



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

JENNIFER COHAN
SECRETARY

August 2, 2018

Mr. Michael Kaszyski
Duffield Associates, Inc.
5400 Limestone Road
Wilmington, Delaware 19808

Dear Mr. Sylvester:

The enclosed Traffic Impact Study (TIS) review letter for the **Wawa – Seaford (f.k.a. Ayers Property)** (Tax Parcels 331-6.00-9.00, 9.01, 9.03 & 9.06) development has been completed under the responsible charge of a registered professional engineer whose firm is authorized to work in the State of Delaware. They have found the TIS to conform to DelDOT's Development Coordination Manual and other accepted practices and procedures for such studies. DelDOT accepts this review letter and concurs with the recommendations. If you have any questions concerning this letter or the enclosed review letter, please contact me at (302) 760-2167.

Sincerely,

Troy Brestel
Project Engineer

TEB:km

Enclosures

cc with enclosures: Mr. Fred Wittig, Diamond State Management
Ms. Constance C. Holland, Office of State Planning Coordination
Mr. Charles Anderson, City Manager, City of Seaford
Mr. Mir Wahed, Johnson, Mirmiran & Thompson, Inc.
Ms. Joanne Arellano, Johnson, Mirmiran & Thompson, Inc.
DelDOT Distribution

DeIDOT Distribution

Annie Cordo, Deputy Attorney General
Robert McCleary, Director, Transportation Solutions (DOTS)
Drew Boyce, Director, Planning
Mark Luszc, Chief Traffic Engineer, Traffic, DOTS
Michael Simmons, Assistant Director, Project Development South, DOTS
J. Marc Coté, Assistant Director, Development Coordination
T. William Brockenbrough, Jr., County Coordinator, Development Coordination
Peter Haag, Traffic Studies Manager, Traffic, DOTS
Alastair Probert, South District Engineer, South District
Gemez Norwood, South District Public Works Manager, South District
Jay Sammons, South District Permit Supervisor, South District
Steve Sisson, Sussex Subdivision Coordinator, Development Coordination
David Dooley, Service Development Planner, Delaware Transit Corporation
Mark Galipo, Traffic Engineer, Traffic, DOTS
Anthony Aglio, Planning Supervisor, Statewide & Regional Planning
Claudy Joinville, Project Engineer, Development Coordination
Kevin Hickman, Johnson, Mirmiran & Thompson, Inc.



August 1, 2018

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

RE: Agreement No. 1774
Project Number T201769002
Traffic Impact Study Services
Task 13A-Wawa-Seaford

Dear Mr. Brestel:

Johnson, Mirmiran and Thompson (JMT) has completed the review of the Traffic Impact Study (TIS) for the proposed Wawa, prepared by Duffield Associates, Inc. dated January 2018. This task was assigned Task Number 13A. Duffield Associates, Inc. prepared the report in a manner generally consistent with DelDOT's *Development Coordination Manual*.

The TIS evaluates the impacts of a proposed 5,585 square-foot Wawa convenience store with gas pumps in the City of Seaford, Sussex County, Delaware. The store will be located at the southeast quadrant of the intersection of US Route 13 and Tharp Road/Herring Run Road (Sussex Road 534). Access is proposed via the rights-in/rights-out entrance that is used by the existing Grotto Pizza along northbound US Route 13 and a full access along Tharp Road opposite the Sussex Plaza driveway. The subject property is on an approximately 9.83-acre assemblage of parcels but only approximately 1.71-acres will be developed for the proposed Wawa. The subject site is currently zoned C-2 (Highway Commercial) and the developer does not plan to rezone the land. Construction is expected to be completed in 2018.

DelDOT currently has one relevant project within the study area which is Phase III of the *Statewide Divided Highway Safety Study* (Contract #T200950017). This project is designed to improve safety along divided highways throughout Delaware. As part of the study, signing 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 13 was evaluated as part of this study, which included the signalized intersection of US Route 13 and Tharp Road/Herring Run Road. Recommendations as part of this study include signage (Yield, Do Not Enter, Wrong Way, One Way, Turn Lane, Divided Highway, etc.) improvements following DE MUTCD specifications. As this is an ongoing study, the above improvements have not yet been implemented.

DelDOT's 2010 Hazard Elimination Program (HEP) identified two locations within the project area. The 2010 HEP Site A is a 0.59-mile corridor located along Tharp Road/Herring Run Road from 0.02-mile east of Bridgeville Road to 0.14-mile west of Jamore Drive. The 2010 HEP Site X



is a 1.69-mile corridor located along US Route 13 from SR 20/Concord Road to 0.30-mile north of Herring Run Road. The Sites A and X Task I report included a crash summary, a review of the Tharp Road/Herring Run Road corridor, a review of the US Route 13 intersection with Herring Run Road/Tharp Road, and an assessment of the proposed improvements to the US Route 13 and Herring Run Road/Tharp Road intersection as a part of the *US Route 13 Seaford Intersection Improvements* project (Contract No. T200412401). Additionally, the Task I report recommended that signal coordination and timing improvements be considered in conjunction with the *US Route 13 Seaford Intersection Improvements* project to improve congestion and progression along US Route 13 and reduce the potential for rear end crashes. A review of converting the side street signal phasing from split phase to concurrent signal phasing was also recommended.

As part of the *US Route 13 Seaford Intersections Improvements* project, eastbound Herring Run Road and westbound Tharp Road would be modified to include two left turn lanes, a through lane, and a right turn lane. Bike lanes would be installed along the eastbound and westbound approaches, and luminaires would be installed on the northwest, southwest and southeast corners of the intersection. Also, a signalized pedestrian crosswalk would be provided across the south leg of the intersection. Based on site observations these improvements have been completed. Additional information regarding *US Route 13 Seaford Intersection Improvements* can be found on the DelDOT website at:

https://deldot.gov/information/projects/CompletedProjects/us13_seaford/

In addition, DelDOT has a future pavement rehabilitation project along US Route 13. This project will involve a mill and overlay of US Route 13 from Brickyard Road (Sussex Road 481) to Old Furnace Road (Sussex Road 46). A contract number has not been assigned. The construction is anticipated to take place Summer of 2018.

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

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

<i>Intersection</i>	<i>Situations for which LOS deficiencies occur</i>
Site Entrance A/Tharp Road (Sussex Road 534)/Sussex Plaza Driveway	2018 PM and Saturday with Wawa development (Case 3)
US Route 13/Tharp Road/Herring Run Road (Sussex Road 534)	2017 AM Existing (Case 1) 2018 AM without Wawa development (Case 2) 2018 AM with Wawa development (Case 3)

The unsignalized intersection of Site Entrance A/Tharp Road/Sussex Plaza Driveway would exhibit LOS deficiencies during the PM and Saturday peak periods with the buildout of the Wawa development. The deficiencies would occur along the northbound Site Entrance A shared through/left turn lane which is projected to operate at LOS F (255.8 seconds of delay per vehicle) with a calculated 95th percentile queue length of approximately 160 feet.



As an unsignalized intersection, the anticipated queue length (approximately 160 feet) during Case 3 along the northbound Site Entrance A approach to Tharp Road could be accommodated on site and have minimal impacts on site operations. However, the westbound 95th percentile queue length along the Tharp Road approach at the US Route 13/Tharp Road intersection (approximately 385 feet with optimized signal timings) would infringe upon vehicles executing left turns from Site Entrance A onto Tharp Road (the US Route 13/Tharp Road intersection is approximately 400 feet to the west). Furthermore, there is a high volume of vehicles executing left in (261 vehicles during the Saturday peak) and right out (293 vehicles during the Saturday peak) movements at the Sussex Plaza driveway. Therefore, it is recommended that left out movements be prohibited from Site Entrance A.

As the undeveloped portions of the property are proposed to be developed in the future, the developer should coordinate with DelDOT on the provision of a connector road to allow access via the Tharp Road/Meadow Wood Road intersection. Per the July 26, 2017 DelDOT Scoping Meeting memorandum, Meadow Wood Road is a planned local road that may someday connect Tharp Road to Beaver Dam Drive, which is approximately 0.30 miles east of the Tharp Road/Meadow Wood Road intersection. With the potential future build of the undeveloped portion of the property and the planned local road connection, increases in volume at the Tharp Road/Meadow Wood Road intersection are expected and may warrant the installation of a traffic signal in the future. When the undeveloped portions of the subject property are proposed to be developed and the future uses are finalized, the developer should also coordinate with DelDOT to determine if any additional improvements are needed with the full build out of the entire site. The signalized intersection of US Route 13/Tharp Road/Herring Run Road (Sussex Road 534) exhibits LOS deficiencies during the AM peak period under existing and future conditions with or without the build out of the Wawa development. However, with signal timing split modifications the intersection would improve to operate at LOS D during each peak period. Therefore, we do not recommend any additional improvements be implemented by the developer at this intersection.

JMT also conducted a crash evaluation using the March 2014 to March 2017 crash data contained in the TIS report. The results are summarized on Page 12.

Should the City of Seaford 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 right turn travel lane/shoulder along northbound US Route 13 from the Tharp Road/Herring Run Road intersection to the southerly limits of the site frontage, at DelDOT's discretion. DelDOT should analyze the existing lane's pavement section and recommend an overlay thickness to the developer's engineer if necessary. Additionally, there is a pavement rehabilitation project planned for US Route 13 from Old Furnace Road to Brickyard Road. As this project



would traverse along the US Route 13 site frontage, the developer should contact Mr. Paul Farkas at (302)-760-2348 to coordinate the resurfacing project with the site related improvements along US Route 13.

2. The developer should provide a bituminous concrete overlay to the eastbound travel lanes along Tharp Road from the US Route 13/Tharp Road/Herring Run Road intersection to the Tharp Road/Meadow Wood intersection at DelDOT’s discretion. DelDOT should analyze the existing lane’s pavement section and recommend an overlay thickness to the developer’s engineer if necessary.
3. The developer should maintain the existing rights-in/rights-out entrance along northbound US Route 13 which is approximately 400 feet south of the US Route 13/Tharp Road intersection and provide the lane configurations as shown in the table below:

Approach	Current Configuration	Proposed Configuration
Westbound Site Entrance B	One right turn lane	No change
Northbound US Route 13	Two through lanes and one right turn lane	No change

The existing storage length of approximately 250 feet should be maintained. The calculated queue lengths from the HCS analysis can be accommodated within the existing storage length.

4. The developer should construct a left turn egress restricted entrance along Tharp Road opposite the Sussex Plaza Driveway and provide the lane configurations as shown in the table below:

Approach	Current Configuration	Proposed Configuration
Eastbound Tharp Road	One left turn lane and one through lane	One left turn lane, one through lane, and one right turn lane
Westbound Tharp Road	One shared through/right turn lane	One left turn lane and one shared through/right turn lane
Northbound Site Entrance A	Approach does not exist	One right turn lane
Southbound Sussex Plaza Driveway	One shared left turn/right turn lane	One shared through/left turn/right turn lane



Based on DelDOT's *Development Coordination Manual*, the recommended minimum storage length (excluding taper) is 120 feet and 145 feet for the westbound Tharp Road left turn lane and the eastbound Tharp Road right turn lane, respectively. The calculated queue lengths from the HCS analysis can be accommodated within the recommended storage length.


5. The following items should be included:
 - a. Utility covers should be moved outside of any designated bicycle lanes and sidewalks or should be flush with the pavement.
 - b. Bike parking racks should be provided near the building entrances. Where the building architecture provides for an awning or other overhang, the bike parking should be covered.
 - c. The developer should coordinate with DART to provide a bus stop along the US Route 13 site frontage, south of the US Route 13/Tharp Road/Herring Run Road intersection. Coordination should include provisions for appropriate amenities (bus pad, shelter, etc.) The sidewalk along US Route 13 should provide a connection to the bus stop.

Please note that this review generally focuses on capacity and level of service issues; additional comments related to bike lanes, sidewalks, safety and operational items will be further addressed through DelDOT's Plan 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 https://www.deldot.gov/Publications/manuals/de_mutcd/index.shtml. For any additional information regarding the work zone impact and mitigation procedures during construction please contact Mr. Mark Buckalew of DelDOT's Traffic Section. Mr. Buckalew can be reached at (302) 894-46353 or by email at Mark.Buckalew@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 Wahed, P.E., PTOE

cc: Joanne Arellano, P.E., PTOE
Enclosure

General Information

Report date: January 2018

Prepared by: Duffield Associates, Inc.

Prepared for: Tharp Road Properties, LLC

Tax Parcel: 331-6.00-9.00, 331-6.00-9.01, 331-6.00-9.03 and 331.6.00-9.06. Based on the Concept Plan, a portion of Tax Parcels 331-6.00-9.00 and 331-6.00-9.01 will be used for the proposed development.

Generally consistent with DelDOT's *Development Coordination Manual*: Yes.

Project Description and Background

Description: The developer seeks to develop a 5,585 square-foot Wawa convenience store with gas pumps.

Location: The subject site is located on the southeast quadrant of the intersection of US Route 13 and Tharp Road/Herring Run Road (Sussex Road 534), in the City of Seaford, Sussex County.

Amount of Land to be developed: The subject property is on an approximately 9.83-acre assemblage of parcels. Approximately 1.71-acres will be used for the proposed development based on the Concept Plan.

Land Use approval(s) needed: Entrance Plan approval.

Proposed completion date: 2018

Proposed access locations: One full movement access on Tharp Road opposite the Sussex Plaza driveway and one rights-in/rights-out access on northbound US Route 13.

Daily Traffic Volumes:

- 2017 Average Annual Daily Traffic on US Route 13: 27,247 vehicles per day.
- 2017 Average Annual Daily Traffic on Tharp Road: 5,716 vehicles per day.

Site Map



**Graphic is an approximation based on the Concept Plan prepared by Bohler Engineering Inc. dated November 18, 2017.*

Relevant and On-going Projects

DelDOT currently has one relevant project within the study area which is Phase III of the *Statewide Divided Highway Safety Study* (Contract #T200950017). This project is designed to improve safety along divided highways throughout Delaware. As part of the study, signing 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 13 was evaluated as part of this study, which included the signalized intersection of US Route 13 and Tharp Road/Herring Run Road. Recommendations as part of this study include signage (Yield, Do Not Enter, Wrong Way, One Way, Turn Lane, Divided Highway, etc.) improvements following DE MUTCD specifications. As this is an ongoing study, the above improvements have not yet been implemented.

DelDOT's 2010 Hazard Elimination Program (HEP) identified two locations within the project area. The 2010 HEP Site A is a 0.59-mile corridor located along Tharp Road/Herring Run Road from 0.02-mile east of Bridgeville Road to 0.14-mile west of Jamore Drive. The 2010 HEP Site X is a 1.69-mile corridor located along US Route 13 from SR 20/Concord Road to 0.30-mile north of Herring Run Road. The Sites A and X Task I report included a crash summary, a review of the Tharp Road/Herring Run Road corridor, a review of the US Route 13 intersection with Herring Run Road/Tharp Road, and an assessment of the proposed improvements to the US Route 13 and Herring Run Road/Tharp Road intersection as a part of the *US Route 13 Seaford Intersection Improvements* project (Contract No. T200412401). Additionally, the Task I report recommended that signal coordination and timing improvements be considered in conjunction with the *US Route 13 Seaford Intersection Improvements* project to improve congestion and progression along US Route 13 and reduce the potential for rear end crashes. A review of converting the side street signal phasing from split phase to concurrent signal phasing was also recommended.

As part of the *US Route 13 Seaford Intersections Improvements* project, eastbound Herring Run Road and westbound Tharp Road would be modified to include two left turn lanes, a through lane, and a right turn lane. Bike lanes would be installed along the eastbound and westbound approaches, and luminaires would be installed on the northwest, southwest and southeast corners of the intersection. Also, a signalized pedestrian crosswalk would be provided across the south leg of the intersection. Based on site observations these improvements have been completed. Additional information regarding *US Route 13 Seaford Intersection Improvements* can be found on the DelDOT website at:

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In addition, DelDOT has a future pavement rehabilitation project along US Route 13. This project will involve a mill and overlay of US Route 13 from Brickyard Road (Sussex Road 481) to Old Furnace Road (Sussex Road 46). A contract number has not been assigned. The construction is anticipated to take place Summer of 2018.

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 1 area.

Investment Level 1

These areas are often municipalities, towns, or urban/urbanizing places in counties where density is generally higher than in surrounding areas. 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. Overall, it is the state's intent to use its spending and management tools to maintain and enhance community character, to promote well-designed and efficient new growth, and to facilitate redevelopment in Investment Level 1 Areas.

In Level 1 Areas the state's first priority will be for preserving existing facilities and making safety improvements. Level 1 areas will also be the highest priority for context sensitive transportation system capacity enhancements, transit-system enhancements, ADA accessibility, and for closing gaps in the pedestrian system, including the Safe Routes to School projects. Further, Level 1 areas are the first priority for planning projects and studies, bicycle facilities, signal-system enhancements, and the promotion of interconnectivity between neighborhoods and public facilities.

Proposed Development's Compatibility with Livable Delaware:

The proposed development is located in the Investment Level 1 area. According to Livable Delaware, Level 1 focuses on new or expansion of economic development projects located in these areas. Therefore, the proposed development is generally consistent with the 2015 update of the Livable Delaware "Strategies for State Policies and Spending."

Comprehensive Plans

(Source: *City of Seaford, Comprehensive Plan, 2008*)

City of Seaford Comprehensive Plan:

The subject property is situated within the City of Seaford and is zoned as C-2 (highway commercial). Rezoning is not necessary to permit the proposed land use.

Proposed Development's Compatibility with the City of Seaford Comprehensive Plan:

Per the *City of Seaford Comprehensive Plan*, the city's goals for the future are to continue to make Seaford a community where both residents and businesses want to be. As such, the proposed use is generally compatible with the *City of Seaford Comprehensive Plan*.

Trip Generation

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 853 (Convenience Market with Gasoline Pumps).

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

Table 1
Wawa Trip Generation

Land Use	ADT	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
5,585 Square Feet Convenience Market with Gasoline Pumps	4,723	115	114	229	142	142	284	131	126	257
Pass-By Trips		72	72	144	94	94	188	87	83	170
Net New Trips		43	42	85	48	48	96	44	43	87

Overview of TIS

Note: The intersections and conditions examined differ from the March 14, 2017 DelDOT Scoping Meeting memorandum as the proposed use has changed from a grocery store and convenience store with gas pumps to only a convenience store with gas pumps.

Intersections examined:

1. Site Entrance A / Tharp Road (Sussex Road 534) / Sussex Plaza Driveway
2. Site Entrance B / US Route 13 (rights-in / rights-out)
3. Meadow Wood Road / Tharp Road
4. US Route 13 / Tharp Road / Herring Run Road (Sussex Road 534)

Conditions examined:

1. Case 1 – 2017 Existing
2. Case 2 – 2018 without development
3. Case 3 – 2018 with development

Peak hours evaluated: Weekday morning, Weekday evening, and Saturday midday peak hours.

Committed Developments considered:

1. Mearfield Single Family (182 single-family detached houses)
2. Mearfield Section 2 (153 condominiums / townhouses)
3. Haggerty Property (280 apartment units and 10,000 square feet of retail space)
4. Grotto Pizza (high-turnover sit-down restaurant) – for proposed entrances
5. Villages of Stoneybrook (192 apartment units, 150 townhouses / condominiums)

Intersection Descriptions

- 1. Site Entrance A / Tharp Road (Sussex Road 534) / Sussex Plaza Driveway**
Type of Control: Existing two-way stop controlled intersection (T-intersection), Proposed two-way stop controlled intersection (four- leg intersection)
Eastbound Approach: (Tharp Road) Existing one left turn lane and one through lane; proposed one left turn lane, one through lane, and one right turn lane
Westbound Approach: (Tharp Road) Existing one shared through/right turn lane; proposed one left turn lane and one shared through/right turn lane
Northbound Approach: (Site Entrance A) Proposed one shared through/left turn lane and one right turn lane, stop controlled
Southbound Approach: (Sussex Plaza Driveway) Existing one shared through/left turn/right turn lane, stop controlled

- 2. Site Entrance B / US Route 13 (rights-in / rights-out)**
Type of Control: existing two-way stop controlled intersection (T-intersection)
Westbound Approach: (Site Entrance B) Existing one right turn lane
Northbound Approach: (US Route 13) Existing two through lanes and one right turn lane

- 3. Meadow Wood Road / Tharp Road**
Type of Control: existing two-way stop controlled intersection (T-intersection)
Eastbound Approach: (Tharp Road) Existing one through lane and one right turn lane
Westbound Approach: (Tharp Road) Existing one through lane and one bypass lane
Northbound Approach: (Meadow Wood Road) Existing one left turn lane and one right turn lane, stop controlled

- 4. US Route 13 / Tharp Road / Herring Run Road (Sussex Road 534)**
Type of Control: Existing signalized intersection
Eastbound Approach: (Herring Run Road) Existing two left turn lanes, one through lane and one right turn lane
Westbound Approach: (Tharp Road) Existing two left turn lanes, one through lane and one right turn lane
Northbound Approach: (US Route 13) Existing two left turn lanes, two through lanes and one channelized right turn lane
Southbound Approach: (US Route 13) Existing one left turn lane, two through lanes and one channelized right turn lane

Transit, Pedestrian, and Bicycle Facilities

Existing transit service: Delaware Transit Corporation (DTC) currently provides existing services via DART Routes 212 and 903 within the study area. Designed bus stops for DART Routes 212 and 903 exist within the study area and are located at the Walmart within Sussex Plaza, within the Seaford Village Shopping Center, and along northbound US Route 13, approximately 0.3 mile south of the US Route 13 intersection with Tharp Road. DART Route 212 provides 12 round trips on weekdays from 5:58 a.m. to 10:23 p.m. Route 212 does not provide any bus service

on weekends. DART Route 903 provides 14 round trips on weekdays from 6:30 a.m. to 7:30 p.m. Route 903 does not provide any bus service on weekends.

Planned transit service: JMT contacted Ms. Tremica Cherry-Wall, Planner at the DTC. Per email correspondence on February 15, 2018 from Ms. Cherry-Wall, 5 feet by 8 feet bus pad is recommended to be installed adjacent to the northbound US Route 13 rights-in/rights-out access.

Existing bicycle and pedestrian facilities: According to DelDOT's *Sussex County Bicycle Map*, Connector Bicycle Route exists within the study area. The Connector Bicycle Route exists along US Route 13 as well as Tharp Road and traverses through all four study intersections. Within the study area, sidewalks exist along Tharp Road adjacent to the proposed development. A pedestrian crosswalk is provided along US Route 13 at the intersection with Tharp Road at the southerly intersection leg.

Planned bicycle and pedestrian facilities: Per email correspondence on February 2, 2018 from Mr. John Fiori, DelDOT's Bicycle Coordinator, the following improvements were recommended:

- A bike lane and shoulder should be provided along Tharp Road.
- A curb ramp and crosswalk should be installed to connect to the existing curb ramp on the other side of Meadow Wood Road.
- An internal sidewalk connection should be provided from US Route 13 to Tharp Road.
- Sidewalk should be installed along US Route 13 beginning at the existing sidewalk at the intersection of Tharp Road and extending a minimum to the existing rights-in/rights-out access.
- If the existing rights-in/rights-out access along US Route 13 is being modified, then bicycle facilities should be incorporated.
- All entrance, roadway and intersection improvements should incorporate bicycle and pedestrian facilities.

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 US Route 13 and Tharp Road site frontages with a 45 miles per hour and 40 miles per hour speed limits, respectively, and the provision of a 5-foot bike lane, the BLOS with the full build out construction of the proposed development are summarized below. The BLOS was determined utilizing the calculators published on the LIB website:

<http://rideillinois.org/blos/blosform.htm>

- US Route 13 – BLOS: C (2.51-3.50)
- Tharp Road – BLOS: B (1.51-2.50)

Crash Evaluation

JMT conducted a crash evaluation at the study intersections using the March 2014 to March 2017 crash data contained in the TIS report. Based on the crash data, there were a total of 67 crashes at

the study intersections with 7 crashes containing injuries and no fatalities reported. The majority of the crashes (60) took place at the US Route 13/Tharp Road intersection. Out of the 60 crashes at the US Route 13/Tharp Road intersection, 40 were rear-ends, 11 were angle and 9 were sideswipe incidents. Three crashes occurred at the US Route 13/Site Entrance B intersection. Out of the 3 crashes, 1 was a sideswipe, 1 was an angle, and 1 was a rear end incident. Three crashes occurred at the Tharp Road/Sussex Plaza Driveway intersection. Out of the 3 crashes, 2 were rear end and 1 was an angle incident. One angle crash occurred at the Tharp Road/Meadow Wood Road intersection. A review of the crashes did not indicate any significant crash trends that need further intersection improvements than those recommended in this TIS review.

Previous Comments

The comments from the Preliminary TIS have been addressed in the TIS. However, JMT determined a few volume inconsistencies in the trip generation used for the committed developments and the proposed Wawa. As such, JMT used updated Cases 2 and 3 volumes in the TIS review.

General HCS Analysis Comments

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

1. For the intersection analyses, the TIS used HCS7 version 7.2.1 whereas JMT used HCS 2010, version 6.90.
2. JMT used heavy vehicle percentages consistent with the existing turning movement counts during Case 1 whereas the TIS did not.
3. Per DelDOT's *Development Coordination Manual*, JMT used a heavy vehicle percentage of 3% for each movement in the Case 2 and Case 3 future scenario analysis, unless the existing heavy vehicle percentage was greater than 3% and there was no significant increase of vehicles along that movement, in which case the existing heavy vehicle percentage was used for analysis of future scenarios. The TIS utilized the heavy vehicle percentage of 3% for all the existing and future scenarios.
4. Per DelDOT's *Development Coordination Manual*, JMT utilized the existing PHF for Case 1 and a future PHF for Cases 2 and 3 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 assumed 0.92 for all existing and future scenarios.
5. JMT utilized updated Cases 2 and 3 volumes. As discussed with DelDOT, the updated volumes were created to address some volume development inconsistencies identified in the TIS report. In addition, JMT utilized updated Case 3 volumes based on new trip assignments developed from discussions with DelDOT.

Table 2
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Wawa
Report Dated: January 2018
Prepared by Duffield Associates, Inc.

Unsignalized Intersection Two-Way Stop Control ¹	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
Site Entrance A/Tharp Road (Sussex Road 534)/Sussex Plaza Driveway						
2017 Existing (Case 1) ²						
Eastbound Tharp Road Left Turn	A (7.9)	A (8.4)	A (8.5)	A (7.9)	A (8.3)	A (8.6)
Southbound Sussex Plaza Driveway Approach	B (10.5)	C (19.2)	C (19.0)	B (10.5)	C (17.7)	C (20.8)
2018 Without development (Case 2)						
Eastbound Tharp Road Left Turn	A (8.1)	A (8.6)	A (8.8)	A (8.1)	A (8.5)	A (8.8)
Southbound Sussex Plaza Driveway Approach	B (11.3)	D (25.0)	C (23.9)	B (11.2)	C (22.8)	C (24.0)
2018 With development (Case 3) ³						
Eastbound Tharp Road Left Turn	A (8.1)	A (8.5)	A (8.7)	A (8.1)	A (8.5)	A (8.7)
Westbound Tharp Road Left Turn	A (7.7)	A (8.2)	A (7.9)	A (7.7)	A (8.1)	A (7.9)
Northbound Site Entrance A Left Turn	C (21.3)	F (222.5)	F (304.0)	C (20.5)	F (143.0)	F (255.8)
Northbound Site Entrance A Right Turn	A (9.1)	A (9.9)	A (9.4)	A (9.1)	A (9.8)	A (9.4)
Northbound Site Entrance A Approach	C (19.4)	F (187.6)	F (255.3)	C (18.6)	F (119.8)	F (213.5)
Southbound Sussex Plaza Driveway Approach	B (11.5)	E (37.1)	D (31.2)	B (11.4)	D (28.7)	D (28.9)

¹ For signalized and unsignalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds.

² As heavy vehicle data was not available during the AM peak hour, both the TIS and JMT utilized a 3% heavy vehicle percentage at each conflicting movement.

³ The TIS configured the northbound Site Entrance A approach as a left turn lane and a right turn lane, and the southbound Sussex Plaza Driveway approach as a shared left turn/right turn lane whereas JMT configured the northbound Site Entrance A approach as a shared through/left turn lane and a right turn lane, and the southbound Sussex Plaza Driveway approach as a shared through/left turn/right turn lane consistent with the Concept Plan dated November 8, 2017.

Table 2 (continued)
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Wawa
Report Dated: January 2018
Prepared by Duffield Associates, Inc.

Unsignalized Intersection Two-Way Stop Control ¹	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
Site Entrance A/Tharp Road (Sussex Road 534)/Sussex Plaza Driveway						
2018 With development (Case 3) with Improvement ⁴						
Eastbound Tharp Road Left Turn	-	-	-	A (8.1)	A (8.5)	A (8.7)
Westbound Tharp Road Left Turn	-	-	-	A (7.7)	A (8.1)	A (7.9)
Northbound Site Entrance A Right Turn	-	-	-	A (9.1)	A (9.8)	A (9.4)
Southbound Sussex Plaza Driveway Approach	-	-	-	B (11.7)	D (30.8)	D (31.8)

⁴ Improvement scenario includes a left turn egress restricted access for proposed Site Entrance A. The southbound Sussex Plaza Driveway approach would provide a shared through/left turn/right turn lane.

Table 3
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Wawa
Report Dated: January 2018
Prepared by Duffield Associates, Inc.

Unsignalized Intersection Two-Way Stop Control ¹	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
Site Entrance B/US Route 13 (rights-in / rights-out)						
2017 Existing (Case 1)						
Westbound Site Entrance B Approach	B (10.5)	B (11.8)	B (12.9)	B (13.1)	B (11.5)	B (12.5)
2018 Without development (Case 2)						
Westbound Site Entrance B Approach	B (10.7)	B (12.1)	B (13.3)	B (13.4)	B (12.0)	B (13.2)
2018 With development (Case 3) ⁵						
Westbound Site Entrance B Approach	B (10.9)	B (12.6)	B (13.9)	B (11.0)	B (12.3)	B (13.7)
2018 With development (Case 3) <i>with Improvement</i> ⁴						
Westbound Site Entrance B Approach	-	-	-	B (11.8)	B (13.9)	C (15.7)

⁵ During the AM peak, JMT reduced the heavy vehicle percentage to 3% for the westbound Site Entrance B approach as there was a significant increase in traffic.

Table 4
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Wawa
Report Dated: January 2018
Prepared by Duffield Associates, Inc.

Unsignalized Intersection Two-Way Stop Control ¹	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday Midday	Weekday AM	Weekday PM	Saturday Midday
Meadow Wood Road/Tharp Road ⁵						
2017 Existing (Case 1)						
Westbound Tharp Road Left Turn	-	-	-	A (7.5)	A (7.8)	A (7.7)
Northbound Meadow Wood Road Approach	-	-	-	B (10.5)	B (11.8)	B (11.5)
2018 Without development (Case 2)						
Westbound Tharp Road Left Turn	-	-	-	A (7.6)	A (8.0)	A (7.8)
Northbound Meadow Wood Road Approach	-	-	-	B (11.6)	B (13.0)	B (12.4)
2018 With development (Case 3)						
Westbound Tharp Road Left Turn	-	-	-	A (7.6)	A (8.1)	A (7.9)
Northbound Meadow Wood Road Approach	-	-	-	B (11.7)	B (13.1)	B (12.5)

⁵ JMT conducted an analysis for this intersection due to the evaluation of various access options which were not performed in the TIS.

Table 5
Peak Hour Levels Of Service (LOS)
Based on Traffic Impact Study for Wawa
Report Dated: January 2018
Prepared by Duffield Associates, Inc.

Signalized Intersection	LOS per TIS			LOS per JMT		
	Weekday AM	Weekday PM	Saturday MIDDAY	Weekday AM	Weekday PM	Saturday MIDDAY
US Route 13/Tharp Road/Herring Run Road (Sussex Road 534) ^{6,7}						
2017 Existing (Case 1)	C (24.3)	C (33.9)	D (39.6)	E (59.6)	D (44.9)	D (44.4)
2018 Without development (Case 2)	C (26.1)	D (37.2)	D (37.2)	E (64.9)	D (48.1)	D (47.1)
2018 Without development (Case 2) with Signal Optimization ⁸	-	-	-	C (33.2)	D (46.6)	D (45.0)
2018 With development (Case 3)	C (28.1)	D (40.3)	D (39.6)	E (70.2)	D (53.7)	D (50.3)
2018 With development (Case 3) with Improvement ⁴	-	-	-	E (66.4)	E (62.4)	E (56.5)
2018 With development (Case 3) with Improvement and Signal Optimization ^{4,9}	-	-	-	D (36.0)	D (50.7)	D (54.9)

⁶ Per *DelDOT's Development Coordination Manual*, JMT used a saturation flow rate of 1,750 pc/h/ln along locations south of the C&D Canal whereas the TIS maintained the default rate of 1,900 pc/h/ln.

⁷ JMT utilized signal timing splits consistent with the DELDOT Timing Plan whereas the TIS did not.

⁸ Signal Optimization scenario includes optimizing signal splits while maintaining cycle lengths consistent with the DelDOT Timing Plans.