

**Abbreviated Engineer's Assessment
Purple Heart Parkway Extension
Montgomery County**

**Prepared for:
Montgomery County**

Prepared by:



**8770 North St., Ste. 110
Fishers, IN 46038**

March 2022

TABLE OF CONTENTS

PROJECT LOCATION 1

PROJECT NEED AND PURPOSE..... 1

EXISTING FACILITY. 1

TRAFFIC FORECAST & INTERSECTION CAPACITY ANALYSIS..... 1

ALTERNATIVES AND RECOMMENDATIONS. 2

TRAFFIC MAINTENANCE DURING CONSTRUCTION..... 5

ENVIRONMENTAL ISSUES..... 5

PERMITS REQUIRED 6

SURVEY REQUIREMENTS..... 6

RIGHT-OF-WAY IMPACTS..... 6

RAILROAD IMPACT..... 6

UTILITY IMPACTS.....6

PRELIMINARY COST ESTIMATE.....7

CONCURRENCE..... 9

Abbreviated Engineer's Assessment

PROJECT LOCATION

This project begins at the intersection of US 231 and Purple Heart Parkway and extends for an approximate length of 1.25 miles to the intersection of S Ladoga Rd and County Road 200S. It is further described as being located in Sections 8 and 9, Township 18 North, Range 4 West in Union Township, all in Montgomery County, Indiana. Site Maps are in Appendix "A-1".

PROJECT NEED AND PURPOSE

Montgomery County is expecting to experience residential, commercial, and industrial development within and near the proposed project area, increasing traffic volumes. The purpose of the project is to provide connectivity from US 231 to S Ladoga Rd by extending the existing east approach of Purple Heart Parkway to CR 200S with a safe and efficient route to accommodate the development and increased traffic volumes. Furthermore, there is a potential to extend Purple Heart Parkway further to the east, connecting to Comfort Drive; this will also provide access from US 231 to Nucor Rd.

EXISTING FACILITY

Since the proposed road is a new terrain construction project by extending Purple Heart Parkway to the east, the existing facility will be considered as Purple Heart Parkway.

Purple Heart Parkway is functionally classified as Urban (Intermediate) Local Street and currently has a signal-controlled intersection at US 231. The posted speed limit is 30 mph from SR 47 to US 231. The existing typical section consists of two lanes total (one 11 ft lane in each direction) with combined curb and gutter with one 12 ft two ways left turn lane on the west end. The existing County Road 200S is a 15' wide gravel road with no speed limit posted.

Site photographs of the existing roadway are included in the Appendix "A-2" and existing typical cross sections are included in Appendix "A-3".

TRAFFIC FORECAST & INTERSECTION CAPACITY ANALYSIS

A traffic forecast was completed for this project. See Appendix "B-1" for the complete traffic analysis.

Abbreviated Engineer's Assessment

The study of trip generation, traffic assignment, and trip distribution for the future the developments were combined with available INDOT traffic counts for the existing roadway to obtain an opening day and design year traffic forecast. Projections of the traffic counts for Purple Heart Parkway Extension are as follows:

TRAFFIC DATA			
A.A.D.T.	(2023)	12,900	V.P.D.
A.A.D.T.	(2033)	14,200	V.P.D.
D.H.V.	(2023)	1,100	V.P.H.
DIRECTIONAL DISTRIBUTION		54	%
TRUCKS		2	% A.A.D.T.
		9	% D.H.V.

The traffic forecast study also provided a proposed segment cross section based on projected traffic volumes.

An intersection capacity analysis was also performed to determine the projected turning movement counts at US 231 & Purple Heart Parkway and Ladoga Rd & Purple Heart Parkway, and to analyze the peak hour capacity. See appendix B-1 for proposed intersection configurations and additional recommendations.

ALTERNATIVES AND RECOMMENDATIONS

Alternatives

Two alternatives or scenarios were considered. These included:

- Alternative A: Do Nothing
- Alternative B: Extend existing Purple Heart Parkway from US 231 to S Ladoga Rd

Alternative A: Do Nothing

The No-Action Alternative involves no disruption of the facility and no additional cost by maintaining the existing condition. If this alternative were chosen, there will be no access provided for land developments to occur between US 231 and S Ladoga Rd. This alternative does not meet the need nor achieves the purpose of the project and will not be considered further.

Abbreviated Engineer's Assessment

Alternative B: Purple Heart Parkway Extension

This alternative meets the need and purpose of the project and is the preferred alternative.

Details of the Preferred Alternative:

The **recommended alternative** involves constructing a new two-lane road beginning at US 231 to S Ladoga Rd. The proposed improvements will include constructing full depth pavement, installing small structures as needed, grading ditches, and potentially installing a storm sewer system.

The proposed horizontal alignment of Purple Heart Parkway consists of three horizontal curves on the west end to minimize the impact to the existing wooded area as well as the existing legal drain, with a tangent section connecting east to S Ladoga Rd on existing County Road 200S.

The profile grade will be higher than existing ground to provide adequate drainage. Roadside ditches and/or an enclosed drainage system through the corridor will be required to convey runoff from the road pavement and from areas which drain toward the road. The lengths of the turn lanes will be provided as per the traffic analysis.

Road Cross Section Considerations

With the preferred alternative, three typical cross sections with drainage options were considered:

- Option 1: Two 12 ft travel lanes with 3' shoulders (2' paved) along with roadside ditches
- Option 2: Two 12 ft travel lanes with 2'-7" combined curb & gutter and curb inlets along with a storm sewer system
- Option 3: Two 12 ft travel lanes with 2'-7" combined curb & gutter and curb turnouts along with roadside ditches

An 8 ft wide paved multi-use path is proposed for all options along the north side of the Purple Heart Parkway. See Appendix C-1 for proposed typical sections.

Abbreviated Engineer's Assessment

Design Criteria used for this project shall be as follows:

Design Speed:	30 mph
Lane Width:	12 ft
Auxiliary Lane Width	12 ft
Shoulder Width:	3 ft useable, 2 ft paved;
Curb Offset:	2 ft
Multi-Use Path	8 ft
Underdrain:	Y
Underdrain Freeboard:	1 ft
Roadway Design Standard:	IDM Chapter 302
Hydraulic and Drainage Design Standard	IDM Chapter 203

The proposed pavement shall consist as follows:

1.5 inches (165 lb/sy) QC/QA-HMA, 2, 64, Surface, 9.5 mm on
2.5 inches (275 lb/sy) QC/QA-HMA, 2, 64, Intermediate, 19.0 mm on
3 inches (330 lb/sy) QC/QA-HMA, 2, 64, Base, 19.0 mm on
2.5 inches (250 lb/sy) Open-Graded Asphalt on
4 inches Compacted Aggregate, No. 53 Base on
Geotextile Type 1A on
Grade Raised Fill or Subgrade Treatment Type IBL

The approximate width of Right-Of-Way is summarized below; an additional 25 ft of utility easement is required for all options on the side of the Purple Heart Parkway.

<u>Option 1</u>	80 ft
<u>Option 2</u>	60 ft
<u>Option 3</u>	80 ft

Other Considerations

Within the traffic forecast study, a Two Way Left Turn Lane was recommended. However, due to limitation of Right-of-Way and lack of information for land development, it is recommended that left- and right-turn lanes be constructed at future driveways along the corridor to provide adequate level of service and capacity.

TRAFFIC MAINTENANCE DURING CONSTRUCTION

The majority of the project may be constructed without impacting existing traffic patterns due to the new terrain alignment. Portions of the project impacting existing approaches will be constructed in phases with maintaining access for the existing property owners.

ENVIRONMENTAL ISSUES

RQAW has evaluated the potential environmental impacts for the proposed Purple Heart Parkway Project. As this project will utilize 100% local funds, a National Environmental Policy Act (NEPA) or State Environmental Policy Act (SEPA) document is not required. However, due to anticipated stream and/or wetland impacts, a Waters of the U.S. Determination Report will need to be prepared. RQAW has already performed a preliminary Red Flag Investigation for the area, see Appendix "D-1". The preliminary findings include:

- The Crawfordsville Municipal Airport, which is a public airport, is located approximately 2.2 miles to the southwest of the project area. Coordination with the Crawfordsville Municipal Airport should occur.
- One (1) pipeline, belonging to the Indiana Gas Company, is adjacent to the west end of the project area. Coordination with the Indiana Gas Company should occur.
- One (1) Stream, Unnamed Tributary (UNT) to Offield Creek is located within/adjacent to the south of the project area. In addition, although not mapped according to GIS, this stream likely transects the project area approximately 0.39 mile east of US-231, according to a review of aerial imagery.
- The project area is located within a mapped floodplain.
- There are two (2) Leaking Underground Storage Tank (LUST) sites mapped just north of the project area. The nearest LUST site is associated with the Murphy USA gas station and is actually located 0.17 mile west of the project area. Impacts are not expected.
- One (1) Underground Storage Tank (UST), associated with the Murphy USA gas station, is located 0.17 mile west of the project area. No impact is expected.

Abbreviated Engineer's Assessment

PERMITS REQUIRED

An Indiana Department of Environmental Management (IDEM) Construction Stormwater General Permit (Formally Rule 5 Permit) will be required as land disturbance activities will exceed one acre. An Indiana Department of Natural Resources (IDNR) Construction in a Floodway (CIF) permit will be required for work that encroaches upon the regulatory floodway. If this project requires tree clearing within a regulatory floodway, habitat mitigation will likely be required as part of the IDNR CIF permit. U.S. Army Corps of Engineers (USACE) Section 404 and IDEM Section 401 water quality permits will be required for any impacts to water resources. Stream and/or wetland mitigation will be required if impacts exceed 300 linear feet and/or 0.1 acre.

If a USACE 404 permit is required, an archaeological investigation may be required for any work that occurs in undisturbed soils.

SURVEY REQUIREMENTS

The required topographic survey for this project will begin at US 231 and continue east to S Ladoga Rd. The width of the survey requirement will be 100 feet from the centerline on the left and the right.

RIGHT-OF-WAY IMPACTS

Additional permanent and temporary right-of-way will be required for this project. It is estimated that 10 parcels will require land acquisition. Further investigation of the required permanent right-of-way will be conducted during the design phase of the project to minimize the need for additional permanent right-of-way.

RAILROAD IMPACT

There are no railroad crossings within the project limits, so there will not be any railroad impacts.

UTILITY IMPACTS

Multiple utilities are located within the existing approach on east and west end. Utilities with facilities include:

- AT&T
- Centerpoint Energy
- Comcast

Abbreviated Engineer's Assessment

- Crawfordsville Electric Light & Power
- Crawfordsville Wastewater
- Indiana American Water
- Zayo

Since the proposed road is a new terrain construction project, it is assumed that utility relocations and installation for new services will be required during future land development. Utility coordination will occur throughout the project, and any necessary relocations will be completed prior to construction of the road. Utility coordination will be needed when installing new services within the utility easement.

PRELIMINARY COST ESTIMATE

The preliminary construction costs for all three options discussed in the Preferred Alternative were estimated; each of them was separated into two phases. Furthermore, preliminary engineering cost estimates are also included for each option. Please refer to Appendix E-1, E-2, and E-3 for more details.

The cost of each option is as follows:

Option 1	
Construction Cost (CN) Phase I	\$2,099,000.00
Construction Cost (CN) Phase II	\$2,752,000.00
Right-of-Way (RW)	\$125,000.00
Preliminary Engineering (PE)	\$660,775.00
Railroad Coord (RR)	\$0
Utility (UT)	\$50,000
Construction Engineering (CE)	\$582,000.00
Total Project Cost	\$6,800,000.00
Option 2	
Construction Cost (CN) Phase I	\$2,125,000.00
Construction Cost (CN) Phase II	\$2,976,000.00
Right-of-Way (RW)	\$90,000.00
Preliminary Engineering (PE)	\$682,025.00
Railroad Coord (RR)	\$0
Utility (UT)	\$50,000
Construction Engineering (CE)	\$612,000.00
Total Project Cost	\$7,100,000.00

Abbreviated Engineer's Assessment

Option 3	
Construction Cost (CN) Phase I	\$2,033,000.00
Construction Cost (CN) Phase II	\$3,010,000.00
Right-of-Way (RW)	\$125,000.00
Preliminary Engineering (PE)	\$680,575.00
Railroad Coord (RR)	\$0
Utility (UT)	\$50,000
Construction Engineering (CE)	\$605,000.00
Total Project Cost	\$7,050,000.00

Abbreviated Engineer's Assessment

CONCURRENCE

Prepared by:



Yan Zhu, P.E.
RQAW Corporation

4/28/2022

Date



Roman Prather, P.E.
RQAW Corporation

4/28/2022

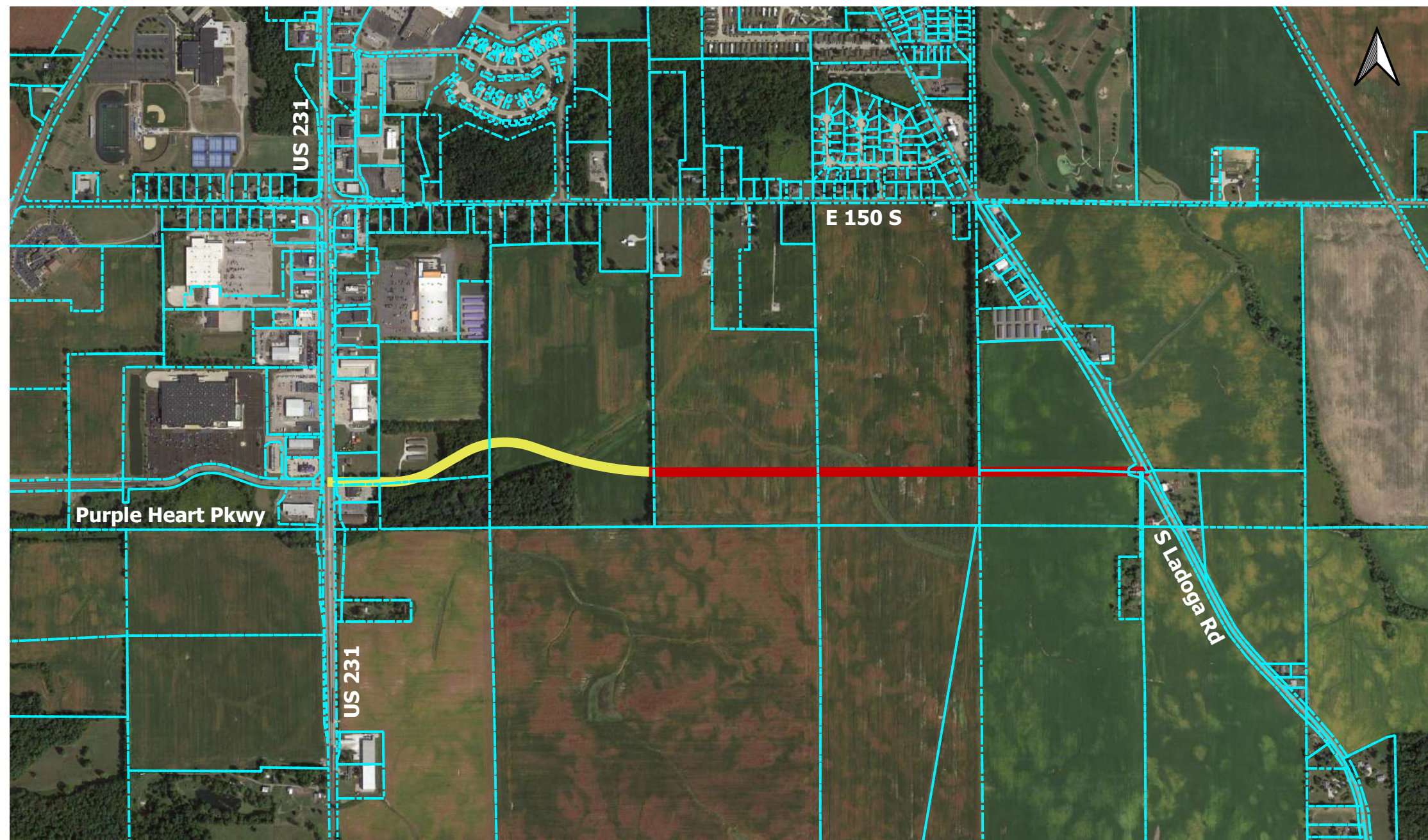
Date

Approved By:
Engineer Review

Tom Klein, P.E.
Montgomery County Administrator
Recommend:
APPROVAL/DISAPPROVAL

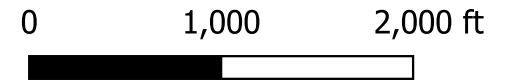
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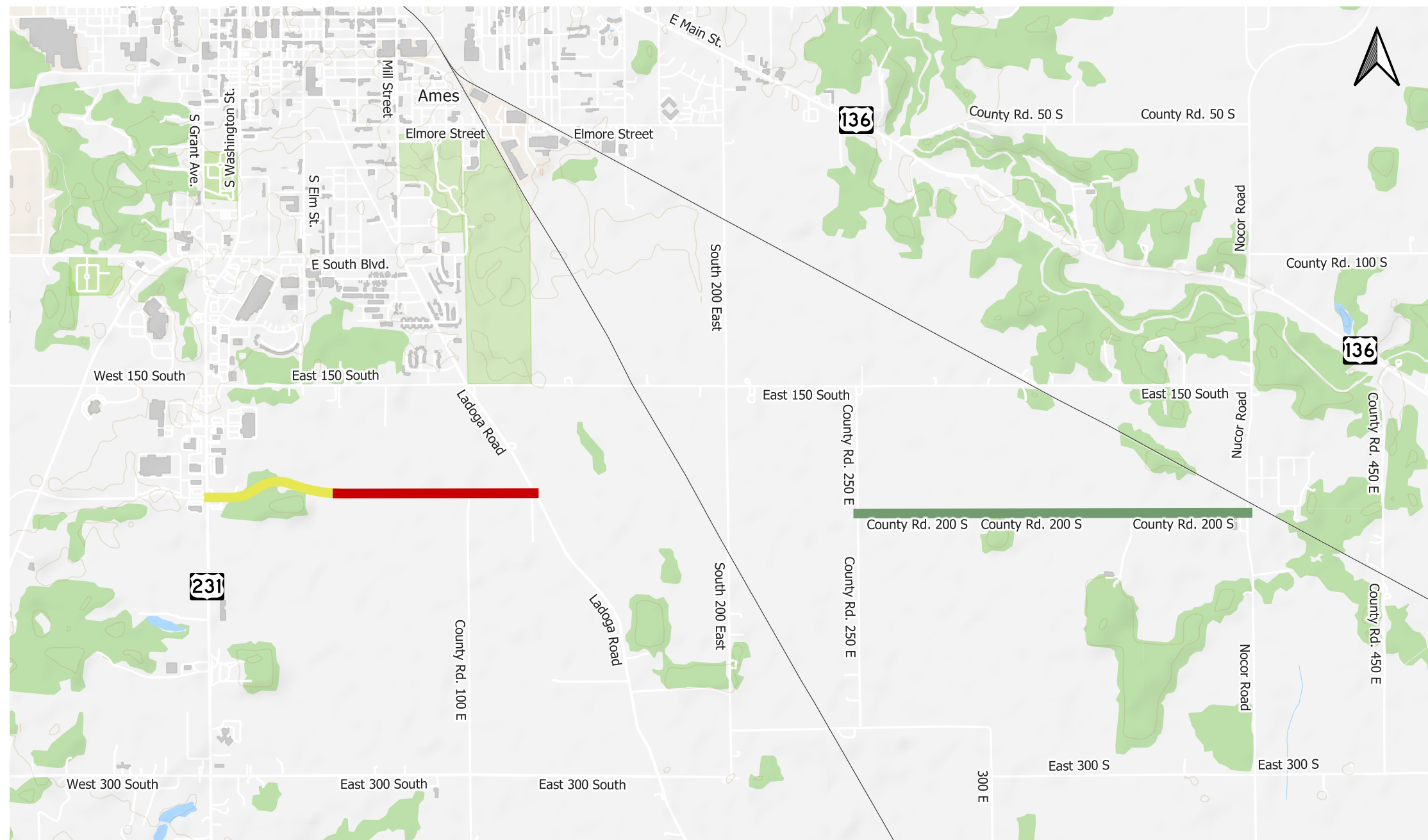
Appendix A-1 Project Location Maps



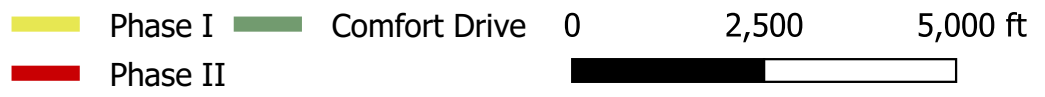
Purple Heart Parkway Extension

-  Phase I
-  Phase II

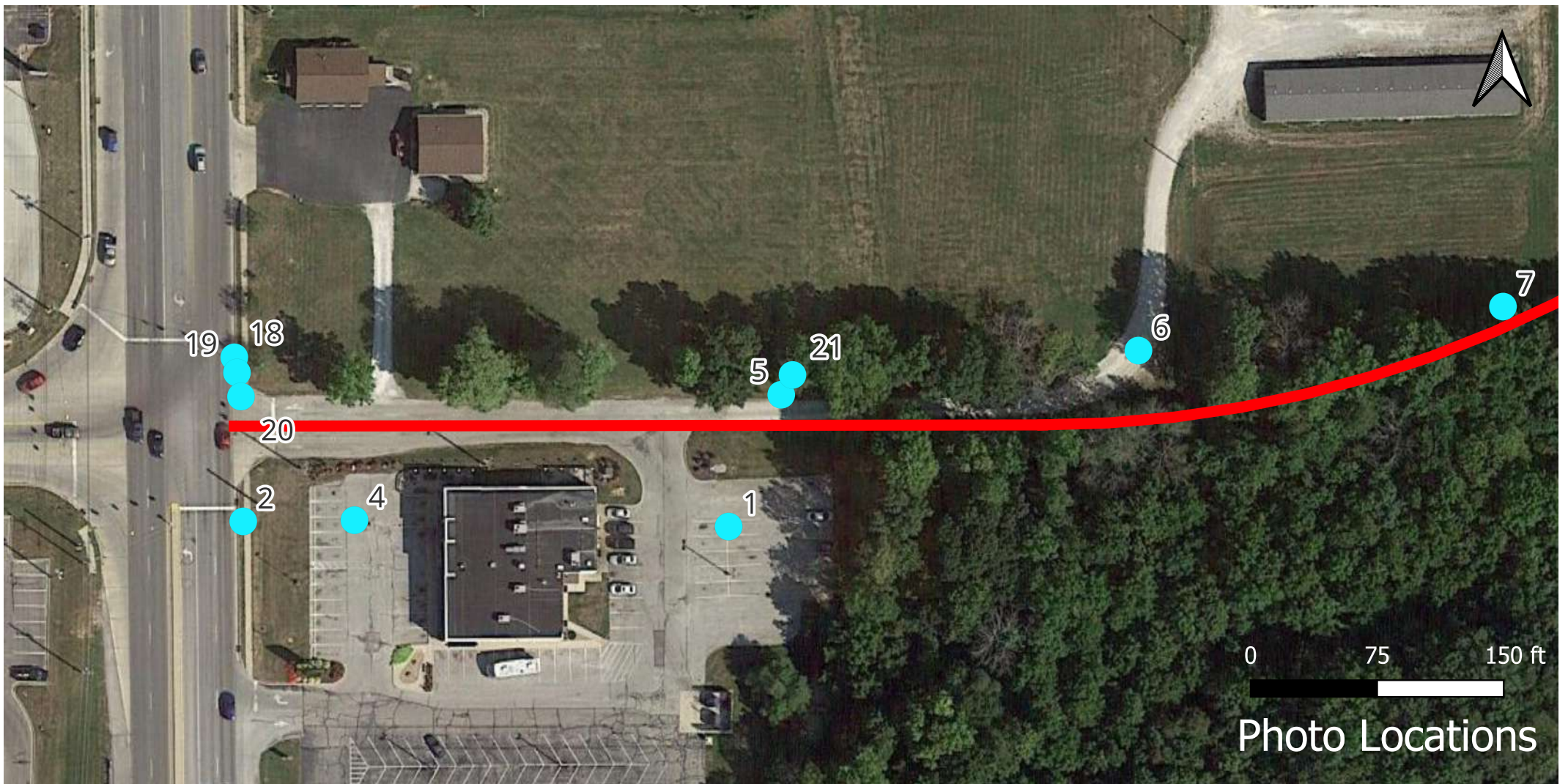




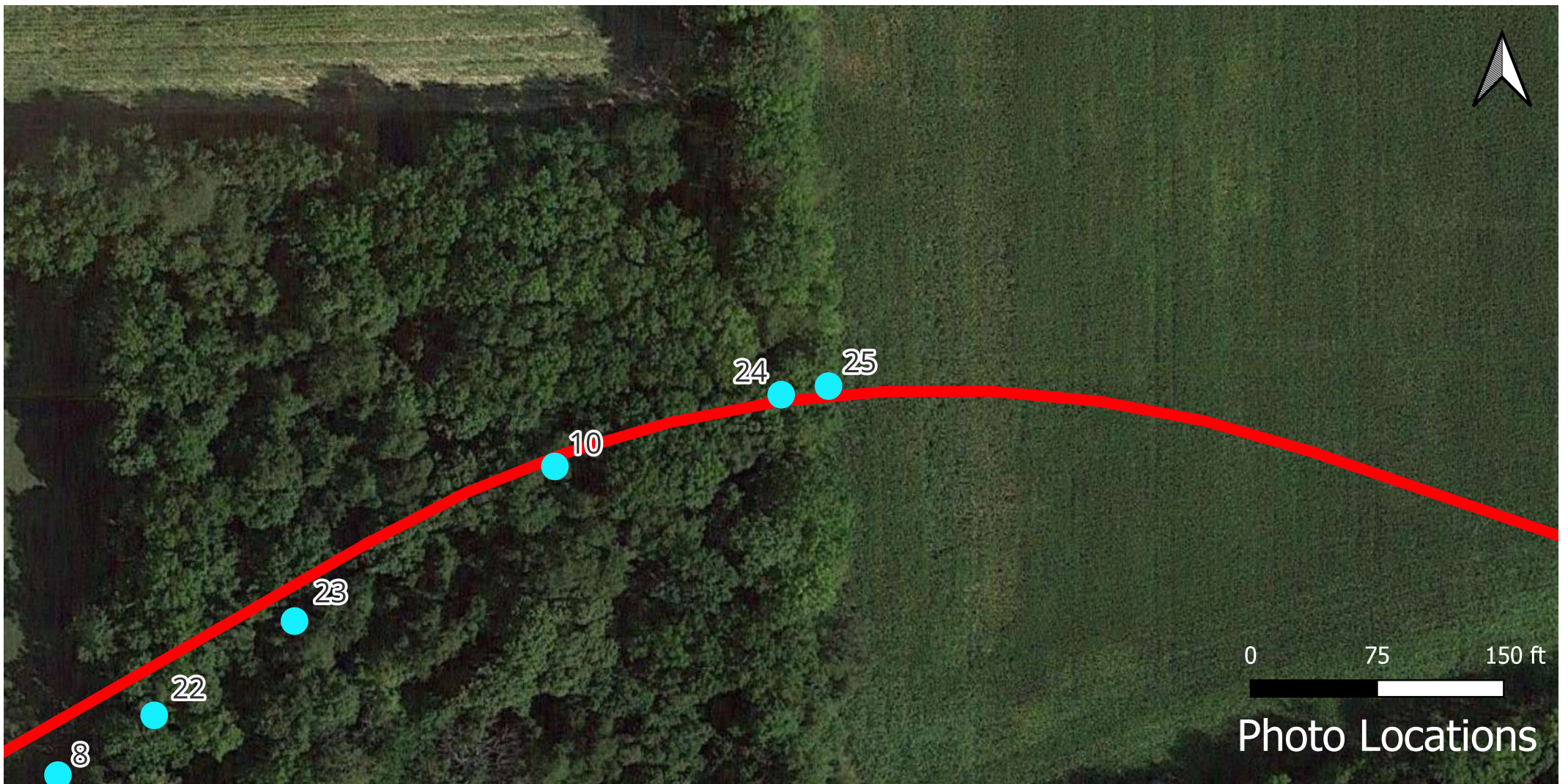
Purple Heart Parkway Extension

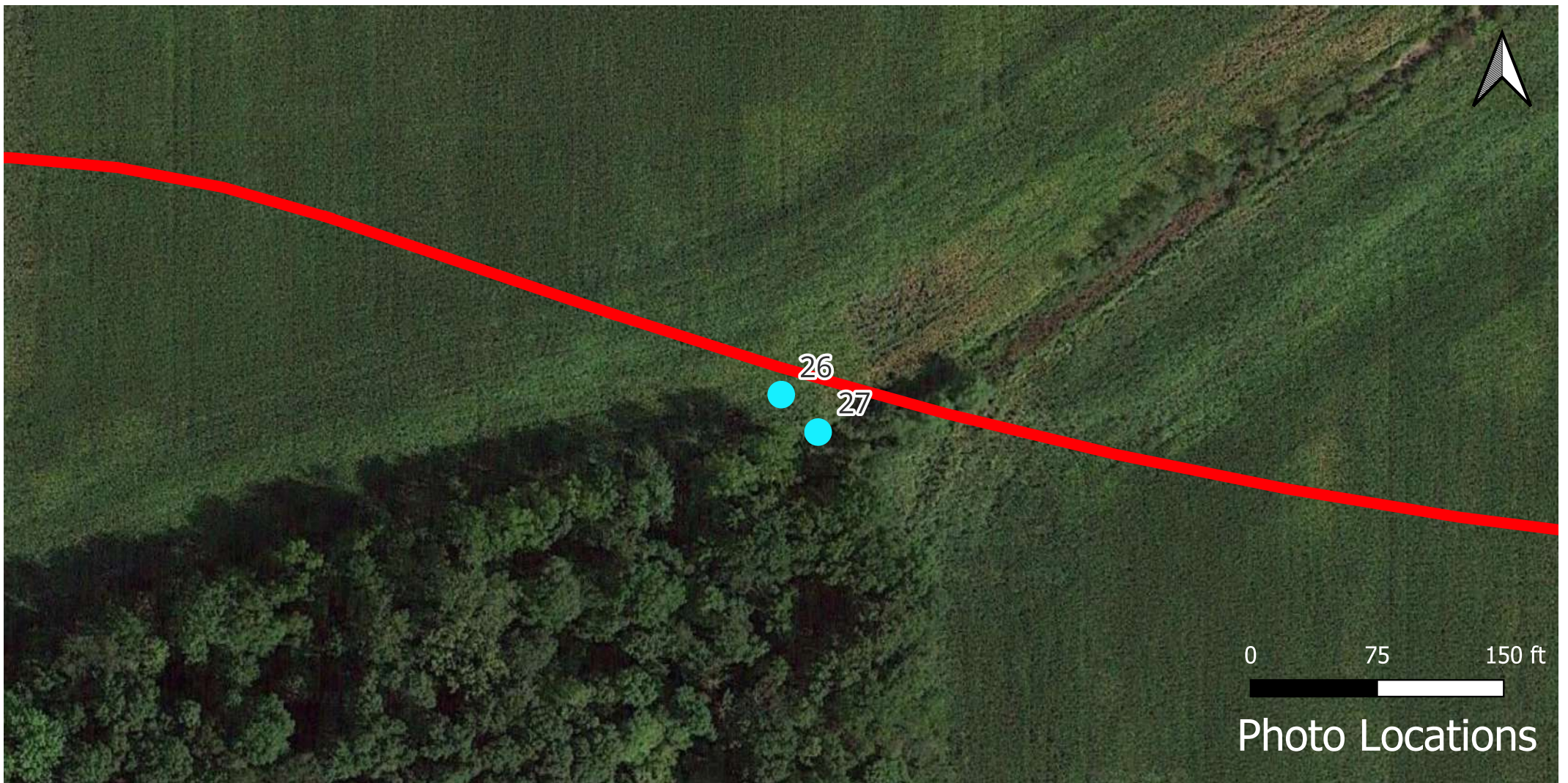


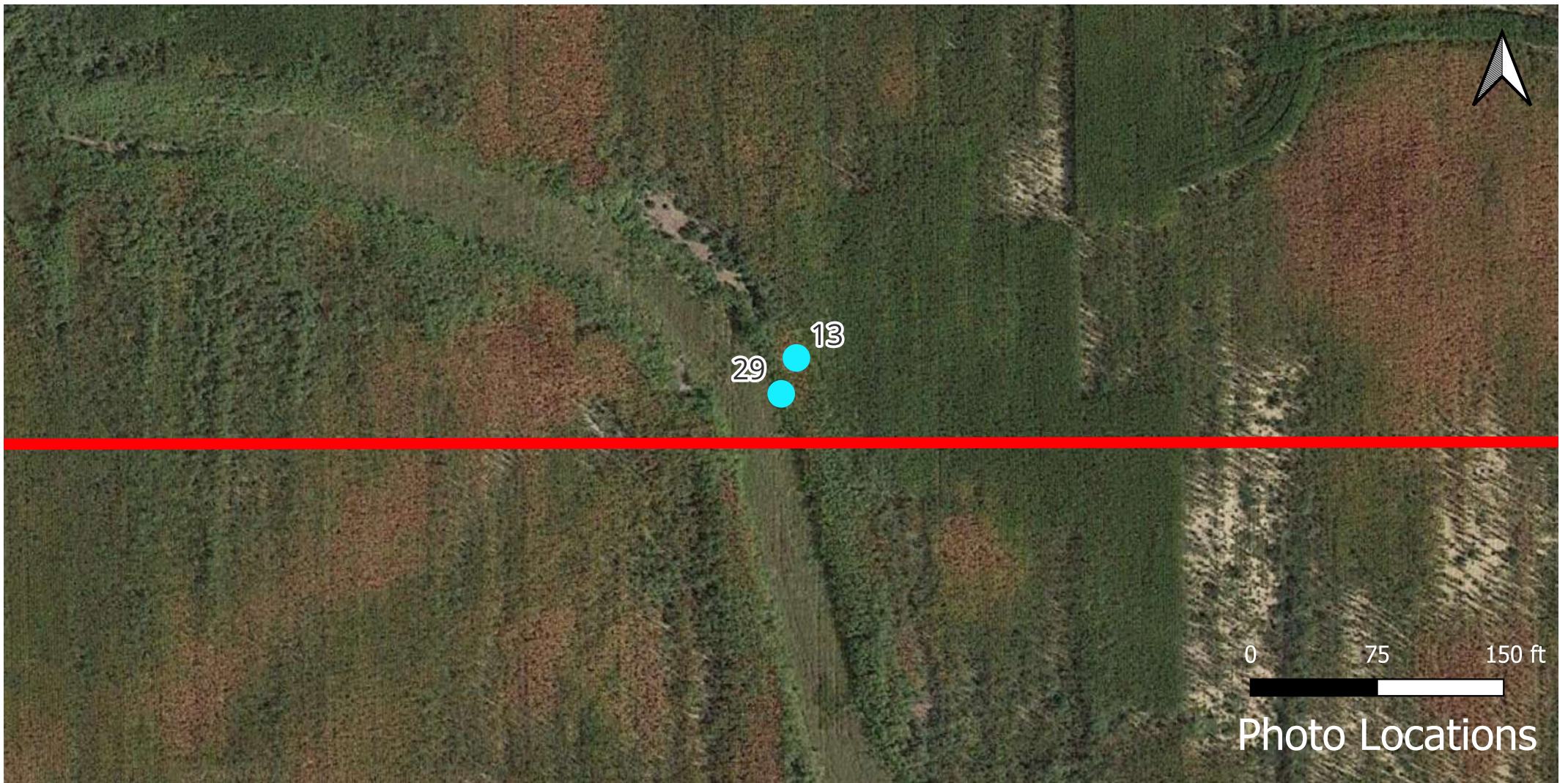
Appendix A-2 Site Photographs

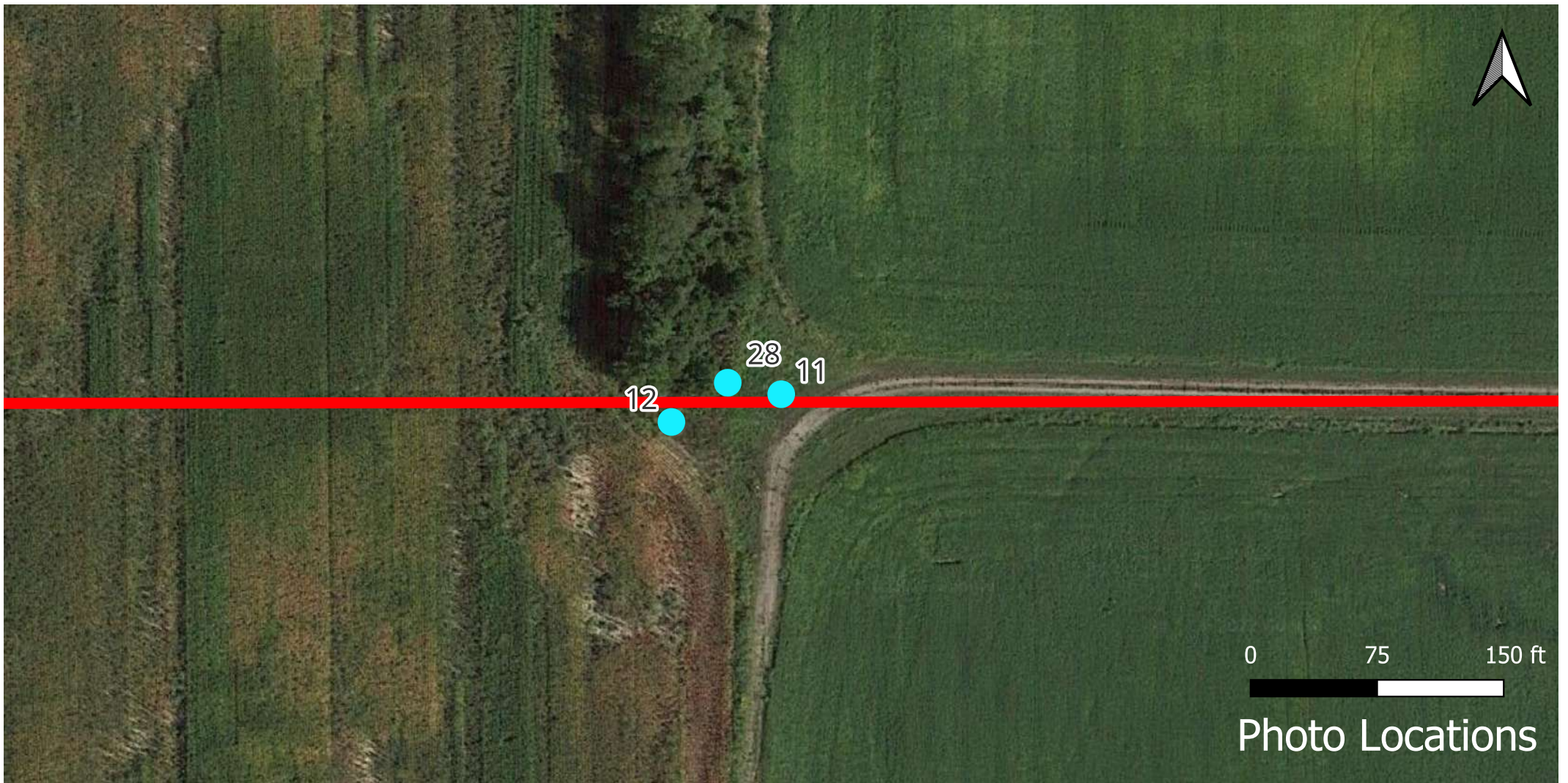


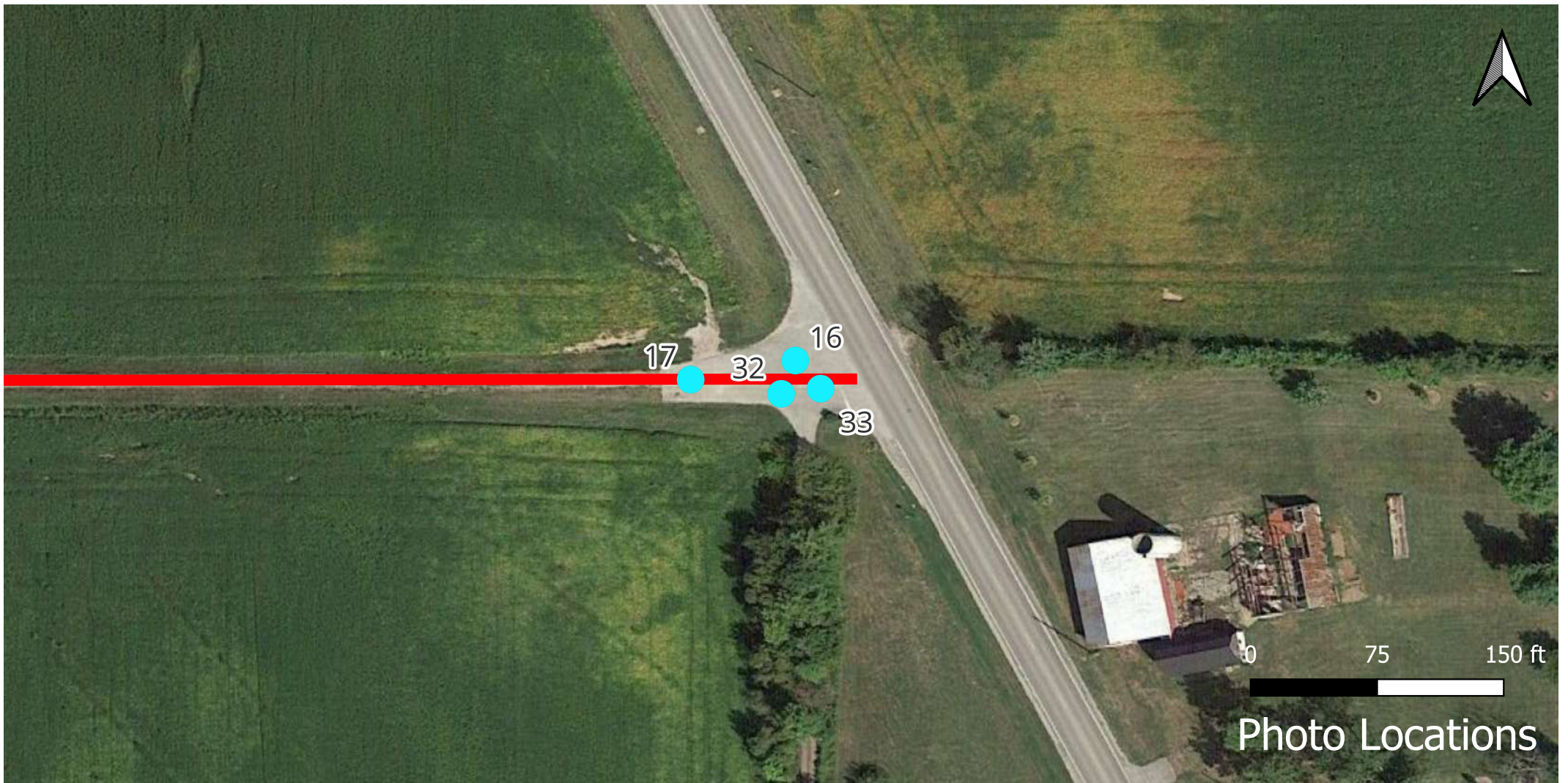










































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27 Looking SW



27 Looking NE



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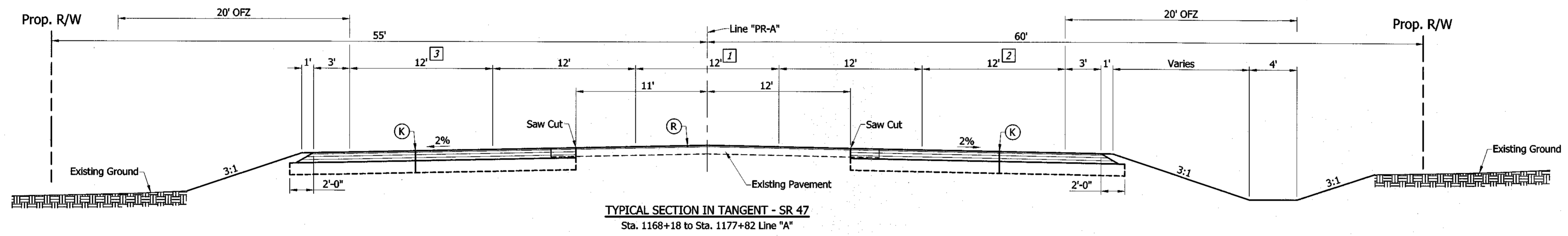
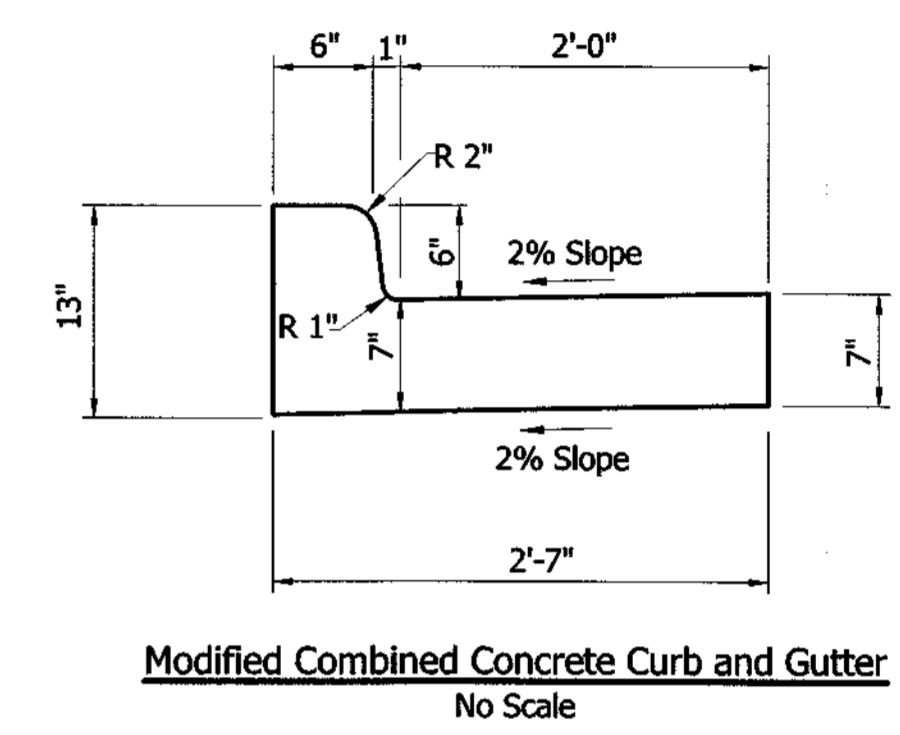
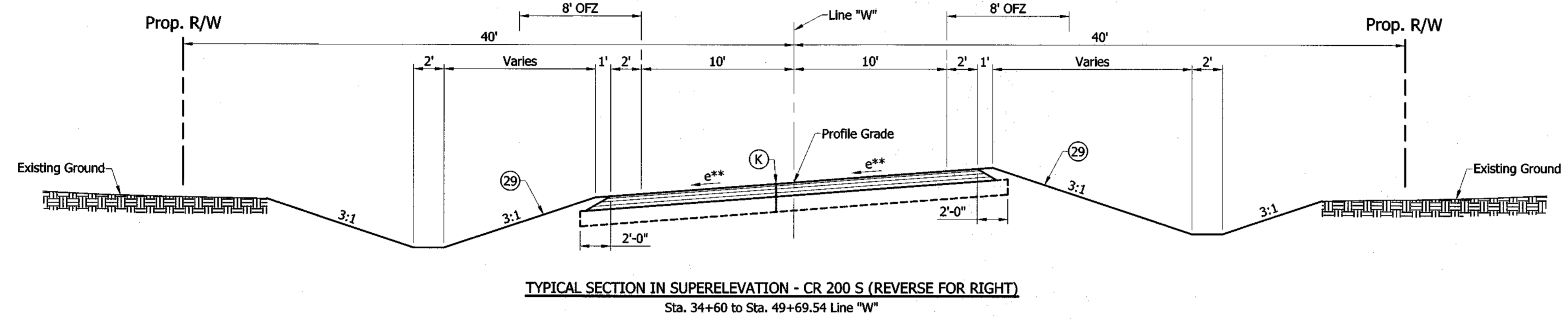
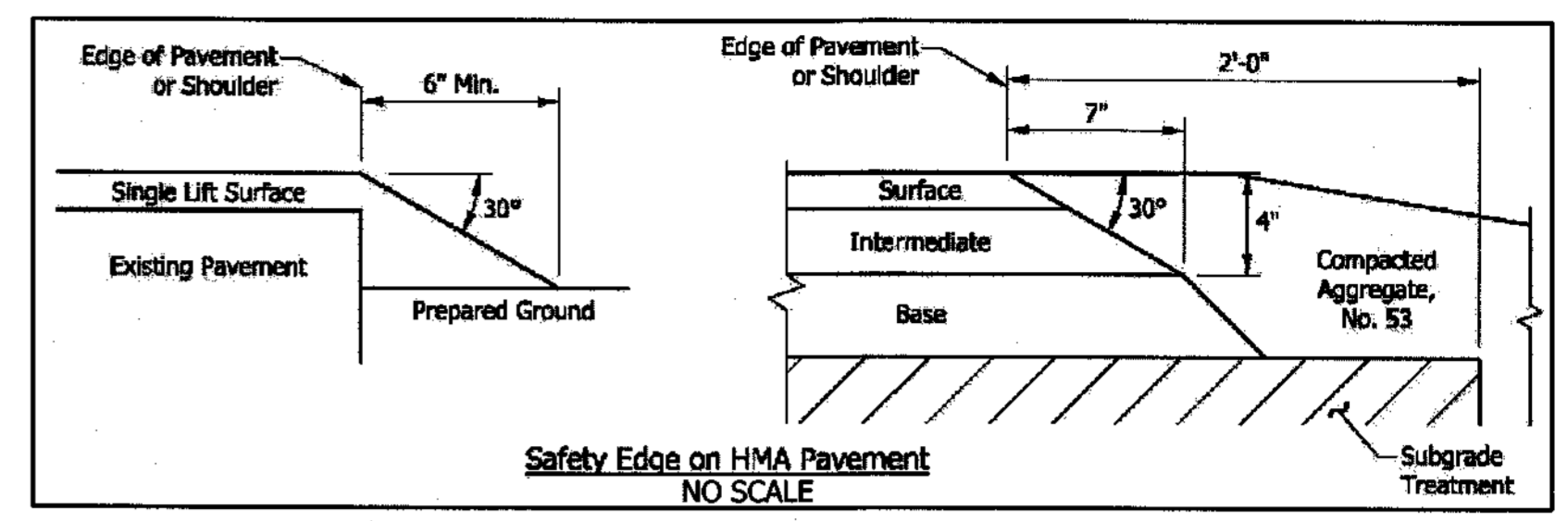
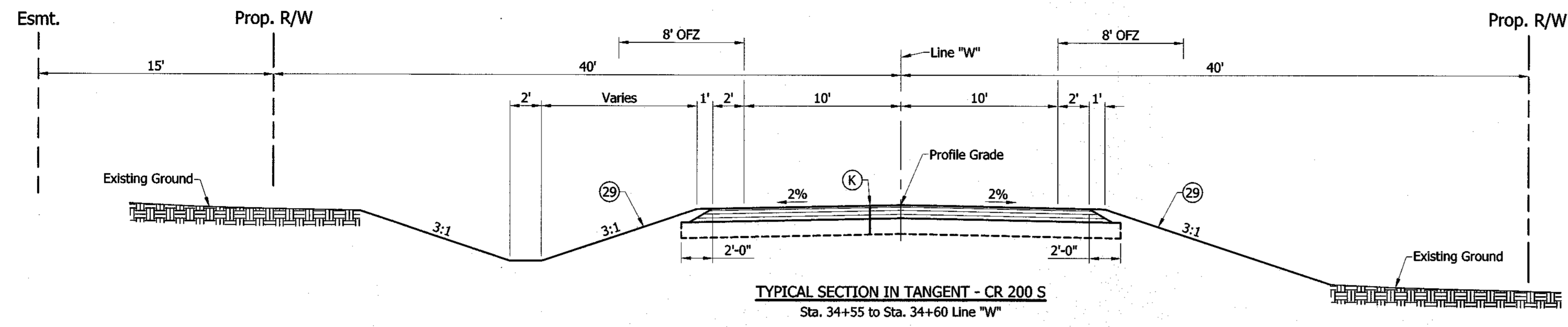
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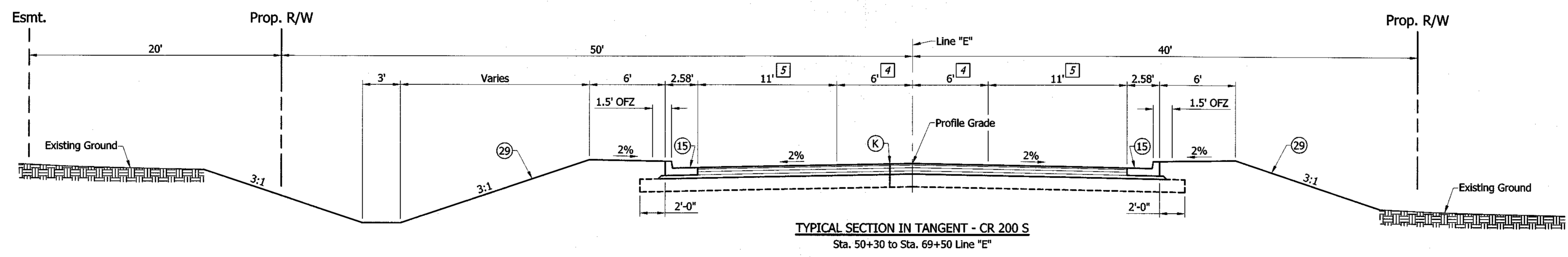
Appendix A-3

Existing Typical Sections



- LEGEND**
- (K) HMA FULL DEPTH PAVEMENT
165#/Syd. QC/QA HMA, 2, 70, Surface, 9.5 mm on 275#/Syd. QC/QA HMA, 2, 70, Intermediate, 19.0 mm on 330#/Syd. QC/QA HMA, 2, 64, Base 25.0 mm on 330#/Syd. QC/QA HMA, 2, 64, Base 25.0 mm on Subgrade Treatment Type 1B
 - (R) RESURFACE/SURFACE MILLING
165#/Syd. QC/QA HMA, 2, 70, Surface 9.5 mm on 1 1/2" Surface Milling
 - (15) Modified Combined Concrete Curb and Gutter (See Detail This Sheet)
 - (26) Sodding
 - (29) Seeding

- NOTES:**
- ** For Superelevation Rate, See Sheet No. 22
 - OFZ = Obstruction Free Zone
 - [1] Varies from 0' @ Sta. 1168+18 to 12' @ Sta. 1169+83
Varies from 12' @ Sta. 1176+17 to 0' @ Sta. 1177+82
 - [2] Varies from 0' @ Sta. 1169+83 to 12' @ Sta. 1170+83
Varies from 12' @ Sta. 1173+61 to 0' @ Sta. 1175+26
 - [3] Varies from 0' @ Sta. 1170+60.80 to 12' @ Sta. 1172+30.80
Varies from 12' @ Sta. 1175+17 to 0' @ Sta. 1176+17
 - [4] Varies from 6' @ Sta. 66+40 to 0' @ Sta. 67+75
 - [5] Varies from 11' @ Sta. 66+40 to 15' @ Sta. 67+75



	RECOMMENDED FOR APPROVAL <i>G.R. Wendling</i> DESIGN ENGINEER 12/14/15	MONTGOMERY COUNTY TYPICAL CROSS SECTIONS CR 200 S / SR 47	HORIZONTAL SCALE 1" = 5'	BRIDGE FILE	
	DESIGNED: CNC		DRAWN: CNC	VERTICAL SCALE 1" = 5'	DESIGNATION
	CHECKED: GRW		CHECKED: GRW	SURVEY BOOK	SHEETS
				CONTRACT	3 of 100

Approved INDOT Permit Number M15C2C0007

**Appendix B-1
Traffic Report**

MEMORANDUM

TO: Lisa Casler, PE RQAW
FROM: Amanda Johnson, PE, PTOE
Lauren Maenhout, EI
DATE: 3/28/2022
RE: Purple Heart Parkway Extension



Amanda M. Johnson

EMCS Inc. has been contracted by RQAW to provide a segment and intersection capacity analysis for the extension of Purple Heart Parkway in Crawfordsville, IN. US 231 & Purple Heart Parkway is currently a signalized intersection. Ladoga Road & Purple Heart Parkway will be constructed with the extension of Purple Heart Parkway in the location of existing County Road 200. A location map is included below indicating the study intersections. This memorandum documents the analysis procedures and results.



Background Information

Purple Heart Parkway currently ends at the intersection of US 231. Purple Heart Parkway to the west varies from a three-lane section with a two-way-left-turn lane at State Road 47 to a two-lane section at US 231 intersection. The current lane configuration for this intersection can be seen in the figures on the following page.



Figure 1: US 231 & Purple Heart Parkway

Traffic Data and Forecast

Existing Traffic Data

Existing traffic data was obtained from Indiana Department of Transportation (INDOT) Traffic Count Database System (TCDS) along US 231, SR 47, and Ladoga Road. There was no historic data available along Purple Heart Parkway. The count stations and the AADT can be seen below.

	Year	Location ID	AADT
US 231	2018	540196	7494
SR 47	2019	540532	5792
Ladoga Road	2018	54W100	1709

To account for existing traffic that will divert to Purple Heart Parkway in the future, a percentage of US 231 and Ladoga Road through traffic was reassigned to Purple Heart Parkway. A diversion to/from US 231 to Ladoga Road via Purple Heart Parkway is not expected to attract much diversion while ending at Ladoga. Therefore a 1% diversion of existing northbound and southbound through traffic was assumed.

TCDS volumes were from 2018 and to grow these volumes to opening day of 2023 a 0.5%/year growth rate was applied. An additional 1%/year growth rate was only applied to the opening day volumes based on historic INDOT forecast data to get horizon year through movements.

Trip Generation

To estimate what traffic volumes are currently using Purple Heart Parkway west of US 231, trip generation was performed using the ITE *Trip Generation Manual, 11th Edition* for all current developments that access Purple Heart Parkway. The square footage of each building was estimated using Google Earth. Two shopping centers and a high-turnover sit-down restaurant are located east of US 231. The west side of US 231 includes two shopping centers, a free-standing discount superstore, and a fast-food restaurant with drive-through window.

For the two restaurants, the AM peak trips were not considered because the restaurants are not open in the morning hours. The west side of US 231 shopping centers and restaurant had an internal trip reduction using ITE *Trip Generation Handbook, 3rd Edition*. The daily and peak hour trips including the internal trip reduction can be seen in the table below.

Land Use	ITE Code	Size	Unit	Daily Total	AM Peak Total	AM Peak Enter	AM Peak Exit	PM Peak Total	PM Peak Enter	PM Peak Exit
Shopping Center	822	28.4	Ksf	1428	67	40	24	187	94	94
					External Trips	60	37	23	114	47
Shopping Center	822	14.0	Ksf	820	33	20	13	92	46	46
					External Trips	29	18	11	56	23
Shopping Center	822	12.4	Ksf	753	29	17	12	82	41	41
Shopping Center	822	2.8	Ksf	348	7	4	3	18	9	9
Free-Standing Discount Superstore	813	285	Ksf	14398	530	297	233	1234	605	629
					External Trips	476	273	203	750	303
Fast-Food Restaurant with Drive-Through Window	934	5.4	Ksf	2524	-	-	-	178	92	86
					External Trips				116	65
High-Turnover (Sit-Down) Restaurant	932	4.7	Ksf	504	-	-	-	43	26	17
Total Trips					601	349	252	1179	514	665

Trip generation was also performed for the future developments that are expected to be constructed along the new extension. This study included 5 proposed residential parcels and one proposed commercial parcel. 4 of the proposed residential parcels were assumed to be single family homes and one a multi-family development. The number of dwelling units is unknown for both single family and multi-family parcels. For the single family homes the number of homes per acres was determined for a near-by neighborhood as well as a one neighborhood constructed by Arbor Homes, and one constructed by Pyatt Builders. Between the three neighborhoods studied, an average of 2.87 homes per acre was determined. This rate was applied to the total number of acres for the 4 residential parcels. EMCS recently completed a traffic impact study for a multi-family development in a similar location which included 25.6 units per acre. This rate was applied to the size of the future residential parcel. For the proposed commercial site, the square footage per acre was estimated from the existing Home Depot to the north which consists of approximately 13,336 square feet per acre and this rate was applied to the size of the future commercial site.

The table below contains a summary of the generated trips for the proposed residential and commercial developments along Purple Heart Parkway Extension for both peak hours as well as the daily number of trips.

Land Use	ITE Code	Size	Unit	Daily Total	AM Peak Total	AM Peak Enter	AM Peak Exit	PM Peak Total	PM Peak Enter	PM Peak Exit
Single-Family Detached Housing	210	594	Dwelling Units	5197	377	98	279	530	334	196
Multi-Family Mid Rise	221	257	Dwelling Units	1179	101	23	78	101	61	40
Shopping Center	820	168	Ksf	6218	141	87	54	571	274	297

Assignment & Distribution

To develop turning movement traffic volumes from the existing and proposed land uses, the trips were assigned and then distributed to the surrounding roadway. The existing land uses as well as the future commercial space have the same overall distribution percentages however the turning movements making those percentages may be different depending on what side of the road the land use is on. The future residential developments have a different overall distribution than the existing land uses and the future commercial space. The overall trips distribution percentages were developed using existing AADT counts and the gravity method. Trips were then assigned to the study intersections by hand. The overall distribution percentages used in the analysis can be seen below and on the following page in **Figures 2 and 3** and the intersection movements can be found in the **Appendix**.



Figure 2: Assignment & Distribution for Existing Land Uses & Proposed Commercial Development



Figure 3: Assignment & Distribution for Proposed Residential Development

Capacity Analysis

The planning methods for urban streets focus on facility level analysis which is estimated by summing the segment level analysis and intersection performance results.

Segment Capacity Analysis

National Cooperative Highway Research Program (NCHRP) Report 825: *Planning and Preliminary Engineering Applications Guide to the Highway Capacity Manual* provided **Figure 4** below which is adapted from the Highway Capacity Manual (HCM) exhibit 16-16 which provided maximum two-way AADT volumes that can be accommodated by an urban street at a given level of service.

Exhibit 45. HCM daily service volume and capacity table for urban streets.

K-Factor	D-Factor	Two-Lane Streets			Four-Lane Streets			Six-Lane Streets		
		LOS C	LOS D	LOS E	LOS C	LOS D	LOS E	LOS C	LOS D	LOS E
Posted Speed Limit = 30 mph										
0.09	0.55	1,700	11,800	17,800	2,200	24,700	35,800	2,600	38,700	54,000
0.09	0.60	1,600	10,800	16,400	2,000	22,700	32,800	2,400	35,600	49,500
0.10	0.55	1,600	10,700	16,100	2,000	22,300	32,200	2,400	34,900	48,600
0.10	0.60	1,400	9,800	14,700	1,800	20,400	29,500	2,200	32,000	44,500
0.11	0.55	1,400	9,700	14,600	1,800	20,300	29,300	2,100	31,700	44,100
0.11	0.60	1,300	8,900	13,400	1,700	18,600	26,900	2,000	29,100	40,500
Posted Speed Limit = 45 mph										
0.09	0.55	7,700	15,900	18,300	16,500	33,600	36,800	25,400	51,700	55,300
0.09	0.60	7,100	14,500	16,800	15,100	30,800	33,700	23,400	47,400	50,700
0.10	0.55	7,000	14,300	16,500	14,900	30,200	33,100	23,000	46,500	49,700
0.10	0.60	6,400	13,100	15,100	13,600	27,700	30,300	21,000	42,700	45,600
0.11	0.55	6,300	13,000	15,000	13,500	27,500	30,100	20,900	42,300	45,200
0.11	0.60	5,800	11,900	13,800	12,400	25,200	27,600	19,100	38,800	41,500

Source: Adapted from HCM (2016), Exhibit 16-16.

Notes: Entries are maximum vehicle volumes per lane that can be accommodated at stated LOS.

AADT = annual average daily traffic. AADT per lane is two-way AADT divided by the sum of lanes in both directions.

This table is built on the following assumptions:

- No roundabouts or all-way STOP-controlled intersections along the facility.
- No on-street parking and no restrictive median.
- Coordinated, semi-actuated traffic signals, with some progression provided in the analysis direction (i.e., arrival type 4).
- 120-second traffic signal cycle lengths, protected left-turn phases provided for the major street, and the weighted average g/C ratio (i.e., ratio of effective green time for the through movement in the analysis direction to the cycle length) = 0.45.
- Exclusive left-turn lanes with adequate queue storage are provided at traffic signals and no exclusive right-turn lanes are provided.
- 2-mile facility length.
- At each traffic signal, 10% of traffic on the major street turns left and 10% turns right.
- Peak hour factor = 0.92 and the base saturation flow rate = 1,900 pc/h/ln.
- Additional assumptions for 30-mph facilities: signal spacing = 1,050 ft and 20 access points/mi.
- Additional assumptions for 45-mph facilities: signal spacing = 1,500 ft and 10 access points/mi.

Figure 4: HCM Daily Service Volume & Capacity for Urban Streets

Purple Heart Parkway has a K-factor and D-Factor of 0.9 and 0.55 respectively, using those values and assuming a 30-mph speed limit, an ADT of 12,875 vehicles per day for this segment would not exceed capacity.

Intersection Capacity Analysis

A capacity analysis has been performed for the study intersections for the 2023 and 2033 scenarios. The capacity analysis was performed using Synchro 11 and HCM 6 methodologies.

The standard parameters for measuring traffic operating conditions is level-of-service (LOS). The LOS ranges from A-F with each indicating driving operations from best to worst. Each letter represents a range of the average delay per vehicle. The Highway Capacity Manual provides LOS criteria for signalized and unsignalized intersections. These criteria are shown in the following table. Typically, a LOS D or better is desired along each approach and for the overall intersection.

LOS	Unsignalized Intersection Control Delay (sec/veh)	LOS	Signalized Intersection Control Delay (sec/veh)
A	<10	A	<10
B	>10 and <15	B	>10 and <20
C	>15 and <25	C	>20 and <35
D	>25 and <35	D	>35 and <55
E	>35 and <50	E	>55 and <80
F	>50	F	>80

Capacity Analysis Results

The capacity analyses have been completed for the opening day and horizon year scenarios. Optimized signal timings were used for the US 231 & Purple Heart Parkway intersection. Capacity analysis result printouts from Synchro is included in the **Appendix**. Scenario 1 capacity results can be seen below. Both intersections overall operate at acceptable levels of service for both AM and PM peak hours, however the westbound approach of the US 231 & Purple Heart Parkway operates at unacceptable levels of service during the PM peak.

Scenario 1: 2023 Opening Day	Eastbound	Westbound	Northbound	Southbound	Intersection
US 231 & Purple Heart Parkway (AM Peak)	B (16.6)	C (26.3)	B (15.4)	B (13.1)	B (17.3)
US 231 & Purple Heart Parkway (PM Peak)	D (36.4)	F (105.4)	C (25.5)	C (24.7)	D (45.5)
Ladoga Road & Purple Heart Parkway (AM Peak)	B (10.8)	- (-)	A (2.7)	A (0)	A (5.3)
Ladoga Road & Purple Heart Parkway (PM Peak)	B (12.5)	- (-)	A (3.7)	A (0)	A (5.3)

Scenario 2 results can be seen below. Both intersections overall operate at acceptable levels of service for both AM and PM peak hours, however the westbound approach of the US 231 & Purple Heart Parkway operates at unacceptable levels of service during the PM peak.

Scenario 2: 2033 Horizon Year	Eastbound	Westbound	Northbound	Southbound	Intersection
US 231 & Purple Heart Parkway (AM Peak)	B (16.6)	C (26.3)	B (15.8)	B (13.2)	B (17.4)
US 231 & Purple Heart Parkway (PM Peak)	D (39.5)	F (105.4)	C (27.1)	C (25.4)	D (45.6)
Ladoga Road & Purple Heart Parkway (AM Peak)	B (11)	- (-)	A (2.6)	A (0)	A (5.2)
Ladoga Road & Purple Heart Parkway (PM Peak)	B (12.7)	- (-)	A (3.5)	A (0)	A (5.2)

Capacity Analysis Improvement Results

For the US 231 and Purple Heart Parkway intersection a westbound right turn lane is suggested due to the high number of right-turning vehicles. It is also suggested that the northbound and southbound left turn flashing yellow arrow be changed to only allow protected left turn movements for the peak hours. The capacity results can be seen below for both Scenario 1 and Scenario 2.

Scenario 1: 2023 Opening Day	Eastbound	Westbound	Northbound	Southbound	Intersection
US 231 & Purple Heart Parkway (AM Peak)	B (17.1)	B (18.6)	B (18.1)	B (19)	B (18.4)
US 231 & Purple Heart Parkway (PM Peak)	C (30.2)	C (21.8)	D (35.8)	C (28.4)	C (28.8)

Scenario 2: 2033 Horizon Year	Eastbound	Westbound	Northbound	Southbound	Intersection
US 231 & Purple Heart Parkway (AM Peak)	B (17.1)	B (18.6)	B (18.1)	B (18.7)	B (18.3)
US 231 & Purple Heart Parkway (PM Peak)	C (30.2)	C (21.8)	D (36.9)	C (27.9)	C (29.0)

Conclusion

It is recommended that the Purple Heart Parkway extension be constructed as a two-lane highway with left- and right-turn lanes to be constructed at future driveways along the corridor. The volume along this segment will not exceed capacity, and the intersection level of service is both an C (US 231 & Purple Heart Parkway) and A (Ladoga Road & Purple Heart Parkway). It is assumed that with the addition of left and right turn lanes along the corridor the segment level of service would be improved.

It is also recommended that a westbound right-turn lane be added to the US 231 & Purple Heart Parkway intersection to reduce the delay for the high number of right-turning vehicles. It is also recommended that for the peak hours the flashing yellow operation be changed to allow only protected left turning movements north and south.

The Ladoga Road & Purple Heart Parkway intersection should be constructed with a single lane in each direction and operate as a one-way stop-controlled intersection with Purple Heart stopping for Ladoga Road. The proposed geometric configuration can be seen below in **Figure 5**.



Figure 5: Ladoga Road & Purple Heart Parkway Extension

APPENDIX

INDOT Traffic Data

US 231

EMCS, INC.

SUBJECT: NB US 231 HOURLY VOLUME

Location Info		Count Data Info	
Location ID	540196_POS	Start Date	2/13/2018
Type	I-SECTION	End Date	2/14/2018
Functional Class	3	Start Time	12:00 PM
Located On	US 231 6.37 MI N OF SR 234	End Time	12:00 PM
		Direction	
Direction	POS	Notes	indot
Community	-	Count Source	SHG000161756
MPO_ID		File Name	
HPMS ID		Weather	
Agency	Indiana Department of Transportation	Study	
		Owner	steve
		QC Status	Accepted
Interval: 60 mins			
Time	Hourly Count		
00:00 - 01:00	9		
01:00 - 02:00	7		
02:00 - 03:00	12		
03:00 - 04:00	23		
04:00 - 05:00	58		
05:00 - 06:00	132		
06:00 - 07:00	235		
07:00 - 08:00	321		
08:00 - 09:00	336		
09:00 - 10:00	225		
10:00 - 11:00	249		
11:00 - 12:00	286		
12:00 - 13:00	241		
13:00 - 14:00	245		
14:00 - 15:00	301		
15:00 - 16:00	319		
16:00 - 17:00	319		
17:00 - 18:00	378		
18:00 - 19:00	214		
19:00 - 20:00	131		
20:00 - 21:00	133		
21:00 - 22:00	110		
22:00 - 23:00	46		
23:00 - 24:00	22		
TOTAL	4352		

SUBJECT: SB US 231 HOURLY VOLUME

Location Info		Count Data Info	
Location ID	540196_NEG	Start Date	2/13/2018
Type	I-SECTION	End Date	2/14/2018
Functional Class	3	Start Time	12:00 PM
Located On	US 231 6.37 MI N OF SR 234	End Time	12:00 PM
		Direction	
Direction	NEG	Notes	indot
Community	-	Count Source	SHG000161758
MPO_ID		File Name	
HPMS ID		Weather	
Agency	Indiana Department of Transportation	Study	
		Owner	steve
		QC Status	Accepted
Interval: 60 mins			
Time	Hourly Count		
00:00 - 01:00	17		
01:00 - 02:00	12		
02:00 - 03:00	16		
03:00 - 04:00	15		
04:00 - 05:00	44		
05:00 - 06:00	74		
06:00 - 07:00	137		
07:00 - 08:00	241		
08:00 - 09:00	209		
09:00 - 10:00	208		
10:00 - 11:00	205		
11:00 - 12:00	227		
12:00 - 13:00	271		
13:00 - 14:00	245		
14:00 - 15:00	313		
15:00 - 16:00	381		
16:00 - 17:00	412		
17:00 - 18:00	412		
18:00 - 19:00	277		
19:00 - 20:00	207		
20:00 - 21:00	170		
21:00 - 22:00	95		
22:00 - 23:00	63		
23:00 - 24:00	50		
TOTAL	4301		

SR 47

SUBJECT: NB 47 HOURLY VOLUME

Location Info					Count Data Info	
Location ID	540532_POS				Start Date	9/24/2019
Type	I-SECTION				End Date	9/25/2019
Functional Class					Start Time	11:00 AM
Located On	SR 47 5.96 MI N OF SR 234				End Time	11:00 AM
					Direction	1
Direction	POS				Notes	
Community	-				Count Source	00000XC36442
MPO_ID					File Name	54053200.PRN
HPMS ID					Weather	
Agency	Indiana Department of Transportation				Study	
					Owner	steve
					QC Status	Accepted
Interval: 15 mins						
Time	15 Min				Hourly Count	
	1st	2nd	3rd	4th		
00:00 - 01:00	3	3	3	1	10	
01:00 - 02:00	2	1	1	2	6	
02:00 - 03:00	2	1	1	0	4	
03:00 - 04:00	2	3	3	5	13	
04:00 - 05:00	6	14	17	12	49	
05:00 - 06:00	29	39	58	59	185	
06:00 - 07:00	63	66	85	54	268	
07:00 - 08:00	67	78	96	86	327	
08:00 - 09:00	65	57	61	38	221	
09:00 - 10:00	45	48	38	40	171	
10:00 - 11:00	41	48	44	43	176	
11:00 - 12:00	34	38	34	35	141	
12:00 - 13:00	37	41	46	53	177	
13:00 - 14:00	49	43	38	45	175	
14:00 - 15:00	42	42	47	41	172	
15:00 - 16:00	51	52	52	52	207	
16:00 - 17:00	35	47	46	57	185	
17:00 - 18:00	42	57	70	37	206	
18:00 - 19:00	50	49	44	37	180	
19:00 - 20:00	74	36	23	32	165	
20:00 - 21:00	38	27	20	10	95	
21:00 - 22:00	16	12	17	11	56	
22:00 - 23:00	11	17	17	2	47	
23:00 - 24:00	5	3	2	2	12	
TOTAL					3248	

SUBJECT: SB 47 HOURLY VOLUME

Location Info					Count Data Info	
Location ID	540532_NEG				Start Date	9/24/2019
Type	I-SECTION				End Date	9/25/2019
Functional Class					Start Time	11:00 AM
Located On	SR 47 5.96 MI N OF SR 234				End Time	11:00 AM
Direction	NEG				Direction	2
Community	-				Notes	
MPO_ID					Count Source	00000XC36442
HPMS ID					File Name	54053200.PRN
Agency	Indiana Department of Transportation				Weather	
					Study	
					Owner	steve
					QC Status	Accepted
Interval: 15 mins						
Time	15 Min				Hourly Count	
	1st	2nd	3rd	4th		
00:00 - 01:00	5	6	2	2	15	
01:00 - 02:00	4	0	2	1	7	
02:00 - 03:00	1	5	3	1	10	
03:00 - 04:00	1	3	1	0	5	
04:00 - 05:00	2	1	3	0	6	
05:00 - 06:00	6	4	8	5	23	
06:00 - 07:00	9	5	15	18	47	
07:00 - 08:00	42	27	33	34	136	
08:00 - 09:00	28	23	27	24	102	
09:00 - 10:00	27	31	27	34	119	
10:00 - 11:00	33	37	42	38	150	
11:00 - 12:00	35	28	48	36	147	
12:00 - 13:00	37	51	50	31	169	
13:00 - 14:00	46	39	35	42	162	
14:00 - 15:00	45	49	60	60	214	
15:00 - 16:00	86	85	82	74	327	
16:00 - 17:00	103	85	84	92	364	
17:00 - 18:00	105	107	93	91	396	
18:00 - 19:00	63	48	52	40	203	
19:00 - 20:00	53	82	50	51	236	
20:00 - 21:00	46	37	37	27	147	
21:00 - 22:00	35	40	22	12	109	
22:00 - 23:00	19	16	9	12	56	
23:00 - 24:00	14	11	15	5	45	
TOTAL					3195	

LADOGA ROAD

SUBJECT: NB LADOGA HOURLY VOLUME

Location Info					Count Data Info	
Location ID	54W100_POS				Start Date	7/24/2018
Type	I-SECTION				End Date	7/25/2018
Functional Class	5				Start Time	10:00 AM
Located On	W 500 N or IR 52				End Time	10:00 AM
Direction	POS				Direction	1
Community	-				Notes	
MPO_ID					Count Source	3
HPMS ID					File Name	54w100.prn
Agency	Indiana Department of Transportation				Weather	
					Study	
					Owner	steve
					QC Status	Accepted
Interval: 15 mins						
Time	15 Min				Hourly Count	
	1st	2nd	3rd	4th		
00:00 - 01:00	1	0	0	2	3	
01:00 - 02:00	1	5	1	1	8	
02:00 - 03:00	0	0	0	1	1	
03:00 - 04:00	1	2	0	1	4	
04:00 - 05:00	1	1	3	3	8	
05:00 - 06:00	2	7	7	6	22	
06:00 - 07:00	7	13	17	10	47	
07:00 - 08:00	13	11	18	19	61	
08:00 - 09:00	12	17	16	14	59	
09:00 - 10:00	5	9	12	18	44	
10:00 - 11:00	14	10	9	12	45	
11:00 - 12:00	17	17	15	26	75	
12:00 - 13:00	16	13	12	8	49	
13:00 - 14:00	15	9	16	12	52	
14:00 - 15:00	8	11	9	14	42	
15:00 - 16:00	28	29	15	27	99	
16:00 - 17:00	25	10	19	14	68	
17:00 - 18:00	18	19	23	13	73	
18:00 - 19:00	18	19	15	8	60	
19:00 - 20:00	9	10	14	7	40	
20:00 - 21:00	6	16	5	8	35	
21:00 - 22:00	7	1	7	8	23	
22:00 - 23:00	19	14	4	2	39	
23:00 - 24:00	6	7	0	1	14	
TOTAL					971	

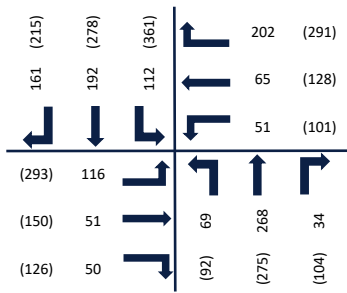
SUBJECT: SB LADOGA HOURLY VOLUME

Location Info					Count Data Info	
Location ID	54W100_NEG				Start Date	7/24/2018
Type	I-SECTION				End Date	7/25/2018
Functional Class	5				Start Time	10:00 AM
Located On	W 500 N or IR 52				End Time	10:00 AM
Direction	NEG				Direction	2
Community	-				Notes	
MPO_ID					Count Source	3
HPMS ID					File Name	54w100.prn
Agency	Indiana Department of Transportation				Weather	
					Study	
					Owner	steve
					QC Status	Accepted
Interval: 15 mins						
Time	15 Min				Hourly Count	
	1st	2nd	3rd	4th		
00:00 - 01:00	0	1	1	0	2	
01:00 - 02:00	3	0	1	0	4	
02:00 - 03:00	0	0	1	2	3	
03:00 - 04:00	0	0	3	1	4	
04:00 - 05:00	5	2	2	2	11	
05:00 - 06:00	1	5	12	6	24	
06:00 - 07:00	5	11	24	11	51	
07:00 - 08:00	9	11	13	12	45	
08:00 - 09:00	9	8	13	13	43	
09:00 - 10:00	8	14	7	10	39	
10:00 - 11:00	10	9	8	5	32	
11:00 - 12:00	8	8	13	10	39	
12:00 - 13:00	10	17	12	16	55	
13:00 - 14:00	13	7	13	10	43	
14:00 - 15:00	10	16	8	11	45	
15:00 - 16:00	17	23	20	15	75	
16:00 - 17:00	10	14	15	24	63	
17:00 - 18:00	23	20	19	20	82	
18:00 - 19:00	14	16	14	4	48	
19:00 - 20:00	8	13	18	11	50	
20:00 - 21:00	8	9	14	20	51	
21:00 - 22:00	19	11	6	6	42	
22:00 - 23:00	6	4	4	6	20	
23:00 - 24:00	4	4	2	1	11	
TOTAL					882	

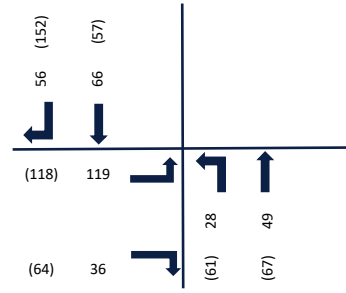
Turning Movements

Scenario 1

Turn Movements Scenario 1 Opening Day 2023



1. US 231 & Purple Heart Parkway



2. Ladoga Road & Purple Heart Parkway

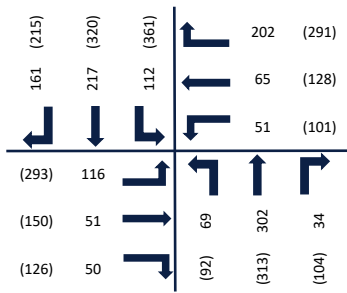
LEGEND

XX=AM PEAK

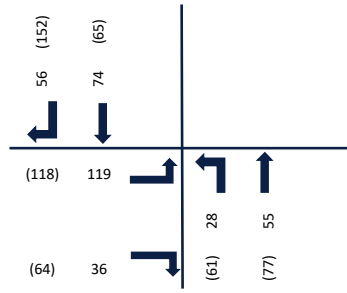
(XX)= PM PEAK

Scenario 2

Turn Movements Scenario 2 Horizon Year 2033



1. US 231 & Purple Heart Parkway



2. Ladoga Road & Purple Heart Parkway

LEGEND

XX=AM PEAK

(XX)= PM PEAK

Traffic Forecast

SUBJECT: TRAFFIC FORECAST AM PEAK

1. US 231 & Purple Heart Parkway

AM Peak	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Raw Traffic 2018	0	0	0	0	0	0	0	336	0	0	241	0	2018	0.005
Purple Heart Parkway Reduction	0	0	0	1	0	1	0	333	3	2	239	0	2023	1.025 growth % for opening day
Background Growth	0	0	0	1	0	1	0	341	3	2	245	0		0.01
Existing Site Trip Gen East	0	4	0	3	3	7	0	-4	1	10	-3	0	2033	1.1 growth % for horizon year
Existing Site Trip Gen West	116	24	50	0	33	0	69	-69	0	0	-50	161		
Commerical Site Trip Gen	0	17	0	11	11	26	0	0	18	43	0	0		
Residential Site Trip Gen	0	6	0	36	18	168	0	0	12	57	0	0		
Scenario 1- Opening Day	116	51	50	51	65	202	69	268	34	112	192	161		
Scenario 2-Horizon Year	116	51	50	51	65	202	69	302	34	112	217	161		

2. Ladoga Road & Purple Heart Parkway

AM Peak	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Raw Traffic 2018	0	-	0	-	-	-	0	61	-	-	82	0
Purple Heart Parkway Reduction	3	-	2	-	-	-	1	60	-	-	81	1
Background Growth	3	-	2	-	-	-	1	62	-	-	83	1
Existing Site Trip Gen East	1	-	1	-	-	-	1	-1	-	-	-1	1
Existing Site Trip Gen West	12	-	12	-	-	-	16	-12	-	-	-16	16
Commerical Site Trip Gen	3	-	3	-	-	-	4	0	-	-	0	4
Residential Site Trip Gen	100	-	18	-	-	-	6	0	-	-	0	34
Scenario 1- Opening Day	119	-	36	-	-	-	28	49	-	-	66	56
Scenario 2-Horizon Year	119	-	36	-	-	-	28	55	-	-	74	56

SUBJECT: TRAFFIC FORECAST PM PEAK

1. US 231 & Purple Heart Parkway

PM Peak	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Raw Traffic 2018	0	0	0	0	0	0	0	378	0	0	412	0	2018	0.005
Purple Heart Parkway Reduction	0	0	0	1	0	1	0	374	4	4	408	0	2023	1.025 growth % for opening day
Background Growth	0	0	0	1	0	1	0	383	4	4	418	0		0.01
Existing Site Trip Gen East	0	15	0	14	13	33	0	-16	2	37	-14	0	2033	1.1 growth % for horizon year
Existing Site Trip Gen West	293	60	126	0	44	0	92	-92	0	0	-126	215		
Commerical Site Trip Gen	0	55	0	62	59	146	0	0	58	134	0	0		
Residential Site Trip Gen	0	20	0	24	12	111	0	0	40	186	0	0		
Scenario 1- Opening Day	293	150	126	101	128	291	92	275	104	361	278	215		
Scenario 2-Horizon Year	293	150	126	101	128	291	92	313	104	361	320	215		

2. Ladoga Road & Purple Heart Parkway

PM Peak	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Raw Traffic 2018	0	-	0	-	-	-	0	99	-	-	82	0
Purple Heart Parkway Reduction	4	-	4	-	-	-	1	98	-	-	81	1
Background Growth	4	-	4	-	-	-	1	100	-	-	83	1
Existing Site Trip Gen East	3	-	3	-	-	-	4	-3	-	-	-4	4
Existing Site Trip Gen West	30	-	30	-	-	-	22	-30	-	-	-22	22
Commerical Site Trip Gen	15	-	15	-	-	-	14	0	-	-	0	14
Residential Site Trip Gen	66	-	12	-	-	-	20	0	-	-	0	111
Scenario 1- Opening Day	118	-	64	-	-	-	61	67	-	-	57	152
Scenario 2-Horizon Year	118	-	64	-	-	-	61	77	-	-	65	152

Trip Generation

SUBJECT: TRIP GENERATION

Parcel	Land Use	ITE Code	Size	Unit	AM Peak	PM Peak	Daily Enter (%)	Daily Exit (%)	Daily Total	Daily Trips Enter	Daily Trips Exit	AM Peak Enter (%)	AM Peak Exit (%)	AM Peak Total	AM Peak Enter	AM Peak Exit	PM Peak Enter (%)	PM Peak Exit (%)	PM Peak Total	PM Peak Enter	PM Peak Exit
A	Southwest Shopping Center A	822	28.4	ksf	Rate	Rate	50%	50%	1428	714	714	60%	40%	67	40	27	50%	50%	187	94	94
B	Northwest Shopping Center B	822	14.0	ksf	Rate	Rate	50%	50%	820	410	410	60%	40%	33	20	13	50%	50%	92	46	46
C	Southeast Shopping Center C	822	12.4	ksf	Rate	Rate	50%	50%	753	376	377	60%	40%	29	17	12	50%	50%	82	41	41
D	Southeast Shopping Center D	822	2.8	ksf	Rate	Rate	50%	50%	348	174	174	60%	40%	7	4	3	50%	50%	18	9	9
E	Walmart w/gas station	813	285.0	ksf	Rate	Rate	50%	50%	14398	7199	7199	56%	44%	530	297	233	49%	51%	1234	605	629
F	Culvers w/drive through	934	5.4	ksf	Rate	Rate	50%	50%	2524	1262	1262	51%	49%	241	-	-	52%	48%	178	92	86
G	Buffalo Wild Wings	932	4.7	ksf	Rate	Rate	50%	50%	504	252	252	55%	45%	45	-	-	61%	39%	43	26	17
	Single Family	210	594.0	Dwelling Units	Equation	Equation	50%	50%	5197	2598	2599	26%	74%	377	98	279	63%	37%	530	334	196
	Multi-family	221	257.0	Dwelling Units	Equation	Equation	50%	50%	1179	589	590	23%	77%	101	23	78	61%	39%	101	61	40
	Commerical	820	168.0	ksf	Rate	Rate	50%	50%	6218	3109	3109	62%	38%	141	87	54	48%	52%	571	274	297

SUBJECT: TRIP GENERATION INTERNAL REDUCTION

Parcel	Land Use	ITE Code	Size	Unit	AM Peak	PM Peak	Daily Enter (%)	Daily Exit (%)	Daily Total	Daily Trips Enter	Daily Trips Exit	AM Peak Enter (%)	AM Peak Exit (%)	AM Peak Total	AM Peak Enter	AM Peak Exit	PM Peak Enter (%)	PM Peak Exit (%)	PM Peak Total	PM Peak Enter	PM Peak Exit
A	Southwest Shopping Center A	822	28.4	ksf	Rate	Rate	50%	50%	1428	714	714	60%	40%	67	40	27	50%	50%	187	94	94
															37	23				47	67
B	Northwest Shopping Center B	822	14.0	ksf	Rate	Rate	50%	50%	820	410	410	60%	40%	33	20	13	50%	50%	92	46	46
															18	11				23	33
E	Walmart w/gas station	813	285.0	ksf	Rate	Rate	50%	50%	14398	7199	7199	56%	44%	530	297	233	49%	51%	1234	605	629
															273	203				303	447
F	Culvers w/drive through	934	5.4	ksf	Rate	Rate	50%	50%	2524	1262	1262	51%	49%	241	-	-	52%	48%	178	92	86
																				65	51

entering internal trips 6.2

exiting internal trips 6.1

Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development

		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Retail	4%	31%
	From Restaurant	14%	30%
	From Cinema/Entertainment	0%	6%
	From Residential	3%	57%
	From Hotel	3%	0%
	From Office	32%	8%
To RETAIL	From Restaurant	8%	50%
	From Cinema/Entertainment	0%	4%
	From Residential	17%	10%
	From Hotel	4%	2%
	From Office	23%	2%

Table 6.2 Unconstrained Internal Person Trip Capture Rates for Trip Destinations within a Mixed-Use Development

		Weekday	
		AM Peak Hour	PM Peak Hour
To OFFICE	From Retail	4%	31%
	From Restaurant	14%	30%
	From Cinema/Entertainment	0%	6%
	From Residential	3%	57%
	From Hotel	3%	0%
	From Office	32%	8%
To RETAIL	From Restaurant	8%	50%
	From Cinema/Entertainment	0%	4%
	From Residential	17%	10%
	From Hotel	4%	2%
	From Office	23%	2%
To RESTAURANT	From Retail	50%	29%
	From Cinema/Entertainment	0%	3%
	From Residential	20%	14%
	From Hotel	6%	5%
	From Office	0%	0%

Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development

		WEEKDAY	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Retail	28%	20%
	To Restaurant	63%	4%
	To Cinema/Entertainment	0%	0%
	To Residential	1%	2%
	To Hotel	0%	0%
	To Office	29%	2%
From RETAIL	To Restaurant	13%	29%
	To Cinema/Entertainment	0%	4%
	To Residential	14%	26%
	To Hotel	0%	5%
	To Office	31%	3%

Table 6.1 Unconstrained Internal Person Trip Capture Rates for Trip Origins within a Mixed-Use Development

		WEEKDAY	
		AM Peak Hour	PM Peak Hour
From OFFICE	To Retail	28%	20%
	To Restaurant	63%	4%
	To Cinema/Entertainment	0%	0%
	To Residential	1%	2%
	To Hotel	0%	0%
	To Office	29%	2%
From RETAIL	To Restaurant	13%	29%
	To Cinema/Entertainment	0%	4%
	To Residential	14%	26%
	To Hotel	0%	5%
	To Office	31%	3%
From RESTAURANT	To Retail	14%	41%
	To Cinema/Entertainment	0%	8%
	To Residential	4%	18%
	To Hotel	3%	7%
	To Office	0%	0%

Shopping Center

Strip Retail Plaza (<40k)

(822)

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

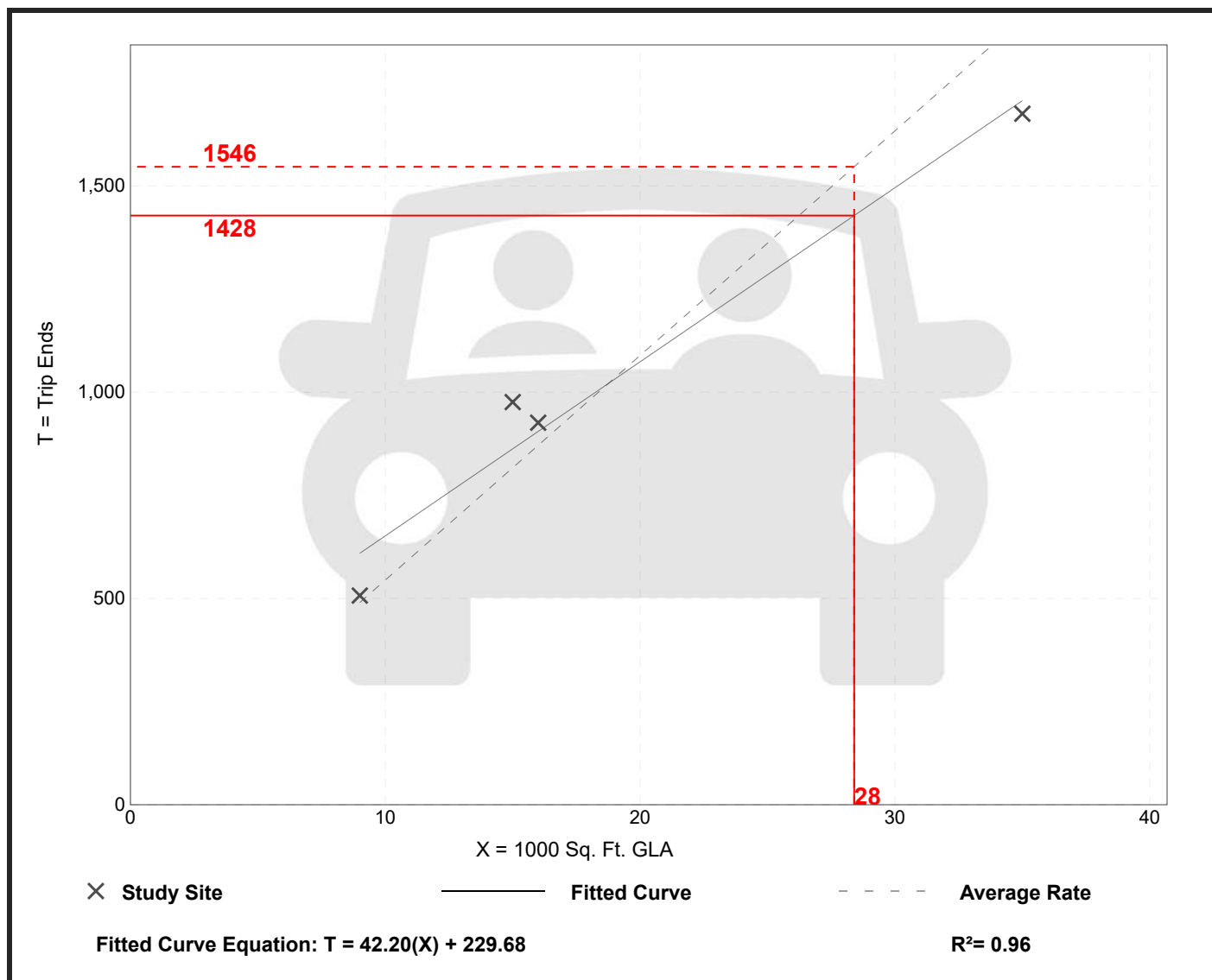
Setting/Location: General Urban/Suburban
 Number of Studies: 4
 Avg. 1000 Sq. Ft. GLA: 19
 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
54.45	47.86 - 65.07	7.81

Data Plot and Equation

Caution – Small Sample Size



Strip Retail Plaza (<40k)

(822)

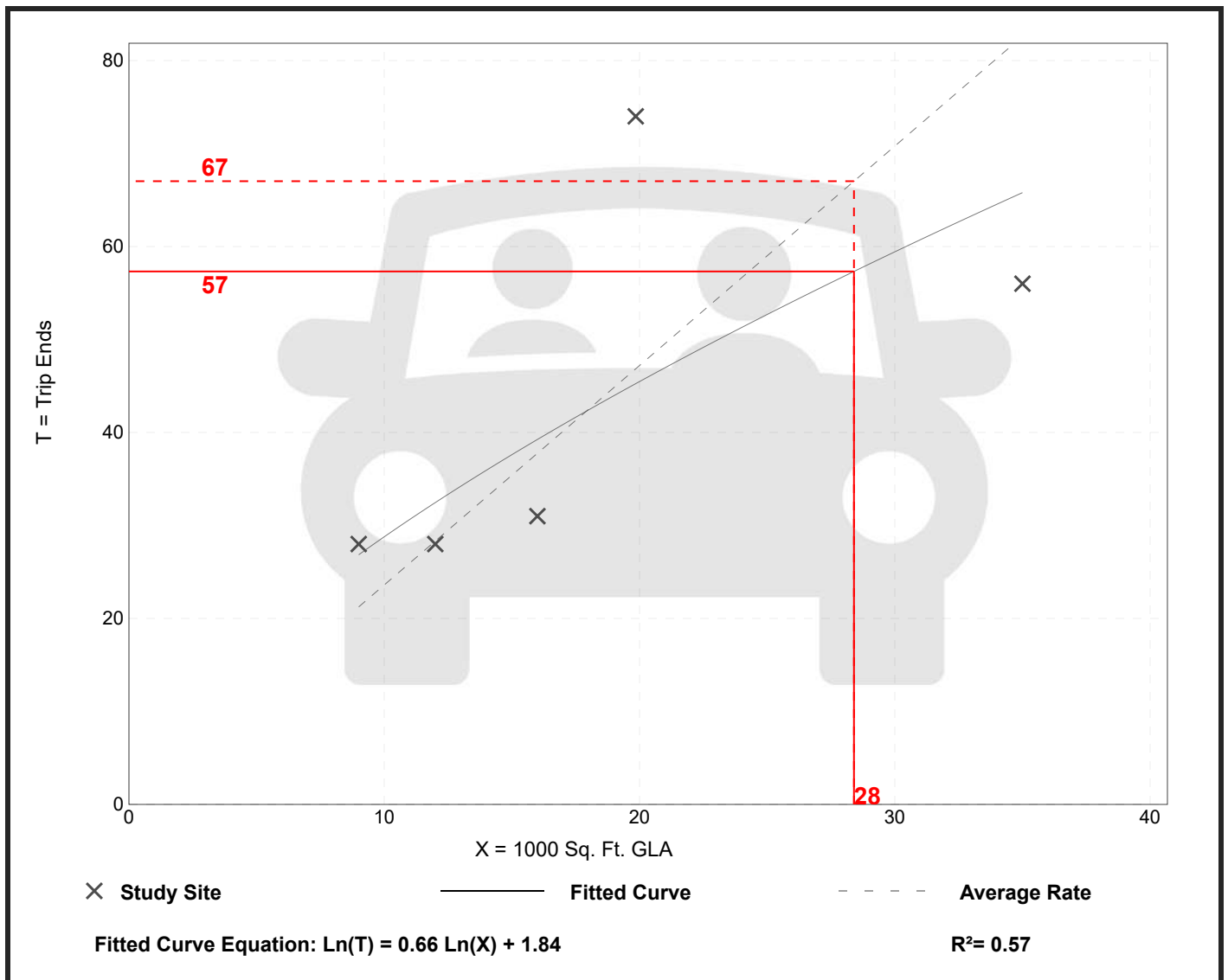
Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 5
 Avg. 1000 Sq. Ft. GLA: 18
 Directional Distribution: 60% entering, 40% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
2.36	1.60 - 3.73	0.94

Data Plot and Equation

Caution – Small Sample Size



Strip Retail Plaza (<40k)

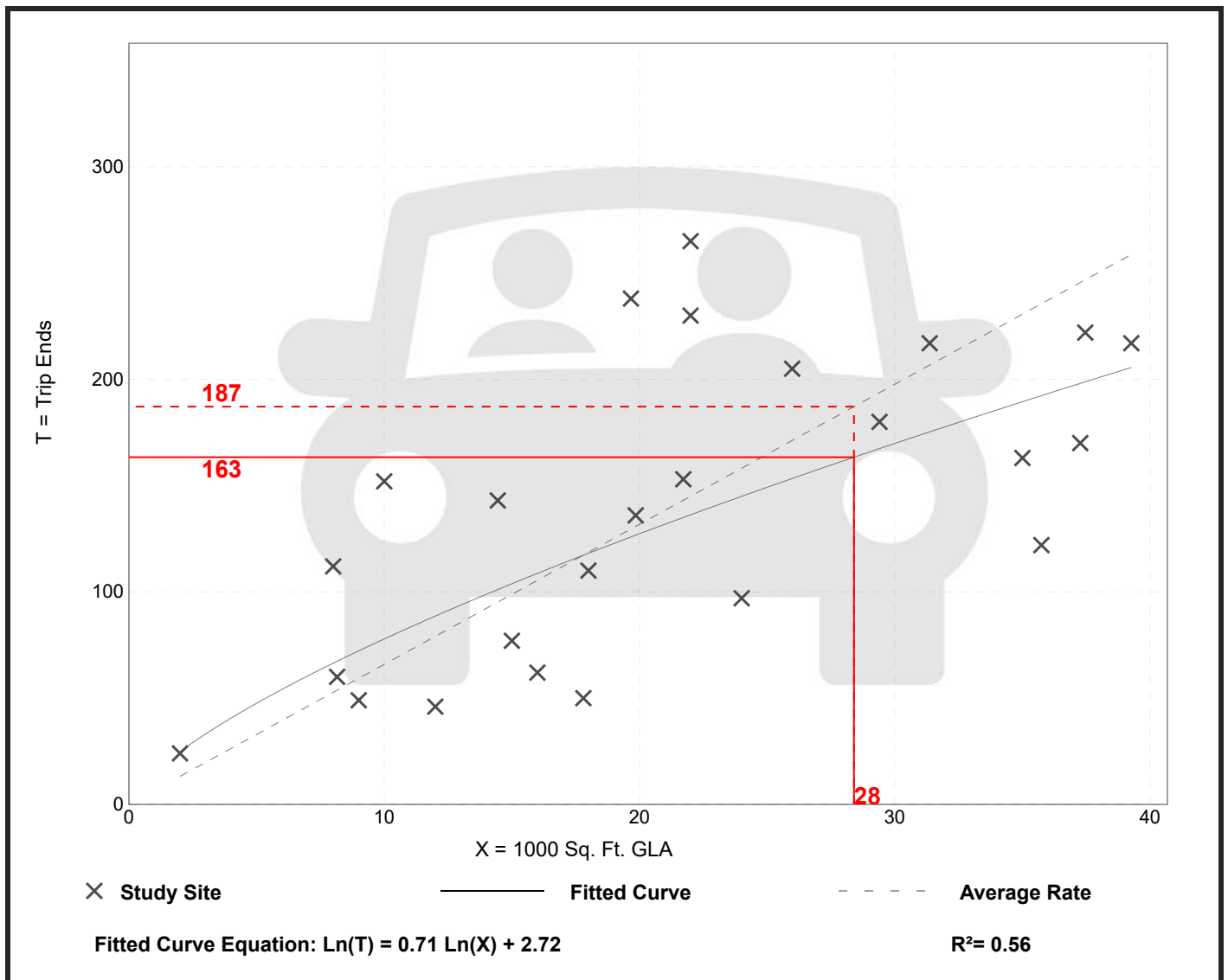
(822)

Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
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: 25
 Avg. 1000 Sq. Ft. GLA: 21
 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
6.59	2.81 - 15.20	2.94

Data Plot and Equation



Shopping Center

Strip Retail Plaza (<40k)

(822)

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

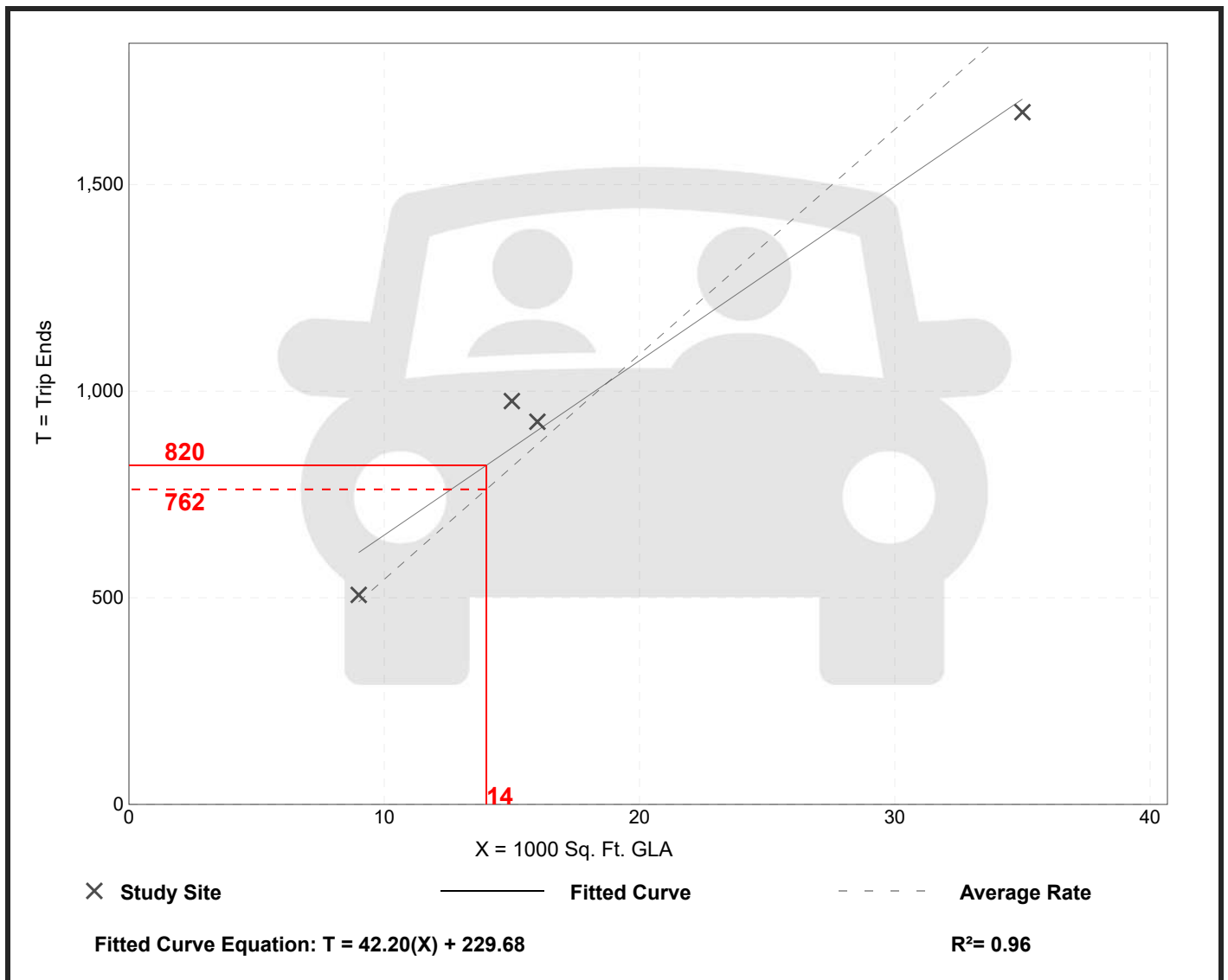
Setting/Location: General Urban/Suburban
 Number of Studies: 4
 Avg. 1000 Sq. Ft. GLA: 19
 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
54.45	47.86 - 65.07	7.81

Data Plot and Equation

Caution – Small Sample Size



Strip Retail Plaza (<40k)

(822)

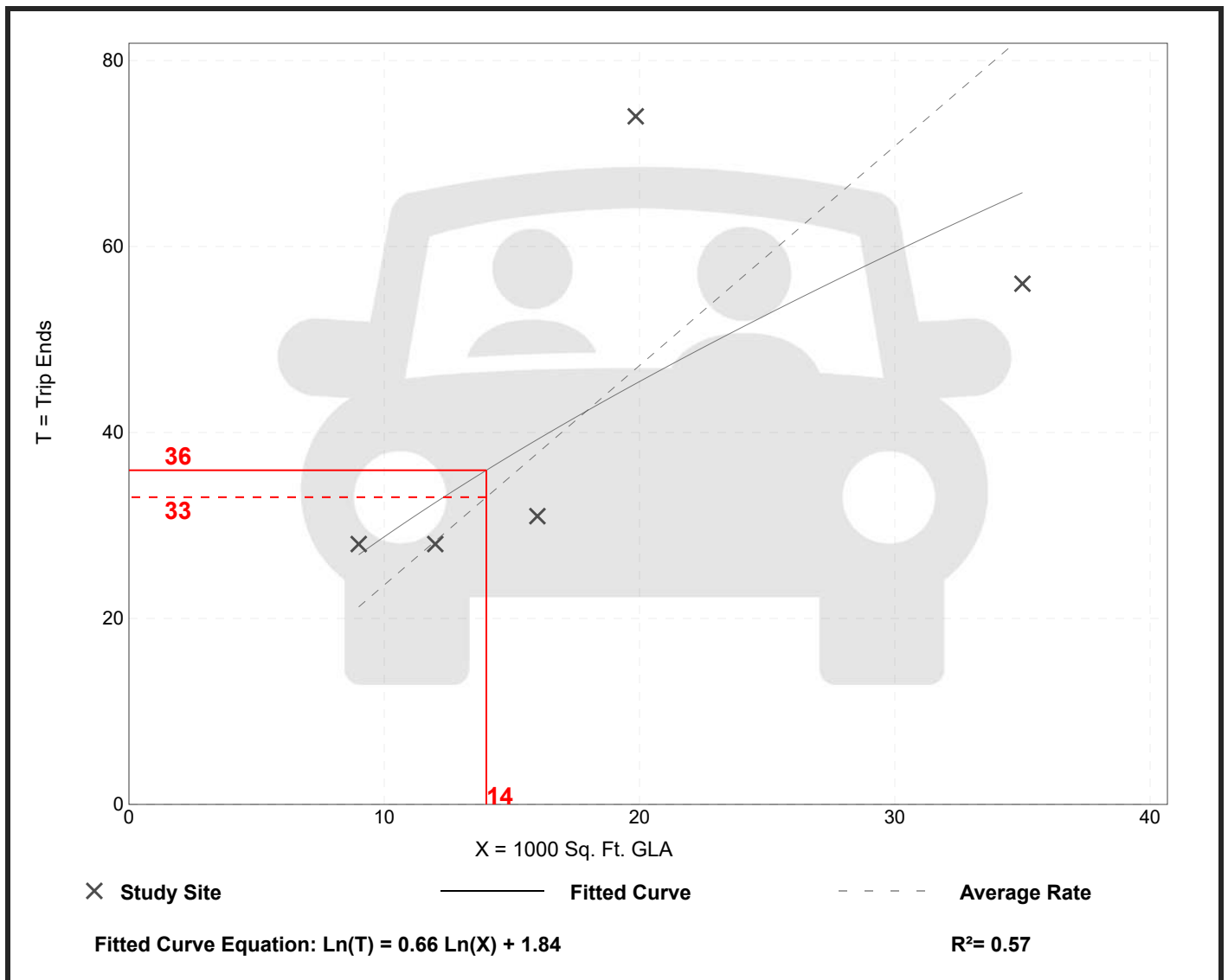
Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 5
 Avg. 1000 Sq. Ft. GLA: 18
 Directional Distribution: 60% entering, 40% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
2.36	1.60 - 3.73	0.94

Data Plot and Equation

Caution – Small Sample Size



Strip Retail Plaza (<40k)

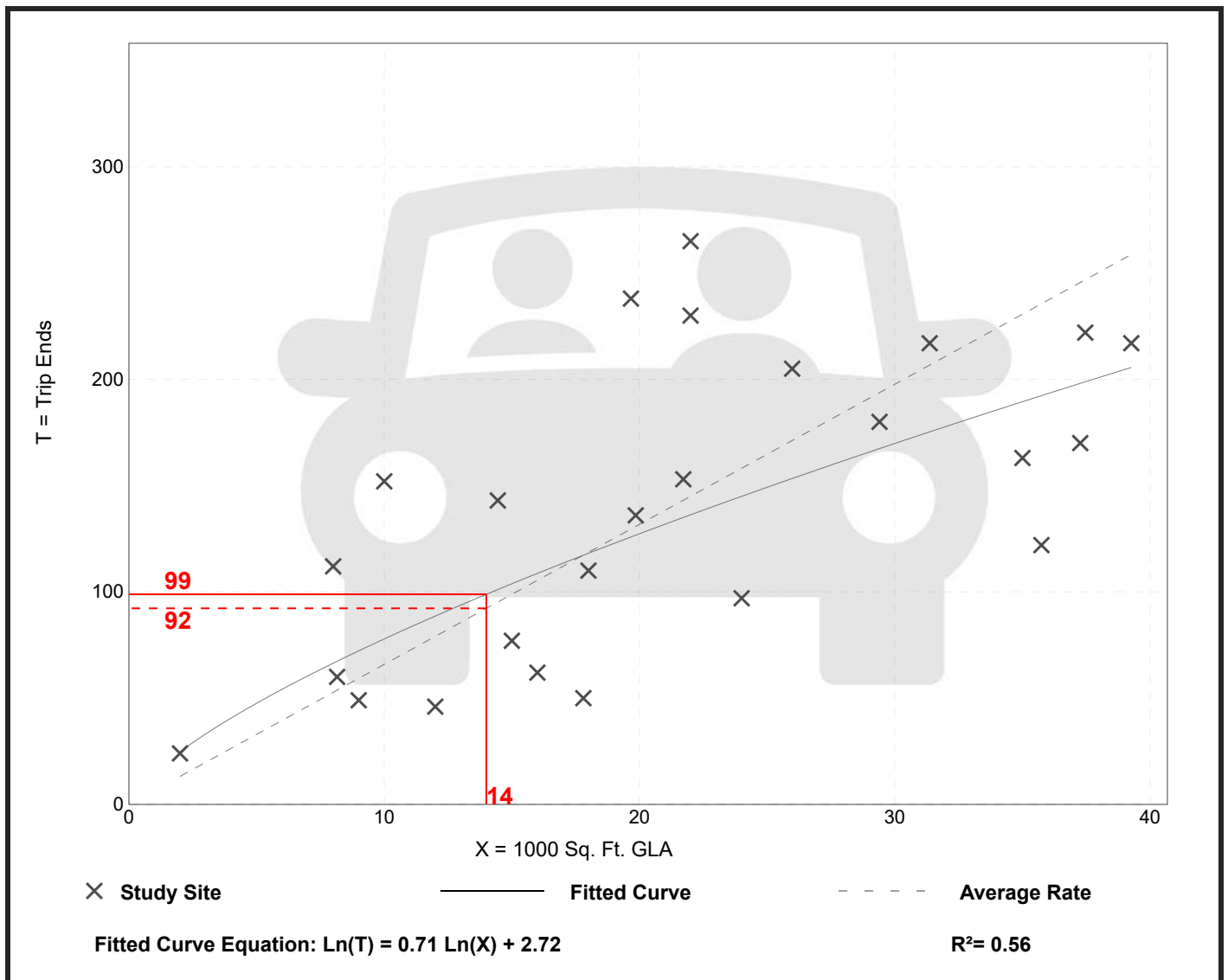
(822)

Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
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: 25
 Avg. 1000 Sq. Ft. GLA: 21
 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
6.59	2.81 - 15.20	2.94

Data Plot and Equation



Shopping Center

Strip Retail Plaza (<40k)

(822)

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

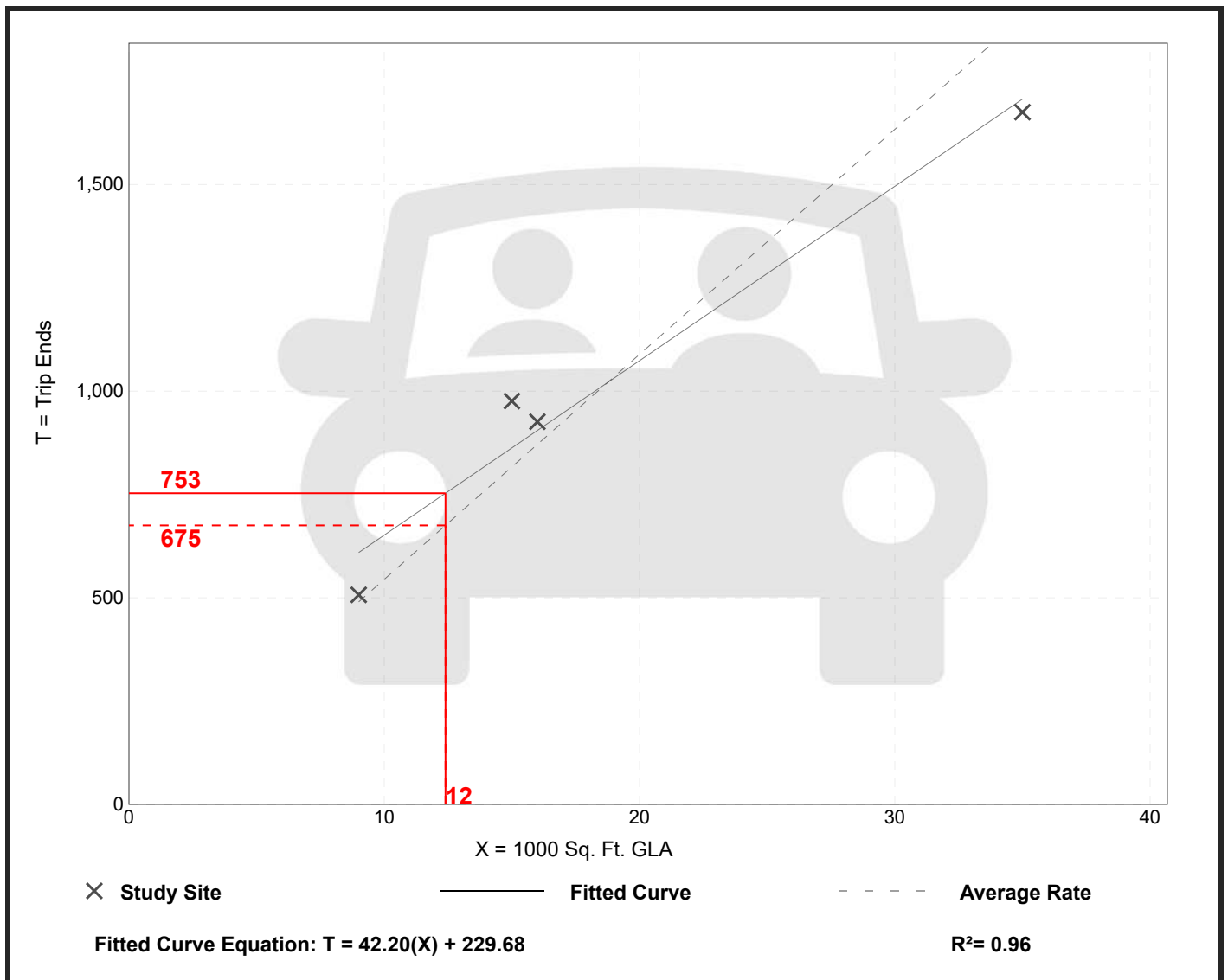
Setting/Location: General Urban/Suburban
 Number of Studies: 4
 Avg. 1000 Sq. Ft. GLA: 19
 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
54.45	47.86 - 65.07	7.81

Data Plot and Equation

Caution – Small Sample Size



Strip Retail Plaza (<40k)

(822)

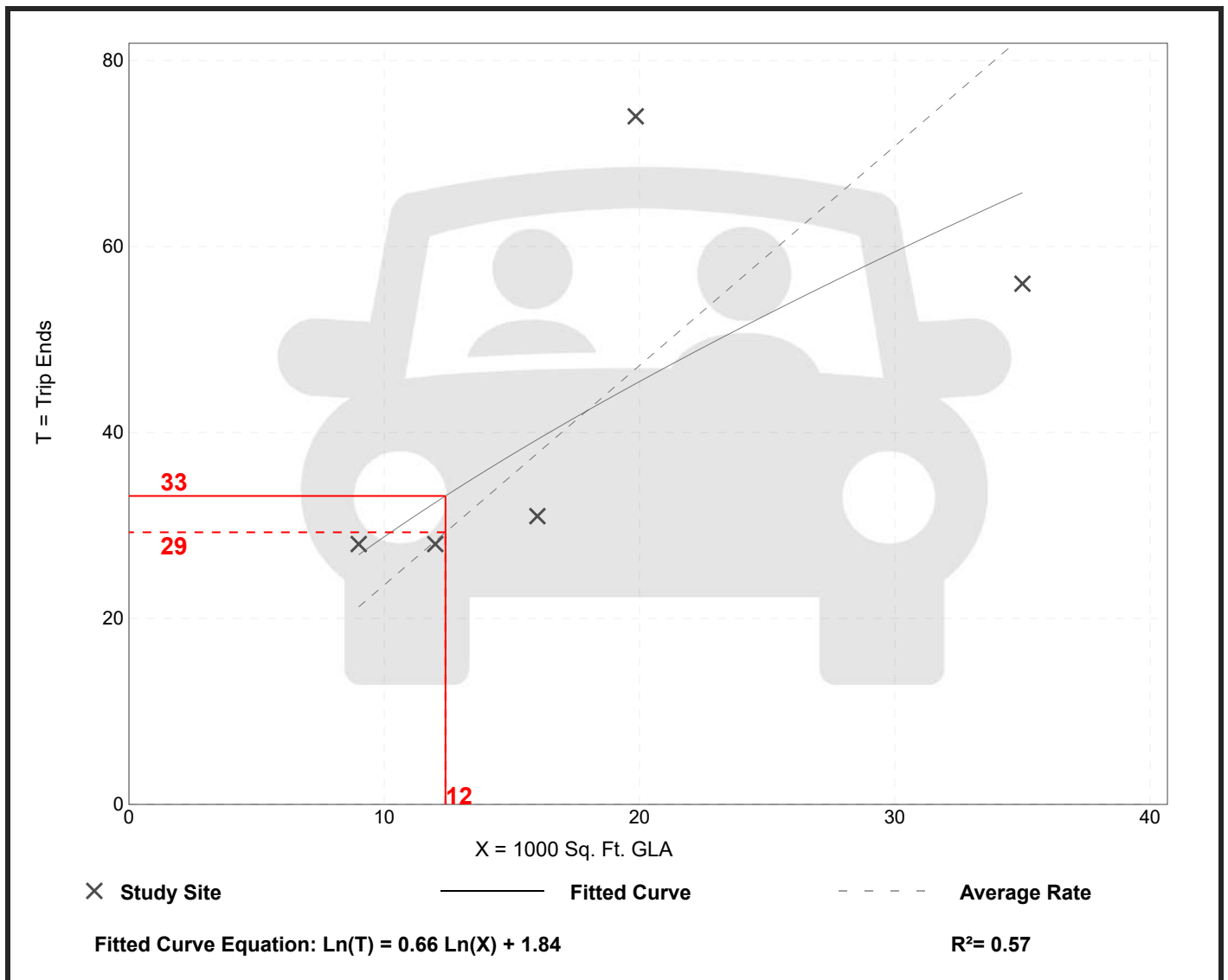
Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 5
 Avg. 1000 Sq. Ft. GLA: 18
 Directional Distribution: 60% entering, 40% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
2.36	1.60 - 3.73	0.94

Data Plot and Equation

Caution – Small Sample Size



Strip Retail Plaza (<40k)

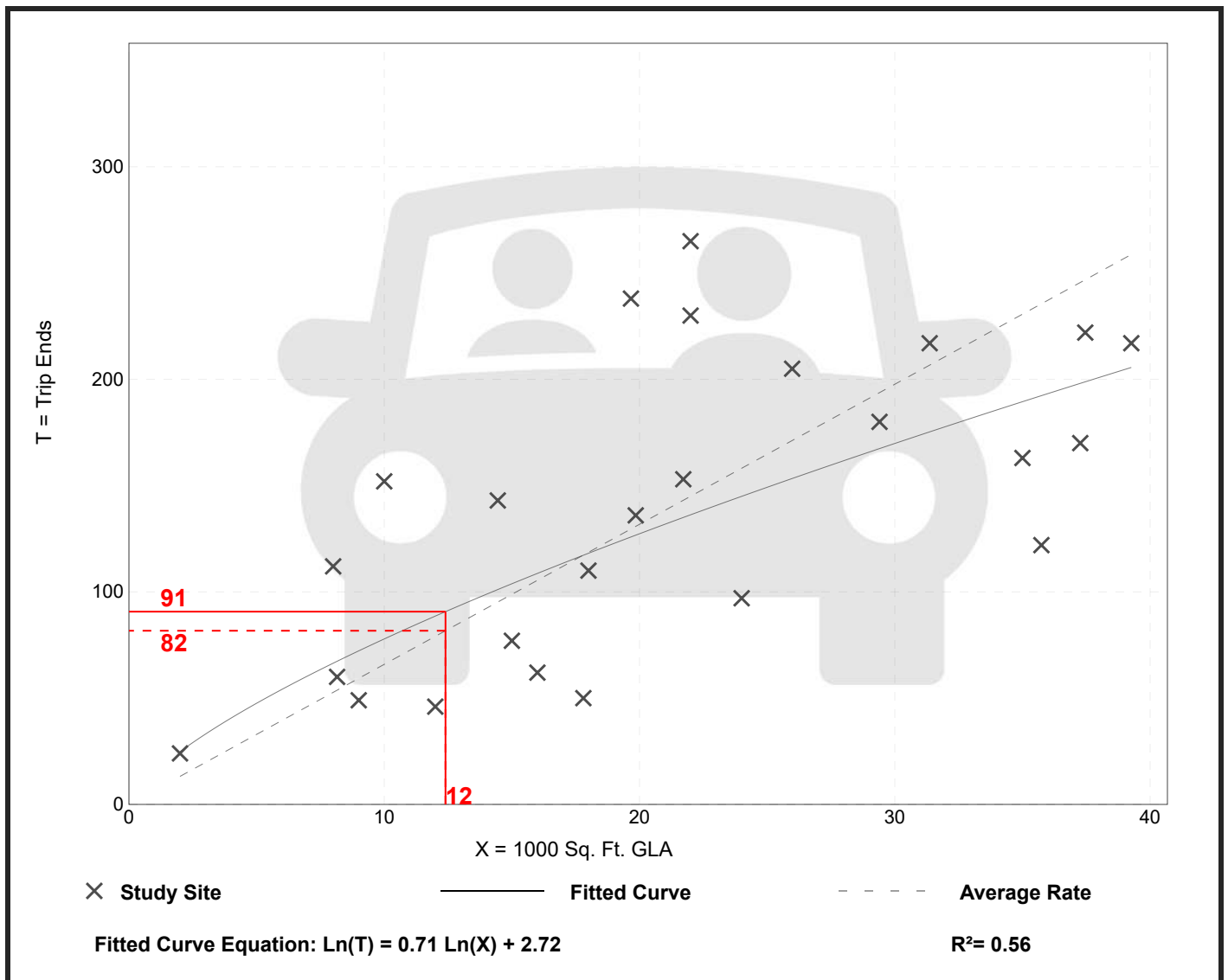
(822)

Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
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: 25
 Avg. 1000 Sq. Ft. GLA: 21
 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
6.59	2.81 - 15.20	2.94

Data Plot and Equation



Shopping Center

Strip Retail Plaza (<40k)

(822)

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

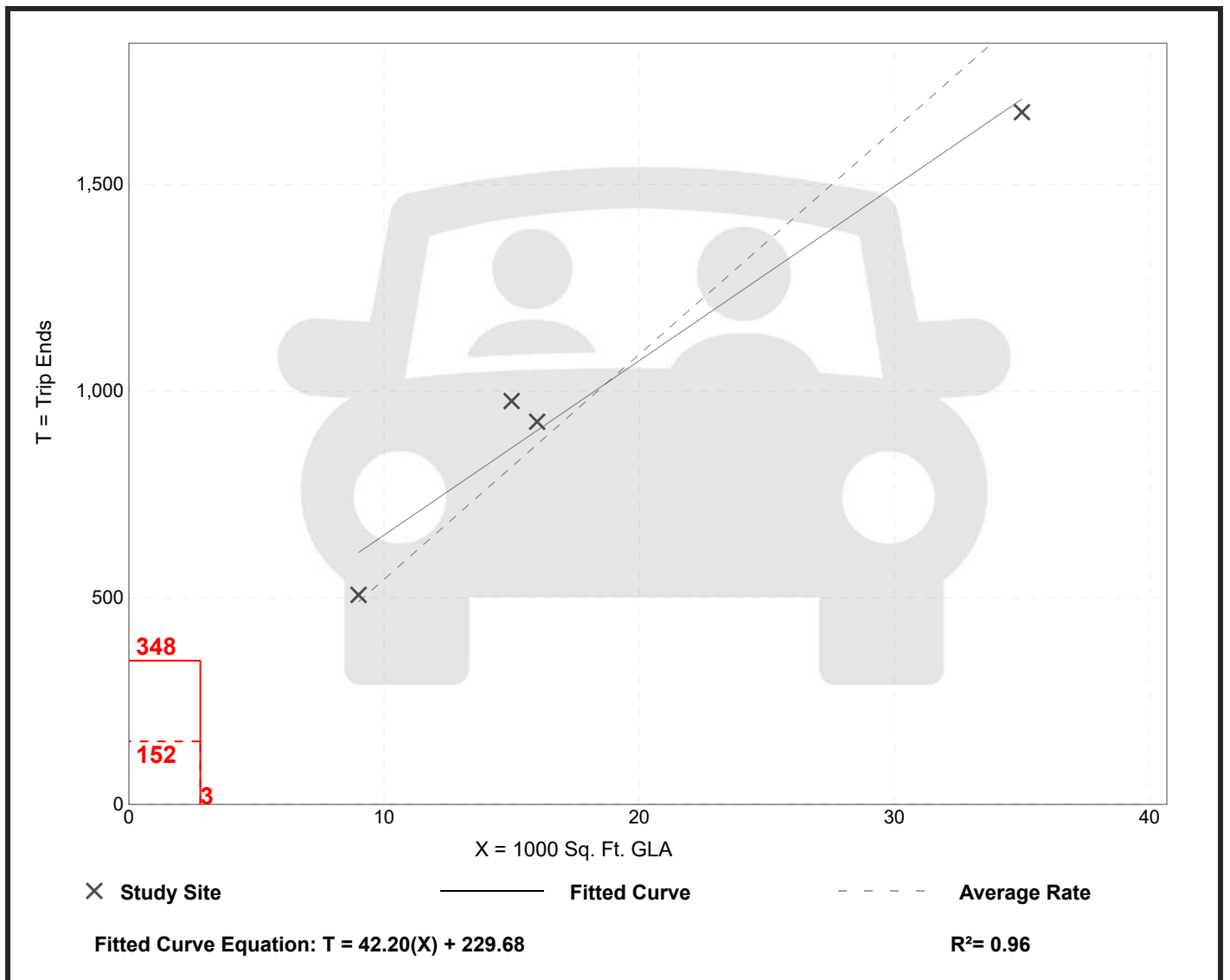
Setting/Location: General Urban/Suburban
 Number of Studies: 4
 Avg. 1000 Sq. Ft. GLA: 19
 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
54.45	47.86 - 65.07	7.81

Data Plot and Equation

Caution – Small Sample Size



Strip Retail Plaza (<40k)

(822)

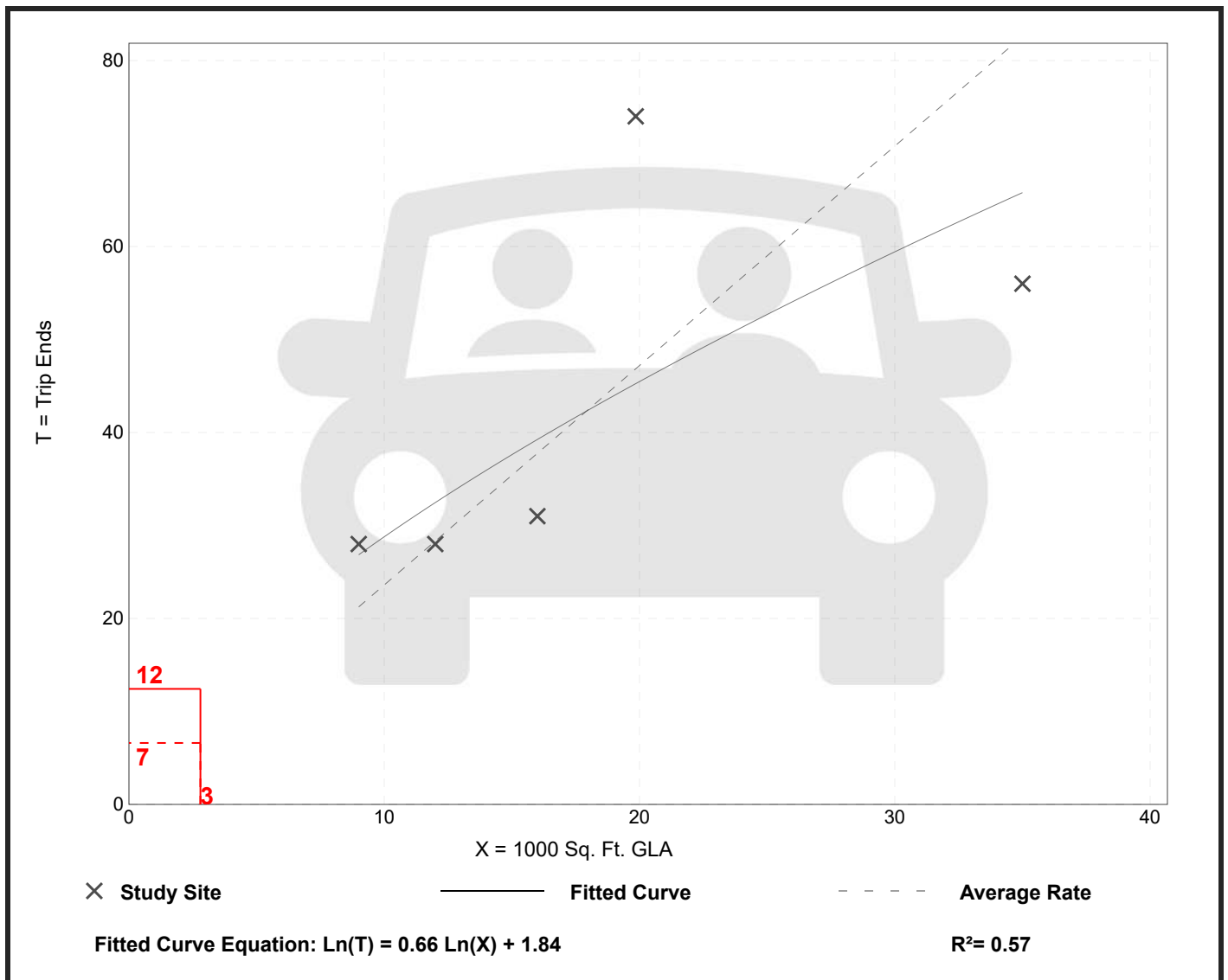
Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 5
 Avg. 1000 Sq. Ft. GLA: 18
 Directional Distribution: 60% entering, 40% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
2.36	1.60 - 3.73	0.94

Data Plot and Equation

Caution – Small Sample Size



Strip Retail Plaza (<40k)

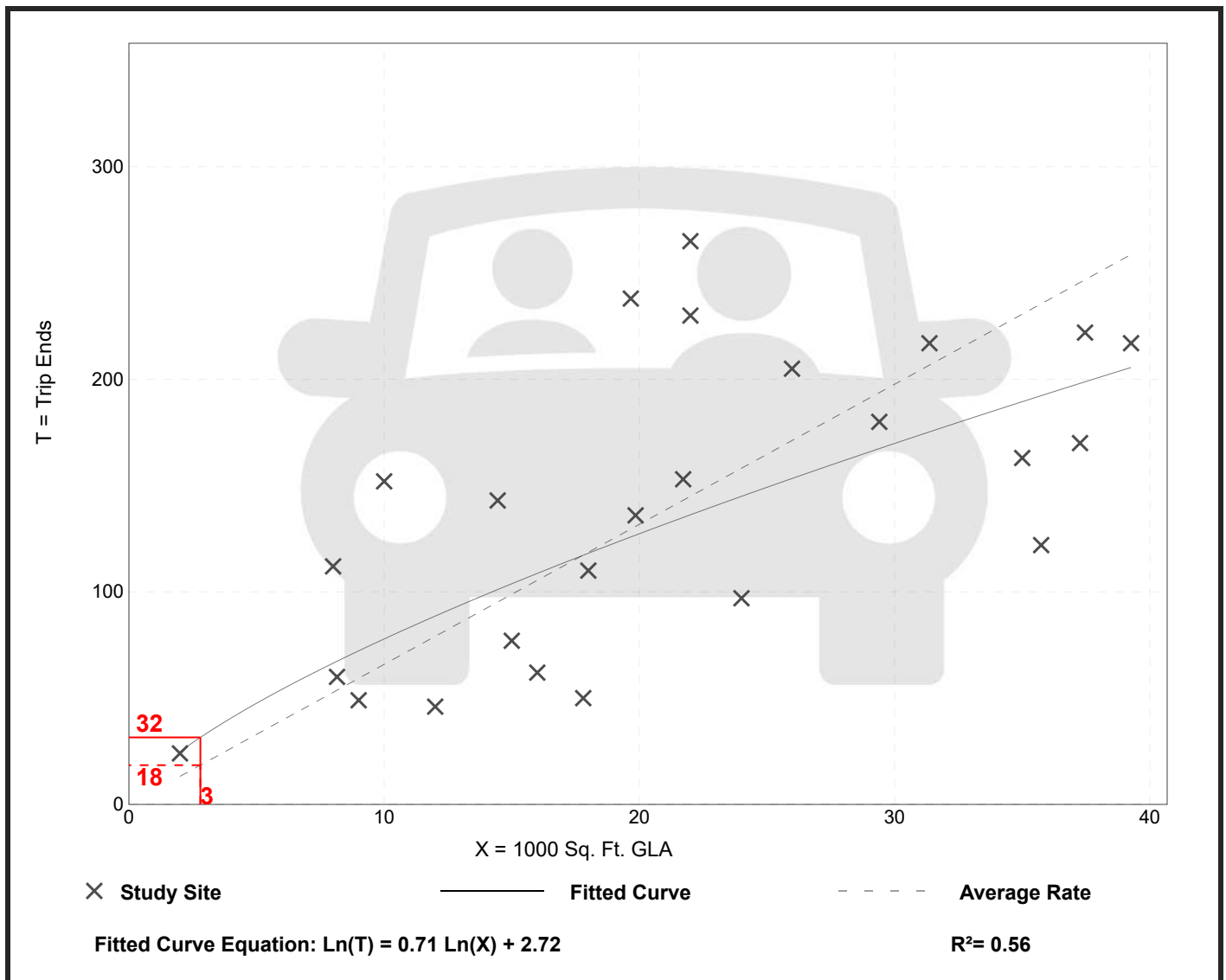
(822)

Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
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: 25
 Avg. 1000 Sq. Ft. GLA: 21
 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
6.59	2.81 - 15.20	2.94

Data Plot and Equation



Free Standing Discount Superstore

Free-Standing Discount Superstore (813)

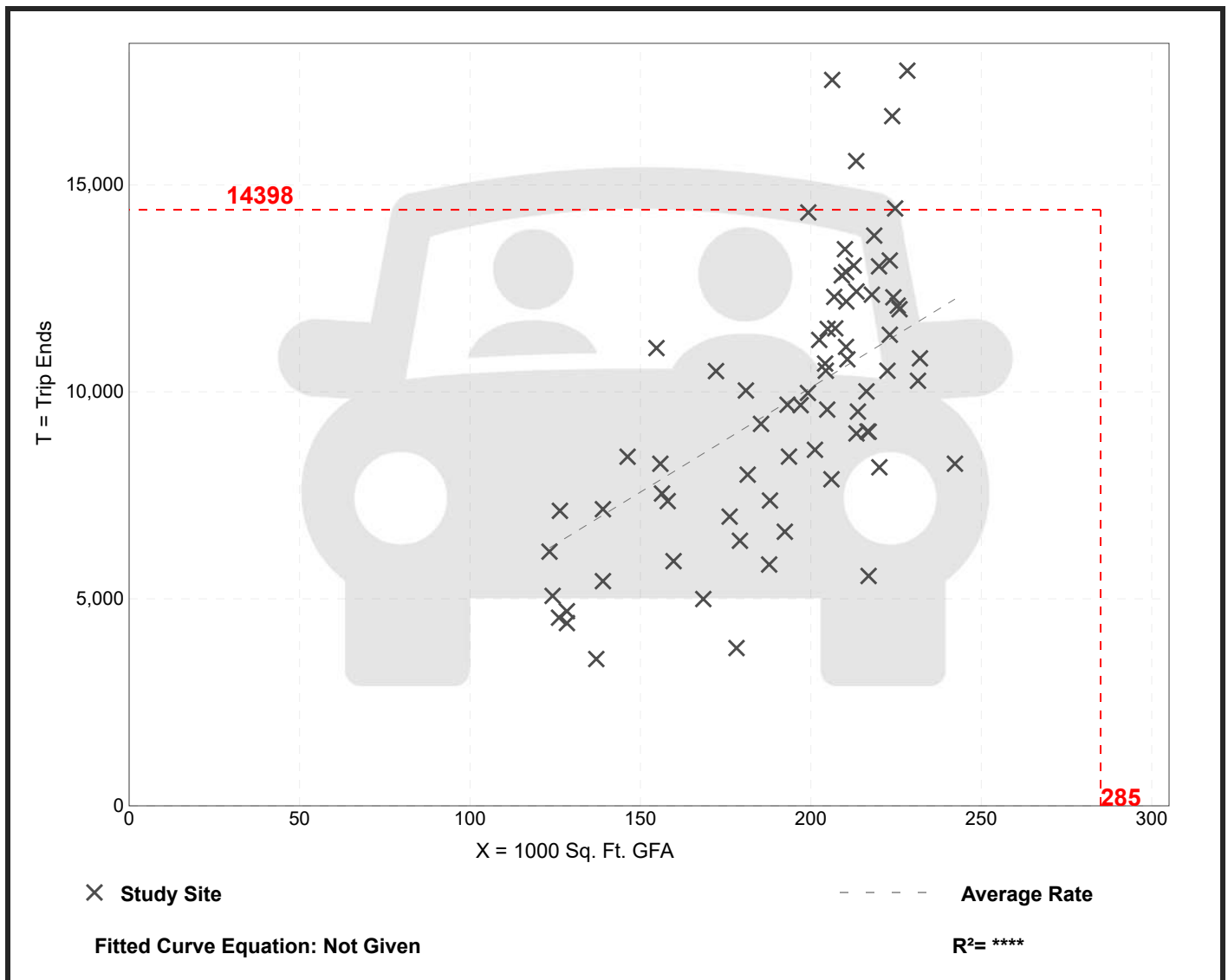
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 72
Avg. 1000 Sq. Ft. GFA: 193
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
50.52	21.39 - 85.01	12.61

Data Plot and Equation



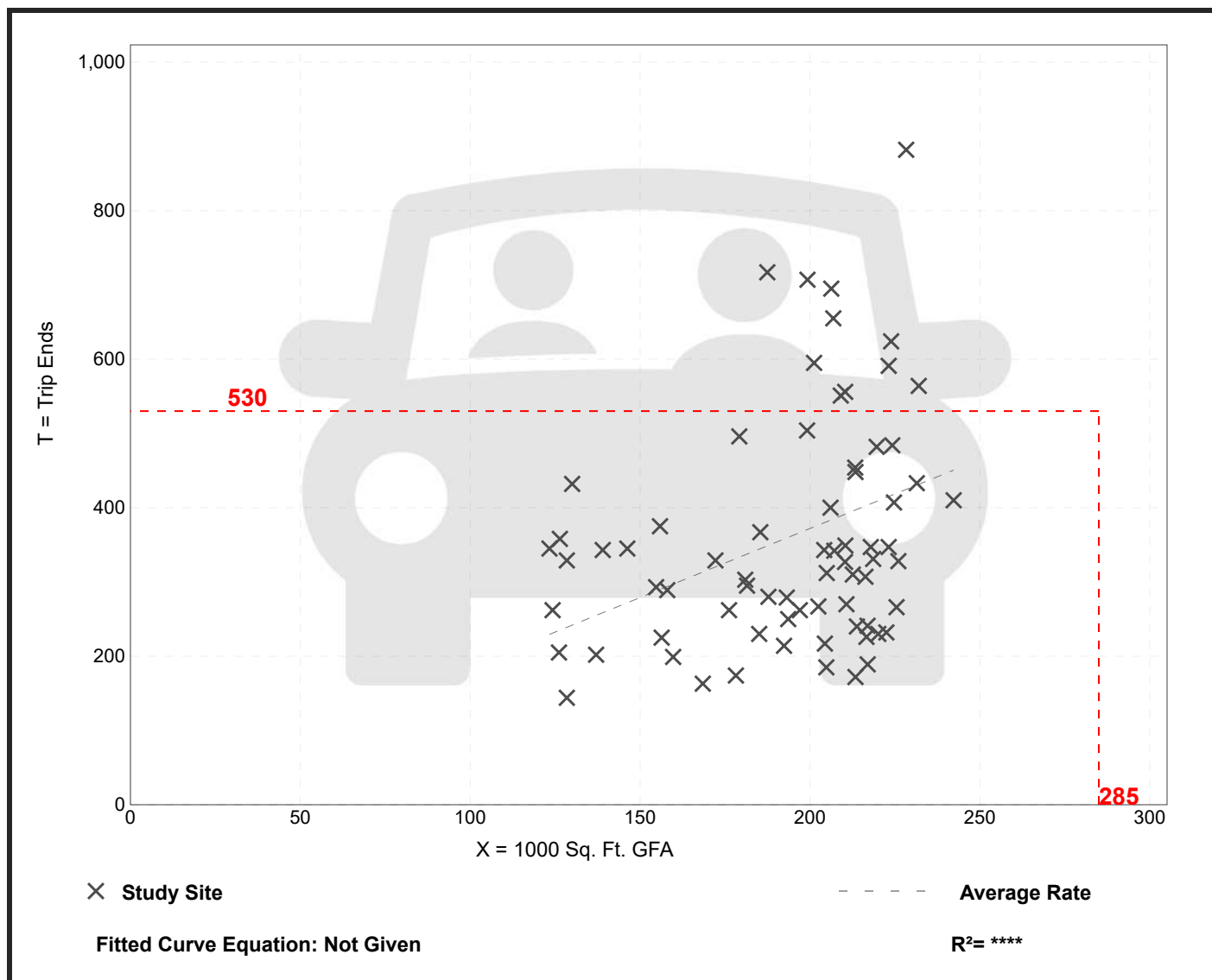
Free-Standing Discount Superstore (813)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 72
 Avg. 1000 Sq. Ft. GFA: 193
 Directional Distribution: 56% entering, 44% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.86	0.81 - 3.86	0.75

Data Plot and Equation



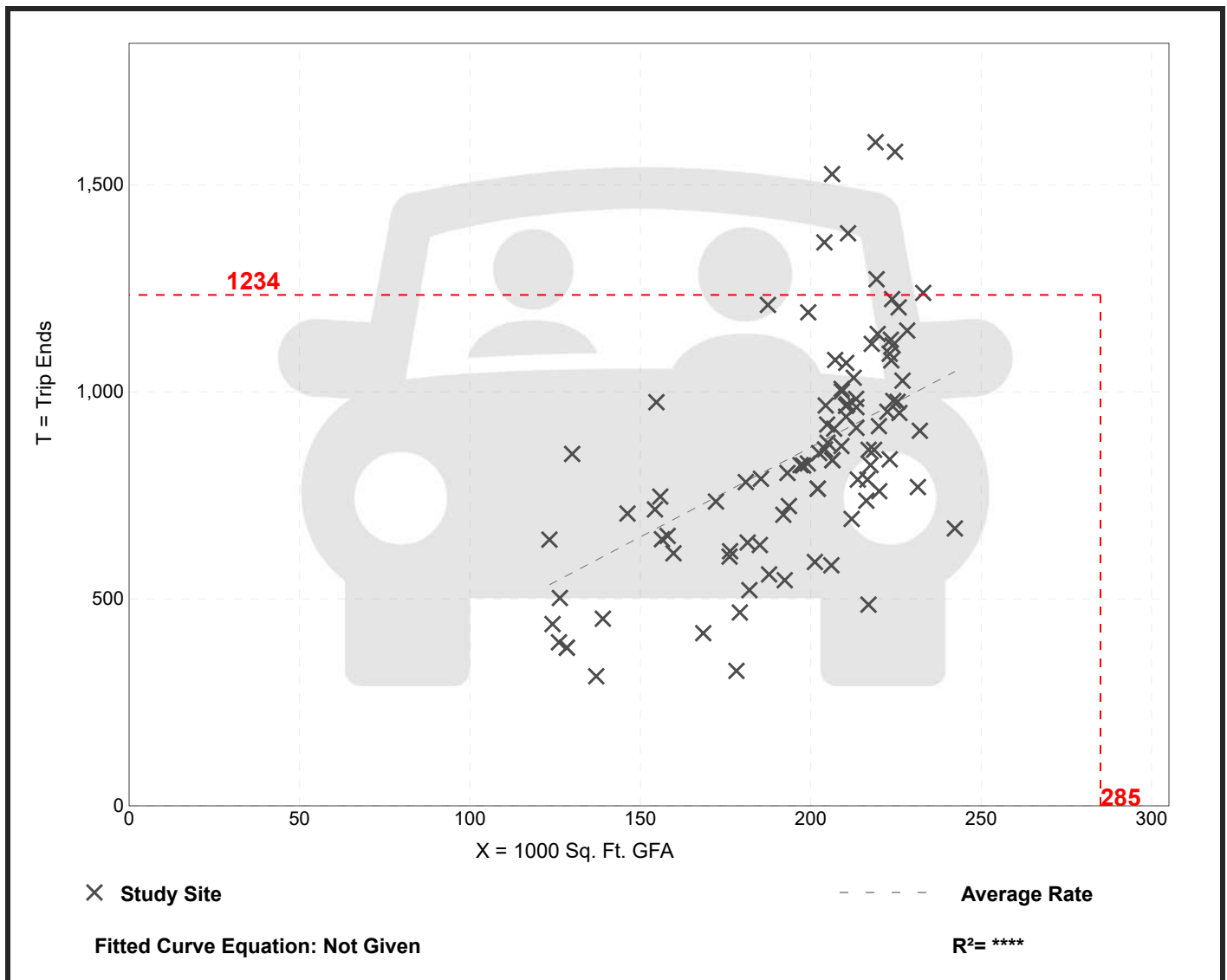
Free-Standing Discount Superstore (813)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 96
 Avg. 1000 Sq. Ft. GFA: 197
 Directional Distribution: 49% entering, 51% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
4.33	1.83 - 7.40	1.10

Data Plot and Equation



High Turnover Restaurant

High-Turnover (Sit-Down) Restaurant (932)

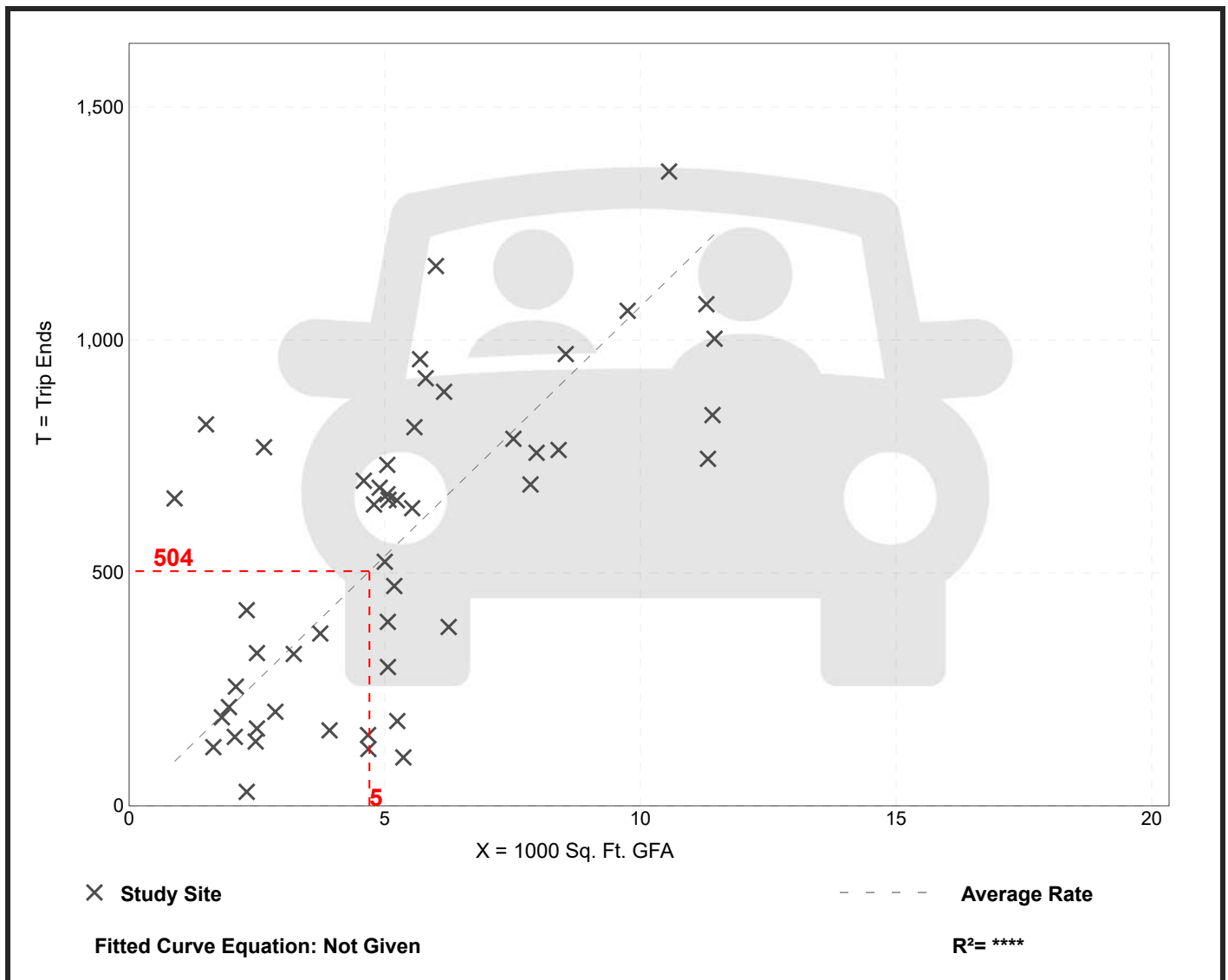
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 50
Avg. 1000 Sq. Ft. GFA: 5
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
107.20	13.04 - 742.41	66.72

Data Plot and Equation



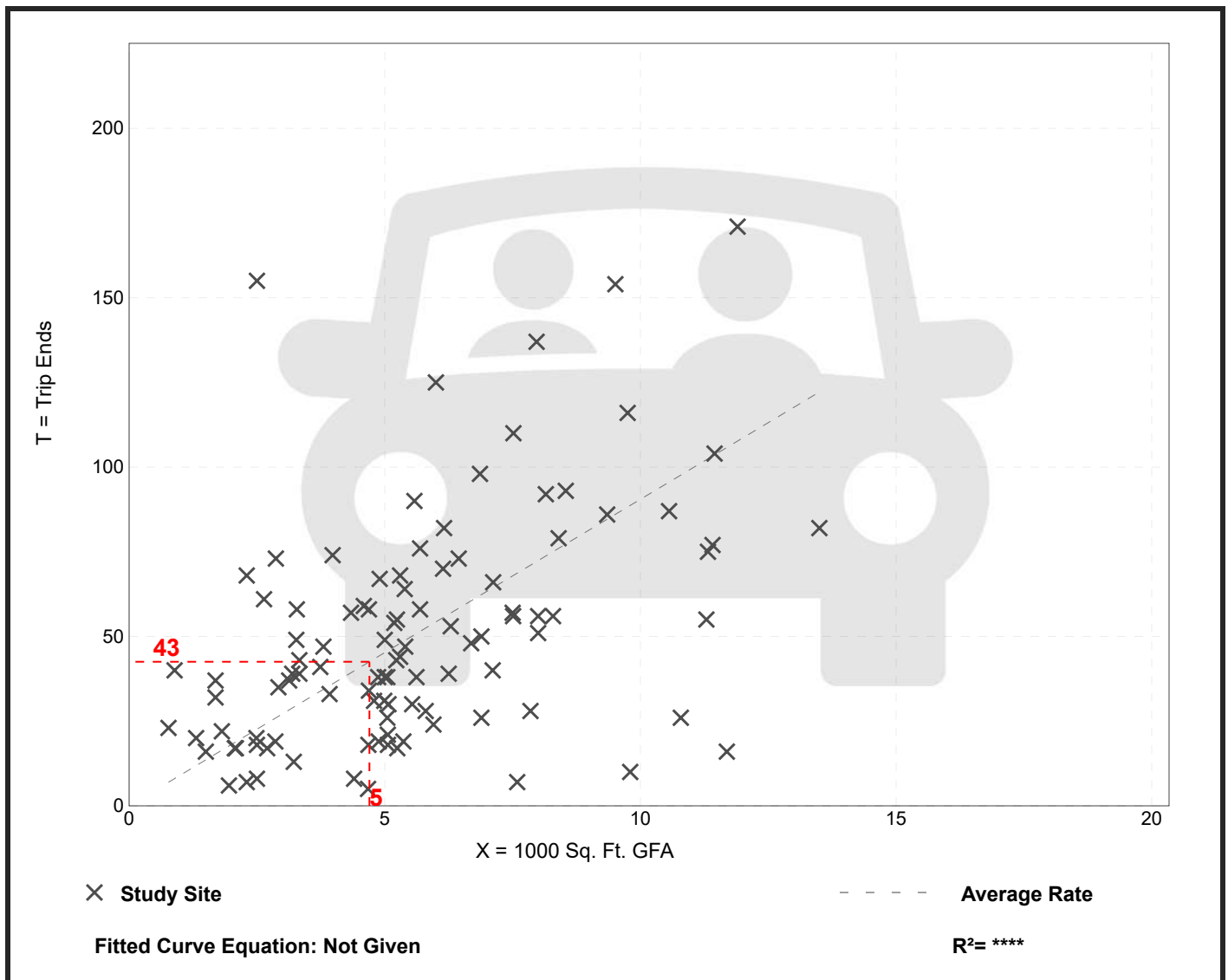
High-Turnover (Sit-Down) Restaurant (932)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 4 and 6 p.m.
 Setting/Location: General Urban/Suburban
 Number of Studies: 104
 Avg. 1000 Sq. Ft. GFA: 6
 Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
9.05	0.92 - 62.00	6.18

Data Plot and Equation



Fast Food Restaurant w/ Drive Through Window

Fast-Food Restaurant with Drive-Through Window (934)

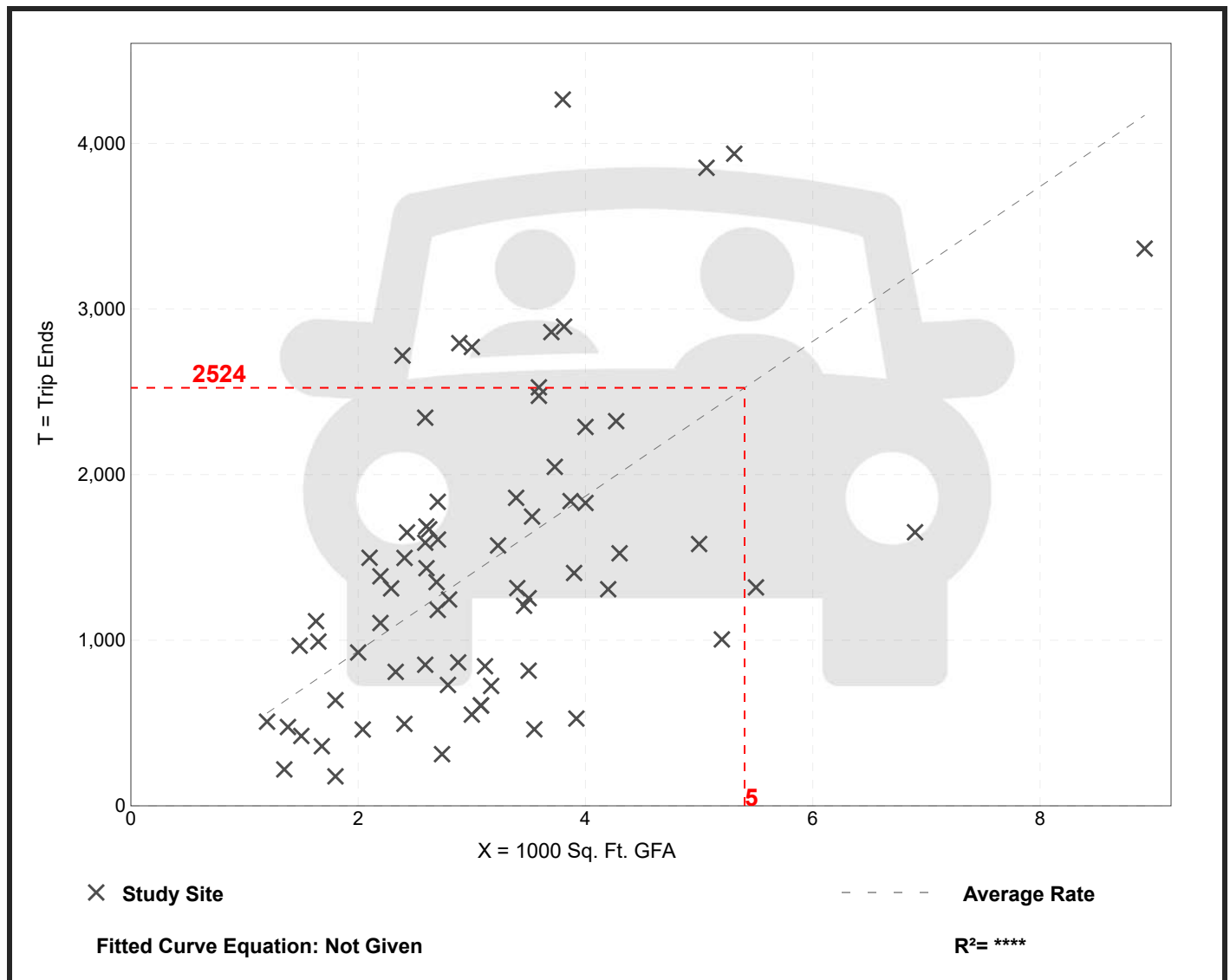
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 71
Avg. 1000 Sq. Ft. GFA: 3
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
467.48	98.89 - 1137.66	238.62

Data Plot and Equation



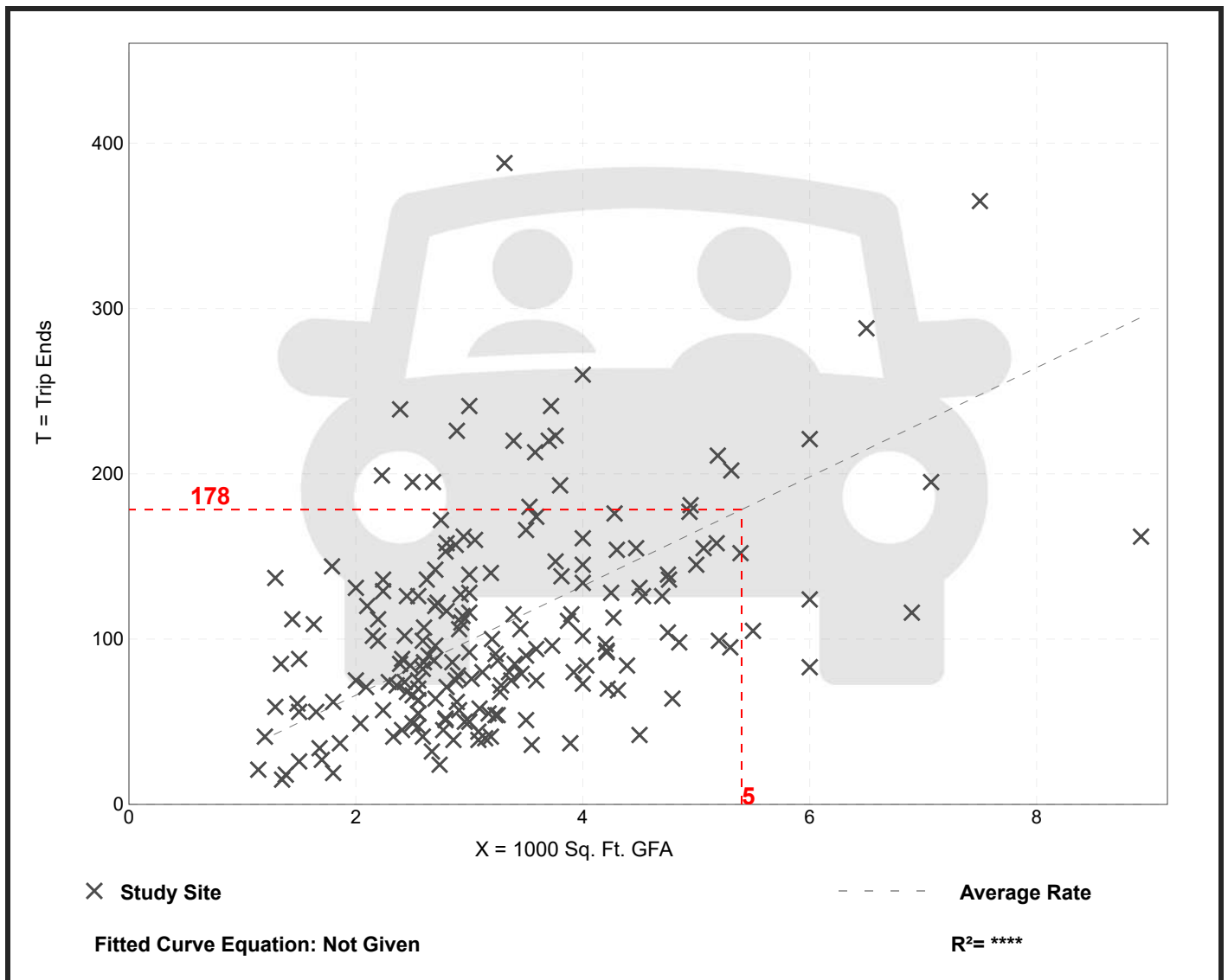
Fast-Food Restaurant with Drive-Through Window (934)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 190
 Avg. 1000 Sq. Ft. GFA: 3
 Directional Distribution: 52% entering, 48% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
33.03	8.77 - 117.22	17.59

Data Plot and Equation



Residential

Single Family

Single-Family Detached Housing (210)

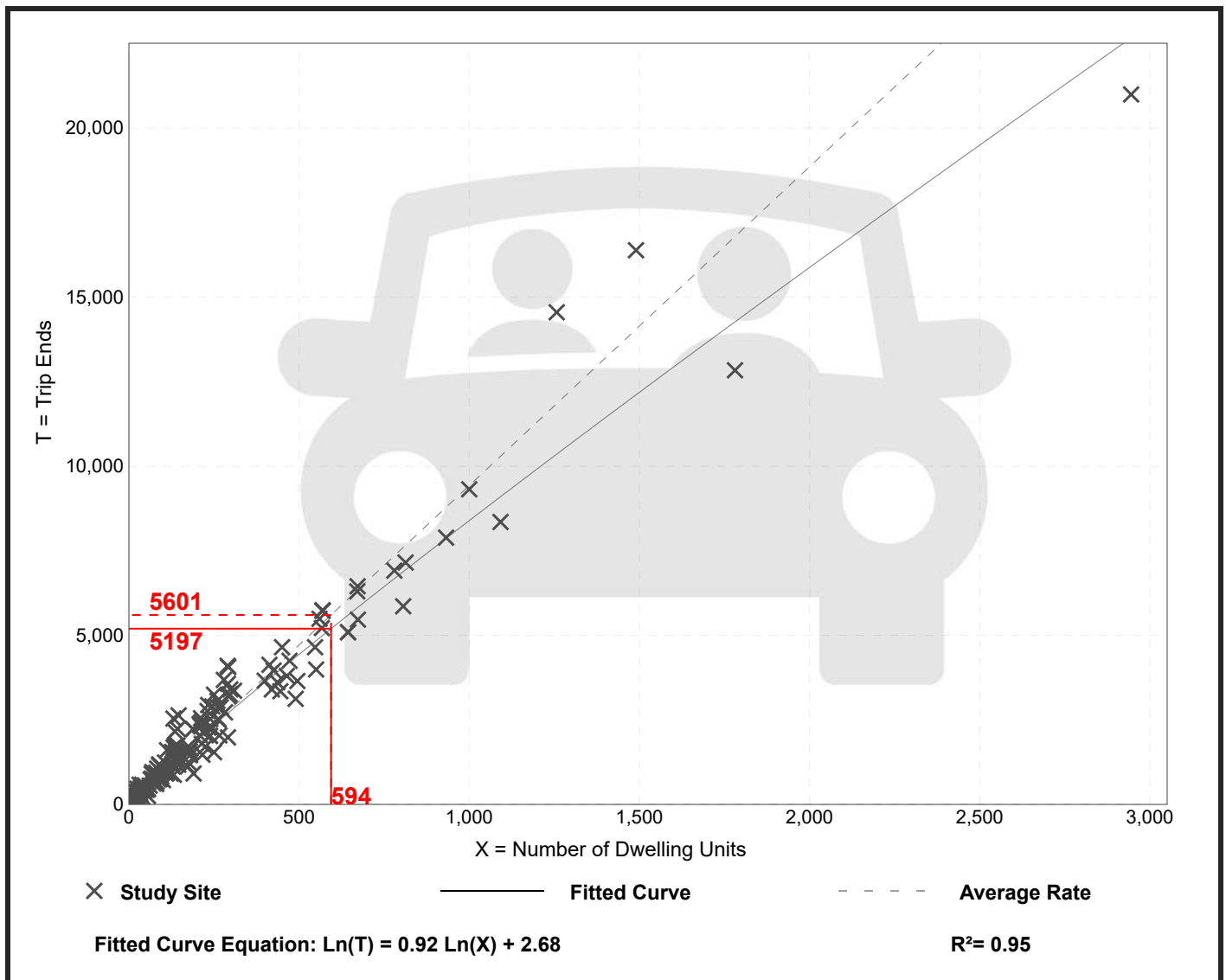
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

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



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

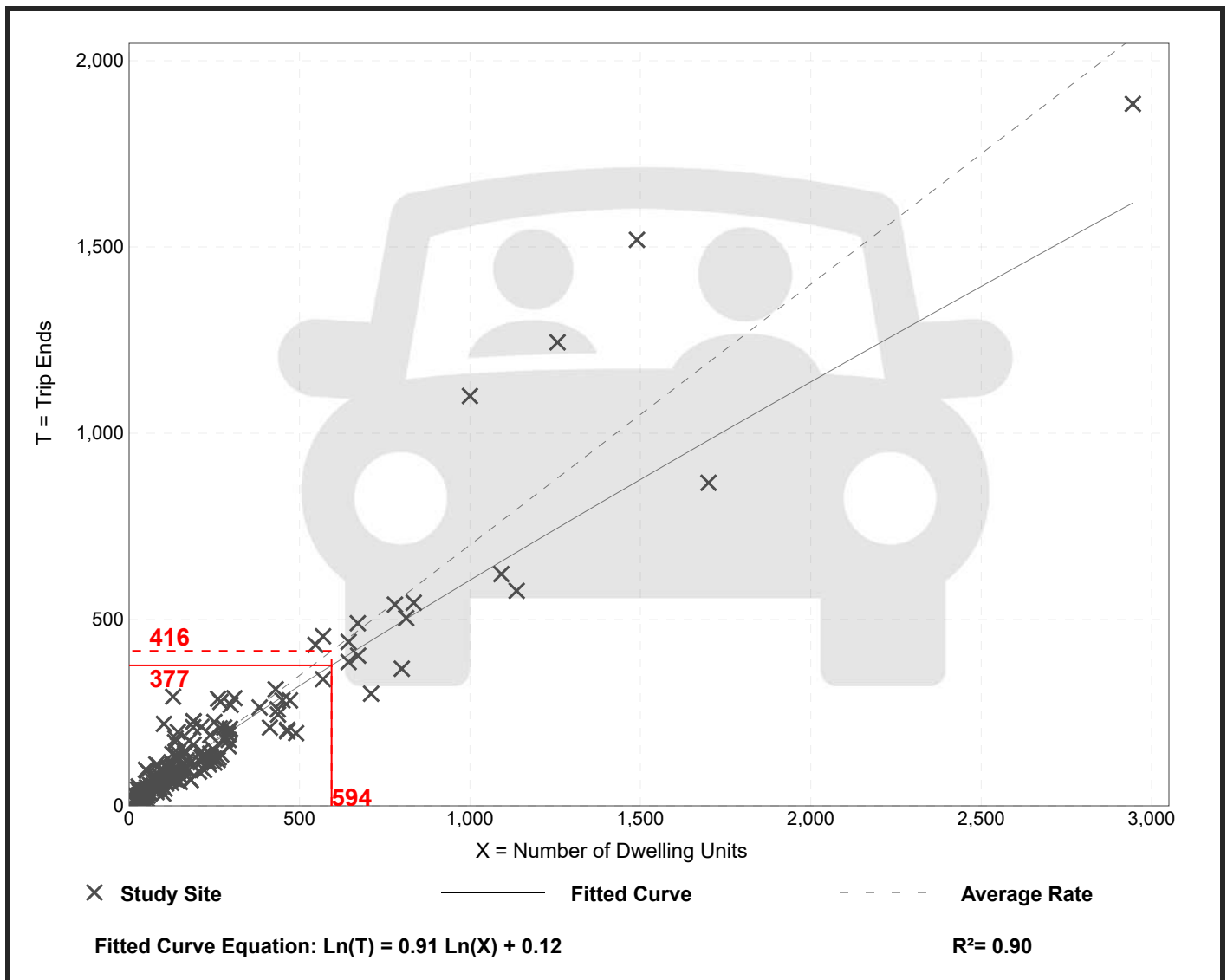
Avg. Num. of Dwelling Units: 226

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

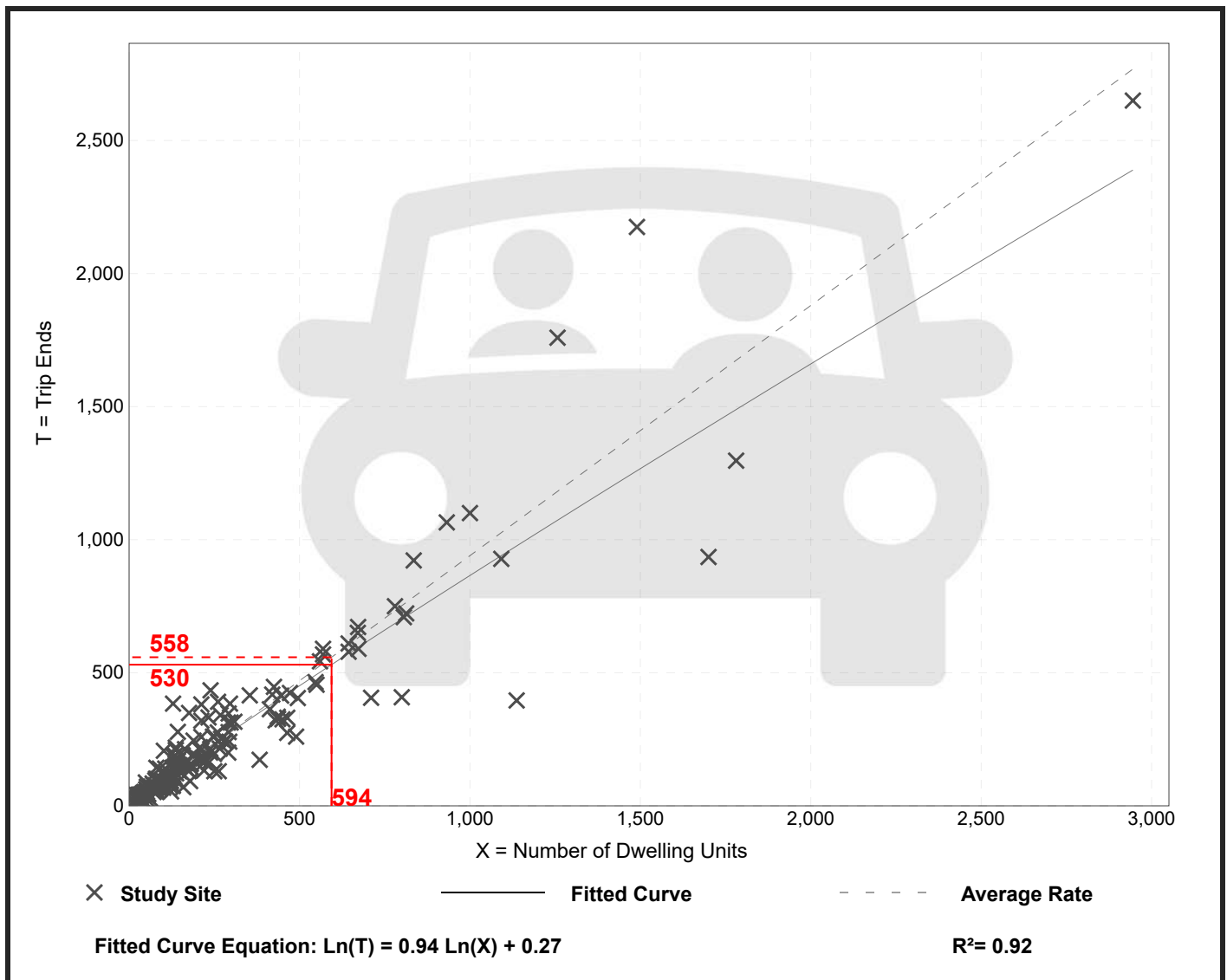
Avg. Num. of Dwelling Units: 248

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



Multi-Family

Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

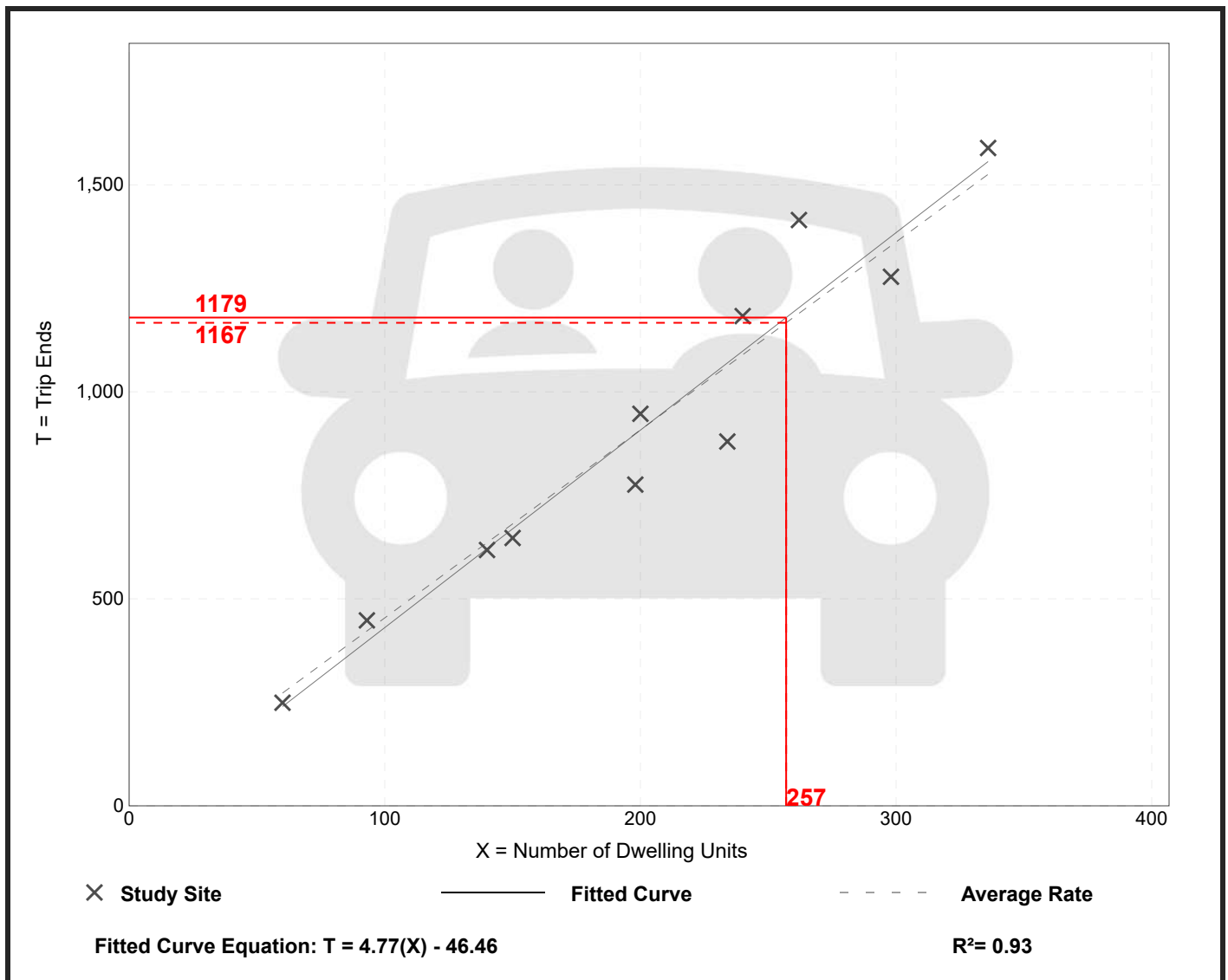
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 11
Avg. Num. of Dwelling Units: 201
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
4.54	3.76 - 5.40	0.51

Data Plot and Equation



Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

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: 30

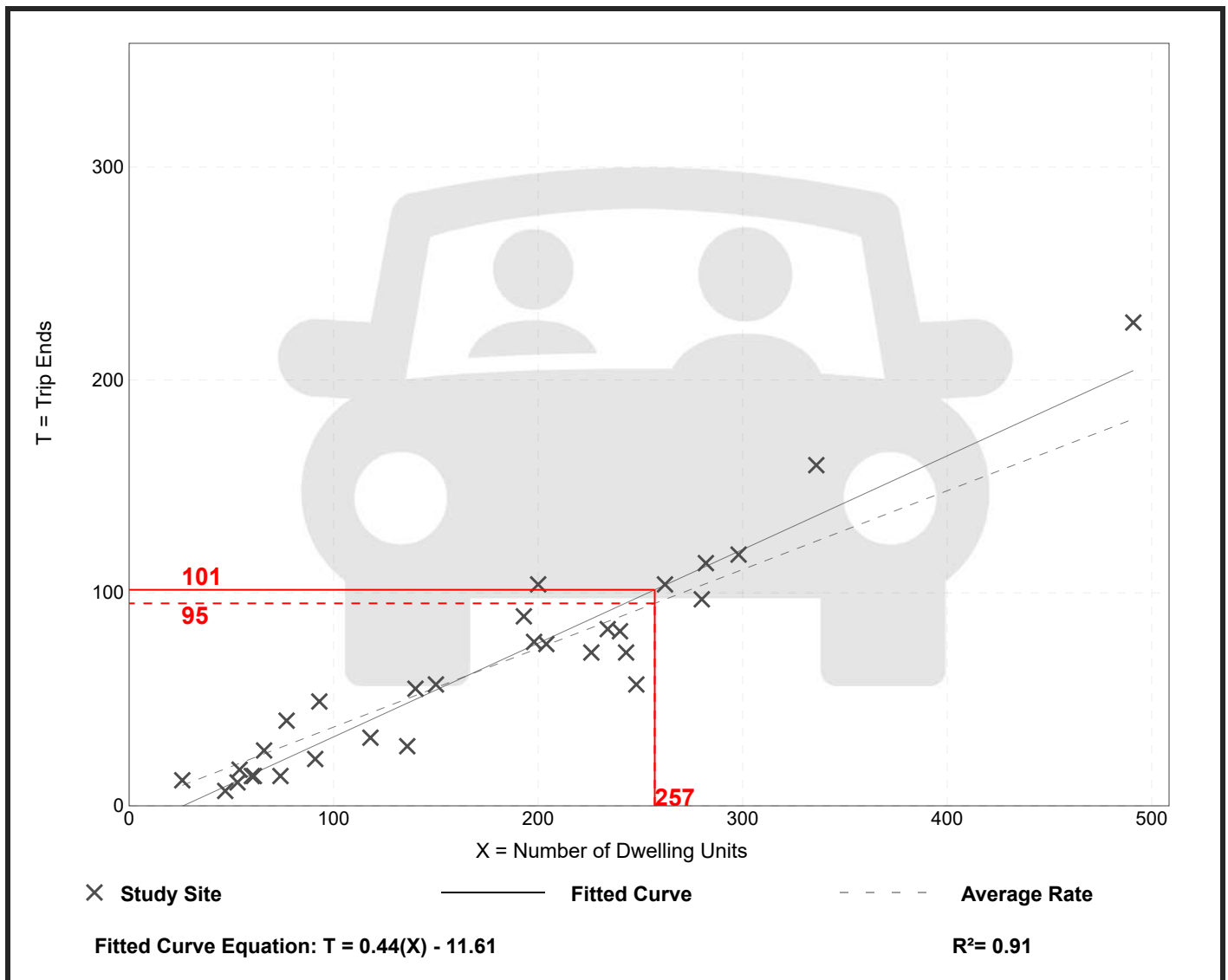
Avg. Num. of Dwelling Units: 173

Directional Distribution: 23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.37	0.15 - 0.53	0.09

Data Plot and Equation



Multifamily Housing (Mid-Rise) Not Close to Rail Transit (221)

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: 31

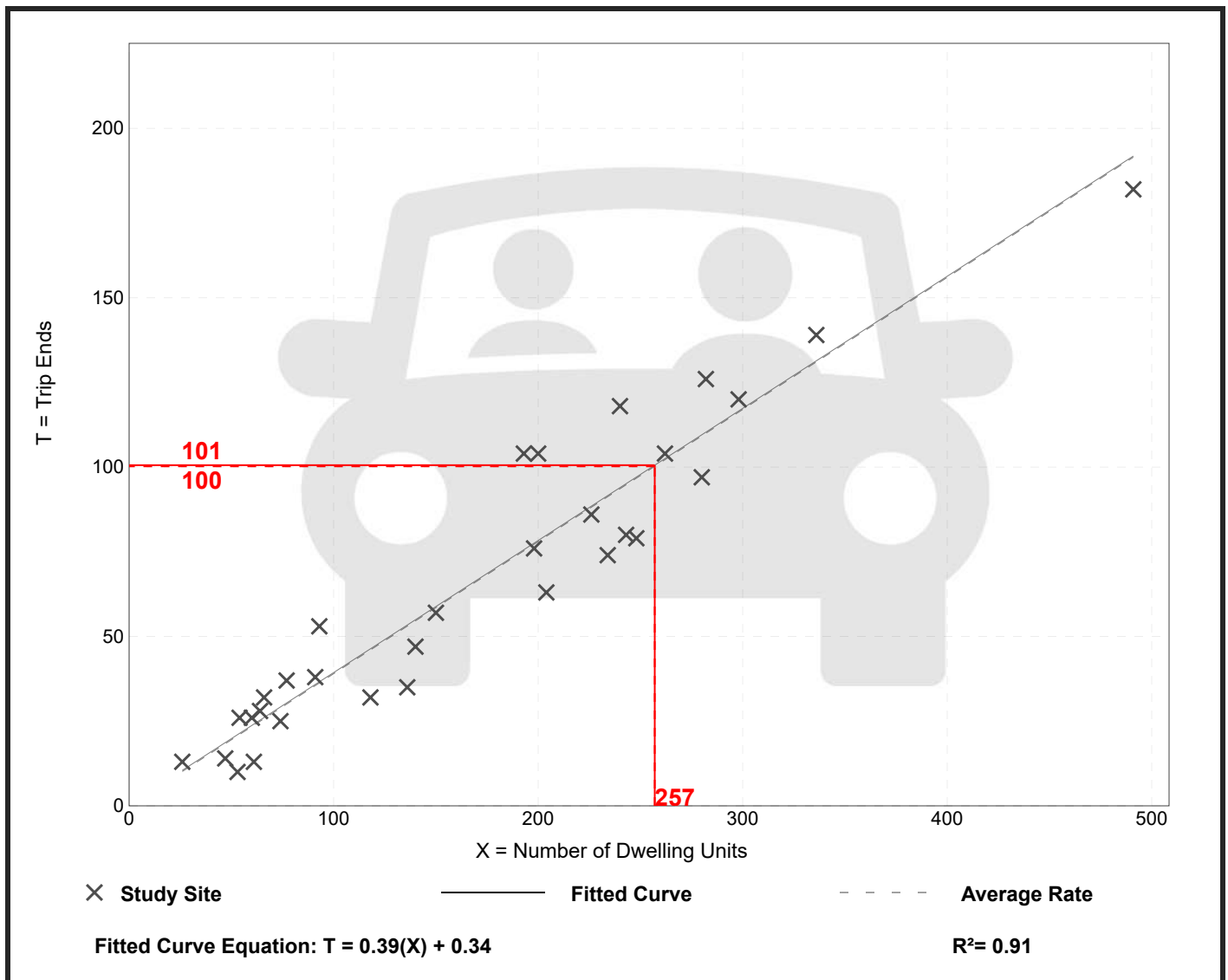
Avg. Num. of Dwelling Units: 169

Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.39	0.19 - 0.57	0.08

Data Plot and Equation



Commercial

Shopping Center (>150k) (820)

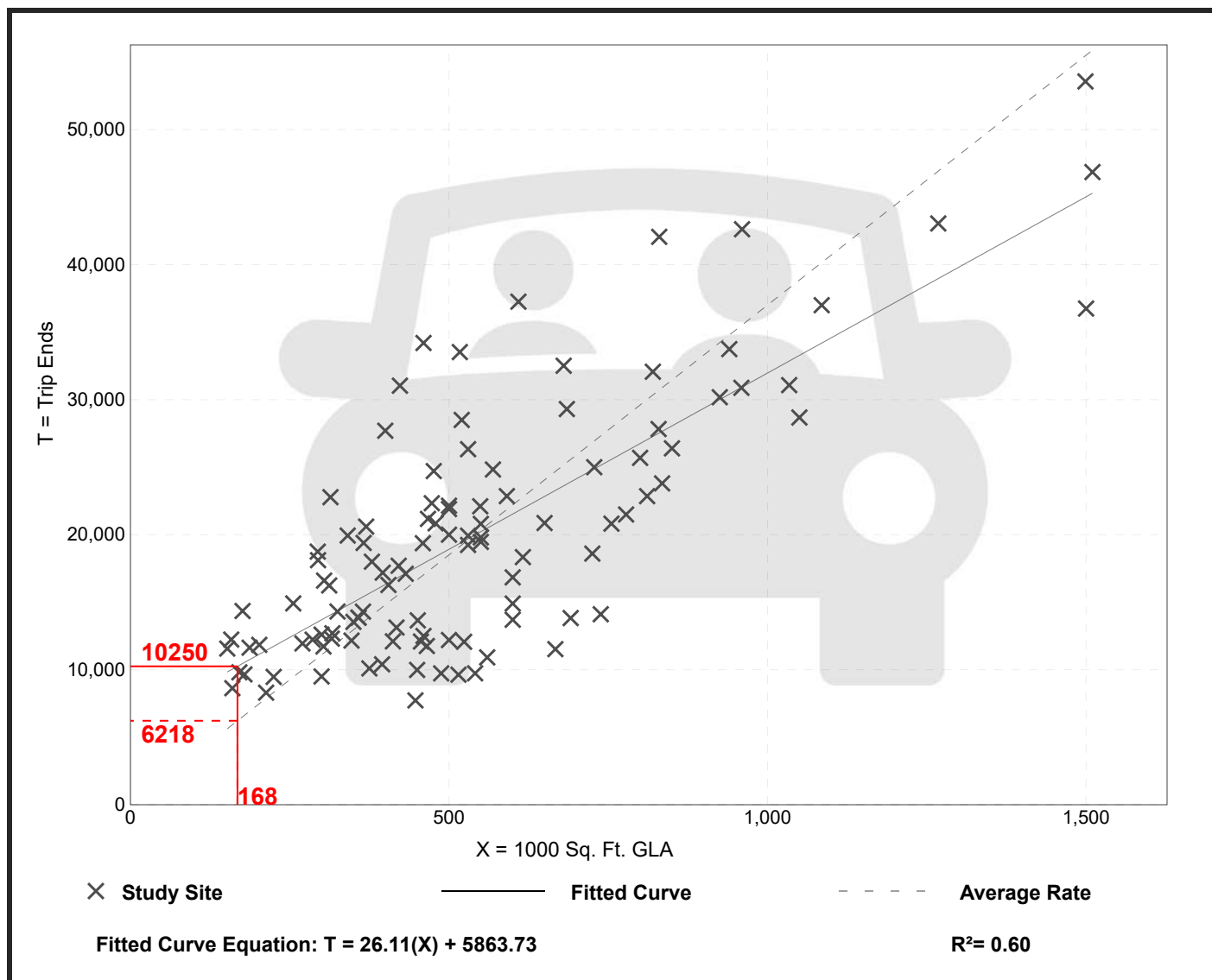
Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 108
Avg. 1000 Sq. Ft. GLA: 538
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
37.01	17.27 - 81.53	12.79

Data Plot and Equation



Shopping Center (>150k) (820)

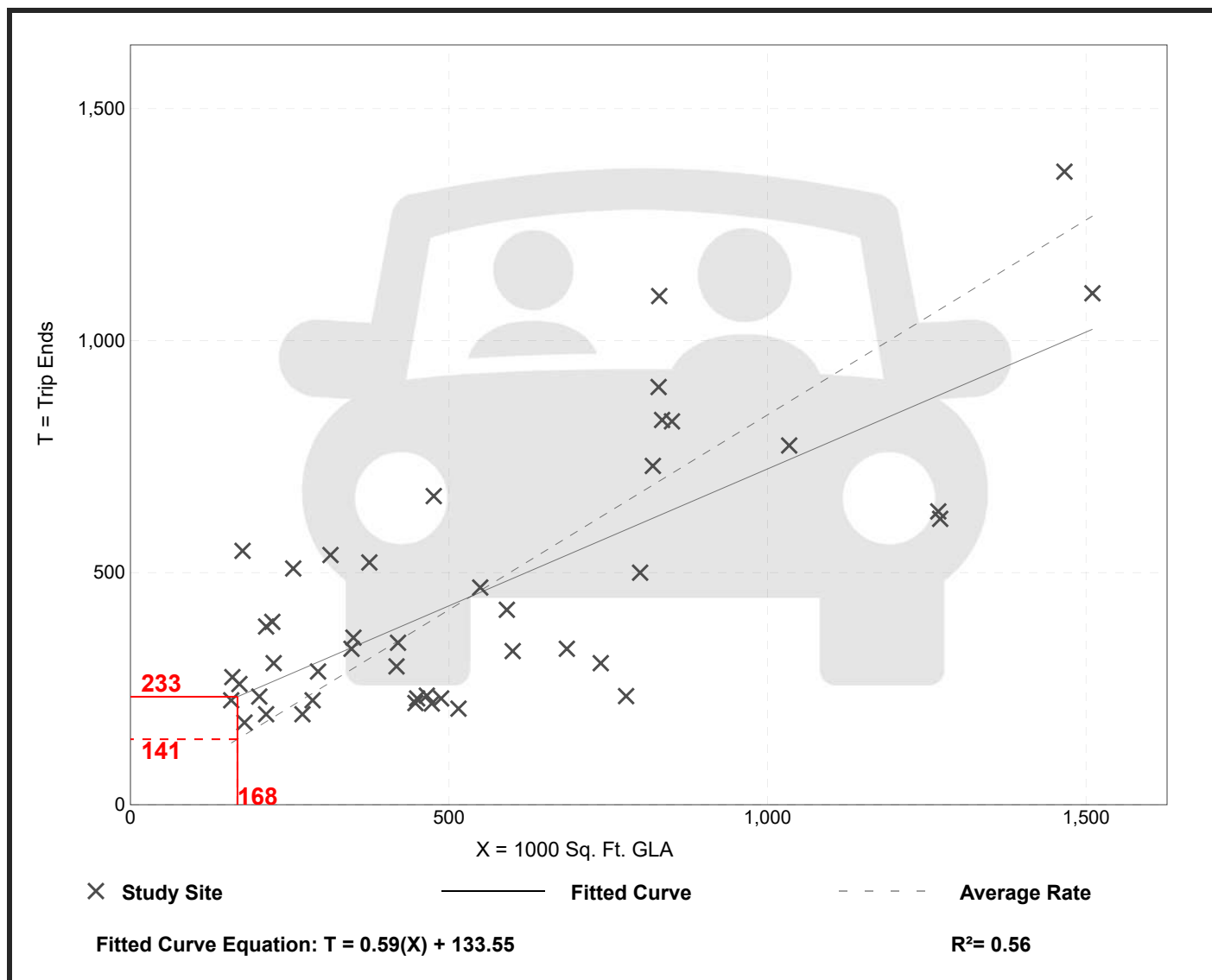
Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban
 Number of Studies: 44
 Avg. 1000 Sq. Ft. GLA: 546
 Directional Distribution: 62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
0.84	0.30 - 3.11	0.42

Data Plot and Equation



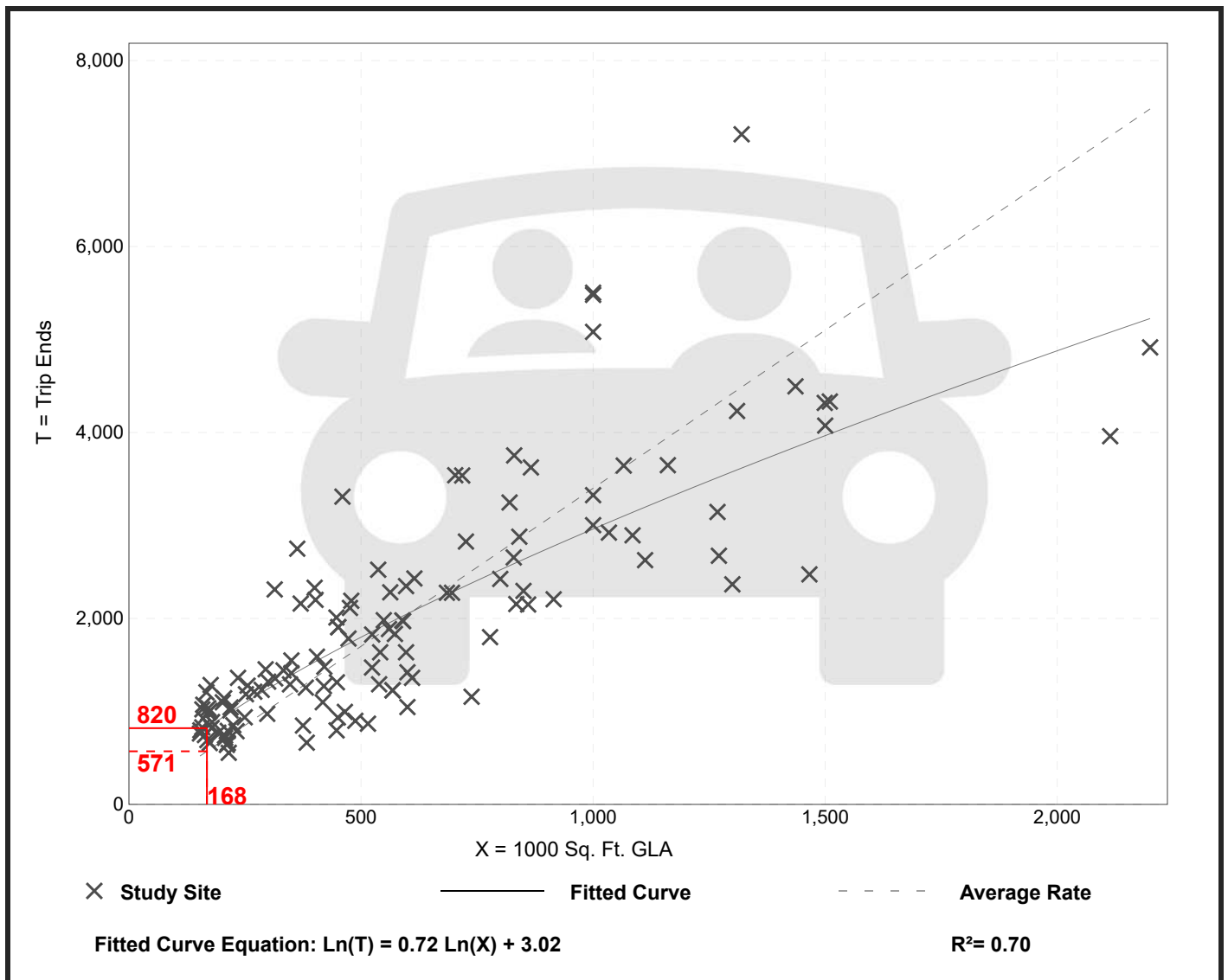
Shopping Center (>150k) (820)

Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
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: 126
 Avg. 1000 Sq. Ft. GLA: 581
 Directional Distribution: 48% entering, 52% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
3.40	1.57 - 7.58	1.26

Data Plot and Equation



Growth Rate

SUBJECT: HISTORIC GROWTH RATE

Taken from INDOT Traffic Count Database System <https://indot.ms2soft.com/tcds/tsearch.asp?loc=Indot&mod>

Location ID	231 540196	Growth	47 540532	Growth
Year			Year	
2020		-7	2020	-7
2019		0	2019	12
2018		-56	2018	0
2017		0	2017	1
2016		94	2016	3
2015		2	2015	2
2014		1	2014	1
2013		-2	2013	-2
Avg.		4	Avg.	1.25
Avg. w/out 2020		5.571428571	Avg. w/out 2020	2.428571429
Avg. w/out 2020, 2018, 2016		0.2		
Volume			Volume	
2018		8653	2019	6443
2013		10472	2016	5785
		-0.03474026		0.037914146
		-3.474025974 %		3.791414578 %
AADT			AADT	
2018		7494	2019	5792
2013		8434	2016	5135
		-0.022290728		0.042648491
		-2.229072801 %		4.264849075 %

Assignment & Distribution

SUBJECT: ASSIGNMENT DISTRIBUTION EAST SHOPPING

1. US 231 & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %		20%						-21%	3%	49%		
AM Exit %				21%	20%	49%					-21%	
AM Enter	0	4	0	0	0	0	0	-4	1	10	0	0
AM Exit	0	0	0	3	3	7	0	0	0	0	-3	0
PM Enter %		20%						-21%	3%	49%		
PM Exit %				21%	20%	49%					-21%	
PM Enter	0	15	0	0	0	0	0	-16	2	37	0	0
PM Exit	0	0	0	14	13	33	0	0	0	0	-14	0

Trips	
AM Enter	21
AM Exit	15
PM Enter	76
PM Exit	67

Autocalculation

1. US 231 & Purple Heart Parkway

AM Total	0	4	0	3	3	7	0	-4	1	10	-3	0
PM Total	0	15	0	14	13	33	0	-16	2	37	-14	0

2. Ladoga Road & Purple Heart Parkway

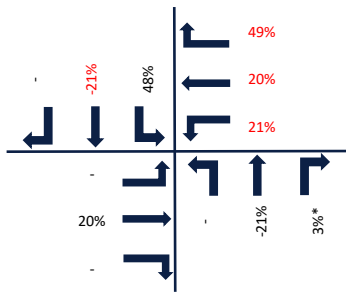
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %							5%				-5%	5%
AM Exit %	5%		5%					-5%				
AM Enter	0	0	0	0	0	0	1	0	0	0	-1	1
AM Exit	1	0	1	0	0	0	0	-1	0	0	0	0
PM Enter %							5%				-5%	5%
PM Exit %	5%		5%					-5%				
PM Enter	0	0	0	0	0	0	4	0	0	0	-4	4
PM Exit	3	0	3	0	0	0	0	-3	0	0	0	0

Trips	
AM Enter	21
AM Exit	15
PM Enter	76
PM Exit	67

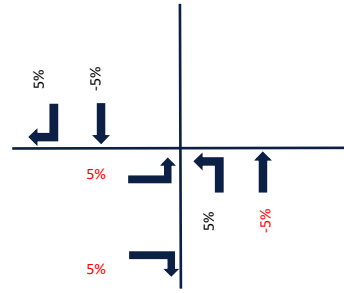
2. Ladoga Road & Purple Heart Parkway

AM Total	1	0	1	0	0	0	1	-1	0	0	-1	1
PM Total	3	0	3	0	0	0	4	-3	0	0	-4	4

Assignment and Distribution Percentages East Shopping Center



1. US 231 & Purple Heart Parkway



2. Ladoga Road & Purple Heart Parkway

*18% is expected to use additional entrance to the south along US 231

LEGEND

Black text is entering volume

Red text is exiting volume

SUBJECT: ASSIGNMENT DISTRIBUTION WEST SHOPPING

1. US 231 & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %			21%		10%		21%	-21%				49%
AM Exit %	49%	10%									-21%	
AM Enter	0	0	0	0	33	0	69	-69	0	0	0	161
AM Exit	116	24	50	0	0	0	0	0	0	0	-50	0
PM Enter %					10%		21%	-21%				49%
PM Exit %	49%	10%									-21%	
PM Enter	0	0	0	0	44	0	92	-92	0	0	0	215
PM Exit	293	60	126	0	0	0	0	0	0	0	-126	0

Trips	
AM Enter	328
AM Exit	237
PM Enter	438
PM Exit	598

Autocalculation

1. US 231 & Purple Heart Parkway

AM Total	116	24	50	0	33	0	69	-69	0	0	-50	161
PM Total	293	60	126	0	44	0	92	-92	0	0	-126	215

2. Ladoga Road & Purple Heart Parkway

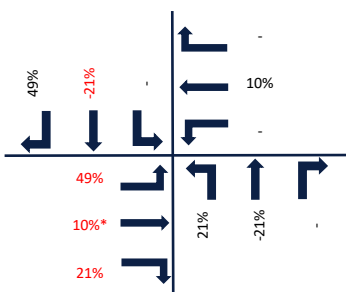
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %			5%				5%				-5%	5%
AM Exit %	5%							-5%				
AM Enter	0	0	0	0	0	0	16	0	0	0	-16	16
AM Exit	12	0	12	0	0	0	0	-12	0	0	0	0
PM Enter %							5%				-5%	5%
PM Exit %	5%		5%					-5%				
PM Enter	0	0	0	0	0	0	22	0	0	0	-22	22
PM Exit	30	0	30	0	0	0	0	-30	0	0	0	0

Trips	
AM Enter	328
AM Exit	237
PM Enter	438
PM Exit	598

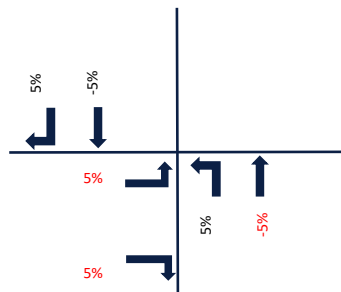
2. Ladoga Road & Purple Heart Parkway

AM Total	12	0	12	0	0	0	16	-12	0	0	-16	16
PM Total	30	0	30	0	0	0	22	-30	0	0	-22	22

Assignment and Distribution Percentages West Shopping Center



1. US 231 & Purple Heart Parkway



2. Ladoga Road & Purple Heart Parkway

*Traffic to and from the West (20%) will not use this intersection

LEGEND

Black text is entering volume

Red text is exiting volume

SUBJECT: ASSIGNMENT DISTRIBUTION RESIDENTIAL

1. US 231 & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %		5%							10%	47%		
AM Exit %				10%	5%	47%						
AM Enter	0	6	0	0	0	0	0	0	12	57	0	0
AM Exit	0	0	0	36	18	168	0	0	0	0	0	0
PM Enter %		5%							10%	47%		
PM Exit %				10%	5%	47%						
PM Enter	0	20	0	0	0	0	0	0	40	186	0	0
PM Exit	0	0	0	24	12	111	0	0	0	0	0	0
AM Total	0	6	0	36	18	168	0	0	12	57	0	0
PM Total	0	20	0	24	12	111	0	0	40	186	0	0

Trips	
AM Enter	121
AM Exit	357
PM Enter	395
PM Exit	236

Autocalculation

1. US 231 & Purple Heart Parkway

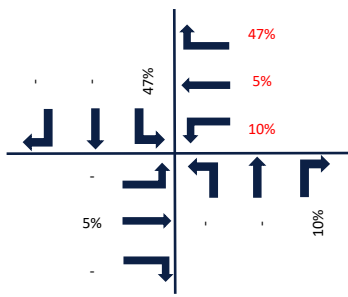
2. Ladoga Road & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %							5%					28%
AM Exit %	28%		5%									
AM Enter	0	0	0	0	0	0	6	0	0	0	0	34
AM Exit	100	0	18	0	0	0	0	0	0	0	0	0
PM Enter %							5%					28%
PM Exit %	28%		5%									
PM Enter	0	0	0	0	0	0	20	0	0	0	0	111
PM Exit	66	0	12	0	0	0	0	0	0	0	0	0
AM Total	100	0	18	0	0	0	6	0	0	0	0	34
PM Total	66	0	12	0	0	0	20	0	0	0	0	111

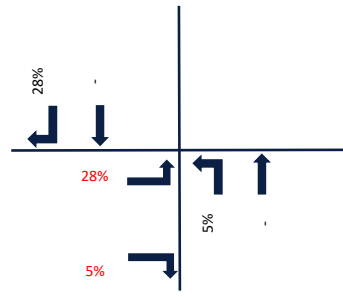
Trips	
AM Enter	121
AM Exit	357
PM Enter	395
PM Exit	236

2. Ladoga Road & Purple Heart Parkway

Assignment and Distribution Percentages Residential



1. US 231 & Purple Heart Parkway



2. Ladoga Road & Purple Heart Parkway

LEGEND

Black text is entering volume

Red text is exiting volume

SUBJECT: ASSIGNMENT DISTRIBUTION COMMERCIAL

1. US 231 & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %		20%							21%	49%		
AM Exit %				21%	20%	49%						
AM Enter	0	17	0	0	0	0	0	0	18	43	0	0
AM Exit	0	0	0	11	11	26	0	0	0	0	0	0
PM Enter %		20%							21%	49%		
PM Exit %				21%	20%	49%						
PM Enter	0	55	0	0	0	0	0	0	58	134	0	0
PM Exit	0	0	0	62	59	146	0	0	0	0	0	0

Trips	
AM Enter	87
AM Exit	54
PM Enter	274
PM Exit	297

Autocalculation

1. US 231 & Purple Heart Parkway

AM Total	0	17	0	11	11	26	0	0	18	43	0	0
PM Total	0	55	0	62	59	146	0	0	58	134	0	0

2. Ladoga Road & Purple Heart Parkway

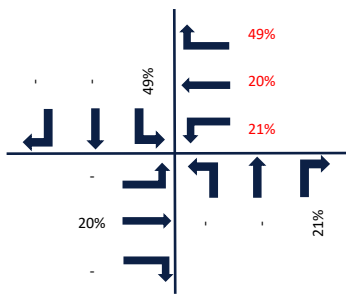
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %							5%					5%
AM Exit %	5%		5%									
AM Enter	0	0	0	0	0	0	4	0	0	0	0	4
AM Exit	3	0	3	0	0	0	0	0	0	0	0	0
PM Enter %							5%					5%
PM Exit %	5%		5%									
PM Enter	0	0	0	0	0	0	14	0	0	0	0	14
PM Exit	15	0	15	0	0	0	0	0	0	0	0	0

Trips	
AM Enter	87
AM Exit	54
PM Enter	274
PM Exit	297

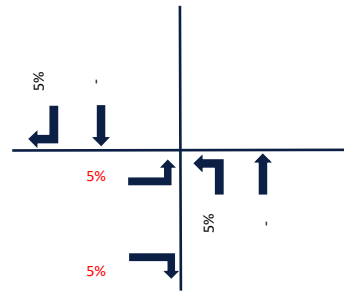
2. Ladoga Road & Purple Heart Parkway

AM Total	3	0	3	0	0	0	4	0	0	0	0	4
PM Total	15	0	15	0	0	0	14	0	0	0	0	14

Assignment and Distribution Percentages Commercial



1. US 231 & Purple Heart Parkway



2. Ladoga Road & Purple Heart Parkway

LEGEND

Black text is entering volume

Red text is exiting volume

Average Daily Trips

SUBJECT: ADT

access points 12 5 7
 segment length ft 6645
 segment length mi 1.258522727
 points/mile 9.534988713 4 5.5621
 Class III

	Peak Hour				Daily	
	AM	D%	PM	D%	D%	
EB Volume	197	0.38	615	0.54	6399	0.50
WB Volume	318	0.62	520	0.46	6476	0.50

Class I Level

Class I Level		2-Lane				
K	D	LOS B	LOS C	LOS D	LOS E	
	0.09	55%	4.9	8.7	14.9	30.2
		4900	8700	14900	30200	

K 0.09
 DHV 1135
 ADT 12875 C
 2033 ADT 14163

Daily Assignment & Distribution

SUBJECT: TRAFFIC FORECAST DAILY

1. US 231 & Purple Heart Parkway

Daily	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Raw Traffic 2018	0	0	0	0	0	0	0	4352	0	0	4301	0	2018	0.005
Purple Heart Parkway Reduction	0	0	0	9	0	10	0	4308	44	43	4258	0	2023	1.025 growth % for opening day
Background Growth	0	0	0	9	0	10	0	4416	45	44	4364	0		0.01
Existing Site Trip Gen East	0	160	0	169	161	393	0	-168	24	393	-169	0	2033	1.1 growth % for horizon year
Existing Site Trip Gen West	4697	959	2013	0	959	0	2013	-2013	0	0	-2013	4697		
Commerical Site Trip Gen	0	622	0	653	622	1523	0	0	653	1523	0	0		
Residential Site Trip Gen	0	159	0	319	159	1499	0	0	319	1498	0	0		
Scenario 1- Opening Day	4697	1900	2013	1150	1901	3425	2013	2235	1041	3458	2182	4697		
Scenario 2-Horizon Year	4697	1900	2013	1151	1901	3426	2013	2677	1046	3462	2618	4697		

2. Ladoga Road & Purple Heart Parkway

Daily	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Raw Traffic 2018	0	-	0	-	-	-	0	971	-	-	882	0
Purple Heart Parkway Reduction	44	-	43	-	-	-	10	961	-	-	873	9
Background Growth	45	-	44	-	-	-	10	985	-	-	895	9
Existing Site Trip Gen East	40	-	40	-	-	-	40	-40	-	-	-40	40
Existing Site Trip Gen West	479	-	479	-	-	-	479	-479	-	-	-479	479
Commerical Site Trip Gen	155	-	155	-	-	-	155	0	-	-	0	155
Residential Site Trip Gen	893	-	159	-	-	-	159	0	-	-	0	892
Scenario 1- Opening Day	1612	-	877	-	-	-	843	466	-	-	376	1575
Scenario 2-Horizon Year	1617	-	881	-	-	-	844	565	-	-	466	1576

SUBJECT: ASSIGNMENT DISTRIBUTION DAILY EAST SHOPPING

1. US 231 & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %		20%						-21%	3%	49%		
AM Exit %				21%	20%	49%					-21%	
AM Enter	0	160	0	0	0	0	0	-168	24	393	0	0
AM Exit	0	0	0	169	161	393	0	0	0	0	-169	0
PM Enter %		20%						-21%	3%	49%		
PM Exit %				21%	20%	49%					-21%	
PM Enter	0	0	0	0	0	0	0	0	0	0	0	0
PM Exit	0	0	0	0	0	0	0	0	0	0	0	0

Trips
Daily Enter 802
Daily Exit 803

Autocalculation

1. US 231 & Purple Heart Parkway

AM Total	0	160	0	169	161	393	0	-168	24	393	-169	0
PM Total	0	0	0	0	0	0	0	0	0	0	0	0

2. Ladoga Road & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %							5%				-5%	5%
AM Exit %	5%		5%					-5%				
AM Enter	0	0	0	0	0	0	40	0	0	0	-40	40
AM Exit	40	0	40	0	0	0	0	-40	0	0	0	0
PM Enter %							5%				-5%	5%
PM Exit %	5%		5%					-5%				
PM Enter	0	0	0	0	0	0	0	0	0	0	0	0
PM Exit	0	0	0	0	0	0	0	0	0	0	0	0

Trips
Daily Enter 802
Daily Exit 803

2. Ladoga Road & Purple Heart Parkway

AM Total	40	0	40	0	0	0	40	-40	0	0	-40	40
PM Total	0	0	0	0	0	0	0	0	0	0	0	0

SUBJECT: ASSIGNMENT DISTRIBUTION DAILY WEST SHOPPING

1. US 231 & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %					10%		21%	-21%				49%
AM Exit %	49%	10%	21%								-21%	
AM Enter	0	0	0	0	959	0	2013	-2013	0	0	0	4697
AM Exit	4697	959	2013	0	0	0	0	0	0	0	-2013	0
PM Enter %					10%		21%	-21%				49%
PM Exit %	49%	10%	21%								-21%	
PM Enter	0	0	0	0	0	0	0	0	0	0	0	0
PM Exit	0	0	0	0	0	0	0	0	0	0	0	0

Trips
Daily Enter 9585
Daily Exit 9585

Autocalculation

1. US 231 & Purple Heart Parkway

AM Total	4697	959	2013	0	959	0	2013	-2013	0	0	-2013	4697
PM Total	0	0	0	0	0	0	0	0	0	0	0	0

2. Ladoga Road & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %							5%				-5%	5%
AM Exit %	5%		5%					-5%				
AM Enter	0	0	0	0	0	0	479	0	0	0	-479	479
AM Exit	479	0	479	0	0	0	0	-479	0	0	0	0
PM Enter %							5%				-5%	5%
PM Exit %	5%		5%					-5%				
PM Enter	0	0	0	0	0	0	0	0	0	0	0	0
PM Exit	0	0	0	0	0	0	0	0	0	0	0	0

Trips
Daily Enter 9585
Daily Exit 9585

2. Ladoga Road & Purple Heart Parkway

AM Total	479	0	479	0	0	0	479	-479	0	0	-479	479
PM Total	0	0	0	0	0	0	0	0	0	0	0	0

SUBJECT: ASSIGNMENT DISTRIBUTION DAILY RESIDENTIAL

1. US 231 & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %		5%							10%	47%		
AM Exit %				10%	5%	47%						
AM Enter	0	159	0	0	0	0	0	0	319	1498	0	0
AM Exit	0	0	0	319	159	1499	0	0	0	0	0	0
PM Enter %		5%							10%	47%		
PM Exit %				10%	5%	47%						
PM Enter	0	0	0	0	0	0	0	0	0	0	0	0
PM Exit	0	0	0	0	0	0	0	0	0	0	0	0

Trips
Daily Enter 3187
Daily Exit 3189

Autocalculation

1. US 231 & Purple Heart Parkway

AM Total	0	159	0	319	159	1499	0	0	319	1498	0	0
PM Total	0	0	0	0	0	0	0	0	0	0	0	0

2. Ladoga Road & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %							5%					28%
AM Exit %	28%		5%									
AM Enter	0	0	0	0	0	0	159	0	0	0	0	892
AM Exit	893	0	159	0	0	0	0	0	0	0	0	0
PM Enter %							5%					28%
PM Exit %	28%		5%									
PM Enter	0	0	0	0	0	0	0	0	0	0	0	0
PM Exit	0	0	0	0	0	0	0	0	0	0	0	0

Trips
Daily Enter 3187
Daily Exit 3189

2. Ladoga Road & Purple Heart Parkway

AM Total	893	0	159	0	0	0	159	0	0	0	0	892
PM Total	0	0	0	0	0	0	0	0	0	0	0	0

SUBJECT: ASSIGNMENT DISTRIBUTION DAILY COMMERCIAL

1. US 231 & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %		20%								21%	49%	
AM Exit %				21%	20%	49%						
AM Enter	0	622	0	0	0	0	0	0	653	1523	0	0
AM Exit	0	0	0	653	622	1523	0	0	0	0	0	0
PM Enter %		20%								21%	49%	
PM Exit %				21%	20%	49%						
PM Enter	0	0	0	0	0	0	0	0	0	0	0	0
PM Exit	0	0	0	0	0	0	0	0	0	0	0	0

Trips
Daily Enter 3109
Daily Exit 3109

Autocalculation

1. US 231 & Purple Heart Parkway

AM Total	0	622	0	653	622	1523	0	0	653	1523	0	0
PM Total	0	0	0	0	0	0	0	0	0	0	0	0

2. Ladoga Road & Purple Heart Parkway

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
AM Enter %							5%					5%
AM Exit %	5%		5%									
AM Enter	0	0	0	0	0	0	155	0	0	0	0	155
AM Exit	155	0	155	0	0	0	0	0	0	0	0	0
PM Enter %							5%					5%
PM Exit %	5%		5%									
PM Enter	0	0	0	0	0	0	0	0	0	0	0	0
PM Exit	0	0	0	0	0	0	0	0	0	0	0	0

Trips
Daily Enter 3109
Daily Exit 3109

2. Ladoga Road & Purple Heart Parkway

AM Total	155	0	155	0	0	0	155	0	0	0	0	155
PM Total	0	0	0	0	0	0	0	0	0	0	0	0

Capacity Analysis Results

Scenario 1

AM Peak

HCM 6th Signalized Intersection Summary
1: US 231 & Purple Heart Parkway

Scenario 1- Opening Day 2023 AM Peak

03/17/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	116	51	50	51	65	202	69	268	34	112	192	161
Future Volume (veh/h)	116	51	50	51	65	202	69	268	34	112	192	161
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	129	57	56	57	72	224	77	298	38	124	213	179
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	317	462	489	502	88	275	518	1008	127	513	1176	648
Arrive On Green	0.08	0.25	0.25	0.05	0.22	0.22	0.06	0.32	0.32	0.07	0.33	0.33
Sat Flow, veh/h	1781	1870	1585	1781	400	1246	1781	3174	401	1781	3554	1585
Grp Volume(v), veh/h	129	57	56	57	0	296	77	166	170	124	213	179
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1646	1781	1777	1798	1781	1777	1585
Q Serve(g_s), s	3.2	1.4	1.5	1.3	0.0	9.9	1.6	4.1	4.2	2.6	2.5	4.4
Cycle Q Clear(g_c), s	3.2	1.4	1.5	1.3	0.0	9.9	1.6	4.1	4.2	2.6	2.5	4.4
Prop In Lane	1.00		1.00	1.00		0.76	1.00		0.22	1.00		1.00
Lane Grp Cap(c), veh/h	317	462	489	502	0	363	518	565	571	513	1176	648
V/C Ratio(X)	0.41	0.12	0.11	0.11	0.00	0.81	0.15	0.29	0.30	0.24	0.18	0.28
Avail Cap(c_a), veh/h	346	591	598	566	0	509	563	565	571	534	1176	648
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.4	17.0	14.4	14.8	0.0	21.6	11.3	14.9	15.0	11.7	13.9	11.5
Incr Delay (d2), s/veh	0.8	0.1	0.1	0.1	0.0	6.9	0.1	1.3	1.3	0.2	0.3	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.6	0.5	0.5	0.0	4.2	0.6	1.7	1.7	1.0	1.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	17.1	14.5	14.9	0.0	28.5	11.4	16.3	16.3	12.0	14.2	12.5
LnGrp LOS	B	B	B	B	A	C	B	B	B	B	B	B
Approach Vol, veh/h		242			353			413			516	
Approach Delay, s/veh		16.6			26.3			15.4			13.1	
Approach LOS		B			C			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.8	23.0	7.5	18.9	8.1	23.8	9.1	17.3				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	18.5	5.1	18.4	5.0	18.5	5.5	18.0				
Max Q Clear Time (g_c+I1), s	4.6	6.2	3.3	3.5	3.6	6.4	5.2	11.9				
Green Ext Time (p_c), s	0.0	1.5	0.0	0.3	0.0	1.5	0.0	0.9				
Intersection Summary												
HCM 6th Ctrl Delay				17.3								
HCM 6th LOS				B								

Intersection						
Int Delay, s/veh	5.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	119	36	28	49	66	56
Future Vol, veh/h	119	36	28	49	66	56
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	132	40	31	54	73	62

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	220	104	135	0	0
Stage 1	104	-	-	-	-
Stage 2	116	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	768	951	1449	-	-
Stage 1	920	-	-	-	-
Stage 2	909	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	751	951	1449	-	-
Mov Cap-2 Maneuver	751	-	-	-	-
Stage 1	900	-	-	-	-
Stage 2	909	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.8	2.7	0
HCM LOS	B		
























Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1449	-	790	-	-
HCM Lane V/C Ratio	0.021	-	0.218	-	-
HCM Control Delay (s)	7.5	0	10.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.8	-	-

PM Peak

HCM 6th Signalized Intersection Summary
1: US 231 & Purple Heart Parkway

Scenario 1- Opening Day 2023 PM Peak

03/17/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	293	150	126	101	128	291	92	275	104	361	278	215
Future Volume (veh/h)	293	150	126	101	128	291	92	275	104	361	278	215
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	326	167	140	112	142	323	102	306	116	401	309	239
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	341	590	593	473	122	277	424	632	235	472	1151	731
Arrive On Green	0.14	0.32	0.32	0.06	0.24	0.24	0.06	0.25	0.25	0.13	0.32	0.32
Sat Flow, veh/h	1781	1870	1585	1781	508	1155	1781	2536	942	1781	3554	1585
Grp Volume(v), veh/h	326	167	140	112	0	465	102	213	209	401	309	239
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1662	1781	1777	1701	1781	1777	1585
Q Serve(g_s), s	10.3	5.0	4.5	3.1	0.0	18.0	2.8	7.6	7.9	10.0	4.8	7.2
Cycle Q Clear(g_c), s	10.3	5.0	4.5	3.1	0.0	18.0	2.8	7.6	7.9	10.0	4.8	7.2
Prop In Lane	1.00		1.00	1.00		0.69	1.00		0.55	1.00		1.00
Lane Grp Cap(c), veh/h	341	590	593	473	0	399	424	443	424	472	1151	731
V/C Ratio(X)	0.96	0.28	0.24	0.24	0.00	1.17	0.24	0.48	0.49	0.85	0.27	0.33
Avail Cap(c_a), veh/h	341	590	593	498	0	399	459	443	424	472	1151	731
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.1	19.3	16.1	15.7	0.0	28.5	15.3	24.0	24.1	21.6	18.8	12.8
Incr Delay (d2), s/veh	37.4	0.3	0.2	0.3	0.0	98.5	0.3	3.7	4.1	13.6	0.6	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	2.1	1.6	1.2	0.0	17.7	1.1	3.5	3.5	3.6	2.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.5	19.6	16.3	16.0	0.0	127.0	15.6	27.7	28.2	35.2	19.3	14.0
LnGrp LOS	E	B	B	B	A	F	B	C	C	D	B	B
Approach Vol, veh/h		633			577			524			949	
Approach Delay, s/veh		38.4			105.4			25.5			24.7	
Approach LOS		D			F			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	14.5	23.2	9.1	28.2	8.9	28.8	14.8	22.5				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	10.0	18.7	5.7	22.6	5.9	22.8	10.3	18.0				
Max Q Clear Time (g_c+I1), s	12.0	9.9	5.1	7.0	4.8	9.2	12.3	20.0				
Green Ext Time (p_c), s	0.0	1.7	0.0	1.2	0.0	2.4	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			45.5									
HCM 6th LOS			D									

Intersection						
Int Delay, s/veh	5.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	118	64	61	67	57	152
Future Vol, veh/h	118	64	61	67	57	152
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	131	71	68	74	63	169

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	358	148	232	0	0
Stage 1	148	-	-	-	-
Stage 2	210	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	640	899	1336	-	-
Stage 1	880	-	-	-	-
Stage 2	825	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	606	899	1336	-	-
Mov Cap-2 Maneuver	606	-	-	-	-
Stage 1	833	-	-	-	-
Stage 2	825	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	3.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1336	-	684	-	-
HCM Lane V/C Ratio	0.051	-	0.296	-	-
HCM Control Delay (s)	7.8	0	12.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.2	-	1.2	-	-

Scenario 2

AM Peak

HCM 6th Signalized Intersection Summary
1: US 231 & Purple Heart Parkway

Scenario 2- Horizon Year 2033 AM Peak

03/17/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	116	51	50	51	65	202	69	302	34	112	217	161
Future Volume (veh/h)	116	51	50	51	65	202	69	302	34	112	217	161
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	129	57	56	57	72	224	77	336	38	124	241	179
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	317	462	489	502	88	275	505	1023	115	496	1176	648
Arrive On Green	0.08	0.25	0.25	0.05	0.22	0.22	0.06	0.32	0.32	0.07	0.33	0.33
Sat Flow, veh/h	1781	1870	1585	1781	400	1246	1781	3221	362	1781	3554	1585
Grp Volume(v), veh/h	129	57	56	57	0	296	77	184	190	124	241	179
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1646	1781	1777	1805	1781	1777	1585
Q Serve(g_s), s	3.2	1.4	1.5	1.3	0.0	9.9	1.6	4.6	4.7	2.6	2.8	4.4
Cycle Q Clear(g_c), s	3.2	1.4	1.5	1.3	0.0	9.9	1.6	4.6	4.7	2.6	2.8	4.4
Prop In Lane	1.00		1.00	1.00		0.76	1.00		0.20	1.00		1.00
Lane Grp Cap(c), veh/h	317	462	489	502	0	363	505	565	574	496	1176	648
V/C Ratio(X)	0.41	0.12	0.11	0.11	0.00	0.81	0.15	0.33	0.33	0.25	0.20	0.28
Avail Cap(c_a), veh/h	346	591	598	566	0	509	549	565	574	516	1176	648
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.4	17.0	14.4	14.8	0.0	21.6	11.3	15.1	15.1	11.8	14.0	11.5
Incr Delay (d2), s/veh	0.8	0.1	0.1	0.1	0.0	6.9	0.1	1.5	1.5	0.3	0.4	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.6	0.5	0.5	0.0	4.2	0.6	1.9	2.0	1.0	1.1	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	17.1	14.5	14.9	0.0	28.5	11.5	16.7	16.7	12.0	14.4	12.5
LnGrp LOS	B	B	B	B	A	C	B	B	B	B	B	B
Approach Vol, veh/h		242			353			451			544	
Approach Delay, s/veh		16.6			26.3			15.8			13.2	
Approach LOS		B			C			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.8	23.0	7.5	18.9	8.1	23.8	9.1	17.3				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.0	18.5	5.1	18.4	5.0	18.5	5.5	18.0				
Max Q Clear Time (g_c+I1), s	4.6	6.7	3.3	3.5	3.6	6.4	5.2	11.9				
Green Ext Time (p_c), s	0.0	1.7	0.0	0.3	0.0	1.7	0.0	0.9				

Intersection Summary

HCM 6th Ctrl Delay	17.4
HCM 6th LOS	B

Intersection						
Int Delay, s/veh	5.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	119	36	28	55	74	56
Future Vol, veh/h	119	36	28	55	74	56
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	132	40	31	61	82	62

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	236	113	144	0	0
Stage 1	113	-	-	-	-
Stage 2	123	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	752	940	1438	-	-
Stage 1	912	-	-	-	-
Stage 2	902	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	735	940	1438	-	-
Mov Cap-2 Maneuver	735	-	-	-	-
Stage 1	892	-	-	-	-
Stage 2	902	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11	2.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1438	-	774	-	-
HCM Lane V/C Ratio	0.022	-	0.223	-	-
HCM Control Delay (s)	7.6	0	11	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.8	-	-

PM Peak

HCM 6th Signalized Intersection Summary
 1: US 231 & Purple Heart Parkway

Scenario 2- Horizon Year 2033 PM Peak

03/17/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	293	150	126	101	128	291	92	313	104	361	320	215
Future Volume (veh/h)	293	150	126	101	128	291	92	313	104	361	320	215
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	326	167	140	112	142	323	102	348	116	401	356	239
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	338	587	591	471	122	277	406	641	211	463	1156	731
Arrive On Green	0.14	0.31	0.31	0.06	0.24	0.24	0.06	0.24	0.24	0.14	0.33	0.33
Sat Flow, veh/h	1781	1870	1585	1781	508	1155	1781	2629	863	1781	3554	1585
Grp Volume(v), veh/h	326	167	140	112	0	465	102	233	231	401	356	239
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1662	1781	1777	1715	1781	1777	1585
Q Serve(g_s), s	10.2	5.0	4.6	3.1	0.0	18.0	2.8	8.6	8.8	10.5	5.6	7.2
Cycle Q Clear(g_c), s	10.2	5.0	4.6	3.1	0.0	18.0	2.8	8.6	8.8	10.5	5.6	7.2
Prop In Lane	1.00		1.00	1.00		0.69	1.00		0.50	1.00		1.00
Lane Grp Cap(c), veh/h	338	587	591	471	0	399	406	434	418	463	1156	731
V/C Ratio(X)	0.96	0.28	0.24	0.24	0.00	1.17	0.25	0.54	0.55	0.87	0.31	0.33
Avail Cap(c_a), veh/h	338	587	591	496	0	399	442	434	418	463	1156	731
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.3	19.4	16.2	15.8	0.0	28.5	15.3	24.7	24.8	21.5	19.0	12.8
Incr Delay (d2), s/veh	39.2	0.3	0.2	0.3	0.0	98.5	0.3	4.7	5.1	15.8	0.7	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.7	2.1	1.6	1.2	0.0	17.7	1.1	4.0	4.0	7.2	2.3	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.5	19.6	16.4	16.0	0.0	127.0	15.7	29.4	29.9	37.2	19.7	14.0
LnGrp LOS	E	B	B	B	A	F	B	C	C	D	B	B
Approach Vol, veh/h		633			577			566			996	
Approach Delay, s/veh		39.5			105.4			27.1			25.4	
Approach LOS		D			F			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	15.0	22.8	9.2	28.0	8.9	28.9	14.7	22.5				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	10.5	18.3	5.7	22.5	5.9	22.9	10.2	18.0				
Max Q Clear Time (g_c+I1), s	12.5	10.8	5.1	7.0	4.8	9.2	12.2	20.0				
Green Ext Time (p_c), s	0.0	1.7	0.0	1.2	0.0	2.7	0.0	0.0				

Intersection Summary

HCM 6th Ctrl Delay	45.6
HCM 6th LOS	D

Intersection						
Int Delay, s/veh	5.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	118	64	61	77	65	152
Future Vol, veh/h	118	64	61	77	65	152
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	131	71	68	86	72	169

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	379	157	241	0	0
Stage 1	157	-	-	-	-
Stage 2	222	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	623	889	1326	-	-
Stage 1	871	-	-	-	-
Stage 2	815	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	589	889	1326	-	-
Mov Cap-2 Maneuver	589	-	-	-	-
Stage 1	824	-	-	-	-
Stage 2	815	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	3.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1326	-	668	-	-
HCM Lane V/C Ratio	0.051	-	0.303	-	-
HCM Control Delay (s)	7.9	0	12.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.2	-	1.3	-	-

























Capacity Analysis Improvements

Scenario 1

HCM 6th Signalized Intersection Summary
1: US 231 & Purple Heart Parkway

























Scenario 1- Opening Day 2023 AM Peak

03/17/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	116	51	50	51	65	202	69	268	34	112	192	161
Future Volume (veh/h)	116	51	50	51	65	202	69	268	34	112	192	161
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	129	57	56	57	72	224	77	298	38	124	213	179
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	425	375	417	448	321	413	112	1056	133	158	1275	698
Arrive On Green	0.08	0.20	0.20	0.05	0.17	0.17	0.06	0.33	0.33	0.09	0.36	0.36
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	3174	401	1781	3554	1585
Grp Volume(v), veh/h	129	57	56	57	72	224	77	166	170	124	213	179
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1777	1798	1781	1777	1585
Q Serve(g_s), s	3.2	1.4	1.5	1.4	1.8	6.7	2.3	3.8	3.9	3.8	2.3	3.9
Cycle Q Clear(g_c), s	3.2	1.4	1.5	1.4	1.8	6.7	2.3	3.8	3.9	3.8	2.3	3.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.22	1.00		1.00
Lane Grp Cap(c), veh/h	425	375	417	448	321	413	112	591	598	158	1275	698
V/C Ratio(X)	0.30	0.15	0.13	0.13	0.22	0.54	0.69	0.28	0.28	0.78	0.17	0.26
Avail Cap(c_a), veh/h	441	609	615	515	609	657	161	591	598	180	1275	698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.7	18.2	15.6	16.0	19.7	17.6	25.4	13.6	13.6	24.7	12.1	9.8
Incr Delay (d2), s/veh	0.4	0.2	0.1	0.1	0.3	1.1	7.3	1.2	1.2	17.8	0.3	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.6	0.5	0.5	0.8	2.3	1.2	1.5	1.6	2.3	0.8	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.1	18.4	15.7	16.1	20.1	18.7	32.7	14.8	14.8	42.5	12.4	10.7
LnGrp LOS	B	B	B	B	C	B	C	B	B	D	B	B
Approach Vol, veh/h		242			353			413			516	
Approach Delay, s/veh		17.1			18.6			18.1			19.0	
Approach LOS		B			B			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.4	22.9	7.4	15.6	8.0	24.3	9.0	14.0				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.6	18.4	5.0	18.0	5.0	19.0	5.0	18.0				
Max Q Clear Time (g_c+I1), s	5.8	5.9	3.4	3.5	4.3	5.9	5.2	8.7				
Green Ext Time (p_c), s	0.0	1.5	0.0	0.3	0.0	1.6	0.0	0.8				
Intersection Summary												
HCM 6th Ctrl Delay				18.4								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary
1: US 231 & Purple Heart Parkway

Scenario 1- Opening Day 2023 PM Peak
03/17/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	293	150	126	101	128	291	92	275	101	361	278	215
Future Volume (veh/h)	293	150	126	101	128	291	92	275	101	361	278	215
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	326	167	140	112	142	323	102	306	112	401	309	239
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	416	450	498	381	336	679	131	586	210	444	1436	841
Arrive On Green	0.13	0.24	0.24	0.07	0.18	0.18	0.07	0.23	0.23	0.25	0.40	0.40
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	2563	919	1781	3554	1585
Grp Volume(v), veh/h	326	167	140	112	142	323	102	210	208	401	309	239
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1777	1705	1781	1777	1585
Q Serve(g_s), s	10.5	6.2	5.5	3.9	5.6	12.2	4.7	8.6	8.9	18.1	4.7	6.9
Cycle Q Clear(g_c), s	10.5	6.2	5.5	3.9	5.6	12.2	4.7	8.6	8.9	18.1	4.7	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.54	1.00		1.00
Lane Grp Cap(c), veh/h	416	450	498	381	336	679	131	406	390	444	1436	841
V/C Ratio(X)	0.78	0.37	0.28	0.29	0.42	0.48	0.78	0.52	0.53	0.90	0.22	0.28
Avail Cap(c_a), veh/h	416	504	544	395	405	738	251	406	390	525	1436	841
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.2	26.3	21.4	21.6	30.3	17.0	37.8	28.0	28.2	30.2	16.2	10.8
Incr Delay (d2), s/veh	9.5	0.5	0.3	0.4	0.8	0.5	9.5	4.7	5.1	17.2	0.3	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	2.7	2.0	1.6	2.5	4.3	2.3	4.1	4.1	9.6	1.9	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.6	26.8	21.7	22.1	31.1	17.6	47.3	32.7	33.3	47.5	16.5	11.6
LnGrp LOS	D	C	C	C	C	B	D	C	C	D	B	B
Approach Vol, veh/h		633			577			520			949	
Approach Delay, s/veh		30.2			21.8			35.8			28.4	
Approach LOS		C			C			D			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	25.2	23.5	9.9	24.5	10.6	38.1	15.0	19.4				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	24.5	19.0	6.1	22.4	11.7	31.8	10.5	18.0				
Max Q Clear Time (g_c+I1), s	20.1	10.9	5.9	8.2	6.7	8.9	12.5	14.2				
Green Ext Time (p_c), s	0.6	1.6	0.0	1.2	0.1	2.8	0.0	0.8				
Intersection Summary												
HCM 6th Ctrl Delay				28.8								
HCM 6th LOS				C								

Scenario 2

HCM 6th Signalized Intersection Summary
1: US 231 & Purple Heart Parkway

Scenario 2- Horizon Year 2033 AM Peak

03/17/2022



























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↑	↗	↖	↑↔		↖	↑↑	↗
Traffic Volume (veh/h)	116	51	50	51	65	202	69	302	34	112	217	161
Future Volume (veh/h)	116	51	50	51	65	202	69	302	34	112	217	161
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	129	57	56	57	72	224	77	336	38	124	241	179
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	425	375	417	448	321	413	112	1071	120	158	1275	698
Arrive On Green	0.08	0.20	0.20	0.05	0.17	0.17	0.06	0.33	0.33	0.09	0.36	0.36
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	3221	362	1781	3554	1585
Grp Volume(v), veh/h	129	57	56	57	72	224	77	184	190	124	241	179
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1777	1805	1781	1777	1585
Q Serve(g_s), s	3.2	1.4	1.5	1.4	1.8	6.7	2.3	4.3	4.3	3.8	2.6	3.9
Cycle Q Clear(g_c), s	3.2	1.4	1.5	1.4	1.8	6.7	2.3	4.3	4.3	3.8	2.6	3.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.20	1.00		1.00
Lane Grp Cap(c), veh/h	425	375	417	448	321	413	112	591	601	158	1275	698
V/C Ratio(X)	0.30	0.15	0.13	0.13	0.22	0.54	0.69	0.31	0.32	0.78	0.19	0.26
Avail Cap(c_a), veh/h	441	609	615	515	609	657	161	591	601	180	1275	698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.7	18.2	15.6	16.0	19.7	17.6	25.4	13.7	13.8	24.7	12.2	9.8
Incr Delay (d2), s/veh	0.4	0.2	0.1	0.1	0.3	1.1	7.3	1.4	1.4	17.8	0.3	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.6	0.5	0.5	0.8	2.3	1.2	1.7	1.8	2.3	1.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.1	18.4	15.7	16.1	20.1	18.7	32.7	15.1	15.1	42.5	12.5	10.7
LnGrp LOS	B	B	B	B	C	B	C	B	B	D	B	B
Approach Vol, veh/h		242			353			451			544	
Approach Delay, s/veh		17.1			18.6			18.1			18.7	
Approach LOS		B			B			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	9.4	22.9	7.4	15.6	8.0	24.3	9.0	14.0				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	5.6	18.4	5.0	18.0	5.0	19.0	5.0	18.0				
Max Q Clear Time (g_c+I1), s	5.8	6.3	3.4	3.5	4.3	5.9	5.2	8.7				
Green Ext Time (p_c), s	0.0	1.7	0.0	0.3	0.0	1.7	0.0	0.8				
Intersection Summary												
HCM 6th Ctrl Delay				18.3								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary
1: US 231 & Purple Heart Parkway

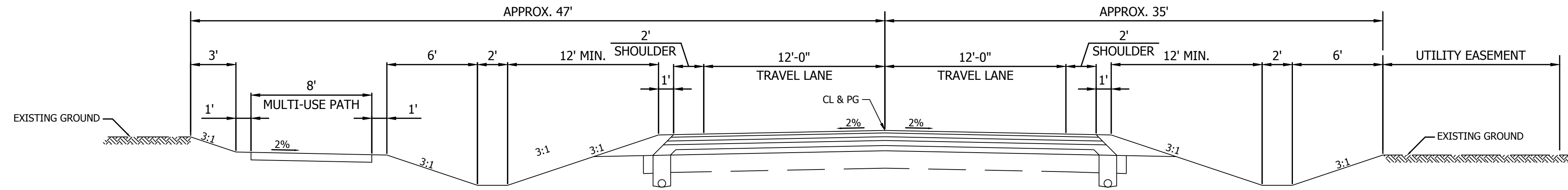
Scenario 2- Horizon Year 2033 PM Peak

03/17/2022

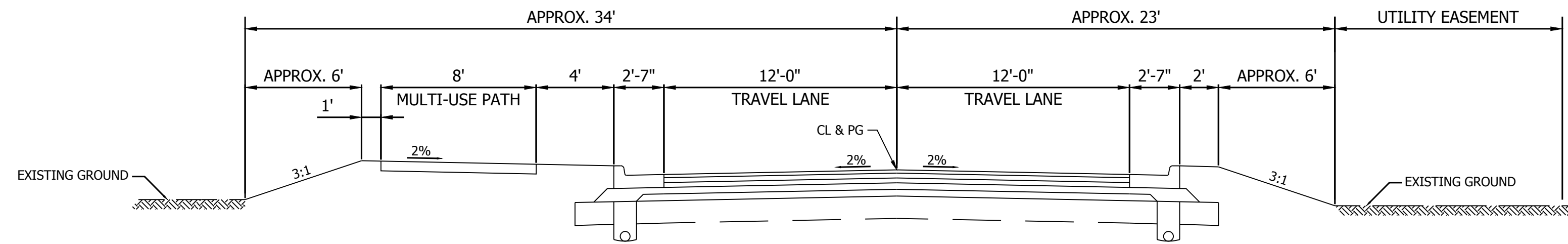
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	293	150	126	101	128	291	92	313	104	361	320	215
Future Volume (veh/h)	293	150	126	101	128	291	92	313	104	361	320	215
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	326	167	140	112	142	323	102	348	116	401	356	239
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	416	450	498	381	336	679	131	601	197	444	1436	841
Arrive On Green	0.13	0.24	0.24	0.07	0.18	0.18	0.07	0.23	0.23	0.25	0.40	0.40
Sat Flow, veh/h	1781	1870	1585	1781	1870	1585	1781	2629	863	1781	3554	1585
Grp Volume(v), veh/h	326	167	140	112	142	323	102	233	231	401	356	239
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	1870	1585	1781	1777	1715	1781	1777	1585
Q Serve(g_s), s	10.5	6.2	5.5	3.9	5.6	12.2	4.7	9.7	10.0	18.1	5.5	6.9
Cycle Q Clear(g_c), s	10.5	6.2	5.5	3.9	5.6	12.2	4.7	9.7	10.0	18.1	5.5	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.50	1.00		1.00
Lane Grp Cap(c), veh/h	416	450	498	381	336	679	131	406	392	444	1436	841
V/C Ratio(X)	0.78	0.37	0.28	0.29	0.42	0.48	0.78	0.57	0.59	0.90	0.25	0.28
Avail Cap(c_a), veh/h	416	504	544	395	405	738	251	406	392	525	1436	841
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.2	26.3	21.4	21.6	30.3	17.0	37.8	28.5	28.6	30.2	16.4	10.8
Incr Delay (d2), s/veh	9.5	0.5	0.3	0.4	0.8	0.5	9.5	5.8	6.3	17.2	0.4	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	2.7	2.0	1.6	2.5	4.3	2.3	4.7	4.7	9.6	2.2	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.6	26.8	21.7	22.1	31.1	17.6	47.3	34.3	34.9	47.5	16.8	11.6
LnGrp LOS	D	C	C	C	C	B	D	C	C	D	B	B
Approach Vol, veh/h		633			577			566			996	
Approach Delay, s/veh		30.2			21.8			36.9			27.9	
Approach LOS		C			C			D			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	25.2	23.5	9.9	24.5	10.6	38.1	15.0	19.4				
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	24.5	19.0	6.1	22.4	11.7	31.8	10.5	18.0				
Max Q Clear Time (g_c+I1), s	20.1	12.0	5.9	8.2	6.7	8.9	12.5	14.2				
Green Ext Time (p_c), s	0.6	1.6	0.0	1.2	0.1	3.2	0.0	0.8				
Intersection Summary												
HCM 6th Ctrl Delay				29.0								
HCM 6th LOS				C								

Appendix C-1

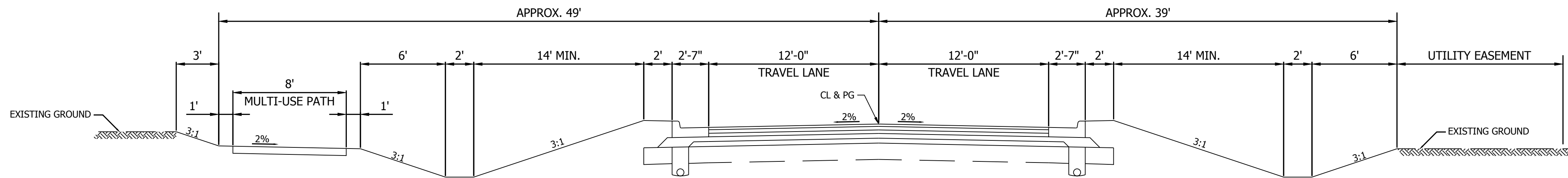
Proposed Typical Cross Sections



TYPICAL SECTION
Option 1: 2' Paved Shoulder Ditch



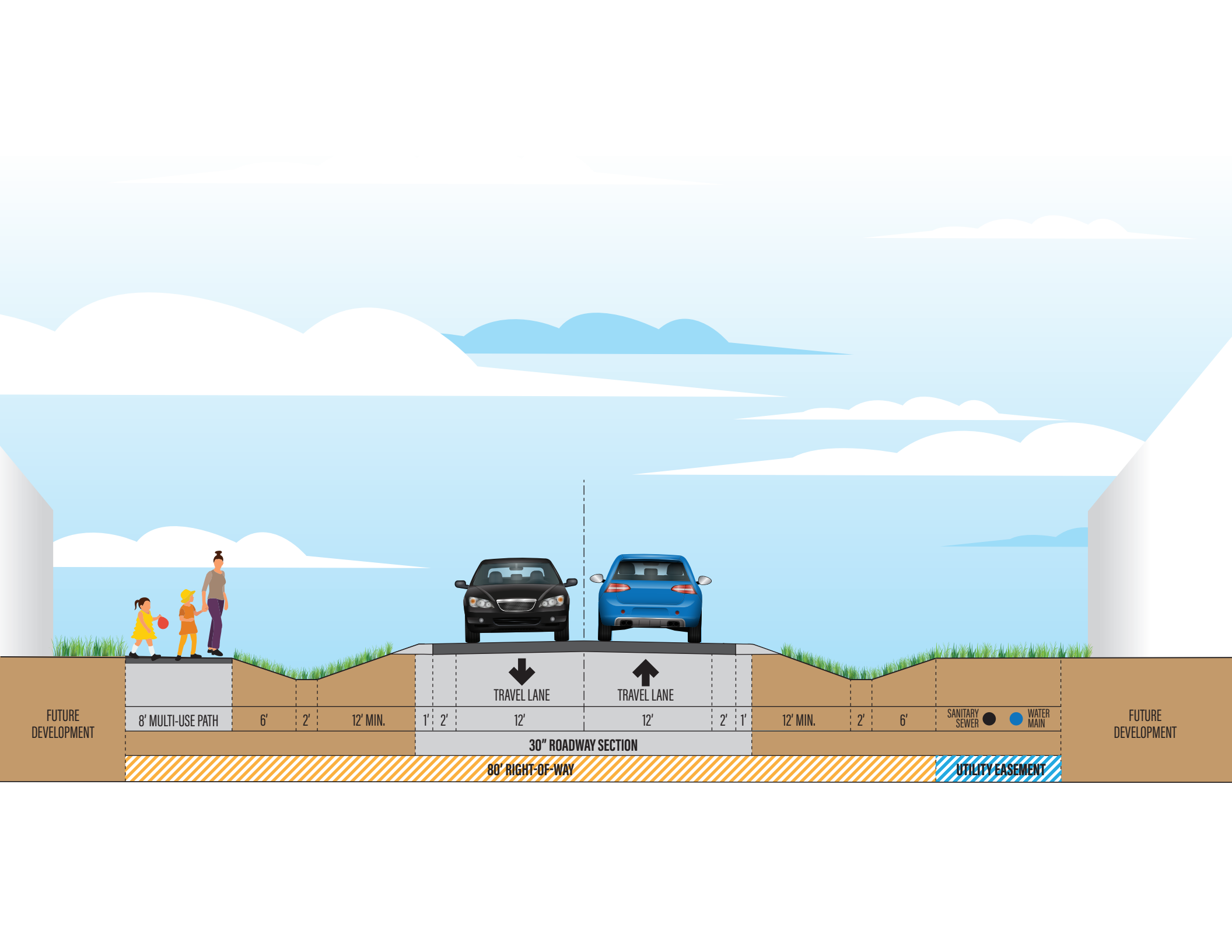
TYPICAL SECTION
Option 2: Curb & Gutter with Curb Inlet (Storm Sewer)

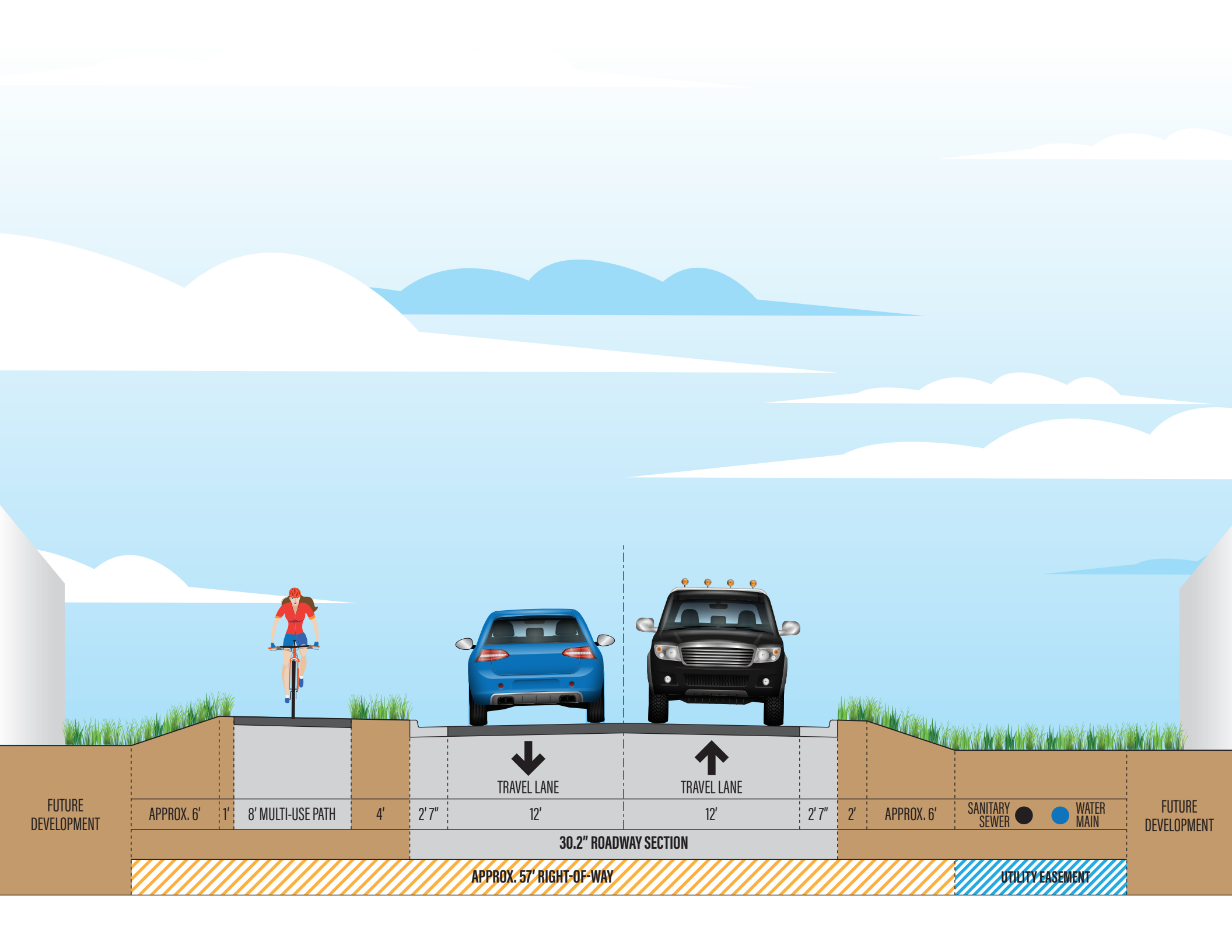


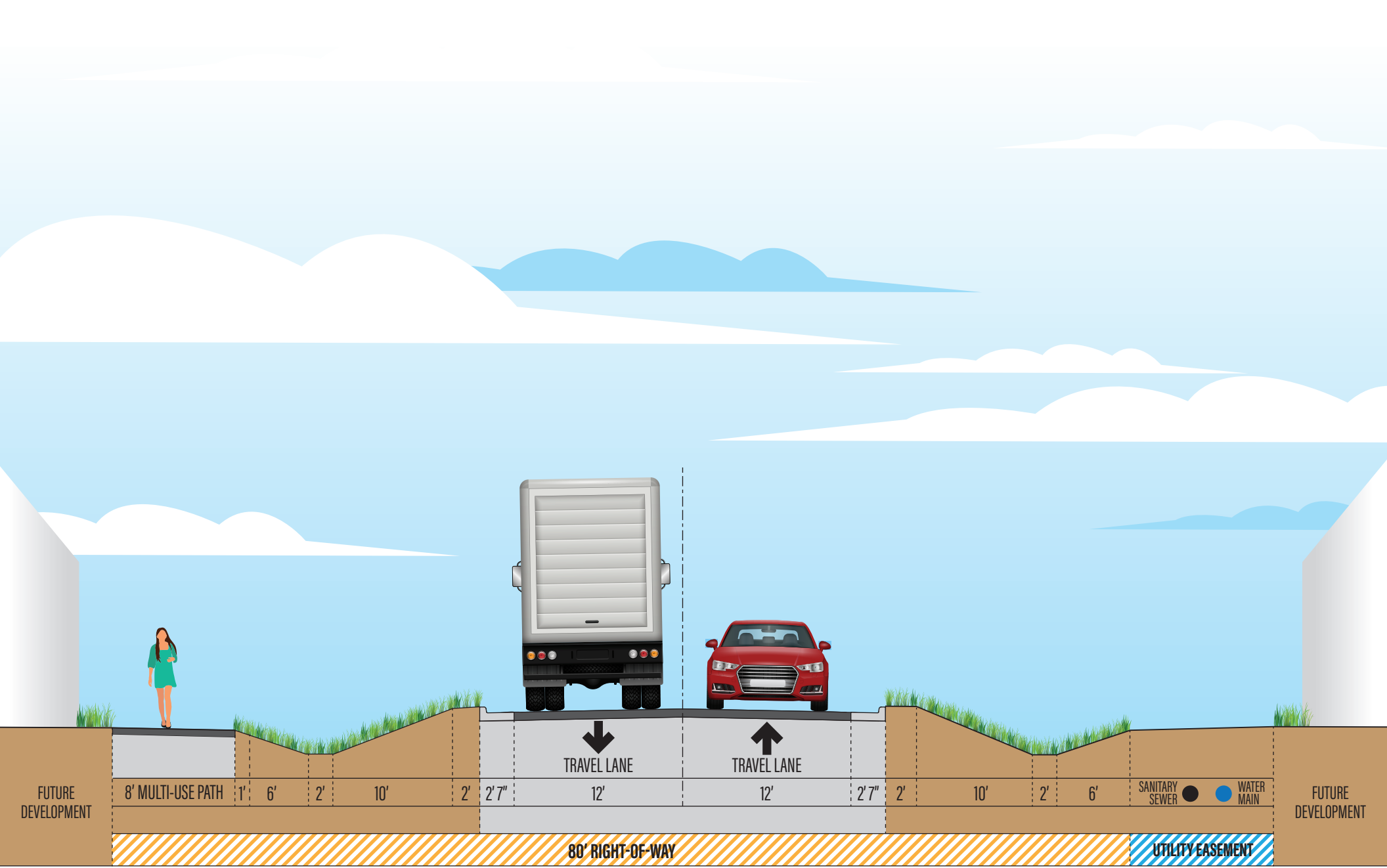
TYPICAL SECTION
Option 3: Curb & Gutter with Curb Turnout and Ditch

PRINT DATE: 3/29/22
 PLOT SCALE: 1:1
 EDIT DATE: 7/12/11 - 1:41 PM
 EDITED BY: YZHU
 DRAWING FILE: P:\2-500-153-1 CR 2006 EXTENSIONS\5 ACAD\200 DESIGN\ENGINEER'S REPORT\SHR TYPICALS.DWG

		RECOMMENDED FOR APPROVAL _____ DESIGN ENGINEER DATE		MONTGOMERY COUNTY		HORIZONTAL SCALE 1" = 5'		BRIDGE FILE N/A	
		DESIGNED: _____ DRAWN: _____				VERTICAL SCALE 1" = 5'		DESIGNATION N/A	
		CHECKED: _____ CHECKED: _____		TYPICAL CROSS SECTIONS		SURVEY BOOK N/A		SHEET 1 of 1	
						CONTRACT N/A		PROJECT N/A	







FUTURE DEVELOPMENT

8' MULTI-USE PATH

1'

6'

2'

10'

2'

2'7"

TRAVEL LANE

12'

TRAVEL LANE

12'

2'7"

2'

10'

2'

6'

SANITARY SEWER

●

WATER MAIN

UTILITY EASEMENT

FUTURE DEVELOPMENT

80' RIGHT-OF-WAY

Appendix D-1

Red Flag Investigation



LUST Sites

UST Site

Floodplain

Proposed Purple Heart Parkway Location

UNT to Offield Creek

Indiana Gas Company Pipeline

MONTGOMERY

231

S 100 E

LADOGARD RD

Appendix E-1

Cost Estimate - Option 1



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE I (SHOULDER & DITCH)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
1	105-06845	CONSTRUCTION ENGINEERING	LS	1	\$ 31,788.36	\$ 31,788.36
2	110-01001	MOBILIZATION AND DEMOBILIZATION	LS	1	\$ 79,470.89	\$ 79,470.89
3	201-52370	CLEARING RIGHT OF WAY	LS	1	\$ 31,788.36	\$ 31,788.36
4	203-02000	EXCAVATION, COMMON	CYS	15734	\$ 30.10	\$ 473,580.76
5	205-09543	NO. 2 STONE	TON	100	\$ 40.00	\$ 4,000.00
	205-11626	PUMP AROUND	EACH	1	\$ 12,538.05	\$ 12,538.05
6	205-12108	STORMWATER MANAGEMENT BUDGET	DOL	46492	\$ 1.00	\$ 46,492.29
7	205-12616	STORMWATER MANAGEMENT IMPLEMENTATION	LS	1	11000	\$ 11,000.00
8	205-12618	SWQCP PREPARATION	LS	1	15000	\$ 15,000.00
9	207-08264	SUBGRADE TREATMENT, TYPE II	SYS	650	\$ 22.08	\$ 14,360.66
10	207-12636	SUBGRADE TREATMENT, TYPE IBL	SYS	9600	\$ 8.27	\$ 79,392.00
11	211-09264	STRUCTURE BACKFILL, TYPE 1	CYS	63	\$ 56.62	\$ 3,538.75
12	211-09265	STRUCTURE BACKFILL, TYPE 2	CYS	29	\$ 83.84	\$ 2,431.36
13	211-09268	STRUCTURE BACKFILL, TYPE 5	CYS	10	\$ 248.01	\$ 2,480.10
14	214-11796	GEOGRID, TYPE IB	SYS	417	\$ 3.55	\$ 1,479.00
15	214-12236	GEOTEXTILE FOR PAVEMENT, TYPE 1A	SYS	8400	\$ 1.43	\$ 12,012.00
16	301-12234	COMPACTED AGGREGATE NO. 53	CYS	1334	\$ 61.61	\$ 82,187.74
17	303-01180	COMPACTED AGGREGATE NO. 53	TON	1168	\$ 29.02	\$ 33,895.36
18	401-07321	QC/QA-HMA, 2, 64, SURFACE, 9.5 mm	TON	704	\$ 110.66	\$ 77,904.64
19	401-07390	QC/QA-HMA, 2, 64, INTERMEDIATE, 19.0 mm	TON	1188	\$ 80.75	\$ 95,931.00
20	401-07423	QC/QA-HMA, 2, 64, BASE, 19.0 mm	TON	1456	\$ 70.60	\$ 102,793.60
21	401-10258	JOINT ADHESIVE, SURFACE	LFT	2700	\$ 0.98	\$ 2,646.00
22	401-10259	JOINT ADHESIVE, INTERMEDIATE	LFT	2700	\$ 0.80	\$ 2,160.00
23	401-11785	LIQUID ASPHALT SEALANT	LFT	2700	\$ 0.50	\$ 1,350.00
24	401-12137	QC/QA-HMA, 4, 76, INTERMEDIATE, OG, 19.0 mm	TON	1279	\$ 71.50	\$ 91,448.50
25	406-05520	ASPHALT FOR TACK COAT	TON	9	\$ 605.59	\$ 5,450.31
26	604-05528	HMA FOR SIDEWALK	TON	432	\$ 107.40	\$ 46,396.80
27	610-07487	HMA FOR APPROACHES, TYPE B	TON	309	\$ 163.30	\$ 50,453.50
28	616-06405	RIPRAP, REVETMENT	TON	195	\$ 69.98	\$ 13,656.73
29	616-12246	GEOTEXTILE FOR RIPRAP TYPE 1A	SYS	413	\$ 4.93	\$ 2,035.40
30	621-01004	MOBILIZATION AND DEMOBILIZATION FOR SEEDING	EACH	2	\$ 529.84	\$ 1,059.68
31	621-06545	FERTILIZER	TON	2	\$ 971.22	\$ 1,942.44
32	621-06553	SEED MIXTURE, R	LBS	521	\$ 5.13	\$ 2,672.73



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE I (SHOULDER & DITCH)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
33	621-06565	MULCHING MATERIAL	TON	6	\$ 650.00	\$ 3,900.00
34	621-06567	WATER	KGAL	9	\$ 21.39	\$ 192.51
35	621-06574	SODDING	SYS	2134	\$ 11.61	\$ 24,775.74
36	714-11705	STRUCTURE, COATED REINFORCED CONCRETE, BOX SECTIONS, 8 FT. X 4 FT.	LFT	96	\$ 1,527.00	\$ 146,592.00
37	715-05048	PIPE, TYPE 4, CIRCULAR, 6 IN.	LFT	5400	\$ 7.56	\$ 40,824.00
38	715-05053	PIPE, UNDERDRAIN, OUTLET 6 IN.	LFT	210	\$ 25.05	\$ 5,260.50
39	715-05151	PIPE, TYPE 2, CIRCULAR, 15 IN.	LFT	41	\$ 72.86	\$ 3,013.08
40	715-05169	PIPE, TYPE 3, CIRCULAR, 15 IN.	LFT	46	\$ 67.74	\$ 3,125.47
41	715-09064	VIDEO INSPECTION FOR PIPE	LFT	41	\$ 1.76	\$ 72.78
42	715-46005	PIPE END SECTION, DIAMETER 15 IN.	EACH	6	\$ 873.88	\$ 5,376.02
43	718-06528	OUTLET PROTECTOR, 1	EACH	14	\$ 992.42	\$ 13,893.88
44	718-12305	GEOTEXTILES FOR UNDERDRAIN, TYPE 1A	SYS	3701	\$ 1.87	\$ 6,920.87
45	718-52610	AGGREGATE FOR UNDERDRAINS	CYS	428	\$ 50.95	\$ 21,806.60
46	801-04308	ROAD CLOSURE SIGN ASSEMBLY	EACH	1	\$ 312.14	\$ 312.14
47	801-06640	CONSTRUCTION SIGN, A	EACH	1	\$ 175.50	\$ 175.50
48	801-06775	MAINTAINING TRAFFIC	LS	1	\$ 15,894.18	\$ 15,894.18
49	801-07119	BARRICADE, III-B	LFT	48	\$ 15.78	\$ 757.44
50	802-05701	SIGN POST, SQUARE TYPE 1 REINFORCED ANCHOR BASE	SFT	26	\$ 26.86	\$ 706.86
51	802-09838	SIGN, SHEET, WITH LEGEND, 0.080 IN.	SFT	13	\$ 38.43	\$ 499.10
52	808-06703	LINE, THERMOPLASTIC, SOLID, WHITE, 4 IN.	LFT	5400	\$ 0.95	\$ 5,130.00
53	808-12032	GROOVING FOR PAVEMENT MARKINGS	LFT	10800	\$ 0.79	\$ 8,532.00
54	808-75245	LINE, THERMOPLASTIC, SOLID, YELLOW, 4 IN.	LFT	5400	\$ 0.80	\$ 4,320.00
55	808-75297	TRANSVERSE MARKING, THERMOPLASTIC, STOP LINE, WHITE, 24 IN.	LFT	36	\$ 16.53	\$ 595.08
56	808-75320	PAVEMENT MESSAGE MARKING, THERMOPLASTIC LANE INDICATION ARRO W	EACH	2	\$ 173.39	\$ 346.78
					\$	1,748,359.55
20% CONTINGENCY					\$	349,671.91
Total Cost Estimate					\$	2,099,000.00



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE II (SHOULDER & DITCH)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
1	105-06845	CONSTRUCTION ENGINEERING	LS	1	\$ 41,683.45	\$ 41,683.45
2	110-01001	MOBILIZATION AND DEMOBILIZATION	LS	1	\$ 104,208.62	\$ 104,208.62
3	201-52370	CLEARING RIGHT OF WAY	LS	1	\$ 41,683.45	\$ 41,683.45
4	203-02000	EXCAVATION, COMMON	CYS	28623	\$ 21.00	\$ 601,088.88
5	205-09543	NO. 2 STONE	TON	100	\$ 40.00	\$ 4,000.00
	205-11626	PUMP AROUND	EACH	1	\$ 12,538.05	\$ 12,538.05
6	205-12108	STORMWATER MANAGEMENT BUDGET	DOL	68877	\$ 1.00	\$ 68,877.47
7	205-12616	STORMWATER MANAGEMENT IMPLEMENTATION	LS	1	\$ 11,000.00	\$ 11,000.00
8	205-12618	SWQCP PREPARATION	LS	1	\$ 15,000.00	\$ 15,000.00
9	207-08264	SUBGRADE TREATMENT, TYPE II	SYS	964	\$ 22.08	\$ 21,275.06
10	207-12636	SUBGRADE TREATMENT, TYPE IBL	SYS	14223	\$ 8.27	\$ 117,624.21
11	211-09264	STRUCTURE BACKFILL, TYPE 1	CYS	63	\$ 56.62	\$ 3,538.75
12	211-09265	STRUCTURE BACKFILL, TYPE 2	CYS	29	\$ 83.84	\$ 2,431.36
13	211-09268	STRUCTURE BACKFILL, TYPE 5	CYS	10	\$ 248.01	\$ 2,480.10
14	214-11796	GEOGRID, TYPE IB	SYS	617	\$ 3.55	\$ 2,191.11
15	214-12236	GEOTEXTILE FOR PAVEMENT, TYPE 1A	SYS	12445	\$ 1.43	\$ 17,796.35
16	301-12234	COMPACTED AGGREGATE NO. 53	CYS	1976	\$ 61.61	\$ 121,741.36
17	303-01180	COMPACTED AGGREGATE NO. 53	TON	1729	\$ 29.02	\$ 50,175.58
18	401-07321	QC/QA-HMA, 2, 64, SURFACE, 9.5 mm	TON	1043	\$ 110.66	\$ 115,418.38
19	401-07390	QC/QA-HMA, 2, 64, INTERMEDIATE, 19.0 mm	TON	1760	\$ 80.75	\$ 142,120.00
20	401-07423	QC/QA-HMA, 2, 64, BASE, 19.0 mm	TON	2157	\$ 70.60	\$ 152,284.20
21	401-10258	JOINT ADHESIVE, SURFACE	LFT	4000	\$ 0.98	\$ 3,920.00
22	401-10259	JOINT ADHESIVE, INTERMEDIATE	LFT	4000	\$ 0.80	\$ 3,200.00
23	401-11785	LIQUID ASPHALT SEALANT	LFT	4000	\$ 0.50	\$ 2,000.00
24	401-12137	QC/QA-HMA, 4, 76, INTERMEDIATE, OG, 19.0 mm	TON	1894	\$ 71.50	\$ 135,421.00
25	406-05520	ASPHALT FOR TACK COAT	TON	14	\$ 605.59	\$ 8,478.26
26	604-05528	HMA FOR SIDEWALK	TON	640	\$ 107.40	\$ 68,736.00
27	610-07487	HMA FOR APPROACHES, TYPE B	TON	458	\$ 163.30	\$ 74,745.92
28	616-06405	RIPRAP, REVETMENT	TON	289	\$ 69.98	\$ 20,232.19
29	616-12246	GEOTEXTILE FOR RIPRAP TYPE 1A	SYS	612	\$ 4.93	\$ 3,015.41
30	621-01004	MOBILIZATION AND DEMOBILIZATION FOR SEEDING	EACH	4	\$ 529.84	\$ 1,877.91
31	621-06545	FERTILIZER	TON	2	\$ 971.22	\$ 1,942.44
32	621-06553	SEED MIXTURE, R	LBS	674	\$ 5.13	\$ 3,457.62



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE II (SHOULDER & DITCH)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
33	621-06565	MULCHING MATERIAL	TON	7	\$ 650.00	\$ 4,550.00
34	621-06567	WATER	KGAL	4	\$ 21.39	\$ 85.56
35	621-06574	SODDING	SYS	800	\$ 11.61	\$ 9,288.00
36	714-11705	STRUCTURE, COATED REINFORCED CONCRETE, BOX SECTIONS, 8 FT. X 4 FT.	LFT	68	\$ 1,527.00	\$ 103,836.00
37	715-05048	PIPE, TYPE 4, CIRCULAR, 6 IN.	LFT	8000	\$ 7.56	\$ 60,480.00
38	715-05053	PIPE, UNDERDRAIN, OUTLET 6 IN.	LFT	300	\$ 25.05	\$ 7,515.00
39	715-05151	PIPE, TYPE 2, CIRCULAR, 15 IN.	LFT	61	\$ 72.86	\$ 4,463.83
40	715-05169	PIPE, TYPE 3, CIRCULAR, 15 IN.	LFT	68	\$ 67.74	\$ 4,630.33
41	715-09064	VIDEO INSPECTION FOR PIPE	LFT	61	\$ 1.76	\$ 107.83
42	715-46005	PIPE END SECTION, DIAMETER 15 IN.	EACH	9	\$ 873.88	\$ 7,964.48
43	718-06528	OUTLET PROTECTOR, 1	EACH	20	\$ 992.42	\$ 19,848.40
44	718-12305	GEOTEXTILES FOR UNDERDRAIN, TYPE 1A	SYS	5482	\$ 1.87	\$ 10,251.34
45	718-52610	AGGREGATE FOR UNDERDRAINS	CYS	634	\$ 50.95	\$ 32,302.30
46	801-04308	ROAD CLOSURE SIGN ASSEMBLY	EACH	1	\$ 312.14	\$ 312.14
47	801-06640	CONSTRUCTION SIGN, A	EACH	1	\$ 175.50	\$ 175.50
48	801-06775	MAINTAINING TRAFFIC	LS	1	\$ 20,841.72	\$ 20,841.72
49	801-07119	BARRICADE, III-B	LFT	48	\$ 15.78	\$ 757.44
50	802-05701	SIGN POST, SQUARE TYPE 1 REINFORCED ANCHOR BASE	SFT	39	\$ 26.86	\$ 1,047.20
51	802-09838	SIGN, SHEET, WITH LEGEND, 0.080 IN.	SFT	19	\$ 38.43	\$ 739.41
52	808-06703	LINE, THERMOPLASTIC, SOLID, WHITE, 4 IN.	LFT	8000	\$ 0.95	\$ 7,600.00
53	808-12032	GROOVING FOR PAVEMENT MARKINGS	LFT	16000	\$ 0.79	\$ 12,640.00
54	808-75245	LINE, THERMOPLASTIC, SOLID, YELLOW, 4 IN.	LFT	8000	\$ 0.80	\$ 6,400.00
55	808-75297	TRANSVERSE MARKING, THERMOPLASTIC, STOP LINE, WHITE, 24 IN.	LFT	24	\$ 16.53	\$ 396.72
56	808-75320	PAVEMENT MESSAGE MARKING, THERMOPLASTIC LANE INDICATION ARRO W	EACH	1	\$ 173.39	\$ 173.39
						\$ 2,292,589.74
20% CONTINGENCY						\$ 458,517.95
Total Cost Estimate						\$ 2,752,000.00

Subject: Construction Cost and Preliminary Engineering Estimate

Prepared for: **Purple Heart Pkwy Extention Option 1**
Project: **Montgomery County, IN**

Total Construction Cost		\$ 4,851,000.0
Roadway	\$ 4,851,000.0	
Retaining Wall	\$ -	
Bridge	\$ -	
 Total Utility Relocation Cost		 \$ 50,000.0
0 Utility Poles	\$ -	
Underground Utilities	\$ 50,000.0	
R/R Intersection Improvement	\$ -	
 Total Right-of-Way Cost		 \$ 125,000.0
Right-of-Way (12.3 acres @ \$10,000.00/ acre)	\$ 125,000.0	
 Total Construction, Utility Relocation and Land Acquisition Cost		 \$ 5,026,000.0
 Design Cost		 \$ 660,775.0
Survey and Location Control Route Survey Plat	\$ 15,000.0	
Hydraulics	\$ -	
Environmental	\$ 50,000.0	
401/404 RGP Permit	\$ 4,500.0	
Rule 5	\$ 5,000.0	
Geotechnical Engineering and pavement design	\$ 72,765.0	
Road Design	\$ 340,000.0	
Bridge Scoping Report	\$ -	
Bridge Design	\$ -	
Bridge Scour Report	\$ -	
Utility Coordination	\$ 15,000.0	
Railroad Coordination	\$ -	
Project Management	\$ 48,510.0	
Construction Phase Services	\$ 10,000.0	
R/W Eng & Land Acq Services (10 parcels @ \$10,000.00 /Parcel)	\$ 100,000.0	
 Construction Inspection		 \$ 582,000.0
Construction Inspection (@ 12 % of Construction)	\$ 582,000.0	
 Total Project Cost		 \$ 6,268,775.0
Inflation (4% per year)		\$ 6,780,307.0
 Use		 \$ 6,800,000.0

Appendix E-1

Cost Estimate - Option 2



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE I (Curb Gutter & Storm Sewer)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
1	105-06845	CONSTRUCTION ENGINEERING	LS	1	\$ 32,186.31	\$ 32,186.31
2	110-01001	MOBILIZATION AND DEMOBILIZATION	LS	1	\$ 80,465.78	\$ 80,465.78
3	201-52370	CLEARING RIGHT OF WAY	LS	1	\$ 32,186.31	\$ 32,186.31
4	203-02000	EXCAVATION, COMMON	CYS	3360	\$ 21.00	\$ 70,560.00
5	205-09543	NO. 2 STONE	TON	100	\$ 40.00	\$ 4,000.00
	205-11626	PUMP AROUND	EACH	1	\$ 12,538.05	\$ 12,538.05
6	205-12108	STORMWATER MANAGEMENT BUDGET	DOL	46492	\$ 1.00	\$ 46,492.29
7	205-12616	STORMWATER MANAGEMENT IMPLEMENTATION	LS	1	\$ 11,000.00	\$ 11,000.00
8	205-12618	SWQCP PREPARATION	LS	1	\$ 15,000.00	\$ 15,000.00
9	207-08264	SUBGRADE TREATMENT, TYPE II	SYS	650	\$ 22.08	\$ 14,360.66
10	207-12636	SUBGRADE TREATMENT, TYPE IBL	SYS	9950	\$ 8.27	\$ 82,286.50
11	211-09264	STRUCTURE BACKFILL, TYPE 1	CYS	63	\$ 56.62	\$ 3,538.75
12	211-09265	STRUCTURE BACKFILL, TYPE 2	CYS	29	\$ 83.84	\$ 2,431.36
13	211-09268	STRUCTURE BACKFILL, TYPE 5	CYS	10	\$ 248.01	\$ 2,480.10
14	214-11796	GEOGRID, TYPE IB	SYS	417	\$ 3.55	\$ 1,479.00
15	214-12236	GEOTEXTILE FOR PAVEMENT, TYPE 1A	SYS	7800	\$ 1.43	\$ 11,154.00
16	301-12234	COMPACTED AGGREGATE NO. 53	CYS	1267	\$ 61.61	\$ 78,059.87
17	401-07321	QC/QA-HMA, 2, 64, SURFACE, 9.5 mm	TON	594	\$ 110.66	\$ 65,732.04
18	401-07390	QC/QA-HMA, 2, 64, INTERMEDIATE, 19.0 mm	TON	990	\$ 80.75	\$ 79,942.50
19	401-07423	QC/QA-HMA, 2, 64, BASE, 19.0 mm	TON	1188	\$ 70.60	\$ 83,872.80
20	401-10258	JOINT ADHESIVE, SURFACE	LFT	2700	\$ 0.98	\$ 2,646.00
21	401-10259	JOINT ADHESIVE, INTERMEDIATE	LFT	2700	\$ 0.80	\$ 2,160.00
22	401-11785	LIQUID ASPHALT SEALANT	LFT	2700	\$ 0.50	\$ 1,350.00
23	401-12137	QC/QA-HMA, 4, 76, INTERMEDIATE, OG, 19.0 mm	TON	1348	\$ 71.50	\$ 96,382.00
24	406-05520	ASPHALT FOR TACK COAT	TON	8	\$ 605.59	\$ 4,844.72
25	604-05528	HMA FOR SIDEWALK	TON	432	\$107.40	\$ 46,396.80
26	605-52807	CURB AND GUTTER, COMBINED	LFT	5400	\$28.86	\$ 155,844.00
27	610-07487	HMA FOR APPROACHES, TYPE B	TON	309	\$ 163.30	\$ 50,453.50
28	616-06405	RIPRAP, REVETMENT	TON	195	\$ 69.98	\$ 13,656.73
29	616-12246	GEOTEXTILE FOR RIPRAP TYPE 1A	SYS	413	\$ 4.93	\$ 2,035.40
30	621-01004	MOBILIZATION AND DEMOBILIZATION FOR SEEDING	EACH	2	\$ 529.84	\$ 1,267.59
31	621-06545	FERTILIZER	TON	1	\$ 971.22	\$ 971.22
32	621-06553	SEED MIXTURE, R	LBS	189	\$ 5.13	\$ 969.57



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE I (Curb Gutter & Storm Sewer)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
33	621-06565	MULCHING MATERIAL	TON	2	\$ 650.00	\$ 1,300.00
34	621-06567	WATER	KGAL	5	\$ 21.39	\$ 106.95
35	621-06574	SODDING	SYS	1200	\$ 11.61	\$ 13,932.00
36	714-11705	STRUCTURE, COATED REINFORCED CONCRETE, BOX SECTIONS, 8 FT. X 4 FT.	LFT	96	\$ 1,527.00	\$ 146,592.00
37	715-05048	PIPE, TYPE 4, CIRCULAR, 6 IN.	LFT	5400	\$ 7.56	\$ 40,824.00
38	715-05053	PIPE, UNDERDRAIN, OUTLET 6 IN.	LFT	210	\$ 25.05	\$ 5,260.50
39	715-05151	PIPE, TYPE 2, CIRCULAR, 15 IN.	LFT	41	\$ 72.86	\$ 3,013.08
40	715-05169	PIPE, TYPE 3, CIRCULAR, 15 IN.	LFT	46	\$ 67.74	\$ 3,125.47
41	715-09064	VIDEO INSPECTION FOR PIPE	LFT	41	\$ 1.76	\$ 72.78
42	715-46005	PIPE END SECTION, DIAMETER 15 IN.	EACH	6	\$ 873.88	\$ 5,376.02
43	718-06528	OUTLET PROTECTOR, 1	EACH	14	\$ 992.42	\$ 13,893.88
44	718-12305	GEOTEXTILES FOR UNDERDRAIN, TYPE 1A	SYS	3701	\$ 1.87	\$ 6,920.87
45	718-52610	AGGREGATE FOR UNDERDRAINS	CYS	428	\$ 50.95	\$ 21,806.60
46	801-04308	ROAD CLOSURE SIGN ASSEMBLY	EACH	1	\$ 312.14	\$ 312.14
47	801-06640	CONSTRUCTION SIGN, A	EACH	1	\$ 175.50	\$ 175.50
48	801-06775	MAINTAINING TRAFFIC	LS	1	\$ 16,093.16	\$ 16,093.16
49	801-07119	BARRICADE, III-B	LFT	48	\$ 15.78	\$ 757.44
50	802-05701	SIGN POST, SQUARE TYPE 1 REINFORCED ANCHOR BASE	SFT	26	\$ 26.86	\$ 706.86
51	802-09838	SIGN, SHEET, WITH LEGEND, 0.080 IN.	SFT	13	\$ 38.43	\$ 499.10
52	808-12032	GROOVING FOR PAVEMENT MARKINGS	LFT	5400	\$ 0.79	\$ 4,266.00
53	808-75245	LINE, THERMOPLASTIC, SOLID, YELLOW, 4 IN.	LFT	5400	\$ 0.80	\$ 4,320.00
54	808-75297	TRANSVERSE MARKING, THERMOPLASTIC, STOP LINE, WHITE, 24 IN.	LFT	36	\$ 16.53	\$ 595.08
55	808-75320	PAVEMENT MESSAGE MARKING, THERMOPLASTIC LANE INDICATION ARRO W	EACH	1	\$ 173.39	\$ 173.39
56		STORM SEWER	LS	1	\$ 371,380.54	\$ 371,380.54
						\$ 1,770,247.24
20% CONTINGENCY						\$ 354,049.45
Total Cost Estimate						\$ 2,125,000.00



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE II (Curb Gutter & Storm Sewer)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
1	105-06845	CONSTRUCTION ENGINEERING	LS	1	\$ 45,088.95	\$ 45,088.95
2	110-01001	MOBILIZATION AND DEMOBILIZATION	LS	1	\$ 112,722.38	\$ 112,722.38
3	201-52370	CLEARING RIGHT OF WAY	LS	1	\$ 45,088.95	\$ 45,088.95
4	203-02000	EXCAVATION, COMMON	CYS	6945	\$ 21.00	\$ 145,845.00
5	205-09543	NO. 2 STONE	TON	100	\$ 40.00	\$ 4,000.00
	205-11626	PUMP AROUND	EACH	1	\$ 12,538.05	\$ 12,538.05
6	205-12108	STORMWATER MANAGEMENT BUDGET	DOL	68877	\$ 1.00	\$ 68,877.47
7	205-12616	STORMWATER MANAGEMENT IMPLEMENTATION	LS	1	\$ 11,000.00	\$ 11,000.00
8	205-12618	SWQCP PREPARATION	LS	1	\$ 15,000.00	\$ 15,000.00
9	207-08264	SUBGRADE TREATMENT, TYPE II	SYS	964	\$ 22.08	\$ 21,275.06
10	207-12636	SUBGRADE TREATMENT, TYPE IBL	SYS	14741	\$ 8.27	\$ 121,905.93
11	211-09264	STRUCTURE BACKFILL, TYPE 1	CYS	63	\$ 56.62	\$ 3,538.75
12	211-09265	STRUCTURE BACKFILL, TYPE 2	CYS	29	\$ 83.84	\$ 2,431.36
13	211-09268	STRUCTURE BACKFILL, TYPE 5	CYS	10	\$ 248.01	\$ 2,480.10
14	214-11796	GEOGRID, TYPE IB	SYS	617	\$ 3.55	\$ 2,191.11
15	214-12236	GEOTEXTILE FOR PAVEMENT, TYPE 1A	SYS	11556	\$ 1.43	\$ 16,525.08
16	301-12234	COMPACTED AGGREGATE NO. 53	CYS	1877	\$ 61.61	\$ 115,641.97
17	401-07321	QC/QA-HMA, 2, 64, SURFACE, 9.5 mm	TON	880	\$ 110.66	\$ 97,380.80
18	401-07390	QC/QA-HMA, 2, 64, INTERMEDIATE, 19.0 mm	TON	1467	\$ 80.75	\$ 118,433.33
19	401-07423	QC/QA-HMA, 2, 64, BASE, 19.0 mm	TON	1760	\$ 70.60	\$ 124,256.00
20	401-10258	JOINT ADHESIVE, SURFACE	LFT	4000	\$ 0.98	\$ 3,920.00
21	401-10259	JOINT ADHESIVE, INTERMEDIATE	LFT	4000	\$ 0.80	\$ 3,200.00
22	401-11785	LIQUID ASPHALT SEALANT	LFT	4000	\$ 0.50	\$ 2,000.00
23	401-12137	QC/QA-HMA, 4, 76, INTERMEDIATE, OG, 19.0 mm	TON	1996	\$ 71.50	\$ 142,714.00
24	406-05520	ASPHALT FOR TACK COAT	TON	11	\$ 605.59	\$ 6,661.49
25	604-05528	HMA FOR SIDEWALK	TON	640	\$107.40	\$ 68,736.00
26	605-52807	CURB AND GUTTER, COMBINED	LFT	8000	\$28.86	\$ 230,880.00
27	610-07487	HMA FOR APPROACHES, TYPE B	TON	458	\$ 163.30	\$ 74,745.92
28	616-06405	RIPRAP, REVETMENT	TON	289	\$ 69.98	\$ 20,232.19
29	616-12246	GEOTEXTILE FOR RIPRAP TYPE 1A	SYS	612	\$ 4.93	\$ 3,015.41
30	621-01004	MOBILIZATION AND DEMOBILIZATION FOR SEEDING	EACH	4	\$ 529.84	\$ 1,877.91
31	621-06545	FERTILIZER	TON	1	\$ 971.22	\$ 971.22
32	621-06553	SEED MIXTURE, R	LBS	279	\$ 5.13	\$ 1,431.27



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE II (Curb Gutter & Storm Sewer)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
33	621-06565	MULCHING MATERIAL	TON	3	\$ 650.00	\$ 1,950.00
34	621-06567	WATER	KGAL	8	\$ 21.39	\$ 171.12
35	621-06574	SODDING	SYS	1778	\$ 11.61	\$ 20,642.58
36	714-11705	STRUCTURE, COATED REINFORCED CONCRETE, BOX SECTIONS, 8 FT. X 4 FT.	LFT	68	\$ 1,527.00	\$ 103,836.00
37	715-05048	PIPE, TYPE 4, CIRCULAR, 6 IN.	LFT	8000	\$ 7.56	\$ 60,480.00
38	715-05053	PIPE, UNDERDRAIN, OUTLET 6 IN.	LFT	300	\$ 25.05	\$ 7,515.00
39	715-05151	PIPE, TYPE 2, CIRCULAR, 15 IN.	LFT	61	\$ 72.86	\$ 4,463.83
40	715-05169	PIPE, TYPE 3, CIRCULAR, 15 IN.	LFT	68	\$ 67.74	\$ 4,630.33
41	715-09064	VIDEO INSPECTION FOR PIPE	LFT	61	\$ 1.76	\$ 107.83
42	715-46005	PIPE END SECTION, DIAMETER 15 IN.	EACH	9	\$ 873.88	\$ 7,964.48
43	718-06528	OUTLET PROTECTOR, 1	EACH	20	\$ 992.42	\$ 19,848.40
44	718-12305	GEOTEXTILES FOR UNDERDRAIN, TYPE 1A	SYS	5482	\$ 1.87	\$ 10,251.34
45	718-52610	AGGREGATE FOR UNDERDRAINS	CYS	634	\$ 50.95	\$ 32,302.30
46	801-04308	ROAD CLOSURE SIGN ASSEMBLY	EACH	1	\$ 312.14	\$ 312.14
47	801-06640	CONSTRUCTION SIGN, A	EACH	1	\$ 175.50	\$ 175.50
48	801-06775	MAINTAINING TRAFFIC	LS	1	\$ 22,544.48	\$ 22,544.48
49	801-07119	BARRICADE, III-B	LFT	48	\$ 15.78	\$ 757.44
50	802-05701	SIGN POST, SQUARE TYPE 1 REINFORCED ANCHOR BASE	SFT	39	\$ 26.86	\$ 1,047.20
51	802-09838	SIGN, SHEET, WITH LEGEND, 0.080 IN.	SFT	19	\$ 38.43	\$ 739.41
52	808-12032	GROOVING FOR PAVEMENT MARKINGS	LFT	8000	\$ 0.79	\$ 6,320.00
53	808-75245	LINE, THERMOPLASTIC, SOLID, YELLOW, 4 IN.	LFT	8000	\$ 0.80	\$ 6,400.00
54	808-75297	TRANSVERSE MARKING, THERMOPLASTIC, STOP LINE, WHITE, 24 IN.	LFT	24	\$ 16.53	\$ 396.72
55	808-75320	PAVEMENT MESSAGE MARKING, THERMOPLASTIC LANE INDICATION ARRO W	EACH	1	\$ 173.39	\$ 173.39
56		STORM SEWER	LS	1	\$ 520,257.13	\$ 520,257.13
						\$ 2,479,892.32
20% CONTINGENCY						\$ 495,978.46
Total Cost Estimate						\$ 2,976,000.00

Subject: Construction Cost and Preliminary Engineering Estimate

Prepared for: **Purple Heart Pkwy Extention Option 2**
Project: **Montgomery County, IN**

Total Construction Cost		\$ 5,101,000.0
Roadway	\$ 5,101,000.0	
Retaining Wall	\$ -	
Bridge	\$ -	
 Total Utility Relocation Cost		 \$ 50,000.0
0 Utility Poles	\$ -	
Underground Utilities	\$ 50,000.0	
R/R Intersection Improvement	\$ -	
 Total Right-of-Way Cost		 \$ 90,000.0
Right-of-Way (8.8 acres @ \$10,000.00/ acre)	\$ 90,000.0	
 Total Construction, Utility Relocation and Land Acquisition Cost		 \$ 5,241,000.0
 Design Cost		 \$ 682,025.0
Survey and Location Control Route Survey Plat	\$ 15,000.0	
Hydraulics	\$ -	
Environmental	\$ 50,000.0	
401/404 RGP Permit	\$ 4,500.0	
Rule 5	\$ 5,000.0	
Geotechnical Engineering and pavement design	\$ 76,515.0	
Road Design	\$ 355,000.0	
Bridge Scoping Report	\$ -	
Bridge Design	\$ -	
Bridge Scour Report	\$ -	
Utility Coordination	\$ 15,000.0	
Railroad Coordination	\$ -	
Project Management	\$ 51,010.0	
Construction Phase Services	\$ 10,000.0	
R/W Eng & Land Acq Services (10 parcels @ \$10,000.00 /Parcel)	\$ 100,000.0	
 Construction Inspection		 \$ 612,000.0
Construction Inspection (@ 12 % of Construction)	\$ 612,000.0	
 Total Project Cost		 \$ 6,535,025.0
Inflation (4% per year)		\$ 7,068,283.0
 Use		 \$ 7,100,000.0

Appendix E-1
Cost Estimate - Option 3



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE I (Curb Gutter & Curb Turnout)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
1	105-06845	CONSTRUCTION ENGINEERING	LS	1	\$ 30,789.89	\$ 30,789.89
2	110-01001	MOBILIZATION AND DEMOBILIZATION	LS	1	\$ 76,974.71	\$ 76,974.71
3	201-52370	CLEARING RIGHT OF WAY	LS	1	\$ 30,789.89	\$ 30,789.89
4	203-02000	EXCAVATION, COMMON	CYS	18792	\$ 21.00	\$ 394,632.00
5	205-09543	NO. 2 STONE	TON	100	\$ 40.00	\$ 4,000.00
	205-11626	PUMP AROUND	EACH	1	\$ 12,538.05	\$ 12,538.05
6	205-12108	STORMWATER MANAGEMENT BUDGET	DOL	46492	\$ 1.00	\$ 46,492.29
7	205-12616	STORMWATER MANAGEMENT IMPLEMENTATION	LS	1	\$ 11,000.00	\$ 11,000.00
8	205-12618	SWQCP PREPARATION	LS	1	\$ 15,000.00	\$ 15,000.00
9	207-08264	SUBGRADE TREATMENT, TYPE II	SYS	650	\$ 22.08	\$ 14,360.66
10	207-12636	SUBGRADE TREATMENT, TYPE IBL	SYS	9950	\$ 8.27	\$ 82,286.50
11	211-09264	STRUCTURE BACKFILL, TYPE 1	CYS	63	\$ 56.62	\$ 3,538.75
12	211-09265	STRUCTURE BACKFILL, TYPE 2	CYS	29	\$ 83.84	\$ 2,431.36
13	211-09268	STRUCTURE BACKFILL, TYPE 5	CYS	10	\$ 248.01	\$ 2,480.10
14	214-11796	GEOGRID, TYPE IB	SYS	417	\$ 3.55	\$ 1,479.00
15	214-12236	GEOTEXTILE FOR PAVEMENT, TYPE 1A	SYS	7800	\$ 1.43	\$ 11,154.00
16	301-12234	COMPACTED AGGREGATE NO. 53	CYS	1267	\$ 61.61	\$ 78,059.87
17	401-07321	QC/QA-HMA, 2, 64, SURFACE, 9.5 mm	TON	594	\$ 110.66	\$ 65,732.04
18	401-07390	QC/QA-HMA, 2, 64, INTERMEDIATE, 19.0 mm	TON	990	\$ 80.75	\$ 79,942.50
19	401-07423	QC/QA-HMA, 2, 64, BASE, 19.0 mm	TON	1188	\$ 70.60	\$ 83,872.80
20	401-10258	JOINT ADHESIVE, SURFACE	LFT	2700	\$ 0.98	\$ 2,646.00
21	401-10259	JOINT ADHESIVE, INTERMEDIATE	LFT	2700	\$ 0.80	\$ 2,160.00
22	401-11785	LIQUID ASPHALT SEALANT	LFT	2700	\$ 0.50	\$ 1,350.00
23	401-12137	QC/QA-HMA, 4, 76, INTERMEDIATE, OG, 19.0 mm	TON	1348	\$ 71.50	\$ 96,382.00
24	406-05520	ASPHALT FOR TACK COAT	TON	8	\$ 605.59	\$ 4,844.72
25	604-05528	HMA FOR SIDEWALK	TON	432	\$107.40	\$ 46,396.80
26	605-52807	CURB AND GUTTER, COMBINED	LFT	5400	\$28.86	\$ 155,844.00
27	605-94811	CURB TURNOUT	EACH	4	\$789.80	\$ 3,159.20
28	610-07487	HMA FOR APPROACHES, TYPE B	TON	309	\$ 163.30	\$ 50,453.50
29	616-06405	RIPRAP, REVETMENT	TON	195	\$ 69.98	\$ 13,656.73
30	616-12246	GEOTEXTILE FOR RIPRAP TYPE 1A	SYS	413	\$ 4.93	\$ 2,035.40
31	621-01004	MOBILIZATION AND DEMOBILIZATION FOR SEEDING	EACH	2	\$ 529.84	\$ 1,267.59
32	621-06545	FERTILIZER	TON	2	\$ 971.22	\$ 1,659.68



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE I (Curb Gutter & Curb Turnout)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
33	621-06553	SEED MIXTURE, R	LBS	621	\$ 5.13	\$ 3,185.73
34	621-06565	MULCHING MATERIAL	TON	7	\$ 650.00	\$ 4,550.00
35	621-06567	WATER	KGAL	9	\$ 21.39	\$ 192.51
36	621-06574	SODDING	SYS	2134	\$ 11.61	\$ 24,775.74
37	714-11705	STRUCTURE, COATED REINFORCED CONCRETE, BOX SECTIONS, 8 FT. X 4 FT.	LFT	68	\$ 1,527.00	\$ 103,836.00
38	715-05048	PIPE, TYPE 4, CIRCULAR, 6 IN.	LFT	5400	\$ 7.56	\$ 40,824.00
39	715-05053	PIPE, UNDERDRAIN, OUTLET 6 IN.	LFT	210	\$ 25.05	\$ 5,260.50
40	715-05151	PIPE, TYPE 2, CIRCULAR, 15 IN.	LFT	41	\$ 72.86	\$ 3,013.08
41	715-05169	PIPE, TYPE 3, CIRCULAR, 15 IN.	LFT	46	\$ 67.74	\$ 3,125.47
42	715-09064	VIDEO INSPECTION FOR PIPE	LFT	41	\$ 1.76	\$ 72.78
43	715-46005	PIPE END SECTION, DIAMETER 15 IN.	EACH	6	\$ 873.88	\$ 5,376.02
44	718-06528	OUTLET PROTECTOR, 1	EACH	14	\$ 992.42	\$ 13,893.88
45	718-12305	GEOTEXTILES FOR UNDERDRAIN, TYPE 1A	SYS	3701	\$ 1.87	\$ 6,920.87
46	718-52610	AGGREGATE FOR UNDERDRAINS	CYS	428	\$ 50.95	\$ 21,806.60
47	801-04308	ROAD CLOSURE SIGN ASSEMBLY	EACH	1	\$ 312.14	\$ 312.14
48	801-06640	CONSTRUCTION SIGN, A	EACH	1	\$ 175.50	\$ 175.50
49	801-06775	MAINTAINING TRAFFIC	LS	1	\$ 15,394.94	\$ 15,394.94
50	801-07119	BARRICADE, III-B	LFT	48	\$ 15.78	\$ 757.44
51	802-05701	SIGN POST, SQUARE TYPE 1 REINFORCED ANCHOR BASE	SFT	26	\$ 26.86	\$ 706.86
52	802-09838	SIGN, SHEET, WITH LEGEND, 0.080 IN.	SFT	13	\$ 38.43	\$ 499.10
53	808-12032	GROOVING FOR PAVEMENT MARKINGS	LFT	5400	\$ 0.79	\$ 4,266.00
54	808-75245	LINE, THERMOPLASTIC, SOLID, YELLOW, 4 IN.	LFT	5400	\$ 0.80	\$ 4,320.00
55	808-75297	TRANSVERSE MARKING, THERMOPLASTIC, STOP LINE, WHITE, 24 IN.	LFT	36	\$ 16.53	\$ 595.08
56	808-75320	PAVEMENT MESSAGE MARKING, THERMOPLASTIC LANE INDICATION ARRO W	EACH	1	\$ 173.39	\$ 173.39
						\$ 1,693,443.68
20% CONTINGENCY						\$ 338,688.74
Total Cost Estimate						\$ 2,033,000.00



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE II (Curb Gutter & Curb Turnout)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
1	105-06845	CONSTRUCTION ENGINEERING	LS	1	\$ 45,604.08	\$ 45,604.08
2	110-01001	MOBILIZATION AND DEMOBILIZATION	LS	1	\$ 114,010.19	\$ 114,010.19
3	201-52370	CLEARING RIGHT OF WAY	LS	1	\$ 45,604.08	\$ 45,604.08
4	203-02000	EXCAVATION, COMMON	CYS	32935	\$ 21.00	\$ 691,635.00
5	205-09543	NO. 2 STONE	TON	100	\$ 40.00	\$ 4,000.00
	205-11626	PUMP AROUND	EACH	1	\$ 12,538.05	\$ 12,538.05
6	205-12108	STORMWATER MANAGEMENT BUDGET	DOL	68877	\$ 1.00	\$ 68,877.47
7	205-12616	STORMWATER MANAGEMENT IMPLEMENTATION	LS	1	11000	\$ 11,000.00
8	205-12618	SWQCP PREPARATION	LS	1	15000	\$ 15,000.00
9	207-08264	SUBGRADE TREATMENT, TYPE II	SYS	964	\$ 22.08	\$ 21,275.06
10	207-12636	SUBGRADE TREATMENT, TYPE IBL	SYS	14741	\$ 8.27	\$ 121,905.93
11	211-09264	STRUCTURE BACKFILL, TYPE 1	CYS	63	\$ 56.62	\$ 3,538.75
12	211-09265	STRUCTURE BACKFILL, TYPE 2	CYS	29	\$ 83.84	\$ 2,431.36
13	211-09268	STRUCTURE BACKFILL, TYPE 5	CYS	10	\$ 248.01	\$ 2,480.10
14	214-11796	GEOGRID, TYPE IB	SYS	617	\$ 3.55	\$ 2,191.11
15	214-12236	GEOTEXTILE FOR PAVEMENT, TYPE 1A	SYS	11556	\$ 1.43	\$ 16,525.08
16	301-12234	COMPACTED AGGREGATE NO. 53	CYS	1877	\$ 61.61	\$ 115,641.97
17	401-07321	QC/QA-HMA, 2, 64, SURFACE, 9.5 mm	TON	880	\$ 110.66	\$ 97,380.80
18	401-07390	QC/QA-HMA, 2, 64, INTERMEDIATE, 19.0 mm	TON	1467	\$ 80.75	\$ 118,433.33
19	401-07423	QC/QA-HMA, 2, 64, BASE, 19.0 mm	TON	1760	\$ 70.60	\$ 124,256.00
20	401-10258	JOINT ADHESIVE, SURFACE	LFT	4000	\$ 0.98	\$ 3,920.00
21	401-10259	JOINT ADHESIVE, INTERMEDIATE	LFT	4000	\$ 0.80	\$ 3,200.00
22	401-11785	LIQUID ASPHALT SEALANT	LFT	4000	\$ 0.50	\$ 2,000.00
23	401-12137	QC/QA-HMA, 4, 76, INTERMEDIATE, OG, 19.0 mm	TON	1996	\$ 71.50	\$ 142,714.00
24	406-05520	ASPHALT FOR TACK COAT	TON	11	\$ 605.59	\$ 6,661.49
25	604-05528	HMA FOR SIDEWALK	TON	640	\$107.40	\$ 68,736.00
26	605-52807	CURB AND GUTTER, COMBINED	LFT	8000	\$28.86	\$ 230,880.00
27	605-94811	CURB TURNOUT	EACH	6	\$789.80	\$ 4,738.80
28	610-07487	HMA FOR APPROACHES, TYPE B	TON	458	\$ 163.30	\$ 74,745.92
29	616-06405	RIPRAP, REVETMENT	TON	289	\$ 69.98	\$ 20,232.19
30	616-12246	GEOTEXTILE FOR RIPRAP TYPE 1A	SYS	612	\$ 4.93	\$ 3,015.41
31	621-01004	MOBILIZATION AND DEMOBILIZATION FOR SEEDING	EACH	4	\$ 529.84	\$ 1,877.91
32	621-06545	FERTILIZER	TON	2	\$ 971.22	\$ 1,942.44



PREPARED BY YZ	DATE 3/30/2022
CHECKED BY ROP	DATE 3/30/2022
PURPLE HEART PKWY PHASE II (Curb Gutter & Curb Turnout)	

Line No	Item Number	Item Description	Unit	Quantity	Unit Cost	Cost
33	621-06553	SEED MIXTURE, R	LBS	806	\$ 5.13	\$ 4,134.78
34	621-06565	MULCHING MATERIAL	TON	8	\$ 650.00	\$ 5,200.00
35	621-06567	WATER	KGAL	4	\$ 21.39	\$ 85.56
36	621-06574	SODDING	SYS	800	\$ 11.61	\$ 9,288.00
37	714-11705	STRUCTURE, COATED REINFORCED CONCRETE, BOX SECTIONS, 8 FT. X 4 FT.	LFT	68	\$ 1,527.00	\$ 103,836.00
38	715-05048	PIPE, TYPE 4, CIRCULAR, 6 IN.	LFT	8000	\$ 7.56	\$ 60,480.00
39	715-05053	PIPE, UNDERDRAIN, OUTLET 6 IN.	LFT	300	\$ 25.05	\$ 7,515.00
40	715-05151	PIPE, TYPE 2, CIRCULAR, 15 IN.	LFT	61	\$ 72.86	\$ 4,463.83
41	715-05169	PIPE, TYPE 3, CIRCULAR, 15 IN.	LFT	68	\$ 67.74	\$ 4,630.33
42	715-09064	VIDEO INSPECTION FOR PIPE	LFT	61	\$ 1.76	\$ 107.83
43	715-46005	PIPE END SECTION, DIAMETER 15 IN.	EACH	9	\$ 873.88	\$ 7,964.48
44	718-06528	OUTLET PROTECTOR, 1	EACH	20	\$ 992.42	\$ 19,848.40
45	718-12305	GEOTEXTILES FOR UNDERDRAIN, TYPE 1A	SYS	5482	\$ 1.87	\$ 10,251.34
46	718-52610	AGGREGATE FOR UNDERDRAINS	CYS	634	\$ 50.95	\$ 32,302.30
47	801-04308	ROAD CLOSURE SIGN ASSEMBLY	EACH	1	\$ 312.14	\$ 312.14
48	801-06640	CONSTRUCTION SIGN, A	EACH	1	\$ 175.50	\$ 175.50
49	801-06775	MAINTAINING TRAFFIC	LS	1	\$ 22,802.04	\$ 22,802.04
50	801-07119	BARRICADE, III-B	LFT	48	\$ 15.78	\$ 757.44
51	802-05701	SIGN POST, SQUARE TYPE 1 REINFORCED ANCHOR BASE	SFT	39	\$ 26.86	\$ 1,047.20
52	802-09838	SIGN, SHEET, WITH LEGEND, 0.080 IN.	SFT	19	\$ 38.43	\$ 739.41
53	808-12032	GROOVING FOR PAVEMENT MARKINGS	LFT	8000	\$ 0.79	\$ 6,320.00
54	808-75245	LINE, THERMOPLASTIC, SOLID, YELLOW, 4 IN.	LFT	8000	\$ 0.80	\$ 6,400.00
55	808-75297	TRANSVERSE MARKING, THERMOPLASTIC, STOP LINE, WHITE, 24 IN.	LFT	24	\$ 16.53	\$ 396.72
56	808-75320	PAVEMENT MESSAGE MARKING, THERMOPLASTIC LANE INDICATION ARRO W	EACH	1	\$ 173.39	\$ 173.39
						\$ 2,508,224.21
20% CONTINGENCY						\$ 501,644.84
Total Cost Estimate						\$ 3,010,000.00

Subject: Construction Cost and Preliminary Engineering Estimate

Prepared for: **Purple Heart Pkwy Extention Option 3**
Project: **Montgomery County, IN**

Total Construction Cost		\$ 5,043,000.0
Roadway	\$ 5,043,000.0	
Retaining Wall	\$ -	
Bridge	\$ -	
 Total Utility Relocation Cost		 \$ 50,000.0
0 Utility Poles	\$ -	
Underground Utilities	\$ 50,000.0	
R/R Intersection Improvement	\$ -	
 Total Right-of-Way Cost		 \$ 125,000.0
Right-of-Way (12.3 acres @ \$10,000.00/ acre)	\$ 125,000.0	
 Total Construction, Utility Relocation and Land Acquisition Cost		 \$ 5,218,000.0
 Design Cost		 \$ 680,575.0
Survey and Location Control Route Survey Plat	\$ 15,000.0	
Hydraulics	\$ -	
Environmental	\$ 50,000.0	
401/404 RGP Permit	\$ 4,500.0	
Rule 5	\$ 5,000.0	
Geotechnical Engineering and pavement design	\$ 75,645.0	
Road Design	\$ 355,000.0	
Bridge Scoping Report	\$ -	
Bridge Design	\$ -	
Bridge Scour Report	\$ -	
Utility Coordination	\$ 15,000.0	
Railroad Coordination	\$ -	
Project Management	\$ 50,430.0	
Construction Phase Services	\$ 10,000.0	
R/W Eng & Land Acq Services (10 parcels @ \$10,000.00 /Parcel)	\$ 100,000.0	
 Construction Inspection		 \$ 605,000.0
Construction Inspection (@ 12 % of Construction)	\$ 605,000.0	
 Total Project Cost		 \$ 6,503,575.0
Inflation (4% per year)		\$ 7,034,266.7
 Use		 \$ 7,050,000.0

Appendix F-1

Coordination Meetings

To: Mr. Jim Peck
County Engineer
Montgomery County
110 W South Blvd
Crawfordsville, IN 47933

From: Ms. Lisa Casler, P.E.
Principal/Division Director of Transportation
RQAW Corporation

Date: March 17th, 2022

Re: Purple Heart Parkway Extension
Kick Off Meeting Minutes

A preliminary field check for the above referenced project was held at 2:00 pm on Friday, January 21st, 2022. Those in attendance were as follows:

Name	Representing	Phone Number	Email
John Frey	County Commissioner	765-376-9694	john.frey@montgomerycounty.in.gov
Tom Klein	Montgomery County	765-362-6514	tom.klein@montgomerycounty.in.gov
Jim Peck	Montgomery County Engineer	765-307-3673	james.peck@montgomerycounty.in.gov
Lisa Casler	RQAW	317-588-1737	lcasler@rqaw.com
Yan Zhu	RQAW	317-588-1743	yzhu@rqaw.com

The following items were discussed:

Introduction

Proposed Purple Heart Pkwy goes from US 231 to S Ladoga Rd

Montgomery County mentioned no bridge will be part of the project, RQAW will need to size culvert.

Montgomery County would like to see the cost estimate break into 2 phases at east edge of parcel 87.

- Phase I: US 231 to east edge of parcel 87
- Phase II: East edge of parcel 87 to S Ladoga Rd

Montgomery County mentioned that his new road will eventually tie into Comfort Drive.

Road design

Speed limit will be 30 mph to match the Purple Heart Pkwy on the west side of US 231.

Montgomery County would like to see two different two-lane typical sections, without a TWLTL (Two-Way Left Turn Lanes)

- Option 1 with curb & gutter and curb turnout
- Option 1 with curb & gutter with storm sewer
- Option 2 with shoulders and open ditches

Underdrain is required with all options and will use the same pavement section design as Comfort Drive. The Comfort Drive pavement section is:

1.5 inches (165 lb/sy) QC/QA-HMA, 2, 64, Surface, 9.5 mm on

2.5 inches (275 lb/sy) QC/QA-HMA, 2, 64, Intermediate, 19.0 mm on

3 inches (330 lb/sy) QC/QA-HMA, 2, 64, Base, 19.0 mm on

2.5 inches (250 lb/sy) Open-Graded Asphalt on

4 inches Compacted Aggregate, No. 53 Base on

Geotextile Type 1A on

Grade Raised Fill or Subgrade Treatment Type IBL

Montgomery County would like to have an 8' Path with grass buffer on north parallel to the new road.

- Option 1: 12' Travel Lane & 2'-7" Combined Curb & Gutter
- Option 2: 12' Travel Lane & 3' Shoulder (2' paved)

Right of Way is anticipated to be 75' feet wide. With a 25' easement on either side for proposed utilities (Water main & sanitary). Similar set up as Comfort Drive.

Utilities

Montgomery County will coordinate with the sewer district assessment in and get cost for sewer. There's a 12" water line west of existing Purple Heart and US 231 intersection which can be used to provide service for the new development along the Purple Heart Extension.

Others

There is legal drain on the south side of the wooded area. The wooded area on the will be a park and the proposed trail will connect to it. The east of the woods will be a regional detention area.

Per the county, detention will not be required for the road project, the county will work with developer to provide detention.

Jim sent the plan set for existing Purple Heart PKWY on west side designer by USI. This was received by RQAW on 1/25/2022.

Montgomery County mentioned that the property owners adjacent to the project are aware of the proposed road the project.

RQAW will set up a field visit to visit and walk through the alignment/site with GPS. RQAW will coordinate with the county to set up the site visit.