Engineering A Brighter Future®

April 29, 2016

Mr. Troy Brestel
Project Engineer
Development Coordination
DelDOT Division of Planning
P O Box 778
Dover, DE 19903

RE: Agreement No. 1654
Project Number T201469011
Traffic Impact Study Services
**Task 10A-Summit Pointe**

Dear Mr. Brestel:

Johnson, Mirmiran and Thompson (JMT) has completed the review of the Traffic Impact Study (TIS) for Summit Pointe, prepared by Traffic Planning and Design, Inc. (TPD). This review was assigned Task Number 10A. TPD prepared the report in a manner generally consistent with DelDOT's *Development Coordination Manual.*

The TIS evaluates the impacts of a proposed residential development, consisting of 99 single family detached houses, on the north side of Bethel Church Road (New Castle Road 433) west of US Route 301 (New Castle Road 16) in New Castle County. The residential development is proposed on a 189.57-acre parcel of undeveloped land that is zoned S (Suburban). Access to the development will be provided via one proposed entrance on Bethel Church Road. Construction is expected to be completed in 2020.

DelDOT currently has four relevant projects within the study area: the *US 301, Maryland State Line to SR 1* project (Contract #T200511301); the *HSIP NCC, N54, Howell School Road, SR 896 to SR 71* project (Contract #T200504110); the *Statewide Divided Highway Safety Study – Phase 3* project (Contract #T200950017); and the *Statewide Horizontal Curve Safety* project (Contract #T200950017). In addition, DelDOT's 2013 HEP (Hazard Elimination Program) Site S identified one location within the project area. Furthermore, two future pavement rehabilitation and resurfacing projects are within the study area.

The *US 301, Maryland State Line to SR 1* project (Contract #T200511301) is divided into several sections and contains improvements that will reduce traffic congestion in the project area and improve highway safety by removing through traffic, especially heavy vehicle truck traffic, from local roads. The Selected Alternative (Green North + Spur Road) provides a four-lane limited access toll road, US Route 301, on a new alignment. The new US Route 301 mainline section would extend from the Maryland State Line, west of Middletown, to the vicinity of Armstrong Corner Road where it would continue northeast, crossing the existing US Route 301 and Boyds

Corner Road before curving east and tying into SR 1 south of the Chesapeake and Delaware (C&D) Canal. Access to the new US Route 301 would be provided via interchanges south of Middletown (Levels Road), in the vicinity of Armstrong Corner Road, and at Jamison Corner Road. The US Route 301 mainline section is anticipated to be completed at the end of 2018. As part of the US Route 301 project, improvements are proposed at the US Route 301 intersection with Bethel Church Road. Specifically, the Spur Road (Section 4) will tie-in with the new US Route 301 mainline just south of Bohemia Mill Road to US Route 301 just south of the C&D Canal. Specifically, the current signalized intersection at US Route 301 and Bethel Church Road will be removed and a new grade separated interchange is proposed with the new Spur Road, which will improve the existing sharp curve on US Route 301. As part of this proposed interchange at US Route 301 and Bethel Church Road, existing Bethel Church Road will connect with the relocated Bethel Church Road via a new unsignalized stop-controlled T-intersection, approximately 2,650 feet west of US Route 301. Additionally, the existing Bethel Church Road will dead-end east of the proposed Site Entrance and will not intersect with US Route 301. Currently, the Spur Road (Section 4) construction funding is not included in the Capital Transportation Program (FY 2016 – FY 2021). Additional information can be found on the DelDOT project website at http://www.deldot.gov/information/projects/us301/

The *HSIP NCC, N54, Howell School Road, SR 896 to SR 71* project (Contract #T200504110) is designed to improve safety and operations along Howell School Road and at the intersections of Howell School Road and Denny Road with US Route 301. Improvements are proposed from just west of the intersection of Denny Road and US Route 301 to the intersection of Howell School Road and Robert C. Peoples Boulevard. The project includes eliminating the existing "dog-leg" intersection formed by the intersections of Howell School Road and Denny Road with US Route 301. Howell School Road will be realigned opposite Denny Road, creating a single signalized intersection with US Route 301. A traffic camera will also be installed along US Route 301. The Meadow Glen Subdivision access via Sweet Hollow Drive at US Route 301 will be eliminated and the subdivision will instead gain access from Howell School Road via Meadow Glen Drive. The existing stop-controlled intersection at Howell School Road and Robert C. People's Boulevard will be reconstructed as a roundabout. A multi-use path along the south side of Howell School Road is proposed to provide improved bicycle and pedestrian access from the Meadow Glen and Caravel Woods Subdivisions to Lums Pond State Park. Construction is scheduled to begin in 2016 and completed by the end of 2017. Additional information can be found on the DelDOT project website at http://www.deldot.gov/information /projects/howell_school_rd/.

The *Statewide Divided Highway Safety Study for Phase 3* project (Contract #T2000950017) is designed to improve safety along divided highways throughout Delaware. As part of the project, signage and striping were evaluated at signalized intersections along divided highways within the state roadway network per the *Delaware Manual on Uniform Traffic Control Devices (DE MUTCD)* standards. US Route 301 was evaluated as part of this project. The following study intersections along US Route 301 that were part of this project include Old Summit Bridge Road, Bethel Church Road, Delaware Route 71/Brennan Boulevard, and Howell School Road. Recommendations as part of this project include signage (Yield, Do Not Enter, Wrong Way, One

Way, No Left Turn, Turn Lane, Divided Highway, and Keep Right) and striping improvements (turn arrows and lane lines) following *DE MUTCD* specifications. As this is an ongoing project, the above improvements have not yet been implemented.

The *Statewide Horizontal Curve Safety* project (Contract #T200950017) is designed to improve safety along horizontal curves for all roadway classifications throughout Delaware. As part of this project, signage is evaluated along existing horizontal curve locations per *DE MUTCD* standards Improvements are recommended based on ball bank studies of each horizontal curve with proper signage and spacing based on Figure 2C-2 and Tables 2C-5 and 2C-6 of the *DE MUTCD*. Horizontal curves are slated for review and recommendations along US Route 301 and Delaware Route 71 north of the C&D Canal. Currently, this project is in the early design stages in relation to these study locations.

DelDOT's 2013 HEP (Hazard Elimination Program) identified one location within the project area. The 2013 HEP Site S is a 0.50-mile corridor located north of Middletown along US Route 301/SR 71/SR 896 from 0.46 miles north of Beaston Road to 0.46 mile south of Bethel Church Road. The Site S Task I report included a crash summary, speed study, lighting evaluation, as well as a review of the Old Summit Bridge Road intersection with US Route 301. Suggested Task I remedial improvements include signage improvements (upgrade and new installation) at the US Route 301/Old Summit Bridge Road intersection in accordance with the *DE MUTCD*. These signage improvements include upgrading the Advance Street Name plaques posted with the Signal Ahead warning signs on the northbound and southbound approaches of US Route 301 to Old Summit Bridge Road, upgrading horizontal curve signage on Old Summit Bridge Road east of US Route 301, installing Divided Highway Crossing and Keep Right signs on the US Route 301 approaches, upgrading street blades and installation of Divided Highway signs on westbound Old Summit Bridge Road, upgrading the Curve warning sign on the US Route 301 southbound approach, and upgrading the Chevron Alignment warning signs on northbound and southbound US Route 301 just north of Old Summit Bridge Road. Additional improvements include installing edge lines along Old Summit Bridge Road and trimming trees to improve sign and signal visibility at and near the intersection. Field visits confirm the above improvements have been completed. However, a recommendation from the Site S Task I report has not been incorporated, which is the removal of the 40 MPH Advisory Speed plaques with the Curve warning signs posted on the northbound and southbound approaches of US Route 301 to the horizontal curve at Old Summit Bridge Road. The removal of these plaques was recommended based on the ball bank and speed measurements conducted in the report.

DelDOT has two future pavement rehabilitation and resurfacing projects within the study area. One project is along US Route 301/Delaware Route 896 from Delaware Route 71 to I-95 (Contract #T201506103). The scope of work involves milling, patching, replacing, and paving of the concrete sections. The construction is scheduled to be completed by Summer of 2016. The other project is along Bethel Church Road from the Maryland State Line to US Route 301 (Contract #T201606109). The scope of work involves milling, patching, replacing, and paving of the bituminous concrete sections. The construction is scheduled to be completed by Summer of 2016.

Additionally, the Southern New Castle County Transportation Improvement District (TID) last updated in November 2013, was used to determine the roadway and intersection improvement needs for the area bounded by Lorewood Grove Road and the C&D Canal to the north, Marl Pit Road to the south, SR 1 and US Route 13 to the east, and US Route 301 to the west. The TID report examined traffic conditions under existing and 2030 future conditions. Recommendations to alleviate capacity constraints were made based on the 2030 traffic volumes. These recommendations included the provision of additional lanes at intersections as well as modifying intersections to be signalized or reconfigured to be a roundabout. Based on this study, none of the intersections from this TIS are included in the Southern New Castle County TID.

Based on our review of the traffic impact study, we have the following comments and recommendations:

The New Castle County Level of Service (LOS) Standards as stated in Section 40.11.210 of the Unified Development Code (UDC) apply to all signalized, all-way-stop, and roundabout intersections. Based on an evaluation of the intersections needed to satisfy the UDC criteria along with the LOS evaluation criteria stated in DelDOT's *Development Coordination Manual*, the following signalized intersections exhibit LOS deficiencies without the implementation of physical roadway and/or traffic control improvements:

| ***Intersection*** | ***Situations for which LOS deficiencies occur*** |
|---|---|
| US Route 301/Bethel Church Road | 2020 AM without Summit Pointe development (Case 2)<br>2020 AM and PM with Summit Pointe development (Case 3) |
| US Route 301/Delaware Route 71/ Brennan Boulevard | 2020 AM with Summit Pointe development(Case 3) |

The signalized intersection of US Route 301/Bethel Church Road would exhibit LOS deficiencies (LOS E with a delay of 79.8 seconds) under the future 2020 AM peak hour conditions without the Summit Pointe development (Case 2) and the future 2020 AM (LOS F with a delay of 86.5 seconds) and PM (LOS E with a delay of 56.5 seconds) peak hour conditions with the Summit Point development (Case 3). Furthermore, the maximum 95$^{th}$ percentile queue length for the southbound US Route 301 right turn lane onto Bethel Church Road is projected to be 400 feet during the Case 3 PM peak hour condition, which will not be accommodated by the current right turn lane length of 350 feet. As mentioned above, this intersection is planned to be removed as part of the *US 301, Maryland State Line to SR 1* project (Contract #T200511301), specifically the Spur Road (Section 4) Alternative. The new Spur Road on US Route 301 will create a two-lane limited access highway and a grade separated interchange with Bethel Church Road. Bethel Church Road will be relocated to the south and existing Bethel Church Road will tie-in with the relocated Bethel Church Road via a new unsignalized stop-controlled T-intersection, approximately 2,650 feet west of US Route 301. As this intersection is scheduled to be redesigned as a grade separated interchange as part of Section 4 of the US Route 301 Mainline project, no additional improvements are recommended as part of this development. Additionally, with completion of the US Route 301 Mainline project (Maryland State Line to SR 1) scheduled at the

end of 2018, traffic is expected to be reduced by at least 20 percent on the local roadways, per DelDOT's *US 301, Maryland State Line to SR 1* project (Contract #T200511301) website.

The signalized intersection of US Route 301/Delaware Route 71/Brennan Boulevard would exhibit LOS deficiencies (LOS E with a delay of 57.8 seconds) under the future 2020 AM peak hour conditions with the Summit Pointe development (Case 3). Furthermore, the maximum 95$^{th}$ percentile queue length for the Brennan Boulevard eastbound right turn lane onto US Route 301 is projected to be 280 feet during the Case 3 PM peak hour condition, which will not be accommodated by the current right turn lane length of 210 feet. In order to address the LOS deficiencies at the US Route 301/Delaware Route 71/Brennan Boulevard intersection, an additional eastbound Brennan Boulevard left turn lane would need to be constructed. However, with the scheduled completion of the US Route 301 Mainline project (Maryland State Line to SR 1) at the end of 2018, traffic is expected to be reduced by at least 20 percent on the local roadways, per DelDOT's *US 301, Maryland State Line to SR 1* project (Contract #T200511301) website. Therefore, we do not recommend any additional improvements be implemented by this developer.

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 developer should provide a bituminous concrete overlay to the existing travel lanes along the existing Bethel Church Road site frontage from the US Route 301/Bethel Church Road intersection to approximately 200 feet west of the Site Entrance, at DelDOT's discretion. DelDOT should analyze the existing lanes' pavement section and recommend an overlay thickness to the developer's engineer, if necessary.

2. The developer should construct a full movement entrance for the proposed Summit Pointe development on existing Bethel Church Road, approximately 2,000 feet west of the Bethel Church Road intersection with US Route 301, to be consistent with the proposed lane configurations as shown in the table below:

| Approach | Current Configuration | Proposed Configuration |
|---|---|---|
| Eastbound Existing Bethel Church Road | One through lane | One left turn lane and one through lane |
| Westbound Existing Bethel Church Road | One through lane | One through lane and one right turn lane |
| Southbound Site Entrance | Approach does not exist | One shared left/right turn lane |

Based on DelDOT's *Development Coordination Manual,* the recommended minimum storage length (excluding taper) is 160 feet for the eastbound existing Bethel Church Road left turn lane and 290 feet for the westbound existing Bethel Church Road right turn lane.

The storage lengths based on the HCS analysis provide shorter queue lengths that what is reported here.

3. The developer should provide an internal roadway connection within the site, located adjacent to Lots 11 and 12 and Lots 19 and 20 to the parcel of vacant land west of the Summit Pointe development (as shown in the Site Map on page 9).

4. 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 along the existing Bethel Church Road site frontage. Within this easement, the developer should construct a ten-foot wide shared-use path that meets current AASHTO and ADA standards. A minimum five-foot setback should be maintained from the edge of the pavement to the shared-use path. If feasible, street trees should be provided within the buffer area, in accordance with New Castle County's Unified Development Code. In addition, the ten-foot wide shared use path should extend from the existing Bethel Church Road Site Driveway internally to Lot 1 of the Summit Pointe development (as shown in the Site Map on page 9). The developer should coordinate with DelDOT's Subdivision Section during the plan review process to identify the exact locations of the proposed pathway.
   b. A minimum fifteen-foot wide permanent easement from the edge of the right-of-way should be dedicated to DelDOT along the US Route 301 site frontage for a potential future shared-use path that would connect to the C&D Canal. Should the location of wetlands on the property provide difficulties in constructing the shared-use path, the developer should coordinate with DelDOT's Subdivision Section during the plan review process to identify an acceptable, alternate approach for this proposed easement.
   c. ADA compliant curb ramps and marked crosswalks should be provided at the site entrance location on existing Bethel Church Road. The use of diagonal curb ramps is discouraged.
   d. Five-foot wide bicycle lanes should be provided along both directions of existing Bethel Church Road from the Site Entrance to the proposed intersection with the relocated Bethel Church Road, as part of the Spur Road (Section 4) of the *US 301, Maryland State Line to SR 1* project (Contract #T200511301).
   e. Utility covers should be moved outside of any bike lanes and paved shoulders or should be flush with the pavement.
   f. All internal roads should be provided with sidewalks on both sides. Sidewalks should also be provided to tie-in with the proposed ten-foot wide shared-use path along the existing Bethel Church Road site frontage.
   g. Sidewalks should be provided along Lot Numbers 11 and 12 and along Lot Numbers 19 and 20 on both sides of the roadway, for future connection with the vacant parcel of land west of the Summit Pointe development.

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 on our review of the TIS are attached. Please contact me at (302) 266-9600 if you have any questions concerning this review.

Sincerely,
Johnson, Mirmiran, and Thompson, Inc.

Mir Ab Wahed,

Mir Wahed, P.E., PTOE

cc: Richard Mishura
Joanne Arellano, P.E., PTOE

Enclosure

## General Information

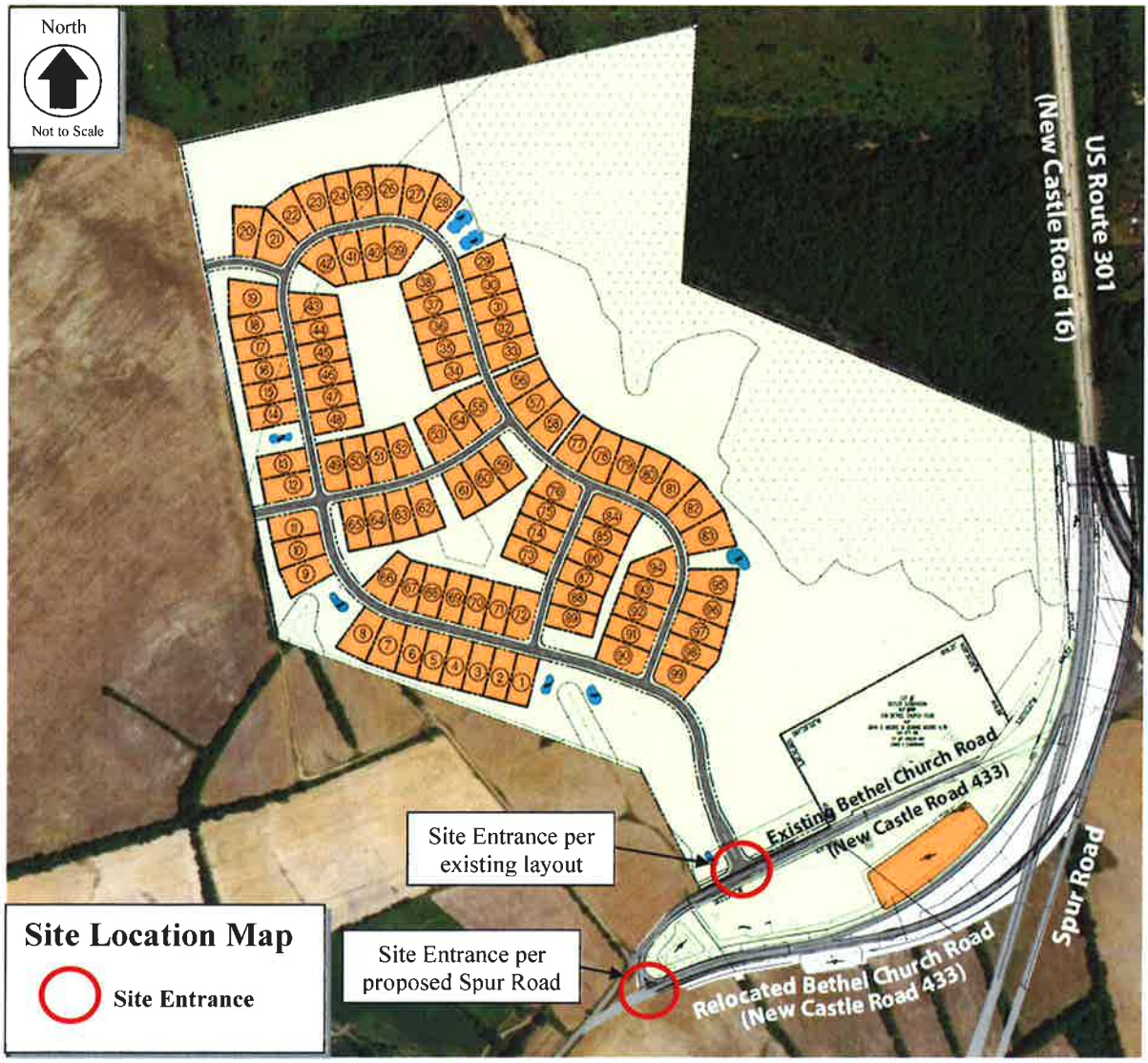
**Report date:** November 20, 2015
**Prepared by:** Traffic Planning and Design, Inc.
**Prepared for:** CDA Engineering
**Tax Parcel:** 11-058.00-012
**Generally consistent with DelDOT's *Development Coordination Manual*:** Yes.

## Project Description and Background

**Description:** The proposed development will consist of 99 single-family detached houses.
**Location:** The subject site is located on Bethel Church Road (New Castle Road 433), west of US Route 301 (New Castle Road 16) in New Castle County.
**Amount of Land to be developed:** The proposed development is on a 189.57-acre parcel.
**Land Use approval(s) needed:** Subdivision Approval.
**Proposed completion date:** 2020.
**Proposed access locations:** One access point is proposed on Bethel Church Road.
**Daily Traffic Volumes:**

- 2014 Average Annual Daily Traffic on Bethel Church Road: 6,362 vehicles per day.

## Site Map




**Graphic is an approximation based on the Record Major Subdivision Plan prepared by CDA Engineering Inc. (last revised on April 15, 2016)*

## Relevant and On-going Projects

DelDOT currently has four relevant projects within the study area: the *US 301, Maryland State Line to SR 1* project (Contract #T200511301); the *HSIP NCC, N54, Howell School Road, SR 896 to SR 71* project (Contract #T200504110); the *Statewide Divided Highway Safety Study – Phase 3* project (Contract #T200950017); and the *Statewide Horizontal Curve Safety* project (Contract #T200950017). In addition, DelDOT's 2013 HEP (Hazard Elimination Program) Site S identified one location within the project area. Furthermore, two future pavement rehabilitation and resurfacing projects are within the study area.

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intersections along US Route 301 that were part of this project include Old Summit Bridge Road, Bethel Church Road, Delaware Route 71/Brennan Boulevard, and Howell School Road. Recommendations as part of this project include signage (Yield, Do Not Enter, Wrong Way, One Way, No Left Turn, Turn Lane, Divided Highway, and Keep Right) and striping improvements (turn arrows and lane lines) following *DE MUTCD* specifications. As this is an ongoing project, the above improvements have not yet been implemented.

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Additionally, the Southern New Castle County Transportation Improvement District (TID) last updated in November 2013, was used to determine the roadway and intersection improvement needs for the area bounded by Lorewood Grove Road and the C&D Canal to the north, Marl Pit Road to the south, SR 1 and US Route 13 to the east, and US Route 301 to the west. The TID report examined traffic conditions under existing and 2030 future conditions. Recommendations to alleviate capacity constraints were made based on the 2030 traffic volumes. These recommendations included the provision of additional lanes at intersections as well as modifying intersections to be signalized or reconfigured to be a roundabout. Based on this study, none of the intersections from this TIS are included in the Southern New Castle County TID.

**Livable Delaware**

*(Source: Delaware Strategies for State Policies and Spending, 2015)*

**Location with respect to the Strategies for State Policies and Spending Map of Delaware:** The proposed development is located within the Investment Level 4 area.

***Investment Level 4***

Delaware's Investment Level 4 Areas are rural in nature, and are where the bulk of the state's open space/natural areas and agricultural industry is located. These areas contain agribusiness activities, farm complexes, and small settlements. They typically include historic crossroads or points of trade, often with rich cultural ties. Delaware's Investment Level 4 Areas are also the location of scattered residential uses, featuring almost entirely single-family detached residential structures. Delaware's Investment Level 4 Areas also include many unincorporated communities, typically with their own distinctive character and identity. Investment Level 4 Areas depend on a transportation system primarily of secondary roads linked to roadways used as regional thoroughfares for commuting and trucking.

It is the state's intent to discourage additional urban and suburban development in Investment Level 4 Areas unrelated to agriculture and to the areas' needs. In Investment Level 4 Areas, the state's investments and policies should retain the rural landscape and preserve open spaces and farmlands, support farmland-related industries, and establish defined edges to more concentrated development. The focus for the Level 4 Areas will be to preserve and maintain existing facilities in safe working order, corridor-capacity preservation, and the enhancement of transportation facilities to support agricultural business.

**Proposed Development's Compatibility with Livable Delaware:**

The proposed development is located in Investment Level 4 area and will consist entirely of single-family detached residential structures. Therefore, this development appears to be generally consistent with the 2015 update of the Livable Delaware "Strategies for State Polices and Spending."

## Comprehensive Plans

*(Source: New Castle County, 2012 Comprehensive Plan)*

**New Castle County Comprehensive Plan:**

The lands of the subject property are situated within New Castle County and zoned as S (Suburban). The developer proposes to maintain the existing zoning. According to the New Castle County Comprehensive Plan, the future land use of the property would be within the Low Density Residential with 1 to 3 dwelling units per acre.

**Proposed Expansion's Compatibility with the New Castle County Comprehensive Plan:**

The proposed development would be comprised of a residential community of approximately 99 single family homes. Per the New Castle County Comprehensive Plan, the future land use is recommended to be 1 to 3 dwelling units per acre. Since the subject site is approximately 190 acres, the development is generally compatible with the New Castle County Comprehensive Plan.

## Trip Generation

As per the TIS, the trip generation for the proposed development was determined by using the comparable land use and rates/equations contained in the *Trip Generation, 9th Edition: An ITE Informational Report*, published by the Institute of Transportation Engineers (ITE) for ITE Land Use Code 210 (Single Family Detached Houses).

The peak period trip generation for the proposed development is included in Table 1.

**Table 1**
Summit Pointe Development

| Land Use | ADT | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total |
| 99 Single Family Detached Housing (ITE Code 210) | 1,042 | 20 | 59 | 79 | 66 | 38 | 104 |

## Overview of TIS

**Intersections examined:**

1. Site Entrance / Bethel Church Road (New Castle Road 433)
2. US Route 301 (New Castle Road 16) / Bethel Church Road
3. US Route 301 / Delaware Route 71 / Brennan Boulevard
4. Brennan Boulevard / Ballina Boulevard
5. US Route 301 / Amberwood Drive
6. Chesapeake City Road (New Castle Road 399) / Delaware Route 71
7. Bethel Church Road / Jessica Drive
8. Bethel Church Road / Old Summit Bridge Road (New Castle Road 63)

9. US Route 301 / Summit Bridge Drive
10. US Route 301 / Old Summit Bridge Road
11. Bethel Church Road / Choptank Road (New Castle Road 435)
12. Bethel Church Road / Entrance to Biggs Farm
13. Bethel Church Road / Fairview Avenue
14. Choptank Road / Clayton Manor Drive
15. Churchtown Road (New Castle Road 432) / Choptank Road

*Note: US Route 301 is also referred to as Summit Bridge Road/SR 896/Delaware Route 71 from Old Summit Bridge Road to Brennan Boulevard/Delaware Route 71. US Route 301 is also referred to as Summit Bridge Road/SR 896 from Brennan Boulevard/Delaware Route 71 to Howell School Road. Additionally, while not required to satisfy the New Castle County Unified Development Code, the intersection of US Route 301/Howell School Road is included in the analysis to satisfy the conditions set forth in DelDOT's Development Coordination Manual.*

**Conditions examined:**

1. Case 1 – 2015 Existing conditions
2. Case 2 – 2020 No Build conditions without Summit Pointe development
3. Case 3 – 2020 Build conditions with Summit Pointe development

**Peak hours evaluated:** Weekday morning and weekday evening peak hours.

**Committed Developments considered:**

1. Rothwell Village (150 single-family detached houses)
2. Country Club Estates (115 single-family detached houses)
3. Carter Farm (321 single-family detached houses and 257 townhouses)
4. Parkside (492 single-family detached houses; 307 unbuilt)
5. Bayberry – North (557 single-family detached houses (458 unbuilt) and 392 townhouses (219 unbuilt))
6. Bayberry – South (580 single-family detached houses, 100 townhouses, 389 age-restricted single-family detached house, 120 age-restricted apartments)
7. Bayberry Town Center (318,594 square feet of retail, a 61,650 square-foot athletic club, a 3,960 square-foot bank with drive-through window)
8. Winchelsea (181 single-family detached houses, 178 townhouses, 154 apartments)
9. Cedar Lane Housing (77 single-family detached houses)

**Intersection Descriptions**

1. **Bethel Church Road (New Castle Road 433) / Site Entrance**
   **Type of Control:** proposed stop controlled intersection (T-intersection)
   **Eastbound Approach:** (Bethel Church Road) existing one through lane; proposed one shared through/left turn lane
   **Westbound Approach:** (Bethel Church Road) existing one through lane; proposed one shared through/right turn lane
   **Southbound Approach:** (Site Entrance) existing approach does not exist; proposed one shared left turn/right turn lane, stop controlled

*Note: As part of the US 301, Maryland State Line to SR 1 project, the signalized intersection of US Route 301/Bethel Church Road will be removed and replaced as an interchange as part of the Spur Road alternative. As such, Bethel Church Road is being realigned south of its existing location.*

2. **US Route 301 (New Castle Road 16) / Bethel Church Road**
   **Type of Control:** existing signal controlled intersection
   **Eastbound Approach:** (Bethel Church Road) existing two left turn lanes and one channelized right turn lane
   **Westbound Approach:** (Bethel Church Road) existing one channelized right turn lane
   **Northbound Approach:** (US Route 301) existing one left turn lane and two through lanes
   **Southbound Approach:** (US Route 301) existing two through lanes and one channelized right turn lane

3. **US Route 301 / Delaware Route 71 / Brennan Boulevard**
   **Type of Control:** proposed signal controlled intersection
   **Eastbound Approach:** (Brennan Boulevard) existing one left turn lane, one shared through/left turn lane, and one channelized right turn lane
   **Westbound Approach:** (Delaware Route 71) existing one left turn lane, one shared through/left turn lane, and one channelized right turn lane
   **Northbound Approach:** (US Route 301) existing one left turn lane, two through lanes, and one channelized right turn lane
   **Southbound Approach:** (US Route 301) existing one left turn lane, two through lanes, and one channelized right turn lane

4. **Brennan Boulevard / Ballina Boulevard**
   **Type of Control:** existing stop controlled intersection
   **Eastbound Approach:** (Brennan Boulevard) existing one shared through/left turn/right turn lane
   **Westbound Approach:** (Brennan Boulevard) existing one shared through/left turn/right turn lane
   **Northbound Approach:** (Ballina Boulevard) existing one shared through/left turn/right turn lane, stop controlled
   **Southbound Approach:** (Ballina Boulevard) existing one shared through/left turn/right turn lane, stop controlled

5. **US Route 301 / Amberwood Drive**
   **Type of Control:** existing stop controlled intersection (T-intersection)
   **Eastbound Approach:** (Amberwood Drive) existing one right turn lane, stop controlled
   **Northbound Approach:** (US Route 301) existing two through lanes
   **Southbound Approach:** (US Route 301) existing two through lanes and one right turn lane

6. **Chesapeake City Road (New Castle Road 399) / Delaware Route 71**
   **Type of Control:** existing stop controlled intersection (T-intersection)

**Eastbound Approach:** (Chesapeake City Road) existing one shared left turn/right turn lane, stop controlled
**Northbound Approach:** (Delaware Route 71) existing one shared through/left turn lane and one bypass lane
**Southbound Approach:** (Delaware Route 71) existing one through lane and one right turn lane

7. **Bethel Church Road / Jessica Drive**
   **Type of Control:** existing stop controlled intersection (T-intersection)
   **Eastbound Approach:** (Bethel Church Road) existing one shared through/left turn lane
   **Westbound Approach:** (Bethel Church Road) existing one shared through/right turn lane
   **Southbound Approach:** (Jessica Drive) existing one shared left turn/right turn lane, stop controlled

8. **Bethel Church Road / Old Summit Bridge Road (New Castle Road 63)**
   **Type of control:** existing stop controlled intersection (T-intersection)
   **Eastbound Approach:** (Bethel Church Road) existing one shared left turn/right turn lane, stop controlled
   **Northbound Approach:** (Old Summit Bridge Road) existing one shared through/left turn lane
   **Southbound Approach:** (Old Summit Bridge Road) existing one shared through/right turn lane

9. **US Route 301 / Summit Bridge Drive**
   **Type of Control:** existing stop controlled intersection (T-intersection)
   **Eastbound Approach:** (Summit Bridge Drive) existing one channelized right turn lane, stop controlled
   **Northbound Approach:** (US Route 301) existing one left turn lane and two through lanes
   **Southbound Approach:** (US Route 301) existing two through lanes and one right turn lane

10. **US Route 301 / Old Summit Bridge Road**
    **Type of Control:** existing signal controlled intersection (T-intersection)
    **Westbound Approach:** (Old Summit Bridge Road) existing one left turn lane and one channelized right turn lane
    **Northbound Approach:** (US Route 301) existing one left turn lane, two through lanes, and one right turn lane
    **Southbound Approach:** (US Route 301) existing one left turn and two through lanes

11. **Bethel Church Road / Choptank Road (New Castle Road 435)**
    **Type of Control:** existing roundabout
    **Eastbound Approach:** (Bethel Church Road) existing one shared left turn/right turn lane, yield controlled
    **Northbound Approach:** (Choptank Road) existing one shared through/left turn lane, yield controlled
    **Southbound Approach:** (Bethel Church Road) existing one shared through/right turn lane, yield controlled

**12. Bethel Church Road / Entrance to Biggs Farm**
**Type of Control:** existing stop controlled intersection (T-intersection)
**Eastbound Approach:** (Bethel Church Road) existing one through lane and one right turn lane
**Westbound Approach:** (Bethel Church Road) existing one shared through/left turn lane
**Northbound Approach:** (Entrance to Biggs Farm) existing one shared left turn/right turn lane, stop controlled

**13. Bethel Church Road / Fairview Avenue**
**Type of Control:** existing stop controlled intersection (T-intersection)
**Eastbound Approach:** (Bethel Church Road) existing one shared through/left turn lane
**Westbound Approach:** (Bethel Church Road) existing one through lane and one right turn lane
**Southbound Approach:** (Fairview Avenue) existing one shared left turn/right turn lane, stop controlled

**14. Choptank Road / Clayton Manor Drive**
**Type of Control:** existing stop controlled intersection (T-intersection)
**Eastbound Approach:** (Clayton Manor Drive) existing one shared left turn/right turn lane, stop controlled
**Northbound Approach:** (Choptank Road) existing one shared through/left turn lane
**Southbound Approach:** (Choptank Road) existing one through lane and one right turn lane

**15. Churchtown Road (New Castle Road 432) / Choptank Road**
**Type of Control:** existing roundabout
**Eastbound Approach:** (Churchtown Road) existing one shared through/left turn/right turn lane, yield controlled
**Westbound Approach:** (Churchtown Road) existing one shared through/left turn/right turn lane, yield controlled
**Northbound Approach:** (Choptank Road) existing one shared through/left turn/right turn lane, yield controlled
**Southbound Approach:** (Choptank Road) existing one shared through/left turn/right turn lane, yield controlled

**16. US Route 301 / Howell School Road (New Castle Road 54)**
**Type of Control:** existing signalized intersection (T-intersection)
**Westbound Approach:** (Howell School Road) existing one through lane and one right turn lane
**Northbound Approach:** (US Route 301) existing two through lanes and one right turn lane
**Southbound Approach:** (US Route 301) existing one left turn lane and two through lanes

*Note: This intersection includes a grassed median approximately 130 feet in width. Roadway striping and signalization within the median accommodate the storage of*

*vehicles to facilitate a two-stage crossing of the northbound and southbound through lanes. This intersection is being improved as part of the DelDOT HSIP NCC, N54, Howell School Road, SR 896 to SR 71 Improvements Project and will be completed prior to the full build out of Summit Pointe. As part of the DelDOT project, Howell School Road will be realigned to form a four-legged intersection with Denny Road. The eastbound Denny Road approach will be modified to provide one left turn lane, one shared through/left lane, and one channelized right turn lane, the westbound Howell School Road approach will be modified to provide one shared through/left lane and one channelized right turn lane, the northbound approach will be modified to provide one left turn lane, two through lanes, and one channelized right turn lane, and the southbound approach will be modified to provide two left turn lanes, two through lanes, and one channelized right turn lane.*

**Transit, Pedestrian, and Bicycle Facilities**

**Existing transit service**: Delaware Transit Corporation (DTC) currently does not provide any service in the study area. The closest DART facility is a Park & Ride located approximately 5.5 miles to the north of the site, in the Peoples Plaza shopping center south of US Route 40. The Park & Ride provides service to DART Routes 40, 41, 42, 46, C1, and C4. None of these routes traverse through any of the subject intersections.

**Planned transit service**: JMT contacted Evan Horgan, Transit Planner at the DTC. In a March 3, 2016 email, Mr. Horgan stated that DTC is planning a commuter style service for this corridor in the future. However, no specific details are yet available.

**Existing bicycle and pedestrian facilities**: According to DelDOT's *New Castle County Bicycle Map*, statewide and connector bicycle routes exist within the study area. The statewide bicycle route (Bicycle Route 1) is along Choptank Road, US Route 301/SR 896/Delaware Route 71 and continues along Howell School Road. The statewide bicycle route along Choptank Road traverses through two of the project's study intersections (the Choptank Road intersections with Churchtown Road and Clayton Manor Drive). The statewide bicycle route along Bethel Church Road traverses through two of the project's study intersections (the Bethel Church Road intersections with Choptank Road and the Site Entrance).The statewide bicycle route along US Route 301/SR 896/Delaware Route 71 traverses through four of the project's study intersections (the US Route 301/SR 896/Delaware Route 71 intersections with Bethel Church Road, Delaware Route 71/Brennan Boulevard, Amberwood Drive, and Howell School Road). The connector bicycle route along US Route 301/SR 896/Delaware Route 71 traverses through two of the project's study intersections (the US Route 301/SR 896/ intersections with Old Summit Bridge Road and Summit Bridge Drive). The connector bicycle route along Bethel Church Road traverses through two of the project's study intersections (the Bethel Church Road intersection with Fairview Avenue and the Entrance to Biggs Farm). The connector bicycle route along Chesapeake City Road traverses through one of the project's study intersection (the Chesapeake City Road intersection with Delaware Route 71).

The following pedestrian facilities are present at the US Route 301 intersections with Delaware Route 71/Brennan Boulevard and Amberwood Drive. Specifically, sidewalks and curb ramps are provided on the west legs of Brennan Boulevard and on Amberwood Drive.

Pedestrian sidewalks are also present at the unsignalized intersections of Brennan Boulevard and Ballina Boulevard, Bethel Church Road and Choptank Road, Choptank Road and Clayton Manor Drive, and Churchtown Road and Choptank Road. Pedestrian sidewalks, curb ramps, and crosswalks are also present at the unsignalized intersection of Bethel Church Road and the Entrance to Biggs Farm.

**Planned bicycle and pedestrian facilities**: JMT contacted Mr. Anthony Aglio, DelDOT's Bicycle and Pedestrian Coordinator. Per email correspondence on March 4, 2016 with Mr. Aglio, the following improvements were recommended:

- Ten-foot wide shared-use path along the site frontage road.
- Easement along US Route 301 frontage for future shared-use pathway
- Curb ramps and crosswalk at the site entrance.
- Bike lanes along both directions of existing Bethel Church Road to the proposed intersection with the relocated Bethel Church Road.
- Internal sidewalks along both sides of the roadway within the proposed development and future connection with the parcel of land west of Summit Pointe.

Mr. Evan Horgan of DTC in a March 3, 2016 email also requested pedestrian connection from Lot 99 within the development to the Site Entrance and extending this connection 60 feet west of the entrance on existing Bethel Church Road.

**Bicycle Level of Service and Bicycle Compatibility Index**: According to the League of Illinois Bicyclists (LIB), Bicycle Level of Service (BLOS) is an emerging national standard for quantifying the bike-friendliness of a roadway by measuring on-road bicyclist comfort levels for specific roadway geometries and traffic conditions. Utilizing the 10-year projected AADT along the site frontages, the BLOS with the construction of the proposed development and the provision of 5' bike lanes are summarized below. The BLOS was determined utilizing the calculators published on the LIB website: http://www.rideillinois.org/blos/blosform.htm

- Bethel Church Road – BLOS: C

**Previous Comments**

All comments from the preliminary TIS have been addressed in the final TIS.

**General HCS Analysis Comments**

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

1. The TIS used HCS+ Version 5.6 for unsignalized intersections and Synchro 8 for signalized intersections, whereas JMT utilized HCS 2010 Version 6.70 for both signalized and unsignalized intersections.

2. As all the intersections within the study area experience some increase in volumes, (per the *Development Coordination Manual*) JMT utilized the future intersection PHF of 0.80 for roadways with less than 500 vph, 0.88 for roadways between 500 and 1,000 vph, and 0.92 for roadways with more than 1,000 vph or the existing PHF, whichever was higher. The TIS utilized existing PHF for future conditions.

3. Per DelDOT's *Development Coordination Manual,* JMT used a heavy vehicle percentage of 3% for each movement in the future scenario analysis, unless the existing heavy vehicle percentage was greater than 3%, in which case the existing heavy vehicle percentage was used for analysis of future scenarios. At some locations, the TIS maintained the heavy vehicle percentages utilized in their existing cases throughout the future cases.

4. The TIS utilized approach grades in the analysis, whereas JMT did not.

5. At some intersections, JMT used heavy vehicle percentages consistent with the traffic count data whereas the TIS did not.

6. The TIS modeled the signalized intersections along US Route 301 (Old Summit Bridge Road, Bethel Church Road, Delaware Route 71/Brennan Boulevard, and Howell Church Road) as one coordinated signal group. From DelDOT's signal timing plans, US Route 301 from Old Summit Bridge Road to Bethel Church Road is part of one coordinated signal group and US Route 301 from Delaware Route 71/Brennan Boulevard to Howell Church Road is part of another coordinated signal group.

7. JMT analyzed the signalized intersections from US Route 301 and Delaware Route 71/Brennan Boulevard to US Route 301 and Howell Church Road as a corridor, which allowed the input of offset data. Although US Route 301 from Summit Bridge Road to Bethel Church Road (from DelDOT's timing plans) is part of a signalized coordinated corridor group, field verification noted that the US Route 301 and Bethel Church Road intersection is operating at a 100 second cycle length during the AM and PM peak periods, which is different from the signal timing plans. Therefore, JMT analyzed the US Route 301/Old Summit Bridge Road and US Route 301/Bethel Church Road as separate intersections. This analysis difference could cause discrepancies between the TIS and JMT's level of service results.

8. The TIS used a saturation flow rate of 1700 vehicles per hour for unsignalized intersections. JMT used the HCS 2010 Version 6.70 default values of 1800 vehicles per hour for through-movements and 1500 vehicles per hour for right-turns for unsignalized intersections.

9. Differences in critical headways were noticed between the TIS and JMT's analysis. JMT utilized the HCS 2010 Version 6.70 default values, except where otherwise noted.

10. JMT included lane widths obtained from field measurements, whereas the TIS did not.

11. JMT incorporated peak hour pedestrian volumes into the analysis based on the existing traffic count data, whereas the TIS did not.

12. JMT included passage times within the signal timing consistent with the DelDOT Timing Plans whereas the TIS did not.

Table 2
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection[1] Two-Way Stop Control (T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Site Access / Bethel Church Road[2]** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2020 with development of Summit Pointe (Case 3) | | | | |
| Eastbound Bethel Church Road Left | A (7.7) | A (9.6) | A (7.8) | A (9.7) |
| Southbound Site Entrance Approach | C (21.6) | D (30.4) | C (21.6) | D (29.3) |

[1] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[2] JMT analyzed the intersection with a separate Bethel Church eastbound left-turn lane and a separate Bethel Church Road westbound right-turn lane per DelDOT's Auxiliary Lane Worksheet. The TIS analyzed the intersection with no auxiliary lanes.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Signalized Intersection[3] (T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **US Route 301 / Bethel Church Road[4,5,6,7,8,9]** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | B (19.1) | B (14.2) | C (33.3) | C (24.1) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2) | D (43.8) | C (22.0) | E (79.8) | D (52.8) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3)[10] | D (47.6) | C (23.5) | F (86.5) | E (56.5) |

[3] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[4] The TIS utilized a saturation flow rate of 1,900 pc/h/ln, whereas JMT utilized a saturation flow rate of 1,750 pc/h/ln, consistent with DelDOT's *Development Coordination Manual* (signalized intersections south of C&D Canal).
[5] In order to model the westbound Bethel Church Road right turn phase correctly in HCS 2010, JMT included a US Route 301 southbound left turn lane with a volume of 1 vehicle.
[6] The TIS utilized a 75 second cycle length, whereas JMT utilized a 100 second cycle for both AM and PM peak periods, per existing field conditions.
[7] The TIS utilized a 0 second offset for both AM and PM peak periods, whereas the DelDOT timing sheets show a 16 and 74 second offset for the AM and PM peak periods, respectively.
[8] Although through movements are not provided along the eastbound and westbound Bethel Church Road approaches, JMT modeled this approach with a through movement since side street approaches with only left and/or right movements must be coded with through movements having a zero volume to be computed properly per McTrans HCS 2010 technical support.
[9] Right turn on red volumes were included in the existing traffic count data at this intersection. The TIS modeled right turn on red volumes based on Synchro 8 default values, whereas JMT modeled right turn on red volumes based on existing count data and proportionally increased for future conditions.
[10] As this signalized intersection is being replaced as an interchange as part of the *US 301, Maryland State Line to SR 1* project (Contract #T200511301), no mitigation scenario was analyzed.

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Signalized Intersection**[11] | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **US Route 301 / Delaware Route 71 / Brennan Boulevard**[12,13,14,15,16,17] | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | C (26.9) | C (26.7) | C (29.3) | C (26.3) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2)[18] | D (39.7) | D (44.3) | D (54.3) | D (43.6) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3)[18] | D (41.8) | D (47.7) | E (57.8) | D (46.7) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3) *with Mitigation*[19] | - | - | D (48.6) | D (45.9) |

[11] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[12] The TIS modified the lane utilization factors for the northbound and southbound US Route 301 approaches to 1.00, whereas JMT utilized the default lane utilization factor of 0.95.
[13] JMT omitted the westbound Delaware Route 71 approach right turn movements from the analysis, due to the provision of channelization with an acceleration lane. However, the TIS included this right turn movement in their analysis.
[14] Right turn on red volumes were not included in the existing traffic volume data at this intersection. The TIS modeled right turn on red volumes based on Synchro 8 default values, whereas JMT modeled the eastbound Brennan Boulevard right turn movement as permissive within the signal phasing.
[15] The TIS utilized a 20 second offset for both AM and PM peak periods, whereas JMT utilized a 77 and 7 second offset for the AM and PM peak periods, respectively per DelDOT's signal timing sheets.
[16] The TIS utilized arbitrary percentages for traffic in the shared lane (shared left/through lanes) for both eastbound and westbound Brennan Boulevard/Delaware Route 71 approaches, whereas JMT assumed 50% of the turns utilized the shared lane for these approaches.
[17] JMT incorporated peak hour pedestrian volumes into the PM peak hour analysis based on the existing traffic count data, whereas the TIS did not.
[18] Both the TIS and JMT utilized traffic volumes from the Traffic Volume Spreadsheet, which differed from the volume figures in the report for the PM peak hour.
[19] Mitigation scenario includes the modification of the eastbound Brennan Boulevard approach to provide two left turn lanes, one through lane, and one right turn lane.

Table 5
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection[20] Two-Way Stop Control** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Brennan Boulevard / Ballina Boulevard[21]** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Eastbound Brennan Boulevard Left | A (7.5) | A (7.5) | A (7.6) | A (7.5) |
| Eastbound Brennan Boulevard Approach | - | - | A (0.3) | A (0.0) |
| Westbound Brennan Boulevard Left | A (7.7) | A (8.0) | A (7.7) | A (8.0) |
| Westbound Brennan Boulevard Approach | - | - | A (1.3) | A (4.0) |
| Northbound Ballina Boulevard Approach | B (13.6) | B (11.8) | B (13.7) | B (11.4) |
| Southbound Ballina Boulevard Approach | C (19.9) | A (0.0) | C (20.3) | B (13.3) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2) | | | | |
| Eastbound Brennan Boulevard Left | A (7.5) | A (7.5) | A (7.6) | A (7.5) |
| Eastbound Brennan Boulevard Approach | - | - | A (0.3) | A (0.0) |
| Westbound Brennan Boulevard Left | A (7.7) | A (8.0) | A (7.7) | A (8.0) |
| Westbound Brennan Boulevard Approach | - | - | A (1.7) | A (4.0) |
| Northbound Ballina Boulevard Approach | B (13.6) | B (11.8) | B (13.7) | B (11.8) |
| Southbound Ballina Boulevard Approach | C (19.9) | A (0.0) | C (20.3) | B (13.3) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3) | | | | |
| Eastbound Brennan Boulevard Left | A (7.5) | A (7.5) | A (7.6) | A (7.5) |
| Eastbound Brennan Boulevard Approach | - | - | A (0.3) | A (0.0) |
| Westbound Brennan Boulevard Left | A (7.7) | A (8.0) | A (7.7) | A (8.0) |
| Westbound Brennan Boulevard Approach | - | - | A (1.7) | A (4.0) |
| Northbound Ballina Boulevard Approach | B (13.6) | B (11.8) | B (13.7) | B (11.4) |
| Southbound Ballina Boulevard Approach | C (19.9) | A (0.0) | C (20.3) | B (13.3) |

[20] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[21] In order to obtain LOS delay values during the PM peak hour, JMT assumed one vehicle for each turning movement for the southbound Ballina Boulevard approach.

Table 6
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection**[22] **Two-Way Stop Control (T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **US Route 301 / Amberwood Drive**[23] | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Eastbound Amberwood Drive Approach | B (11.0) | B (14.8) | B (10.8) | B (12.0) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2)[24] | | | | |
| Eastbound Amberwood Drive Approach | B (12.1) | C (21.7) | B (11.5) | C (23.9) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3)[24] | | | | |
| Eastbound Amberwood Drive Approach | B (12.2) | C (22.2) | B (11.5) | C (23.9) |

[22] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[23] JMT modeled US Route 301 from Delaware Route 71/Brennan Boulevard to Howell School Road as a corridor; therefore, the proportion of time blocked was included. The TIS did not incorporate signal information in their analysis; therefore, proportion of time blocked was not included.
[24] The TIS used a PHF of 0.91 during the PM peak hour whereas JMT used a PHF of 0.92 per DelDOT's *Development Coordination Manual*.

Table 7
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection[25] Two-Way Stop Control** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Chesapeake City Road / Delaware Route 71[26]** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Eastbound Chesapeake City Road Approach | B (11.4) | B (10.5) | B (11.3) | B (10.4) |
| Northbound Delaware Route 71 Left | A (8.0) | A (7.6) | A (8.0) | A (7.6) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2)[27] | | | | |
| Eastbound Chesapeake City Road Approach | B (11.9) | B (10.9) | B (11.6) | B (10.8) |
| Northbound Delaware Route 71 Left | A (8.0) | A (7.7) | A (8.0) | A (7.7) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3)[27] | | | | |
| Eastbound Chesapeake City Road Approach | B (11.9) | B (11.0) | B (11.7) | B (10.9) |
| Northbound Delaware Route 71 Left | A (8.1) | A (7.7) | A (8.0) | A (7.7) |

[25] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[26] Based on field observations, the northbound Red Lion Road approach is configured with one shared through/left turn lane and one bypass lane. As such, the TIS modeled the northbound approach with one shared through/left turn lane. However, JMT modeled the northbound approach with one left turn lane and one through lane.
[27] During the AM peak hour the TIS used a PHF of 0.78, whereas JMT used a PHF of 0.80 per DelDOT's *Development Coordination Manual.*

Table 8
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection[28] Two-Way Stop Control (T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Bethel Church Road / Jessica Drive** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Eastbound Bethel Church Road Left | A (7.3) | A (7.3) | A (7.3) | A (7.3) |
| Southbound Jessica Drive Approach | A (9.0) | A (8.8) | A (9.0) | A (8.7) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2) | | | | |
| Eastbound Bethel Church Road Left | A (7.5) | A (7.4) | A (7.5) | A (7.4) |
| Southbound Jessica Drive Approach | A (9.5) | A (9.0) | A (9.5) | A (9.0) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3) | | | | |
| Eastbound Bethel Church Road Left | A (7.5) | A (7.4) | A (7.5) | A (7.4) |
| Southbound Jessica Drive Approach | A (9.5) | A (9.0) | A (9.5) | A (9.0) |

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

Table 9
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection**[29] **Two-Way Stop Control (T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Bethel Church Road / Old Summit Bridge Road** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Eastbound Bethel Church Road Approach | A (8.8) | A (8.7) | A (8.8) | A (8.7) |
| Northbound Old Summit Bridge Road Left | A (7.4) | A (7.4) | A (7.4) | A (7.4) |
| Northbound Old Summit Bridge Road Approach | - | - | A (1.0) | A (2.2) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2) | | | | |
| Eastbound Bethel Church Road Approach | A (9.0) | A (8.8) | A (9.0) | A (8.8) |
| Northbound Old Summit Bridge Road Left | A (7.5) | A (7.5) | A (7.5) | A (7.5) |
| Northbound Old Summit Bridge Road Approach | - | - | A (4.7) | A (3.7) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3) | | | | |
| Eastbound Bethel Church Road Approach | A (9.0) | A (8.8) | A (9.0) | A (8.8) |
| Northbound Old Summit Bridge Road Left | A (7.5) | A (7.5) | A (7.5) | A (7.5) |
| Northbound Old Summit Bridge Road Approach | - | - | A (4.7) | A (3.7) |

[29] 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 Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection**[30] **Two-Way Stop Control (T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **US Route 301 / Summit Bridge Drive**[31,32] | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1)[33] | | | | |
| Northbound US Route 301 Left | B (11.7) | B (11.1) | B (11.7) | B (11.1) |
| Eastbound Summit Bridge Drive Approach | B (12.1) | B (13.1) | B (12.2) | B (13.3) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2)[34] | | | | |
| Northbound US Route 301 Left | B (13.4) | B (14.5) | B (13.2) | B (14.9) |
| Eastbound Summit Bridge Drive Approach | B (13.4) | C (16.9) | B (13.5) | C (17.6) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3)[34] | | | | |
| Northbound US Route 301 Left | B (13.5) | B (14.6) | B (13.3) | B (15.0) |
| Eastbound Summit Bridge Drive Approach | B (13.5) | C (17.0) | B (13.6) | C (17.7) |

[30] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[31] The TIS modeled the eastbound right turn with no channelization, whereas JMT modeled the eastbound right turn as channelized consistent with existing field conditions.
[32] The TIS modeled the southbound approach of US Route 301 approach as one through lane and one shared through/right turn lane, whereas JMT modeled this approach as two through lanes and one right turn lane per existing field conditions.
[33] During the AM peak hour, the TIS used a PHF of 0.90 whereas JMT used a PHF of 0.91 per DelDOT's *Development Coordination Manual.*
[34] During the AM peak hour, the TIS used a PHF of 0.90 whereas JMT used a PHF of 0.92 per DelDOT's *Development Coordination Manual.*

Table 11
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Signalized Intersection**[35] **(T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **US Route 301 / Old Summit Bridge Road**[36,37,38,39] | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | A (9.9) | A (7.8) | B (10.1) | A (7.1) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2) | A (3.4) | B (10.4) | B (14.8) | A (8.6) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3) | A (3.4) | B (10.4) | B (14.9) | A (8.7) |

[35] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[36] Both the TIS and JMT modeled the northbound US Route 301 with two through lanes and one right turn lane, omitting the left turn lane, as no traffic volume was recorded for this U-turn movement during both peak periods for each scenario; therefore, no vehicle calls were utilized in the signal phasing.
[37] The TIS utilized a saturation flow rate of 1,900 pc/h/ln, whereas JMT utilized a saturation flow rate of 1,750 pc/h/ln consistent with DelDOT's *Development Coordination Manual* (signalized intersections south of C&D Canal).
[38] Right turn on red volumes were included in the existing traffic count data at this intersection. The TIS modeled right turn on red volumes based on Synchro 8 default values, whereas JMT modeled right turn on red volumes based on existing count data and proportionally increased for future conditions.
[39] JMT modeled the westbound Old Summit Bridge Road approach with a through movement since side street approaches with only left and/or right movements must be coded with through movements having a zero volume to be computed properly per McTrans HCS 2010 technical support.

Table 12
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection[40] Roundabout** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Bethel Church Road / Choptank Road** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Eastbound Bethel Church Road Approach | A (6.46) | A (5.70) | A (6.46) | A (5.70) |
| Northbound Choptank Road Approach | B (10.99) | A (5.41) | B (10.99) | A (5.41) |
| Southbound Choptank Road Approach | A (5.07) | A (8.59) | A (5.07) | A (8.59) |
| Overall Intersection | A (8.45) | A (7.39) | A (8.45) | A (7.39) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2)[41] | | | | |
| Eastbound Bethel Church Road Approach | B (12.88) | A (8.81) | B (11.03) | A (9.29) |
| Northbound Choptank Road Approach | D (25.17) | A (7.63) | C (18.07) | A (7.79) |
| Southbound Choptank Road Approach | A (6.20) | C (18.48) | A (5.82) | C (20.27) |
| Overall Intersection | C (16.22) | B (14.03) | B (12.67) | C (15.18) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3)[41] | | | | |
| Eastbound Bethel Church Road Approach | B (13.06) | A (8.86) | B (11.16) | A (9.34) |
| Northbound Choptank Road Approach | D (25.40) | A (7.70) | C (18.26) | A (7.82) |
| Southbound Choptank Road Approach | A (6.27) | C (18.66) | A (5.88) | C (20.48) |
| Overall Intersection | C (16.36) | B (14.14) | B (12.80) | C (15.29) |

[40] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[41] During the AM peak hour the TIS used a PHF of 0.83, whereas JMT used a PHF of 0.92 per DelDOT's *Development Coordination Manual.*

Table 13
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection[42] Two-Way Stop Control (T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Bethel Church Road / Entrance to Biggs Farm[43]** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Westbound Bethel Church Road Left | A (8.0) | A (7.5) | A (8.0) | A (7.5) |
| Westbound Bethel Church Road Approach | - | - | A (0.3) | A (0.2) |
| Northbound Biggs Farm Approach | A (9.4) | A (9.0) | A (9.4) | A (9.0) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2) | | | | |
| Westbound Bethel Church Road Left | A (8.9) | A (7.9) | A (8.9) | A (7.9) |
| Westbound Bethel Church Road Approach | - | - | A (0.2) | A (0.1) |
| Northbound Biggs Farm Approach | B (11.5) | A (10.0) | B (11.4) | A (10.0) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3) | | | | |
| Westbound Bethel Church Road Left | A (8.9) | A (7.9) | A (8.9) | A (7.9) |
| Westbound Bethel Church Road Approach | - | - | A (0.2) | A (0.1) |
| Northbound Biggs Farm Approach | B (11.5) | A (10.0) | B (11.4) | A (10.0) |

[42] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[43] During the PM peak hour the TIS used a PHF of 0.96, whereas JMT used a PHF of 0.97 per the manual turning movement counts.

Table 14
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection[44] Two-Way Stop Control (T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Bethel Church Road / Fairview Avenue[45]** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Eastbound Bethel Church Road Left | A (7.5) | A (7.8) | A (7.4) | A (7.7) |
| Eastbound Bethel Church Road Approach | - | - | A (0.1) | A (0.4) |
| Southbound Fairview Avenue Approach | B (10.2) | A (9.9) | B (10.2) | A (9.9) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2) | | | | |
| Eastbound Bethel Church Road Left | A (7.5) | A (7.8) | A (7.4) | A (7.7) |
| Eastbound Bethel Church Road Approach | - | - | A (0.1) | A (0.4) |
| Southbound Fairview Avenue Approach | B (10.3) | A (10.0) | B (10.2) | A (9.9) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3) | | | | |
| Eastbound Bethel Church Road Left | A (7.5) | A (7.8) | A (7.4) | A (7.7) |
| Eastbound Bethel Church Road Approach | - | - | A (0.1) | A (0.4) |
| Southbound Fairview Avenue Approach | B (10.3) | A (10.0) | B (10.2) | A (9.9) |

[44] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[45] During the AM peak hour the TIS used a PHF of 0.89, whereas JMT used a PHF of 0.90 per the manual turning movement counts.

Table 15
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection[46] Two-Way Stop Control (T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Choptank Road / Clayton Manor Drive** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Eastbound Clayton Manor Drive Approach | B (13.7) | B (13.2) | B (13.7) | B (13.3) |
| Northbound Choptank Road Left | A (7.8) | A (8.3) | A (7.8) | A (8.3) |
| Northbound Choptank Road Approach | - | - | A (0.7) | A (2.0) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2)[47] | | | | |
| Eastbound Clayton Manor Drive Approach | C (16.8) | C (15.5) | C (15.7) | C (15.6) |
| Northbound Choptank Road Left | A (8.1) | A (8.6) | A (8.0) | A (8.6) |
| Northbound Choptank Road Approach | - | - | A (0.7) | A (1.8) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3)[47] | | | | |
| Eastbound Clayton Manor Drive Approach | C (17.0) | C (15.5) | C (15.9) | C (15.8) |
| Northbound Choptank Road Left | A (8.1) | A (8.6) | A (8.0) | A (8.6) |
| Northbound Choptank Road Approach | - | - | A (0.7) | A (1.8) |

[46] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[47] During the AM peak hour the TIS used a PHF of 0.83, whereas JMT used a PHF of 0.88 per DelDOT's *Development Coordination Manual.*

Table 16
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for the Summit Pointe Development
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Unsignalized Intersection[48] Roundabout** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **Churchtown Road / Choptank Road** | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| 2015 Existing (Case 1) | | | | |
| Eastbound Churchtown Road Approach | A (6.64) | A (6.33) | A (6.64) | A (6.33) |
| Westbound Churchtown Road Approach | A (5.86) | A (6.11) | A (5.86) | A (6.11) |
| Northbound Choptank Road Approach | A (7.84) | A (6.11) | A (7.84) | A (6.11) |
| Southbound Choptank Road Approach | A (6.59) | A (8.00) | A (6.59) | A (8.00) |
| Overall Intersection | A (6.96) | A (6.88) | A (6.96) | A (6.88) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2)[49] | | | | |
| Eastbound Churchtown Road Approach | A (9.50) | A (7.84) | A (9.19) | A (8.28) |
| Westbound Churchtown Road Approach | A (7.02) | A (8.04) | A (6.98) | A (8.38) |
| Northbound Choptank Road Approach | A (9.68) | A (8.33) | A (9.27) | A (8.59) |
| Southbound Choptank Road Approach | A (8.53) | B (10.80) | A (8.22) | B (11.56) |
| Overall Intersection | A (8.95) | A (9.10) | A (8.64) | A (9.58) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3)[49] | | | | |
| Eastbound Churchtown Road Approach | A (9.59) | A (7.88) | A (9.28) | A (8.31) |
| Westbound Churchtown Road Approach | A (7.03) | A (8.10) | A (7.00) | A (8.45) |
| Northbound Choptank Road Approach | A (9.72) | A (8.41) | A (9.33) | A (8.69) |
| Southbound Choptank Road Approach | A (8.64) | B (10.90) | A (8.32) | B (11.64) |
| Overall Intersection | A (9.02) | A (9.17) | A (8.71) | A (9.65) |

[48] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[49] During the AM peak hour the TIS used a PHF of 0.84, whereas JMT used a PHF of 0.88 per DelDOT's *Development Coordination Manual*.

Table 17
PEAK HOUR LEVELS OF SERVICE (LOS)
Based on Final Traffic Impact Study for Summit Pointe
Report Dated November 20, 2015
Prepared by Traffic Planning and Design, Inc.

| **Signalized Intersection**[50] **(T-Intersection)** | **LOS per TIS** | | **LOS per JMT** | |
|---|---|---|---|---|
| **US Route 301 / Howell School Road**[51,52] | Weekday AM | Weekday PM | Weekday AM | Weekday PM |
| Existing (Case 1) | C (22.9) | C (31.2) | A (9.4) | B (11.8) |
| | | | | |
| 2020 without development of Summit Pointe (Case 2)[53] | D (35.2) | C (26.7) | B (12.7) | B (13.6) |
| | | | | |
| 2020 with development of Summit Pointe (Case 3) | D (38.2) | C (26.9) | B (12.6) | B (14.0) |

[50] For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.
[51] The TIS modeled this location as two intersections and reporting the higher delay, whereas JMT modeled this location as one intersection.
[52] As JMT modeled this location as one intersection, the westbound Howell School Road approach was shown with a through movement since side street approaches with only left and/or right movements must be coded with through movements having a zero volume to be computed properly per McTrans HCS 2010 technical support.
[53] During the PM peak hour, the TIS utilized a westbound Howell Church Road left turn volume of 47 vehicles, whereas JMT utilized a left turn volume of 56 vehicles consistent with Figure 8 and the Traffic Volume Worksheet of the TIS.