



U.S. Department
of Transportation
**Federal Highway
Administration**

Tennessee Division

October 15, 2021

404 BNA Drive, Suite 508
Nashville, Tennessee 37217
Phone (615) 781-5770

In Reply Refer To:
HFF-TN

Mr. Steve Allen
Director of Strategic Transportation Investments
Tennessee Department of Transportation
James K. Polk Building, Suite 1000
Nashville, TN 37243-0349

Subject: Review of Draft Interstate Access Request for I-75 at I-24 - Phase 2 in
Hamilton County.

Dear Mr. Allen:

The Federal Highway Administration (FHWA) has received the Tennessee Department of Transportation's (TDOT's) July 30, 2021 letter requesting review and approval of the subject project report. After reviewing the request in accordance with FHWA's Policy on Access to the Interstate System, FHWA has determined the alternatives both engineering and operationally acceptable. Therefore, the alternatives, as presented, are conceptually approved and may now proceed into the NEPA phase for environmental review and analysis. If significant engineering and operational changes occur during the course of the NEPA process, then further review will be warranted by FHWA.

To receive approval to proceed with final design, TDOT will need to notify FHWA once the NEPA process is complete, that the design studied and approved in the NEPA document is consistent with the recommended alternative from the IAR, and the project is in the current Transportation Improvement Plan/Statewide Transportation Improvement Plan and Long-Range Transportation Plan. If you need additional assistance, please contact me at (615) 781-5765.

Sincerely,

Gerald Varney P.E.
Field Operations & Finance Team Leader

cc: Ms. Pamela M. Kordenbrock, Division Administrator, FHWA TN Division
Ms. Sabrina David, Deputy Division Administrator, FHWA TN Division
Ms. Pamela Heimsness, Technical Services Team Leader, FHWA TN Division
Mr. Richard Casalone, Area Engineer, FHWA TN Division
Mr. Thor Steffen, Area Engineer, FHWA TN Division
Mr. David Martin, Congestion & Traffic Operations Engineer, FHWA TN Division
Ms. Jessica Rich, Safety Engineer, FHWA TN Division

Mr. Paul Degges, Deputy Commissioner / Chief Engineer, TDOT
Mr. Preston Elliott, Deputy Commissioner / Chief of Environmental Planning, TDOT
Mr. Jeff Jones, Assistant Chief Engineer of Design, TDOT
Mr. Dan Pallme, Assistant Chief of Environmental & Planning / Freight and Logistics, TDOT
Mr. Jim Waters, Assistant Director of Strategic Transportation Investments, TDOT
Mr. Joe Deering, Region 2 Director / Assistant Chief Engineer, TDOT
Mr. Ken Flynn, Region 2 Director of Operations, TDOT
Ms. Rachel Gentry, Region 2 Civil Engineering Manager 1, TDOT
Mr. Michael Gilbert, Civil Engineering Manager 2, TDOT
Mr. Shaun Armstrong, Civil Engineering Manager 2, TDOT



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION
SUITE 1000, JAMES K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TENNESSEE 37243-1402
(615) 741-2208

CLAY BRIGHT
COMMISSIONER

BILL LEE
GOVERNOR

July 30, 2021

Ms. Pamela M. Kordenbrock
Division Administrator
Federal Highway Administration
404 BNA Drive, Suite 508
Nashville, TN 37217

SUBJECT: Interstate Access Request
Interstate 75 Interchange at Interstate 24 – Phase 2
Hamilton County, PIN 114174.01

Enclosed is an electronic version of the subject study for your final review and approval. FHWA comments of June 17, 2021 have been incorporated.

If you have additional comments or concerns, please feel free to contact our office at (615) 741-2208 or our director, Mr. Steve Allen, by email at Steve.Allen@tn.gov.

Sincerely,

Shaun Armstrong, PE
Strategic Transportation Investments Division, C.E. Manager 2

SA/TSA

cc: Mr. Paul Degges
Mr. Jeff Jones
Mr. Steve Allen
Mr. Jim Waters
Mr. Joe Deering
Mr. Michael Gilbert
Mr. David Duncan
Ms. Sabrina David, FHWA
Mr. Gerald Varney, FHWA
Mr. Thor Steffen, FHWA

INTERSTATE ACCESS REQUEST

INTERSTATE 75 INTERCHANGE AT INTERSTATE 24

PHASE 2

HAMILTON COUNTY

PIN 114174.01



PREPARED BY

NEEL-SCHAFFER, INC.

FOR THE

***TENNESSEE DEPARTMENT OF TRANSPORTATION
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION***

This document is covered by 23 USC § 409 and its production pursuant to fulfilling public planning requirements does not waive the provisions of § 409.

1.0 Executive Summary

1.1 Overview

This Addendum Interstate Access Report (IAR) provides an update to an Interstate Access Report originally considered and approved in 2012. The project includes improvements to the interchange of I-24 and I-75 in Chattanooga, Hamilton County, Tennessee. Proposed improvements, as originally planned, consist of two phases. Phase 1, primarily consisting of widening and reconfiguring of ramps associated with the I-24/I-75 interchange and improvements to I-75 south of the interchange, is currently under construction. Phase 2 provides upgrades to the segment of I-24 west of I-75 between Spring Creek Road and South Germantown Road and improvements to I-75 north of the interchange. The Addendum IAR presents desired modifications to the original Phase 2 improvements on I-24. TDOT desires consideration and FHWA concurrence of the proposed modifications prior to proceeding with subsequent Phase 2 project development stages.

1.2 Purpose

The purpose of the Addendum IAR serves to update the previously approved IAR by presenting improvement modifications that build upon the approved design approach and enhance the safety, traffic operations and service life of the planned Phase 2 improvements. Factors indicating the need to review and optimize components of the Original IAR Phase 2 improvements included:

- Continued growth of traffic volumes within the corridor
- Replacement of the Belvoir Avenue interchange bridge over I-24
- Proposed Red Wolf Soccer Stadium and multi-use development
- Newly identified constructability issues regarding North and South Terrace as shown in the Original IAR.

1.3 Description of Modified Phase 2 Improvements

Based on review of these considerations, TDOT developed the following modifications to the I-24 Phase 2 proposed improvements:

- I-24 WB at South Moore Road – Widen the single lane off-ramp to a two-lane off-ramp with I-24 westbound lane 4 being an option lane.
- I-24 WB between South Moore Road and Belvoir Avenue – Reverse the order of ramps to an off-ramp/on-ramp sequence, resulting in removal of a short weaving section on I-24.
- I-24 WB – Extend the addition of the fourth general purpose freeway lane, with the transition to three lanes beginning prior to the South Germantown Road overpass, instead of ending east of Belvoir Avenue.

- I-24 EB between Belvoir Avenue and South Moore Road - Reverse the order of ramps to an off-ramp/on-ramp sequence, eliminating the existing 800-foot weaving section on I-24.

1.4 Summary of Results

Analysis and evaluation of the Addendum IAR conditions concluded that the proposed modifications would provide beneficial impacts. Modeling and simulation techniques, using VISSIM software, allowed tabulation of collective performance measures on a network-wide basis. Analysis results of the Modified Phase 2 showed a 7% and 6% reduction in AM and PM peak hours of delay for the network, respectively. When annualized, Modified Phase 2 reduced total peak-hour delay by 48,358 hours. Proposed enhancements that remove existing freeway weaving sections and extend the westbound widening of I-24 will result in measurable decrease average-flow densities during peak hours. The proposed Modified Phase 2 improvements are also expected to positively impact the frequency of vehicles crashes. Based on the updated traffic analysis and resulting measures of effectiveness, study findings support recommendation for implementation of the Modified Phase 2 improvements. A preliminary estimate of probable cost for all work related to the Modified Phase 2 improvements (original and proposed modifications combined) has been established as \$49.4 million. Modified Phase 2 improvements are estimated by project phase as \$2.3 million for preliminary engineering, ROW phase as \$1 million and construction phase as \$46.1 million.

2.0 Introduction

2.1 Background – Original IAR

This report addendum, and the engineering assessment found within it, provides an updated review regarding the Tennessee Department of Transportation's (TDOT) ongoing efforts to address operational and capacity deficiencies at the interchange of Interstate 24 and Interstate 75 in Chattanooga, Hamilton County. TDOT presented the project in a 2012 Interstate Access Request (Original IAR). The Original IAR recommended proposed improvements (ultimately known as Alternate 7) to the freeway and ramp system along I-24 from approximately Belvoir Avenue (Exit 183A) to its directional interchange with I-75 (Exit 185), south along I-75 to and including the US-41 interchange (Exit 1), and north along I-75 to the SR-320 interchange (Exit 3A).

The Original IAR study followed standard practices to outline the project's purpose and need, to provide preliminary engineering review, and to gain approval from reviewing agencies, notably the FHWA. The report presented project information, candidate alternate scenarios, results of technical analysis and a recommendation of preferred alternatives.

The Original IAR highlighted several motivations for completing the proposed improvements: decrease congestion, improve substandard ramp geometry, improve safety, among others. Engineering analysis prepared for the Original IAR noted high historical crash rates and truck rollovers in the vicinity of the I-24/I-75 interchange. Prior Road Safety Audit Review confirmed the frequency and severity of crash rates by documenting that the critical crash rates exceeded desired minimum ratios. Also, the Original IAR provided information showing that the project was incorporated into the Chattanooga-Hamilton County/North Georgia (CHCNGA) Transportation Planning Organization's (TPO) Long-Range Transportation Plan.

Upon completion of its planning and engineering process, which included consultation between TDOT and FHWA officials, the Original IAR identified Alternate 7 as the preferred alternate. As presented in the Original IAR, TDOT proposed to pursue Phase 1 improvements to I-75 in an initial phase, followed by the remaining improvements to I-75 and improvements to I-24 in a later project to complete the Ultimate improvements.

2.2 Phased Implementation of Original IAR

As part of its project development process, TDOT decided to break implementation of the project's proposed improvements (Alternate 7) into two phases as follows:

Phase 1 - Improvements to I-75 from the project's southern limits including upgrades to the SR-8 (U.S. 41) interchange, I-75 Welcome Center ramps, I-24 interchange and along I-75 to

the north extending across the South Chickamauga Creek bridge and ending prior to the bridge crossing Norfolk-Southern Railroad.

Phase 2 - Improvements to I-24 from the I-75 interchange westward to the Belvoir Avenue overpass and also widening of I-75 to the SR-320 interchange. The original IAR called for the planned widening of I-24 (proposed four lanes each direction) to end and be fully transitioned back to the existing three-lane cross-section just east of the Belvoir Avenue bridge overpass. Phase 1 improvements included all bridge structures and lane widening through the I-24/I-75 interchange called for under the ultimate design, with final lane tie-ins and lane balancing occurring under Phase 2 (i.e., channelization pavement markings would be used to mark-out bridge widths as wide shoulder until which time Phase 2 would be constructed thereby making all lanes along I-24 available to vehicular flow).

TDOT began preliminary design of Phase 1 in early 2018, then executed a Design-Build alternate delivery contract in late 2018 to complete the project's design and construction. Phase 1 is currently under construction and scheduled to be complete in the summer of 2021. With completion of Phase 1 expected, TDOT officials are moving forward with Phase 2 of the project, consisting of I-24 segments west of I-75 and I-75 north.

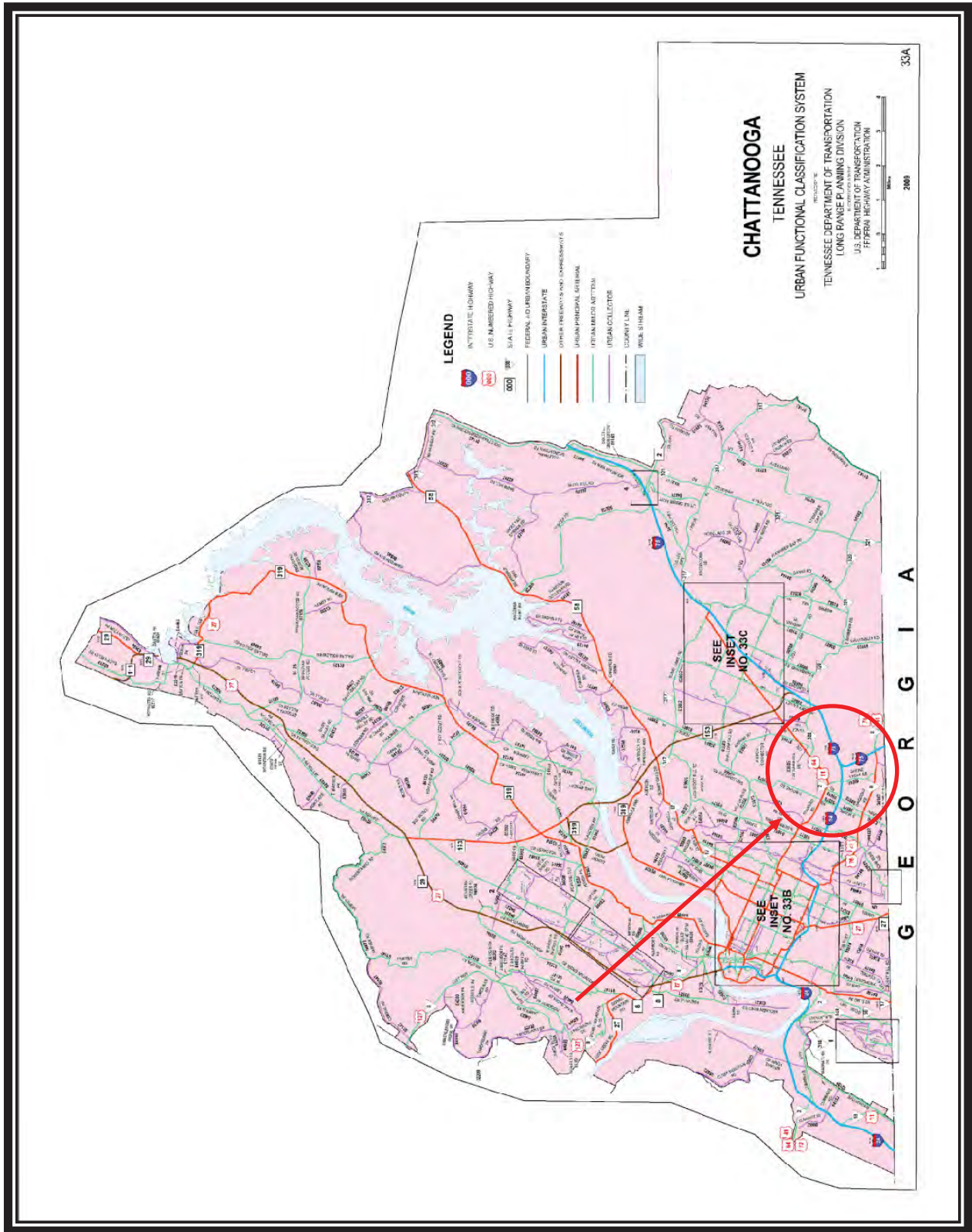


Figure 1: Study Area Map

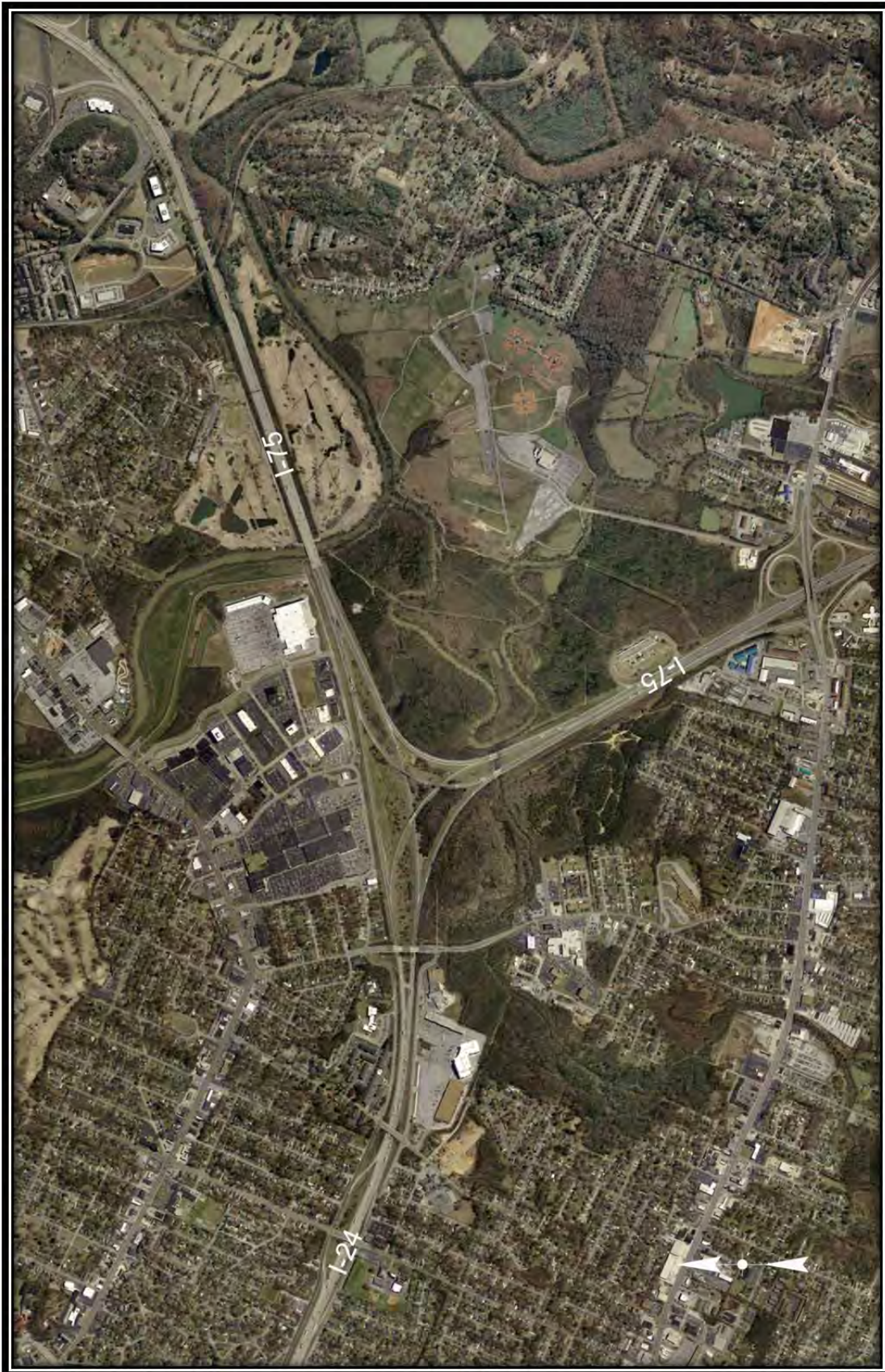


Figure 2: Project Location Map



2.3 Proposed Modification to Original IAR (Modified Phase 2)

TDOT identified the need to conduct follow-up analysis of Phase 2 (I-24 improvements) prior to performing engineering design. Preliminary engineering analysis conducted during Phase 1 found that are opportunities to optimize the planned improvements to I-24.

Purpose and Need – IAR Addendum to Optimize Phase 2 Improvements

The purpose of this IAR Addendum is to update the previously approved IAR by presenting improvement modifications that build upon the approved design approach and enhance the safety, traffic operations and service life of the planned Phase 2 improvements.

Factors indicating the need to review and optimize components of the Original IAR Phase 2 improvements included:

- Continued increase of traffic volumes traveling the I-24 corridor between I-75 and South Germantown Road,
- Replacement of the Belvoir Avenue interchange bridge over I-24,
- Proposed Red Wolf Soccer Stadium and multi-use development in the southwest quadrant of the I-24/I-75 interchange,
- Anticipated difficulty in constructing on and off ramps to North and South Terrace as shown in the Original IAR was found during Phase 1 design. Changes in ramp configurations/locations could potentially solve constructability issues and improve traffic operations.

Additional analysis was conducted that considered the following:

- Development of updated traffic volume data to represent design year 2045 conditions
- Consideration of additional improvements taking advantage of the new bridge modifications at Belvoir Avenue interchange
- Incorporation of the proposed Red Wolf development into the IAR Addendum analysis by including its predicted traffic volume demand and trip assignment in study's design-year (2045) traffic volume model
- Consideration of alternative configurations of freeway-ramp junction sequences to improve constructability, enhance traffic operations and reduce probability of crashes

Overview of Modified Phase 2

This IAR Addendum investigated modifications to the I-24 Phase 2 improvements shown in the Original IAR. Various changes to Phase 2 were considered based on TDOT's observations, a new

major traffic generator in the area, other related improvement projects and constructability. The goal of the review was to determine the most effective and cost-efficient project possible while preserving the originally intended vision and goals of the project as documented and approved in the Original IAR.

Based on the resulting review, TDOT developed the following modifications to the I-24 Phase 2 proposed improvements. These changes will be referred to as Modified Phase 2 in this document.

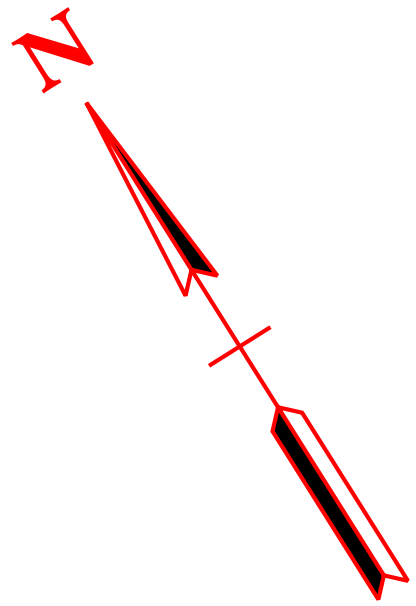
- I-24 WB at South Moore Road - two-lane off-ramp. The Original IAR maintains the current one lane off-ramp while the Modified Phase 2 provides a two-lane off-ramp with I-24 westbound lane 4 being an option lane.
- I-24 WB between South Moore Road and Belvoir Ave – modification of ramp sequence. The Original IAR is an On-Ramp/Off-Ramp sequence, while the Modified Phase 2 flips the ramps to an Off-Ramp/On-Ramp sequence, resulting in removal of a short weaving section on I-24 (approx. 1,300ft).
- I-24 WB – Extend the widened four-lane section further west. The Original IAR transitions I-24 westbound to three lanes east of Belvoir Ave, while the Modified Phase 2 extends the fourth lane, with the transition to three lanes beginning prior to the S. Germantown Road overpass.
- I-24 EB between Belvoir Avenue and South Moore Road - modification of ramp sequence. The Original IAR provides for an on-ramp/off-ramp sequence, while the Modified Phase 2 reverses the ramps' order to an off-ramp/on-ramp sequence. The proposed modification eliminates the approximate 800-foot weaving that currently exists and would remain under the approved Original IAR.




Figure 4 shows the I-24 proposed Modified Phase 2 improvements.

Figure 5 illustrates a conceptual layout for highway guide signing under proposed conditions.

2.4 Relation to Long Range Planning Process

The Chattanooga-Hamilton County/ North Georgia (CHCNGA) Transportation Planning Organization's (TPO) Long-Range Transportation Plan continues to identify the I-24/I-75 project as part of its transportation improvement plan. Phase 1 of the I-24/I-75 project is currently under construction. TDOT is moving Phase 2 through the project development process. The CHCNGA has previously identified Phase 2 of the project as a line item in its Long Range Transportation Plan. TDOT and TPO officials will monitor the need for revisions to the Transportation Improvement Program (TIP) to account for adjustments in funding authorization and project limit conformity.



 ORIGINAL I.A.R.
 MODIFIED I.A.R.
 MEDIAN BARRIER

SCALE: 1" = 150'

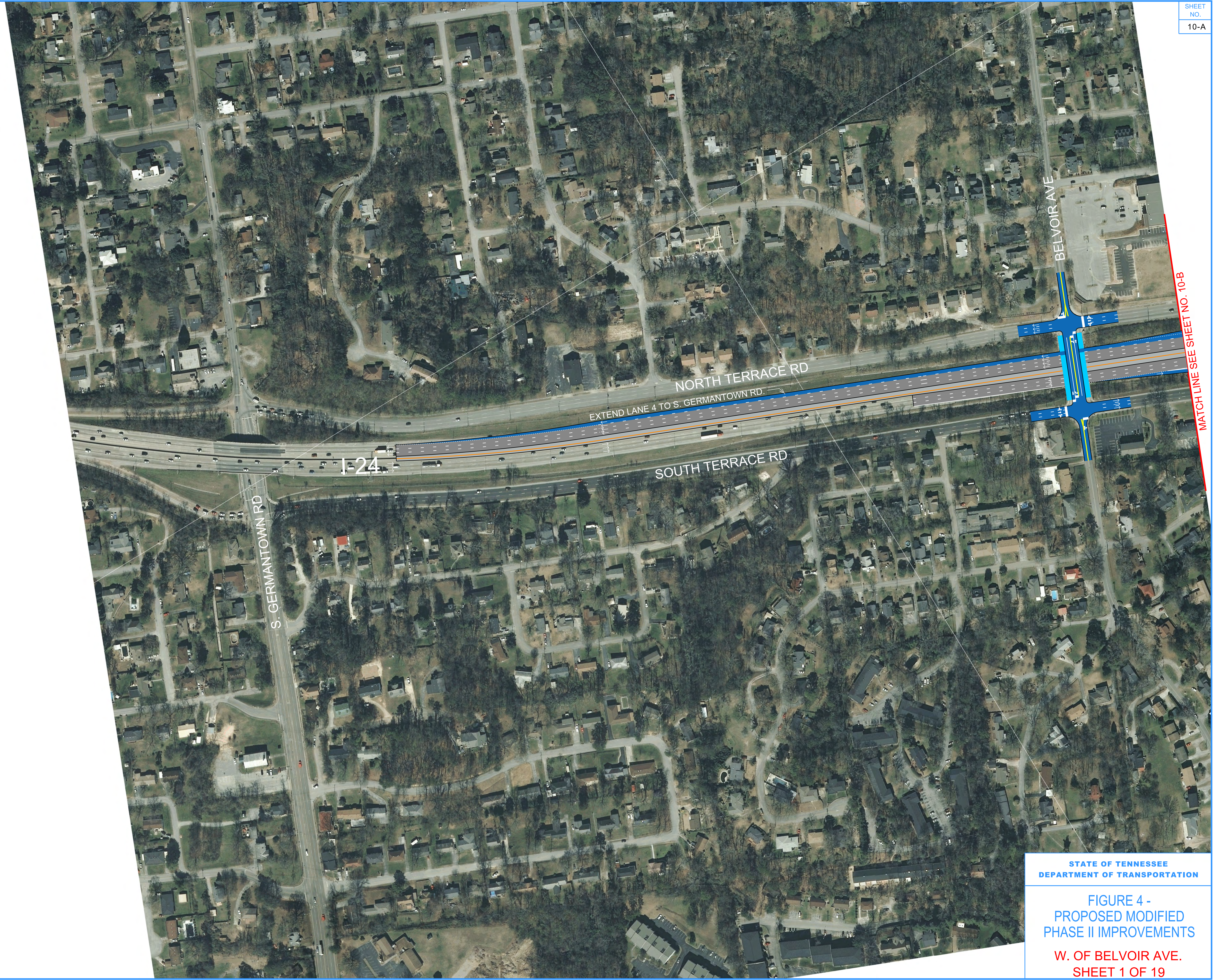


FIGURE 4 -
PROPOSED MODIFIED
PHASE II IMPROVEMENTS

W. OF BELVOIR AVE.
SHEET 1 OF 19

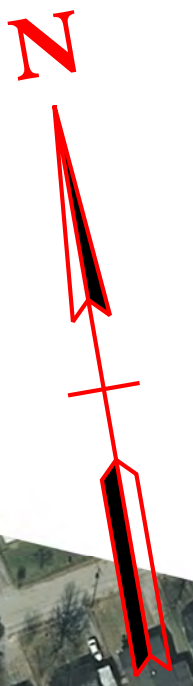


SCALE: 1" = 150'

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FIGURE 4 -
PROPOSED MODIFIED
PHASE II IMPROVEMENTS

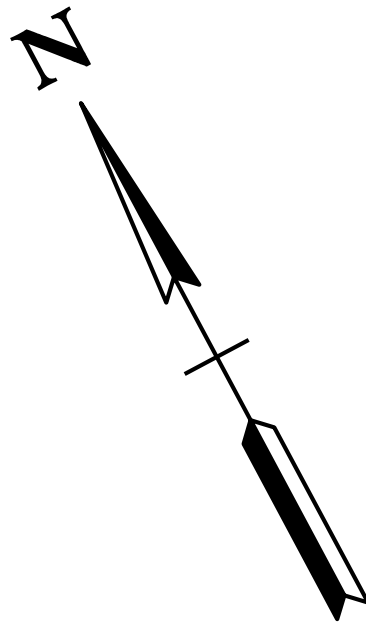
BELVOIR AVE. TO S. MOORE RD.
SHEET 2 OF 19



SCALE: 1" = 150'

E. OF S. MOORE RD.
SHEET 3 OF 19

TYPE	YEAR	PROJECT NO.	SHEET NO.
CONST.	2019	IM/NH-75-1(131)	67



NOTE:

CONTRAST STRIPING SHALL BE USED FOR ALL PERMANENT STRIPING ON CONCRETE PAVEMENT/STRUCTURES ALONG I-75.

SNOWPLOWABLE RAISED PAVEMENT MARKERS TO BE INSTALLED PER STD DWGS. T-M-5, T-M-6, T-M-7, AND T-M-8.

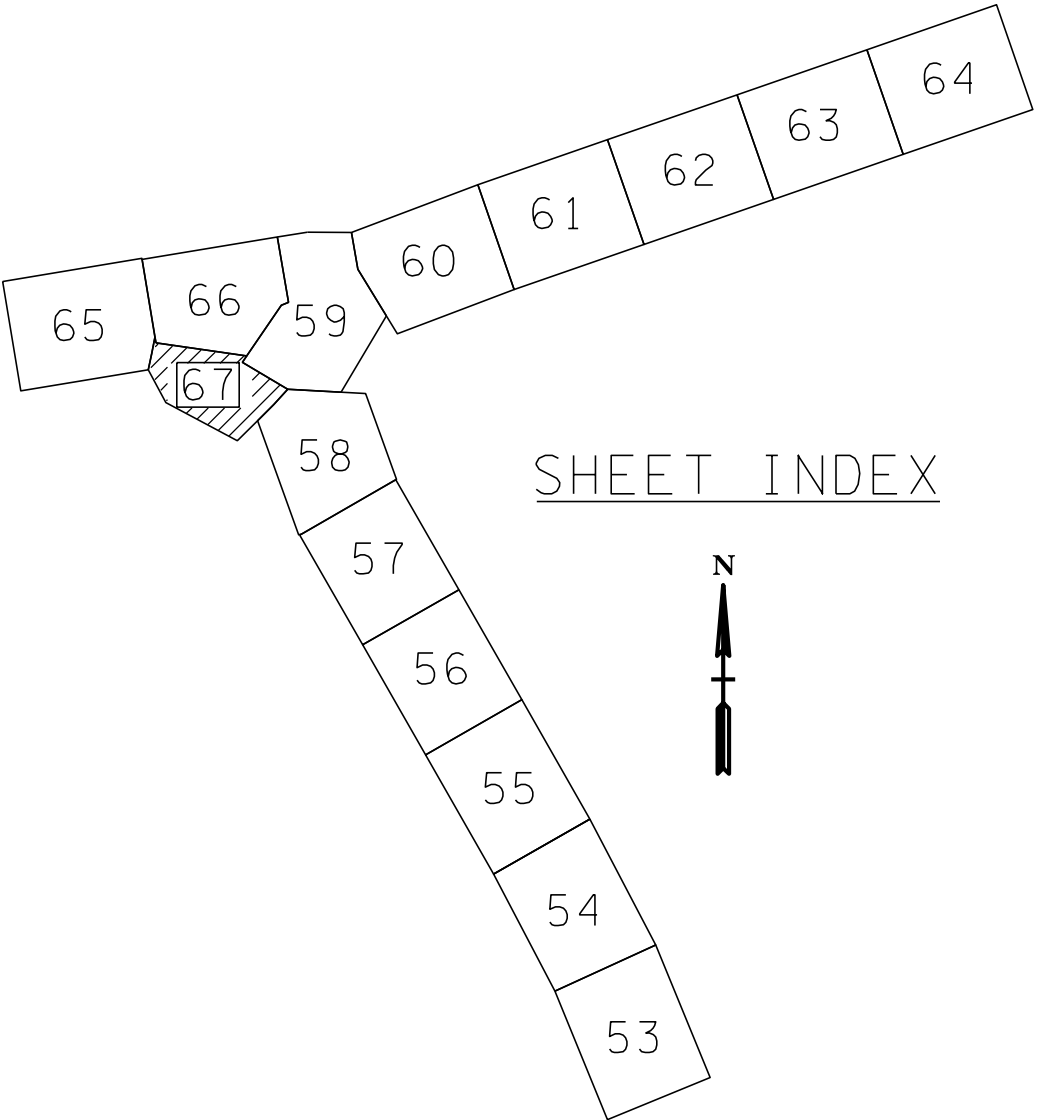
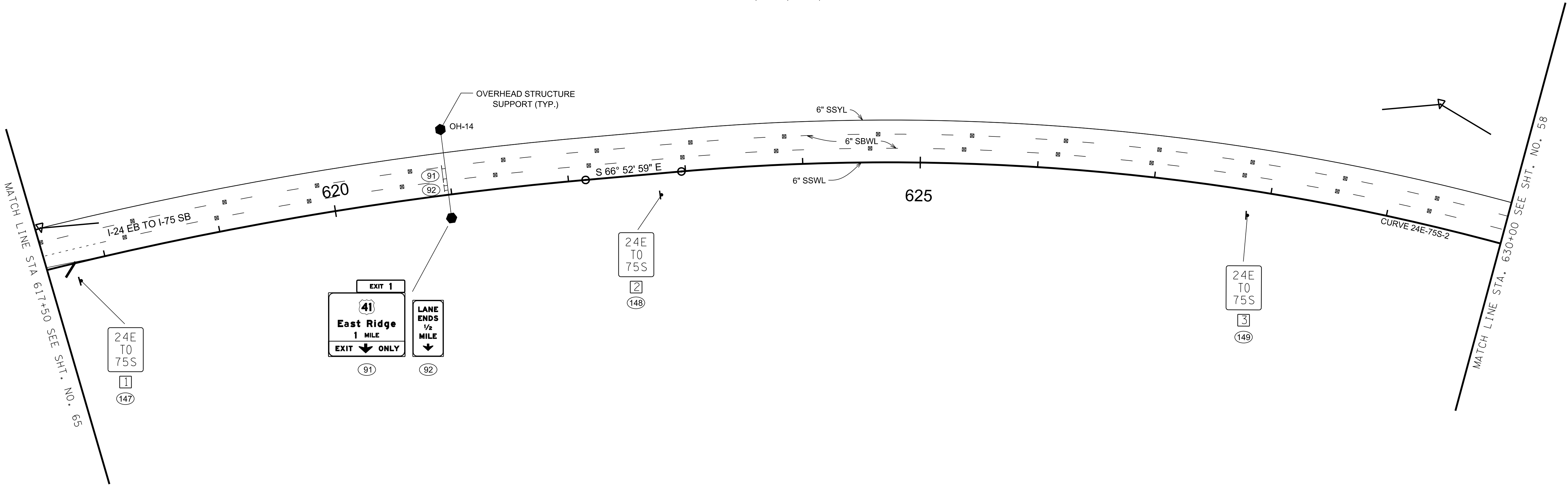


FIGURE 4

PHASE 1 IMPROVEMENTS

SHEET 6 OF 19

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TYPE	YEAR	PROJECT NO.	SHEET NO.
CONST.	2019	IM/NH-75-1(131)	53

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I-75 STA. 303+51.97

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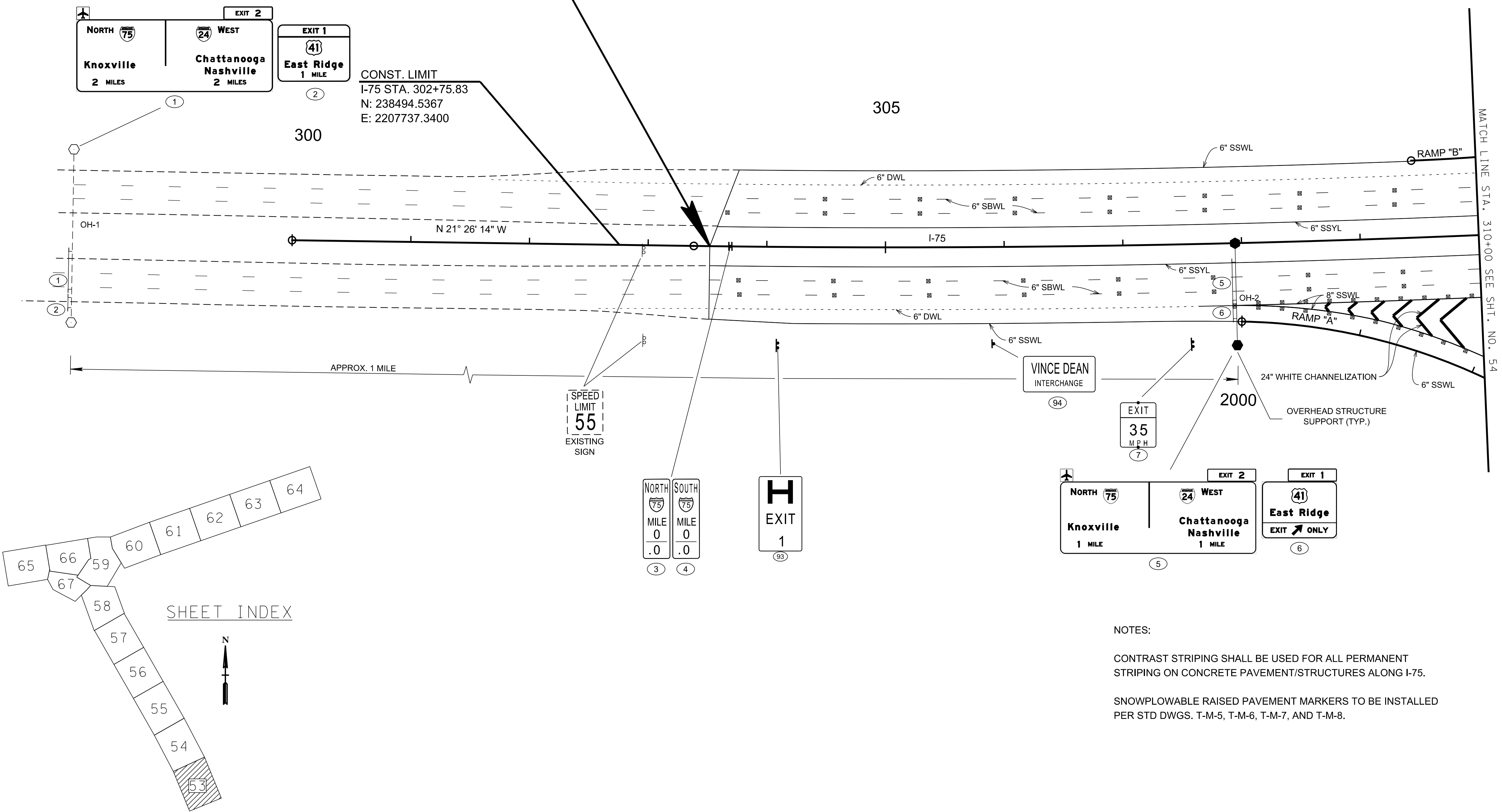
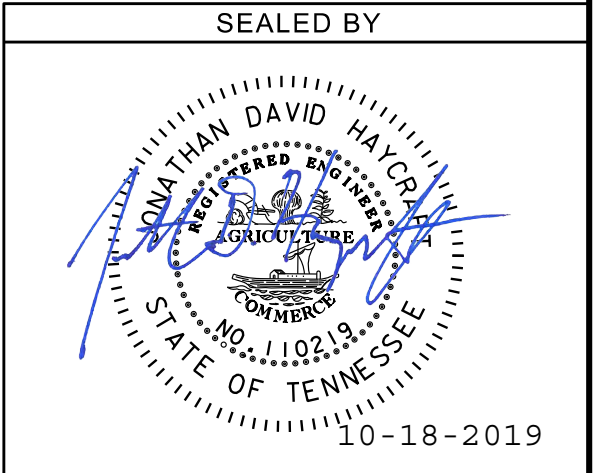


FIGURE 4

PHASE 1 IMPROVEMENTS

SHEET 7 OF 19



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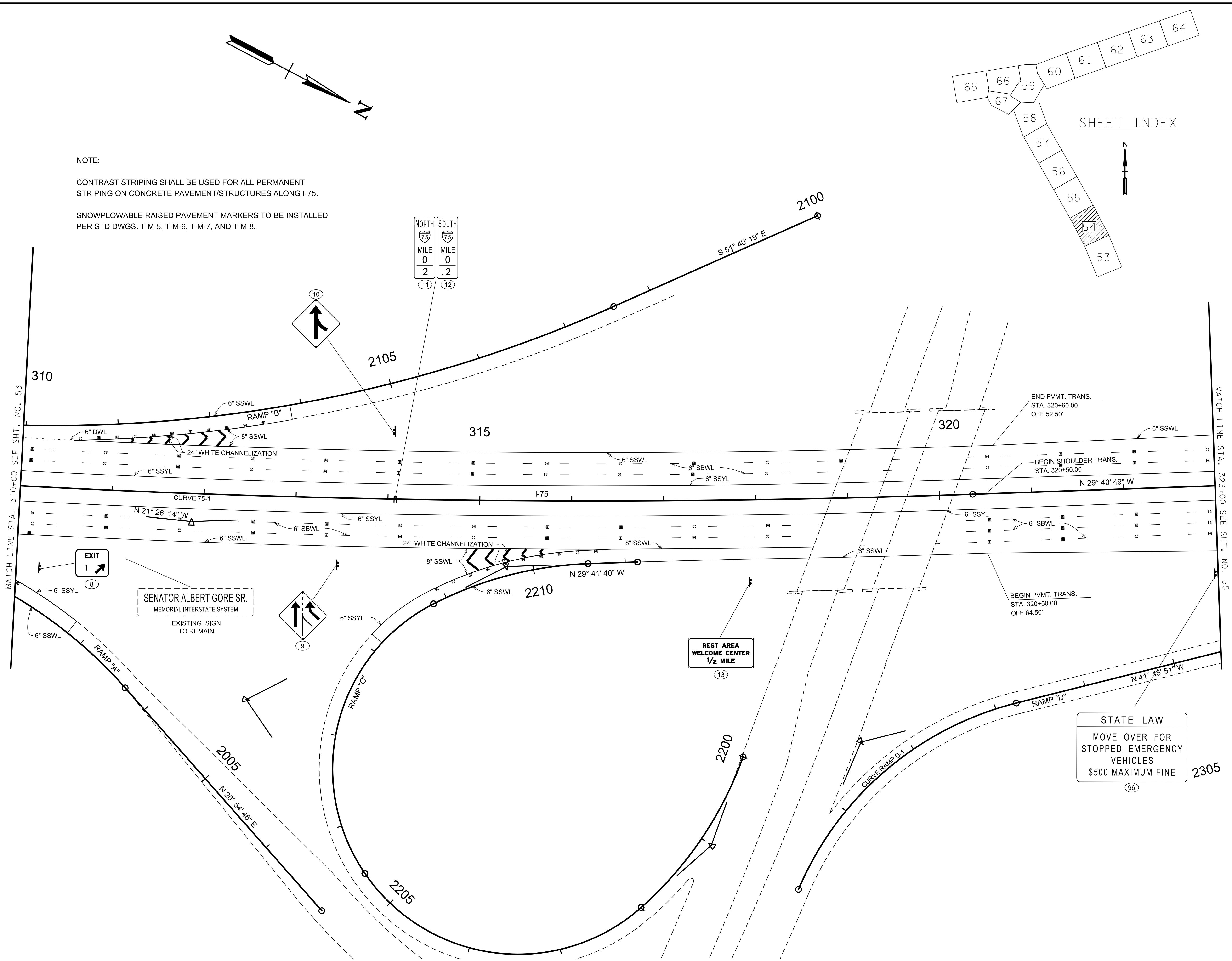
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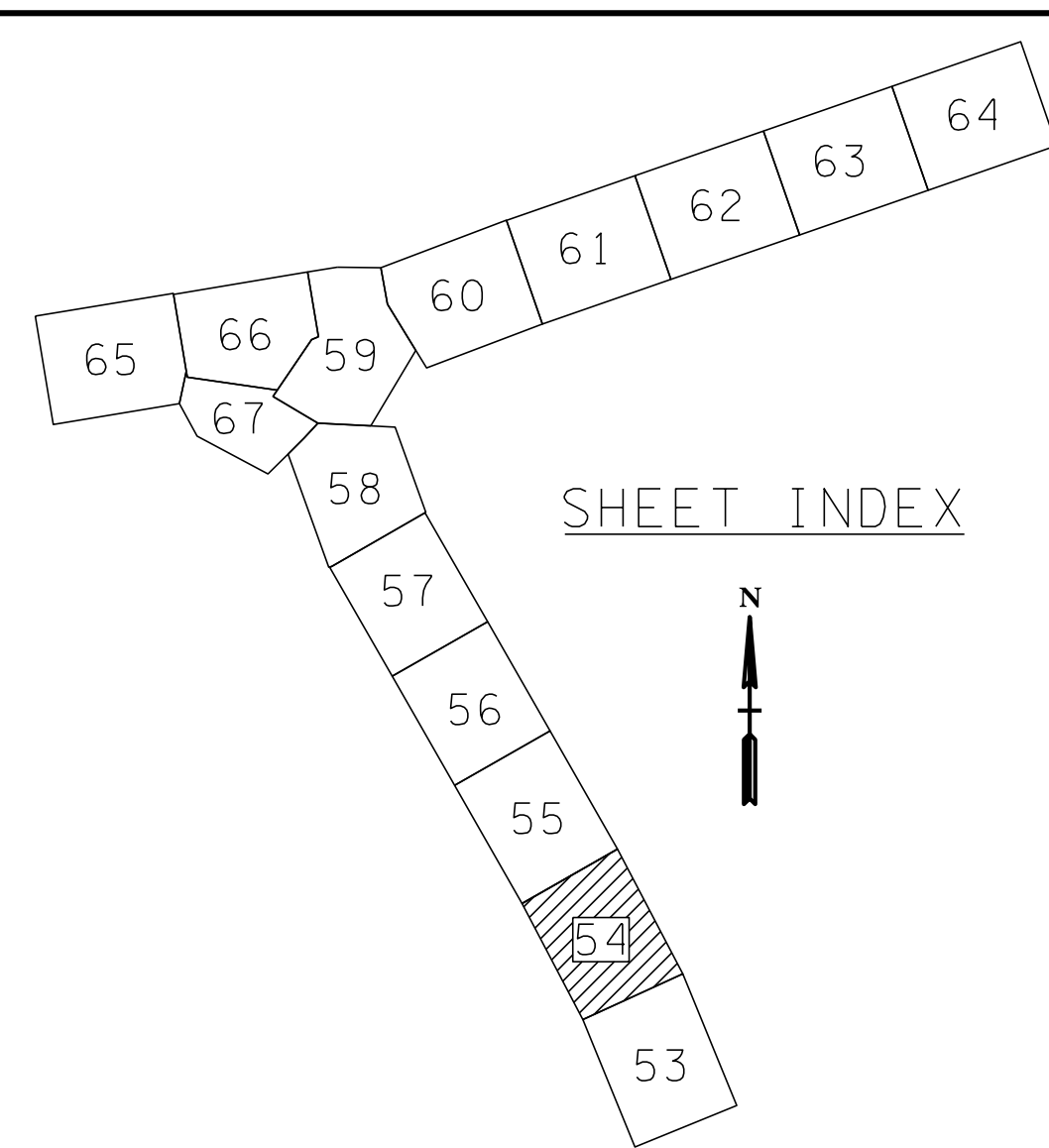
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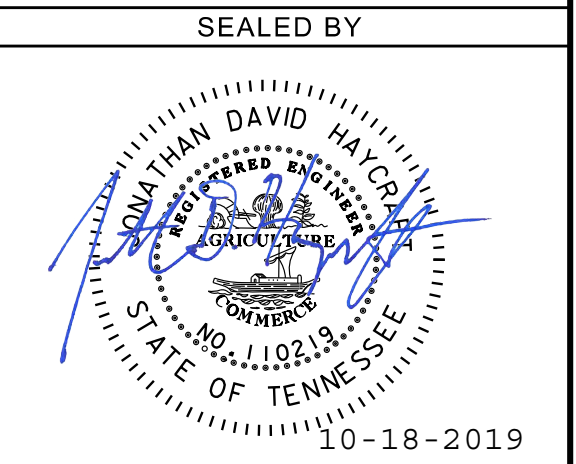
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CONST.	2019	IM/NH-75-1(131)	54

FIGURE 4
PHASE 1 IMPROVEMENTS
SHEET 8 OF 19

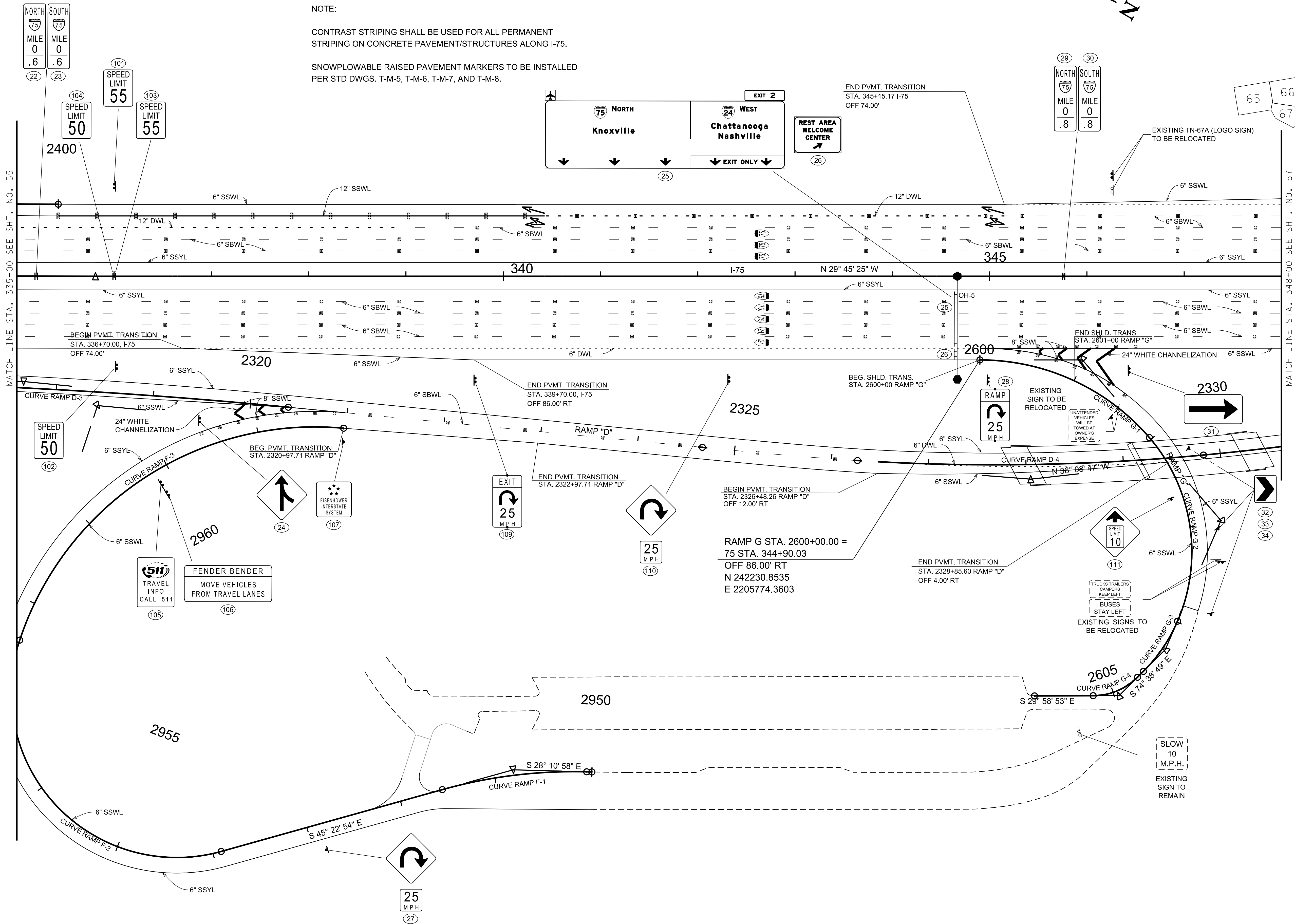


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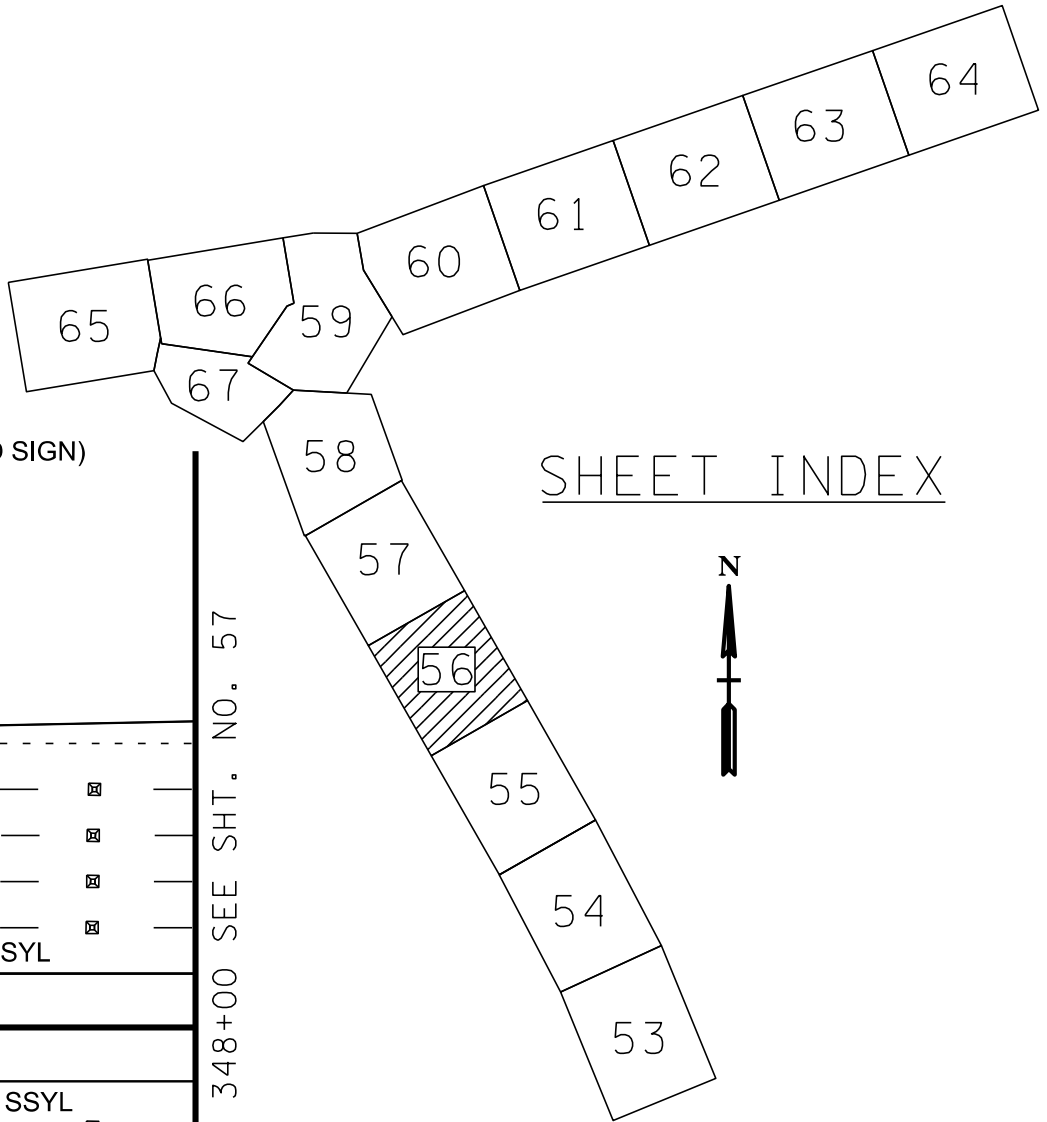
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CONST.	2019	IM/NH-75-1(131)	56



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SHEET INDEX

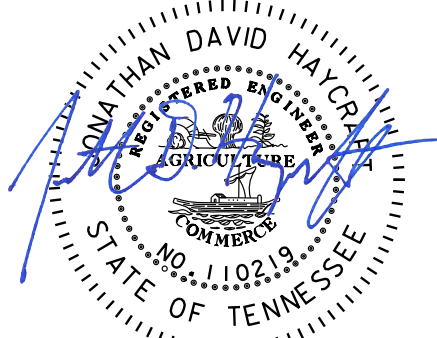


FIGURE 4

PHASE 1 IMPROVEMENTS

SHEET 10 OF 19

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CONST.	2019	IM/NH-75-1(131)	57

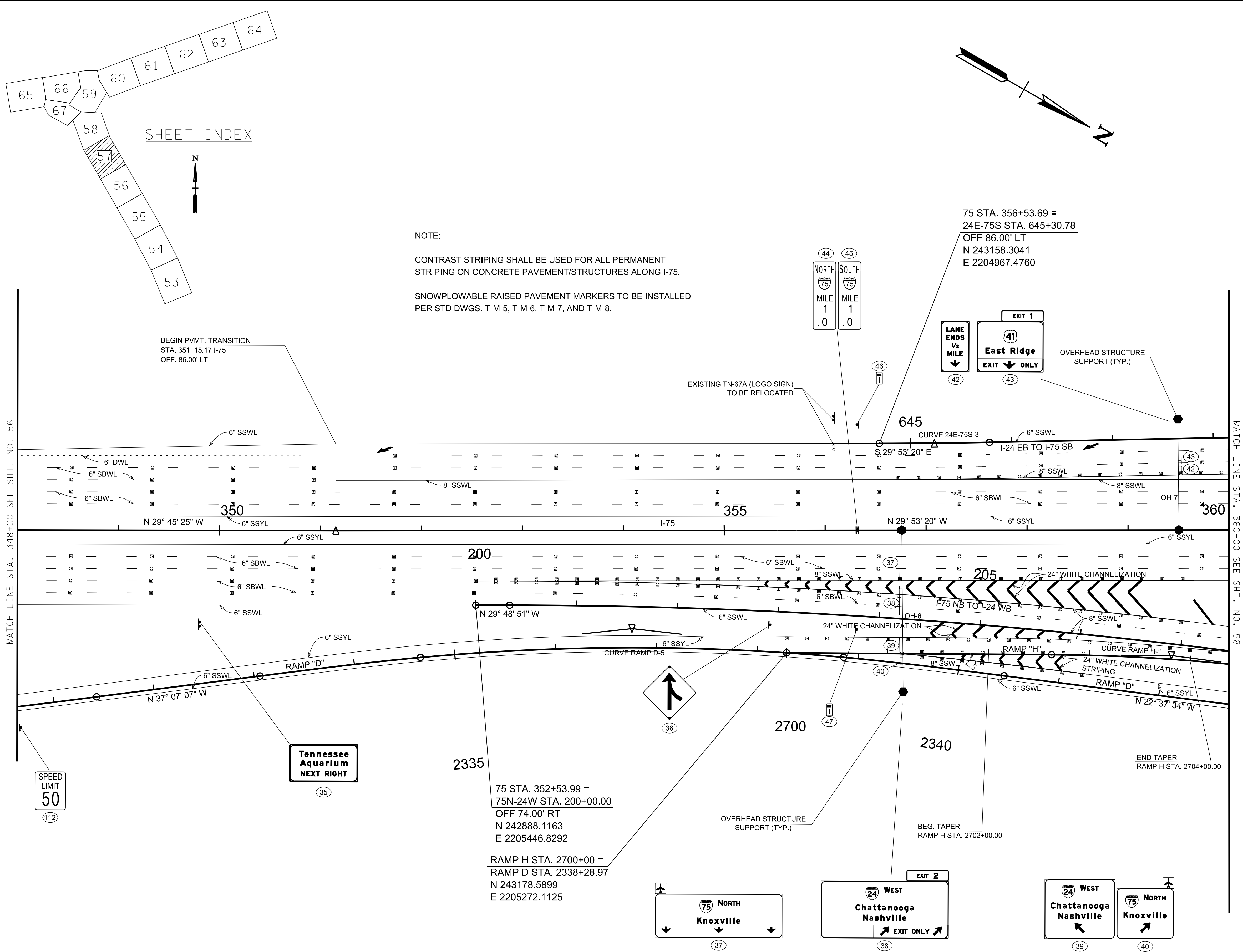


FIGURE 4
PHASE 1 IMPROVEMENTS
SHEET 11 OF 19

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TYPE	YEAR	PROJECT NO.	SHEET NO.
CONST.	2019	IM/NH-75-1(131)	58

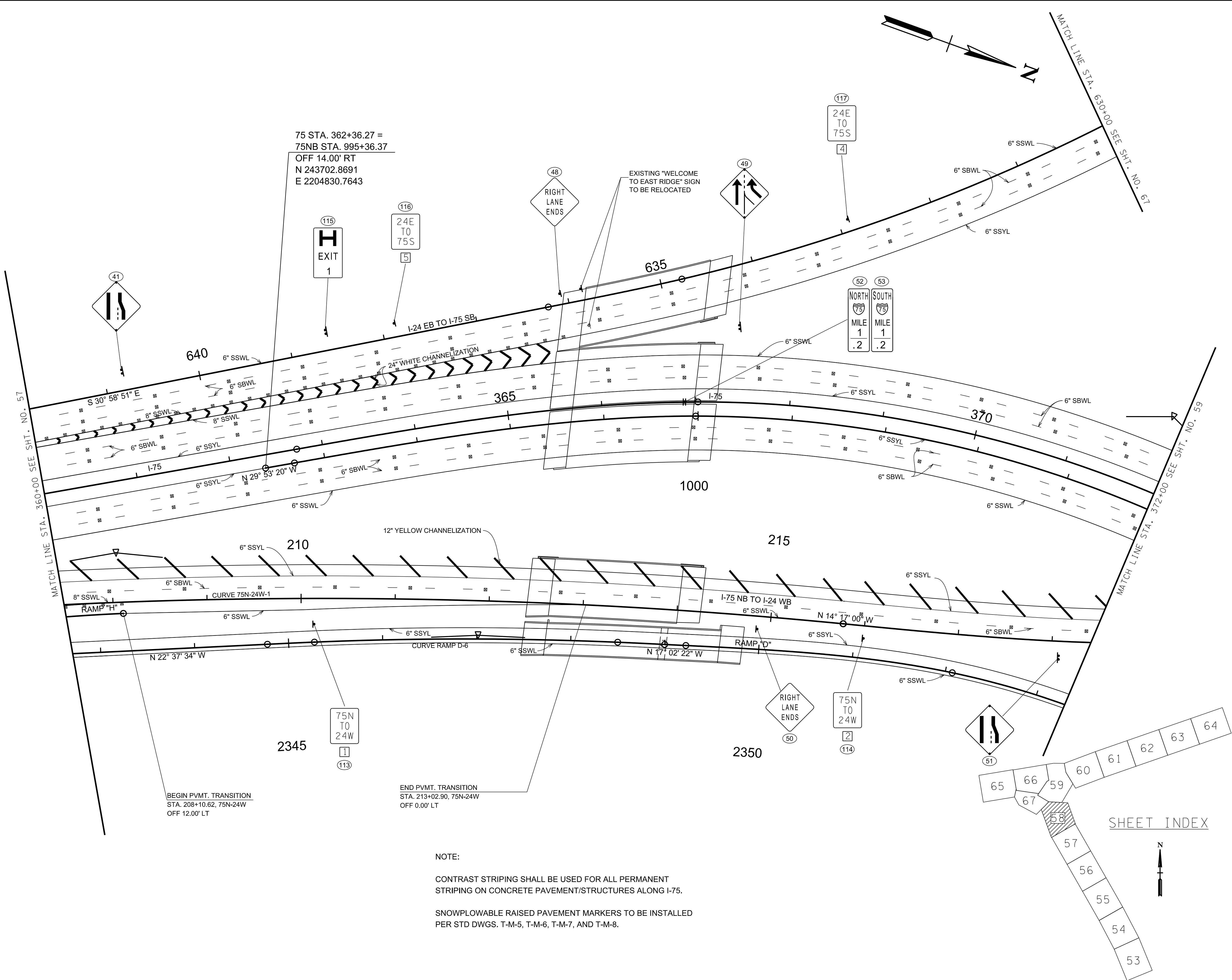


FIGURE 4
PHASE 1 IMPROVEMENTS
SHEET 12 OF 19

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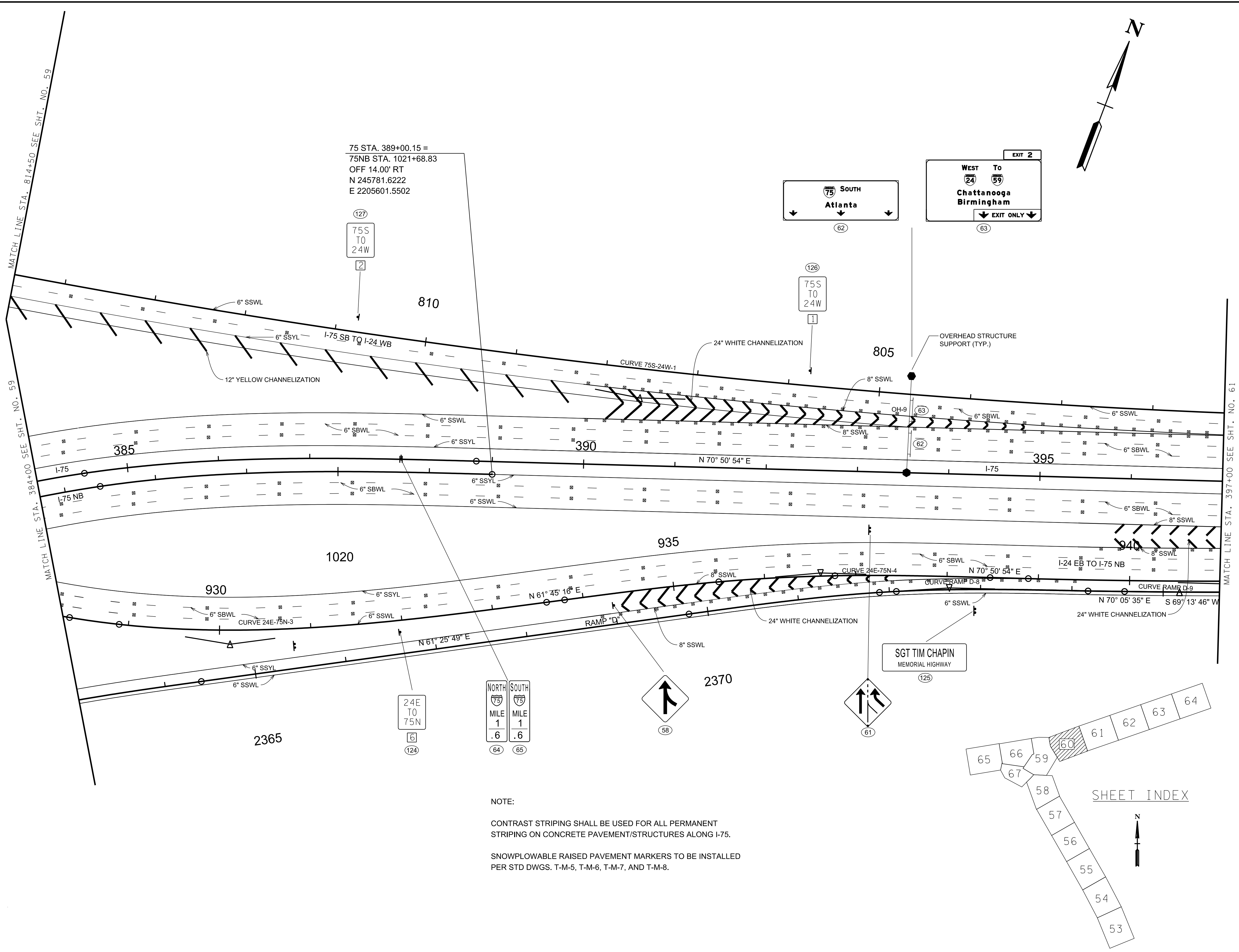
THOMAS DAVID HYATT
REGISTERED ENGINEER
NO. 119213
STATE OF TENNESSEE
10-18-2019

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CONST.	2019	IM/NH-75-1(131)	60

FIGURE 4
PHASE 1 IMPROVEMENTS
SHEET 14 OF 19

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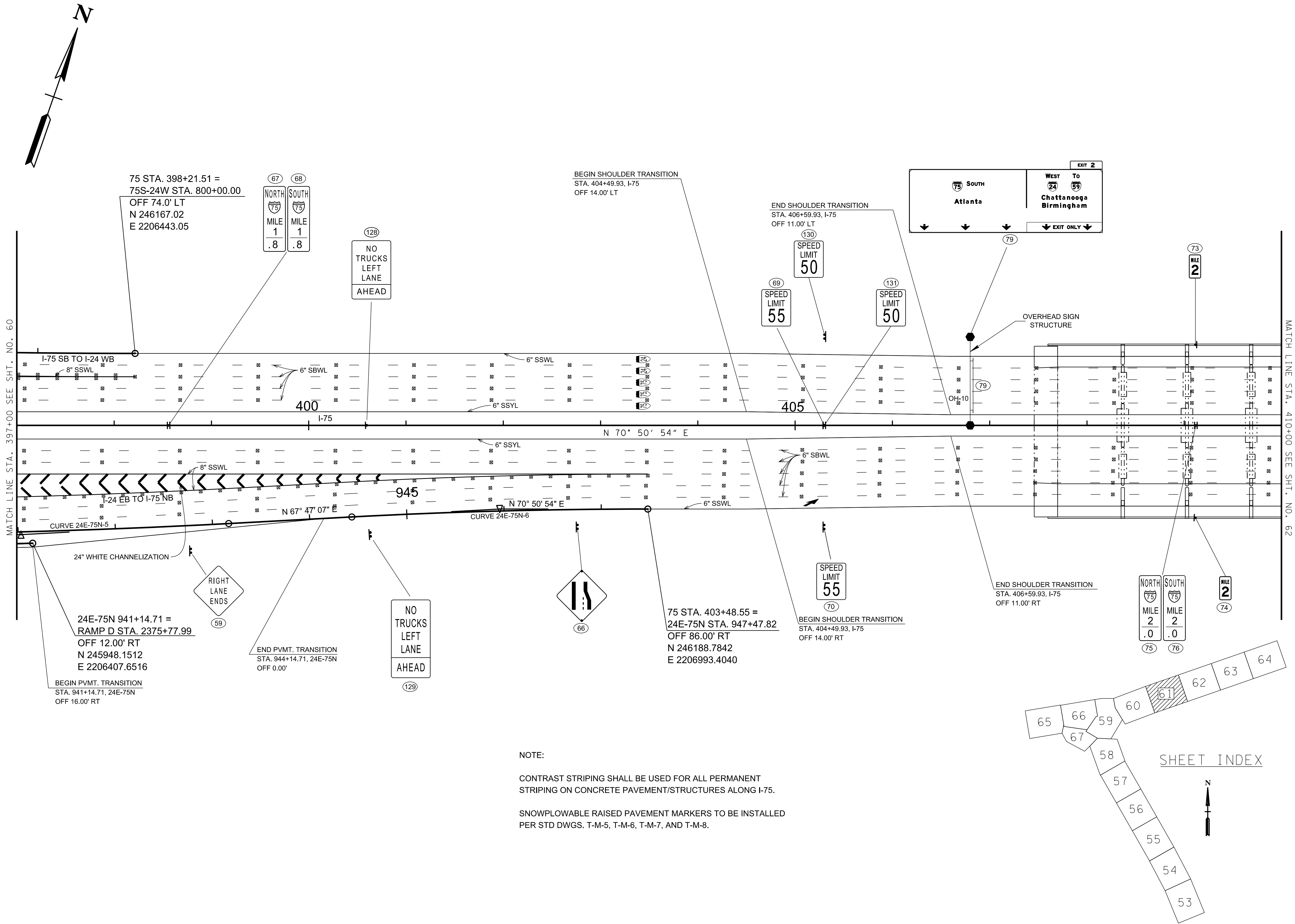


FIGURE 4
PHASE 1 IMPROVEMENTS
SHEET 15 OF 19

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THAN DAVID HYON

REGISTERED ENGINEER

NO. 110213

STATE OF TENNESSEE

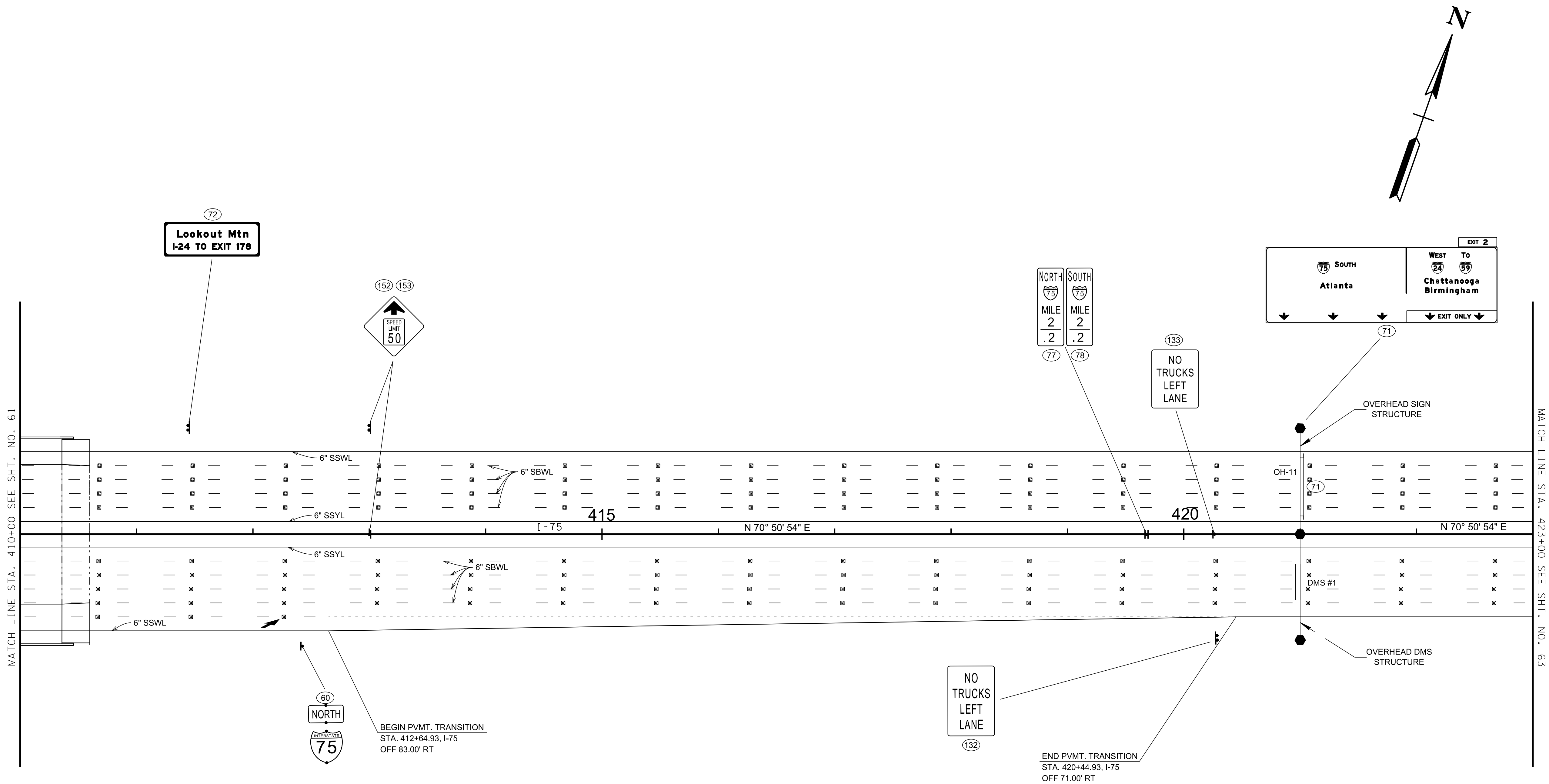
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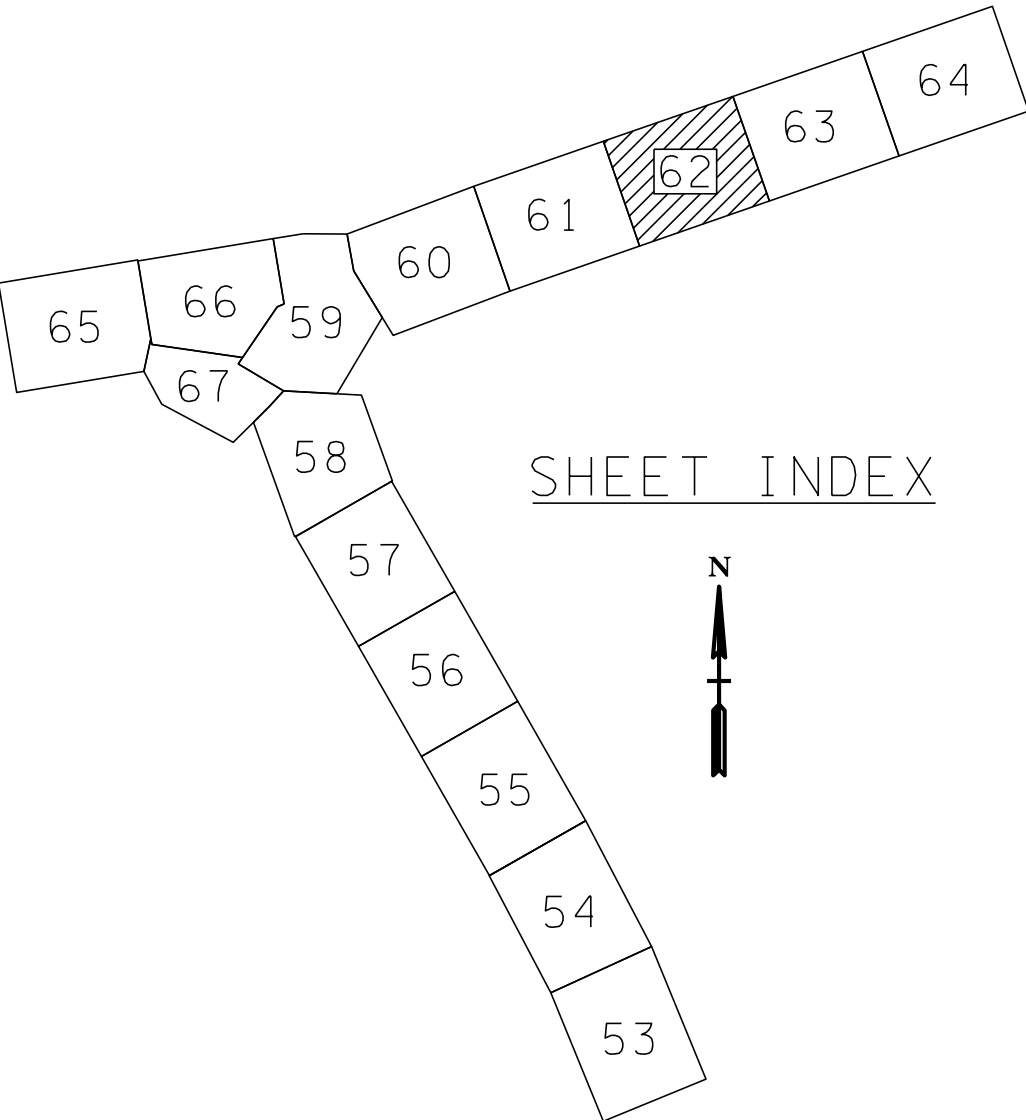


FIGURE 4

PHASE 1 IMPROVEMENTS

SHEET 16 OF 19

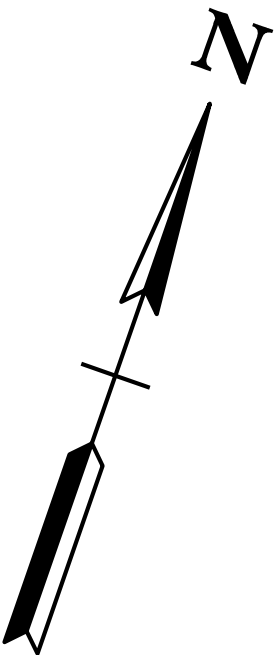
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CONTRAST STRIPING SHALL BE USED FOR ALL PERMANENT STRIPING ON CONCRETE PAVEMENT/STRUCTURES ALONG I-75.

SNOWPLOWABLE RAISED PAVEMENT MARKERS TO BE INSTALLED PER STD DWGS. T-M-5, T-M-6, T-M-7, AND T-M-8.

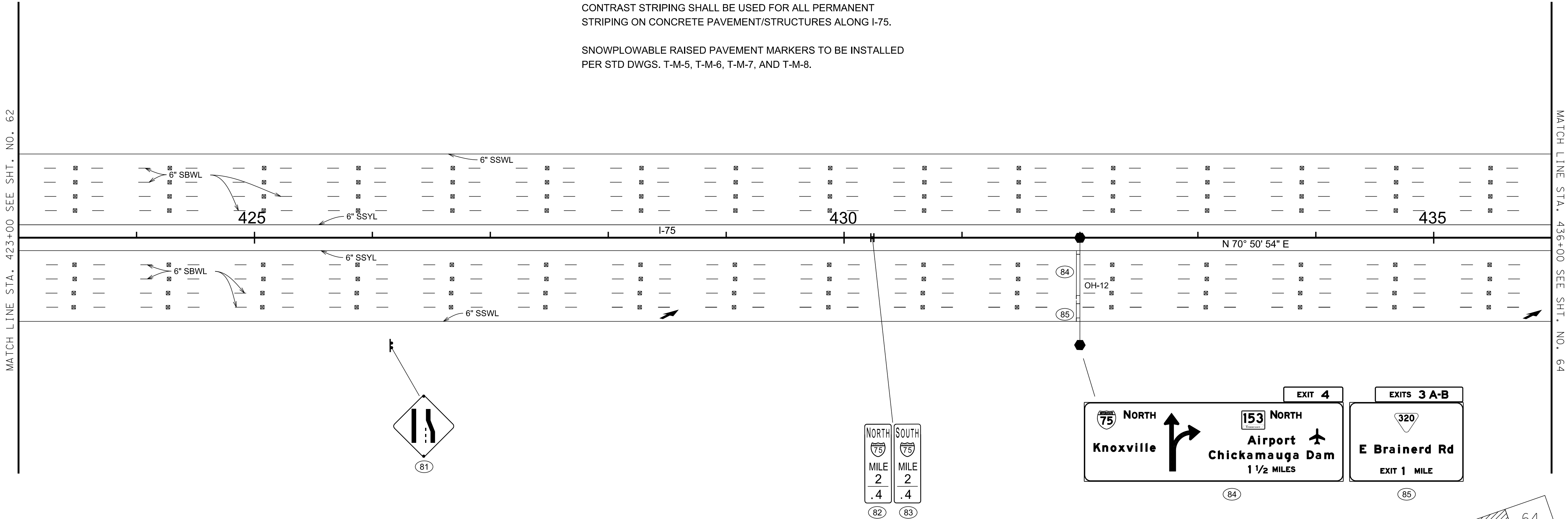
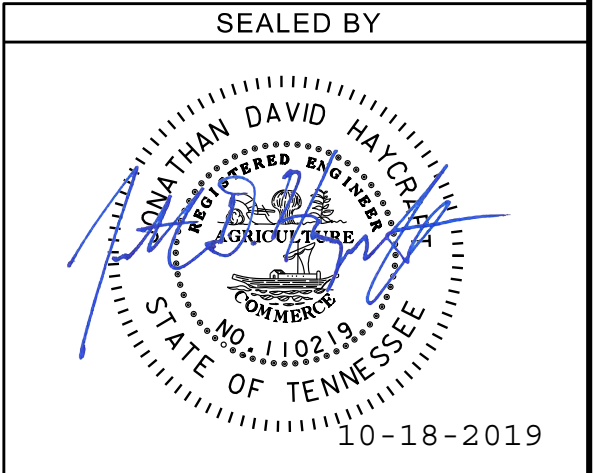


FIGURE 4
PHASE 1 IMPROVEMENTS
SHEET 17 OF 19



COORDINATES ARE NAD/83(1995), ARE DATUM ADJUSTED BY THE FACTOR OF 0.99998 AND TIED TO THE TGRN. ALL ELEVATIONS ARE REFERENCED TO THE NAVD 1988.

STATE OF TENNESSEE
DEPARTMENT OF
TRANSPORTATION

SIGNING AND
PAVEMENT
MARKING
PLANS

TYPE	YEAR	PROJECT NO.	SHEET NO.
R.O.W.	2019	33003-2166-44	16
CONST.	2019	33003-2166-44	16

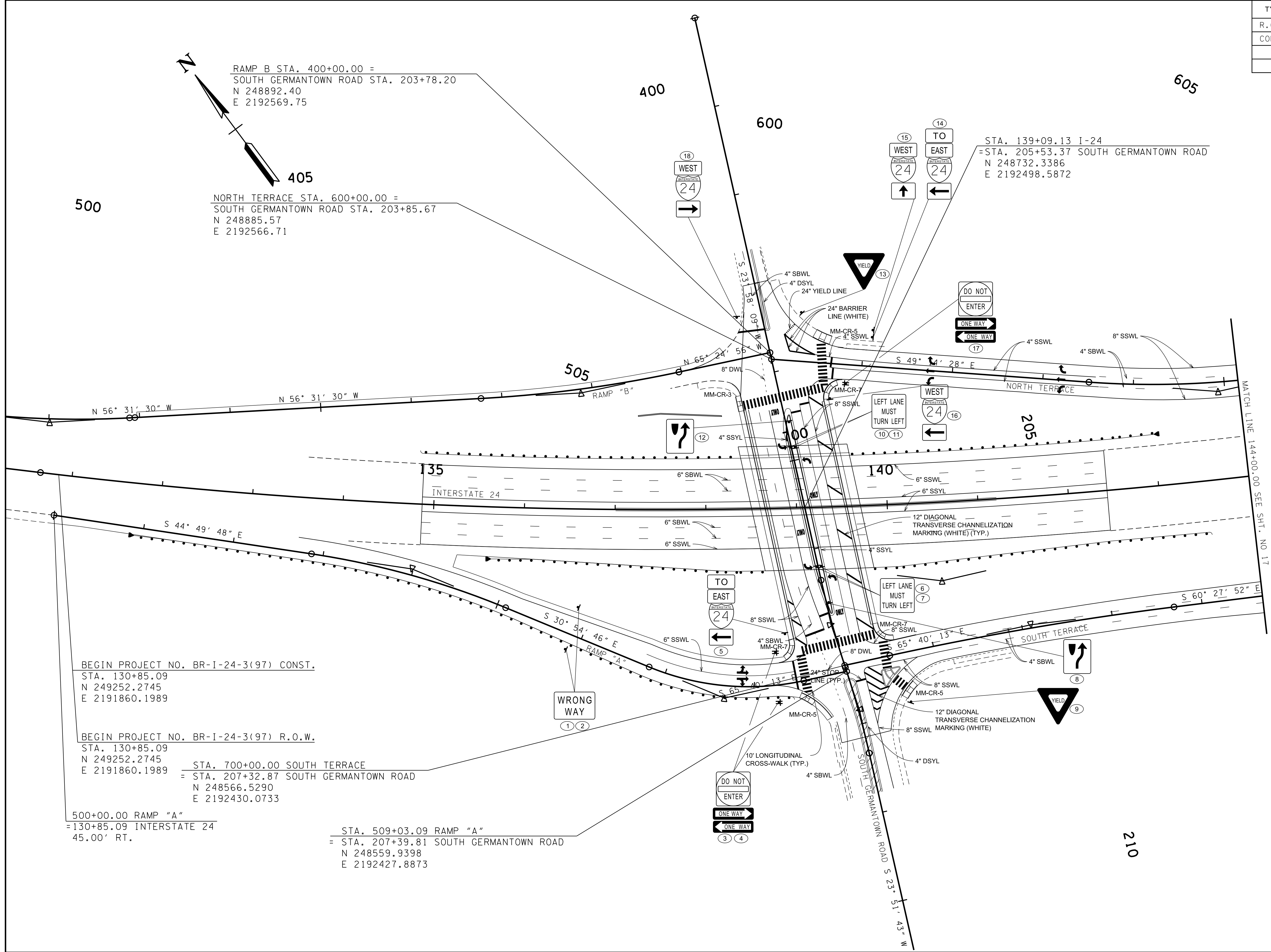


FIGURE 4
S GERMANTOWN RD
CMGC03 - BRIDGE
SHEET 19 OF 19

SEALED BY

**FINAL
CONST.
PLANS
REVIEW**

COORDINATES ARE NAD/83(1995),
ARE DATUM ADJUSTED BY THE
FACTOR OF 0.99998 AND TIED TO
THE TGRN. ALL ELEVATIONS ARE
REFERENCED TO THE NAVD 1988.

**STATE OF TENNESSEE
DEPARTMENT OF
TRANSPORTATION**

**SIGNING AND
PAVEMENT
MARKING
PLANS**

INTERSTATE 75, INTERCHANGE AT INTERSTATE 24

SIGNING AND MARKING - ULTIMATE BUILD OUT (MODIFIED PHASE 2)

STATE PROJ. NO. 44330-1185-44 (NEPA) TDOT PIN: 114174.00
HAMILTON COUNTY

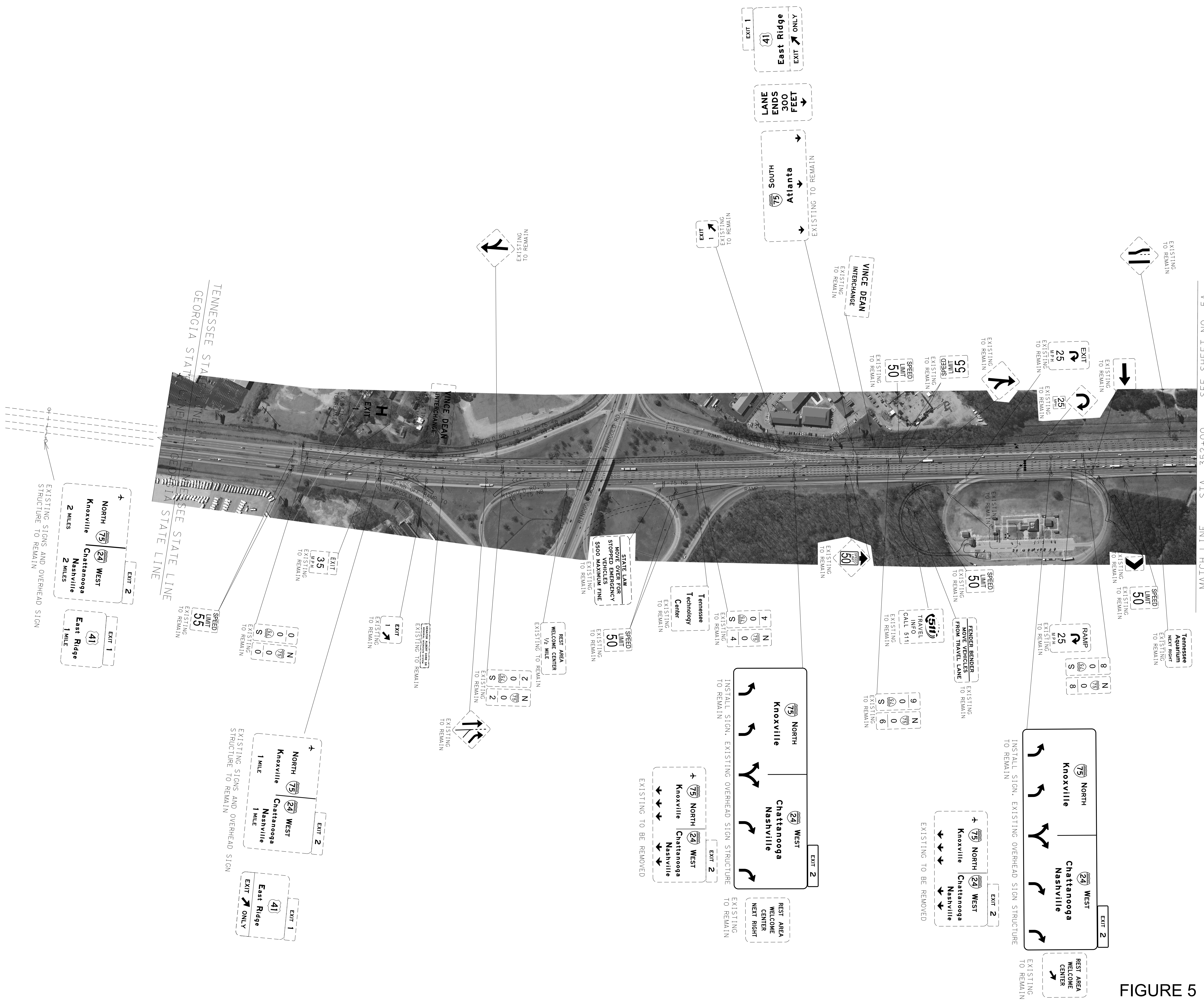
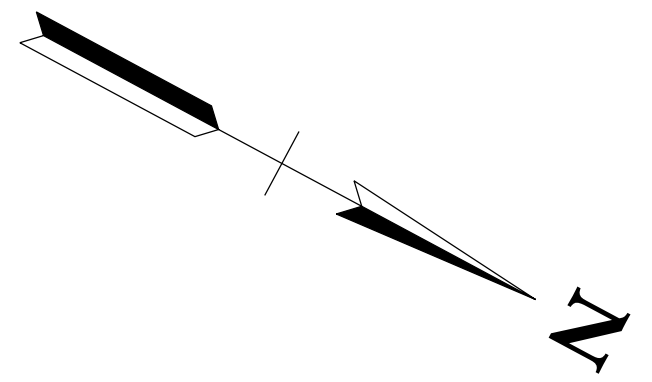


FIGURE 5

STRUCTURE TYPE	LEGEND	
	EXISTING	PROPOSED
OVERHEAD SIGN STRUCTURE		
CANTILEVER		
BRIDGE SIGN STRUCTURE		
POST-MOUNT SIGN		



APRIL 2021



INTERSTATE 75, INTERCHANGE AT INTERSTATE 24

SIGNING AND MARKING - ULTIMATE BUILD OUT (MODIFIED PHASE 2)

STATE PROJ. NO. 44330-1185-44 (NEPA) TDOT PIN: 114174.00
HAMILTON COUNTY

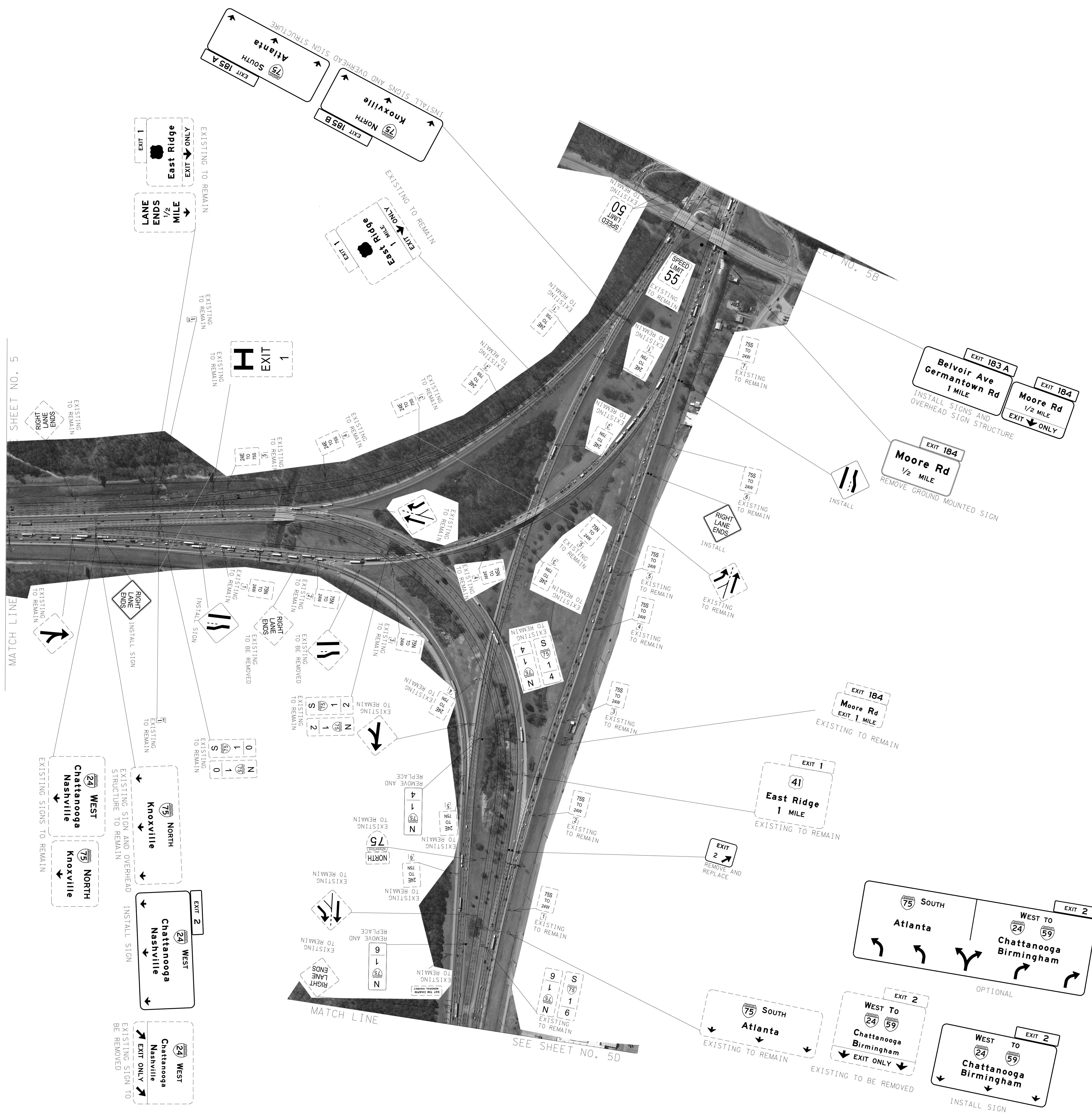
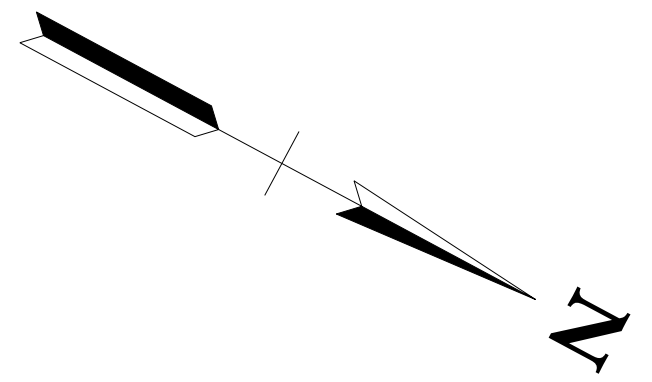


FIGURE 5A

STRUCTURE TYPE	LEGEND	
	EXISTING	PROPOSED
OVERHEAD SIGN STRUCTURE		
CANTILEVER		
BRIDGE SIGN STRUCTURE		
POST-MOUNT SIGN		



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0 200 400 600

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HAMILTON COUNTY




TN
TDOT
Department of
Transportation

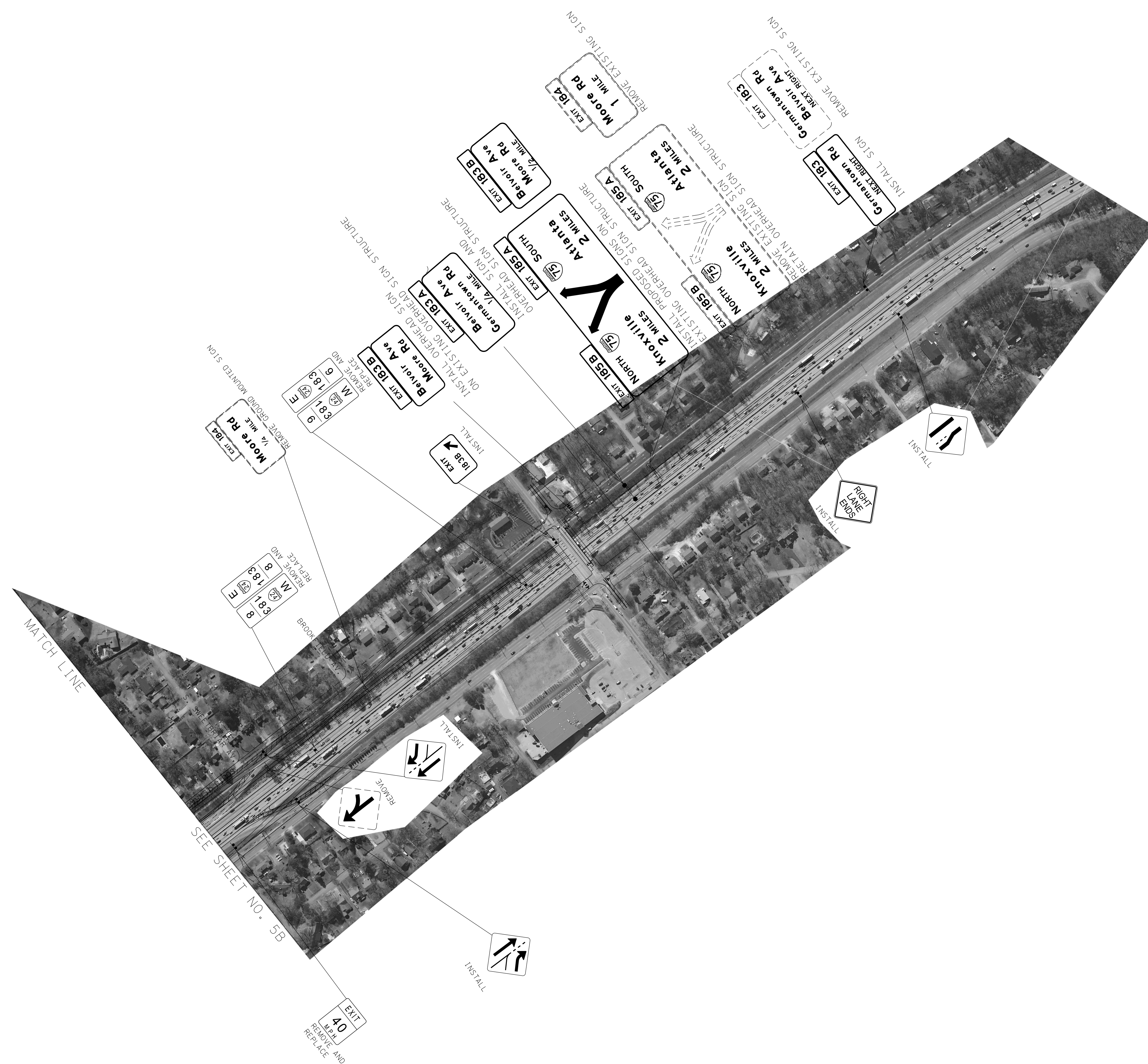
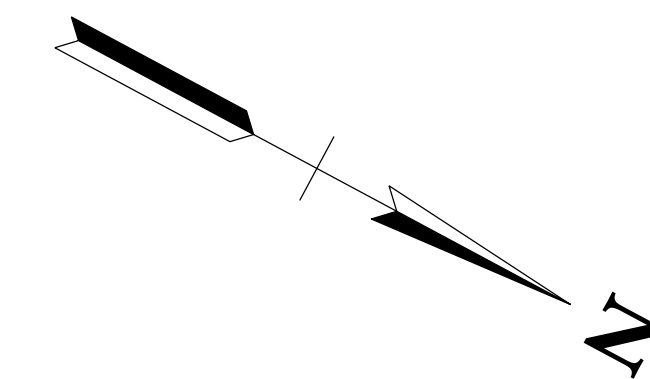
APRIL 2021

SCALE IN FEET

0 200 400 600



STATE PROJ. NO. 44330-1185-44 (NEPA) TDOT PIN: 114174.00
HAMILTON COUNTY



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0 200 400 600



LEGEND		
STRUCTURE TYPE	EXISTING	PROPOSED
OVERHEAD SIGN STRUCTURE		
CANTILEVER		
BRIDGE SIGN STRUCTURE		
POST-MOUNT SIGN		



INTERSTATE 75, INTERCHANGE AT INTERSTATE 24

SIGNING AND MARKING - ULTIMATE BUILD OUT (MODIFIED PHASE 2)

STATE PROJ. NO. 44330-1185-44 (NEPA) TDOT PIN: 114174.00
HAMILTON COUNTY

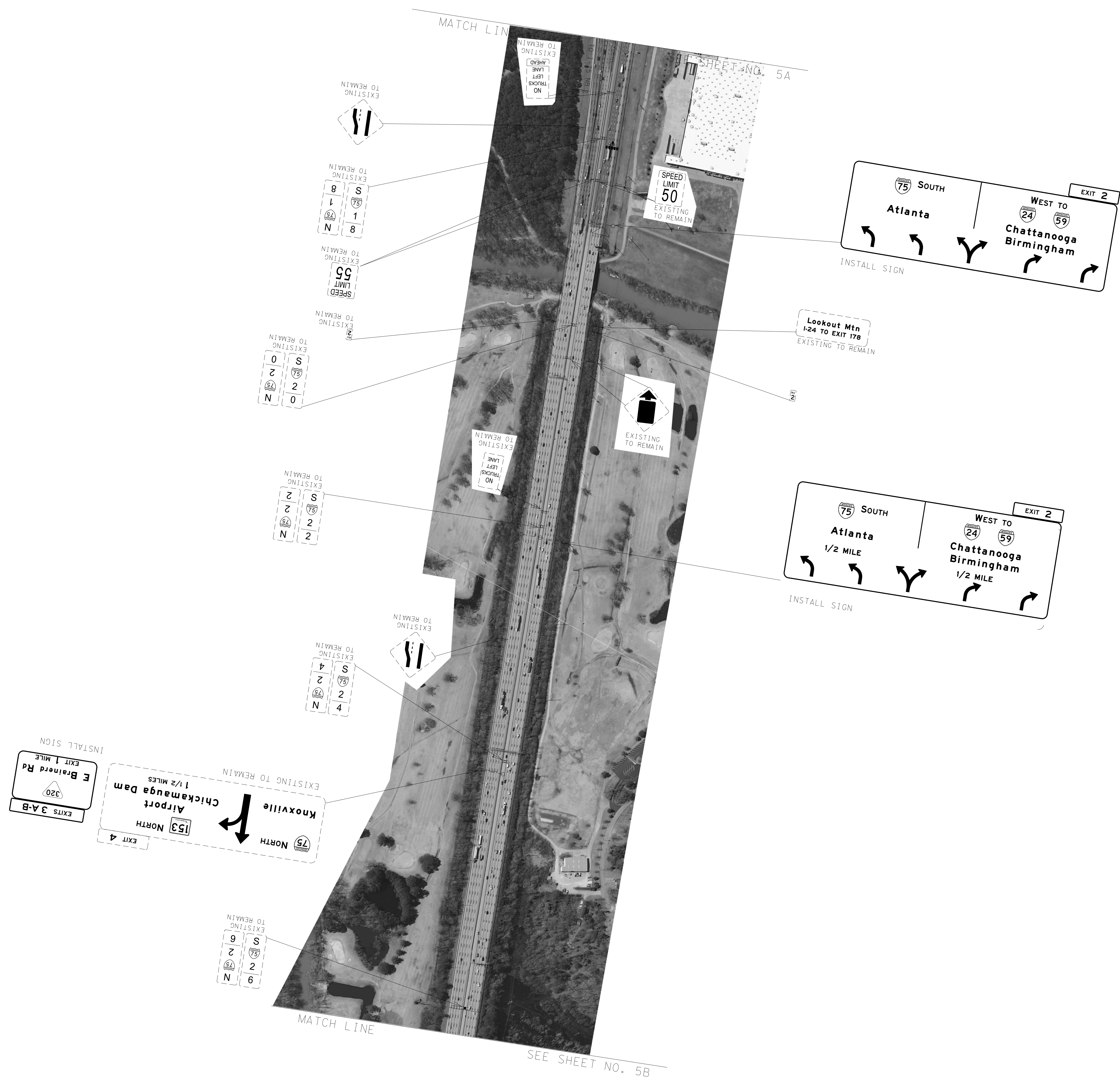
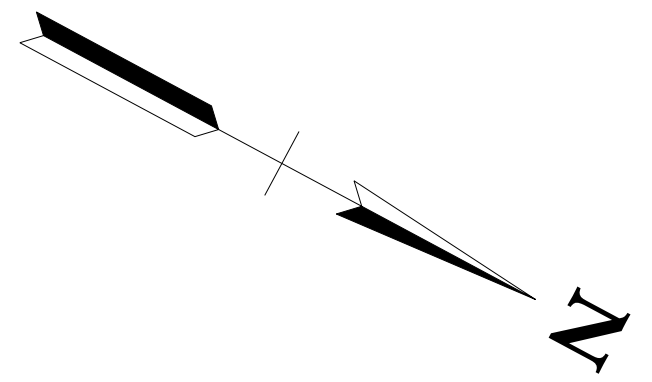


FIGURE 5D

STRUCTURE TYPE	LEGEND	
	EXISTING	PROPOSED
OVERHEAD SIGN STRUCTURE		
CANTILEVER		
BRIDGE SIGN STRUCTURE		
POST-MOUNT SIGN		



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INTERSTATE 75, INTERCHANGE AT INTERSTATE 24

SIGNING AND MARKING - ULTIMATE BUILD OUT (MODIFIED PHASE 2)

STATE PROJ. NO. 44330-1185-44 (NEPA) TDOT PIN: 114174.00
HAMILTON COUNTY

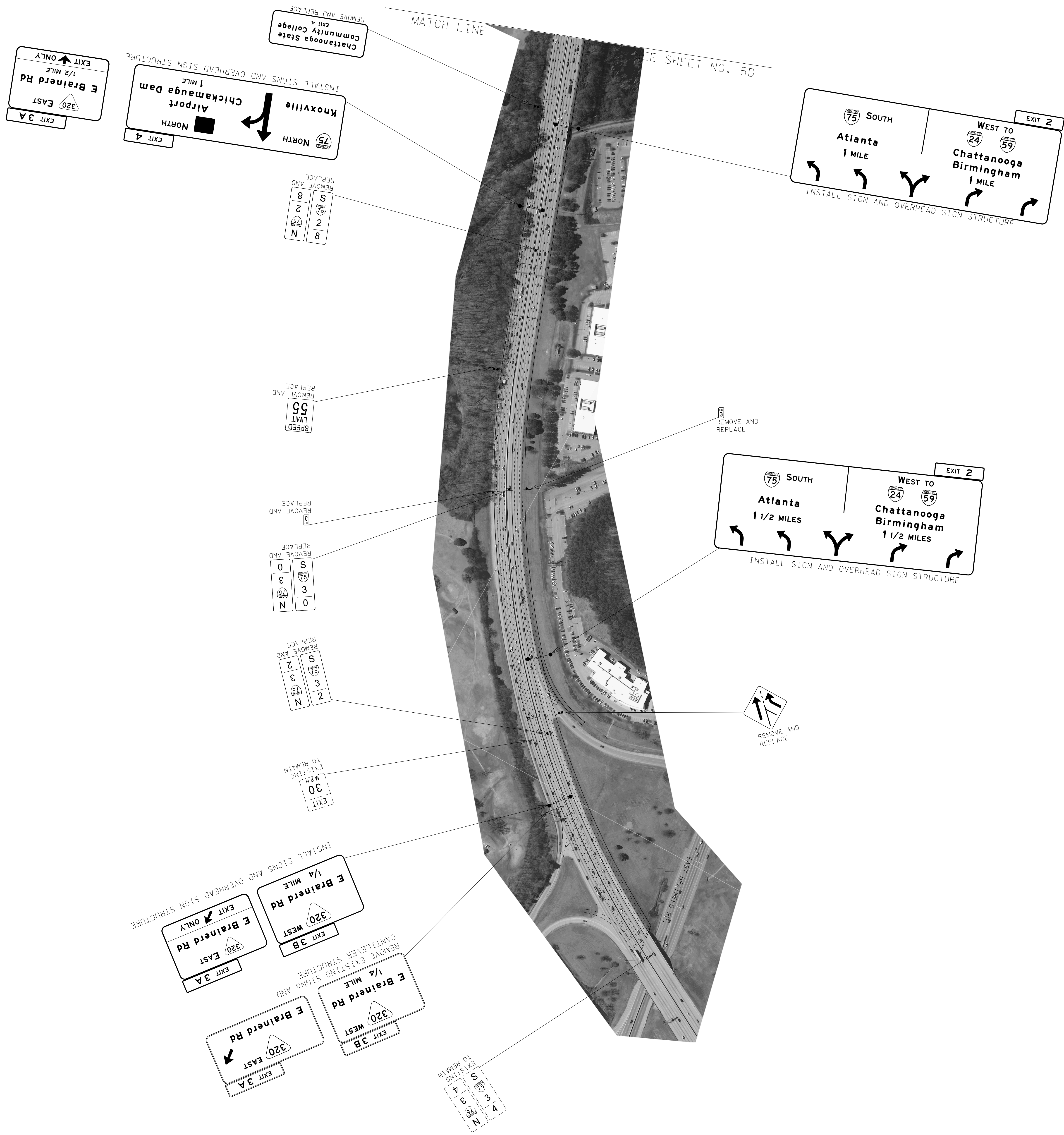
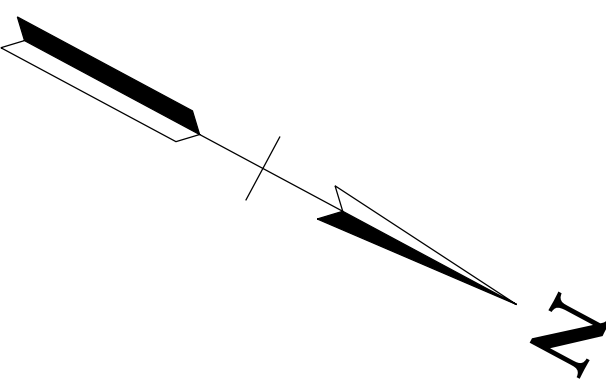


FIGURE 5E

STRUCTURE TYPE	LEGEND	
	EXISTING	PROPOSED
OVERHEAD SIGN STRUCTURE		
CANTILEVER		
BRIDGE SIGN STRUCTURE		
POST-MOUNT SIGN		



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APRIL 2021

SCALE IN FEET
0 200 400 600

3.0 Update to Traffic Volumes

Preparation of the IAR Addendum required an update to the traffic volume forecasts within the study area. The new traffic volume forecasts were needed to prepare the traffic operations analysis and subsequent comparisons of the Original IAR and Modified Phase 2 recommendations. The updated traffic data considered an expanded design horizon year of 2045, ten years beyond the Original IAR. TDOT provided traffic volume data for year 2045, using the maintained travel demand model. It should be noted that, although this addendum's analysis focused on Phase 2 (I-24 segment) improvements, the traffic volumes were updated for the entire original study area. This approach helped to provide consistency with the Original IAR and confidence in the study's analysis results.

In addition to the updated design year volume forecast assignments, traffic forecast for this IAR Addendum considered the Red Wolf Soccer Complex (Figure 6). The development is a multi-year, phased project that includes a new stadium for the Chattanooga Red Wolves professional soccer club (USL League One). The site will also have residential, retail and service land uses. The complex is located in East Ridge, Tennessee, just southwest of the I-24/I-75 interchange. A location map depicting the general area of the development in relation to the I-24 corridor is presented in Figure 6. It is anticipated that vehicle trips generated by the development will influence the surrounding transportation infrastructure. Study methodology incorporated trip demand and volume assignment from the development into the final design year traffic volume projections.

Development of the 2045 travel demand forecast and the projected Red Wolf Soccer Complex traffic volumes provided the final 2045 design year traffic volume estimate. This traffic volume data was used as input into the traffic operations analysis model and subsequent analysis results.

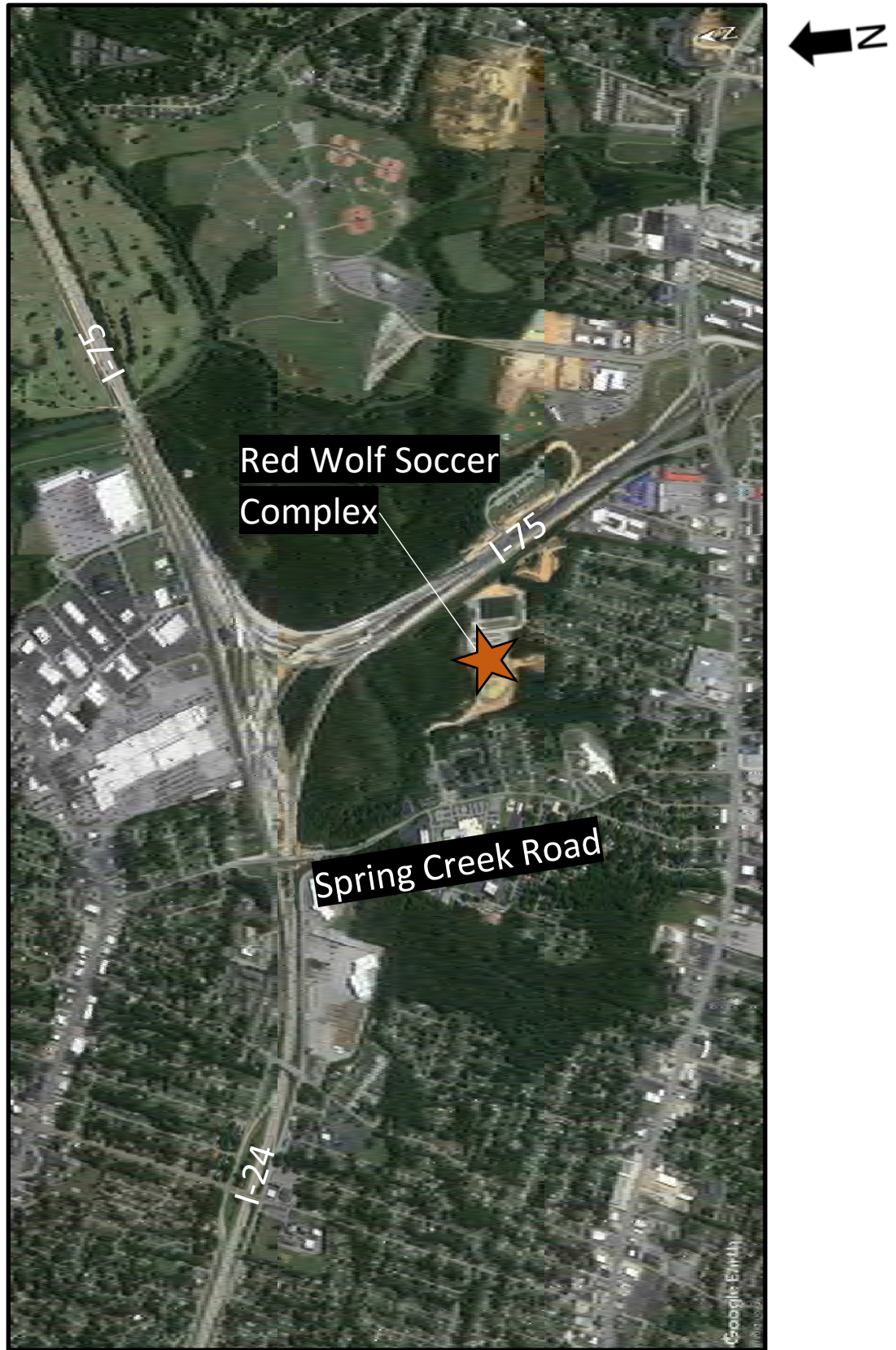


Figure 6: Red Wolf Soccer Complex Vicinity Map

4.0 Proposed Traffic Operations Analysis – Modified Phase 2 vs. Original IAR

Changes to Phase 2 of the I-24/I-75 interchange improvement project provide opportunities to enhance operational and safety performance at specific locations within the project limits. Modifications to the plan primarily involve changes to I-24 on/off-ramp configurations and an extension of the I-24 widening west of the current project limits. The Modified Phase 2 maintains the current number of on-ramps and off-ramps along both directions of I-24 while reversing the interior ramp sequence (from on-off order to off-on order).

The proposed modifications to Phase 2 compared to the Original IAR are as follows:

- WB I-24 at South Moore Road – Two-lane option off-ramp: The Modified Phase 2 scenario provides for an “Exit Only” lane from outside freeway lane (lane 5) and allows for a decision-lane exit from Lane 4 whereby drivers could either exit onto the off-ramp or continue along I-24 WB. This design approach represents a change from the approved Original IAR, where the WB exit onto the South Moore Road ramp included a one-lane off-ramp via the “Exit Only” lane. The modification includes a continuous two-lane ramp to its intersection with South Moore Road. It also reduces the number of lane changes required for exiting traffic from the northbound-to-westbound I-75 ramp. The modified proposal would implement a two-lane off-ramp condition consisting of 12-foot travel lane widths and appropriate shoulder widths and include a proposed new signalized intersection where the ramp intersects North Terrace.
- WB I-24 between South Moore Road and Belvoir Avenue – Modified on/off-ramp sequence: Analysis showed the potential to optimize WB I-24 freeway operations by reconfiguring the sequence of the pair of ramps between the South Moore Road and Belvoir Avenue interchanges. The Original IAR generally maintained the ramp’s configuration as it exists now, except for the added mainline freeway lane as originally and currently proposed. Under present and Original IAR conditions, a westbound on-ramp occurs immediately west of the North Terrace/South Moore Road intersection, which is followed by an off-ramp for the Belvoir Avenue exit. A distance of approximately 1,400 feet separates these ramps with a weaving lane acting as a fifth freeway lane connecting the ramps. The weaving traffic volumes within this section of WB I-24 have notable impacts on the freeway’s operating performance, in terms reoccurring congestion and incidents. A modified concept was conceived whereby the freeway ramps would be provided in reverse order, i.e., the off-ramp followed by the on-ramp. In effect, this concept eliminates the weaving section from the I-24 westbound freeway and moves it to North Terrace, the existing westbound three-lane, one-way frontage road. It was noted that North Terrace has under-utilized capacity, characterized by lower traffic volumes and

travel speeds. The proposed modified concept would include an acceleration lane for the relocated on-ramp of approximately 1,000 feet with transition taper.

- Extend four-lane typical section of WB I-24 to South Germantown Road: TDOT recognized an opportunity to extend the I-24 widening beyond the original project limits. A separately scheduled bridge replacement project at the Belvoir Avenue overpass will allow for the extension of the WB I-24 widening to the South Germantown Road interchange. The Original IAR called for the widening of I-24 to end east of the Belvoir Avenue overpass to avoid impacts to the existing bridge structure. The new Belvoir Avenue bridge provides for the fourth travel lane to be carried further west for approximately an additional 2,500 feet. Traffic observations in the area suggest that this modification will enhance freeway operations along WB I-24. This section of I-24 is known for the long, westbound uphill grade as I-24 crosses the Missionary Ridge area of Chattanooga. The grade noticeably impacts vehicular free-flow speeds during peak commute hours, which is further compounded by the number of heavy vehicles that travel I-24 and their difficulty in maintaining travel speeds on the approach to the ridge. Lengthening the distance of the fourth westbound travel lane will result in improved freeway operations by providing greater distances for vehicles, including heavy trucks, to position and accelerate on their approach to the incline. The improvement will also provide further separation between the convergence of vehicle streams at the I-24/I-75 interchange and the merge condition where I-24 transitions from four to three lanes. Empirical evidence and model analysis have shown that the undesired travel conditions experienced departing the I-24/I-75 junction and also at the westbound uphill grade near South Germantown Road often combine and lead to an overall breakdown in functional operation for the entire freeway segment. Extending the four-lane westbound section and creating further separation between the I-24/75 interchange and the I-24 westbound lane merge will enhance travel safety and reduce the duration of stop-and-go travel conditions during peak periods.
- EB I-24 between Belvoir Avenue and South Moore Road – Modified on/off-ramp sequence: A modification to the Original IAR for EB I-24 on and off ramps is proposed. Similar to the modifications proposed for WB I-24, the eastbound travel direction will maintain the same number of ramp accesses, but with the order of the on-ramp and off-ramp to the freeway would be reversed. The exiting on-ramp from South Terrace would be removed with a new off-ramp created just east of the Belvoir Avenue overpass. The on-ramp from South Terrace onto I-24 eastbound would occur just west of the South Moore Road overpass including an acceleration lane transition of appropriate length. The proposed scenario would maintain the beginning point of the proposed fourth eastbound I-24 freeway lane as conceived in the Original IAR, occurring between the Belvoir Avenue and South Moore Road interchanges. Similarly, the proposed eastbound on-ramp at the

South Moore Road interchange would continue to form the fifth eastbound travel lane on I-24 which extends to the I-75 interchange. The proposed modification eliminates the approximate 800-foot weaving that currently exists and would remain under the approved Original IAR.

To assess the proposed Modified Phase 2 improvements, additional traffic engineering analysis was performed to quantify expected performance results. New VISSIM simulation models were developed to analyze the impacts of the proposed changes.

Methodology considered the following scenarios: updated existing conditions (2019), updated horizon year (2045) Phase 2 - Original IAR, and horizon year (2045) Modified Phase 2. Traffic data was collected and assimilated to assist model development. Average daily traffic (ADT), intersection turning movement counts and travel time studies were used to calibrate the existing conditions model. Validation techniques were performed to improve confidence levels. VISSIM results were used to compare performance metrics between the approved Original IAR and proposed Modified Phase 2 design options.

The analysis found that the Modified Phase 2 is projected to provide improved traffic flow over the Original IAR concept, including reductions in overall delay, as well as better operations on the adjacent surface streets (North Terrace and South Terrace).

4.1 Network Wide Measures of Effectiveness (MOEs)

VISSIM modeling and analysis allowed tabulation of collective performance measures on a network-wide basis. A VISSIM model was created that encompassed the entire study and included all freeway segments, ramp connections and notable surface street roadways:

- Interstate 75, south of I-24/I-75 interchange
- Interstate 75, north of I-24/I-75 interchange
- Interstate 24, west of I-24/I-75 interchange
- North Terrace
- South Terrace
- Ringgold Road (SR-8, U.S. 41), within interchange area of I-75

In doing so, the analysis model considered regional traffic flow to and from the immediate IAR Phase 2 area. This study approach also allowed committed improvements associated with Phase 1 of the project to be incorporated into the assessment. Network-wide analysis provided documentation showing how the Modified Phase 2 improvements would benefit areas within the studied network beyond the immediate location of Phase 2 work. As an example, portions of Westbound I-24 located within Phase 2 will continue to experience congestion during peak periods because of the over-saturated traffic conditions. However, VISSIM modeling predicted that portions of I-75 NB (south of the I-24/I-75 interchange) and I-75 SB (north of the I-24/I-75

interchange) will experience shorter distances of vehicle queuing and reduced duration of oversaturated flow because of the proposed Modified Phase 2 improvements. Stated in other terms, the Modified Phase 2 improvements will not completely eliminate forecasted travel congestion and delay within the I-24 segment but will serve to lower its severity and reach.

Table 1 summarizes the comparison between the Original IAR and Modified Phase 2 for the AM and PM peak periods for delay and throughput. The peak periods are generally considered 7am-9am and 4pm-6pm for the morning and afternoon peak commute timeframes, respectively. The peak periods were documented based on existing traffic data (traffic volume counts, travel time flow studies) collected for the study. Study analysis used field collected data to calibrate and validate the VISSIM existing conditions model prior to conducting proposed conditions analysis. As shown in Table 1, model analysis predicted that the Modified Phase 2 improvements would result in improved operating conditions compared to the Original IAR. Network Total improvements represent reduced delays across the total system modeled, freeway and surface streets combined. Analysis also tabulated delay reductions when isolating impacts to the Interstate system (I-24 and I-75 segments – Freeway Totals). Modified Phase 2 showed a 7% and 6% reduction in AM and PM peak hours of delay for the network, respectively. When annualized, Modified Phase 2 reduced total peak hour delay by 48,358 hours.

Table 1. 2045 Network-Wide Peak Hour MOEs

Network Average Delay (min/veh)	AM	PM
Original IAR	2.7	3.0
Modified Phase 2	2.5	2.8
Change	-7%	-7%

Network Throughput (veh/hr)	AM	PM
Original IAR	29,410	34,436
Modified Phase 2	29,658	34,630
Change	1%	1%

Network Total Vehicle Hours of Delay	AM	PM
Original IAR	1,323	1,722
Modified Phase 2	1,236	1,616
Change	-7%	-6%

Freeway Total Vehicle Hours of Delay	AM	PM
Original IAR	1,228	1,456
Modified Phase 2	1,153	1,351
Change	-6%	-7%

Non-Freeway Total Vehicle Hours of Delay	AM	PM
Original IAR	95	266
Modified Phase 2	83	265
Change	-13%	0%

Annual Peak Hour Delay Savings	AM	PM	Total
Network Total Vehicle Hours of Delay	-21,925	-26,433	-48,358
Freeway Total Vehicle Hours of Delay	-18,750	-26,250	-45,000
Non-Freeway Total Vehicle Hours of Delay	-3,175	-183	-3,358

4.2 I-24 Segment Measures of Effectiveness (MOEs)

VISSIM modeling was used to evaluate the impact of the Modified Phase 2 improvement on I-24. The analysis showed that the overall Levels of Service did not fluctuate significantly, however analysis showed measurable benefits related to freeway flow densities and delays with Modified Phase 2. Table 2 shows the results for the AM peak and Table 3 shows the results for the PM peak.

The analysis found the following advantages and operational improvements on I-24 resulting from the Modified Phase 2:

- For eastbound I-24 during the AM peak, measurable improvement in flow densities from east of Belvoir Avenue through the South Moore Road interchange
- For westbound I-24 during the AM peak, modest to notable decrease in flow densities are expected to occur. Overall Level of Service designations will remain mostly unchanged.
- For eastbound I-24 during the PM peak, Modified Phase 2 is expected to provide measurably improved flow densities.
- For westbound I-24 during the PM peak, freeway densities will remain largely the same except for notable reductions between the South Moore Road and Belvoir Avenue interchanges (which corresponds to the reversal of the on and off ramps that eliminates the existing weaving section on the freeway).
- The Modified Phase 2 improvements was shown to improve flow densities in both travel directions of I-24 during AM and PM peak periods, with Levels of Service designations remaining the same for peak travel directions and some improvement in Level of Service in non-peak travel directions.

Overall, study analysis reported multiple freeway segments are expected to experience measurable betterment in traffic operations as shown by the reduced flow densities. Review of the analysis results noted isolated freeway segments would operate with higher flow densities compared to the Original IAR conditions. Evaluation found that increased flow densities could occur for those freeway segments that were previously downstream of point of restriction or friction, such as lane merges, weaving movements or ramp diverge areas. In locations where the proposed Modified Phase 2 improvements address these issues, the point of flow restrictions and higher densities would shift to other freeway segments within the same travel direction. For example, it would be expected that oversaturated flow during the AM peak would not be altogether eliminated in the WB I-24 travel direction by extending the four-lane typical section,

rather the area of higher flow density would shift west in relation to the limits of the widening. Higher density flows would still be found in areas near and just upstream of the lane reduction. In this example, areas of higher flow density would move west in tandem with the relocated lane transition and hence would result in a higher density flow when compared to the Original IAR conditions for the same freeway segment. Although model analysis predicted that oversaturated conditions will continue within certain freeway segments during peak periods, improvements proposed with the Modified Phase 2 scenario are expected to provide a reduction in delay and flow densities throughout the freeway network as shown in Tables 2 and 3.

**Table 2. 2045 Freeway Segment MOEs - Original IAR vs. Modified Phase 2
AM PEAK CONDITIONS**

	Freeway Segment	Direction of Travel	Density (pcpmpl)			LOS	
			Original IAR	Modified Phase 2	Improvement	Original IAR	Modified Phase 2
I-24 EB	East of Germantown Rd	EB I-24	35.7	35.7	0.1%	E	E
	At Belvoir Ave	EB I-24	35.7	35.5	0.6%	E	E
	East of Belvoir Ave (Seg-1)	EB I-24	35.7	26.5	25.6%	E	D
	East of Belvoir Ave (Seg-2)	EB I-24 Off Ramp	35.7	30.8	13.7%	E	D
	East of Belvoir Ave (Seg-3)	EB I-24 Off Ramp	31.8	22.1	30.3%	D	C
	East of Belvoir Ave (Seg-4)	EB I-24	26.9	22.3	17.1%	D	C
	At S Moore Rd	EB I-24	26.9	21.5	20.1%	D	C
	East of S Moore Rd	EB I-24	26.9	27.1	-0.6%	D	D
	I-24 EB On Ramp from S Moore Rd - Merge Area	EB I-24 On Ramp	25.6	25.2	1.4%	C	C
	I-24 EB from end of Merge Area to I-24 Split	EB I-24	26.1	26.0	0.3%	D	D
I-24 WB	Merge of I-75 NB & I-75 SB to I-24 - 6 Lane Roadway	WB I-24	93.5	81.4	12.9%	F	F
	Lane drop from 6 Lanes to 5 Lanes	WB I-24	97.9	85.0	13.2%	F	F
	Moore Rd Off Ramp - Diverge Area	WB I-24 Off Ramp	76.8	68.9	10.3%	F	F
	At Moore Rd	WB I-24	92.3	81.8	11.4%	F	F
	East of Moore Rd (Seg-1)	WB I-24	92.3	69.1	25.2%	F	F
	East of Moore Rd (Seg-2)	WB I-24 On Ramp	74.2	95.1	-28.2%	F	F
	Between Moore Rd and Belvoir Ave (Seg-1)	WB I-24	88.6	103.4	-16.7%	F	F
	Between Moore Rd and Belvoir Ave (Seg-2)	WB I-24	88.6	84.3	4.8%	F	F

Assessment also considered impacts of moving the weaving movements to the N & S Terrace roadways. Model analysis predicted marginal decline in operational characteristics on the Terrace roadways as a result of the weaving movement being moved to the frontage roads. Data points from the analysis reflected some reduction in travel speed along N & S Terraces within the relocated weaving area compared to existing conditions. However, review of the analysis results and qualitative assessment determined that the benefits realized on the freeway system notably outweigh operational impacts on N and S Terraces. Both frontage roads carry traffic volumes below their capacity limits. This underutilization of capacity will serve to accommodate the newly introduced weaving movement. Model analysis predicted that weaving movements on the Terrace roadways would maintain a LOS of D or better (based on HCM freeway methodology) during peak periods. Assessment also noted that the proposed weaving operation on the Terrace roadways will occur under slower operating speeds and lower traffic volumes compared to I-24, which is expected to result in reduced exposure to critical and severe crashes. Analysis concluded

that the improvements realized on the freeway system would outweigh the expected operational impacts of to the frontage roads. See Exhibit A on following page.

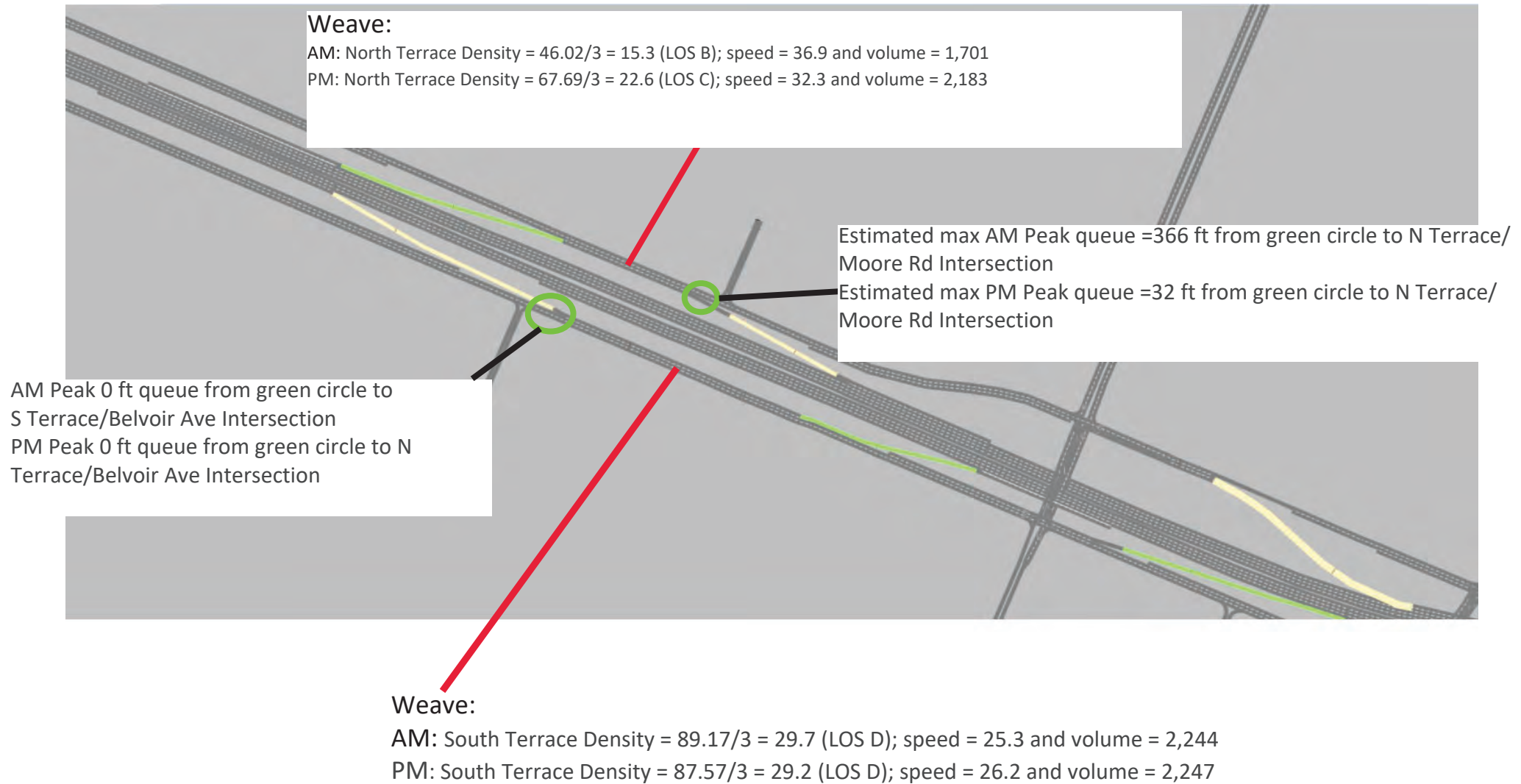
**Table 3. 2045 Freeway Segment MOEs - Original IAR vs. Modified Phase 2
PM PEAK CONDITIONS**

	Freeway Segment	Direction of Travel	Density (pcpmpl)			LOS	
			Original IAR	Modified Phase 2	Improvement	Original IAR	Modified Phase 2
I-24 EB	East of Germantown Rd	EB I-24	70.6	55.1	22.0%	F	F
	At Belvoir Ave	EB I-24	70.6	58.5	17.1%	F	F
	East of Belvoir Ave (Seg-1)	EB I-24	70.6	49.4	30.0%	F	F
	East of Belvoir Ave (Seg-2)	EB I-24	70.6	64.8	8.2%	F	F
	East of Belvoir Ave (Seg-3)	EB I-24 Off Ramp	71.6	68.4	4.5%	F	F
	East of Belvoir Ave (Seg-4)	EB I-24	91.3	83.1	8.9%	F	F
	At S Moore Rd	EB I-24	91.3	75.7	17.1%	F	F
	East of S Moore Rd	EB I-24	91.3	77.4	15.2%	F	F
	I-24 EB On Ramp from S Moore Rd - Merge Area	EB I-24 On Ramp	90.9	79.1	13.0%	F	F
	I-24 EB from end of Merge Area to I-24 Split	EB I-24	85.2	79.2	7.1%	F	F
I-24 WB	Merge of I-75 NB & I-75 SB to I-24 - 6 Lane Roadway	WB I-24	23.8	23.9	-0.6%	C	C
	Lane drop from 6 Lanes to 5 Lanes	WB I-24	28.6	28.8	-0.8%	D	D
	S Moore Rd Off Ramp - Diverge Area	WB I-24 Off Ramp	29.3	29.5	-0.7%	D	D
	At S Moore Rd	WB I-24	31.5	32.0	-1.4%	D	D
	East of S Moore Rd (Seg-1)	WB I-24	31.5	34.0	-7.9%	D	D
	East of S Moore Rd (Seg-2)	WB I-24	31.8	26.5	16.6%	D	D
	B/w S Moore Rd and Belvoir Ave (Seg-1)	WB I-24	67.3	26.3	61.0%	F	D
	B/w S Moore Rd and Belvoir Ave (Seg-2)	WB I-24	67.3	25.1	62.7%	F	C

It is notable to highlight how the improvements proposed with the Modified Phase 2 scenario is expected to provide beneficial impacts to traffic operations along I-24 within the study section. Analysis output from the VISSIM model detailed improved measures of effectiveness at key locations in the eastbound and westbound travel directions of I-24. Because overall travel demand will exceed highway capacity regardless of improvement measures, evaluation of proposed conditions must look beyond Level-of-Service (LOS) designations reported by the traffic analysis. Although many freeway segments within the study corridor will not experience a change in expected LOS (many maintaining LOS “F” during peak periods), closer examination of the VISSIM model results showed that traffic flow characteristics will perform better under the Modified Phase 2 plan, including when compared to the Original IAR scenario. Review of analysis results found that flow densities are expected to noticeably improve within the sections of I-24 where the Modified Phase 2 improvements are proposed:

EXHIBIT A - Model Illustration of Weaving and Queuing along N & S Terraces

*LOS shown on surface streets is based on HCM freeway weave segment criteria
(Note: There are no methodology to estimate LOS for a weave segment on surface streets.)*



Interchange Access Request – Interchange 75 at Interstate 24 - Phase 2 Addendum
Hamilton County

Proposed Improvement	Direction of Travel	I-24 Freeway Segment	Peak Period	% Improvement (Reduction) of Flow Density (veh/mile/lane)
Dual Lane Option Off-Ramp at S. Moore Rd	WB	East of Diverge Area	AM	13%
		At Diverge Area	AM	10%
Removal of WB I-24 Weave Movement	WB	At S. Moore Rd	AM	11%
		East of S. Moore Rd	AM	25%
Extension of 4-lane widening	WB	Just East of Belvoir Ave	AM	5%
Removal of EB I-24 Weave Movement	EB	Just East of Belvoir Ave	AM	26%
		Just West of S Moore Rd	AM	17%
Dual Lane Option Off-Ramp at S. Moore Rd	WB	East of Diverge Area	PM	17%
Removal of WB I-24 Weave Movement	WB	East of S. Moore Rd	PM	41%
Removal of EB I-24 Weave Movement	EB	Just East of Belvoir Ave	AM	30%

**Per VISSIM Segment Analysis*

In addition to density characteristics, the analysis model reported improvements in other measured metrics:

- For the AM peak period, measured annually, freeway vehicle hours of delay are forecast to reduce by 18,750 vehicle-hours, a 6% reduction compared to the Original IAR scenario
- For the PM peak period, the annual freeway vehicle hours of delay are forecast to reduce by 26,250 vehicle-hours, a 7% reduction compared to the Original IAR scenario
- For the AM and PM peak periods, the model predicted total travel time through the study network to reduce by approximately 50 hours, a reduction of 1% compared to the Original IAR.

4.3 Queue Lengths at Off-Ramps

To ensure that queueing would not occur for the off-ramps for Modified Phase 2, queue lengths were evaluated at two off-ramps using the VISSIM model. As shown in Table 4, the analysis found that there is adequate storage on the off-ramps so that traffic is not anticipated to back onto the mainline interstate.

Table 4. Modified Phase 2 Queueing Analysis at Off-Ramps

I-24 WB Off Ramp at South Moore Road (with Free Flow at North Terrace)				
	AM		PM	
	Original IAR	Modified Phase 2	Original IAR	Modified Phase 2
Level of Service (LOS)	A	A	A	A
Average Queue (ft)	0	0	3	0
Max Queue (ft)	9	25	223	3
Available Storage* (ft)	620'			

**Available storage on the ramp exceeds both average queue and maximum queue*

I-24 EB Off Ramp at South Moore Road				
	AM		PM	
	Original IAR	Modified Phase 2	Original IAR	Modified Phase 2
Level of Service (LOS)	D	D	D	D
Average Queue (ft)	198	221	177	168
Max Queue (ft)	562	626	453	453
Available Storage* (ft)	1950'			

**Available storage on the ramp exceeds both average queue and maximum queue*

4.4 Intersection Level of Service Comparison

The frontage road (North Terrace and South Terrace) intersections were analyzed using the VISSIM model for the Original IAR and Modified Phase 2. No significant changes in levels of service were found.

Also, queue lengths on the frontage road were evaluated to ensure traffic would not back up from intersections and block the two relocated entrances to on-ramps. In both cases, the analysis found that adequate storage is expected.

Table 5. Intersection LOS Comparison

North Terrace at South Moore Road					
		AM		PM	
		Original IAR	Modified Phase 2	Original IAR	Modified Phase 2
WB	Level of Service (LOS)	D	D	C	C
	Average Queue (ft)	166	161	128	102
SB	Level of Service (LOS)	B	B	D	D
	Average Queue (ft)	69	71	362	409

South Terrace at South Moore Road					
		AM		PM	
		Original IAR	Modified Phase 2	Original IAR	Modified Phase 2
EB	Level of Service (LOS)	D	D	D	D
	Average Queue (ft)	198	221	177	168
	Max Queue (ft)	562	626	453	453
	Available Storage* (ft)	1,053' between S Moore and beginning of on-ramp			
NB	Level of Service (LOS)	E	E	F	F
	Average Queue (ft)	1,125	1,129	1,218	1,211

**There is adequate storage on South Terrace so the on-ramp entrance is not blocked*

North Terrace at Belvoir Ave					
		AM		PM	
		Original IAR	Modified Phase 2	Original IAR	Modified Phase 2
WB	Level of Service (LOS)	C	C	C	C
	Average Queue (ft)	92	93	174	136
	Max Queue (ft)	310	313	596	540
	Available Storage* (ft)	1,686' between S Moore and beginning of on-ramp			
SB	Level of Service (LOS)	A	B	B	B
	Average Queue (ft)	26	30	96	64

**There is adequate storage on North Terrace so the on-ramp entrance is not blocked*

Interchange Access Request – Interchange 75 at Interstate 24 - Phase 2 Addendum
Hamilton County

South Terrace at Belvoir Ave					
		AM		PM	
		Original IAR	Modified Phase 2	Original IAR	Modified Phase 2
EB	Level of Service (LOS)	C	C	C	C
	Average Queue (ft)	92	87	127	108
NB	Level of Service (LOS)	C	C	D	D
	Average Queue (ft)	141	138	190	161

North Terrace at S Germantown Road					
		AM		PM	
		Original IAR	Modified Phase 2	Original IAR	Modified Phase 2
WB	Level of Service (LOS)	C	B	C	C
	Average Queue (ft)	89	88	131	133
SB	Level of Service (LOS)	B	B	D	D
	Average Queue (ft)	59	62	1,505	1,641

South Terrace at S Germantown Road					
		AM		PM	
		Original IAR	Modified Phase 2	Original IAR	Modified Phase 2
EB	Level of Service (LOS)	C	C	D	D
	Average Queue (ft)	52	52	87	92
NB	Level of Service (LOS)	A	A	A	A
	Average Queue (ft)	17	16	34	36

The analysis found that the Modified Phase 2 is projected to provide improved traffic flow over the Original IAR concept, including reductions in overall delay, as well as better operations on the adjacent surface streets (North Terrace and South Terrace).

5.0 Safety Analysis

Historic crash data was reviewed along I-24 within the project limits for the existing conditions. The three-year period from March 1, 2017 thru February 29, 2020 was examined between the South Germantown Road underpass (Log Mile 12.17) and the Spring Creek Road overpass (Log Mile 14.08). A total of 454 reported crashes occurred along this section during that period - with three (3) fatal crashes involving three (3) fatalities, six (6) suspected serious injury crashes involving seven (7) serious injuries, seventy (70) suspected minor injury crashes involving ninety-three (93) minor injuries, and 375 property damage crashes.

5.1 Crash Analysis

Table 6 shows the crash data and rates for I-24 between Germantown Road and Spring Creek Road. The overall study segment had a crash rate of 1.86 per million vehicle miles traveled. For comparison, the statewide average crash rate for similar urban freeways is 1.22 per million vehicle miles traveled. Notably, the crash rates for all of the proposed Phase 2 sections, under current geometric conditions, exceed the statewide average.

Table 6. I-24 Crash Summary Statistics (3/1/17 - 2/29/20) By Log Mile

Section	Begin		End		Distance (mi)	AADT 2019 (VPD)	Crashes					Overall Rate	Severity Index	A/C Ratio
	L.M.	Description	L.M.	Description			Total	Fatal	Serious Injury	Minor Injury	Property Damage			
Germantown Rd to Belvoir Ave	12.17	Germantown Rd	12.59	Belvoir Ave	0.42	103,740	103	1	2	13	87	2.16	0.20	1.35
Belvoir Ave to Moore Rd	12.59	Belvoir Ave	13.35	S. Moore Rd	0.76	121,610	190	1	2	30	157	1.88	0.20	1.27
S. Moore Rd to McBrien Rd	13.35	S. Moore Rd	13.64	McBrien Rd	0.29	125,220	67	1	1	9	56	1.69	0.22	1.03
McBrien Rd to Spring Creek Rd	13.64	McBrien Rd	14.08	Spring Creek Rd	0.44	125,220	94	0	1	18	75	1.56	0.21	1.00
Overall I-24	12.17	Germantown Rd	14.08	Spring Creek Rd	1.91	116,857	454	3	6	70	375	1.86	0.21	1.34

Notes: Statewide average crash rate for similar facilities (Urban Interstates) is 1.22 crashes per million vehicle miles.
Rates provided are in units of crashes per million vehicle miles traveled.

The safety summary table includes tabulation of crash rate and severity index by segment. Severity Index (SI) is a formula-based computation that normalizes the non-PDO crash types (fatal, incapacitating injury, injury) into a weighted average relative to the total number of crashes. TDOT has incorporated the SI statistic into its standard crash analysis. The SI provides methodology to allow relative comparison of the severity of crashes at different locations. A high SI reflects a location that exhibits a trend of experiencing more severe crash outcomes.

Figures 7 thru 9 depict the crash locations within the project limits.



Figure 7

Legend

- Fatal
- Suspected Serious Injury
- Suspected Minor Injury
- Property Damage

Scale

0 0.125 0.25 0.5
Miles



Figure 8

Legend

- Angle
- No Collision w/Vehicle
- Rear End
- Rear to Side
- Sideswipe/Same Direction
- Other
- Unknown

Scale

0 0.125 0.25 0.5
Miles



Clustered occurrence of crashes within existing weave area

Legend

- Angle
- No Collision w/Vehicle
- Rear End
- Rear to Side
- Sideswipe/Same Direction
- Other
- Unknown

Scale

0 250 500 1,000 Feet

Crash data analysis also summarized current safety trends for locations along the I-24 corridor where the planned Modified Phase 2 improvements will occur. Table 7 shows historical crash data and rates specifically for the I-24 sections that are impacted by the Modified Phase 2 changes:

- WB - Existing Weave Section: Removal of existing I-24 westbound weave section (reversal of ramp sequence)
- WB - Extension of Lane Widening: Extend widening of I-24 (to 4 general purpose lanes) to just east of South Germantown Road overpass
- EB - Existing Weave Section: Removal of existing I-24 eastbound weave section (reversal of ramp sequence)
- WB - Off Ramp at S. Moore Road: Widen existing westbound I-24 off-ramp to two lanes and provide operate Lane 4 as option exit lane.

Table 7. I-24 Crash Summary Statistics (3/1/17 - 2/29/20) for Modified Phase 2 Sections

Section	Begin		End		Distance (mi)	AADT 2019 (VPD)	Crashes					Overall Rate	Severity Index	A/C Ratio
	L.M.	Description	L.M.	Description			Total	Fatal	Serious Injury	Minor Injury	Property Damage			
WB: Existing Weave Section	13.20	Beginning of Existing WB On Ramp Gore	12.91	End of Existing WB Off Ramp Gore	0.29	53,020	75	0	0	14	61	4.46	0.19	2.37
WB: Extension of Lane Widening	12.60	Belvoir Ave Overpass	12.17	End of Widening	0.43	62,720	70	0	1	9	60	2.37	0.16	1.38
EB: Existing Weave Section	12.91	Beginning of Existing EB On Ramp Gore	13.09	End of Existing EB Off Ramp Gore	0.18	61,170	75	0	0	11	64	6.22	0.15	3.10
WB: Off Ramp at S. Moore Rd	13.55	End of Proposed Ramp Gore	14.08	Spring Creek Rd Overpass	0.53	63,660	135	1	2	22	110	3.65	0.22	2.20

Notes: Statewide average crash rate for similar facilities (Urban Interstates) is 1.22 crashes per million vehicle miles.
Rates provided are in units of crashes per million vehicle miles traveled.

Table 8 shows distribution of crash severity, manner of collision, road conditions, and light conditions for the overall I-24 Phase 2 segment. The majority of crashes being rear-end, followed by sideswipe/same direction, no collision with vehicle, and angle. Spatial analysis indicated the majority of rear-end and sideswipe crashes occurred within the vicinity of the freeway ramps, particularly along the auxiliary lane that connect the ramps and through lanes that are within the existing weaving section.

Table 8. I-24 Crash Statistics (3/1/17 - 2/29/20)

Condition	Number of Crashes	Percentage of Total
	Severity	
Fatal	3	1%
Suspected Serious Injury	6	1%
Suspected Minor Injury	70	15%
Property Damage (Over/Under)	375	83%
	Manner of Collision	
Angle	59	13%
Head On	0	0%
Rear End	210	46%
Rear-to-Side/Rear	3	1%
Sideswipe Same Dir.	95	21%
Sideswipe Opp. Dir.	0	0%
No collision w/Vehicle	65	14%
Other	6	1%
Unknown	16	4%
	Road Conditions	
Dry	328	72%
Ice	3	1%
Snow	0	0%
Water-Standing/Moving	1	0%
Wet	117	26%
Unknown	5	1%
	Light Condition	
Dawn	18	4%
Daylight	317	70%
Dusk	13	3%
Dark/Lighted	82	18%
Dark/Not Lighted	15	3%
Dark-Unknown Lighting	9	2%
	Crash Location	
Along Roadway	423	93%
At Intersection	1	0%
Ramp	30	7%
Total	454	

Table 9 tabulates manner of collision characteristics of crashes over the three-year historical period within the general area of each modified section proposed as part of the Modified Phase 2 plan.

Table 9. Manner of Collision Breakdown for Each Modified Section (3/1/17 - 2/29/20)

	Existing WB Weave Section		Area of Extended WB Widening		Existing EB Weave Section		WB Off Ramp at S. Moore Rd	
Angle	10	13%	4	8%	10	13%	12	17%
Head On	0	0%	0	0%	0	0%	0	0%
Rear End	25	33%	27	56%	34	45%	25	35%
Rear-to-Side/Rear	0	0%	0	0%	0	0%	2	3%
Sideswipe Same Dir.	24	32%	8	17%	17	23%	22	31%
Sideswipe Opp. Dir.	0	0%	0	0%	0	0%	0	0%
No Collision w/Vehicle	11	15%	5	10%	12	16%	6	8%
Other	2	3%	1	2%	0	0%	1	1%
Unknown	3	4%	3	6%	2	3%	4	6%
Total	75		48		75		72	

5.2 Modified Phase 2 Safety Impacts

Evaluation results of the crash data anticipates that the Modified Phase 2 improvements should improve safety by reducing vehicle conflicts as a result of the relocated on and off-ramps, removing and reducing weaving movements, and increasing the distance between consecutive driver decision points.

The Modified Phase 2 improvements include widening the off-ramp at South Moore Road to two lanes where freeway lane 5 (ramp lane 1) will become a dedicated exit lane for vehicles departing I-24 and freeway lane 4 (ramp lane 2) will act as an “exit-option” lane. The crash rate for this section of freeway is 1.86 per million vehicle miles traveled. Seventy-two crashes occurred at the off-ramp in the three-year period analyzed. The widening of the off-ramp to two exit lanes will benefit safety in a few ways. Assessment anticipates that the proposed widening will minimize the likelihood of recurring queuing from the ramp onto the freeway. VISSIM modeling found that no vehicle spillback is expected onto the I-24 westbound freeway lanes. There will also be benefits experienced in the diverge areas just upstream from the exit. The addition of the “exit-option” lane (lane 4) reduces the number of lanes that vehicles must cross to exit the freeway onto S Moore Rd compared to the Original IAR. This condition is expected to enhance travel speeds and reduce vehicle weaving as drivers approach from the east. This improvement

is notable given that the South Moore Road exit ramp is the first interchange west of the I-24/I-75 interchange.

Reconfiguring the ramp sequence between South Moore Road and Belvoir Ave in both directions is expected to improve travel safety. This configuration eliminates existing EB and WB weaving sections. Evaluation of historical data indicates elevated crash rates for these segments that noticeably exceed statewide averages. Data review found that 150 total crashes occurred in the EB and WB weave sections during the three-year period analyzed. The proposed Modified Phase 2 eliminates the short weave sections that currently exist on I-24 and move them to the lower speed, lower volume frontage roads. Analysis forecasts that reversing the ramp order from “entry-exit” to “exit-entry” sequence will benefit freeway operations by promoting higher average free-flow travel speeds along the westbound and eastbound segments. Historical evidence and model analysis have confirmed the importance of preserving free-flow speeds, especially in the westbound travel direction. Just downstream of the area proposed for the ramp reversal, near the S Germantown Rd interchange, the westbound travel direction experiences a notable uphill grade. Under the current Ultimate IAR scenario, the weaving section exacerbates congestion and negatively impacts freeway traffic flow as a result of the friction and deceleration that occurs within the weaving area. While design year capacity analysis predicts that congestion will likely occur during peak periods, assessment found that the duration of the severe congestion should occur for shorter periods and with quicker recovery. The proposed Modified Phase 2 improvements include the addition of acceleration lanes for the relocated westbound and eastbound on-ramps. Review of the Crash Modification Factor Clearinghouse noted reference to benefits from addition of freeway acceleration lanes (CM ID 5215). Research guidance indicates crash reductions of 15% or more can be expected with implementation of acceleration lanes.

The proposed Modified Phase 2 IAR provides enhanced geometric conditions compared to the Original IAR. AASHTO’s Policy on Geometric Design (Green Book) provides guidance that weaving conditions (entry-exit ramp sequencing) should include approximately 2,000 feet spacing between the ramps. Under existing and Original IAR conditions, the I-24 freeway weaving movements occur within 1,400 feet in the westbound direction and 800 feet in the eastbound direction. With the Modified Phase 2 option, the proposed exit-entry ramp configuration would occur within approximately 1,100 feet in the westbound direction and 1,500 feet in the eastbound direction, which exceeds the guidance of 800 feet established in the Green Book.

Maintaining the four-lane typical section in the WB direction for approximately 2200 ft beyond the Belvoir Ave overpass will provide more distance for vehicles to maneuver. Also, a new acceleration lane will be provided for westbound vehicles entering I-24 west of South Moore Road via the relocated on-ramp, which will provide operational benefits as vehicles merge and approach the extended four-lane section. The crash rate for this section is 1.43 per million vehicle miles traveled. Forty-eight total crashes occurred in this section, including 27 rear end collisions.

Similar to the removal of the freeway weaving sections, extending the length of the four-lane typical section will provide westbound vehicles additional time and space on approach of the significant uphill grade that is present downstream of the S Germantown Rd interchange. The extended four-lane section will also benefit heavy vehicles as trucks will have additional opportunity to reach desirable speeds as they approach the uphill climb.

6.0 Summary

Summary of Conceptual Cost Estimates

Planning-level estimated costs for Modified Phase 2 improvements were developed. Per the Original IAR, Phase 2 as originally proposed was expected to have a construction cost of \$39,700,000, excluding improvements to the I-75 segment north of the interchange. Estimated total cost for Modified Phase 2, also excluding the improved I-75 segment north of the interchange, is expected to be \$49,400,00.00. Total Modified Phase 2 improvements are estimated by project phase as \$2.3 million for preliminary engineering, ROW phase as \$1 million and construction phase as \$46.1 million.

Conformance to FHWA Policy Points

Policy Point 1: The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands (23 CFR 625.2(a)).

The requested Modified Phase 2 is consistent with the Original IAR for this Point. The proposed Modified Phase 2 suggests modification of ramp terminals and improving traffic control on surface streets to improve operational performance on the I-24 mainline freeway.

Policy Point 2: The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(a)).

The Original IAR considered seven alternate scenarios and concluded that Alternate 7 was preferred. The modifications proposed as part of the Modified Phase 2 maintains fundamental aspects of the approved IAR but with specific enhancements. The Modified Phase 2 seeks to adjust ramp configurations and order of sequence to obtain improved freeway operations.

Policy Point 3: An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

Modified Phase 2 does not propose to change the number or type of access points to the freeway system. Modified Phase 2 maintains the fundamental approach of the approved IAR. Analysis confirmed that the existing frontage road streets have excess capacity which would serve moving weaving movements from the freeway system onto the local street network. By relocating weaving movements and extending mainline freeway widening, I-24 freeway lanes will provide better operational and safety performance. Updated analysis presented an assessment of how the proposed modifications will enhance safety on the freeway system.

Policy Point 4: The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)).

Modified Phase 2 provides the same connections between the freeway and local street networks. No changes are proposed to the type of interchanges present.

Policy Point 5: The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.

The I-24/I-75 interchange is located within the Chattanooga-Hamilton County/North Georgia (CHCNGA) Transportation Planning Organization's (TPO) boundary. The I-24/I-75 project continues to be in the regional transportation plan. Phase 1 of the project is currently under construction.

Policy Point 6: In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d), 23 CFR 625.2(a), 655.603(d), and 771.111).

As confirmed in the Original IAR, there are no expectations for future additional interchange access points within the project limits. Right-of-way and interchange spacing limits consideration for any future new access.

Policy Point 7: When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d)).

Modified Phase 2 was not derived as a direct result or because of any specific proposed adjacent development plan. The proposal is being considered to enhance operational and safety performance of the previously approved option and to take advantage of new conditions within the I-24 corridor that makes Modified Phase 2 viable.

Policy Point 8: The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111).

If approved, necessary additional environmental study will be conducted as required by federal and state procedures. Modified Phase 2 does not significantly vary from the approved Original IAR and is expected to be implemented within existing right-of-way. Significant NEPA reevaluation is not expected but follow-up studies will be conducted as determined by future project development processes.

The eight policy points have been reviewed in relationship to the original IAR approved in 2012. The Original IAR has been provided within the appendix of this report for further information.

Summary

The purpose of this Addendum IAR was to investigate and evaluate proposed modifications to the Original IAR for improvements to the interchange of I-24 and I-75 in Chattanooga. Modifications were considered to Phase 2 of the I-24 segment as shown in the Original IAR during Phase 1 implementation.

Modified Phase 2 proposes operational enhancements to I-24 to further improve traffic operations and safety of the corridor. Modifications include widening of one exit ramp to include two lanes with an optional exit lane, thereby reducing the number of lane changes required from inside lanes to exit the freeway. The proposal also presents a change in the order of consecutive on and off ramps to remove existing weave movements, addresses current shortcomings in meeting AASHTO Green Book geometric design guidelines and enhances constructability.

The proposed Modified Phase 2 is expected to enhance the operation and safety of the I-24 corridor. The modifications take advantage of available existing capacity on the adjacent one-way pair of frontage roads. Also, a recent separately planned bridge widening project now makes it possible to extend the proposed widening of I-24 further west, thereby creating additional distance for vehicles to complete lane maneuvers prior to encountering a significant uphill grade which is known to negatively impact freeway operations. Analysis presented in the Addendum IAR predicts measurable improvement in freeway flow densities and Level of Service in certain segments, as well as reductions in the duration and length of vehicle queuing during peak periods.

APPENDIX



**STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION**

REGION 2
7512 VOLKSWAGEN DRIVE
CHATTANOOGA, TENNESSEE 37416
(423) 892-3430

CLAY BRIGHT
COMMISSIONER

BILL LEE
GOVERNOR

MEMORANDUM

TO: Mr. Steve Allen, Director
Strategic Transportation Investments Division

FROM: Mr. Joseph C. Deering, Assistant Chief Engineer
TDOT Region 2 Office

DATE: April 14, 2021

SUBJECT: Interstate Access Request
Interstate 24 at Interstate 75
Hamilton County

A handwritten signature in blue ink, likely of Joseph C. Deering, is placed next to the "FROM" line of the memorandum.

The Interstate Access Request for the subject project has been received by my office and we concur with the conceptual plan for the proposed alternative.

Please notify me if you need further assistance.

JD/TSA

APPENDIX - A1

Traffic Volume Forecast

**TENNESSEE DEPARTMENT OF TRANSPORTATION
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION**

PROJECT NO.: IM/NH-75-1(131) : 33005-0176-44 ROUTE: I-24 & I-75
COUNTY: HAMILTON CITY: CHATTANOOGA
PROJECT PIN NUMBER: 114174.01
PROJECT DESCRIPTION: I-24 @ I-75 INTERCHANGE MODIFICATION [PHASE 2]

[1] I-24 AVERAGE TRAFFIC DATA.

[2] I-75 AVERAGE TRAFFIC DATA.

DIVISION REQUESTING:

MAINTENANCE ☐

S.T.I.D. ☐

PROG. DEVELOPMENT & ADM. ☐

PUBLIC TRANS. & AERO. ☐

YEAR PROJECT PROGRAMMED FOR CONSTRUCTION: 2025

PROJECTED LETTING DATE: 2025

PAVEMENT DESIGN ☐

STRUCTURES ☐

SURVEY & ROADWAY DESIGN ☒

TRAFFIC SIGNAL DESIGN ☐

OTHER ☐

TRAFFIC ASSIGNMENT:

	BASE YEAR		DESIGN YEAR					DESIGN ROADWAY % TRUCKS		DESIGN AVERAGE DAILY LOADS	
	AADT	YEAR	AADT	DHV	%	YEAR	DIR.DIST.	DHV	AADT	FLEX	RIGID
[1]	124,720	2025	154,910	14,415	9	2045	50-50	10	15	5,017	7,917
[2]	112,780	2025	140,910	12,866	9	2045	53-47	12	18	5,582	8,824

REQUESTED BY: NAME RACHEL GENTRY DATE 11/24/19

DIVISION REGION II PROJECT DEVELOPMENT

ADDRESS 7512 VOLKSWAGEN DRIVE

CHATTANOOGA TN 37416

REVIEWED BY: DEBBI HOWARD DATE 12/30/19

TRANSPORTATION MANAGER I

SUITE 1000, JAMES K. POLK BUILDING

APPROVED BY: TONY ARMSTRONG DATE 12.30.19

TRANSPORTATION MANAGER 2

SUITE 1000, JAMES K. POLK BUILDING

COMMENTS:

THIS TRAFFIC EXTENDED THE PROJECT THRU THE I-24 GERMANTOWN INTERCHANGE AND ADDED TWO INTERSECTIONS ALONG S.R. 8 @ I-75.

Cc: GREG JUDY, NEEL-SCHAFFER

DHV'S ARE NOT REQUIRED FOR SIDE ROADS LESS THAN 1000 AADT.

NOTE: FOR BRIDGE REPLACEMENT PROJECTS, ADLs ARE NOT REQUIRED FOR ADTs OF 1000 OR LESS AND PERCENTAGE OF TRUCKS OF 7% OR LESS.

SEE ATTACHMENTS FOR TURNING MOVEMENTS AND/OR OTHER DETAILS.

(REV. 4/1/18)

**TENNESSEE DEPARTMENT OF TRANSPORTATION
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION**

PROJECT NO.: IM/NH-75-1(131) : 33005-0176-44

ROUTE NO.: I-24 [1]

COUNTY: HAMILTON

CITY: CHATTANOOGA

PROJECT DESCRIPTION: I-24 @ I-75 INTERCHANGE MODIFICATION [PHASE 2]

Interstate

Pavement Structural Design

Calculation of Equivalent Daily 18 Kip Single Axle Loads

Type Vehicle	ADT (No. Counted)	Flexible		Rigid	
		18-kip Factor	ADL	18-kip Factor	ADL
Pass. cars and motorcycles (1-2)	82,113	0.001	82	0.001	82
Pick-up, Panel, Van (3)	36,729	0.004	147	0.005	184
Sing. Unit	Buses (4)	0.300	112	0.300	112
	2-axle, 6-tire (5)	0.170	398	0.170	398
	3-axle or more (6-7)	0.700	963	1.000	1,375
	4-axle (8)	0.700	375	0.780	417
Comb.	5-axle or more (9-13)	1.100	17,983	1.780	29,099
Totals (2035 AADT)	139,815		20,059		31,668

Suggested Percentages of Trucks in Design Lane

	4 Lane	6 Lane	8 Lane
5,000 or less ADT	90%	75%	70%
5,000 - 10,000 ADT	80%	70%	65%
10,000 - 15,000 ADT	75%	65%	60%
15,000 - 20,000 ADT	75%	65%	55%
20,000 - 30,000 ADT	70%	60%	50%
30,000 Plus ADT	65%	60%	50%

No. of Lanes: 10

% Trucks in Design Lane: 50%

ADL in Design Lane:

FLEX:	0.5	X	0.50	X	20058.9	=	5,015
RIGID:	0.5	X	0.50	X	31667.5	=	7,917

ADL Calculations By: TONY ARMSTRONG

Date: 12/27/2019

Reviewed By:

Date:

[REV. 7-1-14]

Debbie Howard

12/30/19

**TENNESSEE DEPARTMENT OF TRANSPORTATION
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION**

PROJECT NO.: IM/NH-75-1(131) : 33005-0176-44

ROUTE NO.: I-75 [2]

COUNTY: HAMILTON

CITY: CHATTANOOGA

PROJECT DESCRIPTION: I-24@ I-75 INTERCHANGE MODIFICATION

Interstate

Pavement Structural Design

Calculation of Equivalent Daily 18 Kip Single Axle Loads

Type Vehicle	ADT (No. Counted)	Flexible		Rigid	
		18-kip Factor	ADL	18-kip Factor	ADL
Pass. cars and motorcycles (1-2)	64,768	0.001	65	0.001	65
Pick-up, Panel, Van (3)	38,751	0.004	155	0.005	194
Sing. Unit	Buses (4)	0.300	137	0.300	137
	2-axle, 6-tire (5)	0.170	457	0.170	457
	3-axle or more (6-7)	0.700	746	1.000	1,065
Comb.	4-axle (8)	0.700	452	0.780	504
	5-axle or more (9-13)	1.100	20,316	1.780	32,875
Totals (2035 AADT)	126,845		22,328		35,296

Suggested Percentages of Trucks in Design Lane

	4 Lane	6 Lane	8 Lane
5,000 or less ADT	90%	75%	70%
5,000 - 10,000 ADT	80%	70%	65%
10,000 - 15,000 ADT	75%	65%	60%
15,000 - 20,000 ADT	75%	65%	55%
20,000 - 30,000 ADT	70%	60%	50%
30,000 Plus ADT	65%	60%	50%

No. of Lanes: 10

% Trucks in Design Lane: 50%

ADL in Design Lane:

FLEX:	0.5	X	0.50	X	22327.6	=	5,582
RIGID:	0.5	X	0.50	X	35296.5	=	8,824

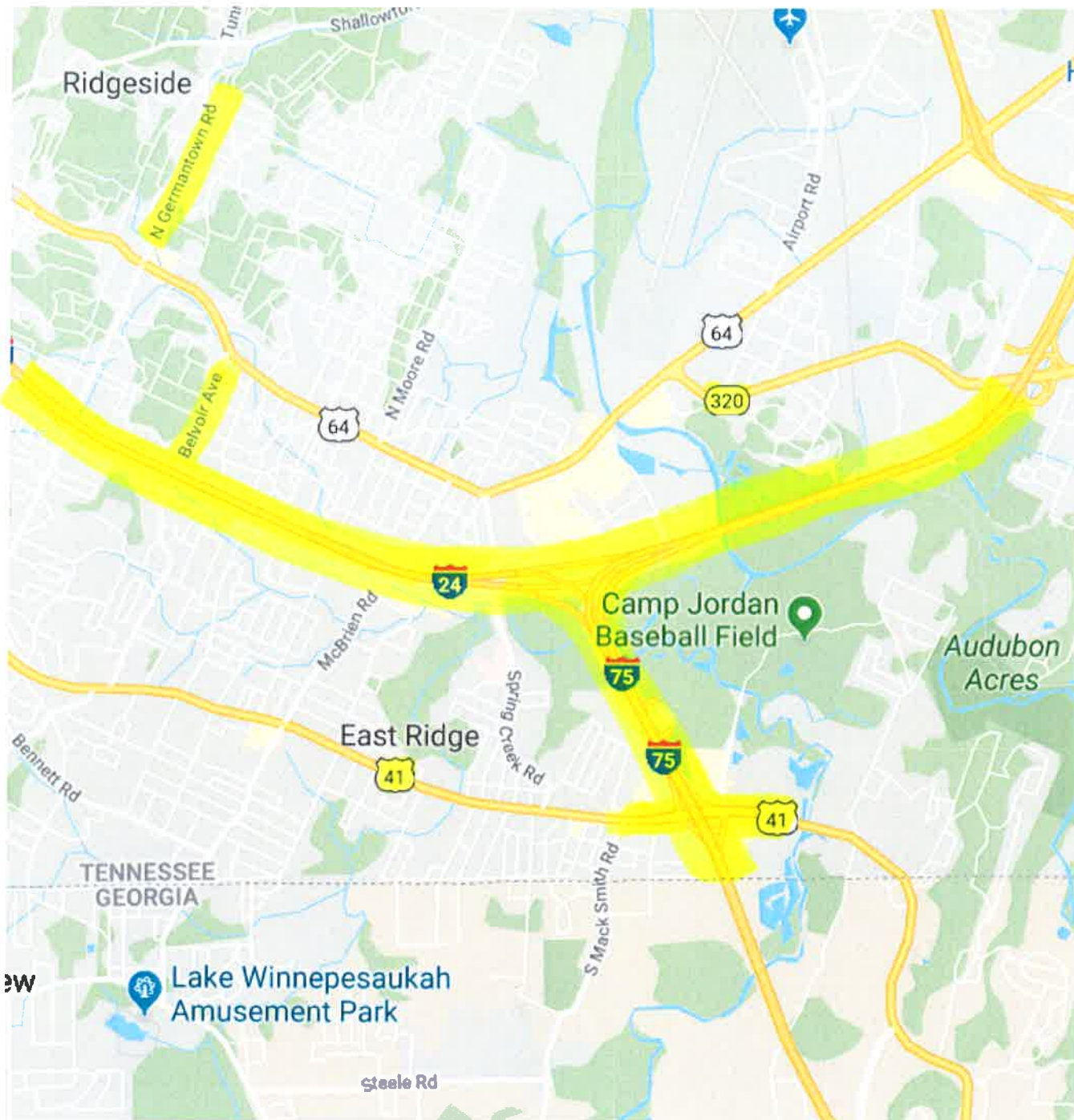
ADL Calculations By: TONY ARMSTRONG

Date: 11/21/2019

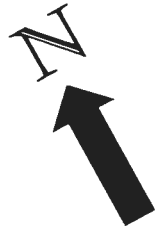
Reviewed By:

Date: 11/21/19

[REV. 7-1-14]

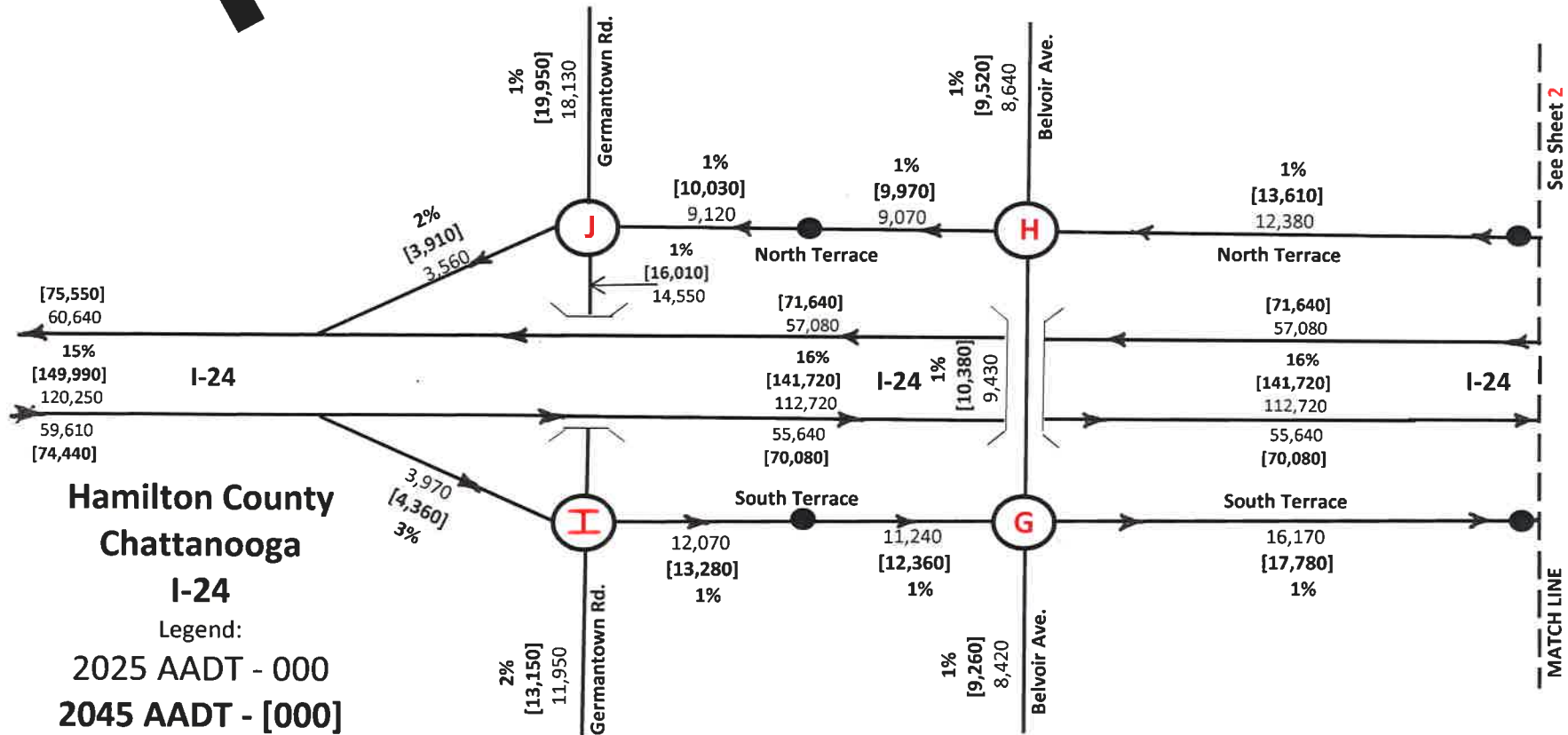


HAMILTON COUNTY
CHATTANOOGA
I-24 @ I-75



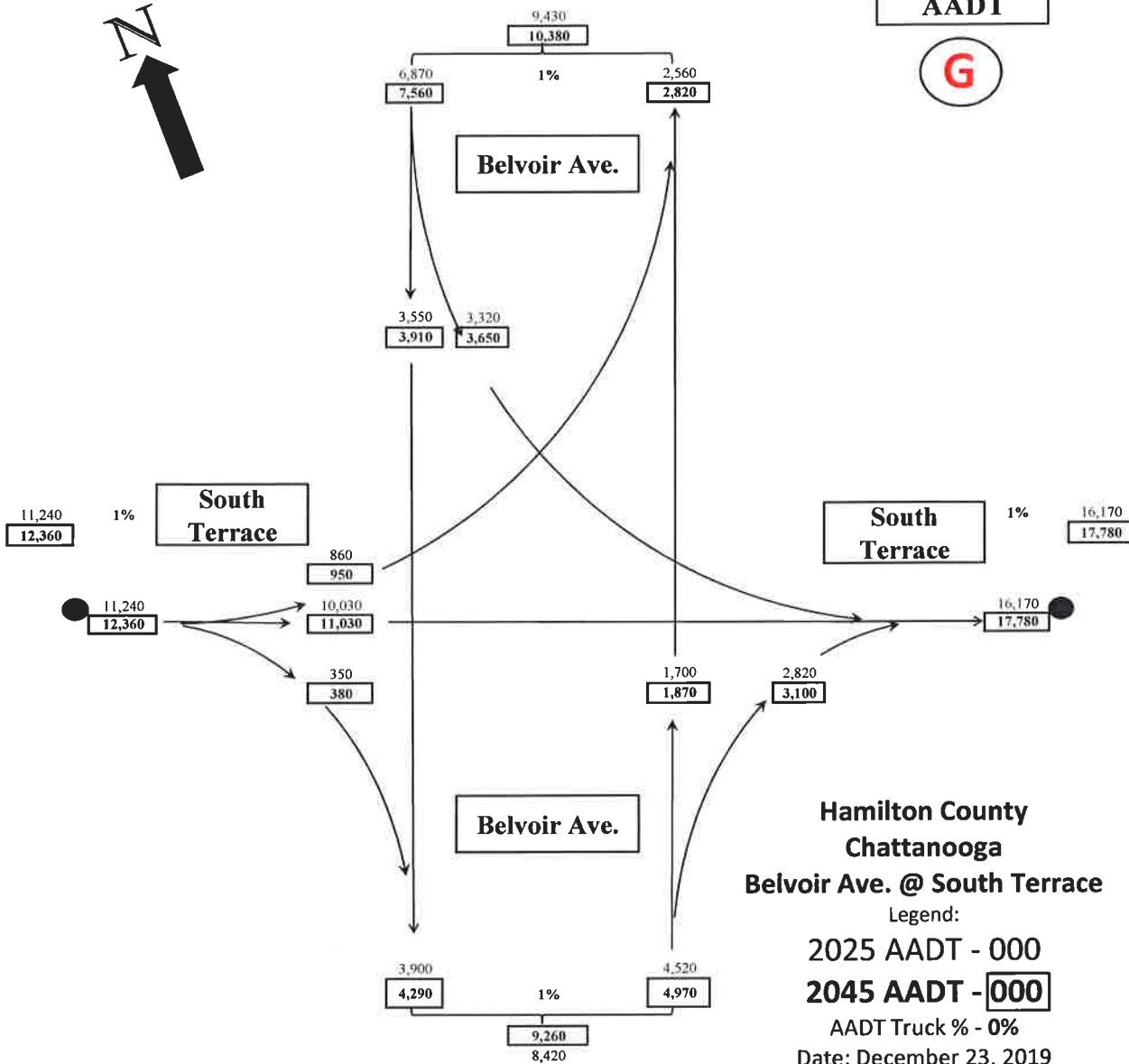
AADT

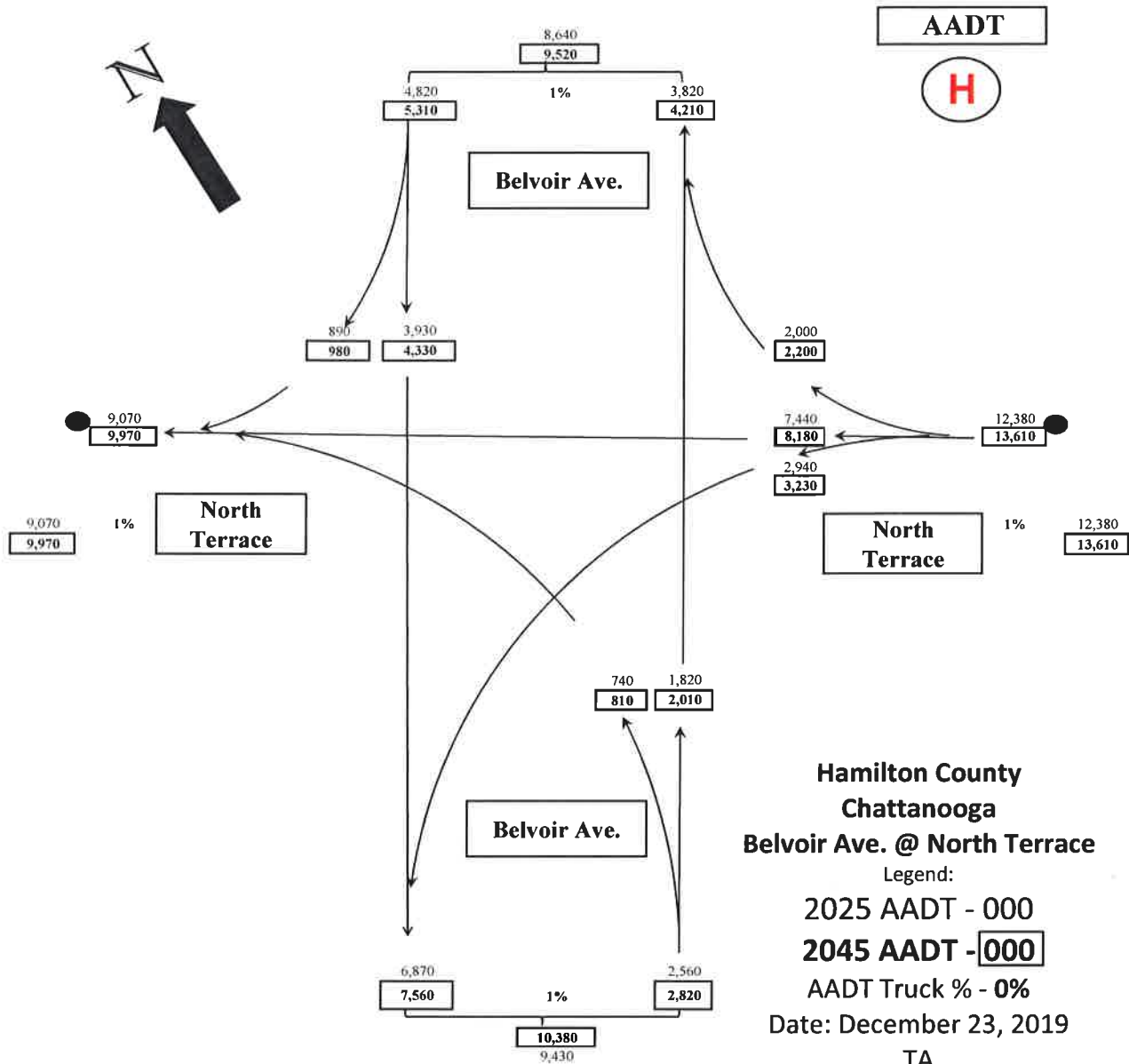
Sheet **1** of **6**





AADT

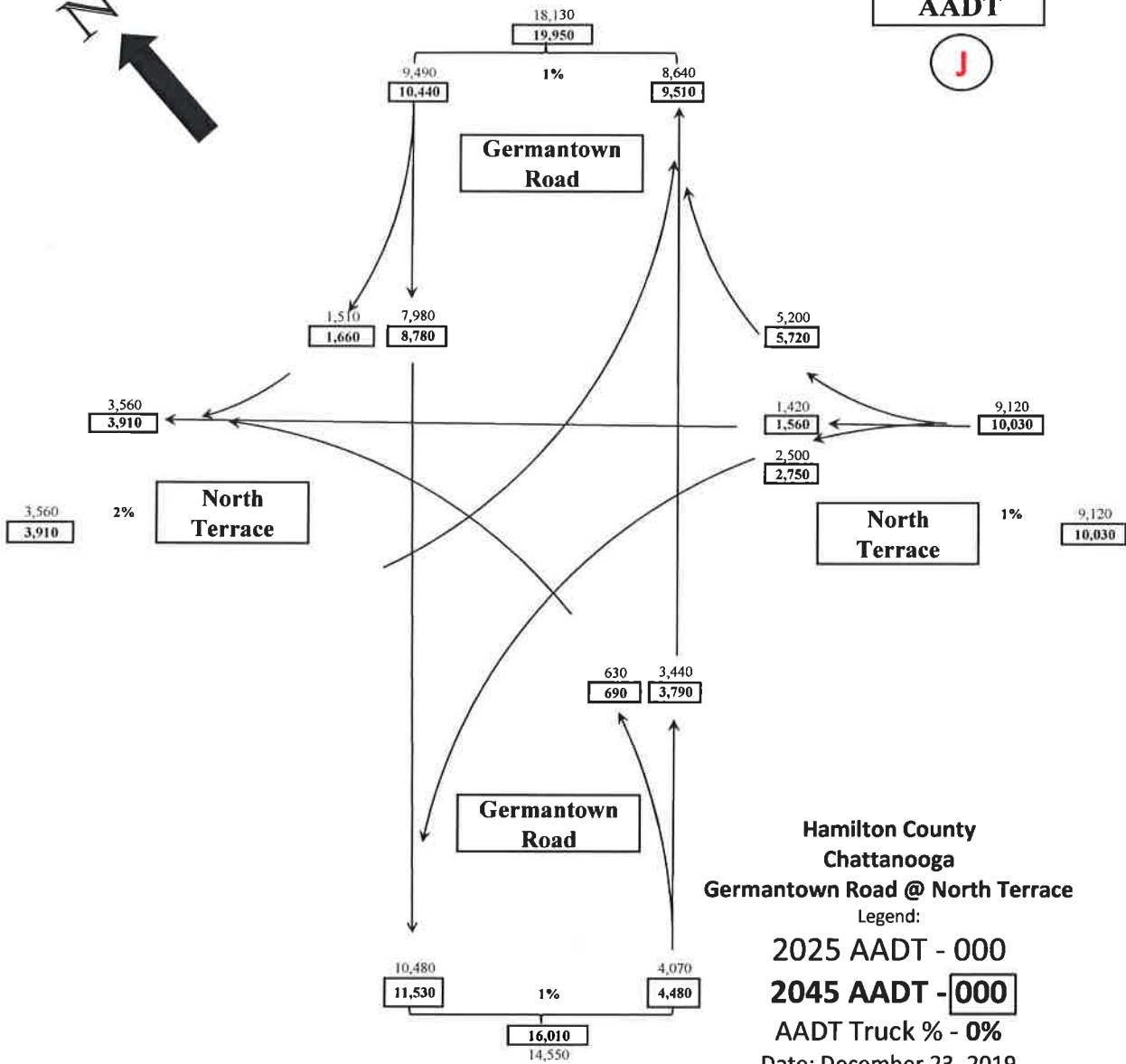








AADT
J



Hamilton County
Chattanooga
Germantown Road @ North Terrace

Legend:

2025 AADT - 000

2045 AADT - 000

AADT Truck % - 0%

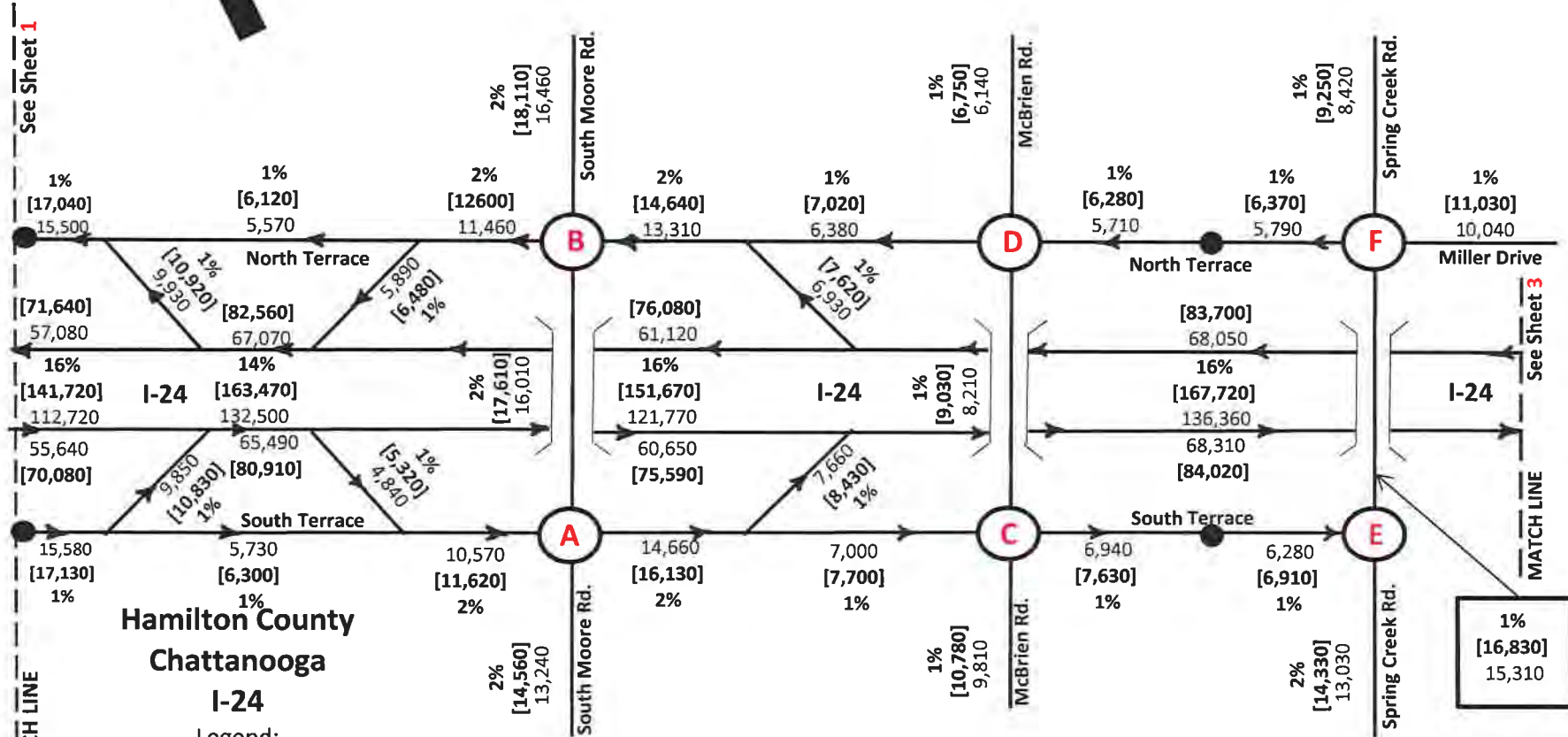
Date: December 23, 2019

TA

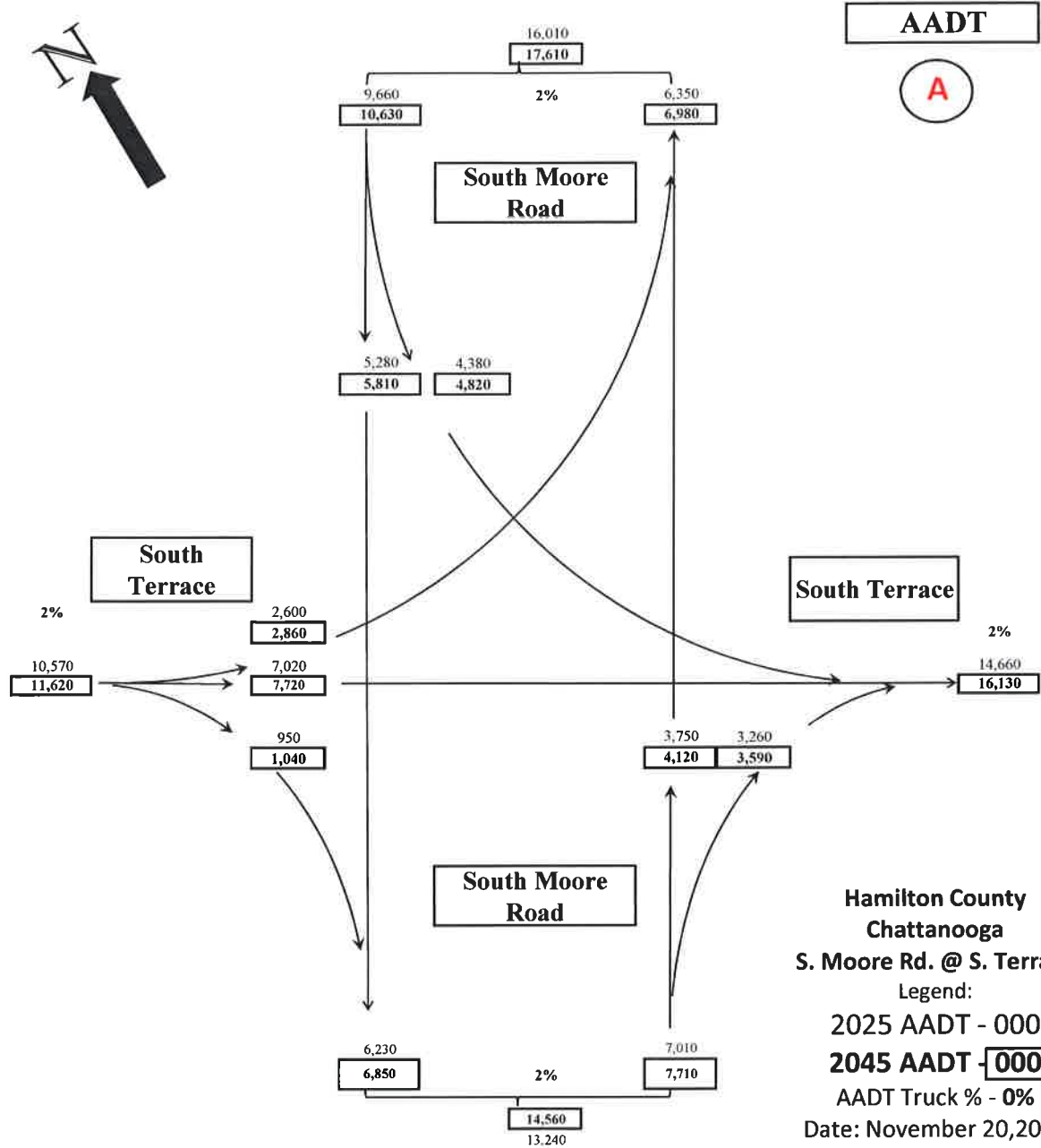


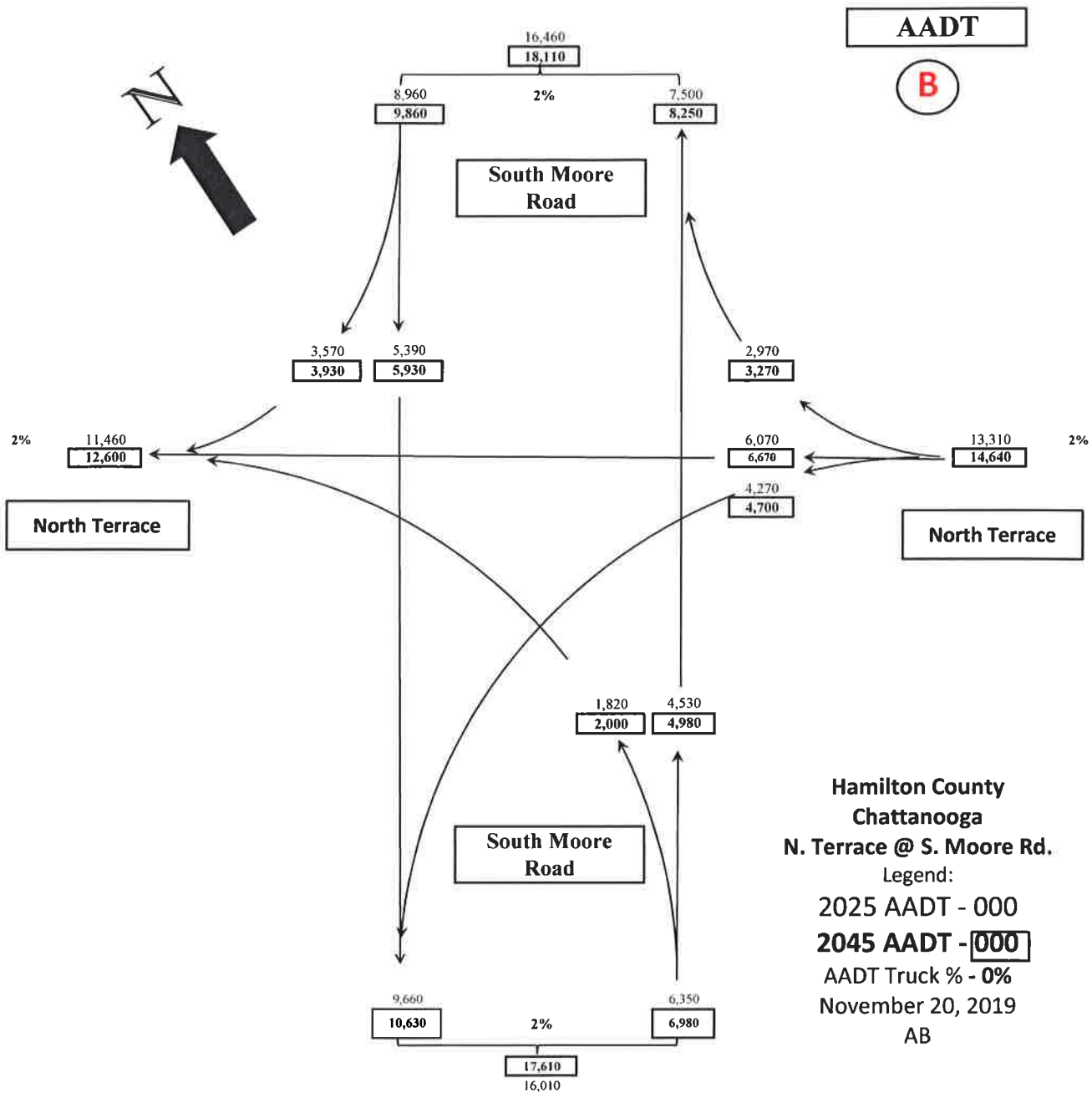
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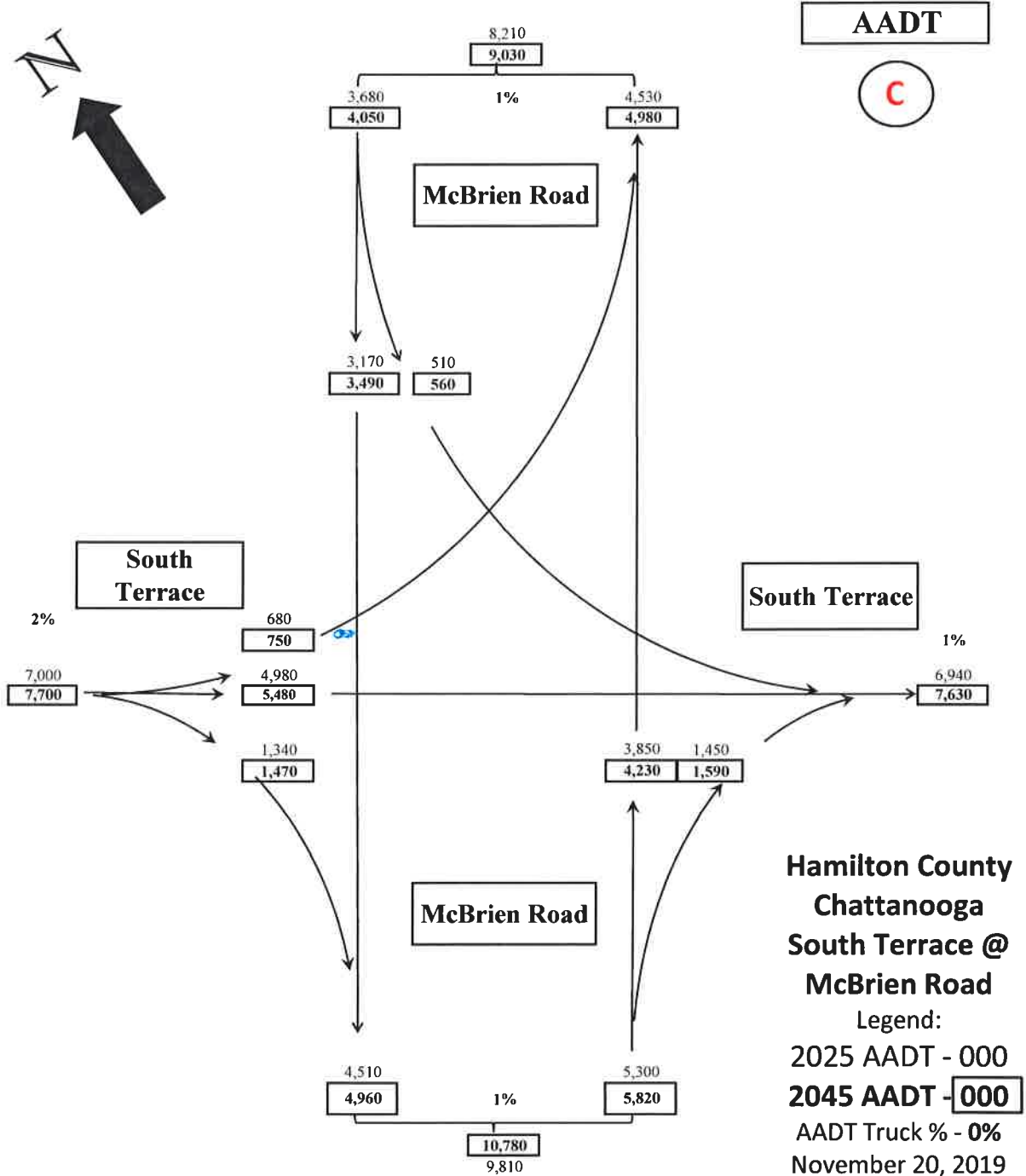
Sheet 2 of 6

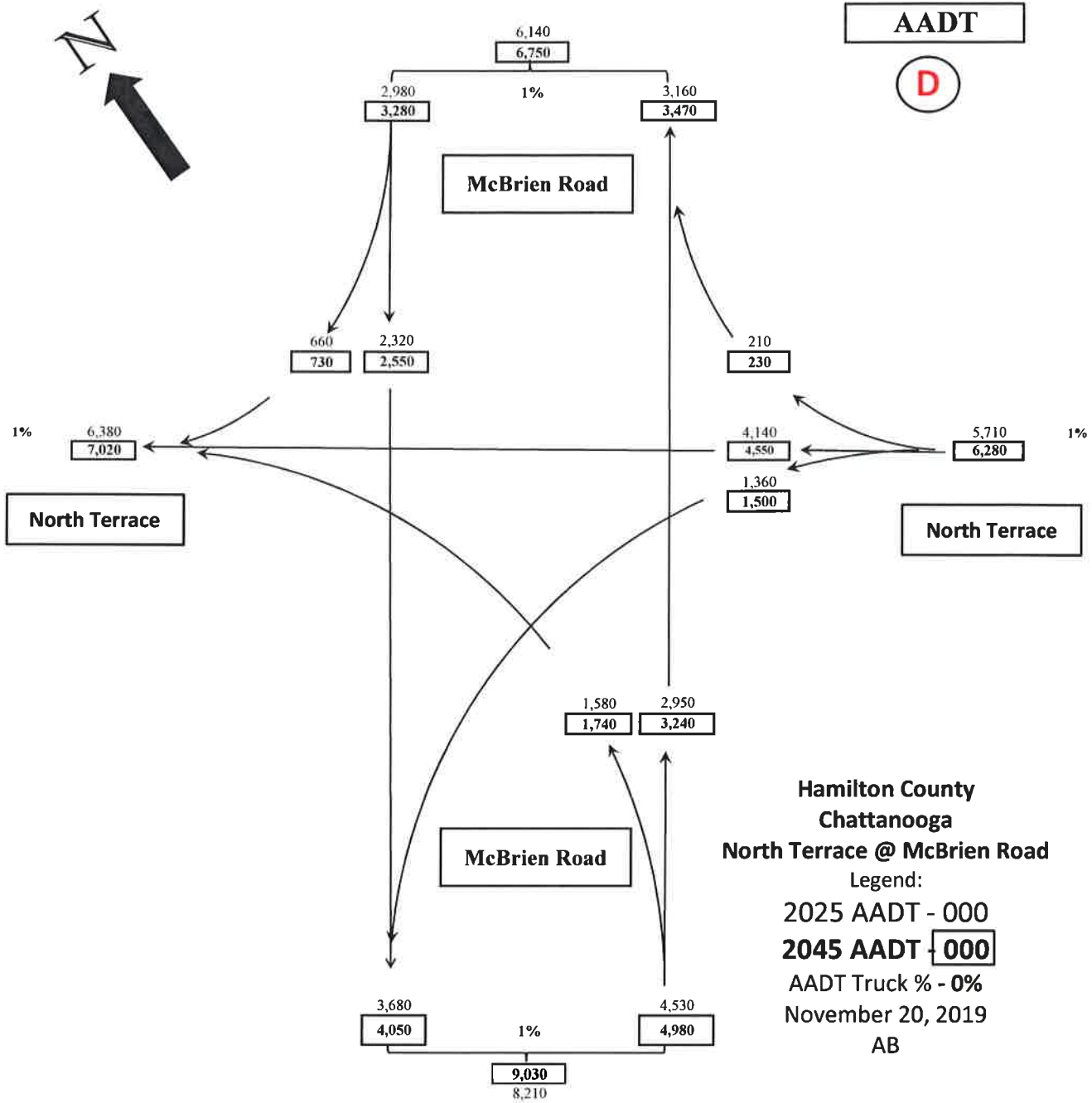


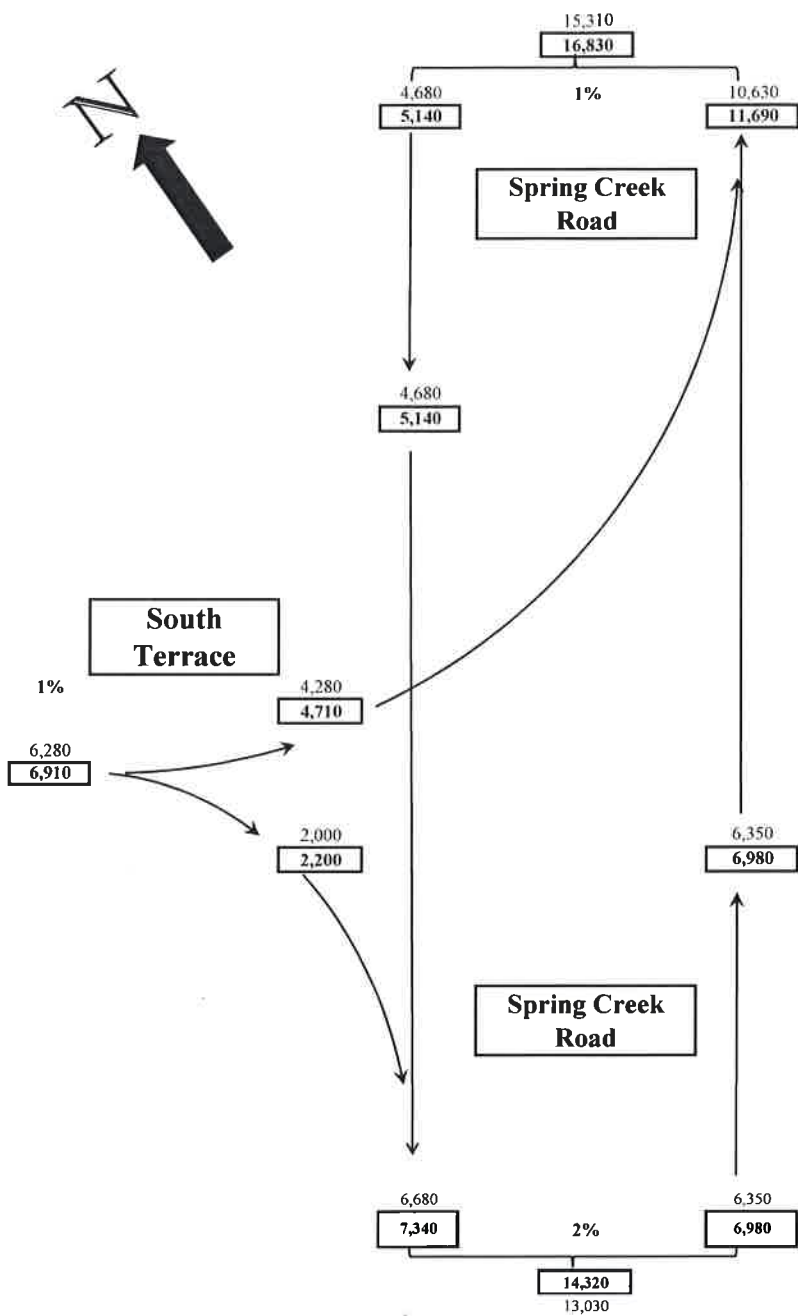
Rev. Date: December 20, 2019
TA











AADT



**Hamilton County
Chattanooga
South Terrace @ Spring
Creek Road**

Legend:

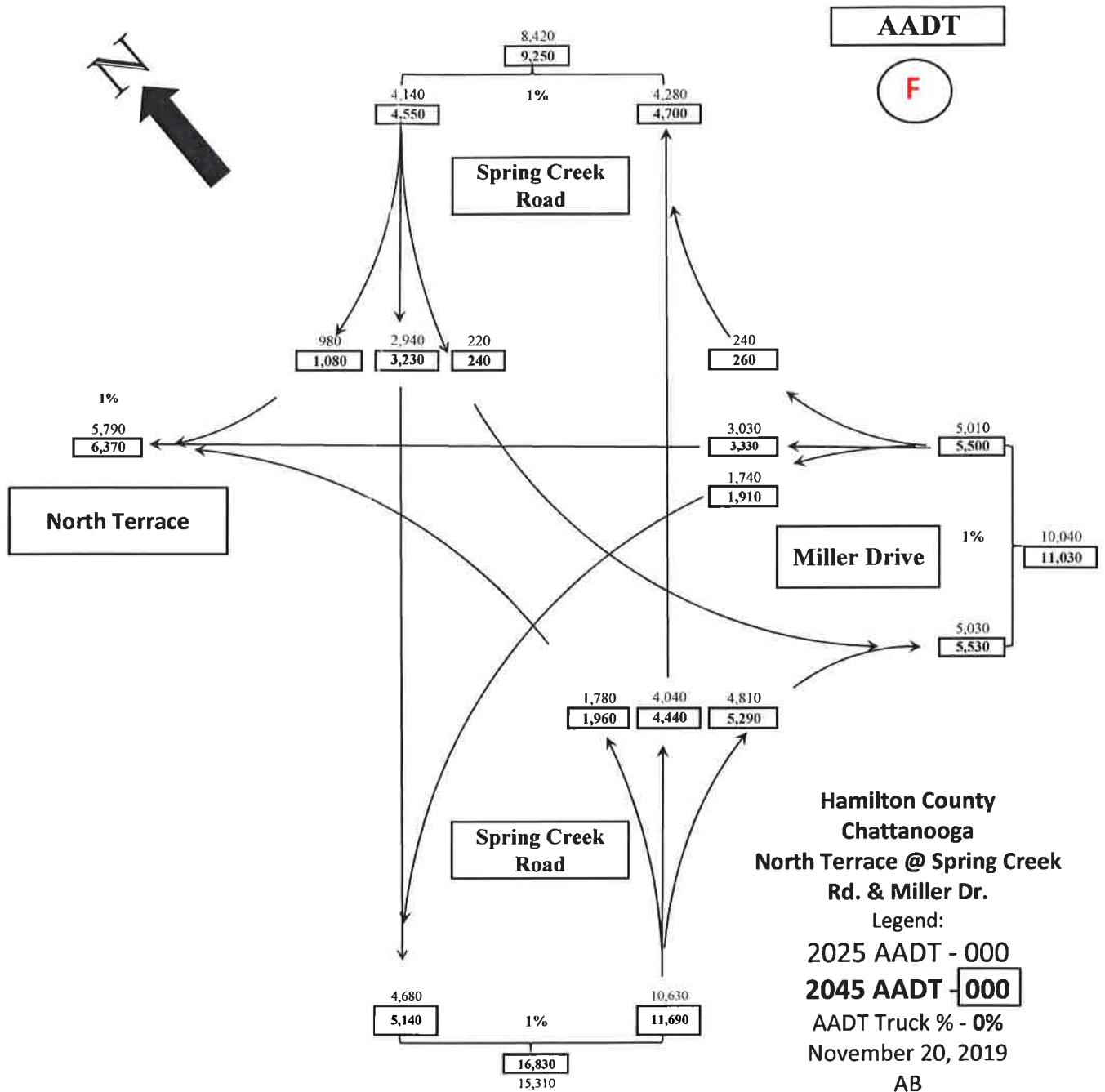
2025 AADT - 000

2045AADT - 000

AADT Truck % - 0%

November 20, 2019

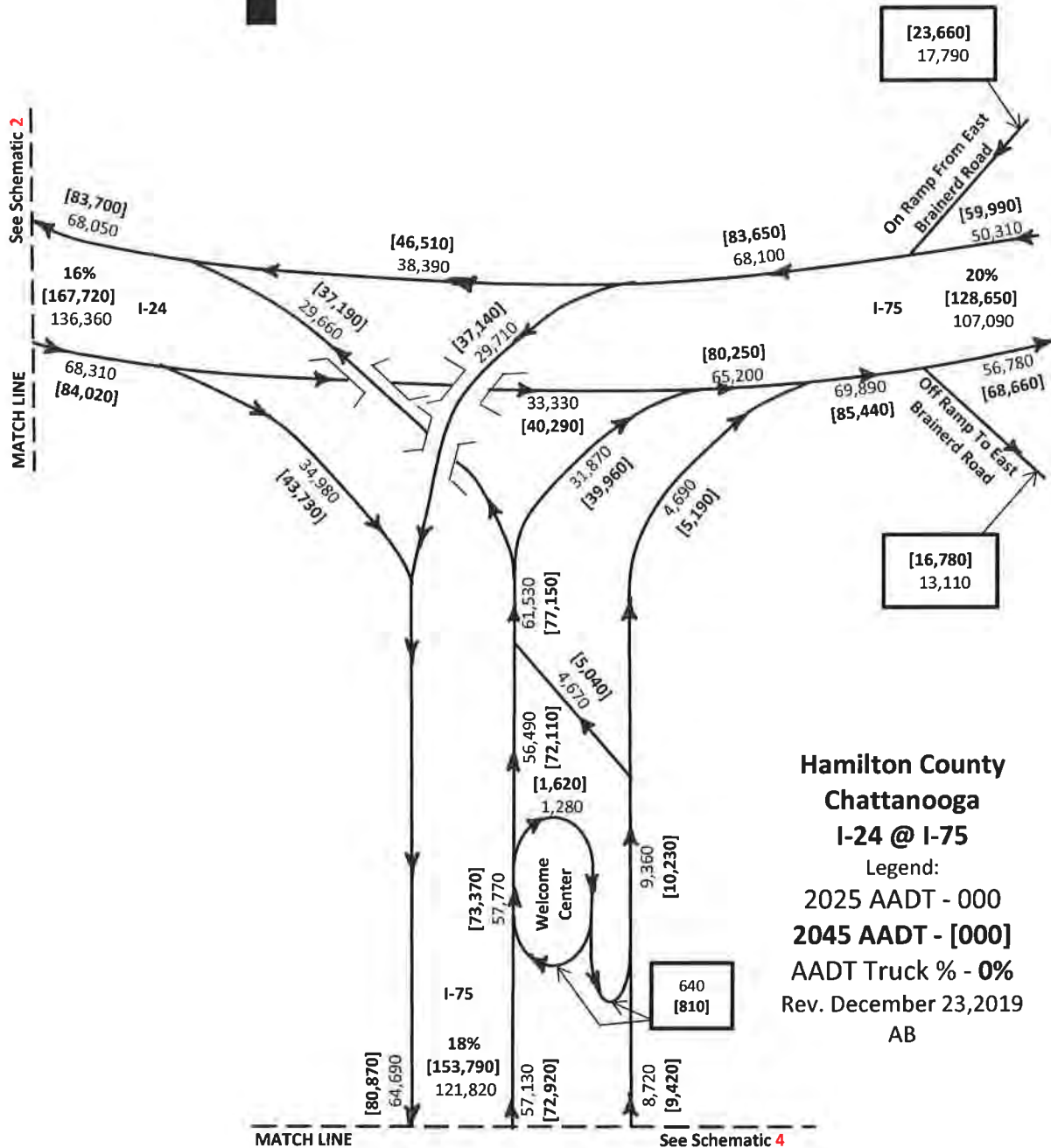
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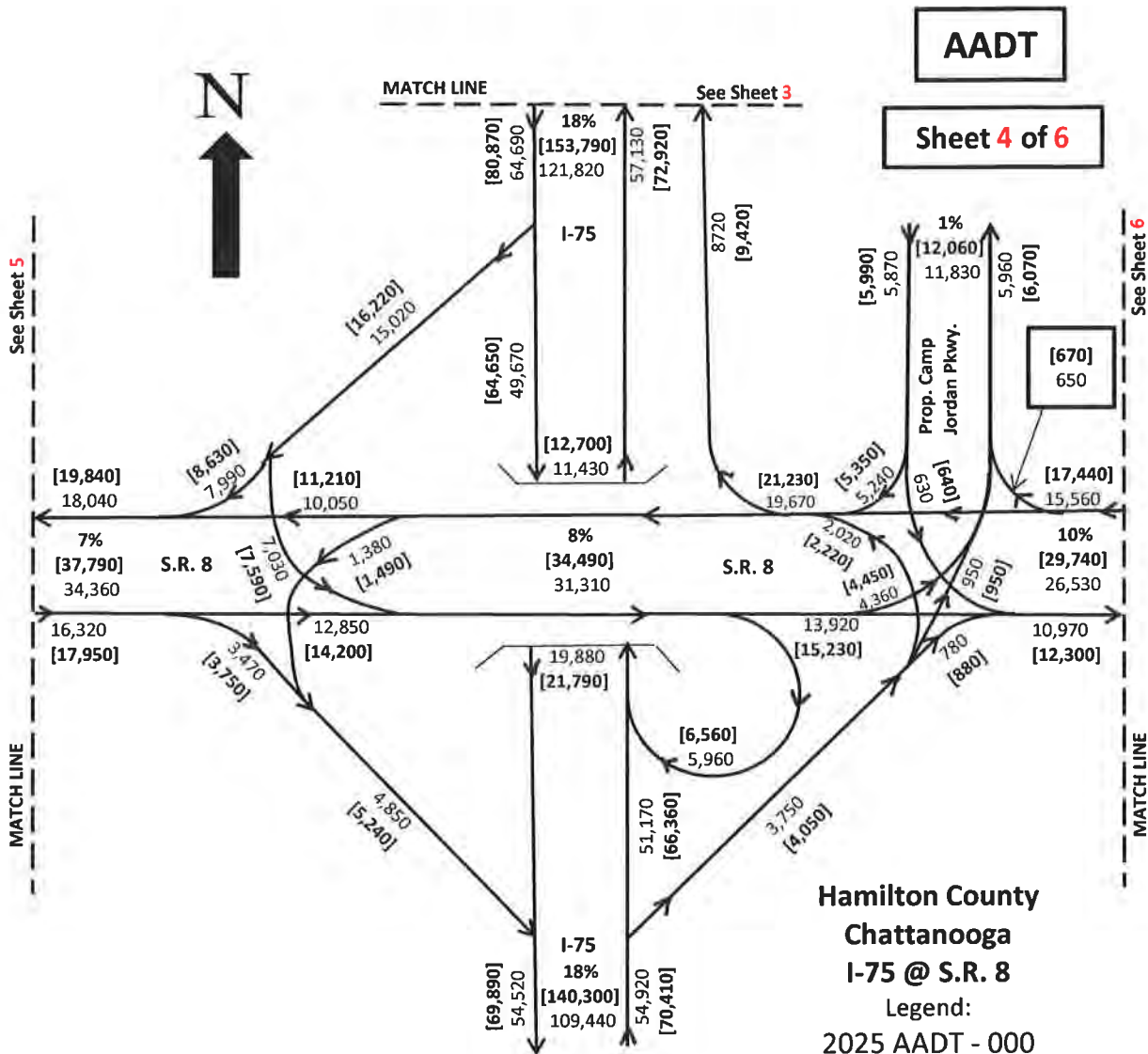




AADT

Sheet 3 of 6

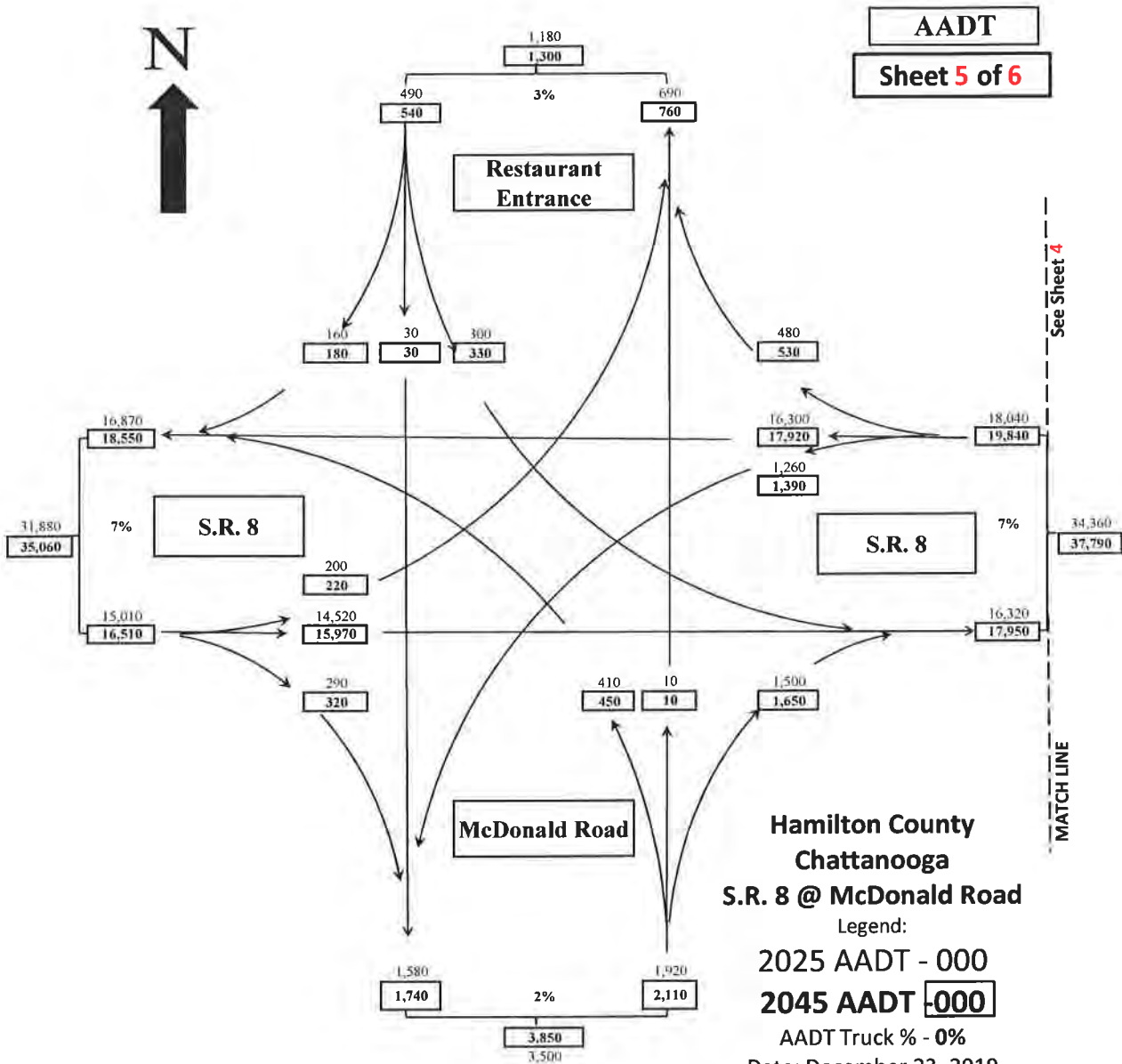






AADT

Sheet 5 of 6



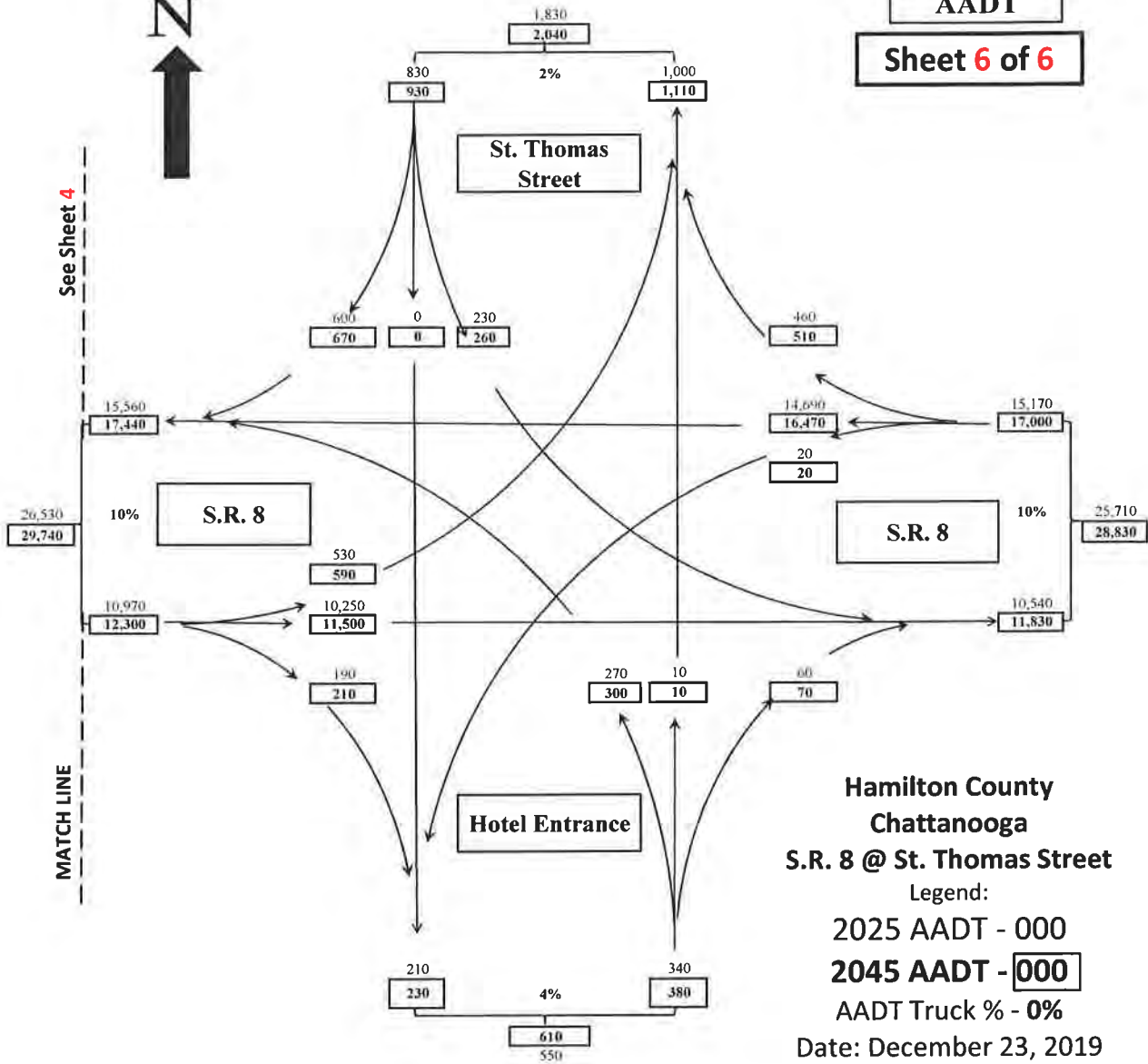


AADT

Sheet 6 of 6

See Sheet 4

MATCH LINE



**Hamilton County
Chattanooga
S.R. 8 @ St. Thomas Street**

Legend:

2025 AADT - 000

2045 AADT - 000

AADT Truck % - 0%

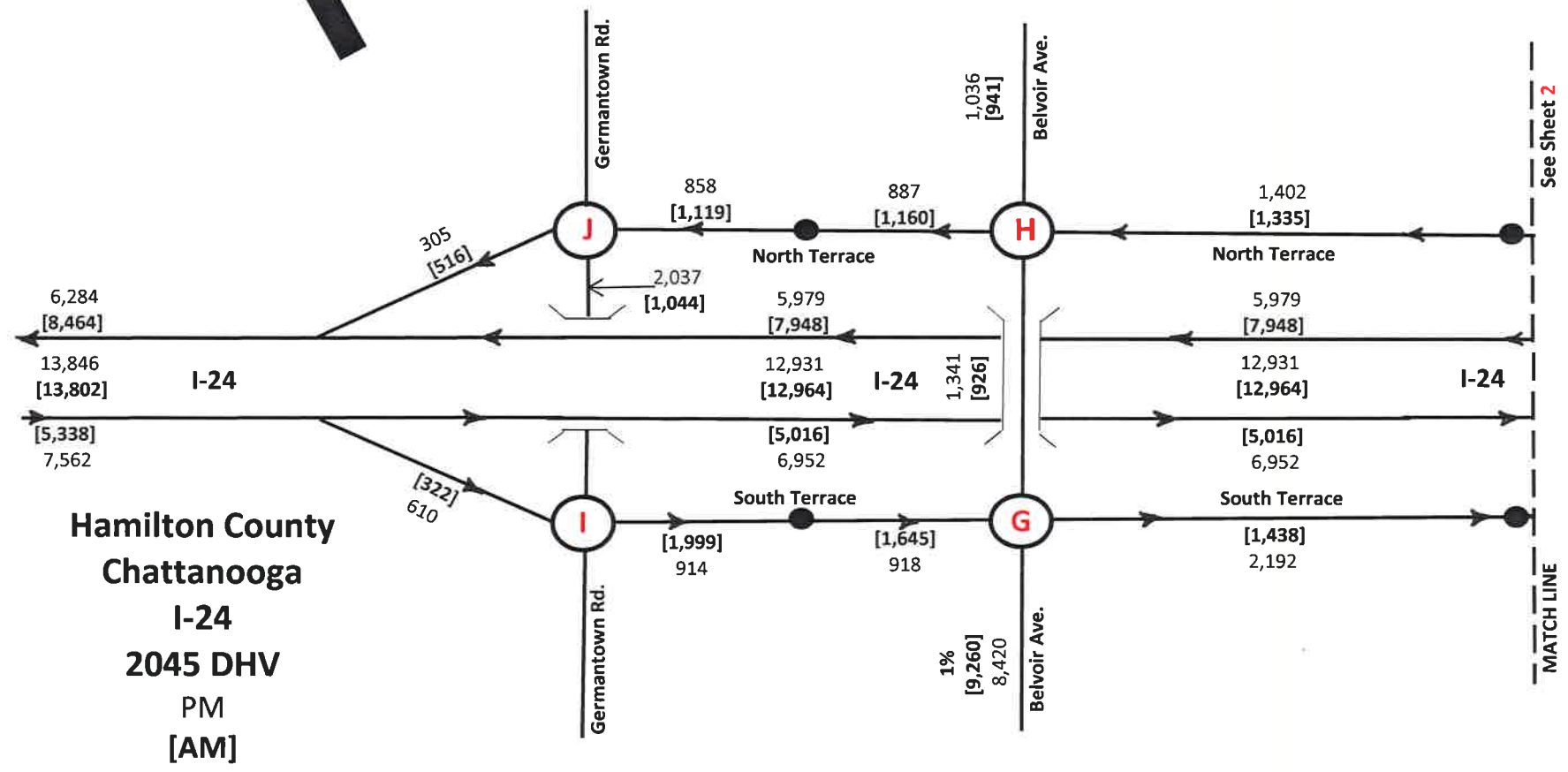
Date: December 23, 2019

TA



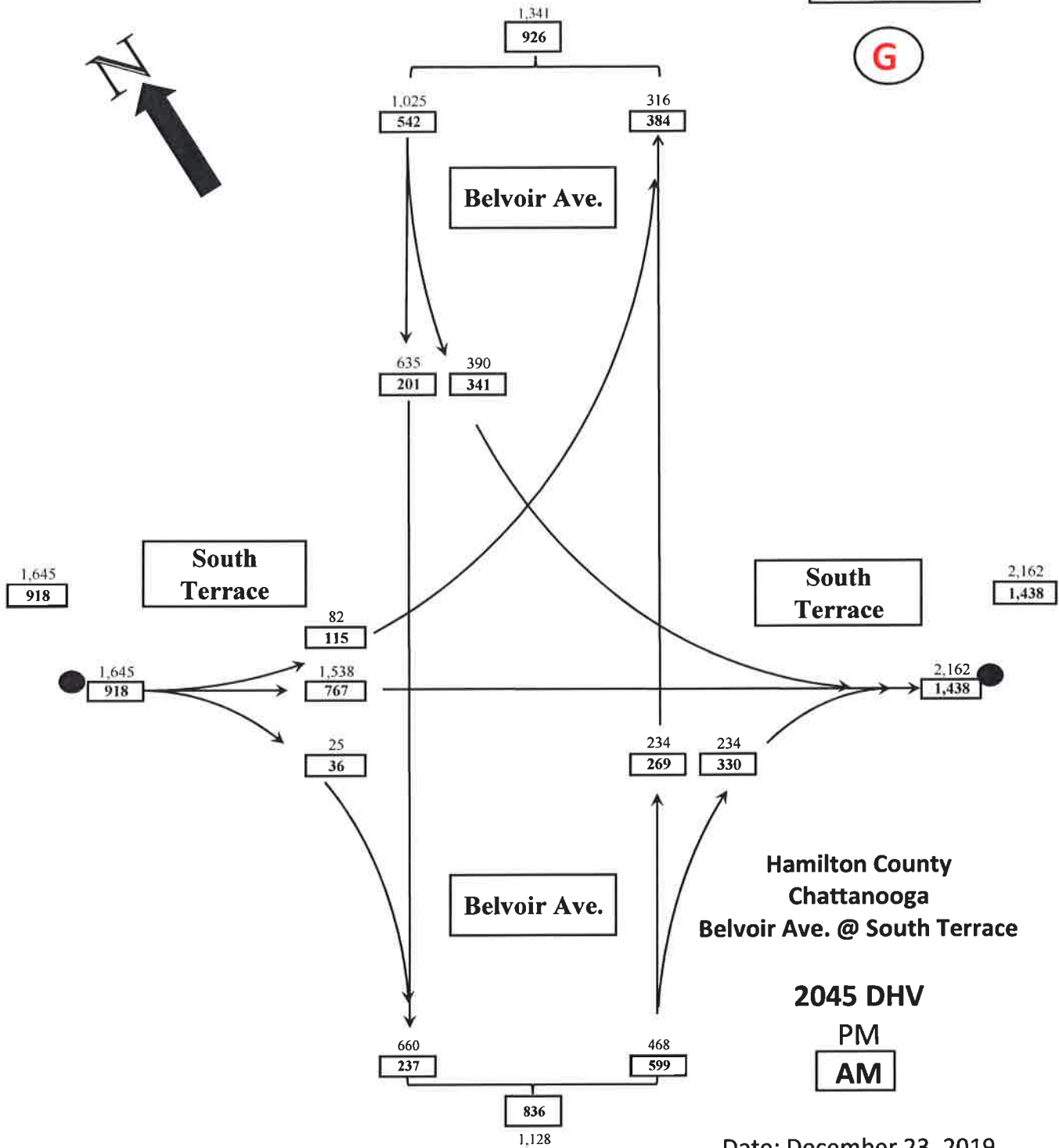
2045 DHV

Sheet 1 of 6

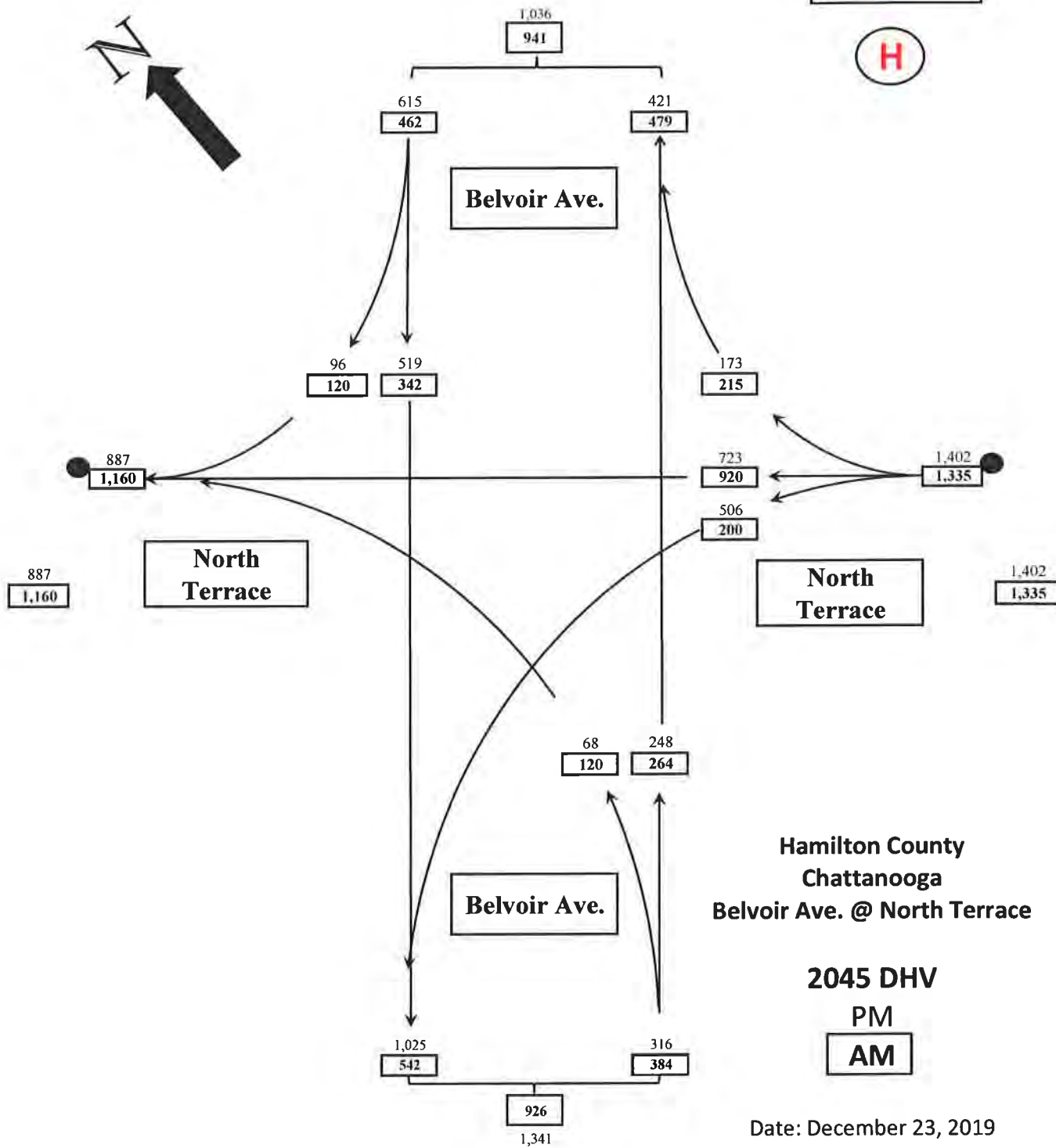


Date: December 20, 2019
TA

2045 DHV



2045 DHV



Hamilton County
Chattanooga
Belvoir Ave. @ North Terrace

2045 DHV

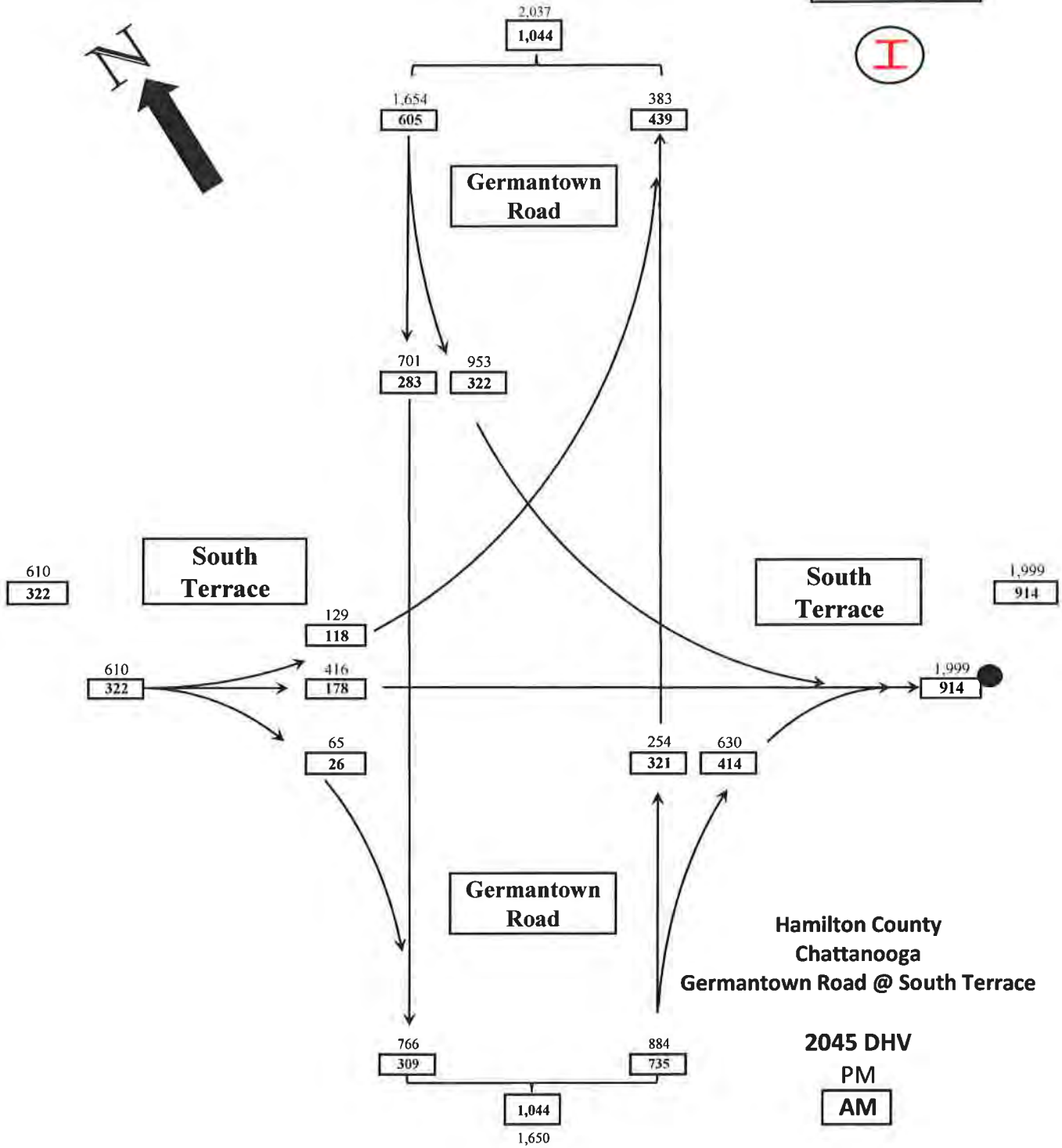
PM

AM

Date: December 23, 2019

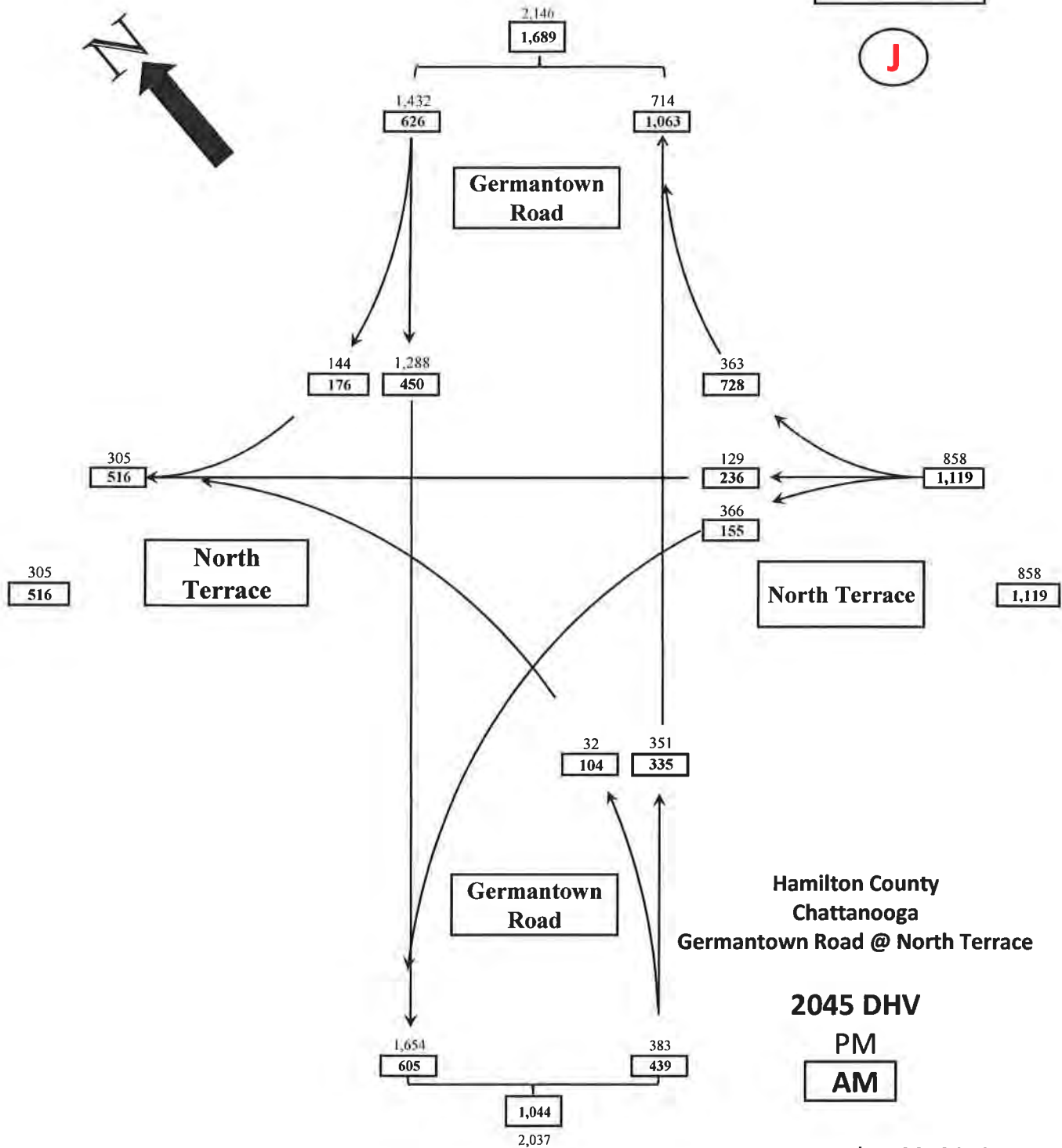
TA

2045 DHV



Date: December 23, 2019
TA

2045 DHV



Hamilton County
Chattanooga
Germantown Road @ North Terrace

2045 DHV

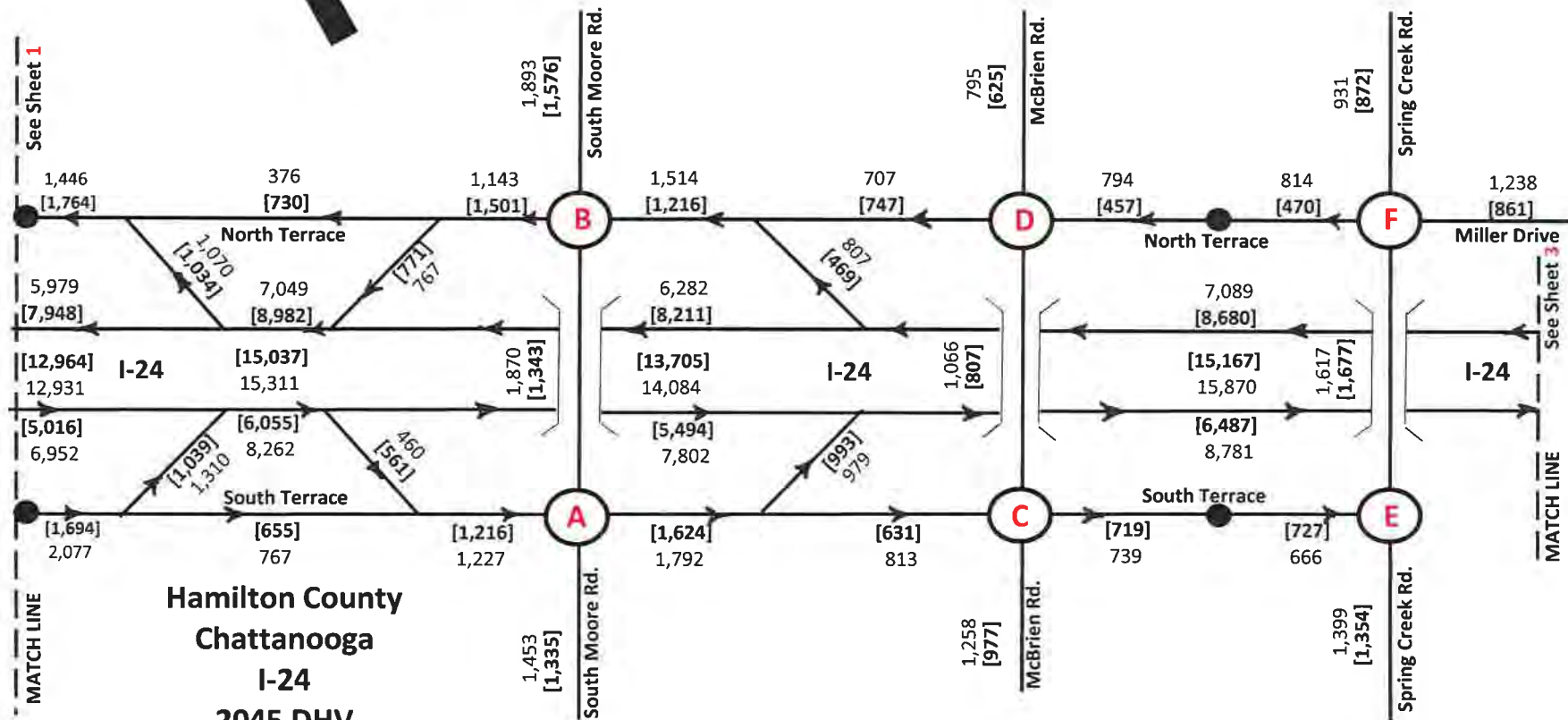
PM

AM

Date: December 23, 2019
TA

2045 DHV

Sheet 2 of 6



Hamilton County
Chattanooga
I-24

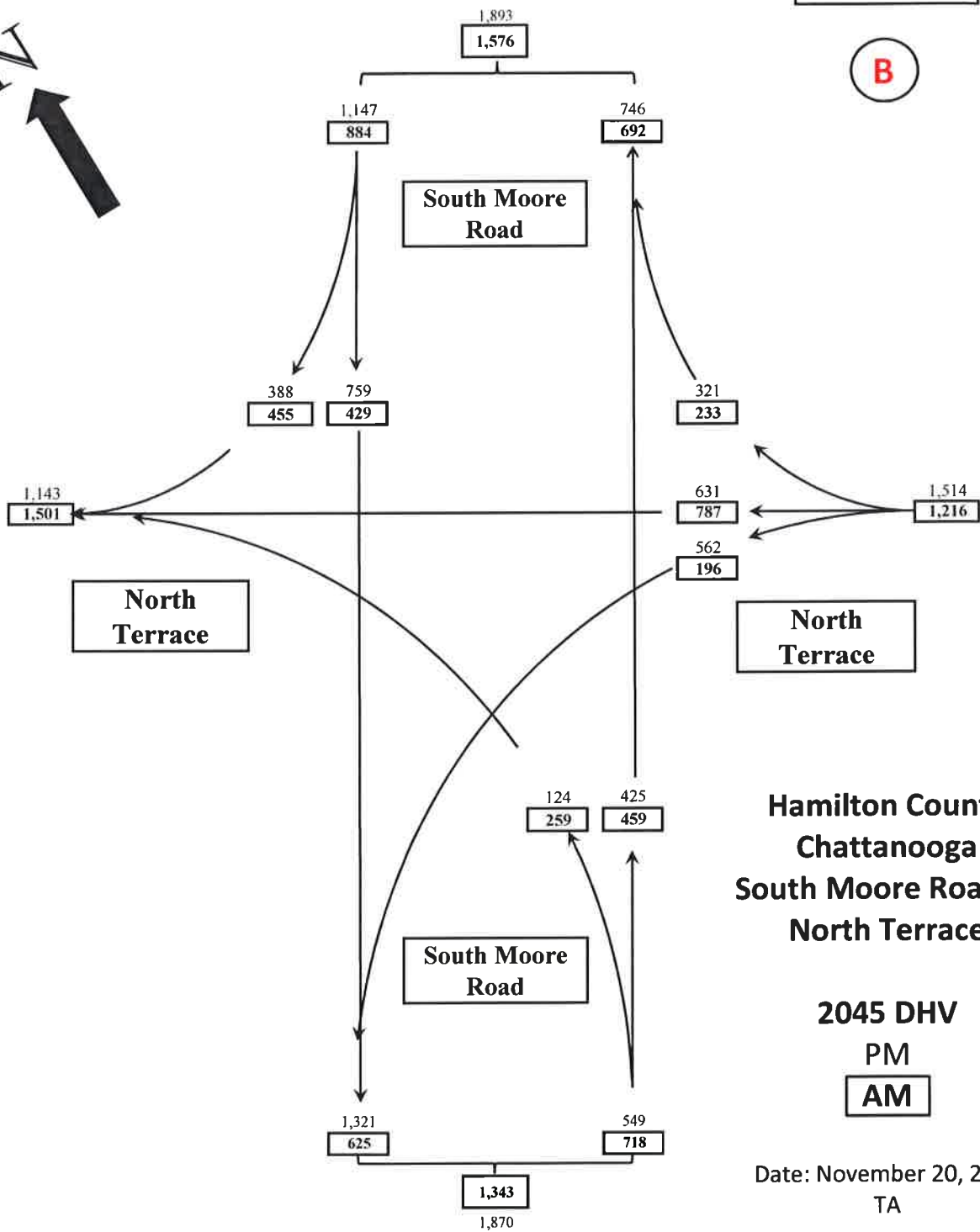
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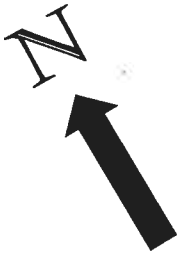
PM

[AM]

Rev. Date: December 20, 2019

TA





2045 DHV



South Terrace

South Terrace

813
631

71
82

557
482

185
67

614
198

562
172

McBrien Road

McBrien Road

1,066
807

McBrien Road

McBrien Road

977
1,258

452
609

381
527

511
738

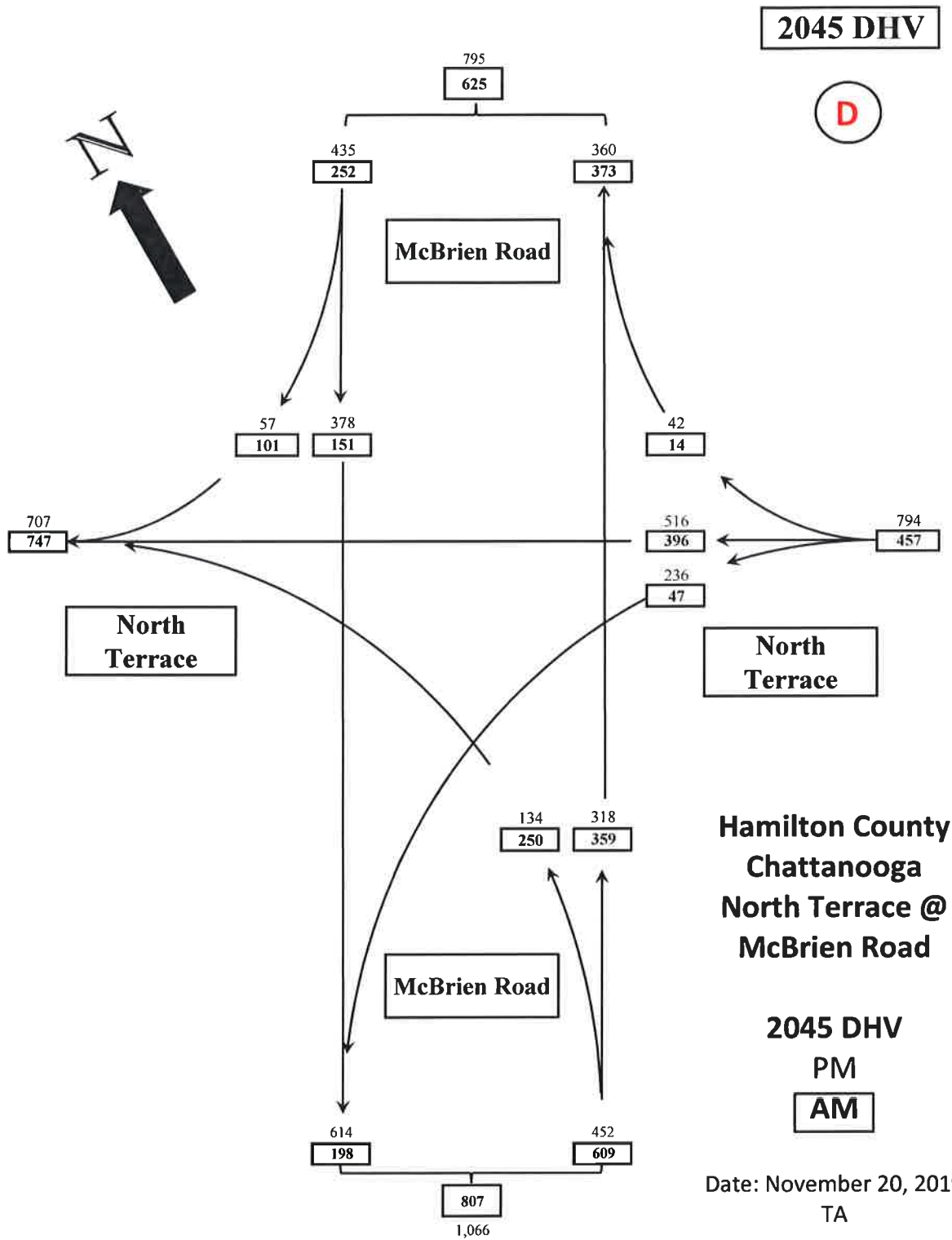
130
211

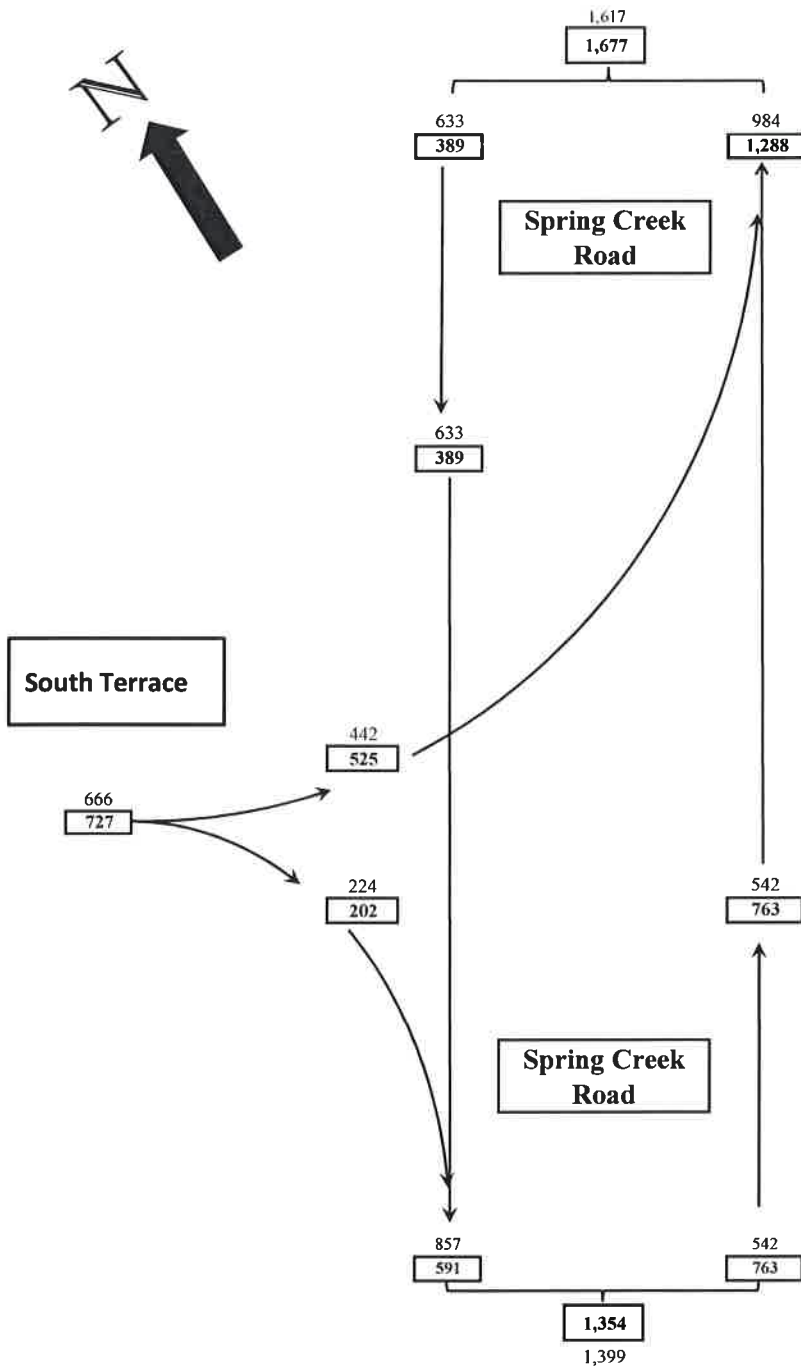
739
719

Hamilton County
Chattanooga
South Terrace @
McBrien Rd.

2045 DHV
PM
AM

Date: November 20, 2019
TA





2045 DHV



Hamilton County
Chattanooga
South Terrace @
Spring Creek Rd.

2045 DHV

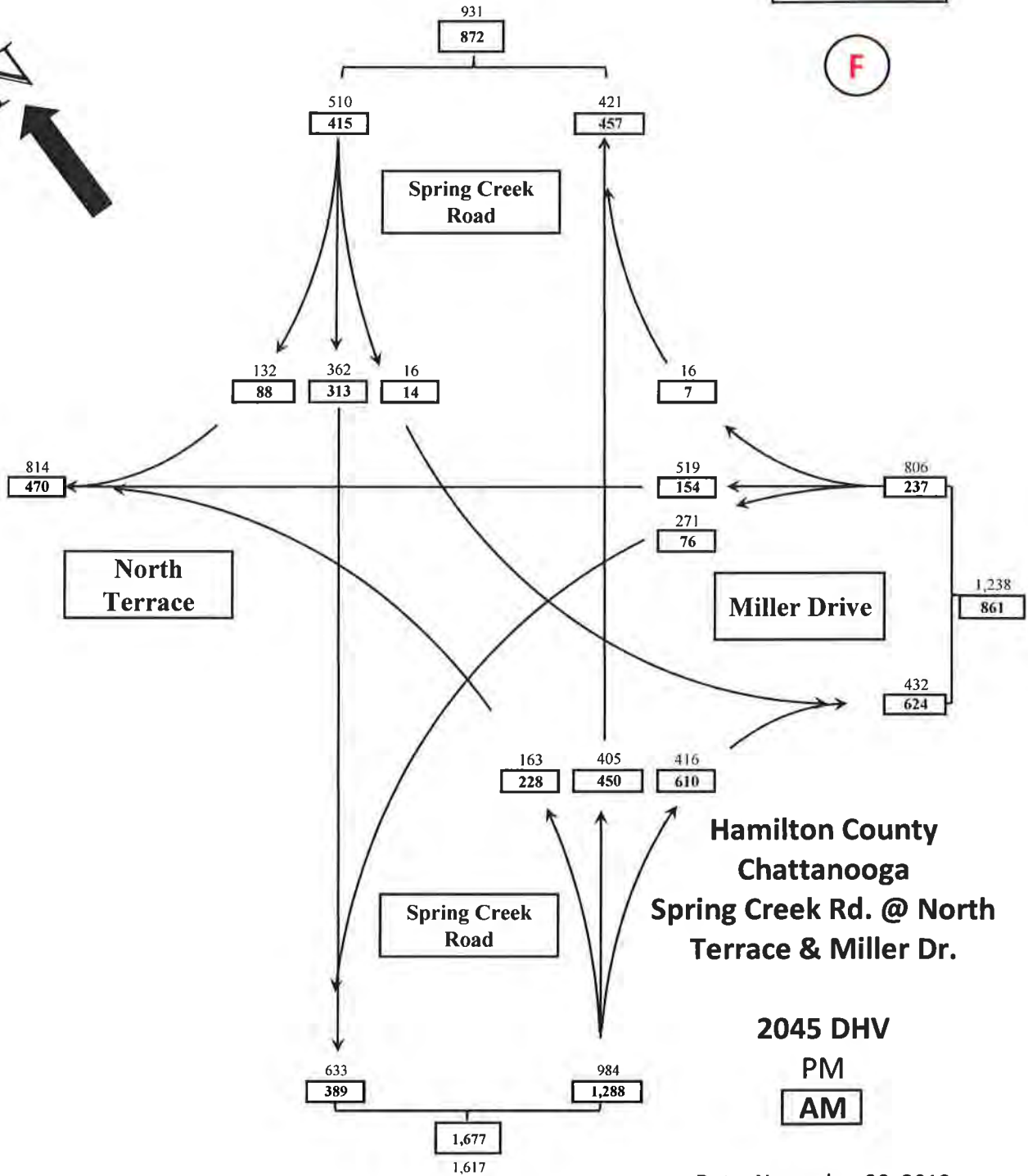
PM

AM

Date: November 20, 2019
TA



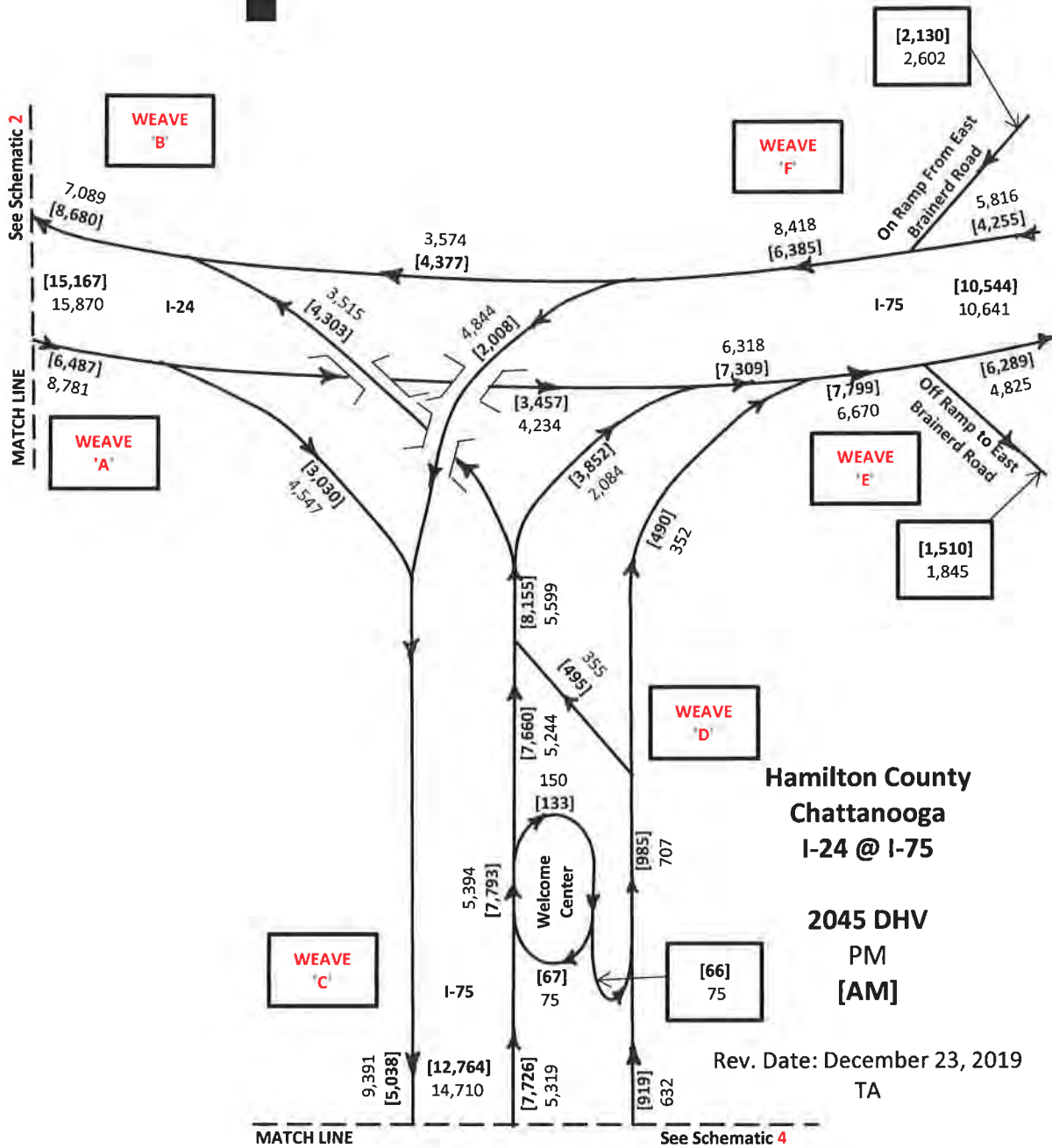
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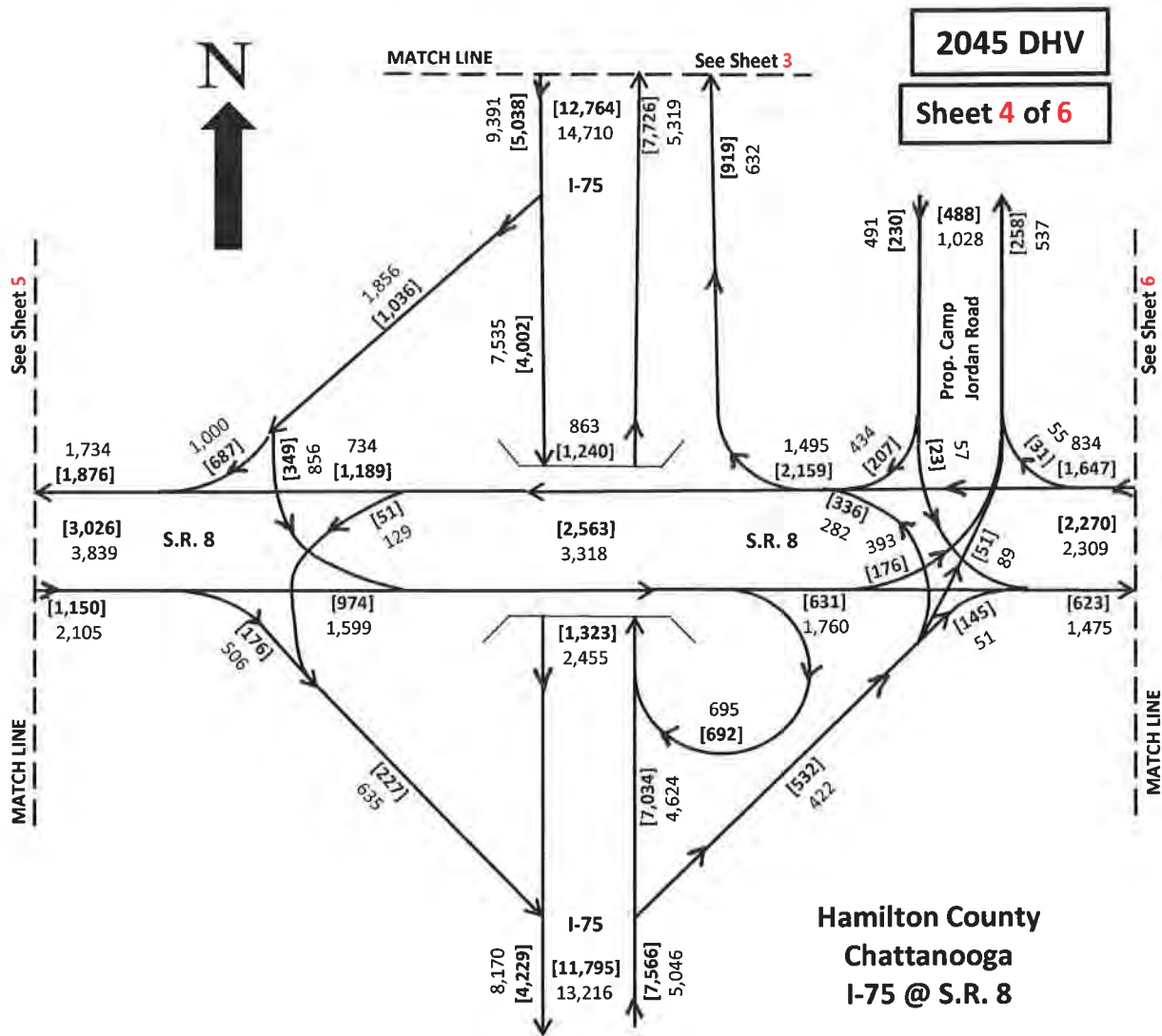


Date: November 20, 2019
TA

2045 DHV

Sheet 3 of 6

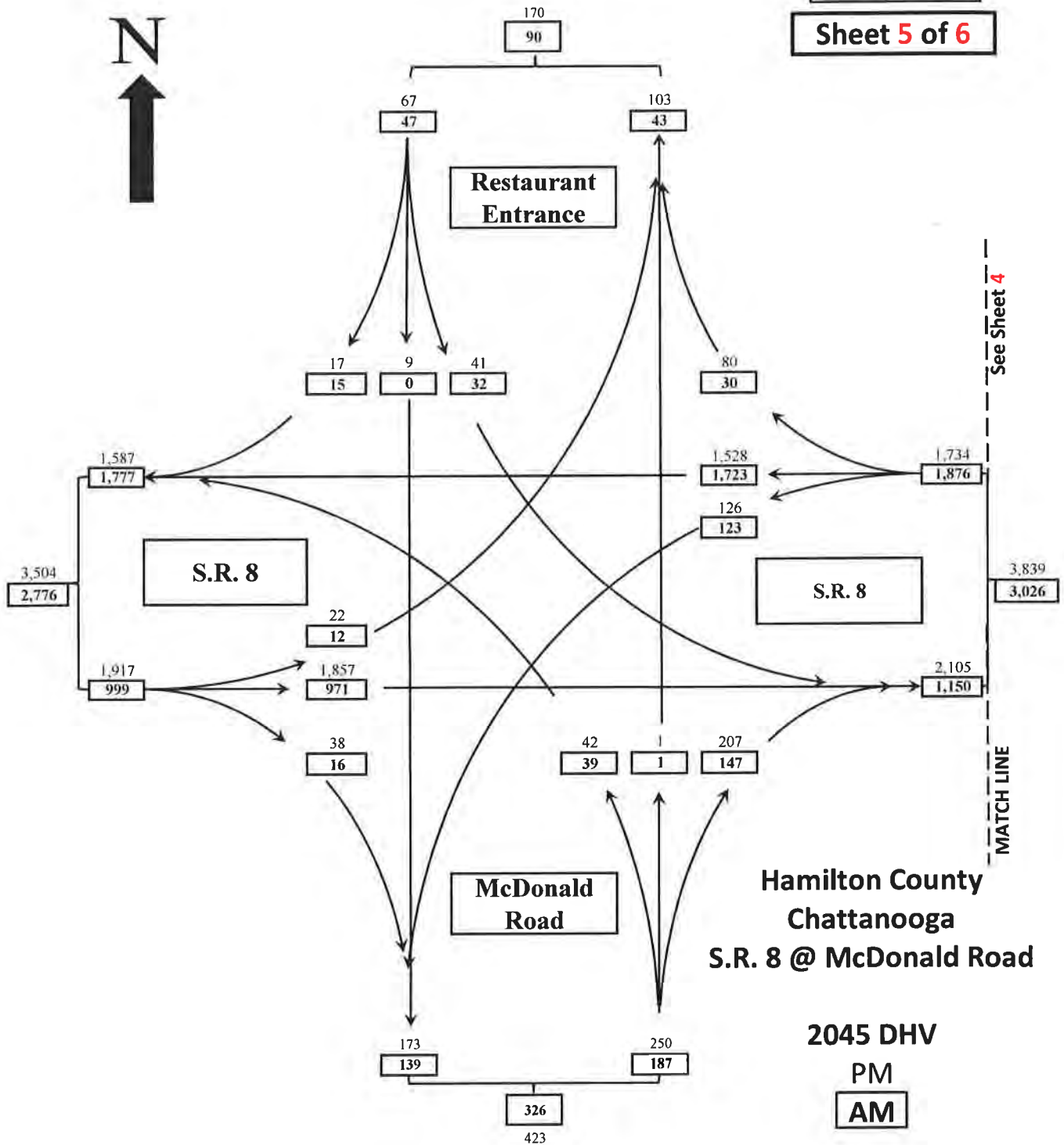






2045 DHV

Sheet 5 of 6



Date: December 23, 2019
TA

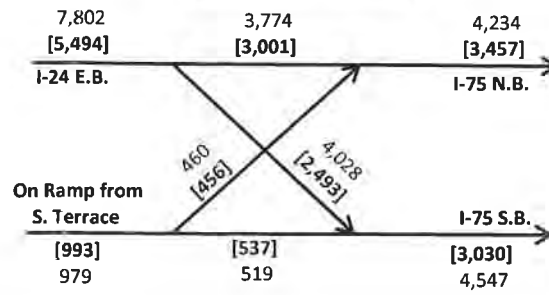
Sheet 6 of 6



Date: December 23, 2019
TA

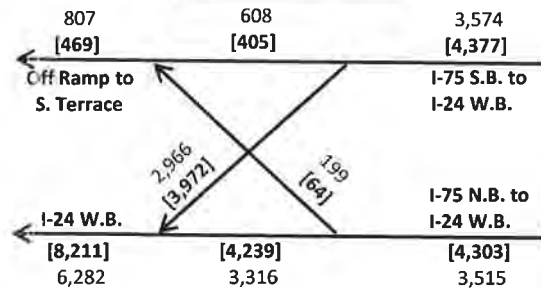
Weave 'A'

Sheet 1 of 2



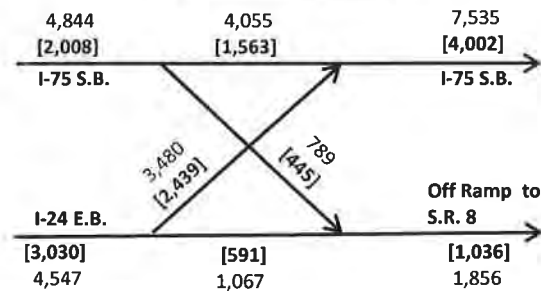
2045 DHV
PM
[AM]

Weave 'B'



2045 DHV
PM
[AM]

Weave 'C'

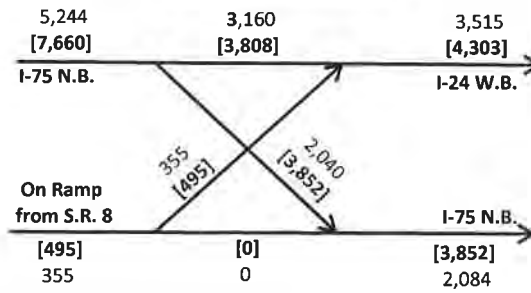


2045 DHV
PM
[AM]

See DHV Sheet 2 of 3 for WEAWE Locations.

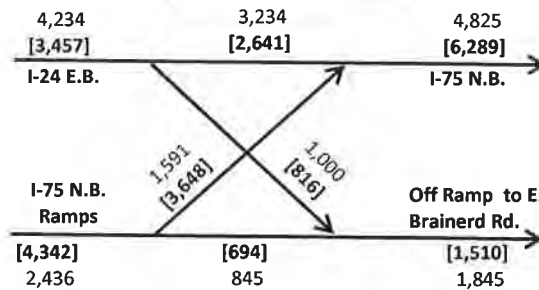
Weave 'D'

Sheet 2 of 2



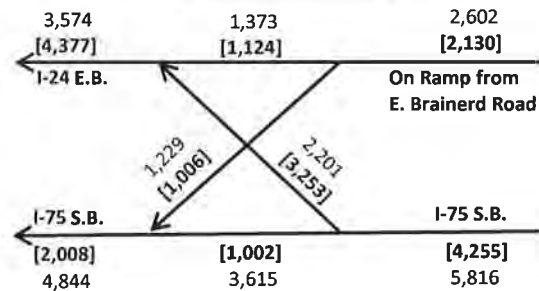
2045 DHV
PM
[AM]

Weave 'E'



2045 DHV
PM
[AM]

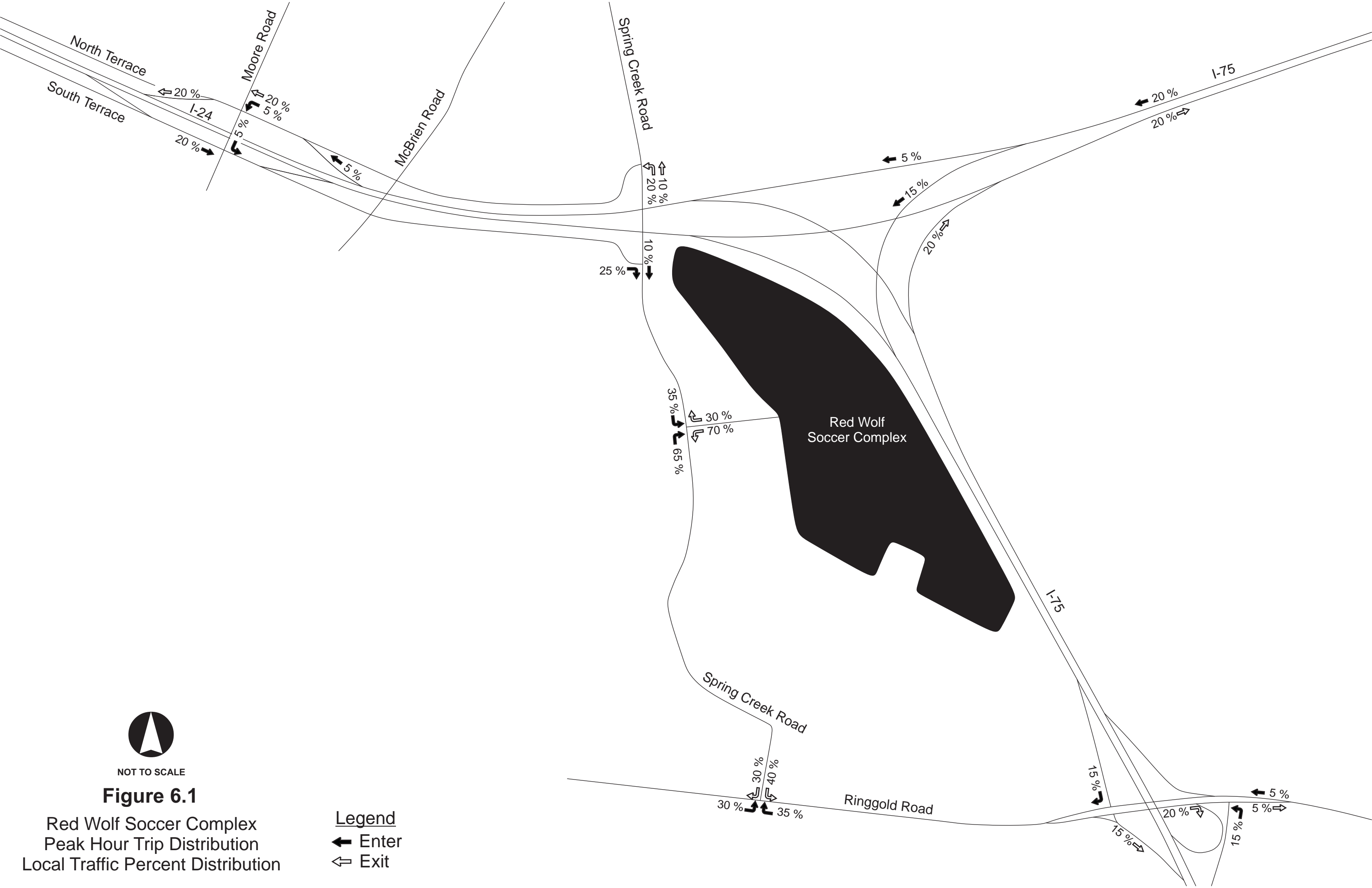
Weave 'F'



2045 DHV
PM
[AM]

See DHV Sheet 2 of 3 for WEAWE Locations.

APPENDIX - A2
Red Wolf Complex
Traffic Forecast



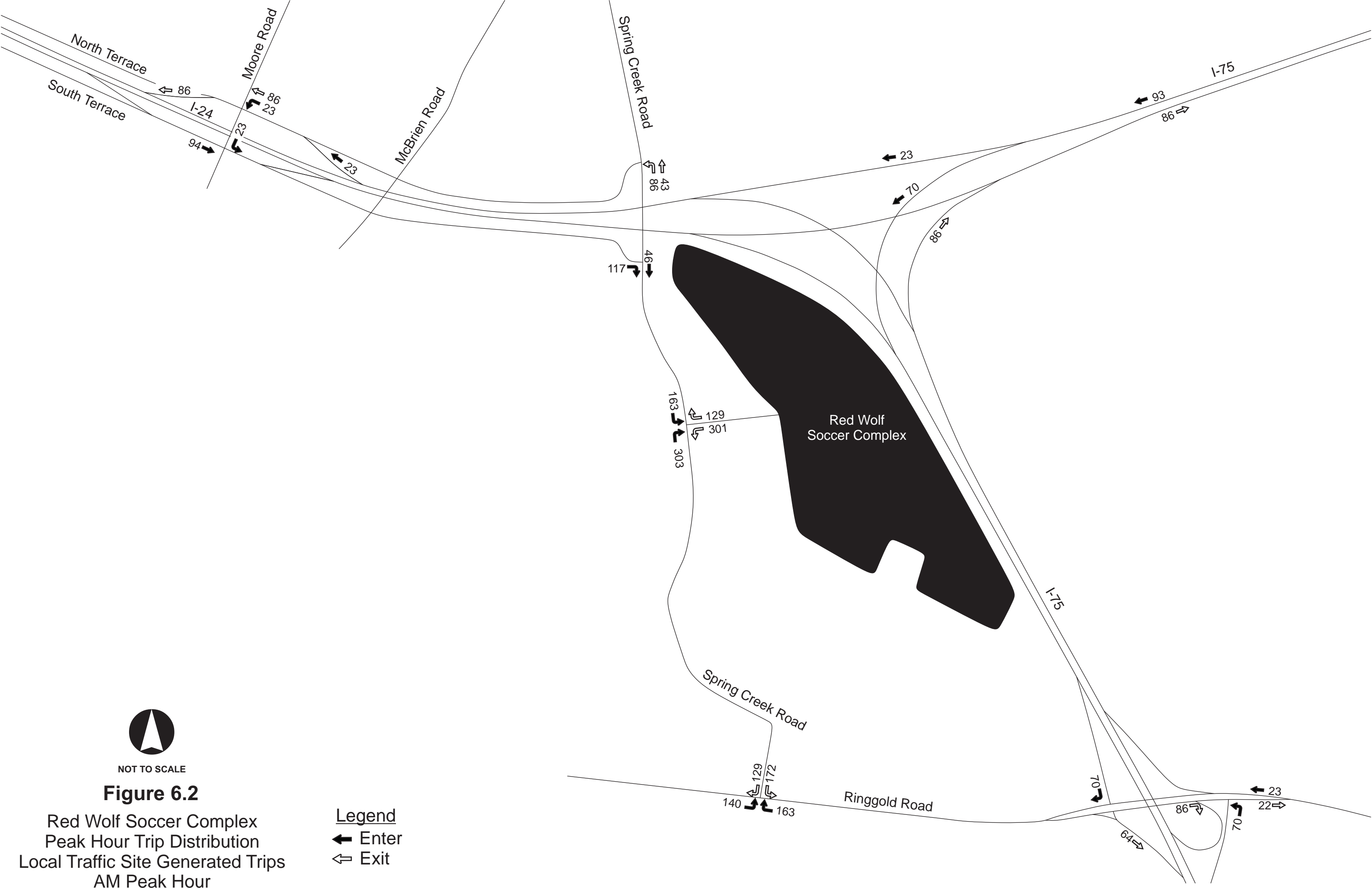
NOT TO SCALE

Figure 6.1

Red Wolf Soccer Complex
Peak Hour Trip Distribution
Local Traffic Percent Distribution

Legend

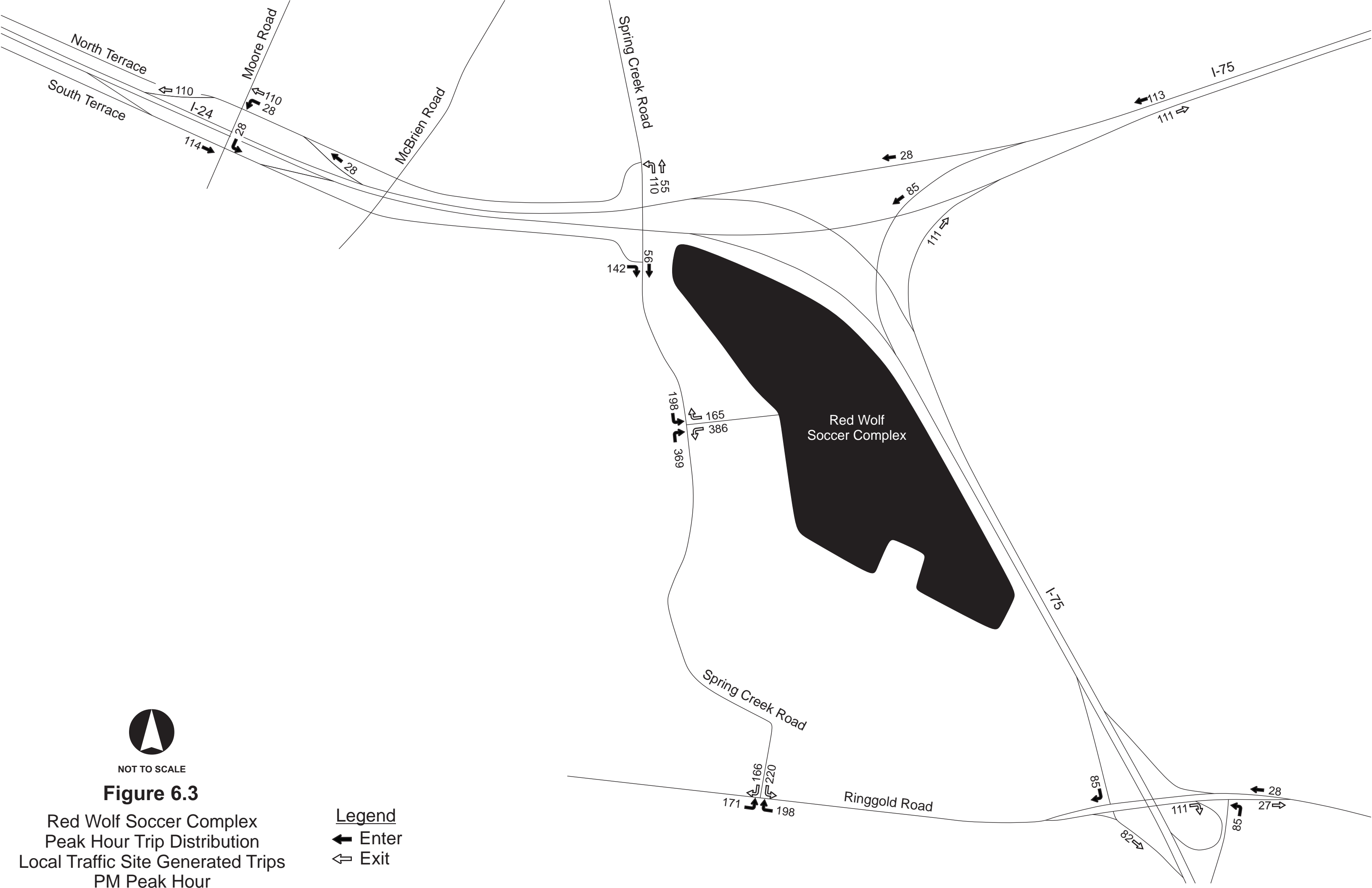
- Enter
- Exit

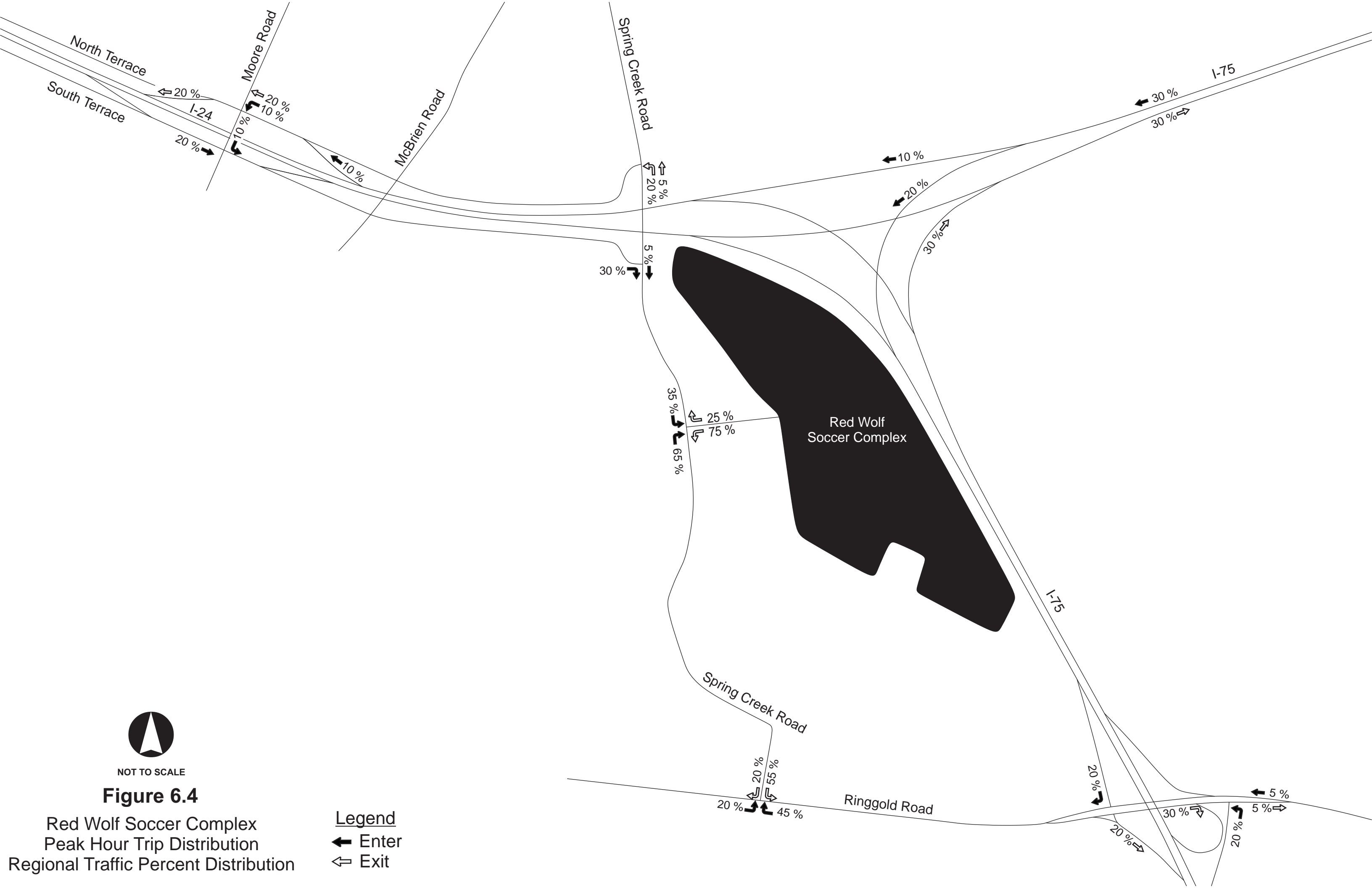


NOT TO SCALE

Figure 6.2

Red Wolf Soccer Complex
Peak Hour Trip Distribution
Local Traffic Site Generated Trips
AM Peak Hour

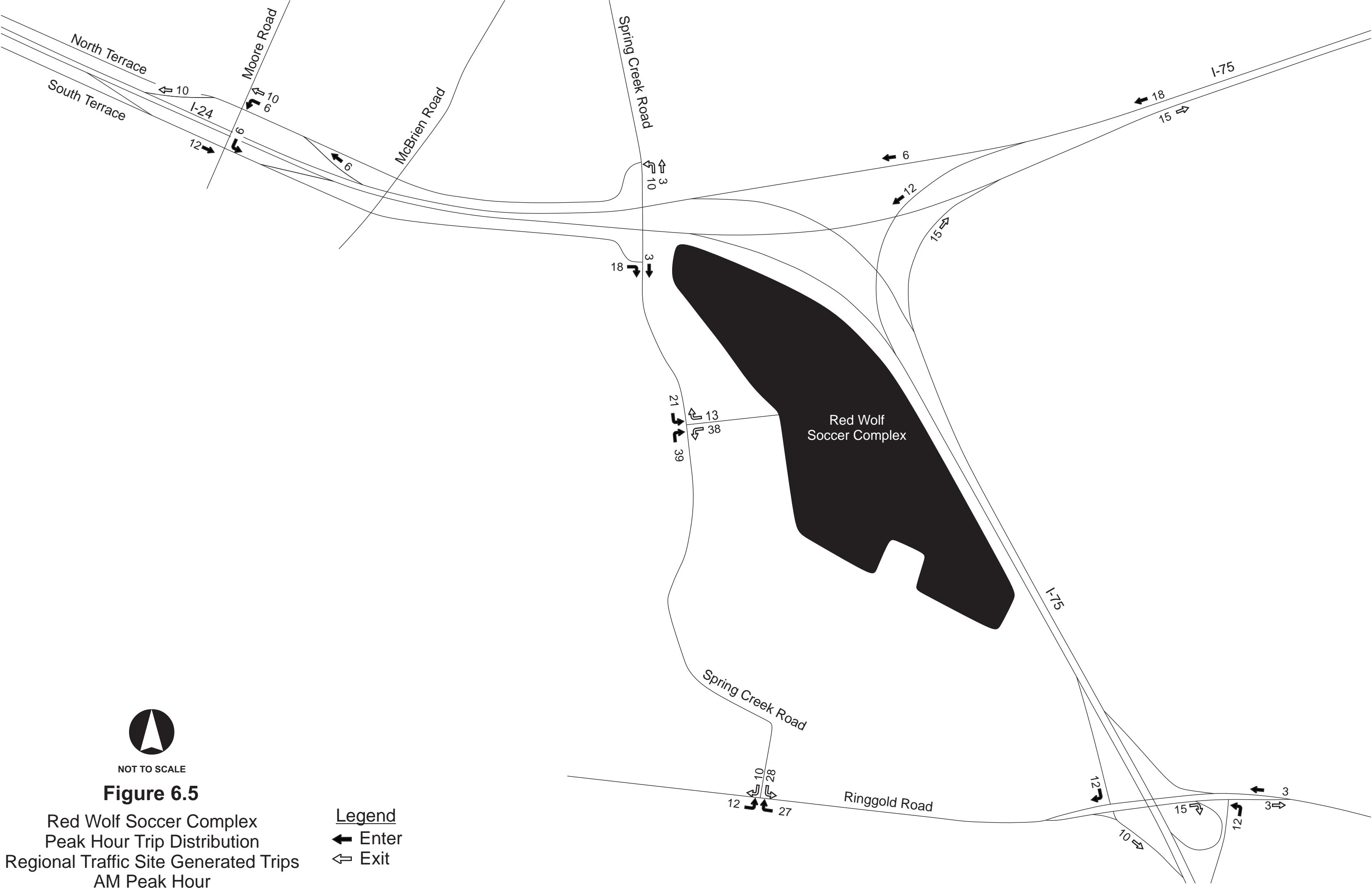




NOT TO SCALE

Figure 6.4

Red Wolf Soccer Complex
Peak Hour Trip Distribution
Regional Traffic Percent Distribution



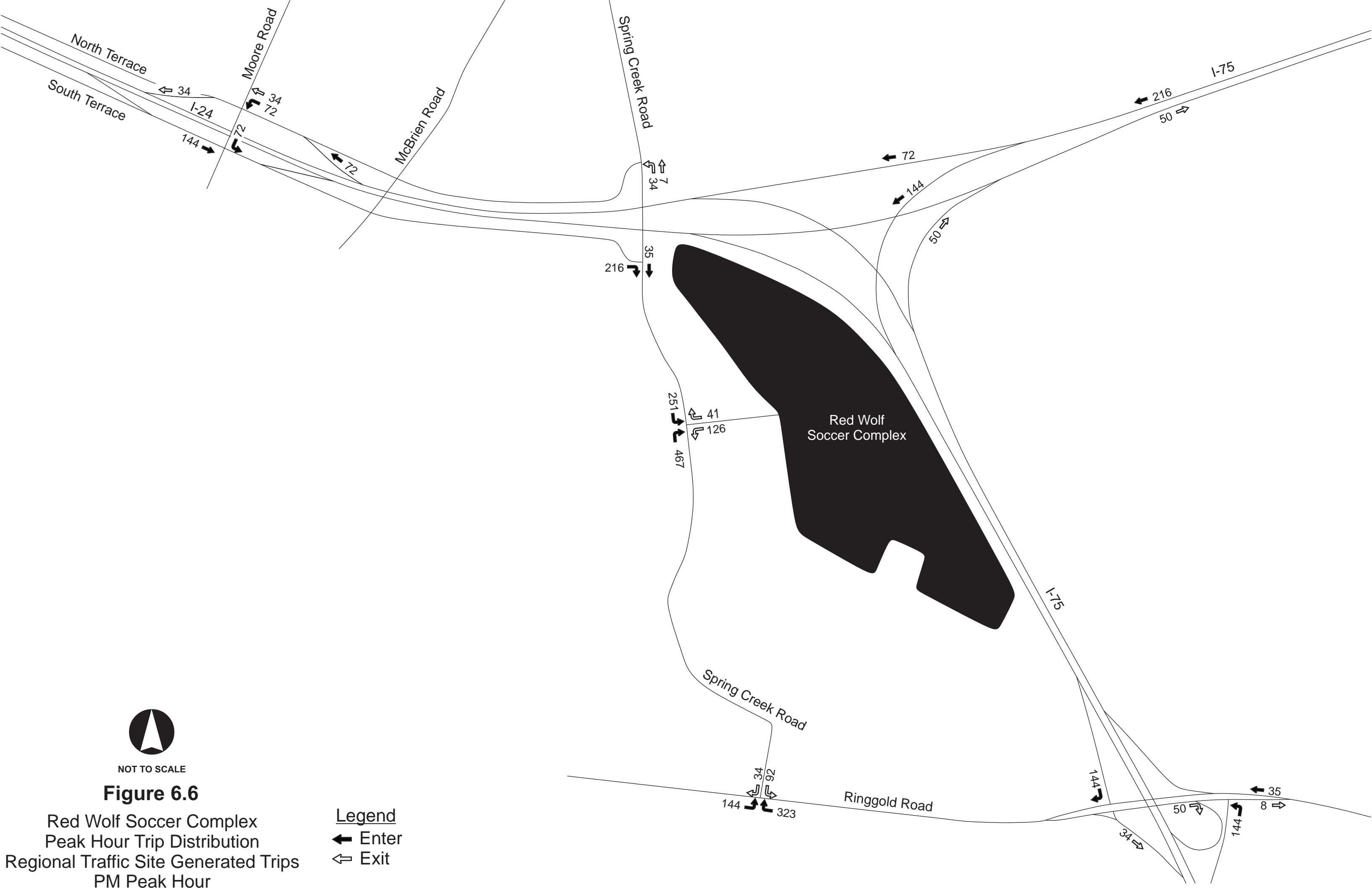
NOT TO SCALE

Figure 6.5

Red Wolf Soccer Complex
Peak Hour Trip Distribution
Regional Traffic Site Generated Trips
AM Peak Hour

Legend

- Enter
- Exit



NOT TO SCALE

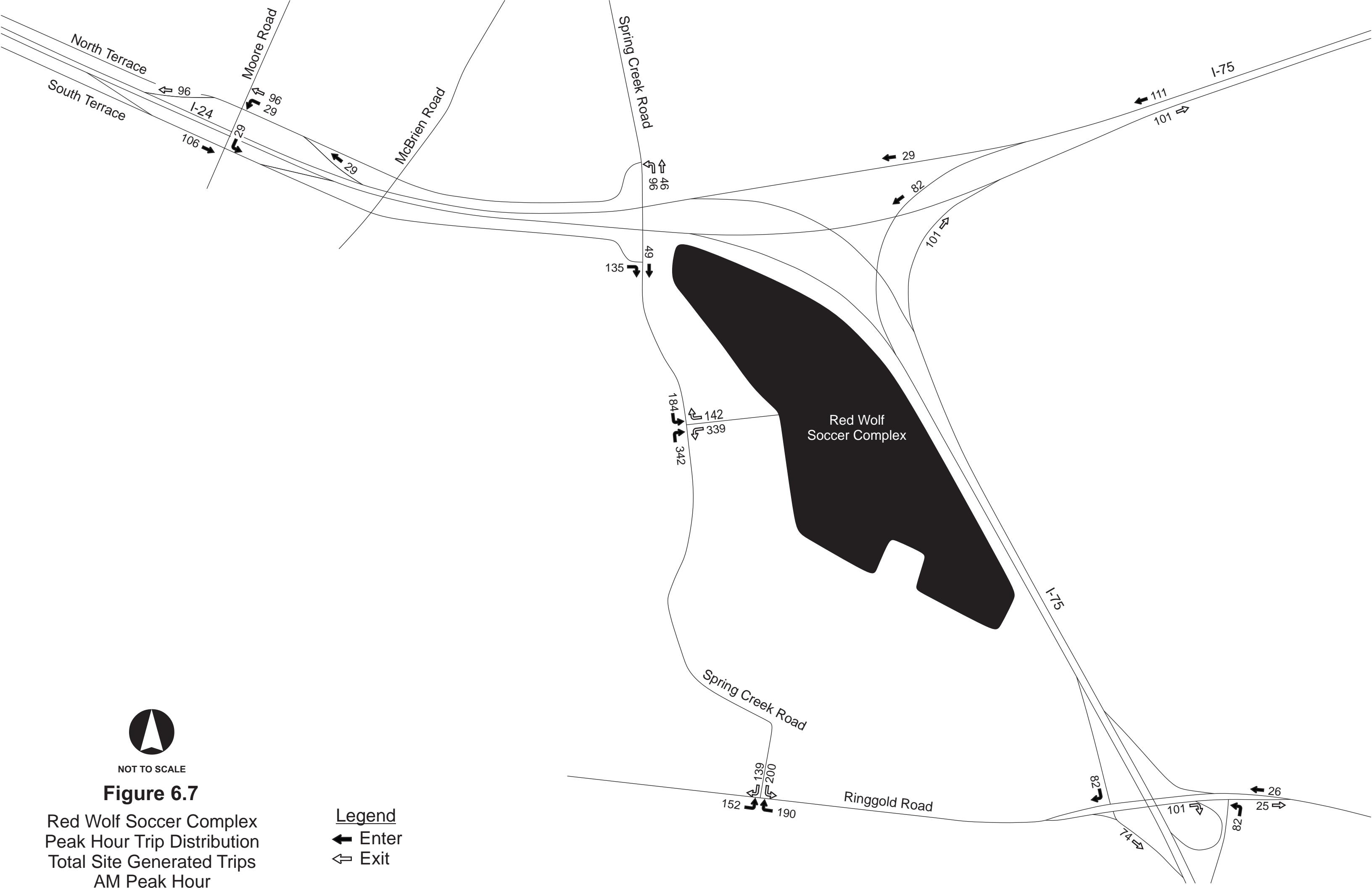
Figure 6.6

Red Wolf Soccer Complex
Peak Hour Trip Distribution
Regional Traffic Site Generated Trips
PM Peak Hour

Legend

Enter

Exit



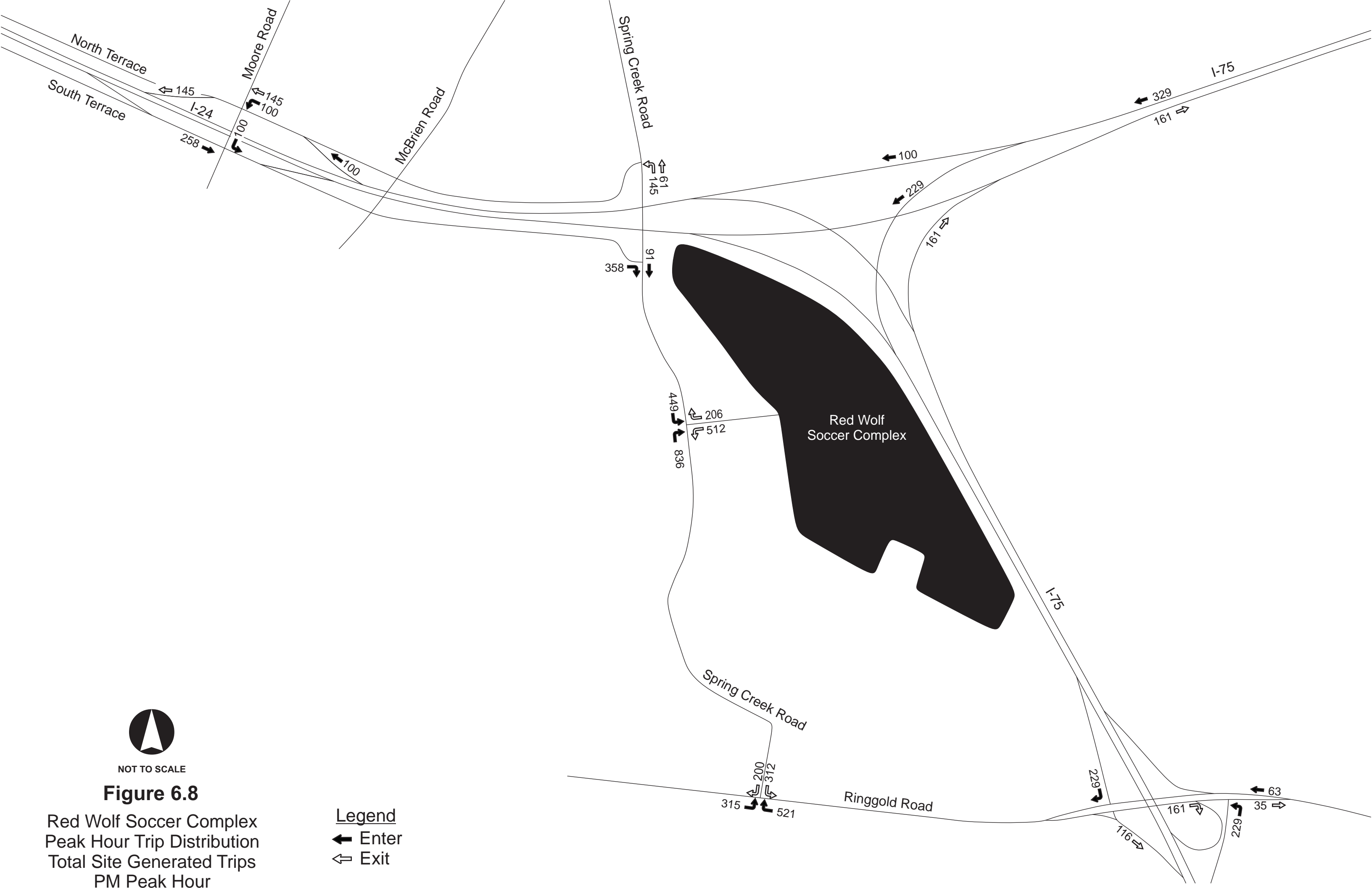
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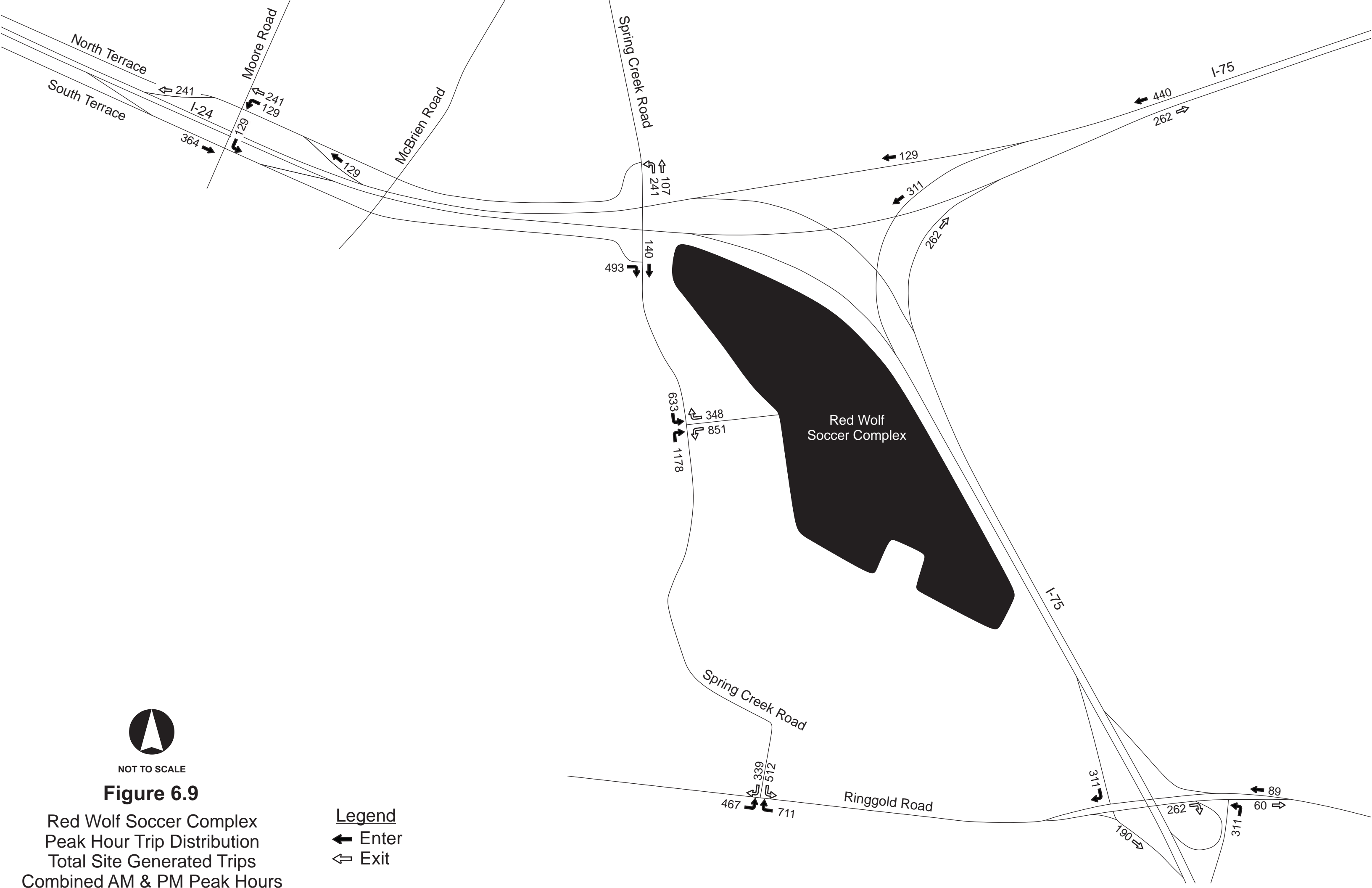
Figure 6.7

Red Wolf Soccer Complex
Peak Hour Trip Distribution
Total Site Generated Trips
AM Peak Hour

Legend

- Enter
- Exit





NOT TO SCALE

Figure 6.9

Red Wolf Soccer Complex
Peak Hour Trip Distribution
Total Site Generated Trips
Combined AM & PM Peak Hours

Legend

- Enter
- Exit

Trip Generation for Chattanooga Stadium Development

[1] 5500 Seat Soccer Stadium:

$$5500 \times 1.24 = 6,820 \text{ AADT}$$

[2] 400 Apartments:

$$5.45 \times 400 - 1.75 = 2,180 \text{ AADT}$$

[3] 375 Room Hotel:

$$11.29 \times 375 - 426.97 = 3,810 \text{ AADT}$$

[4] 475,000 Square Foot Retail:

$$0.68 \ln(475) + 5.57 = 17,340 \text{ AADT}$$

Total AADT:

$$6,820 + 2,180 + 3,810 + 17,340 = 30,150$$

AADT reduced 20% for Capture and Bypass Trips.

$$30,150 \times 0.20 = 6,030 \text{ reduced AADT.}$$

$$30,150 - 6,030 = 24,120 \text{ Total AADT.}$$

The Chattanooga TPO Computer Assignment Model showed 6,100 on the TAZ for this area.

Therefore, the total AADT calculated was reduced by 6,100.

$$24,120 - 6,100 = \underline{\underline{18,020 \text{ Adjusted total AADT for Development.}}}$$

AM Peak Hour Calculations

$$[1] 5,500 \times 0.18 = 990$$

$$[2] 0.83 \ln(400) - 0.27 = 110$$

$$[3] 0.84 \ln(375) + 0.25 = 187$$

$$[4] 2.76(475) + 77.28 = 1,388$$

$$\text{Total AM Peak Hour Calculations} = 990 + 110 + 187 + 1,388 = \underline{\underline{2,675}}$$

The AM Peak Hour Volumes were Reduced by 20% for Capture and Bypass Trips:

$$2,675 \times 0.20 = 535$$

$$2,675 - 535 = 2,140$$

The AM Peak Hour Calculations were also reduced by the percentage of the volume shown in the TAZ in the TPO computer assignment model:

$$6,100 / 24,120 = \mathbf{0.2529\%}$$

$$2,140 \times 0.2529 = 541$$

$$2,140 - 541 = \mathbf{\underline{1,599 \text{ Total Adjusted AM Peak Hour Trips}}}$$

PM Peak Hour Calculations

$$[1] 5,500 \times 0.23 = 1,265$$

$$[2] 0.83\ln(400) - 0.05 = 137$$

$$[3] 0.93\ln(375) - 0.14 = 215$$

$$[4] 0.72\ln(475) + 3.02 = 1,733$$

$$\text{Total PM Peak Hour Calculations} = 1,265 + 137 + 215 + 1,733 = \mathbf{3,350}$$

The PM Peak Hour Volumes were reduced by 20% for Capture and Bypass Trips:

$$3,350 \times 0.20 = 670$$

$$3,350 - 670 = 2,680$$

The PM Peak Hour Calculations were also reduced by the percentage of the volume shown in the TAZ in the TPO computer assignment model:

$$6,100 / 24,120 = \mathbf{0.2529\%}$$

$$2,680 \times 0.2529 = 678$$

$$2,680 - 678 = \mathbf{\underline{2,002 \text{ Total Adjusted PM Peak Hour Trips}}}$$

All Calculations are based on the 10th Edition of the ITE Trip Generation Manuals



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION
SUITE 1000, JAMES K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TENNESSEE 37243-1402
(615) 741-2208

CLAY BRIGHT
COMMISSIONER

BILL LEE
GOVERNOR

May 6, 2020

Mr. Greg Judy P.E., PTOE
Neel-Schaffer, Inc.
201 East Main Street, Suite 325
Murfreesboro, TN 37130

RE: I-24/I-75 IAR Phase 2 [2019] Existing Hourly Traffic Volumes
Chattanooga, Hamilton County

Dear Mr. Judy

The Special Projects Office has reviewed the 2019 Existing Hourly Traffic Volumes and schematics you submitted on May 6, 2020 for the subject project. These traffic schematics and volumes have our approval for use in your VISSIM model.
If I can be of further assistance, please contact me.

Sincerely,

Tony Armstrong

Tony Armstrong
Transportation Manager 2

Cc: Shaun Armstrong
File



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
STRATEGIC TRANSPORTATION INVESTMENTS DIVISION
SUITE 1000, JAMES K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TENNESSEE 37243-1402
(615) 741-2208

CLAY BRIGHT
COMMISSIONER

BILL LEE
GOVERNOR

April 24, 2020

Mr. Greg Judy P.E., PTOE
Neel-Schaffer, Inc.
201 East Main Street, Suite 325
Murfreesboro, TN 37130

RE: I-24/I-75 IAR Phase 2 [2025] Hourly Traffic Volumes
Chattanooga, Hamilton County

Dear Mr. Judy

The Special Projects Office has reviewed the 2025 Hourly Traffic Volumes with trip generation for the Red Wolf Soccer Complex development you submitted on April 24, 2020. These traffic schematics and volumes have our approval for use in the study.

If I can be of further assistance, please contact me.

Sincerely,

Tony Armstrong

Tony Armstrong
Transportation Manager 2

Cc: Shaun Armstrong
File

APPENDIX - A3
TDOT STID
CRASH SUMMARY
REPORTS

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	HAMILTON	Date:	4/15/2021
Route	I0024		
Location	L.M. 12.59 to L.M. 13.35		
Highway Type	Six Lanes Divided		
FUNCTIONAL CLASSIFICATION	URBAN INTERSTATE		
DATA YEARS	03/2017 - 02/2020		
ADT YEARS USED	Trims 2019		
COMMENTS	=		
ANALYZED BY	= NSI		

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN OR EQUAL TO 0.10 MILE

BLM	ELM	Length	Average AADT	VMT
12.590	13.350	0.760	121,610	92,424
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0

0.760 121,610 92,424

INTERSECTION

Log Mile =

PRODUCED PURSUANT TO

PUBLIC RECORDS REQUEST

This document is covered by 23 USC §409

and its production pursuant to a public

document records request does not

waive the provisions of §409

Six Lanes Divided

2017 To 2019

Leg Traffic AADT

North =

East =

South =

West =

Entering AADT 0

Trims 2019

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	190	1	2	3	30
No. of Years	=	3				
SW avg. rate	=	1.222	0.005	0.020	0.025	0.246

17-19 S/W Rates

Exposure (E)	=	101.2038				
Crash Rate (A)	=	1.877	0.010	0.020	0.030	0.296
Critical Rate (C)	=	1.483				
Severity Index (SI)	=	0.2000				
Actual Rate/SW Average	=	1.54	1.98	0.99	1.19	1.21
Ratio of A/C	=	1.27				

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 4/8/15

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	HAMILTON	Date:	4/15/2021
Route	I0024		
Location	L.M. 12.91 to L.M. 13.09		
Highway Type	Six Lanes Divided		
FUNCTIONAL CLASSIFICATION	URBAN INTERSTATE		
DATA YEARS	03/2017 - 02/2020		
ADT YEARS USED	Trims 2019		
COMMENTS	=		
ANALYZED BY	= NSI		
SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN OR EQUAL TO 0.10 MILE			

BLM	ELM	Length	Average AADT	VMT
12.910	13.090	0.180	61,170	11,011
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
		0.180	61,170	11,011

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Leg Traffic AADT

North =

East =

South =

West =

Entering AADT 0

Trims 2019

Six Lanes Divided
2017 To 2019

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	75	0	0	0	11
No. of Years	=	3				
SW avg. rate	=	1.222	0.005	0.020	0.025	0.246

17-19 S/W Rates

Exposure (E)	=	12.0566				
Crash Rate (A)	=	6.221	0.000	0.000	0.000	0.912
Critical Rate (C)	=	2.004				
Severity Index (SI)	=	0.1467				
Actual Rate/SW Average	=	5.09	0.00	0.00	0.00	3.71
Ratio of A/C	=	3.10				

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 4/8/15

T.D.O.T. Strategic Transportation Investments Division/ Safety Data

NSI

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	HAMILTON	Date:	4/15/2021
Route	I0024		
Location	L.M. 12.17 to L.M. 12.59		
Highway Type	Six Lanes Divided		
FUNCTIONAL CLASSIFICATION	URBAN INTERSTATE		
DATA YEARS	03/2017 - 02/2020		
ADT YEARS USED	Trims 2019		
COMMENTS	=		
ANALYZED BY	= NSI		

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN OR EQUAL TO 0.10 MILE

BLM	ELM	Length	Average AADT	VMT
12.170	12.590	0.420	103,740	43,571
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0

0.420 103,740 43,571

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Six Lanes Divided

2017 To 2019

Leg Traffic AADT

North =

East =

South =

West =

Entering AADT 0

Trims 2019

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	103	1	2	3	13
No. of Years	=	3				
SW avg. rate	=	1.222	0.005	0.020	0.025	0.246

17-19 S/W Rates

Exposure (E)	=	47.7100				
Crash Rate (A)	=	2.159	0.021	0.042	0.063	0.272
Critical Rate (C)	=	1.605				
Severity Index (SI)	=	0.2039				
Actual Rate/SW Average	=	1.77	4.19	2.10	2.52	1.11
Ratio of A/C	=	1.35				

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 4/8/15

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	HAMILTON	Date:	4/15/2021
Route	I0024		
Location	L.M. 13.64 to L.M. 14.08		
Highway Type	Six Lanes Divided		
FUNCTIONAL CLASSIFICATION	URBAN INTERSTATE		
DATA YEARS	03/2017 - 02/2020		
ADT YEARS USED	Trims 2019		
COMMENTS	=		
ANALYZED BY	= NSI		

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN OR EQUAL TO 0.10 MILE

BLM	ELM	Length	Average AADT	VMT
13.640	14.080	0.440	125,220	55,097
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0

0.440 125,220 55,097

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Six Lanes Divided

2017 To 2019

Leg Traffic AADT

North =

East =

South =

West =

Entering AADT 0

Trims 2019

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	94	0	1	1	18
No. of Years	=	3				
SW avg. rate	=	1.222	0.005	0.020	0.025	0.246
17-19 S/W Rates						
Exposure (E)	=	60.3310				
Crash Rate (A)	=	1.558	0.000	0.017	0.017	0.298
Critical Rate (C)	=	1.561				
Severity Index (SI)	=	0.2128				
Actual Rate/SW Average	=	1.28	0.00	0.83	0.66	1.21
Ratio of A/C	=	1.00				

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 4/8/15

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	HAMILTON	Date:	4/15/2021
Route	I0024		
Location	L.M. 12.17 to L.M. 14.08		
Highway Type	Six Lanes Divided		
FUNCTIONAL CLASSIFICATION	URBAN INTERSTATE		
DATA YEARS	03/2017 - 02/2020		
ADT YEARS USED	Trims 2019		
COMMENTS	=		
ANALYZED BY	= NSI		

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN OR EQUAL TO 0.10 MILE

BLM	ELM	Length	Average AADT	VMT
12.170	14.080	1.910	116,857	223,197
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0

1.910 116,857 223,197

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Six Lanes Divided

2017 To 2019

Leg Traffic AADT

North =

East =

South =

West =

Entering AADT 0

Trims 2019

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	454	3	6	9	70
No. of Years	=	3				
SW avg. rate	=	1.222	0.005	0.020	0.025	0.246
17-19 S/W Rates						
Exposure (E)	=	244.4006				
Crash Rate (A)	=	1.858	0.012	0.025	0.037	0.286
Critical Rate (C)	=	1.389				
Severity Index (SI)	=	0.2070				
Actual Rate/SW Average	=	1.52	2.45	1.23	1.47	1.16
Ratio of A/C	=	1.34				

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 4/8/15

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	HAMILTON	Date:	4/15/2021
Route	I0024		
Location	L.M. 13.35 to L.M. 13.64		
Highway Type	Six Lanes Divided		
FUNCTIONAL CLASSIFICATION	URBAN INTERSTATE		
DATA YEARS	03/2017 - 02/2020		
ADT YEARS USED	Trims 2019		
COMMENTS	=		
ANALYZED BY	= NSI		

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN OR EQUAL TO 0.10 MILE

BLM	ELM	Length	Average AADT	VMT
13.350	13.640	0.290	125,220	36,314
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0

0.290 125,220 36,314

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Six Lanes Divided

2017 To 2019

Leg Traffic AADT

North =

East =

South =

West =

Entering AADT 0

Trims 2019

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	67	1	1	2	9
No. of Years	=	3				
SW avg. rate	=	1.222	0.005	0.020	0.025	0.246

17-19 S/W Rates

Exposure (E)	=	39.7636				
Crash Rate (A)	=	1.685	0.025	0.025	0.050	0.226
Critical Rate (C)	=	1.643				
Severity Index (SI)	=	0.2239				
Actual Rate/SW Average	=	1.38	5.03	1.26	2.01	0.92
Ratio of A/C	=	1.03				

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 4/8/15

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	HAMILTON	Date:	4/15/2021
Route	I0024		
Location	L.M. 12.91 to L.M. 13.20		
Highway Type	Six Lanes Divided		
FUNCTIONAL CLASSIFICATION	URBAN INTERSTATE		
DATA YEARS	03/2017 - 02/2020		
ADT YEARS USED	Trims 2019		
COMMENTS	=		
ANALYZED BY	= NSI		

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN OR EQUAL TO 0.10 MILE

BLM	ELM	Length	Average AADT	VMT
12.910	13.200	0.290	53,020	15,376
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0

0.290 53,020 15,376

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Six Lanes Divided
2017 To 2019

Leg Traffic AADT

North =

East =

South =

West =

Entering AADT 0

Trims 2019

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	75	0	0	0	14
No. of Years	=	3				
SW avg. rate	=	1.222	0.005	0.020	0.025	0.246
17-19 S/W Rates						
Exposure (E)	=	16.8365				
Crash Rate (A)	=	4.455	0.000	0.000	0.000	0.832
Critical Rate (C)	=	1.879				
Severity Index (SI)	=	0.1867				
Actual Rate/SW Average	=	3.65	0.00	0.00	0.00	3.38
Ratio of A/C	=	2.37				

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 4/8/15

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	HAMILTON	Date:	4/15/2021
Route	I0024		
Location	L.M. 12.17 to L.M. 12.60		
Highway Type	Six Lanes Divided		
FUNCTIONAL CLASSIFICATION	URBAN INTERSTATE		
DATA YEARS	03/2017 - 02/2020		
ADT YEARS USED	Trims 2019		
COMMENTS	=		
ANALYZED BY	= NSI		

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN OR EQUAL TO 0.10 MILE

BLM	ELM	Length	Average AADT	VMT
12.170	12.600	0.430	62,720	26,970
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0

0.430 62,720 26,970

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Six Lanes Divided

2017 To 2019

Leg Traffic AADT

North =

East =

South =

West =

Entering AADT 0

Trims 2019

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	70	0	1	1	9
No. of Years	=	3				
SW avg. rate	=	1.222	0.005	0.020	0.025	0.246

17-19 S/W Rates

Exposure (E)	=	29.5317				
Crash Rate (A)	=	2.370	0.000	0.034	0.034	0.305
Critical Rate (C)	=	1.712				
Severity Index (SI)	=	0.1571				
Actual Rate/SW Average	=	1.94	0.00	1.69	1.35	1.24
Ratio of A/C	=	1.38				

* Severe Crashes are the sum of fatal and incapacitating injury crashes

Revised 4/8/15

TENNESSEE DEPARTMENT OF TRANSPORTATION

COUNTY	HAMILTON	Date:	4/15/2021
Route	I0024		
Location	L.M. 13.55 to L.M. 14.08		
Highway Type	Six Lanes Divided		
FUNCTIONAL CLASSIFICATION	URBAN INTERSTATE		
DATA YEARS	03/2017 - 02/2020		
ADT YEARS USED	Trims 2019		
COMMENTS	=		
ANALYZED BY	= NSI		

SECTION = MORE THAN 0.10 MILE / SPOT = LESS THAN OR EQUAL TO 0.10 MILE

BLM	ELM	Length	Average AADT	VMT
13.550	14.080	0.530	63,660	33,740
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0
0.000	0.000	0.000	0	0

0.530 63,660 33,740

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Six Lanes Divided

2017 To 2019

Leg Traffic AADT

North =

East =

South =

West =

Entering AADT 0

Trims 2019

		Total	Fatal	Incap. Injury	*Severe Crashes	Other Injury
No. of Crashes	=	135	1	2	3	22
No. of Years	=	3				
SW avg. rate	=	1.222	0.005	0.020	0.025	0.246

17-19 S/W Rates

Exposure (E)	=	36.9451				
Crash Rate (A)	=	3.654	0.027	0.054	0.081	0.595
Critical Rate (C)	=	1.659				
Severity Index (SI)	=	0.2222				
Actual Rate/SW Average	=	2.99	5.41	2.71	3.25	2.42
Ratio of A/C	=	2.20				

* Severe Crashes are the sum of fatal and incapacitating injury crashes

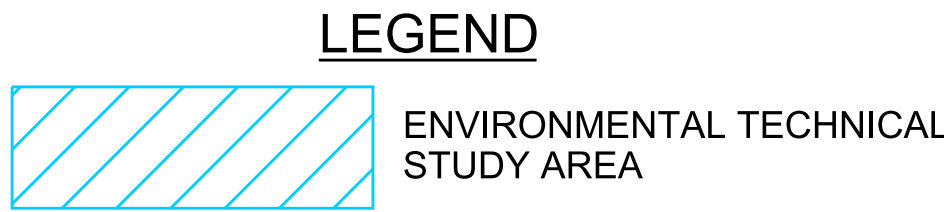
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APPENDIX - A4
Environmental
Technical Study
Boundaries

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	1



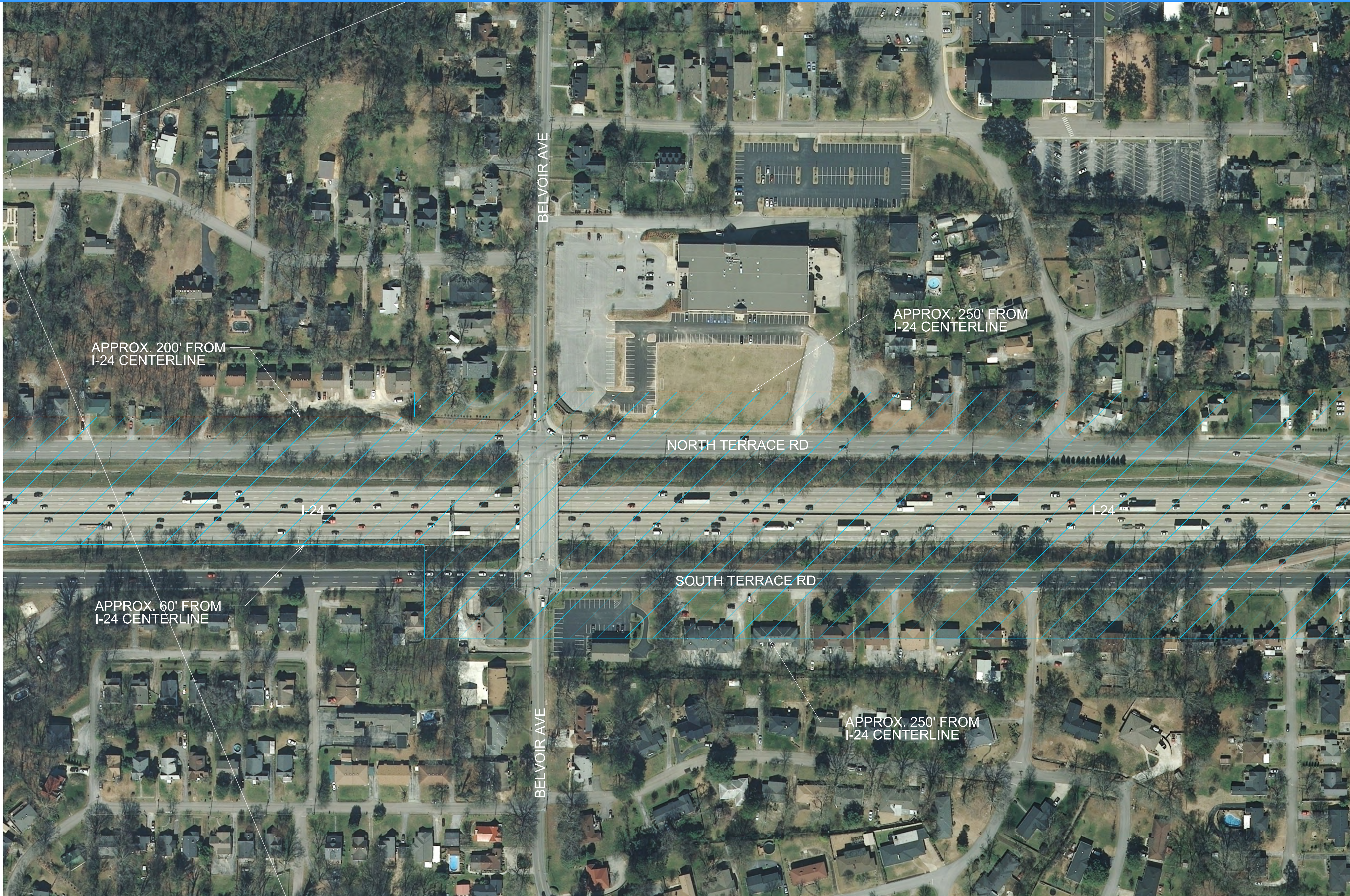
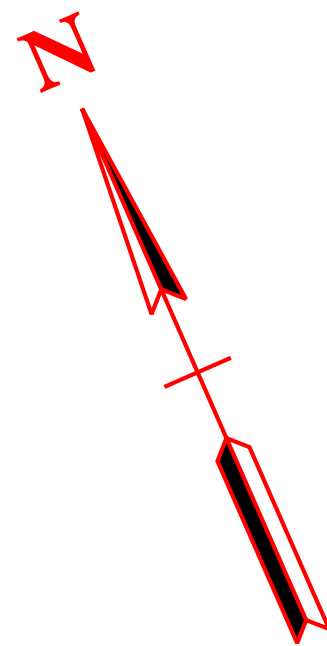
ENVIRONMENTAL TECHNICAL STUDY AREA
I-24 AT I-75 PHASE 2



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

FIGURE 1
I-24 AT I-75
PHASE 2

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	2



ENVIRONMENTAL TECHNICAL STUDY AREA I-24 AT I-75 PHASE 2



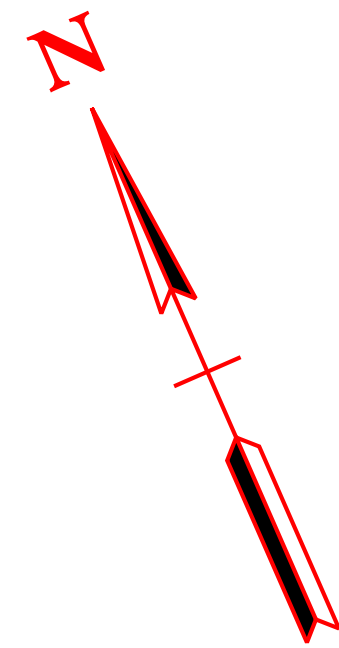
ENVIRONMENTAL TECHNICAL STUDY AREA

LEGEND

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

FIGURE 2
I-24 AT I-75
PHASE 2

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	3



ENVIRONMENTAL TECHNICAL STUDY AREA

I-24 AT I-75 PHASE 2



LEGEND

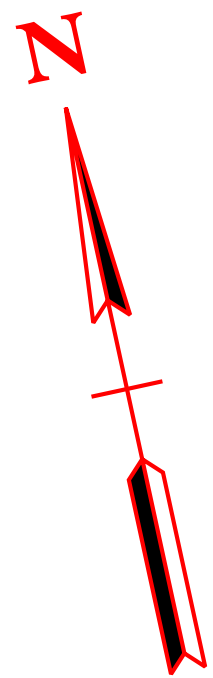


ENVIRONMENTAL TECHNICAL STUDY AREA

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

FIGURE 3
I-24 AT I-75
PHASE 2

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	4




ENVIRONMENTAL TECHNICAL STUDY AREA

I-24 AT I-75 PHASE 2



LEGEND

 ENVIRONMENTAL TECHNICAL STUDY AREA

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

FIGURE 4
I-24 AT I-75
PHASE 2

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	5




ENVIRONMENTAL TECHNICAL STUDY AREA

I-24 AT I-75 PHASE 2



LEGEND

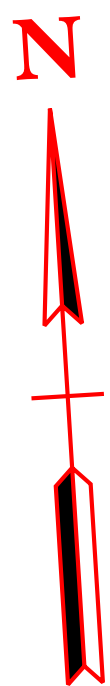
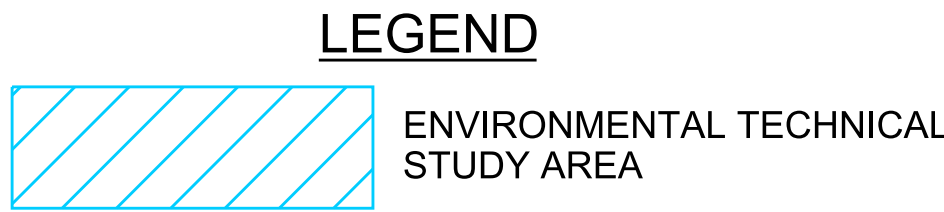
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ENVIRONMENTAL TECHNICAL STUDY AREA
I-24 AT I-75 PHASE 2



TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	6

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

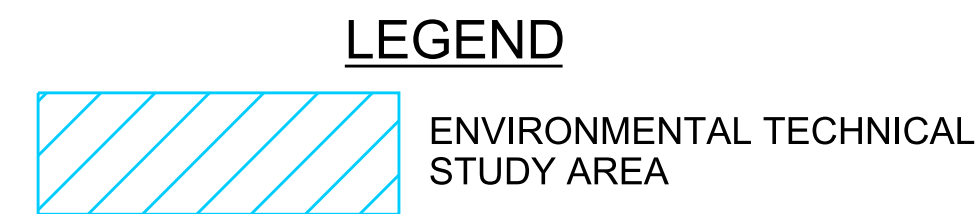
FIGURE 6
I-24 AT I-75
PHASE 2

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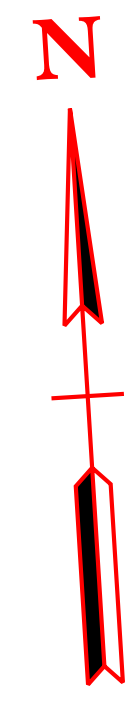
ENVIRONMENTAL TECHNICAL STUDY AREA

I-24 AT I-75 PHASE 2



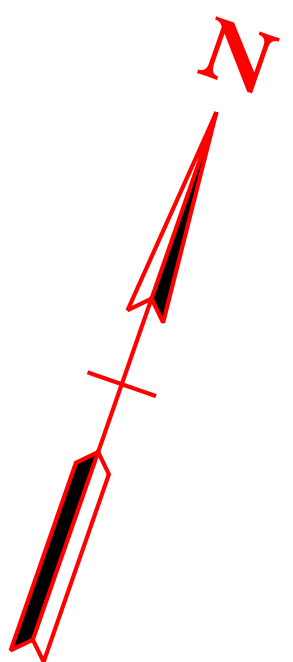
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

FIGURE 7
I-24 AT I-75
PHASE 2



TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	7


TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	8



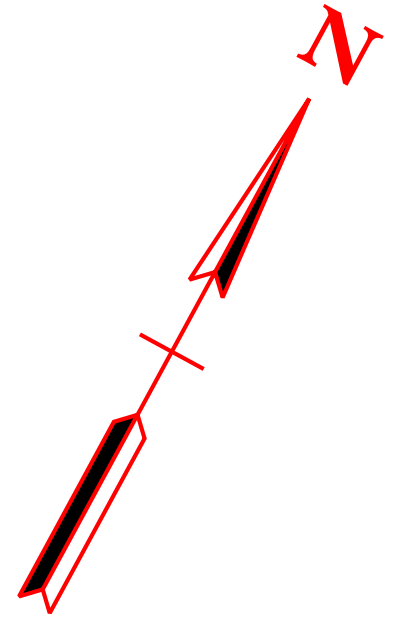
ENVIRONMENTAL TECHNICAL STUDY AREA
I-24 AT I-75 PHASE 2



LEGEND

 ENVIRONMENTAL TECHNICAL STUDY AREA


TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	9



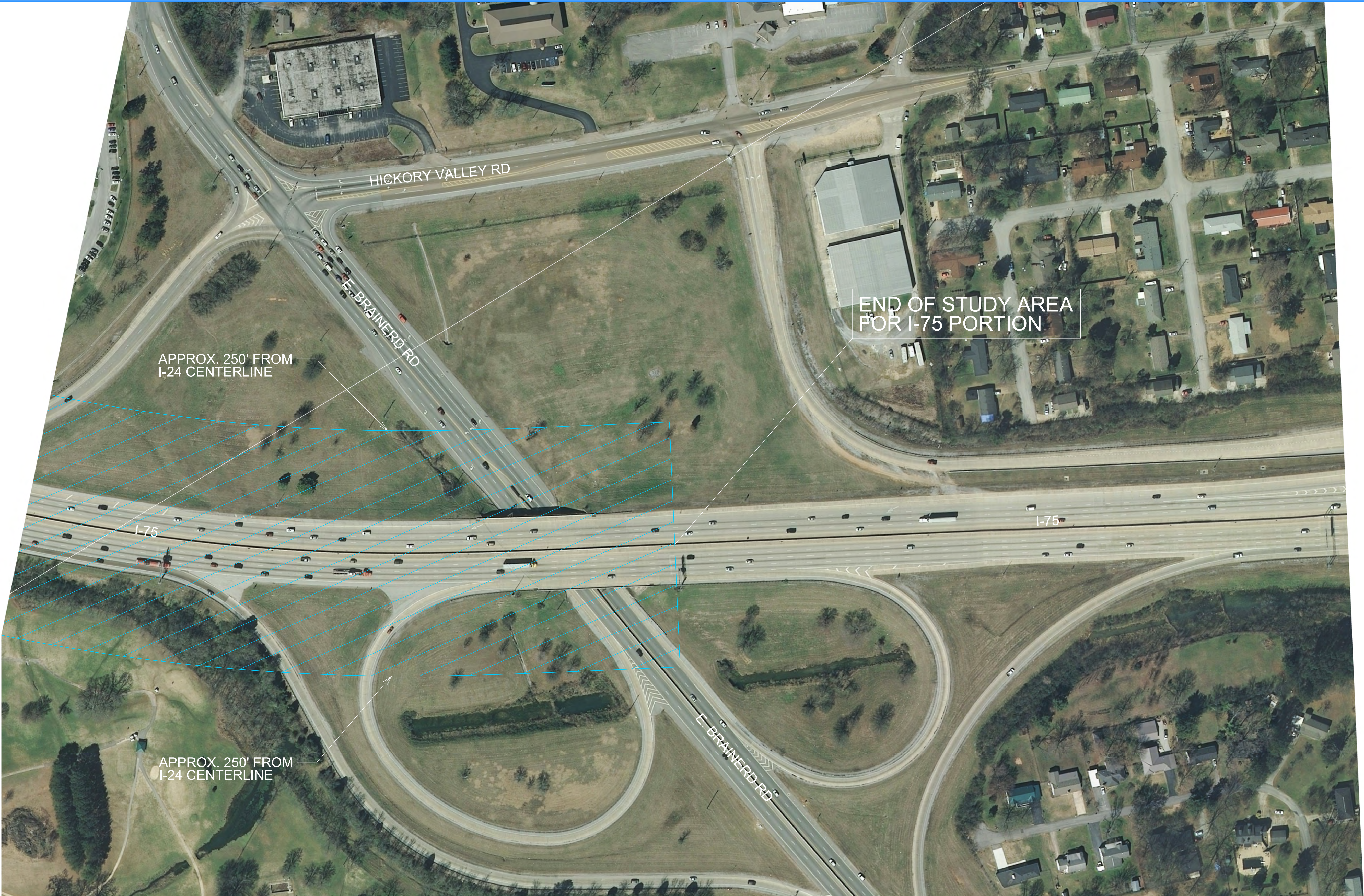
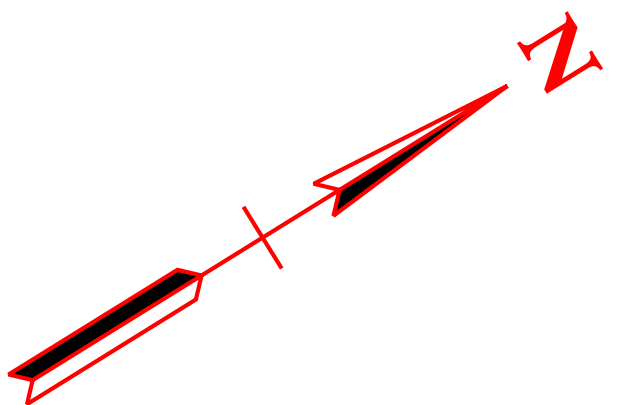
ENVIRONMENTAL TECHNICAL STUDY AREA
I-24 AT I-75 PHASE 2



LEGEND

 ENVIRONMENTAL TECHNICAL STUDY AREA

TYPE	YEAR	COUNTY	FIGURE NO.
TR	2021	HAMILTON	10



ENVIRONMENTAL TECHNICAL STUDY AREA
I-24 AT I-75 PHASE 2



LEGEND

 ENVIRONMENTAL TECHNICAL STUDY AREA

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APPENDIX - A5
Original IAR

INTERSTATE ACCESS REQUEST

*INTERSTATE 75 AT
INTERSTATE 24*

HAMILTON COUNTY



*Prepared by
PALMER
ENGINEERING*

FOR THE
TENNESSEE DEPARTMENT OF
TRANSPORTATION
PLANNING DIVISION

June 2012

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APPENDICES

Appendix A	Alternative Descriptions
Appendix B	Alternative 4 Project Drawings
Appendix C	Alternative 7 Project Drawings
Appendix D	Traffic Forecast
Appendix E	Identification Points 2015 No Build Scenario 2035 No Build Scenario 2015 Alternative 4 Build Scenario 2035 Alternative 4 Build Scenario 2015 Alternative 7 Build Scenario 2035 Alternative 7 Build Scenario
Appendix F	Conceptual Signing Plan Alternative 4 Conceptual Signing Plan Alternative 7
Appendix G	Itemized Cost Estimates
Appendix H	Project Photographs
Appendix I	Meeting Minutes/Correspondence
Appendix J	HCS Analysis (Separate Attachment)
Appendix K	Road Safety Audit Review

Executive Summary

The existing I-75 and I-24 corridor is a heavily traveled corridor that serves Tennessee and Georgia. Both I-75 and I-24 provide a direct connection to downtown Chattanooga, Lookout Mountain, and other area attractions, while I-24 also serves as a direct link between I-75 and I-59. A road safety audit evaluated the I-75 at I-24 interchange area in 2006 and found a high area for crashes. Further review found that truck rollovers were common on the I-75 Northbound and Southbound ramps, with speed being a contributing factor. Rear-end and sideswipe crashes were found to be high on I-75 NB which are due to short merging distances between the Ringgold Road interchange and the I-24 interchange. The on and off ramps at the Welcome Center located between the Ringgold Road and I-24 interchanges also contribute to these crashes. As traffic volumes have increased along the I-24 and I-75 corridors, and with continued growth in the area, the existing interchange at I-75 and I-24 will become more congested and will exceed capacity resulting in increased concern for the interchange safety. This Interstate Access Request (IAR) identifies the modifications required to address the deficiencies of the existing interchange.

Seven (7) alternates were developed for the proposed interstate modifications at a preliminary field review:

- Alternative 1: Widens existing roads and ramps along existing alignments; maintains existing 50 mph design speed
- Alternative 2: Widens existing roads and ramps; increases ramp radii to provide design speed of 70 mph
- Alternative 3: Widens existing roads and ramps; increases ramp radii to provide design speed of 70 mph; shifts interchange to west
- Alternative 4: Widens existing roads and ramps; increases ramp radii to provide 55 mph design speed; shifts interchange to west
- Alternative 5: Widens existing roads and ramps; increases ramp radii to provide design speed of 70 mph; reconfigures I-24 ramps to enter and exit I-75 from the right side
- Alternative 6: Widens existing roads and ramps; increases ramp radii to provide design speed of 70 mph; reconfigures I-24 ramps to enter and exit I-75 from the right side; shifts interchange to west; modifies rest area traffic circulation
- Alternative 7: Widens existing roads and ramps; increases ramp radii to provide 55 mph design speed; reconfigures I-24 ramps to enter and exit I-75 from the right side; shifts interchange to west; modifies rest area traffic circulation

The Federal Highway Administration (FHWA) was involved in a meeting to review these preliminary alternatives for this Interstate Access Request. Alternates 4 and 7 were ultimately selected for carrying forward to the IAR phase and are documented further within this study. Alternate 7 is the preferred alternate. Operational approval is requested for both Alternates 4 and 7 in the event that funding cannot be secured for the more expensive Alternate 7.

Alternative 4 widens the interstate by adding additional lanes with the on ramps at Ringgold Road, South Moore Road, and East Brainerd Road and then dropping those lanes to tie into the existing system with the off ramps at these adjacent interchanges. The existing ramps are widened to three (3) lanes and radii are increased to a minimum 1200 feet to improve the design speed to 55 mph. The interchange is shifted slightly towards the vacant land west of the interchange in order to prevent encroaching on a conservation area but the existing configuration is maintained. Alternative 4 maintains the existing rest area configuration and does not eliminate the existing weaving condition along NB I-75 between the Ringgold Road Interchange and the rest area ramps.

Alternative 7 is similar to Alternative 4 with the following modifications: The I-24 ramps are reconfigured to provide all entry and exit along the right side of I-75, developing I-75 as the thru route. Alternative 7 modifies the circulation patterns of the existing rest area to eliminate the weaving condition along NB I-75 and modifies the WB Ringgold Road to NB I-75 ramp. To provide the opportunity to improve the traffic flow along each of the facilities as funding becomes available, the modifications of Alternative 7 has been developed into a two (2) phase plan. Alternate 7 is the preferred alternate based on the ability to eliminate the weave conditions along I-75.

A Level of Service (LOS) analysis was conducted as part of this IAR to determine the relative performance of each alternative in 2015 and 2035, during the AM and PM Peak periods. The traffic operation analyses were completed using HCS (Highway Capacity Software) on basic freeway segments, weaving segments, ramp merge segments, and ramp diverge segments. Level of Service was used as the measure of effectiveness. Results of the HCS analysis revealed that the existing I-75 and I-24 interchange and the respective corridors will operate at or exceed capacity in the design year, resulting in long delays and congestion if the proposed modifications are not completed. The LOS analyses in Tables 1 thru 5 document the existing capacity of each freeway and ramps through the design year. These tables also document the performance of each segment if the improvements outlined in Alternates 4 and 7 of this Interstate Access Request are completed. Modifications to the I-24/I-75 interchange will decrease congestion and improve substandard ramp geometry resulting in an increase in safety and interstate capacity. Deceleration and acceleration lanes that meet or exceed AASHTO's "A Policy on Geometric Design of Highways and Streets" are provided to enhance merge/diverge points throughout the interchange study area. Enhanced ramp geometry allows improved ramp design speeds and decreases the potential for truck rollovers. The combination of these modifications should reduce congestion and improve safety along the I-24 and I-75 corridor.

The total estimated construction costs for Alternatives 4 and 7 are detailed in Appendix G. The estimated cost associated with Alternative 4 is \$50,200,000. Alternative 7 is expected to cost \$34,100,000 in the Initial Phase and an additional \$54,900,000 (2025 dollars) in the Ultimate Phase.

CHAPTER 1

INTRODUCTION

A. Purpose of the Study

The purpose of this study is to determine the need and justification of modifying the existing I-24 and I-75 interchange in southeast Chattanooga. The proposed modifications will address operational deficiencies that have resulted from growth in the Chattanooga area and safety issues that have developed due to substandard ramp geometry. This study identifies the need for the current and future improvements, analyzes traffic conditions, develops functional layouts for the project, estimates construction costs, and identifies potential environmental, historical, and cultural concerns.

B. Description of Project Location

I-24 within the study area is primarily a six (6) lane, controlled-access facility that is separated by a concrete barrier wall and has a right of way width along I-24 of approximately 500 ft.

The proposed project is located southeast of Chattanooga in Hamilton County, TN and is bounded by adjacent interchanges that vary in proximity and configuration.



Figure 1: I-24 at South Moore Road

I-75 within the study area is primarily an eight (8) lane, controlled-access facility that is separated by a concrete barrier wall and the right of way along I-75 varies from approximately 300 to 600 ft in width.



Figure 2: I-24 at the I-75 interchange

Approximately 1.1 miles to the west is the I-24/South Moore Road interchange and approximately 2.2 miles to the east is the I-75/East Brainerd Road interchange. The I-75/Ringgold Road interchange is approximately 1.1 miles to the south and the Tennessee Welcome Center is located along I-75 NB between the Ringgold Road and I-24 interchanges. Both I-24 and I-75 are public facilities as are all the adjacent interchange crossroads and the project is located within a Transportation Management Area (TMA).

C. Purpose and Need

The purpose of the modifications to the I-24/I-75 interchange is to decrease congestion, improve substandard ramp geometry, improve safety, increase interstate capacity, and improve traffic operations. The modifications are needed to provide a safer facility for roadway users due to high crash rates and truck rollovers throughout the I-24/I-75 interchange.



Figure 3: I-75 SB prior to I-24 WB Diverge



Figure 4: I-75 NB prior to I-24 WB Diverge

D. Background

As traffic volumes have increased along the I-24 and I-75 corridors, and with continued growth in the area, the existing interchange at I-75 and I-24 will not provide capacity for the projected traffic volumes resulting in increased concern for the interchange safety. I-75 was evaluated by the Road Safety Audit Review program in 2006 along the project corridor (LM 1.11 to LM 1.20). It was determined that the area crash ratio (actual crash rate divided by critical crash rate) was 5.75, which exceeded the 3.5 minimum threshold rate. The review found that truck rollovers were common on I-75 Northbound and Southbound, with speed being a contributing factor. Rear-end and sideswipe crashes were also found to be high on I-75 NB which are due to short merging distances between the Ringgold Road interchange and the I-24 interchange. The on and off ramps at the Welcome Center also contribute to these crashes due vehicles entering and exiting the welcome center in a short distance. This roadway segment along I-75 NB between the Welcome Center and the I-24 interchange functions as a weaving segment with vehicles traveling I-75 NB, I-24 WB, exiting to the Welcome Center, and entering from the Welcome Center.

E. Relationship To Previous Planning Studies

The Chattanooga-Hamilton County/ North Georgia (CHCNGA) Transportation Planning Organization's (TPO) Long-Range Transportation Plan for 2035 identifies several projects within the project vicinity in their "*All Year 2035 Needs Plan*" to alleviate congestion. The following list identifies area projects while Figure 5 is a map from the Long Range Transportation Plan that visually locates these projects:

1. *I-24 between Belvoir Ave and I-75*: Interchange reconstruction.
2. *I-75, south of I-24 interchange*: Interstate widening.
3. *I-75, east of I-24 interchange*: Interstate widening.

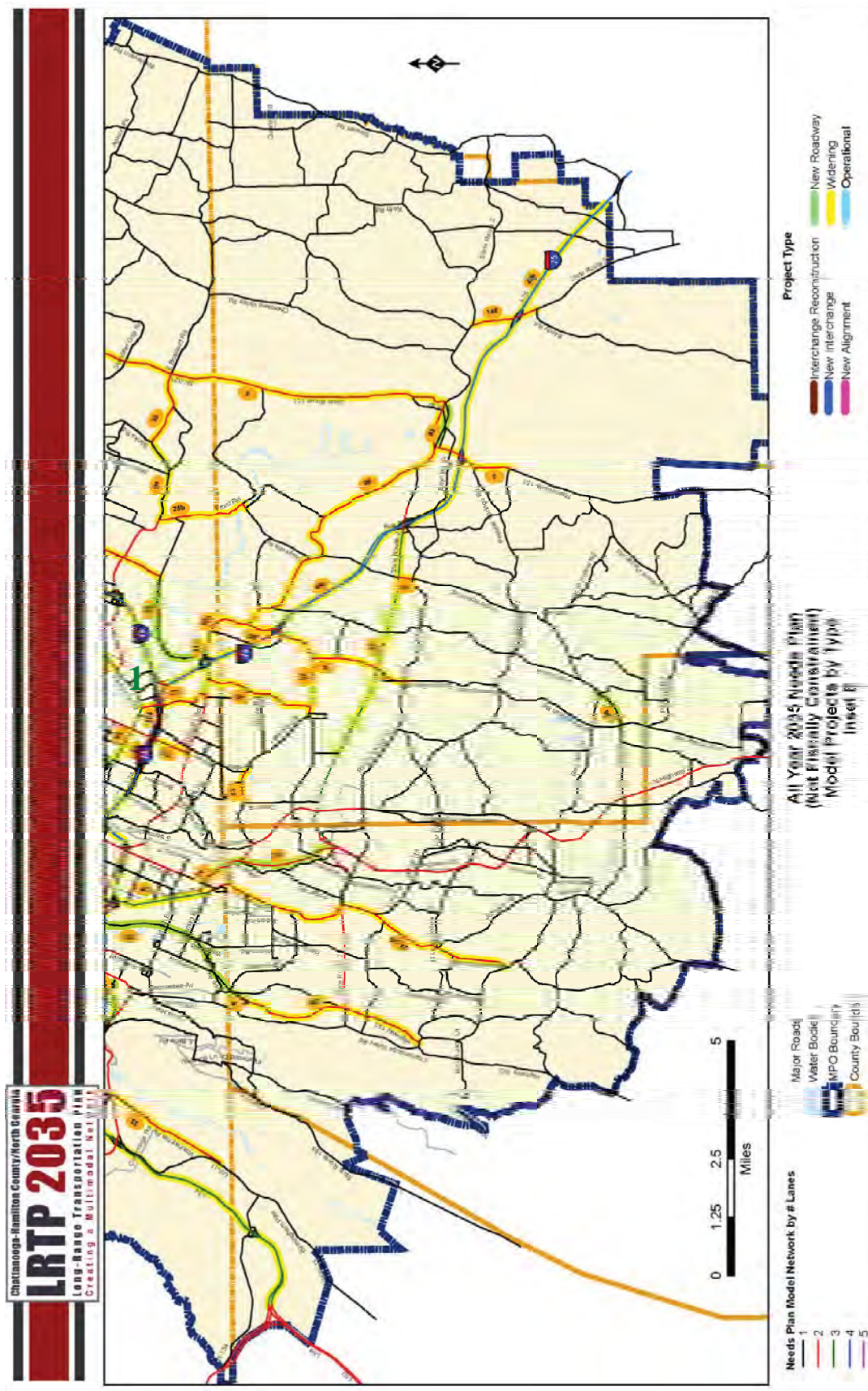


Figure 5: LRTP Project Map

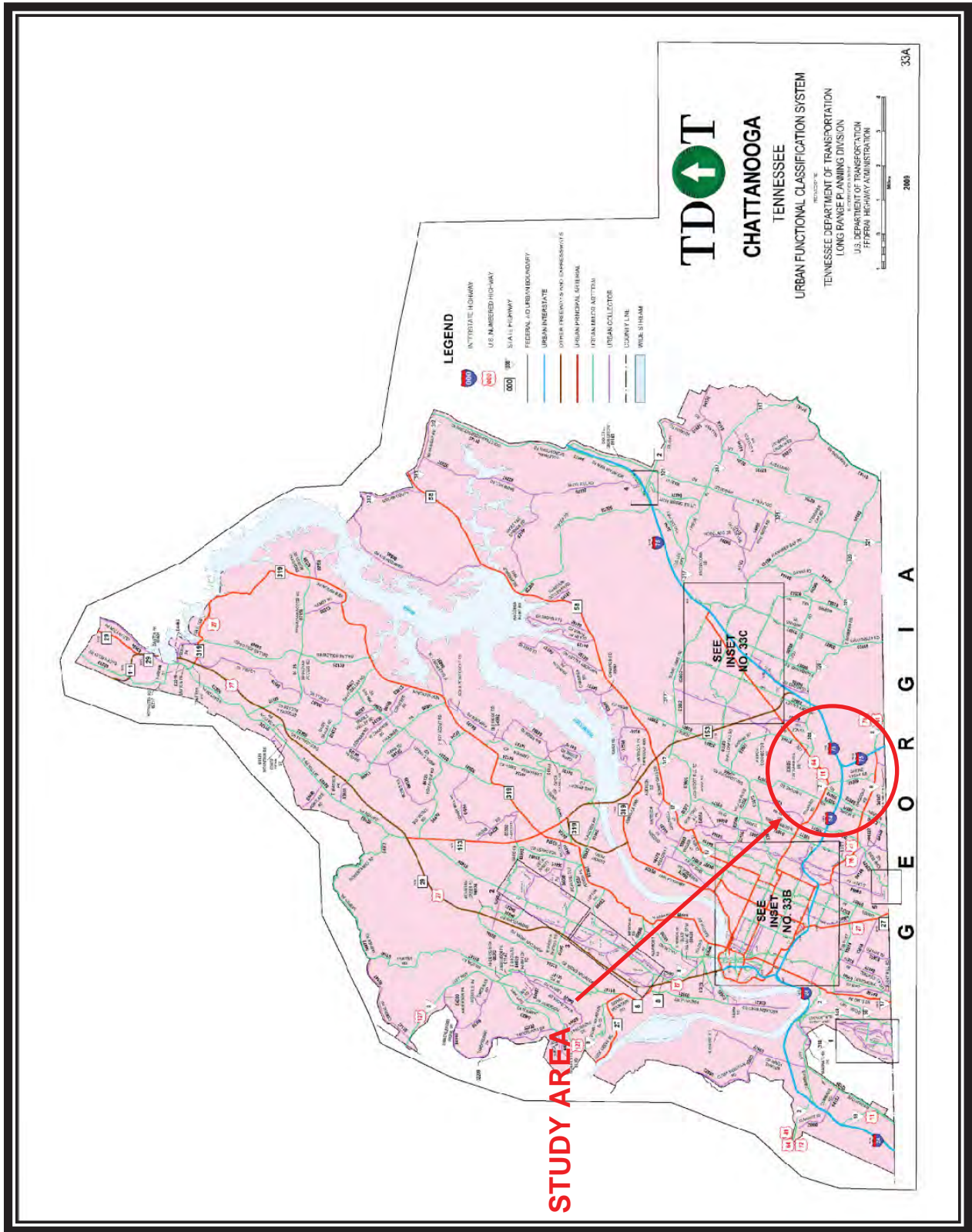


Figure 6: Project Vicinity Map

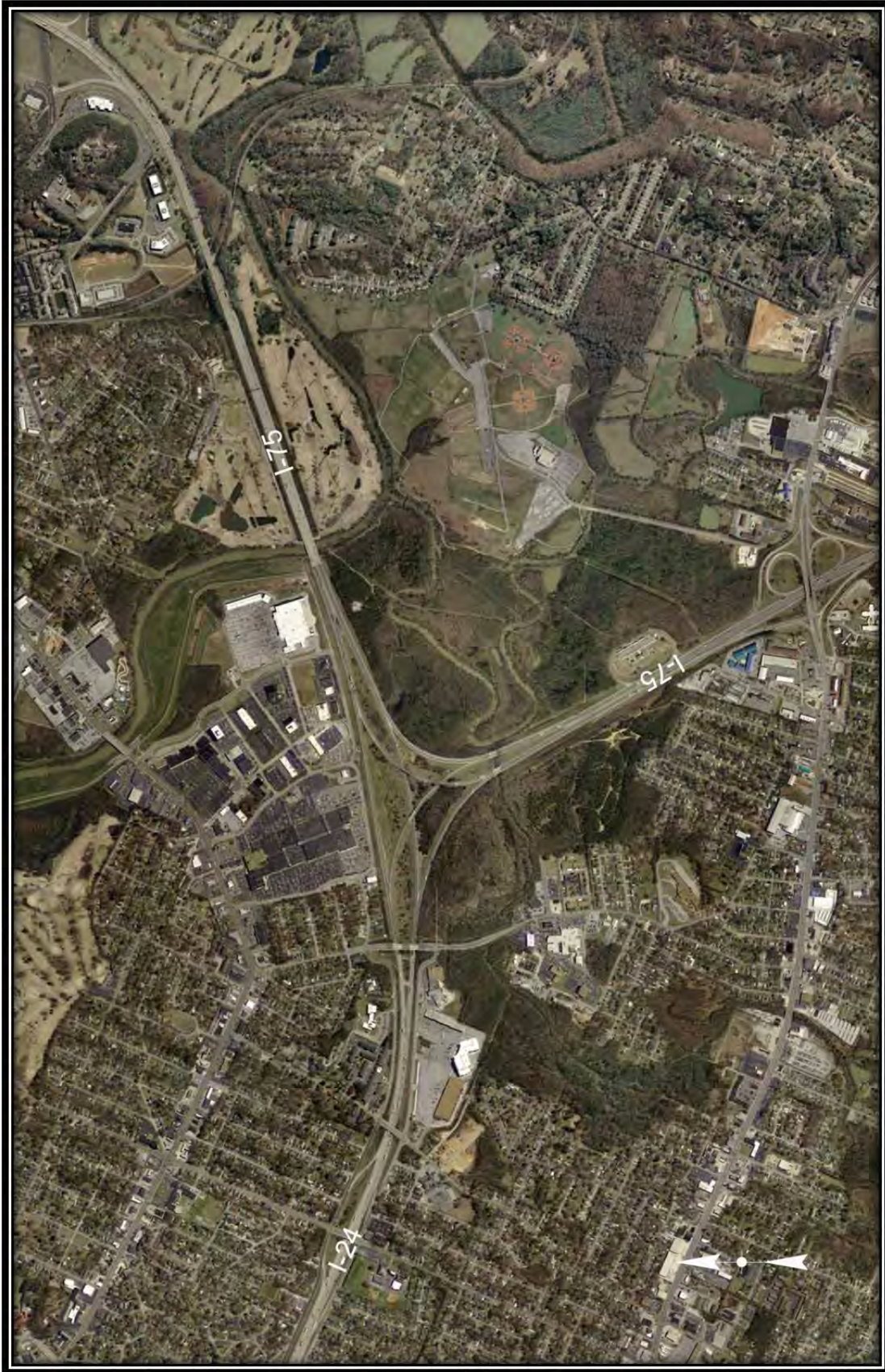


Figure 7: Project Location Map

CHAPTER 2

PRELIMINARY PLANNING DATA

A. Land Use

The area to the north of the interchange consists mostly of residential and commercial land uses. The area to the southwest of the I-24/I-75 interchange is primarily zoned for residential, commercial, and office use although some of the area zoned for commercial use has yet to be developed. The area in the southwest and southeast quadrants is in a floodplain and has been identified as an environmentally sensitive area due to the wetlands. The area to the southeast of the I-24/I-75 interchange is primarily zoned residential, agriculture, and commercial. This area contains Camp Jordan Park, which is protected from development by a conservation easement adjacent to the interchange right of way. A land use map is displayed in Figure 8.

B. Proposed Improvement

Seven (7) alternatives were presented for the proposed interstate modifications at a preliminary field review. The following table briefly describes the differences in the alternatives.

Alternative	Description	Reasons Eliminated
Alternative 1	Widens along existing interstate	Ramp design speed is less than 55 mph
Alternative 2	Improves ramp design speed to 70 mph	Impacts to conservation area east of I-75
Alternative 3	Improves ramp design speed to 70 mph & shifts interchange to west to avoid conservation area	Property impacts & geometric design concerns
Alternative 5	Improves ramp design speed to 55 mph	Impacts to conservation area east of I-75
Alternative 6	Improves ramp design speed to 55 mph & shifts interchange to west to avoid conservation area	Property impacts & geometric design concerns

Appendix A provides a more detailed description and plan view of Alternatives 1-3 and 5-6. Alternatives 4 and 7 are presented in more detail within this document. Operational approval is requested for both Alternatives 4 and 7 but Alternative 7 is the preferred alternative. Operational approval is requested for Alternative 4 in the event that funding cannot be secured for the more expensive Alternative 7. Control of access will be maintained for a minimum of 100' in each direction at each interchange ramp terminal for both alternatives. In addition to the modifications outlined in this study, the crossroads along adjacent interchanges should be analyzed during final design to determine if right-in right-out intersections or improved striping could be effective.

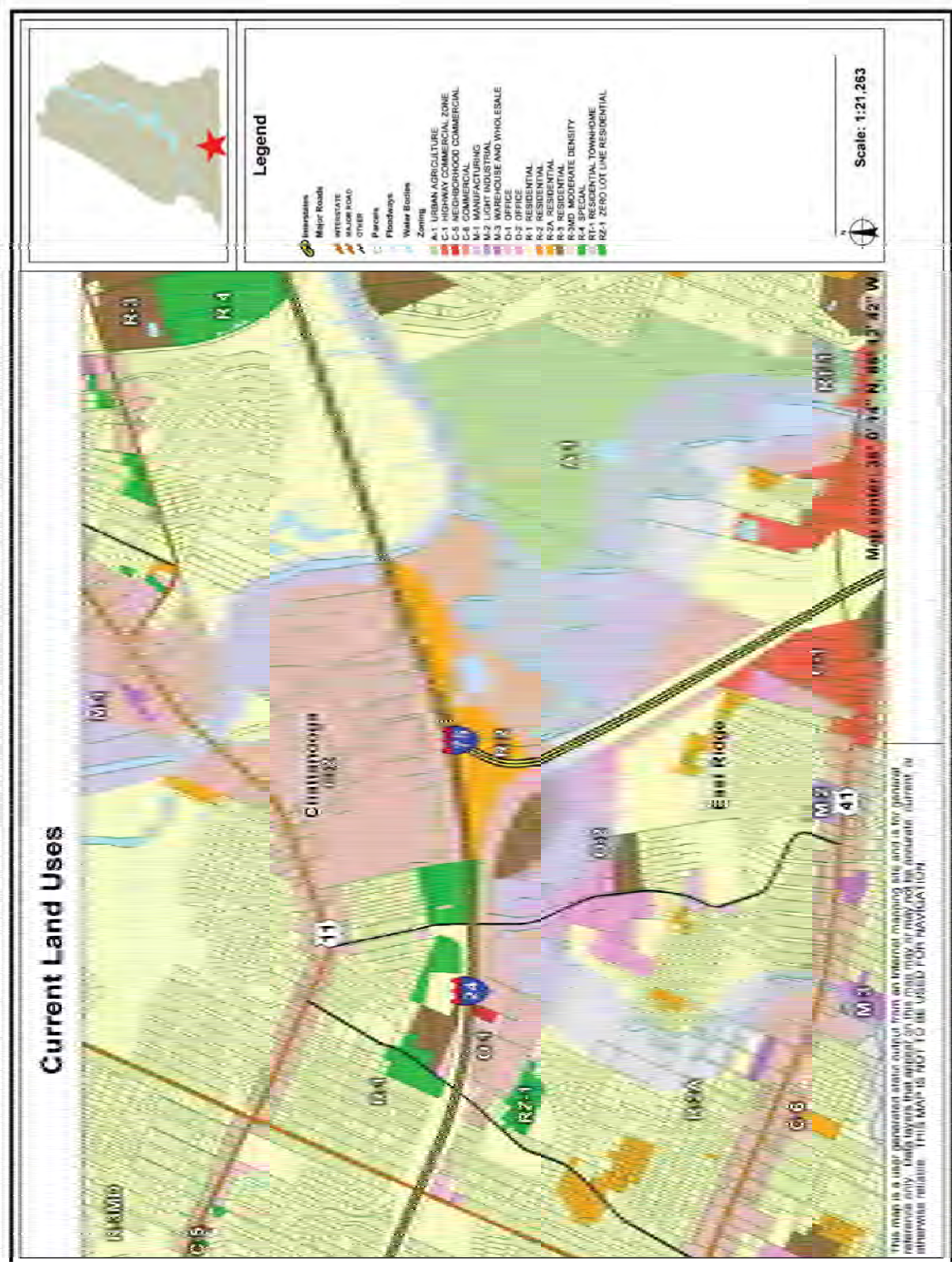


Figure 8: Land Use Map

Alternative 4

Alternative 4 widens the interstate by adding additional lanes with the on ramps at Ringgold Road, South Moore Road, and East Brainerd Road and dropping those lanes to tie into the existing system with the off ramps at these adjacent interchanges. The existing ramps are widened to three (3) lanes and radii are increased to a minimum 1200 feet to allow for a design speed of 55 mph. The interchange is shifted slightly towards the vacant land west of the interchange in order to prevent encroaching on the conservation area but the existing configuration is maintained. Alternative 4 maintains the existing rest area configuration and does not eliminate the existing weaving condition along NB I-75 between the Ringgold Road Interchange and the Welcome Center ramps. Figure 9 details an overview of Alternative 4 and detailed drawings may be found in Appendix B.

Alternative 4 construction includes the following:

- Widen I-24 EB to four (4) lanes between Belvoir Ave on-ramp and South Moore Road on-ramp
- Widen I-24 EB to five (5) lanes between South Moore Road on-ramp and I-24/I-75 diverge
- Construct the new bridge along Spring Creek Road that crosses over I-24 EB and WB
- Widen I-24 WB to six (6) lanes between I-75 merge and east of the Spring Creek Road bridge
- Widen I-24 WB to five (5) lanes between east of the Spring Creek Road bridge and South Moore Road off-ramp
- Widen I-24 WB to four (4) lanes between South Moore Road off-ramp and South Moore Road on-ramp
- Widen I-24 WB to five (5) lanes between South Moore Road on-ramp and Belvoir Ave off-ramp
- Reconstruct the Belvoir Ave on-ramp to I-24 EB
- Construct the new bridge along McBrien Road over I-24
- Construct the new bridge along South Moore Road over I-24
- Widen I-24 EB to I-75 NB ramp to three (3) lanes
- Widen I-75 SB to I-24 WB ramp to three (3) lanes
- Construct the I-75 to I-75 (NB and SB) ramps
- Widen/Construct I-24 EB to I-75 SB ramp to three (3) lanes
- Construct the new bridge along the I-24 EB to I-75 SB ramp that crosses Spring Creek
- Widen/Construct I-75 NB to I-24 WB ramp to three (3) lanes
- Construct the new bridge along the I-75 NB to I-24 WB ramp that crosses over the I-24 EB to I-75 NB ramp
- Construct the new bridge along the I-75 SB to I-75 SB ramp that crosses over the I-24 EB to I-75 NB ramp

- Construct the new bridge along the I-75 SB to I-75 SB that crosses over the I-75 NB to I-24 WB ramp
- Construct the new bridges along the I-75 to I-75 ramps (NB and SB) that crosses Spring Creek
- Widen I-75 SB to six (6) lanes between I-24/I-75 merge and rest area off-ramp (I-75 NB)
- Widen I-75 SB to five (5) lanes between rest area off-ramp (I-75 NB) and Ringgold Road off-ramp
- Widen I-75 SB to four (4) lanes between Ringgold Road off-ramp and existing overpass at Ringgold Road
- Widen I-75 NB to four (4) lanes between Ringgold Road on-ramp and Rest Area on-ramp
- Widen I-75 NB to five (5) lanes between Rest Area on-ramp and I-75/I-24 diverge
- Widen I-75 NB to five (5) lanes between I-75/I-24 merge and East Brainerd Road off-ramp
- Widen I-75 SB to five (5) lanes between East Brainerd Road and I-24/I-75 diverge
- Widen I-75 NB and SB bridge over Chickamauga Creek
- Widen I-75 NB and SB bridge over railroad
- Construct retaining wall along I-24 WB
- Construct retaining wall along I-75 NB to I-75 NB ramp

The project team discussed increasing the exit ramp radii at the welcome center but with an established floodway along the rear of the existing rest area and minimal increase in design speed this improvement was discarded. The team also discussed lengthening the weaving segment in front of the welcome center but found this adversely impacted the Ringgold Road interchange.

An operational analysis for Alternative 4 is presented in Chapter 3.

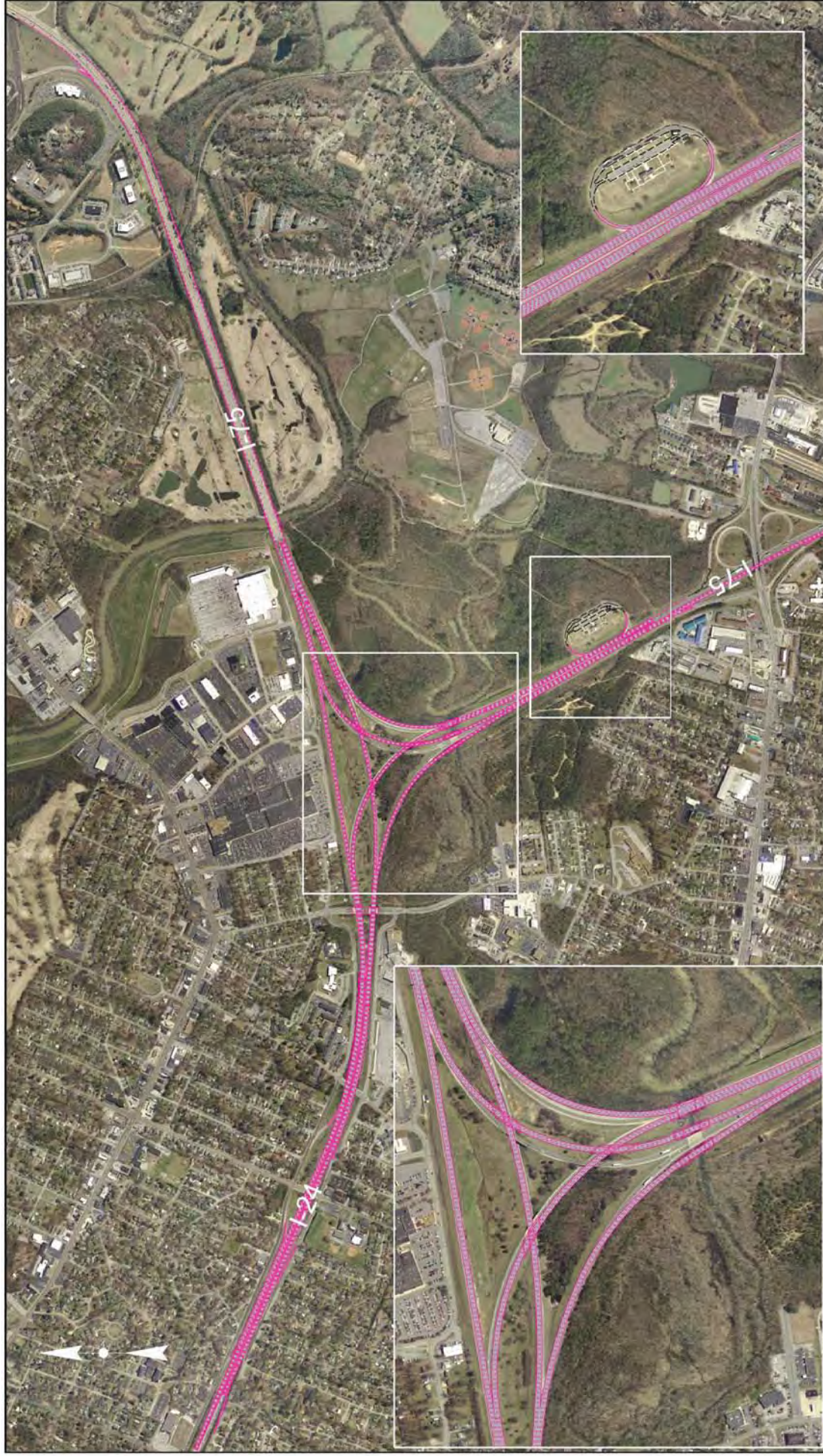


Figure 9: Alternative 4

Alternative 7

Alternative 7 adds additional lanes with the on ramps at Ringgold Road, South Moore Road, and East Brainerd Road and drops these lanes to tie into the existing system with the off ramps at these adjacent interchanges to allow for widening the existing interstate facility. I-75/I-24 ramps are widened to three (3) lanes with increased minimum radii of 1200 feet which provides for a 55 mph design speed. The I-24 ramps are reconfigured to provide all entry and exit along the right side of I-75, developing it as the thru route. Alternative 7 modifies the circulation patterns of the existing rest area to eliminate the weaving condition along NB I-75. The rest area realignment also would modify the WB Ringgold Road to NB I-75 ramp. The modification would realign the ramp to go behind the existing rest area and merge with I-75 north of the existing rest area. Traffic along the proposed ramp traveling NB I-75 will use a ramp parallel to the existing NB ramp and vehicles traveling to I-24 WB will diverge onto the I-24 flyover ramp.

To provide the opportunity to improve traffic flow along each of the facilities as funding becomes available, the modifications of Alternative 7 has been developed into a two (2) phase plan. The Initial Phase consists of constructing the I-75 thru ramps and minor interstate widening to tie in to the proposed ramps. The Ultimate Phase consists of widening the I-75/I-24 ramps, constructing the new rest area configuration, and major interstate widening. Figure 10 provides a layout of Alternative 7 and detailed drawings of the Initial and Ultimate Phases of Alternative 7 may be found in Appendix C.

It is anticipated that the Initial Phase of Alternative 7 will take 2 years to construct. The Initial Phase construction includes the following:

- Construct two (2) lanes of the proposed I-24 EB to I-75 SB ramp
- Construct the new bridge (full width) along the I-24 EB to I-75 SB ramp
- Construct two (2) lanes of the proposed I-75 NB to I-24 WB ramp
- Construct the new bridge (full width) along the I-75 NB to I-24 WB ramp that crosses Spring Creek
- Construct the new bridge (full width) along the I-75 NB to I-24WB ramp that crosses the I-24 EB to I-75 NB ramp
- Construct the new bridge (full width) along Spring Creek Road that cross over I-24 WB
- Construct the I-75 to I-75 ramps (NB and SB)
- Construct the new bridges along the I-75 to I-75 ramps (NB and SB) that crosses over the I-24 EB to I-75 NB ramp
- Construct the new bridges along the I-75 to I-75 ramps (NB and SB) that crosses over the I-75 NB to I-24 WB ramp
- Construct new bridges along the I-75 ramps (NB and SB) that crosses Spring Ck
- Reconstruct existing I-75 NB freeway between the I-24 EB and I-75 NB merge to the existing bridge over Chickamauga Creek
- Widen existing bridge along I-75 NB that crosses over Chickamauga Creek

- Widen I-75 SB to five (5) lanes between the I-75 SB and I-24 EB ramp merge and the Ringgold Road Interchange off-ramp
- Widen I-75 SB to four (4) lanes between the Ringgold Road Interchange off-ramp and existing overpass at Ringgold Road
- Construct two (2) lane exit at I-75 SB to Ringgold Road off-ramp
- Remove existing I-75 SB ramp
- Remove portions of existing I-75 NB and ramps not used in the Ultimate Phase

The Ultimate Phase construction of Alternative 7 consists of the following:

- Widen I-24 EB to I-75 SB ramp to three (3) lanes
- Widen I-75 NB to I-24 WB ramp to three (3) lanes
- Widen I-24 EB to I-75 NB ramp to three (3) lanes
- Widen I-75 SB to I-24 WB ramp to three (3) lanes
- Construct new Rest Area on-ramp and Ringgold Road to I-75 ramp
- Construct new parallel ramp for rest area and Ringgold Road traffic to I-75 NB
- Widen I-75 NB to four (4) lanes between Ringgold Road off-ramp (loop) and where existing Ringgold Road on-ramp is located
- Widen I-75 NB to five (5) lanes between existing Ringgold Road on-ramp to I-75/I-24 diverge
- Reconstruct Welcome Center off-ramp
- Widen location at I-24 EB to I-75 NB Ramp merge with new parallel ramp to I-75 NB to three (3) lanes
- Widen I-75 NB to six (6) lanes between I-24 merge and east of the Chickamauga Creek bridge
- Widen I-75 NB to five (5) lanes between east of the Chickamauga Creek bridge and the East Brainerd Road off-ramp
- Widen the existing bridges along I-75 NB and I-75 SB that cross over the railroad
- Widen I-75 SB to five (5) lanes between East Brainerd Road and the I-75/I-24 diverge
- Widen existing bridge along I-75 SB that crosses over Chickamauga Creek
- Widen I-24 WB to six (6) lanes between I-75 merge and east of the Spring Creek Road bridge
- Widen I-24 WB to five (5) lanes between east of the Spring Creek Road bridge and South Moore Road off-ramp
- Widen I-24 WB to four (4) lanes between South Moore Road off-ramp and South Moore Road on-ramp
- Widen I-24 WB to five (5) lanes between South Moore Road on-ramp and Belvoir Ave off-ramp
- Widen I-24 EB to four (4) lanes between Belvoir Ave on-ramp and South Moore Road on-ramp
- Widen I-24 EB to five (5) lanes between South Moore Road on-ramp and I-24/I-75 diverge
- Reconstruct the Belvoir Ave on-ramp to I-24 EB
- Construct the new bridge along Spring Creek over I-24 EB
- Construct the new bridge along McBrien Road over I-24

- Construct the new bridge along South Moore Road over I-24
- Widen I-75 SB to six (6) lanes between I-24/I-75 merge and rest area off-ramp (I-75 NB)
- Widen I-75 SB to five (5) lanes between rest area off-ramp (I-75 NB) and Ringgold Road off-ramp
- Construct retaining wall along parallel ramp connecting Rest Area/Ringgold Road to I-75 NB. Also construct retaining wall along I-24 WB.

Alternative 7 is the preferred alternative. An operational analysis of both the Initial and Ultimate Phases of Alternative 7 is presented in Chapter 3.

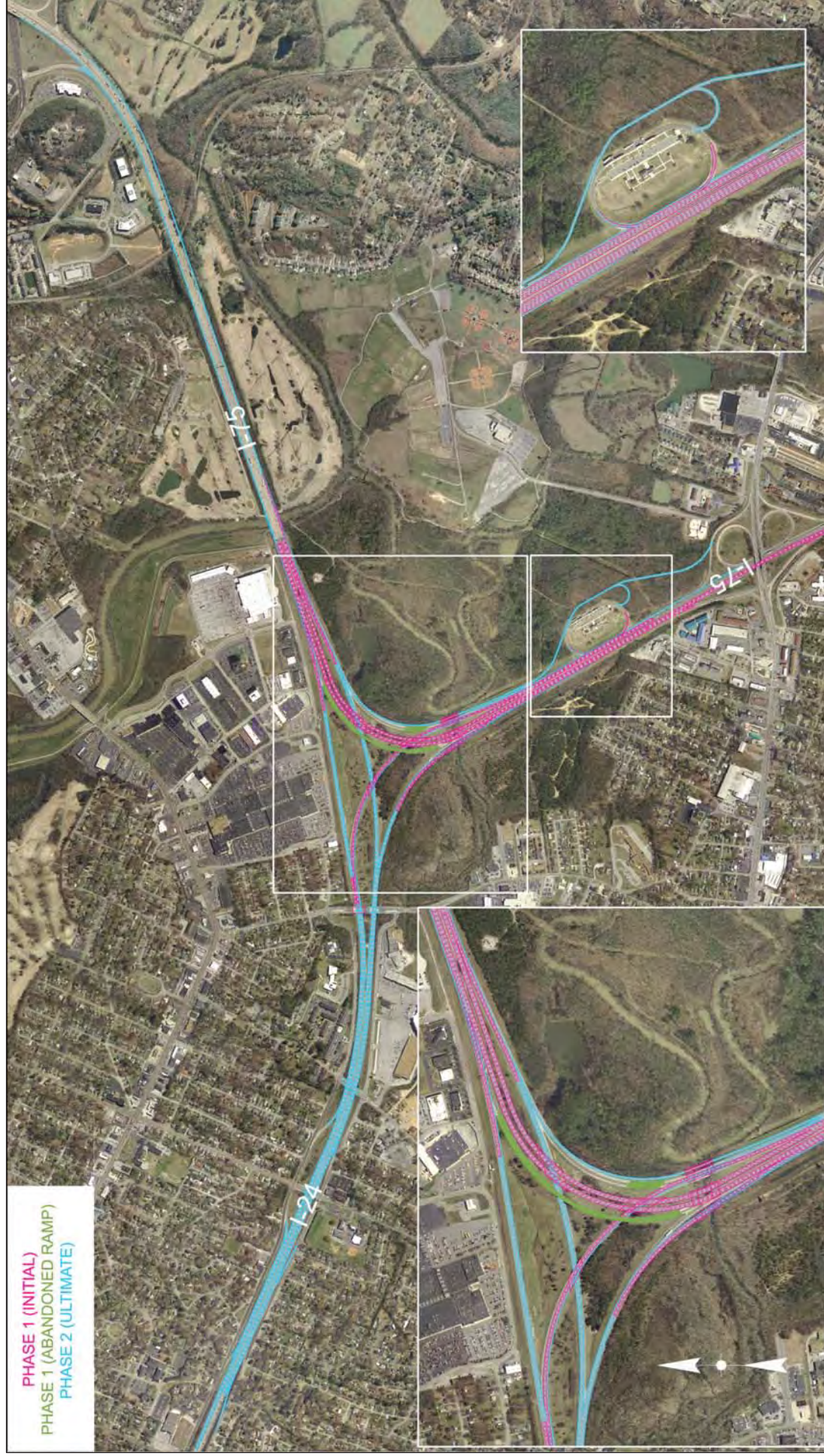


Figure 10: Alternative 7

CHAPTER 3

ENGINEERING INVESTIGATIONS

A. Traffic Operations

Traffic Data

The Chattanooga TransCAD Travel Model was provided by the Chattanooga Transportation Planning Organization (TPO) for use in forecasting volumes and distributions in this study. The 2035 Travel Model is the current TPO model, which includes the current land use and has the long range transportation plan incorporated. The base model data was compared to existing traffic count data for the I-24 and I-75 corridor and were determined to be calibrated along the interstate.

Traffic forecasts were developed along I-24 and I-75 for the base year 2015 and a design year 2035. Existing 2009 count stations were used to develop Annual Average Daily Traffic (AADT) along the interstate and ramps. These volumes were forecasted to 2015 and 2035, based on the growth rate from the TransCAD Travel Model. (2015 No Build and 2035 No Build scenarios were compared along various links within the model to determine an average growth rate for the area.) The TransCAD Travel Model accounted for future interstate widening. Since Alternatives 4 and 7 are identical at each approach to the interchange (I-75 East of Interchange, I-75 South of Interchange, I-24 West of Interchange), the model growth rate was determined acceptable for both alternatives.

Traffic Analysis

A Level of Service (LOS) analysis was conducted to determine the relative performance of each alternative in 2015 and 2035, during the AM and PM Peak periods. The traffic operation analyses were completed using HCS+ (Highway Capacity Software) on basic freeway segments, weaving segments, ramp merge segments, and ramp diverge segments. Level of Service was used as the measure of effectiveness and the analysis files can be found in Appendix J of this report while approved traffic forecasts can be found in Appendix D.

Level of Service Tables 1-5 display the findings for 2015 and 2035 for all freeway segments, ramp merge segments, ramp diverge segments, and for all weaving segments. The following describes what is denoted in those tables.

- The areas designated as major merges are denoted in blue in the following charts. "A major merge area is one in which two (2) primary roadways, each having multiple lanes, merge to form a single freeway segment." Additionally, "where a two (2)-lane on-ramp results in a lane addition," the junction is classified as a major merge segment. According to the Highway Capacity Manual 2000, there are no effective models to predict performance for these major merge areas. Capacities can only be checked on approaching legs and the departing freeway.

- If a single-lane on (or off) ramp results in a lane addition (drop), “the capacity of the ramp is governed by the ramp geometry itself and not by the ramp-freeway junction.” In these situations, the capacity of the ramp roadway is examined. The ramp roadway is not analyzed in terms of LOS but rather if the ramp exceeds capacity (therefore only a LOS F can be received by a ramp roadway when capacity is exceeded). These areas are denoted in yellow in the following charts.
- According to the Highway Capacity Manual 2000, major diverge areas can be analyzed by checking the entering and departing demand on each exit leg against the appropriate entry or departure leg. This “allows the density across all freeway lanes to be estimated for a distance of 1500 ft upstream of the gore area.” The density is then compared with LOS criteria to estimate the LOS in the diverge area. A more accurate representation of traffic conditions present in the I-24/I-75 interchange examines freeway segments both upstream and downstream of the diverge area. These areas are denoted in purple in the following charts.
- Areas denoted in pink in the following charts overlap with weaving segments. The LOS for these areas is determined from the weaving analyses.

Locations of LOS Analysis are coded with a number that is shown on the maps in Appendix E. LOS is also shown on the maps for the 2015 and 2035 No Build scenarios as well as the 2015 and 2035 Alternative 4 and Alternative 7 Build scenarios.

**TABLE 5: WEAIVING LEVEL OF SERVICE
(AM AND PM PEAK HOUR)**

LOS	3 I-75 NB (SOUTH OF INTERCHANGE)							
	NO BUILD		ALT. 4		ALT 7 INITIAL		ALT 7 ULT	
	AM	PM	AM	PM	AM	PM	AM	PM
2015	E	D	D	C	F	D	GOVERNED BY FREEWAY SEGMENT ANALYSIS. SEE TABLE 1.	GOVERNED BY FREEWAY SEGMENT ANALYSIS. SEE TABLE 1.
2016	E	D	D	C	F	D		
2017	E	D	D	C	F	D		
2018	F	D	D	C	F	D		
2019	F	D	D	C	F	D		
2020	F	D	D	C	F	D		
2021	F	E	D	C	F	D		
2022	F	E	D	C	F	D		
2023	F	E	D	C	F	D		
2024	F	E	E	C	F	D		
2025	F	E	E	C	F	E		
2026	F	E	E	D	F	E		
2027	F	E	E	D	F	E		
2028	F	E	E	D	F	E		
2029	F	E	E	D	F	E		
2030	F	E	E	D	F	E		
2031	F	E	E	D	F	E		
2032	F	E	E	D	F	E		
2033	F	E	E	D	F	E		
2034	F	E	E	D	F	E		
2035	F	E	E	D	F	E		

TABLE 1: FREEWAY LEVEL OF SERVICE (AM AND PM PEAK HOUR)

LOS	1 I-24 EB (WEST OF INTERCHANGE)						2 I-24 WB (WEST OF INTERCHANGE)						3 I-75 NB (SOUTH OF INTERCHANGE)						4 I-75 SB (SOUTH OF INTERCHANGE)						5 I-75 NB (EAST OF INTERCHANGE)						6 I-75 SB (EAST OF INTERCHANGE)							
	ALT. 4			ALT 7 INITIAL			ALT 7 ULT			ALT. 4			ALT 7 INITIAL			ALT 7 ULT			ALT. 4			ALT 7 INITIAL			ALT 7 ULT			ALT. 4			ALT 7 INITIAL			ALT 7 ULT				
	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM		
Year	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
2015	D	E	B	C																																		
2016	D	E	B	C																																		
2017	D	E	B	C																																		
2018	D	E	B	C																																		
2019	D	F	B	C																																		
2020	D	F	B	C																																		
2021	D	F	B	C																																		
2022	D	F	B	C																																		
2023	D	F	B	C																																		
2024	D	F	B	C																																		
2025	D	F	B	C																																		
2026	D	F	B	C																																		
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2030	D	F	C																																			
2031	D	F	C																																			
2032	E	F	C																																			
2033	E	F	C																																			
2034	E	F	C																																			
2035	E	F	C																																			

TABLE 2: FREEWAY LEVEL OF SERVICE (AM AND PM PEAK HOUR)

LOS	7 I-24 EB TO I-75 SB RAMP						8 I-24 EB TO I-75 NB RAMP						9 I-75 NB TO I-24 WB RAMP						10 I-75 NB TO I-75 NB RAMP						11 I-75 SB TO I-75 SB RAMP						12 I-75 SB TO I-24 WB RAMP																						
	ALT 4			ALT 7 INITIAL			ALT 7 ULT			ALT 4			ALT 7 INITIAL			ALT 7 ULT			ALT 4			ALT 7 INITIAL			ALT 7 ULT			ALT 4			ALT 7 INITIAL			ALT 7 ULT																			
	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM	NO BUILD	AM	PM																	
Year	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM																	
2015	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2016	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2017	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2018	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2019	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2020	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2021	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2022	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2023	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2024	B	C	A	B	B	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-																		
2025	B	C	A	B	B	C	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2026	B	C	A	B	B	C	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2027	B	C	A	B	B	C	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2028	B	C	A	B	B	C	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2029	B	C	A	B	B	C	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2030	B	C	A	B	B	C	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2031	B	D	A	B	B	D	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2032	B	D	A	B	B	D	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2033	B	D	A	B	B	D	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2034	B	D	A	B	B	D	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
2035	B	D	A	B	B	D	A	B	D	E	C	C	B	B	C	C	B	B	C	B	B	C	C	B	B	C	B	B	C	C	E	B	B	C	C																		
																														NO MODIFICATIONS FROM EXISTING						NO MODIFICATIONS FROM EXISTING						NO MODIFICATIONS FROM EXISTING						NO MODIFICATIONS FROM EXISTING					

In addition to the HCS analyses, the transportation system along I-75 at I-24 was modeled using VISSIM Traffic Simulations. VISSIM is a behavior-based, microscopic simulation model software package that provides a graphic and numeric representation of lane geometry, driver behavior, signal timing, and traffic volumes. The model evaluates the performance of a network or intersection using measures of effectiveness such as travel time or queue length. A traffic simulation model was developed along the project corridor to evaluate the interaction of closely spaced freeway and ramp segments along I-24 and I-75. The VISSIM simulations were used to analyze the existing weaving conditions within the rest area segment and check merge and diverge locations within the study area.

The existing VISSIM simulations identified two major areas of concern. The weaving segment along I-75 NB between Ringgold Road and the Welcome Center and the I-24 EB to I-75 SB major diverge both resulted in high levels of congestion. Simulations of both Alternatives 4 and 7 relieved the congestion at the I-24 EB to I-75 SB major diverge. Congestion at the weaving segment was reduced in Alternative 4 and completely removed with Alternative 7.

B. Safety Analysis

The Tennessee Department of Transportation completed a Road Safety Audit Review (RSAR) throughout the project corridor in March 2006. A copy of the RSAR can be found in Appendix K. A crash ratio (actual crash rate divided by critical crash rate) of 5.75 was calculated along I-75 between log mile 1.11 and 1.20, which exceeds the minimum threshold of 3.5 for Hazard Elimination Safety Program funds.

The RSAR documented rear-end and sideswipe crashes along Northbound I-75 to the weaving segment between the Ringgold Road merge and the I-24 diverge. The cause was attributed to the short weaving segment, in addition to the on and off ramps to the Welcome Center. The RSAR also found that truck rollovers are common along Northbound and Southbound I-75. Contributing factors to these truck rollovers includes truck speed, weather conditions, and load shifts. Additionally, there was a dip in the Southbound I-75 pavement caused by a drop off in superelevation when the curve meets the bridge deck. Truckers often overcorrected at this location, resulting in load shifts.

The RSAR recommended installing rollover warning and speed advisory signs along Northbound and Southbound I-75. Additional overhead diagrammatic signs were recommended along Northbound I-75 and Eastbound I-24 to provide motorists additional time to get into their lane. Repaving the Southbound I-75 segment to correct the superelevation change near the bridge deck was also recommended. The mitigation strategies recommended by the RSAR team were implemented.

Additionally, the proposed Alternatives 4 and 7 will further improve safety within the interchange by providing the following:

- Adequate acceleration and deceleration lanes and taper lengths,
- Improving ramp radii and speeds thus further reducing the potential for truck rollovers,
- Decreasing congestion, improving or eliminating the weaving segment along I-75 between Ringgold Road and I-24, and
- Maintaining advance warning guide signs to allow motorists time to reach their destination lane.

C. Access Analysis

This study has been undertaken in accordance with the Federal Highway Administration's (FHWA) policy for granting new or modified interstate access. The FHWA policy, as described in Federal Register 74, No. 165, August 27, 2009), is provided in the following paragraphs along with comments for consideration.

It is in the national interest to preserve and enhance the Interstate System to meet the needs of the 21st Century by assuring that it provides the highest level of service in terms of safety and mobility. Full control of access along the Interstate mainline and ramps, along with control of access on the crossroad at interchanges, is critical to providing such service. Therefore, FHWA's decision to approve new or revised access points to the Interstate System must be supported by substantiated information justifying and documenting that decision. The FHWA's decision to approve a request is dependent on the proposal satisfying and documenting the following requirements:

1. ***The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands (23 CFR 652.2(a)).***

I-75 is a regional facility that serves both Tennessee and Georgia and I-24 serves as a direct link between I-75 and I-59. Each of these facilities provide a direct connection to downtown Chattanooga, Lookout Mountain, and other area attractions. This Interstate Access Request proposes maintaining the existing regional access by modifying the existing I-75/I-24 interchange as opposed to adding an additional interchange to the system.

Analyses of the existing interchange revealed several movements that are at or beyond capacity in 2015 with most of the area expected to perform at or beyond capacity by the design year 2035. In the initial design stages of modifications for the I-75/I-24 interchange, an alternative (Alternative 1) was developed that would maintain the existing interchange geometry with simply widening the existing

facilities. It was determined during the selection process that this alternative would not meet the project goals. Although capacity would be increased, additional laneage would not improve the Ringgold Road and Welcome Center merging points or correct substandard ramp geometry. Four (4) other alternatives were studied but were eliminated due to not meeting the purpose and need.

Revised access is necessary to increase capacity, correct merge points, and improve ramp geometry. Alternatives 4 and 7 both address these issues. Proposed modifications result in improved safety of the interstate while providing a facility that meets design year traffic demands. There will not be a need to improve cross roads at adjacent interchanges.

2. *The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(a)).*

Seven (7) alternatives were initially developed for the I-75/I-24 interchange (a discussion of these can be found in Chapter 1 and Appendix A). Alternatives addressed widening the existing facilities, increasing ramp radii to improve geometry and provide higher design speeds, modifying the alignment so that I-75 is the thru route, and modifications to the rest area ramps. The alternatives ranged from staying within the existing corridor to shifting east and west of the existing interchange. An adequate number of alternatives were considered to ensure that the most cost-effective solution was developed that increases safety, meets the transportation needs, and enhances traffic flow. Alternatives were evaluated based on their design speed, right-of-way impacts, and environmental impacts. After a preliminary review meeting with TDOT and FHWA officials, Alternative 1 was eliminated due to ramp design speeds less than 55 mph, Alternatives 2 and 5 were eliminated due to impacts to the conservation area east of I-75, and Alternatives 3 and 6 were eliminated due to property impacts and geometric design concerns. Ultimately, Alternatives 4 and 7 were selected to be further developed in the Interstate Access Request document and to gain operational approval. Alternative 7 is the preferred alternative based on the ability to eliminate the weave conditions along I-75.

Providing park and ride lots within the interchange is not desirable and would create ingress/egress problems due to ramps and grade-separations. Park and Ride lots would be possible at the adjacent interchanges and could be studied for implementation.

High-occupancy vehicle (HOV) lanes are not currently present within Chattanooga and there are currently no plans for HOV lanes to be constructed

along I-24 and I-75 in the project vicinity. HOV lanes have not been included in the proposed modifications nor are they considered desirable in this isolated area. Rather, the use of HOV facilities in this area could be part of a larger study that analyzes if HOV lanes are needed and if they provide a benefit along the entire I-24 and I-75 corridors.

Ramp metering is commonly used to regulate traffic that is entering the interstate facility at an on-ramp. The modifications included in this Interstate Access Request include the three (3) on-ramps at the adjacent interchanges. These include the Ringgold Road to I-75 NB on-ramp (ID Point 23), the East Brainerd Road to I-75 SB on-ramp (ID Point 24), and the South Moore Road to EB I-24 on-ramp (ID Point 22). There are several strategies included in the FHWA's "Ramp Management and Control Handbook" (January 2006) that identify when to use ramp metering. Based on the strategies outlined in this handbook, ramp metering is not warranted in this area. This analysis is based on the following:

- The on-ramps result in lane additions which may eliminate the immediate need for merging with the interstate traffic
- There are concerns with having adequate storage lengths available on some of the ramps to maintain ramp metered queues during peak hours and to allow vehicles to accelerate to freeway speeds
- The freeway segments near the on-ramps perform at a LOS D or better in the 2035 design year which indicates that ramp metering is not necessary

Additionally, the I-24 and I-75 corridor throughout the project area is currently equipped with Intelligent Transportation Systems.

3. ***An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type***

and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

Analyses of current and future traffic were completed for freeway segments, merge and diverge movements, and weaving segments within the limits of the I-75/I-24 interchange area. No build analyses for the design year 2035 reveals that much of the area surrounding the interchange will be performing at or beyond functional capacities. Modifications implemented from both Alternatives 4 and 7 will significantly improve the I-75/I-24 interchange and analysis indicates that all segments of the freeway will operate at an acceptable level of service with either alternative. Improving substandard ramp geometry, providing additional laneage, improving design speeds, and enhancing merge/diverge points should reduce the crash potential and improve the overall safety of the interchange.

I-75 (South of I-75/I-24 Interchange)

The existing weaving segment along I-75 NB between the welcome center on-ramp and the I-24 diverge results in a LOS E/D (AM/PM) for the no build scenario in 2015 and the no build 2035 yields a LOS F/E. For Alternative 4, an additional lane is added throughout the area resulting in a LOS increase to D/C in 2015 and E/D in 2035. In the Initial Phase of Alternative 7, the existing laneage stays the same, but the I-24 off-ramp is switched from a left-hand exit to a right-hand exit and the weave distance is reduced by approximately 1000 ft. These modifications result in a LOS F/D in 2015 and following the construction of the Ultimate Phase the existing weaving segment is eliminated. One (1) lane is added throughout the area as with Alternative 4. With the Ultimate Phase of Alternative 7, however, the on ramp for the rest area is reconfigured, eliminating the existing weave. The freeway segment for Alternative 7 results in a 2035 LOS C/C. With the Ultimate Phase of Alternative 7 completed, the I-75 NB freeway segment operates at a LOS C. With Alternative 4, the weaving segment operates at a LOS D or better with the exception of the AM movement beginning in Year 2024.

The existing freeway segment along I-75 SB extending from the I-24 ramp merge to the Ringgold Road off-ramp results in a no build LOS B/C for 2015 and B/D for 2035. An additional lane is added throughout the area in Alternatives 4 and in the Initial Phase of Alternative 7 and resulting in a LOS B/C in 2015 and 2035. LOS C or better are maintained throughout this area with both Alternatives 4 and 7.

The Ringgold Road Merge to I-75 NB results in a LOS F/D for both 2015 and 2035 no build scenarios. In Alternative 4, the Ringgold Road Northbound Merge to I-75 results in a one (1) lane addition from the ramp which cannot be analyzed for LOS and the ramp capacity check is not exceeded in the AM or PM peak

hours for 2035. In the Initial Phase of Alternative 7, no modifications are made to the merge point (maintaining the LOS F/D for both 2015 and 2035) and in the Ultimate Phase, the Ringgold Road Northbound Merge is reconfigured, which eliminates this merge point.

The Ringgold Road Diverge from I-75 SB results in a two (2) lane off-ramp with a lane drop under the existing conditions, as well as under Alternatives 4 and 7. This scenario is analyzed as a major diverge segment.

I-75 (East of I-75/I-24 Interchange)

The existing freeway segment along I-75 NB between the I-24 merge and East Brainerd Road diverge results in a 2015 no build scenario LOS D/D (AM/PM) and a 2035 LOS of E/E. For Alternative 4 and the Ultimate Phase of Alternative 7, an additional lane is added throughout the area. Alternative 4 results in a 2015 LOS C/C. Alternative 4 and the Ultimate Phase of Alternative 7 results in a 2035 LOS C/D. There are no changes from the existing configuration for the Initial Phase of Alternative 7, which would maintain the 2015 LOS D/D. With the proposed modifications of Alternatives 4 and 7, the freeway segment will perform at a LOS D or better for 2015 and 2035.

I-75 SB between East Brainerd Road merge and I-24 diverge results in a no build LOS C/D in 2015 and LOS D/E in 2035. There are no modifications to this segment in the Initial Phase of Alternative 7, which would maintain the 2015 LOS C/D. An additional lane is provided for Alternatives 4 and the Ultimate Phase of Alternative 7. 2015 Alternative 4 LOS is C/C. Alternative 4 and 7 result in a 2035 LOS C/D. The proposed modifications will increase the LOS to D or better.

The East Brainerd Road Merge to I-75 SB results in a one (1) lane addition from the ramp which cannot be analyzed for LOS. The ramp capacity is not exceeded in the AM or PM peak hours for 2035.

The East Brainerd Road Diverge from I-75 NB results in a 2015 no build LOS C/D and 2035 LOS D/E. The Initial Phase of Alternative 7 does not modify the ramp area so the LOS remains C/D in 2015. In Alternatives 4 and the Ultimate Phase of Alternative 7, an additional lane is provided that creates a one (1) lane drop to the ramp which cannot be analyzed for LOS but the ramp capacity is not exceeded in the AM or PM peak hours for the design period.

I-24 (West of I-75/I-24 Interchange)

The existing freeway segment along I-24 EB between the South Moore Road on-ramp and the I-75 Diverge results in a 2015 no build LOS D/E (AM/PM) and the 2035 no build LOS is E/F. The Initial Phase of Alternative 7 does not result in any modifications to the area, thus maintaining the 2015 LOS D/E. Alternatives 4

and the Ultimate Phase of Alternative 7 add two (2) lanes to the segment and improve the 2015 LOS to B/C for Alternative 4. Alternatives 4 and the Ultimate Phase of Alternative 7 improve to a 2035 LOS C/C. With the addition of the proposed modifications in Alternative 4 and the Ultimate Phase of Alternative 7, the freeway segment will improve to a LOS C or better.

The existing freeway segment along I-24 WB between the I-75 Merge and the South Moore Road off-ramp is a 2015 no build LOS F/D and a 2035 LOS F/F. No modifications are made to the existing configuration in the Initial Phase of Alternative 7. Alternative 4 and the Ultimate Phase of Alternative 7 add two (2) lanes throughout the area resulting in a 2015 LOS C/B for Alternative 4. Alternatives 4 and the Ultimate Phase of Alternative 7 result in a 2035 LOS D/C and improve the freeway segment to a LOS D or better with the modifications proposed in Alternative 4 and the Ultimate Phase of Alternative 7.

The South Moore Road Merge with I-24 EB results in a 2015 no build LOS D/E and a 2035 LOS E/F. The Initial Phase of Alternative 7 does not result in any modifications to the area and maintains the existing 2015 LOS. Alternatives 4 and 7 adds a one (1) lane addition from the ramp and cannot be analyzed for LOS but the ramp capacity is not exceeded in the AM or PM peak hours for the design period.

The South Moore Road Diverge from I-24 WB results in a LOS F/D for 2015 no build and a LOS F/F for 2035 no build. Alternative 4 and the Ultimate Phase of Alternative 7 result in a one (1) lane drop to the ramp which cannot be analyzed for LOS but the ramp capacity is not exceeded for 2035.

Preliminary signing plans have been developed for Alternatives 4 and 7. A conceptual signing plan for both alternatives can be found in Appendix F.

- 4. *The proposed access connects to a public road only and will provide for all traffic movements. Less than “full interchanges” may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)).***

I-24 and I-75 are currently on the National Interstate System and the modifications proposed in Alternatives 4 and 7 maintain all traffic movements and allow for continued service to the region. Preliminary design has shown that the proposed modifications for both alternatives are geometrically sufficient and constructible. As preliminary design proceeds, all modifications will be designed to current federal standards for interstate highways and will meet or exceed all American Association of State Highway and Transportation Officials (AASHTO)

criteria. The following design criteria have been addressed with the preliminary design phase:

- Sight distance at adjacent interchange ramp terminals is adequate.
- The first ramp at each adjacent interchange was analyzed based on current and projected demand for storage length. Each ramp will not exceed capacity.
- All structures will meet the minimum vertical clearance as described in AASHTO's "A Policy on Design Standards Interstate System."
- Pedestrians will not be given access throughout the major directional interchange. However, access is currently given at adjacent interchanges.
- The length of all acceleration and deceleration lanes as well as the length of tapers will meet or exceed AASHTO guidelines based on ramp entrance and exit speeds.
- All ramp spacing distances between on and off ramps as described for system interchanges in AASHTO have been met.
- The interchange will maintain lane continuity and lane balance principles as described by AASHTO.
- The interchange design and operational patterns are consistent with driver expectancy and with adjacent interchanges. The I-75/I-24 interchange is a major directional interchange and is the end of I-24.

The modifications to the proposed interchange have been evaluated for operation as outlined in AASHTO's "A Policy on Geometric Design of Highways and Streets." Each pathway has been evaluated for operation from the driver's point of view, which includes merging and diverging lanes and signing along the pathway. The interchange layout meets driver expectancy and improves traffic flow.

Appendix B shows detailed plan sheets for Alternative 4, while Alternative 7 Initial and Ultimate plan sheets can be found in Appendix C.

- 5. *The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.***

The I-75/I-24 interchange is located within the Chattanooga-Hamilton County/ North Georgia (CHCNGA) Transportation Planning Organization's (TPO) boundary. The CHCNGA TPO Long Range Transportation Plan's All Needs Plan details interchange reconstruction at I-24 between Belvoir Avenue and I-75

as well as interchange widening along I-75 south and east of the interchange. Additionally, the CHCNGA's Transportation Improvement Program (TIP) for Fiscal Years 2011-2014 provides for a feasibility/environmental study and the State Transportation Improvement Program (STIP) will be amended to include the I-75/I-24 modifications. If the project is to be constructed in phases, amendments to include both initial and ultimate construction will be included in the STIP.

6. ***In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d), 23 CFR 625.2(a), 655.603(d), and 771.111).***

According to the CHCNGA 2035 LRTP there are no expectations for future interchanges in this vicinity. The CHCNGA 2035 LRTP only identifies one (1) new interchange in the Chattanooga city limits. The proposed interchange, at Ooltewah Georgetown Road, is approximately thirteen (13) miles to the northeast of the proposed project location. Additionally, the I-75 at I-24 interchange modifications are consistent with the previously completed I-75 Corridor Feasibility Study. The interstate corridor study does not provide for any additional interchanges in the study area.

7. ***When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d)).***

The primary objective of the proposed modifications is to improve safety issues within the interchange area due to substandard ramp geometry and improve operational deficiencies that have resulted from growth in the Chattanooga area. The modifications do not relate to any existing or proposed commercial or residential development within the vicinity of the interchange. However, during the process of developing this Interstate Access Request, a development along the east side of I-75 at Ringgold Road has been proposed. This development is in preliminary stages and has yet to be approved. This development will be accessed via Ringgold Road only. Future year traffic volumes accounted for the proposed development. If the proposed development is approved, it is anticipated the existing weaving problem will continue to deteriorate along I-75

with the no build and Alternative 4 alignments. The weaving condition would be eliminated with the Alternative 7 alignment.

The modifications along I-75 and I-24 will be completed by TDOT and does not require financial commitments from other entities. Additionally, the proposed modifications to the interchange are not contingent on the timing of other improvements.

8. ***The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111).***

Environmental studies were not conducted during this phase but will begin once operational approval has been granted by the FHWA. It will be emphasized to project stakeholders that the Interstate Access Request submitted will be a two-step process. The first step entails the engineering and operational acceptability as requested in this document. The second step of the process will be the environmental approvals.

A National Environmental Policy Act (NEPA) study for the project will be conducted. Project design and construction will comply with regulations set forth by Section 106 of the National Historic Preservation Act, Section 4(f), and the Americans with Disabilities Act. It is anticipated that there are not any threatened or endangered species in the area nor will there be any historical sites that will be impacted by the proposed interchange modifications. Further studies will be necessary to determine any historic, archaeological, noise, or ecological impacts of constructing an interchange.

There are wetlands located to the west of the existing I-75/I-24 interchange although the preferred Alternatives 4 and 7 are not anticipated to encroach on this area. Additionally, there is a flood way in the area and any modifications to the interchange are not expected to require the acquisition of any residences.

Camp Jordan is located to the east of the existing I-75/I-24 interchange. Camp Jordan is a 257 acre recreation facility with biking and walking trails. Associated with Camp Jordan is a Conservation Easement. The preferred Alternatives 4 and 7 are not anticipated to impact the area. If by some unknown circumstance, Camp Jordan is affected, mitigation will be required. Regulations set forth by Section 4(f) will be followed.

Additionally, the Brainerd Road Master Plan identifies the long range goals of the area along with outlining stormwater/green infrastructure improvements. As part of the environmental process and future design, the project team will explore opportunities to reduce water runoff and improve the areas water quality that is currently being incorporated with the current project from East Brainerd Road to Spring Creek Road.

Furthermore, transportation conformity is a process required of Metropolitan Planning Organizations (MPOs) pursuant to the Clean Air Act Amendments (CAAA) of 1990. CAAA require that transportation plans, programs, and projects in nonattainment or maintenance areas that are funded or approved by the Federal Highway Administration (FHWA) be in conformity with the State Implementation Plan (SIP), which represents the State's plan to either achieve or maintain the National Ambient Air Quality Standard (NAAQS) for a particular pollutant. Projects conform to the SIP if they are included in a fiscally constrained and conforming Long Range Transportation Plan (LRTP) and Tennessee's State Transportation Improvement Program (STIP). The Chattanooga-Hamilton County/North Georgia (CHCNGA) Transportation Planning Organization (TPO) has been designated a non-attainment area for particulate matter of 2.5 microns or less in size (Chattanooga-Hamilton County/North Georgia LRTP 2035, Volume 2, Conformity Determination Report). For all other criteria pollutants, CHCNGA is designated as in attainment. Modifications to the interstate must conform to standards and not produce new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.

D. Cost

The total estimated construction costs for Alternatives 4 and 7 are detailed in Appendix G. The estimated cost associated with Alternative 4 is \$50,200,000. Alternative 7 is expected to cost \$34,100,000 in the Initial Phase and an additional \$54,900,000 (2025 dollars) in the Ultimate Phase.

E. Bicycle and Pedestrian Considerations

Bicycle and pedestrian routes will not be provided along the interstate or ramps due to the complexities involved with negotiating the interchange. However, bicyclists and pedestrians currently have access across the interstate at adjacent interchanges.

CHAPTER 4

SUMMARY AND CONCLUSIONS

The I-75 and I-24 corridor is a heavily traveled corridor that serves both Tennessee and Georgia. Much of the I-75/I-24 interchange will operate at or exceed capacity in the design year, resulting in long delays and congestion if the proposed modifications are not completed. The LOS analyses in Tables 1 thru 5 demonstrate the existing capacity of the freeway and ramps performance through the design year. These tables also demonstrate how the performance of these segments can be increased if the improvements outlined in either Alternative 4 or 7 of this Interstate Access Request are completed. The improvements enhance merge and diverge points, increase laneage, and correct substandard ramp geometry. With the proposed modifications, the area around the I-75/I-24 interchange can perform at acceptable levels of service through the design year and should improve the overall safety of the area.