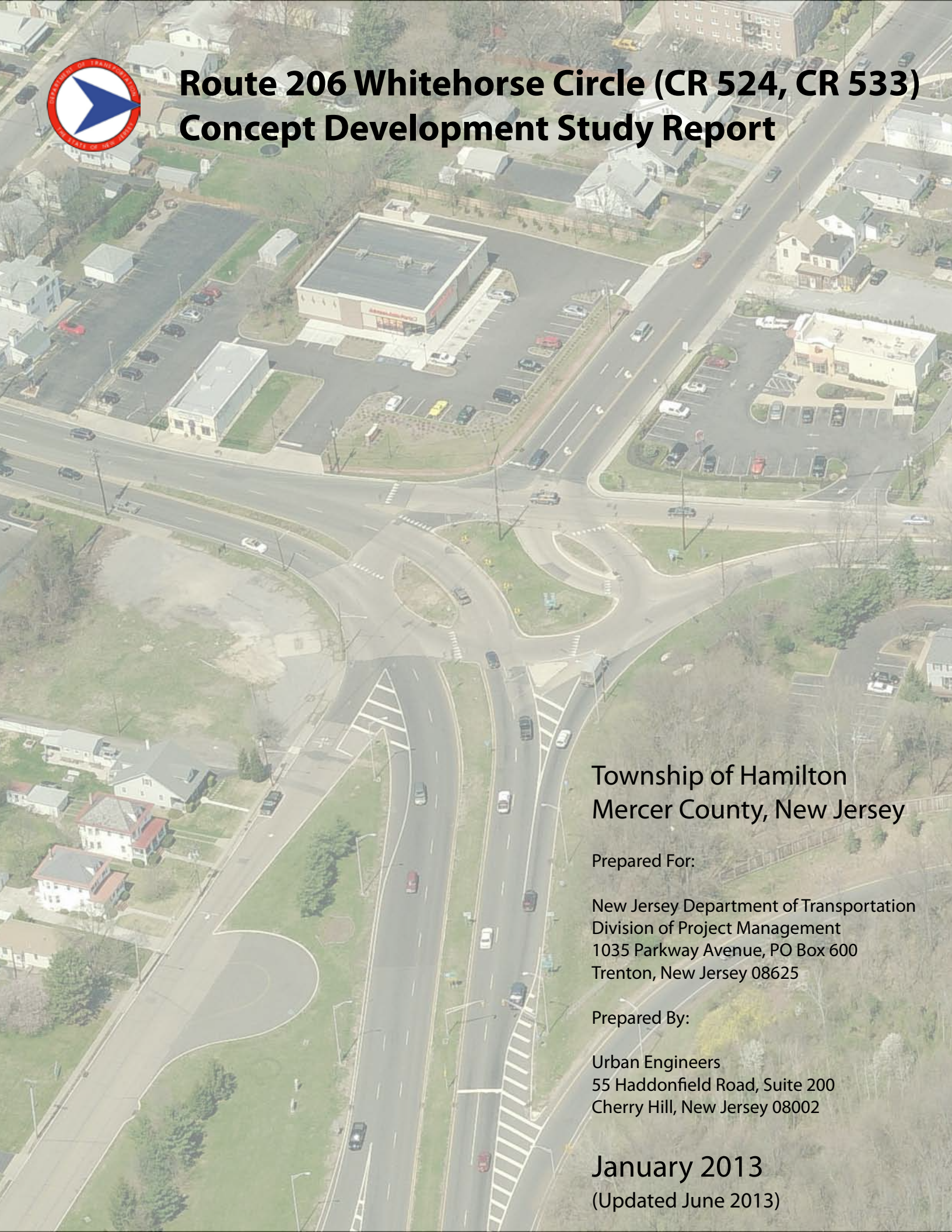

Route 206 Whitehorse Circle (CR 524, CR 533)
Concept Development Study Report

Township of Hamilton
Mercer County, New Jersey

Prepared For:

New Jersey Department of Transportation
Division of Project Management
1035 Parkway Avenue, PO Box 600
Trenton, New Jersey 08625

Prepared By:

Urban Engineers
55 Haddonfield Road, Suite 200
Cherry Hill, New Jersey 08002

January 2013
(Updated June 2013)

Concept Development

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Table of Contents

List of Figures

List of Tables

List of Appendices

Executive Summary

Project Background and History

The Whitehorse Circle (Circle) is located in the Township of Hamilton and serves both local and regional traffic. The project location has a long history of investigation that was started most recently with a problem statement prepared by the Bureau of Safety Programs (BSP). Additionally, Hamilton Township identified the location as the municipality's highest concern due to the excessive number of crashes. In response, NJDOT studied the location, identifying issues including a high number of right-angle crashes. In an effort to improve the safety, NJDOT implemented signing and striping improvements including a complete overhaul of the intersection's guide, regulatory and warning signs to better define vehicle rights of way throughout the complex network of movements. Unfortunately, based on the post-implementation crash data it was determined that the quick-fix treatments did not result in a desired reduction in the angle crashes, crash frequency or injury crashes. A problem statement was developed, summarizing the history of the project and identifying the need for a larger, long-term solution.

Summary of Issues and Concerns

The overall purpose of the Route 206 Whitehorse Circle Concept Development Project is to develop concepts that will improve safety and operational problems.

Crash analysis was performed for the Circle and showed that between 2006 and 2008 there were 161 crashes that occurred in or on the approaches to the circle. The analysis identified four key problem locations where a concentration of the crashes (117 crashes) was occurring. Additionally, the 2009 to 2011 data was provided in 2012 for comparison to the 2006 to 2008 data. The new information showed that the overall crash totals and crash types were comparable to originally analyzed data.

The traffic analysis showed that on the average the Circle operates reasonably well, in part as a result of the signals on the approaches including the metering signal just south of the Circle on US Route 206, but queues in the circle can become long and block through movements creating undesirable and potentially unsafe conditions.

As a result of examination of the existing conditions the following project goals and objectives were developed:

- Improve the safety and movement of traffic within the Whitehorse Circle.
- Improve safety and accessibility for everyone on or near the road including neighborhood residents, pedestrians, bicyclists and motorists.
- Improve and enhance the safety of properties abutting the roadway.
- Preserve and enhance the character of the roadway and surrounding environment, so that the roadway "fits" into the community.

- Encourage a more walkable environment.
- Improve the environmental quality within the project area.

Preliminary Preferred Alternative (PPA)

There were a number of concepts developed to meet the project needs, goals and objectives. The concepts fell into two categories: signalized intersection or modern roundabout along with a no build alternative for comparison.

Seven (7) variations were initially considered. In addition to a "No Build" alternative (Alternative 1), three signalized concepts were designated Alternative 2, 3, and 4, and the three identified roundabout alternatives were designated Alternative 5, 5a, and 5b. An initial impact assessment was conducted to reduce the alternatives considered down to one variation of both a signalized intersection and a roundabout.

After consideration and discussion with NJDOT, Mercer County and Hamilton Township officials, the decision is to advance Alternative 5, a two lane roundabout as the Preliminary Preferred Alternative. The roundabout addresses the identified safety issues including key problem locations, is projected to operate at an overall Level of Service B (LOS B) in the 2035 design year, and maintains consistency with the surrounding community context. The project was presented to the Hamilton Township Officials and the general public. NJDOT received a resolution of support for the advancing solution.

Recommendations

The PPA, as determined through the efforts performed during the Concept Development Study, is recommended for advancement.

I Introduction

A. Foreword and General Project Information

The Concept Development study for Whitehorse Circle (Circle) was initiated by the Division of Project Development (DPD) as a result of a Bureau of Safety Programs (BSP) request. The Circle is located in the Township of Hamilton and serves both local and regional traffic (See ***Figure 1*** - Project Location Map).

The project location has a long history of investigation that was started most recently with a problem statement prepared by the Bureau of Safety Programs (BSP). The statement indicated that Hamilton Township identified the facility as being a high priority accident location. At the time, the number of crashes far exceeded the criteria of five right-angle crashes per year to be eligible for treatment as part of the Right-Angle Crash Reduction Program. Because attempted quick fix solutions did not realize material safety improvements, BSP recommended the project be re-evaluated for increased NJDOT action which resulted in the Concept Development (CD) Study.

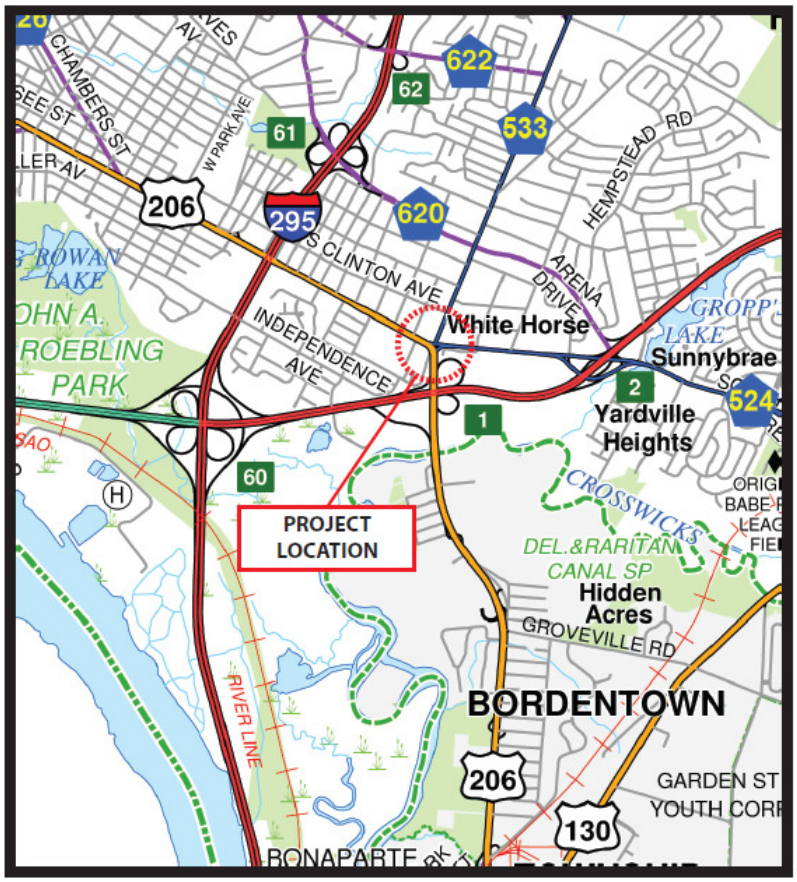

Figure 1 – Project Location Map

1. Project Name

This project is referred to as the Route 206 Whitehorse Circle (CR 533,524) Concept Development Study

2. Project Type/Category

This project is designated as Classification 2, Reconstruction, Widening and Dualization per NJDOT Construction Cost Estimating Guidelines. The work is described as the removal and replacement, rebuilding or upgrading of an existing facility, including intersections.

3. Project limits

The project limits extend from the existing Whitehorse Circle along each of the intersecting roadways. NJDOT currently maintains jurisdiction entering and exiting from the south along US Route 206. US Route 206 (also designated South Broad Street) entering and exiting from the west is under the jurisdiction of Hamilton Township. Both White Horse Avenue (CR 533) from the north and South Broad Street (CR 524) from the east are under Mercer County Jurisdiction. The approximate milepost limits for each road follows:

- US Route 206 – NB – 38.80
- US Route 206 – SB – 90.95
- US Route 206 (S. Broad St.) – 39.00
- White Horse Avenue (CR 533) – 0.03
- South Broad Street (CR 524) – 0.11

4. Project Location

The Circle is located in the Township of Hamilton, Mercer County and serves both local and regional traffic **(See Figure 1 - Project Location Map)**

5. Project Manager

The Project Manager for this effort is William Birch.

B. Original and Successor Projects

The project started with a problem statement prepared by the Bureau of Safety Programs (BSP). The statement indicated that Hamilton Township identified the facility as being a high priority accident location. At the time, the number of crashes far exceeded the criteria of five right-angle crashes per year to be eligible for treatment as part of the Right-Angle Crash Reduction Program. Because attempted

quick fix solutions did not realize material safety improvements, BSP recommended the project be re-evaluated for concept development study.

C. Data Reviewed

During the data collection phase of this project, specific sources were consulted to obtain information on the existing conditions of the study area. This information was evaluated to determine the areas of nonconformance with current design standards and formed the base data for use in the development of improvement alternatives.

The following information was obtained and reviewed:

NJDOT Record Plans

- Plans – Route 39 Section 10B
- Plans – Route 195 Sections 1A, 1E & 10D
- Plans – Route U.S. 206 Section 27B
- ROW Plans – Route 2 Section 7 & 3A (South Broad Street Widening)
- ROW Plans – Route 39 Section 1A & 10
- ROW Plans – Route 29 Freeway Section 10
- NJDOT Jurisdictional Limit Maps

Crash Records

- NJDOT Bureau of Traffic Safety Programs (BTSP) Crash Data for US Route 206, CR 533, and CR 524, contained in Memorandum dated September 9, 2009. 2009 to 2011 updates were provided in 2012 for comparison to the 2006 to 2008 data. The new information showed that the overall crash totals and crash types were comparable to originally analyzed data.
- NJDOT BTSP Crash Summary-Total Crashes at Intersections for State System Roads.

Traffic Counts

Traffic volume data was obtained through Automatic Recorder Counts (ATRs) and manual counts. ATR counts were obtained for the Parent Avenue and Pearson Avenue intersections with US Route 206 for the period March 7-11, 2011, inclusive. Manual counts were obtained for US Route 206 and Broad Street for February 11, 2009.

GIS Information

- NJ Geographic Information Network (njgin.state.nj.us)
- 2007 NJ High Resolution Orthoimagery
- Parcels of Mercer County

Other Information

- Straight-line diagrams
- Tax Maps
- State Development / Redevelopment (SDRP) Guidance
- Environmental Screening Report
- Google and Pictometry Images

D. Design Standards

The following design standards were used to develop the project alternatives:

- AASHTO; A Policy on Geometric Design of Highways and Streets
- Manual of Uniform Traffic Control Devices for Streets and Highways
- NJDOT Complete Streets Policy
- NJDOT Design Exception Manual
- NJDOT Drainage Design Manual
- NJDOT Roadway Design Manual
- NJDOT Soil Erosion and Sediment Control Standards
- NJDOT State Highway Access Management Code

In addition to those design standards, NCHRP Repot 672 Roundabouts: An Information Guide was used to supplement the design information with respect to the design and analysis of roundabout alternatives.

E. Characteristics of the Roadways and Surrounding Area

US Route 206 travels from south to north starting in Hammonton passing through the Whitehorse Circle in Hamilton Township on the way to Trenton and further points north before crossing the NY State Line. Within the project limits, US Route 206 is

functionally classified as an Urban Principal Arterial. Jurisdiction changes from NJDOT to Hamilton Township at the circle.

County Route 533 travels south to north in Mercer County, beginning at the Whitehorse Circle, crossing Route 33 and Route 1 before reconnecting with US Route 206 in Princeton Township.

The circle has an unconventional design where vehicles traveling on US Route 206 have the right-of-way and all other vehicles must yield. ***Figure 2*** shows the Whitehorse Circle with the internal stopping locations.

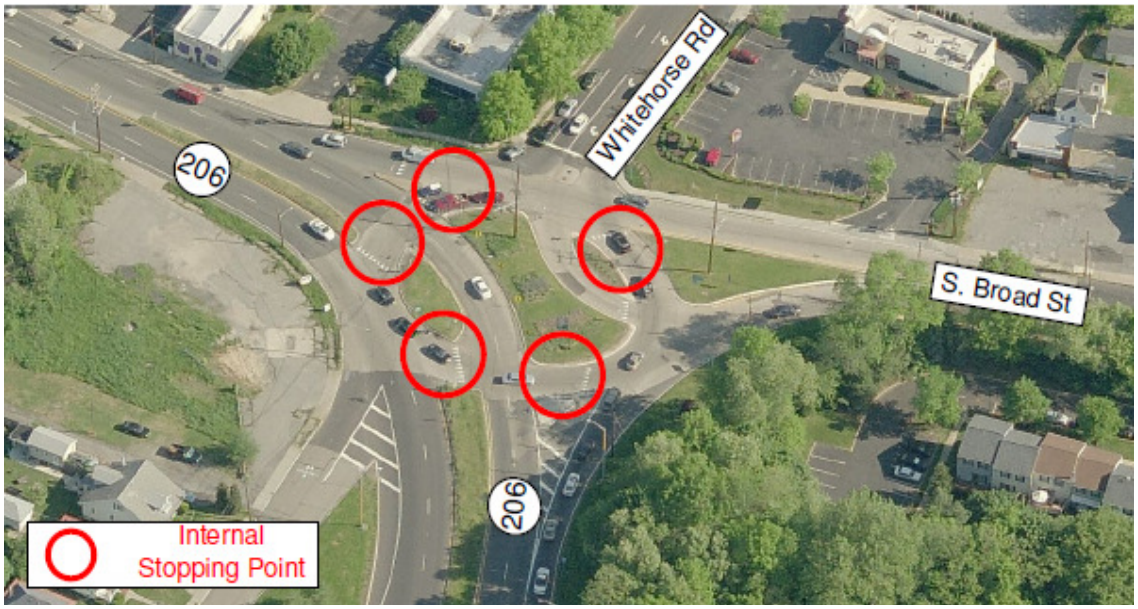

Figure 2 – Internal Stopping/Yield Points

The Circle's design forces vehicles within the Circle to yield to the US Route 206 through traffic resulting in queuing onto US Route 206. The Circle is located on US Route 206 and processes traffic volumes of approximately 21,000 ADT.

The northbound US Route 206 approach operates with a traffic signal that meters the volume entering the Circle. This signal is approximately 375 feet south of the intersection and operates on a 90 second cycle with approximately 60 seconds of green time and 30 seconds of red time. When the signal is red it helps the other three approaches and internal sections of the circle clear.

F. Concept Development Scope Statement

There was no formal Concept Development Scope Statement form prepared for this project; however, the scope for Concept Development followed the current Project Delivery Process activities.

G. CD Public Involvement Action Plan

There was no formal Concept Development Public Involvement Action Plan prepared for this project. Prior to changes in the NJDOT Project Development Process, a scope of work for public involvement activities was developed in coordination with the NJDOT Division of Project Development (DPD). This scope of work incorporated several coordination elements such as, public official's meetings/briefings and a Public Information Center (PIC). Two (2) public officials meetings-status updates and a public officials briefing with the governing body of Hamilton Township occurred. The PIC involved pre-meeting preparation (development of a mailing list and preparation of data sheets), as well as PIC follow up efforts (addressing public comments and documentation).

II Purpose and Need

A. Project Purpose

The purpose of the project is to develop concepts that will improve safety and operational problems at the White Horse Circle.

B. Project Need

Following an evaluation of existing conditions, the project need is to improve safety as the Whitehorse Circle has a high number of crashes.

C. Goals and Objectives

Alternatives developed to address the identified needs should be consistent with the following goals and objectives:

- Improve the safety and movement of traffic within the Whitehorse Circle.
- Improve safety and accessibility for everyone on or near the road including neighborhood residents, pedestrians, bicyclists and motorists.
- Improve and enhance the safety of properties abutting the roadway.
- Preserve and enhance the character of the roadway and surrounding environment, so that the roadway “fits” into the community.
- Encourage a more walkable environment.
- Improve the environmental quality within the project area.

III Existing Inventory and Condition

A. Existing Bridge Inventory and Condition

There are no bridges within the project limits.

B. Scour

There are no stream crossings or bodies of water within the project limits.

C. Maintenance Issues

There were no identified maintenance issues.

D. Existing Roadway Inventory and Condition

1. Classification

US Route 206 runs north-south and is functionally classified urban principal arterial. C.R. 533 runs north-south and is functionally classified as urban minor arterial. C.R. 524 runs east-west and is functionally classified as urban principal arterial.

2. Cross-Section

Whitehorse Circle approach roadway cross-sections vary within the project limits. The project limits extend from the existing Whitehorse Circle along each of the intersecting roadways. NJDOT currently maintains jurisdiction entering and exiting from the south along US Route 206. Approaching the circle, the road maintains two lanes entering with a third lane dedicated to CR 524 east. Exiting the circle, the road is two lanes and adds an auxiliary lane for access to I-195 west. In both cases there is no shoulder due to the auxiliary lanes. US Route 206 (also designated South Broad Street) entering and exiting from the west is under the jurisdiction of Hamilton Township. In both the entering and exiting roads, two lanes exist with limited shoulder width. Both White Horse Avenue (CR 533) from the north and South Broad Street (CR 524) from the east are under Mercer County Jurisdiction. For White Horse Avenue (CR 533) the entering road has a dedicated left turn, through and right turn lane while the exiting is a single wide lane. For South Broad Street (CR 524), both the entering and exiting roads have one wide lane.

3. Speed Limit

The posted speed limits for each road follow:

- US Route 206 – NB – 45 MPH

- US Route 206 – SB – 45 MPH
- US Route 206 (S. Broad St.) – 35 MPH
- White Horse Avenue (CR 533) – 35 MPH
- South Broad Street (CR 524) – 40 MPH

4. Desirable Typical Section

New Jersey State Highway Access Management Code assigns US Route 206 from M.P. 38.49 to 38.90 a DTS of 6A; which is 6 lanes, divided, with shoulders or parking. The other roads intersecting with Whitehorse Circle are not within NJDOT Jurisdiction.

5. Access Level

US Route 206 access level is 3 from M.P. 38.49 to 38.90; this allows for right turn access with provisions for left turn access via jug handles. The other roads intersecting with Whitehorse Circle are not within NJDOT Jurisdiction.

6. Horizontal Alignment

In accordance with the Roadway Design Manual (RDM), Table 2-1 (Sec. 2-03.3, Pg. 2-5), the existing posted speeds result in design speeds of 40-50 mph, 40 mph, and 45 mph along US Route 206, C.R. 533, and C.R. 524, respectively.

In accordance with Table 4-5 (Sec. 4-03.3, Pg, 4-16) the standard curve radii for Urban Highways with design speeds of 40-50, 40, and 45 mph (at 4% maximum superelevation) are 565-930, 565, and 730 feet, respectively.

The obtained record drawings revealed US Route 206 horizontal curve through the circle is less than 930 feet. Therefore, the minimum requirements for horizontal curves are not met at the appropriate design speed.

7. Vertical Alignment

The RDM (Sec. 4-04.4, pg. 4-20) specifies a minimum grade rate of 0.3% for freeways and land service highways. A review of record drawings confirms that the minimum required grade rate criterion is met throughout the project limits.

The obtained record drawings show one vertical crest on US Route 206 south of the circle. Using Figures 4-I and 4-J located on pages 4-22 and 4-23, minimum curve length can be calculated using the equation L = KA. Based on calculations and conducted field visits, the circle approaches meet the minimum requirements.

8. Intersections

The project is an intersection improvement project to address the Whitehorse Circle. The current configuration of the circle has an unconventional design

where vehicles traveling on US Route 206 have the right-of-way and all other vehicles must yield. **Figure 2** shows the Whitehorse Circle with the internal stopping locations.

9. Surface Type

The available record plans show 9" reinforced concrete traveled way and 6" bituminous shoulders on subbase or 6" DGA; both overlaid with bituminous surface course of varying thickness. There are no records of C.R. 533 pavements.

The conducted field visits revealed transverse and longitudinal cracks along construction joints in the vicinity of the circle. Pot-holes and cracks were visible along concrete-asphalt and approach side street interfaces within the project limits. The Pavement Management System information only has data up to milepost 39.0 because US Route 206 changes from NJDOT to Municipal jurisdiction at this point. This area was last resurfaced in 2009 and is not currently identified as a need by the PMS.

10. Cross Slope

The RDM (Sec. 5-02, pg. 5-1) indicates the roadway cross slope pavement should be at a minimum 1.5 percent. Based on Record Plans Typical Sections and conducted field visits, all circle approaches satisfies the minimum 1.5% cross slope requirement within the project limits.

11. Lane Widths

The RDM (Sec. 5-03, pg. 5-4) specifies a minimum lane width of 11 feet. Based on record plans and aerial mapping, all circle approaches meet specified minimum lane width requirement within the project limits.

12. Shoulders

The RDM (Sec. 5-04.2, Pg. 5-5) indicates left and right shoulder widths on land service highways should not be less than 3 and 8 feet, respectively. Based on record drawings and field observations, there are several approaches that have deficient shoulder widths. Approaches and associated deficiencies are as follows:

- US Route 206 heading north, approaching left shoulders are 1 foot wide (NJDOT Jurisdiction)
- US Route 206 heading east, approaching right shoulders are 5 foot wide (Hamilton Township Jurisdiction)

13. Roadside or Border

The RDM (Sec. 5-035 pg. 5-8) specifies a minimum border width of 10 feet. The GIS-based R.O.W. information obtained indicates approach R.O.W. width of 100

feet and varying, 50 to 60 feet, and 80 feet; for US Route 206, C.R. 533, and C.R. 524, respectively. Circle approach roadways typical widths are 66 to 101 feet, 40 feet, and 66 feet, on US Route 206, C.R. 533, and C.R. 524, respectively. Based on obtained record drawings and aerial mapping, select circle approach borders would need to be deed verified.

14. Curbs

Field inspection revealed curbing throughout the project limits. Generally, curbs appear to be in average condition with the exception of select sections.

15. Interchanges

There are no interchanges in the project area. The I-195 interchange with US Route 206 is located south of the Whitehorse Circle.

16. Clear Zone

There are utility poles and light poles located within the Whitehorse Circle and along the approaches.

17. Guide Rail

There is no guiderail within the project area. Adjacent to the project locations, there is guide rail associated with the US Route 206 Bridge over I-195 south of Whitehorse Circle which appears to be in good condition.

18. Drainage

Within the existing project area, the drainage system appears functional. Existing inlets are located within the current circle at the curblines and at “E” inlets within the travelled way. Water is collected and carried to an outfall outside the project limits.

19. Lighting

There are lighting standards at the Whitehorse Circle and along approach roadways.

20. Signing

There are select signs that are poor or inadequate within the project area.

21. Pavement Marking

There are select locations with poor markings within the project area.

22. Pavement Condition

The field visit revealed transverse and longitudinal cracks along construction joints. Also, pot-hole and cracks are visible along concrete-asphalt and approach side street interfaces within the project area.

23. Access

There are number of driveways providing access to properties within the project area. A summary of the driveways locations is provided in an Access Summary located in ***Appendix C-Access - ROW -Jurisdiction - Property Data***

24. Utilities

The field visit revealed that there are existing underground and aerial utilities within the project area. Information pertaining to the Utility Companies with facilities in the project area are compiled in ***Appendix D-Utility Information***.

25. Jurisdiction

US Route 206 (southern leg) is under the jurisdiction of the State of New Jersey. US Route 206 (western leg) is under the jurisdiction of the Township of Hamilton. C.R. 533 and C.R. 524 are both under the County of Mercer jurisdiction.

26. Pedestrian and Bicycle Facilities

The existing facilities are pedestrian compatible with the exception of US Route 206 southern approach. The US Route 206 and CR 524 approaches have inlets that are not bicycle compatible because of the current grates.

27. ITS

Based on field inspection, ITS facilities are not within the project limits. Coordination with the NJDOT suggests the inclusion of facilities in the future.

28. Landscaping

The landscaping is predominantly composed of roadside grassed and isolated forested areas along approach roadways within the project area.

E. Summary of Existing Deficiencies

1. Horizontal Alignment

The obtained record drawings revealed US Route 206 horizontal curve through the circle is less than 930 feet. Therefore, the minimum requirements for horizontal curves are not met at the appropriate design speed.

2. Surface Type

The available record plans for US Route 206 and C.R. 524 show 9" reinforced concrete traveled way and 6" bituminous shoulders on subbase or 6" DGA; both overlaid with bituminous surface course of varying thickness. There are no records of C.R. 533 pavements. The conducted field visits revealed transverse and longitudinal cracks along construction joints in the vicinity of the circle. Pot-holes and cracks were visible along concrete-asphalt and approach side street interfaces within the project limits.

F. List of Substandard Design Elements

1. Shoulders

The RDM (Sec. 5-04.2, Pg. 5-5) indicates left and right shoulder widths on land service highways should not be less than 3 and 8 feet, respectively. Based on record drawings and field observations, there are several approaches that have deficient shoulder widths. Approaches and associated deficiencies are as follows:

- US Route 206 heading north, approaching left shoulders are 1 foot wide (NJDOT Jurisdiction)
- US Route 206 heading east, approaching right shoulders are 5 foot wide (Hamilton Township Jurusdiction)

G. Management System Input

1. Safety Management System (SMS)

A review of the SMS database revealed that US Route 206 (MP 38.9) at County Route 533 showed up on the Top Intersection Crash Locations List by Total Severity for 2003 to 2005 at rank number 364 based on a severity score of 33 with a crash frequency of 27.

The crash analysis completed for available crash data from 2006 to 2008 revealed 161 crashes occurred at or near the circle. A review of the 2009 to 2011 crashes showed crash totals and crash types comparable to the 2006 to 2008 data.

Based on discussions with the Bureau of Safety Programs (BSP) it was determined that the physical nature of the location (i.e., the size and shape of the circle and resulting conflict points) results in the location being significantly underestimated as far as the number of crashes and the severity score.

2. Congestion Management System (CMS)

Congestion Management System information was provided. Part of this section of US Route 206 (Score 4.03/Med-Low) and this section of CR 524 (Score

5.14/Medium) are "Moderately Congested". It was noted that CMS does not provide analysis of traffic circles.

3. Pavement Management System (PMS)

Pavement Management System information was provided. The PMS only has data up to milepost 39.0 because US Route 206 changes from NJDOT to Municipal jurisdiction at this point. This area was last resurfaced in 2009 and is not currently identified as a need by the PMS.

4. Drainage Management System (DMS)

Drainage Management System information was provided. US Route 206, Whitehorse Circle does not rank in Drainage Management Unit's DMS Ranking List. No records were available for Flooding, Icing and Maintenance Crew expenditure for the project limit.

5. Maintenance Management System (MMS)

Maintenance Management System information was provided. No records were available for Maintenance Crew expenditure within the project limit.

6. Bridge Management System (BMS)

There are no bridges within the project limits.

7. Rockfall Hazard Management Systems (RHMS)

There are no rock cuts within the project limits.

8. Geotechnical Data Management System (GDMS)

GDMS indicates some limited subsurface information (specifically, soil borings) within the project limits and it may be accessed through the NJDOT Website

9. Transportation Data Development (TDD)

Currently available information is provided on the NJDOT Website

10. Traffic Engineering and Safety Program (TESP)

TESP has no input to provide in association with this location

11. Commuter Mobility/Bicycle and Pedestrian Programs

Bicycle and Pedestrian Programs has no documentation related to this location.

12. ITS

There are no ITS facilities within the project limits. A request for new facilities has been provided and will be incorporated in the PE Scope Statement.

IV Traffic and Crash Summary

A. Traffic Operations

Traffic operations at the Whitehorse Circle were observed in February and March of 2009. During the AM peak period (7:30 – 8:30 A.M.) the Circle operated fairly well with regards to queuing and delay. The northbound US 206 approach operates with a traffic signal that meters the volume entering the Circle. This signal is approximately 375 feet south of the intersection and operates on a 90 second cycle with approximately 60 seconds of green time and 30 seconds of red time. When this signal is red it allows the other three approaches and internal sections of the Circle to clear, and when the signal returns to green the northbound vehicles heading to CR 533 queue back frequently to the beginning of the auxiliary turn pocket on US 206. This queuing is due to the Circle's design where the northbound vehicles must yield to the westbound vehicles.

In addition to the operational issues, the Circle's design creates storage capacity within the Circle that is inadequate and as a result creates safety concerns. This was evident with observed near-collisions due to vehicles spilling back onto US 206 northbound in the center of the Circle. During field visits, driver confusion was noticed due to the unconventional design of the Circle.

During the PM peak period (4:15 – 5:15 P.M.) the US 206 eastbound approach was observed to be much heavier than the AM peak period resulting in increased queuing on White Horse Avenue and within the Circle. The US 206 eastbound vehicles destined for White Horse Avenue or Broad Street would queue sporadically between 5 and 10 vehicles along US 206 waiting to enter the circle. The southbound (CR 533) left turning vehicles were noticed to have significant delays entering the circle and even more prolonged delays trying to exit the Circle onto Broad Street. The metering traffic signal allowed the Circle to clear out, but potentially unsafe maneuvers were made by vehicles trying to enter the Circle and by vehicles passing through the Circle.

B. Traffic Analysis

Turning movement and ATR counts were collected in February 2009. Peak hour traffic volumes are shown on ***Figure 3***. As seen in ***Figure 3***, the heaviest volumes at the Whitehorse Circle are on the northbound US Route 206 approach during the AM peak period and the eastbound US Route 206 approach during the PM peak period. The heaviest movements are the westbound CR 524 (Broad Street) through movement during the AM peak period and the eastbound US Route 206 right-turn movement during the PM peak period.

Traffic analysis was performed for existing conditions using VISSIM, Version 5.1. VISSIM is a microscopic simulation program capable of handling the complex design and operations at the Whitehorse Circle.

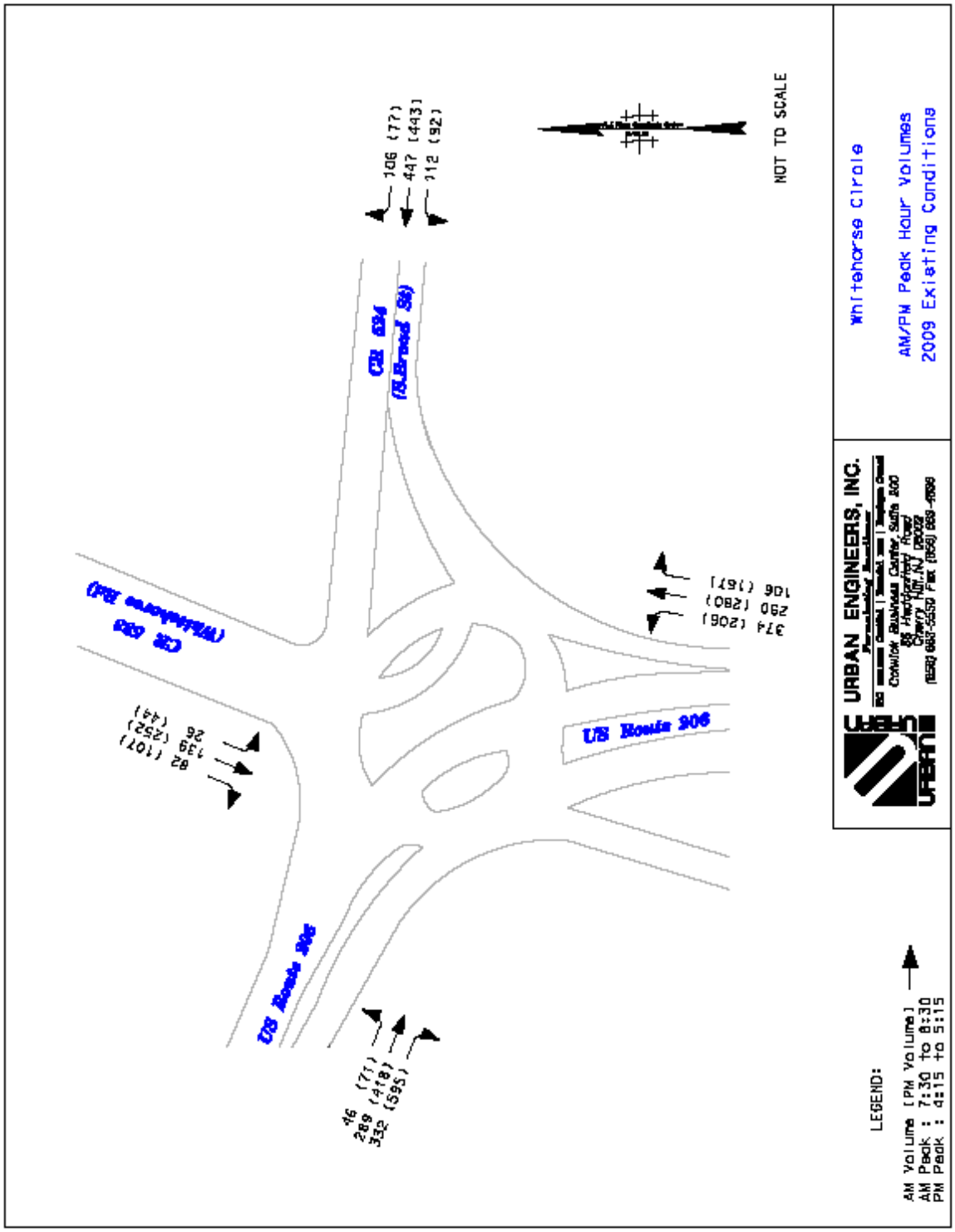

Figure 3 – 2009 Existing Traffic Volumes

The existing Level of Service (LOS) and delay results from the VISSIM analysis for the Whitehorse Circle are shown in ***Table 1***, and are based on 2009 peak hour volumes. The capacity analysis results indicate that the Whitehorse Circle operates at a LOS C during the AM and PM peak periods. The AM peak period operates well with the exception of the northbound vehicles exiting to White Horse Avenue. This movement operates at an average of 72 seconds of delay (LOS E).

During the PM peak period, the southbound CR 533 (White Horse Avenue) approach operates at LOS E due to the difficulty for vehicles to enter and exit the Circle from this approach. The simulated average and maximum queues at this approach are 46 and 242 feet, respectively.

Table 1: 2009 Existing Conditions Approach Peak Hour Levels of Service and Delay

	DELAY (LOS)	
Approach	**AM**	**PM**
Eastbound US Route 206	16 (B)	16 (B)
Westbound CR 524 (Broad Street)	5 (A)	7 (A)
Northbound US Route 206	38 (D)	29 (C)
Southbound CR 533 (White Horse Avenue)	25 (C)	59 (E)
Intersection Total	21 (C)	23 (C)

Overall, during the AM and PM peak periods the Circle operates reasonably well (LOS C) with minimal delay and queuing that generally clears quickly with aid from the traffic signal on northbound US Route 206 that meters the traffic entering the circle. Driver confusion and near-collisions due to the unconventional design and storage capacity within the circle create safety concerns at this location.

C. Traffic Volume Forecasts

Future No Build conditions at the Whitehorse Circle were analyzed with background growth for the year 2035. DVRPC population and employment forecast data for Mercer County was utilized to generate the 0.50% background growth rate that was applied to the 2009 existing traffic volumes.

As shown in ***Table 2***, the capacity analysis results indicate that the Whitehorse Circle is projected to operate at an overall LOS D during the AM and PM peak periods. The AM peak period operates well with the exception of the northbound vehicles exiting to Whitehorse Road. This movement operates at an average of 150 seconds of delay (LOS F) with projected queues extending on average 23 vehicles during the peak hour. Full LOS and delay results are provided in ***Appendix E-Traffic Data and Analysis.***

Table 2: 2035 No Build Conditions Peak Hour Levels of Service and Delay

Approach	LOS (DELAY)	
	AM	**PM**
Eastbound US Route 206	15 (B)	19 (B)
Westbound CR 524 (Broad Street)	5 (A)	5 (A)
Northbound US Route 206	86 (F)	58 (E)
Southbound CR 533 (White Horse Avenue)	27 (C)	87 (F)
Intersection Total	36 (D)	35 (D)

During the PM peak period, the southbound CR 533 (White Horse Avenue) approach operates at LOS F due to the difficulty for vehicles to enter the Circle from this approach. The simulated average and maximum queues at this approach are four and 15 vehicles, respectively. Under the 2035 conditions the northbound US Route 206 vehicles exiting to Whitehorse Road begin to operate at LOS F with maximum queues projected to reach 35 vehicles.

D. Crash Data Analysis and Crash Diagram

The purpose of the crash analysis was to investigate the Whitehorse Circle's safety history to determine (1) if any improvement or deterioration in the overall safety of the intersection has occurred in recent years, and (2) if initial investigations indicate conditions have not improved or have worsen, investigate the crashes to identify problem areas, any underlying deficiencies and potential short-term and long-term solutions.

1. Background and History

As shown previously in ***Figure 2***, the Whitehorse Circle has a significant number of conflict points due to internal crossing locations and US Route 206 northbound having the right-of-way through the circle. In late 1999/early 2000, the NJDOT was notified by Hamilton Township officials about safety concerns. The Township indicated that this location was the municipality's greatest concern in terms of being a "priority high accident location." As a result, the Bureau of Safety Programs (BSP) and Traffic Engineering and Investigations (TE&I) unit were assigned to investigate the location. ***Table 3*** provides a summary of the crashes that occurred between January 2000 and June 2001. The most common accident type identified was angle crashes with 47 in the 18 month time period equating to 31 angle crashes annually. At the time, the number of crashes far exceeded the criteria of five right-angle crashes per year to be eligible for treatment as part of the Right-Angle Crash Reduction Program.

The BSP/TE&I investigation noted that the right angle collisions were occurring mostly at the two, consecutive internal stopping points at the circle's westerly

quadrant where vehicles enter US Route 206 southbound after coming from any of the other three approaches.

Table 3: Crash Summary for January 2000 to June 2001

Type	Number	Percent	2001 State Avg Percent*
Angle	47	68.12 %	22.09 %
Rear End	10	14.49 %	40.42 %
Side-Swipe	6	8.70 %	15.49 %
Fixed Object	5	7.25 %	6.53 %
Right Turn	1	1.44 %	N/A
Total	69	100.00 %	N/A
	57 (83%) were reportable accidents 11 (16%) were injury accidents 13 injuries were reported		

*2001 NJDOT Bureau of Safety Programs Accident Summary – Total Accidents at Intersections for State System Roads (Excluding Toll Roads and Interstates)

2. Initial Mitigation Measures and Results

With the results from the crash analysis, NJDOT decided on several low cost, short term mitigation measures to implement at the circle in an effort to reduce the number of angle crashes. During the summer of 2002, the circle was retrofitted with improved signing and striping, and updated regulatory and warning signs at all yield-controlled intersection conflict points. The NJDOT evaluated this location as part of their 2004 Annual Safety Report only to find the improvements were unable to reduced angle crashes, overall frequency or injury crash percentages. It was then documented by the NJDOT that to resolve underlying deficiencies (i.e., inadequate storage areas and internal conflict points) at this location significant reconstruction into a modern roundabout or at-grade, signalized intersection would be required. The BSP/TE&I concurred with the need for a major study effort to revise the circle. At the time, the Mayor of Hamilton Township, Glen Gilmore, indicated that both short and long term measures to address safety at this location would likely be warranted.

3. NJDOT 2006-2008 Crash Summary

As part of the US Route 206 Whitehorse Circle Study, crash data were requested from the NJDOT for the following locations:

- US Route 206 MP 38.59 – 39.23
- CR 533 (Whitehorse Road) MP 00.00 – 00.25
- CR 524 (South Broad Street) MP 00.00 – 00.30

The BSP provided crash summaries and details of motor vehicle accidents for the years January 1, 2006, through December 31, 2008 for all three locations listed above (***Appendix F***). The reports show the frequency, severity, conditions and circumstances surrounding the crashes. The crash summary revealed a total of 274 crashes had occurred in and around the Circle. A more detailed review of the police reports was completed to narrow the list of crashes to those occurring within the circle or as a result of congestion in the Circle. The results from the crash analysis with a comparison to statewide crash averages are shown in ***Table 4*** and a collision diagram with the four key collision areas (labeled A through D) highlighted is shown in ***Figure 4***.

Table 4: Crash Summary for January 2006 to December 2008

Type	**Number**	**Percent**	**2008 State Avg Percent***
Angle	62	38.51 %	25.32 %
Rear End	68	42.24 %	34.90 %
Side-Swipe	23	14.29 %	14.67 %
Fixed Object	8	4.97 %	6.93 %
Total	161	100.00 %	N/A
	42 (26%) were injury crashes 56 injuries were reported (19 annual)		

*2008 NJDOT Bureau of Safety Programs Crash Summary – Total Crashes at Intersections for State System Road (Excluding Toll Roads and Interstates)

The results from ***Table 4*** show that the most common accident type is rear end crashes with 68 in a 36 month period equating to 23 rear end crashes annually, and the second most being angle crashes with 62 equating to 21 angle crashes annually. The number of angle crashes far exceeded the criteria of five right-angle crashes per year to be eligible for treatment as part of the Right-Angle Crash Reduction Program.

Figure 5 **shows** the four key collision areas further divided by crash clusters and crash types within each collision area.

Location A

Located on the northwest corner of the circle where Whitehorse Road approaches the intersection with a total of 56 crashes most of which are rear end and angle crashes. Location A has three key crash locations within it.

A1 – The crash analysis revealed 15 rear end collisions where drivers looking to move to the internal stopping points within the circle acted with hesitation causing rear end accidents based on the rear driver assuming the front driver was accelerating through the intersection.

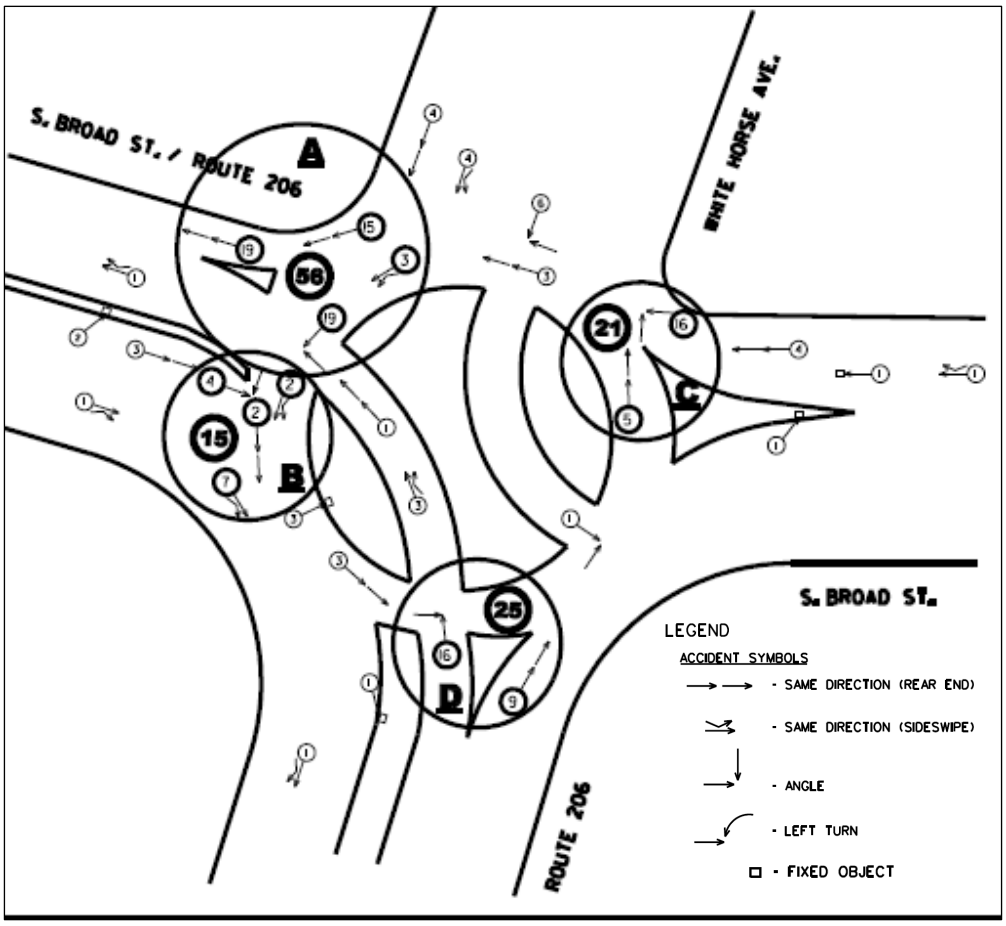

Figure 4 – Collision Diagram 2006 - 2008

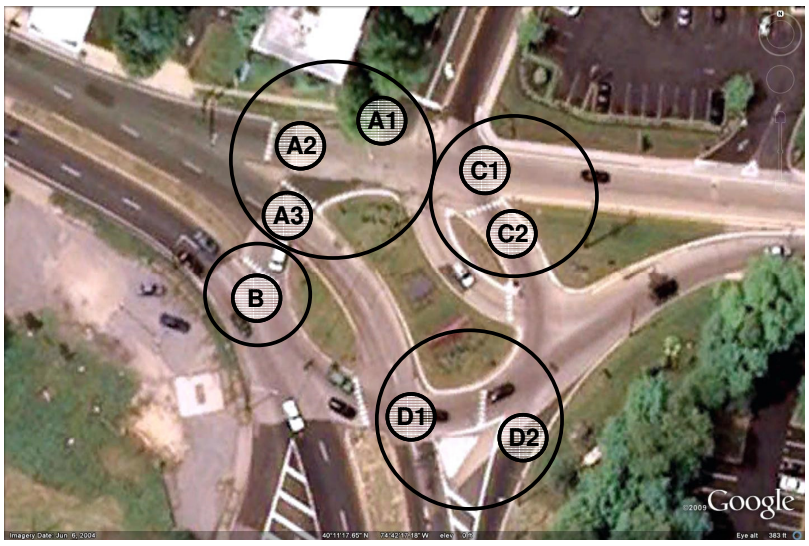

Figure 5 – Key Collision Areas

A2 – This location had 19 rear end collisions stemming from rear drivers assuming the front driver would enter the RT 206 northbound traffic stream.

A3 – This location had 19 angle crashes resulting from vehicle hesitation across RT 206 northbound or insufficient queue storage at the second, westerly internal stopping point within the intersection.

Location B

Located on the west side of the intersection at the second, westerly internal stopping point approximately 15 crashes with a mix of rear end, angle and side-swipe crash types making up the total. It is not uncommon for vehicles destined for northbound Whitehorse Road and eastbound S. Broad Street that yield to RT 206 northbound traffic to queue into Location B causing driver confusion and thru lane blockages at Location B.

Location C

Located on the northeast corner of the intersection where S. Broad Street and Whitehorse Road meet at the intersection a total of 16 angle and five rear end crashes occurred.

C1 – This location contained the 16 angle crashes which mainly resulted from driver confusion as to which driver had the right-of-way.

C2 – This location contained five rear end crashes which mainly results from driver confusion associated with unexpected queuing from location C2.

Location D

Located on the southern approach where RT 206 northbound meets the intersection a total of 16 angle and nine rear end crashes occurred.

D1 – This location contained the 16 angle crashes which mainly resulted from drivers not seeing any vehicles approaching on RT 206 northbound, then beginning to move across RT 206 northbound, and RT 206 northbound vehicles quickly approaching that would collide with vehicles trying to cross.

D2 – This location contained 9 rear end crashes from traffic queuing at Location D2 and driver inattention. Location D2 includes crashes along RT 206 northbound between the southern metering signal and the circle.

4. Crash Summary

The results from ***Table 5*** show that the annual crash frequency has increased from 46 to 54 crashes per year. The results also show the percentage of crashes that involved an injury increased from 16 to 26 percent and the annual number of injuries per year increased from 7 to 19 annually at this location. Although most of the statistics show the crash rate increasing, the percent and annual average of angle crashes has decreased.

Table 5 also shows the 2006 to 2008 crash results are above the 2008 statewide average for angle, rear end and side-swipe crash types.

Table 5: Crash Summary Comparison for Crashes Occurring at the Whitehorse Circle

	Jan 2000 – Jun 2001				Jan 2006 – Dec 2008			
Type	**No.**	**Percent**	**2001 State Avg Percent***	**Annual Avg**	**No.**	**Percent**	**2008 State Avg Percent***	**Annual Avg**
Angle	47	**68.12%**	22.09%	31	62	**38.51%**	25.32%	21
Rear End	10	14.49%	40.42%	7	68	**42.23%**	34.90%	23
Side-Swipe	6	8.70%	15.49%	4	23	14.29%	14.67%	7
Fixed Object	5	**7.25%**	6.53%	3	8	4.97%	6.93%	3
Right Turn	1	1.44%	N/A	1	0	0.00%	N/A	0
Total	69	100%	N/A	46	161	100%	N/A	54
	57 (83%) were reportable crashes 11 (16%) were injury crashes 13 injuries were reported (7 annual)				There were 0 (0%) fatal crashes 42 (26%) were injury crashes 56 injuries were reported (19 annual) 0 (0%) reported pedestrian/bicyclist crashes			

*2001 and 2008 NJDOT Bureau of Safety Programs Crash Summary – Total Crashes at Intersections for State System Roads (Excluding Toll Roads and Interstates)

As part of concluding the project for advancement, the 2009 to 2011 data was provided in 2012 for comparison to the 2006 to 2008 data. The new information showed that the overall crash totals and crash types were comparable to originally analyzed data.

V Social, Economic and Environmental Screening

An Environmental Screening was performed for the project by the NJDOT Division of Environmental Resources on March 8, 2010. Urban confirmed/updated the findings of this screening in November/December, 2011 and the results of the initial screening and update efforts are documented below. The screening confirmation/update was performed through review of readily-available on-line data sources. No additional field investigations were conducted for the update of the initial screening.

A. Community Outreach

The Community Involvement Plan developed for the CD study includes Local Officials Meetings (2), a Local Officials Briefing, and a Public Information Centers (PIC). The initial Public Officials Meeting was held on 9/22/11 and a second occurred on 4/17/12. A PIC was conducted on 9/27/12.

B. Noise and Air Quality

A review of recent aerial photography and a site visit indicates that air and noise sensitive receptors are within 300 feet of the project. These include residences to the southwest, northeast, and southeast. The proposed project is not anticipated to change the vertical alignment of the intersection and is expected to result in minor changes to the horizontal alignment. The project is not expected to result in significant increase in vehicle operating speeds.

The project is listed in Table 2 of the Transportation Conformity Rule as a Type 2 project (safety), and is therefore exempt from the conformity requirements of the Clean Air Act Amendments. This includes exemptions from Carbon Monoxide (CO), Particulate Matter PM 2.5 and PM 10 analyses requirements. Per the USEPA's document "Green Book Nonattainment Areas for Criteria Pollutants" (8/30/11), the project is located in a CO attainment area and PM 10 attainment area, but is in a PM 2.5 non-attainment areas (2006 Standard).

C. Socioeconomics

A review of recent aerial photography and a site visit indicates that there are no active or inactive farmlands in the project area. No community facilities are present at, or in the vicinity of, the project, and no impacts to these resources are anticipated. A review of the Hamilton Township website and recent aerial photography confirmed the absence of existing and planned community facilities in the project area.

There are residences to the southwest (single family dwellings; along Pearson Drive and Parent Avenue), southeast (apartments; parallel to CR 524), and northeast (single family dwellings; parallel to CR 524) of the circle. These are not expected to be displaced or otherwise adversely affected by the project. Currently, the roadway configuration allows direct access to Pearson Drive and residences and a school

(Delaware Valley School) in the southwest quadrant of the study area. Under the two (2) alternatives being considered, this direct access from the circle would be eliminated, and would be substituted by an improved access from CR 524 via Parent Avenue. This proposed change in access is not expected to be adverse.

The proposed project is not expected to result in displacements of businesses. One business (Taco Bell, located on the northeast quadrant of the circle; Block 2524, Lot 1) will incur minor alterations of their parking and two access points (one on CR 533 and the other on CR 524).

Due to the scope of the project, and anticipated minimal socioeconomic impacts, there is a low potential for Environmental Justice involvement.

D. Cultural Resources

A review of recent aerial photography and a site visit indicates that there are several buildings within, or in the vicinity of, the project that appear to be greater than 50 years old. NJDEP's NJ GeoWeb website and the NJDEP Historic Preservation Office's (HPO) website indicate that there is one State and National Register (SR and NR) of Historic Places listed historic district within the project study area- the Abbott Farm Historic District (HD). This district is also a National Historic Landmark and was listed on the NR and SR on 12/18/76 and 8/16/79, respectively. The Abbott Farm HD includes significant prehistoric occupation sites, as well as noteworthy historic homes, related archaeological components, historic sites, and the remains of transportation achievements-the Delaware and Raritan Canal and Camden and Amboy Railroad. The HD boundary lies west of US Route 206 Since the HD is a National Historic Landmark, the Advisory Council must be included in the Section 106 process once initiated. Because of known archaeological deposits, any proposal to construct roadway activities beyond the existing pavement will require systematic archaeological investigations. There are not bridges or culverts within the project study area.

E. Section 4(f) Properties

Several on-line resources were reviewed to identify the presence/absence of recreational Section 4(f) resources in, or in the vicinity of, the project area. These include NJ GeoWeb (State Open Space), and the Hamilton Township website and the NJDEP Green Acres Recreation and Open Space Inventory, or ROSI (parks and recreational facilities). The results of these reviews indicate that there are no planned or existing local/county parks and recreational facilties, no schools/athletic fields, nor wildlife refuges or wildlife management areas within the project study area.

NJ GeoWeb indicates the presence of one public school in the vicinity of the project-the Delaware Valley School, located southwest of the project area on Pearson Drive. Aerial photography shows the presence of a large cemetery to the immediate west of the project area along/fronting US Route 206-Colonial Memorial Park.

F. Highlands/Pinelands

The project area is not within either the Highlands Planning or Preservation areas, nor within the Pinelands Management Area.

G. Wetlands

A review of NJ GeoWeb mapping and aerial photography indicates that there are no waterways or wetlands within or adjacent to, the project study area. Freshwater tidal wetlands associated with Crosswicks Creek are mapped as occurring about 300 feet south of the anticipated project limits. Presence/absence of regulated wetlands will be confirmed through wetland delineation as part of the NEPA process during the Preliminary Design phase.

H. Reforestation

Though forested areas occur within the project area at two locations (within the US Route 206 NB to I-195 WB ramp infield, and along US Route 206 NB southeast of the circle), it is unlikely that tree removal, if required, would result in deforestation of ½ acre or more. Therefore, a reforestation plan pursuant to the NJ No Net Loss Reforestation Act is not expected to be required.

I. Floodplains

The project area is not within the 100-year flood plain as mapped by the applicable Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) (Panel # 15/20; Community Panel #340246 0015C, dated 6/18/90). The FIRM mapping indicates that the project area is in Zone C (area of minimal flooding).

J. Sole Source Aquifer

According to the USEPA, the project area lies within the New Jersey Coastal Plain Sole Source Aquifer Area. Pursuant to the Memorandum of Understanding between the FHWA, Region 1, and the USEPA, Region II, dated 7/9/84, the project would likely not require review under Section 1424(e) of the Safe Drinking Water Act; therefore, no further coordination will be required.

K. Threatened/Endangered Species

According to NJ GeoWeb, the NJDEP Landscape 2.1 Project data shows an Upland Forest area to the east of the circle (see above under Section H, Reforestation). According to the Landscape Project data, this forest area is documented habitat for Eastern box turtle and Great blue heron. The Landscape Project data also identifies the presence of Forested Wetlands and Emergent Wetlands approximately 900 feet south of the proposed project limits; these areas are documented habitats for the Great blue heron and the Great blue heron and cliff swallow, respectively. Lastly, the Landscape Project data shows that wetlands along Crosswicks Creek are documented

Bald eagle foraging habitat. The USFWS NJ Field Office website indicates that bog turtles (Federally Threatened) once occurred in Hamilton Township. Coordination with the US Fish and Wildlife Service and the NJDEP-Endangered and Nongame Species Program (ENSP) will be necessary in the Preliminary Design phase as part of the NEPA process.

L. Category 1 Waters/Trout Fishery Classification

As noted above in Section G-Wetlands, there are no waterways within or adjoining the project area. The closest waterway is Crosswicks Creek, located about 1800 feet to the south of the project area. Crosswicks Creek has a NJDEP Surfacewater Classification of FW2-NT.

M. Vernal Pools

A review of the NJ GeoWeb site and the NJDEP-Endangered and Nongame Species Program/Rutgers University Vernal Pool Mapping site show that no potential or documented vernal pools are within, or in the vicinity of, the project area.

N. Stormwater

A review of the existing drainage systems for the study area indicates that they are functional and there are no documented drainage problems. Implementation of the proposed project will likely result in a net increase of 0.25 acre of more of impervious surface and/or a land disturbance of greater than one acre (refer to Section P., below).

O. Hazardous Waste

NJ GeoWeb was reviewed and a site investigation was performed to identify presence of sites/businesses/land uses that indicate potential for involvement with hazardous or contaminated sites. The following NJ Geoweb hazardous materials listings were reviewed: Known Contaminated Sites List (KCSL), New Jersey Environmental Management System (NJEMS), Underground Storage Tanks (USTs), chromate sites, Groundwater Contamination Areas (CKE and CEA), and gas stations.

A number of sites having potential or existing hazardous waste or contamination are within or in proximity to the proposed ROW. A summary of the database review is presented below:

NJ KCSL: One site was identified- Exxon Station, 3151 South Broad Street; Block 2487, Lot 2 (southwest corner of circle). This is a closed site with restrictions, having a known source or release with contamination. Also listed on the NJEMS and is a CEA (see below).

NJEMS: Eleven (11) sites listed on the NJEMS database within, and/or adjacent to, the project site:

- Dell Tech-Solid Waste Transporter (Block 2487, Lot 2; 127 US Route 206)
- True Servent Pre-School Academy-Site Remediation Program (SRP), Child Care Facility (Block/Lot undetermined; 2630 S. Broad Street0
- Duplication Plus- Right-to Know Program (Block 2487, Lot 2; 127 US Route 206)
- Hess Brothers, Inc.-SRP, Wastewater Treatment License (Block 2487, Lot 2; 135 US Route 206)
- NJDEP Food Town Spill-Hazardous Waste Generator (Block/Lot undetermined; South Broad Street)
- Otis Elevator Co.-Hazardous Waste Generator (Block 2487, Lot 2; 127 US Route 206)
- Abalene Exterminating Co., Inc.-Pesticides Storage (Block 2487, Lot 2; 127 US Route 206)
- Fortune House Super, Buffet Chinese Restaurant-SRP, Wastewater Treatment License [Block 2488, Lots 1 and 21 (unconfirmed); 3150 South Broad Street]
- Verizon Communication-Right-to-Know Program (Block 2481, Lot 2; 3045 South Broad Street)
- Exxon Station- SRP WWT License and Hazardous Waste Generator, and Air Program ((Block 2487, Lot 2; 3151 South Broad Street). Also, on KCSL (see above).
- Verizon-Air Program (Block 2481, Lot 2; 3101 South Broad Street)

Underground Storage Tanks: Two (2) sites listed as USTs within, and/or adjacent to, the project site:

- Sizzler Restaurant [Block 2488, Lots 1 and 21 (unconfirmed; 3150 South Broad Street)
- Hess Brothers, Inc.(Block 2487, Lot 2; 135 US Route 206)

Chromate Sites: None within, or adjacent to, the project area.

Groundwater Contamination Areas (CEA): Exxon Station (Block 2487, Lot 2; 3151 South Broad Street), also listed on the KCSL, has a well restriction area of 0.5 acre, due to presence of ethyl benzene and xylene in groundwater.

Gas Stations: Currently there are none within, or adjacent to, the project area. There are former locations as previously listed.

It is recommended that a Phase 1 Hazardous Waste Screening be performed as part of the NEPA process in the Preliminary Design phase to identify potential hazardous waste areas of concern.

P. Anticipated Environmental Permits or Approvals

The proposed project will likely result in a land disturbance in excess of one (1) acre and/or the addition of >0.25 acre of impervious surface. Therefore, compliance with the NJDEP Stormwater Management Rules (NJAC 7:8) will be required. As no NJDEP-Division of Land Use Regulation (DLUR) permits are anticipated required, review /approval for Stormwater Management Rules compliance will be through NJDOT self-certification. The project will also require a NJDPES Construction Activity Stormwater General Permit (GP) Request for Authorization (RFA) (land disturbance greater than one acre), and a Soil Erosion and Sediment Control Plan Certification (land disturbance of greater than 5000 square feet).

Q. Environmental Summary with Probable NEPA Document Required

The anticipated NEPA environmental document required for implementation of the project is a Class II Action-- Categorical Exclusion, per 23 CFR 771.117 (d) (1) and (2).

VI Evaluation of Conceptual Alternatives

The focus of this phase was to develop fiscally responsible alternatives that met the project purpose and need and advance a Preliminary Preferred Alternative (PPA) into the Preliminary Engineering phase of the project delivery process. Two alternatives, a signalized intersection and a roundabout were the primary themes considered and advanced for further analysis.

A. Conceptual Alternatives

Seven (7) variations were initially considered. In addition to a "No Build" alternative (Alternative 1), three signalized concepts were designated Alternative 2, 3, and 4, and the three identified roundabout alternatives were designated Alternative 5, 5a, and 5b. The preliminary alternatives are depicted below with brief descriptions. An initial impact assessment was conducted to reduce the alternatives considered down to one variation of both a signalized intersection and a roundabout

No Build Alternative

This solution was provided initially for comparison. When considered for viability in relation to the project purpose and need, the alternative does not address the primary objective, which is to address safety concerns. Additionally, the low cost modifications provided by BSP as a means to address the crash history did not result in a substantial reduction of crashes.

Signalized Alternatives

The three signalized intersection alternatives convert the existing Circle into a four-way signalized, at-grade intersection with varying lane configurations. ***Figure 6*** shows the lane configuration of each signalized alternative and how each alternative varies from the previous.

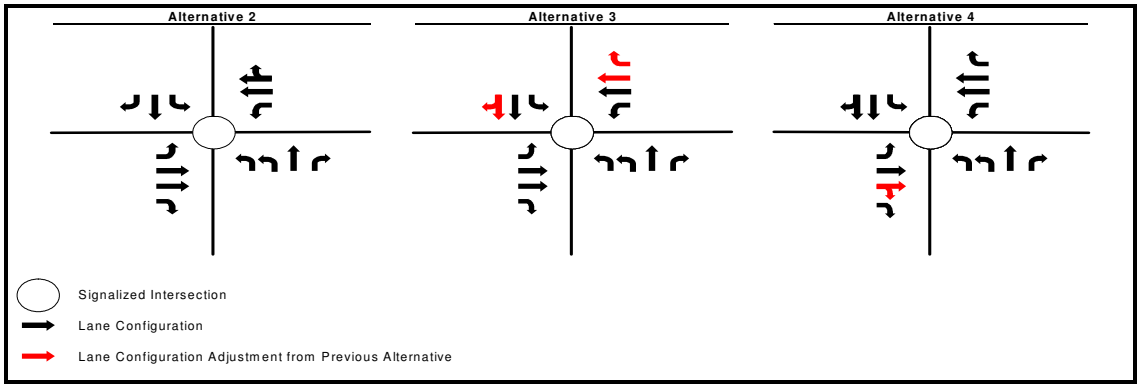

Figure 6 – Signalized Intersection Alternatives

Roundabout Alternatives

The three roundabout alternatives convert the existing Circle into a modern roundabout with varying number of approach and circulating lanes. ***Figure 7*** shows the lane configuration of each roundabout alternative. Alternative 5 is a full 2-lane roundabout with the exception of the single lane exit onto northbound Whitehorse Road. Alternatives 5a and 5b are single/dual lane hybrid roundabouts with varying number of approach, exit, and circulating lanes.

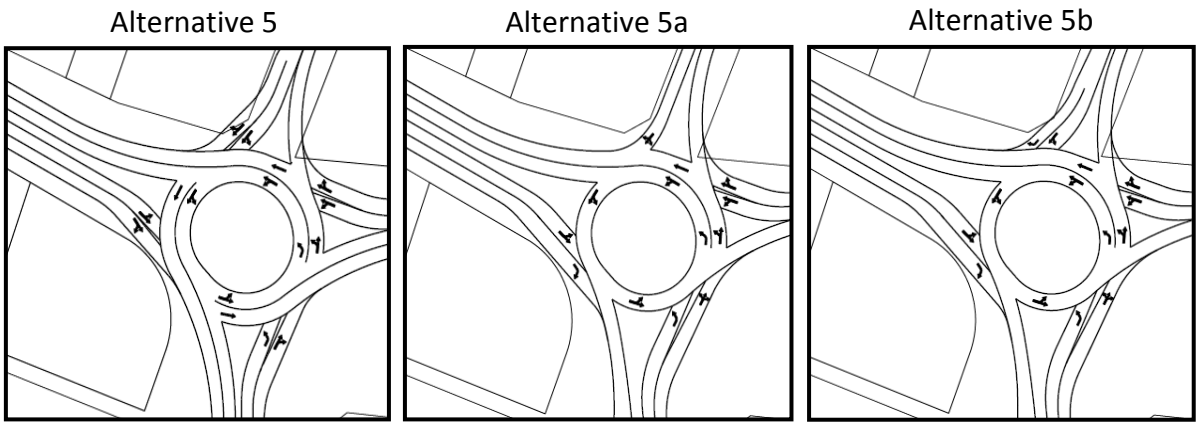

Figure 7 – Roundabout Alternatives

B. Traffic Analysis

Table 6 shows the SimTraffic LOS and delay results for the three signalized alternatives, and indicates that all three alternatives will operate at LOS C or better under 2035 future traffic conditions. Maximum queuing results for the signalized alternatives did not exceed 10 vehicles.

Table 6: 2035 SimTraffic Signalized Alternatives Peak Hour Levels of Service and Delay

	2035 DELAY (LOS)					
	Alt 2		**Alt 3**		**Alt 4**	
Approach	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Eastbound US Route 206	12 (B)	12 (B)	13 (B)	12 (B)	15 (B)	17 (B)
Westbound CR 524 (Broad Street)	20 (C)	22 (C)	17 (B)	18 (B)	23 (C)	27 (C)
Northbound US Route 206	24 (C)	18 (B)	18 (B)	15 (B)	21 (C)	18 (B)
Southbound CR 533 (Whitehorse Rd)	26 (C)	24 (C)	24 (C)	23 (C)	31 (C)	30 (C)
Intersection Total	19 (B)	17 (B)	17 (B)	15 (B)	21 (C)	21 (C)

Tables 7 and 8 shows the VISSIM simulation results for the 2009 and 2035 analysis years, respectively.

Table 7: VISSIM 2009 Roundabout Alternatives Peak Hour Levels of Service and Delay

	2009 DELAY (LOS)					
	Alt 5		Alt 5a		Alt 5b	
Approach	AM	PM	AM	PM	AM	PM
Eastbound US Route 206	3 (A)	5 (A)	5 (A)	19 (B)	5 (A)	20 (B)
Westbound CR 524 (Broad Street)	15 (B)	11 (B)	13 (B)	9 (A)	13 (B)	8 (A)
Northbound US Route 206	8 (A)	14 (B)	9 (A)	31 (C)	9 (A)	30 (C)
Southbound CR 533 (Whitehorse Rd)	19 (B)	14 (B)	41 (D)	57 (E)	26 (C)	29 (C)
Intersection Total	10 (A)	10 (A)	12 (B)	25 (C)	11 (B)	21 (C)

Table 8: VISSIM 2035 Roundabout Alternatives Peak Hour Levels of Service and Delay

	2035 DELAY (LOS)					
	Alt 5		Alt 5a		Alt 5b	
Approach	AM	PM	AM	PM	AM	PM
Eastbound US Route 206	3 (A)	6 (A)	-	-	7 (A)	66 (E)
Westbound CR 524 (Broad Street)	21 (C)	13 (B)	-	-	19 (B)	10 (A)
Northbound US Route 206	13 (B)	32 (C)	-	-	15 (B)	71 (E)
Southbound CR 533 (Whitehorse Rd)	30 (C)	26 (C)	-	-	95 (F)	164 (F)
Intersection Total	14 (B)	17 (B)	-	-	22 (C)	68 (E)

Table 7 shows that all three roundabout alternatives will work under existing traffic conditions with LOS D or better for all approaches with the exception of the southbound White Horse Avenue approach which operates at LOS E during the PM peak hour for Alternative 5a. ***Table 8*** shows the future 2035 traffic conditions results which indicate that a full 2-lane roundabout (Alternative 5) will be required to process the future traffic volumes. Alternative 5a with a single lane approach on White Horse Avenue was not analyzed for 2035 conditions due to failing LOS results from Alternative 5b with a dual southbound approach.

C. Hydrology & Hydraulics Analysis

The existing location sits at the high point of the intersecting roadways. There is an existing drainage system in place that captures surface drainage in several locations. Due to the anticipated reconstruction of the project location, the existing drainage system will be replaced.

Stormwater Management Assessment

The proposed White Horse Circle project is anticipated to be classified as a Major Development and subject to the Stormwater Management Rules. The current amount of net impervious coverage is 0.34 acres, and may be reduced slightly if the opportunity to remove a small portion of existing impervious pavement from Pearson Drive is feasible. The following summarizes the added coverage elements.

Table 9: Stormwater Coverage Assessment

Coverage Element	SF	Acres	TSS Removal
Existing Pavement	129,520	2.97	
Proposed Pavement	115,396	2.65	
Proposed Shoulder	20,871	0.48	
Proposed Sidewalk	8,124	0.19	
Net Change Pavement	6,747	0.16	80%
Net Change Sidewalk	8,124	0.19	NA
Total Added Impervious	14,871	0.34	
Reconstructed Pavement Portion	TBD	TBD	50%

Sidewalks are not subject to the water quality restrictions, but apply to impervious coverage totals and pre and post runoff peak analyses.

D. Right of Way Impacts and Review

A preliminary assessment of the proposed alternatives anticipated impacts of varying magnitude at the four properties adjoining the current circle. For each alternative, the expectation was that impacts would likely occur on the properties at the following locations:

- Block 2488, Lot 20
- Block 2487, Lot 2
- Block 2524, Lot 1
- Block 2523, Lot 1

Initial impacts were summarized in the Alternatives Matrix (see ***Appendix C- Access-Right of Way-Jurisdiction-Property Data***) with limited impacts to the properties that would not adversely impact the property function or operations. The larger signalized intersections generated more impact but not to a level that would be considered adverse.

E. Complete Streets Policy

The NJDOT Complete Streets Policy was established to improve bicycle and pedestrian safety, reduce traffic congestion, and provide/improve multi-modal connections through consideration of pedestrian, bicycle, and transit accommodations in the planning, design, construction, maintenance, and operation of new and retrofit transportation facilities.

Sidewalks are present throughout most of the project area, and the existing facilities are pedestrian compatible with the exception of the US Route 206 southern approach (no sidewalks). The study area is bicycle compatible with the exception of the US Route 206/CR 524 approach, which has stormwater inlets that are not bicycle compatible.

The project area is urban/suburban and local activities (i.e., residences, businesses) are present that generate walking and bicycling trips. Therefore, there is a documented need for pedestrians to cross, as well as travel through, this corridor.

The Complete Streets Checklist has been addressed and is included in ***Appendix J-Preliminary Preferred Alternative.***

F. Access Impacts and Review

A preliminary assessment of the existing condition was developed as part of the CD effort. An Access Impact Summary is provided in ***Appendix C-Access-Right of Way-Jurisdiction-Property Data***. For each alternative, the expectation was that impacts would occur. Primarily, the signalized intersections led to more impacts but not to a level that would be considered adverse.

G. Constructability and Staging Plans and Detour Plan

A preliminary assessment of the proposed alternatives was developed. For each alternative, it was determined that the project would be completed through a staged construction process. The incorporation of a detour could provide high value but the concern of access to the surrounding areas during the detour outweighs the benefit. The anticipated solution would be to maintain one lane of traffic in each direction as the current circle operates in that fashion.

H. Controlling Substandard Design Elements and Reasonable Assurance

The proposed alternatives were developed to incorporate the current minimum design criteria not adversely change the current elements. The existing deficient shoulders, as previously listed are to remain and not be further compromised.

I. Construction Cost Estimate

A preliminary order of magnitude cost assessment was developed for initial comparison. The costs initially ranged from approximately $1.5 million to $2.4

million. Primarily, the signalized intersections were slightly higher due to signal equipment costs but not to a level that would be considered adverse.

Costs for each considered alternative is captured in the Preliminary Alternatives Matrix provided in ***Appendix H-Alternatives Matrix***.

J. Alternatives Matrix

The Preliminary Alternatives Matrix is provided in ***Appendix H-Alternatives Matrix***.

K. Discussion with Subject Matter Experts

Subject Matter Experts were involved through the Concept Development phase of the project. Involvement was initiated at the start of the project within the scope group meeting and continued through the SME specific meetings and coordination. Relevant information is compiled in ***Appendix I–Coordination.***

L. Preliminary Preferred Alternative (PPA)

After consideration and discussion with NJDOT, Mercer County and Hamilton Township officials, the decision is to advance Alternative 5, a two lane roundabout as the PPA. The solution addresses the established purpose and need, and was viewed favorably by the participating entities. All movements (e.g., from US Route 206 to Whitehorse Avenue) currently provided at the circle will be provided with the PPA design with the exception of access to Pearson Drive.

Specifically, the PPA consists of the following:

- Provides for two lanes on each approach
- Provides for two circulating lanes and two exit lanes with the exception of Northbound Whitehorse Avenue, which will have one exiting lane
- Traffic currently using the one-way entrance to Pearson Drive from the circle will access Pearson Drive via Parent Avenue and the existing alley way or will use Hobson Avenue from the intersection with South Broad Street.
- Construction of crosswalks and sidewalks where appropriate
- Removes the metering signal at MP 38.81 (including signal equipment, and pavement markings)
- Revises signs and pavement markings (removes/adds) at and on the approaches to be consistent with latest MUTCD signing and pavement marking standards for roundabouts
- Relocates utility poles

The PPA reduces the number of conflict points and eliminates the yielding while in the circle condition thereby helping to reduce confusion which should help reduce the number of crashes. The PPA also provides a reduction in average vehicle delay,

provides for a gradual speed reduction into the local Hamilton Township and Mercer County transportation network and has operational capacity for the long-term.

To further advance the solution and refine the PPA for advancement into the Preliminary Engineering Phase of the project delivery process, several vital SMEs were asked to provide concurrence on the current design concept. Below is a summary of the key SME discussions. The memos and the comment resolution are provided in ***Appendix I-Coordination***.

1. Geometrics

Information was developed in support of the roundabout concept, specifically, truck turning movements, fastest path calculations and entry and exit geometry. The supporting documentation is provided in ***Appendix J-Preliminary Preferred Alternative.***

2. Traffic

The Bureau of Traffic Engineering (BTE) reviewed the traffic results and initially indicated that a signalized intersection was preferred due to the shorter queue lengths in the 2035 design year. After some discussion and additional traffic analysis, BTE indicated that the roundabout alternative is acceptable as the preliminary preferred alternative with the qualification that in the future, a northbound right-turn lane may be added to ease the potential queuing. The supporting documentation is provided in ***Appendix I-Coordination***.

3. Right of Way

Impacts to existing Right of Way were refined and calculated for the PPA. This project requires permanent right of way acquisitions from one (1) parcel, which will also require temporary site mitigation work easements. The parcel, acquisition and temporary easement areas are outlined in the ***Table 10***

Table 10: Right of Way Impacts

Block	Lot	Total Area	ROW Taking	T.S.M.W. Easement
2524	1	0.701 acres	0.033 ac.	0.100 ac.

A cost estimate was requested from the Bureau of Right of Way and provided. The memo is provided in ***Appendix I–Coordination.***

4. Access

The PPA was provided to the Bureau of Access Design for concurrence with the design. It was determined that the following would be necessary in the future phases of the project delivery process:

- Those driveways located with-in the State Jurisdiction and impacted by the proposed improvements. These can be either, Changes, Adjustments and/or Modifications to the property access and will require a Access Design Cutout (ACO).
    a. Block 2488 Lot 20
    b. Block 2524 Lot 1
    c. Block 2524 Lot 29
    d. Block 2487 Lot 2
    e. Block 2523 Lot 1
- Those driveways located outside the State Jurisdiction, falling under the Local or County Jurisdiction and are impacted by the proposed improvements. These driveways are not covered under the State's Access Code, but will require an ACO stating such and will be labeled Changes to Access.
    a. Block 2488 Lot 2
    b. Block 2488 Lot 21
    c. Block 2488 Lot 1
    d. Block 2488 Lot 3
    e. Block 2488 Lot 4

5. Anticipated Environmental Document/Stormwater Management

The anticipated NEPA environmental document required for implementation of the project is a Class II Action-- Categorical Exclusion, per 23 CFR 771.117 (d) (1) and (2).

The PPA is anticipated to be classified as a Major Development and subject to the Stormwater Management Rules.

6. Constructability

A request was made to NJDOT Construction for a review of the preliminary staging concept provided in ***Appendix J-Preliminary Preferred Alternative***. Two concerns were offered as initial concerns, specifically with regard to Utilities and Material and Equipment Staging. In response, the following responses were provided:

- *Potential Constructability Concern – Utilities* - At this phase, the effort only incorporates completion of utility letter #1. To construct the PPA, we expect some aerial facility relocations and expect to minimize the underground work by maintaining the existing elevations/footprint and trying to limit any major excavation.
- *Potential Constructability Concern – Staging areas for equipment* - Specific to staging, it was preliminarily assumed that the contractor would use the DOT

right of way adjacent to Pearson Drive and/or possibly use part of Pearson Drive to stage the project.

7. Cost

The project cost was further developed with the determination of a PPA. The estimated construction costs for the project are $2.28 Million. Utility Relocation Costs are approximated to be $274,000 and Right of Way Costs are $54,000.

Preliminary Engineering is estimated to be $500,000: Final Design is estimated to be $600,000 and Construction Engineering is estimated to be $360,000.

M. Preliminary Engineering Scope Statement

The Preliminary Engineering Scope Statement is available in ***Appendix L***.

VII Concept Development Recommendation

A. Federal Highway Administration (FHWA) Approval of Report

Pending

B. Capital Program Screening Committee (CPSC) Recommendation

Pending

C. Capital Program Committee (CPC) Approval

Pending