state college area
CONNECTOR

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Alternative Analysis and Screening Report for the State College Area Connector Planning and Environmental Linkages Study

pennsylvania
DEPARTMENT OF TRANSPORTATION

U.S. Department of Transportation
Federal Highway Administration

February 2023

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1 INTRODUCTION

The Pennsylvania Department of Transportation (PennDOT), in cooperation with the Federal Highway Administration (FHWA) and coordination with the Centre County Metropolitan Planning Organization (CCMPO), is conducting a State College Area Connector (SCAC) Planning and Environmental Linkages (PEL) Study. The SCAC PEL Study is a collaborative and integrated study approach to transportation planning that considers the environment, community, and local and regional economic goals in the planning phase of transportation decision making. The study results and decisions will be used as part of the overall project development process. This process is consistent with the National Environmental Policy Act (NEPA) environmental review process for project(s) identified in the PEL Study[1].

This study is intended to identify transportation problems within the PEL study area, while considering the communities' vision and aspirations, and to identify potential solutions to address the transportation challenges. This report documents the SCAC PEL Study alternatives development and screening process.

1.1 Environmental Setting

For the purposes of this PEL Study, the initial data collection area is depicted in **Figure 1 – PEL Study Area for Initial Data Collection**. It is approximately 70 square miles, extending through the southern portion of Centre County, and intersects six municipalities: Centre Hall Borough, Potter, Spring, Harris, College, and Benner Townships. The PEL study area includes major transportation routes that provide access to regional destinations and beyond, such as U.S. Route (US) 322, Pennsylvania Route (PA) 144, PA 45, and Interstate (I-) 99, which provides access to nearby I-80. The initial data collection area is also shaped by the topography of the area. In general, the study area encompasses the southwestern portion of Penns Valley that extends between Nittany Mountain to the north and the Seven Mountains area of the Tussey Mountain range to the south. Parts of Nittany Valley on the north side of Nittany Mountain are also included within the PEL study area, as is the more urbanized Centre Region that connects both valleys at the southern end of Nittany Mountain.

Readily available information concerning natural, cultural, and community resources, along with windshield surveys, were compiled to determine the environmental setting of the PEL study area and to identify resources that may be affected by the implementation and construction of potential transportation improvements. The environmental setting of the PEL study area can be summarized as follows:

[1] For more information on the ability to link planning decisions into the NEPA process see

- 23 CFR 450 Appendix A – Linking the Transportation Planning and NEPA Process. https://www.govinfo.gov/content/pkg/CFR-2010-title23-vol1/pdf/CFR-2010-title23-vol1-part450-appA.pdf
- 23 CFR 450.212 Transportation planning studies and project development. https://www.govinfo.gov/content/pkg/CFR-2010-title23-vol1/pdf/CFR-2010-title23-vol1-part450.pdf
- 23 USC 168 Integration of planning and environmental review. https://www.govinfo.gov/content/pkg/USCODE-2015-title23/pdf/USCODE-2015-title23-chap1-sec168.pdf

- The study area is primarily rural, with development concentrated in small villages and along the major roadway corridors. The western end of the study area is more developed, with small villages and more modern residential subdivisions.
- Many public parks, recreational lands, cemeteries, and various community facilities have been identified throughout the study area.
- The Penns Valley portion of the study area includes large expanses of farmland and agricultural related businesses.
- Potential waste sites include properties with storage tanks, commercial/industrial land uses (particularly within the Nittany Valley portion of the study area in the vicinity of Pleasant Gap and the large quarry area), waste disposal areas, and collection ponds/pits/lagoons.
- Cultural resources include aboveground historic structures, the large Penns Valley/Brush Valley Rural Historic District, and smaller historic districts that encompass older villages. There are also large expanses of land, primarily in both Penns Valley and Nittany Valley, that have been identified as high probability areas for archaeological resources.
- Two main drainage basins (Bald Eagle Creek and Penns Creek) are the ultimate receiving waters for most watercourses identified within the study area. Three primary watersheds (Sinking Creek, Spring Creek, and Little Fishing Creek) cover most of the study area and all watercourses have protected designated water uses for Cold Water Fishes, High Quality-Cold Water Fishes, or Trout Stocking. Wild Trout and Class A Wild Trout designations were identified in portions of the watersheds. Additionally, Stocked Trout designations were identified within the Sinking Creek and Little Fishing Creek watersheds. Wetlands located within the floodplain of Wild Trout Streams, or within the floodplain of tributaries to Wild Trout Streams, are considered exceptional value resources.
- Sensitive terrestrial habitat is present throughout study area valleys and mountains. Some habitats of particular note include Old Growth Forest areas (including along Nittany Mountain and Tussey Mountain areas), an Important Bird Area (within the Rothrock State Forest along the southern edge of the study area), and Natural Heritage Core Habitat areas (located primarily along the northern and southern portions of the study area).
- Threatened and Endangered (T&E) species habitat has been identified in numerous localized areas throughout the study area, including two known bat hibernacula within the study area and one located to the south in Mifflin County. Summer roost and fall swarming habitat for bats encompass the entirety of the study area. T&E plant species are also potentially located in numerous localized areas.

As potential alternatives are developed and screened as discussed in Section 3 and Section 4 of this report, the study area limits may be refined to better represent the alternatives being evaluated. The study area would be modified to ensure that any relevant factors that may influence the study needs and the development of the range of alternatives are incorporated, including identification of logical project termini, assessment of impacts to sensitive environmental resources, and development of potential mitigation.

N

BELLEFONTE

WALKER TOWNSHIP

BENNER TOWNSHIP

SPRING TOWNSHIP

GREGG TOWNSHIP

PLEASANT GAP

Harrison Rd

CENTRE HALL

OLD FORT

Shiloh Rd

Brush Valley Road / SR 2006

Williams Road

CENTRE HILL

Upper Georges Valley Rd

COLLEGE TOWNSHIP

POTTER TOWNSHIP

Boalsburg Rd/SR 3010

Mt. Nittany Expy

Linden Hall Rd / SR 2004

LINDEN HALL

TUSSEYVILLE

POTTERS MILLS

STATE COLLEGE

SR 2006

Elks Club Rd

BUS 322

Boal Av

BOALSBURG

Bear Meadows Rd

HARRIS TOWNSHIP

A

B

C

D

E

550 150 99 144 64 192 26 45 322

0 5,500 11,000 16,500 Feet

LEGEND

Roadway Functional Class

- Interstate Highways
- Other Freeways and Expressways
- Other Principal Arterial
- Minor Arterials
- Major Collector
- Minor Collector
- Local Roads

A OD Sites

Boundaries

- Study_Area
- Township
- Municipality
- Potters Mills Gap Transportation Project

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INDEX MAP

STATE COLLEGE AREA CONNECTOR PEL STUDY AREA FOR INITIAL DATA COLLECTION

CENTRE COUNTY, PENNSYLVANIA

Figure 1	1 Inch = 5,500 Feet

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1.2 Roadway Network and Performance

Within the PEL study area, key roadways include I-99, US 322, PA 26, PA 144, PA 45, PA 192, and PA 64. There are numerous major/minor collector and local roads that provide connections to these key roadways throughout the PEL study area. **Figure 1** illustrates the federal functional classifications for area roadways, which are defined below in **Table 1**.

This section summarizes the traffic operations and safety evaluation conducted on the existing roadway network to identify transportation challenges within the study area. Analysis was conducted for the Existing (Base Year 2017) and No Build (Design Year 2050) scenarios and includes PA 45, PA 144, SR 192, US 322, Boal Avenue (Business Route 0322/SR 3014), Boalsburg Road (SR 3010), Brush Valley Road (SR 2006), and other minor collectors and local roadways. Construction of the US 322 corridor between Sand Mountain Road and Mountain Back Road/Red Mill Road (Potters Mill Gap Transportation Project) was recently completed and is not included in this analysis.

Table 1 – Federal Functional Classifications

Federal Functional Classification	Classification Description	Centre County Roadways
Interstate Highway	Network of limited access, divided highways offering high levels of mobility while linking major urban areas	I-80, I-99
Other Freeways and Expressways	Divided highways with partial (expressway) or full (freeway) control of access that serve through traffic and maximize mobility; abutting land uses not directly served	US 322 (Mount Nittany Expressway)
Other Principal Arterial Highways	Serve major metropolitan areas, provide a high degree of mobility, and can also provide mobility through rural areas. Unlike access-controlled roads, abutting land uses can be served directly.	US 322/Business US 322, PA 144, PA 26
Minor Arterial	Provide service for trips of moderate length, serve geographic areas smaller than their higher arterial counterparts and offer connectivity to the higher arterial system. In rural areas are typically designed to provide relatively high overall travel speeds, with minimum interference to through movement.	PA 45
Major Collector	Gather traffic from Local Roads to funnel to the arterial network, generally serves intra-county travel (rather than statewide) – collector that offers more mobility	PA 192, SR 3010 (Boalsburg Road/Warner Boulevard), SR 2006 (Linden Hall Road)
Minor Collector	Gather traffic from Local Roads to funnel to the arterial network, generally serves intra-county travel (rather than statewide) – collector that offers more access	SR 2006 (Brush Valley Road/Rock Hill Road), SR 2010 (Georges Valley Rd)
Local Roads	Not intended for long distance travel, except at the origin or destination end of the trip, due to their provision of direct access to abutting land. Bus routes generally do not run-on Local Roads and they are often designed to discourage through traffic.	SR 2004 (Linden Hall Road/Cedar Run Road), SR 2001 (Bear Meadows Rd)

1.2.1 Operational Analysis

This section provides a summary of the operational characteristics of the roadways and intersections within the PEL study area. This includes traffic volumes, origin-destination, and levels of service summaries.

Traffic Volumes

Traffic volumes for this analysis were based on the *Route 322/144/45 Corridors, Centre County, Pennsylvania, 2019 Data Refresh Report* (PennDOT 2018). Manual turning movement counts and automatic traffic recorder counts were collected in 2017 and were used to develop Base Year (2017) traffic volumes. Additionally, the Centre County Regional Travel Demand Model (CCRTDM) was utilized in the development of Design Year (2050) traffic projections for No Build as well as Build scenarios. The CCRTDM considers planned/programmed transportation improvements, future land uses changes, regional travel patterns, transit service, and commercial/freight forecasts.

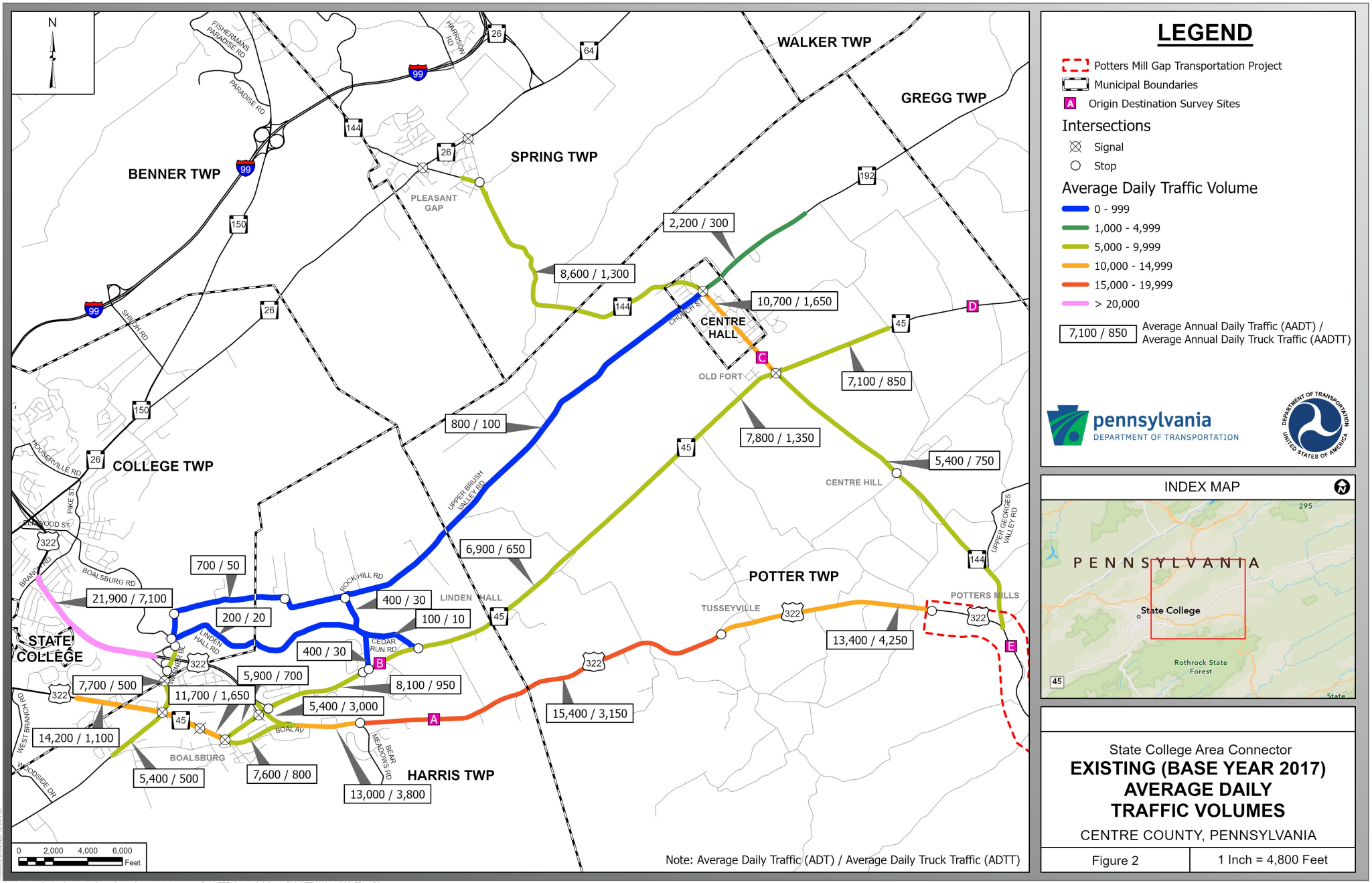
Table 2 lists the Annual Average Daily Traffic (AADT) and Annual Average Daily Truck Traffic (AADTT) for both the Base Year (2017) and Design Year (2050) scenarios along key links within the PEL study area. For the purposes of this Study, trucks include only heavy or medium trucks or those trucks that exceed 14,000 pounds.

Figure 2 and **Figure 3** illustrate the AADT and AADTT for the Base Year (2017) and Design Year (2050) scenarios for the key PEL study area roadways.

Table 2 – Traffic Volume Summary

Roadway	Segment		Base Year (2017)		Design Year (2050)		Growth Rate	
	From	To	AADT	AADTT	AADT	AADTT	Total	Truck
US 322	Boal Ave (Business/ Expressway US 322 Split)	Elks Club Rd	**13,000**	3,800 (29%)	**15,700**	4,850 (31%)	**0.60%**	0.81%
	Elks Club Rd	Neff Road	**15,400**	3,150 (20%)	**18,600**	4,800 (26%)	**0.62%**	1.54%
	Neff Rd	Mountain Back Rd/ Red Mill Rd	**13,400**	4,250 (32%)	**17,900**	4,800 (27%)	**0.99%**	0.38%
PA 45	Warner Blvd/Boalsburg Rd	Boal Ave	**11,700**	1,650 (14%)	**13,500**	1,800 (13%)	**0.46%**	0.29%
	US 322	Elks Club Rd	**8,100**	950 (12%)	**10,900**	1,500 (14%)	**1.01%**	1.64%
	Elks Club Rd	Williams Rd	**6,900**	650 (9%)	**9,200**	1,100 (12%)	**1.05%**	2.10%
	Williams Rd	PA 144	**7,800**	1,350 (17%)	**9,600**	1,700 (18%)	**0.71%**	0.89%
PA 144	US 322	PA 45	**5,400**	750 (14%)	**8,500**	1,200 (14%)	**1.28%**	1.37%
	PA 45	Brush Valley Rd	**10,700**	1,650 (16%)	**14,100**	2,150 (15%)	**0.86%**	0.84%
	Brush Valley Rd	Harrison Rd	**8,600**	1,300 (15%)	**13,400**	1,850 (14%)	**1.26%**	0.92%

AADT = Annual Average Daily Traffic AADTT = Annual Average Daily Truck Traffic (Truck%)
Growth Rate = 2017-2050 Annual Growth Rate (linear)



LEGEND

- Potters Mill Gap Transportation Project
- Municipal Boundaries
- A Origin Destination Survey Sites

Intersections

- Signal
- Stop

Average Daily Traffic Volume

- 0 - 999
- 1,000 - 4,999
- 5,000 - 9,999
- 10,000 - 14,999
- 15,000 - 19,999
- > 20,000

7,100 / 850 Average Annual Daily Traffic (AADT) / Average Annual Daily Truck Traffic (AADTT)

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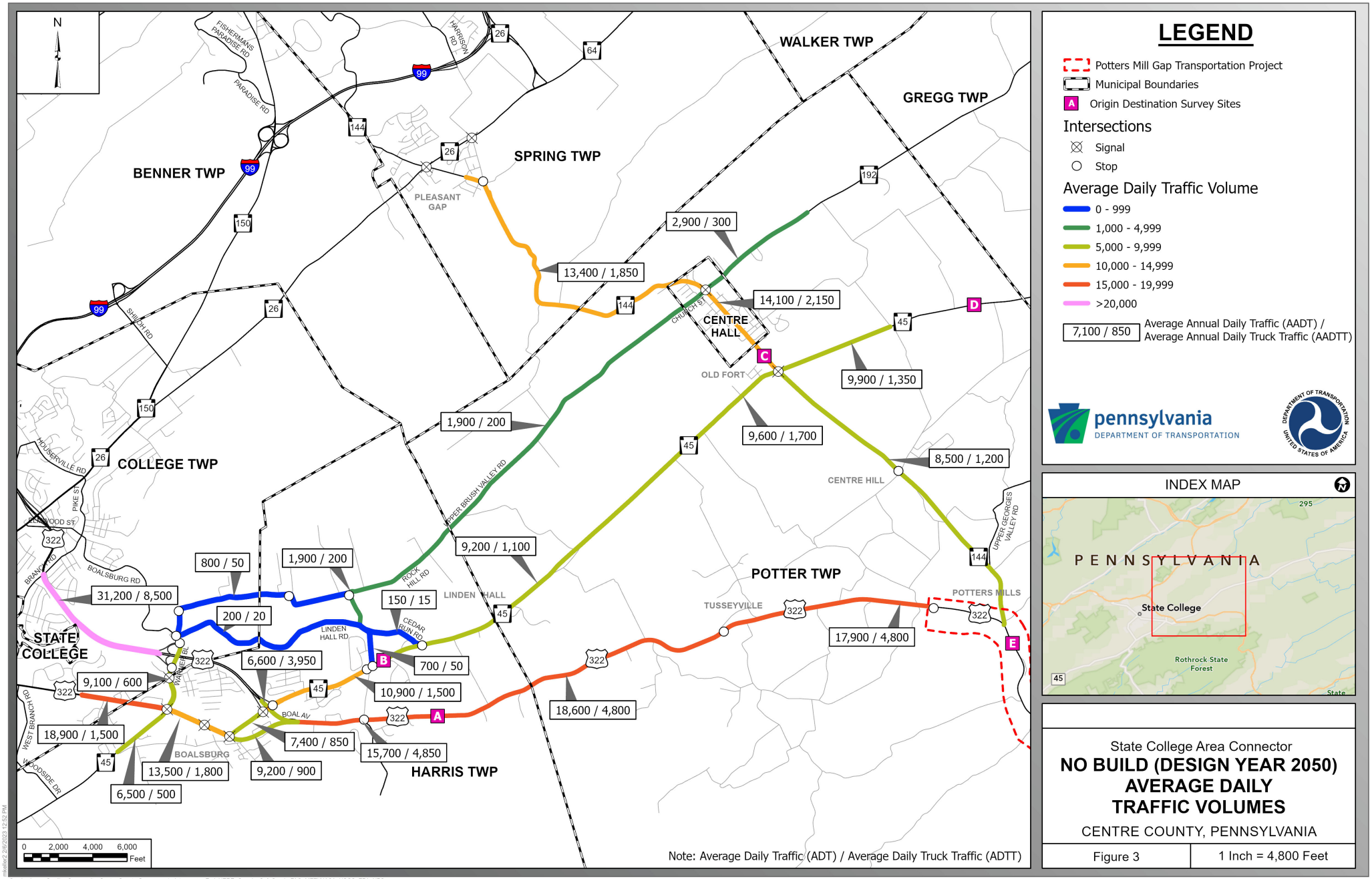
State College Area Connector

EXISTING (BASE YEAR 2017) AVERAGE DAILY TRAFFIC VOLUMES

CENTRE COUNTY, PENNSYLVANIA

Figure 2 | 1 Inch = 4,800 Feet



LEGEND

- Potters Mill Gap Transportation Project
- Municipal Boundaries
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Intersections

- Signal
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7,100 / 850 Average Annual Daily Traffic (AADT) / Average Annual Daily Truck Traffic (AADTT)

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State College Area Connector

NO BUILD (DESIGN YEAR 2050) AVERAGE DAILY TRAFFIC VOLUMES

CENTRE COUNTY, PENNSYLVANIA

Figure 3	1 Inch = 4,800 Feet

Service Layer Credits: Community: Centre County Government, data.pa.gov, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

Along US 322 between Boal Avenue (Business/Express US 322 Split) and Mountain Back Road/Red Mill Road, Base Year (2017) AADT volumes ranged between 13,000 vehicles per day (VPD) and 15,400 VPD with truck percentages between 20 and 32. Within the PEL study area, US 322 is classified as Other Principal Arterial; the statewide average truck percentage for similar roadways is approximately 7 percent. On average, the percentage of trucks traveling along US 322 within the PEL study area is more than three times greater than truck percentages of similar roadways throughout the state. As shown in **Table 2**, the Design Year (2050) volumes along the same segments of US 322 are expected to have AADT volumes that range between 15,700 VPD and 18,600 VPD, with AADTT volumes expected to range between 4,800 to 4,850.

Traffic along PA 45 between the Mt. Nittany Expressway interchange at Boalsburg and the PA 144 intersection at Centre Hall ranges from 6,900 VPD to 11,700 VPD with truck percentages between 9 and 17 percent. Outside of the urbanized area of Boalsburg, truck volumes are anticipated to increase at a greater rate than passenger vehicles. Within the PEL study area, PA 45 is classified as Minor Arterial; the statewide average truck percentage for similar roadways is approximately 7 percent. In the Design Year (2050), traffic volumes are anticipated to increase to between 9,200 VPD and 13,500 VPD and truck percentages are anticipated to increase to between 12 and 18 percent. Although not as significant as the truck traffic utilizing the US 322 corridor, the truck percentages are nearly double the statewide average for similar roadways.

PA 144 is classified as Other Principal Arterial between US 322 and PA 26. Base Year (2017) traffic volumes range between 5,400 VPD and 10,700 VPD with truck percentages averaging 15 percent. In the Design Year (2050), truck volumes increase at a similar rate to passenger vehicles. Design Year (2050) traffic volumes range between 8,500 VPD and 14,100 VPD. There is a weight limit of 10 tons on the section of PA 144 over Nittany Mountain between Centre Hall and Pleasant Gap. Trucks destined for I-80 and other points north that are over 10 tons are signed to follow US 322 and I-99.

Origin-Destination

An origin-destination (OD) analysis was completed to determine existing travel patterns within the PEL study area and within the region. OD data was obtained through StreetLight Data™ and documented in the *SCCCTS StreetLight Origin and Destination Analysis Technical Memorandum* (PennDOT 2018). StreetLight provides a mobility analytics platform that utilizes GPS based data collected from navigation guidance applications. This data can be used to understand travel patterns between origins and destinations for vehicles, trucks, bikes, or pedestrians to identify trip routes. The OD survey sites were located along the following roadways:

- US 322 Eastbound west of Sharer Road
- PA 45 Eastbound east of Linden Hall Road
- PA 144 Southbound north of PA 45
- PA 45 Westbound east of PA 144
- US 322 Westbound east of PA 144

The OD results for trucks and passenger vehicles are shown in **Table 3** for the following trip types:

- External to External (E-E): O&D are outside of the PEL study area (through trip).
- Internal to Internal (I-I): O&D are inside the PEL study area (local trip).
- External to Internal (E-I): Origin is outside, and the destination is inside the PEL study area.
- Internal to External (I-E): Origin is inside, and the destination is outside the PEL study area.

It should be noted that, in addition to the areas shown on **Figure 1**, State College Borough is included within the OD analysis PEL study area as an internal origin or destination.

Table 3 – Origin Destination Summary

Route	Sites	Total Trip Types			Truck	
		E-E	I-I	E-I / I-E	Type	Percent
Trucks						
US 322	Site A (EB) & Site E (WB)	89%	0%	11%	Heavy	74%
		64%	1%	35%	Medium	26%
PA 45	Site B (EB) & Site D (WB)	51%	12%	37%	Heavy	23%
		46%	12%	42%	Medium	77%
PA 144	Site C (SB)	59%	1%	40%	Heavy	14%
		50%	18%	32%	Medium	86%
Passenger Vehicles						
US 322	Site A (EB) & Site E (WB)	26%	4%	70%	--	--
PA 45	Site B (EB)	4%	43%	53%	--	
	Site D (WB)	28%	1%	71%		
PA 144	Site C (SB)	35%	20%	45%	--	--

Truck Types: H=Heavy Truck (>26,000 lbs), M=Medium Truck (14,000 to 26,000 lbs)

Heavy truck traffic along US 322 primarily consists of trips that travel through the PEL study area. Almost 90 percent of heavy trucks have both an origin and destination outside the PEL study area, and 100 percent of all heavy trucks have either an origin or destination outside of the PEL study area. Heavy trucks are typically utilized for long haul trips. Medium trucks, typically used for deliveries, have a similar trip type pattern; however, more medium trucks (35 percent) have an origin or destination within the PEL study area. Alternatively, 74 percent of all passenger vehicles along US 322 have either an origin, destination, or both within the PEL study area.

Truck traffic utilizing PA 45 and PA 144 exhibit a more even trip distribution between regional (E-E) trips and local (I-I or E-I/I-E) trips. The posted weight restriction along PA 144 over Nittany Mountain likely shifts a portion of truck traffic travelling toward I-80 and I-99 to US 322 (current signage routes trucks over 10 tons to US 322 and I-99). However, the percentage of E-E truck traffic clearly indicates that truck operators are not compliant with the posted weight limit restrictions on PA 144. Generally, the trip characteristics for passenger vehicles along PA 45 are more localized, with a majority of the trips having at least one trip beginning and/or ending

internally (96 percent of all eastbound trips and 72 percent of all westbound trips). Nearly 65 percent of PA 144's passenger trips have a starting or ending point within the study area.

Levels of Service

Level of Service (LOS) is a quantitative performance measure that represents the quality of service being provided along a roadway or at an intersection. The Highway Capacity Manual (HCM) defines six LOS, ranging from A to F. **Figure 4** provides a graphical representation illustrating each LOS. LOS A represents the best operating conditions from a traveler's perspective and LOS F represents the worst. Typically, roadways are not designed to operate at LOS A during peak conditions, but instead provide a lower LOS that balances costs and other impacts. The PEL Study area consists of both rural and non-rural areas. For rural areas, LOS A through LOS C is considered acceptable operation and unacceptable operation is considered LOS D through LOS F. For non-rural areas, LOS A through LOS D is considered acceptable operation and unacceptable operation is considered LOS E and LOS F. The non-rural (urbanized) areas within the PEL study area are in the vicinity of Boalsburg and Pleasant Gap.

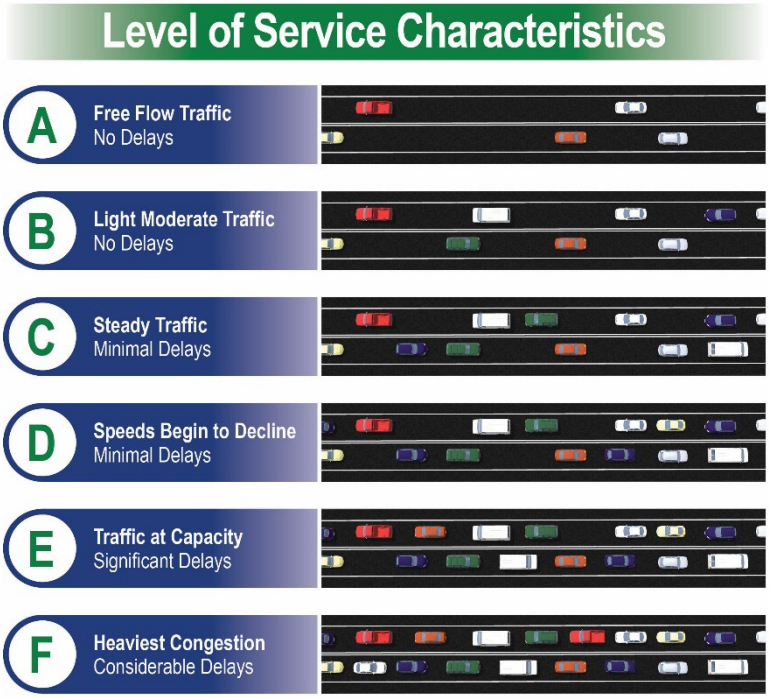
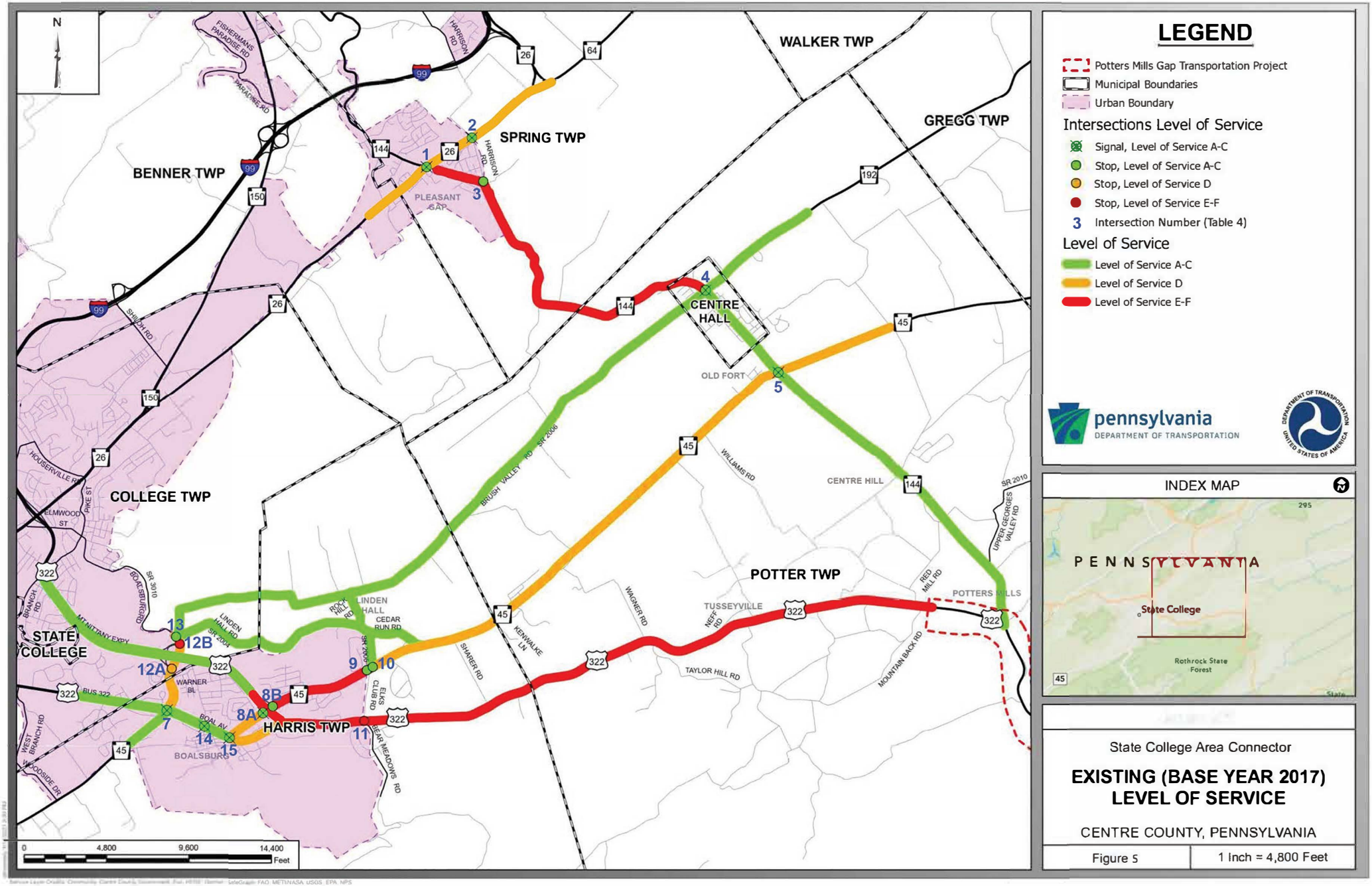


Figure 4 – Level of Service Definitions

The LOS analysis was performed for the following facility types: signalized and unsignalized intersections, two-lane roadway segments, multi-lane roadway segments, freeway segments, and ramp segments. Traffic signal plans and coordination plans were obtained from the Department's Traffic Signal Asset Management System (TSAMS). PEL study area intersections were evaluated using Synchro plus SimTraffic (Trafficware, LLC) software (Version 10), which utilizes the methodologies outlined in the HCM. All roadway segments were analyzed using the Highway Capacity Software (HCS).

A summary of the overall PEL study area intersection levels of service for the Base Year (2017) and Design Year (2050) scenarios is contained in **Table 4**. **Table 5** summarizes the Base Year (2017) and Design Year (2050) segment levels of service. **Figure 5** and **Figure 6** illustrate the levels of service for the Base Year (2017) and Design Year (2050), respectively.



LEGEND

- Potters Mills Gap Transportation Project
- Municipal Boundaries
- Urban Boundary

Intersections Level of Service

- Signal, Level of Service A-C
- Stop, Level of Service A-C
- Stop, Level of Service D
- Stop, Level of Service E-F
- 3 Intersection Number (Table 4)

Level of Service

- Level of Service A-C
- Level of Service D
- Level of Service E-F

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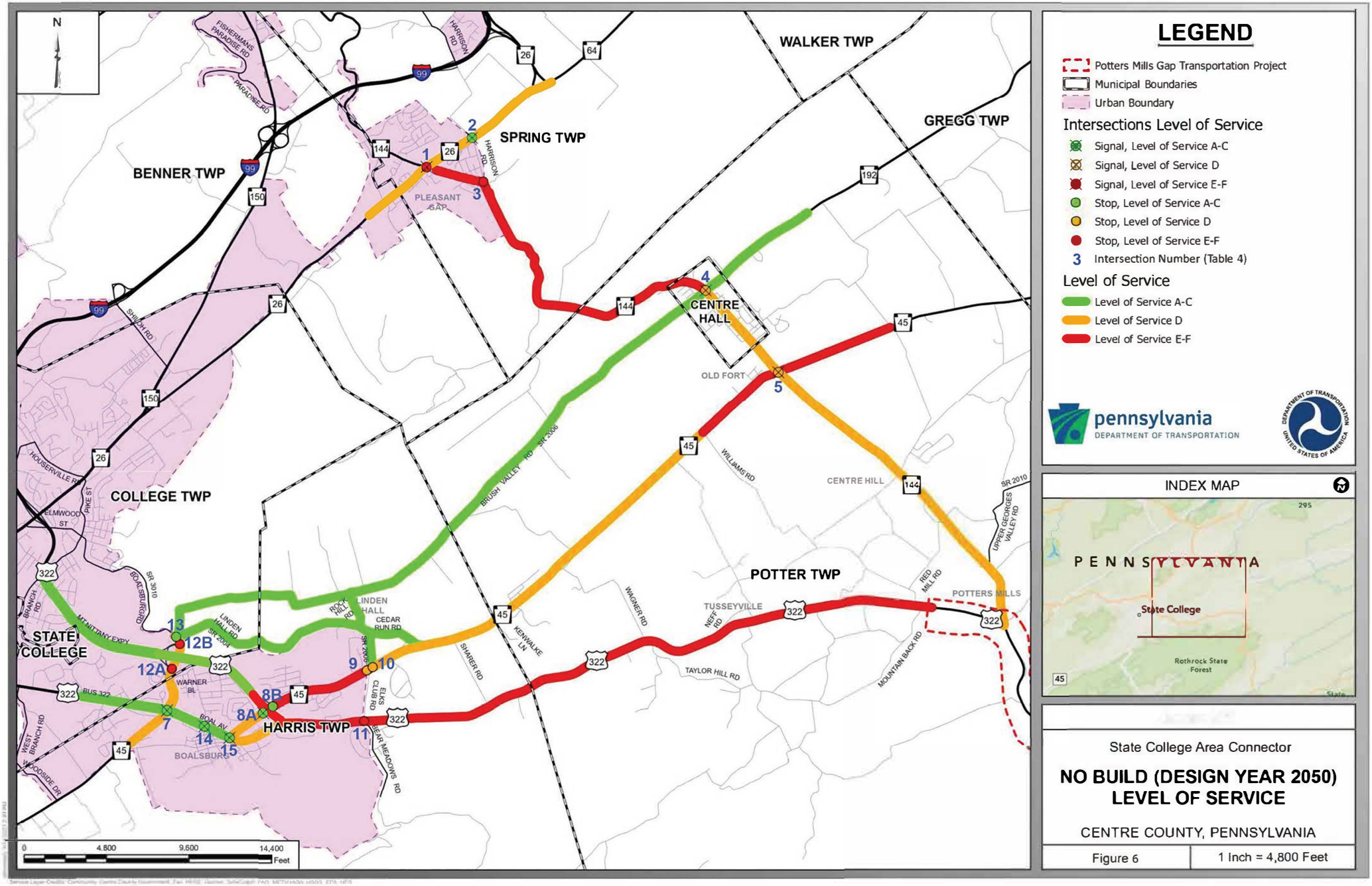
State College Area Connector

EXISTING (BASE YEAR 2017) LEVEL OF SERVICE

CENTRE COUNTY, PENNSYLVANIA

Figure 5 | 1 Inch = 4,800 Feet



LEGEND

- Potters Mills Gap Transportation Project
- Municipal Boundaries
- Urban Boundary

Intersections Level of Service

- Signal, Level of Service A-C
- Signal, Level of Service D
- Signal, Level of Service E-F
- Stop, Level of Service A-C
- Stop, Level of Service D
- Stop, Level of Service E-F
- 3 Intersection Number (Table 4)

Level of Service

- Level of Service A-C
- Level of Service D
- Level of Service E-F

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State College Area Connector

NO BUILD (DESIGN YEAR 2050) LEVEL OF SERVICE

CENTRE COUNTY, PENNSYLVANIA

Figure 6	1 Inch = 4,800 Feet

In the Base Year (2017) scenario, the PEL study area intersections primarily operate at acceptable levels of service, except in the Boalsburg area. The unsignalized intersections of US 322 and Elks Club Road and US 322 westbound on-/off-ramp and Boalsburg Road currently operate at unacceptable levels of service during the peak hour time periods.

The roadway segment analysis revealed that there are many areas that currently operate at unacceptable levels of service. US 322 from Red Mill Road/Mountain Back Road to the Mount Nittany Expressway, PA 45 from US 322 through PA 144, and PA 144 between Brush Valley Road and PA 26 all operate at unacceptable levels of service. The average travel speed during the Base Year (2017) conditions is between 5 and 15 percent less than the posted speed limit.

In the Design Year (2050) scenario, available capacity and operations are anticipated to continue to deteriorate. In addition to the intersections along US 322 operating at unacceptable levels of service, intersections along PA 144 and PA 45 are expected to operate at unacceptable levels of service. All roadway segments along PA 144 within the PEL study area are anticipated to operate at unacceptable levels of service and the entire length of PA 45 and the non-freeway portion of US 322 are expected to operate at unacceptable levels of service. Average travel speeds are anticipated to drop to between 15 and 25 percent less than the posted speed limit with the PEL study area.

Table 4 – Intersection Levels of Service (LOS) Summary

#	Intersection	Base Year (2017)		Design Year (2050)	
		Morning	Evening	Morning	Evening
1	PA 144 & College Avenue (PA 26)	B(14)	B(11)	E(62)	B(17)
2	Harrison Road & College Avenue (PA 26)	B(10)	A(8)	B(17)	A(10)
3	Main Street (PA 144) & Harrison Road	b(14)	b(14)	d(28)	e(44)
4	PA 144 & Brush Valley Road (SR 2006/PA 192)	B(14)	B(14)	D(39)	D(52)
5	PA 144 & Earlystown Road (PA 45)	C(28)	B(19)	D(51)	C(29)
7	Warner Boulevard (PA 45/SR 3010) & Boal Avenue (PA 45/SR 3014)	C(26)	B(17)	C(34)	C(20)
8A	Earlystown Road (PA 45) & US 322 EB Off-Ramp	A(8)	B(14)	B(12)	C(32)
8B	Earlystown Road (PA 45) & US 322 WB On-Ramp	a(0)	a(0)	b(1)	b(1)
9	Elks Club Road & Earlystown Road (PA 45)	c(19)	c(18)	d(29)	d(32)
10	Linden Hall Road (SR 2006) & Earlystown Road (PA 45)	c(16)	b(12)	d(26)	c(17)
11	Elks Club Road & Boal Avenue (US 322)	f(51)	f(66)	f(179)	f(240)
12A	Boalsburg Road (SR 3010) & US 322 EB On-/Off-Ramps	d(29)	c(19)	f(153)	f(183)
12B	Boalsburg Road (SR 3010) & US 322 WB On-/Off-Ramp	e(38)	f(76)	f(314)	f(2,137)
13	Boalsburg Road (SR 3010) & Linden Hall Road & Brush Valley Rd	a(10)	b(10)	b(11)	b(12)
14	Boalsburg Pike/Church Street & Boal Avenue (PA 45)	A(7)	A(7)	A(7)	A(8)
15	Main Street/Earlystown Road (PA 45) & Boal Avenue (PA 45/SR 3014)	A(8)	A(7)	B(11)	B(14)

A(##) – Signalized Level of Service (Expected Delay (seconds))
a(##) – Unsignalized Level of Service (Expected Delay (seconds)) (Unsignalized LOS represents the turning movement that experiences the most delay.)
red – LOS Unacceptable

Table 5 – Segment Level of Service Summary

Roadway	Segment		Facility Type	Base Year (2017)		Design Year (2050)	
	To	From		Morning	Evening	Morning	Evening
PA 45	Main St	Boal Ave (SR 3014)	Two-Lane Urban	C / C	C / C	D / C	C / C
	Warner Blvd (SR 3010)	Main St	Multi-Lane Urban	A / B	A / A	A / B	B / A
	Main St	US 322 EB Off-Ramp	Two-Lane Urban	A / D	D / B	B / D	D / C
	US 322 WB On Ramp	Elks Club Rd	Two-Lane Urban	B / E	D / B	B / E	E / C
	Elks Club Rd	Williams Rd	Two-Lane Rural	A / D	D / B	A / D	D / B
	Williams Rd	Old Fort Rd (PA 144)	Two-Lane Rural	A / E	D / B	B / E	E / C
	Old Fort Rd (PA 144)	Indian Lane	Two-Lane Rural	B / D	D / B	B / D	E / C
PA 144	General Potter Hwy (US 322)	Earlystown Rd (PA 45)	Two-Lane Rural	C / C	C / C	D / C	D / D
	Earlystown Rd (PA 45)	Brush Valley Rd (PA 192)	Two-Lane Rural	C / C	C / C	D / D	D / D
	Brush Valley Rd (PA 192)	Harrison Rd	Two-Lane Rural	E / E	E / E	E / E	E / E
US 322	College Ave (PA 26)	Warner Blvd (SR 3010)	Freeway Urban	A / A	A / A	A / B	B / A
	Boal Ave (SR 3014)	Elks Club Rd	Two-Lane Urban	D / E	E / E	E / E	E / E
	Elks Club Rd	Neff Rd	Two-Lane Rural	D / E	E / E	E / E	E / E
	Neff Rd	Mountain Back Rd	Two-Lane Rural	D / E	E / D	D / E	E / D
Brush Valley Rd (SR 2006/ local)	Boalsburg Rd (SR 3010)	Rock Hill Rd (SR 2006)	Two-Lane Urban	A / A	A / A	A / A	A / A
	Rock Hill Rd (SR 2006)	Pennsylvania Ave (PA 144)	Two-Lane Rural	A / A	A / A	B / B	B / B
	Pennsylvania Ave (PA 144)	Pond Lane	Two-Lane Rural	A / C	C / B	A / C	C / B
Boal Ave (SR 3014)	Branch Rd	Warner Blvd (SR 3010)	Multi-Lane Urban	A / B	B / A	A / B	B / A
	Earlystown Rd (PA 45)	US 322	Two-Lane Urban	B / D	D / C	B / D	D / C
Warner Blvd (SR 3010)	Boal Ave (SR 3014)	US 322 EB On-/Off-Ramps	Two-Lane Urban	A / D	D / C	C / D	D / D
Linden Hall Rd (SR 2004)	Cedar Run Rd (SR 2004)	Boalsburg Rd (SR 3010)	Two-Lane Urban	A / B	A / A	A / B	A / A
Cedar Run Rd (SR 2004)	Earlystown Rd (PA 45)	Linden Hall Rd (SR 2006)	Two-Lane Urban	A / A	A / A	A / A	A / A

Roadway	Segment		Facility Type	Base Year (2017)		Design Year (2050)	
	To	From		Morning	Evening	Morning	Evening
Linden Hall Rd (SR 2006)	Cedar Run Rd (SR 2004)	Earlystown Rd (PA 45)	Two-Lane Urban	A / B	B / A	A / B	B / A
Rock Hill Rd (SR 2006)	Brush Valley Rd	Linden Hall Rd (SR 2004)	Two-Lane Urban	A / B	B / A	A / B	B / A
Earlystown Rd (PA 45)	US 322 EB Off Ramp/WB On Ramp		Ramp Urban	A / A	B / A	A / B	B / A
Boalsburg Rd (SR 3010)	US 322 WB On Ramp/Off Ramp		Ramp Urban	B / B	A / A	B / B	B / A
	US 322 EB On Ramp/Off Ramp		Ramp Urban	A / A	B / B	A / A	B / B

red – LOS Unacceptable

1.2.2 Safety Analysis

Crash data from January 2014 through December 2018 (5-year period) was obtained from PennDOT's open data portal through the Pennsylvania Crash Information Tool (PCIT) and analyzed for various roadways within the project area. The specific roadway sections analyzed in this report are provided below and are illustrated in **Figure 1**:

- PA 45: Between Main Street (Boalsburg) to east of PA 144
- PA 144: Between US 322 to north of PA 26
- PA 192: East of PA 144
- US 322: Between PA 45 to Red Mill Road/Mountain Back Road
- Linden Hall Road/Cedar Hill Road (SR 2004): Entire length
- Brush Valley Road/Red Hill Road (SR 2006): Entire length
- Boalsburg Road/Warner Boulevard (SR 3010): N. of Linden Hall Road (SR 2004) to SR 3014
- Boal Avenue (SR 3014): Between Villa Crest Drive to US 322
- Brush Valley Road (local): Between Boalsburg Road (SR 3010) to Red Hill Road (SR 2006)

There was a total of 396 reportable crashes within the PEL study area over the 5-year period. This included five fatal crashes (1 percent), 168 injury crashes (42 percent), and 223 property damage only crashes (no injuries or fatalities) (57 percent). **Table 6** summarizes the crash severity by corridor.

PA 45 (143 crashes) experienced the highest crash frequency of all the corridors, followed by PA 144 (111 crashes) and US 322 (108 crashes). Out of the five total fatalities, four occurred along PA 144. When compared to PA 144 and US 322, the PA 45 corridor experiences a higher percentage, of injury crashes (almost 50 percent).

Table 6 – Crash Severity by Corridor

Roadway	PDO	Injury	Fatal	Total
PA 45	72 (50%)	70 (49%)	1 (1%)	**143 (36%)**
PA 144	68 (61%)	39 (35%)	4 (4%)	**111 (28%)**
PA 192	-	1 (100%)	-	**1 (<1%)**
US 322	69 (64%)	39 (36%)	-	**108 (27%)**
Linden Hall Rd/Cedar Hill Rd (SR 2004)	1 (100%)	-	-	**1 (<1%)**
Brush Valley Rd/Red Hill Rd (SR 2006)	3 (50%)	3 (50%)	-	**6 (2%)**
Boalsburg Rd/ Warner Blvd (SR 3010)	3 (23%)	10 (77%)	-	**13 (3%)**
Boal Ave (SR 3014)	5 (45%)	6 (55%)	-	**11 (3%)**
Brush Valley Road	2 (100%)		-	**2 (<1%)**
Total	**223 (57%)**	**168 (42%)**	**5 (1%)**	**396 (100%)**

Crash frequencies represent number of crashes (5-year total) not the number of injuries or fatalities
PDO: Property Damage Only (no injuries)

Table 7 summarizes the total crashes by crash type and by corridor. As shown in the table, angle crashes are most prevalent along PA 45 (49 crashes/34 percent), SR 3010 (7 crashes/54 percent), and SR 3014 (4 crashes/37 percent). The high number of angle crashes along PA 45 is likely due to higher travel speeds, substandard roadway elements, and uncontrolled access points. Crashes that hit a fixed object generally occur along PA 144 (52 crashes/47 percent), PA 192 (1 crash/100 percent), SR 2004 (1 crash/100 percent), SR 2006 (3 crashes/50 percent), and Brush Valley Road (2 crashes/100 percent). US 322 has predominately rear-end crashes (42 crashes/39 percent). These rear-end crashes are likely due to the mix of local, through traffic, and uncontrolled access along the corridor.

Weather and lighting do not seem to be a factor in most crashes in the PEL study area, as 313 crashes (80 percent) occurred in conditions classified as “clear”. There were 43 crashes (11 percent) in the rain and another 30 crashes in the snow (8 percent). Additionally, 276 crashes (70 percent) took place in the daylight and 16 crashes (4 percent) took place in areas with streetlights. This accounts for 74 percent of the total crashes.

Table 8 summarizes the total crashes by Unit 1 vehicle type and by corridor. When the Pennsylvania State Police complete a crash report, the vehicle that is listed as Unit 1 is the vehicle the officer believes caused the crash. Approximately 22 percent of all crashes within the study area were caused by a heavy vehicle; this is consistent across the PA 45, PA 144, and US 322 corridors. Additionally, the PCIT database shows that 130 crashes (33 percent) involved at least one truck.

Table 7 – Crash Types by Corridor

Roadway	Angle	Head-On	Hit Fixed Object	Hit Ped	Rear-end	Sideswipe (Opp.)	Sideswipe (Same)	Non-Collision	Other	Total
PA 45	49 (34%)	6 (4%)	43 (30%)	1 (<1%)	28 (20%)	1 (<1%)	3 (2%)	4 (3%)	8 (6%)	**143 (36%)**
PA 144	17 (15%)	4 (4%)	52 (47%)	-	22 (20%)	4 (4%)	1 (1%)	5 (4%)	6 (5%)	**111 (28%)**
PA 192	-	-	1 (100%)	-	-	-	-	-	-	**1 (<1%)**
US 322	18 (17%)	3 (3%)	25 (23%)		42 (39%)	6 (5%)	2(2%)	2 (2%)	10 (9%)	**108 (27%)**
SR 2004	-	-	1 (100%)	-	-	-	-		-	**1 (<1%)**
SR 2006	-	-	3 (50%)	-	-	1(17%)	-	2 (33%)	-	**6 (2%)**
SR 3010	7 (54%)	-	2 (15%)	-	3 (23%)			-	1 (8%)	**13 (3%)**
SR 3014	4 (37%)	-	2 (18%)	-	2 (18%)	-	2 (18%)	-	1 (9%)	**11 (3%)**
Brush Valley	-	-	2 (100%)	-	-	-	-	-	-	**2 (<1%)**
Total	**95 (24%)**	**13 (3%)**	**131 (33%)**	**1 (<1%)**	**97 (24%)**	**12 (3%)**	**8 (2%)**	**13 (3%)**	**26 (7%)**	**396 (100%)**

Crash frequencies represent number of crashes (5-year total)

Table 8 – Unit 1 Vehicle Type by Corridor

Roadway	Passenger Vehicles			Heavy Vehicles (Trucks)			Bicycle	Unk	Total
	Auto	SUV	MC	Large	Small	Bus			
PA 45	76 (53%)	32 (22%)	2 (2%)	3 (2%)	29 (20%)	-	-	1 (1%)	**143 (36%)**
PA 144	53 (48%)	30 (27%)	3 (3%)	3 (3%)	19 (17%)	1 (1%)	1 (1%)	1 (1%)	**111 (28%)**
PA 192	-	1 (100%)	-	-	-	-	-	-	**1 (<1%)**
US 322	57 (53%)	25 (23%)	1 (1%)	8 (7%)	16 (15%)	1 (1%)	-	-	**108 (27%)**
SR 2004	1 (100%)	-	-	-	-	-	-	-	**1 (<1%)**
SR 2006	4 (67%)	1 (17%)	-	-	1 (17%)	-	-	-	**6 (2%)**
SR 3010	7 (54%)	4 (31%)	1 (7.5%)	1 (7.5%)	-	-	-	-	**13 (3%)**
SR 3014	4 (37%)	3 (27%)	1 (9%)	1 (9%)	1 (9%)	-	1 (9%)	-	**11 (3%)**
Brush Valley Road	2 (100%)	-	-	-	-	-	-	-	**2 (<1%)**
Total	**204 (52%)**	**96 (24%)**	**8 (2%)**	**16 (4%)**	**66 (17%)**	**2 (<1%)**	**2 (<1%)**	**2 (<1%)**	**396 (100%)**

Crash frequencies represent number of crashes (5-year total)
MC: Motorcycle
Unk: Unknown Vehicle Type

Highway Safety Analysis

A Highway Safety Manual (HSM) analysis was conducted for the Base Year (2017) and Design Year (2050) to evaluate the safety performance of the existing roadway network. The HSM provides analytical tools and techniques to evaluate how roadway geometry, traffic volumes, and crash history impact safety before design decisions are made during the planning and preliminary design phases. This analysis was conducted utilizing PennDOT's HSM Safety Analysis Tool which combines Rural Two-Lane Roadways, Rural Multilane Highways, and Urban and Suburban Arterials into one spreadsheet that has been customized for use in Pennsylvania.

The HSM Safety Analysis Tool was utilized to calculate three distinct measures: the Predicted Average Crash Frequency (Baseline), Observed Crash Frequency, Expected Average Crash Frequency (Normalized), and the Potential for Safety Improvement (PSI) within the PEL study area. The following defines these different measures.

- **Predicted Average Crash Frequency** predicts the safety performance of the roadways by analyzing roadway geometry and traffic volumes to calculate an average crash frequency on the roadway network, based on the roadway characteristics. This measure is developed for the Base Year (2017) and Design Year (2050) to evaluate the safety performance of the existing roadway network now and in the future with no improvements in place. This measure will also provide a basis for comparing various improvement scenarios to determine which provides the highest safety benefit.
- **Observed Crash Frequency** measures the type, location, and number of crashes recorded for a roadway segment or intersection over a specific period of time.
- **Expected Average Crash Frequency** predicts the safety performance of the existing roadways by analyzing roadway geometry and traffic volumes as well as historical roadway crash data to calculate an estimated crash frequency on the roadway network. This measure is not used for future comparison, as crash information does not exist. This measure only identifies known issues on the existing roadway network.
- **PSI** indicates whether anticipated safety improvements would be beneficial. It estimates the extent to which long-term crash frequency could be reduced along a roadway segment or at an intersection, either through physical alteration of the roadway due to a proposed project or through a reduction in traffic volumes. When the Expected Average Crash Frequency is greater than the Predicted Average Crash Frequency, a roadway has a potential safety need.

Table 9 summarizes the results of the HSM analysis by roadway and scenario. The resulting PSI for the entire PEL study area and each roadway shows that, in general, there is not an overall safety need. Additionally, the percentage of fatal/injury (F/I) crashes is less than predicted by the HSM model. This indicates that the existing base year roadway network is performing better than the HSM model is predicting for the identified 5-year period used for this study.

As shown in **Table 9**, based on current roadway types and features, as well as the continuous increase in traffic volumes into the future, crashes within the overall PEL study area are predicted to increase by 24 percent. However, the number of crashes along PA 144 is predicted to increase by 33 percent due to the anticipated traffic growth in the area. Of the other major corridors within the PEL study area, crashes along US 322 are predicted to increase by 17 percent and crashes along PA 45 are predicted to increase by 20 percent.

Table 9 – Highway Safety Analysis Summary

Roadway	Base Year (2017)												Design Year (2050)			Percent Increase
	Predicted Crash Frequency			Observed Crash Frequency			Expected Crash Frequency			Potential for Safety Improvement			Predicted Crash Frequency			
	F/I	PDO	Total	F/I	PDO	Total	F/I	PDO	Total	F/I	PDO	Total	F/I	PDO	Total	
PA 45	23.0	20.0	43.0	13.0	12.8	25.8	17.0	13.1	30.1	-5.9	-6.9	-12.9	27.6	23.8	51.5	**20%**
PA 144	24.9	22.3	47.2	8.8	14.8	23.6	17.1	13.3	30.3	-7.8	-9.1	-16.9	33.6	29.1	62.7	**33%**
PA 192	0.7	0.9	1.6	0.0	0.0	0.0	0.5	0.1	0.6	-0.3	-0.8	-1.0	0.9	1.1	2.0	**25%**
US 322	15.6	15.0	30.6	7.0	11.8	18.8	11.4	11.5	22.9	-4.2	-3.6	-7.7	18.3	17.6	35.9	**17%**
Linden Hall Road, Cedar Run Road (SR 2004)	0.4	0.3	0.7	0.0	0.2	0.2	0.4	0.3	0.6	0.0	0.0	0.0	0.5	0.3	0.7	**7%**
Linden Hall Road, Rock Hill Road, Brush Valley Road (SR 2006)	2.0	1.8	3.8	0.6	0.6	1.2	1.8	1.3	3.1	-0.2	-0.5	-0.7	3.6	3.2	6.8	**79%**
Boalsburg Road, Warner Boulevard (SR 3010)	3.7	3.5	7.2	2.8	1.4	4.2	3.4	1.8	5.2	-0.4	-1.6	-2.0	4.1	3.7	7.8	**9%**
Boal Avenue (SR 3014)	15.2	6.2	21.4	1.0	0.8	1.8	2.9	0.9	3.7	-12.3	-5.4	-17.6	18.2	7.4	25.6	**20%**
Brush Valley Road	1.2	0.8	2.0	0.0	0.4	0.4	0.9	0.7	1.6	-0.2	-0.1	-0.3	1.4	1.0	2.4	**20%**
Total	**86.7**	**70.7**	**157.4**	**33.2**	**42.8**	**76.0**	**55.3**	**42.9**	**98.2**	**-31.3**	**-27.9**	**-59.2**	**108.2**	**87.2**	**195.4**	**24%**
Percent of Crashes	***55%***	***45%***	***100%***	***44%***	***56%***	***100%***	***56%***	***44%***	***100%***	***53%***	***47%***	***100%***	***55%***	***45%***	***100%***	**-**

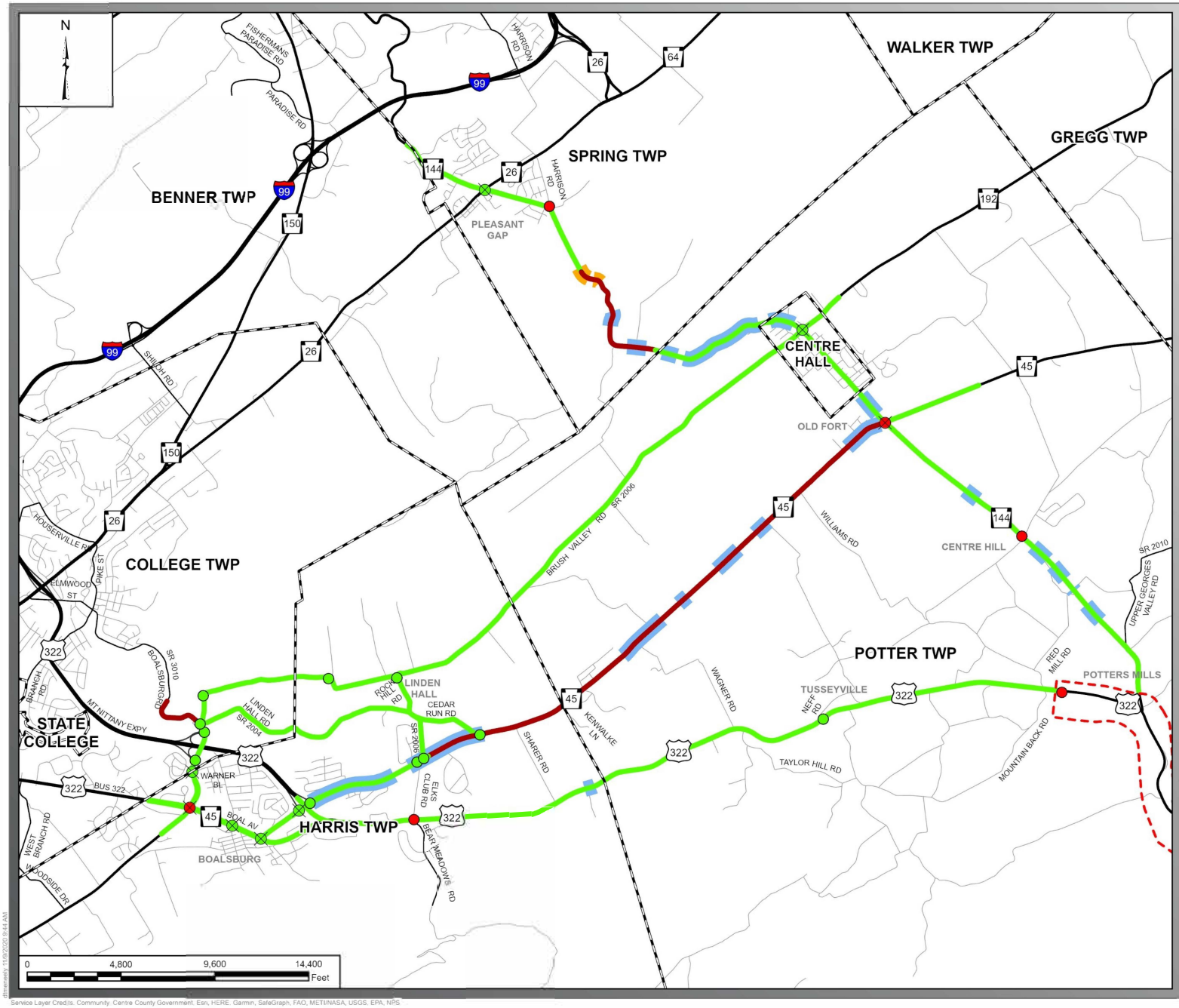
*Displayed in **crashes per year***
***Percent Increase:** Comparison of Design Year (2050) predicted crashes to Base Year (2017) predicted crashes*
***F/I** - Fatal and Injury crashes*
***PDO** – Property Damage Only crash*

However, when evaluating individual roadways by segment and intersection, there are certain individual roadways where the expected number of crashes is greater than the predicted number of crashes. **Figure 7** illustrates the results of the HSM analysis by segment and intersection. Many of the sites identified for PSI correlate with areas that do not meet vertical or horizontal criteria based on the posted speed limits.

The following roadway segments and intersections have a positive PSI (i.e., an improvement could result in a safety benefit):

- PA 144 roadway segment from the top of Nittany Mountain into Pleasant Gap
- PA 45 roadway segment between Elks Club Road and PA 144
- Boalsburg Road roadway segment north of Linden Hall Road
- US 322 and Elks Club Road intersection
- US 322 and Red Mill Road/Mountain Back Road intersection
- PA 144 and Airport Road/Sinking Creek Road intersection
- PA 144 and Harrison Road intersection
- Boal Avenue and PA 45 intersection
- PA 144 and PA 2008 intersection

It should be noted that this was a high-level screening analysis that considered only key intersections along the main roadway corridors to represent the general area. Under detailed investigations, there could be some additional intersections/driveways that could have positive PSI.



LEGEND

- Potters Mills Gap Transportation Project
- Municipal Boundaries

Intersection Safety Analysis

- Signal Intersection - Evaluated
- Signal Intersection - Potential for Safety Improvement
- Stop Intersection - Evaluated
- Stop Intersection - Potential for Safety Improvement

Route Safety Analysis

- Evaluated
- Potential for Safety Improvement

Posted Speed Deficiencies

- Horizontal
- Vertical

pennsylvania DEPARTMENT OF TRANSPORTATION

DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA

INDEX MAP

State College Area Connector

SAFETY ANALYSIS AND ROADWAY ALIGNMENT DEFICIENCIES

CENTRE COUNTY, PENNSYLVANIA

Figure 7	1 Inch = 4,800 Feet

1.3 Study Need

The *Final Purpose and Need for the State College Area Connector Planning and Environmental Linkage Study* (PennDOT 2021) documents the evaluation of transportation problems and documents the study purpose and need.

Three specific transportation needs were identified for the PEL Study. These needs focus on congestion, safety, and system continuity. The following section provides an overview of the need statements (in bold) and key supporting documentation (indented beneath each need statement).

- **High peak hour traffic volumes cause congestion and result in unacceptable LOS (LOS D [rural only], E, or F) on US 322, PA 45, and PA 144 roadways and intersections within the study area.**
  - US 322 serves as the main travel route for local, regional, and interstate traffic, including trucks, within the PEL study area. Currently (2017) during the peak hours, US 322, between the US 322 Mount Nittany Expressway and the Mountain Back Road/Red Mill Road intersection (just west of Potters Mills), operates at a LOS E with an average travel speed that is 10 percent less than the posted speed limit. By 2050, peak hour traffic volumes are anticipated to increase 27 percent which will increase congestion and worsen the LOS on US 322. While a LOS E is still anticipated in 2050, the travel speed will be further decreased, with an average travel speed 15 percent less than the posted speed limit.
  - PA 45 currently (2017) operates at unacceptable LOS (LOS D or E) during the peak hours and will continue to deteriorate through 2050.
  - PA 144 currently (2017) has an unacceptable LOS (LOS E) during peak hours, from north of Centre Hall to Pleasant Gap. By 2050, PA 144 is anticipated to have unacceptable levels of service (LOS D or E) from US 322 to Pleasant Gap.
  - Unsignalized intersections along US 322, PA 45, and PA 144 are anticipated to operate at unacceptable LOS (LOS D, E, or F) due to high volumes of traffic along the uncontrolled main roadway, which limit the availability of gaps in the traffic for making turning movements.
  - US 322 averages three times more truck traffic within the PEL study area in comparison to other similar roadways statewide, and truck traffic is expected to increase by 31 percent along the corridor by 2050. The additional truck traffic increases overall congestion and contributes to unacceptable levels of service. Additionally, between 2014 and 2018, nearly 23 percent of all crashes along US 322 were caused by a heavy vehicle, and 41 percent of all US 322 crashes involved at least one truck.
- **Existing roadway configurations and traffic conditions contribute to safety concerns in the study area.**
  - PA 45 between Elks Club Road and the PA 144 intersection has narrow lane widths and shoulders, with the presence of horizontal curves and passing zones, numerous driveway access points, and hazards adjacent to the roadway (limited clear zones). The Highway Safety Manual (HSM) analysis indicates a potential for safety improvements in this area as the expected (normalized) number of crashes is higher than the predicted (baseline) number of crashes.
  - PA 144 between Centre Hall and Pleasant Gap exhibits roadway conditions similar to PA 45, but also has long stretches with steep grades and horizontal curves. The HSM analysis also

indicates a potential for safety improvements in this area as the expected (normalized) number of crashes is higher than the predicted (baseline) number of crashes.

- Although recent improvements along US 322 have reduced crash frequency and crash severity throughout the corridor, the HSM analysis results indicate the potential for safety improvements at unsignalized intersections. Increasing traffic along US 322 has reduced the number of gaps available for side street and driveway traffic attempting to enter US 322. This causes drivers to make turning movements outside of their comfort zone, which contributes to crashes at side street and driveway intersections. Additionally, the large percentage of through traffic exacerbates the issue, as these drivers may be unfamiliar with the roadway characteristics. Similar conditions exist at the unsignalized intersections along PA 144.

- **The roadway network and configuration in the study area lacks continuity and does not meet driver expectations.**
  - US 322 is on the National Highway System and is classified as a principal arterial that is intended to provide long-distance connections. US 322, adjacent to the PEL study area (near both Potters Mills Gap and Boalsburg), is a four-lane, limited-access, divided highway facility with exit and entrance ramps to provide access to the local roadway network. This type of roadway is conducive to higher travel speeds and supports regional and interstate travel patterns. These adjacent sections of US 322 feed traffic into the PEL study area, where US 322 is currently a two-lane, undivided highway with unrestricted access to driveways and intersecting roadways. The abrupt change in roadway configuration and characteristics creates a roadway network that lacks continuity of facility type and function.
  - Within the PEL study area, US 322 serves local, regional, and interstate traffic (including truck and commuter traffic). The road also services public transit, farm equipment traffic, and bicycle traffic. The change in the roadway cross-section at both ends of the corridor creates inconsistencies which may not meet driver expectations, particularly for regional and interstate traffic. The potential for additional uncontrolled access points along US 322 would continue to degrade roadway continuity along the corridor and create additional locations for conflicts that could result in crashes.
  - PA 144 is a two-lane roadway (with a passing lane in select areas) that serves local, regional, and inter-state traffic. PA 144 is classified as a principal arterial that is intended to provide long-distance connections, but has a posted weight restriction from the PA 192 intersection in Centre Hall, over Nittany Mountain, to the PA 26 intersection in Pleasant Gap. Observations indicate that some heavy truck traffic continues to use the road despite the posted restrictions. The roadway also serves as “Main Street” (South Pennsylvania Avenue) for the Borough of Centre Hall, and traffic in this corridor includes pedestrian, farm equipment traffic, bicycle, and horse-and-buggy traffic that conflicts with through traffic, in particular truck traffic.
  - PA 45, a two-lane roadway, is classified as a minor arterial highway that is intended to provide higher travel speeds with minimum interference to through movement. The corridor includes multiple intersections and driveways and serves as a commuter route to and from the State College Area and outlying residential developments and communities. Traffic in this corridor is primarily (almost 80 percent) local traffic; however, it should be noted that PA 45 westbound traffic experiences more regional through traffic (28 percent) than PA 45 eastbound traffic (4 percent), and only 1 percent of PA 45 westbound traffic appears to be

local trips with both origin and destination within the PEL study area. The road also services public transit, bicycle, farm equipment traffic, and horse-and-buggy traffic.

1.4 Study Purpose

The purpose of this study is to develop and evaluate a range of alternatives to improve mobility and meet interstate and regional through traffic and local needs by reducing congestion, addressing safety, and improving system continuity within the PEL study area while accommodating other modes of traffic (bike, pedestrian, horse and buggies, farm equipment traffic, and public transit) where appropriate, and supporting regional land use visions and goals.

2 RANGE OF ALTERNATIVES CONSIDERED FOR SCREENING

A range of alternatives was developed to address the transportation deficiencies identified within the PEL study area and was presented to resource agencies in December 2020 for review and comment.

The following sections identify and define the range of alternatives under consideration in this PEL Study. Additionally, under each alternative section, there is a discussion of the logical termini used for alternative development purposes. Logical termini are defined as the rational end points for a transportation improvement and environmental impacts. FHWA guidance on the determination of logical termini (FHWA, 1993) recommends that termini be established such that a project/proposal:

- Would connect termini and is of sufficient length to address environmental matters on a broad scale,
- Will not restrict consideration of alternatives for other reasonably foreseeable transportation improvements, and
- Has independent utility or independent significance (e.g., be useable, and be a reasonable expenditure even if no additional transportation improvements in the area are made [23 CFR 771.111(f)]).

Logical termini have been defined as part of the identification and development of the alternatives for all short-term and long-term project alternatives.

2.1 No Build Alternative

The No Build Alternative consists of taking no action to improve the transportation facilities within the PEL study area, with the exception of regional projects which are considered to be "committed" based on a listing of programmed projects in the current CCMPO's *Centre County Long Range Transportation Plan 2050* and the *2021-2024 Transportation Improvement Program.*

2.2 Upgrade Existing Alternative

The Upgrade Existing Alternative would consist of upgrading the existing transportation network within the PEL study area. In general, the Upgrade Existing Alternative would consider roadway improvements generally within the existing right-of-way, such as roadway widening, intersection improvements, horizontal and vertical geometry improvements, and access control. The Upgrade Existing Alternative may include minor right-of-way acquisition to accommodate roadway widening for additional lanes adjacent to the existing roadway, minor roadway realignment, and partial roadway relocation along short roadway sections to address geometric issues. For this PEL Study, the Upgrade Existing Alternative includes four lanes (two in each direction) separated by a concrete barrier. Driveway access would be provided only for right-in and right-out movements. Cross traffic movements would be provided at select locations to support the movement of traffic. **Table 10** provides an overview of the design criteria that were used to develop the Upgrade Existing Alternative. **Figure 8** depicts the anticipated typical section for the Upgrade Existing Alternative.

Table 10 – Design Criteria for Upgrade Existing Alternative

Design Element	Design Criteria from PennDOT Publication 13M, Part 2 (March 2015 revised May 2020)	Proposed Design
Federal Functional Classification	Rural Regional Arterial	Rural Regional Arterial
Design Speed	55 mph	55 mph
Pavement Width	11’ to 12’ lanes	4 - 12’ lanes
Shoulder Width	Right; 10’ (12’ recommended for trucks >250DDHV) Left: 8’ graded	Right: 12’ Left: 8’
Median Width	4’ to 6’ (Level or rolling terrain)	16’ minimum (including shoulders and barrier)
Cross-slopes	8% (maximum) 2% (minimum)	2% to 8%
Horizontal Radius	960’ (minimum)	960’
Vertical Grades	0.5% (minimum) 5% (maximum)	0.5% to 5%
Sight Distance (Stopping)	495’	495’
Minimum Vertical Clearance	16’6” (minimum)	16’6”
Bridge Width	Same minimum widths for lanes and shoulders	Same minimum widths for lanes and shoulders
Clear Zone Width	26’	26’ (minimum)

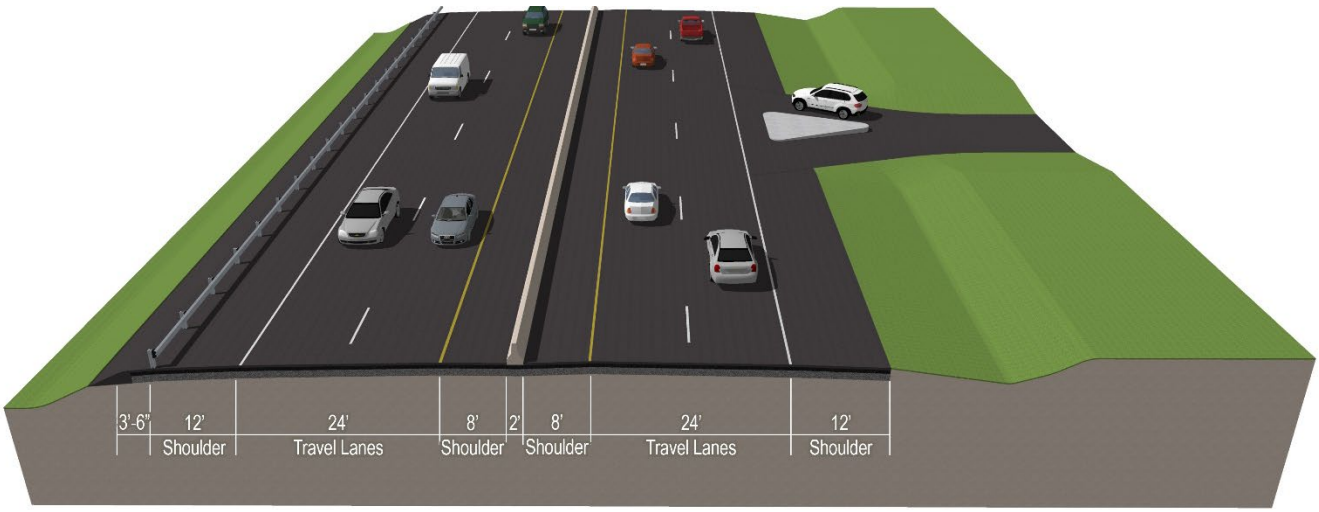


Figure 8 – Anticipated Upgrade Existing Alternative Typical Section

US 322, PA 144, and PA 45 comprise the major roadways that serve the PEL study area. The following provides the rationale for considering these roadways as an Upgrade Existing Alternative option.

- US 322 carries both local and regional through traffic and a mix of all vehicle types (automobiles, medium trucks, and heavy trucks). It is classified as Other Principal Arterial, indicating that the intended purpose of the facility is to convey traffic throughout the region. However, US 322 also functions as a collector route, due to the limited local roadway network serving roadside land development in the area. On a local level, US 322 serves as a key connection to the State College area, providing access to the County's economic hub and to Penn State University's main campus. On an intrastate level, US 322 serves as an important connection for traveling between cities to the east of Centre County and to I-80 and other locations in the Midwest and West. In addition, US 322 currently conveys the largest volume of passenger and truck traffic (**Figure 2**) within the study area and this trend is anticipated to continue into 2050 (**Figure 3)**.
- PA 144 provides a link between US 322 and I-99 along the eastern side of the PEL study area and is identified as Other Principal Arterial. While this roadway provides a key link in the regional roadway network as well as facilitating local travel, it has limitations associated with a posted weight restriction for trucks (10 tons, except for local deliveries) from PA 192 in Centre Hall, over Nittany Mountain, to PA 26 in Pleasant Gap. This stretch of PA 144 also includes a section of reduced speed limit (20 miles per hour [mph]) for trucks and northbound and southbound runaway truck ramps at Nittany Mountain. PA 144 conveys a substantial volume of passenger vehicles (**Figure 2**), and this trend is anticipated to continue into 2050 (**Figure 3)**.
- PA 45 functions as a major east-west roadway through the center of the PEL study area. It is classified as Minor Arterial. PA 45 serves trips of moderate length and provides connectivity to the arterial system with minimum interference to through movement. PA 45 also provides connections from industrial areas (e.g., a quarry, a food processing plant) and the largest agricultural area in the County to the County's economic hub (the State College area and Penn State University's main campus). PA 45 conveys a substantial volume of passenger vehicles (**Figure 2**) and some more localized truck traffic. This trend is anticipated to continue into 2050 (**Figure 3)**.

In addition to being key segments within the local and regional roadway network, US 322, PA 144, and PA 45 move a majority of the daily traffic on the PEL study area roadways. As these roadways play a substantial role in moving local and regional traffic as well as conveying a majority of the traffic, they were each initially identified for consideration as an Upgrade Existing Alternative option.

2.2.1 Logical Termini

The logical termini for the potential Upgrade Existing Alternative options vary for each of the roadway options considered:

- US 322: This Upgrade Existing Alternative option's logical termini would extend from US 322 at Potters Mills to US 322 (Mt. Nittany Expressway).
- PA 144: This Upgrade Existing Alternative option's logical termini would extend from US 322 at Potters Mills to I-99.

- PA 45: This Upgrade Existing Alternative option's logical termini would extend from PA 144 in Centre Hall to US 322 (Mt. Nittany Expressway).

2.3 Transportation Control Measures Alternative

The Transportation Control Measures (TCM) Alternative would consist of developing measures that focus on reducing the volume of vehicles on the transportation network. This strategy would include areawide programs as well as corridor-specific strategies. For the PEL Study, the TCM Alternative would consider:

- Creating Park-and-Ride Facilities
- Designating High-Occupancy Vehicle (HOV) Lanes
- Advocating Ridesharing Services/Vanpool Programs
- Developing Active Transportation (Pedestrian/Bicycle) Facilities
- Promoting Employer-Based Travel Demand Measures (TDM) programs (including Telework or Flexible Work Schedules)

2.3.1 Logical Termini

The logical termini for the TCM Alternative are consistent with the termini defined in the Upgrade Existing Alternative for those measures that have a link to the roadway corridors (e.g., HOV lanes, park-and-rides). For those strategies that are program-oriented, there are no specific logical termini, but these strategies would be considered within the overall PEL study area (e.g., TDM programs, rideshare/van pools).

2.4 Transportation Systems Management Alternative

The Transportation Systems Management (TSM) Alternative, also known as Transportation Systems Management and Operations (TSMO) Alternative, is a set of strategies that focus on operational improvements that preserve and even improve the performance of the existing transportation network without additional capacity. Adding interim capacity can be considered a TSMO strategy if it extends the useful life of a facility or eliminates the need for systemwide capacity improvements. The TSM Alternative goal is to advance comprehensive solutions that consider multimodal opportunities and activities to manage travel demand, thus crossing over political, modal, and jurisdictional boundaries. The TSM Alternative extends beyond a single project or corridor and considers the impacts of the entire transportation system. For this Study, the TSM Alternative would consider:

- Incident and special event management
- Road weather management
- Freight logistics management
- Traffic signal coordination
- Real Time Traveler Information (e.g., PA 511)
- Intelligent Transportation Systems/Emerging Technology
- Integrated corridor management
- Part time shoulder use
- Intersection improvements

2.4.1 Logical Termini

The logical termini for the TSM Alternative are consistent with the termini defined in the Upgrade Existing Alternative for those strategies that have a link to the roadway corridors (e.g., intersection improvements, hard shoulder running lanes, and incident and special event management). For those strategies that are program oriented, there would not be specific logical termini, but these strategies would be considered within the overall PEL study area (e.g., freight management, real time traveler information).

2.5 Public Transportation Alternative

Public transportation in rural areas, such as portions of the PEL study area, is limited by low population densities which inherently have lower ridership, longer travel times, infrequency of service, and higher costs that require substantial subsidies with traditional limitations in funding. Generally, rural public transportation can include demand–response public transportation (e.g., dial-a-ride), traditional and deviated fixed route services (e.g., shuttles, circulators), vanpool, or reimbursement programs. Centre Area Transportation Authority (CATA) offers the following:

- CATARIDE, a demand-response transportation network only for individuals age 65 and over or those eligible for paratransit under the Americans with Disabilities Act (ADA) at reduced fares;
- CATACOMMUTE, a vanpool/rideshare transit;
- CATAGO, an on-demand bus service (similar to Uber); and
- CATABUS, which provides traditional bus service on a fixed route.

Currently, there are no CATABUS fixed routes that extend through the entire PEL study area. For the purposes of this PEL Study, the Public Transportation Alternative would consider adding a new CATABUS fixed bus route that extends throughout the PEL study area.

2.5.1 Logical Termini

The logical termini for the Public Transportation Alternative would extend from the CATA storage at 2081 West Whitehall Road in State College to the Centre Hall area. Potential routes for buses would include using PA 26, PA 45, PA 192, US 322, and PA 144.

2.6 Build Alternative

The Build Alternative would include the construction of a new roadway facility that would add capacity to the local roadway network. For the purposes of the PEL Study, the Build Alternative will be designed as a freeway (**Table 1**) and consist of a limited access roadway on a new alignment within the PEL study area. The Build Alternative options would provide four travel lanes (two in each direction) with full inside and outside shoulders and meet applicable design criteria for freeways. The new alignment alternatives would follow the criteria presented in **Table 11**. **Figure 9** represents a typical cross section of a Build Alternative.

Table 11 – Design Criteria for Build Alternative

Design Element	Design Criteria from PennDOT Publication 13M, Part 2 (March 2015; revised May 2020)	Proposed Design
Federal Functional Classification	Limited Access Freeway (Limited Access – Non-Interstate)	Other Freeways
Design Speed	60 mph	60 mph
Pavement Width	4 or more 12’ lanes	4 - 12’ lanes
Shoulder Width	Right; 10’ (12’ recommended for trucks >250DDHV) Left: 8’ graded	Right: 12’ Left: 8’
Median Width	10’ to 100’ (Level or rolling terrain)	36’ proposed
Cross-slopes	8% (maximum) 2% (minimum)	2% to 8%
Horizontal Radius	1,200’	1,810’
Vertical Grades	0.5% (minimum) 4% (maximum)	0.5% to 4%
Sight Distance (Stopping)	60 mph: 570’	570’
Minimum Vertical Clearance	16’6” (minimum)	16’6”
Bridge Width	Lanes plus right shoulder width plus 6’	Lanes plus right shoulder width plus 6’
Clear Zone Width	30’	30’

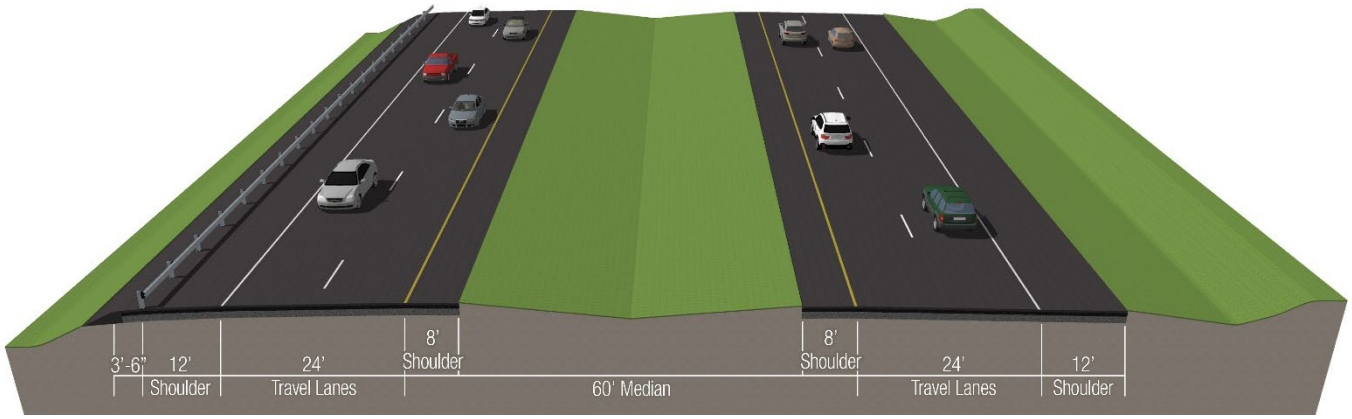


Figure 9 – Build Alternative Typical Section

2.6.1 Logical Termini

The logical termini for any Build Alternative option developed could include possible connections with:

- US 322 – The four-lane limited access portion of US 322 near Potters Mills;
- US 322 – The four-lane limited access portion of US 322 (Mt. Nittany Expressway) at or near Boalsburg; and/or
- I-99 – Limited access I-99 facility north of Pleasant Gap.

3 ALTERNATIVE SCREENING METHODOLOGY

This section describes the methodology and procedures for screening alternatives. **Figure 10** illustrates the screening process. As shown, the process is designed to consider a wide array of transportation options initially and then systematically identify the alternatives that best address the long-term mobility, accessibility, and safety needs and also enhance quality of life.

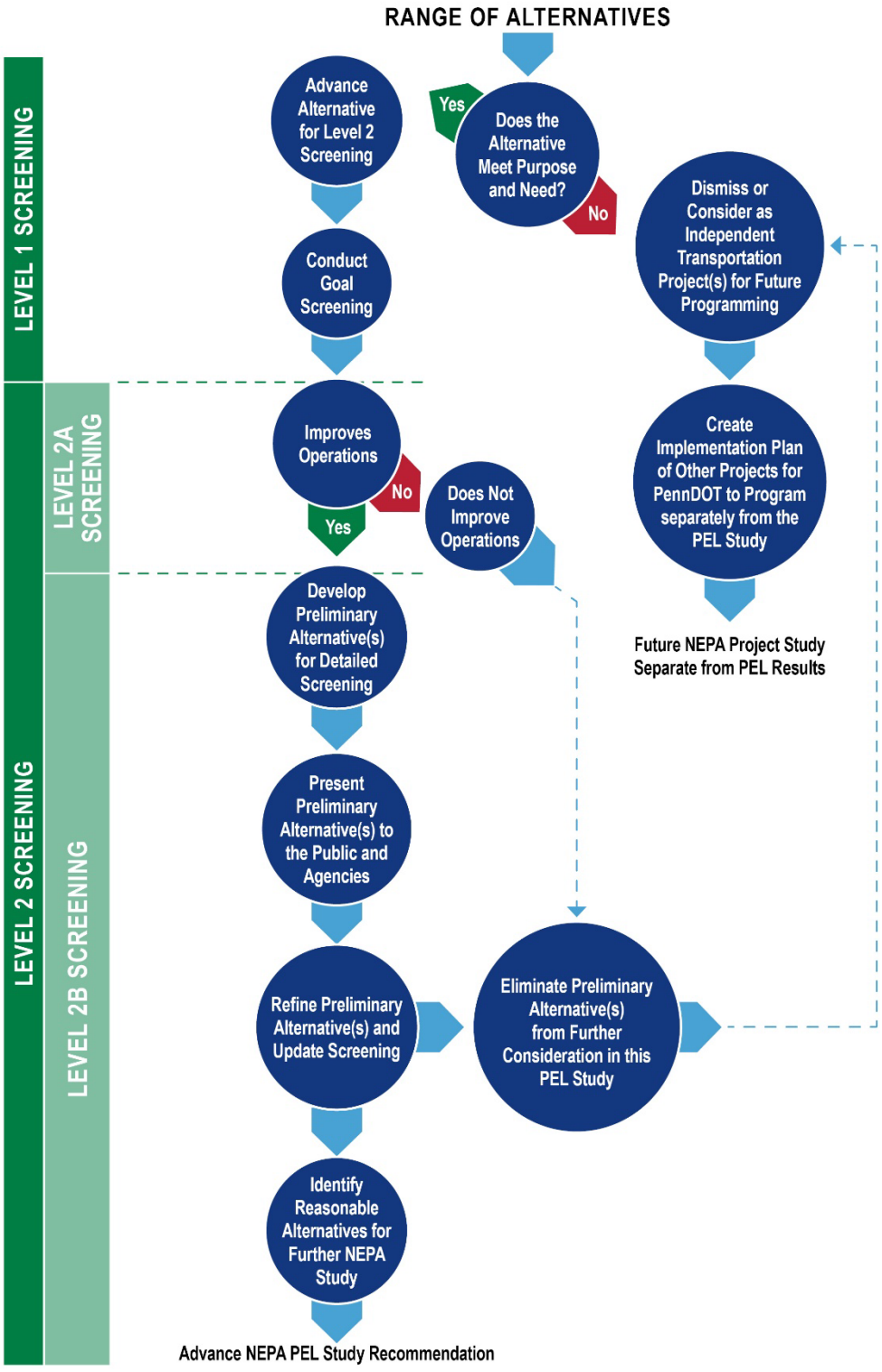


Figure 10 – State College Area Connector PEL Study Alternative Screening Process

3.1 Study Area Goals

Fundamental study goals that support the purpose and need, local transportation and land use planning, transportation mobility, best engineering practices, and environmental stewardship were identified for use in screening the range of alternatives. These goals will be used to qualitatively assess the range of alternatives as well as provide the foundation for the measures of effectiveness that will be used in the quantitative analysis. The study goals include:

- Enhancing local and regional mobility
- Improving recurring and non-recurring congestion
- Reducing travel time delay and traffic congestion
- Improving local and regional access
- Enhancing multimodal opportunity and connectivity
- Developing solutions that coexist with local planning initiatives to the extent possible
- Minimizing impacts to the human, cultural, and natural environment

3.2 Level 1 Screening Overview

The identified range of alternatives represent a wide variety of possible ideas for reducing congestion along roadway segments and intersections, improving safety, and addressing system continuity throughout the PEL study area. The Level 1 screening was a qualitative assessment which utilized a series of questions to determine if the alternative would meet the PEL purpose, need, and goals.

For the purposes of the Level 1 screening, each of the alternatives was evaluated for success in meeting the study purpose, need, and goals as a stand-alone set of improvements.

3.2.1 Level 1 Screening Criteria

Two types of screening were conducted for Level 1. The first screening determined qualitatively if the alternative met the study needs. The second screening assessed the extent to which the alternatives that met the study needs would qualitatively address the fundamental study goals. Both the first and second screenings were completed by answering a specifically designed series of questions. Each alternative was then scored accordingly.

The following summarizes the needs criteria screening questions for the Level 1 screening.

- **Needs Screening**
  - Congestion:
    - Could the alternative meet current and future travel demand?
    - Could the alternative improve operations along roadway segments and at intersections?
  - Safety:
    - Could the alternative enhance safety for all modes of travel?
  - System Continuity:
    - Could the alternative meet driver expectations?

Application of the needs criteria screening questions were qualitatively assessed and assigned a yes or no response to the question. The alternative had to qualitatively meet the identified need in order to receive a "yes". All of the four needs criteria screening questions had to be answered "yes" in order to advance for goal and Level 2 screening.

While the alternatives that would not meet all four of the need criteria (i.e., receive a "no" response for any of the four needs questions) would be dismissed from further evaluation in this PEL Study, the dismissed alternatives could be considered in a high-level planning assessment to determine if they could address other specific transportation issues that remain at the conclusion of this PEL Study. The dismissed alternatives could be included for project consideration as independent transportation projects, which PennDOT would work with the Centre County MPO to plan and program separately. These independent transportation projects are discussed in **Section 8** of this report.

The following summarizes the goal criteria screening questions for those alternatives that passed the needs screening.

- **Goals Screening**
  - To what extent would the alternative improve local and regional mobility?
  - To what extent would the alternative address recurring and non-recurring congestion issues?
  - To what extent would the alternative promote multimodal opportunities?
  - To what extent would the alternative avoid and/or minimize impact to the human, cultural, and/or natural environment?
  - To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?

As the Level 1 screening was only completed qualitatively at this stage of the analysis, the goals that reflect reducing travel time delay and traffic congestion and improving local and regional access were considered as part of the overall improvement to local and regional mobility and congestion issues.

The goals screening criteria was qualitatively assessed and provided a relative score based on a range of 1 to 5, where 1 is the worst and 5 is the best in meeting the goal. **Table 12** provides an overview of the goals scoring used for the range of alternatives. It should be noted that alternatives were not advanced or dismissed based on the cumulative goal score. The goal screening essentially highlights areas where additional alternative refinement, special design considerations, or specific mitigation may be needed to better address the study goals as the alternative is further developed.

Table 12 – Goals Screening Scoring Methodology

Score	Score Description
1	Alternative would not improve or support the goal criteria
2	Alternative would have marginal improvement or support of the goal criteria
3	Alternative would improve and support aspects of the goal criteria
4	Alternative would generally improve and support the goal criteria
5	Alternative would significantly improve or support the goal criteria

3.3 Level 2 Screening Overview

The Level 2A screening evaluated the alternatives by conducting a preliminary quantitative assessment. The assessment determined if an alternative would improve network operations by reducing traffic volumes on key roadways within the PEL study area. A qualitative assessment was also conducted to confirm that the proposed alternatives would continue to meet the PEL Study's purpose and need.

3.3.1 Level 2A Screening Criteria

The general location of the alternatives advanced for Level 2A screening were identified to initiate the planning-level traffic analysis. The alternatives connected the identified logical termini but were not designed or engineered. This level of investigation provided sufficient detail to evaluate future traffic volumes and patterns on the transportation network and to consider their impact on the key roadways.

The study area's key roadways were used to determine the traffic reductions on the network. These roadways included US 322, PA 45, PA 144, PA 26, and Brush Valley Road (SR 2006)/PA 192, which encompass the five major roadways that provide key north, south, east, and west travel through the study area. It should be noted that I-99 was not included in this assessment as it is located outside of the study area and predominantly facilitates more regional travel.

The planning-level traffic analysis determined the AADT and AADTT and peak hour traffic volumes on the key roadways. These roadways were screened to determine generally how traffic changed with the implementation of an alternative compared to the 2050 No Build scenario. The intent of the Level 2A screening was to confirm that the Build Alternative, using the identified logical termini, would generally remove traffic from the study area roadway network. Or in the case of Upgrade Existing Alternative, the additional travel lanes on US 322 would support any increase in traffic volumes on the upgraded roadways, thereby improving network operations. As the alternatives were not fully designed and engineered to maximize performance on the key roadways, the traffic reduction goals were kept conservative. The planning-level goal for the analysis was a general reduction in AADT by 15 percent and a reduction in AADTT by 25 percent on key roadways.

Following the planning-level traffic analysis, a qualitative assessment was conducted to confirm that the proposed alternatives would continue to meet the PEL Study's purpose and need. The need screening criteria utilized in the Level 1 analysis were used to complete this assessment.

Alternatives that did not improve network operations by sufficiently reducing traffic volumes and/or continuing to meet the study needs would be dismissed from further evaluation in this PEL Study. However, these dismissed alternatives could be considered in a high-level planning assessment to determine if they could address other specific transportation issues. The dismissed alternatives could be included for consideration as independent transportation projects which PennDOT would work with the Centre County MPO to plan and program separately. These independent transportation projects are discussed in **Section 8** of this report.

The results of the Level 2A Screening were presented to the public via an open house meeting on September 22 and 23, 2021.

3.3.2 Level 2B Screening Criteria

The Level 2B screening was initiated by developing various options for the alternative concepts that advanced from the Level 2A screening. Alternative options were developed by applying current design standards, engineering criteria, and standard engineering practices, while avoiding or minimizing environmental impacts, as appropriate. These alternative options are considered Preliminary Alternatives for Level 2B screening purposes. Once the Preliminary Alternatives were developed, a quantitative and qualitative assessment was conducted. The quantitative assessment measured how the Preliminary Alternatives improved congestion/mobility/safety, met driver expectations, and impacted/benefitted natural/cultural/socioeconomic resources, as well as select engineering factors. The qualitative assessment evaluated how the Preliminary Alternatives met the study goals developed during the Level 1 screening (**Section 3.2.1.** Level 1 Screening Criteria). The quantitative assessment was conducted first and presented to the public and agencies for review and comment. Following public and agency review of the Preliminary Alternatives and associated impacts, the Preliminary Alternatives were refined, and screening criteria were updated accordingly. Then, the qualitative assessment was conducted taking into consideration the information received during the public and agency engagement and any additional input from local stakeholders. For those potential environmental and community impacts which the Preliminary Alternatives were unable to avoid, mitigation strategies were identified to offset potential impacts.

Level 2B screening concluded by comparing the various Preliminary Alternatives against one another to determine which Preliminary Alternative(s) best met the study purpose and need while minimizing overall environmental impacts and best addressing the study goals. The assessment identified the best performing Preliminary Alternatives to advance as Reasonable Alternatives in a future NEPA study.

The following summarizes the quantifiable and qualitative evaluation criteria for the Level 2B screening.

- **Quantitative Evaluation Criteria**

  The initial evaluation criteria for assessing the Preliminary Alternatives were performance based and quantifiable. The evaluation criteria included a mix of traffic measures and

environmental and engineering considerations designed to evaluate how well the Preliminary Alternatives met the PEL purpose and need while minimizing environmental impacts. The quantifiable evaluation criteria included:

- Safety Analysis
  - Reduce crash frequency
  - Reduce crash severity
- Congestion and Traffic Mobility
  - Obtain acceptable levels of service (segments and intersections)
  - Reduce average delay and average travel time
  - Reduce truck traffic on local roadway network
- Bicycle Facilities
  - Provide adequate bicycle levels of service
  - Reduce cyclist stress level
- Environmental
  - Minimize potential impacts to the natural, cultural, and socio-economic environment
- Engineering
  - Estimated Earthwork
  - Estimated Structures
  - Relative Construction Cost Range

- **Qualitative Evaluation Criteria**

  As previously mentioned, the qualitative assessment was conducted based on information received during public and agency engagement and from additional input from local stakeholders. These criteria evaluated how the Preliminary Alternatives would generally meet the study goals developed during the Level 1 screening (**Section 3.2.1. Level 1 Screening Criteria**). Two additional study goal questions were added for the Level 2B screening. These questions focused on user experience on the roadway network and access through the study area. The Level 2B study goal criteria included:

  - To what extent would the alternative improve local and regional mobility?
  - To what extent would the alternative improve access management through the study area?
  - To what extent would the alternative address recurring and non-recurring congestion issues?
  - To what extent would the alternative provide consistent/improved user experience on the roadway network?
  - To what extent would the alternative promote multimodal opportunities?
  - To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?

  As was conducted in the Level 1 goals screening, the goal criteria were qualitatively assessed and provided a relative score based on a range of 1 to 5 where 1 is the worst and 5 is the best in meeting the goal. This relative score was founded on information

obtained during public and agency engagement, stakeholder coordination, and professional judgement. A rationale for the rating was also provided. **Table 12** provides an overview of the goals scoring used for the range of alternatives as well as the Preliminary Alternatives. It should be noted that the cumulative goal score was not the sole factor for advancing or dismissing a Preliminary Alternative. The goal screening was one factor in the evaluation and highlighted areas where additional alternative refinement, special design considerations, or specific mitigation may be needed to better address the study goals as the alternative is advanced for NEPA study.

While the purpose of this PEL Study is to improve/reduce congestion, address safety, and improve system continuity within the PEL study area, as outlined in the Study Purpose and Need (**Section 1.3 and Section 1.4**), no single solution is likely to address every type of transportation issue within the entire PEL study area. An example of potential issues may include a missing modal link to address connectivity issues or specific intersection/roadway segment congestion. Preliminary Alternatives that are not recommended for future study could be considered in a high-level planning assessment to determine if they could address these other specific transportation issues. The dismissed alternatives could be included for consideration as independent transportation projects which PennDOT would work with the Centre County MPO to plan and program separately. The independent transportation project evaluation is discussed in **Section 8** of this report.

The initial results of the Level 2B Screening were presented to the public via an open house meeting on September 22 and 23, 2021. Refinements were later presented to the public at the April 5 and 6, 2022 and October 19 and 20, 2022 public open house meetings.

4 LEVEL 1 SCREENING OVERVIEW AND RESULTS

4.1 Transportation Alternatives Considered

The full range of alternatives were advanced into the Level 1 screening. **Table 13** provides an overview of the alternative screening results and scoring. Additionally, the following section provides an overview and rationale for the qualitative assessment scoring of how the various alternatives would meet the study needs and goals.

Table 13 – Level 1 Alternative Screening Criteria Results

Level 1 Criteria			Range of Alternatives					
			No Build	Upgrade Existing	TCM	TSM	Public Transit	Build
Study Needs	Congestion	Could the alternative meet current and future travel demand?	No	Yes	No	No	No	Yes
		Could the alternative improve operations along roadway segments and at intersections?	No	Yes	Yes	Yes	No	Yes
	Safety	Could the alternative enhance safety for all modes of travel?	No	Yes	Yes	Yes	No	Yes
	System Continuity	Could the alternative meet driver expectations?	No	Yes	No	No	No	Yes
Study Goals (1=worst scenario and 5=best scenario)		To what extent would the alternative improve local and regional mobility?	NA	4	NA	NA	NA	5
		To what extent would the alternative address recurring and non-recurring congestion issues?	NA	4	NA	NA	NA	5
		To what extent would the alternative promote multimodal opportunities?	NA	4	NA	NA	NA	3
		To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	NA	2	NA	NA	NA	1
		To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	NA	3	NA	NA	NA	3
Goal Score Total				**17**				**17**

[1] *Area community plans reviewed as part of the Final Purpose and Need for the State College Area Connector Planning and Environmental Linkage Study (PennDOT 2021) provided a foundation for the land use planning goal scoring.*

NA = Not Applicable

4.2 Level 1 Screening Results

4.2.1 No Build Alternative

Following the Level 1 screening, the No Build Alternative did not meet all four of the study needs criteria. **Table 14** provides the screening results and the rationale for the assigned criteria scoring for the needs screening criteria. As a result, the No Build Alternative will not be advanced for further consideration in this PEL Study. However, the No Build Alternative will be included for consideration and comparison purposes in any future NEPA study derived from this PEL study.

Table 14 – Level 1 No Build Alternative Screening Criteria Results and Scoring Rationale

Level 1 Criteria			No Build	Scoring Rationale
Study Needs	Congestion	Could the alternative meet current and future travel demand?	No	Alternative would not improve the existing roadway network; therefore, there would be no improvement to address future travel demand.
		Could the alternative improve operations along roadway segments and at intersections?	No	Alternative would not improve operations on the existing roadway network.
	Safety	Could the alternative enhance safety for all modes of travel?	No	Alternative would not improve safety on the existing roadway network.
	System Continuity	Could the alternative meet driver expectations?	No	Alternative would not meet driver expectation.

4.2.2 Upgrade Existing Alternative

Following the Level 1 screening, the Upgrade Existing Alternative is recommended to advance for Level 2 screening. This recommendation is based on the rationale that the Upgrade Existing Alternative met all four study needs criteria (**Table 15**). The Upgrade Existing Alternative also scored 17 out of 25 on study goals criteria.

Table 15 provides the screening results and the rationale for the assigned criteria scoring for the needs and goals screening criteria. While the needs screening determines if the alternative is advanced in this PEL Study, the goal criteria scoring provides direction for areas to consider when developing a design that could better enhance the study goals during future design and Level 2 screening.

Table 15 – Level 1 Upgrade Existing Alternative Screening Criteria Results and Scoring Rationale

Level 1 Criteria			Upgrade Existing	Scoring Rationale
Study Needs	Congestion	Could the alternative meet current and future travel demand?	Yes	Alternative would add capacity to the local roadway network to meet future travel demand.
		Could the alternative improve operations along roadway segments and at intersections?	Yes	Additional capacity and changes to the roadway typical section would improve roadway and intersection operations to address congestion.
	Safety	Could the alternative enhance safety for all modes of travel?	Yes	Safety on the network could be enhanced by widening shoulders, limiting left turns and providing safe cross traffic to select locations. Design considerations would need to address safe entrance from driveways and local roads making right turns into the main travel lanes.
	System Continuity	Could the alternative meet driver expectations?	Yes	This alternative could also be designed to maintain regional through traffic by limiting stops to select locations, thereby meeting driver expectations.
Study Goals (1=worst scenario and 5=best scenario)		To what extent would the alternative improve local and regional mobility?	4	Alternative would add capacity to improve regional mobility. Alternative would not fully address the issues associated with the high number of regional trucks mixing with personal vehicles.
		To what extent would the alternative address recurring and non-recurring congestion issues?	4	Alternative would add capacity to address recurring and non-recurring congestion. Alternative would not fully address the issues associated with the high number of regional trucks mixing with personal vehicles.
		To what extent would the alternative promote multimodal opportunities?	4	Alternative could support multimodal opportunities by incorporating bicycle accommodations into the upgraded roadway areas by designing wider shoulders and including pedestrian facilities with ADA accommodations at intersection locations.
		To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	2	Alternative would limit the ability to avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway is a fixed location with many of these resources being adjacent to the existing facility.

Level 1 Criteria		Upgrade Existing	Scoring Rationale
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	3	Centre County and the Penns Valley Planning Region include the goal for transportation improvements to address traffic movement in the study area. Centre Region and Nittany Valley Planning Regions do not include specific improvement goals for the major study corridors; however, the alternative would have a high potential to conflict with Harris, Potter, and Spring Townships' local land use and planning initiatives. Access roads could potentially increase local access to the improved regional roadway network which may make this area more attractive for development. Any development pressure could stress local utilities and conflict with area plans.[1]
	Goal Score Total	**17**	

[1] *Area community plans reviewed as part of the Final Purpose and Need for the State College Area Connector Planning and Environmental Linkage Study (PennDOT 2021) provided a foundation for the land use planning goal scoring.*

4.2.3 Transportation Control Measure Alternative

Following the Level 1 screening, the TCM Alternative did not meet all four of the study needs criteria. As a result, the TCM Alternative will not be advanced for further consideration in this PEL Study. **Table 16** provides the screening results and the rationale for the assigned criteria scoring for the needs screening criteria.

While the TCM Alternative would not fulfill the full purpose and need identified in this Study, some of the measures may address other transportation needs in the PEL study area. Potential measures that could address these other transportation needs will be considered and discussed in **Section 8** of this report as potential Independent Transportation Projects for Future Programming Consideration. In addition, aspects of TCM could be incorporated into the alternatives that are advanced for further study, as appropriate.

Table 16 – Level 1 TCM Alternative Screening Criteria Results and Scoring Rationale

Level 1 Criteria			TCM	Scoring Rationale
Study Needs	Congestion	Could the alternative meet current and future travel demand?	No	Alternative would have some potential to provide facilities that would encourage changing motorist behavior and reduce the number of vehicles on the roadway network. However, the alternative would not sufficiently address future travel demand to address the study needs.
		Could the alternative improve operations along roadway segments and at intersections?	Yes	Alternative would have some potential to provide facilities that would encourage changing motorist behavior and reduce the number of vehicles on the roadway network, thereby improving travel demand and operations.
	Safety	Could the alternative enhance safety for all modes of travel?	Yes	Alternative would improve safety by promoting alternative means of travel and reduce the number of potential vehicle conflicts on the roadway network. Multimodal Alternative options would also promote improved safety by including bicycle lanes and removing bicycles from the current roadway network that typically has a poor bicycle level of service (BLOS) and creating facilities to support a safer alternative means of travel. [1]
	System Continuity	Could the alternative meet driver expectations?	No	Alternative would not meet the driver expectation need as no alteration to the roadway network would be advanced to provide for a continuous travel experience through the PEL study area.

[1] *BLOS considers roadway conditions such as shoulder widths, motor vehicle volumes and speed, etc. BLOS is discussed in the Final Purpose and Need for the State College Area Connector Planning and Environmental Linkage Study (PennDOT 2021).*

4.2.4 Transportation Systems Management Alternative

Following the Level 1 screening, the TSM Alternative did not meet all four of the study needs criteria (**Table 17**). As a result, the TSM Alternative will not be advanced for further consideration in this PEL Study.

Table 17 provides the screening results and the rationale for the assigned criteria scoring for the needs screening criteria. While the TSM Alternative would not fulfill the full purpose and need identified in this Study, some of the strategies may address other transportation needs in the PEL study area. Potential strategies that could address these other transportation needs will be considered and discussed in **Section 8** of this report as potential Independent Transportation Projects for Future Programming Consideration. In addition, aspects of TSM could be incorporated into the alternatives that are advanced for further study, as appropriate.

Table 17 – Level 1 TSM Alternative Screening Criteria Results and Scoring Rationale

Level 1 Criteria			TSM	Scoring Rationale
Study Needs	Congestion	Could the alternative meet current and future travel demand?	No	Alternative strategies would likely enhance the operation of the existing roadway network. However, the alternative would not sufficiently address future travel demand to address the study needs.
		Could the alternative improve operations along roadway segments and at intersections?	Yes	Alternative strategies would likely enhance the overall operation of the roadway and intersections by providing signal coordination along the corridor.
	Safety	Could the alternative enhance safety for all modes of travel?	Yes	Alternative would improve safety by enhancing intersections, providing information to travelers on roadway conditions, and promoting alternate routes where possible.
	System Continuity	Could the alternative meet driver expectations?	No	Alternative would not meet the driver expectation need as no alteration to the roadway network would be advanced to provide for a continuous travel experience through the PEL study area.

4.2.5 Public Transportation Alternative

Following the Level 1 screening, the Public Transportation Alternative did not meet all four of the study needs criteria. **Table 18** provides the screening results and the rationale for the assigned criteria scoring for the needs screening criteria. As a result, the Public Transportation Alternative will not be advanced for further consideration in this PEL Study.

Table 18 – Level 1 Public Transportation Alternative Screening Criteria Results and Scoring Rationale

Level 1 Criteria			Public Transit	Scoring Rationale
Study Needs	Congestion	Could the alternative meet current and future travel demand?	No	Alternative would encourage motorists to use mass transit thus potentially reducing the number of vehicles on the roadway network. However, a substantial portion of the traffic on the roadway is traffic destined to places outside of the study area or truck traffic which would not use public transit. Overall, the Alternative would not meet future travel demand.
		Could the alternative improve operations along roadway segments and at intersections?	No	Alternative would not improve operations on the existing roadway network as truck traffic and traffic destined to places outside of the study area would still use an unimproved roadway network.
	Safety	Could the alternative enhance safety for all modes of travel?	No	Alternative would not improve safety on the existing roadway network for all modes of travel. Additionally, truck traffic and traffic destined to places outside of the study area would still use the unimproved roadway network.
	System Continuity	Could the alternative meet driver expectations?	No	Alternative would not meet driver expectation. While public transit may accommodate local commuter traffic expectations, it would not address the regional or freight truck driver expectations.

4.2.6 Build Alternative

Following the Level 1 screening, the Build Alternative is recommended to advance for Level 2 screening. This recommendation is based on the rationale that the Build Alternative met all four of the study needs criteria (**Table 19**). The Build Alternative also scored 17 out of 25 on study goals criteria.

Table 19 provides the screening results and the rationale for the assigned criteria scoring for the needs and goals screening criteria. While the needs screening determines if the alternative is advanced in this PEL Study, the goal criteria scoring provides direction for areas to consider when developing a design that could better enhance the study goals during future design and Level 2 screening.

Table 19 – Level 1 Build Alternative Screening Criteria Results and Scoring Rationale

Level 1 Criteria			Build	Scoring Rationale
Study Needs	Congestion	Could the alternative meet current and future travel demand?	Yes	Alternative would add capacity to the local roadway network to meet future travel demand.
		Could the alternative improve operations along roadway segments and at intersections?	Yes	Alternative would provide new facility that would attract trips away from the local roadway network, thus improving roadway and intersection operations.
	Safety	Could the alternative enhance safety for all modes of travel?	Yes	Alternative would improve safety on the roadway network as it would provide a new facility to separate regional traffic from stop and go local traffic thus eliminating potential conflicts. The shift of traffic, specifically trucks, to the new facility would also likely improve BLOS on the local roadways as those are two key considerations in BLOS calculations.[2]
	System Continuity	Could the alternative meet driver expectations?	Yes	Alternative would provide a consistent highway typical section from between the identified logical termini and the connecting roadways
Study Goals (1=worst scenario and 5=best scenario)		To what extent would the alternative improve local and regional mobility?	5	Alternative would add capacity to improve regional mobility.
		To what extent would the alternative address recurring and non-recurring congestion issues?	5	Alternative would add capacity to address recurring and non-recurring congestion.
		To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would likely improve BLOS on the local, thus encouraging multimodal opportunities. [2]
		To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	1	Alternative would have limited ability to fully avoid significant impacts to the natural, cultural, and human environment as the facility would be on a new location.
		To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	3	Centre County and the Penns Valley Planning Region include the goal for transportation improvements to address traffic movement in the study area. Centre Region and Nittany Valley Planning Regions do not include specific improvement goals for the major study corridors; however, the alternative would have a high potential to conflict with Harris, Potter,

Level 1 Criteria		Build	Scoring Rationale
			and Spring Townships' local land use and planning initiatives. Local plans have different transportation goals and initiatives that support a variety of different transportation improvements including new location transportation option preferences.
	Goal Score Total	17	

[1] *Area community plans reviewed as part of the Final Purpose and Need for the State College Area Connector Planning and Environmental Linkage Study (PennDOT 2021) provided a foundation for the land use planning goal scoring.*

[2] *BLOS considers roadway conditions such as shoulder widths, motor vehicle volumes and speed, etc. BLOS is discussed in the Final Purpose and Need for the State College Area Connector Planning and Environmental Linkage Study (PennDOT 2021).*

4.3 Level 1 Screening Summary

Based on the qualitative Level 1 screening of the PEL Study needs criteria, only the Upgrade Existing Alternative and the Build Alternative are recommended for advancement to Level 2 screening. The Level 1 goals screening criteria identify areas where these alternatives should consider ways to better address the goals when further developing the alternatives.

While the TCM and TSM Alternatives would not meet the study need and are not recommended for Level 2 screening, specific measures and strategies from these alternatives can be incorporated into the Upgrade Existing and Build Alternatives to better enhance the study goals during future design and Level 2 screening. In addition, these alternatives will be further considered in **Section 8** of this report as potential Independent Transportation Projects for Future Programming Consideration.

The Public Transportation Alternative would not meet the study need and is not recommended for Level 2 screening. This alternative will also not be considered as a potential Independent Transportation Projects for Future Programming. While CATABUS does not have a current bus route that extends through the entire PEL study area, they do offer other public transportation modes (i.e., CATAGO, CATACOMMUTE, CATARIDE) which provides transportation options in the PEL study area.

The No Build Alternative would not meet the study need and is not recommended for further consideration in this PEL Study. However, the No Build Alternative will be included for consideration and comparison purposes in future alternative screenings and in any future NEPA study derived from this PEL study.

5 LEVEL 2 SCREENING OVERVIEW AND RESULTS

5.1 Transportation Alternatives Considered

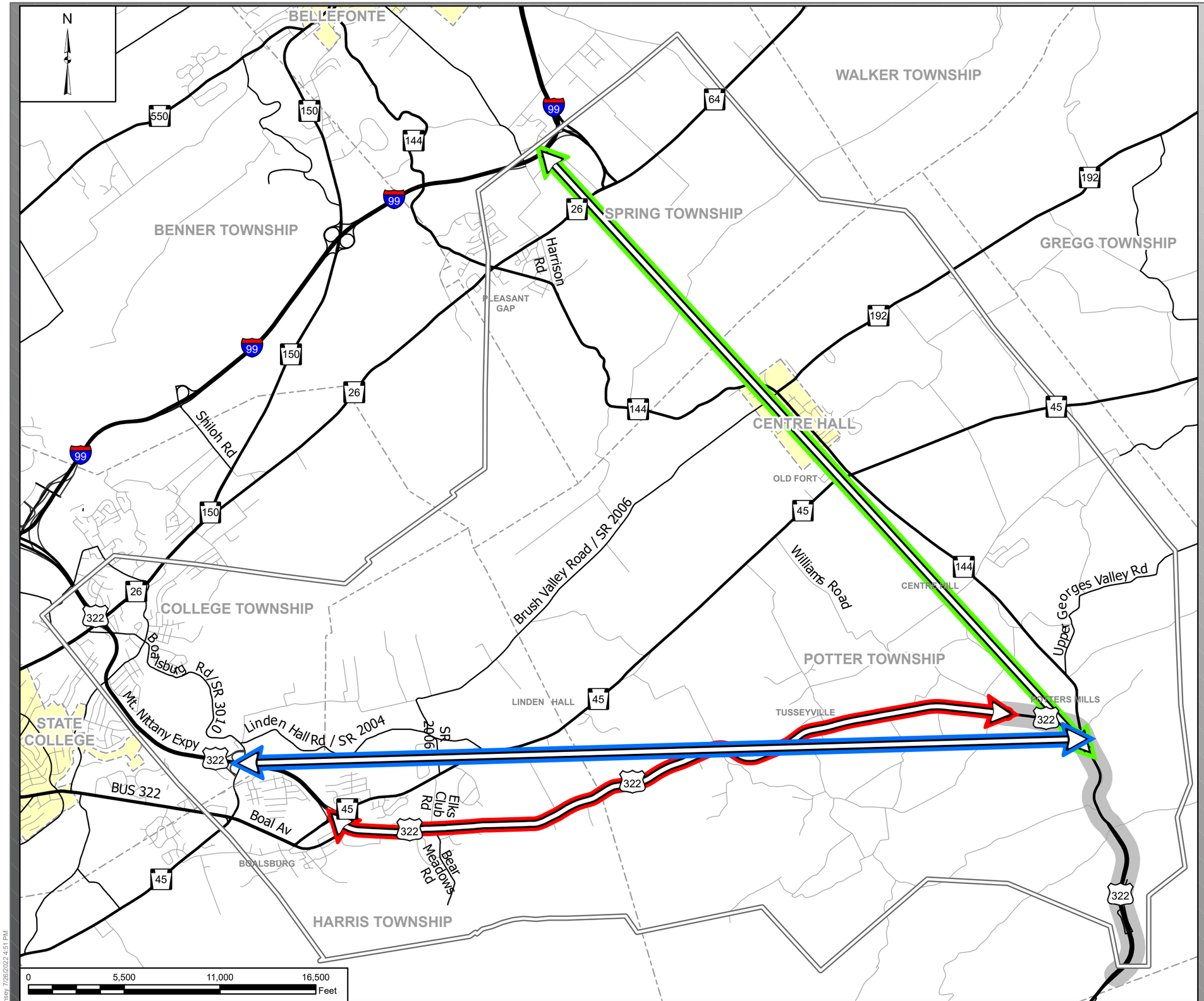
Based on the qualitative Level 1 screening of the PEL Study needs criteria, only the Upgrade Existing Alternative and the Build Alternatives were advanced to Level 2 screening. While the Level 1 goals screening criteria also identified areas where these alternatives should consider ways to better address the goals when further developing alternatives, this analysis was not included as part of the Level 2A screening, but was conducted as part of the Level 2B Screening for those alternatives that passed the Level 2A screening.

5.2 Level 2A Screening Overview

5.2.1 Upgrade Existing Alternative

An Upgrade Existing Alternative was developed that followed the US 322 corridor from the identified logical termini of US 322 at Potters Mills to US 322 (Mt. Nittany Expressway) near Boalsburg (**Figure 11)**. Based on a general engineering assessment, US 322 would be a viable Upgrade Existing Alternative, as the existing roadway geometry would allow for an upgraded design that meets the engineering criteria outlined in **Table 10**, predominately on alignment with no relocations of the roadway required. Based on the surrounding land use and the local access provided by the existing roadway, this upgrade alternative would need to accommodate some local access. As a result, the travel demand model was coded to allow for right turns onto and from US 322 at driveways and local road connections. However, left turns onto US 322 were prohibited due to operational and safety issues that would arise, and the use of jughandles were provided periodically to allow for this traffic movement. (**Figure 12** provides an example of the jughandle concept.) Left turns from US 322 were provided in specific locations to allow access to the local transportation network, including at the intersection of Elks Club Road/Bear Meadow Road. A general alignment location, identification of access points, and addition of travel lanes in the travel demand model provided a sufficient level of detail confirming that the US 322 Upgrade Existing Alternative would support the projected increase in traffic volumes. Based on the travel demand model, the US 322 Upgrade Existing Alternative would improve network operations and thereby continue to meet the need of the PEL Study.

Consideration was also given to developing Upgrade Existing Alternative options that followed the PA 144 corridor from the logical termini of US 322 at Potters Mills to I-99 as well as a PA 45 option from the logical termini of PA 144 to the US 322 (Mt. Nittany Expressway). Based on a general engineering assessment, the PA 144 and PA 45 Upgrade Existing Alternative options were determined to be infeasible and impractical options, as discussed below, and therefore were not advanced for further development and study.



LEGEND

- US 322 Upgrade Existing Alternative
- PA 144 Representative Build Alternative
- US 322 Representative Build Alternative

Boundaries

- Study Area
- Township
- Municipality
- Potters Mills Gap Transportation Project

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA

INDEX MAP

State College Area Connector PEL Study

REPRESENTATIVE ALTERNATIVES

CENTRE HALL BOROUGH, BENNER, COLLEGE, HARRIS, POTTER, AND SPRING TOWNSHIPS
CENTRE COUNTY, PENNSYLVANIA

Figure 11	1 Inch = 5,500 Feet

jramsey 7/26/2022 4:51 PM

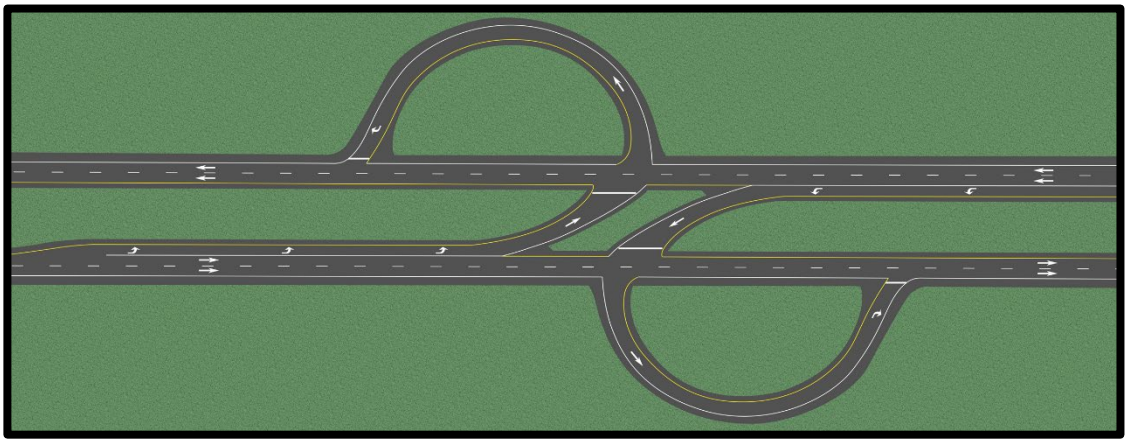


Figure 12 – Example of Jughandle concept.

An Upgrade Existing Alternative along PA 144, from US 322 at Potters Mills to I-99, was not advanced, since upgrading the existing roadway while meeting the design requirements identified in **Table 10** was determined to be infeasible based on the definition of the alternative provided in **Section 2.2**. Key geometric concerns include the existing horizontal curves throughout much of the corridor that do not meet criteria for a 55 MPH design speed. Improving these curves to meet criteria and providing proper transitions between curves cannot be achieved without substantial relocation from the existing alignment and onto a new location alignment. In addition, more than 40 percent of the existing PA 144 alignment was found to have deficient vertical geometry, with excessive grades and limited sight distance. Correcting these grades would require substantial excavation to flatten the roadway grade in large sections of the highway. This, along with the horizontal shifts in the alignment, makes widening the existing facility infeasible.

In addition to geometric concerns, the location of PA 144 through Centre Hall Borough presents other challenges that limit development of an upgrade existing alternative. The proposed roadway typical section for a controlled-access facility would be nearly 100 feet wide, which would have significant impacts in Centre Hall Borough. Nearly half the properties adjacent to PA 144 in this area would be impacted, including nearly 70 residential, commercial, and community buildings in the 1.5-mile section of the borough. In order to meet study goals of driver expectation and system continuity, continuous flow of traffic on the upgrade alternative would further impact the local street system, limit pedestrian access, and eliminate on-street parking, effectively changing the character of the borough.

The substantial horizontal and vertical geometric shifts in the existing PA 144 alignment and issues associated with traversing through Centre Hall Borough would require substantial sections of roadway to be built on new alignment, thus becoming a Build Alternative and not meeting the definition of an Upgrade Existing Alternative. For these reasons, the PA 144 corridor was dropped from consideration as an Upgrade Existing Alternative option.

An Upgrade Existing Alternative only along PA 45, from its termini at PA 144 to US 322 (Mt. Nittany Expressway), would not meet the purpose and need as it would not provide sufficient connections through the study area to meet driver expectations and allow for system continuity. This need would not be met as there would be a gap between US 322 at Potters Mills and PA 45 intersection at PA 144. As a result, PA 45 was dropped from consideration as an Upgrade Existing Alternative option.

To address the identified gap for an Upgrade Alternative along PA 45, a hybrid Upgrade Existing Alternative that would connect termini from US 322 at Potters Mills to US 322 (Mt. Nittany Expressway) by combining sections of PA 144 and PA 45 was also considered. The hybrid Upgrade Existing Alternative would require a realignment/relocation at the intersection of PA 144 and PA 45 in addition to several sections to adjust vertical and horizontal geometry to meet current design criteria. The extent of realignment would not meet the definition of an Upgrade Existing Alternative as it would be more like a Build Alternative. For these reasons, the PA 144/PA 45 hybrid corridor was dropped from consideration as an Upgrade Existing Alternative option.

Throughout the remainder of the document, the Upgrade Existing Alternative will be called US 322 Upgrade Existing Alternative to provide clarity to the reader.

5.2.2 Build Alternative

For the Level 2A screening, the Build Alternative consisted of a four-lane, divided, limited access highway that would connect to the logical termini locations via a straight line and meet the design criteria outlined in **Table 11**. Detailed engineering design was not specifically developed for the alternative and no local access in the form of intermediate interchanges was included at this level of analysis. Based on the Level 2A screening, this design information would be sufficient to conduct a preliminary planning-level assessment to determine the extent of traffic that would be relocated from the key roadways and confirm that the alternative continues to meet the need of the PEL Study.

Two Build Alternative options were developed for the Level 2A screening. The first Build Alternative (Alternative 1) would provide connection between the identified logical termini of US 322 at Potters Mills and US 322 (Mt. Nittany Expressway) near Boalsburg (**Figure 11)**. The second Build Alternative (Alternative 2) would provide connection between the identified logical termini of US 322 at Potters Mills and I-99 north of Pleasant Gap (**Figure 11)**.

5.3 Level 2A Screening Results

5.3.1 US 322 Upgrade Existing Alternative

The Level 2A US 322 Upgrade Existing Alternative followed the existing US 322 corridor from US 322 at Potters Mills to US 322 (Mt. Nittany Expressway) near Boalsburg. As previously stated, no specific engineering design was developed for the alternative, but consideration was given to continuing local access to the lanes while eliminating left turn lanes onto US 322 as outlined in **Section 5.1**.

Planning Level Traffic Analysis Results

As the goal of the US 322 Upgrade Existing Alternative is to draw traffic to the existing US 322, the US 322 data was removed from the planning-level traffic analysis in an attempt to make a comparable assessment of how the alternative reduces traffic throughout the remainder of the existing roadway network. **Table 20** provides an overview and comparison of the key roadways' 2050 Design Year traffic volumes (AADT and AADTT) for No Build and US 322 Upgrade Existing Alternatives.

In summary, by upgrading the existing US 322 corridor, 21 to 48 percent of overall traffic on PA 144 would migrate to the US 322 Upgrade Existing Alternative. Additionally, 33 to 53 percent of all truck traffic would also migrate from PA 144. Between 14 and 37 percent of all traffic and 33 to 50 percent of truck traffic would migrate from Brush Valley Road (SR 2006/PA 192) to the US 322 Upgrade Existing Alternative. PA 45 would see a reduction in overall traffic volumes between US 322 and PA 144 ranging from 10 to 17 percent and 15 to 23 in truck traffic. Changes in traffic volumes on PA 26 would be negligible.

Overall, the implementation of the US 322 Upgrade Existing Alternative (US 322 excluded from the roadway network) would cause nearly 16 percent of all vehicles and 25 percent of all truck traffic to migrate from the local roadway network to the US 322 Upgrade Existing Alternative.

While every roadway segment is not shown, it was determined through the planning analysis that these roadways would not be substantially impacted (i.e., minimal traffic volume reduction or increase) aside from negligible general localized traffic background growth.

Table 20 – US 322 Upgrade Existing Alternative and No Build Traffic Volume Summary Comparison

Roadway	Segment		No Build (2050)		Upgrade Existing (2050)		Percent Change in AADT	Percent Change in AADTT
	From	To	AADT	AADTT	AADT	AADTT		
PA 45	Warner Blvd/ Boalsburg Rd	Boal Ave	13,500	1,800	13,100	1,750	-3%	-3%
	US 322	Elks Club Rd	10,900	1,500	9,100	1,150	-17%	-23%
	Elks Club Rd	Williams Rd	9,200	1,100	7,600	850	-17%	-23%
	Williams Rd	PA 144	9,600	1,700	8,600	1,450	-10%	-15%
	PA 144	Luse Road	9,900	1,350	9,800	1,350	-1%	0%
	AVERAGE VOLUME		10,620	1,490	9,640	1,310	-9%	-12%
PA 144	US 322	PA 45	8,500	1,200	4,400	800	-48%	-33%
	PA 45	Brush Valley Rd	14,100	2,150	9,300	1,000	-34%	-53%
	Brush Valley Rd	Harrison Rd	13,400	1,850	10,600	1,050	-21%	-43%
	AVERAGE VOLUME		12,000	1,733	8,100	950	-9%	-32%
PA 26/ PA 64	PA 144	Norman Ave	9,200	600	9,200	600	0%	0%
	PA 144	I-99 Ramps	7,700	900	7,700	900	0%	0%
	AVERAGE VOLUME		8,450	750	8,450	750	0%	0%
Brush Valley Rd (SR 2006/ PA 192)	PA 144	Pond Lane	1,900	200	1,200	100	-37%	-50%
	PA 144	Blackhawk Rd	2,900	300	2,500	200	-14%	-33%
	AVERAGE VOLUME		2,400	250	1,850	150	-23%	-40%
NETWORK AVERAGE TOTALS			**33,470**	**4,223**	**28,040**	**3,160**	**-16%**	**-25%**
US 322 Upgrade Existing Alternative	Boal Ave	Elks Club Rd	15,700	4,850	25,600	6,500	+63%	+34%
	Elks Club Rd	Neff Road	18,600	4,800	24,200	5,800	+30%	+21%
	Neff Rd	US 322 (Potters Mills)	17,900	4,800	23,200	5,800	+30%	+21%
	AVERAGE VOLUME		17,400	4,817	24,333	6,033	+40%	+25%

US 322 Upgrade Existing Alternative Level 2A Needs Assessment

The study needs assessment conducted during Level 1 was revisited to confirm that the US 322 Upgrade Existing Alternative would continue to meet the purpose and need based on the planning-level traffic analysis. **Table 21** provides the results of the Level 2A qualitative needs assessment.

Table 21 – Level 2A US 322 Upgrade Existing Alternative Screening Criteria Results

Level 2A Criteria			Meet the Need	Rationale
Study Needs	Congestion	Could the alternative meet current and future travel demand?	Yes	Alternative would add capacity to the local roadway network by adding two lanes to existing US 322, one in each direction.
		Could the alternative improve operations along roadway segments and at intersections?	Yes	Additional capacity and changes to the roadway typical section would improve roadway operations by reducing overall traffic by 9% and truck traffic by 12% on other area roads (**Table 20**).
	Safety	Could the alternative enhance safety for all modes of travel?	Yes	While the removal of traffic from the key roadways would not eliminate all safety concerns (i.e., crashes), the US 322 Upgrade Existing Alternative would improve the existing facility to support the relocation of traffic from the key roadways, thus minimizing potential conflicts on these roads and generally improving safety.
	System Continuity	Could the alternative meet driver expectations?	Yes	This alternative, as proposed, generally provides consistent travel experience (i.e., four-lane, divided roadway) through the study area.

US 322 Upgrade Existing Alternative Summary

The intent of the Level 2A screening was to show a reduction in traffic volumes on the existing roadway network. With additional capacity on US 322 under the Upgrade Existing Alternative, this alternative caused 16 percent of all traffic to migrate from the local roadway network, which is within the planning-level goal of 15 percent. Therefore, the Upgrade Existing Alternative would continue to meet the Study Purpose and Needs. It was determined that this alternative will be retained for Level 2B quantitative analysis as further refinement and more in-depth traffic analysis would provide a more meaningful evaluation of this unique alternative and better determine its full impact (adverse and beneficial) on the local roadway network and potential environment. Information obtained from the Level 2A screening will be used to further refine the design and traffic analysis of the US 322 Upgrade Existing Alternative to improve its performance in the Level 2B screening.

5.3.2 Build Alternative

The two Build Alternatives were evaluated independently for the planning-level traffic analysis and as an alternative concept for the study needs assessment. The following sections provide the results accordingly.

Build Alternative 1 (US 322 Corridor)

For the Level 2A Screening, Build Alternative 1 extended in a straight line near US 322 and provided connections between the identified logical termini of US 322 at Potters Mills to US 322 (Mt. Nittany Expressway) near Boalsburg. No specific engineering design and no intermediate interchanges were considered in the development and evaluation of this alternative. **Table 22** provides an overview and comparison of the key roadways' Design Year traffic volumes (AADT and AADTT) for the No Build Alternative and Build Alternative 1.

In summary, between 89 and 95 percent of all traffic along existing US 322 would migrate to the Build Alternative 1 and 94 to 97 percent of all truck traffic. PA 144 would have a 34 to 73 percent reduction in overall traffic and a reduction in truck traffic of 76 to 83 percent with the implementation of the Build Alternative 1. Between 17 and 58 percent in overall traffic and 33 to 50 percent of all truck traffic would also migrate from Brush Valley Road (SR 2006/PA 192). PA 26 could see a slight (1 percent) increase in overall traffic. Truck traffic on PA 26 is anticipated to see an 8 percent decrease south of PA 144 with some shifting of this traffic to the new facility.

Under Build Alternative 1, PA 45, east of US 322, would have a migration of 10 to 23 percent of overall traffic and 26 to 32 percent of truck traffic from the key local roadway network. However, PA 45, west of US 322 (Mt. Nittany Expressway), would see increases in overall and truck traffic of 4 percent and 6 percent, respectively.

It should be noted that while some roadway segment traffic volumes would increase, other segments decrease. Overall, implementation of Build Alternative 1 would cause 47 percent of all traffic and 70 percent of truck traffic to migrate to the new facility from the key roadway network. While every roadway segment is not shown, it was determined through the planning analysis that these roadways would not be substantially impacted (i.e., minimal traffic volume reduction or increase) aside from negligible general localized traffic background growth.

Table 22 – Build Alternative 1 (US 322 Corridor) and No Build Traffic Volume Summary Comparison

Roadway	Segment		No Build (2050)		Alternative 1 (2050)		Percent Change in AADT	Percent Change in AADTT
	From	To	AADT	AADTT	AADT	AADTT		
PA 45	Warner Blvd/ Boalsburg Rd	Boal Ave	13,500	1,800	14,000	1,900	+4%	+6%
	US 322	Elks Club Rd	10,900	1,500	8,900	1,100	-18%	-27%
	Elks Club Rd	Williams Rd	9,200	1,100	7,100	750	-23%	-32%
	Williams Rd	PA 144	9,600	1,700	8,100	1,250	-16%	-26%
	PA 144	Luse Road	9,900	1,350	8,900	1,200	-10%	-11%
	AVERAGE VOLUME		10,620	1,490	9,400	1,240	-11%	-17%
PA 144	US 322	PA 45	8,500	1,200	2,300	200	-73%	-83%
	PA 45	Brush Valley Rd	14,100	2,150	7,500	450	-47%	-79%
	Brush Valley Rd	Harrison Rd	13,400	1,850	8,800	450	-34%	-76%
	AVERAGE VOLUME		12,000	1,733	6,200	367	-48%	-79%
Existing US 322	Boal Ave	Elks Club Rd	15,700	4,850	1,800	150	-89%	-97%
	Elks Club Rd	Neff Road	18,600	4,800	1,100	200	-94%	-96%
	Neff Rd	US 322 (Potters Mills)	17,900	4,800	900	300	-95%	-94%
	AVERAGE VOLUME		17,400	4,817	1,267	217	-93%	-96%
PA 26/ PA 64	PA 144	Norman Ave	9,200	600	9,200	550	0%	-8%
	PA 144	I-99 Ramps	7,700	900	7,800	900	+1%	0%
	AVERAGE VOLUME		8,450	750	8,500	725	+1%	-3%
Brush Valley Rd (SR 2006/ PA 192)	PA 144	Pond Lane	1,900	200	800	100	-58%	-50%
	PA 144	Blackhawk Rd	2,900	300	2,400	200	-17%	-33%
	AVERAGE VOLUME		2,400	250	1,600	150	-33%	-40%
NETWORK AVERAGE TOTALS			**50,870**	**9,223**	**26,967**	**2,698**	**-47%**	**-70%**
Build Alternative 1			-	-	25,500	5,700	-	-

Build Alternative 2 (PA 144 Corridor)

The Level 2A Screening Build Alternative 2 provided connection between the identified logical termini of US 322 at Potters Mills to I-99 north of Pleasant Gap. No specific engineering design and no intermediate interchanges were considered in the development and evaluation of this alternative. **Table 23** provides traffic volumes for the identified PEL study area key roadways associated with Build Alternative 2.

In summary, US 322 would have a reduction of nearly 47 percent of overall traffic volumes and 73 percent in truck traffic as these vehicles would migrate to the Build Alternative 1 (US 322). Additionally, nearly 62 percent of all traffic and 89 percent of truck traffic would migrate from PA 144 roadway to the Build Alternative 2 (US 322). Brush Valley Road (SR 2006/PA 192) would have a migration of 14 to 37 percent of overall traffic and 33 to 50 percent of truck traffic to Build Alternative 2. South of PA 144, PA 26 would see an increase in overall traffic of 12 percent and an

increase in truck traffic of 33 percent. Under Build Alternative 2, PA 45 would see an overall traffic reduction between 5 percent and 15 percent and 3 percent and 32 percent of truck traffic.

Table 23 – Build Alternative 2 (PA 144 Corridor) and No Build Traffic Volume Summary Comparison

Roadway	Segment		No Build (2050)		Alternative 2 (2050)		Percent Change in AADT	Percent Change in AADTT
	From	To	AADT	AADTT	AADT	AADTT		
PA 45	Warner Blvd/ Boalsburg Rd	Boal Ave	13,500	1,800	12,500	1,750	-7%	-3%
	US 322	Elks Club Rd	10,900	1,500	9,300	1,100	-15%	-27%
	Elks Club Rd	Williams Rd	9,200	1,100	7,900	750	-14%	-32%
	Williams Rd	PA 144	9,600	1,700	8,900	1,300	-7%	-24%
	PA 144	Luse Road	9,900	1,350	9,400	1,050	-5%	-22%
	Average		10,620	1,490	9,600	1,190	-10%	-20%
PA 144	US 322	PA 45	8,500	1,200	1,100	100	-87%	-92%
	PA 45	Brush Valley Rd	14,100	2,150	5,900	200	-58%	-91%
	Brush Valley Rd	Harrison Rd	13,400	1,850	6,700	250	-50%	-86%
	Average		12,000	1,733	4,567	183	-62%	-89%
Existing US 322	Boal Ave	Elks Club Rd	15,700	4,850	10,400	1,250	-34%	-74%
	Elks Club Rd	Neff Road	18,600	4,800	9,000	1,250	-52%	-74%
	Neff Rd	US 322 (Potters Mills)	17,900	4,800	8,500	1,350	-53%	-72%
	Average		17,400	4,817	9,300	1,283	-47%	-73%
PA 26/ PA 64	PA 144	Norman Ave	9,200	600	10,300	800	+12%	+33%
	PA 144	I-99 Ramps	7,700	900	7,700	900	0%	0%
	Average		8,450	750	9,000	850	+7%	+13%
Brush Valley Rd (SR 2006/ PA 192)	PA 144	Pond Lane	1,900	200	1,200	100	-37%	-50%
	PA 144	Blackhawk Rd	2,900	300	2,500	200	-14%	-33%
	Average		2,400	250	1,850	150	-23%	-40%
NETWORK AVERAGE TOTALS			**50,870**	**9,223**	**34,317**	**3,657**	**-33%**	**-60%**
Build Alternative 2			-	-	14,700	5,000	-	-

It should be noted that while some roadway segment traffic volumes increase, other segments decrease traffic volumes. Overall, nearly 33 percent of all traffic and 60 percent of truck traffic would migrate from the key roadways to Build Alternative 2. While every roadway segment is not shown, it was determined through the planning analysis that these roadways would not be substantially impacted (i.e., minimal traffic volume reduction or increase) aside from negligible general localized traffic background growth.

Build Alternatives 1 and 2 Level 2A Needs Assessment

The study needs assessment conducted during Level 1 was revisited to confirm that the Build Alternatives would continue to meet the purpose and need based on the planning-level traffic analysis. **Table 24** provides the results of the Level 2A qualitative needs assessment.

Table 24 – Level 2A Build Alternatives 1 and 2 Combined Needs Screening Criteria Results

Level 2A Criteria			Meet the Need	Rationale
Study Needs	Congestion	Could the alternatives meet current and future travel demand?	Yes	Either Build Alternative 1 or Alternative 2 would add capacity to the local roadway network by adding a new, four-lane, limited access facility.
		Could the alternatives improve operations along roadway segments and at intersections?	Yes	Either Build Alternative 1 or Alternative 2 would provide a new facility that would attract trips away from the local roadway network thus reducing overall traffic by 33% to 47% and truck traffic by 60% to 70% along various segments of the network (**Table 22 and Table 23**).
	Safety	Could the alternatives enhance safety for all modes of travel?	Yes	While the removal of traffic from the local roadway network would not eliminate all safety concerns (i.e., crashes), either Build Alternative 1 or Alternative 2 would provide a new facility to separate regional traffic from stop-and-go local traffic thus eliminating potential conflicts and improving safety.
	System Continuity	Could the alternatives meet driver expectations?	Yes	Either Build Alternative 1 or Alternative 2 would provide a consistent highway typical section (i.e., four-lane, divided, limited access roadway) between the identified logical termini and the connecting roadways.

Build Alternative Summary

Build Alternative 1 (US 322 Corridor) and Build Alternative 2 (PA 144 Corridor) meet the 15 percent reduction in total traffic and 25 percent reduction in truck traffic planning goal along various segments of the network for the Level 2A screening. Overall, the network would see 33 to 47 percent migration of total traffic and a 60 to 70 percent migration of truck traffic (**Table 22 and Table 23**) depending on the alternative. Additionally, the qualitative needs analysis identified that the Build Alternative would continue to meet the needs of the PEL Study. Information obtained from the Level 2A screening was used to develop Preliminary Alternatives that enhance the alternatives performance in the Level 2B screening.

5.4 Level 2A Screening Summary

Based on the Level 2A screening, the US 322 Upgrade Existing and the Build Alternatives are recommended for advancement for Level 2B screening. These alternatives would generally improve the operation of the existing roadway network and continue to meet the study needs. Preliminary Alternatives that are alignment specific, were later developed with engineering design considerations and intermediate access (i.e., interchanges/intersections) for the US 322 Upgrade Existing Alternative and Build Alternatives, as appropriate. These Preliminary Alternatives will be used in the Level 2B screening which will expand evaluation criteria for traffic, engineering, and environmental considerations.

6 LEVEL 2B SCREENING OVERVIEW AND RESULTS

6.1 Transportation Alternatives Considered

The Level 2B Screening included the development of preliminary alternatives for the US 322 Upgrade Existing Alternative and the Build Alternatives (US 322 and PA 144). Once the preliminary alternatives were developed, a quantitative traffic analysis was conducted to determine traffic volumes, LOS, and safety projections (i.e., predicted crash frequencies) for each of the preliminary alternatives and the local roadway network. An engineering analysis was conducted to develop planning-level construction and right-of-way cost estimates for each alternative. The cost analysis incorporated major construction components including roadway pavement, drainage, bridges, earthwork volumes, local road connections/access, and other ancillary construction costs including erosion and sediment control and temporary traffic control during construction. The environmental analysis documented the natural, cultural, and socioeconomic resources within each of the preliminary alternative corridors. Lastly, a qualitative planning analysis evaluated how each alternative met the study goals that support the purpose and need, local transportation and land use planning, transportation mobility, best engineering practices, and environmental stewardship. At the conclusion of the Level 2B Screening, reasonable alternatives to advance for future environmental and engineering studies in the NEPA phase of the transportation development process were identified.

6.1.1 Preliminary Alternatives Development

Preliminary alternatives for the US 322 Upgrade Existing and Build Alternatives (US 322 and PA 144) were developed to identify potential corridors for which engineering features and environmental, planning, and traffic impact analyses could be determined. The location of the US 322 Upgrade Existing and Build Alternatives (US 322 and PA 144) were developed by updating previous study corridors and creating new corridors that meet design standards (**Table 10 and Table 11)** and minimize impacts on critical environmental resources. Consideration was also provided for how the Build Alternatives would connect and provide access to the local roadway network. For the US 322 Upgrade Existing Alternative, the roadway typical section was used to identify a 250’ corridor width to identify potential environmental, planning, and traffic impacts. Additional space was included to accommodate jughandles for the left turning traffic movement in key areas.

Each of the conceptual Build Alternative corridors used a common roadway template to establish the typical footprint required. A consistent 350’ width was applied across most of the Build Alternative corridors and expanded to accommodate interchange locations. The width was established to contain the roadway template, embankment slopes, drainage swales, bridge structures, and local roadway network modifications. The width was modified in two locations, the mountainous terrain over Nittany Mountain and the more developed areas of Harris Township. On the PA 144 Build Alternatives, the width was expanded to 900’ to provide space for the additional earthwork needed to accommodate the proposed roadway over Nittany Mountain. On the US 322 Build Alternatives that follow the western portion of the existing US

322 corridor in Harris Township, the width was reduced to 250' to minimize the corridor footprint in this urbanized area.

For the Build Alternative, six US 322 Build Alternative corridors and three PA 144 Build Alternative corridors were developed for analysis.

The following sections provide an overview of the alternative corridors developed for Level 2B Screening. More detailed information on the alternative development can be found in the *Engineering Technical Memorandum* (February 2023).

- US 322 Upgrade Existing Alternative

The US 322 Upgrade Existing Alternative would extend from the logical termini at the US 322 (Mt. Nittany Expressway) in Boalsburg to the newly constructed US 322/PA 144 interchange at Potters Mills Gap (**Figure 13**). This alternative includes four lanes, a paved median with concrete barrier separation, and full-width shoulders. The alternative would include access-controlled lanes with at-grade intersections and jughandle turnarounds strategically located to maintain local road network connectivity. The US 322 Upgrade Existing Alternative would be 7.2 miles.

- US 322-1S Build Alternative

The US 322-1S Build Alternative (US 322-1S) would have logical termini at the US 322 (Mt. Nittany Expressway) in Boalsburg and US 322 at Potters Mills Gap (**Figure 14**). US 322-1S would begin at the existing US 322-1S interchange with PA 45 near Boalsburg and follow existing US 322 to a point east of the Elks Club Road/Bear Meadows Road intersection. In this area, a two-lane service road would be provided on the north side of the limited access highway to provide connectivity to the local road network. US 322-1S would shift off existing US 322 to the north until it crosses over US 322 near Neff Road in Tusseyville. An interchange with a connector road between PA 45 and US 322 would be proposed near Iron Horse Lane and the Harley Davidson Center. The alternative would parallel US 322 to the south before connecting to the newly constructed US 322/PA 144 interchange at Potters Mills Gap. The Build Alternative US 322-1S would be 8.3 miles.

- US 322-1OEX Build Alternative

The US 322-1OEX Build Alternative (US 322-1OEX) is a hybrid of US 322-1S that attempts to maximize the use of the existing US 322 right-of-way (**Figure 14**). US 322-1OEX would have logical termini at the US 322 (Mt. Nittany Expressway) in Boalsburg and US 322 at Potters Mills Gap. US 322-1OEX would begin at the existing US 322 interchange with PA 45 near Boalsburg and follow existing US 322 to a point east of the Elks Club Road/Bear Meadows Road intersection. In this area, a two-lane service road would be provided on the north side of the limited access highway to provide connectivity to the local road network. US 322 1-1OEX would shift off existing US 322 to the north until it crosses over US 322 near Neff Road in Tusseyville. An interchange with a connecter road between PA 45 and US 322 would be proposed near Iron Horse Lane and the Harley Davidson Center. Near Neff Road, US 322-1OEX would shift to follow existing US 322 to the

N

BELLEFONTE

WALKER TWP

SPRING TWP

GREGG TWP

CENTRE HALL

BENNER TWP

COLLEGE TWP

POTTER TWP

STATE COLLEGE

POTTERS MILLS

HARRIS TWP

FERGUSON TWP

0 3,000 6,000 9,000 Feet

LEGEND

- Potters Mills Gap Transportation Project
- PEL Study Area
- Municipal Boundaries
- US322 Upgrade Existing

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA

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State College Area Connector PEL Study

US 322 UPGRADE EXISTING ALTERNATIVE

CENTRE HALL BOROUGH, BENNER, COLLEGE, HARRIS, POTTER, AND SPRING TOWNSHIPS
CENTRE COUNTY, PENNSYLVANIA

Figure 13 | 1 Inch = 6,000 Feet

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Service Layer Credits: NAIP: Esri, USDA Farm Service Agency, Community: Centre County Government, data.pa.gov, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

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BELLEFONTE
Zion
WALKER TWP
Bellefonte Airport
Fishermans Paradise
State Gamelands No 333
SPRING TWP
GREGG TWP
Farmers Mills
Pleasant Gap
Gap Run
MOUNTAIN
SCI Rockview Prison
Peru
University Park Airport
NITTANY
CENTRE HALL
Centre County Old Fort Grange Park
Dale Summit
Houserville
BENNER TWP
Penn State University
Lions Paw Alumni Association
Lemont
COLLEGE TWP
POTTER TWP
Centre Hill
Red Mill
Sinking Creek
Potter Run
Potters Mills
Linden Hall
Cedar Run
Tusseyville
STATE COLLEGE
Mountain View Country Club
Spring Creek
Boalsburg
Colyer Lake
HARRIS TWP
Shingletown
FERGUSON TWP
TUSSEY MOUNTAIN
SEVEN MOUNTAINS

0 3,000 6,000 9,000 Feet

LEGEND

- Potters Mills Gap Transportation Project
- PEL Study Area
- Municipal Boundaries
- Streams

US 322 Alternatives

- US322 1 OEX
- US322 1 S
- US322 2
- US322 3
- US322 4
- US322 5

PA 144 Alternatives

- PA144 1
- PA144 2
- PA144 3

pennsylvania
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UNITED STATES OF AMERICA

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State College Area Connector PEL Study

PROPOSED ALTERNATIVE CORRIDORS

CENTRE HALL BOROUGH, BENNER, COLLEGE, HARRIS, POTTER, AND SPRING TOWNSHIPS
CENTRE COUNTY, PENNSYLVANIA

Figure 14	1 Inch = 6,000 Feet

Service Layer Credits: NAIP: Esri, USDA Farm Service Agency, Community: Centre County Government, data.pa.gov, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

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newly constructed US 322/PA 144 interchange at Potters Mills Gap, with the inclusion of a two-lane service road to maintain local access for properties adjacent to the new limited access facility. US 322-1OEX would be 8.3 miles long.

- US 322-2 Build Alternative

The US 322-2 Build Alternative (US 322-2) would have logical termini at the US 322 (Mt. Nittany Expressway) near Boalsburg and US 322 at Potters Mills Gap (**Figure 14**). US 322-2 would begin at the existing US 322 interchange with PA 45 (Boalsburg Pike), proceed past the Oak Hall Regional Park property and continue north and east of Linden Hall where it would turn southward to cross Lower Brush Valley Road and PA 45. An interchange would be proposed at PA 45 near Kenwalke Lane with a connector road that extends from existing US 322 to PA 45. The corridor would parallel existing US 322 to the north until it crosses over US 322 near Neff Road in Tusseyville. Paralleling US 322 to the south, it would connect to the newly constructed US 322/PA 144 interchange at Potters Mills Gap. US 322-2 would be 10.0 miles long.

- US 322-3 Build Alternative

The US 322-3 Build Alternative (US 322-3) would have logical termini at the US 322 (Mt. Nittany Expressway) near Boalsburg and US 322 at Potters Mills Gap (**Figure 14**). US 322-3 would begin at the US 322 interchange at the existing PA 45 (Oak Hall interchange) full access interchange, proceed past the Oak Hall Regional Park property and through the northern portion of Linden Hall. It would parallel Linden Hall and Cedar Run Roads when approaching a PA 45 interchange, with a connector road that extends from existing US 322 to PA 45. The corridor would parallel existing US 322 to the north until it crosses over US 322 near Neff Road in Tusseyville. It would then parallel US 322 to the south before it would connect to the newly constructed US 322/PA 144 interchange at Potters Mills Gap. US 322-3 would be 9.7 miles.

- US 322-4 Build Alternative

The US 322-4 Build Alternative (US 322-4) would have logical termini at the US 322 (Mt. Nittany Expressway) in Boalsburg and US 322 at Potters Mills Gap (**Figure 14**). US 322-4 would begin at the existing US 322 interchange with PA 45 near Boalsburg, diverge south over US 322 until it would turn eastward generally along the base of Tussey Mountain, paralleling US 322. An interchange is proposed near Taylor Hill Road with a connection to US 322. The corridor would continue paralleling US 322 to the south crossing over Church Hill Road, Dogtown Road, and Red Mill Road and connect to the newly constructed US 322/PA 144 interchange at Potters Mills Gap. US 322-4 would be 8.6 miles long.

- US 322-5 Build Alternative

The US 322-5 Build Alternative (US 322- 5) would have logical termini at the US 322 (Mt. Nittany Expressway) in Boalsburg and US 322 at Potters Mills Gap (**Figure 14**). US 322-5 would begin at the existing US 322 interchange with PA 45 near Boalsburg and follow existing US 322 to a point east of the Elks Club Road/Bear Meadows Road intersection. A two-lane service road on the north

side of the limited access highway would connect to the local road network. US 322-5 would turn southeast off existing US 322 corridor near Tait Road, connect with US 322-4, and proceed east along Tussey Mountain, paralleling US 322. An interchange is proposed near Taylor Hill Road with a connection to US 322. The corridor would continue paralleling US 322 to the south crossing over Church Hill Road, Dogtown Road, and Red Mill Road and connect to the newly constructed US 322/PA 144 interchange at Potters Mills Gap. US 322-5 would be 8.4 miles long.

- PA 144-1 Build Alternative

The PA 144-1 Build Alternative (PA 144-1) would have logical termini at the newly constructed US 322/PA 144 interchange at Potters Mills Gap and I-99 north of Pleasant Gap (**Figure 14**). PA 144-1 would proceed in a northerly direction from the US 322/PA 144 interchange at Potters Mills Gap, paralleling Goodhart Road to the east. At Airport Road, PA 144-1 would head northeast and parallel PA 144 before it turns west to parallel PA 45. An interchange would be provided at PA 45 between Rudy Lane and Williams Road to provide local access. PA 144-1 would then proceed to the north and bridge Upper Brush Valley Road to the east of Black Hawk Village mobile home park. The corridor would proceed north through the Black Hawk Gap and curve to the east crossing over PA 144 to the north of Lower Greens Valley Road. PA 144-1 would continue in a northeasterly direction across Mount Nittany. PA 144-1 would terminate at the existing PA 26/I-99 interchange. PA 144-1 would be 10.3 miles long.

- PA 144-2 Build Alternative

The PA 144-2 Build Alternative (PA 144-2) would have logical termini at the newly constructed US 322/PA 144 interchange at Potters Mills Gap and I-99 north of Pleasant Gap (**Figure 14**). PA 144-2 would proceed in a northerly direction from the US 322/PA 144 interchange at Potters Mills Gap, paralleling Goodhart Road to the east. At Airport Road, PA 144-2 would head northeast and parallel PA 144 before it turns west to parallel PA 45. An interchange would be provided at PA 45 between Rudy Lane and Williams Road to provide local access. PA 144-2 would then proceed to the north and bridge Upper Brush Valley Road to the east of Black Hawk Village mobile home park. The corridor would proceed north through the Black Hawk Gap staying west of PA 144-1 before it would curve to the east crossing over PA 144 to the north of the existing PA 26/I-99 interchange. PA 144-2 would be 10.5 miles long.

- PA 144-3 Build Alternative

The PA 144-3 Build Alternative (PA 144-3) would have logical termini at the newly constructed US 322/PA 144 interchange at Potters Mills Gap and I-99 north of Pleasant Gap (**Figure 14**). PA 144-3 would proceed in a northerly direction from the US 322/PA 144 interchange at Potters Mills Gap, paralleling Goodhart Road to the east. As PA 144-3 approaches Airport Road, the corridor would head in a northwest direction to a perpendicular crossing of PA 45. An interchange would be provided at PA 45 between Rudy Lane and Williams Road to provide local access. From the PA 45 crossing, PA 144-3 would proceed north crossing over Brush Valley Road before turning west to cross Mount Nittany through the Black Hawk Gap. The corridor would proceed north staying

just east of PA 144-2 before it would curve to the east crossing over PA 144 to the north of Lower Greens Valley Road. PA 144-3 would continue in a northeasterly direction across Mount Nittany. PA 144-3 would terminate at the existing PA 26/I-99 interchange. This corridor would be 9.7 miles long.

6.2 Level 2B Screening Results

6.2.1 Traffic Analysis Overview

The representative Upgrade Existing Alternative and Build Alternative corridors developed for the Level 2A Screening were utilized as a starting point for the Level 2B Screening to initiate the planning-level traffic analysis. As in Level 2A, the alternatives connected the identified logical termini but were not designed or engineered.

From a traffic analysis perspective, the alternatives developed for traffic screening, included:

- US 322 Upgrade Existing Alternative consisted of geometric advancements of the current corridor following the existing US 322 corridor from logical termini at the US 322 (Mt. Nittany Expressway) in Boalsburg to the newly constructed US 322 at Potters Mills Gap. This four-lane, barrier separated alternative would allow left turns from US 322 at select intersections. Access to local roads and properties adjacent to the highway would be restricted to right-in and right-out movements with left turns accommodated at jughandles turnarounds spaced throughout the corridor.
- US 322 Build Alternative provided a new limited access roadway connection between logical termini at the US 322 (Mt. Nittany Expressway) in Boalsburg to the US 322 at Potters Mills Gap with an option for an intermediate interchange in the vicinity of the Harris Township/Potter Township border connecting to PA 45.
- PA 144 Build Alternative provided a new limited access roadway connection between logical termini at the US 322 at Potters Mills Gap to I-99 north of Pleasant Gap with an intermediate interchange at PA 45.

Future year (2050), planning-level, traffic volume forecasts were further refined for these representative alternatives. Since access/connections with the existing roadway network are similar for all six US 322 Build Alternative corridors (US 322-1OEX, US 322-1S, US 322-2, US 322-3, US 322-4, US 322-5) and the three PA 144 Build Alternative corridors (PA 144-1, PA 144-2, PA 144-3), two representative corridors were developed to forecast the planning-level traffic, one for the US 322 Build Alternative corridors and one for the PA 144 Build Alternative corridors. Therefore, a single traffic analysis was conducted for each family of alternatives as opposed to separate analyses for each individual corridor since the results for corridors would be similar at the planning level of analysis. The US 322 Upgrade Existing Alternative was modeled independently.

Based on the Level 2B Screening, the representative alternatives provided sufficient detail to conduct a preliminary planning-level assessment to determine the effectiveness of the various alternatives at meeting the purpose and need for the PEL Study in the future design year of 2050.

Traffic Volumes

From a traffic perspective, Level 2B Screening found the following:

- US 322 Upgrade Existing Alternative

  The Level 2B Screening showed that the US 322 Upgrade Existing Alternative would be expected to have 17 percent of total traffic (AADT) and 21 percent of truck traffic (AADTT) migrate to the upgraded section of US 322. **Table 25** shows the 2050 traffic volumes for the local roadway network in the study area with the US 322 Upgrade Existing Alternative. Similar to the Level 2A Screening, the Level 2B Screening determined that total traffic (AADT) and truck traffic (AADTT) on the local road network (minus US 322) would decrease or remain the same in the 2050 traffic conditions. It should be noted that since this alternative involves upgrading the existing US 322 roadway, US 322 was excluded from the analysis as it would intentionally increase in traffic as a result of the improvements, thus negatively skewing the results. However, the increase in traffic volumes for US 322 is provided in **Table 25** for comparison purposes. With the reduction in traffic volume on the local roadway network in the study area, the US 322 Upgrade Existing Alternative would improve overall study area traffic operations and continue to meet the purpose and need based on the planning-level traffic analysis.

- US 322 Build Alternative

  For the US 322 Build Alternative, with intermediate interchange included, the Level 2B Screening showed that the US 322 Build Alternative would be expected to have 53 percent of total traffic (AADT) and 73 percent of truck traffic (AADTT) would migrate to the Build Alternative. **Table 25** shows the projected change in the 2050 traffic volumes for the local roadway network in the study area with the implementation of the US 322 Build Alternative. As the table indicates, most of the local roadway network in the study area would have a reduction in total traffic (AADT) and truck traffic volumes (AADTT).

Table 25 – Upgrade Existing and US 322 and PA 144 Build Alternatives Traffic Volume Comparison

Roadway	Segment		Year 2050 Traffic Volumes							
			No Build		US 322 Upgrade Existing		US 322 Build Alternative		PA 144 Build Alternative	
	From	To	AADT	AADTT	AADT	AADTT	AADT	AADTT	AADT	AADTT
PA 45	Boalsburg Rd	Boal Ave	**13,500**	1,800	**13,000**	1,800	**12,400**	1,600	**14,400**	2,000
	SR 0322	Elks Club Rd	**10,900**	1,500	**9,100**	1,150	**3,200**	450	**6,100**	700
	Elks Club Rd	Williams Rd	**9,200**	1,100	**7,500**	850	**-**	-	**5,200**	550
	Elks Club Rd	Connector Rd	**-**	-	**-**	-	**2,400**	350	**6,100**	1,000
	Connector Rd	Williams Rd	**-**	-	**-**	-	**9,300**	1,450	**6,100**	1,000
	Williams Rd	SR 0144	**9,600**	1,700	**8,600**	1,450	**9,300**	1,450	**6,100**	1,000
	SR 0144	Luse Rd	**9,900**	1,350	**9,800**	1,350	**9,400**	1,350	**12,400**	1,600
	Average		***10,620***	*1,490*	***12,000***	*1,320*	***7,340***	*1,040*	***8,840***	*1,170*
PA 144	SR 0322	SR 0045	**8,500**	1,200	**4,400**	800	**2,200**	200	**1,400**	50
	SR 0045	Brush Valley Rd	**14,100**	2,150	**9,300**	1,800	**7,600**	400	**3,000**	150
	Brush Valley Rd	Harrison Rd	**13,400**	1,850	**10,000**	800	**8,000**	500	**600**	100
	Average		***12,000***	*1,733*	***7,900***	*1,133*	***5,933***	*367*	***1,667***	*100*
US 322	Boal Ave	Elks Club Rd	**15,700**	4,850	**23,400**	6,500	**1,400**	100	**9,100**	1,600
	Elks Club Rd	Neff Rd	**18,600**	4,800	**26,000**	6,500	**700**	50	**8,000**	1,350
	Neff Rd	US 322/ Potters Mills	**17,900**	4,800	**23,000**	5,400	**500**	200	**8,500**	1,950
	Average		***17,400***	*4,817*	***25,100***	*6,133*	***867***	*117*	***8,533***	*1,633*
PA 26/ PA 64	PA 144	Norman Ave	**9,200**	600	**9,200**	600	**8,700**	600	**7,200**	800
	PA 144	I-99 Ramps	**7,700**	900	**7,700**	900	**8,100**	900	**8,200**	1,000
	Average		***8,450***	*750*	***8,450***	*750*	***8,400***	*750*	***7,700***	*900*
Brush Valley Rd (SR 2006 / SR 0192)	PA 144	Blackhawk Rd	**1,900**	200	**1,200**	100	**700**	100	**1,000**	100
	PA 144	Pond Lane	**2,900**	300	**2,600**	200	**2,300**	200	**900**	50
	Average		***2,400***	*250*	***1,900***	*150*	***1,500***	*150*	***950***	*75*
US 322 Build Alternative	Boalsburg Rd (SR 3010)	PA 45/US 322	**-**	-	**-**	-	**31,000**	7,500	**-**	-
	PA 45/US 322	US 322/ Potters Mills	**-**	-	**-**	-	**22,000**	6,750	**-**	-
	Average		**-**	-	**-**	-	**26,500**	7,125	**-**	-
PA 144 Build Alternative	US 322/ Potters Mills	PA 45	**-**	-	**-**	-	**-**	-	**15,000**	6,250
	PA 45	PA 26/I-99	**-**	-	**-**	-	**-**	-	**27,000**	8,250
	Average		**-**	-	**-**	-	**-**	-	**21,000**	7,250
Network Traffic Reduction with Implementation of Alternative					**17%**	**21%**	**53%**	**73%**	**46%**	**57%**

- PA 144 Build Alternative

  For the PA 144 Build Alternative, with intermediate interchange included, the Level 2B Screening showed that the PA 144 Build Alternative would be expected to have 46 percent of total traffic (AADT) and 57 percent of truck traffic (AADTT) would migrate to the Build Alternative. **Table 25** shows the projected change in the 2050 traffic volumes for the local roadway network in the study area with the implementation of the PA 144 Build Alternative. As the table indicates, most of the local roadway network in the study area would have a reduction in total traffic and truck traffic volumes.

Level of Service (Roadway)

When evaluating the traffic performance of the roadway by evaluating the LOS compared to a No Build scenario, all alternatives improved operations at most key study intersections and along approximately 20 miles of key local roadways within the study area. However, all alternatives still had segments on the local roadway network and at least one intersection with a predicted LOS that did not meet current acceptable criteria.

- US 322 Upgrade Existing Alternative

  The US 322 Upgrade Existing Alternative had 6.6 lane miles of unacceptable LOS in the 2050 analysis (**Table 26**). This included the 3.5-mile section of existing PA 144 over Mount Nittany, which is an issue related to roadway geometry. This alternative also had one intersection (Boalsburg Road (SR 3010) & US 322 WB On/Off Ramp) that did not meet an acceptable LOS during the morning peak hour traffic only.

- US 322 Build Alternative

  The US 322 Build Alternative also had 6.6 lane miles of unacceptable LOS in the 2050 analysis (**Table 26**). This included the 3.5-mile section of existing PA 144 over Mount Nittany, which is an issue related to roadway geometry. This alternative also had two intersections (Boalsburg Road (SR 3010) & US 322 WB On/Off Ramp and Boalsburg Road (SR 3010) & US 322 EB On/Off Ramp) that did not meet an acceptable LOS during the morning and afternoon peak hour traffic.

- PA 144 Build Alternative

  The PA 144 Build Alternative had 8.5 lane miles of unacceptable LOS in the 2050 analysis (**Table 26**). This included the 3.5-mile section of existing PA 144 over Mount Nittany, which is an issue related to roadway geometry. This alternative also had one intersection (Boalsburg Road (SR 3010) & US 322 WB On/Off Ramp) that did not meet an acceptable LOS during the morning and afternoon peak hour traffic.

Safety

A safety analysis was conducted using the crash predictive model of the Highway Safety Manual (HSM) analysis to quantitatively evaluate the safety benefits associated with each alternative. The

safety analysis considered US 322, PA 144, and PA 45 and the alternatives using the 2050 traffic volume projections to calculate a predicted crash frequency for each alternative. This was done by summing the predicted crash frequencies for each of the roadways and comparing the results for each alternative to a No Build scenario. This comparison determined the quantitative change in crash frequencies for all crashes and of fatal and injury crashes.

Table 26 – Level 2B Screening LOS and Safety Summary

Traffic Analysis	US 322 Upgrade Existing	US 322 Build Alternatives (US 322-1OEX, US 322-1 S, US 322-2,US 322-3, US 322-4, US 322-5)	PA 144 Build Alternatives (PA 144-1,PA 144-2,PA 144-3)
Level of Service – Segment Miles Unacceptable (miles)	6.6	6.6	8.5
Level of Service – Intersections Unacceptable (number of intersections)	1	2	1
Improves BLOS	Yes*	Yes	Yes
Safety Improvements – Improves Predicted Total Crashes	No	Yes	Yes
Safety Improvements – Improves Predicted Fatal &Injury Crashes	No	Yes	Yes

* US 322 would be unusable by bikes without the inclusion of dedicated bicycle facility.

- US 322 Upgrade Existing Alternative

  Under the US 322 Upgrade Existing Alternative, the number of total crashes was predicted to decrease along PA 144 and PA 45 largely due to decreased volumes on these roadways. However, predicted crashes nearly doubled along US 322 due to increased volumes and the continued presence of local access points at jughandle intersections and driveways providing conflict points. Within the study area, overall crashes were predicted to increase by approximately 10 percent and fatality/injury would decrease by 3 percent. In general, this alternative did not improve overall safety.

- US 322 Build Alternative

  Under US 322 Build Alternative, predicted crashes decreased on study area roadways due to the diverted traffic volumes and improved facility, with existing US 322 having the largest decrease. Within the study area, the overall number of crashes would be reduced by approximately 18 percent and fatality/injury crashes were reduced by approximately 22 percent. This alternative improved safety.

- PA 144 Build Alternative

  Under PA 144 Build Alternative, predicted crashes decreased on study area roadways due to the diverted traffic volumes on these roadways and improved facility, with existing PA 144 having the largest decrease. Within the study area, the overall number of crashes was reduced by approximately 25 percent and fatality/injury crashes were reduced by approximately 28 percent. This alternative improved safety.

Bicycle Level of Service

A Bicycle Level of Service (BLOS) analysis was also conducted for the US 322 Upgrade Existing and US 322 and PA 144 Build Alternatives. Slight improvement in BLOS would be realized on some existing roadway links that have a reduction in traffic volumes associated with an alternative, while other segments remained the same. Based on the analysis, the US 322 Upgrade Existing Alternative would essentially eliminate the use of US 322 as a viable bicycle route. Appreciable improvement in BLOS would not be realized without upgrades to existing shoulders or provisions for separate bicycle facilities throughout the study area. **Table 27** provides a comparison of the various US 322 Upgrade Existing and Build Alternatives BLOS to the No Build Scenario.

Traffic Conclusions

While the US 322 Upgrade Existing Alternative improved traffic operations, it decreased overall safety on the study area network over the existing facility with 2050 traffic volumes. As a result, the US 322 Upgrade Existing Alternative would not meet the purpose and need of the PEL Study to improve safety. The US 322 Upgrade Existing Alternative was not advanced for further evaluation in the Level 2B Screening or this PEL Study.

As summarized in the list below and supported by **Table 26** and **Table 27**, from a traffic operations and safety perspective, both Build Alternatives substantially improved mobility, congestion, and safety on the study area roadways.

- Either Build Alternative would be acceptable from a traffic operations and safety perspective.
- Both Build Alternatives would meet the projected traffic and safety needs.
- Both Build Alternatives would carry the majority of through car and truck traffic.
- Both Build Alternatives would improve overall safety on study area roads by virtue of removing through traffic and shifting heavy truck traffic to the new limited access road.
- Both Build Alternatives would leave some residue traffic concerns related to congestion on the existing road network.

Table 27 – Bicycle Levels of Service Summary (Design Year 2050)

Roadway	Segment		Facility Type	Design Year (2050) Bicycle Level of Service							
				No Build		US 322 Upgrade Existing		US 322 Build Alternative		PA 144 Build Alternative	
	From	To		AM	PM	AM	PM	AM	PM	AM	PM
PA 45	SR 0322 WB On Ramp	Elks Club Rd	Two-Lane	E / E	D / E	F / E	F / F	B / B	B / A	F / E	F / F
	Elks Club Rd	Williams Rd	Two-Lane	F / E	D / E	F / E	F / F	B / B	B / A	F / E	F / F
	Elks Club Rd	Connector Rd	Two-Lane	-	-	-	-	F / E	F / F	-	-
	Connector Rd	Williams Rd	Two-Lane	-	-	-	-	F / E	F / F	-	-
	Williams Rd	Old Fort Rd (SR 0144)	Two-Lane	E / D	D / D	F / E	F / F	F / E	F / F	F / E	F / F
PA 144	General Potter Hwy (SR 0322)	Earlystown Rd (SR 0045)	Two-Lane	D / F	E / E	F / F	F / F	F / F	F / F	B / D	E / C
	Earlystown Rd (SR 0045)	Brush Valley Rd (SR 0192)	Two-Lane	D / D	D / D	E / F	F / F	E / F	F / F	C / C	D / D
	Brush Valley Rd (SR 0192)	Harrison Rd	Two-Lane	D / D	D / D	E / F	F / E	E / F	F / E	A / A	A / A
US 322	Boal Ave (SR 3014)	Elks Club Rd	Two-Lane Multi-Lane	F / F -	E / F -	- F / F	- F / F	A / A -	A / A -	D / C -	D / E -
	Elks Club Rd	Neff Rd	Two-Lane Multi-Lane	F / F -	E / F -	- F / F	- F / F	A / A -	A / A -	E / D -	D / E -
	Neff Rd	Mountain Back Rd	Two-Lane Multi-Lane	F / F -	D / F -	- F / F	- F / F	A / A -	A / A -	D / D -	D / E -

US 322 Build Alternative options would carry more total traffic than the PA 144 Build Alternative options by virtue of attracting more traffic destined to the State College area including Boalsburg, Ferguson Township, and certain downtown sites. Car and truck traffic destined to those areas would not follow a PA 144 Build Alternative option and be faced with driving through State College to get to points west of the Mount Nittany Expressway. As a result, the PA 144 Build Alternative options leave more residue traffic on US 322; conversely due to the interchange at PA 45, the PA 144 Build Alternative options carry more State College destined traffic from the valley. Fifty (50) percent to 60 percent of all traffic would migrate from the local roadway network in the study area for the US 322 Build Alternative options and 40 percent to 50 percent of all network traffic would migrate from the local roadway network in the study area for the PA 144 Build Alternative options. This reflects the State College destinations and the likelihood that traffic destined to those areas would follow existing US 322 rather than proceed over the mountain on a PA 144 option and then traversing south on I-99.

As a result, the US 322 and PA 144 Build Alternatives would meet the purpose and need and were recommended to be advanced for further study from a traffic perspective. More detailed

information on the traffic analysis can be found in the *Traffic Analysis Technical Memorandum for the State College Area Connector Planning and Environmental Linkage Study (December 2022).*

6.2.2 Engineering Analysis Overview

Following the development of the preliminary alternatives, engineering studies were conducted to quantify the major engineering features which contribute to the overall cost of each of the Build Alternatives. Key items considered included roadway costs (e.g., pavement, barriers, drainage, stormwater, etc.), earthwork costs (e.g., excavation/placement of materials, relocation/acquisition of borrow material), structures (e.g., bridges), and major utility relocations. Allowances were also included for maintenance of traffic during construction, erosion control, stormwater management, and contractor mobilization during construction. These items were then used to develop a planning-level construction cost estimate. As this is a planning study, a 20 percent contingency fee was applied to the cost estimate for each of the Build Alternative corridors.

A planning-level investigation was also conducted to determine an estimated right-of-way cost for each of the Build Alternative corridors. These estimates considered residential and commercial relocation and partial land acquisition, geography of the relocations, current market averages in the geographies, and potential mineral right losses. As the proposed Build Alternatives only had conceptual engineering and full right-of-way plans were not developed, the planning-level right-of-way analysis provided a baseline cost for comparing the Build Alternative corridors during the PEL Study.

Table 28 provides a summary of the comparative screening for the alternatives based on various engineering features identified at the planning-level. The planning-level right-of-way and construction cost estimates were the key engineering features used to recommend an alternative for further study from an engineering perspective, as they provided a summation of the other engineering features identified. At this planning level, the costs were depicted as a dollar value range. Build Alternatives with an overall lower cost were recommended to advance for further evaluation from an engineering perspective. As a result, while all the Build Alternatives met the purpose and need, the US 322-1OEX, US 322-1S, US 322-4, and US 322-5 Build Alternative corridors were recommended to be advanced for further study from an engineering perspective. More detailed information can be found in the *Engineering Technical Memorandum for the State College Area Connector Planning and Environmental Linkage Study (February 2023).*

Table 28 – Engineering Screening Summary

Engineering Feature	US 322-1OEX	US 322-1S	US 322-2	US 322-3	US 322-4	US 322-5	PA 144-1	PA 144-2	PA 144-3
Corridor Length (mi.)	8.3	8.3	10.0	9.7	8.6	8.4	10.3	10.5	9.7
Total Cut Excavation (YD^3)	3,170,000	3,648,000	4,611,000	4,822,000	3,458,000	2,593,000	16,263,000	6,152,000	8,989,000
Total Fill Excavation (YD^3)	2,023,000	2,521,000	3,554,000	3,901,000	5,340,000	6,699,000	6,512,000	10,900,000	7,678,000
Bridge Deck (FT^2)	501,575	486,810	617,530	763,530	387,850	366,940	344,468	411,130	325,030
Planning Level ROW Cost*	$58M to $63M	$42M to $47M	$37M to $42M	$47M to $52M	$40M to $45M	$32M to $37M	$60M to $65M	$60M to $65M	$55M to $60M
Planning Level Construction Cost*	$405M to $430M	$390M to $415M	$475M to $500M	$545M to $570M	$390M to $415M	$455M to $480M	$550M to $575M	$680M to $705M	$455M to $480M
Planning Level Total Cost*	$468M to $493M	$432M to $462M	$512M to $542M	$592M to $622	$430 to $460	$487M to $517M	$610M to $640M	$740M to $770M	$510M to $540M

* In 2021 dollar value

6.2.3 Environmental Analysis Overview

At the start of the PEL Study, environmental features in the study area were identified through secondary sources, select site reconnaissance, coordination with government agencies and private organizations, and outreach to the public. These features have been mapped using a Geographic Information Systems (GIS) database. Additionally, resource specific technical memoranda were developed and provide additional information. The following technical memoranda can be reviewed for more information.

- Agricultural Resources Technical Memorandum for the State College Area Connector Planning and Environmental Linkage Study (December 2021)
- Wetland and Watercourses Technical Memorandum for the State College Area Connector Planning and Environmental Linkage Study (August 2021)
- Archaeological Resources Technical Memorandum for the State College Area Connector Planning and Environmental Linkage Study (May 2021)
- Socioeconomic Technical Memorandum for the State College Area Connector Planning and Environmental Linkage Study (June 2021)
- Historic Resources Survey Technical Memorandum for the State College Area Connector Planning and Environmental Linkage Study (July 2021)
- Threatened and Endangered Species Technical Memorandum for the State College Area Connector Planning and Environmental Linkage Study (May 2021)
- Terrestrial Habitat Technical Memorandum for the State College Area Connector Planning and Environmental Linkage Study (May 2021)
- Hazardous and Residual Wastes Technical Memorandum for the State College Area

The collected environmental features were then used during the development of preliminary alternatives to aid in guiding the location of alternatives to be evaluated in this PEL Study. Once the Build Alternative corridors were identified, traffic analysis completed, and the alternatives which continued to meet the transportation purpose and needs for the PEL study confirmed, an assessment was conducted to identify potential environmental impacts associated with the various Build Alternative corridors. The potential impacts were then used to identify which Build Alternative corridors to recommended to be advanced for further study from an environmental perspective.

Potential Environmental Impact Identification

Utilizing the environmental information stored in the GIS, potential environment impacts were considered for each of the Build Alternative corridors. **Table 29** provides a summary of potential environmental resources which could be impacted under the various Build Alternatives.

While federal regulations require that impacts to all resources be balanced with engineering considerations, ability to meet needs, public input and agency consultation, other regulations require examination of avoidance alternatives or pose strict requirements for any impact. Following the initial identification of potential impacts, a refined analysis was conducted to focus on those resources with statutory or implementing regulations with specific requirements for the evaluation and advancement of alternatives. The refined screening provided a comparative analysis for each of the Build Alternatives and provided a foundation for identifying which alternative provided the best opportunity to minimize overall environmental impacts.

Table 29 – Potential Environmental Impacts

	Feature	US322 - 1 OEX		US322 - 1 S		US322 - 2		US322 - 3		US322 - 4		US322 - 5		144-1		144-2		144-3		Average Impact Value	Lower Magnitude of Impact	Higher Magnitude of Impact
	Potential Limit of Disturbance Area (acres)	463		446		482		493		429		432		696		699		670		534	429	699
Natural Resources	**Agricultural Resources**																					
	Productive Agricultural Land (acres)	251		278		361		313		180		181		294		296		268		269	180	361
	Agricultural Security Areas **(within Productive Agricultural Land)** (acres)	111		112		192		146		70		57		165		166		183		134	57	192
	Agricultural Zoning Districts **(within Productive Agricultural Land)** (acres)	152		160		246		212		99		97		133		135		132		152	97	246
	Soil Capability Classes I-IV **(within Productive Agricultural Land)** (acres)	240		265		331		296		168		168		291		292		259		257	168	331
	Other Land Preservation																					
	Conservation Easements (acres)	24		16		0		50		17		15		108		111		110		50	0	111
	Conservation Easements **(within Productive Agricultural Land)** (acres)	22		15		0		39		0		0		40		40		37		22	0	40
	Act 319 Clean and Green Areas **(within Productive Agricultural Land)** (acres)	189		213		281		258		146		137		192		193		203		201	137	281
	Water Resources																					
	Wetlands (bridges) (acres)	4		3		2		3		6		8		7		6		8		5	2	8
	Total Streams **(bridges)** (# of crossing | linear feet)	20	5,576	21	6,681	14	5,965	15	6,265	16	9,124	20	10,331	11	7,070	11	7,067	10	5,265	7038	5265	10331
	CWF-HQ/CWF Streams **(bridges)** (# of crossings | linear feet)	16	5,129	21	6,681	14	5,965	14	5,066	16	9,124	19	9,046	9	6,275	11	7,067	8	4,481	6537	4481	9124
	Ponds/Lakes (# | acres)	8	3	8	5	2	0	2	0	8	1	9	1	2	0	2	0	2	0	1	0	5
	100 Yr. Floodplains (acres)	21		9		10		15		12		13		10		11		10		12	9	21
	Terrestrial Habitat and Threatened and Endangered Species																					
	Forested/Wooded Habitats (acres)	25		23		26		59		149		111		248		261		269		130	23	269
	PA Natural Heritage Core Habitat (acres)	25		11		11		11		15		15		8		8		8		12	8	25
	Karst Features (#)	26		26		47		26		2		2		53		52		61		33	2	61
	Bat Swarming Area **(Combined)** (acres)	134		90		266		234		71		71		658		660		631		313	71	660
	Bat Swarming Area **(Combined) (Forested)** (acres)	15		7		20		52		7		7		248		261		269		98	7	269
	NLE Bat Swarming Area (acres)	134		90		266		234		71		71		658		660		631		313	71	660
	NLE Bat Swarming **(Forested)** (acres)	15		7		20		52		7		7		248		261		269		98	7	269
	Indiana Bat Swarming Area (acres)	100		56		56		56		71		71		658		660		631		262	56	660
	Indiana Bat Swarming **(Forested)** (acres)	13		6		6		6		7		7		248		261		269		91	6	269
	Rothrock State Forest (acres)	0		0		0		0		0		0		0		0		0		0	0	0
	Stone Mountain Important Bird Area (acres)	0		0		0		0		125		78		1		1		1		23	0	125

	Feature	US322 - 1 OEX	US322 - 1 S	US322 - 2	US322 - 3	US322 - 4	US322 - 5	144-1	144-2	144-3	Average Impact Value	Lower Magnitude of Impact	Higher Magnitude of Impact
	Potential Limit of Disturbance Area (acres)	463	446	482	493	429	432	696	699	670	534	429	699
Cultural Resources	**Historic Resources**												
	NRHP Listed Property (#)	0	0	0	1	0	0	0	0	0	0	0	1
	NRHP Eligible Property (#)	1	1	0	0	0	1	0	0	0	0	0	1
	Potentially Inividually NRHP Eligible Property (#)	3	2	0	1	0	2	2	2	1	1	0	3
	Penns Valley/Brush Valley Rural Historic District Contributing Property (# |acres)	67 | 263	45 | 266	64 | 372	54 | 331	49 | 301	48 | 254	38 | 279	38 | 276	33 | 263	289	254	372
	Archaeological Resources												
	Known Archaeological Sites (#)	3	3	1	1	2	4	3	4	3	3	1	4
	Historic Period Archaeological Sensitivity Area (acres)	16	10	21	22	13	14	22	23	19	18	10	23
	Statewide Prehistoric/Pre-Contact Model - High Probability Area (acres)	245	211	295	282	190	199	208	222	237	232	190	295
	Statewide Prehistoric/Pre-Contact Model - Medium Probability Area (acres)	176	188	165	181	167	160	271	272	250	203	160	272
Social Resources	**Socioeconomic Resources**												
	Residential Units (#)	25	8	21	29	8	11	13	13	9	15	8	29
	Commercial (non-ag operations) (#)	6	3	1	1	4	2	3	3	2	3	1	6
	Places of Worship (#)	1	1	1	1	1	1	0	0	0	1	0	1
	HUD Subsidized Housing Units (#)	0	0	0	0	0	0	0	0	0	0	0	0
	Community Facilities (acres)	2	2	1	1	18	2	36	22	9	10	1	36
	Neighborhood/Community (# | acres)	12 | 26	12 | 26	4 | 9	8 | 52	3 | 18	12 | 39	1 | 0	2 | 1	1 | 0	6	1	12
	Conservation/Forest Conservation/Natural Area Zoning Districts (acres)	0	0	0	0	37	20	192	196	189	70	0	196
	Parks (# | acres)	0 | 0.00	0 | 0.00	0 | 0.00	1 | 0.35	1 | 0.31	1 | 0.31	0 | 0.00	0 | 0.00	0 | 0.00	0.11	0.00	0.35
	Developable Area within Regional Growth Boundary (acres)	29	29	7	7	15	30	0	0	0	13	0	30
	Waste Sites (#)	12	9	5	3	5	8	9	9	7	7	3	12
	Quarry and Mineral Mining Operations (surface quarry acres |property acres)	0 | 0	0 | 0	0 | 0	0 | 0	0 | 0	0 | 0	69 | 170	60 | 171	60 | 172	57	0	172
	SWP Area TMP - Zone 2 (#, acres)	0 | 0	0 | 0	0 | 0	0 | 0	0 | 0	0 | 0	3 | 41	3 | 41	3 | 43	14	0	43
	SWPArea - Zone 2 (#, acres)	0 | 0	0 | 0	0 | 0	0 | 0	0 | 0	0 | 0	5 | 89	5 | 88	3 | 60	26	0	89

	US 322 Corridor	PA 144 Corridor	Impact Comparison

source

Impacts that are higher than 110% of the average
Impacts that are less than 90% of the average

The key statutes and regulations included:

- Section 404 of the Clean Water Act (CWA) and Chapter 105 of 25 PA Administrative Code permitting process: These statutes require examination of practicable alternatives to avoid wetlands and streams. If the proposed projects cannot avoid impacts to wetlands and streams, they require the issuance of a Section 404 Permit by the USCOE (and the corresponding Section 401 Water Quality Certification [WQC] from the PA DEP). As part of the permit application, a 404(b)(1) Alternatives Analysis is completed along with the identification of avoidance, minimization, and compensatory mitigation measures.

- Agricultural Land Condemnation Approval Board (ALCAB) Agricultural Land Condemnation Approval Board (ALCAB) authorized under Section 306 of The Administrative Code of 1929 (71 P.S. §106) (Act 100): If productive agricultural land will need to be acquired for a project and the project does not meet the exemption clauses in PA Act 1979-100 or PA Act 1981-43, a project may need an ALCAB Hearing for approval to condemn agricultural property. This includes the taking of productive agricultural land enrolled in preserved farmland, such as agricultural conservation easements, as well as productive agricultural lands enrolled in Agricultural Security Areas. Where amicable settlement cannot be reached for acquisition of productive agricultural land, including lands protected under PA Act 1979-100 and PA Act 1981-43, ALCAB approval that the selected alternative is the most reasonable and prudent alternative must be obtained before condemnation proceedings can begin.

- Endangered Species Act (ESA): This statute requires consultation with the USFWS to seek ways to avoid jeopardizing the continued existence of Federally threatened and endangered species and their habitats. (In addition, there are similar requirements associated with applicable State codes, such as the Game and Wildlife Code, the Fish and Boat Code, and the Conservation of Natural Wild Plants Code for state species). Section 7 does not require selection of the alternative that causes “least harm” to listed species, but its requirements are nonetheless stringent. Impacts to listed species can play a role in the alternative analyses under the guidelines. For example, significant adverse impacts to listed species could result in the rejection of an alternative that has the least impact on another environmental resource.

- Section 106 of the National Historic Preservation Act (as amended): This statute requires that consideration be given to the effects of a project on historic and archaeological resources. Requirements include consultation with the State Historic Preservation Officer (SHPO) and other appropriate consulting parties in addition to the assessment of effects on historic properties, districts, and structures listed in or eligible for the NRHP. Requirements for archaeological studies and reports also include consultation with federally recognized tribes as part of the investigation of prehistoric/pre-contact sites. Historic and archaeological resources listed or determined eligible for listing in the NRHP are considered Section 4(f) resources except archaeological sites that are determined to be important

chiefly for what can be learned by data recovery and have minimal value for preservation in place. These archaeological sites would not be considered Section 4(f) resources per 23 CFR 774.13(b).

- Section 4(f) of the U.S. DOT Act of 1966: Section 4(f) properties include publicly owned public parks, recreational areas, wildlife or waterfowl refuges, and any significant historic sites. Section 4(f) allows the use (impact) of such land for a transportation project only when:

  There is no feasible and prudent alternative to the use of the Section 4(f) property.

  The project includes all possible planning to minimize harm (as defined in 23 CFR §774.17) to the Section 4(f) property resulting from the use.

  Or

  The use, including any measures to minimize harm (such as any avoidance, mitigation, minimization, or enhancement measures) will have a de minimis impact on the property as defined in 23 CFR 774.17.

- Community Impact Assessment: Community and socioeconomic impacts must also be considered. Federal regulations require that an activity or project receiving federal funding or requiring federal approval undergo an analysis of the effect on natural and human environments. The effects to be assessed include but are not limited to ecological, social, economic, aesthetic, historic, cultural, and health. There are also many other federal and state statues, regulations, executive orders, and guidance documents that establish the legal basis to address impacts to the community that may be affected by proposed transportation improvements. These include, but are not limited to, the Uniform Relocation Assistance and Real Property Acquisition Policies Act, Title VI of the Civil Rights Act, Executive Order (EO) 12898 on Federal Actions to Address Environmental Justice, EO 13985 on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government, and PA Section 2002 of the Administrative Code of 1929.

Table 30 provides a summary of a comparative environmental screening of the alternatives that meet the purpose and need based on their proposed impacts to regulatory resources that would be considered in the evaluation processes required for implementation. This assessment was used to identify which Build Alternatives should be advanced for further study from an environmental perspective.

Table 30 – Regulatory Resource Potential Comparative Environmental Impacts [1]

Environmental Review Process	US 322-1 Existing (US 322-1 OEX)	US 322-1 South (US 322-1 S)	US 322-2	US 322-3	US 322-4	US 322-5	PA 144-1	PA 144-2	PA 144-3
CWA Section 404 Analysis									
Wetlands (acres)	4	3	2	3	6	8	7	6	8
CWF-HQ/CWF Stream (linear feet)	5,129	6,681	5,965	5,066	9,124	9,046	6,275	7,067	4,481
ESA Section 7 Consultation									
"Rothrock State Forest (part) & Stone Mountain" Important Bird Area (acres)	0	0	0	0	125[2]	78[2]	1	1	1
PA Natural Heritage Core Habitat (acres)	25[3]	11	11	11	15	15	8	8	8
Bat Swarming Area (acres of forested land only)	15	7	20	52	7	7	248	261	269
ALCAB Approval Process[4]									
Productive Agricultural Land (acres)	251	278	361	313	180	181	294	296	268
Conservation Easements (within Productive Agricultural Land, acres)	22	15	0	39	0	0	40	40	37
Agricultural Security Areas (within Productive Agricultural Land, acres)	111	112	192	146	70	57	165	166	183
Agricultural Zoning (within Productive Agricultural Land, acres)	152	160	246	212	99	97	133	135	132
Section 4(f) Evaluation									
NRHP Listed/Eligible/Potentially Eligible Property (# involving historic structure displacements)[5]	0	0	0	1	0	0	1	1	0
Penns Valley/Brush Valley Rural Historic District Contributing Property (acres)	263	266	372	331	301	254	279	276	263
Public Parks (acres)[6]	0	0	0	0.4	0.3	0.3	0	0	0
Community Impact Assessment[6]									
Residential Displacements (# of resident units)	25	8	21	29	8	11	13	13	9
Commercial Operations Displacements (# of operations)[7]	6	3	1	1	4	2	3	3	2
Places of Worship Displacements (# of primary structures used for worship)	1	1	1	1	1	1	0	0	0
Community Facilities (acres of property only)	2	2	1	1	18	2	36[8]	22[8]	9[8]
Public Water Supply Well Protection Zone Area (acres)	0	0	0	0	0	0	130	129	103
Quarry and Mineral Mining Operations (property acres)	0	0	0	0	0	0	170	171	172
Recommended Corridors for NEPA Review (Preferred Corridor for at least 3 of the 5 Environmental Review Processes)	X	X	---	---	---	X	---	---	---

[1] Higher impacts per resource category in comparison to other corridors (above 110% of average impact estimate) =

[2] The total IBA includes 89,736 acres that extend through three counties: Centre, Huntingdon, and Mifflin Counties. The impacts include only the lower slopes of the Seven Mountains area of the Tussey Mountain range at the edge of the IBA and outside of the Rothrock State Forest property. The impact area also includes some existing deforested areas.

[3] Includes acreage of existing US 322 roadway and other developed property in the impact estimate that previously converted the natural area to developed land use.

[4] Information gathered for the PEL Study does not include potential impacts to individual farm operations that will be required for the ALCAB farmland assessment and gathered during the NEPA review phase, including farm operator interviews.

[5] Other alternatives that impact NRHP properties include land encroachments but no structure displacements. Corridors US 322-3, PA 144-1, and PA 144-2 impacts include the displacement of historic farmstead structures.

[6] Impacts to public parks associated with Corridors US 322-3, 322-4, and 322-5 would be minor (less than 1 acre at the edge of the impacted park and no facilities affected) that would most likely be avoided or minimized during more detailed design efforts to the extent that the Section 4(f) use would either be avoided or result in De Minimis findings; therefore, these impacts are not factored into the Section 4(f) evaluation process for this planning study.

[7] Includes only commercial enterprises that are not agricultural nor quarry/mineral mining operations.

[8] These community facility impacts are associated with forested areas at the other edge of the SCI Rockville property that is outside the prison grounds and facility areas and therefore considered minor.

Level 2B Screening Regulatory Environmental Resources Summary

The following provides a comparative analysis for each Build Alternative that aided in the determination of whether an alternative was environmentally recommended to be carried forward for further study.

- US 322-1OEX Build Alternative – Environmentally preferred to be carried forward into the NEPA review process
  - Minimizes potential impacts to water resources that would facilitate obtaining a Section 404/Chapter 105 Joint Permit.
  - Minimizes potential impacts to terrestrial habitat for wildlife and plant species protected under Section 7 of the ESA.
  - The comparatively high potential impacts to PA Natural Heritage Core Habitat Areas are associated with the eastern section and include acreage of existing US 322 roadway and other developed property.
  - Moderate potential impacts to productive agricultural land, agricultural security areas, and conservation easements to be considered during the ALCAB Approval Process.
  - Minimizes potential impacts to public parks/recreational areas and significant historic properties considered for the Section 4(f) Evaluation.
  - Includes high number of residential and commercial displacements due to the extent of the proposed corridor's use of the existing US 322 roadway alignment that includes developed lands immediately adjacent to the roadway.
  - Meets the Study purpose and need.
- US 322-1S Build Alternative – Environmentally preferred to be carried forward into the NEPA review process
  - Minimizes potential impacts to water resources that would facilitate obtaining a Section 404/Chapter 105 Joint Permit.
  - Minimizes potential impacts to terrestrial habitat for wildlife and plant species protected under Section 7 of the ESA.
  - Moderate potential impacts to productive agricultural land, agricultural security areas, and conservation easements to be considered during the ALCAB Approval Process.
  - Minimizes potential impacts to public parks/recreational areas and significant historic properties considered for the Section 4(f) Evaluation.
  - Minimizes the number of residential and commercial displacements and the impacts to other community resources.
  - Meets the Study purpose and need.
- US 322-2 Build Alternative – Not environmentally preferred to be carried forward into the NEPA review process
  - Highest potential impacts to productive agricultural land and agricultural security areas to be considered during the ALCAB Approval Process.
  - Highest potential impacts to the Penns Valley/Brush Valley Rural Historic District's contributing properties that would be considered for the Section 4(f) evaluation.

- High number of residential displacements.
- Meets the Study purpose and need.

- US 322-3 Build Alternative – Not environmentally preferred to be carried forward into the NEPA review process
  - High potential impacts to productive agricultural land, including high impacts to land within conservation easements to be considered during the ALCAB Approval Process.
  - High potential impacts to significant historic properties (include displacement of a historic farmstead) and high potential impacts to the Penns Valley/Brush Valley Rural Historic District's contributing properties that would be considered for the Section 4(f) Evaluation.
  - Highest number of residential displacements.
  - Meets the Study purpose and need.
- US 322-4 Build Alternative – Not environmentally preferred to be carried forward into the NEPA review process
  - High potential impacts to water resources that are considered during the permit application process for a Section 404/Chapter 105 Joint Permit.
  - High potential impacts to the "Rothrock State Forest (part) & Stone Mountain" Important Bird Area (IBA) that would include habitat for wildlife and plant species protected under Section 7 of the ESA. However, these potential impacts are along the edge of the 89,736- acre IBA and outside of the actual Rothrock State Forest property.
  - High potential impacts to the Penns Valley/Brush Valley Rural Historic District's contributing properties that would be considered for the Section 4(f) Evaluation.
  - Highest potential impacts to Harris Township's only industrial zoned land with potential displacements.
  - Meets the Study purpose and need.
- US 322-5 Build Alternative – Environmentally preferred to be carried forward into the NEPA review process
  - High potential impacts to water resources that would need to be reviewed during detailed studies and efforts undertaken to avoid and minimize impacts during the permit application process for a Section 404/Chapter 105 Joint Permit.
  - Moderate potential impacts to terrestrial habitat for wildlife and plant species protected under Section 7 of the ESA. The potential impacts to the "Rothrock State Forest (part) & Stone Mountain" IBA are along the edge of the 89,736-acre IBA and outside of the actual Rothrock State Forest property. The potential impact area also includes some existing deforested areas.
  - Minimizes potential impacts to productive agricultural land, agricultural security areas, and conservation easements to be considered during the ALCAB Approval Process.
  - Minimizes potential impacts to public parks/recreational areas and significant historic properties considered for the Section 4(f) Evaluation.
  - Minimizes the number of residential and commercial displacements and the impacts to other community resources.

  - Meets the Study purpose and need.
- PA 144-1 Build Alternative – Not environmentally preferred to be carried forward into the NEPA review process
  - High potential impacts to wetlands that are considered during the permit application process for a Section 404/Chapter 105 Joint Permit.
  - High potential impacts to terrestrial habitat for wildlife and plant species protected under Section 7 of the ESA, including high potential impacts to forest land and bat swarming areas.
  - High potential impacts to agricultural security areas and productive agricultural land, including high potential impacts to land within conservation easements to be considered during the ALCAB Approval Process.
  - High potential impacts to significant historic properties (include displacement of a historic farmstead) that would be considered for the Section 4(f) Evaluation.
  - High potential impacts to public water supply well protection areas and quarry and mineral mining operations that are valuable community resources that cannot be easily replaced.
  - Meets the Study purpose and need.
- PA 144-2 Build Alternative – Not environmentally preferred to be carried forward into the NEPA Review Process
  - High potential impacts to wetlands that are considered during the permit application process for a Section 404/Chapter 105 Joint Permit.
  - High potential impacts to terrestrial habitat for wildlife and plant species protected under Section 7 of the ESA, including high impacts to forest land and bat swarming areas.
  - High potential impacts to agricultural security areas and productive agricultural land, including high impacts to land within conservation easements to be considered during the ALCAB Approval Process.
  - High potential impacts to significant historic properties (include displacement of a historic farmstead) that would be considered for the Section 4(f) Evaluation.
  - High potential impacts to public water supply well protection areas and quarry and mineral mining operations that are valuable community resources that cannot be easily replaced.
  - Meets the Study purpose and need.
- PA 144-3 Build Alternative – Not environmentally preferred to be carried forward into the NEPA Review Process
  - High potential impacts to wetlands that are considered during the permit application process for a Section 404/Chapter 105 Joint Permit.
  - Highest potential impacts to terrestrial habitat for wildlife and plant species protected under Section 7 of the ESA, including high impacts to forest land and bat swarming areas.

- High potential impacts to agricultural security areas and productive agricultural land, including high impacts to land within conservation easements to be considered during the ALCAB Approval Process.
- High potential impacts to public water supply well protection areas and quarry and mineral mining operations that are valuable community resources that cannot be easily replaced.
- Meets the Study purpose and need.

Level 2B Screening Environmental Resources Conclusion

While all the Build Alternatives would meet the purpose and need, US 322-1OEX, US 322-1S, and US 322-5 Build Alternative corridors were recommended to be advanced for further study from an environmental perspective as they provided the best balance and opportunity to minimize overall environmental impacts.

6.2.4 Planning Analysis Overview

Generally using the same criteria from the Level 1 Screening, the fundamental study goals that support the purpose and need, local transportation and land use planning, transportation mobility, best engineering practices, and environmental stewardship were qualitatively assessed for screening each of the Build Alternatives. The same five questions were used to assess how each of the Build Alternative corridors addressed the study goals. They included:

- To what extent would the alternative improve local and regional mobility?
- To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?
- To what extent would the alternative promote multimodal opportunities?
- To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?
- To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?

The information developed during the traffic, environmental, and engineering screenings along with public and agency input were used to provide a relative planning score for each of the Build Alternatives. Using a scoring scale of 1 to 5, with 5 being the best and 1 being the worst, a score was assigned to each of the five planning questions to aid in assessing how well the alternative would meet the planning goal. A rationale for each score was also provided. After assigning a score to each of the planning questions, a corridor score was assigned by summing the individual question scores.

It was determined that all of the Build Alternatives would generally meet the planning goals; however, some of the Build Alternatives may better meet the study planning goals when compared to others.

Scoring Methodology

- Traffic

  The scoring to address the traffic and operations goal utilized the information developed during the Level 2B Screening traffic analysis and associated results. Since this is a planning level analysis and the Level 2B Screening did not identify a discernible difference among alternatives, all the Build Alternatives received a 5 for this traffic planning analysis as all the alternatives would improve traffic operations and safety.

- Multimodal

  The scoring to address whether an alternative would promote multimodal opportunities, considered, the Level 2B Screening traffic analysis and specifically the BLOS evaluation. Utilizing the information in **Table 27**, the multimodal planning score was determined. The scores were calculated by examining the nine roadway segments BLOS for the AM and PM conditions (total of 18 sections) and identifying the number of segments along the roadway that received a BLOS of A, B, or C in the year 2050. The scores were then assigned according to **Table 31.**

Table 31 – Multimodal Corridor Screening Criteria

Score	Number of Roadway Segments
5	15 – 18
4	12 – 14
3	8 – 11
2	5 – 7
1	0 – 4

- Environmental

  The scoring to address the environmental goal utilized the information developed during the Level 2B Screening environmental analysis. Using the refined analysis portion for the five regulatory resource processes (CWA, Section 4(f), Community Impact, ESA, and ALCAB process), a score of 1 to 5 was provided for each of the alternatives based on the potential impact to a regulatory resource process. All of the Build Alternatives started the analysis with 5 points, if one of the regulatory resources processes had a potential impact that exceeded 110 percent of the average impact estimate, a point was deducted from the score.

- Planning

For the planning screening, the environmental, traffic, and engineering data previously collected was utilized along with the public comments from the open house public meetings and other public input, and local municipal input to assign a planning score to each of the alternatives. Professional judgement was utilized to score the alternatives by balancing all of the concerns considered with specific detail shown to potential zoning conversions and access areas, potential agricultural impacts, key community concerns, general environmental impact concerns, and community resource impacts. The scores were assigned and the key issues for the alternatives were listed in the accompanying tables.

Table 32 through **Table 40** provide the analysis used to evaluate each of the Build Alternatives and rationale for the scoring.

Table 32 – US 322 – 1OEX Build Alternative Planning Screening

US 322-1OEX			
	Goal Screening	**Score**	**Score Rationale**
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative improve local and regional mobility?	5	Based on the traffic analysis and associated recommendations, it was determined that US 322-1OEX would improve regional mobility as nearly 53% of all traffic and 73% of truck traffic would migrate to the alternative.
	To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?	5	Based on the traffic analysis and associated recommendations, US 322-1OEX would address recurring and non-recurring congestion by adding capacity. Traffic operations would be improved at all but 2 study area key intersections and 6.6 miles of key local roadways.
	To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would improve BLOS (A, B, or C) on the eight segments of the local roads, thereby better accommodating multimodal opportunities.
	To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	3	Alternative would avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway. Based on key ENV Impacts, this alternative minimizes impacts to water resources, terrestrial habitat, and recreational facilities and opportunities. However, this alternative has higher impacts to PA Natural Heritage Core Habitat Areas and residential and commercial relocations. Has moderate productive agricultural impacts.
	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	2	Impacts would occur from conversion of areas zoned rural residential, agricultural, residential, commercial, and village. Would have a minor impact on the only remaining industrial property in Harris Twp. No displacements in this industrial area but would have higher commercial displacements.
Goal Score Total		**18**	

Table 33 – US 322 – 1S Build Alternative Planning Screening

US 322-1S			
	Goal Screening	**Score**	**Score Rationale**
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative improve local and regional mobility?	5	Based on the traffic analysis and associated recommendations, it was determined that US 322 Build Alternative would improve regional mobility as nearly 53% of all traffic and 73% of truck traffic would migrate to the alternative.
	To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?	5	Based on the traffic analysis and associated recommendations, US 322 Build Alternative would address recurring and non-recurring congestion by adding capacity. Traffic operations would be improved at all but 2 study area key intersections and 6.6 miles of key local roadways.
	To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would improve BLOS (A, B, or C) on the eight segments of the local roads, thereby better accommodating multimodal opportunities.
	To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	5	Alternative would limit the ability to avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway is a fixed location with many of these resources being adjacent to the existing facility. (Based on key ENV Impacts). Minimizes impacts to water resource, terrestrial habitat, recreational facilities and opportunities, and residential and commercial relocations. Has moderate productive agricultural impacts.
	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	3	Impacts would occur from conversion of areas zoned rural residential, agricultural, residential, and commercial. Would have a minor impact on the only remaining industrial property in Harris Twp. No displacements in this industrial area.
Goal Score Total		**21**	

Table 34 – US 322 – 2 Build Alternative

US 322-2			
	Goal Screening	**Score**	**Score Rationale**
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative improve local and regional mobility?	5	Based on the traffic analysis and associated recommendations, it was determined that US 322 Build Alternative would improve regional mobility as nearly 53% of all traffic and 73% of truck traffic would migrate to the alternative.
	To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?	5	Based on the traffic analysis and associated recommendations, US 322 Build Alternative would address recurring and non-recurring congestion by adding capacity. Traffic operations would be improved at all but 2 study area key intersections and 6.6 miles of key local roadways.
	To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would improve BLOS (A, B, or C) on the eight segments of the local roads, thereby better accommodating multimodal opportunities.
	To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	2	Alternative would limit the ability to avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway is a fixed location with many of these resources being adjacent to the existing facility. (Based on key ENV Impacts). Recorded the highest impacts on productive agricultural areas and Penn Valley/Brush Valley Rural Historic District. Has high impacts on residential relocations. Public concern for Cedar Creek and streams in the area.
	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	2	Impacts would occur from conversion of areas zoned rural residential, agricultural, residential, and commercial. Would have higher impacts to agricultural and historic landscape as alternative diverges away from existing transportation corridors and existing US 322 business district.
Goal Score Total		**17**	

Table 35 – US 322 – 3 Build Alternative

US 322-3			
	Goal Screening	**Score**	**Score Rationale**
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative improve local and regional mobility?	5	Based on the traffic analysis and associated recommendations, it was determined that US 322-Build Alternative would improve regional mobility as nearly 53% of all traffic and 73% of truck traffic would migrate to the alternative.
	To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?	5	Based on the traffic analysis and associated recommendations, US 322 Build Alternative would address recurring and non-recurring congestion by adding capacity. Traffic operations would be improved at all but 2 study area key intersections and 6.6 miles of key local roadways.
	To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would improve BLOS (A, B, or C) on the eight segments of the local roads, thereby better accommodating multimodal opportunities.
	To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	2	Alternative would limit the ability to avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway is a fixed location with many of these resources being adjacent to the existing facility. (Based on key ENV Impacts) Recorded high impacts on productive agricultural areas and Penn Valley/Brush Valley Rural Historic District. Had the highest impacts on residential relocations. Public concern for Cedar Creek and streams in the area.
	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	2	Impacts would occur from conversion of areas zoned rural residential, agricultural, residential, and commercial. Would have higher impacts to agricultural and historic landscape as alternative diverges away from existing transportation corridors and existing US 322 business district.
Goal Score Total		**17**	

Table 36 – US 322 – 4 Build Alternative

US 322-4			
	Goal Screening	**Score**	**Score Rationale**
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative improve local and regional mobility?	5	Based on the traffic analysis and associated recommendations, it was determined that US 322 Build Alternative would improve regional mobility as nearly 53% of all traffic and 73% of truck traffic would migrate to the alternative.
	To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?	5	Based on the traffic analysis and associated recommendations, US 322 Build Alternative would address recurring and non-recurring congestion by adding capacity. Traffic operations would be improved at all but 2 study area key intersections and 6.6 miles of key local roadways.
	To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would improve BLOS (A, B, or C) on the eight segments of the local roads, thereby better accommodating multimodal opportunities.
	To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	2	Alternative would limit the ability to avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway is a fixed location with many of these resources being adjacent to the existing facility. (Based on key ENV Impacts). High impacts to water resources, and Rothrock State Forest & Stone Mountain important bird area, and had the highest residential relocations. Public specifically called out extensive concern for potential impacts to the community resources of the Calvary Church property and associated community recreation area, along with access and connectivity concerns to area recreational trails.
	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	1	Impacts would occur from conversion of areas zoned rural residential, agricultural, residential, and commercial. Would impact only remaining industrial properties in Harris Twp. with displacements and no local relocation possible within township. Minimized agricultural impacts. However, would impact community facility, Harvest Fields, which raised substantial community concerns.
Goal Score Total		**16**	

Table 37 – US 322 – 5 Build Alternative

US 322-5			
	Goal Screening	**Score**	**Score Rationale**
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative improve local and regional mobility?	5	Based on the traffic analysis and associated recommendations, it was determined that US 322 Build Alternative would improve regional mobility as nearly 53% of all traffic and 73% of truck traffic would migrate to the alternative.
	To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?	5	Based on the traffic analysis and associated recommendations, US 322 Build Alternative would address recurring and non-recurring congestion by adding capacity. Traffic operations would be improved at all but 2 study area key intersections and 6.6 miles of key local roadways.
	To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would improve BLOS (A, B, or C) on the eight segments of the local roads, thereby better accommodating multimodal opportunities.
	To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	3	Alternative would limit the ability to avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway is a fixed location with many of these resources being adjacent to the existing facility. (Based on key ENV Impacts) Minimizes impacts to productive agriculture, public parks, and residential relocations, but would have higher impacts on water resources and terrestrial habitat.
	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	3	Impacts would occur from conversion of areas zoned rural residential, agricultural, residential, and commercial. Would have minor impact on only remaining industrial property in Harris Twp. No displacements in this industrial area.
Goal Score Total		**19**	

Table 38 – PA 144 – 1 Build Alternative

PA 144 – 1			
	Goal Screening	**Score**	**Score Rationale**
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative improve local and regional mobility?	5	Based on the traffic analysis and associated recommendations, it was determined that PA 144 Build Alternative would improve regional mobility as nearly 46% of all traffic and 57% of truck traffic would migrate to the alternative.
	To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?	5	Based on the traffic analysis and associated recommendations, PA 144 Build Alternative would address recurring and non-recurring congestion by adding capacity. Traffic operations would be improved at all but 1 study area key intersections and 8.5 miles of key local roadways.
	To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would likely improve BLOS on the local roads, better accommodating multimodal opportunities. Provides some opportunity near Boalsburg area for modal connections.
	To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	1*	Alternative would limit the ability to avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway is a fixed location with many of these resources being adjacent to the existing facility. (Based on key ENV Impacts)
	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	1	Impacts would occur from conversion of areas zoned rural residential, agricultural, residential, open space, conservation, rural resources, and industrial. Alternative is located within the well protection zone 2 for Centre Hall Borough and Potter Township. Alternative would impact local airport flight patterns. Would impact operations at quarry. Would have high agricultural impacts.
Goal Score Total		**15**	

* This alternative recorded a higher comparative impact in each of the five statutory resources considered but was scored a 1 as that is the lowest possible ranking in this analysis (**Table 30**).

Table 39 – PA 144 – 2 Build Alternative

PA 144 – 2			
	Goal Screening	**Score**	**Score Rationale**
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative improve local and regional mobility?	5	Based on the traffic analysis and associated recommendations, it was determined that PA 144 Build Alternative would improve regional mobility as nearly 46% of all traffic and 57% of truck traffic would migrate to the alternative.
	To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?	5	Based on the traffic analysis and associated recommendations, PA 144 Build Alternative would address recurring and non-recurring congestion by adding capacity. Traffic operations would be improved at all but 1 study area key intersections and 8.5 miles of key local roadways.
	To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would likely improve BLOS on the local roads, better accommodating multimodal opportunities. Provides some opportunity near Centre Hall for modal connections.
	To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	1*	Alternative would limit the ability to avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway is a fixed location with many of these resources being adjacent to the existing facility. (Based on key ENV Impacts)
	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	1	Impacts would occur from conversion of areas zoned rural residential, agricultural, residential, open space, conservation, rural resources, and industrial. Alternative is located within the well protection zone 2 for Centre Hall Borough and Potter Township. Alternative would impact local airport flight patterns. Would impact operations at quarry. Would have high agricultural impacts.
Goal Score Total		**15**	

* This alternative recorded a higher comparative impact in each of the five statutory resources considered but was scored a 1 as that is the lowest possible ranking in this analysis (**Table 30**).

Table 40 – PA 144 – 3 Build Alternative

PA 144 – 3			
	Goal Screening	**Score**	**Score Rationale**
Study Goals (1=worst scenario and 5=best scenario)	To what extent would the alternative improve local and regional mobility?	5	Based on the traffic analysis and associated recommendations, it was determined that PA 144 Build Alternative would improve regional mobility as nearly 46% of all traffic and 57% of truck traffic would migrate to the alternative.
	To what extent would the alternative address recurring and non-recurring congestion issues and reduce delay?	5	Based on the traffic analysis and associated recommendations, PA 144 Build Alternative would address recurring and non-recurring congestion by adding capacity. Traffic operations would be improved at all but 1 study area key intersections and 8.5 miles of key local roadways.
	To what extent would the alternative promote multimodal opportunities?	3	Alternative is expected to shift traffic and specifically trucks from the local roadway network. This shift would likely improve BLOS on the local roads, better accommodating multimodal opportunities. Provides some opportunity near Centre Hall for modal connections.
	To what extent would the alternative avoid and/or minimize impacts to the human, cultural, and natural environment?	1	Alternative would limit the ability to avoid or minimize impacts to the natural, cultural, and human environment as the existing roadway is a fixed location with many of these resources being adjacent to the existing facility. (Based on key ENV Impacts)
	To what extent would the alternative be consistent with/accommodate local land use/planning initiatives?[1]	1	Impacts would occur from conversion of areas zoned rural residential, agricultural, residential, open space, conservation, rural resources, and industrial. Alternative is located within the well protection zone 2 for Centre Hall Borough and Potter Township. Alternative would impact local airport flight patterns. Would impact operations at quarry. Would have high agricultural impacts.
Goal Score Total		**15**	

The scores for the Build Alternative corridor options range from 15 to 21 with US 322-1OEX, US 322-1S, and US 322-5 having a slightly better opportunity to meet the planning goals and were the recommended corridors to be advanced into NEPA phase of the project development process from a planning perspective.

6.3 Level 2B Screening Summary

The Level 2B Screening developed preliminary alternatives for the US 322 Upgrade Existing Alternative and nine Build Alternatives. These preliminary alternatives were analyzed from a traffic perspective (e.g., traffic volumes, LOS, and safety) for each of the preliminary alternatives. The analysis resulted in all nine of the Build Alternatives being recommended for further study from a traffic perspective. The US 322 Upgrade Existing Alternative failed to improve safety on the existing roadway network; therefore, this alternative did not meet the PEL Study purpose and needs and was dismissed from further study.

The engineering analysis found that when considering the planning level total cost estimate which accounted for construction costs (e.g., roadway pavement, drainage, bridges, earthwork volumes, local road connections/access, and other ancillary construction costs including erosion and sediment control and temporary traffic control during construction) and right-of-way cost estimates for each alternative, the US 322-1OEX, US 322-1S, US 322-4, and US 322-5 Build Alternative corridors were recommended to be advanced for further study from an engineering perspective.

The environmental analysis documented the potential impacts to natural, cultural, and socioeconomic resources within each of the preliminary alternative corridors. The results of the environmental analysis recommended that the US 322-1OEX, US 322-1S, and US 322-5 Build Alternative corridors be advanced for further study.

The qualitative planning analysis evaluated how each alternative met the study goals that support the PEL Study purpose and need, local transportation and land use planning, transportation mobility, best engineering practices, and environmental stewardship. The results of the planning analysis recommended the US 322-1OEX, US 322-1S, and US 322-5 Build Alternative corridors be advanced for further study.

The next step evaluated the various recommendations and identified which corridors to advance for further study in the preliminary engineering and environmental phase of project development.

7 IDENTIFICATION OF STUDY ALTERNATIVE(S) TO ADVANCE INTO NEPA

Six alternative concepts were identified for screening in this PEL Study (e.g., TSM, TCM, Transit, No Build, Build, and Upgrade Existing Alternatives). The range of alternative concepts were qualitatively and/or quantitatively screened, and advanced based on their ability to meet PEL Study purpose and needs. These alternative concepts were also screened from a traffic, engineering, planning and environmental perspective. This section discusses the PEL Study findings on which alternatives were dismissed and which alternatives were recommended to advance for further study. **Figure 15** provides a summary of the alternatives evaluation results.

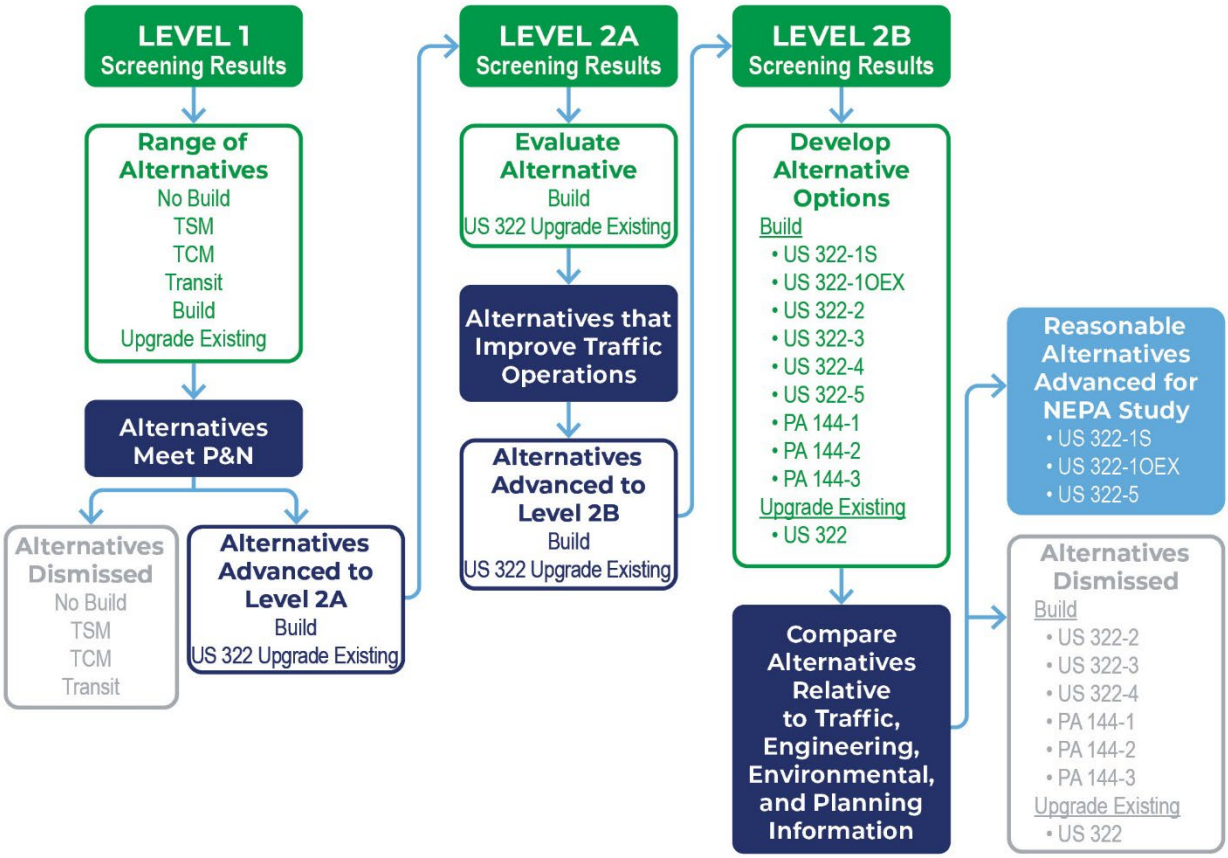


Figure 15 – PEL Alternatives Screening Summary

7.1 Dismissed Alternatives

7.1.1 Level 1 Screening

The TSM, TCM, Transit, and No Build Alternatives were dismissed from further study during the Level 1 Screening. These alternative concepts were qualitatively assessed and determined to be unable to meet the PEL Study purpose and needs to accommodate future congestion, improve safety, or provide system continuity. Screening details can be found in **Chapter 4** of this

memorandum.

7.1.2 Level 2 Screening

The US 322 Upgrade Existing Alternative and nine Build Alternative options (US 322-1OEX, US 322-1S, US 322-2, US 322-3, US 322-4, US 322-5, PA 144-1, PA 144-2, and PA 144-3) were advanced for Level 2 Screening.

US 322 Upgrade Existing Alternative

The US 322 Upgrade Existing Alternative was evaluated from a traffic perspective. The findings indicated that while this alternative would improve future congestion levels, the alternatives would reduce safety on the key local roadway network when compared to the existing conditions along existing US 322. As a result, the US 322 Upgrade Existing Alternative did not meet the purpose and need of the PEL Study one of which was to improve safety on the local roadway network. This alternative was dismissed from further study.

Build Alternatives

Based on the Level 2 Screening, six of the Build Alternative corridor options were dismissed from further study (US 322-2, US 322-3, US 322-4, PA 144-1, PA 144-2, and PA 144-3). The following provides an overview of the reason for dismissal of these Build Alternative options.

- US 322-2 Build Alternative

  While the US 322-2 Build Alternative would meet the PEL Study purpose and need, it was dismissed from further consideration based on the environmental, engineering, and planning screenings (**Figure 14**). Environmentally, this alternative would have higher potential impacts to three of the five comparative regulatory resources evaluated. Specifically, this alternative would be most impactful to productive agricultural lands (361 acres) including Agricultural Security Areas (192 acres) and agricultural zoning (246 acres) which are subject to the ALCAB approval process. This alternative would have the potential to relocate 21 residential properties. Additionally, this alternative would have the highest acreage impact on the Penns Valley/Brush Valley Rural Historic District (372 acres), a protected Section 4(f) resource. From a planning perspective, this alternative extends away from the existing US 322 corridor, away from the current US 322 business district, and potentially opens new areas for development that is not wanted locally. This alternative is the longest of the US 322 corridors and has a higher comparative planning-level total cost estimate. Overall, when comparing this alternative against other Build Alternative corridors, US 322-2 Build Alternative would have higher impacts on three of the five comparative regulatory resources evaluated and does not provide sufficient benefit to balance the potential impacts. Therefore, US 322-2 Build Alternative was dismissed from further study.

- US 322-3 Build Alternative

  While the US 322-3 Build Alternative would meet the PEL Study purpose and need, it was dismissed from further consideration based on the environmental and planning screenings (**Figure 14**). Environmentally, this alternative would have higher potential impacts to three of the five comparative regulatory resources evaluated. Specifically, this alternative would have

higher comparative impacts on productive agricultural lands (313 acres) including Conservation Easements (39 acres) and agricultural zoning (212 acres) which are subject to the ALCAB approval process. This alternative would have the highest number of potential residential relocations (29 homes). Additionally, this alternative would have higher comparative impacts on the Penns Valley/Brush Valley Rural Historic District (331 acres), a protected Section 4(f) resource. From a planning perspective, this alternative also extends away from the existing US 322 corridor, away from the current US 322 business district, and potentially opens new areas for development that is not wanted locally. This alternative is the second longest of the US 322 Build Alternative corridors, but it has the highest estimated planning-level total cost estimate largely related to the extent of structures and excavation required. Overall, when comparing this alternative against other Build Alternative corridors, US 322-3 Build Alternative would have higher impacts on three of the five comparative regulatory resources evaluated and does not provide sufficient benefit to balance the potential impacts. Therefore, US 322-3 Build Alternative was dismissed from further study.

- US 322-4 Build Alternative

  While the US 322-4 Build Alternative would meet the PEL Study purpose and need, it was dismissed from further consideration based on the environmental, engineering, and planning screenings (**Figure 14**). Environmentally, this alternative would have higher potential impacts to three of the five comparative regulatory resources evaluated. Specifically, this alternative would have higher comparative impacts on regulated Waters of the US including 6 acres of wetlands and 9,124 linear feet of CWF-HQ/ CWF streams. This alternative would displace four commercial facilities. This alternative would have the highest impact on the Rothrock State Forest (part) and Stone Mountain Important Bird area (125 acres). From a planning perspective, this alternative would impact the only remaining industrially zoned land in Harris Township. The impact to the industrial area would displace existing businesses with no potential to relocate within the Township. This alternative would also impact a community facility, Harvest Fields, which raised substantial community concerns. While this facility would not be a displacement, many of the community amenities and supporting uses would be directly impacted. Overall, when comparing this alternative against other Build Alternative corridors, US 322-4 Build Alternative would have higher impacts on three of the five comparative regulatory resources evaluated and does not provide sufficient benefit to balance the potential impacts. Therefore, US 322-4 Build Alternative was dismissed from further study.

- PA 144 Build Alternatives (PA 144-1, PA 144-2, and PA 144-3)

  As the PA 144 Build Alternative corridors are so closely linked, they are being dismissed from further study as a family of alternatives (**Figure 14**). While the PA 144 Build Alternatives would meet the PEL Study purpose and need, they were dismissed from further consideration based on the environmental, engineering, and planning screenings. Environmentally, these alternatives would have higher potential impacts in four or five of the comparative regulatory resources evaluated. Only PA 144-3 would not have comparatively higher impacts to Section

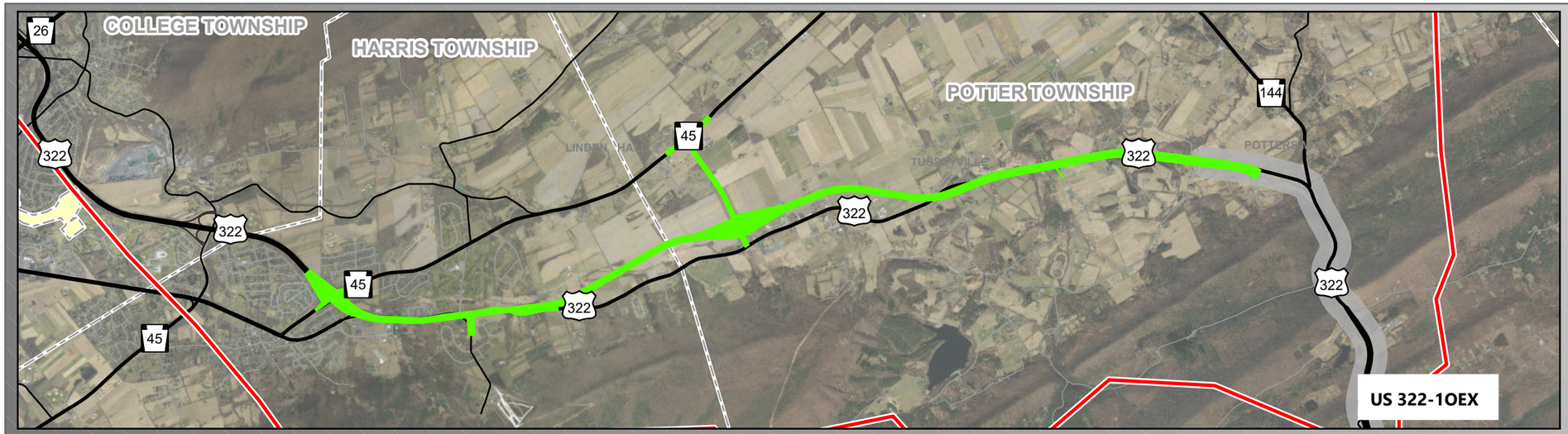
4(f) resources. Specifically, these alternatives would have higher comparative impacts on regulated Waters of the US including 6 to 8 acres of wetlands. These alternatives would have 103 to 130 acres of impact on the public water supply well protection zone area for Centre Hall Borough and Potter Township. These alternatives would have the highest impacts on the area bat swarming habitat (248 to 269 acres) and be in proximity to two known bat caves. Specifically, these alternatives would be impactful to productive agricultural lands (268 to 294 acres) including Agricultural Security Areas (165 to 183 acres) and conservation easements (37 to 40 acres) which are subject to the ALCAB approval process. In addition to the environmental impacts, these alternatives would also impact the Centre Airpark, a local airport, to varying degrees. From an engineering perspective, the PA 144 Build Alternative corridors have longer distances, significantly higher excavation volumes, and higher planning-level total cost estimated. Overall, when comparing these alternatives against other US 322 Build Alternative corridors, the PA 144 Build Alternative corridors would have higher impacts on the comparative regulatory resources evaluated, higher total costs, and do not provide sufficient benefit to balance the potential impacts. Therefore, PA 144 Build Alternative corridors (PA 144-1, PA 144-2, and PA 144-3) were dismissed from further study.

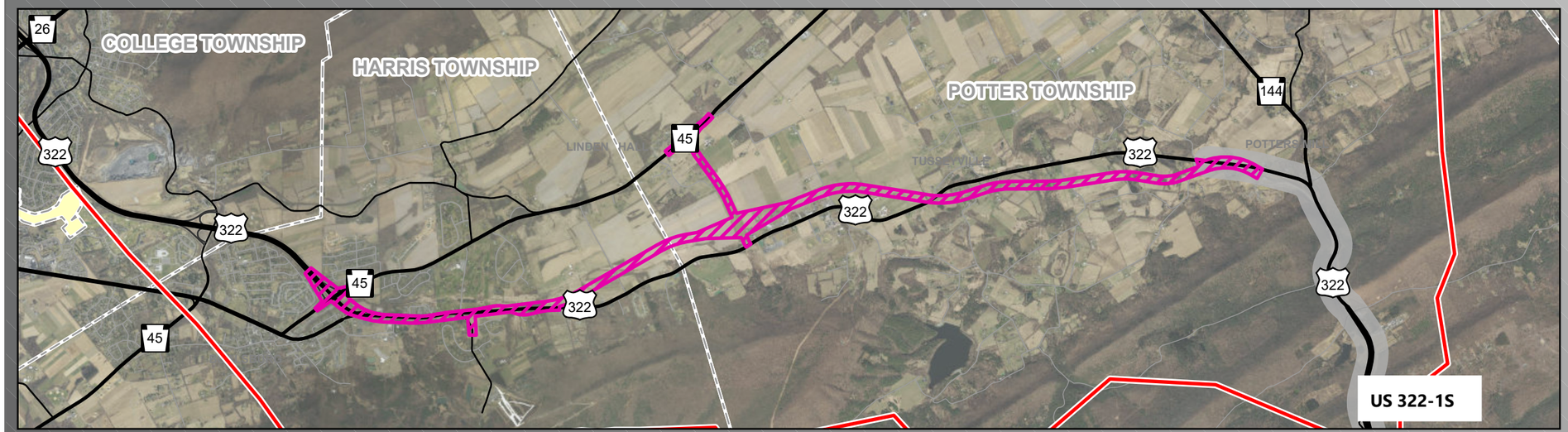
7.1.3 Alternatives Advanced For Further Study

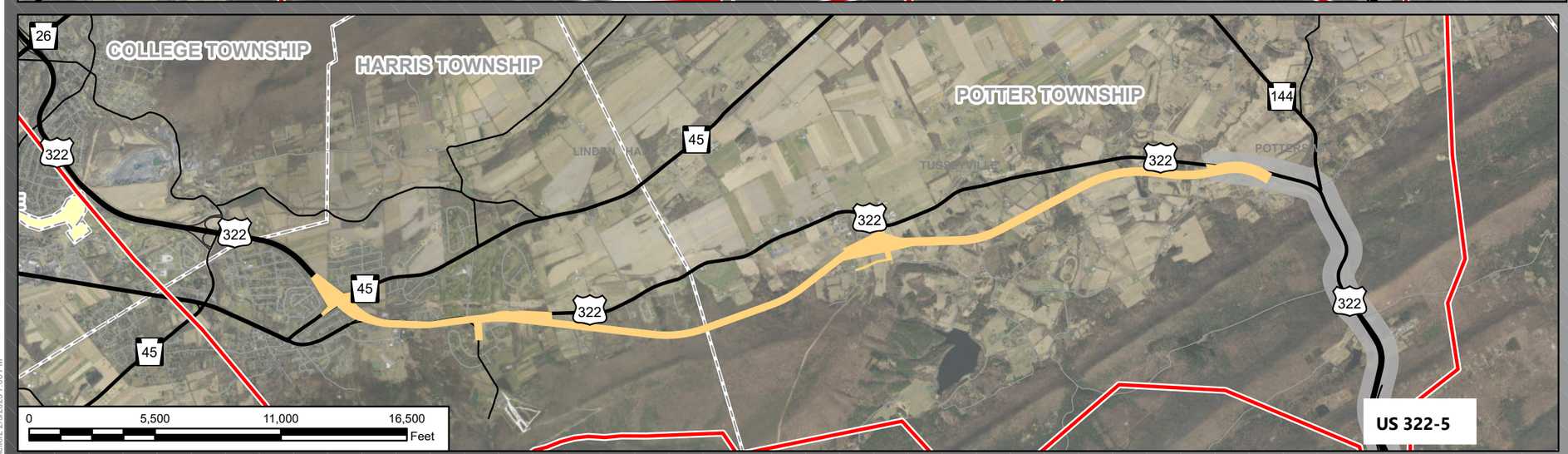
Throughout the traffic, environmental, engineering, and planning screenings, various Build Alternatives were identified as recommended for each discipline. When balancing the overall traffic, environmental, engineering, and planning data and analyses, the US 322- 1OEX, US 322-1S, and US 322-5 Build Alternative corridors were identified as reasonable alternatives and recommended to be advanced for further engineering and environmental study in the NEPA phase of the transportation project development process (**Figure 16**).

US 322-1OEX Build Alternative

The US 322-1OEX Build Alternative would meet the PEL Study purpose and need. Based on the environmental, engineering, and planning screenings, this alternative was recommended to be advanced for further study. Environmentally, this alternative would minimize potential impacts to the comparative regulatory resources evaluated. Specifically, this alternative would minimize impacts to Waters of the US (4 acres of wetlands and 5,129 linear feet of CWF-HQ/CWF streams); productive agricultural resources (251 acres), including Agricultural Security Areas (111 acres), conservation easements (22 acres) and agricultural zoning (152 acres) which are subject to the ALCAB approval process; and Section 4(f) resources. From a planning perspective, this alternative would minimize disruption of the area land use and maintain the existing US 322 business district. This alternative is one of the shortest alternatives (8.3 miles) and had one of the lowest comparative planning-level total cost estimates. When comparing this alternative against other Build Alternative corridors, US 322-1OEX Build Alternative would provide a better balance in the minimizing overall regulatory environmental impacts, minimizing planning concerns, and meeting engineering expectations, while meeting the purpose and need. Therefore, US 322-1OEX Build Alternative was recommended to be advanced for further study.







LEGEND

- PEL Study Area
- Potters Mills Gap Transportation Project
- Township
- Municipality
- US 322-1OEX
- US 322-1S
- US 322-5

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pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

INDEX MAP

State College Area Connector PEL Study

PEL STUDY REASONABLE ALTERNATIVES TO ADVANCE FOR FURTHER STUDY

CENTRE HALL BOROUGH, BENNER, COLLEGE, HARRIS, POTTER, AND SPRING TOWNSHIPS
CENTRE COUNTY, PENNSYLVANIA

Figure 16	1 Inch = 5,500 Feet

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US 322-1S Build Alternative

The US 322-1S Build Alternative would meet the PEL Study purpose and need. Based on the environmental, engineering, and planning screenings, this alternative was recommended to be advanced for further study. Environmentally, this alternative would minimize potential impacts for all of the comparative regulatory resources evaluated. Specifically, this alternative would minimize impacts to Waters of the US (3 acres of wetlands and 6,681 linear feet of CWF-HQ/CWF streams); projected habitat including PA Natural Heritage Core Habitat (11 acres) and bat swarming areas (7 acres); productive agricultural resources (278 acres), including Agricultural Security Areas (112 acres), conservation easements (15 acres) and agricultural zoning (160 acres) which are subject to the ALCAB approval process; Section 4(f) resources; and community resources. From a planning perspective, this alternative would minimize disruption to area land use and maintain the existing US 322 business district. This alternative is one of the shortest alternatives (8.3 miles) and one of the lowest comparative planning-level total cost estimates. When comparing this alternative against other Build Alternative corridors, US 322-1S Build Alternative would provide a better balance in the minimizing of overall regulatory environmental impacts, minimizing planning concerns, and meeting engineering expectations, while meeting the purpose and need. Therefore, US 322-1S Build Alternative was recommended to be advanced for study.

US 322-5 Build Alternative

The US 322-5 Build Alternative would meet the PEL Study purpose and need. Based on the environmental, engineering, and planning screenings, this alternative was recommended to be advanced for further study. Environmentally, this alternative would minimize potential impacts to the comparative regulatory resources evaluated. While this alternative would have higher potential impacts to wetlands, it would minimize impacts to productive agricultural resources (181 acres), including Agricultural Security Areas (57 acres), conservation easements (0 acres) and agricultural zoning (97 acres) which are subject to the ALCAB approval process; Section 4(f) resources, and community resources. From a planning perspective, this alternative would minimize disruption to area land use and provide easy access to the existing US 322 business district. This alternative is one of the shortest alternatives (8.4 miles) and had a moderate comparative planning-level total cost estimate. When comparing this alternative against other Build Alternative corridors, US 322-5 Build Alternative would provide a better balance in the minimizing overall regulatory environmental impacts, minimizing planning concerns, and meeting engineering expectations, while meeting the purpose and need. Therefore, US 322-5 Build Alternative was recommended to be advanced for study.

8 IDENTIFICATION OF INDEPENDENT TRANSPORTATION PROJECTS FOR FUTURE CONSIDERATION

While the PEL Study identifies several Build Alternatives to address the regional transportation purpose and needs, there may still be other localized projects that would benefit other existing less-than-desirable conditions throughout the Study Area. These projects could include improvements to roadway intersections and segments, as well as accommodations for bikeways and other modes of travel, which could be advanced as separate transportation projects with independent funding mechanisms. If any of the independent projects are identified for further development, PennDOT would work with the CCMPO to plan and program these new projects accordingly. A conceptual planning analysis was conducted to determine where potential independent transportation projects may still be needed following the implementation of the Build Alternative and identify potential solutions to address these local needs. The following sections provide an overview of potential projects that could incorporate various aspects of the range of alternatives including TSM and TCM strategies and measures, Upgrade Existing Alternative concepts, and non-motorized improvements that have been dismissed from further study to address local needs. It should be noted that any study area roadway substantially impacted as a result of a Build Alternative would be addressed as part of the Build Alternative for the future State College Area Connector project.

8.1 Roadway Intersections

Roadway intersection projects could include improvements such as realignments, dedicated turn lanes, or road diets to improve sight distance and other geometric deficiencies, enhance safety, optimize traffic operations, and slow traffic. The identification of intersections for potential improvements was based on deficiencies identified from analyses/evaluation performed for the PEL Study and/or public comments provided through the public engagement process. Prior to implementing any additional project, PennDOT and CCMPO will further evaluate these locations and determine their continued need following the implementation of a Build Alternative.

The following eight intersections were considered in this analysis (**Figure 17)**:

1. PA 45 at Willowbrook Drive / Rockey Ridge Road
2. PA 45 at SR 2006 (Linden Hall Road)
3. PA 45 at SR 2004 (Cedar Run Road)
4. US 322 at Bear Meadows Road / Elks Club Road
5. US 322 and Church Hill Road
6. US 322 and Red Mill Road / Mountain Back Road
7. PA 144 and Bible Road / Short Road
8. PA 144 and Airport Road / Sinking Creek Road

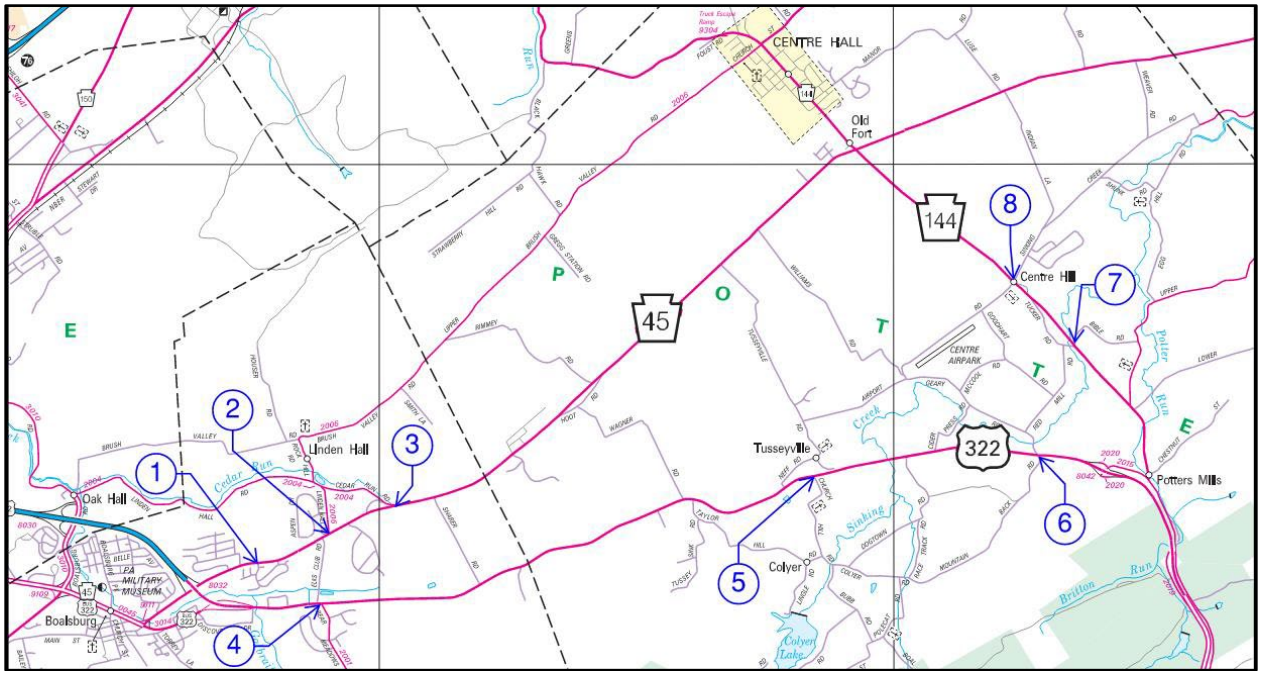

Figure 17 – Intersections Considered in Evaluation

8.1.1 PA 45 at Willowbrook Drive / Rockey Ridge Road

Willowbrook Drive and Rockey Ridge Road are stop-controlled local roads at PA 45 (**Figure 18**). The PEL Study analysis noted that the vertical alignment does not meet current design criteria but did not identify a need for safety specific improvements at the intersection based on 2016 to 2020 crash data.

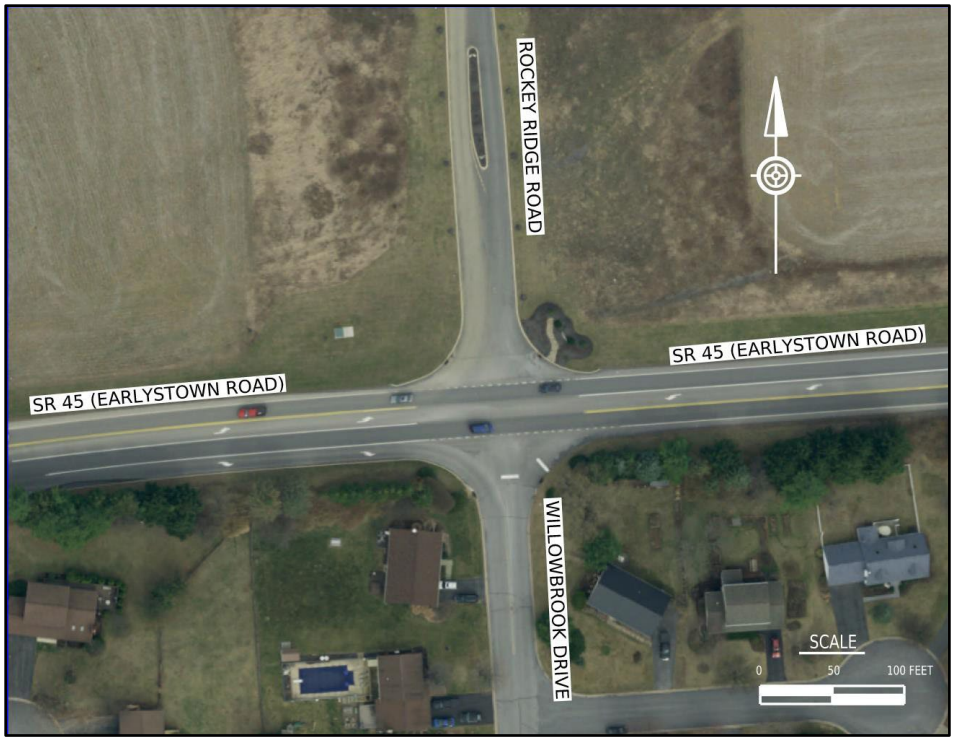

Figure 18 – PA 45 / Willowbrook Drive / Rockey Ridge Road Intersection

8.1.2 PA 45 at SR 2006 (Linden Hall Road)

SR 2006 is stop-controlled at PA 45 and intersects with PA 45 at a less than desirable angle (**Figure 19**). The PEL Study analysis noted that the vertical alignment does not meet current design criteria. Between 2016 and 2020, a total of four crashes were reported at or near the intersection all resulting in injuries.

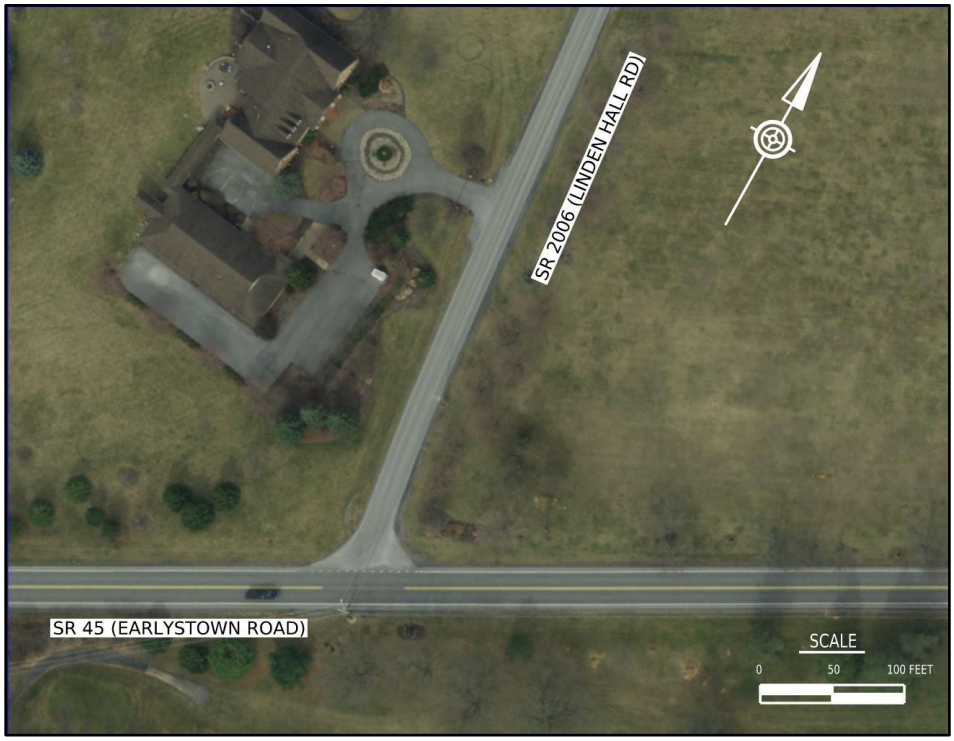

Figure 19 – PA 45 / Linden Hall Road Intersection

8.1.3 PA 45 at SR 2004 (Cedar Run Road)

SR 2004 (Cedar Run Road) is a local road that is stop-controlled at PA 45 (**Figure 20**). The geometric analysis conducted as part of the PEL Study noted that the vertical alignment does not meet current design criteria which can make left turn ins and right turns out difficult to navigate. The slope at SR 2004 approaching PA 45 also limits the sight distance for turning vehicles and the roadway width does not meet current PennDOT standards.

Figure 20 – PA 45 / Cedar Run Road Intersection

8.1.4 US 322 at Bear Meadows Road/Elks Club Road

Bear Meadows Road and Elks Club Road are stop-controlled local roads at US 322 (**Figure 21**). The analysis conducted as part of the PEL Study evaluated the intersection and concluded that improvements could be made to further improve safety. The intersection was also mentioned as an intersection of concern during the public engagement activities. A speed limit change on US 322 westbound occurs roughly ½ mile from the intersection from 55 MPH to 45 MPH. Vehicles approaching Boalsburg from this direction are likely still travelling at or near that speed.

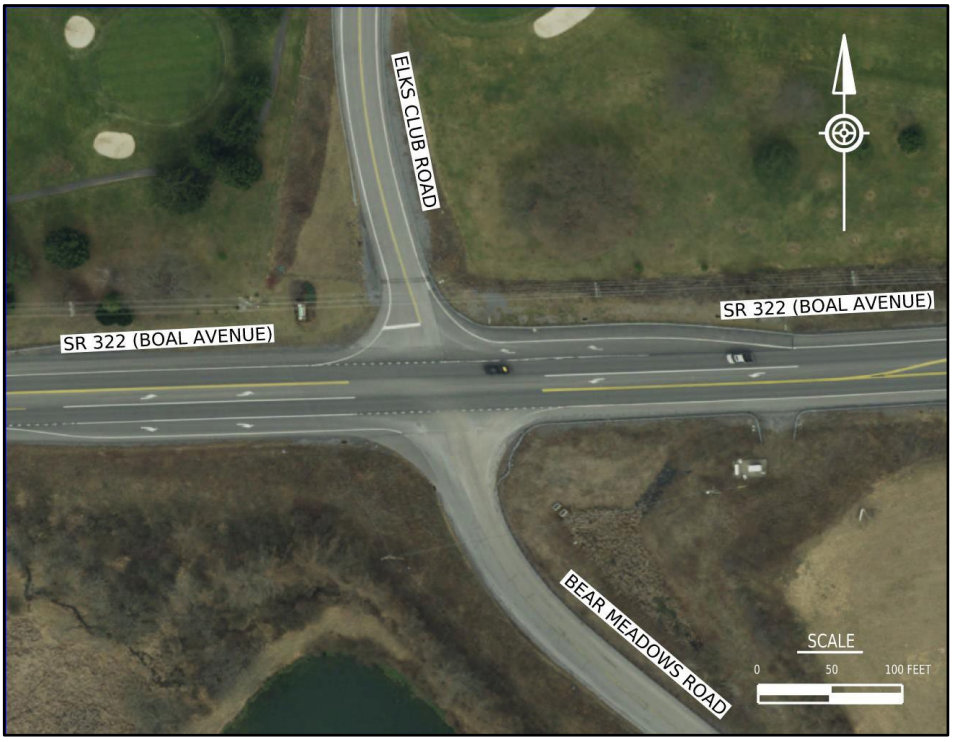

Figure 21 – US 322 / Bear Meadows Road/Elks Club Road Intersection

8.1.5 US 322 at Church Hill Road

Church Hill Road is a stop-controlled local road at US 322. Analysis conducted as part of the PEL Study did not identify the need for specific geometric or safety improvements at the intersection (**Figure 22**). However, during public engagement, it was specifically mentioned as an intersection of concern. The existing intersection is skewed, which makes left turns in and right turns out of Church Hill Road more difficult to navigate.

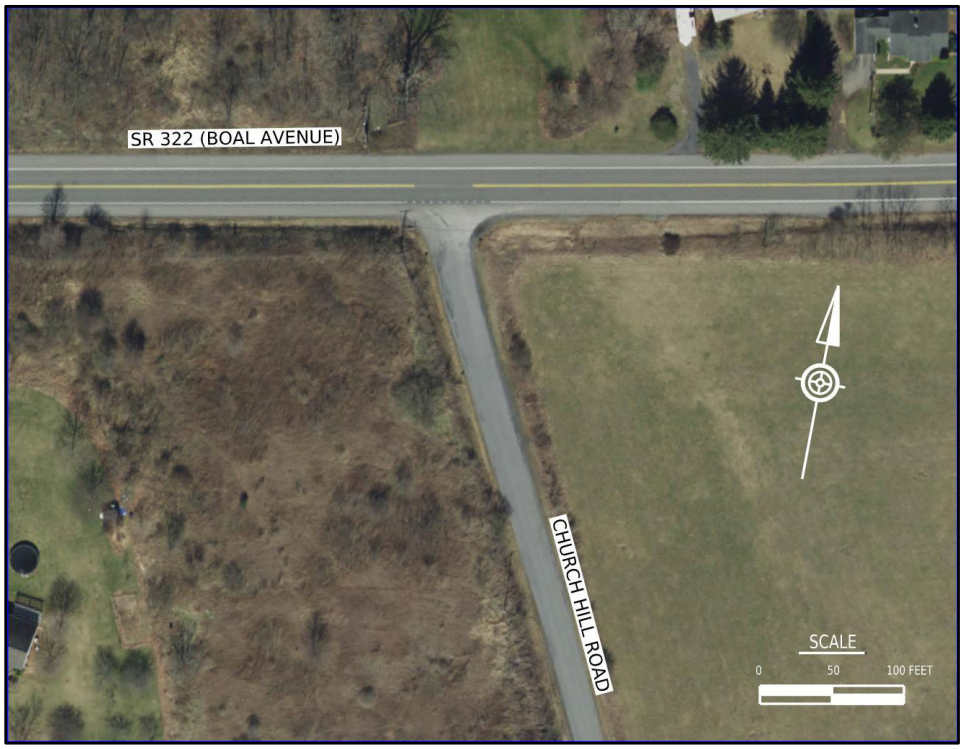

Figure 22 – US 322 / Church Hill Road Intersection

8.1.6 US 322 at Red Mill Road / Mountain Back Road

Red Mill Road and Mountain Back Road are two-lane, stop-controlled roads at US 322. Mountain Back Road intersects US 322 at a skewed angle, which makes left turns in and right turns out of Mountain Back Road more difficult to navigate. Red Mill Road also intersects US 322 at a skew, which does not meet current design criteria. Analysis conducted as part of the PEL Study did not identify the need for specific geometric or safety improvements at the intersection (**Figure 23**). However, the intersection was specifically mentioned as an intersection of concern during the public engagement activities. Between 2016 and 2020, a total of eight crashes were reported at or near the intersection, including one reported injury.

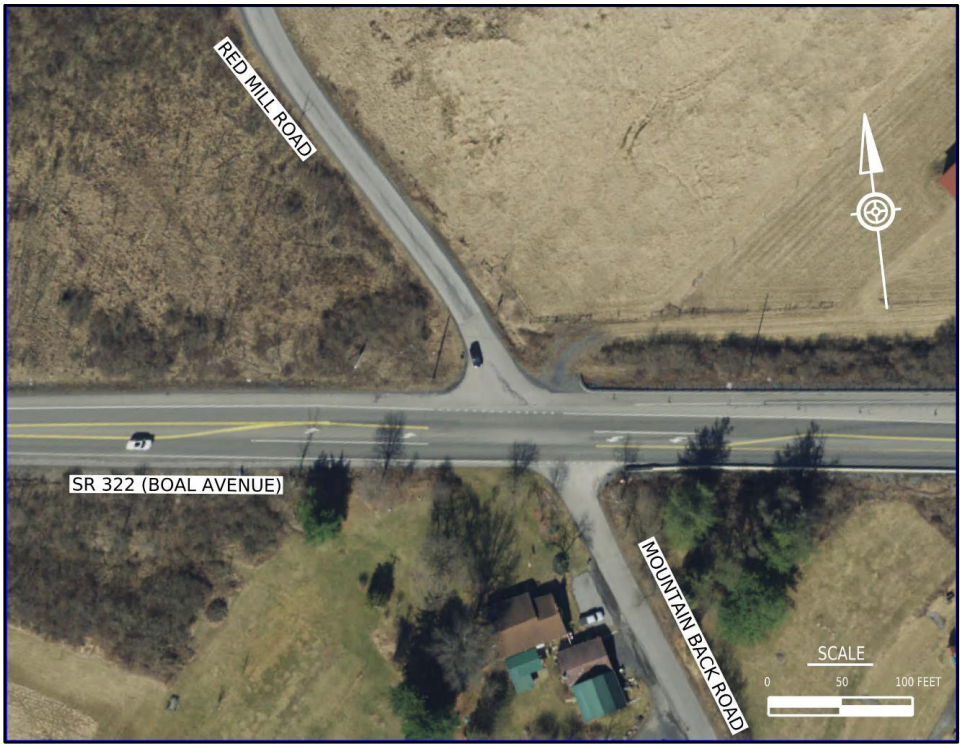

Figure 23 – US 322 / Red Mill Road / Mountain Back Road Intersection

8.1.7 PA 144 at Bible Road / Short Road

Bible Road and Short Road are both stop-controlled local roads. Analysis conducted as part of the PEL Study did not identify the need for specific geometric or safety improvements at the intersection (**Figure 24**). However, the intersection was specifically mentioned as an intersection of concern during public engagement activities. Bible Road and Short Road intersect PA 144 at offset angles. This layout hinders sight distance. A total of three crashes were reported at or near the intersection, one of which resulted in a fatality.

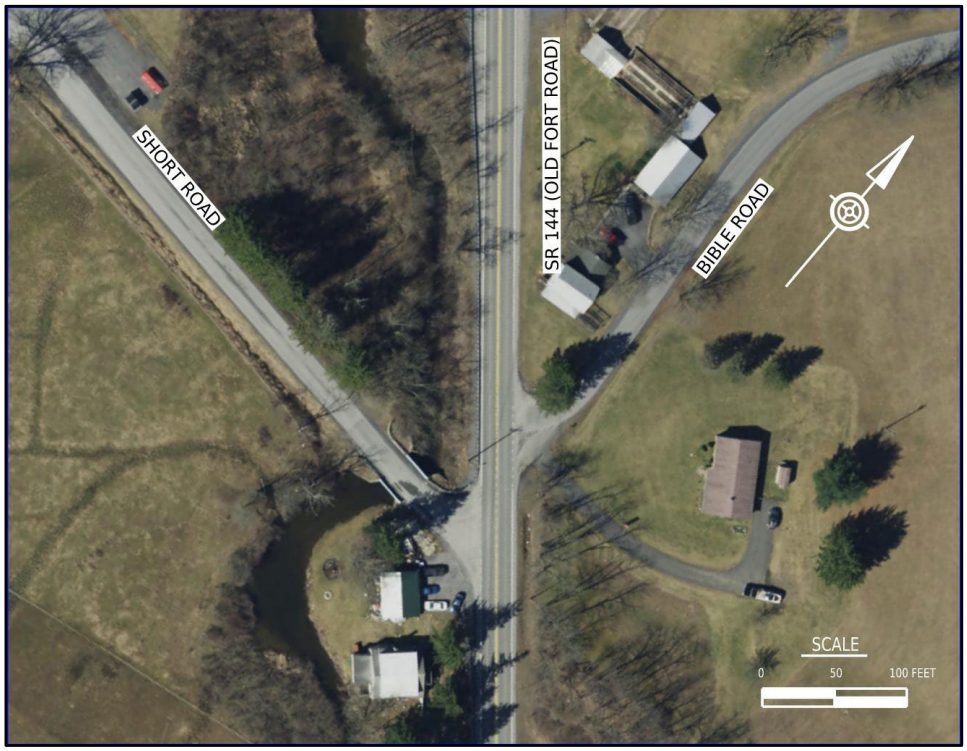

Figure 24 – PA 144 / Short Road / Bible Road Intersection

8.1.8 PA 144 at Airport Road / Sinking Creek Road

The intersection of PA 144 with Airport Road and Sinking Creek Road is a slightly staggered intersection with stop-controls on both side road approaches (**Figure 25**). Analysis conducted as part of the PEL Study concluded that improvements could be made in this location to improve safety. The southbound approach of PA 144 experiences a downgrade which may attribute to higher vehicle speed through the intersection. An existing embankment on either side of the road limits driver visibility when approaching the PA 144 intersection. Two angle-type collisions occurred at the intersection.

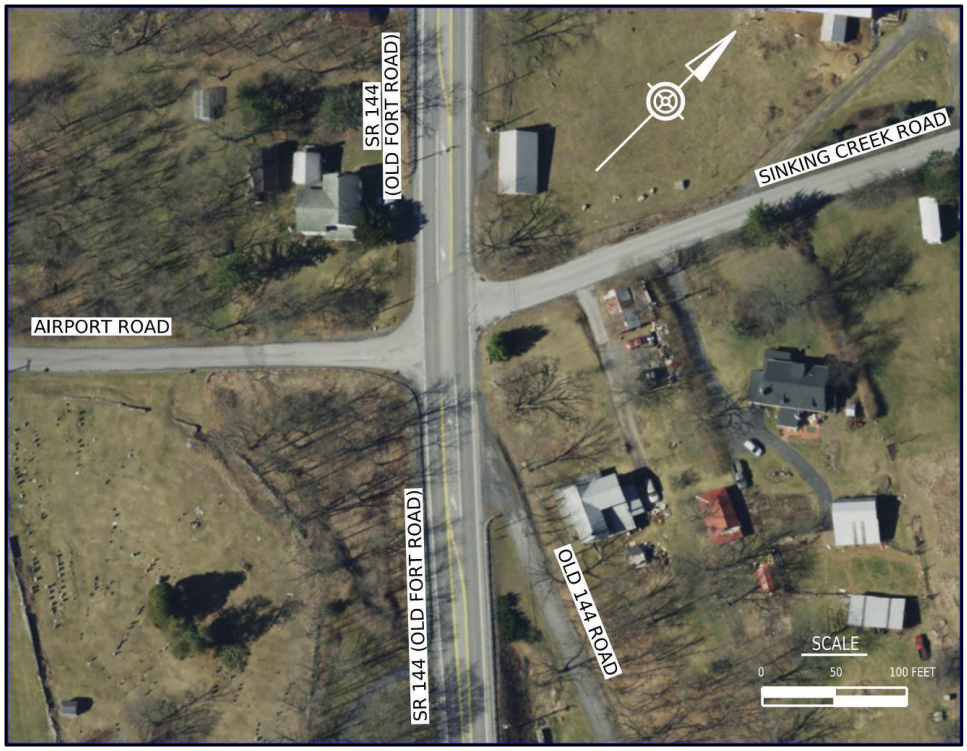

Figure 25 – PA 144 / Airport Road / Sinking Creek Road Intersection

8.2 Roadway Segments

8.2.1 PA 45 (Earlystown Road)

In the development and evaluation of alternatives including potential upgrades to existing facilities, an engineering review was conducted along the PA 45 corridor to compare the existing conditions to current engineering design standards for both horizontal and vertical geometry as established in PennDOT's Publication 13M, Design Manual Part 2, and the AASHTO publication, A Policy on Geometric Design of Highways and Streets.

Although all horizontal curves through the corridor within the study area meet current design criteria, this engineering review did identify several areas along the PA 45 corridor as "deficient" or "substandard", reflecting locations where the existing vertical curvature or steepness of grade were not within the allowable range defined in these current design regulations based on the posted speed of the highway. The identified substandard conditions included 3 vertical curves which did not meet current criteria, as well as numerous stretches of the highway where the existing vertical alignment is flatter than the desired minimum grade of 0.50 percent which is primarily established to facilitate efficient drainage of the roadway pavement and prevent icing during winter months.

In the evaluation of alternatives, it was determined that upgrades to PA 45 did not fully meet the study's purpose and need; therefore, this concept was not advanced for further development and analysis. However, throughout the PEL process, safety concerns have continued to be raised regarding travel conditions along PA 45, (see Appendix E for Township letters of specific concern). Although geometric elements which do not meet current design criteria do not necessarily indicate unsafe conditions, a full safety analysis including an evaluation to determine possible correlations between crash history and geometric conditions could be conducted as an independent stand-alone project. This potential safety study along PA 45 could also be expanded to evaluate the need for other improvements involving other design elements such as shoulder widths, intersection geometry, sight distance, pedestrian/bicycle accommodations, and access management.

8.2.2 US 322 (Mount Nittany Expressway)

The "S-Curve" along US 322 (Mount Nittany Expressway) immediately to the east of the PA 26 interchange was identified as a concern by the public at public outreach events (**Figure 26**). In general, concerns focused on the increase in traffic volume projections for the area, particularly with the US 322 Build Alternative, and how the increase in traffic volumes may affect safety.

The "S-Curve" of US 322 carries nearly 20,000 vehicles per day (20% trucks) and is classified as a limited access roadway. The "S-Curve" is approximately 4000-feet long and connects two reverse horizontal curves. A total of 18 crashes were reported in the area between the years 2016 and 2020.

In recent years, PennDOT has implemented mitigation measures, including Dynamic Message Signs to improve safety by alerting drivers of the approaching curves in attempt to slow travel speeds approaching the "S-Curve". Other safety improvement measures are currently programmed under separate contract and PennDOT will continue to evaluate performance of these improvements. As innovation in technology advances, PennDOT will look to implement additional measures to enhance the safety of the highway in this area, as needed.

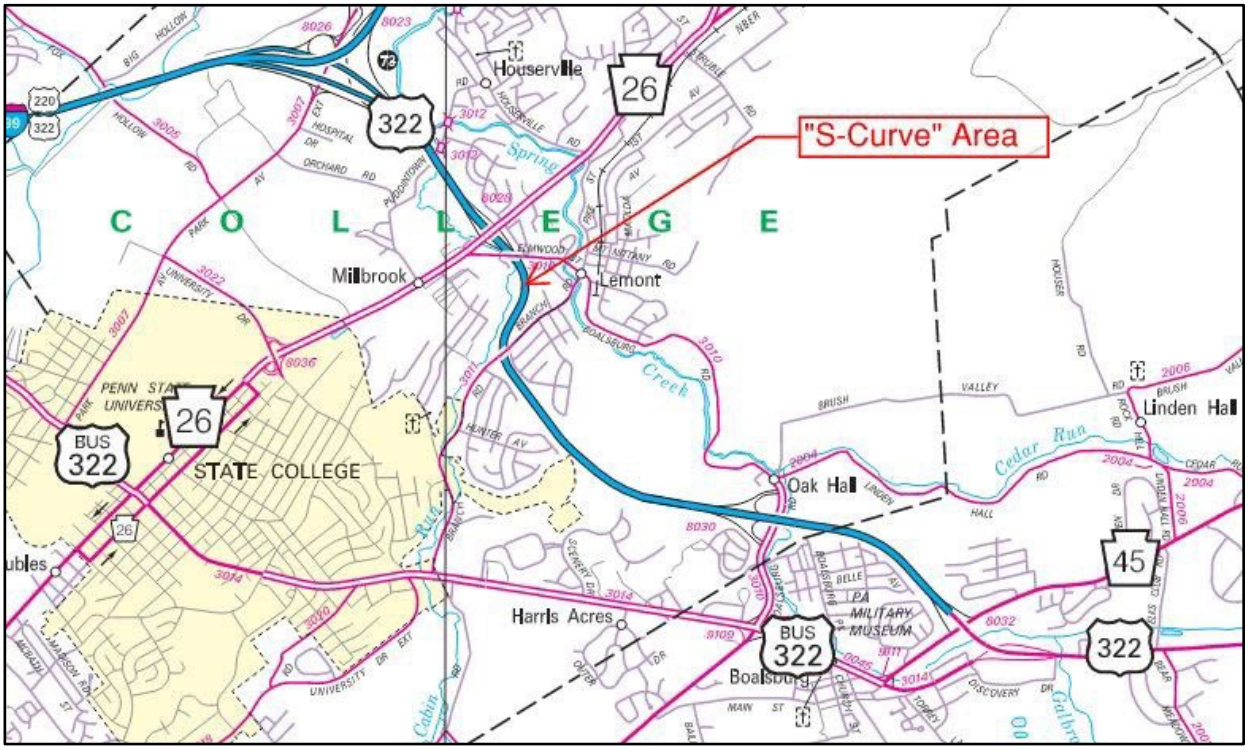

Figure 26 – "S-Curve Location"

8.3 Multi-Modal Improvements

Multi-modal improvements could be included as part of the Build Alternative, where appropriate, or programmed as new projects or upgraded facilities to improve multi modal connectivity throughout the study area. Specific improvements could include park-n-ride lots with electric vehicle charging stations, dedicated bikeways or bike lanes, pedestrian trails, shared use paths, widened shoulders along project area roadways, or other improvements to allow pedestrians, bicycles, and other non-motorized modes of travel to move safely throughout the area. Locations of these improvements would need to be coordinated between planning partners, local officials, stakeholders, and PennDOT to ensure that the improvements are consistent with both local and state-wide active transportation plans, and provide connectivity between communities, community facilities and other destinations such as parks, employment centers, or other multi-modal facilities.

9 REFERENCES

Centre County Metropolitan Planning Organization. September 2020. *Centre County Long Range Transportation Plan 2050*. Adopted September 22, 2020.

Centre County Metropolitan Planning Organization. October 2020. *2021-2024 Centre Transportation Improvement Program*.

Federal Highway Administration. November 1993. *NEPA Implementation: The Development of Logical Project Termini.* Accessed from website https://www.environment.fhwa.dot.gov/legislation/nepa/guidance_project_termini.aspx on March 3, 2021.

Pennsylvania Department of Transportation. December 2018. *SCCCTS Streetlight Origin and Destination Analysis Technical Memorandum.*

Pennsylvania Department of Transportation. April 2019. *Route 322/144/45 Corridors, Centre County, Pennsylvania, 2019 Data Refresh Report.*

Pennsylvania Department of Transportation. February 2021. *Final Purpose and Need for the State College Area Connector Planning and Environmental Linkage (PEL) Study.*

Pennsylvania Department of Transportation. February 2023. *Engineering Technical Memorandum for the State College Area Connector Planning and Environmental Linkages (PEL) Study.*

Pennsylvania Department of Transportation. February 2023. *Traffic Technical Memorandum for the State College Area Connector Planning and Environmental Linkages (PEL) Study.*