MEMORANDUM

TO: Mr. Dante Angelucci
Senior Vice President - Development
Alexandria Real Estate Equities, Inc.
400 Technology Square, Suite 101
Cambridge MA, 02139

FROM: Mr. Jeffrey S. Dirk, P.E., PTOE, FITE
Managing Partner
Vanasse & Associates, Inc.
35 New England Business Center Drive
Suite 140
Andover, MA 01810-1066
(978) 269-6830
jdirk@rdva.com
Professional Engineer in CT, MA, ME, NH, RI and VA

DATE: March 17, 2022

RE: 9141

SUBJECT: Transportation Impact Assessment
3000 Minuteman Road – Initial Campus Redevelopment
Andover, Massachusetts

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the renovation and expansion of the former Philips Healthcare campus located at 3000 Minuteman Road in Andover, Massachusetts, to accommodate laboratory/current Good Manufacturing Practice (cGMP) uses (hereafter referred to as the "Project"). This assessment provides a general overview of the initial phase of the Project and provides a detailed assessment of the following areas: i) existing conditions context of the transportation infrastructure serving the Project site; ii) a qualitative evaluation of the potential impact of the initial phase of the Project along River Road, 1776 Drive and Minuteman Road; and iii) an evaluation of safety at the River Road/1776 Drive and River Road/Minutemen Road/Shattuck Road intersections. Expanded development within the campus beyond this initial phase will be the subject of a separate TIA.

Based on this assessment it has been concluded that the initial phase of the Project will result in a reduction in traffic during the weekday commuter peak hours (up to 13 percent) when compared to the fully occupied Philips Healthcare campus that included approximately 3,000 employees and, as such, will be less impactful on the transportation infrastructure.

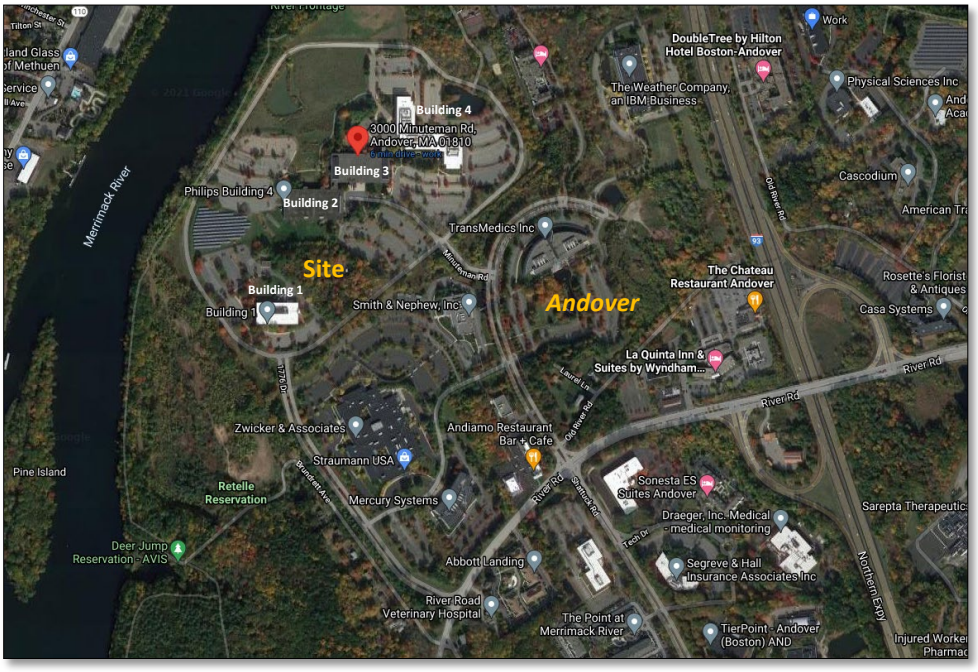
The following details our assessment of the initial phase of the Project.

PROJECT DESCRIPTION AND EXISTING CONDITION CONTEXT

Project Description

The Project will entail the renovation and expansion of the former Philips Healthcare campus located at 3000 Minuteman Road in Andover, Massachusetts, to accommodate laboratory/cGMP uses. The campus currently contains four (4) buildings that encompass approximately 726,000± square foot (sf) of office/manufacturing space. The redevelopment plan will transform the former office/manufacturing campus into a life sciences campus consisting of a mix of laboratory, research and development, office,

cGMP manufacturing and warehouse space, and will include an expansion of one (1) of the existing building (Building 1) and the addition of two (2) new future buildings. When complete, the campus will contain approximately 1.126± million sf of space. The Project site is bounded by areas of open and wooded space and the Merrimack River to the north and west, and commercial properties to the south and east.



Imagery ©2021 Google

The initial phase of the Project, which is the subject of this TIA, will involve the four (4) existing buildings within the campus and will consist of the following elements:

- ***Building 1:*** renovation of the existing 86,000± sf office building to accommodate lab/office (research and development (R&D)) space and the construction of a 100,000± sf addition that will include cGMP and warehouse space
- ***Building 2:*** renovation of the existing 164,100± sf building that was formerly used as office (41,025± sf) and associated electronics manufacturing space (123,075± sf) to accommodate a similar amount of laboratory/office (41,025± sf) and associated cGMP space (123,075± sf)
- ***Building 3:*** renovation of the existing 171,200± sf building that was formerly used as office (42,800± sf) and associated electronics manufacturing space (128,400± sf) to accommodate a similar amount of laboratory/office (42,800± sf) and associated cGMP space (128,400± sf).
- ***Building 4:*** renovation of the existing 256,700± sf building that was formerly used as office space to accommodate a similar amount (256,700± sf) of laboratory/office space.

The existing Link & Amenities Building (48,200± sf) will continue to provide accessory and supporting amenities for the campus, with no change to the existing function of the building.

Access to the Project site will continue to be provided by way of the existing driveways that serve the campus and are connected to 1776 Drive and Minuteman Road, both of which provide access to River Road. ***There are no changes proposed to the existing campus roadway network as it relates to 1776 Drive and Minuteman Road that would result in a change in travel patterns or the increased use of 1776 Drive.*** In fact, the subsequent addition of buildings to the campus as a part of a later phase of the Project will occur in a portion of the campus that is more proximate to the Minuteman Road access.

Existing Condition Context

In order to establish the existing conditions context of the Project with respect to the transportation infrastructure, a comprehensive field inventory of existing conditions within the study area was conducted in May and December 2021. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; as well as posted speed limits and land use information along River Road, 1776 Drive and Minutemen Road in the vicinity of the Project site. The following provides a description of the transportation infrastructure serving the Project site.

Roadways

River Road

- Two to four-lane urban minor arterial roadway under Town jurisdiction, with the exception of the segment of roadway between the I-93 north and southbound ramps, which is under MassDOT jurisdiction
- Traverses the study area in a general east-west direction
- Provides four 11 to 12-foot-wide travel lanes separated by a raised median with variable width marked shoulders provided between Shattuck Road and North Street; west of Shattuck Road, River Road provides two 11 to 12-foot wide travel lanes separated by a double-yellow center with variable width marked shoulders provided
- Sidewalks are generally provided along one or both sides of the roadway within the study area
- Illumination is provided by way of street lights mounted on wood poles
- Posted speed limit along River Road within the study area is 35 miles per hour (mph) west of the I-93 northbound ramps and 30 mph to the east
- Bicycle lanes are provided along both sides of the roadway between 1776 Drive and Minuteman Road
- Land use within the study area consists of the Project site, commercial properties and areas of open and wooded space

1776 Drive

- Four-lane private roadway
- Traverses a general north-south direction between River Road and the Project site (approximately 2,200 lf)
- Provides two 12-foot wide travel lanes per direction separated by a raised median with 1-foot wide marked shoulders provided
- Sidewalks are not provided

- Land use within the study area consists of the Project site, commercial properties, and areas of open and wooded space

Minuteman Road

- Four-lane private road
- Traverses a general north-south direction between River Road and the Project site (approximately 2,500 lf)
- Provides two 12-foot wide travel lanes per direction separated by a raised median with 1 to 2-foot wide marked shoulders provided
- Posted speed limit is 25 mph
- A sidewalk is provided along the east side of the roadway
- Land use within the study area consists of the Project site, commercial properties, and areas of open and wooded space

Pedestrian and Bicycle Accommodations

Sidewalks are provided along both sides of River Road west of Minuteman Road and Shattuck Road; along the north side of River Road between the I-93 southbound ramps and Minuteman Road; along the east side of Minuteman Road; and along the west side of Shattuck Road. Marked crosswalks are provided for crossing Minuteman Road and the River Road west leg of the River Road/Minuteman Road/Shattuck Road intersection, with pedestrian traffic signal equipment and phasing provided for crossing River Road. Bicycle lanes are provided along both sides of River Road between Brundrett Avenue and Minuteman Road, with the remaining portions of River Road and both Minuteman Road and Shattuck Road providing sufficient width (combined travel lane and shoulder)[1] to support bicycle travel in a shared travelled-way configuration.

Public Transportation Services

The Project site is served by public transportation services that are provided by the Merrimack Valley Regional Transit Authority (MVRTA). The MVRTA operates bus Route 37, *Beacon Street*, which travels along River Road to Minuteman Road, with a stop located at Springhill Suites by Marriot (north of the Project site), and thereafter to the Buckley Transportation Center in Lawrence where connections can be made to other bus lines. From the Buckley Transportation Center, bus service is provided to Lawrence Station on the Haverhill Line of the Massachusetts Bay Transportation Authority (MBTA) Commuter Rail system with service to North Station in Boston. MVRTA buses operate in a passenger demand service mode and will stop anywhere along the service route where it is safe to pick-up or discharge a passenger.

Motor Vehicle Crash Data

Motor vehicle crash information for the River Road/1776 Drive and River Road/Minuteman Road/ Shattuck Road intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent five-year period available (2015 through 2019, inclusive) in order to examine motor vehicle crash trends occurring within the study area. A review of this data indicates a total

[1] A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared traveled-way condition.

of three (3) motor vehicle crashes were reported to have occurred at the River Road/1776 Drive intersection and a total of two (2) motor vehicle crashes were reported to have occurred at the River Road/ Minuteman Road/Shattuck Road intersection over the five-year review period, or an average of less than one (1) crash per year at both locations. The crash data indicated that the majority of the reported crashes occurred on a weekday, during daylight, under clear weather conditions and involved rear-end type collisions that resulted in property damage only.

A review of the MassDOT statewide High Crash Location List indicated that there were no locations within the study area that were included on MassDOT's Highway Safety Improvement Program (HSIP) listing. ***Based on a review of the MassDOT motor vehicle crash data, no discernible safety deficiencies were apparent within the Project study area.***

PROJECT-GENERATED TRAFFIC

In order to determine the traffic characteristics of the initial phase of the Project, trip-generation methodologies established by the Institute of Transportation Engineers (ITE)[2] were used. The ITE provides trip-generation information for various types of land uses developed as a result of scientific studies that have been conducted over the past 50 plus years, the most recent update of which was published in 2021. This data includes trip estimates for similar functional areas to those that will be associated with the campus redevelopment (functionally classified as research and development (R&D) and manufacturing for trip-generation purposes). ITE Land Use Codes (LUCs) 140, *Manufacturing* and 760, *Research and Development Center*, were used to establish the traffic characteristics of the Project, the results of which are summarized in Table 1.

Table 1
TRIP GENERATION SUMMARY

	Vehicle Trips		
Time Period/Direction	(A) Lab/Office/R&D Space (426,525 sf)[a]	(B) Manufacturing/ Warehouse Space (cGMP) (351,475 sf)[b]	(A + B) Total trips
Average Weekday Daily:			
Entering	2,193	764	2,957
Exiting	2,193	764	2,957
Total	4,386	1,528	5,914
Weekday Morning Peak Hour:			
Entering	331	170	501
Exiting	73	54	127
Total	404	224	628
Weekday Evening Peak Hour:			
Entering	61	89	150
Exiting	322	199	521
Total	383	288	671

[a]Based on ITE LUC 760, *Research and Development Center*.
[b]Based on ITE LUC 140, *Manufacturing.*

[2]*Trip Generation*, 11th Edition; Institute of Transportation Engineers; Washington, DC; 2021.

Project-Generated Traffic Volume Summary

As can be seen in Table 1, the initial phase of the Project is expected to generate approximately 5,536 vehicle trips on an average weekday (two-way volume over the operational day of the Project, or 2,768 vehicles entering and 2,768 exiting), with approximately 567 vehicle trips (455 vehicles entering and 112 exiting) expected during the weekday morning peak-hour and 584 vehicle trips (123 vehicles entering and 461 exiting) expected during the weekday evening peak-hour.

Table 2 compares the traffic characteristics of the initial phase of the Project to those of the former Philips Health Care campus at full occupancy (approximately 3,000 employees). As discussed previously, the existing Link & Amenities Building (48,200± sf) will continue to provide accessory and supporting amenities for the campus, with no change to the existing function of the building. As such, trips associated with this building will be the same for both the initial phase of the Project and for the former Philips Health Care campus.

Table 2
TRIP GENERATION SUMMARY COMPARISON

	Vehicle Trips[a]		
Time Period/Direction	(A) Initial Campus Renovation and Expansion (826,200 sf)	(B) Former Philips Healthcare Campus (726,200 sf)[b]	(A - B) Difference
Average Weekday Daily:	5,914	5,600	+314
Weekday Morning Peak Hour:	628	874	-117
Weekday Evening Peak Hour:	671	873	-87

[a]Includes trips associated with the Link & Amenities Building (48,200 sf).
[b]Based on ITE LUC 140, *Manufacturing*; 251,475 sf; LUC 710, *General Office Building*; 342,700 sf; and LUC 760, *Research and Development Center*; 83,825 sf.

As can be seen in Table 2, the initial phase of the Project is expected to generate 314 additional vehicle trips on an average weekday (an approximate 6 percent increase) when compared to the former Philips Health Care campus at full occupancy, with 117 fewer vehicle trips expected during the weekday morning peak-hour (an approximate 13 percent decrease) and 87 fewer vehicle trips during the weekday evening peak-hour (an approximate 10 percent decrease).

Based on this comparative assessment, it is clear that the initial phase of the Project will be less impactful on the transportation infrastructure during the weekday commuter peak hours when compared to the former Philips Health Care campus at full occupancy. The noted increase in traffic on an average weekday (314 vehicle trips, or a 6 percent increase) will be dispersed over the operational day of the Project and will occur during off peak hours on a weekday when traffic volumes are lower and reserve capacity exists to accommodate the additional trips. For context, we note that predicted traffic volume increase is within the range of normal daily traffic volume fluctuations that occur over the course of the week.

As discussed previously, expansion of the campus beyond the initial phase of the Project will be the subject of a separate TIA that will assess the impact of the added traffic and define appropriate measures that will be undertaken as a part of the Project to address the identified impact on the transportation infrastructure.

SUMMARY

VAI has completed an assessment of the potential impacts on the transportation infrastructure associated with the initial phase of the renovation and expansion of the former Philips Healthcare campus located at 3000 Minuteman Road in Andover, Massachusetts, to accommodate laboratory/cGMP uses. This assessment includes a general overview of the traffic characteristics of the initial phase of the Project and provides a comparative assessment of the traffic volumes attributable to the former Philips Heath Care campus at full occupancy to those of the initial phase of the Project. Expanded development within the campus beyond that associated with this initial phase of the Project will be the subject of a separate TIA.

Based on this assessment, we have concluded the following with respect to the initial phase of the Project:

1. Using trip-generation statistics published by the ITE[3] for similar functional areas to those that will be associated with the campus redevelopment (R&D and manufacturing space for trip-generation purposes), the initial phase of the Project is predicted to generate approximately 5,536 vehicle trips on an average weekday (two-way volume over the operational day of the Project), with approximately 567 vehicle trips expected during the weekday morning peak-hour and 584 vehicle trips expected during the weekday evening peak-hour;

2. In comparison to the former Philips Health Care campus at full occupancy, the initial phase of the Project is expected to generate approximately 314 additional vehicle trips on an average weekday (an approximate 6 percent increase) when compared to the former Philips Health Care campus at full occupancy, with 117 fewer vehicle trips expected during the weekday morning peak-hour (an approximate 13 percent decrease) and 87 fewer vehicle trips during the weekday evening peak-hour (an approximate 10 percent decrease); and

3. No apparent safety deficiencies were noted in the proximity of the Project site based on a review of available data.

Given the reduction in peak-hour trips (up to 13 percent) that the initial phase of the Project represents when compared to the former Philips Health Care campus at full occupancy, it can be concluded that the initial phase of the Project will be less impactful on the transportation infrastructure when compared to the former use. As such and in consideration of the above, we have concluded that the initial phase of the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner.

cc: File

Attachments: Trip-Generation Calculations

[3]Ibid 2.

ATTACHMENTS

TRIP-GENERATION CALCULATIONS

FORMER PHILIPS HEALTHCARE CAMPUS

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
140

LAND USE GROUP:
(100-199) Industrial

LAND USE :
140 - Manufacturing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

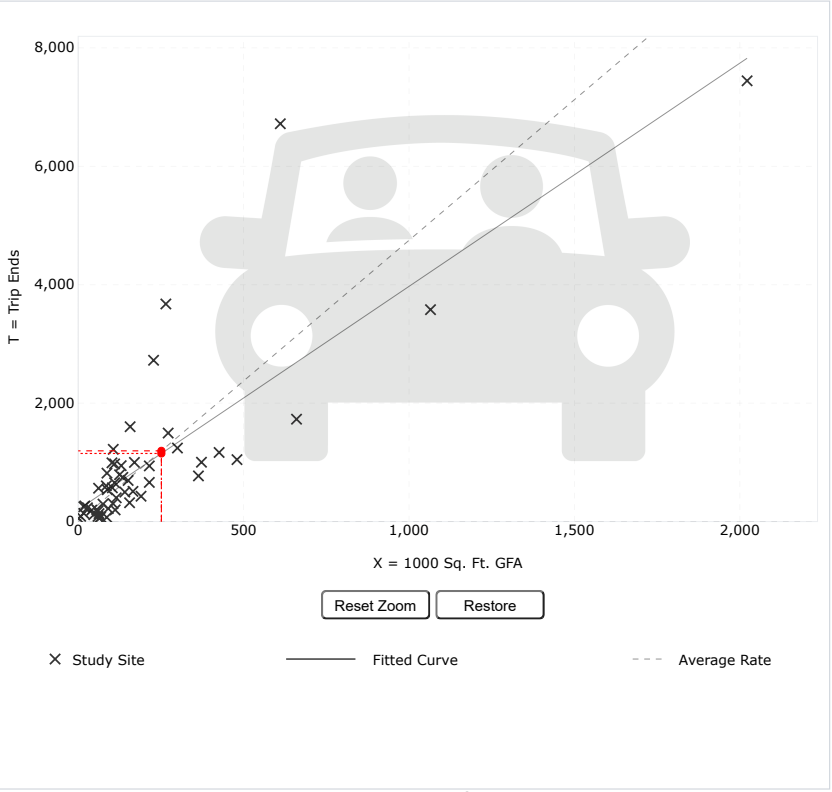
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
251.48 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Manufacturing (140) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
53

Avg. 1000 Sq. Ft. GFA:
208

Average Rate:
4.75

Range of Rates:
0.83 - 49.50

Standard Deviation:
3.20

Fitted Curve Equation:
T = 3.77(X) + 201.98

R^2:
0.68

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 1195 (Total), 597 (Entry), 598 (Exit)
Fitted Curve: 1150 (Total), 575 (Entry), 575 (Exit)

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
140

LAND USE GROUP:
(100-199) Industrial

LAND USE :
140 - Manufacturing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

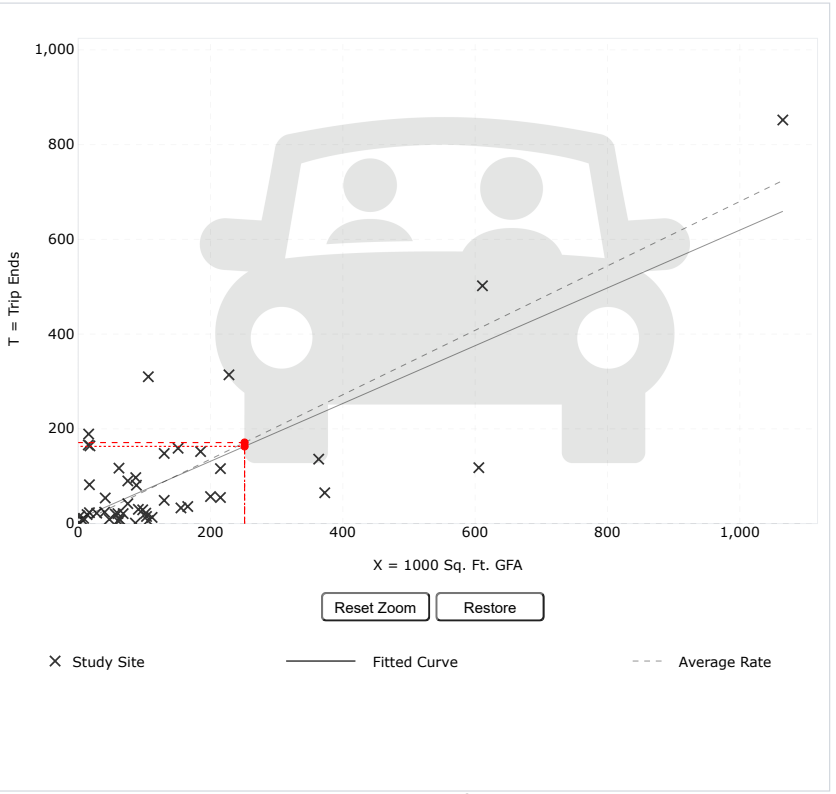
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
251.48 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Manufacturing (140) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
48

Avg. 1000 Sq. Ft. GFA:
138

Average Rate:
0.68

Range of Rates:
0.01 - 11.93

Standard Deviation:
1.03

Fitted Curve Equation:
T = 0.61(X) + 9.54

R^2:
0.62

Directional Distribution:
76% entering, 24% exiting

Calculated Trip Ends:
Average Rate: 171 (Total), 130 (Entry), 41 (Exit)
Fitted Curve: 163 (Total), 124 (Entry), 39 (Exit)

Graph Look Up

ITETripGen Web-based App

Graph Look Up

How to Use *ITETripGen*

TGM Desk Reference

TGM Appendices

Support Documents

Add Users

Comments

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
140

LAND USE GROUP:
(100-199) Industrial

LAND USE :
140 - Manufacturing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

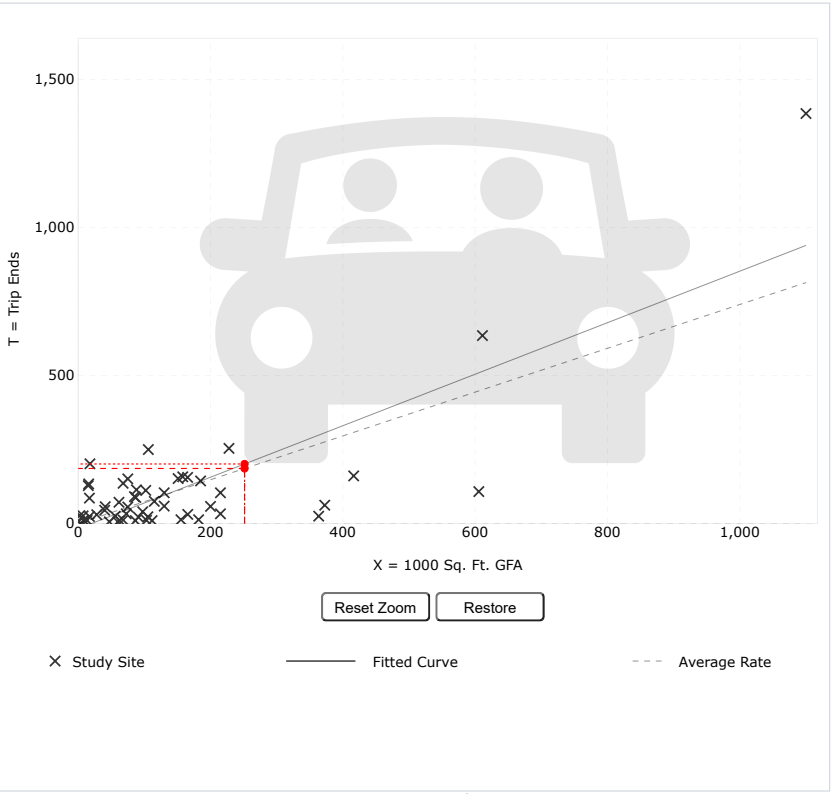
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
251.48 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Manufacturing (140) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
55

Avg. 1000 Sq. Ft. GFA:
142

Average Rate:
0.74

Range of Rates:
0.07 - 11.37

Standard Deviation:
0.93

Fitted Curve Equation:
T = 0.87(X) - 17.50

R^2:
0.64

Directional Distribution:
31% entering, 69% exiting

Calculated Trip Ends:
Average Rate: 186 (Total), 58 (Entry), 128 (Exit)
Fitted Curve: 201 (Total), 62 (Entry), 139 (Exit)

Add-ons to do more

Try OTISS Pro

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
710

LAND USE GROUP:
(700-799) Office

LAND USE :
710 - General Office Building

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

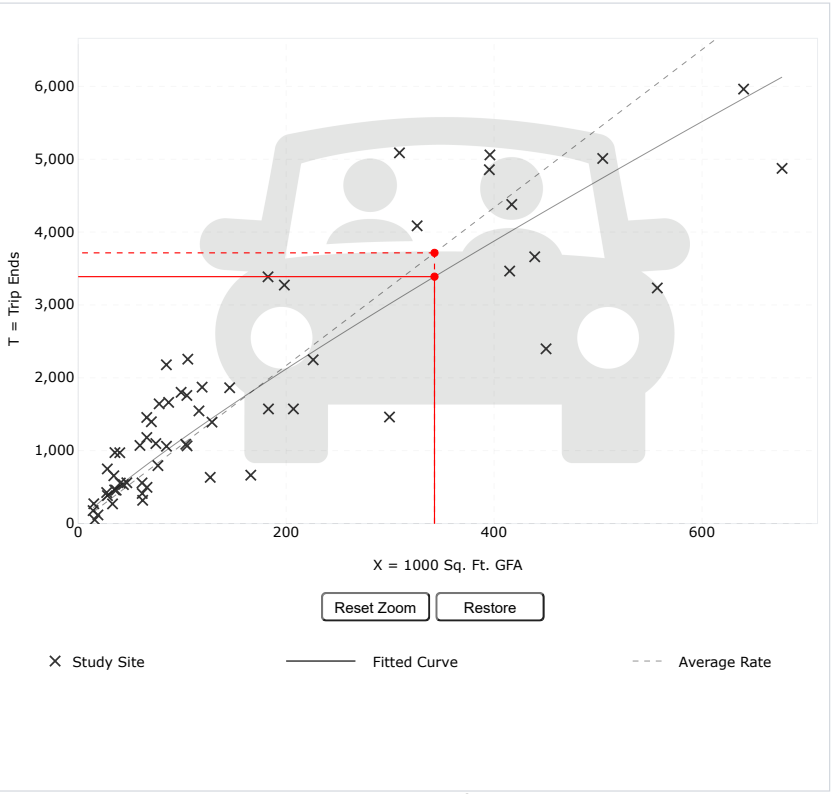
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
342.7 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
General Office Building (710) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
59

Avg. 1000 Sq. Ft. GFA:
163

Average Rate:
10.84

Range of Rates:
3.27 - 27.56

Standard Deviation:
4.76

Fitted Curve Equation:
Ln(T) = 0.87 Ln(X) + 3.05

R^2:
0.78

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 3715 (Total), 1857 (Entry), 1858 (Exit)
Fitted Curve: 3388 (Total), 1694 (Entry), 1694 (Exit)

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
710

LAND USE GROUP:
(700-799) Office

LAND USE :
710 - General Office Building

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

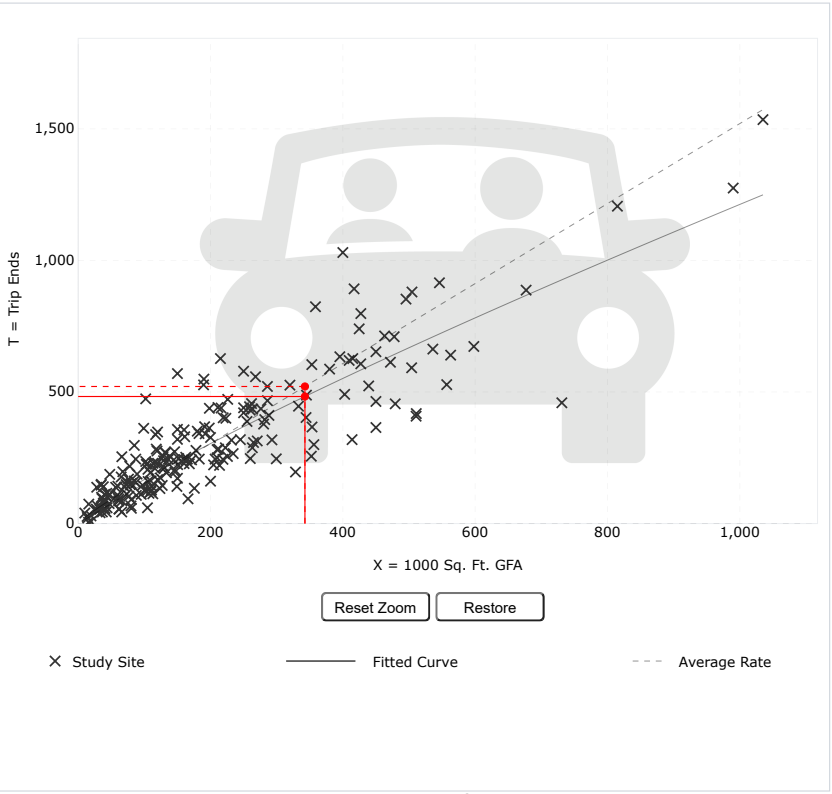
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
342.7 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
General Office Building (710) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
221

Avg. 1000 Sq. Ft. GFA:
201

Average Rate:
1.52

Range of Rates:
0.32 - 4.93

Standard Deviation:
0.58

Fitted Curve Equation:
Ln(T) = 0.86 Ln(X) + 1.16

R^2:
0.78

Directional Distribution:
88% entering, 12% exiting

Calculated Trip Ends:
Average Rate: 521 (Total), 458 (Entry), 63 (Exit)
Fitted Curve: 483 (Total), 425 (Entry), 58 (Exit)

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
710

LAND USE GROUP:
(700-799) Office

LAND USE :
710 - General Office Building

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

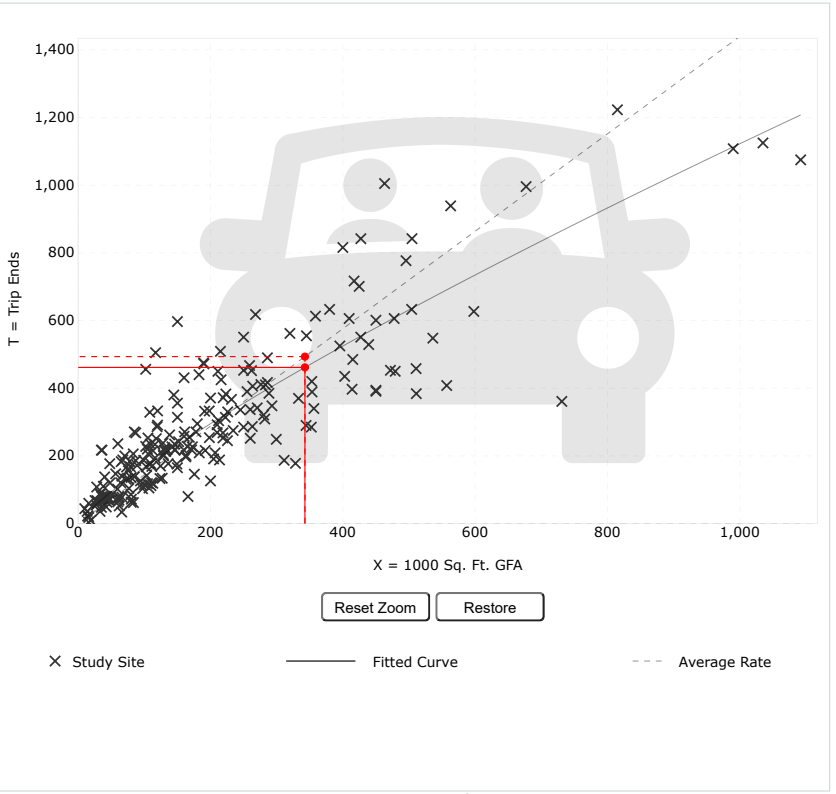
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
342.7 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
General Office Building (710) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
232

Avg. 1000 Sq. Ft. GFA:
199

Average Rate:
1.44

Range of Rates:
0.26 - 6.20

Standard Deviation:
0.60

Fitted Curve Equation:
Ln(T) = 0.83 Ln(X) + 1.29

R^2:
0.77

Directional Distribution:
17% entering, 83% exiting

Calculated Trip Ends:
Average Rate: 493 (Total), 83 (Entry), 410 (Exit)
Fitted Curve: 462 (Total), 78 (Entry), 384 (Exit)

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
760

LAND USE GROUP:
(700-799) Office

LAND USE :
760 - Research and Development Center

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

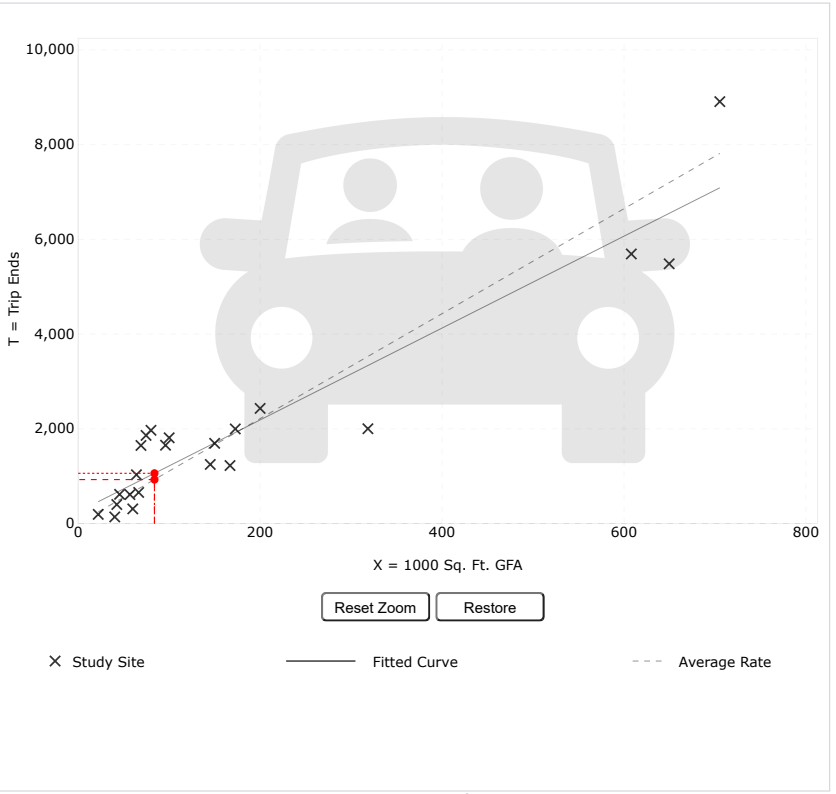
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
83.83 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Research and Development Center (760) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
22

Avg. 1000 Sq. Ft. GFA:
179

Average Rate:
11.08

Range of Rates:
3.48 - 24.95

Standard Deviation:
4.45

Fitted Curve Equation:
T = 9.70(X) + 247.71

R^2:
0.89

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 929 (Total), 464 (Entry), 465 (Exit)
Fitted Curve: 1061 (Total), 530 (Entry), 531 (Exit)

Add-ons to do more

Try OTISS Pro

Graph Look Up

ITETripGen Web-based App

Graph Look Up

How to Use *ITETripGen*

TGM Desk Reference

TGM Appendices

Support Documents

Add Users

Comments

Query | Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
760

LAND USE GROUP:
(700-799) Office

LAND USE :
760 - Research and Development Center

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

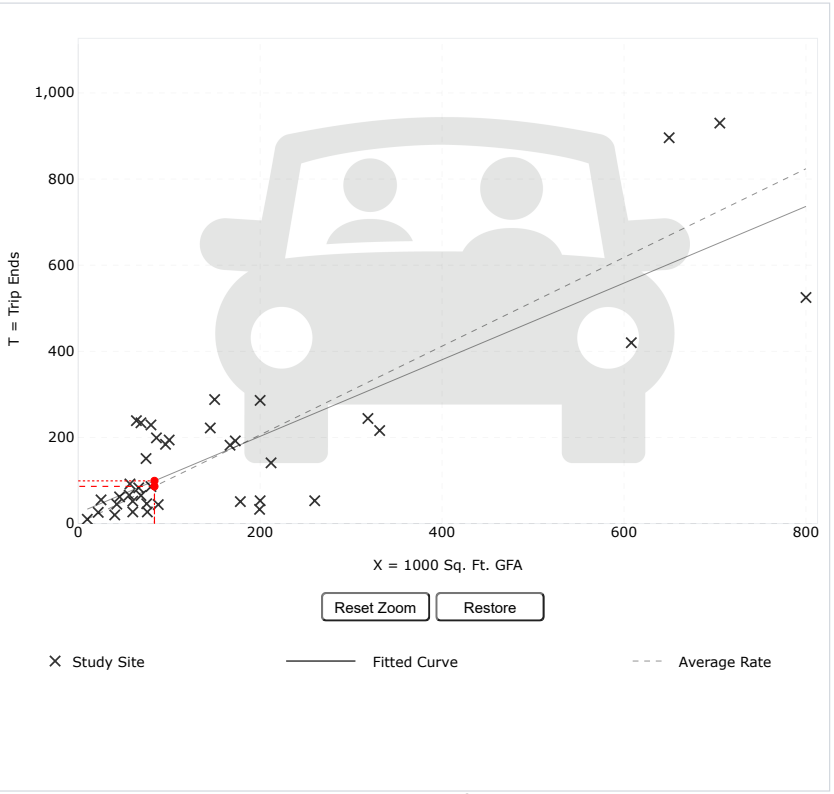
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
83.83 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Research and Development Center (760) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
39

Avg. 1000 Sq. Ft. GFA:
173

Average Rate:
1.03

Range of Rates:
0.17 - 3.73

Standard Deviation:
0.65

Fitted Curve Equation:
T = 0.89(X) + 24.54

R^2:
0.70

Directional Distribution:
82% entering, 18% exiting

Calculated Trip Ends:
Average Rate: 86 (Total), 70 (Entry), 16 (Exit)
Fitted Curve: 99 (Total), 81 (Entry), 18 (Exit)

Add-ons to do more

Try OTISS Pro

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
760

LAND USE GROUP:
(700-799) Office

LAND USE :
760 - Research and Development Center

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

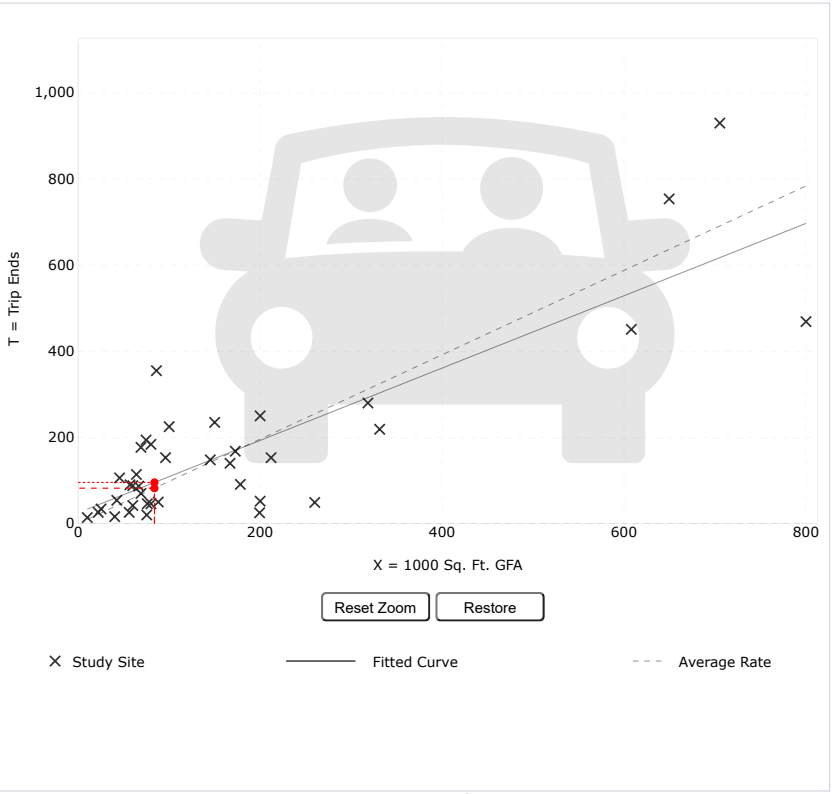
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
83.83 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Research and Development Center (760) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
39

Avg. 1000 Sq. Ft. GFA:
173

Average Rate:
0.98

Range of Rates:
0.13 - 4.13

Standard Deviation:
0.64

Fitted Curve Equation:
T = 0.84(X) + 25.08

R^2:
0.70

Directional Distribution:
16% entering, 84% exiting

Calculated Trip Ends:
Average Rate: 82 (Total), 13 (Entry), 69 (Exit)
Fitted Curve: 95 (Total), 15 (Entry), 80 (Exit)

INITIAL CAMPUS REDEVELOPMENT PROGRAM

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
140

LAND USE GROUP:
(100-199) Industrial

LAND USE :
140 - Manufacturing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

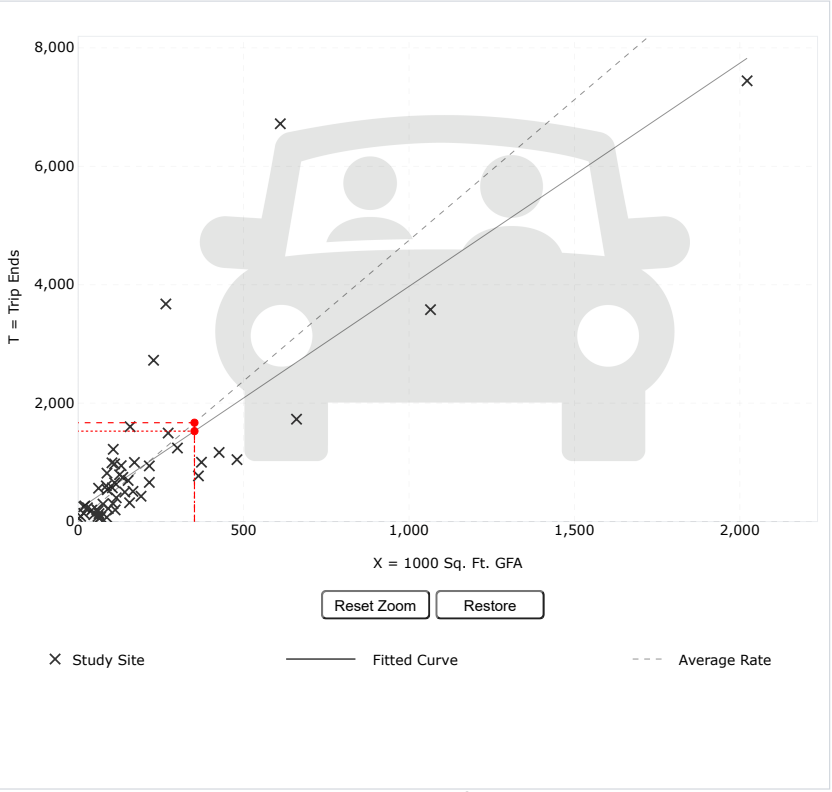
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
351.48 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Manufacturing (140) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
53

Avg. 1000 Sq. Ft. GFA:
208

Average Rate:
4.75

Range of Rates:
0.83 - 49.50

Standard Deviation:
3.20

Fitted Curve Equation:
T = 3.77(X) + 201.98

R^2:
0.68

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 1670 (Total), 835 (Entry), 835 (Exit)
Fitted Curve: 1527 (Total), 763 (Entry), 764 (Exit)

Graph Look Up

ITETripGen Web-based App

Graph Look Up

How to Use *ITETripGen*

TGM Desk Reference

TGM Appendices

Support Documents

Add Users

Comments

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
140

LAND USE GROUP:
(100-199) Industrial

LAND USE :
140 - Manufacturing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

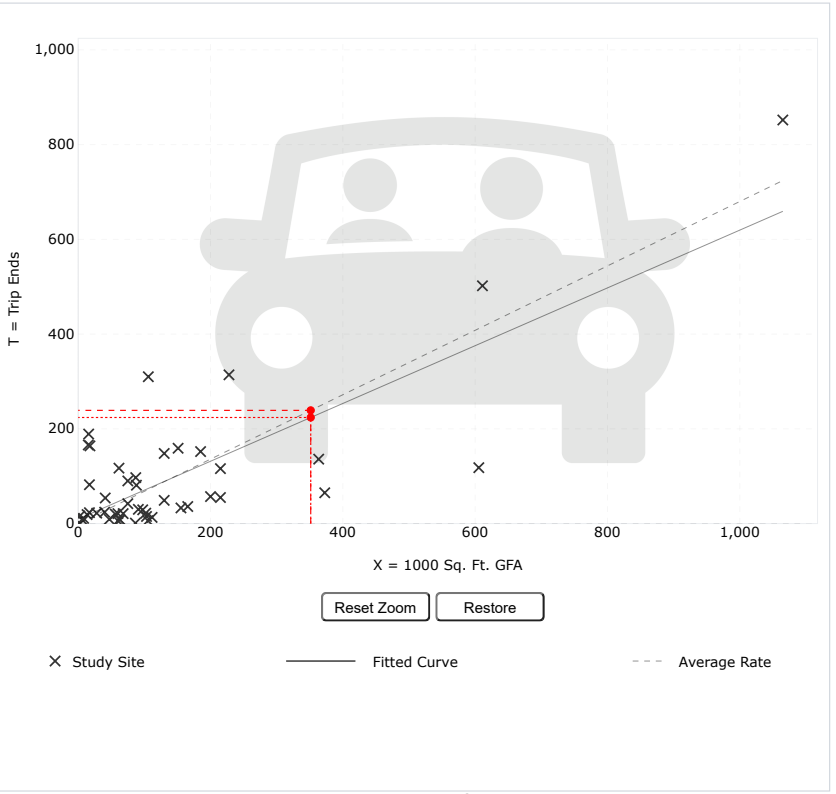
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
351.48 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Manufacturing (140) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
48

Avg. 1000 Sq. Ft. GFA:
138

Average Rate:
0.68

Range of Rates:
0.01 - 11.93

Standard Deviation:
1.03

Fitted Curve Equation:
T = 0.61(X) + 9.54

R^2:
0.62

Directional Distribution:
76% entering, 24% exiting

Calculated Trip Ends:
Average Rate: 239 (Total), 182 (Entry), 57 (Exit)
Fitted Curve: 224 (Total), 170 (Entry), 54 (Exit)

Add-ons to do more

Try OTISS Pro

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
140

LAND USE GROUP:
(100-199) Industrial

LAND USE :
140 - Manufacturing

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

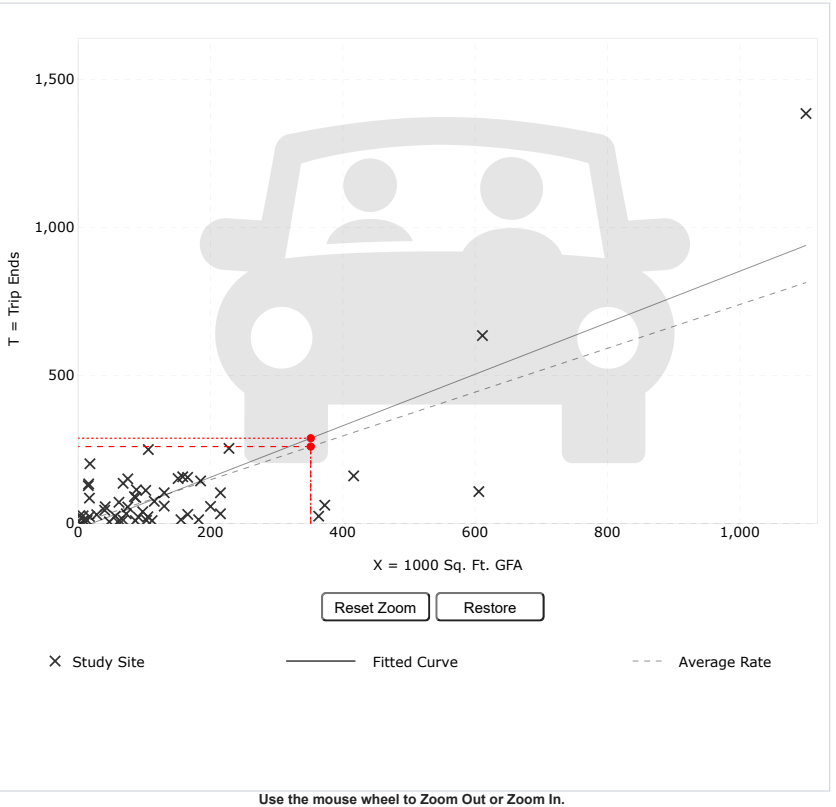
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
351.48 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Manufacturing (140) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
55

Avg. 1000 Sq. Ft. GFA:
142

Average Rate:
0.74

Range of Rates:
0.07 - 11.37

Standard Deviation:
0.93

Fitted Curve Equation:
T = 0.87(X) - 17.50

R^2:
0.64

Directional Distribution:
31% entering, 69% exiting

Calculated Trip Ends:
Average Rate: 260 (Total), 81 (Entry), 179 (Exit)
Fitted Curve: 288 (Total), 89 (Entry), 199 (Exit)

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
760

LAND USE GROUP:
(700-799) Office

LAND USE :
760 - Research and Development Center

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

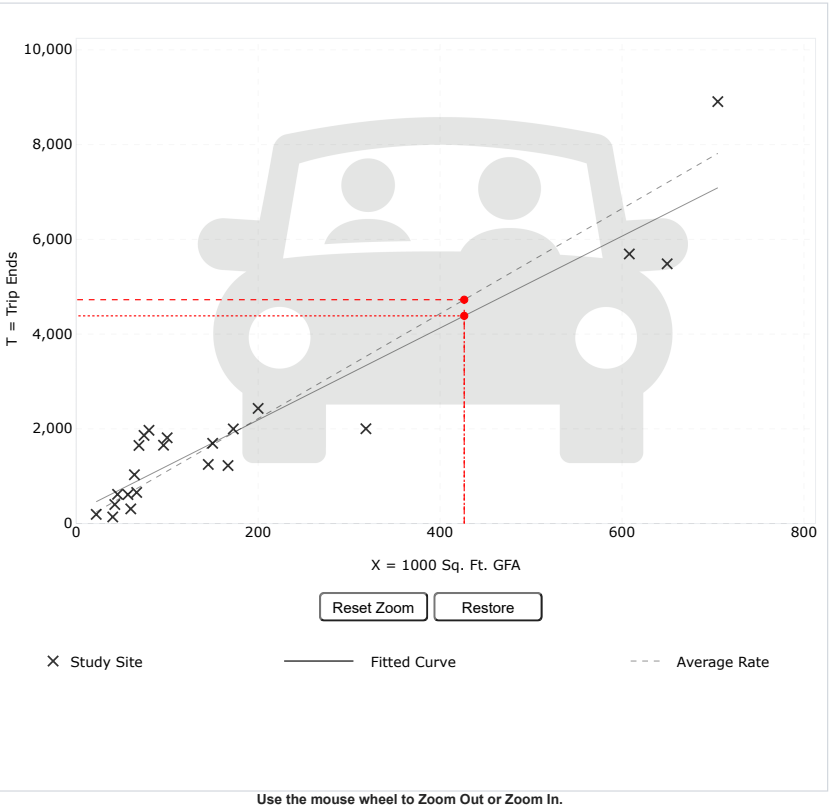
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
426.53 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Research and Development Center (760) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
22

Avg. 1000 Sq. Ft. GFA:
179

Average Rate:
11.08

Range of Rates:
3.48 - 24.95

Standard Deviation:
4.45

Fitted Curve Equation:
T = 9.70(X) + 247.71

R^2:
0.89

Directional Distribution:
50% entering, 50% exiting

Calculated Trip Ends:
Average Rate: 4726 (Total), 2363 (Entry), 2363 (Exit)
Fitted Curve: 4385 (Total), 2192 (Entry), 2193 (Exit)

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
760

LAND USE GROUP:
(700-799) Office

LAND USE :
760 - Research and Development Center

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

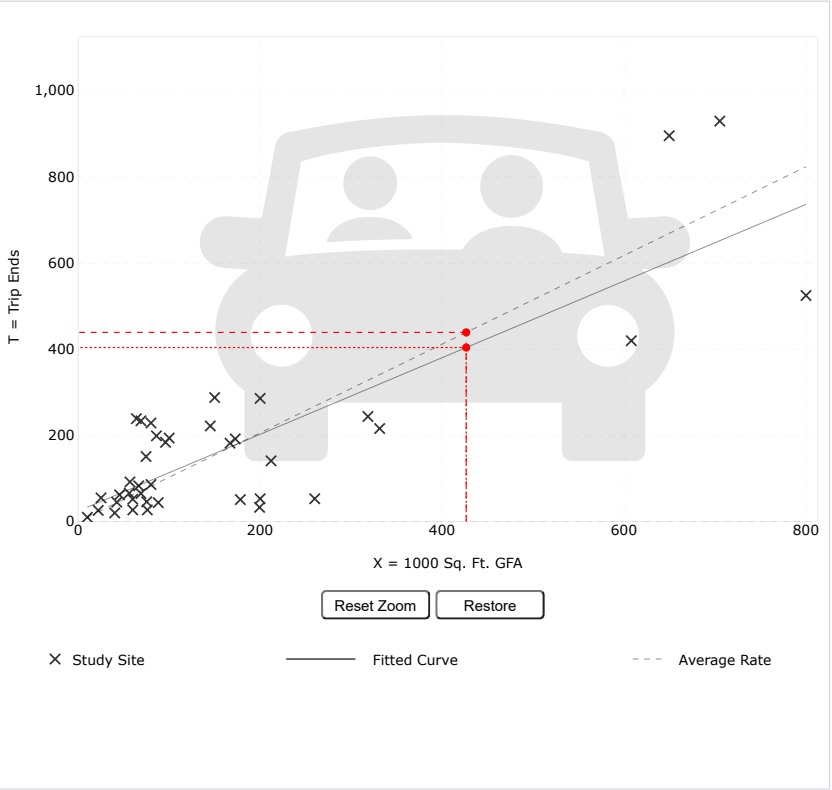
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
426.53 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Research and Development Center (760) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 7 and 9 a.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
39

Avg. 1000 Sq. Ft. GFA:
173

Average Rate:
1.03

Range of Rates:
0.17 - 3.73

Standard Deviation:
0.65

Fitted Curve Equation:
T = 0.89(X) + 24.54

R^2:
0.70

Directional Distribution:
82% entering, 18% exiting

Calculated Trip Ends:
Average Rate: 439 (Total), 360 (Entry), 79 (Exit)
Fitted Curve: 404 (Total), 331 (Entry), 73 (Exit)

Graph Look Up

Query Filter

DATA SOURCE:
Trip Generation Manual, 11th Ed

SEARCH BY LAND USE CODE:
760

LAND USE GROUP:
(700-799) Office

LAND USE :
760 - Research and Development Center

LAND USE SUBCATEGORY:
All Sites

SETTING/LOCATION:
General Urban/Suburban

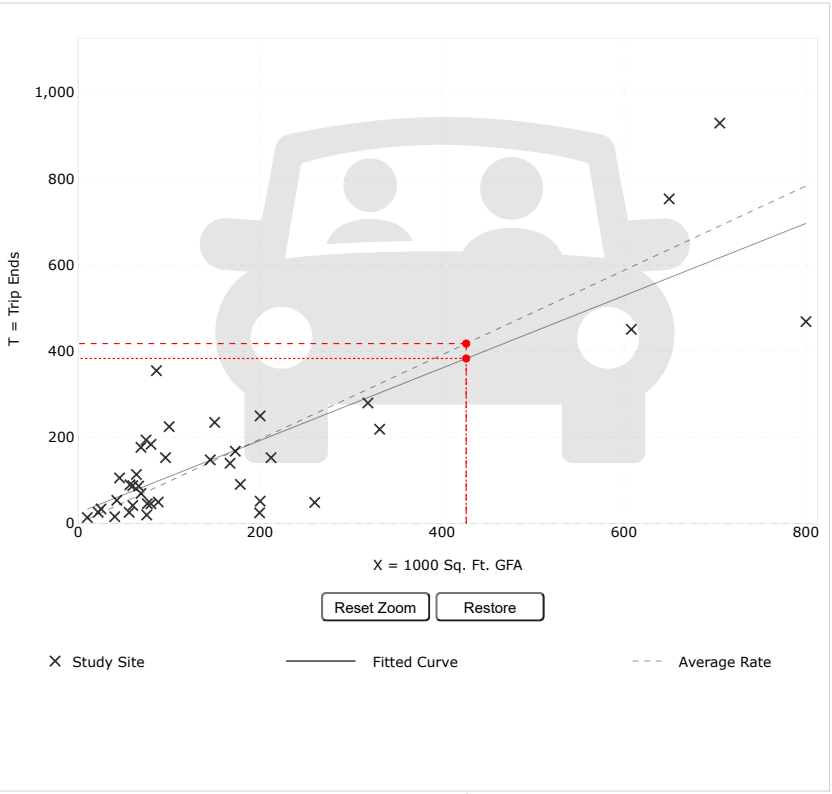
INDEPENDENT VARIABLE (IV):
1000 Sq. Ft. GFA

TIME PERIOD:
Weekday, Peak Hour of Adjacent Street Traffic

TRIP TYPE:
Vehicle

ENTER IV VALUE TO CALCULATE TRIPS:
426.53 Calculate

Data Plot and Equation



Use the mouse wheel to Zoom Out or Zoom In.
Hover the mouse pointer on data points to view X and T values.

DATA STATISTICS

Land Use:
Research and Development Center (760) Click for Description and Data Plots

Independent Variable:
1000 Sq. Ft. GFA

Time Period:
Weekday
Peak Hour of Adjacent Street Traffic
One Hour Between 4 and 6 p.m.

Setting/Location:
General Urban/Suburban

Trip Type:
Vehicle

Number of Studies:
39

Avg. 1000 Sq. Ft. GFA:
173

Average Rate:
0.98

Range of Rates:
0.13 - 4.13

Standard Deviation:
0.64

Fitted Curve Equation:
T = 0.84(X) + 25.08

R^2:
0.70

Directional Distribution:
16% entering, 84% exiting

Calculated Trip Ends:
Average Rate: 418 (Total), 67 (Entry), 351 (Exit)
Fitted Curve: 383 (Total), 61 (Entry), 322 (Exit)