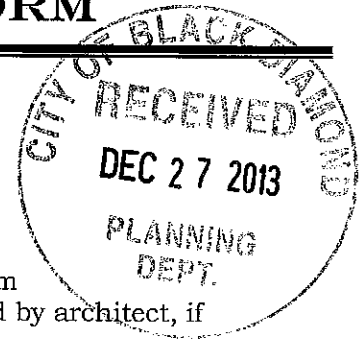


24.

Traffic Impact Study, Transpo Group
December 19, 2013



REVISION/CORRECTION SUBMITTAL FORM



Submittal Requirements:

All revisions / correction submittals **MUST** contain the following:

1. A completed City of Black Diamond Revision/Correction submittal form
2. Two (2) sets of revised and/or corrected drawings/sheets (wet stamped by architect, if applicable).
3. Revised structural calculations, if applicable (must be stamped by engineer)
4. A written letter to the City that shows an itemized summary of your submittal (must include sheet and detail numbers)
5. All changes **MUST BE CLOUDED** or **HIGHLIGHTED** on each plan set

Date: 12/23/13

Permit #: PLN13-0027

Property Address: See the villages mpp Phase 2 Prelim. Plat C project narrative.
 Project Name: The villages mpp Phase 2 Plat C.
 Contact Person: Colin Lund
 Phone: (425) 898-2100
 Email: clunde.yarrowbayholdings.com

TYPE OF SUBMITTAL:

Supplemental Information

REVISION: A change the applicant has made to a plan that is either:

1. An approved plan already issued by the City or
2. A project under current plan review

CORRECTION: An applicant response to a correction letter written by the City to the applicant

Permit Issued? Yes No *A plan check fee for revision is \$84 per hour with a minimum of \$42 for ½ hour

Please describe revision/correction submittal:

The villages mpp - Phase 2 Plat C Traffic Impact Study dated 12/19/13
by Transpo Group.

Sheets Affected: _____ If more than two (2) sheets will be changed, please submit two (2) new full sets of plans. Revisions on issued permits only require submittal of the affected sheets.

For City Use Only:

REQ'D APPROVAL	CHECKED BY	ROUTE TO	DATE	INITIAL	COMMENTS	FEES
()	1. BUILDING	_____	_____	_____	_____	_____
()	2. PLANNING	_____	_____	_____	_____	_____
()	3. FIRE	_____	_____	_____	_____	_____
()	4. PW	_____	_____	_____	_____	_____
()	5	_____	_____	_____	_____	_____

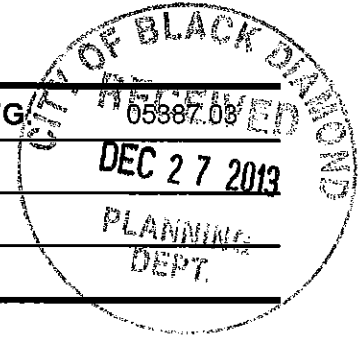
TOTAL \$

TECHNICAL MEMORANDUM

Date: December 19, 2013
To: Colin Lund – YarrowBay Holdings
From: Kevin L. Jones, P.E., PTOE – Transpo Group
Subject: The Villages MPD - Phase 2 Plat C Traffic Impact Study

TG

05887.08



This memo serves as a Traffic Impact Study (TIS) for a portion of The Villages MPD Phase 2 described as Plat C. It provides a description of the plat as well as estimates of daily and weekday PM peak hour vehicle trip generation. It also determines if any off-site improvements would be triggered, potential impacts to traffic safety, addresses construction impacts known at this time, and describes the traffic calming measures to be included as part of the plat.

Project Description

The subject plat is located southeast of The Villages MPD Phase 1A, one-half mile south of Roberts Drive in the City of Black Diamond. Plat C will include 203 single-family (SF) dwelling units. A neighborhood collector roadway ("Road A") and woonerf ("Woonerf A") would provide vehicular access via Willow Avenue SE to the northwest. A site plan is provided in Attachment 1.

Project Trip Generation

Weekday PM peak hour trip generation was estimated by first calculating the difference in gross trip generation between 647 SF dwelling units (the collective number of SF units in The Villages MPD Phase 1A and Phase 2 Plat C) and 444 SF dwelling units (the number of SF units in The Villages MPD Phase 1A). Gross trip generation was estimated based on the number of units and assumptions outlined in *The Villages Transportation Technical Report (TTR)* (Parametrix, December 2009) and applied in the *Traffic Monitoring Report for The Villages and Lawson Hills MPDs – Phase 2* (Transpo Group, December 2013). These assumptions include use of a trip equation for single-family housing in *Trip Generation* (Institute of Transportation Engineers [ITE], 8th Edition, 2008) and resulted in an estimate of 160 gross PM peak hour trips.

Next, an internal trip reduction was applied considering the land uses proposed in The Villages MPD Phase 1A. Phase 1A development includes office, retail, an elementary school and residential land uses which are likely to draw some short trips from Phase 2 Plat C and travel exclusively within The Villages MPD. Similar internal trip reductions were applied in estimating the number of net new PM peak hour trips for Phase 2 (see *The Villages TTR* and *Traffic Monitoring Report for The Villages and Lawson Hills MPDs – Phase 2*) based on methodologies described in the *Trip Generation Handbook* (ITE, 2nd Edition, 2004).

Table 1 summarizes the gross and net new trip generation as well as internal trip assumptions for Phase 2 Plat C. More detailed trip generation calculations are included in Attachment 2.

Table 1. Estimated Weekday PM Peak Hour Trip Generation for The Villages Phase 2 Plat C

Land Use ¹	Unit ²	Size	Gross Trips	Internal Trips	Net New Trips
			Total (In/Out)	Total (In/Out)	Total (In/Out)
SF Residential	DUs	203	160 (100/60)	-23 (-13/-10)	137 (87/50)

1. SF = Single-Family
 2. DUs= dwelling units

It is estimated that Phase 2 Plat C would generate 137 net new PM peak hour trips. This trip generation is representative of approximately 137 equivalent residential units (ERUs).

It is estimated that Plat C would generate approximately 1,700 gross daily trips. This figure was estimated using a daily trip equation in *Trip Generation* for single-family housing and calculating the difference in gross trip generation between 647 SF dwelling units (The Villages MPD Phase 1A and Phase 2 Plat C) and 444 SF dwelling units (The Villages MPD Phase 1A).

Timing of Improvements

The *Traffic Monitoring Report for The Villages and Lawson Hills MPDs – Phase 2* determined that the first intersection improvement associated with Phase 2 would be triggered after 202 ERUs or after approximately 1,392 ERUs of Phase 1A and Phase 2 combined. Since Phase 2 development is anticipated in The Villages MPD before the Lawson Hills MPD, including up to 252 SF dwelling units in the first year, and Phase 2 Plat C would generate traffic representative of approximately 137 ERUs, no intersection improvements would be required in conjunction with this plat.

Per The Lawson Hills MPD Development Agreement, the Master Developer is required to complete the preliminary design, alignment and right-of-way dedication for Pipeline Road prior to the 1,200th dwelling unit of The Villages MPD. Since the combined number of residential units associated with Phase 1A (444 SF dwelling units and 338 multi-family (MF) units) and Phase 2 Plat C (203 SF units) is 985 units, less than this threshold, the preliminary design, alignment, and right-of-way dedication for Pipeline Road would not be required in conjunction with this plat.

Traffic Safety

Collision data for the most recent three-year period were obtained from WSDOT and summarized at each intersection evaluated in the *Traffic Monitoring Report for The Villages and Lawson Hills MPDs – Phase 2*. The number of collisions reported at these intersections are summarized below.

Table 2. Three-Year Collision Summary at Intersections – 2010 to 2012

Intersection	2010	2011	2012	Total	Annual Average	Collisions per MEV ¹
SE 288th St/216th Ave SE	2	1	1	4	1.33	0.38
SE 288th St/232nd Ave SE	0	0	0	0	0.00	0.00
SE Covington-Sawyer Rd/216th Ave SE	1	4	2	7	2.33	0.55
SE Auburn-Black Diamond Rd/218th Ave SE	2	2	1	5	1.67	0.73
Roberts Dr/Lake Sawyer Rd SE	0	0	0	0	0.00	0.00
Roberts Dr/Morgan St	0	0	0	0	0.00	0.00
SR 169/SE 288th St	2	2	2	6	2.00	0.44
SR 169/SE Black Diamond-Ravensdale Rd	3	0	2	5	1.67	0.37
SR 169/Roberts Dr	2	1	2	5	1.67	0.37
SR 169/Baker St	1	0	1	2	0.67	0.17
SR 169/Lawson Rd	1	0	1	2	0.67	0.18
SR 169/Jones Lake Rd	2	3	1	6	2.00	0.58
SR 169/SE Green Valley Rd	0	0	3	3	1.00	0.29
SE Kent-Kangley Rd/Landsburg Rd SE	2	2	2	6	2.00	0.65
SE Auburn-Black Diamond Rd/SE Green Valley Rd	2	0	1	3	1.00	0.22

Source: WSDOT, 2013.

1. Collisions per one million entering vehicles (No. of reported collisions x 1,000,000) / (Average daily traffic volumes x 365 x 3 years)

As shown in Table 2, one study intersection (SE Covington-Sawyer Road/216th Avenue SE) experienced, on average, approximately 2.3 collisions per year or less and 11 intersections experienced an average of approximately 1.7 collisions or less during this three-year time period. Based on a review of collision severity, no fatal collisions occurred at any of the study intersections between 2010 and 2012. Of all reported collisions, approximately 52 percent involved injuries, the remainder resulted in property damage only, none involved pedestrians and one involved a bicyclist (at the intersection of SE 288th Street/216th Avenue SE).

King County classifies High Accident Locations (HALs) based on intersections with nine or more reported collisions during a three-year period. Given there are no locations with more than seven collisions between 2010 and 2012, none of the study intersections are classified by King County as a HAL.

In addition to evaluating the average number of collisions per year at each location, the number of collisions per million entering vehicles was evaluated to provide a comparable rate between locations and determine if further evaluation of traffic safety is necessary. *The Transportation Impact Analyses for Site Development, An ITE Recommended Practice* (ITE, 2010) recommends the following procedure in evaluating traffic safety at intersections:

The initial review of existing data within a study area should include recent (within 3 years) collision experience. This review should identify locations where transportation safety should be given extra consideration. High-collision locations (based on number, rate and severity) on roadways serving the study site should be analyzed. Collision rates vary, but any intersection with more than one collision per million entering vehicles may be worthy of additional analysis. (page 74)

Based on the data summarized in Table 2 above, all study intersections experienced collision rates well below one collision per one million entering vehicles, indicating no safety issues that would necessitate additional analysis.

2010-2012 collision data along roadway segments in the City of Black Diamond were also obtained from WSDOT and analyzed. A summary of collision data during the most recent three-year period is summarized in Table 3.

Table 3. Three-Year Collision Summary for Roadway Segment – 2010 to 2012

Roadway Segments	2010	2011	2012	Total	Annual Average	Collisions per MVM ¹
SE ABD Rd (218th Ave SE to Lake Sawyer Rd SE)	1	3	2	6	2.00	0.85
Roberts Dr (Lake Sawyer Rd SE to Morgan St)	1	0	0	1	0.33	0.41
Roberts Dr (Morgan St to SR 169)	1	2	0	3	1.00	1.43
Morgan St (Roberts Dr to Baker St)	0	0	0	0	0.00	0.00
216th Ave SE (SE 288th St to SE 304th St)	4	2	1	7	2.33	0.58
Lake Sawyer Rd SE (SE 304th St to Roberts Dr)	1	2	0	3	1.00	0.95
SR 169 (SE 288th St to Roberts Dr)	4	4	5	13	4.33	0.78
SR 169 (Roberts Dr to Lawson St)	2	0	0	2	0.67	0.50
SR 169 (Lawson St to Jones Lake Rd)	1	1	0	2	0.67	0.66
SR 169 (Jones Lake Rd to SE Green Valley Rd)	4	5	1	10	3.33	0.83

Source: WSDOT, 2013.

Note: ABD = Auburn-Black Diamond

1. Collisions per one million vehicle mile traveled (No. of reported collisions x 1,000,000) / (Segment length x Average daily traffic volumes x 365 x 3 years)

Among the roadway segments, on average, approximately 4.3 collisions per year or less were reported during the most recent three-year period. One collision resulted in a fatality, approximately 28 percent were injury related, and the majority (approximately 70 percent) included property damage only. The one fatality occurred in August 2011 near the 3100 block of 228th Avenue SE when the driver of a motorcycle died after a motorist failed to yield the right of way. None of the collisions along the roadway segments involved pedestrians and one involved a bicyclist (along 216th Avenue SE between SE 288th Street and SE 304th Street).

King County classifies High Accident Road Segments (HARS) as road segments where nine or more collisions were reported during a three-year period. A road segment is defined as 1,000 feet long and while it may cross an intersection, intersection-related collisions are not considered in the threshold. King County has not identified any HARS within the study area. It should be noted that the data in Table 3 summarizes collision data by roadway segments longer than 1,000 feet and includes collision data from intersections that were not identified as study intersections in the *Traffic Monitoring Report for The Villages and Lawson Hills MPDs – Phase 2*.

In addition, the number of collisions occurring per one million vehicle miles (MVM) traveled was calculated for each segment and ranged from none to 1.43 collisions per MVM traveled. The one roadway segment with more than one collision per MVM travelled is Roberts Drive between SR 169 and Morgan Street, a minor arterial that averaged two or fewer collisions per year between 2010 and 2012. By comparison, based on the rates presented in the *2010 Washington State Collision Data Summary*, the average collision rate for minor arterials was 2.07 collisions per MVM travelled in WSDOT's Northwest Region and 2.65 per MVM travelled in all of Washington State. Therefore, the collision history on this segment of Roberts Drive is well below the average for similar roads within the region and state.

New traffic generated by Phase 2 Plat C would likely result in a proportionate increase in the probability of traffic accidents. It is unlikely, however, that this traffic would create a safety hazard or significantly increase the number of reported accidents. Project traffic would not exacerbate an existing traffic safety hazard because none of the study intersections and roadway segments in Black Diamond experienced an unusually high collision rate during the most recent three-year period.

Construction Impacts

A construction phasing and timing plan is currently being developed for The Villages MPD Phase 2 Plat C and once completed, it will be used to estimate construction trip (crew and truck) generation and disclose potential construction-related impacts. This information will be provided in a forthcoming technical memo.

Section 1.17 of the City of Black Diamond Engineering Design and Construction Standards requires that a construction management plan be developed by the developer in close coordination with the City to provide for a safe and efficient construction site and minimize the impacts to traffic operations in the area. Specific traffic-related items anticipated to be addressed in such a construction management plan include:

- Truck Routes - identifying specific haul routes for trucks, which will avoid impacts to local residential streets.
- Noise – minimizing noise impacts associated with construction on-site as well as from haul trucks on the roads.
- Parking – identifying parking areas for employees as well as staging areas for trucks and materials.
- Access – Identifying specific areas for access that would likely require safe controlled access for large trucks to and from the site.

- Compute Trip Reduction – encouraging carpooling and other ride sharing by employees to minimize the number of single occupant vehicle trips on site.

It is intended that off-site construction impacts will be limited and minimized through containing equipment, materials and workers on-site as much as possible. This includes accommodating staging, construction facilities and parking on-site. An overall grading plan has been completed for Phase 2 of The Villages MPD which provides an approximate balance (within 13 percent) of materials on site and as such, minimizes the number of truck trips to/from the site. Truck routes will be established to use major routes in the vicinity, including SR 169, and prohibit use of SE Green Valley Road (except for the easterly 1,000 feet immediately west of SR 169).

Traffic Calming Measures

As part of Phase 2 Plat C of The Villages MPD and to supplement the 10-foot wide travel lanes on residential streets, a variety of traffic calming measures will be incorporated to calm traffic and help minimize excessive vehicle speeds, including:

- Curb bulb-outs at 13 different intersections, including "Road A"/Willow Avenue SE, "Road A"/Woonerf C," "Road A"/"Road C," both intersections of "Road A"/"Road B," "Road A"/"Alley B," "Road A"/"Alley C," "Road A"/"Alley D," "Road C"/"Alley A," "Road C"/"Alley B," "Road C"/"Alley C," "Road C"/"Alley D" and "Road B"/"Road C;" and
- Curb-bulb outs at two mid-block locations, including "Road A" between "Woonerf C" and "Road C" and "Road C" between "Alley B" and "Alley C."

Curb bulb-outs narrows the roadway width by providing a physical constraint requiring motorists to travel through intersections and along residential streets at slower speeds.

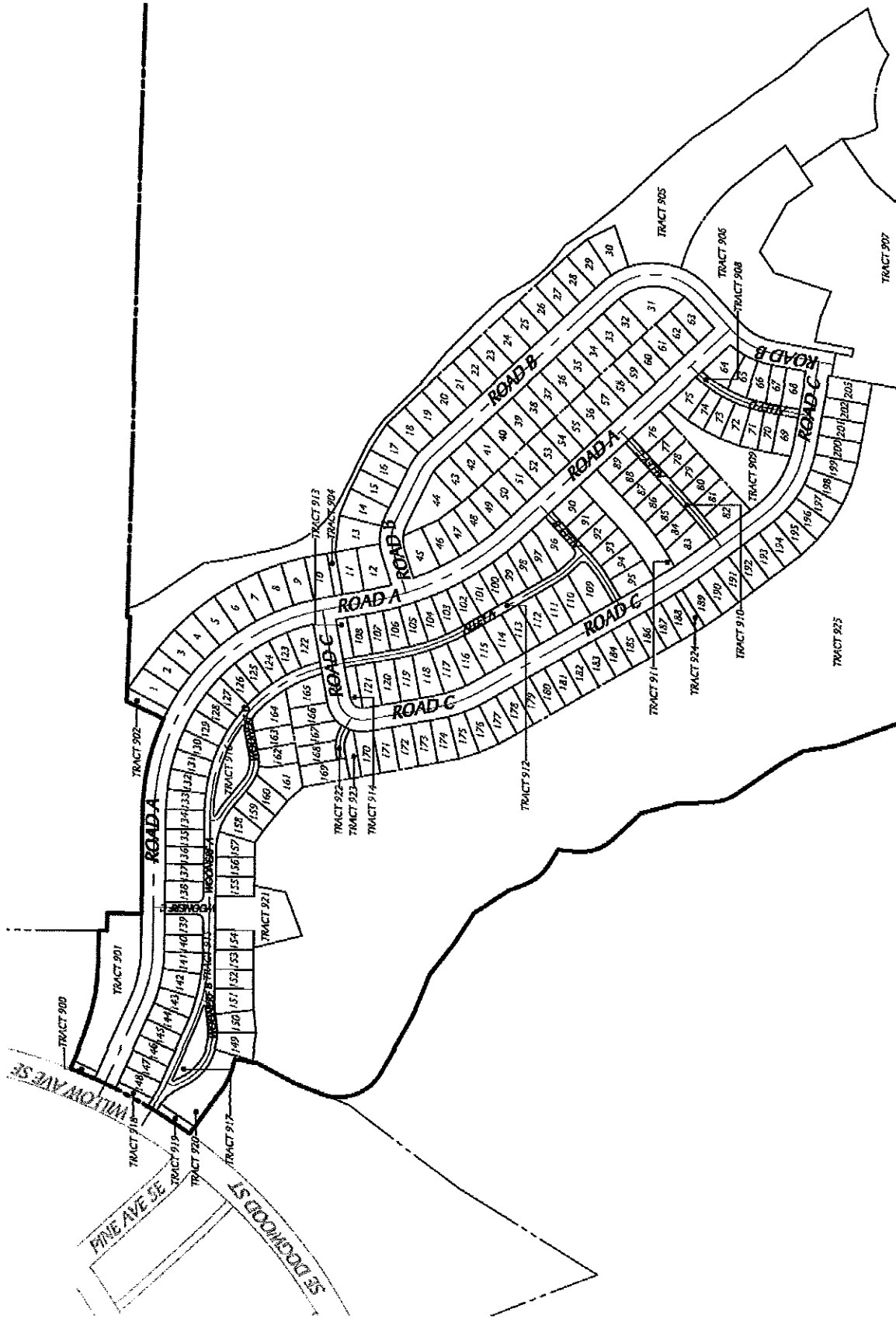
In addition to curb bulb-outs at intersections and mid-block locations, all residential streets will include on-street parking on both sides of the street, including "Road A," "Road B" and "Road C" and on-street parking will be provided on one side of each woonerf, including "Woonerf A," "Woonerf B," "Woonerf C" and "Woonerf D." On-street parking has a measurable effect on vehicle speeds. For many reasons, motorists generally travel at slower speeds in the presence of on-street parking¹. For example, parked vehicles present the possibility of motorists entering/exiting the flow of traffic which requires more attentive driving behavior and slower speeds. Parked vehicles also give the perception of narrower travel lanes which reduces vehicular speeds.

Attachments 1-2

¹ It is worth noting that lower-speed streets with on-street parking also have some of the lowest collision rates with respect to serious accidents. Likewise, pedestrian safety is enhanced as on-street parking provides a buffer or barrier between pedestrian traffic and vehicular traffic. Therefore, facilities with on-street parking tend to be safer and more walkable than facilities without on-street parking.



NOT TO SCALE



Site Plan

The Villages MPD - Phase 2 Plat C

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ATTACHMENT

1



PM Peak Hour Trip Generation Calculations - The Villages MPD Phase 2 Plat C (Phase 1A and Phase 2 Plat C Cumulative)

Size	Units	ITE/LU	Rate ¹	Total Trips		% IN		Total Trips		Internal Trips		External Trips		Pass-by ²		Primary Trips		
				In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In
Commercial																		
Retail	160,000	sf	EQN 5.45	872	49%	445	47	57	380	388	0.20	154	303	311	614			
Office	30,000	sf	EQN 1.66	50	23%	38	4	9	8	29	0.00	0	8	29	37			
Total Commercial	190,000	sf		922		483	51	66	388	477		154	311	340	651			
Residential																		
Single Family Homes	647	DU	EQN 0.87	564	63%	209	47	36	308	173	0	0	308	173	481			
Multi-family	338	DU	EQN 0.60	203	65%	132	18	12	114	59	0	0	114	59	173			
Total Residential	985	DU		767		280	65	48	422	232		0	422	232	654			
Elementary School	450	Students	AVG 0.15	68	49%	33	10	11	23	24	0	0	23	24	47			
Overall Total				1757		959	126	125	833	673		154	756	596	1,352			

PM Peak Hour Trip Generation Calculations - The Villages MPD Phase 2 Plat C (Phase 1A only)

Size	Units	ITE/LU	Rate ¹	Total Trips		% IN		Total Trips		Internal Trips		External Trips		Pass-by ²		Primary Trips	
				In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
Commercial																	
Retail	160,000	sf	EQN 5.45	872	49%	445	47	57	380	388	0.20	154	303	311	614		
Office	30,000	sf	EQN 1.66	50	23%	38	4	9	8	29	0.00	0	8	29	37		
Total Commercial	190,000	sf		922		483	51	66	388	477		154	311	340	651		
Residential																	
Single Family Homes	444	DU	EQN 0.91	404	63%	149	34	26	221	123	0	0	221	123	344		
Multi-family	338	DU	EQN 0.60	203	65%	132	18	12	114	59	0	0	114	59	173		
Total Residential	782	DU		607		287	52	38	335	182		0	335	182	517		
Elementary School	450	DU	AVG 0.15	68	49%	33	10	11	23	24	0	0	23	24	47		
Overall Total				1597		859	113	115	746	623		154	669	546	1,215		

PM Peak Hour Trip Generation Calculations - The Villages MPD (Phase 2 Plat C only)

Size	Units	ITE/LU	Rate ³	Total Trips		% IN		Total Trips		Internal Trips		External Trips		Pass-by ²		Primary Trips	
				In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
Residential																	
Single Family Homes	203	DU	-	160	0%	60	13	10	87	50	0	0	87	50	137		
Overall Total				160		60	13	10	87	50		0	87	50	137		

1. Trip rate used based on ITE procedures as the size of the development increases, the ITE trip rate decreases.
2. Pass-by rate was reduced to account for limited growth in background traffic volumes on the adjacent street system.
3. Number of total trips for Phase 2 of The Villages MPD was calculated by subtracting the total trips for Phase 1A only from the cumulative trips of Phase 1A and 2.