

Date: 20 November 2023
To: Benjamin Avery, Greenfield Growth Consulting
From: Corey Mack, PE, PTOE, Consultant Transportation Engineer
Subject: Homestead Campground – Site Transportation Assessment

WCG has reviewed the proposed mixed-use redevelopment of the Homestead Campground at 864 Ethan Allen Highway (US-7) in Georgia, Vermont. Following the Town of Georgia Development Regulations, TIS Guidelines from the Vermont Agency of Transportation (VTrans) and standard engineering practice outlined by the Institute of Transportation Engineers (ITE) and other sources, WCG has prepared the following assessment of the likely transportation impacts.

In summary:

- The Homestead Campground Redevelopment Project proposes the construction of 39 residential units, 33 senior living units, and 12,000 SF of commercial space in a mixed use planned unit development.
- The proposed site is adjacent to two high crash locations based on data from 2012 through 2016. Since this time, the total number of crashes has decreased substantially, and the roadway has been reclassified. It is unlikely the roadway segments would continue to be considered high crash locations.
- The proposed project is estimated to generate 56 AM peak hour trip ends, 112 PM peak hour trip ends, and 1,166 trip ends over the course of an average weekday. After accounting for internal capture, pass-by trip making, and the effects of transportation demand management, the proposed project is estimated to generate 42 AM, 64 PM, and 755 new, external primary vehicle peak hour trip ends on an average weekday.
- The full build out of the proposed project is expected to operate acceptably in the 2025 build year and the 2030 future year scenarios. When the site driveway is combined with the Dollar General driveway, and with the addition of an unidentified volume of traffic to approximate additional development along Ballard Road, the level of service along the eastbound Ballard Road approach to US-7 falls below the VTrans standard for acceptable operations.
- The available sight distance at the proposed access opposite the existing Ballard Road approach to US-7 exceeds the minimum stopping sight distance and design target intersection sight distance for the location.
- Turn lanes at the site access are not warranted by traffic volumes and are also not recommended based on site context and characteristics.

- The Georgia South Village Transportation Master Plan recommended the installation of a traffic signal based on community context and transportation network considerations.
- A traffic signal is not warranted by volume in both the existing / no-build condition and proposed build condition if the site context is considered urbanized.
- A traffic signal is warranted by volume in both the existing / no-build condition and proposed build condition if the site's location is considered a built up area of an isolated community of less than 10,000 people.
- The site may be assessed an Act 145 Transportation Impact Fee of \$10,206 to project STP 5800(3) in Milton.

Based on our analysis, the proposed project is not expected to cause or worsen undue traffic congestion or safety issues. No roadway infrastructure mitigation is recommended as a result of the Homestead Campground redevelopment project. At 50% build out, we recommend the project prepare an updated trip generation estimate, traffic capacity analysis, turn lane warrant assessment and traffic signal warrant assessment to evaluate and confirm the resulting transportation impacts at the observed and projected occupancy levels.

Following review of the site plan, we offer the following recommended revisions:

- The proposed site plan does not indicate if on-street parking is allowed. If allowed, we recommend the site design team consider the installation of curb extensions into the parking aisle to reduce the crossing width and define the parking aisle.
- To help meet local and regional vehicle electrification goals, we recommend the site design team consider installation of Level 2 electric vehicle charging infrastructure in off-street parking lots available for use to the multifamily and townhouse residential units.

Based on the analysis conducted for this report, the proposed project will not cause or exacerbate any unreasonable congestion or unsafe conditions on the local roadway network and will not unnecessarily or unreasonably endanger the public's investment in any local roads, highways, or related infrastructure.

BACKGROUND

Greenfield Development proposes to construct a mixed-use planned unit development on approximately 12.3 acres along US-7 opposite the southern end of Ballard Road in Georgia, Vermont. The mixed-use development project consists of:

- (8) 2-bedroom units within multifamily / mixed use buildings
- (25) 2-bedroom townhouse-style attached units
- (6) 3-bedroom single family units
- 33 senior living units
- 12,000 SF of first floor commercial

The site proposes direct access to US-7 from a new public road directly opposite Ballard Road near US-7 mile point 0.83, and through internal roadways to the existing Dollar General. The proposed site plan is illustrated in Figure 1.

FIGURE 1: PROPOSED HOMESTEAD CAMPGROUND REDEVELOPMENT SITE PLAN, DATED 7/7/23 (SOURCE: O’LEARY-BURKE CIVIL ASSOCIATES, PLC)



The proposed site plan illustrates four surface parking lots with a total of 137 parking spaces, plus parking for two vehicles in each single-family lot driveway, for a total of 149 off street parking spaces. The roadways are approximately 28-feet wide, which would allow for parking on one side of the street and two 10-foot travel lanes, which would be consistent with narrow, traffic-calmed neighborhood roadways.

The site is located within the Town of Georgia’s “South Village” zoning district. The Town of Georgia, Northwest Regional Planning Commission, and VTTrans have developed the South Village Transportation Master Plan¹ identifying preferred infrastructure treatments adjacent to the project area, including a new traffic signal and crosswalk at US-7 & Ballard Road and a

¹ Georgia South Village Transportation Master Plan, 17 May 2019
https://vtrans.vermont.gov/sites/aot/files/planning/documents/corridor/FINAL%20-%20Georgia%20South%20Village%20Transportation%20Master%20Plan_05.17.19_redux.pdf

“potential future connector public” road through the proposed development at Homestead Campground.

The South Village zoning district is not a state designated neighborhood or center.

There are no identified active or planned highway construction projects on US-7 near the project area.

EXISTING TRANSPORTATION NETWORK

The roadway context along US-7 in Georgia is primarily commercial with some single-family residential driveways south of Ballard Road. Adjacent and nearby commercial land uses include a free-standing discount retail store, a seasonal ice cream window, an urgent care medical facility, gas station / convenience stores / grocery stores, a bank, and other office and commercial space.

US Route 7 is a state-controlled highway under Vermont Agency of Transportation jurisdiction. The roadway is classified as an urban minor arterial from Milton through the project area to I-89 Exit 18, about ½ mile north of the project site. At Ballard Road, the roadway consists of an 11-foot travel lane and 3-foot shoulder in both directions, for a total roadway width of 28-feet. The roadway is uncurbed on both sides with an open drainage system. The speed limit of US-7 is 40 mph.

Ballard Road is a Class 3 Town Highway under local jurisdiction, classified as a local road. The road is 24-feet wide, with no striped centerline or fog line. Ballard Road intersects with US-7 at mile point 0.83. The Ballard Road approach to US-7 flares widely in a large asphalt radius, extending the pedestrian crossing distance significantly. The corners are striped with hatching to discourage high speed turns through the wide radius.

The proposed site has easement access through the Dollar General driveway, approximately 150 feet north of Ballard Road. The private driveway is approximately 30 feet wide, consisting of one lane in both the entering and exiting direction.

There are limited pedestrian walkways and no dedicated bicycle infrastructure along US-7. US-7 is designated as a “High Use / Priority” bicycle corridor by the VTrans On-Road Bicycle Plan. There are no transit stops proximate to the project area, but Green Mountain Transit (GMT) operates two routes near I-89 Exit 18:

- Route 96: St Albans Link Express: 2 morning and 2 evening services in the northbound and southbound directions from the Exit 18 park and ride located on Skunk Hill Road, approximately ½ mile north of the project site.
- Route 115: Alburgh – Georgia Commuter with one morning and one evening service to the Exit 18 park and ride on Skunk Hill Road (nearest stop), plus the Arrowhead and Georgia Regional Business Parks.

Automatic traffic recorder site ATR F378 located about 1,000-feet north of the project site (south of VT-104A) reported a 2022 average annual daily traffic (AADT) volume of 6,621 vehicles per day (vpd). This is based on 7 days of data in late June and early July 2022. However, there

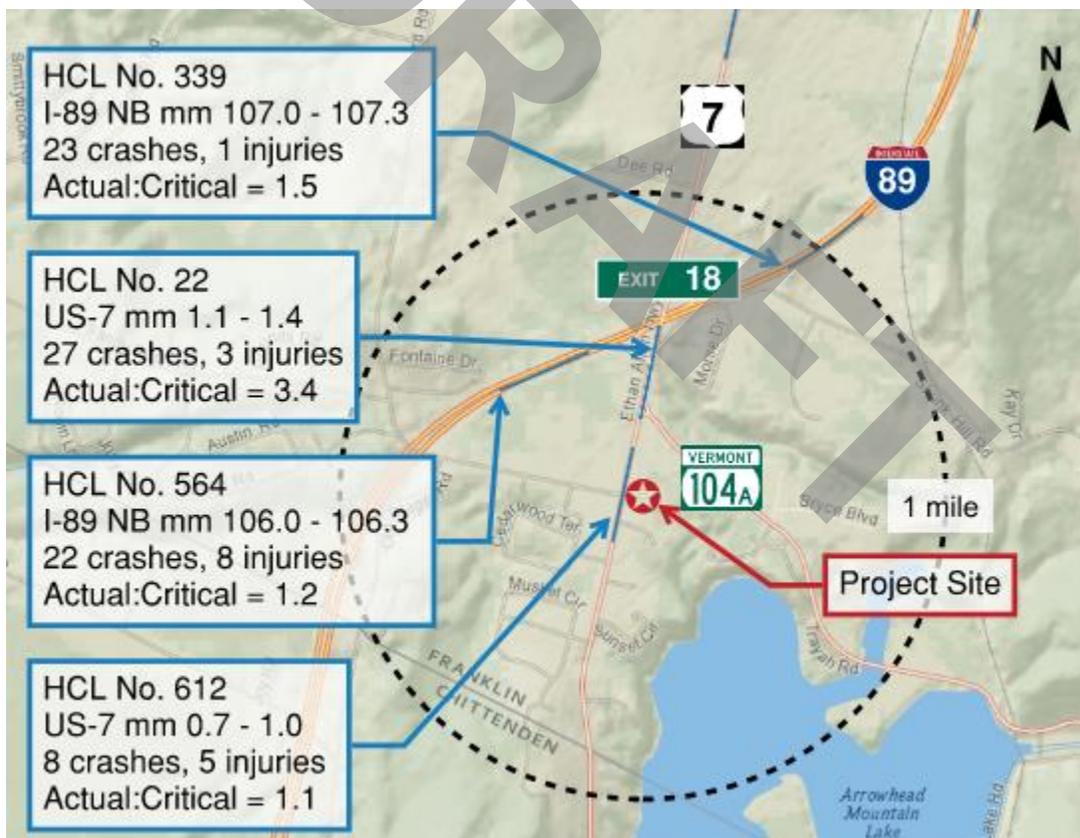
appears to be an anomaly within the dataset, with one of the days recording a significantly lower volume than expected. WCG estimated a corrected 2022 AADT of 7,240 vpd, with documentation provided in Attachment B.

The observation in 2022 recorded a peak hour volume of 836 vehicles per hour (vph), a resulting corrected %K of 11.5%, and a northbound directional split (%D) of 58% in the PM peak. With data available in 1-hour increments, the morning peak hour was observed from 8:00 AM to 9:00 AM, and the afternoon peak hour was observed from 4:00 PM to 5:00 PM.

CRASH REVIEW

High crash locations (HCLs) are intersections or roadway segments where the actual crash rate over a five-year period exceeds the critical crash rate. WCG reviewed the most HCL report prepared by VTrans, which uses 2012-2016 crash data. Four HCLs are reported within 1 mile of the project site (Figure 2), including an HCL directly adjacent to the proposed site.

FIGURE 2: 2012-2016 HIGH CRASH LOCATION SEGMENTS WITHIN 1 MILE OF THE PROJECT SITE



- Two of the HCLs are on I-89 northbound: one near the northbound exit ramp diverge, and the other near the northbound entrance ramp merge.

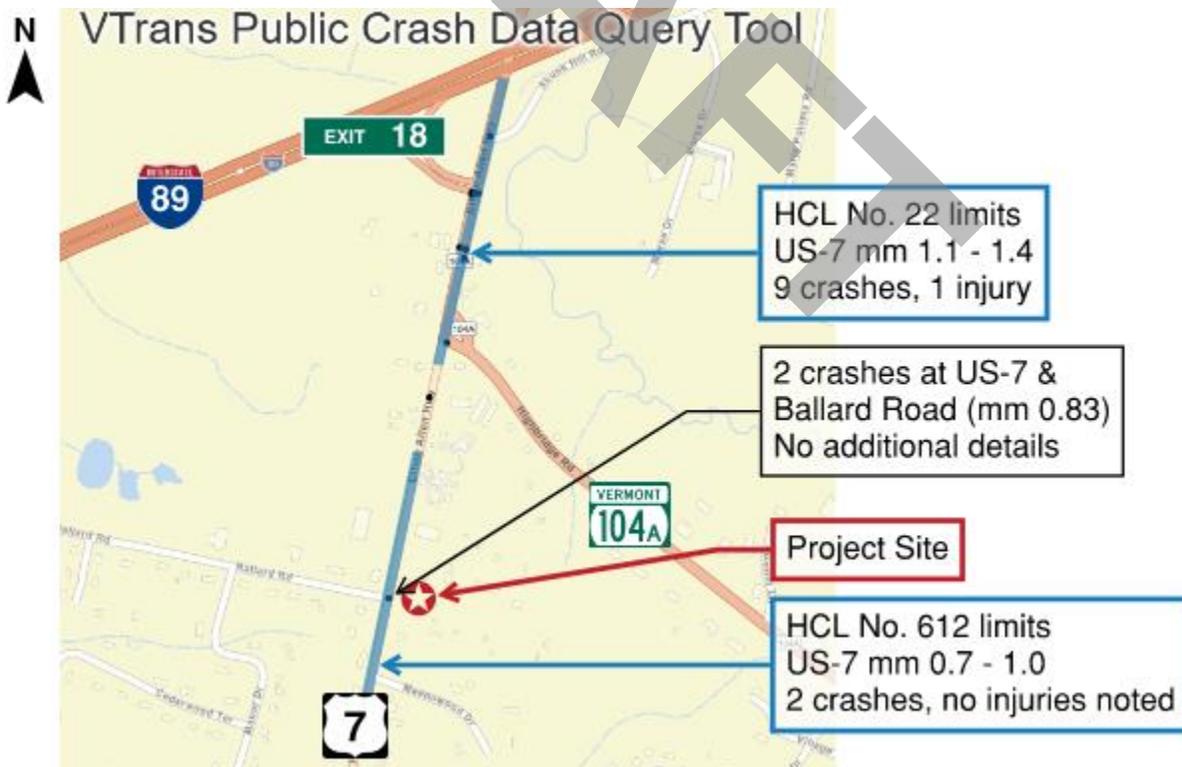
- One HCL is a segment of US-7 that includes multiple high volume intersections including Skunk Hollow Road, the Exit 18 northbound ramp intersections, a gas station / convenience store with two driveways, and the VT-104A intersection.
- The HCL nearest the site includes the Ballard Road intersection. This HCL is ranked #612 out of 772 HCL segments throughout the state. There were 8 crashes over five years, with five injuries resulting.

WCG reviewed reported crashes from 1 January 2018 through 31 December 2022 within the same limits of the HCLs along US-7. These crashes, as mapped by the VTrans Public Crash Query Tool, are shown in Figure 5. The number of reported crashes decreased substantially:

- Within the limits of the HCL nearest the project site (#612), 2 crashes were reported with no reported injuries from 2018 through 2022, down 75% from 8 crashes and five injuries from 2012 through 2016.
- There were 9 reported crashes with one injury within the limits of HCL #22 further north on US-7, down 67% from 27 crashes and 3 injuries from 2012 through 2016.

With such a reduction in reported crashes, as well as a recent reclassification of US-7 to an urban minor arterial with an associated increase in the critical crash rate, the two segments of road would no longer be considered high crash locations.

FIGURE 3: REPORTED CRASHES NEAR PROJECT SITE, 2018 THROUGH 2022



ESTIMATED TRAFFIC VOLUMES

Traffic Analysis Scenarios

Consistent with the VTrans TIS Guidelines, traffic analyses should consider the base year (year in which the project is completed) and the planning year (base year plus five years). For this project, the base year is assumed to be 2025 and the planning year is 2030. VTrans recommends a baseline growth rate of 8% over 20 years at sites across the state, or about 0.4% per year. WCG applied this growth rate to the estimated 2022 AADT on US-5 to estimate the 2025 and 2030 AADT volumes, documented in Attachment B.

Design Hour Volume

Consistent with the VTrans TIS Guidelines, traffic analysis will be conducted with traffic volumes representing the 30th highest hour. From the VTrans TIS Guidelines²:

Since it is impractical to design a highway for the highest volume encountered during the year, highway engineers have sought a compromise between capacity and cost. Thus, a highway is designed for the 30th highest hourly volume of the year, commonly known as the "Design Hour Volume" (DHV).

WCG estimated the 2025 and 2030 DHV using TIS Guideline method C, "VTrans 'Alternative DHV Determination Method' by Poll Group" using the correct estimated AADT. The resulting estimated 2025 DHV was 3% greater than the observed 2022 highest hour. Attachment B documents the recommended DHV estimate methodology.

No Build Traffic Volumes

WCG conducted 13-hour turning movement counts at the US-7 & Ballard Road intersection, and the US-7 & Dollar General intersection on Thursday 17 August 2023. Weather conditions were clear and sunny, and temperatures were seasonably warm. The AM peak hour was observed from 7:15 AM to 8:15 AM, and PM peak hour was observed from 4:30 to 5:30 PM.

WCG adjusted the observed traffic volumes to represent the base year and planning year DHV. The total adjustment to the observed volumes was +6.3% and +8.3% to represent PM peak DHV in 2025 and 2030, respectively, and +29.4% and +31.4% to represent AM peak hour conditions in 2025 and 2030, respectively.

Other Development Volumes

Town Planning and Zoning staff identified the proposed Black Walnut mixed-use development project located at 26-104 Ballard Road as a potential Other Development Volume (ODV) to include as existing in the current study. The Black Walnut mixed-use development is described in a TIS:

² Traffic Impact Study Guidelines, April 2019, Page 18

“The proposed redevelopment program consists of removing the go-kart track, bumper boat pool, mini golf course and driving range, barn and silo, and constructing a 3,000 square-foot daycare, 1,500 square-foot pharmacy, 32 residential units, 60 elderly housing units, 172 parking spaces, and new water and sewer lines.”³

The estimated trip generation resulting from the proposed project as detailed in the Black Walnut TIS is included as an ODV in this analysis.

Town staff further recommended doubling the trip generation associated with the Black Walnut development to account for further development along Ballard Road. An additional amount of traffic equal to the Black Walnut trip generation is included in a separate 2030 high-growth analysis scenario.

No Build Scenario Volumes

The 2025 and 2030 No-Build Scenario Design Hour Volumes are illustrated in XXX, respectively. The traffic volume development spreadsheet is presented in XXX.

Base Vehicle Trip Generation

Trip generation refers to the number of vehicle trips originating at or destined for a particular land use development. The proposed project will generate new trip ends from the land use being developed, as detailed in Table 1.

TABLE 1: LAND USE DEVELOPMENT PROGRAM

Development Program Description	ITE Land Use Code (LUC)	Units
(8) 2-bedroom units within multifamily / mixed use buildings	220: Multifamily Housing (Low-Rise)	8 dwelling units
(25) 2-bedroom townhouse-style attached units	215: Single-Family Attached Housing	25 dwelling units
(6) 3-bedroom single family units	210: Single-Family Detached Housing	6 dwelling units
(33) senior living units	252: Senior Adult Housing - Multifamily	33 dwelling units
12,000 SF of first floor commercial	822: Strip Retail Plaza (<40k)	12 KSF GFA

Data from the Institute of Transportation Engineers (ITE) can be applied to estimate trip generation associated with the existing and proposed land uses. WCG consulted the ITE Trip Generation Manual, 11th Edition to estimate base vehicle trips, documented in Table 3.

³ 26-104 Ballard Road Redevelopment Traffic Impact Study, May 14, 2019

Base vehicle trip generation refers to the total site trip generation prior to any adjustment associated with internal capture, pass-by trip characteristics, walk, bike, or transit mode share, or other transportation demand management strategies. Given the mixed land uses of the proposed development, the South Village neighborhood context, and the project's investment in walking infrastructure, we recommend adjustments to the base vehicle trip generation to account for internal capture, pass-by trip making, and transportation demand management strategies.

Internally Captured Trips

Because of the scale and complementary nature of the commercial and residential land uses on the proposed site, some trips are expected to be made entirely on-site. This capture of trips internal to the site has the net effect of reducing external vehicle trip generation from the overall development site on the external street system. For these internally captured trips, the origin, destination, and travel path are all within the site.

Internally captured trips have been estimated using a modified methodology in the ITE Trip Generation Handbook⁴ and are shown in Table 3. Internal capture trips are estimated prior to splitting site generated trips into pass-by and non-pass-by trips or estimating the effect of TDM strategies.

Pass-By and Primary Trips

According to standard engineering practice, external trips may be separated into pass-by and non-pass-by trips. Non-pass-by trips can be further classified into primary trips and diverted network trips. In this study, all non-pass-by trips are considered primary trips. Primary trips are dedicated, intentional trips between origins and destinations, while pass-by trips are trips siphoned from the existing traffic flow. As defined by the ITE Trip Generation Handbook, 3rd Edition:

“A pass-by trip is made as an intermediate stop on the way from an origin to a primary trip destination without a route diversion. Pass-by trips are attracted from traffic passing the site on an adjacent street...”

In essence, a primary trip is a new trip on the road network, whereas a pass-by trip results in a change in turning traffic at project intersections but does not add to the traffic volume of the adjacent street network.

Pass-by trips are estimated using the average pass-by rates surveyed by ITE for that land use. Pass-by trip making data is available for LUC 821: Shopping Plaza (40-150k) in the weekday PM peak hour, with an average pass-by rate of 40%. These data were applied to the AM and PM peak hour external trips to estimate a pass-by and primary external trip classification for the proposed site.

⁴ NCHRP Report 684 - Enhancing Internal Trip Capture Estimation for Mixed-Use Developments

Transportation Demand Management

Transportation demand management (TDM) encompasses a broad set of strategies to reduce or reallocate personal vehicle travel to achieve specific goals such as congestion mitigation, air quality improvements and emissions reductions, reduced parking demand, and improved public health. TDM strategies may generally be grouped into four categories: physical, operational, financial, and organizational.

At this site specifically, there is limited transit service, bicycle infrastructure, or pedestrian facilities along US-7 near the site. The site is located in a mixed-use zoning district with existing, planned, and permitted complimentary land uses and sidewalk infrastructure requirements that would leverage walk-bike trips. To support future non-vehicle access to the site, Table 2 documents recommended TDM features as detailed in the VTrans TDM Guidance⁵ for mixed-use / low transit sites to be considered for implementation on the Homestead Campground site.

TABLE 2: RECOMMENDED TDM FEATURES ON SITE

TDM Measure	Percent Trip Reduction	Details
Physical		
Design site to support transit and walk access	2%	Minimal setbacks, main entrance fronting streets
Secure bicycle parking	1%	In residential multifamily buildings
Exterior bicycle racks	0.5%	At each building
Sidewalk / shared-use path improvements	2%	Sidewalks throughout site and along US-7 frontage connecting to Dollar General site
On-site amenities	1%	Mixed use commercial
Organizational		
Marketing / information program	2%	Include TDM materials in leasing documents
Total	8.5%; Max. 4%	

As noted in the VTrans TDM Guidance, a site with physical measures only (without organizational and operational, and/or financial measures), the maximum TDM credit is 4%. This credit is applied to new, primary vehicle trip generation.

⁵ VTrans Transportation Demand Management (TDM) Guidance, February 2016

Summary of Trip Generation and Classification

TABLE 3: ESTIMATED TRIP GENERATION AND CLASSIFICATION

Homestead Campground Redevelopment Proposed Build				AM Peak Hour			PM Peak Hour			Weekday
ITE LUC	Description	Size	Unit	Base			Base			Base
				Enter	Exit	Total	Enter	Exit	Total	Total
210	Single-Family Detached Housing	6	DU	1	5	6	4	3	7	76
215	Single-Family Attached Housing	25	DU	3	9	12	8	6	14	180
220	Multifamily Housing (Low-Rise)	8	DU	1	2	3	3	1	4	54
252	Senior Adult Housing - Multifamily	33	DU	2	5	7	5	3	8	120
822	Strip Retail Plaza (<40k)	12	KSF	17	11	28	40	39	79	736
Estimated Base Trip Generation, Proposed Site				24	32	56	60	52	112	1166
Internally Captured Trips (NCHRP 684 Model)				1	1	2	9	9	18	114
Total External Trips				23	31	54	51	43	94	1052
Pass-by Trips				6	4	10	14	14	28	266
Non-pass-by (Primary) Trips				17	27	44	37	29	66	786
TDM Mitigated Trips 4%				1	1	2	1	1	2	31
Total New External Primary Vehicle Trips				16	26	42	36	28	64	755

VTrans guidelines specify that a traffic study should be considered if the proposed development will generate 75 or more new peak hour trips.⁶ The estimated new primary external vehicle trip generation is 42 AM and 64 PM peak hour trips, just below the threshold meriting further evaluation.

Estimated Trip Distribution

The estimated external vehicle trip generation presented in Table 3 was distributed proportionally to the no-build traffic volumes. We assumed 25% of primary trips originating from or destined to points north would access the site through the existing Dollar General driveway, and all pass-by trips would use the new driveway access opposite Ballard Road. The resulting trip generation and distribution of the primary and pass-by vehicle trips is illustrated in XXX.

Build Scenario Traffic Volumes

The estimated trip distribution illustrated in XXX is added to the 2025 and 2030 adjusted weekday no build design hour volumes in XXX and XXX, respectively, to estimate build scenario traffic volumes. These build scenario turning movement volumes are presented in XXX and XXX.

⁶ Vermont Agency of Transportation, Policy and Planning Division, Development Review and Permitting Services, *Traffic Impact Study Guidelines* (April 2019).

Combined Driveway Traffic Volumes

Future development along the corridor may require that the existing Dollar General driveway is closed at the discretion of VTrans. In this scenario, the existing Dollar General traffic would be routed through the proposed development at the proposed driveway opposite Ballard Road. In addition, the unknown / unplanned additional development equal and in addition to the Black Walnut project is included in this scenario. The volumes associated with the combined driveway and future Ballard Road development have been estimated for the 2030 build scenarios in **XXX**.

CAPACITY ANALYSIS

Intersection capacity analyses were performed at the US-7 & Ballard Road and US-7 & Dollar General driveway intersections. Analyses evaluated average control delay, level of service (LOS), and volume to capacity (v/c) ratios consistent with methodologies documented in the Highway Capacity Manual.

Level of Service Definition

Level of service (LOS) is a qualitative measure describing the operating conditions as perceived by motorists driving in a traffic stream. LOS is calculated using the procedures outlined in the Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis⁷ (HCM6). In addition to traffic volumes, key inputs include the number of lanes at each intersection, traffic control type (signalized or unsignalized), and the traffic signal timing plans, if applicable.

The HCM6 defines six qualitative grades to describe the level of service at an intersection. Level-of-service is based on the average control delay per vehicle; average control delay is a function of a gap acceptance model. Table 4 shows the various LOS grades and descriptions for unsignalized intersections. According to HCM procedures, an overall LOS cannot be calculated for two-way stop-controlled intersections, such as US-7 & Ballard Road and US-7 & Dollar General driveway intersections, because not all movements experience delay.

The VTrans policy on level of service is:

- Overall LOS C should be maintained for state-maintained highways and other streets accessing the state's facilities.
- Reduced LOS may be acceptable on a case-by-case basis when considering, at minimum, current and future traffic volumes, delays, volume to capacity ratios, crash rates, and negative impacts resulting from improvements necessary to achieve LOS C.

⁷ The HCM6 does not provide methodologies for calculating intersection delays at certain intersection types including signalized intersections with exclusive pedestrian phases and signalized intersections with non NEMA-standard phasing. Because of these limitations, HCM 2000 and HCM 2010 methodologies are employed where necessary and as noted.

- LOS D should be maintained for side roads with volumes exceeding 100 vehicles/hour for a single lane approach (150 vehicles/hour for a two-lane approach) at two-way stop-controlled intersections.

TABLE 4: LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED AND SIGNALIZED INTERSECTIONS

LOS	CHARACTERISTICS	UNSIGNALIZED AVERAGE DELAY (SEC)	SIGNALIZED AVERAGE DELAY (SEC)
A	Little or no delay	≤ 10.0	≤ 10.0
B	Short delays	10.1-15.0	10.1-20.0
C	Average delays	15.1-25.0	20.1-35.0
D	Long delays	25.1-35.0	35.1-55.0
E	Very long delays	35.1-50.0	55.1-80.0
F	Extreme delays	> 50.0	> 80.0

Volume to Capacity Ratio Definition

The volume to capacity ratio (v/c) represents the sufficiency of an approach leg to accommodate the vehicular demand. According to FHWA:

“As the v/c ratio approaches 1.0, traffic flow may become unstable, and delay and queuing conditions may occur. Once the demand exceeds the capacity (a v/c ratio greater than 1.0), traffic flow is unstable and excessive delay and queuing is expected.”⁸

VTrans does not have a v/c policy. Typically, v/c is used as an alternative indicator of performance, with preferred values below 0.95.

Results of Capacity Analysis: 2025 Scenarios

WCG evaluated average control delay, LOS, and v/c for the 2025 build year AM and PM peak hour conditions in the build and no build scenarios. These analysis scenarios include the proposed Black Walnut traffic volumes as an existing development included in all scenarios. The resulting capacity analyses are summarized in Table 5 and included as Attachment E.

⁸ Federal Highway Administration (FHWA), *Signalized Intersections: Informational Guide*, 2004

TABLE 5: RESULTS OF INTERSECTION CAPACITY ANALYSES USING THE 2025 DESIGN HOUR VOLUMES IN NO-BUILD AND BUILD SCENARIOS

2025 Scenarios												
Intersections	AM Peak Hour						PM Peak Hour					
	LOS	No Build Delay	v/c	LOS	Build Delay	v/c	LOS	No Build Delay	v/c	LOS	Build Delay	v/c
 US-7 & Dollar General WB L/R, along Dollar General SB L, along US-7	B	14	0.01	B	13	0.02	B	15	0.06	B	15	0.07
	A	8	0.01	A	8	0.01	A	8	0.01	A	8	0.02
 US-7 & Ballard Road EB L/T/R, along Ballard Rd WB L/T/R, along Prop Ballard Rd Ext NB L, along US-7 SB L, along US-7	C	23	0.61	D	27	0.67	C	25	0.47	D	32	0.56
		<i>n/a</i>		B	12	0.06		<i>n/a</i>		C	17	0.12
	A	8	0.02	A	8	0.02	A	9	0.06	A	9	0.06
		<i>n/a</i>		A	8	0.01		<i>n/a</i>		A	8	0.02

With no conflicting traffic volumes, the northbound shared through / right turn lane does not experience delay. Left turning vehicles along US-7 experience an average of 8-9 seconds of delay, resulting in a LOS A; the new trips associated with the project do not result in any significant increase in delay along US-7. The stop-controlled westbound approach from the existing Dollar General driveway and proposed site access experience acceptable delay. In the AM peak hour, the average delay for the Dollar General approach decreases, as more right turning vehicles are expected on this approach. Since right turning vehicles experience less delay, the average delay for all movements decreases.

The average control delay along the eastbound Ballard Road approach in the AM peak hour is expected to increase from 23 seconds / LOS C to 26 seconds / LOS D. In the PM peak hour, the average control delay along this approach increases from 25 seconds / LOS C to 32 seconds, LOS D. In both cases, the average control delay and resulting LOS is within the VTrans Guidelines as acceptable.

Results of Capacity Analysis: 2030 Scenarios

WCG evaluated average control delay, LOS, and v/c for the 2030 build year AM and PM peak hour conditions in the build and no build scenarios. These analysis scenarios include the proposed Black Walnut traffic volumes as an existing development included in all scenarios.

Furthermore, VTrans requested that the analysis consider the impacts of potential access management modifications along US-7 that would result in consolidating the Dollar General driveway into the proposed westbound Ballard Road approach to US-7. This analysis scenario is identified as the Build Combined Driveway scenario.

The Build Combined Driveway scenario also includes traffic from an unidentified and unplanned project to ensure spare capacity in the future planning of the US-7 & Ballard Road intersection. The added traffic is equal to the traffic estimated in the Black Walnut traffic study intended to represent a high-growth scenario.

The resulting 2030 capacity analyses are summarized in Table 6 and included as Attachment F.

TABLE 6: RESULTS OF INTERSECTION CAPACITY ANALYSIS USING THE 2030 DESIGN HOUR VOLUMES IN NO-BUILD AND BUILD SCENARIOS

2030 Scenarios									
Intersections	AM Peak Hour						Build High Growth Combined Driveway		
	LOS	No Build Delay	v/c	LOS	Build Delay	v/c	LOS	Delay	v/c
STOP US-7 & Dollar General WB L/R, along Dollar General SB L, along US-7	B	14	0.01	B	13	0.02	<i>n/a</i>		
	A	8	0.01	A	8	0.01			
STOP US-7 & Ballard Road EB L/T/R, along Ballard Rd WB L/T/R, along Prop Ballard Rd Ext NB L, along US-7 SB L, along US-7	C	24	0.63	D	28	0.68	E	37	0.78
		<i>n/a</i>		B	12	0.05	B	12	0.06
	A	8	0.02	A	8	0.02	A	8	0.02
		<i>n/a</i>		A	8	0.01	A	8	0.01
2030 Scenarios									
Intersections	PM Peak Hour						Build High Growth Combined Driveway		
	LOS	No Build Delay	v/c	LOS	Build Delay	v/c	LOS	Delay	v/c
STOP US-7 & Dollar General WB L/R, along Dollar General SB L, along US-7	B	15	0.07	B	15	0.07	<i>n/a</i>		
	A	8	0.01	A	8	0.02			
STOP US-7 & Ballard Road EB L/T/R, along Ballard Rd WB L/T/R, along Prop Ballard Rd Ext NB L, along US-7 SB L, along US-7	D	26	0.49	D	34	0.58	F	53	0.74
		<i>n/a</i>		C	18	0.12	C	20	0.22
	A	9	0.06	A	9	0.06	A	9	0.07
		<i>n/a</i>		A	8	0.02	A	8	0.03

With no conflicting traffic volumes, the northbound shared through / right turn lane does not experience delay. Left turning vehicles along US-7 experience an average of 8-9 seconds of delay, resulting in a LOS A; the new trips associated with the project do not result in any significant increase in delay along US-7. The stop-controlled westbound approach from the existing Dollar General driveway and proposed site access experience acceptable delay. In the AM peak hour, the average delay for the Dollar General approach decreases, as more right turning vehicles are expected on this approach. Since right turning vehicles experience less delay, the average delay for all movements decreases.

The average control delay along the eastbound Ballard Road approach in the AM peak hour is expected to increase from 24 seconds and LOS C to 28 seconds and LOS D. In the combined driveway scenario with high traffic growth along Ballard Road, the delay and LOS increases to 37 seconds and LOS E.

In the PM peak hour, the average control delay and level of service along the eastbound Ballard Road approach is expected to increase from 26 seconds and LOS D to 34 seconds, remaining LOS D. Under the combined driveway scenario and high traffic growth along Ballard Road scenario, this delay and LOS is expected to increase to 57 seconds and LOS F.

Under the build scenario, the intersection meets the VTrans Level of Service policy. The combined driveway and high traffic growth along Ballard Road scenario does not meet the VTrans Level of Service policy along the eastbound Ballard Road approach to US-7.

SIGHT DISTANCE REVIEW

As defined in the 2018 publication *A Policy on Geometric Design of Highways and Streets*, from the American Association of State Highway and Transportation Officials (AASHTO), sight distance is the “the length of roadway ahead that is visible to the driver.”⁹ Sight distances of sufficient length are necessary at all points along a roadway to ensure vehicles can safely stop or avoid colliding with potential obstructions or other vehicles on the roadway.

Standard practice in assessing intersection safety and operations involves measuring two separate sight distances – **stopping sight distance** and **intersection sight distance**.

Stopping sight distance (SSD) is the visible distance along a roadway between an advancing motorist and a potential obstacle in the roadway. It is measured from a point representing the approaching driver’s eye and a point representing an obstacle in the roadway.¹⁰ Stopping sight distances of adequate length are needed along all roadways, both at and away from intersections, so that drivers travelling at design speeds can react to potential obstacles and safely brake to avoid collisions. Design minimum stopping sight distances are calculated based on factors such as design speed, response times, and grades as reported in the *2018 Policy on Geometric Design of Highways and Streets*.¹¹

Intersection sight distance (ISD) is the distance available along the major road travelled way corresponding with the maximum visibility between an advancing motorist on the major road and an entering motorist on an intersecting minor road. It is measured between a point representing the advancing driver’s eye above the major road and a point representing the entering driver’s eye above the intersecting road.¹²

⁹ American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets*, Seventh Edition (Washington D.C.: American Association of State Highway and Transportation Officials, 2018). Page 3-2.

¹⁰ As noted in the 2018 *Policy on Geometric Design of Highways and Streets* (page 3-15), the height of the driver’s eye is assumed to be 3.5’ above the road surface and the height of a potential obstacle is 2.0’ above the road surface.

¹¹ American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets*, Seventh Edition (Washington D.C.: American Association of State Highway and Transportation Officials, 2018). Page 3-5 to 3-6.

¹² As noted in the 2018 *Policy on Geometric Design of Highways and Streets* (page 3-16), the height of the driver’s eye of the approaching vehicle is assumed to be 3.5’ above the road surface of the major road and the height of the driver’s eye of the entering vehicle is assumed to 3.5’ above the minor road surface. The decision point offset from the travel way varies with sight conditions (page 9-38); in this case we assume the decision point is 15-feet from the travel way.

The 2018 Policy on Geometric Design of Highways and Streets states that the available intersection sight distance should be at least equal to the required stopping sight distance along the major road.

“Sight distance is also provided at intersections to allow the drivers of stopped vehicles a sufficient view of the intersecting highway to decide when to enter the intersecting highway or to cross it. If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions.”

However, when possible, it is desirable to have intersection sight distances that exceed the design minimum stopping sight distances to offer improved operations, such that major road traffic need not decelerate to accommodate entering traffic.

“However, in some cases a major-road vehicle may need to stop or slow to accommodate the maneuver by a minor road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.”

Based on the posted speed limit of 40 MPH and a relatively level grade (<3%), the design minimum stopping sight distance is 250 feet along US-5. The target minimum intersection sight distance for turning traffic is 335 feet to the left and 390 feet to the right.

ISD and SSD were measured at the approximate proposed site driveway location. The resulting ISD and SSD observations are detailed in the following pictures and table.

FIGURE 4: STOPPING SIGHT DISTANCE PERSPECTIVE TO THE NORTH (LEFT) AND SOUTH (RIGHT) AT US-7 & BALLARD ROAD



TABLE 7: REQUIRED AND MEASURED SIGHT DISTANCES AT THE PROPOSED NORTHERN FULL ACCESS SITE DRIVEWAY

	Required Minimum	Design Target	Measured
Stopping Sight Distance	250'	n/a	>500' (met)
Intersection Sight Distance	left, to south: 250' right, to north: 250'	left, to south: 335' right, to north: 390'	left, to south: >500' (met) right, to north: >500' (met)

The required minimum stopping sight distance and design target intersection sight distance is met at the US-7 & Ballard Road intersection.

WARRANT ANALYSES

Turn Lane Warrant Evaluation

WCG conducted left- and right-turn lane volume warrant evaluations for the 2030 build scenarios with the combined driveway and high traffic growth along Ballard Road during the AM and PM peak hour. The volume warrant evaluations were conducted following standard practice outlined in the VTrans Transportation Impact Study Guidelines. The results of the turn lane volume warrant evaluation are summarized in Table 8. Left- and right-turn lanes are not warranted by volume in any scenario.

TABLE 8: TURN LANE WARRANT EVALUATION SUMMARY

	2030 AM Build	2030 PM Build
Left Turn Lane Warrant Met?	No	No
Right Turn Lane Warrant Met?	No	No

The proposed project does not warrant the installation of a left turn lane by volume. Installation of a turn lane would widen the roadway, increase pedestrian crossing distances, and likely lead to higher travel speeds. A turn lane was not included in the conceptual schematic drawings of the intersection in the South Village Transportation Master Plan. With adequate sight distances on approach to the intersection, left and right turn lanes are not recommended.

Traffic Signal Warrant Evaluation

A signal warrant evaluation is a set of tests run to determine if a traffic signal would significantly improve operations, mobility, and safety at an intersection. There are a total of 8 warrants:

- 1) Eight-Hour Vehicular Traffic Warrant: when a large amount of intersecting traffic occurring over an 8-hour period is the principal reason for installing a traffic signal, or where excessive delays occur on minor approaches to an intersection.
- 2) Four-Hour Vehicular Traffic Warrant: when a large amount of intersecting traffic occurring over a 4-hour period is the principal reason for installing a traffic signal.

- 3) Peak Hour Warrant: when the minor-street traffic suffers unduly delay when entering or crossing the major-street during the average peak hour is the principal reason for installing a traffic signal.
- 4) Pedestrian Volume Warrant: when the traffic volumes on a major street are so heavy that pedestrians experience excessive delays.
- 5) School Crossing Warrant: when school children crossing a major street are the principal reason for installing a traffic signal.
- 6) Coordinated Signal System Warrant: when maintaining proper platooning of vehicles is the principal reason for installing a traffic signal.
- 7) Crash Experience Warrant: when the severity and frequency of accidents is the principal reason for installing a traffic signal.
- 8) Roadway Network Warrant: when the concentration and organization of traffic flow is the principal reason for installing a traffic signal.

A signal warrant analysis is considered advisory only. This means that simply meeting any warrant may not be sufficient cause for installing a traffic signal. For example, meeting the peak hour warrant is usually not sufficient in and of itself to warrant installing a traffic signal. The rationale for this is that one hour (or less) of congestion in a day is probably not severe enough to justify the potential crash risk and investment in the traffic signal controller and related equipment and software.

With only two crashes occurring at the US-7 & Ballard Road intersection in a five-year period, only the first three traffic volume-related warrants are applicable at the site. Using the twelve-hour count data collected on 17 August 2023 the following adjustments and modifications were made to represent 2030 no-build and build scenario volumes. The build scenario includes the combined driveway and high growth along Ballard Road traffic volumes.

Adjustments to the observed traffic volumes include:

- Adjusted the count to represent 2030 design hour volumes following the methodology described earlier.
- Applied a 0.85 adjustment factor to represent average traffic volumes.
- Added in the Black Walnut and an equal sized ODV along Ballard Road, with trip demand and distribution estimated proportional to the traffic volume outside of the peak hours.
- Distributed the non-peak hour, non-pass-by trips proportionally based on the adjusted traffic volumes over a 24-hour period.
- Distributed the non-peak hour, pass-by trips proportionally based on the adjusted traffic volumes over a 12-hour period from 7 AM to 9 PM.
- Distributed all project generated traffic proportional to the observed entering and exiting traffic volumes at the US-7 & Ballard Road intersection.

The detailed traffic signal warrant evaluations are available in Attachment H. Table 9 summarizes the results of the signal warrant evaluation.

TABLE 9: SUMMARY OF TRAFFIC SIGNAL WARRANT ANALYSIS

	2030 No Build	2030 Build
Warrant 1: Eight-Hour Vehicular Traffic Warrant	Hours met: 3 Hours needed: 8 NOT MET	Hours met: 3 Hours needed: 8 NOT MET
Warrant 2: Four-Hour Vehicular Traffic Warrant	Hours met: 1 Hours needed: 4 NOT MET	Hours met: 2 Hours needed: 4 NOT MET
Warrant 3: Peak Hour Warrant	Hours met: 0 Hours needed: 1 NOT MET	Hours met: 0 Hours needed: 1 NOT MET

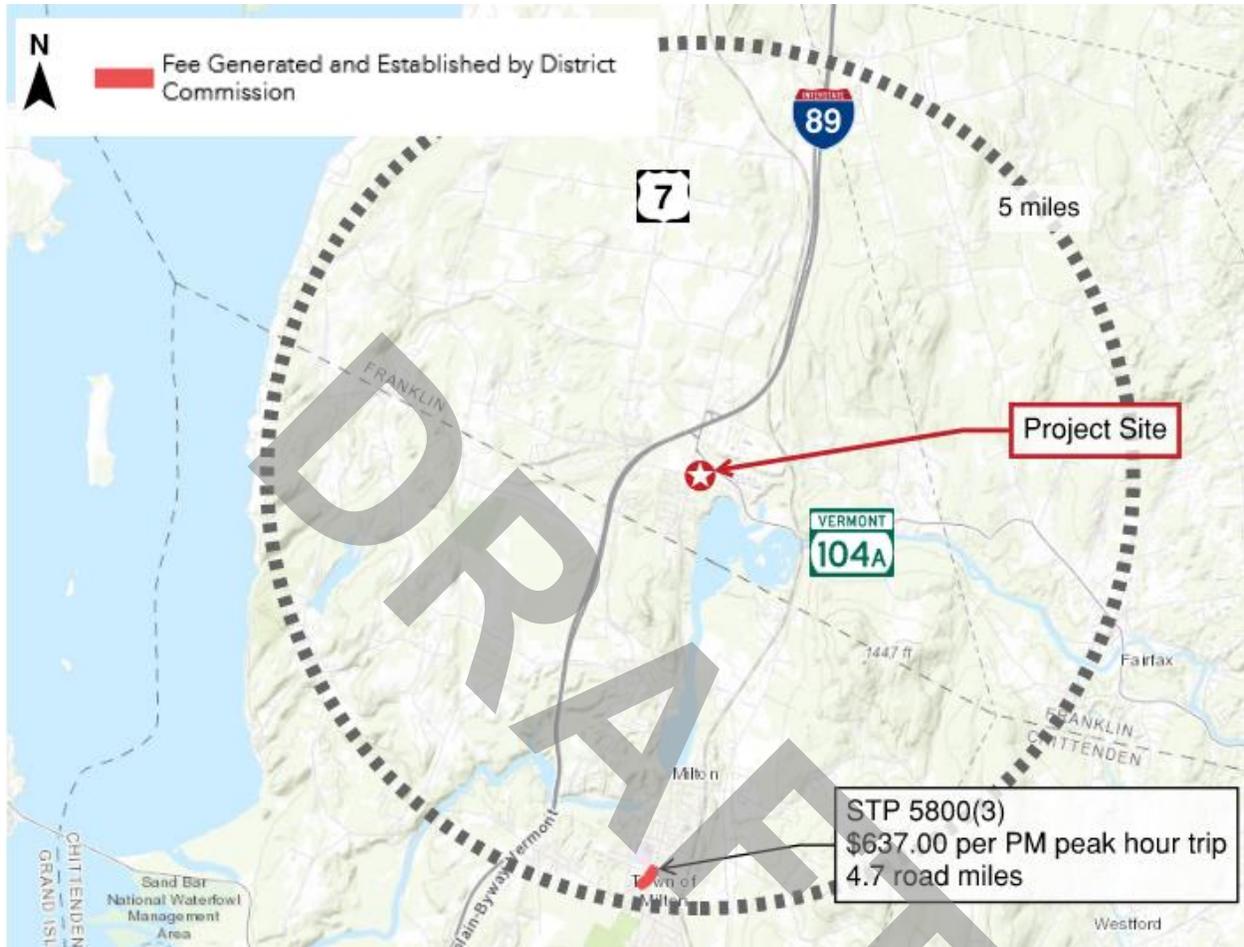
A traffic signal is not warranted by volume in either the build or no build condition.

As the South Village neighborhood develops, the intersection may be considered to “lie within a built up area of an isolated community having a population of less than 10,000.” In these situations, the MUTCD allows for a 70% reduction in the warranting traffic volumes. When considering the reduced volumes, the intersection meets warrants 1, 2, and 3 in both no-build and build scenarios.

TRANSPORTATION IMPACT FEE

A statewide transportation impact fee will likely be assessed to this project. Since the project is generating over 75 new external primary trips, the impact fee is based on fee-generating projects within five road miles. There is one Act 145 Transportation Impact Fee generating project located within 5 road miles: STP 5800(3) - Traffic Signal and Intersection Improvements at US-7 and Middle Rd. / Railroad St.; \$630 per PM peak hour trip.

FIGURE 5: NEAREST ACT 145 TRANSPORTATION IMPACT FEE GENERATING PROJECTS



The Act 145 fee is based on new trip generation. As such, the fee is only applied to external primary trips, not pass-by trips (trips already on the road network). The PM peak hour trips towards through the fee generating project are illustrated in Attachment I.

With proposed sidewalk facilities throughout the site and connections to the existing and future planned South Village sidewalk network, the site qualifies for a 10% reduction in the Act 145 impact fee.¹³

¹³ VTrans Act 145 Transportation Impact Fee Guidance dated January 3, 2022, Table 1

TABLE 10: TRANSPORTATION IMPACT FEE CALCULATION

Project	Fee Rate (\$/PM Trip)	PM Peak Hour Trips	Base Project Fee
STP 5800(3)	\$630	18	\$11,340
Total Base Fee			\$11,340
Impact Fee Adjustment			-10%
Total Act 145 Transportation Impact Fee			\$10,206

POTENTIAL MITIGATION CONSIDERATIONS

The proposed Homestead Campground Redevelopment project in Georgia is estimated to generate a total of 56 AM peak hour trip ends and 112 PM peak hour trip ends, including both internal and external trips. Considering only the new, primary vehicle trip ends, the proposed project is expected to generate 42 AM peak hour primary trip ends and 64 PM peak hour primary trip ends (Table 3).

Roadway Infrastructure Mitigation

As demonstrated in the capacity analysis, the proposed project will not create an undue adverse impact on the transportation system in the future year. All affected intersections are expected to operate within the VTrans Level of Service standards. No mitigation is necessary to avoid causing or worsening safety issues or undue congestion. We recommend that a follow up trip generation assessment, traffic capacity analysis, and signal warrant evaluation is conducted at 50% occupancy to evaluate the resulting transportation impacts at the observed and projected occupancy.

After 100% build out and with continued development along Ballard Road beyond the proposed Black Walnut development, the level of service along Ballard Road falls below the VTrans standard. The Homestead Campground and adjacent development will increase the built up environment around Ballard Road, meriting the use of the lower traffic volume threshold for the signal warrant. A traffic signal at US-7 & Ballard Road is consistent with the Georgia South Village Transportation Master Plan, and a traffic signal would have benefits to pedestrians crossing US-7 and for vehicles exiting driveways and side streets in the vicinity of the intersection. While not warranted or recommended as a result of this project, a traffic signal will likely be warranted and recommended as development continues within the South Village. The capacity increasing traffic signal will likely be eligible for partial reimbursement through Act 145 Statewide Transportation Impact Fees.

Turn lanes are not warranted or recommended. We do recommend that the traffic signal mast arms and are located to allow for future widening and designed for appropriate loading to accommodate turn lanes if needed.

Site Plan Comments

The proposed site plan does not indicate if on-street parking is allowed. If allowed, we recommend considering the installation of curb extensions into the parking aisle to reduce the crossing width and define the parking aisle.

To help meet local and regional vehicle electrification goals, we recommend the site design team consider installation of Level 2 electric vehicle charging infrastructure in off-street parking lots available for use to the multifamily and townhouse residential units.

ATTACHMENTS

Attachment A – Crash Query Results

Attachment B – Existing Traffic Volumes

Attachment C – Traffic Volume Worksheet

Attachment D – Traffic Volume Figures

Attachment E – 2025 Synchro Capacity Analysis Worksheets

Attachment F – 2030 Synchro Capacity Analysis Worksheets

Attachment G – Turn Lane Warrant Worksheets

Attachment H – Traffic Signal Warrant Worksheets

Attachment I – Act 145 Fee Trip Distribution