STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

CLEON L. CAULEY, SR.
ACTING SECRETARY

June 7, 2011

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

Dear Mr. Culver:

The enclosed Traffic Impact Study (TIS) conditions letter for the **Appoquinimink School District Odessa Campus** 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 prepared the TIS to conform to DelDOT's Standards and Regulations for Subdivision Streets and other accepted practices and procedures for such studies. DelDOT accepts this TIS 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 enclosed conditions letter, please contact me at (302) 760-2109.

Sincerely,

T. William Brockenbrough, Jr.
County Coordinator

TWB:km
Enclosures
cc with enclosures: Ms. Constance C. Holland, Office of State Planning Coordination
Ms. Tigist Zegeye, WILMAPCO
Mr. Ted C. Williams, Landmark JCM
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

DelDOT

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Troy Brestel, Project Engineer, Development Coordination

June 6, 2011

Mr. T. William Brockenbrough, P.E.
County Coordinator
DelDOT Division of Planning
P O Box 778
Dover, DE 19903

RE: Agreement No. 1528
Traffic Impact Study Services
Task 02B-Appoquinimink School District–Old State Road Campus (Odessa Campus)

Dear Mr. Brockenbrough,

Johnson, Mirmiran and Thompson (JMT) has completed the Traffic Impact Study (TIS) for the Appoquinimink School District Old State Road Campus (Odessa Campus). This task was assigned Task Number 02B. JMT prepared the report in a manner generally consistent with DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access.*

The TIS evaluates the impacts of the Appoquinimink School District Campus which is proposed along Old State Road (New Castle Road 441) southwest of the Old State Road (New Castle Road 441/Delaware Route 299) and Taylors Bridge Road (Delaware Route 9) intersection in New Castle County, Delaware. The development would consist of a 330-student early childhood center (kindergarten center), an 840-student elementary school, a 1,000-student middle school, and a 1,600-student high school on an approximately 272.20-acre parcel. The parcel is zoned S (Suburban) and will be developed under that zoning. The school district is proposing one access point on Old State Road. Construction is anticipated to proceed in two phases with only the early childhood center and the elementary school being completed by 2012, and the full site being developed in 2016.

The School District has also provided for the possibility of a future connection directly onto US Route 13 for this campus. However, neither the School District nor the State intends to currently build that connection. Therefore, the traffic analysis does not incorporate a connection to US Route 13 under future conditions.

DelDOT is requiring the Appoquinimink School District to provide a Traffic Operational Analysis (TOA) for the intersection of US Route 13 with Old State Road. This intersection is already the subject of a signal agreement associated with the Bishop's Walk subdivision and it is possible that a signal will be needed at this location someday. While Landmark Engineering is currently working on the TOA, DelDOT's review of their work thus far has shown that a signal is not warranted yet and would not be warranted in 2016 with the site fully developed.

DelDOT currently has no relevant projects in the study area. In addition, none of the study area intersections have been selected for DelDOT's Hazard Elimination Program (HEP) or High Risk Rural Road Program (HRRRP) within the last five years.

However, DelDOT has pavement rehabilitation and resurfacing projects scheduled for Old State Road from US Route 13 to Main Street (Delaware Route 299) and on Thomas Landing Road (Delaware Route 9) from Cedar Swamp Road (New Castle Road 453) to Old State Road. Construction is anticipated to begin in 2012.

Additionally, New Castle County Department of Land Use in conjunction with DelDOT and Whitman, Requardt and Associates conducted a study of the southern New Castle County roadway networks which was completed in 2003. At the time of the study, the entire 43,000 acre study area was characterized as rural, dominated by large farms, scattered residential developments, and some residential lots along local roads. The 2003 *Southern New Castle County Local Road Plan* thoroughly evaluated existing and forecast conditions for the roadways in Southern New Castle County, and recommended a set of integrated potential roadway improvements and land development policies to accommodate the 2025 projected growth within the area. The scope of the study is limited to those roads that are classified by DelDOT as collector or local roadways. The proposed improvements include roadway widening to minimum DelDOT standards, upgrading roadway classifications, providing turn lanes or roundabouts at intersections and development entrances, reconstructing horizontal and vertical curve deficiencies and the installation of pedestrian and bicycle facilities. In addition, it was also discussed to consider a transportation fee assessment district in southern New Castle County and the development of a local circulation plan for the entire study area.

As part of the *Southern New Castle County Local Road Plan*, Old State Road was identified as a roadway that would have marginally deficient capacity in 2025, even after improving the roadway to meet the minimum DelDOT standards. Based on this, the plan recommends that Old State Road, from US Route 13 to Taylors Bridge Road, be improved to collector road standards to include two twelve-foot travel lanes and two eight-foot shoulders. The study also evaluated substandard horizontal and vertical curves based on the design speeds of each roadway and by using field observations and USGS-level topographic data. The horizontal curve just north of the Old State Road/Taylors Bridge Road intersection was identified as substandard by the plan. Based on our field observations, the horizontal substandard curve on Old State Road north of the Taylors Bridge Road intersection provides insufficient sight distance for the westbound left turn movements from Taylors Bridge Road.

In addition, DelDOT's Traffic Section had also performed a traffic safety and speed study in October of 2008 for this substandard curve north of Taylors Bridge Road and an advisory speed limit of 40 MPH was recommended along Old State Road between Taylors Bridge Road and Old Corbit Road. In addition, based on the study, placement of chevron signs were recommend north of the Taylors Bridge Road. The recommended advisory speed limit sign and chevron signs have already been installed within the study area.

In another section of the *Southern New Castle County Local Road Plan,* Average Accident Rates were identified for each roadway, with high accident areas being designated as clusters. A cluster that required further study was detected on the southern section of Old State Road between US Route 13 and Taylors Bridge Road. However, no HEP study was reported in this area within the past 5 years. By analyzing the past 3 years of crash data, it was determined that there is currently no significant crash problem along Old State Road within the study area.

Nevertheless, there are further measures that DelDOT could take to improve safety along the Old State Road curvature. Such measures include advance curve warning signs, restriping, centerline rumble strips, and reflectors. We recommend that DelDOT's Traffic Section consider implementing some or all of these measures.

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

The following intersections exhibit level of service (LOS) deficiencies without the implementation of physical roadway and/or traffic control improvements.

Intersection	***Situations for which deficiencies occur***
Old State Road and Proposed Site Entrance	2016 AM and PM with full development of school district campus (Case 5)
Old State Road and Taylors Bridge Road	2016 AM with full development of school district campus (Case 5)

Significantly, these deficiencies would occur only on the approaches that must stop. Because these intersections operate under two-way (as opposed to all-way) stop control, the proposed development will meet the New Castle County LOS standards stated in Section 40.11.210 of the Unified Development code (UDC).

The intersection of Old State Road and the site entrance would exhibit LOS deficiencies for future full build conditions during the weekday morning and afternoon peak hours. The LOS deficiency occurs on the eastbound minor street left turn movement. The 95th percentile queue lengths on the eastbound left turn site entrance approach during the typical peak hours are expected to be about 870 feet in the AM and 200 feet in the PM peak hours. To address the LOS deficiency at this intersection we recommend that a signal be installed at the intersection of Old State Road and the site entrance when the appropriate warrants are met as demonstrated through the Signal Justification Study. With the installation of a traffic signal, this intersection would operate at an acceptable level of service.

The intersection of Old State Road and Taylors Bridge Road would exhibit LOS deficiencies under future full build condition during the weekday morning peak hour. The LOS deficiencies in future conditions would occur on the westbound Taylor's Bridge Road approach. The 95th percentile queue length on the approach during the typical AM peak hour is expected to be about

440 feet. In addition, the section of Old State Road immediately north of the Old State Road/Taylors Bridge Road intersection has an existing substandard curvature which could present an operational issue at the intersection. The geometric layout of the intersection and restricted sight distance would make it difficult for westbound Taylors Bridge Road motorists to turn onto southbound Old State Road especially with the additional traffic on Old State Road with the full build out scenario.

In order to address the LOS deficiency at this intersection, we performed an additional analysis with a separate left turn and right turn lane on westbound Taylors Bridge Road. While this modified geometry would address the future LOS deficiencies, it would not address the sub standard horizontal curvature and the subsequent intersection sight distance issue at the intersection. To address the operational deficiency we evaluated the realignment of westbound Taylors Bridge Road approach to connect directly with the northern leg of Old State Road as the through roadway. The southern leg of Old State Road would intersect this road as a T-intersection. With this modification, the substandard horizontal curve north of Taylors Bridge Road would be eliminated and motorists who would turn left from Taylors Bridge Road onto Old State Road would not have any sight distance issue. However, this modified intersection would need to be signalized to address the LOS deficiency. While this realigned T-intersection would operate with acceptable LOS this would require major realignment of Taylors Bridge Road, installation of a new signal and the need of purchase additional right-of-way.

As an alternative to the intersection realignment, a single lane roundabout was evaluated. A roundabout would address both the LOS and operational issues at the intersection and is therefore recommended. This improvement would eliminate any sight distance issue at the intersection. In addition, due to the reduced speed limit on the approach leg of a roundabout there would not be any operational issue on the horizontal curve north of the intersection. In addition, having a roundabout just north of the proposed school entrance on Old State Road would also help reduce the speed of southbound traffic before they enter the school zone of 20 mph.

While the remaining intersections within the study area would operate with acceptable LOS under all future conditions, the roadway segments of Spring Creek Drive and Chestnut Lane between US Route 13 and Old State Road could have operational issues with regard to cut-through traffic. These two roads are subdivision streets and are not meant for through traffic. Although the study assumed that the traffic from the school campus would use Old State Road to access US Route 13, there is the potential for some motorists to use Spring Creek Drive and Chestnut Lane to access US Route 13. We performed three year crash analysis in the study area and did not observe any major crash patterns that could be attributed to cut-through traffic. As such, we do not recommend any improvement on either street now. However, we recommend monitoring Spring Creek Drive and Chestnut Lane for cut-through traffic as the site is developed.

Should the County 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 School District should improve the site frontage on Old State Road to meet DelDOT's local road standards. These standards include, but are not limited to, two eleven-foot travel lanes and two five-foot shoulders on both sides of the road. The developer should provide a bituminous concrete overlay to the existing travel lanes, at DelDOT's discretion. DelDOT should analyze the existing lanes' pavement section and recommend an overlay thickness to the School District's engineer if necessary.

2. Based on the *Southern New Castle County Local Road Plan* recommendation, the School District should dedicate sufficient right-of-way in front of the site frontage for the potential future widening of Old State Road to collector road standards. These standards include, but are not limited to, two twelve-foot travel lanes and two eight-foot shoulders.

3. The School District should construct a full access site entrance on Old State Road to be consistent with the proposed lane configuration as shown in the table below.

Approach	Current Configuration	Proposed Configuration
Northbound Old State Road	One through lane	One left turn lane and one through lane
Southbound Old State Road	One through lane	One through lane and one right turn lane
Eastbound Site Approach	Does not exist	One left turn lane and one right turn lane

The recommended minimum storage lengths (excluding tapers) of the separate turn lanes are listed below.

Approach	Left Turn Lane	Right Turn Lane
Northbound Old State Road	325 feet	N/A
Southbound Old State Road	N/A	360 feet
Eastbound Site Approach	400 feet	260 feet

The storage length provided here is based on the HCS analysis. Due to the reduced speed limit in the school zone, DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access* may permit a shorter length than what is reported here.

4. The School District should enter into a traffic signal agreement with DelDOT for the intersection of Old State Road and Site Entrance. The agreement should include signal heads, pedestrian signals and crosswalks at DelDOT's discretion. The School District

will be required to perform a signal justification study including a peak hour and a four-hour signal warrant analysis at DelDOT's discretion.

5. The School District should enter into an agreement with DelDOT to install a single lane roundabout at the intersection of Old State Road and Taylors Bridge Road and to improve Old State Road from Taylors Bridge Road to the site frontage to meet DelDOT's local road standards as described in item 1 above before the opening of the middle school or high school. A preliminary concept plan will need to be designed by the School District to determine if the necessary right-of-way exists for a single lane roundabout.

6. The School District should enter into a traffic signal agreement with DelDOT for the intersection of US Route 13 and Old State Road. The agreement should include signal heads, interconnections and ITS equipment such as CCTV cameras at DelDOT's discretion. At least one other developer (Bishop's Walk) is expected to enter into a traffic signal agreement for this intersection as well. The School District should coordinate with DelDOT on the implementation and equitable cost sharing of the traffic signal.

7. The School District should enter into an agreement with DelDOT regarding the provision and/or funding of traffic calming measures on Spring Creek Drive and Chestnut Lane. The agreement should extend long enough to address full development of the site, including all site amenities such as athletic fields which may be developed after the schools are occupied. The agreement should be applicable to a broad range of traffic calming measures.

8. The following bicycle, pedestrian, and transit improvements should be included:

    a. A minimum fifteen-foot wide permanent easement from the edge of the right-of-way should be dedicated to DelDOT within the site frontage along Old State Road. Within this easement, a ten-foot wide multi multi-use path that that meets current AASHTO and ADA standards should be constructed. A five-foot minimum setback should be maintained from the edge of the pavement to the multi-use path.
    b. ADA compliant curb ramps and marked crosswalks should be provided at the site entrance. The use of Type 3 curb ramps is discouraged.
    c. Where internal sidewalks are located alongside of parking spaces, a buffer, physical barrier or signage should be added to eliminate vehicular overhang onto the sidewalk.
    d. Where the right turn lanes are added on Old State Road a bicycle lane should also be provided through the right turn lane. A Right Turn Yield to Bikes sign (MUTCD R4-4) should be added at the start of the right turn lane.
    e. Bicycle Warning signs (W11-1) should be placed on both the northbound and southbound approaches on Old State Road.
    f. Covered bike parking racks should be provided near the building entrances.
    g. Utility covers should be moved outside of the designated bicycle lane or should be flush with the pavement.

h. A multi-use path connection should be provided from the school to Spring Creek subdivision at Labrador Lane.
i. The establishment of a school zone with appropriate pavement markings and signage, and an appropriate speed limit should be provided on both approaches of Old State Road in front of the school.

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

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.

Additional details regarding this TIS are attached. Please contact me at (302) 266-9600 if you have any questions concerning this review.

Sincerely,
Johnson, Mirmiran, and Thompson, Inc.

David DuPlessis, P.E.
cc: Mir Wahed, P.E., PTOE

Enclosure

General Information

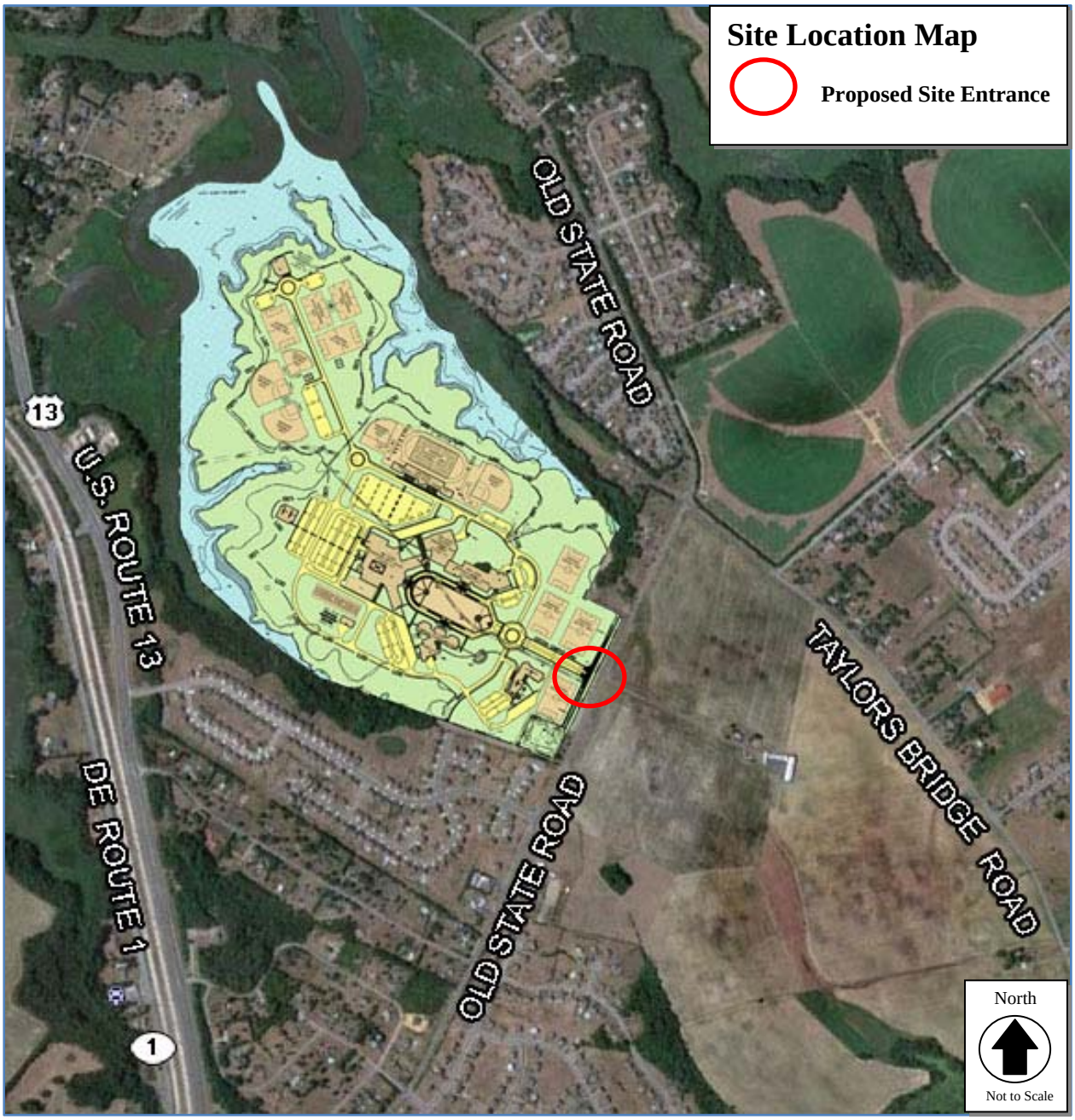
Report date: May, 2011.
Prepared by: JMT.
Prepared for: Appoquinimink School District
Tax Parcel: 14.007-00.028.
Generally consistent with DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*: Yes.

Project Description and Background

Description: A 330-student early childhood center (kindergarten center), an 840-student elementary school, a 1,000-student middle school, and a 1,600-student high school.
Location: The project is located along Old State Road (New Castle Road 441), southwest of the southwest of the Old State Road (New Castle Road 441/Delaware Route 299) and Taylors Bridge Road (Delaware Route 9) intersection in New Castle County, Delaware.
Amount of Land to be developed: Approximately 272.20 acres of land.
Land Use approval(s) needed: New School Campus approval.
Proposed completion date: 2016.
Proposed access locations: One access point is proposed on Old State Road (New Castle Road 441).
Daily Traffic Volumes:

- 2009 Average Annual Daily Traffic on Old State Road (New Castle Road 441): 473 vehicles per day.

Site Map



**Graphic is an approximation based on the proposed site access plan prepared by Landmark Engineering dated November 30, 2010 and last revised December 7, 2010.*

Relevant and On-going Projects

DelDOT currently has no relevant projects in the study area. In addition, none of the study area intersections were selected for DelDOT's Hazard Elimination Program (HEP) or High Risk Rural Road Program (HRRRP) within the last five years.

However, DelDOT has pavement rehabilitation and resurfacing projects scheduled for Old State Road from US Route 13 to Main Street (Delaware Route 299) and on Thomas Landing Road (Delaware Route 9) from Cedar Swamp Road (New Castle Road 453) to Old State Road. Construction is anticipated to begin in 2012.

Livable Delaware
(Source: Delaware Strategies for State Policies and Spending, 2010)

Location with respect to the Strategies for State Policies and Spending Map of Delaware: The proposed development is located within an Investment Level 2 area.

Investment Level 2

These areas can be composed of less developed areas within municipalities, rapidly growing areas in the counties that have or will have public water and wastewater services and utilities, areas that are generally adjacent to or near Investment Level 1 Areas, smaller towns and rural villages that should grow consistently with their historic character, and suburban areas with public water, wastewater, and utility services. They serve as transition areas between Level 1 and the state's more open, less populated areas. They generally contain a limited variety of housing types, predominantly detached single-family dwellings.

In Investment Level 2 Areas, like 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. Investments should encourage departure from the typical single-family-dwelling developments and promote a broader mix of housing types and commercial sites encouraging compact, mixed-use development where applicable. Level 2 Areas share similar priorities as with the Level 1 Areas where the aim remains to: make context sensitive transportation system capacity enhancements, preserve existing facilities, make safety enhancements, make transportation system capacity improvements, create transit system enhancements, ensure ADA accessibility, and close gaps in the pedestrian system, including the Safe Routes to School projects. Other priorities for Level 2 Areas include: Corridor Capacity Preservation, off-alignment multi-use paths, interconnectivity of neighborhoods and public facilities, and signal-system enhancements.

Proposed Development's Compatibility with Livable Delaware:

This site is located within an Investment Level 2 area where residential growth is supported. As residential growth is generated, adequate education infrastructure is kept in mind by the State. Therefore, the proposed school campus appears to be generally consistent with the 2010 update

of the Livable Delaware "Strategies for State Policies and Spending" since the proposed development would be situated adjacent to many residential communities.

Comprehensive Plans

(Source: New Castle County 2007 Comprehensive Development Plan Update, adopted July 24, 2007)

New Castle County Comprehensive Plan:

The future land use plan goals for developments in New Castle County aims to protect and improve the quality of life in the county by minimizing the impacts of proposed developments and abating all potential nuisances through implementation of the strategies contained in the *Comprehensive Plan* document and a balancing of the regulations contained in the New Castle County Unified Development Code to allow a variety of uses and development options.

Additionally the plan aims to promote the use of redevelopment and infill to help meet projected development needs throughout New Castle County by encouraging the redevelopment and development of infill parcels where infrastructure already exists as a means of accommodating growth. The plan states that these reinvestments are improving the appearance and desirability of the previously developed areas, easing growth pressure on the rural areas, and helping to reverse the trend of decay in older suburbs.

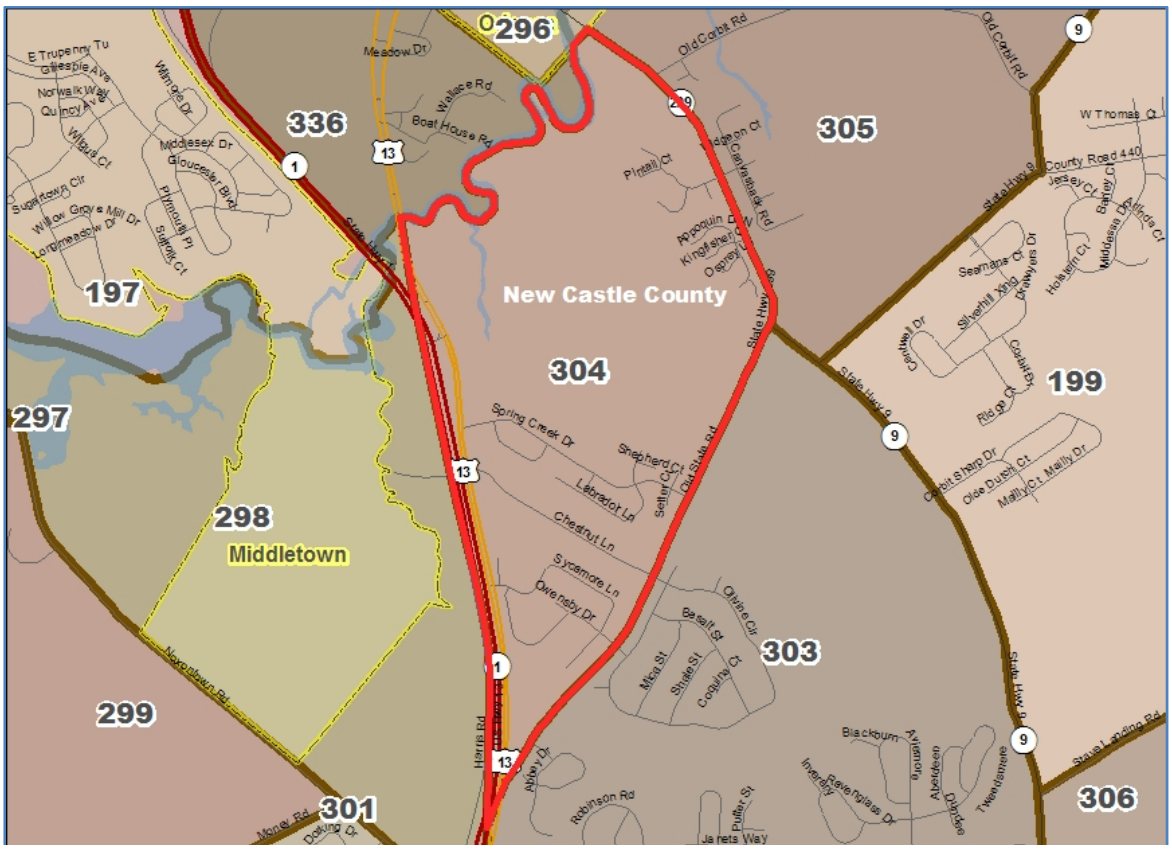
Proposed Development's Compatibility with the County Comprehensive Plan:

Per the existing land use map, the parcel is zoned as S (Suburban). The developer does not seek to rezone any portion of the land. Furthermore, the proposed school campus is in line with the objectives of the New Castle County Comprehensive Plan by providing more capacity at schools since enrollment is projected to increase due to new residential developments within the area. As such, the proposed project is compatible with the New Castle County Comprehensive Plan**.**

Transportation Analysis Zones (TAZ)

Transportation Analysis Zones (TAZ) where development would be located: 304

TAZ Boundaries:



Current employment estimate for TAZ: 13 in 2010
Future employment estimate for TAZ: 350 in 2040
Current employment estimate part of the education and health sector for TAZ: 2 in 2010
Future employment estimate part of the education and health sector for TAZ: 88 in 2040
Current Population estimate for TAZ: 935 in 2010
Future Population estimate for TAZ: 1,421 in 2040
Current household estimate for TAZ: 315 in 2010
Future household estimate for TAZ: 515 in 2040
Relevant committed developments in the TAZ: Sycamore Farms
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: Yes

Trip Generation

Trip generation for the proposed development was computed using comparable land uses and the equations contained in the *Trip Generation, 8th Edition: An ITE Informational Report*, published by the Institute of Transportation Engineers (ITE). The following land uses were utilized to estimate the amount of new traffic generated for this development.

- 330-student Early Childhood Center (ITE Land Use Code 520)
- 840-student Elementary School (ITE Land Use Code 520)
- 1,000-student Middle School (ITE Land Use Code 522)
- 1,600-student High School (ITE Land Use Code 530)

The peak period trip generation for the proposed Appoquinimink School District Campus is included in Table 1. The PM peak hour trip generation presented below is based on the PM peak hour of the generator since school volumes peak during that time period.

Table 1

APPOQUINIMINK SCHOOL DISTRICT CAMPUS TRIP GENERATION

Land Use	**ADT**	**AM Peak Hour**			**PM Peak Hour**		
		In	Out	Total	In	Out	Total
330-Student Early Childhood Center	426	64	52	116	37	45	82
840-Student Elementary School	1,084	185	151	336	102	124	226
1,000-Student Middle School	1,620	297	243	540	140	170	310
1,600-Student High School	2,530	457	215	672	153	311	464
New Trips		1,003	661	1,664	432	650	1,082
Net Trip Reduction*		50	33	83	22	33	55
Total Trips	**5,660**	**953**	**628**	**1,581**	**410**	**617**	**1,027**

Since the location of the proposed institutional uses will all be within the same campus, it is assumed that there will be some trip reduction due to common uses. Assumed 5% net trip reduction.

Overview of TIS

Intersections examined:

1. Old State Road (New Castle Road 441)/Site Entrance
2. Old State Road/Spring Creek Drive
3. Old State Road/Chestnut Lane/Olivine Circle
4. Old State Road/Owensby Drive/Stonefield Drive
5. Spring Creek Drive/Setter Court/Spaniel Court
6. Spring Creek Drive/Labrador Lane
7. Old State Road/Taylors Bridge Road (Delaware Route 299)
8. Old State Road (Delaware Route 299)/Kingfisher Court
9. Old State Road/Old Squaw Road
10. Taylors Bridge Road/Thomas Landing Road (Delaware Route 9)
11. Thomas Landing Road/Cantwell Drive
12. Taylors Bridge Road (Delaware Route 9)/Corbit Sharp Drive

Conditions examined:

1. Case 1 - 2011 Existing conditions
2. Case 2 - 2012 No Build conditions without Appoquinimink School District campus
3. Case 3 - 2012 Build conditions with development of early childhood center and elementary school for Appoquinimink School District campus
4. Case 4 - 2016 No Build conditions without Appoquinimink School District campus
5. Case 5 - 2016 Build conditions with full Appoquinimink School District campus

Peak hours evaluated: Weekday morning and afternoon peak hours. The weekday afternoon peak hour of 2:00PM to 4:00PM was evaluated since school volumes peak during that time period.

Committed Developments considered:

1. Odessa National (563 single-family detached houses (221 unbuilt), 18,970 square foot clubhouse, 98 single-family attached houses (28 unbuilt), 100 townhouses (17 unbuilt), 7,000 square foot community center)
2. Fairways at Odessa National (80 single-family detached houses (62 unbuilt))
3. Goldsborough Farm (79 single-family detached houses)
4. Preserve at Robinson Farms (109 single-family detached houses, 60 single-family attached houses, 139 townhouses, 168 apartments)
5. Enclave at Odessa (182 single-family detached houses (106 unbuilt), 22 single-family attached houses (19 unbuilt))
6. Sycamore Farms (49 single-family detached houses, some lots eliminated by highway construction (10 unbuilt))

Intersection Descriptions

1. **Old State Road/Site Entrance**
   Type of Control: proposed stop-controlled intersection (T-Intersection)

Eastbound Approach: (Site Entrance) proposed one left turn lane and one right turn lane
Northbound Approach: (Old State Road) proposed one left turn lane and one through lane
Southbound Approach: (Old State Road) proposed one right turn lane and one through lane

2. **Old State Road/Spring Creek Drive**
Type of Control: stop-controlled intersection (T-Intersection)
Northbound Approach: (Old State Road) one shared through/left turn lane
Southbound Approach: (Old State Road) one shared through/right turn lane
Eastbound Approach: (Spring Creek Drive) one shared left turn/right turn lane, stop controlled
Note: The striping along the southbound Old State Road approach does not depict two lanes. However, based on field observation the approach was noted to operate as one through lane and one right turn lane.

3. **Old State Road/Chestnut Lane/Olivine Circle**
Type of Control: stop-controlled intersection
Northbound Approach: (Old State Road) one shared through/left turn/right turn lane
Southbound Approach: (Old State Road) one shared through/left turn/right turn lane
Eastbound Approach: (Chestnut Lane) one shared through/left turn/right turn lane, stop controlled
Westbound Approach: (Olivine Circle) one shared through/left turn/right turn lane, stop controlled

4. **Old State Road/Owensby Drive/Stonefield Drive**
Type of Control: stop-controlled intersection
Northbound Approach: (Old State Road) one shared through/left turn/right turn lane
Southbound Approach: (Old State Road) one shared through/left turn/right turn lane
Eastbound Approach: (Owensby Drive) one shared through/left turn/right turn lane, stop controlled
Westbound Approach: (Stonefield Drive) one shared through/left turn/right turn lane, stop controlled

5. **Spring Creek Drive/Setter Court/Spaniel Court**
Type of Control: stop-controlled intersection
Eastbound Approach: (Spring Creek Drive) one shared through/left turn/right turn lane
Westbound Approach: (Spring Creek Drive) one shared through/left turn/right turn lane
Northbound Approach: (Setter Court) one shared through/left turn/right turn lane, stop controlled
Southbound Approach: (Spaniel Court) one shared through/left turn/right turn lane, stop controlled

6. **Spring Creek Drive/Labrador Lane**
Type of Control: stop-controlled intersection

Eastbound Approach: (Spring Creek Drive) one shared through/left turn/right turn lane
Westbound Approach: (Spring Creek Drive) one shared through/left turn/right turn lane
Northbound Approach: (Labrador Lane) one shared through/left turn/right turn lane, stop controlled
Southbound Approach: (Labrador Lane) one shared through/left turn/right turn lane, stop controlled

7. **Old State Road/Taylors Bridge Road**
   Type of Control: stop-controlled intersection (T-Intersection)
   Northbound Approach: (Old State Road) one shared through/right turn lane
   Southbound Approach: (Old State Road) one shared through/left turn lane
   Westbound Approach: (Taylors Bridge Road) one shared left turn/right turn lane, stop controlled

8. **Old State Road/Kingfisher Court**
   Type of Control: stop-controlled intersection (T-Intersection)
   Northbound Approach: (Old State Road) one shared through/left turn lane
   Southbound Approach: (Old State Road) one shared through/right turn lane
   Eastbound Approach: (Kingfisher Court) one shared left turn/right turn lane, stop controlled
   Note: The striping along the southbound Old State Road approach does not depict two lanes. However, based on field observation the approach was noted to operate as one through lane and one right turn lane.

9. **Old State Road/Old Squaw Road**
   Type of Control: stop-controlled intersection
   Northbound Approach: (Old State Road) one shared through/left turn/right turn lane
   Southbound Approach: (Old State Road) one shared through/left turn/right turn lane
   Eastbound Approach: (West Old Squaw Road) one shared through/left turn/right turn lane, stop controlled
   Westbound Approach: (East Old Squaw Road) one shared through/left turn/right turn lane, stop controlled
   Note: The striping along the northbound and southbound Old State Road approaches do not depict separate right turn lanes. However, based on the field observation the approaches were noted to operate with separate right turn lanes.

10. **Taylors Bridge Road/Thomas Landing Road**
    Type of Control: stop-controlled intersection (T-Intersection)
    Eastbound Approach: (Taylors Bridge Road) one shared through/left turn lane
    Westbound Approach: (Taylors Bridge Road) one shared through/right turn lane
    Southbound Approach: (Thomas Landing Road) one shared left turn/right turn lane, stop controlled

11. **Thomas Landing Road/Cantwell Drive**
    Type of Control: stop-controlled intersection (T-Intersection)

Northbound Approach: (Thomas Landing Road) one through lane and one right turn lane
Southbound Approach: (Thomas Landing Road) one shared through/left turn lane and one bypass lane
Westbound Approach: (Cantwell Drive) one shared left turn/right turn lane, stop controlled
Note: The striping along the westbound Cantwell Drive approach does not depict two lanes. However, based on field observation the approach was noted to operate as one left turn lane and one right turn lane.

12. **Taylors Bridge Road/Corbit Sharp Drive**
Type of Control: stop-controlled intersection (T-Intersection)
Eastbound Approach: (Taylors Bridge Road) one shared through/left turn lane
Westbound Approach: (Taylors Bridge Road) one shared through/right turn lane
Southbound Approach: (Corbit Sharp Drive) one shared left turn/right turn lane, stop controlled

Transit, Pedestrian, and Bicycle Facilities

Existing transit service: Delaware Transit Corporation (DTC) currently does not provide any service to the area.

Planned transit service: JMT contacted Ivan Mitchell, Service Development Planner of DTC. In an email dated April 11, 2011, he indicated that DTC does not have any plans to provide service to the area in the immediate future; therefore no transit related improvements are requested.

Existing bicycle and pedestrian facilities: According to DelDOT's *Delaware Bicycle Facility Master Plan* (October 2005), Thomas Landing Road and Taylors Bridge Road from Thomas Landing Road to the East is designated as a Statewide Route. Old State Road from Taylors Bridge Road to 0.30 miles north of the property limit and Taylors Bridge Road from Old State Road to Thomas Landing Road is designated as a Regional Bicycle Route. Old State Road from Taylors Bridge Road to US Route 13 is a local road and do not have any Bicycle Route designation.

Per the *New Castle County Bicycle Map,* the following bicycle routes exist in the vicinity of the site:

- A Statewide Bicycle Route that does not contain a bikeway exists approximately 0.50 miles northeast of the subject property along Taylors Bridge Road and Thomas Landing Road. Connections to this route are located at the Taylors Bridge Road intersection with Thomas Landing Road. Within the site vicinity, this Statewide Bicycle Route provides mobility along Taylors Bridge Road and Thomas Landing Road. This bike route runs mostly north-south along Thomas Landing Road and Taylors Bridge Road through three of the project's intersections, including Thomas Landing Road/Cantwell Drive, Thomas Landing Road/Taylors Bridge Road and Taylors Bridge Road/Corbit Sharp Drive.

- A Regional Bicycle Route without a bikeway is located approximately 0.30 miles north of the subject property along Old State Road and Taylors Bridge Road. This route can be accessed via Old State Road and Taylor Bridge Road. Within the vicinity of the project site, the Regional Bicycle Route runs through four of the project's intersections, including Old State Road/Taylors Bridge Road, Taylors Bridge Road/Thomas Landing Road, Old State Road/Kingfisher Court and Old State Road/Old Squaw Road.
- A Connector Bicycle Route that contains a bikeway exists approximately 1.2 miles south and west of the site and can be accessed at the Old State Road intersection with US Route 13.

Planned bicycle and pedestrian facilities: JMT, Inc. contacted Mr. Anthony Aglio, DelDOT's Bicycle Coordinator, and Sarah Coakley, the Safe Routes to School Coordinator. In emails dated April 28, 2011, and May 4, 2011, they requested the following bicycle and pedestrian improvements:

- A minimum of fifteen-foot wide permanent easement from the edge of the right-of-way should be dedicated to DelDOT within the site frontage along Old State Road. Within this easement, a ten-foot wide multi use path that meets current AASHTO and ADA standards should be constructed. A minimum of five-foot setback should be maintained from the edge of the pavement to the multi use path.
- ADA compliant curb ramps and crosswalks should be provided at the site entrance.
- A bicycle lane should be added to the southbound movement. A Right Turn Yield to Bikes sign (MUTCD R4-4) should be added at the start of the right turn lane.
- Bicycle Warning signs (W11-1) should be placed on both the northbound and southbound approaches on Old State Road.
- Where internal sidewalks are located alongside of parking spaces, a buffer, physical barrier or signage should be added to eliminate vehicular overhand onto the sidewalk.
- Bicycle and pedestrian connections, including bike lanes, multi-use paths and sidewalks, should be provided to the surrounding communities.

Previous Comments

None

General HCS Analysis Comments

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

1) JMT applied the peak hour factors in accordance to the guidelines provided in the *DelDOT Standards and Regulations for Subdivision Streets and State Highway Access*.

2) The *DelDOT Standards and Regulations for Subdivision Streets and State Highway Access* recommends using 3% heavy vehicles for each movement at intersections when there is significant change in intersection volume. The specific movements that required changes to the truck percentages were identified based on the increase in traffic volumes by more than 75 vph per approach.

3) JMT used a PM peak hour analysis between 2:00 p.m. to 4:00 p.m. as required by the TIS.

Table 2
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[1] Two-Way Stop Control (T-intersection)	**LOS**	
Old State Road/Site Entrance[2]	Weekday AM	Weekday PM
2012 with development of early childhood center and elementary school only (Case 3)		
Northbound Old State Road – Left	A (8.0)	A (7.7)
Eastbound Site Entrance - Left	B (13.7)	B (11.4)
Eastbound Site Entrance - Right	A (9.2)	A (9.1)
2016 with development of school district campus (Case 5)		
Northbound Old State Road – Left	B (13.0)	A (8.5)
Eastbound Site Entrance - Left	F (1276)	E (45.5)
Eastbound Site Entrance - Right	B (10.7)	B (10.5)

Signalized Intersection[1]	**LOS**	
Old State Road/Site Entrance[3]	Weekday AM	Weekday PM
2016 with development of school district campus (Case 5-Improvement 1)[4]	B (14.8)	B (13.2)
2016 with development of school district campus (Case 5-Improvement 2)[5]	B (20.5)	B (16.2)

[1] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[2] Lane configurations at this intersection were based upon a site entrance plan prepared by Landmark Engineering, dated December 1, 2010. Due to the school entrance a higher heavy vehicle percentage, 7%, was used in the intersection analyses.
[3] A cycle length of 90 seconds was used for all conditions.
[4] Improvement 1 involved using a protected/permissive northbound left turn movement.
[5] Improvement 2 involved changing the northbound lane assignments to be one left turn lane and one shared through/left turn lane, with a northbound/southbound split phase.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[6] Two-Way Stop Control (T-intersection)	**LOS**	
Old State Road/Spring Creek Drive	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Northbound Old State Road - Through/Left	A (8.3)	A (7.8)
Eastbound Spring Creek Drive	A (9.2)	A (9.4)
2012 without development of school district campus (Case 2)		
Northbound Old State Road - Through/Left	A (8.3)	A (7.8)
Eastbound Spring Creek Drive	A (9.2)	A (9.4)
2012 with development of early childhood center and elementary school only (Case 3)		
Northbound Old State Road - Through/Left	A (8.7)	A (8.1)
Eastbound Spring Creek Drive	B (10.6)	B (10.6)
2016 without development of school district campus (Case 4)		
Northbound Old State Road - Through/Left	A (8.4)	A (7.8)
Eastbound Spring Creek Drive	A (9.2)	A (9.4)
2016 with development of school district campus (Case 5)		
Northbound Old State Road - Through/Left	A (9.8)	A (8.9)
Eastbound Spring Creek Drive	C (17.9)	B (14.9)

[6] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[7] **Two-Way Stop Control**	**LOS**	
Old State Road/Chestnut Lane/Olivine Circle	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Northbound Old State Road	A (7.3)	A (7.7)
Southbound Old State Road	A (7.3)	A (7.3)
Westbound Olivine Circle	A (8.9)	A (8.8)
Eastbound Chestnut Lane	B (10.0)	A (9.7)
2012 without development of school district campus (Case 2)		
Northbound Old State Road	A (7.3)	A (7.7)
Southbound Old State Road	A (7.3)	A (7.3)
Westbound Olivine Circle	A (8.9)	A (8.8)
Eastbound Chestnut Lane	B (10.0)	A (9.7)
2012 with development of early childhood center and elementary school only (Case 3)		
Northbound Old State Road	A (7.6)	A (8.0)
Southbound Old State Road	A (7.5)	A (7.5)
Westbound Olivine Circle	A (9.9)	A (9.6)
Eastbound Chestnut Lane	B (12.2)	B (11.0)

[7] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 4 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[8] **Two-Way Stop Control**	**LOS**	
Old State Road/Chestnut Lane/Olivine Circle	Weekday AM	Weekday PM
2016 without development of school district campus (Case 4)		
Northbound Old State Road	A (7.3)	A (7.7)
Southbound Old State Road	A (7.3)	A (7.3)
Westbound Olivine Circle	A (8.9)	A (8.8)
Eastbound Chestnut Lane	B (10.0)	A (9.8)
2016 with development of school district campus (Case 5)		
Northbound Old State Road	A (8.1)	A (8.8)
Southbound Old State Road	A (8.6)	A (7.8)
Westbound Olivine Circle	B (15.0)	B (11.8)
Eastbound Chestnut Lane	C (23.9)	C (15.5)

[8] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 5
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[9] Two-Way Stop Control	**LOS**	
Old State Road/Owensby Drive/Stonefield Drive	Weekday AM	Weekday PM
2011 Existing (Case 1)[10]		
Northbound Old State Road	A (7.3)	A (7.7)
Southbound Old State Road	A (7.3)	A (7.3)
Westbound Stonefield Drive	A (9.2)	A (9.1)
Eastbound Owensby Drive	A (9.3)	A (9.8)
2012 without development of school district campus (Case 2)		
Northbound Old State Road	A (7.3)	A (7.7)
Southbound Old State Road	A (7.3)	A (7.3)
Westbound Stonefield Drive	A (9.2)	A (9.1)
Eastbound Owensby Drive	A (9.3)	A (9.9)
2012 with development of early childhood center and elementary school only (Case 3)		
Northbound Old State Road	A (7.6)	A (8.0)
Southbound Old State Road	A (7.5)	A (7.5)
Westbound Stonefield Drive	B (11.2)	B (10.3)
Eastbound Owensby Drive	B (10.9)	B (11.4)

[9] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[10] Heavy vehicle percentages were not available for this intersection. Analysis utilized heavy vehicle percentages from the Old State Road and Chestnut Lane/Olivine Circle intersection.

Table 5 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[11] **Two-Way Stop Control**	**LOS**	
Old State Road/Owensby Drive/Stonefield Drive	Weekday AM	Weekday PM
2016 without development of school district campus (Case 4)		
Northbound Old State Road	A (7.3)	A (7.7)
Southbound Old State Road	A (7.3)	A (7.3)
Westbound Stonefield Drive	A (9.3)	A (9.1)
Eastbound Owensby Drive	A (9.3)	A (9.9)
2016 with development of school district campus (Case 5)		
Northbound Old State Road	A (8.1)	A (8.8)
Southbound Old State Road	A (8.6)	A (7.8)
Westbound Stonefield Drive	C (23.4)	B (14.3)
Eastbound Owensby Drive	C (18.7)	C (16.7)

[11] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 6
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[12] **Two-Way Stop Control**	**LOS**	
Spring Creek Drive/Setter Court/Spaniel Court	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.2)	A (7.2)
Northbound Setter Court	A (8.4)	A (8.6)
Southbound Spaniel Court	A (8.8)	A (8.9)
2012 without development of school district campus (Case 2)[13]		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.2)	A (7.2)
Northbound Setter Court	A (8.4)	A (8.6)
Southbound Spaniel Court	A (8.8)	A (8.9)
2012 with development of early childhood center and elementary school only (Case 3)		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.2)	A (7.2)
Northbound Setter Court	A (8.4)	A (8.6)
Southbound Spaniel Court	A (8.8)	A (8.9)

[12] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[13] Existing PHF utilized in future conditions (Cases 2 through 5) analyses since the intersection volumes did not increase from the existing volumes.

Table 6 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[14] Two-Way Stop Control	**LOS**	
Spring Creek Drive/Setter Court/Spaniel Court	Weekday AM	Weekday PM
2016 without development of school district campus (Case 4)		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.2)	A (7.2)
Northbound Setter Court	A (8.4)	A (8.6)
Southbound Spaniel Court	A (8.8)	A (8.9)
2016 with development of school district campus (Case 5)		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.2)	A (7.2)
Northbound Setter Court	A (8.4)	A (8.6)
Southbound Spaniel Court	A (8.8)	A (8.9)

[14] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 7
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[15] Two-Way Stop Control	**LOS**	
Spring Creek Drive/Labrador Lane	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.7)	A (7.2)
Northbound Labrador Lane	A (8.4)	A (9.5)
Southbound Labrador Lane	A (8.6)	A (8.9)
2012 without development of school district campus (Case 2)[16]		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.7)	A (7.2)
Northbound Labrador Lane	A (8.4)	A (9.5)
Southbound Labrador Lane	A (8.6)	A (8.9)
2012 with development of early childhood center and elementary school only (Case 3)		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.7)	A (7.2)
Northbound Labrador Lane	A (8.4)	A (9.5)
Southbound Labrador Lane	A (8.6)	A (8.9)

[15] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[16] Existing PHF utilized in future conditions (Cases 2 through 5) analyses since the intersection volumes did not increase from the existing volumes.

Table 7 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[17] **Two-Way Stop Control**	**LOS**	
Spring Creek Drive/Labrador Lane	Weekday AM	Weekday PM
2016 without development of school district campus (Case 4)		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.7)	A (7.2)
Northbound Labrador Lane	A (8.4)	A (9.5)
Southbound Labrador Lane	A (8.6)	A (8.9)
2016 with development of school district campus (Case 5)		
Eastbound Spring Creek Drive	A (7.2)	A (7.3)
Westbound Spring Creek Drive	A (7.7)	A (7.2)
Northbound Labrador Lane	A (8.4)	A (9.5)
Southbound Labrador Lane	A (8.6)	A (8.9)

[17] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 8
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[18] Two-Way Stop Control (T-intersection)	**LOS**	
Old State Road/Taylors Bridge Road	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Southbound Old State Road – Through/Left	A (7.5)	A (7.5)
Westbound Taylors Bridge Road	B (10.3)	A (9.4)
2012 without development of school district campus (Case 2)		
Southbound Old State Road – Through/Left	A (7.6)	A (7.6)
Westbound Taylors Bridge Road	B (11.1)	A (9.8)
2012 with development of early childhood center and elementary school only (Case 3)		
Southbound Old State Road – Through/Left	A (7.8)	A (7.9)
Westbound Taylors Bridge Road	B (14.0)	B (11.8)
2016 without development of school district campus (Case 4)		
Southbound Old State Road – Through/Left	A (7.6)	A (7.7)
Westbound Taylors Bridge Road	B (11.3)	A (9.9)
2016 with development of school district campus (Case 5)		
Southbound Old State Road – Through/Left	A (8.5)	A (8.8)
Westbound Taylors Bridge Road	F (104.6)	C (24.9)

[18] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 8 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[19] Two-Way Stop Control (T-intersection)	**LOS**	
Old State Road/Taylors Bridge Road	Weekday AM	Weekday PM
2016 with development of school district campus (Case 5 - Improvement)[20]		
Southbound Old State Road – Through/Left	A (8.5)	A (8.8)
Westbound Taylors Bridge Road – Left	D (34.6)	D (28.7)
Westbound Taylors Bridge Road – Right	C (15.1)	B (11.1)

Roundabout[21]	**LOS**	
Old State Road/Taylors Bridge Road	Weekday AM	Weekday PM
2016 with development of school district campus (Case 5)		
Northbound Old State Road	A (7.6)	A (9.0)
Southbound Old State Road	A (9.0)	A (10.0)
Westbound Taylors Bridge Road	B (13.3)	B (11.6)

[19] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[20] Proposed improvement consists of installing separate left turn and right turn lanes to the westbound approach of Taylors Bridge Road.
[21] Roundabout analysis was performed using SIDRA Intersection 5.0. The numbers in parenthesis following level of service are average delay per vehicle, measured in seconds, calculated with the SIDRA Intersection US HCM Model. The analysis assumed an environment factor of 1.2.

Table 8 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[22] Two-Way Stop Control (T-intersection)	**LOS**	
Old State Road/Taylors Bridge Road[23]	Weekday AM	Weekday PM
2012 with development of early childhood center and elementary school only (Case 3)		
Northbound Taylors Bridge Road – Left	A (7.7)	A (7.9)
Eastbound Old State Road – Left	C (16.0)	B (12.0)
Eastbound Old State Road – Right	A (8.7)	A (9.5)
2016 with development of school district campus (Case 5 - Improvement)		
Northbound Taylors Bridge Road – Left	A (8.9)	A (8.3)
Eastbound Old State Road – Left	F (97.1)	C (20.2)
Eastbound Old State Road – Right	A (9.0)	A (10.0)

Signalized Intersection[22]	**LOS**	
Old State Road/Taylors Bridge Road[23]	Weekday AM	Weekday PM
2012 with development of early childhood center and elementary school only (Case 3)	B (12.1)	B (13.2)
2016 with development of school district campus (Case 5 - Improvement)	B (12.3)	B (13.4)

[22] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[23] The intersection geometry is based on the realignment of Taylors Bridge Road. The intersection configuration includes one through lane and one right turn lane on southbound Old State Road, one though and one left turn lane on northbound Taylors Bridge Road and one left turn and one right turn lane on eastbound Old State Road.

Table 9
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[24] Two-Way Stop Control (T-intersection)	**LOS**	
Old State Road/Kingfisher Court	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Northbound Old State Road – Through/Left	A (7.8)	A (7.5)
Eastbound Kingfisher Court	B (10.4)	A (10.0)
2012 without development of school district campus (Case 2)		
Northbound Old State Road – Through/Left	A (7.8)	A (7.7)
Eastbound Kingfisher Court	B (11.2)	B (10.8)
2012 with development of early childhood center and elementary school only (Case 3)		
Northbound Old State Road – Through/Left	A (8.1)	A (7.8)
Eastbound Kingfisher Court	B (12.8)	B (11.7)
2016 without development of school district campus (Case 4)		
Northbound Old State Road – Through/Left	A (7.8)	A (7.7)
Eastbound Kingfisher Court	B (11.3)	B (10.9)
2016 with development of school district campus (Case 5)		
Northbound Old State Road – Through/Left	A (9.0)	A (8.1)
Eastbound Kingfisher Court	C (20.4)	B (14.7)

[24] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 10
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[25] Two-Way Stop Control	**LOS**	
Old State Road/Old Squaw Road	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Northbound Old State Road – Through/Left	A (7.3)	A (7.6)
Southbound Old State Road	A (8.1)	A (7.6)
Westbound Old Squaw Road	B (10.4)	B (10.3)
Eastbound Old Squaw Road	B (10.8)	B (10.9)
2012 without development of school district campus (Case 2)		
Northbound Old State Road – Through/Left	A (7.3)	A (7.8)
Southbound Old State Road	A (8.3)	A (7.7)
Westbound Old Squaw Road	B (11.1)	B (11.2)
Eastbound Old Squaw Road	B (11.6)	B (12.0)
2012 with development of early childhood center and elementary school only (Case 3)		
Northbound Old State Road – Through/Left	A (7.5)	A (7.9)
Southbound Old State Road	A (8.5)	A (7.9)
Westbound Old Squaw Road	B (12.1)	B (12.4)
Eastbound Old Squaw Road	B (13.4)	B (13.2)

[25] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 10 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[26] **Two-Way Stop Control**	**LOS**	
Old State Road/Old Squaw Road	Weekday AM	Weekday PM
2016 without development of school district campus (Case 4)		
Northbound Old State Road – Through/Left	A (7.3)	A (7.8)
Southbound Old State Road	A (8.3)	A (7.8)
Westbound Old Squaw Road	B (11.2)	B (11.4)
Eastbound Old Squaw Road	B (11.8)	B (12.2)
2016 with development of school district campus (Case 5)		
Northbound Old State Road – Through/Left	A (8.1)	A (8.1)
Southbound Old State Road	A (9.1)	A (8.4)
Westbound Old Squaw Road	C (15.9)	C (15.1)
Eastbound Old Squaw Road	C (22.0)	C (16.4)

[26] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 11
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[27] Two-Way Stop Control (T-intersection)	**LOS**	
Taylors Bridge Road/Thomas Landing Road	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Eastbound Taylors Bridge Road – Through/Left	A (7.4)	A (7.5)
Southbound Thomas Landing Road	A (9.5)	A (9.3)
2012 without development of school district campus (Case 2)		
Eastbound Taylors Bridge Road – Through/Left	A (7.5)	A (7.6)
Southbound Thomas Landing Road	B (10.0)	A (9.9)
2012 with development of early childhood center and elementary school only (Case 3)		
Eastbound Taylors Bridge Road – Through/Left	A (7.6)	A (7.6)
Southbound Thomas Landing Road	B (10.3)	B (10.0)
2016 without development of school district campus (Case 4)		
Eastbound Taylors Bridge Road – Through/Left	A (7.5)	A (7.6)
Southbound Thomas Landing Road	B (10.1)	A (10.0)
2016 with development of school district campus (Case 5)		
Eastbound Taylors Bridge Road – Through/Left	A (7.8)	A (7.7)
Southbound Thomas Landing Road	B (11.7)	B (10.5)

[27] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 12
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[28] Two-Way Stop Control (T-intersection)	**LOS**	
Thomas Landing Road/Cantwell Drive[29]	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Southbound Thomas Landing Road - Left	A (7.3)	A (7.9)
Westbound Cantwell Drive - Left	A (9.6)	A (9.3)
Westbound Cantwell Drive - Right	A (8.8)	A (8.8)
2012 without development of school district campus (Case 2)		
Southbound Thomas Landing Road - Left	A (7.3)	A (7.9)
Westbound Cantwell Drive - Left	A (9.6)	A (9.3)
Westbound Cantwell Drive - Right	A (8.8)	A (8.8)
2012 with development of early childhood center and elementary school only (Case 3)		
Southbound Thomas Landing Road - Left	A (7.3)	A (7.9)
Westbound Cantwell Drive - Left	A (9.8)	A (9.4)
Westbound Cantwell Drive - Right	A (8.8)	A (8.9)

[28] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[29] Based upon field conditions, the Southbound Thomas Landing Road approach contains a bypass lane. As such, the approach has been modeled in HCS with one left turn lane and one through lane. In addition, no striping exists on the westbound Cantwell Drive approach. However, based on field observations this approach was analyzed as separate left turn and right turn lanes.

Table 12 (Continued)
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[30] **Two-Way Stop Control** **(T-intersection)**	**LOS**	
Thomas Landing Road/Cantwell Drive	Weekday AM	Weekday PM
2016 without development of school district campus (Case 4)		
Southbound Thomas Landing Road - Left	A (7.3)	A (7.9)
Westbound Cantwell Drive - Left	A (9.7)	A (9.4)
Westbound Cantwell Drive - Right	A (8.8)	A (8.8)
2016 with development of school district campus (Case 5)		
Southbound Thomas Landing Road - Left	A (7.3)	A (8.0)
Westbound Cantwell Drive - Left	B (10.3)	A (9.8)
Westbound Cantwell Drive - Right	A (8.9)	A (9.0)

[30] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

Table 13
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Traffic Impact Study for Appoquinimink School District Old State Road Campus
Prepared by JMT

Unsignalized Intersection[31] **Two-Way Stop Control** **(T-intersection)**	**LOS**	
Taylors Bridge Road/Corbit Sharp Drive	Weekday AM	Weekday PM
2011 Existing (Case 1)		
Eastbound Taylors Bridge Road – Through/Left	A (7.4)	A (7.4)
Southbound Corbit Sharp Drive	A (8.8)	A (8.6)
2012 without development of school district campus (Case 2)		
Eastbound Taylors Bridge Road – Through/Left	A (7.6)	A (7.4)
Southbound Corbit Sharp Drive	A (9.2)	A (8.9)
2012 with development of early childhood center and elementary school only (Case 3)		
Eastbound Taylors Bridge Road – Through/Left	A (7.7)	A (7.5)
Southbound Corbit Sharp Drive	A (9.4)	A (8.9)
2016 without development of school district campus (Case 4)		
Eastbound Taylors Bridge Road – Through/Left	A (7.6)	A (7.4)
Southbound Corbit Sharp Drive	A (9.2)	A (8.9)
2016 with development of school district campus (Case 5)		
Eastbound Taylors Bridge Road – Through/Left	A (7.9)	A (7.6)
Southbound Corbit Sharp Drive	B (10.0)	A (9.1)

[31] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.