

TRAFFIC ENGINEERING STUDY

CR 552/ORCHARD ROAD CORRIDORS

**Cumberland County
New Jersey**

June 2003

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CR 552/ORCHARD ROAD CORRIDORS

**CR 552 and
Orchard Road**

**Cumberland County
New Jersey**

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EXCECUTIVE SUMMARY

Under contract to the South Jersey Transportation Planning Organization, Horner & Canter Associates completed a Corridor Study for Cumberland County Route 552 extending from Laurel Street in Bridgeton City to Main Road in the City of Vineland, and along Orchard Road from CR 552 to Chestnut Avenue. The ultimate task of the study was to determine the transportation needs of the Corridor based on both existing and future design hour traffic flows. Other areas such as school speed limits and emergency response travel patterns were also examined along the corridors in question.

The findings of the study showed that the CR 552 Corridor will ultimately require widening to a four to five lane section from Kenyon Road to Main Road with additional improvements at some of the intersections. West of the Carmel area, CR 552 as a two-lane roadway will operate with satisfactorily flows. The Orchard Road corridor from CR 552 to Chestnut Avenue will operate sufficiently as a two-lane roadway; however, the County should re-examine the need for widening Orchard Road to a three-lane section with the potential development in the area.

Under exiting traffic flows and geometric conditions, we found there are several areas for improvements the County should consider. At the Nabb Avenue/Morton Avenue and the Chestnut Avenue intersections, improvements to provide larger radii to allow a bus to turn without encroachment should be considered. In addition, the consideration should be given to pedestrian signal indicators at the Nabb Avenue/Morton Avenue intersection.

At the Boulevards, the existing flasher along CR 552 should be replaced with flashers that meet the *Manual on Uniform Traffic Control Devices*. There are various signs and markings along the Corridor that need replacing due to fading or improper alignment. Regarding school speed zones, we recommend that a School Speed Limit 25 MPH be installed in the area of the Cumberland Christian School, and school warning signs be installed in the area of the Pineland Elementary School.

At the South Woodruff Avenue intersection, a detailed review of traffic signal warrants should be conducted, including a 12-hour manual count, to determine the need for a traffic signal. In addition, an independent evaluation of the sight distance from South Woodruff

Avenue should be conducted since our observations show that the sight distance is restricted by vegetation, signs, poles, and the existing topography. To further enhance the traffic control at this intersection, the County may consider installing rumble strips or widening the South Woodruff Avenue approaches at the intersection.

The improvements to be implemented by the New Jersey Department of Transportation and the South Jersey Health System at the Route 47 and Orchard Road/College Drive intersections, respectively, will improve the capacity and efficiency of the intersection and will aid in decreasing certain types of accidents such as rear-ends. However, with the short-term development (known or under construction) in the immediate area, these intersections will require additional improvements particularly at the Orchard Road/College Drive intersection. The construction of right-turn lane along the CR 552 eastbound approach will aid in improving the efficiency of the intersections. At the Route 47 intersection, we recommend that the County coordinate with the NJDOT for proper signal phasing/timing at this intersection.

With the potential development along or in the vicinity of the corridors over the next two decades the need for improvement to corridors will be crucial in maintaining free-flow of traffic, lessening the potential for accidents, and providing a safe and efficient transportation system. Accounting for potential development and general traffic growth, the finding of the study showed a 2.00% to 4.25% annual growth rate with the lower percentage found in the area of Bridgeton City and the higher growth rate in the City of Vineland area.

The CR 552 corridor will require widening to a five-lane section with shoulders particularly to the east of Route 55. We recognize that the Route 55 overpass can be a bottleneck area for traffic flow, and as such, we suggest the a four-lane cartway be maintained across the Route 55 overpass through Jessie's Bridge Road and tapering back to the existing two lane (40-foot section) beyond Kenyon Road. Alternatively, the four-lane section can be tapered back to the existing two lanes at the bridge structure over the Parvins Tarkin Branch.

By 2025, additional improvements will be necessary to the intersection along the corridor if traffic grows and development occurs as anticipated. The intersections west of Carmel Road will not require any physical improvements with the exception of the Lebanon Road intersection. We would recommend that the signal warrants at the various unsignalized intersections should be examined periodically. If a signal is justified, we would recommend the implementation of

left-turn lanes along CR 552 to increase capacity and enhance safety. At the Lebanon Road intersection, Lebanon Road should be realigned to create 90-degree intersection with CR 552. In addition, CR 552 should be improved allowing for a larger radius and superelevation to maintain free-flow speed.

The intersections along CR 552 from the Carmel area to Main Road will require improvements. A brief summary of the intersection is as follows with more detailed information provided in the body of the report:

Nabb Avenue/Morton Avenue

This intersection will require left-turn lanes on all four approaches and a westbound right-turn lane. The ideal lane widths along CR 552 at this intersection would be a 12-foot-wide left turn and 13-foot-wide through lanes against the vertical curb.

Carmel Road

This intersection, if maintained in its existing alignment, may potentially require a traffic signal, which will require coordination with the Nabb Avenue/Morton Avenue intersection. The left-turn lane along CR 552 at Nabb Avenue should extend through the Carmel Road intersection.

Route 55

Ultimately, traffic signals may be warranted at the northbound and southbound off-ramps from Route 55. The signals at the off-ramps must be coordinated with one another ensuring that the traffic signals work as one intersection. A four-lane section at the overpass may be necessary for capacity reasons.

Orchard Road/College Drive

This intersection will require a five-lane approach on Sherman Avenue and three lanes along the Orchard Road/College Drive approaches. With the potential

development in the area (existing and future), this intersection should be re-examined with each development proposal that is submitted to either the City of Vineland and/or Cumberland County.

Route 47

To maintain the optimal free flow of traffic at this intersection of two arterials, the need for five to six lanes on each approach may be warranted. We recognize that the ultimate cartway may seem extensive, however, the need for such lane is common when two major arterials intersect. Other configurations may be proposed, such as an interchange or a divided highway with jughandles. Under these configurations, the need for additional right-of-way as well a construction costs will be greater than a wide at-grade intersection.

Boulevards

These intersections will require signalization. Based on the closeness of the Boulevards (less than 100 feet), a six-lane section across the railroad tracks will be necessary. An inside clearance will be necessary along CR 552 so that all traffic clears the railroad tracks. Railroad pre-emption will be necessary as well as improving the vertical offset of the railroad tracks and CR 552.

Main Road

With the recommended five-lane section along CR 552 and a five-lane section along Main Road, this intersection will operate an acceptable level of service.

A concern regarding by-passing the Carmel area was raised by various municipal representatives. The most likely route of the by-pass would be to use a portion of Lebanon Road as it intersects with CR 552, crossing over the Lebanon Branch and extending the by-pass as a new roadway to connect back into CR 552 from the general area of Garrison Road to Kenyon Road. The policy makers will have to make a value judgment on the advantages and disadvantages of designing and constructing a by-pass. If a by-pass would be constructed, access management and the appropriate zoning must be implemented. If the proper planning

steps are not pursued, the primary goal of the by-pass (diverting traffic) would ultimately not be met.

With the various intersection and roadway improvements in place, the CR 552 Corridor should maintain acceptable levels of service. In order to limit the widening that may be needed at various intersections and to aid in decreasing traffic along and within the vicinity of the corridor, trip reduction strategies and/or the introduction of public transit along the corridors should be considered. In addition, the continual evaluation of the corridor either through traffic studies as required by the various municipalities or the County, or through the SJTPO yearly traffic data collection should be implemented.

INTRODUCTION

Horner & Canter Associates has been contracted by the South Jersey Transportation Planning Organization to determine the highway transportation needs of the CR 552 Corridor and a portion of the Orchard Road corridor as its adjacent lands are developed over the next few decades.

The scope of study along CR 552 extended from its intersection with Laurel Street (CR 606) to Main Road (CR 555), and along Orchard Road from Sherman Avenue (CR 552) to Chestnut Street. The length of the CR 552 Corridor is approximately 18 miles and the Orchard Road section is approximately 2 miles. Figure 1 shows the corridor areas in question.

The purpose of this Corridor Analysis is to evaluate the current traffic operating conditions, assess the capability of the corridor to accommodate the traffic needs for decades ahead, recommend improvements for the corridor, and recommend the improvements defines as both short-term or long-term.

SCOPE OF STUDY

In order to accomplish the above-mentioned goals, the following tasks were completed:

1. Field reconnaissance of the subject corridor, examining and inventorying all physical features that affect traffic flow and traffic safety. These features include existing traffic control devices, existing lane use assignments, auxiliary lanes and adjacent land uses.
2. Verification of the existing topographic information along the corridor as provided by Cumberland County.
3. Measure existing traffic flows along CR 552 and Orchard Road and at key locations.

4. Analysis of existing conditions to determine areas that currently need improvement(s).
5. Identify and analyze interim highway and intersection improvements currently being planned by other agencies or developers.
6. Determine estimates of future traffic volumes when lands adjoining the corridor are fully developed.
7. Identify any highway deficiencies and suggest (conceptually) roadway and intersection improvements to safely and efficiently accommodate the future traffic volumes.
8. Advise on providing school speed zones along the subject corridors.
9. Provide recommendations to enhance/supplement the SJTPO's *Congestion Management Report*.

CORRIDOR DESCRIPTION

Ø *County Route 552*

County Route 552 (a.k.a. Sherman Avenue, a.k.a. Irving Avenue) is a County highway under the jurisdiction of Cumberland County Board of Chosen Freeholders. CR 552 originates in the City of Bridgeton at Laurel Street (CR 606) traveling through Upper Deerfield Township, thence Deerfield Township, thence the City of Vineland through Maurice River Township into Atlantic County and terminating at Route 40 for a total distance of approximately 27.5 miles. Route numbers in the 500-series are plated on the Official New Jersey State Map for inter-County mobility.

Within the study area, CR 552 is a two-lane roadway and is classified¹ as a Urban Minor Arterial within the City of Bridgeton limits, then a Rural Major Collector through Upper Deerfield

¹ 1994 New Jersey Functional Classification Maps - FHWA

Township changing to a Urban Collector through Deerfield Township until Route 47 where the classification changes to an Urban Minor Arterial.

The posted speed limit along the CR 552 corridor varies from 25 MPH then 35 MPH then 40 MPH within the City of Bridgeton limits, increasing to 50 MPH east of CR 654 (Irving Avenue), decreasing to 40 MPH then 35 MPH in the area of Carmel, finally increasing to 50 MPH east of the Carmel area.

Ø **Orchard Road**

Orchard Road is part of **County Route 628** and extends north from its intersection with Sherman Avenue (CR 552) to Wheat Road (CR 619). South of Sherman Avenue, CR 628 is known as College Drive, which extends to Route 47. Orchard Road is a two-lane roadway with a posted speed limit of 50 MPH between CR 552 to Elm Road, decreasing to 45 MPH then decreasing to 40 MPH north of Chestnut Avenue where a school zone of 25 MPH is posted near the Dane Barse Elementary School.

Ø **Existing Conditions**

- **CR 552**

As a base for our evaluation, we examined and inventoried the existing conditions along the corridors. As aforementioned, CR 552 is a two-lane roadway within the subject area. Generally, CR 552 has a 40-foot-wide cartway except in the area of Carmel and the Bridgeton City limits where the cartway decreases to 34 to 36 feet wide. Deceleration and acceleration lanes are provided at the Route 55 interchange. Rumble strips are provided within the shoulder area between the Route 55 interchange and Carmel Road.

Traffic control signals exists at the following intersections along CR 552:

1. Laurel Street (CR 606)
2. N.J. Route 77 (a.k.a. North Pearl Street)
3. Manheim Avenue (CR 669)
4. North Burlington Street (CR 638)

5. Nabb Avenue/Morton Avenue
6. Orchard Road/College Drive (CR 628)
7. N.J. Route 47
8. Main Road (CR 555)

At each of the signalized intersections, each of the approaches provide one lane for all turning movements except at the intersections of Route 47 and Main Road, in which a exclusive left and shared through-right lanes are provided on all approaches. At the College Drive northbound approach to CR 552, an exclusive left and shared through-right lane is provided.

All other intersections are STOP-sign controlled with CR 552 as the through street with the exception of the Boulevards, which are 4-way STOP-sign controlled intersections. All of the side streets are a one-lane approach with the exception of Carmel Road in which the right turn movement is channelized and under YIELD control. In addition, an eastbound right-turn lane is provided along CR 552 at the Carmel Road intersection. At the Lebanon Road intersection, westbound Irving Avenue is STOP-sign controlled.

An intersection flashing signal exists at the intersection of South Woodruff Avenue (CR 553) and a flashing beacon is located in conjunction with the STOP-sign on the northbound CR 552 approach to Southwest Boulevard. We observed that the Boulevards approach, and the South Woodruff Avenue approaches to CR 552 have STOP signs on both sides of the roadway for additional emphasis.

The CR 552 intersections with Southeast and Southwest Boulevards are separated by railroad tracks for a distance of approximately 100 feet. In addition, the Boulevards are lower in elevation than the railroad tracks by approximately 5 to 7 feet.

The Route 55 interchange with CR 552 is a composite diamond and cloverleaf design. Due to the configuration, the movements from Route 55 (north and south) to westbound CR 552 are STOP-sign controlled. Exclusive right-turn lanes are provided for the on-ramps.

For additional reference, Figures 2A and 2B show the lane configuration and traffic control at the respective intersections. The NJDOT's *Straight-Line Diagrams* are provided in the report Appendix as well.

- **Orchard Road**

Orchard Road is a two-lane roadway approximately 28 feet wide. The adjacent land uses are primarily residential in a nature. Of the four study intersections, only Chestnut Avenue is signalized with walk/don't walk pedestrian indications. The other three side streets (Garrison Road, Elm Road and West Walnut Road) are STOP-sign controlled at Orchard Road. Along the Elm Road and West Walnut Road approaches, two STOP-signs are provided on each approach as well as stop-ahead warning signs. Passing is prohibited along the section of studied roadway.

Figure 2C shows the geometric lane configurations at the respective intersections along Orchard Road.

Ø ***Existing Traffic Volumes***

In order to understand the nature of the existing traffic operations, HCA (with the aid of A-TECH Engineering) measured the volume of traffic along the subject corridor and at major intersections. The counts were conducted in late January and February 2003 once the Cumberland County College was in full session for the spring. The detailed traffic data is included within the Technical Appendix – Traffic Count section.

In addition, the Cumberland County Engineer's office provided traffic data for southbound on/off ramp at the Route 55 interchange and the Carmel Road intersection. These counts were conducted in February 2002. Traffic data was also provided for the Boulevard intersection, which was obtained in 2000.

- **Volume**

Traffic volumes were measured at several key locations along CR 552 and Orchard Road via automatic traffic recorders (ATRs). The locations are identified along CR 552 as milepost (MP) 0.5, MP 3.5, MP 5.8 (Carmel area), MP 9.0, MP 10.6, and MP 11.5. Volumes along Orchard Road were measured at two locations.

A tabular summary of the roadway counts is provided in Table 1.

Table 1			
Existing Roadway Volumes			
<i>Location</i>	<i>Daily</i> <i>veh/day</i>	<i>AM Peak</i> <i>veh/hr</i>	<i>PM Peak</i> <i>veh/hr</i>
CR 552			
MP 0.5	6,800	450	650
MP 3.5	6,900	500	650
MP 5.8	9,600	625	850
MP 6.5	11,700	900	1,100
MP 9.0	12,450	950	1,200
MP 10.6	9,800	900	950
MP 11.5	8,900	600	800
Orchard Road			
Btn. Garrison and Elm	4,600	300	400
Btn. Walnut and Chestnut	3,850	250	350

For intersection analyses, manual turning movement counts were conducted at the various intersections during the typical morning and afternoon commuter peak periods (7AM – 9AM; 4PM – 6PM).

The comparison of the counts was conducted and some adjustments were made to account for daily fluctuations in traffic and increase in traffic for the older counts. The peak hour volumes (morning and afternoon) are shown in Figures 3A to 3C, rounded for schematic purposes only.

- **Vehicle Classification**

The vehicle composition was measure at several locations along CR 552 Corridor. The results are shown in Table 2.

Table 2				
Vehicle Classification – Percent (%)				
<u>Location</u>	<i>Passenger</i> <u>Cars</u>	<u>Buses</u>	<i>Single Unit</i> <u>Trucks</u>	<i>Tractor-Trailer</i> <u>Trucks</u>
CR 552				
MP 3.5	94.2	0.8	3.4	1.6
MP 9.0	93.9	0.9	3.6	1.6
MP 10.6	93.4	1.0	3.8	1.8

As shown in the above table, the number of heavy trucks (single-unit and tractor trailers) equate to approximately 5% of the traffic using CR 552. This percentage is higher than the typical 2 to 3% that is usually found on similar roadway. One of the reasons for this higher heavy vehicle percentage is that CR 552 serves as a direct route to the nearby Solid Waste Complex.

- **Speed**

Measurements were also made of the speed of existing traffic along the CR 552 Corridor at two key locations. A comparison of the posted speed limit and the measured 85th percentile speed is shown in Table 3.

Table 3		
Speed Measurement		
<i>Location</i>	<i>Posted</i> <u>Speed</u>	<i>Measured 85%tile</i> <u>Speed</u>
CR 552 MP 3.5	50	54.77
CR 552 MP 5.8	40	49.92

Ø ***Existing Levels of Service***

In order to evaluate the efficiency of a highway system, we need to compare the traffic volumes to the capacity (vehicle carrying capability) of the system. In this regard, we separately

evaluate the intersection and highway sections. The more critical of these will control the flow of traffic in the immediate vicinity.

The quality of flow along a highway and at an intersection is measured in terms of Level of Service (LOS) ranging from LOS A to LOS F. A general description of LOS is as follows with a more detailed explanation provided in the Technical Appendix:

Level of Service	A - Excellent - Free flow
	B - Very Good - Stable flow of traffic
	C - Good - Stable flow of traffic
	D - Satisfactory flow - Occasional short periods with minor delays
	E - CAPACITY FLOW - Regular delays
	F - Forced flow - Significant delays and queuing

For highway and street sections, capacity of a roadway is based on the physical characteristics of width, number of lanes, grades, shoulders, parking, etc. With the capacity calculated, the volume to capacity ratio (v/c) is a measure of the capacity consumed.

At signalized intersections, Level of Service is based on the average delay to all motorists at the intersection. The v/c ratio represents the capacity sufficiency of the intersection based on its physical characteristics. At unsignalized intersections, Level of Service is based on the average delay to controlled and yielding movements, such as exiting movements from a STOP sign or the left turn from a through street onto a side street. Table 4 summarizes the v/c ratio and the respective LOS for the various roadway segments. Tables 5 and 6 summarize the delay at the signalized and unsignalized intersections, respectively.

Figures 4A to 4C shows the existing levels of service at the study intersections and along each segment of the corridors.

- **Capacity Assessment - Roadway**

As shown in Table 4, the saturation (v/c ratio) along the CR 552 Corridor ranges from 12% to 50%, with the highest saturation between Route 55 and Orchard Road. Orchard Road operates at a good borderline LOS B/C with saturation levels at approximately 17%.

- **Capacity Assessment - Intersections**

As shown in Table 5, all of the signalized intersections operate at acceptable levels of service. We note that the Route 47 intersection during the afternoon peak hour operates at an overall LOS E. While two of the signals along CR 552 (Orchard Road and Route 47) are approaching capacity.

During the morning peak hour, all of the STOP-sign controlled approaches/movements operate at LOS C or better with the exception of the Carmel Road left-turn movement, which operates with LOS E delays. During the afternoon peak hour, all of the approaches, with a few exceptions, operate at an LOS D or better. The Southwest Boulevard approaches typically operate with LOS F delays. The left-turn movements from Carmel Road and northbound Route 55 operate with LOS E delays.

ACCIDENT ANALYSIS

The detailed accident reports for the past three-year period were requested from the various agencies for the corridors in question. The City of Vineland provided extensive accident reports along CR 552 within their municipal boundaries along CR 552 and Orchard Road. We also obtained database information from Cumberland County for the Bridgeton City area intersections.

We have summarized each accident report including the location, date, time, a brief description, and the attenuating circumstances related to the cause of the accidents for the intersection along the corridors in question. A detailed summary of each accident is provided in the Technical Appendix – Accident Report section. In addition, tables are also provided in the Appendix of this report that summarizes the accidents with regard to type and the contributing circumstances for each intersection.

Ø *Vineland City*

Accidents within the City of Vineland from 2000 to 2002 totaled 267 in which 40 accidents occurred along Orchard Road. Approximately one-third of the accidents occurred at the Sherman Avenue and Delsea Drive intersection. The intersection of CR 552 and Orchard

Road was the second highest accident location, with 41 accidents or approximately 15%. The Boulevards and Main Road were the third highest accident intersection with approximately 10%.

It should be noted that of the accidents at CR 552 and Delsea Drive accidents there were a significant number of accidents (approximately 30%) that occurred at the Wawa and Sunoco driveways. The significant number of accidents is most likely due to the close proximity of the access points to the signalized intersection.

At both the Delsea Drive and Orchard Road intersections, approximately 40% of the incidents were rear-ended accidents. At Main Road, the rear-ended accidents increased to 50%.

At the Boulevard intersections, over 50% of the accidents were angle-typed accidents, which leads to the conclusion that motorists are either entering the intersection at the same time from different directions or are not waiting sufficient time to allow another motorist to clear the intersection which could be related to the LOS F delays.

Overall, rear-ended accidents comprised 37% of the accidents with angle-typed accidents a close second (34%). The primary contributing circumstances to the accidents were driver inattention with 135 accidents or over 50% of the accidents. Failure to yield was the second highest reason for accidents with 13%.

Ø **Bridgeton City**

Accident data for the years 2001 and 2002 at the intersections along Irving Avenue in the City of Bridgeton totaled 134. The highest accident location was Route 77 with 21 accidents (16%). The remaining intersections had less than 10% of the total accidents. The type of accidents that were most frequent were rear-ended, sideswipe, and angle-type accounting for 15% of the accidents each or 45% total.

At the Route 77 intersection, approximately 40% of the accidents were rear-ended accidents with the angle-type accident a close second at 33%. We observed 27 incidents were classified as "hit and run", which is approximately 20% of the total accidents.

EXISTING CONDITIONS ANALYSIS

To determine if any improvements may be currently warranted, we examined the capacity analyses to first define areas in which a closer inspection was needed to determine if improvements are necessary. Typically, for a roadway section, when the saturation levels reach the LOS E range, a detailed examination of the physical characteristics of the corridor should be conducted. As of today, there are no sections that operate at LOS E saturation levels.

For signalized intersections, the first clue in determining the need for improvements, either physical or timing adjustments, is the overall volume-to-capacity ratio. When the saturation levels of the intersection reach 90 to 100%, improvements should be examined. Along the corridor, while technically no intersections are within the above-referenced range, there are two intersections that are borderline (within a percent or two) on the saturation levels for potential improvements.

The two intersections in question are at Orchard Road/College Drive and at Route 47. We are aware of the hospital improvements at the Orchard Road/College Drive and the NJDOT improvements along Route 47 including the CR 552 intersection. Since these improvements have either begun construction or are planned for short-term, we will further examine these intersections under the Interim Improvement section of this report.

Regarding the unsignalized intersections, we first examined the traffic signal warrants as found in the *Manual on Uniform Traffic Control Devices* for the various unsignalized intersections along the corridors. It should be noted that the MUTCD no longer recognizes the peak hour volume warrants unless there is a land use in the immediate vicinity that discharges a significant number of employees in a short amount of time such as in a Business Park setting. As such, at a minimum, any unsignalized intersection must meet a minimum of 4 hours of volume warrants to justify a traffic signal.

We found that several intersections may have a potential of warranting a traffic signal installation: South Woodruff Avenue (CR 553), Carmel Road, and the Boulevards. We would recommend that the County conduct a more in-depth analysis of these intersections including a 12-hour manual "turning movement" volume count to further examine the potential of signaling these intersections. The Carmel Road intersection is in close proximity to the Nabb

Avenue/Morton Avenue intersection, and a closer examination will also be necessary. Typically, signals should be located a minimum of 800 to 1,000 feet to allow proper coordination.

We are aware of the recent fatality and the accident history at the intersection of South Woodruff Avenue. A field examination was completed at this intersection with respect to traffic control and sight distance. The traffic control at this intersection meets the MUTCD with a stop ahead symbol sign with supplemental plates (STOP AHEAD), and two STOP signs on each approach. The provision of the flasher further enhances the traffic control at this intersection.

Regarding the sight distance, it appears that generally accepted standards are met from a profile view. However, it was noticed that several sight restrictions exist at the intersection that the County may consider independently evaluating. The vegetation "at" the northeast corner should be trimmed within the right-of-way to provide maximum sight distance. From the southbound approach looking east, there is a sign series consisting of a County Route symbol sign (553) with a supplemental double arrow plate and a custom made sign (Crusader for Christ Reeves Rd.) that inhibits a portion of the available sight distance. The County should consider relocating this sign outside the sight triangle.

From the southbound approach looking east, there is only a small "window of opportunity" for motorists to view on-coming traffic due to the utility pole, signal pole and the berm in front of the nearby residence.

Even though striping, signs and signals advise motorists of the STOP-controlled conditions, the County can consider the following improvements to further enhance the traffic control at this intersection. The first improvement would be to remove or relocate the objects inhibiting the available sight distance. The introduction of a series of rumble strips along the South Woodruff Avenue approaches will enhance the motorist awareness of the traffic control at this intersection. The evaluation of illumination at the intersection should be conducted to determine if the one light fixture at the intersection is sufficient and if not, install additional lighting.

The County could consider widening the South Woodruff Avenue approaches for 250-300 feet from the intersection. This type of improvement "alerts" motorists that the roadway characterizes are changing and as such, motorists tend to be more aware of the roadway. This

technique, which is derived from the FHWA's Positive Guidance theory, has provided an effective means of reducing accidents. The review of the signal warrants with detailed traffic count data should be conducted, and if a signal is warranted, the County, if desired, can design, receive NJDOT approval, and install a traffic signal.

We examined two of the signalized intersections that are in direct vicinity of a school, Nabb Avenue/Morton Avenue and Chestnut Avenue, to determine if school buses can sufficiently turn at these intersections without encroachment. We found that at both intersections, school buses will require encroachment to execute a right turn. We would recommend that the County consider improving the radii at these intersections. We also observed that crosswalks are provided at each intersection; however, the Nabb Avenue/Morton Avenue intersection does not provide for any pedestrian signal indications. If pedestrians are frequent at the intersection, the County should consider installing the pedestrian signal indications.

Other improvements that the County should consider are as follows:

1. Upgrade the flasher at the Boulevards. The existing one-head flasher in conjunction with the STOP-sign does not meet the MUTCD. The MUTCD requires either one head on top and bottom of the STOP-sign or two heads at the top.
2. Several signs along the corridor should be replaced. The identified signs are as follows:
 - a. "School Bus Entering Highway" sign on CR 552 (both directions) near Carmel
 - b. The double arrow sign (W1-7) facing Rogers Avenue
 - c. Several milepost signs are starting to fade
 - d. Several speed limit signs appear not to meet MUTCD standards
 - e. The warning sign "BUMP" on College Drive near CR 552
 - f. The direction sign (directing to the County office and Route 49) near South Woodruff Avenue, which is black lettering on white background, is faded and

should be replaced with the appropriate color scheme. Black on white is typically reserved for regulation type signs only

3. Install W1-7 double arrow signs at the T-end intersection, where appropriate, such as Garrison Road.
4. Install a 24 inch solid white stop bar along the CR 552 westbound approach to Lebanon Road.
5. The existing school signs along CR 552 (or on any other County roadway) that are yellow in color should be replaced with the fluorescent yellow-green that is the current MUTCD color for school warning signs.
6. The railroad pavement markings for the tracks in the City of Bridgton should be repainted.
7. At the Orchard Road/College Drive intersection with CR 552, it appears that the double centerline marking does not “line-up” and is offset. The County should evaluate this offset and take correction measure as necessary.
8. The eastbound right-turn lane along CR 552 at Sherman Avenue and the hospital entrance are trap lanes. As such, sufficient signage should be provided alerting motorists to this condition.
9. The transition of traffic just east of Route 55 where the new improvements implemented by the hospital does not meet the generally accepted standards. Typically, the transition should be the product of the speed times the offset. If the center 10-foot left-turn lane is extended, the transition should be at a minimum, 250 feet (5' x 50 MPH). The County should re-evaluate the striping and take correction measures as necessary.

INTERIM IMPROVEMENTS

We are aware of several interim improvements being planning along the corridor for near-term implementation.

Cumberland County has plans to widen Nabb Avenue to 40 feet wide from Route 47 to CR 552 and the New Jersey Department of Transportation is proposing improvements along the Route 47 corridor. At the Route 47 and Sherman Avenue intersection, these improvements include widening all four approaches to provide for an additional through lane on the Route 47 approaches and an exclusive right-turn lane along the Sherman Avenue approaches. It is our understanding that the final design will be completed in the first quarter of 2003.

The hospital, as part of their construction, will widen the CR 552 eastbound approach to the Orchard Road/College Drive signalized intersection to provide a 10-foot wide center left-turn lane, an exclusive through lane and a channelized right-turn lane. Lastly, the County is considering signaling the Boulevards. It is our understanding that the County will be issuing a Request of Proposals in the near future for the traffic signal design of this intersection.

Since the NJDOT will need to acquire the right-of-way within the vicinity of the Route 47/Sherman Avenue intersection, bid and award the project, a 5-year analysis (2008) was assumed. We used a growth rate of 1% plus added the traffic to be generated by the nearby hospital, the expansion to the Cumberland County College, the rehabilitation hospital, and the medical office along CR 552 since these projects are either under construction or detailed information is known. Only the afternoon peak hour was analyzed, since the corridor carries more traffic during the afternoon peak period, which represents a worst-case scenario.

We also treated these improvements as “existing” geometrics for our long-term analysis with discussion to follow.

ASSESSMENT OF INTERIM IMPROVEMENTS

We analyzed the intersections discussed in the above sections (Nabb Avenue, College Drive and Route 47). Interim peak hour volumes and projected operating conditions are provided on Figure 5. A description of each intersection is as follows:

CR 552 and Nabb Avenue/Morton Avenue

While Nabb Avenue will be improved to the south from its intersection with CR 552, the northbound approach will continue to remain as a one-lane approach with additional width for vehicles to maneuver around any queued left-turning traffic. Since the existing Levels of Service along this approach is an LOS C, we believe that any increase in traffic along this approach as a result of the college and hospital development will be somewhat offset by the increase in capacity from the additional width provided.

CR 552 and Route 47

This intersection, once improved by the NJDOT, will operate at overall LOS E with LOS F delays on the Sherman Avenue left-turn movements under the same phasing and timing operations as today. With some reallocation in timing, the overall intersection could operate at an overall LOS D with no individual movement operating at less than an LOS D. The signal timing reallocation will improve the saturation of the intersection by more than 20%. Furthermore, the increase in capacity along Route 47 and Sherman Avenue would result in less queuing and would lessen the potential for rear-ended accidents.

We would suggest that the County coordinate with the NJDOT through their design phase to implement the recommended timing changes. The County may also consider prohibiting left turns from the nearest WaWa and Sunoco gas station driveways due to accident history as part of the NJDOT capital improvement program.

CR 552 and Orchard Road/College Drive

With the implementation of the improvements by the hospital, the College Drive/Orchard Road approaches will operate with LOS E delays, warranting additional improvements. Signal phasing/timing adjustments to include a left lead green along CR 552 and a northbound lead green along College Drive will improve the saturations levels significantly; however, the intersection will operate at capacity.

Regarding accidents, the implementation of the left-turn lane will lessen angle accidents and to some extent sideswipe accidents, but typically will not aid in decreasing other types of

accidents. The introduction of an eastbound right-turn lane will further reduce sideswipe and some rear-ended accidents.

CR 552 between College Drive and Delsea Drive

With the increase in traffic along CR 552 as a result of the area developments, the saturation of CR 552 will increase. Under the 2008 volume projections, CR 552 is projected to have a saturation (v/c ratio) of 58%, at an acceptable LOS D. We note that the cartway of CR 552 is 40-foot-wide, which allows motorist to by-pass (on the shoulder) any queued left-turning vehicle into the various driveways along Sherman Avenue.

CR 552 and the Boulevards

Since the design of the intersection has yet to be determined as well as the phasing and the physical constraints regarding the vertical difference between the railroad tracks and CR 552, the railroad coordination, and the potential right-of-way issues, we feel that this improvement will not occur as a short-term improvement. As such, no further evaluation was conducted as an interim improvement.

TRAFFIC GROWTH – DESIGN HOUR VOLUMES

In order to identify future highway needs along the CR 552 Corridor and along the Orchard Road Corridor, we need to estimate the volume of new traffic that will be generated in the future years. Our goal was to determine the ultimate highway needs when lands along or within the immediate vicinity of the corridor are fully developed. We accomplished this by estimating the traffic to be generated as follows:

1. Development presently approved and under construction
2. Development presently approved and not built
3. Vacant parcels with potential development as currently zoned
4. A factor for “background” growth of through traffic generated outside the corridor

Development information was obtained through interviews with the Planning staff of the various municipalities along the Corridor. Where traffic studies had previously been conducted,

we extracted the site trips from those reports, while for development without a traffic study on file, we estimated the site traffic using the ITE's *Trip Generation*, Sixth Edition.

Based on field reconnaissance and tax maps, we identified usable vacant lands and estimated its trip making potential using the above referenced ITE publication based on the current zoning of the lands and the bulk requirements. A table summary in the Technical Appendix of the report shows the projected land uses and the new PM traffic generated.

While it is difficult to estimate a year this corridor will be fully developed, since economic conditions is a deciding factor in construction, we chose a design year of 2025 allowing 22 years of growth to complete development along this corridor. We used this design year since several other publications for this region also focused on 2025 as their design year. Since the corridor currently exhibits more traffic in the afternoon peak period and the development (known and projected) typically generates greater traffic in the afternoon than compared to the morning peak hour, the afternoon peak hour was used as the design hour.

Figures 6A to 6C present the projected 2025 design hour volumes. To estimate traffic growth traveling within the corridor as a result of future development outside the corridor, we used an annual growth factor of ½ to 1%. When combined with the development growth inside this corridor, the following annual growth factors are yielded for each municipality along the corridor:

Vineland City	4.20%
Deerfield Township	3.00%
Upper Deerfield Township	2.75%
Bridgeton City	2.00%

We also recognize that with the relocation of the primary functions of the hospital, traffic flow in the immediate vicinity of the existing hospital, such as Manheim Avenue, will have a decrease in traffic volumes. In addition, there will be some changes in traffic flow along CR 552 as a result of the hospital relocation. Since the hospital will continue to have some operational capacity at the Bridgeton location, no adjustments were made to the traffic flows for the primary reason that it is difficult to estimate exactly how much traffic will continue to be generated by the

existing hospital and if the hospital was ever vacated, the re-use of the buildings would generate traffic.

RECOMMENDED IMPROVEMENTS

Improvements along the CR 552 corridor can consist of several types, such as widening CR 552, improving geometrics at the intersections, providing turning lanes or auxiliary lanes at intersection, signaling intersections, installing additional signage, etc.

Ø *Design Criteria*

The following design criteria should be followed when designing improvements along the subject corridors:

- ***Design Speed:*** With the existing speed limits and speed of traffic along CR 552 and Orchard Road, we would recommend a design speed of 55 to 60 MPH along CR 552 from Burlington Avenue to Main Road. West of Burlington Avenue, a lower design speed can be used due to the lower speed limits and the introduction of parking along CR 552. Along Orchard Road, the speed limit varies and would recommend a design speed of 5 MPH above the posted speed limit.
- ***Geometric Controls:*** The standards used for geometric controls should be from *A Policy on Geometric Design of Highways and Street*, 2001, by the American Association of State Highway and Transportation Officials (AASHTO), supplemented by the NJDOT's *Design Manual – Roadways*.
- ***Lane Widths:*** Lane widths of 12 feet are ideal for this type of corridor, except where a lane is adjacent to a vertical curb, where a minimum 13-foot-wide lane is recommended. In cases where the speeds are lower, smaller lane widths can help in “controlling” speeds.
- ***Shoulders:*** Shoulders are desirable on any highway, as they contribute to increase safety and efficiency. They can also serve as speed change lanes into driveways, provide an area for snow, and emergency situations. We would recommend an 8-

foot shoulder along the roadways. At intersections, the shoulders can be converted into an auxiliary lane. Shoulders can also serve pedacyclists along the roadway.

- Guiderail: Guiderails should only be placed wherever engineering judgment indicates the hazard being protected against is more detrimental to an errant vehicle than the guiderail itself. Guiderails should typically be considered along side slopes steeper than 3:1.
- Border: The border area is defined as the area between the physical cartway and the right-of-way line. Typically, this area is used for sidewalks, utility poles, signs, mail boxes and guiderail (where warranted). We recommend a minimum 10-foot border area.
- Parking: Parking is not recommended along CR 552 except in the City of Bridgeton limits where businesses and residents require the use of on-street parking.
- Curbing: Curbing is not recommended except where needed as follows:
 - Drainage control
 - Within 200 feet of an intersection
 - To control access along an active frontage to a commercial establishment or subdivision
- Inlets/Manholes: All inlets and manholes should be flush with the pavement with the paved cartway. All inlets must be bicycle safe. Typically, “B-type” inlets located along the roadway sections without curbing should have at least 10 feet of curbing installed on either side of the inlet. Type “B” inlets located within a travel lane must not be “dished”.
- Sight Distance: Vertical and horizontal sight distance should be provided at intersections and driveways along CR 552 and Orchard Road meeting the minimum standards as found in the afore-mentioned AASHTO publication. Roadway signs should be placed 7 feet from the ground. Identification signs to commercial and residential land uses should not be located in the sight triangle area.

Another area of sight distance for site plan review is landscaping at the access. All vegetation within the sight triangles should be no greater than 30" measured from the pavement.

Ø **Roadway Cartway**

The American Association of State Highway and Transportation Officials (AASHTO) recommends a design level of service for the types of functional classifications (freeway, arterial, collector, and local) with specified combination of area and terrain types. For this area and the function of the CR 552 and Orchard Road, an LOS C is recommended.

The AASHTO publication further states that highway agencies should strive to provide the highest level of service practical; however, the use of lower design levels should be used sparingly and only in heavily developed sections. The publication further states that the appropriate level of service choice is "properly left to the highway designer".

Based on the saturation levels of a two-lane roadway, saturation levels greater than 30% are typically defined as LOS D. However, we feel that striving for a highway design of 30% or less during peak hours is not practical and overly burdensome to the governing agencies. We would recommend a minimum standard of 75 to 80%.

As shown in Table 7, the 2025 volume-to-capacity ratios (under existing conditions) will exceed the 80% saturation level threshold from Nabb Avenue to Main Road, with the area between Route 55 to Route 47 at saturation levels exceeding 1.0. Along Orchard Road, the saturation levels will be less than 45%, not warranting improvements along this section of the studied roadway.

Typically, once the saturation levels reach 80%, the roadways in question should be considered for improvements such as a widening to a four-lane roadway. It is important to remember that CR 552 is a land service highway and the provision for the safe and convenient access to land development is necessary. In order to accommodate this need, it is typical to provide a five-lane cross-section with auxiliary lanes at major driveways. Shoulders should be provided since this can serve as a deceleration area for driveways and a place for emergencies that will not overly disrupt the traffic flow.

Figure 7 shows the desirable cross-section area of a five-lane section with a full-width shoulder and typical border area, which is based on the NJDOT's cross-section for a five-lane section. This cross-section would necessitate a 104-foot-wide right-of-way. Recognizing that the availability of right-of-way and the monetary value of buying right-of-way, a smaller cartway can be provided with a 13-foot-wide center left-turn lane, an 11-foot-wide inner travel lane, a 12-foot-wide outer lane, and an 8-foot-wide shoulder. This would require a 95-foot-wide right-of-way.

- **CR 552**

We recognize that CR 552 has several physical constraints that must be considered, primarily the Route 55 overpass. The Route 55 interchange is a man-made boundary between the Deerfield Township and Vineland City areas. We also recognize that overpass areas can be a bottleneck area of congestion if the travel lanes at the overpass are less than the number of travel lanes on the sides of the bridge. As such, the continuation of a four-lane roadway across the Route 55 overpass is critical to level of service and decreased congestion.

The cartway width of the CR 552 overpass at Route 55 is approximately 50 feet wide, which can accommodate a four-lane roadway. While the ideal improvement would be to widen the Route 55 overpass to provide a four-lane roadway with shoulder/auxiliary lanes, the likelihood of replacing the bridge structure will be small, and the project very costly.

Accounting for the man-made border of the Route 55 limited access freeway and the potential land uses along the corridor, we would recommend that CR 552 be widened to a minimum standard of five lanes with shoulders east of Route 55 due to the projected volume, the intensity of the land uses and the potential need for improvements at the College Drive/Orchard Road and Route 47 intersections as discussed in the previous sections. The provision of a five-lane section will enhance the free flow of traffic and will have excess capacity for future development along the corridor.

West of the Route 55 interchanges, we would recommend that CR 552 maintain a four-lane roadway with shoulders to Kenyon Road then tapering back to a two-lane roadway. At the CR 552 intersection with Jessie's Bridge Road and Kenyon Road, we would recommend

additional widening to provide left-turn lanes along Sherman Avenue. While the saturation levels from Kenyon Road to the Carmel area will be in the range of 80%, we recognize the need for motorists to decrease operating speeds as approaching the Carmel area. The affect of narrowing the roadway is to provide an impression to motorists that the comfort level has decreased, and as such, slower speeds should be obtained.

There is a significant bridge structure just west of the Route 55 overpass at the Parvins Tarkin Branch. The County can consider, as an alternative, limiting the widening of CR 552 from the bridge westward and maintaining a two-lane roadway eastward after the aforementioned bridge.

In the areas along CR 552, where the saturation levels are below the 80% criteria for closer examination, we would recommend that the governing bodies continue to examine the growth potential along the corridor beyond 2025. If improvements are needed, the County should implement those necessary improvements.

In those areas where CR 552 can be maintained as a two-lane roadway (i.e. west of Kenyon Avenue), we would suggest that the roadway cartway be 40 feet wide (12-foot-wide travel lanes and 8-foot-wide shoulders) except in the area where the posted speeds are lower and/or where on-street parking is introduced such as the Carmel and Bridgeton areas and except in areas where natural restrictions such as wetlands that physically prohibit the widening exist.

We would recommend that any intersection the County may consider signalizing, the provision of two through lanes with the appropriate tapers in addition to left-turn lanes be carefully reviewed. In those instances, where a traffic signal may not be warranted or the closeness to another intersection prohibits signalization, we would recommend installation left-turn lanes at those key intersections so that left-turning traffic will not affect through motorists.

With the implementation of the four to five-lane section along CR 552 primarily to the east of Route 55, the relocation of the utility poles will be necessary. The utility poles on the south side have aeriels and as such require more right-of-way (or easements). The utility poles on the north side are typically smaller.

- **Orchard Road**

While the saturation levels along Orchard Road do not require the need for improvements, as land is developed primarily in the area of the CR 552 intersection, the need to provide auxiliary or turning lanes at driveways will be critical in maintaining capacity and free flow of traffic. If the characteristics of the land uses along Orchard Road start to change from residential to neighborhood office or commercial uses, the County may then want to evaluate the need for providing a three-lane section which incorporates a center turn lane.

Ø ***Intersections***

Improvements at the various intersections along CR 552 and Orchard Road can vary from minor signal timing adjustments at existing traffic signals to major rehabilitations at intersections that may include widening to provide turning or auxiliary lanes. Any proposal for traffic signal installation will ultimately require the NJDOT approval with a certification that the intersection location meets the MUTCD signal warrants.

While we identify the probable improvements at each intersection based on the adjacent lands being developed by 2025, we recognize that the development market and changes in zoning can affect land intensity and development construction timetables. As such, the County or the affected municipalities should continue to monitor such growth and the time when such improvements may be necessary.

Each of the study intersections is addressed below:

CR 552 and Laurel Street

By 2025, this intersection will have saturation levels with less than 60%, not warranting any improvements.

CR 552 and Route 77

This signalized intersection will warrant a signal phasing improvement to provide a westbound lead along Irving Avenue. We recognize that the saturation levels will reach

capacity threshold levels and would technically warrant more improvements such as turning lanes. However, since this intersection is located in an area of Bridgeton City where adjacent land uses are very close to the highway, widening will impact the local residents and local businesses as well as on-street parking. Any improvements, even a signal timing change, are subject to NJDOT approval since the State has jurisdiction over Route 77.

CR 552 at Bank Street, Walnut Street, and East Avenue

These unsignalized intersections will have LOS E and F delays on the stop-controlled approaches. While the design hour volumes may meet the volume warrants for a traffic signal, we believe that warrants for the required other hours outside the peak will not be met at these intersections. If the County would consider a traffic signal at any location assuming that the volume warrants are met, the more beneficial location would be East Avenue since it is the farthest from the signal at Route 77 and exceeds the minimum distance standards for traffic signalization. Further evaluation of these intersections should be conducted as traffic grows along the corridor to determine if and when a signal may be warranted.

CR 552 and Manheim Avenue

This intersection, under 2025 volumes, will operate at sufficient levels of service, thereby not requiring any further improvements. We recognize that with the relocation of the hospital's primary function to the Vineland City location, traffic at this intersection will decrease (in the short-term); and therefore, will operate at better levels of service than anticipated.

CR 552 and Spring Street

This local residential street will exhibit LOS C delays in 2025, thereby not requiring any improvements.

CR 552 and North Burlington Avenue

This signalized intersection will operate with overall LOS C delays and with saturation levels at approximately 75%, not warranting improvements. However, as the left-turn volumes

increase along CR 552, the County may want to consider widening to install left-turn lanes for increased efficiency and decrease accidents.

CR 552 and Lebanon Road

The CR 552 westbound approach will operate at future LOS F delays. We recognize that the higher volume, today and in the future, will be along CR 552, and as such CR 552 should be the through movement. We would recommend geometric and traffic control modifications to this intersection, as shown in Figure 8.

In order to maintain CR 552 as a throughput, CR 552 should be improved to provide a larger radius for continuous free-flow of traffic. Lebanon Road should be realigned to intersection CR 552 at a 90-degree angle for maximum sight distance. With the realignment and the reversal of the STOP-sign, the left-turn movement from CR 552 will function at an LOS A and the movements from Lebanon Road at an LOS C.

CR 552 and South Woodruff Avenue

By 2025, this intersection will most likely require improvements since LOS F delays are predicated along the South Woodruff Avenue approaches. A review of the 2025 design hour volumes show that a traffic signal may potentially be warranted at this location. If a traffic signal was installed and left-turn lanes along CR 552, the intersection would operate at overall LOS C delays with saturation levels less than 65%.

CR 552 at East Avenue (CR 675), Rogers Avenue and Sugarman Avenue

With the potential development that may occur within the Deerfield Township area, the East Avenue approach will function at an LOS D while the Rogers Avenue and Sugarman Avenue approaches will function at with LOS F delays, potentially warranting improvements. A signal at each location would function at overall LOS C delays with less than 80% saturation.

We recognize that traffic signals can be costly to both the County and municipality regarding design, construction, maintenance and utility costs. As such, we would not recommend signaling all three intersections unless there is a clear need (i.e. volume

warrants). In order of priority, East Avenue, then Sugarman Avenue, then Rodgers Avenue would be suggested order of reviewing the signal warrants based on the design hour volumes. A traffic signal installed at Sugarman Avenue should have a pre-emption coordinated with the nearby firehouse.

We also recognize that left-turn lanes may be warranted at East Avenue and Sugarman Avenue. The County may want to consider installing left-turn lanes along CR 552 at these intersections. While the left-turn lanes will not be a direct benefit to the operations of the side street, it will allow traffic along CR 552 to by-pass any queued left-turning traffic.

We would also recommend that as the lands surrounding these intersections and roadways develop, that collector roadways be designed and incorporated from a municipal level to potentially provide local roadways that will allow motorist to traverse from one roadway to another. With the collector roadway, there may be a better potential to warrant a traffic signal or provide motorists an option to use a collector roadway to travel to an area signal to execute a left-turn onto CR 552.

CR 552 and Nabb Avenue/Morton Avenue

This intersection, in 2025, with the existing geometrics and the Nabb Avenue improvements will be over-saturated assuming the potential development of the immediate land uses.

The widening of the intersection to provide left-turn lanes along the Sherman/Irving Avenue and Nabb Avenue/Morton Avenue approaches and a potential westbound right-turn lane will significantly improve the operation of the intersection so that excess capacity will exist for additional traffic growth, as shown in Figure 9. The westbound right-turn lane may not be necessary if a shoulder is provided. However, the provision of such an auxiliary lane aids in guiding motorists, reduces the potential rear-ended or sideswipe accidents, and increases the available capacity.

Ideally, the lane widths should be 12 feet wide for the center left-turn lane and 13 feet wide for the outside through right lane against the vertical curb. Increased radii at the corner of the intersection will be necessary since the receiving lane will be narrow.

We recognize that this area is located on the outskirts of the Carmel “downtown” area and the current width of CR 552 is 36 feet wide. An alternative that can be provided is decreasing the left-turn lane to a minimum standard of 10 feet wide with the outside curbed lanes at 13 feet wide, which would equal 36 feet wide, which is the existing cartway of CR 552 in this area. Radii of 35 feet are suggested since this intersection is in close proximity to nearby schools. An increased radius would allow buses to execute turning movements with minimal encroachment.

CR 552 and Carmel Road

This intersection is in close proximity (450 feet) to the Nabb Avenue/Morton Avenue intersection. In 2025, this intersection has a potential to be signalized. If signalized, the coordination with the Nabb Avenue/Morton Avenue intersection will be critical due the closeness of the intersections. In addition, the center left-turn lane along Sherman Avenue at Nabb Avenue should be carried through the Carmel Road intersection to provide a center left-turn lane. The right-turn auxiliary lane along eastbound CR 552 should remain. Figure 9 shows the relationship of improvements between this intersection and Nabb Avenue/Morton Avenue.

If signalized, the intersection will operate at an overall LOS B with saturation levels less than 80%.

CR 552 at Kenyon Avenue and Jessie’s Bridge Road

These two unsignalized intersections will exhibit LOS F delays in 2025. A traffic signal would improve the operation of the intersection; however, it is unlikely that the minimum four-hour warrants could be met. Widening of the side streets for exclusive turn lanes could provide less delay to the right turns; however, with the projected volume and the sight distance issue that is created with two approach lanes at an unsignalized intersection, we would recommend not widening the approaches.

CR 552 and Route 55

The Route 55 interchange will also exhibit LOS F delays for the STOP-sign controlled approaches. A traffic signal would be warranted at both ramp intersections and would require

coordination between them such that the two signals would operate at one. With a four-lane bridge and traffic signals, the off-ramps will operate as acceptable LOS C with the overall intersection under saturation levels of 65%.

CR 552 and Orchard Road/College Drive

This intersection will have significant delays and queuing issues based on the improvement that will be implemented by the hospital. With the potential development that may occur with the recent purchase of the SPCA property and the vacant land the hospital owns along College Drive, this intersection will be a focal point of these adjacent parcels.

The CR 552 approaches should consist of an exclusive left-turn lane, two through lanes and a right-turn lane. The College Drive and Orchard Road approaches should consist, at a minimum, of exclusive turning lanes for all three movements: left, through, and right. We would also recommend that College Drive be slightly realigned to a 90° angle at CR 552. Even with this geometric layout and proposed signal phasing, this intersection will operate with a v/c ratio slightly exceeding 1.0. The County can consider allowing left movements to turn from the through lane on College Drive while still maintaining the three lane approach (L, LT, R) as shown in Figure 10. Under this lane configuration, split phasing on the CR 628 approaches will be necessary. The saturation levels will increase to 95%.

Alternatively, providing two left-turn lanes on the northbound College Drive approach with an exclusive phase will decrease the saturation levels to approximately 85%. While the increase in capacity is significant (20%), the increased cartway and the further affect to adjacent land uses may be cost prohibitive.

CR 552 and Route 47

This signalized intersection, in 2025, will operate with significant LOS F delays where the saturation levels will be very high that motorists will most likely divert to other area roadways - potentially local residential roadways; and increased accidents may result due to the lengthy queuing and delays.

With a five by five lane section at the intersection, which is consistent with the NJDOT improvements along Route 47 and the recommended five-lane section along CR 552, this intersection will continue to have significant delays and queuing.

Providing right-turn lanes on all approaches will alleviate some of the queuing in the through lanes; however, the concern lies in the left-turn volume from CR 552. The need for two left-turn lanes on CR 552 will be necessary with split phasing on Sherman Avenue. Figure 11 shows the potential ultimate improvements.

Once the volumes at an intersection, such as this one, grow to a point in which the number of lanes on each approach is significant, several issues are raised. One, the land needed to accommodate such a geometric configuration can be extensive both at the intersection and along the approaches. Two, the need for a grade-separated interchange or a by-pass becomes more viable (even if it is costly). Lastly, motorists will divert to the adjacent roadways to avoid the intersection.

Typically, motorist will choose an alternative parallel route to “by-pass”. To/from the south, motorist can use College Drive. The County should carefully examine this section of roadway for a potential five-lane roadway. To/from the north, motorist will choose to use Orchard Road, which is more residential in nature than Route 47, and then use the more local roadways to reach Route 47.

As previously noted, Orchard Road is projected to operate at saturation levels between 35 to 45% in 2025 once the area lands are developed. With any additional increase in traffic due to a Route 47/552 diversion, the saturation level of the roadway and the available capacity at the intersections will decrease. The need to re-evaluate Orchard Road will be critical in determining if additional improvements may be warranted. At a minimum, a three-lane section would be necessary to “remove” any left-turn from the through traffic for increased efficiency and capacity.

CR 552 and the Boulevards

Similar to the existing conditions, by 2025, the Boulevards, as unsignalized intersection will operate at LOS F delays. As previously mentioned in the Interim Conditions section of this

report, Cumberland County will be issuing an RFP for the intersection design. This intersection requires a careful examination of the potential turning movements, signal phasing, and coordination with the railroad.

Field observations show that the railroad tracks are higher than the roadway cartway. To provide maximum efficiency of the signalized intersection, lowering of the tracks or raising the roadway is recommended similar to the grade at the intersection of Park Avenue and Chestnut Avenue along the Boulevards.

Our findings show that a six-lane section across the railroad tracks will be necessary to provide for left, through and through right lanes on the CR 552 approaches. Side-by-side left-turn lanes will be necessary since there is not sufficient storage to provide back-to-back left-turn lane between the Boulevards. We also recommend an inside clearance phase be required to clear the traffic from the track area. A conceptual layout of the intersection is shown in Figure 12.

With the configuration and signal timing phasing, the intersection will operate at overall LOS C delays.

CR 552 and Main Road

Under a separate contract, Horner & Canter Associates has studied the Main Road Corridor for Cumberland County and recommended that Main Road be a five-lane roadway. At this intersection, Sherman Avenue will also require a five-lane section. With the geometric recommendations (Figure 13) and signal timing changes, the intersection will operate with saturation levels less than 90% during the peak hours.

Orchard Road at Garrison Road, Elm Street, and West Walnut Avenue

These STOP-signed controlled intersections will function at LOS C delays in 2025, warranting no geometric improvements.

With the potential increase in traffic at the intersection due to diverted traffic from the Route 47 intersection, the re-evaluation of these intersections as land is developed in Vineland City will be necessary on a routine basis.

Orchard Road and Chestnut Avenue

This signalized intersection will operate at an overall LOS B with no approach functioning less than an LOS C.

The potential for improvements at this intersection as a result of diverted traffic will require evaluation.

CARMEL BY-PASS

There were recommendations that an analysis of providing a by-pass area around the Carmel area of Deerfield Township be conducted. While we recognize that a by-pass will lower traffic volumes from one location (in this case, the Carmel area) and increase traffic volumes on surrounding roadway(s) that may be used as part of the by-pass, there are other fiscal and local impacts that the County will have to consider and as a value judgment before designing and implementing a by-pass. Those other impacts may be the potential economic impact to the loss of visibility to business in the Carmel area, the potential for widening other intersections or roadways that will be part of the by-pass area, or potential environmental impacts.

The most likely route of a by-pass would be to use Lebanon Road from its intersection with CR 552 crossing over the Lebanon Branch of Mill Creek in the area of Garrison Road and intersecting at CR 552 again in the vicinity of Kenyon Road with a sweeping “T” alignment. Under this alignment of the by-pass, eastbound CR 552 should intersect the by-pass (near Kenyon Road) to form a T-end intersection under signalization. At the western end of Lebanon Road, the previous recommendation to realign CR 552 would not occur and the existing alignment would remain with the westbound approach of CR 552 better aligned into Lebanon Road to form a 90-degree intersection with potential signal control. The proposed alignment is shown as Figure 14.

Lebanon Road will most likely require widening to 40 feet with increased lanes at major intersections along the by-pass route. With the decrease in through traffic along CR 552 due to the by-pass, the potential to signalize intersections from Lebanon to Kenyon Road will be lessened.

The County and municipality will need to re-analyze the land uses and the access availability along the by-pass. A secondary impact to providing a by-pass is that more regionalized land uses (office and retail establishments) develop along the new corridor. If there is no access management in place along the by-pass, there exists a potential that one day the volume along the by-pass will increase to the point that motorists may divert back to CR 552 thereby increasing the volumes along CR 552, and so forth. This syndrome is common in areas where by-passes are created to avoid a downtown area but access management and appropriate zoning are not implemented. The Woodbury “by-pass” in Gloucester County circa 1930 is a prime example of this condition.

IMPROVEMENT PRIORITIZATION

Several improvements were identified along the Sherman Avenue and Orchard Road Corridors. Each intersection is listed on Table 8 with the respective improvements suggested. We also identified each improvement as short-term or long-term, as well as prioritization (low, medium or high). We further ranked the improvements for each priority section in order of implementation or consideration, as shown in Table 9.

Ultimately, the County will be the approving authority for any improvement along the corridor. However, the various municipalities can aid the County in their endeavors by routinely evaluating intersections for signal warrants or providing financial aid in implementing improvements such as designing improvements or obtaining any right-of-way necessary. Major projects should be placed on the Regional Planning agency’s Transportation Improvement Program (TIP) for federal funding.

To prioritize the recommended improvements, obviously the short-term items should be the first to be implemented. The County can replace the various signs and markings as identified. Either the municipalities or the County can comprehensively review the signal warrants at various intersections for the justification of a traffic signal.

The long-term improvements will vary in implementation due to available funding for the various improvements. However, the section between Route 55 and Route 47 will require a careful review of the necessary improvements at periodic times. As each section of the Corridor is developed (or redeveloped), the County should require the particular developer to dedicate the necessary right-of-way for the ultimate roadway cartway as well as implement a portion of the roadway improvements.

SCHOOL SPEED ZONES

The New Jersey Statutes Annotated Title 39 provides the rules and laws regarding motor vehicles and traffic regulations. Section 39-4-98 (Rates of Speed) states that the prima facie speed limit when passing through a school zone shall be 25 MPH. This prima facie speed is to be observed when children are clearly visible from the roadway, during recess, and while children are going to or leaving school during opening and closing hours. The definition of a school zone furthers defines areas that are maintained by appropriate “school signs”.

A field view of the subject corridor shows that two schools front CR 552. The Pineland Elementary School is located along Sherman Avenue at approximate milepost 5.7 in the Carmel area. The Cumberland Christian School is located along CR 552 between Orchard Road and Route 47 at approximate milepost 16.0.

Signs are currently provided along CR 552 in the area of the Christian school identifying the area as a school zone. The Cumberland Christian School is located such that there is grade differential between CR 552 and the school grounds. Students on the playground cannot be readily seen from CR 552. Students can be seen walking between the buildings and in the front of the main building during drop-off and pick-up times.

In the area of the Pineland Elementary School, no school warning signs are posted. Similar to the Cumberland Christian School, students are not readily seen when on the playground. Students can be seen in the front near the bus drop-off/pick-up area.

In the area of the Christian school, there is no indication of student “walkers” or children playing in the areas in the vicinity of the highway. However, the County can consider providing

flashers in conjunction with the advance school signs that further advise motorists of the nearby school, and should upgrade the existing advance school signs to fluorescent yellow-green.

Regarding the Pinelands Elementary School, the school is close to the roadway and is clearly visible from the roadway. As such, we would recommend the existing school warning/identification signs be installed along the CR 552 in conformance to the *Manual on Uniform Traffic Control Devices* and modifying the Speed Zone approval to include School/Speed Limit 25 signing.

NEW JERSEY TRANSIT

Based on our research and observations, there are four bus routes (Routes #313, 408, 410, and 553) in this area. None of these routes travel directly along CR 552. The bus route #553 is classified as the Upper Deerfield - Atlantic City route. The #553 bus line travels from Upper Deerfield at the intersection of Route 77 and Landis Avenue traverses through Bridgeton City then Millville City via Route 49, to the bus terminal in Vineland with a diversion to the Cumberland County College before traveling into Atlantic County and terminating in Atlantic City.

The #553 route stops at the Cumberland County College at least once an hour between 7 AM to 10 PM on weekdays. Between 9 and 10 PM, there are two final stops at the college. There are no stops on weekends at the college.

We contacted NJ Transit officials and found that the Bus #553 line would be extended providing a stop at the new hospital. NJ Transit is looking into providing a bus shelter at the hospital. It is anticipated that the frequency of the bus stop would be similar to the existing #553 bus route at the Cumberland County College.

NJ Transit does not have any immediate plans to expand or increase their bus service in the area. However, we were advised that on a quarterly basis, NJ Transit reviews their routes and ridership to determine if any changes in routes or stops need to be implemented. NJ Transit will accept request from governing agencies or the SJTPO to review the potential of providing bus services along future roadways in the service area. As such, we would

recommend that if there is a need for bus service directly along the CR 552 or Orchard Road Corridors that the governing bodies request NJ Transit to provide such service.

EMERGENCY RESPONSE

While emergency response times and traffic patterns are critical, it is difficult to determine the time, nature, and origin of such emergency calls. It is our understanding that the while the majority of the hospital operations are being relocated from the Bridgeton Hospital location to the new hospital location in Vineland City along CR 552, that emergencies will continue to be serviced at the Bridgeton Hospital location.

From a traffic perspective, the New Jersey Statutes Annotated Title 39 Section 4-92 states that drivers must stop in a position along the roadway to clear the right-of-way along the roadway or intersection for an emergency vehicle giving audible signal. As such, non-emergency vehicles must yield the right-of-way to oncoming emergency vehicles when audible signals can be heard.

We recognize that a significant portion of CR 552 is 40 feet wide, which is sufficient for motorists to maneuver onto the shoulder and allow an emergency vehicle to pass without any encroachment on oncoming traffic or crossing the marked centerline. However, there are areas in which CR 552 is not 40 feet wide, the optimum width for emergency vehicle flow efficiency.

We examined the minimum width that CR 552 can be to provide a safe area for both stopped motorists and the passage of an emergency vehicle. A cartway width of 32 feet would allow an 8-foot-wide area on each side of the road for non-emergency vehicles to stop and maintain a 15-foot-wide area for emergency vehicles to flow. We recognize that under this situation the emergency vehicle will be required to straddle the centerline markings. The emergency vehicle drivers will require more cautionary measures under this situation since he/she must confirm that all traffic will stop for the emergency vehicle to pass.

We also recognize that as traffic increases along CR 552 that the potential need for more traffic signals along the corridor may be necessary. The installation of traffic signals will require the traffic to stop along CR 552 and may inhibit the traffic flow of any emergency response vehicles. A pre-emption system can be implemented at the traffic signals along the

corridor so that the priority (i.e. green) will be provided to the approach that the emergency vehicles are traveling.

CONGESTION MANAGEMENT PROGRAM

Parsons Brinkerhoff developed a *Congestion Management System Report* for the South Jersey Transportation Planning Organization. The report identified the roadways that should be included within the congestion management system (CMS), the performance measures and the potential strategies that can be evaluated, ranked, and implemented. It should be noted that the design year used in the CMS was 2025.

The CR 552 and Orchard Road corridors in question meet the criteria to be included within the CMS. The report outlines different performance criteria that can be selected as a basis of measuring congestion. The report recommends using the volume-to-capacity ratios (v/c) as an initial basis. The report further defines area in the SJTPO region as urban, rural, seasonal, or rural center. The Vineland City area is noted as Urban, the Bridgeton City as a Rural Center, and Deerfield and Upper Deerfield Townships as Rural.

The report outlines different v/c ratio ranges for the various area types to define congestion as below, approaching or above capacity. Typically, a rural or rural center area with a v/c ratio between 0.75 and 0.90 is defined as approaching capacity whereas an urban area with a v/c ratio ranging between 0.80 to 1.00 is considered approaching capacity. It should be noted that this study used an 80% capacity saturation level as a means for closer examination for improvements, generally consistent with the CMS.

The report outlines roadways within the southern counties that require CMS needs. In Cumberland County, CR 552 from Orchard Road to Lincoln Avenue is noted as an area of concern as well as the Boulevards starting from Sherman Avenue.

Ø *Recommended CMS practices*

In order for the SJTPO to continue to monitor congestion along the CR 552 and Orchard Road corridor, we would recommend the following practices be implemented.

- Addition of Links to CMS

As previously mentioned, CR 552 is noted as an area of concern. However, we would recommend that the SJTPO expand CR 552 linkage to include Route 55 since the section between Orchard Road and Route 55 is reaching capacity today.

- Traffic data collection

The SJTPO, in conjunction with Cumberland County and the various municipalities should periodically measure traffic data at key locations to determine how traffic is growing and to what extent. From the data collected, the SJTPO can rather quickly compare the v/c ratio performance measure to determine if a close examination of the roadway in question is necessary.

We are aware that the SJTPO publishes a Request for Proposal every year for traffic data collection. It is recommended that the SJTPO list the CR 552 area for yearly traffic data collection.

- Municipal/County involvement

Typically, the County and/or the various municipalities will require a traffic study as part of a site plan review. The reviewing authority should make the reports available to the SJTPO that directly affect the corridors in questions or provide to SJTPO a summary of any traffic data or analysis of subject intersections along the corridor.

- Trip Reduction Strategies

As the corridor develops, there will be a need to develop and implement trip reduction strategies to reduce the potential traffic generation to a level that will allow reasonable traffic improvements to be designed and constructed. These strategies could include local ordinances or tax incentive for large employers (such as the office or an office/medical complex) to develop ride sharing or van pooling programs or flexible shift times; for homeowners associations to provide mini-bus service to places such as the Cumberland Mall, the college, the hospital, etc.

- ITS Implementation

As the traffic grows along the corridor and congestion becomes more noticeable under the existing geometry, the provision of Intelligent Transportation Systems (ITS) may become more viable. For example, providing variable message signs on Route 55 alerting motorists of the potential conditions along CR 552 will allow motorists to divert to area interchanges.

- ROW Dedication/Fair-Share

The Board of Chosen Freeholders should implement a policy that requires developers for any new development along the CR 552 and Orchard Road corridor to dedicate the necessary right-of-way for future widening along the corridor in accordance with a Master Plan or Official Map adopted to implement the recommendations of this study. In addition, the applicant would be responsible to contribute their fair-share of future intersection improvements the County has planned. Typically, the generally accepted method is the percentage of afternoon peak hour site traffic of the overall intersection volume. The County could, at their discretion, require the applicant to incorporate the planned improvements. In addition, the County should also require applicants to widen their frontages, typically, 200 feet in both directions of an access to provide an acceleration/deceleration area.

The County could also consider adoption of a modified version of the NJ State Highway Access Management Code as provided in N.J.A.C. 16:47-9.

With the above-mentioned methods in place, the future development along CR 552 will contribute funds and/or implement and dedicate the right-of-way for the improvements identified in this report.

SUMMARY

This traffic engineering study of the CR 552 (Sherman/Irving Avenue) and Orchard Road is a "Master Plan" of the highway and intersection needs of the affected roadways for the next two decades. As such, any highway improvements that are implemented can be completed in stages, yet compatible with the ultimate needs. The area in the vicinity of College Drive/Orchard Road and Route 47 must be the first area of concentration with the

implementation of the recommended improvements due to the current volumes along the adjacent roadways and the short-term potential of the adjacent lands being developed.

The recommended intersection and roadway designs, some with a cartway as much as 96 feet wide, may seem at first glance, unreasonable; however, these designs will be necessary to accommodate the future traffic volumes. There are other potential solutions such as installing jughandles or grade-separating two major roadways; however, the right-of-way necessary for these types of improvements costs and impact on adjacent landowners will be greater than the widening of the corridor and area intersections.

We also note that these intersection and roadway designs are not uncommon to other parts of southern New Jersey. Camden County has been systematically implementing, by stages, widening of the Berlin-Cross Keys Corridor to a five-lane section with additional widening at several intersections, as a result of our 1992 Corridor Study. Gloucester County has just completed a 5-lane by-pass of the Cross Keys area, and Atlantic County has adopted several corridor programs.

The development and implementation of trip-reduction strategies will also become more critical as the land along and in the immediate area of the corridors are developed and excessive intersection improvements would be necessary.

While we have identified the probable improvements at each intersection based on the adjacent lands being developed by 2025, we recognize that the development market and changes in zoning can affect land use intensity and development construction time-tables. As such, the County or the affected municipalities should continue to monitor such growth and plan a time-table for implementation as improvements become necessary.