EXECUTIVE SUMMARY

Purpose of Study
State Route 49 located between State Route 13 (LM 5.980), in the Town of Erin, on the west to State Route 46 (LM 9.900), in unincorporated Houston County, on the east, is functionally classified as a rural minor arterial on the Surface Transportation Program system. The purpose of this study is to identify existing roadway geometric deficiencies, forecast future traffic demand, develop potential improvement options, and to identify environmental or cultural issues.

Project Initiation
The Greater Nashville RPO recommended improvements to State Route 49, a major east-west arterial for Stewart and Houston County.

Improvement Options
Three (3) possible improvement options were developed. These options are listed below. Cost estimates for 2013 include a 10% annual rate of inflation.

- **No Build Option**
  Make no physical changes to the existing roadway other than routine safety and maintenance.

- **Build Option A**
  Widen the existing roadway from SR 13 to SR 46 to add shoulders and improve deficient horizontal and vertical curves. Option includes widening of Musterground Creek Bridge and signalization and installation of appropriate turn lanes at the intersection of SR 49 and SR 13.

    - ROW, Construction, and PE Cost 2013 est. $51,960,000

- **Build Option B**
  Make spot improvements to the existing roadway to improve safety.

    - Spot Option A – Clear vegetation from Right-of-Way
      $52,000

    - Spot Option B – Install Reflective Striping
      $79,000

    - Spot Option C – Install Advanced Curve Warning Signage
      $7,000

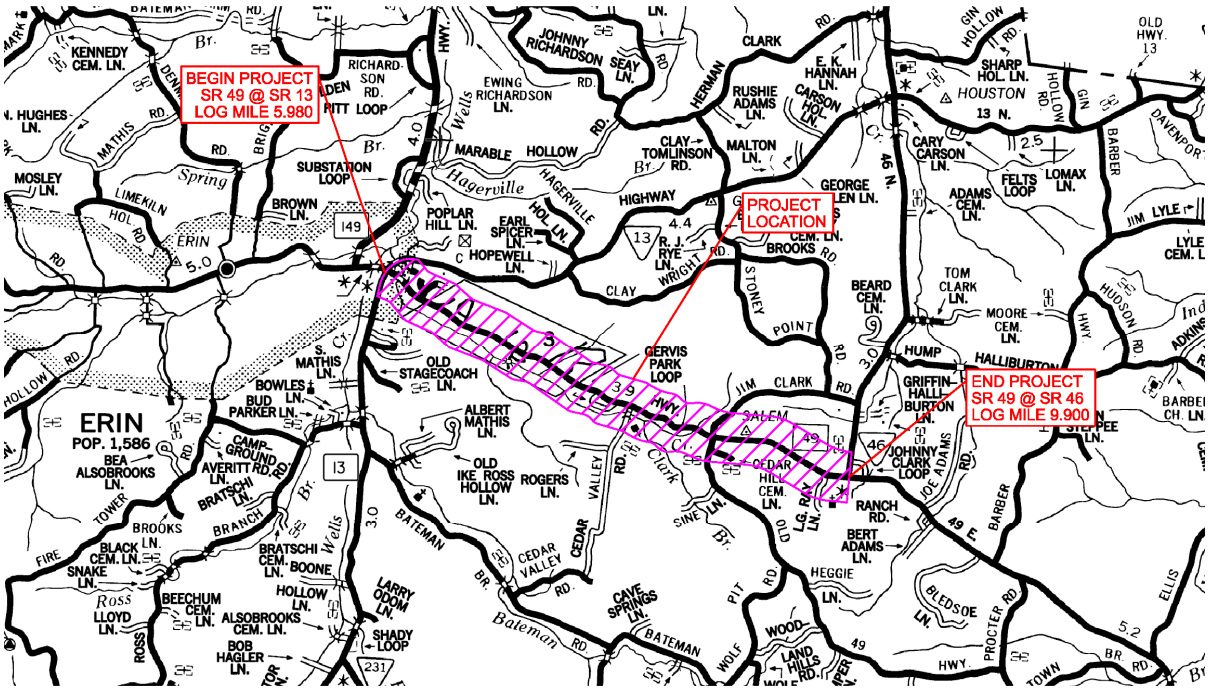
    - Spot Option D – Install Guardrail at Select Locations
      $157,000

    - Spot Improvement E – Modify Horizontal and Vertical Curve (LM 6.11 – 6.43)
      $4,130,000

- Spot Improvement F – Modify Horizontal Curve (LM 7.94 – 8.15) $2,590,000

- Spot Improvement G – Modify Horizontal and Vertical Curve (LM 8.30 – 8.56) $3,190,000

Project Location Map



TRANSPORTATION PLANNING REPORT

State Route 49

FROM STATE ROUTE 13 TO STATE ROUTE 46
HOUSTON COUNTY
PIN 112462.00

PREPARED BY
SAIN ASSOCIATES, INC.
For the
TENNESSEE DEPARTMENT OF TRANSPORTATION
PROJECT PLANNING DIVISION

Approved by:	Signature	DATE
CHIEF OF ENVIRONMENT AND PLANNING		1/22/10
TRANSPORTATION DIRECTOR PROJECT PLANNING DIVISION		1-21-10
TRANSPORTATION MANAGER 2 PROJECT PLANNING DIVISION		1/20/10

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1.0 PURPOSE OF THE TRANSPORTATION PLANNING REPORT

This Transportation Planning Report (TPR) documents the process undertaken to evaluate options for improving transportation on State Route 49 that would increase safety and provide additional traffic capacity. A TPR is intended to establish the immediate and long term needs for improvement, and to assess options for meeting those needs. A complete and approved TPR is intended to be a planning tool rather than a design document.

The Greater Nashville RPO recommended State Route 49 for study, a major east-west arterial for Stewart and Houston County. State Route 49 extends from US 79 (State Route 76) in Dover (Stewart County) to the Kentucky State line in Robertson County, spanning 105.78 miles. The corridor was divided into 12 segments based on logical termini or significant changes in traffic. The Long Range Planning Division conducted a Needs Assessment study for the State Route 49 corridor segments. After evaluation of the corridor segments based upon congestion, safety, and access, the Long Range Planning Division recommended the segment of State Route 49, from SR 13 to SR 46, covered in this document be selected for a Transportation Planning Report.

This study is intended to identify existing and future deficiencies or needs along State Route 49 within the study area. The study area includes a small portion of the town of Erin (population 1,490, 2000 census), with the majority of the study area located within unincorporated Houston County (population 8,088, 2000 census). In addition to identifying the existing needs of State Route 49, this study evaluates a no build option, a spot improvement option, and a facility widening option and identifies potential impacts to the adjacent community and environment.

2.0 HISTORY & BACKGROUND

State Route 49 is functionally classified as a rural minor arterial on the Surface Transportation Program system. As shown in Figure 1, the study area is bound on the west by State Route 13 and on the east by State Route 46. Through the study corridor, State Route 49 is a two lane roadway and extends in a west/east orientation across Houston County, providing access to State Route 13 on the west to State Route 46 on the east. State Route 49 also serves to connect the county seats of Erin in Houston County to Dover in Stewart County and Charlotte in Dickson County and proceeds to the northeast to the Kentucky state line. State Route 49 provides indirect access to Nashville and Davidson County. Existing land uses in the study area are predominantly residential. The study area is characterized by undulating topography and a rural community setting.

There are no known on-going or completed transportation or traffic related studies in or near the study corridor, other than what was described in the previous section of this report.

State Route 49 is not currently in the Tennessee Department of Transportation Long Range Plan or the Statewide Transportation Improvement Program. This study does appear on the Greater Nashville RPO Recommended Studies for TPR list.

There are no known pending or scheduled improvements within the study corridor. However, this section of State Route 49 is scheduled to be resurfaced in the next 2 to 3 years, according to the TDOT Region 3 Maintenance office.

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

TYPE	YEAR	PROJECT NO.	SHT NO.
TPR	2009	PIN NO. 112462.00	3

N

0 1 MILE

BEGIN PROJECT
SR 49 @ SR 13
LOG MILE 5.980

PROJECT LOCATION

END PROJECT
SR 49 @ SR 46
LOG MILE 9.900

COUNTY

CUMBERLAND CITY

MONTGOMERY COUNTY

TO DOVER

TO CLARKSVILLE

TO VANLEER

ERIN
POP. 1,586

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

LOCATION MAP

FIGURE 1

3.0 EXISTING CONDITIONS

3.1 Description of the Study Area

Houston County was established in 1871 and Erin, the county seat, was incorporated in 1909. The only other incorporated area within Houston County is Tennessee Ridge. Houston County is situated approximately seventy-five (75) miles west of Nashville. Access to points outside the county is provided by state and county roadway facilities as no Interstates lie within the county. Interstate 40 is located approximately 20 miles to the south and Interstate 24 is located approximately 30 miles to the northeast of Houston County. The county topography is generally rolling.

This Transportation Planning Report (TPR) examines a portion of State Route 49 located between State Route 13 (LM 5.980), in the Town of Erin, on the west to State Route 46 (LM 9.900), in unincorporated Houston County, on the east, approximately 3.92 miles in length. Figure 2 shows the study area for this evaluation.

State Route 49 is functionally classified as a rural minor arterial on the Surface Transportation Program system. For the length of the study, State Route 49 is a two lane roadway and extends in a west/east orientation across Houston County, providing access to State Route 13 on the west side and to State Route 46 on the east side. Further east of the study endpoint, State Route 49 provides access to the city of Charlotte and Dickson County and indirectly to Nashville and Davidson County. Existing land uses in the study area are predominantly residential.

Erin Elementary School is located on State Route 13, approximately 1,500 feet south of State Route 49. The school is part of the Houston County School system and has approximately 450 students in grades Pre-Kindergarten through 5th grade. Although not within the study boundary, the school generates traffic which utilizes the study corridor including specifically the intersection with State Route 13.

Table 1 summarizes general population data for Houston County, the town of Erin, and the state of Tennessee. Population density and housing density in Houston County are less than the statewide average while population and housing density in Erin are greater than the statewide average. The percent of total population living below the poverty level in Houston County (18.1%) and Erin (23.7%) is greater than the statewide average (13.1%). Census data indicates that the percentage of persons speaking a language other than English in the home in Houston County and Erin is less than the statewide average.

Table 1
Population Data by Geographic Area (Year 2000)

Data	Houston County	Town of Erin	Tennessee
Land Area excluding water (square miles)	200.21	4.10	41,217.12
Population Density (persons per square mile)	40.4	363.6	138.0
Housing Density (units per square mile)	19.5	159.4	59.2
Percent of Population below poverty level	18.1%	23.7%	13.1%
English not spoken at home (% of total population)	2.7%	2.1%	5.5%

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

TYPE	YEAR	PROJECT NO.	SHT. NO.
TPR	2009	PIN NO. 112462.00	5

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

STUDY AREA

FIGURE 2

$$$$SYTIME$$$$$
$$$$DGNSPEC$$$

The population of Houston County and the City of Erin in the last decennial census (year 2000) was 8,088 and 1,490, respectively. As shown in Table 2, population in Houston County increased by 15.2% between 1990 and 2000, similar to the growth experienced by the State of Tennessee. In contrast, the population of Erin decreased by 6.1% over the same time period. According to 2007 estimates, relative to data from the 2000 census, the population has decreased in both Houston County and Erin by 0.2% and 2.6%, respectively. Comparatively, population growth in the state of Tennessee has continued at an average annual rate of approximately 1.2%.

Table 2
Population Trends

	Houston County			Erin			Tennessee		
Year	Pop	% Change	Avg. Annual Growth Rate	Pop	% Change	Avg. Annual Growth Rate	Pop	% Change	Avg. Annual Growth Rate
1990	7,018	-	-	1,586	-	-	4.88 M	-	-
2000	8,088	15.2%	1.5%	1,490	-6.1%	-0.1%	5.69 M	16.6%	1.7%
2007 Est.	8,075	-0.2%	-0.0%	1,452	-2.6%	-0.3%	6.16 M	8.2%	1.2%

According to data from the 2000 census, approximately 98% of the employed labor force commuted to work and the mean commute time was 32 minutes. This reflects local data acquired during research for the TPR, suggesting a significant number of the labor force is employed outside of Houston County. A portion of these commuters utilize State Route 49 to travel eastward to work in Dickson and Davidson Counties. According to the Greater Nashville RPO, approximately 25% of the Houston County workforce is employed in Dickson County.

According to statistics for June 2009 compiled by the Tennessee Department of Labor and Workforce Development, the labor force in Marion County has an unemployment rate of 13.0% (non-seasonally adjusted). This unemployment rate is higher than the Tennessee statewide average of 11.1% (non-seasonally adjusted) for the same month.

3.2 Crash History

The Safety Planning Section of TDOT's Project Planning Division conducted an analysis of traffic crashes on State Route 49 from State Route 13 to State Route 46. TDOT provided corridor crash data from 2005 through 2007 and statewide crash data from 2003 through 2005. Table 3 summarizes general crash rates compared to the statewide averages.

Table 3
General Traffic Crash Rates

Location	Exposure Rate	Actual Crash Rate	Severity Index
SR 13 to SR 46	11.3319	1.412	1.0625
Statewide Average Crash Rate ('03-'05)	-	1.701	-

Within the studied period (2005-2007), there were a total of 16 crashes on State Route 49, of which 3 resulted in an incapacitating injury and 2 resulted in fatalities. Table 4 represents the injury and fatality crash rates for the corridor.

Table 4
Injury and Fatal Crash Rates

Location	Fatal Crash Rate	Incap. Injury Crash Rate	Severe Crash Rate	Other Injury Crash Rate
SR 13 to SR 46	0.176	0.265	0.441	0.265
Statewide Average ('03-'05)	0.031	0.096	0.127	0.511

Table 5 represents a summary of the crash data for each incapacitating injury crash.

Table 5
Summary of Incapacitating Injury and Fatal Crashes

Crash Date	Time	Log Mile	Location	Killed	Incap Injury	Vehicles Involved	Crash Type
01/21/2005	23:20	8.450	West of Old Hwy 49	1	0	1	No Collision w/ Vehicle
02/25/2006	09:50	8.787	@ Old Hwy 49	0	1	2	Angle
05/31/2006	12:20	6.330	West of Pitts Hill Lane	1	1	1	No Collision w/ Vehicle
03/14/2007	19:00	7.300	East of Baggett Hollow Road	0	1	1	No Collision w/ Vehicle
07/26/2007	12:35	7.400	East of Baggett Hollow Road	0	1	1	No Collision w/ Vehicle

A review of the crash data shows that of the 16 crashes along the study corridor, 15 occurred between State Route 13 and Old Highway 49/Jim Clark Road. Several of the crashes on State Route 49 appear to be influenced by current geometric conditions as they were lane departure crashes. The existing roadway geometry is described in detail in the next section of this report.

3.3 Geometrics

State Route 49 is a two-lane rural minor arterial administered by the Tennessee Department of Transportation under the Surface Transportation Program (STP) system. State Route 49 connects Houston County with Dickson County and indirectly with Davidson County, common places of employment for Houston County residents.

Within the study area, State Route 49 has a cross section that consists of two travel lanes (width varies from 10' to 11') with paved shoulders (width varies from 1' to 2'), within a 60' right-of-way. Although the roadway facility laneage, shoulders, and right-of-way are consistent within the study limits, the terrain changes significantly. From State Route 13 to Old Highway 49/Jim Clark Road, approximately 2.8 miles, Musterground Creek is parallel to and located just south of the roadway while multiple rock bluffs are located just north of the roadway. This "west segment" of State Route 49 contains more significant terrain changes traversed with severe horizontal and vertical curves and contains heavy vegetation. The "east segment," from Old Highway 49/Jim Clark Road to State Route 46, contains rolling terrain with less vegetation.

The west segment of State Route 49, due to its proximity to Musterground Creek, has numerous severe vertical and horizontal curves. In multiple locations along the roadway, an unsloped vertical fall (up to approximately 15') exists just outside the edge of the shoulder These unprotected vertical falls coincide with Musterground Creek, maintained private property, or natural ground within the right-of-way. Also in this segment, several rock bluffs exist on the north side of the roadway, with the rock face just outside the edge of the shoulder. Vehicular traffic is generally not separated nor protected by a guardrail from collision with these physical objects. There are two (2) short segments of guardrail in place on the south side of State Route 49. The first segment is approximately 875' in length and is located near Fussell Lane (LM 6.55 to LM 6.72). The other segment is approximately 325' in length and is located west of Cedar Valley Road (LM 7.98 to LM 8.04). These guardrail segments are reflected on the figures located in the appendix. The rolling, rural terrain in combination with the roadway curvature creates sight distance issues along this segment of State Route 49. The sight distance issues are evident when travelling on State Route 49 and also when attempting to enter State Route 49 from one of the public side streets or private driveways located within the segment. Overall, the west segment exhibits a lack of clear zones mainly due to natural physical elements and has existing safety issues.

The east segment of State Route 49 is more gently rolling as it does not parallel Musterground Creek. The more gentle terrain has allowed for a more balanced distribution of residential development along the roadway and more consistent maintenance of private property. The improved maintenance enhances the clear zone characteristics, relative to the west segment.

The study corridor contains non-reflective striping and is absent of roadway lighting. In times of low or no natural light, the roadway striping is difficult to detect and, therefore, offers little guidance to drivers. Minor geometric improvements, namely the installation of centerline rumble strips, were completed in recent years. The centerline rumble strips are in place at certain horizontal curve locations within the study corridor.

3.4 Level of Service Analyses

A "Level of Service" (LOS) index was used to gauge the operational performance for endpoint intersections and for the study segments. The LOS is a qualitative measure that describes traffic conditions related to speed and travel time, freedom to maneuver, traffic interruptions, etc. There are six levels ranging from "A" to "F" with "F" being the worst. Each level represents a range of operating conditions. Table 6 shows the traffic flow conditions and approximate driver comfort level at each level of service.

Table 6
Level of Service (LOS) Description

LOS	Service Description
A	Free flow operations. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. The general level of physical and psychological comfort provided the driver is high.
B	Reasonably free flow operations. The ability to maneuver within the traffic stream is only slightly restricted and the general level of physical and psychological comfort provided to the driver is high.
C	Flow with speeds at or near free flow. Freedom to maneuver within the traffic stream is noticeably restricted and lane changes require more vigilance on the part of the driver. The driver notices an increase in tension because of additional vigilance required for safe operation.
D	Speeds decline with increasing traffic. Freedom to maneuver within the traffic stream is noticeably limited. The driver experiences reduced physical and psychological comfort levels.
E	At the lower boundary, the facility is at capacity. Operations are volatile because there are virtually no gaps in the traffic stream. There is little or no room to maneuver. The driver experiences poor levels of physical and psychological comfort.
F	Breakdowns in traffic flow. Then number of vehicles entering the highway section exceeds the capacity, or ability of the highway to accommodate that number of vehicles. There is little or no room to maneuver. The driver experiences poor levels of physical and psychological comfort.

Source: Tennessee Department of Transportation

For the segment capacity analysis, State Route 49 was divided into the same two segments described in the Crash History section of this report. The west segment experienced the highest traffic volume relative to the 2009 data collection sites and exhibits more rolling terrain than the east segment. The east segment accommodated a lower traffic volume and is more level than the west segment. Table 7 reflects the existing (2009) traffic data collected and the corresponding level of service for each segment.

Table 7
Existing (2009) Segment Traffic Data

Segment of SR 49	AADT	% Trucks	No. of Lanes	HCS v/c	LOS
West Segment (SR 13 to Old Hwy 49/Jim Clark Rd)	2,640	4%	2	0.13	C
East Segment (Old Hwy 49/Jim Clark Rd to SR 46)	1,510	5%	2	0.05	B

The LOS values reflected in Table 7 are derived from the Highway Capacity Manual software, based on user entered roadway traffic volumes and geometric condition. The roadway operates at acceptable levels of service under existing conditions.

In addition to the segment capacity analysis, intersection capacity analyses were performed for the intersections of State Route 13 and for State Route 46. Table 8 reflects the results of the peak hour capacity analysis for each intersection.

Table 8
Existing (2009) Intersection Levels of Service

Intersection	Movement	AM Peak (7:00 - 8:00)	Midday Peak (11:00 - 12:00N)	PM Peak (3:00 - 4:00)
SR 49 @ SR 13 (Unsignalized)	SR 49 EB Left	C	A	C
	SR 49 EB Through	C	A	C
	SR 49 EB Right	C	A	C
	SR 49 WB Left	B	A	B
	SR 49 WB Through	B	A	B
	SR 49 WB Right	-	A	B
	SR 13 NB Left	C	A	B
	SR 13 NB Through	C	A	B
	SR 13 NB Right	C	A	B
	SR 13 SB Left	B	-	B
	SR 13 SB Through	B	A	B
	SR 13 SB Right	B	A	B
	INTERSECTION	C	A	B
SR 49 @ SR 46 (Unsignalized)	SR 49 EB Left	A	A	A
	SR 49 EB Through	A	A	A
	SR 49 WB Right	A	A	A
	SR 49 WB Through	A	A	A
	SR 46 SB Left	A	A	A
	SR 46 SB Right	A	A	A
	INTERSECTION	A	A	A

- Volume = 0 during time period; no LOS calculated

The above data was analyzed using Synchro 7 software. The turning movement counts were collected concurrently with the segment volumes. The peak hours were found to be the following:

- 7:00 AM to 8:00 AM
- 11:00 AM to 12:00 Noon
- 3:00 PM to 4:00 PM

The afternoon peak hour correlates with the dismissal time for Erin Elementary School.

According to the MUTCD (2003 Edition) guidelines, the intersection at State Route 13 was evaluated for signalization. Under existing conditions, the intersection does not warrant signalization. The existing conditions signal warrants are included in the Appendix of this report.

3.5 Land Uses / Traffic Generators

Other than the commercial properties at the intersection with State Route 13, the study area land use is almost exclusively residential. The only land uses other than residential observed during the field reviews included a home daycare (it was unclear if still in operation) and a small church, Cedar Valley United Methodist Church, with a cemetery. Those type developments generate small amounts of traffic and primarily in short, specific time periods. These two properties, along with the commercial properties at the State Route 13 intersection, comprise the traffic generators within the study corridor.

Traffic generators located outside the study corridor include Erin Elementary School which is located on State Route 13, approximately 1,500 feet south of State Route 49.

3.6 Major Structures

At LM 6.100, an older concrete bridge (bridge number 42SR0490005) exists over Musterground Creek. The bridge is approximately 100' in length and has two 10' travel lanes but does not have shoulders. According to the TDOT Structures Division, the bridge was constructed around 1927 and is not scheduled for replacement or repair. Data regarding weight restrictions for the bridge was not available. This is the only major structure on State Route 49.

Other structures located within the study corridor include five (5) bridges and a large double-barrel culvert. These structures all serve to provide access to residential properties separated from State Route 49 by Musterground Creek. Three (3) of the bridges are located on public roadways, including:

- Hallie Griffin Lane (LM 7.133)
- Sambo Hill Road (LM 7.410)
- Cedar Valley Road (LM 8.123)

The other two (2) bridges and the double barrel culvert are in place on private driveways at the following locations:

- LM 6.84
- LM 8.29
- LM 8.45 (double barrel culvert)

3.7 Topography

The topography within the study area consists of rolling hills. The occasional steep hill or valley does exist and the west segment of State Route 49 contains multiple sharp horizontal and vertical curves.

3.8 Multi-modal Facilities

- Passenger Transportation Modes

Within the study corridor, alternative modes of transportation are nonexistent. There are no dedicated pedestrian, bicycle, or transit facilities within the study area.

State Route 49 is a proposed bike route from Dover to State Route 13 in Erin and from State Route 250 in Cheatham County to the Kentucky border. In 2008, the Greater Nashville RPO recommended the segment of State Route 49 from State Route 13 to State Route 46 be reviewed for designation as a state bike route. The GNRPO also recommended that the intersection of State Route 49 and State Route 13 include crosswalks and sidewalks due to the proximity of Erin Elementary School.

Toll ferry service on SR 147 was resumed in 2007. The Houston-Benton Ferry provides access between the counties over Kentucky Lake, near McKinnon. The ferry operates 365 days a year and can accommodate approximately 20 passengers and 10 vehicles per trip.

- Freight and Goods Transportation Modes

In the vicinity of the study, but outside the study area, are air, rail, and water facilities. The Houston County Airport is located in the northwest corner of the county, approximately 15 miles from the study corridor, and provides general aviation services.

The Humphreys County Airport is approximately 20 miles away and provides general aviation and transportation services. The Nashville International Airport is located approximately 80 miles east and is served by 16 airlines operating 350 average daily flights to 89 markets and 45 non-stop markets.

Rail lines exist within Houston County, neighboring counties, and also in Nashville. According to the Middle Tennessee Industrial Development Association (MTIDA), local railroads are served by RT Corman. Some rail lines through Nashville and New Johnsonville are operated by CSX Transportation (CSXT). No rail passenger service is provided locally.

Serving as the Houston County west boundary line, the Tennessee River is a navigable waterway. The nearest river port is located in New Johnsonville, approximately 41 miles outside the study corridor. The port boasts mooring cells, loading ramp, crane, hopper, conveyors, screening plant, and open storage. The facility provides general freight transfer services, including to the CSX rail line.

4.0 FIELD REVIEW

On July 17, 2009, a field review meeting of stakeholders was conducted to identify concerns and opportunities related to improvements of State Route 49. The meeting included TDOT, Houston County, Erin, Greater Nashville RPO, and Sain Associates, Inc. personnel. An overall group discussion was held first at the Houston County Courthouse followed by a drive through the study corridor. The official meeting minutes, including a list of attendees and full list of discussion topics are included in the Appendix of this report. Key elements of the discussion included:

- Improvement options should be focused on safety issues rather than traffic capacity issues
- Houston County is a commuter oriented area with residents mainly travelling out of the county for work; State Route 49 is the route of choice for motorist destined for Dickson and Davidson counties
- There are no known historical properties in the corridor and no known plans for future development
- USTs at abandoned general store at Old Highway 49 intersection are believed to have been removed; USTs at existing tire store at State Route 13 intersection are believed to remain in place
- Low traffic volumes likely preclude 3 lane and 4 lane improvement options

Additional field reviews were performed by Sain Associates, Inc. staff on May 5 – 7, 2009, and again on June 2 -3, 2009. These reviews included survey of the existing cross-section, speed limits, traffic counts, and a general overview of the traffic flow in the area.

5.0 PURPOSE AND NEED FOR IMPROVEMENTS

The primary purpose and need for improvement to State Route 49 is to upgrade the overall safety of the roadway, thereby increasing vehicular capacity, to further the overall goal of improving the attractiveness of the corridor for connectivity, economic development, and tourism purposes.

State Route 49 is functionally classified as a rural minor arterial generally with 24' of travelway, consisting of 10'-11' lanes and 1'-2' paved shoulders. Safety issues along the corridor not only reduce the facility capacity but also limit its ability to provide broader community functions impacting quality of life, such as providing connectivity and supporting growth and development. The route is a major commuter route for residents working outside the county and roadside development is mainly single family residences. There appears to be a limited amount of undeveloped property along State Route 49 within the study limits due to terrain limitations. However, outside the study limits, Houston County does have large tracts of undeveloped viable property and is well located for future growth.

5.1 Safety

The section of State Route 49 located between State Route 13 and Old Highway 49/Jim Clark Road exhibits significant horizontal and vertical curves, superelevation not up to current design standards, and sight distance issues. The corridor could benefit from additional signage, reflectors, and guardrail. Additionally, there is a general lack of clear zones, mainly on the west segment. Existing obstructions within the clear zone include utilities, vegetation, rock bluffs, and Musterground Creek. There are several locations where Musterground Creek and rock bluffs are adjacent to the travelway and are not protected by guardrail. According to data provided by the Safety Planning Section of TDOT's Project Planning Division, the total crash rate on State Route 49 for the years 2005 through 2007 was 1.412 compared to a statewide average total crash rate of 1.701 (2003-2005). However, rates specific to incapacitating injury and fatalities are slightly above the statewide average.

The Greater Nashville RPO has recommended the study segment as a state bike route and, specifically, that the intersection with State Route 13 be equipped with sidewalks and crosswalks due to the proximity of Erin Elementary School. The intersection is currently not equipped with pedestrian features.

The roadway improvement options detailed in subsequent sections of this report would alleviate some of the existing safety issues, such as curvature, superelevation, sight distance, and clear zone issues.

5.2 System Linkage

State Route 49 is a two-lane rural minor arterial administered by the Tennessee Department of Transportation under the Surface Transportation Program (STP) system. In the study area, the highway provides east/west connectivity between Erin and unincorporated Houston County. Regionally, the Houston County workforce is commuter oriented and State Route 49 serves as the major route to places of employment in Dickson County and also indirectly to Davidson County. This study examines options for improving existing State Route 49 by performing spot improvements or widening the existing cross section. No new transportation system links are proposed.

5.3 Capacity

❖ Segment Analysis

Analysis of existing traffic volumes indicates that traffic operations on State Route 49 under existing conditions are within acceptable levels of service. Traffic forecasts for the horizon years 2014 and 2034 were prepared using a growth rate derived from historic traffic data and were compared to forecast volumes provided by TDOT. An annual growth rate of 2% was used for forecast purposes and the forecast volumes were approved by TDOT. Tables 9 and 10 reflect traffic data for the horizon years.

Table 9
2014 Segment Traffic Data

Segment of SR 49	AADT	% Trucks	No. of Lanes	HCS v/c	LOS
West Segment (SR 13 to Old Hwy 49/Jim Clark Rd)	2,920	4%	2	0.17	C
East Segment (Old Hwy 49/Jim Clark Rd to SR 46)	1,670	5%	2	0.06	C

Table 10
2034 Segment Traffic Data

Segment of SR 49	AADT	% Trucks	No. of Lanes	HCS v/c	LOS
West Segment (SR 13 to Old Hwy 49/Jim Clark Rd)	4,340	4%	2	0.19	C
East Segment (Old Hwy 49/Jim Clark Rd to SR 46)	2,480	5%	2	0.09	C

Traffic projections for 2014 and 2034 indicate acceptable levels of service for both segments of State Route 49. The levels of service shown are based on the existing roadway geometric conditions without improvement. The current geometric configuration is not deficient for capacity purposes. A LOS C or better is desired on all segments of State Route 49, according to TDOT standards for rural roads.

❖ Intersection Analysis

As described in the Existing Conditions section of this report, intersection capacity analyses were performed at State Route 13 and State Route 46. Like the segment volume forecasts, intersection peak hour volumes were projected to horizon years with a 2% annual growth rate.

According to the MUTCD (2003 Edition) guidelines, the intersection at State Route 13 was evaluated for signalization. Based on the 2014 projected approach volumes the intersection does warrant signalization, specifically under Warrant 1A and Warrant 2. Based on the 2034 projected approach volumes the intersection warrants signalization, under Warrants 1A, 1B, 1A & 1B, and 2. The 2014 and 2034 signal warrants are included in the Appendix of this report.

Table 11 and Table 12 reflect the levels of service for each horizon year under existing geometric conditions, including the State Route 13 intersection being unsignalized. Table 13 and Table 14 reflect the levels of service with the State Route 13 intersection being

signalized. Signalization with the existing geometry resulted in unacceptable levels of service. Therefore, additional laneage was included in the intersection analysis to achieve acceptable levels of service. Based on the specific horizon year volumes, the following improvements were assumed in place for signalized analysis:

- 2014
  - State Route 49 eastbound right turn lane (200' storage)
  - State Route 13 northbound left turn lane (200' storage)
  - State Route 13 southbound left turn lane (200' storage)
- 2034
  - State Route 49 westbound left turn lane (200' storage)
  - State Route 49 eastbound left turn lane (200' storage)
  - State Route 13 southbound right turn lane (200' storage)

Table 11
2014 Intersection Levels of Service (Unsignalized)

Intersection	Movement	AM Peak	Midday Peak	PM Peak
SR 49 @ SR 13 (Unsignalized)	SR 49 EB Left	C	B	C
	SR 49 EB Through	C	B	C
	SR 49 EB Right	C	B	C
	SR 49 WB Left	B	A	B
	SR 49 WB Through	B	A	B
	SR 49 WB Right	-	A	B
	SR 13 NB Left	D	B	C
	SR 13 NB Through	D	B	C
	SR 13 NB Right	D	B	C
	SR 13 SB Left	B	-	B
	SR 13 SB Through	B	A	B
	SR 13 SB Right	B	A	B
	INTERSECTION	C	A	C
SR 49 @ SR 46 (Unsignalized)	SR 49 EB Left	A	A	A
	SR 49 EB Through	A	A	A
	SR 49 WB Right	A	A	A
	SR 49 WB Through	A	A	A
	SR 46 SB Left	A	A	A
	SR 46 SB Right	A	A	A
	INTERSECTION	A	A	A

- Volume = 0 during time period; no LOS calculated

Table 12
2034 Intersection Levels of Service (Unsignalized)

Intersection	Movement	AM Peak	Midday Peak	PM Peak
SR 49 @ SR 13 (Unsignalized)	SR 49 EB Left	F	C	F
	SR 49 EB Through	F	C	F
	SR 49 EB Right	F	C	F
	SR 49 WB Left	D	B	C
	SR 49 WB Through	D	B	C
	SR 49 WB Right	-	B	C
	SR 13 NB Left	F	B	F
	SR 13 NB Through	F	B	F
	SR 13 NB Right	F	B	F
	SR 13 SB Left	C	-	C
	SR 13 SB Through	C	B	C
	SR 13 SB Right	C	B	C
	INTERSECTION	F	C	F
SR 49 @ SR 46 (Unsignalized)	SR 49 EB Left	A	A	A
	SR 49 EB Through	A	A	A
	SR 49 WB Right	A	A	A
	SR 49 WB Through	A	A	A
	SR 46 SB Left	A	A	A
	SR 46 SB Right	A	A	A
	INTERSECTION	A	A	A

- Volume = 0 during time period; no LOS calculated

Table 13
2014 State Route 49 at State Route 13 Levels of Service (Signalized)

Intersection	Approach	AM Peak	Midday Peak	PM Peak
SR 49 @ SR 13 (Signalized)	SR 49 EB	A	A	A
	SR 49 WB	B	B	B
	SR 13 NB	B	A	A
	SR 13 SB	B	A	A
	INTERSECTION	B	A	A

Table 14
2034 State Route 49 at State Route 13 Levels of Service (Signalized)

Intersection	Approach	AM Peak	Midday Peak	PM Peak
SR 49 @ SR 13 (Signalized)	SR 49 EB	B	A	A
	SR 49 WB	C	B	B
	SR 13 NB	B	B	C
	SR 13 SB	C	A	B
	INTERSECTION	B	B	B

5.4 Transportation Demand

There are no plans for improvement of State Route 49 in the State Transportation Improvement Plan (STIP) or Long-Range Transportation Plan. Traffic forecasts were developed for this study using a historic growth trend rate for State Route 49.

5.5 Legislation

There is no federal, state, or local government mandate for improvement of State Route 49. The Greater Nashville RPO listed this study on its requested studies list. The Greater Nashville RPO recommended State Route 49 for study. After evaluation of the corridor segments based upon congestion, safety, and access, the Long Range Planning Division recommended the segment of State Route 49, from SR 13 to SR 46, covered in this document be selected for a Transportation Planning Report.

5.6 Social Demands or Economic Development

Erin Elementary School, located near the western limit of the study area, places additional traffic demand on the study segment, including school buses. The Greater Nashville RPO has recommended the study segment as a state bike route and specifically that the intersection with State Route 13 be equipped with sidewalks and crosswalks due to the proximity of Erin Elementary School.

There are no known economic development projects, private developments, or land use changes within the study area which would necessitate roadway improvements.

5.7 Roadway Deficiencies

The options considered in this study would provide correction of or mitigation of existing deficiencies by performing spot improvements to specific problem locations or improving the roadway geometry for the full study length of the existing facility. Both options would improve safety issues along the corridor including horizontal and vertical curves, superelevation, sight distance, and clear zone issues. Improvement of geometric conditions on the west segment would make State Route 49 more desirable as a designated bike route, as recommended by the Greater Nashville RPO. Under all improvement options discussed in this report, State Route 49 would remain in the State Highway System.

6.0 OPTIONS FOR IMPROVEMENT

Several options were considered and evaluated as a means of addressing the transportation needs within the study area. The options include the following:

- No Build – Make no physical changes to the existing roadway.
- Build Option A – Widen the existing roadway to add shoulders and improve deficient horizontal and vertical curves.
- Build Option B – Make spot improvements to the existing roadway to improve safety.

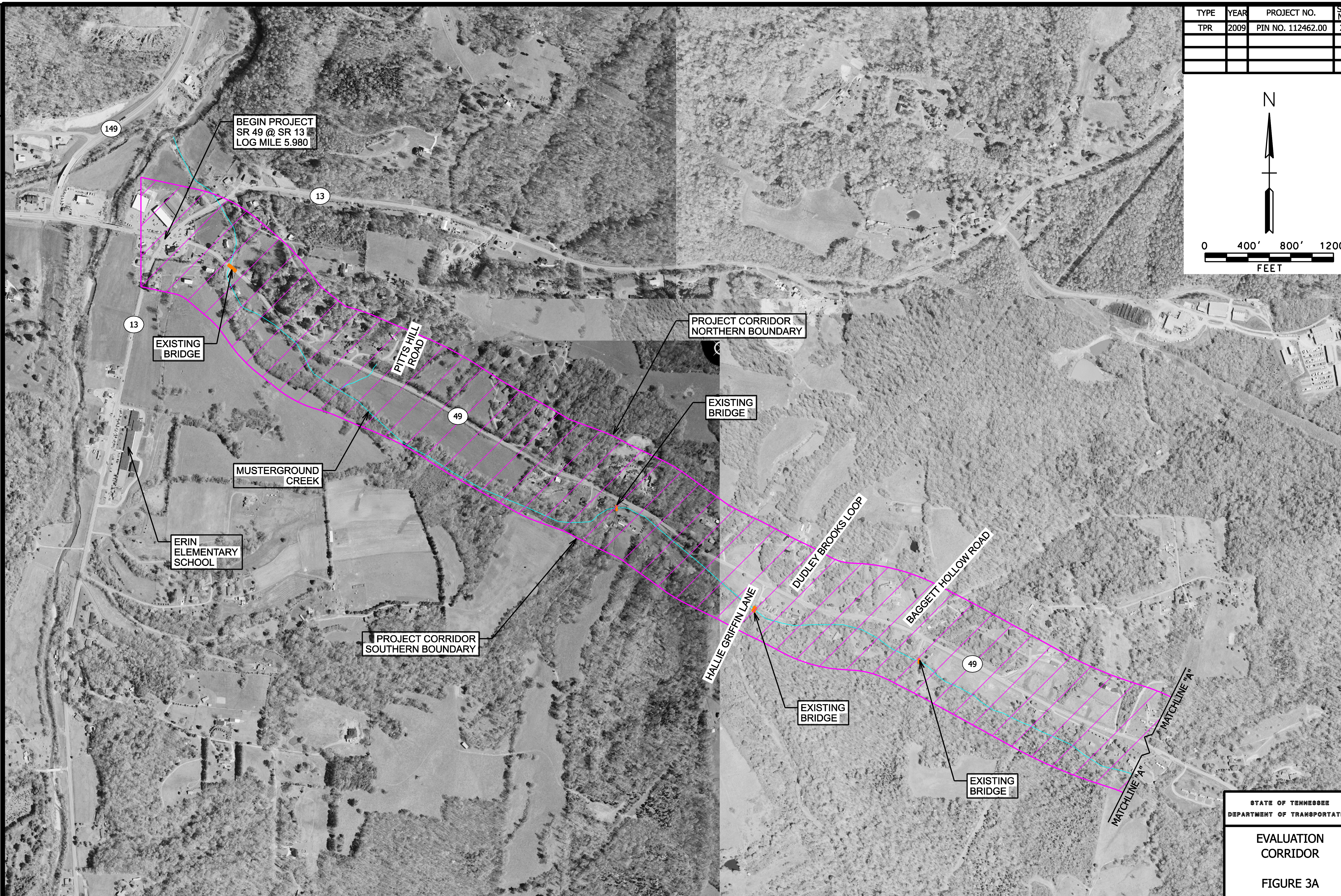
Both build options consist of improvements to the existing facility. The options detailed below would not constitute a new alignment, and consequently a unique study corridor, although the improvements would alter the existing layout. The evaluation corridor, common to both build options, is reflected in Figures 3A and 3B.

Relocation of State Route 49 was not considered as a part of this study for several reasons. First, the existing and projected capacity and safety deficiencies can be mitigated via improving the existing facility. Secondly, the existing terrain is a key limiting factor. The existing facility is constricted between Musterground Creek to the south and steep rock hills to the north. Consequently, a new alignment would require significant financial commitment in terms of construction and could cause a major disruption involving property acquisition and residential relocation. Third, related to the rural location, a new alignment could cause unnecessary environmental impacts. Lastly, a new alignment would also fall short of several of the seven guiding principles used by TDOT for corridor assessment.

The following sections of this report summarize the concept, typical section, identified environmental and cultural resource concerns, structural impacts, and preliminary cost (based upon a per mile estimate) of each considered option. For each option, an operational performance assessment was conducted to provide an objective measure of the benefits and/or shortcomings of each option. The operational performance assessment is based upon future peak hour volumes estimated by multiplying the annual average daily traffic (AADT) projections by a design hour factor. Traffic projections for State Route 49 were developed for two horizon years, 2014 and 2034, by applying a historic growth trend rate to existing traffic counts.

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

TYPE	YEAR	PROJECT NO.	SHT. NO.
TPR	2009	PIN NO. 112462.00	20



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

EVALUATION CORRIDOR

FIGURE 3A

$$$$SYTIME$$$$
$$$$DGNSPEC$$$$

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

TYPE	YEAR	PROJECT NO.	SHT. NO.
TPR	2009	PIN NO. 112462.00	21

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

EVALUATION CORRIDOR

FIGURE 3B

$$$$SYTIME$$$$
$$$$DGNSPEC$$$$

6.1 Corridor Improvements

No Build Option

Concept:
Make no improvements to the existing roadway network outside of routine maintenance.

Typical Section:
All roadway sections would remain as they are currently configured.

Operational Performance:
State Route 49 volumes are projected to reach approximately 3,000 vehicles per day by the base year 2014 and approximately 4,000 vehicles per day by the design year 2034. Under these conditions, State Route 49 traffic operations would remain at an acceptable level of service C through design year 2034.

However, the geometric and safety deficiencies would not be improved under the no-build option.

Build Option A

Improved 2 Lane Concept:
Improve the existing two-lane facility to current design standards for the length of the study.
Typical Section (proposed):

- Build Option A
  - Two 12' travel lanes, one in each direction.
  - Paved shoulders 10' in width
  - Minimum 120' right-of-way (temporary slope easements may also be required)
- All other roadways would maintain existing typical section.

The typical section (based on TDOT standard drawing RD-TS-3) is reflected as a figure in the Appendix.

Operational Performance:
Tables 15 and 16 represent traffic volumes, truck percentages, and LOS values for 2014 and 2034 under Build Option A conditions.

Table 15
Build Option A 2014 Segment Traffic Data

Segment of SR 49	AADT	% Trucks	No. of Lanes	HCS v/c	LOS
West Segment (SR 13 to Old Hwy 49/Jim Clark Rd)	2,920	4%	2	0.12	C
East Segment (Old Hwy 49/Jim Clark Rd to SR 46)	1,670	5%	2	0.06	B

Table 16
Build Option A 2034 Segment Traffic Data

Segment of SR 49	AADT	% Trucks	No. of Lanes	HCS v/c	LOS
West Segment (SR 13 to Old Hwy 49/Jim Clark Rd)	4,340	4%	2	0.17	C
East Segment (Old Hwy 49/Jim Clark Rd to SR 46)	2,480	5%	2	0.09	B

As shown in the above tables, the Build Option A does produce acceptable levels of service for design year traffic projections. Also, the construction of paved shoulders and correction of existing deficient horizontal and vertical curvature would improve the suitability of State Route 49 for designation as a bike route.

Disposition of Existing Route
No portion of existing State Route 49 will be disposed or removed from the State Highway System, although the improvements likely would result in deviation from the existing layout while correcting existing deficiencies. Possible relocation of State Route 49 was not considered as a part of this study. The existing and projected capacity and safety deficiencies can be mitigated via improving the existing facility. In addition, the existing terrain limits the possible relocation of State Route 49 and any such relocation would cause major disruption to the area and at extreme financial costs.

Build Option B

Concept:
Construct spot improvements to existing State Route 49 from State Route 13 to State Route 46, focusing on safety issues and geometric deficiencies. Spot improvements (SI) are described by location in the following paragraphs.

- SI A – Clear vegetation from Right-of-Way (LM 5.980 to LM 9.900)
  The existing right-of-way contains a substantial amount of vegetation. This contributes to the lack of sight distance along the roadway and from side streets and driveways. Clearing the vegetation would contribute to the desired safety improvement of the entire facility.
  Cost for this option is estimated to be $32,000 ($52,000 with inflation).

- SI B – Install Reflective Striping (LM 5.980 to LM 9.900)
  The centerline and edgeline striping on State Route 49 should be replaced with reflective striping for the full length of the study. This option would not impact adjacent structures and would not require acquisition of additional right-of-way. According to TDOT Maintenance personnel, this section of State Route 49 should be resurfaced in 2 to 3 years. The reflective striping could be installed as part of the normal maintenance schedule. Installation should adhere to current TDOT standards.

  If this option is included in a group of Spot Improvements selected for construction, care should be taken in coordination to avoid overlapping improvements.
  Cost for this option is estimated to be $49,000 ($79,000 with inflation).

❖ SI C – Install Advanced Curve Warning Signage (LM 5.980 to LM 9.900)

The horizontal curves within the study area have limited or no advanced warning signage. Additional advanced warning signs would assist drivers in preparation for the curves. The signs should be installed according to current TDOT standards for both directions of travel. Figures 4A and 4B reflect suggested curve locations for advanced warning signs and those locations are listed below: *(Figures 4A and 4B also reflect SI D for consolidation purposes)*

- Curve A – LM 6.19 to 6.35 – (W1-2 signs)
- Curve B – LM 7.20 to 7.28 – (W1-2 signs)
- Curve C – LM 7.29 to 7.39 – (W1-2 signs)
- Curve D – LM 7.97 to 8.06 – (W1-2 signs)
- Curve E – LM 8.43 to 8.48 – (W1-2 signs)

The above locations are based on a broad review. Detailed analysis may reveal signage at any of these curves is not necessary and/or that additional curves qualify.

If this option is included in a group of Spot Improvements selected for construction, care should be taken in coordination to avoid overlapping improvements.
Cost for this option is estimated to be $5,000 ($8,000 with inflation).

❖ SI D – Install Guardrail at Select Locations (LM 5.980 to LM 9.900)

Several locations in the study area exhibit deficient horizontal curves or steep grade changes just off the travelway. These locations could be separated from errant vehicles via guardrails. The general locations recommended for guardrail are listed below and are represented graphically in Figures 4A and 4B. *(Figures 4A and 4B also reflect SI C for consolidation purposes)*

- Location 1 – LM 6.64 to 6.79
- Location 2 – LM 6.86 to 7.06
- Location 3 – LM 7.20 to 7.41
- Location 4 – LM 7.68 to 7.82
- Location 5 – LM 8.40 to 8.57

Guardrail should be installed according to current TDOT standards. The above locations are based on the TPR level review. Detailed analysis may reveal guardrail at any of these locations is not necessary and/or that additional locations qualify.

If this option is included in a group of Spot Improvements selected for construction, care should be taken in coordination to avoid overlapping improvements.
Cost for this option is estimated to be $98,000 ($157,000 with inflation).

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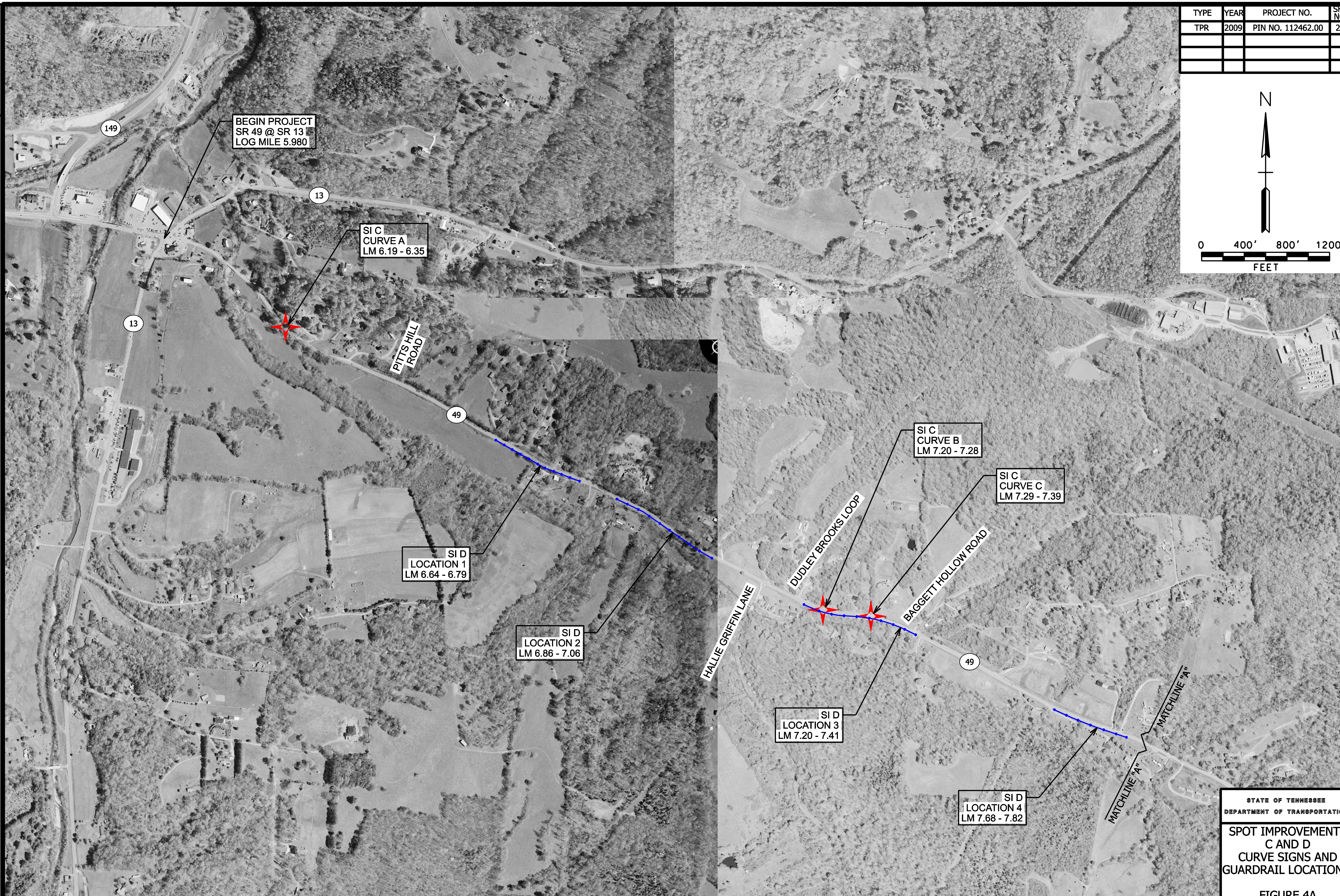


STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SPOT IMPROVEMENTS
C AND D
CURVE SIGNS AND
GUARDRAIL LOCATIONS

FIGURE 4A

$$$$SYTIME$$$$
$$$$DGNSPEC$$$

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

TYPE	YEAR	PROJECT NO.	SHT NO.
TPR	2009	PIN NO. 112462.00	26

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SPOT IMPROVEMENTS
C AND D
CURVE SIGNS AND
GUARDRAIL LOCATIONS

FIGURE 4B

❖ SI E – Modify Horizontal and Vertical Curve (LM 6.11 to 6.43)

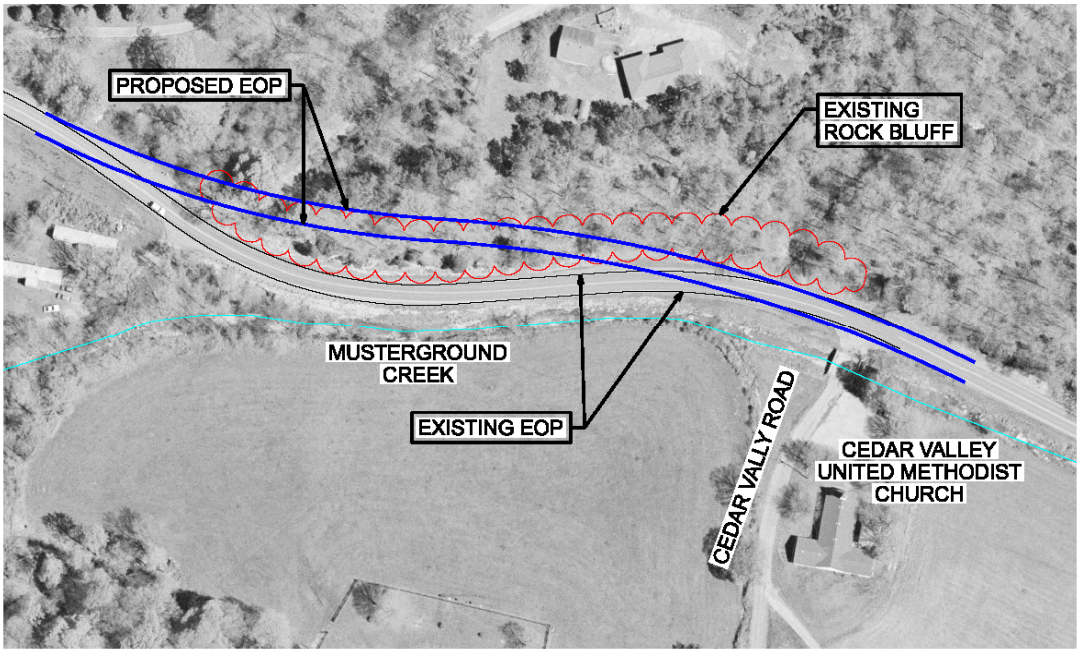
This option considers modifying the existing deficient horizontal and vertical curvature, generally located from just east of the Musterground Creek bridge to near Pitts Hill Lane. The segment is comprised of short straight sections and short curves, having approximately 800 foot radii as measured along the centerline. According to TDOT standards, the minimum radius for a horizontal curve (based on 60 mph design speed and 4% superelevation) is approximately 1,500 feet. The modification would involve construction of an approximately 1,500 foot centerline radius with two (2) 12' travel lanes and 10' paved shoulders. Construction should adhere to current TDOT standards. This option would require acquisition of additional right-of-way and construction could require relocation of approximately 10 utility poles, 1,500 feet of gas line, and a couple of residential service connections. This modification and associated construction estimates were based on construction of the typical section included in the Appendix.

Cost for this option is estimated to be $2,560,000 ($4,130,000 with inflation).

SI E CONCEPT PLAN

❖ SI F – Modify Horizontal Curve (LM 7.94 to 8.15)

This option considers modifying the existing deficient horizontal curvature, generally located from 1,500 feet west of Cedar Valley Road to just east of Cedar Valley Road. This segment is bound by Musterground Creek to the south and rock bluffs to the north. The segment is comprised of two curves separated by an approximately 175 foot tangent section. The west curve radius is approximately 500 feet and the east curve is approximately 600 feet. The modification would consist of the same general layout but improve the horizontal curve radii centerline radius, including two (2) 12' travel lanes and 10' paved shoulders. Construction should adhere to current TDOT standards. This option would require acquisition of additional right-of-way and construction could require relocation of approximately 1,100 feet of water line. The construction would involve a large rock amount of excavation. This modification and associated construction estimates were based on construction of the typical section included in the Appendix.
Cost for this option is estimated to be $1,610,000 ($2,590,000 with inflation).

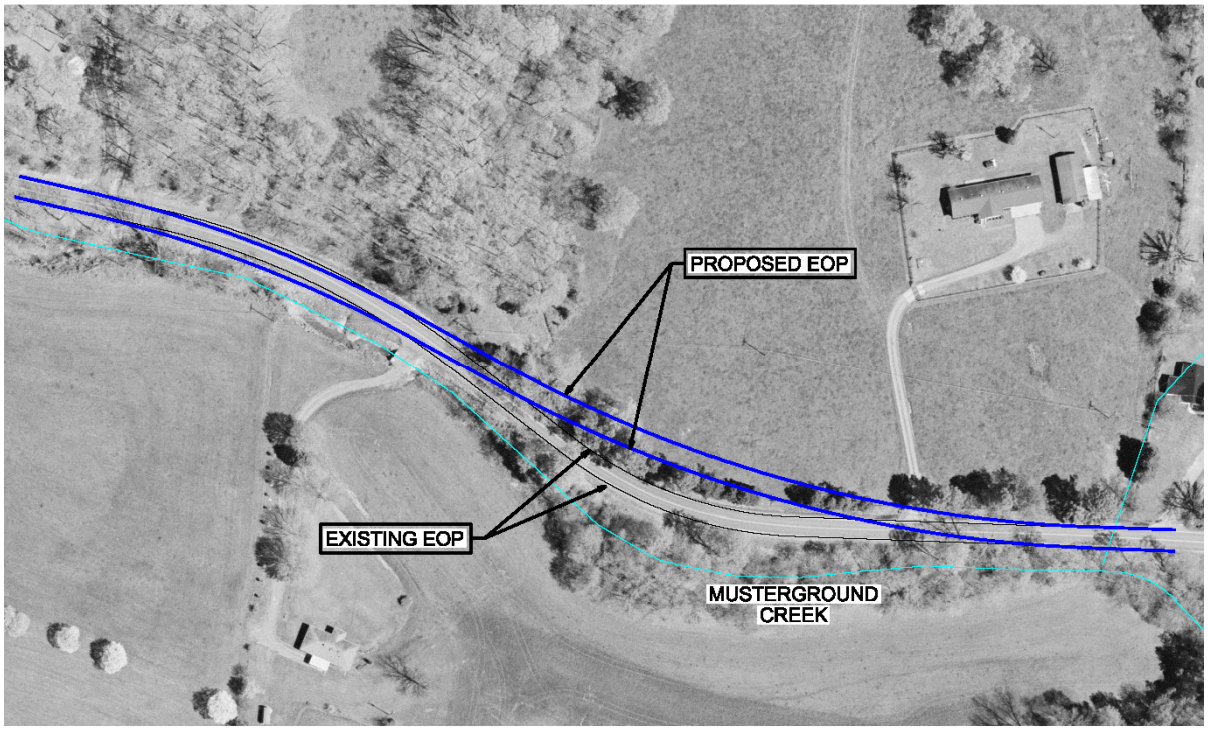


SI F CONCEPT PLAN

❖ <u>SI G – Modify Horizontal and Vertical Curve (LM 8.30 to 8.56)</u>

This option considers modifying the existing deficient horizontal curvature, generally located from approximately 2,600 feet west of Old Highway 49 to approximately 1,200 feet west of Old Highway 49. This segment is bound by Musterground Creek to the south. The segment is comprised of two curves separated by an approximately 165 foot tangent section. The west curve radius is approximately 900 feet and the east curve is approximately 450 feet. The modification would consist of the same general layout but improve the centerline horizontal curve radii to approximately 1,500 feet, including two (2) 12' travel lanes and 10' paved shoulders. Construction should adhere to current TDOT standards. This option would require acquisition of additional right-of-way and construction could require relocation of approximately 1,100 feet of water line. This modification and associated construction estimates were based on construction of the typical section included in the Appendix.

Cost for this option is estimated to be $1,980,000 ($3,190,000 with inflation).



SI G CONCEPT PLAN

6.2 Environmental Impacts

A preliminary environmental review, provided by TDOT, shows that the population of the entire study area is below the poverty level. This population may qualify for consideration under Title VI. In the 2000 Census, approximately 18.1% of Houston County's population and 23.7% of Erin's population was identified as below poverty level. A detailed analysis will be needed to identify any environmental justice considerations.

The other major environmental impact, in either Build Option, would involve Musterground Creek. Given its proximity to State Route 49, care must be taken in design and construction phases to ensure minimal impact.

There is forested land within the corridors defined for both the Build Options.

Other environmental concerns specific to each considered option are as follows:

No Build

No specific environmental concerns are identified at this time for the No Build option.

Build Option A

The evaluation corridor for Build Option A encompasses two (2) blue line streams. Also, portions of this option are in the 100 year flood zone of the blue line streams and cross areas of possible wetlands associated with the blue line streams. This option has the potential to impact underground storage tanks (UST) at the following locations:

- The existing Tire Shop at the intersection of State Route 13, in the SE quadrant
- Abandoned general store at the intersection of Old Highway 49/Jim Clark Road, although, it is believed that these USTs have been removed

A detailed environmental study and concept plan for improvements would be needed to assess the UST impacts of construction.

Build Option B

The evaluation corridor for this option is the same as for Build Option A, however, this Option is comprised of individual Spot Improvements. Therefore, the impacts associated with this Option would be based on the combination of improvements selected for construction.

The evaluation corridor for Build Option B encompasses two (2) blue line streams. Also, portions of this option are in the 100 year flood zone of the blue line streams and cross areas of possible wetlands associated with the blue line streams. This option has the potential to impact underground storage tanks (UST) at the following location:

- Abandoned general store at the intersection of Old Highway 49/Jim Clark Road, although, it is believed that these USTs have been removed

A detailed environmental study and concept plan for improvements would be needed to assess the UST impacts of construction.

6.3 Cultural Impacts

There are no National Historic Register sites located within the study area, according to the NHR website.

There are no known archaeologically significant sites within the study area. It is unclear whether any archaeological investigations have been performed within the study area. An archaeological investigation may be needed to assess the potential presence of archaeological resources in the evaluation corridor.

Other potential cultural impacts specific to each considered option are as follows:

No Build

No specific cultural concerns are identified at this time for the No Build option.

Build Option A

The evaluation corridor for the Build Option A includes the Cedar Valley United Methodist Church and its cemetery. The Cedar Hill Cemetery is located just outside the evaluation corridor, east of Old Highway 49. Relative to this improvement option, it is unlikely the cemetery will be impacted. Similarly, Erin Elementary School is located just south of the evaluation corridor and likely would only be impacted indirectly by construction activities. However, if Build Option A is chosen, diligence should be exercised near these sites.

Build Option B

The evaluation corridor for this option is the same as for Build Option A, however, this Option is comprised of individual Spot Improvements. Therefore, the impacts associated with this Option would be based on the combination of improvements selected for construction, if any.

The evaluation corridor for the Build Option A includes the Cedar Valley United Methodist Church and its cemetery. The Cedar Hill Cemetery is located just outside the evaluation corridor, east of Old Highway 49. Relative to this improvement option, it is unlikely the cemetery will be impacted. Similarly, Erin Elementary School is located just south of the evaluation corridor and likely would only be impacted indirectly by construction activities. However, if Build Option A is chosen, diligence should be exercised near these sites.

6.4 Structural Impacts

Build Option A could impact the bridge over Musterground Creek (LM 6.100). The existing bridge was constructed in 1927 and is not currently scheduled for repair or replacement, according to the TDOT Structures Division. Although the general intent of Build Option A is to widen the existing facility to construct shoulders, bridge replacement could be deemed necessary or prudent. Build Option B does not include a Spot Improvement for replacing the bridge. The improvements listed for Build Option B likely would not impact the existing bridge.

Both Build Options have the potential to require substantial rock excavation. The rock bluffs are shown on the Topo ID maps in the Appendix.

6.5 Cost Estimate

For Build Option A, a preliminary total project cost estimate was prepared based upon per mile costs. The total project cost for Option A was estimated based on a general assumption that the option involved the reconstruction of an existing two-lane state highway.

For Build Option B, preliminary total project cost estimates were prepared for each Spot Improvement and are shown with its description. Table 17 summarizes the estimated total project cost for each improvement option based on 2008 average prices, excluding inflation allowances.

Table 17
Comparison of Construction Cost Estimates

Option	Number of New Lanes	Total Project Cost*** (2008 $)	Length (miles)	Cost Per Lane Mile (2008 $)
No Build	0	N/A	0	N/A
Build Option A	2	$32,250,000*	3.92	$3,990,000*
Build Option B	N/A	$6,330,000**	N/A	N/A

* Includes bridge replacement estimated cost and recommended turn lanes at intersection with SR 13
** Total of all Spot Improvements (SI A through SI G)
*** Total Project Cost includes PE, ROW, and Construction costs

7.0 ASSESSMENT OF CORRIDOR OPTIONS

The Tennessee Department of Transportation has adopted seven guiding principles against which all transportation projects are to be evaluated. These guiding principles address concerns for system management, mobility, economic growth, safety, community, environmental stewardship, and fiscal responsibility. These guiding principles are discussed in the following paragraphs as they relate to the options discussed in this report.

7.1 Preserve and Manage the Existing Transportation System

Both improvement options involve improvement to the existing transportation system. Neither option involves construction of a roadway on new alignment, rather a widening of the existing roadway. None of the options will add any distance to the State Highway System.

7.2 Move a Growing, Diverse, and Active Population

Both improvement options would serve to assist in creating additional facility capacity by addressing existing deficiencies (not by additional laneage), thereby increasing vehicular mobility for residents and visitors alike.

7.3 Support the State's Economy

Both improvement options would, as mentioned previously, increase the safety of the facility and, consequently, the capacity of the facility. This would promote further residential, commercial, and industrial growth in the area into the future. The roadway capacity under the No Build option would not promote additional growth in the area. Build Option A provides the highest potential of economic support.

7.4 Maximize Safety and Security

Both improvement options would alleviate existing safety issues along the corridor. Construction of shoulders combined with clear zone improvements in Build Option A would improve the safety of the entire facility. Individual components of Build Option A would address itemized safety issues thereby improving the existing facility. The No Build option would not meet this principle.

7.5 Build Partnerships for Livable Communities

The Build Option A provides the opportunity for the construction of paved shoulders for the length of the study with the goal of improving mobility and the quality of life for residents. The terrain of the study area inherently limits the viability of modes of transportation such as bicycling and walking. The components of Build Option B would have limited application to this principle. The No Build option would not meet this principle.

7.6 Promote Stewardship of the Environment

A detailed environmental study is needed to fully address the impacts of each considered option. Preliminary environmental data based upon information of record is included in the Appendix. Reasonable efforts should be made to minimize impacts to natural and cultural resources. All options seek to limit environmental impacts by improving the existing facility rather than constructing a new facility.

7.7 Promote Financial Responsibility

This Transportation Planning Report (TPR) is prepared in accordance with the Goals and Objectives set forth in Tennessee's Long Range Transportation Plan (LRTP).

Preliminary total project cost estimates were prepared for each considered option based upon typical per mile costs. Table 17 summarizes the total project cost estimates for all options.

8.0 SUMMARY

Purpose and Need
The primary purpose and need for improvement of State Route 49 is to upgrade the overall safety of the roadway, thereby increasing vehicular capacity, to further the overall goal of improving the attractiveness of the corridor for connectivity, economic development, and tourism purposes.

The following options and potential benefits are considered:

No Build Option
- Make no physical changes to the existing transportation infrastructure

Build Option A:
- Widen the existing facility to construct paved shoulders the length of the project
- Improve deficient horizontal and vertical curvature
- Improve clear zone characteristics of the facility

Build Option B:
- Comprised of multiple Spot Improvements for individual selection implementation
- Each Spot Improvement addresses an existing safety or geometric deficiency
- Allows for mitigation of existing critical issues individually in an economical manner

Summary Tables

Comparison of Projected Operational Performance and Costs

The operational performance of each option was evaluated using level of service analysis. Table 18 summarizes the level of service (LOS) and percentage of truck traffic computed for each option and horizon year. The traffic data shown in Table 18 is for the West segment of State Route 49 as described earlier in this report. A level of service D is considered deficient by TDOT standards for rural roads. All options perform at acceptable levels of service in the 2014 and 2034 horizon years. Preliminary total project cost estimates are also included in Table 18. Current total project costs were based on 2008 average prices. Future total project costs account for a 10% yearly inflation increase.

Table 18
Performance Measure Comparison
2014 & 2034

Performance Measure	No Build		Build Option A		Build Option B	
	2014	2034	2014	2034	2014	2034
AADT	2,920	4,340	2,920	4,340	2,920	4,340
LOS	C	C	C	C	C	C
Truck %	4%		4%		4%	
Total Project Cost*** 2008 (2013)	$0		$32,250,000* ($51,960,000)*		$6,330,000** ($10,210,000)**	
Approximate Length	-		3.92		N/A	

* Includes bridge replacement estimated cost and recommended turn lanes at intersection with SR 13
** Total of all Spot Improvements (SI A through SI G)
*** Total Project Cost includes PE, ROW, and Construction costs

Advantages/Disadvantages of Each Option

Following are items that summarize the performance or issues associated with each option:

No Build:

Advantages

- Does not require additional right-of-way
- Creates no additional environmental impacts
- Does not create additional roadway maintenance for TDOT
- Traffic operations remain acceptable for horizon years

Disadvantages

- Does not meet the purpose and need for improvement
- Does not correct existing facility deficiencies

Build Option A:

Advantages

- Improves safety of entire facility
- Provides opportunity to mitigate existing unbarricaded physical features
- Improved facility safety improves facility capacity
- Improves traffic operations
- Provides a paved shoulder suitable for accommodating bicycle traffic

Disadvantages

- Requires acquisition of additional right-of-way
- Has a higher potential for environmental impacts than No Build
- Adds additional roadway maintenance for TDOT
- Likely involves bridge upgrade or replacement

Build Option B:

Advantages

- Allows flexibility to improve individual deficiencies
- Provides opportunity to address issues in an economical manner
- Provides opportunity to mitigate existing unbarricaded physical features
- Improves traffic operations

Disadvantages

- Requires acquisition of additional right-of-way, although less than Option A
- Has a higher potential for environmental impacts than No Build but less than Option A

Summary Based on Purpose and Need

State Route 49 is functionally classified as a rural minor arterial on the Surface Transportation Program system. For the length of the study, State Route 49 is a two lane roadway and extends in a west/east orientation across Houston County, providing access to State Route 13 on the west side and to State Route 46 on the east side. Further east of the study endpoint, State Route 49 provides access to Dickson County and indirectly to Davidson County.

A traffic crash rate was calculated for State Route 49 from crash data for the years 2005 through 2007. Within the studied period, there were a total of 16 crashes on State Route 49, of which 3 resulted in an incapacitating injury and 2 resulted in fatalities. The overall crash rate for this section of State Route 49 is below the statewide average but other crash rates, such as fatality and incapacitating injury rates, are above the statewide average.

The primary purpose and need for improvement to State Route 49 is to upgrade the overall safety of the roadway, thereby increasing vehicular capacity, to further the overall goal of improving the attractiveness of the corridor for connectivity, economic development, and tourism purposes.

Build Option A and Build Option B (Spot Improvements) provide the most potential for operational and safety benefit to the study area. Both of the options, however, have a greater potential for environmental impacts than the No Build Option. Additional studies are needed to quantify the level of potential impact and possible mitigation measures.

APPENDIX

COST ESTIMATES

STUDY AREA ON U.S.G.S. QUAD MAPS

EVALUATION CORRIDOR ON U.S.G.S. QUAD MAPS

EES MAPS

EES SCORING SHEETS AND REPORT

TOPO ID

TYPICAL SECTION

COST ESTIMATES

COST ESTIMATE SUMMARY

	Item	Total Cost (2008 Cost)	Total Cost (with Inflation)
OPTION A			
*	MAINLINE WIDENING	$ 29,450,000	$ 47,430,000
*	BRIDGE	$ 1,840,000	$ 2,970,000
*	TURN LANES	$ 820,000	$ 1,330,000
*	SIGNALIZATION	$ 140,000	$ 230,000
TOTAL		**$ 32,250,000**	**$ 51,960,000**
OPTION B			
*	SI A	$ 32,000	$ 52,000
*	SI B	$ 49,000	$ 79,000
*	SI C	$ 5,000	$ 8,000
*	SI D	$ 98,000	$ 157,000
*	SI E	$ 2,560,000	$ 4,130,000
*	SI F	$ 1,610,000	$ 2,590,000
*	SI G	$ 1,980,000	$ 3,190,000
TOTAL		**$ 6,330,000**	**$ 10,210,000**

Turn Lanes
2014
ROW, Construction, & PE Cost

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Factor	Length	Cost
ROW	$930,000	1.00				0.05	$46,500
CON	$6,045,000		1.00	1.10		0.05	$332,475
PE					0.10		$33,248
Subtotal Cost							**412,223**

TOTAL COST with Inflation (10% per year over 5 years) **$663,888**

2034
ROW, Construction, & PE Cost

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Factor	Length	Cost
ROW	$930,000	1.00				0.05	$46,500
CON	$6,045,000		1.00	1.10		0.05	$332,475
PE					0.10		$33,248
Subtotal Cost							**412,223**

TOTAL COST with Inflation (10% per year over 5 years) **$663,888**

Turn Lanes Total Costs

	TOTAL COST (2008 $)						**$824,445**
	TOTAL COST with Inflation (10% per year over 5 years)						**$1,327,777**

SR 49 @ SR 13
Signalization Estimate
Based on TDOT website - Average Bid Prices (2008)

SIGNAL POLES

1	Wood Pole	@	$1,707	ea.	==>	$1,707
	Steel Strain Pole	@		ea.	==>	$0
	Concrete Strain Pole	@		ea.	==>	$0
4	Steel Mast-Arm	@	$12,500	ea.	==>	$50,000
	Twin Mast-Arm	@		ea.	==>	$0
4	Luminaire (400W)	@	$605	ea.	==>	$2,420
			SUBTOTAL			**$54,127**

CONTROLLER & CABINET

	2 Phase w/ Cabinet	@		ea.	==>	$0
	4 Phase w/ Cabinet	@		ea.	==>	$0
1	8 Phase Cabinet (Base Mtd)	@	$8,978	ea.	==>	$8,978
1	8 Phase Controller	@	$3,351	ea.	==>	$3,351
			SUBTOTAL			**$12,329**

VEHICLE DETECTION

	Single Channel Detector	@		ea.	==>	$0
	Four Channel Detector	@		ea.	==>	$0
	6' x 6' Pulse Loop	@		ea.	==>	$0
	6' x 50' Quad Loop	@		ea.	==>	$0
	6' x 50' Presence Loop	@		ea.	==>	$0
5	Pull Box	@	$300	ea.	==>	$1,500
1	Video Detection	@	$25,000	ea.	==>'	$25,000
			SUBTOTAL			**$26,500**

SIGNAL HEADS

4	3-Section Signal Head	@	$790	ea.	==>	$3,160
4	5-Section Signal Head	@	$1,362	ea.	==>	$5,449
1	Signal Cable Assembly	@	$3,000	ea.	==>	$3,000
			SUBTOTAL			**$11,609**

PEDESTRIAN FEATURES

4	Steel Pedestal	@	$1,077	ea.	==>	$4,307
8	Pedestrian Signal Head	@	$650	ea.	==>	$5,200
4	Ped Pushbutton w/ Sign	@	$225	ea.	==>	$900
			SUBTOTAL			**$10,407**

CONDUIT

100	Conduit (Underground)	@	$5.00	l.f.	==>	$500
150	Conduit (Jack & Bore)	@	$45.00	l.f.	==>	$6,750
	Conduit (Riser)	@		l.f.	==>	$0
			SUBTOTAL			**$7,250**

ELECTRICAL

1	Electric Service	@	$500	ea.	==>	$500
	Service Wire (#6 AWG)	@		l.f.	==>	$0
	Ground Rod (Copper)	@		l.f.	==>	$0
	Fiber Optic Interconnect	@		l.f.	==>	$0
			SUBTOTAL			**$500**

STRIPING

	4" Traffic Stripe	@		l.f.	==>	$0
	8" Traffic Stripe	@		l.f.	==>	$0
	12" Traffic Stripe	@		l.f.	==>	$0
	18" Traffic Stripe	@		l.f.	==>	$0
150	24" Traffic Stripe	@	$10.53	l.f.	==>	$1,580
4	Sign	@	$200	ea.	==>	$800
150	Pedestrian Cross Walk	@	$33.08	l.f.	==>	$4,962
			SUBTOTAL			**$7,342**

MOBILIZATION	l.s.	==>	**$7,500**
PREEMPTION	l.s.	==>	**$5,000**

TOTAL COST	**$142,564**
TOTAL COST with Inflation (10% per year over 5 years)	**$ 229,601**

Option A

ROW, Construction, & PE Cost

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Factor	Length	Cost
ROW	$930,000	1.00				3.92	$3,645,600
CON	$6,045,000		1.10	0.90		3.92	$23,459,436
PE					0.10		$2,345,944
Subtotal Cost							**$29,450,980**

Subtotal Cost with Inflation (10% per year over 5 years) $47,431,097

Musterground Creek Bridge

Removal							$500,000
Replacement							$1,344,739
Subtotal Cost							**$1,844,739**

Subtotal Cost with Inflation (10% per year over 5 years) $2,970,971

Option A Total Costs

							Cost/Mile
	TOTAL COST (2008 $)					**$31,295,719**	$3,990,000
	TOTAL COST with Inflation (10% per year over 5 years)					**$50,402,068**	$6,430,000

Option B
SI A

	Width (ft)	Length (ft)	Area (acre)		Cost	**Total Cost**
Clear Vegetation from ROW	34	20697.6	16.2	$	2,000.00	**$32,310**

TOTAL COST with Inflation (10% per year over 5 years) **$52,036**

Option B
SI B

	# of Stripes	Length (mi)	Total Length		Cost	**Total Cost**
Reflective Striping (Centerline & Edge Lines, no passing)	4	3.92	15.7	$	3,144.16	**$ 49,300**
	TOTAL COST with Inflation (10% per year over 5 years)					**$79,399**

(Using Plastic Pavement Marking rather than Painted)

Option B
SI C

	# of Signs (each)	Cost	**Total Cost**
Curve Warning Signs	10	$ 500.00	**$ 5,000**
TOTAL COST with Inflation (10% per year over 5 years)			**$8,053**

Option B
SI D

Install Guardrail	Length of Guardrail (ft)	End Anchor (each)	Cost of Guardrail	Cost of End Anchors	**Total Cost**
Location 1	792.00	2			
Location 2	1056.00	2			
Location 3	1108.80	2			
Location 4	739.20	2			
Location 5	897.60	2			
Total	4,593.60	10	$15.59	$2,608.09	**$97,695**
TOTAL COST with Inflation (10% per year over 5 years)					**$157,339**

Option B
SI E
ROW, Construction, & PE Cost

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Factor	Length	Cost
ROW	$930,000	1.00				0.33	$306,900
CON	$6,045,000		1.10	0.90		0.33	$1,974,902
PE					0.10		$197,490
Total Cost							**2,479,292**

Utility Cost

Gas	1500	ft	$ 25.00	$	37,500.00
Gas Service Connections	2	each	$ 1,000.00	$	2,000.00
Power	10	pole	$ 2,500.00	$	25,000.00
Total Relocation Cost				$	64,500.00
Utility Cost Subtotal			**30% Increase**	**$**	**83,850.00**

Current Cost $ 2,563,142

TOTAL Cost with Inflation
(10% per year over 5 years) **$4,127,965**

Total Cost Per Mile $ 12,508,986

Option B
SI F
ROW, Construction, & PE Cost

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Factor	Length	Cost
ROW	$930,000	1.00				0.21	$195,300
CON	$6,045,000		1.10	0.90		0.21	$1,256,756
PE					0.10		$125,676
Total Cost							**1,577,731**

Utility Cost

Water	1100 ft	$	20.00	$ 22,000.00
Total Relocation Cost				$ 22,000.00
Utility Cost Subtotal		**30% Increase**		**$ 28,600.00**

Current Cost $ 1,606,331

TOTAL Cost with Inflation (10% per year over 5 years) **$2,587,012**

Total Cost Per Mile $12,319,106

Option B
SI G
ROW, Construction, & PE Cost

STATE ROUTES	Cost		Terrain	Construction			
	Per Mile	Area Factor	Factor	Factor	Factor	Length	Cost
ROW	$930,000	1.00				0.26	$241,800
CON	$6,045,000		1.10	0.90		0.26	$1,555,983
PE					0.10		$155,598
Total Cost							**1,953,381**

Utility Cost

Water	1100 ft	$	20.00	$ 22,000.00
Total Relocation Cost				$ 22,000.00
Utility Cost Subtotal		**30% Increase**		**$ 28,600.00**

Current Cost $ 1,981,981

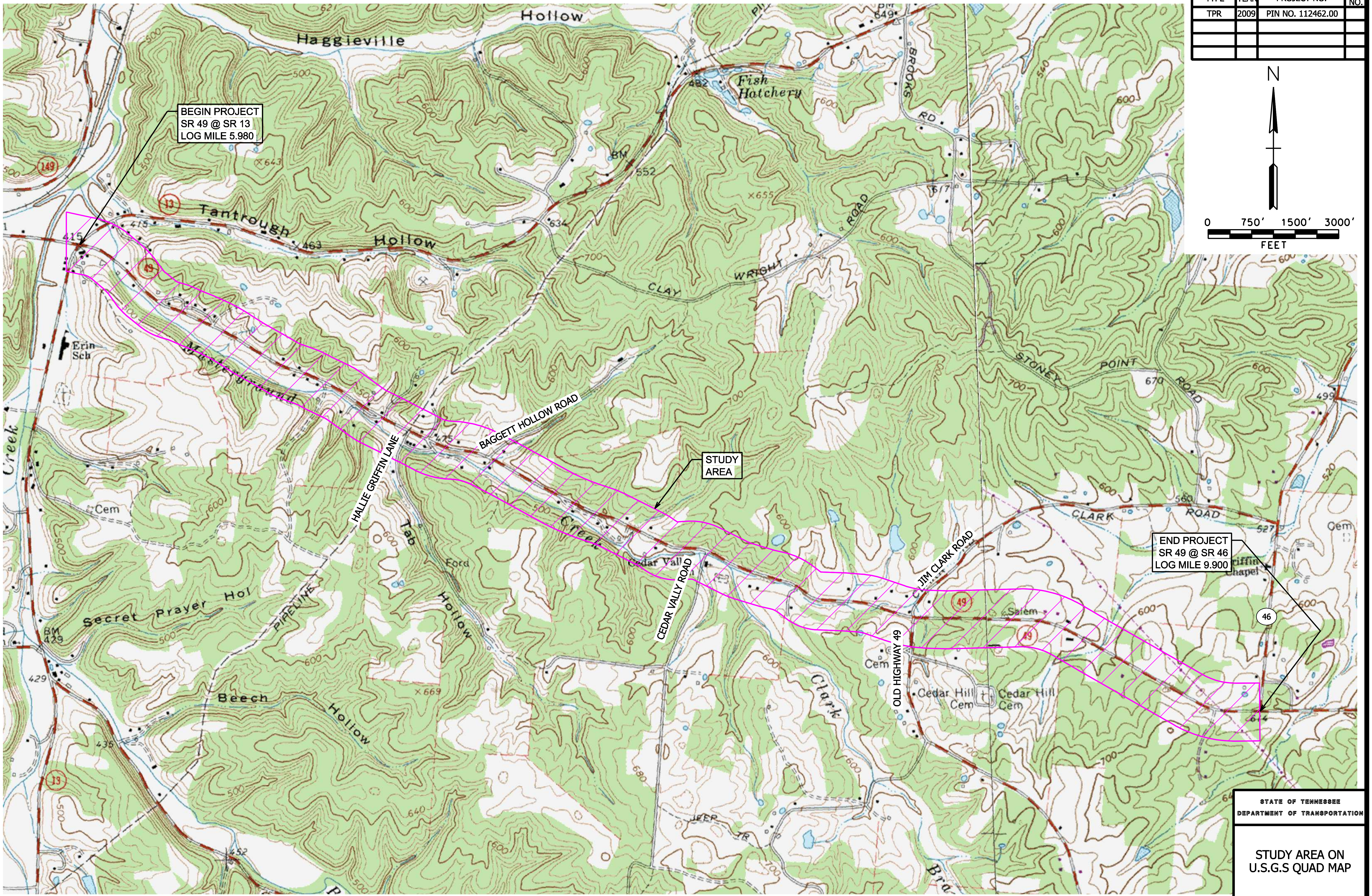
TOTAL Cost with Inflation (10% per year over 5 years) **$3,192,001**

Total Cost Per Mile $ 12,276,926

STUDY AREA ON U.S.G.S. QUAD MAPS

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

TYPE	YEAR	PROJECT NO.	SHT NO.
TPR	2009	PIN NO. 112462.00	



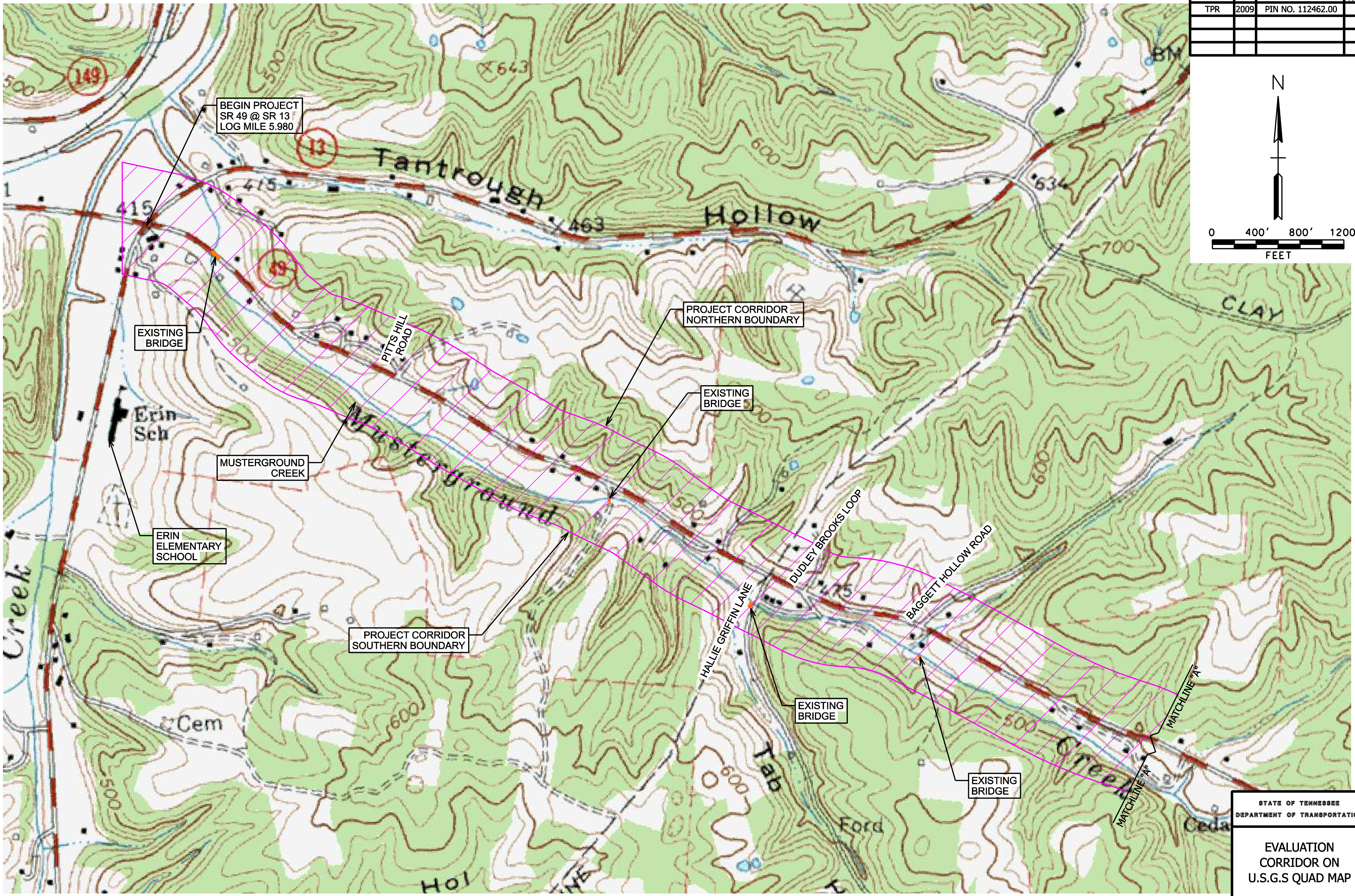
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

STUDY AREA ON
U.S.G.S QUAD MAP

EVALUATION CORRIDOR ON U.S.G.S. QUAD MAPS

TYPE	YEAR	PROJECT NO.	SHT NO.
TPR	2009	PIN NO. 112462.00	

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



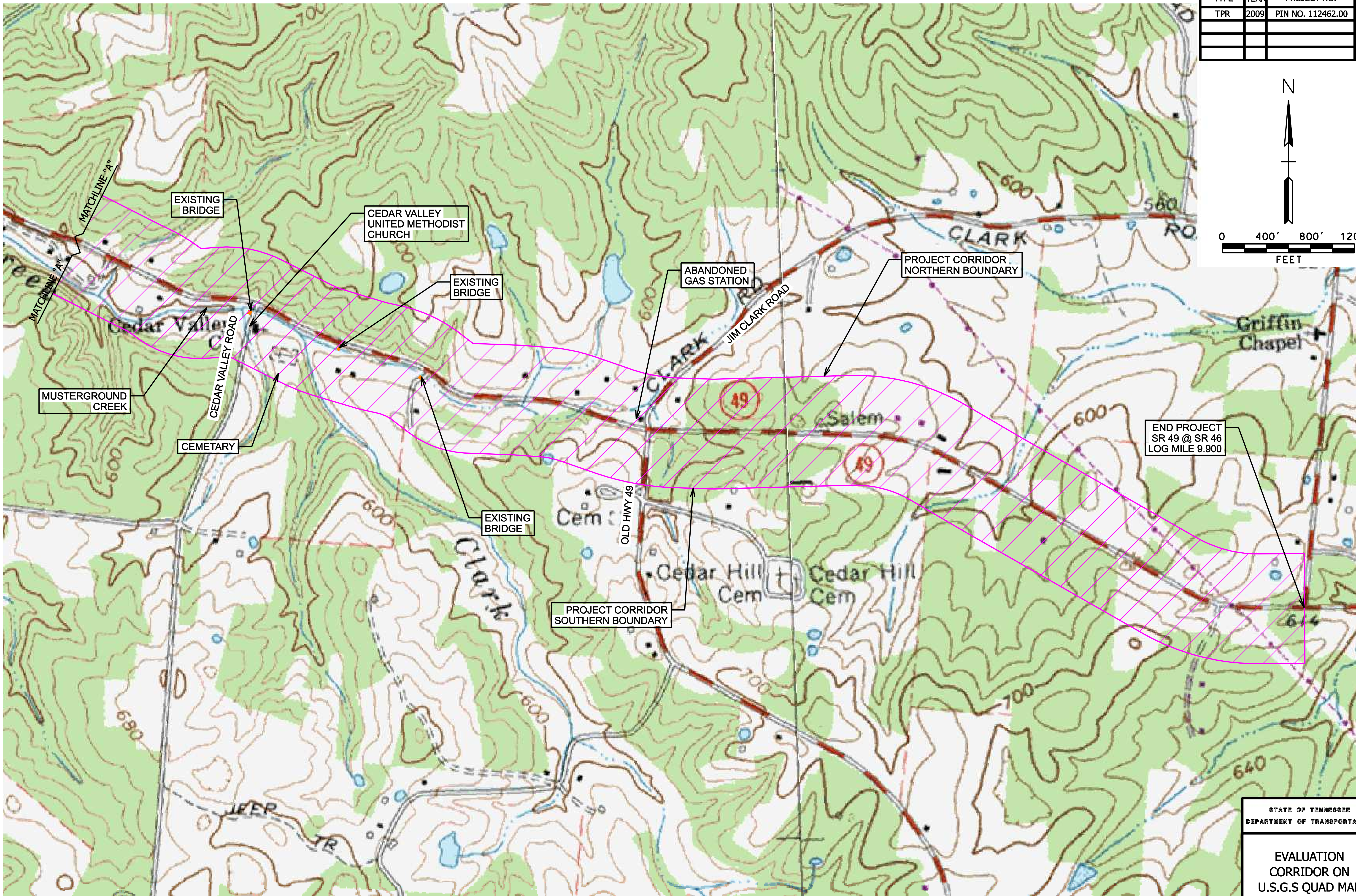
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

EVALUATION CORRIDOR ON U.S.G.S QUAD MAP

TENNESSEE D.O.T.
DESIGN DIVISION

FILE NO.

TYPE	YEAR	PROJECT NO.	SHT NO.
TPR	2009	PIN NO. 112462.00	



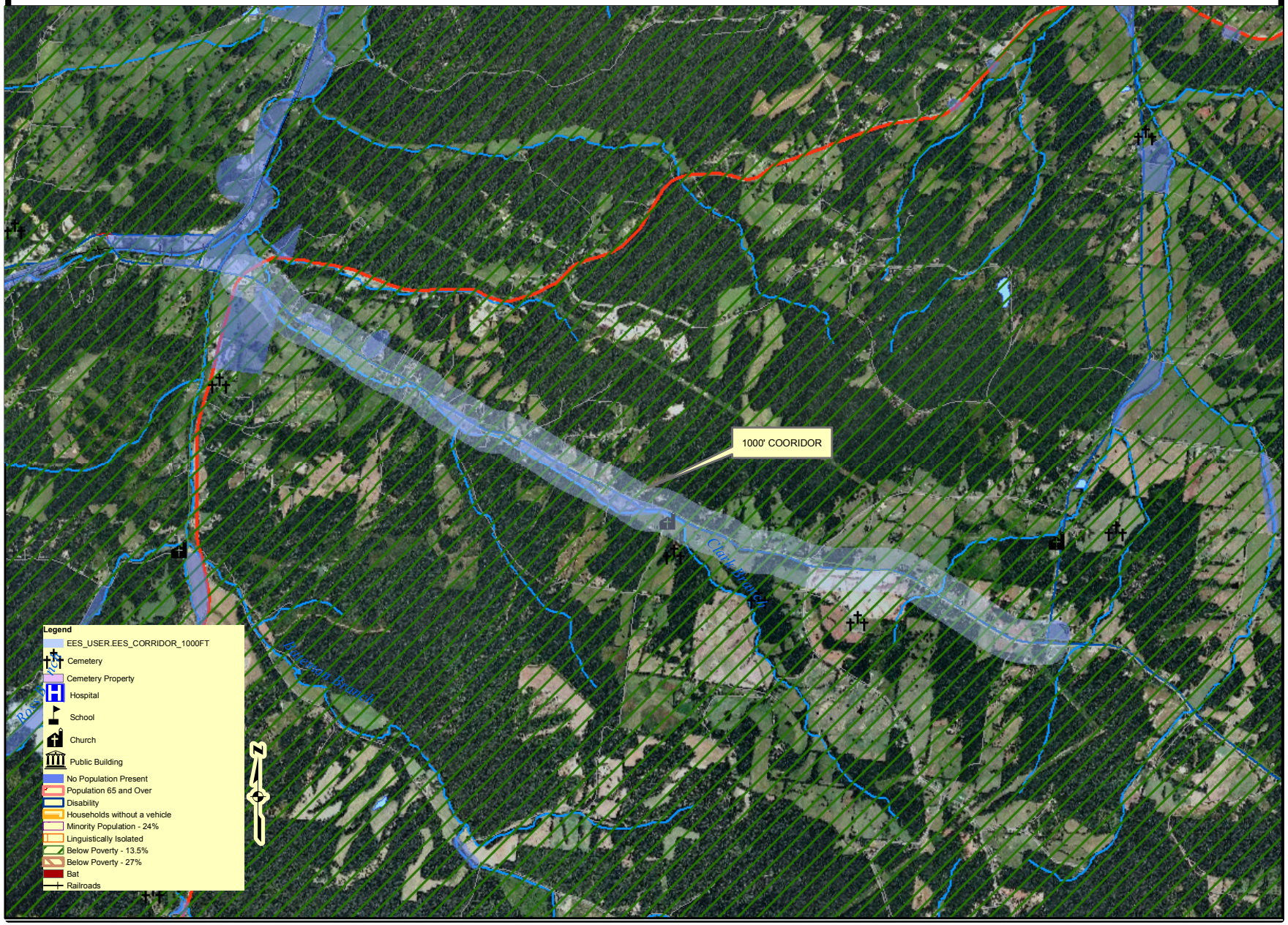
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

EVALUATION CORRIDOR ON U.S.G.S QUAD MAP

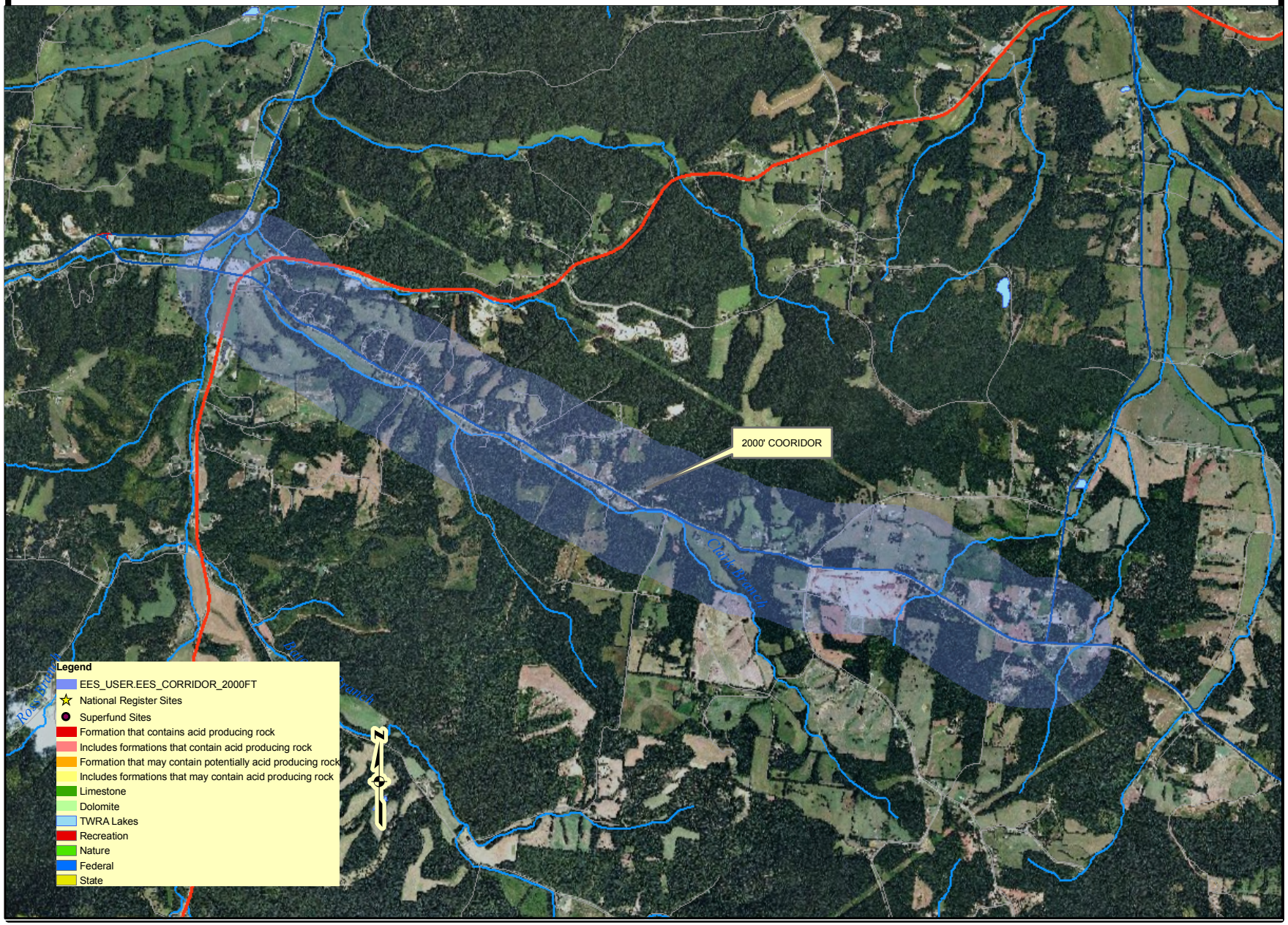
$$$$SYTIME$$$$$$
$$$$DGNSPEC$$

EES MAPS

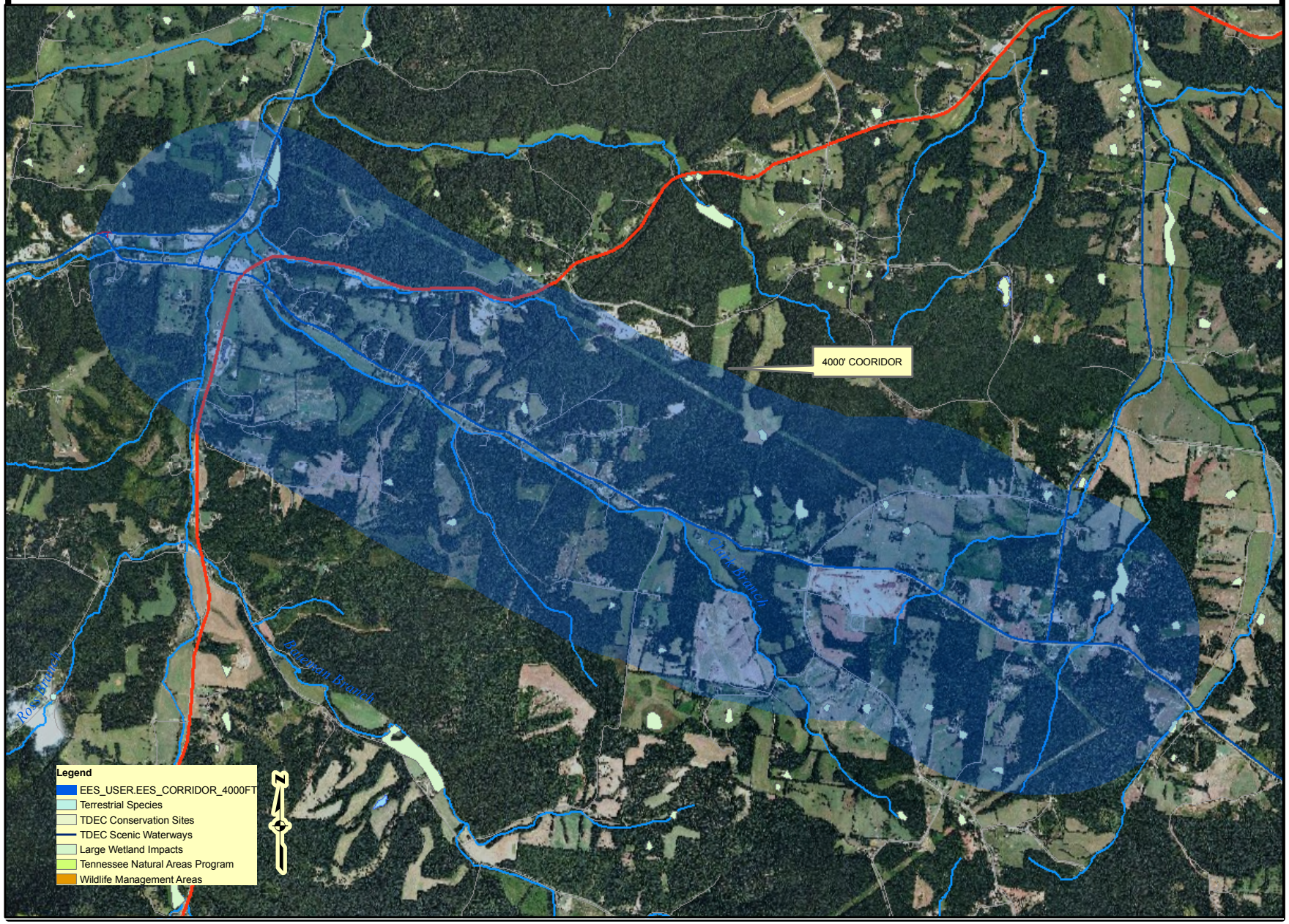
HOUSTON COUNTY STATE ROUTE 49
PIN # 112462.00



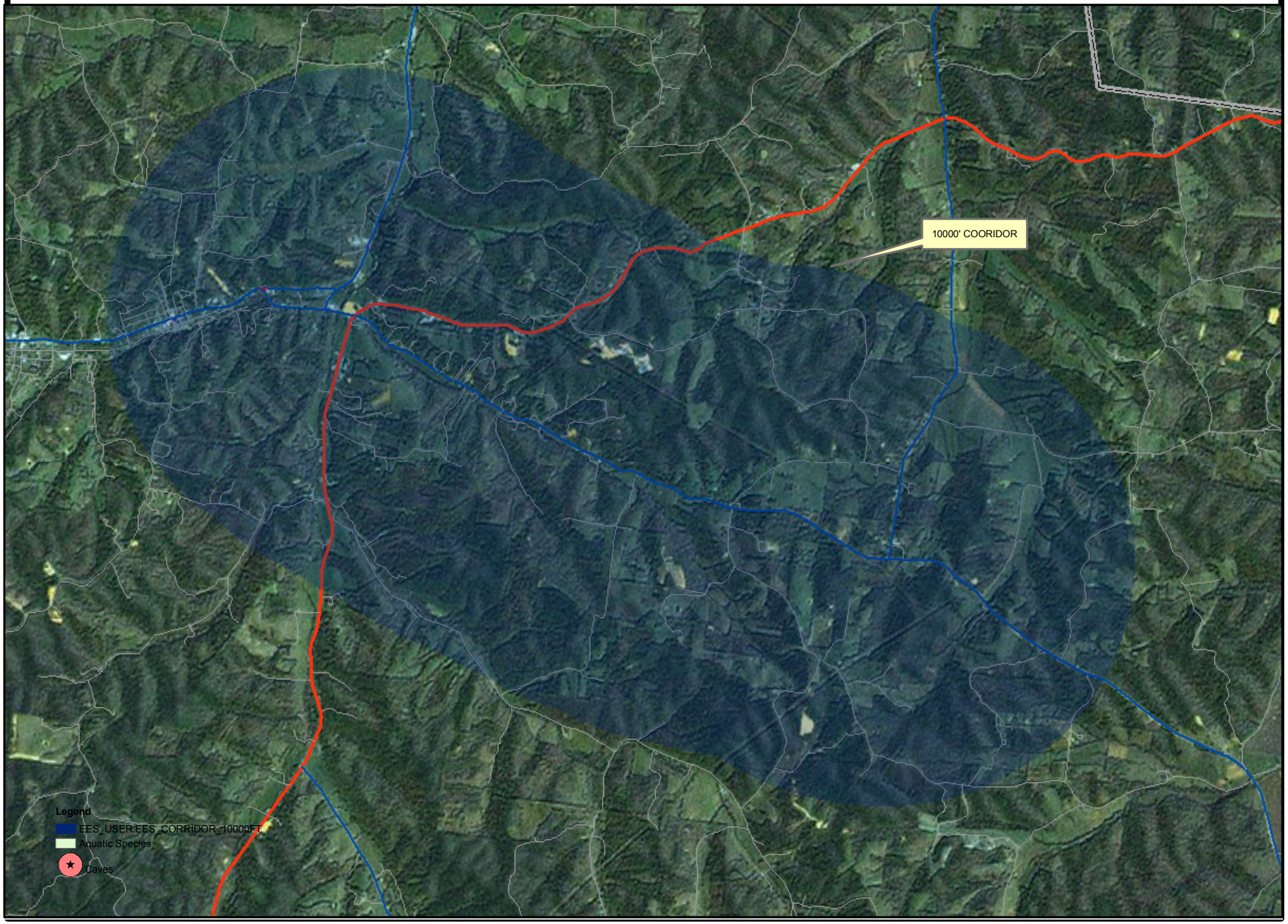
HOUSTON COUNTY STATE ROUTE 49
PIN # 112462.00



HOUSTON COUNTY STATE ROUTE 49
PIN # 112462.00



HOUSTON COUNTY STATE ROUTE 49
PIN # 112462.00



EES SCORING SHEETS AND REPORT

Tennessee Department of Transportation
EARLY ENVIRONMENTAL SCREENING PROCESS (EES)
PROJECT SCORING

Project Score Factors

	Total Impacts Evaluated	Total Impacts to Evaluate	EES Evaluation
Project Impact Areas:	**15**	**15**	**Complete**
Date of Evaluation:	June 18, 2009		
Evaluation done by:	Chris Armstrong		
	Transportation Planner 4		
County:	Houston		
Route:	State Route 49		
PIN:	112462.00		
Termini:	From SR-13 to SR-46		

Impact Ranking of Features Evaluated:	**Total by Rank**
Features with No Impact	**13**
Cemetery Sites & Cemetery Properties	
National Register Sites	
Bat	
Terrestrial Species	
Aquatic Species	
TDEC Conservation Sites & TDEC Scenic Waterways	
Superfund Sites	
Caves	
Pyritic Rock	
Railroads	
Tennessee Natural Areas Program	
Wildlife Management Areas	
TWRA Lakes & Other Public Lands	
Features with Low Impact	**0**

Features with Moderate Impact	**0**
Features with Substantial Impact	**1**

Large Wetland Impacts

Community Impacts Present:

Institutions:

Church

Populations:

No population present

Populations below poverty - State average- 13%

EES Project Impact: **Complete**

Impacts Evaluated Within 1,000 Ft of Study Area

CEMETERY SITES & CEMETERY PROPERTIES

Impact

Project Impact (Environmental, Time, Cost, Design, and Maintenance)	☑ **None** - No impact on the project as there are no known cemetery sites within or abutting the project study area or corridor. It is anticipated that a 'normal' effort to complete this environmental review as part of NEPA.

INSTITUTIONS & SENSITIVE COMMUNITY POPULATIONS

Sensitive Populations Project Impact:	Present	Not Present
Institutions:		
Hospital	☐	☑
School	☐	☑
Church	☑	☐
Public Building	☐	☑
Populations:		
No population present	☑	☐
65 and older populations	☐	☑
Disability populations	☐	☑
Households without a vehicle	☐	☑
Minority populations 24%	☐	☑
Linguistically isolated populations	☐	☑
Populations below poverty - State average - 13%	☑	☐
Populations below poverty - State average - 27%	☐	☑

BAT

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** – No project impact is anticipated. There is no occurrence of Indiana or gray bats within 4 miles of the proposed project study area or corridor.

RAILROADS

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** – No impact on the project is anticipated. There are no railroads located within the project study area or corridor.

Impacts Evaluated Within 2,000 Ft of Study Area

NATIONAL REGISTER SITES

Impact

Project Impact (Environmental, Time, Cost, Design, and Maintenance)	☑ **None** – No project impact is anticipated as there are no National Register listed properties abutting or within the project study area or corridor.

SUPERFUND SITES

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** – No project impact is anticipated as there are no known contaminated land tracts abutting or within the project study area or corridor.

PYRITIC ROCK

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** – No project impact is anticipated. Pyritic rock is not known to occur in the study area/corridor or project does not involve excavation. Limestone (symbolized as dark green) and dolomite (symbolized as light green) are present.

TWRA LAKES & OTHER PUBLIC LANDS

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** – No impact on the project is anticipated as there area no parks located within or abutting the project study area or corridor.

Impacts Evaluated Within 4,000 Ft of Study Area

TERRESTRIAL SPECIES

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** - No impact to the project is anticipated. There is no known occurrence of a rare, state, or federally-protected terrestrial species within the proposed transportation study area or corridor.

TDEC CONSERVATION SITES & TDEC SCENIC WATERWAYS

Impact

Project Impact (Environment, Time, Cost, Design, Maintenance)	☑ **None** – No project impact is expected as there are no scenic waterways or TDEC Conservation Sites within project study area or corridor.

LARGE WETLAND IMPACTS

Impact

Project Impact (Environment, Time, Cost, Design, Maintenance)	☑ **Substantial** – Regions 1, 2, and 3: A substantial impact to the project is probable as there is greater than 2 acres of wetlands within the project study area or corridor. Compensatory mitigation will be required. Design effort will be needed to avoid and minimize impacts to wetlands to the maximum extent practicable. If a floodplain is crossed by the project, floodplain culverts may be necessary.

TENNESSEE NATURAL AREAS PROGRAM

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** – No impact on the project is anticipated as the project study area or corridor does not include a Natural Area.

WILDLIFE MANAGEMENT AREAS

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** – No project impact is anticipated as a WMA does not abut nor is located within the project study area or corridor.

Impacts Evaluated Within 10,000 Ft of Study Area

AQUATIC SPECIES

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** - No impact to the project is anticipated. There is no known occurrence of a rare, state, or federally-protected aquatic species within the project study area or corridor.

CAVES

Impact

Project Impact (Environment, Time, Cost, Design, and Maintenance)	☑ **None** – No project impact is anticipated as there are no caves in the project study area or corridor.

EES Report

PIN 112462.00

1,000 Foot Corridor

Study Line ID: 112462_4201V01

Version Date: May 01, 2009

Created by: Chris Armstrong

Cemetery Sites & Cemetery Properties

Cemeteries	None were found
Cemetery Property	None were found

Institutions & Sensitive Community Populations

Institutions: Total= 1

Church	Cedar Valley Church

Populations:

No population present	Present
65 & older populations	None were found
Disability populations	None were found
Households without a vehicle	None were found
Minority populuations 24%	None were found
Linguistically isolated populations	None were found
Populations below poverty-State average-13%	Present
Populations below poverty-State average-27%	None were found

Bat

None were found

Railroads

None were found

EES Report

PIN 112462.00

2,000 Foot Corridor

Study Line ID: 112462_4201V01

Version Date: May 01, 2009

Created by: Chris Armstrong

National Register Sites	None were found
Superfund Sites	None were found
Pyritic Rock	None were found
TWRA Lakes & Other Public Lands	
TWRA Lakes	None were found
Other Public Lands	None were found

EES Report

PIN 112462.00

4,000 Foot Corridor

Study Line ID: 112462_4201V01

Version Date: May 1, 2009

Created by: Chris Armstrong

Terrestrial Species — None were found

TDEC Conservation Sites & TDEC Scenic Waterways

TDEC Conservation Sites — None were found

TDEC Scenic Waterways — None were found

Large Wetland Impacts — **Total Acerage** = 24.69

PFO1A	4.53	acres
PFO1A	3.59	acres
PSS1A	0.91	acres
PUBFx	0.57	acres
PUBHh	0.80	acres
PUBHh	0.73	acres
PUBHh	0.78	acres
PUBHh	0.65	acres
PUBHh	2.05	acres
PUBHh	1.09	acres
PUBHh	0.41	acres
PUBHh	0.75	acres
PUBHh	0.39	acres
PUBHh	0.44	acres
PUBHh	0.57	acres
PUBHh	0.74	acres
PUBHh	0.72	acres
PUBHh	0.78	acres
PUBHh	0.73	acres
PUBHh	0.90	acres
PUBHh	0.42	acres
PUBHx	0.51	acres
PUBHx	0.32	acres
PUBHx	0.44	acres
R2USA	0.87	acres

Tennessee Natural Areas Program — None were found

Wildlife Management Areas — None were found

EES Report

PIN 112462.00

10,000 Foot Corridor

Study Line ID: 112462_4201V01

Version Date: May 01, 2009

Created by: Chris Armstrong

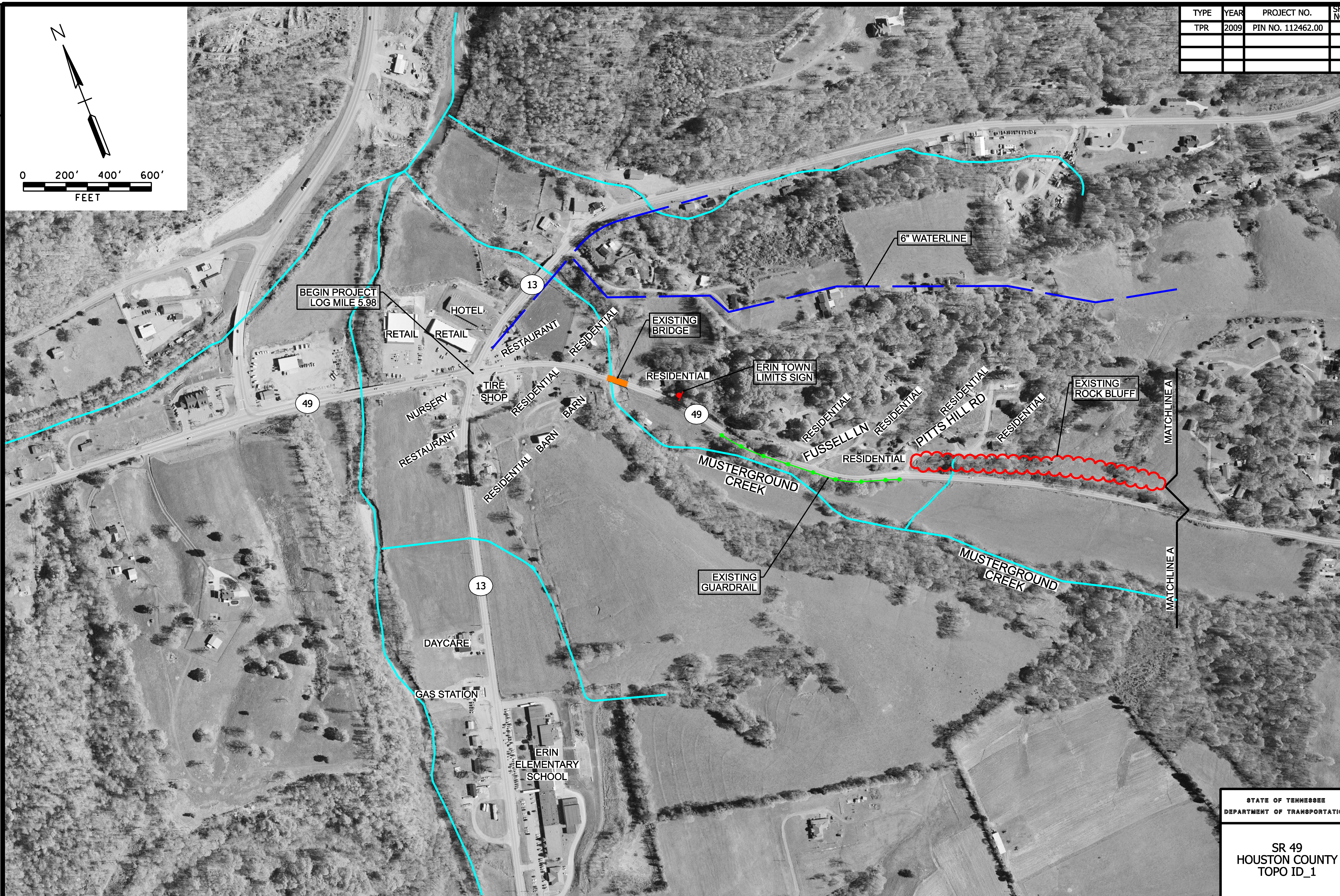
Aquatic Species	None were found
Caves	None were found

TOPO ID

TENNESSEE D.O.T.
DESIGN DIVISION

FILE NO.

TYPE	YEAR	PROJECT NO.	SHT NO.
TPR	2009	PIN NO. 112462.00	



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SR 49
HOUSTON COUNTY
TOPO ID_1

$$$$SYTIME$$$$$$
$$$$DGNSPEC$$

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

TYPE	YEAR	PROJECT NO.	SHT. NO.
TPR	2009	PIN NO. 112462.00	

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SR 49
HOUSTON COUNTY
TOPO ID_2

$$$$SYTIME$$$$
$$$$DGNSPEC$$$$

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

TYPE	YEAR	PROJECT NO.	SHT NO.
TPR	2009	PIN NO. 112462.00	

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SR 49
HOUSTON COUNTY
TOPO ID_3

$$$$SYTIME$$$$
$$$$DGNSPEC$$$$

TENNESSEE D.O.T.
DESIGN DIVISION

FILE NO.

TYPE	YEAR	PROJECT NO.	SHT. NO.
TPR	2009	PIN NO. 112462.00	

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SR 49
HOUSTON COUNTY
TOPO ID_4

$$$$SYTIME$$$$$
$$$$DGNSPEC$$

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

TYPE	YEAR	PROJECT NO.	SHT NO.
TPR	2009	PIN NO. 112462.00	

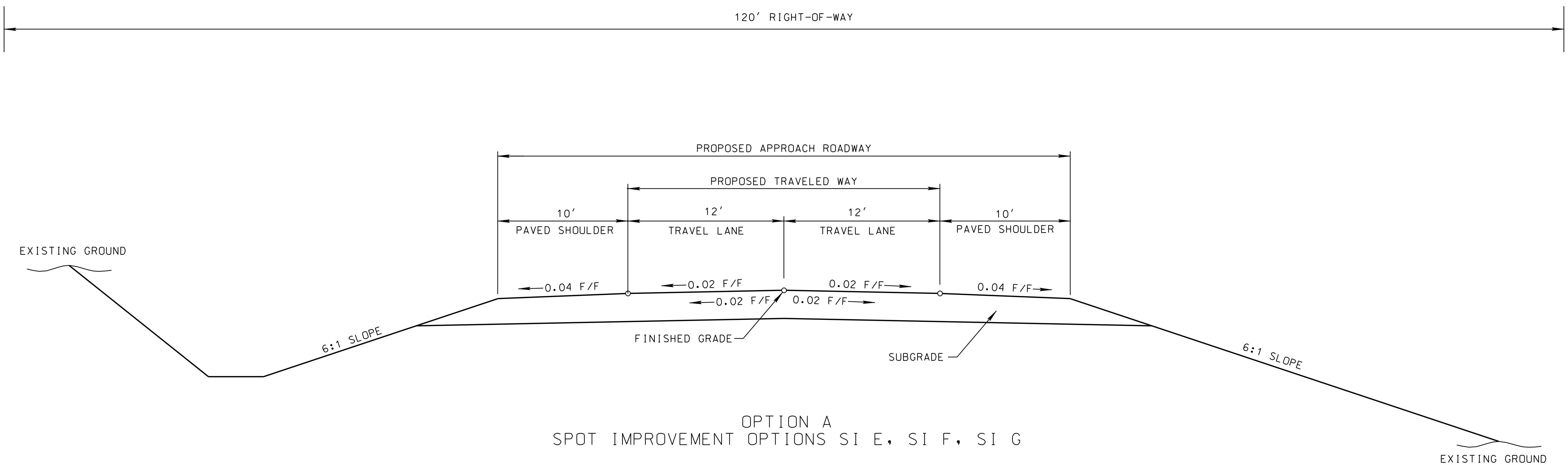
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

SR 49
HOUSTON COUNTY
TOPO ID_5

$$$$SYTIME$$$$
$$$$DGNSPEC$$$$

TYPICAL SECTION

TYPE	YEAR	PROJECT NO.	SHT NO.
TPR	2009	PIN NO. 112462.00	



OPTION A
SPOT IMPROVEMENT OPTIONS SI E, SI F, SI G

BASED ON TDOT STD DWG RD01-TS-3

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

$$$$SYTIME$$$$$$$
$$$$DGNSPEC$$

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

TYPICAL SECTION
OPTION A
AND
SPOT IMPROVEMENTS
SI E, SI F, SI G