



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

CAROLANN WICKS, P.E.  
SECRETARY

June 3, 2010

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 Operational Analysis (TOA) review letter for the **Churchmans Meadows** 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 TOA to conform to DelDOT's Standards and Regulations for Subdivision Streets and State Highway Access and other accepted practices and procedures for such studies. DelDOT accepts this TOA review and concurs with the recommendations. We are providing it to you in fulfillment of our joint agreement regarding the review of TOA. If you have any questions concerning this letter or the attached review letter, please contact me at (302) 760-2109.

Sincerely,

T. William Brockenbrough, Jr.  
County Coordinator

TWB:tby  
Enclosures

cc with enclosures: Ms. Constance C. Holland, Office of State Planning Coordination  
Ms. Tigist Zegeye, WILMAPCO  
Mr. Larry J. Tarabicos, Young, Conaway, Stargatt & Taylor  
Mr. Thomas D. Carroll, Landmark 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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Joshua Schwartz, Subdivision Manager, Development Coordination  
Troy Brestel, Project Engineer, Development Coordination

June 3, 2010

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. 51A – Churchmans Meadows**

Dear Mr. Sammons,

McCormick Taylor has completed its review of the Traffic Operational Analysis (TOA) for the Churchmans Meadows development prepared by Landmark Engineering, Inc. (Landmark), dated December 4, 2009. This review was assigned as Task Number 51A. Landmark prepared the report in a manner generally consistent with DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*.

The TOA evaluates the impacts of the Churchmans Meadows development, proposed to be located west of Christiana-Stanton Road (New Castle Road 26) directly opposite the intersection with Road A (New Castle Road 336A) in New Castle County, Delaware. The proposed development would consist of 245 apartments and a 6,400 square-foot clubhouse on approximately 29 acres of land. One access point is proposed on the 300-foot stub street known as Eagle Run Road (as depicted on this application), approximately 225 feet west of Christiana-Stanton Road. West of the proposed Churchmans Meadows development, there is a separate existing road also called Eagle Run Road (New Castle Road 347), which intersects Delaware Route 273 opposite Chapman Road (also New Castle Road 347) and currently ends approximately 2,500 feet north of Delaware Route 273. To avoid confusion and excess wordiness, the existing stub street that intersects Christiana-Stanton Road is identified as "Eagle Run Road Stub" throughout this TOA review. The Churchmans Meadows site entrance off Eagle Run Road Stub was actually already constructed in 2008 as part of a previously-approved plan for this site. This would remain as the only access point. Construction is anticipated to be complete by 2016.

The land is currently zoned as ST (Suburban Transition) within New Castle County, and the developer does not propose to change the zoning. The developer proposes to develop the site under the Work Force Housing Option of the New Castle County Unified Development Code (UDC). A previously-approved plan for the site consisted of 145 age-restricted townhouses and a clubhouse. However, nothing was built on the property. Now the developer has redesigned the site for 245 apartments instead of 145 age-restricted townhouses.

There are three relevant roadway projects in the study area:

- DelDOT's *SR 1 / I-95 Interchange* project (State Contract No. 28-090-03)
- DelDOT's Road A Improvements Agreement (with the developer of the Christiana Fashion Center)
- Eagle Run Road extension (by others)

The *SR 1 / I-95 Interchange* project is a major reconstruction of the nearby interchange to add high speed connecting ramps from northbound Delaware Route 1 to northbound I-95 and from southbound I-95 to southbound Delaware Route 1. This will reduce traffic weaving and congestion around the Christiana Mall, Delaware Route 1 and I-95 area. Along with separating local traffic movements from high-speed through movements, the project will include improvements to local intersections within the study area and will affect travel patterns through these intersections. Specifically, one element that would directly affect one of the local intersections included in this TOA study is a new ramp from southbound I-95 that would become the fourth leg of the intersection of Road A and the Southbound Delaware Route 1 Ramps. Lane configurations and turn-lane lengths on the existing approaches of that intersection would also be modified. The *SR 1 / I-95 Interchange* project is in final design and is funded for construction, which will begin as early as the spring of 2011 and will continue for at least three years.

The second project is DelDOT's Road A Improvements Agreement. This is an agreement that DelDOT entered into in 2006 with the developer of the planned Christiana Fashion Center (to be located east of the eastern terminus of Road A). DelDOT agreed to monitor and analyze traffic conditions at the intersections on Road A every two years. When conditions reached Level of Service (LOS) E or F, DelDOT would design and construct improvements needed to attain LOS D or better. Road A improvements should be designed and constructed in coordination with DelDOT's *SR 1 / I-95 Interchange* project.

The third roadway project, which potentially has a significant impact on the proposed Churchmans Meadows development, is the planned extension of Eagle Run Road. This project would connect the existing portion of Eagle Run Road heading north from Delaware Route 273 over to Christiana-Stanton Road. While design of the Eagle Run Road extension is not complete, one potential alignment would send Eagle Run Road north of the Christiana Medical Center office complex. If this alignment were to be built, it is unlikely that the proposed Churchmans Meadows development would have direct access to Eagle Run Road. However, the TOA (Landmark) assumed that the Eagle Run Road extension would connect to Eagle Run Road Stub at the north end of the Churchmans Meadows property. If this alignment were to be built, existing Eagle Run Road, the Eagle Run Road extension, and Eagle Run Road Stub would be collectively known as Eagle Run Road. Churchmans Meadows traffic would have direct access to Eagle Run Road and could use it to reach Christiana-Stanton Road and Delaware Route 273 (at either end of Eagle Run Road). The Eagle Run Road extension would be constructed by the developer of the proposed Promenade at Christiana and/or Market Place at Christiana development(s). The construction schedule is undetermined at this time.

As mentioned above, the TOA assumed the Eagle Run Road extension (from Delaware Route 273) would connect to Eagle Run Road Stub. All TOA analyses that include the Eagle Run Road extension are based on this alignment.

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

New Castle County has determined that the proposed development is a Minor Plan that would provide Workforce Housing. Thus the County cannot require a Traffic Impact Study and the development is not subject to the transportation concurrency requirements in the Unified Development Code (UDC). Because the development is not a Major Plan and does not require rezoning, the County did not require preliminary traffic information. However, the developer did give the County a comparison of trip generation between the proposed development and the approved development. The County relayed this information to DelDOT, which required the TOA.

Based on DelDOT’s evaluation criteria, the following intersections exhibit LOS deficiencies 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>
Eagle Run Road Stub and Christiana-Stanton Road	Unsignalized	2016 PM with Churchmans Meadows (with Eagle Run Road extension)
Christiana-Stanton Road and Road A	Signalized	2016 PM without and with Churchmans Meadows
Road A and Southbound Delaware Route 1 Ramps	Signalized	2016 PM without and with Churchmans Meadows
Road A and Northbound Delaware Route 1 Ramps / Center Boulevard (New Castle Road 336A)	Signalized	2016 PM without and with Churchmans Meadows

Although analysis indicates that the intersections along Road A would have LOS deficiencies during the future PM peak hour, due to the timing of DelDOT’s *SR 1 / I-95 Interchange* project and DelDOT’s agreement with the developer of the Christiana Fashion Center, we do not recommend any improvements be implemented directly by the developer at these intersections. Capacity improvements at these intersections should be completed as part of the DelDOT project and/or DelDOT’s agreement with the Christiana Fashion Center developer. In lieu of constructing specific improvements at these intersections, the developer of Churchmans Meadows should contribute funds toward improvements at the intersection of Christiana-Stanton Road and Road A, as described below in Item Nos. 5 and 6.

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. In anticipation of the potential future extension of Eagle Run Road from Delaware Route 273 to Eagle Run Road Stub as proposed by others, the developer should dedicate to DelDOT sufficient right-of-way along the northern edge of the property to the west of the existing site entrance on Eagle Run Road Stub. The right-of-way dedication has been determined to be 10 feet wide and 355 feet long, measured from the proposed entrance. The location and exact dimensions should be subject to review by DelDOT's Subdivision Section in their review of the preliminary plan, provided however that the dimensions of the right-of-way shall not exceed the aforesaid.
2. In anticipation of the potential future extension of Eagle Run Road from Delaware Route 273 to Eagle Run Road Stub as proposed by others, the developer should dedicate to DelDOT an additional 5 feet of right-of-way and a 5-foot wide permanent easement beyond the right-of-way along the Eagle Run Road Stub site frontage, from Christiana-Stanton Road to the existing site entrance on Eagle Run Road Stub. The location and exact dimensions should be subject to review by DelDOT's Subdivision Section in their review of the preliminary plan, provided however that the dimensions of the right-of-way shall not exceed the aforesaid.
3. The developer should enter into an agreement with DelDOT to fund a proportional share of improvements to the intersection of Eagle Run Road Stub and Christiana-Stanton Road if Eagle Run Road is extended from Delaware Route 273 to Eagle Run Road Stub as proposed by others. These improvements include the construction and striping of an exclusive left-turn lane on the northbound approach of Christiana-Stanton Road. As presently contemplated they exclude any work on Eagle Run Road Stub. To the extent that such work is added, the developer should not be required to contribute toward that added work.

At least one other developer (Market Place at Christiana) is expected to be responsible for part of these improvements as well. The Churchmans Meadows share would be based on only the number of additional trips generated by 245 apartments beyond the number of trips generated by the previously-approved 145 age-restricted townhouses.

The initial recommended minimum turn-lane length (excluding taper) is 465 feet for this left-turn lane on northbound Christiana-Stanton Road (based on DelDOT's *Road Design Manual* and queuing analysis).

The combined length of the northbound left-turn lane and the length of southbound left-turn lane(s) needed to accommodate queues on Christiana-Stanton Road at Road A will exceed the available distance between intersections (approximately 650 feet). As such, these left-turn lanes may need to be constructed side-by-side instead of back-to-back.

Based on the current proposals for the Market Place at Christiana and Churchmans Meadows, Churchmans Meadows’ proportional share is calculated to be 11.2 percent and based on preliminary plans and current construction costs, this improvement is estimated to cost \$560,373. Therefore Churchmans Meadows’ share of the improvements is estimated to be \$62,762 in current dollars. The terms of the agreement should be subject to review by DeIDOT’s Subdivision Section but should cap Churchmans Meadows’ contribution toward this improvement at the amount just stated with an adjustment for inflation.

4. The developer should enter into a traffic signal agreement with DeIDOT for the intersection of Eagle Run Road Stub and Christiana-Stanton Road. As per standard DeIDOT practice, the agreement should provide that the signal will only be installed if warrants are met. The agreement should include pedestrian signals, crosswalks, interconnection, and ITS equipment such as CCTV cameras at DeIDOT’s discretion. At least one other developer (Market Place at Christiana) is expected to enter into a traffic signal agreement for this intersection as well. The developer should coordinate with DeIDOT on the implementation of the traffic signal.

Based on the current proposals for the Market Place at Christiana and Churchmans Meadows, Churchmans Meadows’ proportional share is calculated to be 11.2 percent and based on preliminary plans and current construction costs, this improvement is estimated to cost \$225,000. Therefore Churchmans Meadows’ share of the improvements is estimated to be \$25,200 in current dollars. The terms of the agreement should be subject to review by DeIDOT’s Traffic Section but should cap Churchmans Meadows’ contribution toward this improvement at the amount just stated with an adjustment for inflation.

5. The developer should enter into an agreement with DeIDOT to fund a proportional share of improvements to the intersection of Christiana-Stanton Road and Road A. The proposed configuration is shown in the table below. Should an alternative design be developed for this intersection, the developer should fund a proportional share of those improvements.

Approach	Current Configuration	Proposed Configuration
Northbound Christiana-Stanton Road	One through lane and one right-turn lane	One through lane and one right-turn lane
Southbound Christiana-Stanton Road	One left-turn lane and one through lane	Two left-turn lanes and one through lane
Westbound Road A	One shared left/right-turn lane	One left-turn lane and one right-turn lane

If Eagle Run Road is not extended, the second left-turn on the southbound approach of Christiana-Stanton Road may not be required to achieve acceptable LOS, although it

would be desired to better accommodate queues. Additionally, if that second left-turn lane is added to the southbound approach, a third receiving lane would be needed along eastbound Road A, such that eastbound Road A would consist of two through lanes continuing through the downstream traffic signal at the southbound Delaware Route 1 Ramps and one right-turn lane for turns onto the ramp to southbound Delaware Route 1.

Due to the projected volumes and corresponding queues, and the close proximity of existing and planned traffic signals, DelDOT may develop an alternate design for this intersection. At least one other developer (Market Place at Christiana) is expected to be responsible for part of these improvements as well. The Churchmans Meadows share would be based on only the number of additional trips generated by 245 apartments beyond the number of trips generated by the previously-approved 145 age-restricted townhouses. The developer of Churchmans Meadows should coordinate with DelDOT's Subdivision Section and Division of Transportation Solutions, and with the developer of Market Place at Christiana, to determine the final lane configurations and turn-lane lengths on each approach, and to discuss implementation of these improvements.

Based on the current proposals for the Market Place at Christiana and Churchmans Meadows, Churchmans Meadows' proportional share is calculated to be 8.2 percent and based on preliminary plans and current construction costs, this improvement is estimated to cost \$556,706. Therefore Churchmans Meadows' share of the improvements is estimated to be \$45,650 in current dollars. The terms of the agreement should be subject to review by DelDOT's Subdivision Section but should cap Churchmans Meadows' contribution toward this improvement at the amount just stated with an adjustment for inflation.

6. The developer should enter into a traffic signal agreement with DelDOT for the intersection of Christiana-Stanton Road and Road A. The agreement will cover modifications to the existing signal required by the physical improvements noted in Item No. 5. The agreement should include pedestrian signals, crosswalks, interconnection, and ITS equipment such as CCTV cameras at DelDOT's discretion. At least one other developer (Market Place at Christiana) is expected to enter into a traffic signal agreement for this intersection as well. The developer should coordinate with DelDOT on the implementation of the traffic signal.

Based on the current proposals for the Market Place at Christiana and Churchmans Meadows, Churchmans Meadows' proportional share is calculated to be 8.2 percent and based on preliminary plans and current construction costs, this improvement is estimated to cost \$180,000. Therefore Churchmans Meadows' share of the improvements is estimated to be \$14,760 in current dollars. The terms of the agreement should be subject to review by DelDOT's Traffic Section but should cap Churchmans Meadows' contribution toward this improvement at the amount just stated with an adjustment for inflation.

7. The following bicycle, pedestrian, and transit improvements should be included:
- a. If Eagle Run Road is extended from Delaware Route 273 to Eagle Run Road Stub by others as proposed, a right-turn yield to bikes sign (MUTCD R4-4) should be added at the start of the right-turn lane added to Eagle Run Road.
  - b. Sidewalks along the Eagle Run Road Stub and Christiana-Stanton Road site frontages should be upgraded as needed to ensure they are ADA compliant. The sidewalks should connect to any paths on adjacent parcels or to the shoulder at the beginning and ending limits of the site frontage.
  - c. ADA compliant curb ramps and crosswalks should be provided at all pedestrian crossings, including all site entrances. Type 3 curb ramps are discouraged.
  - d. 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.
  - e. Where internal sidewalks are located alongside of parking spaces, we recommend that a buffer or equivalent measure be provided to eliminate or account for vehicular overhang onto the sidewalk.
  - f. The developer should provide a paved shoulder for a bus pull-off at the existing bus stop along the Christiana-Stanton Road site frontage. The redesigned bus stop should be ADA-compliant and include a bus shelter.
  - g. In anticipation of the future extension of Eagle Run Road from Delaware Route 273 to Eagle Run Road Stub by others as proposed, the developer should dedicate to DeIDOT a permanent easement on Christiana-Stanton Road in the vicinity of Eagle Run Road Stub to accommodate a future bus pull-off. The permanent easement has been determined to be 15 feet wide and 190 feet long. The location and exact dimensions should be subject to review by DeIDOT's Subdivision Section in their review of the preliminary plan, provided however that the dimensions of the easement shall not exceed the aforesaid.
  - h. The developer should coordinate with the DTC and DeIDOT regarding the details and implementation of all transit-related improvements. Internal sidewalks should be connected to any new or redesigned transit facilities and parking facilities for bicyclists should be included.

Improvements in this TOA may be considered "significant" under DeIDOT's *Work Zone Safety and Mobility Procedures and Guidelines*. These guidelines are available on DeIDOT's website at [http://www.deldot.gov/information/pubs\\_forms/manuals/de\\_mutcd/index.shtml](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 DeIDOT's Traffic Section. Mr. Weiser can be reached at (302) 659-4073 or by email at [Adam.Weiser@state.de.us](mailto: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 DeIDOT's subdivision review process.

Additional details on our review of this TOA are attached. Please contact me at (302) 738-0203 or through e-mail at [ajparker@mtmail.biz](mailto: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:** December 4, 2009

**Prepared by:** Landmark Engineering, Inc.

**Prepared for:** M-C Development

**Tax parcel:** 09-030.00-031 and 09-024.00-033

**Generally consistent with DelDOT's *Standards and Regulations for Subdivision Streets and State Highway Access*:** Yes

## **Project Description and Background**

**Description:** The proposed development would consist of 245 apartments and a 6,400 square-foot clubhouse.

**Location:** The Churchmans Meadows development is proposed to be located west of Christiana-Stanton Road (New Castle Road 26) directly opposite the intersection with Road A (New Castle Road 336A) in New Castle County, Delaware. A site location map is included on Page 10.

**Amount of land to be developed:** approximately 29 acres of land

**Land use approval(s) needed:** Subdivision approval. The land is currently zoned as ST (Suburban Transition) within New Castle County, and the developer does not propose to change the zoning. The developer proposes to develop the site under the Work Force Housing Option of the New Castle County Unified Development Code (UDC). A previously-approved plan for the site consisted of 145 age-restricted townhouses and a clubhouse, but no structures have yet been built on the property, and now the developer has redesigned the site for 245 apartments instead of 145 age-restricted townhouses.

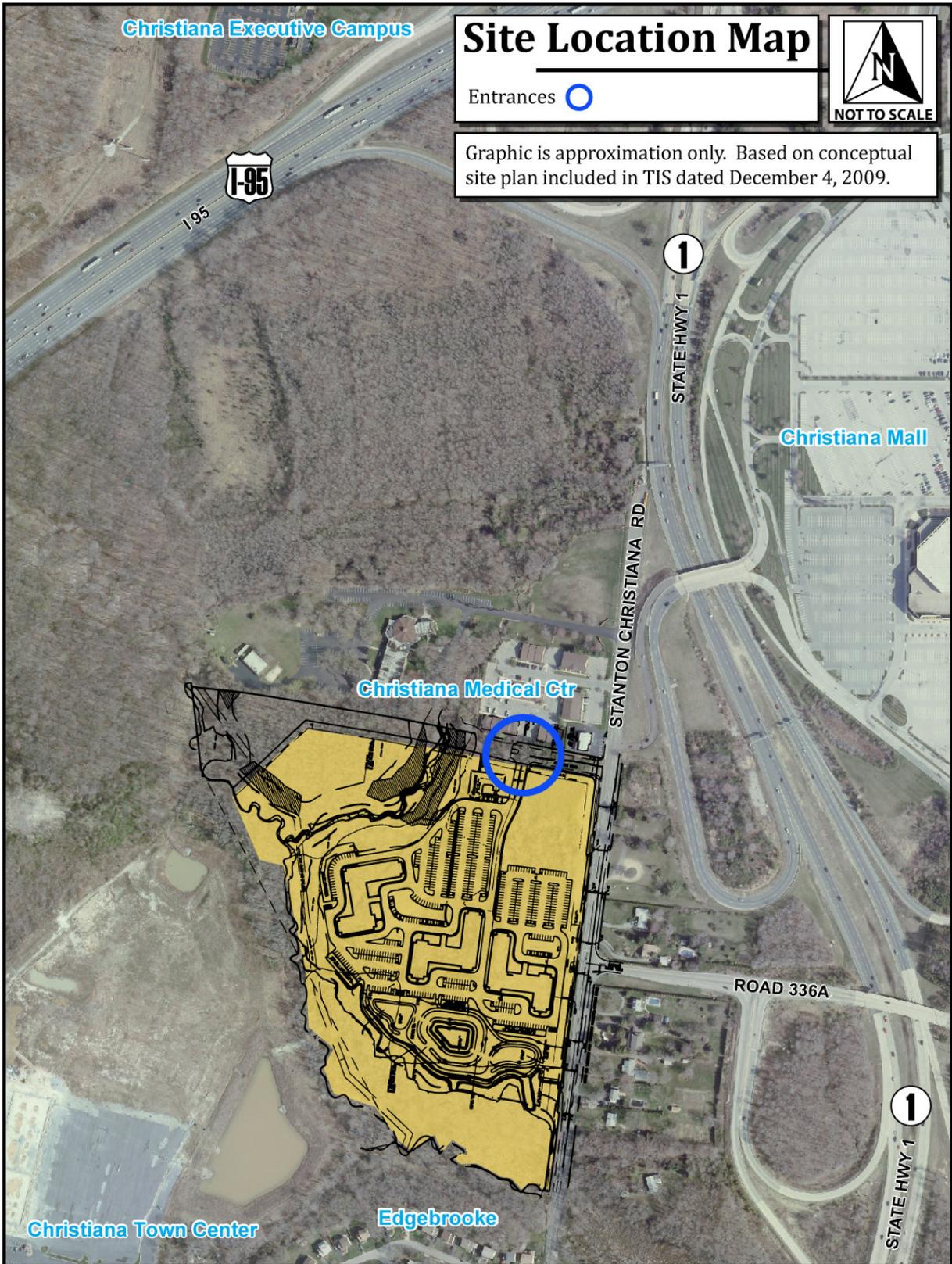
**Proposed completion date:** 2016

**Proposed access locations:** One access point is provided on the stub street known as Eagle Run Road (as depicted on this application). The stub street is approximately 300-feet in length, and the entrance is located approximately 225 feet west of Christiana-Stanton Road. The stub street and the site entrance were actually already constructed in 2008 as part of the previously-approved plan for this site. This will remain as the only access point.

West of the proposed Churchmans Meadows development, there is a separate existing road also called Eagle Run Road (New Castle Road 347), which intersects Delaware Route 273 opposite Chapman Road (New Castle Road 347). Eagle Run Road currently ends approximately 2,500 feet north of Delaware Route 273. To avoid confusion and excess wordiness, the existing stub street that intersects Christiana-Stanton Road is identified as "Eagle Run Road Stub" throughout this TOA review.

### **Daily Traffic Volumes:**

- 2008 Average Annual Daily Traffic on Christiana-Stanton Road: 2,004 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 proposed Churchmans Meadows development 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 Churchmans Meadows development falls within Investment Level 1 and is to be developed with apartments. According to Livable Delaware, higher densities are typical in these areas. 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 Churchmans Meadows development is located in an area with future land use designated as Medium Density Residential (3-9 dwelling units per acre).

Additionally, the parcel is currently zoned ST (Suburban Transition). The developer plans to use the Work Force Housing Option but does not plan to rezone the parcel. According to Section 40.02.221 of the New Castle County UDC, characteristics of ST zoning include:

- This district provides for high quality moderately high density development with a full range of residential and limited nonresidential uses.
- The design requirements provide a suburban transition character while encouraging pedestrian linkages in addition to automobile access.
- This intensity of this district accommodates a range of housing types from small single-family to multi-family.
- Projects with a gross density of 5 dwelling units per acre or greater shall have access to transit services.

**Proposed Development's Compatibility with Comprehensive Plan:** With 245 units on approximately 29 acres, the gross density of this residential development would be approximately 8.4 units per acre, which is near the upper end of the Medium Density range of 3-9 dwelling units per acre. The proposed development is planned as apartments, which is generally compatible with ST zoning as long as certain criteria are met, such as pedestrian linkages and access to transit facilities. 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: 224**

**TAZ Boundaries:**



**Current employment estimate for TAZ:** 156 jobs in 2005

**Future employment estimate for TAZ:** 196 jobs in 2030

**Current population estimate for TAZ:** 53 people in 2005

**Future population estimate for TAZ:** 380 people in 2030

**Current household estimate for TAZ:** 20 houses in 2005

**Future household estimate for TAZ:** 155 houses in 2030

**Relevant committed developments in TAZ:** Faith City Church

**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**

### **Relevant Roadway Projects**

There are three relevant roadway projects in the study area:

- DelDOT's *SR 1 / I-95 Interchange* project (State Contract No. 28-090-03)
- DelDOT's Road A Improvements Agreement (with the developer of the Christiana Fashion Center)
- Eagle Run Road extension (by others)

The *SR 1 / I-95 Interchange* project is a major reconstruction of the nearby interchange to add high speed connecting ramps from northbound Delaware Route 1 to northbound I-95 and from southbound I-95 to southbound Delaware Route 1. This will reduce traffic weaving and congestion around the Christiana Mall, Delaware Route 1 and I-95 area. Along with separating local traffic movements from high-speed through movements, the project will include improvements to local intersections within the study area and will affect travel patterns through these intersections. Specifically, one element that would directly affect one of the local intersections included in this TOA study is a new ramp from southbound I-95 that would become the fourth leg of the intersection of Road A and the Southbound Delaware Route 1 Ramps. Lane configurations and turn-lane lengths on the existing approaches of that intersection would also be modified. The *SR 1 / I-95 Interchange* project is in final design and is funded for construction, which will begin as early as the spring of 2011 and will continue for at least three years.

The second project is DelDOT's Road A Improvements Agreement. This is an agreement that DelDOT entered into in 2006 with the developer of the planned Christiana Fashion Center (to be located east of the eastern terminus of Road A). DelDOT agreed to monitor and analyze traffic conditions at the intersections on Road A every two years. When conditions reached Level of Service (LOS) E or F, DelDOT would design and construct improvements needed to attain LOS D or better. Road A improvements should be designed and constructed in coordination with DelDOT's *SR 1 / I-95 Interchange* project.

The third roadway project, which potentially has a significant impact on the proposed Churchmans Meadows development, is the planned extension of Eagle Run Road. This project would connect the existing portion of Eagle Run Road heading north from Delaware Route 273 over to Christiana-Stanton Road. While design of the Eagle Run Road extension is not complete, one potential alignment would send Eagle Run Road north of the Christiana Medical Center office complex. If this alignment were to be built, it is unlikely that the proposed Churchmans Meadows development would have direct access to Eagle Run Road. However, the TOA (Landmark) assumed that the Eagle Run Road extension would connect to Eagle Run Road Stub at the north end of the Churchmans Meadows property. If this alignment were to be built, existing Eagle Run Road, the Eagle Run Road extension, and Eagle Run Road Stub would be collectively known as Eagle Run Road. Churchmans Meadows traffic would have direct access to Eagle Run Road and could use it to reach Christiana-Stanton Road and Delaware Route 273 (at either end of Eagle Run Road). The Eagle Run Road extension would be constructed by the

developer of the proposed Promenade at Christiana and/or Market Place at Christiana development(s). The construction schedule is undetermined at this time.

As mentioned above, the TOA assumed the Eagle Run Road extension (from Delaware Route 273) would connect to Eagle Run Road Stub. All TOA analyses that include the Eagle Run Road extension are based on this alignment.

**Trip Generation**

Trip generation for the proposed development was computed using comparable land uses and equations contained in Trip Generation, Eighth Edition, published by the Institute of Transportation Engineers (ITE). AM, PM, and Saturday volumes are shown in the tables below, although this TOA only required analysis of PM conditions. The following land use was utilized to estimate the amount of new traffic generated for this development:

- 245 apartments (ITE Land Use Code 220)

Table 1  
CHURCHMANS MEADOWS PEAK HOUR TRIP GENERATION

Land Use	AM Peak Hour			PM Peak Hour			Saturday Mid-day		
	In	Out	Total	In	Out	Total	In	Out	Total
245 apartments	25	99	124	99	53	152	60	60	120
<b>TOTAL TRIPS</b>	<b>25</b>	<b>99</b>	<b>124</b>	<b>99</b>	<b>53</b>	<b>152</b>	<b>60</b>	<b>60</b>	<b>120</b>

Table 2  
CHURCHMANS MEADOWS DAILY TRIP GENERATION

Land Use	Weekday ADT			Saturday ADT		
	In	Out	Total	In	Out	Total
245 apartments	804	804	1608	834	834	1668
<b>TOTAL TRIPS</b>	<b>804</b>	<b>804</b>	<b>1608</b>	<b>834</b>	<b>834</b>	<b>1668</b>

**Overview of TOA**

**Intersections examined:**

- 1) Eagle Run Road Stub & Christiana-Stanton Road
- 2) Christiana-Stanton Road & Road A
- 3) Road A & Southbound Delaware Route 1 Ramps
- 4) Road A & Northbound Delaware Route 1 Ramps / Center Boulevard (New Castle Road 336A north of Road A)

**Conditions examined:**

- 1) 2009 existing conditions (Case 1)
- 2) 2016 without Churchmans Meadows (Case 2)
- 3) 2016 with Churchmans Meadows
  - a) With Eagle Run Road extension and with I-95 / Delaware Route 1 Interchange Project (Case 3A)
  - b) With Eagle Run Road extension and without I-95 / Delaware Route 1 Interchange Project (Case 3B)
  - c) Without Eagle Run Road extension and with I-95 / Delaware Route 1 Interchange Project (Case 3C)
  - d) Without Eagle Run Road extension and without I-95 / Delaware Route 1 Interchange Project (Case 3D)

**Peak hours evaluated:** Weekday evening peak hour

**Committed developments considered:**

- 1) Christiana Fashion Center (915,000 square-foot retail mall)
- 2) Christiana Town Center I (two 8,000 square-foot restaurants and one 10,000 square-foot restaurant)
- 3) Christiana Town Center II (200,000 square feet of retail space)
- 4) Christiana Mall Redevelopment (138,000 square-foot Nordstrom store, 85,000 square-foot Macy's addition, 43,881 square feet of new restaurants, and 4,805 square feet of additional retail space)
- 5) Faith City Church (21,200 square-foot gym / health spa addition to existing church)
- 6) Hudson Village I (77 townhouses)
- 7) Hudson Village II (113 townhouses)
- 8) Traditions at Christiana (25 single-family active-adult dwelling units)
- 9) Comfort Suites at Christiana (37-room addition to existing motel)
- 10) Market Place at Christiana / Budovitch Property (220,000 square feet of retail space, 62,400 square-foot (119-room) hotel, 15,600 square feet of office space, and a 5,000 square-foot restaurant)
- 11) Promenade at Christiana / Sears Property (446,850 square feet of retail space (to replace 286,498 square feet of retail/warehouse space))

**Intersection Descriptions**

**1) Eagle Run Road Stub & Christiana-Stanton Road**

**Type of Control:** two-way stop-controlled (T-intersection)

**Northbound approach:** (Christiana-Stanton Road) one shared through/left-turn lane

**Southbound approach:** (Christiana-Stanton Road) one shared through/right-turn lane

**Eastbound approach:** (Eagle Run Road Stub) one left-turn lane and one right-turn lane, stop-controlled

**Note:** The western leg of this intersection (Eagle Run Road Stub) is currently blocked by barricades. Therefore, no turning movements can be made at this intersection. A 300-foot section of Eagle Run Road Stub west of Christiana-Stanton Road, along with the Churchmans Meadows site entrance on Eagle Run Road Stub, were constructed in 2008

as part of the previously-approved plan for the site. However, nothing was built on the property at that time, and the roadway was blocked since Eagle Run Road Stub does not serve any destination (it dead ends just west of the site entrance). The intersection was originally planned to include an exclusive left-turn lane on the northbound approach of Christiana-Stanton Road, but this was changed to a shared through/left-turn lane during a DelDOT pavement rehabilitation project. It is assumed that this northbound exclusive left-turn lane would be striped for future conditions including Churchmans Meadows.

**2) Christiana-Stanton Road & Road A**

**Type of Control:** signalized three-leg intersection

**Northbound approach:** (Christiana-Stanton Road) one through lane and one right-turn lane

**Southbound approach:** (Christiana-Stanton Road) one left-turn lane and one through lane

**Westbound approach:** (Road A) one shared left/right-turn lane

**3) Road A & Southbound Delaware Route 1 Ramps**

**Type of Control:** signalized three-leg intersection

**Northbound approach:** (Delaware Route 1 Ramp) one left-turn lane and one right-turn lane

**Eastbound approach:** (Road A) one through lane and one right-turn lane

**Westbound approach:** (Road A) one left-turn lane and one through lane

**4) Road A & Northbound Delaware Route 1 Ramps / Center Boulevard**

**Type of Control:** signalized three-leg intersection

**Northbound approach:** (Delaware Route 1 Ramp) one left-turn lane and one through lane

**Southbound approach:** (Center Boulevard) one left-turn lane, one through lane, and one right-turn lane

**Eastbound approach:** (Road A) one left-turn lane and one right-turn lane

**Note:** There is a fourth leg of this intersection that has only been constructed as far as the curb returns. This is the eastern leg, which is a future site entrance for the planned Christiana Fashion Center. This is the reason for the southbound left-turn lane, but no traffic currently makes that movement.

**Transit, Pedestrian, and Bicycle Facilities**

**Existing transit service:** The Delaware Transit Corporation (DTC) currently operates four bus routes near the Churchmans Meadows development. Bus Routes 34, 40, 54 and 55 travel along Christiana-Stanton Road in the immediate vicinity of the site. These routes make many round trips each weekday. Saturday service is also offered on Routes 40, 54 and 55. These routes connect with numerous other bus routes nearby at the Christiana Mall and the Park & Ride at Delaware Route 273 & Delaware Route 7. There is a bus pad along Christiana-Stanton Road near the site.

**Planned transit service:** Landmark Engineering contacted Mr. Ivan Mitchell, a Service Development Planner for the DTC, to determine whether DTC has any plans to extend the existing transit system in the vicinity of the development. In a letter dated July 1, 2009, Mr. Mitchell replied and indicated the proposed future extension of Eagle Run Road could result in DTC developing additional routes and/or redesigning existing routes to serve the new corridor. He also described two transit-related improvements that should be included if the development moves forward, consisting of the following:

- Bus stops on Christiana-Stanton Road: A pedestrian path should be constructed to connect the existing bus pad on Christiana-Stanton Road to the proposed internal sidewalks. Additionally, that existing bus stop does not include a shoulder for a bus to egress from traffic, so DTC requests that this bus stop be redesigned to include a bus pull-off. The redesigned bus stop should be ADA-compliant. A location for another bus stop should be identified and reviewed for possible implementation. The developer should also make a one-time contribution of \$10,000 toward an endowment fund for maintenance of the redesigned bus stop and the future installation of a bus shelter at the planned bus stop.
- Bus stops on Eagle Run Road: To provide for future bus service, the developer should install two ADA-compliant bus stops along Eagle Run Road; one at the site entrance and the other at a corresponding location. The shoulders at these stops should be wide enough for a bus to egress from traffic. The developer should also make a one-time contribution of \$20,000 toward an endowment fund for maintenance of these two bus stops and the future installation of a bus shelter at one or both of these planned bus stops.

**Existing bicycle and pedestrian facilities:** According to the *New Castle County Bicycle Map*, Road A is designated as having above average cycling conditions. Christiana-Stanton Road and Center Boulevard are each designated as having below average cycling conditions. There are sidewalks in place along the site frontages on Christiana-Stanton Road and Eagle Run Road, and a crosswalk is in place across Eagle Run Road Stub at Christiana-Stanton Road. There are no bicycle lanes within the project area.

**Planned bicycle and pedestrian facilities:** DelDOT's Bicycle and Pedestrian Facilities Team indicated, in a letter from Anthony Aglio and Jennifer Baldwin dated June 22, 2009, that the following bicycle and pedestrian facilities should be required. In the letter, they 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 should be included along all property frontage.
- b. Connections to internal sidewalk network and frontage sidewalk should be included.
- c. Bicycle facilities should be included through all right turn lanes.
- d. Non-motorized connections, such as pedestrian paths/trails, should be pursued to surrounding development to reduce vehicular traffic.

- e. 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 the bus stops and include parking facilities for bicyclists.

The letter also indicates that both Christiana-Stanton Road and Road A are designated as Connector Bicycle Routes.

### **Previous Comments**

All comments from DeIDOT's Scoping Letter and Preliminary TOA Review were addressed in the Final TOA submission.

### **General HCS Analysis Comments**

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

- 1) Due to significant changes in the future roadway network and traffic volumes, for future conditions at all intersections, the TOA and McCormick Taylor assumed a peak hour factor (PHF) of 0.92 for all movements.
- 2) For future conditions, the TOA assumed uniform a heavy vehicle factor (HV) of 3% for all movements at all intersections. McCormick Taylor's analysis assumed a future HV of either existing HV or 2%, whichever was greater.
- 3) The existing-conditions HCS analyses included in the TOA did not always reflect the lane widths observed in the field by McCormick Taylor. The TOA then assumed a uniform lane width of 12 feet for all future conditions. McCormick Taylor's HCS analyses incorporated the field-measured lane widths for existing and future conditions.
- 4) The TOA and McCormick Taylor used different cycle lengths and/or signal timing parameters when analyzing the signalized intersections in some cases.
- 5) The TOA included percent grade in their analysis. McCormick Taylor could not confirm the percent grade and did not take it into consideration.
- 6) The TOA assumed Right-Turn-on-Red (RTOR) volume as 15% of the total right-turn volume for each approach. McCormick Taylor input no RTOR volumes.

Table 3  
PEAK HOUR LEVELS OF SERVICE (LOS)  
based on Traffic Operational Analysis for Churchmans Meadows  
Report dated December 4, 2009  
Prepared by Landmark Engineering, Inc.

<b>Unsignalized Intersection <sup>1</sup> Two-Way Stop Control (T-intersection)</b>	<b>LOS per TOA <sup>2</sup></b>	<b>LOS per McCormick Taylor</b>
<b>Eagle Run Road Stub &amp; Christiana-Stanton Road</b>	Weekday PM	Weekday PM
2016 with Churchmans Meadows (Case 3A)		
Eastbound Eagle Run Road Stub (extended)	N/A	F (109.4)
Northbound Christiana-Stanton Road – Left	N/A	B (14.7)
2016 with Churchmans Meadows (Case 3B)		
Eastbound Eagle Run Road Stub (extended)	N/A	F (192.7)
Northbound Christiana-Stanton Road – Left	N/A	C (18.9)
2016 with Churchmans Meadows (Case 3C)		
Eastbound Eagle Run Road Stub	N/A	B (14.3)
Northbound Christiana-Stanton Road – Left	N/A	A (9.5)
2016 with Churchmans Meadows (Case 3D)		
Eastbound Eagle Run Road Stub	N/A	C (16.0)
Northbound Christiana-Stanton Road – Left	N/A	B (10.0)

<sup>1</sup> 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.

<sup>2</sup> The TOA assumed this intersection as signalized for all future cases. McCormick Taylor evaluated the intersection as unsignalized (as shown above) and as signalized (as shown on the next page).

Table 3 (continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
based on Traffic Operational Analysis for Churchmans Meadows  
Report dated December 4, 2009  
Prepared by Landmark Engineering, Inc.

<b>Signalized Intersection <sup>3</sup></b>	<b>LOS per TOA</b>	<b>LOS per McCormick Taylor</b>
<b>Eagle Run Road Stub &amp; Christiana-Stanton Road</b>	Weekday PM	Weekday PM
2016 with Churchmans Meadows (Case 3A)	C (0.79)	C (0.90)
2016 with Churchmans Meadows (Case 3B)	D (0.87)	C (0.92)
2016 with Churchmans Meadows (Case 3C)	A (0.56)	A (0.62)
2016 with Churchmans Meadows (Case 3D)	B (0.61)	B (0.70)

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<sup>3</sup> 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 4  
PEAK HOUR LEVELS OF SERVICE (LOS)  
based on Traffic Operational Analysis for Churchmans Meadows  
Report dated December 4, 2009  
Prepared by Landmark Engineering, Inc.

Signalized Intersection <sup>4</sup>	LOS per TOA <sup>5</sup>	LOS per McCormick Taylor
<b>Christiana-Stanton Road &amp; Road A</b>	Weekday PM	Weekday PM
2009 Existing (Case 1) <sup>6</sup>	B (0.40)	B (0.35)
2016 without Churchmans Meadows (Case 2)	N/A	F (1.20)
2016 without Churchmans Meadows (Case 2) <i>With Improvement Option 1</i> <sup>7</sup>	N/A	D (0.91)
2016 without Churchmans Meadows (Case 2) <i>With Improvement Option 2</i> <sup>8</sup>	C (0.86)	D (0.79)
2016 with Churchmans Meadows (Case 3A)	N/A	F (2.22)
2016 with Churchmans Meadows (Case 3A) <i>With Improvement Option 1</i> <sup>7</sup>	N/A	F (1.26)
2016 with Churchmans Meadows (Case 3A) <i>With Improvement Option 2</i> <sup>8</sup>	D (0.94)	D (0.86)

<sup>4</sup> 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.

<sup>5</sup> For all future cases, the TOA assumed that intersection improvements associated with the Market Place development would be in place. These improvements include the addition of a second left-turn lane on the southbound approach and a separate right-turn lane on the westbound approach. These improvements are consistent with what McCormick Taylor analyzed as Improvement Option 2.

<sup>6</sup> The TOA analyzed Case 1 for this intersection with an incorrect lane configuration for the westbound Road A approach, consisting of one exclusive left-turn lane and one shared left/right-turn lane. The correct configuration, as analyzed by McCormick Taylor, consists of just one shared left/right-turn lane.

<sup>7</sup> Improvement Option 1 consists of adding a separate right-turn lane on the westbound approach of Road A.

<sup>8</sup> Improvement Option 2 consists of Improvement Option 1 and the addition of a second left-turn lane on the southbound approach of Christiana-Stanton Road.

Table 4 (continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
based on Traffic Operational Analysis for Churchmans Meadows  
Report dated December 4, 2009  
Prepared by Landmark Engineering, Inc.

Signalized Intersection <sup>9</sup>	LOS per TOA <sup>10</sup>	LOS per McCormick Taylor
<b>Christiana-Stanton Road &amp; Road A</b>	Weekday PM	Weekday PM
2016 with Churchmans Meadows (Case 3B)	N/A	F (2.36)
2016 with Churchmans Meadows (Case 3B) <i>With Improvement Option 1</i> <sup>11</sup>	N/A	F (1.46)
2016 with Churchmans Meadows (Case 3B) <i>With Improvement Option 2</i> <sup>12</sup>	D (0.95)	D (0.87)
2016 with Churchmans Meadows (Case 3C)	N/A	F (1.46)
2016 with Churchmans Meadows (Case 3C) <i>With Improvement Option 1</i> <sup>11</sup>	N/A	D (0.93)
2016 with Churchmans Meadows (Case 3C) <i>With Improvement Option 2</i> <sup>12</sup>	C (0.89)	D (0.83)
2016 with Churchmans Meadows (Case 3D)	N/A	F (1.44)
2016 with Churchmans Meadows (Case 3D) <i>With Improvement Option 1</i> <sup>11</sup>	N/A	D (0.94)
2016 with Churchmans Meadows (Case 3D) <i>With Improvement Option 2</i> <sup>12</sup>	C (0.90)	D (0.82)

<sup>9</sup> 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.

<sup>10</sup> For all future cases, the TOA assumed that intersection improvements associated with the Market Place development would be in place. These improvements include the addition of a second left-turn lane on the southbound approach and a separate right-turn lane on the westbound approach. These improvements are consistent with what McCormick Taylor analyzed as Improvement Option 2.

<sup>11</sup> Improvement Option 1 consists of adding a separate right-turn lane on the westbound approach of Road A.

<sup>12</sup> Improvement Option 2 consists of Improvement Option 1 and the addition of a second left-turn lane on the southbound approach of Christiana-Stanton Road.

Table 5  
PEAK HOUR LEVELS OF SERVICE (LOS)  
based on Traffic Operational Analysis for Churchmans Meadows  
Report dated December 4, 2009  
Prepared by Landmark Engineering, Inc.

Signalized Intersection <sup>13</sup>	LOS per TOA	LOS per McCormick Taylor
<b>Road A &amp; Southbound Delaware Route 1 Ramps</b>	Weekday PM	Weekday PM
2009 Existing (Case 1)	B (0.59)	B (0.59)
2016 without Churchmans Meadows (Case 2) <sup>14</sup>	C (0.77)	F (2.71)
2016 without Churchmans Meadows (Case 2) With Improvement Option 1 <sup>15</sup>	N/A	E (0.98)
2016 without Churchmans Meadows (Case 2) With Improvement Option 2 <sup>16</sup>	N/A	D (0.76)
2016 with Churchmans Meadows (Case 3A) <sup>14, 17</sup>	D (0.97)	F (3.77)
2016 with Churchmans Meadows (Case 3A) With Improvement Option 2 <sup>16</sup>	N/A	F (1.07)
2016 with Churchmans Meadows (Case 3A) With Improvement Option 3 <sup>18</sup>	N/A	E (0.98)
2016 with Churchmans Meadows (Case 3A) With Improvement Option 4 <sup>19</sup>	N/A	D (0.86)

<sup>13</sup> 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.

<sup>14</sup> For Cases 2 and 3A, the TOA assumed the following improvements: addition of a second through lane on the eastbound approach of Road A, and addition of a second through lane and a second left-turn lane on the westbound approach of Road A. McCormick Taylor assumed existing lane configurations.

<sup>15</sup> Improvement Option 1 consists of adding a second left-turn lane on the westbound approach of Road A.

<sup>16</sup> Improvement Option 2 consists of Improvement Option 1 and the addition of a second through lane on the eastbound approach of Road A.

<sup>17</sup> For Case 3A, the TOA assumed the following lane configuration for the new fourth-leg ramp from I-95 (southbound approach): one left-turn lane, two through lanes, and one right-turn lane. McCormick Taylor assumed one shared through/left-turn lane and one right-turn lane.

<sup>18</sup> Improvement Option 3 consists of Improvement Option 2 and the addition of a second right-turn lane on the northbound approach of the Delaware Route 1 Ramp.

<sup>19</sup> Improvement Option 4 consists of Improvement Option 3 and the addition of a second right-turn lane on the southbound approach of the new fourth-leg ramp from I-95.

Table 5 (continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
based on Traffic Operational Analysis for Churchmans Meadows  
Report dated December 4, 2009  
Prepared by Landmark Engineering, Inc.

Signalized Intersection <sup>20</sup>	LOS per TOA	LOS per McCormick Taylor
<b>Road A &amp; Southbound Delaware Route 1 Ramps</b>	Weekday PM	Weekday PM
2016 with Churchmans Meadows (Case 3B) <sup>21</sup>	C (0.93)	F (3.51)
2016 with Churchmans Meadows (Case 3B) <i>With Improvement Option 1</i> <sup>22</sup>	N/A	F (1.07)
2016 with Churchmans Meadows (Case 3B) <i>With Improvement Option 2</i> <sup>23</sup>	N/A	D (0.81)
2016 with Churchmans Meadows (Case 3C) <sup>24, 25</sup>	C (0.92)	F (3.32)
2016 with Churchmans Meadows (Case 3C) <i>With Improvement Option 2</i> <sup>23</sup>	N/A	E (0.96)
2016 with Churchmans Meadows (Case 3C) <i>With Improvement Option 3</i> <sup>26</sup>	N/A	D (0.88)
2016 with Churchmans Meadows (Case 3D) <sup>24</sup>	C (0.85)	F (2.85)
2016 with Churchmans Meadows (Case 3D) <i>With Improvement Option 1</i> <sup>22</sup>	N/A	E (1.00)
2016 with Churchmans Meadows (Case 3D) <i>With Improvement Option 2</i> <sup>23</sup>	N/A	D (0.77)

<sup>20</sup> 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.

<sup>21</sup> For Case 3B, the TOA assumed the following improvements: addition of a second through lane on the eastbound approach of Road A, and addition of a second through lane and a second left-turn lane on the westbound approach of Road A. McCormick Taylor assumed existing lane configurations.

<sup>22</sup> Improvement Option 1 consists of adding a second left-turn lane on the westbound approach of Road A.

<sup>23</sup> Improvement Option 2 consists of Improvement Option 1 and the addition of a second through lane on the eastbound approach of Road A.

<sup>24</sup> For Cases 3C and 3D, the TOA assumed the following improvements: addition of a second through lane on the eastbound approach of Road A, addition of a second through lane and a second left-turn lane on the westbound approach of Road A, and addition of a second right-turn lane on the northbound approach of the Delaware Route 1 Ramp. McCormick Taylor assumed existing lane configurations.

<sup>25</sup> For Case 3C, the TOA assumed the following lane configuration for the new fourth-leg ramp from I-95 (southbound approach): two exclusive left-turn lanes, one shared through/left-turn lane, and two right-turn lanes. McCormick Taylor assumed one shared through/left-turn lane and one right-turn lane.

<sup>26</sup> Improvement Option 3 consists of Improvement Option 2 and the addition of a second right-turn lane on the northbound approach of the Delaware Route 1 Ramp.

Table 6  
PEAK HOUR LEVELS OF SERVICE (LOS)  
based on Traffic Operational Analysis for Churchmans Meadows  
Report dated December 4, 2009  
Prepared by Landmark Engineering, Inc.

Signalized Intersection <sup>27</sup>	LOS per TOA <sup>28</sup>	LOS per McCormick Taylor <sup>29</sup>
<b>Road A &amp; Northbound Delaware Route 1 Ramps / Center Boulevard</b>	Weekday PM	Weekday PM
2009 Existing (Case 1)	B (0.55)	B (0.53)
2016 without Churchmans Meadows (Case 2)	N/A	F (5.40)
2016 without Churchmans Meadows (Case 2) With Improvement Option 1 <sup>30</sup>	D (0.86)	D (0.90)
2016 with Churchmans Meadows (Case 3A)	N/A	F (4.41)
2016 with Churchmans Meadows (Case 3A) With Improvement Option 1 <sup>30</sup>	E (0.98)	E (0.95)
2016 with Churchmans Meadows (Case 3A) With Improvement Option 2 <sup>31</sup>	N/A	E (0.90)
2016 with Churchmans Meadows (Case 3A) With Improvement Option 3 <sup>32</sup>	N/A	D (0.82)

<sup>27</sup> 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.

<sup>28</sup> For future cases, the TOA assumed the following configurations: one left-turn lane, two through lanes, and one right-turn lane on the northbound approach of the Delaware Route 1 Ramp; one left-turn lane, two through lanes, and two right-turn lanes on the southbound approach of Center Boulevard; two left-turn lanes, two through lanes, and one right-turn lane on both the eastbound approach of Road A and the westbound approach of the planned Christiana Fashion Center. These configurations are consistent with what McCormick Taylor analyzed as Improvement Option 1. For future cases under “base conditions”, McCormick Taylor assumed one left-turn lane, one through lane, and one right-turn lane on the northbound, southbound, and westbound approaches, and one left-turn lane and one shared through/right-turn lane on the eastbound approach.

<sup>29</sup> For future cases, McCormick Taylor analyzed this intersection with different volumes than those used by the TOA. This was done at DelDOT’s direction, using volumes provided by DelDOT, and was done to reflect the most up-to-date site entrance plans for the Christiana Fashion Center. A change from one site access point to three site access points affected the projected volumes at this intersection.

<sup>30</sup> Improvement Option 1 consists of the lane configurations described above in Footnote 28.

<sup>31</sup> Improvement Option 2 consists of Improvement Option 1 and the addition of a second left-turn lane on the northbound approach of the Delaware Route 1 Ramp.

<sup>32</sup> Improvement Option 3 consists of Improvement Option 1 and the addition of a third through lane on the westbound approach of the planned Christiana Fashion Center.

Table 6 (continued)  
PEAK HOUR LEVELS OF SERVICE (LOS)  
based on Traffic Operational Analysis for Churchmans Meadows  
Report dated December 4, 2009  
Prepared by Landmark Engineering, Inc.

Signalized Intersection <sup>33</sup>	LOS per TOA <sup>34</sup>	LOS per McCormick Taylor <sup>35</sup>
<b>Road A &amp; Northbound Delaware Route 1 Ramps / Center Boulevard</b>	Weekday PM	Weekday PM
2016 with Churchmans Meadows (Case 3B)	N/A	F (5.73)
2016 with Churchmans Meadows (Case 3B) <i>With Improvement Option 1</i> <sup>36</sup>	D (0.93)	D (0.91)
2016 with Churchmans Meadows (Case 3C)	N/A	F (4.09)
2016 with Churchmans Meadows (Case 3C) <i>With Improvement Option 1</i> <sup>36</sup>	D (0.93)	E (0.90)
2016 with Churchmans Meadows (Case 3C) <i>With Improvement Option 2</i> <sup>37</sup>	N/A	E (0.87)
2016 with Churchmans Meadows (Case 3C) <i>With Improvement Option 3</i> <sup>38</sup>	N/A	D (0.76)
2016 with Churchmans Meadows (Case 3D)	N/A	F (5.13)
2016 with Churchmans Meadows (Case 3D) <i>With Improvement Option 1</i> <sup>36</sup>	D (0.89)	D (0.86)

<sup>33</sup> 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.

<sup>34</sup> For future cases, the TOA assumed the following configurations: one left-turn lane, two through lanes, and one right-turn lane on the northbound approach of the Delaware Route 1 Ramp; one left-turn lane, two through lanes, and two right-turn lanes on the southbound approach of Center Boulevard; two left-turn lanes, two through lanes, and one right-turn lane on both the eastbound approach of Road A and the westbound approach of the planned Christiana Fashion Center. These configurations are consistent with what McCormick Taylor analyzed as Improvement Option 1. For future cases under “base conditions”, McCormick Taylor assumed one left-turn lane, one through lane, and one right-turn lane on the northbound, southbound, and westbound approaches, and one left-turn lane and one shared through/right-turn lane on the eastbound approach.

<sup>35</sup> For future cases, McCormick Taylor analyzed this intersection with different volumes than those used by the TOA. This was done at DelDOT’s direction, using volumes provided by DelDOT, and was done to reflect the most up-to-date site entrance plans for the Christiana Fashion Center. A change from one site access point to three site access points affected the projected volumes at this intersection.

<sup>36</sup> Improvement Option 1 consists of the lane configurations described above in Footnote 34.

<sup>37</sup> Improvement Option 2 consists of Improvement Option 1 and the addition of a second left-turn lane on the northbound approach of the Delaware Route 1 Ramp.

<sup>38</sup> Improvement Option 3 consists of Improvement Option 1 and the addition of a third through lane on the westbound approach of the planned Christiana Fashion Center.