

**Queuing Analysis
for
Dutch Bros. Coffee
98th Street and Volcano Road
Albuquerque, NM**

**Prepared for:
Dutch Bros. Coffee
110 SW 4th Street
Grants Pass, OR 97526**



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INTRODUCTION

The following provides a trip generation and queuing analysis for a proposed coffee shop in the northwest quadrant of Albuquerque, New Mexico. Dutch Bros. Coffee plans to construct a 950 square foot drive-through-only coffee shop with dual drive-through lanes on a 0.69-acre portion of a larger 11.09-acre parcel at 98th Street and Volcano Road. The proposed development consists of a queue storage capacity of 21 vehicles (11 vehicles in Lane 1 and 10 vehicles in Lane 2). Figure 1 is a map of the proposed development, and Figure 2 is the proposed site plan.



Figure 1. Location of Proposed Development.

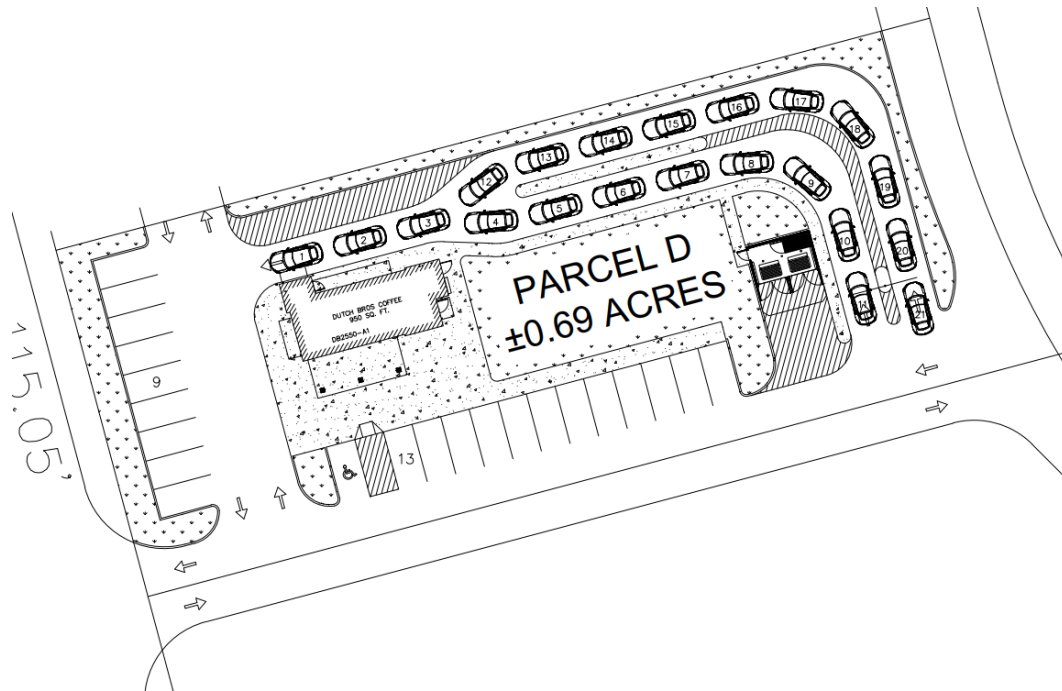


Figure 2: Proposed Site Plan.

TRIP GENERATION

The number of trips generated by the Dutch Bros. Coffee development depends on land use and the number of Drive-Thru lanes. Trip generation for the development was performed using the procedures and methodologies provided in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition. Estimated trip generation is calculated using Weekday, AM Peak Hour, and PM Peak Hour rates. Trip generation tables from the *ITE- 938 Coffee/Donut Shop with Drive-Through Window and No Indoor Seating* land use category are in Table 1. However, these trip generation rates contain few data points with high variation between studies. Therefore, in addition to the ITE trip generations, a recent KD Anderson & Associates survey of Dutch Bros. Coffee Shops was also used to determine site trips. This survey associated trip generation rates to adjacent street traffic volumes finding that 3.35 AM Peak Hour trips are generated per thousand adjacent street vehicles. Adjacent street average weekday daily traffic volume was obtained from the Mid-Region Council of Government's Traffic Counts map. A growth rate was applied to adjacent street AWDT as the most recent AWDT of 30,003 is from 2020. This growth rate was approximately 0.69% per year and was obtained by comparing the previous year's AWDTs. Entering and exiting percentages from *ITE Land Use Category 938* were used. The trip generation characteristics for the proposed development at Build-Out are shown in Table 2.

Table 1: Trip Generation (ITE)

Use	Units		TRIP GENERATION							PEAK HOUR TRIPS			
			Weekday	AM Peak			PM Peak			AM Peak		PM Peak	
			Trips	Rate	Enter	Exit	Rate	Enter	Exit	In	Out	In	Out
ITE 938 Coffee/Donut Shop with Drive-Through Window and No Indoor Seating	2	Drive-Through Lanes	358	100	50%	50%	34	50%	50%	50	50	17	17

Table 2: Trip Generation (KD Anderson survey)

Use	Generation Rates			Trips			
				Adjacent Street Vehicles (Forecasted AWDT)	AM Peak		
	Rate	Enter	Exit		Total	In	Out
Dutch Bros. Coffee Shop	3.35 (per thousand vehicles)	50%	50%	33,023	112	56	56

*Trip values rounded up to the nearest whole trip

The higher of the two trip generations, 56 during AM peak Hour, is used to facilitate a conservative analysis.

ANTICIPATED QUEUING AT THE PROPOSED LOCATION

This study presumes queuing at the proposed location is a function of:

- Percentage of vehicles using Lane 2 (the lane that leads into the bypass area) versus Lane 1 (the lane that leads to the pick-up window).
- The Peak Hour Arrival Rate (λ) (veh/hr).
- Peak Hour Service Rate (μ) (veh/hr).

The site plan for the proposed development has space for 21 vehicles (11 in Lane 1 and 10 in Lane 2). The estimated trip generation suggests that the AM Peak Hour is the busiest time of day, with 50 arrivals. Dutch Bros. values "speed" and has a goal of processing 100 vehicles per hour. On-site storage capacity based upon the site plan, estimated arrival rate, and desired service rate are provided in Table 3.

Table 3. On-Site Storage Capacity, Estimated Arrival Rate, and Service Rate for Proposed Dutch Bros.

Dutch Bros. - 98th St. and Volcano Rd.	
Lane 1 Site Plan Storage Capacity (veh)	11
Lane 2 Site Plan Storage Capacity (veh)	10

Total Vehicle Storage Capacity (veh)	21
Assumed Peak Hour Arrival Rate, λ (veh/hr)	56
Assumed Service Rate, μ (veh/hr)	100

The probability of a queue length being more than a specific value (k) can be determined using the following equation (assuming an M/M/1 queuing model):

$$\text{Probability of More Than "k" Units in the System} = \left(\frac{\lambda}{\mu}\right)^{k+1}$$

Where:

- k = storage capacity from the pick-up window to the fire lane or the storage capacity from the pick-up window to the roadway (provided in Table 3).
- λ = peak hour arrival rate (veh/hr).
- μ = service rate (veh/hr).

Cumulative probability provides the probability of k or fewer vehicles in the queue. The estimated queue length probabilities for the proposed site are summarized in Table 4.

Table 4. Queue Length Probabilities.

State (k vehicles)	Probability of State	Cumulative Probability
0	44.0%	44%
1	24.6%	69%
2	13.8%	82%
3	7.7%	90%
4	4.3%	94%
5	2.4%	97%
6	1.4%	98%
7	0.8%	99%
8	0.4%	99%
9	0.2%	100%
10	0.1%	100%

At the proposed Drive Dutch Bros. Coffee, the probability of a queue extending from the drive-through lanes is 0%. The queuing analysis suggests that no queue will exist 44% of the time. Additionally, a queue is not estimated to exceed the site's capacity of 21 vehicles. The queuing analysis results in Table 4 show that, as analyzed, queuing will be accommodated by the on-site storage.

SUPPLEMENTARY QUEUING ANALYSIS

As a supplement to the above evaluation, the following analysis calculates the lowest acceptable service rate where on-site queueing is accommodated by the provided storage (95th percentile queue). Table 5 shows the probability of k vehicles in the queue when the 95th percentile probability meets or exceeds the capacity of 21 vehicles.

Table 5: 95% Probability of "k" Vehicles in the Queue

State (k vehicles)	Probability of State	Cumulative Probability	State (k vehicles)	Probability of State	Cumulative Probability
0	12.6%	13%	13	2.2%	85%
1	11.0%	24%	14	1.9%	87%
2	9.7%	33%	15	1.7%	89%
3	8.4%	42%	16	1.5%	90%
4	7.4%	49%	17	1.3%	91%
5	6.4%	56%	18	1.1%	92%
6	5.6%	61%	19	1.0%	93%
7	4.9%	66%	20	0.8%	94%
8	4.3%	70%	<u>21</u>	<u>0.7%</u>	<u>95%</u>
9	3.7%	74%	22	0.6%	96%
10	3.3%	77%	23	0.6%	96%
11	2.9%	80%	24	0.5%	97%
12	2.5%	83%	25	0.4%	97%

At the expected arrival rate calculated previously, the drive-through queue exceeds the development's capacity when the service rate reduces to 64 vehicles per hour. This service rate is nearly two-thirds to half of the desired service rate of 100 vehicles per hour. Dutch Bros. Coffee plans to use available staff to adjust their service rate as demand increases. Dutch Bros. Coffee prepares a customized traffic control action plan to address and mitigate traffic when high customer volumes are anticipated. Site-specific features at this location include a pair of ordering kiosks and drive-through lanes that converge into one before arriving at the pick-up window. Additionally, Figure 2 shows an "escape lane" that allows vehicles that have received their order via a "drink runner" to exit the queue and leave the site before reaching the pick-up window.

This analysis is a conservative evaluation of queueing and does not consider any service rate improvements. Improved service rates are likely to shorten on-site queues. It is anticipated that the proposed Dutch Bros. Coffee site plan has sufficient queueing area for the calculated demand.

RECOMMENDATIONS

No modifications to the queueing area are proposed based on the queueing analysis.

Land Use: 938

Coffee/Donut Shop with Drive-Through Window and No Indoor Seating

Description

This land use includes any coffee and donut restaurant that has only drive-through window service. A patron cannot walk into the shop and purchase items. The restaurant sells freshly brewed coffee (along with coffee-related accessories) and a variety of food/drink products such as donuts, bagels, breads, muffins, cakes, sandwiches, wraps, salads, and other hot and cold beverages. The restaurant marketing and sales may emphasize coffee beverages over food (or vice versa).

The coffee/donut shops contained in this land use typically hold long store hours (more than 15 hours) with an early morning opening.

Coffee/donut shop without drive-through window (Land Use 936) and coffee/donut shop with drive-through window (Land Use 937) are related uses.

Additional Data

The sites were surveyed in the 1990s, the 2000s, and the 2010s in Arizona, New Hampshire, Oregon, and Washington.

Source Numbers

514, 644, 755, 981, 1028

Coffee/Donut Shop with Drive-Through Window and No Indoor Seating (938)

Vehicle Trip Ends vs: Drive-Through Lanes On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 8

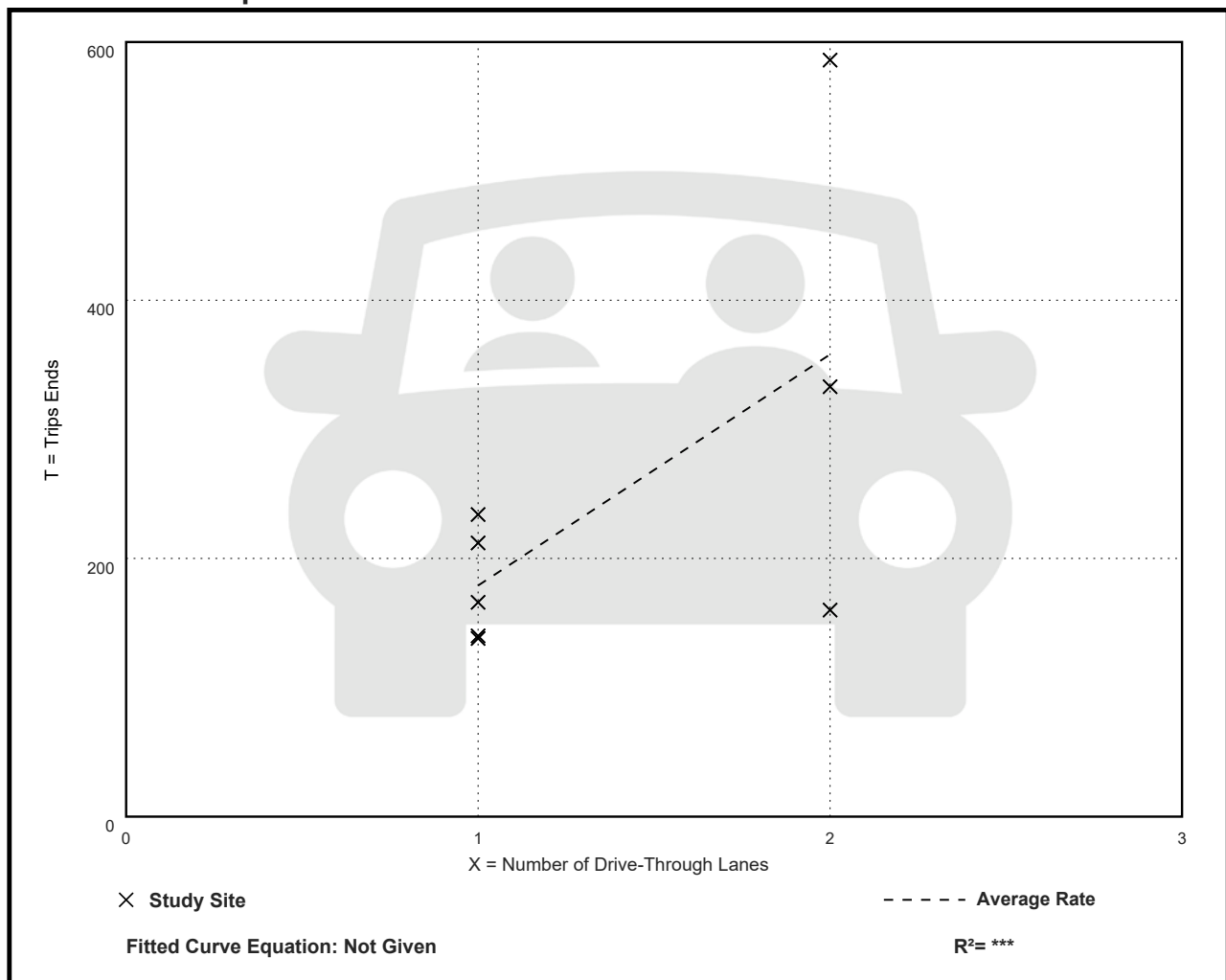
Avg. Num. of Drive-Through Lanes: 1

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Drive-Through Lane

Average Rate	Range of Rates	Standard Deviation
179.00	80.00 - 293.00	74.48

Data Plot and Equation



Coffee/Donut Shop with Drive-Through Window and No Indoor Seating (938)

Vehicle Trip Ends vs: Drive-Through Lanes

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: 20

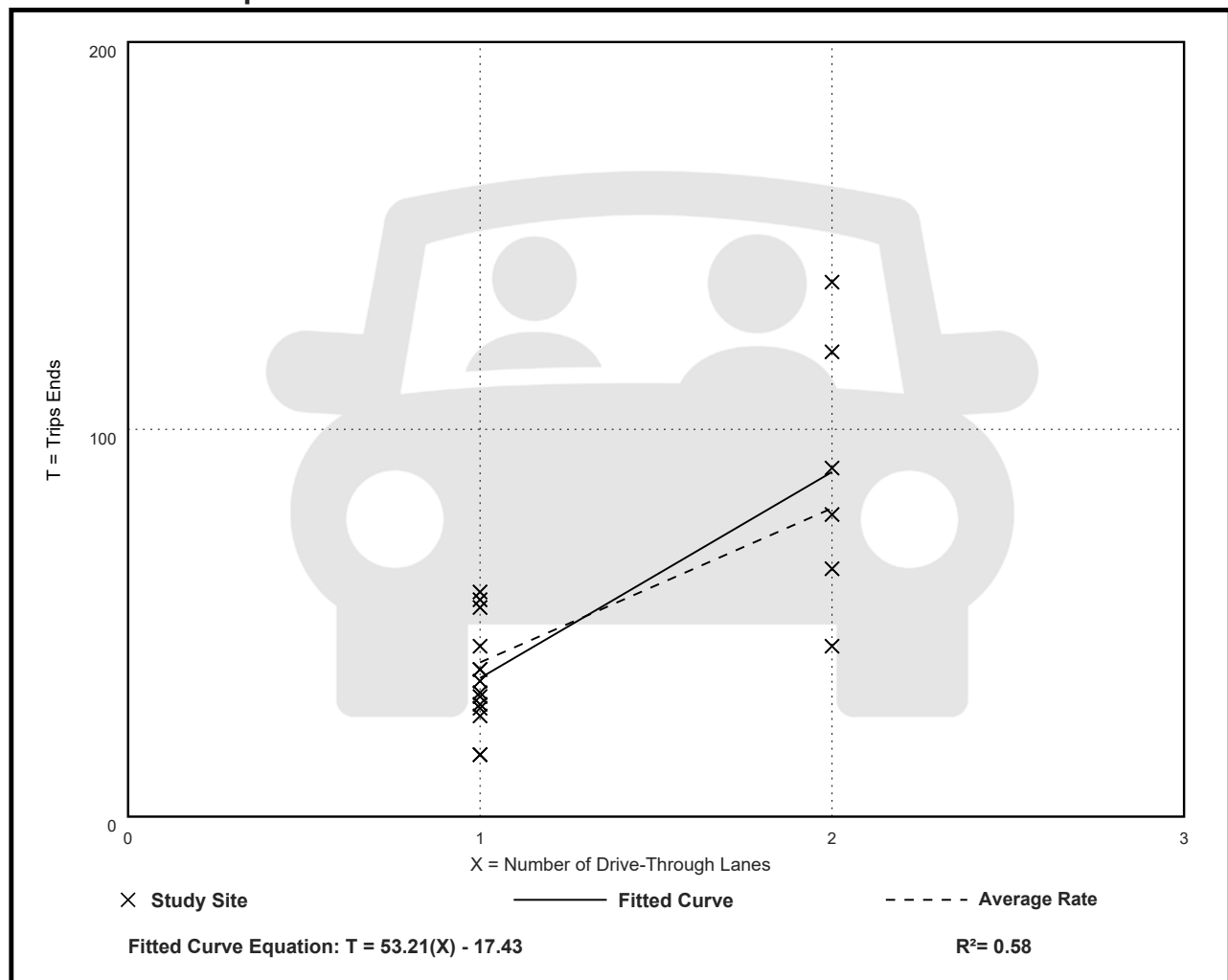
Avg. Num. of Drive-Through Lanes: 1

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Drive-Through Lane

Average Rate	Range of Rates	Standard Deviation
39.81	16.00 - 69.00	15.44

Data Plot and Equation



Coffee/Donut Shop with Drive-Through Window and No Indoor Seating (938)

Vehicle Trip Ends vs: Drive-Through Lanes

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

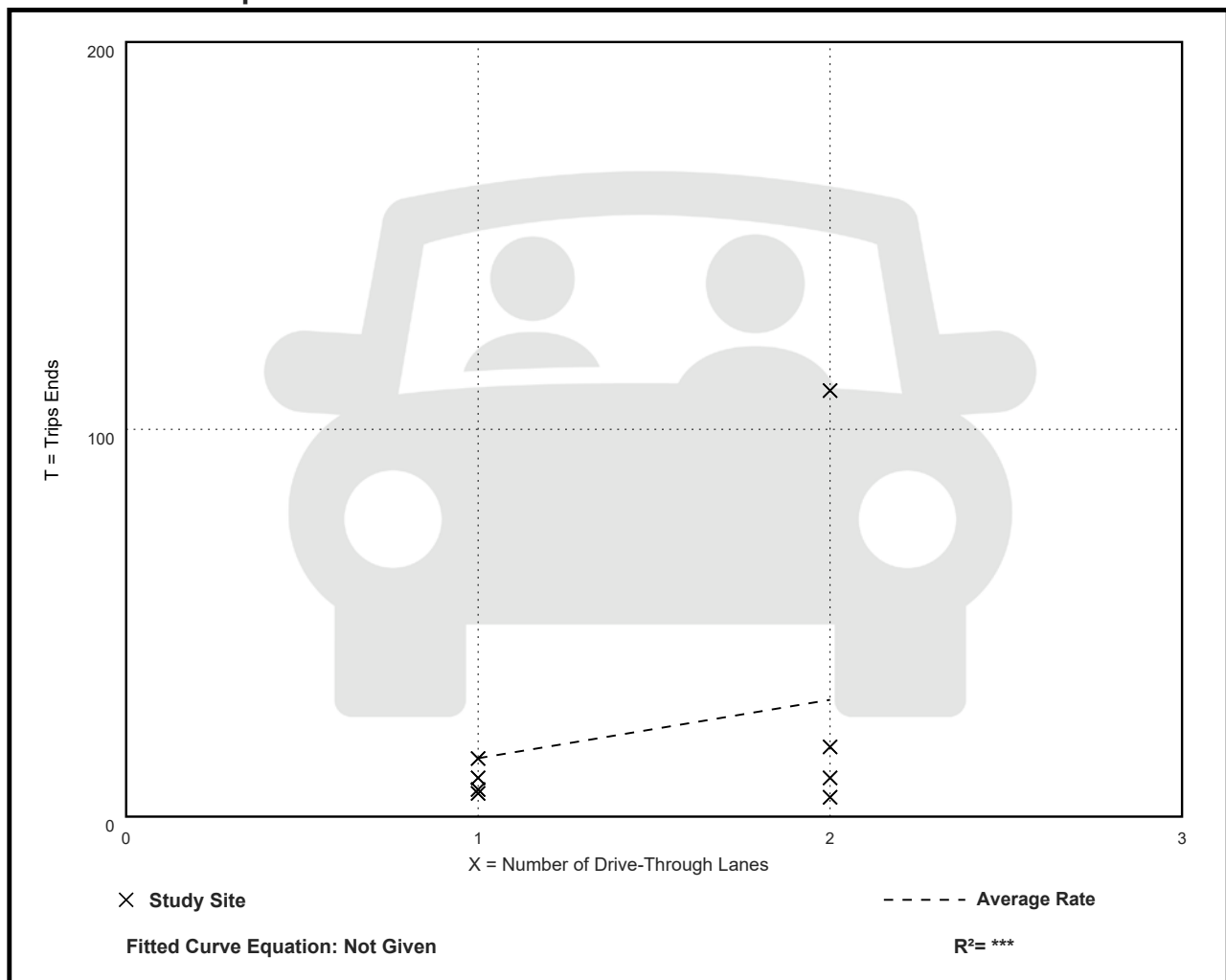
Avg. Num. of Drive-Through Lanes: 2

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Drive-Through Lane

Average Rate	Range of Rates	Standard Deviation
15.08	2.50 - 55.00	19.41

Data Plot and Equation



Coffee/Donut Shop with Drive-Through Window and No Indoor Seating (938)

Vehicle Trip Ends vs: Drive-Through Lanes

On a: Weekday,

AM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 10

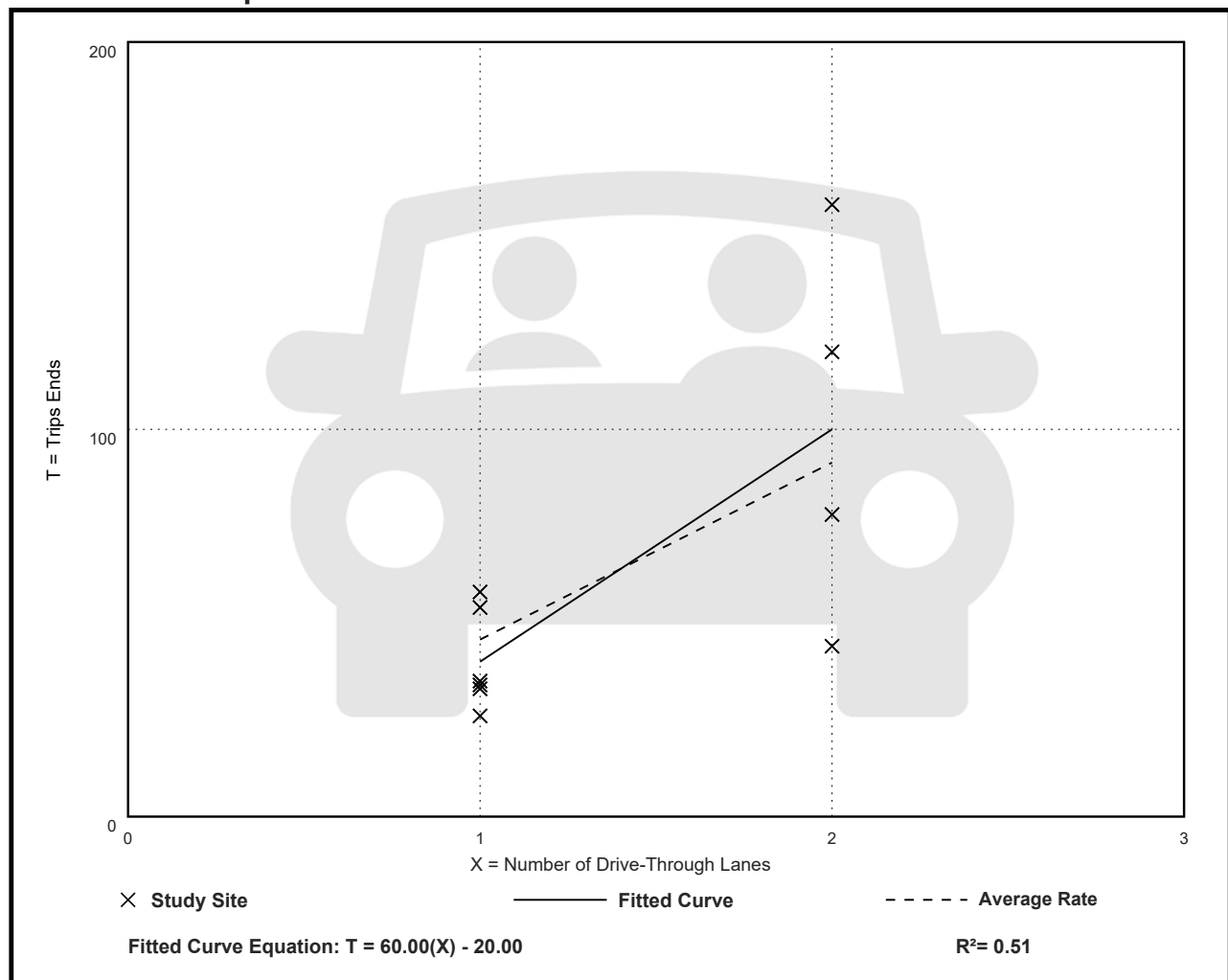
Avg. Num. of Drive-Through Lanes: 1

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Drive-Through Lane

Average Rate	Range of Rates	Standard Deviation
45.71	22.00 - 79.00	19.64

Data Plot and Equation



Coffee/Donut Shop with Drive-Through Window and No Indoor Seating (938)

Vehicle Trip Ends vs: Drive-Through Lanes

On a: **Weekday,**
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban

Number of Studies: 9

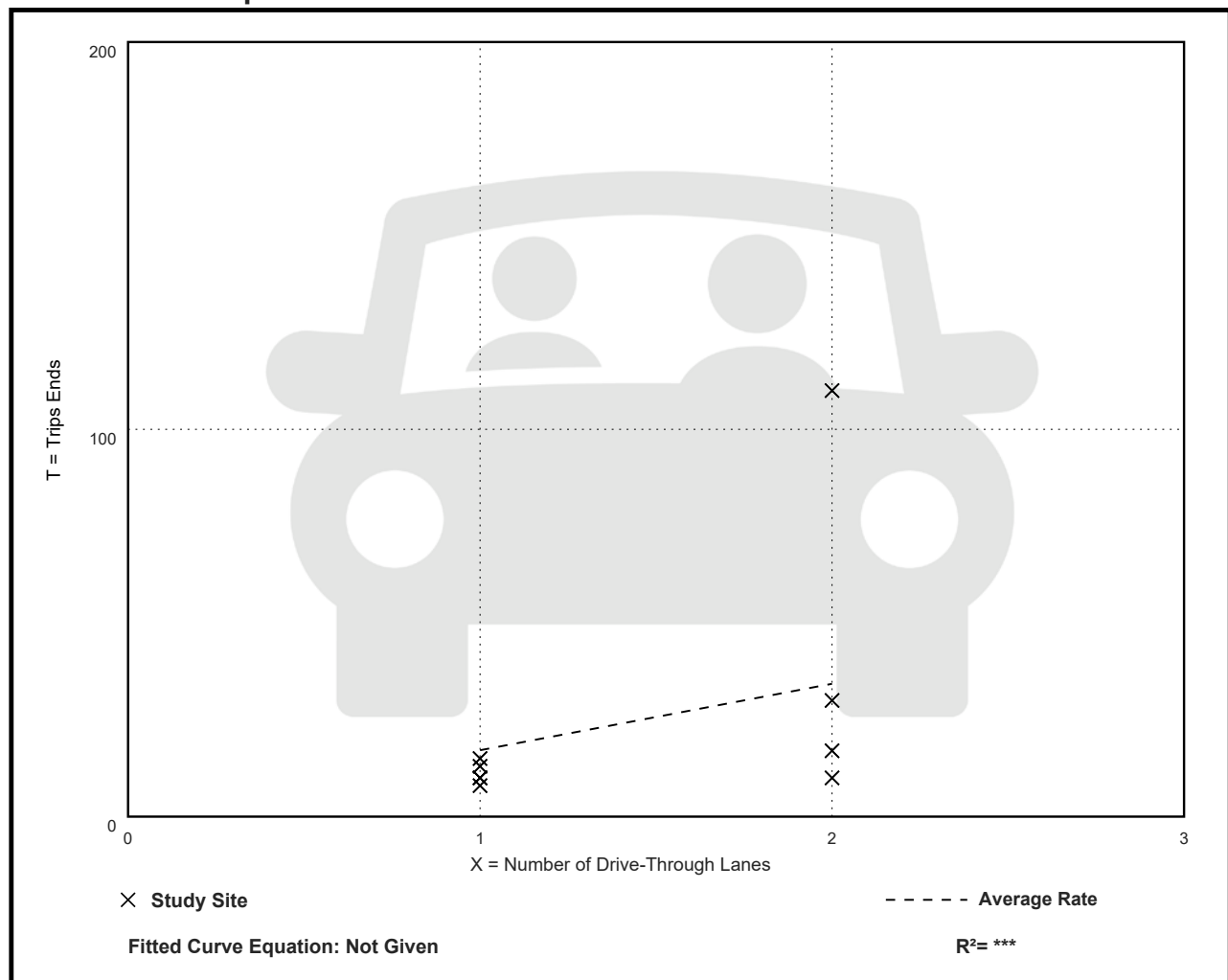
Avg. Num. of Drive-Through Lanes: 1

Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Drive-Through Lane

Average Rate	Range of Rates	Standard Deviation
17.15	5.00 - 55.00	17.47

Data Plot and Equation



STATEMENT OF OPERATIONS

Proposal

The applicant proposes to construct a 950 square foot Dutch Bros. Coffee with dual drive-through lanes, an exit lane, one drive-through window, one walk-up window, and associated site improvements including landscaping, curbing, and a trash/recycle enclosure, on a 0.69 acre portion of a larger 11.09 acre parcel currently in the process of being subdivided.

Dutch Bros. Coffee Introduction

Dutch Bros. Coffee, known for its upbeat “broistas” and genuine-caring service, is a growing drive-through coffee company with more than 500 locations in eleven states and over 12,000 employees. The three main company values are speed, quality, and service. In addition to serving drinks, Dutch Bros. Coffee strives to excel in philanthropy benefitting not only the communities where they are located but also larger efforts such as the Muscular Dystrophy Association. They give back through fundraisers, grants and donations.

Service

All Dutch Bros. Coffee locations serve coffee that is roasted in Grants Pass, Oregon. Along with hot and cold brewed coffee drinks, the menu includes a variety of Dutch Bros. Blue Rebel energy drinks, cocoa, lemonade, soda, smoothies and tea options. Packaged food items such as muffin tops and granola bars are also part of the menu.

Site Design and Orientation

The layout of a site is designed to create the best possible flow and the maximum queuing of vehicles possible to reduce the impact and spillover onto adjacent properties or public roads. In addition to the drive-through window with double queuing lanes, Dutch Bros. Coffee includes a separate customer window that is oriented to the opposite side of the structure to serve pedestrian walk-up traffic only. Parking stalls are accommodated on site.

Architecture

The proposed building is designed to be visually interesting and will be constructed with a variety of quality building materials offering simple yet bold colors. Vertical and horizontal façade breaks, building massing, and modulation have all been incorporated into the design. Canopy awnings are provided over entrances and service doors, including a large canopy over the customer walk-up service window providing weather protection. Colorful and visually interesting wall signs depicting the Dutch Bros. Coffee logos are installed on all sides of the building.

Signs and Lighting

Signs proposed for use at the project site will conform to the zoning code. Signs proposed to be installed at the project site include wall, menu, drive-through, parking lot, and directional signs. Signs will be constructed with quality materials and properly installed under separate permits.

Site lighting is important for the safety and security of customers, pedestrians, and employees. Outdoor lighting and illumination at the site includes parking lot security lighting and pedestrian scale lighting within the patio space and along the pedestrian pathway. Exterior building lighting will be installed on the building façade. The drive-through area will be provided with security lighting. All lights will include shields to direct light toward the project site and keep glare away from the adjacent land uses and rights-of-way.

Hours of Operation and Employees

Dutch Bros. Coffee will be open from 5:00am to 11:00pm everyday with up to seven (7) staff members during peak periods.

Customer Traffic

While Dutch Bros. Coffee does not have daily customer count data, on average, it is estimated a 950 square foot kiosk generates 141 trips in the a.m. peak hours (7a-9a) and 115 trips in the evening peak hours (3p-5p); approximately 1,600 trips per day.

To satisfy the company value of “speed,” Dutch Bros. Coffee employs a comprehensive sign package, tailored to each site, to direct customers efficiently to and through the site.

In addition to the signage, staff are stationed outside to help alleviate congestion. All staff are required to attend a monthly shop meeting to discuss traffic plans in detail. The staff also gather before each shift to ensure the traffic strategy is set and employees understand their duties. During the peak hours, one employee's sole responsibility is traffic control which includes instructing all vehicles to pull forward as close as possible to utilize the maximum queuing available, directing cars into the waiting area or the escape/exit lane if needed, and ensuring no cars are blocking the roads or other areas. Three or four staff are also dedicated to the parking area throughout the day to take orders, receive payments, and sometimes deliver drinks allowing customers to exit via the bypass/exit lane; these employees are referred to as “runners.”

These measures have proven effective in reducing customer time at the window to 30 to 45 seconds and efficiently controlling traffic, significantly minimizing the potential for queuing spillover outside the dedicated drive-through lanes.

Solid Waste Collection Plan

Dutch Bros. Coffee proposals include a 20' x 12' trash and recycle enclosure designed to be consistent with the colors and materials for the overall development and accessible by truck from the front with a pedestrian access point off of the rear. Typical service includes one 4-yard dumpster, one 3-yard recycling canister.

Conclusion

The Dutch Bros. Coffee project is proposed to enhance the use of the outlying area of the WinCo parcel and serve as commercial in-fill. Dutch Bros. Coffee is a successful business that will promote improvement of the existing commercial area; the company sites are known to be clean and well maintained, providing quick service from friendly staff. The proposed coffee shop will provide enhanced landscaping areas, lighting, and pedestrian open space at the project site.