



TECHNICAL MEMORANDUM

TO: Lupoli Companies, LLC
Attn: Gary Armstrong
280 Merrimack Street
Lawrence, Massachusetts 01843

DATE: September 30, 2025

FROM: Kevin R. Dandrade, PE, PTOE, Principal
Rana Eslamifard, Traffic Designer/Planner II

PROJECT NO.: T1687

RE: Proposed Educational Redevelopment - 305 N. Main Street – Andover, Massachusetts
Trip Generation & Site Access Assessment

TEC, Inc. (TEC) has been retained by Lupoli Companies, LLC (the “Applicant”) to prepare a Trip Generation Assessment associated with the proposed change-in-use of the existing three-story building located at #305 North Main Street in Andover, Massachusetts. The project involves converting the existing 48,900 square foot (SF) office building, which includes approximately 76 off-street parking spaces, into a higher educational use accommodating up to 233 students.

The Applicant seeks to maintain the location and flow pattern of the existing driveway curb cut along North Main Street (Route 28), which lies under MassDOT jurisdiction. The North Main Street driveway is approximately 16 feet wide and operates as an egress-only driveway with a restriction for right-turn-out-only. The Balmoral Street driveway curb cut, which lies under the Town’s jurisdiction, is approximately 18 feet wide and has operated principally as a one-way entrance driveway for the site. Although there are no signs prohibiting egress at this location, the updated site plan depicts the appropriate signs and markings to better define the existing one-way entrance flow patterns.

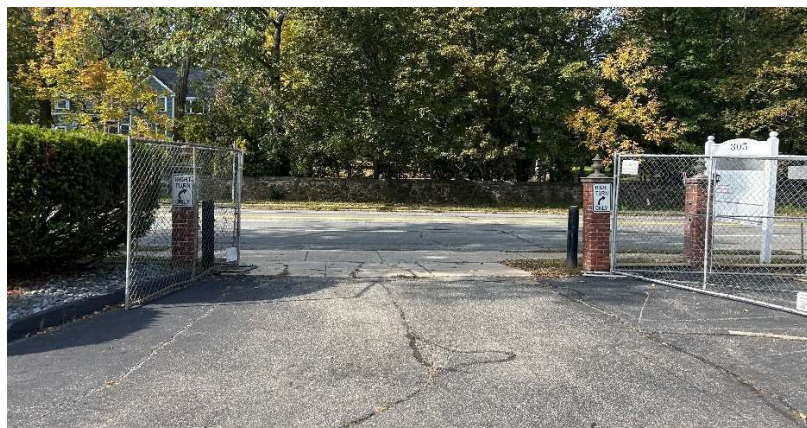


Figure 1: Photo of Existing Right-Out-Only Driveway onto North Main Street (Route 28)



These flow patterns vary from the most recently approved Planning Board Special Permit (Application SP19-0-6 – 1/8/2020 Decision) in an effort to maintain the existing flow patterns and reduce the number of vehicle conflicts along North Main Street.

Site Trip Generation

The Project proposes to convert the 48,900 SF office building to a university/college building with a 233-student use designation (this is a student use projection as opposed to a maximum capacity). TEC estimated the site-generated traffic based on industry standard trip rates published in the Institute of Transportation Engineers (ITE) publication, *Trip Generation, 11th Edition* for Land Use Codes (LUC) 550 – University/College and LUC 710 – General Office Building.

A comparison summary of the site generated trips in both the existing and proposed conditions is shown in Table 1.

Table 1 - Trip Generation Summary

Time Period / Direction	Existing Office^a (48,900 SF)	Proposed University/College^b (233 Students)	NET Trips^c
<i>Weekday Daily</i>	530	364	-166
<i>Weekday Morning Peak Hour</i>			
Enter	65	27	-38
Exit	<u>9</u>	<u>8</u>	-1
Total	74	35	-39
<i>Weekday Evening Peak Hour</i>			
Enter	12	11	-1
Exit	<u>58</u>	<u>24</u>	-34
Total	70	35	-35

^a LUC 710 – General Office Building – Average Rate

^b LUC 550 – University/College – Average Rate

^c NET Trips = Proposed Trips minus Existing Trips

As shown in Table 1, the proposed conversion of the office space to a college/ university space is anticipated to reduce the traffic to/from the site by approximately 166 vehicle trips during the average weekday, with 39 fewer vehicle trips (38 fewer entering and 1 fewer exiting) during the weekday morning peak hour and 35 less vehicle trips (1 fewer entering and 34 fewer exiting) during the weekday evening peak hour. Trip generation worksheets are provided in Attachment A.

Please note that the use of 233-student enrollment variable provides a conservative basis for the trip generation analysis, as it does not account for building-specific alternative modes of transportation such as public transit via Merrimack Valley Transit (MEVA) on Bus Routes #2 and #21, bicycling, or walking by students and employees.

Sight Distance Characteristics

TEC measured the available sight distances at the site driveway with Balmoral Street. The available sight lines were compared to minimum requirements established by the American Association of State Highway and Transportation Officials (AASHTO).

Sight distance represents the length of roadway that is visible to a driver traveling within the roadway. Two types of sight distance are typically evaluated for driveways and intersections: stopping sight distance (SSD) and intersection sight distance (ISD). SSD is the minimum distance required for a driver traveling along a roadway to perceive an object in the roadway and stop safely in advance of the object when traveling on a wet pavement surface. SSD is measured from an eye height of 3.5-feet to an object height of 2-feet above the ground, which is equivalent to a driver viewing the taillight of a vehicle ahead. SSD is measured along the centerline of the travel lane approaching the driveway or intersection.

ISD represents the length of the roadway visible to a driver waiting to exit a driveway or minor street. Minimum ISD requirements are based on the distance required for a driver to exit a minor street onto a major street without requiring an approaching vehicle to reduce its speed from the design speed to less than 70 percent of the design speed. ISD is measured from an eye height of 3.5-feet to an object height of 3.5-feet and is measured from a distance 14.5-feet beyond the edge of the travel-way of the major roadway to represent a driver waiting to exit a driveway or minor roadway.

SSD is typically considered the critical sight distance, as it represents the minimum distance required for safe stopping, while ISD represents an acceptable speed reduction for approaching vehicles. The ISD, however, must be at least equal to the minimum required SSD in order to prevent a driver from entering the roadway when an approaching vehicle is too close to safely stop. The guidance provided by AASHTO states:

“If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.”

Tables 2 and 3 provide a summary of the available SSD and ISD at the site driveway curb cut intersections, respectively. *The sight line characteristics are tabulated for the Balmoral Street driveway as a point of reference even though this curb cut will be better defined as a one-way entrance driveway with the proposed site plan updates.*

Table 2 – Existing Stopping Sight Distance Measurements

Approach / Direction	Operating Speed ^a	AASHTO Recommended Minimum	Measured Stopping Sight Distance
Site Driveway at Balmoral Street			
<i>Balmoral Street Eastbound</i>	30 MPH	200 FT	±130 FT ^b
<i>Balmoral Street Westbound</i>	30 MPH	200 FT	±670 FT
Site Driveway at North Main Street			
<i>North Main Street Northbound</i>	30 MPH	200 FT	>1,000 FT

^a Operating speeds calculated as prima facie speed of thickly settled roadway (30 MPH)

^b Sight distance extends from adjacent unsignalized intersection at North Main Street / Balmoral Street where turning speeds are lower

Table 3 – Existing Intersection Sight Distance Measurements

Approach / Direction	Operating Speed ^a	AASHTO Recommended Minimum	Measured Intersection Sight Distance
Site Driveway at Balmoral Street			
<i>Looking Right (East) of Driveway</i>	30 MPH	200 FT	±185 FT
<i>Looking Left (West) of Driveway</i>	30 MPH	200 FT	±130 FT ^b
Site Driveway at North Main Street			
<i>Looking Left (South) of Driveway ^c</i>	30 MPH	200 FT	>350 FT

^a Operating speeds calculated as prima facie speed of thickly settled roadway (30 MPH)

^b Sight distance extends to adjacent unsignalized intersection

^c Sight distance is only applicable for a site line looking to the south because the driveway is regulated to right-out-only

As shown in Table- 2, the SSD at the intersection of Balmoral Street and the existing Site Driveway are in excess of AASHTO minimum recommendations based on the measured speed along the Balmoral Street. Note that the proximity of Route 28 to the west of the driveway is within the minimum sight line; however, speeds turning southbound left or northbound right along Route 28 are expected to be slower and therefore there is not anticipated to be conflict between vehicles exiting the driveway and vehicles along Balmoral Street eastbound approaching from Route 28. The stopping sight distance for motorists on North Main Street northbound is superior at greater than 1,000 feet given the roadway’s straight alignment.

Similar to SSD, the ISD at the intersection of Balmoral Street and the existing Site Driveway, looking west, extends to Route 28 where there is anticipated to be no conflict between vehicles exiting the driveway and vehicles along Balmoral Street eastbound approaching from Route 28. To the east, the ISD only extends 185 feet from the site driveway and is restricted by a stone bridge rail for the bridge over the Shawsheen River. This condition exists today and has no feasible means of mitigation without removal of bridge-related components. Although the sight distance does not meet minimum recommendations, a vehicle pulling up one additional foot closer to edge of travel-way (13.5 feet from edge of travel-way measurement), the sight line would increase in excess of AASHTO minimum recommendations for 30 miles per hour (mph). These sight line characteristics are not a limiting element of site access because this driveway will be better identified and regulated to entrance-only.

The intersection sight line from the North Main Street (Route 28) curb cut provides more than 400 feet of visibility to observe on-coming northbound traffic on North Main Street for this right-out-only movement.

Attachment A

Trip Generation Data

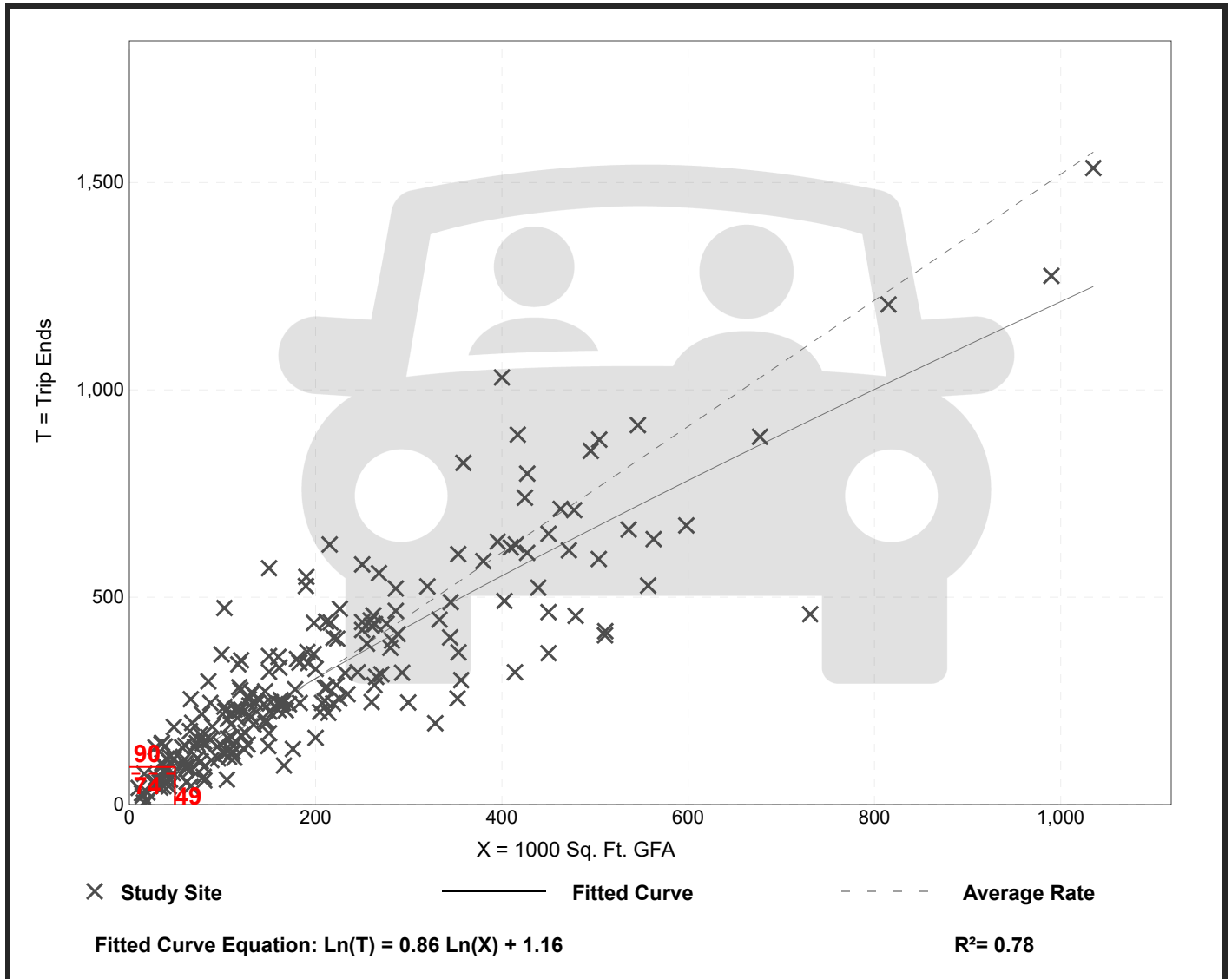
General Office Building (710)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
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: 221
 Avg. 1000 Sq. Ft. GFA: 201
 Directional Distribution: 88% entering, 12% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.52	0.32 - 4.93	0.58

Data Plot and Equation



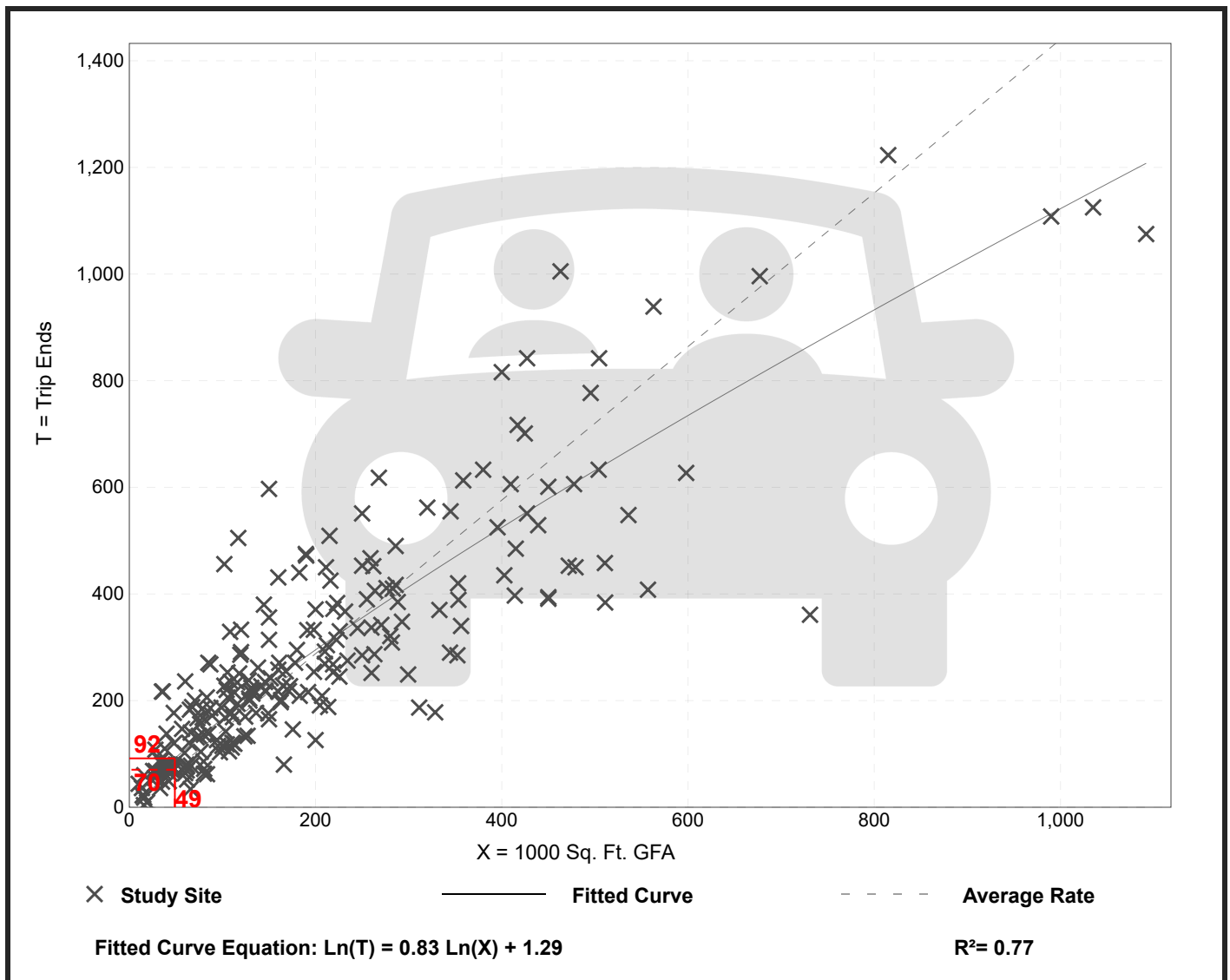
General Office Building (710)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
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: 232
 Avg. 1000 Sq. Ft. GFA: 199
 Directional Distribution: 17% entering, 83% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.44	0.26 - 6.20	0.60

Data Plot and Equation



General Office Building (710)

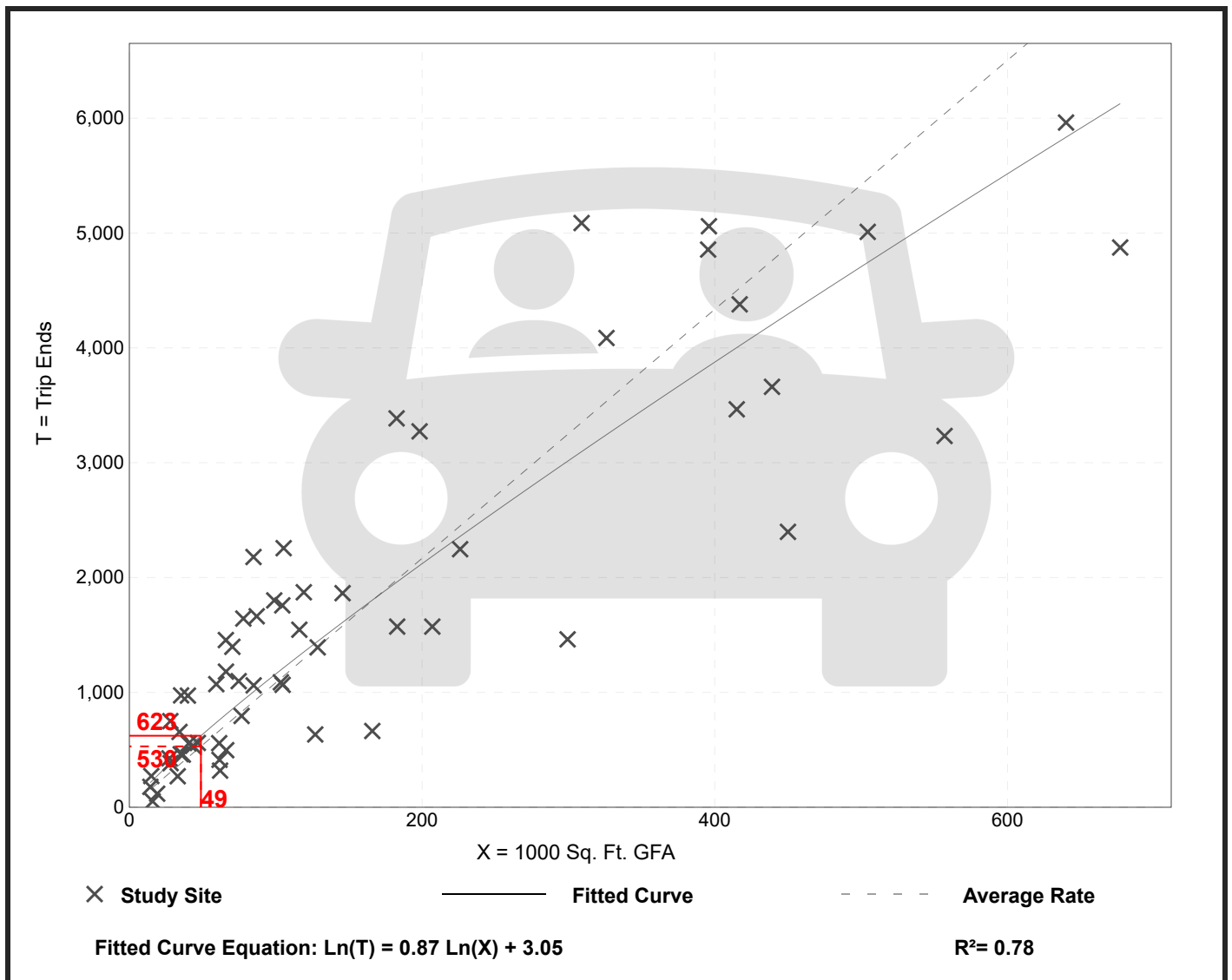
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 59
Avg. 1000 Sq. Ft. GFA: 163
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
10.84	3.27 - 27.56	4.76

Data Plot and Equation



University/College (550)

Vehicle Trip Ends vs: Students
On a: Weekday

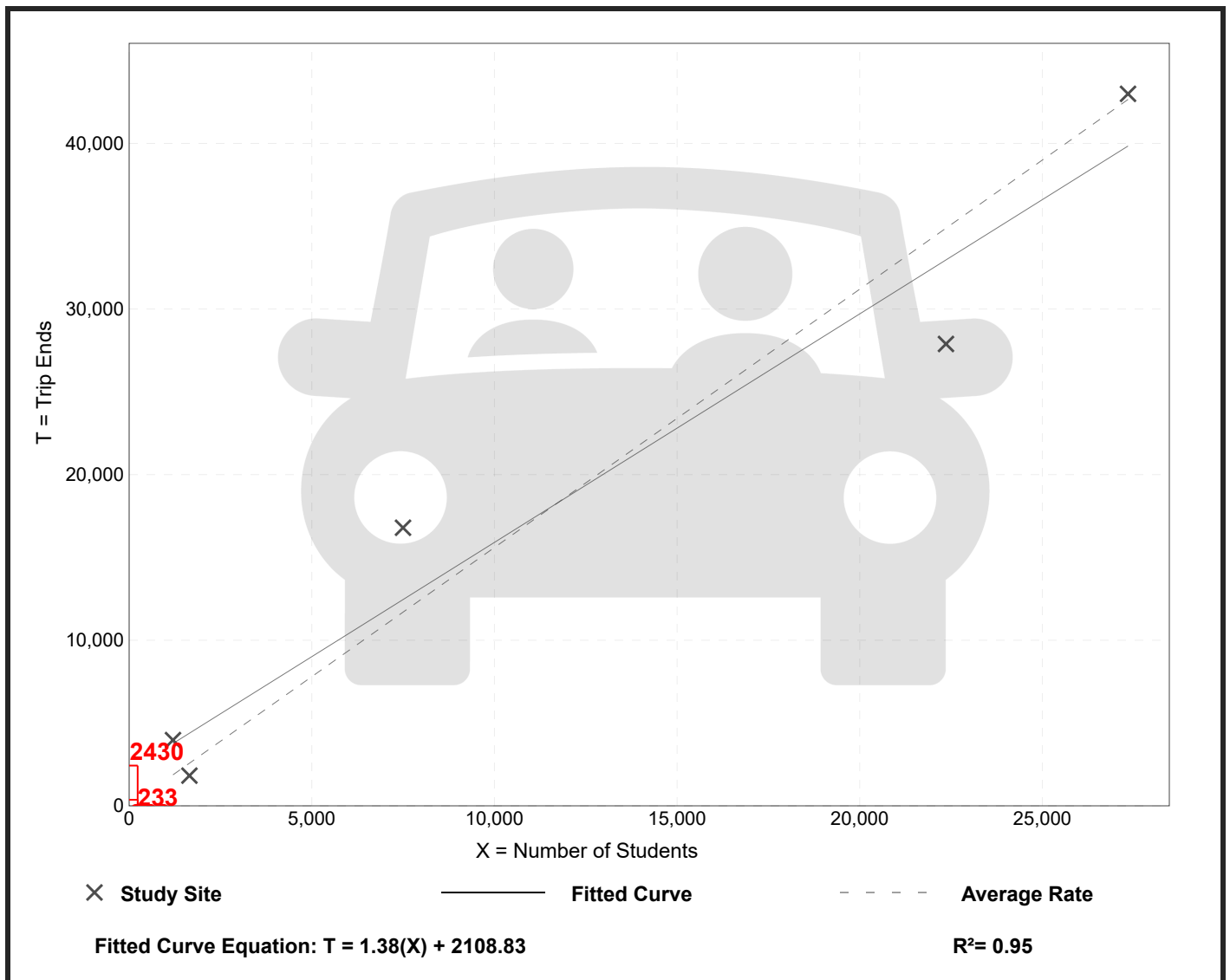
Setting/Location: General Urban/Suburban
 Number of Studies: 5
 Avg. Num. of Students: 12010
 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
1.56	1.10 - 3.31	0.45

Data Plot and Equation

Caution – Small Sample Size



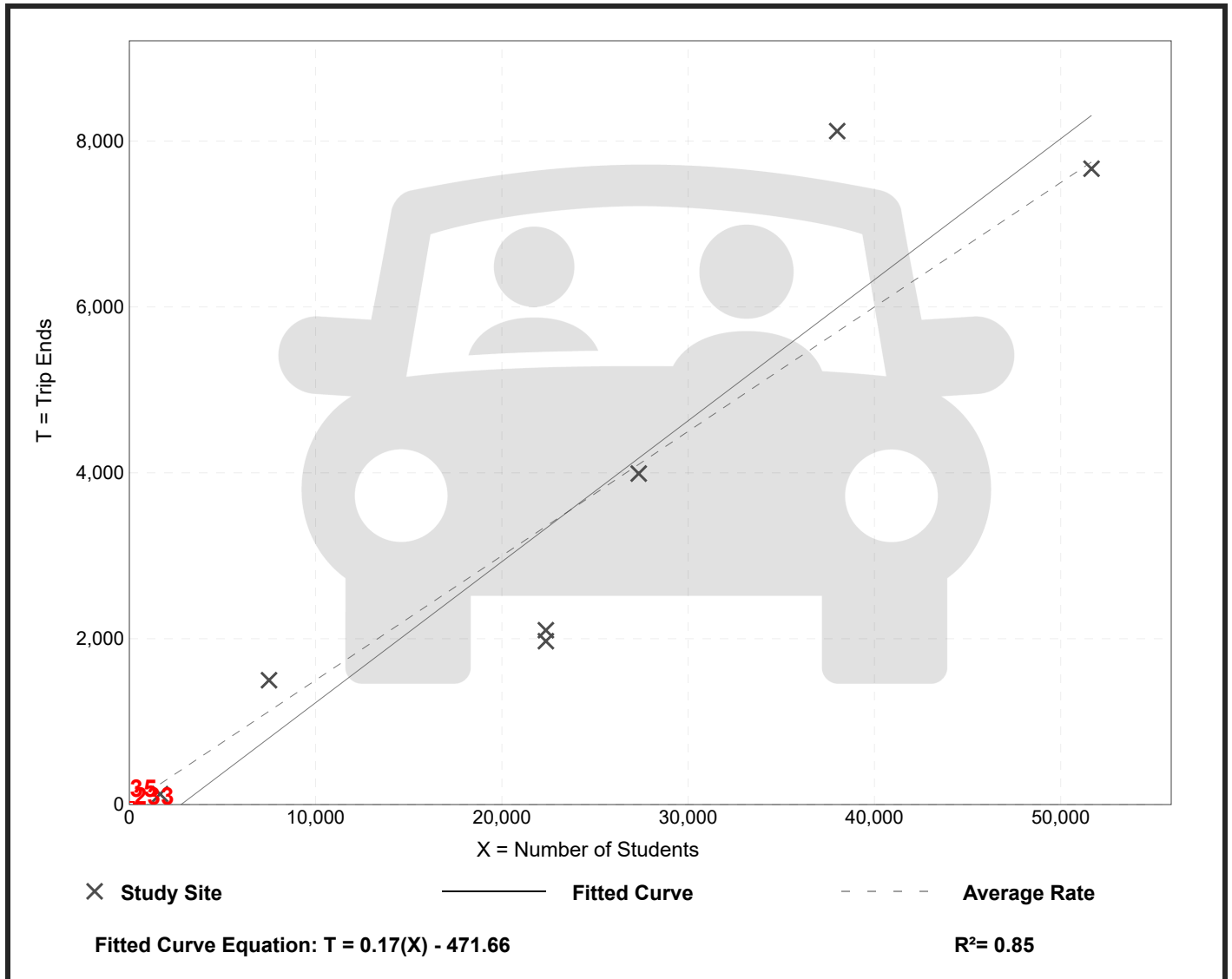
University/College (550)

Vehicle Trip Ends vs: Students
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: 7
 Avg. Num. of Students: 24409
 Directional Distribution: 78% entering, 22% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.15	0.08 - 0.21	0.05

Data Plot and Equation



University/College (550)

Vehicle Trip Ends vs: Students
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: 9
 Avg. Num. of Students: 19135
 Directional Distribution: 32% entering, 68% exiting

Vehicle Trip Generation per Student

Average Rate	Range of Rates	Standard Deviation
0.15	0.05 - 0.77	0.05

Data Plot and Equation

