June 7, 2021

Mr. Robert Lamoureux
Centerville Builders
164 Centerville Road
Warwick, RI 02886

RE: Proposed Land Development Project
Waterside at Little Pond Condominiums
Warwick, Rhode Island

Dear Mr. Lamoureux:

BETA Group, Inc., in accordance with our scope of services, has completed an assessment of existing and future traffic operational and safety conditions of the immediate servicing roadways to a proposed residential development in the City of Warwick, Rhode Island. This study was completed for submission to the city as part of the local planning approval process. The study provides a summary of existing roadway conditions and an estimate of future traffic conditions if the project was to be approved and constructed.

The subject property is situated on the southerly side of Sandy Lane west of Warwick Avenue in the vicinity of the Warwick Public Library. The lot is defined by AP 350, Lot 583, which contains approximately 4 - acres of land. The property was previously developed with a single-family home which was recently razed to allow for redevelopment of the site.

Based upon a review of the proposed site plan provided by *Garofalo & Associates, Inc.,* it is our understanding that the current proposal includes construction of ten duplex buildings providing twenty (20) residential condominium units. Access will be provided from a new access road intersection on Sandy Lane in the vicinity of the existing driveway. Figure 1 on the following page depicts the general vicinity of the project in the City of Warwick.

The following is a summary of our investigation of the potential traffic impacts, and recommendations to provide safe and efficient access to the residential development;

Traffic Safety Assessment

Project Approach

The objective of this study is to define existing and potential future operational and/or safety concerns along the servicing roadways to the proposed residential development. A review of the existing roadway features was completed to determine if any potential deficiencies presently warrant mitigation. In addition to the existing conditions analysis, the study also included the assessment of potential impacts resulting from the traffic entering and exiting the site access road to and from the proposed development project. The study focused on these issues and made recommendations for improvements if determined necessary based upon the findings of the data collection and analysis phases of the study.

Waterside Condominiums

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Figure 1 - Project Vicinity Map

In order to complete our analysis, the following scope of work was conducted for the project:

- An inventory of the physical roadway characteristics of Sandy Lane was completed to determine the adequacy of the existing roadway geometric features relating to operations and safety.

- Accident records were requested from the City of Warwick Police Department to determine if there are any safety concerns relative to the frequency, severity or pattern of crashes along Sandy Lane in the immediate project area.

- Future traffic volumes for the proposed residential development were estimated using data from the 10th Edition of the "Trip Generation Manual", an informational report published by the Institute of Transportation Engineers (ITE) to provide the City an understanding of the traffic to be generated by the residential land use.

- An evaluation of the traffic safety and general operational conditions was completed for existing and future periods.

- Appropriate mitigation to maintain safe and efficient traffic flow in the project area was developed where necessary.

Project Area

As noted in the previous section, the proposed residential development will be situated on a four (4) acre parcel of land along the southerly side of Sandy Lane between Cedar Swamp Road and Mellon Road. The lot, which is primarily wooded, was previously developed with a single-family home and driveway access on Sandy Lane. Land use in the immediate area along Sandy Lane consists of predominately residential uses including single family homes, condominiums and apartments. To the east in the vicinity of Warwick Avenue properties become commercial in nature with a gasoline station, restaurants, retail plaza's, and pharmacies. West of the site, towards West Shore Road it also becomes commercial in nature with small businesses and the Mickey Stevens Sports Complex including two rinks, a swimming pool and athletic fields.

Sandy Lane will serve as the main access/egress route to the residential development. Based upon the good operating characteristics of this roadway adjacent to the site, and the minor anticipated traffic volumes to be generated by the residential development, a study impact area was defined for this project. The limits of our analysis focused on Sandy Lane in the immediate area of the property between Social Drive and Trent Avenue. Figure 2 on the following page depicts the subject site and the general project area of the study.

Roadways

Sandy Lane

Sandy Lane is 35 mph, east/west urban minor arterial under city jurisdiction, linking at its terminus to Route 117 to both the east and west. Sandy Lane is a two-lane, forty-four (44) foot road with one fourteen (14) foot travel lane and eight (8) foot shoulder in each direction. The travel lanes are separated by a

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Figure 2 - Project Area Map

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double yellow centerline and white markings delineate the shoulders. Concrete curbing and bituminous sidewalks are provided along both sides of the roadway. The condition of the road can be classified as being fair with multiple areas of utility patching and some cracking and rutting.

The utility pole corridor with cobra head lighting for nighttime illumination is located on the northerly side of the road. These features along with the generally straight and level physical characteristics of Sandy Lane are depicted in the above photograph looking east from the site frontage.

Intersections

The only major signalized junction in the project area is located at the Sandy Lane intersection with the Warwick Public Library driveway, which is a three-way, "T"- type junction. The Sandy Lane approaches consist of one general purpose lane. The Library driveway forms the northbound approach leg of the intersection with separate left and right turn lanes.

The traffic signal operates in a fully actuated two phase manner with the eastbound and westbound movements on Sandy Lane operating in Phase 1, and the northbound flow from the Library Driveway in Phase 2. Pedestrian accommodations are provided with a delineated crosswalk, pushbuttons and pedestrian signal heads for crossing Sandy Lane. The equipment is relatively old and could be uupgraded for improved efficiency and safety. Such improvements would include upgraded signal heads with new LED lenses, and backplates for improved visibility, and new ADA compliant pedestrian signal heads/pushbuttons with countdown timers for ease of access and efficiency. It is our understanding that several of these measures will be completed by the city in the near future as part of a requirement for a recent approval of a development project on Sandy Lane adjacent to the library.

Safety Analysis

To determine if there are any limiting factors affecting safety relating to the proposed site access, the physical characteristics of Sandy Lane in the immediate vicinity of the subject property were investigated. These limiting factors would potentially include horizontal or vertical alignment changes or roadside obstructions that limit sight distances for vehicles traveling along the road or entering the road from a side street or driveway location. In this instance, the sight distance standard is necessary to permit turning vehicles to safely enter and exit the new site access road.

The alignment of Sandy Lane can be described as generally straight and level in the defined project area. Based upon these existing physical features along Sandy Lane, the sight distances at the proposed site

access road intersection were determined to be over 600 feet in each direction. The sight distances measured are greater than the minimum stopping sight distance of 250 feet required according to the industry standard AASHTO criteria for the posted speed limit of 35 mph and the 305 feet required for the observed travel speeds on Sandy Lane of 35 to 40 mph under free-flow conditions.

Also, as part of our analysis, a request was made to the Warwick Police Department to obtain recent vehicle crash data along this segment of Sandy Lane to determine if any location in the project area experienced a high frequency or pattern of accidents. As of completion of this study, accident records were not available. Upon receipt, BETA will complete an analysis of the record information to determine if additional measures are warranted to enhance safety within the project area. If determined necessary, BETA will provide a supplemental letter summarizing the data and providing recommendations for safety improvements if warranted.

In the absence of the recent data from the police department our office reviewed information available in a previous traffic study that had been completed several years ago that included the accident data research in this area. In the previous study, crash information from the Warwick Police Department was obtained for the three-year period between January, 2016 and December, 2018. The segment of road reviewed included Sandy Lane in the immediate area between Trent Avenue and Wilde Acre Drive. A total of twenty-one crashes (avg. 7 per year) occurred within the project area over the three-year study period, with six involving injuries.

Summarizing the data, fourteen of the twenty-one accidents occurred at the traffic signal with thirteen rear end crashes, and one angle collision. As can be seen, over 90% of the crashes were rear-end type resulting from vehicles stopped in traffic at the signal. This is a common type of crash at a traffic signal due to the numerous stopping and starting of vehicles associated with the signal change intervals. It should also be noted that this is an east/west route and sun glare was identified as a factor in a few of the crashes. These accidents could potentially be reduced with installation of backplates on the signal heads that would improve visibility of the lens indications and change intervals. As noted previously, these improvements are being implemented by the city in the near future.

The remaining crashes occurred along the corridor at either side streets or driveway locations, though there was no particular location experiencing a greater number of crashes or a severity indicative of a particular safety issue. These crashes were also primarily rear-end type as a result of driver distraction or error where drivers were not being alert to vehicles slowing or stopped to make a turn. It can be concluded from the safety evaluation of the existing roadway geometry and physical features, that there does not appear to be any significant physical roadway safety deficiencies that exist within the study area warranting mitigation.

Reviewing the accident data found that, based upon the type of crashes that have been occurring along Sandy Lane, and the numerous side streets and driveway locations, restriping the road to provide a median turn lane that could reduce the potential for rear end and sideswipe crashes related to turning vehicles. This safety improvement could be studied by the city to determine if the alternative is appropriate for the volume of traffic serviced along the road on a daily basis. A separate median lane throughout the corridor could also improve the efficiency of the roadway as through traffic would not have to stop and wait behind a turning vehicle or swerve around the vehicle using the shoulder in an effort to avoid stopping which is not

desirable. The median area could also provide an opportunity to install raised median refuge islands for pedestrians at the mid-block crosswalk locations, improving visibility and potentially reducing vehicles speeds in these areas. If not considered viable along the corridor, the left turn lanes could be installed at the major junctions including the Library and higher volume side streets and driveways such as the Mickey Stevens Sports Complex to the west. These potential improvements would be considered under a long range roadway infrastructure maintenance program undertaken by the city for the Sandy Lane corridor.

Trip Generation and Analysis

To determine the traffic impact of a proposed development, estimates of anticipated traffic to be generated by a particular land use must be calculated. As previously discussed, the current development proposal includes construction of ten new duplex residential buildings on approximately four acres of undeveloped land. Access will be provided on Sandy Lane at a new site access road intersection. The site plan prepared by *Garofalo & Associates* depicting the development layout and access can be found on the figure provided on the following page.

Projected traffic volumes for the residential use were developed from utilization of trip generation factors. These factors are taken from the "Trip Generation Manual", an informational report published by the Institute of Transportation Engineers (ITE), a national professional organization for traffic and transportation engineers. The data provided in the ITE report are based on extensive traffic studies for various types of land uses (residential, commercial, industrial, etc.). This data has been found to be very reliable and provides a sound basis for estimating trip volumes for a new development.

The ITE land use information is included in the Attachments, along with the trip estimate calculations for the project. Following is a summary of the peak hour volumes estimated for the proposed residential condominiums utilizing the ITE factors.

Trip Generation Summary

ITE – Code 220 *Multifamily Housing (20 units)*

AM Peak Hour		PM Peak Hour	
Two Way Trip Total:	*9*	*Two Way Trip Total:*	*11*
Entering:	2	Entering:	7
Exiting:	7	Exiting:	4

It should be noted that a trip is defined as a one-way vehicle movement, therefore driving to and from the site, for example is equivalent to two trips. As can be seen in the table, the residential development will result in a low volume of peak hour site related traffic that should have no discernable impact to operating conditions on Sandy Lane, specifically at the proposed driveway intersection. These trips should be easily accommodated at the new site access road intersection with Sandy Lane where the adjacent traffic signal to the east will aid in creating gaps in the main

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Figure 3 - Site Layout

Site Plan provided by Garofalo & Associates, Inc.

street traffic to allow for easier access. Typically, only one vehicle would be waiting on the minor approach from the neighborhood to turn onto the Sandy Lane during the busiest periods of the day, with minor acceptable delays and no traffic congestion.

Conclusion and Recommendations

In summary, the study has shown that the proposed residential project access and circulation plan has been designed to maintain a desirable level of traffic safety and efficiency on the surrounding roadway system. The site access road intersection was reviewed for safety and found to provide sufficient stopping sight distances for entering and exiting vehicles based upon the existing physical characteristics of Sandy Lane adjacent to the subject property. In addition, the proposed landscape buffer along the property frontage that will be developed behind the existing sidewalk, will be designed with the appropriate vegetation (species and size), and at locations to maintain clear lines of sight in either direction to provide the sight distances that the roadway geometry permits as noted.

The study has also determined that the small residential development will add a minor hourly volume of traffic to the local servicing roadway network during the daily peak traffic conditions. These new vehicles will not change or negatively affect the acceptable operating conditions that presently exist. Vehicles exiting the site access road onto Sandy Lane will experience typical delays of adjacent side streets and driveways along Sandy Lane, and due to its location be able to take advantage of available gaps in traffic created by the traffic signal located at the library driveway.

Therefore, based upon the analysis and study completed for this project, it can be concluded that the future traffic conditions resulting from the proposed residential development, will provide for adequate and safe access to a public street, and will not have a detrimental effect on public safety and welfare in the study area. We trust that this letter sufficiently addresses the requirements of the City of Warwick to obtain your local approvals. If you should have any questions or require any

Very truly yours,
BETA Group, Inc.

Paul J. Bannon
Associate

Attachment

ATTACHMENTS

A. Traffic Crash Data

B. Trip Generation

ATTACHMENT A – Traffic Crash Data

January 2016 through December 2018

Sandy Lane

Crash Analysis Summary

Sandy Lane

			2016	2017	2018	Total	Percent
Collision Type							
Intersection			4	7	5	16	
Non-Intersection			3		2	5	
		Rear End	7	5	5	17	81%
		Angle		1	2	3	14%
		Head On				0	0%
		Single Vehicle Crash				0	0%
		Sideswipe, Same Direction				0	0%
		Sideswipe, Opposite Direction				0	0%
		Rear to Rear				0	0%
		Unknown/Other		1		1	5%
		Total	7	7	7	21	100%
Accident Severity							
		Property Damage Only	5	5	5	15	71%
		Injury	2	2	2	6	29%
		Fatal				0	0%
		Not Reported				0	0%
Light Condition							
		Day	7	5	6	18	86%
		Night		2	1	3	14%
		Dusk/Dawn				0	0%
		Dark, Lighted Roadway				0	0%
		Dark, Roadway Not Lighted				0	0%
		Not Reported				0	0%
Road Condition							
		Dry	7	5	7	19	90%
		Wet		1		1	5%
		Snow		1		1	5%
		Ice				0	0%
		Not Reported				0	0%
Hour of Day							
		6:00 AM -9:00 AM	2			2	10%
		9:00 AM -3:00 PM	1	2	2	5	24%
		3:00 PM -6:00 PM	3	4	2	9	43%
		6:00 PM -6:00 AM	1	1	3	5	24%
		Total Accidents:	7	7	7	21	

Obtained from record study completed for the "Library Condominium" Development

November, 2019

ATTACHMENT B – Trip Generation

Trip Generation Summary

Trip Generation Summary

Waterside at Little Pond Condominiums

Summary;

Source	Description	Enter	Exit	Total
AM Peak Hour				
ITE Code 220	Multifamily Housing	2	7	9
PM Peak Hour				
ITE Code 220	Multifamily Housing	7	4	11

Calculations;

Code 220 – Multifamily Housing (20 Units)

Independent Variable (X) = Number of Units X = 20

AM Peak *Directional Distribution 23% Entering, 77% Exiting*

T = 0.46 (X)
T = 0.46 (20)
T = 9

Enter: 2
Exit: 7
Total 9

PM Peak *Directional Distribution 63% Entering, 37% Exiting*

T = 0.56 (X)
T = 0.56 (20)
T = 11

Enter: 7
Exit: 4
Total 11

Land Use: 220
Multifamily Housing (Low-Rise)

Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels (floors). Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), and off-campus student apartment (Land Use 225) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the low-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:45 and 5:45 p.m., respectively. For the one site with Saturday data, the overall highest vehicle volume was counted between 9:45 and 10:45 a.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 11:45 a.m. and 12:45 p.m.

For the one dense multi-use urban site with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 6:15 and 7:15 p.m., respectively.

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

The average numbers of person trips per vehicle trip at the five general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.13 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.21 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in British Columbia (CAN), California, District of Columbia, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Minnesota, New Jersey, New York, Ontario, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, and Washington.

It is expected that the number of bedrooms and number of residents are likely correlated to the number of trips generated by a residential site. Many of the studies included in this land use did not indicate the total number of bedrooms. To assist in the future analysis of this land use, it is important that this information be collected and included in trip generation data submissions.

Source Numbers

168, 187, 188, 204, 211, 300, 305, 306, 319, 320, 321, 357, 390, 412, 418, 525, 530, 571, 579, 583, 864, 868, 869, 870, 896, 903, 918, 946, 947, 948, 951

Multifamily Housing (Low-Rise)
(220)

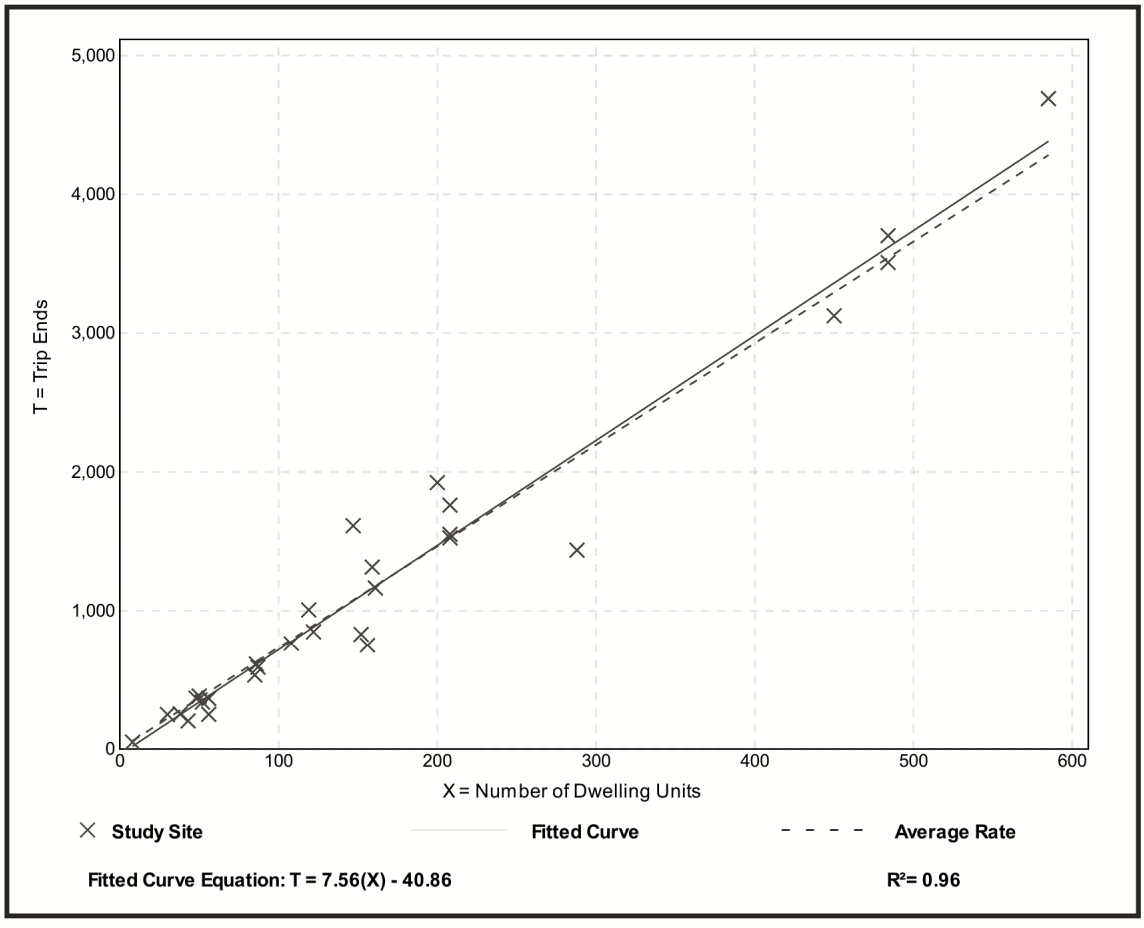
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 29
Avg. Num. of Dwelling Units: 168
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
7.32	4.45 - 10.97	1.31

Data Plot and Equation



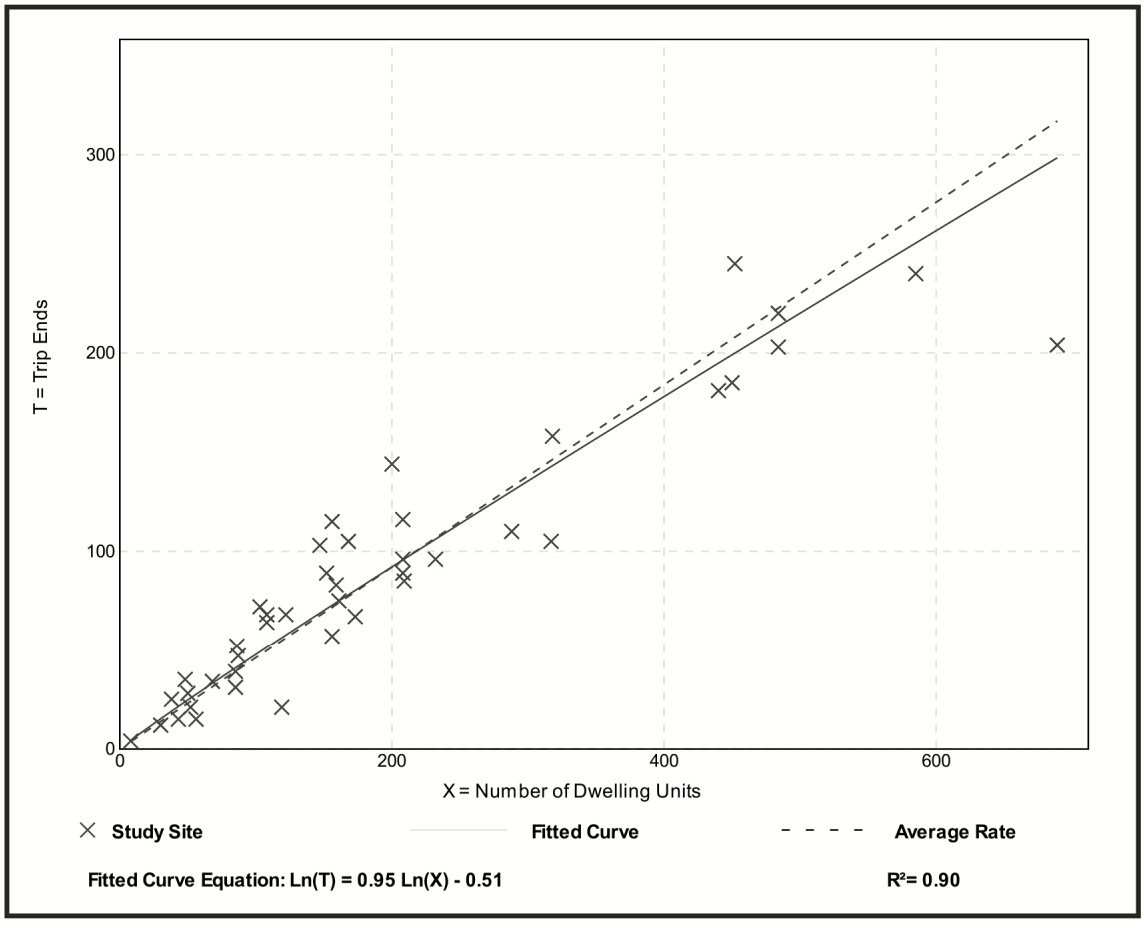
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 42
Avg. Num. of Dwelling Units: 199
Directional Distribution: 23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.18 - 0.74	0.12

Data Plot and Equation



Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 50
Avg. Num. of Dwelling Units: 187
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.56	0.18 - 1.25	0.16

Data Plot and Equation