

CITY OF LAUREL
ROADWAY IMPROVEMENT CONCEPT STUDY
[DRAFT]

VAN DUSEN ROAD IMPROVEMENTS

(CONTEE ROAD TO OLD SANDY SPRING ROAD)

November 26, 2023



Prepared by:



Prepared for:



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1.0 INTRODUCTION

Century Engineering, LLC, A Kleinfelder Company (Century) was tasked by the City of Laurel Department of Public Works (City) to prepare this pedestrian and vehicular traffic safety improvement Concept Study (Study) along the Van Dusen Road corridor, from Contee Road to Old Sandy Spring Road (approximately 1.6 miles) in Laurel, Maryland. The scope of the Study included assessments of pedestrian/bicycle facilities (ramps, crosswalks, sidewalks, Hiker-Biker Trails), Bus Stop locations, traffic signal operations, and Drainage/Stormwater Management (SWM) requirements, along with a determination of Utility, Right-of-Way (ROW), and environmental impacts. An *Order-of-Magnitude (OOM) Cost Estimate* was prepared for all the recommended improvements. The overall Study goal was to better define the scope of work for the Final Design and construction of the safety and operational improvements along the Van Dusen Road Study corridor. Preparation of this Roadway Improvement Concept Study, and the design and construction of the improvements will use American Rescue Plan Act (ARPA) 2023 funding.

2.0 STUDY CORRIDOR LOCATION AND DESCRIPTION

2.1 Study Corridor

The Van Dusen Road Study corridor includes 1.6 miles (approx.) of roadway, from the southern limit at Contee Road to the northern limit at Old Sandy Spring Road (see *Figure 1*). It runs in a north-south direction and has a posted speed limit of 30 MPH. The corridor's typical cross section is a combination of open-section roadway and closed-section roadway, with the vehicular travel lanes conveying 2-lanes of traffic up to 6-lanes of traffic across multiple segments. There are also pedestrian and bicycle facilities throughout the corridor; these are described further in this report.

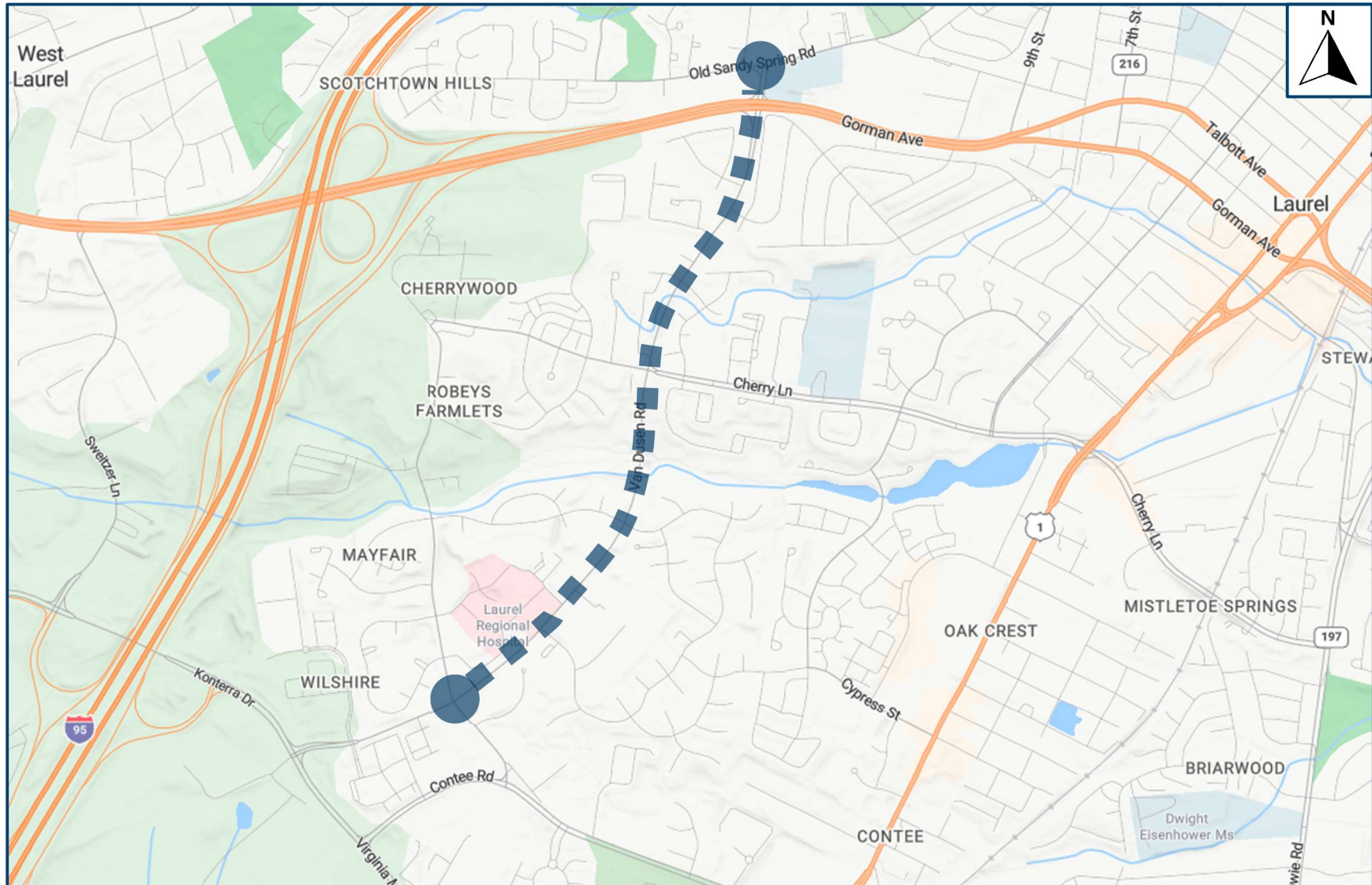
2.2 Corridor Main Segments

The segment of Van Dusen Road **between Contee Road and Cherry Lane is classified as a Major Collector** with the typical roadway section varying between 2-lanes and 4-lanes for vehicular traffic. It has a 1,035 ft. flush median just south of the Cherry Lane intersection, which separates a single lane of traffic in each direction. A Hiker-Biker trail runs along the east side of the roadway, which also has curb and gutter and storm drain inlets (closed-section) for the entire segment length. The west side of the segment is primarily an open-section roadway with 10 ft. shoulder from 520 ft. north of Contee Road to 110 ft. south of the intersection at UMD Laurel Medical Center; and from 220 ft. north of the UMD Laurel Medical Center intersection to 325 ft. south of the intersection at Olive Branch Way/Killbarron Drive. The segment contains four (4) signalized intersections at Contee Road, UMD Laurel Medical Center, Olive Branch Way/Killbarron Drive, and Cherry Lane.

Between Cherry Lane and MD 198 (Sandy Spring Road), Van Dusen Road is classified as a Minor Arterial with a typical roadway section varying between 2-lanes and 6-lanes for vehicular traffic. Sidewalk runs along the east side of the roadway, which also has curb and gutter and storm drain inlets (closed-section) for the entire segment length. The west side of the segment is primarily an open-section roadway from the Laurel Oaks Lane southern ingress/egress to MD 198, with shoulder widths varying from 0 ft. – 11 ft. There is some guardrail, however, not all sections without shoulder have guardrails. There are three (3) signalized intersections – excluding the Cherry Lane intersection – at South Arbory Lane, Arbory Court, and MD 198.

The segment of Van Dusen Road **between MD 198 and Old Sandy Spring Road is classified as a Major Collector** with a typical roadway section of 6-lanes, i.e., 2-lanes northbound and 4-lanes southbound, separated by a raised median up to 35 ft.-wide, having plantings (trees and shrubs). This segment is a closed-section roadway with sidewalk running along the east side of the roadway. There is no storm drain inlet within the segment.

Figure 1
VAN DUSEN ROAD CONCEPT STUDY LIMITS



Source: Bing Maps®

3.0 CORRIDOR FIELD REVIEW

This section of the Study, along with *Section 4.0* and *Section 5.0* present the findings of preliminary field reviews of the Van Dusen Road corridor, with a focus on Traffic Control Devices (TCD), pedestrian and bicycle facilities, drainage facilities, and potential environments impacts. *Appendix A* contains aerial imagery plans of the existing Van Dusen Road corridor that depict the existing signing and pavement markings and the condition (compliant/non-compliant) of pedestrian/bicycle, Bus Stop, and roadside facilities within the Study limits.

3.1 Van Dusen Road

Signing and Pavement Markings

The following are some general observations of the condition and application of the signing and pavement markings along the corridor. Additional descriptions of specific locations and their associated deficiencies are provided in *Section 6.2*.

- The signing and pavement markings for multiple turn bays along Van Dusen Road do not meet guidance provided in the Federal Manual on Uniform Traffic Control Devices (MUTCD) and the Maryland Supplement to the MUTCD (MDMUTCD).
- The Van Dusen Road through lanes for multiple locations drop or widen with little guidance. This does not meet driver expectation.
- Most of the signing along Van Dusen Road does not meet requirements of the MDMUTCD.

Pedestrian and Bicycle Facilities

- 4 ft. sidewalk next to utility or light poles:
 - Along northbound Van Dusen Road from Cherry Lane to Arbory Court
 - Along both sides of Old Sandy Spring Road.
- 10 ft. Hiker-Biker trail along northbound Van Dusen Road from Contee Road to Cherry Lane.
- ADA compliant 5 ft. – 8 ft. wide sidewalks from Arbory Court to Old Sandy Spring Road.
- Along southbound of Van Dusen Road at Duniho Nigh Community Park, there are no sidewalks from Laurel Oaks Lane or South Arbory Lane, which are the two nearest streets to the community park.
- Thirty-seven (37) non-complaint pedestrian ramps. Five (5) are non-compliant due to detectable warning surfaces issues including the Laurel Park Drive pedestrian ramp detectable warning surface do not extend through the width of the ramp; and Church of Jesus Christ Latter-Day Saints and Laurel Park Shopping Center ADA ramps have detectable warning surfaces on an unsignalized or unnamed roadway.
- Two (2) ADA ramps are missing from the west leg of Van Dusen Road at Old Sandy Spring Road. There is an existing crosswalk on this leg.

Bus Stops

- Seven (7) non-compliant bus stops due to missing pedestrian bus pads. There are four (4) bus stops along southbound Van Dusen Road and three (3) bus stops along northbound Van Dusen Road. The four (4) southbound Van Dusen Road bus stops are currently placed along existing drainage ditches with non-compliant/no handrails.
- One (1) non-compliant existing pedestrian bus pad.
- One (1) complaint bus pad along southbound of Van Dusen Road at the UMD Laurel Medical Center entrance; however, the sidewalk in front of it is 4 ft. wide.

Handrails

- Four (4) non-compliant handrails due to insufficient height requirements. These are located along the back of inlets.

Traffic Barriers

- All the existing traffic barrier within the project limits is non-complaint including the wooden railing behind the Hiker-Biker trail between Kilbarron Drive and Cherry Lane.
- The wooden railing is too short to protect pedestrian/bikers from a steep drop-off behind the Hiker-Biker trail.

Drainage Facilities

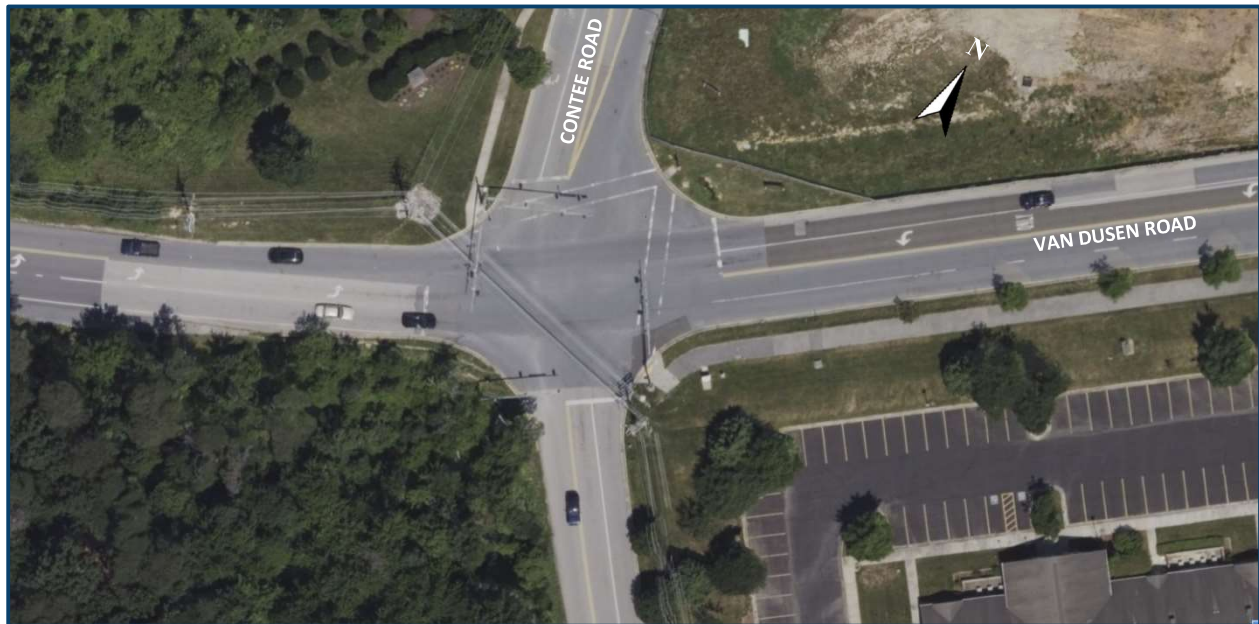
- Century was able to visually assess the condition of most drainage structures. Some structures could not be opened due to traffic and/or fixed covers. Generally, all drainage structures appeared to be in good condition, with a few exceptions listed below.
- Roadside swales along the corridor were visually assessed. Generally, swales appeared to be stable and functioning as designed, with few exceptions listed below.
- Storm drain outfalls were visually assessed and observed to be in stable condition.

4.0 INTERSECTION FIELD REVIEWS

4.1 Contee Road (Signalized)

At this location, Van Dusen Road is a closed-section Major Collector roadway that runs in a north-south direction with a 30 MPH posted speed limit. South of the intersection (and the project limits) the posted speed limit increases to 35 MPH. Northbound and southbound have one (1) left-turn and one (1) through/right-turn lane. The east leg of Contee Road is classified as a Major Collector roadway and the west leg is a Local roadway. Contee Road runs in an east-west direction with a 35 MPH posted speed limit. West of the intersection the posted speed limit decreases to 30 MPH. Eastbound and westbound have one (1) through/left and one (1) right turn lane. Sidewalk runs along both sides of the west leg and along the west side of the north leg. A Hiker-Biker trail begins in the southeast quadrant and runs along east side Van Dusen Road. There are marked crosswalks on the north and west legs of the intersection. No issues were observed for traffic barriers and drainage facilities at this intersection. An image of the intersection is shown in *Figure 2*.

Figure 2
VAN DUSEN ROAD AT CONTEE ROAD



Source: Bing Maps®

Traffic Signal

- Southbound Van Dusen Road exclusive/permissive left-turn and through signal indications were activated concurrently during every signal phase, even when there were no left-turning vehicles.
- Accessible Pedestrian Signal (APS)/Countdown Pedestrian Signal (CPS) are ono-compliant.
- Durations of the pedestrian clearance phases appear to be insufficient. They were observed at 16 seconds on the north leg and 18 seconds on the west leg. They should be 23/24 seconds.
- The signal appears to have been installed more than seventeen (17) years ago. Need to confirm the signal has routine operational and structural inspections.

Signing and Pavement Markings

- Southbound Van Dusen Road left-lane drops does not appear to be necessary.
- The eastbound and westbound Contee Road right turn bays have signing and/or pavement markings for a right lane drop.
- The north and west leg crosswalks are marked with 12 in. transverse pavement markings.

Pedestrian and Bicycle Facilities

- All pedestrian ramps at this location are non-compliant due to 4 ft. ramp widths.
- The pedestrian bus pad along southbound Van Dusen Road is non-compliant due to slope.
- The bus stop along northbound Van Dusen Road is non-compliant due to no bus pad connection from the Hiker-Biker trail to Van Dusen Road.
- The north leg has 5 ft. sidewalk along southbound Van Dusen Road and an approximately 10 ft. Hiker-Biker trail along northbound Van Dusen Road.
- Also, the south leg has a goat path along northbound Van Dusen Road.

4.2 UMD Laurel Medical Center (Signalized)

At this location, Van Dusen Road is a closed section Major Collector that runs in a north-south direction with a 30 MPH posted speed limit. Northbound has one (1) left/through and one (1) through lane. Southbound has one (1) right-turn and one (1) through lane. The UMD Laurel Medical Center access runs in an east-west direction. Eastbound has one (1) left and one (1) right turn lane. Sidewalk runs along the west side of Van Dusen Road from the UMD Medical Center to the bus stop. There is a marked crosswalk on the south leg that connects this sidewalk to the Hiker-Biker trail that runs along the east side of Van Dusen Road. No issues were observed for traffic barriers and drainage facilities at this intersection. An image of the intersection is shown in *Figure 3*.

Figure 3
VAN DUSEN ROAD AT UMD LAUREL MEDICAL CENTER



Source: Bing Maps®

Traffic Signal

- Pedestrian signals and pushbuttons are not APS/CPS-compliant.
- The signal appears to have been installed more than twenty-eight (28) years ago.
- Need to confirm the signal has routine operational and structural inspections.

Signing and Pavement Markings

- The south leg crosswalk is marked with 12 in. transverse pavement markings and additional 12 in. diagonal hatching.
- The diagonal hatching is angled the wrong way.
- The UMD Laurel Medical Center access pavement markings are faded so it is no longer visible.

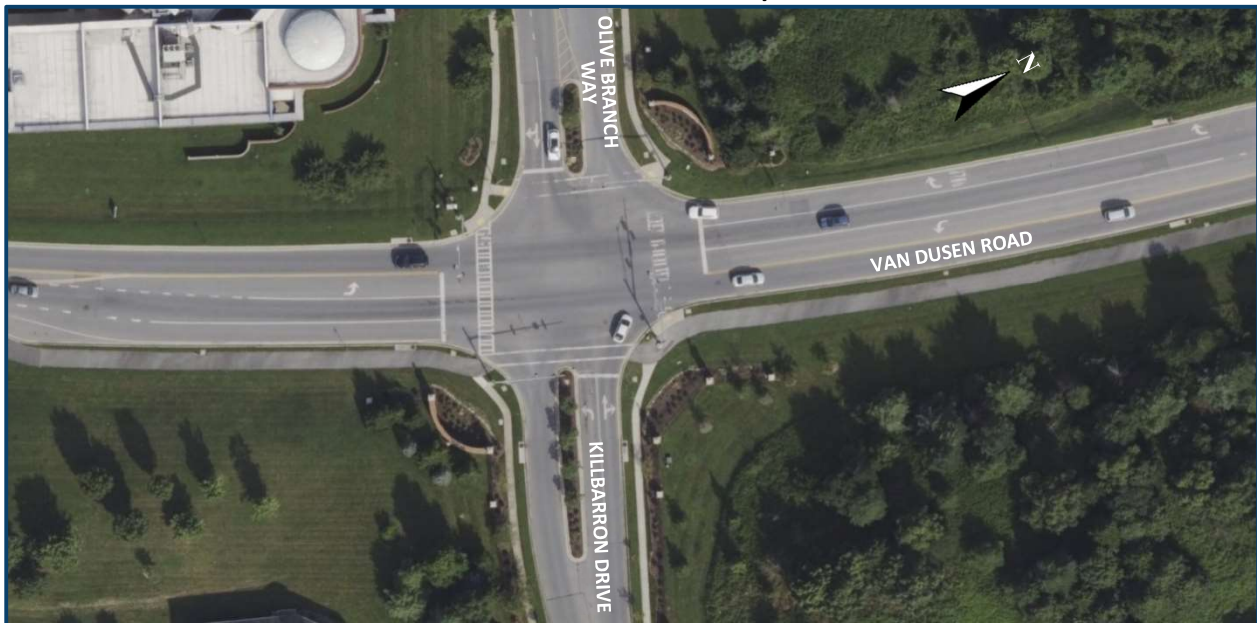
Pedestrian and Bicycle Facilities

- The pedestrian ramp within the southwest corner of the intersection at the UMD Laurel Medical Center is non-compliant due to a 4 ft. width.
- The bus stop at the southwest corner is compliant but the sidewalk is 4 ft. wide.
- There is an approximate 10 ft. Hiker-Biker trail along northbound Van Dusen Road.
- Additionally, the handrail at the inlet along northbound Van Dusen Road is non-compliant due to insufficient height requirements.

4.3 Olive Branch Way / Killbarron Drive (Signalized)

At this location, Van Dusen Road is a closed section Major Collector that runs in a north-south direction, with a 30 MPH posted speed limit. Northbound and southbound have one (1) left-turn, one (1) through and one (1) right-turn lane. Olive Branch Way and Killbarron Drive are classified as Local roadways that run in an east-west direction with a 25 MPH posted speed limit. Eastbound and westbound have one (1) left-turn and one (1) through/right-turn lane. Sidewalk runs along both sides of Olive Branch Way/Killbarron Drive, and a Hiker-Biker trail runs along the east side Van Dusen Road. There are marked crosswalks on all four (4) legs of the intersection. An image of the intersection is shown in *Figure 4*.

Figure 4
VAN DUSEN ROAD AT OLIVE BRANCH WAY/KILLBARRON DRIVE



Source: Bing Maps

Traffic Signal

- The northbound Van Dusen Road exclusive/permissive left turn phase was not operating correctly. The left turn phase would come up at multiple times during the through phase, when no vehicles were present. In addition, a resident commented that the southbound exclusive/permissive left turn phase is extremely short and only allows for one to two vehicles. This happens at all times of the day. A different resident commented that there is a lot of red light running at the intersection and was concerned about safety. The red-light-running was observed many times during the field observations.
- The pedestrian pushbuttons in the northeast and southwest quadrants were broken and not APS/CPS compliant. The duration of the pedestrian clearance phases appears to be insufficient. They were observed at 16 seconds but should be 20 seconds.
- The signal appears to have been installed more than eighteen (18) years ago. Need to confirm the signal has routine operational and structural inspections.

Signing and Pavement Markings

- The east and west leg crosswalks are marked with 12 in. transverse pavement markings.
- The north and south leg crosswalks are marked with 12 in. transverse pavement markings with additional 12 in. longitudinal lines.

Pedestrian and Bicycle Facilities

- All pedestrian ramps at this location are non-compliant. The pedestrian ramps along the east leg of the intersection are missing detectable warning surfaces; all the other ramps are non-compliant due to 4 ft. width and slope requirements.
- There are non-compliant bus stops in the northwest and southeast corners without pedestrian bus pads.
- The sidewalks along Olive Branch Way are approximately 4 ft. wide.
- The Hiker-Biker trail along northbound of Van Dusen Road is approximately 10 ft. wide and has overhanging tree branches.

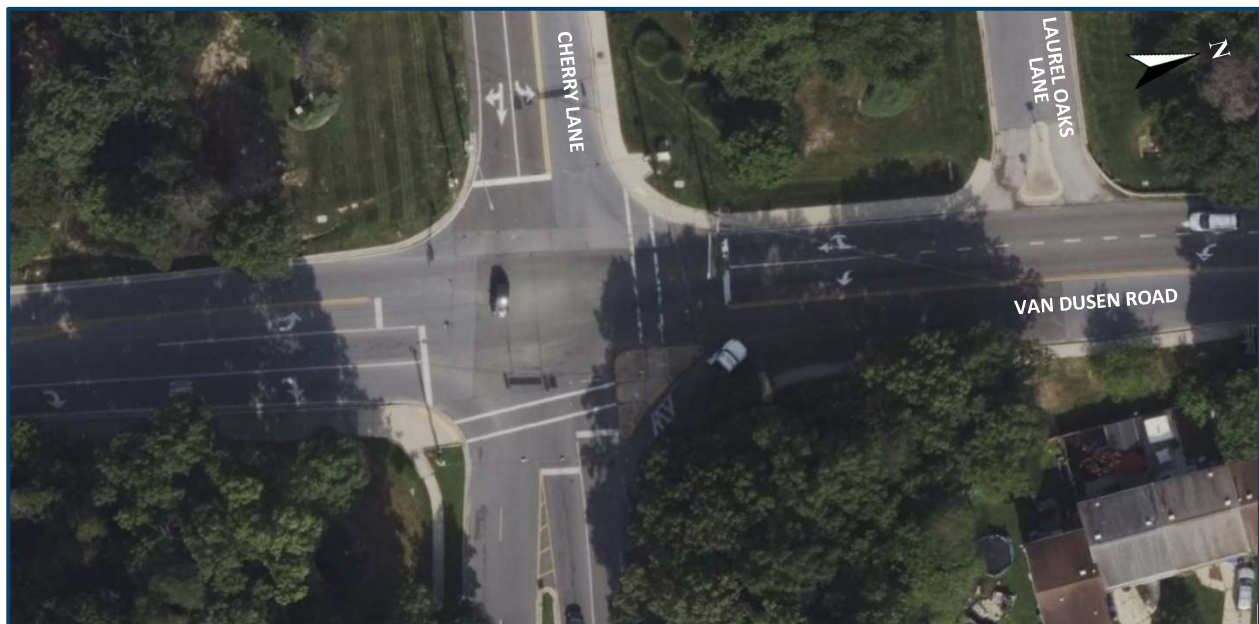
Drainage Facilities

- A roadside swale conveys runoff from the adjacent property from the south towards the intersection. A low spot in topography was observed at the southwest quadrant of the intersection. It is likely during high intensity storm events that runoff will pond at this low spot and spill into the roadway. Runoff will continue to flow north, across the Olive Branch Way intersection towards the next downstream inlet located approximately 260 ft. north of the intersection. Runoff from these high intensity storm events are likely excessive with the potential to create an adverse safety condition for drivers.

4.4 Cherry Lane (Signalized)

At this location, Van Dusen Road is a closed section Minor Arterial on the north leg and a Major Collector on the south leg. It runs in a north-south direction with a 30 MPH posted speed limit. Northbound has one (1) left-turn, one (1) through and one (1) right-turn lane. Southbound has one (1) left-turn and one (1) through/right-turn lane. Additionally, southbound (south of the intersection) is monitored with a speed enforcement camera. Cherry Lane is a closed section Minor Arterial on the east leg and a Local roadway on the west leg that runs in an east-west direction with a 30 MPH posted speed limit. Eastbound has one (1) left-turn and one (1) through/right-turn lane. Westbound has one (1) left-turn, one (1) through and one (1) right-turn lanes. Sidewalk runs along the north and the south sides of the intersection. A Hiker-Biker trail begins in the southeast quadrant. There are marked crosswalks on the north and east legs of the intersection. No issues were observed with the drainage facilities at this intersection. An image of the intersection is shown in *Figure 5*.

Figure 5
VAN DUSEN ROAD AT CHERRY LANE



Source: Bing Maps®

Traffic Signal

- The pedestrian pushbuttons are not APS/CPS compliant.
- The durations of the pedestrian clearance phases are insufficient. They were observed at 12 seconds and should be 15 seconds.
- The signal appears to have been installed more than eighteen (18) years ago. Confirm the signal has routine operational and structural inspections.

Signing and Pavement Markings

- The north and east leg crosswalks are marked with 12 in. transverse pavement markings.
- The east leg channelized right turn pedestrian crossing is diagonally hatched.
- Many school children use the crosswalks. All of them used the pushbuttons.
- There are no school crossing or standard school zone signs.
- The pavement markings and signing for the westbound Cherry Lane right and left lane drops are not correct.
- The MD 198 and I-95 trailblazer assemblies along Cherry Lane are not correct.

Pedestrian and Bicycle Facilities

- All pedestrian ramps in the concrete island at Cherry Lane are ADA-compliant, including the ramp in the northeast corner of Van Dusen Road and Cherry Lane.
- The northeast ADA ramp is adjacent to a 4 ft. sidewalk that transitions to 5 ft. just for the ramp.
- The southeast ADA ramp has a detectable warning surface that is too long and there is no connecting ramp in the southwest corner.
- The sidewalk in the northeast corner is 4 ft. wide, the northwest sidewalk along Van Dusen Road is 5 ft. wide, and the Hiker-Biker trail along the southeast leg of Van Dusen Road is approximately 10 ft. wide.
- There is an ADA ramp at Laurel Oaks Lane that leads to a raised island without pedestrian cut-through access.

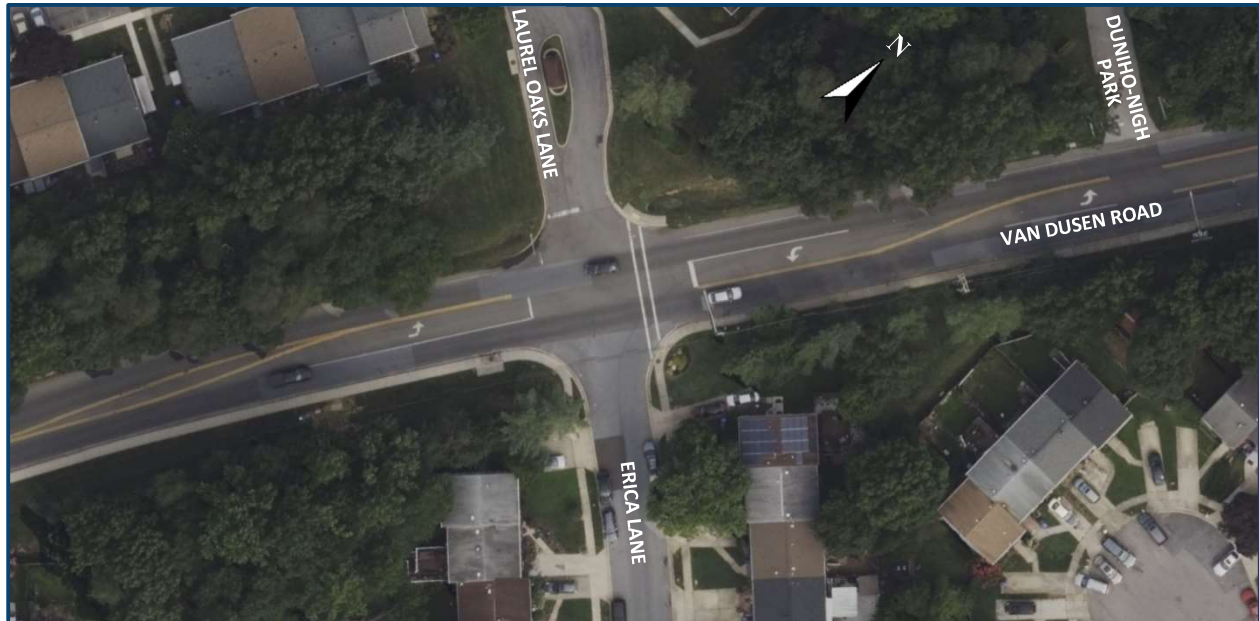
Traffic Barriers

- Traffic barrier at this location is non-compliant due to insufficient height requirements.

4.5 Laurel Oaks Lane / Erica Lane (Unsignalized)

At this location, Van Dusen Road is an open and closed section Minor Arterial that runs in a north-south direction with a 30 MPH posted speed limit. Northbound and southbound have one (1) left-turn and one (1) through/right-turn lane. Laurel Oaks Lane and Erica Lane are classified as Local roadways that runs in an east-west direction with a 25 MPH posted speed limit. Both have one (1) left/through/right turn lane. Sidewalk runs along both sides of Erica Lane and the east side Van Dusen Road. There is a marked unsignalized crosswalk on the north leg. An image of the intersection is shown in *Figure 6*.

Figure 6
VAN DUSEN ROAD AT LAUREL OAKS LANE/ERICA LANE



Source: Bing Maps®

Signing and Pavement Markings

- Northbound and southbound Van Dusen Road are uncontrolled but there are stop lines in the northbound and southbound left turn bays.
- The north leg crosswalk is marked with 12 in. transverse pavement markings.
- There is no stop line for westbound Erica Lane.

Pedestrian and Bicycle Facilities

- There is a school bus stop in the northwest quadrant that served 10-15 students.
- All pedestrian ramps are non-compliant in this location due to 4 ft. ramp widths and the adjacent 4 ft. sidewalk.
- There is a bus stop sign at the north leg but there is no bus pad.
- The bus stop in the south leg is compliant but the sidewalk is 4 ft. wide.
- There is no crosswalk across Erica Lane connecting the ADA ramps.

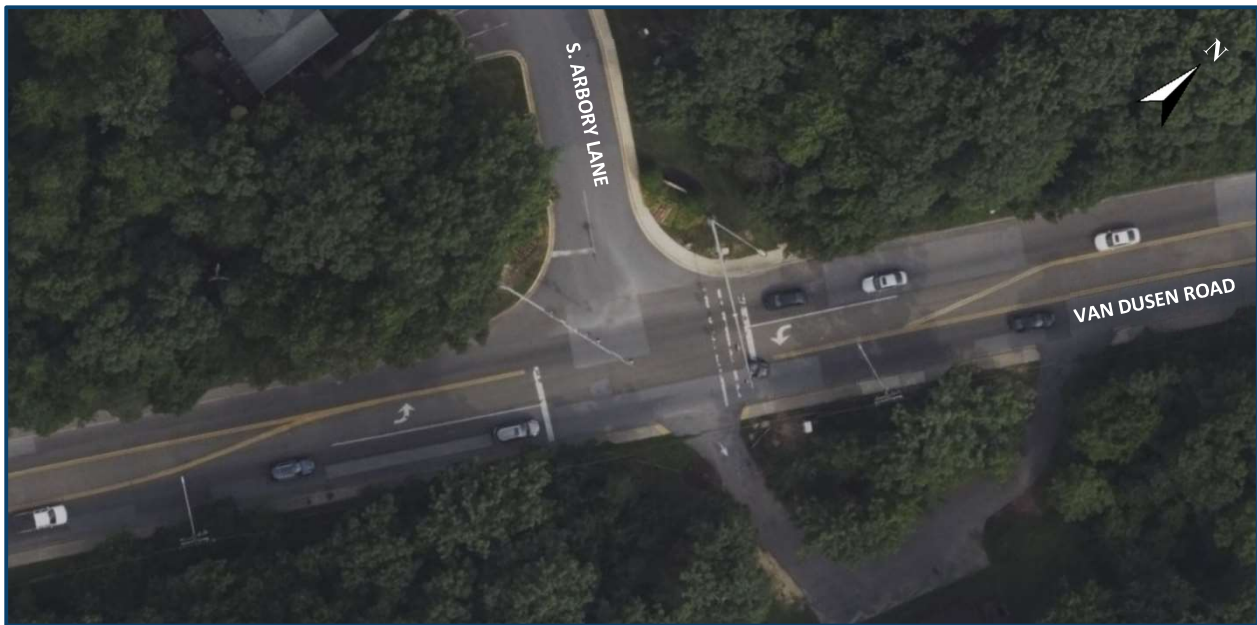
Drainage Facilities

- The 24 in. concrete culvert located under Laurel Oaks Lane was observed to be clogged with sediment.

4.6 South Arbory Lane (Signalized)

At this location, Van Dusen Road is an open and closed section Minor Arterial that runs in a north-south direction with a 30 MPH posted speed limit. Northbound has one (1) left-turn and one (1) through/right-turn lane. Southbound has one (1) left-turn and one (1) through/right-turn lane. Additionally, southbound (north of the intersection) is monitored with a speed enforcement camera. S. Arbory Lane is classified as a Local roadway that runs in an east-direction. Eastbound has one (1) left/through/right turn lane. The east leg is an entrance only for the Leo E. Wilson Community Park. Sidewalk runs along the north and east side of the intersection and is connected with a marked crosswalk on the north leg. No issues were observed with drainage facilities at this location. An image of the intersection is shown in *Figure 7*.

Figure 7
VAN DUSEN ROAD AT SOUTH ARBORY LANE



Source: Bing Maps®

Traffic Signal

- The presence detection for the northbound Van Dusen Road left turn lane is not working properly. The exclusive/permissive left turn phase came up multiple times during the through phase when no vehicles were in the left turn lane. This causes southbound Van Dusen Road through vehicles to stop and queue unnecessarily.
- The pedestrian pushbuttons are not APS/CPS compliant.
- The signal appears to have been installed more than thirty-three (33) years ago. Need to confirm that the signal undergoes routine operational and structural inspections.

Signing and Pavement Markings

- The north leg crosswalk is marked with 12 in. transverse pavement markings.

Pedestrian and Bicycle Facilities

- All pedestrian ramps at this location are non-complaint. Both pedestrian ramps along the east leg are non-complaint due to slope and adjoining 4 ft. sidewalk on both sides.
- There is no crosswalk connecting the east leg of the intersection.
- The north leg pedestrian ramp is non-complaint due to 4 ft. sidewalk width requirements.
- There is a bus stop sign in the northwest corner but no bus pad.

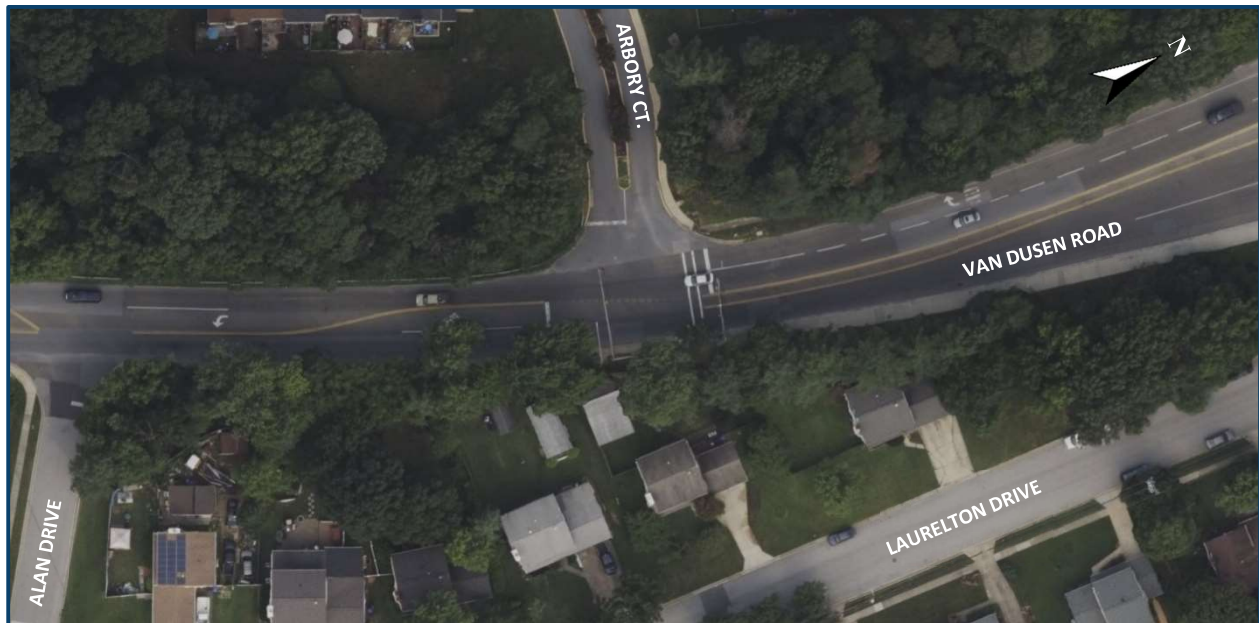
Traffic Barriers

- The traffic barrier along southbound Van Dusen Road is non-compliant due to insufficient height requirements.

4.7 Arbory Court (Signalized)

At this location, Van Dusen Road is an open and closed section Minor Arterial that runs in a north-south direction with a 30 MPH posted speed limit. Northbound has one (1) left-turn and one (1) through lane. Southbound has one (1) right-turn and one (1) through lane. Arbory Court is classified as a Local roadway that runs in an east direction. Eastbound has one (1) left/through/right turn lane. Sidewalk runs along the north and east side of the intersection and is connected with a marked crosswalk on the north leg. An image of the intersection is shown in *Figure 8*.

Figure 8
VAN DUSEN ROAD AT ARBORY COURT



Source: Bing Maps®

Traffic Signal

- The presence detection for the northbound Van Dusen Road left turn lane is not working properly.
- The exclusive/permissive left turn activates when no vehicles are present in the left turn lane. This causes the southbound Van Dusen Road through vehicles to stop and queue unnecessarily.
- Also, the presence detection for eastbound Arbory Court is not working properly. A resident commented that a vehicle at the stop line does not always send a call. This delay causes some drivers to run the red light or turn right and turn around.
- The pedestrian pushbuttons are not APS/CPS compliant.
- The walk phase (16 seconds) and pedestrian clearance phase (7 seconds) are reversed.
- The signal appears to have been installed more than 24 years ago. Confirm the signal has routine operational and structural inspections.

Signing and Pavement Markings

- The pavement markings and signing for the southbound Van Dusen Road lane-drops are not correct.
- The north leg crosswalk is marked with 12 in. transverse pavement markings.

Pedestrian and Bicycle Facilities

- Both pedestrian ramps at this intersection are non-compliant. The ramp in the northwest corner does not have a detectable warning surface and the ramp in the northeast corner does not meet slope requirements.
- The 8 ft. sidewalk along northbound Van Dusen Road transitions into a 4 ft. non-compliant sidewalk.

Traffic Barriers

- The traffic barrier along southbound of Van Dusen is not the proper height.

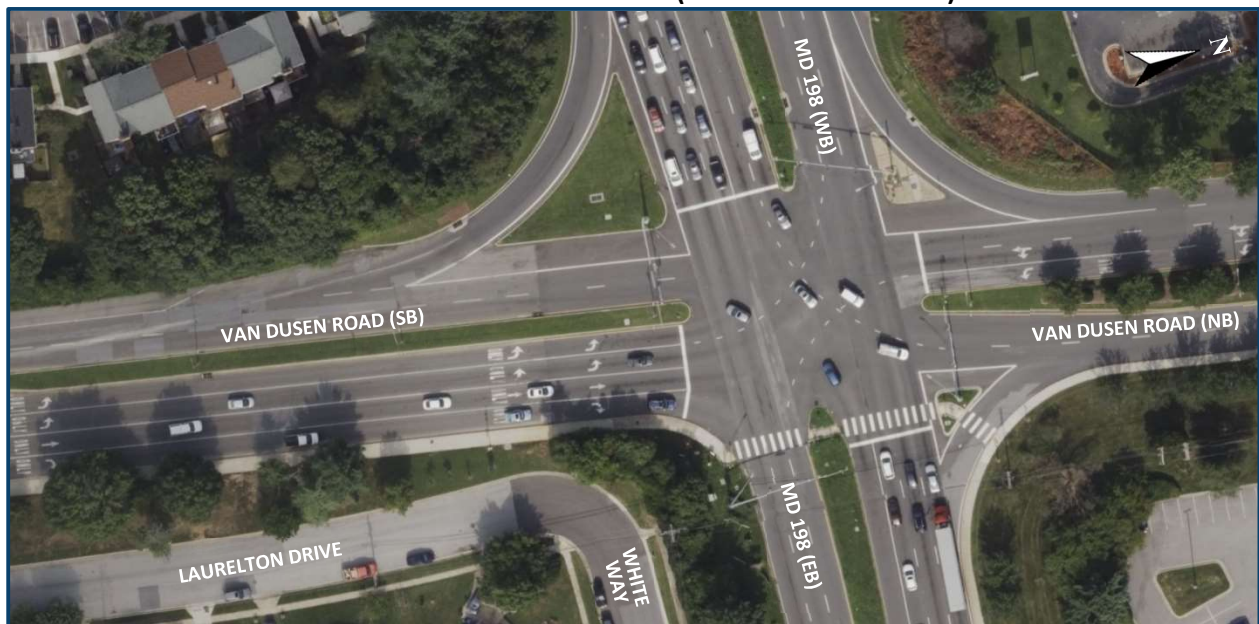
Drainage Facilities

- The 18 in. concrete culvert located under Arbory Court was observed to be clogged with sediment.

4.8 MD 198 (Signalized)

At this location, Van Dusen Road is a divided, closed section Major Collector on the north leg and a Minor Arterial on the south leg. It runs in a north-south direction with a 30 MPH posted speed limit. Northbound has two (2) left-turn, one (1) through and one (1) right-turn lane. Southbound has one (1) left-turn, one (1) through/left, one (1) through, and one (1) channelized right-turn lane. MD 198 is classified as a Principal Arterial-Other roadway that runs in an east-west direction with a 35 MPH posted speed limit. Eastbound has two (2) left-turn lanes, three (3) through lanes and one (1) channelized right-turn lane. Westbound has one (1) left-turn lane, two (2) through lanes and one (1) through/right-turn lane. A sidewalk runs along the east side of the intersection and is connected with marked crosswalks on the east leg. No traffic signal equipment issues, nor drainage facility issues were observed at this location. An image of the intersection is shown in *Figure 9*.

Figure 9
VAN DUSEN ROAD AT MD 198 (SANDY SPRING ROAD)



Source: Bing Maps®

Signing and Pavement Markings

- The ONLY pavement markings are not necessary in the northbound and southbound Van Dusen Road left turn bay or the northbound right turn bay.
- There are no advanced trailblazer assemblies for MD 198 along southbound Van Dusen Road.
- The northbound Van Dusen Road pavement markings are incorrect.
- The advanced signing along northbound Van Dusen Road is in poor condition and incorrect.
- The W6-1 divided highway sign in the south leg median nose and the southbound W4-2R sign, south of MD 198 are not correct.

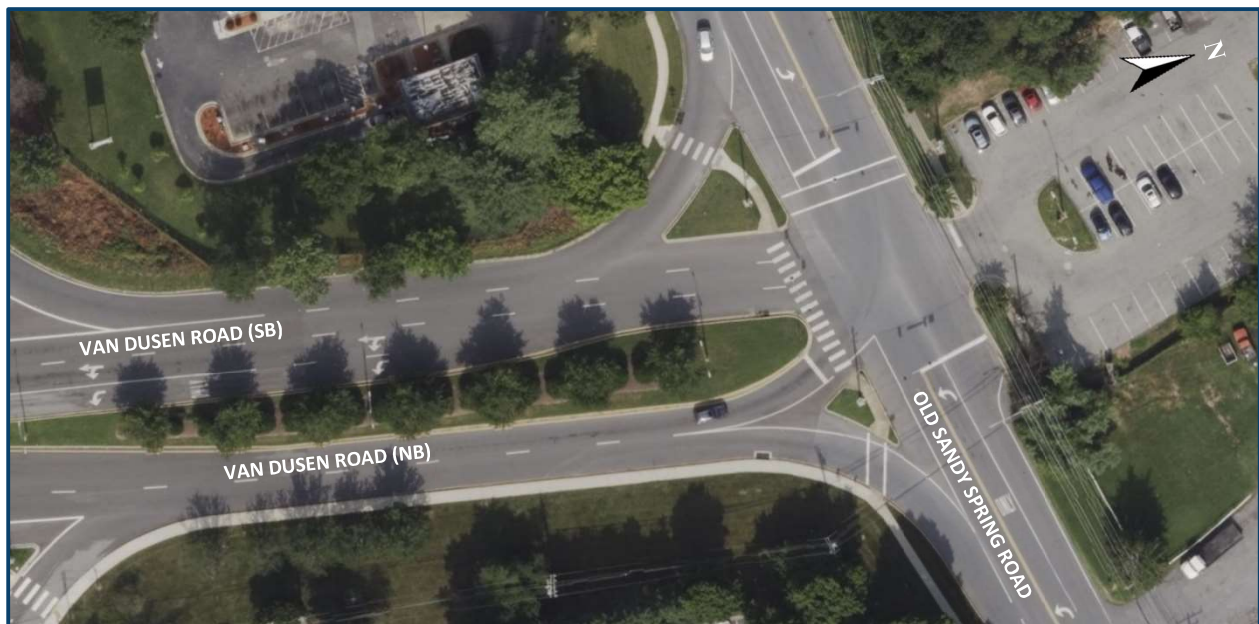
Pedestrian and Bicycle Facilities

- All ramps and sidewalk at this intersection are compliant.
- The sidewalk along northbound of Van Dusen Road is 8 ft. wide.

4.9 Old Sandy Spring Road (Signalized)

At this location, Van Dusen Road is a divided, closed section Major Collector that runs in a north-south direction with a 30 MPH posted speed limit. Northbound has one (1) combined through/left-turn and one (1) channelized right-turn lane. Southbound (Laurel Park and Ride) has one (1) left/through/right lane. Old Sandy Spring Road is classified as a Major Collector on the east leg and a Local roadway on the west leg. It runs in an east-west direction with a 25 MPH posted speed limit. Eastbound has one (1) left-turn, one (1) through and one (1) channelized right-turn lane. Westbound has one (1) left-turn and one (1) through/right-turn lane. Sidewalk runs along both roadways with marked crosswalks on the south and west legs. No issues were observed with the drainage facilities at this location. An image of the intersection is shown in *Figure 10*.

Figure 10
VAN DUSEN ROAD AT OLD SANDY SPRING ROAD



Source: Bing Maps®

Traffic Signal

- Vehicles making a left turn from northbound Van Dusen Road did not yield to pedestrians in the crosswalk during the walk phase.
- The pedestrian signals and pushbuttons are not APS/CPS compliant.
- The signal appears to have been installed more than thirty-two (32) years ago. Need to confirm that the signal has routine operational and structural inspections.

Signing and Pavement Markings

- The west leg and north leg channelized right turn crosswalks are marked with 12 in. transverse pavement markings.
- The existing high visibility continental crosswalk on the south leg does not align with vehicle wheel paths.
- The 5 in. solid white, arrow and ONLY pavement markings for the eastbound and westbound left turn bays are incorrect.
- The location of the north leg stop line encourages vehicles to block the sidewalk path.
- The R4-7a sign in the south leg median nose and yield signs are in poor condition.
- The pedestrian and down arrow signs for the channelized crossings are fluorescent yellow green.

Pedestrian and Bicycle Facilities

- There is an existing crosswalk across the west leg of this intersection but there are no ADA ramps for pedestrians to cross.
- All but one (1) pedestrian ramp is non-compliant due to slope requirements.
- The sidewalk in-front of the Laurel Park and Ride is 4 ft. wide and the sidewalk along northbound Van Dusen Road is 5 ft. wide.

5.0 ENVIRONMENTAL REVIEW

A desktop analysis and visual field investigation were performed by Century on October 11 and 12, 2023 to identify any natural resources, including wetlands, waterways, floodplains, forest, and specimen trees within 50 ft. of Van Dusen Road along the project corridor.

5.1 *Wetlands and Waters of the U.S.*

The field investigation identified five (5) nontidal wetlands, four (4) perennial waterways, two (2) intermittent waterways, and one 100-year floodplain. The northern most perennial channel is located between Arbory Court and S. Arbory Lane and is culverted under Van Dusen Road, flowing in a southeasterly direction. This perennial stream channel receives flow from one (1) intermittent stream channel beginning at a culvert under Arbory Court flowing south. South of S. Arbory Lane and north of the access drive for tennis courts, one (1) perennial stream channel is culverted eastward under Van Dusen Road. This perennial stream channel receives flow from one (1) intermittent stream channel flowing north from a head cut, west of Van Dusen Road. In addition, a palustrine forested (PFO) wetland was identified on the upstream left bank of the perennial stream. Crows Branch is a perennial stream located between the north and south ends of Laurel Oaks Lane and has a culverted flow eastward under Van Dusen Road, the upstream end of this culvert was not found and is assumed to be beyond the road right of way, based on desktop mapping. Bear Branch is the final perennial channel within the study area and is located south of Cherry Lane and north of Olive Branch Way. Bear Branch enters the study area from the west as a two-channel system and is culverted under Van Dusen Road, flowing to the east. Two (2) nontidal wetlands were identified south of Bear Branch on the western side of Van Dusen Road, the northern most wetland was classified as a palustrine emergent (PEM) wetland and southern wetland was classified as a palustrine scrub-shrub and forested (PSS/PFO) wetland. One (1) nontidal wetland was identified north of Bear Branch on the western side of Van Dusen Road and was classified as a PEM wetland. The final wetland identified was located north of Bear Branch on the eastern side of Van Dusen Road, this wetland was classified as PEM within the right of way and extend east transitioning into a PFO wetland. Additionally, there is a Federal Emergency Management Administration (FEMA) mapped 100-year floodplain along Bear Branch.

5.2 *Specimen Trees and Potential Forest Stands*

The desktop analysis and visual field investigation identified one (1) specimen tree and eight (8) adjacent forested areas.

One (1) 36.1" southern red oak (*Quercus falcata*) specimen tree was located on the east side of Van Dusen Road, south of Erica Lane. Three (3) forested areas were identified on the northern portion of the study corridor along the west side of Van Dusen Road between Cherry Lane and Arbory Court. In addition, one (1) additional forested area was identified on the northern portion of the study corridor, along the east side of Van Dusen Road, between Alan Drive and Carissa Lane. On the central portion of the study corridor, one (1) forested area was identified on the west side of Van Dusen Road along Bear Branch and two (2) forested areas on the east side of Van Dusen Road along Bear Branch. The last area of forest identified is located on the southern portion of the study corridor, east of Laurel Regional Hospital and west of Van Dusen Road.

6.0 DATA COLLECTION AND CONDITIONS ASSESSMENT

6.1 Traffic Data Collection

Five (5) of the traffic counts were obtained from previous City of Laurel traffic studies. Three (3) locations, Van Dusen Road at Arbory Court, Van Dusen Road at S. Arbory Lane and Van Dusen Road at the UMD Laurel Medical Center required AM/PM peak hour counts. These counts were performed by Century under clear weather conditions, and with a dry roadway surface. *Appendix B* contains the detailed traffic count summaries.

The existing traffic signal timing data was provided by the City of Laurel and the Maryland State Highway Administration (SHA). Six (6) of the Van Dusen Road traffic signals are maintained and operated for the City of Laurel by Econolite and run a single timing plan. These timing plans had to be modified based on observed field operations. MD 198 (Sandy Spring Road) is a SHA signal and Contee Road is Prince George's County signal. The signal timing plan for Contee was not provided so it was developed from field observations. The signal timing sheets, and AM/PM *Synchro* model files were provided by SHA for MD 198. *Appendix C* includes the signal timing data and *Appendix D* includes the *Synchro/SimTraffic* reports.

The GIS topography (impervious areas and buildings) and ROW were obtained from the Prince George's County GIS website. The aerial used is the 6 in. imagery provided by SHA. The physical features such as utility poles and electrical boxes were obtained by a combination of the aerial and field verification. The existing signs were obtained from a review of *Google®* aerial imagery and through field verification. The as-built traffic signal plans for the eight (8) signals along Van Dusen Road were provided by the City of Laurel and are included in *Appendix E*.

6.2 Signing and Pavement Marking Deficiencies

The existing signing and pavement markings throughout the corridor do not meet the current MDMUTCD requirements, nor satisfy driver expectation. For example:

- The 5 in. white, ARROW and ONLY pavement markings are incorrectly installed in many of the Van Dusen Road turn bays. ONLYs should be reserved for through lane drops. Upgrade the corridor based on the guidance in the MDMUTCD Section 3B.20.
- Through lane configuration do not meet driver expectations.
 - Southbound Van Dusen Road north of Contee Road is one lane and signed/ marked as a left lane drop. This makes through traffic merge right to stay on Van Dusen Road.
 - Northbound Van Dusen Road at UMD Laurel Medical Center does not have a dedicated left turn lane. There are 98 AM and 24 PM left turns that through traffic must bypass.
 - Southbound Van Dusen Road right lane drops into Arbory Court. There are eighteen (18) right-turns and AM and fifty-two (52) right-turn during the AM and PM Peak Periods, respectively. Also, most of the southbound traffic is directed into the right lane south of MD 198. There are 187 AM and 197 PM trips from the southbound Van Dusen Road through/left turn lane and 438 AM and 758 PM from eastbound MD 198 right turn lane.
 - Northbound Van Dusen Road south of MD 198 widens from one lane to four lanes with minimal guidance.
- Existing signing size, color and design do not meet current MDMUTCD guidance. For example:
 - R3-7, Right Lane Must Turn Right and the Left Lane Must Turn Left signs are not used appropriately along Van Dusen Road. These signs should be reserved for through lane drops. Upgrade the corridor based on the guidance in the MDMUTCD Section 2B.19, paragraph 04c.

creating unnecessary southbound delay and queuing. In addition, a resident commented that the southbound exclusive/permissive left turn phase is extremely short and only allows for one to two vehicles. Another resident commented that there is a lot of red light running at the intersection and was concerned about safety. The red light running was observed many times during field observations.

- b. The pedestrian pushbuttons in the northeast and southwest quadrants were broken and not APS/CPS compliant. Additionally, the durations of the pedestrian clearance phases appear to be insufficient. They were observed at 16 seconds.

South Arbory Lane

- a. The presence detection for the northbound Van Dusen Road protected/permissive left-turn phase is not working properly. The left-turn phase comes up when no vehicles are in the left-turn lane, creating unnecessary southbound delay and queuing.

Arbory Court

- a. The pedestrian pushbuttons are not APS/CPS compliant.
- b. The presence detection for the northbound Van Dusen Road protected/permissive left-turn phase is not working properly. The left-turn phase comes up when no vehicles are in the left-turn lane, creating unnecessary southbound delay and queuing.
- c. The pedestrian pushbuttons are not APS/CPS compliant. Additionally, the walk phase (16 seconds) and pedestrian clearance phase (7 seconds) are reversed.
- d. The presence detection for eastbound Arbory Court is not working properly. A resident commented that a vehicle's presence at the stop line does not always send a call causing drivers to run the red light or turn right and turn around.

6.4 Stormwater Management Deficiencies/Impacts

A low spot in topography was observed at the southwest quadrant of the Van Dusen Road and Olive Branch Way/Killbarron Drive intersection. During heavy rainfall events, runoff may pond at this location and spill into the roadway, with the potential to create an unsafe condition for motorists. Drainage computations may be required to demonstrate the existing storm drain system has the capacity to convey the additional runoff. In addition, Utility test pits may be necessary at a later design phase of the project to identify and avoid utility impacts.

6.5 Environmental Resources (Impacts/Permit Requirements)

Should the limit of disturbance encompass or impact wetlands, 25 ft. wetland buffers, perennial/intermittent waterways, or the 100-year floodplain, a Joint Permit Application may be required to receive authorization from the Maryland Department of the Environment (MDE) and the United States Army Corps of Engineers (USACE). In addition, if tree clearing or trimming is to occur in State road ROW, a Maryland Department of Natural Resources Roadside Tree Permit will be required to account for and mitigate tree impacts.

MD 198 Intersection Lane-use Reconfiguration

Century analyzed removing the southbound Van Dusen Road right lane drop at Arbory Court. This alternative proposes to reduce southbound Van Dusen Road to one (1) through-lane at MD 198. Currently the southbound Van Dusen Road lane configuration on the approach to MD 198 is one (1) left-turn lane, one (1) shared through/left lane, one (1) through lane, and one (1) channelized right-turn lane. This alternative proposes modifying this configuration to two (2) left-turn lanes, one (1) through-lane, and one (1) channelized right-turn lane. This would result in one (1) southbound lane along Van Dusen Road between Arbory Court and MD 198 and facilitate more efficient traffic flow for vehicles merging onto southbound Van Dusen Road from eastbound MD 198. To analyze this alternative, southbound Van Dusen Road between MD 198 and Arbory Court was modeled to show an acceleration lane for eastbound MD 198 right-turns and a deceleration lane for Arbory Court right-turns. With this alternative, the impacted signalized intersections would continue to operate at an acceptable LOS D or better, with sufficient turn bay storage along Van Dusen Road. The LOS and Delay for this Alternative are summarized in *Table 3*. The 95th Percentile Queue results are shown in *Appendix D*.

Table 3
MD 198 INTERSECTION LANE-USE RECONFIGURATION
ALTERNATIVE – TWO (2) SB LEFT-TURN LANES

INTERSECTION (w/ VAN DUSEN ROAD)	MD 198 EXISTING LANE-USE (WEEKDAY AM PM PH)				MD 198 ALT. LANE-USE (WEEKDAY AM PM PH)			
	LOS		Delay (sec/veh)		LOS		Delay (sec/veh)	
S. Arbory Lane	A	A	5.6 s	4.7 s	A	A	5.7 s	4.4 s
Arbory Court	A	A	9.0 s	8.9 s	A	A	9.0 s	7.5 s
MD 198 (Sandy Spring Road)	D	D	37.1 s	41.5 s	D	D	36.4 s	46.2 s
Old Sandy Spring Road	A	B	9.7 s /	11.0 s	B	B	10.1 s	12.3 s

8.0 PROPOSED IMPROVEMENTS

8.1 General Traffic Calming/Safety Considerations

The following are some general considerations that were considered/applied when assessing the corridor to determine the application of appropriate operations and safety improvements:

- Raised medians narrow the roadway, provide physical barrier between opposing traffic, and create a closed section feel along the roadway segment. Additionally, they produce an opportunity for green space. This feature could be installed along median section is currently unused pavement, such as near the Bear Branch damn.
- Converting a shoulder to sidewalk narrows the roadway and discourage aggressive driving will creating a dedicated place for pedestrian to walk.
- Raised Crosswalks were considered along Van Dusen Road. Based on DDOT guidelines (see *Appendix F*), Raised Crosswalks can be considered along Local roadways with mostly residential land uses and an Average Daily Traffic (ADT) less than 5,000 veh/day. In special cases they can be considered along Collector roadways with ADTs up to 7,500 veh/day. They are not ideal along roadways with transit routes, fire stations and/or hospitals. This section of Van Dusen Road is classified as a Major Collector and Minor Arterial and maintains an ADT above 12,000 veh/day. Additionally, the UMD Laurel Medical Center and Laurel Volunteer Fire Department access Van Dusen Road. Therefore, we do not recommend raised crosswalks at this time.

The following subsections describe the Van Dusen Road proposed corridor-wide improvements, as well as specific improvements recommended on each Concept Plan sheet. Concept Plans showing the general scope/area of these improvements are included in *Appendix G*.

8.2 Corridor-wide Improvements

- Correct the current signal malfunctions along Van Dusen Road at Contee Road, Olive Branch Way/Killbarron Drive, S. Arbory Lane, and Arbory Court.
- All signals should be routinely inspected. This would include operational reviews every three (3) years and structural inspections every three (3) years. This will address the issues indicated in *Section 7.0, Traffic Signal Analysis*, and minimize future signal timing and operations issues.
- Prepare Signing and Pavement Marking plans to upgrade the TCDs throughout the corridor to meet MDMUTCD guidance, including upgrading all crosswalks to High Visibility Continental Crosswalks. This section of Van Dusen has inconsistent crosswalk pavement markings. Upgrading the crossings to High Visibility Continental Crosswalks will provide a consistent feel and added visibility to alert drivers to where pedestrians are crossing. In addition, they should be installed to avoid vehicle wheel paths which reduces maintenance. These improvements will address the items indicated in *Section 6.2*. This would include upgrading all crosswalks to High Visibility Continental Crosswalks to improve visibility.
- It is anticipated stormwater management will need to be provided at five (5) Points of Investigation (POI). The City is amenable to using permeable pavement for sidewalks to treat stormwater management requirements where feasible.
- Prepare Roadway Design Plans to install the improvements listed below and shown in *Appendix G*. This would include cleaning all accessible drainage structures and storm drains along the corridor.

Drawing PS-14 to PS-16 (Eastside Sidewalk)

- Install 5 ft. sidewalk and curb and gutter along southbound Van Dusen Road from STA 160+60 LT to STA 167+00 LT utilizing the 4 ft. shoulder to avoid the existing ditch. The headwalls along both sides of the Duniho-Nigh Community Park entrance warrants traffic barrier that will impact the headwall and handbox.

Drawing PS-15 to PS-16 (S. Arbory Lane)

- Install a raised median within the footprint of the existing flush median north and south of S. Arbory Lane.
- Reconstruct all pedestrian ramps to meet ADA requirements.
- Install a pedestrian bus pad for the existing bus stops at STA 167+85 LT and STA 170+20 RT. The pedestrian bus pad at STA 170+20 RT will require a backer-curb and handrail due to a steep slope.
- Upgrade the Van Dusen Road at S Arbory Lane signal to include APS/CPS.
- Repair the northbound exclusive/permissive left turn presence detection so this phase only comes up when a vehicle is present.

Drawing PS-17 (Arbory Court)

- Reconstruct all pedestrian ramps to meet ADA requirements.
- Upgrade the Van Dusen Road at Arbory Court signal to include APS/CPS and evaluate the pedestrian clearance intervals. Repair the northbound exclusive/ permissive left turn presence detection so this phase only comes up when a vehicle is present. Also repair the eastbound Arbory Court presence detection so it does detect a vehicle on Arbory Court.
- Trim existing ditch from approximately STA 172+00 LT to STA 173+60 LT (at downstream end of culvert under Arbory Court).

Drawing PS-17 to PS-19 (Arbory Court to MD 198)

- Remove the southbound Van Dusen Road right lane drop at Arbory Court by reconfiguring the southbound Van Dusen Road lane configuration north of MD 198. This will require coordination with SHA.
- Modify southbound Van Dusen Road to one through lane from MD 198 to Arbory Court as shown in the Concept Plans. The MD 198 at Van Dusen Road signal modification will require coordination with SHA, see *Section 7.0* for the analysis results.
- Install a raised median within the footprint of the existing flush median north of S. Arbory Lane from STA 174+40 to STA 179+00.
- Modify northbound Van Dusen Road south of MD 198 as shown in the Concept Plans.
- Recommend installing advance trailblazer assembly signs for MD 198.

Drawing PS-20 (Old Sandy Spring Road)

- Widen both islands towards Old Sandy Spring Road to shorten the west leg crosswalk, better channelize right-turns, and discourage aggressive driving.
- Upgrade the sidewalk in front of the Laurel Park and Ride to 5 ft. Install two (2) ramps along the west leg to connect to the existing crosswalk. Reconstruct all pedestrian ramps to be to meet ADA requirements except for 1 ramp located at approximately STA 187+90 LT. The ramp reconstruction at approximately STA 187+60 LT will impact a manhole. The ramp reconstruction at the east island will potentially impact the traffic signal.
- Upgrade the Van Dusen Road at Old Sandy Spring Road signal to include APS/CPS and a Leading Pedestrian Interval (LPI) on the west leg pedestrian signal.

- Relocate the existing stop line on the north leg so stopped vehicles will not block the pedestrian crossing. Upgrade signing within the intersection.
- The eastbound and westbound Old Sandy Spring Road left lane drops do not meet MDMUTCD guidance. Consider upgrading the lane drops signing and pavement markings.

8.4 Stormwater Management Improvements (by Stationing)

The project will comprise of 14 separate Points of Investigation (POIs) and Lines of Investigations (LOIs) where runoff from the project site will leave City right-of-way. Runoff from some of these POIs/LOIs leave the ROW at different locations along the project corridor, but ultimately combine at the same location as other POIs/LOIs downstream of the project site. These POIs/LOIs are indicated with a letter in addition to a POI/LOI number. For example, runoff from POI 6A and LOI 6B will leave the right-of way at different locations but ultimate converge just beyond the ROW.

It is anticipated stormwater management will need to be provided at POIs 1, 4, 5A, 6A and 7A. The City is amenable to using permeable pavement for sidewalks to treat stormwater management requirements where feasible. The permeable pavement proposed on this project will utilize Prince George's County detail and design specifications, meeting all State and County requirements. From the USDA Natural Resources Conservation Services Web Soil Survey, the project area consists of soils within the Hydrologic Soil Groups C and D. Due to the low infiltration rates typically associated with Type D soil, permeable pavement is not a suitable stormwater management practice and will not be proposed on Type D soil. Where permeable pavement is proposed, underdrains will be provided which will either tie into existing drainage structures or outfall into an existing swale.

Throughout the project, impervious area is proposed to be reconstructed and restored to its original function. In is anticipated these reconstructed impervious areas will qualify for an MDE 3.3.A stormwater management waiver and no stormwater management will need to be provided for these areas.

There are some locations where runoff will shift from one drainage area to another from existing to proposed conditions due to the widening of sidewalk (LOI 5A to POI 5, LOI 6A to POI 6, and LOI 7A to POI 7). With the proposed removal of existing impervious area and the installation of permeable pavement, the Runoff Curve Number and peak discharges may decrease in proposed conditions, therefore not requiring quantity stormwater management measures for these POIs. Further analysis will be required at a later design stage to confirm.

POI 1 (STA 101+40 RT) Contee Road

A proposed 5 ft. wide sidewalk, widening of the roadway to accommodate a bike lane, and a proposed pedestrian ramp will introduce approximately 0.02 acres of new imperious area within the drainage area to POI 1. There is limited opportunity to provide the required stormwater management for this POI without impacted the wooded area adjacent to the roadway. Soil information from the USDA Web Soil Survey indicates the drainage area within the project site consists entirely of Type D hydraulic soil, making permeable pavement an unsuitable stormwater management option at this location. **Alternative stormwater management opportunities will be discussed with the City of Laurel after the initial concept submission, such as providing a stormwater management practice currently outside of the project limits.**

Drawing PS-07 (STA 129+80 LT) Olive Branch Way/Killbarron Drive

A low spot in topography was observed at the southwest quadrant of the Van Dusen Road and Olive Branch Way/Killbarron Drive intersection. During heavy rainfall events, runoff may pond at this location and spill into the roadway, with the potential to create an unsafe condition for motorists. **Recommend**

installing a yard inlet at his low spot and connecting to the existing curb opening inlet at STA 129+80 LT with a 15 in. diameter concrete pipe. Utility test pits may be necessary at a later design phase of the project to identify and avoid utility impacts. Drainage computations may be required to demonstrate the existing storm drain system has the capacity to convey the additional runoff.

POI 4 (STA 138+50 RT) 750 ft. North of Olive Branch Way/Killbarron Drive

POI 4 proposes to introduce approximately 0.01 areas of new impervious area and remove approximately 0.08 acres of existing impervious area (existing asphalt median is proposed to be replaced with a grass median). Due to the net decrease in imperious area, **no stormwater management practices are required at this POI.**

POI 5A (STA 153+65 RT) 400 ft. North of Cherry Lane

POI 5A proposes to introduce approximately 0.03 areas of new impervious area. An approximate 260 ft. long section of **permeable pavement is proposed to be used for the sidewalk** from STA 150+30 to 152+90 RT to provide the required stormwater management treatment at this POI.

Recommend **trimming existing ditch** from approximately STA 158+50 LT to STA 160+00 LT (at upstream end of culvert under Laurel Oaks Lane) and from STA 160+30 LT (downstream end of culvert) to STA 162+80 LT.

POI 6A (STA 164+45 RT) 250 ft. South of S. Arbory Lane

POI 6A proposes to introduce approximately 0.08 areas of new impervious area and remove approximately 0.02 acres of existing impervious area (existing asphalt median is proposed to be replaced with a grass median). An approximate 295 ft. and 195 ft. section of **permeable pavement is proposed to be used for the sidewalk** from STA 157+10 to STA 160+05 RT and STA 160+80 to STA 162+75 RT, respectively to provide the required stormwater management treatment at this POI.

POI 7A (STA 169+60 RT) 250 ft. North of S. Arbory Lane

POI 7A proposes to introduce approximately 0.03 areas of new impervious area and remove approximately 0.08 acres of existing impervious area (existing asphalt median is proposed to be replaced with a grass median). Due to the net decrease in imperious area, **no stormwater management practices are required at this POI.**

9.0 RECOMMENDATIONS

Based on the TCD, Stormwater Management, and Environmental assessments performed for this Study; the traffic signal operations analysis performed using Synchro/SimTraffic microsimulation software; and the proposed potential improvements described in *Section 6.0* of this report, Century recommends the maintenance and design activities as a part of a corridor-wide improvement project.

1. Correct the current traffic signal operational malfunctions along Van Dusen Road at Contee Road, Olive Branch Way/Killbarron Drive, S. Arbory Lane, and Arbory Court.
2. Routine inspection and maintenance of all traffic signals. This would include a review of signal operations and structural inspections of the signal infrastructure every three (3) years.
3. Prepare Traffic Signal, Signing and Pavement Markings, and Intersection Lighting plans to upgrade TCDs throughout the corridor to meet the MDMUTCD guidance. This would include upgrading all APS/CPS infrastructure at signalized intersections, upgrading crosswalks to High Visibility Continental Crosswalks, and upgrading intersection lighting to LED luminaires.
4. Clean out all accessible drainage structures and storm drain pipes along the corridor.
5. Prepare Final Roadway Design Plans to install the improvements shown in *Appendix G*.

The OOM Cost Estimate for implementing the improvements recommended in this Study is \$4.2M. The cost breakdown by construction Category Code is provided in *Appendix H*.

Appendix A Van Dusen Road Existing Conditions

Appendix B Traffic Counts

Appendix C Signal Timing Data

Appendix D

Synchro/SimTraffic Reports

Appendix E

Traffic Signal As-Built Plans

Appendix F DDOT Vertical Traffic Calming Guidelines

Appendix G

Van Dusen Road Concept Plans

Appendix H Van Dusen Road Concept Cost Estimate