



## Memorandum

### Phase 1 Technical Memorandum - Traffic

March 12, 2014

*Revised January 23, 2015*

Re: Phase 1 Site Access Requirements  
Silo Ridge Development  
Town of Amenia, NY

This technical memorandum reviews the Phase 1 design criteria for access to the proposed Silo Ridge project. While this evaluation is primarily for Phase 1 of the development, where the evaluation indicates that improvements are required on the passing roadways, an additional analysis was performed to determine whether these improvements will be sufficient to support the development upon full build out of the project. As indicated in the SEQRA Compliance Memo (revision dated 1/23/2015), the currently proposed project will generate less than half the volume of peak-hour traffic that the 2009 approved Master Development Plan (MDP) was projected to generate, resulting in better intersection operating conditions and requiring less mitigation (a traffic signal and a southbound right-turn lane will no longer be warranted at the site's main driveway).

Subsequent to VHB's August 12, 2014 submission of this memorandum to NYSDOT, the phasing of the project has been modified, with more development occurring in Phase 1. This memorandum has been revised to reflect the change in development and includes updated trip generations, volume projections and analyses. The following describes the currently proposed project, the associated trip generation and the results of the design criteria review.

#### Project Description

The currently proposed project will be a private, gated, residential community, and will have almost no commercial space (just the Winery Restaurant, which will be accessed via its own driveway, and 21 hotel units, which will be available by reservation only and will require pre-announced access). The project is to consist of the following uses:

- Residential (224 dwelling units)
  - Single-family homes (159 units)
  - Condominium/Townhouse units (65 units)
- Commercial
  - Winery Restaurant (80 seats)
  - 21 Hotel Units
- Amenities
  - Existing 18-hole golf course to be renovated and clubhouse to be demolished and rebuilt.

The project will also contain recreational facilities for the development's residents. The development is to be constructed in at least two phases, with Phase 1 consisting of 141 single-family homes, 65 condominium units, the 21 hotel units and the golf course renovation with rebuilt clubhouse facility. At full build-out, the Winery Restaurant and 18 single-family homes and will be added.



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The Phase 1 access plan for the approved development includes two driveways on Route 22; the existing main site driveway and the existing landfill driveway which will function as a secondary access road. This southern driveway will provide access to the wastewater treatment facility and the golf maintenance facility. Above these facilities, the driveway will be gated and will afford an emergency access to the property as well as access to the overflow parking area for valets. If needed in the future, residents may also be permitted to exit from this driveway to reduce traffic exiting at the main driveway. The Phase 1 access plan will also include one driveway on Route 44 for the 10 parking space overlook.

### **Trip Generation**

Trips generated by the currently proposed project were determined from trip data contained in the Institute of Transportation Engineers' (ITE) publication, *Trip Generation, Ninth Edition*. ITE Land Use Code 210 (Single-Family Detached Housing) and Code 230 (Residential Condominium/Townhouse) were used to generate trips for the single-family and condominium components. The Silo Ridge development's residential component will be exclusively for second-home ownership. As such, VHB has reviewed available trip generation data to determine the appropriate residential trip rates to use in the analysis. Research data (attached) indicates that second-home residences generate between 26 and 38 percent of the trip rates for single-family homes contained in the ITE *Trip Generation Manual, Ninth Edition*. A review of the range of peak hour trip rates for ITE Land Use Code 210 ("Single-Family Detached Housing") indicates that the lowest surveyed rates constitute less than 48 percent of the average ITE trip rate. Based on this information, it is realistically anticipated that the Silo Ridge residential homes will only generate half as much traffic as projected by ITE for primary residences and as evaluated in the previous Phase 1 technical memorandum dated March 12, 2014.

Land Use Code 310 (Hotel) was used to generate trips for the hotel units (as this resulted in slightly higher trip generation than if these units were considered as condos/townhouses). Land Use Code 931 (Quality Restaurant) was used to generate trips for the Winery restaurant and Code 430 (Golf Course) was used to project the trips to the golf course. It is anticipated that the residents of the development (including hotel residents) would represent a significant portion of the peak hour trips to the golf course and the trip generation takes into account this expected synergy between these components as well as the fact that the development is proposed as a private, gated facility. The following provides a summary of the methodology utilized to generate trips for the individual land uses.

- Restaurant – Trips for the restaurant were projected using ITE rates for land use 931, Quality Restaurant for 80 diners. No reductions for synergy between the development's components were applied to the restaurant trips.
- Golf course – Trips for the golf course were projected with the assumption that 43 percent of the golf trips would be comprised of the development's residents (internal trips) and would not travel on the external roadways. The remainder of the trips would consist of golf course staff and guests coming from outside of the development.
- Residential (Single-family, condominiums and hotel) – The 43 percent of trips made internally to or from the golf facility constitute between 16 to 19 percent of the residential trips, depending on the time of day.

The trip generations from the currently proposed project are shown in Table 1. The Table indicates the Phase 1 trips and the trips from full development of the site.



**Table 1 – Peak Hour Trip Generation**

Development	Size	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		Total Trips <sup>(1)</sup>	Internal Trips	New Trips	Total Trips <sup>(1)</sup>	Internal Trips	New Trips	Total Trips <sup>(1)</sup>	Internal Trips	New Trips
<b>Phase 1</b>										
Single Family	141 du	61	-7	<b>54</b>	82	-11	<b>72</b>	79	-12	<b>67</b>
Condo/Townhouses	65 du	23	-5	<b>18</b>	28	-6	<b>22</b>	39	-8	<b>31</b>
Hotel	21 units	11	-3	<b>8</b>	13	-4	<b>8</b>	15	-5	<b>10</b>
Golf Course & Clubhouse <sup>(2)</sup>	18 holes	34	-15	<b>19</b>	48	-21	<b>28</b>	57	-25	<b>32</b>
<b>Total Phase 1</b>		<b>129</b>	<b>-29</b>	<b>100</b>	<b>171</b>	<b>-42</b>	<b>129</b>	<b>190</b>	<b>-49</b>	<b>141</b>
<b>Full Build-out</b>										
Single Family	159 du	68	-8	<b>60</b>	91	-11	<b>80</b>	88	-13	<b>75</b>
Condo/Townhouses	65 du	23	-5	<b>18</b>	28	-7	<b>21</b>	39	-8	<b>31</b>
Hotel	21 units	11	-3	<b>8</b>	13	-5	<b>8</b>	15	-5	<b>10</b>
Golf Course & Clubhouse	18 holes	37	-16	<b>21</b>	53	-23	<b>30</b>	62	-27	<b>35</b>
Winery Restaurant (3)	80 seats	2	0	<b>2</b>	21	0	<b>21</b>	14	0	<b>14</b>
<b>Total Full Build-out</b>		<b>142</b>	<b>-32</b>	<b>110</b>	<b>205</b>	<b>-46</b>	<b>159</b>	<b>218</b>	<b>-53</b>	<b>165</b>

Notes: (1) For Single-family and Condo/Townhouse trips, values shown reflect 50% of ITE values, plus internal trips to golf and hotel (subsequently subtracted, leaving rates for new traffic added to off-site roadways equivalent to 50% of ITE rates).

(2) Phase 1 Golf Course trips estimated to be 92% of full build-out trips as majority of golf trips will be from residential component which is not fully built in Phase 1.

(3) Midday Saturday Winery restaurant trips are 75% of Saturday Peak generator hour (evening) trips.

As indicated in Table 1, at full build-out, the project will generate 110 new trips during the AM peak hour, 159 new trips in the PM peak hour and 165 new trips during the Saturday midday peak hour. For Phase 1, the project is projected to generate approximately 14% less traffic than it will at full build-out.



### **Analysis of Access Requirements**

To determine the level of improvement required for access to the Site in Phase 1, an analysis was performed to identify the access needs at the site's driveways as detailed below.

#### **Route 22 at Main Site Access**

This intersection currently consists of one lane in each direction on Route 22 with separate left and right turn lanes exiting the driveway which currently provides access to the golf course. Virtually all of the proposed development's traffic will use this driveway in Phase 1 and the majority will use this driveway at full development (the remainder will use the two Route 44 driveways providing access to the Winery restaurant and Vineyard Cottages parcels). Traffic counts conducted in June of 2013 revealed that peak-hour traffic on Route 22 have increased by an average of 3 % since May 2007. Access improvements previously proposed for this location included signalization of the intersection as well as the construction of a northbound left turn lane and a southbound right turn lane on Route 22 (January 8, 2009 Findings Statement). To determine if these improvements would be required for Phase 1 and/or full build-out, new traffic volume projections were prepared and analyses performed. The analyses performed included intersection capacity analysis, traffic signal warrant analysis and turn lane warrant analyses. To develop new traffic volumes, Automatic Traffic Recorder (ATR) counts were conducted on Route 22 adjacent to the driveway for a one-week period from June 15 to June 22, 2013. To account for background growth not related to the project, the counted volumes were increased by 4 percent to represent No-Build volumes for Phase 1 and by a total of 8 percent to signify No-Build volumes for the fully developed site. The Phase 1 and full build-out trip generations identified in Table 1 were distributed to the intersection based on the previously approved distribution patterns and added to the No-Build volumes, resulting in the Build volumes for Phase 1 and full build-out of the project.

#### **Capacity Analysis**

Detailed unsignalized intersection capacity analyses of the Build condition for the PM peak hour for Phase 1 and for the full build-out of the project were prepared using Synchro software (version 8). The analysis was performed assuming the existing geometry and a new northbound left turn lane on Route 22, as well as the potential benefits of adding a southbound right-turn lane (per NYSDOT Highway Design Manual §5.9.8.2 D). The results of this analysis (appended) indicate that the eastbound left turn exiting the driveway will operate at Level of Service (LOS) E with delays of 42.8 seconds for Phase 1 and at LOS E (47.1 seconds delay) under full build-out conditions. The volume to capacity ratio (v/c) for the left turn movement will be 0.38 under Phase 1 conditions and 0.40 at full build-out.

The analyses clearly indicate that the driveway will have adequate capacity to accommodate project and non-project traffic in Phase 1 and at full build-out. The left-turn movement will be operating at only 40 percent of capacity at full build-out. Peak-hour, average delays for all vehicles, except left-turns exiting the development, will be minimal (11 seconds or less on the remaining entering and exiting movements and virtually no delay on the through movements). Delays on the left-turn movement exiting the site will be tolerable and confined to the site.

After the completion of Phase 1, peak hour surveys will be conducted at the driveway to confirm that the average delay exiting the site does not fall below the projected LOS E. If the surveys indicate that excessive delays are experienced on the exiting movements, the Applicant will consider permitting residents to exit at the secondary (southern) access driveway. Appropriate permits will be filed at that time, if necessary.



### Traffic Signal Warrant Analysis

A traffic signal warrant analysis was performed at this intersection. The traffic volumes were applied to the various warrants contained in the 2009 edition of the *Manual on Uniform Traffic Control Devices* (MUTCD). The MUTCD volumes are the minimum threshold which must be reached before the NYSDOT will consider installing a traffic signal.

As detailed hereafter, the analysis indicates that the traffic volumes are not projected to reach the threshold values provided in the MUTCD at full build out of the site, therefore, signalization is not projected to be warranted at this location under the full build-out condition. Since Phase 1 volumes are projected to be 14 percent lower than full build-out volumes, a traffic signal is not warranted for Phase 1 conditions either. A summary of the Warrant analysis is provided below.

- Warrant 1 – Eight-Hour Vehicular Volume: Warrant 1 includes Condition A, the Minimum Vehicular Volume and Condition B, the Interruption of Continuous Traffic. The Warrant is met for Condition A or B when, for any 8 hours of an average day, the major street volumes (both approaches) and the minor street exiting volumes meet the volume thresholds provided in Table 4C-1 of the MUTCD. For the Route 22 and the Main Site driveway intersection, the 70 percent threshold values from Table 4C-1 were applied as the major street speed exceeds 40 mph. The Build traffic volumes for this intersection for a 24-hour period were developed using the 2013 ATR counts, increased by 8 percent to account for background growth and projecting the site generated volumes to each hour of the day. Table 2 summarizes the results of Warrant 1. The Table indicates that the major street threshold values are met for 15 hours for Condition A and 8 hours in Condition B; however, during those same hours, the minor street volumes do not meet the volume threshold for the required 8 hours for either condition (0 hours for both Condition A and Condition B). Therefore, the Warrant is not satisfied.



**Table 2 – Summary of Warrant 1**

				Warrant 1 - Eight-Hour Vehicular Volume			
				Condition A Minimum Vehicular Warrant		Condition B Interruption of Continuous Traffic	
Time of Day	Major Street - Rt. 22 Total Both Directions		Minor Street Main Driveway	Major Street Threshold	Minor Street Threshold	Major Street Threshold	Minor Street Threshold
	2013 Existing	2017 Build	Exiting Site Traffic	70%	70%	70%	70%
				350	140	525	70
				Meets Threshold Value?	Meets Threshold Value?		
12-1 am	47	57	6	NO	NO	NO	NO
1-2 am	17	21	2	NO	NO	NO	NO
2-3 am	15	18	2	NO	NO	NO	NO
3-4 am	19	23	2	NO	NO	NO	NO
4-5 am	55	67	12	NO	NO	NO	NO
5-6 am	115	140	27	NO	NO	NO	NO
6-7 am	267	326	61	NO	NO	NO	NO
7-8 am	329	401	77	YES	NO	NO	YES
8-9 am	323	394	69	YES	NO	NO	NO
9-10 am	331	404	63	YES	NO	NO	NO
10-11 am	362	442	54	YES	NO	NO	NO
11am-12 pm	405	494	57	YES	NO	NO	NO
12-1 pm	481	587	57	YES	NO	YES	NO
1-2 pm	454	554	53	YES	NO	YES	NO
2-3 pm	517	631	40	YES	NO	YES	NO
3-4 pm	564	688	44	YES	NO	YES	NO
4-5 pm	581	709	45	YES	NO	YES	NO
5-6 pm	642	783	50	YES	NO	YES	NO
6-7 pm	525	641	41	YES	NO	YES	NO
7-8 pm	462	564	36	YES	NO	YES	NO
8-9 pm	360	439	28	YES	NO	NO	NO
9-10 pm	311	379	24	YES	NO	NO	NO
10-11 pm	205	250	16	NO	NO	NO	NO
11pm -12am	126	154	10	NO	NO	NO	NO
<b>Total Hours Met</b>				<b>15</b>	<b>0</b>	<b>8</b>	<b>1</b>
<b>Total Same Hours Met</b>				<b>0</b>		<b>0</b>	
<b>Meets Warrant?</b>				<b>NO</b>		<b>NO</b>	

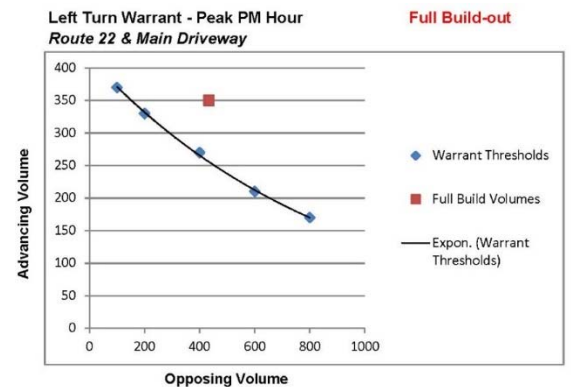
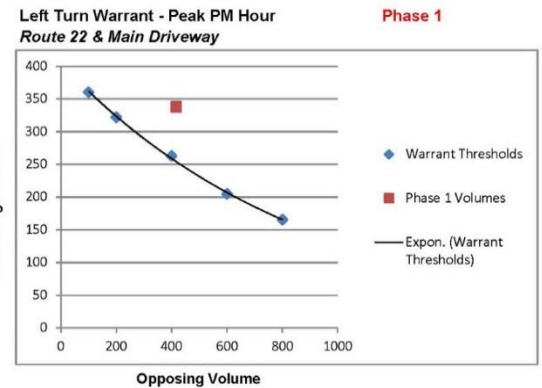


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- Warrant 2 – Four-Hour Vehicular Volume: The Warrant is met when, for each of any 4 hours of an average day, the plotted points representing the hourly vehicles on the major street (total of both approaches) and the corresponding vehicles exiting the minor street approach all fall above the applicable curve in Figure 4C-1 or Figure 4C-2 (70 percent factor) of the MUTCD. For the Route 22 and the Main Site driveway intersection, Figure 4C-2 was used as the major street speed exceeds 40 mph. The minor street threshold volume for Warrant 2 is 80 vehicles per hour (vph). The Build volumes for Route 22 and the Main site driveway shown in Table 2 were applied to Figure 4C-2. The driveway approach does not meet the 80 vph threshold value during any hour of the day. Similarly, the major street volume falls below the curve for each hour; therefore, the warrant is not met.
- Warrant 3 – Peak-Hour Vehicular Volume: The Warrant is met when, for one hour of an average day, the plotted points representing the hourly vehicles on the major street (total of both approaches) and the corresponding vehicles exiting the minor street approach fall above the applicable curve in Figure 4C-3 or Figure 4C-4 (70 percent factor) of the MUTCD. For the Route 22 and the Main Site driveway intersection, Figure 4C-4 was used as the major street speed exceeds 40 mph. The minor street threshold volume for Warrant 3 is 100 vph. The Build volumes for Route 22 and the Main site driveway shown in Table 2 were applied to Figure 4C-4. The driveway approach does not meet the 100 vph threshold value during any hour of the day. Similarly, the major street volume falls below the curve; therefore, the warrant is not met for any hour of the day.
- Warrant 4 – Pedestrian Volume: To satisfy this Warrant, a minimum of 75 pedestrians per hour crossing the intersection for the four-hour pedestrian volume warrant or 93 pedestrians per hour for the pedestrian peak hour warrant is required. As the pedestrian volumes at the subject intersection are negligible, this Warrant is not met.
- Warrant 5 – School Crossing: This Warrant is intended for locations with existing school crossings and requires a minimum of 20 schoolchildren crossing the major street during the same period when the number of adequate gaps in the traffic stream is insufficient. As the subject intersection does not currently have an established school crossing and will not provide one in the future, this Warrant is not met.
- Warrant 6 – Coordinated Signal System: This Warrant is intended to maintain proper platooning of vehicles in a coordinated signal system and may necessitate signalization at an intersection that would not otherwise need signalization. This Warrant is not met at the subject intersection as it does not fall within a coordinated system.
- Warrant 7 – Crash Experience: This Warrant is intended for application at locations where the severity and frequency of crashes would be the principal reasons to install a traffic signal. There are various criteria that need to be met to satisfy the warrant, including a minimum of 5 crashes that would be of the type susceptible to correction by a traffic signal. For the Route 22 and Main Site driveway intersection, accident records for the most recent three-year period were obtained from NYSDOT. These records indicate that only one accident occurred in the vicinity of the subject intersection during the period evaluated. Therefore, the intersection does not meet the minimum criteria for number of accidents.
- Warrant 8 – Roadway Network: This Warrant is intended at the common intersection of two or more major routes that could be considered as part of a roadway network. This warrant is not applicable for the subject intersection as the site driveway is a private road.
- Warrant 9 – Intersection Near a Grade Crossing: This Warrant is for intersections adjacent to at-grade railroad crossings. This Warrant is not applicable for the subject intersection as it is not located near a grade crossing.

### Left Turn Lane Warrant Analysis

A left turn lane warrant analysis was performed for the northbound approach of Route 22 at the Main Site driveway intersection with the Build volumes for Phase 1 and for the fully developed site. The analysis was based on Exhibit 9-23 (Guide for Left-Turn Lanes on Two-Lane Highways) from the 2011 edition of *A Policy on Geometric Design of Highways and Streets* published by the American Association of State Highway and Transportation Officials (AASHTO). The AASHTO publication provides values for determining whether a left-turn lane is warranted based on the operating speed, opposing volume, advancing volume and proportion of left turns. The analysis of the northbound left-turn movement indicated that a left turn lane would be warranted under Phase 1 and at full build-out. Therefore, it is recommended that a 75-foot left turn lane, with appropriate tapers, be constructed at this location in accordance with the requirements of the NYSDOT's highway work permitting process.



### Right Turn Lane Warrant Analysis

NYSDOT Highway Design Manual §5.9.8.2 D simply states that "the decision to install exclusive right-turn lanes should be based on a comparison, using capacity analysis, of intersection operations with and without the turn lanes".

At the completion of Phase 1, 42 vehicles are projected to make the southbound right-turn movement into the site during the busiest hour of the day, delays on the left-turn exiting movement are projected to be 42.8 seconds and the volume-to-capacity ratio on this movement is projected to be 0.38. With the addition of a southbound right-turn lane, these values are projected to be reduced by 2.2 seconds and 0.02, respectively, which will be imperceptible and which will not result in any changes in Level of Service. It is, therefore, concluded that a right-turn lane is not warranted for Phase 1 of the project.

At the completion of full build-out, 42 vehicles are projected to make the southbound right-turn movement into the site during the busiest hour of the day, delays on the left-turn exiting movement are projected to be 47.1 seconds and the volume-to-capacity ratio on this movement is projected to be 0.40. With the addition of a southbound right-turn lane, these values are projected to be reduced by 2.6 seconds and 0.01, respectively, which will be imperceptible and which will not result in any changes in Level of Service. It is, therefore, concluded that a right-turn lane is not warranted for full build-out of the project.





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### **Route 22 at Southern Site Driveway**

Route 22 consists of one lane in each direction at this existing driveway. No improvements to NY Route 44 were required at the southern access from the property to NY Route 22 in the 2009 Findings Statement for the approved development. Under Phase 1 and full build-out, this driveway will function as a secondary access road, providing access to the golf maintenance facility and the wastewater treatment plant and will also serve as an emergency access to the site. As such, generally less than 10 trips per hour will utilize this driveway, therefore, no improvements are proposed.

### **Route 44 at Proposed Site Access/Area "M" (Overlook and Winery Restaurant)**

This proposed unsignalized site access will be constructed during Phase 1 to provide access to approximately 10 parking spaces at the overlook (at full development, this driveway will also provide access to the proposed winery, including an 80-seat restaurant). Other than the construction of the driveway, no improvements to NY Route 44 were required at this location in the 2009 Findings Statement for the approved development.

A review of the Build capacity analyses of this intersection contained in the 2007 DEIS indicate that during the PM peak hour, the busiest hour in terms of delay, the westbound driveway approach operated at acceptable LOS C with a delay of 16.0 seconds. Since the 10-parking space overlook will generate substantially less traffic than at full-buildout which was contemplated in the Findings Statement, improvements to NYS Route 44 associated with the construction of this driveway are not required for Phase 1 of the project.

### **Summary of Access Requirements**

Based on the analysis performed herein, the following summarizes the site access requirements for each driveway location for Phase 1.

- Route 22 at Main Site Access
  - Maintain existing driveway geometry (separate left and right turn exiting lanes and one entering lane);
  - Construct 75-foot northbound left turn lane on Route 22;
- Route 22 and Southern Site Driveway
  - Driveway will be a secondary access, utilized by vehicles accessing the wastewater treatment and golf maintenance facilities and providing for emergency access; no improvements required in the public right of way.
- Route 44 and Proposed Site Access /Area "M"(Overlook and Winery Restaurant)
  - Construct the site driveway to provide one entering lane and one exiting lane.

**Residential Trip Generation Data  
for Second Home Residences**

Jefferson County

# QUIMPER PENINSULA TRAVEL DEMAND MODEL DOCUMENTATION

Prepared for:  
Jefferson County

October 2008

Prepared by:



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07268.00

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## Existing and Forecast Land Use

Land use data were used in the modeling process to estimate the quantity of travel activity associated with each TAZ. The land use process was a coordinated effort between Transpo, Jefferson County, and the City of Port Townsend. Jefferson County was primarily responsible for providing the 2007 and 2031 land use data outside of Port Townsend. The process by which the land use was calculated and refined for the Quimper Peninsula Model is documented in Appendix C.

Existing and future land use data provided by Jefferson County were quantified according to the categories shown in Exhibit 6.

**Exhibit 6 2007 Quimper Peninsula Model Land Use Categories**

Land Use Type	Units	Land Use Description
SFDU	Dwelling Units	Single-family dwelling units in Port Townsend
CntySFDU	Dwelling Units	Single-family dwelling units outside Port Townsend
MFDU	Dwelling Units	Multi-family dwelling units, including duplexes
<u>RetireDU</u>	Dwelling Units	Retirement dwelling units/ <u>second homes</u>
NRC	Employees	Natural resource (Agriculture, Forestry, Fishing, Mining) and construction employment
Manuf	Employees	Manufacturing and Industrial employment
CTU	Employees	Communication, Transportation, Utilities employment
Whole	Employees	Wholesale employment
Retail-High	Employees	Retail employment along Upper Sims Way
Retail-Low	Employees	Retail employment along Lower Sims Way/Water Street
CntyRetail	Employees	Retail employment outside of Port Townsend
FIRE	Employees	Finance, Insurance, and Real Estate employment
Edu	Employees	Education employees (Elementary and Secondary)
Med	Employees	Medical employment
Office/Other	Employees	Office or other services employment
CntyOffice	Employees	Office or other services employment outside of Port Townsend
GOV	Employees	Government employment
Motel	Rooms	Motels, hotels, and resort destinations

Exhibit 7 summarizes the existing and future land use data for households and employment organized by sub-area including Port Townsend, North Peninsula, Mid-Peninsula, the Port Hadlock UGA, South Peninsula, and the Port Ludlow MPR.

## Trip Generation

The trip generation process is used to convert the land use/socio-economic data into vehicle trips and estimate the number of trips per TAZ. The trip rate parameters can be adjusted to allow the model to better reflect existing conditions as part of the calibration/validation process. A simple trip generation methodology was applied to estimate the number of PM Peak Hour trips for each TAZ in the Quimper Peninsula Model. Trip generation rates were adjusted in an Excel spreadsheet for the 2007 base year and 2031 horizon year and were input directly into the VISUM model.

### Trip Rates

Exhibit 9 contains the trip rates that were used in the 2007 and 2031 Quimper Peninsula Model. The trip rate calibration process began with the 2006 Port Townsend Model. Rates were created for SFDU, Retail, and Office land uses outside of Port Townsend to differentiate between travel patterns of people in a more urban area compared to people in a more rural area.

**Exhibit 9 Weekday PM Peak Hour Rates<sup>1</sup>**

Land Use Category	Units	Rates (Trips per unit)	Percent Origins	Percent Destinations
<u>SFDU</u>	Dwelling Units	<u>0.80</u>	40 %	60 %
CntySFDU	Dwelling Units	0.62	40 %	60 %
MFDU	Dwelling Units	0.55	40 %	60 %
<u>RetireDU</u>	Dwelling Units	<u>0.30</u>	50 %	50 %
NRC	Employees	0.48	98 %	2 %
Manuf	Employees	0.48	98 %	2 %
CTU	Employees	0.72	98 %	2 %
Whole	Employees	0.62	98 %	2 %
Retail-High	Employees	2.00	21 %	79 %
Retail-Low	Employees	1.30	21 %	79 %
CntyRetail	Employees	2.00	30 %	70 %
FIRE	Employees	0.72	98 %	2 %
Edu	Employees	1.12	50 %	50 %
Med	Employees	0.49	90 %	10 %
Office/Other	Employees	0.92	98 %	2 %
CntyOffice	Employees	0.65	98 %	2 %
GOV	Employees	0.52	98 %	2 %
Motel	Rooms	0.52	50 %	50 %

$0.30/0.80 =$   
37.5%

1. Trip rates based on *Trip Generation, Seventh Edition*, Institute of Transportation Engineers, 2003. Adjusted during model calibration to better replicate travel patterns and traffic counts within the study area.

The trip generation process estimates origins and destinations within each TAZ. For a PM Peak Hour trip model, origins are normally associated with employment, since they correspond to where almost all PM Peak Hour trips begin. Destinations are normally associated with households because this is where PM Peak Hour trips are usually directed.

The PM Peak Hour for the Quimper Peninsula Model falls between 4:15 pm and 5:15 pm which corresponds to the peak hour of a majority of the intersection counts used to calibrate the model. Most of the intersections that do not have a peak hour between 4:15 pm and 5:15 pm have a peak hour that starts within 15 minutes before or after 4:15 pm.

# Single-Family Detached Housing (210)

Average Vehicle Trip Ends vs: Vehicles  
On a: Weekday,  
Peak Hour of Adjacent Street Traffic,  
One Hour Between 7 and 9 a.m.

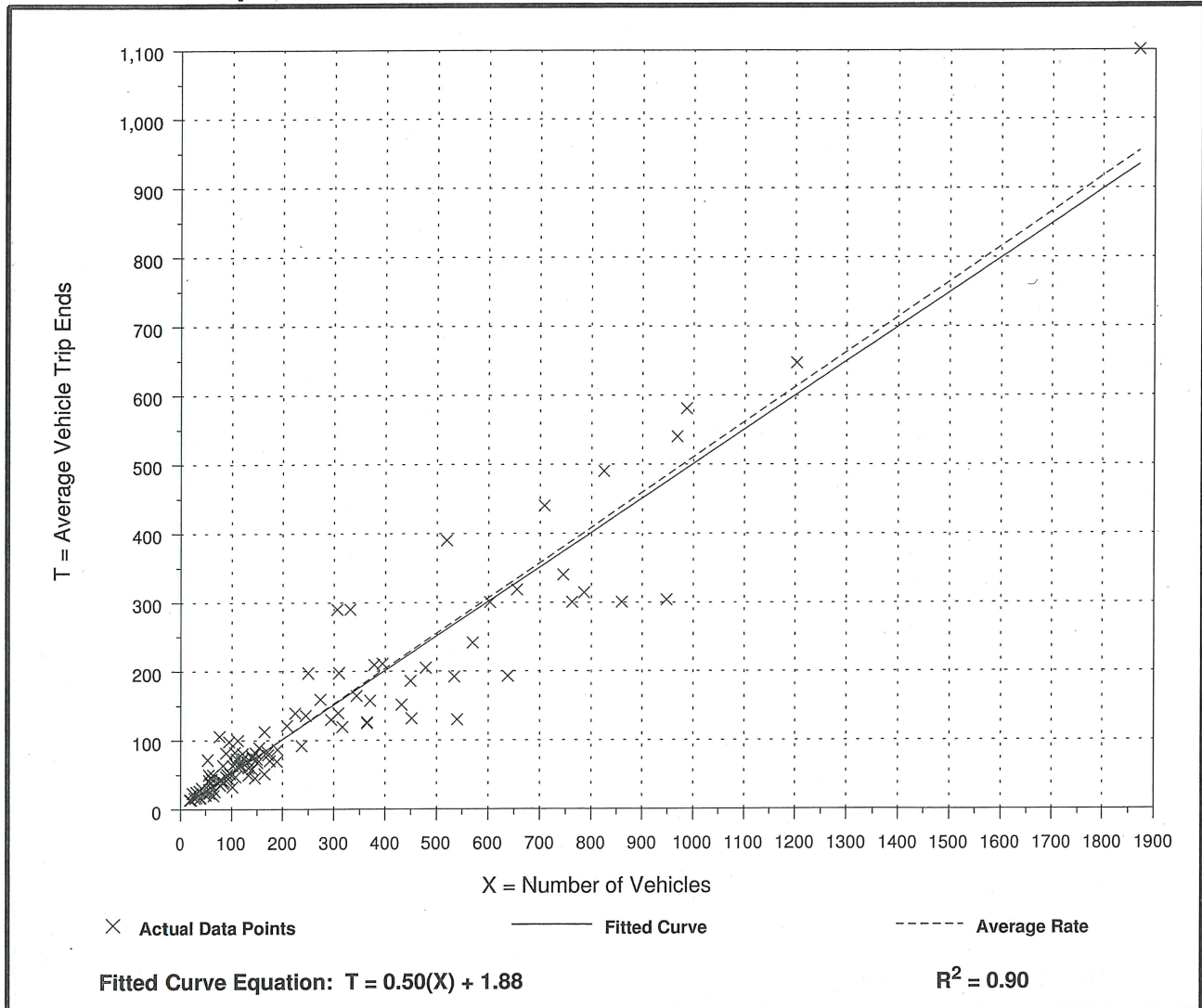
Number of Studies: 110  
Average Number of Vehicles: 262  
Directional Distribution: 31% entering, 69% exiting

## Trip Generation per Vehicle

Average Rate	Range of Rates	Standard Deviation
0.51	0.24 - 1.38	0.73

= 47% of avg. rate

## Data Plot and Equation



# Single-Family Detached Housing (210)

Average Vehicle Trip Ends vs: Dwelling Units  
 On a: Weekday,  
 Peak Hour of Adjacent Street Traffic,  
 One Hour Between 4 and 6 p.m.

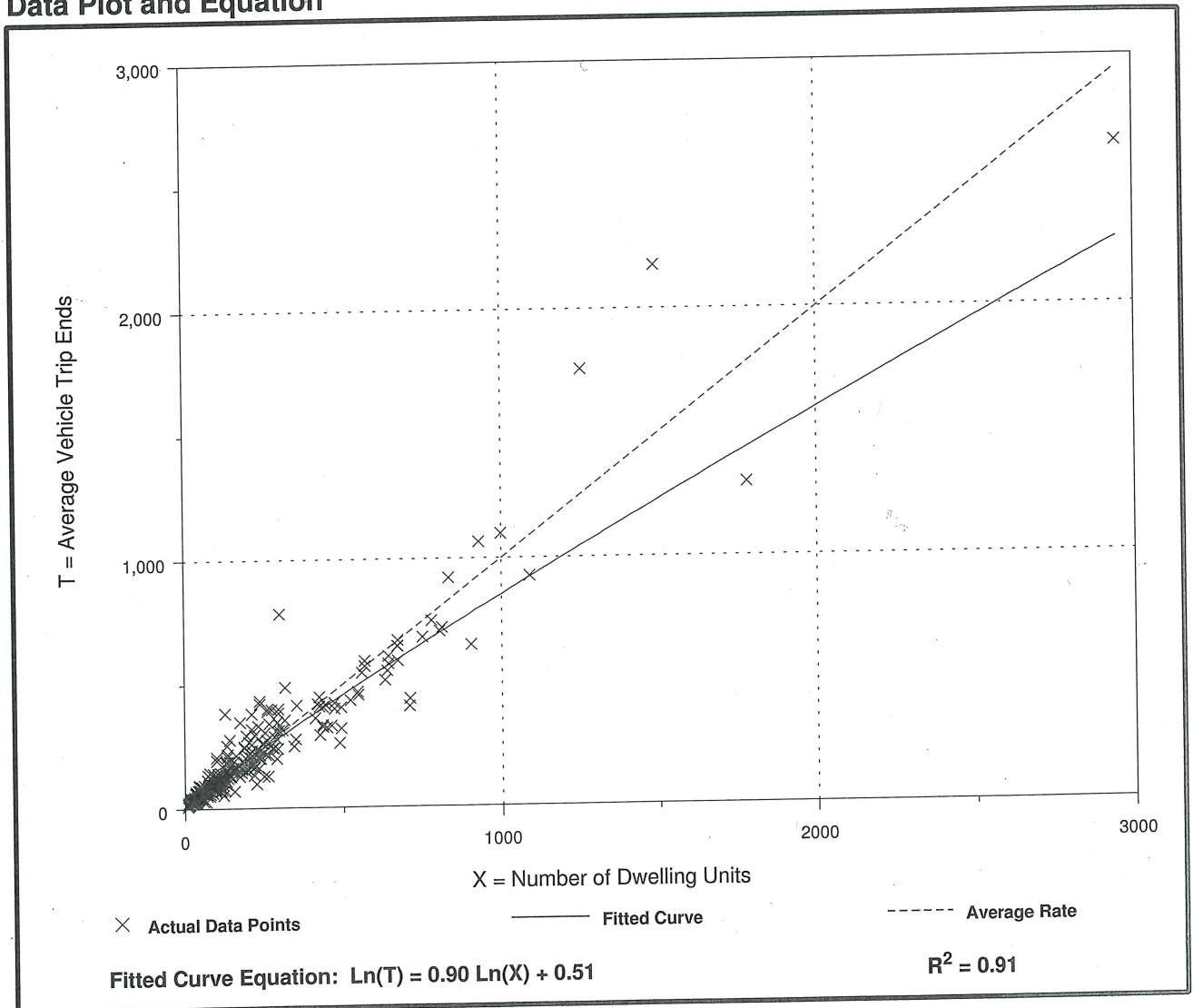
Number of Studies: 321  
 Avg. Number of Dwelling Units: 207  
 Directional Distribution: 63% entering, 37% exiting

## Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.00	0.42 - 2.98	1.05

0.42 = 42% of avg. rate

## Data Plot and Equation



# Recreational Homes (260)

**Average Vehicle Trip Ends vs: Dwelling Units**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**

Number of Studies: 2  
 Avg. Number of Dwelling Units: 1,091  
 Directional Distribution: 67% entering, 33% exiting

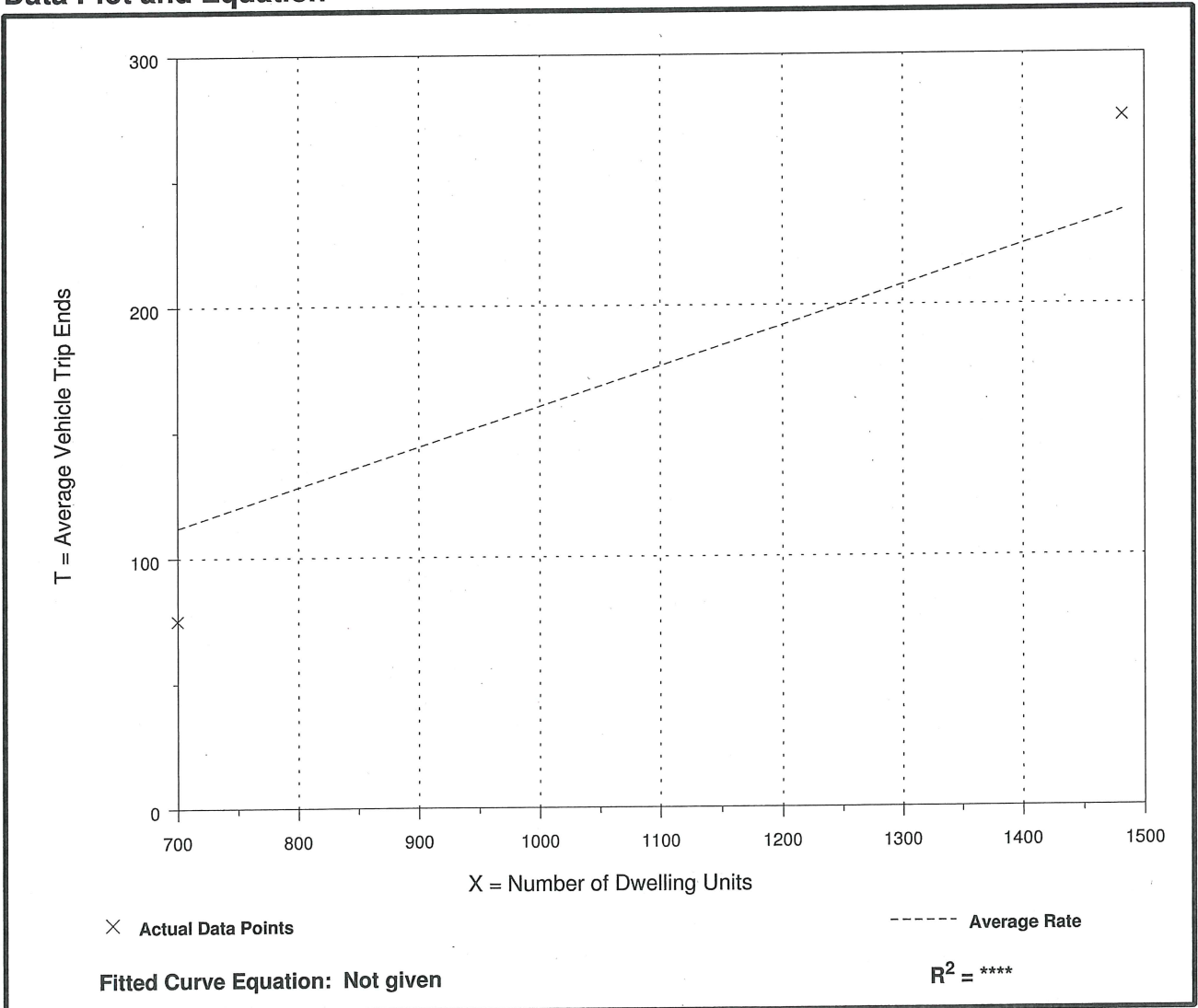
### Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.16	0.11 - 0.19	*

= 31% of LUC 210 Avg. rate (0.51)

### Data Plot and Equation

*Caution - Use Carefully - Small Sample Size*





# Recreational Homes (260)

Average Vehicle Trip Ends vs: Dwelling Units  
On a: Weekday,  
Peak Hour of Adjacent Street Traffic,  
One Hour Between 4 and 6 p.m.

Number of Studies: 2  
Avg. Number of Dwelling Units: 1,091  
Directional Distribution: 41% entering, 59% exiting

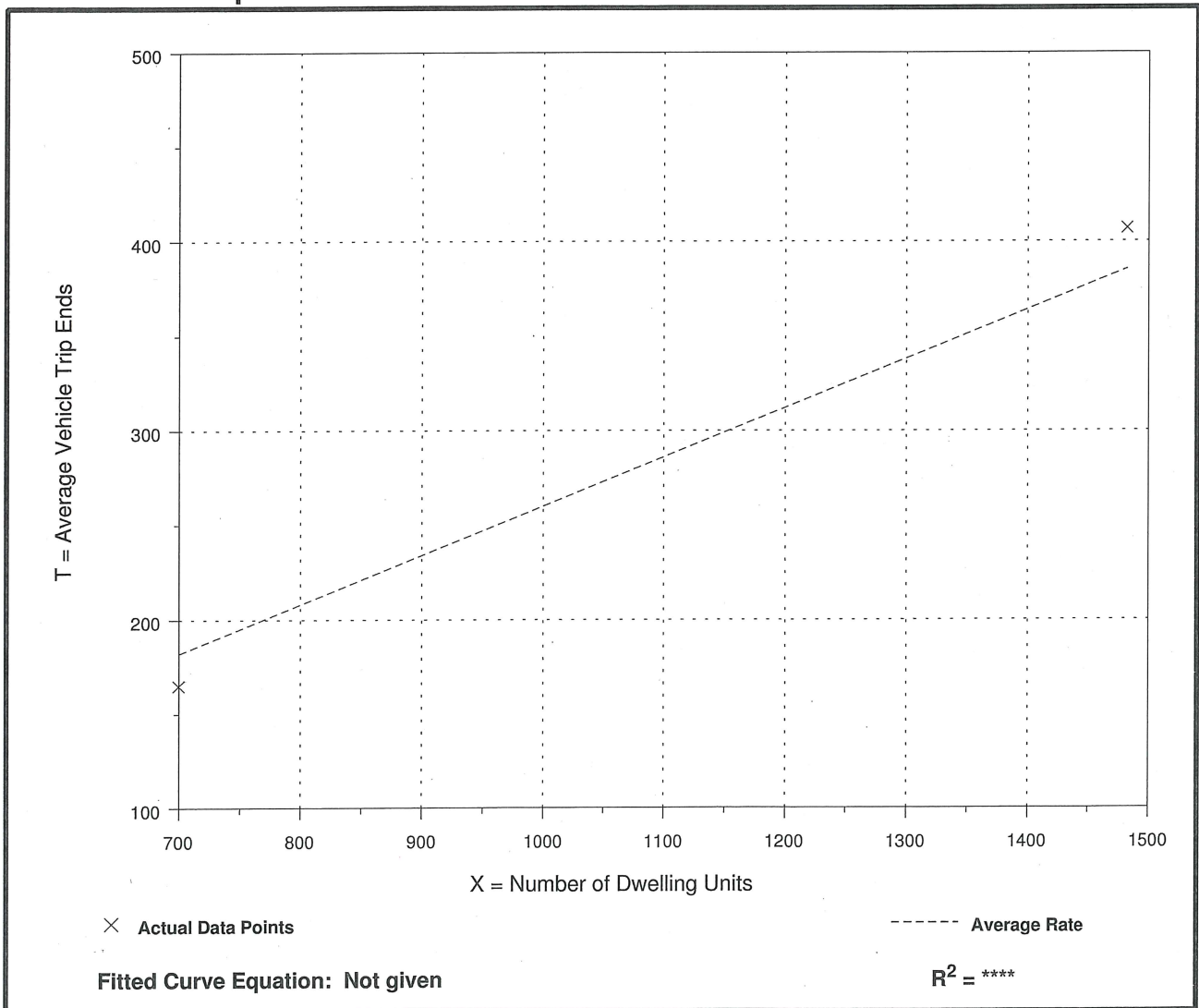
## Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.26	0.24 - 0.27	*

→ = 26% of LUC 210 avg. rate (1.00)

## Data Plot and Equation

Caution - Use Carefully - Small Sample Size



## **Synchro - Level of Service Analysis Worksheets**

- **Phase 1**
- **Full Build-Out**

PM Build - Phase 1 - with NB Left Turn Lane  
 3: NYS Route 22 & Silo Ridge Main Drwy

PM Peak Hour  
 Jan 2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	25	42	373	294	42
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.44	0.63	0.25	0.61	0.88	0.75
Hourly flow rate (vph)	57	40	168	611	334	56
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	1310	362	390			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1310	362	390			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	62	94	86			
cM capacity (veh/h)	150	683	1168			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	57	40	168	611	390
Volume Left	57	0	168	0	0
Volume Right	0	40	0	0	56
cSH	150	683	1168	1700	1700
Volume to Capacity	0.38	0.06	0.14	0.36	0.23
Queue Length 95th (ft)	40	5	13	0	0
Control Delay (s)	42.8	10.6	8.6	0.0	0.0
Lane LOS	E	B	A		
Approach Delay (s)	29.6		1.9	0.0	
Approach LOS	D				

Intersection Summary					
Average Delay			3.4		
Intersection Capacity Utilization			34.7%	ICU Level of Service	A
Analysis Period (min)			15		

2017 PM Full Build-out - with NB Left Lane  
3: NYS Route 22 & Silo Ridge Main Drwy

PM Peak Hour  
Jan 2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	25	42	392	308	42
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.44	0.63	0.25	0.61	0.88	0.75
Hourly flow rate (vph)	57	40	168	643	350	56
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	1357	378	406			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1357	378	406			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	60	94	85			
cM capacity (veh/h)	140	669	1153			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	57	40	168	643	406
Volume Left	57	0	168	0	0
Volume Right	0	40	0	0	56
cSH	140	669	1153	1700	1700
Volume to Capacity	0.40	0.06	0.15	0.38	0.24
Queue Length 95th (ft)	44	5	13	0	0
Control Delay (s)	47.1	10.7	8.7	0.0	0.0
Lane LOS	E	B	A		
Approach Delay (s)	32.1		1.8	0.0	
Approach LOS	D				

Intersection Summary					
Average Delay			3.5		
Intersection Capacity Utilization			35.4%	ICU Level of Service	A
Analysis Period (min)			15		

PM Build - Phase 1 - with NB Left & SB Right Lane  
3: NYS Route 22 & Silo Ridge Main Drwy

PM Peak Hour  
Jan 2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	25	42	373	294	42
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.44	0.63	0.25	0.61	0.88	0.75
Hourly flow rate (vph)	57	40	168	611	334	56
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	1282	334	390			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1282	334	390			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	64	94	86			
cM capacity (veh/h)	156	708	1168			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	57	40	168	611	334	56
Volume Left	57	0	168	0	0	0
Volume Right	0	40	0	0	0	56
cSH	156	708	1168	1700	1700	1700
Volume to Capacity	0.36	0.06	0.14	0.36	0.20	0.03
Queue Length 95th (ft)	38	4	13	0	0	0
Control Delay (s)	40.6	10.4	8.6	0.0	0.0	0.0
Lane LOS	E	B	A			
Approach Delay (s)	28.2		1.9	0.0		
Approach LOS	D					

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

2017 PM Full Build-out - with NB Left & SB Right Lanes  
 3: NYS Route 22 & Silo Ridge Main Drwy

PM Peak Hour  
 Jan 2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	25	42	392	308	42
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.44	0.63	0.25	0.61	0.88	0.75
Hourly flow rate (vph)	57	40	168	643	350	56
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	1329	350	406			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1329	350	406			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	61	94	85			
cM capacity (veh/h)	146	693	1153			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	57	40	168	643	350	56
Volume Left	57	0	168	0	0	0
Volume Right	0	40	0	0	0	56
cSH	146	693	1153	1700	1700	1700
Volume to Capacity	0.39	0.06	0.15	0.38	0.21	0.03
Queue Length 95th (ft)	42	5	13	0	0	0
Control Delay (s)	44.5	10.5	8.7	0.0	0.0	0.0
Lane LOS	E	B	A			
Approach Delay (s)	30.5		1.8	0.0		
Approach LOS	D					

Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			32.9%	ICU Level of Service	A	
Analysis Period (min)			15			