase 1 consists of shifting the traffic to the interior lanes as the fills and roadway construction takes place along the outside lane. Three (3) sets of barrier (one (1) set in the median and one (1) set on each outside direction) will be used to delineate the traveling public from the outside work and the oncoming lanes, and approximately 97 ft. of roadway surface will be provided in both directions. During phase 2, traffic will shift to the far outside on the newly completed highway while Work continues on both NB and SB HOV lanes, TOL lanes, and the high speed lanes of the mainline. Separation barriers between HOV and TOL and between TOL and mainline are also constructed in addition to new median barrier. Phase 3 will include miscellaneous finishes and be ready for the new traffic alignment after re-striping mainline in each direction. The only existing bridge in this sub-segment is the bridge at Bells Ferry Rd. It is a mainline bridge to be replaced. This can be worked with the highway work, building the outside first.

- **Station 582+00 to 635+00 (Typical Section – 597+00):** The new I-75 centerline in this section drifts in both directions from 60 ft. west to 45 ft. east from the existing I-75 centerline. In addition to super elevation changes, large embankments must be built for the new roadway. These embankments range in a maximum height of 35 ft. (SB) to 25 ft. (NB). In this sub-segment, there are 6 lanes in both the NB and SB direction. There is variability of cuts and fills along this sub-segment. Instead of embankments, certain sections along the sub-segment require excavations.

  See Staging Typical Section C for Station 597, found in *Appendix F*. In phase 1 the traffic remains in the interior lanes of the section as the embankments and roadway on SB outside lanes is constructed. During this phase, the NB embankment (outside lanes) will also be built. In phase 2, SB traffic is placed on the outside and will travel on the newly constructed embankment and roadway, while NB traffic will remain on the outside of the existing roadway (from 25 ft. east of existing centerline to 100 ft. east of existing centerline). Utilizing temporary barrier to separate both NB and SB traffic, temporary asphalt, approximately 30 ft. wide, is to be placed just to the west of NB traffic. In phase 3, SB traffic is left in the same location as phase 2, while NB traffic is shifted approximately 30 ft. west (on to the temporary asphalt placed in phase 2). This will allow the outside 90 ft. of the NB roadway and any remaining grading work to be completed. In phase 4, NB traffic will be shifted back toward the outside in the permanent alignment while the SB lanes remain to the outside. This will allow the interior roadway section, approximately 240 ft. in width, to be constructed and miscellaneous finishes to be completed.

There is one (1) existing bridge and four (4) proposed bridges within this sub-segment. The existing bridge is the I-575 ramp to I-75 SB and as described in Section 5.3.1.1 above can be staged with the highway work to reduce the number of heavy lifts over traffic lanes requiring I-75 closures. The four (4) proposed bridges are all HOV or TOL ramps at the I-75/I-575 Interchange and likewise can be staged with the highway traffic shifting to mitigate I-75 closures required.

- **Station 635+00 to 670+00 (Typical Section 640+00):** Consisting of 3 to 4 lanes in both the NB and SB direction, this sub-segment completes segment 3 and continues on into segment 4. The centerline for new and existing is the same in this section. This sub-segment differs from the others as there is an existing open median which does allow some temporary shifting of traffic into the median. Significant changes to the work and traffic phasing begin near the Barrett Parkway exit (Station 665+00) where the median, rather than the outside of the section, is widened. These changes will be discussed in greater detail in segment 4. See Staging Typical Section E for Station 640, found in *Appendix F*.

  In phase 1, SB traffic will be shifted approximately 25 ft. east of centerline so that temporary asphalt can be placed between centerline and the 25 ft. east offset. NB traffic will remain in its existing location while the new outside roadway and large slope cut to the east is completed. Phase 2 will require shifting the SB traffic east to utilize the temporary asphalt placed in phase 1 while the NB traffic remains in the same location. The outside SB roadway (approximately 75 ft. west of centerline to 160 ft. west of centerline) and a large slope excavation to the west are completed in this phase. Phase 3 will utilize the newly constructed outside lanes to carry traffic in both directions while the interior roadway is completed and other finishes are completed. Removing temporary barrier and any remaining temporary striping will complete phase 4 and the sub-segment. The only existing bridge within this sub-segment is the bridge at Barrett Parkway, a mainline bridge to be widened.

- **Station 35+00 to 80+00 (on I-575*)*:** This sub-segment is located from the I-75 interchange to just south of Barrett Parkway and consists of 4500’ of reconstruction of I-575. The existing traffic configuration is 2 lanes in both the NB and SB directions and the work requires 5 phases to complete. Note that traffic switches and construction for each phase of this sub-segment will be considered to occur in both NB and SB simultaneously. See Staging Typical Sections in *Appendix H*, Segment 5 MOT Staging drawings.

  Phase 1 of this sub-segment includes the placement of temporary barrier along the outside of the existing shoulders approximately 3 ft. from the edge line, which will shield construction activities from traffic. Next, the grading work and new 12 ft. outside shoulder construction will take place and finishes such as slopes, outside retaining walls and guardrail will be completed in the phase. In phase 2, the temporary barrier used in phase 1 is removed and the existing 10 ft. shoulder adjacent to the newly constructed shoulders is removed. This removal and replacement with a temporary pavement section (7”of asphalt over 10” of GAB) is then completed, placed under single lane closures, from the outer edge of the existing pavement to the new 12 ft. shoulder so that the section may be later used to carry traffic. During phase 3, traffic is shifted to the outside to the temporary and newly constructed pavement from phase 2. Temporary barrier is placed along the inside to delineate the interior lanes approximately 41 ft. from centerline. Once the barrier is installed, the interior lanes and shoulders are constructed out from centerline approximately 37 ft. This work would include the building of the median barrier, the 4 ft. and 10 ft. HOV shoulders, a 12 ft. HOV lane, the first stage of the barrier wall and 7 ft. of the 14 ft. wide general purpose lane shoulder. For phase 4, traffic is redirected to the newly constructed HOV lane and shoulders that are temporarily stripped to accommodate two (2) 12 ft. lanes of traffic and the temporary barrier is reset approximately 32 ft. from centerline. Next, the two (2) each 12 ft.

general purpose (GP) lanes and remaining 7 ft. of the GP shoulder are completed to finish the roadway work in the sub-segment. Phase 5 work includes final pavement markings, signage, barrier completion, and other finishes to complete the sub-segment.

5.3.2 Construction Methods

5.3.2.1 Bridges

SR-5 Bridges: The foundations for the new intermediate piers as presently called out in the I-75 Bridge Matrix are steel piles, approximately 20 ft. long. This will require double lane takings on either side within the fall radius of the piles during nighttime lane takings described above.

Because of the extensive excavation cut required on the eastern ends of the new bridges, temporary shoring will be required. This can be installed in the existing median and will likely consist of driven soldier piles with lagging installed as excavation proceeds. Soil nailing or other means may be used in the deeper cuts.

The beams for the new superstructure are AASHTO Type III PSC beams. At 583 lbs per ft., the lifts for the beams will all be in the 23 – 28 ton range. Because the length is not excessive, a lifting frame/bar could be used to apply the loads at the ends. Care must be exercised with PSC beams designed to be end supported. A medium sized truck crane like the Grove GMK 5275 or equal could safely lift each beam at a minimum 70 ft. radius. By setting up on I-75 just north of the bridge and loading the counterweights, the beams could then be offloaded directly from a trailer parked on I-75 and set into place. The I-75 detours described above would be necessary for the three (3) western spans on each bridge. Once a protective deck is attached to the lower flange of the type III beams, and adequate fall protection and other safety measures are in place, work could continue on the stay in place forms, deck rebar, and deck concrete. Work along the edges must be done at night with coordinated lane takings.

Other Segment 3 Bridges: The replacement bridge for the Georgia NE Railroad Bridge is planned as being located directly adjacent to and parallel to the existing RR bridge. It will be located as close as possible to minimize the transition distance to tie new tracks to old tracks. But this distance will likely be about 1200 ft. on each end. The scope of the tie-in must be such that a weekend shut down of the RR could accommodate completion of work. While other approaches to the work are being looked at, this plan is workable. The new substructure would be similar to existing piers. They are presently called out on the I-75 Bridge Matrix as rectangular, 14 ft. by 7 ft. with 24 piles per abutment. The work to construct these abutments under traffic conditions is similar to SR-5 described above.

The plate girders for the Georgia NE RR Bridge weigh 400 lbs. per ft. With a maximum span of 95’, the weight of each beam is about 19 tons, easily handled by a medium sized truck crane with a single pick and a lifting frame. The 12” deck for the RR Bridge is thicker than the highway bridges. With a protective underdeck in place and high temporary side walls in place most of the superstructure work including cross tie setting and rails could take place without I-75 traffic closures.

For the Canton Rd. Bridge, with the exception of the one (1) abutment mentioned above that falls in an existing ramp, the substructure work is very similar to the SR-5 Bridge and will likely be built under the same nightly traffic set-ups due to their proximity. The span lengths and type III PSC beams are also similar so the medium sized tuck crane mentioned for SR-5, the Grove GMK 5275 or equal, is adequate.

The third and final existing overhead bridge (OE) in Segment 3, is the I-575 to I-75 SB ramp bridge. Only one (1) of the new piers for this bridge must be constructed under traffic conditions, that is the center pier located in the existing median. This center pier will be built following the same methods as described for the cluster bridge, SR-5, with a similar wide median shoulder to help mitigate impact to traffic. The beams for this ramp are steel plate girders up to 220 ft. long at 500 lbs. per ft. This yields 55 tons per beam. Due to the length and weight a double pick would be used. Using the same conservative approach described earlier, each crane would need to lift 45 tons, while engineered calculations and a heavy lift procedure could likely reduce this to approximately 36 tons each. The important element here however is the staging and moving of the trailers carrying the beams. The beams would be spliced on trailers at the side of the highway and then, under the highway closure, moved out into the travel lanes, and positioned such that each crane could operate at a 60 ft.-80 ft. radius. Truck cranes cannot be moved once the counterweights are loaded. It is anticipated that a heavy truck cane like the Grove GMK 6350 or equal in conjunction with a work zone crawler crane, a 300 ton crawler like the Manitowoc 2250 or equal would facilitate these lifts.

For the three (3) Segment 3 Mainline Bridges, all three (3) are planned to match existing spans lengths over the respective cross roads, Dickson Rd., Bells Ferry Rd., and Barrett Parkway. All three (3) will use AASHTO type III PSC beams. The Bells Ferry Rd. Bridge is a full replacement, while the other two (2) are only widened. The traffic set up to construct the additional center piers on Barrett Parkway was described earlier. All other end abutments and intermediate piers will be pile supported, cast in place concrete with work carried out off of the existing roadways.

The heaviest lifts for these three (3) bridges is the 90' long type III PSC beams for Bells Ferry Rd. Bridge. At 583 lbs. per ft., this yields a lift of 26 tons without safety factors. Since space is limited on a two (2) lane roadway such as Bells Ferry Rd. it is recommended to use one (1) crane and a lifting frame to protect the PSC beam. A single Grove GMK 5275 or equal at a radius of 70 ft. can safely handle this lift.

Regarding the four (4) proposed ramp bridges in Segment 3, the first one (1) is a large braided ramp. It is the NB TOL ramp to I-575. There are miscellaneous smaller braided ramps over other ramps shown on the Bridge Matrix and not discussed in this report but since this one (1) is the largest and is for I-75 mainline traffic, it warrants discussion. It is a box shaped structure through which traffic passes longitudinally while other traffic passes over the top. It is commonly used where two (2) roadways will intersect at a skew such that the braided ramp becomes the most efficient structure. In this case, a box like structure is built for the mainline traffic to pass through. It is 600 ft. long and 115 ft. wide. The four (4) lanes of mainline traffic will pass through it while the two (2) lanes of truck-only traffic passes over the top of the box, at a skewed angle, as it exits onto I-575 and ends as TOL lanes. The construction of the braided ramp consists of pile supported columns at 50 ft. spacing along each side. A 3 ft. by 3 ft. cap beam provides support for bulb tee beams, BT 54's at 8.5' spacing, spanning across the 115 ft. width of the box like structure. The 8.6" deck or roof provides the support for the TOL lanes to pass over the top. Fortunately all of these braided ramps in segment 3 can be built in work zones away from existing traffic. For this braided ramp, the 115 ft. long BT 54's will each weigh almost 40 tons. The length could be done as a single pick without damage to the PSC beams if a lifting frame is designed to put the loading at the ends. A 300 ton crawler crane in the work zone could lift these at an 80' radius. It may be most efficient to have the crane walk backwards after it sets each beam and work its way out. Most other braided ramps shown on the Bridge Matrix are for a ramp over ramp situation and are only 45 ft.-50 ft. wide.

The other three (3) proposed bridges in Segment 3 are the remaining TOL and HOV ramps that span over I-75 at the I-575 Interchange. Taking the longest span of 210 ft., on the HOV to I-75 SB ramp, and using 500 lbs. per ft. as indicated on the Bridge Matrix, yields a 53 ton pick. Because of the length, a double pick is required. Following the same approach as the I-575 to I-75 SB ramp described above, a heavy truck crane like the Grove GMK 6350 or equal and a work zone 300 ton class crawler crane could set these beams. Also if the sequence allows setting certain spans before and others after the I-75 traffic switch as mentioned above, bringing in a large truck crane could be avoided.

5.3.2.2 Highways

See Section 2.2.3 of this report for a discussion of highway construction methods common to all bridge and highway segments.

For concrete deliveries in Segment 3, it is anticipated that the majority of concrete would be batched at the proposed batch plant to be located at Wade Green Rd., the present site of the Archer Western Plant. However, for concrete placements in the southern end of Segment 3, either of the other two (2) proposed plants could be called upon depending on traffic conditions. The other two (2) locations are SR-92 on I-575 and the Cumberland BRT site on I-75.

At this early stage of design, fill areas are shown to be retained by MSE wall. Excavation or cut areas are assumed at this early stage of design to be supported by soil nailing or other means. Segment 3 stands out as having large quantities of excavation and soil nailing. More excavation generally means a greater chance of rock excavation. Planned geotechnical exploration will determine the extent of rock.

5.3.3 Construction Risks

See Section 2.2.4 of this report for a discussion of construction risks common to all bridge and highway segments.

SR-5 Bridges: There is a telephone line duct bank supported on the SR-5 WB Bridge. These lines must be relocated onto the new SR-5 EB Bridge promptly upon completion of the EB bridge or demolition of the existing SR-5 WB Bridge will be delayed.

Other Segment 3 Bridges: The following utilities exist on the other segment 3 Bridges and must be relocated. The existing Canton Rd. Bridge has telephone, gas, and water lines. Cross roads have utilities in their roadways which likely will not be disturbed. Most of the new abutments for the mainline bridges are in line with the existing abutments. For example, a gas line in the sidewalk of Barrett Parkway should not be disturbed since the new abutments will be up the slope where the existing end abutments are. If a cross road must be lowered, usually utilizes must be relocated. None of the segment 3 cross roads are presently being considered for lowering.

Highways: The potential for differing rock conditions in this area is anticipated based on existing geotechnical information. The risk is in proper identification of the types and quantity, both of which can be minimized with an extensive geotechnical investigation not just an overview.

Significant utility impacts to the highway work are a realistic potential in this segment. Of note are the two (2) transmission lines and a 24 inch gas line at the I-75/I-575 Interchange.

5.3.4 Value Engineering

SR-5 Bridges: There is a value engineering opportunity, as noted on the I-75 Bridge Matrix, to salvage the western 3 spans of each existing bridge and then constructing an 85 ft. plate girder (PG) span followed by a 145 ft. PG span. Steel will be used to match existing superstructure and accommodate the 145 ft. end span. This longer span is more cost effective than building an intermediate abutment.

Other Segment 3 Bridges: Both the Georgia NE RR Bridge and the Canton Rd. Bridge have an opportunity to be explored as noted on the I-75 Bridge Matrix, consisting of an option to salvage all of the existing bridges, except for the east ends. In the case of the RR bridge, the eastern 132 ft. is demolished and replaced by two (2) plate girder spans of 95 ft. and 40 ft. In the case of Canton Rd. bridge, the eastern 68 ft. is demolished and replaced by a 150 ft. plate girder span. However in both cases, the existing bridges must be jacked up between 0.5 and 1.0 ft. and staging may require temporary bridges.

One (1) other Segment 3 bridge that has a cost-savings opportunity to be explored as noted on the I-75 Bridge Matrix, involves the Barrett Parkway Bridge, which is shown as a widening (Category 2). However, the new alignment at this existing bridge location is actually at a slight skew to the existing alignment. As a result, salvaging the existing structure requires trimming trapezoidal shapes from the existing bridge structures. The existing structure also has approach slab spans. The option of replacing the Barrett Parkway Bridge verses widening will be investigated further.

Highways: See Section 2.2.5 of this report for a discussion of value engineering opportunities common to all highway segments.

In Segment 3, there are cost saving opportunities with the level of detail and ultimate final design of the rock slopes as discussed in the Section 5.3.3 Construction Risks.

5.4 SEGMENT 4

This section of the Constructability Report addresses the Segment 4 bridges and highway work. Segment 4 is approximately 6 miles long, starting at 670+00 and extending to the end of project on I-75. There are 3 proposed new Bridges and 6 existing Bridges in Segment 4. All except one (1) of the existing bridges must be replaced or widened. The Wade Green Rd. Bridge can remain as is. One (1) of these 6 existing bridges one (1) was chosen as a Cluster Bridge for which a preliminary design was completed.

Key Construction Elements

- **General:** The scope includes adding one (1) high occupancy vehicle (HOV) lane and two (2) truck-only lanes (TOL) in both the NB and SB directions on I-75. The various alternates are described in Section 5.2 Segment 2. In addition to the added lanes, there will be widened shoulders on mainline and wider shoulders with the added HOV and TOL lanes. This report will address constructability of Alternate 2 with Section 2.2.2 of this report addressing differences with Alternate 1. There are 3 proposed new bridges and 6 existing bridges in Segment 4. All except one (1) of the existing bridges must be replaced or widened. The Wade Green Rd. Bridge can remain as is. One (1) of these 6 existing bridges one (1) was chosen as a Cluster Bridge for which a conceptual design was completed. The Cluster Bridge for segment 4 is the Chastain Rd. Bridge. This section of the Constructability Report will address the Cluster Bridge in detail but also discuss constructability issues on the other Segment 4 bridges. The constructability issues are derived from the I-75 Bridge Matrix prepared and from field inspection and photos taken.
- **Chastain Rd. Bridge:** This section of the Constructability Report will address construction of the Chastain Rd. Bridge over I-75 in Segment 4. As shown on the bridge drawings, construction will take place in 3 stages. In order to stage the construction and maintain the same level of traffic capacity on Chastain Rd. (7-8 lanes), the centerline of Chastain Rd. will be permanently shifted 38’ to the north. The first stage, over 57 ft. wide, built to the north provides a surface for all westbound traffic during stage 2 (4 lanes). Completion of the 41 ft. stage 2 width allows all traffic (8 lanes) to be placed on completed stage 1 and 2 bridge structure during stage 3 construction which is the last 20 ft. wide section.
- **Other Segment 4 Bridges:** Of the four (4) other existing bridges requiring work, two (2) are other overhead (OE) bridges like Chastain Rd. Bridge and two (2) are mainline or underpass (UE) bridges. The two (2) overhead bridges are smaller than Chastain Rd. and can be replaced at the same grade as existing (Category 5). They are Shiloh Rd. Bridge and Hickory Grove Rd. Bridge. Both are existing steel beamed bridges that are to be replaced with shorter spanned concrete beam structures.

  The two (2) mainline bridges are the I-75 SB Bridge over Noonday Creek and the Frey Rd. Bridge. Both are widened with new structure with some edge work on the existing bridges (Category 2). For the Noonday Creek Bridge, the existing NB and SB bridges are widened and a new SB HOV structure is added. The Frey Rd. Bridge will have the median area filled in by widening the existing bridge with steel members. This will serve HOV and TOL traffic. New structures for mainline traffic are built on the outside with concrete beams.

  The 3 proposed bridges in Segment 4 consist of an HOV access bridge over I-75 NB for access to Town Center BRT station and two (2) TOL flyovers at the north end of the alignment so the TOL lanes can get to the outside.
- **Highway:** The existing highway in segment 4 starts at Station 670+00 (just north of Barrett Parkway) with 3 lanes in both the southbound (SB) and northbound (NB) directions. Heading northward, there are 3 existing lanes SB and 3 existing lanes NB to the end of the I-75 portion of the project. The major difference in this segment in comparison to the others is the widening occurs mainly in the median rather than the outside. For this reason the additional ROW required is significantly less than the preceding segments.

5.4.1 Access/Traffic/MOT/Staging and Sequencing

5.4.1.1 Bridges

Chastain Rd. Bridge: Presently on Chastain Rd. there are two (2) through lanes and one (1)/two (2) turn lanes in each direction, a total of seven (7) lanes. Through the use of a center median curb, the three (3) available turn lanes are channeled to provide two (2) to turn onto the ramp to I-75 at each end. During construction eight (8) total lanes will be maintained, two (2) through lanes and two (2) turn lanes in each direction. The temporary lanes will be 11 ft. in width. There will not be a median during Construction. The I-75 traffic passing below the bridge consists of three (3) lanes in each direction.

The first stage 1 construction activities will require off peak lane closures. This is in order to demolish the existing south sidewalk and the median to facilitate the traffic switch for Chastain Rd. traffic to the south. Soldier pile driving for the stage 1 temporary support of excavation (SOE) at each end of the existing bridge is required during off peak or nights. The SOE maintains the approach for traffic.

Demolishing the 20 ft. wide section of the existing bridge to facilitate stage 1 construction will require I-75 Traffic to be detoured. To demolish the two (2) easternmost spans and the east intermediate bent, northbound I-75 traffic can be sent up the Chastain Rd. off ramp, across Chastain Rd. and immediately back onto I-75 via the northbound on ramp. In a similar manner the western half of the 20 ft. wide section of the bridge can be accomplished by sending SB I-75 traffic up the off ramp and immediately back down the on ramp. To demolish the center pier, the fact that the existing median is approximately 40 ft. wide makes the job easier, but for safety reasons the left lane in each direction will probably be taken during off peak traffic hours. This sequence must be repeated for each of the 3 phases in order to demolish the existing bridge.

In a similar manner, during erection of new superstructure, for example, the setting of the AASHTO Type III PSC beams, northbound and southbound I-75 traffic will have to be sent up the ramps and back down, during nighttime traffic detours. Once again, this will be required for each of the 3 stages of bridge staging.

For foundation and substructure work, the new center pier falls in the middle of the existing wide median but the new intermediate pier between TOL SB and I-75 SB falls on the edge of the existing right lane of I-75 SB. As a result, this work will either be done at night with one (1) or two (2) lane takings or I-75 could be realigned temporarily more to the east for this work.

The bridge MOT for Chastain Rd. traffic, during each of the 3 stages, is designed to maintain existing traffic capacity. New approaches on both ends of the bridge, along the north side are required to support the start of stage 2 Construction. There is adequate room on each end of the bridge to accommodate traffic wanting to turn onto an I-75 on ramp. Other than the occasional off peak lane closures, the plan is to maintain 8 lanes of traffic on Chastain Rd. at all times.

Other Segment 4 Bridges: While Chastain Rd. has 7-8 lanes of traffic, the two (2) other overhead bridges to replace, Shiloh Rd. and Hickory Grove Rd., each only have 2 lanes plus shoulders. Wade Green Rd. has 5 lanes but fortunately it does not need to be replaced. Utilizing a permanent centerline shift, and because of the existing shoulder areas, Shiloh Rd. and Hickory Grove Rd. bridges may be completed in 2 stages, 3 maximum. Both existing bridges are 46 ft. wide and will be replaced with 47 ft. wide and 51 ft. wide bridges, respectively. The two (2) existing lanes of traffic on each roadway will be maintained during construction, likely with 11 ft. wide lanes and no shoulder/sidewalk.

For each overhead bridge, I-75 NB or I-75 SB will need to be closed during existing bridge demolition, new bridge beam setting, and other critical superstructure activities. Once a protective underdeck and edge protection is set, remaining activities can be completed with only possible lane closures.

For the Shiloh Rd. Bridge work, the I-75 detour would be Chastain Rd., George Busbee Parkway, and Wade Green Rd. For the Hickory Grove Rd. Bridge work, there does not appear to be a reasonably convenient detour since the next exit north of Hickory Grove Rd. is Cherokee Rd., about 1.5 miles north and the exit south of Hickory Grove Rd. is Wade Green Rd. over 2 miles south. For this reason it may be prudent to plan temporary detour crossovers on either side of the Hickory Grove Rd. crossing. The existing median is wide and relatively flat. The detour would only be used at night during non peak traffic volumes.

The foundation and substructure work for the Shiloh Rd. Bridge does not appear to have much impact on existing traffic due to the wide median and proposed piers located outside of the existing alignment. Only occasional lane takings are anticipated. A standard temporary barrier set up will be used to protect the workers as there is presently no guardrail or barrier along the grassy median. Construction vehicles entering and leaving the median work zone will need to do so in a safe manner with room to accelerate or de-accelerate. A single line of barriers and a temporary roadway can be used to facilitate this.

The new piers the Hickory Grove Rd. bridge have I-75 traffic issues. An HOV access ramp is planned as part of the new bridge structure and is to be built as an embankment enclosed by MSE walls. The new center pier for the Hickory Grove Bridge falls in the middle of the existing left travel lane of I-75 NB. The intermediate pier between SB TOL and SB mainline falls on the edge of the existing right travel lane of I-75 SB. Since the bridge must be built first, I-75 will have to be re-aligned at each of these locations so as to allow the new abutments to be built. This re-alignment will have to be in place until the first highway shift to the outside onto new highway.

The two (2) mainline bridges in Segment 4, the I-75 bridge over Noonday Creek and at Frey Rd., will be phased with the highway MOT plan. In these areas the highway MOT plan is to build the outside area first, traffic is then moved to the outside, work is performed on the inside median area, move traffic to the median area, and then tie in the two (2) areas.

The I-75 bridge over Frey Rd. (Sta. 795+00) will follow the highway MOT plan. Because of an existing clearance issue on the SB bridge over Frey Rd., the Frey Rd. road surface may have to be lowered 6”. The new SB structure built on the outside is a separate structure and can be built higher for acceptable clearance. Lowering Frey Rd. will have to be staged to allow traffic to be maintained and weekend shutdowns could be necessary.

During new beam setting and some other superstructure activities, Frey Rd. will have to be closed and detoured. Except for local traffic, Frey Rd. could be closed at Chastain Rd. and detoured to Busbee Dr. and George Busbee Parkway. Once a protective underdeck is set and edge protection is in place, the remaining activities can be done with only lane closings. Frey Rd. has two (2) lanes in each direction.

At the end of the alignment, there are two (2) TOL flyovers that move the truck lanes to the outside. The work on the foundations and substructure will be staged to minimize impact to existing traffic with piers near the existing alignment built after traffic is shifted to the outside in conformance with the Highway MOT plan. If possible, setting the beams for the superstructure will be staged with the traffic shift. If heavy lifts over travel lanes are required, I-75 NB or SB will be closed and traffic detoured. The I-75 detour would be similar to what is described above for Hickory Rd. Bridge work whereby temporary crossovers are built for the nighttime closures until the beams are set. Setting a protective underdeck and edge protection could be done in phases along the length with lane closures.

For the proposed HOV access Bridge across I-75 NB near the Town Center BRT Station, an I-75 NB closure will be required to set the bridge beams and for some of the superstructure work. The detour for the closure would be I-575 and Chastain Rd.

5.4.1.2 Highway

For purposes of developing a Staging/MOT Plan for Segment 4, the segment was subdivided into three (3) smaller subsegments, with the first continuing on from Segment 3, the second in the middle of the segment, and the third completing the north end of the project. What drove the delineations made were the different phasing efforts required to complete the work. The term, outside means west of existing SB and east of existing NB. Temporary barriers will be used extensively in each phase discussed to provide protection to the traveling public and to protect the workers. Temporary striping will be used in each phase to delineate travel lanes. Each of the three (3) subsegments will be discussed in order from south to north. The traffic shifts across adjoining subsegments will require detailed coordination and scheduling to ensure smooth traffic flow and consistent project progression.

The three (3) subsegments are discussed below, in order from south to north;

- **Station 670+00 to 735+00 (Typical Section – 670+00):** For this first sub-segment of about 1 ¼ miles, the new construction takes places mainly to the inside (median). See Staging Typical Section for Station 670, found in *Appendix G*.

  Phase 1 of the highway staging/MOT is to construct the NB and SB inside areas first, while the traveling public uses the existing 3 lanes. Once phase 1 is complete, traffic in both directions will be directed on to the newly built inside lanes, so the phase 2 work can commence on the outside of the section (3 ea. travel lanes and outside shoulder NB and SB). The work included in phase 3 is the construction of the permanent barriers and any required miscellaneous finishes. There is one (1) existing bridge within this sub-segment and one (1) proposed bridge. The existing bridge is the set of I-75 bridges over Noonday Creek, which are planned to be widened. Commensurate with the highway staging, the widening to the inside or median side will be completed first. The proposed bridge is the Town Center BRT station connector which spans over I-75 NB. The inside area pier can be built in phase 1 and the outside pier in phase 2.
- **Station 735+00 to 860+00 (Typical Section – 753+00 to 791+00 and 848+00):** For this sub-segment, two (2) separate cross sections best illustrate the traffic staging and construction. For Stations 753+00 to 791+00 (Chastain Road to Frye Road), the additional lanes are constructed to the inside and outside of the existing roadway and at Station 848+00 (Wade Green Road) the additional work is completed mainly in the interior of the section. However, both sections require coordination with bridge construction as existing substructure is located inside the new roadway limits. To differentiate the two (2), Station 753+00 to 791+00 will be discussed first and Station 848+00 second.
- For phase 1 of the (Sta. 753+00 to 791+00) portion, the existing travel lanes are utilized for the traveling public while work is built to the outside in both NB and SB. See Staging Typical Section for Station 753 to 791, found in *Appendix G*.

  Three (3) 12 ft. GPL, a 12 ft. outside shoulder, a portion of the GP inside shoulder, and outside permanent barrier wall may be constructed in this phase. In the NB direction, an existing pier for the Chastain Rd. bridge is located between the 2 proposed inside GP lanes, so overhead bridge work in this area must be completed prior to traffic switches to these lanes. During phase 2, traffic is shifted to the newly constructed outside lanes while the interior lanes and shoulders of the roadway are built. Temporary barrier wall, used in phase 1 to separate traffic from the work, is shifted toward centerline approximately 5 ft. to provide adequate distance across the section. Two (2) 12 ft. truck-only lanes, a 14 ft. shoulder outside of those lanes, a 12 ft. HOV lane, a 10‘ HOV shoulder, and a 4 ft. median shoulder are constructed in this phase in both directions. For phase 3, traffic will remain in its phase 2 location so that the remaining portion of the inside GP shoulder can be completed in both NB and SB directions. Phase 4 work, consisting of completion of permanent barrier, removal of temporary barrier and any required finishes, will be completed with traffic away from the work area.
- For phase 1 of the (Sta. 848+00) portion the existing travel lanes are utilized for the traveling public while work is built to the outside in both NB and SB. See Staging Typical Section for Station 848, found in *Appendix G*.

  The outside 12 ft. GPL, 12 ft. GP outside shoulder, and permanent barrier wall may be constructed in this phase. In the NB direction, an existing pier for the Shiloh Rd. Bridge is located in the outside half of the proposed GP shoulder, so overhead bridge work in this area must be completed prior to traffic switches to these lanes. During phase 2, traffic is remains on the existing lanes and newly constructed outside shoulder while the interior lanes and shoulders of the roadway are built. Temporary barrier wall, used in phase 1 to separate traffic from the work, is shifted toward centerline approximately 5’ to provide adequate distance across the section. Two (2) 12 ft. TOL, a 14 ft. shoulder outside of those lanes, a 12 ft. HOV lane, a 10 ft. HOV shoulder, and a 4 ft. median shoulder are constructed in this phase in both directions. For phase 3, traffic will shift on to the newly completed interior lanes the 2 inside GP lanes and inside 14ft. GP shoulder can be completed in both NB and SB directions. Phase 4 work, consisting of completion of permanent barrier, removal of temporary barrier, and any required finishes, will be completed with traffic away from the work area. Besides the two (2) existing overhead bridges just mentioned, bridges at Chastain Rd. and Shiloh Rd., requiring construction before any traffic staging shifts, there is one (1) other existing bridge requiring work, the I-75 Bridge over Frey Rd. This is a mainline bridge which can be built outside areas first to be consistent with the highway MOT staging described herein. The Wade Green Bridge at the northern end of this sub-segment can remain as is.

Since the highway MOT staging in this sub-segment was similar to the previous sub-segment in segment 4, there are no issues with the transition.

- **Station 860+00 to 975+00 (Typical Section – 879+00 to 881+00):** For this sub-segment, the NB and SB lanes are separated by a distance of up to 290 FT. Embankments, in excess of 20 ft. in height, are required in the median to construct the proposed roadway section. There also is a centerline shift to the east of approximately 30' in the vicinity of Hickory Grove Rd. where HOV access ramps up to Hickory Grove Rd. are planned. See Staging Typical Section for Station 879 to 881, found in *Appendix G*.

  Phase 1 of the Highway Staging / MOT is to construct the NB and SB inside areas first, while the traveling public uses the existing 3 lanes. This work will consist of the embankment and roadway construction. Once phase 1 is complete, traffic in both directions will be directed on to the newly built inside lanes, so the phase 2 work can commence on the outside of the section (3 ea. travel lanes and outside shoulder NB and SB). The work included in phase 3 is the construction of the permanent barriers and any required miscellaneous finishes. There is one (1) existing bridge and two (2) proposed bridges within this sub-segment. The existing bridge is an overhead bridge at Hickory Grove Rd. requiring replacement. There is also a 30 FT centerline shift to the east and HOV access ramps at this location. Because of the wider alignment and existing pier conflict with the proposed GP lanes, the Hickory Grove Rd. Bridge must be built first. During bridge reconstruction both the I-75 NB and SB lanes must be slightly shifted east for pier construction caused by the centerline shift. For phase 1 of the Highway MOT described above, at Hickory Grove Rd. the SB side can be worked as described but the NB cannot. During phase 2 both NB and SB outside areas can be worked. Once traffic is shifted to the outside, then and only then can the NB inside area be worked. At this same time the HOV ramps up to Hickory Grove Rd. can be built. So there is an added phase for NB in the vicinity of Hickory Grove Rd. North of Hickory Grove Rd. are two (2) proposed TOL ramps that sweep to the outside for merging with existing traffic. Construction of these flyover ramps can be coordinated with the highway MOT staged work to mitigate heavy lifts over travel lanes requiring a closure.

5.4.2 Construction Methods

5.4.2.1 Bridges

Chastain Rd. Bridge: The demolition for stage 2 Construction requires 3 existing intermediate piers to be saw cut next to the column support with the column portion retained for support. However, very little traffic load will be imposed on these columns, as it is mostly the deck beyond the temporary edge barrier.

Each end of the bridge must be excavated out in stages to accommodate the new abutment locations. The temporary shoring indicated on the bridge drawings is intended to be soldier pile and lagging with added soil nails for any deeper cuts. The temporary shoring allows the adjacent approach to be maintained for traffic. MSE walls will be used at the abutments. This requires cutting the slope back further for the MSE straps. The MSE wall will be backfilled after pile driving for the abutment foundations. The end abutments can then be placed. This cycle is repeated at the beginning of each stage. Slip joints in the MSE wall will be used at the vertical line between stages.

The beams for the new superstructure are AASHTO type III PSC beams. At 583 lbs per ft., the lifts for the beams will all be in the 21 – 25 ton range. Because the 85 ft. maximum length is not excessive, a lifting frame/bar could be used to apply the loads at the ends. A medium sized truck crane like the Grove GMK 5275 could safely lift each beam at a maximum 70 ft. radius. By setting up on I-75 just north of the bridge and loading the counterweights, the beams could then be offloaded directly from a trailer parked on I-75 and set into place. The I-75 detours described above would be necessary for the two (2) interior spans at a minimum. Once a protective deck is attached to the lower flange of the type III beams, and adequate fall protection and other safety measures are in place, work could continue on the stay in place forms, deck rebar, and deck concrete. Work along the edges must be done at night with coordinated lane takings.

The bridge drawings indicate a construction option to put in an additional row of temporary shoring should it be decided to retain the use of the remaining portion of the existing bridge during stage 3 construction. The temporary shoring allows the approaches to be maintained.

Other Segment 4 Bridges: While each of the two (2) overhead bridges, Shiloh Rd. and Hickory Grove Rd., are only two (2) lane bridges, they both will have to be staged similar to Chastain Rd. The Shiloh Rd. Bridge will have new piers in the median and on the existing shoulders of I-75. Standard methods can be used to drive the piles and construct the substructure on day shift within work zones. The beams are PSC Type III's, 90 ft. long, each weighing 26 tons. Since the beams are more easily delivered via the highway, the crane used should be a truck crane brought in for these picks. If a lifting frame is used to put the load on the ends of the prestressed beams, a single truck crane like the Grove GMK 5275 or equal could handle this at a maximum radius of 75 ft. The outside spans are outside the existing alignment and could be handled by a medium size work zone crawler crane if available.

As mentioned earlier, the Hickory Rd. Bridge has an HOV access ramp rising up to it on the south side. It is supported by MSE walls which can either be run to the north past the bridge or end in a bulkhead to contain the ramp fill. This is different than other OE bridges with HOV access such as Dupree Rd. over I-575 which uses the ramp as an end bent. Once I-75 is shifted slightly to allow access to the center pier and west bent and the demolition of the northern half of the bridge is done, work on the foundations and substructure can commence. The centerline shift is about 9 ft. and may allow the bridge to be completed in 2 stages if shoulders are not required on the Hickory Grove roadway during construction.

The Hickory Grove Bridge will use a longer span of 120 ft. over existing I-75 travel lanes. For the beam picks, the 120 ft. long AASHTO BT 72's each weigh 48 tons. The length is too long for a single pick so a dual pick is planned. Using the conservative 10 percent plus 50 percent rule previously discussed yields 39 tons each. This could possibly be reduced to 32 tons each with calculations. If the trailers with the beams are driven into position first and then the truck cranes are positioned and loaded with counterweights, a 70 ft. radius would work for a pair of Grove GMK 5275's or equal. If a work zone crawler is used, since much of the beam is outside of the existing alignment, then positioning the trailer is easier. After bridge completion and the I-75 traffic is shifted to the outside, the MSE walls for the HOV ramp structure up to Hickory Grove Rd. can be constructed.

The mainline bridge over Noonday Creek is widened with new three (3) structures and a slight widening of the I-75 SB bridge by using WF beams. The new SB structure uses the same 80 ft. spans and is built with AASHTO type III beams. There is a separate SB HOV structure with 120 ft. spans using AASHTO BT 72's. The NB is widened with a separate structure similar to SB, 80 ft. spans and type III beams. The heaviest lift here is the same as the Hickory Grove Rd. Bridge. If a 70 ft. radius can be made to work by positioning truck cranes on the existing SB bridge with room to bring in the trailer, then a pair of medium truck cranes like the Grove GMK 5275 or equal will work. If a longer radius is needed larger truck cranes are required. Work zone crawler cranes may also be available since the median area will be a work zone when the SB HOV is built.

For the TOL flyovers at the northern end of the alignment, each use 160 ft. spans, including the sections over the existing I-75 SB and NB. Taking the span of 160 ft., and using 400 lbs. per ft. as indicated on the I-75 Bridge matrix, yields a 32 ton pick. Because of the length, a double pick is required. Following the same approach as the I-575 to I-75 SB ramps described in segment 3, a medium truck crane like the Grove GMK 5275 or equal and a work zone 200 ton class crawler crane could set these beams. Also if the sequence allows setting certain spans before and others after the I-75 traffic switch as mentioned above, bringing in a Truck crane could be avoided.

The proposed HOV access bridge to the Town Center BRT Station calls for a 115 ft. span using AASHTO BT 63's. Each would weigh 43 tons and require a dual pick. Following the same approach as the I-575 to I-75 SB ramps described in Segment 3, yields a 36 ton load, possibly reduced to 28 tons each. Since there is no existing bridge affecting the room to maneuver, it is expected that two (2) medium sized Truck cranes like the Grove GMK 5275 or equal can make this lift even at a tight radius of 65'.

5.4.2.2 Highway

See Section 2.2.3 of this report for a discussion of highway construction methods common to all bridge and highway segments.

For concrete deliveries in Segment 4, it is anticipated that the majority of concrete would be batched at the proposed Batch Plant to be located at Wade Green Rd., the present site of the Archer Western Plant. This is centrally located within this segment.

Some of the quantities for Segment 4 reflect the fact there is more room in this section of I-75. While having a large amount of embankment, only second to segment 2, segment 4 only has half as much MSE wall as the average segment. In a similar manner, segment 4 has almost a million cubic yards of excavation but very little soil nailing. So laybacks and slopes are more prevalent in this segment.

5.4.3 Construction Risks

See Section 2.2.4 of this report for a discussion of construction risks common to all bridge and highway segments.

Chastain Rd.: There are utility lines supported under the existing Chastain Rd. Bridge. Preliminary indications are a water line, a gas line, and telephone lines. The gas line appears to be on the northern edge of the existing Chastain Rd. Bridge and will have to be moved twice since the northern section is demolished in stage 1 when there is no new structure to support the gas line from.

Other Segment 4 Bridges: There are additional utility risks associated with the other Segment 4 bridges. The existing Shiloh Rd. Bridge has water, telephone, and a gas line suspended from the bridge. Utility information is not yet confirmed for the existing Hickory Grove Rd. Bridge.

The I-75 bridge over Shiloh Rd. has overhead electric lines on each side of the existing bridges which will need to be relocated for the widening. There is also a possible clearance issue at Shiloh Rd. which may result in lowering of Shiloh Rd. putting existing utilities, gas, electric, cable, and sanitary at risk for relocation.

Highway: While most of the identified to date utility work is associated with the segment 4 bridges, there are additional electric, gas, and water lines that may need to be relocated after location verification. In addition, there are highway lighting systems in the median and ATMS system in the existing shoulder area that will need to be kept in service by temporary systems.

For subsurface risk, the potential for encountering rock is believed to be greater in this segment.

5.4.4 Value Engineering

Chastain Rd. Bridge: An alternate approach would be to salvage the two (2) 100 ft. spans that are over the existing I-75 NB and SB traffic. While 100 ft. is wider than the 73 ft. and 85 ft. spans required for the new alignment HOV and TOL, the additional width could be used for median, additional shoulder or police/emergency vehicle holding stations. This alternative requires the use of a temporary bridge since the centerline of Chastain Road is not being shifted north as in the Alternative discussed in this report. Additional right of way would also have to be considered.

Other Segment 4 Bridges: One (1) additional option is presently known for the other Segment 3 Bridges. It is for the I-75 bridge over Frey Rd. concerns the elevation of the new SB bridge section. If Frey Rd. is lowered sufficiently the new section will not have to be at a higher elevation. As it is, Frey

Rd. will have to be lowered about 6" to obtain 16.5 ft. clearance under existing SB bridge, which is being widened.

The Hickory Grove Rd. Bridge with HOV access ramps was reviewed to see if it could be built similar to the I-575 Dupree Rd. design with abutments on the MSE wall structure. However, due to the I-75 centerline shift, it cannot be made to work with the planned staging.

Highway: See Section 2.2.5 of this report for a discussion of value engineering to all highway segments.

One (1) opportunity for Segment 4 is potential reuse of the concrete pavement planned to be installed near term. This is a current GDOT contract with Archer Western. There is a potential for considerable cost savings. The issues affecting such a decision will be variable shoulder widths, pavement joint locations, and additional engineering.

5.5 SEGMENT 5

The existing highway in Segment 5 (55,662 lf) starts at Station 80+00 with 2 lanes in both the southbound (SB) and northbound (NB) directions. Two (2) existing lanes in each direction continue through the entire segment, with an additional 3rd lane existing between Towne Lake Parkway and SR 92 in both directions. The scope of the NWC Project in Segment 5 includes adding one (1) high occupancy vehicle (HOV) lane in both the NB and SB directions on I-575. This segment does not contain an Alternate 1 and Alternative 2 alignment options like the I-75 portion of the NWC Project. The proposed Truck only lanes (TOL) from I-75 land and end just south of the Barrett Parkway on I-575. The proposed HOV lanes for I-575 will have a 4 ft. shoulder on the inside and a 10 ft. shoulder on the outside. The shoulders on the two (2) existing mainline travel lanes are increased to 14 ft. shoulders on both sides. This results in an overall cross section of paved surface being increased from approximately 39' existing in each direction to approximately 79 ft. in each direction.

Of the 15 existing bridges in segment 5, one-third or 5, can accommodate this widened alignment with no work done to them. These 5 are overhead bridges (OEs) over I-575 which have a wide enough span and a center pier which does not interfere with the proposed work. The 5 bridges which can remain, as is, are Chastain Rd., Booth Rd., SR-92, Rope Mill Rd., and Sixes Rd. They are given a construction category 1 in Appendix *A, NWC Bridges—Reworking Existing and Proposed*. The bridge categories are explained in Section 2.2.2 of this report.

There is a second group of 5 bridges on I-575 which only need to be widened to the outside and to the inside over the existing median. These are underpass (Use's) or mainline bridges where I-575 passes over the cross road. On these existing structures there is only minor edge work to tie in the new bridge structure, particularly the new deck to the existing deck. The 5 bridges on I-575 which are widened only are Barrett Parkway, Noonday Creek – South, Noonday Creek- North, Town Lake Parkway, and Little River. They are given a construction category 2 in *Appendix A*.

This leaves (5) I-575 Bridges which need substantial work. Essentially they are to be replaced. Moving from south to north, the first 3 are all Mainline Bridges (UEs) over cross roads. They are Big Shanty Rd., Bells Ferry, and Hawkins Store Rd. They are given a construction category 2A in *Appendix A*. The next 2 are overpass bridges (OEs). They are Shallowford Rd. and Dupree Rd. They are given a construction category 5 in *Appendix A*.

For purposes of discussion, the bridge portions of this section of the Report, Sections 5.5.1.1 and 5.5.2.1, will utilize the following groupings;

- Widening I-575 Bridges – Category 2
  - Barrett Parkway
  - Noonday Creek—South
  - Noonday Creek—North
  - Town Lake Parkway
  - Little River

- Mainline I-575 Bridges Replaced—Category 2A
  - Big Shanty Rd.
  - Bells Ferry Rd.
  - Hawkins Store Rd.
- Overpass Bridges Replaced--- Category 5
  - Shallowford Rd.
  - Dupree Rd.

5.5.1 Access/Traffic/MOT/Staging and Sequencing

5.5.5.1 Bridges

Widening Bridges: Since 3 of the 5 bridges in this category are over rivers or creeks, discussion of MOT on cross roads will focus on Barrett Parkway and Town Lake Parkway. Of the two (2), Barrett Parkway is a more traveled route with 3 lanes in each direction with an additional alternating turn lane in the center just outside the ft.print of the bridge. As a result, 7 lanes are needed to maintain existing capacity during the various stages of construction on Barrett Parkway. Town Lake Parkway has 4 lanes total. Furthermore, the I-575 Bridge over Town Lake Parkway does not have a center pier, but instead spans across both travel directions of Town Lake Parkway. Consequently, Barrett Parkway will be used for discussion purposes of the widening bridges.

To construct the new portion of the center pier along the centerline of Barrett Parkway, it is recommended to shift both eastbound and westbound parkway traffic to the outside by moving/narrowing sidewalk or eliminating sidewalk as well as narrowing travel lanes to 11 ft. This will result in a center work zone of about 12 ft. in width. The work zone will be set up with temporary barriers and temporary attenuators and be used to construct the new pile foundations, ft.ings, columns, and pier caps at each of the 3 required locations. This should be done after the outside intermediate piers, the ones away from the parkway on either side, are constructed. Then, after the center piers are completed, traffic can be restored to the pre-construction alignment for the superstructure work. While the Barrett Parkway Bridge is planned in 2 stages, outside work first, then inside (I-575 median area) work next, it is prudent to get all the substructure work done at the same time with only two (2) traffic shifts on Barrett Parkway.

For setting new bridge beams and installation of protective under decking over Barrett Parkway, all traffic under that span must be detoured. For these closures, traffic can be detoured using Chastain Meadows Parkway, Big Shanty Rd. and George Busbee Parkway. Presently 30 ft. piles are assumed for the new center pier. This operation, given that length of pile, will also require a detour of all Barrett Parkway traffic.

Regarding I-575 Traffic, these 5 Category 2 Bridges are staged to be in line with the general staging of I-575 work. See the next section, Section 5.5.1.2 of this report, for the I-575 Highway MOT plan.

Mainline I-575 Bridges Replaced: Of the 3 bridges in this category, Hawkins Store Rd. is the most straightforward. There are only 2 lanes of traffic on Hawkins Store Rd. The existing 185 ft. single span is being replaced by 117 ft. single spans. The abutments are behind vertical MSE walls replacing the existing slopes. With only two (2) lanes of traffic, all substructure work can take place off the roadway. However for demolition work, setting new bridge beams and some other superstructure work, Hawkins Store Rd. will be shut down and traffic diverted using Kings Crossing Rd., Shallowford Rd., and Bells Ferry Rd. These closures would be limited to nighttime or possibly a weekend for the demolition of the existing post tensioned box structure. This demolition must be done in steps for structural safety reasons.

Big Shanty Rd. is similar in that there are only two (2) lanes of traffic and the proposed design is single span replacing single span. Big Shanty is also an HOV access location. Long MSE retaining walls are planned to allow HOV traffic to come up and down ramps from Big Shanty Rd. to access elevated I-575. Also the Big Shanty Rd. bridge has a trapezoidal ft.print to accommodate Bus turns with the ends of abutments closer to the existing roadway. It is still anticipated that the majority of work can be executed without road / lane closures on Big Shanty Rd. The exceptions are similar to

Hawkins Store Rd., that is demolition (also a post tensioned box), new beam setting, and some superstructure work. The detour for Big Shanty Rd. would be Chastain Meadows Parkway, Chastain Rd. and George Busbee Parkway.

The most challenging of the three (3) is Bells Ferry Rd. with 5 lanes of traffic to maintain. There is an existing center pier but the proposed new bridge will span 130 ft. without a center pier. End abutments will be behind vertical MSE walls. This allows the substructure work to be done off roadway. Setting the new beams at night will require closure and detour of Bells Ferry Rd. but the demolition work including the large center abutments will have more of an impact to traffic. Bells Ferry is also a post tensioned concrete box which must be demolished in a staged procedure. Web by web is removed with shoring towers providing temporary support. This may require an extended closure such as a weekend closure. The detour for Bells Ferry Rd. is North Booth Rd. and Shiloh Rd.

Regarding I-575 traffic, only one (1) of these Category 2A bridges (total replacement of a mainline bridge) are staged to be in line with the general staging of I-575 work. stage 1 is constructing new a bridge to the outside, shifting the I-575 traffic, and then stage 2 is working the inside. Two (2) of these three (3), Bells Ferry Rd. and Hawkins Store Rd. are anomalies in that they are the only two (2) I-575 bridges that differ in staging sequence. They must be constructed with the inside work done first, then the outside work. There is simply not enough room to shift traffic off of the old bridge onto the new outside work. There is enough room on the inside. Fortunately these two (2) bridges are next to each other and can be phased together. I-575 staging will require crossovers for this one (1) area, approximately a mile in length. See the next section, Section 5.5.1.2 of this report.

Overpass Bridges Replaced: Shallowford Rd. and Dupree Rd. are similar in that they are both two (2) lane overpass bridges with proposed HOV access requiring bridge replacement. The bridge drawings show a two (2) staged approach for maintaining two (2) lanes of cross road traffic. In the case of Shallowford Rd., new bridge structure is built to the south and takes the traffic while stage 2 is built. This results in a permanent 6 ft. shift of Shallowford Rd. centerline to the south. Dupree Rd. also builds to the south in stage 1, also has two (2) stages, but does not result in a permanent centerline shift. During all stages of construction, the two (2) lanes of cross road traffic is maintained.

Regarding I-575 traffic, to support the stage 1 completion at each location, MSE retaining walls must be built close to the existing I-575 travel lanes. These walls will allow HOV ramps from I-575 access to each of the elevated cross roads. However, to allow cross road traffic to be placed on stage 1 construction, these walls and enclosed fill must be in place. To work on these MSE walls, existing I-575 traffic will have to be shifted to the outside, possibly a lane width. See Section 5.5.1.2 below for a discussion on how the bridge work is coordinated with the highway MOT staging.

The critical overhead work on these two (2) bridges will require I-575 detours, at least one (1) direction at a time. This includes demolition work, setting new beams, and some other superstructure work. Unfortunately, there are no on/off ramps at these locations to allow for built in detours. For Shallowford Rd. it is recommended to seek approval for crossovers to allow for NB traffic to detour over to SB side during these overhead operations, performed during nighttime, non peak hours. For Dupree Rd. there are existing I-575 off/on ramps at SR-5, just south of Dupree Rd. and Town Lake Parkway, just north of Dupree Rd. The detoured traffic could use Canton Highway to travel to the next exit to get back on to I-575.

5.5.1.2 Highway

For purposes of developing a feasible staging/MOT Plan for Segment 5, it was sub-divided into 8 smaller subsegments, with the first tying in at Station 80+00 (from segment 3) and the eighth completing the work on I-575. What determined the delineations was whether or not the sub-segment contained HOV entrance and exits or was in a non-typical bridge phasing area (two (2) bridges need to be widened to the inside first instead of the typical outside). This results in three (3) basic types of staging for Segment 5. The subsegments without HOV access and without non-typical bridges are referred to as the standard Segment 5 highway MOT staging. The first sub-segment described is an example of this. Subsequent subsegments which follow this will refer back to the standard Segment 5 highway MOT staging described in the first sub-segment but the details will not be repeated.

The second type is occurs where there is a proposed set of HOV access ramps in the median. The second sub-segment described is an example of this. Subsequent subsegments which follow this will refer back to the HOV Ramp Segment 5 highway MOT staging described in the second sub-segment but the details will not be repeated.

The third type is unique and occurs in one (1) sub-segment only where there are two (2) existing bridges needing replacement that must be built on the inside first. This is the sub-segment from Station 205+00 to 440+00.

Temporary barriers will be used extensively in each phase discussed to provide protection to the traveling public and to protect the workers. Unlike most of the I-75 work, no significant additional right-of-way is required to accommodate the widened alignment. Temporary striping will be used in each phase to delineate travel lanes. The traffic transfer across different and adjoining subsegments will require careful coordination and scheduling to mitigate crossovers or large shifts in the east / west direction.

Each of the eight (8) subsegments will be discussed in order from south to north. Note that traffic switches and construction for each phase of this sub-segment will occur in both NB and SB simultaneously when discussed.

- **Station 80+00 to 118+00 (Typical Section I-575: I-75 to Sixes Road):** This sub-segment requires 5 phases to complete. The detailed description contained herein is an example of the Standard Segment 5 highway MOT staging and shall be referred to in four (4) subsequent subsegments but will not be repeated in each.

  Phase 1 of this sub-segment includes the placement of temporary barrier along the outside of the existing shoulders approximately 3 ft. from the edge line, which will shield construction activities from traffic. Next, the grading work and new 12 ft. outside shoulder construction will take place and finishes such as slopes, outside retaining walls and guardrail will be completed in the phase. In phase 2, the temporary barrier used in phase 1 are removed and the existing 10 ft. shoulder adjacent to the newly constructed shoulders is removed .This removal and replacement with a temporary pavement section (7"of asphalt over 10" of GAB) is then completed, placed under single lane closures, from the outer edge of the existing pavement to the new 12 ft. shoulder so that the section may be later used to carry traffic. During phase 3, traffic is shifted to the outside to the temporary and newly constructed pavement from phase 2. Temporary barrier is placed along the inside to delineate the interior lanes approximately 41' from centerline. Once the barrier is installed, the interior lanes and shoulders are constructed out from centerline approximately 37 ft. This work would include the building of the median barrier, the 4 ft. and 10 ft. HOV shoulders, a 12 ft. HOV lane, the first stage of the barrier wall and 7 ft. of the 14 ft. wide general purpose lane shoulder. For phase 4, traffic is redirected to the newly constructed HOV lane and shoulders that are temporarily striped to accommodate two (2) 12 ft. lanes of traffic and the temporary barrier is reset approximately 32' from centerline. Next, the two (2) each 12 ft. general purpose lanes and remaining 7ft. of the GP shoulder are completed to finish the roadway work in the sub-segment. Phase 5 work includes final pavement markings, signage, barrier completion, and other finishes to complete the sub-segment. The Barrett Parkway Bridge within this sub-segment is a bridge widening that can be staged to be consistent with the staging described herein.

- **Station 118+00 to 160+00 (Typical Section With HOV Ramp I-575: I-75 to Sixes Road):** This sub-segment requires 5 phases to complete and contains HOV exit / entrance ramps. The detailed description contained herein is an example of the HOV ramp Segment 5 highway MOT staging and shall be referred to in two (2) subsequent subsegments but will not be repeated in each.

  Phase 1 of this sub-segment includes the placement of temporary barrier along the existing outside shoulders approximately 10 ft. from the edge line, which will shield construction activities from traffic. Next, any required grading work, including construction of outside retaining walls will take place. Next the construction of new 12' outside shoulder and the two (2) each 12 ft. general purposes lanes will take place. Finishes such as slopes and guardrail will complete the phase. In phase 2, traffic is shifted onto the newly constructed general purpose lanes. The temporary barrier used in phase 1 is relocated from approximately 67 ft. to 71 ft. from centerline. The median work consisting of the HOV lane and shoulders and 7 ft. of the 14 general purpose lane shoulders is built out from approximately 33 ft. to 70 ft. from centerline while the traveling public operates on the newly built outside lanes. Additionally, work available on the HOV ramps will be started including early wall staging and embankments(completion of this work will extend through stage 5) During phase 3, temporary barrier is shifted to approximately 64 ft. from centerline ,and the remaining 7 ft. portion of 14 ft. shoulder, that was inaccessible due to prior phasing, is completed. Traffic during this phase will utilize the inside HOV lane and HOV shoulders temporarily striped to accommodate two (2) 12 ft. lanes of traffic. For phase 4, traffic is redirected to the completed general purpose lanes while permanent barrier wall and other finish work are completed. The temporary barrier is shifted out to approximately 70' from centerline. Phase 5 work consists of the construction of the median HOV access lanes and shoulders and MSE walls required for these lanes. The two (2) bridges within this sub-segment are the bridges at Noonday Creek south and Big Shanty Rd. Both are mainline bridges and can be staged consistent with the highway staging described herein. The HOV access ramps mentioned provide access down to Big Shanty Rd.

- **Station 160+00 to 205+00 (Typical Section I-575: I-75 to Sixes Road):** This sub-segment requires 5 phases to complete.

  The five (5) phase highway MOT staging for this sub-segment is identical to what is described in the first sub-segment, following the standard Segment 5 highway MOT staging. The Chastain Rd. Bridge is the only existing bridge within this sub-segment and does not need any work and can remain as is.

- **Station 205+00 to 440+00 (Typical Section I-575: I-75 to Sixes Road):** This sub-segment requires 5 phases to complete. This is the sub-segment with unique staging due to the two (2) non standard bridges within the sub-segment.

  The three (3) existing bridges within this sub-segment are the bridge at Booth Rd., I-575 bridge over Bells Ferry Rd., and I-575 bridge over Hawkins Store Rd. The Booth Rd. bridge does not require any work so it can remain as is. However both the Bells Ferry Rd. bridge and the Hawkins Rd. bridge are full replacements of mainline bridges. They are both presently designed to be built from the inside or median side first. This is unique in the I-575 corridor, all other mainline bridges requiring rework are planned to be built from the outside first.

  Phase 1 of this sub-segment includes the placement of temporary barrier along the outside of the existing shoulders, approximately 3 ft. from the edge line, which will shield construction activities from traffic. Next, the grading work and new 12 ft. outside shoulder construction will take place and finishes such as slopes, outside retaining walls and guardrail will be completed. During this phase, the inside or median side work on the Bells Ferry Rd. and Hawkins Store Rd. Bridges can commence. The traffic leading up to each bridge is being shifted to the inside and at each bridge it is shifted to the outside to accommodate the bridge work on the inside. So a transition at each bridge approach is needed to allow these activities to proceed concurrently. In phase 2, the temporary barriers used in phase 1 are removed and the existing 10 ft. shoulder adjacent to the newly constructed shoulders is removed. This removal and replacement with a temporary pavement section (7"of asphalt over 10" of GAB) is then completed, placed under single lane closures, from the outer edge of the existing pavement to the new 12 ft. shoulder so that the section may be later used to carry traffic. Meanwhile at the two (2) bridges, work continues on the inside or median side, constructing new bridge spans over the cross roads. During phase 3, traffic is shifted to the outside to the temporary and newly constructed pavement from phase 2. Temporary barrier is placed along the inside to delineate the interior lanes approximately 41 ft. from centerline. Once the barrier is installed, the interior lanes and shoulders are constructed out from centerline approximately 37 ft. This work would include the building of the median barrier, the 4 ft. and 10 ft. HOV shoulders, a 12 ft. HOV lane, the first stage of the barrier wall and 7 ft. of the 14' wide general purpose lane shoulder. Also during this phase, the inside work at the Bells Ferry Rd. and Hawkins Store Rd. bridges is completed. During phase 3, traffic approaching each bridge must still transition but now the traffic is coming from the outside. For phase 4, traffic is redirected to the newly constructed HOV lane and shoulders that are temporarily striped to accommodate two (2) 12 ft. lanes of traffic and the temporary barrier is reset approximately 32 ft. from centerline. Next, the two (2) each 12 ft. GPL and remaining 7 ft. of the GP shoulder are completed to finish the roadway work in the sub-segment. During this phase, the bridge on the inside has been completed in the previous phase so traffic is placed on the inside across each bridge. Traffic on the highway section and the bridges is now consistent. Phase 5 work includes final pavement markings, signage, barrier completion, and other finishes to complete the sub-segment. Part of phase 5 is striping and finishing one (1) side and then shifting traffic to stripe and finish the other side.

It will be important to coordinate and complete bridge and highway work in phase 3 in this sub-segment so as to not delay the start of phase 4.

- **Station 440+00 to 472+00 (Typical Section With HOV Ramp I-575: I-75 to Sixes Road):** This sub-segment requires 5 phases to complete and does contain HOV exit/entrance ramps. The five (5) phase highway MOT staging for this sub-segment is identical to what is described in the second sub-segment, following the HOV ramp segment 5 Highway MOT staging.

  Phase 5 work includes completion of the construction of the elevated median HOV access lanes at Shallowford Rd. and shoulders and MSE walls required for these lanes. The only existing bridge within this sub-segment is the overhead bridge at Shallowford Rd. which requires full replacement. The existing spans and pier location of the existing bridge can accommodate the staging described herein. However, in order to put Shallowford Rd. traffic on the stage 1 bridge staging portion of the Shallowford Rd. bridge, the elevated HOV access ramps, at least in the area of Shallowford Rd., must be built and in-place. The HOV embankment ramps form the center span for cross road traffic on Shallowford Rd. Since the existing piers do not interfere with the new alignment, the Shallowford Rd. Bridge work does not need to be done first. If it is delayed though, the existing east abutment will need some work and the existing slope will need to be reworked into a vertical wall end abutment by installing tiebacks.

- **Station 472+00 to 547+00 (Typical Section I-575: I-75 to Sixes Road):** This sub-segment requires 5 phases to complete. The five (5) phase highway MOT staging for this sub-segment is identical to what is described in the first sub-segment, following the standard segment 5 highway MOT staging.

  The only existing bridge within this sub-segment is the bridge at SR-92. This bridge does not require work and can remain as is.

- **Station 547+00 to 586+00 (Typical Section With HOV Ramp I-575: I-75 to Sixes Road):** This sub-segment requires 5 phases to complete and does contain HOV access ramps up to Dupree Rd. The five (5) phase highway MOT staging for this sub-segment is identical to what is described in the second sub-segment, following the HOV ramp segment 5 highway MOT staging.

  There are three (3) existing bridges within this sub-segment. Two (2) of them are mainline bridges, I-575 bridges over Noonday Creek north and Town Lake Parkway, both are bridge widenings and can be staged consistent with the highway staging described herein. The third is the overhead bridge at Dupree Rd. which is very similar to the Shallowford Rd. bridge described previously. Both are full replacements and have elevated HOV access ramps which form the center spans for cross road traffic so construction of the HOV ramps, at least the portion at Dupree Rd. must be complete for Dupree Rd. traffic to be placed on a new bridge section. Fortunately, as is the case with Shallowford Rd., the existing center pier and end abutments do not interfere with the proposed work. So, unlike the I-75 overhead bridges, they do not have to be built first, and in fact could be built at the same time and could even be completed after the new I-575 alignment is put into service.

- **Station 586+00 to 759+00 (Typical Section I-575: I-75 to Sixes Road):** This sub-segment requires 5 phases to complete. The five (5) phase highway MOT staging for this sub-segment is identical to what is described in the first sub-segment, following the standard segment 5 highway MOT staging.

  There are three (3) existing bridges within this sub-segment, the bridges at Rope Mill Rd., Little River, and Sixes Rd. The bridges at Rope Mill Rd. and Sixes Rd. are overhead bridges which do not require work and can remain as is. The bridge at Little River is a mainline bridge which is to be widened and can be done consistent with the staging described herein.

5.5.2 Construction Methods

5.5.2.1 Bridges

The work on I-575 bridges, as described utilizes MSE walls for vertical abutment walls and side walls as well as to provide support for HOV access ramps at Big Shanty (UE), Shallowford Rd. (OE), and Dupree Rd. (OE).

Foundation elements are proposed as driven steel piles up to 30 ft. long for intermediate bents and up to 60 ft. long for end bents. Traffic within the fall zone of the piles will be detoured or shifted away from the work.

Cast in place ft.ings, columns, and pier caps provide the substructure for setting support beams. Regarding bridge support beams, one (1) bridge, Barrett Parkway, is using prestressed concrete (PSC) box beams to match existing bridge structure in a widening operation. Big Shanty Rd. calls for 72” steel plate girders to achieve a span up to 185 ft. in length. Three (3) bridges, Noonday Creek—South, Town Lake Parkway, and Noonday Creek—North call for PSC Type III beams. The remainder of the 10 bridges requiring work call for AASHTO bulb tees, either BT 54’s, BT 63’s, or BT 72’s as supporting members.

The 3 locations with the heaviest lifts for setting new beams are Big Shanty (60 tons), Dupree Rd. (54 tons), and Bells Ferry Rd. (48 tons).

For Big Shanty the plate girders are up to 185 ft. long in stage 2, requiring two (2) cranes. Using 10 percent for rigging and a conservative 50 percent safety factor for a double pick yields 49 tons per crane. Detailed calculations may yield a smaller value but this lift will require the largest truck cranes or 300 ton class crawlers. They could be walked down the HOV ramp, one (1) on each side and pick the beams from trailers driven on completed stage 1 on I-575. The reach required is in the 90 ft. range.

The Dupree Rd. bridge has BT 72’s up to 136 ft. long, also requiring a double pick. This can be done from below on the closed I-575. Using the same conservative approach the 54 tons yields 44 tons for each crane. Mid-range to heavy sized truck cranes like the Grove GMK 5275 or the GMK 6350 or equal can accommodate such a lift.

The Bells Ferry Rd. bridge staging requires the inside to be constructed first in stage 1. For the load indicated, a pair of Grove GMK 5275’s or equal could be utilized. For stage 1 picks, each crane could be positioned adjacent to the stage 1 end abutment with the new BT 63’s, 130’ long brought in by trailer on one (1) lane of I-575. In a similar fashion for stage 2, cranes are behind stage 2 end abutments and the trailer is on one (1) lane of I-575, which is now shifted inside.

5.5.2.2 Highways

See Section 2.2.3 of this report for a discussion of highway construction methods common to all bridge and highway segments.

For concrete deliveries in Segment 5, it is anticipated that the majority of concrete would be batched at the proposed batch plant location at the SR-92 interchange infield on I-575. However, for concrete placements in the southern end of Segment 5, the proposed Batch Plants at Wade Green Rd. on I-75 may be called upon.

At this early stage of design, fill areas are shown to be retained by MSE wall. Excavation or cut areas are assumed at this early stage of design to be supported by soil nailing. Cuts and fills in Segment 5 while sizeable, are not as prevalent as the I-75 segments.

Segment 5 is the longest segment on the NWC Project. While the alignment is not as wide as I-75 segments, it still ends up with the highest quantity of concrete pavement, well over a million square yards of a 12” thick slab, roughly the same as Segment 2. A third of the sound barrier planned for the project at this time occurs in Segment 5.

5.5.3 Construction Risks

See Section 2.2.4 of this report for a discussion of Construction risks common to all bridge and highway segments.

Bridges: The Shallowford Rd. Bridge has a gasline and telephone ducts supported by the existing bridge. The Dupree Rd. Bridge has telephone ducts supported. The utility companies will be required to relocate these to the completed stage 1 structure, including running the lines through the HOV access ramp portion. There appears to not be any double relocations unless the Dupree telephone lines are located along the south edge of the existing bridge. This portion is demolished up to the first web to make room for stage 1 work.

The bridge work at Big Shanty Rd. may require relocation of telephone, electric, water, and gas lines since the ft.ings and end abutments do not match existing pier locations. A transmission pole on the east end has been identified as needing relocation.

Highways: All major utilities are present along the I-575 alignment. There is a multitude of utilities needing to be located in the field and protected during construction. Some will require relocation for the highway work. Of note are the transmission line crossing about halfway between Barrett Parkway and Big Shanty Rd. and a buried 230KV line just north of Dupree Rd.

5.5.4 Value Engineering

Bridges: An alternate design for the Big Shanty Rd. Bridge has been developed. It is a more traditional ft.print with 3 spans in lieu of the trapezoidal shaped one (1) span bridge reviewed herein. It will be investigated for potential cost/schedule savings.

The Hawkins Store Rd. Bridge is designed to be completely replaced. It is possible to salvage the existing spans and widen the crossing with additional structure similar to the (5) Category 2 I-575 bridges. However the new structure would be BT 54's whereas the existing structures are post tensioned webbed concrete boxes.

Highways: See Section 2.2.5 of this report for a discussion of value engineering common to all highway segments.

One (1) opportunity on Segment 5 highways concerns the re-use of existing pavement. This would involve reuse of the existing asphalt section, adding the widened portion using the same section, and then milling down the existing surface 2"-3" to match the proposed surfacing. A new top coat of asphalt would then be installed across both existing and widened sections. Most of the existing pavement section is within the proposed new alignment.

6 – BRT Stations

The Bus Rapid Transit (BRT) system shares the HOV lanes along a 15-mile stretch of I-75 from the existing HOV lanes at Akers Mill Road to Wade Green Road (Town Center/Big Shanty Road). The system includes dedicated entry/exit ramps, a bus maintenance and storage facility, and five (5) BRT stations with associated parking facilities located at proposed interchanges along I-75. The limits of the system and planned stations are shown on *Figure 6.1 – NWC BET Station Locations and Limits* below.

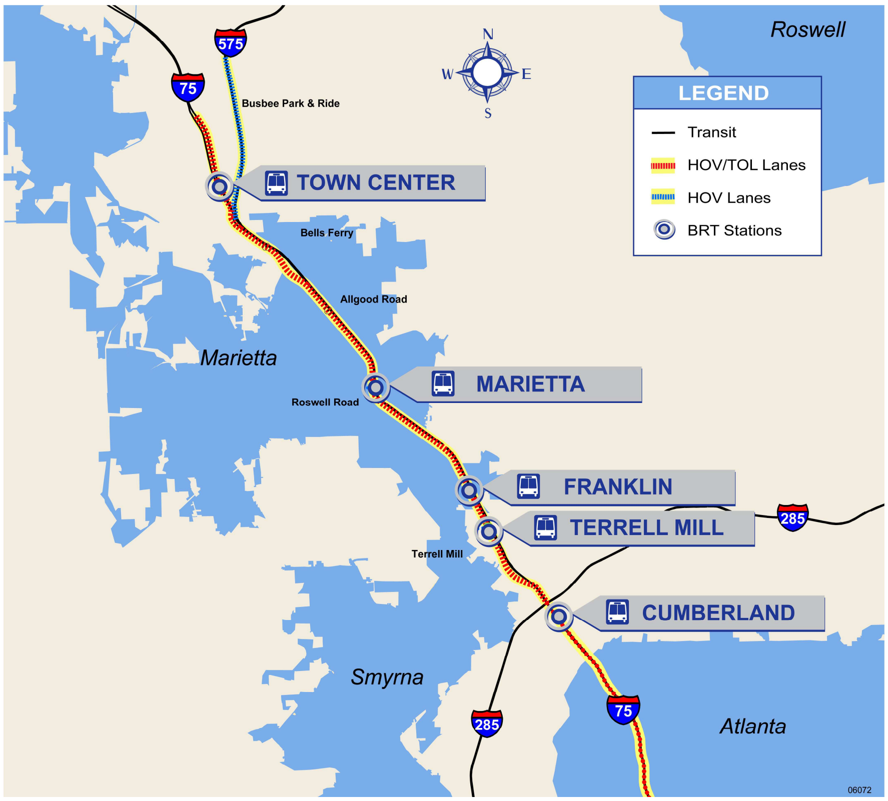

Figure 6.1 – NWC BRT Station Locations and Limits

6.1 Cumberland

The Cumberland BRT station is elevated above the center of I-75 on the south side of Akers Mill Road and the parking structure is located remote to the station on the west side of I-75 to the south of the Performing Arts Center. A combination of an on-grade walkway and an elevated pedestrian bridge which crosses southbound I-75 connects the two (2) components. Station access for the BRT buses is from the I-75 HOV lanes. The parking structure is accessed from the local streets only. An on-grade access road connects the local street to the top level of the parking structure. The current conceptual scheme provides for (3) structured levels and one (1) 1-grade level with 384 standard size parking places and an elevated bus loop with eighteen (18) bus bays.

The bus loop is a “U-shape” configuration with nine (9) bus bays in each leg. An elevated pedestrian bridge connects the bus bays to the on-grade pedestrian walkway on the west side of I-75. This bridge is located over highway access ramps. At the west end of the pedestrian bridge there is a stair and elevator tower which take pedestrians to the on-grade walkway leading to the parking structure.

At the bus bay platforms there are stairs and a pair of elevators providing pedestrian access from the pedestrian bridge down to the first BRT platform. The bridge continues across to the second bus bay platform area which is also serviced by stairs and pair of elevators.

The elevated bus loop is supported by four (4) rows of piers aligned parallel with the traffic lanes of I-75 lanes. The columns which support the two (2) center rows of piers will be placed in the available shoulder space alongside the existing HOV ramp from I-75 to Akers Mill Road. The western row of piers is located in the shoulder between ramps coming from I-285 and I-75 SB. The eastern row of piers is located between the ramp from Cumberland Parkway to I-75 NB and an idle ramp.

The bus station deck will be a cast-in-place (CIP) concrete slab supported, primarily, by AASHTO 72 " bulb tee, prestressed beams. The deck at the northwest exit to Akers Mill Road, will be supported by AASHTO 63" bulb tee prestressed beams with 72 " bulb tee fascia beams. Four (4) steel plate girders will be provided to support the CMU (concrete masonry unit) elevator and stair towers and provide space for the elevator pits. Portions of the overhang of the existing Akers Mill Road Bridge will be rebuilt to provide access to the bus station.

6.1.1 Access/Traffic/MOT/Staging and Sequencing

The proposed location of the Cumberland BRT station directly above 12 lanes of heavily traveled interstate highway and 2 HOV ramp lanes poses considerable constructability challenges. The design of the station will keep constructability in mind to minimize work over and adjacent to the existing traffic lanes thereby minimizing lane closures.

The two (2) center rows of columns adjacent to the existing HOV access ramp only have access from an existing high speed, left lane. Access will be limited to nights only. Utilizing temporary jersey barriers a construction access point can be created for construction vehicles to pull into a temporary deceleration lane and then back up into the work zone. The offset arrangement of barriers provides protection for the workers without creating a blunt end situation for the traveling public.

The east row of columns can be accessed from the adjacent idle ramps. The nearest idle ramp has vehicular access from Cumberland Boulevard to the south.

The west row of columns is located in the grassy median between I-75 SB mainline and on ramps coming from I-285. A safe arrangement with temporary jersey barriers, similar to that described above center rows of columns, can be set for construction access to the grassy median.

Erection of the AASHTO bulb tees for the deck will be primarily from closed travel lanes. Temporary lane closures will also be required to build a protective under deck across the bottom flanges of the beams. Once a deck is established, personnel access can be via a temporary stair tower erected on the idle ramps or via Akers Mill Road for construction vehicular access.

Anticipated traffic restrictions for lane takings on I-75 mainline are described in Section 2.2.1 of this report.

It is anticipated that for the two (2) center rows of piers the foundation work, column work, and pier caps will require establishing a work zone that takes up the existing 14' shoulder for an extended period of time. This work zone will be created utilizing temporary jersey barriers. At a minimum the adjacent, high speed left lane would need to be taken during active work. An additional lane taking, for a total of two (2) lanes, with a 9 hour work window per night, will be required for some stages.

Most of the work on the two (2) outside rows of piers the foundation work, column work, and pier caps will require will only require one (1) lane taking at certain stages.

Erection of station deck support members (AASHTO bulb tees) will require full lane closure of I-75 mainline in one (1) direction at a time. The heavy lifts required to erect a deck over I-75 can only be done safely with a full closure. Detours capable of carrying a minimum of 2 lanes of traffic must be established for both I-75 NB and SB. See *Appendix I* for preliminary detour routes. The I-75 NB detour would require construction of a temporary road from the existing idle ramp which originates from I-75 NB. The I-75 SB detour requires that a temporary ramp be built connecting the Exit 25B lanes of I-75 SB with the 3 lane ramp coming from I-285. Both of these detours would be designed for a speed of 35 mph and would likely be limited to use between 11pm and 4am only.

All maintenance of traffic (MOT) plans will be prepared and submitted to GDOT for approval prior to the start of construction of the affected phase. All work will be carried out in accordance with the latest revision of GDOT Specification Section 150—Traffic Control and MUTCD.

6.1.2 Construction Methods

The BRT Station conceptual design requires approximately 20 ft. long driven piles and pile caps as foundation elements. Two (2) lane takings will be required during pile cap work for picker support and material offloading. Driven piles will require a pile cap approximately 3 ft. thick with the top of the cap about 3 ft. below finished grade. For the 6 ft. deep excavations adjacent to traffic, a prefabricated support of excavation (SOE) system such as Krings is recommended. During non-work hours when travel lanes are active, the temporary barriers taking up the 14 ft. shoulder will protect the public from the pile cap work site.

After the foundation elements are in place, columns will be formed, rebar installed, and concrete placed. The straddle bents are then formed, rebar installed and concrete placed. Two (2) lane takings will primarily be required during this work although some work can safely be done with a single lane taking.

Once the four (4) sets of straddle bents are in place, the most critical elements, the deck support beams can be set. A center span of 61 ft. is located over the HOV ramp to Akers Mill Road, a span of 132 ft. is located over I-75 NB, a span of 140 ft. is located over I-75 SB, and a span of 60 ft. is located over the Cumberland Boulevard Ramp. AASHTO BT72's are specified on the conceptual design drawings for the longer spans and BT63's for the shorter spans.

Each 140 ft. long 72" bulb tee beam will weigh approximately 56 tons. Due to their length, two (2) cranes, one (1) at each end, will be used to pick these off of a trailer parked on I-75 and place them into position. Taking half the weight, adding 10% for rigging and a conservative 50% safety factor for a dual pick yields 46 tons for each crane. This would require a pair of Grove GMK 6350's or equal if a radius of 65' for each can be set up. Maneuvering the trailers carrying the 140 ft. long 72 " bulb tee is key to a successful beam placement. Once the truck cranes are positioned and loaded with counterweights they cannot be moved during a lift.

The cast-in-place concrete deck will be placed without lane closures beneath. A protective underdeck system resting on the bottom flanges of the beans will be provided and the stay-in-place forms will be utilized. This arrangement provides double protection to the traffic below. Upon completion of the cast-in-place concrete deck with edge fall protection installed, the work required to install the bus bays, edge walls and station finishes may precede.

The pedestrian bridge from the kiss & ride and garage area located on the west side of I-75 to the Cumberland Station presently require spans of 60 ft. to 130 ft. This keeps the weight of the superstructure (assuming steel truss design) in the 55 -70 ton range for the longest span. This allows the lifting of the main span to be completed with all but poured reinforced concrete deck and the architectural finishes to be accomplished. Erecting the pedestrian bridge with as much of the superstructure completed as possible avoids later work over travel lanes.

6.1.3 Construction Risks

Minimizing safety risks to the craft workers and to the traveling public is a key element of the station construction. See Section 2.2.4 of this report for a discussion of this risk. All appropriate safety precautions will be taken. All personnel will receive safety training on a regular basis.

All attempts will be made to minimize cost and schedule risks that are associated with traffic restrictions, precast deliveries, and applications of new construction technologies.

6.1.4 Value Engineering

The station's location above I-75 has a significant impact to the overall cost of the station. Alternative locations should be evaluated.

As an alternative to a CIP reinforced concrete deck, the use of precast deck members should be investigated to minimize construction over traffic.

Consideration should be given to deletion of the Cumberland BRT Parking structure and share parking facilities with the adjacent Performing Arts Center. This would significantly reduce the walking distance from parking to the BRT bus loop.

6.2 TERRELL MILL

The Terrell Mill BRT Station is proposed to be located in the median of I-75. It is supported on a bridge structure that is approximately 2,300 ft. long and 105 ft. wide which effectively creates a tunnel beneath the station. HOV access lanes connecting Terrell Mill Rd. with I-75 above, pass under the Station, A surface parking area is located on the west side of I-75 SB. The parking area is connected to the BRT Station by a pedestrian bridge passing over I-75 SB and connects to a tower with a stair and an elevator down to the BRT station platform.

The constructability of the proposed I-75 bridges over Terrell Mill Rd is discussed in detail in Section 5.1 of this report. This section of the report should be read in conjunction with that section. Construction of the BRT Station in the median area of the bridge structure represents the third and final stage of construction.

At the start of the Terrell Mill BRT Station construction, stage 2 of the Terrell Mill Bridge reconstruction has been completed. At this stage reconstruction of both I-75 NB and SB has been essentially completed. The MSE walls located on the edge of the HOV through lanes will have to have partially built at least in the area of the new abutments and the approach leading up to the abutments. Existing I-75 SB is raised 3.25 ft. and existing I-75 NB is raised 4.75 ft. Before traffic is switched to the final alignment, the walls forming the sides of the cut for HOV access ramps down to Terrell Mill Rd. should be completed to take advantage of the sizeable work zone between stage 2 temporary traffic alignment. At this time there will be a 290 ft. wide work zone.

6.2.1 Access/Traffic/MOT/Staging and Sequencing

Prior to traffic being placed on the final I-75 alignment complete with HOV and TOL lanes a sizeable work zone is available within the median area. The width of this work zone affords adequate space to work in a very safe environment. Access to this area can be from I-75 NB and/or I-75 SB by setting up a staggered temporary jersey barrier arrangement. This is accomplished by ending the temporary barrier on the left side of travel and offsetting the continuation of barrier further to the left, leaving a wide deceleration/acceleration lane for construction vehicles. Construction vehicles entering the work zone pull over to the far left, decelerate, and back into the work zone. The barriers to protect the traveling public are in place without any blunt ends facing the direction of traffic.

A temporary closure of Terrell Mill Road will be required to set the BRT station bridge members that span across the road. A temporary road closure will also be required to build a protective under-deck across the bottom flanges of the beams. The detour at night would route traffic to Cobb Parkway and Windy Hill Road.

When I-75 is opened in the final alignment work may still be progressing on the BRT station. At this point in time, the permanent bus ramps from I-75 NB and SB will be used by construction forces to complete the BRT Station including finishes.

The pedestrian bridge over I-75 SB will require a nighttime closure of I-75 SB. The proposed detour for the few hours needed to make this lift would be detour traffic off I-75 SB at the Delk Road exit, a right onto Delk Road, a left on Franklin Road, a left on Cobb Parkway, a left on Windy Hill Rd. and back onto I-75 SB. It is recommended this work be done from 3am to 6am on a Sunday morning to minimize the disruption of traffic.

6.2.2 Construction Methods

The main challenge in the Terrell Mill Road bridge area is the method of and the sequencing of the construction of the walls that form the sides of the HOV ramps down to Terrell Mill Road. It is proposed that MSE walls be utilized at this location though alternatives will be considered during detailed engineering As previously discussed both I-75 NB and SB are raised up to almost 5 ft. from today's profile.

One (1) method and sequence of construction is to excavate for the MSE walls once traffic is moved onto completed stage 1 construction on the outside. Since MSE walls typically require a minimum cutback of 10 ft. or 70 percent of wall height, whichever is greater, for the straps, this distance over the 2,100 ft. length of the walls would need to be cut back on both sides before stage 2 roadway or stage 2 bridge work can begin. On the NB side, the present grade indicates a cut of about 20 ft. so this side would be laid back 14 ft. plus slope distance at 2.5 to 1, almost 70 ft. total. On the SB side the cut is about 32 ft. which would require a cut back of 22 ft. plus slope distance at 2.5 to 1, approximately 100 ft. total. There is a potential constructability issue with this approach. Since the new I-75 SB is only about 60 ft. away and it will likely have traffic on it at the start of this stage a temporary retaining wall may be required unless rock or other very competent material is encountered that will allow a steeper slope. While this approach of installing the MSE wall first represents a potential schedule impact, it does allow all subsequent work to proceed in an unrestricted manner.

Another method and sequence of construction, assuming opening the highway in the new alignment is of paramount schedule importance, is to only build what is required to complete the highway alignment. And then proceed with HOV access ramps and BRT Station. Geotechnical information, not currently available, would be necessary to assess this option. Support walls other than MSE would be required. Options include a sheetpiling and a tieback system or slurry walls. These options are more expensive and/or require some additional layout to build.

It is recommended to plan on constructing the MSE wall forming the sides of the HOV access ramps down to Terrell Mill Rd. at the beginning of stage 2 Construction, by over excavating under the proposed alignment layout.

Once the MSE wall is in place, the substructure for the elevated station can be built. Piles are driven along each side of the proposed HOV ramps. Ft.ings and columns are placed at each location. Pier caps, connecting the columns, are constructed to support the AASHTO BT63 cross beams. The 105 ft. long BT63's will each weigh 39 tons each. They can be set by walking a crane up the ramp, setting the beams closest to Terrell Mill Rd. first. The beams can be brought by trailer onto the HOV through lanes, at night if the new highway alignment is open. To make these picks at an 80 ft. radius, the crane needs to be a 250 to 300 ton class Crawler. Another option is to use two (2) cranes, one (1) on the ramp and one (1) up above near the trailer and double pick the beams.

At the intersection of Terrell Mill Rd. a straddle bent is constructed on each side so that AASHTO 72 " bulb tees can span the 140 ft. over Terrell Mill Rd. These will need to be set from above from the HOV through lanes. The trailer would need to be placed on the HOV lanes, over Terrell Mill Rd. A truck crane (assuming the new highway is open) would need to be positioned on each end of the trailer. As discussed in the Terrell Mill Bridge section of this report, lifting these with two (2) cranes and appropriate safety factors require the largest truck cranes such as the Grove GMK 7550 or equal. The most difficult beams to set are the ones along the centerline of the BRT station. These would require a crane reach of about 80 ft.

A cast-in-place bridge deck will be constructed atop of the AASHTO beams. Stay-in-place forms will be utilized for the construction of the deck. The deck will provide the structural platform for BRT Station.

A pedestrian bridge provides access from the at-grade parking lot to the Terrell Mill BRT station. The bridge spans across I-75 SB approximately 190 ft. plus additional spans of 40 ft. and 50 ft. For such a large span it is anticipated that the pedestrian bridge, assuming a box girder design with side trusses, would weigh approximately 100 tons. Utilizing two (2) cranes the lift of the pedestrian bridge truss can be done during a nighttime shutdown of I-75 SB. Two (2) Truck cranes, Grove GMK 6350's or equal or 200–250 ton crawlers can be positioned to accommodate the lift.

6.2.3 Construction Risks

See Section 2.2.4 of this report for a discussion of the risks associated with the construction of this station.

6.2.4 Value Engineering

Opportunities exist for cost savings in the solution to the grade issue between the surface parking lot and the BRT platform. Presently an elevator/stair tower on the BRT platform is planned for with a pedestrian bridge crossing over I-75 SB. The tower is estimated to be 55–60 ft. high above the BRT platform to achieve the needed clearance over I-75 for the pedestrian bridge.

There are also elevators and stairways from the BRT station down to Terrell Mill Rd. Consideration should be given to deletion of these and replacing them with taxi and kiss & ride areas next to the parking structure.

As described in the beginning of this Section 6.2, the HOV ramps down to Terrell Mill Rd. effectively act as a 2,000 long tunnel and may be subject to tunnel design requirements. Consideration should be given to an alternative approach to eliminate potential added costs. In a similar situation, the Marietta BRT station uses double MSE walls and an embankment supported station which avoids the tunnel effect for the HOV access ramps down to Roswell Rd. However this solution requires a wider alignment which would necessitate additional ROW acquisition.

6.3 Franklin Road

The Franklin Road BRT Station is proposed to be located along the west of the project along I-75 approximately 4,000 ft. north of the Delk Road interchange. The site will also serve as an HOV access point to I-75 for local HOV traffic. The access from the highway to the BRT station will be from elevated ramps in the median of I-75 that will provide access to a bridge that will cross over I-75 southbound to the station on the west side of the highway. The ramps will be constructed using MSE walls with the bridge being a precast bulb tee girder and concrete deck structure. The elements included in the 5½ acre station site will consists of a 900 ft. long two (2) lane access road off Franklin Road, an asphalt paved parking lot, at grade bus deck with six (6) bays with station amenities, retaining walls around the site and the access bridges and ramps to the HOV/BRT lanes in the median of I-75. Kiss & ride drop offs are planned on the west side of the station.

Access to the BRT parking lot for patrons and local busses to the station will be from Franklin Road on the west. The I-75 BRT lanes will directly access the passenger loading area at the station via the dedicated BRT/HOV ramps from I-75 in the median.

6.3.1 Access/Traffic/MOT/Staging and Sequencing

The proposed location of the Franklin Road BRT Station presents some challenges for construction sequencing. The station's access to I-75 is situated in the center of the proposed new alignment; the required phasing of the roadway will dictate the station work including the MSE walls that support the access ramps. Construction of these ramps will take place during later stages of the highway construction, when traffic has been shifted to the outside. Access to this area for the construction of the ramps and portion of the crossover bridge, will only be from the mainline inside shoulders.

Access to the site elements on the west ROW will be limited, relatively difficult and available only from the west off of Franklin Road on the proposed access road. Access from other directions is unavailable. Adjacent to the site are fully occupied apartment complexes on both the north and south sides. On the east side of the site is Rottenwood Creek. Work on the site and construction access will need to be coordinated and performed to protect rights of the adjoining property owners.

The access issues most problematic at this location will be the delivery of materials to and from the site including items such as earthwork, aggregate materials, concrete, and structural elements.

The work at this site will require a plan that addresses temporary erosion control and water runoff, security, employee parking, adjacent street cleanup (sweeping), haul routes, trash, and fire protection. The goal of this plan is to provide an efficient, effective and safe environment with a positive image for the site.

Due to the work required on the I-75 and Franklin Road, a traffic control plan addressing the MOT issues will be submitted to GDOT for approval prior to the start of construction. All work must be carried out in accordance with the latest revision of GDOT Specification Section 150—Traffic Control and MUTCD.

6.3.2 Construction Methods

The first operations to be constructed will be the site work on the 5½ acre site. The preliminary site work of building and pavement removal, securing the limits of the site and reestablishment of the roadways and services along the perimeter of the site will take place first. The follow-up site work will include the establishment of the turn lane off of Franklin Road, then approximately 22,000 yd^3 of excavation for embankment, installation of MSE and CIP concrete walls and the completion of a stormwater detention structure with the associated drainage system. Conventional excavation equipment including track backhoes, scrapers, trucks and vibratory compactors will be used. The final determination of equipment requirements will depend on the results of the soils investigation. Equipment used for the MSE wall will be similar to the site work with the possible addition of a small crane. Site work also includes the construction of a cast-in-place concrete gravity walls. It should be assumed that following the initial site work, the station site will be the west access point for the structures spanning Rottenwood Creek and I-75 SB. The construction of the foundations for both these structures and the subsequent substructure and superstructure work will precede the completion of the parking lot and bus/pedestrian transfer station. Conceptually, the foundations are driven steel piles, approximately 20 ft. long with CIP concrete caps. Pile driving equipment will include a crawler crane and pile hammer with leads.

While construction activities are progressing on the west ROW elements, the construction of the MSE walls, which form the BRT/HOV access ramps to the station, is ongoing. These walls also support the end bent of the structure that will span I-75 SB. The elevated section over I-75 will be precast AASHTO bulb tee girders on the concrete substructure with concrete deck. Equipment used here will need to be sized to be capable of handling the required loads involved with the beams over I-75. These are spans of 90 ft. using 54 inch bulb tees and 140 ft. using 72 inch bulb tees considerations for the erection crane foundation and access of the precast elements of the structure is a significant activity. A coordinated traffic plan to set these girders is required. The completion of the elevated portion of the BRT/HOV ramp will be accomplished using access from both the east and west ends.

The completion of the station and parking lot will follow since work will need to be done from east to west due to the access limitations to the site. Ability for access becomes even worse as the site becomes completed. Work on the access roads; grading, sub base, and asphalt can be ongoing with activities with the station construction. The station’s bus deck will be an 8 inch on grade concrete slab. The parking lot and surrounding access roads are to be constructed using a 7 inch asphalt section on 10 inches of GAB.

Following the completion of the structural and civil elements of the station, electrical, mechanical, fire protection and the architectural elements such as canopies, fences, sidewalks, and finishes will be completed. The actual completion of the final asphalt paving will be the last activity.

6.3.3 Construction Risks

In addition to the risks discussed in Section 2.2.4 there are some specific issues related to this site due to it’s proximity to I-75, as well as to several housing structures. This work contains elements that will be constructed in the median and over and adjacent to I-75 where there will be a substantial traffic impact. Additionally there is the proposed access road, parking lot and BRT station site that will have significant local traffic issues for access. Concerns that will need to be addressed along with the traffic impacts are the high potential of pedestrian traffic through and adjacent to the site. As mentioned the site is adjacent to multiple units housing that will generate high volumes of pedestrian traffic. Issues such as construction access to the site, providing security and protection of the site, nuisance ordinances, limiting the access to the site by unauthorized personal and public awareness are some that will need to be addressed.

In addition, there are other risks such as local ordinances for noise or disturbances which could be substantial. Also, the risks applicable to excavation required on both the west ROW and the center can be minimized with an effective geotechnical program The close proximity of Rottenwood Creek will have environmental and flood risks.

6.3.4 Value Engineering

Site relocation may be an opportunity to mitigate the risks described above and reduce costs. An alternative site may have better access, lower site costs, and possible bridge reduction costs.

6.4 MARIETTA

The Marietta BRT Station is proposed to be located in the median of I-75 just to the north of Roswell Road. It will be constructed on grade on a MSE wall supported fill for most of its length, with a small portion over Roswell Road on a bridge structure. The complete station site will consists of four (4) structures; the (690 ft. long by 80 ft. wide) bus deck with eight (8) bays (with capacity to expand to 14 bays), a 350 ft. long pedestrian walkway bridge, an at-grade, 6 bay CCT bus transfer area west of I-75 SB, and a 5 level parking garage also west of I-75. Kiss & ride bus drop offs are planned on both the north and south sides of Roswell Road as it passes under the BRT station with access to the station via a stairway or elevator. A pedestrian bridge (350 ft. long) elevated over I-75 SB connects the Marietta BRT Station to both the CCT bus deck and the parking structure. The parking structure is connected to the bus deck at its fifth or top level.

Access to the BRT parking and local busses will be from Roswell Road on the south, relocated Chert Road on the north and from Haygood Circle on the west. The I-75 BRT lanes will directly access the patron loading area in the center of I-75.

The bus deck will be a 10 inch CIP on grade concrete slab using the same section as the roadway, except as noted above where a bridge structure using Type I and II AASHTO girders with a concrete deck will be used.

Architectural features include bus and pedestrian canopies, raised pedestrian platforms for bus loading, and accesses to the parking garage.

The parking garage presently being considered is a precast structure on a slab on grade similar to many other recently constructed in the metro Atlanta area. Foundations planned are steel pile supported concrete ft.ings.

The kiss & ride areas are slab on grade construction and will be part of the Roswell Road widening.

6.4.1 Access/Traffic/MOT/Staging and Sequencing

The proposed location of the Marietta Station BRT presents some challenges in construction sequencing. The station not only is situated in the center of the proposed new alignment, the required phasing of the roadway will dictate timing of the station work including the MSE walls that support the station. Construction completion of the center section of the station will be during late stages of the highway construction. Construction access to the station will be from the I-75 inside shoulders or future Roswell Road exit and entrance ramps.

Access to other structures at the site will be relatively unencumbered. Access will be available from the south at Roswell Road, Haygood Circle on the west and Chert Road from the north. Adjacent businesses along the west side of the site will be minimally impacted. Access issues with property owners along the north side of the site and relocated Chert Road will need to be addressed to ensure our access has minimal negative impacts to them.

The access issues most problematic at this location will be the delivery of materials to and from the site including earthwork, aggregates materials, concrete, and precast parking garage elements.

A traffic control plan addressing the MOT issues will be submitted to GDOT for approval prior to the start of construction. All work must be carried out in accordance with the latest revision of GDOT Specification Section 150—Traffic Control and MUTCD.

In addition to the traffic control plan, the work at this site will require a plan that addresses, temporary erosion control and water runoff, security, employee parking, adjacent street cleanup(sweeping), haul routes, trash, and fire protection. The goal of this plan will be to provide an efficient, effective and safe environment with a positive image for the site

6.4.2 Construction Methods

The first operations to be constructed will be the site work on the 8½ acre site. The work will include approximately 38,000 yd^3 of excavation and 17,000 yd^3 of embankment and the completion of a detention structure and associated drainage. Conventional excavation equipment including track backhoes, scrapers, trucks and vibratory compactors will be used. The final determination of equipment requirements will depend on the soils investigation. Site work also includes the construction of a cast-in-place concrete gravity wall along the west side of the proposed parking structure and the phased construction of the at-grade bus platform in the center of I-75. It should be assumed that following the site work the area on the west ROW will be used as a laydown and staging area for equipment and materials for the advancement of the highway construction to a level to allow the BRT elements to begin and then for the center portion of the BRT station. The construction of the foundations for both the parking garage and elevated portion of the bus deck over Roswell Road follows the site work. Conceptually these foundations are driven steel piles, approximately 20 ft. long with CIP concrete caps. Pile driving equipment will include a crawler crane and pile hammer w/leads. The construction of the MSE walls, which support the HOV access ramps to and from Roswell Rd. to the mainline HOV lanes, follow the foundation work. This must be coordinated with the adjacent highway work since room for the MSE wall straps will extend into the highway alignment. See Section 5.2.1.2 of this report for more details. The SB side MSE wall can be built as part of phase 1 of the highway MOT plan. The NB side may be required to be built first in phase 2 of the MOT plan before the highway section can be started.

A second set of MSE walls support the at-grade portion of the BRT Station in the center of I-75. Equipment used for the MSE wall will be similar to the site work with the possible addition of a small crane. As elements of the at-grade portion of the center BRT station are being constructed, the completion of the elevated section this area can be completed. The elevated section of the BRT station over Roswell Rd. requires placement of precast AASHTO 54" bulb tee girders, 105 ft. in length and placement of a concrete deck. Equipment used here will need to be the smallest capable of handling the required loads as space adjacent to the active Roswell Road will be limited. As the progress of the center portion of the station advances, the remaining areas of the BRT site become available to complete.

The completion of the parking garage will follow as work will need to be done from west to east due to the topography of the site and because access becomes reduced as the site becomes completed. Considerations for the erection crane foundation and access of the precast structure is a significant activity. Work on the access roads; grading, sub base, and asphalt can be ongoing with activities with the center station construction. The actual completion of the final asphalt paving will be the last activities. The completion of at grade CCT bus transfer station and elevated towers to support the pedestrian bridge will follow the parking garage erection. The completion of the parking garage ground floor and the station area at grade concrete pavements would follow the elevated work. The placement of the two (2) piece pedestrian bridge between the parking garage and the tower in the center of I-75 would be completed next, utilizing on site or outside rented cranes capable of the approximately 100 ton pick.

Following the completion of the site, structural and civil elements of the station, electrical, mechanical, fire protection and the architectural elements such as canopies, fences, elevators, stairways, and finishes would be completed.

6.4.3 Construction Risks

In addition to the risks discussed in Section 2.2.4, there are other risks which are specific to this site. Portions of the station will be constructed adjacent to I-75 where there will be a substantial traffic impacts around the site. Additionally there is the proposed parking structure and CCT transfer site that will have significant local traffic issues. The existing Roswell Road running under the elevated portion is the south limit of the parking and bus transfer and carries a significant amount of traffic as it is a major east-west connector. Concerns that will need to be addressed along with the traffic impacts are the high potential of pedestrian traffic through and adjacent to the site. Issues such as construction access to the site, providing security, limiting the access to the site by unauthorized personal and public awareness are some that will need to be addressed.

In addition, there are risks associated with the excavation required on both the west ROW and the center as well as with existing utilities along the west ROW.

6.4.4 Value Engineering

The following opportunities will be evaluated

- One (1) opportunity to be evaluated is to relocate the CCT bus loop adjacent to the proposed Marietta parking structure on Chert Rd. This relocation would result in the deletion of an elevator and stair tower and simplify pedestrian access to the bus loop.
- Another opportunity to be evaluated is to delete the pedestrian access to Roswell Rd. from the BRT station and provide services such as Kiss & ride next to the parking structure. This will delete two (2) elevators and stairways.
- The precast parking garage could be reviewed and potentially a cast in place structure may have some advantages.

6.5 Town Center

The Town Center BRT Station consists of two (2) structures; an elevated bus deck with six (6) bays and a kiss & ride bus drop off below the elevated deck adjacent to a 6 level parking structure. The station is located east of I-75, adjacent to the proposed Big Shanty Road extension and south of the existing CCT bus stop on Busby Drive. A grade walkway connects the kiss & ride area to the parking structure. Patrons from the parking structure will have access to the bus bay from the central stair and elevators located at grade in the kiss & ride area.

Access to and from the BRT to the I-75 BRT/HOV lanes will be an approximately 1,000 ft. long 4 lane HOV access ramp. The ramp will be GAB and asphalt section constructed on MSE walls, which bring the ramp from the station to a bridge over I-75 northbound.

The bus deck will be an cast-in-place (CIP) concrete slab supported, by Type I and II AASHTO girders. Architectural features include bus and pedestrian canopies, raised pedestrian platforms for bus loading, and access to the parking garage and kiss & ride lot.

The parking garage presently being considered is a precast structure on a slab on grade similar to many other recently constructed in the metro Atlanta area. Foundations planned are steel pile supported concrete ft.ings.

The kiss & ride loop is on grade concrete slab construction

6.5.1 Access/Traffic/MOT/Staging and Sequencing

The proposed location of the Town Center BRT will allow relatively unencumbered access. Access will be almost entirely completed from the east side utilizing the proposed Big Shanty Road corridor.

Some additional access may also be made from the northeast off Busbee Drive thru the current CCT (Cobb Community Transit) facility. Concerns of adjacent businesses to the site such as Brand Smart department store, CCT, and Kennesaw State College will need to be addressed to ensure our access has minimal negative effects on them.

The access issues most problematic at this location will be the delivery of materials to and from the site including items such as earthwork, aggregate, MSE wall materials, concrete, and precast parking garage elements.

The access within the site for construction will be somewhat self-contained. Ongoing work should not affect the surrounding area other than the construction access issues as described above.

A traffic control plan addressing the MOT issues will be submitted to GDOT for approval prior to the start of construction. All work must be carried out in accordance with the latest revision of GDOT Specification Section 150—Traffic Control and MUTCD.

In addition to the traffic control plan, the work at this site will require a plan that addresses; temporary erosion control and water runoff, security, employee parking, adjacent street cleanup (sweeping), haul routes, trash, and fire protection. The goal of this plan would be to provide an efficient, effective and safe environment with a positive image for the site.

The staging/sequencing will be bottom up construction. Not every step will need to be 100% complete before the next activity is started. There will be a lag between starts of consecutive activities as long as the previous activity is far enough complete to avoid the follow on activity from “catching up“. The limited space of the project site will also be a factor in the overall progression as only compatible activities can successfully be completed simultaneously.

Laydown areas will be confined to the site and to adjacent properties outside the ROW with proper lease agreements. Areas with potential include the proposed phase 2 CCT park and ride lots on the east side of the BRT site along with other landowners just east of the site.

6.5.2 Construction Methods

The first operations to be constructed will be the site work on the 10½ acre site. The work will include excavation and embankment of approximately 40,000 yd^3, completion of a detention pond and the associated drainage. Conventional excavation equipment including track backhoes, scrapers, trucks and vibratory compactors will be used. The final determination of equipment requirements will depend on the soils investigation. Site work also includes the construction of 95 ft. 8 ft. x 8 ft. concrete box culvert. CIP method of construction is planned. The construction of the foundations for both the parking garage and elevated bus deck follow the site work. Conceptually these foundations are driven steel piles, approximately 20 ft. long with CIP concrete caps. Pile driving equipment will include a crane and pile hammer w/leads. Construction of the MSE walls, which support the access ramp to the mainline HOV lanes, follow the foundation work. Equipment used for the MSE wall will be similar to the site work with the possible addition of a small crane. At this point, coordination for access and material laydown will be required with the completion of the east abutment of the access bridge over I-75 northbound. The completion of the parking garage will follow as work will need to be done from west to east as the access becomes reduced and the site becomes completed. Considerations for the erection crane foundation and access of the precast structure is a significant activity. Work on the access roads; grading, sub base, and asphalt can be ongoing activities after the MSE wall completion. The completion of elevated bus deck follows starting with the substructure, then setting the AASHTO girders, and finally placing the concrete deck. The concrete pavements for the parking garage ground floor and the station kiss & ride area will follow the elevated work. Following the completion of the site structural and civil elements of the station, electrical, mechanical, fire protection and the architectural elements such as canopies, fences, elevators, stairways, and finishes will be completed.

6.5.3 Construction Risks

In addition to the risks discussed in Section 2.2.4, there are also other risks which are specific to this site. Even though this station is not on the interstate, there will be a substantial traffic impact around the site. The proposed Big Shanty Road Extension will be operational and will carry a significant amount of traffic along the south side of the project along with the adjacent business traffic to the site such as Brand Smart, CCT, and Kennesaw State College. Concerns that will need to be addressed will be the traffic impacts due to the construction access to the site, providing security, and limiting the access to the site by unauthorized personal.

Other risks at this site include the installation of utilities in the Big Shanty ROW.

6.5.4 Value Engineering

The following opportunities will be evaluated:

- Review the precast parking garage design and potentially a cast in place structure may have some advantages.
- Stack the parking structure over an at-grade bus loop. This would eliminate the elevated structure for the bus loop, canopies, one (1) set of elevators and stairs, and reduce the ft.print of the station site.
- Utilize HOV access ramps from Big Shanty extension to I-75 for both BRT and HOV vehicles instead of a ramp and bridge crossing I-75 Northbound (currently no direct access the from Big Shanty to I-75 is planned)

6.6 MAINTENANCE FACILITY

The BRT Maintenance Facility consists of three (3) structures; a shop and administrative/operations center (42,000 ft.^{2}), a fuel island and depot, and a bus washing facility (5,500 ft.^{2}). The facility includes employee and fleet parking for the BRT operations. The maintenance facility is located on the proposed Big Shanty Road Extension between Barrett Lakes Parkway and West Townpark Parkway, approximately 1,000 ft. directly west of I-75.

Access to and from the BRT Maintenance Facility will be from I-75 using the Town Center Station BRT/HOV access to the Big shanty Rd. extension or from Chastain Road, west of I-75.

6.6.1 Access/Traffic/MOT/Staging and Sequencing

The proposed location of the BRT Maintenance Facility will allow relatively unencumbered access. Access will be usually from the south and west sides utilizing the proposed Big Shanty Road Extension corridor. Some additional access may also be made from the east off the existing north-south road connecting to Chastain Road.

Adjacent businesses are generally light industrial. Traffic impact concerns due to the construction access to the site, will need to be addressed to ensure construction access has minimal impacts to adjacent properties. The access issues most problematic at this location will be the delivery of materials to and from the site including items such as earthwork, aggregates, asphalt, concrete, and building elements. Proper installation, use, and maintenance of construction entrances will minimize issues.

The access within the site for construction will be somewhat self-contained. Ongoing work should not affect the surrounding area other than the construction access issues as described above.

A traffic control plan addressing the MOT issues will be submitted to GDOT for approval prior to the start of construction. All work must be carried out in accordance with the latest revision of GDOT Specification Section 150—Traffic Control and MUTCD.

In addition to the traffic control plan, the work at this site will require a plan that addresses; temporary erosion control and water runoff, security, employee parking, adjacent street cleanup (sweeping), haul routes, trash, and fire protection. The goal of this plan would be to provide an efficient, effective and safe environment with a positive image for the site.

The staging/sequencing will be bottom up construction. There will be a lag between starts of consecutive activities as long as the previous activity is far enough complete to avoid the follow on activity from “ catching up “. The space limitations of the project site will also be a factor in the overall progression as only compatible activities can successfully be completed simultaneously.

Laydown areas for the work required will be confined to the site as there appears to be enough area. Potentially this site could be used as a laydown or staging area for other BRT site or highway elements material required on the project.

6.6.2 Construction Methods

The first operations to be constructed will be the site work on the 10½ acre site. The work will include excavation and haul off of approximately 300,000 yd^3 of existing stockpiled material, completion of a storm water detention pond and the associated site drainage. This drainage is primarily reinforced concrete pipe with multiple catch basins. Conventional excavation equipment including track backhoes, scrapers, trucks and vibratory compactors will be used. The final determination of equipment requirements will depend on the soils investigation. No rock excavation is visually apparent on the site. The site work will include the site entrances and placement of on grade sub base materials. The facilities structures will be constructed on at grade foundations. Specific equipment foundations may include some driven steel piles, approximately 20 ft. long with CIP concrete caps; these are anticipated to be minimal. Pile driving equipment, if required, will include a crane, pile hammer w/leads. The construction of the foundations for the maintenance/operations building, fuel depot and bus wash parking garage and elevated bus deck will follow the site work. Specific work items like the excavation and installation of the fuel tanks and their protective systems will occur simultaneously with the foundation and site work activities. The completion of the at grade concrete work (8 inch structural slab) for the maintenance/operations building, will be first, followed by the slabs for the bus wash and fuel depot. After the completion of the structural slabs the completion of the installation of the underground utilities and amenities would be next. The parking lot and surrounding access roads are to be constructed using a 7 inch asphalt section on 10 inches of Graded Aggregate Base (GAB) material. Typical equipment to be used would be dozers, rubber tired front end loaders, motor graders, water truck, and smooth drum rollers. The completion of the GAB and 5 of the 7 inches of asphalt next would satisfy access and material laydown requirements for the sites two (2) buildings. The structures are anticipated to be metal type insulated buildings with the operations section to be upgraded with finishes. Considerations for the erection crane access to the structures will need to be made. Work on the access roads and parking lot; grading, sub base, and asphalt can be ongoing with building erection as long as sufficient laydown areas are maintained for the building components following the completion of the sites’ building and civil elements, the electrical, mechanical, fire protection and the architectural elements such as lightning, fences, signage, and finishes would be completed. The completion of the final 2 inches of asphalt paving and pavement markings will be the last activity.

Prefabricated metal buildings appear to be most economical for the building elements. The at-grade structural components are considered to be CIP concrete.

Regarding architectural finish materials for the BRT Maintenance Facility no specific features are identified as it is assumed that the facility will be similar to other “shop” facilities where architectural features are not a paramount issue.

6.6.3 Construction Risks

In addition to the risks discussed in Section 2.2.4, there are also other risks present which are specific to this site. Primarily, there will be a substantial traffic impact around the site. The proposed Big Shanty Road Extension is expected to be operational and will carry a significant amount of traffic along the south and west sides of the site along with the adjacent businesses. These businesses are generally light industrial; however some traffic from nearby Kennesaw State College should be anticipated. Concerns that will need to be addressed will be the traffic impacts due to the construction access to the site, providing security, and limiting the access to the site by unauthorized personal.

In addition, the proposed site contains approximately 300,000 yd^3 of excess material, the use of this material on NWC Project site is a potential risk.

6.6.4 Value Engineering

The following opportunities will be evaluated.

- Locate the Maintenance Facility at an alternative site with lower land costs
- Locate the facility on a site requiring less earth work required and eliminating the excavation of approximately 300,000 cy of existing stockpile material.
- Outsource maintenance, construction of an operations center only, and deferring construction of larger facility.

7 – Material Selections

While project specific material specifications have not yet been developed for the NWC Project, the preliminary design work performed to date and GDOT standard specifications/details are the basis for this report. Laboratory testing of construction materials is assumed to take place at existing GDOT certified facilities.

7.1 Bridges—Reworking Existing

As described in the bridge sections earlier, at this stage of design, it is anticipated that driven steel piles will be used for foundation elements. For most of existing I-75 Bridges, 20 ft. long piles have been assumed while intermediate bent lengths up to 30 ft. long and up to 60 ft. long are assumed for the widening of the existing I-575 Bridges. The piles, typically 8-9 per location will be capped with a ft.ing or pile cap.

The substructure, square or rectangular columns and caps will be poured in place concrete, with approximately 200-250 lbs. of reinforcement per cubic yard. Most columns for reworking existing bridges are expected to be 3 ft. by 3 ft. or 3 ft. by 6 ft. with the Railroad Bridge the largest at 14 ft. by 7 ft. The end abutment walls are planned to be MSE, allowing a greater width of alignment to pass under the bridge without lengthening the spans. Temporary shoring for staged bridge construction is planned to be soldier pile and lagging with soil nails or some other means as required.

Support members for the superstructure are prestressed concrete except where matching existing bridge members such as steel WF shapes or where longer spans (over 140 ft.) are required. The PSC members called out are either AASHTO type III beams, bulb tees BT 54’s, BT 63’s, or BT 72’s. In one (1) case, for I-575 over Barrett Parkway prestressed concrete boxes are called for, 27” deep. This is to match existing structure in a widening situation. Steel plate girders are called out for the longer spans. These will be 72” deep and weigh approximately 400 to 650 lbs. per linear ft. Splices are assumed to be bolted splices at this stage of design. There are some standard WF steel shapes called for to match existing bridge members in widening situations.

Bridge decks are poured in place over stay-in-place forms with reinforcement in the range of 250 lbs. per cubic yard. Standard GDOT mix AA is anticipated to be used. With the exception of the Railroad Bridge (12”), the deck thicknesses will be in the range of 7.75” to 8.75”. The finish will be grooved by sawcutting and sealed. Overhead bridges will follow standard sidewalk and parapet details with curved fencing. Highway bridges will follow standard GDOT barrier details. Following standard details, there will be poured in place mid span diaphragms, end bent diaphragms, and edge beams at intermediate bents.

7.2 Segment 1 Bridge structures and Other Proposed Flyovers

The I-285/I-75 Interchange area in Segment 1 has over 35,000 linear ft. of elevated structure to accommodate all required traffic moves. This is all new structure being added to the existing highway infrastructure. Further north, within the alignment, there are almost a dozen additional flyover or viaduct structures. For all of these new structures, plate girders are proposed. The vast majority of span lengths are 160 ft. The plate girders are 72” deep and most weigh 650 lbs. per ft. They will be designed to span a group of 3 to 4, 60 ft. spans as continuous members. Splice locations will be at the quarter span points. Bolted splices are assumed.

To reduce the number of bents required, given the congested nature of the area, the longer span of 160 ft. was chosen. This span is too much for the largest PSC members such as the BT 72. One (1) option would be shorter spans with PSC members. Another is the use of segmental concrete. For this approach, two (2) different methods are employed. One (1) utilizes an overhead gantry with the structure designed for balanced cantilever erection. The other utilizes temporary beams, which can be launched ahead, and is designed for span-by-span, simple supported erection. Curved alignments are more difficult for this method but can be done. Because of the very high elevations of some of the piers (up to 125 ft.) an overhead gantry with balanced cantilever erection would be worth investigating.

Foundations for the elevated flyovers are steel piles, same as the rework planned on existing bridges. The piers for these structures are either single column hammerheads, cantilevered bents, straddle bents, or in a few cases, double straddle bents (two (2) levels, supporting two (2) or more structures) depending on the geometric constraints of pier locations and adjacent travelways. They will be cast in place concrete, with expected cross sections per column in the range of 8 to 10 ft. by 6 ft. Given the height of some of the piers, there will be placement height limitations on the individual column pours. Deck details and barriers are similar to the rework planned on existing bridges.

7.3 ROADWAY

For I-75 and I-575 roadway, a 12” reinforced concrete slab is planned. It is anticipated the slab will be reinforced with one (1) layer of longitudinal # 6 rebar at 12” on centers with minimal transverse rebar. A 4,000 psi mix is likely. Control joints will be sawcut and the surface will be sealed. Adjacent placements will be doweled together.

The 12” concrete roadway slab will be bedded with a 3” layer of asphaltic 19 mm base, placed over 12” of compacted, graded aggregate base. Materials for backfilling in structural and non-structural areas will follow standard GDOT specification requirements.

Concrete side barriers will follow GDOT standards, type 7 series, type 2 series, and type 6 series. Concrete median barriers will follow GDOT standard type 20 series.

There is extensive cuts and fills along the widened alignment. At this early stage of design, fill areas are shown to be MSE wall. Excavation or cut areas are assumed to be supported by soil nailing.

7.4 BRT STATIONS

Each BRT Station is relatively unique in how they are supported structurally. Starting at the south end of the project, Cumberland Station is a large U-shaped platform directly over both I-75 NB and SB. While structural steel could be used, for maintenance and cost reasons, the structural elements supporting this platform are shown as concrete. Poured in place ft.ings and columns over driven steel piles support precast or poured in place caps. The majority of structural members are PSC BT 72’s and BT 63’s. On the BRT platform, the elevator tower will require additional support, a total of 8 plate girders spanning up to 140 ft. are required. The deck is poured in place, but precast will be also be investigated. The parking garage for Cumberland Station is multi-level, but set down to take advantage of a depression in grade with retaining walls at the two (2) corners.

Terrell Mill Station and Marietta Station are both located in the median of the proposed alignment. Terrell Mill Station is supported on an elevated 2300 ft. long bridge structure supported by columns at 30 ft. spacing, straddle bents at Terrell Mill Rd. and BT 63’s spanning the 105 ft. width. Marietta Station is also elevated, but is structurally supported on a backfilled MSE wall structure. Terrell Mill will have a surface parking lot on the west side of I-75 SB, while Marietta Station will have a multi level precast concrete parking garage also on the west side of I-75 SB. The Marietta Station has a grade issue between the elevation of the BRT median Station and the top level of the parking garage. A tower may be required to achieve the elevation and clearance needed over I-75 SB.

Franklin Station and Town Center Station are both on raised platforms away from the highway alignment. HOV access points are located within the median of I-75 with bridge structures allowing Buses and HOV traffic access to the Stations. Poured in place columns with PSC members and poured in place decks are anticipated.

Cumberland Station, Terrell Mill Station, and Marietta Station require pedestrian bridges to span over I-75 SB. It is anticipated that these bridges will be utilize a steel box girder design. There are specialty subcontractors who can provide these for the spans anticipated on this project. They can be lifted in place with all but the concrete deck and finishes installed.

Regarding architectural finish materials for the BRT Stations, the pedestrian bridges will likely have standing seam aluminum roofing. Enclosing the bridges with a combination of louvers and lexan panels will be discussed. Canopy structures will be fabricated of aluminum with an anodized finish.

Windscreens will be aluminum framed with high impact glazing, probably lexan. Stair enclosures will likely have a considerable amount of glass. The perimeter of each bus bay area is a 4 ft. high concrete wall with rail or fencing. The surface of the pedestrian areas are broom concrete finish.

8 – UTILITIES

8.1 UTILITY TYPES

As discussed in Section 3.1 of this report, GTP has completed a Level B subsurface utility engineering (SUE) of the I-75 and I-575 corridors. Some of the utilities owners identified within the NWC Project limits include; The Northeast Georgia Railroad, Adelphia Cable, Cobb County Water and Sewer, Georgia Power, Comcast Communications, Atlanta Gas and Light, Cobb EMC, MEAG Power, Marietta Power, Colonial Pipeline Company (petroleum lines), City of Marietta , Bellsouth, Cobb County DOT, Cherokee County Water, MCI , Georgia Department of Transportation.

These are the current owners as identified in the project's SUE work completed to date. Due to the long duration of the project, both the I-75 and I-575 corridors will need continuous monitoring to address any additional utility installations ongoing, planned or permitted.

The types of utilities identified include both the major and minor utility crossings under or over the corridor, along with the utilities within the corridor's existing and proposed ROW. The key utilities located include: waterlines, sanitary sewer both gravity and force main lines, petroleum lines, electrical transmission and service lines, gas lines, cable TV, Phone and other communication lines, local traffic control lines, and GDOT ATMS system.

Many of the utilities are presently supported under existing bridges requiring demolition and replacement as part of the scope of the NWC Project. All utility work will require close coordination and cooperation by all parties to avoid delays to construction activities.

8.2 MAJOR UTILITIES BY SEGMENT

The utility information has been put into a data format and will be put into the project's utility database. Locations of individual utilities can be created by plotting this information on the appropriate mapping file. The listing of utilities by station and type for both I-75 and I-575 are attached. See Appendix J, Utility Matrix for I-75 and Appendix K, Utility Matrix for I-575.

The upcoming work required for the utilities is discussed in Section 3 with early construction packages, detailed in Section 3.1-Utility Relocation. This includes the various stages of utility drawing development and establishment of utility agreements. Also included in Section 5 is the construction risk associated with each segment, along with the prevalent utilities in each segment.

In addition to the work described in Section 3.1, additional work in identifying certain utilities to a Level A upon the selection of the final corridor alignment will be required. Advances in both the I-75 and I-575 corridors to a Level A may be warranted.

9 – Traffic Incident Management

The overwhelming majority of work associated with the NWC Project will be performed in close proximity to the large volumes of traffic on I-75, I-575, and I-285. Properly designed and implemented construction work zones will help protect the traveling public from construction dangers, while protecting construction workers from the dangers of adjacent traffic. Every precaution must be taken to mitigate the possibility of traffic incidents. Traffic control devices and procedures must be designed and implemented to guide the public safely past the work zone. As an integral part of an overall Traffic Incident Management (TIM) Program for the NWC Project, construction will develop, train personnel for, and execute a TIM plan.

To accomplish this goal, GTP will utilize the information provided in the *NWC Recommendations for Incident Management Planning and Construction* dated August 2006. In addition, both joint venture partners of GTP, Bechtel and Kiewit, have the plans and experience from other large highway projects where traffic incident management was paramount to the work.

The draft report has in Table B-1 a list of prioritized recommendations during construction. These will be discussed in order:

- **HERO Units and Towing Support:** Highway Emergency Response Operator (HERO) units have proven to be effective in decreasing the impact of traffic incidents on highways in the Atlanta metro area with timely response to clear minor incidents and reduce the opportunity for more severe secondary crashes. In addition they provide timely input to the Transportation Management Center (TMC). Providing space in the work zone for dedicated HERO units can be accommodated.

  On site Towing support and dedicated police presence are also part of this recommendation and will be supported.
- **Strategic Deployment of ITS Devices:** This is the placement of temporary devices in advance of a construction work zone to warn motorists of approaching Construction activity or a lane closure or a detour. They are called variable message signs (VMS) in some states and changeable message signs (CMS) in others. They are an integral part of a designed and approved temporary traffic set up and will be employed by construction.
- **Real – Time Tracking of the Queue:** This recommendation relates to the existing ITS system, possibly supplemented by additional CMS and the fiber cables which will need to be relocated during construction. It is apparent that a temporary ITS system will need to be designed and implemented during construction. This system is an effective method to keep motorists informed of queue locations to enable them to modify their travel routes and even provide recommended alternate routes.
- **Temporary Construction TMC:** This recommendation will need the most work to further explore and determine if the cost, is warranted for the benefits derived. It may be that implementing a temporary Construction Traffic Management Center (CTMC) is the most prudent step to take. The key is defining roles and responsibilities between the existing TMC and a proposed CTMC. Duplication of responsibilities may not be desirable and insertion of additional steps to a rapid response may not be warranted. Historically the majority of these incidents are related to worker injuries and utility disruptions. Traffic related incidents are included in the scope of incident management. Response by construction forces to assist in accident clearing as well as mitigating excessive queues are part of this. The key point in discussion will be authority to make decisions related to the highway. Directing the public via CMS to seek an alternate route is an example. Authority to approve submitted traffic plans for implementing the work is another example.

  The complexity of this project and the real probability of overlapping traffic plan requests warrant the need for a central clearing house within GTP to ensure all project requests are consistent and not in conflict with each other. Communication of approved NWC traffic plans to all affected agencies, responders, and the public can be the responsibility of GTP or may be incorporated into existing TMC procedures.

Understanding the existing TMC procedures and how they might be supplemented or augmented to include the resources necessary to manage traffic incidents related to the NWC Project is required before the right decision can be made.

- **Early and Well Publicized Enforcement:** This is intended to keep vehicle speeds through construction work zones down to required speeds for both the safety of the public and the safety of the workers. The presence of police details before of the work zone, as well as posted speeds and signs that state increased fines within the construction zone, are all recommended as effective and required.
- **No Parking and Tow Away Zones:** Keeping approaches to work zones clear for emergency response vehicles is essential.
- **Rumble Strips and Temporary Pavement Markings:** While rumble strips provide an effective means of slowing traffic and preventing drowsy driver type accidents, each situation will need to be weighed in terms of cost benefit and duration of need.

  Pavement markings are considered essential for all temporary lane configurations on the highways. All shifts in alignment, other than a nightly lane taking (barrels), will be re-striped. The length of time planned for a traffic shift and existing surface, asphalt or concrete, will dictate whether tape, paint, or thermoplastic is warranted. It will be the responsibility of construction to maintain lane markings.
- **Video Enforcement and Display Systems:** Variable speed display signs indicating a driver's speed are commonly used and are effective in reducing speed in construction zones.

The Incident Management Plan developed by construction will include all necessary aspects for dealing effectively with traffic Incidents. The Plan will include, but not be limited, to the following components:

- Contact listings for all affected agencies, state, county, municipalities
- Contact listings for all emergency responders
- Contact listings for all contractor emergency contacts including subcontractors
- Contact listings for utility companies
- Listing/definition of incident levels and steps to take
- Communications including radio frequencies
- Accident investigation
- Alternate route maps for traffic
- Location of area hospitals and medical centers
- Hazardous spill contacts
- Organization chart for incident management team
- Roles and responsibilities of team members
- Notifications required
- Procedures for different situations
- Dealing with the media
- Checklists