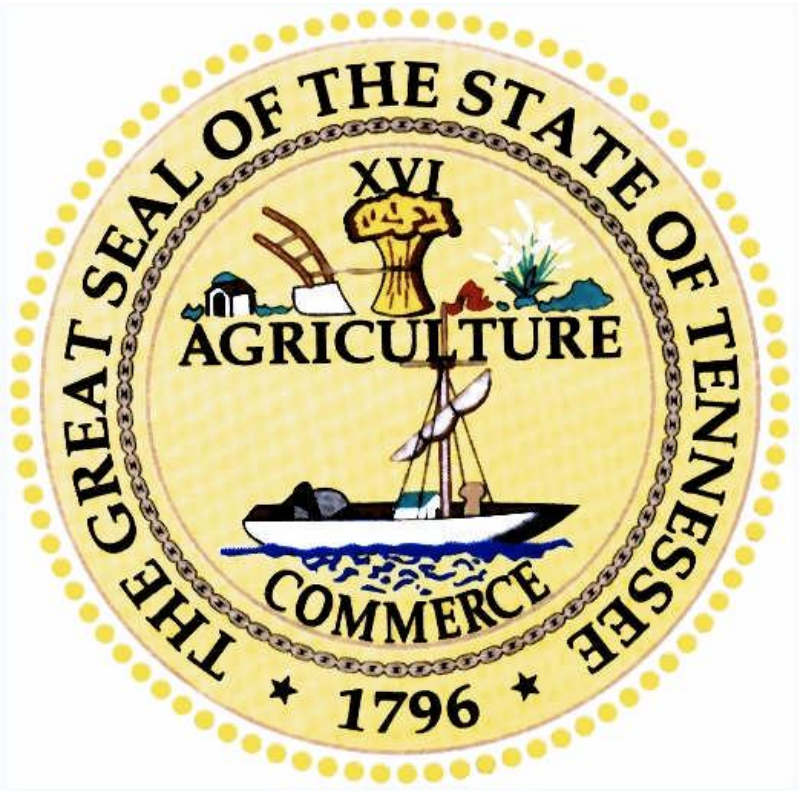
TECHNICAL REPORT

INTERSTATE 40 LANE ADDITIONS

FROM CENTRAL PIKE TO EAST OF SR-109

WILSON COUNTY

PIN 114169.00



PREPARED BY
ARCADIS
FOR THE
TENNESSEE DEPARTMENT OF TRANSPORTATION
PROJECT PLANNING DIVISION

FINAL REPORT

APRIL 12, 2011

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Introduction

The purpose of this study is to provide a technical evaluation of proposed modifications to Interstate 40 (I-40) in Wilson County. Approximate project limits are the Central Pike underpass (LM 2.02) to approximately one (1) mile east of the SR-109 eastbound onramp (LM 10.52). Total length of project study area is approximately 8.5 miles. An area map is contained on Figure 1 and a location map depicting the project study area is provided on Figure 2.

This project is part of the Nashville Area MPO Fiscal Years 2011-2015 Transportation Improvement Program (TIP). The TIP project number is 2011-72-107.

Existing Transportation Conditions

Within the project area, I-40 is a multi-lane highway facility with twelve (12) foot lanes and ten (10) to twelve (12) foot shoulders, and a 2011 Annual Average Daily Traffic (AADT) volume of 70,950 vehicles. Between Central Pike and SR-171, I-40 consists of four (4) lanes, including one (1) high occupancy vehicle (HOV) lane in each direction, with a median barrier. Through the SR-171 interchange and extending approximately 1.7 miles east, I-40 consists of three (3) lanes, including an HOV lane in each direction with a median barrier. The remaining length of the project consists of two (2) lanes in each direction with a depressed median. Near LM 7.43, I-40 crosses Wilson Creek on parallel bridges spans.

Three (3) interchanges are located within the project. Exit 226 to SR-171, Mt Juliet Road (LM 3.12) is basically a diamond interchange with a cloverleaf added for the eastbound I-40 to northbound SR-171 movement. I-40 eastbound under the SR-171 overpass has a minimum travel lane vertical clearance of 16.21 feet, minimum 8.6-foot paved inside shoulder width and eighteen (18) foot wide paved outside shoulders. Westbound I-40 has a minimum travel lane vertical clearance of 18.68 feet, nine (9) foot minimum paved inside shoulder width and seventeen (17) foot wide paved outside shoulders.

Exit 229 to Beckwith Road (LM 6.28) is a partial cloverleaf configuration. I-40 eastbound under the Beckwith Road overpass has a minimum travel lane vertical clearance of 18.21 feet. Westbound I-40 has a minimum travel lane vertical clearance of 17.49 feet. Inside paved shoulder widths are a minimum 8.6 feet and outside paved shoulder widths are a minimum 10.7 feet in both directions.

Exit 232 to SR-109, Gallatin (LM 9.10) is basically a diamond interchange with a cloverleaf added for the eastbound I-40 to northbound SR-109 movement. I-40 eastbound under the SR-109 overpass has a minimum travel lane vertical clearance of 18.12 feet, with a minimum 13.1-foot paved inside shoulder and a minimum 13.5-foot paved outside shoulder. Westbound I-40 has a minimum travel lane vertical clearance of 15.94 feet, with a minimum 3.7-foot paved inside shoulder and 10.6-foot paved outside shoulder. See project photos for areas near the three (3) existing underpasses.

Truck parking areas are located on both the eastbound and westbound I-40 lanes between SR-171 and Beckwith Road. The truck parking area for eastbound traffic is located approximately 1,300 feet east of the SR-171 eastbound entrance ramp, with a connecting auxiliary lane forming a weave. No auxiliary lane is existing on the westbound side, thus there is no weave.

The Project Planning Division of TDOT developed 2033 AADT Volumes and Design Hour Volumes for the project. From these projections it is expected that the traffic on this section of I-40 will increase by 35 percent, to an AADT of 95,740 by 2033. This data is contained in Appendix A.

Proposed Improvements

The proposed I-40 improvements will provide four (4) twelve (12) foot wide travel lanes (including one [1] HOV lane) in each direction, with a median barrier from Central Pike to SR-109. Generally, ten (10) foot paved outside shoulders and twelve (12) foot wide paved inside shoulders will be provided. Desirable lengths according to AASHTO A Policy on Geometric Design of Highways and Streets, 2004 Edition shall be used for acceleration and deceleration lanes and tapers. All work must be completed within existing right-of-way limits utilizing any measures necessary.

From Central Pike to 1.5 miles east of the SR-171 overpass, the I-40 improvements will consist of milling and overlaying the existing three lanes and adding a twelve (12) foot wide travel lane and ten (10) foot wide paved outside shoulder in each direction. The eastbound auxiliary lanes and a concrete barrier wall to SR-171 will require reconstruction. No improvements are anticipated to the inside shoulders or existing median barrier.

The remaining 5.5 miles consist of adding a twelve (12) foot HOV lane, twelve (12) foot wide inside shoulder and median barrier between the east and west bound lanes. Additionally, ten (10) to twelve (12) feet of roadway widening and ten (10) feet of shoulder paving are required adjacent to the existing outside travel lanes. All remaining pavement will be milled and overlaid within this section.

Near LM 7.43, I-40 crosses Wilson Creek on parallel bridge spans. The proposed improvements will require widening the 150-foot-long spans approximately fifty (50) feet to the inside and five (5) to ten (10) feet along the outside. A combined total of seven (7) box bridges and culverts are located within the project area. It is anticipated that at some locations box/culvert extension and/or barrier protection will be required, and should be evaluated during design.

These improvements will result in four lanes each direction separated by a median barrier per TDOT standard drawing RD01-TS-5B. Typical roadway sections are provided in the functional plans. New pavement markings will be installed for the entire length of the project. No significant interchange reconfigurations are anticipated during this project, however 800 linear feet of Leeville Road will require relocation near LM 8.5.

TDOT Project Planning Division has an existing Automatic Traffic Recorder (ATR #34) located at the end of the Beckwith Road Interchange westbound on-ramp (near LM 5.91). This ATR presently collects traffic data for both eastbound and westbound directions. The planned I-40 improvements will require an additional ATR for collecting the eastbound traffic. The existing ATR (located westbound) will require replacement due to the proposed widening. Additional information has been provided in Appendix B.

TDOT Maintenance is proposing a new salt storage building in the eastbound truck parking area. The salt storage facility is contingent on funding and should not impact the design or construction of this project. A

combined HOV enforcement and emergency vehicle/police refuge area is also under consideration for inclusion in this project.

Guide signage along this section of I-40 has been addressed. Several signs will require relocation based on the proposed widening and have been noted. All signs identified during design that do not meet the 2009 Manual on Uniform Traffic Control Devices (MUTCD) retro-reflectivity requirements shall be replaced. The functional plans note any proposed and/or modification to existing guide signs.

Functional plans for the proposed improvements are contained in Appendix C.

Underpass Clearances

Three (3) I-40 underpasses at SR-171 (LM 3.12), Beckwith Road (LM 6.28) and SR-109 (LM 9.10) were field surveyed and bridge profiles created. Each bridge was profiled along the east and west side of the structure. A full profile across the travel lanes and along the lowest member of the structure was generated. Horizontal and vertical control was established at each crossing using Global Positioning System (GPS) methods. The datum collected was Tennessee State Grid coordinates NAD 83 for horizontal and NAVD 88 for vertical. Control points were established using the OPUS Rapid Static survey process. Data points were collected using traditional survey methods in combination with reflectorless technology to locate the bottom of the bridge structure. The control points are noted on the functional plans and bridge profiles showing both present and proposed roadway configurations are provided in Appendix D.

TDOT standard drawing RD01-TS-5B requires a minimum twelve (12) feet from inside edge of travel lane to centerline median barrier (using a ten [10] foot minimum inside shoulder width) and minimum ten (10) foot wide paved outside shoulders. Minimum acceptable vertical bridge clearance per the AASHTO A Policy on Geometric Design of Highways and Streets, 2004 Edition is sixteen (16) feet, including usable shoulder width. A summary of the minimum shoulder widths and minimum vertical clearances for the proposed improvements at each underpass is shown below:

	SR-171 Underpass (LM 3.12) (feet)	**Beckwith Road Underpass (LM 6.28)**	**SR-109 Underpass (LM 9.10)**
Minimum Vertical Clearance			
East Bound Travel Lane	15.65	17.38	17.76
East Bound Shoulder	15.05	17.45	17.63
West Bound Travel Lane	18.41	17.22	15.74
West Bound Shoulder	17.06	17.36	15.52
Shoulder Width			
East Bound Inside	4.0	10.7	10.7
East Bound Outside	10.3	12.0	12.0
West Bound Inside	10.0	10.7	11.3
West Bound Outside	11.3	12.0	12.0
Red text indicates minimum standard not met.			

Ramp/Weave Analysis

Highway Capacity Software (HCS) analyses were made for the proposed improvements at the eastbound diverge to SR-171, the westbound merge from SR-171, and the eastbound weave between the SR-171 on ramp and the truck parking area. These analyses were made assuming fifteen (15) percent of the through volume is occupying the HOV lane. The fifteen (15) percent is derived from data collected by TDOT for I-65 in Williamson County. Printouts of the capacity analysis are provided in Appendix D. Capacity results are shown on Figure 3.

Capacity analysis indicated that by 2033, the eastbound diverge to SR-171 will reach an LOS F in the P.M. peak and that the westbound merge from SR-171 will reach an LOS F in the A.M. These operational deficiencies are mainly due to the heavy through traffic volume between the Mt. Juliet area and Nashville. These basic freeway sections also have operational deficiencies by 2033, with an eastbound LOS E and a westbound LOS F. Improving this deficiency would require a total of five (5) lanes (including one HOV lane) each direction to accommodate the projected traffic volumes. The weave between SR-171 and the truck parking area will reach an LOS D in the P.M. West of SR-171 all basic freeway sections would be expected to operate at an LOS C or better.

Design Exceptions

The majority of the project does not require design exceptions, however three locations were identified that have or will have less than minimum horizontal and/or vertical clearance. At the SR-171 (Mt Juliet Road) underpass, the width of the proposed eastbound inside shoulder is four (4) feet. A shoulder width design exception is contained in Appendix D. As shown in the bridge sections, the vertical clearance at this location will be 15.05 feet. Options to achieve a sixteen (16) foot minimum vertical clearance shall be identified and evaluated during design.

At the SR-109 interchange underpass the existing westbound vertical clearance is 15.52 feet. Additionally, the proposed twelve (12) foot wide eastbound outside shoulder may require an approximately nine (9) foot high retaining wall. Options to achieve sixteen (16) foot minimum vertical clearance and a twelve (12) foot wide outside shoulder shall be identified and evaluated during design.

Bridge profiles including all critical dimensions are provided in Appendix D.

Summary

I-40 project limits are the Central Pike underpass (LM 2.02) to approximately one (1) mile east of the SR-109 eastbound onramp (LM 10.52) or approximately 8.5 miles. The existing Annual Average Daily Traffic (AADT) volume is 70,950 vehicles and by 2033 the traffic should increase by 35 percent to an AADT of 95,740.

Capacity analysis was performed at the Mt Juliet Ramps and the weave located between Mt Juliet on ramp and the eastbound truck parking area. Below is a list of the results:

- Diverge to SR-171 will reach an LOS F in the P.M. peak (improving the LOS will require an additional travel lane between Mt. Juliet and Nashville due to the heavy through traffic volume.)

- Merge from SR-171 will reach an LOS F in the A.M. peak (improving the LOS will require an additional travel lane between Mt. Juliet and Nashville due to the heavy through traffic volume.)
- Weave between SR-171 and the truck parking area will reach an LOS D in the P.M. West of SR-171

The proposed I-40 improvements will provide eight (8) twelve (12) foot wide travel lanes, including one (1) HOV lane each direction, with ten (10) foot wide paved outside shoulders and twelve (12) foot wide paved inside shoulders from Central Pike to SR-109. The improvements will require one shoulder width design exception at the SR-171 underpass, bridge widening at Wilson Creek near LM 7.43, replacing the ATR#34 near LM 5.95 and relocation of Leeville Road.

Project Photographs

TECHNICAL REPORT
Interstate 40 Lane Additions
From Central Pike to East of SR-109
Wilson County
Photos Taken: 01/27/2011

Photo 1

I-40 at SR-171/Mt Juliet Road Underpass Looking West

Photo 2

I-40 at SR-171/Mt Juliet Road Underpass Looking West

Photo 3

I-40 at Beckwith Road
Underpass Looking East

Photo 4

I-40 at Beckwith Road
Underpass Looking West

Project Photographs

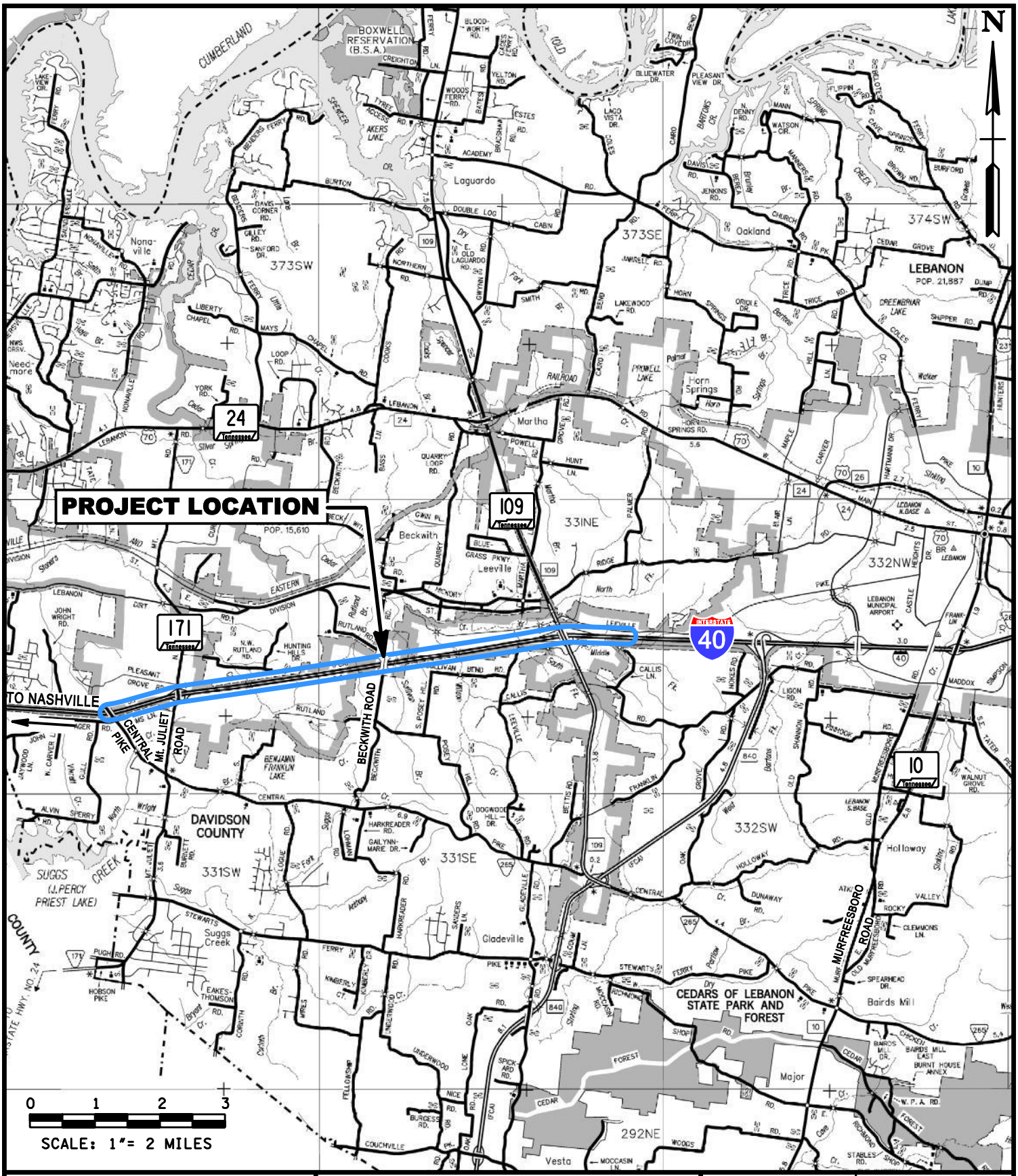
TECHNICAL REPORT
Interstate 40 Lane Additions
From Central Pike to East of SR-109
Wilson County
Photos Taken: 01/27/2011

Photo 5

I-40 at
SR-109 Underpass Looking
East

Photo 6

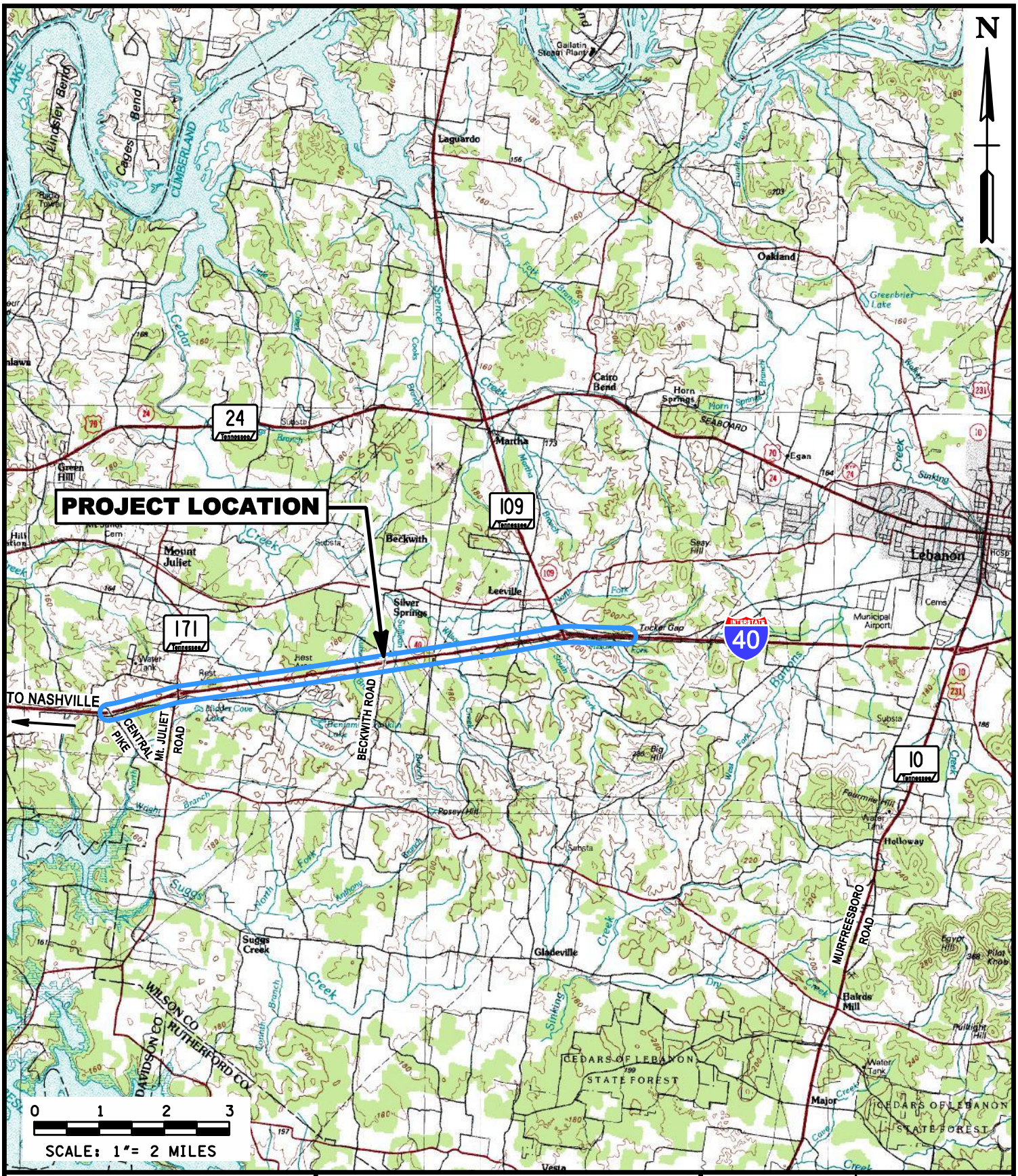
I-40 at SR-109 Underpass
Looking West



TDOT

AREA MAP
INTERSTATE 40 LANE ADDITIONS
CENTRAL PIKE TO EAST OF SR-109
(WILSON COUNTY, TN)

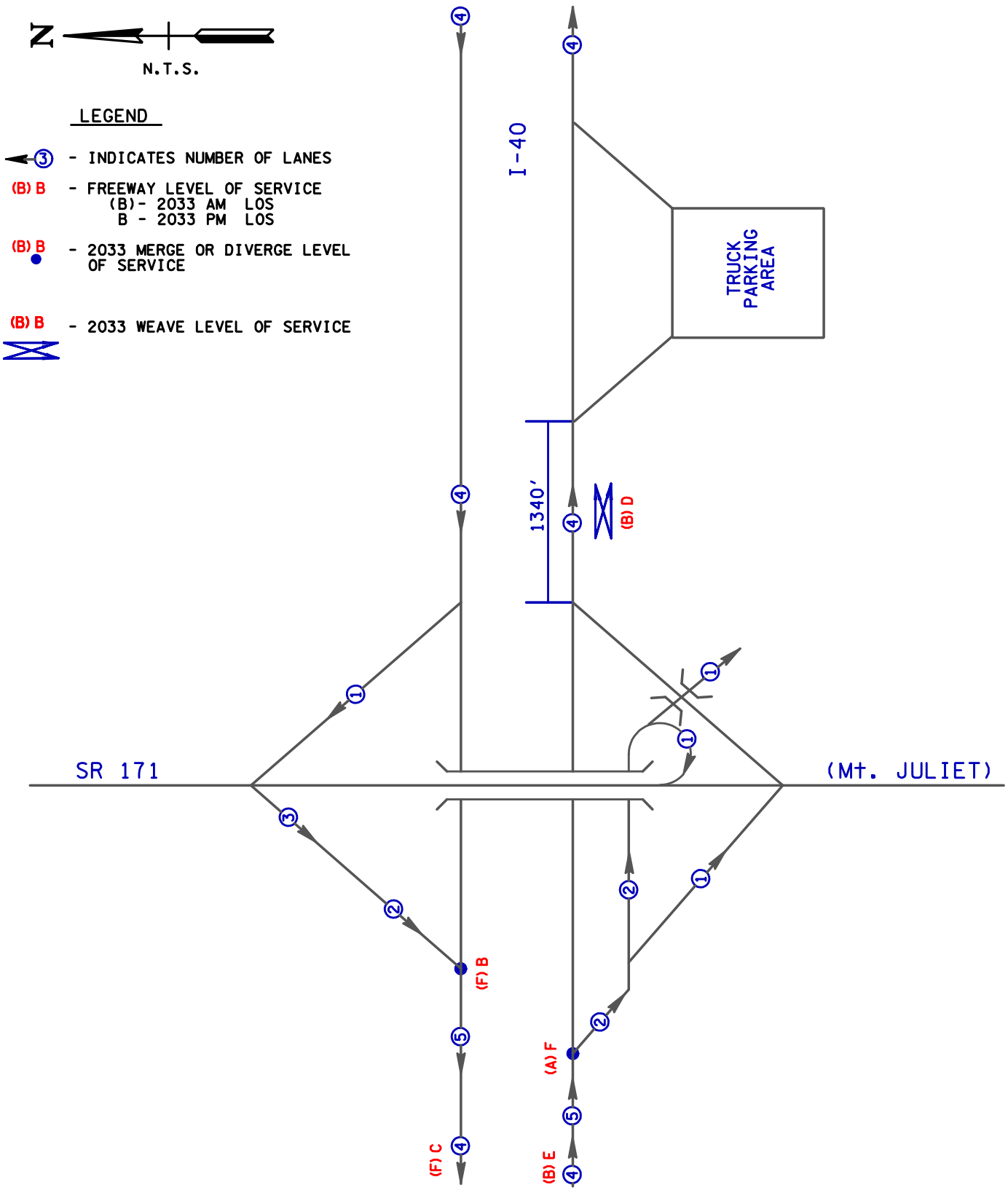
DRAWN BY:	CHECKED BY:
TJC	HAM
P.I.N. 114169.00	
PROJECT NO. 99108-7087-04	
FIGURE 1	DATE: 02-02-11



TDOT

LOCATION MAP
INTERSTATE 40 LANE ADDITIONS
CENTRAL PIKE TO EAST OF SR-109
(WILSON COUNTY, TN)

DRAWN BY:	CHECKED BY:
TJC	HAM
P.I.N. 114169.00	
PROJECT NO. 99108-7087-04	
FIGURE 2	DATE: 02-02-11



TDOT

2033 RAMP/WEAVE RESULTS INTERSTATE 40 LANE ADDITIONS CENTRAL PIKE TO EAST OF SR-109 (WILSON COUNTY, TN)

DRAWN BY:	CHECKED BY:
TJC	HAM

P.I.N. 114169.00

PROJECT NO. 99108-7087-04

FIGURE	DATE:
3	03-29-11

Appendix A

Projected Traffic Volumes

TENNESSEE DEPARTMENT OF TRANSPORTATION
PROJECT PLANNING DIVISION

PROJECT NO.: _____ ROUTE: I-40
COUNTY: WILSON CITY: MT. JULIET
PROJECT PIN NUMBER: 114169.00
PROJECT DESCRIPTION: WIDENING FROM WEST OF S.R. 171 TO EAST OF S.R. 109. [DESIGN BUILD]

DIVISION REQUESTING:

		PAVEMENT DESIGN	☐
MAINTENANCE	☐	STRUCTURES	☐
PLANNING	☐	SURVEY & DESIGN	☐
PROG. DEVELOPMENT & ADM.	☐	TRAFFIC SIGNAL DESIGN	☐
PUBLIC TRANS. & AERO.	☐	OTHER PROJ. MANAGEMENT	☒

YEAR PROJECT PROGRAMMED FOR CONSTRUCTION: 2013
PROJECTED LETTING DATE: 2013

TRAFFIC ASSIGNMENT:

BASE YEAR		DESIGN YEAR					DESIGN ROADWAY % TRUCKS		DESIGN AVERAGE DAILY LOADS	
AADT	YEAR	AADT	DHV	%	YEAR	DIR.DIST.	DHV	AADT	FLEX	RIGID
72,540	2013	95,740	8,308	8	2033	60-40	12	18	4,052	6,350

REQUESTED BY: NAME DANIELLE HAGEWOOD DATE 3/15/11
DIVISION PROJECT MANAGEMENT
ADDRESS 6601 CENTENNIAL BLVD.
NASHVILLE TN 37209

REVIEWED BY: TONY ARMSTRONG Tony Armstrong DATE 3-23-11
TRANSPORTATION MANAGER 1
SUITE 1000, JAMES K. POLK BUILDING

APPROVED BY: BILL HART Bill Hart DATE 3/23/11
TRANSPORTATION MANAGER 2
SUITE 1000, JAMES K. POLK BUILDING

COMMENTS:

THIS TRAFFIC WAS UPDATED FROM THE PREVIOUS PROJECT PREPARED FOR BRIAN HURST IN PLANNING DATED 1-18-2011.

cc: LIA OBAID : CONSTRUCTION OFFICE

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

NOTE: FOR BRIDGE REPLACEMENT PROJECTS, ADLs ARE NOT REQUIRED FOR AADT's OF 1000 OR LESS AND PERCENTAGE OF TRUCKS OF 7% OR LESS.
SEE ATTACHMENTS FOR TURNING MOVEMENTS AND/OR OTHER DETAILS. (REV. 9/20/07)

TENNESSEE DEPARTMENT OF TRANSPORTATION
TRAFFIC PLANNING AND STATISTICS OFFICE

PROJECT NO.: _____ ROUTE NO.: I-40
COUNTY: WILSON CITY: MT. JULIET
PROJECT DESCRIPTION: WIDENING FROM WEST OF S.R. 171 TO EAST OF S.R. 109.

Interstate

Pavement Structural Design

Calculation of Equivalent Daily 18 Kip Single Axle Loads

Type Vehicle		ADT (No. Counted)	Flexible 18-kip Factor	Flexible ADL	Rigid 18-kip Factor	Rigid ADL
Pass. cars and motorcycles (1-2)		55,356	0.001	55	0.001	55
Pick-up, Panel, Van (3)		13,639	0.004	55	0.005	68
Sing. Unit	Buses (4)	327	0.300	98	0.300	98
	2-axle, 6-tire (5)	2,656	0.170	452	0.170	452
	3-axle or more (6-7)	793	0.700	555	1.000	793
Comb.	4-axle (8)	535	0.700	375	0.780	417
	5-axle or more (9-13)	10,834	1.100	11,917	1.780	19,285
Totals (2023 AADT)		84,140		13,507		21,168

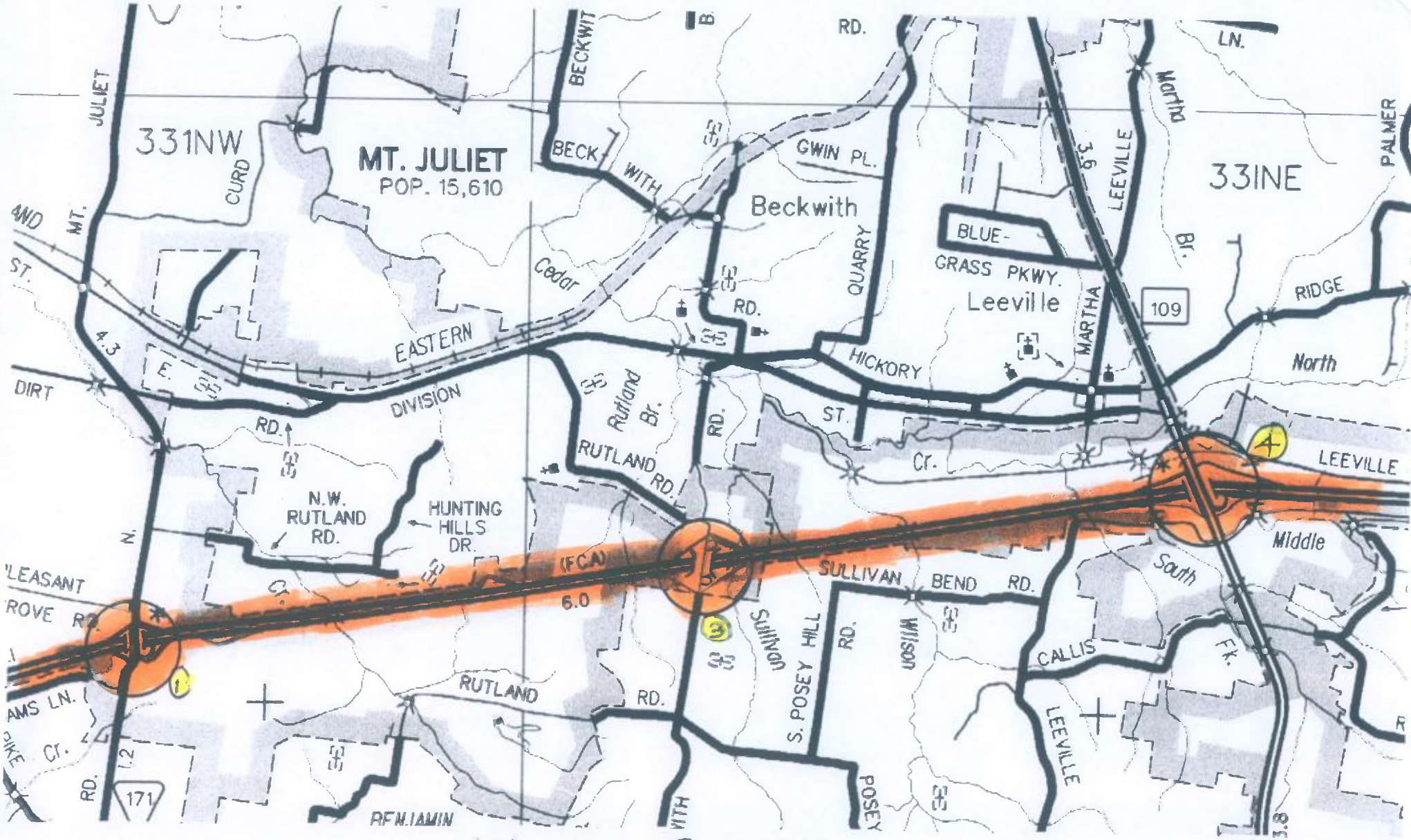
Suggested Percentages of Trucks in Design Lane

	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: 6
% Trucks in Design Lane: 60%
ADL in Design Lane:

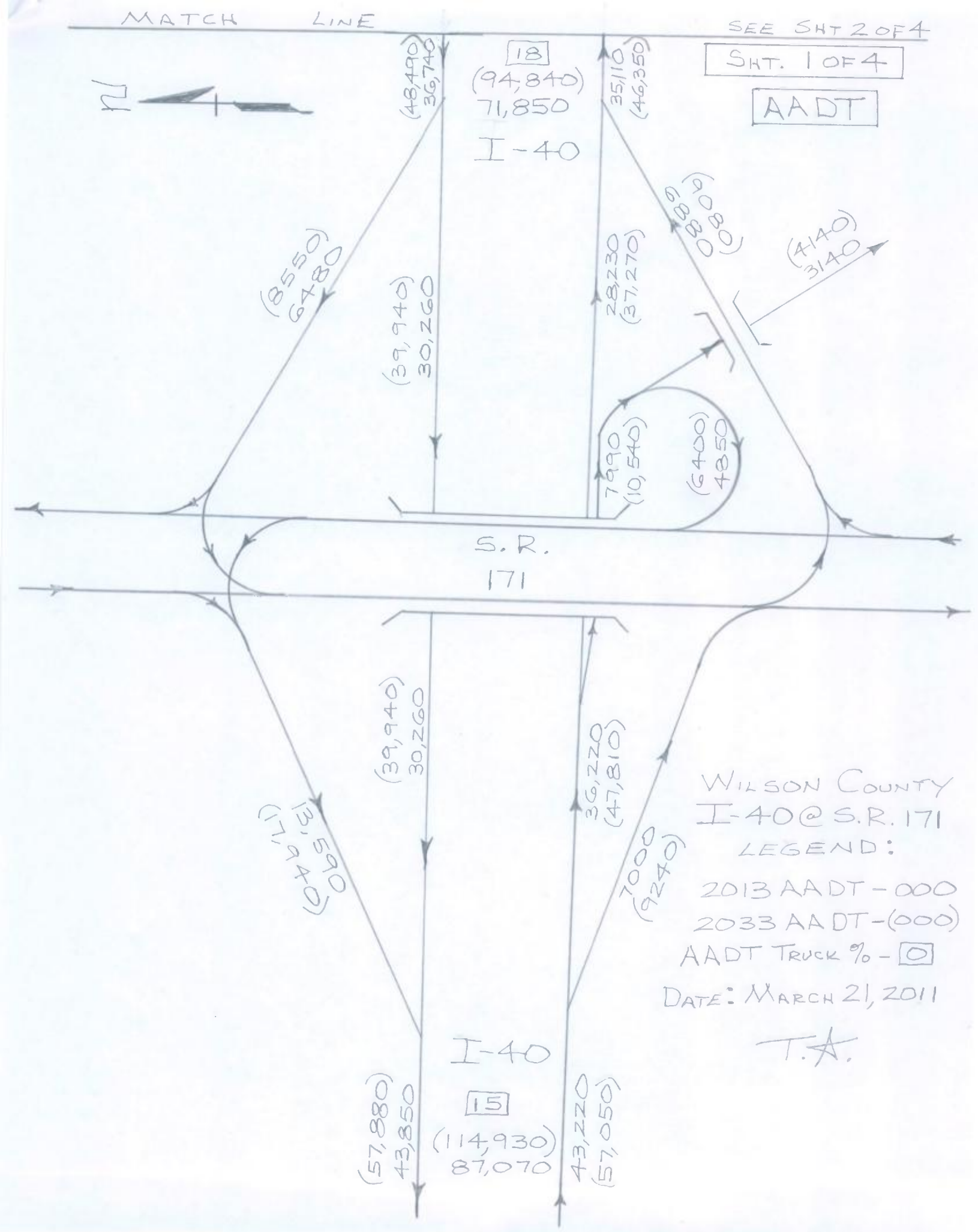
FLEX:	0.5	X	0.60	X	13506.5	=	4,052
RIGID:	0.5	X	0.60	X	21168.0	=	6,350

ADL Calculations By: TONY ARMSTRONG Date: 3/23/2011
Reviewed By: Bill Hunt Date: 3/23/11
[REV. 11-6-06]



WILSON COUNTY

I-40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I-40
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(46,350)
(8550)
6480
(39,940)
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S.R.
171
(39,940)
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(17,940)
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I-40
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87,070
(57,880)
43,850
43,220
(57,050)
WILSON COUNTY
I-40 @ S.R. 171
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2033 AADT - (000)
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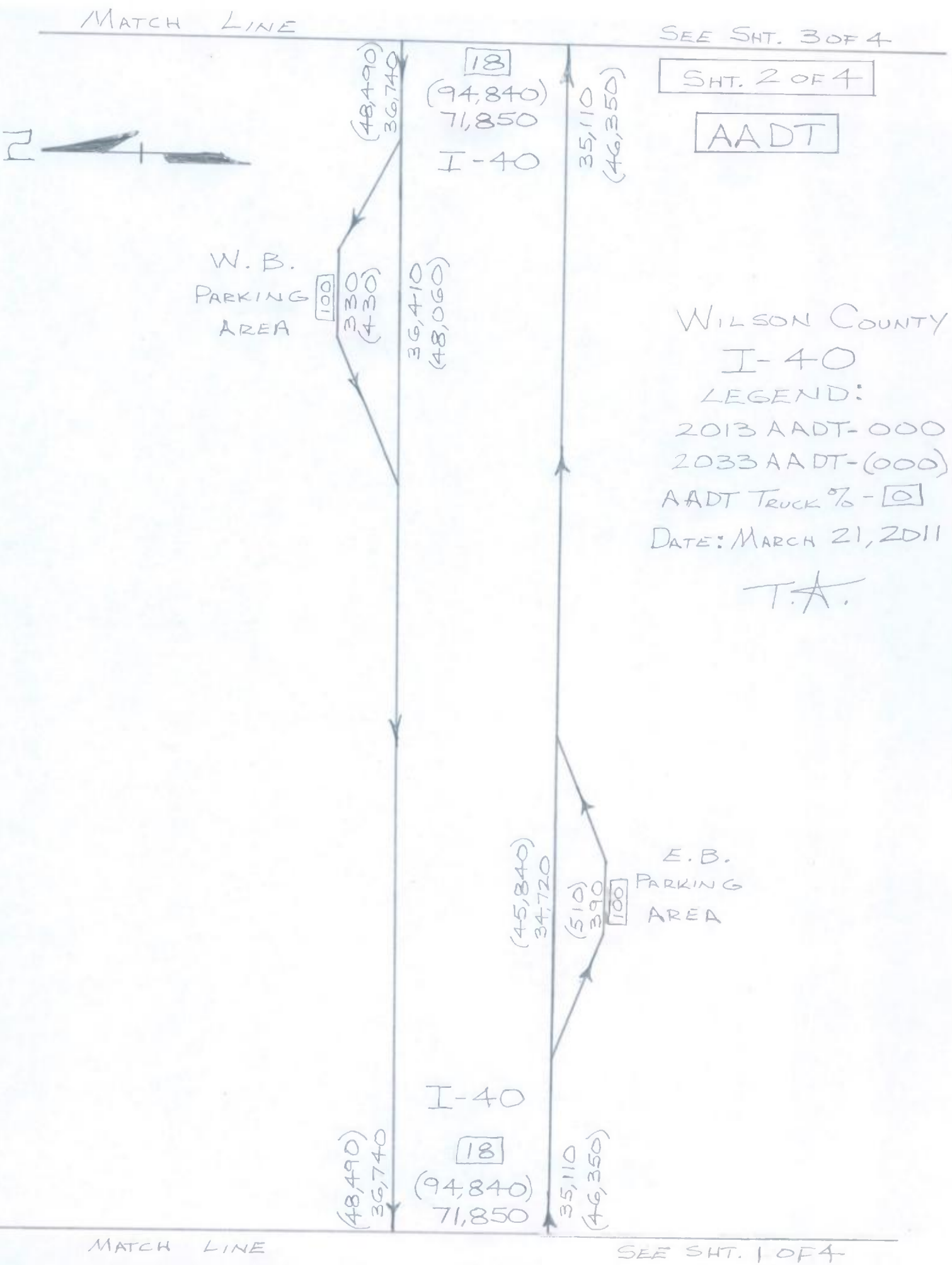
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(46,350)
W.B.
PARKING
AREA
100
330
(430)
36,410
(48,060)
WILSON COUNTY
I-40
LEGEND:
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2033 AADT-(000)
AADT TRUCK % - 0
DATE: MARCH 21, 2011
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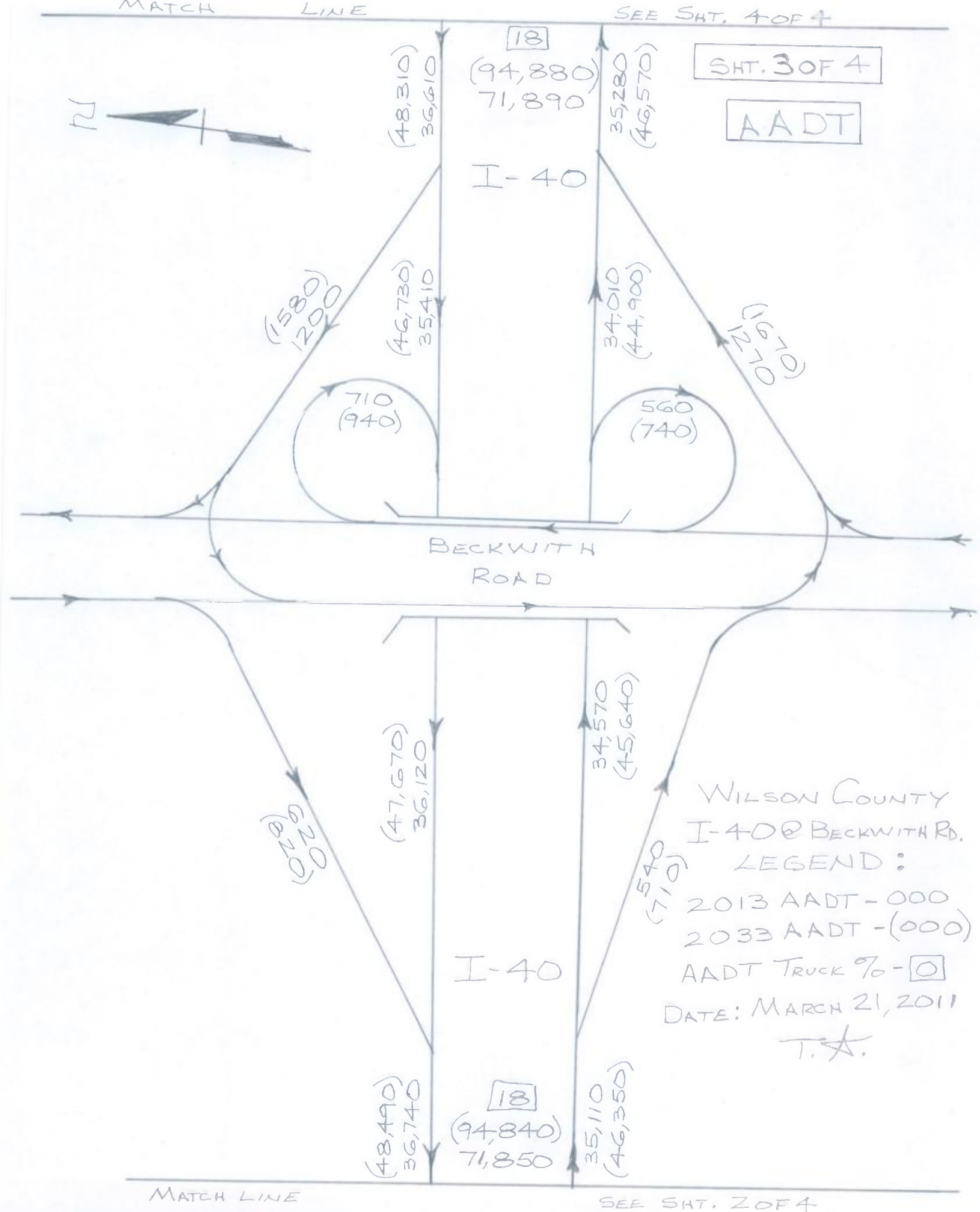
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1270
710
(940)
560
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BECKWITH ROAD
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(920)
700
540
(710)
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18
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71,850
(48,490)
36,740
35,110
(46,350)
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SEE SHT. 2 OF 4
WILSON COUNTY
I-40 @ BECKWITH RD.
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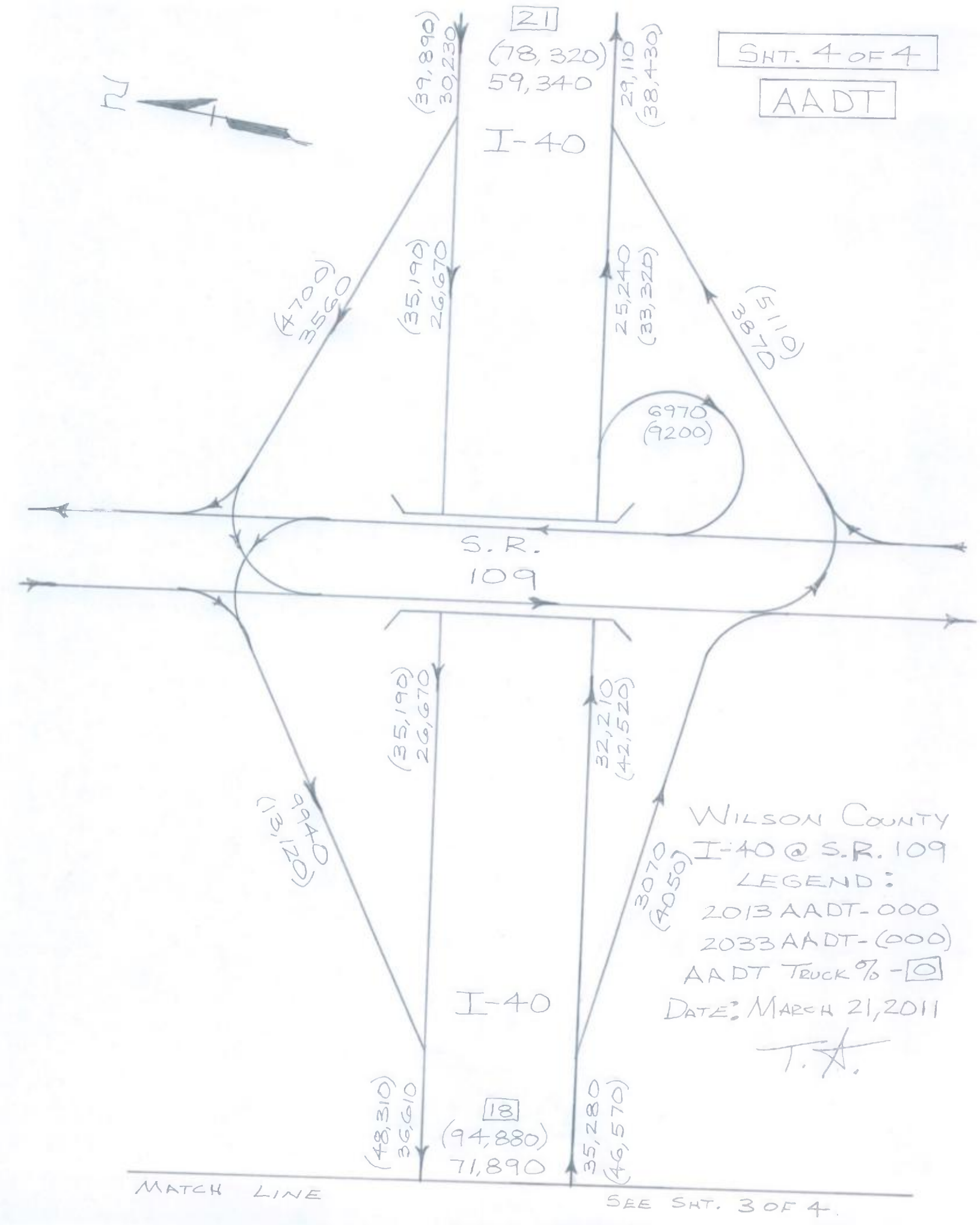
2033 AADT - (000)
AADT TRUCK % - 0
DATE: MARCH 21, 2011
T.A.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WILSON COUNTY
I-40 @ S.R. 109
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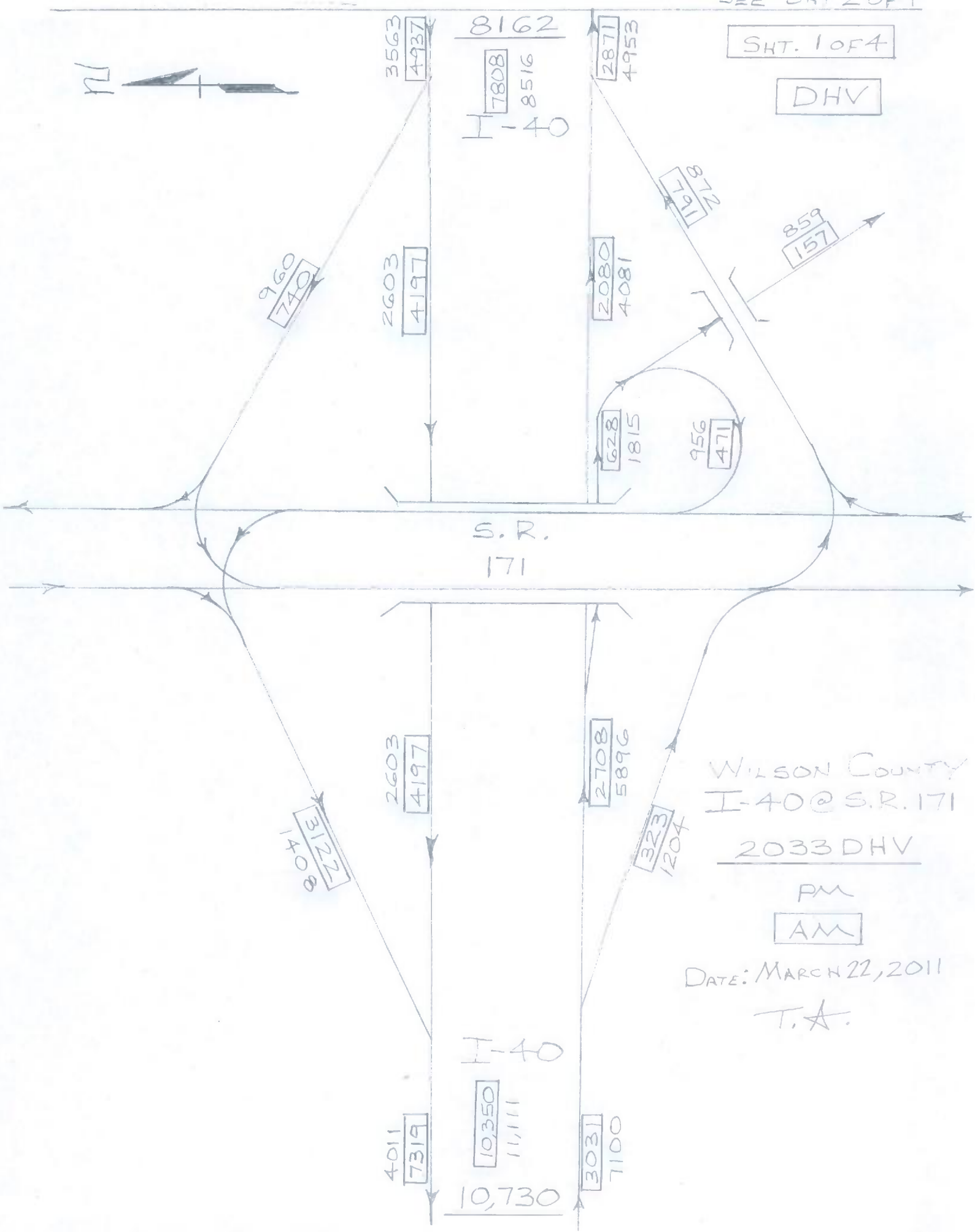
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956
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4197
2708
5896
323
1204
315
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731
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WILSON COUNTY
I-40 @ S.R. 171
2033 DHV
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AM
DATE: MARCH 22, 2011
T.A.

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SHT. 2 OF 4

DHV

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8162

7808 8516

I-40

2871 4953

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WILSON COUNTY

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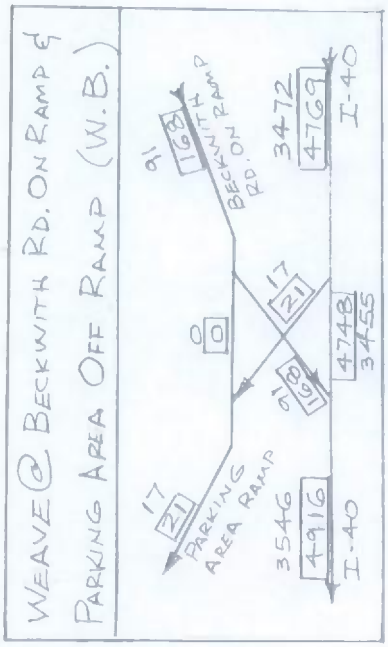

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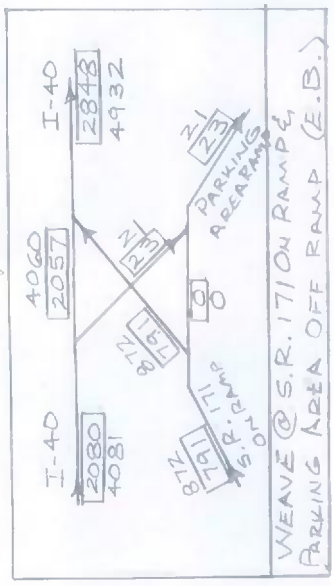


I-40

3563 4937

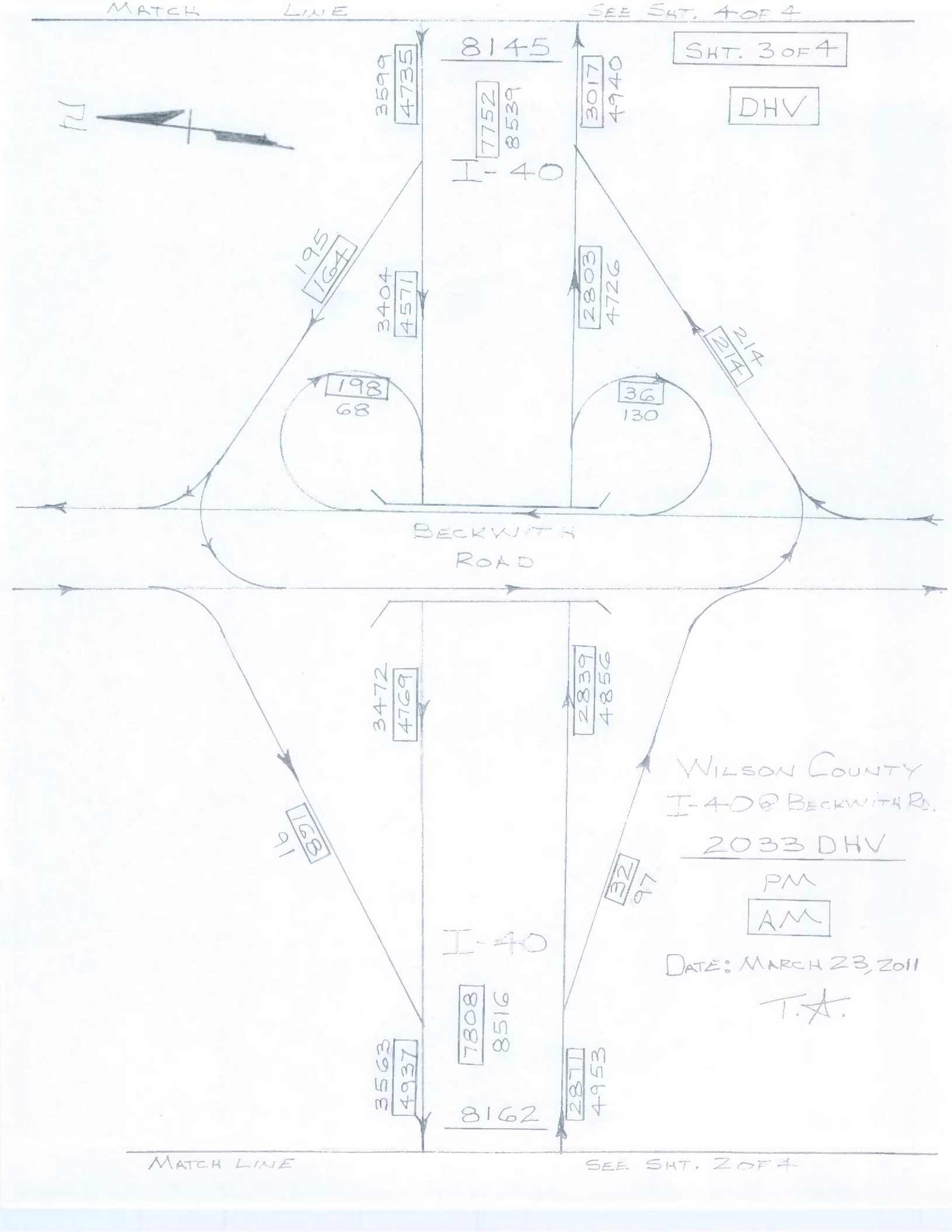
8162

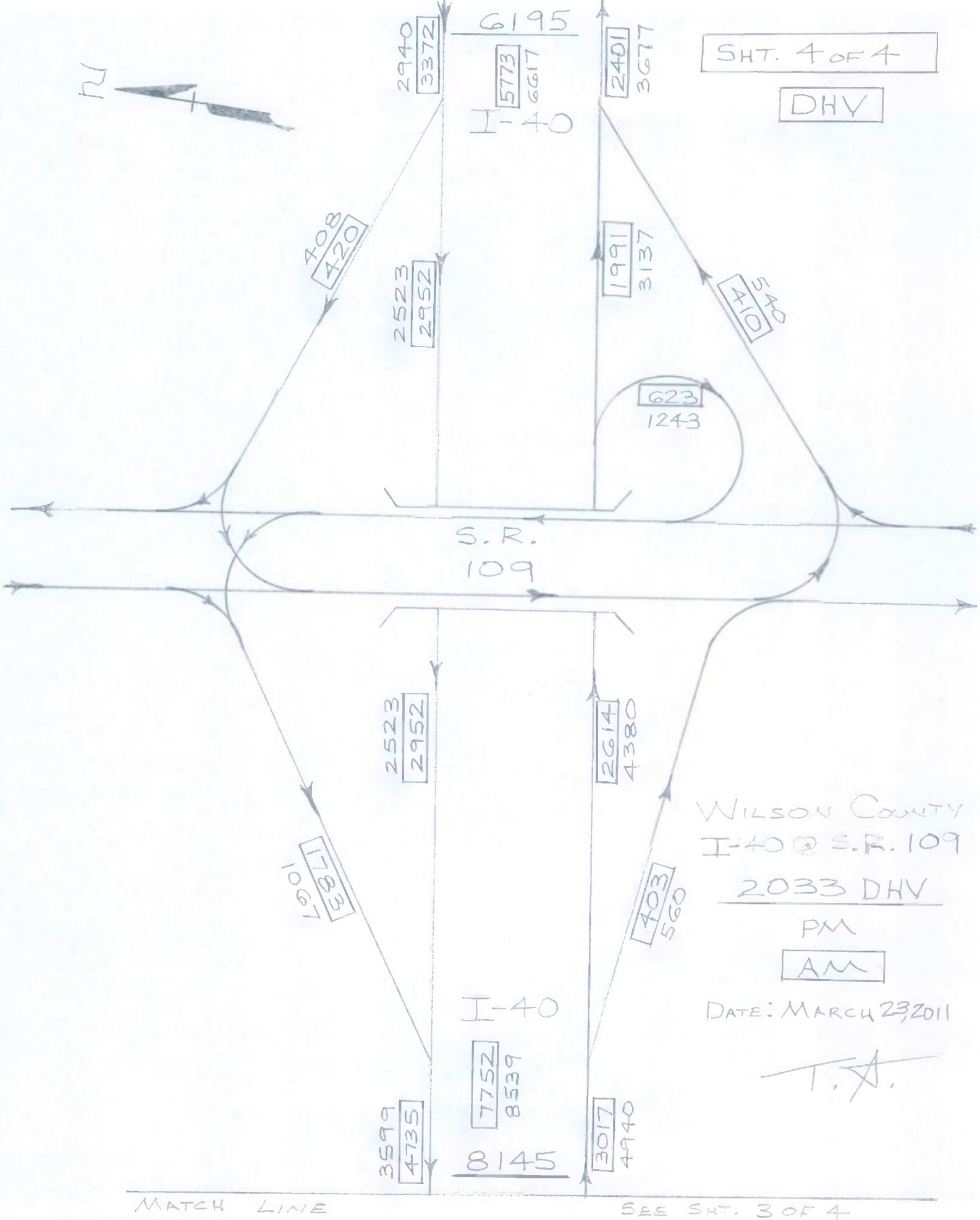
7808 8516

2871 4953

MATCH LINE

SEE SHT. 1 OF 4


MATCH LINE
SEE SHT. 4 OF 4
SHT. 3 OF 4
DHV
8145
3599
4735
7752
8539
3017
4940
I-40
195
164
3404
4571
2803
4726
214
214
198
68
36
130
BECKWITH ROAD
3472
4769
2839
4856
168
91
32
97
I-40
7808
8516
3563
4937
2871
4953
8162
WILSON COUNTY
I-40 & BECKWITH RD.
2033 DHV
PM
AM
DATE: MARCH 23, 2011
T.A.
MATCH LINE
SEE SHT. 2 OF 4


SHT. 4 OF 4
DHV
6195
2940
3372
5773
6617
I-40
2401
3677
408
420
2523
2952
1991
3137
540
410
623
1243
S.R.
109
2523
2952
2614
4380
1783
1067
403
560
I-40
7752
8539
3599
4735
8145
3017
4940
WILSON COUNTY
I-40 @ S.R. 109
2033 DHV
PM
AM
DATE: MARCH 23, 2011
T.A.
MATCH LINE
SEE SHT. 3 OF 4

Appendix B

Automatic Traffic Recorder Information

TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

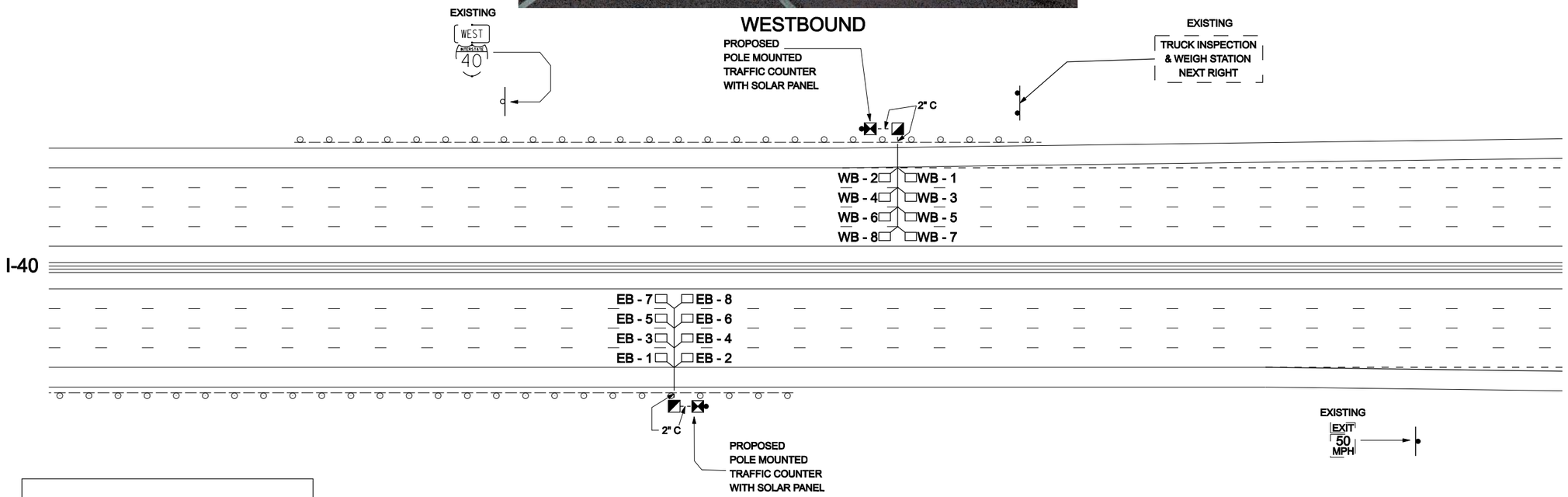
TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011		

N

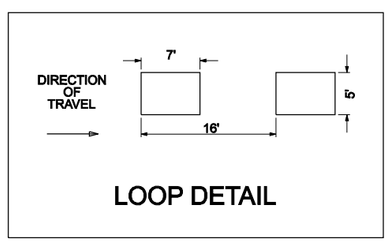
EASTBOUND

WESTBOUND

NOTE: NOTIFICATION OF COMPLETION AND THE X/Y COORDINATES OF ALL PULL BOXES IS REQUIRED SEE SPECIAL TRAFFIC COUNTER SPECIFICATIONS



BECKWITH ROAD
INTERCHANGE



LOOP DETAIL

I-40, WILSON COUNTY, LM 5.942 (EASTBOUND) LM 5.906 (WESTBOUND) ATR #34

NOT TO SCALE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

AUTOMATIC
TRAFFIC
RECORDER
DETAIL

3/28/2011 10:22:38 AM
C:\Documents and Settings\JJ0396\My Documents\Projects\ATRs and Loops\Wilson County\I40\ATR #34\ATR 34.dgn

SPECIAL TRAFFIC COUNTER SPECIFICATIONS

CONTRACTOR SHALL SUPPLY AND INSTALL ALL RELATED EQUIPMENT SO THAT ONCE A TRAFFIC COUNTER AND MODEM ARE INSTALLED BY THE STATE'S PLANNING DIVISION'S TRAFFIC COUNTER PERSONNEL, THE COUNT STATION WILL BE FULLY OPERATIONAL. THE CONTRACTOR SHALL MAKE SURE EACH DETECTION LOOP IS OPERATIONAL AT THE COMPLETION OF THE PROJECT.

COUNTER CABINET SHALL NOT TO BE PRE-WIRED FOR A TRAFFIC SIGNAL AND DOES NOT NEED TO INCLUDE A VENTILATION FAN. THE CABINET SHALL INCLUDE ONE (1) SHELVE. THE CABINET SHALL BE POLE-MOUNTED TO A FOUR INCH (4") GALVANIZED, RIGID CONDUIT POLE WITH THE BOTTOM OF THE CABINET AT LEAST 36" ABOVE GROUND LEVEL.

THE CABINET DOOR SHALL BE SEALED WITH A CLOSED CELL NEOPREME GASKET BONDED TO THE INSIDE OF THE DOOR WITH AN OIL RESISTENT ADHESIVE THAT WILL BE POSITIONED TO PREVENT ANYTHING FROM PENTRATING THROUGH THE CRACK BETWEEN THE DOOR AND THE CABINET WHEN THE DOOR IS CLOSED. THE CABINET SHALL BE MOUNTED SO THAT THE CABINET DOOR WILL OPEN TOWARD THE ROADWAY.

INSTALLATION SHALL INCLUDE EXTERNAL GROUNDING OF THE CABINET FOR LIGHTNING PROTECTION. THIS GROUNDING SHALL INCLUDE AN EIGHT FOOT (8') GROUNDING ROD INSTALLED OUTSIDE IN THE GROUND CONNECTED TO A #6 COPPER WIRE TERMINATING TO A GROUNDING BAR INSIDE THE CABINET.

THE 12-VOLT SOLAR PANEL SHALL BE 80-WATT WITH CABINET VOLTAGE REGULATOR. THE SOLAR PANEL SHALL BE MOUNTED EIGHT FEET (8') ABOVE THE CABINET AND ON THE SAME CONDUIT POLE. IT SHALL HAVE A ONE (1") INCH SCHEDULE 40 CONDUIT ATTACHED TO THE POLE COMPLETE WITH A WEATHER HEAD. THIS CONDUIT SHOULD START AT THE TOP OF THE POLE AND EXTEND DOWN THE POLE, INTO THE CABINET.

ALL LOOPS SHALL BE FIVE FEET BY SEVEN FEET (5' X 7') AND TYPICAL IN SIZE WITH THREE (3) TURNS OF LOOP WIRE.

ALL LOOP WIRES AND SOLAR PANEL WIRES SHALL TERMINATE IN THE CABINET CONNECTED TO A TERMINAL STRIP.

EACH LOOP DETECTOR LEAD-IN SHALL BE MARKED WITH LANE IDENTIFICATION, DENOTING THE LANE AND POSITION IN THE LANE FOR EACH LOOP (SUCH AS EB-1 FOR EASTBOUND 1, ECT.).

PAYMENT OF TELEPHONE BILLS SHOULD BE INVOICED TO:
DIRECTOR OF PROJECT PLANNING DIVISION
SUITE 1000, JAMES K. POLK BUILDING
505 DEADRICK STREET
NASHVILLE, TN 37243-0344

FOR QUESTIONS CONCERNING ANY OF THE INSTALLATION OF THE COUNTER EQUIPMENT, PLEASE CONTACT STANLEY DUNN AT 615-350-4571 OR AT STANLEY.DUNN@TN.GOV. CONTRACTOR SHALL NOTIFY STANLEY DUNN TO REPORT THAT WORK HAS BEEN COMPLETED SO HE CAN FINISH THE INSTALLATION.

THE CONTRACTOR SHALL SUPPLY STANLEY DUNN WITH THE X / Y COORDINATES (BASED ON WGS COORDINATES) OF EACH PULL BOX.

SPECIAL GENERAL NOTES REQUIRED:

EQUIPMENT AND INSTALLATION OF TRAFFIC SIGNAL ITEMS SHALL COMPLY WITH TDOT STANDARD SPECIFICATIONS, SECTION 730.

DETECTION LOOPS SHALL BE INSTALLED BEFORE THE FINAL SURFACE IS APPLIED.

STANDARD DRAWINGS REQUIRED:

RD-L-3 STANDARD LEGEND FOR SIGNALIZATION AND LIGHTING
T-SG-2 LOOP LEAD-INS, CONDUIT AND PULL BOXES
T-SG-3 STANDARD NOTES AND DETAILS OF INDUCTIVE LOOPS

ITEMS AND QUANTITIES:

730-03.21	INSTALL PULL BOX (TYPE B)	EACH	2
730-12.02	CONDUIT 2” DIAMETER (PVC)	L.F.	60
730-14.02	SAW SLOT	L.F.	710
730-14.03	LOOP WIRE	L.F.	3240
730-15.07	CABINET	EACH	2

FOOTNOTE ITEM 730-15.07---MINIMUM SIZE OF CABINET SHALL BE 41” TALL, 25” WIDE AND 18” DEEP. ITEM INCLUDES COMPLETE INSTALLATION PER SPECIAL TRAFFIC COUNTER SPECIFICATION NOTES CONCERNING THE COUNTER CABINET. ITEM INCLUDES THE 4” GALVANIZED, RIGID CONDUIT POLE THAT THE CABINET IS TO BE MOUNTED ONTO. ITEM ALSO INCLUDES COMPLETE INSTALLATION OF THE SOLAR PANEL.

Appendix C

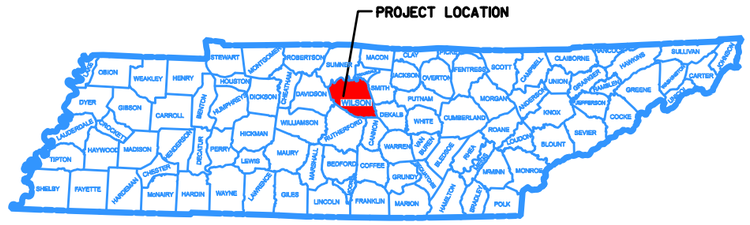
Functional Plans

TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

Index Of Sheets

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING

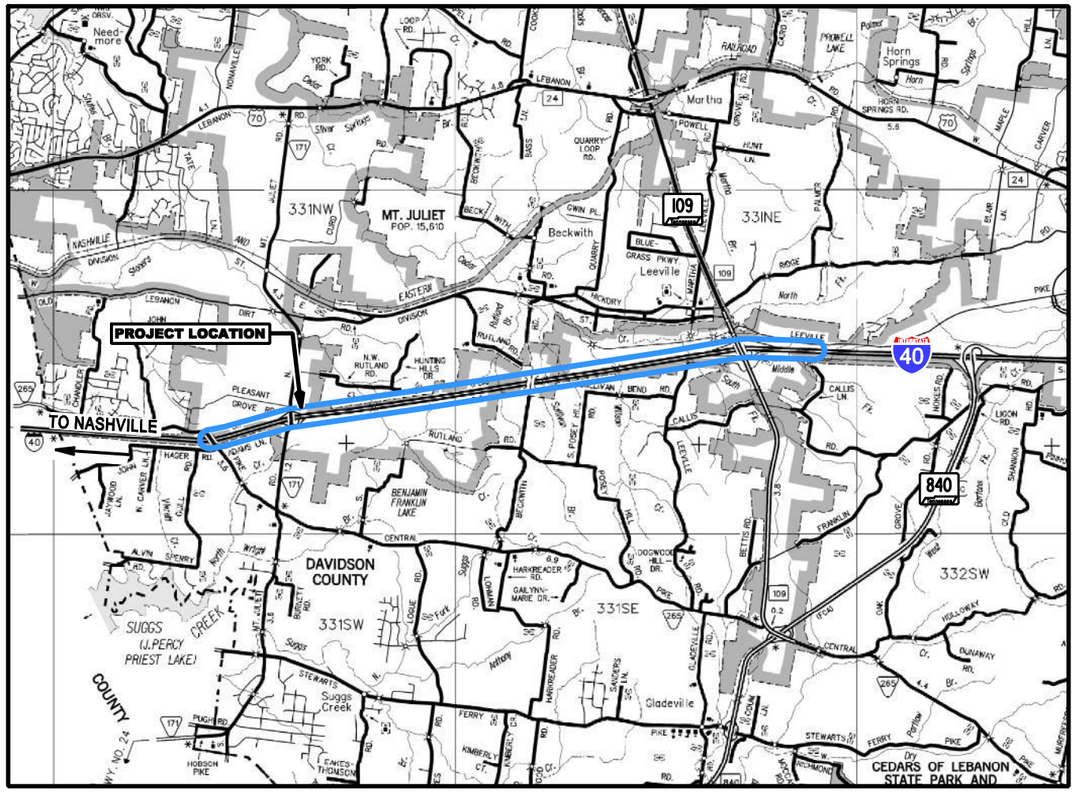
TENN.	YEAR	SHEET NO.
	2011	1
FED. AID PROJ. NO.		
STATE PROJ. NO.	99108-7087-04	



WILSON COUNTY

INTERSTATE 40 LANE ADDITIONS
FROM CENTRAL PIKE TO EAST OF SR-109

STATE HIGHWAY NO. F.A.H.S. NO.



N

SCALE: 1"= 2 MILES

SEALED BY

APPROVED:
CHIEF ENGINEER

DATE:

APPROVED:
COMMISSIONER

SPECIAL NOTES

PROPOSALS MAY BE REJECTED BY THE COMMISSIONER IF ANY OF THE UNIT PRICES CONTAINED THEREIN ARE OBVIOUSLY UNBALANCED, EITHER EXCESSIVE OR BELOW THE REASONABLE COST ANALYSIS VALUE.

THIS PROJECT TO BE CONSTRUCTED UNDER THE STANDARD SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION DATED MARCH 1, 2006 AND ADDITIONAL SPECIFICATIONS AND SPECIAL PROVISIONS CONTAINED IN THE PLANS AND IN THE PROPOSAL CONTRACT.

TDOT C.E. MANAGER 1 OR
TDOT DESIGN MANAGER 1 _____
TDOT ROAD SP. SV. 2 _____
DESIGNED BY _____
DESIGNER _____ CHECKED BY _____

P.E. NO. _____

PIN NO. _____

TRAFFIC DATA	
ADT (2011)	70,950
ADT (2031)	93,650
DHV (2011)	8,051
D	60% / 40%
T (ADT)	18%
T (DHV)	12%

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED:

DIVISION ADMINISTRATOR DATE

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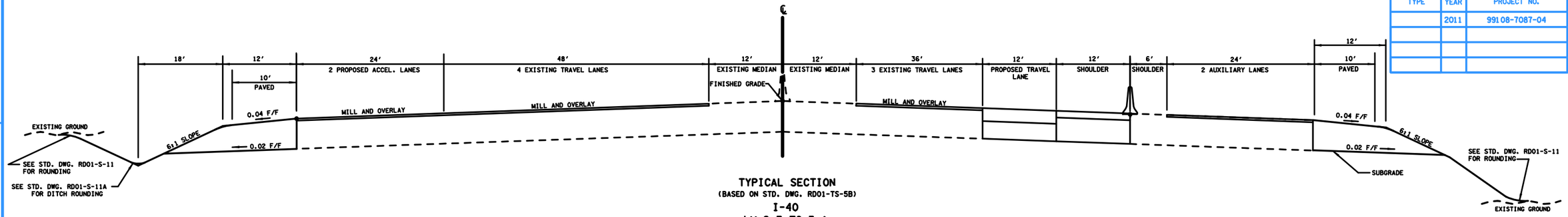
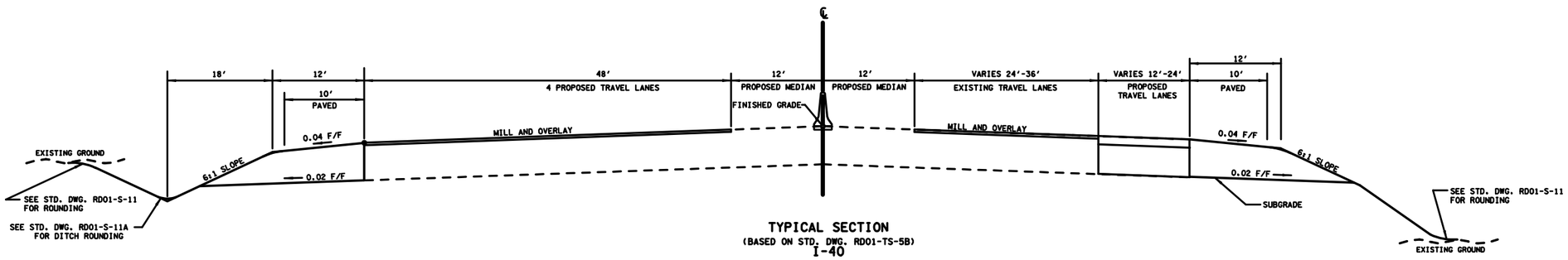
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

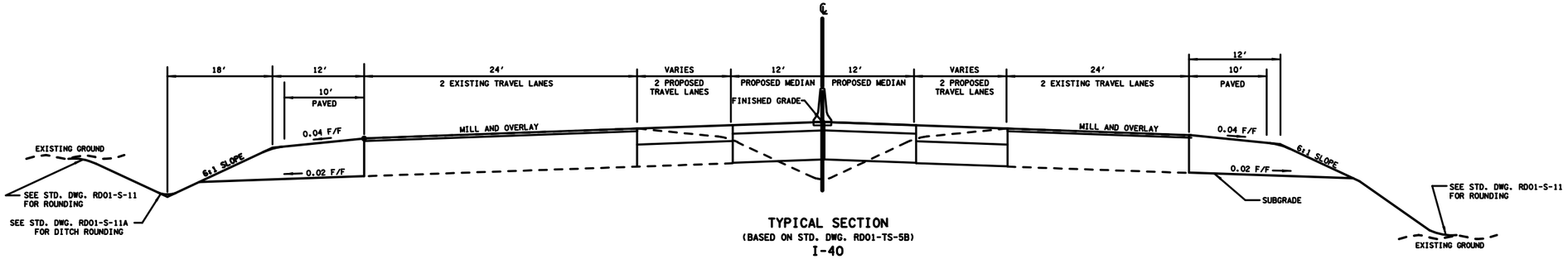
TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	2



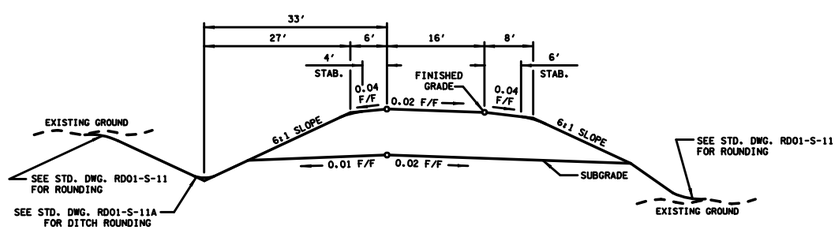
TYPICAL SECTION
(BASED ON STD. DWG. RD01-TS-5B)
I-40
LM 2.7 TO 3.1

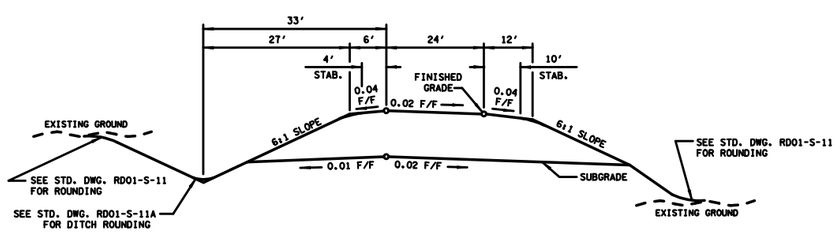


TYPICAL SECTION
(BASED ON STD. DWG. RD01-TS-5B)
I-40
LM 3.1 TO lm 4.75



TYPICAL SECTION
(BASED ON STD. DWG. RD01-TS-5B)
I-40
LM 4.75 TO LM 10.2





TYPICAL SECTION
(BASED ON STD. DWG. RD01-TS-4)
I-40 RAMPS

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109
TYPICAL SECTIONS

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	3

TILLMAN DR

CENTRAL PIKE

APPROXIMATE C.A.R.O.W.

SEE SHEET 4

40

12′ 12′ 12′ 12′

12′ 12′ 12′ 12′

LM 2.0

LM 2.1

LM 2.2

EXITS 226 A-B-C
171
Mt. Juliet
Belinda Pky
1 MILE

REPLACE

APPROXIMATE C.A.R.O.W.

JOHN HAGER RD

MATCH LINE

N

0 100′ 200′ 300′

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	4

MATCH LINE

SEE SHEET 5

EXTEND EXISTING CULVERT APPROXIMATELY 40' LT

APPROXIMATE C.A.R.O.W.

FILL

CUT

300' TAPER

1500' ACCEL. LANE

TYPE 2 GUARDRAIL

TYPE 13

INTERSTATE 40

10' SHLDR

12'

12'

12'

12'

LM 2.3

LM 2.4

LM 2.5

EXISTING BOX CULVERT

12'

12'

12'

12'

12'

10' SHLDR

TYPE 38

TYPE 2 GUARDRAIL

300' TAPER

1500' AUXILIARY LANE

FILL

INTERSTATE 40

CUT

APPROXIMATE C.A.R.O.W.

ADAMS LN

SEE SHEET 3

MATCH LINE

NORTH CREEK

EXIT 226 C

Providence Way

EXISTING

EXITS 226 A-B-C

171

Mt. Juliet

Belinda Pky

EXIT ONLY

RELOCATE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	5

MATCH LINE

SEE SHEET 6

SEE SHEET 4

MATCH LINE

APPROXIMATE C.A.R.O.W.

FILL

CUT

EXISTING RETAINING WALL

500' ACCEL. LANE

1500' ACCEL. LANE

300' TAPER

TYPE 2 GUARDRAIL

TYPE 38

10' SHLDR

12'

LM 2.6

LM 2.7

LM 2.8

TYPE 2 GUARDRAIL

1500' AUXILIARY LANE

10' SHLDR

TYPE 13

3° DIVERGENCE ANGLE

TYPE 38

TYPE 2 GUARDRAIL

CONC. BARRIER W/ ATTENUATOR

APPROXIMATE C.A.R.O.W.

ADAMS LN

HOV LANE ENDS

TO BE REMOVED

EXITS 226 A-B-C

171

Mt. Juliet
Belinda Pky
Providence Way

EXIT ONLY

RELOCATE

N

0 100' 200' 300'

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	6

MATCH LINE

EXISTING RETAINING WALL

CUT

500' ACCEL. LANE

10' SHLDR

12'

12'

12'

12'

TYPE 13

APPROXIMATE C.A.R.O.W.

FILL

CUT

TYPE 2 GUARDRAIL

TIE GUARDRAIL TO BARRIER WALL

FILL

SEE SHEET 7

12' SHLDR

12'

12'

12'

12'

LM 2.8

36" RCP

LM 2.9

36" RCP

30" RCP

LM 3.0

CONC BARRIER

12' SHLDR

6' SHLDR

12'

12'

10' SHLDR

10' SHLDR

12'

12'

TYPE 2 GUARDRAIL

CUT

FILL

APPROXIMATE C.A.R.O.W.

CUT

SEE SHEET 5

MATCH LINE

EXTEND 36" RCP APPROXIMATELY 5'

EXIT 226 C
Belinda Pky
Providance Way

RELOCATE

EXIT 226 B
171 NORTH
Mt. Juliet
1/4 MILE

RELOCATE

EXIT 226 A
171 SOUTH

RELOCATE

N

0 100' 200' 300'

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	7

MATCH LINE

SEE SHEET 6

SEE SHEET 8

APPROXIMATE C.A.R.O.W.

171

SURVEY CONTROL POINT
2" PIPE WITH ARCADIS CAP
N 669613.024
E 1817214.768
EL 647.384

CUT

CONC. BARRIER

TYPE 13

11.3'

TYPE 38

10' SHLDR

12'

12'

12'

12'

12'

10'

4.0'

12'

LM 3.1

12'

12'

12'

LM 3.2

TIE TO EXISTING GUARDRAIL

FILL

TYPE 2 GUARDRAIL

FILL

TYPE 38

LM 3.3

10' SHLDR

CUT

40

CONC BARRIER

12'

12'

6' SHLDR

8' SHLDR

10.5'

TIE TO EXISTING BARRIER WALL

171

CUT

SURVEY CONTROL POINT
2" PIPE WITH ARCADIS CAP
N 669237.417
E 1817176.685
EL 655.9760

EXIT 226 C
Belinda Pky
Providence Way
RAMP 30 MPH
RELOCATE

EXIT 226 B
171 NORTH
Mt Juliet
RAMP 30 MPH
RELOCATE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	8

EXIT 226
171
Mt Juliet
RELOCATE

STONEGATE DR
STONERIDGE CT

MATCH LINE

SEE SHEET 9

FILL
APPROXIMATE C.A.R.O.W.
TYPE 2 GUARDRAIL
500' DECEL. LANE
300' TAPER
10' SHLDR
12'
12'
12'
12'
12'
LM 3.4
LM 3.5
12'
12'
12'
12'
12'
10' SHLDR
TYPE 2 GUARDRAIL
1340' WEAVE SECTION
FILL
FILL
APPROXIMATE C.A.R.O.W.
TIE TO EXISTING GUARDRAIL

SEE SHEET 7

MATCH LINE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	9

STONERS CREEK

MATCH LINE

SEE SHEET 10

EXTEND 30" RCP APPROXIMATELY 30' LT

APPROXIMATE C.A.R.O.W.

FILL

CUT

40

TYPE 2 GUARDRAIL

60' CMP

TYPE 38

10' SHLDR

12'

LM 3.6

LM 3.7

LM 3.8

30" RCP

TYPE 13

1340' WEAVE SECTION

SEE SHEET 8

EXTEND 30" RCP APPROXIMATELY 25' RT

TRUCK PARKING AREA

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	10

MATCH LINE

SEE SHEET 11

APPROXIMATE C.A.R.O.W.

CUT

FILL

CUT

40

10' SHLDR

12'

12'

12'

12'

24" RCP

LM 3.9

12'

12'

12'

12'

12'

LM 4.0

LM 4.1

10' SHLDR

40

SEE SHEET 9

1000' ACCEL' LANE

CUT

APPROXIMATE C.A.R.O.W.

MATCH LINE

EXTEND 24" RCP APPROXIMATELY 30' RT

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	11

STONERS CREEK

MATCH LINE

SEE SHEET 12

APPROXIMATE C.A.R.O.W.

CUT

INTERSTATE 40

CUT

FILL

CUT

10' SHLDR

12'

12'

12'

12'

8' X 3' BOX CULVERT

LM 4.2

LM 4.3

12'

12'

12'

12'

10' SHLDR

SEE SHEET 10

300' TAPER LENGTH

CUT

INTERSTATE 40

CUT

MATCH LINE

APPROXIMATE C.A.R.O.W.

1000' ACCEL. LANE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

4/1/2011 3:51:16 PM
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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	12

MATCH LINE

SEE SHEET 13

2 PERSONS MINIMUM PER VEHICLE
7AM-9AM MON-FRI
RELOCATE

EXIT 226
171
Mt. Juliet
1 MILE
EXISTING

APPROXIMATE C.A.R.O.W.

CUT

FILL

INTERSTATE 40

TYPE 13

TYPE 38

TYPE 2 GUARDRAIL

10' SHLDR

12'

CONC BARRIER

LM 4.4

LM 4.5

LM 4.6

SEE SHEET 11

MATCH LINE

APPROXIMATE C.A.R.O.W.

MUNDY MEMORIAL DR

N

NOTES:
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3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	13

MATCH LINE

SEE SHEET 14

HOV LANE
AHEAD

RELOCATE

APPROXIMATE C.A.R.O.W.

CUT

FILL

TYPE 2 GUARDRAIL

TYPE 38

INTERSTATE 40

10' SHLDR

12'

12'

12'

12'

300' TAPER LENGTH

TYPE 13

TYPE 2 GUARDRAIL

1000' ACCEL' LANE

12' SHLDR

12' SHLDR

CONC. BARRIER

LM 4.7

LM 4.8

LM 4.9

12'

12'

12'

12'

10' SHLDR

FILL

INTERSTATE 40

APPROXIMATE C.A.R.O.W.

CUT

TYPE 38

TYPE 2 GUARDRAIL

FILL

MUNDY MEMORIAL DR

SEE SHEET 12

MATCH LINE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	14

MATCH LINE

APPROXIMATE C.A.R.O.W.

40

1000' ACCEL' LANE

CUT

TYPE 38

TYPE 2 GUARDRAIL

10' SHLDR

12'
12'
12'
12'
12'

CONC. BARRIER

12' SHLDR
12' SHLDR

12'
12'
12'
12'
12'

LM 5.0

10' SHLDR

TYPE 2 GUARDRAIL

TYPE 13

40

FILL

CUT

APPROXIMATE C.A.R.O.W.

SEE SHEET 13

TRUCK PARKING AREA

CUT

SEE SHEET 15

LM 5.1

LM 5.2

MATCH LINE

EXIT 229 A-B
Beckwith Rd
1 MILE

EXISTING

N

NOTES:
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2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	15

MATCH LINE

SEE SHEET 16

SEE SHEET 14

MATCH LINE

RUTLAND BRANCH

APPROXIMATE C.A.R.O.W.

CUT

FILL

CUT

500' AUXILARY LANE

TYPE 13

TYPE 2 GUARDRAIL

300' TAPER

10' SHLDR

10' SHLDR

12'

12'

12'

12'

12' SHLDR

12' SHLDR

12'

12'

12'

12'

10' SHLDR

LM 5.3

LM 5.4

CONC. BARRIER

FILL

CUT

CUT

APPROXIMATE C.A.R.O.W.

N

NOTES:
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2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	16

RUTLAND BRANCH

MATCH LINE

300' TAPER

APPROXIMATE C.A.R.O.W.

FILL

CUT

FILL

CUT

SEE SHEET 17

TYPE 2 GUARDRAIL

TYPE 38

10' SHLDR

12'

12'

12'

12'

12' SHLDR

12' SHLDR

LM 5.5

LM 5.6

LM 5.7

12'

12'

12'

12'

10' SHLDR

CONC. BARRIER

CUT

FILL

FILL

CUT

APPROXIMATE C.A.R.O.W.

SEE SHEET 15

MATCH LINE

EXIT 229 A

SOUTH
Beckwith
Rd
½ MILE

EXISTING

N

NOTES:
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0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	17

MATCH LINE

EXTEND 8' X 6' BOX CULVERT APPROXIMATELY 35' LT

AUTOMATIC TRAFFIC RECORDER (ATR*34) SEE AUTOMATIC TRAFFIC RECORDER INFORMATION APPENDIX B.

APPROXIMATE C.A.R.O.W.

300' TAPER

1000' ACCEL LANE

CUT

FILL

TYPE 13

TYPE 2 GUARDRAIL

TYPE 38

10' SHLDR

12'

12' SHLDR

LM 5.8

LM 5.9

LM 6.0

8' X 6' BOX CULVERT

SEE SHEET 18

SEE SHEET 16

CONC. BARRIER

500' AUXILIARY LANE

EXTEND 8' X 6' BOX CULVERT APPROXIMATELY 40' RT

RUTLAND BRANCH

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
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0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	18

MATCH LINE

SEE SHEET 19

SULLIVAN BRANCH

APPROXIMATE C.A.R.O.W.

CUT

1000' ACCEL LANE

300' TAPER

715' ACCEL LANE

10' SHLDR

12'

12'

12'

12'

CONC. BARRIER

12' SHLDR

12' SHLDR

LM 6.1

24" RCP

LM 6.2

LM 6.3

SURVEY CONTROL POINT
2" PIPE WITH ARCADIS CAP
N 672074.236
E 1833777.202
EL 602.886

SEE SHEET 17

EXIT 229 B
NORTH
Beckwith
Rd
¼ MILE

RELOCATE

EXIT 229 A
SOUTH
Beckwith
Rd

RELOCATE

FILL

SURVEY CONTROL POINT
2" PIPE WITH ARCADIS CAP
N 671770.964
E 1833518.944
EL 591.288

500' AUXILIARY LANE

BECKWITH RD

EXIT 229 B
NORTH
Beckwith
Road
EXIT 30 MPH

RELOCATE

MATCH LINE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
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0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	19

MATCH LINE

SEE SHEET 18

SEE SHEET 20

SULLIVAN BRANCH

APPROXIMATE C.A.R.O.W.

CUT

FILL

715' ACCEL LANE

TYPE 13

TYPE 2 GUARDRAIL

CONC. BARRIER

TYPE 38

40

10' SHLDR

12'

12' SHLDR

LM 6.4

LM 6.5

8' X 10' BOX CULVERT

1000' ACCEL LANE

N

NOTES:
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0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	20

SULLIVAN BRANCH

EXIT 229
Beckwith Rd
RELOCATE

MATCH LINE

APPROXIMATE C.A.R.O.W.

CUT

500' AUXILARY LANE

300' TAPER

CONC. BARRIER

CUT

FILL

SEE SHEET 21

10' SHLDR
12'
12'
12'
12'
12'
12' SHLDR
12' SHLDR

8' X 10' BOX CULVERT

LM 6.6

LM 6.7

LM 6.8

12'
12'
12'
12'
12'
10' SHLDR

1000' ACCEL LANE

300' TAPER

CUT

APPROXIMATE C.A.R.O.W.

CUT

FILL

CUT

SEE SHEET 19

MATCH LINE

N

NOTES:
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0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	21

MATCH LINE

SEE SHEET 22

APPROXIMATE C.A.R.O.W.

CUT

CONC. BARRIER

10' SHLDR
12'
12'
12'
12'
12' SHLDR
12' SHLDR
12'
12'
12'
12'
10' SHLDR

LM 6.9

LM 7.0

LM 7.1

CUT

APPROXIMATE C.A.R.O.W.

SEE SHEET 20

MATCH LINE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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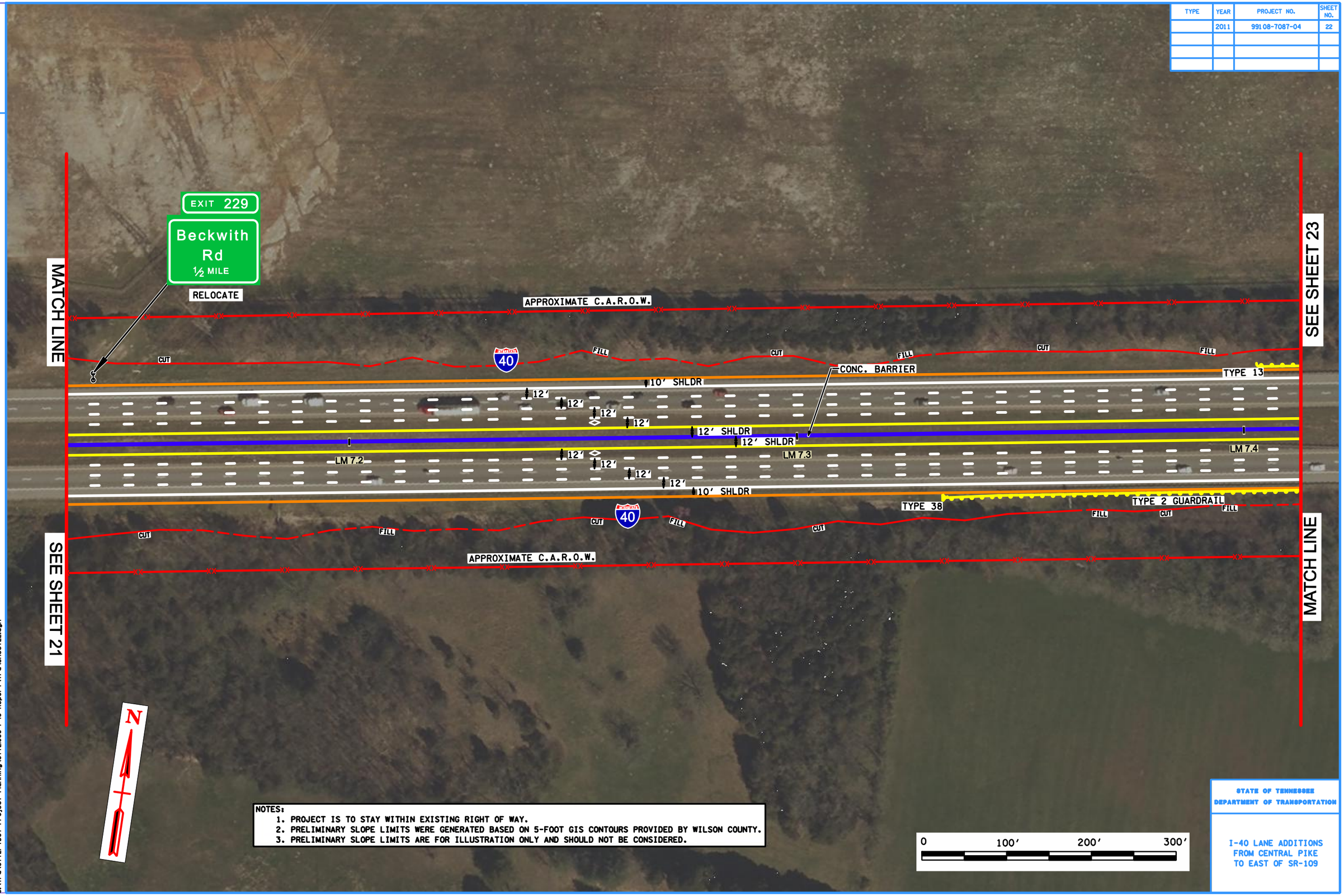
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	22



NOTES:
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2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	23

MATCH LINE

SEE SHEET 24

SEE SHEET 22

MATCH LINE

APPROXIMATE C.A.R.O.W.

APPROXIMATE C.A.R.O.W.

BRIDGE WIDENING

TYPE 2 GUARDRAIL

TYPE 2 GUARDRAIL

TYPE 38

CONC. BARRIER

TYPE 2 GUARDRAIL

TYPE 13

FILL

CUT

FILL

CUT

FILL

CUT

FILL

CUT

FILL

CUT

10' SHLDR

12'

12'

12'

12'

12' SHLDR

12' SHLDR

12'

12'

12'

12'

10' SHLDR

LM 7.5

LM 7.6

WILSON CREEK

INTERSTATE 40

INTERSTATE 40

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	24

MATCH LINE

SEE SHEET 25

EXIT 229
Beckwith Rd
1 MILE
RELOCATE

APPROXIMATE C.A.R.O.W.

CUT

FILL

CONC. BARRIER

10' SHLDR
12'
12'
12'
12'
12' SHLDR
12' SHLDR
12'
12'
12'
12'
10' SHLDR

LM 7.7
LM 7.8
LM 7.9

40

SEE SHEET 23

MATCH LINE

EXIT 232 A-B
109
Gallatin
1 MILE
EXISTING

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	25

MATCH LINE

APPROXIMATE C.A.R.O.W.

CUT

FILL

CUT

40

CONC. BARRIER

10' SHLDR
12'
12'
12'
12'
12' SHLDR
12' SHLDR
12'
12'
12'
12'
10' SHLDR

LM 8.0

LM 8.1

LM 8.2

CUT

40

APPROXIMATE C.A.R.O.W.

CUT

SEE SHEET 26

SEE SHEET 24

MATCH LINE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	26

MATCH LINE

SEE SHEET 27

SEE SHEET 25

MATCH LINE

CEDAR CREEK

APPROXIMATE C.A.R.O.W.

CUT

FILL

CUT

CONC. BARRIER

40

10' SHLDR

12'

12'

12'

12'

12' SHLDR

12' SHLDR

12'

LM 8.3

LM 8.4

LM 8.5

48" RCP

12'

12'

12'

10' SHLDR

TYPE 38

TYPE 2 GUARDRAIL

TYPE 13

FILL

CUT

CUT

LEEVILLE RD

12'

12'

LEEVILLE RD RELOCATION

FILL

EXTEND 48" RCP APPROXIMATELY 35' RT

APPROXIMATE C.A.R.O.W.

APPROXIMATE C.A.R.O.W.

FILL

CUT

HOV LANE ENDS

NEW

EXIT 232 B

109 NORTH

Gallatin

¾ MILE

RELOCATE

EXIT 232 A

109 SOUTH

½ MILE

RELOCATE

N

NOTES:

1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	27

MATCH LINE

APPROXIMATE C.A.R.O.W.

CUT

300' TAPER

1000' ACCEL LANE

FILL

CONC. BARRIER

10' SHLDR

12'

12'

12'

12'

12' SHLDR

12' SHLDR

12'

12'

LM 8.6

12'

12'

LM 8.7

10' SHLDR

SEE SHEET 28

SEE SHEET 26

CUT

TYPE 38

300' TAPER

500' AUXILIARY LANE

TYPE 2 GUARDRAIL

FILL

MATCH LINE

LEEVILLE RD

APPROXIMATE C.A.R.O.W.

EXIT 232 B
109 NORTH
Gallatin
¼ MILE

RELOCATE

EXIT 232 A
109 SOUTH

RELOCATE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	28

SEE SHEET 27

APPROXIMATE C.A.R.O.W.

1000' ACCEL LANE

CONC. BARRIER

FILL

TYPE 13

TYPE 2 GUARDRAIL

TYPE 38

12'

12'

12'

LM 8.8

12'

12'

12'

12'

10' X 10' BOX CULVERT

LM 8.9

LM 9.0

12' SHLDR

12' SHLDR

12' SHLDR

10' SHLDR

CUT

FILL

CUT

MATCH LINE

MATCH LINE

TYPE 13

FILL

SEE SHEET 29

LEEVILLE RD

APPROXIMATE C.A.R.O.W.

CEDAR CREEK

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

4/11/2011 4:09:21 PM
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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	29

CEDAR CREEK

APPROXIMATE C.A.R.O.W.

MATCH LINE

SURVEY CONTROL POINT
2" PIPE WITH ARCADIS CAP
N 674371.701
E 1848427.000
EL 603.8010

TIE TO EXISTING GUARDRAIL

MATCH LINE

CUT

CUT

109

40

CONC. BARRIER

FILL

10' SHLDR

12'

12'

12'

12'

12' SHLDR

12' SHLDR

LM 9.1

12'

12'

12'

12'

LM 9.2

30" RCP

LM 9.3

10' SHLDR

SEE SHEET 28

40

109

FILL

CUT

CUT

CUT

SEE SHEET 30

SURVEY CONTROL POINT
2" PIPE WITH ARCADIS CAP
N 674104.057
E 1848219.223
EL 610.704

EXIT 232 B
109 NORTH
Gallatin

RELOCATE

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

SAFARI CAMP RD

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

4/1/2011 4:08:08 PM
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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	30

LEEVILLE PIKE

MATCH LINE

MATCH LINE

EXIT 232

109

Gallatin

RELOCATE

APPROXIMATE C.A.R.O.W.

FILL

TYPE 2 GUARDRAIL

40

500' AUXILARY LANE

300' TAPER

CUT

TYPE 38

10' SHLDR

12'

12'

12'

12'

10' X 10' BOX CULVERT

LM 9.3

LM 9.4

CONC. BARRIER

12' SHLDR

12' SHLDR

LM 9.5

12'

12'

12'

SEE SHEET 29

40

CUT

CUT

10' SHLDR

1000' ACCEL LANE

APPROXIMATE C.A.R.O.W.

SAFARI CAMP RD

SEE SHEET 31

CEDAR CREEK

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	31

LEEVILLE PIKE

CEDAR CREEK

MATCH LINE

SEE SHEET 32

APPROXIMATE C.A.R.O.W.

CUT

40

10' SHLDR

12'

CONC. BARRIER

12' SHLDR

LM 9.6

LM 9.7

LM 9.8

60' CMP

1000' ACCEL LANE

300' TAPER

1500'

SAFARI CAMP RD

SEE SHEET 30

MATCH LINE

CEDAR CREEK

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	32

MATCH LINE

SEE SHEET 31

LEEVILLE PIKE

CUT

APPROXIMATE C.A.R.O.W.

HOV LANE AHEAD

NEW

FILL

300' TAPER

CONC. BARRIER

300' TAPER

12' 12' 12' 12'
12' SHLDR
12' SHLDR
12' 12' 12' 12'

LM 9.9

LM 10.0

1500'

10' SHLDR

840' TAPER LENGTH

CUT

APPROXIMATE C.A.R.O.W.

SAFARI CAMP RD

CALLIS LN

CEDAR CREEK

N

SEE SHEET 33

MATCH LINE

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	33

MATCH LINE

SEE SHEET 34

EXIT 232
109
Gallatin
1 MILE

LEEVILLE PIKE

APPROXIMATE C.A.R.O.W.

CONC. BARRIER

40

LM 10.1

LM 10.2

LM 10.3

12'

12'

12'

10' SHLDR

1500'

SEE SHEET 32

840' TAPER LENGTH

CUT

40

APPROXIMATE C.A.R.O.W.

SAFARI CAMP RD

MATCH LINE

N

SOUTH FORK

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	34

SOUTH FORK

LEEVILLE PIKE

MATCH LINE

APPROXIMATE C.A.R.O.W.

40

CONC. BARRIER

EXISTING CULVERT

TYPE 13

TYPE 38

LM 10.4

LM 10.5

LM 10.6

12'

12'

10' SHLDR

1500'

840' TAPER LENGTH

CUT

FILL

40

APPROXIMATE C.A.R.O.W.

SAFARI CAMP RD

SEE SHEET 33

N

NOTES:
1. PROJECT IS TO STAY WITHIN EXISTING RIGHT OF WAY.
2. PRELIMINARY SLOPE LIMITS WERE GENERATED BASED ON 5-FOOT GIS CONTOURS PROVIDED BY WILSON COUNTY.
3. PRELIMINARY SLOPE LIMITS ARE FOR ILLUSTRATION ONLY AND SHOULD NOT BE CONSIDERED.

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

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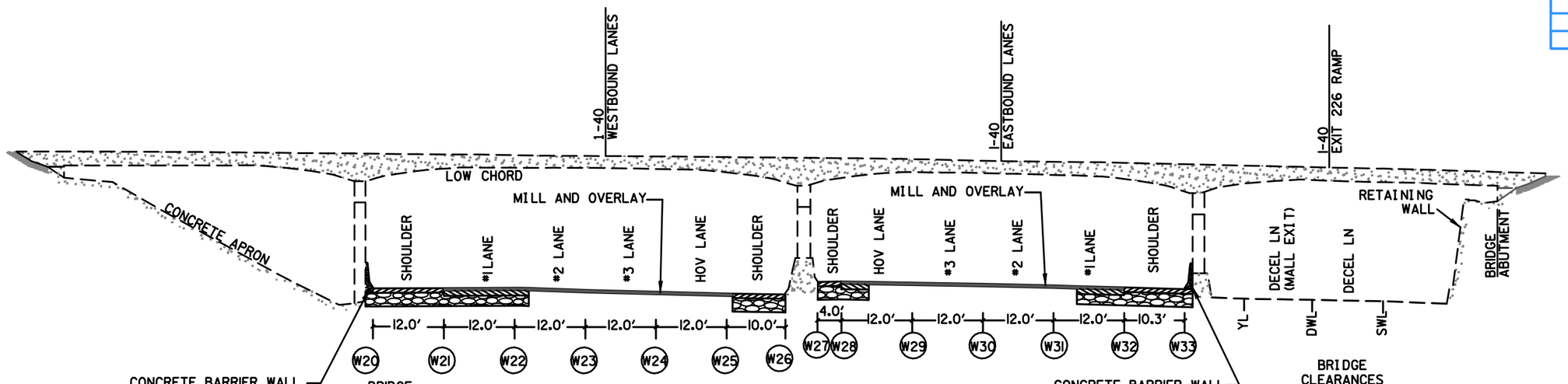
Appendix D

Bridge Profiles

TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	1



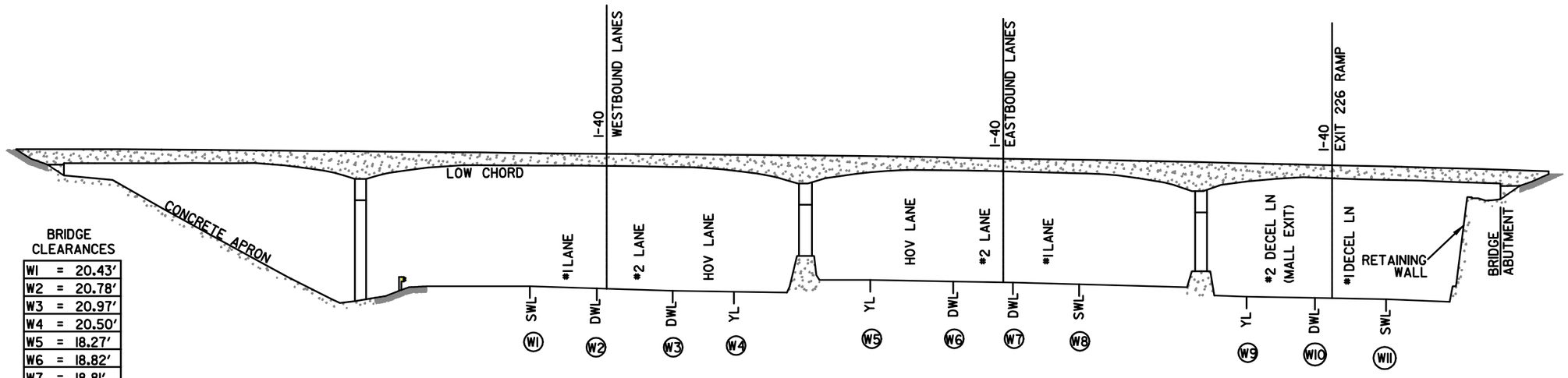
BRIDGE CLEARANCES

W20	= 18.61′
W21	= 20.30′
W22	= 20.41′
W23	= 20.74′
W24	= 20.86′
W25	= 20.63′
W26	= 19.02′

BRIDGE CLEARANCES

W27	= 16.90′
W28	= 17.58′
W29	= 18.78′
W30	= 18.83′
W31	= 18.79′
W32	= 18.45′
W33	= 16.58′

PROPOSED ROADWAY CONFIGURATION
I-40 @ SR-171 (WEST SIDE)
BRIDGE PROFILE



BRIDGE CLEARANCES

W1	= 20.43′
W2	= 20.78′
W3	= 20.97′
W4	= 20.50′
W5	= 18.27′
W6	= 18.82′
W7	= 18.81′
W8	= 18.79′
W9	= 19.53′
W10	= 20.35′
W11	= 20.22′

EXISTING ROADWAY CONFIGURATION
I-40 @ SR-171 (WEST SIDE)
BRIDGE PROFILE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ SR-171
WEST SIDE UNERPASS
WILSON COUNTY

SCALE: 1″ = 20′

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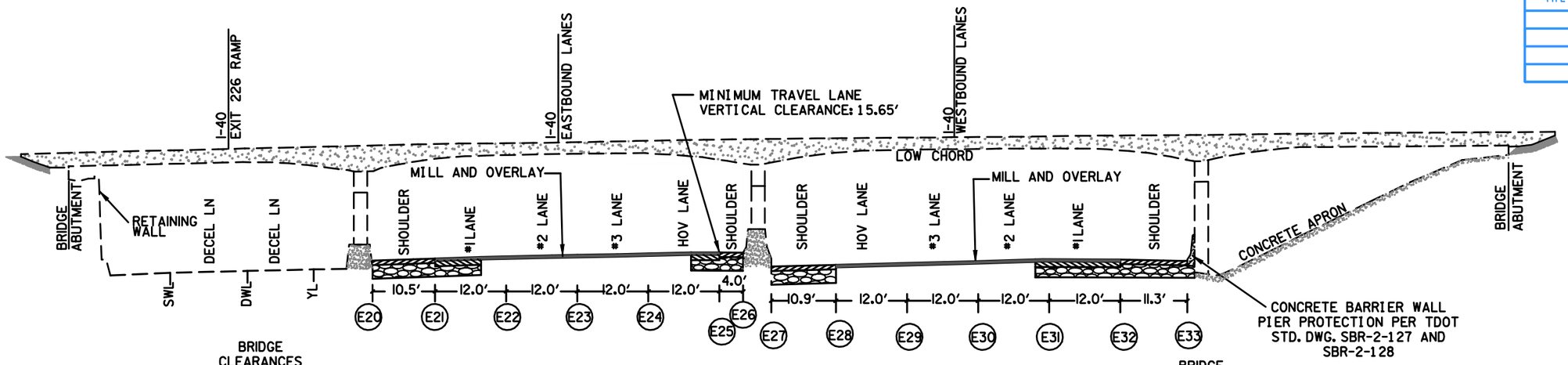
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	2



BRIDGE CLEARANCES

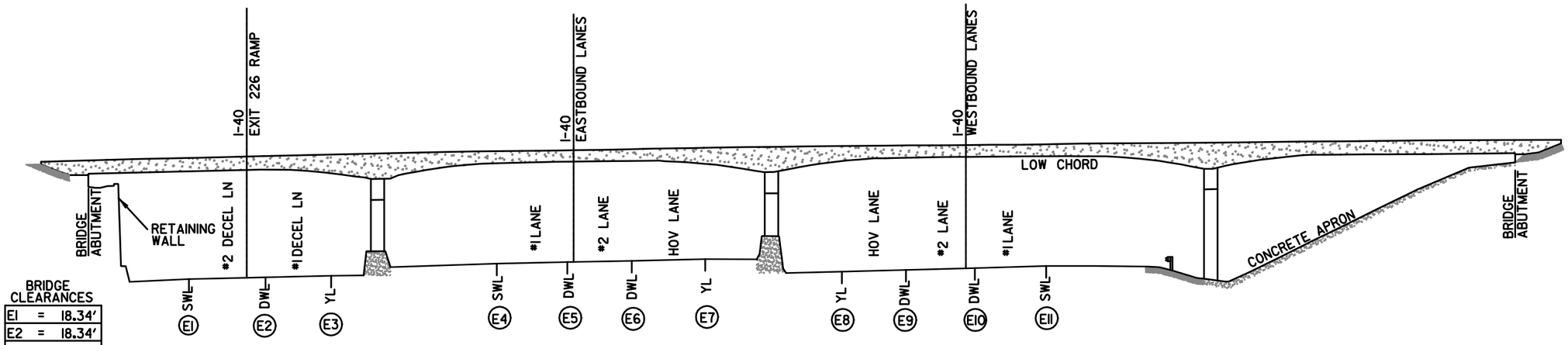
*	E20 =	15.34'
	E21 =	16.84'
	E22 =	17.12'
	E23 =	17.08'
	E24 =	16.87'
*	E25 =	15.65'
*	E26 =	15.05'

* BELOW 16 FEET MINIMUM VERTICAL CLEARANCE

BRIDGE CLEARANCES

E27 =	17.56'
E28 =	18.94'
E29 =	19.11'
E30 =	18.90'
E31 =	18.65'
E32 =	18.41'
E33 =	17.06'

PROPOSED ROADWAY CONFIGURATION
I-40 @ SR-171 (EAST SIDE)
BRIDGE PROFILE



BRIDGE CLEARANCES

E1 =	18.34'	
E2 =	18.34'	
E3 =	17.46'	
E4 =	17.07'	
E5 =	17.09'	
E6 =	17.01'	
E7 =	16.21'	
E8 =	18.84'	
E9 =	19.11'	
E10 =	18.95'	
E11 =	18.68'	

EXISTING ROADWAY CONFIGURATION
I-40 @ SR-171 (EAST SIDE)
BRIDGE PROFILE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ SR-171
EAST SIDE UNDERPASS
WILSON COUNTY

SCALE: 1" = 20'

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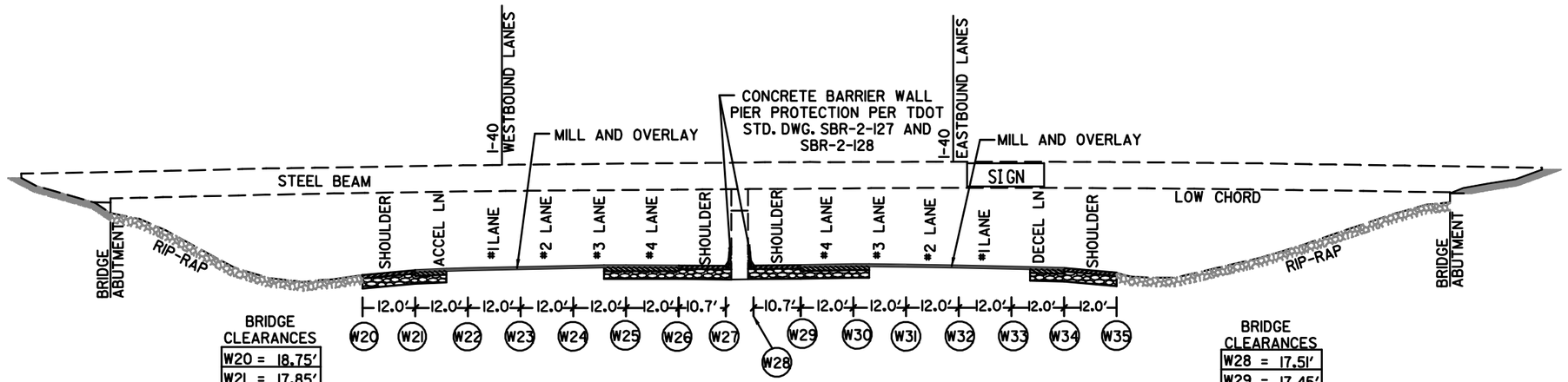
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	3



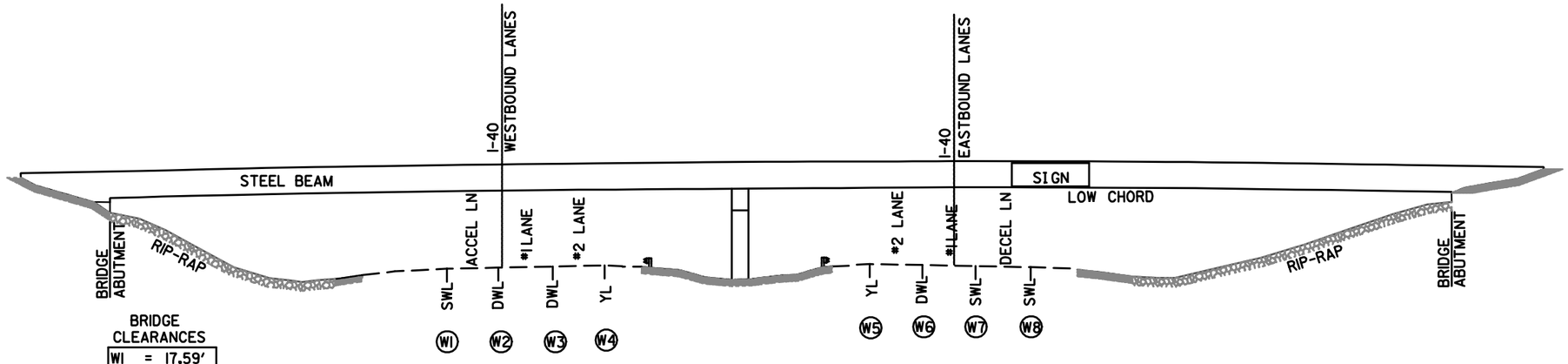
BRIDGE CLEARANCES

W20	= 18.75′
W21	= 17.85′
W22	= 17.54′
W23	= 17.39′
W24	= 17.31′
W25	= 17.22′
W26	= 17.36′
W27	= 17.53′

PROPOSED ROADWAY CONFIGURATION
I-40 @ BECKWITH ROAD (WEST SIDE)
BRIDGE PROFILE

BRIDGE CLEARANCES

W28	= 17.51′
W29	= 17.45′
W30	= 17.38′
W31	= 17.53′
W32	= 17.77′
W33	= 18.01′
W34	= 18.30′
W35	= 19.30′



BRIDGE CLEARANCES

W1	= 17.59′
W2	= 20.78′
W3	= 20.97′
W4	= 20.50′
W5	= 18.27′
W6	= 18.82′
W7	= 18.81′
W8	= 18.79′

EXISTING ROADWAY CONFIGURATION
I-40 @ BECKWITH ROAD (WEST SIDE)
BRIDGE PROFILE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ BECKWITH
WEST SIDE UNDERPASS
WILSON COUNTY

SCALE: 1" = 30'

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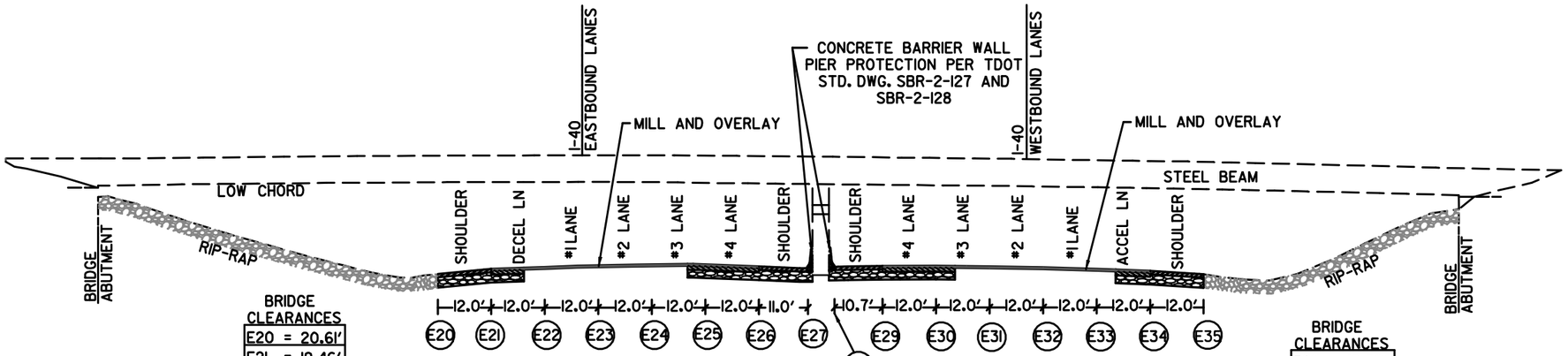
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	4



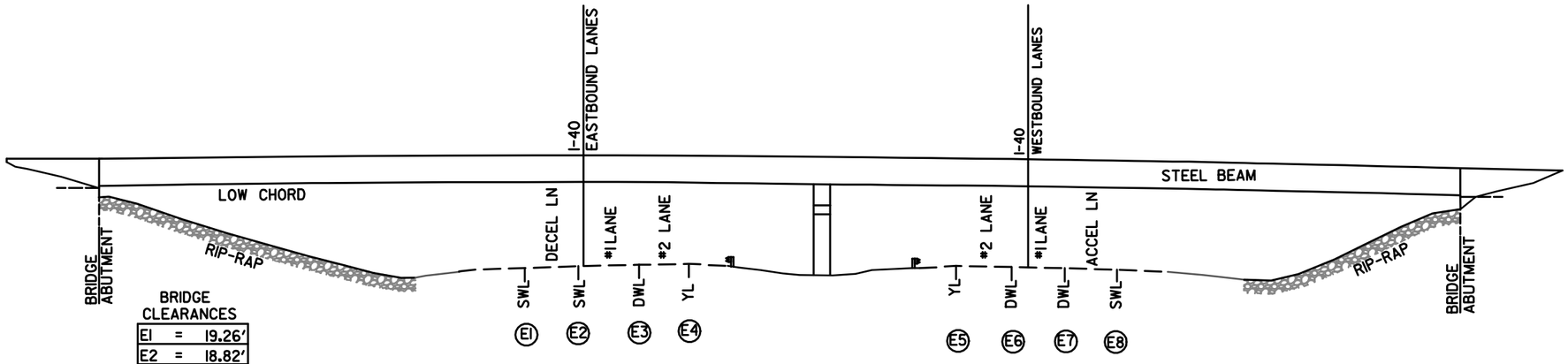
BRIDGE CLEARANCES

E20	= 20.61′
E21	= 19.46′
E22	= 19.09′
E23	= 18.73′
E24	= 18.47′
E25	= 18.30′
E26	= 18.65′
E27	= 18.89′

BRIDGE CLEARANCES

E28	= 18.50′
E29	= 18.22′
E30	= 18.04′
E31	= 18.10′
E32	= 18.16′
E33	= 18.30′
E34	= 18.57′
E35	= 19.09′

PROPOSED ROADWAY CONFIGURATION
I-40 @ BECKWITH ROAD (EAST SIDE)
BRIDGE PROFILE



BRIDGE CLEARANCES

E1	= 19.26′
E2	= 18.82′
E3	= 18.52′
E4	= 18.21′
E5	= 18.02′
E6	= 18.13′
E7	= 18.18′
E8	= 18.37′

EXISTING ROADWAY CONFIGURATION
I-40 @ BECKWITH ROAD (EAST SIDE)
BRIDGE PROFILE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ BECKWITH
EAST SIDE UNDERPASS
WILSON COUNTY

SCALE: 1" = 30'

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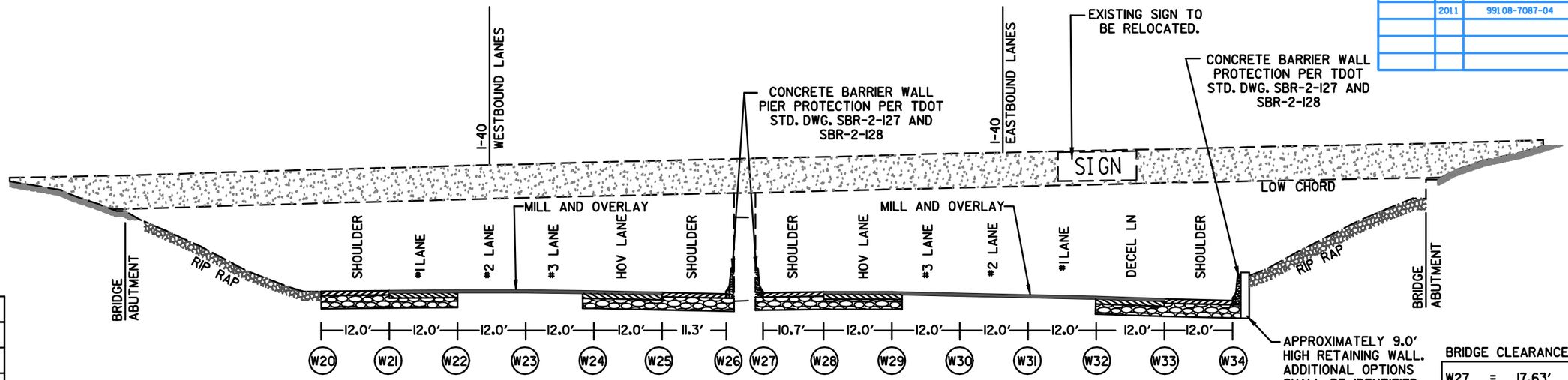
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	5



PROPOSED ROADWAY CONFIGURATION
I-40 @ HIGHWAY 109(WEST SIDE)
SOUTHBOUND BRIDGE PROFILE

BRIDGE CLEARANCES

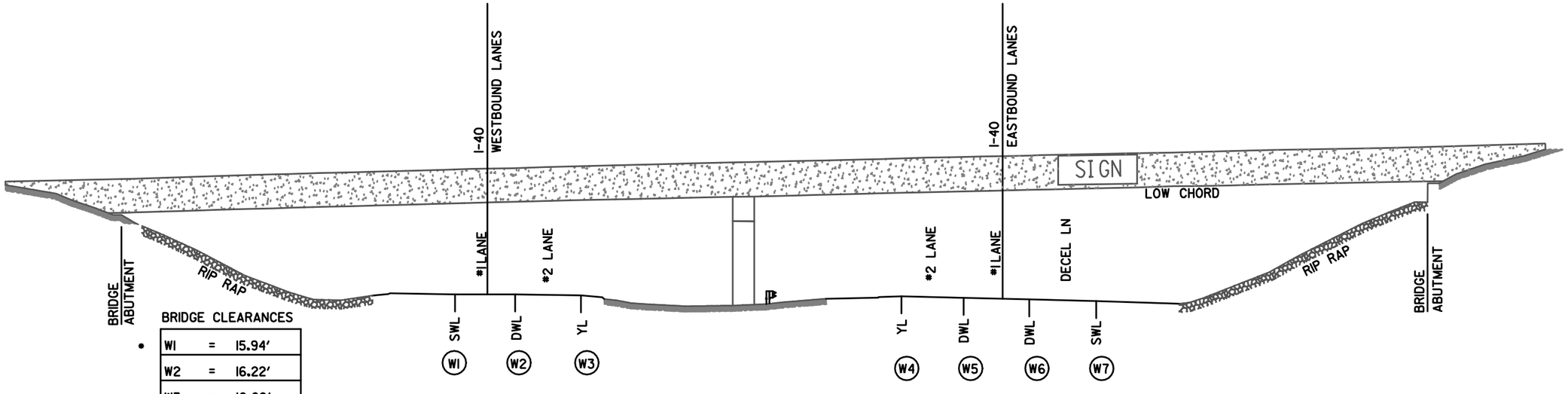
*	W20	=	15.52′
*	W21	=	15.74′
*	W22	=	15.94′
	W23	=	16.26′
	W24	=	16.73′
	W25	=	17.24′
	W26	=	17.74′

* BELOW 16 FEET MINIMUM VERTICAL CLEARANCE.

OPTIONS TO ACHIEVE MINIMUM VERTICAL CLEARANCE SHALL BE IDENTIFIED AND EVALUATED DURING DESIGN.

BRIDGE CLEARANCES

	W27	=	17.63′
	W28	=	17.76′
	W29	=	18.08′
	W30	=	18.64′
	W31	=	19.17′
	W32	=	19.74′
	W33	=	20.47′
	W34	=	20.96′



EXISTING ROADWAY CONFIGURATION
I-40 @ HIGHWAY 109(WEST SIDE)
SOUTHBOUND BRIDGE PROFILE

BRIDGE CLEARANCES

*	W1	=	15.94′
	W2	=	16.22′
	W3	=	16.69′
	W4	=	18.12′
	W5	=	18.65′
	W6	=	19.17′
	W7	=	19.73′

* BELOW 16 FEET MINIMUM VERTICAL CLEARANCE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ 109 SOUTH BOUND
WEST SIDE UNDERPASS
WILSON COUNTY

SCALE: 1″ = 20′

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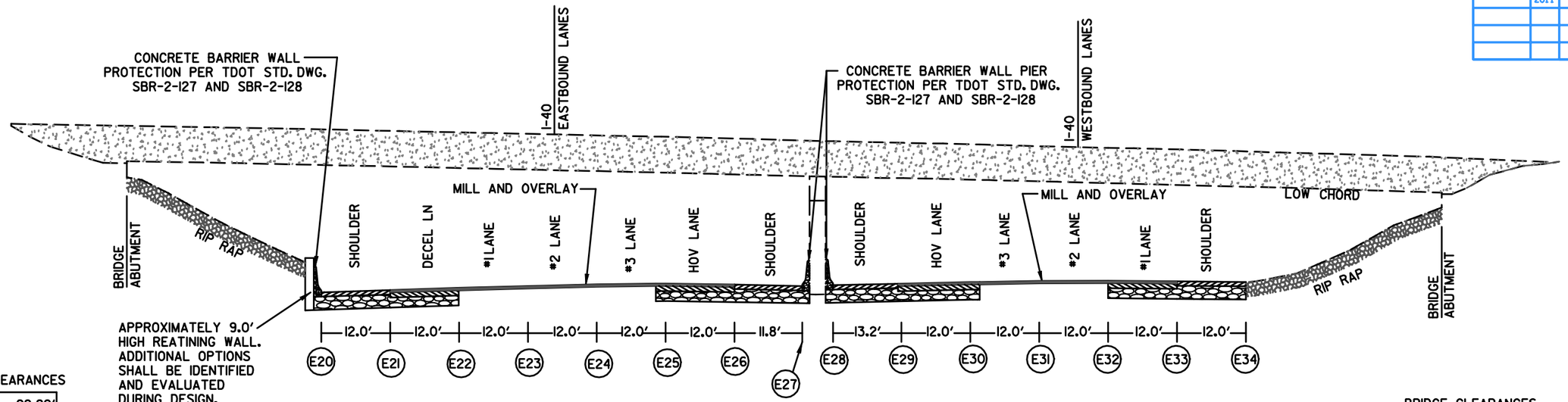
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	6



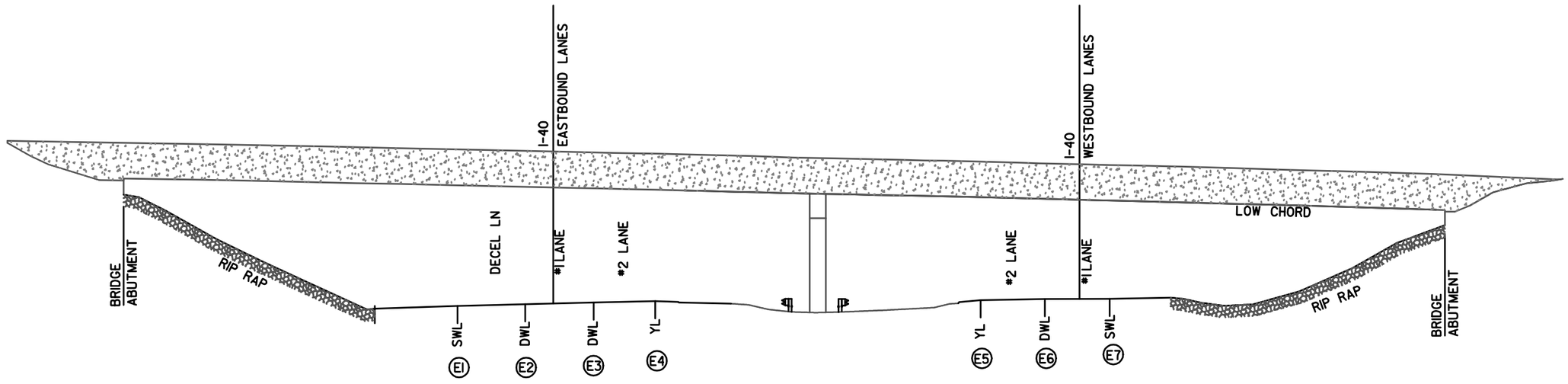
BRIDGE CLEARANCES

E20	=	22.22'
E21	=	21.58'
E22	=	20.92'
E23	=	20.33'
E24	=	19.78'
E25	=	19.40'
E26	=	19.23'
E27	=	19.20'

PROPOSED ROADWAY CONFIGURATION
I-40 @ HIGHWAY 109(EAST SIDE)
SOUTHBOUND BRIDGE PROFILE

BRIDGE CLEARANCES

E28	=	18.93'
E29	=	18.43'
E30	=	17.89'
E31	=	17.37'
E32	=	17.02'
E33	=	16.82'
E34	=	16.63'



BRIDGE CLEARANCES

E1	=	20.92'
E2	=	20.33'
E3	=	19.78'
E4	=	19.31'
E5	=	17.84'
E6	=	17.35'
E7	=	17.02'

EXISTING ROADWAY CONFIGURATION
I-40 @ HIGHWAY 109(EAST SIDE)
SOUTHBOUND BRIDGE PROFILE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ SR-109 SOUTH BOUND EAST SIDE UNDERPASS
WILSON COUNTY

SCALE: 1" = 20'

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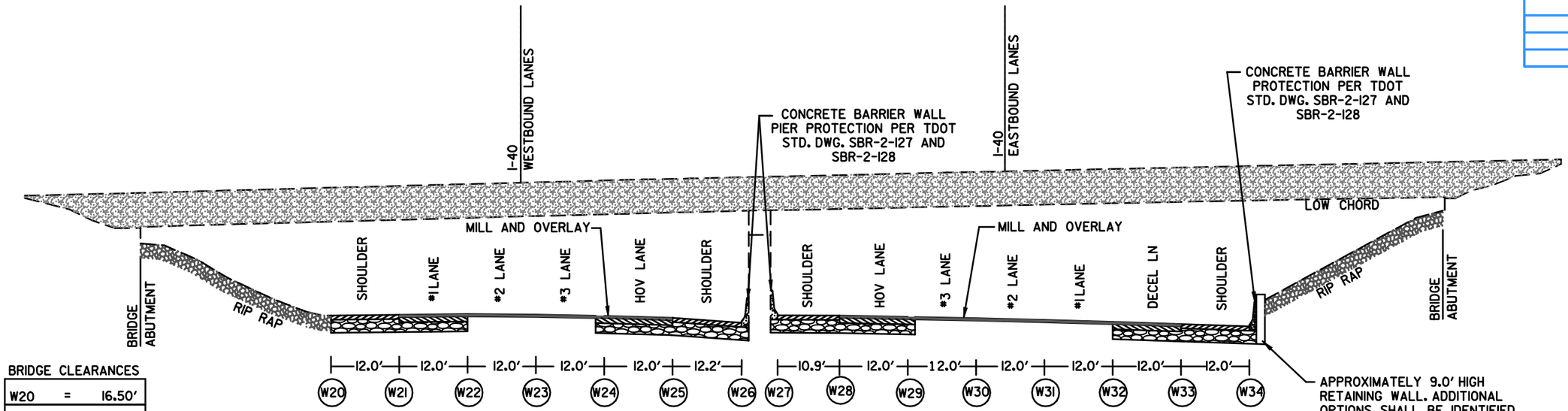
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	7



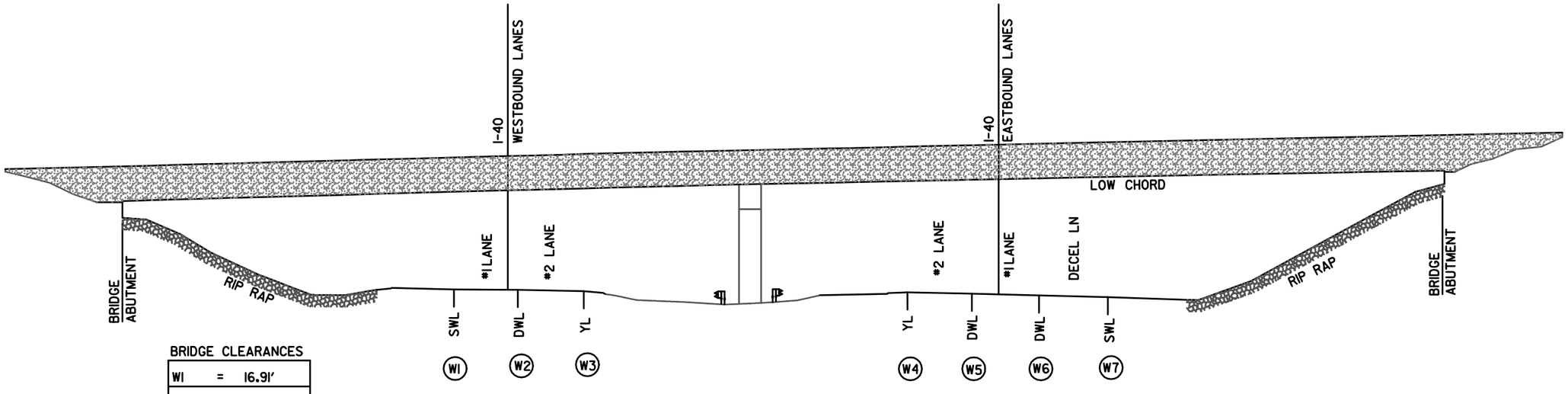
BRIDGE CLEARANCES

W20	=	16.50′
W21	=	16.61′
W22	=	16.71′
W23	=	17.32′
W24	=	17.85′
W25	=	18.50′
W26	=	19.67′

BRIDGE CLEARANCES

W27	=	18.49′
W28	=	18.75′
W29	=	19.25′
W30	=	19.72′
W31	=	20.27′
W32	=	20.86′
W33	=	21.49′
W34	=	22.12′

PROPOSED ROADWAY CONFIGURATION
I-40 @ HIGHWAY 109(WEST SIDE)
NORTHBOUND BRIDGE PROFILE



BRIDGE CLEARANCES

W1	=	16.91′
W2	=	17.29′
W3	=	17.81′
W4	=	19.29′
W5	=	19.73′
W6	=	20.27′
W7	=	20.86′

EXISTING ROADWAY CONFIGURATION
I-40 @ HIGHWAY 109(WEST SIDE)
NORTHBOUND BRIDGE PROFILE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ SR-109 NORTH BOUND WEST SIDE UNDERPASS
WILSON COUNTY

SCALE: 1″ = 20′

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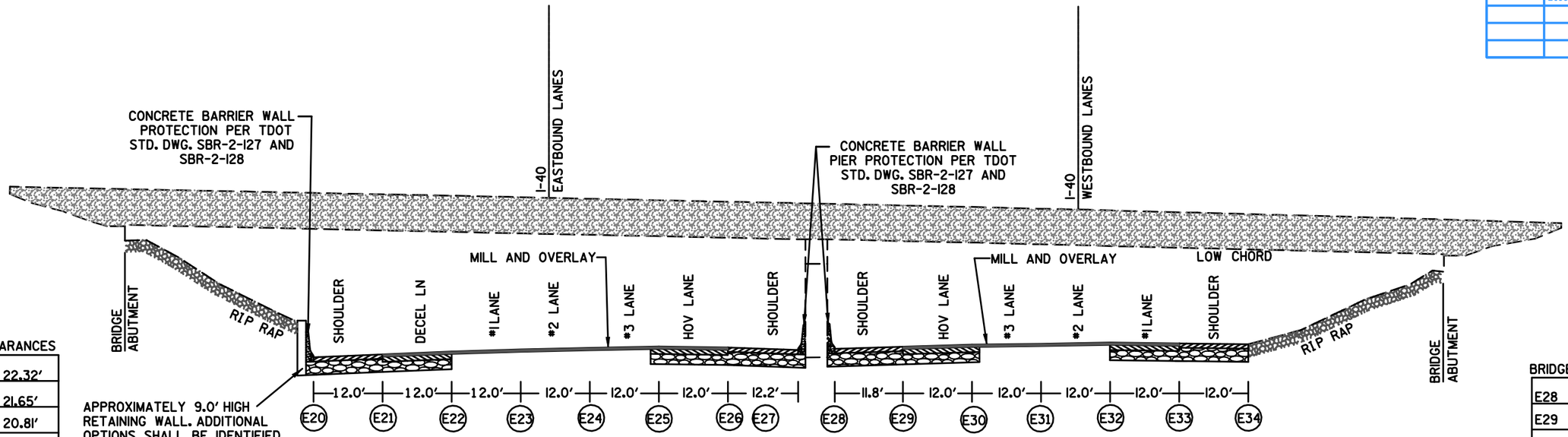
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	8



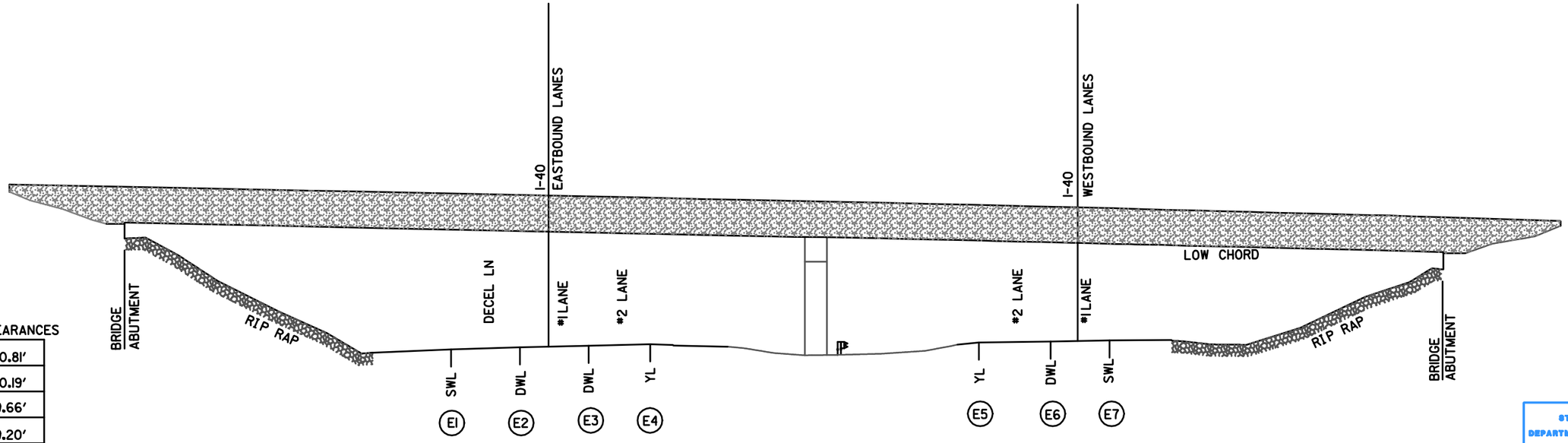
BRIDGE CLEARANCES

E20	=	22.32'
E21	=	21.65'
E22	=	20.81'
E23	=	20.19'
E24	=	19.66'
E25	=	19.17'
E26	=	19.08'
E27	=	19.25'

BRIDGE CLEARANCES

E28	=	19.01'
E29	=	18.38'
E30	=	17.75'
E31	=	17.30'
E32	=	16.79'
E33	=	16.64'
E34	=	16.51'

PROPOSED ROADWAY CONFIGURATION
I-40 @ HIGHWAY 109(EAST SIDE)
NORTHBOUND BRIDGE PROFILE



BRIDGE CLEARANCES

E1	=	20.81'
E2	=	20.19'
E3	=	19.66'
E4	=	19.20'
E5	=	17.73'
E6	=	17.25'
E7	=	16.79'

EXISTING ROADWAY CONFIGURATION
I-40 @ HIGHWAY 109(EAST SIDE)
NORTH BOUND BRIDGE PROFILE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ SR-109 NORTH BOUND EAST SIDE UNDERPASS
WILSON COUNTY

SCALE: 1" = 20'

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Appendix E

Capacity Analysis

HCS+: Basic Freeway Segments Release 5.2

Operational Analysis

Analyst:	McKaig
Agency or Company:	ARCADIS
Date Performed:	1/27/2011
Analysis Time Period:	A.M.
Freeway/Direction:	I-40 Eastbound
From/To:	West of SR 171
Analysis Year:	2033
Description:	Assumed: 15% of total volume in HOV lane.

Flow Inputs and Adjustments

Volume, V	2576	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	716	v
Trucks and buses	12	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1011	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1011	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	3	
Density, D	14.4	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.2

Operational Analysis

Analyst:	McKaig
Agency or Company:	ARCADIS
Date Performed:	1/27/2011
Analysis Time Period:	P.M.
Freeway/Direction:	I-40 Eastbound
From/To:	West of SR 171
Analysis Year:	2033
Description:	Assumed: 15% of total volume in HOV lane.

Flow Inputs and Adjustments

Volume, V	6035	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1676	v
Trucks and buses	12	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2369	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2369	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	54.5	mi/h
Number of lanes, N	3	
Density, D	43.4	pc/mi/ln
Level of service, LOS	E	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.2

Operational Analysis

Analyst:	McKaig
Agency or Company:	ARCADIS
Date Performed:	1/27/2011
Analysis Time Period:	A.M.
Freeway/Direction:	I-40 Westbound
From/To:	West of SR 171
Analysis Year:	2033
Description:	Assumed: 15% of total volume in HOV lane.

Flow Inputs and Adjustments

Volume, V	6221	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	1728	v
Trucks and buses	12	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	2442	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	2442	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S		mi/h
Number of lanes, N	3	
Density, D		pc/mi/ln
Level of service, LOS	F	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Basic Freeway Segments Release 5.2

Operational Analysis

Analyst:	McKaig
Agency or Company:	ARCADIS
Date Performed:	1/27/2011
Analysis Time Period:	P.M.
Freeway/Direction:	I-40 Westbound
From/To:	West of SR 171
Analysis Year:	2033
Description:	Assumed: 15% of total volume in HOV lane.

Flow Inputs and Adjustments

Volume, V	3409	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	947	v
Trucks and buses	12	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.943	
Driver population factor, fp	1.00	
Flow rate, vp	1338	pc/h/ln

Speed Inputs and Adjustments

Lane width	12.0	ft
Right-shoulder lateral clearance	6.0	ft
Interchange density	0.50	interchange/mi
Number of lanes, N	3	
Free-flow speed:	Measured	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	3.0	mi/h
Free-flow speed, FFS	70.0	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1338	pc/h/ln
Free-flow speed, FFS	70.0	mi/h
Average passenger-car speed, S	70.0	mi/h
Number of lanes, N	3	
Density, D	19.1	pc/mi/ln
Level of service, LOS	C	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS+: Ramps and Ramp Junctions Release 5.2

Diverge Analysis

Analyst:	McKaig
Agency/Co.:	ARCADIS
Date performed:	1/26/2011
Analysis time period:	A.M. Peak
Freeway/Dir of Travel:	I-40 Eastbound
Junction:	SR 171
Analysis Year:	2033
Description:	Assumed: 15% of total volume in HOV lane.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	2576	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	323	vph
Length of first accel/decel lane	780	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2576	323		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	716	90		v
Trucks and buses	12	12		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.943	0.943		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	3034	380		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v - v_F) P_{FD} = 1574$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	3034	6750	No
v_{12}	1574	4400	No
$v_{FO} = v - v_R$	2654	6750	No
v_R	380	3800	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D = 3.7$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	D_S = 0.462	
Space mean speed in ramp influence area,	S_R = 49.0	mph
Space mean speed in outer lanes,	S_O = 58.5	mph
Space mean speed for all vehicles,	S = 53.2	mph

HCS+: Ramps and Ramp Junctions Release 5.2

Diverge Analysis

Analyst:	McKaig
Agency/Co.:	ARCADIS
Date performed:	1/26/2011
Analysis time period:	P.M. Peak
Freeway/Dir of Travel:	I-40 Eastbound
Junction:	SR 171
Analysis Year:	2033
Description:	Assumed: 15% of total volume in HOV lane.

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	3	
Free-flow speed on freeway	55.0	mph
Volume on freeway	6035	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	1204	vph
Length of first accel/decel lane	780	ft
Length of second accel/decel lane	0	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	6035	1204		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	1676	334		v
Trucks and buses	12	12		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	0.00 %	0.00 %	%	
Length	0.00 mi	0.00 mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.943	0.943		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	7108	1418		pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 0.450 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD} = 3978$ pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	7108	6750	Yes
v_{12}	3978	4400	No
$v_{FO} = v_F - v_R$	5690	6750	No
v_R	1418	3800	No

Level of Service Determination (if not F)

Density, $D = 4.252 + 0.0086\, v_{12} - 0.009\, L_D = 24.4$ pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable,	$D_S = 0.556$	
Space mean speed in ramp influence area,	$S_R = 47.8$	mph
Space mean speed in outer lanes,	$S_O = 52.0$	mph
Space mean speed for all vehicles,	$S = 49.6$	mph

HCS+: Ramps and Ramp Junctions Release 5.2

Merge Analysis

Analyst:	McKaig
Agency/Co.:	ARCADIS
Date performed:	1/28/2011
Analysis time period:	A.M.
Freeway/Dir of Travel:	I-40 Westbound
Junction:	SR 171
Analysis Year:	2033

Description: Assumed: 15% of total volume in HOV lane.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	70.0	mph
Volume on freeway	3567	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	35.0	mph
Volume on ramp	3122	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	1500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	3567	3122		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	991	867		v
Trucks and buses	12	12		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.943	0.943		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	4201	3677		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.555 Using Equation 0

$v = v (P_{FM})$ = 2332 pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	7878	7200	Yes
v_{R12}	6009	4600	Yes

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 35.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence F

Speed Estimation

Intermediate speed variable, M_S = 1.734

Space mean speed in ramp influence area, S_R = 21.5 mph

Space mean speed in outer lanes, S_O = 65.1 mph

Space mean speed for all vehicles, S = 25.5 mph

HCS+: Ramps and Ramp Junctions Release 5.2

Merge Analysis

Analyst:	McKaig
Agency/Co.:	ARCADIS
Date performed:	1/28/2011
Analysis time period:	P.M.
Freeway/Dir of Travel:	I-40 Westbound
Junction:	SR 171
Analysis Year:	2033
Description:	Assumed: 15% of total volume in HOV lane.

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	3	
Free-flow speed on freeway	70.0	mph
Volume on freeway	2212	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	2	
Free-flow speed on ramp	35.0	mph
Volume on ramp	1408	vph
Length of first accel/decel lane	500	ft
Length of second accel/decel lane	1500	ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	2212	1408		vph
Peak-hour factor, PHF	0.90	0.90		
Peak 15-min volume, v15	614	391		v
Trucks and buses	12	12		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.943	0.943		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	2605	1658		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 0.555 Using Equation 0

$v = v (P_{FM})$ = 1446 pc/h

12 F FM

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	4263	7200	No
v_{R12}	3104	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 13.2 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, M_S = 0.233

Space mean speed in ramp influence area, S_R = 63.5 mph

Space mean speed in outer lanes, S_O = 67.6 mph

Space mean speed for all vehicles, S = 64.6 mph

HCS+: Freeway Weaving Release 5.2

Operational Analysis

Analyst:	McKaig
Agency/Co.:	ARCADIS
Date Performed:	1/27/2011
Analysis Time Period:	A.M.
Freeway/Dir of Travel:	I-40 Eastbound
Weaving Location:	SR 109 to Truck Park
Analysis Year:	2033
Description:	Assumed: 15% of total volume in HOV lane.

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1340	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.32	
Weaving ratio, R	0.03	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	1748	0	23	791	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	486	0	6	220	v
Trucks and buses	12	4	25	12	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.943	0.980	0.889	0.943	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	2058	0	28	931	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.71	0.38
Weaving and non-weaving speeds, Si	50.11	58.43
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		1.12
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	55.50	mph
Weaving segment density, D	18.12	pc/mi/ln
Level of service, LOS	B	
Capacity of base condition, cb	5722	pc/h

Capacity as a 15-minute flow rate, c	5398	pc/h
Capacity as a full-hour volume, ch	4858	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	959	2800	a
Average flow rate (pcphpl)	1005	2400	b
Volume ratio, VR	0.32	0.45	c
Weaving ratio, R	0.03	N/A	d
Weaving length (ft)	1340	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

HCS+: Freeway Weaving Release 5.2

Operational Analysis

Analyst:	McKaig
Agency/Co.:	ARCADIS
Date Performed:	1/27/2011
Analysis Time Period:	P.M.
Freeway/Dir of Travel:	I-40 Eastbound
Weaving Location:	SR 109 to Truck Park
Analysis Year:	2033
Description:	Assumed: 15% of total volume in HOV lane.

Inputs

Freeway free-flow speed, SFF	70	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1340	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	
Volume ratio, VR	0.21	
Weaving ratio, R	0.02	

Conversion to pc/h Under Base Conditions

	Non-Weaving		Weaving		
	V A-C	V B-D	V A-D	V B-C	
Volume, V	3451	0	21	872	veh/h
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	
Peak 15-min volume, v15	959	0	6	242	v
Trucks and buses	12	4	25	12	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.943	0.980	0.889	0.943	
Driver population adjustment, fP	1.00	1.00	1.00	1.00	
Flow rate, v	4064	0	26	1027	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
a (Exhibit 24-6)	0.15	0.00
b (Exhibit 24-6)	2.20	4.00
c (Exhibit 24-6)	0.97	1.30
d (Exhibit 24-6)	0.80	0.75
Weaving intensity factor, Wi	0.97	0.53
Weaving and non-weaving speeds, Si	45.41	54.18
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		0.91
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	52.11	mph
Weaving segment density, D	32.73	pc/mi/ln
Level of service, LOS	D	
Capacity of base condition, cb	6245	pc/h

Capacity as a 15-minute flow rate, c	5892	pc/h
Capacity as a full-hour volume, ch	5303	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded Maximum	See Note Note
Weaving flow rate, Vw	1053	2800	a
Average flow rate (pcphpl)	1705	2400	b
Volume ratio, VR	0.21	0.45	c
Weaving ratio, R	0.02	N/A	d
Weaving length (ft)	1340	2500	e

Notes:

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

Appendix F

Design Exceptions

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
NASHVILLE, TENNESSEE 37243-1402

DESIGN EXCEPTION REQUEST AND JUSTIFICATION FORM

TO: _____ , Division Administrator, FHWA

FROM: _____ ,

DATE: 1/31/2011

SUBJECT: **Design Exception Request**
Project No. 99108-7087-04
PIN 114169.00
Project Description: I-40 Lane Additions from Central Pike to East of SR-109

CONTROLLING CRITERIA FOR WHICH EXCEPTION IS REQUESTED:

Design Speed	☐	Lane Width	☐	Shoulder Width	☒	Grades	☐
Horizontal Alignment	☐	Vertical Alignment	☐	Cross Slopes	☐		
Stopping Sight Distance	☐	Superelevation	☐	Bridge Width	☐		
Horizontal Clearance (other than clear zone)	☐	Vertical Clearance	☐	Structural Capacity	☐		

DESIGN EXCEPTION REQUESTED:
Eastbound inside shoulder width along the Interstate 40 underpass at SR-171.

DESIGN DATA:

Highway Functional Classification: Interstate
Standard for the Above Classification: _____
Existing Posted Speed: 70 mph — Proposed Posted Speed: 70 mph
Type of Terrain: Flat to Rolling — Rural or Urban Area: Urban

Traffic Data: ADT (2011): 70,950 — D: 60% -40%
ADT (2031): 93,650 — T: 18%
DHV: 8,051 — V: _____

DESIGN FEATURES:

	Standard	Existing	Proposed	N/A
Cross Slope:				☒
Superelevation:				☒
Minimum Radius of Curve:				☒
Minimum Stopping Sight Distance:				☒
Minimum "K" Value for Crest Vertical Curve:				☒
Minimum "K" Value for Sag Vertical Curve:				☒
Maximum Grade:				☒

ROADWAY TYPICAL SECTION:

	Standard	Existing	Proposed	N/A
Horizontal Clearance: (other than the clear zone)				☒
Shoulder Widths:				☒
Outside Shoulders:	10' Paved	18.1'	10.3'	☒
Inside Shoulders:	10'	8.6'	4.0'	☒
Lane Width:	12'	12'	12'	☒

BRIDGE FEATURES:

	Standard	Existing	Proposed	N/A
Traffic Lane Widths:				☒
Outside Shoulder Widths:				☒
Inside Shoulder Widths:				☒
Load Capacity or Sufficiency Rating:				☒
Vertical Clearance				☐
To Waterway:				☒
To Other Highway:				☒
To Railroad:				☒

FACTORS CONSIDERED:

1) **Accident experience or data**
Data Available ☐ No Data Available ☒ Not Applicable ☐

2) **Effect of the variance from the design standards on safety and operation of the facility**
Effect considered ☒ No effect on the facility ☐ Not Applicable ☐
The only I-40 shoulder at the SR-171 underpass not meeting the minimum inside shoulder width of 10 feet and/or the minimum paved outside shoulder width of 10 feet is the east bound 4.0 feet wide inside shoulder. The impact to safety and operations should be minimum considering the narrow shoulder is located adjacent to an HOV lane and occurs only under the SR-171 overpass. The HOV lane is significant since an HOV lane typically carries less traffic during the peak hour than the regular travel lanes.

3) **Safety mitigation measures considered and provided**
Measures provided ☒ Measures not justified ☐ Not Applicable ☐
There is an existing bridge barrier wall along the edge of the eastbound inside shoulder.

4) **Compatibility of the design and operation with adjacent sections**
Considered ☐ Not a Consideration ☒ Not Applicable ☐

5) **Comparative cost of the full standard versus the lower design proposed**
Considered ☐ Not a Consideration ☐ Not Applicable ☒
Achieving the minimum 10 feet inside shoulder would require relocating an existing bridge pier. This would result in replacing the bridge which is cost prohibitive.

6) **Long term effect of the reduced design as compared to the full standard**
Considered ☒ Not a Consideration ☐ Not Applicable ☐
The long term effect should be minimal since an HOV lane carries a lower percentage of traffic than the three adjacent lanes.

7) **Difficulty obtaining the full standard such as right-of-way restriction, environmental impacts, etc.**
Considered ☒ Not a Consideration ☐ Not Applicable ☐
The issue is the limited distance between the existing bridge piers. The only option is to relocate a bridge pier which would require complete bridge replacement.

8) **Capacity reductions or operational reductions caused by the design**
Considered ☐ Not a Consideration ☐ Not Applicable ☒
Should have a limited impact on capacity since the shoulder is nearest the HOV lane and an HOV lane typically handles a lower percentage of the peak hour traffic.

9) **Level of service for the full standard versus the proposed design**
Considered ☐ Not a Consideration ☒ Not Applicable ☒

10) **Cumulative effect of more than one standard that is being reduced**
Considered ☐ Not a Consideration ☐ Not Applicable ☒

11) **Possibility of improving or achieving the full standard feature in the future**
Applicable ☐ Not Applicable ☒ Not on the state highway system ☐

The issue is the limited distance between the existing bridge piers. The only option is to relocate a bridge pier which would require complete bridge replacement.

DESIGN EXCEPTION AND JUSTIFICATION:
As stated above the eastbound I-40 inside shoulder at the SR-171 underpass does not meet the minimum shoulder width of 10 feet. A design exeception is requested for the 4.0 feet shoulder width. The limited shoulder width is caused by the location of the existing bridge piers. Relocating a bridge pier which would require a new bridge which is cost prohibitive. Additionaly, the 4.0 feet shoulder is located adjacent to an HOV lane. HOV lanes typically carry less traffic which should minimize the impacts. See the attached conceptual plan and bridge profiles for additional information.

ATTACHMENTS:
A location map, conceptual plan and bridge profiles showing both bridge faces along with existing and proposed roadway configurations are attached.

DESIGN EXCEPTION REVIEW COMMITTEE RECOMMENDATION FOR APPROVAL:

_____, Assistant Director, Design Division, Region 1

_____, Assistant Director, Design Division, Region 2

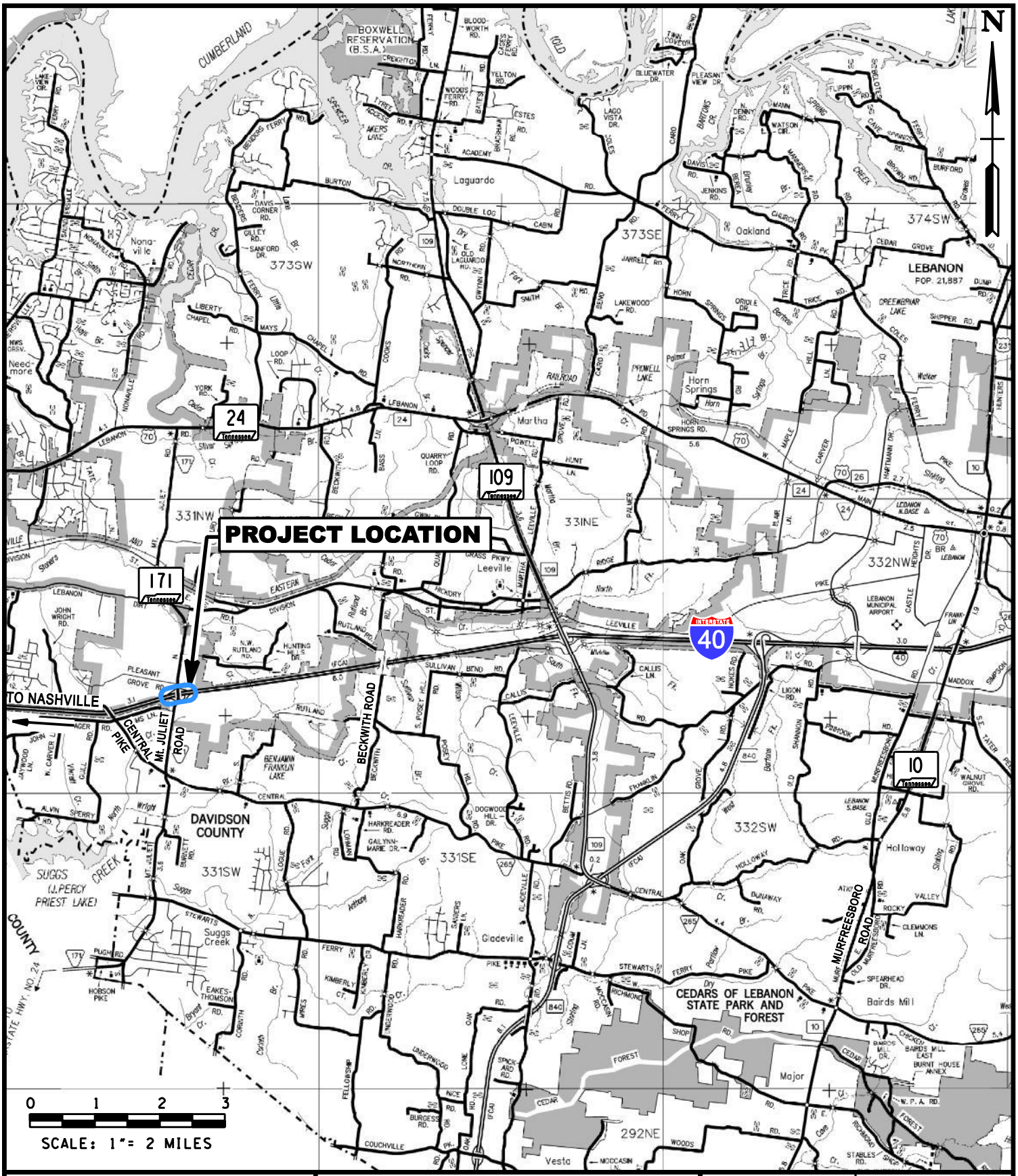
_____, Assistant Director, Design Division, Region 3

_____, Assistant Director, Design Division, Region 4

☐ Comments Attached

APPROVED: _____ _____
Division Administrator, FHWA **Date**

cc: Quality Assurance Section



LOCATION MAP
INTERSTATE 40 AT SR-171
DESIGN EXCEPTION
(WILSON COUNTY, TN)

DRAWN BY:	CHECKED BY:
TJC	HAM
P.I.N. 114169.00	
PROJECT NO. 99108-7087-04	
FIGURE 1	DATE: 02-02-11

TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO.

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	2

MATCH LINE

SEE SHEET 6

SEE SHEET 8

APPROXIMATE C.A.R.O.W.

171

SURVEY CONTROL POINT
2" PIPE WITH ARCADIS CAP
N 669613.024
E 1817214.768
EL 647.384

CONC. BARRIER

TYPE 13

11.3'

TYPE 38

10' SHLDR

12'

12'

12'

12'

10'

4.0'

12'

LM 3.1

12'

12'

12'

LM 3.2

TIE TO EXISTING GUARDRAIL

TYPE 2 GUARDRAIL

TYPE 38

LM 3.3

10' SHLDR

CONC BARRIER

6' SHLDR

12'

12'

8' SHLDR

10.5'

TIE TO EXISTING BARRIER WALL

SURVEY CONTROL POINT
2" PIPE WITH ARCADIS CAP
N 669237.417
E 1817176.685
EL 655.9760

EXIT 226 C
Belinda Pky
Providence Way
RAMP 30 MPH
RELOCATE

EXIT 226 B
171 NORTH
Mt Juliet
RAMP 30 MPH
RELOCATE

N

0 100' 200' 300'

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

I-40 LANE ADDITIONS
FROM CENTRAL PIKE
TO EAST OF SR-109

2/22/2011 10:00:10 AM
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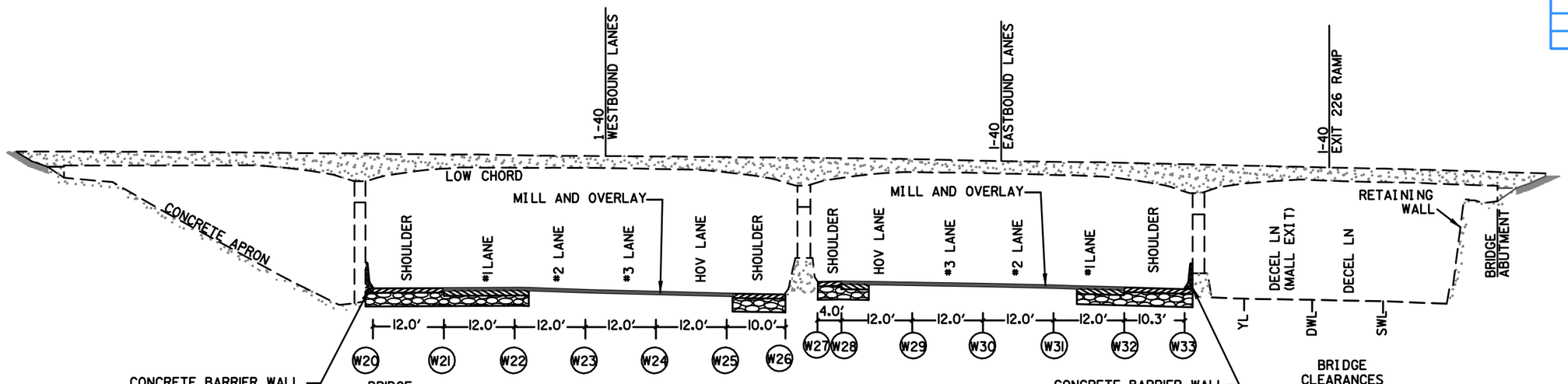
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	1



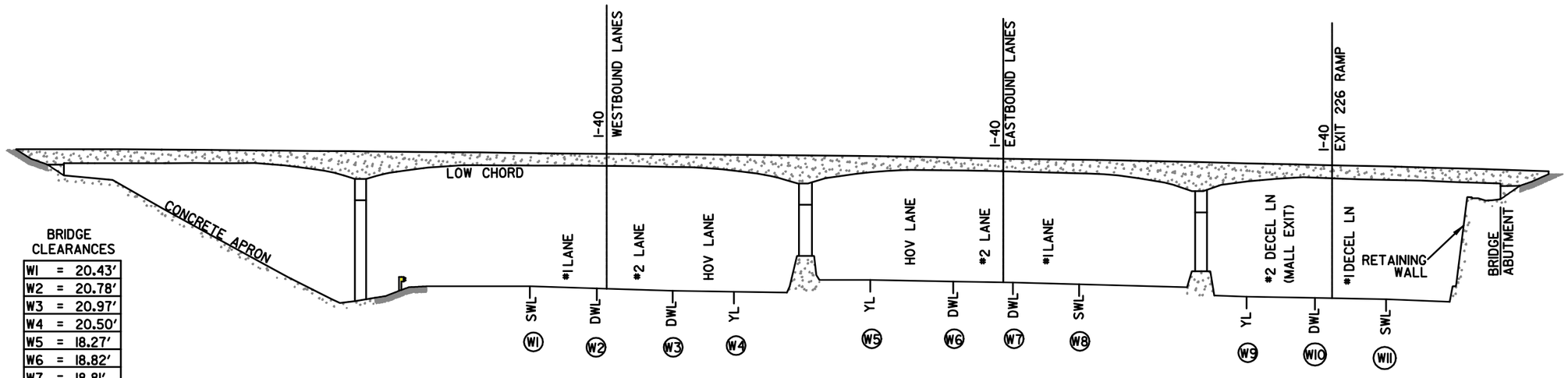
BRIDGE CLEARANCES

W20	= 18.61′
W21	= 20.30′
W22	= 20.41′
W23	= 20.74′
W24	= 20.86′
W25	= 20.63′
W26	= 19.02′

BRIDGE CLEARANCES

W27	= 16.90′
W28	= 17.58′
W29	= 18.78′
W30	= 18.83′
W31	= 18.79′
W32	= 18.45′
W33	= 16.58′

PROPOSED ROADWAY CONFIGURATION
I-40 @ SR-171 (WEST SIDE)
BRIDGE PROFILE



BRIDGE CLEARANCES

W1	= 20.43′
W2	= 20.78′
W3	= 20.97′
W4	= 20.50′
W5	= 18.27′
W6	= 18.82′
W7	= 18.81′
W8	= 18.79′
W9	= 19.53′
W10	= 20.35′
W11	= 20.22′

EXISTING ROADWAY CONFIGURATION
I-40 @ SR-171 (WEST SIDE)
BRIDGE PROFILE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ SR-171
WEST SIDE UNERPASS
WILSON COUNTY

SCALE: 1″ = 20′

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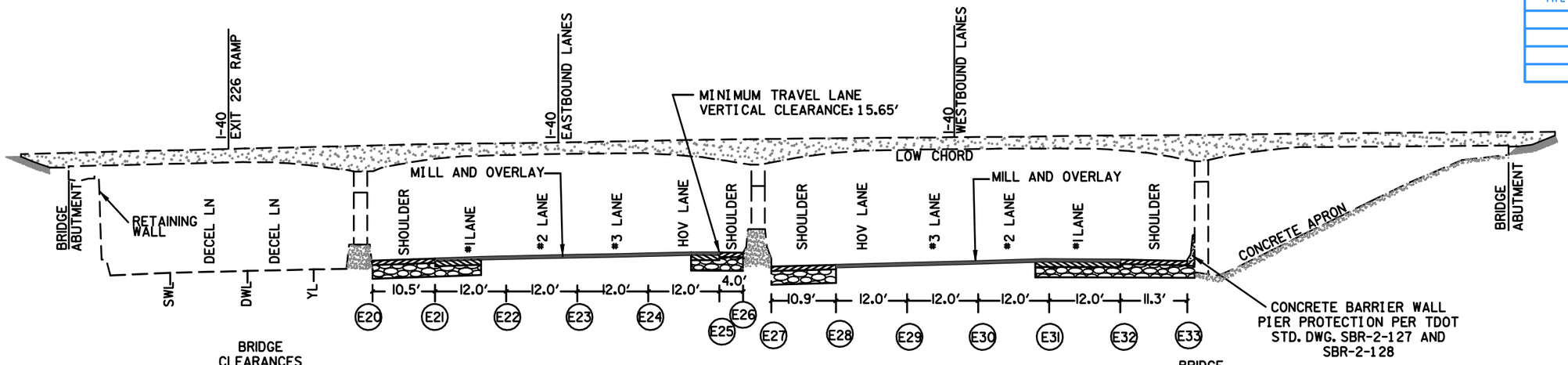
TENNESSEE D.O.T.
DESIGN DIVISION
FILE NO. ---

TYPE	YEAR	PROJECT NO.	SHEET NO.
	2011	99108-7087-04	2



BRIDGE CLEARANCES

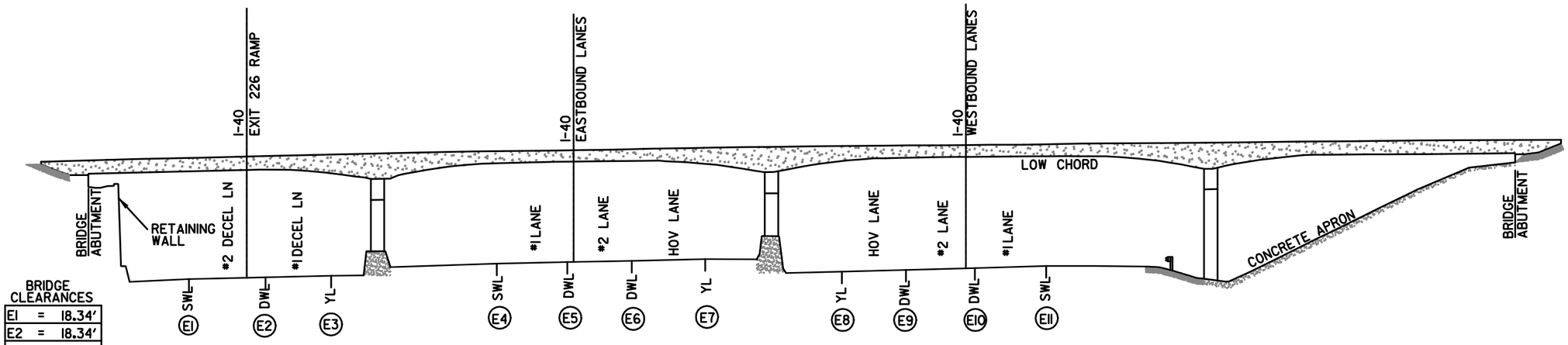
*	E20 =	15.34'
	E21 =	16.84'
	E22 =	17.12'
	E23 =	17.08'
	E24 =	16.87'
*	E25 =	15.65'
*	E26 =	15.05'

* BELOW 16 FEET MINIMUM VERTICAL CLEARANCE

BRIDGE CLEARANCES

E27 =	17.56'
E28 =	18.94'
E29 =	19.11'
E30 =	18.90'
E31 =	18.65'
E32 =	18.41'
E33 =	17.06'

PROPOSED ROADWAY CONFIGURATION
I-40 @ SR-171 (EAST SIDE)
BRIDGE PROFILE



BRIDGE CLEARANCES

E1 =	18.34'	
E2 =	18.34'	
E3 =	17.46'	
E4 =	17.07'	
E5 =	17.09'	
E6 =	17.01'	
E7 =	16.21'	
E8 =	18.84'	
E9 =	19.11'	
E10 =	18.95'	
E11 =	18.68'	

EXISTING ROADWAY CONFIGURATION
I-40 @ SR-171 (EAST SIDE)
BRIDGE PROFILE

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILES
I-40 @ SR-171
EAST SIDE UNDERPASS
WILSON COUNTY

SCALE: 1" = 20'

2/22/2011 8:15:15 AM
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