Traffic and Circulation Study
for the Cui Family Land Subdivision

Xiaoqing Zeng, PhD, PE
Stetson Engineers Inc.

12/19/2024

This memorandum documents the traffic and circulation study in support of the Cui Family Land Subdivision Project (Project) in Point Reyes Station, Marin County, California. The proposed subdivision is to comply with the Marin County permit application requirements.

1. Project Location and Overview

The subject property (82.32 acres) is located near 11798 State Route 1 (SR-1), Point Reyes Station in the unincorporated area of Marin County (APN: 119-050-04, 119-050-09, 119-140-03, and 119-140-09). It is within the village limit boundaries of the community of Point Reyes Station and located within the Coastal Zone. Figure 1a shows the property location in Marin County and Figure 1b shows the project vicinity and the existing property parcels (4 parcels). The property is bounded by Point Reyes-Petaluma Road and Lagunitas Creek on the south, State Route 1 (SR-1) to the west, rural residential housing to the north, and open pastureland to the east. The project site is currently vacant and undeveloped.

Figure 2a shows the Coastal Zone land use zoning and the property location. The property is within the zoning of C-ARP-3 -- Coastal, Agricultural, Residential Planned (1 unit per 3 acres). The C-ARP land use zoning is designed to preserve productive lands for agricultural use through the clustering of allowed residential development.

The project site is subject to the Marin Countywide Plan (CWP)'s C-AG3 (Coastal Agricultural 3; 1 unit per 1 – 9 acres) land use designation. The C-AG3 land use category was established for residential use within the context of small-scale agricultural and agriculturally related uses. According to Map 19e Point Reyes Station Land Use Policy Map, the density associated with C-AG3 is 1 unit per every 1 to 9 acres (see Figure 2b).

The 82.32-acre subject property is proposed to be subdivided into 37 parcels for future single-family residential development (see Figure 3). Of the 37 parcels, 5 parcels are designated as affordable housing. The subdivision considered a density bonus of 35% after meeting the 20% affordable housing requirement. Preliminary plan shown in Figure 3 indicates that individual lots will range between about 1.02- and 8.2-acres, meeting the density requirement for the C-AG3 land use designation (1 unit per 1 to 9 acres).

The land subdivision proposal includes conceptual plans for new driveways to access all the new parcels and driveway tie-in aprons at State Route 1 and Point Reyes-Petaluma Road, roadway improvements to Point Reyes-Petaluma Road at the southeast corner, utility installation and maintenance areas, onsite wastewater treatment systems, limited tree removal, and general grading to accommodate site improvements such as new driveways.

2. Existing Conditions

The Project site is in a rural area. Important roadways adjacent to the project site are discussed below:

SR-1 is a two-lane minor arterial that runs generally north-south. It has 12-foot travel lanes and shoulders that range from one foot to six feet. North of Point Reyes-Petaluma Road, SR-1 has a roughly 13-foot parking lane on the west side, with no shoulder on the east side. SR-1 is posted with a speed limit of 35 miles per hour (mph) northbound and 25 mph southbound near the Project site.

Point Reyes-Petaluma Road is a two-lane major collector street that runs generally east-west and has 12-foot travel lanes with roughly two- to four-foot shoulders. It is posted with a 45-mph speed limit but has a 25-mph speed limit at the curve. There is a stop sign on Point Reyes-Petaluma Road westbound at the intersection with SR-1.

3. Trip Generation Assessment for the Project

Refer to Attachment A for the trip generation assessment for the Project. The proposed Project would be expected to generate an average of 107 vehicle trips per day, fewer than 110 daily vehicle trips and, therefore, the Project is presumed to result in a less-than-significant transportation impact and is not subject to a detailed VMT (vehicle miles traveled) analysis, based on the following CEQA Screening Criterion under SB 743.

> *Small Project Screening: Any development that would generate fewer than 110 daily vehicle trips shall be presumed to have a less-than-significant transportation impact.*

4. Site Access and Circulation

Access to the development will be provided via an eastward extension of the existing Water Tank Road, via a new access driveway from State Route 1 a few hundred yards north of the existing Water Tank Road, and a new driveway extending from Point Reyes-Petaluma Road in the southeast corner of the site (see Figure 3).

The main entrance is connected to the existing Water Tank Road. This driveway enters and exits at the main gate of Water Tank Road.

The westernmost driveway intersects with SR-1. Exit from this driveway could also act as an emergency exit.

The above two driveways are located in the northern area of the land and intersect each other near the center of the land.

The southern area of the Project site has one independent driveway that intersects with Point Reyes-Petaluma Road. This driveway provides access for 4 parcels (#34 - #37).

Driveway Width:

All driveways are designed to meet the following width requirements specified in the Marin Coastal Zoning Code section 20.65.030.A.

- The minimum improved width of a driveway serving a single dwelling unit is 12 feet.
- The minimum improved width of a driveway serving two to six dwelling units is 16 feet.
- A driveway which serves more than six dwelling units shall be considered equivalent to a private road and designed accordingly. The minimum width is 20 ft.

Driveway Slope

The Marin County Code Section 24.04.280 requires that the maximum gradient measured along the centerline should not be steeper than eighteen percent and shall not be steeper than twenty-five percent.

All driveways are designed to have slopes not more than 18%, meeting the Marin County Code requirements.

Turning Design

All the centerline radius of the proposed driveways are more than or equal to 40 feet, which will be sufficient for turning all types of vehicles including trucks at the proposed driveways.

Left-Turn Lane Warrants

According to Caltrans guidelines, a left-turn lane is typically warranted at an intersection when a significant volume of left-turning traffic exists, causing delays and potential safety hazards, and this volume can be measured using specific criteria outlined in the "California Highway Design Manual" which includes factors like the number of left-turning vehicles per hour, the volume of through traffic, and the geometry of the intersection itself; essentially, a left-turn lane is justified when the volume of left turns is high enough to significantly impact the overall traffic flow at the intersection.

Figure 4 shows the vehicles movement count data observed during the AM and PM peak hours on 8/20/2024. The observed traffic volumes on both SR-1 and Point Reyes-Petaluma Road were low under existing conditions. The Project-generated small number of trips would increase future volumes insignificantly. A left-turn lane is not warranted on both SR-1 and Point Reyes-Petaluma Road at the Project driveways during either peak hour.

5. Sight Distance Assessment

Sight distance was evaluated to determine if drivers will have adequate visibility to enter a roadway safely without resulting in a conflict with traffic already on the roadway. The evaluation was conducted based on the sight distance criteria contained in the Highway Design Manual published by Caltrans (2018).

Sight distance is the continuous length of highway ahead, visible to the highway user. There are four types of sight distance: passing, stopping, decision, and corner. Passing sight distance is used where use of an opposing lane can provide passing opportunities. Stopping sight distance is the minimum sight distance for a given design speed to be provided on multilane highways and on 2-lane roads when passing sight distance is not economically obtainable. Stopping sight distance also is to be provided for all users, including motorists and bicyclists, at all elements of interchanges and intersections at grade, including private road connections. Decision sight distance is used at major decision points. Corner sight distance is used at intersections.

For this Project, stopping sight distance and corner site distance are more applicable for the evaluation. The sections below provide evaluations for stopping and corner sight distances.

Stopping Site Distance Evaluation

The stopping sight distance at the new intersection locations is evaluated based on the stopping sight distance criterion and the approach speed on the major street (see Table 1 below).

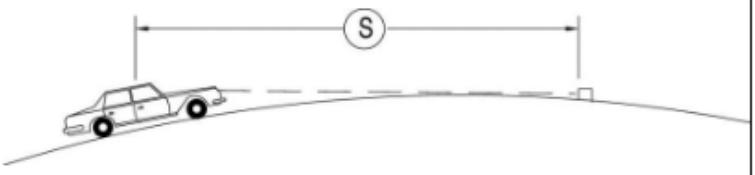
Table 1 Stopping Sight Distance Standards
(Caltrans 2018 Highway Design Manual, Table 201.1)

Design Speed[(1)] (mph)	Stopping[(2)] (ft)	Passing (ft)
10	50	---
15	100	---
20	125	800
25	150	950
30	200	1,100
35	250	1,300
40	300	1,500
45	360	1,650
50	430	1,800
55	500	1,950
60	580	2,100
65	660	2,300
70	750	2,500
75	840	2,600
80	930	2,700

(1) See Topic 101 for selection of design speed.
(2) For sustained downgrades, refer to underlined standard in Index 201.3

The minimum stopping sight distance is the distance required by the user, traveling at a given speed, to bring the vehicle or bicycle to a stop after an object ½-foot high on the road becomes visible. Stopping sight distance for motorists is measured from the driver's eyes, which are assumed to be 3½ feet above the pavement surface, to an object ½-foot high on the road. The schematics below provide the stopping sight distances at crest vertical curves and sag vertical curves.

Stopping Sight Distance on Crest Vertical Curves
(Caltrans 2018 Highway Design Manual, Table 201.4)



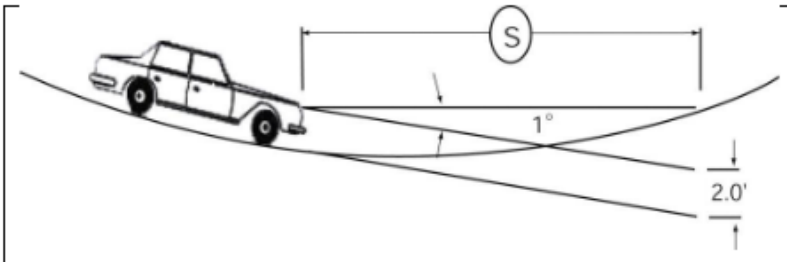
Drivers eye height is 3 ½ feet.
Object height is ½-foot.

L = Curve Length (feet)
A = Algebraic Grade Difference (%)
S = Sight Distance (feet)
V = Design Speed for "S" in mph
K = Distance in feet required to achieve a 1% change in grade. K value as shown on graph is valid when S < L.

Notes:
- Before using this figure for intersections, branch connections and exits, see Indexes 201.7 and 405.1, and Topic 504.
- See Figure 204.4 for vertical curve formulas.
- See Index 204.4 for minimum length of vertical curve

When S > L	When S < L
$L = 2S - 1329/A$	$L = AS^2/1329$

Stopping Sight Distance on Sag Vertical Curves
(Caltrans Highway Design Manual, Table 201.5)



L = Curve Length (feet)
A = Algebraic Grade Difference (%)
S = Sight Distance (feet)
V = Design Speed for "S" in mph
K = Distance in feet required to achieve a 1% change in grade. K value as shown on graph is valid when S < L.

Notes:
- For sustained downgrades, see Index 201.3.
- Before using this figure for intersections, branch connections and exits, see Indexes 201.7 and 405.1, and Topic 504.
- See Figure 204.4 for vertical curve formulas.
- See Index 204.4 for minimum length of vertical curve.

When S > L	When S < L
$L = 2S - (400 + 3.5S)/A$	$L = AS^2/(400 + 3.5S)$

SR-1 is posted with a speed limit of 35 mph northbound and 25 mph southbound near the Project site. The required minimum stopping sight distance is 250 ft northbound and 150 ft southbound. Field observation indicates that the stopping sight distance between SR-1 northbound and the Project driveway that intersects with SR-1 is approximately 330 feet, and the stopping sight distance between SR-1 southbound and the Project driveway is about 300 feet. The lines of sight for vehicles exiting/entering the driveway and vehicles travelling northbound/southbound on SR-1 are clear and visible.

Point Reyes-Petaluma Road has a 25-mph speed limit at the curve. The required stopping sight distance is 150 ft. Field observation indicates that the stopping sight distance between Point Reyes-Petaluma Road eastbound and the Project driveway in the south is approximately 210 feet. The stopping sight distance between Point Reyes-Petaluma Road westbound and the Project driveway is approximately 155 feet. The lines of sight for vehicles exiting/entering the driveway and vehicles travelling eastbound/westbound on Point Reyes-Petaluma Road are clear and visible. In addition, the existing stop sign at the intersection of SR-1 and Point Reyes-Petaluma Road would provide additional safety for the Point Reyes-Petaluma Road traveling near the Project driveway. The Project design will install a signage/mirror at the curve to improve the safety for the Point Reyes-Petaluma Road traveling near the Project driveway.

Corner Site Distance Evaluation

Corner sight distance is measured from a point on the minor road (with a setback distance for the vehicle waiting on the minor road) to an object on the major road. Line of sight for corner sight distance for passenger cars is to be determined from a 3 and 1/2-foot height at the location of the driver of the vehicle in the center of the minor road lane to a 3 and 1/2-foot object height in the center of the approaching outside lane of the major road. The minimum value for corner sight distance at signalized intersections should be equal to the stopping sight distance.

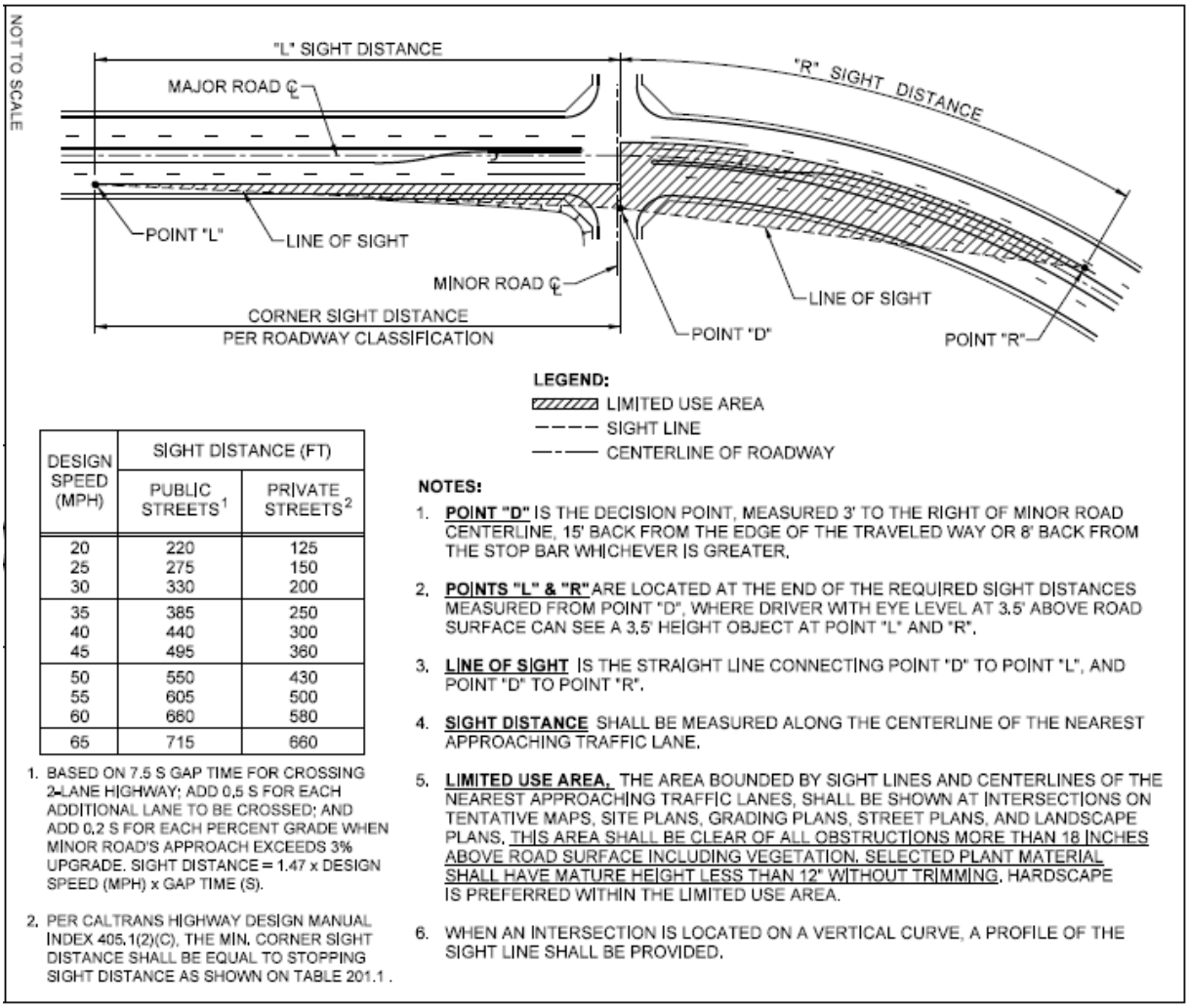
The corner sight distance at the new intersection locations is evaluated based on the corner sight distance criterion and the approach speed on the major street (see the table in the graph below).

SR-1 is posted with a speed limit of 35 mph northbound and 25 mph southbound near the Project site. The required minimum corner sight distance is 385 ft northbound and 275 ft southbound. Field observation indicates that the corner sight distance at the Project driveway that intersects with SR-1 to the northbound of SR-1 is approximately 400 ft, and the corner sight distance at the Project driveway to the southbound of SR-1 is about 550 feet. The lines of sight for vehicles entering SR-1 at the Project driveway are clear and visible.

Point Reyes-Petaluma Road has a 25-mph speed limit at the curve. The required minimum corner sight distance is 275 ft. Field observation indicates that the corner sight distance at the Project driveway in the south to the westbound of Point Reyes-Petaluma Road is approximately 140 feet, and the corner sight distance at the Project driveway to the eastbound of Point Reyes-Petaluma Road is approximately 195 feet. The corner sight distances at the Project driveway are not adequate. However, the existing stop sign at the intersection of SR-1 and Point Reyes-Petaluma Road would provide additional safety for the Point Reyes-Petaluma Road traveling at/near the

curve. The Project design will install a signage/mirror at the curve to improve the safety for the Point Reyes-Petaluma Road traveling near the Project driveway.

Corner Sight Distance



DESIGN SPEED (MPH)	SIGHT DISTANCE (FT)	
	PUBLIC STREETS[1]	PRIVATE STREETS[2]
20	220	125
25	275	150
30	330	200
35	385	250
40	440	300
45	495	360
50	550	430
55	605	500
60	660	580
65	715	660

1. BASED ON 7.5 S GAP TIME FOR CROSSING 2-LANE HIGHWAY; ADD 0.5 S FOR EACH ADDITIONAL LANE TO BE CROSSED; AND ADD 0.2 S FOR EACH PERCENT GRADE WHEN MINOR ROAD'S APPROACH EXCEEDS 3% UPGRADE. SIGHT DISTANCE = 1.47 x DESIGN SPEED (MPH) x GAP TIME (S).
2. PER CALTRANS HIGHWAY DESIGN MANUAL INDEX 405.1(2)(C), THE MIN. CORNER SIGHT DISTANCE SHALL BE EQUAL TO STOPPING SIGHT DISTANCE AS SHOWN ON TABLE 201.1 .

NOTES:

1. **POINT "D"** IS THE DECISION POINT, MEASURED 3' TO THE RIGHT OF MINOR ROAD CENTERLINE, 15' BACK FROM THE EDGE OF THE TRAVELED WAY OR 8' BACK FROM THE STOP BAR WHICHEVER IS GREATER.
2. **POINTS "L" & "R"** ARE LOCATED AT THE END OF THE REQUIRED SIGHT DISTANCES MEASURED FROM POINT "D", WHERE DRIVER WITH EYE LEVEL AT 3.5' ABOVE ROAD SURFACE CAN SEE A 3.5' HEIGHT OBJECT AT POINT "L" AND "R".
3. **LINE OF SIGHT** IS THE STRAIGHT LINE CONNECTING POINT "D" TO POINT "L", AND POINT "D" TO POINT "R".
4. **SIGHT DISTANCE** SHALL BE MEASURED ALONG THE CENTERLINE OF THE NEAREST APPROACHING TRAFFIC LANE.
5. **LIMITED USE AREA.** THE AREA BOUNDED BY SIGHT LINES AND CENTERLINES OF THE NEAREST APPROACHING TRAFFIC LANES, SHALL BE SHOWN AT INTERSECTIONS ON TENTATIVE MAPS, SITE PLANS, GRADING PLANS, STREET PLANS, AND LANDSCAPE PLANS. THIS AREA SHALL BE CLEAR OF ALL OBSTRUCTIONS MORE THAN 18 INCHES ABOVE ROAD SURFACE INCLUDING VEGETATION. SELECTED PLANT MATERIAL SHALL HAVE MATURE HEIGHT LESS THAN 12" WITHOUT TRIMMING. HARDSCAPE IS PREFERRED WITHIN THE LIMITED USE AREA.
6. WHEN AN INTERSECTION IS LOCATED ON A VERTICAL CURVE, A PROFILE OF THE SIGHT LINE SHALL BE PROVIDED.

6. Conclusions

- The proposed project would be expected to generate an average of 107 trips per day, fewer than 110 daily vehicle trips and, therefore, the Project is presumed to result in a less-than-significant transportation impact and is not subject to a detailed VMT analysis, based on the CEQA Screening Criteria under SB 743.

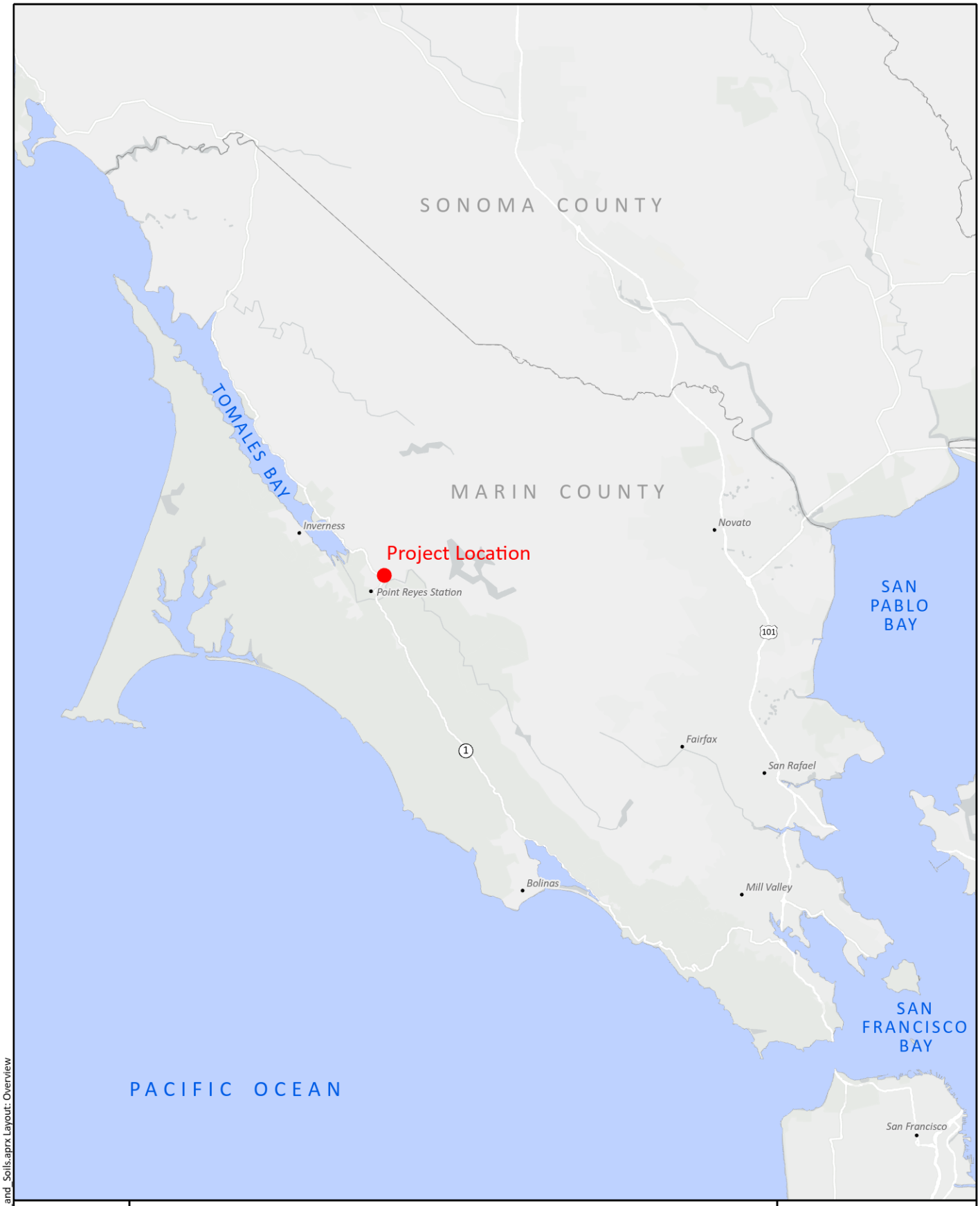
- The Project driveway designs meet the Marin County Code requirements in terms of driveway width, slope, and centerline radius.

- The observed traffic volumes on both SR-1 and Point Reyes-Petaluma Road near the Project site during both the AM and PM peak hours on 8/20/2024 were low under existing conditions. The Project-generated small number of trips would increase future volumes insignificantly. A left-turn lane is not warranted on both SR-1 and Point Reyes-Petaluma Road at the Project driveways during either peak hour.

- The Proposed driveway at the intersection with SR-1 has adequate stopping and corner sight distances.

- The Proposed driveway at the intersection with Point Reyes-Petaluma Road has adequate stopping sight distances but inadequate corner sight distances. However, the existing stop sign at the intersection of SR-1 and Point Reyes-Petaluma Road would provide additional safety for the Point Reyes-Petaluma Road traveling at/near the curve. The Project design will install a signage/mirror at the curve to improve the safety for the Point Reyes-Petaluma Road traveling near the Project driveway.

Figure 1a



Path: j:\jn2904\Stormwater_and_Soils.aprx Layout: Overview

STETSON ENGINEERS INC.

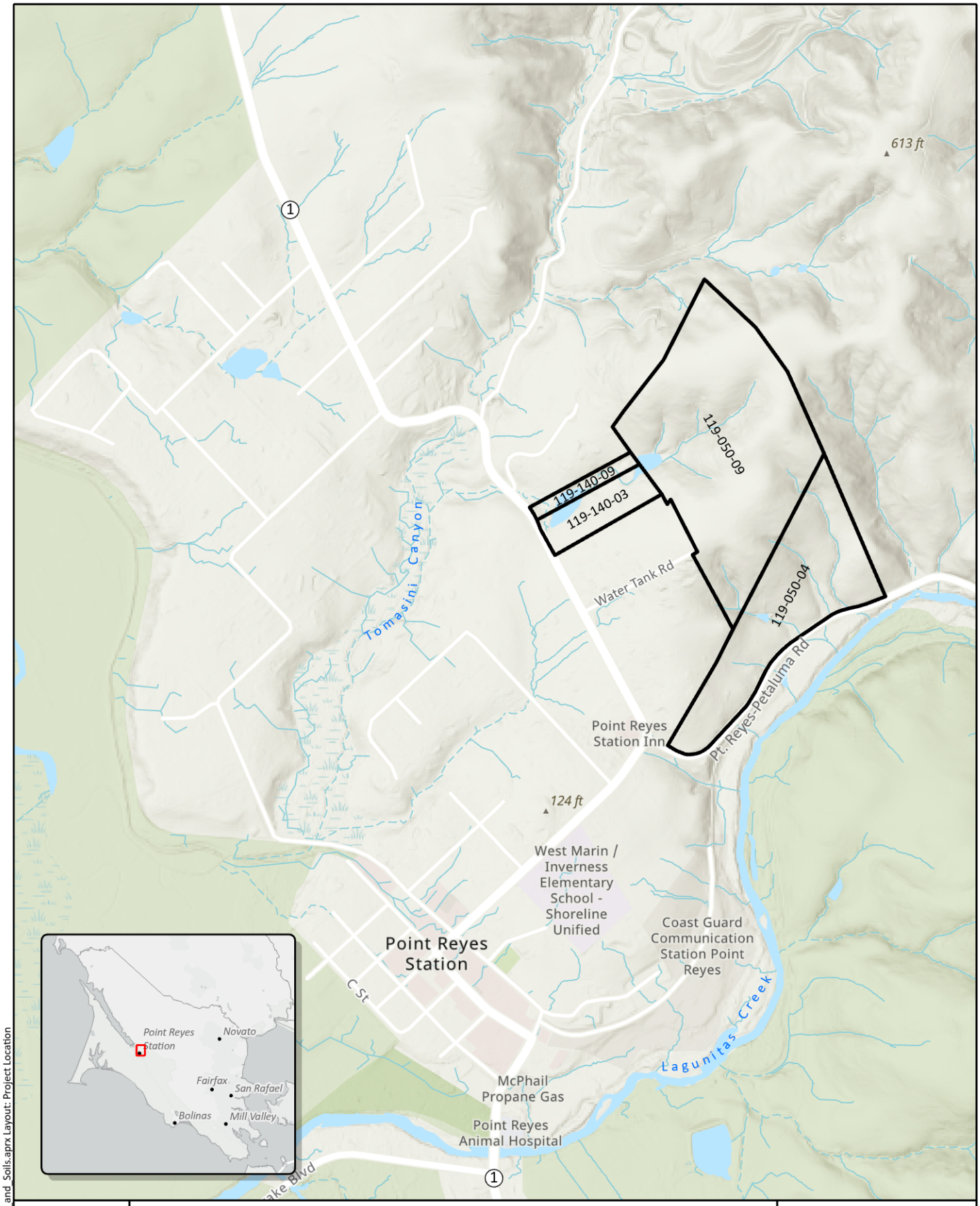
Note:

PROJECT LOCATION
POINT REYES STATION, CA

N

0 3 6
Miles

Figure 1b



Path: J:\jn2904\Stormwater_and_Soils.aprx Layout: Project Location

STETSON ENGINEERS INC.

PROJECT VICINITY AND EXISTING PROPERTY PARCELS
POINT REYES STATION, CA

Note: Parcel Boundaries from Marin County.

N

0 500 1,000

US Feet

Figure 2a

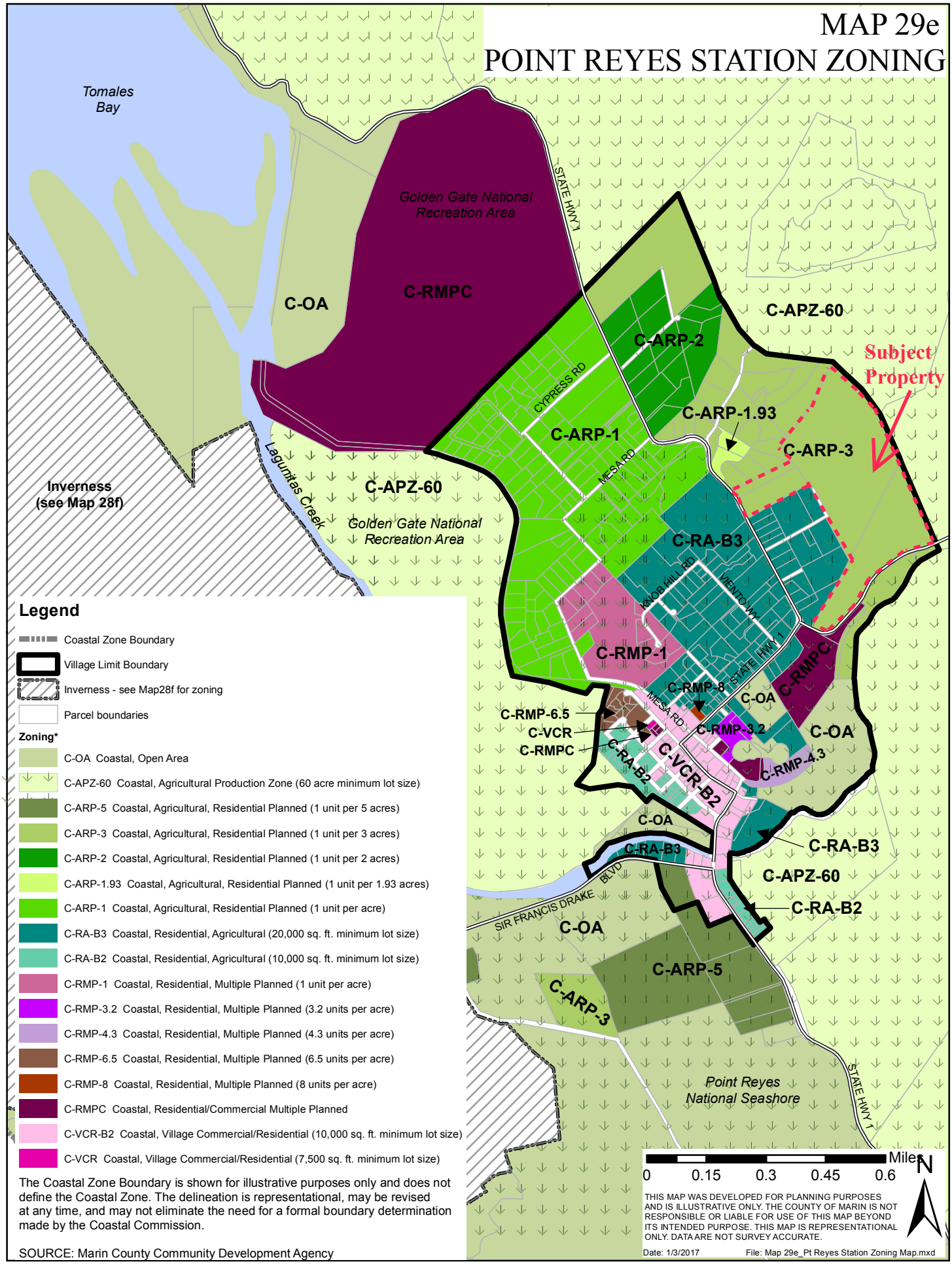
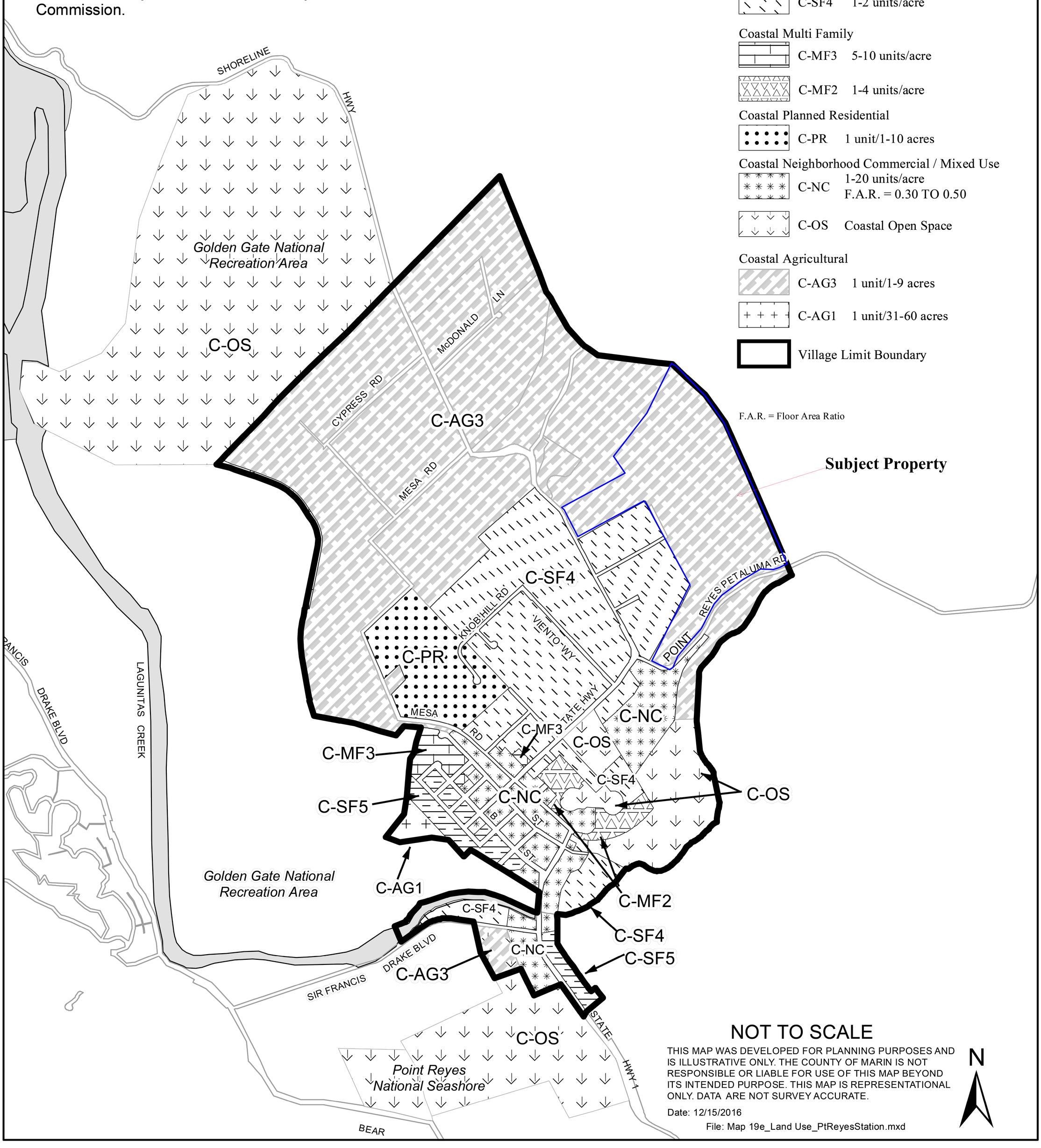

MAP 29e
POINT REYES STATION ZONING
Tomales Bay
Golden Gate National Recreation Area
C-OA
C-RMPC
STATE HWY 1
C-APZ-60
C-ARP-2
Subject Property
CYPRESS RD
C-ARP-1
C-ARP-1.93
C-ARP-3
MESA RD
Inverness (see Map 28f)
Lagunitas Creek
C-APZ-60
Golden Gate National Recreation Area
C-RA-B3
KNOB HILL RD
VIENTO WY
C-RMP-1
STATE HWY 1
C-RMPC
C-RMP-8
C-OA
MESA RD
C-RMP-6.5
C-VCR
C-RMPC
C-RMP-3.2
C-OA
C-RA-B2
C-VCR-B2
C-RMP-4.3
C-OA
C-RA-B3
C-RA-B3
BLVD
C-APZ-60
SIR FRANCIS DRAKE
C-RA-B2
C-OA
C-ARP-5
C-ARP-3
Point Reyes National Seashore
STATE HWY 1
Legend
Coastal Zone Boundary
Village Limit Boundary
Inverness - see Map28f for zoning
Parcel boundaries
Zoning*
C-OA Coastal, Open Area
C-APZ-60 Coastal, Agricultural Production Zone (60 acre minimum lot size)
C-ARP-5 Coastal, Agricultural, Residential Planned (1 unit per 5 acres)
C-ARP-3 Coastal, Agricultural, Residential Planned (1 unit per 3 acres)
C-ARP-2 Coastal, Agricultural, Residential Planned (1 unit per 2 acres)
C-ARP-1.93 Coastal, Agricultural, Residential Planned (1 unit per 1.93 acres)
C-ARP-1 Coastal, Agricultural, Residential Planned (1 unit per acre)
C-RA-B3 Coastal, Residential, Agricultural (20,000 sq. ft. minimum lot size)
C-RA-B2 Coastal, Residential, Agricultural (10,000 sq. ft. minimum lot size)
C-RMP-1 Coastal, Residential, Multiple Planned (1 unit per acre)
C-RMP-3.2 Coastal, Residential, Multiple Planned (3.2 units per acre)
C-RMP-4.3 Coastal, Residential, Multiple Planned (4.3 units per acre)
C-RMP-6.5 Coastal, Residential, Multiple Planned (6.5 units per acre)
C-RMP-8 Coastal, Residential, Multiple Planned (8 units per acre)
C-RMPC Coastal, Residential/Commercial Multiple Planned
C-VCR-B2 Coastal, Village Commercial/Residential (10,000 sq. ft. minimum lot size)
C-VCR Coastal, Village Commercial/Residential (7,500 sq. ft. minimum lot size)
The Coastal Zone Boundary is shown for illustrative purposes only and does not define the Coastal Zone. The delineation is representational, may be revised at any time, and may not eliminate the need for a formal boundary determination made by the Coastal Commission.
SOURCE: Marin County Community Development Agency
Miles
0 0.15 0.3 0.45 0.6
N
THIS MAP WAS DEVELOPED FOR PLANNING PURPOSES AND IS ILLUSTRATIVE ONLY. THE COUNTY OF MARIN IS NOT RESPONSIBLE OR LIABLE FOR USE OF THIS MAP BEYOND ITS INTENDED PURPOSE. THIS MAP IS REPRESENTATIONAL ONLY. DATA ARE NOT SURVEY ACCURATE.
Date: 1/3/2017
File: Map 29e_Pt Reyes Station Zoning Map.mxd

Figure 2b

MAP 19e

POINT REYES STATION LAND USE POLICY MAP

The Coastal Zone Boundary is shown for illustrative purposes only and does not define the Coastal Zone. The delineation is representational, may be revised at any time in the future, is not binding on the Coastal Commission, and may not eliminate the need for a formal boundary determination made by the Coastal Commission.



Legend

Coastal Single Family

- C-SF5 2-4 units/acre
- C-SF4 1-2 units/acre

Coastal Multi Family

- C-MF3 5-10 units/acre
- C-MF2 1-4 units/acre

Coastal Planned Residential

- C-PR 1 unit/1-10 acres

Coastal Neighborhood Commercial / Mixed Use

- C-NC 1-20 units/acre, F.A.R. = 0.30 TO 0.50
- C-OS Coastal Open Space

Coastal Agricultural

- C-AG3 1 unit/1-9 acres
- C-AG1 1 unit/31-60 acres

Village Limit Boundary

F.A.R. = Floor Area Ratio

Subject Property

NOT TO SCALE

THIS MAP WAS DEVELOPED FOR PLANNING PURPOSES AND IS ILLUSTRATIVE ONLY. THE COUNTY OF MARIN IS NOT RESPONSIBLE OR LIABLE FOR USE OF THIS MAP BEYOND ITS INTENDED PURPOSE. THIS MAP IS REPRESENTATIONAL ONLY. DATA ARE NOT SURVEY ACCURATE.

Date: 12/15/2016

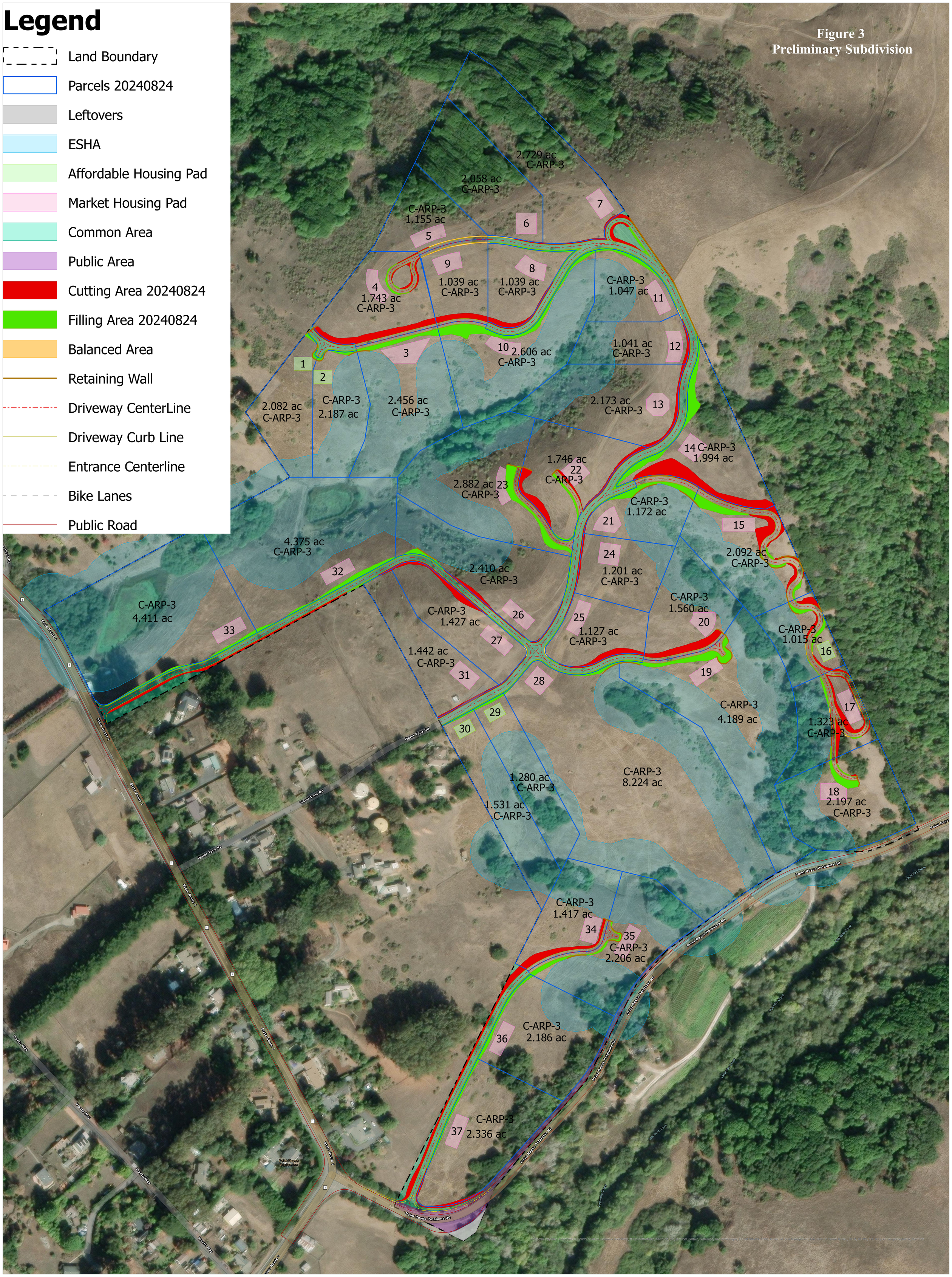
File: Map 19e_Land Use_PtReyesStation.mxd

N

Figure 3
Preliminary Subdivision

Legend

- Land Boundary
- Parcels 20240824
- Leftovers
- ESHA
- Affordable Housing Pad
- Market Housing Pad
- Common Area
- Public Area
- Cutting Area 20240824
- Filling Area 20240824
- Balanced Area
- Retaining Wall
- Driveway CenterLine
- Driveway Curb Line
- Entrance Centerline
- Bike Lanes
- Public Road

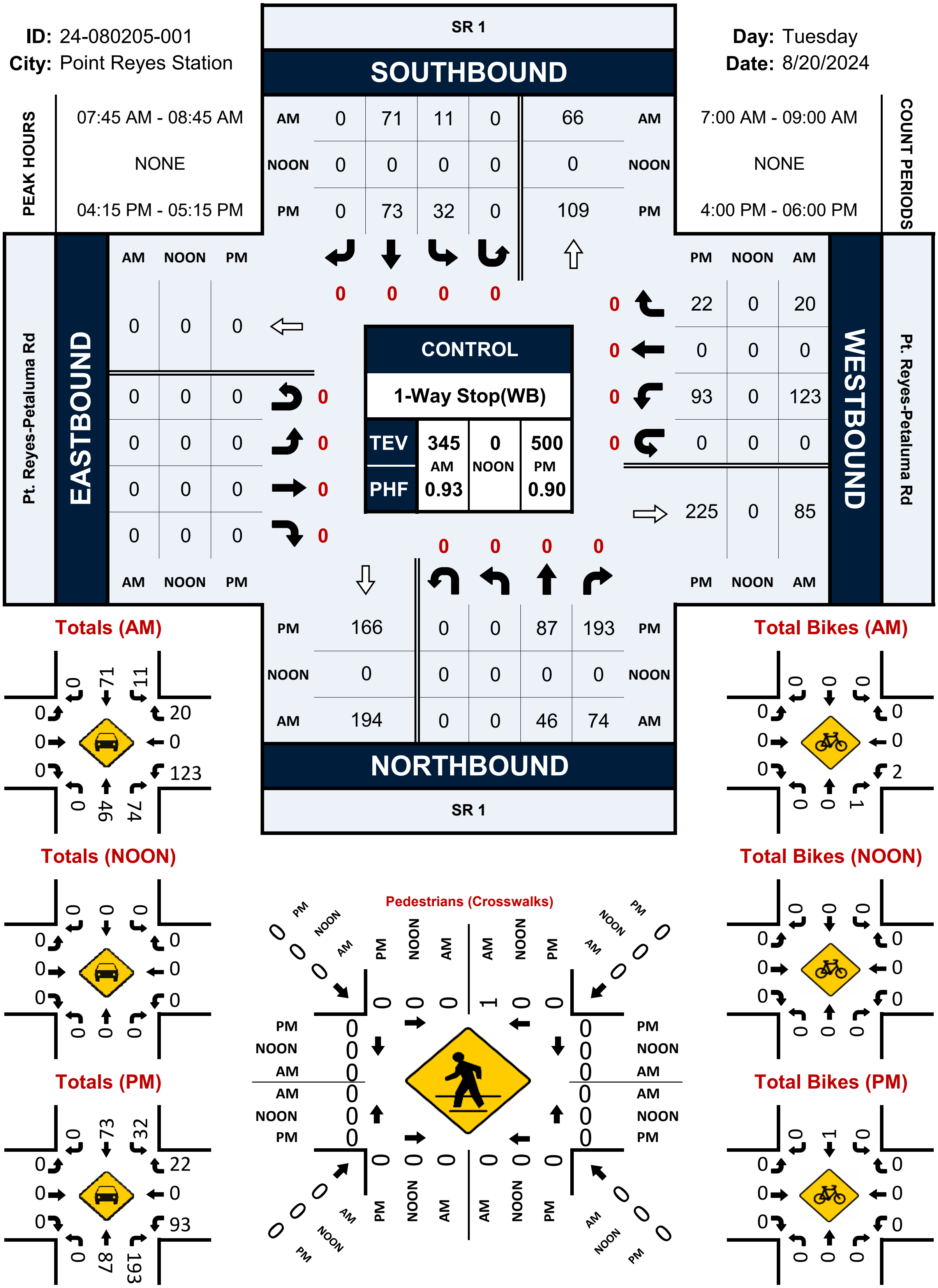


Prepared by National Data & Surveying Services

Figure 4

SR 1 & Pt. Reyes-Petaluma Rd

Peak Hour Turning Movement Count



Attachment A

MEMORANDUM

2171 E. Francisco Blvd., Suite K • San Rafael, California • 94901
TEL: (415) 457-0701 FAX: (415) 457-1638 e-mail: xiaoqingz@stetsonengineers.com

TO: Yan Cui, Property Owner

DATE: September 23, 2024

FROM: Xiaoqing Zeng, PhD, PE

JOB NO: 2904

RE: **Trip Generation Assessment for the Cui Family Land Subdivision Project**

This memorandum documents the trip generation assessment conducted by Stetson Engineers Inc. (Stetson) in support of the Cui Family Land Subdivision Project (Project) in Point Reyes Station, Marin County, California. The assessment concludes that the Project would be expected to generate fewer than 110 daily vehicle trips and, therefore, the Project is presumed to result in a less-than-significant transportation impact and is not subject to a detailed VMT (vehicle miles traveled) analysis, based on the following CEQA Screening Criterion under SB 743.

> *Small Project Screening: Any development that would generate fewer than 110 daily vehicle trips shall be presumed to have a less-than-significant transportation impact.*

Project Description

The subject property (82.32 acres) is located near 11798 State Route 1, Point Reyes Station in Marin County (APN: 119-050-04, 119-050-09, 119-140-03, and 119-140-09). Figure 1a shows the property location in Marin County and Figure 1b shows the project vicinity and the existing property parcels (4 parcels). The property is bounded by Point Reyes-Petaluma Road and Lagunitas Creek on the south, State Route 1 to the west, rural residential housing to the north, and open pastureland to the east.

Figure 2 shows the land use zoning and the property location. The property is within the zoning of C-ARP-3 -- Coastal, Agricultural, Residential Planned (1 unit per 3 acres). The C-ARP land use zoning is designed to preserve productive lands for agricultural use through the clustering of allowed residential development.

The 82.32-acre subject property is proposed to be subdivided into 37 parcels for future single-family residential development (see Figure 3). Of the 37 parcels, 5 parcels are designated as affordable housing. The subdivision considered a density bonus of 35% after meeting the 20% affordable housing requirement.

Trip Generation Factors, Project Characteristics, and Demographics of Point Reyes Station

Trip Generation Factors

Trips are an intermediate good, each one-way trip will be for one of 3 possible purposes: work, school, shop/dine/recreation/other. Trips are also classified as "home-based" if they are produced at home and attracted to the location that gives rise to the trip purpose; or "non-home-based" when they are part of a linked trip in which the trip is produced at one purpose location and attracted to another purpose location. For the purpose of Trip Generation, it is preferred to talk in terms of production and attraction because trips tend to be "produced" at home and attracted to particular activities (work, shop, etc.). A substantial portion of these home-based trips tend to be followed later in the day with a reverse trip home. Non-home-based trips are linked trips between activities that don't involve the home and aren't necessarily followed by a return trip. For home-based trips, the home (the production end) is the trip origin for the outbound trip and the destination for the mirrored return trip (the attraction end is the destination of the outbound trip and the origin of the mirrored return trip). For non-home-based trips, the production end is always the origin and the attraction end is always the destination.

The following trip purposes will be the trip generation factors:

1) Outbound home-based work
2) Outbound home-based school
3) Outbound home-based shopping & recreation
4) Inbound home-based work
5) Inbound home-based school
6) Inbound home-based shopping & recreation
7) Work-based non-home
8) School based non-home
9) Non-home-based shopping & recreation

Project Characteristics

The subject property is zoned as **C-ARP** (Coastal, Agriculture Residential Planned). The C-ARP land use zoning is designed to preserve productive lands for agricultural use through the clustering of allowed residential development. The single-family housing in this land use zoning would be for the on-site farmers and would be very different from the single-family housing in urban and suburban areas in terms of daily trips. Specifically, the on-site farmers of the single-family housing in this land use zoning would not have the following work-related trips:

- Outbound home-based work (factor #1 above)
- Inbound home-based work (factor #4 above)
- Work-based non-home (factor #7 above)

Demographics of Point Reyes Station

Currently there are about 380 residents in Point Reyes Station. Table 1 below shows the demographics of Point Reyes Station. As shown in the table, there are no school-age children (< 17 years old) and most of the residents are more than 65 years old (53%). Residents older than 55 years account for about 86% (33% + 53% = 86%). It is expected that the residents in the new single-family housing in the project area would have similar demographics and would not have the following school-related trips:

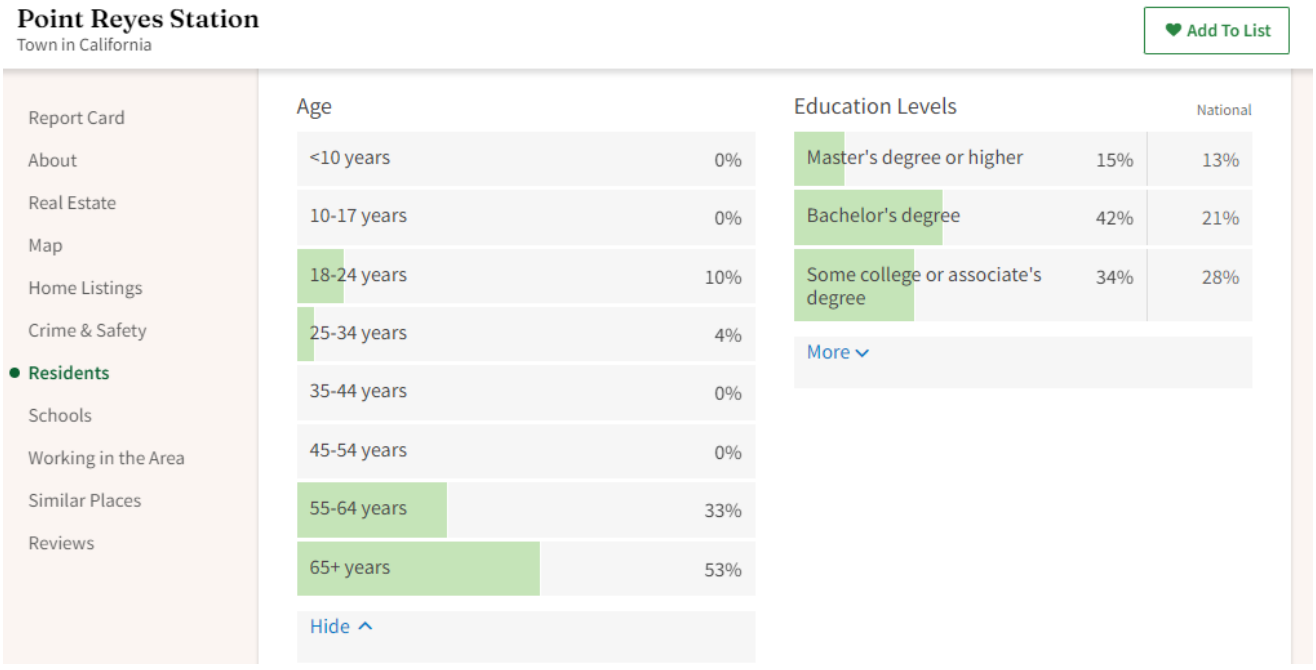
- Outbound home-based school (factor #2 above)
- Inbound home-based school (factor #5 above)
- School-based non-home (factor #8 above)

In addition, seniors would have less trips related to the remaining three trip generation factors that are related to shopping & recreation:

- Outbound home-based shopping & recreation (factor #3 above)
- Inbound home-based shopping & recreation (factor #6 above)
- Non-home-based shopping & recreation (factor #9 above).

Further, the trip generation related to shopping from the project area would be even lower because it's a long way to get to anything, so people aren't likely to be running short errands and generating a lot of trips.

Table 1 Demographics of Point Reyes Station
(Source: https://www.niche.com/places-to-live/point-reyes-station-marin-ca/#residents)



Standard Trip Generation Rates and Their Applicability to the Project

The residential standard trip generation rates published by the Institute of Transportation Engineers (ITE) in the Trip Generation Manual, 11th Edition, 2021 represent the empirical data obtained from urban and suburban areas. Table 2 below is a summary of three relevant residential standard trip generation rates published in the Trip Generation Manual. Refer to Appendix A for more detailed information about the data.

As discussed in the previous section, the standard trip rate for senior single-family housing would be more applicable to the Project that has an average rate of 4.31 daily trips with a range of 2.90 – 6.66. The standard trip rate for senior single-family housing represents the empirical data obtained from urban and suburban areas. The single-family housing of the Project would be for on-site farmers and would most likely generate fewer daily trips than the standard rate. Further, the trip generation from the project area would be even lower because it's a long way to get to anything, so people aren't likely to be running short errands and generating a lot of trips. Taking into consideration all these reasons, the lower end of the data range (2.90) would be more applicable to the Project. Therefore, the Project's 37 units of single-family housing would be expected to generate about 107 daily trips (37 × 2.90 = 107). The 5 units of affordable housing may generate even fewer daily trips. SB 743 also has the following CEQA Screening Criterion:

> Affordable Housing Screening: Projects with 100 percent affordable housing shall be presumed to have a less-than-significant transportation impact on VMT.

Table 2 Standard Daily Trip Rate per Dwelling Unit Published in the ITE's Trip Generation Manual

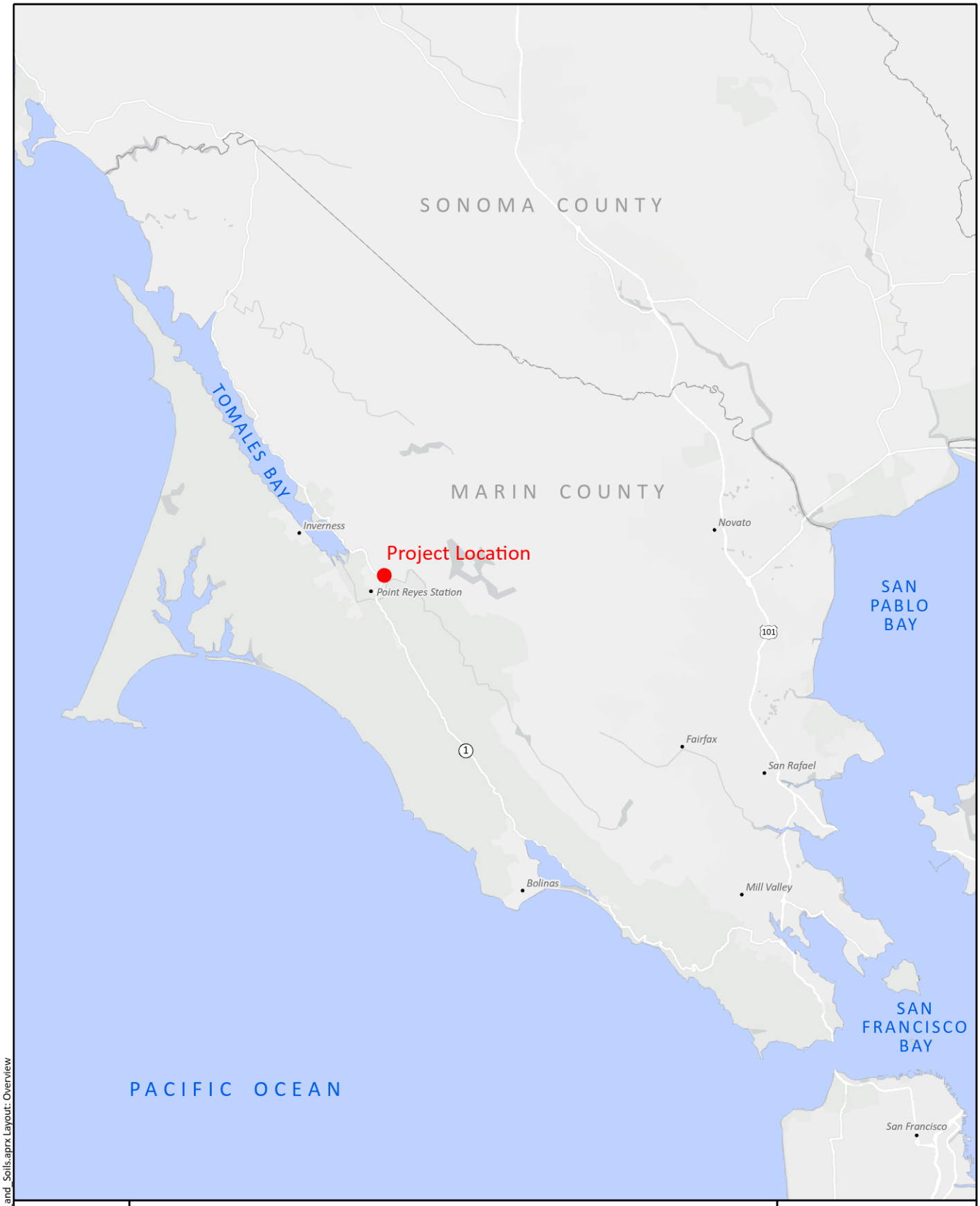
Land Use Type (ITE Code)	Average Rate	Data Range
Single-Family Detached Housing (210)	9.43	4.45 - 22.61
Affordable Housing/ Multi-family (223)*	4.81	4.03 - 12.16
55+ Senior Adult Housing/ Single-Family (251)	4.31	2.90 - 6.66

* The Manual does not have data for single-family affordable housing.

Conclusion

The proposed project would be expected to generate an average of 107 vehicle trips per day, fewer than 110 daily trips (one of the CEQA Screening Criteria under SB 743). Therefore, the Project is presumed to result in a less-than-significant transportation impact and is not subject to a detailed VMT analysis.

Figure 1a



Path: j:\jn2904\Stormwater_and_Soils.aprx Layout: Overview

STETSON ENGINEERS INC.

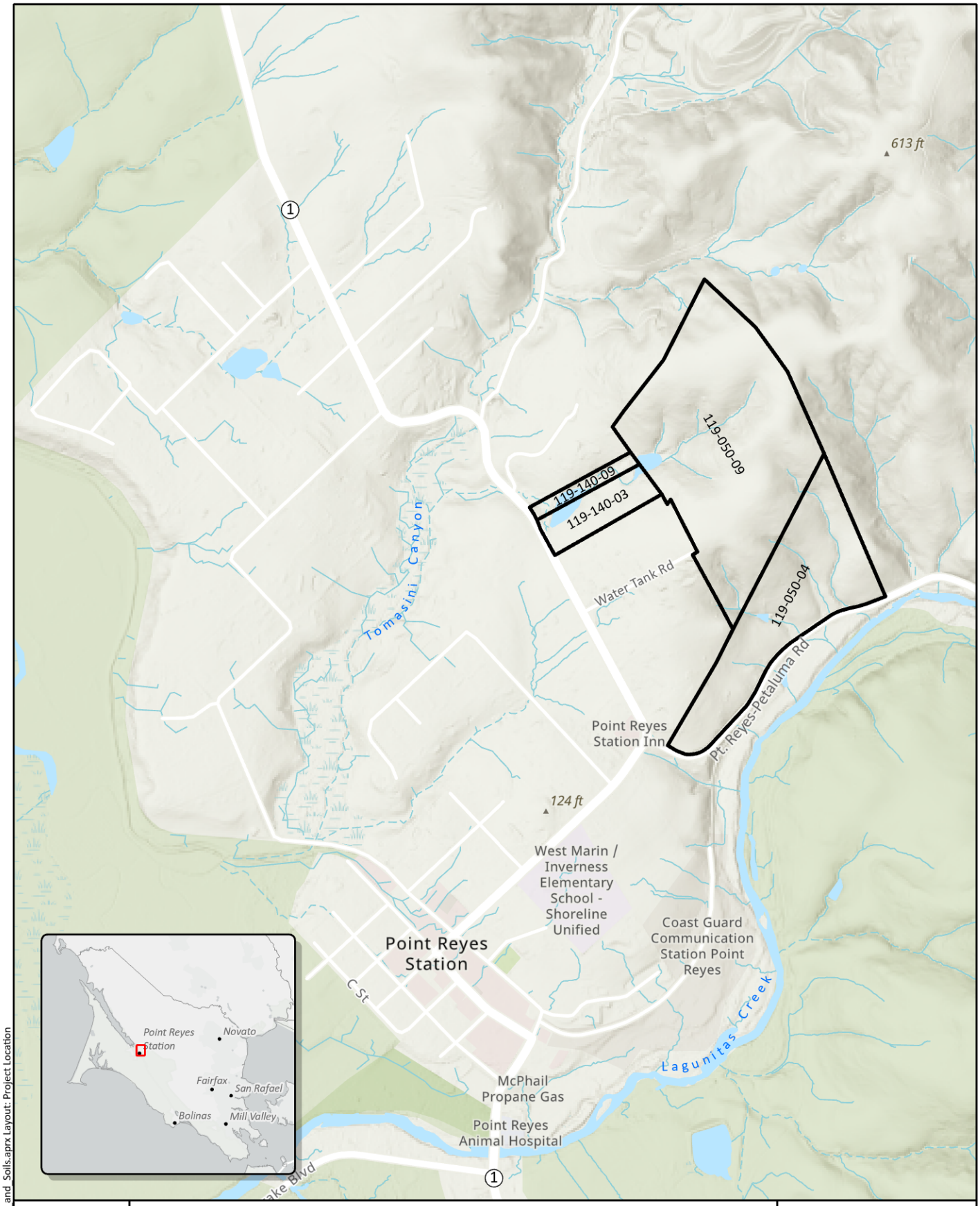
Note:

PROJECT LOCATION
POINT REYES STATION, CA

N

0 3 6
Miles

Figure 1b



Path: J:\jn2904\Stormwater_and_Soils.aprx Layout: Project Location

STETSON ENGINEERS INC.

PROJECT VICINITY AND EXISTING PROPERTY PARCELS
POINT REYES STATION, CA

Note: Parcel Boundaries from Marin County.

N

0 500 1,000

US Feet

Figure 2

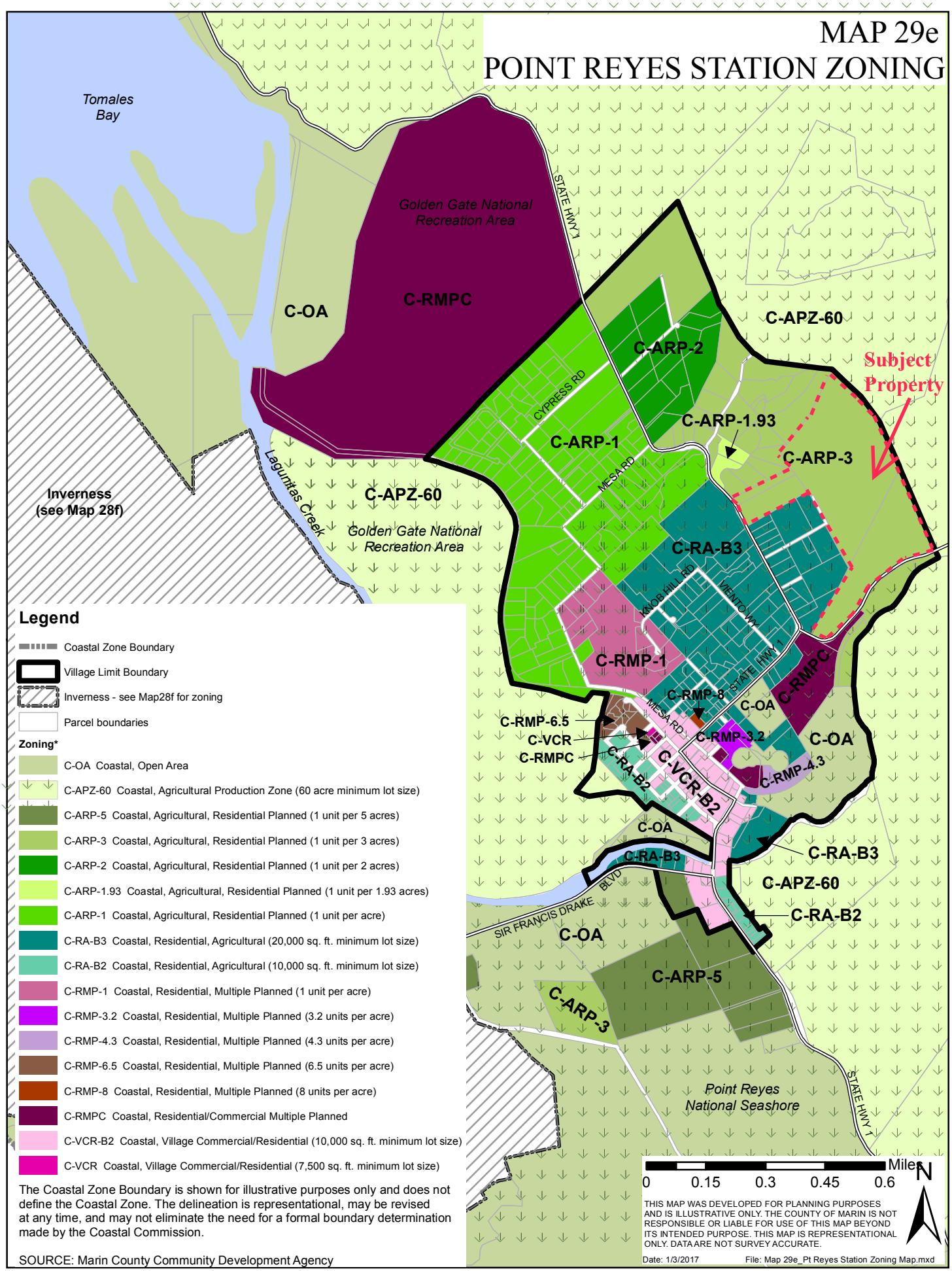
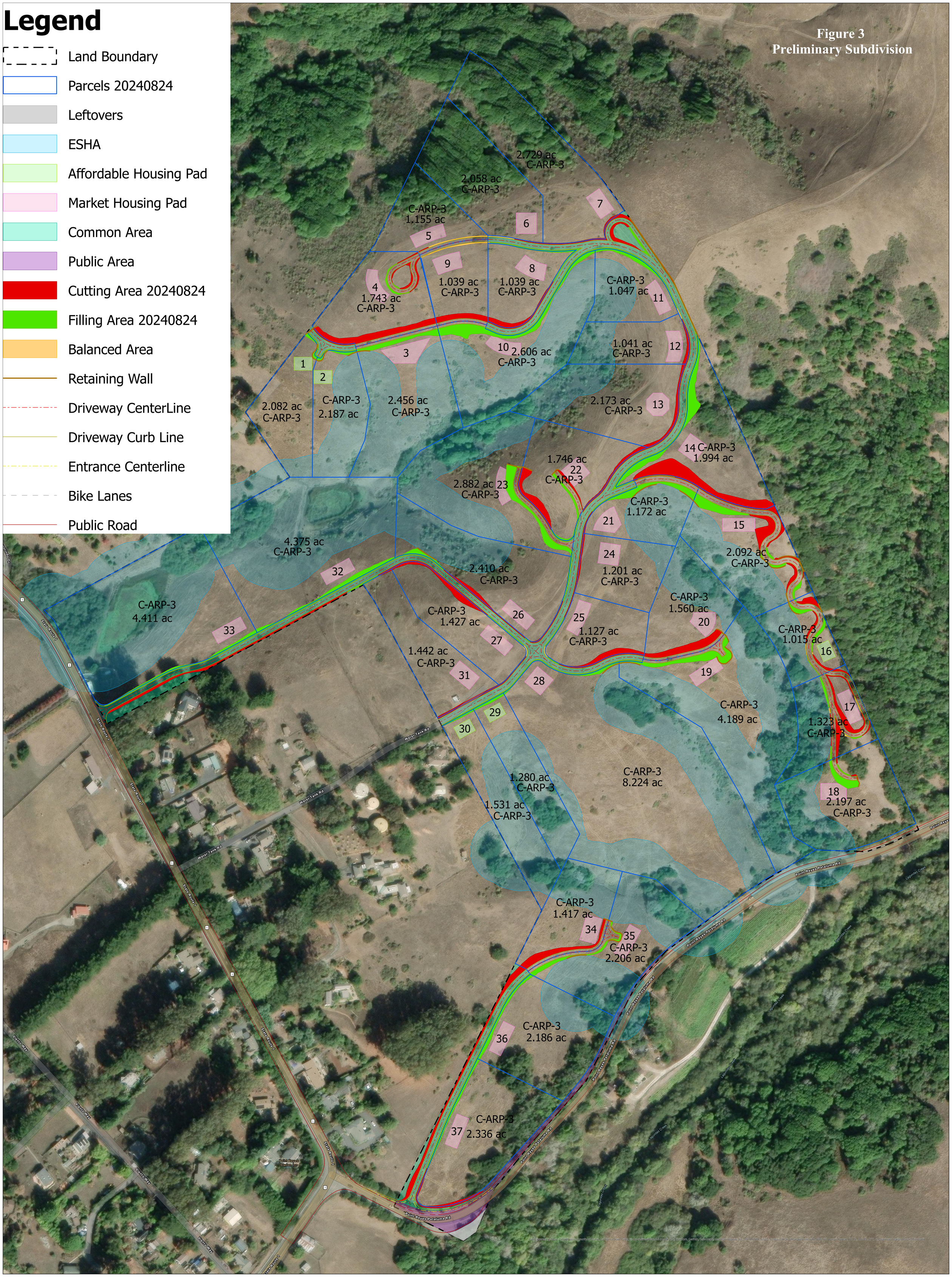

MAP 29e
POINT REYES STATION ZONING
Tomales Bay
Golden Gate National Recreation Area
C-OA
C-RMPC
STATE HWY 1
C-APZ-60
C-ARP-2
Subject Property
CYPRESS RD
C-ARP-1
C-ARP-1.93
C-ARP-3
MESA RD
Inverness (see Map 28f)
Lagunitas Creek
C-APZ-60
Golden Gate National Recreation Area
C-RA-B3
KNOB HILL RD
VIENTO WY
C-RMP-1
STATE HWY 1
C-RMPC
C-RMP-8
C-OA
MESA RD
C-RMP-6.5
C-VCR
C-RMPC
C-RMP-3.2
C-OA
C-RA-B2
C-VCR-B2
C-RMP-4.3
C-OA
C-RA-B3
C-RA-B3
BLVD
C-APZ-60
SIR FRANCIS DRAKE
C-RA-B2
C-OA
C-ARP-5
C-ARP-3
Point Reyes National Seashore
STATE HWY 1
Legend
Coastal Zone Boundary
Village Limit Boundary
Inverness - see Map28f for zoning
Parcel boundaries
Zoning*
C-OA Coastal, Open Area
C-APZ-60 Coastal, Agricultural Production Zone (60 acre minimum lot size)
C-ARP-5 Coastal, Agricultural, Residential Planned (1 unit per 5 acres)
C-ARP-3 Coastal, Agricultural, Residential Planned (1 unit per 3 acres)
C-ARP-2 Coastal, Agricultural, Residential Planned (1 unit per 2 acres)
C-ARP-1.93 Coastal, Agricultural, Residential Planned (1 unit per 1.93 acres)
C-ARP-1 Coastal, Agricultural, Residential Planned (1 unit per acre)
C-RA-B3 Coastal, Residential, Agricultural (20,000 sq. ft. minimum lot size)
C-RA-B2 Coastal, Residential, Agricultural (10,000 sq. ft. minimum lot size)
C-RMP-1 Coastal, Residential, Multiple Planned (1 unit per acre)
C-RMP-3.2 Coastal, Residential, Multiple Planned (3.2 units per acre)
C-RMP-4.3 Coastal, Residential, Multiple Planned (4.3 units per acre)
C-RMP-6.5 Coastal, Residential, Multiple Planned (6.5 units per acre)
C-RMP-8 Coastal, Residential, Multiple Planned (8 units per acre)
C-RMPC Coastal, Residential/Commercial Multiple Planned
C-VCR-B2 Coastal, Village Commercial/Residential (10,000 sq. ft. minimum lot size)
C-VCR Coastal, Village Commercial/Residential (7,500 sq. ft. minimum lot size)
The Coastal Zone Boundary is shown for illustrative purposes only and does not define the Coastal Zone. The delineation is representational, may be revised at any time, and may not eliminate the need for a formal boundary determination made by the Coastal Commission.
SOURCE: Marin County Community Development Agency
Miles
0 0.15 0.3 0.45 0.6
N
THIS MAP WAS DEVELOPED FOR PLANNING PURPOSES AND IS ILLUSTRATIVE ONLY. THE COUNTY OF MARIN IS NOT RESPONSIBLE OR LIABLE FOR USE OF THIS MAP BEYOND ITS INTENDED PURPOSE. THIS MAP IS REPRESENTATIONAL ONLY. DATA ARE NOT SURVEY ACCURATE.
Date: 1/3/2017
File: Map 29e_Pt Reyes Station Zoning Map.mxd

Figure 3
Preliminary Subdivision

Legend

- Land Boundary
- Parcels 20240824
- Leftovers
- ESHA
- Affordable Housing Pad
- Market Housing Pad
- Common Area
- Public Area
- Cutting Area 20240824
- Filling Area 20240824
- Balanced Area
- Retaining Wall
- Driveway CenterLine
- Driveway Curb Line
- Entrance Centerline
- Bike Lanes
- Public Road



Appendix A

Residential Standard Trip Generation Rates for the Following Three Land Use Types (ITE Code):

- **Single-Family Detached Housing (210)**
- **Affordable Housing/ Multi-family (223)**
- **55+ Senior Adult Housing/ Single-Family (251)**

Source: ITE's Trip Generation Manual, 11th Edition, 2021

Land Use: 210
Single-Family Detached Housing

Description

A single-family detached housing site includes any single-family detached home on an individual lot. A typical site surveyed is a suburban subdivision.

Specialized Land Use

Data have been submitted for several single-family detached housing developments with homes that are commonly referred to as patio homes. A patio home is a detached housing unit that is located on a small lot with little (or no) front or back yard. In some subdivisions, communal maintenance of outside grounds is provided for the patio homes. The three patio home sites total 299 dwelling units with overall weighted average trip generation rates of 5.35 vehicle trips per dwelling unit for weekday, 0.26 for the AM adjacent street peak hour, and 0.47 for the PM adjacent street peak hour. These patio home rates based on a small sample of sites are lower than those for single-family detached housing (Land Use 210), lower than those for single-family attached housing (Land Use 251), and higher than those for senior adult housing -- single-family (Land Use 251). Further analysis of this housing type will be conducted in a future edition of *Trip Generation Manual*.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (https://www.ite.org/technical-resources/topics/trip-and-parking-generation/).

For 30 of the study sites, data on the number of residents and number of household vehicles are available. The overall averages for the 30 sites are 3.6 residents per dwelling unit and 1.5 vehicles per dwelling unit.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Arizona, California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Jersey, North Carolina, Ohio, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, Virginia, and West Virginia.

Source Numbers

100, 105, 114, 126, 157, 167, 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 869, 903, 925, 936, 1005, 1007, 1008, 1010, 1033, 1066, 1077,1078, 1079

Single-Family Detached Housing
(210)

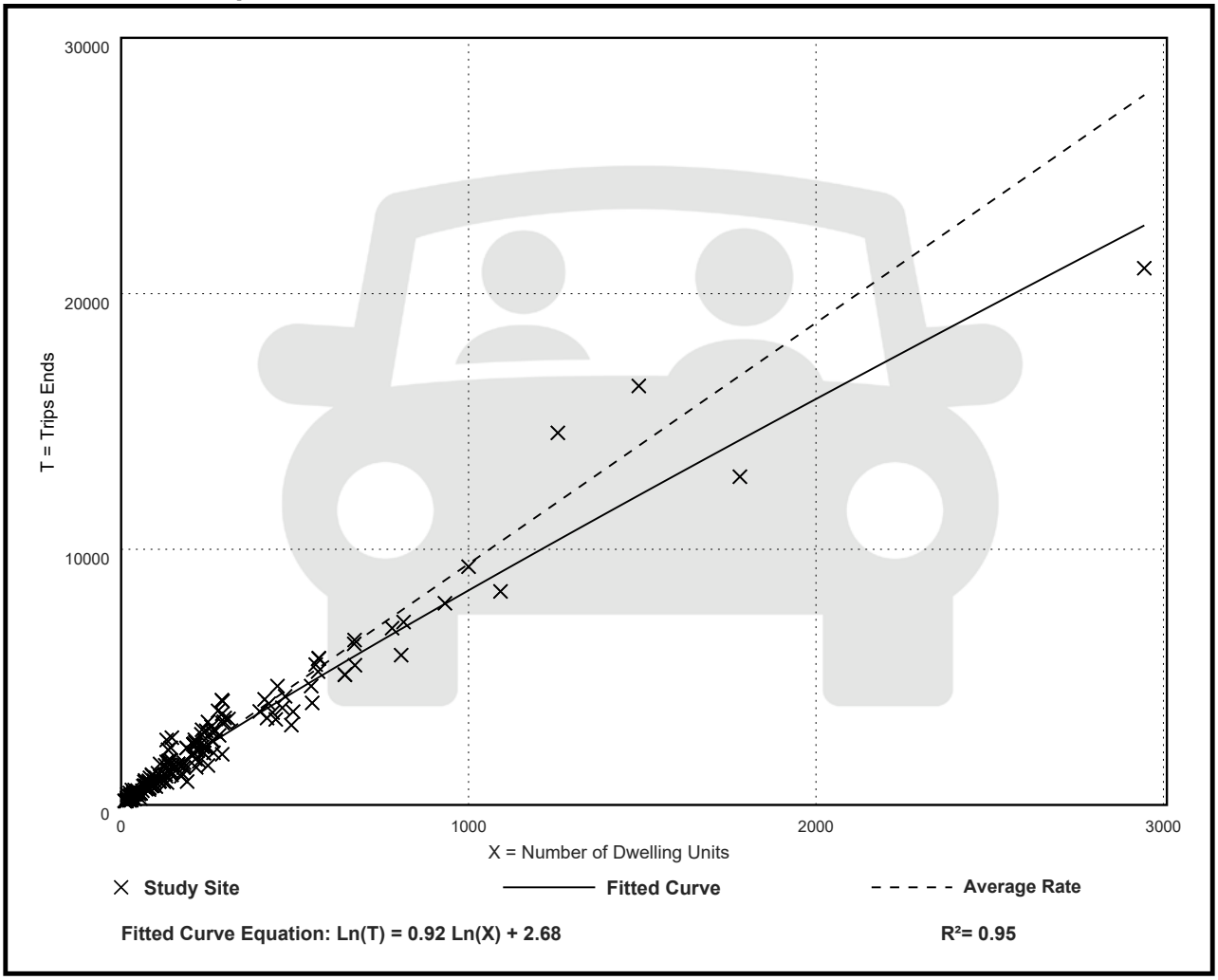
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 174
Avg. Num. of Dwelling Units: 246
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.43	4.45 - 22.61	2.13

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 2.68

R^2= 0.95

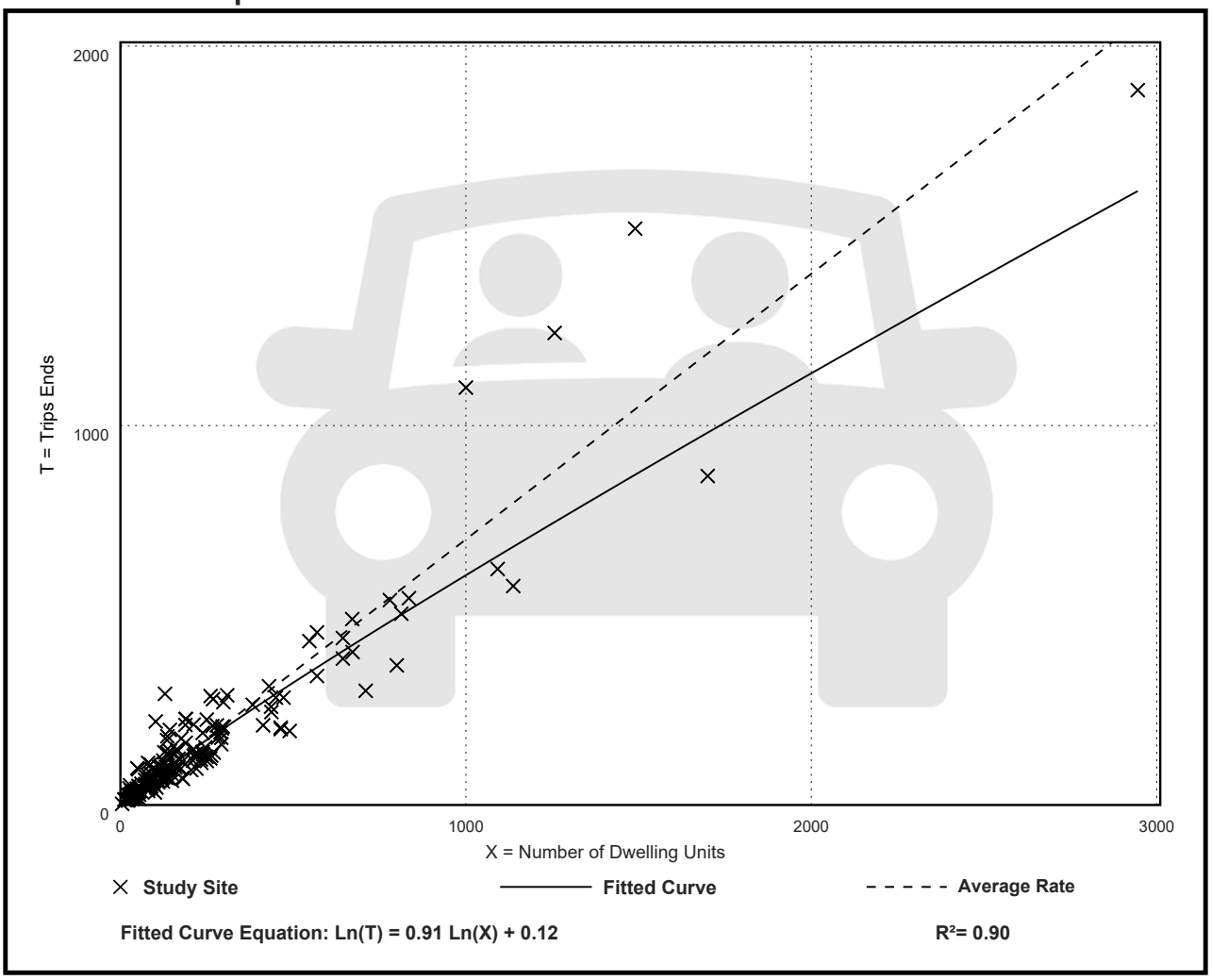
Single-Family Detached Housing
(210)

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: 192
Avg. Num. of Dwelling Units: 226
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.70	0.27 - 2.27	0.24

Data Plot and Equation



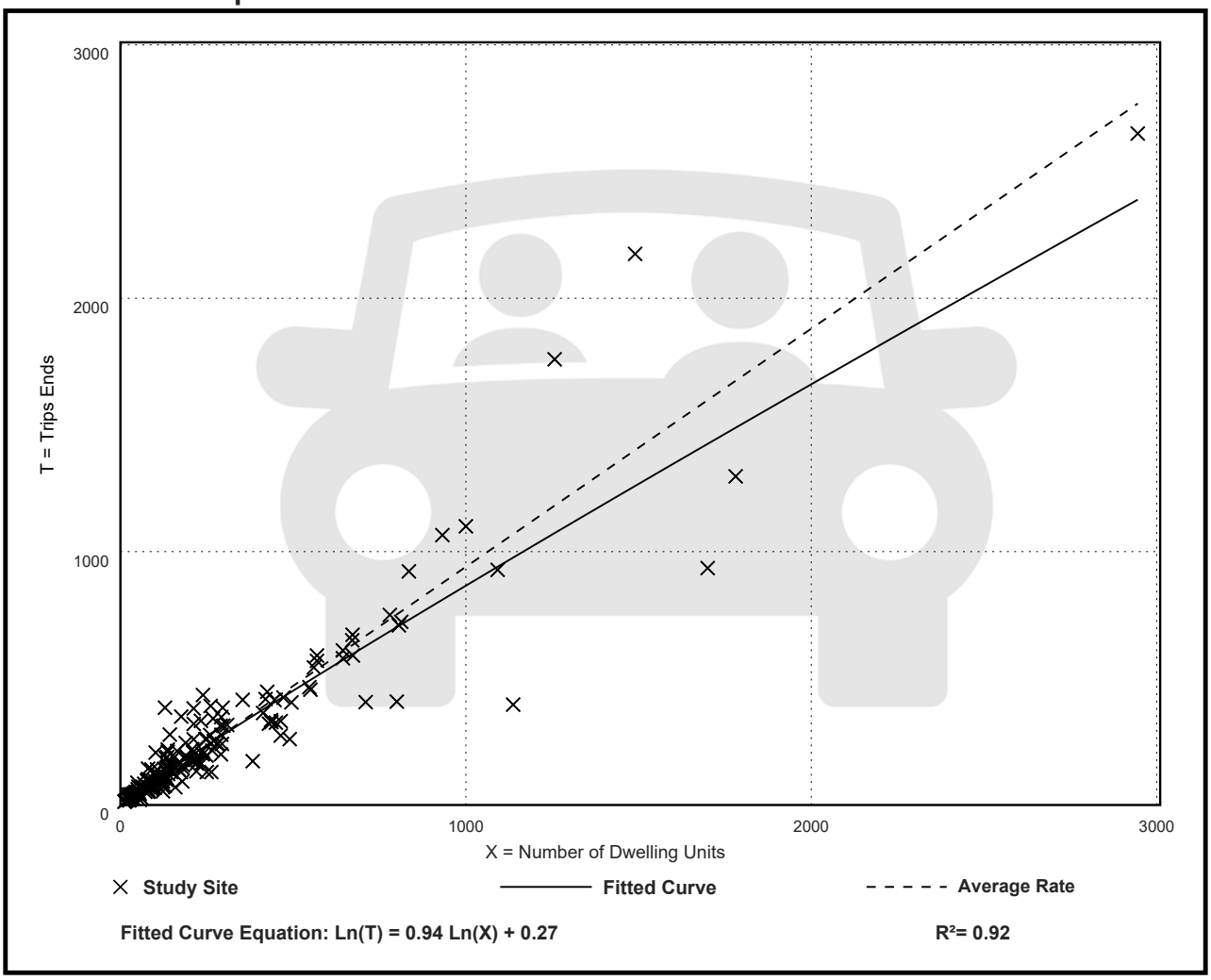
Single-Family Detached Housing
(210)

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: 208
Avg. Num. of Dwelling Units: 248
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.94	0.35 - 2.98	0.31

Data Plot and Equation



Single-Family Detached Housing
(210)

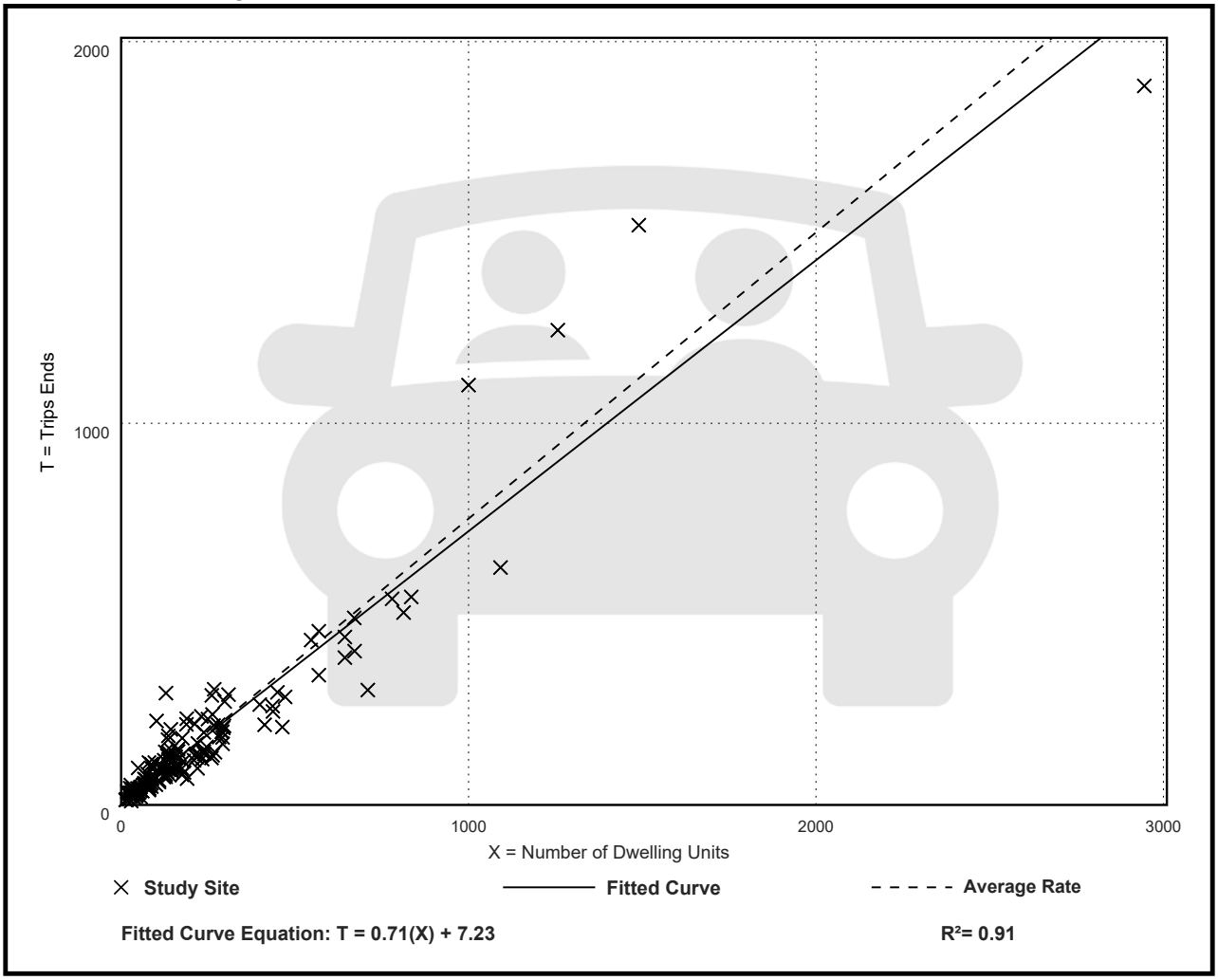
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
AM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 169
Avg. Num. of Dwelling Units: 217
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.75	0.34 - 2.27	0.25

Data Plot and Equation



Fitted Curve Equation: T = 0.71(X) + 7.23

R^2= 0.91

Single-Family Detached Housing
(210)

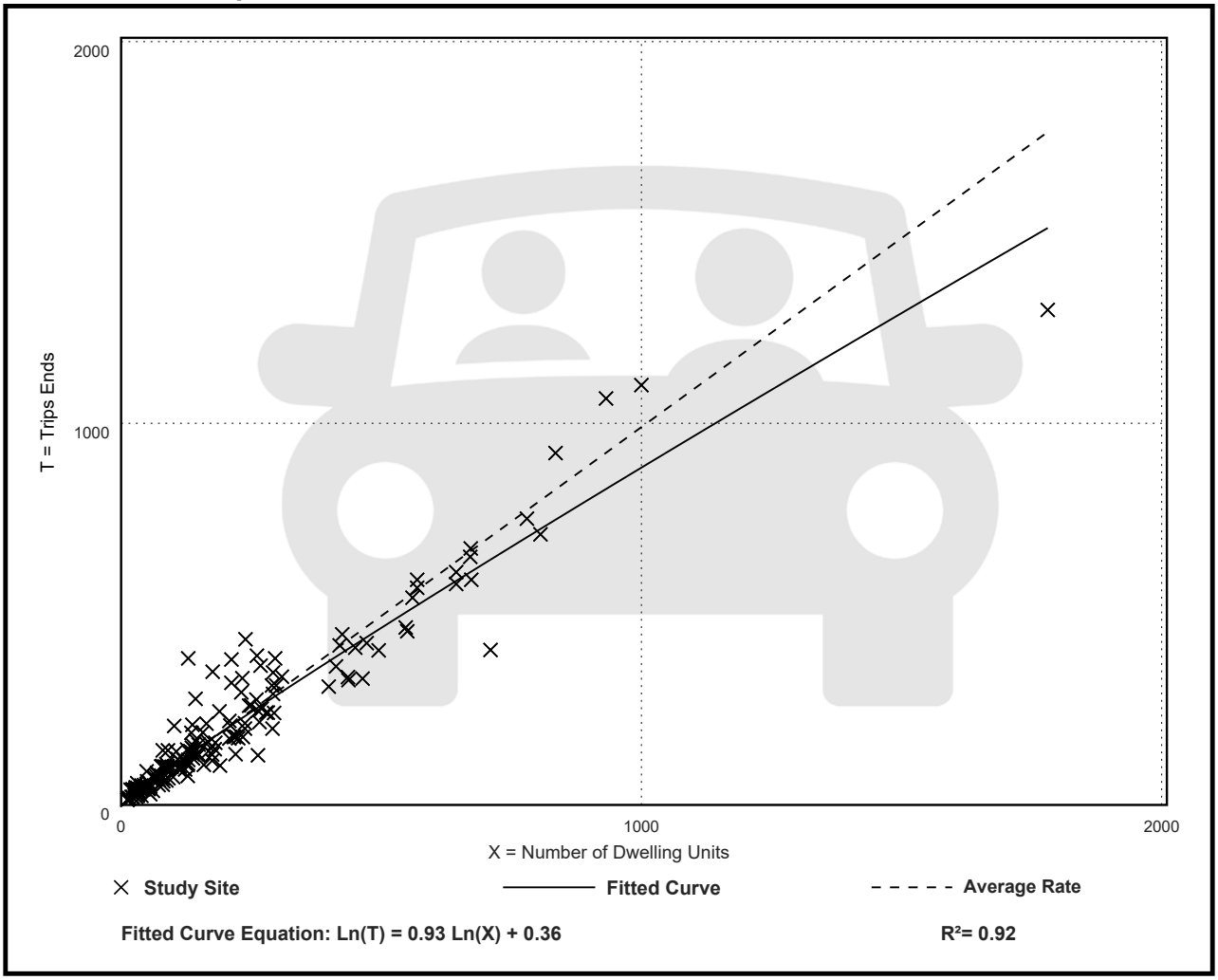
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 178
Avg. Num. of Dwelling Units: 203
Directional Distribution: 64% entering, 36% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.49 - 2.98	0.28

Data Plot and Equation



Single-Family Detached Housing
(210)

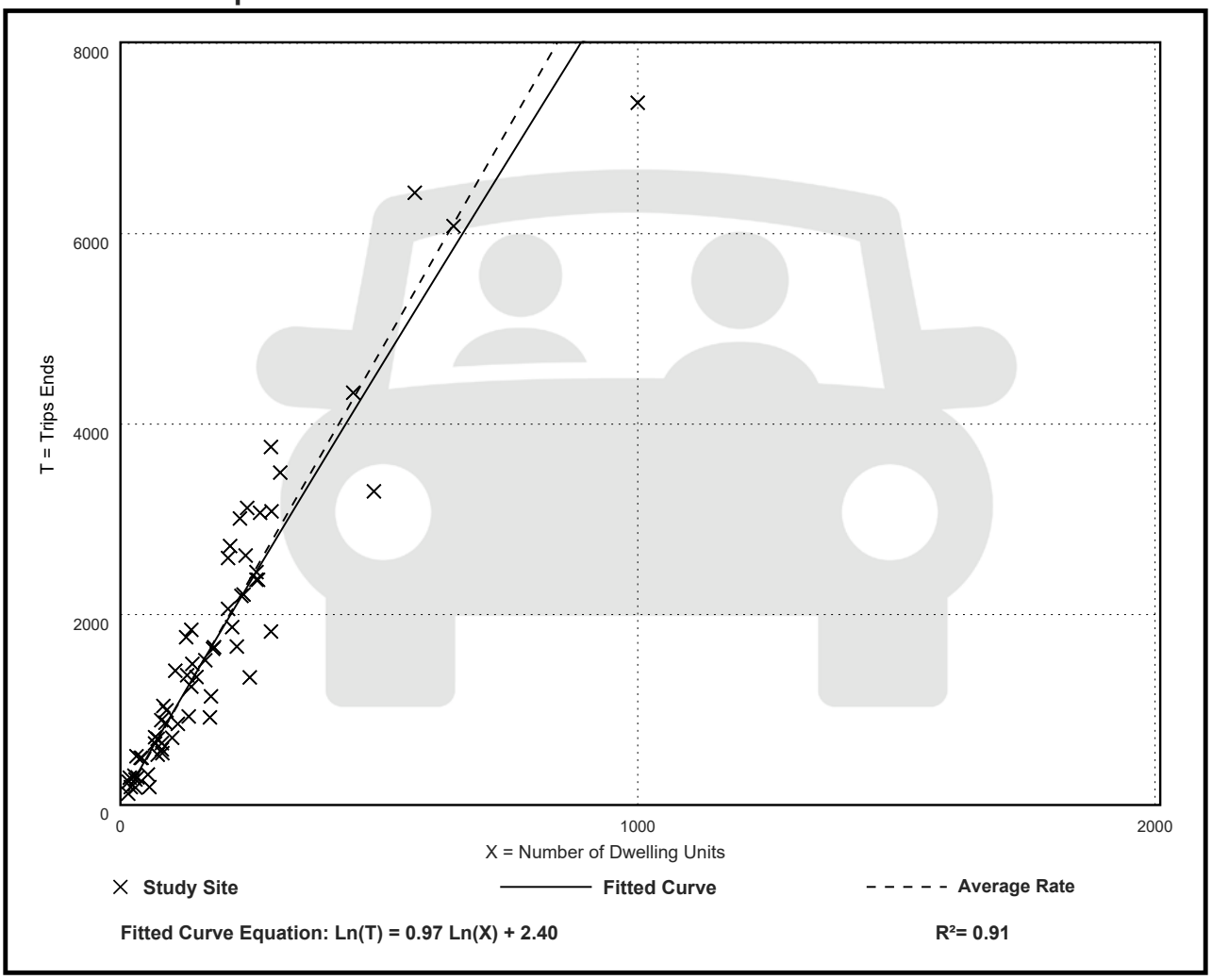
Vehicle Trip Ends vs: Dwelling Units
On a: Saturday

Setting/Location: General Urban/Suburban
Number of Studies: 63
Avg. Num. of Dwelling Units: 179
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.48	3.36 - 16.52	2.26

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.97 Ln(X) + 2.40

R^2= 0.91

Single-Family Detached Housing
(210)

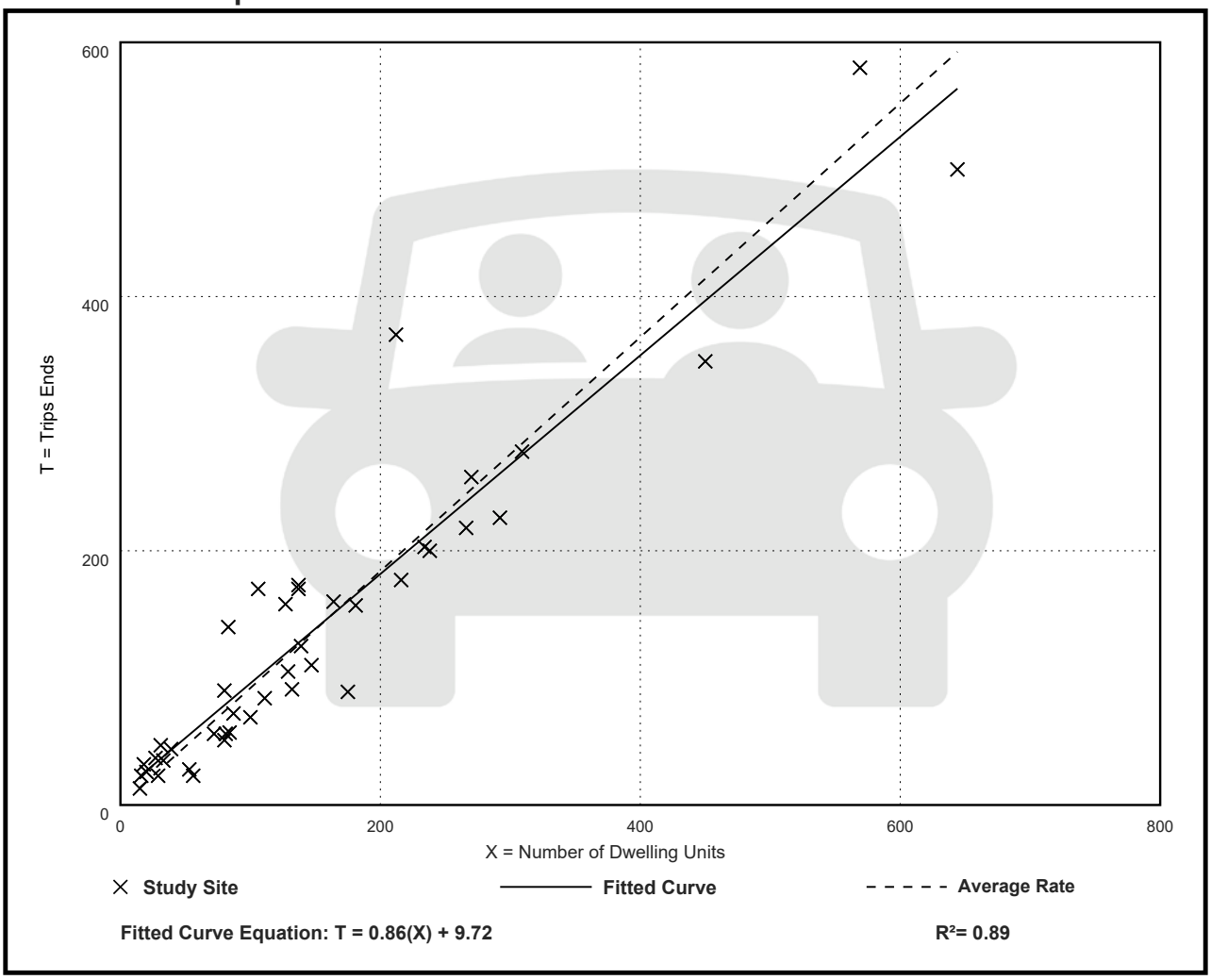
Vehicle Trip Ends vs: Dwelling Units
On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 42
Avg. Num. of Dwelling Units: 152
Directional Distribution: 54% entering, 46% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.92	0.41 - 1.78	0.27

Data Plot and Equation



Fitted Curve Equation: T = 0.86(X) + 9.72

R^2= 0.89

Single-Family Detached Housing
(210)

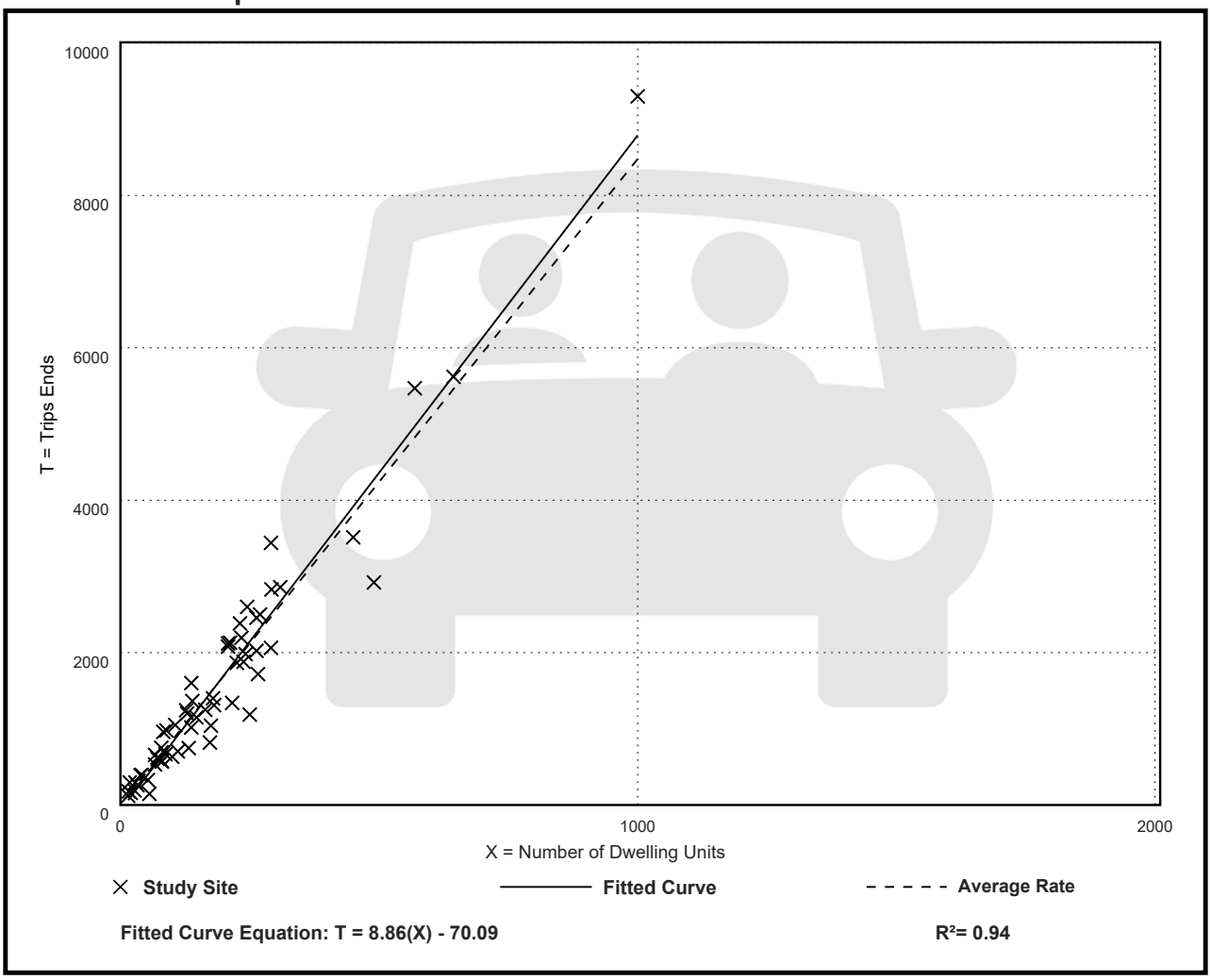
Vehicle Trip Ends vs: Dwelling Units
On a: Sunday

Setting/Location: General Urban/Suburban
Number of Studies: 60
Avg. Num. of Dwelling Units: 186
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
8.48	2.61 - 16.44	1.74

Data Plot and Equation



Single-Family Detached Housing
(210)

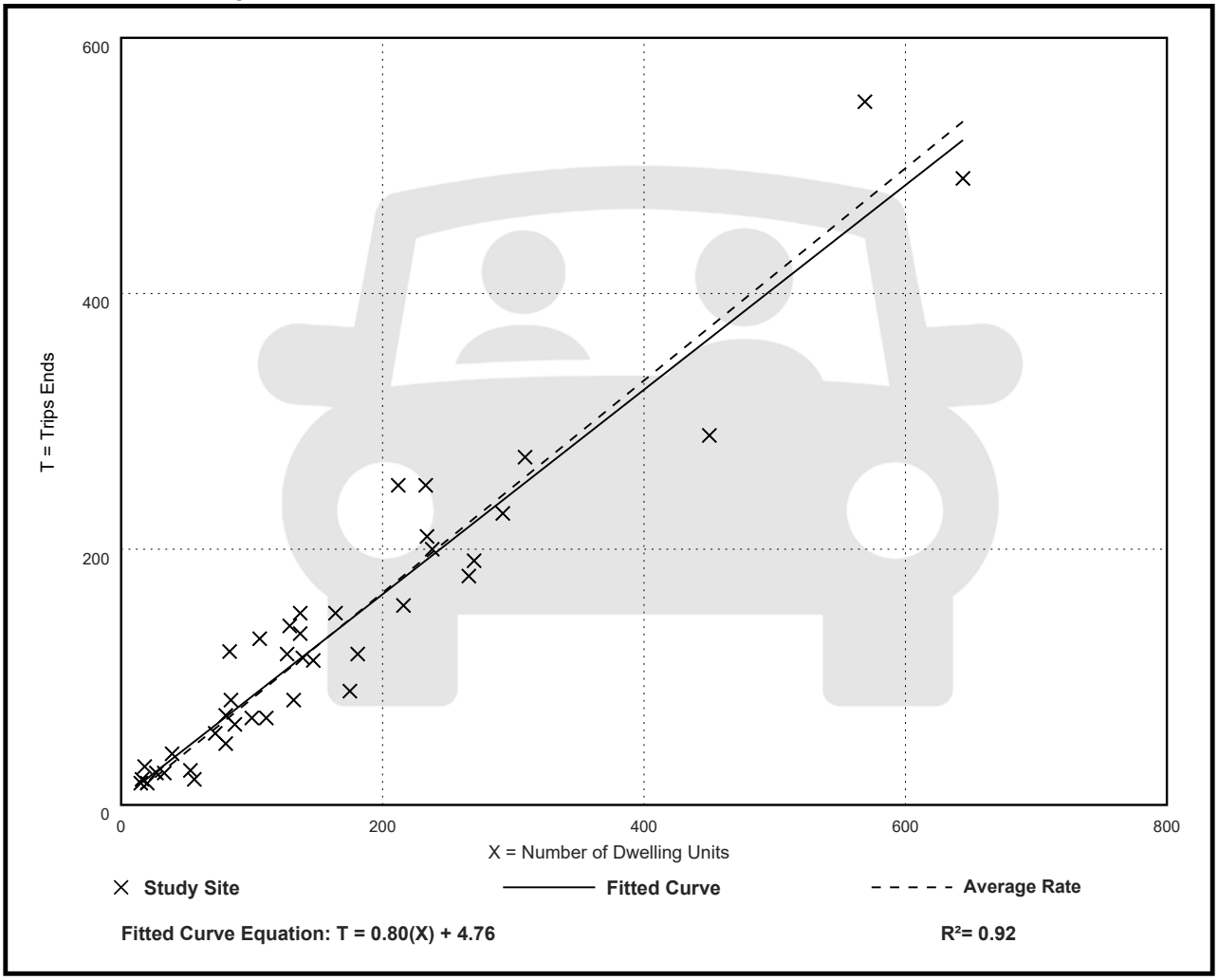
Vehicle Trip Ends vs: Dwelling Units
On a: Sunday, Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 40
Avg. Num. of Dwelling Units: 162
Directional Distribution: 53% entering, 47% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.83	0.36 - 1.67	0.19

Data Plot and Equation



Single-Family Detached Housing
(210)

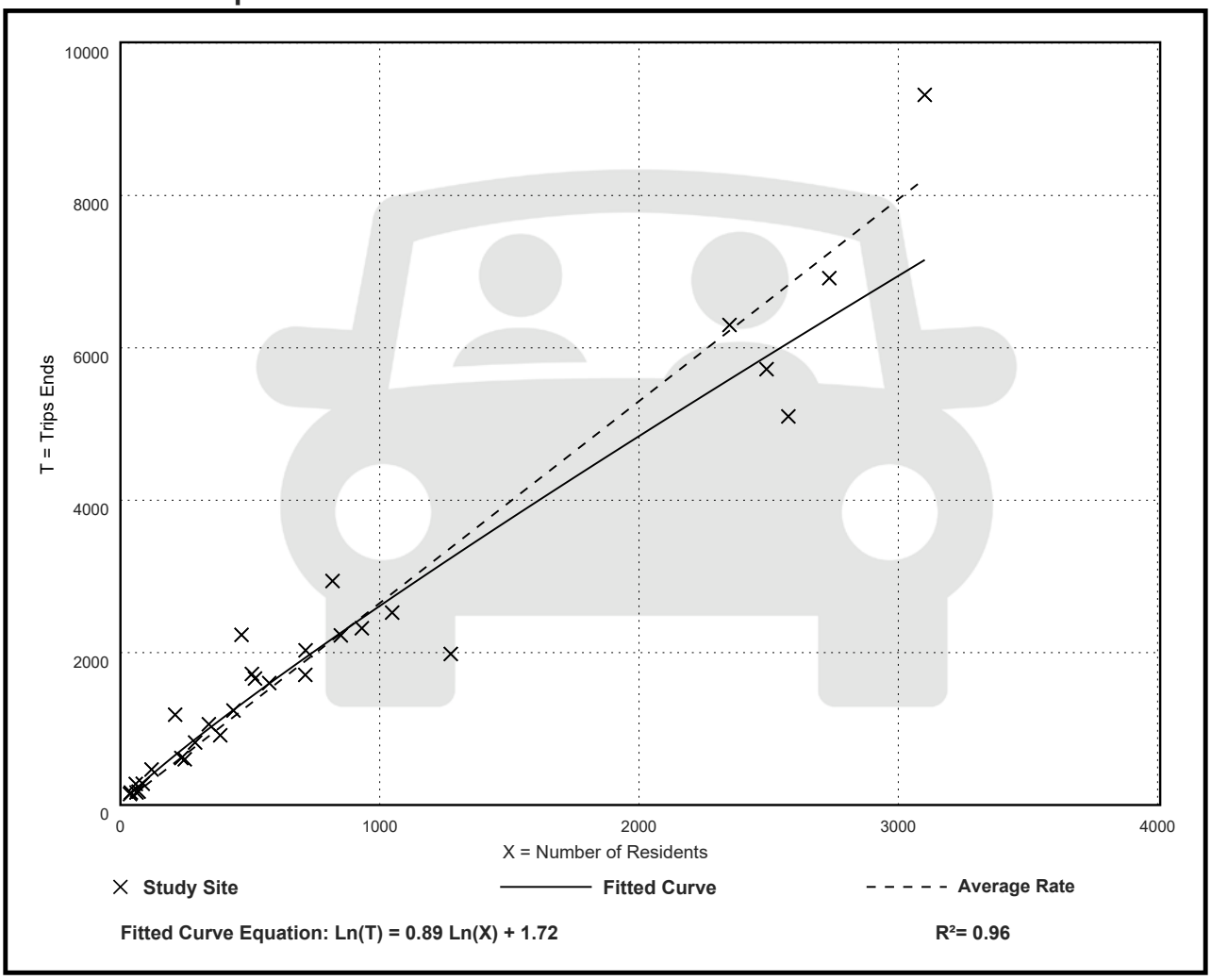
Vehicle Trip Ends vs: Residents
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 30
Avg. Num. of Residents: 810
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
2.65	1.56 - 5.62	0.64

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.89 Ln(X) + 1.72

R^2= 0.96

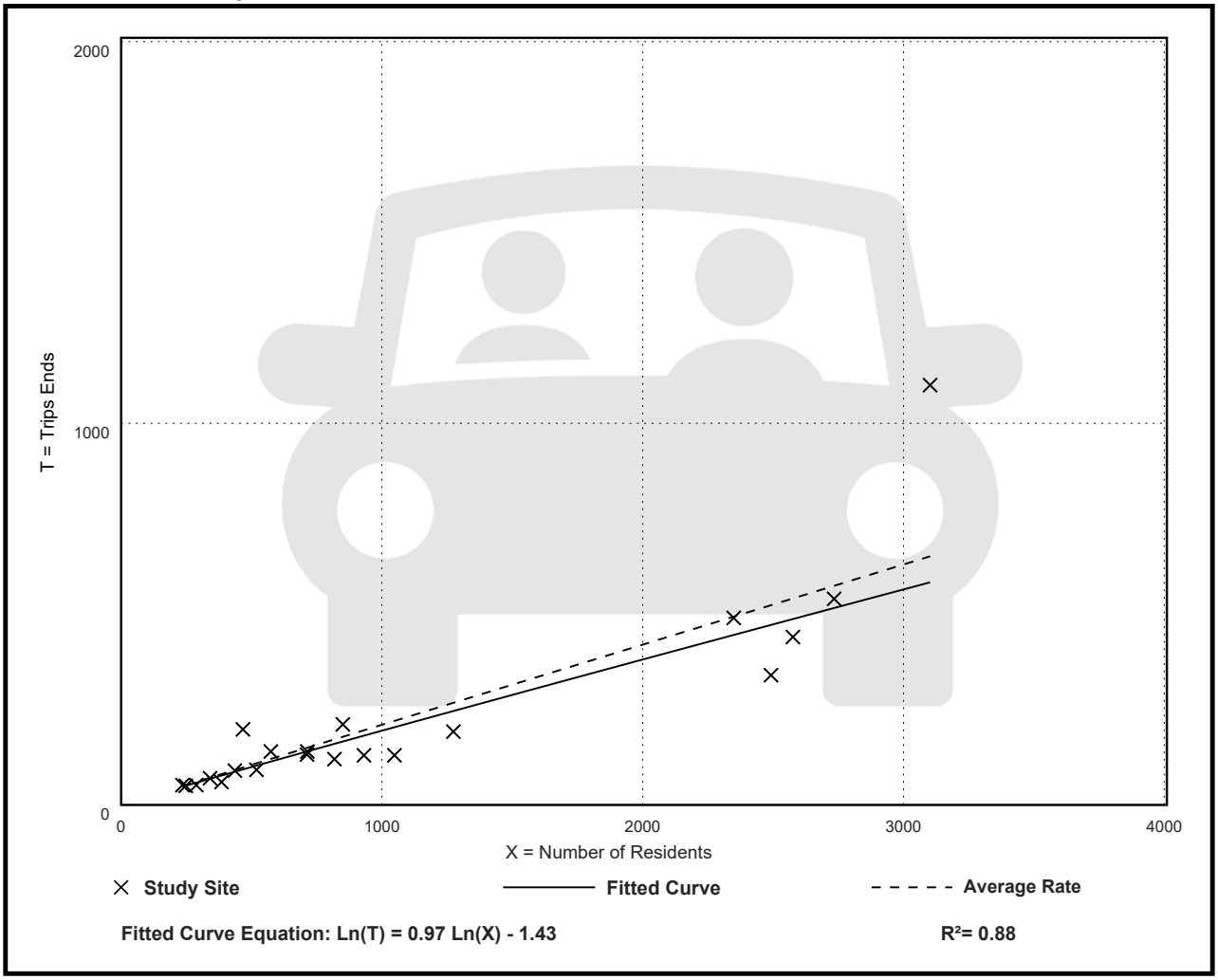
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Residents**
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: 21
Avg. Num. of Residents: 1100
Directional Distribution: 31% entering, 69% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.21	0.12 - 0.42	0.08

Data Plot and Equation



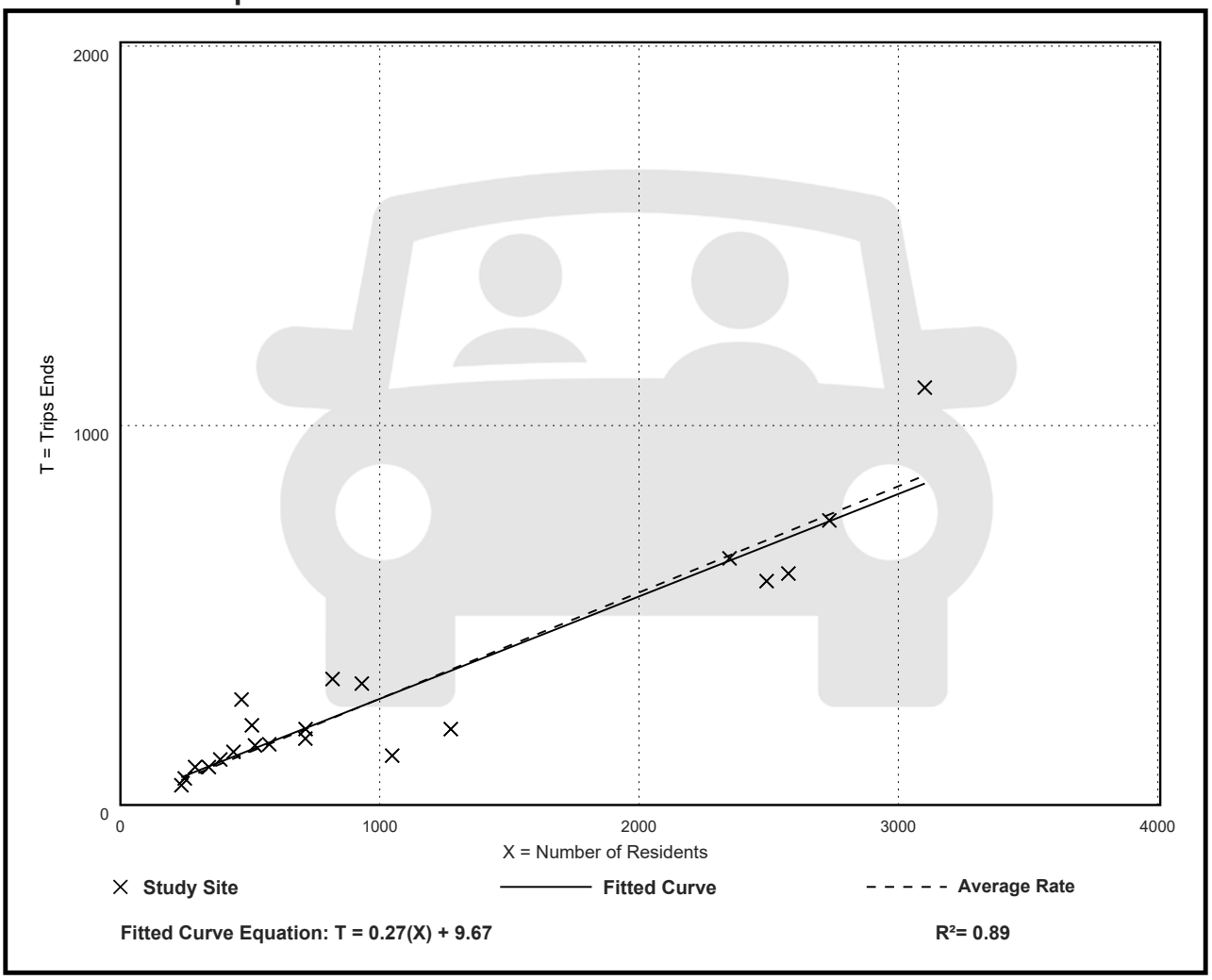
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs: **Residents**
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: 21
Avg. Num. of Residents: 1083
Directional Distribution: 66% entering, 34% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.28	0.12 - 0.60	0.08

Data Plot and Equation



Single-Family Detached Housing
(210)

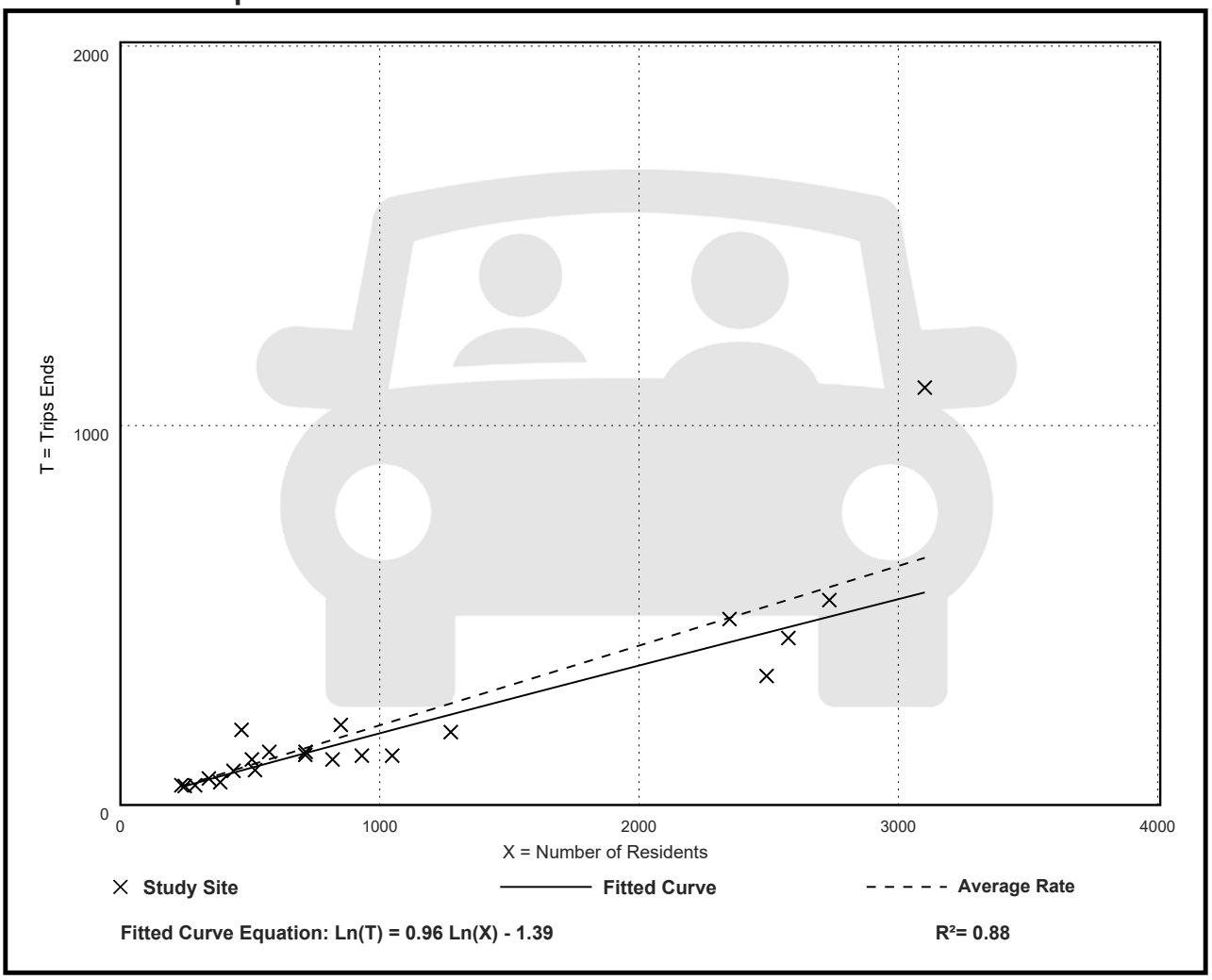
Vehicle Trip Ends vs: Residents
On a: Weekday,
AM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 22
Avg. Num. of Residents: 1073
Directional Distribution: 30% entering, 70% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.21	0.12 - 0.42	0.08

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.96 Ln(X) - 1.39

R^2= 0.88

Single-Family Detached Housing
(210)

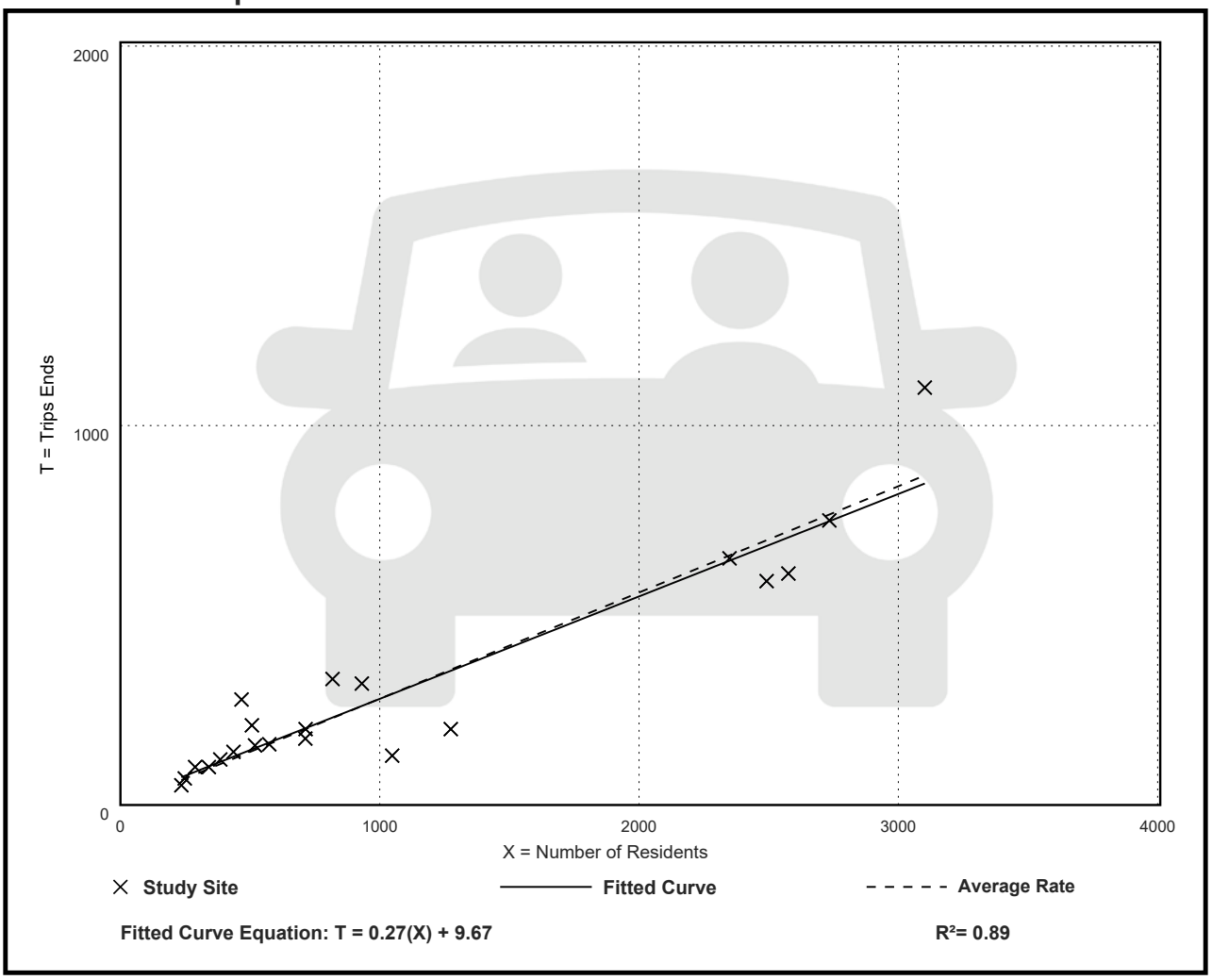
Vehicle Trip Ends vs: Residents
On a: Weekday,
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 21
Avg. Num. of Residents: 1083
Directional Distribution: 66% entering, 34% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.28	0.12 - 0.60	0.08

Data Plot and Equation



Single-Family Detached Housing
(210)

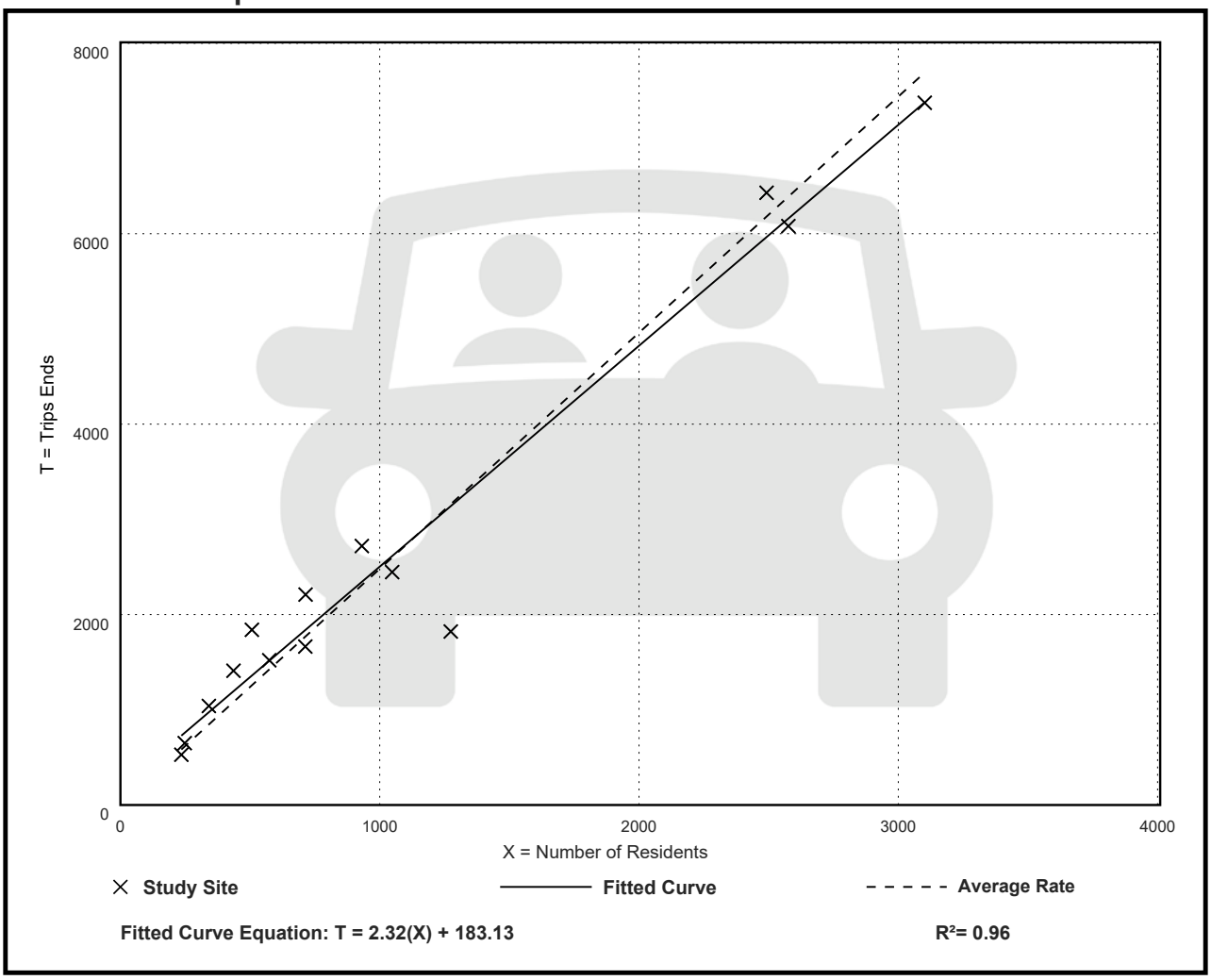
Vehicle Trip Ends vs: Residents
On a: Saturday

Setting/Location: General Urban/Suburban
Number of Studies: 14
Avg. Num. of Residents: 1085
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
2.48	1.43 - 3.63	0.46

Data Plot and Equation



Fitted Curve Equation: T = 2.32(X) + 183.13

R^2= 0.96

Single-Family Detached Housing
(210)

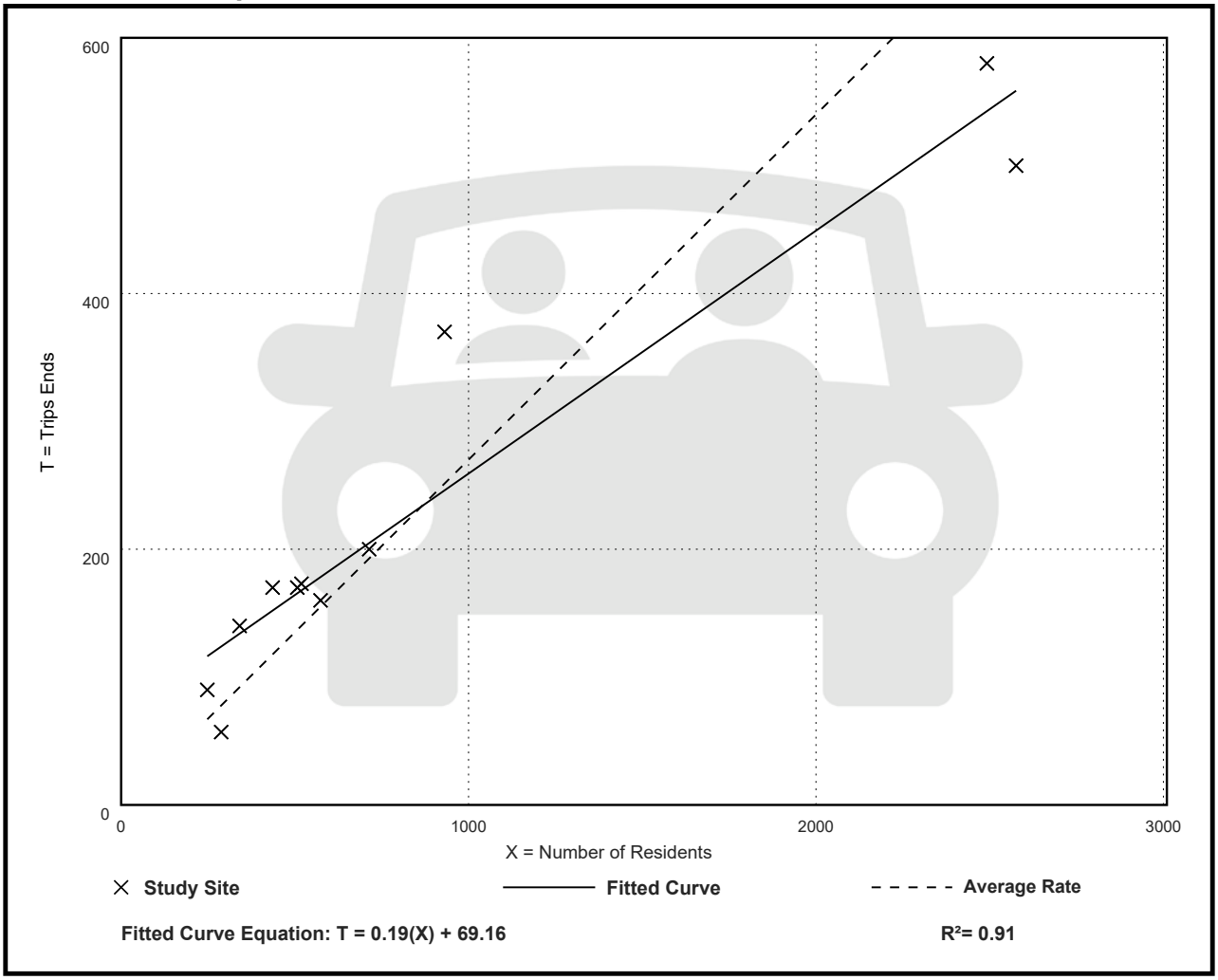
Vehicle Trip Ends vs: Residents
On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 11
Avg. Num. of Residents: 875
Directional Distribution: 54% entering, 46% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.27	0.19 - 0.41	0.08

Data Plot and Equation



Fitted Curve Equation: T = 0.19(X) + 69.16

R^2= 0.91

Single-Family Detached Housing
(210)

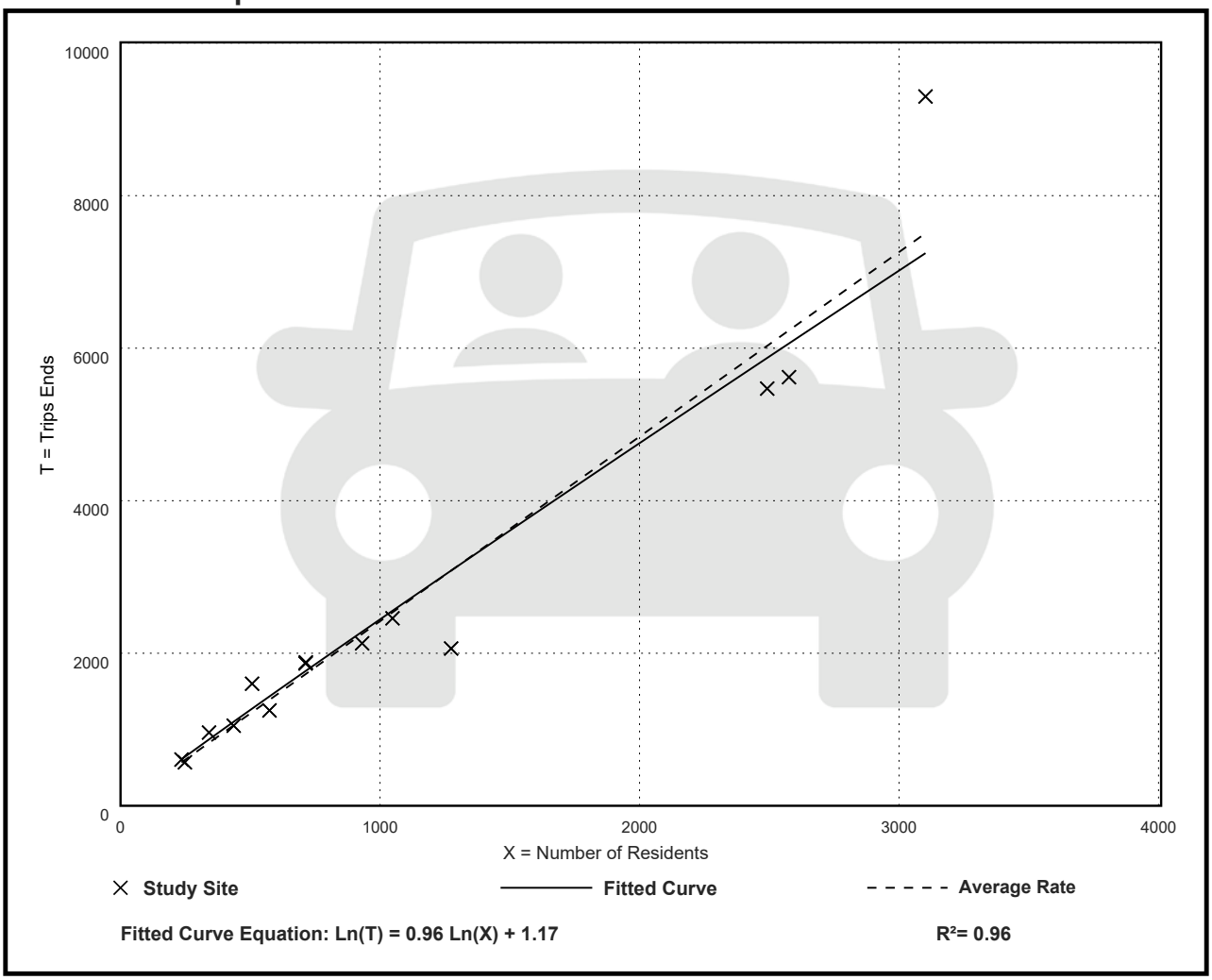
Vehicle Trip Ends vs: Residents
On a: Sunday

Setting/Location: General Urban/Suburban
Number of Studies: 14
Avg. Num. of Residents: 1085
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
2.42	1.62 - 3.16	0.43

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.96 Ln(X) + 1.17

R^2= 0.96

Single-Family Detached Housing
(210)

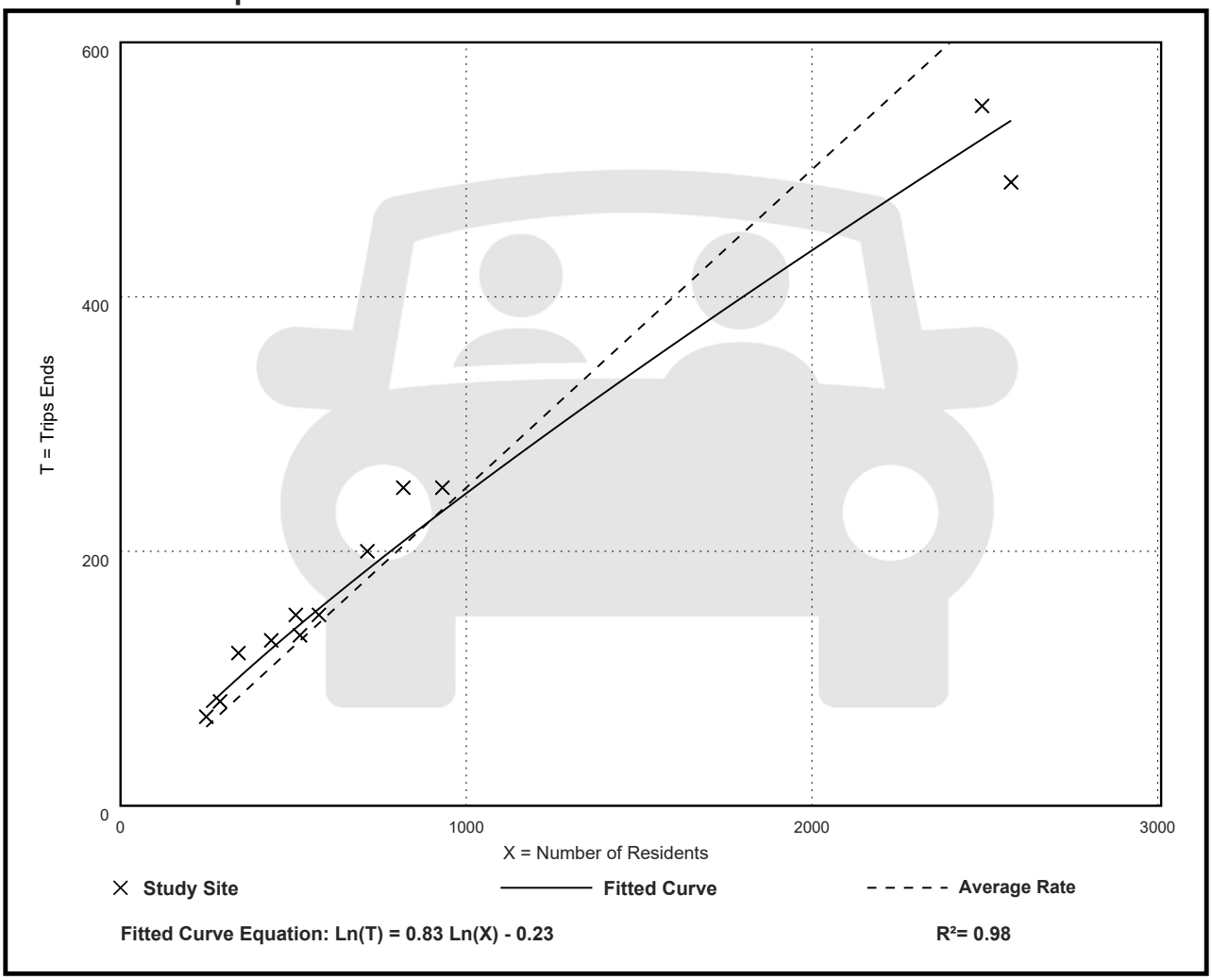
Vehicle Trip Ends vs: Residents
On a: Sunday, Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 12
Avg. Num. of Residents: 870
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.25	0.19 - 0.35	0.05

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.83 Ln(X) - 0.23

R^2= 0.98

Land Use: 223
Affordable Housing

Description

Affordable housing includes all multifamily housing that is rented at below market rate to households that include at least one employed member. Eligibility to live in affordable housing can be a function of limited household income and resident age. Multifamily housing (low-rise) (Land Use 220), multifamily housing (mid-rise) (Land Use 221), and multifamily housing (high-rise) (Land Use 222) are related land uses.

Land Use Subcategory

Data are presented for three subcategories for this land use: (1) sites with income limitations for its tenants (denoted as income limits in the data plots), (2) sites with both minimum age thresholds and income limitations for its tenants (denoted as senior in the data plots), and (3) sites designed for and occupied by residents with special needs, such as persons with physical and mental impairments, single mothers, recovering addicts and others living in a group setting.

Additional Data

For most study sites contained in this land use, all dwelling units in the development are classified as affordable units. For residential study sites that provide a mix of market value and affordable units, the study sites with at least 75 percent of the dwelling units designated as affordable are also included in this land use database.

It is expected that the number of bedrooms and number of residents are likely correlated to the trips generated by a residential site. To assist in future analysis, trip generation studies of all multifamily housing should attempt to obtain information on occupancy rate and on the mix of residential unit sizes (i.e., number of units by number of bedrooms at the site complex).

The sites were surveyed in the 1980s and 2010s in California, Ontario (CAN), and New Jersey.

Source Numbers

237, 918, 1003, 1004, 1046, 1057

Affordable Housing - Income Limits
(223)

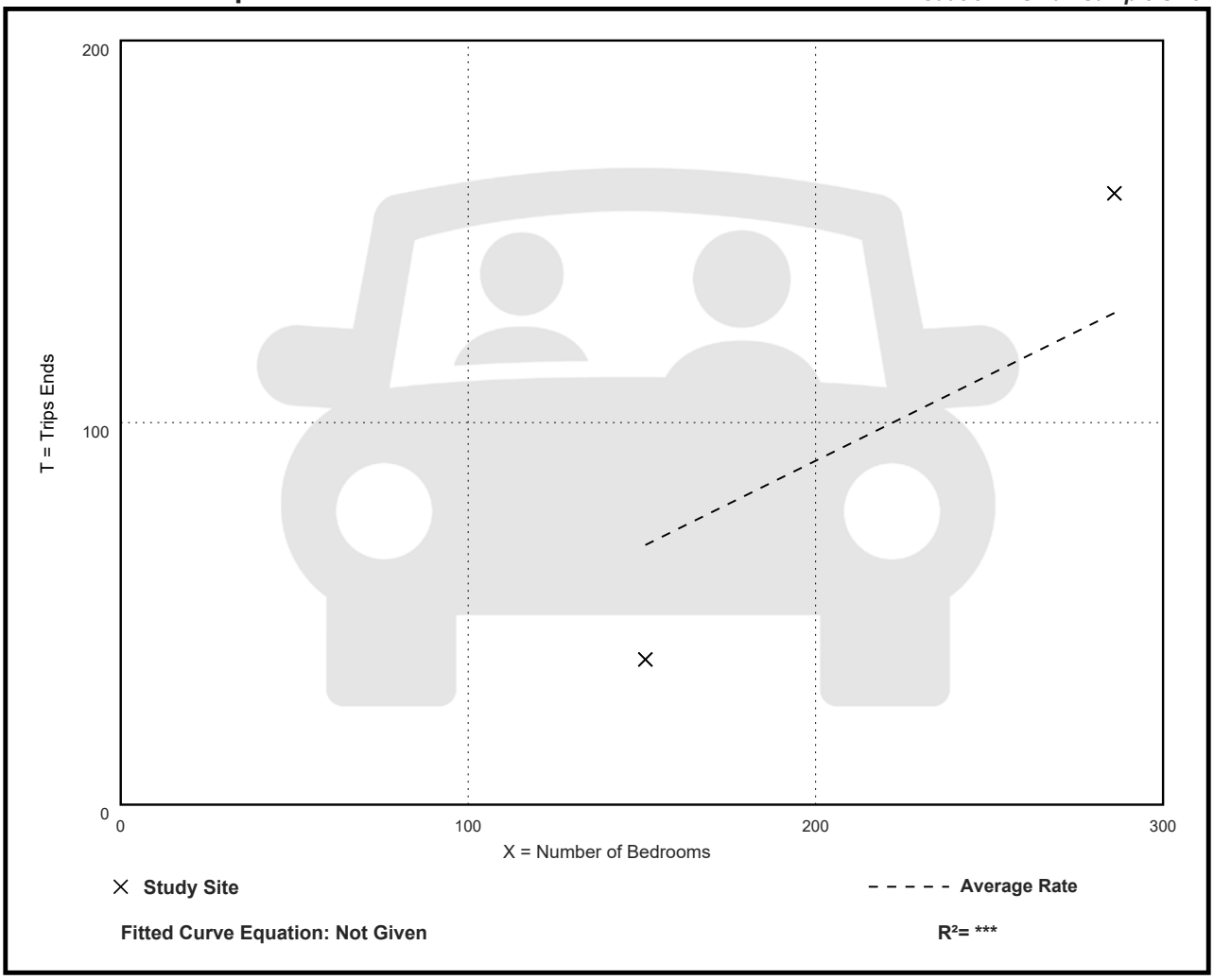
Vehicle Trip Ends vs: Bedrooms
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Bedrooms: 219
Directional Distribution: 37% entering, 63% exiting

Vehicle Trip Generation per Bedroom

Average Rate	Range of Rates	Standard Deviation
0.45	0.25 - 0.56	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits
(223)

Vehicle Trip Ends vs: Bedrooms
On a: Weekday,
AM Peak Hour of Generator

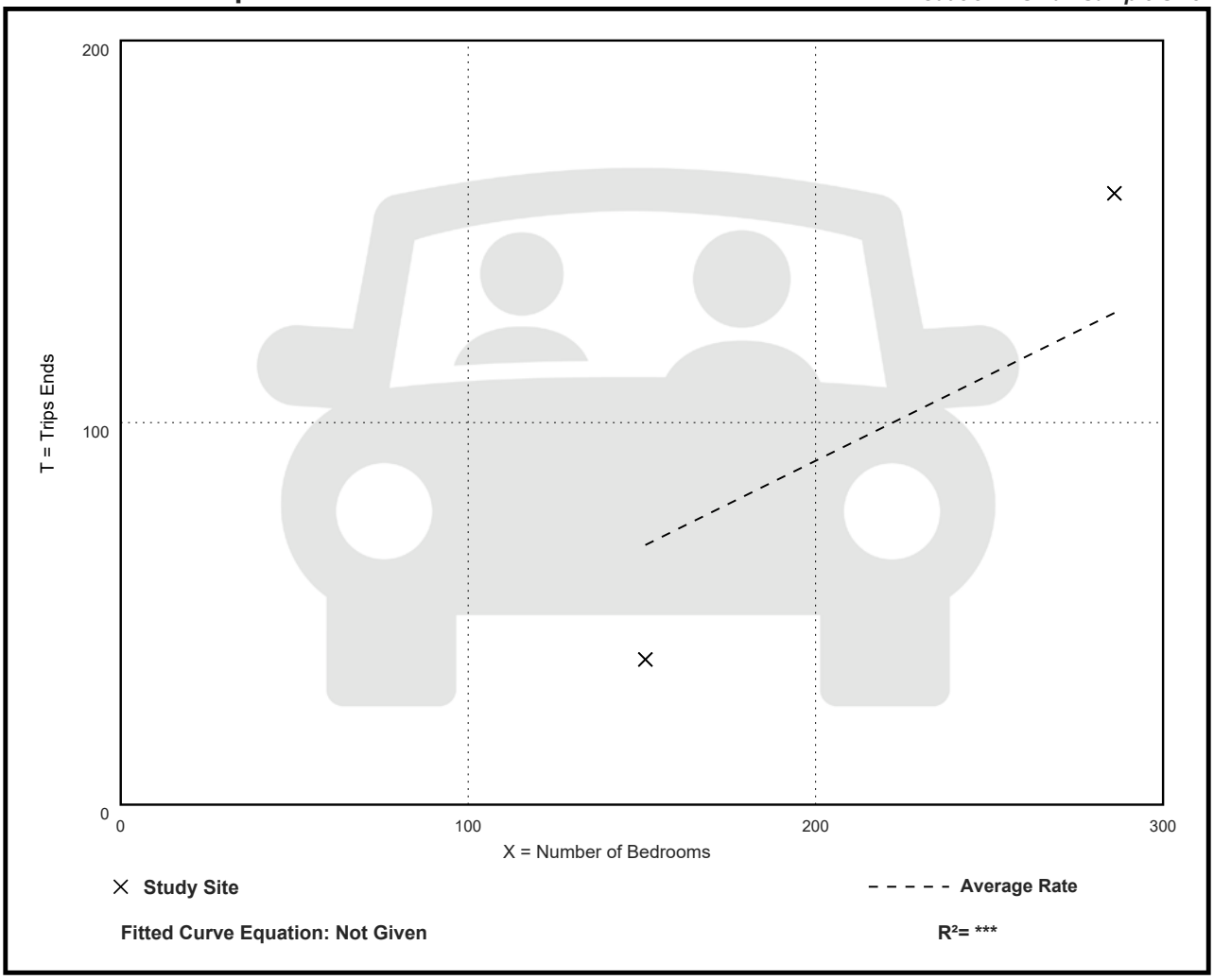
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Bedrooms: 219
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Bedroom

Average Rate	Range of Rates	Standard Deviation
0.45	0.25 - 0.56	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ***

Affordable Housing - Income Limits
(223)

Vehicle Trip Ends vs: Bedrooms
On a: Weekday,
PM Peak Hour of Generator

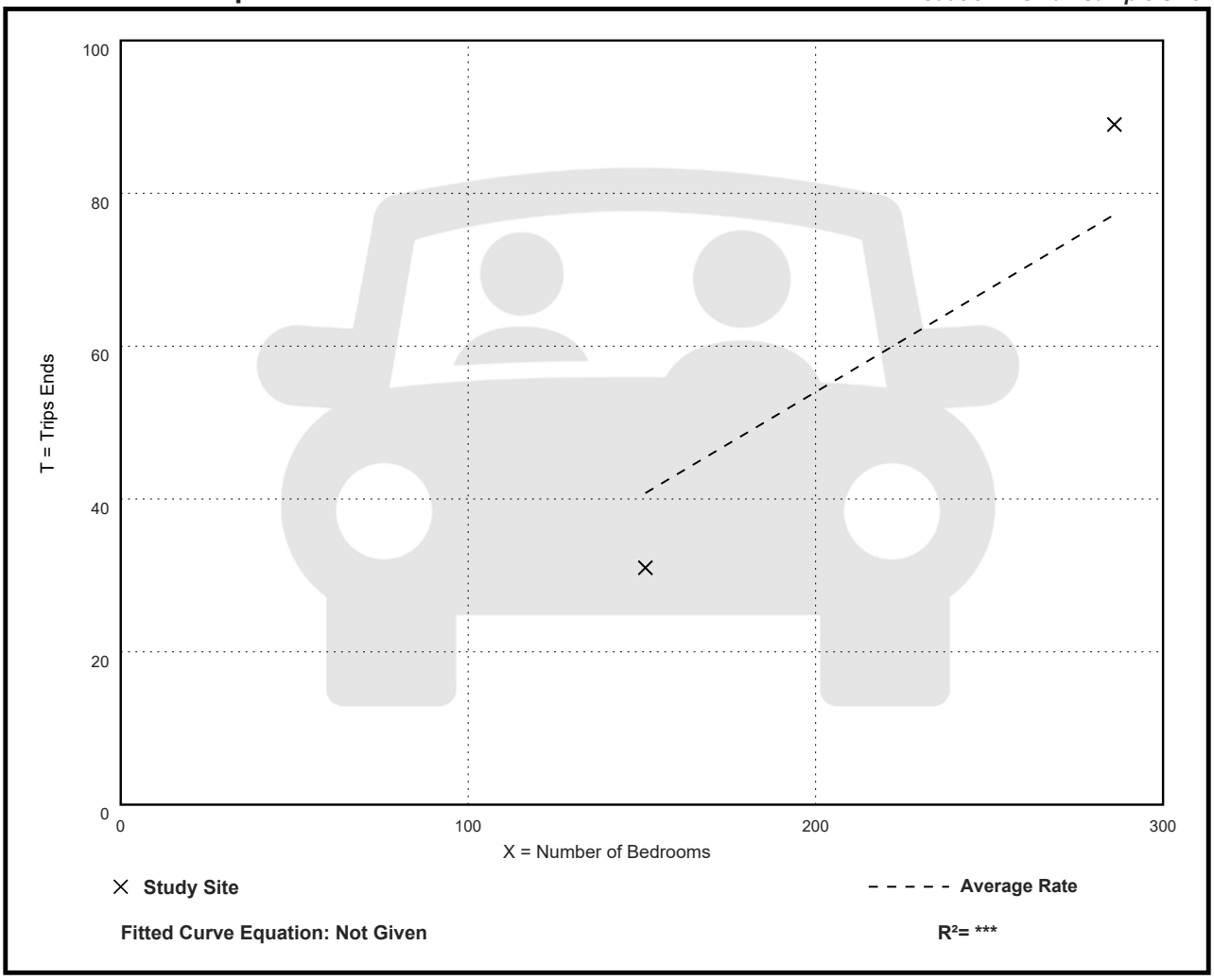
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Bedrooms: 219
Directional Distribution: 59% entering, 41% exiting

Vehicle Trip Generation per Bedroom

Average Rate	Range of Rates	Standard Deviation
0.27	0.21 - 0.31	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits
(223)

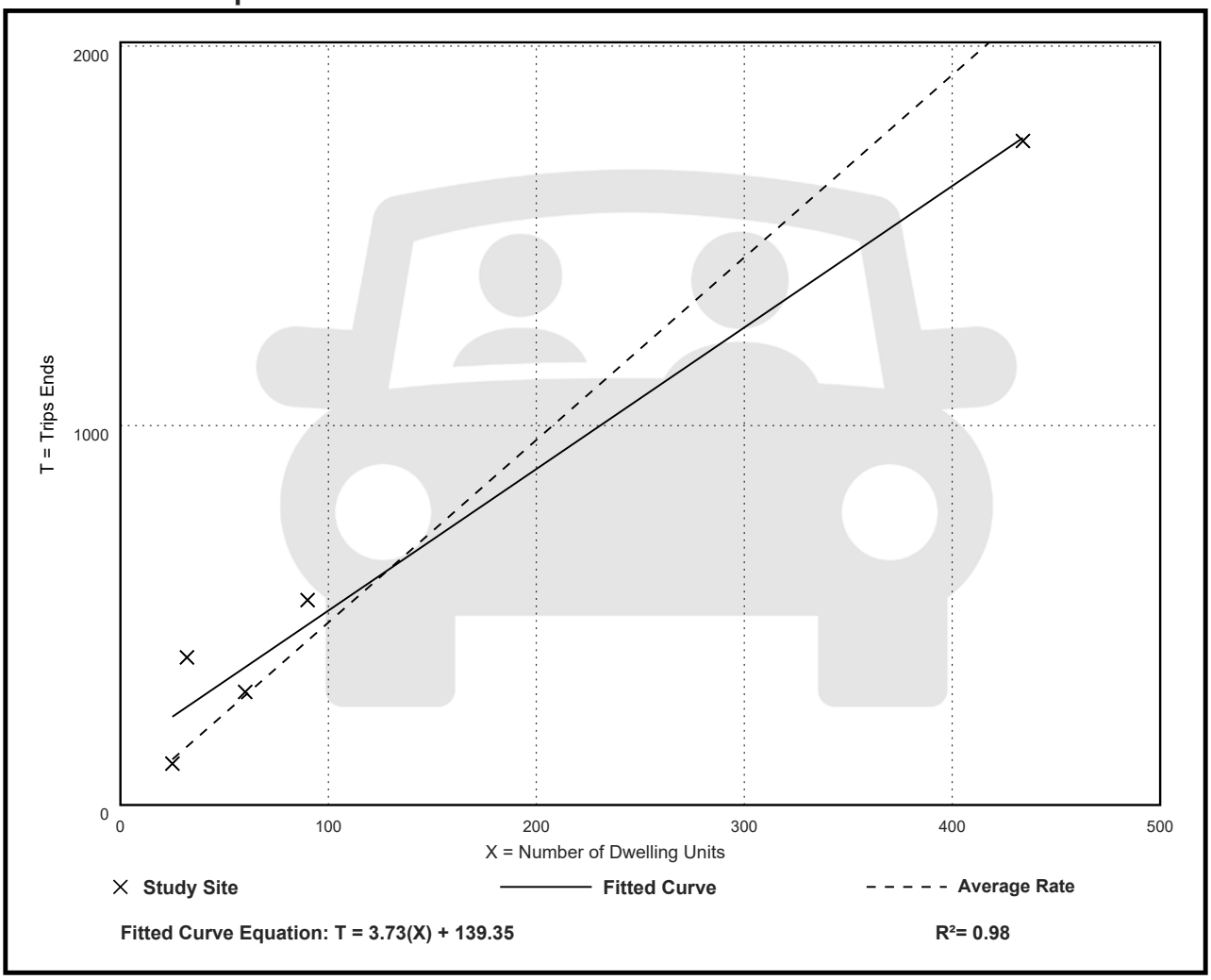
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 5
Avg. Num. of Dwelling Units: 128
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
4.81	4.03 - 12.16	2.03

Data Plot and Equation



Fitted Curve Equation: T = 3.73(X) + 139.35

R^2= 0.98

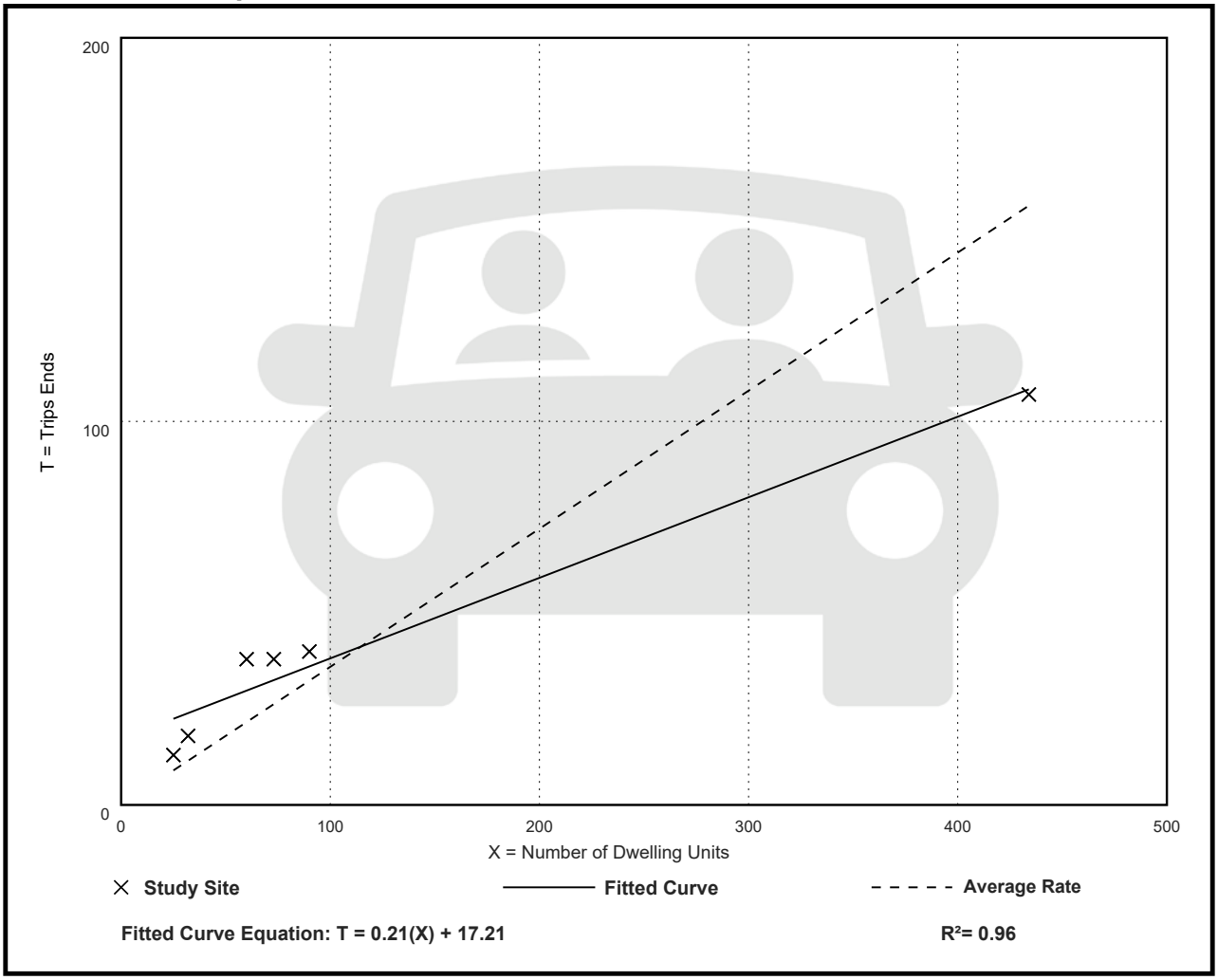
Affordable Housing - Income Limits
(223)

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: 6
Avg. Num. of Dwelling Units: 119
Directional Distribution: 29% entering, 71% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.25 - 0.63	0.16

Data Plot and Equation



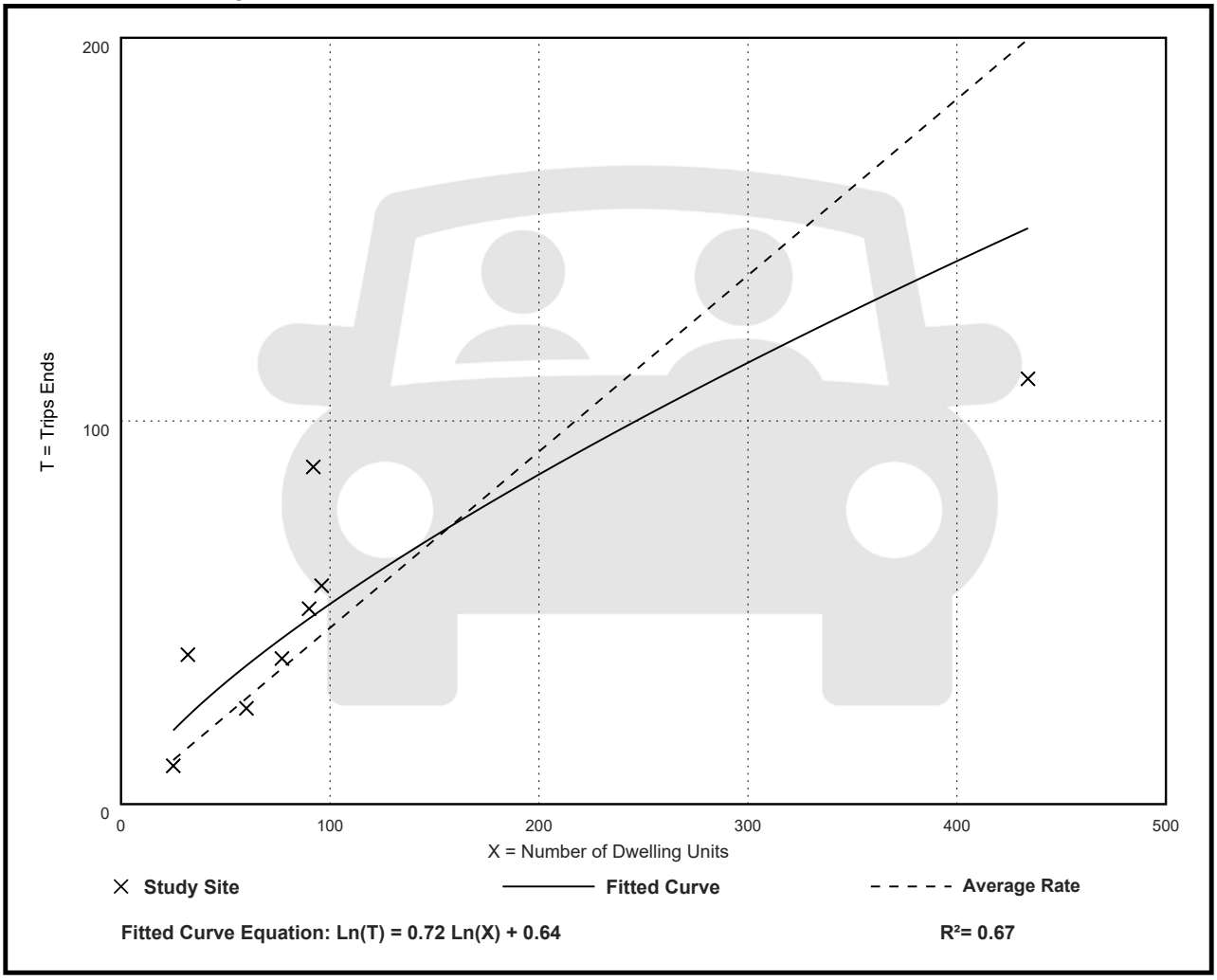
Affordable Housing - Income Limits
(223)

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: 8
Avg. Num. of Dwelling Units: 113
Directional Distribution: 59% entering, 41% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.26 - 1.22	0.28

Data Plot and Equation



Affordable Housing - Income Limits
(223)

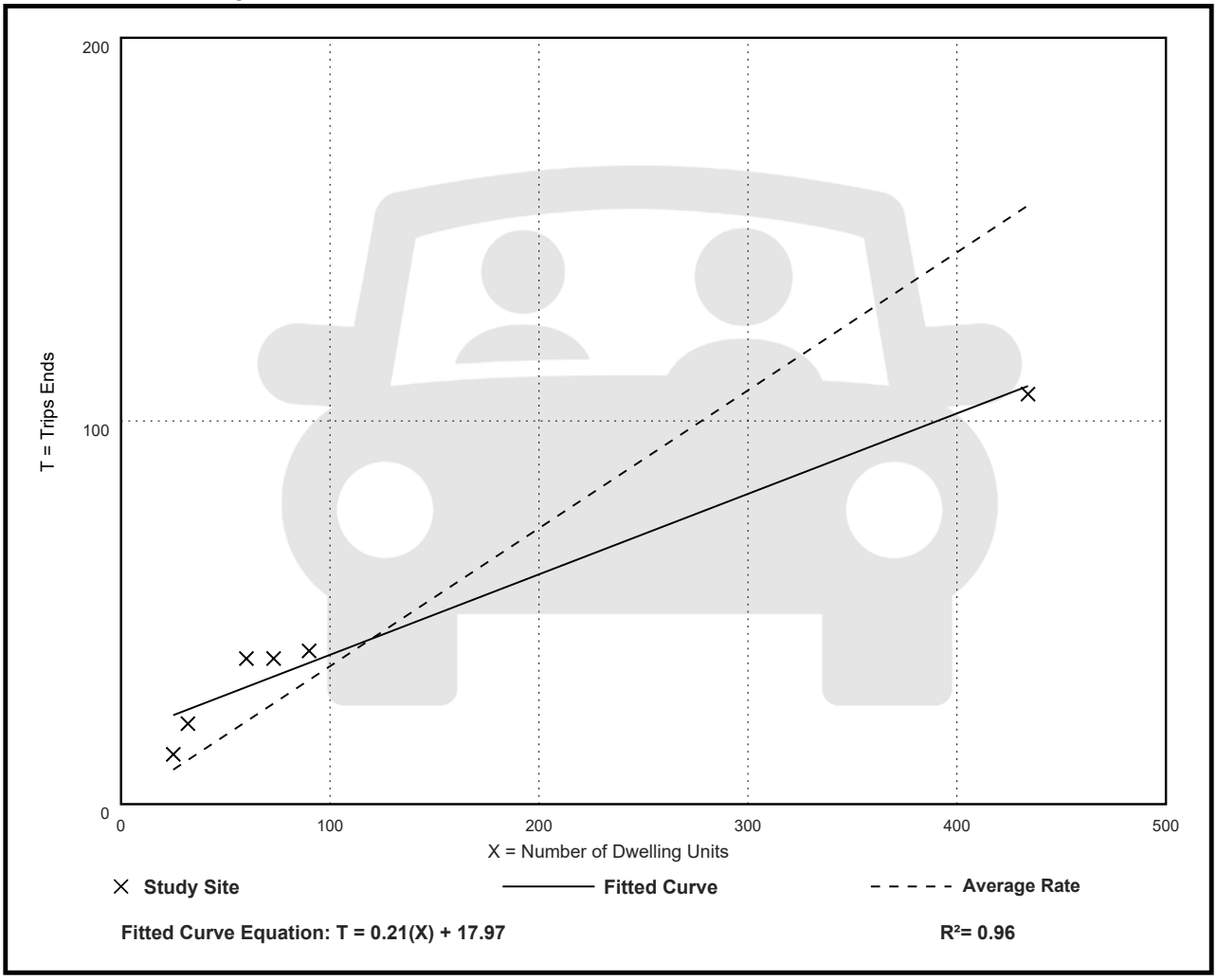
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
AM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 6
Avg. Num. of Dwelling Units: 119
Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.25 - 0.66	0.16

Data Plot and Equation



Fitted Curve Equation: T = 0.21(X) + 17.97

R^2= 0.96

Affordable Housing - Income Limits (223)

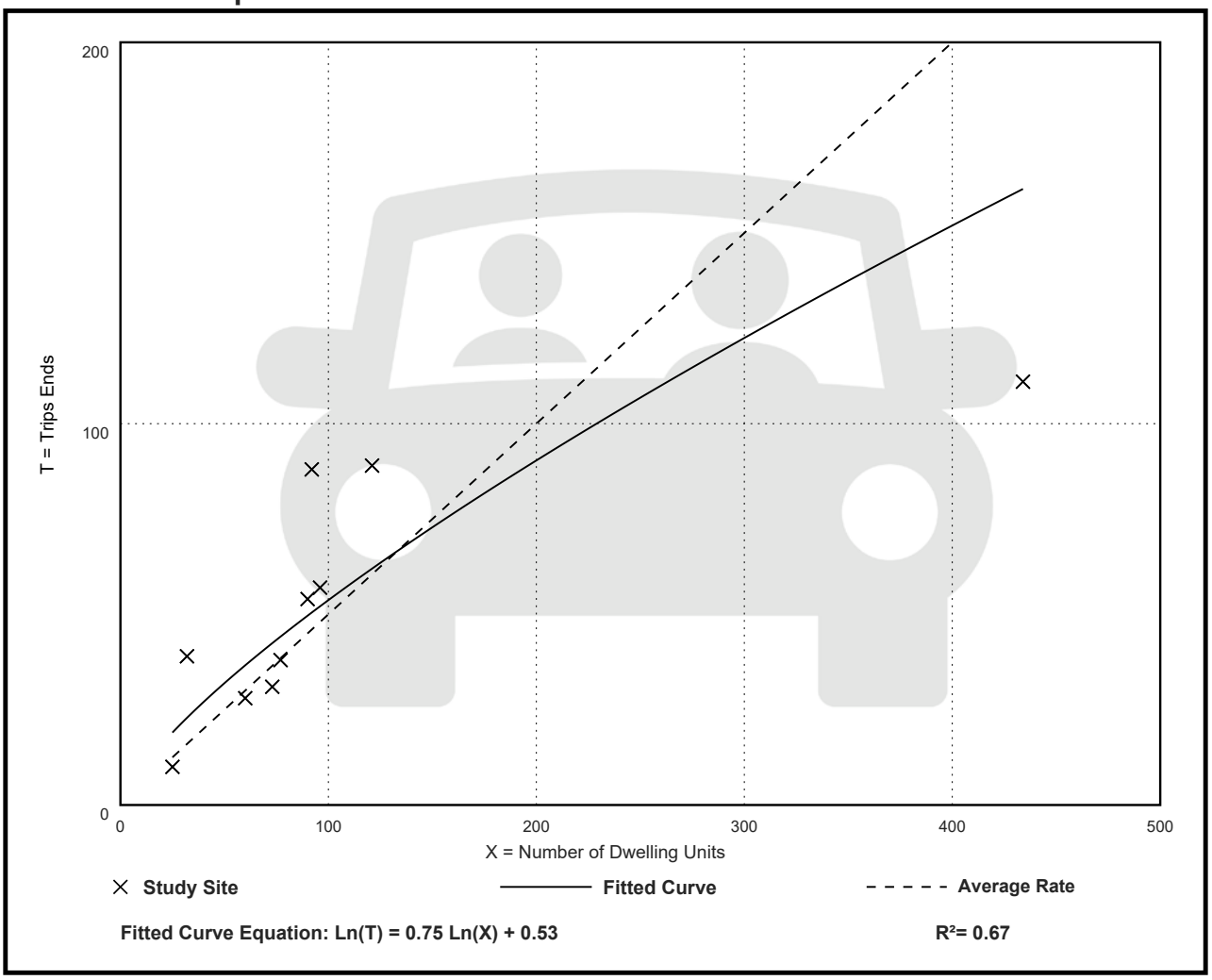
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 10
Avg. Num. of Dwelling Units: 110
Directional Distribution: 58% entering, 42% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.50	0.26 - 1.22	0.27

Data Plot and Equation



Affordable Housing - Income Limits
(223)

Vehicle Trip Ends vs: Dwelling Units
On a: Saturday

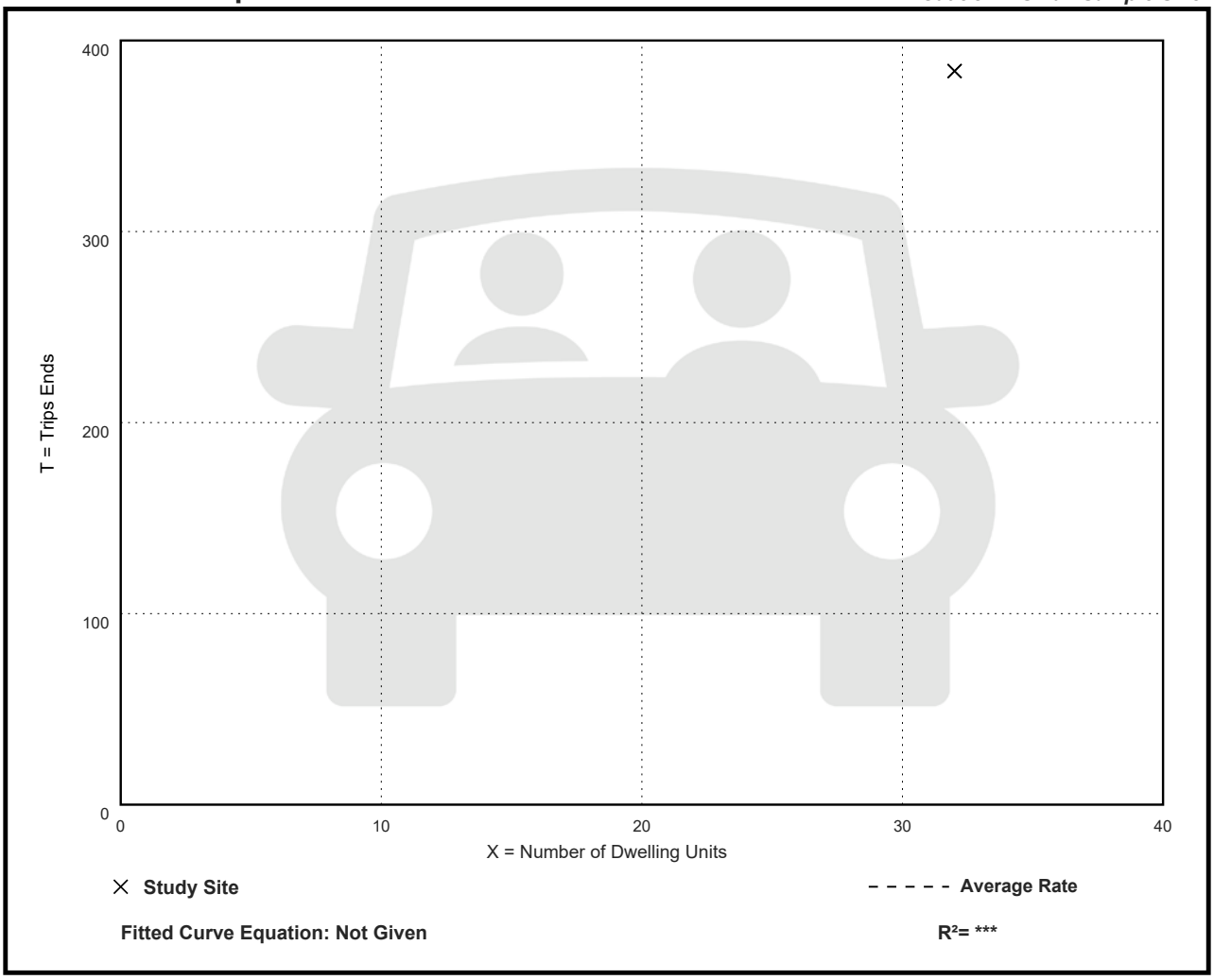
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 32
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
12.00	12.00 - 12.00	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits
(223)

Vehicle Trip Ends vs: Dwelling Units
On a: Saturday, Peak Hour of Generator

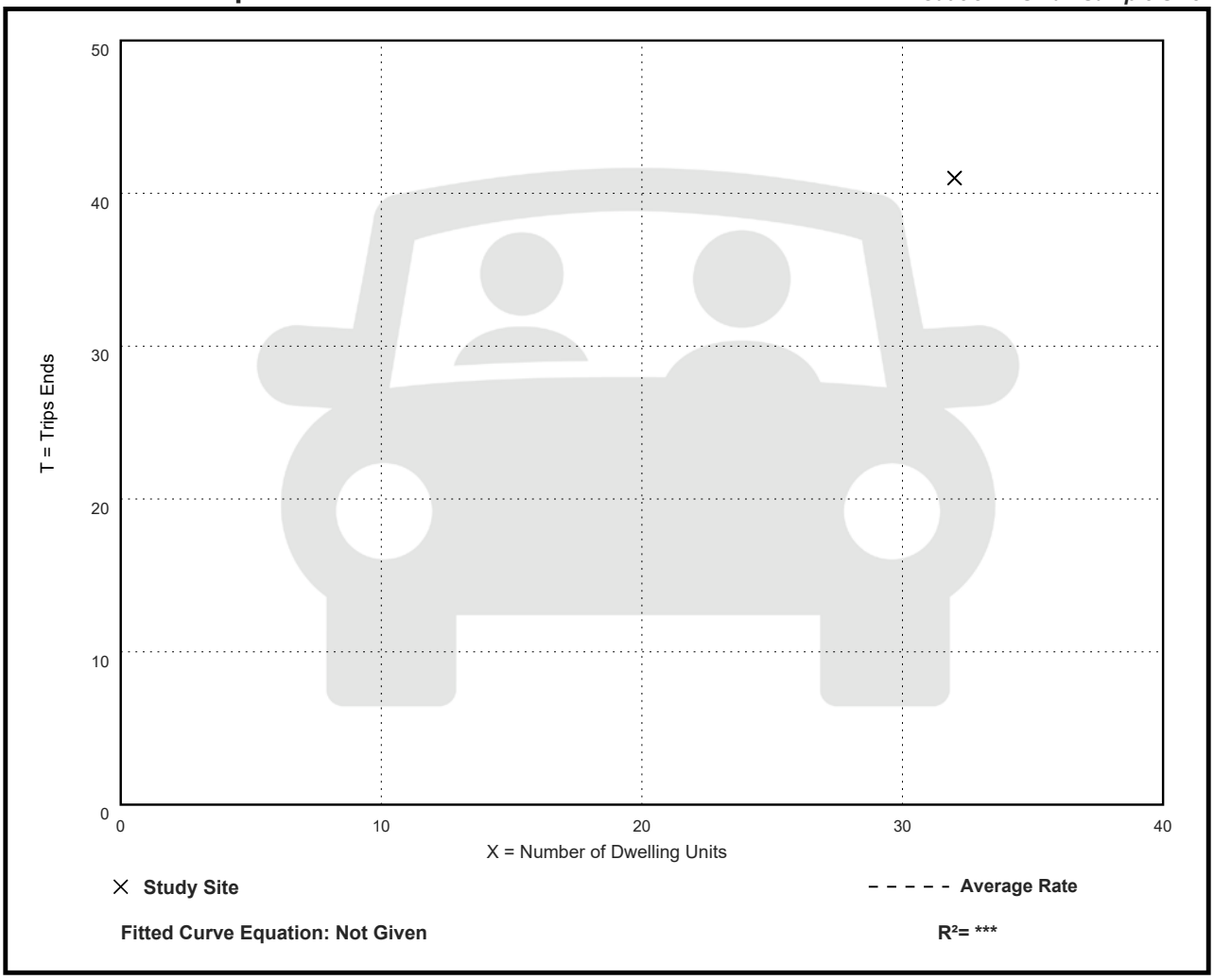
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 32
Directional Distribution: 59% entering, 41% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.28	1.28 - 1.28	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits
(223)

Vehicle Trip Ends vs: Dwelling Units
On a: Sunday

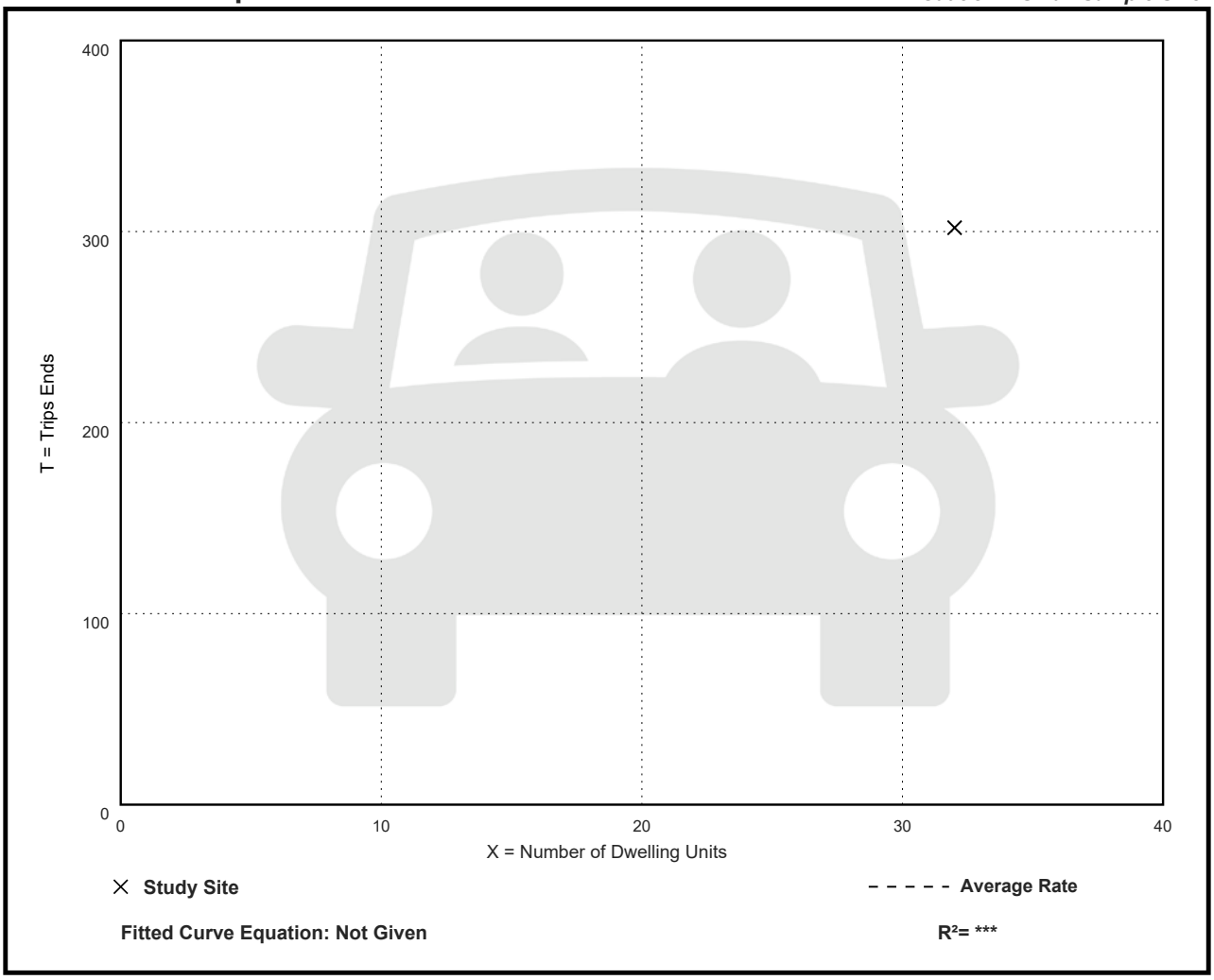
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 32
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	9.44 - 9.44	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits
(223)

Vehicle Trip Ends vs: Dwelling Units
On a: Sunday, Peak Hour of Generator

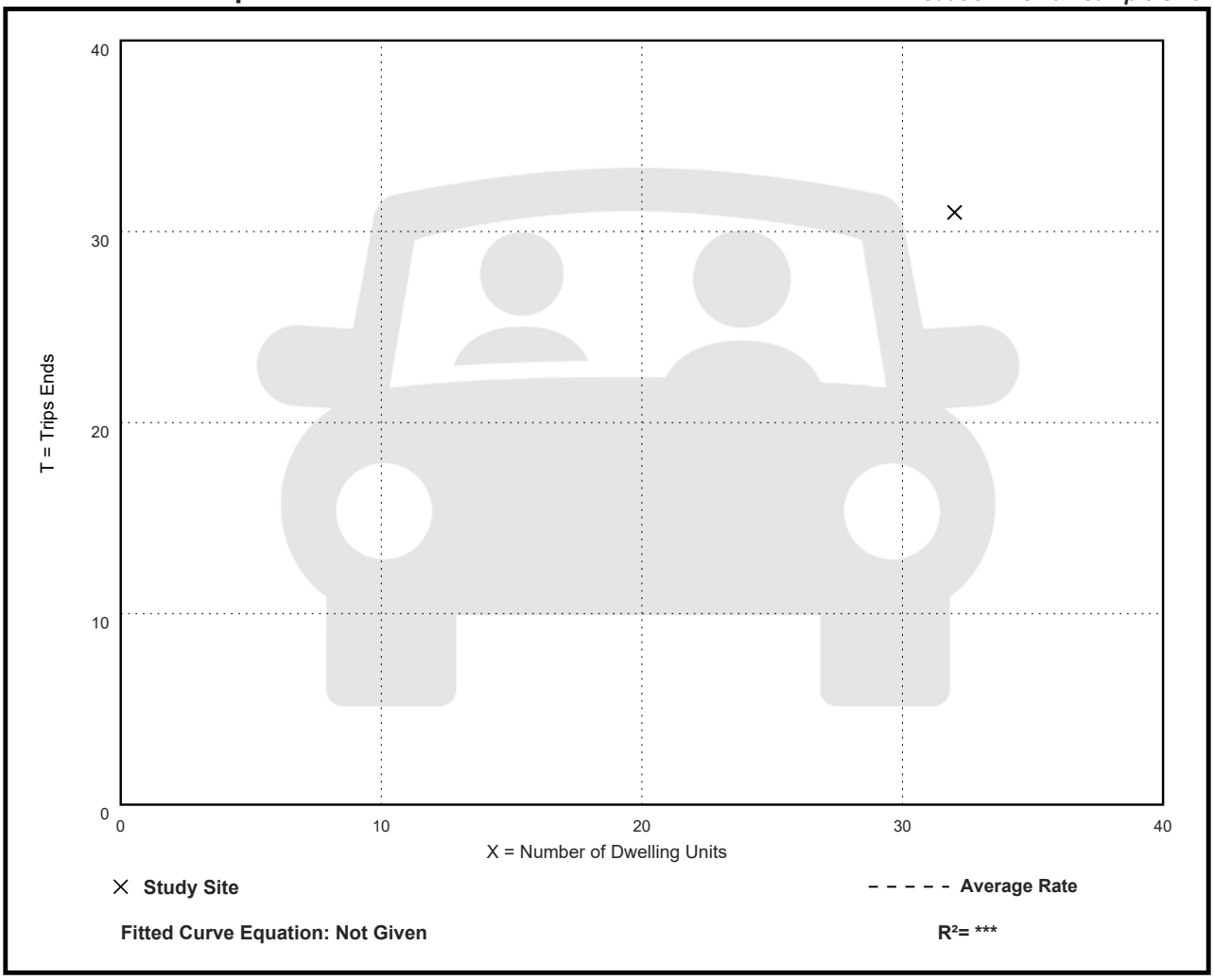
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 32
Directional Distribution: 52% entering, 48% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.97	0.97 - 0.97	***

Data Plot and Equation

Caution – Small Sample Size



Affordable Housing - Income Limits
(223)

Vehicle Trip Ends vs: Residents
On a: Weekday

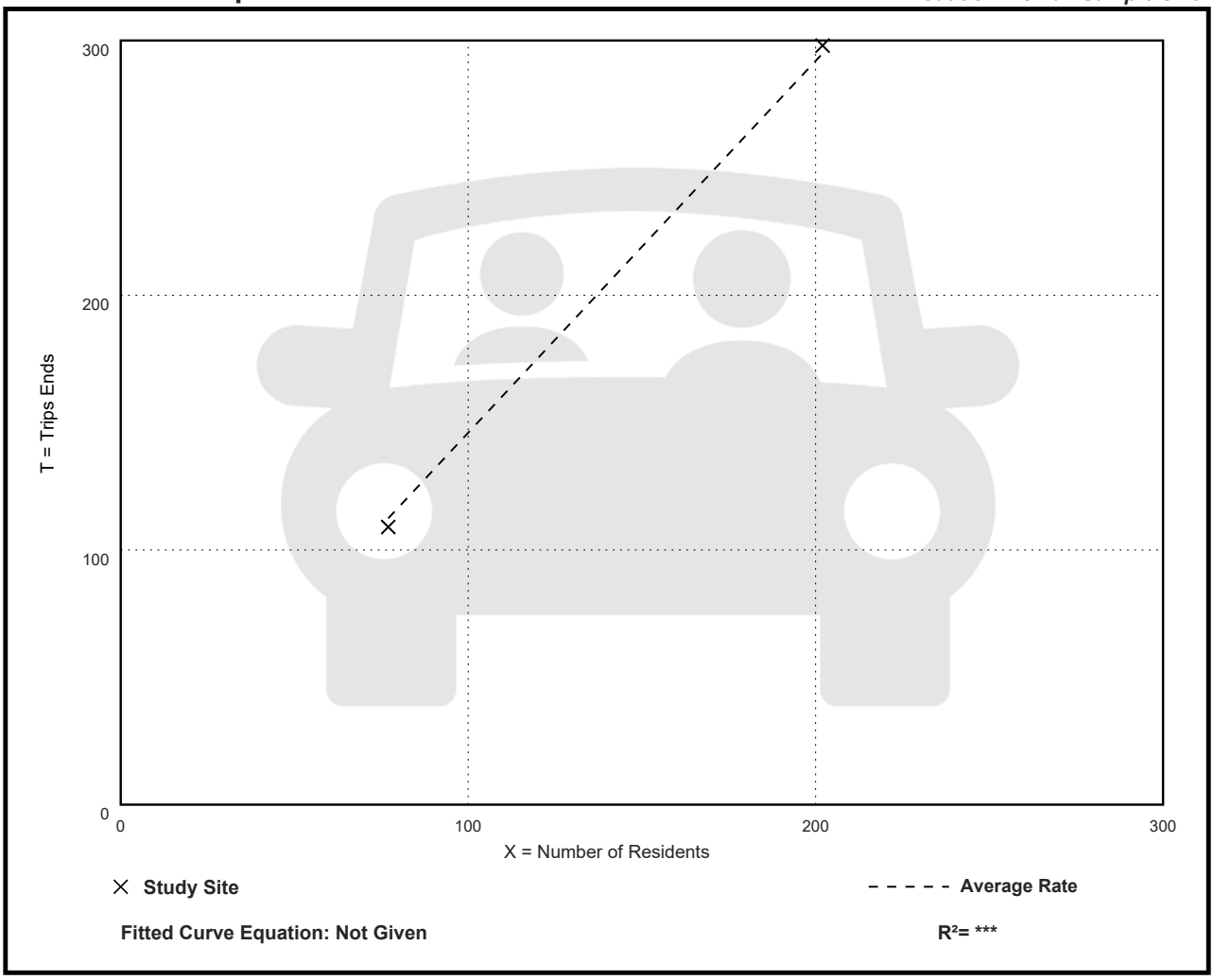
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
1.46	1.42 - 1.48	***

Data Plot and Equation

Caution – Small Sample Size



Affordable Housing - Income Limits
(223)

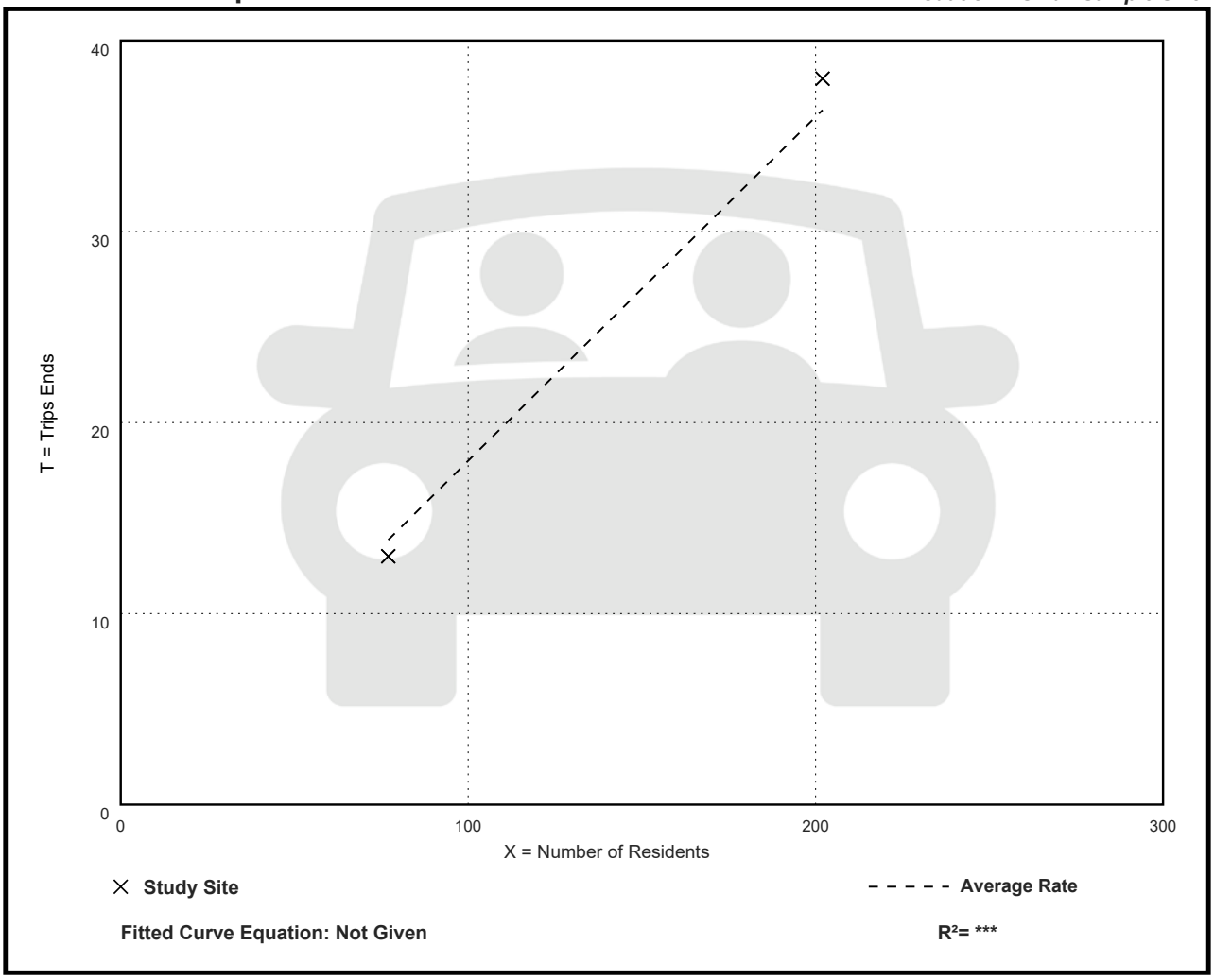
Vehicle Trip Ends vs: Residents
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 31% entering, 69% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.18	0.17 - 0.19	***

Data Plot and Equation

Caution – Small Sample Size



Affordable Housing - Income Limits
(223)

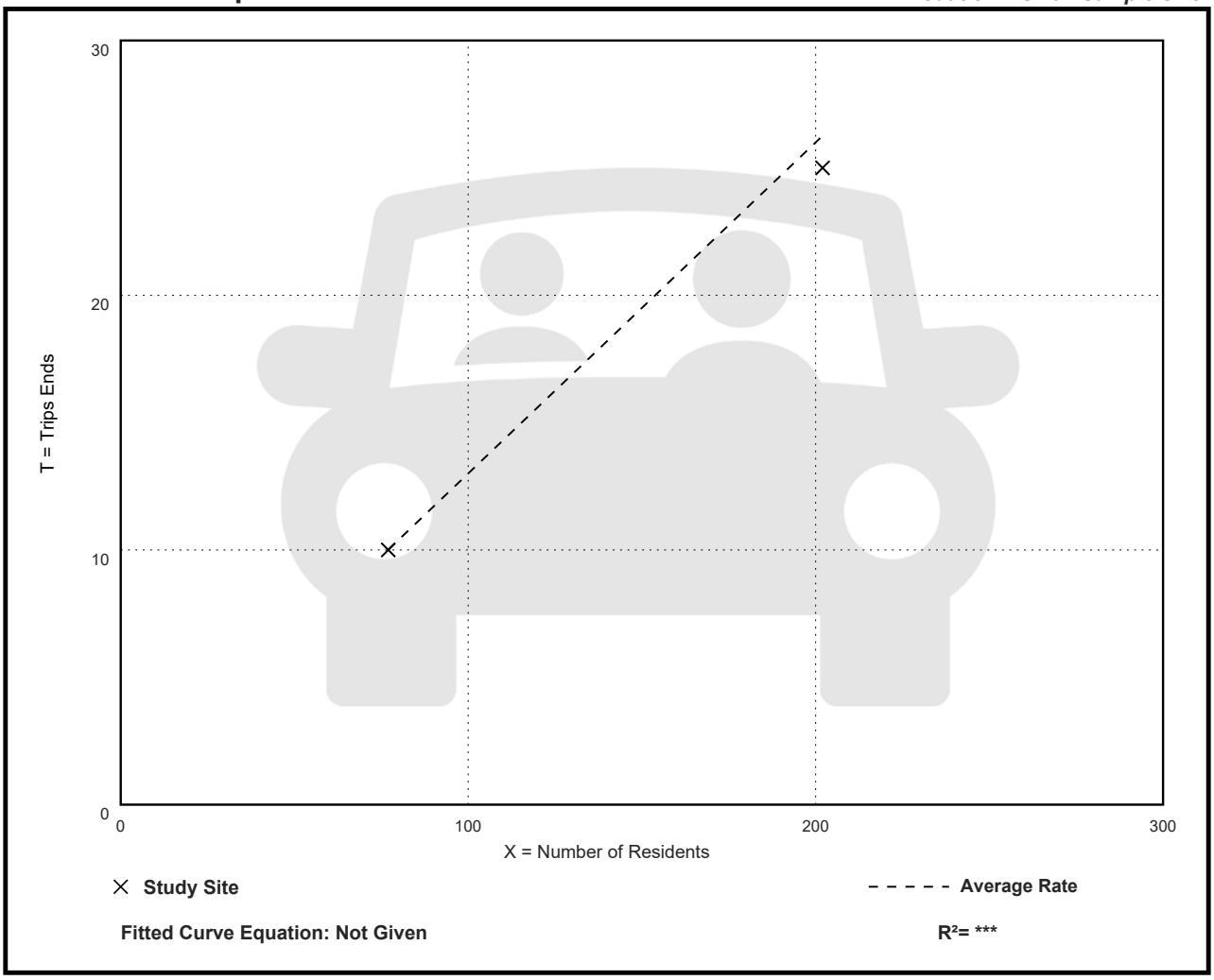
Vehicle Trip Ends vs: Residents
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 71% entering, 29% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.13	0.12 - 0.13	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Affordable Housing - Income Limits (223)

Vehicle Trip Ends vs: Residents
On a: Weekday,
AM Peak Hour of Generator

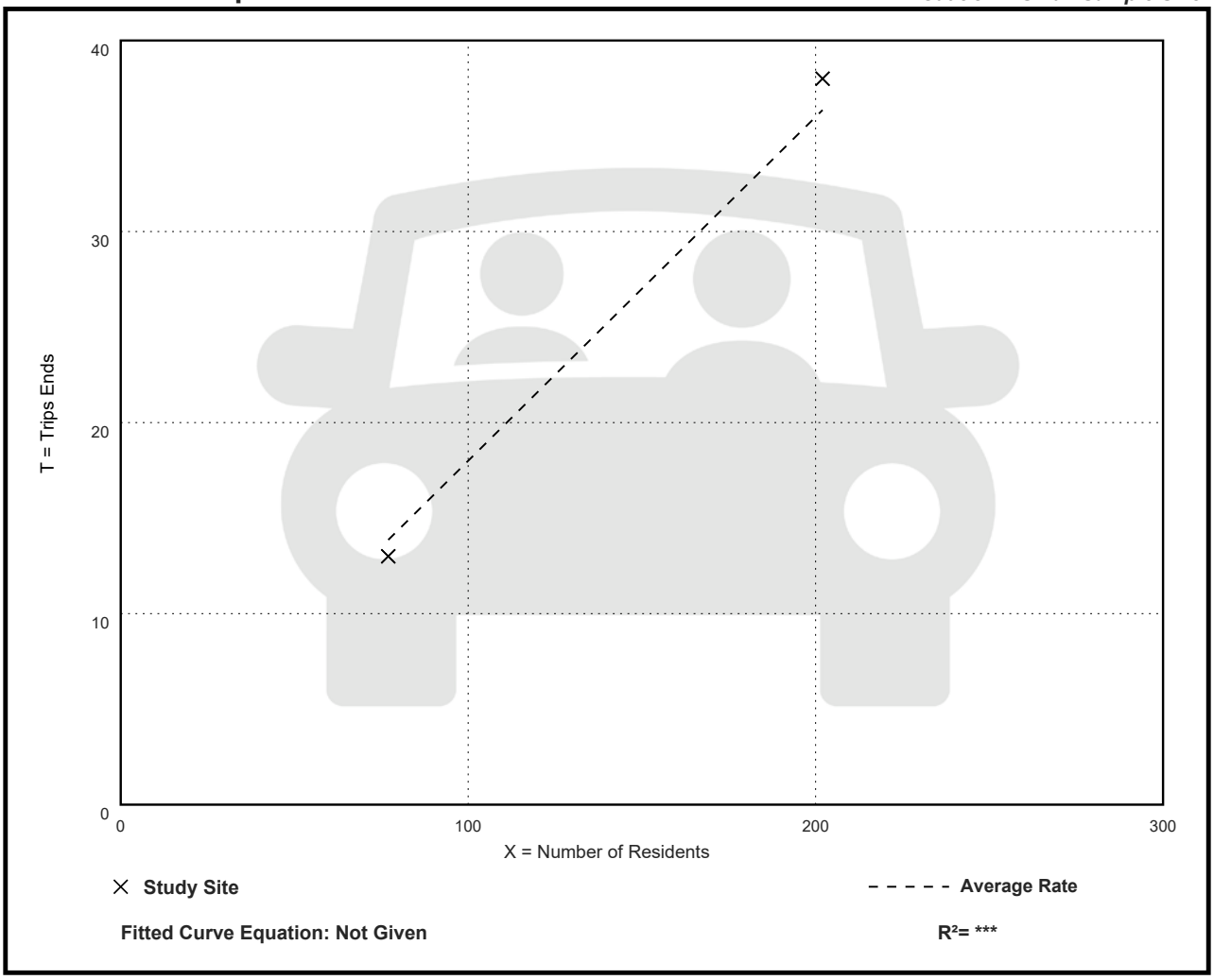
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 31% entering, 69% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.18	0.17 - 0.19	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ***

Affordable Housing - Income Limits
(223)

Vehicle Trip Ends vs: Residents
On a: Weekday,
PM Peak Hour of Generator

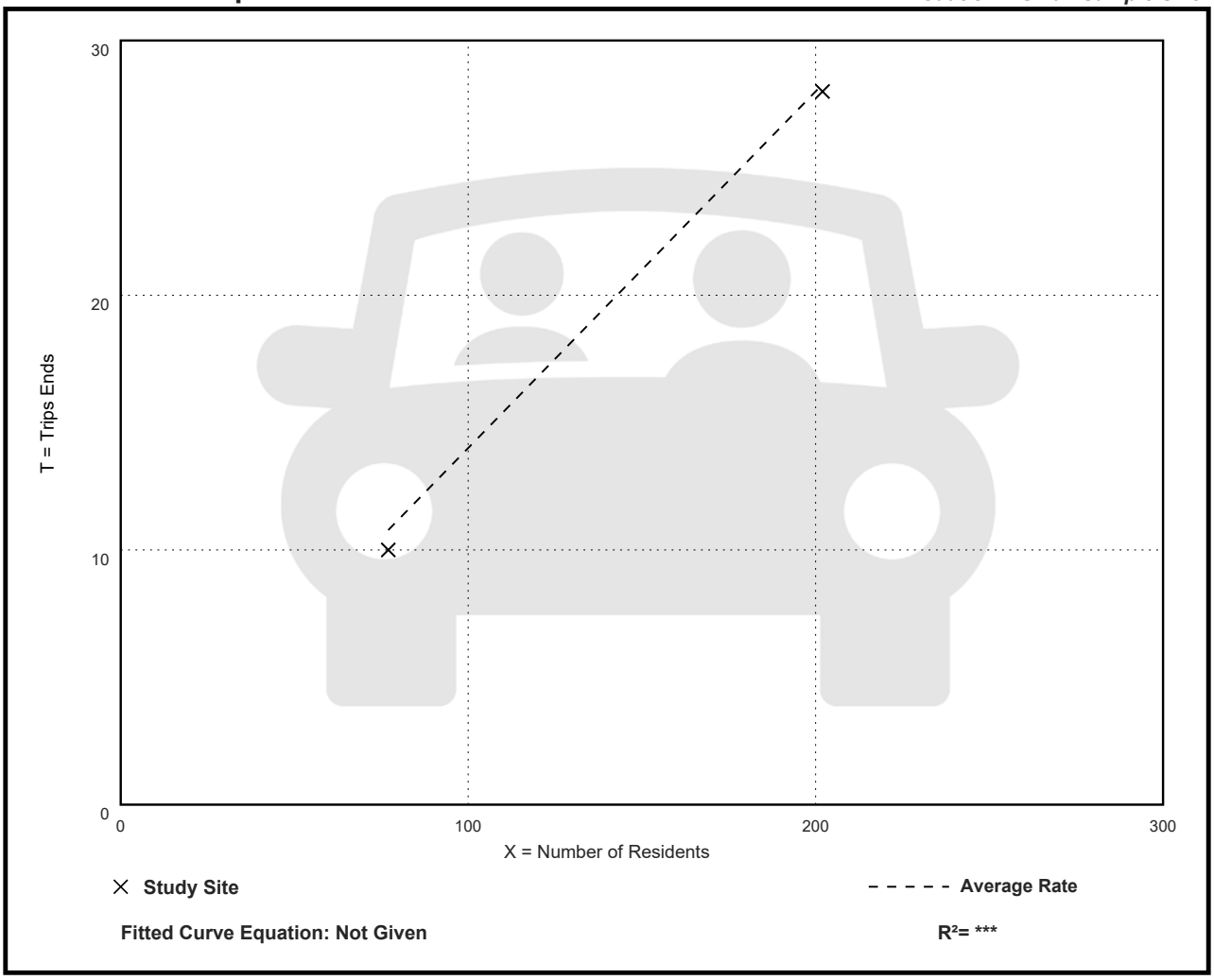
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Residents: 140
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Resident

Average Rate	Range of Rates	Standard Deviation
0.14	0.13 - 0.14	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

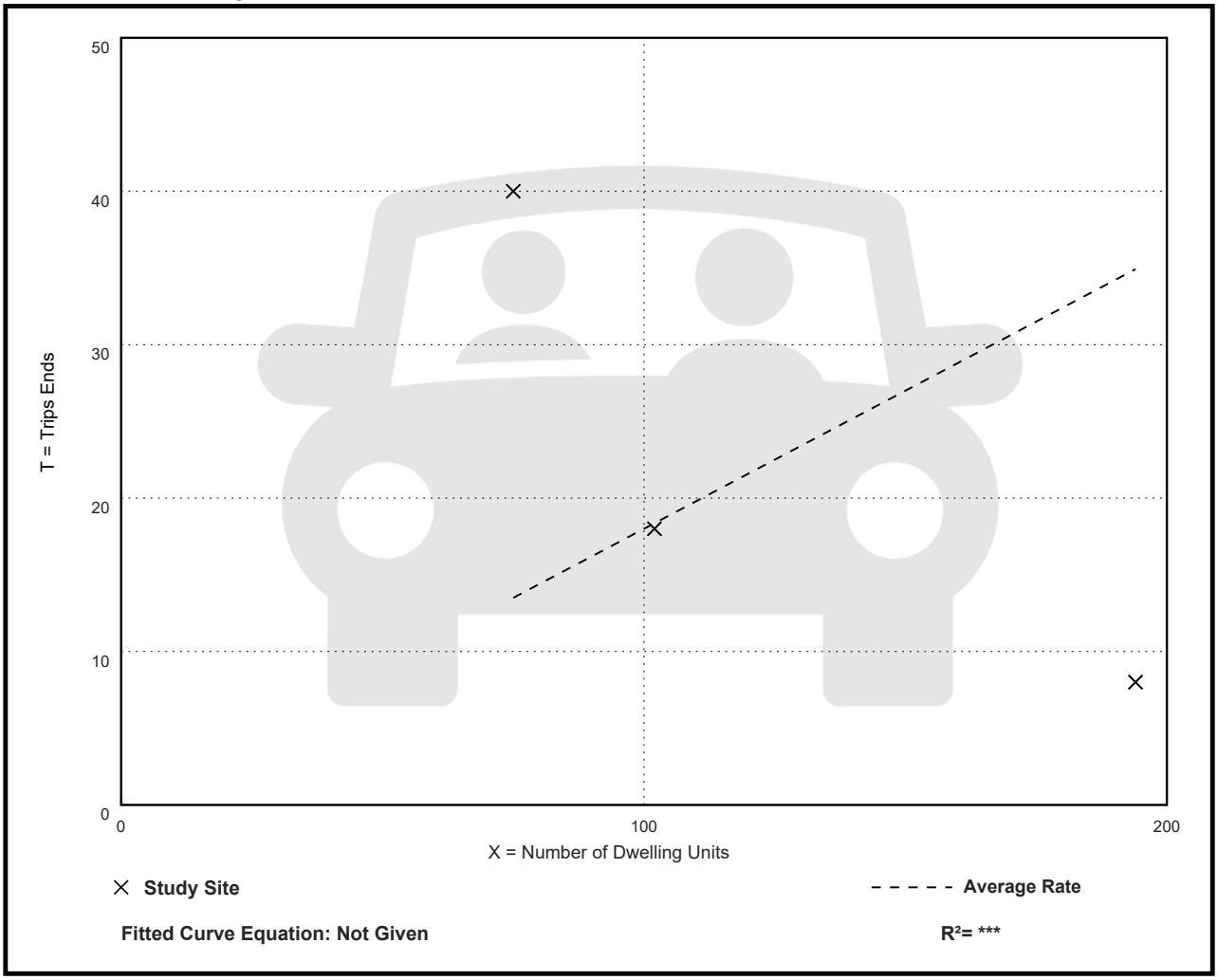
Affordable Housing - Senior
(223)

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: 3
Avg. Num. of Dwelling Units: 124
Directional Distribution: 58% entering, 42% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.18	0.04 - 0.53	0.23

Data Plot and Equation



Affordable Housing - Senior
(223)

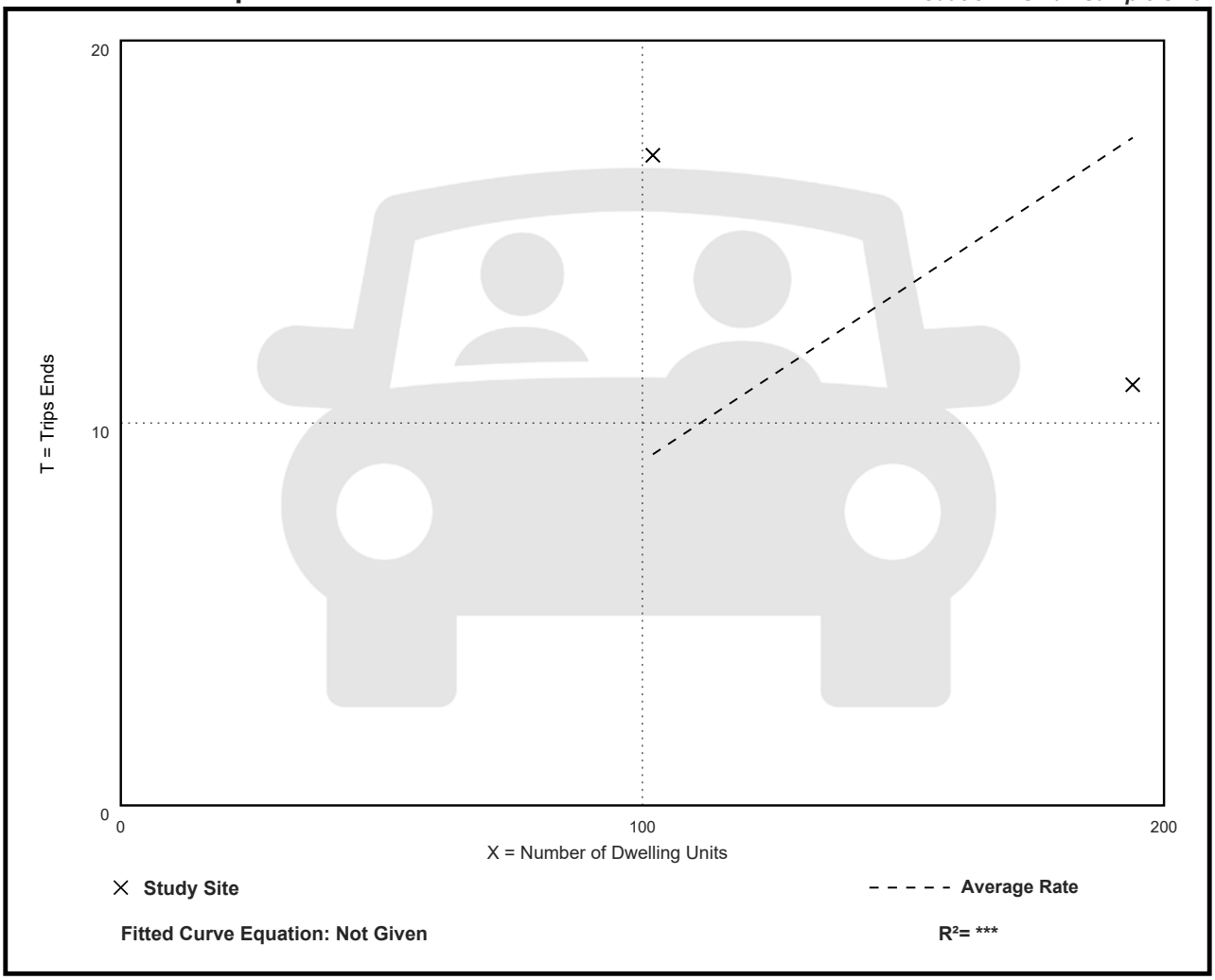
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 2
Avg. Num. of Dwelling Units: 148
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.09	0.06 - 0.17	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ***

Affordable Housing - Senior
(223)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
PM Peak Hour of Generator

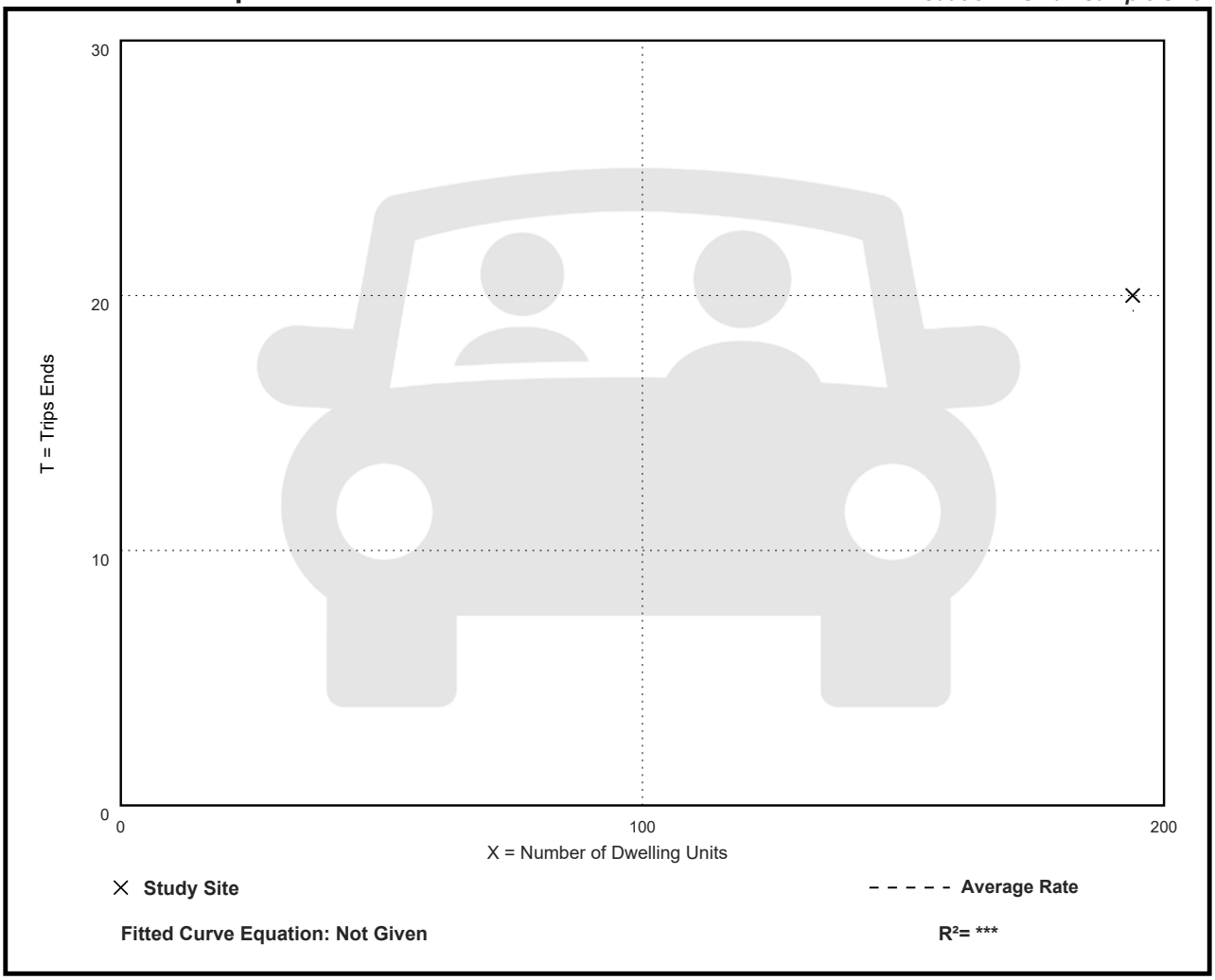
Setting/Location: General Urban/Suburban
Number of Studies: 1
Avg. Num. of Dwelling Units: 194
Directional Distribution: 64% entering, 36% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.10	0.10 - 0.10	***

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= *

Land Use: 251
Senior Adult Housing—Single-Family

Description

Senior adult housing—single-family sites are independent living developments that are called various names including retirement communities, age-restricted housing, and active adult communities. The development has a specific age restriction for its residents, typically a minimum of 55 years of age for at least one resident of the household.

Residents in these communities are typically considered active and requiring little to no medical supervision. The percentage of retired residents varies by development. The development may include amenities such as a golf course, swimming pool, 24-hour security, transportation, and common recreational facilities. They generally lack centralized dining and on-site health facilities.

The dwelling units can be either detached or attached. The types of housing types represented by sites in the database include traditional single-family detached homes, patio homes, duplexes, and townhouses. Single-family attached housing includes any single-family housing unit that shares a wall with an adjoining dwelling unit, whether the walls are for living space, a vehicle garage, or storage space.

Senior adult housing—multifamily (Land Use 252), congregate care facility (Land Use 253), assisted living (Land Use 254), and continuing care retirement community (Land Use 255) are related land uses.

Additional Data

Caution should be used when applying trip rates for this land use as it may contain a wide variety of studies ranging from communities with very active, working residents to communities with older, retired residents. As more data become available, consideration will be given to future stratification of this land use.

Many factors affected the trip rates for detached senior adult housing. Factors such as the average age of residents, development location and size, affluence of residents, employment status, and vehicular access should be taken into consideration when conducting an analysis. Some developments were located within close proximity to medical facilities, restaurants, shopping centers, banks, and recreational activities.

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (https://www.ite.org/technical-resources/topics/trip-and-parking-generation/).

For the six sites for which data were provided for both occupied dwelling units and total dwelling units, an average of 98 percent of the units were occupied.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), California, Delaware, Florida, Maryland, New Jersey, New York, Pennsylvania, Virginia, and Washington.

Source Numbers

221, 289, 398, 421, 500, 550, 598, 601, 602, 629, 930, 1015, 1060, 1074

Senior Adult Housing - Single-Family (251)

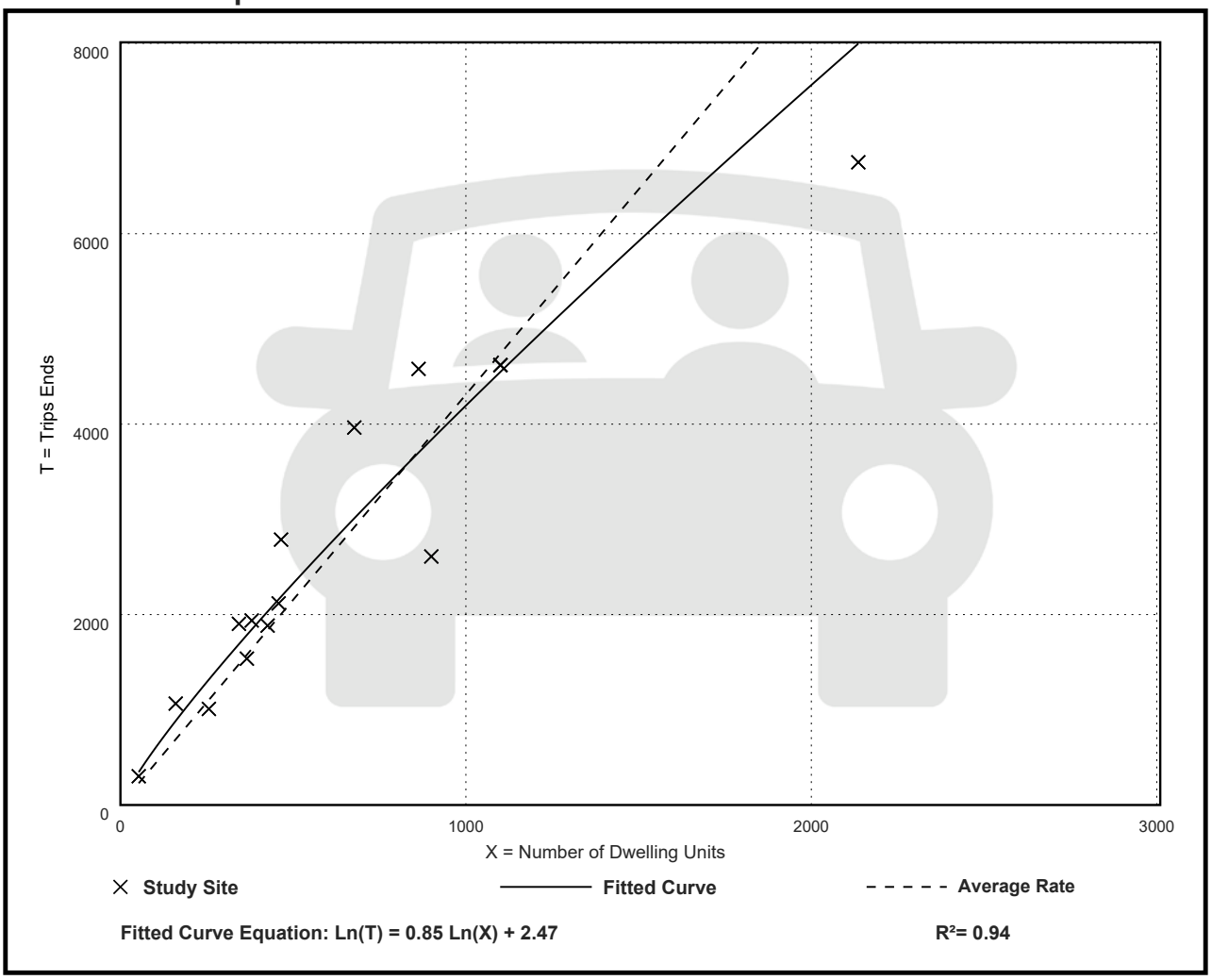
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 15
Avg. Num. of Dwelling Units: 646
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
4.31	2.90 - 6.66	1.07

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.85 Ln(X) + 2.47

R^2= 0.94

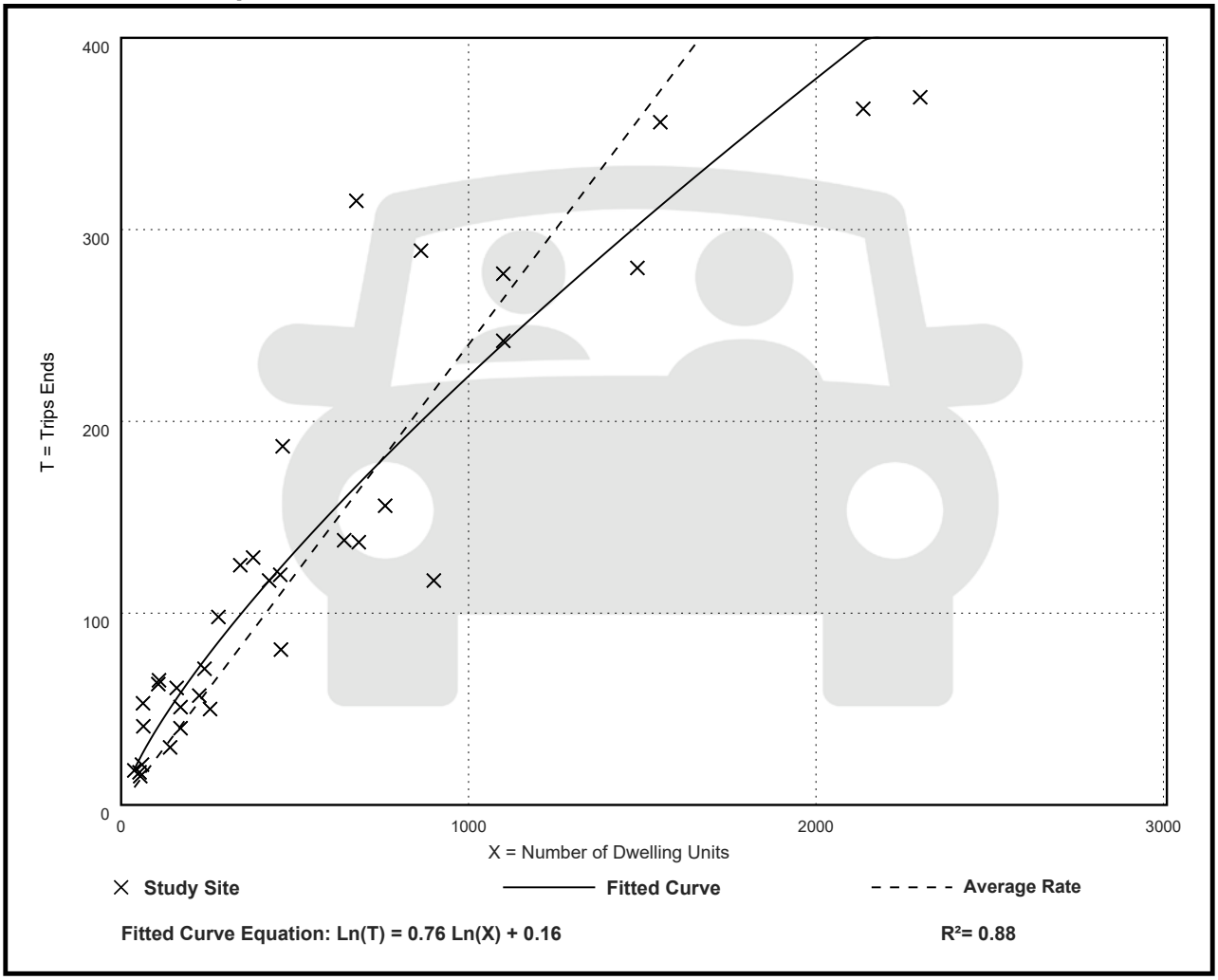
Senior Adult Housing - Single-Family
(251)

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: 34
Avg. Num. of Dwelling Units: 557
Directional Distribution: 33% entering, 67% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.24	0.13 - 0.84	0.10

Data Plot and Equation



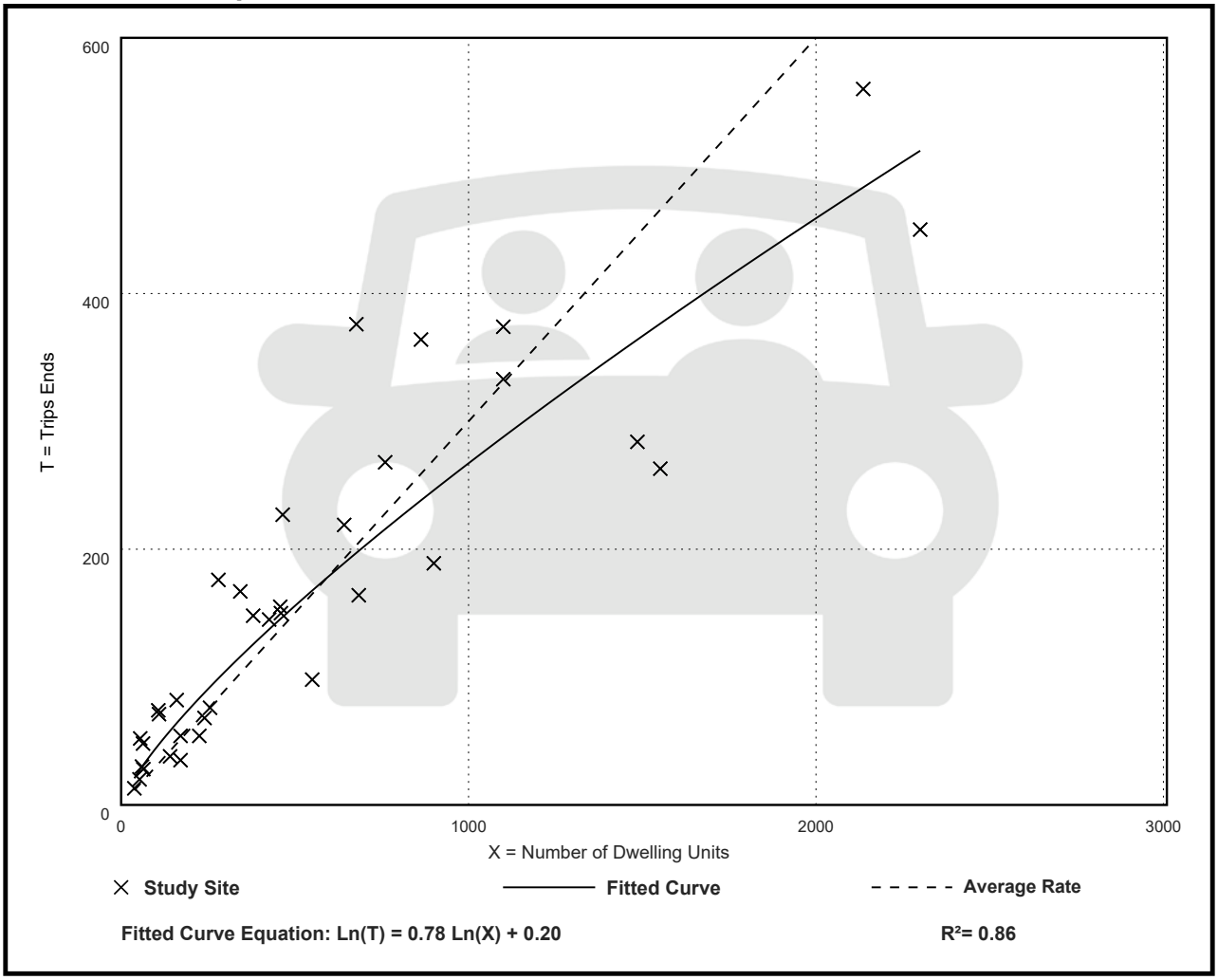
Senior Adult Housing - Single-Family
(251)

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: 35
Avg. Num. of Dwelling Units: 556
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.30	0.17 - 0.95	0.12

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.78 Ln(X) + 0.20

R^2= 0.86

Senior Adult Housing - Single-Family
(251)

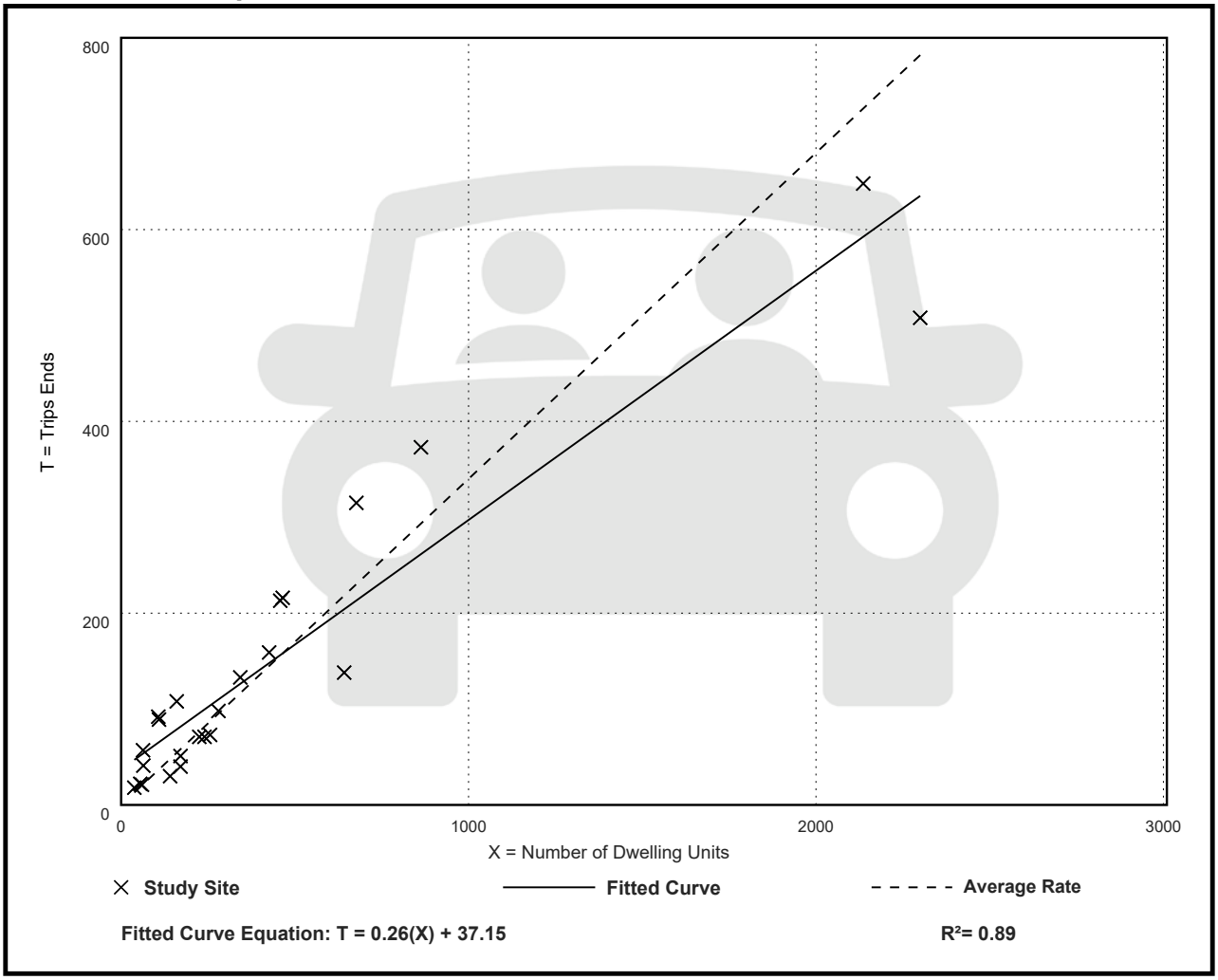
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
AM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 24
Avg. Num. of Dwelling Units: 435
Directional Distribution: 43% entering, 57% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.34	0.21 - 0.90	0.14

Data Plot and Equation



Fitted Curve Equation: T = 0.26(X) + 37.15

R^2= 0.89

Senior Adult Housing - Single-Family
(251)

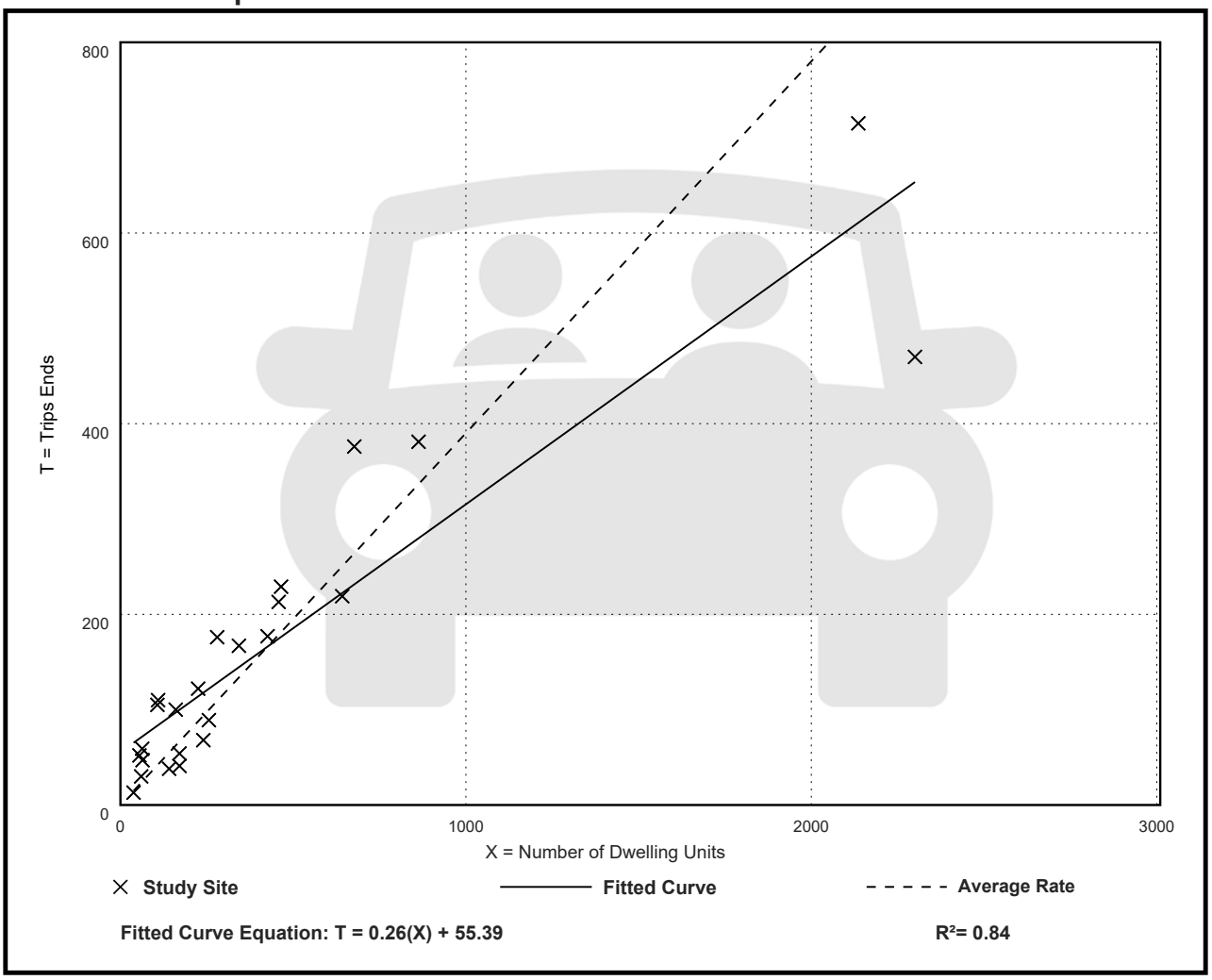
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 24
Avg. Num. of Dwelling Units: 435
Directional Distribution: 56% entering, 44% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.39	0.20 - 1.01	0.17

Data Plot and Equation



Fitted Curve Equation: T = 0.26(X) + 55.39

R^2= 0.84

Senior Adult Housing - Single-Family (251)

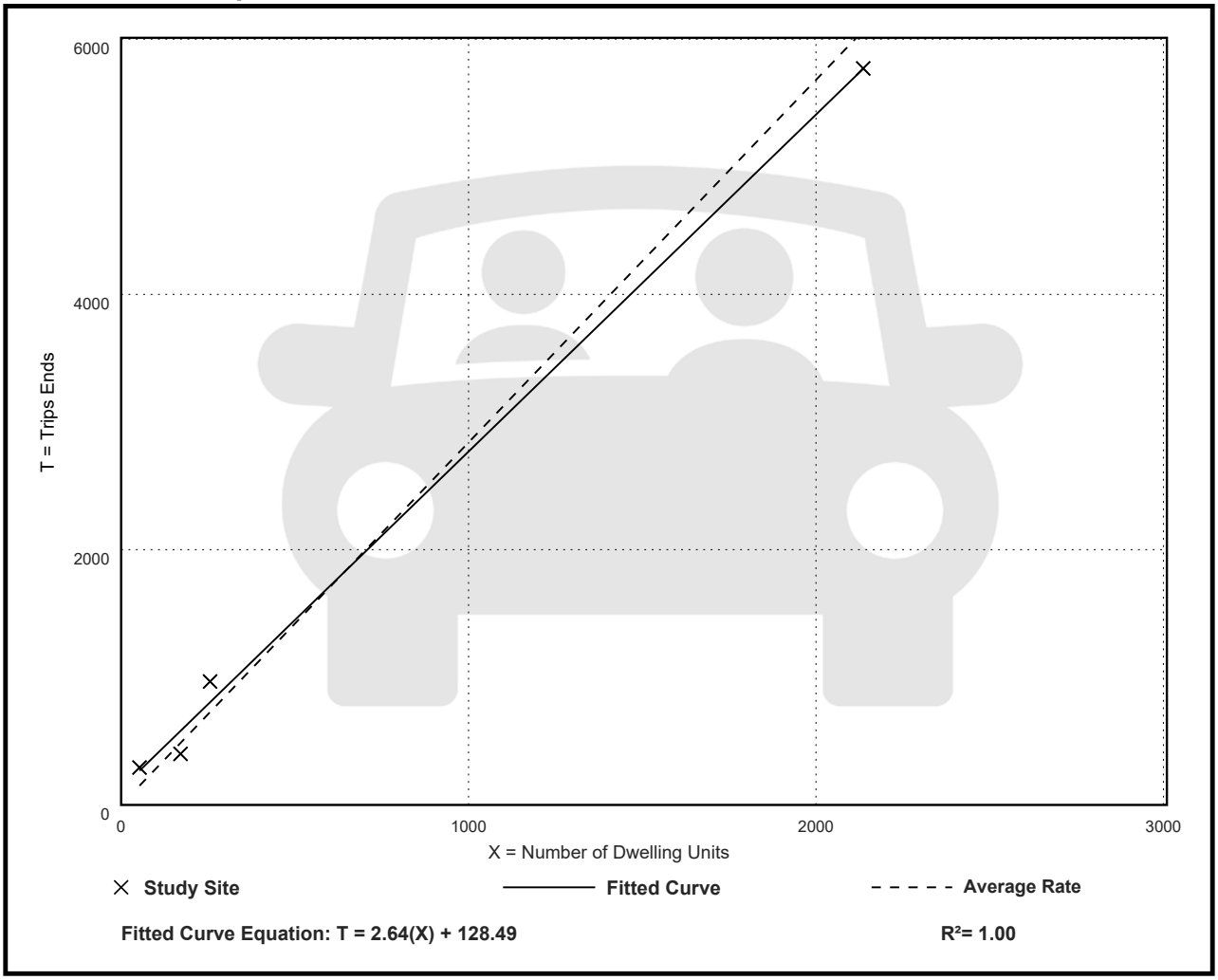
Vehicle Trip Ends vs: Dwelling Units
On a: Saturday

Setting/Location: General Urban/Suburban
Number of Studies: 4
Avg. Num. of Dwelling Units: 654
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
2.84	2.34 - 5.53	0.59

Data Plot and Equation



Fitted Curve Equation: T = 2.64(X) + 128.49

R^2= 1.00

Senior Adult Housing - Single-Family (251)

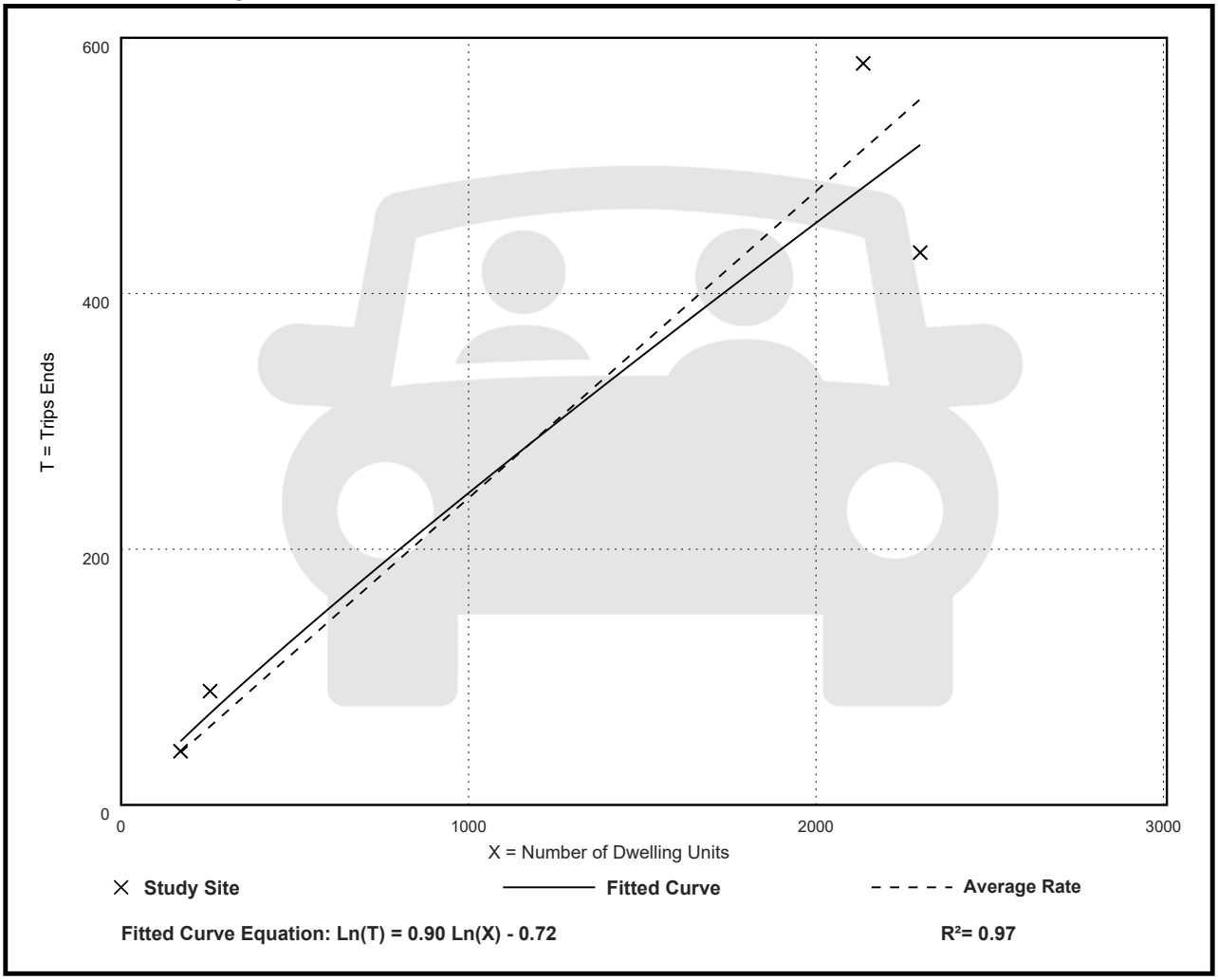
Vehicle Trip Ends vs: Dwelling Units
On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 4
Avg. Num. of Dwelling Units: 1216
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.24	0.19 - 0.35	0.06

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.90 Ln(X) - 0.72

R^2= 0.97

Senior Adult Housing - Single-Family (251)

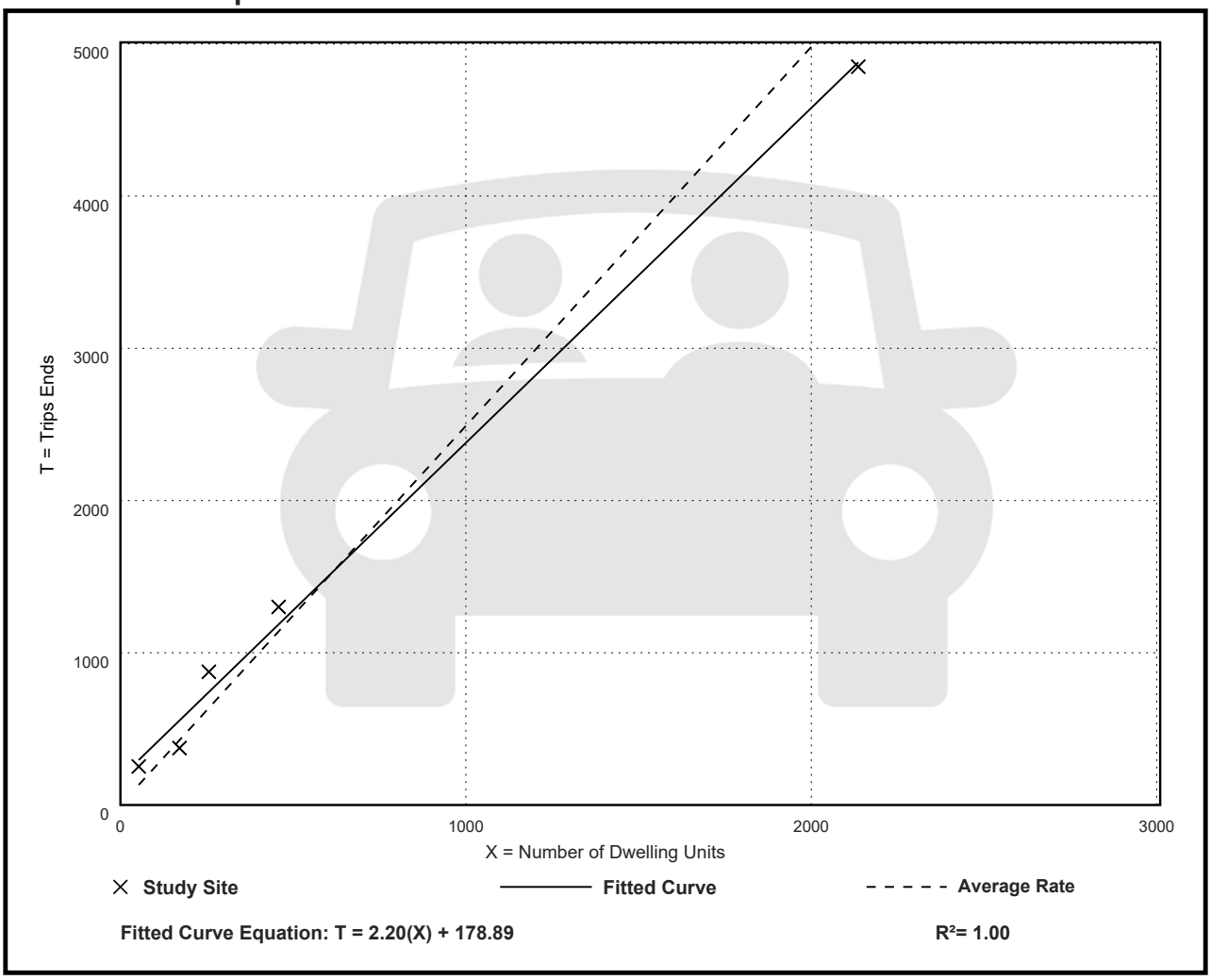
Vehicle Trip Ends vs: Dwelling Units
On a: Sunday

Setting/Location: General Urban/Suburban
Number of Studies: 5
Avg. Num. of Dwelling Units: 615
Directional Distribution: 51% entering, 49% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
2.49	2.19 - 4.77	0.52

Data Plot and Equation



Fitted Curve Equation: T = 2.20(X) + 178.89

R^2= 1.00

Senior Adult Housing - Single-Family (251)

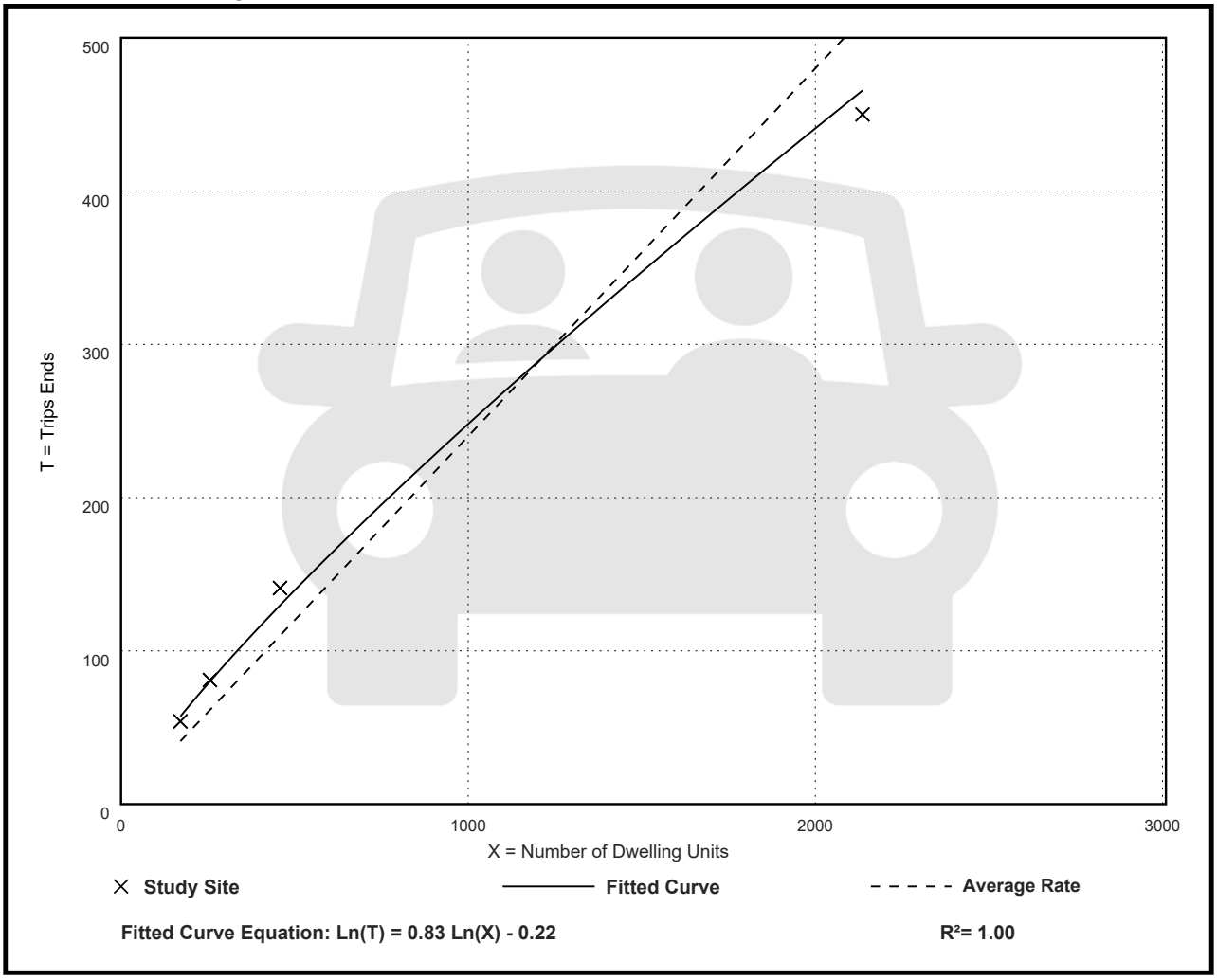
Vehicle Trip Ends vs: Dwelling Units
On a: Sunday, Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 4
Avg. Num. of Dwelling Units: 755
Directional Distribution: 54% entering, 46% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.24	0.21 - 0.32	0.05

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.83 Ln(X) - 0.22

R^2= 1.00