

## **Part 2**

# **Planning Commission Agenda Packet**

**November 28, 2023**



WELLS + ASSOCIATES

# FRIANT PROPERTY

## TRAFFIC IMPACT ANALYSIS

August 3, 2023

Revised October 11, 2023

Revised November 2, 2023



**FRIANT PROPERTY  
TRAFFIC IMPACT ANALYSIS  
TOWN OF BERRYVILLE, VIRGINIA**

August 3, 2023  
Revised October 11, 2023  
Revised November 2, 2023

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## TABLE OF CONTENTS

	<u>PAGE</u>
<b>EXECUTIVE SUMMARY</b> _____	<b>1</b>
<b>SECTION 1: INTRODUCTION</b> _____	<b>3</b>
Study Purpose .....	3
Study Objectives.....	3
Study Scope.....	4
<b>SECTION 2: EXISTING (2022) CONDITIONS</b> _____	<b>6</b>
Existing Roadway Network.....	6
Existing Bicycle and Pedestrian Accommodations.....	6
Crash Data Evaluations.....	6
Existing Traffic Counts .....	8
Existing (2022) Levels of Service.....	8
Existing (2022) Queues.....	12
<b>SECTION 3: BACKGROUND FUTURE (2026) CONDITIONS</b> _____	<b>14</b>
Planned Roadway Network Improvements.....	14
Pipeline Developments .....	14
Regional Growth .....	14
Background Future (2026) Traffic Forecasts.....	14
Background Future (2026) Levels of Service .....	14
Background Future (2026) Queues .....	18
<b>SECTION 4: TOTAL FUTURE (2026) CONDITIONS</b> _____	<b>20</b>
Project Description.....	20
Site Access Concept.....	20
Proposed Bicycle and Pedestrian Accommodations.....	20
Site Trip Generation .....	20
Site Trip Assignments .....	20
Total Future (2026) Traffic Forecasts .....	25
Total Future (2026) Levels of Service .....	25
Total Future (2026) Queues .....	25
<b>SECTION 5: ACCESS MANAGEMENT AND SITE ACCESS DESIGN</b> _____	<b>29</b>
Intersection Spacing Requirements.....	29
Turn Lane Warrants.....	29
Secondary Streets Acceptance Requirements.....	29
<b>SECTION 6: CONCLUSIONS AND RECOMMENDATIONS</b> _____	<b>32</b>
Conclusions .....	32
Recommendations .....	32

**SECTION 7: TOTAL FUTURE (2026) CONDITIONS WITHOUT BATTLETOWN ACCESS 33**

Site Trip Assignments ..... 33  
Total Future (2026) Traffic Forecasts without Battletown Drive Access..... 33  
Total Future (2026) Levels of Service without Battletown Drive Access ..... 33  
Total Future (2026) Queues without Battletown Drive Access ..... 33  
Turn Lane Warrants..... 38

**LIST OF FIGURES**

<u>FIGURE</u>	<u>TITLE</u>	<u>PAGE</u>
1-1	Site Location and Study Intersections.....	5
2-1	Existing (2022) Intersection Lane Use and Traffic Controls.....	7
2-2	Existing (2022) Traffic Counts .....	10
3-1	Regional Growth (2022 to 2026) .....	15
3-2	Background Future (2026) Traffic Forecasts.....	16
4-1	Concept Plan Reduction .....	21
4-2	Total Future (2026) Intersection Lane Use and Traffic Controls .....	22
4-3	Site Trip Assignments .....	24
4-4	Total Future (2026) Traffic Forecasts.....	26
5-1	Intersection Spacing Requirements.....	31
7-1	Site Trip Assignments without Battletown Drive Access.....	34
7-2	Total Future (2026) Traffic Forecasts without Battletown Drive Access .....	35



## LIST OF TABLES

<u>TABLE</u>	<u>TITLE</u>	<u>PAGE</u>
2-1	Crash Data Analysis .....	9
2-2	Existing (2022) Intersection Levels of Service Summary .....	11
2-3	Existing (2022) Intersection Queuing Summary.....	13
3-1	Background Future (2026) Intersection Levels of Service Summary.....	17
3-3	Background Future (2026) Intersection Queuing Summary .....	19
4-1	Site Trip Generation Analysis.....	23
4-2	Total Future (2026) Intersection Levels of Service Summary.....	27
4-3	Total Future (2026) Intersection Queuing Summary .....	28
5-1	Intersection Spacing Summary .....	30
7-1	Total Future (2026) Intersection Levels of Service Without Battletown Drive Access.....	36
7-2	Total Future (2026) Intersection Queueing Summary Without Battletown Drive Access.....	37

## LIST OF APPENDICES

<b>APPENDIX</b>	<b>TITLE</b>
A	TIA Scoping Agreement
B	Crash Data Analysis
C	Existing Traffic Counts
D	Existing (2022) Conditions Analysis (Synchro Reports)
E	Background Future (2026) Conditions Analysis (Synchro Reports)
F	Full-size Concept Plan
G	Total Future (2026) Conditions Analysis (Synchro Reports)
H	VDOT Turn Lane Warrants Analysis
I	Total Future (2026) Conditions Analysis Without Battletown Drive Access (Synchro Reports)
J	Turn Lane Warrants Without Battletown Drive Access

## EXECUTIVE SUMMARY

### Project Description

The Friant Property site is approximately ±97.84 acres, located in the growth area of the Town of Berryville, south of Route 7 Bypass, north of East Main Street, and east of the Norfolk-Southern railroad line. The site is further identified as Tax Map 14-A-80. D.R. Horton, (the "Applicant") proposes to rezone and annex the site in order to develop up to 198 single-family detached dwelling units (DU). Full-movement access to the new community is anticipated to connect to a master-planned collector road extension from Battletown Drive which would ultimately extend through Sub-area 17 to E. Main Street south of Route 7 Bypass. A secondary entrance would be provided on the eastern section of Battletown Drive.

### Conclusions and Recommendations

The conclusions of this study are:

1. The existing (2022) signalized study intersection operates at an acceptable overall LOS "D" during both AM and PM peak hours. Existing unsignalized study intersections operate at LOS "B", or better. Existing turning movement queues are accommodated by the available storage.
2. Under background future (2026) conditions (including regional growth), the future signalized study intersection would continue to operate at an acceptable overall LOS "D" during both AM and PM peak hours. Future unsignalized study intersections would operate at LOS "B", or better, consistent with existing conditions. Background future turning movement queues would be accommodated by the available storage.
3. The proposed Friant Property development would generate 139 AM peak hour trips, 189 PM peak hour trips, and 1,892 average daily trips at full build-out.
4. Under total future (2026) conditions (including an extension of Battletown Drive and new connection to E. Main Street), the future signalized study intersection would continue to operate at an acceptable overall LOS "D" during both AM and PM peak hours. Future unsignalized study intersections would operate at LOS "B", or better, consistent with background conditions. Total future turning movement queues would be accommodated by the available storage.
5. The proposed development entrances meet minimum intersection spacing requirements. Left and right turn lanes are not warranted along E Main Street at the intersection with Battletown Drive; however, a right turn lane and taper at the intersection of E Main Street and the New Access Road.

The recommendations of this study are:

1. Construct the proposed site entrances in the location shown on the General Development Plan.
2. Provide a connection to E. Main Street at the proposed extension of Battletown Drive.

## **SECTION 1 INTRODUCTION**

### **Study Purpose**

This study was completed in support of the Applicant's rezoning application to satisfy the Town of Berryville's requirement of a traffic impact analysis (TIA).

As discussed in more detail within this study, the proposed Friant Property development would generate 2,032 average daily trips at full build-out. Therefore, this study would not warrant review under Virginia Department of Transportation (VDOT) Chapter 870 TIA requirements. The study was scoped with the Town, Clarke County, and VDOT staff over two meetings held virtually on February 14<sup>th</sup> and 22<sup>nd</sup>, 2022. The study was conducted in accordance with the VDOT TIA Guidelines, the latest Adopted Berryville Plan, and the signed TIA scoping agreement shown in Appendix A.

### **Study Objectives**

Tasks undertaken in this study included the following:

1. Review of proposed development plans, previous studies completed for other nearby developments, nearby approved roadway projects, and other background data.
2. Review of existing roadway and intersection geometrics, traffic controls, and speed limits.
3. Agreement with Town, County, and VDOT staff regarding the TIA scope (see Appendix A).
4. Collection of traffic data at existing study intersections.
5. Calculation of existing levels of service at the study intersections based on existing peak hour traffic counts, existing traffic controls, and intersection geometrics.
6. Forecast of background traffic volumes with planned roadway improvements, pipeline developments, and regional growth for 2026 background future traffic conditions.
7. Calculation of 2026 background future levels of service at the study intersections based on 2026 background future traffic forecasts, background traffic controls, and background intersection geometrics.
8. Estimation of the number of AM peak hour, PM peak hour, and daily trips that would be generated by the proposed development based on standard Institute of Transportation Engineers (ITE) trip generation rates and/or equations.
9. Preparation of 2026 total future traffic forecasts based on 2026 background traffic forecasts plus site generated traffic assignments.

10. Calculation of 2026 total future levels of service at the study intersections and site entrances based on 2026 total future traffic forecasts, proposed traffic controls and intersection geometrics.

11. Evaluation of access management and entrance design criteria for the site entrances.

Sources of data for this analysis included traffic counts conducted by Wells + Associates; the Institute of Transportation Engineers (ITE); plans prepared by Dewberry, publicly available data from VDOT; D.R. Horton; and the files of Wells + Associates.

### **Study Scope**

The study area is shown on Figure 1-1 which identifies the site location and study intersections.

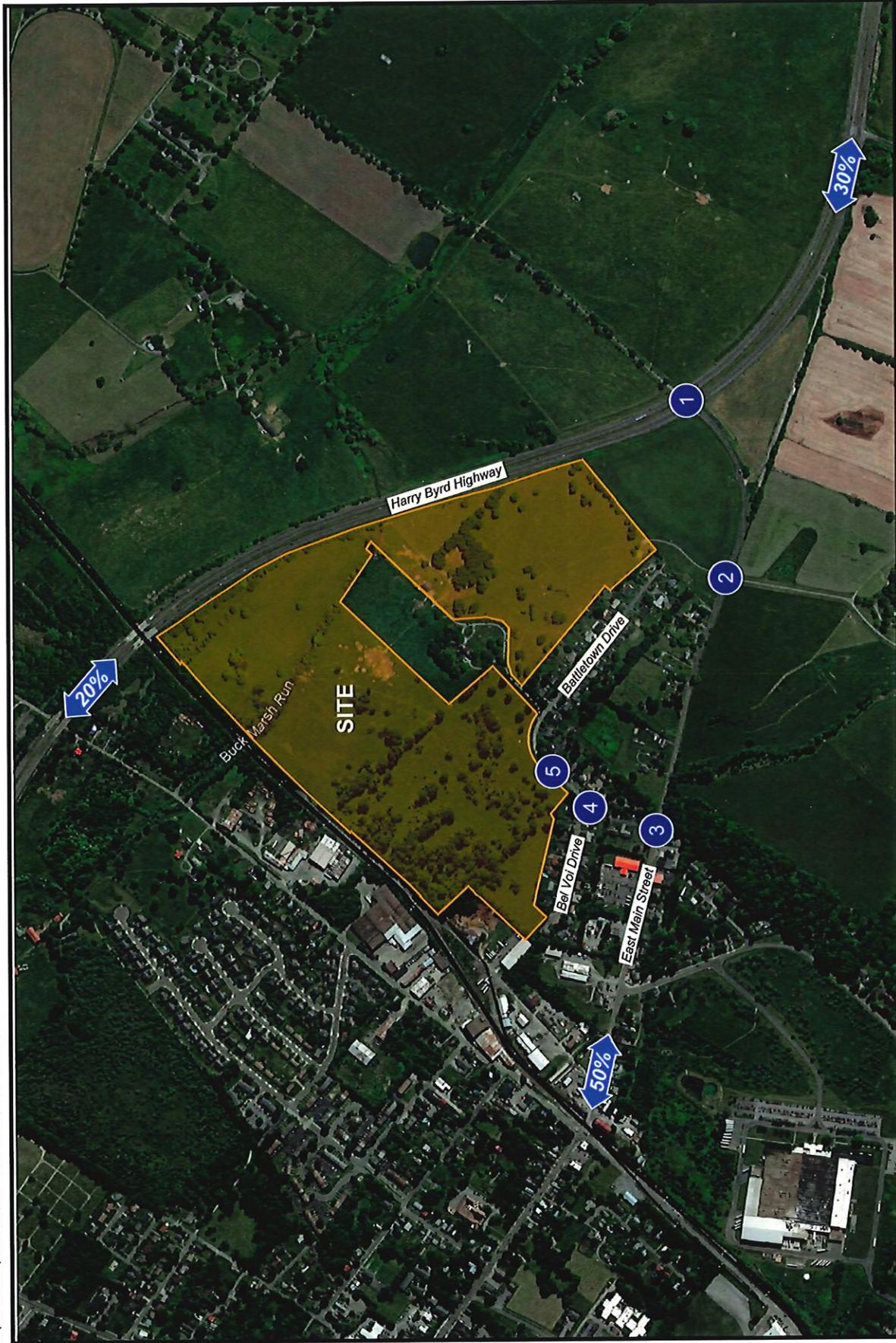
The study includes the following existing intersections:

- Route 7 Bypass/E. Main Street
- E. Main Street/Battletown Drive
- Battletown Drive/Bel Voi Drive

The study includes the following future planned intersections:

- E. Main Street/New Access Road
- Battletown Drive/New Access Road

No approved, but unbuilt, pipeline development projects were identified within the study area.



# Study Intersection

← NORTH  
Friant Property  
Clarke County, Virginia

**Figure 1-1**  
Site Location &  
Site Trip Distributions

## SECTION 2 EXISTING (2022) CONDITIONS

### Existing Roadway Network

Regional access to the project area is provided by Harry Byrd Highway (Route 7) to the west and east and Lord Fairfax Highway (Route 340) to the north and south. Local access will be provided at site entrances along a new access road that forms intersections with E. Main Street and Battletown Drive. Existing intersection lane use and traffic controls at the study intersections are shown on Figure 2-1.

Study area roadway features are noted as follows:

**Harry Byrd Highway (US Route 7)** is a four-lane, median divided roadway with a posted speed limit of 55 miles per hour (mph) in the vicinity of the study area. Harry Byrd Highway is classified by VDOT as a Principal Arterial. According to 2021 VDOT traffic data, Harry Byrd Highway carried 23,000 vehicles per day (vpd) in Annual Average Daily Traffic (AADT) between 340 North of Berryville and SR East of Berryville.

**E. Main Street (Route 7 Bypass)** is a two-lane, undivided roadway with a posted speed limit of 25 mph between Lord Fairfax Highway and Harry Byrd Highway. E. Main Street is classified by VDOT as a Major Collector. According to 2021 VDOT traffic data, E. Main Street carried 5,200 vpd in AADT between US 340 Berryville and ECL Berryville.

**Battletown Drive (Route 671)** is a two-lane, undivided roadway with an assumed speed limit of 25 miles mph. Battletown Drive is classified by VDOT and the Town of Berryville as a local street. According to 2021 VDOT traffic data, Battletown Drive carried up to 460 vpd in AADT between E Main Street and Bel Voi Drive and 230 from Bel Voi to the dead end. It should be noted that the VDOT daily counts for Battletown Drive were conducted in 2012. However, there has been no development along Battletown Drive since that time that would increase the AADT.

### Existing Bicycle and Pedestrian Accommodations

Existing bicycle and pedestrian facilities along the area of the project frontages include the following:

- Currently, no sidewalks or shared use paths exist along Battletown Drive.

### Crash Data Evaluation

A review of recent crash data (within the past 5-years) was completed and evaluated at each of the existing study intersections. The crash data was provided by VDOT and includes the period of January 2017 to September 2021.



**Figure 2-1**  
**Existing Intersection Lane Uses and Traffic Controls**

Represents One Travel Lane  
 Signalized Intersection  
 Stop Sign

Study Intersection

AM PEAK HOUR  
 PM PEAK HOUR  
 000 / 000

NORTH  
 Friant Property  
 Town of Berryville/Clarke County, Virginia

The number of reported crashes were tabulated and delineated by collision type and crash severity. A crash rate per year was calculated for each intersection and reported. The reported crash rate was then compared to a predicted crash rate based on American Association of State Highway Transportation Officials (AASHTO's) Highway Safety Manual (HSM) as reported by the VDOT Extended HSM Spreadsheets. Detailed crash data and the VDOT Extended HSM Spreadsheets are provided in Appendix B.

The results of the crash data evaluation are summarized in Table 2-1 and indicate the following:

- Harry Byrd Highway & E. Main Street (Study Int. #1) experienced a crash rate per year above the expected value over the three-year period.
- Battletown Drive & E. Main Street (Study Int. #3) experienced a crash rate per year above the expected value over the three-year period.

### **Existing Traffic Counts**

Existing weekday AM and PM peak period traffic counts and vehicle classification counts were collected by Wells + Associates on Wednesday, March 2, 2022, from 6:00 to 9:00 AM and 4:00 to 7:00 PM at the following intersections:

- Route 7 Bypass/E. Main Street
- E. Main Street/Battletown Drive
- Battletown Drive/Bel Voi Drive

Individual peak hours for each study intersection used in existing conditions analyses. The resulting existing (2022) traffic volumes are shown in Figure 2-2. The raw traffic counts are included in Appendix C.

### **Existing (2022) Levels of Service**

Existing (2022) peak hour levels of service were estimated at the existing study intersections based on the existing intersection lane use and traffic controls shown on Figure 2-1, the existing (2022) traffic counts shown on Figure 2-2, and the Highway Capacity Manual methodologies using available Synchro analysis files as provided by VDOT. The results are presented in Appendix D and summarized in Table 2-2.

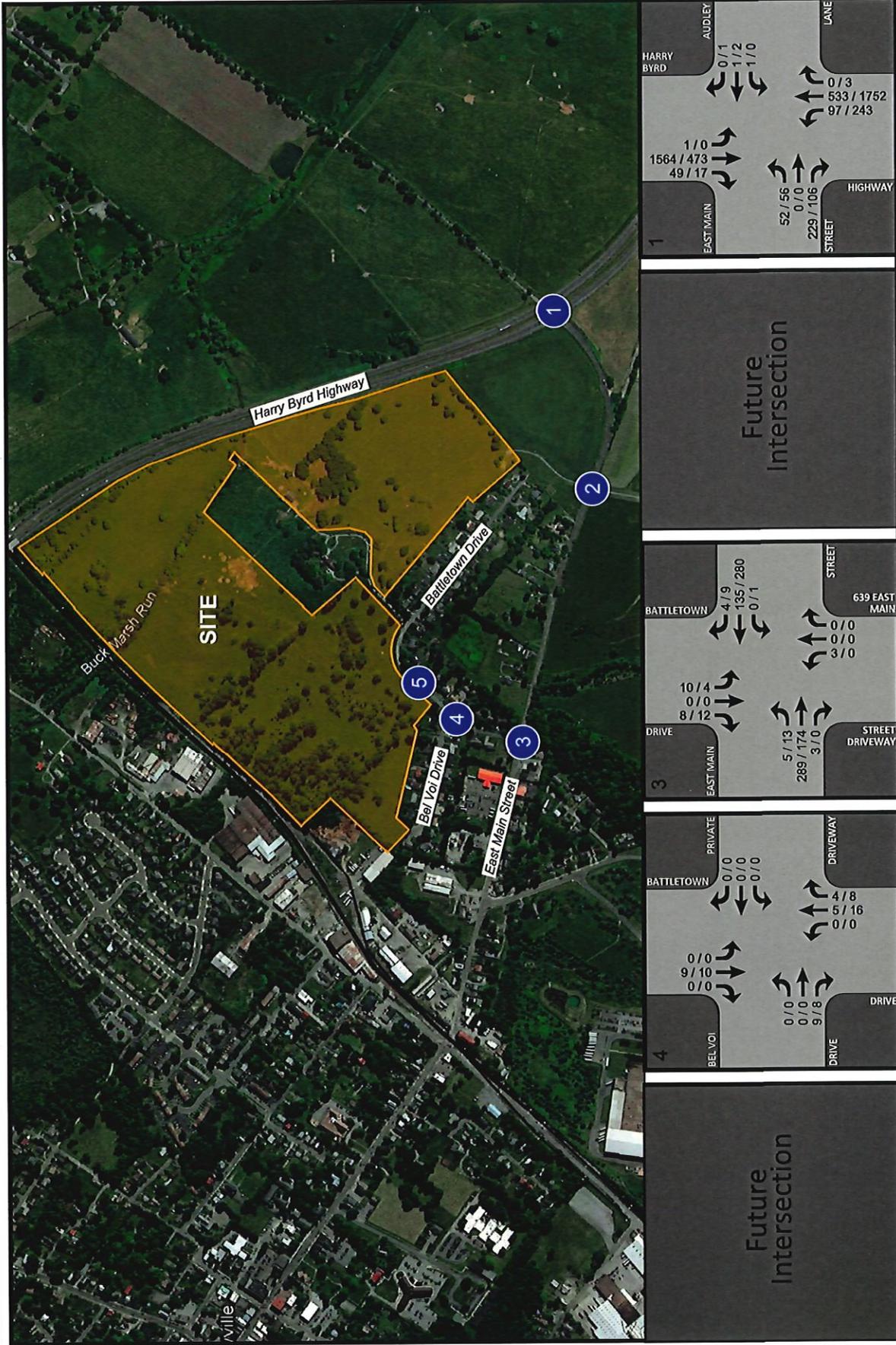
Table 2-2 indicates that the existing signalized study intersection, intersection #1, operates at overall LOS "D", or better. Of the unsignalized intersection approaches, all critical turning movements operate at LOS "B" or better during both the AM and PM peak hours.

Table 2-1  
Friant Property  
Crash Data Analysis (1/12)

Intersection	Approaches	Control	Period (years)	Criteria	Collision Type							Crash Severity								
					Multiple-Vehicle			Single-Vehicle				Total	Property Damage Only (PDO)	Fatal Crashes	Injury Crashes	Total				
					Rear End	Angle	Head On	Sideswipe	Animal	Fixed Object	Non-collision						Pedestrian	Bicycle		
Intersection 1 Harry Byrd Highway & E. Main Street	4-Legs	Signalized	3	Crashes	7	5	-	-	1	1	1	-	-	-	14	9	-	5	14	
				Crashes/Year	2.333	1.667	-	-	0.333	0.333	-	-	-	-	-	4.667	3.0	-	1.7	4.7
				Expected Value	1.298	0.769	0.101	0.151	-	0.131	0.004	0.016	0.044	2.967	1.9	3	4.9			
Intersection 3 Battletown Drive & E. Main Street	3-Legs	Unsignalized	3	Crashes	1	-	-	-	-	-	-	-	-	1	-	-	-	1		
				Crashes/Year	0.333	-	-	-	-	-	-	-	-	0.333	-	0.3	0.3			
				Expected Value	0.022	0.015	0.002	0.004	-	0.015	0.001	0.001	0.001	0.153	-	0	0.0			

Notes: 1. Traffic accident data obtained from the Virginia Department of Transportation (VDOT) for February 2019 to September 2021.  
2. Expected value data based on AASHTO's Highway Safety Manual as reported by the VDOT Extended HSM Spreadsheets.





**Figure 2-2**  
Existing (2022) Traffic Counts

Table 2-2  
 Friant Property  
 Intersection Levels of Service Summary <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup>

Intersection	Operating Condition	Street Name	Approach/ Movement	Existing (2022)	
				AM	PM
1 Harry Bryd Highway & E Main Street/Audley Lane	Signalized	E Main Street	EBL	D (45.6)	D (38.3)
			EBTR	D (43.9)	D (36.2)
		Audley Lane	WBLTR	D (52.3)	D (45.1)
			NBL	E (58.0)	D (45.9)
		Harry Bryd Highway	NBT	B (11.8)	C (24.8)
			NBR	A (0.0)	A (7.0)
		Harry Bryd Highway	SBL	D (52.6)	A (0.0)
			SBT	D (43.5)	C (25.3)
		Harry Bryd Highway	SBR	B (13.7)	C (21.2)
			Overall	D (36.9)	C (27.5)
2 New Access Road/Clermont Lane & E Main Street	STOP	Future Intersection	EBLTR		
			WBLTR		
			NBLTR		
			SBLTR		
3 Battletown Drive/Parking Lot & E Main Street	STOP	Future Intersection	EBLTR	A [0.1]	A [0.6]
			WBLTR	A [0.0]	A [0.0]
			NBLTR	B [12.5]	A [0.0]
			SBLTR	B [11.0]	B [10.7]
			Parking Lot		
4 Battletown Drive & Bel Voi Drive	STOP	Future Intersection	EBLR	A [8.4]	A [8.4]
			NBLT	A [3.3]	A [2.4]
			SBTR	A [0.0]	A [0.0]
5 Battletown Drive & New Access Road	STOP	Future Intersection	EBLR		
			NBLT		
			SBTR		

Notes (1) Roadway names in bold are considered north/south for purposes of this analysis

(2) Numbers in parentheses ( ) represent delay at signalized intersections in seconds per vehicle, as reported by Synchro, Version 10.

(3) Numbers in brackets [ ] represent delay at unsignalized intersections in seconds per vehicle, as reported by Synchro, Version 10.

(4) Asterisks \* represent delays in excess of 999.9 seconds.



### Existing (2022) Queues

A queueing analysis was completed for existing (2022) peak hour conditions for the study intersections. Synchro was used to conduct the analysis, using the 50<sup>th</sup> percentile (“average”) queue and the 95<sup>th</sup> percentile (“worst case”) queue. The 50<sup>th</sup> percentile queue is defined as the maximum back of queue on a typical cycle and the 95<sup>th</sup> percentile queue is defined as the maximum back of queue with 95<sup>th</sup> percentile traffic volumes. The queueing results are presented in Appendix D and summarized in Table 2-3.

As shown in Table 2-3, existing turning movement queues are contained within available storage lengths during the AM and the PM peak hours.

Table 2-3  
 Friant Property  
 Intersection Queuing Summary <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup>

Intersection	Operating Condition	Street Name	Approach/ Movement	Available Storage (ft)	Existing (2022)	
					AM	PM
1 Harry Bryd Highway & E Main Street/Audley Lane	Signalized	E Main Street	EBL	-	79	81
			EBTR	190	0	0
		Audley Lane	WBLTR	-	10	11
			NBL	420	121	246
			NBT	-	166	817
		Harry Bryd Highway	NBR	35	0	0
			SBL	150	6	0
			SBT	-	894	217
			SBR	325	0	0
2 New Access Road/Clermont Lane & E Main Street	STOP	E Main Street	EBLTR	-	Future Intersection	
			WBLTR	-		
			NBLTR	-		
			SBLTR	-		
3 Battletown Drive/Parking Lot & E Main Street	STOP	E Main Street	EBLTR	-	0	1
			WBLTR	-	0	0
		Battletown Drive	NBLTR	-	0	0
			SBLTR	-	2	2
		Parking Lot				
4 Battletown Drive & Bel Voi Drive	STOP	Bel Voi Drive	EBLR	-	1	1
			NBLT	-	0	0
			SBTR	-	0	0
5 Battletown Drive & New Access Road	STOP	New Access Road	EBLR	-	Future Intersection	
			NBLT	-		
			SBTR	-		

Notes: (1) Queue length is based on the 95th percentile queue in feet as reported by Synchro, Version 10.

(2) Roadway names in bold are considered north/south for purposes of this analysis.

(3) For available storage, "-" at the left and right-turn lanes indicate the turn-lane would extend back to the immediate upstream intersection.

(4) For available storage, "-" at the through movements indicate storage available up to the immediate upstream intersection.



## **SECTION 3**

### **BACKGROUND FUTURE (2026) CONDITIONS**

#### **Planned Roadway Network Improvements**

There are no planned improvements to the roadway network in the study area considered to be constructed and open for public use in background future conditions by 2026.

#### **Pipeline Developments**

No approved, but unbuilt, pipeline development projects were identified within the study area.

#### **Regional Growth**

Additional regional growth in the study area was estimated based on an analysis of VDOT AADT data between 2009 and 2018. Based on this analysis, a 1% growth rate, compounded annually, was utilized along E. Main Street and a 3% growth rate, compounded annually, was utilized along Route 7, between existing (2022) and future (2026) conditions. These regional growth rates were applied to through movements along the respective roadways. The resulting regional growth is shown on Figure 3-2.

#### **Background Future (2026) Traffic Forecasts**

Background future (2026) traffic forecasts were developed by combining the existing (2022) baseline traffic volumes shown on Figure 2-3 and regional growth shown on Figure 3-1. The resulting background future (2026) traffic forecasts are shown on Figure 3-2.

#### **Background Future (2026) Levels of Service**

Background future (2026) peak hour levels of service were estimated at the future study intersections based on the existing intersection lane use and traffic controls shown on Figure 2-1, the background future (2026) traffic forecasts shown on Figure 3-2, and the Highway Capacity Manual methodologies using Synchro analysis files. The results are presented in Appendix E and summarized in Table 3-1.

Table 3-1 indicates that under background future (2026) conditions, the signalized study intersection, intersection #1, operates at overall LOS "D", or better. Of the unsignalized intersection approaches, all critical turning movements operate at LOS "B" or better during both the AM and PM peak hours, consistent with existing conditions.



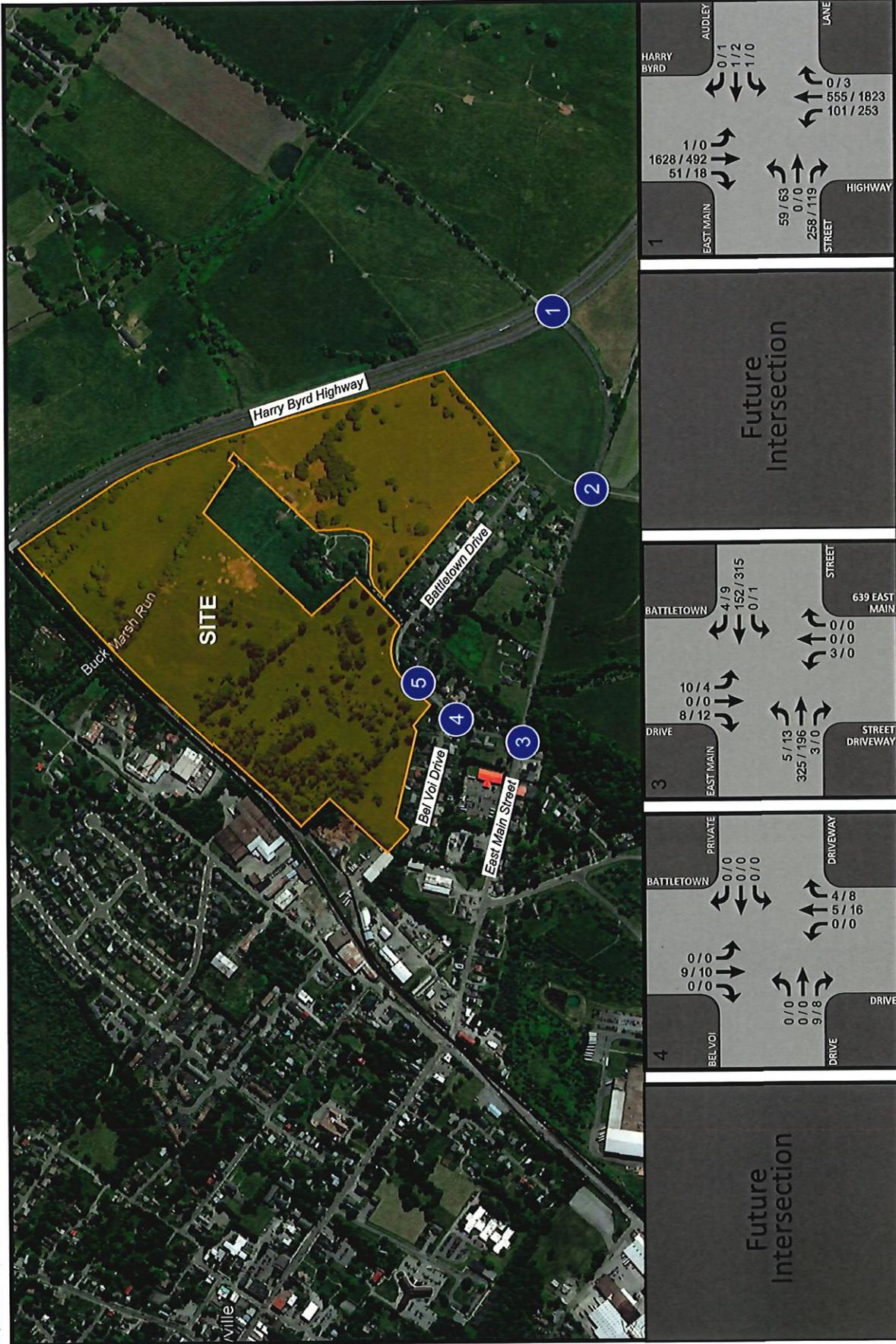
**Figure 3-1**  
Regional Growth (2022 to 2026)

← AM PEAK HOUR  
 ↗ PM PEAK HOUR  
 000 / 000

**#** Study Intersection

**←** NORTH

Friant Property  
 Town of Berryville/Clarke County, Virginia



← NORTH  
 AM PEAK HOUR  
 PM PEAK HOUR  
 000 / 000

# Study Intersection

**Figure 3-2**  
 Background Future (2026) Traffic Forecasts

Friant Property  
 Town of Berryville/Clarke County, Virginia

Table 3-1  
 Friant Property  
 Intersection Levels of Service Summary <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup>

Intersection	Operating Condition	Street Name	Approach/ Movement	Existing (2022)		Background Future (2026)	
				AM	PM	AM	PM
1 Harry Bryd Highway & E Main Street/Audley Lane	Signalized	E Main Street	EBL	D (45.6)	D (38.3)	D (48.2)	D (38.7)
			EBTR	D (43.9)	D (36.2)	D (45.9)	D (36.3)
		Audley Lane	WBLTR	D (52.3)	D (45.1)	D (54.4)	D (45.3)
			NBL	E (58.0)	D (45.9)	D (50.3)	D (45.4)
		Harry Bryd Highway	NBT	B (11.8)	C (24.8)	B (11.6)	C (31.2)
			NBR	A (0.0)	A (7.0)	A (0.0)	A (7.0)
		Harry Bryd Highway	SBL	D (52.6)	A (0.0)	D (54.1)	A (0.0)
			SBT	D (43.5)	C (25.3)	E (57.4)	C (26.2)
		Overall	SBR	B (13.7)	C (21.2)	B (14.4)	C (21.7)
				D (36.9)	C (27.5)	D (45.4)	C (31.9)
2 New Access Road/Clermont Lane & E Main Street	STOP	E Main Street	EBLTR	Future Intersection			
			WBLTR	Future Intersection			
			NBLTR	Future Intersection			
			SBLTR	Future Intersection			
3 Battletown Drive/Parking Lot & E Main Street	STOP	E Main Street	EBLTR	A [0.1]	A [0.6]	A [0.1]	A [0.6]
			WBLTR	A [0.0]	A [0.0]	A [0.0]	A [0.0]
		Battletown Drive	NBLTR	B [12.5]	A [0.0]	B [13.1]	A [0.0]
			SBLTR	B [11.0]	B [10.7]	B [11.4]	B [11.1]
		Parking Lot					
4 Battletown Drive & Bel Voi Drive	STOP	Bel Voi Drive	EBL	A [8.4]	A [8.4]	A [8.4]	A [8.4]
			NBLT	A [3.3]	A [2.4]	A [3.2]	A [2.5]
			SBTR	A [0.0]	A [0.0]	A [0.0]	A [0.0]
5 Battletown Drive & New Access Road	STOP	New Access Road	EBL	Future Intersection			
			NBLT	Future Intersection			
			SBTR	Future Intersection			

Notes: (1) Roadway names in bold are considered north/south for purposes of this analysis

(2) Numbers in parentheses ( ) represent delay at signalized intersections in seconds per vehicle, as reported by Synchro, Version 10.

(3) Numbers in brackets [ ] represent delay at unsignalized intersections in seconds per vehicle, as reported by Synchro, Version 10.

(4) Asterisks \* represent delays in excess of 999.9 seconds.



### **Background Future (2026) Queues**

A queueing analysis was completed for background future (2026) conditions for the study intersections. Synchro was used to conduct the analysis, using the 50<sup>th</sup> percentile (“average”) queue and the 95<sup>th</sup> percentile (“worst case”) queue. The 50<sup>th</sup> percentile queue is defined as the maximum back of queue on a typical cycle and the 95<sup>th</sup> percentile queue is defined as the maximum back of queue with 95<sup>th</sup> percentile traffic volumes. The queueing results are presented in Appendix E and summarized in Table 3-3.

As shown in Table 3-2, background future (2026) conditions turning movement queues are contained within available storage lengths.

Table 3-2  
 Friant Property  
 Intersection Queuing Summary <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup>

Intersection	Operating Condition	Street Name	Approach/ Movement	Available Storage (ft)	Existing (2022)		Background Future (2026)	
					AM	PM	AM	PM
1 Harry Bryd Highway & E Main Street/Audley Lane	Signalized	E Main Street	EBL	-	79	81	86	89
			EBTR	190	0	0	0	0
		Audley Lane	WBLTR	-	10	11	10	11
			NBL	420	121	246	124	260
		Harry Bryd Highway	NBT	-	166	817	174	876
			NBR	35	0	0	0	0
Harry Bryd Highway	SBL	150	6	0	6	0		
	SBR	325	894	217	950	226		
2 New Access Road/Clermont Lane & E Main Street	STOP	E Main Street	EBLTR	-	Future Intersection			
			WBLTR	-	Future Intersection			
			NBLTR	-	Future Intersection			
			SBLTR	-	Future Intersection			
3 Battletown Drive/Parking Lot & E Main Street	STOP	E Main Street	EBLTR	-	0	1	0	1
			WBLTR	-	0	0	0	0
		Battletown Drive	NBLTR	-	0	0	1	0
			SBLTR	-	2	2	3	2
4 Battletown Drive & Bel Voi Drive	STOP	Bel Voi Drive	EBLR	-	1	1	1	1
			NBLT	-	0	0	0	0
		Battletown Drive	SBTR	-	0	0	0	0
5 Battletown Drive & New Access Road	STOP	New Access Road	EBLR	-	Future Intersection			
			NBLT	-	Future Intersection			
		Battletown Drive	SBTR	-	Future Intersection			

Notes (1) Queue length is based on the 95th percentile queue in feet as reported by Synchro, Version 10.

(2) Roadway names in bold are considered north/south for purposes of this analysis.

(3) For available storage, "-" at the left and right-turn lanes indicate the turn-lane would extend back to the immediate upstream intersection.

(4) For available storage, "-" at the through movements indicate storage available up to the immediate upstream intersection.



## **SECTION 4**

### **TOTAL FUTURE (2026) CONDITIONS**

#### **Project Description**

The Friant Property site is approximately ±97.84 acres, located in the growth area of the Town of Berryville, south of Route 7 Bypass, north of East Main Street, and east of the Norfolk-Southern railroad line. The site is further identified as Tax Map 14-A-80. D.R. Horton, (the “Applicant”) proposes to rezone and annex the site in order to develop up to 198 single-family detached dwelling units (DU). A full-size copy of the Applicant’s concept plan is provided in Appendix F.

#### **Site Access Concept**

Access to the site will be provided via two full-movement entrances: one along Battletown Drive and one along East Main Street. An additional analysis scenario without access to Battletown Drive is provided in Section 7. A new right-turn lane and taper from westbound East Main Street at the new access will be provided. A reduction of the Applicant’s concept plan shown on Figure 4-1. The resulting total future intersection lane use and traffic controls are shown on Figure 4-2. An additional connection to Battletown Drive may be provided to the new access road, but the connection is not considered in this analysis as it is not necessitated for site traffic.

#### **Proposed Bicycle and Pedestrian Accommodations**

With the proposed development, proposed bicycle and pedestrian improvements include sidewalk connections throughout the planned development and along the extension road connecting to East Main Street.

#### **Site Trip Generation**

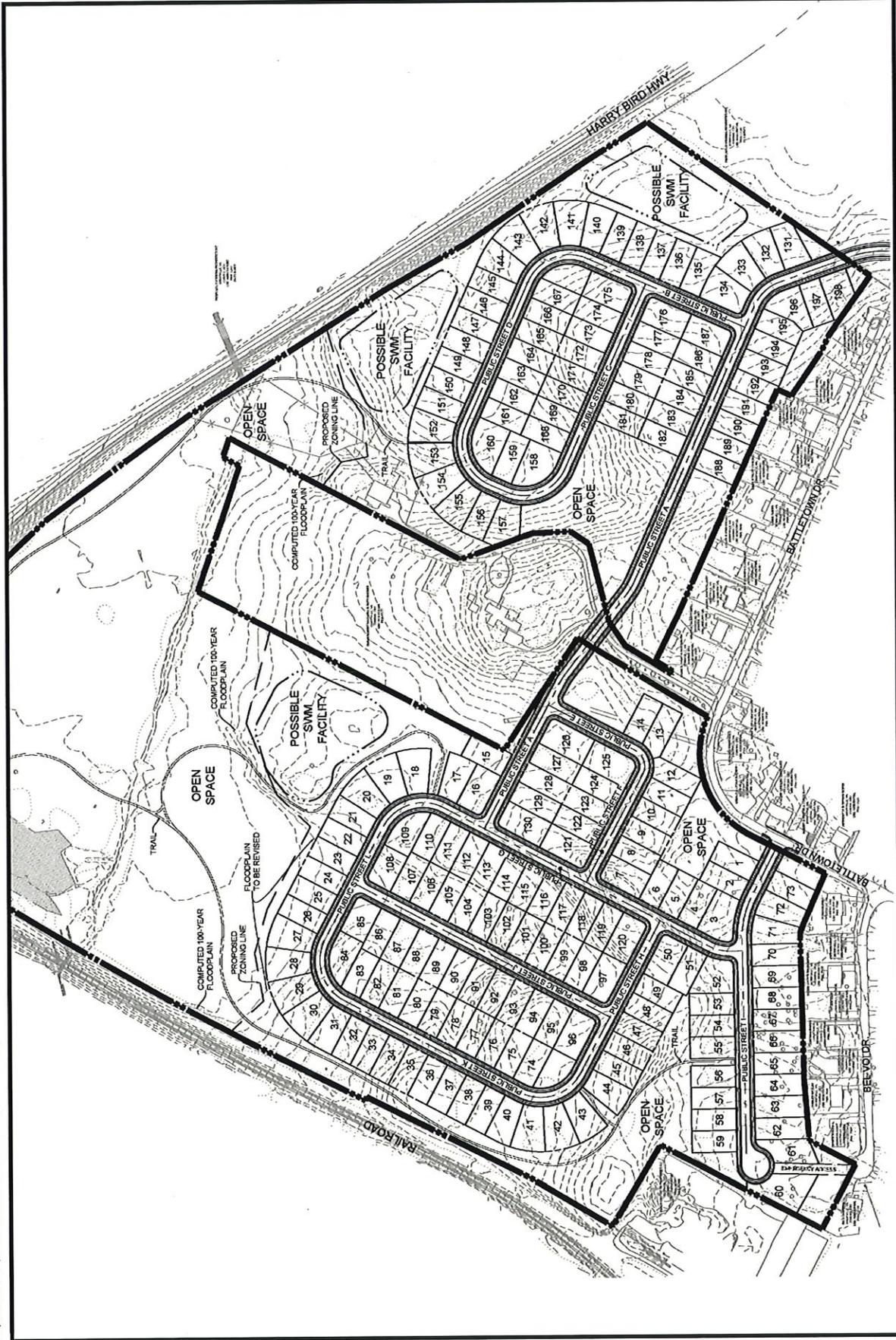
The number of weekday peak hour trips that would be generated by the proposed 198 single family homes were estimated based on the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 11th Edition. The trip generation analysis results are shown in Table 4-1. The trip generation analysis summary indicates that proposal would generate 139 new AM peak hour trips (36 inbound/103 outbound), 189 new PM peak hour trips (119 inbound/70 outbound), and 1,892 new average daily trips.

#### **Site Trip Assignments**

The site trips generated by the proposed development were assigned to the study intersection according to the directional distributions below:

- Harry Byrd Highway to/from north 20%
- Harry Byrd Highway to/from south 30%
- East Main Street to/from west 50%

The resulting site trip assignments are shown in Figure 4-3.



 NORTH  
Friant Property  
Clarke County, Virginia

**Figure 4-1**  
Concept Plan Reduction



**Figure 4-2**  
 Total Future Intersection Lane Use  
 and Traffic Controls

Represents One Travel Lane  
 Signalized Intersection  
 Stop Sign

Study Intersection  
 000 / 000  
 AM PEAK HOUR  
 PM PEAK HOUR

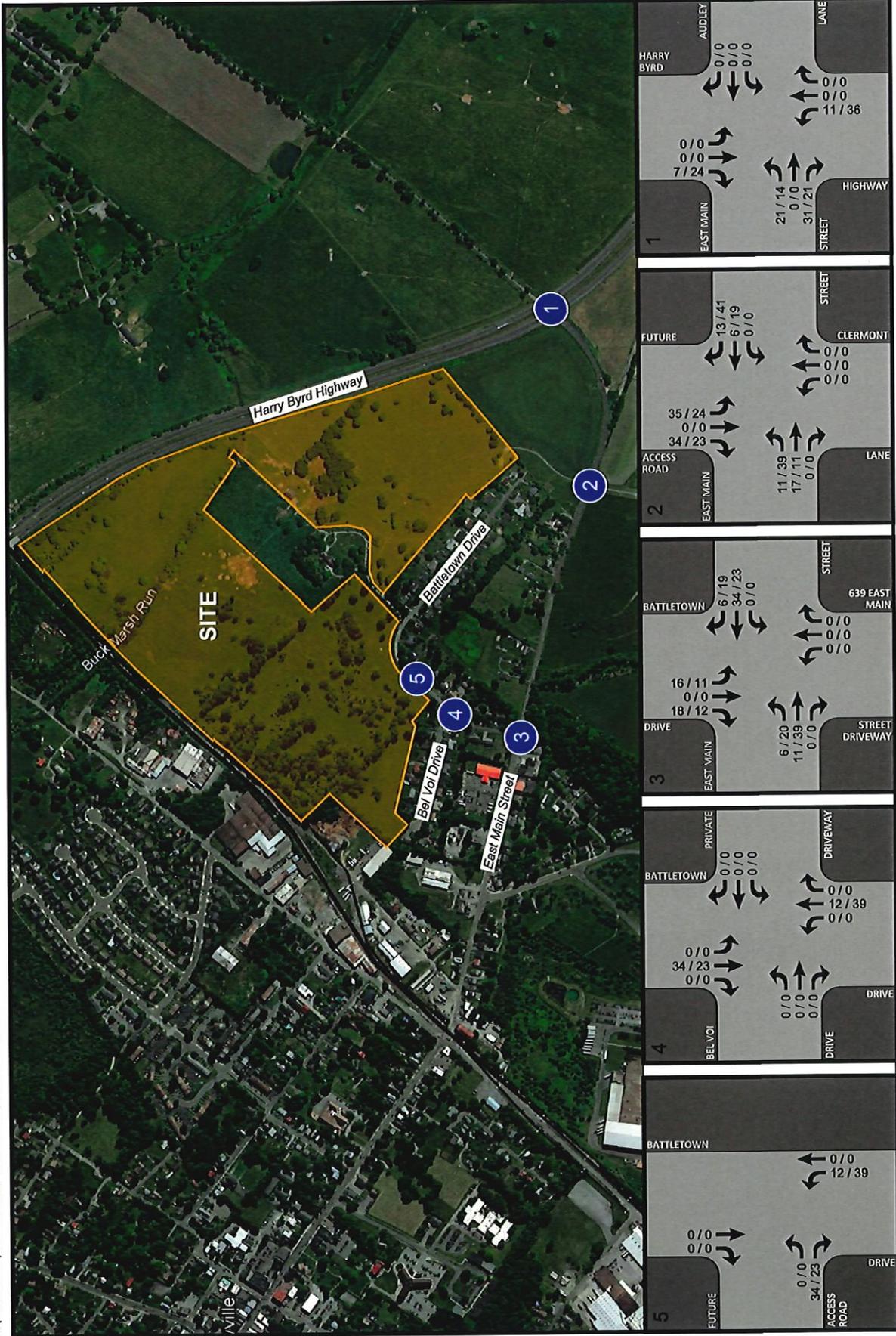
NORTH  
 Friant Property  
 Town of Berryville/Clarke County, Virginia

Table 4-1  
 Friant Property  
 Site Trip Generation Analysis<sup>(1)</sup>

Use	ITE Land Use Code	Amount	Units	AM Peak Hour		PM Peak Hour		ADT		
				In	Out	In	Out		Total	
Single Family Detached	210	198	DU	36	103	139	119	70	189	1,892

Notes:  
 (1) Trips generated using Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition.





**Figure 4-3**  
 Site Trip Assignments

**NORTH**  
 Friant Property  
 Town of Berryville/Clarke County, Virginia

### **Total Future (2026) Traffic Forecasts**

Total future (2026) traffic forecasts were developed by combining the background future (2030) traffic forecasts shown on Figure 3-3 and the site trip assignments shown on Figure 4-3. The resulting total future (2026) traffic forecasts are shown on Figure 4-4.

### **Total Future (2026) Levels of Service**

Total future (2026) peak hour levels of service were estimated at the future study intersections based on the total future intersection lane usage and traffic controls shown on Figure 4-2, the total future (2026) traffic forecasts shown on Figure 4-4, and the Highway Capacity Manual methodologies using Synchro analysis files. The 2026 results are presented in Appendix G and summarized in Table 4-2.

Table 4-2 indicates that under total future (2026) conditions, the signalized study intersection, intersection #1, operates at overall LOS "D", or better, during both the AM and PM peak hours. Of the unsignalized study intersection approaches, all critical turning movements operate at LOS "B" or better, during both the AM and PM peak hours, which is consistent with background future (2026) conditions without buildout of the site.

### **Total Future (2026) Queues**

A queueing analysis was completed for total future (2026) conditions for the study intersections. The queueing results are presented in Appendix G and summarized in Table 4-3. As shown in Table 4-3, total future (2026) conditions turning movement queues are contained within available storage lengths, which is consistent with background future (2026) conditions, without buildout of the site.



AM PEAK HOUR  
PM PEAK HOUR  
000 / 000

# Study Intersection

**Figure 4-4**  
Total Future (2026) Traffic Forecasts

Friant Property  
Town of Berryville/Clarke County, Virginia



Table 4-2  
Friant Property  
Intersection Levels of Service Summary (1) (2) (3) (4)

Intersection	Operating Condition	Street Name	Approach/ Movement	Existing (2022)		Background Future (2026)		Total Future (2026)	
				AM	PM	AM	PM	AM	PM
1 Harry Bryd Highway & E Main Street/Audley Lane	Signalized	E Main Street	EBL	D (45.6)	D (38.3)	D (48.2)	D (38.7)	D (50.9)	D (39.5)
			EBTR	D (43.9)	D (36.2)	D (45.9)	D (36.3)	D (46.2)	D (36.5)
		Audley Lane	WBLTR	D (52.3)	D (45.1)	D (54.4)	D (45.3)	D (54.9)	D (45.8)
			NBL	E (58.0)	D (45.9)	D (50.3)	D (45.4)	D (52.0)	D (42.8)
		Harry Bryd Highway	NBT	B (11.8)	C (24.8)	B (11.6)	C (31.2)	B (11.7)	C (31.7)
			NBR	A (0.0)	A (7.0)	A (0.0)	A (7.0)	A (0.0)	A (7.1)
		Harry Bryd Highway	SBL	D (52.6)	A (0.0)	D (54.1)	A (0.0)	D (54.6)	A (0.0)
			SBT	D (43.5)	C (25.3)	E (57.4)	C (26.2)	E (61.4)	C (29.1)
			SBR	B (13.7)	C (21.2)	B (14.4)	C (21.7)	B (14.9)	C (23.9)
				<b>Overall</b>	<b>D (36.9)</b>	<b>C (27.5)</b>	<b>D (45.4)</b>	<b>C (31.9)</b>	<b>D (48.0)</b>
2 New Access Road/Clermont Lane & E Main Street	STOP	E Main Street	EBLTR	Future Intersection					
			WBLTR	Future Intersection					
			NBLTR	Future Intersection					
			SBLTR	Future Intersection					
3 Battletown Drive/Parking Lot & E Main Street	STOP	E Main Street	EBLTR	A [0.1]	A [0.6]	A [0.1]	A [0.6]	A [0.3]	A [1.3]
			WBLTR	A [0.0]	A [0.0]	A [0.0]	A [0.0]	A [0.0]	A [0.0]
		Battletown Drive	NBLTR	B [12.5]	A [0.0]	B [13.1]	A [0.0]	B [14.5]	A [0.0]
			SBLTR	B [11.0]	B [10.7]	B [11.4]	B [11.1]	B [12.3]	B [13.0]
4 Battletown Drive & Bel Voi Drive	STOP	Bel Voi Drive	EBLR	A [8.4]	A [8.4]	A [8.4]	A [8.4]	A [8.6]	A [8.5]
			NBLT	A [3.3]	A [2.4]	A [3.2]	A [2.5]	A [1.3]	A [1.0]
			SBTR	A [0.0]	A [0.0]	A [0.0]	A [0.0]	A [0.0]	A [0.0]
5 Battletown Drive & New Access Road	STOP	New Access Road	EBLR	Future Intersection					
			NBLT	Future Intersection					
			SBTR	Future Intersection					

Notes: (1) Roadway names in bold are considered north/south for purposes of this analysis

(2) Numbers in parentheses ( ) represent delay at signalized intersections in seconds per vehicle, as reported by Synchro, Version 10.

(3) Numbers in brackets [ ] represent delay at unsignalized intersections in seconds per vehicle, as reported by Synchro, Version 10.

(4) Asterisks \* represent delays in excess of 999.9 seconds.



Table 4-3  
Friant Property  
Intersection Queuing Summary <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup>

Intersection	Operating Condition	Street Name	Approach/ Movement	Available Storage (ft)	Existing (2022)		Background Future (2026)		Total Future (2026)	
					AM	PM	AM	PM	AM	PM
1 Harry Bryd Highway & E Main Street/Audley Lane	Signalized	E Main Street	EBL	-	79	81	86	89	109	106
			EBTR	190	0	0	0	0	0	
		Audley Lane	WBLTR	-	10	11	10	11	10	11
			NBL	420	121	246	124	260	135	319
		Harry Bryd Highway	NBT	-	166	817	174	876	173	876
			NBR	35	0	0	0	0	0	0
Harry Bryd Highway	SBL	150	6	0	6	0	6	6	0	
	SBT	-	894	217	950	226	963	963	226	
	SBR	325	0	0	0	0	0	0	0	
2 New Access Road/Clermont Lane & E Main Street	STOP	E Main Street	EBLTR	-	Future Intersection		Future Intersection		1	3
			WBLTR	-					0	0
		Clermont Lane	NBLTR	-					0	0
			SBLTR	-					11	9
3 Battletown Drive/Parking Lot & E Main Street	STOP	E Main Street	EBLTR	-	0	1	0	1	1	2
			WBLTR	-	0	0	0	0	0	0
		Battletown Drive	NBLTR	-	0	0	1	0	1	0
			SBLTR	-	2	2	3	2	8	7
4 Battletown Drive & Bel Voi Drive	STOP	Bel Voi Drive	EBLR	-	1	1	1	1	1	1
			NBLT	-	0	0	0	0	0	0
		Battletown Drive	SBTR	-	0	0	0	0	0	0
5 Battletown Drive & New Access Road	STOP	New Access Road	EBLR	-	Future Intersection		Future Intersection		3	2
			NBLT	-					1	2
		Battletown Drive	SBTR	-					0	0

Notes: (1) Queue length is based on the 95th percentile queue in feet as reported by Synchro, Version 10.

(2) Roadway names in bold are considered north/south for purposes of this analysis.

(3) For available storage, "-" at the left and right-turn lanes indicate the turn-lane would extend back to the immediate upstream intersection.

(4) For available storage, "-" at the through movements indicate storage available up to the immediate upstream intersection.



## **SECTION 5**

### **ACCESS MANAGEMENT AND SITE ACCESS DESIGN**

#### **Intersection Spacing Requirements**

Minimum intersection spacing requirements per VDOT's Road Design Manual (RDM), Appendix F, Table 2-2, are provided based on the roadway functional classification, entrance type, and posted speed limit. The spacing requirements and an evaluation of the requirement satisfaction are summarized in Table 5-1 and shown in Figure 5-1.

The proposed intersection spacing would satisfy the required centerline to centerline spacing requirements.

#### **Turn Lane Warrants**

Based on total future (2030) traffic forecasts shown on Figure 4-5, left and right turn lane warrants, per the VDOT RDM Appendix F, were evaluated for turning movements along E. Main Street at the New Access Road (Study Int. #2) and Battletown Drive (Study Int. #3). The turn lane warrant worksheets are presented in Appendix H and the results summarized below:

##### E. Main Street & New Access Road (Study Int. #2)

- E. Main Street eastbound left-turn: NOT WARRANTED
- E. Main Street westbound right-turn: Taper Required (Full-width turn lane + taper provided)

##### E. Main Street & Battletown Drive (Study Int. #3)

- E. Main Street eastbound left-turn: NOT WARRANTED
- E. Main Street westbound right-turn: NOT WARRANTED

#### **Secondary Streets Acceptance Requirements**

The Applicant intends the proposed internal site roads to be accepted into VDOT's secondary system of state highways. As such, according to the Secondary Streets Acceptance Requirements (SSAR) found in 24VAC30-92, a proposed new addition to VDOT's secondary system must provide multiple connections to existing and/or future public streets. As shown on the Applicant's concept plan, this requirement is met with the proposed new access road on E. Main Street and on Battletown Drive.

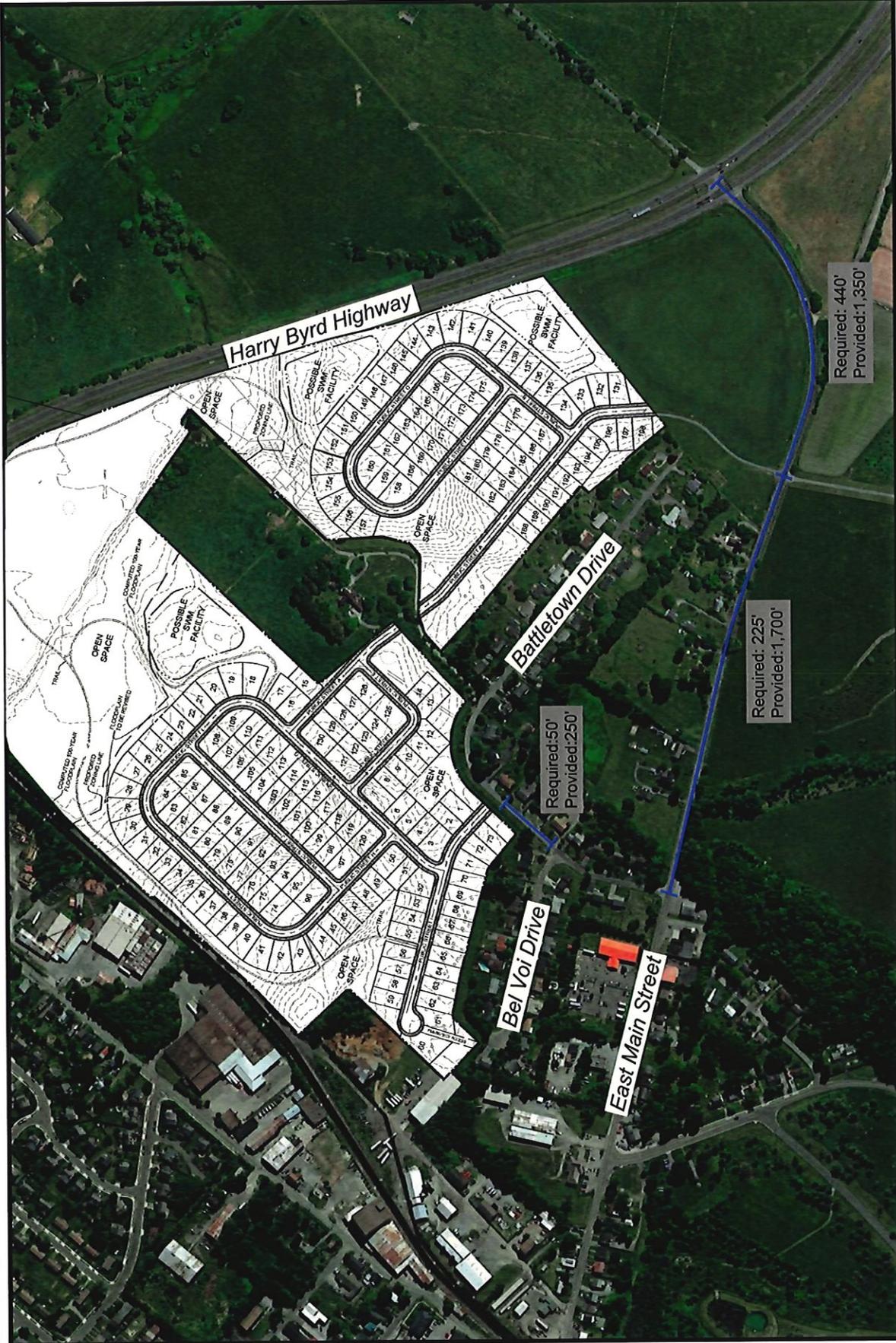
Table 5-1  
 Friant Property  
 Intersection Spacing Summary<sup>(1) (2)</sup>

Roadway	Classification	Posted Speed Limit (mph)	From	To	Intersection Type	Spacing (ft) Standard Provided	Meets Standard?
East Main Street (Route 7 Bypass)	Major Collector	25	Harry Byrd Highway New Access Road	New Access Road Battletown Drive	Type 2 (Unsignalized) Type 3 (Full Access)	440 225 1,350 1,700	YES YES
Battletown (Route 671)	Local Street	25	Bel Voi Drive	New Access Road	Type 3 (Full Access)	50 <sup>(3)</sup> 250	YES

Notes:

- (1) Access Management requirements based on VDOT Road Design Manual, Appendix F Table 2-2 "Minimum Spacing Standards for Commercial Entrance, Intersections, and Median Crossovers".
- (2) All measured distances are approximate centerline to centerline measurements.
- (3) Minimum local street spacing requirement is 50 feet between entrance radii.





NORTH  
Friant Property  
Clarke County, Virginia

Figure 5-1  
Intersection Spacing Summary



## **SECTION 6**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **Conclusions**

The conclusions of this study are:

1. The existing (2022) signalized study intersection operates at an acceptable overall LOS "D" during both AM and PM peak hours. Existing unsignalized study intersections operate at LOS "B", or better. Existing turning movement queues are accommodated by the available storage.
2. Under background future (2026) conditions (including regional growth), the future signalized study intersection would continue to operate at an acceptable overall LOS "D" during both AM and PM peak hours. Future unsignalized study intersections would operate at LOS "B", or better, consistent with existing conditions. Background future turning movement queues would be accommodated by the available storage.
3. The proposed Friant Property development would generate 139 AM peak hour trips, 189 PM peak hour trips, and 1,892 average daily trips at full build-out.
4. Under total future (2026) conditions (including an extension of Battletown Drive and new connection to E. Main Street), the future signalized study intersection would continue to operate at an acceptable overall LOS "D" during both AM and PM peak hours. Future unsignalized study intersections would operate at LOS "B", or better, consistent with background conditions. Total future turning movement queues would be accommodated by the available storage.
5. The proposed development entrances meet minimum intersection spacing requirements. Left and right turn lanes are not warranted along E Main Street intersection with Battletown Drive however a right turn lane and taper at the intersection of E Main Street and the New Access Road.

#### **Recommendations**

The recommendations of this study are:

1. Construct the proposed site entrances in the location shown on the General Development Plan.
2. Provide a connection to E. Main Street at the proposed extension of Battletown Drive.

## **SECTION 7**

### **TOTAL FUTURE (2026) CONDITIONS WITHOUT BATTLETOWN DRIVE ACCESS**

#### **Site Trip Assignments**

The site trips generated by the proposed development were assigned to the study intersection according to the directional distributions below:

- Harry Byrd Highway to/from north 20%
- Harry Byrd Highway to/from south 30%
- E. Main Street to/from west 50%

The resulting site trip assignments are shown in Figure 7-1.

#### **Total Future (2026) Traffic Forecasts without Battletown Drive Access**

Total future (2026) traffic forecasts were developed by combining the background future (2030) traffic forecasts shown on Figure 3-3 and the site trip assignments shown on Figure 7-1. The resulting total future (2026) traffic forecasts are shown on Figure 7-2.

#### **Total Future (2026) Levels of Service without Battletown Drive Access**

Total future (2026) peak hour levels of service were estimated at the future study intersections based on the total future intersection lane usage and traffic controls shown on Figure 4-2, the total future (2026) traffic forecasts shown on Figure 7-2, and the Highway Capacity Manual methodologies using Synchro analysis files. The 2026 results are presented in Appendix I and summarized in Table 7-1.

Table 7-1 indicates that under total future (2026) conditions without Battletown Drive access, the signalized study intersection, intersection #1, operates at overall LOS "D", or better, during both the AM and PM peak hours. Of the unsignalized study intersection approaches, all critical turning movements operate at LOS "B" or better, during both the AM and PM peak hours, which is consistent with background future (2026) conditions without buildout of the site.

#### **Total Future (2026) Queues without Battletown Drive Access**

A queueing analysis was completed for total future (2026) conditions without Battletown Drive access for the study intersections. The queueing results are presented in Appendix I and summarized in Table 7-2. As shown in Table 7-2, total future (2026) conditions turning movement queues are contained within available storage lengths, which is consistent with background future (2026) conditions, without buildout of the site.



**Figure 7-1**  
 Site Trip Assignments  
 Without Battletown Drive Access

AM PEAK HOUR  
 PM PEAK HOUR  
 000 / 000  
 # Study Intersection  
 NORTH  
 Friant Property  
 Town of Berryville/Clarke County, Virginia



NORTH  
 AM PEAK HOUR  
 PM PEAK HOUR  
 Study Intersection  
 000 / 000

**Figure 7-2**  
 Total Future (2026) Traffic Forecasts  
 Without Battletown Drive Access

Friant Property  
 Town of Berryville/Clarke County, Virginia

Table 7-1  
 Friant Property  
 Intersection Levels of Service Summary without Battletown Drive Access <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup>

Intersection	Operating Condition	Street Name	Approach/ Movement	Total Future (2026)	
				AM	PM
1 Harry Bryd Highway & E Main Street/Audley Lane	Signalized	E Main Street	EBL	F (108.0)	F (155.0)
			EBTR	D (45.6)	D (35.9)
		Audley Lane	WBLTR	E (55.5)	D (46.1)
			NBL	D (52.9)	D (44.3)
		Harry Bryd Highway	NBT	B (12.2)	D (36.8)
			NBR	A (0.0)	A (7.6)
		Harry Bryd Highway	SBL	E (55.2)	A (0.0)
			SBT	E (66.7)	C (30.2)
		SBR	B (15.4)	C (24.7)	
		Overall	D (52.9)	D (39.3)	
2 New Access Road/Clermont Lane & E Main Street	STOP	E Main Street	EBLTR	A [0.6]	A [2.4]
		E Main Street	WBLTR	A [0.0]	A [0.0]
		Clermont Lane	NBLTR	A [0.0]	A [0.0]
		New Access Road	SBLTR	B [12.9]	B [14.3]
3 Battletown Drive/Parking Lot & E Main Street	STOP	E Main Street	EBLTR	A [0.1]	A [0.5]
		E Main Street	WBLTR	A [0.0]	A [0.0]
		Battletown Drive	NBLTR	B [14.2]	A [0.0]
		Parking Lot	SBLTR	B [12.1]	B [11.7]
4 Battletown Drive & Bel Voi Drive	STOP	Bel Voi Drive	EBLR	A [8.4]	A [8.4]
		Battletown Drive	NBLT	A [3.2]	A [2.5]
		Battletown Drive	SBTR	A [0.0]	A [0.0]

Notes (1) Roadway names in bold are considered north/south for purposes of this analysis  
 (2) Numbers in parentheses ( ) represent delay at signalized intersections in seconds per vehicle, as reported by Synchro, Version 10.  
 (3) Numbers in brackets [ ] represent delay at unsignalized intersections in seconds per vehicle, as reported by Synchro, Version 10.  
 (4) Asterisks \* represent delays in excess of 999.9 seconds.



Table 7-2  
 Friant Property  
 Intersection Queuing Summary <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup> <sup>(4)</sup>

Intersection	Operating Condition	Street Name	Approach/ Movement	Available Storage (ft)	Total Future (2026)	
					AM	PM
1 <b>Harry Bryd Highway &amp; E Main Street/Audley Lane</b>	Signalized	E Main Street	EBL EBTR	- 190	160 0	172 0
		Audley Lane	WBLTR	-	10	11
		Harry Bryd Highway	NBL	420	135	319
			NBT	-	173	876
			NBR	35	0	0
		Harry Bryd Highway	SBL	150	6	0
SBT	-		963	226		
SBR	325		0	0		
2 <b>New Access Road/Clermont Lane &amp; E Main Street</b>	STOP	E Main Street	EBLTR	-	1	4
		E Main Street	WBLTR	-	0	0
		Clermont Lane	NBLTR	-	0	0
		New Access Road	SBLTR	-	19	15
3 <b>Battletown Drive/Parking Lot &amp; E Main Street</b>	STOP	E Main Street	EBLTR	-	0	1
		E Main Street	WBLTR	-	0	0
		Battletown Drive	NBLTR	-	1	0
		Parking Lot	SBLTR	-	3	2
4 <b>Battletown Drive &amp; Bel Voi Drive</b>	STOP	Bel Voi Drive	EBLR	-	1	1
		Battletown Drive	NBLT	-	0	0
		Battletown Drive	SBTR	-	0	0

Notes: (1) Queue length is based on the 95th percentile queue in feet as reported by Synchro, Version 10.  
 (2) Roadway names in bold are considered north/south for purposes of this analysis.  
 (3) For available storage, " - " at the left and right-turn lanes indicate the turn-lane would extend back to the immediate upstream intersection.  
 (4) For available storage, " - " at the through movements indicate storage available up to the immediate upstream intersection.



## Turn Lane Warrants

Based on total future (2030) traffic forecasts shown on Figure 7-2, left and right turn lane warrants, per the VDOT RDM Appendix F, were evaluated for turning movements along East Main Street at the New Access Road (Study Int. #2). The turn lane warrant worksheets are presented in Appendix J and the results summarized below:

### E. Main Street & New Access Road (Study Int. #2)

- E. Main Street eastbound left-turn: WARRANTED
- E. Main Street westbound right-turn: Taper Required (Full-width turn lane + taper provided)

For purposes of determining when turn lanes treatments would be warranted based on the buildout of the ultimate density, additional turn lane warrants were performed and summarized below:

### 185<sup>th</sup> Dwelling Unit:

#### E. Main Street & New Access Road (Study Int. #2)

- E. Main Street eastbound left-turn: NOT WARRANTED
- E. Main Street westbound right-turn: Taper Required (Full-width turn lane + taper provided)

### 117<sup>th</sup> Dwelling Unit:

#### E. Main Street & New Access Road (Study Int. #2)

- E. Main Street eastbound left-turn: NOT WARRANTED
- E. Main Street westbound right-turn: NOT WARRANTED

The turn lane warrant worksheets are presented in Appendix J for these threshold scenarios described above.

Beginning with the 118<sup>th</sup> dwelling unit, a westbound right-turn taper is warranted. Beginning with the 186<sup>th</sup> dwelling unit, an eastbound left-turn lane is warranted.

# APPENDIX A TIA SCOPING AGREEMENT



## NON-CH.870 TIA

### PRE-SCOPE OF WORK MEETING FORM

#### Information on the Project Traffic Impact Analysis Base Assumptions

The applicant is responsible for entering the relevant information and submitting the form to VDOT and the locality no less than three (3) business days prior to the meeting. If a form is not received by this deadline, the scope of work meeting may be postponed.

#### Contact Information

Consultant Name: Tele: E-mail:	Lester E. Adkins III, P.E., PTOE, PTP / Wells + Associates (703) 676-3646 leadkins@wellsandassociates.com
Developer/Owner Name: Tele: E-mail:	Priya Tiwari / D.R. Horton 443-223-3152 PDTiwari@drhorton.com

#### Project Information

Project Name:	Friant Property	Locality/County:	Town of Berryville / Clarke County
Project Location: <small>(Attach regional and site specific location map)</small>	The subject property is located in the growth area of the Town of Berryville south of Route 7 Bypass, north of East Main Street and east of the Norfolk-Southern railroad line as shown on ATTACHMENT 1. The approximate 97.84-acre property is further identified as Tax Map 14-A-80.		
Submission Type	Comp Plan <input type="checkbox"/>	Rezoning <input checked="" type="checkbox"/>	Site Plan <input type="checkbox"/> Subd Plat <input type="checkbox"/>
Project Description: <small>(Including details on the land use, acreage, phasing, access location, etc. Attach additional sheet if necessary)</small>	<p>The subject 97.84-acre site is currently designated for medium-low and low density residential with the potential for more units than allocated with a master plan approach to transportation connectivity of Sub-areas in the Northeastern Residential Growth Area.</p> <p>The Applicant intends to file a rezoning application to rezone and annex the site in order to develop up to 214 single family detached dwelling units. A copy of a preliminary conceptual rendering plan is shown in ATTACHMENT 2. Access to the site is proposed to be provided via a new full-movement entrance connected to a master planned collector road extended from Battletown Drive (Route 671) which would ultimately extend through Sub-area 17 to E. Main Street south of Route 7 Bypass. A secondary entrance would be provided on the eastern section of Battletown Drive.</p>		
Proposed Use(s): <small>(Check all that apply; attach additional pages as necessary)</small>	Residential <input checked="" type="checkbox"/>	Commercial <input type="checkbox"/>	Mixed Use <input type="checkbox"/> Other <input type="checkbox"/>

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

	<b>Residential Uses(s)</b> Number of Units: 214 DUs ITE LU Code(s): 210 (See ATTACHMENT 3)	_____	_____	_____
	<b>Commercial Use(s)</b> ITE LU Code(s): _____ _____	_____	<b>Other Use(s)</b> ITE LU Code(s): _____	_____
	Square Ft or Other Variable: _____		Independent Variable(s): _____	_____
<b>Total Peak Hour Trip Projection:</b>	Less than 100 <input type="checkbox"/>	100 – 499 <input checked="" type="checkbox"/>	500 – 999 <input type="checkbox"/>	1,000 or more <input type="checkbox"/>

**Traffic Impact Analysis Assumptions**

<b>Study Period</b>	Existing Year: 2022	Build-out Year: 2026	Design Year: N/A
---------------------	---------------------	----------------------	------------------

<b>Study Area Boundaries</b> (Attach map)	North: Route 7	South: East Main Street
	East: N/A	West: Norfolk-Southern railroad line

<b>External Factors That Could Affect Project</b> (Planned road improvements, other nearby developments)	The 2015 Berryville Area Plan recommends East Main Street, which is currently constructed as a two-lane section, to be reconstructed with a three lane section where feasible with utility relocation, drainage improvements and new sidewalk construction.
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<b>Consistency With Comprehensive Plan</b> (Land use, transportation plan)	The property is identified in the 2015 Berryville Area Plan as Low Density Residential (2 Residential Units/Acre).
---	--

<b>Available Traffic Data</b> (Historical, forecasts)	<p>East Main Street: 4,208 (2009); 4,282 (2012); 4,518 (2015); 5,241 (2018) 2009-2018 growth: 2.7% 2012-2018 growth: 3.7% 2015-2018 growth: 5.3% Recommended 3% growth rate for forecasting</p>
	<p>Route 7: 22,248 (2009); 21,461 (2012); 22,176 (2015); 22,875 (2018) 2009-2018 growth: 0.3% 2012-2018 growth: 1.1% 2015-2018 growth: 0.5% Recommend 1% growth rate for forecasting</p>
	<p>Wells + Associates proposes to conduct new traffic counts at all existing study intersections. While the use of new traffic count data was previously suspended due to the current Covid-19 pandemic impacts, Clarke County Public Schools has resumed full in-person attendance, for both students and staff.</p>

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

Trip Distribution (Attach sketch)	Road Name: See ATTACHMENT 4		Road Name:		
	Road Name:		Road Name:		
Annual Vehicle Trip Growth Rate:	1% along Route 7;	Peak Period for Study (check all that apply)	<input checked="" type="checkbox"/> AM	<input checked="" type="checkbox"/> PM	<input type="checkbox"/> SAT
	3% along E. Main Street	Peak Hour of the Generator	Individual intersection peak hours to be used		
Study Intersections and/or Road Segments (Attach additional sheets as necessary)	1.Route 7 Bypass / E. Main Street		6.e		
	2.E. Main Street / New Access Road		7.		
	3.E. Main Street / Battletown Drive		8.		
	4.Battletown Drive / Bel Voi Drive		9.		
	5.Battletown Drive / New Access Road		10.		
Trip Adjustment Factors	Internal allowance: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Reduction: _____% trips		Pass-by allowance: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Reduction: _____% trips		
Software Methodology	<input checked="" type="checkbox"/> Synchro <input type="checkbox"/> HCS (v.2000/+) <input type="checkbox"/> aaSIDRA <input type="checkbox"/> CORSIM <input type="checkbox"/> Other _____				
Traffic Signal Proposed or Affected (Analysis software to be used, progression speed, cycle length)	Existing Route 7 / East Main Street				
Improvement(s) Assumed or to be Considered	No identified improvements to be constructed by the 2026 build-out year.				
Background Traffic Studies Considered	No identified approved yet unbuilt developments in the surrounding area to be constructed by the 2026 build-out year.				
Plan Submission	<input type="checkbox"/> Master Development Plan (MDP)		<input checked="" type="checkbox"/> Generalized Development Plan (GDP)		
	<input type="checkbox"/> Preliminary/Sketch Plan		<input type="checkbox"/> Other Plan type (Final Site, Subd. Plan)		
Additional Issues to be Addressed	<input checked="" type="checkbox"/> Queuing analysis	<input type="checkbox"/> Actuation/Coordination	<input type="checkbox"/> Weaving analysis		
	<input type="checkbox"/> Merge analysis	<input checked="" type="checkbox"/> Bike/Ped Accommodations	<input checked="" type="checkbox"/> Intersection(s)		
	<input type="checkbox"/> TDM Measures	<input checked="" type="checkbox"/> Other VDOT Access Management			

NOTES on ASSUMPTIONS: \_\_\_\_\_

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

1. Level of Service (LOS) calculations for existing and forecasted future conditions will be based on the Highway Capacity Manual (HCM) 2000, as computed by Synchro software, Version 10. Specific Synchro parameters will be applied to the model consistent with the VDOT Traffic Operations and Safety Analysis Manual (TOSAM), Version 2.0.
2. Crash data for the most recent available three years will be provided and discussed in the report.
3. Percent heavy vehicles (%HV) applied in this analysis will be based on current count data.

**It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.**

FRIANT PROPERTY  
PRE-SCOPE OF WORK MEETING FORM

SIGNED:  DATE: 04/28/2022  
Applicant or Consultant

PRINT NAME: Lester E. Adkins III, P.E., PTOE, PTP  
Applicant or Consultant

SIGNED: Bobby Boyce DATE: 5/3/2022  
VDOT Representative

PRINT NAME: Bobby Boyce  
VDOT Representative

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_  
Town of Berryville Representative

PRINT NAME: \_\_\_\_\_  
Town of Berryville Representative

SIGNED: \_\_\_\_\_ DATE: \_\_\_\_\_  
Clarke County Representative

PRINT NAME: \_\_\_\_\_  
Clarke County Representative

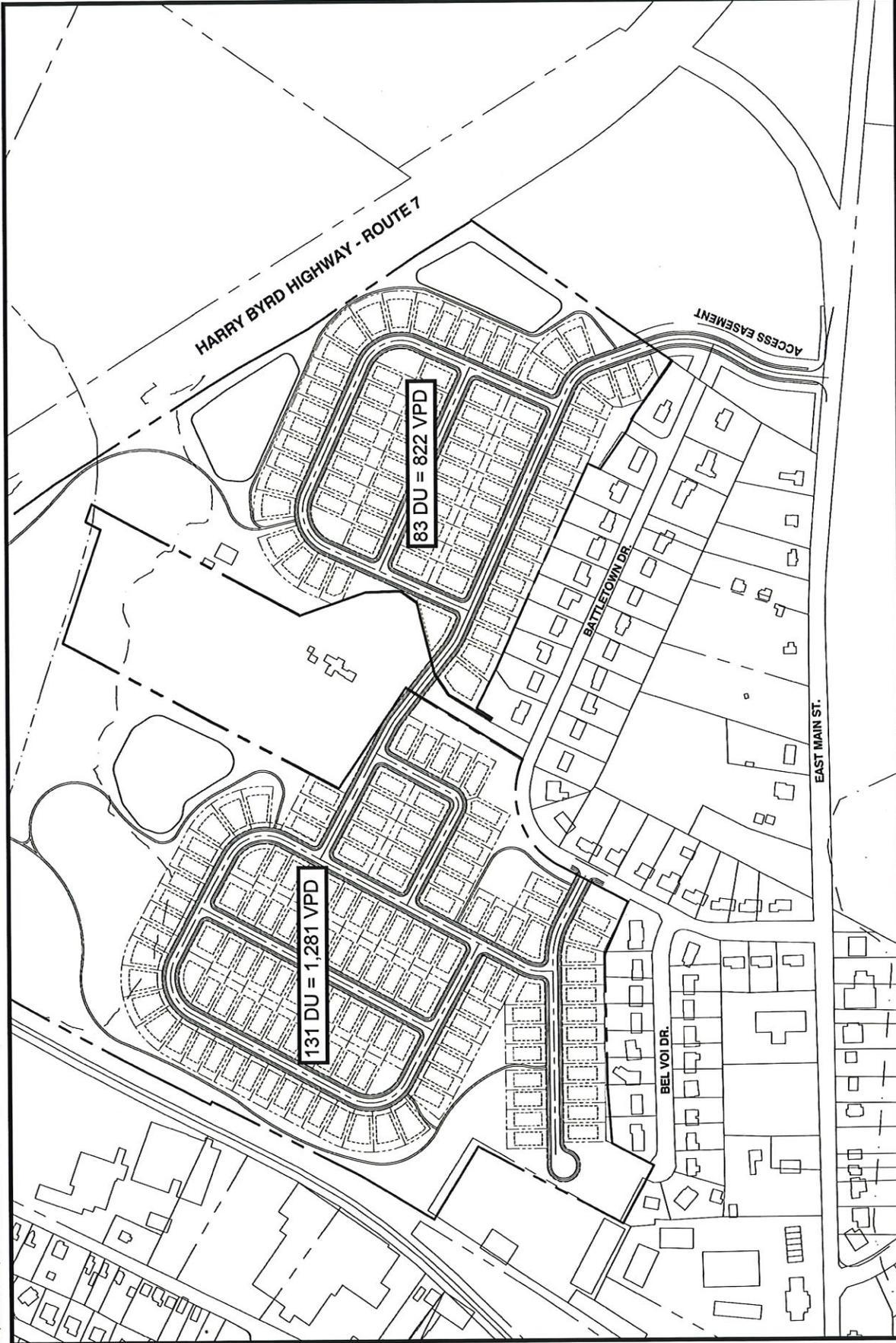


**Attachment 1**  
Site Location



NORTH  
Friant Property  
Clarke County, Virginia





NORTH  
Friant Property  
Clarke County, Virginia

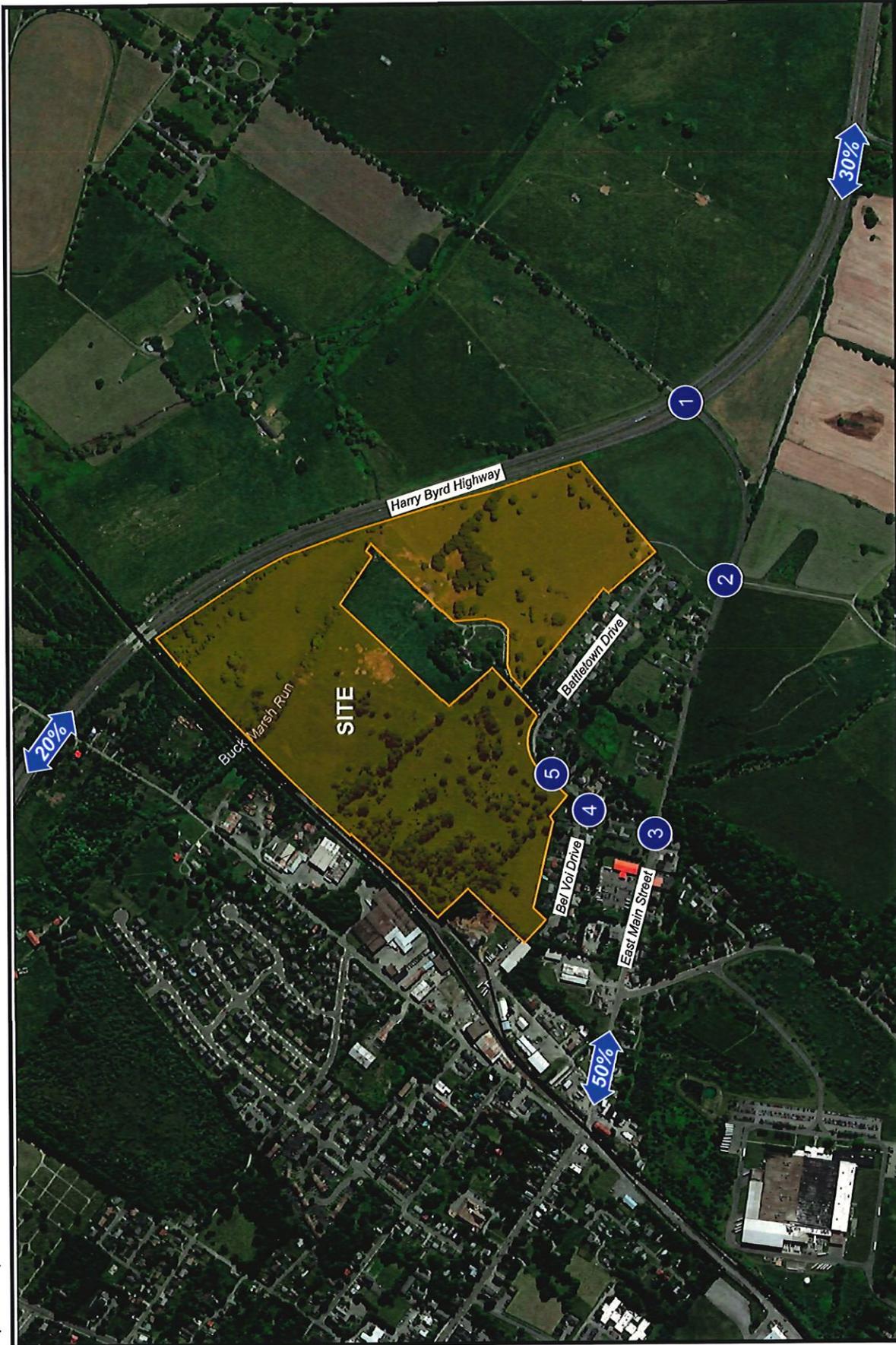


**Attachment 3**  
**Friant Property - Town of Berryville, Clarke County, Va**  
**Trip Generation Analysis**

Use	ITE Land Use Code	Amount	Units	AM Peak Hour		PM Peak Hour		ADT		
				In	Out	In	Out		Total	
Single Family <sup>(1)</sup>	210	214	DU	39	110	149	128	75	203	2,032

**Notes:**

1 Trips generated using Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition.



**Attachment 4**  
Study Intersections &  
Site Trip Distributions

# Study Intersection  
xx% Trip Distribution

← NORTH  
Friant Property  
Clarke County, Virginia



## APPENDIX B CRASH DATA ANALYSIS

Document Number	Crash Date	Crash Time	Day Of Week	Collision Type	Crash Description	First Harmful Event	Event Location	MABCO Severity Code	Route Name	Route Number	Secondary Location	Route Or Street Name	Crash Severity	Pedestrian Fatality Count	Non Pedestrian Fatality Count	Pedestrian Injury Count	Non Pedestrian Injury Count	Work Zone Related
170285148	1/24/2017	16:10	Tue	1. Rear End	VEHICLE 2 WAS STOPPED IN LEFT TRAVEL LANE DUE TO HEAVY TRAFFIC. VEHICLE 1 WAS FOLLOWING TOO CLOSELY AND STRUCK VEHICLE 2 IN THE REAR- END.	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	VA-7W	7	ROUTE 7 EAST BUSINESS	ROUTE 7	property damage crash	0	0	0	0	0.2. No
170525166	2/15/2017	6:15	Wed	1. Rear End	VEHICLE ONE STRUCK VEHICLE TWO CAUSING VEHICLE TWO TO STRIKE VEHICLE THREE IN THE REAR.	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	VA-7E	7	k	RT 7	property damage crash	0	0	0	0	0.2. No
172795229	10/6/2017	12:05	Fri	1. Rear End	VEHICLE 1 WAS FOLLOWING TOO CLOSELY AND STRUCK VEHICLE 2 IN THE REAR WHILE VEHICLE 2 WAS STOPPED FOR TRAFFIC AT A TRAFFIC LIGHT.	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	VA-7E	7	RT 7 BUSINESS	RT 7	property damage crash	0	0	0	0	0.2. No
173225199	11/16/2017	17:35	Thu	2. Angle	VEHICLE 1 DISOBEYED RED TRAFFIC LIGHT. VEHICLE 2 HAD GREEN LIGHT, WENT TO PULL OUT TO HEAD WEST RT 7. VEHICLE 1 STRUCK FRONT OF VEHICLE 2.	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	VA-7E	7	RT 7 E MAIN STREET	RT 7	property damage crash	0	0	0	0	0.2. No
180595042	2/27/2018	12:30	Tue	1. Rear End	VEHICLE 1 STRUCK VEHICLE 2 IN THE REAR.	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	VA-7W	7	RT 7 BUSINESS	RT 7	property damage crash	0	0	0	0	0.2. No
180905057	3/29/2018	6:20	Thu	4. Sideswipe - Same Direction	VEHICLE 2 MADE AN UNSAFE LANE CHANGE AND SIDE SWIPED VEHICLE 1. VEHICLE 2 THEN FLED THE SCENE.	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	VA-7E	7	ROUTE 7 BUSINESS	ROUTE 7	property damage crash	0	0	0	0	0.2. No
181065458	4/24/2018	20:15	Sat	8. Non-Collision	VEHICLE ONE TIRE BLEW OUT AND BEGAN TO FISH TALE THEN ROLLED FOUR TIMES THEN CAME TO FINAL REST ON THE DRIVER SIDE. CRASH EVENTS (FIRST EVENT 42 - TIRE BLOW OUT) REVISION DUE TO BETTER LOCATION OF CRASH (0.2MILES WEST OF RT 608)	4. Roadside	30. Overturn (Rollover)	No Injury (O)	VA-7E	7	RT 608	RT 7	property damage crash	0	0	0	0	0.2. No
181755043	6/22/2018	2:40	Fri	9. Fixed Object - Off Road	V1 SWERVED TO MISS DEER, RAN OFF ROAD LEFT, STRUCK GUARD RAIL AND WENT INTO DITCH	3. Median	5. Guard Rail	No Injury (O)	VA-7W	7	RT 7 BUSINESS (E MAIN ST)	RT 7	property damage crash	0	0	0	0	0.2. No
181915327	7/9/2018	17:30	Mon	1. Rear End	V1 AND V2 WERE STOPPED FOR TRAFFIC AT THE TRAFFIC LIGHT. V1 SAW TRAFFIC MOVING IN RIGHT LANE. PUSHED THE ACCELERATOR, AND STRUCK THE REAR OF V2.	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	VA-7W	7	RT 7 BUSINESS	RT 7	property damage crash	0	0	0	0	0.2. No
182205237	8/8/2018	12:15	Wed	2. Angle	VEHICLE 1 WAS WESTBOUND ON EAST MAIN STREET AND DRIVER ADVISED THAT HE MUST HAVE FALLEN ASLEEP. VEHICLE 1 CROSSED DOUBLE YELLOW LINES HEADED WESTBOUND IN EASTBOUND LANE WHERE IT STRUCK VEHICLE 2 IN THE DRIVER SIDE TRUCK BED. VEHICLE 2 SPUN AND CAME TO REST AGAINST A TREE.	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	BUS VA-7E (1 Town of Berryville)	7	BATTLETOWN DR.	629 East Main Street	property damage crash	0	0	0	0	0.2. No
182505361	9/4/2018	7:25	Tue	1. Rear End	VEHICLE #2 STOPPED IN TRAVEL LANE TO GIVE VEHICLE #1 RIGHT OF WAY. VEHICLE #1 STRUCK VEHICLE #2. VEHICLE X WAS VOLUNTEER FIRST RESPONDER OPERATING PERSONAL VEHICLE WITH AUXILIARY FLASHING LIGHT ACTIVATED	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	VA-7E	7	ROUTE 7B	ROUTE 7	property damage crash	0	0	0	0	0.2. No
190055015	1/4/2019	1:45	Fri	9. Fixed Object - Off Road	V1 MADE LEFT TURN ONTO RT 7, CUT THE CORNER TOO CLOSE, RAN OFF ROAD LEFT AND STRUCK GUARDRAIL. REPORT REVISED TO ADD CNV PAGE TO REPORT.	3. Median	5. Guard Rail	No Injury (O)	VA-7W	7	EAST MAIN ST	RT 7	property damage crash	0	0	0	0	0.2. No
191435134	5/14/2019	6:54	Tue	1. Rear End	V1 REAR ENDED V2 WHILE V2 WAS STOPPED IN MORNING TRAFFIC	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	VA-7E	7	EAST MAIN STREET	HARRY BYRD HIGHWAY	property damage crash	0	0	0	0	0.2. No
191735133	6/21/2019	15:15	Fri	1. Rear End	VEHICLE 2 WAS SLOWING IN LEFT TRAVEL LANE DUE TO A YELLOW TRAFFIC SIGNAL. VEHICLE 1 WAS FOLLOWING TOO CLOSELY STRIKING VEHICLE 2 IN THE REAR- END.	1. On Roadway	20. Motor Vehicle In Transport	Non-incapacitating Injury (B)	VA-7W	7	ROUTE 7 / EAST MAIN STREET	ROUTE 7	Injury crash	0	0	0	0	2.2. No
192465487	8/29/2019	9:15	Thu	1. Rear End	VEHICLE TWO WAS STOPPED FOR A REFUGER TRUCK THAT WAS MAKING A PICK UP. VEHICLE ONE STRUCK VEHICLE TWO IN THE REAR. VEHICLE TWO WAS A VDOT MAINTENANCE TRUCK.	1. On Roadway	20. Motor Vehicle In Transport	Non-incapacitating Injury (B)	BUS VA-7E (1 Town of Berryville)	7	CLERMONT LN PRIVATE	ROUTE 7B	Injury crash	0	0	0	0	1.2. No
192435109	8/31/2019	11:00	Sat	1. Rear End	VEHICLE 1 STRUCK VEHICLE 2, WHILE VEHICLE 2 WAS WAITING FOR A VEHICLE TO TURN ONTO BATTLETOWN DR.	1. On Roadway	20. Motor Vehicle In Transport	No Injury (O)	BUS VA-7E (1 Town of Berryville)	7	BATTLETOWN DR	600 E MAIN ST	property damage crash	0	0	0	0	0.2. No



# APPENDIX C EXISTING TRAFFIC COUNTS



# Wells + Associates, Inc

Tysons, Virginia

## Turning Movement Count - Total Vehicles

<b>PROJECT:</b> Friant Property <b>W+A JOB NO:</b> 8592 <b>INTERSECTION:</b> Battletown Dr. & Bel Voi Dr. <b>LOCATION:</b> Clarke County, VA	<b>DATE:</b> 3/2/2022 <b>DAY:</b> Wednesday <b>WEATHER:</b> clear <b>COUNTED BY:</b> Agan <b>INPUTED BY:</b> agan	<b>SOUTHBOUND ROAD:</b> Battletown Drive - 671 <b>NORTHBOUND ROAD:</b> Battletown Drive - 671 <b>WESTBOUND ROAD:</b> 0 <b>EASTBOUND ROAD:</b> Bel Voi Drive 1020
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Time Period	Southbound Battletown Drive - 671					Westbound 0					Northbound Battletown Drive - 671					Eastbound Bel Voi Drive 1020					North & South	East & West	Total										
	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru				Left	U-Turn	Total	PHF						
<b>Minute Volumes</b>																																	
6:00 AM - 6:15 AM	0	2	0	0	2		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		2	0	2
6:15 AM - 6:30 AM	0	2	0	0	2		0	0	0	0	0		0	1	0	0	1		0	0	0	0	0		0	0	0	0	0		3	0	3
6:30 AM - 6:45 AM	0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		1	0	0	0	1		0	0	0		1	1	2		
6:45 AM - 7:00 AM	0	1	0	0	1		0	0	0	0	0		0	0	1	0	1		1	0	0	0	1		3	1	4						
7:00 AM - 7:15 AM	0	2	0	0	2		0	0	0	0	0		0	0	0	0	0		4	0	0	0	4		5	4	9						
7:15 AM - 7:30 AM	0	3	0	0	3		0	0	0	0	0		0	2	0	0	2		3	0	0	0	3		3	3	6						
7:30 AM - 7:45 AM	0	2	0	0	2		0	0	0	0	0		0	0	1	0	1		2	0	0	0	2		4	2	6						
7:45 AM - 8:00 AM	0	2	0	0	2		0	0	0	0	0		0	2	1	0	3		0	0	0	0	0		5	0	5						
8:00 AM - 8:15 AM	0	2	0	0	2		0	0	0	0	0		0	1	0	0	1		2	0	0	0	2		3	2	5						
8:15 AM - 8:30 AM	0	2	0	0	2		0	0	0	0	0		0	1	0	0	1		0	0	0	0	0		4	0	4						
8:30 AM - 8:45 AM	0	2	0	0	2		0	0	0	0	0		0	2	0	0	2		0	0	0	0	0		8	0	8						
8:45 AM - 9:00 AM	0	3	0	0	3		0	0	0	0	0		0	3	2	0	5		0	0	0	0	0		10	1	11						
9:00 AM - 9:15 PM	2	2	0	0	4		0	0	0	0	0		0	5	1	0	6		1	0	0	0	1		3	0	3						
9:15 PM - 9:30 PM	0	2	0	0	2		0	0	0	0	0		0	1	2	0	3		0	0	0	0	0		4	0	4						
9:30 PM - 9:45 PM	0	1	0	0	1		0	0	0	0	0		0	4	2	0	6		1	0	0	0	1		6	1	7						
9:45 PM - 10:00 PM	0	0	0	0	0		0	0	0	0	0		0	5	0	0	5		0	0	0	0	0		8	0	8						
10:00 PM - 10:15 PM	0	3	0	0	3		0	0	0	0	0		0	5	0	0	5		0	0	0	0	0		9	2	11						
10:15 PM - 10:30 PM	0	2	0	0	2		0	0	0	0	0		0	6	1	0	7		2	0	0	0	2		11	3	14						
10:30 PM - 10:45 PM	0	4	0	0	4		0	0	0	0	0		0	5	2	0	7		3	0	0	0	3		5	0	5						
10:45 PM - 11:00 PM	0	2	0	0	2		0	0	0	0	0		0	2	1	0	3		0	0	0	0	0		9	3	12						
11:00 PM - 11:15 PM	0	2	0	0	2		0	0	0	0	0		0	3	4	0	7		3	0	0	0	3		7	1	8						
11:15 PM - 11:30 PM	0	4	0	0	4		0	0	0	0	0		0	1	2	0	3		1	0	0	0	1		4	0	4						
11:30 PM - 11:45 PM	0	3	0	0	3		0	0	0	0	0		0	1	0	0	1		0	0	0	0	0		2	0	2						
11:45 PM - 12:00 AM	0	1	0	0	1		0	0	0	0	0		0	1	0	0	1		0	0	0	0	0		119	24	143						
<b>Total</b>	2	49	0	0	51		0	0	0	0	0		0	46	22	0	68		24	0	0	0	24										

Time Period	Southbound Battletown Drive - 671					Westbound 0					Northbound Battletown Drive - 671					Eastbound Bel Voi Drive 1020					North & South	East & West	Total				
	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru				Left	U-Turn	Total	PHF
<b>One Hour Volumes</b>																											
7:00 AM - 7:15 AM	0	5	0	0	5	0.625	0	0	0	0	0		0	1	0	0	1	0.25	1	0	0	0	1	0.25	6	1	7
7:15 AM - 7:30 AM	0	5	0	0	5	0.625	0	0	0	0	0		0	1	1	0	2	0.5	2	0	0	0	2	0.5	7	2	9
7:30 AM - 7:45 AM	0	6	0	0	6	0.5	0	0	0	0	0		0	2	1	0	3	0.375	6	0	0	0	6	0.375	9	6	15
7:45 AM - 8:00 AM	0	8	0	0	8	0.667	0	0	0	0	0		0	2	2	0	4	0.5	9	0	0	0	9	0.563	12	9	21
8:00 AM - 8:15 AM	0	9	0	0	9	0.75	0	0	0	0	0		0	3	3	0	6	0.75	10	0	0	0	10	0.625	15	10	25
8:15 AM - 8:30 AM	0	9	0	0	9	0.75	0	0	0	0	0		0	5	3	0	8	0.667	9	0	0	0	9	0.563	17	9	26
8:30 AM - 8:45 AM	0	8	0	0	8	1	0	0	0	0	0		0	4	3	0	7	0.583	7	0	0	0	7	0.583	15	7	22
8:45 AM - 9:00 AM	0	8	0	0	8	1	0	0	0	0	0		0	6	2	0	8	0.667	4	0	0	0	4	0.5	16	4	20
9:00 AM - 9:15 AM	0	9	0	0	9	0.75	0	0	0	0	0		0	8	3	0	11	0.55	2	0	0	0	2	0.25	20	2	22
9:15 AM - 9:30 AM	0	9	0	0	9	0.75	0	0	0	0	0		0	10	6	0	16	0.667	2	0	0	0	2	0.5	23	2	25
9:30 AM - 9:45 AM	2	5	0	0	7	0.438	0	0	0	0	0		0	10	6	0	16	0.667	2	0	0	0	2	0.25	21	1	22
9:45 AM - 10:00 AM	0	6	0	0	6	0.5	0	0	0	0	0		0	10	5	0	15	0.625	1	0	0	0	1	0.25	27	3	30
10:00 AM - 10:15 AM	0	6	0	0	6	0.5	0	0	0	0	0		0	16	5	0	21	0.75	3	0	0	0	3	0.375	27	3	30
10:15 AM - 10:30 AM	0	6	0	0	6	0.5	0	0	0	0	0		0	20	5	0	25	0.893	6	0	0	0	6	0.5	34	6	40
10:30 AM - 10:45 AM	0	9	0	0	9	0.563	0	0	0	0	0		0	18	4	0	22	0.786	5	0	0	0	5	0.417	33	5	38
10:45 AM - 11:00 AM	0	11	0	0	11	0.688	0	0	0	0	0		0	16	8	0	24	0.857	8	0	0	0	8	0.667	34	8	42
11:00 AM - 11:15 AM	0	10	0	0	10	0.625	0	0	0	0	0		0	11	9	0	20	0.714	7	0	0	0	7	0.583	32	7	39
11:15 AM - 11:30 AM	0	12	0	0	12	0.75	0	0	0	0	0		0	7	7	0	14	0.5	4	0	0	0	4	0.333	25	4	29
11:30 AM - 11:45 AM	0	11	0	0	11	0.688	0	0	0	0	0		0	7	7	0	14	0.5	4	0	0	0	4	0.333	25	4	29
11:45 AM - 12:00 PM	0	10	0	0	10	0.625	0	0	0	0	0		0	6	6	0	12	0.429	4	0	0	0	4	0.333	22	4	26

# Wells + Associates, Inc

Tysons, Virginia

## Turning Movement Count - Total Vehicles

**PROJECT:** Friant Property  
**W+A JOB NO:** 8582  
**INTERSECTION:** E. Main Street & Battletown Dr.  
**LOCATION:** Clarke County, VA

**DATE:** 3/2/2022  
**DAY:** Wednesday  
**WEATHER:** clear  
**COUNTED BY:** Ramiz  
**INPUTED BY:** agan

**SOUTHBOUND ROAD:** Battletown Drive - 671  
**NORTHBOUND ROAD:** Parking Lot  
**WESTBOUND ROAD:** East Main Street - 78  
**EASTBOUND ROAD:** East Main Street - 78

Time Period	Southbound Battletown Drive - 671					Westbound East Main Street - 78					Northbound Parking Lot					Eastbound East Main Street - 78					North & South	East & West	Total				
	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru				Left	U-Turn	Total	PHF
<b>Minute Volumes</b>																											
6:00 AM - 6:15 AM	0	0	1	0	1		0	14	0	0	14		0	0	0	0	0		0	33	0	0	33		1	47	48
6:15 AM - 6:30 AM	1	0	1	0	2		0	11	0	0	11		0	0	0	0	0		0	38	1	0	39		2	50	52
6:30 AM - 6:45 AM	0	0	0	0	0		0	43	0	0	43		0	0	0	0	0		0	51	0	0	51		0	94	94
6:45 AM - 7:00 AM	2	0	1	0	3		0	51	0	0	51		0	0	0	0	0		0	68	0	0	68		3	119	122
7:00 AM - 7:15 AM	2	0	2	0	4		0	22	0	0	22		0	0	0	0	0		0	81	1	0	82		4	104	108
7:15 AM - 7:30 AM	4	0	3	0	7		1	29	0	0	30		0	0	0	0	0		0	62	1	0	63		7	93	100
7:30 AM - 7:45 AM	5	0	2	0	7		0	33	0	0	33		0	0	0	0	0		0	85	1	0	86		7	119	126
7:45 AM - 8:00 AM	2	0	1	0	3		1	48	0	0	49		0	0	1	0	1		1	65	1	0	67		4	116	120
8:00 AM - 8:15 AM	1	0	1	0	2		3	30	0	0	33		0	0	1	0	1		1	69	1	0	71		3	104	107
8:15 AM - 8:30 AM	0	0	6	0	6		0	24	0	0	24		0	0	1	0	1		1	70	2	0	73		7	97	104
8:30 AM - 8:45 AM	0	0	2	0	2		2	26	0	0	28		0	0	0	0	0		0	46	2	0	48		2	76	78
8:45 AM - 9:00 AM	2	0	1	0	3		1	22	0	0	23		0	0	1	0	1		0	36	4	0	40		4	63	67
9:00 AM - 9:15 AM	4	0	0	0	4		3	63	0	0	66		0	0	0	0	0		0	55	5	0	60		4	126	130
9:15 AM - 9:30 AM	1	0	1	0	2		0	75	0	0	75		0	0	0	0	0		0	46	2	0	48		2	123	125
9:30 AM - 9:45 AM	0	0	0	0	0		1	82	0	0	83		0	0	0	0	0		0	34	3	0	37		0	120	120
9:45 AM - 10:00 AM	1	0	1	0	2		5	60	1	0	66		0	0	0	0	0		0	39	3	0	42		2	108	110
10:00 AM - 10:15 AM	1	0	2	0	3		2	56	0	0	58		1	0	0	0	1		0	35	5	0	40		4	98	102
10:15 AM - 10:30 AM	3	0	1	0	4		3	58	0	0	61		0	0	0	0	0		0	38	6	0	44		4	105	109
10:30 AM - 10:45 AM	5	0	2	0	7		3	66	0	0	69		0	0	0	0	0		0	36	4	0	40		7	109	116
10:45 AM - 11:00 AM	5	0	2	0	7		3	80	1	0	84		0	0	0	0	0		0	34	1	0	35		2	119	121
11:00 AM - 11:15 AM	1	0	1	0	2		3	80	1	0	84		0	0	0	0	0		0	35	6	0	41		6	99	105
11:15 AM - 11:30 AM	4	0	1	0	5		3	54	1	0	58		0	0	1	0	1		0	31	2	0	33		6	70	76
11:30 AM - 11:45 AM	6	0	0	0	6		1	36	0	0	37		0	0	0	0	0		0	31	2	0	33		5	70	75
11:45 AM - 12:00 PM	3	0	1	0	4		0	46	0	0	46		0	0	1	0	1		2	21	1	0	24		1	70	71
12:00 PM - 12:15 PM	1	0	0	0	1		0	54	0	0	54		0	0	0	0	0		2	13	1	0	16				
<b>Total</b>	<b>49</b>	<b>0</b>	<b>31</b>	<b>0</b>	<b>80</b>		<b>32</b>	<b>1083</b>	<b>3</b>	<b>0</b>	<b>1118</b>		<b>1</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>7</b>		<b>7</b>	<b>1121</b>	<b>53</b>	<b>0</b>	<b>1181</b>		<b>87</b>	<b>2299</b>	<b>2386</b>
<b>One Hour Volumes</b>																											
6:00 AM - 7:00 AM	3	0	3	0	6	0.5	0	119	0	0	119	0.583	0	0	0	0	0		0	190	1	0	191	0.702	6	310	316
6:15 AM - 7:15 AM	5	0	4	0	9	0.563	0	127	0	0	127	0.623	0	0	0	0	0		0	238	2	0	240	0.732	9	367	376
6:30 AM - 7:30 AM	8	0	6	0	14	0.5	1	145	0	0	146	0.716	0	0	0	0	0		0	262	2	0	264	0.805	14	410	424
6:45 AM - 7:45 AM	13	0	8	0	21	0.75	1	135	0	0	136	0.667	0	0	0	0	0		0	296	3	0	299	0.869	21	435	456
7:00 AM - 8:00 AM	13	0	8	0	21	0.75	2	132	0	0	134	0.684	0	0	1	0	1	0.25	1	293	4	0	298	0.866	22	432	454
7:15 AM - 8:15 AM	12	0	7	0	19	0.679	5	140	0	0	145	0.74	0	0	2	0	2	0.5	2	281	4	0	287	0.834	21	432	453
7:30 AM - 8:30 AM	8	0	10	0	18	0.643	4	135	0	0	139	0.709	0	0	3	0	3	0.75	3	289	5	0	297	0.863	21	436	457
7:45 AM - 8:45 AM	3	0	10	0	13	0.542	6	128	0	0	134	0.684	0	0	3	0	3	0.75	3	250	6	0	259	0.887	16	393	409
8:00 AM - 9:00 AM	3	0	10	0	13	0.542	6	102	0	0	108	0.818	0	0	3	0	3	0.75	2	221	9	0	232	0.795	16	340	356
8:15 AM - 9:15 AM	6	0	2	0	8	0.5	9	280	1	0	290	0.873	0	0	0	0	0		0	174	13	0	187	0.779	8	477	485
8:30 AM - 9:30 AM	3	0	4	0	7	0.583	8	273	1	0	282	0.849	1	0	0	0	1	0.25	0	154	13	0	167	0.87	8	449	457
8:45 AM - 9:45 AM	5	0	4	0	9	0.563	11	256	1	0	268	0.807	1	0	0	0	1	0.25	0	146	17	0	163	0.926	10	431	441
9:00 AM - 10:00 AM	10	0	6	0	16	0.571	13	240	1	0	254	0.92	1	0	0	0	1	0.25	0	148	18	0	166	0.943	17	420	437
9:15 AM - 10:15 AM	10	0	6	0	16	0.571	11	260	1	0	272	0.81	1	0	0	0	1	0.25	0	143	16	0	159	0.903	17	431	448
9:30 PM - 10:30 PM	10	0	6	0	16	0.571	11	260	1	0	272	0.81	1	0	0	0	1	0.25	0	143	17	0	160	0.909	19	432	451
9:45 PM - 10:45 PM	13	0	5	0	18	0.643	12	258	2	0	272	0.81	0	0	1	0	1	0.25	0	136	13	0	149	0.909	21	397	418
10:00 PM - 11:00 PM	16	0	4	0	20	0.714	10	236	2	0	248	0.738	0	0	1	0	1	0.25	0	136	13	0	149	0.909	21	397	418
10:15 PM - 11:15 PM	14	0	3	0	17	0.708	7	216	2	0	225	0.67	0	0	2	0	2	0.5	2	121	10	0	133	0.811	19	358	377
10:30 PM - 11:30 PM	14	0	2	0	16	0.667	4	190	1	0	195	0.841	0	0	2	0	2	0.5	4	100	10	0	114	0.695	18	309	327

# Wells + Associates, Inc

Tysons, Virginia

## Turning Movement Count - Total Vehicles

<b>PROJECT:</b> Friant Property <b>W+A JOB NO:</b> 8582 <b>INTERSECTION:</b> Hary Byrd Hwy. & E. Main Street <b>LOCATION:</b> Clarke County, VA	<b>DATE:</b> 3/2/2022 <b>DAY:</b> Wednesday <b>WEATHER:</b> clear <b>COUNTED BY:</b> Tyler & Austin <b>INPUTED BY:</b> agn	<b>SOUTHBOUND ROAD:</b> Hary Byrd Highway - 7 <b>NORTHBOUND ROAD:</b> Hary Byrd Highway - 7 <b>WESTBOUND ROAD:</b> Audley Lane <b>EASTBOUND ROAD:</b> East Main Street - 78
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Time Period	Southbound Hary Byrd Highway - 7					Westbound Audley Lane					Northbound Hary Byrd Highway - 7					Eastbound East Main Street - 78					North & South	East & West	Total				
	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru				Left	U-Turn	Total	PHF
<b>Minute Volumes</b>																											
6:00 AM - 6:15 AM	10	358	0	0	368		0	0	1	0	1		0	27	4	0	31		25	1	3	0	29		399	30	429
6:15 AM - 6:30 AM	6	388	0	0	394		0	0	0	0	0		0	50	7	0	57		36	0	5	0	41		451	41	492
6:30 AM - 6:45 AM	29	477	0	0	506		1	1	0	0	2		0	59	15	0	74		44	0	6	0	50		580	52	632
6:45 AM - 7:00 AM	24	412	0	0	436		0	0	0	0	0		0	75	23	0	98		51	1	7	0	59		534	59	593
7:00 AM - 7:15 AM	12	368	0	0	380		1	0	0	0	1		1	68	8	0	77		69	0	13	0	82		457	83	540
7:15 AM - 7:30 AM	9	432	0	0	441		0	0	0	0	0		0	119	23	0	142		57	0	8	0	65		583	65	648
7:30 AM - 7:45 AM	8	381	1	0	390		0	0	0	0	0		0	157	27	0	184		55	0	23	0	78		574	78	652
7:45 AM - 8:00 AM	24	374	0	0	398		0	1	1	0	2		0	150	23	0	173		56	0	18	0	74		571	76	647
8:00 AM - 8:15 AM	8	377	0	0	385		0	0	0	0	0		0	107	24	0	131		61	0	3	0	64		516	64	580
8:15 AM - 8:30 AM	5	250	0	0	255		0	0	0	0	0		2	90	18	0	110		63	0	9	0	72		365	72	437
8:30 AM - 8:45 AM	3	258	0	0	261		1	0	0	0	1		0	80	23	0	103		42	0	8	0	50		364	51	415
8:45 AM - 9:00 AM	7	219	0	0	226		0	0	0	0	0		0	88	16	0	104		34	0	3	0	37		330	37	367
9:00 AM - 9:15 AM	4	132	0	0	136		0	1	1	0	2		1	386	67	0	454		33	1	20	0	54		590	56	646
9:15 PM - 9:30 PM	3	119	2	0	124		0	0	0	0	0		4	349	70	0	423		34	0	10	0	44		547	44	591
9:30 PM - 9:45 PM	3	117	0	0	120		1	2	0	0	3		2	443	69	0	514		21	0	7	0	28		634	31	665
9:45 PM - 10:00 PM	5	130	0	0	135		0	0	0	0	0		1	473	59	0	533		29	0	9	0	38		668	38	706
10:00 PM - 10:15 PM	4	100	0	0	104		0	0	0	0	0		0	444	56	0	500		19	0	18	0	37		604	37	641
10:15 PM - 10:30 PM	5	126	0	0	131		0	0	0	0	0		0	392	59	0	451		27	0	16	0	43		582	43	625
10:30 PM - 10:45 PM	7	125	0	0	132		0	0	0	0	0		0	363	63	0	426		24	0	6	0	30		558	30	588
10:45 PM - 11:00 PM	4	133	0	0	137		0	0	1	0	1		1	356	84	0	441		30	0	8	0	38		578	39	617
11:00 PM - 11:15 PM	7	125	0	0	132		0	0	0	0	0		0	299	54	0	353		25	0	9	0	34		463	34	497
11:15 PM - 11:30 PM	4	106	0	0	110		0	0	0	0	0		1	284	31	0	316		21	2	7	0	30		419	30	449
11:30 PM - 11:45 PM	4	99	0	0	103		0	0	0	0	0		0	216	43	0	259		19	0	3	0	22		350	25	375
11:45 PM - 12:00 AM	13	78	0	0	91		3	0	0	0	3		0	218	41	0	259		14	2	2	0	18		353	19	372
12:00 AM - 12:15 AM	9	84	1	0	94		0	0	1	0	1		0	218	43	0	259		14	2	2	0	18		353	19	372
<b>Total</b>	<b>210</b>	<b>5643</b>	<b>4</b>	<b>0</b>	<b>5857</b>		<b>7</b>	<b>5</b>	<b>5</b>	<b>0</b>	<b>17</b>		<b>13</b>	<b>5293</b>	<b>907</b>	<b>0</b>	<b>6213</b>		<b>889</b>	<b>7</b>	<b>221</b>	<b>0</b>	<b>1117</b>		<b>12070</b>	<b>1134</b>	<b>13204</b>

Time Period	Southbound Hary Byrd Highway - 7					Westbound Audley Lane					Northbound Hary Byrd Highway - 7					Eastbound East Main Street - 78					North & South	East & West	Total				
	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru	Left	U-Turn	Total	PHF	Right	Thru				Left	U-Turn	Total	PHF
<b>One Hour Volumes</b>																											
6:00 AM - 7:00 AM	69	1635	0	0	1704	0.842	1	1	1	0	3	0.375	0	211	49	0	260	0.663	156	2	21	0	179	0.758	1964	182	2146
6:15 AM - 7:15 AM	71	1645	0	0	1716	0.848	2	1	0	0	3	0.375	1	252	53	0	306	0.781	200	1	31	0	232	0.707	2022	235	2257
6:30 AM - 7:30 AM	74	1689	0	0	1763	0.871	2	1	0	0	3	0.375	1	321	69	0	391	0.688	221	1	34	0	256	0.78	2154	259	2413
6:45 AM - 7:45 AM	53	1593	1	0	1647	0.934	1	0	0	0	1	0.25	1	419	81	0	501	0.681	232	1	51	0	284	0.866	2148	285	2433
7:00 AM - 8:00 AM	53	1555	1	0	1609	0.912	1	1	1	0	3	0.375	1	494	81	0	576	0.783	237	0	62	0	299	0.912	2185	302	2487
7:15 AM - 8:15 AM	49	1564	1	0	1614	0.915	0	1	1	0	2	0.25	0	533	97	0	630	0.856	229	0	52	0	281	0.901	2244	283	2527
7:30 AM - 8:30 AM	45	1382	1	0	1428	0.897	0	1	1	0	2	0.25	2	504	92	0	598	0.813	235	0	53	0	288	0.923	2026	290	2316
7:45 AM - 8:45 AM	40	1259	0	0	1299	0.816	1	1	1	0	3	0.375	2	427	88	0	517	0.747	222	0	38	0	260	0.878	1816	263	2079
8:00 AM - 9:00 AM	23	1104	0	0	1127	0.732	1	0	0	0	1	0.25	2	365	81	0	448	0.855	200	0	23	0	223	0.774	1575	224	1799
9:00 AM - 10:00 AM	15	498	2	0	515	0.947	1	3	1	0	5	0.417	8	1651	265	0	1924	0.902	117	1	46	0	164	0.759	2439	169	2608
10:00 AM - 11:00 AM	15	466	2	0	483	0.894	1	2	0	0	3	0.25	7	1709	254	0	1970	0.924	103	0	44	0	147	0.835	2453	150	2603
11:00 AM - 12:00 PM	17	473	0	0	490	0.907	1	2	0	0	3	0.25	3	1752	243	0	1998	0.937	96	0	50	0	146	0.849	2488	149	2637
12:00 PM - 1:00 PM	21	481	0	0	502	0.93	0	0	0	0	0		1	1672	237	0	1910	0.896	99	0	49	0	148	0.86	2412	148	2560
1:00 PM - 2:00 PM	20	484	0	0	504	0.92	0	0	1	0	1	0.25	1	1555	262	0	1818	0.909	100	0	48	0	148	0.86	2322	149	2471
2:00 PM - 3:00 PM	20	490	0	0	510	0.931	0	0	1	0	1	0.25	1	1410	260	0	1671	0.926	106	0	39	0	145	0.843	2181	146	2327
3:00 PM - 4:00 PM	19	463	0	0	482	0.88	0	0	1	0	1	0.25	2	1302	232	0	1536	0.871	100	2	30	0	132	0.868	2018	133	2151
4:00 PM - 5:00 PM	25	416	0	0	441	0.805	3	0	1	0	4	0.333	2	1155	212	0	1369	0.776	95	2	27	0	124	0.816	1810	128	1938
5:00 PM - 6:00 PM	30	367	1	0	398	0.905	3	0	1	0	4	0.333	1	1017	169	0	1187	0.841	79	4	21	0	104	0.765	1585	108	1693

**APPENDIX D  
EXISTING (2022) CONDITIONS ANALYSIS  
(SYNCHRO REPORTS)**

Queues  
1: Route 7 & E Main St/Audley Lane

Existing Conditions  
AM Peak Hour



Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	54	236	2	100	549	1	1612	51
v/c Ratio	0.31	0.42	0.01	0.47	0.25	0.01	0.94	0.06
Control Delay	46.1	2.4	43.5	46.4	8.5	46.0	35.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.1	2.4	43.5	46.4	8.5	46.0	35.9	0.1
Queue Length 50th (ft)	28	0	1	52	43	1	416	0
Queue Length 95th (ft)	79	0	10	121	166	6	#894	0
Internal Link Dist (ft)		2849	555		862		886	
Turn Bay Length (ft)				420		150		325
Base Capacity (vph)	215	581	235	526	2287	378	1710	869
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.41	0.01	0.19	0.24	0.00	0.94	0.06

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis  
 1: Route 7 & E Main St/Audley Lane

Existing Conditions  
 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕		↖	↗	↗	↖	↗	↖
Traffic Volume (vph)	52	0	229	1	1	0	97	533	0	1	1564	49
Future Volume (vph)	52	0	229	1	1	0	97	533	0	1	1564	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.4	9.4			9.2		8.3	6.4		8.8	6.6	6.6
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.85			1.00		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1553			1817		1687	3374		1687	3374	1509
Flt Permitted	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1553			1863		1687	3374		1687	3374	1509
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	54	0	236	1	1	0	100	549	0	1	1612	51
RTOR Reduction (vph)	0	216	0	0	0	0	0	0	0	0	0	26
Lane Group Flow (vph)	54	20	0	0	2	0	100	549	0	1	1612	25
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	7%	7%	7%
Turn Type	Split	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3			4		1	6		5	2	
Permitted Phases				4					6			2
Actuated Green, G (s)	8.9	8.9			1.3		8.9	57.7		0.9	50.0	50.0
Effective Green, g (s)	8.9	8.9			1.3		8.9	57.7		0.9	50.0	50.0
Actuated g/C Ratio	0.09	0.09			0.01		0.09	0.56		0.01	0.49	0.49
Clearance Time (s)	9.4	9.4			9.2		8.3	6.4		8.8	6.6	6.6
Vehicle Extension (s)	3.0	3.0			4.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	150	134			23		146	1897		14	1644	735
v/s Ratio Prot	c0.03	0.01					c0.06	c0.16		0.00	c0.48	
v/s Ratio Perm					c0.00							0.02
v/c Ratio	0.36	0.15			0.09		0.68	0.29		0.07	0.98	0.03
Uniform Delay, d1	44.2	43.4			50.1		45.5	11.7		50.4	25.8	13.7
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.5	0.5			2.2		12.5	0.1		2.2	17.7	0.0
Delay (s)	45.6	43.9			52.3		58.0	11.8		52.6	43.5	13.7
Level of Service	D	D			D		E	B		D	D	B
Approach Delay (s)		44.2			52.3			18.9			42.6	
Approach LOS		D			D			B			D	

Intersection Summary			
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	102.6	Sum of lost time (s)	33.8
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 3: Parking Lot/Battletown Dr & E Main St

Existing Conditions  
 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	289	3	0	135	4	3	0	0	10	0	8
Future Volume (Veh/h)	5	289	3	0	135	4	3	0	0	10	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	5	318	3	0	148	4	3	0	0	11	0	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	152			321			488	482	320	480	481	150
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	152			321			488	482	320	480	481	150
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	98	100	99
cM capacity (veh/h)	1417			1228			484	483	721	495	483	896
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	326	152	3	20								
Volume Left	5	0	3	11								
Volume Right	3	4	0	9								
cSH	1417	1228	484	620								
Volume to Capacity	0.00	0.00	0.01	0.03								
Queue Length 95th (ft)	0	0	0	2								
Control Delay (s)	0.1	0.0	12.5	11.0								
Lane LOS	A		B	B								
Approach Delay (s)	0.1	0.0	12.5	11.0								
Approach LOS			B	B								
Intersection Summary												
Average Delay			0.6									
Intersection Capacity Utilization			29.4%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 4: Battletown Dr & Bel Voi Dr

Existing Conditions  
 AM Peak Hour



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			4	4	
Traffic Volume (veh/h)	0	9	4	5	9	0
Future Volume (Veh/h)	0	9	4	5	9	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	11	5	6	11	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	27	11	11			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	27	11	11			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	985	1070	1608			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	11	11	11			
Volume Left	0	5	0			
Volume Right	11	0	0			
cSH	1070	1608	1700			
Volume to Capacity	0.01	0.00	0.01			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.4	3.3	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.4	3.3	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			3.9			
Intersection Capacity Utilization			13.8%	ICU Level of Service	A	
Analysis Period (min)			15			

Queues  
1: Route 7 & E Main St/Audley Lane

Existing Conditions  
PM Peak Hour



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	61	115	3	264	1904	3	514	18
v/c Ratio	0.32	0.18	0.02	0.73	0.86	0.00	0.45	0.03
Control Delay	41.1	0.6	35.3	42.1	17.3	0.0	25.0	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.1	0.6	35.3	42.1	17.3	0.0	25.0	0.1
Queue Length 50th (ft)	27	0	1	113	286	0	94	0
Queue Length 95th (ft)	81	0	11	246	#817	0	217	0
Internal Link Dist (ft)		2843	555		862		886	
Turn Bay Length (ft)				420		35		325
Base Capacity (vph)	232	673	243	567	2222	1066	1845	921
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.17	0.01	0.47	0.86	0.00	0.28	0.02

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 1: Route 7 & E Main St/Audley Lane

Existing Conditions  
PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕		↖	↗	↗	↖	↗	↖
Traffic Volume (vph)	56	0	106	0	2	1	243	1752	3	0	473	17
Future Volume (vph)	56	0	106	0	2	1	243	1752	3	0	473	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.4	9.4			9.2		8.3	6.4	6.4		6.6	6.6
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00		0.95	1.00
Fr't	1.00	0.85			0.95		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00	1.00		1.00	1.00
Satd. Flow (prot)	1736	1553			1779		1687	3374	1509		3374	1509
Flt Permitted	0.95	1.00			1.00		0.95	1.00	1.00		1.00	1.00
Satd. Flow (perm)	1736	1553			1779		1687	3374	1509		3374	1509
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	0	115	0	2	1	264	1904	3	0	514	18
RTOR Reduction (vph)	0	103	0	0	1	0	0	0	1	0	0	12
Lane Group Flow (vph)	61	12	0	0	2	0	264	1904	2	0	514	6
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	7%	7%	7%
Turn Type	Split	NA			NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3			4		1	6		5	2	
Permitted Phases				4					6			2
Actuated Green, G (s)	8.9	8.9			1.2		17.5	53.3	53.3		27.3	27.3
Effective Green, g (s)	8.9	8.9			1.2		17.5	53.3	53.3		27.3	27.3
Actuated g/C Ratio	0.10	0.10			0.01		0.20	0.60	0.60		0.31	0.31
Clearance Time (s)	9.4	9.4			9.2		8.3	6.4	6.4		6.6	6.6
Vehicle Extension (s)	3.0	3.0			4.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	174	156			24		333	2034	909		1041	466
v/s Ratio Prot	c0.04	0.01			c0.00		0.16	c0.56			0.15	
v/s Ratio Perm									0.00			0.00
v/c Ratio	0.35	0.07			0.08		0.79	0.94	0.00		0.49	0.01
Uniform Delay, d1	37.1	36.0			43.1		33.7	16.0	7.0		24.9	21.2
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.2	0.2			2.1		12.2	8.8	0.0		0.4	0.0
Delay (s)	38.3	36.2			45.1		45.9	24.8	7.0		25.3	21.2
Level of Service	D	D			D		D	C	A		C	C
Approach Delay (s)		36.9			45.1			27.3			25.1	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	88.4	Sum of lost time (s)	33.8
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Unsignalized Intersection Capacity Analysis

## 3: Parking Lot/Battletown Dr & E Main St

Existing Conditions  
PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	174	0	1	280	9	0	0	0	4	0	12
Future Volume (Veh/h)	13	174	0	1	280	9	0	0	0	4	0	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	14	187	0	1	301	10	0	0	0	4	0	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	311			187			536	528	187	523	523	306
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	311			187			536	528	187	523	523	306
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	99	100	98
cM capacity (veh/h)	1238			1375			443	450	855	460	453	734
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	201	312	0	17								
Volume Left	14	1	0	4								
Volume Right	0	10	0	13								
cSH	1238	1375	1700	644								
Volume to Capacity	0.01	0.00	0.00	0.03								
Queue Length 95th (ft)	1	0	0	2								
Control Delay (s)	0.6	0.0	0.0	10.7								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.6	0.0	0.0	10.7								
Approach LOS			A	B								
Intersection Summary												
Average Delay			0.6									
Intersection Capacity Utilization			28.9%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 4: Battletown Dr & Bel Voi Dr

Existing Conditions  
 PM Peak Hour



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	
Traffic Volume (veh/h)	0	8	8	16	10	0
Future Volume (Veh/h)	0	8	8	16	10	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	9	9	19	12	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	49	12	12			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	49	12	12			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	955	1069	1607			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	9	28	12			
Volume Left	0	9	0			
Volume Right	9	0	0			
cSH	1069	1607	1700			
Volume to Capacity	0.01	0.01	0.01			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.4	2.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.4	2.4	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			2.9			
Intersection Capacity Utilization			17.9%	ICU Level of Service	A	
Analysis Period (min)			15			

**APPENDIX E  
BACKGROUND FUTURE (2026) CONDITIONS ANALYSIS  
(SYNCHRO REPORTS)**



Queues  
1: Route 7 & E Main St/Audley Lane

Background Conditions  
AM Peak Hour



Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	61	266	2	104	572	1	1678	53
v/c Ratio	0.36	0.48	0.01	0.50	0.25	0.01	1.04	0.06
Control Delay	47.6	3.0	44.0	47.7	8.4	46.0	57.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.6	3.0	44.0	47.7	8.4	46.0	57.8	0.1
Queue Length 50th (ft)	32	0	1	54	45	1	456	0
Queue Length 95th (ft)	86	0	10	124	174	6	#950	0
Internal Link Dist (ft)		2849	555		862		886	
Turn Bay Length (ft)				420		150		325
Base Capacity (vph)	203	573	222	498	2261	358	1619	835
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.46	0.01	0.21	0.25	0.00	1.04	0.06

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 1: Route 7 & E Main St/Audley Lane

Background Conditions  
AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷			↕		↶	↷	↷	↶	↷	↷
Traffic Volume (vph)	59	0	258	1	1	0	101	555	0	1	1628	51
Future Volume (vph)	59	0	258	1	1	0	101	555	0	1	1628	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.4	9.4			9.2		8.3	6.4		8.8	6.6	6.6
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.85			1.00		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1553			1817		1687	3374		1687	3374	1509
Flt Permitted	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1553			1863		1687	3374		1687	3374	1509
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	61	0	266	1	1	0	104	572	0	1	1678	53
RTOR Reduction (vph)	0	244	0	0	0	0	0	0	0	0	0	27
Lane Group Flow (vph)	61	22	0	0	2	0	104	572	0	1	1678	26
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	7%	7%	7%
Turn Type	Split	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3			4		1	6		5	2	
Permitted Phases				4					6			2
Actuated Green, G (s)	8.9	8.9			1.3		11.2	61.3		1.0	51.4	51.4
Effective Green, g (s)	8.9	8.9			1.3		11.2	61.3		1.0	51.4	51.4
Actuated g/C Ratio	0.08	0.08			0.01		0.11	0.58		0.01	0.48	0.48
Clearance Time (s)	9.4	9.4			9.2		8.3	6.4		8.8	6.6	6.6
Vehicle Extension (s)	3.0	3.0			4.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	145	130			22		177	1945		15	1631	729
v/s Ratio Prot	c0.04	0.01					c0.06	0.17		0.00	c0.50	
v/s Ratio Perm					c0.00							0.02
v/c Ratio	0.42	0.17			0.09		0.59	0.29		0.07	1.03	0.04
Uniform Delay, d1	46.3	45.3			51.9		45.3	11.5		52.2	27.4	14.4
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.0	0.6			2.4		4.9	0.1		1.9	30.0	0.0
Delay (s)	48.2	45.9			54.4		50.3	11.6		54.1	57.4	14.4
Level of Service	D	D			D		D	B		D	E	B
Approach Delay (s)		46.3			54.4			17.5			56.1	
Approach LOS		D			D			B			E	

### Intersection Summary

HCM 2000 Control Delay	45.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	106.3	Sum of lost time (s)	33.8
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Unsignalized Intersection Capacity Analysis

## 3: Parking Lot/Battletown Dr & E Main St

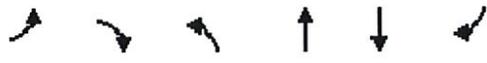
Background Conditions  
AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	5	325	3	0	152	4	3	0	0	10	0	8
Future Volume (Veh/h)	5	325	3	0	152	4	3	0	0	10	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	353	3	0	165	4	3	0	0	11	0	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	169			356			540	534	354	532	533	167
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	169			356			540	534	354	532	533	167
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	98	100	99
cM capacity (veh/h)	1396			1192			446	451	689	457	451	877
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	361	169	3	20								
Volume Left	5	0	3	11								
Volume Right	3	4	0	9								
cSH	1396	1192	446	583								
Volume to Capacity	0.00	0.00	0.01	0.03								
Queue Length 95th (ft)	0	0	1	3								
Control Delay (s)	0.1	0.0	13.1	11.4								
Lane LOS	A		B	B								
Approach Delay (s)	0.1	0.0	13.1	11.4								
Approach LOS			B	B								
Intersection Summary												
Average Delay				0.6								
Intersection Capacity Utilization				31.3%	ICU Level of Service	A						
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis  
 4: Battletown Dr & Bel Voi Dr

Background Conditions  
 AM Peak Hour



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			4	4	
Traffic Volume (veh/h)	0	9	4	5	9	0
Future Volume (Veh/h)	0	9	4	5	9	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	10	4	5	10	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	23	10	10			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	23	10	10			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	991	1071	1610			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	10	9	10			
Volume Left	0	4	0			
Volume Right	10	0	0			
cSH	1071	1610	1700			
Volume to Capacity	0.01	0.00	0.01			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.4	3.2	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.4	3.2	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			3.9			
Intersection Capacity Utilization			13.8%	ICU Level of Service	A	
Analysis Period (min)			15			

Queues  
1: Route 7 & E Main St/Audley Lane

Background Conditions  
PM Peak Hour



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	68	129	3	275	1982	3	535	20
v/c Ratio	0.35	0.20	0.02	0.73	0.89	0.00	0.49	0.03
Control Delay	41.8	0.7	35.7	41.8	19.6	0.0	25.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.8	0.7	35.7	41.8	19.6	0.0	25.9	0.1
Queue Length 50th (ft)	30	0	1	118	321	0	102	0
Queue Length 95th (ft)	89	0	11	260	#876	0	226	0
Internal Link Dist (ft)		2843	555		862		886	
Turn Bay Length (ft)				420		35		325
Base Capacity (vph)	231	666	242	565	2219	1065	1838	919
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.19	0.01	0.49	0.89	0.00	0.29	0.02

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 1: Route 7 & E Main St/Audley Lane

Background Conditions  
PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕		↖	↕	↗	↖	↕	↗
Traffic Volume (vph)	63	0	119	0	2	1	253	1823	3	0	492	18
Future Volume (vph)	63	0	119	0	2	1	253	1823	3	0	492	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.4	9.4			9.2		8.3	6.4	6.4		6.6	6.6
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00		0.95	1.00
Frt	1.00	0.85			0.95		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00	1.00		1.00	1.00
Satd. Flow (prot)	1736	1553			1779		1687	3374	1509		3374	1509
Flt Permitted	0.95	1.00			1.00		0.95	1.00	1.00		1.00	1.00
Satd. Flow (perm)	1736	1553			1779		1687	3374	1509		3374	1509
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	68	0	129	0	2	1	275	1982	3	0	535	20
RTOR Reduction (vph)	0	116	0	0	1	0	0	0	1	0	0	14
Lane Group Flow (vph)	68	13	0	0	2	0	275	1982	2	0	535	6
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	7%	7%	7%
Turn Type	Split	NA			NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3			4		1	6		5	2	
Permitted Phases				4					6			2
Actuated Green, G (s)	9.0	9.0			1.2		18.2	53.5	53.5		26.8	26.8
Effective Green, g (s)	9.0	9.0			1.2		18.2	53.5	53.5		26.8	26.8
Actuated g/C Ratio	0.10	0.10			0.01		0.21	0.60	0.60		0.30	0.30
Clearance Time (s)	9.4	9.4			9.2		8.3	6.4	6.4		6.6	6.6
Vehicle Extension (s)	3.0	3.0			4.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	176	157			24		346	2035	910		1019	455
v/s Ratio Prot	c0.04	0.01			c0.00		0.16	c0.59			0.16	
v/s Ratio Perm									0.00			0.00
v/c Ratio	0.39	0.08			0.08		0.79	0.97	0.00		0.53	0.01
Uniform Delay, d1	37.3	36.1			43.2		33.5	16.9	7.0		25.7	21.7
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.4	0.2			2.1		11.9	14.2	0.0		0.5	0.0
Delay (s)	38.7	36.3			45.3		45.4	31.2	7.0		26.2	21.7
Level of Service	D	D			D		D	C	A		C	C
Approach Delay (s)		37.1			45.3			32.9			26.0	
Approach LOS		D			D			C			C	

### Intersection Summary

HCM 2000 Control Delay	31.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	88.7	Sum of lost time (s)	33.8
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Unsignalized Intersection Capacity Analysis

## 3: Parking Lot/Battletown Dr & E Main St

Background Conditions  
PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	13	196	0	1	315	9	0	0	0	4	0	12
Future Volume (Veh/h)	13	196	0	1	315	9	0	0	0	4	0	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	14	211	0	1	339	10	0	0	0	4	0	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
	None				None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	349			211			598	590	211	585	585	344
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	349			211			598	590	211	585	585	344
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	99	100	98
cM capacity (veh/h)	1199			1348			403	415	829	418	418	699
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	225	350	0	17								
Volume Left	14	1	0	4								
Volume Right	0	10	0	13								
cSH	1199	1348	1700	604								
Volume to Capacity	0.01	0.00	0.00	0.03								
Queue Length 95th (ft)	1	0	0	2								
Control Delay (s)	0.6	0.0	0.0	11.1								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.6	0.0	0.0	11.1								
Approach LOS			A	B								
Intersection Summary												
Average Delay			0.6									
Intersection Capacity Utilization			30.1%	ICU Level of Service							A	
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

Background Conditions

## 4: Battletown Dr & Bel Voi Dr

PM Peak Hour



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			T	T	
Traffic Volume (veh/h)	0	8	8	16	10	0
Future Volume (Veh/h)	0	8	8	16	10	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	9	9	17	11	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	46	11	11			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	46	11	11			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	959	1070	1608			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	9	26	11			
Volume Left	0	9	0			
Volume Right	9	0	0			
cSH	1070	1608	1700			
Volume to Capacity	0.01	0.01	0.01			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.4	2.5	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.4	2.5	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			3.1			
Intersection Capacity Utilization		17.9%		ICU Level of Service		A
Analysis Period (min)			15			

# APPENDIX F FULL-SIZE CONCEPT PLAN



**APPENDIX G  
TOTAL FUTURE (2026) CONDITIONS ANALYSIS  
(SYNCHRO REPORTS)**

Queues

1: Route 7 & E Main St/Audley Lane

10/31/2023



Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	82	298	2	115	572	1	1678	60
v/c Ratio	0.47	0.54	0.01	0.53	0.25	0.01	1.05	0.07
Control Delay	50.9	3.7	44.5	48.6	8.5	47.0	62.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.9	3.7	44.5	48.6	8.5	47.0	62.3	0.2
Queue Length 50th (ft)	44	0	1	61	48	1	~495	0
Queue Length 95th (ft)	109	0	10	135	173	6	#963	0
Internal Link Dist (ft)		1199	555		862		886	
Turn Bay Length (ft)				420		150		325
Base Capacity (vph)	201	572	220	492	2256	354	1601	828
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.52	0.01	0.23	0.25	0.00	1.05	0.07

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 1: Route 7 & E Main St/Audley Lane

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕		↖	↗	↗	↖	↗	↗
Traffic Volume (vph)	80	0	289	1	1	0	112	555	0	1	1628	58
Future Volume (vph)	80	0	289	1	1	0	112	555	0	1	1628	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.4	9.4			9.2		8.3	6.4		8.8	6.6	6.6
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.85			1.00		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1553			1817		1687	3374		1687	3374	1509
Flt Permitted	0.95	1.00			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	1553			1863		1687	3374		1687	3374	1509
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	82	0	298	1	1	0	115	572	0	1	1678	60
RTOR Reduction (vph)	0	272	0	0	0	0	0	0	0	0	0	31
Lane Group Flow (vph)	82	26	0	0	2	0	115	572	0	1	1678	29
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	7%	7%	7%
Turn Type	Split	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3			4		1	6		5	2	
Permitted Phases				4					6			2
Actuated Green, G (s)	9.4	9.4			1.3		11.8	61.9		1.0	51.4	51.4
Effective Green, g (s)	9.4	9.4			1.3		11.8	61.9		1.0	51.4	51.4
Actuated g/C Ratio	0.09	0.09			0.01		0.11	0.58		0.01	0.48	0.48
Clearance Time (s)	9.4	9.4			9.2		8.3	6.4		8.8	6.6	6.6
Vehicle Extension (s)	3.0	3.0			4.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	151	135			22		185	1944		15	1614	722
v/s Ratio Prot	c0.05	0.02					c0.07	0.17		0.00	c0.50	
v/s Ratio Perm					c0.00							0.02
v/c Ratio	0.54	0.19			0.09		0.62	0.29		0.07	1.04	0.04
Uniform Delay, d1	46.9	45.5			52.5		45.7	11.6		52.7	28.0	14.9
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.9	0.7			2.4		6.3	0.1		1.9	33.4	0.0
Delay (s)	50.9	46.2			54.9		52.0	11.7		54.6	61.4	14.9
Level of Service	D	D			D		D	B		D	E	B
Approach Delay (s)		47.2			54.9			18.4			59.8	
Approach LOS		D			D			B			E	

Intersection Summary			
HCM 2000 Control Delay	48.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	107.4	Sum of lost time (s)	33.8
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Unsignalized Intersection Capacity Analysis

## 2: Clermont Lane/Access Road & E Main St

10/31/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	11	333	0	0	171	13	0	0	0	35	0	34
Future Volume (Veh/h)	11	333	0	0	171	13	0	0	0	35	0	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	362	0	0	186	14	0	0	0	38	0	37
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (ft)	1279											
pX, platoon unblocked												
vC, conflicting volume	200			362			616	586	362	579	579	193
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	200			362			616	586	362	579	579	193
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	91	100	96
cM capacity (veh/h)	1360			1186			383	419	683	423	422	849
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	374	200	0	75								
Volume Left	12	0	0	38								
Volume Right	0	14	0	37								
cSH	1360	1186	1700	562								
Volume to Capacity	0.01	0.00	0.00	0.13								
Queue Length 95th (ft)	1	0	0	11								
Control Delay (s)	0.3	0.0	0.0	12.4								
Lane LOS	A		A	B								
Approach Delay (s)	0.3	0.0	0.0	12.4								
Approach LOS			A	B								
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization		37.1%		ICU Level of Service	A							
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 3: Parking Lot/Battletown Dr & E Main St

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	11	336	3	0	186	10	3	0	0	26	0	26
Future Volume (Veh/h)	11	336	3	0	186	10	3	0	0	26	0	26
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	1.00	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	365	3	0	202	11	3	0	0	28	0	28
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	213			368			626	604	366	598	600	208
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	213			368			626	604	366	598	600	208
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	100	100	93	100	97
cM capacity (veh/h)	1345			1180			381	409	679	411	411	833
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	380	213	3	56								
Volume Left	12	0	3	28								
Volume Right	3	11	0	28								
cSH	1345	1180	381	551								
Volume to Capacity	0.01	0.00	0.01	0.10								
Queue Length 95th (ft)	1	0	1	8								
Control Delay (s)	0.3	0.0	14.5	12.3								
Lane LOS	A		B	B								
Approach Delay (s)	0.3	0.0	14.5	12.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			1.3									
Intersection Capacity Utilization			36.8%		ICU Level of Service				A			
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 4: Battletown Dr & Bel Voi Dr

10/31/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			Y	Y	
Traffic Volume (veh/h)	0	9	4	17	43	0
Future Volume (Veh/h)	0	9	4	17	43	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	10	4	18	47	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	73	47	47			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	73	47	47			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	928	1022	1560			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	10	22	47			
Volume Left	0	4	0			
Volume Right	10	0	0			
cSH	1022	1560	1700			
Volume to Capacity	0.01	0.00	0.03			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.6	1.3	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.6	1.3	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			1.5			
Intersection Capacity Utilization		14.3%		ICU Level of Service		A
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 5: Battletown Dr & Access Road

10/31/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	
Traffic Volume (veh/h)	0	34	12	5	9	0
Future Volume (Veh/h)	0	34	12	5	9	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	37	13	5	10	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	41	10	10			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	41	10	10			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	99			
cM capacity (veh/h)	963	1071	1610			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	37	18	10			
Volume Left	0	13	0			
Volume Right	37	0	0			
cSH	1071	1610	1700			
Volume to Capacity	0.03	0.01	0.01			
Queue Length 95th (ft)	3	1	0			
Control Delay (s)	8.5	5.3	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.5	5.3	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			6.3			
Intersection Capacity Utilization			17.6%	ICU Level of Service	A	
Analysis Period (min)			15			

Queues

1: Route 7 & E Main St/Audley Lane

10/31/2023



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	84	152	3	314	1982	3	535	46
v/c Ratio	0.42	0.23	0.02	0.73	0.89	0.00	0.54	0.08
Control Delay	43.8	0.8	36.0	39.7	19.8	0.0	28.5	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.8	0.8	36.0	39.7	19.8	0.0	28.5	0.3
Queue Length 50th (ft)	37	0	1	130	335	0	113	0
Queue Length 95th (ft)	106	0	11	#319	#876	0	226	0
Internal Link Dist (ft)		1199	555		862		886	
Turn Bay Length (ft)				420		35		325
Base Capacity (vph)	228	665	239	559	2217	1064	1818	911
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.23	0.01	0.56	0.89	0.00	0.29	0.05

Intersection Summary

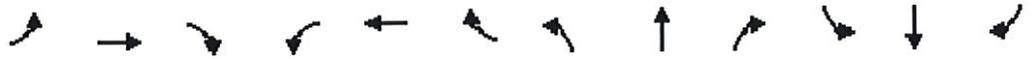
# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 1: Route 7 & E Main St/Audley Lane

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕		↖	↗	↗	↖	↗	↖
Traffic Volume (vph)	77	0	140	0	2	1	289	1823	3	0	492	42
Future Volume (vph)	77	0	140	0	2	1	289	1823	3	0	492	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.4	9.4			9.2		8.3	6.4	6.4		6.6	6.6
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00		0.95	1.00
Fr <sub>t</sub>	1.00	0.85			0.95		1.00	1.00	0.85		1.00	0.85
Fl <sub>t</sub> Protected	0.95	1.00			1.00		0.95	1.00	1.00		1.00	1.00
Satd. Flow (prot)	1736	1553			1779		1687	3374	1509		3374	1509
Fl <sub>t</sub> Permitted	0.95	1.00			1.00		0.95	1.00	1.00		1.00	1.00
Satd. Flow (perm)	1736	1553			1779		1687	3374	1509		3374	1509
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	84	0	152	0	2	1	314	1982	3	0	535	46
RTOR Reduction (vph)	0	136	0	0	1	0	0	0	1	0	0	33
Lane Group Flow (vph)	84	16	0	0	2	0	314	1982	2	0	535	13
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	7%	7%	7%
Turn Type	Split	NA			NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3			4		1	6		5	2	
Permitted Phases				4					6			2
Actuated Green, G (s)	9.4	9.4			1.2		21.0	53.9	53.9		24.4	24.4
Effective Green, g (s)	9.4	9.4			1.2		21.0	53.9	53.9		24.4	24.4
Actuated g/C Ratio	0.11	0.11			0.01		0.23	0.60	0.60		0.27	0.27
Clearance Time (s)	9.4	9.4			9.2		8.3	6.4	6.4		6.6	6.6
Vehicle Extension (s)	3.0	3.0			4.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	182	163			23		395	2031	908		919	411
v/s Ratio Prot	c0.05	0.01			c0.00		0.19	c0.59			0.16	
v/s Ratio Perm									0.00			0.01
v/c Ratio	0.46	0.10			0.09		0.79	0.98	0.00		0.58	0.03
Uniform Delay, d <sub>1</sub>	37.7	36.2			43.6		32.2	17.2	7.1		28.1	23.9
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d <sub>2</sub>	1.9	0.3			2.2		10.6	14.6	0.0		0.9	0.0
Delay (s)	39.5	36.5			45.8		42.8	31.7	7.1		29.1	23.9
Level of Service	D	D			D		D	C	A		C	C
Approach Delay (s)		37.6			45.8			33.2			28.7	
Approach LOS		D			D			C			C	

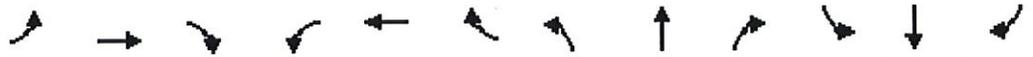
### Intersection Summary

HCM 2000 Control Delay	32.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	89.5	Sum of lost time (s)	33.8
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Unsignalized Intersection Capacity Analysis

## 2: Clermont Lane/Access Road & E Main St

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	39	193	0	0	314	41	0	0	0	24	0	23
Future Volume (Veh/h)	39	193	0	0	314	41	0	0	0	24	0	23
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	42	210	0	0	341	45	0	0	0	26	0	25
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (ft)	1279											
pX, platoon unblocked												
vC, conflicting volume	386			210			682	680	210	658	658	364
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	386			210			682	680	210	658	658	364
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			100	100	100	93	100	96
cM capacity (veh/h)	1162			1349			341	360	830	367	371	681
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	252	386	0	51								
Volume Left	42	0	0	26								
Volume Right	0	45	0	25								
cSH	1162	1349	1700	475								
Volume to Capacity	0.04	0.00	0.00	0.11								
Queue Length 95th (ft)	3	0	0	9								
Control Delay (s)	1.7	0.0	0.0	13.5								
Lane LOS	A		A	B								
Approach Delay (s)	1.7	0.0	0.0	13.5								
Approach LOS			A	B								
Intersection Summary												
Average Delay				1.6								
Intersection Capacity Utilization				44.7%	ICU Level of Service	A						
Analysis Period (min)				15								

# HCM Unsignalized Intersection Capacity Analysis

## 3: Parking Lot/Battletown Dr & E Main St

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	33	235	0	1	338	28	0	0	0	15	0	24
Future Volume (Veh/h)	33	235	0	1	338	28	0	0	0	15	0	24
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	35	253	0	1	363	30	0	0	0	16	0	26
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	393			253			729	718	253	703	703	378
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	393			253			729	718	253	703	703	378
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			100	100	100	95	100	96
cM capacity (veh/h)	1155			1301			318	344	786	344	351	669
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	288	394	0	42								
Volume Left	35	1	0	16								
Volume Right	0	30	0	26								
cSH	1155	1301	1700	492								
Volume to Capacity	0.03	0.00	0.00	0.09								
Queue Length 95th (ft)	2	0	0	7								
Control Delay (s)	1.3	0.0	0.0	13.0								
Lane LOS	A	A	A	B								
Approach Delay (s)	1.3	0.0	0.0	13.0								
Approach LOS			A	B								
Intersection Summary												
Average Delay			1.3									
Intersection Capacity Utilization			47.1%		ICU Level of Service					A		
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 4: Battletown Dr & Bel Voi Dr

10/31/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	8	8	55	33	0
Future Volume (Veh/h)	0	8	8	55	33	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	9	9	60	36	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	114	36	36			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	114	36	36			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	877	1037	1575			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	9	69	36			
Volume Left	0	9	0			
Volume Right	9	0	0			
cSH	1037	1575	1700			
Volume to Capacity	0.01	0.01	0.02			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.5	1.0	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.5	1.0	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay				1.3		
Intersection Capacity Utilization				19.6%	ICU Level of Service	A
Analysis Period (min)				15		

# HCM Unsignalized Intersection Capacity Analysis

## 5: Battletown Dr & Access Road

10/31/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	23	39	15	10	0
Future Volume (Veh/h)	0	23	39	15	10	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	25	42	16	11	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	111	11	11			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	111	11	11			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	97			
cM capacity (veh/h)	863	1070	1608			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	25	58	11			
Volume Left	0	42	0			
Volume Right	25	0	0			
cSH	1070	1608	1700			
Volume to Capacity	0.02	0.03	0.01			
Queue Length 95th (ft)	2	2	0			
Control Delay (s)	8.4	5.3	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.4	5.3	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			5.5			
Intersection Capacity Utilization			19.6%	ICU Level of Service	A	
Analysis Period (min)			15			

# APPENDIX H VDOT TURN LANE WARRANT ANALYSIS



# Right Turn Lane Treatment Warrant Assessment

Project: Friant Property  
 Jurisdiction: Town of Berryville/Clarke County, Virginia

Intersection: East Main Street / Clermont Lane

Section: 2-Lane Highway

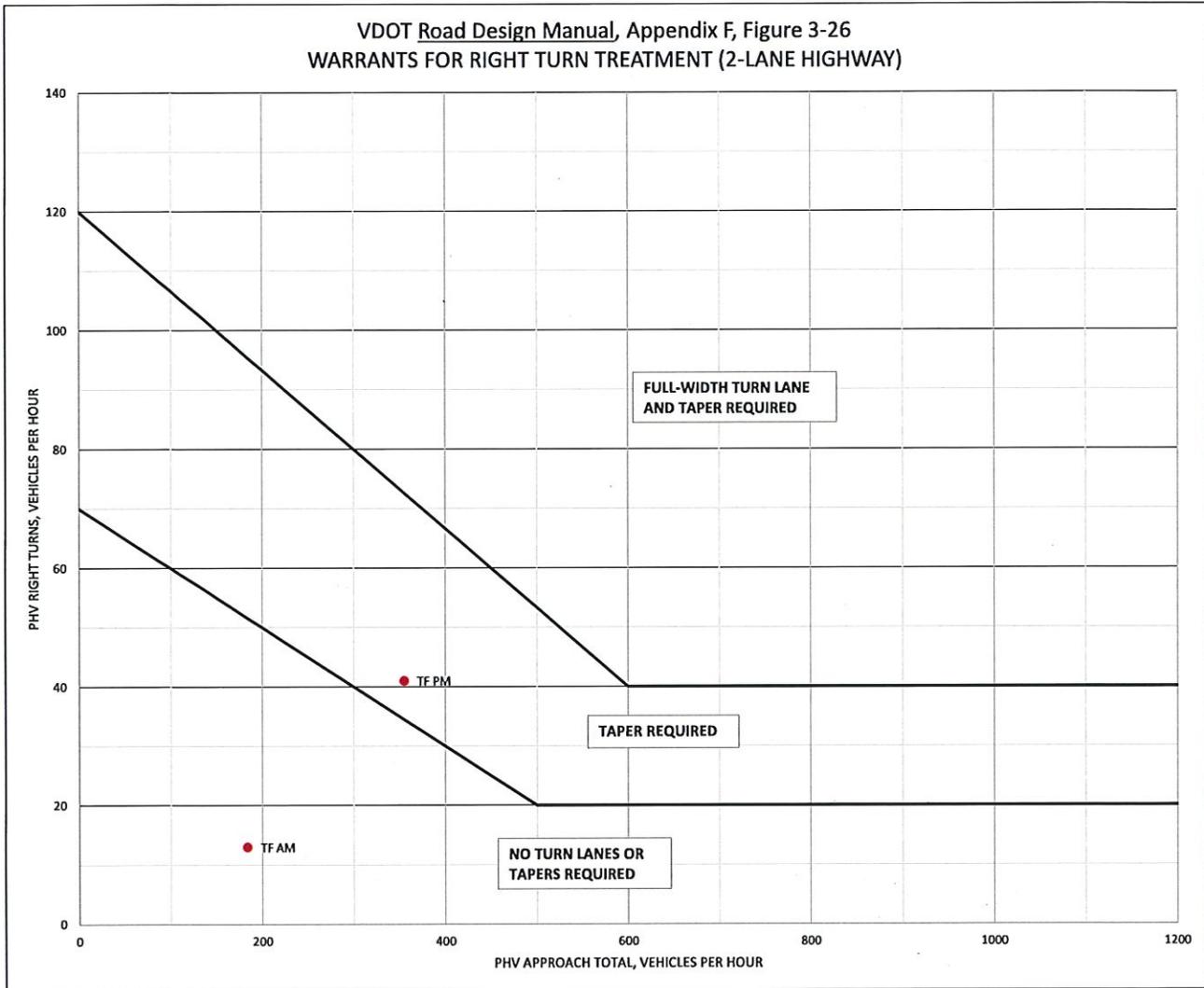
Approach: Westbound

Approach Posted Speed: ≤45 MPH

Adjustment for Right Turns? No

For posted speeds ≤ 45 MPH, right turns >40, and approach total <300, reduce right turns by 20.

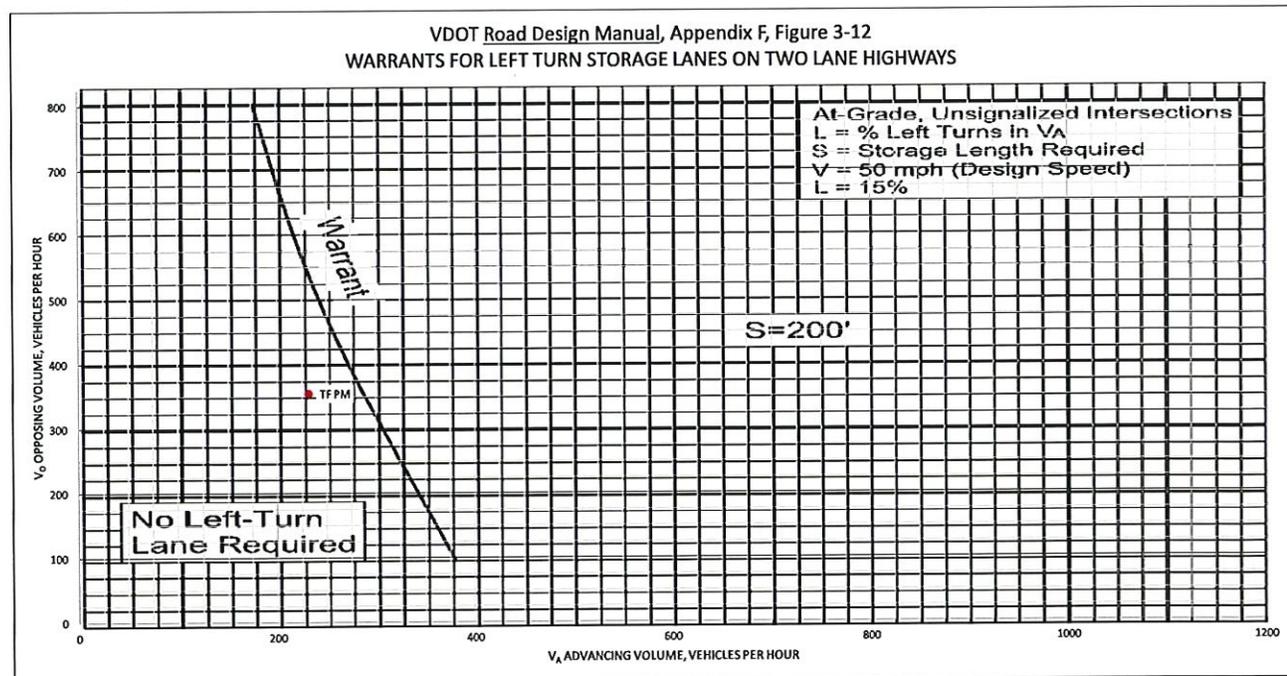
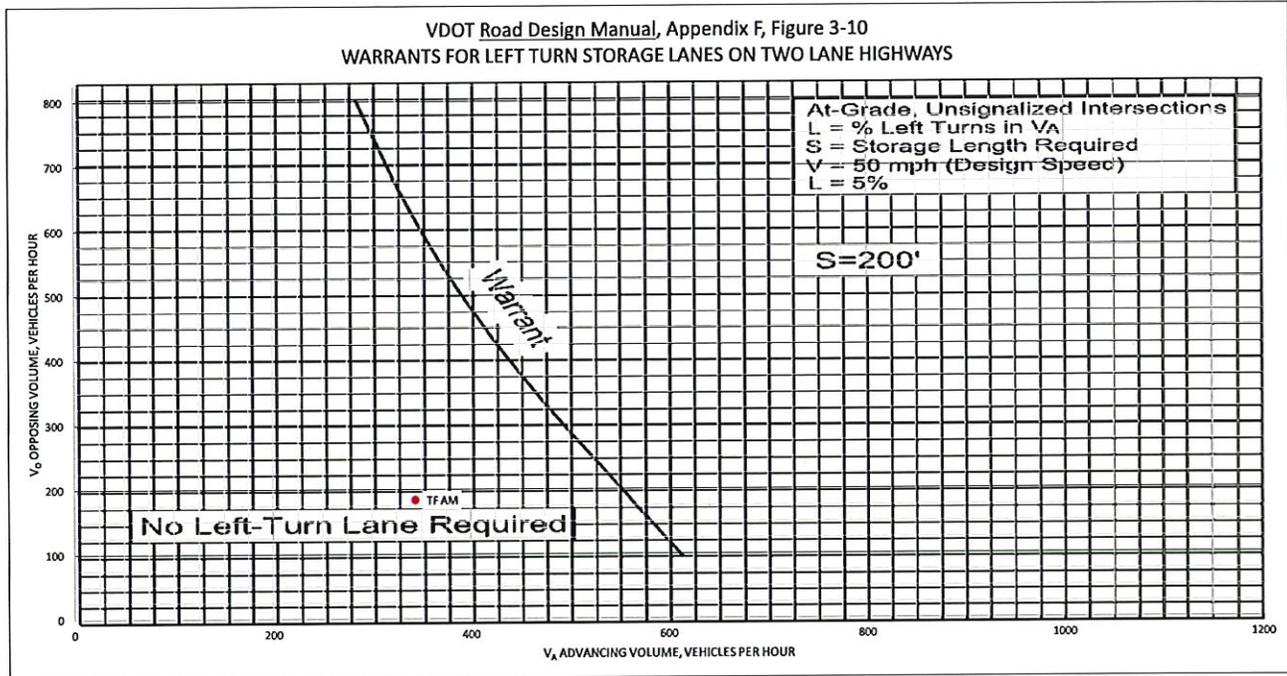
Scenario	Approach Total, Vehicles per Hour	Right Turns, Vehicles per Hour	Taper Only Warranted at # Right Turns	Full-width Turn Lane and Taper Warranted at # Right Turns	Warranted Treatment
TF AM	184	13	51.6	96	No Turn Lanes or Tapers Required
TF PM	355	41	34.5	73	Taper Required



# Left Turn Lane Treatment Warrant Assessment

Project: Friant Property  
 Jurisdiction: Town of Berryville/Clarke County, Virginia  
 Intersection: East Main Street / Clermont Lane  
 Section: 4-Lane Highway Undivided  
 Approach: Eastbound  
 Design Speed: 50 MPH

Scenario	Advancing Volumes, Vehicles per Hour	Left Turns, Vehicles per Hour	% Left Turns in Advancing Volumes	Opposing Volumes, Vehicles per Hour	Appropriate Figure	Warranted Treatment
TF AM	344	11	3.2%	184	Figure 3-10	No Left-Turn Required
TF PM	232	39	16.8%	355	Figure 3-12	No Left-Turn Required



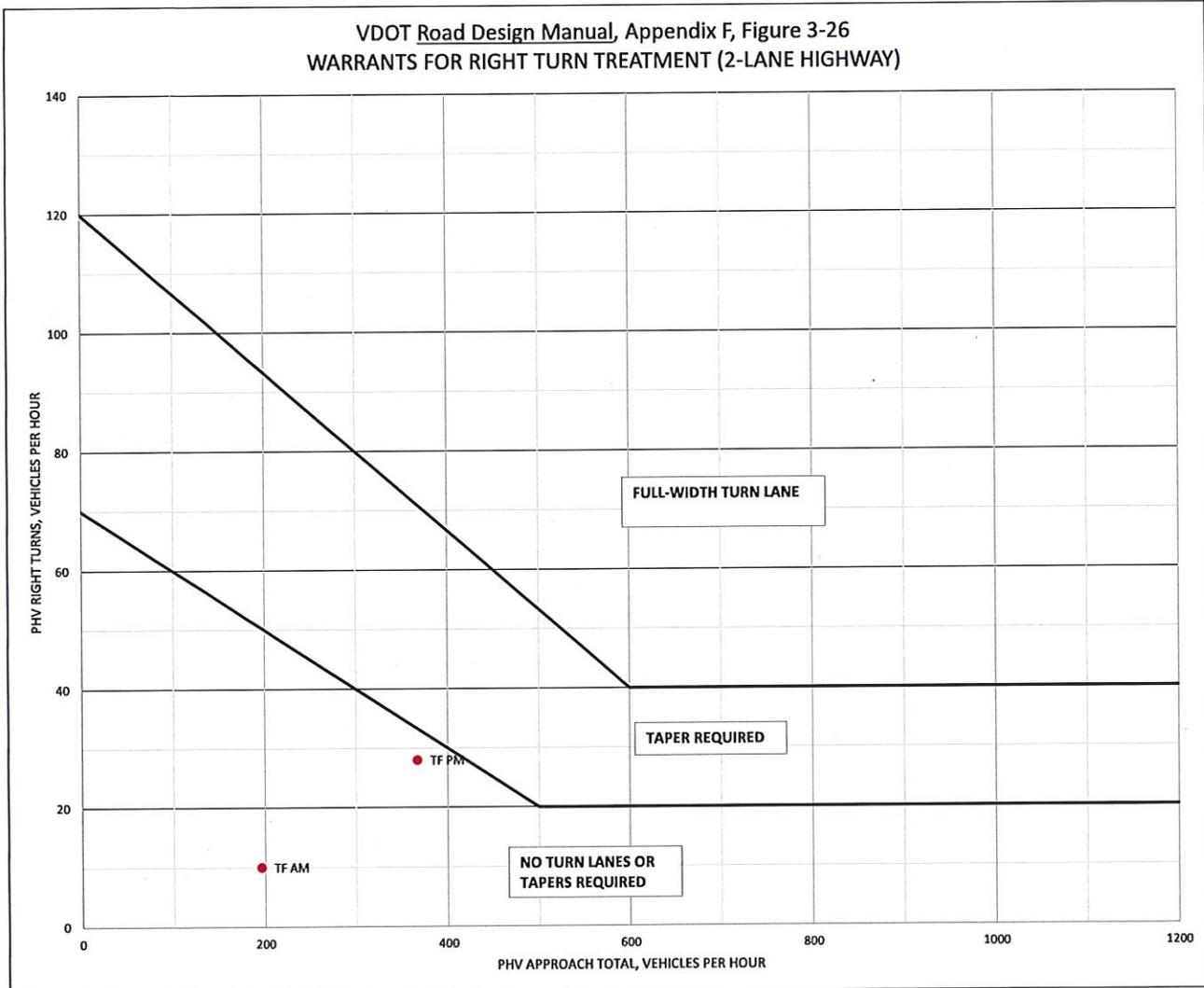
# Right Turn Lane Treatment Warrant Assessment

**Project:** Friant Property  
**Jurisdiction:** Town of Berryville/Clarke County, Virginia  
**Intersection:** East Main Street / Battletown Drive  
**Section:** 2-Lane Highway  
**Approach:** Westbound  
**Approach Posted Speed:** ≤45 MPH  
**Adjustment for Right Turns?** No

For posted speeds ≤ 45 MPH, right turns >40, and approach total <300, reduce right turns by 20.

Scenario	Approach Total, Vehicles per Hour	Right Turns, Vehicles per Hour	Taper Only Warranted at # Right Turns	Full-width Turn Lane and Taper Warranted at # Right Turns	Warranted Treatment
TF AM	196	10	50.4	94	No Turn Lanes or Tapers Required
TF PM	367	28	33.3	72	No Turn Lanes or Tapers Required

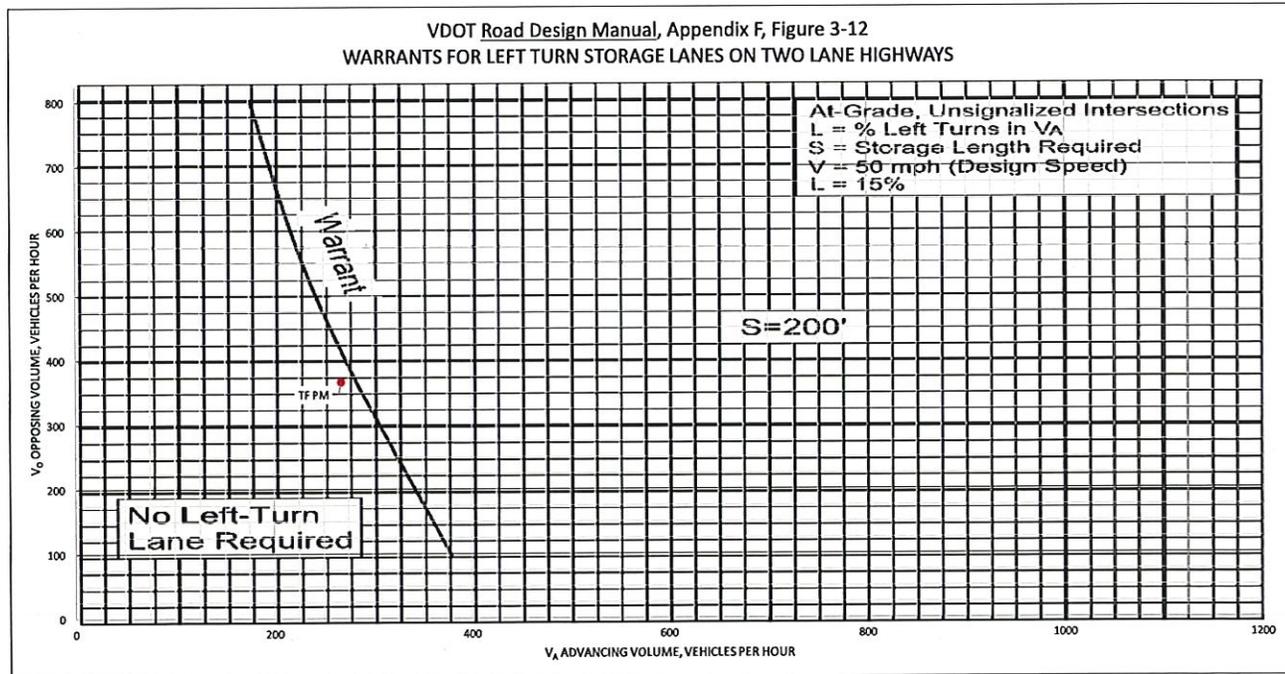
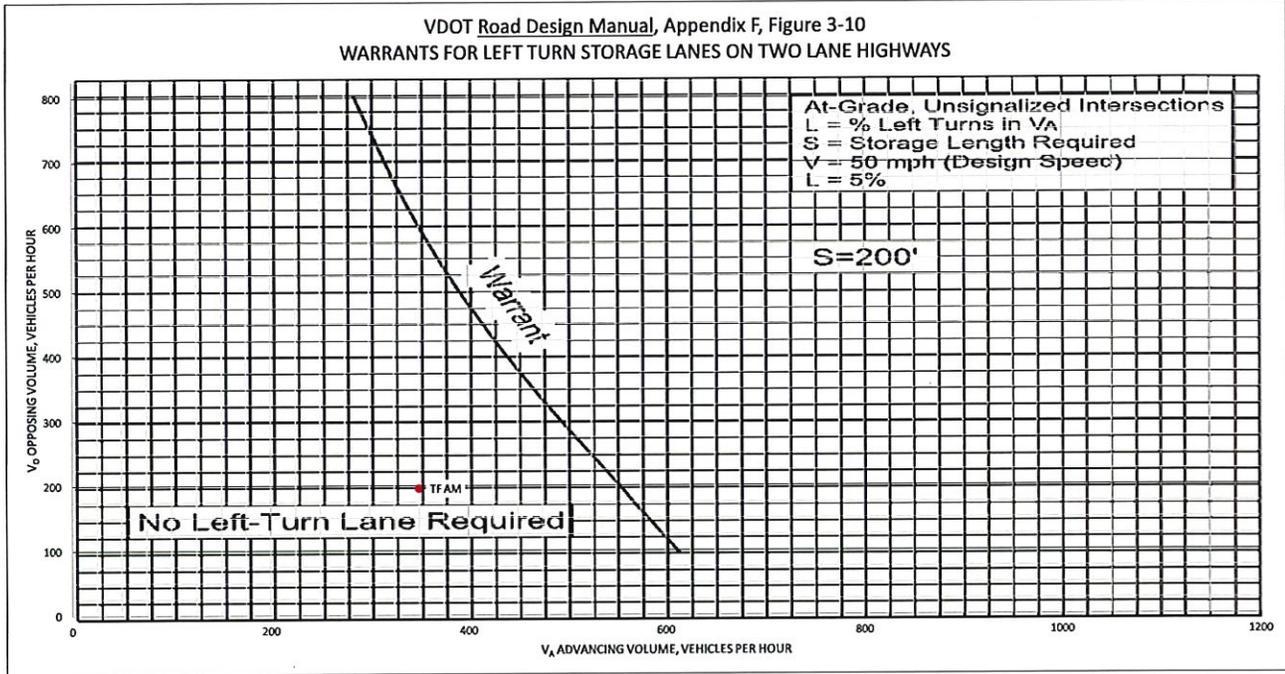
VDOT Road Design Manual, Appendix F, Figure 3-26  
**WARRANTS FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)**



# Left Turn Lane Treatment Warrant Assessment

**Project:** Friant Property  
**Jurisdiction:** Town of Berryville/Clarke County, Virginia  
**Intersection:** East Main Street / Battletown Drive  
**Section:** 4-Lane Highway Undivided  
**Approach:** Eastbound  
**Design Speed:** 50 MPH

Scenario	Advancing Volumes, Vehicles per Hour	Left Turns, Vehicles per Hour	% Left Turns in Advancing Volumes	Opposing Volumes, Vehicles per Hour	Appropriate Figure	Warranted Treatment
TF AM	350	11	3.1%	196	Figure 3-10	No Left-Turn Required
TF PM	268	33	12.3%	367	Figure 3-12	No Left-Turn Required



**APPENDIX I**  
**TOTAL FUTURE (2026) CONDITIONS ANALYSIS WITHOUT**  
**BATTLETOWN DRIVE ACCESS (SYNCHRO REPORTS)**



Queues

1: Route 7 & E Main St/Audley Lane

10/31/2023



Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	82	298	2	115	572	1	1678	60
v/c Ratio	0.77	0.52	0.01	0.54	0.26	0.01	1.06	0.07
Control Delay	85.5	3.4	44.5	49.3	8.8	47.0	68.1	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	85.5	3.4	44.5	49.3	8.8	47.0	68.1	0.2
Queue Length 50th (ft)	46	0	1	62	51	1	~540	0
Queue Length 95th (ft)	#160	0	10	135	173	6	#963	0
Internal Link Dist (ft)		1199	555		862		886	
Turn Bay Length (ft)				420		150		325
Base Capacity (vph)	106	570	216	485	2223	349	1577	819
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.52	0.01	0.24	0.26	0.00	1.06	0.07

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 1: Route 7 & E Main St/Audley Lane

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕		↖	↗	↗	↖	↗	↖
Traffic Volume (vph)	80	0	289	1	1	0	112	555	0	1	1628	58
Future Volume (vph)	80	0	289	1	1	0	112	555	0	1	1628	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.4	9.4			9.2		8.3	6.4		8.8	6.6	6.6
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	1.00
Fr <sub>t</sub>	1.00	0.85			1.00		1.00	1.00		1.00	1.00	0.85
Fl <sub>t</sub> Protected	0.95	1.00			0.98		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	1553			1817		1687	3374		1687	3374	1509
Fl <sub>t</sub> Permitted	0.51	1.00			1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	936	1553			1863		1687	3374		1687	3374	1509
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	82	0	298	1	1	0	115	572	0	1	1678	60
RTOR Reduction (vph)	0	269	0	0	0	0	0	0	0	0	0	32
Lane Group Flow (vph)	82	29	0	0	2	0	115	572	0	1	1678	28
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	7%	7%	7%
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		3			4		1	6		5	2	
Permitted Phases	3			4					6			2
Actuated Green, G (s)	10.7	10.7			1.3		11.8	61.8		1.0	51.3	51.3
Effective Green, g (s)	10.7	10.7			1.3		11.8	61.8		1.0	51.3	51.3
Actuated g/C Ratio	0.10	0.10			0.01		0.11	0.57		0.01	0.47	0.47
Clearance Time (s)	9.4	9.4			9.2		8.3	6.4		8.8	6.6	6.6
Vehicle Extension (s)	3.0	3.0			4.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	92	153			22		183	1920		15	1593	712
v/s Ratio Prot		0.02					c0.07	0.17		0.00	c0.50	
v/s Ratio Perm	c0.09				c0.00							0.02
v/c Ratio	0.89	0.19			0.09		0.63	0.30		0.07	1.05	0.04
Uniform Delay, d <sub>1</sub>	48.4	45.0			53.1		46.3	12.1		53.3	28.6	15.4
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d <sub>2</sub>	59.6	0.6			2.4		6.6	0.1		1.9	38.1	0.0
Delay (s)	108.0	45.6			55.5		52.9	12.2		55.2	66.7	15.4
Level of Service	F	D			E		D	B		E	E	B
Approach Delay (s)		59.1			55.5			19.0			65.0	
Approach LOS		E			E			B			E	

### Intersection Summary

HCM 2000 Control Delay	52.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	108.6	Sum of lost time (s)	33.8
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Unsignalized Intersection Capacity Analysis

## 2: Clermont Lane/Access Road & E Main St

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	18	316	0	0	165	18	0	0	0	52	0	52
Future Volume (Veh/h)	18	316	0	0	165	18	0	0	0	52	0	52
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	343	0	0	179	20	0	0	0	57	0	57
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (ft)	1279											
pX, platoon unblocked												
vC, conflicting volume	199			343			629	582	343	572	572	189
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	199			343			629	582	343	572	572	189
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	87	100	93
cM capacity (veh/h)	1361			1205			364	418	700	426	424	853
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	363	199	0	114								
Volume Left	20	0	0	57								
Volume Right	0	20	0	57								
cSH	1361	1205	1700	568								
Volume to Capacity	0.01	0.00	0.00	0.20								
Queue Length 95th (ft)	1	0	0	19								
Control Delay (s)	0.6	0.0	0.0	12.9								
Lane LOS	A		A	B								
Approach Delay (s)	0.6	0.0	0.0	12.9								
Approach LOS			A	B								
Intersection Summary												
Average Delay				2.5								
Intersection Capacity Utilization				43.5%	ICU Level of Service	A						
Analysis Period (min)				15								

# HCM Unsignalized Intersection Capacity Analysis

## 3: Parking Lot/Battletown Dr & E Main St

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	5	343	3	0	204	4	3	0	0	10	0	8
Future Volume (Veh/h)	5	343	3	0	204	4	3	0	0	10	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	1.00	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	373	3	0	222	4	3	0	0	11	0	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	226			376			618	610	374	608	610	224
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	226			376			618	610	374	608	610	224
iC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
iC, 2 stage (s)												
iF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	97	100	99
cM capacity (veh/h)	1331			1172			396	407	672	406	408	815
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	381	226	3	20								
Volume Left	5	0	3	11								
Volume Right	3	4	0	9								
cSH	1331	1172	396	525								
Volume to Capacity	0.00	0.00	0.01	0.04								
Queue Length 95th (ft)	0	0	1	3								
Control Delay (s)	0.1	0.0	14.2	12.1								
Lane LOS	A		B	B								
Approach Delay (s)	0.1	0.0	14.2	12.1								
Approach LOS			B	B								
Intersection Summary												
Average Delay			0.5									
Intersection Capacity Utilization			32.2%	ICU Level of Service							A	
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 4: Battletown Dr & Bel Voi Dr

10/31/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	
Traffic Volume (veh/h)	0	9	4	5	9	0
Future Volume (Veh/h)	0	9	4	5	9	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	10	4	5	10	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	23	10	10			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	23	10	10			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	991	1071	1610			
<b>Direction, Lane #</b>						
	EB 1	NB 1	SB 1			
Volume Total	10	9	10			
Volume Left	0	4	0			
Volume Right	10	0	0			
cSH	1071	1610	1700			
Volume to Capacity	0.01	0.00	0.01			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.4	3.2	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.4	3.2	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			3.9			
Intersection Capacity Utilization			13.8%	ICU Level of Service	A	
Analysis Period (min)			15			

Queues

1: Route 7 & E Main St/Audley Lane

10/31/2023



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	84	152	3	314	1982	3	535	46
v/c Ratio	0.97	0.23	0.02	0.74	0.91	0.00	0.55	0.08
Control Delay	129.4	0.8	36.0	40.6	21.5	0.0	29.2	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	129.4	0.8	36.0	40.6	21.5	0.0	29.2	0.3
Queue Length 50th (ft)	40	0	1	133	358	0	116	0
Queue Length 95th (ft)	#172	0	11	#319	#876	0	226	0
Internal Link Dist (ft)		1199	555		862		886	
Turn Bay Length (ft)				420		35		325
Base Capacity (vph)	87	662	235	548	2179	1049	1784	898
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.97	0.23	0.01	0.57	0.91	0.00	0.30	0.05

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis  
 1: Route 7 & E Main St/Audley Lane

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕		↖	↕	↗	↖	↕	↗
Traffic Volume (vph)	77	0	140	0	2	1	289	1823	3	0	492	42
Future Volume (vph)	77	0	140	0	2	1	289	1823	3	0	492	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	9.4	9.4			9.2		8.3	6.4	6.4		6.6	6.6
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00		0.95	1.00
Frt	1.00	0.85			0.95		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00	1.00		1.00	1.00
Satd. Flow (prot)	1736	1553			1779		1687	3374	1509		3374	1509
Flt Permitted	0.37	1.00			1.00		0.95	1.00	1.00		1.00	1.00
Satd. Flow (perm)	677	1553			1779		1687	3374	1509		3374	1509
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	84	0	152	0	2	1	314	1982	3	0	535	46
RTOR Reduction (vph)	0	134	0	0	1	0	0	0	1	0	0	34
Lane Group Flow (vph)	84	18	0	0	2	0	314	1982	2	0	535	12
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	7%	7%	7%	7%	7%	7%
Turn Type	Perm	NA			NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		3			4		1	6		5	2	
Permitted Phases	3			4					6			2
Actuated Green, G (s)	10.8	10.8			1.3		21.1	53.8	53.8		24.2	24.2
Effective Green, g (s)	10.8	10.8			1.3		21.1	53.8	53.8		24.2	24.2
Actuated g/C Ratio	0.12	0.12			0.01		0.23	0.59	0.59		0.27	0.27
Clearance Time (s)	9.4	9.4			9.2		8.3	6.4	6.4		6.6	6.6
Vehicle Extension (s)	3.0	3.0			4.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	80	184			25		391	1996	893		898	401
v/s Ratio Prot		0.01			c0.00		0.19	c0.59			0.16	
v/s Ratio Perm	c0.12								0.00			0.01
v/c Ratio	1.05	0.10			0.08		0.80	0.99	0.00		0.60	0.03
Uniform Delay, d1	40.1	35.7			44.2		32.9	18.4	7.6		29.1	24.7
Progression Factor	1.00	1.00			1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	115.0	0.2			1.9		11.3	18.4	0.0		1.1	0.0
Delay (s)	155.0	35.9			46.1		44.3	36.8	7.6		30.2	24.7
Level of Service	F	D			D		D	D	A		C	C
Approach Delay (s)		78.3			46.1			37.7			29.7	
Approach LOS		E			D			D			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			39.3			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			1.13									
Actuated Cycle Length (s)			90.9			Sum of lost time (s)			33.8			
Intersection Capacity Utilization			86.0%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis  
 2: Clermont Lane/Access Road & E Main St

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	60	182	0	0	295	60	0	0	0	35	0	35
Future Volume (Veh/h)	60	182	0	0	295	60	0	0	0	35	0	35
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	198	0	0	321	65	0	0	0	38	0	38
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (ft)	1279											
pX, platoon unblocked												
vC, conflicting volume	386			198			720	714	198	682	682	354
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	386			198			720	714	198	682	682	354
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			100			100	100	100	89	100	94
cM capacity (veh/h)	1162			1363			311	337	843	349	352	690
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	263	386	0	76								
Volume Left	65	0	0	38								
Volume Right	0	65	0	38								
cSH	1162	1363	1700	463								
Volume to Capacity	0.06	0.00	0.00	0.16								
Queue Length 95th (ft)	4	0	0	15								
Control Delay (s)	2.4	0.0	0.0	14.3								
Lane LOS	A		A	B								
Approach Delay (s)	2.4	0.0	0.0	14.3								
Approach LOS			A	B								
Intersection Summary												
Average Delay				2.4								
Intersection Capacity Utilization				46.2%	ICU Level of Service	A						
Analysis Period (min)				15								

# HCM Unsignalized Intersection Capacity Analysis

## 3: Parking Lot/Battletown Dr & E Main St

10/31/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	13	256	0	1	350	9	0	0	0	4	0	12
Future Volume (Veh/h)	13	256	0	1	350	9	0	0	0	4	0	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	14	275	0	1	376	10	0	0	0	4	0	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	386			275			699	691	275	686	686	381
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	386			275			699	691	275	686	686	381
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	100	100	99	100	98
cM capacity (veh/h)	1162			1277			344	363	764	358	365	666
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	289	387	0	17								
Volume Left	14	1	0	4								
Volume Right	0	10	0	13								
cSH	1162	1277	1700	554								
Volume to Capacity	0.01	0.00	0.00	0.03								
Queue Length 95th (ft)	1	0	0	2								
Control Delay (s)	0.5	0.0	0.0	11.7								
Lane LOS	A	A	A	B								
Approach Delay (s)	0.5	0.0	0.0	11.7								
Approach LOS			A	B								
Intersection Summary												
Average Delay			0.5									
Intersection Capacity Utilization			33.3%		ICU Level of Service					A		
Analysis Period (min)			15									

# HCM Unsignalized Intersection Capacity Analysis

## 4: Battletown Dr & Bel Voi Dr

10/31/2023



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	8	8	16	10	0
Future Volume (Veh/h)	0	8	8	16	10	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	9	9	17	11	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	46	11	11			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	46	11	11			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	959	1070	1608			
<b>Direction, Lane #</b>						
	EB 1	NB 1	SB 1			
Volume Total	9	26	11			
Volume Left	0	9	0			
Volume Right	9	0	0			
cSH	1070	1608	1700			
Volume to Capacity	0.01	0.01	0.01			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	8.4	2.5	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.4	2.5	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			3.1			
Intersection Capacity Utilization			17.9%	ICU Level of Service	A	
Analysis Period (min)			15			

# APPENDIX J

## TURN LANE WARRANTS WITHOUT BATTLETOWN DRIVE ACCESS

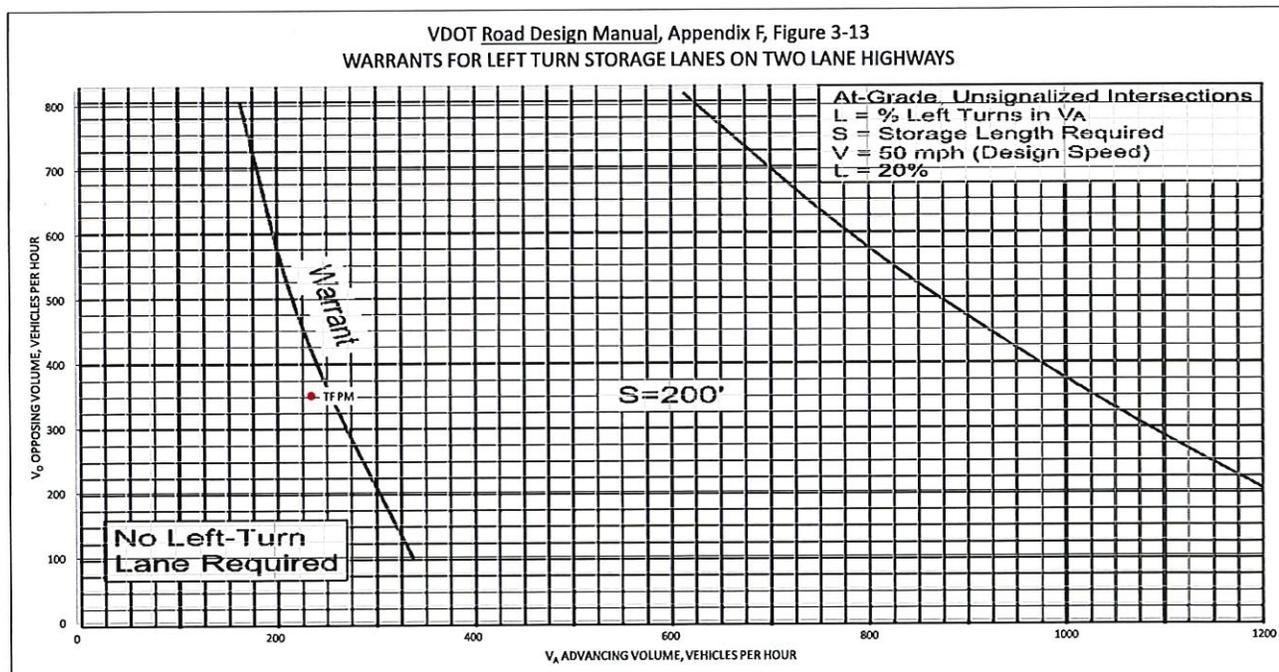
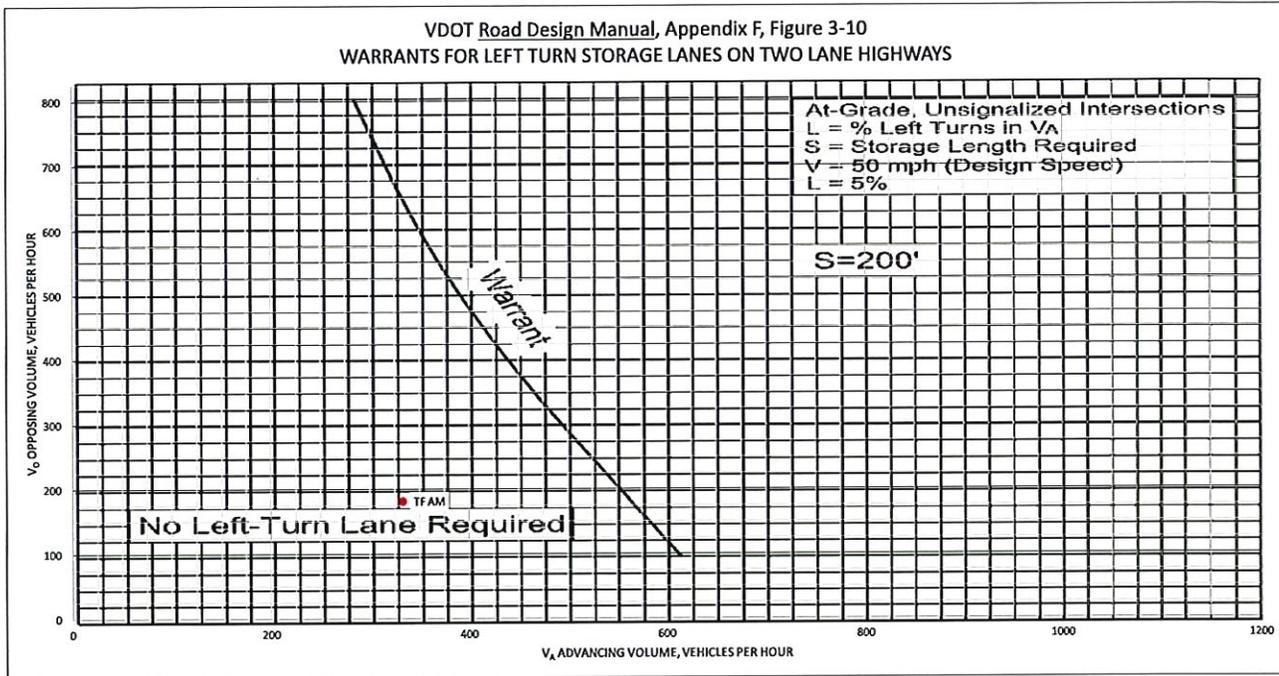


# Left Turn Lane Treatment Warrant Assessment

Project: Friant Property  
 Jurisdiction: Town of Berryville/Clarke County, Virginia  
 Intersection: East Main Street / Clermont Lane  
 Section: 4-Lane Highway Undivided  
 Approach: Eastbound  
 Design Speed: 50 MPH

**185 DU density - left turn is not warranted**

Scenario	Advancing Volumes, Vehicles per Hour	Left Turns, Vehicles per Hour	% Left Turns in Advancing Volumes	Opposing Volumes, Vehicles per Hour	Appropriate Figure	Warranted Treatment
TF AM	333	17	5.1%	182	Figure 3-10	No Left-Turn Required
TF PM	238	56	23.5%	351	Figure 3-12	No Left-Turn Required



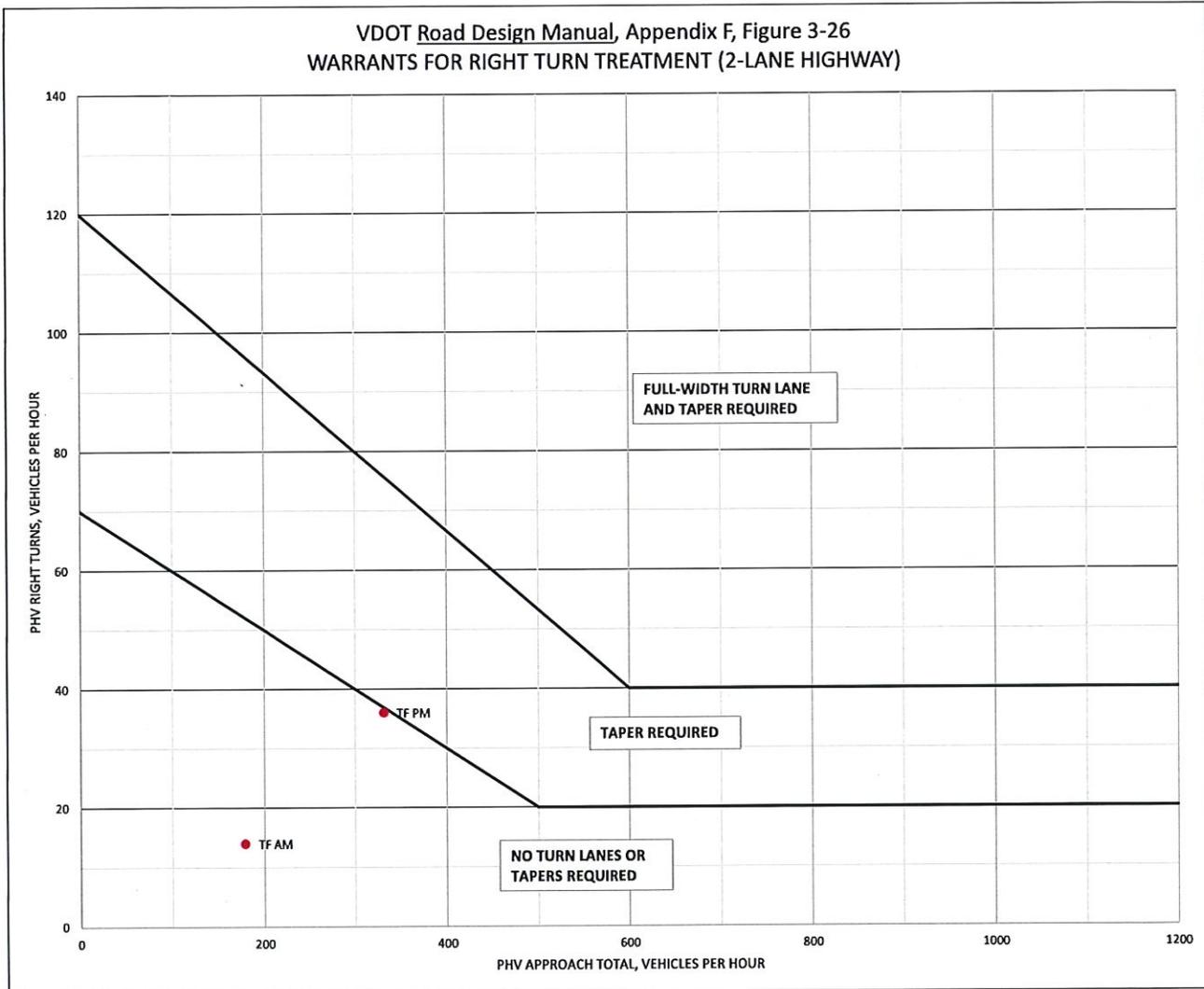
# Right Turn Lane Treatment Warrant Assessment

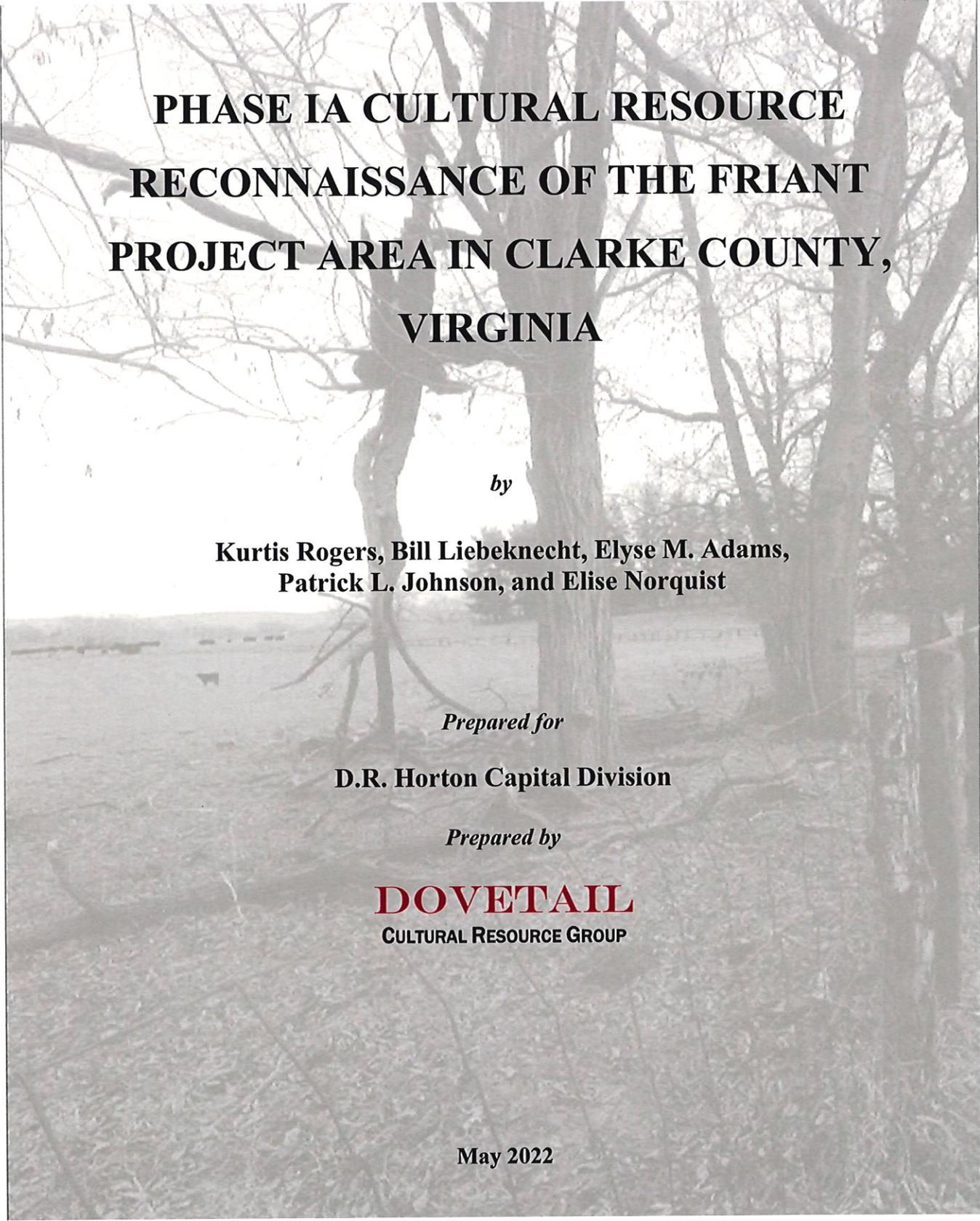
Project: Friant Property  
 Jurisdiction: Town of Berryville/Clarke County, Virginia  
 Intersection: East Main Street / Clermont Lane  
 Section: 2-Lane Highway  
 Approach: Westbound  
 Approach Posted Speed: ≤45 MPH  
 Adjustment for Right Turns? No

**117 DU density - right turn taper is not warranted**

For posted speeds ≤ 45 MPH, right turns >40, and approach total <300, reduce right turns by 20.

Scenario	Approach Total, Vehicles per Hour	Right Turns, Vehicles per Hour	Taper Only Warranted at # Right Turns	Full-width Turn Lane and Taper Warranted at # Right Turns	Warranted Treatment
TF AM	179	14	52.1	97	No Turn Lanes or Tapers Required
TF PM	331	36	36.9	76	No Turn Lanes or Tapers Required





**PHASE IA CULTURAL RESOURCE  
RECONNAISSANCE OF THE FRIANT  
PROJECT AREA IN CLARKE COUNTY,  
VIRGINIA**

*by*

**Kurtis Rogers, Bill Liebeknecht, Elyse M. Adams,  
Patrick L. Johnson, and Elise Norquist**

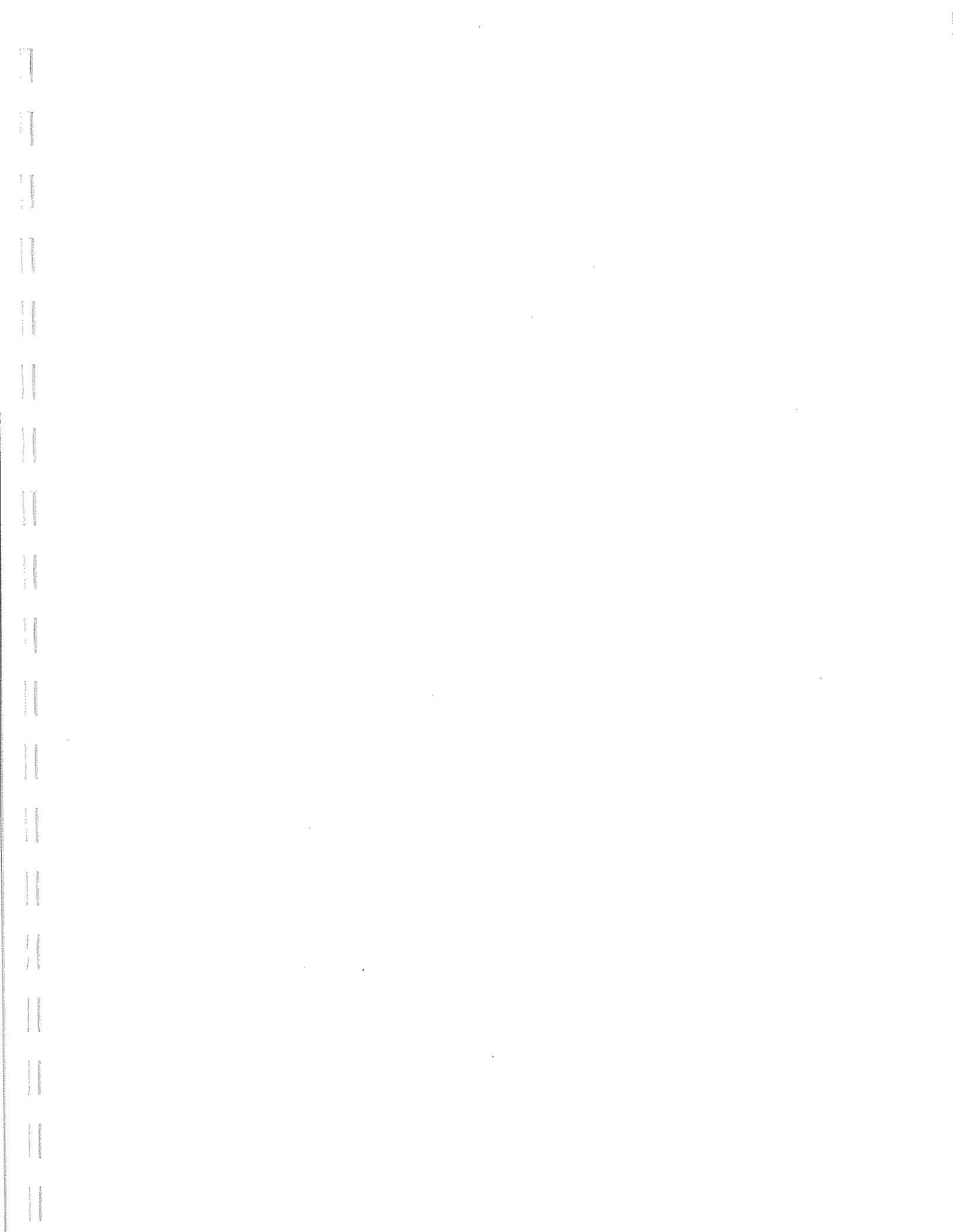
*Prepared for*

**D.R. Horton Capital Division**

*Prepared by*

**DOVETAIL**  
CULTURAL RESOURCE GROUP

May 2022



**Phase IA Cultural Resource Reconnaissance of the  
Friant Project in Clarke County, Virginia**

*by*

Kurtis Rogers, Bill Liebeknecht, Elyse M. Adams,  
Patrick L. Johnson, and Elise Norquist

*Prepared for*

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Dovetail Job #21-071  
May 2022

  
Kerri Barile, Principal Investigator  
Dovetail Cultural Resource Group

May 4, 2022  
Date

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## ABSTRACT

Dovetail Cultural Resource Group (Dovetail) conducted a Phase IA cultural resource reconnaissance for the Friant project area for D.R. Horton Capital Division in December 2021. The approximately 98.1-acre (39.7-ha) project area (referred to herein as the project footprint/limits of disturbance) is located in central Clarke County, Virginia. The Phase IA study was intended to determine the location, nature, and, if possible, extent, of any cultural features visible on the surface and to identify areas with the potential to contain archaeological sites as well as above-ground resources over 50 years in age. This study included recommendations regarding whether a Phase IB cultural resource investigation is warranted prior to the proposed development of the project area, and how much of the project area should be subjected to such an investigation.

The Phase IA archaeological reconnaissance study included a pedestrian survey of the project area. No subsurface excavations were conducted during this phase of work. The studies resulted in the definition of locations suitable for subsurface archaeological investigations within the project area based on the probability of encountering intact archaeological resources. Based on the background research and the amount of visibly undisturbed area observed during the pedestrian survey, Dovetail recommends that a **Phase IB archaeological survey of the entire 98.1-acre (39.7-ha) project area is warranted.**

The goal of the architectural fieldwork was to locate above-ground resources over 50 years in age located within the architectural project area that may require identification-level (Phase IB) architectural survey. The architectural project area for this fieldwork included the project area plus a 300-foot (91.44-m) buffer to account for the surrounding viewshed.

Three previously recorded architectural resources are within the architectural project area, only one of which partially overlaps the project footprint. Bel Voi (021-0142), a sliver of which is located in the limits of disturbance, was determined not eligible for the National Register of Historic Places (NRHP) by the Virginia Department of Historic Resources (DHR) in 1992. Given that it has not been resurveyed within the last five years, Dovetail **recommends that it be resurveyed at the Phase IB level to meet state guidelines.** The Norfolk and Western Railroad Corridor (021-5007) was determined not eligible and has been surveyed within the last five year; as such, Dovetail **recommends that it not be resurveyed.** The Long Marsh Run Rural Historic District (021-0967) was listed in the NRHP and Virginia Landmarks Register (VLR) by DHR staff in 2013. Because this resource has not been resurveyed within the last five years, Dovetail **recommends a resurvey at the Phase IB level.**

Thirty-four newly identified resources, all in the architectural project area but not in the project footprint, meet the architectural survey criteria. These include 29 twentieth-century single-family dwellings as well as five twentieth-century industrial buildings. Dovetail **recommends that all newly identified resources within the architectural project study area should be the subject of a Phase IB reconnaissance-level survey.**

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## TABLE OF CONTENTS

ABSTRACT.....	i
INTRODUCTION .....	1
PROJECT AREA DESCRIPTION.....	5
ENVIRONMENTAL SETTING .....	7
Geology and Topography .....	7
Hydrology .....	7
Soils.....	7
HISTORIC CONTEXT .....	11
Precontact Periods.....	11
Pre-Clovis (Pre-13,000 BP) .....	11
Paleoindian Period (13,000–10,000 BP).....	12
Archaic Period (10,000–3200 BP).....	12
Woodland Period (3200–400 BP).....	13
Historic Period .....	14
Contact Period (1607–1750).....	14
Colony to Nation (1751–1789).....	15
Early National Period (1790–1829).....	16
Antebellum Period (1830–1860).....	16
Civil War (1861–1865).....	17
Reconstruction and Growth (1866–1916).....	19
World War I to World War II (1917–1945).....	19
The New Dominion (1946–1991).....	19
Post-Cold War (1992–Present) .....	20
SURVEY METHODOLOGY .....	21
Historic Map Review .....	21
Archaeological Survey.....	21
Architectural Survey .....	21
BACKGROUND RESEARCH .....	23
Previous Surveys.....	23
Previously Recorded Archaeological Sites.....	23
Previously Recorded Architectural Resources.....	24
RESULTS OF THE PHASE IA STUDY .....	27
Historic Map Review .....	27
Archaeological Survey Results.....	31
Architectural Survey Results .....	33
SUMMARY AND RECOMMENDATIONS.....	39
REFERENCES .....	41
APPENDIX A: PREVIOUSLY RECORDED ARCHITECTURAL RESOURCES WITHIN A 1-MILE (1.6-KM) RADIUS	
APPENDIX B: PRINCIPAL INVESTIGATOR QUALIFICATIONS	

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## List of Figures

Figure 1: Map of Clarke County, Virginia, and the Project Area Location.....	2
Figure 2: Location of the Project Area and Architectural Project Area on the USGS Clarke County, Virginia, 7.5 Minute Digital Raster Graphic Mosaic.....	3
Figure 3: Soils within the Project Area.....	9
Figure 4: 1884 Harpers Ferry Topographic Map with Approximate Project Area Indicated with Pink Circle .....	27
Figure 5: 1939 USGS Berryville Topographic Map with Approximate Project Area Indicated with Pink Circle .....	28
Figure 6: 1968 USGS Berryville Topographic Map with Approximate Project Area Indicated with Pink Circle .....	29
Figure 7: 1997 USGS Berryville Topographic Map with Approximate Project Area Indicated with Pink Circle .....	30
Figure 8: 2017 Aerial Showing Approximate Project Area Outline with Pink with Surrounding Development Near Berryville .....	30
Figure 9: Architectural Resources within the Architectural Project Area .....	35
Figure 10: Aerial of Norfolk and Western Railroad Corridor (021-5007) with Project Area and Architectural Project Area.....	36
Figure 11: Aerial of Long Marsh Rural Historic District (021-0967) with Project Area and Architectural Project Area .....	37

## List of Photos

Photo 1: View of Pasture within the Northwestern Portion of the Project Area, Looking Northeast.....	5
Photo 2: View of Fence Line Surrounding the Pasture, Looking Northeast.....	6
Photo 3: View of Exposed Boulders within the Eastern Portion of the Project Area, Looking Northwest.....	31
Photo 4: Exposed Patches of Subsoil within the Eastern Portion of the Project Area, Looking South.....	32
Photo 5: View of Informal Parking Area in the Southeast Portion of the Project Area, Looking South.....	32

## List of Tables

Table 1: Soils in the Project Area .....	8
Table 2: Civil War Battlefields and Relevant Distances to the Project Area.....	18
Table 3: Previous Cultural Resource Surveys within a 1-Mile (1.6-km) Radius of the Project Area.....	23
Table 4: Previously Recorded Archaeological Resources within a 1-Mile (1.6-Km) Radius of the Project Area.....	24
Table 5: Architectural Resources within the Architectural Project Area .....	33

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## INTRODUCTION

Dovetail Cultural Resource Group (Dovetail) conducted a Phase IA cultural resource reconnaissance study for the 98.1-acre (39.7-ha) Friant project area for D.R. Horton Capital Division. The Friant project area, also referred to herein as the project footprint and limits of disturbance, lies within central Clarke County (Figure 1–Figure 2, pp. 2–3). The Phase IA study was intended to determine if or to what extent a Phase IB cultural resource survey is warranted prior to the proposed development of the project area.

The Phase IA study, conducted on December 1, 2021, included an archaeological pedestrian survey of the project area as well as an architectural survey to locate above-ground resources over 50 years in age within the architectural project area that may require identification-level (Phase IB) architectural survey. No subsurface investigations were completed during this phase of work. The archaeological reconnaissance work resulted in the definition of locations suitable for subsurface archaeological investigations within the project area based on the probability of encountering intact archaeological resources. The archaeological project area comprises the 98.1-acre (39.7-acre) project footprint. The architectural project area included the project area plus a 300-foot (91.44-m) buffer to account for the surrounding viewshed. In addition to fieldwork, a review of historic maps relevant to the project area and surrounding vicinity was conducted.

The archaeological reconnaissance fieldwork was conducted by Dr. Patrick Johnson. The architectural reconnaissance fieldwork was conducted by Kurtis Rogers and Jonathan Valalik. Dr. Kerri Barile served as the Principal Investigator. Dr. Barile meets or exceeds the standards for archaeologists, historians, and architectural historians as established by the Secretary of Interior (SOI). Dr. Johnson meets the SOI standards as an archaeologist, and Mr. Rogers and Mr. Valalik meet the standards for architectural historian.

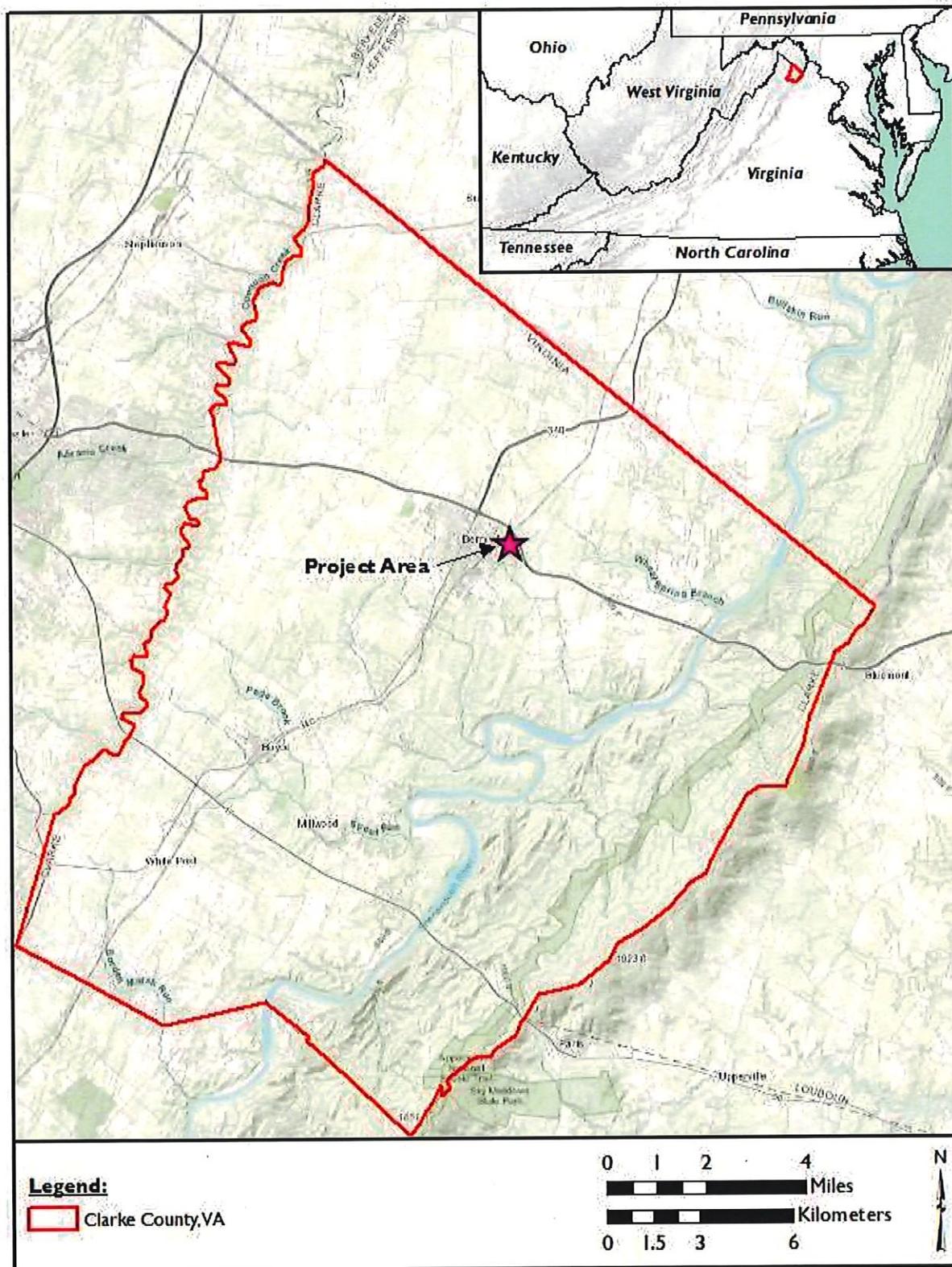


Figure 1: Map of Clarke County, Virginia, and the Project Area Location (Esri 2021a).

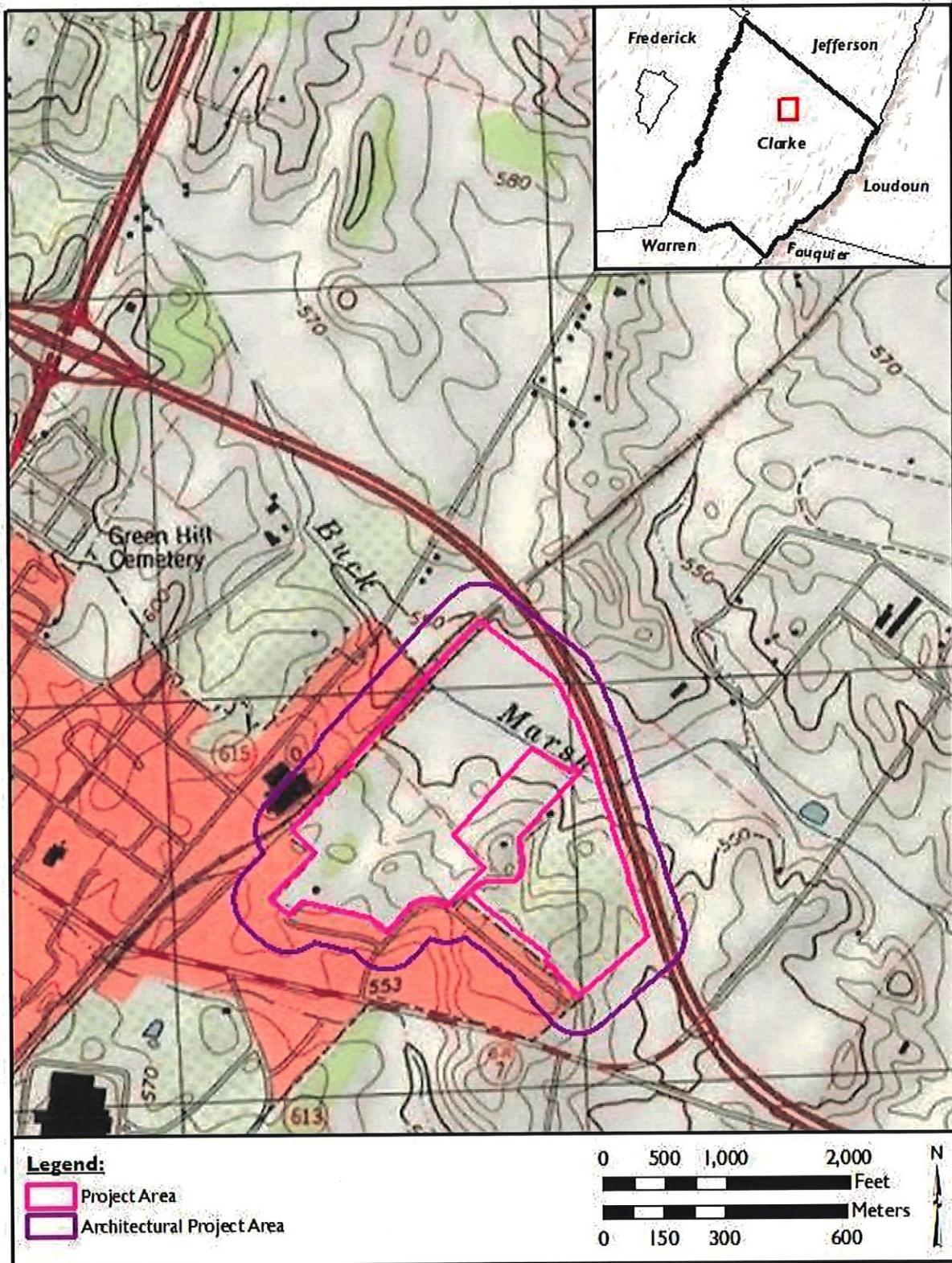


Figure 2: Location of the Project Area and Architectural Project Area on the United States Geological Survey (USGS) Clarke County, Virginia, 7.5 Minute Digital Raster Graphic Mosaic (Esri 2021b).

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## PROJECT AREA DESCRIPTION

The approximately 98.1-acre (39.7-ha) project area is located in central Clarke County, Virginia, east of the town of Berryville, southwest of Route 7, and southeast of the Norfolk and Western Railroad Corridor. The Buck Marsh Run runs from the northwest to the southeast through the northern portion of the project area. The project area includes a cow pasture made up of clearings and deciduous hardwoods with generally level topography throughout. The northwest portion of the project area was actively being used as a cow and horse pasture by the landowners (Photo 1; Photo 2, p. 6).



Photo 1: View of Pasture within the Northwestern Portion of the Project Area, Looking Northeast.



Photo 2: View of Fence Line Surrounding the Pasture, Looking Northeast.

## ENVIRONMENTAL SETTING

The project area is located in central Clarke County, Virginia, just east of the town of Berryville, and south of the West Virginia state line. Clarke County is bound by Frederick County on the west, Loudon County to the east, Warren County to the southwest, Fauquier County on the southeast, and Jefferson County in West Virginia to the north. The immediate vicinity of the project area is historically rural land, but has seen recent commercial and industrial growth.

### Geology and Topography

The project area is situated in the Piedmont physiographic province. The Piedmont, located between the Coastal Plain to the east and the foothills of the Blue Ridge Mountains to the west, is characterized by gently rolling topography generally underlain by crystalline metamorphic rocks. The current project area lies within the Conococheague Formation which is dominated by limestone with significant dolostone and sandstone beds. The formation is present throughout the Valley of Virginia and ranges in thickness from about 2,200 feet (670.6 m) in northern Virginia to 1,700 feet (518.2 m) near Abingdon, Virginia (USGS n.d.). The local topography consists of relatively flat terrain, with elevations ranging from 550 to 552 feet (167.6–168.3 m) above mean sea level (AMSL).

### Hydrology

The project area is drained by Buck Marsh Run, which flows southeast into the Dog Run which flows south and then east into the Shenandoah River. The Shenandoah, in turn, flows northeast into West Virginia and into the Potomac River, which in turn flows into the Chesapeake Bay and connects to the Atlantic Ocean.

### Soils

Fertile, well-drained soils attracted both humans and game over millennia. Moreover, the wild grasses, fruits, and seeds consumed by people both before and after the adoption of agriculture flourished in such settings. As a consequence, numerous archaeologists have cited the correlation between the distribution of level to gently sloping, well-drained, fertile soils and archaeological sites (e.g., Lukezic 1990; Potter 1993; Turner 1976; Ward 1965). Soil scientists classify soils according to natural and artificial fertility and the threat posed by erosion and flooding, among other attributes. In general, soil Classes 1 and 2 represent the most fertile soils, those best suited for not only agriculture but for a wide range of uses. Of course, soil productivity must be considered in relation to the productivity of the surrounding soils as well.

The project area consists of a range of soils (Table 1, p. 8, Figure 3, p. 9). Class 2 soils, totaling 33 percent of the project area, are generally well drained prime farmlands and include Nicholson-Duffield silt loams; Poplimento silt loam; Poplimento silt loam, rocky; Poplimento-Webbtown complex; Poplimento-Webbtown complex, rocky; and Timberville silt loam. Class 3 soils, totaling 67.1 percent of the project area, include somewhat poorly drained farmlands

of statewide importance (McGary silty clay loam totals 2.1 percent of the project area) as well as well drained not prime farmlands (Pagebrook silty clay loam, Poplimento-Rock outcrop, and Webbtown-Poplimento-Rock outcrop complexes total 65 percent of the project area). A little over half of soils in the project area are well drained and prime farmland or farmland of statewide importance.

Table 1: Soils in the Project Area (Soil Survey Staff 2021).

Soil Name	Class	Slope	Characteristics	Percent of Project Area
McGary silty clay loam	3w	0–3%	Somewhat poorly drained, farmland of statewide importance	2.1%
Nicholson-Duffield silt loams	2e	3–8%	Well to moderately well drained, farmland of statewide importance	2.1%
Pagebrook silty clay loam	3e	0–7%	Moderately well drained, not prime farmland	0.9%
Poplimento silt loam	2e	3–8%	Well drained, all areas are prime farmland	4.4%
Poplimento silt loam, rocky	2e	3–8%	Well drained, all areas are prime farmland	2.4%
Poplimento-Rock outcrop complex	3e	3–15%	Well drained, not prime farmland	34.8%
Poplimento-Webbtown complex	2e	3–8%	Well drained, all areas are prime farmland	2.6%
Poplimento-Webbtown complex, rocky	2e	3–8%	Well drained, all areas are prime farmland	7.3%
Timberville silt loam	2w	0–7%	Well drained, not prime farmland	14.2%
Webbtown-Poplimento-Rock outcrop complex	3e	3–15%	Well drained, not prime farmland	29.3%



Figure 3: Soils within the Project Area (Esri 2018).

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## HISTORIC CONTEXT

Virginia's prehistory typically is divided into three main periods, Paleoindian, Archaic, and Woodland, based on changes in material culture and settlement patterns. Recently, the possibility of a human presence in the region that pre-dates the Paleoindian period has moved from remote to probable; for this reason, a Pre-Clovis discussion precedes the traditional tripartite division of Virginia's prehistory. The seventeenth-through-twentieth-century historical overview follows the Virginia Department of Historic Resources (DHR) (2017) guidelines. The cultural context, as defined by the Secretary of the Interior's *Standards and Guidelines* for archaeology (United States Department of the Interior 1983) and DHR's 2017 *Guidelines for Conducting Historic Resource Surveys in Virginia*, provides the historic social and environmental information required for evaluation of any archaeological and architectural resources present within the project area.

### Precontact Periods

The precontact cultural sequence of Virginia's Piedmont and Coastal Plain parallels that of the other areas of Virginia and the Middle Atlantic Region. It is generally broken into three periods: Paleoindian (13,000–10,000 BP), Archaic (10,000–3,200 BP), and Woodland (3,200–400 BP), which are often further divided into Early, Middle and Late periods. While this sequence represents a cultural continuum, archaeologists have noted that periods of adaptational stability are punctuated by periods of rapid change that do not necessarily correlate with the traditional cultural periods (Custer 1984; Smith 1986).

#### *Pre-Clovis (Pre-13,000 BP)*

The 1927 discovery, at Folsom, New Mexico of a fluted point in the ribs of an extinct species of bison proved that ancient North Americans had immigrated during the Pleistocene. It did not, however, establish the precise timing of the arrival of humans in the Americas, nor did it adequately resolve questions about the lifestyle of those societies (Meltzer 1988:2–3). Recent discoveries suggest humans possibly occupied the Americas, including Virginia, prior to the appearance of Clovis fluted points in the archaeological record (Boyd 2003; Carr 2018; Goodyear et al. 2005). Both the stratigraphic record and the radiocarbon assays from the recently excavated Cactus Hill site in Sussex County, Virginia, suggest the possibility of human occupation well before the fluted point makers appeared on the scene (McAvoy and McAvoy 1997). Buried strata at the Cactus Hill Site, in Sussex County, Virginia, have returned radiocarbon dates of 15,000 years ago from sandy strata situated below levels containing fluted points (McAvoy and McAvoy 1997:165). The Cactus Hill data suggest pre-Clovis peoples relied on unfluted knives, prismatic blade-like flakes chipped from prepared cobbles and sandstone grinding and abrading tools, possibly indicating production of wood and bone tools. Because these tools do not possess unique characteristics which immediately identify them as dating to the Pleistocene, archaeologists must recognize the possibility that 15,000-year old sites have been overlooked for years (Boyd 2003; Carr 2018; Goodyear et al. 2005).

### ***Paleoindian Period (13,000–10,000 BP)***

The precontact occupation of the eastern portion of North America dates to approximately 13,000 to 10,000 BP. The Paleoindian settlement-subsistence pattern revolved around hunting and foraging in small nomadic bands. These bands focused on hunting caribou, elk, deer, and now extinct mega-fauna (Goodyear et al. 1979; Meltzer 1988; Smith 1986). Evidence for this occupation is manifest in fluted projectile points used for hunting. Fluted points are rare and often identified as isolated occurrences. While these discoveries are infrequent, the eastern half of the United States has some of the highest concentrations of these finds. Almost 1,000 known fluted projectile points have been discovered in Virginia (Anderson and Faught 1998). While the fluted Clovis and Folsom projectile points are the best known of the Paleoindian point types, others include Hardaway-Dalton and Hardaway Side-Notched (Barber and Barfield 1989). Paleoindian stone tools are usually made from high quality cryptocrystalline lithic material. The Paleo tool kit included scrapers, graters, unifacial tools, wedges, hammerstones, abraders, and other tools used for chopping and smashing (Gardner 1989).

### ***Archaic Period (10,000–3200 BP)***

The Archaic period is generally divided into three phases, Early (10,000–8800 BP), Middle (8800–5500 BP), and Late (5500–3200 BP). There does not appear to be a dramatic change in the tool kits of the Early Archaic and their Paleoindian predecessors. Their settlement and subsistence patterns appear to be very similar (Anderson et al. 1996; Cable 1996). The transition into the Archaic period is marked by an increase in site size and artifact quantity, as well as an increase in the number of sites (Egloff and McAvoy 1990). Diagnostic artifacts of the Early Archaic period include the Kirk Corner-Notched and Palmer Corner-Notched projectile points (Coe 1964; Custer 1990). In addition, some bifurcated stem points such as St. Albans and LeCroy appear to be associated with the increased use of hafted endscapers (Coe 1964). The Early Archaic also marks the first appearance of ground stone tools such as axes, celts, adzes and grinding stones. At the close of this period, we see a shift to an increased reliance on a wider range of lithic resources.

While there appears to be a relatively high degree of cultural continuity between the Early and Middle Archaic periods, sites dating to the Middle Archaic period are more numerous, suggesting an increase in population, and sites appear to be occupied for longer periods of time. The Middle Archaic period coincides with a relatively warm and dry period that may have resulted in widespread population movements (Delcourt and Delcourt 1987; Stoltman and Baerreis 1983). Mauer (1991:10) sees the primary cultural attributes of the Middle Archaic as “small-group band organization, impermanent settlement systems, infrequent aggregation phases, and low levels of regional or areal integration and interaction.” Projectile points diagnostic of the Middle Archaic period include Stanley Stemmed, Morrow Mountain Stemmed, Guilford Lanceolate, and Halifax Side-Notched.

The Late Archaic period is often seen as the culmination of trends that began during the Early and Middle Archaic (Dent 1995:178). Dent (1995:178) suggests that the Late Archaic is “a time that contains both the ends of one way of life and the beginnings of a significant redirection.” The artifact assemblage is dominated by bifacial tools; however, expedient flake scrapers, drills, perforators and utilized flakes are characteristic of these assemblages. Ground

stone tools, including adzes, celts, and axes are seen during this period, with the grooved axe making its first appearance during the Late Archaic (Dent 1995:181–182). Diagnostic projectile points of the narrow blade tradition, often viewed as the early portion of the Late Archaic period, include the Vernon, Bare Island/Lackawaxen, Clagett, and Holmes (Dent 1995; Mouer 1991).

### ***Woodland Period (3200–400 BP)***

The Woodland period is divided into three phases, Early (3200 BP–2300 BP), Middle (2300–1100 BP), and Late (1100–400 BP). The introduction of pottery, agriculture, and a more sedentary lifestyle mark the emergence of the Woodland period. The population surge that began in the Archaic continued in this period. The concurrent development of agriculture and pottery led early theorists to posit that they were linked; however, few still support this position. Alternatively, the evolution of technological and subsistence systems, as well as various aspects of pan-Eastern interaction, are currently believed to underlie the evolution of ceramic vessels (Egloff 1991).

Steatite tempered Marcey Creek pottery, dating to the Early Woodland period, are thought to be the earliest ceramic wares in Virginia's Piedmont. Marcey Creek wares, considered experimental, are typically shallow, slab-built forms (Dent 1995; McLearn 1991). Another steatite-tempered ware, Selden Island, followed Marcey Creek and soon other temper types appear in the archaeological record (McLearn 1991). Approximately 1100 BP there is a shift from the earlier slab construction techniques to coil and conoidal or globular vessels. This shift is accompanied by the introduction of surface treatments such as cord marking and net impression (Dent 1995; McLearn 1991). Projectile points associated with the Early Woodland period include Rossville Stemmed and possibly Piscataway Stemmed (Dent 1995).

The Middle Woodland is marked by the rise of certain sociocultural characteristics that include “interregional interaction spheres, including the spread of religious and ritual behaviors which appear in locally transformed ways; localized stylistic developments that sprung up independently alongside interregional styles increased sedentism and evidence of ranked societies or incipient ranked societies” (McLearn 1992:55). While there is a degree of commonality among Middle Woodland peoples, one of the striking characteristics of this period is the rise of regional trends, particularly in pottery. Coastal Plain and Piedmont ceramic styles can be distinguished, as well as north-south differences that correspond to river drainages that drain into the Chesapeake Bay or Albemarle Sound. The diversity of surface treatments increase after 1500 BP and analysis of the regional pottery indicates that the Potomac, the Rappahannock, and Upper Dan were slightly different cultural subareas in the physiographic province of the Piedmont (Hantman and Klein 1992). The Middle Woodland period also sees the introduction of the triangular or Levanna projectile point.

The Late Woodland period is marked by an increased reliance on agriculture, attendant population growth, larger villages and increased sociocultural complexity (Turner 1992). Ceramic types of the Late Woodland period in the Coastal Plain and Piedmont include the quartz-tempered Gaston Simple Stamped, sand/crushed rock-tempered Dan River pottery, and a potential variant of Dan River Wares, the sand-tempered Clarksville Ware (Hantman and Klein 1992; Gardner 1980). The trend towards sedentary settlements continues throughout the

Late Woodland period. In the early portion of this period, settlements consist of small clusters of houses with little to no internal organization. However, by 300 BP, larger villages are observed. Features associated with these villages include palisades, houses, hearths, storage pits, and burials (Hantman and Klein 1992). The smaller Madison triangular projectile point is generally associated with the Late Woodland period.

## **Historic Period**

### ***Contact Period (1607–1750)***

The early explorers of the New World often did not keep detailed records, so it is uncertain when the Shenandoah Valley was first explored. It is thought that the Jesuit missionaries who arrived at Jamestown in 1609 were among the first to enter the Valley. In 1632, the Jesuits entered the Valley with the Iroquois, who they were attempting to convert to Christianity. The Jesuits kept no written records of their trip but shared what they had learned with Samuel de Champlain, a Frenchman, who detailed the wilderness of the Valley in a map of the New World. Some scholars believe that John Lederer, a physician from Hamburg, Germany, was the first European to explore the Valley (Kalbian 1992:19).

The land that encompasses what is now Clarke County was originally part of Orange County and designated as Frederick County by the House of Burgesses. This eighteenth-century Frederick County extended from the top of the Blue Ridge Mountains to the Mississippi River and the Great Lakes (Gold 1914:11). The county was originally owned by the Virginia Company but was taken over by the crown in 1624. By 1681, Thomas, the Second Lord Culpepper, owned the Northern Neck, which contained Frederick County (Frederick County Planning Commission 2021:1). After Lord Culpepper's passing in 1689, the land went to his daughter, Catherine, and her husband, Thomas, the Fifth Lord of Fairfax. Their son, Thomas, the Sixth Baron Fairfax of Cameron, was heir to the Northern Neck (Frederick County Planning Commission 2021:1).

Robert "King" Carter, Lord Fairfax's land agent and the wealthiest and most prominent landholder in Tidewater Virginia, was given a 50,212-acre (20,330.1-ha) grant by Lord Fairfax in 1730. This land included less than half of what is now Clarke County. While Carter's land was largely unavailable for settlement until the mid-eighteenth century, Lord Fairfax and the Virginia Governors Council were distributing land in Frederick County in smaller grants (Clarke County Planning Department 2013:I-7; Frederick County Planning Commission 2021:1). Lord Fairfax himself moved from England to Virginia in 1748 and established a home, the Manor of Greenway Court, in Frederick County (now Clarke County) in 1752 (Kalbian 1992:20).

The Council of Virginia was granting land to settlers within Fairfax's Northern Neck due to a misunderstanding of the original land grant. This land was granted with the stipulation that for each thousand acres, the land must be settled by one or more families within two years. Jost Hite (Hans Jost Heydt) was one of the first permanent settlers in Frederick County. Hite, from Strasburg, Germany, travelled to the county from Pennsylvania with 16 other families, most German and Scotch-Irish. Quakers, also from Pennsylvania, settled the northern part of

Frederick County around the same time (Kalbian 1992:19–21). Other early settlers came from New Jersey, Maryland, and from across the Blue Ridge (Gold 1914:13). Around the mid-eighteenth century, Carter’s land, which included a large portion of the future-Clarke County, began to be settled. This land was rented out to farmers or divided into tenancies (Clarke County Planning Department 2013:I–7). Lord Fairfax’s Manor of Greenway Court and Manor of Leeds also became part of the future Clarke County (Kalbian 1992:21).

The historic landscape of the county was described by historian Samuel Kercheval as deserted and covered with a few “fields of corn or some other grains” (Kercheval 1925 [1833]:266, as cited in Kalbian 1989:47). As more people settled in the county, sawmills and gristmills were soon being built along the streets (Gold 1914:13). Farming, however, was done at a subsistence level with wheat, corn, and rye being planted for personal consumption. It is also possible that there were some fruit orchards as they were present in other areas of the Valley (Kalbian 1989:47).

### *Colony to Nation (1751–1789)*

Settlement of the Valley increased during the period from 1750 to 1789. By the 1780s, there were numerous farmsteads and small settlements in the area of Frederick County that would later become Clarke County. Many of those migrating to Clarke County were from Tidewater, Virginia, where the soil was depleted, and tobacco was in decline. Wheat became the primary cash crop of the county and new mills, including the Burwell-Morgan Mill, were established to serve this industry. Horse breeding also emerged as a prominent market because the Tidewater families brought thoroughbreds with them and Clarke County had an abundance of blue grass, which made it an ideal location for horse breeding (Kalbian 1989:16, 19, 48, 75).

There were three main sites of commercial activity in Frederick County: Millwood, White Post, and Berryville. Millwood developed around the Burwell-Morgan Mill, constructed in 1785, and the village of White Post grew up around Lord Fairfax’s Manor of Greenway Court. Berryville, originally Battletown, was first settled in 1775. Winchester, chartered in 1752, was the county seat and the location through which all major transportation routes later passed, including the Great Wagon Road (now Route 11), Routes 50 and 522, and Route 7. Routes 50 and 22 ran east-west and southeast-west, respectively, while the Great Wagon Road ran north-south and Route 7 ran east to Berryville (Kalbian 1989:16, 21, 25, 75).

During the French and Indian War, several local citizens joined the militia (Kalbian 1989:90). There were no battles fought in the county during the American Revolution (1775–1783). However, Clarke County residents joined the war efforts, providing food and supplies to the troops. General Danial Morgan, a resident of Clarke County, and his “Long Rifles” also played an important role in many major battles. Prisoners of war were kept in barracks in the county. In 1780, a new barracks was built about four miles west of Winchester to hold additional prisoners. By 1781, the number of British prisoners in Frederick County numbered 1,600 (Kalbian 1992: 21–22; Frederick County Planning Commission 2021:4).

### ***Early National Period (1790–1829)***

Families from Tidewater Virginia continued to migrate to Frederick County, including the area that would become the future Clarke County (Kalbian 1989:21). The Tidewater families brought with them not only their thoroughbreds, but also their wealth, style of architecture, and the slave system.

As more settlers moved into the area and set up plantations, there was a large increase in the number of farm buildings. These farms were very prosperous and produced wheat, rye, Indian corn, barley, and small amounts of tobacco. Wheat was the county's primary cash crop and by 1809 there were over 12 grist mills in operation. Distilleries were another major industry with rye and Indian corn being distilled into gin and whiskey. Apples and peaches were also distilled into brandy. There were no lumber or paper mills in Frederick County during this time period but tanning made up another profitable industry in the county (Kalbian 1989:49, 99–100).

During this time period, transportation systems grew rapidly, influencing the further development of the county's largest towns. Berryville, platted in 1798, was the largest town in the county and experienced substantial growth. Millwood and White Post also continued to grow while new hamlets were founded at Stone Bridge and Sugar Hill (Kalbian 1989:25, 62). Transportation facilitated economic growth and agricultural activities. By 1820, Frederick County was home to 54 grist mills and numerous tanneries, sawmills, and other businesses (Frederick County Planning Commission 2021:5).

### ***Antebellum Period (1830–1860)***

In 1836, Clarke County was established from Frederick County and named for George Rogers Clark (no "e"), a Virginian and the highest-ranking military officer on the northwestern frontier during the American Revolution. The split from Frederick County occurred because people in eastern Frederick County felt that the county seat in Winchester was too far away. Another reason for the separation was social differences between the people to the east and west of the Opequon Creek (Kalbian 1992:21; Gold 1914). Clarke County, settled by the Tidewater families of Virginia, was distinguishable from the rest of the Valley due to the large enslaved population. In 1836, Clarke County's African American residents outnumbered white. There were a total of 2,867 white residents, 3,325 enslaved African American, and 161 free African Americans. The number of enslaved African Americans owned by county residents varied though most farms had two to three and larger farms had eight to ten. Some of the wealthier Tidewater families had significantly more (Kalbian 1989:71–72). George H. Burwell of Burwell-Morgan Mill was documented in the 1860 Census as owning approximately 100 enslaved African Americans (Kalbian 2000:7). The 1840 U.S. Census documents over 50 percent of the population in Clarke County was of African American descent (Clarke County Planning Department 2013:1-7).

Clarke County prospered during the Antebellum period with an agricultural economy largely based on wheat production. Thoroughbred breeding continued to be a profitable enterprise; however, the profitability of both declined after the Panic of 1837. Farmers began to diversify their crops which included wheat, corn, rye, and buckwheat. Despite its size, Clarke County

ranked second in wheat production in 1860, producing a total of 330,000 bushels compared to Rockingham County's 360,000 (Kalbian 1989:26–27, 51–52).

Transportation systems in Clarke County improved significantly during the Antebellum Period. In 1836, the Winchester & Potomac Railroad reached the county. This railroad extended from Winchester to Harper's Ferry where it connected with the Baltimore & Ohio Railroad (Ebert and Lazazzera 1988:44–46). Several new turnpikes were also completed, including the Winchester-Berry's Ferry Turnpike in 1852. This turnpike extended from the Shenandoah River through Berryville to Winchester and Charlestown. Ferries were also vital to the Valley's thriving economy. The wheat grown and milled in Clarke County was shipped down-river on the Shenandoah River to Harper's Ferry. From Harper's Ferry it was sent to Baltimore and other markets via the Baltimore & Ohio Railroad (Kalbian 1989:63–64). Another improvement that was discussed in the 1830s but never completed was a canal off of the Shenandoah River. The idea was abandoned due to opposition from residents in the central and western portions of the Shenandoah Valley (Hofstra 1986:69–70).

### *Civil War (1861–1865)*

The Shenandoah Valley was an important strategic location for both the Union and the Confederacy during the Civil War. It was important to the Confederacy due to its proximity to Washington, D.C., and the food, livestock, and horses that it provided to the Confederate troops. The Valley became known as the “breadbasket of the South” because it supplied the Confederates with huge quantities of grains (Frederick County Planning Commission 2021:5; Kalbian 1989:53). Three important rail lines transported these goods to the troops stationed further south. The most significant were the Manassas Gap Railroad and the Winchester and Potomac spur of the Baltimore & Ohio Railroad (Gallagher 1991).

During the first several years of the war, there were numerous battles in the Shenandoah Valley, including Clarke County, as the Confederate and Union forces fought for control of the area. One major battle—the largest and bloodiest in Clarke County—was the Battle of Cool Springs. On July 16–17, Union troops under orders from Union Maj. Gen. Horatio Wright entered the Valley through Snicker's Gap. The troops, in pursuit of Confederate Lieut. Gen. Jubal Early, established a temporary base in Berryville, Clarke County. On July 17, Union Gen. Alfred Duffie's calvary attempted an attack on Early's pickets on the western shore of the Shenandoah River at Castleman's Ferry. This attempt and the following morning's were unsuccessful, so Union Generals Wright and George Crook decided to send troops approximately 2 miles (3.2 ha) downriver where they would cross and flank the Confederates (Geier et al. 1997:37–52; Shenandoah University McCormick Civil War Institute 2017).

Crook ordered Col. Joseph Thoburn and Col. Daniel Frost's brigade to cross the Shenandoah River at Island Ford. Col. George Wells led the crossing at Island Ford, capturing 15 Confederate soldiers in the processes. The Confederate prisoners were interrogated by Col. Thoburn and informed their captors of enemy forces within a mile or two of Island Ford. Gen. Crook ordered Thoburn to cease his efforts and wait for reinforcements. Thoburn's troops, however, skirmished with the Confederates on an upland ridge east of the Cool Spring House and refused to withdraw after receiving word that additional Confederate troops were

advancing (Geier et al. 1997:37–52; Shenandoah University McCormick Civil War Institute 2017).

The Confederates charged Thorburn’s right flank, which was commanded by Union Col. Samuel K. Young. Young’s troops did not put up much resistance and retreated across the river. Thorburn repositioned his regiment, moving the 116<sup>th</sup> Ohio to the right flank and ordering Col. Daniel Frost and his troops to face west instead of north. Frost was mortally wounded in an ensuing attack, causing many of his brigade to flee across the river. Some remained to fend off Confederate Gen. Robert E. Rodes’ division. Although Thorburn’s men did receive aid from Col. Charles H. Tompkins, Wright’s artillery chief, the Union ultimately retreated across the river, ending the Battle of Cool Springs (Geier et al. 1997:37–52; Shenandoah University McCormick Civil War Institute 2017). Other engagements in Clarke County include the Fight at Berry’s Ferry (July 19, 1864), Fight at Double Toll Gate (August 11, 1864), the Buck Marsh Fight near Berryville (August 13, 1864), and the Fight at Colonel Morgan’s Lane (August 19, 1864) (Gold 1914:117,133).

Maj. Gen. Philip H. Sheridan assumed command of the Union army in the Shenandoah Valley on August 7, 1864. Lt. Gen. Ulysses S. Grant instructed Sheridan “that nothing should be left to invite the enemy to return... Such as cannot, be consumed destroy...” (Gallagher 2006:xiii). Sheridan launched his drive south into the valley, reaching Berryville in Clarke County on September 3. Confederate Lt. Gen. Early simultaneously sent Maj. Gen. Joseph B. Kershaw’s divisions to Berryville where they found Union Gen. George Crook’s corps, operating under orders from Col. Joseph Thorburn, encamped. Kershaw attacked and before dark the fight, known as the Battle of Berryville, became a stalemate (National Park Service 2021). Confederate and Union forces met again at the Fight at Gold’s Farm (September 4, 1864), the Fight at Mt. Airy (September 15, 1864), the Vineyard Fight (December 16, 1864), and the Mt. Carmel Fight (February 19, 1865) (Kalbian 1989:91–92).

The boundaries for these battles were established by the Civil War Sites Advisory Commission (CWSAC), aided by the American Battlefield Protection Program (ABPP), in the early 1990s and were revised in 2009. As part of the 2009 revision, the ABPP created a four-tiered system that included such factors as historic significance, current condition, and level of threat to determine preservation priorities among the battlefields (CWSAC 2009). Table 2 lists distances from the project area to the currently-mapped boundaries for these battles that are within the project area’s vicinity, including the regions of direct fighting, the associated marching routes for soldiers, and the potential NRHP boundaries.

Table 2: Civil War Battlefields and Relevant Distances to the Project Area.

<b>CWSAC/ABPP Battlefield</b>	<b>Distance from Project Area to ABPP Mapped Study Area</b>	<b>Distance from Project Area to ABPP Mapped Core Area</b>	<b>Distance from Project Area to Potential NRHP Area</b>
Berryville Battlefield	0.3 mile (0.48 km)	1.21 miles (1.95 km)	0.3 mile (0.48 km)

### ***Reconstruction and Growth (1866–1916)***

The collapse of the plantation system after the war significantly impacted Clarke County because most farms had been dependent upon enslaved labor. There was very little growth in the county until the completion of the Shenandoah Railroad in 1879. The arrival of the railroad spurred residential construction in Clarke County, particularly around Berryville, and brought about the establishment of new towns and hamlets. Millwood, which was not serviced by the Shenandoah Railroad, lost its position as an important commercial and industrial center. The “Great Boom” of the 1890s also spurred growth in Clarke County, which like the rest of the Valley was recognized for its prime location and rich soil. New towns or lots around existing towns were laid out by land and improvement companies. Route 615 is commonly referred to as “Boom Road” (Kalbian 1989:35–36, 65, 1992:124).

After the war, several African American communities were established. In 1871, 31 1-acre (0.4-ha) lots were laid out south of Berryville. These lots were sold at public auction for \$100 each, exclusively to African Americans. The community was named Josephine City. Other African American communities established during this period include Lewisville, located in northern Clarke County in a rural setting; Stringtown, near Lewisville; Claytonville, between Millwood and Old Chapel on Route 225; Browntown, also located between Millwood and Old Chapel on Route 225; and Balltown, located on Route 340 (now Route 617). Some former slave owners offered freedmen a small piece of land on their property (Kalbian 1989:36–38).

Clarke County maintained its agriculture-based economy producing corn, wheat, and rye. According to the 1879 report of the County Commissioner, the average yield of corn and wheat in Clarke County was the best in the state, continuing into the twentieth century. During the 1880s, hay production increased, rising from 4,700 tons in 1880 to 9,300 tons in 1890. Other markets that evidenced an increase include dairy production and sheep husbandry, the later increasing after the 1870s. Apple production began to replace wheat as the county’s primary cash crop, particularly after 1905. Fruit packing houses were constructed to serve this market (Kalbian 1989:54, 101)

### ***World War I to World War II (1917–1945)***

The pattern of growth that commenced in the 1880s continued into the late-nineteenth and early-twentieth century. Growth in the suburbs was brought about by the advent of the automobile. However, the rural and agricultural nature of the county was preserved by the county’s zoning laws. Those moving into the county in the 1920s were constructing larger barns or restoring older ones for use in the raising of thoroughbred horses. In 1930s, new construction increased in the mountainous areas of the county around Route 7. The buildings constructed were primarily residences, not farmhouses. Clarke County’s economy remained primarily agricultural in the twentieth century. Apple production reached its peak and cattle and dairy production continued to increase. (Kalbian 1989:41–44, 57).

### ***The New Dominion (1946–1991)***

Clarke County remained rural, and its main source of income continued to be agriculture. Berryville was the center of industrial activity in the county and was home to several major

industries, including American Woodmark, a manufacturer of cabinets, Smalley Package Company, a producer of pallets, and Doubleday, a manufacturer of books. The tourist industry boomed because of the automobile and new motor lodges were opened. An interesting tourist attraction developed in the 1950s and 1960s was Dinosaurland, a “theme park” that explored the theme of transportation (Kalbian 1989:68, 101).

### ***Post-Cold War (1992–Present)***

Rapid industrial growth dominated the northern Shenandoah Valley counties during the early-twentieth century. Apple production was booming and textile industries, such as woolen and knitting mills, were leading commercial ventures in Winchester (Morton 1925:258; Shellenhammer et al. 2005:3–11). Berryville was the manufacturing, commercial, and governmental center of the county (Clarke County Planning Department 2013: I–8).

In the late twentieth century, people were increasingly moving to Clarke County to construct homes and restore older residences. The county enacted land use regulations in the 1980s to preserve the rural character of the county and its agricultural economy. These regulations called for new housing in the Berryville area and limited residential development in rural areas of the county. By the beginning of the twenty-first century, apple production had declined, and beef and dairy cattle, and horses had become the main sources of income for the county (Clarke County Planning Department 2013:I-8).

## **SURVEY METHODOLOGY**

The goals of the survey were to identify any previously recorded and previously unrecorded cultural resources over 50 years in age within the architectural project area and locate areas in the project area with the potential to contain archaeological sites. The survey methods employed to meet these goals was chosen with regard to the project's scope and local field conditions. Based on the topographic and environmental setting of the project area, as well as the antiquity of the surrounding road system and length of historic occupation, it was judged to have a moderate to high potential for archaeological sites over 50 years in age.

### **Historic Map Review**

Dovetail conducted a background literature and records review at the DHR, including an investigation of records on previous cultural resource investigations and previously recorded archaeological sites and architectural properties within a 1-mile (1.6-km) radius of the project area. In addition, Dovetail consulted various online repositories, resulting in the acquisition of additional historic maps on the project area. The purpose of this work was to obtain information to complete a context of the project area and surrounding area.

To complete the historic map review, Dovetail examined historic maps and other resources that potentially provided information about the location of historic resources within the project area. Because a plethora of archival documents are now available online, extensive travel was not required to complete the research. Online resources included the Library of Congress in Washington, D.C., Google Maps, maps prepared by the ABPP, and resources available at the DHR.

### **Archaeological Survey**

The field survey consisted of a pedestrian survey to inspect the entire project area. Notes and photographs were used to document the landforms and field conditions. Once this was accomplished, the collected data was used to determine locations that had the highest potential for subsurface deposits. Dovetail did not conduct subsurface excavations during this work, but any existing ground disturbance was investigated for archaeological remains. The field crew was equipped with a handheld GPS capable of sub-meter accuracy. In addition, the GPS was used to record any areas of special interest, such as features or artifact deposits visible on the surface.

### **Architectural Survey**

The goal of the reconnaissance architectural survey was to locate above-ground resources over 50 years in the age located within the architectural project area that may require identification-level (Phase IB) architectural survey. This study included an inspection of the architectural project area, defined as the project area plus a 300-foot (91.4-m) buffer. Digital photographs were taken of a sample of architectural properties surrounding the project area. For above-ground resources, a table listing all previously recorded architectural resources over 50 years

in age within the architectural project area was generated. No architectural documentation was completed during this work.

## BACKGROUND RESEARCH

Prior to conducting fieldwork, the potential of the project area to contain significant archaeological resources and NRHP-eligible architectural properties was assessed by searching the DHR site file maps and records, and examining all relevant maps produced by the CWSAC. In total, nine archaeological sites and 113 architectural resources were located within a 1-mile (1.6-km) radius of the project area. This section of the report summarizes those surveys and resources and does not serve as the results of the Phase IA study, which are presented in the subsequent chapter entitled “Results of the Phase IA Study” (p. 27).

### Previous Surveys

Three previous cultural resource surveys have occurred within 1 mile (1.6 km) of the project area and are mapped and recorded in DHR’s Virginia Cultural Resources Information System (VCRIS) database (Table 3). Thunderbird conducted two archaeological surveys in 1978 and 1999. The first, a partial preliminary cultural resources reconnaissance of the New Construction Area at the Grafton School in Berryville, identified no sites or historic resources (Walker 1978). The 1999 Phase I archeological resources reconnaissance of the proposed Jack Enders Boulevard identified two sites (Gardner and Mitchell-Watson 1999). In 2008, Dovetail Cultural Resource Consultants, LLC conducted a Phase I cultural resource survey in anticipation of the Berryville Utility Line Project. This survey identified five archaeological sites and 14 architectural resources, recommending one site and three historic resources as potentially eligible (Schamel-González et al. 2008).

Table 3: Previous Cultural Resource Surveys within a 1-Mile (1.6-km) Radius of the Project Area.

DHR Report#	Title	Author(s)/Affiliation	Year
CK-004	<i>A Partial Preliminary Cultural Resources Reconnaissance of the New Construction Area at the Grafton School in Berryville, Clarke County, Virginia</i>	Joan M. Walker; Thunderbird	1978
CK-017	<i>A Phase I Archeological Resources Reconnaissance of the Proposed Jack Enders Boulevard, Clarke County, Virginia</i>	William M. Gardner and Leslie D. Mitchell-Watson; Thunderbird	1999
CK-023	<i>Phase I Cultural Resource Survey of Berryville Utility Line Project, Clarke County, Virginia</i>	Kerry Schamel-González et al; Dovetail Cultural Resource Group, LLC	2008

### Previously Recorded Archaeological Sites

A total of nine previously recorded archaeological sites is located within a 1-mile (1.6-km) radius of the project area (Table 4, p. 24). Of these, two sites (44CK0138 and 44CK0139), are trash middens dating to the nineteenth and twentieth centuries and have been evaluated as not eligible by the DHR staff. The remaining seven sites have not been evaluated for the NRHP. Six of seven sites not evaluated date from the late nineteenth through twentieth centuries and

consist of a warehouse (44CK0154), two dwellings (44CK0155 and 44CK0188), a school (44CK0168), and a store (44CK0177). The remaining site that has not been evaluated is complex of building known as Clermont (44CK0152) and consists of a dwelling, ice house, and kitchen.

Table 4: Previously Recorded Archaeological Resources within a 1-Mile (1.6-Km) Radius of the Project Area.

DHR #	Type	Period	DHR Evaluation
44CK0079	Springhouse	18th century	Not evaluated
44CK0138	Refuse Scatter	Last quarter 19th through 20th century	DHR Staff: Not Eligible
44CK0139	Refuse Scatter	19th century, 20th century	DHR Staff: Not Eligible
44CK0152	Clermont Dwelling, multiple, Ice house, Kitchen	Second half 18 <sup>th</sup> , 19 <sup>th</sup> century through 20 <sup>th</sup> century	Not evaluated
44CK0154	Warehouse	Reconstruction and Growth (1866–1916), WW I to WW II (1917–1945)	Not evaluated
44CK0155	Dwelling, single	Reconstruction and Growth (1866–1916), WW I to WW II (1917–1945)	Not evaluated
44CK0168	School	Reconstruction and Growth (1866–1916), WW I to WW II (1917–1945)	Not evaluated
44CK0177	Store	WW I to WW II (1917–1945), The New Dominion (1946–1991), Post Cold War (1992–Present)	Not evaluated
44CK0188	Single Dwelling	Reconstruction and Growth (1866–1916), WW I to WW II (1917–1945), New Dominion (1946–1991), Post Cold War (1992–Present)	Not evaluated

### Previously Recorded Architectural Resources

There are 113 previously recorded above-ground resources within a 1-mile (1.6-km) radius of the architectural project area (Appendix A, p. 49). Of these resources, nine are listed in the NRHP and Virginia Landmarks Register (VLR) (021-0019, 021-0057, 021-0073, 021-0967, 021-5025, 168-0001, 168-0012, 168-5027, and 168-5029). DHR staff determined three resources eligible (021-0004, 021-0092, and 168-5028) and determined four resources not eligible (021-0137, 021-0142, 021-0376, and 021-5007), while only one resource was determined by DHR staff as potentially eligible (021-5011). The remaining 96 resources have not been evaluated (see complete listing in Appendix A, p. 49).

Of the nine resources listed in the NRHP and VLR, four are historic districts including the rural historic districts of Long Marsh (021-0967) and the Chapel (021-5025). Both significant under Criteria A and C, the Long Marsh Rural Historic District was listed in the NRHP and VLR in 1996 while the Chapel Rural Historic District was listed in 2013 and 2014. Each of these districts have resources dating to as early as circa 1765 and comprise over 10,000 acres (4046.9-ha) of rural landscape that are dotted with domestic and agricultural buildings and structures with minimal modern development preserving much of Clarke County’s historic

agricultural landscape. The Berryville Historic District (168-0012), listed in 1987 under Criterion A, encompasses residential and commercial buildings with primarily vernacular architecture with a few late-nineteenth- and twentieth-century Italianate, Queen Anne, and Colonial Revival dwellings.

The Josephine City Historic District (168-5029), an African American community founded in 1870, is located in the south end of Berryville. The district, which was NRHP listed in 2014 under Criteria A and C, includes community resource such as school buildings and a cemetery, as well as several dwellings. The Josephine City School (168-5027), listed individually in 1995 in the NRHP and VLR under Criterion A for its function of a Reconstruction-era Black school house, also contributes to the significance of the Josephine City Historic District.

The Clermont Farm (021-0019) was listed in NRHP and VLR in 1996 under Criteria A and C for its agricultural significance as being a part of the one of the most productive areas in the state. This resource also contributes to the Chapel Rural Historic District. The House at 6259 Harry Byrd Highway (021-0057) was listed individually in the NRHP and VLR in 1994 under Criterion C for its unusual high-style architecture in Clarke County. This resource also contributes to the Long Marsh Rural Historic District. The Clarke County Court House (168-0001) was listed in the NRHP and VLR in 1983 and 1982, respectively, under Criterion A and C for its function as the county's courthouse and its Classical Revival/Roman Republican architecture. This resource contributes to Berryville's Historic District (168-0012). The Soldiers Rest (021-0073) was listed in 1996 under Criterion C for being one of the Clarke County's earliest frame dwellings.

Two resources were determined eligible for the NRHP: the Audley Farm (021-0004) and Dandridge Acres (021-0092). Determined eligible in 1994, the Audley Farm was constructed in circa 1796 by Warner Washington, Jr, George Washington's cousin, and retrains several outbuildings related to its function as a horse farm. The significance of this resource is under Criterion A, as a famous equestrian farm in the area, and Criterion C, as representing the Federal style with several surviving architectural elements. Dandridge Acres is composed of over 10 acres (4.0-ha) and surrounded by rural farmland. Constructed circa 1850, this dwelling was determined eligible by DHR staff under Criterion C for its unaltered conditions and character-defining features of Italianate and Greek Revival styles.

Four resources were determined not eligible for the NRHP, which include three dwellings Eustace Jackson House (021-0137), Bel Voi (021-0142), Stonebriar (021-0376), and the Norfolk and Western Railroad Corridor (021-5007). The three dwellings were constructed between circa 1825 through circa 1870 and constructed in Colonial Rival, Craftsman, and Federal styles. The remaining 96 resources have not been formally evaluated for NRHP potential. These resources comprise single-family dwellings, churches, cemeteries, and commercial buildings and primarily date to the second half of the nineteenth century. They are representative of various architectural styles and forms that were common in this part of Virginia during that period.

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## RESULTS OF THE PHASE IA STUDY

### Historic Map Review

Historic maps suggest that the area within and immediately adjacent to the project has experienced infrastructure growth due to the Norfolk and Western railway during the 1860s. The town of Berryville, located west of the project area, remained a crossroads community and primarily rural with few residential properties through the end of the nineteenth century (Figure 4). Within the immediate vicinity of the project area, there were a few houses and farms during this period, some of which are still standing, such as Bel Voi (021-0142), an early nineteenth-century house with associated outbuildings. During the 1930s Berryville experienced an influx of residential, commercial, and industrial growth outside the city limits. West of the project area, industrial and commercial buildings began to be constructed along the Norfolk and Western railway. Southwest of the project area, residential properties dotted the rural landscape as well as a subdivision adjacent to the Norfolk and Western railway (Figure 5, p. 28). By the late 1960s the town of Berryville developed residential subdivisions in the once flat and agricultural landscape (Figure 6, p. 29). Residential properties adjacent to the project area are vernacular-style dwellings built in the 1960s. State Highway 7 and residential properties began to encroach on the project area and the historic farm, Bel Voi from the north and south, respectively.

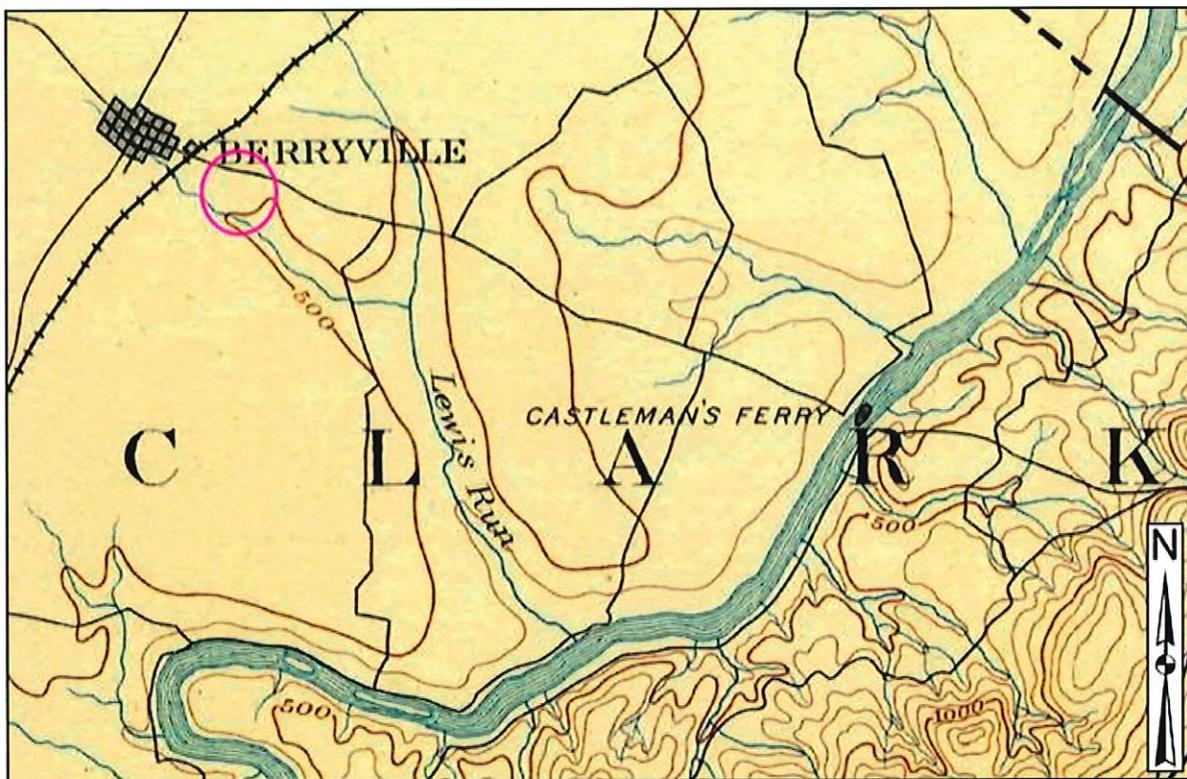


Figure 4: 1884 Harpers Ferry Topographic Map with Approximate Project Area Indicated with Pink Circle (USGS 1884). Not to Scale.

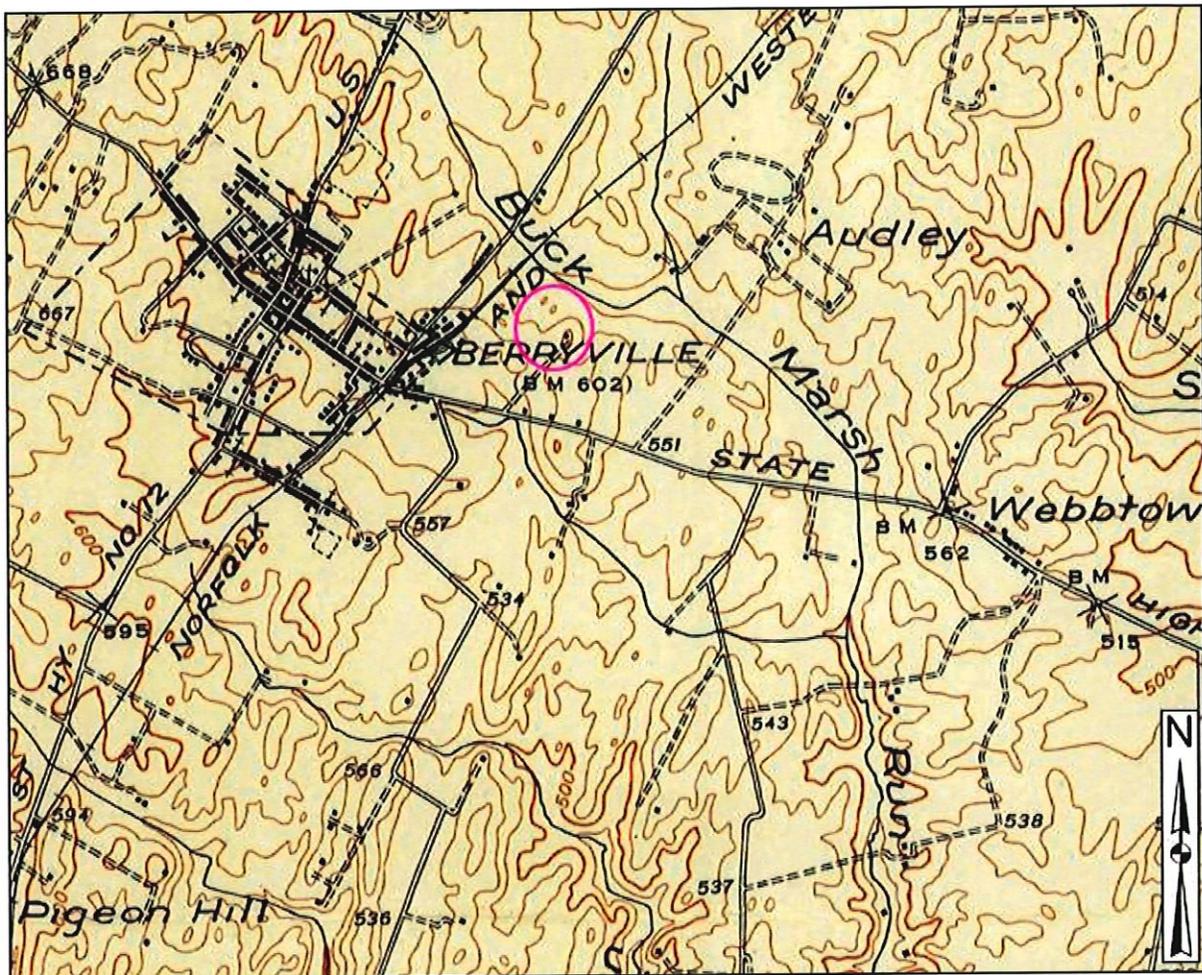


Figure 5: 1939 USGS Berryville Topographic Map with Approximate Project Area Indicated with Pink Circle (USGS 1939). Not to Scale.

By the late twentieth-century, Berryville's city limits expanded and absorbed the new residential sprawl surrounding the town. By 1997, most of the western boundary of the project area was incorporated into Berryville's city districting, and an unidentified and no-longer extant building existed in the southwest corner of the project area (Figure 7, p. 30). By 2017, residential and industrial property lines the project area to the west with Harry Byrd Highway to the northeast (Figure 8, p. 30). Route 7 forms a buffer area between the project area and the VLR- and NRHP-nominated Long Marsh Run Rural Historic District (021-0967).

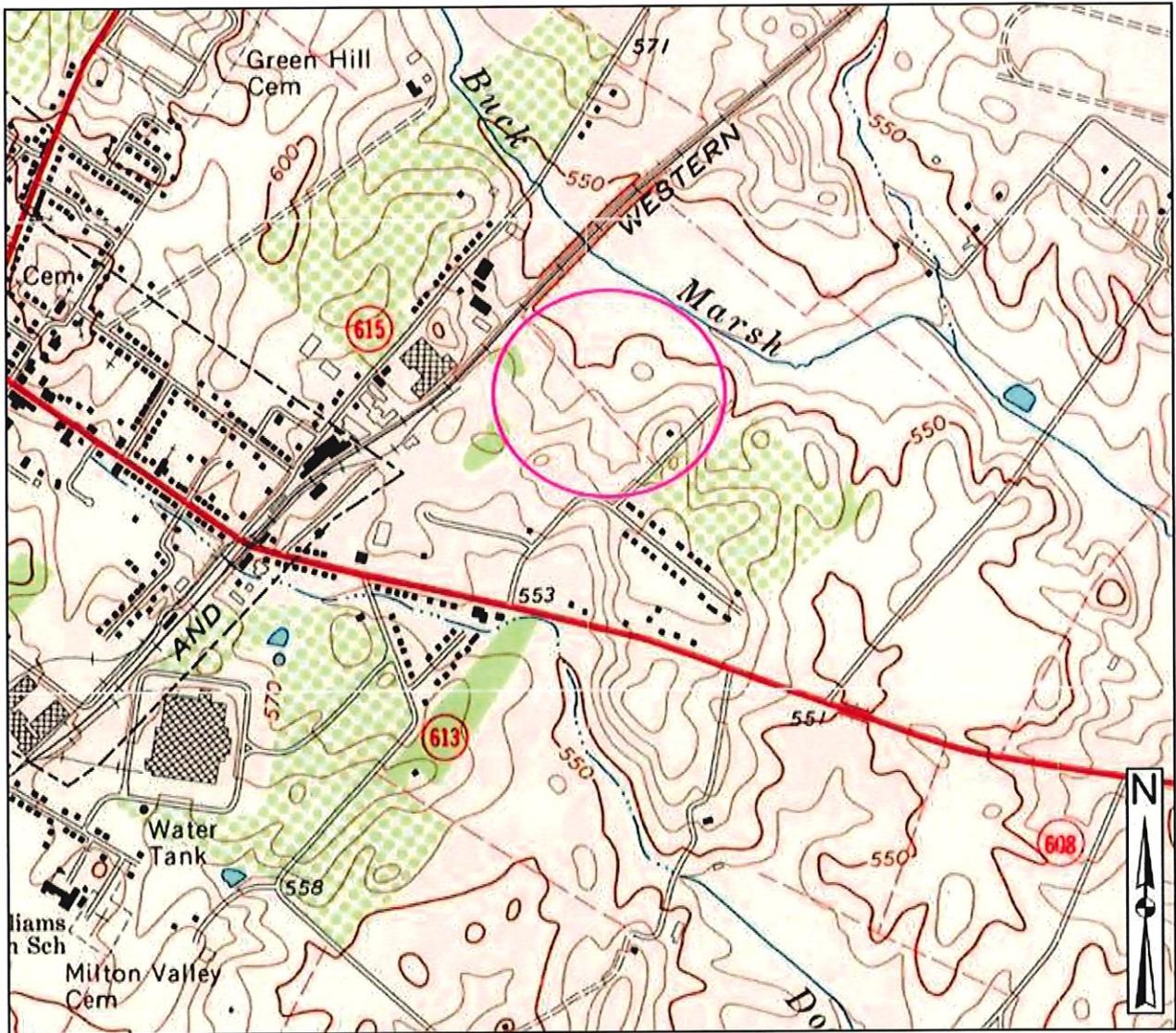


Figure 6: 1968 USGS Berryville Topographic Map with Approximate Project Area Indicated with Pink Circle (USGS 1968). Not to Scale.

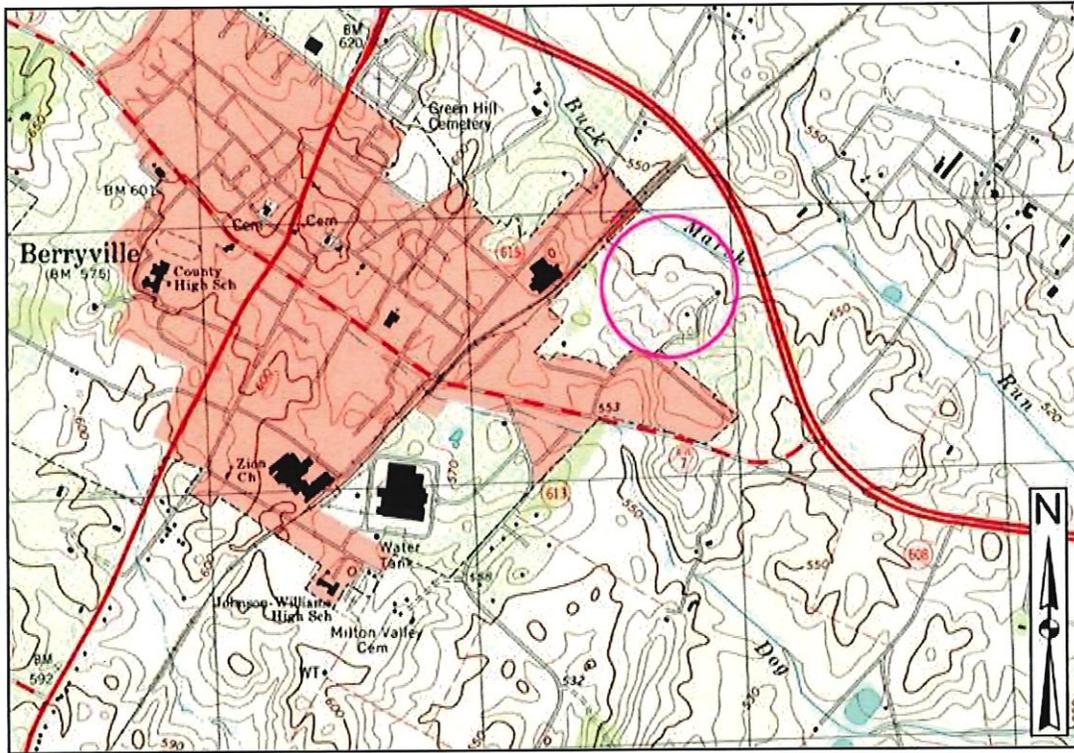


Figure 7: 1997 USGS Berryville Topographic Map with Approximate Project Area Indicated with Pink Circle (USGS 1997). Not to Scale.

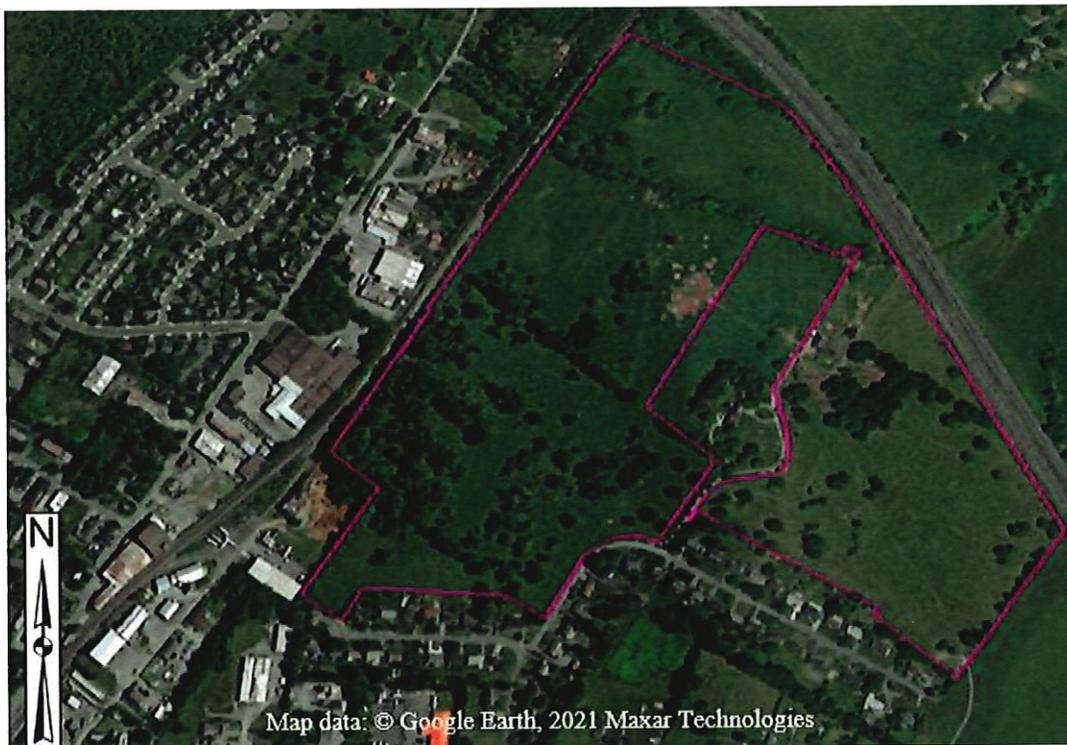


Figure 8: 2017 Aerial Showing Approximate Project Area Outline with Pink with Surrounding Development Near Berryville (Google Earth 2017). Not to Scale.

## Archaeological Survey Results

The archaeological survey included a pedestrian evaluation of the approximately 98.1-acre (39.7-ha) project area (see Figure 2, p. 3). The project area includes a cow pasture made up of clearings and deciduous hardwoods with generally level topography throughout. No artifacts or features were identified within the project area. The northwest portion of the project area was actively being used as a cow and horse pasture by the landowners (see Photo 1 and Photo 2, pp. 5–6). In general, the soils are intact throughout the project area, though the eastern portion of the project area contains large boulders and exposed subsoil (Photo 3 and Photo 4, p. 31). Disturbances within the project area are limited to fences associated with the pasture and a small driveway or parking area in the southeast corner of the project area (Photo 5, p. 32).

While there are only nine previously identified archaeological sites within 1 mile (1.6 km) of the project area, none of which were recorded as intersecting the project area, the presence of Buck Marsh Run and well-drained soils within the project area increases the area's potential to contain archaeological sites from both the precontact and historic periods. Thus, based on the background research and pedestrian survey, Dovetail recommends that the entire 98.1-acres (39.7-ha) of the project area appears to have the potential to contain intact archaeological remains (see Figure 2, p. 3). Based on the amount of apparently undisturbed area, Dovetail recommends that a **Phase IB archaeological survey of the 98.1-acre (39.7-ha) project area is warranted.**



Photo 3: View of Exposed Boulders within the Eastern Portion of the Project Area, Looking Northwest.



Photo 4: Exposed Patches of Subsoil within the Eastern Portion of the Project Area, Looking South.



Photo 5: View of Informal Parking Area in the Southeast Portion of the Project Area, Looking South.

## Architectural Survey Results

The reconnaissance architectural study included an inspection of the proposed development project area plus a 300-foot (91.44-m) buffer, or the architectural project area. In total, 37 above-ground resources were noted within the architectural project area during the vehicular survey and desktop survey that are either previously recorded (n=3) or previously unrecorded and are 50 years in age or older (n=34) (Table 5, p. 33; Figure 9–Figure 11, pp. 35–37).

Of the three previously recorded resources, only one overlaps the project footprint. A small agricultural field within Bel Voi (021-0142), a circa-1825, single-family dwelling constructed in a vernacular style, partially overlays the development area (see Figure 9, p. 35). Secondary resources recorded during a 1992 survey on the property but not in the project footprint included a slave quarter and smoke house; a barn and a corncrib are within the project impact area. This resource was determined not eligible for the NRHP by DHR staff in 1992. Since this property has not been resurveyed within the last five years, **it is recommended that it be resurveyed at the Phase IB level to meet DHR guidelines.** The other two previously recorded resources are in the architectural project area (viewshed) but not in the project footprint. The Norfolk and Western Railroad Corridor (021-5007) abuts the northwest boundary of the project area (see Figure 9–Figure 10, pp. 35–36). The resource was determined not eligible and surveyed within the last five and as such **Dovetail recommends that it not be resurveyed.** The remaining previously recorded resource, the Long Marsh Run Rural Historic District (021-0967), is east of Harry Byrd Highway. It was listed in the NRHP and VLR in 2013 (see Figure 9, p. 35; see Figure 11, p. 37). Because this resource has not been resurveyed within the last five years, **Dovetail recommends a resurvey at the Phase IB level.**

The remaining 34 resources are newly identified resources that meet the survey criteria. They are located outside of the project footprint but within the surrounding viewshed. Of these, 29 are single-family dwellings (see Figure 9, p. 35). Estimated dates of construction are primarily from the 1960s with three spanning from circa 1928 through circa 1950 that overwhelmingly reflect styles and forms that were common during this period in rural Virginia. Also included are five industrial buildings built circa 1932 through circa 1972, comprised of concrete and metal building materials with rectangular forms. **Dovetail recommends that all newly identified resources within the architectural project area should be the subject of a Phase IB reconnaissance-level survey.**

Table 5: Architectural Resources within the Architectural Project Area.

DHR ID/ Temp #	Name and Address	Date of Construction	Previous Eligibility Determination	Survey Recommendation
021-0142	Bel Voi	ca. 1825	DHR Staff: Not Eligible: 2013	Phase IB Recommended
021-0967	Long Marsh Run Rural Historic District	post 1770	NRHP Listing, VLR Listing: 2013	Phase IB Recommended
021-5007	Norfolk and Western Railroad Corridor	1879	DHR Staff: Not Eligible: 2018	No Further Survey Recommended
4	201 Battletown Dr.	ca. 1967	N/A	Phase IB Recommended
5	117 Battletown Dr.	ca. 1963	N/A	Phase IB Recommended
6	115 Battletown Dr.	ca. 1962	N/A	Phase IB Recommended

<b>DHR ID/ Temp #</b>	<b>Name and Address</b>	<b>Date of Construction</b>	<b>Previous Eligibility Determination</b>	<b>Survey Recommendation</b>
7	113 Battletown Dr.	ca. 1966	N/A	Phase IB Recommended
8	111 Battletown Dr.	ca. 1963	N/A	Phase IB Recommended
9	107 Battletown Dr.	ca. 1961	N/A	Phase IB Recommended
10	105 Battletown Dr.	ca. 1960	N/A	Phase IB Recommended
11	103 Battletown Dr.	ca. 1962	N/A	Phase IB Recommended
12	101 Battletown Dr.	ca. 1961	N/A	Phase IB Recommended
13	204 Battletown Dr.	ca. 1962	N/A	Phase IB Recommended
14	122 Battletown Dr.	ca. 1962	N/A	Phase IB Recommended
15	120 Battletown Dr.	ca. 1959	N/A	Phase IB Recommended
16	116 Battletown Dr.	ca. 1964	N/A	Phase IB Recommended
17	114 Battletown Dr.	ca. 1963	N/A	Phase IB Recommended
18	112 Battletown Dr.	ca. 1967	N/A	Phase IB Recommended
19	108 Battletown Dr.	ca. 1959	N/A	Phase IB Recommended
20	106 Battletown Dr.	ca. 1961	N/A	Phase IB Recommended
21	104 Battletown Dr.	ca. 1960	N/A	Phase IB Recommended
22	20 Battletown Dr.	ca. 1968	N/A	Phase IB Recommended
23	12 Battletown Dr.	ca. 1968	N/A	Phase IB Recommended
24	2 Bel Voi Dr.	ca. 1967	N/A	Phase IB Recommended
25	4 Bel Voi Dr.	ca. 1968	N/A	Phase IB Recommended
26	6 Bel Voi Dr.	ca. 1970	N/A	Phase IB Recommended
27	10 Bel Voi Dr.	ca. 1969	N/A	Phase IB Recommended
28	15 Bel Voi Dr.	ca. 1972	N/A	Phase IB Recommended
29	17 Bel Voi Dr.	ca. 1972	N/A	Phase IB Recommended
30	214 First St.	ca. 1972	N/A	Phase IB Recommended
31	222 First St.	ca. 1972	N/A	Phase IB Recommended
32	230 First St.	ca. 1932	N/A	Phase IB Recommended
33	300 First St.	ca. 1932	N/A	Phase IB Recommended
34	324 First St.	ca. 1960	N/A	Phase IB Recommended
35	418 First St.	ca. 1950	N/A	Phase IB Recommended
36	422 First St.	ca. 1947	N/A	Phase IB Recommended
37	428 First St.	ca. 1928	N/A	Phase IB Recommended

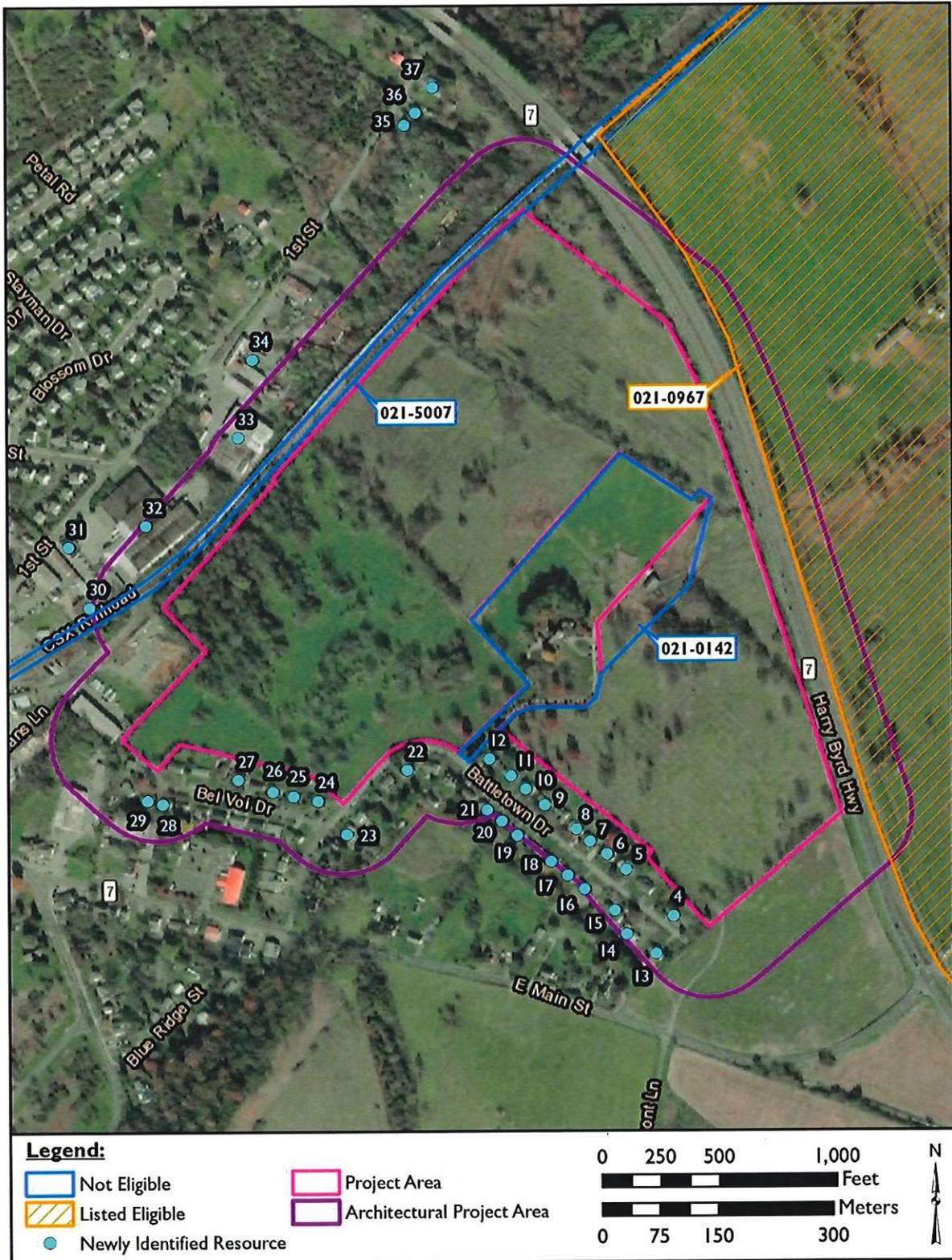


Figure 9: Architectural Resources within the Architectural Project Area (Esri 2018).

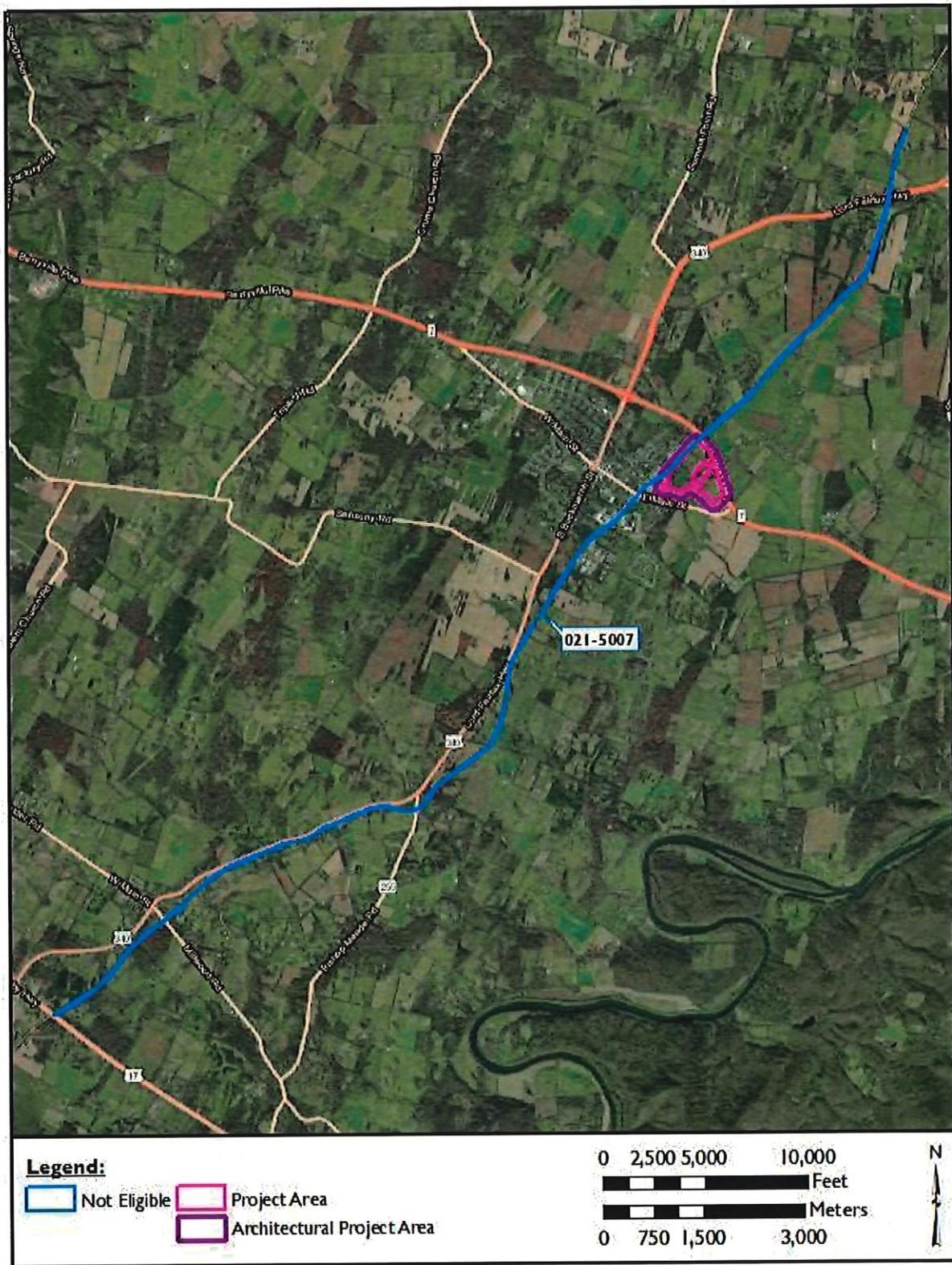


Figure 10: Aerial of Norfolk and Western Railroad Corridor (021-5007) with Project Area and Architectural Project Area (Esri 2018).

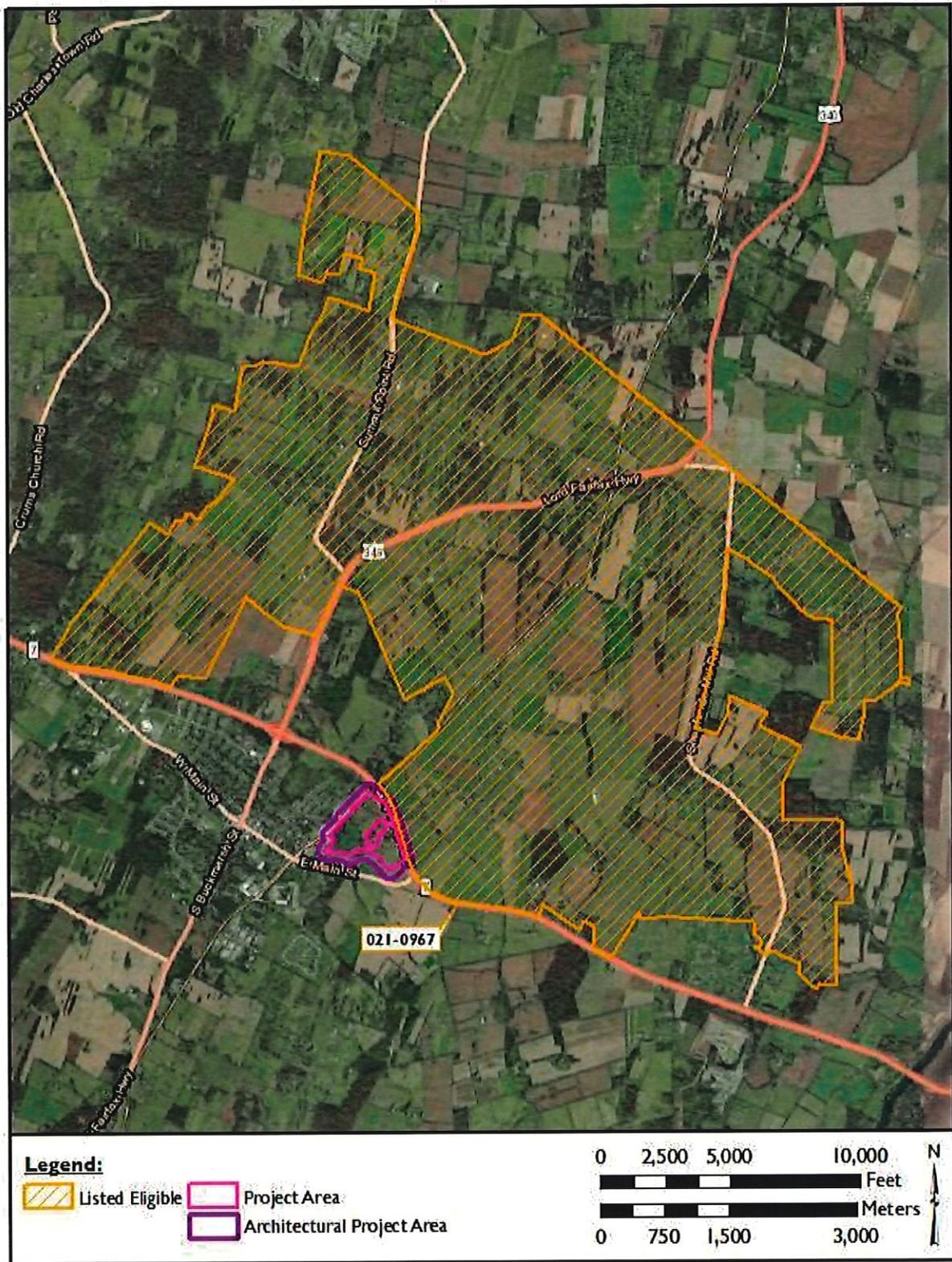


Figure 11: Aerial of Long Marsh Rural Historic District (021-0967) with Project Area and Architectural Project Area (Esri 2018).

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## SUMMARY AND RECOMMENDATIONS

Dovetail conducted a Phase IA cultural resource reconnaissance of the Friant Clark project area for D.R. Horton Capital Division. The approximately 98.1-acre (39.7-ha) project area is located in central Clarke County, Virginia. The Phase IA study was intended to determine the location, nature, and, if possible, extent of any cultural features visible on the surface and to identify areas with the potential to contain archaeological sites. In addition, areas which do not warrant archaeological investigations due to inundation or other disturbance were noted. The results of the field study were used to make recommendations regarding whether a Phase IB cultural resource investigation is warranted prior to the proposed development of the parcel, and how much of the parcel should be subjected to such an investigation.

The Phase IA archaeological reconnaissance study included a pedestrian survey of the project area. The work resulted in the definition of locations suitable for subsurface archaeological investigations within the project area based on the probability of encountering intact archaeological resources. Although some small areas may be inundated, exhibit exposed boulders, or are disturbed in such a way as to preclude the placement of individual STPs, the project area in general shows little disturbance. The presence of agriculturally productive soils and level or gently sloping topography in the vicinity of Buck Marsh Run make the area relatively well suited to contain archaeological sites from both the precontact and historic periods. Thus, based on the background research and pedestrian survey, Dovetail recommends that the entire 98.1-acres (39.7-ha) of the project area appears to have the potential to contain intact archaeological remains (see Figure 2, p. 3). Based on the amount of apparently undisturbed area, Dovetail recommends that a **Phase IB archaeological survey of the 98.1-acre (39.7-ha) project area is warranted.**

The reconnaissance architectural survey included an inspection of the architectural project area, which comprises the proposed development project area plus a 300-foot (91.4m) buffer. In total, the 37 above-ground resources noted during the architectural survey are either previously recorded or previously unrecorded and are 50 years in age or older. Of these, Bel Voi (021-142) is partially within the project footprint. It is a circa-1825, single-family dwelling constructed in a vernacular style. Secondary resources recorded during a 1992 survey included a slave quarter and smoke house (neither of which is in the project footprint) plus a barn and a corner crib (both within the boundaries of the project area). This dwelling and its associated outbuildings were determined not eligible for the NRHP by DHR staff in 1992. Since this property has not been resurveyed within the last five years, **it is recommended that it be resurveyed at the Phase IB level.** The Norfolk and Western Railroad Corridor (021-5007), abuts the northeast boundary of the project area. The resource was determined not eligible and surveyed within the last five years; as such, Dovetail **recommends that it not be resurveyed.** The remaining previously recorded resource is The Long Marsh Run Rural Historic District (021-0967), located east of Harry Byrd Highway. It was listed in the NRHP in 2013. Because this resource has not been resurveyed within the last five years Dovetail **recommends a resurvey at the Phase IB level.**

Thirty-four newly identified resources that meet the survey criteria include 29 single-family dwellings and five industrial buildings. Dovetail **recommends that all newly identified**

**resources within the architectural project area should be the subject of a Phase IB reconnaissance-level survey.**

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#### Virginia Department of Historic Resources (DHR)

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1978 *A Partial Preliminary Cultural Resources Reconnaissance of the New Construction Area at the Grafton School in Berryville, Clarke County, Virginia.* Thunderbird Archaeological Associates, Gainesville, Virginia.

Ward, H. Trawick

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## APPENDIX A: PREVIOUSLY RECORDED ARCHITECTURAL RESOURCES WITHIN A 1-MILE (1.6-KM) RADIUS

<b>DHR #</b>	<b>Name</b>	<b>Eligibility Determination</b>
021-0004	Audley Farm	DHR Staff: Eligible
021-0019	Clermont Farm	NRHP Listing, VLR Listing
021-0057	House, 6259 Harry Byrd Highway	NRHP Listing, VLR Listing
021-0062	Green Hill Cemetery	Not Evaluated
021-0073	Soldier's Rest	NRHP Listing, VLR Listing
021-0079	Commercial Building, 304 North Buckmarsh Street	Not Evaluated
021-0080	House, Route 340 N	Not Evaluated
021-0092	Dandridge Acres	DHR Staff: Eligible
021-0097	House, Route 340 North	Not Evaluated
021-0108	Not Evaluated	Not Evaluated
021-0109	House, Route 340 N	Not Evaluated
021-0110	House, Route 340 N	Not Evaluated
021-0111	Supreme Council of House of Jacob	Not Evaluated
021-0112	House, 21 Blackburn St.	Not Evaluated
021-0113	House, 22 Blackburn St.	Not Evaluated
021-0114	House, 19 Blackburn St.	Not Evaluated
021-0115	House, 20 Blackburn St.	Not Evaluated
021-0116	House, 15 Blackburn St.	Not Evaluated
021-0117	House, 14 Blackburn St.	Not Evaluated
021-0118	House, 205 Route 616	Not Evaluated
021-0119	House, 207 Route 616	Not Evaluated
021-0120	House, Route 615	Not Evaluated
021-0121	Barn, Route 615	Not Evaluated
021-0122	House, Route 615	Not Evaluated
021-0123	House, Route 615	Not Evaluated
021-0124	House, Route 615	Not Evaluated
021-0125	House, Route 615	Not Evaluated
021-0126	House, Route 615	Not Evaluated
021-0127	House, Route 615	Not Evaluated
021-0128	House, Route 615	Not Evaluated
021-0129	House, Route 615	Not Evaluated
021-0130	House, Route 615	Not Evaluated
021-0131	House, Route 615	Not Evaluated
021-0132	House, Route 615	Not Evaluated
021-0133	House, Route 615	Not Evaluated
021-0134	House, Route 615	Not Evaluated
021-0135	House, Route 615	Not Evaluated
021-0136	House, 112 Springsbury Road	Not Evaluated
021-0137	Eustace Jackson House	DHR Staff: Not Eligible

<b>DHR #</b>	<b>Name</b>	<b>Eligibility Determination</b>
021-0138	House, Route 7E	Not Evaluated
021-0139	House, Route 7 East	Not Evaluated
021-0140	House, Route 7E	Not Evaluated
021-0141	House, Route 7 Business E	Not Evaluated
021-0142	Bel Voi	DHR Staff: Not Eligible
021-0143	House, Main Steet	Not Evaluated
021-0144	House, Main Steet	Not Evaluated
021-0145	House, Main Steet	Not Evaluated
021-0146	House, 319 S. Church Street	Not Evaluated
021-0147	House, 321 S. Church Street	Not Evaluated
021-0148	House, 324 S. Church Street	Not Evaluated
021-0149	House, 325 S. Church Street	Not Evaluated
021-0150	House, 406 S. Church Street	Not Evaluated
021-0151	House, 409 S. Church Street	Not Evaluated
021-0152	House, 412 S. Church Street	Not Evaluated
021-0153	House, 410 S. Church Street	Not Evaluated
021-0178	House, Route 340	Not Evaluated
021-0254	Buildings, Route 7	Not Evaluated
021-0356	Brentwood	Not Evaluated
021-0375	Fielding House	Not Evaluated
021-0376	Stonebriar	DHR Staff: Not Eligible
021-0751	House, Route 615	Not Evaluated
021-0762	Peyton, Dorothy House	Not Evaluated
021-0763	Miller-Hubert House	Not Evaluated
021-0967	Long Marsh Run Rural Historic District	NRHP Listing, VLR Listing
021-5007	Norfolk and Western Railroad Corridor	DHR Staff: Not Eligible
021-5011	Berryville Battlefield	DHR Staff: Potentially Eligible
021-5025	Chapel Rural Historic District	NRHP Listing, VLR Listing
021-5037	Buck Marsh Fight Marker	Not Evaluated
168-0001	Clarke County Court House	NRHP Listing, VLR Listing
168-0002	Clerk's Office and Jail	Not Evaluated
168-0003	Crow's Nest	Not Evaluated
168-0004	Duncan Methodist Memorial Church	Not Evaluated
168-0005	Grace Episcopal Church	Not Evaluated
168-0006	The Nook	Not Evaluated
168-0008	Berryville Presbyterian Church	Not Evaluated
168-0009	Hawthorne Hall	Not Evaluated
168-0010	Barns of Rose Hill	Not Evaluated
168-0011	Taylor House	Not Evaluated
168-0012	Berryville Historic District	NRHP Listing, VLR Listing
168-0013	House, Buckmarsh Street	Not Evaluated
168-0014	House, Buckmarsh Street	Not Evaluated
168-0015	House, Buckmarsh Street	Not Evaluated
168-0016	House, Buckmarsh Street	Not Evaluated
168-5001	House, 203 N. Church Street	Not Evaluated

<b>DHR #</b>	<b>Name</b>	<b>Eligibility Determination</b>
168-5002	House, 205 N. Church Street	Not Evaluated
168-5003	House, 16 Blackburn Street	Not Evaluated
168-5004	Zion Baptist Church	Not Evaluated
168-5005	House, 20 Josephine Street	Not Evaluated
168-5006	Annie Hoseby House	Not Evaluated
168-5007	House, Josephine Street	Not Evaluated
168-5008	Doleman House	Not Evaluated
168-5009	House, 110 Josephine Street	Not Evaluated
168-5010	Gilleson Log House	Not Evaluated
168-5011	House, 114 Josephine Street	Not Evaluated
168-5012	House, 218 Josephine Street	Not Evaluated
168-5013	House, 312 Josephine Street	Not Evaluated
168-5014	Cemetery, 313 Josephine Street	Not Evaluated
168-5015	House, 307 Josephine Street	Not Evaluated
168-5016	House, 229 Josephine Street	Not Evaluated
168-5017	House, 227 Josephine Street	Not Evaluated
168-5018	Hampton-Page House	Not Evaluated
168-5019	House, 213 Josephine Street	Not Evaluated
168-5020	Clubhouse, 203 Josephine Street	Not Evaluated
168-5021	House, 113 Josephine Street	Not Evaluated
168-5022	House, 109 Josephine Street	Not Evaluated
168-5023	House, 103 Josephine Street	Not Evaluated
168-5024	House, 15 Josephine Street	Not Evaluated
168-5025	Benjamin Franklin Annex	Not Evaluated
168-5026	Johnson-Williams Annex	Not Evaluated
168-5027	Education Building, 303 Josephine Street	NRHP Listing, VLR Listing
168-5028	House, 328 N. Buckmarsh Street	DHR Board Det. Eligible
168-5029	Josephine City Historic District	NRHP Listing, VLR Listing
168-5031	Berryville Courthouse Common Soldier	Not Evaluated

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# APPENDIX B: PRINCIPAL INVESTIGATOR QUALIFICATIONS

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# DOVETAIL

## CULTURAL RESOURCE GROUP

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### YEARS EXPERIENCE

With this firm: 16

With other firms: 13

### EDUCATION

PhD/Anthropology & Architectural History, 2004

MA/Anthropology, 1999

MCert/Museum Management, 1999

BA/Historic Preservation, 1994

### REGISTRATIONS/QUALIFICATIONS

Registered Professional Archaeologist

Secretary of Interior Standards Qualified as  
Archaeologist, Architectural Historian, and Historian

Council of Virginia Archaeologists

### PUBLICATIONS/PRESENTATIONS/COMMITTEES

Board Member and Conference Committee  
Chair/American Cultural Resources Association (2013–  
present)

Co-Editor/Bulletin of the Archaeological Society of  
Delaware (2011–present)

Member/Fredericksburg Architectural Review Board  
(2010–present)

Co-Chair/Council of Virginia Archaeologists Award's  
Committee (2010–present)

*Fredericksburg: The Official Guide* (Editor, 2013)

*A Woman in a War-Torn Town: The Journal of Jane  
Howison Beale, 1850–1862* (Editor, 2011)

Tectonics in the Piedmont; Environmental Archaeology  
on the Colonial Virginia Frontier. *Historical  
Archaeology* (2010)

City of Fredericksburg Historic Preservation Plan  
(Primary author, Adopted 2010)

*Household Chore and Households Choices: Theorizing  
the Domestic Sphere in Historical Archaeology* (2004)

High Speed Rail and Linear Resources in the Mid-  
Atlantic. Paper presented at the Transportation Research  
Board ADC50 Conference, Richmond, Virginia (2019)

## KERRI S. BARILE, PHD, RPA

### President/Principal Investigator

### EXPERIENCE

Dr. Barile has almost 30 years of professional experience in the fields of archaeology, architectural history, historic research, and Cultural Resource Management (CRM). She has directed the excavation of a wide array of archaeological sites in Virginia and across the country, and has recorded and researched an abundance of historic buildings, structures, districts, and objects. She has written and contributed to over 700 CRM reports, and she has extensive experience in a variety of cultural resource, environmental, and transportation legislation including authoring dozens of Memorandums of Agreement (MOA) and Programmatic Agreements (PA). In addition to CRM experience, Dr. Barile has taught university courses in historic preservation and preservation law, architectural history, and archaeology. She has also published numerous professional articles and papers on her studies, including articles in *Historical Archaeology* and several National Register of Historic Places nominations.

### SAMPLE PROJECTS

*Principal Investigator/Southeast High Speed Rail Corridor Study, Raleigh, North Carolina, to Washington, D.C.* (DRPT/NCDOT). Cultural resource studies and project effect coordination for over 200 miles of rail and 100 miles of roadway, including the recordation of over 4,000 architectural resources and more than 100 sites, and involving almost 100 agencies and consulting parties.

*Principal Investigator/Cultural Resource Study of Slavery-Related Sites, Stafford County, Virginia* (Stafford County/DHR). CLG Grant Program project to gather data on properties throughout the county with ties to slavery. Work included extensive coordination with the local community, archival research, and descendant interviews.

*Principal Investigator/US Route 301 Cultural Resources Studies, New Castle County, Delaware* (DelDOT). Multi-year mega project to create a new roadway in Delaware. Studies included Phase I, II, and III archaeology, reconnaissance and intensive architectural studies, archival research, museum displays, pamphlet production, public talks, professional papers, and more.

*Principal Investigator/Historic Context of Commercial Resources, 1961–1980, Montgomery and Prince George's County, Maryland* (MDOT SHA). Developed an extensive context and architectural evaluation guide for recent resources in Maryland. Involved extensive agency coordination.

*Principal Investigator/Roebling Historic Architectural Evaluation, Burlington County, New Jersey* (Kampack). Performed an intensive architectural evaluation and archival research on this early-20<sup>th</sup> century planned community to house and service workers at the nearby ironworks.

*Project Manager/Interstate 95 Gerard Avenue Archaeological Studies, Philadelphia, Pennsylvania* (PennDOT/AECOM). Manager for Dovetail's involvement in multiyear study to conduct archaeological data recovery at scores of sites along the Philadelphia waterfront.

*Principal Investigator/Riverfront Park, Fredericksburg, Virginia* (City of Fredericksburg). Performed extensive studies on new 3-acre urban park including all phases of archaeology, architectural analysis, archival research, and coordinating resource avoidance with park designers.

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