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

JENNIFER COHAN
SECRETARY

November 26, 2019

Ms. Betty Tustin
The Traffic Group, Inc.
104 Kenwood Court
Berlin, MD 21811

Dear Ms. Tustin:

The enclosed Traffic Impact Study (TIS) review letter for the proposed **Keastone Bay (f.k.a. Bridlewood at Baywood)** (Tax Parcels 234-17.00-170.00, 172.00, 173.00 & 174.00; 234-18.00-68.00; 234-24.00-1.00 & 2.00) 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. Robert Tunnell, III, Tunnell Companies
Ms. Constance C. Holland, Office of State Planning Coordination
Ms. Janelle Cornwell, Sussex County Planning and Zoning
Mr. Andrew Parker, McCormick Taylor, Inc.
DelDOT Distribution

DelDOT

DelDOT Distribution

Brad Eaby, Deputy Attorney General
Shanté Hastings, Director, Transportation Solutions (DOTS)
Drew Boyce, Director, Planning
Mark Luszcz, Deputy Director, DOTS
Michael Simmons, Assistant Director, Project Development South, DOTS
J. Marc Coté, Assistant Director, Development Coordination
T. William Brockenbrough, Jr., County Coordinator, Development Coordination
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Alastair Probert, South District Engineer, South District
Gemez Norwood, South District Public Works Manager, South District
Susanne Laws, Sussex Subdivision Review Coordinator, Development Coordination
David Dooley, Service Development Planner, Delaware Transit Corporation
Mark Galipo, Traffic Engineer, Traffic, DOTS
Anthony Aglio, Planning Supervisor, Statewide & Regional Planning
John Andrescavage, Sussex County Subdivision Reviewer, Development Coordination
Claudy Joinville, Project Engineer, Development Coordination

November 25, 2019

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

RE: Agreement No. 1773
Traffic Impact Study Services
**Task No. 1A Subtask 24A – Keastone Bay**

Dear Mr. Brestel:

McCormick Taylor has completed its review of the Traffic Impact Study (TIS) for Keastone Bay residential development prepared by The Traffic Group, Inc dated May 10, 2019. The Traffic Group prepared the report in a manner generally consistent with DelDOT's Development Coordination Manual.

The TIS evaluates the impacts of the Keastone Bay residential development, proposed to be located on both sides of Green Road (Sussex Road 298A) northeast of the intersection of Green Road with Banks Road (Sussex Road 298) in the Long Neck area of Sussex County, Delaware. The proposed development would consist of 675 single-family detached houses. Two full-movement access points are proposed on Green Road. Construction is anticipated to be complete by 2034.

The subject land is located on an approximately 311-acre assemblage of parcels. The land is currently zoned as AR-1 (Agricultural Residential) in Sussex County, and the developer plans to develop under the County's Environmentally Sensitive Zone option.

DelDOT currently has one capital project within the area of study. The SR 24 at SR 5 / SR 23 Intersection Improvements Project (State Contract No. T201200903) includes the intersections of Delaware Route 24 & Indian Mission Road / Long Neck Road and Delaware Route 24 & White Pine Drive and several commercial entrances along Delaware Route 24. The need for the project was identified, in part, through DelDOT's Hazard Elimination Program (HEP). The proposed improvements associated with this project include various operational and safety improvements at and near these intersections, such as adding channelization islands at accesses, extending turn lanes, adding sidewalk, and adding bike lanes. Other proposed improvements include relocating the entrance of the Timber Acres community to align with Plaza Drive, and reconstructing both traffic signals. This project is currently in the design and right of way acquisition phase, with construction anticipated to begin in the spring of 2021.

Following submission of the TIS, DelDOT further considered the impact of traffic from several other developments in the area that were not contemplated in the original scope of the TIS. Based on this, it was determined that an additional through lane in each direction is going to be needed

along Delaware Route 24. As such, the developer should make an equitable share contribution towards the cost of the both the aforementioned SR 24 at SR 5 / SR 23 Intersection Improvements Project and the future widening of Delaware Route 24, as described below in Item No. 7.

As part of DelDOT's Statewide Horizontal Curve Assessment Project, several horizontal curves along Banks Road from Long Neck Road to Green Road were evaluated in early 2018. This evaluation led to numerous signing improvements implemented in this area later in 2018.

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

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

| ***Intersection*** | ***Existing Traffic Control*** | ***Situations for which deficiencies occur*** |
|---|---|---|
| Banks Road and Green Road / Back Nine Way | Unsignalized | 2034 with development weekday PM & Saturday (Case 3) |
| Delaware Route 24 and Banks Road | Unsignalized | 2034 without development Saturday (Case 2);<br>2034 with development weekday AM, PM & Saturday (Case 3) |
| Delaware Route 24 and Holly Lake Road | Unsignalized | 2018 Existing Saturday (Case 1)<br>2034 without development weekday PM & Saturday (Case 2)<br>2034 with development weekday PM & Saturday (Case 3) |
| Long Neck Road and Bayshore Drive / Future Baywood Gardens Access | Unsignalized | 2034 without development Saturday (Case 2)<br>2034 with development Saturday (Case 3) |
| Delaware Route 24 and Indian Mission Road / Long Neck Road | Signalized | 2034 without development Saturday (Case 2)<br>2034 with development Saturday (Case 3) |
| School Lane and Bay Farm Road | Unsignalized | 2034 without development weekday PM & Saturday (Case 2)<br>2034 with development weekday AM, PM & Saturday (Case 3) |

Banks Road and Green Road / Back Nine Way

This unsignalized intersection experiences LOS deficiencies in the PM and Saturday midday peak hours under the 2034 with development scenario on the southbound Green Road approach when analyzed as a single shared lane as proposed in the TIS. It is anticipated that the projected LOS deficiencies would be resolved by adding a separate right-turn lane on the Green Road approach, as described below in Item No. 4.

Delaware Route 24 and Banks Road

This unsignalized intersection experiences LOS deficiencies in the Saturday midday peak hour under the 2034 without development scenario and during all peak hours under the 2034 with development scenario. All LOS deficiencies would occur on the westbound Banks Road approach.

It is anticipated that the projected LOS deficiencies would be resolved by installing a signal at this intersection when warranted, as described below in Item No. 5. The developer should perform a Traffic Signal Justification Study at a later time when required by DelDOT to determine if and when the signal is warranted.

Delaware Route 24 and Holly Lake Road

This unsignalized intersection experiences LOS deficiencies in the Saturday midday peak hour under all scenarios and the weekday PM peak hour during both 2034 scenarios. The deficiencies are for the stop-controlled eastbound Holly Lake Road approach, which has one shared lane for lefts and rights. This approach operates at LOS E during the existing Saturday peak hour and at LOS F during all 2034 scenarios (PM and Saturday peak hours). The 95$^{th}$ percentile queue length during the 2034 with development Saturday peak hour is projected to be nearly 400 feet long. As described below in Item No. 6, the developer should add a separate right-turn lane on the eastbound Holly Lake Road approach to alleviate delays and reduce queue lengths. While the added turn lane would not completely eliminate the LOS deficiencies, it is anticipated to significantly reduce delays and queue lengths on eastbound Holly Lake Road.

Long Neck Road and Bayshore Drive / Future Baywood Gardens Access

This unsignalized intersection experiences LOS deficiencies in the Saturday midday peak hour under both 2034 scenarios. The deficiencies are for the northbound Bayshore Drive approach and the future southbound Baywood Gardens approach. Given that the southbound approach (north leg) will be added to this existing intersection as part of the proposed Baywood Gardens residential development, that development will be responsible for appropriate intersection improvements to be determined in coordination with DelDOT. Given that the Keastone Bay development would have much less impact than Baywood Gardens on volumes, delays and queues at this intersection, the Keastone Bay developer is not required to be responsible for any improvements here.

Delaware Route 24 and Indian Mission Road / Long Neck Road

This signalized intersection experiences LOS deficiencies in the Saturday midday peak hour under both 2034 scenarios. To mitigate the delays and queues, the developer should contribute toward DelDOT's SR 24 at SR 5 / SR 23 Intersection Improvements Project as described below in Item No. 7.

School Lane and Bay Farm Road

This unsignalized intersection experiences LOS deficiencies in the PM and Saturday midday peak hours under the 2034 without development scenario and during all peak hours under the 2034 with development scenario. All LOS deficiencies would occur on the stop-controlled southbound School Lane approach. It is anticipated that the projected LOS deficiencies would be resolved by installing a traffic signal at the intersection, as described below in Item No. 8.

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

1. The developer should improve Green Road along the entire site frontage, and Banks Road from the southern edge of tax parcel 234-17.00-169.00 (approximately 250 feet north of Green Road) to the southern edge of the site frontage (near Pond Road). Both roads should be improved as needed in order to meet DelDOT's local road standards. These standards include but are not limited to eleven-foot travel lanes and five-foot shoulders. The developer should provide a bituminous concrete overlay to the existing travel lanes, at DelDOT's discretion. DelDOT should analyze the existing lanes' pavement section and recommend an overlay thickness to the developer's engineer if necessary.

2. The developer should construct Site Entrance A (south access) on Green Road. The proposed configuration is shown in the table below.

| Approach | Current Configuration | Proposed Configuration |
|---|---|---|
| Northbound Green Road | One through lane | One left-turn lane, one through lane and one right-turn lane |
| Southbound Green Road | One through lane | One left-turn lane and one shared through/right-turn lane |
| Eastbound Site Entrance A | Does not exist | One shared left/through/right-turn lane |
| Westbound Site Entrance A | Does not exist | One shared left/through/right-turn lane |

Initial recommended minimum turn-lane lengths (excluding tapers) of the separate turn lanes are listed below. The developer should coordinate with DelDOT's Development Coordination Section to determine final turn-lane lengths during the site plan review.

| Approach | Left-Turn Lane | Right-Turn Lane |
|---|---|---|
| Northbound Green Road | 95 feet * | 110 feet * |
| Southbound Green Road | 95 feet | N/A |
| Eastbound Site Entrance A | N/A | N/A |
| Westbound Site Entrance A | N/A | N/A |

* Initial turn-lane length based on DelDOT's *Auxiliary Lane Worksheet*.

3. The developer should construct Site Entrance B (north access) on Green Road. The proposed configuration is shown in the table below.

| Approach | Current Configuration | Proposed Configuration |
|---|---|---|
| Northbound Green Road | One through lane | One shared left-turn/through lane and one right-turn lane |
| Southbound Green Road | One through lane | One shared left/through/right-turn lane |
| Eastbound Site Entrance B | Does not exist | One shared left/through/right-turn lane |
| Westbound Site Entrance B | Does not exist | One shared left/through/right-turn lane |

Initial recommended minimum turn-lane lengths (excluding tapers) of the separate turn lanes are listed below. The developer should coordinate with DelDOT's Development Coordination Section to determine final turn-lane lengths during the site plan review.

| Approach | Left-Turn Lane | Right-Turn Lane |
|---|---|---|
| Northbound Green Road | N/A | 110 feet * |
| Southbound Green Road | N/A | N/A |
| Eastbound Site Entrance B | N/A | N/A |
| Westbound Site Entrance B | N/A | N/A |

* Initial turn-lane length based on DelDOT's *Auxiliary Lane Worksheet*.

4. The developer should improve the intersection of Banks Road and Green Road / Back Nine Way by adding a separate right-turn lane on the southbound Green Road approach. This southbound right-turn lane is initially recommended to be 100 feet in length (excluding taper). The developer should coordinate with DelDOT's Development Coordination Section to determine final turn-lane length and design details.

5. The developer should enter into a traffic signal agreement with DelDOT for design and construction of a future traffic signal for the intersection of Delaware Route 24 and Banks Road. The agreement should include pedestrian signals, crosswalks, interconnection, and ITS equipment such as CCTV cameras at DelDOT's discretion. The developer should coordinate with DelDOT on the design details and implementation of the traffic signal. The agreement should provide for installation and activation of the signal at DelDOT's discretion.

Entering into a Traffic Signal Revolving Fund agreement for this intersection is an option instead of the traditional traffic signal agreement. The developer should coordinate with DelDOT's Development Coordination Section regarding the appropriate type of agreement needed and details thereof.

6. The developer should improve the intersection of Delaware Route 24 and Holly Lake Road by adding a separate right-turn lane on the eastbound Holly Lake Road approach. This eastbound right-turn lane is initially recommended to be 125 feet in length (excluding taper). The developer should coordinate with DelDOT's Development Coordination Section to determine final turn-lane length and design details.

7. The developer should coordinate with DelDOT regarding an equitable share contribution toward DelDOT's SR 24 at SR 5 / SR 23 Intersection Improvements Project. The amount of the contribution should be determined through coordination with DelDOT's Development Coordination Section. As described on pages 1-2, the contribution amount should account for the cost of both the DelDOT project as presently planned and the future widening of Delaware Route 24 to include an additional through lane in each direction.

8. The developer should enter into a traffic signal agreement with DelDOT for design and construction of a future traffic signal for the intersection of School Lane and Bay Farm Road. The agreement should include pedestrian signals, crosswalks, interconnection, and ITS equipment such as CCTV cameras at DelDOT's discretion. The construction schedule of the new traffic signal is yet to be determined by DelDOT. The developer should coordinate with DelDOT on the design details and implementation of the traffic signal. The agreement should provide for installation and activation of the signal at DelDOT's discretion.

   Entering into a Traffic Signal Revolving Fund agreement for this intersection is an option instead of the traditional traffic signal agreement. The developer should coordinate with DelDOT's Development Coordination Section regarding the appropriate type of agreement needed and details thereof.

9. The following bicycle and pedestrian improvements should be included:

   a. Adjacent to the proposed right-turn lanes on northbound Green Road at both proposed site entrances, a minimum of a five-foot bicycle lane should be dedicated and striped with appropriate markings for bicyclists through the turn lane in order to facilitate safe and unimpeded bicycle travel.

   b. Appropriate bicycle symbols, directional arrows, pavement markings, and signing should be included along bicycle facilities and turn lanes within the project limits.

   c. Utility covers should be made flush with the pavement.

d. If clubhouses or other community facilities are constructed as shown on the site plan, bicycle parking should be provided near building entrances. Where building architecture provides for an awning, other overhang, or indoor parking, the bicycle parking should be covered.

e. A minimum 15-foot wide easement from the edge of the right-of-way should be dedicated to DelDOT within the site frontages along Green Road and Banks Road.

f. Within the easements along Green Road and Banks Road, a minimum of a ten-foot wide shared-use path that meets current AASHTO and ADA standards should be constructed along each site frontage. These shared-use paths should be constructed on both sides of Green Road and along one side (north/east side) of Banks Road. Along Green Road, the paths should be constructed along the entire length of the site frontage. Along Banks Road, the path should be constructed from the southern edge of tax parcel 234-17.00-169.00 (approximately 250 feet north of Green Road) to the southern edge of the site frontage (near Pond Road). Each shared-use path should have a minimum of a five-foot buffer from the roadway. Each shared-use path should connect to the adjacent property or to the shoulder in accordance with DelDOT's *Shared-Use Path and/or Sidewalk Termination Reference Guide* dated August 1, 2018. The developer should coordinate with DelDOT's Development Coordination Section to determine exact locations and details of the shared-use path connections at the property boundaries.

g. Coordinate with DelDOT's Development Coordination Section to determine if a crosswalk should be constructed across Banks Road at Green Road to connect to sidewalk along Back Nine Way. Such a crosswalk might require pedestrian flashing beacons. If it is determined that a crosswalk is desired and feasible, the developer should further coordinate with DelDOT regarding design details for the crosswalk and possible flashing beacons along with the plan for implementation of this crossing.

h. ADA compliant curb ramps and crosswalks should be provided at all pedestrian crossings within the development. Type 3 curb ramps are discouraged.

i. Internal sidewalks for pedestrian safety and to promote walking as a viable transportation alternative should be constructed within the development. These sidewalks should each be a minimum of five feet wide (with a minimum of a five-foot buffer from the roadway) and should meet current AASHTO and ADA standards. These internal sidewalks should connect to the proposed shared-use paths along both sides of Green Road.

j. Access-ways should be used to connect shared-use paths or sidewalks along a road to an interior trail or subdivision street when the spacing between streets is inadequate to accommodate convenient pedestrian and bicycle travel. Based on the Office of State Planning Coordination PLUS review (July 25, 2018), two access-ways are

recommended. One would be from a cul-de-sac proposed near the intersection of Banks Road & Green Road out to that intersection. The other would be from a subdivision street out to Banks Road near the south limit of the site frontage.

k. Where internal sidewalks are located alongside of parking spaces, a buffer should be added to prevent vehicular overhang onto the sidewalk.

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://deldot.gov/Publications/manuals/de_mutcd/index.shtml.

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.

Additional details on our review of this TIS are attached. Please contact me at (610) 640-3500 or through e-mail at ajparker@mccormicktaylor.com if you have any questions concerning this review.

Sincerely,

**McCormick Taylor, Inc.**

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

Enclosure

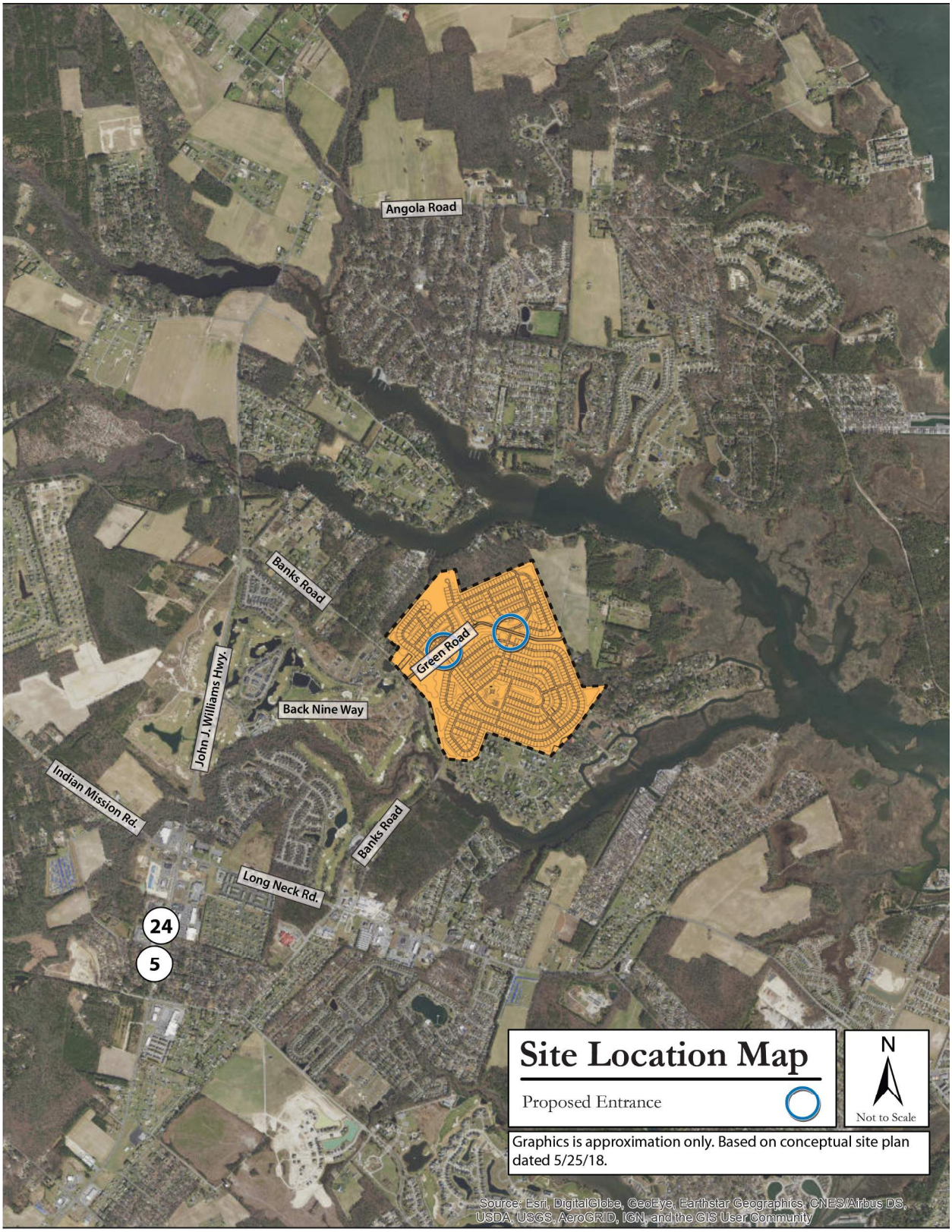
## General Information

**Report date:** May 10, 2019
**Prepared by:** The Traffic Group, Inc.
**Prepared for:** Baywood LLC
**Tax parcel:** 234-17.00-170.00, 172.00, 173.00, 174.00; 234-18.00-68.00; 234-24.00-1.00 & 2.00
**Generally consistent with DelDOT's Development Coordination Manual:** Yes

## Project Description and Background

**Description:** The proposed Keastone Bay development would consist of 675 single-family detached homes.
**Location:** The site is located on both sides of Green Road (Sussex Road 298A) northeast of the intersection of Green Road with Banks Road (Sussex Road 298) in the Long Neck area of Sussex County, Delaware. A site location map is included on page 10.
**Amount of land to be developed:** approximately 311 acres
**Land use approval(s) needed:** Subdivision approval. The land is currently zoned as AR-1 (Agricultural Residential), and the developer plans to proceed under Sussex County's AR-1 Environmentally Sensitive Zone Option.
**Proposed completion date:** 2034
**Proposed access locations:** Two full-movement access points are proposed along Green Road.
**Daily Traffic Volumes (per DelDOT Traffic Summary 2018):**

- 2018 Average Annual Daily Traffic on Green Road: 371


Angola Road
Banks Road
Green Road
John J. Williams Hwy.
Back Nine Way
Indian Mission Rd.
Banks Road
Long Neck Rd.
24
5
Site Location Map
Proposed Entrance
N
Not to Scale
Graphics is approximation only. Based on conceptual site plan dated 5/25/18.
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

## 2015 Delaware Strategies for State Policies and Spending

**Location with respect to the Strategies for State Policies and Spending Map of Delaware:** The proposed Keastone Bay development is located within an Investment Level 3 area.

*Investment Level 3*
Investment Level 3 reflects areas where growth is anticipated by local, county, and state plans in the longer-term future. Investment Level 3 areas generally fall into two categories. The first category covers lands that are in the long-term growth plans of counties or municipalities, but where development is not necessary to accommodate expected short-term population growth. The second category includes lands that are adjacent to fast-growing Investment Level 1 and 2 areas but are often impacted by environmentally sensitive features, agricultural-preservation issues, or other infrastructure issues. In these instances, development and growth may be appropriate in the near term, but the resources on the site and in the surrounding area should be carefully considered and accommodated by state Agencies and local governments with land-use authority.

Generally, Investment Level 3 areas should not be developed until surrounding Investment Level 1 and 2 areas are substantially built out. From a housing perspective, Investment Level 3 areas are characterized by low density and rural homes. New housing developments in the short term would, in most cases, represent leap-frog development, which is undesirable. Higher density housing in Investment Level 3 areas is more appropriate once Level 2 areas are built out and utilities are available.

**Proposed Development's Compatibility with Strategies for State Policies and Spending:**
The proposed Keastone Bay residential development includes 675 single-family detached homes located within an Investment Level 3 area. Investment Level 3 reflects areas where growth is anticipated by local, county, and State plans in the longer-term future. Given that the location is in a Growth Area as defined by Sussex County and that the anticipated opening date for this development is more than ten years out, the proposed development generally appears to comply with the guidelines of Investment Level 3 areas as described in the 2015 "Strategies for State Policies and Spending."

## Comprehensive Plan

**Sussex County Comprehensive Plan:**
*(Source: Sussex County Comprehensive Plan Update, June 2008)*

The Sussex County Comprehensive Plan Future Land Use Map indicates that the proposed development parcels are within the Environmentally Sensitive Developing Area (categorized as a Growth Area).

Growth Areas, including the Environmentally Sensitive Developing Area, are designed to accommodate concentrated levels of development. The Environmentally Sensitive Developing Area has been designated by Sussex County for large areas around Rehoboth Bay, Indian River Bay, and Little Assawoman Bay (the inland bays). This designation recognizes two characteristics of these areas. First, these regions are among the most desirable locations in Sussex County for

new housing, as reflected in new construction data and real estate prices. Second, these regions contain ecologically important wetlands and other coastal lands that help absorb floodwaters and provide extensive habitat for native flora and fauna. These areas also have great impacts upon the water quality of the bays and inlets and upon natural habitats.

The challenge in these regions is to safeguard genuine natural areas and mitigate roadway congestion without stifling the tourism and real estate markets that: a) provide many jobs; b) create business for local entrepreneurs; and c) help keep local tax rates reasonable. The County has major initiatives to extend public sewer service to replace failing on-site systems in many of these areas. Very careful control of stormwater runoff is an extremely important concern to keep sediment and other pollutants out of the inland bays.

The following major guidelines should apply to future growth in Environmentally Sensitive Developing Areas:

*Permitted uses* – Environmentally Sensitive Developing Areas are areas that can accommodate development provided special environmental concerns are addressed. A range of housing types should be permitted in Environmentally Sensitive Areas, including single-family homes, townhouses and multi-family units. Retail and office uses are appropriate but larger shopping centers and office parks should be confined to selected locations with access to arterial roads. Careful mixtures of homes with light commercial and institutional uses can be appropriate to provide for convenient services and to allow people to work close to home. Major new industrial uses are not proposed in these areas. Industrial zones are regulated by the Delaware Coastal Zone Act, which restrict heavy industry and bulk transfer.

*Densities* – The Environmentally Sensitive Developing Areas function as an "overlay" area to several underlying zoning districts. It may be advisable for legal reasons to convert this overlay area into regular zoning districts, while maintaining the current standards. Most of the Environmental Sensitive Developing Areas should continue to allow 2 homes per acre. The option should exist to go up to 4 units per acre if the developer uses optional density bonuses. Smaller lots and flexibility in dimensional standards should be allowed if the developer uses a cluster option that results in permanent preservation of a substantial percentage of the tract.

The County may also consider an additional layer of protection in the Environmentally Sensitive Developing Areas. Tidal wetland area could be subtracted from the total tract size so that "net" tract size is used as the basis for calculating how much development is allowed.

All applicants for developments of a minimum size (as specified in zoning) should continue to be required to provide information that analyzes the development's potential environmental impacts, including effects on stormwater runoff, nitrogen and phosphorous loading, wetlands, woodlands, wastewater treatment, water systems, and other matters that affect the ecological sensitivity of the inland bays.

*Infrastructure* – Central water and sewer facilities are strongly encouraged. If central utilities are not possible, permitted densities should be limited to 2 units per acre.

**Proposed Development's Compatibility with Comprehensive Plan:** The proposed Keastone Bay residential development is planned to be developed as 675 single-family detached homes on a 311-acre assemblage of parcels. The site is currently zoned AR-1 (Agricultural Residential). The developer plans to develop under Sussex County's AR-1 Environmentally Sensitive Zone option. The purpose of this zoning district is to protect agricultural lands and activities and other valuable natural resources. Low-density housing is permitted along with churches, recreational facilities, and accessory uses as may be necessary or is normally compatible with residential surroundings. The proposed development appears to comply with the characteristics of Growth Areas in general as well as the *Permitted Uses* for the Environmentally Sensitive Developing Area. However, due to a proposed density of greater than 2 units per acre, this development raises questions regarding consistency with Sussex County zoning regulations; therefore additional discussion may be required.

## Relevant Projects in the DelDOT Capital Transportation Program

DelDOT currently has one capital project within the area of study. The SR 24 at SR 5 / SR 23 Intersection Improvements Project (State Contract No. T201200903) includes the intersections of Delaware Route 24 & Indian Mission Road / Long Neck Road and Delaware Route 24 & White Pine Drive and several commercial entrances along Delaware Route 24. The need for the project was identified, in part, through DelDOT's Hazard Elimination Program (HEP). The proposed improvements associated with this project include various operational and safety improvements at and near these intersections, such as adding channelization islands at accesses, extending turn lanes, adding sidewalk, and adding bike lanes. Other proposed improvements include relocating the entrance of the Timber Acres community to align with Plaza Drive, and reconstructing both traffic signals. This project is currently in the design and right of way acquisition phase, with construction anticipated to begin in the spring of 2021.

As part of DelDOT's Statewide Horizontal Curve Assessment Project, several horizontal curves along Banks Road from Long Neck Road to Green Road were evaluated in early 2018. This evaluation led to numerous signing improvements implemented in this area later in 2018.

## Trip Generation

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

- 675 single-family detached houses (ITE Land Use Code 210)

Table 1
KEASTONE BAY PEAK HOUR TRIP GENERATION

| Land Use | Weekday AM Peak Hour of Adjacent Street | | | Weekday PM Peak Hour of Adjacent Street | | | SAT Peak Hour | | |
|---|---|---|---|---|---|---|---|---|---|
| | In | Out | Total | In | Out | Total | In | Out | Total |
| 675 Single-Family Homes | 121 | 363 | 484 | 400 | 235 | 635 | 316 | 269 | 585 |

Table 2
KEASTONE BAY DAILY TRIP GENERATION

| Land Use | Weekday Daily | | | Saturday Daily | | |
|---|---|---|---|---|---|---|
| | In | Out | Total | In | Out | Total |
| 675 Single-Family Homes | 3012 | 3012 | 6024 | 2953 | 2954 | 5907 |

**Overview of TIS**

**Intersections examined:**

1) Site Entrance A (south access) & Green Road
2) Site Entrance B (north access) & Green Road
3) Banks Road & Green Road / Back Nine Way
4) Delaware Route 24 & Banks Road
5) Delaware Route 24 & Holly Lake Road (Sussex Road 301)
6) Banks Road & Pond Road
7) Long Neck Road (Sussex Road 22) & School Lane (Sussex Road 298) / Banks Road
8) Long Neck Road & Greens Way
9) Long Neck Road & Bayshore Drive
10) Delaware Route 24 & Indian Mission Road (Sussex Road 22) / Long Neck Road
11) School Lane & Bay Farm Road (Sussex Road 299)

**Conditions examined:**

1) 2018 existing conditions (case 1)
2) 2034 without Keastone Bay development (case 2)
3) 2034 with Keastone Bay development (case 3)

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

**Committed developments considered:**

1) Pelican Point (400 single-family detached houses; 279 unbuilt)
2) Independence (a.k.a Indigo Run) (450 single-family detached houses; 166 unbuilt)
3) Acadia f.k.a. Insight at Lewes Point (238 single-family detached houses)
4) The Woods at Burton Pond (a.k.a. Headwater Cove) (164 single-family detached houses)
5) Burton Pond (265 single-family detached houses, 100 multi-family mid-rise houses)

6) Deerbrook (120 single-family detached houses)
7) Peninsula Lakes (588 single-family detached houses (445 unbuilt), 72 multi-family low-rise houses)
8) Baylis Estates (136 single-family detached houses)
9) Baywood at Garden Villas (353 multi-family low-rise houses)
10) Peninsula Square (40,000 square feet of retail space, 15,000 square feet of medical office space, a 6,200 square-foot high turn-over sit-down restaurant, 144 apartments, and a 100-room hotel)

**Intersection Descriptions**

1) **Site Entrance A (south access) & Green Road**
**Type of Control:** no existing intersection; proposed two-way stop
**Northbound approach:** (Green Road) one left-turn lane, one through lane, and one right-turn lane
**Southbound approach:** (Green Road) one shared left-turn/through/right-turn lane
**Eastbound approach:** (Site Access) one shared left-turn/through/right-turn lane, stop controlled
**Westbound approach:** (Site Access) one shared left-turn/through/right-turn lane, stop controlled

2) **Site Entrance B (north access) & Green Road**
**Type of Control:** no existing intersection; proposed two-way stop
**Northbound approach:** (Green Road) one shared left-turn/through lane and one right-turn lane
**Southbound approach:** (Green Road) one shared left-turn/through/right-turn lane
**Eastbound approach:** (Site Access) one shared left-turn/through/right-turn lane, stop controlled
**Westbound approach:** (Site Access) one shared left-turn/through/right-turn lane, stop controlled

3) **Banks Road & Green Road / Back Nine Way**
**Type of Control:** Two-way stop-controlled intersection
**Northbound approach:** (Back Nine Way) one shared left-turn/through lane and one right-turn lane, stop controlled
**Southbound approach:** (Green Road) one shared left-turn/through/right-turn lane, stop controlled
**Eastbound approach:** (Banks Road) one shared left-turn/through lane and one right-turn lane
**Westbound approach:** (Banks Road) one shared left-turn/through/right-turn lane

4) **Delaware Route 24 & Banks Road**
**Type of Control:** One-way stop (T-intersection)
**Northbound approach:** (Delaware Route 24) one through lane and one right-turn lane
**Southbound approach:** (Delaware Route 24) one left-turn lane and one through lane
**Westbound approach:** (Banks Road) one left-turn lane and one right-turn lane, stop controlled

5) **Delaware Route 24 & Holly Lake Road**
**Type of Control:** One-way stop (T-intersection)
**Northbound approach:** (Delaware Route 24) one shared left-turn/through lane
**Southbound approach:** (Delaware Route 24) one through lane and one right-turn lane
**Eastbound approach:** (Holly Lake Road) one shared left/right-turn lane, stop controlled

6) **Banks Road & Pond Road**
**Type of Control:** One-way stop (T-intersection)
**Northbound approach:** (Banks Road) one shared through/right-turn lane
**Southbound approach:** (Banks Road) one shared left-turn/through lane
**Westbound approach:** (Pond Road) one shared left/right-turn lane, top controlled

7) **Long Neck Road & School Lane / Banks Road**
**Type of Control:** signalized four-leg intersection
**Northbound approach:** (School Lane) one left-turn lane, one through lane and one right-turn lane
**Southbound approach:** (Banks Road) one left-turn lane, one through lane and one right-turn lane
**Eastbound approach:** (Long Neck Road) one left-turn lane, one through lane and one channelized right-turn lane
**Westbound approach:** (Long Neck Road) one left-turn lane, one through lane and one channelized right-turn lane

8) **Long Neck Road & Greens Way**
**Type of Control:** One-way stop (T-intersection)
**Southbound approach:** (Greens Way) one left-turn lane and one right-turn lane, stop controlled
**Eastbound approach:** (Long Neck Road) one left-turn lane and one through lane
**Westbound approach:** (Long Neck Road) one through lane and one right-turn lane

9) **Long Neck Road & Bayshore Drive**
**Type of Control:** One-way stop (T-intersection)
**Northbound approach:** (Bayshore Drive) one shared left/right-turn lane, stop controlled
**Eastbound approach:** (Long Neck Road) one through lane and one right-turn lane
**Westbound approach:** (Long Neck Road) one shared left-turn/through lane and one bypass lane
**Note:** A fourth leg is proposed to added to this intersection as part of the Baywood Gardens development. While the design of the intersection modifications is not yet final, preliminarily the proposed changes consist of a new southbound approach (Baywood

Gardens driveway) with one shared left-turn/through lane and one right-turn lane, the addition of an eastbound left-turn lane, and the addition of a westbound right-turn lane.

10) **Delaware Route 24 & Indian Mission Road / Long Neck Road**
**Type of Control:** signalized four-leg intersection
**Northbound approach:** (Delaware Route 24) one left-turn lane, one through lane and one channelized right-turn lane
**Southbound approach:** (Delaware Route 24) one left-turn lane, one through lane and one channelized right-turn lane
**Eastbound approach:** (Indian Mission Road) one left-turn lane, one through lane and one channelized right-turn lane
**Westbound approach:** (Long Neck Road) one left-turn lane, one through lane and one channelized right-turn lane

11) **School Lane & Bay Farm Road**
**Type of Control:** One-way stop (T-intersection)
**Southbound approach:** (School Lane) one shared left/right-turn lane, stop controlled
**Eastbound approach:** (Bay Farm Road) one left-turn lane and one through lane
**Westbound approach:** (Bay Farm Road) one shared through/right-turn lane

## Safety Evaluation

**Crash Data:** Per current DelDOT policy, review of crash data was not conducted at this time.

**Sight Distance:** The study area generally consists of flat roadways and there are few potential visual obstructions. Sight distance appears adequate throughout the study area, except for vegetation at some intersections. It is noted that there are several horizontal curves along Banks Road from Long Neck Road to Green Road. These curves were evaluated by DelDOT in early 2018, leading to numerous signing improvements that were implemented later in 2018.

## Transit, Pedestrian, and Bicycle Facilities

**Existing transit service:** The Traffic Group contacted a representative from Delaware Transit Corporation (DTC) to determine existing and planned transit services near the proposed development. The nearest existing transit service is DART bus route 215. There nearest existing marked transit stops are located at Delaware Route 24 & Holly Lake Road, Long Neck Road & Greens Way, and Long Neck Road & Bayshore Drive (over one mile from the Keastone Bay frontage intersection of Green Road and Banks Road).

**Planned transit service:** There are currently no plans to provide transit service to the proposed development. Based on coordination with DTC representatives, there are plans for bus stops along Delaware Route 24 near Long Neck Road / Indian Mission Road. It is requested that if any improvements are made to the intersections with existing or future transit service, that bus stops are built to DelDOT standards.

**Existing bicycle and pedestrian facilities**: According to the Sussex County bicycle map, State Route 24 and Long Neck Road are classified as Regional Bicycle Routes. Both roads are noted as high-traffic roads with shoulders on both sides. Existing bicycle facilities in the study area include bike lanes along parts of Long Neck Road, at Long Neck Road & School Lane / Banks Road, and at Delaware Route 24 & Indian Mission Road / Long Neck Road. There are also bicycle lanes along Bay Farm Road.

Existing pedestrian facilities in the study area include crosswalks with pedestrian signals and pushbuttons for all four legs at Long Neck Road & School Lane / Banks Road.

**Planned bicycle and pedestrian facilities:** The Traffic Group contacted a representative from DelDOT's Statewide and Regional Planning Section regarding bicycle and pedestrian facilities. The Traffic Group reports that bike lanes are requested along the frontage on Banks Road. A multi-use path is requested along the frontage of Banks Road from Pond Road to Green Road and an easement on Banks Road for the portion of the property north of Green Road for a future multi-use path. Sidewalks are requested along both sides of Green Road. A crosswalk is requested across Banks Road from Green Road to connect to sidewalk along Back Nine Way.

## Previous Comments

In a review letter dated March 27, 2019, DelDOT indicated that the Preliminary TIS was acceptable contigent upon modifications to a number of exhibits.

It appears that all substantive comments from DelDOT's TIS Scoping Memorandum, Traffic Count Review, Preliminary TIS Review, Revised Preliminary TIS Review, and other correspondence were addressed in the Final TIS submission.

## General HCS Analysis Comments

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

1) As per HCM methodologies, the TIS and McCormick Taylor applied percent heavy vehicles (HV) by movement at two-way stop control and roundabout intersections, and HV by lane group at signalized intersections. The TIS and McCormick Taylor generally assumed future HV to be the same as existing HV at all intersections. Both the TIS and McCormick Taylor assumed 3% HV for future movements to and from the proposed site access points (as per DelDOT's Development Coordination Manual).

2) For existing conditions, the TIS and McCormick Taylor determined and utilized overall intersection peak hour factors (PHF). The TIS and McCormick Taylor assumed future PHF to be the same as existing PHF at all existing intersections. At the site entrances, future PHF were based on DelDOT's Development Coordination Manual. The TIS and McCormick Taylor used different PHF at the southern site entrance in the Saturday peak hour case.

3) For analyses of signalized intersections, the TIS and McCormick Taylor used a base saturation flow rate of 1,750 pc/hr/ln per DelDOT's Development Coordination Manual for all peak hours.

4) The TIS generally assumed channelized right turn lanes for signalized intersection analyses were signalized. McCormick Taylor assumed these movements were not signalized since they are yield movements, and input the data as "Unsignalized Movement."

5) For analyses of all intersections, the TIS assumed 0% grade for all movements. McCormick Taylor utilized field data for existing grades and assumed future grades to be the same.

6) The TIS and McCormick Taylor used different signal timings when analyzing the signalized intersections in some cases.

7) The TIS and McCormick Taylor used different Right Turn on Red and pedestrian volumes when analyzing some intersections. All volumes for McCormick Taylor's analyses were taken directly from traffic counts in Appendix A of the TIS.

Table 3
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
*Report dated May 10, 2019*
Prepared by The Traffic Group

| **Unsignalized Intersection** [1] **Two-Way Stop Control** | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **Banks Rd & Green Rd / Back Nine Way** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2018 Existing (case 1) | | | | | | |
| Eastbound Banks Road – Left | A (7.7) | A (7.4) | A (7.6) | A (7.5) | A (7.4) | A (7.6) |
| Westbound Bank Road – Left | A (7.3) | A (7.5) | A (7.5) | A (7.3) | A (7.5) | A (7.8) |
| Northbound Back Nine Way – Left/Thru | A (10.0) | B (10.3) | B (11.6) | B (10.4) | B (10.7) | B (11.4) |
| Northbound Back Nine Way – Right | A (8.6) | A (9.0) | A (8.7) | A (8.6) | A (9.1) | A (9.1) |
| Southbound Green Road | A (9.7) | A (8.8) | B (10.1) | A (9.4) | A (8.8) | B (10.2) |
| | | | | | | |
| 2034 without Keastone Bay (case 2) | | | | | | |
| Eastbound Banks Road – Left | A (7.9) | A (7.5) | A (7.7) | A (7.6) | A (7.5) | A (7.7) |
| Westbound Bank Road – Left | A (7.4) | A (7.7) | A (7.7) | A (7.4) | A (7.7) | A (7.9) |
| Northbound Back Nine Way – Left/Thru | B (10.8) | B (11.4) | B (13.0) | B (11.4) | B (11.7) | B (12.8) |
| Northbound Back Nine Way – Right | A (8.7) | A (9.4) | A (9.4) | A (8.8) | A (9.5) | A (9.4) |
| Southbound Green Road | B (10.2) | A (9.0) | B (10.7) | A (10.0) | A (9.0) | B (10.8) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) | | | | | | |
| Eastbound Banks Road – Left | A (8.2) | A (8.6) | A (8.6) | A (7.9) | A (8.6) | A (8.6) |
| Westbound Bank Road – Left | A (7.4) | A (7.7) | A (7.7) | A (7.4) | A (7.7) | A (7.9) |
| Northbound Back Nine Way – Left/Thru | C (18.6) | D (30.2) | D (32.7) | C (19.9) | D (33.5) | D (33.0) |
| Northbound Back Nine Way – Right | A (8.7) | A (9.4) | A (9.4) | A (8.8) | A (9.5) | A (9.4) |
| Southbound Green Road | C (24.4) | E (39.6) | E (48.7) | C (22.9) | E (44.3) [2] | F (55.2) [3] |
| | | | | | | |
| 2034 with Keastone Bay (case 3) *With Improvement Option 1* [4] | | | | | | |
| Eastbound Banks Road – Left | N/A | N/A | N/A | A (7.9) | A (8.6) | A (8.6) |
| Westbound Bank Road – Left | N/A | N/A | N/A | A (7.4) | A (7.7) | A (7.9) |
| Northbound Back Nine Way – Left/Thru | N/A | N/A | N/A | C (19.9) | D (33.5) | D (33.0) |
| Northbound Back Nine Way – Right | N/A | N/A | N/A | A (8.8) | A (9.5) | A (9.4) |
| Southbound Green Road | N/A | N/A | N/A | B (14.4) | D (27.5) [5] | D (28.0) [6] |

[1] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.
[2] 95th percentile queue length is anticipated to be approximately 6 vehicles (150 feet).
[3] 95th percentile queue length is anticipated to be approximately 8 vehicles (200 feet).
[4] Improvement Option 1 includes the addition of a separate right-turn lane on the southbound Green Road approach.
[5] 95th percentile queue length is anticipated to be approximately 3 vehicles (75 feet).
[6] 95th percentile queue length is anticipated to be approximately 4 vehicles (100 feet).

Table 4
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
*Report dated May 10, 2019*
Prepared by The Traffic Group

| **Unsignalized Intersection** [7] **Two-Way Stop Control** | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **DE 24 & Holly Lake Rd** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2018 Existing (case 1) | | | | | | |
| Eastbound Holly Lake Road | C (16.1) | C (23.7) | E (38.9) | C (16.1) | C (23.7) | E (39.0) |
| Northbound DE 24 – Left | A (8.0) | A (9.2) | A (9.1) | A (8.0) | A (9.2) | A (9.1) |
| | | | | | | |
| 2034 without Keastone Bay (case 2) | | | | | | |
| Eastbound Holly Lake Road | D (26.6) | F (61.2) | F (264.6) | D (26.6) | F (61.4) | F (270.8) |
| Northbound DE 24 – Left | A (8.4) | B (10.8) | B (10.6) | A (8.4) | B (10.8) | B (10.6) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) | | | | | | |
| Eastbound Holly Lake Road | D (26.3) | F (160.5) | F (1340) | D (26.5) | F (164.9) [8] | F (1577.6) [9] |
| Northbound DE 24 – Left | A (8.8) | B (12.4) | B (11.8) | A (8.8) | B (12.4) | B (11.8) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) *With Improvement Option 1* [10] | | | | | | |
| Eastbound Holly Lake Road | N/A | N/A | N/A | C (25.0-) | F (67.7) [11] | F (524.9) [12] |
| Northbound DE 24 – Left | N/A | N/A | N/A | A (8.8) | B (12.4) | B (11.8) |

[7] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.
[8] 95th percentile queue length is anticipated to be approximately 6 vehicles (150 feet).
[9] 95th percentile queue length is anticipated to be approximately 15 vehicles (375 feet).
[10] Improvement Option 1 includes the addition of a separate right-turn lane on the eastbound Holly Lake Road approach.
[11] 95th percentile queue length is anticipated to be approximately 2 vehicles (50 feet).
[12] 95th percentile queue length is anticipated to be approximately 5 vehicles (125 feet).

Table 5
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
*Report dated May 10, 2019*
Prepared by The Traffic Group

| **Unsignalized Intersection** [13] **Two-Way Stop Control** | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **DE 24 & Banks Rd** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2018 Existing (case 1) | | | | | | |
| Westbound Bank Rd – Left | C (19.3) | E (41.4) | E (44.6) | C (20.2) | E (44.9) | E (48.9) |
| Westbound Banks Rd – Right | B (14.2) | B (14.5) | C (22.9) | B (14.4) | B (14.7) | C (23.7) |
| Westbound Banks Rd – approach | B (14.7) | C (15.8) | C (24.5) | B (14.9) | C (16.2) | D (25.5) |
| Southbound DE 24 – Left | A (8.7) | A (9.6) | A (9.7) | A (8.7) | A (9.6) | A (9.7) |
| | | | | | | |
| 2034 without Keastone Bay (case 2) | | | | | | |
| Westbound Banks Rd – Left | D (34.8) | F (163.4) | F (212.2) | E (37.7) | F (191.7) | F (257.8) |
| Westbound Banks Rd – Right | C (24.4) | C (23.6) | F (90.6) | D (25.3) | C (24.5) | F (99.6) |
| Westbound Banks Rd – approach | D (25.2) | D (31.2) | F (98.9) | D (26.2) | D (33.5) | F (110.4) [14] |
| Southbound DE 24 – Left | A (9.7) | B (12.1) | B (12.1) | A (9.7) | B (12.1) | B (12.1) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) | | | | | | |
| Westbound Banks Rd – Left | E (46.9) | F (1036) | F (915.9) | F (51.5) | F(1248.9) | F (1105.9) |
| Westbound Banks Rd – Right | F (97.4) | F (57.3) | F (289.2) | F (105.6) | F (62.1) | F (308.9) |
| Westbound Banks Rd – approach | F (95.4) | F (85.5) | F (317.6) | F (103.4) [15] | F (96.3) [16] | F (345.1) [17] |
| Southbound DE 24 – Left | B (10.2) | C (18.4) | C (16.0) | B (10.2) | C (18.4) | C (16.0) |
| | | | | | | |
| With Improvement – Traffic Signal | D (43.4) | D (45.9) | D (49.5) | D (54.3) | D (46.1) | D (53.8) |

[13] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.
[14] 95th percentile queue length is anticipated to be approximately 11 vehicles (275 feet).
[15] 95th percentile queue length is anticipated to be approximately 15 vehicles (375 feet).
[16] 95th percentile queue length is anticipated to be approximately 9 vehicles (225 feet).
[17] 95th percentile queue length is anticipated to be approximately 27 vehicles (675 feet).

Table 6
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
*Report dated May 10, 2019*
Prepared by The Traffic Group

| **Signalized Intersection** [18] | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **DE 24 & Indian Mission Rd / Long Neck Rd** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2018 Existing (case 1) | C (23.9) | C (25.3) | C (34.4) | C (21.7) | C (23.2) | C (30.4) |
| | | | | | | |
| 2034 without Keastone Bay (case 2) | C (32.4) | D (39.5) | E (76.4) | C (28.3) | C (34.3) | E (64.4) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) | C (34.2) | D (42.8) | F (85.0) | C (29.9) | D (36.9) | E (73.6) |

[18] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 7
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
*Report dated May 10, 2019*
Prepared by The Traffic Group

| **Unsignalized Intersection** [19] **Two-Way Stop Control** | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **School Ln & Bay Farm Rd** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2018 Existing (case 1) | | | | | | |
| Eastbound Bay Farm Road – Left | A (8.2) | A (8.2) | A (8.5) | A (8.2) | A (8.2) | A (8.6) |
| Southbound School Lane | B (12.7) | B (12.6) | C (16.9) | B (12.7) | B (12.7) | C (17.0) |
| | | | | | | |
| 2034 without Keastone Bay (case 2) | | | | | | |
| Eastbound Bay Farm Road – Left | A (9.2) | A (8.9) | A (9.6) | A (9.2) | A (8.9) | A (9.6) |
| Southbound School Lane | D (27.1) | F (89.6) | F (221.9) | D (27.1) | F (90.5) | F (222.9) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) | | | | | | |
| Eastbound Bay Farm Road – Left | A (9.4) | A (9.4) | B (10.1) | A (9.4) | A (9.4) | B (10.1) |
| Southbound School Lane | E (44.7) | F (246.4) | F (421.6) | E (44.7) | F (248.3) | F (423.0) |
| | | | | | | |
| With Improvement – Traffic Signal | C (25.9) | C (23.0) | C (33.8) | C (28.5) | C (24.9) | D (39.2) |
| | | | | | | |
| With Improvement – Roundabout | N/A | N/A | N/A | A (8.4) | A (8.9) | A (9.7) |

[19] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 8
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
*Report dated May 10, 2019*
Prepared by The Traffic Group

| **Signalized Intersection** [20] | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **Long Neck Rd & School Ln / Banks Rd** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2018 Existing (case 1) | B (17.2) | C (25.4) | C (24.0) | B (15.6) | C (24.1) | C (23.4) |
| | | | | | | |
| 2034 without Keastone Bay (case 2) | B (17.9) | C (30.1) | C (29.1) | B (17.2) | C (28.5) | C (28.6) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) | C (20.7) | C (30.9) | C (31.5) | B (19.1) | C (29.2) | C (30.9) |

[20] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 9
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
*Report dated May 10, 2019*
Prepared by The Traffic Group

| **Unsignalized Intersection** [21] **Two-Way Stop Control** | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **Banks Rd & Pond Rd** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2018 Existing (case 1) | | | | | | |
| Westbound Pond Road | A (9.4) | A (10.0) | B (10.9) | A (9.4) | A (9.9) | B (10.8) |
| Southbound Banks Road – Left | A (7.5) | A (7.5) | A (7.8) | A (7.5) | A (7.5) | A (7.8) |
| | | | | | | |
| 2034 without Keastone Bay (case 2) | | | | | | |
| Westbound Pond Road | A (10.0) | B (10.9) | B (12.0) | A (9.9) | B (10.8) | B (11.8) |
| Southbound Banks Road – Left | A (7.6) | A (7.6) | A (8.0) | A (7.6) | A (7.6) | A (8.0) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) | | | | | | |
| Westbound Pond Road | B (11.3) | B (13.9) | C (15.4) | B (11.1) | B (13.6) | B (15.0-) |
| Southbound Banks Road – Left | A (7.8) | A (8.1) | A (8.4) | A (7.8) | A (8.1) | A (8.4) |

[21] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 10
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
*Report dated May 10, 2019*
Prepared by The Traffic Group

| **Unsignalized Intersection** [22] **Two-Way Stop Control** | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **Long Neck Rd & Greens Way** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2018 Existing (case 1) | | | | | | |
| Eastbound Long Neck Road – Left | A (8.6) | A (8.0) | A (8.7) | A (8.6) | A (8.0) | A (8.7) |
| Southbound Greens Way | B (13.6) | B (14.3) | C (19.4) | B (13.5) | B (14.3) | C (19.5) |
| | | | | | | |
| 2034 without Keastone Bay (case 2) | | | | | | |
| Eastbound Long Neck Road – Left | A (8.8) | A (8.2) | A (9.1) | A (8.9) | A (8.2) | A (9.1) |
| Southbound Greens Way | C (15.3) | C (16.7) | D (25.6) | C (15.2) | C (16.7) | D (25.7) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) | | | | | | |
| Eastbound Long Neck Road – Left | A (9.0) | A (8.3) | A (9.3) | A (9.1) | A (8.3) | A (9.3) |
| Southbound Greens Way | C (16.4) | C (18.5) | D (28.8) | C (16.3) | C (18.5) | D (28.9) |

[22] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 11
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
*Report dated May 10, 2019*
Prepared by The Traffic Group

| **Unsignalized Intersection** [23] **Two-Way Stop Control** | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **Long Neck Rd & Bayshore Dr** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2018 Existing (case 1) | | | | | | |
| Westbound Long Neck Road – Left | A (8.0) | A (8.4) | A (8.7) | A (8.0) | A (8.5) | A (8.7) |
| Northbound Bayshore Drive | C (15.0+) | B (13.7) | C (21.1) | C (16.0) | B (14.4) | C (23.6) |
| | | | | | | |
| 2034 without Keastone Bay (case 2) | | | | | | |
| Eastbound Long Neck Road – Left | A (8.6) | A (8.4) | A (9.7) | A (8.6) | A (8.4) | A (9.7) |
| Westbound Long Neck Road – Left | A (8.1) | A (8.7) | A (9.0) | A (8.1) | A (8.7) | A (9.0) |
| Northbound Bayshore Drive | D (27.0) | C (22.3) | F (120.5) | D (30.5) | C (24.7) | F (173.3) |
| Southbound Baywood Gardens access | C (18.5) | C (16.2) | F (65.1) | C (18.6) | C (16.2) | F (65.6) |
| | | | | | | |
| 2034 with Keastone Bay (case 3) | | | | | | |
| Eastbound Long Neck Road – Left | A (8.8) | A (8.5) | A (9.9) | A (8.8) | A (8.5) | A (9.9) |
| Westbound Long Neck Road – Left | A (8.2) | A (8.9) | A (9.1) | A (8.2) | A (8.9) | A (9.2) |
| Northbound Bayshore Drive | D (31.4) | D (25.9) | F (165.8) | D (36.3) | D (29.1) | F (243.9) |
| Southbound Baywood Gardens access | C (17.5) | C (16.6) | E (43.9) | C (17.5) | C (16.6) | E (44.2) |

[23] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 12
PEAK HOUR LEVELS OF SERVICE (LOS)
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| **Unsignalized Intersection** [24] **Two-Way Stop Control** | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **Site Entrance A (south access) & Green Road** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2034 with Keastone Bay (case 3) | | | | | | |
| Eastbound Site Entrance | A (8.6) | A (8.5) | A (8.6) | A (8.6) | A (8.5) | A (8.6) |
| Westbound Site Entrance | B (10.5) | B (10.9) | B (10.8) | B (10.8) | B (11.9) | B (11.6) |
| Green Road – Left | A (7.3) | A (7.3) | A (7.3) | A (7.3) | A (7.3) | A (7.3) |
| Green Road – Left | A (7.3) | A (7.6) | A (7.5) | A (7.3) | A (7.6) | A (7.5) |

[24] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.

Table 13
PEAK HOUR LEVELS OF SERVICE (LOS)
*based on Traffic Impact Study for Keastone Bay*
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| **Unsignalized Intersection** [25] **Two-Way Stop Control** | **LOS per TIS** | | | **LOS per McCormick Taylor** | | |
|---|---|---|---|---|---|---|
| **Site Entrance B (north access) & Green Road** | Weekday AM | Weekday PM | Saturday Mid-Day | Weekday AM | Weekday PM | Saturday Mid-Day |
| 2034 with Keastone Bay (case 3) | | | | | | |
| Eastbound Site Entrance | A (9.8) | A (9.1) | A (9.3) | A (9.8) | A (9.1) | A (9.5) |
| Westbound Site Entrance | B (14.2) | C (15.9) | C (15.5) | B (14.7) | C (18.0) | C (19.3) |
| Green Road – Left | A (7.7) | A (7.6) | A (7.7) | A (7.7) | A (7.6) | A (7.7) |
| Green Road – Left | A (7.5) | A (8.1) | A (7.9) | A (7.5) | A (8.1) | A (8.0) |

[25] For both unsignalized and signalized analyses, the numbers in parentheses following levels of service are average delay per vehicle, measured in seconds. For signalized analyses, LOS analysis results are given for only the overall intersection delay.