Memorandum

Silo Ridge Resort Community Technical Memorandum - Traffic

March 12, 2014
Revised January 23, 2015

Re: SEQRA Compliance (Proposed MDP) - Traffic
Silo Ridge Development
Town of Amenia, NY

VHB has prepared this technical memorandum to determine whether a proposed change in the size and land use mix of the Silo Ridge development which received SEQRA approval in 2009 will be in compliance with the 2009 SEQRA findings statement. This technical memorandum provides a comparison between the 2009 approved Master Development Plan (MDP) and the development currently proposed with regards to the trip generation, Level of Service results and required mitigation. As indicated hereafter, the currently proposed project will generate substantially less traffic than the previously approved MDP, 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 to respond to comments received from the NYSDOT. It includes updated trip generation projections, volume projections and detailed analyses.

Project Description

The approved development, the Silo Ridge Resort Project, previously received MDP and SUP approvals which were subject to conditions contained in the SEQRA Findings Statement adopted January 8, 2009. That project, which was proposed as a combination public-private residential and commercial facility, consisted of the following land uses:

- Residential (338 dwelling units)
    - Single-family homes – (41 units)
    - Condominium/Townhouse units (297 units)
- Commercial
    - Resort Hotel/Condominium (300 condo units capable of being divided into 367 hotel rental rooms) including hotel amenities (banquet space, restaurant, bar/lounge and café)
    - Restaurant
    - Conference space
    - Spa and Wellness Center
    - Retail shops

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Memorandum

- Amenities
    - Existing 18-hole golf course to be renovated and clubhouse to be demolished and rebuilt.

Access to the approved project was to be provided by two driveways on Route 44 and two driveways on Route 22.

The currently proposed project[1] differs from the approved project in that it will be a private, gated community, will have fewer residential units and 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). Access to the project will differ from the approved project in that the existing southern driveway on Route 22 (the old Landfill driveway) will function as a secondary access. This 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 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 golf course clubhouse will be rebuilt and expanded to meet the residents' needs but the golf course will no longer be open to the public (except for use by residents in the 21 hotel units).

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.

[1] The current proposal differs slightly from the October 2013 MDP submission which had a slightly larger residential component than the current program described herein (229 units vs. the current program's 224 units).

Memorandum

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 SEQRA compliance 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 generations take 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 course constitute between 16 and 19 percent of the trips generated by the residential component of the development, depending on the time of day. These trips were not added to the surrounding roadways.

Peak-hour trip generation for full build-out of the currently proposed project is shown in Table 1.

Memorandum

Table 1 – Peak Hour Trip Generation

Development	Size	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		Total Trips(1)	Internal Trips	New Trips	Total Trips(1)	Internal Trips	New Trips	Total Trips(1)	Internal Trips	New Trips
Full Build-out										
Single Family	159 du	68	-8	**60**	91	-11	**80**	88	-13	**75**
Condo/Townhouses	65 du	23	-5	**18**	28	-7	**21**	39	-8	**31**
Hotel	21 units	11	-3	**8**	13	-5	**8**	15	-5	**10**
Golf Course & Clubhouse	18 holes	37	-16	**21**	53	-23	**30**	62	-27	**35**
Winery Restaurant (3)	80 seats	2	0	**2**	21	0	**21**	14	0	**14**
Total Full Build-out		***142***	***-32***	***110***	***205***	***-46***	***159***	***218***	***-53***	***165***

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

As indicated in Table 1, at full build-out, the currently proposed 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. These trips were compared to those of the approved project as indicated in Table 2.

Table 2 – Trip Generation Comparison – Full Build-out

Development	AM Peak Hour New Trips	PM Peak Hour New Trips	Saturday Peak Hour New Trips
Approved Project (1)	442	660	699
Currently Proposed Project	110	159	165
Reduction in Trips (% reduction)	***-332 (-75%)***	***-501 (-76%)***	***-534 (-76%)***

Notes: Trips represent full build-out of the project.
(1) Approved project trip generations are from the Approved Master Development Plan (MDP).

As shown in Table 2, the currently proposed development will result in significantly fewer trips than the approved development. The number of trips generated will be 75 percent to 76 percent lower than the approved project.

Memorandum

Impact Analysis

An impact analysis was performed for the currently proposed development to identify whether the reduction in development trips would require the same level of mitigation that was identified for the approved project. The impact analysis was conducted to identify mitigation required for full Build-out of the project. The following provides an impact evaluation of each study location and recommendations for mitigation.

Route 22 at Main Site Access

At the Main Site driveway on Route 22, the mitigation previously proposed included signalization of the intersection and construction of a northbound left turn lane and a southbound right turn lane on Route 22 to facilitate access into the site. Since 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, to determine if these improvements would be required for full build-out, new traffic volume projections were prepared and analyses performed for the PM peak hour, which was the critical time frame. 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 a total of 8 percent to signify No-Build volumes for the fully developed site. The 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 full build-out of the project.

Capacity Analysis

Detailed unsignalized intersection capacity analyses of the Build condition for the full build-out of the project were prepared using Synchro software (version 8). The intersection currently consists of one lane in each direction on Route 22 and separate left and right turn lanes exiting the driveway. The analysis was performed assuming the existing geometry and a new northbound left turn lane on Route 22. 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 47.1 seconds for full build-out conditions. The volume to capacity ratio (v/c) for the left turn movement will be 0.40 at full build-out, indicating that there will be sufficient capacity to handle demand. Compared to the analyses for the approved project, the left turn delays for the currently proposed project are projected to be lower by an order of magnitude. The eastbound right turn and northbound left turn movements will operate at acceptable LOS B or better during the full build-out conditions.

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 with the Build volumes for the fully developed site. 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. The analysis indicates that the traffic volumes do not meet the threshold values provided in the MUTCD, therefore, signalization is not projected to be

warranted at this location, even under the full build-out condition. A summary of the Warrants 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 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 3 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 of hours for either condition (0 hours for both Condition A and Condition B). Therefore, the Warrant is not satisfied.

Memorandum

Table 3 – Summary of Warrant 1

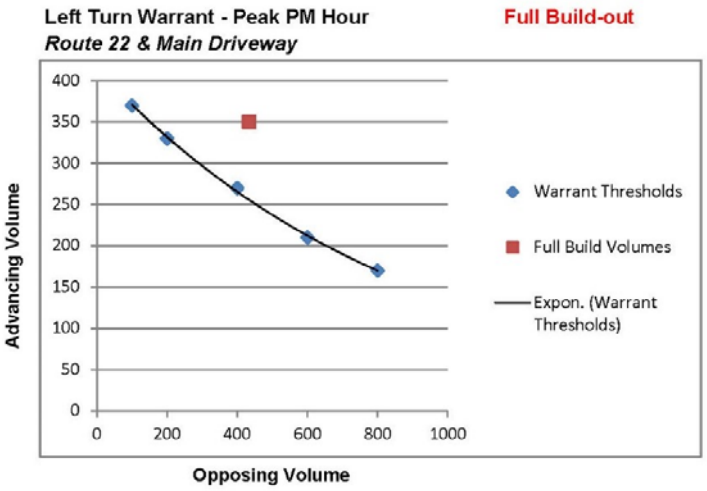
				Warrant 1 - Eight-Hour Vehicular Volume			
				Condition A Minimum Vehicular Warrant		Condition B Interruption of Continuous Traffic	
	Major Street - Rt. 22 Total Both Directions		Minor Street Main Driveway	Major Street Threshold	Minor Street Threshold	Major Street Threshold	Minor Street Threshold
Time of Day	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
			Total Hours Met	***15***	***0***	***8***	***1***
			Total Same Hours Met	***0***		***0***	
			Meets Warrant?	***NO***		***NO***	

Memorandum

- 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 3 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 3 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.

Memorandum

Left Turn Lane Warrant Analysis



A left turn warrant analysis was performed for the northbound approach of Route 22 at the Main Site driveway intersection with the 2017 Build volumes 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. 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 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.

Route 22 at Route 44

At the signalized intersection of Route 22 and Route 44, the mitigation listed in the 2009 Findings Statement for the approved development included monitoring of the intersection with NYSDOT oversight after project completion and, if required, signal timing changes were to be implemented based upon NYSDOT input.

A review of the No Build and Build capacity analyses of this intersection contained in the 2007 DEIS indicate that during the Saturday peak hour, the busiest hour in terms of delay, the intersection operated at acceptable LOS C with a delay of 23.8 seconds for the No Build condition and 32.3 seconds under Build conditions, an increase of 8.5 seconds attributable to the project's traffic. The currently proposed development will generate approximately 76 percent fewer trips through this intersection during the Saturday peak hour than the approved development. With the 76 percent

reduction in site traffic it can be expected that the Build delay would be reduced to 25.8 seconds including a 2.0 second increase associated with project traffic. As in the approved Findings Statement, it is recommended that the intersection be monitored by the NYSDOT after project completion and, if required, signal timing changes were to be implemented based upon NYSDOT input.

Route 22 at Lake Amenia Road/Dunn Road

At the unsignalized intersection of Route 22 with Lake Amenia Road/Dunn Road, the mitigation listed in the 2009 Findings Statement for the approved development included a reassessment of the intersection upon project completion, in conjunction with input from NYSDOT.

A review of the No Build and 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 Dunn Road approach operated at LOS D with a delay of 32.2 seconds for the No Build condition and at LOS E with 38.4 seconds of delay under Build conditions, an increase of 6.2 seconds attributable to the project's traffic. The currently proposed development will generate approximately 76 percent fewer trips through the intersection during the PM peak hour than the approved development. With the 76 percent reduction in site traffic it can be expected that the Build delay would be reduced to 33.7 seconds including a 1.5 second increase associated with project traffic. As in the approved Findings Statement, it is recommended that the intersection be reassessed upon project completion, in conjunction with input from NYSDOT.

Route 22 at Southern Site Driveway

At the unsignalized intersection of Route 22 and the Southern Site Driveway (which is now located at the existing paved driveway which used to serve the landfill), no mitigation was required in the 2009 Findings Statement for the approved development. The Southern Site 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. Therefore, no improvements are required or proposed as generally less than 10 trips per hour will exit the site at this location.

Route 44 at Proposed Site Access/Area "L" (Vineyard Cottages)

At the proposed unsignalized intersection of Route 44 and the Site Access, the mitigation listed in the 2009 Findings Statement for the approved development included the construction of an eastbound left turn lane on Route 44 and a requirement that the driveway be situated at a location that would provide the greatest sight lines. It is now proposed to make this driveway an emergency only access so no left-turn is required. It will still be a requirement that the driveway be situated at a location that would provide the greatest sight lines.

Route 44 at Proposed Site Access/Area "M" (Winery Restaurant)

At the proposed unsignalized intersection of Route 44 and the Site Access to the Winery Restaurant parcel, no mitigation was 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. The currently proposed development will generate approximately the same number of trips through this intersection during the PM peak hour as the approved development and it can be expected that the Build delay will remain approximately 16.0 seconds.

Residential Trip Generation Data for Second Home Residences

Jefferson County

QUIMPER PENINSULA TRAVEL DEMAND MODEL DOCUMENTATION

Prepared for:
Jefferson County

October 2008

Prepared by:

transpoGROUP

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07268.00

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
RetireDU	Dwelling Units	Retirement dwelling units/second homes
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[1]

Land Use Category	Units	Rates (Trips per unit)	Percent Origins	Percent Destinations
SFDU	Dwelling Units	0.80	40 %	60 %
CntySFDU	Dwelling Units	0.62	40 %	60 %
MFDU	Dwelling Units	0.55	40 %	60 %
RetireDU	Dwelling Units	0.30	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 %

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.

0.30/0.80 = 37.5%

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.

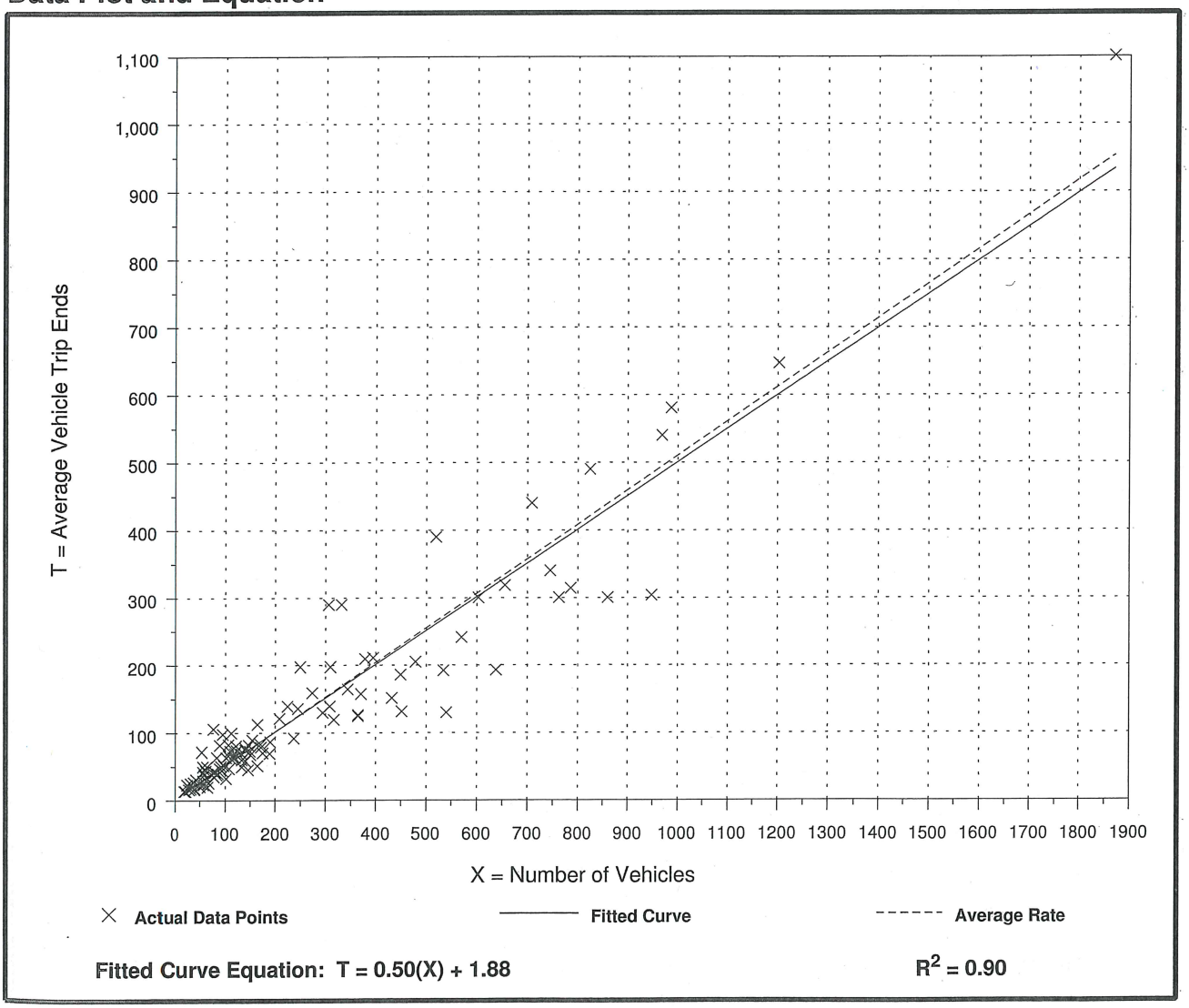
Number of Studies: 110
Average Number of Vehicles: 262
Directional Distribution: 31% entering, 69% exiting

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



Fitted Curve Equation: T = 0.50(X) + 1.88

R^2 = 0.90

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.

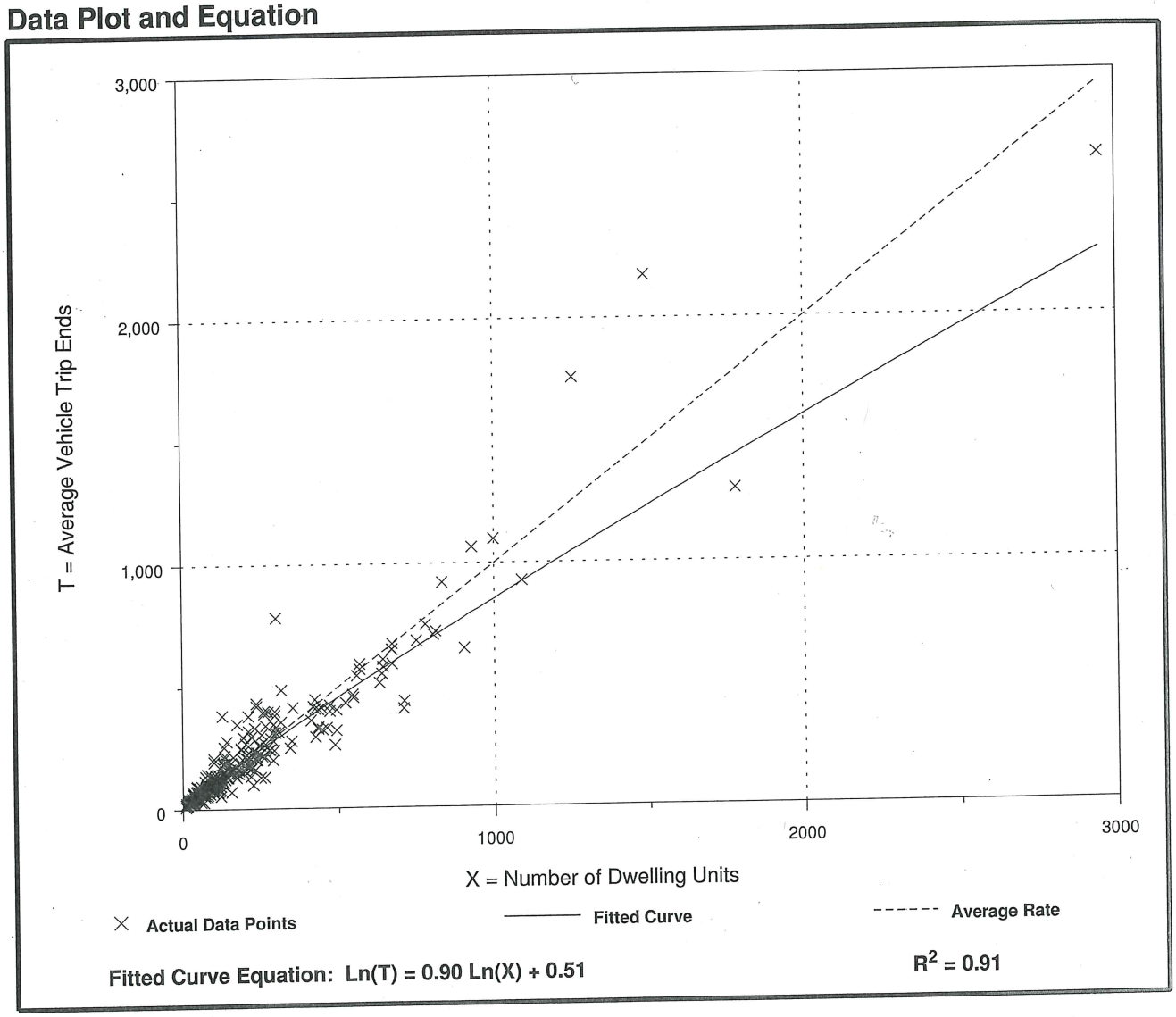
Number of Studies: 321
Avg. Number of Dwelling Units: 207
Directional Distribution: 63% entering, 37% exiting

Trip Generation per Dwelling Unit

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

= 42% of avg. rate

Data Plot and Equation



Fitted Curve Equation: $Ln(T) = 0.90\ Ln(X) + 0.51$

$R^2 = 0.91$

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

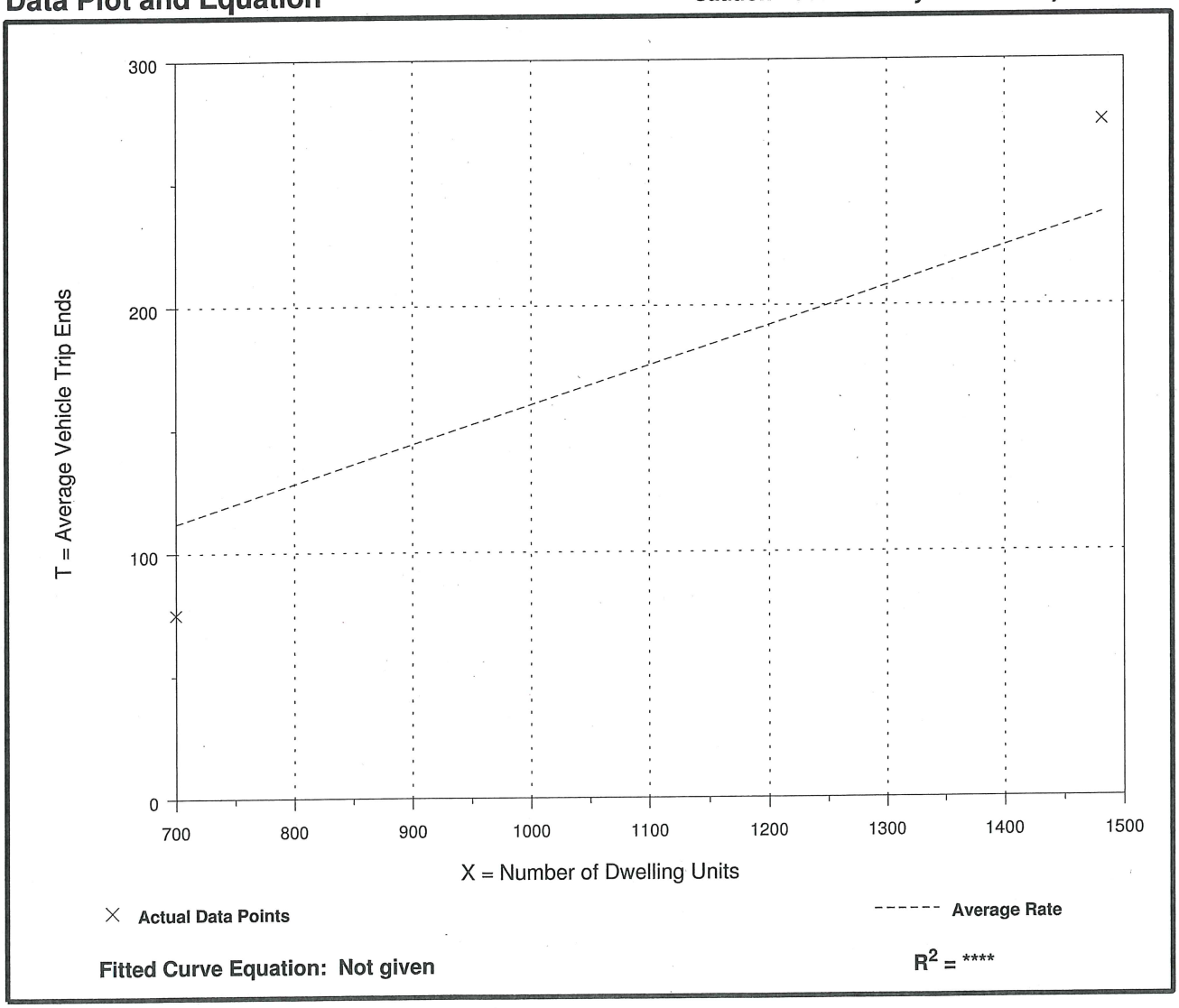
Trip Generation per Dwelling Unit

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



Fitted Curve Equation: Not given

R^2 = ****

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

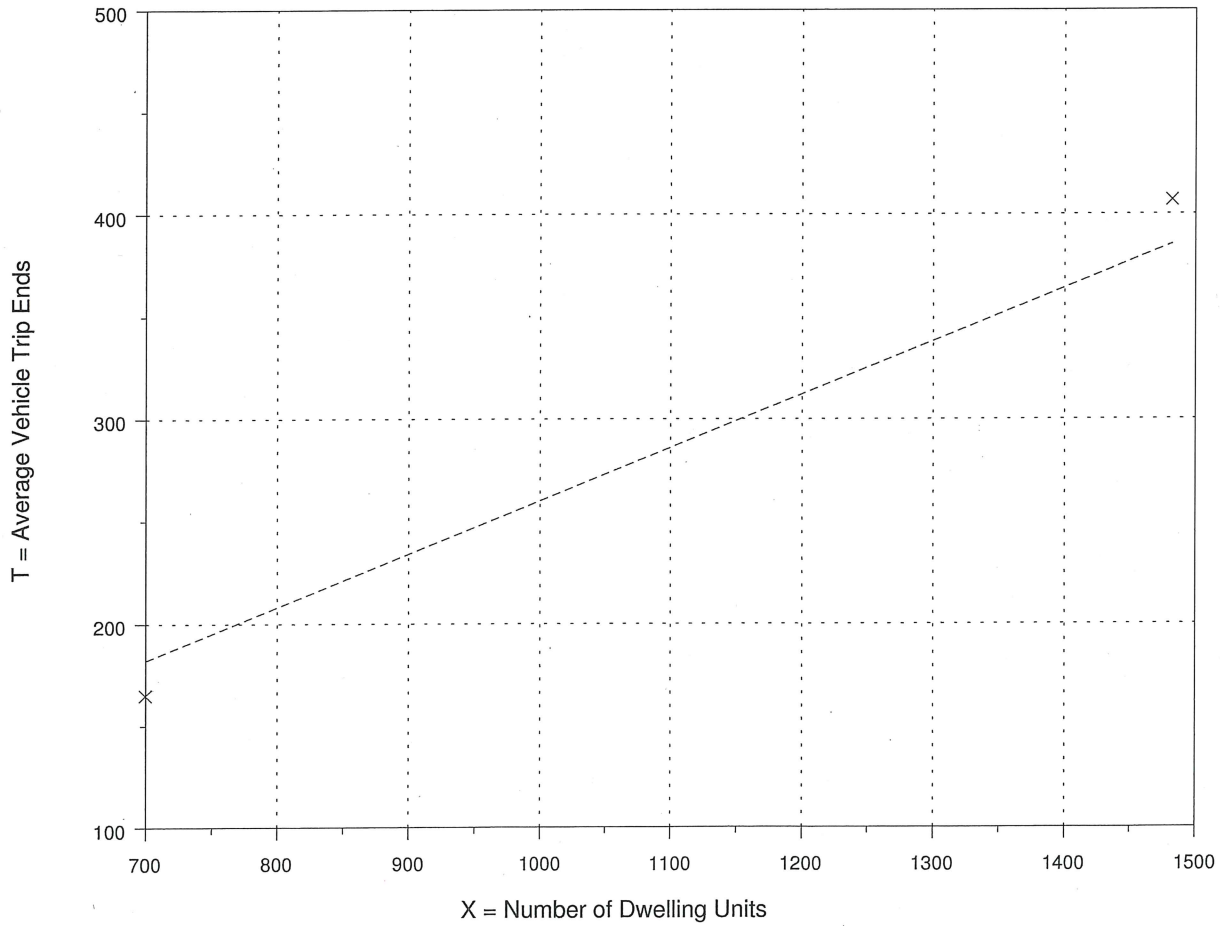
Trip Generation per Dwelling Unit

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

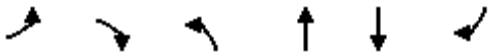


Fitted Curve Equation: Not given

R^2 = ****

Synchro – Level of Service Analysis Worksheets

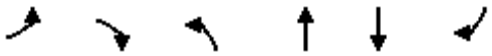
- **Full Build-Out**



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		



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		