



STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION

800 BAY ROAD
P.O. Box 778
DOVER, DELAWARE 19903

CAROLANN WICKS, P.E.
SECRETARY

October 19, 2009

Mr. David Culver
General Manager
New Castle County Department of Land Use
87 Reads Way
New Castle, DE 19720

Dear Mr. Culver:

The attached Traffic Impact Study (TIS) review letter for the **Greenville Center** development has been completed under the responsible charge of a registered professional engineer whose firm is authorized to work in the State of Delaware. They have found the TIS to conform to DeIDOT's Rules and Regulations for Subdivision Streets and other accepted practices and procedures for such studies. DeIDOT accepts this TIS review and concurs with the recommendations. We are providing it to you in fulfillment of our joint agreement regarding the review of TIS. If you have any questions concerning this letter or the attached review letter, please contact me at (302) 760-2134.

Sincerely,

A handwritten signature in blue ink, appearing to be "Todd Sammons".

Todd Sammons
Project Engineer

TS:km

Enclosures

cc with enclosures: Ms. Constance C. Holland, Office of State Planning Coordination
Mr. Tigist Zegeye, WILMAPCO
Mr. Carol Ohm, Apex Engineering, Inc.
Mr. George Haggerty, New Castle County Department of Land Use
Mr. John Janowski, New Castle County Department of Land Use
Mr. Andrew Parker, McCormick Taylor
Mr. Mir Wahed, Johnson, Mirmiran, and Thompson

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Pao Lin, Subdivision Manager, Development Coordination
Richard Woodhall, Subdivision Manager, Development Coordination
Troy Brestel, Project Engineer, Development Coordination

October 19, 2009

Mr. Todd J. Sammons
Project Engineer
DelDOT Division of Planning
P.O. Box 778
Dover, DE 19903

RE: Agreement No. 1404
Traffic Impact Study Services
Task No. 42A – Greenville Center

Dear Mr. Sammons,

McCormick Taylor has completed its review of the Traffic Impact Study (TIS) for the Greenville Center development (expansion) prepared by Apex Engineering, Inc. (Apex), dated May 22, 2009. This review was assigned as Task Number 42A. Apex prepared the report in a manner generally consistent with DelDOT's *Rules and Regulations for Subdivision Streets*.

The TIS evaluates the impacts of the proposed expansion of the Greenville Center development, located on the east side of Delaware Route 52 (Kennett Pike / New Castle Road 9) and the north side of Buck Road (New Castle Road 265), within Christiana Hundred in New Castle County, Delaware. The proposed expansion would add 22,235 square feet of retail space and 27 luxury condominium units, and would eliminate 4,064 square feet of office space. Including the existing development plus the proposed expansion, the completed Greenville Center would consist of 94,703 square feet of retail space, 58,805 square feet of office space, 3,451 square feet of medical office space, and 27 luxury condominium units on approximately 10.5 acres of land. There are two existing access points for the Greenville Center development; one on Delaware Route 52 and one on Buck Road. They will remain as the only access points. Construction is anticipated to be complete by 2012.

The land is currently zoned as CR (Commercial Regional) in New Castle County. The developer does not propose to change the zoning.

DelDOT currently does not have any relevant projects within the study area. However, since the development is located within the Brandywine Valley Scenic Byway area, DelDOT's policy, as part of the strategies to manage the byway, is to avoid widening Delaware Route 52 and Montchanin Road (Delaware Route 100 / New Castle Road 225) if possible.

Based on our review, we have the following comments and recommendations:

The proposed development meets the New Castle County Level of Service (LOS) Standards as stated in Section 40.11.210 of the Unified Development Code (UDC). The stop-controlled minor street approach at the following intersection does not meet the DelDOT level of service criteria without the implementation of physical roadway and/or traffic control improvements.

<i>Intersection</i>	<i>Existing Traffic Control</i>	<i>Situations for which deficiencies occur</i>
Delaware Route 52 and Greenville Crossing Shopping Center (North Egress)	Unsignalized	2008 Existing AM and PM; 2012 AM and PM without Greenville Center expansion; 2012 AM and PM with Greenville Center expansion

The unsignalized T-intersection of Delaware Route 52 and Greenville Crossing Shopping Center (North Egress) exhibits LOS deficiencies under existing and future conditions. However, we do not recommend additional improvements be implemented by the developer at this intersection. While improvements could be made to improve traffic operations at this location, such as widening the median of Delaware Route 52 to allow left turns exiting the shopping center to be completed as a two-stage movement (with drivers stopping in the median if necessary), the impacts would be significant and a two-stage exit could potentially be less safe than the existing design. Additionally, the traffic volume exiting Greenville Crossing at this location would not increase due to the Greenville Center expansion, and motorists leaving Greenville Crossing also have the option of exiting via the south access, which is a signalized intersection across from Hillside Road (New Castle Road 264).

Should the County choose to approve the proposed development, the following items should be incorporated into the site design and reflected on the record plan. All applicable agreements (i.e. letter agreements for off-site improvements and traffic signal agreements) should be executed prior to entrance plan approval for the proposed development.

1. The developer should improve the intersection of Buck Road and the Site Entrance. The proposed configuration is shown in the table below.

Approach	Current Configuration	Proposed Configuration
Southbound Site Entrance	One shared left/right-turn lane	One 12' left-turn lane and one 12' right-turn lane*
Eastbound Buck Road	One left-turn lane and one through lane	One left-turn lane and one through lane
Westbound Buck Road	One shared through/right-turn lane	One through lane and one right-turn lane

* The northern leg of this intersection should also include a 15' receiving lane for traffic entering the site, separated from southbound traffic leaving the site by a mountable median.

These improvements must meet all DelDOT and AASHTO entrance design standards, including adequate radius of the entrance curblines for the appropriate design vehicle that would enter and exit the site. Based on evidence of tire scuff marks on curbs at this site entrance, the existing geometry is inadequate for vehicles entering and exiting this development.

Initial recommended minimum turn-lane lengths (excluding tapers) of the separate turn lanes are listed below. The developer should coordinate with DelDOT’s Subdivision Section to determine final turn-lane lengths.

Approach	Left-Turn Lane	Right-Turn Lane
Southbound Site Entrance	25 feet*	25 feet*
Eastbound Buck Road	185 feet**	N/A
Westbound Buck Road	N/A	100 feet***

- * turn-lane length based on storage length per queuing analysis, with 25-foot minimum
- ** turn-lane length based on deceleration + storage length per DelDOT’s *Standards and Regulations for Subdivision Streets and State Highway Access*, but length is limited by the existing upstream left-turn lane along westbound Buck Road at the intersection of Delaware Route 52. These are back-to-back left-turn lanes and queuing analyses indicate that the current lengths should be maintained.
- *** turn-lane length based on deceleration + storage length per DelDOT’s *Standards and Regulations for Subdivision Streets and State Highway Access*

2. The developer should enter into a traffic signal agreement with DelDOT for the intersection of Buck Road and the Site Entrance. The agreement should include pedestrian signals, crosswalks and interconnection at DelDOT’s discretion, and the developer will be required to perform a signal warrant analysis for eight-hour volume (Warrant 1), four-hour volume (Warrant 2), peak hour volume (Warrant 3), pedestrian volume (Warrant 4), and crash experience (Warrant 7).
3. To the extent that it is legally permissible, physically feasible, and financially viable, the adjoining property owner reasonably cooperates, and there are no other constraints, the developer should make a good faith attempt to establish a cross access easement for a roadway connection between the Greenville Center development and the Greenville Crossing Shopping Center immediately to the north. At a minimum, the developer should identify a location on the Greenville Center property where this easement can be established and protected even if it is not possible to complete the connection under current conditions or constraints.
4. The following bicycle, pedestrian, and transit improvements should be included:
 - a. A right-turn yield to bikes sign (MUTCD R4-4) should be added at the start of the right-turn lane added to Buck Road.
 - b. Where the right-turn lane is added to Buck Road, a minimum of a five-foot bicycle lane should be dedicated and striped with appropriate markings for bicyclists through the turn lane in order to facilitate safe and unimpeded bicycle travel.
 - c. Appropriate bicycle symbols, directional arrows, striping (including stop bars), and signing should be included along bicycle facilities and right-turn lanes within the project limits.

- d. Utility covers should be moved outside of the designated bicycle lane or be flush with the pavement.
- e. Covered bike parking should be included near the entrances of all commercial establishments and office buildings to be included within this development.
- f. Sidewalks along the Delaware Route 52 and Buck Road site frontages should be upgraded as needed to ensure they are ADA compliant.
- g. Along Buck Road, the existing sidewalk should be extended down to the reconfigured site entrance.
- h. ADA compliant curb ramps and crosswalks should be provided at all pedestrian crossings, including all site entrances. Type 3 curb ramps are discouraged.
- i. Internal sidewalks for pedestrian safety and to promote walking as a viable transportation alternative should be constructed within the development. These internal sidewalks should connect the building entrances to the frontage sidewalks and to adjacent parcels where applicable.
- j. Where internal sidewalks are located alongside of parking spaces, a buffer should be added to eliminate vehicular overhang onto the sidewalk.
- k. The developer should install an ADA accessible 5' x 3' concrete pad at the existing bus stop along the Delaware Route 52 site frontage at the northern end of the site. The pad should have a maximum slope of 2% for water drainage. It should be connected to the existing frontage sidewalk and internal sidewalks. The Parking facilities for bicyclists should be included. The developer should coordinate with the Delaware Transit Corporation regarding the details and implementation of the transit-related improvements.

Improvements in this TIS may be considered “significant” under DelDOT’s *Work Zone Safety and Mobility Procedures and Guidelines*. These guidelines are available on DelDOT’s website at http://www.deldot.gov/information/pubs_forms/manuals/de_mutcd/index.shtml. For any additional information regarding the work zone impact and mitigation procedures during construction please contact Mr. Adam Weiser of DelDOT’s Traffic Section. Mr. Weiser can be reached at (302) 659-4073 or by email at Adam.Weiser@state.de.us.

Please note that this review generally focuses on capacity and level of service issues; additional safety and operational issues will be further addressed through DeDOT's subdivision review process.

Additional details on our review of this TIS are attached. Please contact me at (302) 738-0203 or through e-mail at ajparker@mtmail.biz if you have any questions concerning this review.

Sincerely,

McCormick Taylor, Inc.



Andrew J. Parker, P.E., PTOE
Project Manager

Enclosure

General Information

Report date: May 22, 2009

Prepared by: Apex Engineering, Inc.

Prepared for: Greenville Center Associates

Tax parcel: 07-026.00-094

Generally consistent with DelDOT's Rules and Regulations for Subdivision Streets: Yes

Project Description and Background

Description: The proposed expansion of the existing Greenville Center development would add 22,235 square feet of retail space and 27 luxury condominium units, and would eliminate 4,064 square feet of office space.

Location: The Greenville Center development is located on the east side of Delaware Route 52 (Kennett Pike / New Castle Road 9) and the north side of Buck Road (New Castle Road 265), within Christiana Hundred in New Castle County, Delaware. A site location map is included on Page 7.

Amount of land to be developed: approximately 10.5 acres of land

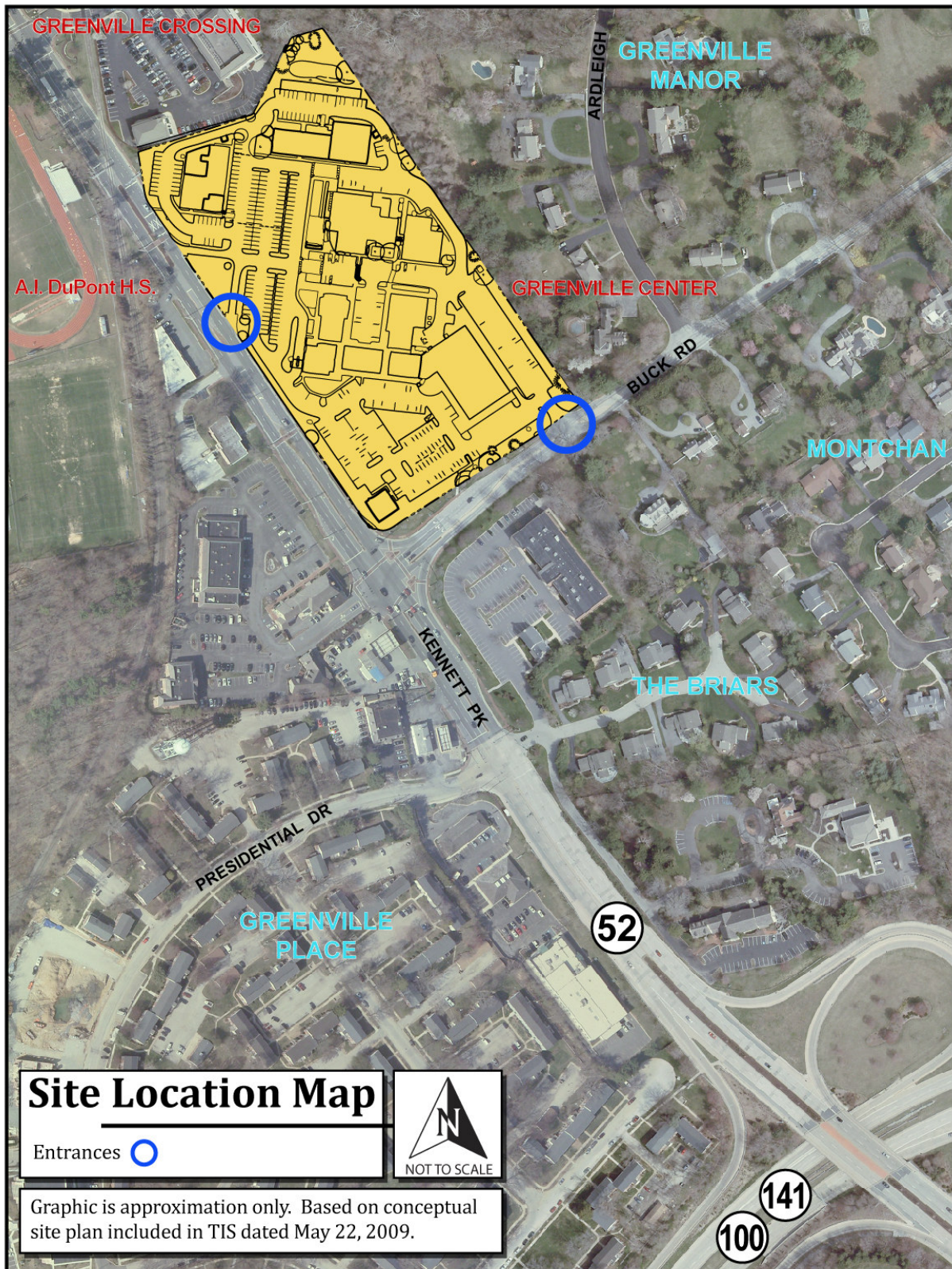
Land use approval(s) needed: Subdivision approval. The land is currently zoned as CR (Commercial Regional) within New Castle County, and the developer does not propose to change the zoning.

Proposed completion date: 2012

Proposed access locations: There are two existing access points for the Greenville Center development; one on Delaware Route 52 and one on Buck Road. They will remain as the only access points.

Daily Traffic Volumes:

- 2008 Average Annual Daily Traffic on Delaware Route 52: 17,461 vpd
- 2008 Average Annual Daily Traffic on Buck Road: 2,968 vpd



Livable Delaware

(Source: Delaware Strategies for State Policies and Spending, July 2004)

Location with respect to the Strategies for State Policies and Spending Map of Delaware:
The Greenville Center development (expansion) is located within Investment Level 1.

Investment Level 1

These areas are often municipalities or urban/urbanizing places where density is generally higher than in surrounding areas. Areas classified as Investment Level 1 are population centers built around a traditional central business district, which offers a wide range of opportunities for employment, shopping and recreation. Investment Level 1 Areas are considered to drive Delaware's economy and therefore reinvestment and redevelopment are encouraged.

In Investment Level 1 Areas, state investments and policies should support and encourage a wide range of uses and densities, promote other transportation options, foster efficient use of existing public and private investments, and enhance community identity and integrity. Typical transportation projects included new or expanded facilities and services for all modes of transportation, including public transportation facilities and services. Projects will also include those that manage traffic flow and congestion, support economic development and redevelopment efforts, and encourage connections between communities and the use of local streets for local trips.

Proposed Development's Compatibility with Livable Delaware:

The proposed Greenville Center development (expansion) falls within Investment Level 1 and is to be developed with commercial and residential sites, relatively consistent with the character of the existing Greenville Center and other developments in this area. According to Livable Delaware, reinvestment and redevelopment within these areas is encouraged, and higher densities are typical in these areas. As such, this development appears to be generally consistent with the 2004 update of the Livable Delaware "Strategies for State Policies and Spending."

Comprehensive Plan

New Castle County Comprehensive Plan: The proposed Greenville Center development (expansion) is located in an area with future land use designated as Community Redevelopment, which calls for a mix of housing types, densities, and businesses that fit well into the surrounding community.

Additionally, the parcel is currently zoned CR (Commercial Regional), and the developer does not plan to rezone the parcel. According to Section 40.02.225 of the New Castle County Unified Development Code (UDC), characteristics of CR zoning include:

- This district is intended to provide for community and regional commercial services. Its character is suburban transition.
- Design controls are intended to promote circulation by foot and automobile within contiguous commercial or office areas. These design features are intended to lessen

congestion on roads and create large commercial complexes rather than development strips.

- Mixed uses are permitted to provide residential customers within the development. Transit facilities are also required.
- The new areas to be zoned for this use should be large and deep. Small shallow frontages shall not be designated for this type of use.

Proposed Development's Compatibility with Comprehensive Plan: The proposed expansion of the Greenville Center development would add retail space and condominiums, and the entire property would remain zoned as CR (Commercial Regional). The proposed land use is compatible with CR zoning as long as certain criteria are met, such as inclusion of transit facilities. There are some community concerns regarding the existing site entrance configurations, the associated traffic flow/circulation issues, and the height of the proposed condominium building, but the proposed development is an expansion of the existing development and it would fit relatively well into the surrounding area. As such, the proposed development appears to be generally compatible with the New Castle County Comprehensive Plan.

Transportation Analysis Zones (TAZ)

Transportation Analysis Zones (TAZ) where development would be located: 76

TAZ Boundaries:



Current employment estimate for TAZ: 560 jobs in 2005

Future employment estimate for TAZ: 657 jobs in 2030

Current population estimate for TAZ: 706 people in 2005

Future population estimate for TAZ: 802 people in 2030

Current household estimate for TAZ: 256 houses in 2005

Future household estimate for TAZ: 309 houses in 2030

Relevant committed developments in TAZ: None

Would the addition of committed developments to current estimates exceed future projections: No

Would the addition of committed developments and the proposed development to current estimates exceed future projections: Unknown (possibly for employment)

Relevant Projects in the DelDOT Capital Transportation Program (FY 2009 – FY 2014)

DelDOT currently does not have any relevant projects within the study area. However, since the development is located within the Brandywine Valley Scenic Byway area, DelDOT's policy, as part of the strategies to manage the byway, is to avoid widening Delaware Route 52 and Montchanin Road (Delaware Route 100 / New Castle Road 225) if possible.

Trip Generation

Trip generation for the proposed development was computed using comparable land uses and equations contained in Trip Generation, Seventh Edition, published by the Institute of Transportation Engineers (ITE). The following land use was utilized to estimate the amount of new traffic generated for this development:

- + 22,253 square-foot shopping center (ITE Land Use Code 820)
- - 4,064 square-foot office space (ITE Land Use Code 710)
- + 27 units of luxury condos (ITE Land Use Code 233*)

* Note: ITE does not provide Saturday peak hour or any ADT data for Land Use Code 233, so Land Use Code 232 (high-rise condo) was used for the Saturday peak hour trips and ADT trips.

Table 1
THE GREENVILLE CENTER TRIP GENERATION
(additional volumes from expansion only)

Land Use	AM Peak Hour			PM Peak Hour			Saturday Mid-day		
	In	Out	Total	In	Out	Total	In	Out	Total
+ 22,235 square feet of retail	14	9	23	47	51	98	69	64	133
- 4,064 square feet of office	-6	0	-6	0	-4	-4	-1	-1	-2
+ 27 units of luxury condos	3	12	15	9	6	15	4	5	9
Pass-by Trips	-	-	-	11	13	24	26	23	49
TOTAL TRIPS	11	21	32	45	40	85	46	45	91

Table 2
THE GREENVILLE CENTER DAILY TRIP GENERATION
(additional volumes from expansion only)

Land Use	Weekday ADT			Saturday ADT		
	In	Out	Total	In	Out	Total
+ 22,235 square feet of retail	1278	1278	2556	1792	1792	3584
- 4,064 square feet of office	-57	-57	-114	-14	-14	-28
+ 27 units of luxury condos	163	163	326	152	152	304
TOTAL TRIPS	1384	1384	2768	1930	1930	3860

Overview of TIS

Intersections examined:

- 1) Buck Road & Site Entrance
- 2) Delaware Route 52 & Site Entrance
- 3) Buck Road & Ardleigh Drive
- 4) Buck Road & Greenock Drive
- 5) Buck Road & Montchanin Road
- 6) Delaware Route 52 & Buck Road / Powder Mill Square Shopping Center
- 7) Delaware Route 52 & Hillside Road (New Castle Road 264) / Greenville Crossing Shopping Center (South Entrance)
- 8) Delaware Route 52 & Greenville Crossing Shopping Center (Middle Entrance)
- 9) Delaware Route 52 & Greenville Crossing Shopping Center (North Egress)
- 10) Hillside Road & A.I. DuPont High School (East Entrance)
- 11) Hillside Road & A.I. DuPont High School (Middle Entrance)
- 12) Delaware Route 52 & Briars Lane / Presidential Drive
- 13) Delaware Route 52 & Delaware Route 141

Conditions examined:

- 1) 2008 existing conditions (Case 1)
- 2) 2012 without Greenville Center (Case 2)
- 3) 2012 with Greenville Center (Case 3)

Peak hours evaluated: Weekday morning and evening, and Saturday mid-day peak hours

Committed developments considered:

- 1) A.I. Dupont High School (addition of 4 classrooms and a 7,689 square foot auditorium – COMPLETED PRIOR TO TRAFFIC COUNTS)
- 2) Greenville Place Apartments (234 apartments (111 unoccupied))

Intersection Descriptions

- 1) **Buck Road & Site Entrance**
Type of Control: two-way stop-controlled (T-intersection)
Southbound approach: (Site Entrance) one shared left/right-turn lane, stop-controlled
Eastbound approach: (Buck Road) one left-turn lane and one through lane
Westbound approach: (Buck Road) one shared through/right-turn lane

- 2) **Delaware Route 52 & Site Entrance**
Type of Control: two-way stop-controlled
Northbound approach: (Delaware Route 52) one left-turn lane, one exclusive through lane and one shared through/right-turn lane
Southbound approach: (Delaware Route 52) one exclusive through lane and one shared through/right-turn lane
Eastbound approach: (Business Entrance) one shared left/right-turn lane, stop-controlled
Westbound approach: (Site Entrance) one right-turn-only lane, stop-controlled

- 3) **Buck Road & Ardleigh Drive**
Type of Control: two-way stop-controlled (T-intersection)
Southbound approach: (Ardleigh Drive) one shared left/right-turn lane, stop-controlled
Eastbound approach: (Buck Road) one left-turn lane and one through lane
Westbound approach: (Buck Road) one shared through/right-turn lane

- 4) **Buck Road & Greenock Drive**
Type of Control: two-way stop-controlled (T-intersection)
Northbound approach: (Greenock Drive) one shared left/right-turn lane, stop-controlled
Eastbound approach: (Buck Road) one shared through/right-turn lane
Westbound approach: (Buck Road) one shared through/left-turn lane

- 5) **Buck Road & Montchanin Road**
Type of Control: signalized four-leg intersection
Northbound approach: (Montchanin Road) one shared left/through/right-turn lane
Southbound approach: (Montchanin Road) one shared left/through/right-turn lane
Eastbound approach: (Buck Road) one shared left/through/right-turn lane
Westbound approach: (Buck Road) one shared left/through/right-turn lane

- 6) **Delaware Route 52 & Buck Road / Powder Mill Square Shopping Center**
Type of Control: signalized four-leg intersection
Northbound approach: (Delaware Route 52) one left-turn lane, two through lanes and one right-turn lane
Southbound approach: (Delaware Route 52) one left-turn lane, two through lanes and one right-turn lane
Eastbound approach: (Powder Mill Shopping Center) one shared through/left-turn lane and one right-turn lane

- Westbound approach:** (Buck Road) one exclusive left-turn lane, one shared through/left-turn lane and one right-turn lane
- 7) **Delaware Route 52 & Hillside Road / Greenville Crossing Shopping Center (South Entrance)**
Type of Control: signalized four-leg intersection
Northbound approach: (Delaware Route 52) one left-turn lane, two through lanes and one right-turn lane
Southbound approach: (Delaware Route 52) one left-turn lane, one through lane and one right-turn lane
Eastbound approach: (Hillside Road) one shared through/left-turn lane and one right-turn lane
Westbound approach: (Greenville Crossing Shopping Center) one shared through/left-turn lane and one right-turn lane
- 8) **Delaware Route 52 & Greenville Crossing Shopping Center (Middle Entrance)**
Type of Control: unsignalized T-intersection, with shopping center driveway a one-way ingress
Northbound approach: (Delaware Route 52) one exclusive through lane and one shared through/right-turn lane
Southbound approach: (Delaware Route 52) one left-turn lane and one through lane
- 9) **Delaware Route 52 & Greenville Crossing Shopping Center (North Egress)**
Type of Control: unsignalized T-intersection, with shopping center driveway a one-way egress
Northbound approach: (Delaware Route 52) one through lane
Southbound approach: (Delaware Route 52) one through lane
Westbound approach: (Greenville Crossing Shopping Center) one left-turn lane and one right-turn lane, stop-controlled
- 10) **Hillside Road & A.I. DuPont High School (East Entrance)**
Type of Control: two-way stop-controlled (T-intersection)
Northbound approach: (A.I. DuPont High School Entrance) one shared left/right-turn lane, stop-controlled
Eastbound approach: (Hillside Road) one shared through/right-turn lane
Westbound approach: (Hillside Road) one shared through/left-turn lane
Note: Approximately 70 feet east of this intersection is another T-intersection with a street called Squirrel Run, which is a very low-volume street serving just seven houses. Because the volume is so low and the intersection is offset instead of lining up directly across from the high school entrance, the Squirrel Run intersection was not analyzed by the TIS or McCormick Taylor.

- 10) **Hillside Road & A.I. DuPont High School (Middle Entrance)**
Type of Control: two-way stop-controlled (T-intersection)
Northbound approach: (A.I. DuPont High School Entrance) one shared left/right-turn lane, stop-controlled
Eastbound approach: (Hillside Road) one shared through/right-turn lane
Westbound approach: (Hillside Road) one shared through/left-turn lane
- 11) **Delaware Route 52 & Briars Lane / Presidential Drive**
Type of Control: signalized four-way intersection
Northbound approach: (Delaware Route 52) one left-turn lane, two through lanes and one right-turn lane
Southbound approach: (Delaware Route 52) one left-turn lane, two through lanes and one right-turn lane
Eastbound approach: (Presidential Drive) one shared through/left-turn lane and one right-turn lane
Westbound approach: (Briars Lane) one shared left/through/right-turn lane
- 12) **Delaware Route 52 & Delaware Route 141**
Type of Control: Interchange
Northbound approach: (Delaware Route 52) two through lanes and a weave section including the deceleration lane for a ramp to westbound Delaware Route 141. There is no ramp to eastbound Delaware Route 141.
Southbound approach: (Delaware Route 52) two through lanes and a ramp to westbound Delaware Route 141. There is no ramp to eastbound Delaware Route 141.
Eastbound approach: (Delaware Route 141) two through lanes, a ramp to southbound Delaware Route 52 and a ramp to northbound Delaware Route 52
Westbound approach: (Delaware Route 141) two through lanes and a ramp to northbound Delaware Route 52. There is no ramp to southbound Delaware Route 52.

Transit, Pedestrian, and Bicycle Facilities

Existing transit service: The Delaware Transit Corporation (DTC) currently operates one bus route near the Greenville Center development. Bus Route 10 travels along Delaware Route 52 directly in front of the site, making 13 round trips each weekday. There is no Saturday service. There are signed bus stops along Delaware Route 52 near the site, included at least one directly along the site frontage (at the northern end of the site).

Planned transit service: McCormick Taylor contacted Mr. Ivan Mitchell, a Service Development Planner for the DTC, via email on June 10, 2009 to determine whether DTC has any plans to extend the existing transit system in the vicinity of the development. Mr. Mitchell replied and indicated there are no planned changes to the existing transit service in this area. He also stated that comments in his April 25, 2008 letter to Stephen Davies of Apex Engineering were still valid. In that letter, he described two transit-related improvements that should be included if the expansion of this development moves forward, consisting of the following:

- DTC requests that the developer install a 5' x 3' concrete pad at the existing bus stop location with a maximum slope for water drainage of 1:50 (2%). The pad should connect to the existing 5' frontage sidewalk on Delaware Route 52.
- DTC requests handicap ramps between the Delaware Route 52 access connect to the frontage sidewalk, and internal sidewalk connections with the existing frontage sidewalk.

Existing bicycle and pedestrian facilities: According to the *New Castle County Bicycle Map*, Delaware Route 52 north of Buck Road and Delaware Route 141 east of Delaware Route 52 are each designated as having above average cycling conditions. Hillside Road is designated as having average cycling conditions. Buck Road, Montchanin Road, Delaware Route 52 south of Buck Road, and Delaware Route 141 west of Delaware Route 52 are each designated as having below average cycling conditions. Delaware Route 52 and Delaware Route 141 each have high traffic volumes (greater than 10,000 ADT). There are currently sidewalks in place along both sides of Delaware Route 52.

Planned bicycle and pedestrian facilities: DelDOT's Bicycle and Pedestrian Facilities Team indicated, in a letter from Anthony Agilo and Jennifer Baldwin dated June 22, 2009, that the following bicycle and pedestrian facilities should be required. In the letter, Mr. Aglio commented that Livable Delaware's updated State Strategies for Spending Map indicates the site is located in an Investment Level 1 area, where transportation options should be diverse and include public transportation, walking and bicycling. The following should be incorporated into the project to facilitate bicycle and pedestrian transportation:

- a. ADA compliant sidewalks with five-foot buffer should be included along all property frontage.
- b. Connections to internal sidewalk network and frontage sidewalk should be included.
- c. Marked crosswalks and ADA compliant pedestrian facilities should be included at the intersection of Delaware Route 52 and Buck Road.
- d. Bicycle facilities should be included through all right turn lanes.
- e. Non-motorized connections, such as pedestrian paths/trails, should be pursued to surrounding development to reduce vehicular traffic.
- f. The developer of this project should contact DART regarding the addition of transit service and transit facilities at this location. The internal sidewalks should be connected to this stop and include parking facilities for bicyclists.

Mr. Aglio also indicated the development is located on an existing Statewide Bicycle Route (Delaware Route 52), as well as a major transit route.

Previous Comments

All comments from DelDOT's Scoping Letter, Traffic Count Review, and Preliminary TIS Review, and Revised Preliminary TIS Review were addressed in the Final TIS submission.

General HCS Analysis Comments

(see table footnotes on the following pages for specific comments)

- 1) For future conditions at the existing intersections, the TIS often assumed a peak hour factor (PHF) of either existing PHF or 0.92, even when the lane group volume did not increase from existing to future. In cases where the lane group volume increased from existing to future, McCormick Taylor assumed a PHF of either existing PHF or 0.88, whichever was greater. However, for cases where the lane group volume did not change from existing to future conditions, McCormick Taylor assumed a future PHF equal to existing PHF.
- 2) For future conditions at existing intersections, the TIS assumed heavy vehicle factors (HV) to be the same as existing HV and assumed no minimum HV. In cases where increases in volumes were projected, McCormick Taylor's analysis assumed a future HV of either existing HV or 2%, whichever was greater.
- 3) The HCS analyses included in the TIS did not always reflect the lane widths observed in the field by McCormick Taylor. McCormick Taylor's HCS analyses incorporated the field-measured lane widths.
- 4) The TIS and McCormick Taylor used different cycle lengths and/or signal timing parameters when analyzing the signalized intersections in some cases.
- 5) The TIS included percent grade in their analysis. McCormick Taylor could not confirm the percent grade and did not take it into consideration.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹ Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day ³	Weekday AM	Weekday PM	Saturday Mid-day
Buck Road & Site Entrance ²						
2008 Existing (Case 1)						
Eastbound Buck Road – Left	A (7.9)	A (7.9)	A (7.8)	A (7.8)	A (7.9)	A (7.8)
Southbound Site Entrance	B (10.0)	B (13.8)	B (11.7)	A (10.0)	B (14.0)	B (11.7)
2012 without Greenville Center (Case 2)						
Eastbound Buck Road – Left	A (7.8)	A (7.9)	A (7.5)	A (7.8)	A (8.0)	A (7.9)
Southbound Site Entrance	A (9.8)	B (13.1)	A (9.2)	A (9.9)	B (13.9)	B (11.9)
2012 with Greenville Center (Case 3)						
Eastbound Buck Road – Left	A (7.8)	A (8.0)	A (8.0)	A (7.8)	A (8.0)	A (8.0)
Southbound Site Entrance	B (10.2)	B (14.7)	A (9.8)	B (10.2)	C (15.7) ⁴	B (13.3)
2012 with Greenville Center (Case 3) <i>With Improvement Option 1</i> ⁵						
Eastbound Buck Road – Left	N/A	N/A	N/A	A (7.8)	A (8.0)	A (8.0)
Southbound Site Entrance	N/A	N/A	N/A	B (10.0)	B (12.4)	B (11.7)
2012 with Greenville Center (Case 3) <i>With Improvement Option 2</i> ⁶						
Eastbound Buck Road – Left	N/A	N/A	N/A	A (7.8)	A (8.0)	A (8.0)
Southbound Site Entrance	N/A	N/A	N/A	B (10.1)	B (14.9)	B (12.9)
2012 with Greenville Center (Case 3) <i>With Improvement Option 3</i> ⁷						
Eastbound Buck Road – Left	N/A	N/A	N/A	A (7.8)	A (8.0)	A (8.0) ⁸
Southbound Site Entrance	N/A	N/A	N/A	A (9.9)	B (12.0)	B (11.4)

¹ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

² The TIS accounted for upstream signal influence in their analysis of this intersection, while McCormick Taylor did not attempt to account for it due to the relatively minimal effect of the upstream signal on the results and the uncertainty involved in selecting input parameter values for future cases.

³ The TIS analyzed this intersection using incorrect volumes for the Saturday peak hour in Cases 2 and 3.

⁴ The 95th percentile queue length for the southbound Site Entrance approach during the Case 3 PM peak hour is approximately 66 feet.

⁵ Improvement Option 1 includes a separate left-turn lane on the southbound Site Entrance approach.

⁶ Improvement Option 2 includes a separate right-turn lane on the westbound Buck Road approach.

⁷ Improvement Option 3 includes both Improvement Option 1 and Improvement Option 2.

⁸ The 95th percentile queue length for the eastbound Buck Road left-turn lane during the Case 3 Saturday peak hour with Improvement Option 3 is approximately 14 feet.

Table 3 (continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Signalized Intersection ⁹	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Buck Road & Site Entrance						
2012 with Greenville Center (Case 3)	N/A	N/A	N/A	A (0.32)	B (0.57)	B (0.44)
2012 with Greenville Center (Case 3) With Improvement Option 1 ¹⁰	N/A	N/A	N/A	A (0.26)	B (0.34)	A (0.30)
2012 with Greenville Center (Case 3) With Improvement Option 2 ¹¹	N/A	N/A	N/A	A (0.28)	B (0.50)	B (0.39)
2012 with Greenville Center (Case 3) With Improvement Option 3 ¹²	N/A	N/A	N/A	A (0.22)	B (0.28)	A (0.25)

⁹ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

¹⁰ Improvement Option 1 includes a separate left-turn lane on the southbound Site Entrance approach.

¹¹ Improvement Option 2 includes a separate right-turn lane on the westbound Buck Road approach.

¹² Improvement Option 3 includes both Improvement Option 1 and Improvement Option 2.

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹³ Two-Way Stop Control	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Delaware Route 52 & Site Entrance						
2008 Existing (Case 1)						
Eastbound Business Entrance	B (14.8)	B (13.1)	B (14.0)	C (15.8)	B (13.8)	C (15.6)
Westbound Site Entrance – Right	A (9.1)	B (11.1)	A (9.9)	A (9.4)	B (10.8)	B (10.3)
Northbound Delaware Route 52 – Left	B (11.1)	A (8.7)	A (9.0)	B (11.2)	A (8.7)	A (9.3)
2012 without Greenville Center (Case 2)						
Eastbound Business Entrance	C (16.6)	B (14.9)	C (15.7)	C (18.5)	B (13.6)	C (16.1)
Westbound Site Entrance – Right	A (9.1)	B (11.0)	B (10.4)	A (9.4)	B (11.6)	B (10.3)
Northbound Delaware Route 52 – Left	B (11.8)	A (8.9)	A (9.3)	B (12.0)	A (8.8)	A (9.4)
2012 with Greenville Center (Case 3)						
Eastbound Business Entrance	C (16.7)	C (15.1)	C (15.9)	C (18.5)	B (13.7)	C (16.4)
Westbound Site Entrance – Right	A (9.2)	B (11.3)	B (10.5)	A (9.4)	B (12.0)	B (10.5)
Northbound Delaware Route 52 – Left	B (11.8)	A (8.9)	A (9.4)	B (12.0)	A (8.9)	A (9.5)

¹³ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

Table 5
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹⁴ Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day ¹⁶	Weekday AM	Weekday PM	Saturday Mid-day
Buck Road & Ardleigh Drive ¹⁵						
2008 Existing (Case 1)						
Eastbound Buck Road – Left	A (7.5)	A (7.6)	A (7.5)	A (7.5)	A (7.6)	A (7.5)
Southbound Ardleigh Drive	A (9.2)	A (9.6)	A (9.2)	A (9.2)	A (9.6)	A (9.3)
2012 without Greenville Center (Case 2)						
Eastbound Buck Road – Left	A (7.5)	A (7.6)	A (7.8)	A (7.5)	A (7.6)	A (7.5)
Southbound Ardleigh Drive	A (9.1)	A (9.6)	B (10.5)	A (9.2)	A (9.8)	A (9.3)
2012 with Greenville Center (Case 3)						
Eastbound Buck Road – Left	A (7.5)	A (7.6)	A (7.8)	A (7.5)	A (7.6)	A (7.6)
Southbound Ardleigh Drive	A (9.1)	A (9.7)	A (10.6)	A (9.2)	A (9.8)	A (9.4)

¹⁴ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

¹⁵ The TIS accounted for upstream signal influence in their analysis of this intersection, while McCormick Taylor did not attempt to account for it due to the relatively minimal effect of the upstream signal on the results and the uncertainty involved in selecting input parameter values for future cases.

¹⁶ The TIS analyzed this intersection using incorrect volumes for the Saturday peak hour in Cases 2 and 3.

Table 6
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ¹⁷ Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Buck Road & Greenock Drive ¹⁸						
2008 Existing (Case 1)						
Westbound Buck Road – Left	A (7.6)	A (7.6)	A (7.4)	A (7.6)	A (7.6)	A (7.4)
Northbound Greenock Drive	A (9.9)	B (10.4)	A (9.7)	A (9.9)	B (10.4)	A (9.7)
2012 without Greenville Center (Case 2)						
Westbound Buck Road – Left	A (7.5)	A (7.6)	A (7.4)	A (7.5)	A (7.6)	A (7.5)
Northbound Greenock Drive	A (9.7)	B (10.4)	A (9.6)	A (9.8)	B (10.6)	A (9.8)
2012 with Greenville Center (Case 3)						
Westbound Buck Road – Left	A (7.5)	A (7.6)	A (7.5)	A (7.5)	A (7.6)	A (7.5)
Northbound Greenock Drive	A (9.8)	B (10.5)	A (9.7)	A (9.9)	B (10.7)	A (9.9)

¹⁷ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

¹⁸ The TIS accounted for upstream signal influence in their analysis of this intersection, while McCormick Taylor did not attempt to account for it due to the relatively minimal effect of the upstream signal on the results and the uncertainty involved in selecting input parameter values for future cases.

Table 7
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Signalized Intersection ¹⁹	LOS per TIS ²⁰			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Buck Road & Montchanin Road						
2008 Existing (Case 1)	C (-)	C (-)	C (-)	C (0.87)	C (0.77)	B (0.51)
2012 without Greenville Center (Case 2)	C (-)	C (-)	C (-)	C (0.86)	C (0.83)	B (0.55)
2012 with Greenville Center (Case 3)	C (-)	C (-)	C (-)	C (0.87)	C (0.84)	B (0.57)

¹⁹ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

²⁰ The HCS analysis printouts provided in the TIS did not include X-critical. Therefore, LOS per TIS is based on delay criteria only.

Table 8
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Signalized Intersection ²¹	LOS per TIS ²²			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Delaware Route 52 & Buck Road / Powder Mill Shopping Center						
2008 Existing (Case 1)	C (-)	C (-)	C (-)	B (0.58)	C (0.83)	B (0.51)
2012 without Greenville Center (Case 2)	B (-)	C (-)	C (-)	B (0.62)	C (0.90)	B (0.55)
2012 with Greenville Center (Case 3)	B (-)	C (-)	C (-)	B (0.62)	C (0.93) ²³	B (0.57)

²¹ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

²² The HCS analysis printouts provided in the TIS did not include X-critical. Therefore, LOS per TIS is based on delay criteria only.

²³ The 95th percentile queue length for the westbound Buck Road left-turn lane during the Case 3 PM peak hour is approximately 213 feet.

Table 9
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Signalized Intersection ²⁴	LOS per TIS ²⁵			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Delaware Route 52 & Hillside Road / Greenville Crossing Shopping Center (South Entrance)						
2008 Existing (Case 1)	D (-)	C (-)	C (-)	C (0.85)	C (0.87)	B (0.61)
2012 without Greenville Center (Case 2)	D (-)	C (-)	C (-)	C (0.88)	C (0.80)	B (0.60)
2012 with Greenville Center (Case 3)	D (-)	C (-)	C (-)	C (0.88)	C (0.84)	B (0.61)

²⁴ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

²⁵ The HCS analysis printouts provided in the TIS did not include X-critical. Therefore, LOS per TIS is based on delay criteria only.

Table 10
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ²⁶ Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Delaware Route 52 & Greenville Crossing Shopping Center (Middle Entrance) ^{27, 28}						
2008 Existing (Case 1)						
Southbound Delaware Route 52 – Left	A (8.4)	B (10.5)	A (8.8)	A (8.7)	B (11.7)	A (9.2)
2012 without Greenville Center (Case 2)						
Southbound Delaware Route 52 – Left	A (8.6)	B (10.9)	A (8.6)	A (9.0)	B (12.5)	A (9.2)
2012 with Greenville Center (Case 3)						
Southbound Delaware Route 52 – Left	A (8.6)	B (11.0)	A (8.7)	A (9.0)	B (12.6)	A (9.3)

²⁶ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

²⁷ The TIS analyzed the southbound Delaware Route 52 approach as one shared through/left-turn lane and one through lane. Based on field observations, McCormick Taylor analyzed the southbound approach as one left-turn lane and one through lane.

²⁸ The TIS accounted for upstream signal influence in their analysis of this intersection, while McCormick Taylor did not attempt to account for it due to the relatively minimal effect of the upstream signal on the results and the uncertainty involved in selecting input parameter values for future cases.

Table 11
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ²⁹ Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Delaware Route 52 & Greenville Crossing Shopping Center (North Egress)³⁰						
2008 Existing (Case 1)						
Westbound Greenville Crossing Shopping Center (North Egress)	B (13.4)	B (12.8)	B (11.9)	E (41.4)	F (904.3)	C (23.6)
2012 without Greenville Center (Case 2)						
Westbound Greenville Crossing Shopping Center (North Egress)	B (13.9)	B (13.2)	B (11.3)	F (67.6)	F (2808)	D (25.9)
2012 with Greenville Center (Case 3)						
Westbound Greenville Crossing Shopping Center (North Egress)	B (14.0)	B (13.3)	B (11.4)	F (71.1)	F (3548)	D (27.3)
2012 with Greenville Center (Case 3) <i>With Improvement Option 1</i> ³¹						
Westbound Greenville Crossing Shopping Center (North Egress)	N/A	N/A	N/A	C (20.5)	E (46.2)	C (16.4)

²⁹ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

³⁰ The TIS analyzed the Delaware Route 52 approaches as two through lanes in each direction, and selected median type as undivided. Based on field observations, McCormick Taylor analyzed the Delaware Route 52 approaches as one through lane in each direction, and selected median type as raised curb with storage for zero vehicles.

³¹ Improvement Option 1 reconfigures the median of Delaware Route 52 to create storage space for one vehicle turning left out of Greenville Crossing and heading south of Delaware Route 52, thereby allowing left turns out of the shopping center to be completed as a two-stage movement.

Table 12
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ³² Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Hillside Road & A.I. DuPont High School (East Entrance) <small>33, 34</small>						
2008 Existing (Case 1)						
Westbound Hillside Road – Left	B (11.2)	A (7.4)	A (7.5)	B (11.1)	A (7.4)	A (7.5)
Northbound A.I. DuPont High School East Entrance	C (23.7)	A (8.7)	A (9.1)	C (24.9)	A (8.7)	A (9.0)
2012 without Greenville Center (Case 2)						
Westbound Hillside Road – Left	A (9.6)	A (7.4)	A (7.4)	A (9.8)	A (7.4)	A (7.4)
Northbound A.I. DuPont High School East Entrance	B (14.3)	A (8.7)	A (8.9)	C (17.4)	A (8.7)	A (8.9)
2012 with Greenville Center (Case 3)						
Westbound Hillside Road – Left	A (9.6)	A (7.4)	A (7.4)	A (9.8)	A (7.4)	A (7.4)
Northbound A.I. DuPont High School East Entrance	B (14.3)	A (8.7)	A (8.9)	C (17.4)	A (8.7)	A (8.9)

³² For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

³³ The TIS analyzed the northbound A.I. DuPont High School Entrance approach as one left-turn lane and one right-turn lane. Based on field observations, McCormick Taylor analyzed the northbound approach as one shared left/right-turn lane having a flared approach with storage for one vehicle.

³⁴ The TIS accounted for upstream signal influence in their analysis of this intersection, while McCormick Taylor did not attempt to account for it due to the relatively minimal effect of the upstream signal on the results and the uncertainty involved in selecting input parameter values for future cases.

Table 13
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Unsignalized Intersection ³⁵ Two-Way Stop Control (T-intersection)	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Hillside Road & A.I. DuPont High School (Middle Entrance) ³⁶						
2008 Existing (Case 1)						
Westbound Hillside Road – Left	A (8.9)	A (7.4)	A (7.5)	A (8.7)	A (7.4)	A (7.4)
Northbound A.I. DuPont High School Middle Entrance	B (14.5)	A (9.6)	N/A ³⁷	C (15.3)	A (9.6)	N/A ³⁷
2012 without Greenville Center (Case 2)						
Westbound Hillside Road – Left	A (8.7)	A (7.4)	A (7.4)	A (8.8)	A (7.4)	A (7.4)
Northbound A.I. DuPont High School Middle Entrance	B (12.8)	A (9.5)	N/A ³⁷	C (15.6)	A (9.6)	N/A ³⁷
2012 with Greenville Center (Case 3)						
Westbound Hillside Road – Left	A (8.7)	A (7.4)	A (7.4)	A (8.8)	A (7.4)	A (7.4)
Northbound A.I. DuPont High School Middle Entrance	B (12.8)	A (9.5)	N/A ³⁷	C (15.6)	A (9.6)	N/A ³⁷

³⁵ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

³⁶ The TIS analyzed the northbound A.I. DuPont High School Entrance approach as one left-turn lane and one right-turn lane. Based on field observations, McCormick Taylor analyzed the northbound approach as one shared left/right-turn lane.

³⁷ Delay and level of service results were not reported due to zero volume on the northbound approach.

Table 14
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Signalized Intersection ³⁸	LOS per TIS ³⁹			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Delaware Route 52 & Briars Lane / Presidential Drive						
2008 Existing (Case 1)	B (-)	B (-)	B (-)	B (0.55)	B (0.50)	A (0.34)
2012 without Greenville Center (Case 2)	B (-)	C (-)	B (-)	B (0.59)	B (0.65)	A (0.39)
2012 with Greenville Center (Case 3)	B (-)	C (-)	B (-)	B (0.59)	B (0.66)	A (0.39)

³⁸ For unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, those numbers are X-critical, a composite volume-to-capacity ratio.

³⁹ The HCS analysis printouts provided in the TIS did not include X-critical. Therefore, LOS per TIS is based on delay criteria only.

Table 15
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Ramp Diverge Junction ⁴⁰	LOS per TIS ⁴¹			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Eastbound Delaware Route 141 & Off-Ramp to Southbound Delaware Route 52 ⁴²						
2008 Existing (Case 1)	B (17.2)	B (14.2)	A (9.7)	C (25.2)	B (19.8)	B (14.2)
2012 without Greenville Center (Case 2)	B (18.7)	B (15.4)	B (10.6)	C (27.7)	C (21.5)	B (15.5)
2012 with Greenville Center (Case 3)	B (18.7)	B (15.4)	B (10.6)	C (27.7)	C (21.5)	B (15.5)

⁴⁰ For ramp junction analyses, the number in parentheses following the level of service is the density of the merge influence area measured in passenger cars per mile per lane.

⁴¹ The TIS analyzed this interchange facility with incorrect Freeway volumes.

⁴² The TIS did not input adjacent ramp information while McCormick Taylor did.

Table 16
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Ramp Diverge Junction ⁴³	LOS per TIS ⁴⁴			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Eastbound Delaware Route 141 & Off-Ramp to Northbound Delaware Route 52 ⁴⁵						
2008 Existing (Case 1)	B (12.3)	B (10.0)	A (7.9)	B (19.6)	B (17.5)	B (12.9)
2012 without Greenville Center (Case 2)	B (13.3)	B (10.9)	A(8.6)	C (21.5)	B (19.0)	B (14.2)
2012 with Greenville Center (Case 3)	B (13.3)	B (10.9)	A (8.6)	C (21.5)	B (19.1)	B (14.2)

⁴³ For ramp junction analyses, the number in parentheses following the level of service is the density of the merge influence area measured in passenger cars per mile per lane.

⁴⁴ The TIS analyzed this interchange facility with incorrect Freeway volumes.

⁴⁵ The TIS did not input adjacent ramp information while McCormick Taylor did.

Table 17
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Ramp Diverge Junction ⁴⁶	LOS per TIS ⁴⁷			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Westbound Delaware Route 141 & Off-Ramp to Northbound Delaware Route 52 ⁴⁸						
2008 Existing (Case 1)	A (9.9)	B (14.8)	A (4.8)	B (14.6)	C (20.2)	A (9.1)
2012 without Greenville Center (Case 2)	A (10.0)	B (16.0)	A (5.2)	B (15.5)	C (22.3)	A (9.9)
2012 with Greenville Center (Case 3)	A (10.0)	B (16.0)	A (5.2)	B (15.5)	C (22.3)	A (9.9)

⁴⁶ For ramp junction analyses, the number in parentheses following the level of service is the density of the merge influence area measured in passenger cars per mile per lane.

⁴⁷ The TIS analyzed this interchange facility with incorrect Freeway volumes.

⁴⁸ The TIS did not input adjacent ramp information while McCormick Taylor did.

Table 18
PEAK HOUR LEVELS OF SERVICE (LOS)
based on Traffic Impact Study for Greenville Center
Report dated May 22, 2009
Prepared by Apex Engineering, Inc.

Ramp Merge Junction ⁴⁹	LOS per TIS			LOS per McCormick Taylor		
	Weekday AM	Weekday PM	Saturday Mid-day	Weekday AM	Weekday PM	Saturday Mid-day
Westbound Delaware Route 141 & On-Ramp from Northbound Delaware Route 52 ⁵⁰						
2008 Existing (Case 1)	B (13.1)	B (19.5)	A (7.9)	B (13.5)	B (19.8)	A (8.2)
2012 without Greenville Center (Case 2)	B (13.3)	C (20.9)	A (8.3)	B (14.4)	C (21.7)	A (8.8)
2012 with Greenville Center (Case 3)	B (13.3)	C (20.9)	A (8.3)	B (14.4)	C (21.7)	A (8.8)

⁴⁹ For ramp junction analyses, the number in parentheses following the level of service is the density of the merge influence area measured in passenger cars per mile per lane.

⁵⁰ The TIS did not input adjacent ramp information while McCormick Taylor did.