

# INTERSECTION IMPROVEMENT ANALYSIS

## EVALUATION OF INTERSECTION IMPROVEMENTS

Salem County  
New Jersey



### Prepared For:

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## Executive Summary

One (1) intersection and three (3) roadway corridors in Salem County, New Jersey were studied as part of an intersection/roadway improvement analysis. The evaluation at Porcupine/Straughns Road (CR 643) in Olmans Township was limited to a study for Local Freight Impact Funding and was presented in a separate report to the County to meet the funding deadlines. A copy of the report is included in Appendix A of this report for reference. The evaluation at the remaining intersection and roadway corridors included a field investigation, traffic data collection, crash evaluation, road condition analysis, and signal warrant evaluation and development of conceptual improvements to assist Salem County in developing projects that will qualify for federal funding.

The following intersection and roadway corridors were studied:

- Porcupine/Straughns Mill Road (CR 643)- Oldmans Township (Included in Appendix A)
- Intersection of Centerton Road (CR 553) and Garden Road (CR 674) – Pittsgrove Township
- Almond Road (CR 540) & Parvin State Park entrance approximately 1,300 ft. west of Parvin Mill Road (CR 645) – Pittsgrove Township
- Acton Station Road (CR 653) from NJ Route 49 to Cream Ridge Road (local road) – Quinton Township

Automatic Traffic Recorder (ATR) counts, including speed data, were conducted at the following locations:

- Centerton Road (CR 553) north of Garden Road (CR 674) from 10:40 AM Tuesday, January 7<sup>th</sup>, 2020 through 10:35 AM Friday, January 9<sup>th</sup>, 2020
- Garden Road (CR 674) east of Centerton Road from 9:35 AM Monday, December 16<sup>th</sup>, 2019 through 12:15 PM Wednesday, December 18<sup>th</sup>, 2019
- Garden Road (CR 674) west of Centerton Road from 9:50 AM Monday, December 16<sup>th</sup>, 2019 through 12:55 PM Wednesday, December 18<sup>th</sup>, 2019
- Almond Road (CR 540) & Parvin State Park entrance approximately 1,300 ft. west of Parvin Mill Road (CR 645) from 11:30 AM Tuesday, January 7<sup>th</sup>, 2020 through 11:30 AM Thursday, January 9<sup>th</sup>, 2020
- Acton Station Road (CR 653) between NJ Route 49 and Ridge Road (local road) - from 8:15 AM Tuesday, January 14<sup>th</sup>, 2020 through 8:30 AM Friday, January 17<sup>th</sup>, 2020

Crash data for the study intersection and three (3) roadways for the five-year period from 2014 to 2018 was obtained through the NJDOT website. Crashes are broken down by type, location, time of day, month and year, roadway conditions and severity.

The intersection of Centerton Road (CR 553) and Garden Road (CR 674) is a four-leg intersection in Pittsgrove Township. At Centerton Road (CR 553) and Garden Road (CR 674) Pennoni is recommending the following improvement options for the county's consideration:

- Milling and resurfacing of pavement on Garden Road
- Refresh of striping, and pavement markings on Garden Road
- The addition of "Deer Crossing" signs on Centerton Road and Garden Road
- Relocation of utility poles on the northeast and southwest corners
- Installation of curbing on the corners to discourage the "cutting the corners" when making a right turn

The intersection of Almond Road (CR 540) and the Parvin State Park driveways is in Pittsgrove Township. Pennoni is recommending the following improvement options for the county's consideration:

- Install a Rapid Rectangular Flashing Beacons
- Refresh crosswalk pavement markings on Almond Road
- Install "PED XING AHEAD" pavement markings in advance of crosswalks

The intersection of Acton Station Road (CR 653) and NJ Route 49 is a three-leg intersection in Quinton Township with stop control on Acton Station Road (CR 653). The intersection of Acton Station Road (CR 653) and Cream Ridge Road

(local road) is a four-leg intersection in Quinton Township with stop control on Cream Ridge Road. The study area corridor lies between NJ Route 49 and Cream Ridge Road (local road) on Acton Station Road (CR 653). Between 2014 and 2018, there were eleven (11) crashes at the intersection, which included 5 crashes in the year of 2015. Based on the intersection evaluation, Pennoni is recommending the following improvement options for the county's consideration:

- Refreshing striping and pavement markings
- The installation of speed limit/ radar speed limit signing on Acton Road (CR 653)
- The addition of "Deer Crossing" signs on Acton Road (CR 653)
- Improvements to existing roadside ditches to improve the clear zone on Acton Station Road

## Introduction

One (1) intersection and three (3) roadway corridors in Salem County, New Jersey were studied as part of an intersection/roadway improvement analysis. The evaluation at Porcupine/Straughns Road (CR 643) in Olmans Township was limited to a study for Local Freight Impact Funding and was presented in a separate report to the County to meet the funding deadlines. A copy of the report is included in Appendix A of this report for reference. The evaluation at the remaining locations included field investigation, traffic data collection, crash evaluation, road condition analysis, a signal warrant evaluation and the development of conceptual improvements to assist Salem County in developing projects that will qualify for federal funding.

The following locations were selected by Salem County for study:

- Intersection of Centerton Road (CR 553) and Garden Road (CR 674) – Pittsgrove Township
- Almond Road (CR 540) & Parvin State Park entrance approximately 1,300 ft. west of Parvin Mill Road (CR 645) – Pittsgrove Township
- Acton Station Road (CR 653) from NJ Route 49 to Ridge Road (local road) – Quinton Township

**FIGURE 1** shows the overall study area. **FIGURES 2, 3, and 4** are 2015 aerials of the individual locations from the New Jersey Office of Information Technology (NJGIT), Office of Geographic Information Systems (OGIS).

## Methodology

The study locations selected by the County were evaluated based on the crash history, the roadway condition, and traffic. Based on the evaluations, recommendations regarding possible roadway improvements were developed. Specific elements of the evaluation include:

- An inventory of the roadway facilities in the vicinity of this project, including the existing physical and traffic operating characteristics
- Manual turning movement counts performed at the study intersections during weekday morning and afternoon peak traffic hours
- Capacity analysis of existing conditions
- Crash analysis for the study area roadways
- Multi-way stop/Signal warrant evaluation of the study intersections
- Identification of improvement options

## Centerton Road (CR 553) and Garden Road (CR 674)

The intersection of Centerton Road (CR 553) and Garden Road (CR 674) is a four-leg intersection in Pittsgrove Township with stop control on Garden Road. Each approach contains one left/thru/right lane and one receiving lane.

The following roadways make up the intersection:

- **Centerton Road (CR 553)** is a north south urban major collector. Within the study area, Centerton Road is 22' wide and designated two-way with one travel lane in each direction. Passing is allowed in the southbound direction on Centerton Road. The speed limit on Centerton Road according to the NJDOT Straight Line Diagram 50 mph. The speed limit is not posted on Centerton Road and New Jersey law sets speed limits as 50 mph on roadways unless otherwise posted or in school zones, business or residential districts.
- **Garden Road (CR 674)** is an east-west oriented urban local roadway. Within the study area, Garden Road is 22' wide and designated two-way with one travel lane in each direction. The speed limit on Garden Road according to the NJDOT Straight Line Diagram 50 mph. The speed limit is not posted on Garden Road and New Jersey law sets speed limits as 50 mph on roadways unless otherwise posted or in school zones, business or residential districts. Garden Road is stop controlled at Centerton Road.





FIGURE 1  
PROJECT LOCATION





FIGURE 2  
2015 AERIAL ORTHOGRAPHY  
CENTERTON ROAD (CR 553) AND GARDEN ROAD (CR 674)





FIGURE 3  
2015 AERIAL ORTHOGRAPHY  
ALMOND ROAD (CR 540) AND GARDEN STATE PARK





FIGURE 4  
2015 AERIAL ORTHOGRAPHY  
ACTON STATION ROAD (CR 653)  
BETWEEN NJ ROUTE 49 AND CREAM RIDGE ROAD



Photo 1: Centerton Road looking north from intersection



Photo 2: Centerton Road looking south from intersection



Photo 3: Garden Road looking east from intersection



Photo 4: Garden Road looking west from intersection

## Roadway Condition

At the intersection of Centerton Road (CR 553) and Garden Road (CR 674), the pavement on Garden Road is in poor condition on both approaches to Centerton Road. The pavement markings on Garden Road are also in poor condition. The pavement and pavement marking condition are shown in Photos 5 and 6. Centerton Road through the intersection was recently resurfaced and restriped and is good condition.

At each corner of the intersection, tire tracks and rutting are present outside the pavement, indicating that turning vehicles are cutting the corners and the tire paths are leaving the paved roadway (See Photo 6). Also, the utility poles located on the northeast and southwest corners of the intersection have impact marks at a height of approximately 3'-5' (see Photos 7 and 8), presumably from the vehicles cutting the corner. The utility poles on the northeast and southwest corners of the intersection are located approximately 2-3 feet away from the edge of pavement, with the utility pole located at the northeast corner of the intersection exhibiting the most visible sign of impact damage.

There are no pedestrian accommodations provided at the intersection, in the form of sidewalks, ADA Ramps or crosswalks and there are no signs indicating heavy pedestrian use (worn paths in the grass).

There is a single streetlight at the intersection on the southeast corner but no other lighting at the intersection or along either Centerton Road (CR 553) or Garden Road (CR 674).





Photo 5: Garden Road looking West from intersection



Photos 6: Utility pole on northeast corner of intersection



Photo 7: Garden Road looking West from intersection



Photos 8 and 9: Utility pole on northeast corner of intersection

## Existing Traffic Volumes

Automatic Traffic Recorder (ATR) counts were conducted from Tuesday, January 7, 2020 thru Thursday, January 9, 2020 at the intersection of Centerton Road (CR 553) and Garden Road (CR 674) and included volume and speed data. Centerton Road (CR 553) is an urban major collector with bi-directional traffic volume of approximately 5,600 vehicles per day, based on the ATR. Garden Road (CR 674) is an urban local roadway with bidirectional daily traffic of approximately 1,660 vehicles per day east of Centerton Road, and approximately 900 vehicles per day west of Centerton Road.

The hourly traffic volumes are summarized in **TABLE 1** and is provided in **APPENDIX B**.



TABLE 1  
ATR VOLUME SUMMARY  
CENTERTON ROAD (CR 553) AND GARDEN ROAD (674)

Time	Garden Road (East Approach)		Garden Road (West Approach)		Centerton Road	
	Eastbound	Westbound	Eastbound	Westbound	Northbound	Southbound
6:00-7:00 AM	32	49	35	18	115	193
7:00-8:00 AM	54	79	44	37	234	252
8:00-9:00 AM	68	72	41	23	163	218
9:00-10:00 AM	37	68	20	22	134	157
10:00-11:00 AM	41	43	17	20	113	130
11:00 AM -12:00 PM	43	55	20	29	108	143
12:00 – 1:00 PM	52	48	15	38	128	136
1:00 – 2:00 PM	74	55	32	51	135	163
2:00 – 3:00 PM	82	76	24	58	162	209
3:00 – 4:00 PM	81	101	20	35	264	269
4:00 – 5:00 PM	103	98	5	56	263	289
5:00 – 6:00 PM	80	74	5	44	235	237
6:00 – 7:00 PM	76	40	10	46	164	162
7:00 – 8:00 PM	49	33	8	30	100	112

## Capacity Analysis of Existing Conditions

The performance of the study intersection under existing conditions was evaluated through a qualitative measure of operating conditions called Levels of Service (LOS). Six levels of Service (LOS) are defined for unsignalized intersections with letter designations from 'A' to 'F', with Level of Service 'A' representing delays up to ten seconds and Level of Service 'F' indicating delays exceeding fifty seconds. Level of Service 'C' or better is considered acceptable, with a threshold of Level of Service 'D' in urban areas. Levels of Service are determined through analysis procedures outlined in the 2006 *Highway Capacity Manual* (Transportation Research Board, Washington, D.C.) utilizing using the *Synchro* Version 10.0 software.

Levels of Service for unsignalized intersections are defined in terms of delay to vehicles entering from the side road and turning left from a major road. Delay is a function of the capacity of the approach and degree of saturation. The capacity is based on the distribution of gaps in the major street traffic stream, driver judgment in selecting a gap through which to execute the desired maneuver, and follow-up time required by each driver in a queue. The Level of Service Criteria for unsignalized intersections is provided in **APPENDIX C**.

Under the existing conditions, all movements operate at LOS B or better, and none of the queues exceed the available storage. Results of the 2019 existing condition Level of Service and queue analysis are summarized in **TABLE 2**. The *Synchro* output summaries are provided in **APPENDIX D**.

TABLE 2  
EXISTING LEVEL OF SERVICE SUMMARY  
CENTERTON ROAD (CR 553) AND GARDEN ROAD (674)

MOVEMENT	EXISTING 2020 CONDITIONS					
	AM PEAK HOUR			PM PEAK HOUR		
	LOS	DELAY (SEC.)	95% QUEUE (VEH.)	LOS	DELAY (SEC.)	95% QUEUE (VEH.)
Garden Road (CR 674) EB	B	14.7	0.7	B	15.3	0.4
Garden Road (CR 674) WB	B	13.7	0.3	B	18.0	1.3
Centerton Road (CR 553) NB	A	0.0	0.0	A	0.0	0.0
Centerton Road (CR 553) SB	A	0.0	0.0	A	0.0	0.0
Overall Intersection	A	2.8	-	A	3.8	-

## Crash Analysis

Crash data for the intersection of Centerton Road (CR 553) and Garden Road (CR 674) for the five-year period from 2014 to 2018 was obtained through New Jersey Department of Transportation. Crashes are broken down by type, location, time of day, month and year, roadway conditions and severity.

Between 2014 and 2018, there were 18 crashes at or near the intersection of Centerton Road (CR 553) and Garden Road (CR 674). Of the 18 crashes, two occurred in 2014, six crashes occurred in 2015, four crashes occurred in 2016, three crashes occurred in 2017 and three crashes occurred in 2018. Of the 18 crashes, five (28%) involved fixed objects, three (17%) were right angle crashes, and three (17%) crashes were rear end crashes. There were four crashes of an unknown type. There were six (33%) crashes that resulted in injuries. All but two of the crashes occurred with dry roadway conditions and eleven (69%) of the crashes occurred during daylight hours.

A Summary of the crashes provided in the attached **TABLE 3**. The full summary of all the crash data and a crash diagram for Almond Road (CR 540) and Parvin State Park are found in **APPENDIX C**.

TABLE 3  
CRASH SUMMARY  
CENTERTON ROAD (CR 553) AND GARDEN ROAD (674)

Date	Crash Time	Crash Type	Light Condition	Roadway Condition	Severity
5/12/2014	5:10 AM	Animal	Daylight	Dry	Property Damage
5/18/2014	10:51 AM	Fixed Object	Daylight	Dry	Property Damage
1/28/2015	5:14 PM	Animal	Daylight	Dry	Property Damage
2/22/2015	9:12 PM	Unknown	Dark	Icy	Property Damage
5/8/2015	5:12 PM	Rear-End	Daylight	Dry	Injury
5/15/2015	1:43 PM	Right Angle	Daylight	Dry	Injury
7/15/2015	3:14 PM	Fixed Object	Daylight	Dry	Injury
8/20/2015	1:50 AM	Unknown	Dark	Dry	Property Damage
3/7/2016	11:22 AM	Fixed Object	Dark	Dry	Injury
4/10/2016	9:05 PM	Unknown	Dark	Dry	Property Damage
5/13/2016	8:28 PM	Unknown	Dawn	Dry	Property Damage
8/27/2016	11:49 AM	Rear End	Daylight	Dry	Injury
3/25/2017	3:43 AM	Fixed Object	Dark	Dry	Property Damage
6/10/2017	1:25 PM	Right Angle	Daylight	Dry	Injury
10/13/2017	6:34 AM	Animal	Dawn	Dry	Property Damage
3/3/2018	8:09 AM	Fixed Object	Daylight	Wet	Property Damage
3/26/2018	1:36 PM	Rear-End	Daylight	Dry	Property Damage
5/27/2018	4:27 PM	Right Angle	Daylight	Dry	Property Damage

The summary of all the crash data and a crash diagram for the intersection of Centerton Road (CR 553) and Garden Road (CR 674) are found in **APPENDIX D**.

To analyze the crash data at the intersection, the crash rate for each condition and crash type was compared to the most recent crash rates provided by the NJDOT (2018). There were certain crash types at the intersection that were significantly higher than the NJDOT crash rates. See the comparisons below in **TABLE 4**.

TABLE 4  
CRASH SUMMARY COMPARISONS  
CENTERTON ROAD (CR 553) AND GARDEN ROAD (674)

Crash Type	NJDOT Crash Rate	Intersection Crash Rate	Difference in Crash Rates
Animal	2.17 %	16.66 %	+14.49 %
Fixed Object	6.03 %	27.78 %	+21.75 %
Unknown	0.04 %	22.22 %	+22.18 %

## Multi-way Stop Warrant Analysis

The intersection of Centerton Road (CR 553) and Garden Road (CR 674) has the minor road stop controlled. The intersection was evaluated for multi-way stop control.

Chapter 2B of the MUTCD identifies the following criteria for the consideration of a multi-way stop control:

- Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation.
- The vehicular volume entering the intersection from the major street approaches averages at least 300 vehicles per hour for any 8 hours of an average day; and the combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches averages at least 200 units per hour for the same 8 hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the highest hour.
- Where the previous two criteria are not satisfied but where the crash and volume criteria are both satisfied to 80 % of the minimum volumes.
- Need to control left-turn conflicts
- Need to control vehicle/pedestrian conflicts
- Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless cross traffic is also required to stop.

#### Multi-way Stop Warrant Analysis (MUTCD – Warrant 2B.07 – Multi-way Stop Evaluation)

Condition A: Where traffic signal control is justified, the multi-way stop is an interim measure to quickly control traffic while arrangements are being made.

Result: **Not Applicable**

Condition B: 5 or more reported crash in a 12-month period that is susceptible to correction by a multi-way stop installation.

The only year where five or more crashed occurred was 2015. Of the six crashes, two are susceptible to correction by a multi-way stop (right turn, left turn, and angle). Two of the crashes were categorized as unknown. Assuming the two unknown crashes to be included as susceptible to correction by a multi-way stop, that yields a total of four crashes susceptible to correction by a multi-way stop.

Result: There were less than five crashes susceptible to correction reported in a 12-month period. Therefore, **Condition B is not satisfied.**

Condition C: Minimum Volumes & Delay

In order to meet minimum volume criteria for a multi-way stop vehicular volume entering the intersection from the major street approaches averages at least 300 vehicles per hour for any 8 hours of an average day; and the combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches averages at least 200 units per hour for the same 8 hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the highest hour. Where the 85<sup>th</sup> percentile approach speed of the major street exceeds 40 mph, the minimum volume warrants are reduced by 30%. The posted speed on the major street Centerton Road (CR 553) is 50 mph and the measured 85<sup>th</sup> percentile speed is 53 mph thus meeting the requirement for reduced minimum volumes. A summary of the volume evaluation is shown in **TABLE 5**.

Count Date: 1/8/2020

Qualifiers:

40 mph speed exceeded criteria applicable: Yes

85<sup>th</sup> Percentile speed on Major Street above 40 mph: Yes

(Posted Speed Limit: 50, 85<sup>th</sup> Percentile Speed: 53 mph)

TABLE 5  
MULTI-WAY STOP EVALUATION  
MINIMUM VOLUME REQUIREMENTS  
CENTERTON ROAD (CR 553) AND GARDEN ROAD (674)

	Required Hourly Volume	Average 8 Hour Volume	# Hours That Meet Required Volume
Centerton Road (CR 553)	210*	429*	8
Garden Road (CR 674)	140**	92**	0

\*Average vehicular volume entering the intersection from the major street (total of both approaches)

\*\*Average combined vehicular, pedestrian & bicycle volume entering the intersection from the minor street (total of both approaches)

Requirement: Volumes for common Eight (8) hours above minimums.

Result: **Condition C is not met** for the minor street approaches.

Optional Criteria:

A multi-way stop control can be installed at a two-way stop-controlled intersection where a road user, after stopping, cannot see conflicting traffic and is not able to reasonably safely negotiate the intersection unless the conflicting cross street is required to stop.

A sight distance evaluation was conducted at the study intersection in accordance with the guidelines contained in the NJDOT Roadway Design Manual. **TABLE 6** details the findings of the sight distance evaluation.

TABLE 6  
MULTI-WAY STOP EVALUATION  
SIGHT DISTANCE  
CENTERTON ROAD (CR 553) AND GARDEN ROAD (674)

Approach	Speed Limit (mph)	Sight Distance (ft.)					
		Required Stopping Distance	Recommended			Actual	
			P	SU	WB	To Left	To Right
Garden Road (CR 674) eastbound	50*	425'	555'/480'	700'/625'	845'/775'	805'	490'
Garden Road (CR 674) westbound			555'/480'	700'/625'	845'/775'	650'	480'

##/## = Left-Turn/Right-Turn or Cross

\*Speed limit on Centerton Road (CR 553) used to calculate minimum sight distance

Result: As shown on **TABLE 6** the sight distance from Garden Road does not meet the recommended sight distance for trucks but does meet the required stopping distance for a roadway with a 50 MPH on both approaches.

## Intersection Improvements

Upon evaluation of the intersection of Centerton Road (CR 553) and Garden Road (CR 674) the following intersection improvement items were identified for the County's consideration:



#### **Pavement Repair**

The existing pavement on Garden Road is in poor condition. Heavy cracking is present at the westbound and eastbound approach. On the eastbound approach, the fatigue cracking spans from edge of pavement to edge of pavement. On the westbound approach, the fatigue cracking is located along the shoulder on both sides of Garden Road. It is recommended that the County consider milling and resurfacing Garden Road, at least in the vicinity of Centerton Road.

#### **Pavement Markings**

The pavement markings on Centerton Road and the stop lines on Garden Road are new and were installed when Centerton Road was repaved. The remaining pavement markings on Garden Road are in poor condition and in need of refreshing. It is recommended that the County consider refreshing the pavement markings on Garden Road, at least in the vicinity of Centerton Road.

#### **Deer Signing**

Of the 18 crashes at or near the intersection of Centerton Road (CR 553) and Garden Road (CR 674) between 2014 and 2018, 3 of the crashes involved an animal (deer). It is recommended that the County consider the installation of deer warning signs (W11-3) on Centerton and Garden Roads. Although there is no evidence that the presence of deer warning signs are effective in reducing the number of deer-vehicle collisions, it will drivers users in advance of locations where unexpected entries into the roadway by animals might occur.

#### **Relocation of Utility Poles**

Upon review of the crash analysis, the most prevalent type of crash at the intersection of Centerton Road (CR 553) and Garden Road (CR 674) involves a fixed object. The crashes correspond with the damage observed on utility poles. Along with the visible damage evident on the utility poles, tire tracks and rutting are visible on the corners indicating that vehicles are cutting the corners when making right turns onto Centerton Road from Garden Road. In order to alleviate the issue, it is recommended that the County consider pursuing the relocation of the utility poles on the northeast and southwest corners either back away from the roadway or off the corner radii.

#### **Add curbing on corners**

As previously mentioned, along with the visible damage evident on the utility poles, tire tracks and rutting are visible on the corners indicating that vehicles are cutting the corners when making right turns onto Centerton Road from Garden Road. To address this, it is recommended that the County consider curbing the corners of the intersection to provide a positive barrier between the paved roadway and the adjacent grass and to discourage the "cutting the corners" when making a right turn.

The above improvements will mitigate the fixed object and animal related crashes. In addition, they will improve the sight distance at the stop controlled westbound approach. The recommended improvements are illustrated in **FIGURE E1** in **Appendix E**.

The estimated cost of the improvements for County consideration is approximately 16,850. The engineers estimate is included in **APPENDIX F**.

## Almond Road (CR 540) and Parvin State Park

The intersection of Almond Road (CR 540) and Parvin State Park is an un-signalized intersection on Almond Road (540) with two Parvin State Park driveways oriented in the north/south direction. Each approach contains one shared left/thru/right lane and one receiving lane. The southern leg of the intersection is a where vehicles can drop off passengers at the Parvin Grove swimming facility. The intersection is in Pittsgrove Township.



Photo 10: Parvin State Park looking North from the intersection



Photo 11: Parvin State Park looking South from the intersection



Photo 12: Almond Road (CR 540) looking East from the intersection



Photo 13: Almond Road (CR 540) looking West from the intersection

The following County roadways make up the intersection:

- **Almond Road (CR 540)** is an east-west oriented road. Almond Road is a rural major collector east of Muddy Run and an urban major collector west of Muddy Run. Within the study area Almond Road (CR 540) is 22' wide and designated two-way with one travel lane and a 3' shoulder in each direction. The posted speed limit is 35 mph within the study area. From Speed data collected on Almond Road indicates that the average speed is approximately 39 mph. Outside of the study area, the posted speed limit is 50 mph.

## Roadway Condition

At the intersection of Almond Road (CR 540) and Parvin State Park, the pavement on Almond Road and the park driveways is in good condition. The lane lines on Almond Road are in fair condition and the crosswalks are in poor condition. The pavement and pavement markings are shown in Photos 14 and 15.

There are two crosswalks on Almond Road approximately 175 feet from each other on either side of the Parvin Park driveways. There is one handicap ramp located at each end of the crosswalk. The handicap ramps are all at flush, ADA compliant and are connected to the sidewalk between the parking lot on the north side of Almond Road and the swimming facility at Parvin Grove.



Photo 14: Roadway and Pavement Markings –  
West Crosswalk



Photo 15: Roadway and Pavement Markings –  
East Crosswalk

## Crosswalk Signing

There is signing present on Almond Road giving advanced warning of the crosswalks at Parvin Lake and pedestrian warning signs at the crosswalks. There are flashing light assemblies located approximately 630 feet east and west of the crossings, advanced pedestrian warning signs located approximately 350 feet from the crosswalks, and pedestrian crossing signs on each approach located at the crosswalks. There is also a custom sign, warning drivers to slow down due to the Parvin Grove recreational area approximately 1,000 feet prior to the crosswalks. The advanced signing is illustrated in Photos 16 - 19.



Photo 16: Advanced warning sign approx.  
1,000 feet prior to crosswalks



Photo 17: Advanced warning signs and flashers  
located 630 feet east of the crosswalks





Photo 18: Advanced warning sign approx.  
1,000 feet prior to crosswalks



Photo 19: Pedestrian warning signs at crosswalk

## Existing Traffic Volumes

Automatic Traffic Recorder (ATR) counts were conducted from 11:30 AM Tuesday, January 7<sup>th</sup>, 2020 thru 11:30 AM Thursday, January 9<sup>th</sup>, 2020 at the intersection of Almond Road (CR 540) and Parvin State Park and included volume and speed data. Almond Road (CR 540) is an urban major collector with bi-directional traffic volume of approximately 5,600 vehicles per day and an 85<sup>th</sup> percentile speed of 39 mph, based on the ATR.

The hourly traffic volumes are summarized in **TABLE 7** and is provided in **APPENDIX B**.

TABLE 7  
ATR VOLUME SUMMARY  
ALMOND ROAD (CR 540) & PARVIN STATE PARK

Time	Almond Road (East Approach)	
	Eastbound	Westbound
6:00-7:00 AM	37	69
7:00-8:00 AM	81	120
8:00-9:00 AM	67	83
9:00-10:00 AM	23	36
10:00-11:00 AM	31	42
11:00 AM -12:00 PM	24	44
12:00 – 1:00 PM	48	63
1:00 – 2:00 PM	53	95
2:00 – 3:00 PM	61	99
3:00 – 4:00 PM	85	127
4:00 – 5:00 PM	87	138
5:00 – 6:00 PM	93	99
6:00 – 7:00 PM	48	77
7:00 – 8:00 PM	26	43

## Crash Analysis

Between 2014 and 2017, there were nine crashes near the intersection of Almond Road (CR 540) and Parvin State Park. Of the nine crashes, two (22%) were rear-end crashes. There were three crashes (33%) that resulted in injury and six (67%) of the crashes involved property damage only. Five (56%) crashes occurred in dry conditions, three (33%) occurred in wet conditions, and one (11%) crash occurred in snowy conditions. Five (56%) of the crashes occurred during daylight hours and four (44%) occurred during the Dark Light Condition. One of the crashes occurred in 2014, three occurred in 2015, three occurred in 2016, and two occurred in 2017. A Summary of the crashes provided in the attached **TABLE 8**.

TABLE 8  
CRASH SUMMARY  
ALMOND ROAD (CR 540) & PARVIN STATE PARK

Date	Crash Time	Crash Type	Light Condition	Roadway Condition	Severity
3/22/2014	12:01 PM	Parked Vehicle	Daylight	Dry	Property Damage
1/1/2015	4:27 AM	Animal	Dark	Dry	Property Damage
6/19/2015	6:18 AM	Fixed Object	Daylight	Wet	Injury
8/15/2015	1:28 PM	Rear-End	Daylight	Wet	Injury
2/15/2016	5:46 PM	Fixed Object	Dark	Snowy	Property Damage
4/12/2016	7:26 AM	Fixed Object	Daylight	Wet	Property Damage
5/30/2016	3:51 AM	Fixed Object*	Dark	Dry	Injury
2/8/2017	2:57 PM	Rear-End	Daylight	Dry	Property Damage
6/7/2017	3:52 AM	Fixed Object	Dark	Dry	Property Damage

\*Involved Drugs or Alcohol

It should be noted that none of the crashes involved pedestrians, although 1 rear-end crash appears to have occurred in the vicinity of the eastern crosswalk and may have been related to a vehicle stopping for a pedestrian.

The summary of all the crash data and a crash diagram for Almond Road (CR 540) and Parvin State Park are found in **APPENDIX C**.

## Multi-way Stop Warrant Analysis

The intersection of Almond Road (CR 540) and Parvin State Park has the park driveways stop controlled. The intersection was evaluated for multi-way stop control.

### Multi-way Stop Warrant Analysis (MUTCD – Warrant 2B.07 – Multi-way Stop Evaluation)

Condition A: Where traffic signal control is justified, the multi-way stop is an interim measure to quickly control traffic while arrangements are being made.

Result: **Not Applicable**

Condition B: 5 or more reported crash in a 12-month period that is susceptible to correction by a multi-way stop installation.

As stated above, there was one crash in 2014, three crashes in 2015, three crashes in 2016, and two crashes in 2017 at the study intersection. Of the 9 crashes over the last 4 years, two are considered susceptible to correction by a multi-way stop (right turn, left turn, and angle). A Summary of the crashes provided in the attached **TABLE 8**.



Result: There were less than five crashes susceptible to correction reported in a 12-month period (January 1, 2014 – December 31, 2017). Therefore, **Condition B is not met**.

Condition C: Minimum Volumes & Delay

In order to meet minimum volume criteria for a multi-way stop vehicular volume entering the intersection from the major street approaches averages at least 300 vehicles per hour for any 8 hours of an average day; and the combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches averages at least 200 units per hour for the same 8 hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the highest hour. Where the 85<sup>th</sup> percentile approach speed of the major street exceeds 40 mph, the minimum volume warrants are reduced by 30%. The speed on the major street Almond Road (CR 540) is 35 mph and the measured 85<sup>th</sup> percentile speed is 39 mph thus not meeting the requirement for reduced minimum volumes. A summary of the volume evaluation is shown in **TABLE 9**.

Count Date: 1/8/2020

Qualifiers:

85<sup>th</sup> Percentile speed on Major Street above 40 mph: No (within the study area)

40 mph speed exceeded criteria applicable: No

(Posted Speed Limit: 35 mph, 85<sup>th</sup> Percentile Speed: 39 mph)

TABLE 9  
MULTI-WAY STOP EVALUATION  
MINIMUM VOLUME REQUIREMENTS  
ALMOND ROAD (CR 540) & PARVIN STATE PARK

	Required Hourly Volume	Average 8 Hour Volume	# Hours That Meet Required Volume
Centerton Road (CR 553)	210*	177*	2

\*Vehicular volume entering the intersection from the major street (total of both approaches)

Requirement: Average volumes for common Eight (8) hours above minimums.

Result: **Condition C is not met** for the major street approach.

Optional Criteria:

A multi-way stop control can be installed at a two-way stop-controlled intersection where a road user, after stopping, cannot see conflicting traffic and is not able to reasonably safely negotiate the intersection unless the conflicting cross street is required to stop.

A sight distance evaluation was conducted at the study intersection in accordance with the guidelines contained in the NJDOT Roadway Design Manual. **TABLE 10** details the findings of the evaluation.

TABLE 10  
MULTI-WAY STOP EVALUATION  
SIGHT DISTANCE  
ALMOND ROAD (CR 540) & PARVIN STATE PARK

Approach	Speed Limit (mph)	Sight Distance (ft.)					
		Required Stopping Distance	Recommended			Actual	
			P	SU	WB	To Left	To Right
Parvin Park Driveway southbound	35*	250'	390'/335'	490'/440'	595'/540'	560'	570'
Parvin Park Driveway northbound			390'/335'	490'/440'	595'/540'	400'	510'

##/## = Left-Turn/Right-Turn or Cross

\*Speed Limit on Almond Road (CR 540) (within the study area) used to calculate minimum sight distance

Result: As shown on **TABLE 10**, the sight distance from the Parvin State Park driveways do not meet the recommended sight distance for trucks but does meet the required stopping distance for a roadway with a 35 MPH on both approaches.

## Intersection Improvements

Upon evaluation of the stop-controlled intersection of Almond Road (CR 540) and Parvin State Park the following intersection improvement items were identified for the County's consideration:

### Flashing Beacon

Rectangular Rapid Flash Beacons (RRFBs) are typically used to increase driver yielding behavior at crosswalks, aids in the effectiveness of other advance yield markings signs with "STOP HERE FOR PEDESTRIANS" signs. Studies have shown the positive impacts of beacons on pedestrian safety by increasing the number of cars yielding from 18 percent to 81 percent. When two additional beacons were added, the percent of cars yielding increased to 88 percent.

RRFBs can be automated (i.e. video or infrared), and/or can be manually activated via manual-push buttons. It should be noted that RRFBs typically receive power through solar panel units, however, for an installation at Almond Road (CR 540) and Parvin State Park it is recommended that can be supplied through traditional means. See photos 20 and 21 for examples of RRFBs.



Photo 20: Rectangular Rapid Flashing Beacons at a trail crossing



Photo 21: Rectangular Rapid Flashing Beacons at an intersection

### Pavement Markings

As previously noted, the existing pavement markings for the crosswalks are in poor condition. It is recommended that the County consider refreshing the pavement markings for the crosswalks and consider using a “ladder” style crosswalk to increase visibility. Photo 22 illustrates an example of a “ladder” style crosswalk. In addition, it is recommended that the County should consider the use of “PED XING” pavement markings approaching the crosswalks. Photo 23 illustrates an example of a “Ped XING” pavement markings.



Photo 22: “Ladder” style crosswalk.



Photo 23: Ped Crossing pavement markings

### Raised Crosswalks

Raised crosswalks were evaluated for the purpose of increasing pedestrian visibility and to act as a traffic calming measure. There are many considerations when deciding to install a raised crosswalk. To better illustrate the net benefit, a pros and cons table was created. See **TABLE 11** below:

TABLE 11  
RAISED CROSSWALK PROS-CONS  
ALMOND ROAD (CR 540) & PARVIN STATE PARK

PROS	CONS
<ul style="list-style-type: none"> <li>• Raised crosswalks typically reduce speeds an average of 6 mph</li> <li>• Improves visibility of/for pedestrians</li> <li>• Could result in reduced traffic volumes</li> </ul>	<ul style="list-style-type: none"> <li>• Slows emergency vehicles by 4-6 seconds</li> <li>• Required more maintenance than traditional crosswalk</li> <li>• Icing can be a problem if snow is not properly removed</li> <li>• Due to the raised crosswalk, curb and handicap ramps at each corner will have to be restructured</li> <li>• A catch basin should be installed for drainage on the uphill side of the crosswalk – will require a significant amount of work to account for drainage due to the current grade being relatively flat</li> <li>• Cost could be \$10,000, more per crossing if drainage is necessary</li> <li>• Will require NJDOT approval due to the posted speed limit being above 30 mph – C.39:4-8.9.2.a-d</li> <li>• According to 15-B in the NJDOT Design Manual – Roadway, a minimum spacing of 525-575 feet is required in between vertical speed tables (raised crosswalks), which is not present between the 2 existing crosswalks. To comply with this design standard either the whole intersection would need to be raised or one of the crossings would have to be eliminated.</li> <li>• Significant roadway modification for a condition that is seasonal.</li> </ul>

Two of the of benefits of raised crosswalks are reduced speeds and potentially reduced traffic volumes. From the ATR data acquired, the bi-directional ADT on Almond Road is approximately 5,600 vehicles and the 85<sup>th</sup> percentile speed was found to be 39 mph, 4 mph above what the posted speed limit. That indicates that the traffic volumes and speeding does not appear to be significant issue within the study area.

An alternative to raised crosswalks is raising the entire intersection. A raised intersection has similar benefits and drawbacks to raised crosswalks but can cost significantly more. Based on the evaluation of installing a raised crosswalk at this location and the limited benefit when compared to the hurdles associated with it, a raised crosswalk/intersection is an improvement option that could be considered, but not an improvement option that is recommended that the County pursue.

The items identified for consideration by the County are intended to improve driver awareness of the pedestrian crossings at Almond Road (CR 540) and Parvin State Park and improve overall safety at the intersection. The recommended improvements are illustrated in **FIGURES E1 and E2 in Appendix E**.

The estimated cost of the identified improvements for the County's consideration, including the flashing beacons and restriping, are approximately \$38,100. The engineers estimate is for the improvements is included in **APPENDIX F**.



## Acton Station Road (CR 653) from NJ Route 49 to Cream Ridge Road

The roadway corridor of Acton Station Road (CR 653) from Route 49 to Cream Ridge Road is approximately 0.6 miles long and is a north-south oriented rural local road. Acton Station Road is approximately 22' wide and designated two-way with one travel lane and a 1-foot shoulder in each direction. The southern portion of the corridor is adjacent to Alloway Creek and separated from the creek by approximately 1300 feet of guiderail on the east side of the roadway. The speed limit on Acton Road according to the NJDOT Straight Line Diagram is 25 mph, but it is not posted and there is no resolution establishing the 25 mph speed limit. New Jersey law sets speed limits as 50 mph on roadways unless otherwise posted or in school zones, business or residential districts the 50 mph speed limit is appropriate based on the roadway characteristics. The corridor is in Quinton Township and is bookended by unsignalized intersections with Route 49 and Cream Ridge Road.

The intersection of Acton Road (CR 653) and Route 49 is a three-leg intersection with stop control on Acton Road. The intersection of Acton Road (CR 653) and Cream Ridge Road is a four-leg intersection with stop control on Cream Ridge Road.



Photo 26: Looking north on Acton Station Road (CR 653) from the intersection with Route 49



Photo 27: Looking east on Route 49 at the intersection with Acton Station Road (CR 653)



Photo 28: Looking north on Acton Station Road (CR 653) toward the intersection with Cream Ridge Road



Photo 29: Looking south on Acton Station Road (CR 653) from the intersection with Cream Ridge Road



## Roadway Condition

The pavement on Acton Station Road between Route 49 to Cream Ridge Road is in good condition is newer the pavement on Route 49, Cream Ridge Road or Acton Station Road north of Cream Ridge Road (See Photos 28 and 29). The pavement markings on Acton Station Road between Route 49 to Cream Ridge Road are also in good condition. The pavement and pavement marking condition are shown in Photos 5 and 6. Centerton Road through the intersection was recently resurfaced and restriped and is good condition.

There are no pedestrian accommodations (sidewalk, crosswalks, etc..) provided at along Acton Station Road or at the intersections with Route 49 to Cream Ridge Road and there are no signs of heavy pedestrian use (worn paths in the grass) that would indicate the need.

As previously mentioned, southern portion of the corridor is adjacent to Alloway Creek and there is a warning sign “Road may be flooded” on southbound Acton Station at its closest point to the creek. However, during the field visit there was no visible indication of recent flooding.

There are two drainage ditches, one on either side of road, between Acton Station Road and adjacent fields on the northern half of the corridor. Measurements were taken to determine the width and depth of the ditches. On the east and west side, the ditches were approximately 4 feet wide and approximately 2.5 feet in depth. Both ditches were located approximately 4-5 feet to the edge of pavement and are in the roadway’s “clear zone” which is defined as “an area at the edge of the traveled way that is available for safe use by errant vehicles”.

At approximately the midpoint of the corridor, Acton Station road has a pair of horizontal reversed curves or “S curve. The curves are signed in both directions but does not include advisory speed plaques. The curbs appear to meet the minimum radius curve for a 50-mph design speed (assumed). However, the curves don not appear to meet the minimum desired tangent length between reversing curves of 500 to 600 feet for a design speed of 50 mph.



Photo 30: “Road May be Flooded” sign on southbound Acton Station Road



Photo 31: “S Curve” sign on southbound Acton Station Road (CR 653)



Photo 32: Drainage ditch on east side of Acton Station Road (CR 653)



Photo 33: Drainage ditch on west side of Acton Station Road (CR 653)

## Existing Traffic Volumes

Automatic Traffic Recorder (ATR) counts were conducted from 8:15 AM Tuesday, January 14<sup>th</sup>, 2020 thru 8:30 AM Friday, January 17<sup>th</sup>, 2020 on Acton Station Road between NJ Route 49 and Cream Ridge Road and included volume and speed data. Acton Station Road is a rural local road with bi-directional traffic volume of approximately 4,300 vehicles per day and an 85<sup>th</sup> percentile speed of 57 mph, based on the ATR data.

The hourly traffic volumes are summarized in **TABLE 12** and is provided in **APPENDIX A**.

**TABLE 12**  
**ATR VOLUME SUMMARY**  
**ACTON STATION ROAD (CR 653)**

Time	Almond Road (East Approach)	
	Eastbound	Westbound
6:00-7:00 AM	93	46
7:00-8:00 AM	123	47
8:00-9:00 AM	86	56
9:00-10:00 AM	54	26
10:00-11:00 AM	36	45
11:00 AM -12:00 PM	42	36
12:00 – 1:00 PM	43	48
1:00 – 2:00 PM	44	54
2:00 – 3:00 PM	73	75
3:00 – 4:00 PM	85	83
4:00 – 5:00 PM	74	99
5:00 – 6:00 PM	55	105
6:00 – 7:00 PM	44	53
7:00 – 8:00 PM	20	38

## Crash Analysis

Between 2014 and 2018, there were three crashes on Acton Station Road (CR 653) between NJ Route 49 and Cream Ridge Road, four crashes on Route 49 at/near the Acton Station Road intersection, and three crashes on Acton Station Road just north of the intersection with Cream Ridge Road. Of the Crashes on Acton Station Road, all three of the crashes occurred in 2015. One of the crashes involved an animal and two of the crashes were out of control vehicles for unknown reasons. All three of the crashes on Acton Station Road (CR 653) between NJ Route 49 and Cream Ridge Road involved property damage only, one crash occurred in icy conditions, one crash occurred in snowy conditions, and one crash occurred in dry conditions.

Summaries of the crashes provided in the attached **TABLES 13-15**. The summary of all the crash data and a crash diagram for Acton Station Road are found in **APPENDIX C**.

**TABLE 13**  
**CRASH SUMMARY**  
**ACTON STATION ROAD (CR 653) FROM NJ ROUTE 49 TO CREAM RIDGE ROAD**

Date	Crash Time	Crash Type	Light Condition	Roadway Condition	Severity
2/10/2015	4:57 AM	Unknown	Dark	Icy	Property Damage
2/22/2015	7:11 AM	Unknown	Dawn	Slush	Property Damage
11/24/2015	11:04 PM	Animal	Dark	Dry	Property Damage

**TABLE 14**  
**CRASH SUMMARY**  
**ACTON STATION ROAD (CR 653) NORTH OF CREAM RIDGE ROAD**

Date	Crash Time	Crash Type	Light Condition	Roadway Condition	Severity
10/12/2017	10:03 PM	Hit Moving Object	Dark	Dry	Property Damage
4/28/2018	2:43 AM	Animal	Dark	Dry	Property Damage
9/12/2018	5:42 AM	Animal	Dawn	Dry	Property Damage

**TABLE 15**  
**CRASH SUMMARY**  
**NJ ROUTE 49 AT ACTON STATION ROAD**

Date	Crash Time	Crash Type	Light Condition	Roadway Condition	Severity
10/14/2014	2:45 PM	Rear-End	Daylight	Dry	Property Damage
2/19/2015	12:03 PM	Rear-End	Dark	Wet	Injury
7/22/2015	8:37 AM	Fixed Object	Daylight	Dry	Property Damage
6/27/2016	7:02 PM	Rear-End*	Daylight	Dry	Property Damage
4/28/2017	2:15 PM	Fixed Object	Daylight	Dry	Property Damage

## Intersection Improvements

Upon evaluation of the stop-controlled intersection of Acton Station Road (CR 540) and Parvin State Park the following intersection improvement items were identified for the County's consideration:

### Speed Limit Signing

There are homes on the Acton Station Road and vehicular speed has been identified as a concern of the residents. There are homes on the Acton Station Road and vehicular speed has been identified as a concern of the residents.

As previously mentioned, the speed limit posted on Acton Station Road according to the NJDOT Straight Line Diagram is 25 mph but it is not posted. New Jersey law sets speed limits as 50 mph on roadways unless otherwise posted or in school zones, business or residential districts. The 85<sup>th</sup> percentile speed recorded by the ATR on Acton Station Road was 57 mph with approximately 42 vehicles (2%) exceeding 65 mph. The 85<sup>th</sup> percentile speed is a typically a dominant factor in establishing posted speeds. The manual on Uniform Traffic Control Devices (MUTCD) indicates that posted speeds "should be within 5 mph of the 85th-percentile speed of free-flowing traffic."

Based on the crash history, there is no indication that the speed limit on Acton Station Road (assumed to be the State minimum of 50 mph) is a factor in the crashes.

The lack of crashes that can be linked to the speed limit along with the recorded 85<sup>th</sup> percentile speed on the roadway does not indicate a need to reduce the speed on Acton Station Road. However, the County can consider improving the speed limit signing on Acton Station Road. In addition, the County can consider the installation of radar speed sign, the purpose which is to reduce vehicular speeds by making drivers aware when they are driving above the posted speed limit. Studies have found that radar speed signs effective in slowing traffic and been found to reduce in 85th percentile speed up to 8 mph can result in a dramatic reduction in the speed of those vehicles that were traveling in excess of the limit, while not interfering with the progress of the majority of traffic that is already traveling at or below the speed limit.

### Deer Signing

Of the 6 crashes that occurred on Acton Station Road, including the 3 that occurred north of Cream Ridge Road, 3 of the crashes involved an animal (deer). It is recommended that the County consider the installation of deer warning signs (W11-3) on Acton Station Road, Although there is no evidence that that the presence of deer warning signs are effective in reducing the number of deer-vehicle collisions, it will drivers users in advance of locations where unexpected entries into the roadway by animals might occur.

### Improving Clear Zone

As previously indicated, there are two drainage ditches, one on either side of road, between Acton Station Road and adjacent fields on the northern half of the corridor. Both ditches were located approximately 4-5 feet to the edge of pavement and are in the roadway's "clear zone" which is defined as "an area at the edge of the traveled way that is available for safe use by errant vehicles". It is recommended that the County consider improving the drainage in those segments of Acton Station Road to eliminate the ditches from the clear zone.

On the north end of the existing drainage ditches there is expose concrete pipe which is thought to tie into the existing underground drainage system evident by the inlets present at the intersection of Acton Station Road and Cream Ridge Road (see Photos 34). This could also require the relocation of some utility poles on the east side of Acton Station Road that are in the drainage ditch (see Photo 35)



Photo 34: Inlet on northeast corner of Acton Station Road (CR 653) and Cream Ridge Road



Photo 35: Utility pole in drainage ditch on east side of Acton Station Road (CR 653)

The identified improvements for the County's consideration are illustrated in **FIGURE 4**.

The estimated cost of the identified improvements for the County's consideration are approximately \$77,000. The engineers estimate is for the improvements is included in **APPENDIX F**.



## Conclusions

One (1) intersection and three (3) roadway corridors in Salem County, New Jersey were studied as part of an intersection/roadway improvement analysis. The evaluation at Porcupine/Straughns Road (CR 643) in Olmans Township was limited to a study for Local Freight Impact Funding and was presented in a separate report previously submitted to the County to meet the funding deadlines. A copy of the report is included in Appendix A of this report for reference.

After analysis of the existing conditions at each of the intersection the following recommendations were developed for the county's consideration:

### **Centerton Road (CR 553) and Garden Road (CR 674)**

- Milling and resurfacing of pavement on Garden Road
- Refresh of striping, and pavement markings on Garden Road
- The addition of "Deer Crossing" signs on Centerton Road and Garden Road
- Relocation of utility poles on the northeast and southwest corners
- Installation of curbing on the corners to discourage the "cutting the corners" when making a right turn

### **Almond Road (CR 540) and Parvin State Park**

- Install a Rapid Rectangular Flashing Beacons
- Refresh crosswalk pavement markings on Almond Road
- Install "PED XING AHEAD" pavement markings in advance of crosswalks

### **Acton Road (CR 653) from NJ Route 49 to Cream Ridge Road**

- Refreshing striping and pavement markings
- The installation of speed limit/ radar speed limit signing on Acton Road (CR 653)
- The addition of "Deer Crossing" signs on Acton Road (CR 653)
- Improvements to existing roadside ditches to improve the clear zone on Acton Station Road

Although these recommendations have been developed, it is ultimately up to the County to weigh the costs and benefits and determine whether to implement any or all of the proposed improvement options.

# **SALEM COUNTY INTERSECTION IMPROVEMENTS**

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## **APPENDIX A**

TRAFFIC STUDY FOR LOCAL FREIGHT IMPACT FUND  
PORCUPINE/STRAUGHNS MILL ROAD (CR 643)



# Traffic Study for Local Freight Impact Fund

## PORCUPINE /STRAUGHNS MILL ROAD (CR 643)

Oldmans Township

Salem County, New Jersey



### Prepared For:

**Salem County**

Fifth Street Complex

110 Fifth Street, Suite 600

Salem, NJ 08079

October 2019

SALEM19001

Beth-Ann M. Grasso, PE, CME  
NEW JERSEY REG. No. 24GE04312100



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## Introduction

At the request of the Salem County, Pennoni has prepared the following Traffic Study evaluating the AADT and Large Truck percentage on Porcupine Road/ Straughns Mill Road (CR 643) between Beaver Creek (milepost 2.89) and Route 130 (milepost 4.71) in accordance with the criteria for the New Jersey Department of Transportation's Local Freight Impact Fund Grant Program (LFIF).

The "Procedures and Criteria for Local Freight Impact Fund Grant Program" indicates that to be eligible for the grant a project must have a minimum of 10% large truck volume within its limits when compared to the total ADT. A large truck is defined as a medium or heavy truck, excluding buses and motor homes, with a gross vehicle weight rating (GVWR) greater than 5 Tons (10,000 pounds) and AADT is defined as the total volume of traffic on a roadway segment for one year, divided by the number of days in the year.

Porcupine Road/Straughns Mill Road is a bi-directional roadway in Oldmans Township, NJ. The roadway is named Straughns Mill Road from Beaver Creek (milepost 2.89) to the Pennsgrove-Pedricktown Road/Mill Street intersection (milepost 3.61) where the name changes to Porcupine Road, from milepost 3.61, and terminates at Route 130 (milepost 4.71). The project area is illustrated in **Figure 1**.

The roadway segments evaluated are summarized in the following **Table 1**:

**TABLE 1**  
**ROADWAY SEGMENT SUMMARY**

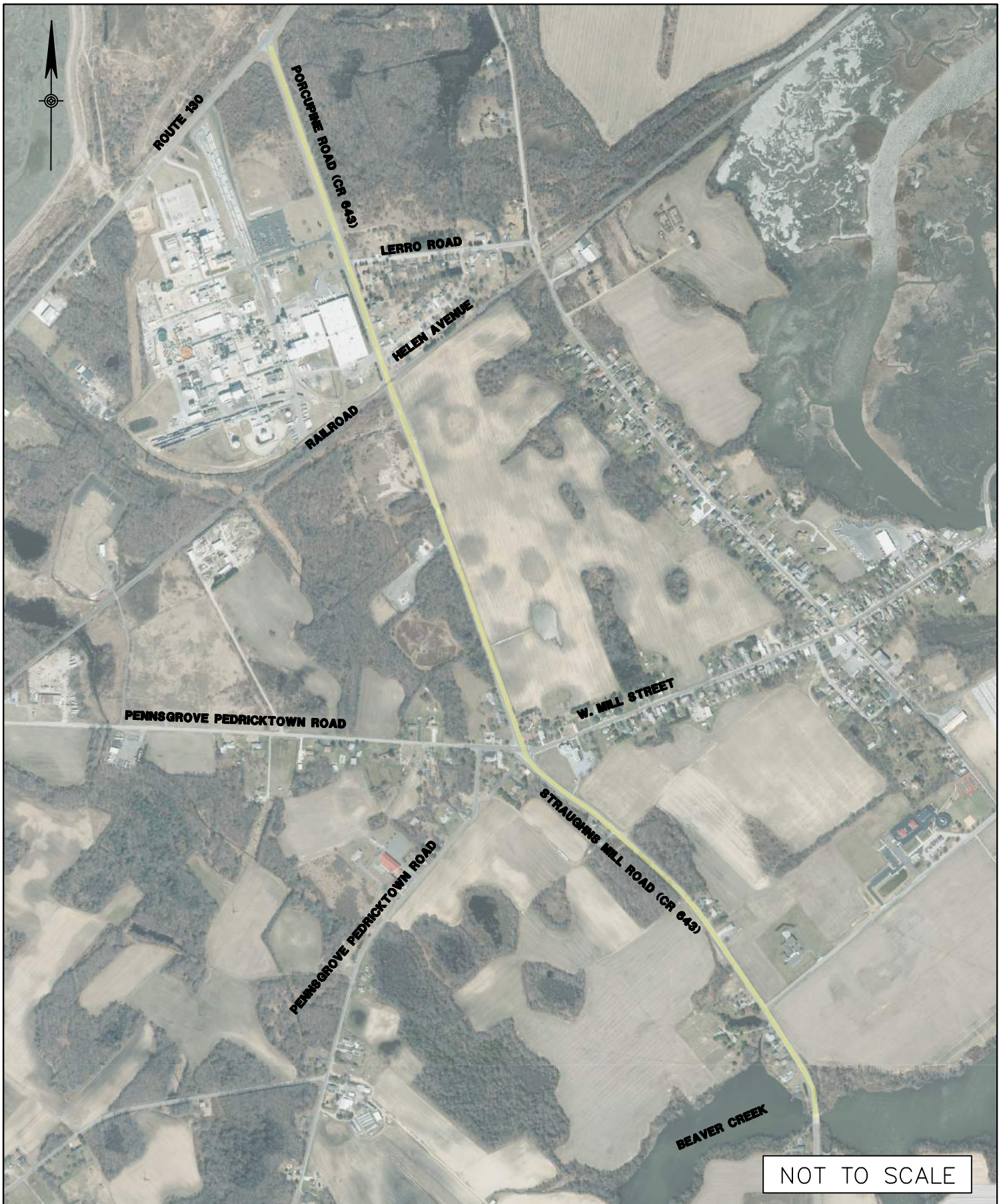
Street Name	Approx. Milepost Range	Functional Classification	Number of Lanes	Median Type	Speed Limit
Straughns Mill Road	2.89 -3.08	Rural Major Collector	2	None	35
Straughns Mill Road	3.08 -3.45	Urban Major Collector	4	None	35
Straughns Mill Road	3.45 -3.61	Urban Major Collector	4	None	35
Porcupine Road	3.61-3.70	Urban Major Collector	4	None	35
Porcupine Road	3.70-4.10	Urban Major Collector	2	None	50
Porcupine Road	4.10-4.23	Urban Major Collector	4	Curbed	50
Porcupine Road	4.23-4.71	Rural Major Collector	4	Curbed	50

## Data Collection

Automatic Traffic Recorders (ATRs), which utilize road tubes to collect traffic data, were placed on Porcupine Road/Straughns Mill Road to collect bi-directional axle classification data for a period of at least seven days. An ATR was placed on Porcupine Road approximately 1,100' south of the railroad tracks (approx. M.P. 3.98) from Monday, September 16, 2019 through Tuesday, September 24, 2019. A second ATR was placed on Porcupine Road approximately 1,000' south of Route 130 (approx. M.P. 4.52) from Monday, September 16, 2019 through Tuesday, September 24, 2019 to collect the southbound data and from Monday, September 30, 2019 through Wednesday October 9, 2019 to collect the northbound data.

The ATR locations are illustrated in **Figure 2**.



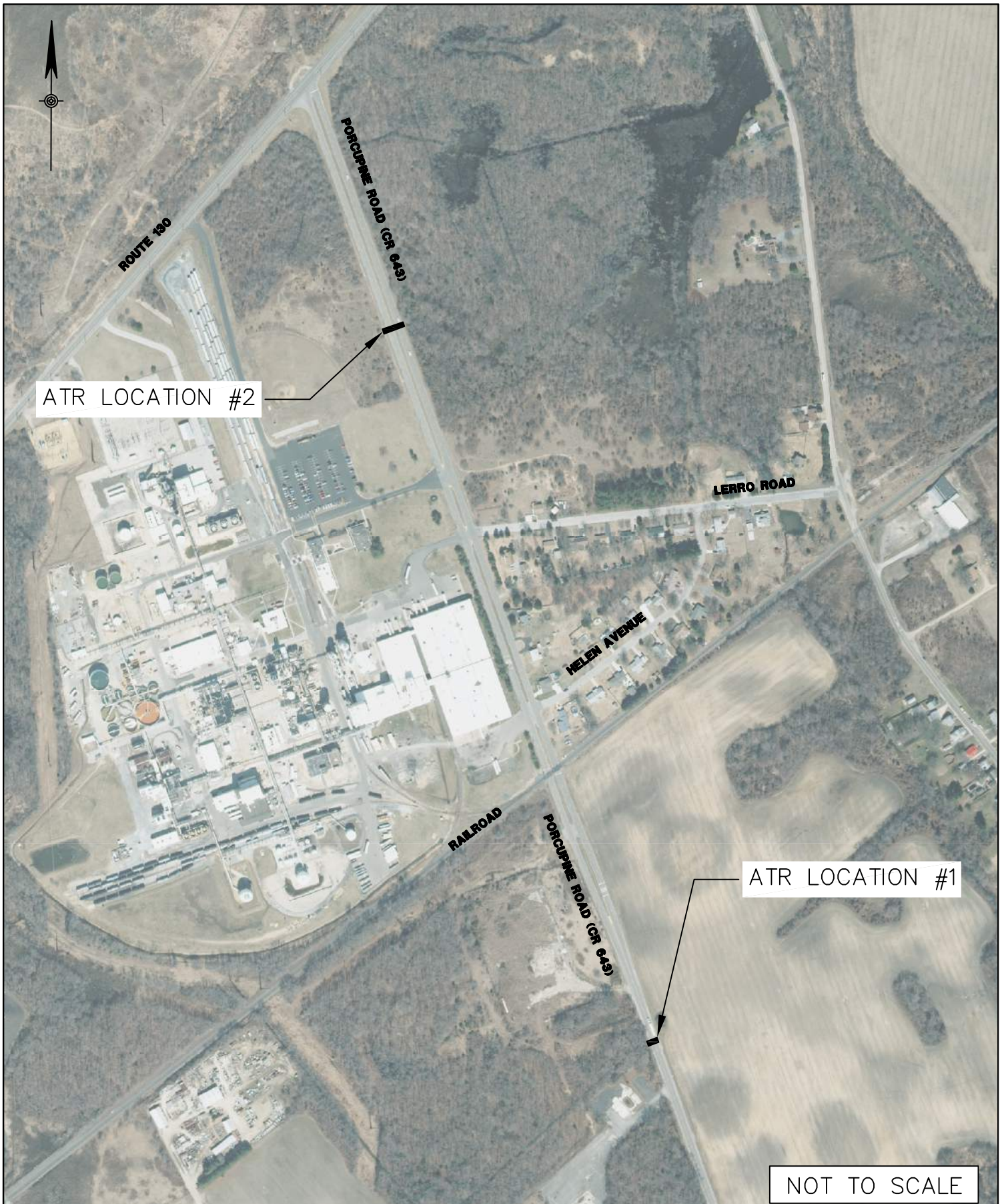


PENNONI ASSOCIATES INC.  
CONSULTING ENGINEERS  
515 GROVE STREET  
HADDON HEIGHTS, NJ

# **TRAFFIC STUDY FOR LFIF** Porcupine/Straughns Mill Road Oldmans Township, New Jersey

**FIGURE 1**  
Project Area





PENNONI ASSOCIATES INC.  
CONSULTING ENGINEERS  
515 GROVE STREET  
HADDON HEIGHTS, NJ

# **TRAFFIC STUDY FOR LFIF** Porcupine/Straughns Mill Road Oldmans Township, New Jersey

**FIGURE 2**  
ATR Location

The ATRs collected axel-based classification and speed data. Based on the axle spacing, the vehicles were classified as light vehicles (FHWA class 1-4 vehicles) and Large Trucks (FHWA Class 5-13 vehicles). Summaries of the ATR data is provided in **Appendix A**.

### Calculating AADT

The AADT for Porcupine Road/Straughns Mill Road was calculated based on the ATR data collected and applying the seasonal adjustment factor based on the New Jersey Department of Transportation Traffic Monitoring Program (TTMP).

Porcupine Road/Straughns Mill Road is located in NJDOT's Regional Pattern Group 3 and is primarily classified as an urban major collector (TTMP Code 5).

The seasonal adjustment factor utilized in calculating the AADT is summarized in **Table 2**.

**TABLE 2  
NJDOT SEASONAL ADJUSTMENT FACTOR**

Regional Pattern Group	Functional Class	TTMP Code	Month	Factor
3	Urban Major Collector	5	September	0.990

The traffic volumes by machine, direction, and day along with the seasonal adjustments and AADT calculations are summarized in **Table 3**.

**TABLE 3  
SUMMARIZED ATR DATA AND AADT CALCULATIONS**

ATR LOCATION #1 (M.P. 3.98)	DIRECTION	SUN	MON	TUES	WED	THURS	FRI	SAT	TOTAL
Porcupine Road	NB	137	383	370	394	346	339	149	2,118
	SB	127	383	425	405	386	336	170	2,232
Total		264	766	795	799	732	675	319	4,350
Seasonally Adjusted		262	759	787	791	725	669	316	4,309
AADT		616							

ATR LOCATION #2 (M.P. 4.52)	DIRECTION	SUN	MON	TUES	WED	THURS	FRI	SAT	TOTAL
Porcupine Road	NB	103	261	242	262	251	261	124	1,504
	SB	106	301	326	333	316	272	128	1,782
Total		209	562	568	595	567	533	252	3,286
Seasonally Adjusted		207	556	562	589	561	528	249	3,252
AADT		465							

### Calculating Large Truck Percentage

A large truck is defined within the “Procedures and Criteria for Local Freight Impact Fund Grant Program” as a medium or heavy truck, excluding buses and motor homes, with a gross vehicle weight rating (GVWR) greater than 5 Tons (10,000 pounds). For the purposes of this evaluation, a 2-Axel, Six Tire (FHWA Class 5) vehicle and anything larger is considered a large truck. The large truck percentage is calculated by dividing the AADT-Large trucks by the total roadway AADT.

The summary of the large vehicles by day and the calculation of the large vehicle percentage is summarized in **TABLE 4**.

**TABLE 4**  
**SUMMARIZED LARGE VEHICLE PERCENTAGE**

ATR LOCATION #1 (M.P. 3.98)	DIRECTION	SUN	MON	TUES	WED	THURS	FRI	SAT	TOTAL
Porcupine Road	NB	10	41	44	51	33	36	3	218
	SB	12	62	61	73	71	56	11	346
Total Large Trucks		22	103	105	124	104	92	14	564
Seasonally Adjusted		22	102	104	123	103	91	14	559
AADT – Large Trucks		80							
AADT		616							
Large Truck %		13.1%							

ATR LOCATION #2 (M.P. 4.52)	DIRECTION	SUN	MON	TUES	WED	THURS	FRI	SAT	TOTAL
Porcupine Road	NB	9	38	26	40	38	37	7	195
	SB	10	46	55	54	67	47	10	289
Total Large Trucks		19	84	81	94	105	84	17	484
Seasonally Adjusted		19	83	80	93	104	83	17	479
AADT – Large Trucks		68							
AADT		465							
Large Truck %		14.6%							



### **Conclusion**

The "Procedures and Criteria for Local Freight Impact Fund Grant Program" states that for a project must have a minimum of 10% large truck volume within its limits when compared to total AADT in order to eligible for the grant program.

The ATR data collected at the two locations on Porcupine Road/Straughns Mill Road indicated large truck percentages of 13.1% and 14.6% when compared to the total AADT. Therefore, a project on Porcupine Road/Straughns Mill Road will meet the eligibility requirements for large truck percentage of the New Jersey Department of Transportation's Local Freight Impact Fund Grant Program.



# ***SALEM COUNTY INTERSECTION IMPROVEMENTS***

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## **APPENDIX B**

### **TRAFFIC COUNT DATA**





Name: Centerton Rd  
 Date/Time: 1/8/2020  
 Site Code:  
 Station ID:  
 Location 1:  
 Latitude: 0.000000  
 Longitude: 0.000000  
 Channels: , Channel 1 - Direction NB, Lane 1, Channel 2 - Direction SB, Lane 2  
 Filters Applied: None

<u>Start time</u>	<u>End Time</u>	<u>NB</u>	<u>SB</u>	<u>Total</u>	<u>Hourly Totals</u>	NB	SB
12:00:00 AM	12:15:00 AM	5	0	5	-		
12:15:00 AM	12:30:00 AM	4	4	8	-		
12:30:00 AM	12:45:00 AM	4	2	6	-		
12:45:00 AM	1:00:00 AM	2	3	5	24	15	9
1:00:00 AM	1:15:00 AM	2	4	6	25		
1:15:00 AM	1:30:00 AM	2	3	5	22		
1:30:00 AM	1:45:00 AM	1	3	4	20		
1:45:00 AM	2:00:00 AM	1	0	1	16	6	10
2:00:00 AM	2:15:00 AM	2	2	4	14		
2:15:00 AM	2:30:00 AM	0	1	1	10		
2:30:00 AM	2:45:00 AM	2	2	4	10		
2:45:00 AM	3:00:00 AM	2	6	8	17	6	11
3:00:00 AM	3:15:00 AM	2	3	5	18		
3:15:00 AM	3:30:00 AM	1	5	6	23		
3:30:00 AM	3:45:00 AM	0	3	3	22		
3:45:00 AM	4:00:00 AM	3	2	5	19	6	13
4:00:00 AM	4:15:00 AM	2	7	9	23		
4:15:00 AM	4:30:00 AM	3	10	13	30		
4:30:00 AM	4:45:00 AM	2	13	15	42		
4:45:00 AM	5:00:00 AM	4	11	15	52	11	41
5:00:00 AM	5:15:00 AM	6	17	23	66		
5:15:00 AM	5:30:00 AM	5	8	13	66		
5:30:00 AM	5:45:00 AM	13	24	37	88		
5:45:00 AM	6:00:00 AM	5	35	40	113	29	84
6:00:00 AM	6:15:00 AM	8	32	40	130		
6:15:00 AM	6:30:00 AM	23	44	67	184		
6:30:00 AM	6:45:00 AM	30	62	92	239		
6:45:00 AM	7:00:00 AM	54	55	109	308	115	193
7:00:00 AM	7:15:00 AM	82	67	149	417		
7:15:00 AM	7:30:00 AM	37	78	115	465		
7:30:00 AM	7:45:00 AM	62	48	110	483		
7:45:00 AM	8:00:00 AM	53	59	112	486	234	252
8:00:00 AM	8:15:00 AM	62	56	118	455		
8:15:00 AM	8:30:00 AM	22	49	71	411		
8:30:00 AM	8:45:00 AM	45	51	96	397		
8:45:00 AM	9:00:00 AM	34	62	96	381	163	218
9:00:00 AM	9:15:00 AM	52	40	92	355		
9:15:00 AM	9:30:00 AM	36	28	64	348		
9:30:00 AM	9:45:00 AM	24	38	62	314		
9:45:00 AM	10:00:00 AM	22	51	73	291	134	157
10:00:00 AM	10:15:00 AM	26	28	54	253		
10:15:00 AM	10:30:00 AM	32	35	67	256		
10:30:00 AM	10:45:00 AM	36	33	69	263		
10:45:00 AM	11:00:00 AM	19	34	53	243	113	130
11:00:00 AM	11:15:00 AM	31	33	64	253		
11:15:00 AM	11:30:00 AM	28	35	63	249		
11:30:00 AM	11:45:00 AM	23	35	58	238		
11:45:00 AM	12:00:00 PM	26	40	66	251	108	143
12:00:00 PM	12:15:00 PM	32	42	74	261		
12:15:00 PM	12:30:00 PM	33	31	64	262		
12:30:00 PM	12:45:00 PM	35	30	65	269		
12:45:00 PM	1:00:00 PM	28	33	61	264	128	136
1:00:00 PM	1:15:00 PM	21	41	62	252		
1:15:00 PM	1:30:00 PM	34	27	61	249		
1:30:00 PM	1:45:00 PM	44	57	101	285		
1:45:00 PM	2:00:00 PM	36	38	74	298	135	163

Name: Garden Road East  
Date/Time: 12/17/2019  
Site Code:  
Station ID:  
Location 1:  
Location 1:  
Latitude: 0.000000  
Longitude: 0.000000  
Channels: , Channel 1 - EB, Channel 2 - WB  
Filters Applied: None

Start time	End Time	EB	WB	Total	Hourly Totals	EB	WB
12:00:00 AM	12:15:00 AM	0	1	1	-		
12:15:00 AM	12:30:00 AM	1	3	4	-		
12:30:00 AM	12:45:00 AM	0	0	0	-		
12:45:00 AM	1:00:00 AM	0	0	0	5	1	4
1:00:00 AM	1:15:00 AM	1	0	1	5		
1:15:00 AM	1:30:00 AM	0	0	0	1		
1:30:00 AM	1:45:00 AM	0	0	0	1		
1:45:00 AM	2:00:00 AM	0	0	0	1	1	0
2:00:00 AM	2:15:00 AM	0	1	1	1		
2:15:00 AM	2:30:00 AM	2	0	2	3		
2:30:00 AM	2:45:00 AM	1	0	1	4		
2:45:00 AM	3:00:00 AM	0	0	0	4	3	1
3:00:00 AM	3:15:00 AM	2	0	2	5		
3:15:00 AM	3:30:00 AM	1	1	2	5		
3:30:00 AM	3:45:00 AM	1	1	2	6		
3:45:00 AM	4:00:00 AM	0	0	0	6	4	2
4:00:00 AM	4:15:00 AM	3	0	3	7		
4:15:00 AM	4:30:00 AM	0	2	2	7		
4:30:00 AM	4:45:00 AM	2	0	2	7		
4:45:00 AM	5:00:00 AM	1	4	5	12	6	6
5:00:00 AM	5:15:00 AM	5	2	7	16		
5:15:00 AM	5:30:00 AM	0	1	1	15		
5:30:00 AM	5:45:00 AM	4	5	9	22		
5:45:00 AM	6:00:00 AM	5	4	9	26	14	12
6:00:00 AM	6:15:00 AM	4	8	12	31		
6:15:00 AM	6:30:00 AM	10	8	18	48		
6:30:00 AM	6:45:00 AM	8	15	23	62		
6:45:00 AM	7:00:00 AM	10	18	28	81	32	49
7:00:00 AM	7:15:00 AM	14	9	23	92		
7:15:00 AM	7:30:00 AM	15	14	29	103		
7:30:00 AM	7:45:00 AM	8	25	33	113		
7:45:00 AM	8:00:00 AM	17	31	48	133	54	79
8:00:00 AM	8:15:00 AM	19	23	42	152		
8:15:00 AM	8:30:00 AM	11	20	31	154		
8:30:00 AM	8:45:00 AM	14	17	31	152		
8:45:00 AM	9:00:00 AM	24	12	36	140	68	72
9:00:00 AM	9:15:00 AM	9	21	30	128		
9:15:00 AM	9:30:00 AM	7	15	22	119		
9:30:00 AM	9:45:00 AM	13	19	32	120		
9:45:00 AM	10:00:00 AM	8	13	21	105	37	68
10:00:00 AM	10:15:00 AM	7	10	17	92		
10:15:00 AM	10:30:00 AM	13	11	24	94		
10:30:00 AM	10:45:00 AM	16	12	28	90		
10:45:00 AM	11:00:00 AM	5	10	15	84	41	43
11:00:00 AM	11:15:00 AM	11	19	30	97		
11:15:00 AM	11:30:00 AM	9	14	23	96		
11:30:00 AM	11:45:00 AM	14	9	23	91		
11:45:00 AM	12:00:00 PM	9	13	22	98	43	55
12:00:00 PM	12:15:00 PM	15	9	24	92		
12:15:00 PM	12:30:00 PM	10	17	27	96		
12:30:00 PM	12:45:00 PM	12	11	23	96		
12:45:00 PM	1:00:00 PM	15	11	26	100	52	48
1:00:00 PM	1:15:00 PM	18	16	34	110		
1:15:00 PM	1:30:00 PM	17	10	27	110		
1:30:00 PM	1:45:00 PM	16	15	31	118		

Name: Garden Road East  
Date/Time: 12/17/2019  
Site Code:  
Station ID:  
Location 1:  
Location 1:  
Latitude: 0.000000  
Longitude: 0.000000  
Channels: , Channel 1 - EB, Channel 2 - WB  
Filters Applied: None

<u>Start time</u>	<u>End Time</u>	<u>EB</u>	<u>WB</u>	<u>Total</u>	<u>Hourly Totals</u>	<u>EB</u>	<u>WB</u>
1:45:00 PM	2:00:00 PM	23	14	37	129	74	55
2:00:00 PM	2:15:00 PM	13	19	32	127		
2:15:00 PM	2:30:00 PM	34	19	53	153		
2:30:00 PM	2:45:00 PM	17	18	35	157		
2:45:00 PM	3:00:00 PM	18	20	38	158	82	76
3:00:00 PM	3:15:00 PM	7	14	21	147		
3:15:00 PM	3:30:00 PM	30	22	52	146		
3:30:00 PM	3:45:00 PM	18	32	50	161		
3:45:00 PM	4:00:00 PM	26	33	59	182	81	101
4:00:00 PM	4:15:00 PM	21	24	45	206		
4:15:00 PM	4:30:00 PM	29	27	56	210	94	116
4:30:00 PM	4:45:00 PM	21	24	45	205		
4:45:00 PM	5:00:00 PM	32	23	55	201	103	98
5:00:00 PM	5:15:00 PM	22	26	48	204		
5:15:00 PM	5:30:00 PM	25	13	38	186		
5:30:00 PM	5:45:00 PM	19	21	40	181		
5:45:00 PM	6:00:00 PM	14	14	28	154	80	74
6:00:00 PM	6:15:00 PM	22	15	37	143		
6:15:00 PM	6:30:00 PM	19	8	27	132		
6:30:00 PM	6:45:00 PM	25	7	32	124		
6:45:00 PM	7:00:00 PM	10	10	20	116	76	40
7:00:00 PM	7:15:00 PM	19	10	29	108		
7:15:00 PM	7:30:00 PM	10	8	18	99		
7:30:00 PM	7:45:00 PM	8	9	17	84		
7:45:00 PM	8:00:00 PM	12	6	18	82	49	33
8:00:00 PM	8:15:00 PM	6	8	14	67		
8:15:00 PM	8:30:00 PM	12	7	19	68		
8:30:00 PM	8:45:00 PM	9	9	18	69		
8:45:00 PM	9:00:00 PM	8	4	12	63	35	28
9:00:00 PM	9:15:00 PM	4	3	7	56		
9:15:00 PM	9:30:00 PM	4	1	5	42		
9:30:00 PM	9:45:00 PM	8	3	11	35		
9:45:00 PM	10:00:00 PM	5	3	8	31	21	10
10:00:00 PM	10:15:00 PM	2	2	4	28		
10:15:00 PM	10:30:00 PM	2	4	6	29		
10:30:00 PM	10:45:00 PM	3	4	7	25		
10:45:00 PM	11:00:00 PM	3	1	4	21	10	11
11:00:00 PM	11:15:00 PM	3	0	3	20		
11:15:00 PM	11:30:00 PM	6	3	9	23		
11:30:00 PM	11:45:00 PM	4	4	8	24		
11:45:00 PM	12:00:00 AM	2	1	3	23	15	8
Total		982	973	1955			

Name: Garden Rd West

Date/Time: 12/17/2019

Site Code:

Station ID:

Location 1:

Location 1:

Latitude: 0.000000

Longitude: 0.000000

Channels: Channel 1 - WB, Channel 2 - Direction EB

<u>Start time</u>	<u>End Time</u>	<u>WB</u>	<u>EB</u>	<u>Total</u>	<u>Hourly Totals</u>	WB	EB
12:00:00 AM	12:15:00 AM	0	0	0			
12:15:00 AM	12:30:00 AM	0	1	1			
12:30:00 AM	12:45:00 AM	0	0	0			
12:45:00 AM	1:00:00 AM	0	0	0	1	0	1
1:00:00 AM	1:15:00 AM	0	1	1	2		
1:15:00 AM	1:30:00 AM	0	0	0	1		
1:30:00 AM	1:45:00 AM	0	0	0	1		
1:45:00 AM	2:00:00 AM	0	0	0	1	0	1
2:00:00 AM	2:15:00 AM	0	0	0	0		
2:15:00 AM	2:30:00 AM	0	1	1	1		
2:30:00 AM	2:45:00 AM	0	0	0	1		
2:45:00 AM	3:00:00 AM	0	0	0	1	0	1
3:00:00 AM	3:15:00 AM	0	1	1	2		
3:15:00 AM	3:30:00 AM	0	0	0	1		
3:30:00 AM	3:45:00 AM	0	1	1	2		
3:45:00 AM	4:00:00 AM	0	1	1	3	0	3
4:00:00 AM	4:15:00 AM	0	0	0	2		
4:15:00 AM	4:30:00 AM	0	0	0	2		
4:30:00 AM	4:45:00 AM	0	2	2	3		
4:45:00 AM	5:00:00 AM	0	1	1	3	0	3
5:00:00 AM	5:15:00 AM	0	2	2	5		
5:15:00 AM	5:30:00 AM	0	0	0	5		
5:30:00 AM	5:45:00 AM	0	0	0	3		
5:45:00 AM	6:00:00 AM	0	3	3	5	0	5
6:00:00 AM	6:15:00 AM	0	2	2	5		
6:15:00 AM	6:30:00 AM	0	6	6	11		
6:30:00 AM	6:45:00 AM	0	5	5	16		
6:45:00 AM	7:00:00 AM	0	5	5	18	0	18
7:00:00 AM	7:15:00 AM	0	7	7	23		
7:15:00 AM	7:30:00 AM	0	12	12	29		
7:30:00 AM	7:45:00 AM	0	6	6	30		
7:45:00 AM	8:00:00 AM	0	12	12	37	0	37
8:00:00 AM	8:15:00 AM	0	13	13	43		
8:15:00 AM	8:30:00 AM	0	4	4	35		
8:30:00 AM	8:45:00 AM	0	4	4	33		
8:45:00 AM	9:00:00 AM	0	2	2	23	0	23
9:00:00 AM	9:15:00 AM	0	7	7	17		
9:15:00 AM	9:30:00 AM	0	7	7	20		
9:30:00 AM	9:45:00 AM	0	4	4	20		
9:45:00 AM	10:00:00 AM	0	4	4	22	0	22
10:00:00 AM	10:15:00 AM	0	4	4	19		
10:15:00 AM	10:30:00 AM	0	8	8	20		
10:30:00 AM	10:45:00 AM	0	5	5	21		
10:45:00 AM	11:00:00 AM	0	3	3	20	0	20
11:00:00 AM	11:15:00 AM	0	7	7	23		
11:15:00 AM	11:30:00 AM	0	8	8	23		
11:30:00 AM	11:45:00 AM	0	10	10	28		
11:45:00 AM	12:00:00 PM	0	4	4	29	0	29
12:00:00 PM	12:15:00 PM	0	10	10	32		
12:15:00 PM	12:30:00 PM	0	9	9	33		
12:30:00 PM	12:45:00 PM	0	9	9	32		
12:45:00 PM	1:00:00 PM	0	10	10	38	0	38
1:00:00 PM	1:15:00 PM	0	11	11	39		
1:15:00 PM	1:30:00 PM	0	16	16	46		
1:30:00 PM	1:45:00 PM	0	9	9	46		
1:45:00 PM	2:00:00 PM	0	15	15	51	0	51



Name: Garden Rd West

Date/Time: 12/17/2019

Site Code:

Station ID:

Location 1:

Location 1:

Latitude: 0.000000

Longitude: 0.000000

Channels: Channel 1 - WB, Channel 2 - Direction EB

2:00:00 PM	2:15:00 PM	0	15	15	55		
2:15:00 PM	2:30:00 PM	0	21	21	60		
2:30:00 PM	2:45:00 PM	0	10	10	61		
2:45:00 PM	3:00:00 PM	0	12	12	58	0	58
3:00:00 PM	3:15:00 PM	0	6	6	49		
3:15:00 PM	3:30:00 PM	0	10	10	38		
3:30:00 PM	3:45:00 PM	0	8	8	36		
3:45:00 PM	4:00:00 PM	0	11	11	35	0	35
4:00:00 PM	4:15:00 PM	0	15	15	44		
4:15:00 PM	4:30:00 PM	0	13	13	47	0	47
4:30:00 PM	4:45:00 PM	0	13	13	52		
4:45:00 PM	5:00:00 PM	0	15	15	56	0	56
5:00:00 PM	5:15:00 PM	0	9	9	50		
5:15:00 PM	5:30:00 PM	0	9	9	46		
5:30:00 PM	5:45:00 PM	0	15	15	48		
5:45:00 PM	6:00:00 PM	0	11	11	44	0	44
6:00:00 PM	6:15:00 PM	0	13	13	48		
6:15:00 PM	6:30:00 PM	0	9	9	48		
6:30:00 PM	6:45:00 PM	0	14	14	47		
6:45:00 PM	7:00:00 PM	0	10	10	46	0	46
7:00:00 PM	7:15:00 PM	0	12	12	45		
7:15:00 PM	7:30:00 PM	0	4	4	40		
7:30:00 PM	7:45:00 PM	0	5	5	31		
7:45:00 PM	8:00:00 PM	0	9	9	30	0	30
8:00:00 PM	8:15:00 PM	0	4	4	22		
8:15:00 PM	8:30:00 PM	0	6	6	24		
8:30:00 PM	8:45:00 PM	0	10	10	29		
8:45:00 PM	9:00:00 PM	0	4	4	24	0	24
9:00:00 PM	9:15:00 PM	0	1	1	21		
9:15:00 PM	9:30:00 PM	0	2	2	17		
9:30:00 PM	9:45:00 PM	0	3	3	10		
9:45:00 PM	10:00:00 PM	0	2	2	8	0	8
10:00:00 PM	10:15:00 PM	0	1	1	8		
10:15:00 PM	10:30:00 PM	0	2	2	8		
10:30:00 PM	10:45:00 PM	0	1	1	6		
10:45:00 PM	11:00:00 PM	0	2	2	6	0	6
11:00:00 PM	11:15:00 PM	0	2	2	7		
11:15:00 PM	11:30:00 PM	0	5	5	10		
11:30:00 PM	11:45:00 PM	0	3	3	12		
11:45:00 PM	12:00:00 AM	0	1	1	11	0	11

Total	0	570	570
-------	---	-----	-----

Name: Almond Rd  
 Date/Time: 1/8/2020  
 Site Code:  
 Station ID:  
 Location 1:  
 Location 1:  
 Latitude: 0.000000  
 Longitude: 0.000000  
 Channels: , Channel 1 - Direction EB, Lane 1, Channel 2 - Direction WB, Lane 2  
 Filters Applied: None

<u>Start time</u>	<u>End Time</u>	<u>EB</u>	<u>WB</u>	<u>Total</u>	<u>Hourly Totals</u>	<u>EB</u>	<u>WB</u>
12:00:00 AM	12:15:00 AM	0	0	0	-		
12:15:00 AM	12:30:00 AM	1	2	3	-		
12:30:00 AM	12:45:00 AM	0	1	1	-		
12:45:00 AM	1:00:00 AM	0	3	3	7	1	6
1:00:00 AM	1:15:00 AM	0	1	1	8		
1:15:00 AM	1:30:00 AM	1	2	3	8		
1:30:00 AM	1:45:00 AM	0	1	1	8		
1:45:00 AM	2:00:00 AM	1	0	1	6	2	4
2:00:00 AM	2:15:00 AM	1	0	1	6		
2:15:00 AM	2:30:00 AM	0	0	0	3		
2:30:00 AM	2:45:00 AM	0	1	1	3		
2:45:00 AM	3:00:00 AM	0	0	0	2	1	1
3:00:00 AM	3:15:00 AM	0	0	0	1		
3:15:00 AM	3:30:00 AM	1	1	2	3		
3:30:00 AM	3:45:00 AM	0	0	0	2		
3:45:00 AM	4:00:00 AM	0	1	1	3	1	2
4:00:00 AM	4:15:00 AM	1	4	5	8		
4:15:00 AM	4:30:00 AM	0	1	1	7		
4:30:00 AM	4:45:00 AM	2	0	2	9		
4:45:00 AM	5:00:00 AM	2	5	7	15	5	10
5:00:00 AM	5:15:00 AM	3	2	5	15		
5:15:00 AM	5:30:00 AM	0	3	3	17		
5:30:00 AM	5:45:00 AM	9	8	17	32		
5:45:00 AM	6:00:00 AM	8	12	20	45	20	25
6:00:00 AM	6:15:00 AM	11	20	31	71		
6:15:00 AM	6:30:00 AM	6	11	17	85		
6:30:00 AM	6:45:00 AM	10	13	23	91		
6:45:00 AM	7:00:00 AM	10	25	35	106	37	69
7:00:00 AM	7:15:00 AM	14	37	51	126		
7:15:00 AM	7:30:00 AM	25	27	52	161		
7:30:00 AM	7:45:00 AM	19	13	32	170		
7:45:00 AM	8:00:00 AM	23	43	66	201	81	120
8:00:00 AM	8:15:00 AM	29	30	59	209	96	113
8:15:00 AM	8:30:00 AM	20	21	41	198		
8:30:00 AM	8:45:00 AM	11	23	34	200		
8:45:00 AM	9:00:00 AM	7	9	16	150	67	83
9:00:00 AM	9:15:00 AM	5	9	14	105		
9:15:00 AM	9:30:00 AM	13	13	26	90		
9:30:00 AM	9:45:00 AM	3	4	7	63		
9:45:00 AM	10:00:00 AM	2	10	12	59	23	36
10:00:00 AM	10:15:00 AM	4	9	13	58		
10:15:00 AM	10:30:00 AM	12	14	26	58		
10:30:00 AM	10:45:00 AM	7	10	17	68		
10:45:00 AM	11:00:00 AM	8	9	17	73	31	42
11:00:00 AM	11:15:00 AM	10	9	19	79		
11:15:00 AM	11:30:00 AM	4	11	15	68		
11:30:00 AM	11:45:00 AM	3	14	17	68		
11:45:00 AM	12:00:00 PM	7	10	17	68	24	44
12:00:00 PM	12:15:00 PM	8	14	22	71		
12:15:00 PM	12:30:00 PM	15	15	30	86		
12:30:00 PM	12:45:00 PM	13	23	36	105		
12:45:00 PM	1:00:00 PM	12	11	23	111	48	63
1:00:00 PM	1:15:00 PM	12	22	34	123		
1:15:00 PM	1:30:00 PM	7	26	33	126		
1:30:00 PM	1:45:00 PM	18	24	42	132		
1:45:00 PM	2:00:00 PM	16	23	39	148	53	95
2:00:00 PM	2:15:00 PM	15	10	25	139		
2:15:00 PM	2:30:00 PM	12	18	30	136		
2:30:00 PM	2:45:00 PM	8	40	48	142		
2:45:00 PM	3:00:00 PM	26	31	57	160	61	99

Name: Almond Rd  
 Date/Time: 1/8/2020  
 Site Code:  
 Station ID:  
 Location 1:  
 Location 1:  
 Latitude: 0.000000  
 Longitude: 0.000000  
 Channels: , Channel 1 - Direction EB, Lane 1, Channel 2 - Direction WB, Lane 2  
 Filters Applied: None

<u>Start time</u>	<u>End Time</u>	<u>EB</u>	<u>WB</u>	<u>Total</u>	<u>Hourly Totals</u>	<u>EB</u>	<u>WB</u>
3:00:00 PM	3:15:00 PM	22	13	35	170		
3:15:00 PM	3:30:00 PM	23	32	55	195		
3:30:00 PM	3:45:00 PM	19	38	57	204		
3:45:00 PM	4:00:00 PM	21	44	65	212	85	127
4:00:00 PM	4:15:00 PM	31	39	70	247	94	153
4:15:00 PM	4:30:00 PM	22	32	54	246		
4:30:00 PM	4:45:00 PM	15	32	47	236		
4:45:00 PM	5:00:00 PM	19	35	54	225	87	138
5:00:00 PM	5:15:00 PM	23	25	48	203		
5:15:00 PM	5:30:00 PM	14	32	46	195		
5:30:00 PM	5:45:00 PM	35	26	61	209		
5:45:00 PM	6:00:00 PM	21	16	37	192	93	99
6:00:00 PM	6:15:00 PM	19	22	41	185		
6:15:00 PM	6:30:00 PM	10	29	39	178		
6:30:00 PM	6:45:00 PM	9	11	20	137		
6:45:00 PM	7:00:00 PM	10	15	25	125	48	77
7:00:00 PM	7:15:00 PM	8	12	20	104		
7:15:00 PM	7:30:00 PM	6	13	19	84		
7:30:00 PM	7:45:00 PM	5	9	14	78		
7:45:00 PM	8:00:00 PM	7	9	16	69	26	43
8:00:00 PM	8:15:00 PM	11	12	23	72		
8:15:00 PM	8:30:00 PM	7	6	13	66		
8:30:00 PM	8:45:00 PM	10	8	18	70		
8:45:00 PM	9:00:00 PM	9	8	17	71	37	34
9:00:00 PM	9:15:00 PM	2	5	7	55		
9:15:00 PM	9:30:00 PM	5	13	18	60		
9:30:00 PM	9:45:00 PM	6	4	10	52		
9:45:00 PM	10:00:00 PM	1	7	8	43	14	29
10:00:00 PM	10:15:00 PM	2	3	5	41		
10:15:00 PM	10:30:00 PM	2	4	6	29		
10:30:00 PM	10:45:00 PM	7	3	10	29		
10:45:00 PM	11:00:00 PM	3	3	6	27	14	13
11:00:00 PM	11:15:00 PM	1	3	4	26		
11:15:00 PM	11:30:00 PM	1	3	4	24		
11:30:00 PM	11:45:00 PM	0	1	1	15		
11:45:00 PM	12:00:00 AM	1	2	3	12	3	9
Total		862	1268	2130			

Name: Acton Station Rd

Date/Time: 1/16/2020

Site Code:

Station ID:

Location 1:

Location 1:

Latitude: 0.000000

Longitude: 0.000000

Channels: , Channel 1 - Direction EB, Lane 1, Channel 2 - Direction WB, Lane 2

Filters Applied: None

<u>Start time</u>	<u>End Time</u>	<u>EB</u>	<u>WB</u>	<u>Total</u>	Hourly Total	<u>EB</u>	<u>WB</u>
12:00:00 AM	12:15:00 AM	0	4	4	-		
12:15:00 AM	12:30:00 AM	0	0	0	-		
12:30:00 AM	12:45:00 AM	1	1	2	-		
12:45:00 AM	1:00:00 AM	1	1	2	8	2	6
1:00:00 AM	1:15:00 AM	0	1	1	5		
1:15:00 AM	1:30:00 AM	0	0	0	5		
1:30:00 AM	1:45:00 AM	0	1	1	4		
1:45:00 AM	2:00:00 AM	0	0	0	2	0	2
2:00:00 AM	2:15:00 AM	0	1	1	2		
2:15:00 AM	2:30:00 AM	0	1	1	3		
2:30:00 AM	2:45:00 AM	2	0	2	4		
2:45:00 AM	3:00:00 AM	3	0	3	7	5	2
3:00:00 AM	3:15:00 AM	1	1	2	8		
3:15:00 AM	3:30:00 AM	1	0	1	8		
3:30:00 AM	3:45:00 AM	1	0	1	7		
3:45:00 AM	4:00:00 AM	2	3	5	9	5	4
4:00:00 AM	4:15:00 AM	3	2	5	12		
4:15:00 AM	4:30:00 AM	4	4	8	19		
4:30:00 AM	4:45:00 AM	9	1	10	28		
4:45:00 AM	5:00:00 AM	4	4	8	31	20	11
5:00:00 AM	5:15:00 AM	5	6	11	37		
5:15:00 AM	5:30:00 AM	8	2	10	39		
5:30:00 AM	5:45:00 AM	16	8	24	53		
5:45:00 AM	6:00:00 AM	22	13	35	80	51	29
6:00:00 AM	6:15:00 AM	21	9	30	99		
6:15:00 AM	6:30:00 AM	27	25	52	141		
6:30:00 AM	6:45:00 AM	30	7	37	154		
6:45:00 AM	7:00:00 AM	15	5	20	139	93	46
7:00:00 AM	7:15:00 AM	28	11	39	148		
7:15:00 AM	7:30:00 AM	35	15	50	146		
7:30:00 AM	7:45:00 AM	35	9	44	153		
7:45:00 AM	8:00:00 AM	25	12	37	170	123	47
8:00:00 AM	8:15:00 AM	28	21	49	180	123	57
8:15:00 AM	8:30:00 AM	26	7	33	163		
8:30:00 AM	8:45:00 AM	22	14	36	155		
8:45:00 AM	9:00:00 AM	10	14	24	142	86	56
9:00:00 AM	9:15:00 AM	11	8	19	112		
9:15:00 AM	9:30:00 AM	20	7	27	106		
9:30:00 AM	9:45:00 AM	14	3	17	87		
9:45:00 AM	10:00:00 AM	9	8	17	80	54	26
10:00:00 AM	10:15:00 AM	9	10	19	80		
10:15:00 AM	10:30:00 AM	11	8	19	72		
10:30:00 AM	10:45:00 AM	8	12	20	75		
10:45:00 AM	11:00:00 AM	8	15	23	81	36	45
11:00:00 AM	11:15:00 AM	13	7	20	82		
11:15:00 AM	11:30:00 AM	10	8	18	81		
11:30:00 AM	11:45:00 AM	9	12	21	82		
11:45:00 AM	12:00:00 PM	10	9	19	78	42	36
12:00:00 PM	12:15:00 PM	9	10	19	77		
12:15:00 PM	12:30:00 PM	17	14	31	90		
12:30:00 PM	12:45:00 PM	11	10	21	90		
12:45:00 PM	1:00:00 PM	6	14	20	91	43	48
1:00:00 PM	1:15:00 PM	12	16	28	100		
1:15:00 PM	1:30:00 PM	11	11	22	91		
1:30:00 PM	1:45:00 PM	8	10	18	88		



Name: Acton Station Rd

Date/Time: 1/16/2020

Site Code:

Station ID:

Location 1:

Location 1:

Latitude: 0.000000

Longitude: 0.000000

Channels: , Channel 1 - Direction EB, Lane 1, Channel 2 - Direction WB, Lane 2

Filters Applied: None

<u>Start time</u>	<u>End Time</u>	<u>EB</u>	<u>WB</u>	<u>Total</u>	Hourly Total	<u>EB</u>	<u>WB</u>
1:45:00 PM	2:00:00 PM	13	17	30	98	44	54
2:00:00 PM	2:15:00 PM	20	5	25	95		
2:15:00 PM	2:30:00 PM	18	12	30	103		
2:30:00 PM	2:45:00 PM	16	33	49	134		
2:45:00 PM	3:00:00 PM	19	25	44	148	73	75
3:00:00 PM	3:15:00 PM	15	17	32	155		
3:15:00 PM	3:30:00 PM	21	24	45	170		
3:30:00 PM	3:45:00 PM	28	18	46	167		
3:45:00 PM	4:00:00 PM	21	24	45	168	85	83
4:00:00 PM	4:15:00 PM	28	22	50	186		
4:15:00 PM	4:30:00 PM	10	23	33	174		
4:30:00 PM	4:45:00 PM	17	30	47	175		
4:45:00 PM	5:00:00 PM	19	24	43	173	74	99
5:00:00 PM	5:15:00 PM	17	35	52	175		
5:15:00 PM	5:30:00 PM	14	21	35	177	67	110
5:30:00 PM	5:45:00 PM	13	22	35	165		
5:45:00 PM	6:00:00 PM	11	27	38	160	55	105
6:00:00 PM	6:15:00 PM	15	13	28	136		
6:15:00 PM	6:30:00 PM	11	15	26	127		
6:30:00 PM	6:45:00 PM	12	14	26	118		
6:45:00 PM	7:00:00 PM	6	11	17	97	44	53
7:00:00 PM	7:15:00 PM	8	7	15	84		
7:15:00 PM	7:30:00 PM	6	13	19	77		
7:30:00 PM	7:45:00 PM	2	9	11	62		
7:45:00 PM	8:00:00 PM	4	9	13	58	20	38
8:00:00 PM	8:15:00 PM	1	4	5	48		
8:15:00 PM	8:30:00 PM	3	5	8	37		
8:30:00 PM	8:45:00 PM	2	11	13	39		
8:45:00 PM	9:00:00 PM	4	8	12	38	10	28
9:00:00 PM	9:15:00 PM	2	9	11	44		
9:15:00 PM	9:30:00 PM	0	8	8	44		
9:30:00 PM	9:45:00 PM	5	8	13	44		
9:45:00 PM	10:00:00 PM	4	4	8	40	11	29
10:00:00 PM	10:15:00 PM	3	4	7	36		
10:15:00 PM	10:30:00 PM	5	5	10	38		
10:30:00 PM	10:45:00 PM	3	1	4	29		
10:45:00 PM	11:00:00 PM	1	0	1	22	12	10
11:00:00 PM	11:15:00 PM	1	4	5	20		
11:15:00 PM	11:30:00 PM	3	2	5	15		
11:30:00 PM	11:45:00 PM	2	2	4	15		
11:45:00 PM	12:00:00 AM	1	3	4	18	7	11
Total		995	943	1938			



# ***SALEM COUNTY INTERSECTION IMPROVEMENTS***

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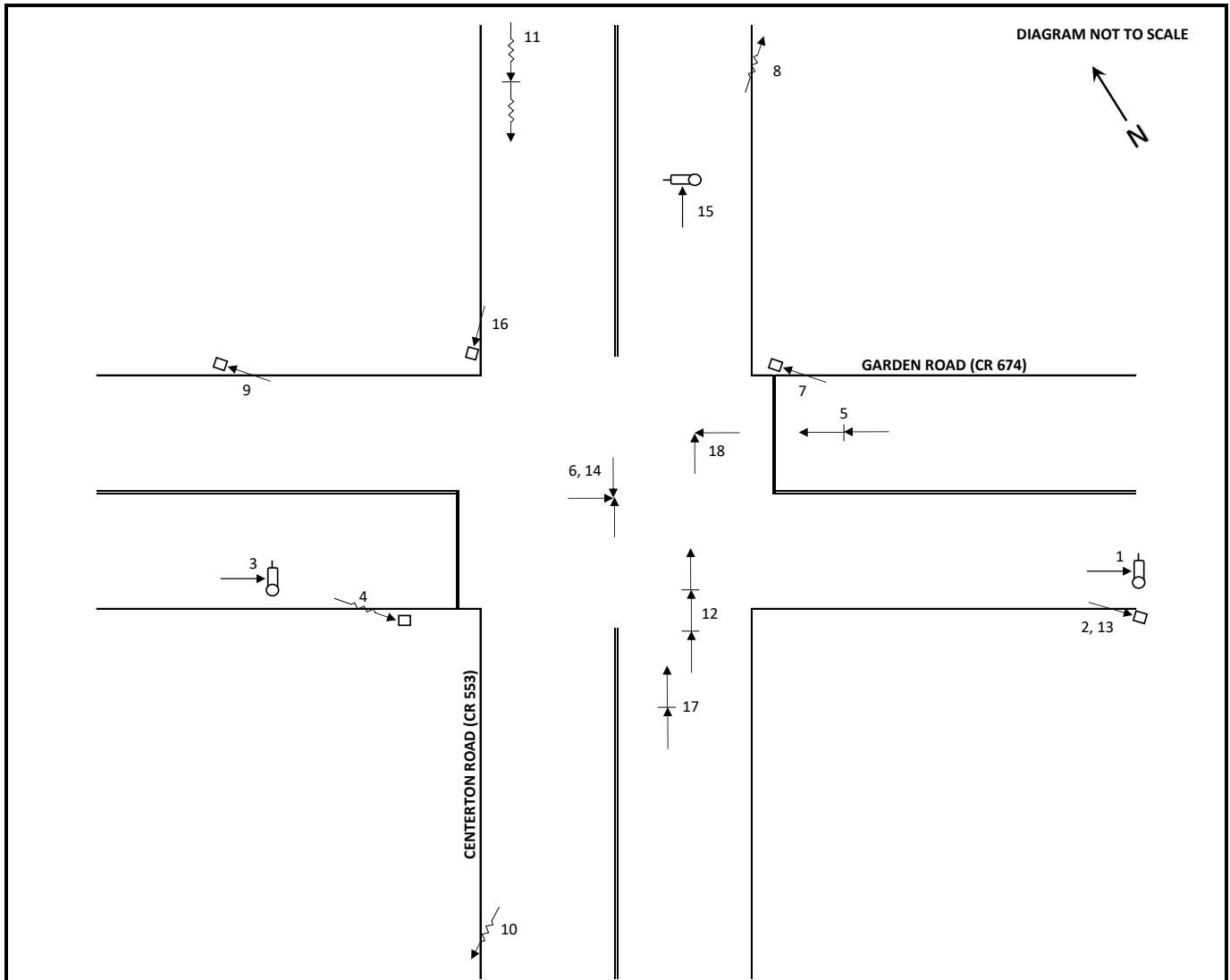
## **APPENDIX C**

### **CRASH DATA**





**COLLISION DIAGRAM - CENTERTON ROAD (CR 553, MP 28.79) & GARDEN ROAD (CR 674, MP 4.82)  
PITTSBURGH TOWNSHIP, SALEM COUNTY, NEW JERSEY**

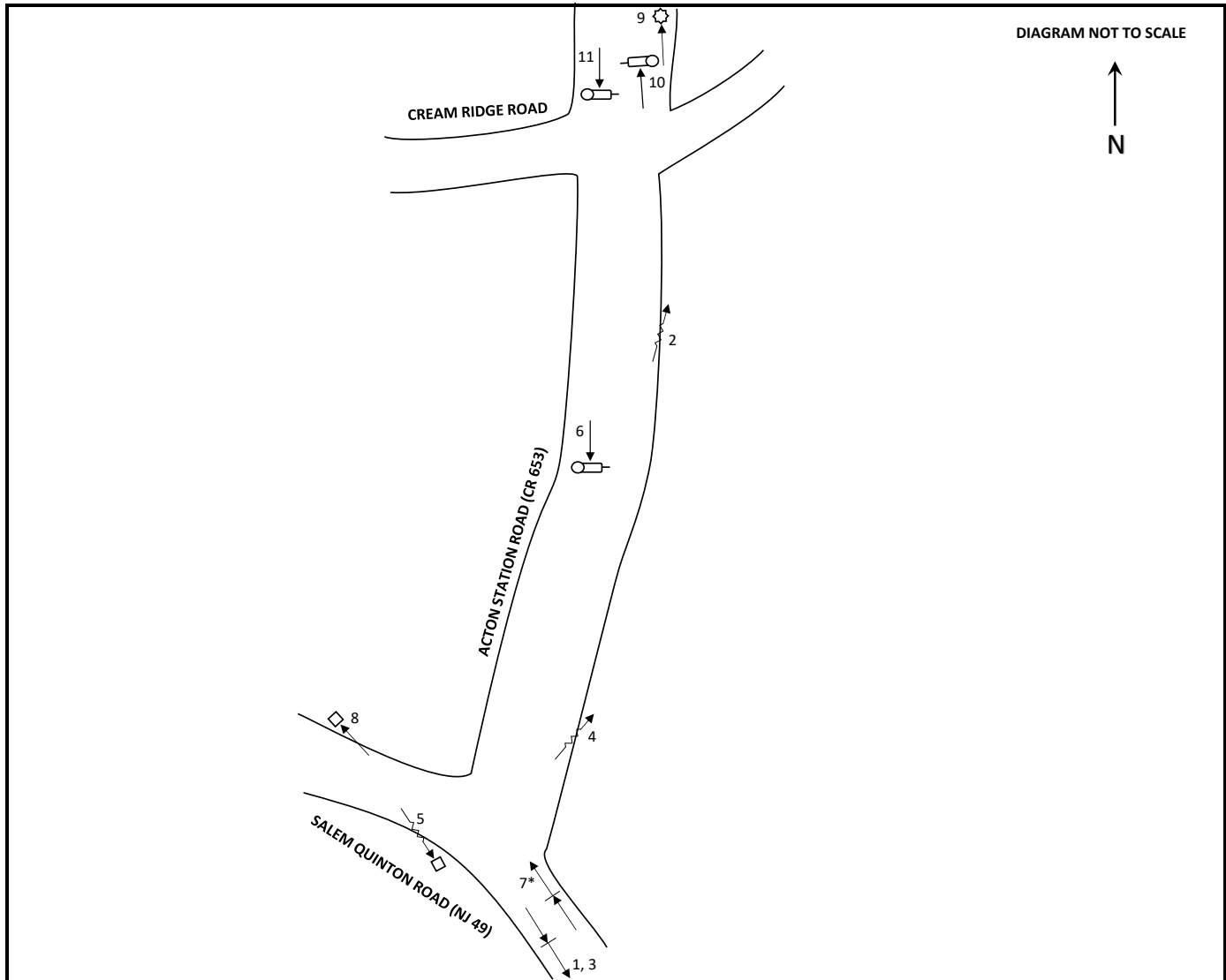


CRASH TYPE								EPDO:		ROAD SURFACE (R/S):					
REAR- END	→ →			SIDE SWIPE	→ ↘			1 = Property Damage Only		1 = Dry					
ANGLE	→ ↓			OUT OF CONTROL (UNKNOWN)	→ ~			5 = Injury		2 = Wet					
HEAD-ON	→ ←			OVERTURNED	→ ↻			10 = Fatality		3 = Snowy					
BACKING	→ ←←			HIT MOVING OBJECT	→ ⊙			* Indicates Drugs or Alcohol		4 = Icy					
TURNING MOVEMENT	→ ↘			HIT ANIMAL	→ ⊙					5 = Slush					
				HIT FIXED OBJECT	→ □					6 = Water					
				PEDESTRIAN/ BICYCLE	→ ⊙										
				PARKED VEHICLE	→ ⊞										
								ENVIRONMENTAL CONDITIONS (E/C):		LIGHT CONDITIONS (L/C):					
								1 = Clear		1 = Daylight					
								2 = Rain		2 = Dawn					
								3 = Snow		3 = Dusk					
								4 = Fog/Smog/Smoke		4 = Dark - Street Lights Off					
								5 = Overcast		5 = Dark - No Street Lights					
								6 = Sleet/Hail/Freezing Rain		6 = Dark - Street Lights On - Continuous					
								7 = Other		7 = Dark - Street Lights On - Spot					

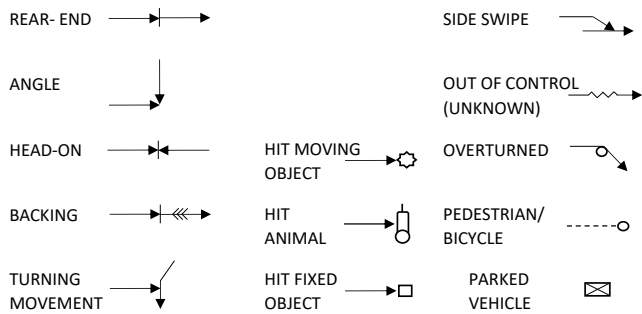
#	DATE	DAY	TIME	EPDO	R/S	E/C	L/C	#	DATE	DAY	TIME	EPDO	R/S	E/C	L/C
1	5/12/2014	M	5:10	1	1	1	1	13	3/25/2017	SA	3:43	1	1	1	5
2	5/18/2014	S	10:51	1	1	1	1	14	6/10/2017	SA	13:25	5	1	1	1
3	1/28/2015	W	17:14	1	1	1	1	15	10/13/2017	FR	6:34	1	1	1	2
4	2/22/2015	S	21:12	1	4	1	5	16	3/3/2018	SA	8:09	1	2	1	1
5	5/8/2015	F	17:12	5	1	1	1	17	3/26/2018	MO	13:36	1	1	1	1
6	5/15/2015	F	13:43	5	1	1	1	18	5/27/2018	SU	16:27	1	1	1	1
7	7/15/2015	W	15:14	5	1	1	1								
8	8/20/2015	TH	1:50	1	1	1	6								
9	3/7/2016	M	11:22	5	1	1	5								
10	4/10/2016	S	21:05	1	1	1	5								
11	5/13/2016	F	20:28	1	1	1	2								
12	8/27/2016	SA	11:49	5	1	1	1								



**COLLISION DIAGRAM - ACTON STATION ROAD (CR 653)  
FROM NJ STATE ROUTE 49 TO CREAM RIDGE ROAD (MP 0.00 - 0.58)  
QUINTON TOWNSHIP, SALEM COUNTY, NEW JERSEY**



**CRASH TYPE**



**EPDO:**

1 = Property Damage Only  
5 = Injury  
10 = Fatality

\* Indicates Drugs or Alcohol

**ROAD SURFACE (R/S):**

1 = Dry  
2 = Wet  
3 = Snowy  
4 = Icy  
5 = Slush  
6 = Water

**ENVIRONMENTAL CONDITIONS (E/C):**

1 = Clear  
2 = Rain  
3 = Snow  
4 = Fog/Smog/Smoke  
5 = Overcast  
6 = Sleet/Hail/Freezing Rain  
7 = Other

**LIGHT CONDITIONS (L/C):**

1 = Daylight  
2 = Dawn  
3 = Dusk  
4 = Dark - Street Lights Off  
5 = Dark - No Street Lights  
6 = Dark - Street Lights On - Continuous  
7 = Dark - Street Lights On - Spot

#	DATE	DAY	TIME	EPDO	R/S	E/C	L/C	#	DATE	DAY	TIME	EPDO	R/S	E/C	L/C
1	10/14/2014	TU	14:45	1	1	1	1								
2	2/10/2015	TU	4:57	1	4	2	5								
3	2/19/2015	TH	12:03	5	2	1	1								
4	2/22/2015	S	7:11	1	5	6	2								
5	7/22/2015	W	8:37	1	1	1	1								
6	11/24/2015	TU	23:04	1	1	1	5								
7 *	6/27/2016	M	19:02	1	1	1	1								
8	4/28/2017	FR	14:15	1	1	1	1								
9	10/12/2017	TH	20:03	1	1	1	5								
10	4/28/2018	SA	2:43	1	1	4	5								
11	9/12/2018	WE	5:42	1	1	4	2								

# ***SALEM COUNTY INTERSECTION IMPROVEMENTS***

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## **APPENDIX D**

CENTERTON ROAD (CR 553) AND GARDEN ROAD (CR 674)  
CAPACITY ANALYSIS







HCM 6th TWSC  
3: Centerton Road & Garden Road

04/13/2020

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	37	0	0	79	0	0	234	0	0	252	0
Future Vol, veh/h	0	37	0	0	79	0	0	234	0	0	252	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	40	0	0	86	0	0	254	0	0	274	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	571	528	274	548	528	254	274	0	0	254	0	0
Stage 1	274	274	-	254	254	-	-	-	-	-	-	-
Stage 2	297	254	-	294	274	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	432	456	765	447	456	785	1289	-	-	1311	-	-
Stage 1	732	683	-	750	697	-	-	-	-	-	-	-
Stage 2	712	697	-	714	683	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	369	456	765	417	456	785	1289	-	-	1311	-	-
Mov Cap-2 Maneuver	369	456	-	417	456	-	-	-	-	-	-	-
Stage 1	732	683	-	750	697	-	-	-	-	-	-	-
Stage 2	624	697	-	672	683	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	13.7		14.7			0			0			
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1289	-	-	456	456	1311	-	-				
HCM Lane V/C Ratio	-	-	-	0.088	0.188	-	-	-				
HCM Control Delay (s)	0	-	-	13.7	14.7	0	-	-				
HCM Lane LOS	A	-	-	B	B	A	-	-				
HCM 95th %tile Q(veh)	0	-	-	0.3	0.7	0	-	-				

HCM 6th TWSC  
3: Centerton Road & Garden Road

04/13/2020

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	47	0	0	116	0	0	290	0	0	283	0
Future Vol, veh/h	0	47	0	0	116	0	0	290	0	0	283	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	51	0	0	126	0	0	315	0	0	308	0
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	686	623	308	649	623	315	308	0	0	315	0	0
Stage 1	308	308	-	315	315	-	-	-	-	-	-	-
Stage 2	378	315	-	334	308	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	362	402	732	383	402	725	1253	-	-	1245	-	-
Stage 1	702	660	-	696	656	-	-	-	-	-	-	-
Stage 2	644	656	-	680	660	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	274	402	732	346	402	725	1253	-	-	1245	-	-
Mov Cap-2 Maneuver	274	402	-	346	402	-	-	-	-	-	-	-
Stage 1	702	660	-	696	656	-	-	-	-	-	-	-
Stage 2	520	656	-	627	660	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	15.3		18			0			0			
HCM LOS	C		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1253	-	-	402	402	1245	-	-				
HCM Lane V/C Ratio	-	-	-	0.127	0.314	-	-	-				
HCM Control Delay (s)	0	-	-	15.3	18	0	-	-				
HCM Lane LOS	A	-	-	C	C	A	-	-				
HCM 95th %tile Q(veh)	0	-	-	0.4	1.3	0	-	-				

# ***SALEM COUNTY INTERSECTION IMPROVEMENTS***

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## **APPENDIX E**

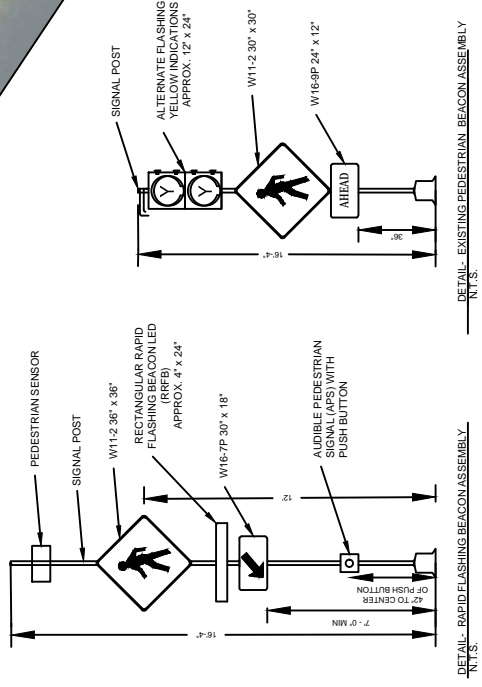
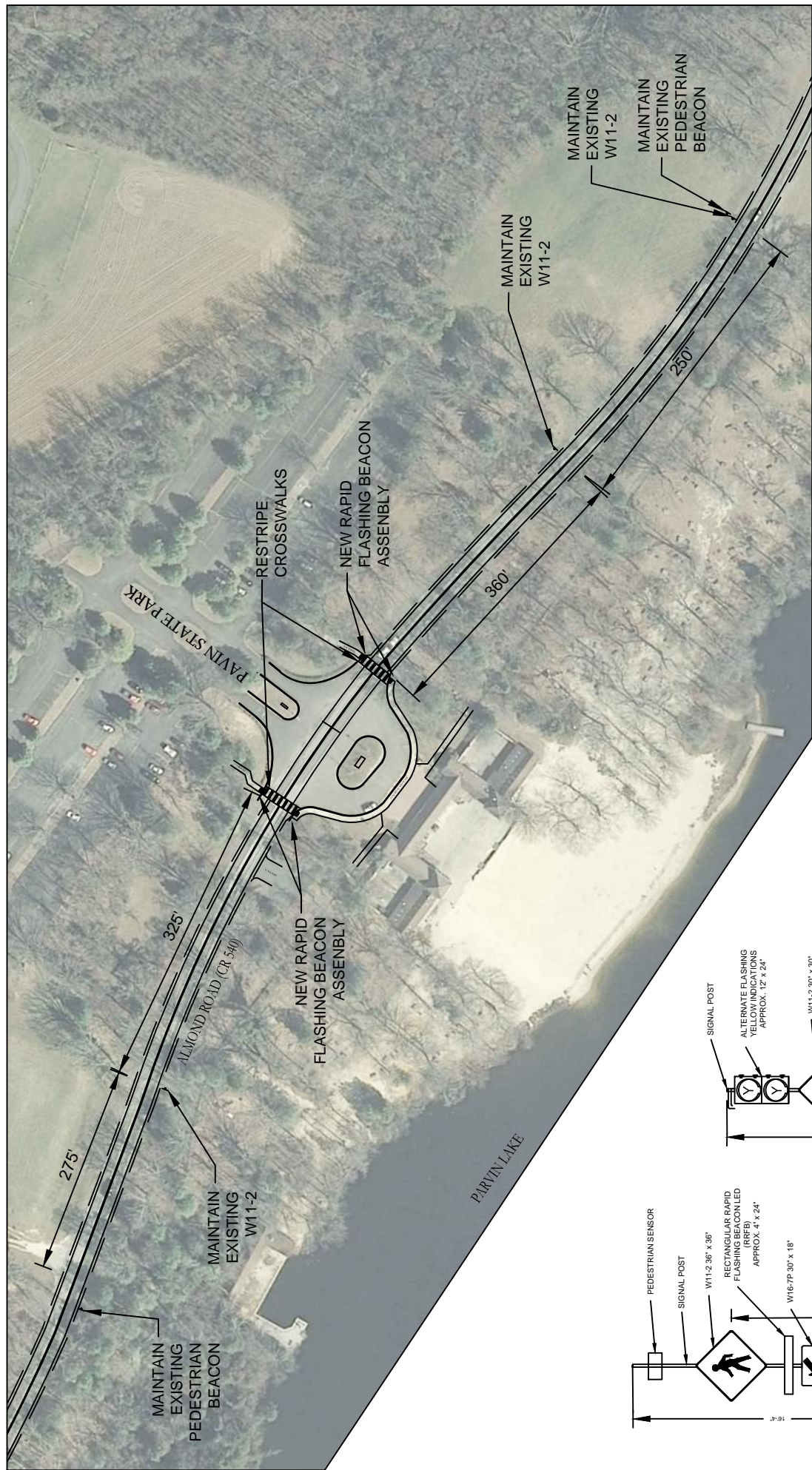
### **CONCEPTUAL PLANS**











NOT TO SCALE

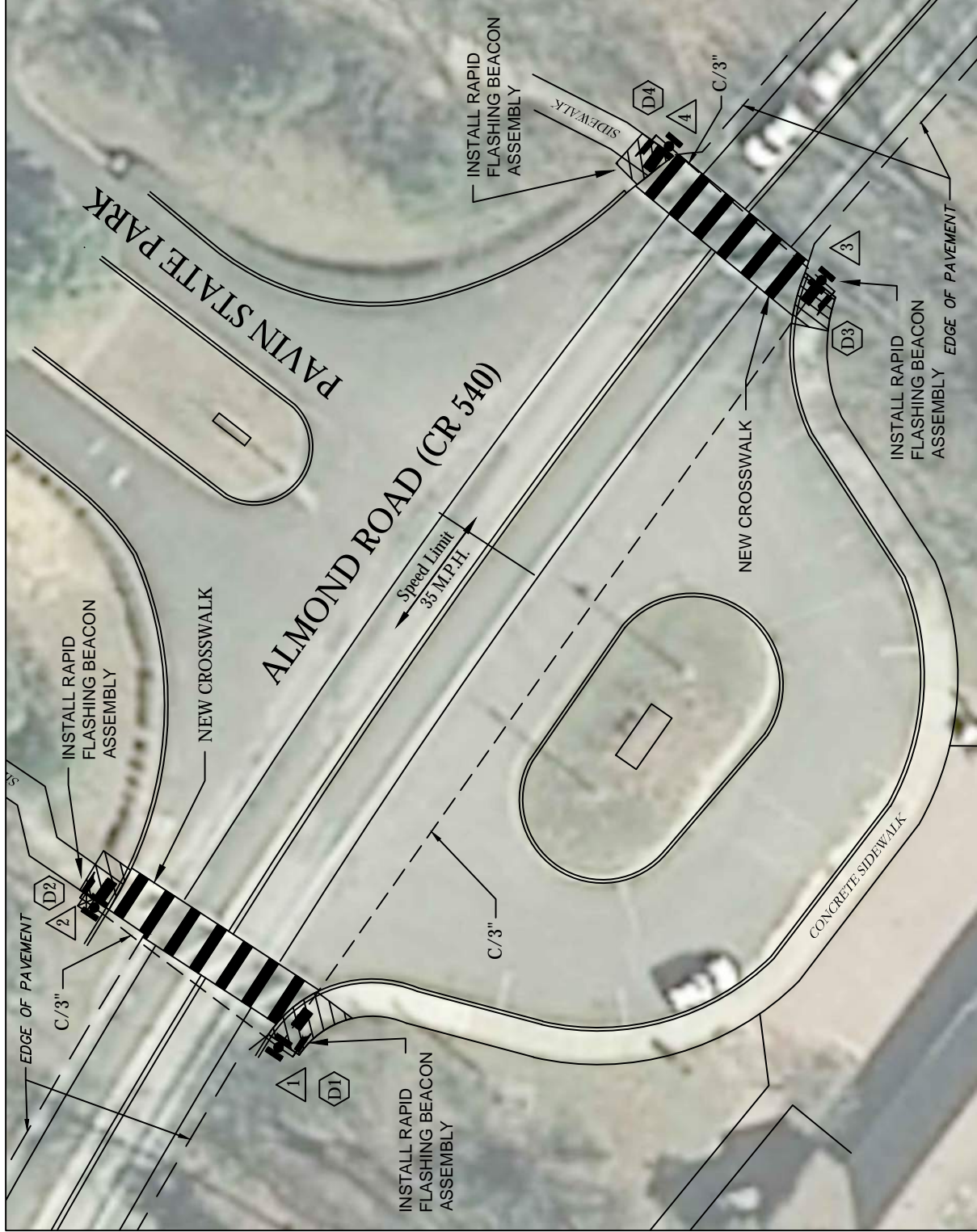
**FIGURE E-2**  
Almond Road (CR 540) &  
Parvin State Park  
Recommendations (Conceptual)

**ROADWAY IMPROVEMENT STUDY**  
Salem County, New Jersey

PENNONI  
515 GROVE STREET  
SUITE 1B  
HADDON HEIGHTS, NJ

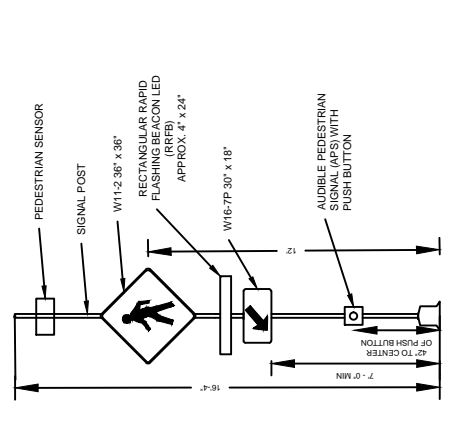






NOT TO SCALE

- LEGEND**
- NEW RAPID FLASHING BEACON ASSEMBLY
  - ASSEMBLY NUMBER
  - PEDESTRIAN SENSOR
  - AREA OF DETECTION
  - CONTROLLER (POLE MOUNTED)
  - NEW CONDUIT AND SIZE



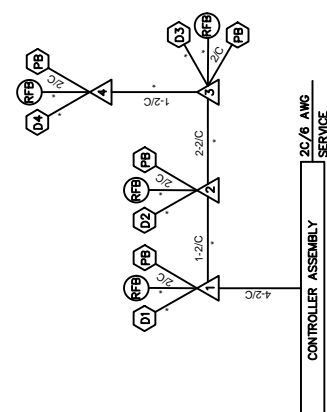
DETAIL - RAPID FLASHING BEACON ASSEMBLY  
N17.5

**RAPID FLASHING BEACON NOTES:**

THE RAPID FLASHING BEACONS SHALL BE ACTIVATED BY PEDESTRIANS WITHIN THE SPECIFIED AREAS OF DETECTION MOVING TO CROSS ALMOND ROAD OR BY USE OF PUSH BUTTON.

UPON PEDESTRIAN DETECTION THE RAPID FLASHING BEACONS SHALL BE ACTIVATED AND THE "FLASHING PHASE" SHALL BE 18 SECONDS.

IF THE BEACONS ARE FLASHING WHEN A PEDESTRIAN IS DETECTED THE CONTROLLER SHALL IMMEDIATELY TERMINATE THE FLASHING PHASE AND A NEW 18 SECOND PHASE WILL IMMEDIATELY COMMENCE.



**WIRING DIAGRAM**  
NOT TO SCALE

NOTES: \* POWER AND CAMERA COMMUNICATION CABLE TO BE SUPPLIED AS RECOMMENDED BY MANUFACTURER

**WIRING DIAGRAM LEGEND**

- PEDESTRIAN DETECTOR
- TRAFFIC SUPPORT
- PEDESTRIAN PUSH BUTTON
- RAPID FLASHING BEACON
- CABLE (NO. OF COND./SIZE AWG)

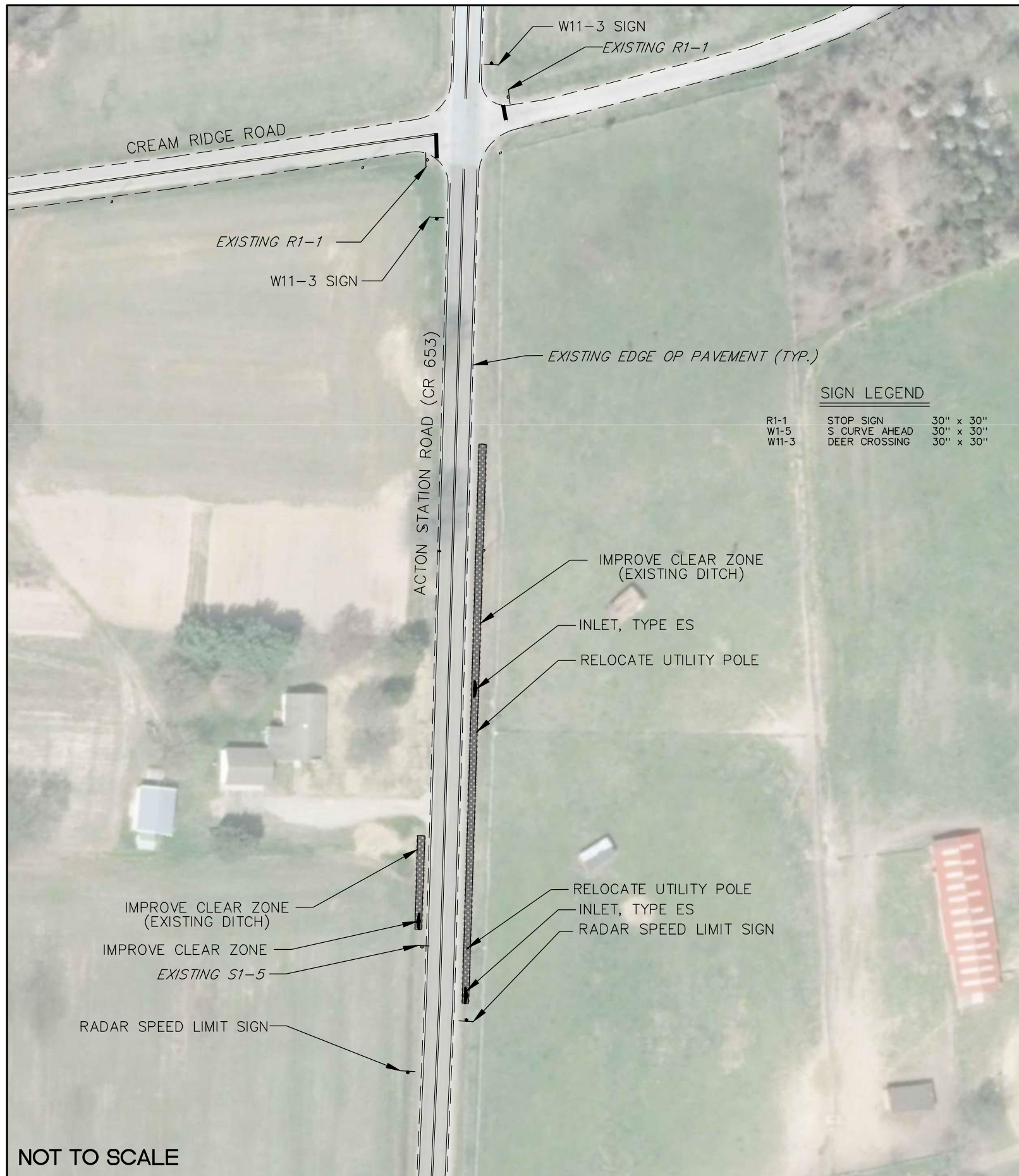
**FIGURE E-3**

**ROADWAY IMPROVEMENT STUDY**  
Salem County, New Jersey

Almond Road (CR 540) &  
Parvin State Park  
Recommendations (Conceptual)

PENNONI  
515 GROVE STREET  
SUITE 1B  
HADDON HEIGHTS, NJ





PENNONI  
515 GROVE STREET  
SUITE 1B  
HADDON HEIGHTS, NJ

## ROADWAY IMPROVEMENT STUDY

Salem County, New Jersey

### FIGURE E-4

Acton Station Road (CR 553)  
SR Route 49 to  
Cream Ridge Road  
Recommendations (Conceptual)

# ***SALEM COUNTY INTERSECTION IMPROVEMENTS***

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## **APPENDIX F**

### **ENGINEERS ESTIMATE**







## ENGINEER'S ESTIMATE

**PROJECT NAME:** Salem County Evaluation of Intersection Improvements  
**SITE LOCATION:** Centerton Road (CR 553) and Garden Road  
**COUNTY PROJECT NO.:** SALEM19001

**DATE:** 5/27/2020  
**REVISED**  
**PREPARED BY:** S. Slack  
**REVIEWED BY:** B. Grasso

ITEM NO	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1	MOBILIZATION AND TRAFFIC CONTROL	1	LUM SUM	\$5,000.00	\$5,000.00
2	HMA MILLING, 3" OR LESS	515	SY	\$4.00	\$2,060.00
3	TACK COAT	52	GAL	\$10.00	\$520.00
4	PRIME COAT	156	GAL	\$16.00	\$2,496.00
5	HOT MIX ASPHALT, 12.5 M E, SURFACE COURSE, 2" THICK	7	TON	\$85.00	\$595.00
6	9"x16" CONCRETE VERTICAL CURB	120	LF	\$35.00	\$4,200.00
7	TRAFFIC STRIPES, 4"	880	LF	\$1.50	\$1,320.00
8	REGULATORY AND WARNING SIGNS	13	SF	\$50.00	\$650.00
9	UTILITY POLE RELOCATION	2	UNIT	-	-

<b>TOTAL COST</b>	<b>\$16,841.00</b>
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Note: Assumed that relocation of utility poles done by utility at no cost to County



## ENGINEER'S ESTIMATE

**PROJECT NAME:** Salem County Evaluation of Intersection Improvements  
**SITE LOCATION:** Almond Road (CR 540) and Parvin State Park  
**COUNTY PROJECT NO.:** SALEM19001

**DATE:** 5/27/2020  
**REVISED**  
**PREPARED BY:** S. Slack  
**REVIEWED BY:** B. Grasso

ITEM NO	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1	MOBILIZATION AND TRAFFIC CONTROL	1	LUM SUM	\$5,000.00	\$5,000.00
6	TRAFFIC STRIPES, 4"	180	LF	\$1.50	\$270.00
7	TRAFFIC MARKING LINES, 24"	78	LF	\$10.00	\$780.00
10	RAPID FLASHING BEACON ASSEMBLY	4	UNIT	\$5,000.00	\$20,000.00
11	PEDESTRIAN DETECTOR	4	UNIT	\$500.00	\$2,000.00
12	3" RIGID NON-METALLIC CONDUIT	360	LF	\$25.00	\$9,000.00
13	TRAFFIC SIGNAL CABLE, 2 CONDUCTOR	300	LF	\$2.25	\$675.00
14	SERVICE WIRE, NO. 6 AWG	120	LF	\$3.00	\$360.00

<b>TOTAL COST</b>	<b>\$38,085.00</b>
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Note : This estimate does not include raised crosswalks or a raised Intersection. Costs associated with raised crosswalks and raised intersections vary based on roadway width, drainage conditions and the type of material. A raised crosswalk can be expected to cost from \$10,000 - 20,000 per crossing and raised intersections can cost \$60,000 or more.



## ENGINEER'S ESTIMATE

**PROJECT NAME:** Salem County Evaluation of Intersection Improvements  
**SITE LOCATION:** Acton Station Road (CR 653)  
**COUNTY PROJECT NO.:** SALEM19001

**DATE:** 5/27/2020  
**REVISED**  
**PREPARED BY:** S. Slack  
**REVIEWED BY:** B. Grasso

ITEM NO	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1	MOBILIZATION AND TRAFFIC CONTROL	1	LUM SUM	\$5,000.00	\$5,000.00
8	REGULATORY AND WARNING SIGNS	13	SF	\$50.00	\$650.00
9	UTILITY POLE RELOCATION	2	UNIT	-	-
15	RADAR SPEED LIMIT SIGN	2	UNIT	\$2,500.00	\$5,000.00
16	INLET, TYPE ES	3	UNIT	\$6,500.00	\$19,500.00
17	24" REINFORCED CONCRETE PIPE	650	LF	\$72.00	\$46,800.00

<b>TOTAL COST</b>	<b>\$76,950.00</b>
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Note: Assumed that relocation of utility poles done by utility at no cost to County