

3.0 Existing Conditions

3.1 Site Characteristics

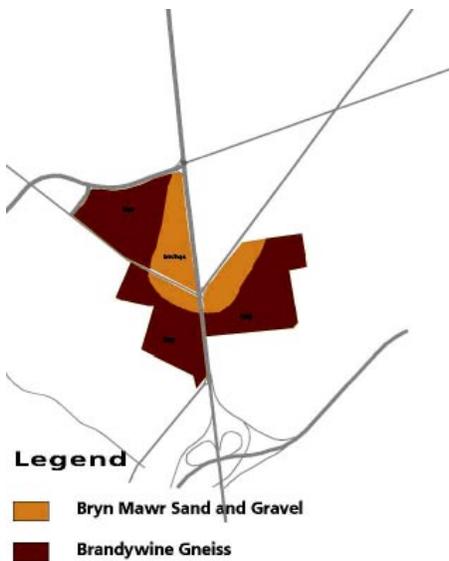
The team developed an understanding of the characteristics of the properties through field examination and analyses, a focused geotechnical-testing program, computer modeling of the watershed and transportation patterns, and review of existing studies and reports. The salient characteristics of the properties as they relate to master planning are summarized below.

3.1.1 Geology

The Blue Ball properties lie in the Piedmont physiographic province of Delaware – a transition zone between the Appalachian province to the northwest and the Coastal Plain province to the south. The Piedmont province is an eroded and dissected area of uplands developed on metamorphic crystalline bedrock. The site itself is underlain by Precambrian rock of the Wilmington Complex (predominantly gneiss) with a patchy veneer of Tertiary conglomerates of the Bryn Mawr formation. Both gneiss and conglomerate rocks crop out at the surface of the site.

The majority of the site consists of Brandywine Gneiss, which is characterized as variable with typical depths to bedrock of up to approximately 20 feet. This was confirmed by geotechnical testing which encountered gneiss in many locations at considerably less than 20 feet deep. The very hard and dense rock has irregular fractures with large boulders ranging in size from 1 to 10 feet in diameter. This rock necessitates specialized excavation techniques and foundation engineering for structures.

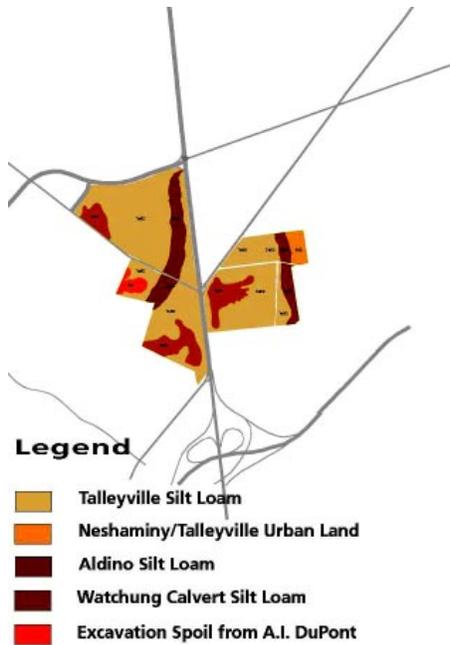
Bryn Mawr Sand and Gravel are located at the higher elevations of the site in a band parallel to and south of Rockland Road and Foulk Road. These sands and gravels are poorly sorted and erratically distributed in this portion of the site. They typically overlay the gneiss at depths of up to 5 or 10 feet.



Existing Conditions- Geology



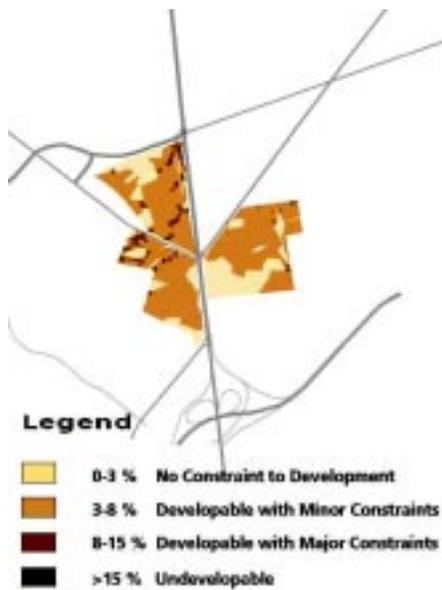
3.1.2 Soils



Existing Conditons- Soils

Soils in the site generally fall into either the Neshaminy-Aldino-Watchung or Neshaminy-Talleyville-Urban Associations. The majority of the site is covered by Talleyville Silt Loam which tends to be deep and well drained, presenting few limitations to development. Aldino Silt Loam covers areas to the east and west of Route 202. It is less well drained with seasonal wetness and shallow depth to bedrock. The Alapocas and Matson Run stream corridors are characterized by Watchung Calvert Silt Loam which is poorly drained with high water tables. An area containing excavation spoil from the construction of the A.I. DuPont Institute occupies a large area on the west of the site, adjacent to the Institute's property.

3.1.3 Slopes



Existing Conditons- Slopes

Route 202 is located on the ridgeline separating the east and west portions of the Blue Ball properties. The Weldin parcel is characterized by gentle slopes of less than 10% falling to the east and southeast toward Matson Run. These slopes do not present a constraint to development except near the stream corridor.

The Alapocas parcel on the west consists of farm fields sloping, typically less than 8 %, west and south toward Alapocas Creek. Steeper slopes of over 15 % are located adjacent to the stream corridor. The greatest slopes in the site are west of the stream. The land rises dramatically at over 15 % to meet the A.I. DuPont Institute parking lot. The steepest slopes are those around the Institute's construction spoil site. This feature was created by constructing a dike and filling its interior with rock and soil excavated during hospital site preparation.

The fall of the land from the ridgeline of Route 202 provides sweeping views to both sides of the park from traffic southbound on the road. Northbound



traffic on 202 progresses uphill and thus has less commanding views into the property. Major landmarks visible from the road include the hedgerows on the east and the Blue Ball Barn and woods on the west, both set in agricultural fields.

3.1.4 Vegetation



Existing Conditions- Vegetation

The majority of the site, on both sides of Route 202, is characterized by agricultural fields. In the Weldin parcel there are also hedgerows originally planted to protect fields from wind. They consist of trees and shrubs. The hedgerows are approximately 1,400 feet long and 100 feet wide in the north/south direction and 1,100 feet long by 50 feet wide in the east/west direction. While the hedgerows are generally diverse, offering wildlife habitat, the greatest diversity exists in the north where they mingle with the woods surrounding the Weldin Plantation ruins.

The eastern portion of the Weldin parcel contains woodlands that grade from shrubs and modest secondary growth to more mature trees on the extreme east, including numbers of large oaks, beech and yellow poplar. Wetland vegetation characterizes the Matson Run stream corridor with sweet gums, maples and ash trees in evidence.

Approximately half the Alapocas parcel is covered by agricultural fields. A small scrub shrub and young woodland area is located on its south border adjacent to the Alapocas residential developments. Woodlands predominate from the eastern side of the Alapocas stream corridor to the west of the parcel. Wetland species characterize the stream corridor itself with upland species in a small stand east of the stream and the majority of the west side. A three to four acre area of mown lawn is located next to the A.I. DuPont Institute parking lot.

3.1.5 Wildlife Habitat

As described in the preceding section, the property consists of a mix of open fields bordered by mostly younger aged forests or wooded hedgerows. The forested areas buffer perennial streams (Matson Run and Alapocas Creek) and associated narrow bands of wetlands. Thus from the standpoint of habitat structure, there are three (3) major categories present: 1) the closed-canopy forests and their associated understory and tree boles, 2) the open



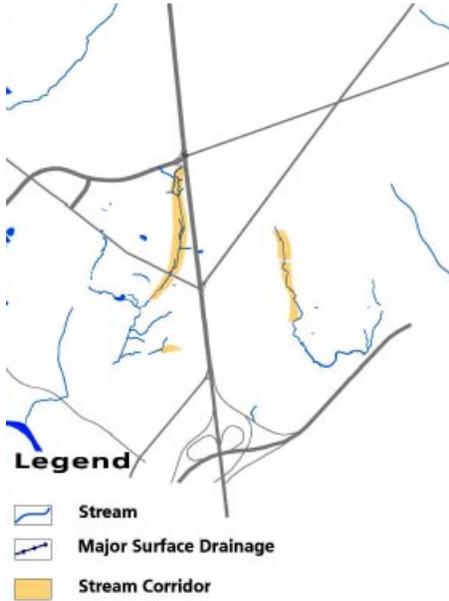
agricultural fields, and 3) the edges (ecotones) formed by the juxtaposition of these. Note that hedgerows are structurally equivalent to field forest edge, differing only in that the trees/shrubs within them have edges on two sides rather than the single side found at the edge of a forest. The forested and emergent wetlands, and the perennial streams represent other relatively minor, but significant landscape elements.

Actual field observations of the site's wildlife made during early Spring (April) 2000 were combined with an evaluation of the suitability of the site's vegetative associations for various types of wildlife. The results are presented in the *Natural Resources Investigation* prepared for the project by Environmental Consultants, Inc. (May 2000). Because project timing required field sampling to be completed prior to the breeding season for most birds, direct observation of bird species' use of the tract was limited to year-round residents (e.g., woodpeckers, Carolina chickadee) and did not include migratory species. Habitat usage by these latter species was inferred using known species-habitat associations.

Overall, the fragmented nature of the site's vegetative community provides habitat for species most commonly associated with forest/field edges (e.g., eastern cottontail, white-tail deer, raccoon, song sparrow, mockingbird, red-tailed hawk) and small woodlots (e.g., Carolina chickadee, downy woodpecker). Species requiring larger tracts of unbroken forest such as Neotropical migrant forest warblers, vireos, and thrushes are probably limited in number on the site proper, but likely are regular breeders in the mature forest west of Alapocas Creek on the adjacent A. I. DuPont property.

3.1.6 Hydrology

The site consists of two major drainage areas, one east and one west of Route 202. The Weldin parcel on the east drains through overland flow and a series of swales to Matson Run along its eastern border. Matson Run is one of the three subwatersheds of the Shellpot Creek watershed, which drains an area of approximately 5,300 acres. Most of that area, as well as the watershed of Matson Run, was developed prior to the State of Delaware's institution of stormwater management for new development. Consequently, the Matson Run watershed is subject to increased storm flows due to high coverage by impervious surfaces. Additionally, significant disturbance to the natural stream system (including relocation, channelization and lining, flood-



Existing Conditions- Hydrology

plain/riparian buffer encroachment) has occurred. The combination of increased flows and stream disturbance has caused the system to exceed its natural capacity resulting in flooding, erosion and other flood-related problems.

The Alapocas parcel drainage is carried by Alapocas Creek which flows to the Brandywine. Stormwater flows from the agricultural fields by sheet flow and along a number of swales to the Creek. The Alapocas Run itself shows signs of severe erosion caused by upstream conditions similar to those described for Matson Run above. A temporary detention basin designed to accommodate Route 202 runoff is located to the southwest of the intersection of Route 202 and Rockland Road.

3.1.7 Wetlands

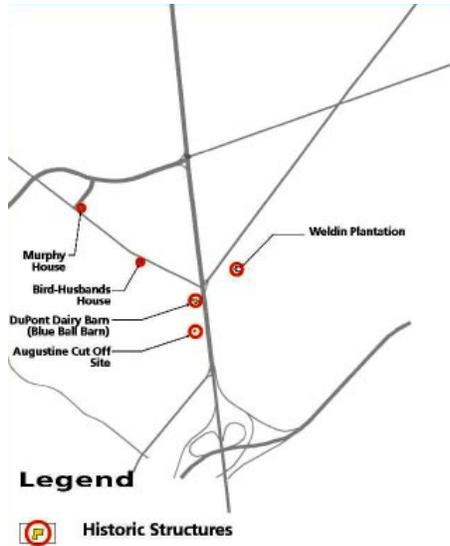


Existing Conditions- Wetlands

Wetlands have been mapped along the length of Matson Run in the Weldin parcel, along the southern border of the parcel adjacent to the Alapocas residential developments, along the Alapocas stream corridor itself and at the base of the construction spoil fill area located on the western border of the parcel.



3.1.8 Historic Structures



Existing Conditions- Historic Structures

A complete documentation of the cultural resources on the Blue Ball properties was conducted for the Master Plan and has been published in a separate document as noted in the Introduction. The most visible among the extant historic resources associated with the site are the Bird-Husbands House, DuPont Dairy Barn, Weldin Plantation site, and the William Murphy House.

The Bird-Husbands House is located in the western portion of the Alapocas parcel, approximately 100' south of Rockland Road. It is listed as a contributing cultural resource in the Nemours National Register Historic District. It is a small vernacular-style, wood frame farmhouse originally constructed between 1808 and 1816 and is representative of nineteenth century vernacular farmhouse design.

The DuPont Dairy Barn, often called the Blue Ball Dairy Barn, is located to the southwest of the intersection of Route 202 and Rockland Road. The building is listed as a contributing resource to the Nemours National Register Historic District. The barn is a large, stone wall/stucco coated building constructed in 1914 as part of the A.I. DuPont estate. It is an example of the American Country House Movement and reflects the changing agricultural practices of the time.

The Weldin Plantation site is located in the Weldin parcel approximately 400 feet east of the intersection of Foulk and Weldin Roads. The site consists of the stone foundations of at least five structures, only some of whose uses have been determined. It was likely constructed in the latter part of the 18th century.

An historic archaeological site (7NC-B-49/N-13717) identified as the Augustine Cut-Off site is located west of Route 202, approximately 500 feet north of the Augustine Cut-Off intersection with Route 202. The site consists of brick-lined cistern dating from the late nineteenth to early twentieth centuries.

The William Murphy House is located outside the Blue Ball properties at the intersection of Rockland Road and Children's Drive. It is listed as a contributing historic resource in the Nemours Historic District. It was purchased by Henry DuPont in 1882, who later passed the land on to his son, William.



3.2 Transportation Characteristics

The US Route 202 and Delaware Route 141 corridors in the Blue Ball area north of Wilmington have experienced 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 problems that would likely result from new development.

A variety of large-scale solutions to transportation congestion and safety concerns have been studied in the last 15 years. In the last six years two significant local projects were approved:

Delaware Route 141, Rockland Road to US Route 202

This project, completed in 1997, included the grade-separation of the Delaware Route 141/Rockland Road intersection; an alignment shift of Delaware Route 141 between Rockland Road and US Route 202; and improved intersections with Childrens Drive, the AstraZeneca entrance, and US Route 202.

US Route 202 Safety Improvement Project

From Augustine Cut-Off to Delaware Route 141, the alignment of US Route 202 was shifted slightly to eliminate many minor curves. Additional capacity was added at the Foulk Road and Delaware Route 141 intersections. A southbound transit "diamond" lane was added between those two intersections.

3.2.1 Travel Patterns

US Route 202 is a heavily traveled roadway with an Annual Average Daily Traffic (AADT) volume of 68,000 vehicles per day (vpd) between Augustine Cut-Off and Foulk Road. North of Delaware Route 141, the AADT drops to 50,000 vpd. The other regional roadways within the area have the following AADTs: Foulk Road, 18,000 vpd; Delaware Route 141, 19,000 vpd; Murphy Road, 23,000 vpd; and Augustine Cut-Off, 11,000 vpd. Local connector roads within the area carry significantly less traffic, such as Rockland Road (3,000 vpd), and Weldin Road (5,000 vpd). All AADT values are based on DelDOT's 1999 *Traffic Summary* publication.

Although the above referenced AADT values show a degree of roadway



usage, they do not indicate congestion levels. To determine the operational effectiveness of a transportation system, peak hour traffic volumes are collected and analyzed with respect to available roadway capacity (which is mainly related to the number of lanes, intersection signalization, and other physical roadway characteristics). To obtain the necessary data for this analysis, peak hour turning movement counts were conducted for the Blue Ball Properties project at over fifty intersections and ramps in the study area. This data can be found in the *AstraZeneca Traffic Impact Study*. The delay, level of service, and capacity analyses conducted (based on those counts) are discussed further in the following section.

To better understand the travel patterns throughout the study area and region, and to assist in the calibration of DelDOT's regional traffic model (used to forecast future traffic volumes), an Origin-Destination Study was performed in August, 1999. This study resulted in a detailed view of traffic patterns through the area (i.e., how much traffic entering the study area on southbound US Route 202 traveled to Delaware Route 141, or I-95, or Murphy Road, etc.), as well as a regional view of the origins and destinations of drivers. Additional information was gathered on trip purposes, trip frequency, etc. Complete details of this study are included in the *Blue Ball Development Project Origin-Destination Study*, one of the supplemental reports prepared for the Master Plan.

The Origin-Destination Study revealed the following travel patterns:

- 76 percent of the study area traffic has both origins and destinations in the State of Delaware.
- 18 percent has one or both trip ends in Pennsylvania.
- 54 percent of the trips were made while commuting to work.
- 46 percent of the trips were made five or more times a week.
- 76 percent of the vehicles surveyed contained only one person.

3 .2.2 Traffic Congestion

Even with the improvements to Routes 141 and 202 noted above, congestion will remain an issue. Congestion is measured by level of service, as defined by the *1997 Highway Capacity Manual*, the nationally recognized standard for traffic analysis. These definitions are presented in the *Level of Service Criteria for Signalized Intersections* table.



Level of Service Criteria for Signalized Intersections

Level of Service	Average Delay (seconds/vehicle)	Description
A	≤ 10	This level of service 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.

The *Average Intersection Delays and Level of Service* table documents existing and projected congestion at key area intersections. Projected congestion assumes no further traffic improvements beyond the two cited above. Should no transportation improvements beyond the US Route 202 Safety 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 US Route 202/Delaware Route 141/ Murphy Road, US Route 202/Augustine Cut-Off, and Delaware Route 141/ Childrens Drive are expected to triple. Average intersection delays at US 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.



Average Intersection Delays and Level of Service

Intersection	1999 Existing Conditions				2010 No-Build			
	Morning		Afternoon		Morning		Afternoon	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
US Route 202 & Delaware Route 141 & Murphy Road	105	F	93	F	347	F	344	F
US Route 202 & Foulk Road & Rockland Road	225	F	179	F	404	F	482	F
US 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
Childrens Drive & Rockland Road	31	C	42	D	52	D	50	D

3.2.3 Traffic Safety

Traffic safety is the other motivation to address the traffic system in the area. State-reportable accident data for the three-year period of July 1996 through June 1999 are presented in the *Study Area Accidents* table. Because far more accidents occurred on US 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 US Route 202) US Rou

Study Area Accidents

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



Within the Route 202 corridor, the primary high accident location (not addressed by the Route 202 safety improvements) is the intersection of Route 202 and the Augustine Cut-Off. Details of the accident history at this location are presented in the *US Route 202 and Augustine Cut-Off Intersection Accident Summary* table below.

US Route 202 and Augustine Cut-Off Intersection Accident Summary

	Directions				
	Total	Percentage	US Route 202 NB	US 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

3.2.4 Transit

Currently four Delaware Transit Corporation (DTC) bus routes serve the Blue Ball area with a daily ridership of 1,934 trips. The four routes include:

- Route 2 (Concord Pike), service from the downtown (Wilmington) area to the Brandywine Town Center starting at the downtown Amtrak station and traveling via Wilmington Hospital, Fairfax, Talleyville, and Concord Pike shopping centers.
- Route 21 (Foulk Road), service from the downtown area to the Park-and-Ride at the First Union Bank on Naamans Road starting at the downtown Amtrak station and traveling via Foulk Road. A proposed DTC service change for the Fiscal Year 2001 would modify this route to serve the new AstraZeneca campus as well.



- Route 28, (A.I. DuPont Institute/Nemours Clinic), service from the downtown area to the AstraZeneca campus, the DuPont Experimental Stations, the A.I. DuPont Institute, and the Nemours Clinic starting at the downtown Amtrak station and traveling via Concord Pike and Powder Mill Road.
- Route 35 (Concord Pike/Shipleigh Road), service from the downtown area to Brandywine Town Center starting at the downtown Amtrak station, but looping over to Shipleigh Road and serving a wider variety of locations at the outer end of the Route (e.g., Dartmouth Woods, Cigna/First Union).

One existing Park-and-Ride lot is located within the study area, at the Aldersgate United Methodist Church (shared use lot) on US Route 202. Just east of the study area, another shared use Park-and-Ride lot is located at the Concord Presbyterian Church on Foulk Road.

There is currently no access to rail service within the Blue Ball area.

3.2.5 Pedestrian and Bicycle Facilities

Pedestrian and bicycle facilities are available in scattered locations around the properties. Sidewalks are currently provided at the following locations:

- US Route 202, from Broom Street to Augustine Cut-Off on the west side of the roadway.
- US Route 202, from Foulk Road to Murphy Road on the east side of the roadway.
- US Route 202, from Delaware Route 141 to the northern study area limits on the west side of the roadway.
- Murphy Road, from US Route 202 to the eastern study area limits, continuously on the south side of the roadway, and sporadically on the north side of the roadway.
- Delaware Route 141, from Children's Drive to the Woodbrook development on the north of the roadway.
- Childrens Drive, from Delaware Route 141 to Rockland Road on the west side of the roadway.

Pedestrian crosswalks are currently provided at the following signalized intersections:



- US Route 202 & Independence Mall Driveway
- US Route 202 & Delaware Route 141/Murphy Road
- US Route 202 & AstraZeneca Driveway
- Delaware Route 141 & AstraZeneca Driveway
- Delaware Route 141 & Childrens Drive

A bicycle path is currently provided along the south side of Delaware Route 141 from US Route 202 west. Beginning at US Route 202, the path is immediately south of Delaware Route 141 until it diverges onto the alignment of Old Murphy Road west of the AstraZeneca entrance. It follows this alignment to the intersection of Childrens Drive and Rockland Road. The path then continues west on Rockland Road and up the embankment back to Delaware Route 141, where it continues west.