

DESIGN DIVISION
REG 3
RECEIVED

NOV 01 2002

STATE OF TENNESSEE
DEPT. OF TRANSPORTATION

PRELIMINARY ENGINEERING REPORT FOR:

**INTERCHANGE OF I-65 @ 8th AVENUE
NASHVILLE, TENNESSEE**

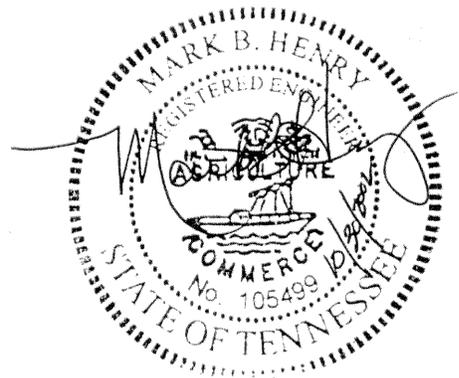
Date Submitted: September 25, 2002

PREPARED FOR:

Tennessee Department of Transportation

PREPARED BY:

HNTB Corporation
341 Cool Springs Blvd., Suite 210
Franklin, Tennessee 37067
Phone: (615) 778-0817
Fax: (615) 778-0818
Contact Person: Mark B. Henry, P.E.



INTERCHANGE OF I-65 @ 8th AVENUE

Preliminary Engineering Report Table of Contents

CHAPTER I – INTRODUCTION AND EXECUTIVE SUMMARY 1

 PART A – INTRODUCTION..... 1

 PART B - EXECUTIVE SUMMARY..... 2

CHAPTER II – EXISTING CONDITIONS..... 4

 PART A – INTRODUCTION..... 4

 PART B – STUDY AREA..... 4

 PART C – EXISTING FACILITY..... 4

 PART D – ACCIDENT AND SAFETY ANALYSIS 7

CHAPTER III – TRAFFIC..... 8

 PART A – EXISTING TRAFFIC 8

 PART B – FUTURE TRAFFIC 9

CHAPTER IV – PROPOSED IMPROVEMENTS..... 12

 PART A – RAMP A..... 12

 PART B – RAMP B..... 12

 PART C – RAMP C..... 12

 PART D – RAMP D..... 13

 PART E – 8th AVENUE..... 14

CHAPTER V – COSTS 15

APPENDIX A 16

 I-65 / 8TH AVENUE INTERCHANGE TURNING DIAGRAM 2003 AND 2023 ADT 16

 I-65 / 8TH AVENUE INTERCHANGE TURNING DIAGRAM 2023 DHV 17

 GARFIELD AVENUE TURNING DIAGRAM 2023 DHV 18

 DOMINICAN DRIVE TURNING DIAGRAM 2023 DHV 18

 VANTAGE WAY TURNING DIAGRAM 2023 DHV..... 19

 ATHENS WAY TURNING DIAGRAM 2023 DHV 19

 10TH AVENUE TURNING DIAGRAM 2023 DHV 20

CHAPTER I – INTRODUCTION AND EXECUTIVE SUMMARY

PART A – INTRODUCTION

The interchange of Interstate 65 (I-65) and 8th Avenue (State Route 12) is located at the northern edge of the Central Business District of Nashville between Interstate 40 and Interstate 24. See Exhibit A-1 for project location. The interchange was designed and constructed in the mid-1960's to carry a much lower ADT compared to the traffic that travels through the interchange today.

Location Map

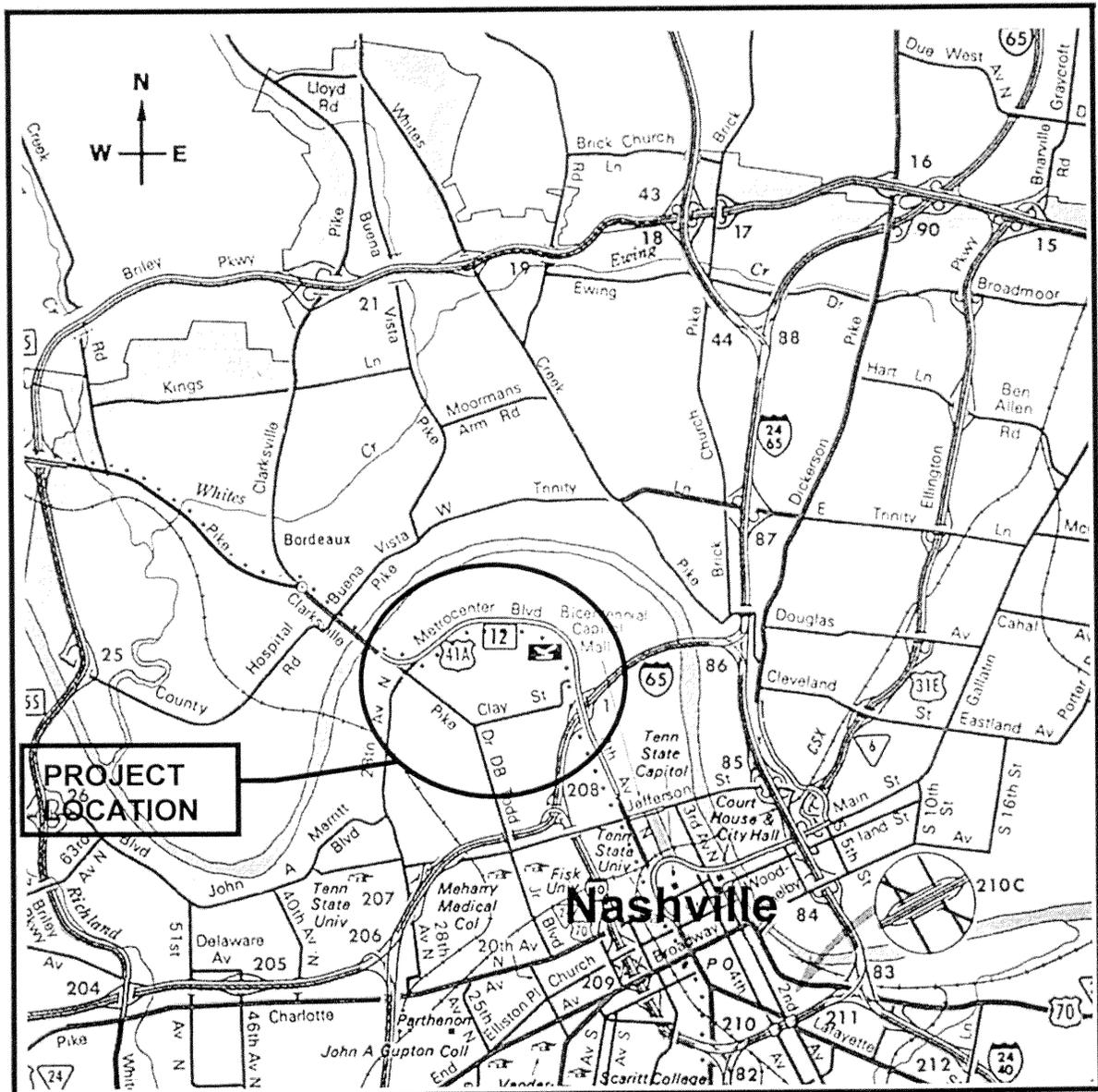


Exhibit A-1

HNTB Corporation (HNTB) was retained by the Tennessee Department of Transportation (TDOT) to develop a Preliminary Engineering Report to examine the interchange and recommend a scope of work that would improve the traffic operations of the interchange. This report documents the procedures, findings, and recommendations to improve the interchange traffic operations.

PART B - EXECUTIVE SUMMARY

The following is a summary of the Preliminary Engineering Report.

Study Area

The study area includes the interchange of Interstate 65 with State Route 12 (8th Avenue) and 8th Avenue from Garfield Avenue to 10th Avenue. The limits on I-65 are generally from the I-65 / I-24 Interchange to the north to the I-65 / I-40 Interchange to the south. The study area is shown in Exhibit A-2.

Traffic

The Tennessee Department of Transportation provided all traffic counts used in this report. Counts were collected in 2002 and projected for 2023. The METRO Public Works Department provided the traffic signal timing and phasing.

2001 Existing Traffic Operations

The existing traffic volumes, intersection and ramp geometrics, and traffic signal timings and phasing were used in the analysis of the existing conditions. Level of Service (LOS) analyses were performed to establish a baseline for the operational level of the interstate, ramps and intersections within the study area. The existing levels of service for the interstate and the ramp junctions were at an acceptable level with the minimum LOS being found on Ramp A in the AM with a LOS of D, Ramp C in the AM with a LOS of E, and Ramp D in the PM with a LOS of D. These levels of service are due to the large volumes using the interchange to access the north part of downtown Nashville in the AM and the same traffic departing downtown in the PM.

The existing levels of service along 8th Avenue did not meet acceptable levels. The levels of service ranged from C to F with little variation between the AM and PM peak times. Large commuter traffic volumes cause the delays at the signalized intersections

2023 Future Traffic Operations

The future traffic volumes were first applied to the existing intersection and ramp geometrics, and traffic signal timings and phasing to determine what would occur in the levels of service with no improvements to the existing infrastructure. As expected, there were diminished levels of service in nearly all areas. Ramps B and C actually failed in the AM with a LOS of F and likewise Ramps A and D in the PM.

Improvements were proposed for the ramps to help improve traffic operations. These improvements were analyzed using year 2023 traffic. The specific improvements and the resulting levels of service associated with each ramp follow this summary.

Recommended Improvements

The recommended improvements for both entrance ramps to I-65 (i.e., Ramps A and D) are to accommodate dual left turn lanes and a separate right turn lane from 8th Avenue. The lanes will form a two-lane entrance ramp to I-65. The second entrance ramp lane will be developed as an auxiliary lane. The new alignments will utilize as much of the existing ramp construction as possible.

The recommended improvements for Ramps B and C (i.e., the exit ramps) are to relocate the point of intersection with 8th Avenue closer to the center of the interchange to improve the alignment of each intersection. This will reduce the distances between opposing stop bars on 8th Avenue and help reduce delay in the intersections. The right turn lane onto 8th Avenue on both ramps will be realigned to create a stopping condition controlled by the ramp traffic signal. Ramps B and C will be modified to become two lane exit terminals with auxiliary lanes.

It is recommended that 8th Avenue be widened through the interchange to allow for dual left turns. These left turn lanes should be extended to provide additional queue area for vehicles. The proposed improvement will also require the widening of the 8th Avenue Bridge over I-65.

The signalized intersections of 8th Avenue with Garfield Avenue, Dominican Drive, Vantage Way, Athens Way and 10th Avenue are recommended to be coordinated with the interchange traffic signals to improve traffic flow along the corridor.

Study Area

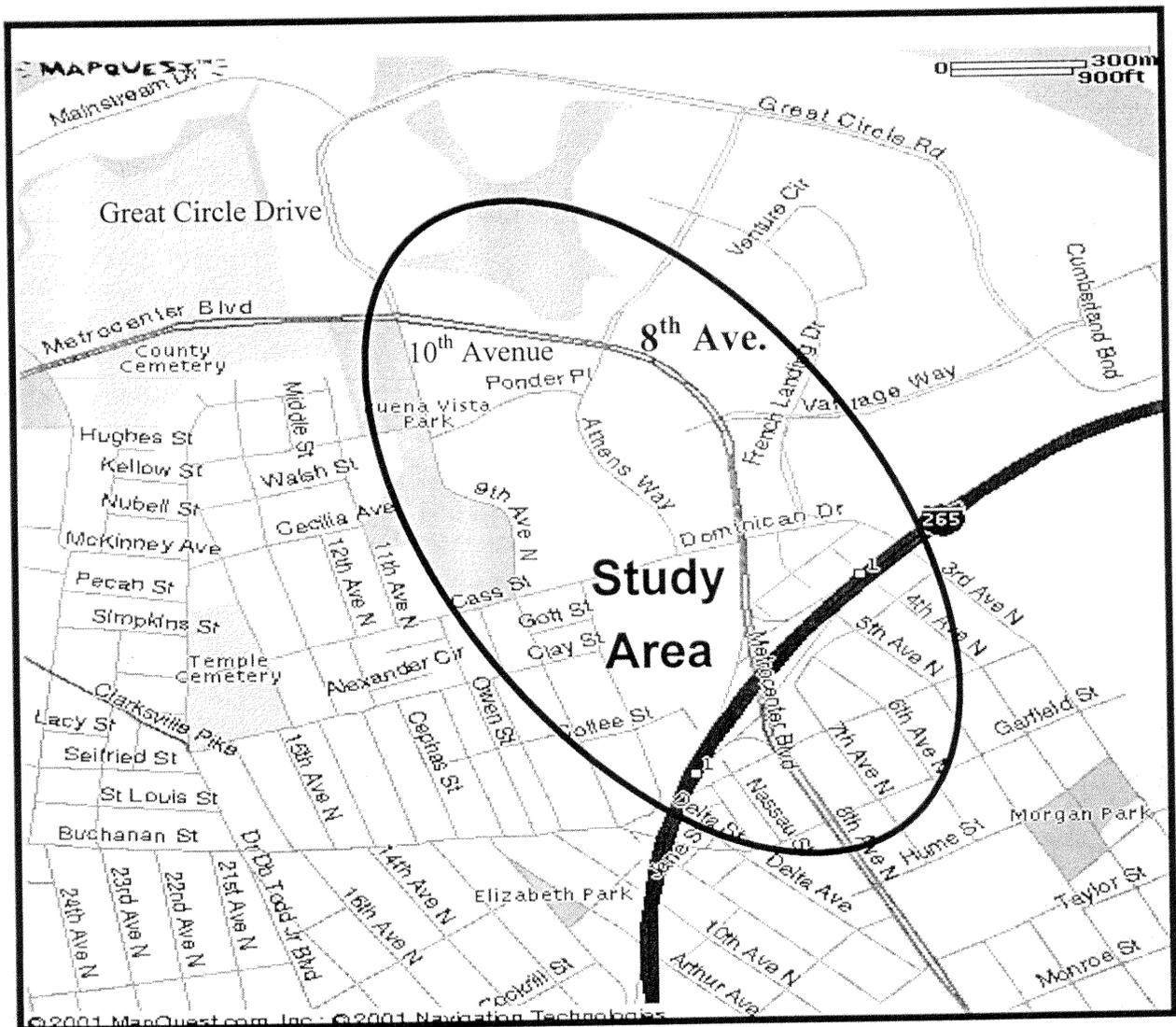


Exhibit A-2

CHAPTER II – EXISTING CONDITIONS

PART A – INTRODUCTION

The location map for this preliminary engineering report is shown in Exhibit A-1, and the study area is shown in Exhibit A-2. The Tennessee Department of Transportation (TDOT) initiated a project to improve the traffic flow at the 8th Avenue (SR 12) Interchange with Interstate 65 (I-65) in downtown Nashville. The first step towards making the interchange improvements was to task HNTB Corporation (HNTB) with the development of a scope of work. During the initial review with the TDOT staff, it was determined that an arterial analysis of 8th Avenue from Garfield Avenue to 10th Avenue should be included in the study. This preliminary engineering report represents the examination, evaluation and analysis of the interchange and arterial. HNTB applied current design standards and traffic volumes to determine the scope of work that improves the functionality of the interchange and Arterial.

PART B – STUDY AREA

The study area includes a section of I-65, a section of 8th Avenue, and the SR 12 Interchange at I-65. The I-65 study limits are generally from the I-65 / I-24 Interchange to the north to the I-65 / I-40 Interchange to the south. The variable width Right-of-Way (ROW) along I-65 is full access control. The 8th Avenue study limits extend from Garfield Avenue to 10th Avenue. The intersections along 8th Avenue at Garfield Avenue, Dominican Drive, Vantage Way, Athens Way and 10th Avenue are included in the study. The 8th Avenue ROW is a combination of full access control and partial access control. The area of full access control exists between the interchange ramps. Refer to Exhibit A-2 for the study area limits.

PART C – EXISTING FACILITY

The existing interstate and interchange were originally constructed in the late-1960's. Since their initial construction, several improvements have been made to the roadway facilities. Descriptions of the individual roadways included in the study are as follows:

Interstate 65 traverses the state from south to north passing through Nashville where it intersects both Interstates 24 and 40. The section of I-65 within our study area is oriented west to east but for the purposes of this report shall be referred to as south to north. The interchange is an urban design with six 12-foot traffic lanes, three in each direction with shoulders and a median barrier. The 2003 ADT south of the interchange is 81,240 vpd and 78,980 vpd to the north.

RAMP A (Southbound On-Ramp to I-65) is a single lane taper style entrance ramp from 8th Avenue to I-65 south. The ramp accommodates a single left turn lane and a single right turn lane from 8th Avenue. The right turn lane yields to the left turn lane. The 2003 ADT is 2,530 vpd for the left turning movements and 10,130 vpd for the right turning movements.

RAMP B (Northbound Off-Ramp to 8th Avenue) is a single lane parallel style exit ramp from I-65 northbound to 8th Avenue. The ramp begins as a continuation of the outside lane of the two-lane exit ramp from I-40 westbound from the I-40/I-65 Interchange. The ramp has a deceleration length of 1,700 feet and diverges to form a single right turn lane and dual left turn lanes with 8th Avenue. The right turn lane merges into 8th Avenue in a yield condition. The dual left turn lanes intersect 8th Avenue at the southern existing traffic signal. The 2003 ADT is 9,900 vpd for the left turning movements and 2,480 vpd for the right turning movements.

RAMP C (Southbound Off-Ramp to 8th Avenue) is a single-lane taper style exit ramp from I-65 to 8th Avenue. The ramp begins at the interstate with a single lane then divides into a second lane approximately 400-feet from the gore point. These lanes become dual left turning lanes at the northern interchange traffic signal on 8th Avenue. The rightmost of the left turn lanes splits to form a dual right lane that merges with 8th Avenue. The outer right turn lane joins 8th Avenue as a continuous turn lane to Dominican Drive. The inner lane yields to the outer 8th Avenue through traffic lane. The 2003 ADT is 2,550 vpd for the left turning movements and 9,830 vpd for the right turning movements.

RAMP D (Northbound On-Ramp to I-65) is a single-lane taper style entrance ramp from 8th Avenue to I-65 north. The ramp accommodates a single left turn lane and a single right turn lane from 8th Avenue. The right turn lane yields to the left turn lane. The 2003 ADT is 8,320 vpd for the left turning movements and 2,080 vpd for the right turning movements.

8th Avenue (State Route 12) is a four-lane divided major arterial with turn lanes that links the northern Central Business District (CBD) with the Metrocenter area residing to the north of I-65. The arterial continues northwest across the Cumberland River towards Clarksville, TN. The 2001 ADT south of the interchange is 20,630 vpd and 49,170 vpd to the north.

Garfield Avenue is primarily a two-lane roadway that provides access into residential areas. The western approach to 8th Avenue has a single lane dedicated for both left and right turning movements. In addition to the dual through lanes, 8th Avenue has a single lane dedicated for left turning movements from the northern and southern approaches. The 2003 ADT on Garfield Avenue is 7,950 vpd from the west and 3,940 vpd from the east. The 2003 ADT on 8th Avenue is 18,640 vpd from the south and 20,630 vpd from the north.

Dominican Drive is primarily a two-lane roadway that provides access to a mix of commercial and residential areas. The western approach to 8th Avenue has a single lane dedicated for both left and right turning movements; and the eastern approach has a single lane dedicated for left turn movements. In addition to the dual through lanes, 8th Avenue has a single lane dedicated for both left and right turning movements from the northern and southern approaches. The 2003 ADT on Dominican is 6,760 vpd from the west and 13,700 vpd from the east. The 2003 ADT on 8th Avenue is 49,170 vpd from the south and 36,710 vpd from the north.

Vantage Way is a four-lane roadway that provides access to commercial areas. The western approach originates from a cul-de-sac with a single lane dedicated for left turning movements and a single lane dedicated for left, through and right turning movements. The eastern approach has a single lane dedicated for left turn movements and a single lane dedicated to left, through and right turning movements. In addition to the dual through lanes, 8th Avenue has a single lane dedicated for left turning movements from the northern and southern approaches. The southern approach of 8th avenue also has a dedicated single lane for right turning movements. The 2003 ADT on Vantage Way is 3,070 vpd from the west and 9,340 vpd from the east. The 2003 ADT on 8th Avenue is 36,710 vpd from the south and 30,780 vpd from the north.

Athens Way is a multi-lane roadway that provides access to commercial areas. The western approach to 8th Avenue has a single lane dedicated for left and through movements and a single lane dedicated for right turn movements. The eastern approach has a single lane dedicated for left turn movements, a single lane dedicated for left and through movements, and a single lane dedicated for right turning movements. In addition to the dual through lanes, 8th Avenue has a single lane dedicated for left turning movements from the northern and southern approaches. The southern approach of 8th Avenue also has a single lane dedicated for right turning movements. The 2003 ADT on Athens Way is 1,920 vpd from the west and 5,640 vpd from the east. The 2003 ADT on 8th Avenue is 30,780 vpd from the south and 28,040 vpd from the north.

10th Avenue / Great Circle North is a multi-lane roadway that provides access to a mix of residential and commercial areas. The western approach to 8th Avenue has a single lane dedicated for left, through and right turning movements. The eastern approach has double lanes dedicated for left turn movements and a single lane dedicated for through and right turning movements. In addition to the dual through lanes, 8th Avenue has a single lane dedicated for left turning movements from the northern and southern approaches. The southern approach of 8th Avenue also has a single lane dedicated for right turning movements. The 2003 ADT on 10th Avenue / Great Circle North is 4,960 vpd from the west and 4,890 vpd from the east. The 2003 ADT on 8th Avenue is 28,040 vpd from the south and 27,110 vpd from the north.

Project Constraints

There are several physical constraints associated with this project that will limit the ramp improvements at the 8th Avenue Interchange. One constraint is the two bridge overpasses on I-65 to the north and south of the interchange. The 3rd Avenue Bridge over I-65 (north) is approximately 1,600 feet from the 8th Avenue Interchange Bridge with a horizontal clearance width of 155 feet. The Garfield Street Bridge over I-65 (south) is approximately 1,550 feet from the 8th Avenue Interchange Bridge with an approximate horizontal clearance width of 145 feet. Without shoulders, Interstate 65 utilizes 100 feet of the available horizontal width between the closed abutments under each bridge.

A second constraint is the I-65/I-40 Interchange at the south end of the study area. The I-65/I-40 Interchange will be accounted for in weave calculations associated with the redesign of the northbound exit ramp to 8th Avenue and the southbound entrance ramp from 8th Avenue. Its proximity to the 8th Avenue Interchange will affect a vehicle's ability to exit or enter the ramps.

PART D – ACCIDENT AND SAFETY ANALYSIS

Traffic accident data was examined for the years 1997, 1998 and 1999. The results are shown in Table 1.

Table 1
Accidents for Years 1997 through 1999

	Accident Types									
	Right Angle	Rear End	Out of Control	Side Swipe	Left Turn	Lane Change	Passing	Head On	Merge	Backing Vehicle
1997	10	37	7	11	0	2	0	3	2	1
1998	8	18	10	0	8	11	5	0	0	0
1999	11	40	8	23	0	0	0	7	1	0
TOTAL	29	95	25	34	8	13	5	10	3	1

Examination of the collision diagrams prepared by the Tennessee Department of Transportation display several high accident locations within the 8th Avenue Interchange. The leading type of accidents at the traffic signal and the ramp junctions are right angle, rear end, out of control and side-swipes. Although rear end collisions represent a majority of the accidents, all accident types are related to the inability for a vehicle to clear the traffic signal or ramp junctions. The failure to clear both locations is attributed to congestion and queuing in undesignated locations. Queues have formed on the interstate and the interstate shoulders due to limited storage areas on the ramps.

The improvement goals will be to maximize storage areas for queues that will separate slowed and stopped vehicles from the through traffic and to minimize delays at the signalized intersections. These improvements will help reduce the number of accidents in the interchange area.

CHAPTER III – TRAFFIC

PART A – EXISTING TRAFFIC

Level of Service analyses were performed for all signalized intersections, ramps, and interstate lanes in the study area utilizing the Highway Capacity Software 2000 (HCS2000). TDOT furnished the existing and future traffic volumes. The METRO Department of Public Works provided all traffic signal timing and phasing.

Ramp Junctions

The analysis of the ramp junctions results in acceptable levels of service for most ramps. Ramp C reflects a LOS of E during the AM Peak Hour. The LOS signifies that the ramp is reaching capacity and causing queues to form on both the ramp and interstate. Ramp A in the AM Peak and Ramp D in the PM Peak both show levels of service of D. LOS of D indicates a tendency for vehicles to slow down to accommodate either merging or diverging maneuvers. Queues may form on Ramp D, but the interstate lanes operation should remain stable. This is the expected pattern of levels of service due to the AM traffic using Ramp C to access the northern part of the CBD and the reverse in the PM with commuter traffic using Ramp D to access the interstate. See Table 2 for the levels of service on all ramp junctions.

Table 2
2003 Existing Peak Hour Operating Conditions – Ramp Junctions

	Level of Service at Ramp Junctions			
	Ramp A	Ramp B	Ramp C	Ramp D
AM Peak	D	B	E	B
PM Peak	C	B	C	D

Interstate 65

The AM and PM Peak traffic flows for Interstate 65 result in a LOS of C. A LOS of C indicates a level at which speed begins to decline slightly with increasing flows. The driver experiences comfortable driving conditions with slight speed adjustment to accommodate ramp maneuvers. Table 3 summarizes the levels of service for I-65.

Table 3
2003 Existing Peak Hour Operating Conditions – Interstate 65

Interstate 65 Analysis		
	Direction	Level of Service
AM Peak	NB	C
PM Peak	SB	C

8th Avenue (State Route 12)

The traffic signals at Garfield Avenue, north and south ramp intersections at I-65, Dominican Drive, Vantage Way, Athens Way, and 10th Avenue were analyzed as individual intersections using the existing signal timings. The resulting levels of service varied from a LOS of C to a LOS of F. At these levels, the intersections are congested with several traffic signal phases unable to serve all queued vehicles. Table 4 summarizes the levels of service for the 8th Avenue intersections.

Table 4
2003 Existing Peak Hour Operating Conditions - Intersections

Intersection	Peak Hour	Traffic Control	Level of Service per Movement by Approach											
			Southbound			Westbound			Northbound			Eastbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Garfield Avenue	AM	Traffic Signal	D	D	D	C	C	C	D	D	E	E	D	D
	PM	Traffic Signal	D	D	D	B	E	E	D	D	D	E	C	C
8 th Avenue South Intersection w/I-65	AM	Traffic Signal	-	-	-	-	C	B	F	-	-	F	A	-
	PM	Traffic Signal	-	-	-	-	D	C	F	-	-	F	B	-
8 th Avenue North Intersection w/I-65	AM	Traffic Signal	B	-	-	F	F	-	-	-	-	-	F	F
	PM	Traffic Signal	D	-	-	C	B	-	-	-	-	-	F	F
Dominican Drive	AM	Traffic Signal	F	C	B	F	F	F	B	C	B	E	E	F
	PM	Traffic Signal	E	C	B	F	D	D	B	F	B	D	D	F
Vantage Way	AM	Traffic Signal	B	C	C	C	C	C	F	C	B	C	C	C
	PM	Traffic Signal	B	D	D	B	F	F	B	F	C	C	B	B
Athens Way	AM	Traffic Signal	D	D	D	F	C	B	D	D	D	B	C	C
	PM	Traffic Signal	F	D	F	E	C	B	D	D	D	B	C	C
10 th Avenue	AM	Traffic Signal	C	C	C	C	B	B	F	F	F	A	E	E
	PM	Traffic Signal	D	D	D	B	D	C	F	F	F	C	C	C

PART B – FUTURE TRAFFIC**Ramp Junctions**

The future traffic volumes were first applied to the existing intersection and ramp geometrics and traffic signal timings to determine the levels of service outcome with no improvements to the existing infrastructure. As expected, there were diminished levels of service in nearly all areas. Ramps B and C actually failed in the AM with a LOS of F and likewise Ramps A and D failed in the PM. (See Table 5.) A LOS of F represents breakdown or unstable operation. At this level, approach demand exceeds the discharge capacity of the downstream interstate and ramp. In the case of diverging areas, queues form on the interstate and on-ramps and continue to grow as long as approaching demand exceeds the discharge capacity of the section.

Ramps A and B failed due to the volume of traffic entering and exiting the interstate via the ramp. The capacity of the single existing lane is not sufficient to carry the volume without failing.

Ramp C failed due to the volume of traffic to the ramp and also due to the volume of traffic in the first and second interstate lanes adjacent to the ramp. Ramp D also failed due the volume of traffic in the first and second interstate lanes.

Table 5**2023 Future Peak Hour Operating Conditions – Ramp Junctions (Existing Facility)**

	Level of Service at Ramp Junctions			
	Ramp A	Ramp B	Ramp C	Ramp D
AM Peak	E	F	F	B
PM Peak	F	C	C	F

Modifications to the interchange can be seen on the accompanying functional drawing. This modified interchange was analyzed using the 2023 DHV's. The modifications and results of the analysis are discussed in CHAPTER IV.

Interstate 65

Traffic volumes for Interstate 65 remain at a LOS of C for both the AM and PM. Table 6 summarizes the levels of service for I-65.

Table 6**2023 Future Peak Hour Operating Conditions – Interstate 65**

Interstate 65 Analysis		
	Direction	Level of Service
AM Peak	NB	C
PM Peak	SB	C

8th Avenue (State Route 12)

The intersections along 8th Avenue were analyzed as individual intersections. The 2008 and 2023 signal timings were adjusted to improve the intersection. The future traffic volumes resulted in levels of service decreases at all intersections. The traffic volumes exceeded lane capacity creating the potential for excessive delays. Table 7 summarizes the intersection levels of service for the year 2008. Table 8 summarizes the intersection LOS for the year 2023.

Table 7
2008 Future Peak Hour Operating Conditions - Intersections

Intersection	Peak Hour	Traffic Control	Level of Service per Movement by Approach											
			Southbound			Westbound			Northbound			Eastbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Garfield Avenue	AM	Traffic	E	E	E	C	B	B	F	D	D	B	E	E
	PM	Signal	E	E	E	E	D	D	E	D	F	C	C	C
8 th Avenue South Intersection w/I-65	AM	Traffic	-	-	-	-	D	D	F	-	C	D	C	-
	PM	Signal	-	-	-	-	D	B	D	-	C	F	B	-
8 th Avenue North Intersection w/I-65	AM	Traffic	C	-	F	D	E	-	-	-	-	-	C	A
	PM	Signal	C	-	D	F	C	-	-	-	-	-	C	B
Dominican Drive	AM	Traffic	F	A	A	F	E	E	F	F	F	D	E	E
	PM	Signal	D	F	A	F	F	F	F	F	B	D	D	D
Vantage Way	AM	Traffic	F	F	F	D	D	D	D	C	B	D	D	D
	PM	Signal	C	E	E	F	D	D	C	C	B	D	D	D
Athens Way	AM	Traffic	D	D	D	F	C	B	D	D	D	C	F	F
	PM	Signal	F	D	F	C	F	B	D	D	D	C	F	F
10 th Avenue	AM	Traffic	E	E	E	F	D	D	F	F	F	C	F	F
	PM	Signal	D	F	F	D	D	B	F	F	F	C	D	D

Table 8
2023 Future Peak Hour Operating Conditions - Intersections

Intersection	Peak Hour	Traffic Control	Level of Service per Movement by Approach											
			Southbound			Westbound			Northbound			Eastbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Garfield Avenue	AM	Traffic	E	E	E	D	D	D	F	D	D	D	F	F
	PM	Signal	F	F	F	F	F	F	D	D	E	C	F	F
8 th Avenue South Intersection w/I-65	AM	Traffic	-	-	-	-	D	D	F	-	C	D	E	-
	PM	Signal	-	-	-	-	E	B	E	-	C	F	C	-
8 th Avenue North Intersection w/I-65	AM	Traffic	C	-	F	E	F	-	-	-	-	-	C	A
	PM	Signal	C	-	E	F	B	-	-	-	-	-	E	D
Dominican Drive	AM	Traffic	F	F	B	F	F	F	F	F	F	F	F	F
	PM	Signal	D	F	B	F	F	F	F	F	B	D	D	F
Vantage Way	AM	Traffic	C	F	F	F	C	C	D	F	C	C	D	D
	PM	Signal	D	F	F	B	B	B	C	F	C	B	B	B
Athens Way	AM	Traffic	E	D	F	F	E	D	D	D	E	D	F	F
	PM	Signal	F	E	D	E	F	B	D	D	D	C	F	F
10 th Avenue	AM	Traffic	C	C	C	C	C	C	F	F	F	B	F	F
	PM	Signal	D	E	E	D	F	C	F	F	F	C	F	F

CHAPTER IV – PROPOSED IMPROVEMENTS

PART A – RAMP A

The proposed Ramp A improvements include widening of the ramp, extension of the acceleration lane, and modifications to the right turn lane. The widening of the ramp from one-lane to two-lane is needed to accept the dual turning movements proposed on 8th Avenue. The two-lane cross section continues approximately 300 feet from the intersection before merging into a single lane. The remaining lane continues 1,000 feet beyond the gore point before merging with I-65. Any further modification to Ramp A is restrained by the Garfield Avenue overpass and the I-65/I-40 Interchange. The overpass restricts horizontal clearance width along I-65 and the interchange limits the weaving distance. The improvements to the right turn lane are increased storage capacity along 8th Avenue. The right turning movements remain a yield to left turning traffic from 8th Avenue.

These improvements result in a LOS of C in the AM until the year 2005 and in the PM until the year 2007. After these years, both AM and PM become a LOS of D. At a LOS of C, the average speed within the ramp area begins to decline, as the effect of merging turbulence becomes noticeable. Both interstate and on-ramp vehicles begin to adjust their speeds to accommodate smooth merging maneuvers. Driving conditions are still relatively comfortable at this level. For a LOS of D, turbulence levels become intrusive and virtually all vehicles slow to accommodate merging maneuvers.

PART B – RAMP B

Ramp B improvements include the realignment of the ramp with 8th Avenue and the extension of the existing auxiliary lane. The ramp intersection with 8th Avenue is proposed to coincide with Ramp D. The new location will reduce the distance between opposing traffic on 8th Avenue and reduce delays in the intersection. As part of the realignment, the right turn lane onto 8th Avenue will be modified to a stopping condition controlled by the ramp intersection traffic signal.

The Ramp B improvements provide a LOS of B for both the AM and PM Peak traffic. A LOS of B represents unrestricted operations. Density is low enough to permit merging and diverging maneuvers without disruption to through vehicles. There is virtually no noticeable turbulence in the ramp influence area, and speeds remain close to the expected basic interstate section level.

PART C – RAMP C

Improvements proposed to Ramp C include realignment of the ramp with 8th Avenue and the addition of an auxiliary lane along I-65. Ramp C alignment is proposed to coincide with Ramp A. The new intersection is intended to reduce the distance between opposing traffic on 8th Avenue and reduce the delays in the intersection. The right turn lanes were realigned to 8th Avenue to create a stopping condition. The configuration is intended to eliminate the merging of the ramp lane into a through lane.

The improvements to Ramp C initially provide a LOS of A for the PM Peak traffic and a LOS of C for the AM Peak traffic. After 2007, ramp volumes become critical during the AM Peak traffic and result in a LOS of F.

PART D – RAMP D

The future traffic volumes were applied to the modified ramp configuration for Ramp D. The single left turn from 8th Avenue was modified into a dual left turn and Ramp D was modified to accept two left turn lanes from 8th Avenue. Ramp D was modified to accept a separate right turn lane from 8th Avenue that merges with the two-lane section with required tapers. This results in a cross section of three lanes near the intersection with 8th Avenue. This cross section merges to two lanes downstream from the intersection. The two lane configuration continues for 850 feet then merges to a single lane for another 850 feet before ending with a 300-foot transition. This creates an auxiliary lane within the two-lane entrance ramp.

The improvements to Ramp D provide a LOS of B in the PM until 2007 due to the traffic volume on the ramp. After 2007, the ramp volume becomes a critical factor and results in a LOS of F.

Table 9
2008 Future Peak Hour Operating Conditions – Ramp Junctions
(With Proposed Improvements)

	Level of Service at Ramp Junctions			
	Ramp A	Ramp B	Ramp C	Ramp D
AM Peak	D	B	F	A
PM Peak	D	B	A	F

Table 10
2023 Future Peak Hour Operating Conditions – Ramp Junctions
(With Proposed Improvements)

	Level of Service at Ramp Junctions			
	Ramp A	Ramp B	Ramp C	Ramp D
AM Peak	D	B	F	A
PM Peak	F	B	B	F

PART E – 8th AVENUE

8th Avenue is proposed to be widened to allow for dual left turns in both directions at the two interchange intersections. The widening requires an additional 12 feet be added to each side of the bridge over I-65. These left turn lanes were also extended in both directions along 8th Avenue to increase the stacking area for turning vehicles and to help separate turning traffic from through traffic to increase the efficiency of the intersections.

With the relocation of the intersection points of both Ramps B and C with 8th Avenue, the corresponding intersections are more compact with respect to the distances vehicles have to travel to clear the intersection. This will improve the efficiency of the intersections and reduce delay.

Additional intersection efficiency will occur with traffic signal coordination with adjacent intersections. The intersections of Garfield Avenue, Dominican Way, Vantage Way, Athens Way, and 10th Avenue/Great Circle Drive should be included in the final traffic signal sequencing.

CHAPTER V – COSTS**ROADWAY OPINION OF PROBABLE CONSTRUCTION COSTS
INTERCHANGE IMPROVEMENTS**PROJECT: Interstate 65 at 8th Avenue Interchange

LOCATION: Davidson County

RIGHT-OF-WAY

LAND, IMPROVEMENTS & DAMAGES	(# Acres 1.00)	\$ 150,000
INCIDENTALS	(# Tracts 5)	\$ 12,500
RELOCATION PAYMENTS	(Residences 1)	\$ 25,000
	(Businesses 0)	
	(Non-Profits 0)	

Total Right-of-Way Costs \$ 187,500

UTILITY RELOCATION

Reimbursable
Non-Reimbursable

Total Utility Adjustment Cost \$ 0

CONSTRUCTION

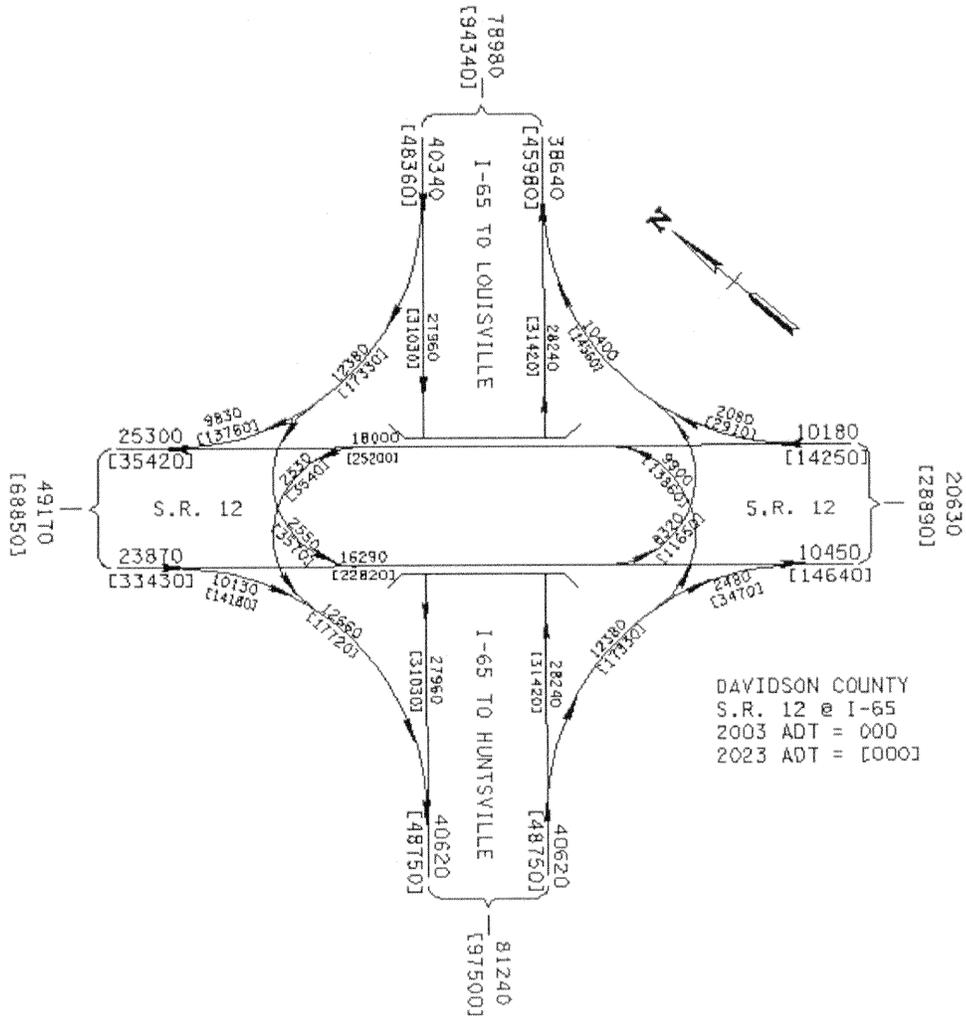
Clearing and Grubbing	\$ 50,000
Earthwork	\$ 280,000
Pavement Removal	\$ 50,000
Drainage	\$ 130,000
Structures	\$ 1,280,000
Railroad Crossing	\$ 0
Paving	\$ 1,020,000
Retaining Walls	\$ 235,000
Maintenance of Traffic	\$ 50,000
Topsoil	\$ 5,000
Seeding	\$ 5,000
Sodding	\$ 5,000
Signing	\$ 100,000
Signalization	\$ 270,000
Fence	\$ 25,000
Guardrail	\$ 50,000
Rip-Rap of Slope Protection	\$ 10,000
Other Construction (8.5%)	\$ 303,025
Mobilization	\$ 179,061
10% Contingency	\$ 404,709

Total Construction Cost \$ 4,451,795
Preliminary Engineering (10% of Const.) \$ 445,179

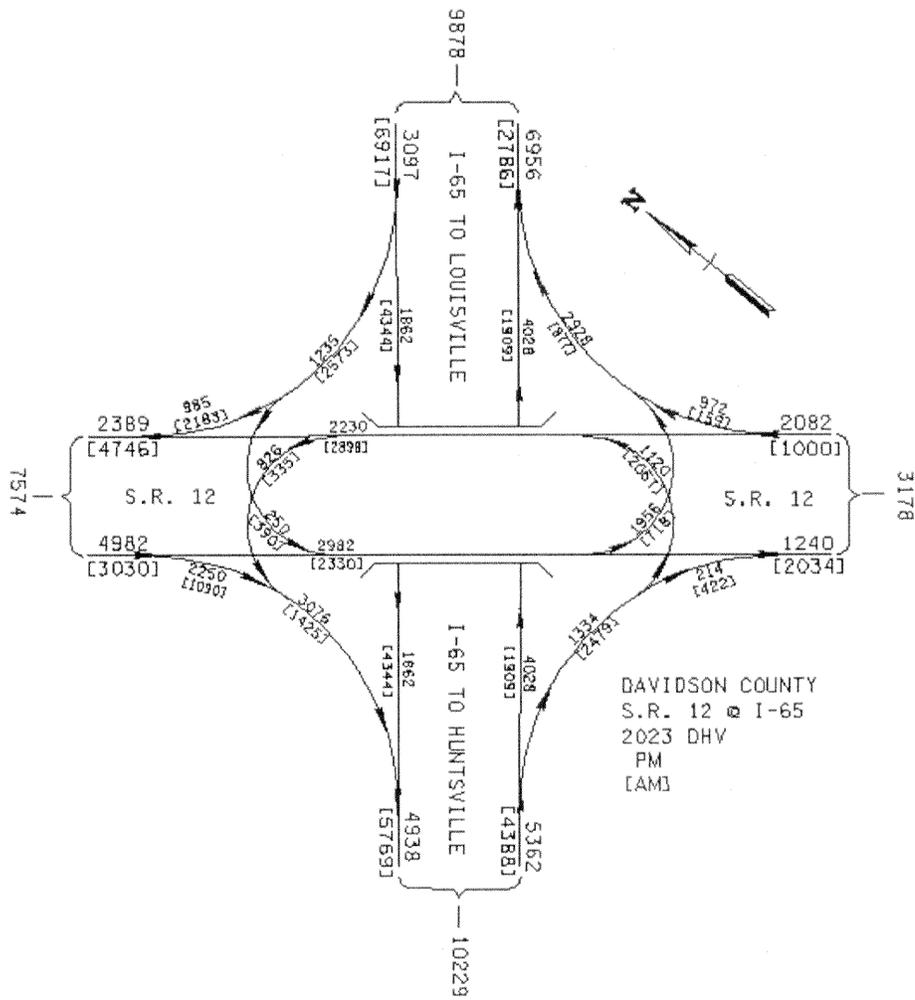
TOTAL COST OF IMPROVEMENTS**\$5,084,474**

APPENDIX A

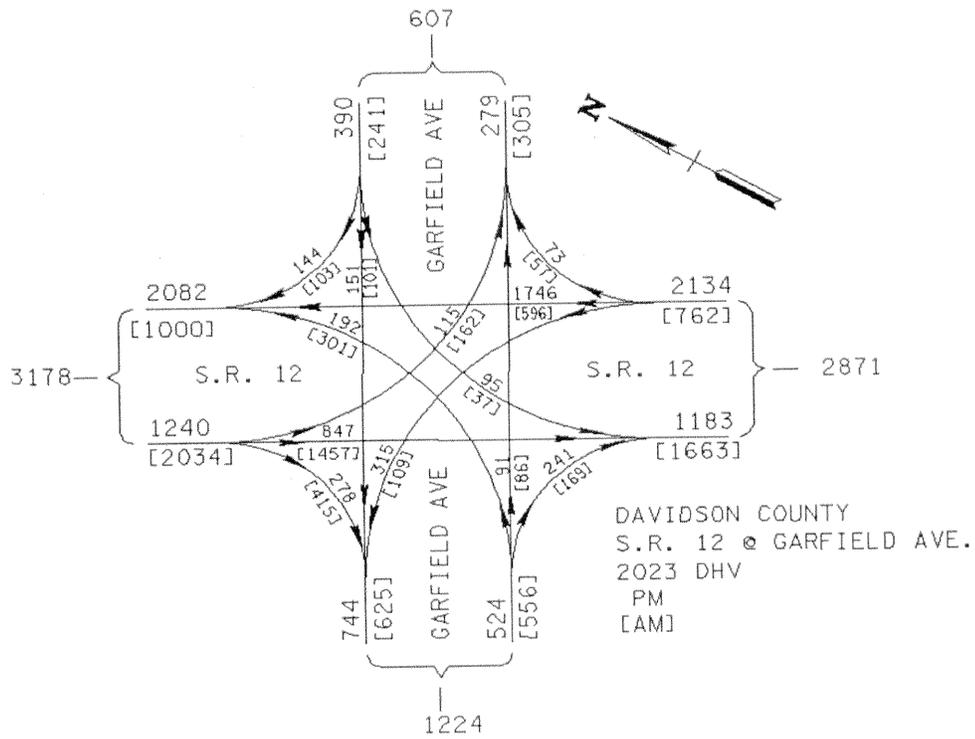
I-65 / 8TH AVENUE INTERCHANGE TURNING DIAGRAM 2003 AND 2023 ADT



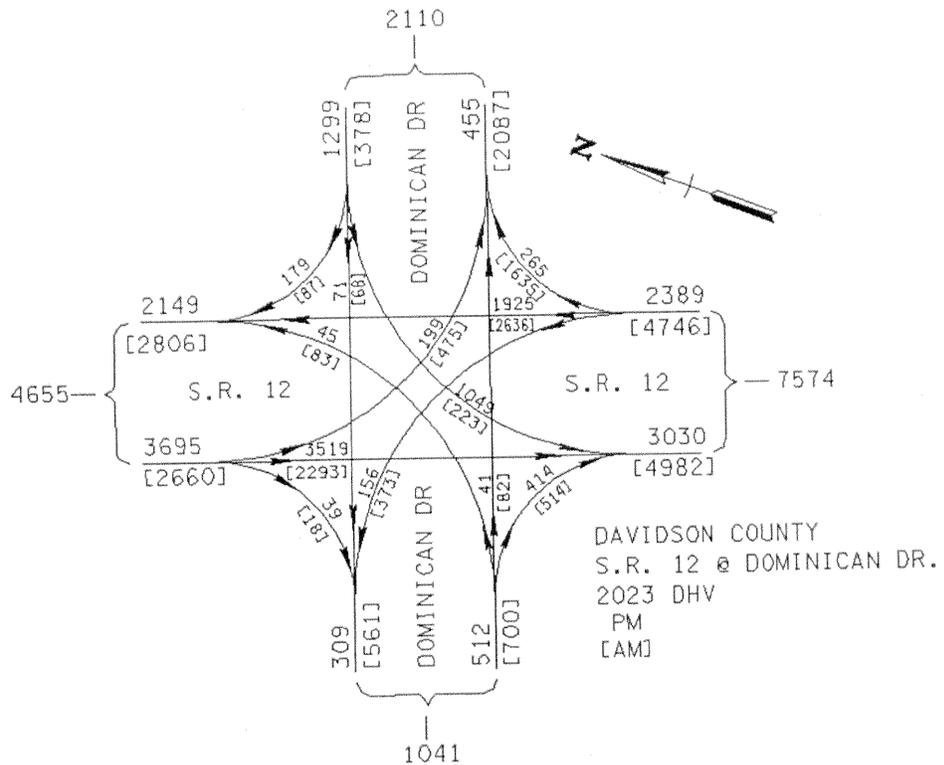
I-65 / 8TH AVENUE INTERCHANGE TURNING DIAGRAM 2023 DHV



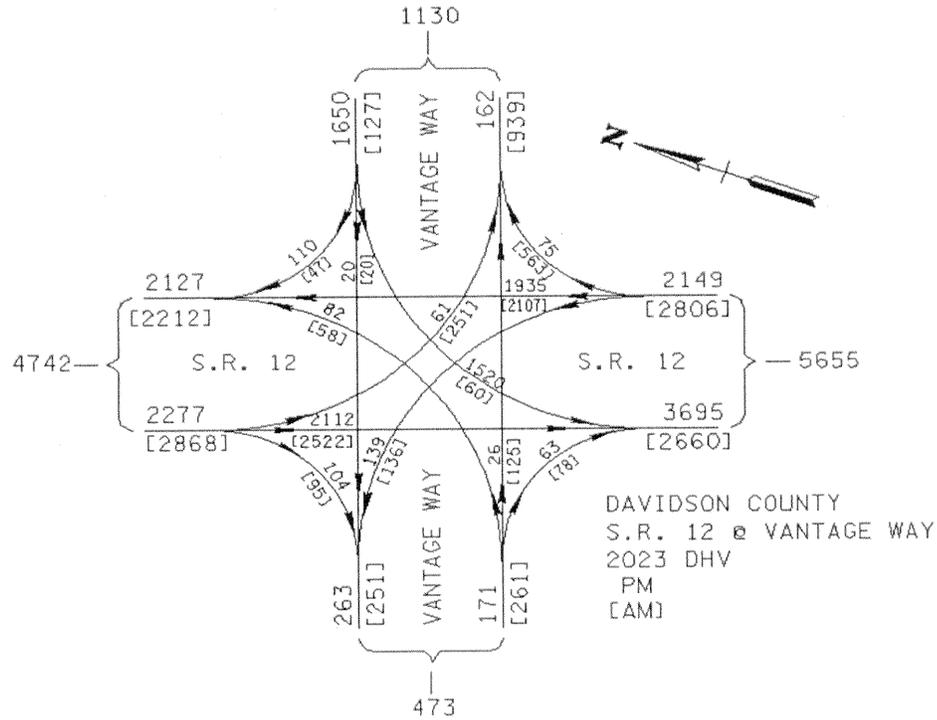
GARFIELD AVENUE TURNING DIAGRAM 2023 DHV



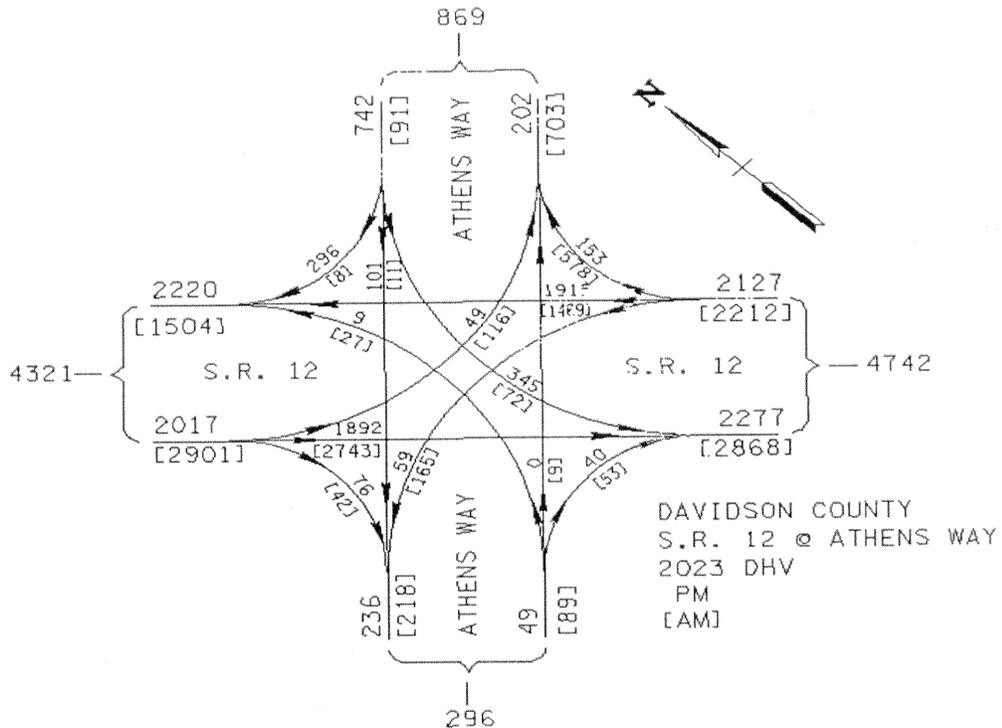
DOMINICAN DRIVE TURNING DIAGRAM 2023 DHV



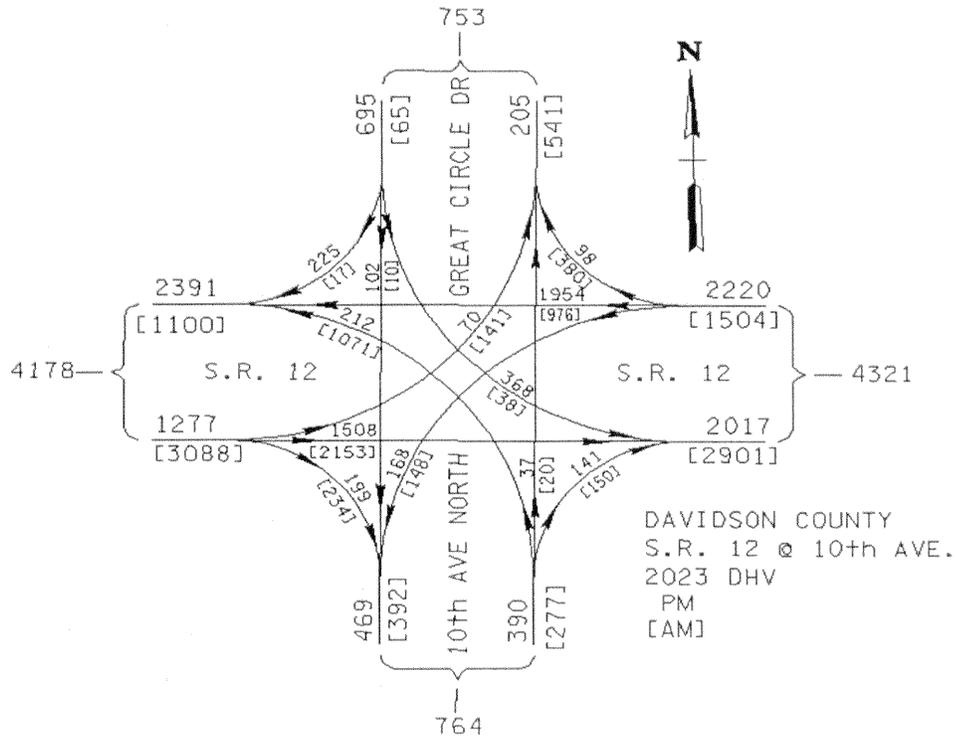
VANTAGE WAY TURNING DIAGRAM 2023 DHV



ATHENS WAY TURNING DIAGRAM 2023 DHV



10TH AVENUE TURNING DIAGRAM 2023 DHV



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

Index Of Sheets

SHEET NO.	DESCRIPTION
1.....	TITLE SHEET
2-2A.....	TYPICAL SECTIONS
3-9.....	I-65/8TH AVENUE LAYOUT

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING AND DEVELOPMENT

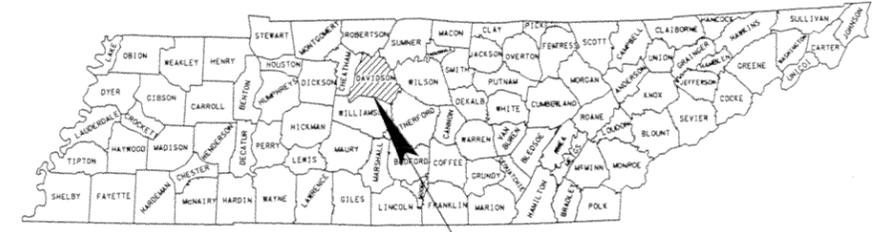
DAVIDSON COUNTY

INTERSECTION IMPROVEMENT
INTERSTATE 65 AND S.R. 12 (8TH AVENUE)

FUNCTIONAL LAYOUT

STATE HIGHWAY NO. F.A.H.S. NO. 41

TENN.	YEAR	SHEET NO.
	2002	1
FED. AID PROJ. NO.	IM-65-(105)86	
STATE PROJ. NO.	19010-1151-44	



PROJECT LOCATION



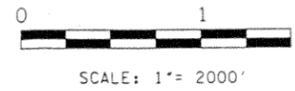
PROJECT LOCATION

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, 1995 AND ADDITIONAL SPECIFICATIONS AND SPECIAL PROVISIONS CONTAINED IN THE PLANS AND IN THE PROPOSAL CONTRACT

TDOT ROAD SP. SV. 2 JIM MAXWELL
DESIGNER MARK HENRY, PE CHECKED BY GABRIEL MOORE, PE
P.E. NO. _____

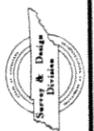


TRAFFIC DATA	
ADT (2003)	30150
ADT (2023)	42230
DHV (2023)	4645
D	55 - 45
T (ADT)	4 %
T (DHV)	3 %
V	60 MPH

APPROVED: JHC Jones
DIRECTOR, DESIGN DIVISION
DATE: _____
APPROVED: Bruce Little Sr.
COMMISSIONER

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
APPROVED: _____
DIVISION ADMINISTRATOR DATE

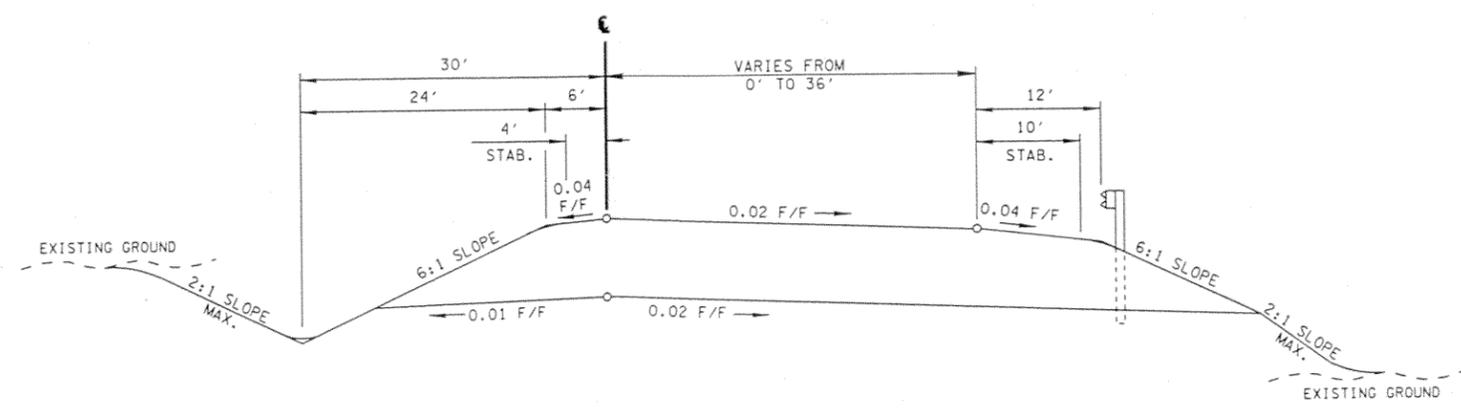
D:\Jobs\3445\Tech\od\plan\Apr_Sheets\vdv00801.dgn 30-OCT-2002 09:34



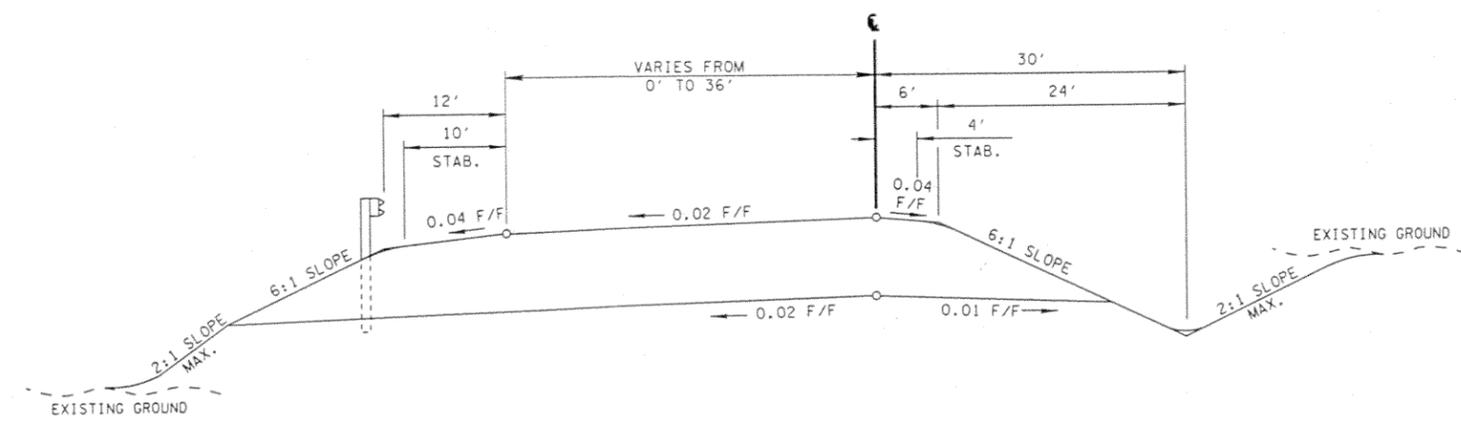
TYPE	YEAR	PROJECT NO.	SHEET NO.
PER	2002	IM-65-(105)86	2

TENNESSEE D.O.T.
DESIGN DIVISION

FILE NO.

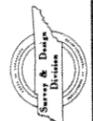


RAMP B AND D TANGENT SECTION
(BASED ON STD. DWG. RD-TS-4)



RAMP A AND C TANGENT SECTION
(BASED ON STD. DWG. RD-TS-4)

30-OCT-2002 10:36
P:\jobs\3445\Techprod\plan\Apr_Sheets\dv09802.dgn

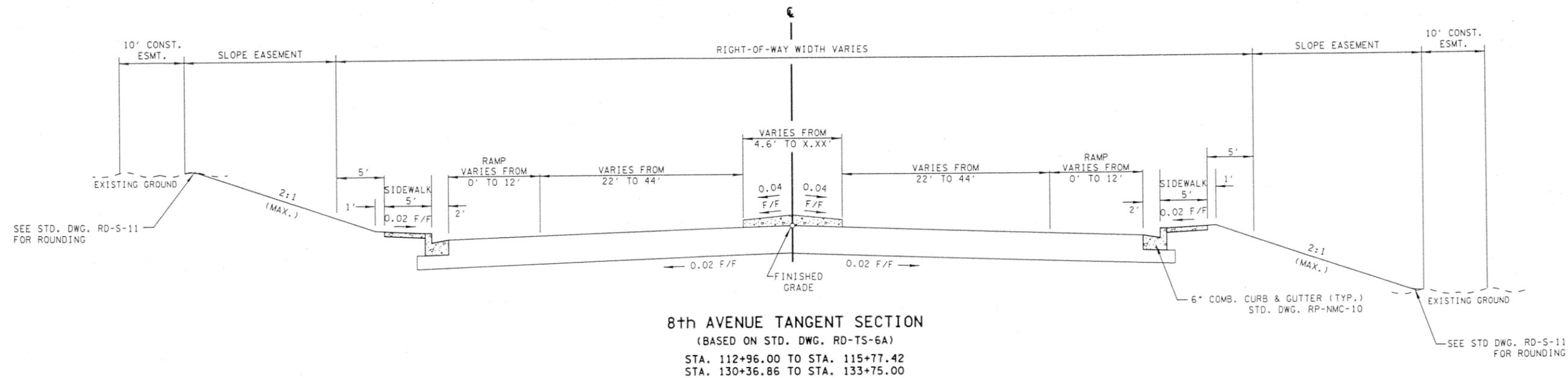


STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

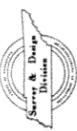
TYPICAL
SECTIONS

TYPE	YEAR	PROJECT NO.	SHEET NO.
PER	2002	IM-65-(105)86	2A

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

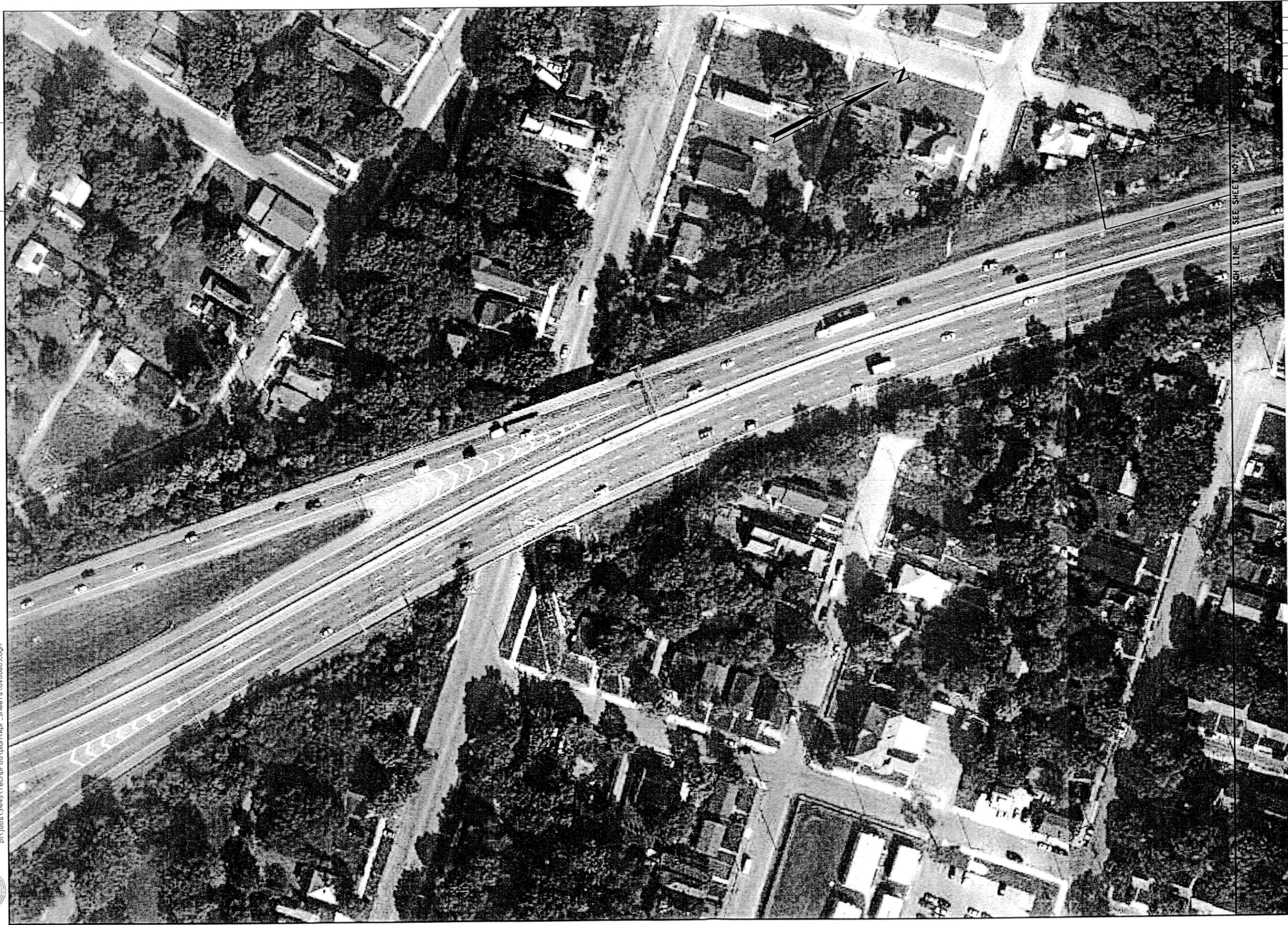


30-OCT-2002 10:36
 P:\jobs\3445\T\tech\pr\od\plan\Apr_Sheet1.s\dw00802a.dgn



STATE OF TENNESSEE
 DEPARTMENT OF TRANSPORTATION
 BUREAU OF PLANNING & DEVELOPMENT

TYPICAL SECTIONS



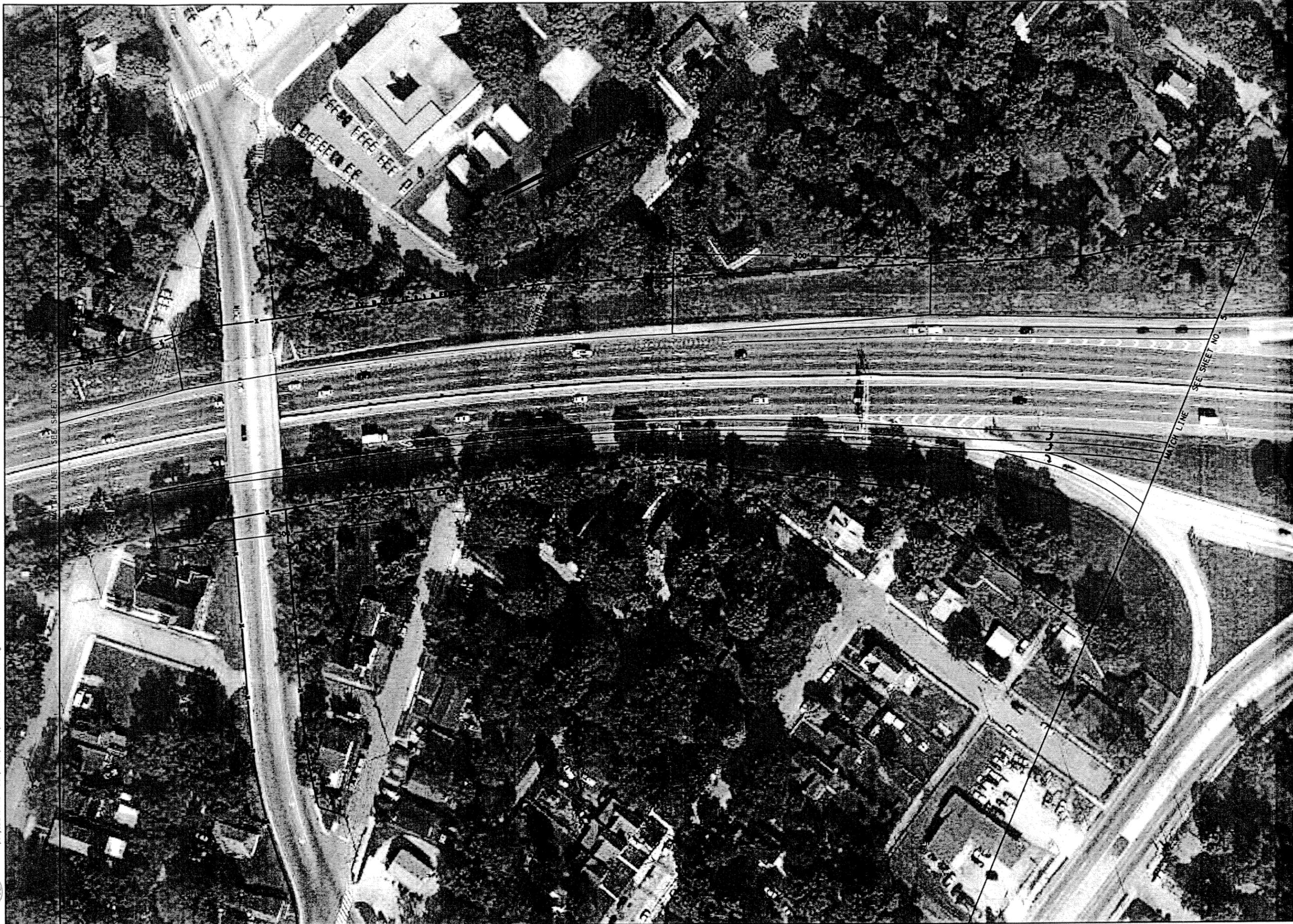
TYPE	YEAR	PROJECT NO.	SHEET NO.
PER	2002	IM-65-(105)86	3

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

I-65/
8TH AVENUE
LAYOUT

TYPE	YEAR	PROJECT NO.	SHEET NO.
PER	2002	IM-65-(105)86	4

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



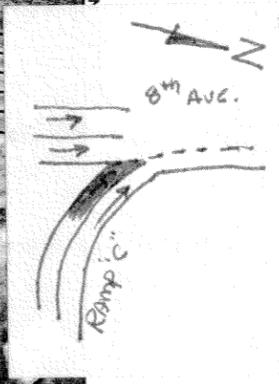
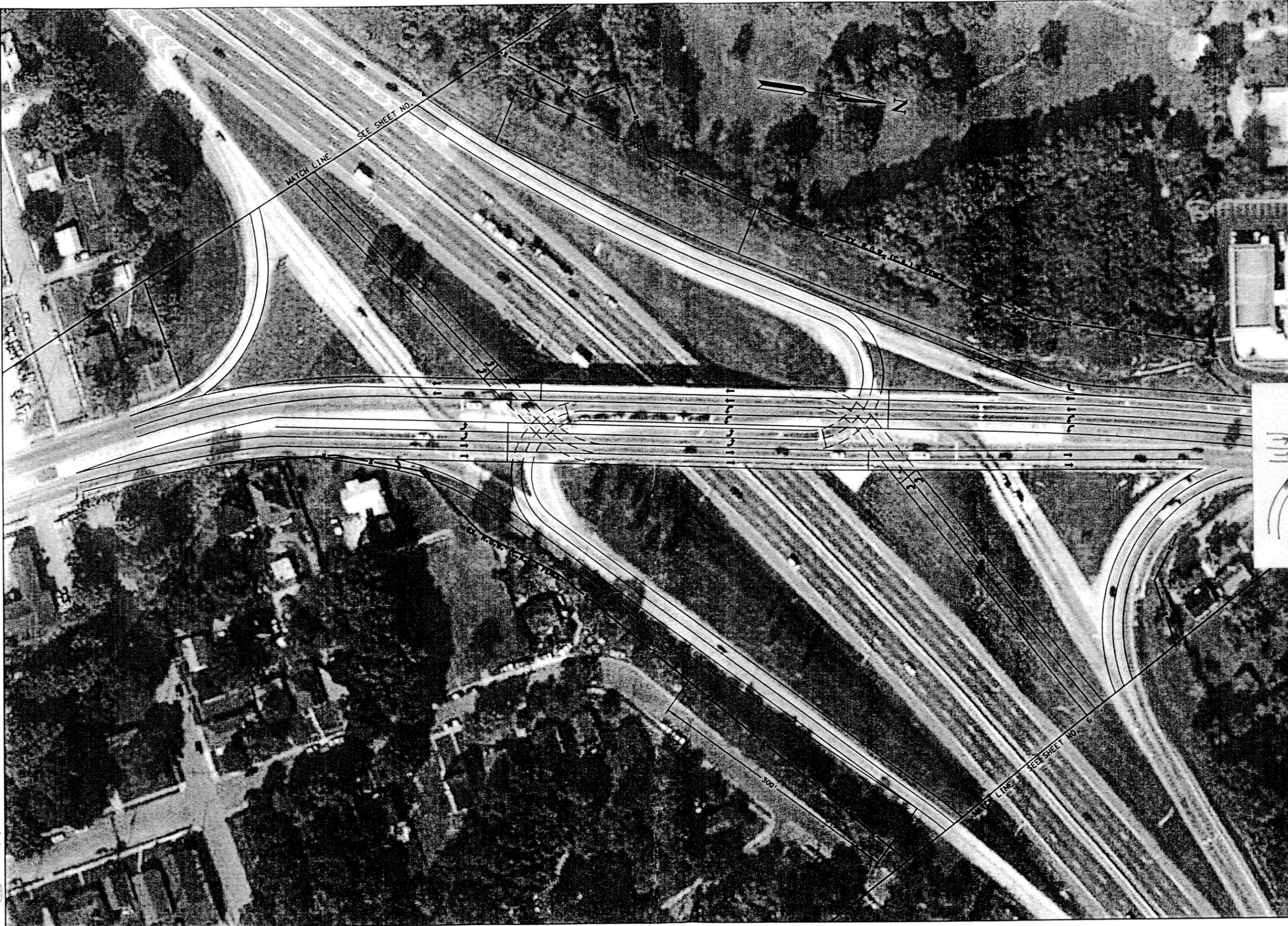
30-OCT-2002 10:37
P:\Jobs\3445\Techprod\plan\Apr_Sheets\dwg0804.dgn



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

I-65/
8TH AVENUE
LAYOUT

TYPE	YEAR	PROJECT NO.	SHEET NO.
PER	2002	IM-65-(105)86	5

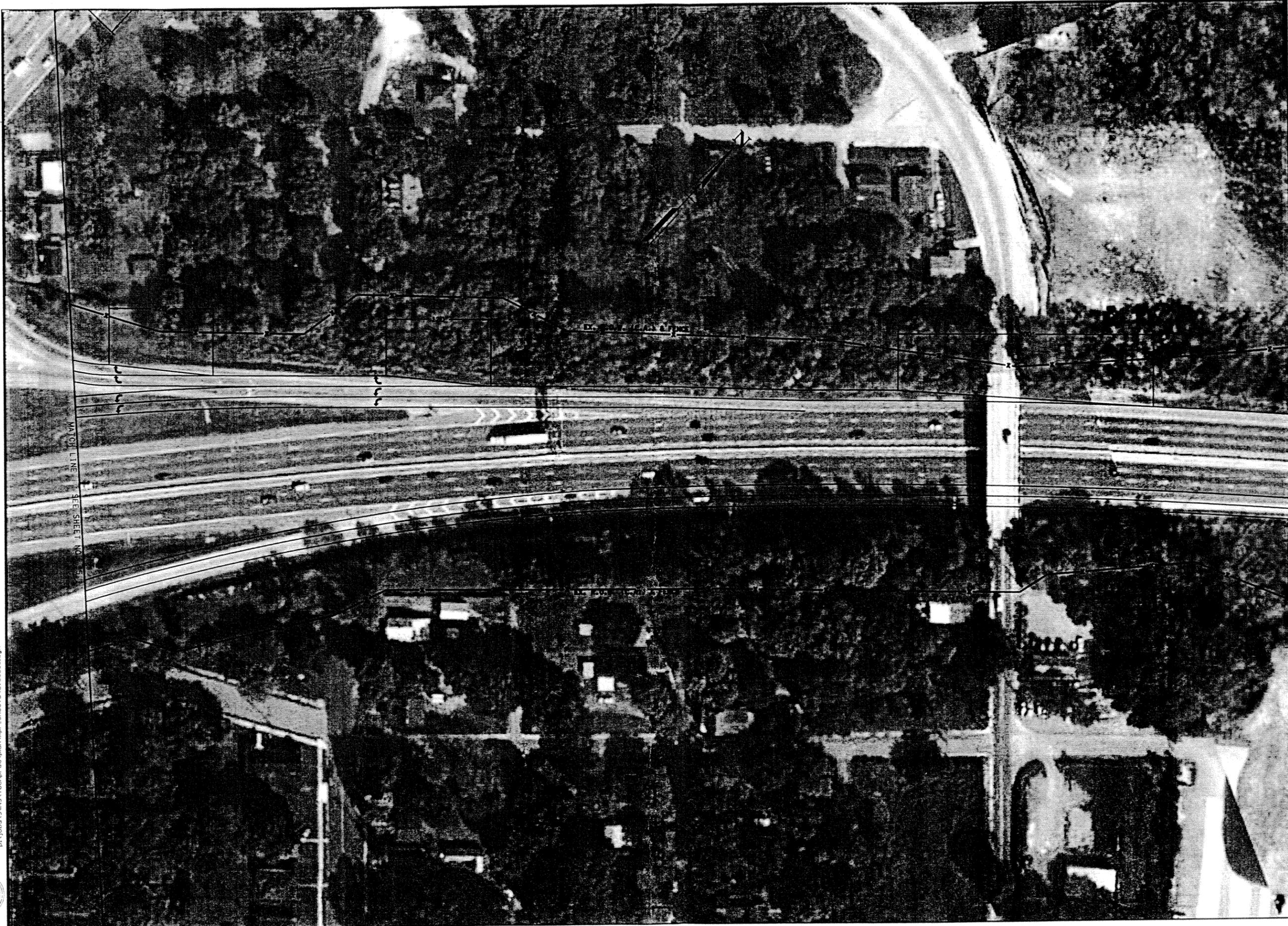
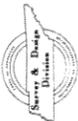


10. 9

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

I-65/ 8TH AVENUE LAYOUT





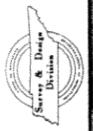
MATCH LINE SEE SHEET NO. 5

MATCH LINE SEE SHEET NO. 7

TYPE	YEAR	PROJECT NO.	SHEET NO.
PER	2002	IM-65-(105)86	6

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

I-65/
8TH AVENUE
LAYOUT



TYPE	YEAR	PROJECT NO.	SHEET NO.
PER	2002	IM-65-(105)86	7

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

I-65/
8TH AVENUE
LAYOUT



TYPE	YEAR	PROJECT NO.	SHEET NO.
PER	2002	IM-65-(105)86	8

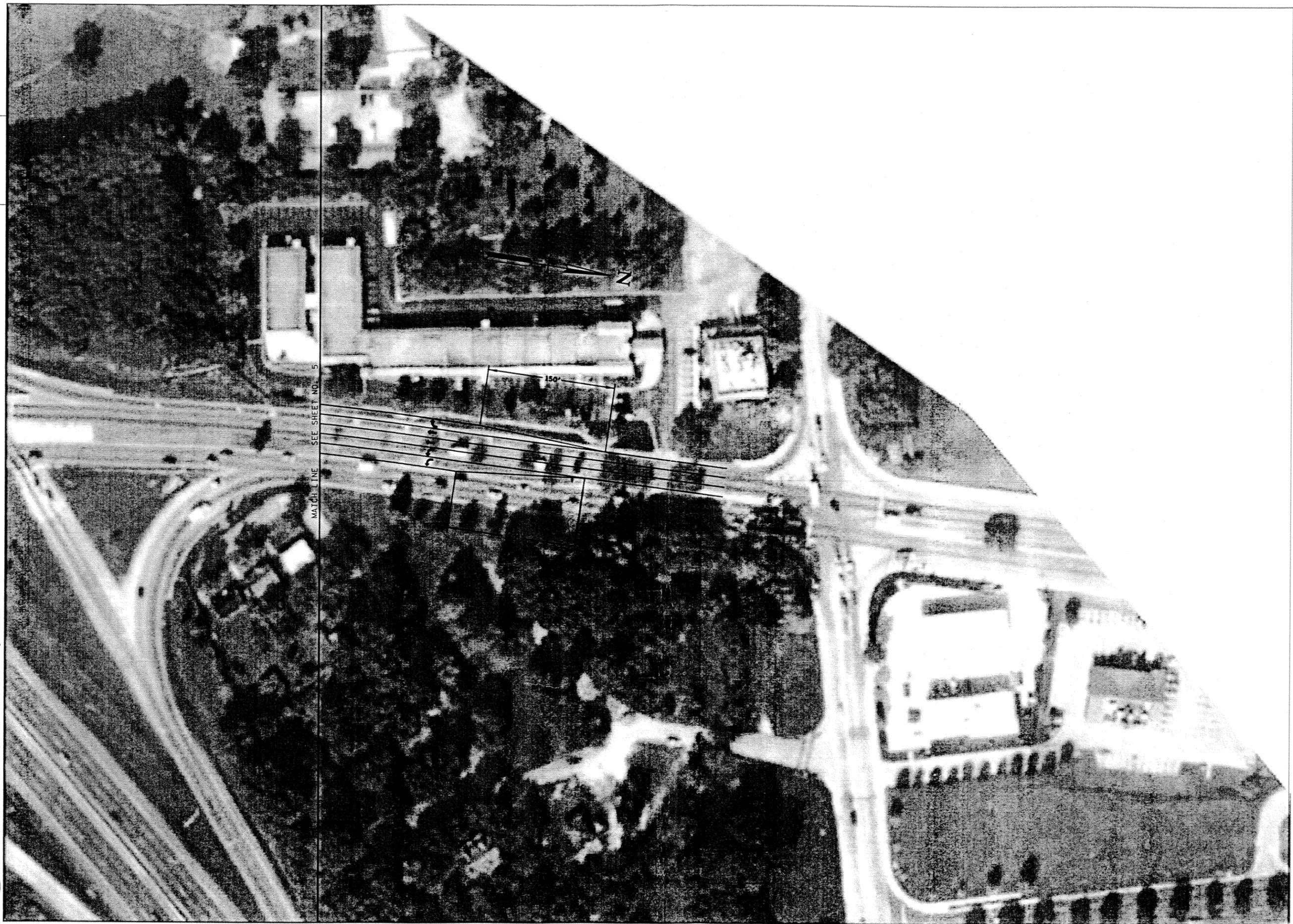
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

I-65/
8TH AVENUE
LAYOUT

TENNESSEE D.O.T.
DESIGN DIVISION

FILE NO.

30-OCT-2002 10:38
P:\Jobs\3445\Techprod\plan\Apr_Sheets\000803.dgn



TYPE	YEAR	PROJECT NO.	SHEET NO.
PER	2002	IM-65-(105)86	9

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
BUREAU OF PLANNING & DEVELOPMENT

I-65/
8TH AVENUE
LAYOUT