I INTRODUCTION

A. Early Project History

The Blue Ball Properties Transportation Improvements Project is located north of Wilmington in New Castle County, Delaware in the proximity of U.S. Route 202, Delaware Route 141 and Foulk Road ***(Figure 1)***. More specifically, the study area extends from Broom Street just south of the U.S. Route 202/I-95 Interchange north to the existing AstraZeneca corporate entrance north of Delaware Route 141, and from the new Rockland Road bridge on Delaware Route 141 east to Murphy Road/Wilson Road/Foulk Road intersection ***(Photo 1)***.

The U.S. Route 202 and Delaware Route 141 corridors in the Blue Ball area have experienced residential and commercial development, traffic congestion and safety problems for many years. At the same time, local residents and civic groups have been interested in preserving several tracts of land from high density development for two principal reasons: 1) maintaining the open space in the area, and 2) avoiding the additional traffic and congestion problems that would likely result from continued residential and community development.

Previously, in May 1992 an Environmental Assessment (EA) was approved for Delaware Route 141 improvements, from Delaware Route 141, Montchanin Road (S.R. 100) to U.S. Route 202 (Concord Pike). The EA evaluated potential impacts to the widening of a 4.5 mile section of Delaware Route 141 to accommodate year 2010 traffic forecasts. As part of the EA, four (4) alternatives were presented for the 2.4 mile corridor between Montchanin Road (Delaware Route 100) and U.S. Route 202. The Preferred Alternative, D1 (known as the "Spaghetti Plan"), consisted of an urban diamond interchange at Foulk Road and U.S. Route 202, the interconnection of Rockland Road and Augustine Cut-Off, and an optional tunnel connection from Rockland Road/Augustine Cut-Off to U.S. Route 202.

A Public Hearing was held for the project and as a result of public input and plans for changes in future land use projections, Alternative D1 was modified to include six lanes over the Brandywine River at the Tyler McConnell Bridge, provide interchanges at Alapocas Drive and Old Murphy Road, and modify the Foulk Road/U.S. Route 202 interchange. Later in 1992, a phased approach to building the improvements along Delaware Route 141 was presented, with a bridge over Rockland Road being constructed first, then a new six-lane bridge over the Brandywine Creek, and finally the improved interchange between I-95, U.S. Route 202, and Delaware Route 141. In December 1992, it was declared official that the six-lane bridge over the Brandywine Creek would only be a four-lane bridge.

After much public opposition between 1992 and 1994 over the Preferred Alternative, D1, the approved transportation improvements were re-evaluated. As a result, two (2) phases of the project, the widening of the Tyler McConnell Bridge and the Foulk Road/U.S. Route 202 interchange were put on hold while the following two phases were advanced to construction ***(Figure 2)***:

- *Delaware Route 141, Rockland Road to U.S. Route 202*. This project, completed in 1997, included the grade-separation of the Delaware Route 141/Rockland Road intersection; an

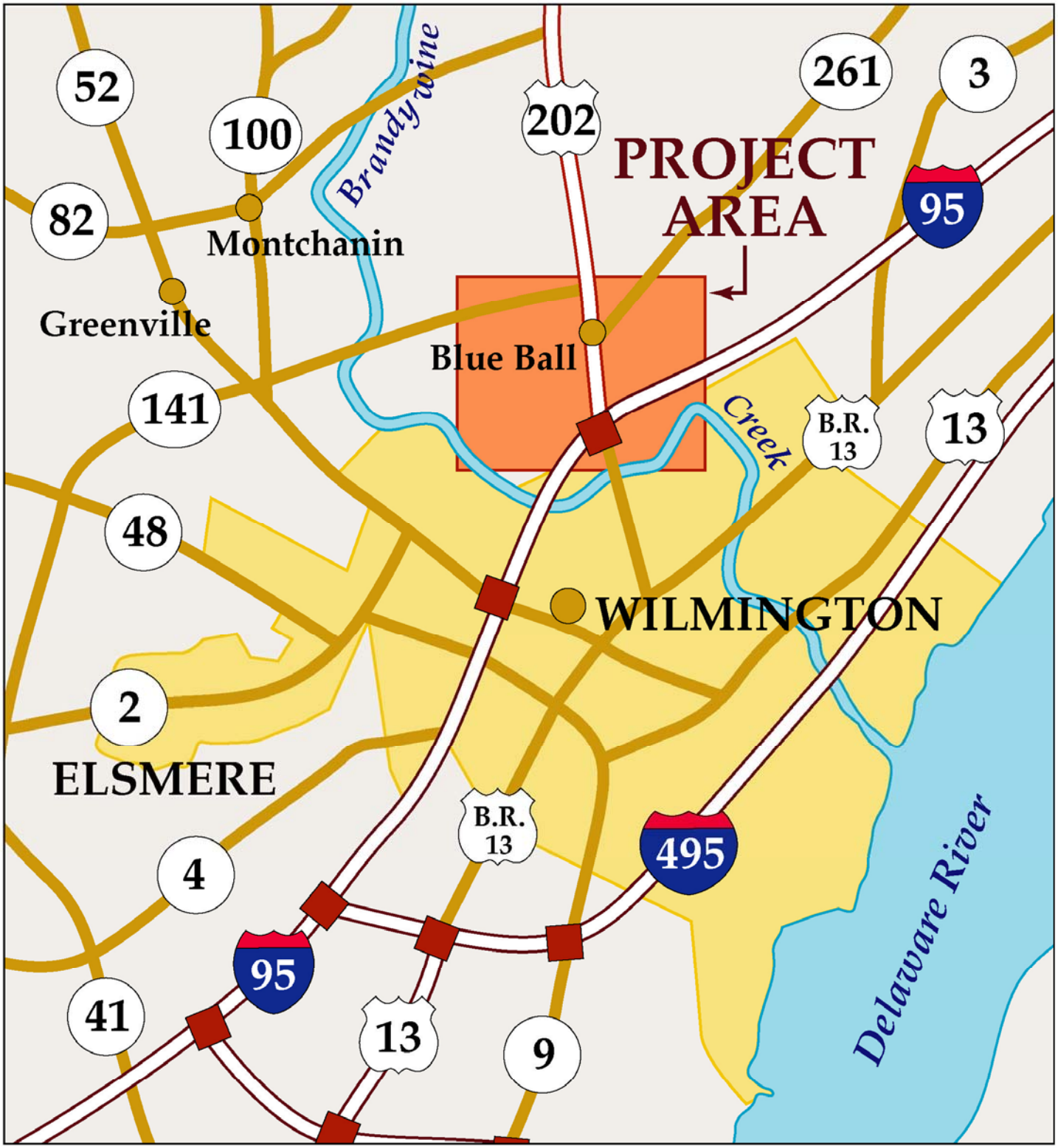

FIGURE 1: PROJECT LOCATION/REGIONAL CONTEXT

N

0 1/2 1

mile

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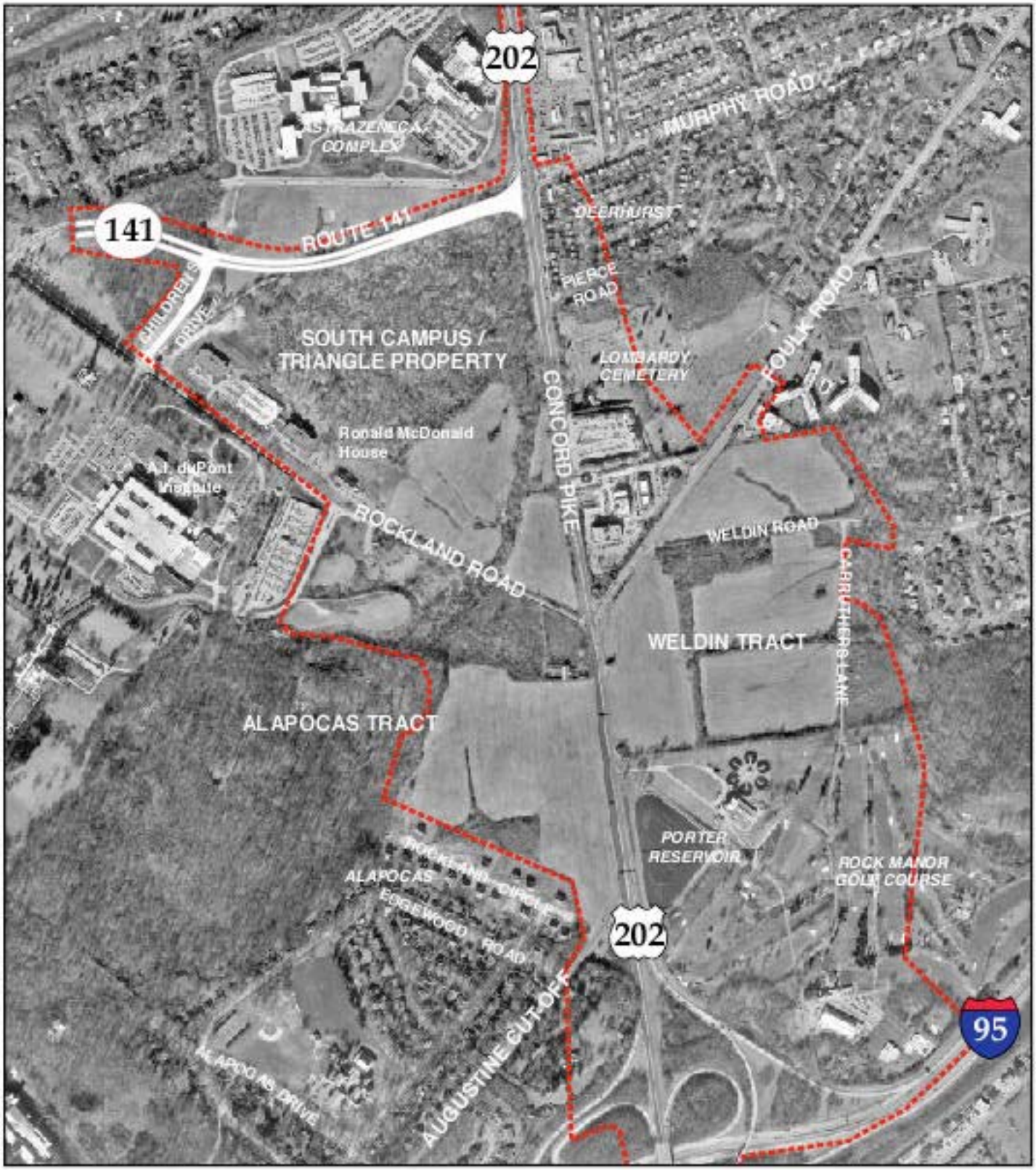

PHOTO 1: PROJECT AREA

Source: 1995 Keystone Aerial Survey, Inc.

N

0 500 1000

feet

Area of Potential Effect

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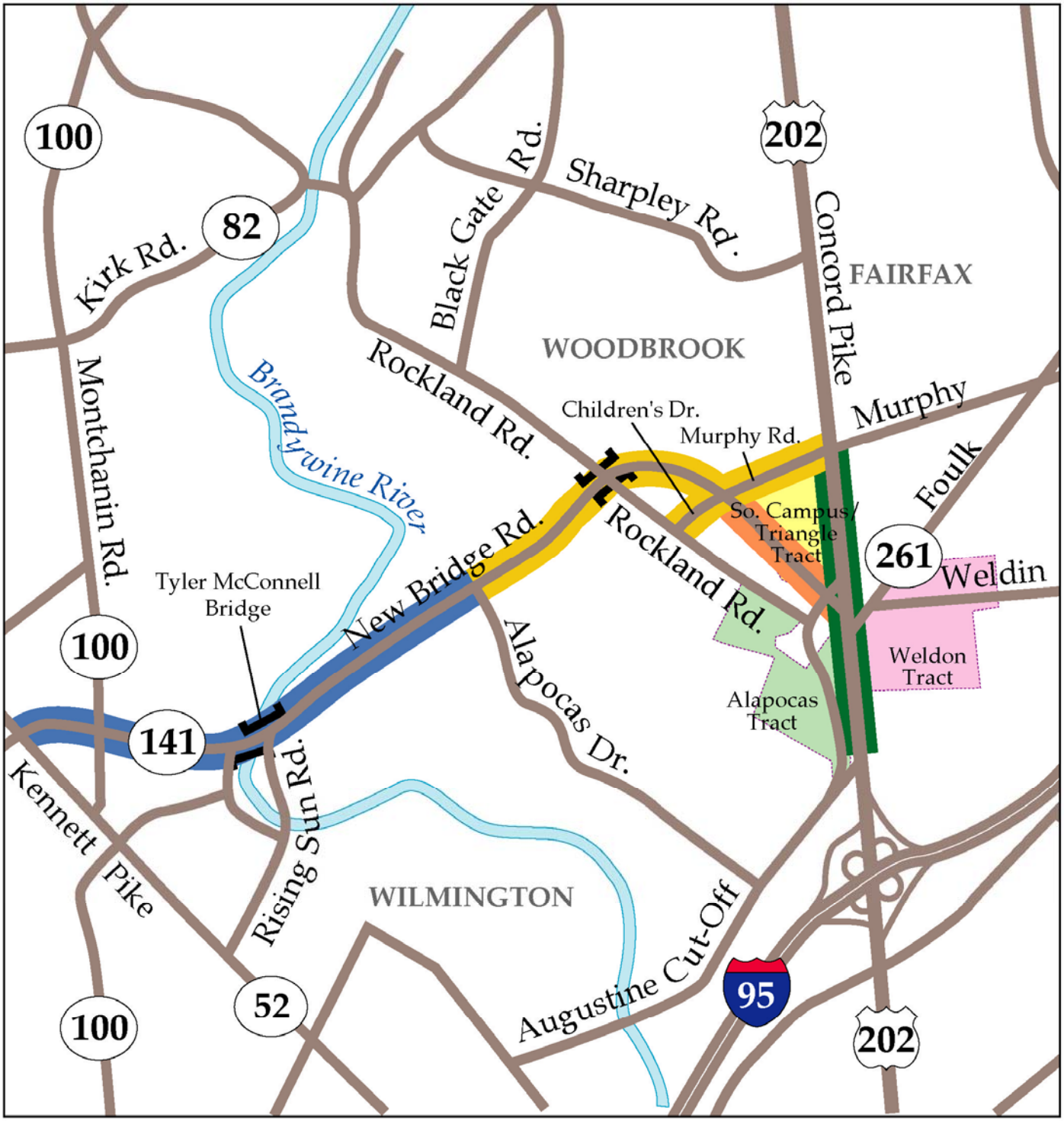

FIGURE 2: COMPONENTS OF PREVIOUSLY PROPOSED ROUTE 141 IMPROVEMENT PROJECT

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Not to Scale

- US-202 Safety Improvement (Completed)
- Powder Mill Road Widening / Rockland Road Bridge (Completed)
- Route 141 Relocation (Not Completed)
- Delaware Route 141 Improvements and Tyler-McConnell Bridge (Not Completed)

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alignment shift of Delaware Route 141 between Rockland Road and U.S. Route 202; and improved intersections with Childrens Drive, the pharmaceutical company Zeneca's entrance, and U.S. Route 202.

- *U.S. Route 202 Safety Improvement Project*. Completed in 2000, this project consisted of improvements from Augustine Cut-Off to Delaware Route 141. The alignment of U.S. Route 202 was shifted and realigned slightly to eliminate many minor curves. Additional capacity was added at the Foulk Road and Delaware Route 141 intersections, and a southbound transit "diamond" lane was added between those two intersections.

Appendix A of this EA shows a comparison of impacts to natural and cultural resources from the previously approved Alternative D1 (the "Spaghetti Plan") and the Blue Ball Properties Area Transportation Improvements Master Plan Alternative.

B. Recent Project History

In 1999, the England-based drug company Zeneca merged with the Sweden-based drug company Astra, to form the fifth largest pharmaceutical company in the world. Because of the economic development benefits represented by such a large corporate expansion, the Delaware Economic Development Office (DEDO) offered several incentives to attract the expansion to Delaware. A competition between Delaware and Pennsylvania to host the North American headquarters and the 5,000 new high tech jobs it would bring, was won by the State of Delaware. The selection of the Delaware location was based on infrastructural improvement commitments made by the Delaware State Government. These commitments were:

- To create an attractive location ("home") for the company;
- For Delaware Department of Transportation (DelDOT) to address the existing traffic, safety and capacity problems to the area; and
- Provide significant open space/recreational facilities for the area and the state as a whole.

The proposed AstraZeneca expansion would include an additional 2,000,000 square feet of office and research and development facilities (beyond the 1,000,000 square feet currently located at Delaware Route 141 and U.S. 202). As part of the agreement, the state was to provide adequate transportation improvements, and acquire the two tracts of land known as the Alapocas tract and the Weldin tract, to develop for open space and recreation ***(Figure 3)***.

The master planning process undertaken to develop and evaluate transportation and recreational improvements for this area was a coordinated effort between the Delaware Department of Transportation (DelDOT), DEDO, the Department of Natural Resources and Environmental Control (DNREC), New Castle County and other public officials and civic leaders. DEDO was designated as the lead state agency and provided the overall project management. DelDOT focused on transportation improvements, DNREC focused on park and recreation improvements and DEDO and New Castle County focused on the proposed expansion of the AstraZeneca site.

Several committees were established to assist in planning and project development. They were: the Transportation Committee, chaired by Gene Abbott of DelDOT; the Recreation & Historic

FIGURE 3: BLUE BALL PROPERTIES MASTER PLAN

N

Not to Scale

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Preservation Committee, chaired by Mark Chura of DNREC; a Policy Committee consisting of local elected officials; and an Executive Committee consisting of cabinet level and other appointed officials, Governor Thomas R. Carper, and New Castle County Executive Thomas P. Gordon. The committees and public involvement process is described in more detail in ***Section VI. Coordination/Community Involvement***.

The Transportation and Recreation & Historic Preservation Committees consisted of representatives of local citizen organizations and the general interested public from the surrounding area, as well as local elected officials.

The Transportation Committee's goals were to:

- Emphasize roadway aesthetics;
- Minimize impact on residential roads, and to protect adjacent neighborhoods;
- Address monitoring / mitigation as a result of impacts;
- Minimize open space "takings" for roads;
- Improve and coordinate traffic flow on U.S. Route 202;
- Address Delaware Route 141 road capacity at Brandywine Crossing.

The Transportation Committee also helped to identify transportation improvement options and make recommendations to the Policy and Executive Committees. The Preferred Transportation Improvement Concept was also presented to the Governor of Delaware, Thomas R. Carper, and New Castle County Executive Thomas P. Gordon, for their review and comment.

The Recreation & Historic Preservation Committee's goals were to:

- Maximize open space;
- Preserve open space for passive recreation;
- Connect greenway system across both sides of U.S. Route 202;
- Restore historic structures;
- Reuse the Blue Ball Barn for a restaurant, clubhouse or other purpose;
- Identify origins and destinations for pedestrians and bicycles;
- Consider enlargements of the Porter Reservoir;
- Develop recreation design standards for the area.

Based on the joint recommendations of the Transportation Committee and the Recreation & Historic Preservation Committee, the following performance measures or criteria were developed for transportation improvements options:

Traffic

- "No degradation" of current Level of Service (explained in more detail in ***Section I.D. Purpose and Need***).

- Wherever possible, separate local from regional traffic.

Land Use

- Minimize the consumption of land for roadways.
- Maximize land available for park use.
- Maximize land within the triangle for AstraZeneca's use to increase planning flexibility and to keep heights.

Environmental Impacts

- Minimize impacts on cultural resources, natural resources and aesthetics.
- Minimize impacts on historic structures and sites.
- Minimize filling of wetlands and need for mitigation, which consumes valuable parkland that may be put to use.

Access

- Provide efficient access to the A. I. DuPont Hospital, particularly for emergency vehicles.

Community Impacts

- Minimize traffic impacts on residential streets and neighborhoods.
- Minimize impacts on the local street system; separate regional traffic from local traffic.
- Widening Rockland, Weldin, Foulk, or Murphy Roads or the Augustine Cut-Off (or increasing traffic volumes) is not desirable from the standpoint of the users located on these roads.

Implementation

- Minimize disruption to existing travel routes during construction.
- Minimize time required for implementation.

Relative Cost

- All other factors being equal, lower costs are favored.

Once the transportation project needs (summarized in ***Section I. D: Project Purpose and Need)*** and project performance criteria were established, the existing land use features and cultural and natural resources in the project area were identified and considered in the development of the transportation improvement options. Major features include: the Nemours Historic District, the Blue Ball Barn, the William Murphy House, the Bird-Husbands House, and the Weldin-Husbands House; as well as wetlands and waters associated with Alapocas Run and Matson Run. Additionally, potential impacts to the communities adjacent to the project area, the Alapocas and Deerhurst residential areas, were considered. The development of concepts were then initiated in consideration of three main components: project needs, project performance criteria and minimization of environmental impacts to cultural, natural and community resources.

Subsequently, during the fall and winter of 1999, transportation improvement options were developed by the project team, with significant input from the public through the Transportation Committee, the Recreation & Historic Preservation Committee, the legislative town meetings (monthly public meetings held by the local legislature to discuss issues that effect the Brandywine Hundred area), and a public open house forum. During the early Master Planning stage, the project team presented some initial roadway concepts that met the goal criteria of the project, and the public made comments and added further concepts for consideration. The number of options to consider grew substantially during this stage, as new concepts were added. After the initial screening of options, many were dismissed from further consideration because they did not meet the project needs or project performance criteria or had unacceptable impacts on the environment or surrounding community. The concepts that were retained were further refined through engineering and environmental analysis and public input. Ultimately, a preferred transportation concept was recommended and carried forward for formal project development, engineering, and environmental studies.

By the end of December 1999, several options for the transportation improvement concept presented at the weekly committee meeting were being considered by the Transportation Committee and the Project Team because they satisfied the established project criteria. The resulting recommendations of the committees were passed on to the Policy Committee and Executive Committees in January 2000. On March 3, 2000, Governor Carper and County Executive Gordon approved the proposed transportation concept for further evaluation and development by DelDOT. This was announced to the public in a newspaper article on March 4, 2000 in the News Journal.

C. Project Area Conditions

U.S. Route 202 and Delaware Route 141 connect Wilmington and I-95 with the dense commercial and residential areas of the Brandywine Hundred. The study area for this project extends from Broom Street (just south of the U.S. Route 202/I-95 Interchange) north to the existing AstraZeneca entrance north of Delaware Route 141, and from the new Rockland Road bridge on Delaware Route 141 east to the Murphy Road/Wilson Road/Foulk Road intersection.

The highway system within the project area includes one interstate route, two principal arterials, and two minor arterials, as well as several local roads. I-95 mainly serves Wilmington area traffic, as most traffic traveling from Pennsylvania to points south of Wilmington would utilize Interstate 495. U.S. Route 202 (Concord Pike) is a north-south six lane principle arterial, which connects Wilmington to Brandywine Hundred and Chester County, Pennsylvania.

U.S. Route 202 includes an interchange with I-95 and major study area intersections with Delaware Route 141, Foulk Road, Route 261 and Augustine Cut-Off. Delaware Route 141 (Powder Mill Road) is a four-lane principal arterial which forms a loop around the west side of Wilmington. Only the section traversing the Brandywine River on the Tyler McConnell Bridge (west of the project area) is a two-lane section. Foulk Road is a four-lane minor arterial in the project area, connecting U.S. Route 202 to points in northeastern Delaware. Augustine Cut-Off is a two-lane minor arterial, which connects U.S. Route 202 to points in northwest Wilmington. Murphy Road is a four-lane major collector which includes many local residential access points.

Other important collector and local roads in the project area include Rockland Road, Weldin Road and Alapocas Drive.

Existing land use can be classified as primarily suburban and includes everything from natural woodlands and parks along the Brandywine Creek Valley to the institutional facilities of A.I. DuPont Hospital and the Ronald McDonald House. Historic Structures or archaeological features are present throughout the project area. ***Figure 27*** of this EA (page 117) illustrates the location of these cultural resources. More detail discussing these cultural resources can be seen in ***Section V:B*** (page 115) and in the draft Section 106 Case report as a supplemental aid.

Wetlands and waterways as regulated under the ACOE have been identified in the project area. More detailed information and characteristics of wetlands and waterways are discussed in ***Section V:J*** (page 157) of this report and in ***Appendix B***.

There is current office development in the area. Specifically, the proposed expansion to the AstraZeneca facility will present a change in land use from a mix of forest/rangeland to a corporate campus headquarters. There are also many residential communities within and surrounding the immediate project area.

There are three (3) parcels of open land in the project area that have been included in proposed future development of the area. They are: the AstraZeneca Triangle parcel, located south of existing Delaware Route 141; the Alapocas Tract, located south of Rockland Road; and the Weldin Tract, located south of Foulk Road ***(Figure 4 and Photo 2)***. Due to proposed future land use development in the area, the AstraZeneca Triangle parcel will be privately developed by the AstraZeneca Pharmaceutical Company. In conjunction with the Blue Ball Area Transportation project and the Master Planning process, the Alapocas and Weldin Tracts will be preserved for active and passive recreational facilities, stormwater management and wetland enhancement and mitigation. ***Page 13 depicts project area Photos 3 and 4***.

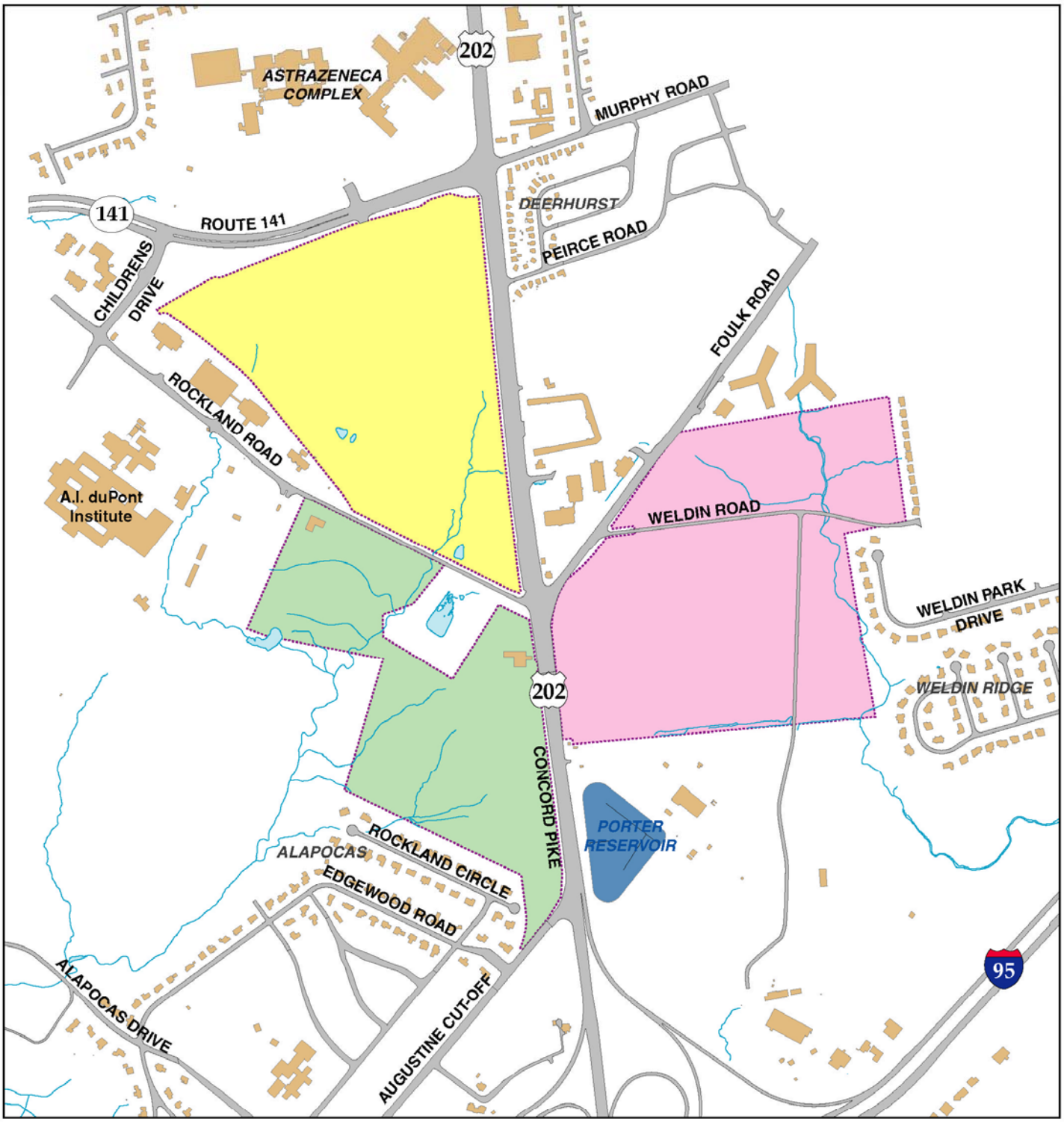

FIGURE 4: PARCELS OF PROPOSED IMPROVEMENTS

South Campus / Triangle Property

Alapocas Tract

Weldon Tract

N

0 1000

feet

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PHOTO 2: PROJECT AREA

Date of Photograph: March 14, 1994

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Blue Ball Properties

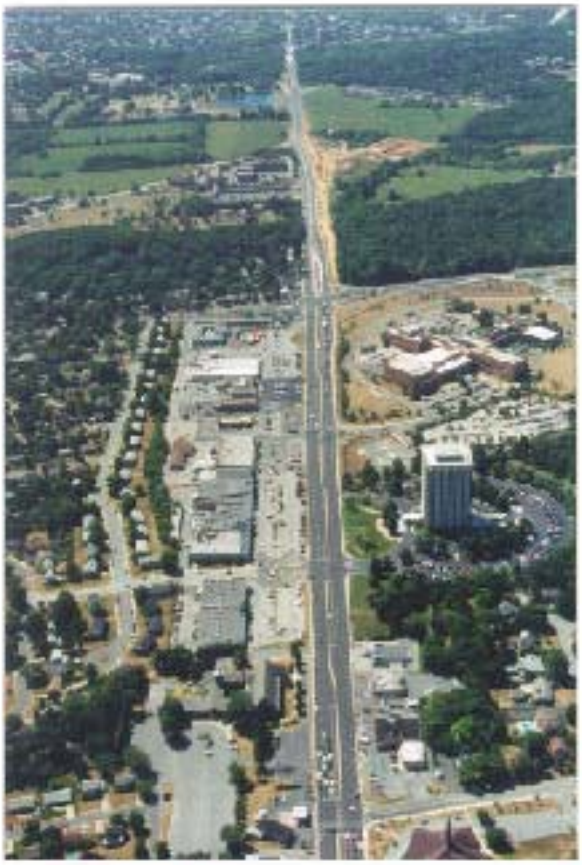

PHOTO 3: U.S. 202 looking South, including the AstraZeneca campus, Porter Reservoir, Route 141, Murphy Road, Foulk Road, Rockland Road and the Augustine Cut-Off.

PHOTO 4: U.S. 202 (looking east) including Porter Reservoir, Rockland Road, Foulk Road, Augustine Cut-Off and the I-95 on-ramp.

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D. Project Purpose and Need

The principal project needs for this study are traffic congestion relief and traffic safety. These are the primary problems that are present on the existing roadway system, and both problems would be expected to worsen in the future, without transportation improvements in the area. Secondary project needs are based on the comprehensive planning and economic development goals for the area. This includes the development of open space and recreation facilities in the area as well as the AstraZeneca campus expansion to support the recommended Master Plan.

1. Definition of "No Degradation"

Due to the existing congestion problems in the study area, and the public's opposition to the extensive systems-type interchange (Alternative D1) proposed in the early 1990s, a "no degradation" approach to traffic capacity was developed. This means that no degradation from existing levels of service (LOS) would occur in the design year 2010. The Department of Transportation and Coordinating Committee of this project have defined the "no degradation" criteria as follows:

- At each major study area intersection, projected average intersection delays in 2010 would be no worse than 1999 existing average intersection delays.
- 1999 existing conditions would consider the roadway network prior to improvements made as part of the U.S. Route 202 Safety Project.
- 2010 was selected as the design year, based on the full build-out schedule and projected employment of AstraZeneca.
- 2010 projected traffic volumes would include traffic generated by AstraZeneca, the proposed duPont employment and facilities expansion, background growth and the widening of the Tyler McConnell Bridge.
- Only intersections currently operating at level of service F would be subject to the "no degradation" criteria. Other intersections would be subject to standard level of service standards for a highly developed urban area (assumed to be level of service E, based on existing levels of congestion at several study area intersections).

Average intersection delays were determined by using the methods of the *1997 Highway Capacity Manual*, the nationwide standard for such analyses. Due to the unique development, traffic, and public involvement aspects of this project, average overall intersection delays were used with respect to level of service and "no degradation" criteria; DelDOT's volume-to-capacity ratio policy, which is specific to Delaware, was not utilized.

2. Traffic Congestion

There are several methods for quantifying traffic congestion; the one chosen for this study is based on the *1997 Highway Capacity Manual*. This nationally recognized standard for traffic operations analyses takes into consideration peak-hour turning movement volumes, peak-hour factors, heavy vehicle percentages, roadway geometry, vehicle arrival patterns, and signal phasings and timings. At signalized intersections, the results of the analysis include volume-to-

capacity ratios, average delays, and levels of service for lanes, approaches, and the intersection as a whole. ***Table I-1*** shows level of service definitions based on delay. Peak hour turning movement counts were conducted at study area intersections in 1999 and 2000. Based on these counts, DelDOT's regional traffic model, AstraZeneca's traffic impact study (TIS), and an origin-destination (O-D) study conducted in 1999, design year 2010 traffic projections were developed.

The 1999 existing and projected 2010 No-Build delays and levels of service at key study area intersections are shown in ***Table I-2***. As seen in ***Table I-2***, all three major intersections on U.S. Route 202 operate at level of service F in the 1999 existing scenario (prior to the safety improvement project). It is to these three intersections currently operating at level of service F in 1999 that the "no degradation" criteria principally applies. Particularly poor operations are found at the U.S. Route 202/Foulk Road/Rockland Road intersection, where delays range from 179 to 225 seconds per vehicle during peak hours. Field observations have confirmed the poor operating conditions at this intersection: peak-hour queue lengths typically extend in the southbound direction to, and sometimes through, the Augustine Cut-Off intersection and I-95 ramp area, while northbound queues typically extend through the Independence Mall intersection. Westbound Foulk Road traffic frequently backs-up beyond the Weldin Road intersection.

The congestion problems indicated at the intersections, however, are not isolated to those intersections. In addition to vehicle queues extending toward and through nearby intersections, drivers attempt to avoid the congested conditions by taking alternate routes. Often these alternate routes may be through residential communities, with roadways and environments not designed for heavy non-local traffic. Many local residents have noted this "cut-through" traffic as a problem in their neighborhoods.

Should no transportation improvements beyond the U.S. Route 202 Safety Improvement Project be undertaken, given the current development plans in the area, by 2010 traffic operations are projected to deteriorate substantially. Average peak hour intersection delays at the intersections of U.S. Route 202/Delaware Route 141/Murphy Road, U.S. Route 202/Augustine Cut-Off, and Delaware Route 141/Childrens Drive are expected to triple, while average intersection delays at the worst intersection in the study area, U.S. Route 202/Foulk Road/Rockland Road, would be expected to double. The "cut-through" traffic problem in local residential neighborhoods would likely get worse as well.

3. Traffic Safety

State-reportable accident data for the three-year period of July 1996 through June 1999 was examined for major study area roadways. ***Table I-3*** shows the number of reported accidents that occurred on each major study area roadway within that time period. Because far more accidents occurred on U.S. Route 202 than on all of the other routes combined, and many of the accidents on other routes occurred at or near their intersection with U.S. Route 202, U.S. Route 202 intersections and mid-block accidents were the primary focus of this study.

TABLE I-1
Level of Service Criteria for Signalized Intersections

Level of Service	Average Delay (seconds/vehicle)	Description
A	<= 10	This LOS occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	> 10 and <= 20	This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.
C	> 20 and <= 35	These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
D	> 35 and <= 55	At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	> 55 and <= 80	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.
F	> 80	This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may be major contributing causes to such delay levels.

SOURCE: *1997 Highway Capacity Manual*, page 9-7 and Table 9-1.

Table I-4 shows U.S. Route 202 intersection and mid-block accidents for the time period being examined. Although the number of accidents that occurred on most sections of U.S. Route 202 examined is high, many of the roadway safety problems from just north of Augustine Cut-Off through Delaware Route 141 are being addressed as part of the U.S. Route 202 Safety

Improvement Project. Therefore, the primary high accident location that has yet to be addressed is the intersection of U.S. Route 202 and Augustine Cut-Off. Further details on the accidents that occurred during the time period examined are shown in ***Table I-5***.

TABLE I-2
Average Intersection Delays and Level of Service

Intersection	*1999 Existing Conditions*				*2010 No-Build Conditions*			
	Morning Peak Hour		*Afternoon Peak Hour*		*Morning Peak Hour*		*Afternoon Peak Hour*	
	Delay (sec/ veh)	*LOS*	*Delay (sec/ veh)*	*LOS*	*Delay (sec/ veh)*	*LOS*	*Delay (sec/ veh)*	*LOS*
U.S. Route 202 & Delaware Route 141 & Murphy Road	105	F	93	F	347	F	344	F
U.S. Route 202 & Foulk Road & Rockland Road	225	F	179	F	404	F	482	F
U.S. Route 202 & Augustine Cut-Off	70	E	92	F	188	F	301	F
Delaware Route 141 & Childrens Drive	34	C	37	D	92	F	106	F

TABLE I-3
Study Area Accidents

Study Area Roadway	Number of Reported Accidents (7/96-6/99)
U.S. Route 202	854
Delaware Route 141 & Murphy Road	79
Foulk Road	76
Rockland Road	13
Augustine Cut-Off	15
Weldin Road	5
Broom Street	17

TABLE I-4
U.S. Route 202 Accident Summary (7/96-6/99)

U.S. Route 202 at . . .	Number of Reported Accidents	Injury Type Accidents	Property Damage Only Type Accidents
Delaware Route 141/Murphy Road Intersection	180	49	131
Between Delaware Route 141/Murphy Road and Foulk Road/Rockland Road	126	32	94
Foulk Road/Rockland Road Intersection	243	51	192
Between Foulk Road/Rockland Road and Augustine Cut-Off	155	54	101
Augustine Cut-Off Intersection	165	49	116
I-95 Ramp Area	25	6	19
Broom Street Intersection	48	20	28

TABLE I-5:
U.S. Route 202 & Augustine Cut-Off Intersection Reported Accident Summary

			Direction		
	Total	*Percentage*	*U.S. Route 202 NB*	*U.S. Route 202 SB*	*Augustine Cut-Off EB*
Number of Accidents	165	100	12	140	13
Injury Type	49	30	3	43	3
Property Damage Only Type	116	70	9	97	10
Collision Type:					
Head On	2	1	0	2	0
Rear End	120	73	5	110	5
Side Swipe	3	2	1	2	0
Angle	33	20	5	24	4
Other	7	4	1	2	4

4. Project Purpose Statement

In summary, the purpose of the Blue Ball Properties Area Transportation Improvement Project is to:

- Decrease vehicular congestion within the study area, by:
  - Meeting the "No Degradation" level of service criteria at all applicable study area intersections, and
  - Meeting standard level of service criteria for highly developed urban areas at other major study area intersections.
- Improve the transportation safety within the study area.
- Provide adequate transportation facilities to support the planned study area economic and recreational development.
- Encourage non-single occupancy vehicle trips by significantly improving transit in the region and developing transportation demand management strategies.
- Utilize Intelligent Transportation Management System strategies to optimize traffic flow within the study area.