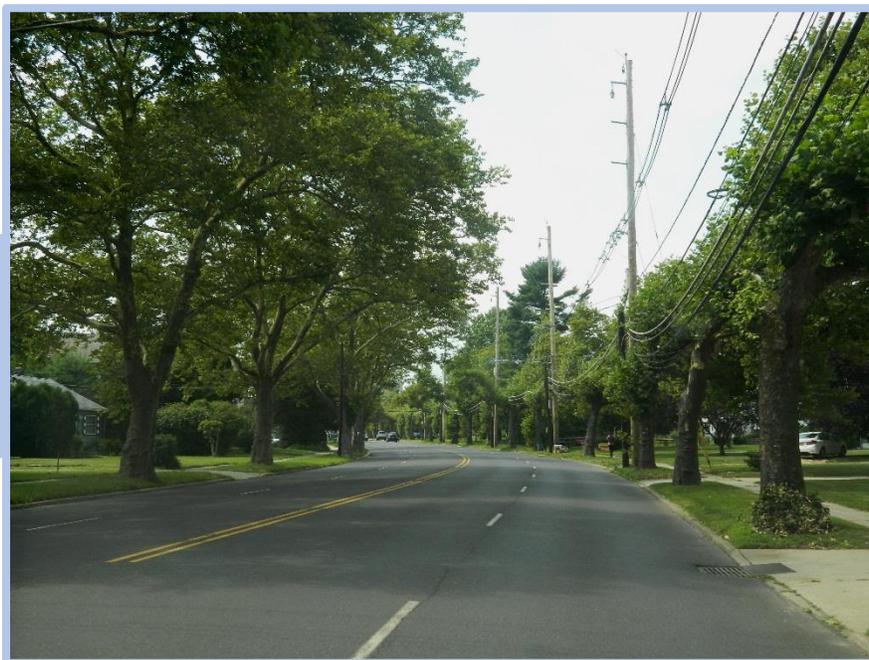


# CONCEPT DEVELOPMENT REPORT

Mercer County Route 634 (Parkway Avenue), Scotch Road  
(CR 611) to Pennington Road (NJ 31) MP 2.20 – MP 4.40



**Prepared for:**

Bureau of Safety, Bicycle and Pedestrian Programs  
Division of Statewide Planning

**Prepared by:**

**Michael Baker**  
INTERNATIONAL

Michael Baker International, Inc.  
300 American Metro Boulevard

July 2019

# CONTENTS

- I. Introduction .....1
  - A. Foreword .....1
  - B. Original and Successor Projects .....2
  - C. Data Reviewed .....3
  - D. Design Standards .....3
  - E. Characteristics of the Roadways and Surrounding Area .....4
  - F. Concept Development Scope Statement .....4
  - G. CD Public Involvement Action Plan .....4
- II. Purpose and Need .....5
  - A. Bridge Needs .....6
  - B. Scour Needs .....6
  - C. Maintenance Needs .....6
  - D. Roadway Needs .....6
  - E. Goals and Objectives .....6
- III. Existing Inventory and Condition .....6
  - A. Existing Bridge Inventory and Condition .....7
  - B. Existing Drainage and Stormwater Inventory and Condition .....7
    - B-1 Hydrology .....7
    - B-2 Stormwater Management .....7
    - B-3 Existing Drainage Evaluation .....7
  - c. Scour .....8
  - d. Maintenance issues .....8
  - e. Existing Roadway Inventory and Condition .....8
    - E-1 Major Cross-Sectional Elements and Geometry .....8
    - E-2 Intersections .....8
    - E-3 Existing Pavement .....9
    - E-4 Curbs, Guiderail, Median Roadside Barrier .....9
    - E-5 Highway Lighting .....9
    - E-6 RaiRoad Crossing .....9
    - E-7 Land Use .....9
    - E-9 Access .....9
    - E-10 Complete Streets Compatibility .....9
    - E-11 Public Transportation .....10



f. Existing Utilities .....	10
g. Summary of Existing Deficiencies .....	11
h. List of Substandard DDesign Elements.....	11
i. Management Systems Input .....	12
J. As-Built Plans, Right of Way Maps and Jurisdiction Map .....	12
IV. Traffic and Crash Summary .....	12
A. Traffic Operations.....	12
B. Traffic DAta .....	13
C. Traffic Volume Forecasts .....	14
D. Crash Data Analysis and Crash Diagram .....	14
E. PrEdictive Crash ANalysis.....	15
V. Social, Economic and Environmental Screening.....	16
A. Community Outreach .....	16
B. Noise and Air Quality .....	17
C. Socioeconomics .....	17
D. Cultural Resources.....	17
E. Section 4(f) Properties .....	18
F. Highlands/Pinelands .....	18
G. Wetlands .....	18
H. Reforestation.....	18
I. Floodplain .....	18
J. Sole Source Aquifer .....	18
K. Threatened/Endangered Species .....	18
L. Category 1 Waters .....	18
M. Vernal Pools.....	18
N. Stormwater .....	19
O. Hazardous Waste .....	19
P. Anticipated Environmental Permits or Approvals .....	20
Q. Environmental Summary with Probable NEPA Document Required .....	20
VI. Evaluation of conceptual alternatives .....	21
A. Bridge Rehabilitation versus Bridge Replacement .....	21
B. Temporary Bridge Location and Widening Constraints.....	21
C. Conceptual Alternatives .....	21
C-1 Alternative 1 – No Build ‘A’: 4 Lanes Undivided .....	22



C-2 Alternative 2 – No Build ‘B’: Modified Road Diet .....	22
C-3 Alternative 3 – Basic Road Diet .....	22
C-4 Alternative 4 – Enhanced Road Diet.....	22
C-5 Reduced Roadway Width & Sidepaths .....	23
C-6 Intersection/Spot Improvements .....	23
D. Traffic Analysis.....	24
E. Hydrology & Hydraulics Analysis .....	25
F. Right of Way Impacts and Review .....	26
G. Utility Impacts .....	26
H. ITS Facilities .....	26
I. Complete Streets Policy.....	26
J. Access Impacts and Review .....	26
K. Constructability and Staging .....	27
L. Controlling Substandard Design Elements .....	27
M. Construction Cost Estimate .....	27
N. Value Engineering Study and Report.....	28
O. Life Cycle Cost Analysis .....	28
P. Alternatives Matrix .....	28
Q. Risk Register .....	28
R. Discussions with Subject Matter Experts.....	28
S. Preliminary Preferred Alternative (PPA) .....	28
T. Preliminary Engineering Scope Statement .....	29
VII. Concept Development Recommendation .....	29
A. Federal Highway Administration (FHWA) Approval of Report .....	29



## Appendices

- A. Straight Line Diagrams
- B. CD PIAP
- C. Environmental Screening
- D. Correspondence
- E. As-Built Plans
- F. Historical and Predictive Crash Data and Analysis
- G. Community Profile
- H. Traffic Count Data
- I. ADA Compliance Memo and Complete Streets Checklist
- J. Project Fact Sheet
- K. Field Work Inventory
- L. Drainage and Stormwater Memorandum
- M. Utility Communication
- N. Controlling Substandard Design Elements Memorandum
- O. PE Scope Statement
- P. Background Growth Rate Memorandum
- Q. Conceptual Alternatives
- R. Maintenance and Protection of Traffic
- S. Cost Estimates
- T. Alternatives Matrix
- U. Risk Register
- V. Preliminary Preferred Alternative
- W. Photos



## I. INTRODUCTION

### A. FOREWORD

Michael Baker International, Inc. (Michael Baker) was tasked by the New Jersey Department of Transportation (NJDOT) Office of Bicycle and Pedestrian Programs (OBPP) to perform a Safety Concept Development (CD) Study on Mercer County Route 634 (Parkway Avenue) from Scotch Road, milepost (MP) 2.20, to Pennington Road (NJ 31), MP 4.40 (eastbound and westbound) in Ewing Township and the City of Trenton, Mercer County, New Jersey. This NJDOT CD Study is being performed through the Federal Highway Administration's (FHWA) Highway Safety Improvement Program in collaboration with project partners Mercer County and the Delaware Valley Regional Planning Commission (DVRPC). The purpose of the HSIP is to achieve a significant reduction in traffic fatalities and serious injuries on all public roadways through a data-driven, strategic approach to improving highway safety.

As part of this CD Study, existing roadway conditions within the project limits were reviewed and assessed, opportunities and deficiencies were identified, conceptual alternatives were developed and evaluated, and a Preliminary Preferred Alternative (PPA) was selected to advance to Preliminary Engineering (PE), Final Design (FD), and Construction. The PPA will be further refined and detailed in the PE and FD Phases. In accordance with the HSIP, the primary goal of this CD Study is to develop and advance a PPA that improves substantive safety for all roadway users along Parkway Avenue within the project limits, is feasible, cost effective, meets the applicable design standards, and is supported by the community. Secondary goals of the study include:

- Upgrade existing signalized intersections to meet current standards
- Upgrade of traffic control and other design elements to include crash countermeasures with quantifiable safety improvements
- Upgrade curb ramps to meet ADA standards
- Upgrade curbs, sidewalk, and driveways where appropriate
- Improvements at area schools (Parkway Elementary School and Ewing High School)
- Complete Streets compliance

The project limits and study area for this CD Study are shown in Figure 1. Additionally, Straight Line Diagrams of the project area are included in Appendix A.



Figure 1: Project Location Map



## B. ORIGINAL AND SUCCESSOR PROJECTS

Prior to the initiation of this Safety CD Study, Parkway Avenue has been the focus of several safety and mobility improvement studies, plans, and projects. Documentation, results, and goals from these initiatives were reviewed and considered during the development of alternatives within the study limits. These initiatives are summarized below:

- In January 2013, a General Motors/Naval Air Warfare Center - Parkway Avenue Redevelopment Plan was completed and adopted by Ewing Township. The redevelopment plan focuses on improving the former sites and meeting goals for community vision, land use, and circulation, many of which are transportation-oriented.
- In October 2013, a Trenton Senior Mobility Workshop was conducted at the ECHO, Inc. Senior Center in Trenton. The workshop resulted in a final report which identified safety concerns along Parkway Avenue between Parkside Avenue and Pennington Road and at Parkway Avenue and Olden Avenue. The report included a matrix of high-level improvement recommendations.
- In July 2014, the Parkway Avenue Redevelopment Area Transportation Study was completed for Mercer County in partnership with Ewing Township under the Delaware Valley Regional Planning Commission (DVRPC) Transportation and Community Development Program. The purpose of the study was to develop a staged transportation plan to meet the mobility needs of the proposed Parkway Avenue Redevelopment Plan. The study culminated with recommended build concepts that included improvements which impact the Parkway Avenue corridor:
  - Install southbound left-turn lane at Parkway Avenue and Lower Ferry Road
  - Extend Silvia Street, linking the proposed Ewing Town Center to Parkway Avenue
  - Implement road diet along Parkway Avenue
  - Signalized or Roundabout Improvement at Parkway Avenue and Scotch Road/Silvia Street

- Corridor-wide bicycle and pedestrian improvements, including bike lanes along Parkway Avenue
- In November 2015, the New Jersey Department of Transportation (NJDOT) in conjunction with the Metropolitan Planning Organizations in New Jersey initiated a Road Diet Pilot Program. The program evaluated corridors in New Jersey to identify non-state maintained roadways as possible candidates for road diet projects. Parkway Avenue (CR 634) was selected as the candidate in the Delaware Valley Regional Planning Commission region to advance for a full safety analysis.
- In September 2017, a section of Parkway Avenue between Lower Ferry Road, MP 2.67, and Olden Avenue, MP 3.25, was converted from a four-lane undivided cross section with two through lanes in each direction to a four-lane cross section with a two-way left turn lane (TWLTL), two eastbound lanes, and one westbound lane.

### C. DATA REVIEWED

As part of the data collection phase of the project, available data was requested and reviewed to assess the existing conditions of the corridor. This information was evaluated to determine areas of nonconformance with current design standards.

- Available As-built Plans provided by Mercer County (Appendix E)
- Environmental Screening Report performed by NJDOT Bureau of Landscape Architecture and Environmental Solutions (BEPR), prepared in 2013 (Appendix C)
- Crash Data - Reportable crash data for the most recent five years (2011-2016) were obtained from the NJDOT – Bureau of Transportation Data and Safety in July 2017. (Appendix F)
- Traffic Count Data (Appendix H)
  - Turning Movement Counts (TMC) were performed on September 13, 2017 at the following intersections:
    - Parkway Avenue and Scotch Road
    - Parkway Avenue and Lower Ferry Road
    - Parkway Avenue and Farrell Avenue
    - Parkway Avenue and N. Olden Avenue/Lexington Avenue
    - Parkway Avenue and Parkside Avenue
    - Parkway Avenue and Pennington Road
  - Automatic Traffic Recorders (ATR) were installed to collect bi-directional traffic volumes from September 12, 2017 to September 20, 2017 at the following locations:
    - Parkway Avenue, east of Walter Street
    - Parkway Avenue, east of N. Olden Avenue/Lexington Avenue

In addition to existing data collection, field investigations were performed to verify the existing conditions. Documented assessments of existing curb ramps and pedestrian control features at all intersections in the project limits were performed and included in the ADA Compliance Memorandum in Appendix I.

### D. DESIGN STANDARDS

The following design standards and guidance were used in the development of the project alternatives:

American Association of State Highway and Transportation Officials (AASHTO)

- A Policy of Geometric Design of Highways and Streets 6<sup>th</sup> Edition, AASHTO, 2011



- Guide for the Development of Bicycle Facilities 4<sup>th</sup> Edition, AASHTO, 2012
- Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1<sup>st</sup> Edition, AASHTO, 2004
- Highway Safety Manual, 1<sup>st</sup> Edition, AASHTO, 2010

#### Federal Highway Administration (FHWA)

- Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), FHWA, 2009 Edition, Rev. 2.

#### New Jersey Department of Transportation (NJDOT)

- NJDOT Roadway Design Manual, 2015
- NJDOT Bicycle Compatible Roadway and Bikeways Guidelines, 1996
- NJDOT Design Exception Manual, 2012
- NJDOT Access Design Guidelines, 2012
- NJDOT State Highway Access Management Code, November 2014
- NJDOT Complete Streets Policy No. 703, December 3, 2009
- NJDOT State Soil Erosion and Sediment Control Standards, 2008
- NJDOT Drainage Design Manual
- NJDOT Construction Cost Estimating Guide, 2006

#### Additional References

- NCHRP Report 672, Roundabouts: An Informational Guide 2<sup>nd</sup> Edition, TRB
- Crash Modification Factor Clearinghouse, FHWA
- Highway Capacity Manual (HCM) 2010
- NJDEP Stormwater Management Guidelines
- NJAC 7:8

### E. CHARACTERISTICS OF THE ROADWAYS AND SURROUNDING AREA

Parkway Avenue is classified as a Minor Principal Arterial with posted speed limits ranging from 35 MPH to 40 MPH. The Parkway Avenue corridor is a vital connection to the local Ewing and Trenton communities, serving residential neighborhoods, public transit routes, two schools, major employment centers including the NJDOT, and nearby places of interest like Trenton-Mercer Airport and The College of New Jersey. There are six signalized intersections within the project limits. Parkway Avenue Straight Line Diagrams are included in Appendix A.

### F. CONCEPT DEVELOPMENT SCOPE STATEMENT

As this project is being performed through the Highway Safety Improvement Program and did not originate through the NJDOT Capital Project Management, a formal CD Scope Statement was not prepared prior to initiation of the CD Phase. A scope of work was developed with concurrence from NJDOT and FHWA, in accordance with the NJDOT Capital Project Delivery CD Phase processes. This included the appropriate tasks (Data Collection, Alternative Development and Analysis, selection of a PPA, and preparation of a CD Report) and associated activities to advance the project to Preliminary Engineering.

### G. CD PUBLIC INVOLVEMENT ACTION PLAN

As safety and mobility improvements along this vital link will directly impact the adjacent communities and frequent roadway users, a robust CD Public Involvement Action Plan (PIAP) was developed to engage



local leadership, stakeholders, and the community, and maintain ongoing participation in the planning process. The purpose of the public involvement effort for the project is to have an informed and involved public who has access to the design options and is a collaborative part of the transportation development process. The CD PIAP is designed to actively seek public input so that improvements can be developed to address community needs, public concerns, and build public support for proposed projects. Below is a summary of the PIAP and public outreach efforts conducted throughout the length of the project. The CD PIAP, including a list of project stakeholders is included in Appendix B. A summary of public communications, including meeting summaries, agendas, and attendance documentation is included in Appendix D.

The goals of the PIAP are:

- Provide clear, concise information on where the public will be involved in the project process and where they can learn about its progress.
- Address public involvement activities from project inception throughout project development.
- Provide an effective and convenient mechanism for the general public to offer feedback.
- Obtain public input during the Concept Development process.

The project team identified key stakeholders and developed a mailing list to disseminate information. The mailing list was re-evaluated and maintained throughout the project's life. This list was utilized to send project related information. Stakeholders included state, county, and local representatives, property owners within 300 feet of the project limits.

The CD PIAP identifies the Study Advisory Committee (SAC) which included representatives from NJDOT, FHWA, Mercer County, DVRPC, TMA, local partners and key advocates with bike/pedestrian safety experience and provides a timeline and objectives for public meetings and outreach events. Four in-person SAC meetings were held throughout the duration of the study.

Two "rounds" of public meetings, which included separate meetings with local officials and stakeholders, and a Public Information Center (PIC) were conducted at the conclusion of the data collection task and at the conclusion of the alternatives analysis task. The first round of public meetings introduced the project, provided a summary of data collection and existing conditions analyses, and solicited input for the project's purpose and need and development of preliminary alternatives. The second round of meetings presented the alternatives development and analysis process and solicited input and feedback on alternatives to assist with selection and refinement of the PPA.

## II. PURPOSE AND NEED

The overall purpose of this project is to recommend, advance, and implement safety improvements along Parkway Avenue within the project limits. This CD Study will review and assess existing roadway conditions, identify opportunities and deficiencies, develop and evaluate improvement alternatives, and select a Preliminary Preferred Alternative (PPA) to advance to design and construction.

This study was initiated through the Federal Highway Administration's (FHWA) Highway Safety Improvement Program (HSIP). The goal of this program is to achieve a significant reduction in traffic fatalities and serious injuries, on public roadways through a data-driven, strategic approach to improving



highway safety. This Safety CD Study will strive to maximize substantive safety along the Parkway Avenue corridor for all roadway users.

#### A. BRIDGE NEEDS

There are no bridges within the project study area; bridge needs are not applicable.

#### B. SCOUR NEEDS

There are no waterways within the project study area; scour needs are not applicable.

#### C. MAINTENANCE NEEDS

While no existing maintenance needs or concerns were identified, Mercer County Engineering requested that potential road diet alternatives concepts not include curb extensions along the mainline of Parkway Avenue, as they may interfere with snow removal and plowing procedures.

#### D. ROADWAY NEEDS

Parkway Avenue has numerous sidewalk obstructions, missing ADA curb ramps, faded or missing crosswalks, no bike lanes and lack of bus stop amenities. A Pedestrian Road Safety Audit was conducted on November 9, 2017 to identify deficiencies and areas for safety improvements. There is also a need for geometric, traffic signal and safety improvements that will mitigate the overrepresentation of crashes within the corridor. The study will include an evaluation of traffic calming measures, Complete Streets, pedestrian scale lighting and mid-block crossing locations.

#### E. GOALS AND OBJECTIVES

While the primary purpose of the CD Phase is to advance a Preliminary Preferred Alternative to the PE, FD, and construction, the Parkway Avenue project has a number of project-specific goals. The primary goals include:

- Reduce the frequency and severity of crashes within the project corridor
- Improve mobility and accessibility for bicyclists and pedestrians
- Upgrade the corridor to comply with NJDOT, Mercer County, and municipal Complete Streets Policy

Secondary goals of the CD study will address highlighted problem areas. These include intersection improvements, substandard design elements, ADA compliancy, drainage, and signal upgrades.

### III. EXISTING INVENTORY AND CONDITION

A field inventory and investigation into the existing condition of project corridor was performed as part of the Parkway Avenue CD Study. This also included a multi-disciplinary Pedestrian Road Safety Audit conducted in November 2017. Data collection teams investigated various aspects of the project study area and roadway elements including existing pavement, utilities drainage, bicycle and pedestrian facilities, roadway and roadside conditions, and socioeconomic data. A comprehensive traffic volume data



collection program was implemented which supported traffic operations analyses for both no-build and alternative models (detailed further in Section IV.). A detailed summary of the project study area existing conditions data is summarized in the Project Fact Sheet, included in Appendix J.

## A. EXISTING BRIDGE INVENTORY AND CONDITION

There are no bridges or roadway structures within the project study area.

## B. EXISTING DRAINAGE AND STORMWATER INVENTORY AND CONDITION

A Drainage and Stormwater Management Evaluation Technical Memorandum was prepared to evaluate the existing conditions. The memorandum is attached in Appendix L. The following provides a summary of the memorandum.

---

### B-1 HYDROLOGY

The entire project area is within two (2) Hydrologic Unit Code (HUC) 14 areas: 02040105240020 – Assunpink Creek (below Shipetaukin Creek) and 02040105210080 – Alexauken Creek / Moore Creek / Jacobs Creek. Within the project area, there are seven (7) sub-area watersheds as shown on the Drainage Area, Soil Type, and Land Use Map 1 and 2 in Appendix L. The sub-watersheds were delineated using ArcHydro. A field investigation was performed to confirm these watershed boundaries. Watershed 1 is located within HUC-14 02040105210080 and the remainder are in HUC-14 02040150240020. The watersheds are characterized by substantial urban development, including residential, commercial, and industrial areas. These watersheds are part of the overall Delaware River basin. Soil Types were identified using the NJDEP Mercer County Soil Database. The land uses were identified using the NJDEP Land Use Layer -2012 Land Use. Many inlets were Identified as not meeting the new standard regulations and are noted.

---

### B-2 STORMWATER MANAGEMENT

The project area is developed, consisting primarily of impervious surfaces. The existing topography is level. There are no major stream crossing/outfalls within the study limits. The roadway is mostly drained by the existing storm sewer system which creates a short flow path and a low time of concentration.

---

### B-3 EXISTING DRAINAGE EVALUATION

A field investigation was performed to confirm the watershed boundaries, and to assess the presence of drainage structures. The field investigation was performed on the morning of 10/24/2017, with weather conditions at 52 degrees Fahrenheit and intermediate rain events with about +/-1 in of rainfall. Detailed information from the field investigation is included in Appendix K.

During Preliminary Engineering, an additional survey of the project area will be recommended to clearly identify drainage structure locations and elevations, and sizes and connections of pipe systems. Lastly, some of the curb-openings throughout the project site do not follow the NJDEP Eco requirements.



## C. SCOUR

There are no waterways within the project study area.

## D. MAINTENANCE ISSUES

No existing maintenance issues were identified within the project study area.

## E. EXISTING ROADWAY INVENTORY AND CONDITION

### E-1 MAJOR CROSS-SECTIONAL ELEMENTS AND GEOMETRY

In general, the existing right of way (ROW) width is 80' along the main line, with pavement widths ranging from 30' to 48'. The Parkway Avenue ROW lines were determined utilizing available as-builts and tax maps and are included in Appendix E. Parkway Avenue is classified as a Minor Principal Arterial with posted speed limits ranging from 35 MPH to 40 MPH.

**Table 1 – Existing Roadway Section**

Mileposts	Pavement Width	Typical Cross Section
MP 2.20 – 2.67	48'	Two (2) – 12' thru lanes in each direction, no shoulders, no median
MP 2.67 – 3.25	48'	Two (2) – 12' EB thru lanes, One (1) – 12' WB thru lane, One (1) – 12' TWLTL, No shoulders, No median
MP 3.25 – 4.11	44'	Two (2) – 11' thru lanes in each direction, no shoulders, no median
MP 4.11 – 4.40	30'	One (1) – 15' thru lane in each direction, no shoulders, no median

### E-2 INTERSECTIONS

Parkway Avenue, within the project study limits, contains six signalized intersections and 20 unsignalized intersections. The signalized intersections are listed as follows:

1. Parkway Avenue and Scotch Road – MP 2.20
2. Parkway Avenue and Lower Ferry Road – MP 2.67
3. Parkway Avenue and Farrell Avenue – MP 2.97
4. Parkway Avenue and N. Olden Avenue/Lexington Avenue – MP 3.25
5. Parkway Avenue and Parkside Avenue – MP 4.11
6. Parkway Avenue and Pennington Road – MP 4.40

Manual Turning Movement Counts (TMCs) were conducted during peak hours. Traffic signal plans and signal timing directives for signalized intersections are included in Appendix H.



---

### E-3 EXISTING PAVEMENT

As part of the partial road diet conversion in September 2017, Parkway Avenue between Lower Ferry Road and Olden Avenue was resurfaced. A pavement evaluation was not completed as part of this CD Study.

---

### E-4 CURBS, GUIDERAIL, MEDIAN ROADSIDE BARRIER

Curbs are provided along all of Parkway Avenue within the study limits. Based on visual inspection, there are sections of curb that require replacement or maintenance. There are no median barriers or guide rail within the study limits.

---

### E-5 HIGHWAY LIGHTING

Highway lighting is located at the existing signalized intersections, most unsignalized intersections and between intersections along the entire corridor. A lighting warrant analysis and conceptual level plans for the layout of lighting design should be completed during PE. Pedestrian scale lighting is not present within the project study area and plans for installation of pedestrian scale lighting should be developed for proposed signalized intersections, pedestrian crossings, and proposed roundabouts during PE.

---

### E-6 RAILROAD CROSSING

There are no at-grade or grade-separated railroad crossings within the project study limits.

---

### E-7 LAND USE

Land use, roadway characteristics, trip generators, and community institutions vary throughout the 2.20-mile length of the Parkway Avenue project. Land uses within ½ mile of Parkway Avenue consist primarily of residential properties and low density commercial properties. The Parkway Avenue corridor is a vital connection to the local Ewing and Trenton communities, serving residential neighborhoods, public transit routes, two schools, major employment centers including the NJDOT, and nearby places of interest like Trenton-Mercer Airport and The College of New Jersey.

---

### E-9 ACCESS

An access evaluation to meet NJDOT Access Design Guidelines 2012 and the NJ State Highway Access Management Code was not performed because the improvements would maintain the existing roadway profile and would limit the general roadway work from curb to curb. For roundabout alternatives, access should be reevaluated based on the finalized roundabout designs which will be developed during PE.

---

### E-10 COMPLETE STREETS COMPATIBILITY

According to the NJDOT Complete Streets Policy dated December 2009, a complete street facility provides safe access for all users by providing a comprehensive, integrated, multi-modal network of transportation options. Complete street design includes investigation of bicycle, pedestrian, and transit facilities to ensure mobility for all users, including those with disabilities. The NJDOT, Mercer County, and both local



municipalities, Ewing Township and the City of Trenton, have adopted resolutions in support of complete streets on public roadways within their respective jurisdictions.

Due to the proximity of schools, residential neighborhoods, and businesses to the Parkway Avenue project limits, adequate pedestrian and bicycle facilities are important to allow safe travel of non-motorized traffic throughout the corridor. Parkway Avenue, as it currently exists, contains limited complete streets components beyond a complete sidewalk network (with the exception of a small segment between Lower Ferry Road and Gold Street where sidewalk is not provided) and crosswalk markings at major intersections. No bicycle facilities are provided throughout the corridor. As a 35-40 MPH roadway with no shoulders, Parkway Avenue is not bicycle compatible. Minimum signage and amenities are provided for bus stops, with buses occupying a full travel lane when loading or unloading passengers. While curb ramps typically exist at intersections, there is generally not compliance with ADA due to one or more substandard elements. There are also no crosswalks across Parkway Avenue at mid-block or unsignalized intersection locations, including at entrances to both schools along the route. Documented assessments of existing curb ramps and pedestrian control features at the intersections in the project limits were also performed and included in the ADA Compliance Memorandum in Appendix I.

As part of the field inventory, the Complete Streets checklist was utilized and is included in Appendix I. As complete streets and improved accessibility and mobility for bicyclists and pedestrians are primary goals of this safety CD study, alternatives were developed to make Parkway Avenue Complete Streets compatible.

---

## E-11 PUBLIC TRANSPORTATION

NJ Transit bus route #607 runs along Parkway Avenue through Ewing, Trenton, and Hamilton Township. Bus route #607 runs from the Delaware Heights Apartments in Ewing to Independence Plaza in Hamilton. There are no Park & Ride facilities located on Parkway Avenue.

The commuter rail station closest to the Parkway Avenue project limits is the West Trenton Station. The West Trenton Station is the northern terminus of the SEPTA West Trenton line, which provides service to Center City Philadelphia.

The Trenton Transit Center is located just over 2 miles from the project limits and provides service to points other than Center City Philadelphia. The Trenton Transit Center services the NJ Transit Northeast Corridor line as well as numerous Amtrak lines.

## F. EXISTING UTILITIES

Utility poles are located along both sides of the roadway. There are numerous utility companies with overhead and underground facilities within the project limits. Utility Contact Letters were sent to the utilities list below to verify the existing facilities within the project limits.

- Comcast
- Ewing Lawrence Sewerage Authority
- Public Service Electric and Gas Company



- Trenton Sewer Utility
- Trenton Water Works
- Verizon Communications – NJ

A summary of utility contacts and preliminary utility engineering funding information is included in Appendix M.

## G. SUMMARY OF EXISTING DEFICIENCIES

The following deficiencies were identified during the data collection and public outreach processes:

- High historical crash rates, particularly at signalized intersections
- No bicycle infrastructure is present throughout the corridor
- Minimum transit and pedestrian facilities, despite proximity to planned Town Center
- Lack of safe crossing locations directly in front of Ewing High School and Parkway Elementary School
- At intersections, existing curb ramps do not comply with ADA standards
- Presence of controlling substandard design elements

## H. LIST OF SUBSTANDARD DESIGN ELEMENTS

The assessment of the study area identified existing substandard design elements based on NJDOT *Design Exception Manual's* list of Controlling Substandard Design Elements (CSDE), and in accordance with the latest NJDOT *Roadway Design Manual* and AASHTO's *A Policy on Geometric Design of Highways and Streets 2011, 6<sup>th</sup> edition* design standards. The CSDEs as indicated in the NJDOT *Design Exception Manual*, dated 2012, include the following roadway elements:

- Stopping Sight Distance (vertical curves, horizontal curves and non-signalized intersections)
- Superelevation (for mainline and ramps)
- Minimum Radius of Curve (for mainline and ramps)
- Minimum and Maximum Grades
- Cross Slope
- Lane Width (through and auxiliary)
- Shoulder Width
- Through Lane Drop Transition Length
- Acceleration and Deceleration Lane Length (for ramps)
- Design Speed
- Vertical Clearance

Michael Baker performed this preliminary review based on the available aerial mapping, as-built plans, and field data collection. The following criteria were applied to evaluate the existing design elements for Parkway Avenue within the project study limits:



- Classification – Urban Minor Arterial
- Posted Speed – Varies between 30 mph and 40 mph (from NJDOT SLD 2011)
- Design Speed – Varies between 35 mph and 45 mph
- Annual Daily Traffic (ADT, 2012) – Varies between 5,667 and 19,161 depending on location (from NJDOT TMS)
- Median – None
- Terrain – Flat

Within the project limits, CSDEs were identified in the following three categories:

- Minimum Radius of Curve
- Lane Width
- Shoulder Width

The Controlling Substandard Design Elements Memorandum is included in Appendix N.

## I. MANAGEMENT SYSTEMS INPUT

As this project was not located along a NJDOT-maintained roadway, NJDOT management systems are not applicable to the project study limits.

## J. AS-BUILT PLANS, RIGHT OF WAY MAPS AND JURISDICTION MAP

As-built plans were provided by NJDOT and are included in Appendix E.

## IV. TRAFFIC AND CRASH SUMMARY

### A. TRAFFIC OPERATIONS

The methodologies outlined in the *Highway Capacity Manual (HCM) 2010* were used to perform planning level analysis of roadway levels of services (LOS). The LOS concept uses a grading scale of “LOS A” through “LOS F” with “LOS A” representing free flowing conditions and “LOS F” representing forced flow conditions. Street segment LOS are based upon planning level threshold volumes as provided in Table 2.

**Table 2: HCM LOS at Signalized Intersections**

LOS	Control Delay per Vehicle (seconds per vehicle)
A	≤10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

Traffic analyses were performed at the study intersections to determine the average control delay and LOS during existing year (2017), construction year (2020), and design year (2040) under the no-build condition. The results of these analyses are documented in Table 3.



**Table 3: Parkway Avenue Level of Service Analyses for 2017, 2020 and 2040**

Intersections	Peak	2017 Existing		No-Build			
		Delay (sec)	LOS	2020		2040	
				Delay (sec)	LOS	Delay (sec)	LOS
Scotch Road	AM	22.6	C	23.0	C	24.8	C
	PM	55.6	E	55.6	E	66.9	E
Lower Ferry Road	AM	23.1	C	22.1	C	38.6	D
	PM	22.3	C	20.7	C	30.5	C
Farrell Avenue	AM	11.0	B	7.6	A	13.5	B
	PM	9.7	A	8.4	A	10.6	B
N Olden Avenue	AM	23.1	C	29.5	C	31.5	C
	PM	28.3	C	28.3	C	30.8	C
Parkside Avenue	AM	16.7	B	16.7	B	17.5	B
	PM	18.6	B	18.6	B	19.9	B
Pennington Road	AM	24.8	C	30.7	C	26.8	C
	PM	24.8	C	26.3	C	27.0	C

**B. TRAFFIC DATA**

The NJDOT-Traffic Monitoring System (TMS) website provided ATR data collected from four location along Parkway Avenue over the last 3 years. Additionally, Michael Baker collected automatic traffic recorder and manual turning movement counts from September 12, 2017 to September 20, 2017. For purposes of analysis, traffic signal plans and timing directives were requested and obtained from NJDOT and Mercer county for signalized intersections. Table 4 shows the AADTs on Parkway Avenue as listed on the NJDOT-TMS website. Count data collected by Michael Baker is included in Appendix H. Traffic signal plans and timing directives are included in Appendix H.

**Table 4: Annual Average Daily Traffic (AADT)**

Location	MP	AADT	Year
Parkway Avenue, east of Lower Ferry Road	2.71	17,410	2015
Parkway Avenue, between Saratoga Avenue and Olden Avenue	3.12	16,915	2016
Parkway Avenue between Hillcrest Avenue and Gardner Avenue	3.97	9,559	2017
Parkway Avenue, east of Pennington Road	4.65	5,165	2015

- Turning Movement Counts (TMC) were performed on September 13, 2017 at the following intersections:
  - Parkway Avenue and Scotch Road
  - Parkway Avenue and Lower Ferry Road
  - Parkway Avenue and Farrell Avenue
  - Parkway Avenue and N. Olden Avenue/Lexington Avenue
  - Parkway Avenue and Parkside Avenue
  - Parkway Avenue and Pennington Road
- Automatic Traffic Recorders (ATR) were installed to collect bi-directional traffic volumes from September 12, 2017 to September 20, 2017 at the following locations:
  - Parkway Avenue, east of Walter Street
  - Parkway Avenue, east of N. Olden Avenue/Lexington Avenue



## C. TRAFFIC VOLUME FORECASTS

An Annual Background Growth Rate (ABGR) for Parkway Avenue traffic volumes was calculated based on the analysis of available socio-economic and census data for Ewing Township, the City of Trenton, and Mercer County. Table 5 summarizes the average annual growth rate that was calculated using the DVRPC forecasted data.

**Table 5: Average Annual Growth Rate Demographic Forecasts**

Municipality	DVRPC Population Forecast			DVRPC Employment Forecast		
	2015	2045	ABGR	2015	2045	ABGR
Mercer County	371,398	402,283	0.27%	286,295	310,084	0.27%
Ewing Township	36,486	39,550	0.27%	22,150	24,680	0.36%
City of Trenton	84,225	89,372	0.20%	78,922	81,096	0.09%

Using the NJDOT Annual Background Growth Rate table and the demographic forecasts identified above, the growth percentages summarized in Table 6 were used to calculate the traffic volumes for the construction year (2020) and the design year (2040). As the majority of the project falls within Ewing Township, and considering the planned Ewing Town Center, the most conservative growth rate of 0.36%/year was used for years 2020-2040.

**Table 6: Calculated Growth for 2020 and 2040**

Year	Annual Growth Rate	Number of Years	Growth
Construction Year 2020	1.0%	3 (2017-2020)	3.03%
Design Year 2040	0.36 %	20 (2020-2040)	7.45%

The Background Growth Rate Memorandum is included in Appendix P.

## D. CRASH DATA ANALYSIS AND CRASH DIAGRAM

Crash data was obtained from NJDOT - Bureau of Transportation Data and Safety for the most recent three years available. The data included reported crashes on Parkway Avenue between MP 2.20 and MP 4.40, from January 1, 2014 to December 31, 2016. The reportable crash data obtained identifies crashes by milepost location. A Crash Technical Memorandum was prepared to assess existing crash data, identify high crash locations and suggest mitigation measures. A total of 234 crashes were reported within the study location. The locations with the four highest crash frequencies are:

- Intersection of Parkway Avenue with Lower Ferry Road with a total of 53 crashes
- Intersection of Parkway Avenue with Olden Avenue with a total of 14 crashes
- Intersection of Parkway Avenue with Parkside Avenue with a total of 14 crashes
- Intersection of Parkway Avenue with Pennington Road with a total of 13 crashes

According to the NJDOT Crash Summary, 53 (22.5%) of the 234 crashes were “Right Angle” crashes. There were 51 (21.8%) “Same Direction-Rear End” crashes, as well as “Same Direction-Sideswipe” crashes. The



Historical Crash Analysis Memorandum which includes crash data analysis and crash diagrams is located in Appendix F.

## E. PREDICTIVE CRASH ANALYSIS

To quantify the safety benefit of each alternative, an HSM Predictive Analysis was performed to compare the expected crash frequency to the no-build condition. This effort quantified the benefit of potential improvement alternatives in terms of crashes reduced by severity and their associated societal costs. The HSM Predictive Analysis allows planners and engineers to compare facilities and countermeasures in a quantitative way. This analysis is used to identify site elements, segments and intersections, within a study area that have the most potential for safety improvement based on the element's crash frequency compared to peer sites with similar characteristics and traffic conditions.

The Predictive Method generates a predicted crash rate based on the Safety Performance Function, as determined by those site characteristics and conditions related to safety and potential for crashes. Types and severities of crashes are predicted using variables such as AADT, Roadway/Intersection class, historical crash data, geometric design, and roadway cross sectional elements. Regression-to-the-mean bias is accounted for by applying historical crash data to the predicted crash rate using the Empirical-Bayes methodology. Including the historical crash data in the analysis allows an expected crash rate to be generated, a weighted rate between the historical crash rate and the rate predicted by the Safety Performance Function.

Proposed improvements that have a known effect on crash rate are included in the analysis through Crash Modification Factors (CMFs). CMFs are factors multiplied by the expected crash rate or the Safety Performance Function (depending on the availability of historical crash data) at specific sites to compute and estimate the expected crash rate following the implementation of those improvements.

Parkway Avenue was analyzed using the methodology designed for urban and suburban arterials. The segments were divided at each of the signalized intersections, where the highest concentrations of crashes occurred. The individual elements were analyzed individually for proposed alternatives at specific locations, as well as together for corridor-wide improvements. For multi-year analysis, 2020 was used as the construction year and 2040 was used as the design year. Twenty-year analysis allows evaluators to see the benefit of treatments or alternatives over the useful life of most infrastructure improvements. The assumption was made that traffic growth would increase 0.36% annually for the multi-year analysis. The Predictive Crash Analysis Memorandum, along with associated backup spreadsheets, data, and analysis is included in Appendix F. Results of the Predictive crash analysis for each alternative are discussed in Section VI.



## V. SOCIAL, ECONOMIC AND ENVIRONMENTAL SCREENING

As part of the social, economic, and environmental screening, two documents were prepared: the Community Profile (Appendix G) and an Environmental Screening Report (Appendix C), which was completed by NJDOT Bureau of Environmental Program Resources. The environmental screening and available geospatial data were reviewed to confirm the presence or absence of environmental resources within the project area.

### A. COMMUNITY OUTREACH

Public meetings were held throughout the project to keep local officials and stakeholders, as well as the general public informed and to gather public opinion. The following community outreach activities were held:

- Local Officials Briefing #1 – October 16, 2017
- Study Advisory Committee Meeting #1 – October 16, 2017 (Conference Call)
- Pedestrian Road Safety Audit – November 9, 2017
- Study Advisory Committee Meeting #2 – December 4, 2017
- Stakeholder Meeting #1 – December 11, 2017
- Public Information Meeting #1 – December 11, 2017
- Study Advisory Committee Meeting #3 – April 11, 2018
- Core Group Meeting #1 – May 31, 2018
- Stakeholder Meeting #2 – June 26, 2018
- Public Information Meeting #2 – June 26, 2018

Meeting summaries were prepared and are included in Appendix D. Additional correspondence with local officials is also included in Appendix D. Subsequent public meetings are anticipated to be performed during PE and FD.

A Community Profile was developed to identify potential impacts of the project on the existing population and demographic data, land uses and transportation facilities within the project limits. The Community Profile is included in Appendix G. According to the NEPA Act of 1969, Title VI of the Civil Rights Act of 1964 and Executive Order 12898 (1994), environmental justice related issues should be considered as transportation projects are developed. Executive Order 12898 on Environmental Justice states that to the extent practicable and permitted by law, neither minority nor low-income populations may receive disproportionately high and adverse impacts as a result of a proposed project. It requires that any low-income or minority population that could be affected by the project in the community be given the opportunity to be included in the impact assessment and public involvement process. Title VI of the Civil Rights Act of 1964 states that, “no persons in the United States shall on the grounds of race, color, or national origin be excluded from participation in, be denied and benefit of, or subject to discrimination under any program or activity receiving Federal financial assistance”.

The project area does not contain municipalities that meet the Environmental Justice designation. However, equal opportunity should still be extended to all nearby residents to participate in the process.



There are various land uses within the Parkway Avenue project limits. Commercial, educational and residential uses are located on Parkway Avenue. In addition, NJDOT headquarters are located within the project limits.

## B. NOISE AND AIR QUALITY

Although there are some sensitive receptors, including schools and residences, the project will not provide for a change in vehicle operating speed, geometry or capacity, therefore air quality or noise concerns are not anticipated.

## C. SOCIOECONOMICS

As this project’s purpose and need are focused on improving safety and mobility for motorists, pedestrians, and bicyclists, it is anticipated that recommended alternatives will have a positive impact on the local community and environmental justice concerns will likely be an issue. Improvements to intersections will be subject to upgrades to meet ADA compliance. Design features regarding ADA compliance will be evaluated and incorporated where appropriate during the PE phase.

It is not anticipated that the project will have a disproportionately high or adverse effect on low income and/or minority communities. The study will not affect farmland or community facilities. Access to community facilities, bus stop shelters, playgrounds, parks or gardens, and sidewalks is necessary and maintaining them during the study is important for the community. Based on the community profile, access to public transportation is also a critical issue for the community. The PPA concept is in compliance with the goals of Executive Order 12898 and the requirements of the Civil Rights Act of 1964.

## D. CULTURAL RESOURCES

The Environmental Screening Report identified cultural resources within the project’s area of potential effects. There were no undisturbed areas, old foundations, or building rubble present, and the project study area does not fall within an archeological grid or contain a known archeological site. While no historic districts are present within the vicinity of the project, three historic properties were identified, summarized in Table 7 below:

**Table 7: Identified Cultural Resources**

Resource	Status
Bath House and Day Camp of the Trenton Jewish Community Center	National Register: 2/23/1984 State Register: 1/6/1984
NJ State Highway Department Laboratory, Building 18	Individually Eligible: 6/19/2007
NJDOT Fernwood Complex	Eligible, FEMA project

Since the project is federally funded, coordination with the NJSHPO per Section 106 of the National Historic Preservation Act is required during PE. Based on the proposed project activities, a “No Effects” determination is anticipated.



## E. SECTION 4(F) PROPERTIES

The Department of Transportation Act of 1966 included a special provision which stipulated that the Federal Highway Administration cannot approve the use of land from public owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historic sites unless there is no feasible and precedent alternative to the use of land and the action includes all possible planning to minimize harm to the property resulting from use. No known Section 4(f) designated properties are located within the project study area.

## F. HIGHLANDS/PINELANDS

The project is not located within the Highlands Planning Area or Pinelands Management Area.

## G. WETLANDS

There are no wetlands or streams located within the project study area.

## H. REFORESTATION

The New Jersey No Net Loss Reforestation Act (N.J.S.A. 13:1L-14.1 et seq.) requires that for any state project or any project constructed on state land removing 0.5 acres or more of forest, the state agency must develop and execute a reforestation plan. Based on the location and nature of the project activities, it is not anticipated that the project will result in more than 0.5 acre of contiguous deforestation.

## I. FLOODPLAIN

Impacts to regulated resources may occur through the inclusion of new fill in the flood hazard area. As the project is located within the Delaware and Raritan Canal Review Zone B, the need for New Jersey Department of Environmental Protection (NJDEP) Flood Hazard Area Control Act and/or Freshwater Wetland Protection Act Permits will be evaluated as the project advances to PE, including the anticipated revisions to these rules.

## J. SOLE SOURCE AQUIFER

There were no identified sole source aquifers within the project study area.

## K. THREATENED/ENDANGERED SPECIES

There were no identified threatened or endangered species within the project study area.

## L. CATEGORY 1 WATERS

There were no identified category 1 waters within the project study area.

## M. VERNAL POOLS

There were no identified vernal pools within the project study area.



## N. STORMWATER

The NJDEP Stormwater Management Rules (N.J.A.C. 7:8) require all projects that meet the definition of major development to incorporate Best Management Practices for water quality treatment, water quantity control, and groundwater recharge. Major development is defined as those projects introducing 0.25 acres or more of net new impervious surface and/or result in more than 1 acre of ground disturbance. It is not anticipated that project improvements will exceed the 0.25 acre threshold for net new impervious surface. However, if the proposed project will exceed one acre of ground disturbance and therefore, is categorized as a major development.

Since the 0.25 acre threshold for net new impervious surface will likely not be exceeded, Best Management Practices (BMP) for water quality treatment are not required. Based on the minor amount of new impervious surface and the length of the project corridor, any increase in post-construction runoff is anticipated to be negligible and will not result in flood damage at or downstream of the site. Additionally, a decrease in the groundwater recharge rates would also be negligible. Stormwater management review by the NJDEP will be required as part of the anticipated Division of Land Use Regulations permits for the project. Due to the minimized increase in post-construction runoff and decrease in post-construction groundwater recharge, it is likely that a Linear Development Waiver for N.J.A.C. 7:8-5.2(e) for strict compliance with Stormwater Quantity and Groundwater Recharge requirements can be obtained from the NJDEP. Early coordination with NJDEP in PE is recommended.

## O. HAZARDOUS WASTE

Known contaminated sites were identified within the vicinity of the project area using available geospatial data from the NJDEP. The known contaminated sites that were identified are listed in Tables 8 and 9.

**Table 8: Known Contaminated Sites**

Contaminated Site
1071 Parkway Avenue, Sabir Inc.
1085 Parkway Avenue, Dangelos Cleaners
1006 Parkway Avenue, NJDOT Fernwood
Parkway/Olden Avenue, Mobil Service Station
801 Parkway Avenue, Larkin's Service Center

**Table 9: Underground Storage Tank Locations**

Underground Storage Tanks
1254 Parkway Avenue, AQSA LLC
1071 Parkway Avenue, Sabir Inc
780 Parkway Avenue, Former Shell Service Station

Since there are multiple known contaminated sites identified within the project area, there is a potential for involvement with regulated material or contaminated sites. The extent of involvement depends on the proposed project activities and ROW acquisition. Limited ROW acquisition may be necessary in areas of curb ramp and roundabout improvements. If no ROW acquisition is required, additional studies may



not be warranted. It is anticipated that oversight from a Licensed Site Remediation Professional (LSRP) may be required during construction per the NJDEP Linear Construction Technical Guidance.

## P. ANTICIPATED ENVIRONMENTAL PERMITS OR APPROVALS

Numerous regulated resources are located within the project corridor. The following environmental permits and interagency coordination may be necessary:

### Federal Permits/Approvals/Coordination

- Compliance with the National Environmental Policy Act of 1969
- EO 11990 Wetlands for any proposed activities that will disturb wetlands
- EO 11988 Floodplain for any proposed fill within the floodplain
- Section 106 of the National Historic Preservation Act of 1966 for consideration of Cultural Resources
- Section 4(f) of the US Department of Transportation Act for use of historic resources and publicly owned recreation/parkland resources
- Compliance with the Federal Clean Air Act Amendments of 1990
- Conformance with 23 CFR 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise

### State Permits/Approvals/Coordination

- NJDEP Flood Hazard Area Control Act Individual Permit (N.J.A.C. 7:13) authorizing regulated activities in floodways, flood fringes, and riparian zones.
- NJDEP Water Quality Certification which is issued with either the NJDEP Freshwater Wetlands Protection Act Permit or Flood Hazard Area Control Act Permit
- NJDEP New Jersey Pollution Discharge Elimination System Construction Activity Stormwater GP (Request for Authorization) for projects that disturb 1 acre or more of land.
- Compliance with the NJDEP Stormwater Management Rules (N.J.A.C. 7:8) if the project qualifies as a major development. Major developments include those projects that disturbance an acre of land or more and/or results in addition of 0.25 net new impervious surface. As currently designed, the project is not anticipated to exceed the 0.25 acre threshold.
- Project Authorization under the New Jersey Register of Historic Places Act (N.J.A.C. 7:4) for encroachment on any properties listed on the State Register of Historic Places.
- Compliance with the NJ Air Pollution Control Act (N.J.S.A. 26:2C).
- Compliance with NJDEP Noise Control Regulation (N.J.A.C. 7:29)
- Compliance with NJDEP Technical Requirements for Site Remediation (N.J.A.C. 7:26E) and Linear Construction Technical Guidance

## Q. ENVIRONMENTAL SUMMARY WITH PROBABLE NEPA DOCUMENT REQUIRED

Based on the current PPA improvements and the baseline environmental assessment, it is anticipated the project will result in minimal adverse impacts to regulated resources. The project satisfies the Categorical Exclusion definition outlined in 23 CFR 771.117 (a) and will not result in significant environmental impacts.



The project is categorized as CE No. 771.117(c)26 – Modernization of a highway by resurfacing, restoration, rehabilitation, reconstruction, adding shoulders, or adding auxiliary lanes (including parking, weaving, turning, and climbing lanes). Based on this categorization, the project NEPA document will require Federal Highway Administration approval. A Certified Categorical Exclusion Document (CCED) will likely be required and is to be confirmed during the PE Phase.

## VI. EVALUATION OF CONCEPTUAL ALTERNATIVES

Investigation of existing conditions, including substandard geometric conditions and high vehicle and pedestrian crash locations, resulted in the identification of several improvements. Segment (corridor) alternatives focus on reducing segment-related crashes, or crashes that occur between intersections. On urban/suburban arterials such as Parkway Avenue, the biggest design factor which affects crash rates is the roadway configuration. Additionally, conceptual alternatives were developed to mitigate existing deficiencies. Surface and striping improvements are proposed where practical. This section summarizes the conceptual alternatives analyzed.

### A. BRIDGE REHABILITATION VERSUS BRIDGE REPLACEMENT

There are no existing or proposed bridges or roadway structures within the project study area.

### B. TEMPORARY BRIDGE LOCATION AND WIDENING CONSTRAINTS

There are no existing or proposed bridges or roadway structures within the project study area.

### C. CONCEPTUAL ALTERNATIVES

Conceptual alternatives for the Parkway Avenue corridor were divided into two types: segment/corridor-wide and intersection/spot improvements. Segment (corridor) alternatives focus on reducing segment-related crashes, or crashes that occur between intersections. On urban/suburban arterials such as Parkway Avenue, the biggest design factor which affects crash rates is the roadway configuration. Spot improvements focus on reducing intersection-related crashes and crashes that occur at specific locations, such as high-volume access driveways or high-volume pedestrian crossings. Conceptual alignments for each alternative considered are included in Appendix Q.

Due to limited right-of-way, numerous access points, and close proximity of residences and businesses to the roadway, significant widening of the Parkway Avenue to allow for additional pavement width along the entire corridor would be impractical. Because of this, corridor-wide lane reconfigurations that were considered are developed to fit, for the most part, within the existing pavement width. Corridor improvements will be primarily evaluated based on two analyzed criteria – impacts to traffic operation and impacts to crash reduction. In addition to modifications to lane configuration, each corridor-wide alternative considered will include recommended spot sidewalk and lighting improvements where existing facilities do not exist or are in substandard condition. Five corridor-wide alternatives were considered:



---

#### C-1 ALTERNATIVE 1 – NO BUILD ‘A’: 4 LANES UNDIVIDED

This configuration was the existing condition along Parkway Avenue prior to the reconfiguration to a modified road diet between Olden Avenue and Lower Ferry Road. Under this alternative, the roadway will consist of 4 undivided travel lanes, 2 in each direction, with no shoulder. While this alternative allows for the greatest motor vehicle capacity, 4 lane undivided roadways typically experience a higher crash rate, higher speeds, and are less accommodating to bicyclists and pedestrians than roadways with one through lane in each direction.

---

#### C-2 ALTERNATIVE 2 – NO BUILD ‘B’: MODIFIED ROAD DIET

With this option, the lanes along Parkway Avenue will remain relatively the same as they exist today. The modified road diet implemented between Olden Avenue and Lower Ferry Road in August 2017 remains, with a through lane and two-way turn lane in the westbound direction only. While removing the through lane should reduce westbound crashes within this segment, feedback from the community has indicated operational concerns, particularly at the transitions into and out of this configuration. Additionally, despite removing a through lane, this alternative does not allow for dedicated bicycle facilities or striped shoulders.

---

#### C-3 ALTERNATIVE 3 – BASIC ROAD DIET

With the road diet alternative, one through lane in each direction will be removed and the entire corridor will consist of a typical section of three travel lanes, one through lane in each direction, and a center two-way left-turn lane. The remaining roadway width will be restriped as shoulders.

This road diet configuration has been shown to reduce rear-end, same-direction sideswipe, right angle, fixed-object, vehicle-bicyclist, and vehicle-pedestrian crashes, all of which were among the historically highest represented crash types along Parkway Avenue. 86.2% of all crashes that occurred along the corridor within the last 3 years were one of these crash types.

Although the theoretical capacity of the roadway is reduced since two through lanes are being removed, impacts to traffic operations are minimized, particularly in locations with a high density of access points like Parkway Avenue, since turning vehicles are removed from the through-lanes. The basic road diet can be implemented inexpensively, since the reconfiguration involves only striping modifications within the existing roadway footprint, and no geometrical changes will be made.

---

#### C-4 ALTERNATIVE 4 – ENHANCED ROAD DIET

The enhanced road diet alternative includes additional safety features beyond simple striping improvements that primarily enhance safety and mobility for pedestrians and bicyclists. The enhanced road diet includes the same lane configuration for motorists as the basic road diet - two through lanes and a center two-way left turn lane, and will function the same operationally for motor vehicles.

The enhanced road diet includes the following safety features:



- Bicycle lanes – Roadway width available from removing through-lanes can be converted to buffered bicycle lanes, allowing for a safe, dedicated bicycle facility throughout the corridor. At points along the corridor, where it is not practical to provide a dedicated bicycle facility within the pavement width, off-roadway accommodations and treatments will be provided.
- Curb extensions at intersections and crossing locations to increase pedestrian visibility to motorists and reduce crossing distances. Curb extensions also reduce vehicle speeds at intersections, resulting in traffic calming.
- Pedestrian refuge islands – Raised center medians with pedestrian refuge islands reduce potential for head-on and opposite direction sideswipe crashes and allow pedestrians a safe refuge at intersection approaches and longer crossing distance locations.

---

#### C-5 REDUCED ROADWAY WIDTH & SIDEPATHS

Alternative 5 is the conversion of the current 4-lane sections to a road diet with an 11-ft through lane in each direction and a 12-ft a center two-way left-turn lane. Shared use paths (8-10 feet wide) are to be provided either side of the roadway outside the existing pavement width, utilizing a painted shoulder in the remaining available pavement width. The section between Parkside Avenue and Pennington Road will have the same configuration and striped shoulder as Alternatives 3 and 4.

---

#### C-6 INTERSECTION/SPOT IMPROVEMENTS

These improvements focus on reducing intersection-related crashes and crashes that occur at specific locations, such as high-volume access driveways or high-volume pedestrian crossings.

---

#### NO-BUILD

Striping at intersections will remain relatively unchanged and will transition into whatever segment configuration is selected.

---

#### ROUNDBABOUTS

A roundabout is a type of circular intersection configuration that safely and efficiently moves traffic through an intersection. At roundabouts, entering traffic yields to vehicles already circulating, leading to improved operational performance. Roundabouts feature offset channelized approaches and a center island that results in lower speeds and fewer conflict points. These designs often provide a safer, more efficient, less costly and more aesthetically appealing design than conventional intersection designs.

Within the corridor, both one and two-lane roundabouts were considered at five different intersections; Parkway Avenue and Scotch Road, Lower Ferry Road, Farrell Avenue, Olden Avenue, and Pennington Road.



---

## SIGNAL TIMING/TRADITIONAL INTERSECTION IMPROVEMENTS

At signalized intersections where roundabouts are not feasible alternatives, several safety improvements were evaluated utilizing existing signals:

- Dedicated turn lanes
- Protected left turn phasing
- Leading Pedestrian Intervals
- Retroreflective backplates on signal heads
- ADA Compliant curb ramps and intersections
- Bicycle treatments through intersections

ADA improvements will be made at both signalized and unsignalized intersections throughout the corridor.

---

## MIDBLOCK/UNSIGNALIZED CROSSING IMPROVEMENTS

Midblock crossing treatments, or crossing improvements at unsignalized intersections, were considered for both Parkway Elementary School and Ewing High School. A range of crossing treatments are being evaluated ranging from improved striping, rapid rectangular flashing beacons, and HAWK signals. Crossing improvements can reduce pedestrian crashes by up to 69%.

### D. TRAFFIC ANALYSIS

Traffic analysis was performed at the study intersections to determine the average control delay and LOS during existing year (2017), construction year (2020), and design year (2040). The results of these analyses are documented in Table 10.



**Table 10: Parkway Avenue Level of Service Analysis for 2017, 2020 and 2040**

Intersections	Peaks	2017 Existing		No Build				Build			
				2020		2040		2020		2040	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
Scotch Road	AM	22.6	C	23.0	C	24.8	C	8.7	A	8.7	A
	PM	55.6	E	55.6	E	66.9	E	29.2	D	29.2	D
Lower Ferry Road	AM	23.1	C	22.1	C	38.6	D	13.9	B	13.9	B
	PM	22.3	C	20.7	C	30.5	C	13.4	B	13.4	B
Farrell Avenue	AM	11.0	B	7.6	A	13.5	B	26.2	C	26.2	C
	PM	9.7	A	8.4	A	10.6	B	22.9	C	22.9	C
N Olden Avenue	AM	23.1	C	29.5	C	31.5	C	10.6	B	10.6	B
	PM	28.3	C	28.3	C	30.8	C	10.0	A	10.0	A
Parkside Avenue	AM	16.7	B	16.7	B	17.5	B	17.9	B	17.9	B
	PM	18.6	B	18.6	B	19.9	B	20.5	C	20.5	C
Pennington Road	AM	24.8	C	30.7	C	26.8	C	9.9	A	9.9	A
	PM	24.8	C	26.3	C	27.0	C	11.7	B	11.7	B

Under the Build scenarios, the analyses performed show that all the intersections analyzed, except Scotch Road during the PM peak, will operate at LOS C or better during both peak hours. Scotch Road, however, is expected to improve from the current LOS E to a LOS D under the Build scenario during the PM peak.

#### E. HYDROLOGY & HYDRAULICS ANALYSIS

Based on the existing conditions evaluation and field investigation, additional survey work will be required during PE to confirm the properties of existing drainage structures. For the PPA, the implementation of a road diet will likely not have major impacts to stormwater or drainage management as improvements will consist of restriping the roadway within the existing pavement limits. With the implementation of the two roundabouts, further investigation will be required during PE and FD to determine the ultimate layout and



alignment of each roundabout approach. Impacts to existing drainage structures will then be determined, along with establishing which NJDEP and DRCC stormwater quality, stormwater quantity, or groundwater recharge requirements are applicable.

#### F. RIGHT OF WAY IMPACTS AND REVIEW

Major ROW impacts are not currently anticipated for this project. Limited ROW acquisition may be necessary in areas of curb ramp and signal improvements, as well as at the two proposed roundabout locations. Construction easements may also be necessary to address outfall improvements. ADA compliant curb ramp design and signal pole placement should be further reviewed in PE to determine the extent of potential ROW impacts.

#### G. UTILITY IMPACTS

The NJDOT Roadway Design Manual states that *“the curb ramp area (curb ramp, landing area, and approach sidewalk transition) shall be kept clear of existing and proposed obstructions such as light standards, traffic signals, meter boxes, controller boxes, utility poles, inlets, fire hydrants, guide rail, signs, planters, etc. Existing obstructions should be relocated as necessary, so as to provide maximum visibility of and for the curb ramp user. Existing manholes, junction boxes, and valve boxes shall be reset to slope of curb ramp.”*

Impacts to existing underground and overhead utilities are anticipated at the proposed roundabout locations. Impacts will be further evaluated during PE when the roundabout designs are finalized.

#### H. ITS FACILITIES

ITS facilities are not anticipated and were not included in considered alternatives.

#### I. COMPLETE STREETS POLICY

Compliance with the Complete Streets Policy was evaluated for each alternative and considered as evaluation criteria in the Alternatives Matrix. It is anticipated that the recommended PPA will comply with the Complete Streets Policy adopted by NJDOT and will be supported by Mercer County, Ewing Township, and the City of Trenton as bicycle facilities, ADA-compliance upgrades, pedestrian crossing improvements, and traffic calming measures are included.

#### J. ACCESS IMPACTS AND REVIEW

Access impacts were not identified as part of this project based on the recommendation of maintaining the existing roadway profile and limiting the roadway work from curb to curb. Overall, access impacts are expected to be minimal for this project; however, a detailed review of access during construction is recommended during the PE Phase. For proposed roundabout alternatives, access should be reevaluated based on the finalized roundabout locations which will be developed during PE.



## K. CONSTRUCTABILITY AND STAGING

The re-striping and road diet conceptual alternatives will be performed while utilizing daily lane closings, lane shifts, or flagging operations (alternating traffic) and are to be in accordance with the NJDOT Standard Traffic Control Details.

The roundabout locations will either require complex traffic control and staging plans to be developed or a detour evaluation/plan developed and finalized in PE that account for the design (geometric, drainage, etc.) of each roundabout option.

## L. CONTROLLING SUBSTANDARD DESIGN ELEMENTS

A copy of the submitted Controlling Substandard Design Exception memo is located in Appendix N.

## M. CONSTRUCTION COST ESTIMATE

A summary of the construction cost estimate for the recommended PPA is shown in Table 11 below. The detailed cost estimate for each alternative developed, including backup is located in Appendix S.

**Table 11: Recommended PPA**

Location	Alt Summary	Totals
Corridor-wide	Road diet	\$1,918,700.00
Scotch Road	NA	\$0.00
Lower Ferry Road	Roundabout	\$1,239,800.00
Farrell Avenue	Signalized	\$580,500.00
Olden Avenue	Roundabout	\$1,619,500.00
Parkside Avenue	Signalized	\$511,300.00
Pennington Road	NA	\$0.00
Ewing H.S.	RFFB	\$25,000.00
TOTAL		\$5,894,800.00
SAY		\$6,000,000.00

**Consultant Cost (Does not include In-House Design Costs)**

Preliminary Engineering	\$	600,000
Final Design	\$	1,100,000
Post Design Services	\$	360,000
<b>Consultant Cost Total:</b>	<b>\$</b>	<b>2,060,000</b>



## N. VALUE ENGINEERING STUDY AND REPORT

A value engineering review and life cycle cost analysis was not performed on this project, as the estimated construction cost is less than \$50 million.

## O. LIFE CYCLE COST ANALYSIS

A value engineering review and life cycle cost analysis was not performed on this project, as the estimated construction cost is less than \$50 million.

## P. ALTERNATIVES MATRIX

An Alternatives Matrix was prepared for the four conceptual alternatives. It lists each alternative and how the identified deficiencies have been addressed as part of this study. The Alternatives Matrix is included in Appendix T.

## Q. RISK REGISTER

Risk Analysis is one out of five key components of the Risk Management Process. It prioritizes risks for further analysis or action by assessing and combining their probability of occurrence and magnitude of impact. Major risks that are typical to newer, less known safety countermeasures often include public, stakeholder, and local government resistance. To minimize the potential for these risks during later phases of the project, a robust public outreach effort was conducted and close coordination with local officials was maintained as part of this CD Study. A Risk Register is included in Appendix U.

## R. DISCUSSIONS WITH SUBJECT MATTER EXPERTS

Coordination with NJDOT and Mercer County Subject Matter Experts (SMEs) was maintained throughout the Concept Development phase of the project. A meeting was held on May 31, 2018 with the SMEs and Core Group to discuss the project purpose and needs, existing conditions findings, proposed suggested alternatives and to solicit input. Meeting minutes for the SME and Core Group meeting are included in Appendix D. During the meeting, the no-build, road diet, signalized, and roundabout alternatives were discussed.

## S. PRELIMINARY PREFERRED ALTERNATIVE (PPA)

The proposed Preliminary Preferred Alternative will be to implement a 3-lane road diet throughout the corridor, convert two signalized intersections to roundabouts, and make signalized intersection improvements at two intersections. Additionally, upgrades to meet ADA-compliance is recommended at all curb ramps at intersections throughout the corridor, and a high-visibility crossing with Rapid Rectangular Flashing Beacons at Saratoga Avenue (in front of Ewing High School). Table 12 below summarizes the PPA recommendation at each location. Detailed conceptual plans for the PPA are included in Appendix V.



Intersection improvements were initially intended for Scotch Road and Pennington Road; however, at this time they have been removed from the project limits. Scotch Road is currently undergoing improvements that are compatible with the proposed road diet. Pennington Road is under state jurisdiction and further improvements should be advanced by NJDOT. Additionally, a roundabout was proposed at Farrell Ave; however, at this time, Mercer County believes that signalized intersection improvements are more appropriate at this location.

**Table 12: Recommended PPA**

<b>Location</b>	<b>PPA Recommended</b>
Corridor-Wide	Enhanced Road Diet
Parkway Avenue and Scotch Road	Improvements included in another project
Parkway Avenue and Lower Ferry Road	2-lane roundabout
Parkway Avenue and Farrell Avenue	Signal improvements
Parkway Avenue and N. Olden Avenue	2-lane roundabout
Parkway Avenue and Parkside Avenue	Signal improvements
Parkway Avenue and Pennington Road	No Improvements (Recommended for future evaluation)
Corridor-wide (at intersections)	ADA-Curb Ramp Improvements
Ewing High School	Install RRFB

## T. PRELIMINARY ENGINEERING SCOPE STATEMENT

The PE Scope Statement was prepared with input from NJDOT SMEs and Mercer County and is included in Appendix O.

## VII. CONCEPT DEVELOPMENT RECOMMENDATION

### A. FEDERAL HIGHWAY ADMINISTRATION (FHWA) APPROVAL OF REPORT

*To be inserted upon receipt.*

