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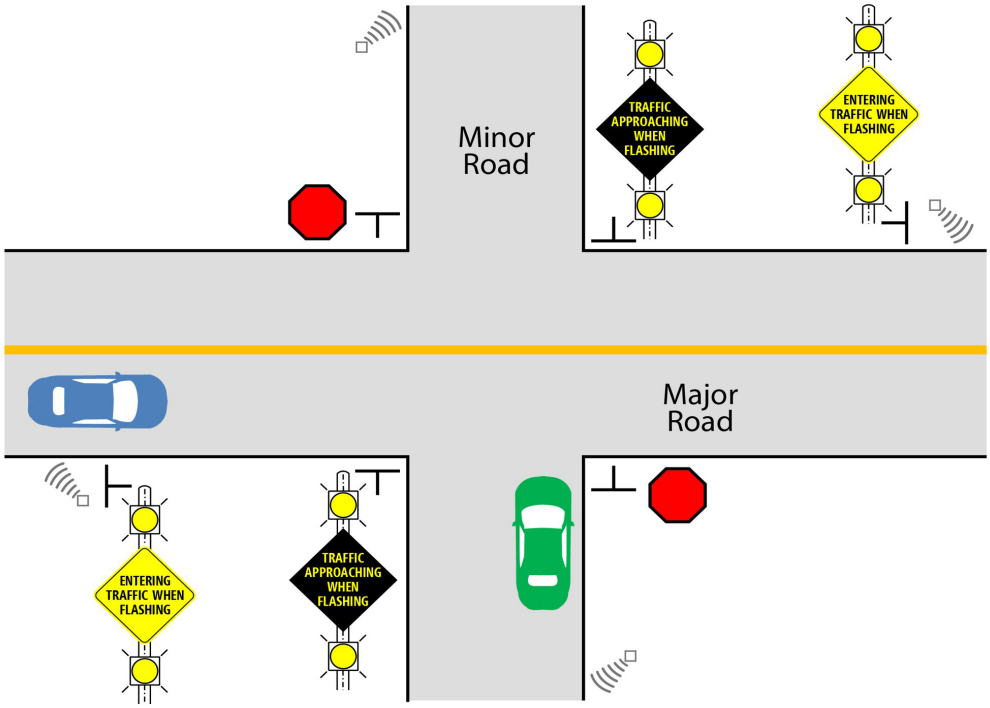
RESEARCH PROGRAM
INDIANA DEPARTMENT OF
TRANSPORTATION AND PURDUE UNIVERSITY

Safety Performance of Non-Signalized Traffic Control Strategies



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JOINT TRANSPORTATION RESEARCH PROGRAM

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NOTICE

COVER IMAGE

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16. Abstract

The Indiana safety management program targets the reduction of crashes at high-speed, two-way stop-controlled (TWSC) intersections, which are responsible for 8.2% of serious crashes statewide that cause approximately 1,000 serious injuries and over 90 fatalities annually. Key risk factors include human error, high traffic volumes, and high speeds. Despite the implementation of measures, such as alternative intersection designs and enhanced visibility, additional countermeasures are needed to further mitigate these risks at rural TWSC intersections with lower traffic volumes. Intersection Conflict Warning Systems (ICWS) presents a promising solution by alerting drivers to potential vehicle conflicts.

The main objective of this study was to evaluate the effectiveness of the ICWS installed at 17 high-risk intersections in Indiana. To address the inherent selectivity bias of choosing high-risk locations, 33 additional nearby intersections without ICWS were selected as a control group. A negative binomial model was applied to identify factors that contribute to crashes and other conditions that help improve safety at these intersections. The analysis revealed that ICWS reduced the number of crashes, but its effectiveness decreased when traffic volume increased on the major road. This necessitated the development of Crash Modification Function of traffic volume on major roads instead of a single-valued Crash Modification Factor.

Crash severity analysis showed that ICWS reduced the frequency of crashes at a similar rate independently of the crash severity. This finding allows applying a single Crash Modification Factor (CMF) to all the severity levels. To study the effect of ICWS on driver behavior, a portable LiDAR-based vehicle tracking system—TScan—was used. Analysis of vehicle trajectories obtained with TScan indicated no statistically significant reduction in the speed of vehicles along the main road. This result refuted the most obvious mechanism of crash severity reduction and supported the single CMF applicable to all crashes regardless of their severity. A supplemental analysis of post-encroachment times (PET) showed no statistically significant difference in short PETs between intersections with and without ICWS. In spite of the system's obvious effectiveness in reducing the number of crashes, the findings emphasized the importance of conducting benefit-cost analyses of the ICWS safety benefits before installation, and the importance of revisiting the system safety effectiveness over time after the traffic volume increases.

17. Key Words two-way stop control, intersection conflict warning system, safety performance, non-signalized traffic control strategies	**18. Distribution Statement** No restrictions. This document is available through the National Technical Information Service, Springfield, VA 22161.

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EXECUTIVE SUMMARY

Research Problem

One of the objectives of Indiana's Safety Management Program is improving safety at rural high-speed, two-way stop-controlled (TWSC) intersections. These intersections account for a considerable number of serious crashes statewide that have a high risk for serious injuries and fatalities. Human errors, aggressive behavior, and violation of the right of way, coupled with high traffic volumes and speeds, create risky conditions that result in frequent collisions and severe outcomes.

Serious crashes at TWSC intersections occur even at sites that do not exhibit obvious deficiencies in geometry and traffic control. This confirms that human error is a primary causal factor for crashes, which is compounded by high speeds reducing driver reaction time. Intersection Conflict Warning System (ICWS) is designed to alert drivers on the crossing road about vehicles approaching or entering the TWSC intersection from a high-speed major road. This system is viewed as a promising countermeasure for the aforementioned conditions. Recently, the Indiana Department of Transportation (INDOT) installed these systems at 17 intersections statewide.

The primary objective of this research was to evaluate the effectiveness of the installed conflict warning system and to identify local conditions that make the system more effective. There were three research elements in the reported study.

1. The frequency and severity of crashes was compared before and after installation of the system, and safety changes that were observed at similar intersections without ICWS were implemented.
2. Conditions were identified that justified installation of the system to increase the effectiveness of this countermeasure. The conditions considered included speed, volume, road geometry, and sight distance.
3. Crash modification factors (CMF) were estimated for ICWS at various levels of severity to see if the countermeasure affected severity differently at different levels. If not, a single CMF was proposed instead.

Findings

This study investigated the effectiveness of ICWS installed at unsignalized TWSC intersections in Indiana. Since the ICWS system was only installed at high-crash locations, several intersections with no ICWS were used as control intersections to adjust for the expected selection bias.

A negative binomial analysis was used to identify key safety factors at the TWSC intersections studied. The results confirmed that ICWS reduced the number of crashes. Although traffic volume was associated with the increased crash risk, three-legged intersections experienced lower risk, and the presence of medians with speed limits under 45 mph decreased the crash risk.

While previous studies have reported mixed results on the effectiveness of ICWS across different states, they did not explore the relationship between system performance and traffic volume. By including AADT as a safety factor, this research could demonstrate that the system's effectiveness was reduced at intersections with a high traffic volume on major roads. This insight calls for a more customized criteria for installing the system. For more robust decision-making, it is recommended that the decision to install the system be supported with a benefit-cost (B-C) analysis. Statistical models of crash frequency and severity were developed in this study to facilitate the B-C analysis.

The field observations conducted with the help of the CRS traffic scanning system (TScan) provided no statistical evidence of speed reduction on the main road after the system was installed and activated. This finding eliminated the primary method by which the system was expected to reduce crash severity. Indeed, the statistical analysis confirmed that the crash reduction might be assumed equal at all the studied levels of crash severity. This safety improvement was particularly effective at intersections with low volumes on major roads, but it was less effective at intersections with higher volumes on major roads. The safety benefits at locations with a major road AADT higher than 9,000 veh/day could not be confirmed. Consequently, the estimated crash modification factors (CMF) increase with the increase of the major traffic volume, and CMF reached 1.00 at an AADT close to 9,000 veh/day. This result applied to crashes at all the severity levels.

An attempt to confirm the safety improvement mechanism with an expected increase in the post encroachment time (PET) at intersections with the installed ICWS was inconclusive due to the insufficient number of safety-relevant low-value PETs. Although the cumulative distributions showed an increased proportion of high PET values, they were within the range of long and safe values of PET.

Implementation

The statistical analysis confirmed that ICWS installations at rural TWSC intersections have a considerable and statistically significant reduction in the number of crashes. However, the effectiveness diminished at intersections with high AADT on a major road. It is presumed that this trend was caused by the growing frequency of warnings that make drivers wait a long time for a gap. This situation caused impatience, and it made drivers prone to ignore the warnings. The study identified an upper threshold of 9,000 veh/day on major roadways as a key criterion for selecting locations where an ICWS installation is likely to yield significant safety benefits. The recommended CMF factor is calculated with the developed equation in this project, which involves AADT on a major road. The equation is applicable to major road AADT between 2,000 and 9,000 veh/day. The lower range is the value observed in the field. The actual lower range should be decided based on the B-C analysis.

The analysis of crash severity before and after installation of the ICWS did not confirm that the crash reduction was different at different crash severity levels. It implied that a common CMF may be used for all the crash severity levels.

Although the AADT upper range on major roads is a convenient criterion for installing the ICWS; to make the countermeasures more cost-effective at the system level, the benefit-cost (B-C) analysis is recommended for individual installation. The analysis should involve consideration of the installation and maintenance costs, and an assessment of the expected safety benefits should be calculated with the help of the CMF equation provided.

The B-C analysis for Indiana safety projects is facilitated with a tool called RoadHAT. Although the presented study provides some of the needed inputs, the current version of RoadHAT needs to be modified. The current RoadHAT version assumes that considered safety improvements have fixed CMFs, and that they are applied repeatedly at a frequency determined by the countermeasure's fixed lifetime. In the case of the ICWS, the safety effect of the countermeasure varies with the traffic volume and may need to be removed when the AADT reaches a critical value.

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1. INTRODUCTION

1.1 Research Problem

Enhancing safety at rural high-speed, two-way stop-controlled (TWSC) intersections is a key priority of Indiana's Safety Management Program. These intersections contribute to an estimated 1,000 serious injuries and over 100 fatalities each year or approximately 8% of serious crashes statewide. Ongoing safety improvement efforts at TWSC intersections must address such safety factors as human errors, aggressive behavior, violation of the right of way, high traffic volumes, and high speeds. Altogether, these factors may cause high-risk conditions, which together increase both the likelihood and severity of crashes at rural TWSC intersections.

Serious crashes at TWSC intersections frequently occur even when these sites do not exhibit obvious safety deficiencies. It suggests that human error may be a primary factor. High speeds reduce drivers' time to correct mistakes, while high traffic volume increases exposure to these errors, compounding the risk of severe outcomes. A range of strategies have been implemented from alternative intersection designs to enhanced traffic control visibility. Yet, more efficient counter measures are needed to further reduce the crash risk at these locations.

One promising countermeasure is called intersection conflict warning system (ICWS), which alerts drivers on the crossing road about vehicles approaching or entering the intersection from the high-speed major road. Recently, the Indiana Department of Transportation (INDOT) has installed these systems at 17 intersections across the state.

1.2 Research Objectives

The primary objective of research is to evaluate the effectiveness of the installed conflict warning systems. There are three research components of the proposed study.

1. Compare the frequency and severity of crashes before and after installation of the systems and adjust them with safety changes observed at similar intersection where the system was not installed.
2. Identify conditions that justify installation of the system to increase the effectiveness of the countermeasure. These conditions may include speed, volume, intersection geometry, and visibility.
3. Estimate crash modification factor (CMF) for ICWS at various levels of severity if the countermeasure affects severity differently at different levels. Otherwise, a single CMF will be proposed.

1.3 Research Scope

The scope of this research is centered on TWSC intersections in Indiana, with a specific focus on intersections along high-speed roads where advanced traffic warning systems such as ICWS have been installed.

To assess the impact of these systems, this report investigates their effectiveness in reducing crash frequency and severity, and it develops crash modification factors (CMFs) to guide implementation. Additionally, this project includes observing and analyzing drivers' behavior at selected intersections. The behavior is represented by drivers' speeds on the major road and post encroachment time (PET) between vehicles on the main road and vehicles crossing that road. Recording and analyzing the data will be done with TScan technology (Bandaru et al., 2021; Tarko et al., 2023).

This research aimed at developing criteria that is helpful in selecting intersections for ICWS installations. The factors considered for inclusion in the warrants are traffic volumes, vehicle speeds, and site characteristics. Establishing these criteria are meant to support an effective deployment of the ICWS in order to improve rural TWSC intersection safety in Indiana.

2. CURRENT STATE OF PRACTICE AND KNOWLEDGE

2.1 Literature Review

Reducing the frequency of severe right-angle crashes at rural intersections is a priority for transportation agencies due to the high risk of fatalities and severe injuries associated with these incidents. Several factors may increase the likelihood of these events including roadway physical aspects, driver related aspects, and environmental aspects. Regarding physical aspects, these crashes have been related to high-speed approaches, restricted sight distance, and intersection geometry (Kuehl et al., 2016). The driver related aspects are poor identification of safe intersection crossing gaps, age-related deterioration in physical and cognitive skills in older drivers, inexperience and risk-taking behavior in young drivers, and the perception, attitude and comprehension of the automated safety systems (Tian et al., 2021). In addition, adverse weather conditions can represent an adverse condition at the intersection.

Intelligent transportation systems (ITS)-based solutions have emerged as a promising solution to address the occurrence of right-angle crashes at rural intersections. In 2011, the Federal Highway Administration (FHWA) compiled recommendations for the application of four different systems at stop-controlled intersections (Bryer, 2011).

1. A system that measures the speed and trajectory of vehicles on the crossing road to determine if the driver may run the stop sign.
2. A system that measures the speed of the vehicles coming through the crossing road and deploys a message in case the speed is greater than a safe speed.
3. A system considered alerts the drivers on the stop approach to be aware of the traffic when a vehicle is detected on the major road.

4. Intersection conflict warning system (ICWS), a system that alerts drivers on the through route when a vehicle is stopped on the crossroad approach.

Similarly, in 2016, the Minnesota Department of Transportation (MnDOT) deployed the *Intersection Safety Technologies Guidebook*, in which two ITS-based systems were evaluated (Kuehl et al., 2016).

1. Intersection conflict warning system (ICWS).
2. LED stop signs system: These signs enhance the visibility of a conventional static stop sign by activating in the presence of approaching vehicles. MnDOT found that the deployment of LED stop signs could reduce by 10-13% the crash frequency and severity.

Eventually, the intersection conflict warning system was identified as the only system with the potential to be successfully implemented. Therefore, transportation agencies have focused on implementing the ICWS at rural intersections. ICWS provides drivers with real-time information about approaching vehicles to enhance gap selection, reduce the likelihood of incidents and improve safety at the intersections (Tian et al., 2021). This system has been widely deployed in several states around the U.S., and numerous studies have been aimed at determining its effectiveness.

The 2011 *Design and Evaluation Guidance for Intersection Conflict Warning System*, established minimum parameters that should be considered for the ICWS evaluation, including crash data for before and after the installation, intersection geometry, sight distance, traffic volume, and other relevant safety measures (Crowson & Jackels, 2011).

The study, *Multistate Safety Evaluation of ICWS* (Himes et al., 2016), evaluated the effectiveness of ICWS installations at over 90 intersections in Minnesota, Missouri and North Carolina. Data collection included system location, message type displayed, existing physical conditions, and other countermeasures present at the intersections. Key variables were intersection characteristics like the number of lanes, total number of years and crashes before and after ICES installation, traffic volumes (AADT), as well as the presence of medians, intersections angles, exclusive left-turn lanes, and posted speed limits on major roads. The study conducted both an aggregate analysis and a disaggregate analysis. In the aggregate analysis, the estimated crash modification factor (CMF) ranged between 0.70 and 0.85 for fatal and injury crashes, as well as right-angle crashes, at two-lanes at two-lane and four-lane at two-lane intersections. The disaggregate analysis examined CMFs for five categories based on installation factors and found significant crash reductions in some categories; however, certain sites showed CMFs over 1.0, indicating no improvement or even an increase in crashes (Himes et al., 2016).

Similarly, the 2018 MnDOT study titled *Evaluation of Intersection Conflict Warning System: A Critical Gap* (Thapa et al., 2018) evaluated ICWS effectiveness by analyzing the critical gap size at five treated intersections, with ICWS present, and at least one control intersection selected on the same major road. Data about critical gap size was collected with video cameras in a period before the installation, in a period 1 month after the installation, and a period 12-months after the installation. The study used both: the deterministic approach (Raff's method), and the probabilistic approach (Logit models) to assess critical gap sizes based on turn type (left turn, right turn, or through), vehicle type (passenger cars, or trucks, buses and farm vehicles), and type of stop (complete stops or rolling stops). Overall, MnDOT found that while the critical gap decreased 1 month after installation, the intersections showed an average increase of 0.4 to 1.6 seconds after 12 months. On the other hand, control intersections did not show any significant increase in the critical gap size (Thapa et al., 2018).

ITS–based solutions have emerged not only to reduce crashes and optimize critical gap selection but also to address vehicle speeds on major roads. In 2011, a study was conducted in Minnesota to evaluate an advanced LED warning system for rural intersections, considered an early form of today's ICWS (Weidemann et al., 2011). This study, which focused on a single intersection, recorded vehicle speeds on the main road before and after the system's installation with a 1 mph accuracy. Researchers analyzed speed data under different conditions, day vs. night, morning and evening peak hours, hours, weekdays, and seasonal variations, and found an average reduction of 4.5 mpg in approaching speeds across all scenarios (Weidemann et al., 2011). A similar study in 2020 evaluated the Rural Intersection Active Warning System (RIAWS) in a rural Western Australia intersection. Using a driving simulator, 96 participants drove through a simulated rural intersection with varied signage scenarios. Results showed a speed reduction of 10 to 20 km/h across participants (Meuleners et al., 2020). These findings demonstrate the potential of ITS-based warning systems to enhance safety by reducing vehicle approach speeds.

ICWS has been proven to be a promising countermeasure for improving safety at rural intersections with crash history and sight restrictions. According to the FHWA, factors such as sign message, size and shape, placement, and traffic conditions significantly impact the effectiveness of the system (Bryer, 2011). While the mentioned studies have shown encouraging results in the effect of ICWS in reducing crash frequency, certain limitations need to be addressed in further research. Firstly, as the ICWS has been applied since relatively few years ago, there is insufficient information to conduct a comprehensive long-term post-installation analysis. To fully understand the system's effects on long-term improvements in safety, and drivers' behavior a longer after-installation period should be considered. Additionally, the use of video cameras to collect data on drivers' behavior at intersections may influence that behavior. Finally, there is a risk that the selectivity bias effect is present as the intersections included in the previous analysis are those that had experienced large

numbers of crashes before treatment. Addressing these limitations will be vital in future research.

3. STATISTICAL ANALYSIS AND RESULTS

3.1 Data

3.1.1 Data Acquisition

Indiana Department of Transportation (INDOT) provided data on the locations and dates of installation of ICWSs. A total of 50 intersections were relevant to this study, comprising 17 treated intersections, where ICWSs had been installed, and 33 pair intersections. For each one of them a unique ID is assigned: a number indicating the treated intersection, followed by a letter, *a* if it is a treated one or *b*, *c,* or *d* if it is a pair one. For each treated intersection up to four pair intersections are selected along the same major road with similar physical characteristics, traffic volume and environmental conditions. Summarized information for the treated intersections is presented in Table 3.1 and information about the control intersection are present in Table 3.2.

For both treated and pair intersections, INDOT traffic data shapefiles covering the years from 2015 until 2023 were used to collect features such as posted speed limit, median type and width, functional class, annual average daily traffic (AADT). Additionally, from Google Maps' Satellite View and Street Views information about the type of road, presence of exclusive right or left turn lane, channelization and visibility scores were obtained.

Google Maps Street View and Satellite View images of the locations with ICWS systems installed are presented in Appendix A. Similarly, the corresponding images for the chosen control intersections are presented in Appendix B.

3.1.2 Variables

Type of Road

The type of road of the major and minor approaches of the intersections was identified using Google Maps and Google Street View. The type of road variable indicates whether the intersection is urban or rural for both, treated and control intersections. The distribution of the intersections by type of road is shown in Figure 3.1

Posted Speed Limit

The posted speed limit information was extracted for both, treated and control intersections, for each major road approach from the shapefile provided by INDOT and verified using the Google Maps Street View feature. The distribution of posted speed limits is shown in Figure 3.2.

Number of Legs

The intersection number of legs was extracted by using Google Maps Street View feature. There were 14 three-leg and 36 four-leg intersections. The distribution of intersections by number of legs is shown in Figure 3.3.

Median Type and Width

The type of median and its width were obtained from the shapefile provided by INDOT. The distribution of the intersections by median type and median width are shown in Figure 3.4.

Number of Through Lanes

The number of through lanes at each intersection was noted manually using the satellite view of Google Maps. The distribution of number of through lanes is shown in Figure 3.5.

TABLE 3.1
Locations with ICWS

ID	Major	Minor	County	Latitude	Longitude	Installation Date	Speed Limit (mph)
1	US 27	SR 28	Randolph	40.27843	-84.97643	1/25/2021	40
2	SR 38	Moontown Road/Hinkle Road	Hamilton	40.07796	-86.09035	11/20/2020	55
3	US 40	CR 600 E	Hancock	39.78862	-85.68896	8/5/2021	60
4	US 40	SR 3/CR 325 W	Henry	39.8021	-85.44814	10/15/2021	45
5	SR 70	SR 245	Spencer	38.00114	-86.90608	4/20/2021	40
6	SR 65	Boonville/New Harmony Road	Vanderburgh	38.10196	-87.64599	4/20/2021	50
7	SR 45	SR 54	Greene	39.01554	-86.72445	3/26/2021	50
8	SR 109	CR 400 N	Whitley	41.22173	-85.49194	2/2/2021	40
9	SR 26 (CR 900 S)	CR 950 E	Grant	40.42245	-85.49288	2/22/2021	55
10	SR 60	Old SR 60 (S Jct)	Washington	38.56927	-86.04894	5/4/2021	55
11	SR 60	Ebenezer Church Road	Clark	38.44096	-85.82298	5/4/2021	55
12	SR 46	Lower Schooner Road	Brown	39.15873	-86.31145	3/26/2021	55
13	SR 46	Sewell Road	Monroe	39.15176	-86.38285	3/26/2021	55
14	SR 144	Pennington/Neitzel Road	Morgan	39.59414	-86.34106	12/29/2020	45
15	SR 47	CR 625 E	Montgomery	40.10385	-86.786	2/12/2021	50
16	US 41	Evans Avenue	Vigo	39.57165	-87.36995	6/24/2021	40
17	SR 63	SR 28	Warren	40.27989	-87.40381	6/24/2021	60

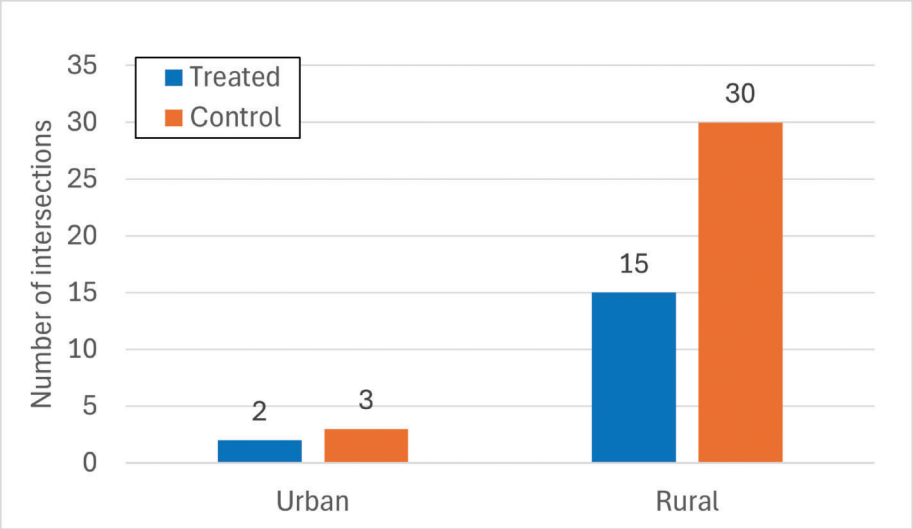


Figure 3.1 Urban vs. rural intersections.

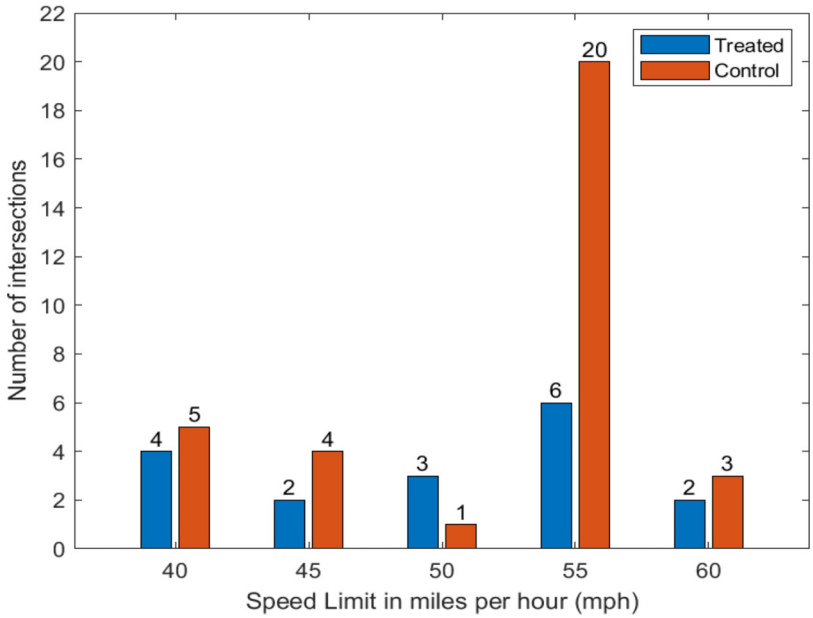


Figure 3.2 Speed limits of intersections.

Functional Class

The functional class of all approaches for treated and control intersections was obtained from the shapefile provided by INDOT. There are three functional classes: collectors, minor arterials, and principal arterials. The distribution of the treated intersections by their functional class is shown in Figure 3.6.

Visibility Score

Visibility score is a subjective ranking of the sight distance along the major road from the intersecting minor approach. Visibility scores applied to a major road were evaluated from each approach on the crossing road. Two separate scores for the major road were obtained from each approach on the crossing road: one for the left-hand major road segment, and another one for the right-hand major road segment, on both approaches in the nearest point to the stop line based on Google Maps Street View. The score was affected by the presence of trees, vegetation, structures, horizontal and vertical curves. Three visibility scores were defined.

- *Level 3 Good Visibility:* There are no geometric or physical aspects that affect visibility.
- *Level 2 Partial/Limited Visibility:* Road visibility is affected by some structures or trees located near the

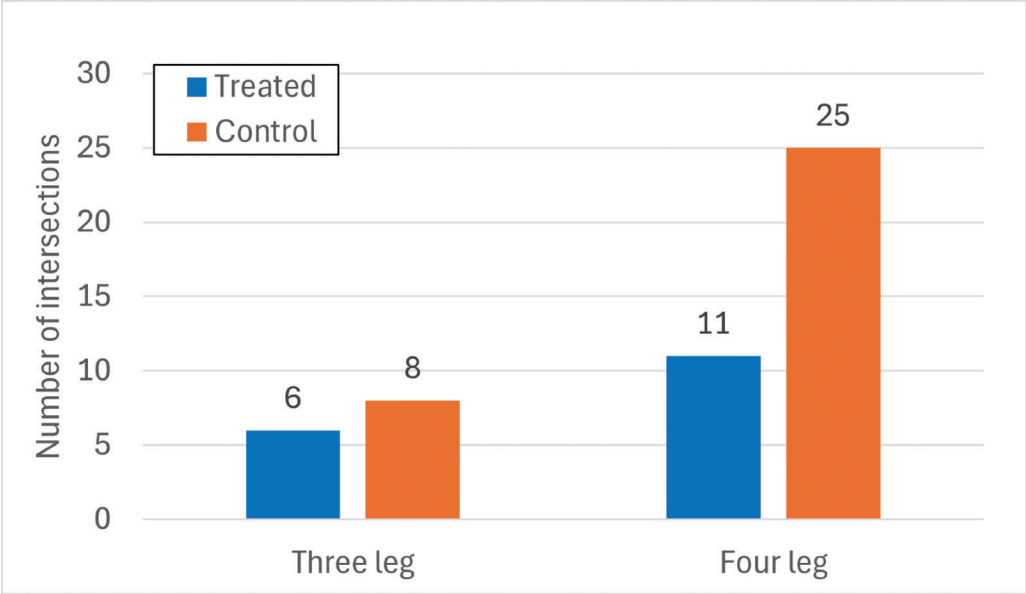


Figure 3.3 Number of intersection legs.

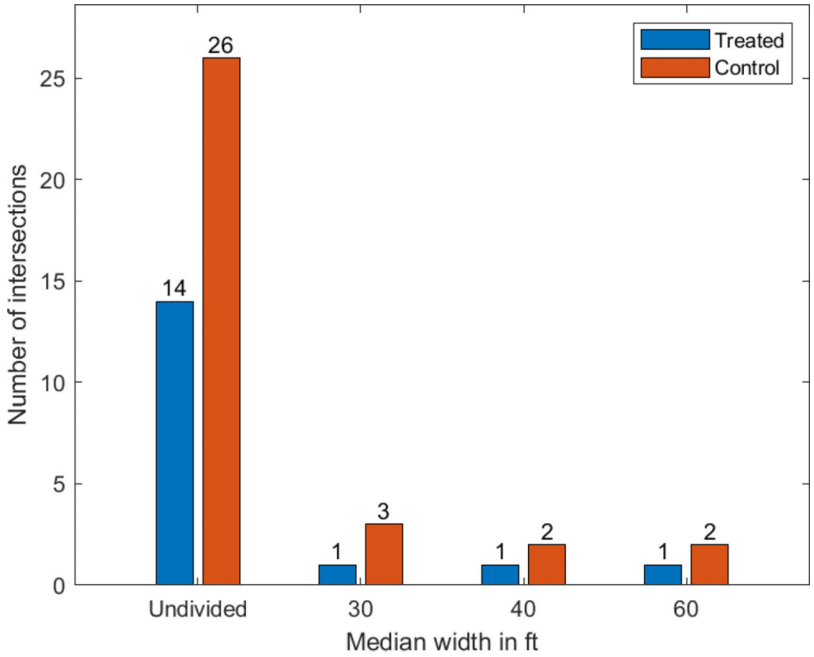


Figure 3.4 Median presence in intersections.

corners of the intersection, but it is not completely restricted. There are no geometric aspects of the road that could affect it.

- *Level 1 Poor Visibility:* There are both geometric and physical aspects that completely restrict visibility.

Examples of each score of visibility are shown in Figure 3.7.

Annual Average Daily Traffic (AADT)

AADT values on the main roads and the crossroads for the years 2015 to 2022 were extracted from the shapefiles provided by INDOT. An example distribution of the 2019 AADT values for main and crossing roads at treated and control intersections are shown in Figures 3.8 through 3.11.

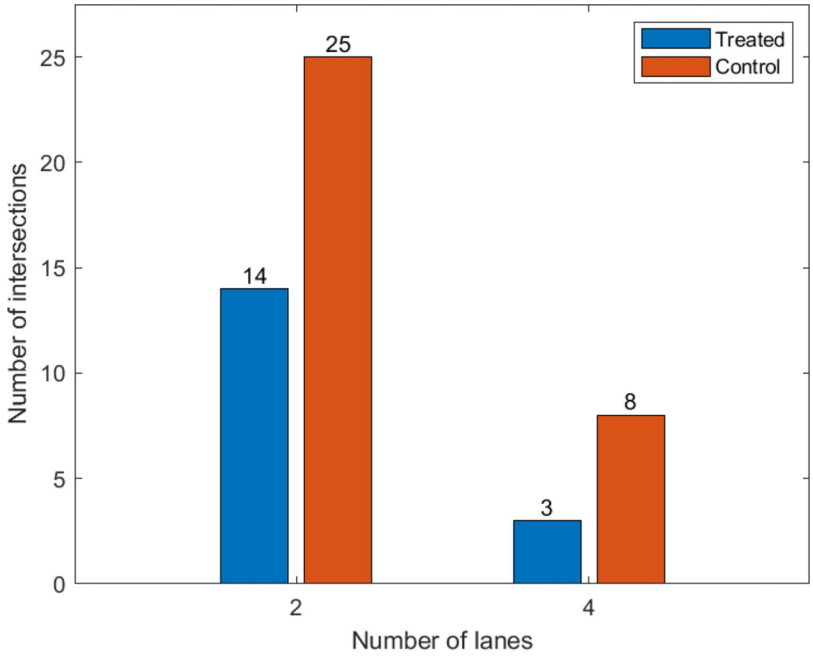


Figure 3.5 Number of through lanes of main road.

TABLE 3.2
Pair intersections without ICWS

ID	Major Rd	Minor Rd	Latitude	Longitude
1b	US 28	US 1	40.29327854	-85.14863525
1c	US 27	East Union City Pike	40.18309102	-84.96955268
1d	US 28	County Rd 600 W	40.29376027	-85.09305495
2b	SR 38	Six Points Rd	40.11496977	-86.17532288
2c	SR 38	Springmill Rd	40.11073712	-86.16576218
2d	SR 38	Oakridge Rd	40.10235653	-86.14672235
3b	US 40	CR 500 E	39.7879482	-85.70796453
3c	US 40	CR 400 E	39.78717979	-85.72695744
3d	US 40	Main St	39.79126877	-85.61267847
4b	US 40	SR 3 E jct	39.80245931	-85.43427411
4c	US 40	S CR 400 W	39.8022163	-85.46150939
4d	US 40	S CR 425 W	39.80228338	-85.47027312
4e	US 40	Pennville Rd	39.81382117	-85.10827261
5b	SR 62/161	CR 650 E	38.0606764	-87.11834512
6b	SR 65	W Baseline Rd	38.12435071	-87.65474453
7b	SR 45	SR 58	38.92042072	-86.75572317
8b	SR 109	CR 500 N	41.23608572	-85.49182829
8c	SR 109	CR 600 N	41.25058106	-85.49171935
9b	SR 26	CR 700 S & S Main St	40.45185688	-85.49379976
10b	SR 60	Old SR 60	38.57864551	-86.05664254
10c	SR 60	Farabee Rd	38.55169441	-86.0389828
11b	SR 60	Wilson Switch Rd	38.44453237	-85.82970238
11c	SR 60	Dean Lake Rd	38.44503118	-85.86422178
12b	SR 46	Upper Schooner Rd	39.15993271	-86.28377848
12c	SR 46	Jackson Creek Rd	39.15759654	-86.33828482
13b	SR 46	N Brummette Creek Rd	39.15171419	-86.38975971
14b	SR 144	N Centenary Rd and N Mann Rd	39.56948617	-86.29012274
14c	SR 267	E Hendricks County Rd	39.63066312	-86.38558578
15b	SR 47	CR 500 E	40.08884766	-86.80985933
15c	SR 47	CR 275 E	40.07258375	-86.85221702
16b	US 41	Evans Ave both W Jct	39.571647	-87.369945
17b	US 41	SR 26	40.4547707	-87.37409438
17c	SR 63	SR 234	39.95225173	-87.45152578

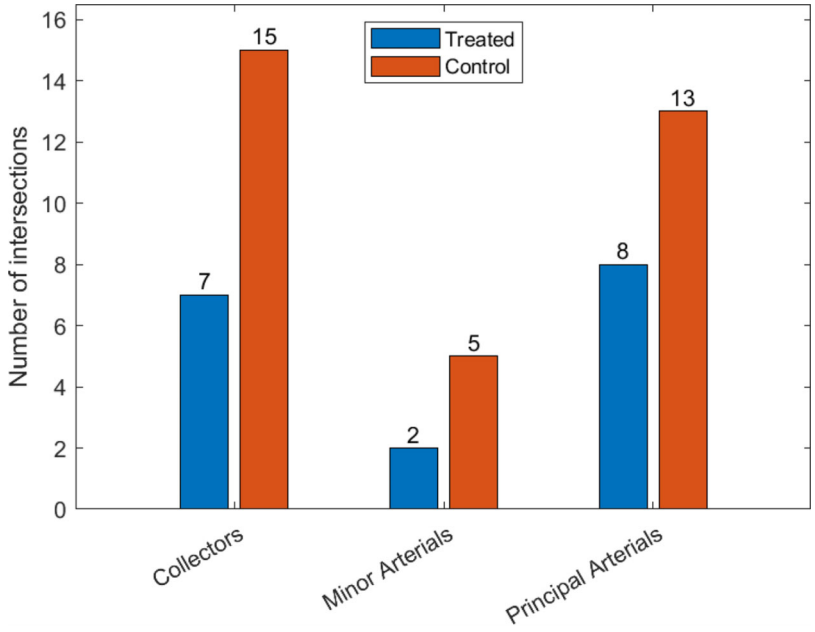


Figure 3.6 Functional class of intersections.

Location Description	Street View Image	Visibility Score
Right-hand segment of SR 38, as seen from Springmill Road southbound approach.		Good
Left-hand segment of US 40, as seen from Cartage Rd northbound approach		Limited
Left-hand segment of SR 38, as seen from Hinkle Rd southbound approach.		Poor

Figure 3.7 Visibility score examples.

Main Road: Treated Intersections

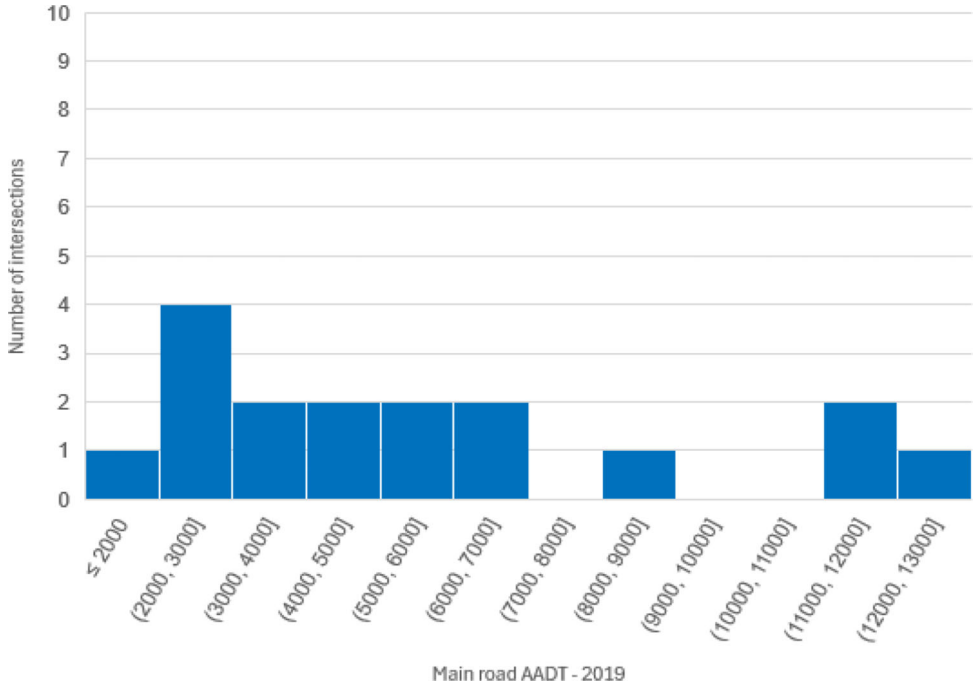


Figure 3.8 Treated intersections: main road, 2019 AADT.

Main Road: Control Intersections

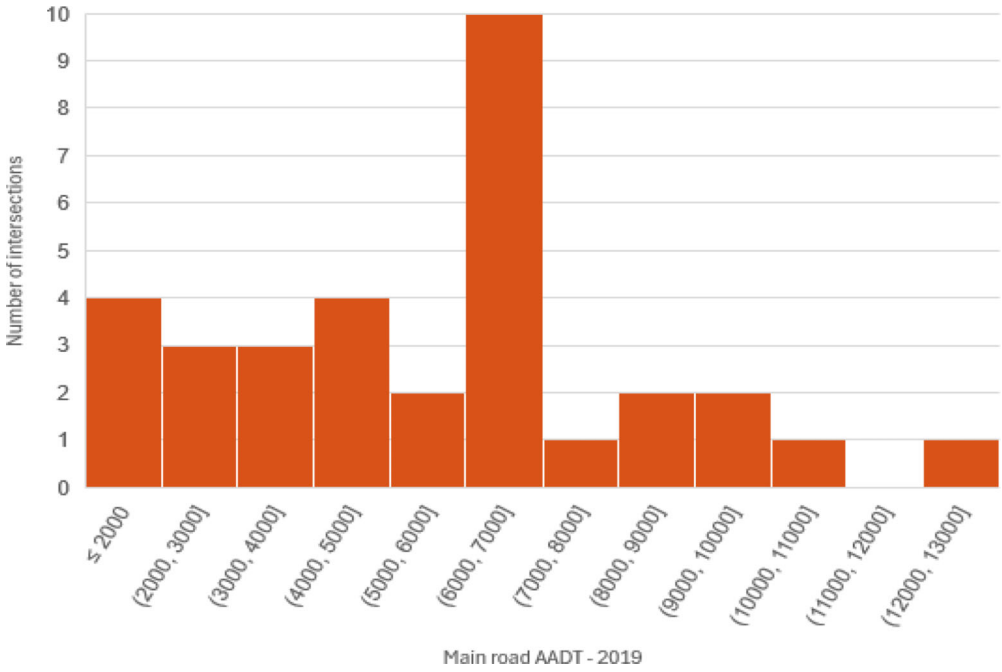


Figure 3.9 Control intersections: main road, 2019 AADT.

Cross Road: Treated Intersections

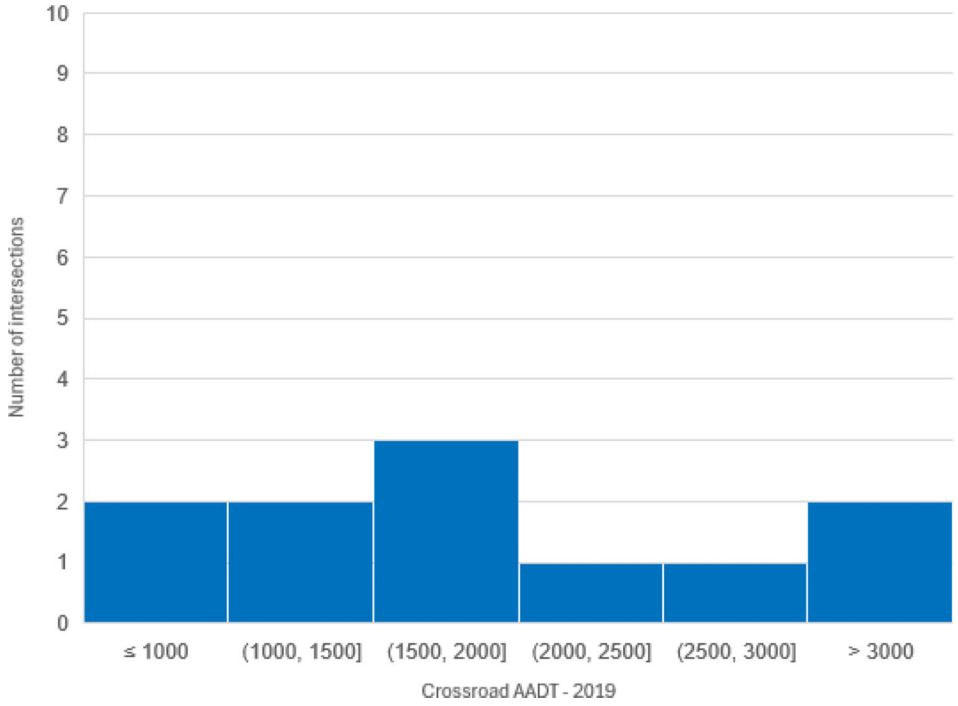


Figure 3.10 Treated intersections: crossroad, 2019 AADT.

Cross Road: Control Intersection

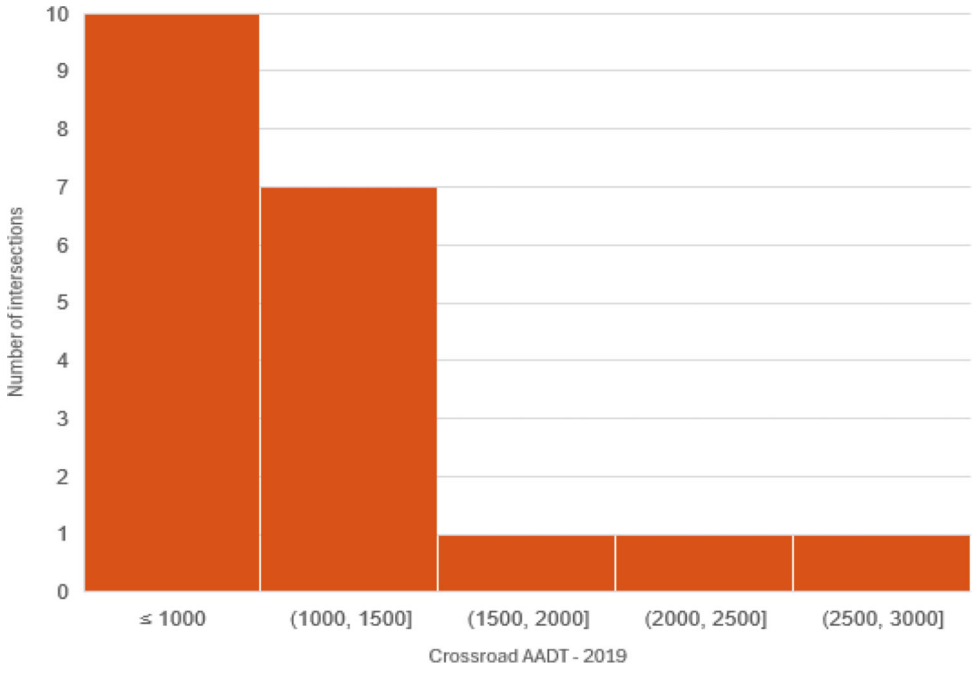


Figure 3.11 Control intersections: crossroad, 2019 AADT.

3.1.3 Descriptive Statistics

The summary statistics of the continuous variables are shown in Table 3.3 and of the discrete variables are shown in Table 3.4.

3.1.4 Crash Data

Crashes from 2015 to 2023 were obtained from the Automated Reporting Information Exchange System (ARIES), which is an electronically updated database of police-reported crashes occurring in Indiana. Using GIS tools, corner-approach crashes belonging to intersections used for this study were extracted. Corner-approach crashes are crashes where one vehicle was approaching the intersection from the major road and another approaching the intersection from the crossroad. Each crash was assigned to an intersection based on its proximity. A summary of the number of crashes by severity at the intersections considered in the study is given in Table 3.5.

The analyzed crashes were separated by year and by location including ICWS and control intersections. The annual corner-approach crashes are shown in

TABLE 3.3
Descriptive statistics: continuous variables

Variable	Mean	Median	Standard Deviation	Min	Max
Number of Through Lanes	3.20	3.00	0.40	3.00	4.00
Number of Legs in the Intersection	3.71	4.00	0.46	3.00	4.00
Posted Speed Limit	50.88	55.00	6.84	35.00	60.00
Visibility Score	1.88	2.00	0.76	1.00	3.00
AADT Main Rd (2015)	5,397	5,368	2,645	1,334	11,841
AADT Crossing Rd (2015)	2,126	1,368	1,787	379	6,738
AADT Main Rd (2016)	5,496	5,436	2,792	1,341	12,656
AADT Crossing Rd (2016)	2,114	1,419	1,727	379	6,346
AADT Main Rd (2017)	5,703	5,409	1,727	379	6,346
AADT Crossing Rd (2017)	1,835	1,142	1,616	285	6,356
AADT Main Rd (2018)	5,677	5,241	2,923	1,394	12,821
AADT Crossing Rd (2018)	1,518	1,135	1,191	207	5,195
AADT Main Rd (2019)	5648	5,241	2,932	1,397	12,898
AADT Crossing Rd (2019)	1,526	1,186	1,198	207	5,221
AADT Main Rd (2020)	5,111	5,241	2,595	1,217	11,206
AADT Crossing Rd (2020)	1,456	1,007	1,128	207	4,835
AADT Main Rd (2021)	5,603	5,241	2,893	1,295	11,849
AADT Crossing Rd (2021)	1,586	1,145	1,261	338	5,261
AADT Main Rd (2022)	5,583	5,702.5	2,732	1,283	12,409
AADT Crossing Rd (2022)	1,667	1,453	1,147	338	5,166
AADT Main Rd (2023)	5,900	5,668.5	2,928	1,330	12,682
AADT Crossing Rd (2023)	1,810	1,380	1,487	338	6,812

TABLE 3.4
Descriptive statistics: discrete variables

Variable		Count	Percent of Observations
Type of Road	Urban	5	9.8
	Rural	45	88.2
Functional Class	Collectors	22	44.0
	Minor arterials	7	14.0
	Principal arterials	21	42.0
	Other arterial	1	2.0
Selected	1 if intersection is selected for ICWS installation	17	34.0
	0 otherwise	33	66.0

TABLE 3.5
Crash statistics

Location	No. of Intersections	KA Crash	BC Crash	PDO Crash	Total
Treated	17	60	33	108	201
Control	33	38	22	67	127

Figure 3.12. The year 2020 was considered separately as it was affected by COVID 19. Most of the ICWS systems were installed in 2021 and thus that year is excluded from the analysis. Thus, there are 8 years of data for each intersection where ICWS systems were installed

3.2 Statistical Modeling

Intersection Conflict Warning Systems are designed to reduce the risk of right-angle crashes at rural intersections. To estimate the effectiveness of these systems, this study collected 9 years of crash data (2015–2023) at 50 intersections. Among these intersections, the ICWS was installed and turned operational at 17 intersections for at least 2 years in 2022 or 2023. Data preparation included extracting crashes where at least two vehicles were involved, and one vehicle was traveling on the main road and the other was approaching the intersection from a crossroad. The annual numbers of these crashes were analyzed by identifying conditions that affected these numbers including the ICWS presence and other factors. Variables used in the final model, not described previously, are shown in Table 3.6.

3.2.1 Crash Frequency Model

A usual and justified statistical assumption for crash counts recorded at various roads is that they follow the Negative Binomial distribution. This assumption was followed in this study. The analyzed crash counts formed sequences of nine annual numbers at each intersection. It is highly plausible that crash counts at the same intersection are influenced by conditions specific for the intersection and different from conditions at other intersections. Because of these unknown effects at the same intersection affecting crash counts for 9 years, there is a common unknown random effect shared by all the nine observations. To account for this heterogeneity problem, a negative binomial model with random effects was applied. This unknown random effect is represented with ID, the same for nine observations at the same intersection and different at different intersections. In fact, this ID can be viewed as an intersection ID. The structure of the model is as follows:

$$\begin{aligned} &CrashNum_i = NegativeBinomial(\mu,\delta) \\ &\mu = \alpha_0 + \alpha_{ID} + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_j X_j \\ &\alpha_{ID} \sim Normal(0,\sigma_{ID}) \\ &\delta = \mu + \rho\mu^2 \end{aligned} \quad \text{(Eq. 3.1)}$$

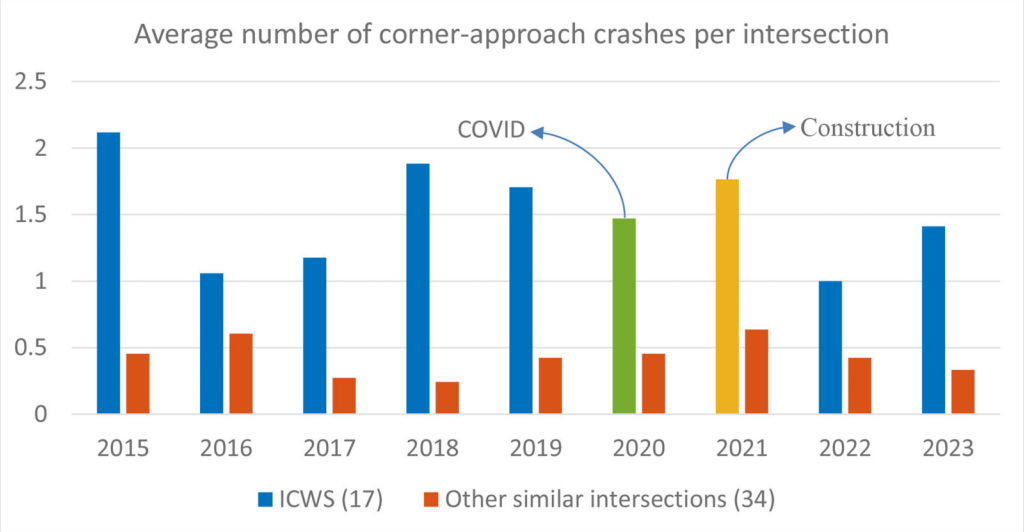


Figure 3.12 Crash per intersection.

TABLE 3.6
Summary statistics of additional variables used in model

Variable		Count	Percent of Observations
ICWS installed	1 if the system is installed and active	34	7.85
	0 otherwise	399	92.15
LowSpLmt_withMedian	1 if the posted speed limit is 45 or less and the main road has a median	18	4.15
	0 otherwise	415	95.85
CR_AADT_missing	1 if crossroad AADT value is missing	176	40.64
	0 otherwise	257	59.36

The model expressed in Equation 3.1 assumes that crash counts are assumed to follow negative binomial distribution. The mean value μ is expected to have linear relationships with explanatory variables (X_1, X_2, … X_j), which include collected traffic volume, intersection geometry and ICWS treatments. Because the proposed model assumed random effects among intersections (differentiated by intersection ID), the model intercept includes an additional term, α_{ID}, which accounts for the unobserved heterogeneity. When the estimated variance of this additional term σ_{ID} is significant, the random effect assumption is validated. The variance value δ is the summation of two terms, mean μ and multiple of square of mean and dispersion parameter ρ. When the dispersion parameter ρ is close to zero, the negative binomial model descends into a Poisson model, when the dispersion parameter ρ is positive and significant, the negative binomial model assumption is confirmed. The input data for crash frequency modeling is shown in Appendix D.

3.2.2 Crash Severity Model

In 2016, the Federal Highway Administration introduced regulations to enhance safety performance reporting requirements. One key requirement was for states to report Suspected Serious Injuries (SSI) using the criteria established in the fourth edition of the Model Minimum Uniform Crash Criteria (MMUCC). Before this rule making, Indiana defined an incapacitating injury based on an officer's observation that a crash victim was transported from the scene for treatment. This definition was acceptable in previous editions of the MMUCC. However, relying solely on this criterion, combined with certain injury types, could lead to potential misinterpretations by officers.

In late 2019, the vendor managing Indiana's crash records system (ARIES) for the Indiana State Police updated the officer's reporting software. This update removed the "Transported from the Scene" designation as a requirement for identifying incapacitating injuries. Instead, officers were required to select from an approved list of injury nature definitions associated with serious injuries for each injured person.

The deployment of the ARIES 6 officer reporting system continued into 2023, with ongoing training until all Indiana law enforcement agencies had installed the new system and were using the updated reporting tool. The transition to ARIES 6 for all Indiana police agencies was expected to be completed by the end of 2023.

As a result of these changes, the criteria for classifying incapacitating injuries before 2020 differed from those used after 2020. Additionally, due to the multi-year deployment and training process for the latest version of ARIES, injuries classified as incapacitating between 2020 and 2023 did not necessarily adhere to consistent criteria.

Due to the change in definitions regarding injury severity, it was decided to use only two severity levels, injury crashes (non-PDO) and property damage only crashes (PDO). It should be stressed that reducing the number of severity levels increases the number of observations in the combined level. This aggregation of observations increases the chance of detecting the effect of the studied ICWS on severity if such an effect indeed exists.

A logistic model is proposed to investigate whether ICWS has significantly different performance for PDO and non-PDO crashes. In the logistic model, each crash is used as one observation and their corresponding ICWS treatment conditions (with ICWS and without ICWS) were introduced into the model as a dummy variable. If this treatment variable was found to be significant, then ICWS has different effectiveness for PDO and non-PDO crashes. Otherwise, it is concluded that ICWS does not change the severity distribution and the estimated crash modification factors from crash frequency analysis can be applied to crashes of all severity levels. The input data for crash severity modeling is shown in Appendix D.

3.2.3 Results and Interpretations

Crash Frequency Model

The estimated crash frequency model (negative binomial with random effect) is shown in Table 3.7.

In the covariance parameter estimates part, the effects of Intercept (ID) are significant with 0.0027 p-value, indicating the correct assumption of random effects among intersections. In the fixed effect's part, several important crash risk factors, traffic volume, three-leg intersection, low speed limit with median cases and the effect of ICWS were identified. A positive estimate is in fixed effects indicate that the corresponding factor will increase the crash risk. Most presented variables are significant; the only insignificant but necessary variable is the binary indicator for missing volume on the crossing road. The indicator of missing AADT variable allowed increasing the number of treated and control intersections in the analysis by adding intersections that did not have AADT information for the crossing road. This addition should not skew the important results while it helps increase the results' significance.

As expected, three traffic volume related variables, logarithm of major road AADT, logarithm of crossing road AADT, and a binary indicator for missing volume on the crossing road, are found to be positive. The effect of major roads (0.9915) is greater than that of crossing roads (0.3442). The estimated effect of crossing road AADT when the data is missing is by average 1.3749.

Three-leg intersections are found to be safer (-1.4689) than common four-leg intersections due to the fewer number of conflict points and simpler traffic situation. Intersections with low-speed limit (posted speed limit of 45 mph or less) on the major road and a median separating the two opposing streams of traffic on the major road are generally safer (-1.356).

TABLE 3.7
Crash frequency model

Covariance Parameter Estimate				
	Estimate	**Std. Error**	**z-value**	**p-value**
Intercept (ID)	0.6118	0.2197	2.79	0.0027
Scale	0.0899	0.0829	1.09	0.1389
Fixed Effects				
Effect	**Estimate**	**Std. Error**	**t-value**	**p-value**
Intercept	-11.5862	2.4796	-4.67	<.0001
log(R_AADT)	0.9915	0.2645	3.75	0.0002
log(CR_AADT)	0.3442	0.2288	1.5	0.1332
CR_AADT_missing	1.3749	1.6868	0.82	0.4155
Three_leg	-1.4689	0.4169	-3.52	0.0005
LowSpdLmt_withMedian	-1.356	0.7178	-1.89	0.0597
Selected	1.4946	0.3109	4.81	<.0001
ICWS_installed	-5.4297	3.036	-1.79	0.0745
logMR_AADT * ICWS_installed	0.5947	0.3488	1.7	0.0891

The variable *Selected* represents whether the intersection was chosen to install ICWS. This variable helps estimate the potential selection bias caused by non-random selection of intersections for treatment. This bias is caused by the correct safety management policy of prioritizing intersections with a large number of crashes. It means that the intersections selected for treatment tend to be "caught" when they have by chance a number of crashes larger than usual. Fortunately, this bias can be detected in statistical analysis by using the control group of intersections without the treatment and the results properly adjusted. In the case presented here, the variable representing bias is equal to 1.495 and it is significant.

Another important variable in the model is the effect of traffic volume on the crash reduction after installation of the ICWS system. It was postulated by the SAC members that the growing volume on the major road may have a detrimental effect on the ICWS effectiveness due to frequent activation of the warnings that may at some point, at least hypothetically, be nearly continuous. Even before that rather extreme condition, some drivers may become insusceptible to the warnings, particularly on the crossing road. To test the effect of major road traffic volume on the system safety effect, an interaction between the major volume and the presence of the system was introduced.

The most critical variables that reflect the effectiveness of ICWS are *ICWS_installed* and *logMR_AADT* ICWS_installed*. These two variables determine the performance of ICWS together. Because the estimate of *ICWS_installed* (-5.4297) is negative and the estimate of *logMR_AADT*ICWS_installed* (0.5947) is positive, it is inferred that ICWS decreases the crash risk while its effectiveness is diminishing as the AADT of the major road increase. This second effect confirms the "eroding" effect of the main road volume on the system effectives.

Crash modification factors for the ICWS system are calculated based on the expected number of crashes with and without the system estimated with the negative binomial crash frequency model (Table 3.7). The following equation is used to calculate the sample crash modification factor:

$$CMF = \frac{Expected\ Crashes\ with\ ICWS}{Expected\ Crashes\ without\ ICWS} \quad \text{(Eq. 3.2)}$$

The denominator is obtained by setting the model variable *ICWS_installed* to zero and the numerator is obtained by setting the same model variable to one. Once the terms common to both the numerator and denominator are cancelled out and removed, the obtain CMF equation is:

$$CMF = \exp(-5.4297 + 0.5947 * \log MR\_AADT)$$

$$CMF = 4.384 \cdot 10^{-3} \cdot MR\_AADT^{0.5947} \quad \text{(Eq. 3.3)}$$

The above equation indicates that as the AADT of the major road increases, the expected sample crash modification factor increases (the system becomes less effective). This result produces the CMF dependance on the major road traffic volume. Specifically, the effectiveness of the evaluated system tends to diminish in the study sample with the increase of traffic volume on the major road. This trend is presented in (Figure 3.13) by comparing the individual CMF estimated at the 17 intersections studied to the corresponding majorroad volumes. The blank circles represent the individual intersection CMFs calculated as the ratio of annual crash counts after installation to annual crash counts before installation. For intersections with zero crashes before the system installation, the ratios were unspecified and represented by blanks. The estimable CMFs vary between 0 to 1.7 due to the randomness of crashes. The triangles represent the CMF derived from

the crash estimation model presented in Equation 3.3. These numbers, in general, follow the trend of individual CMF values, but with the random variability observed at the studied intersections removed. This trend is applicable to Indiana intersections. According to the model estimates, the expected CMF approaches the value of one at intersections with the major road AADT equals 9,000 veh/day. It is greater than one for higher AADT values. This result indicates that, on average, the studied system might not reduce crashes at intersections with busy major roads. Table 3.8 presents the characteristics of the 17 intersections used in the study together with the calculated CMFs.

The average CMF calculated based on the total number of annual crashes before and after installing the system at the 17 studied intersections is 0.77. Using this value and ignoring the weakening effect of the major road AADT on the system effectiveness would promote incorrect application of the system at high-volume roads.

Crash Severity Model

The results of the logistic model for crash severity are shown in Table 3.9. It is seen that both *ICWS_installed* and *Selected* variables are not statistically significant. This implies that ICWS does not influence the distribution of severity of crashes. Therefore, the crash modification factor obtained from crash frequency analysis described above can be used for crashes of all severity levels.

The result is not surprising. The field observations of drivers' behavior on the major road indicated only a slight reduction in their speed when passing the intersection (1–2 mi/h at average initial speed of 50 mi/hour). Given the nature of right-angle collisions and the lack of any considerable reduction in speed on the major road, the drivers who make a mistake and expose themselves to the right-angle collision impact are not protected in any way during the collision and neither are able to offset the impact.

Furthermore, the selection bias mentioned when discussing the ICWS effect on crash frequency, is not expected to be present in the severity effect analysis. The severity model reflects this with the variable *Selected* being statistically insignificant. The final severity model without the insignificant variables is shown in Table 3.10.

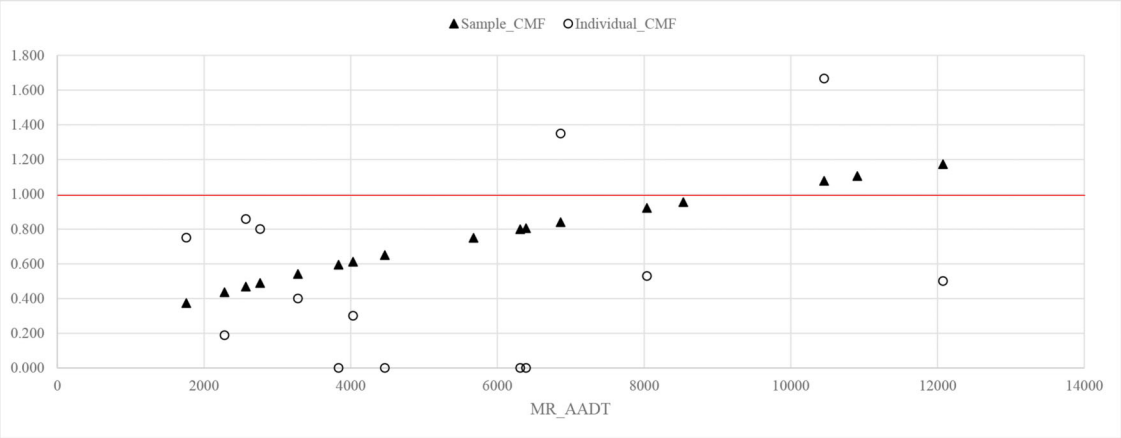


Figure 3.13 Sample CMF and individual CMF vs. main road AADT.

TABLE 3.8
CMF estimated with crashes and sample CMF calculations

ID	Three Leg Intersection	Low Speed Limit on Divided Major Road	MR_ AADT	Log MR_ AADT	CR_ AADT	Log CR_ AADT	CR AADT Missing	Annual Crash Count Without ICWS	Annual Crash Count with ICWS	Crash-Count Based CMF	Expected Crashes Without ICWS	Expected Crashes with ICWS	Model-Based CMF
1	0	0	3,283	8.10	1,627	7.39	0	2.50	1.00	0.40	1.62	0.88	0.54
2	0	0	10,454	9.25	1,271	7.15	0	3.00	5.00	1.67	4.69	5.05	1.08
3	0	0	6,864	8.83	2,216	7.70	0	3.33	4.50	1.35	3.74	3.14	0.84
4	0	1	5,677	8.64	4,802	8.48	0	0.00	1.50	–	1.04	0.78	0.75
5	0	0	1,762	7.47	801	6.69	0	0.67	0.50	0.75	0.68	0.26	0.37
6	0	0	2,767	7.93	1,549	7.35	0	2.50	2.00	0.80	1.34	0.66	0.49
7	1	0	3,837	8.25	2,379	7.77	0	1.00	0.00	0.00	0.50	0.29	0.59
8	0	0	4,467	8.40	0	0.00	1	0.17	0.00	0.00	0.68	0.44	0.65
9	0	0	2,573	7.85	1,037	6.94	0	1.17	1.00	0.86	1.09	0.51	0.47
10	1	0	8,536	9.05	0	0.00	1	0.00	0.00	–	0.30	0.28	0.95
11	1	0	10,907	9.30	0	0.00	1	0.00	0.00	–	0.38	0.42	1.10
12	1	0	6,392	8.76	0	0.00	1	0.17	0.00	0.00	0.22	0.18	0.80
13	1	0	6,313	8.75	0	0.00	1	0.17	0.00	0.00	0.22	0.18	0.80
14	0	0	12,076	9.40	0	0.00	1	2.00	1.00	0.50	1.83	2.14	1.17
15	0	0	2,281	7.73	1,167	7.06	0	2.67	0.50	0.19	1.01	0.44	0.44
16	1	0	8,041	8.99	2,103	7.65	0	5.67	3.00	0.53	0.99	0.91	0.92
17	0	0	4,033	8.30	1,629	7.40	0	1.67	0.50	0.30	1.99	1.21	0.61

TABLE 3.9
Crash severity model with *selected* and *ICWS_installed*

Effect	Estimate	Std Err	Wald Chi-Square	p-value
Intercept	0.648	0.373	3.02	0.0821
CR_local	0.708	0.305	5.39	0.0202
MR_Median_Type_Grass	0.240	0.139	2.98	0.0841
Selected	-0.114	0.261	0.19	0.662
ICWS_installed	0.155	0.375	0.17	0.6789

TABLE 3.10
Final crash severity model

Effect	Estimate	Std Err	Wald Chi-Square	p-value
Intercept	0.648	0.373	3.02	0.0821
CR_local	0.708	0.305	5.39	0.0202
MR_Median_Type_Grass	0.240	0.139	2.98	0.0841

4. FIELD OBSERVATIONS

4.1 Measurement Equipment

Traffic Scanner (TScan) is an innovative fully automated trailer-based data collection system for acquisition of microscopic traffic measurements (Figure 4.1). TScan was developed by Center for Road Safety (CRS) at Purdue with funding from INDOT through the Joint Transportation Research Program (Bandura et al., 2021; Tarko et al., 2016, 2023).

TScan uses Light Detection and Ranging (LiDAR) technology with 3-dimensional laser scanning unit complemented with a camera for data collection. TScan LiDARs perform a 360 degree scan every 0.1 seconds. TScan is capable of tracking all types of road users namely pedestrians, bicyclists, cars, trucks and classifying them with high accuracy (Bandura et al., 2021; Tarko et al., 2016). The effective range of the TScan version used for this study is 250 ft for vehicles. The results of tracking include information such as position, velocity, acceleration and orientation of each road user, every 0.1 second in addition to properties such as dimension, origin and destination.

4.2 Field Observations Setup

TScan was used to collect data at two different locations. The first location was at the intersection of SR 47 and CR 625 E in Darlington, Indiana. Data was collected on June 22nd, 2023 (Figure 4.2). The summary of traffic counts by turning movements over the observed 11-hour period is shown in Table 4.1 along with the average and 85th percentile vehicle speeds.

The second location was the intersection of US 41 and Evans Ave east junction located 6.18 miles south of SR 163 (Figure 4.3). This location was advantageous for a data collection effort point of view, since there were two intersections adjacent to each other that could be observed simultaneously by TScan. The east intersection had the ICWS system installed whereas the west intersection does not. The major road passing through the west intersection had US 41 southbound and Clinton St, northbound whereas the major road passing through the east intersection was US 41 northbound. Therefore, these two intersections are not identical in terms of traffic flow, nevertheless, the fact that US 41 passes through both allows us to compare the two intersections within certain considerations for the purposes of this study.

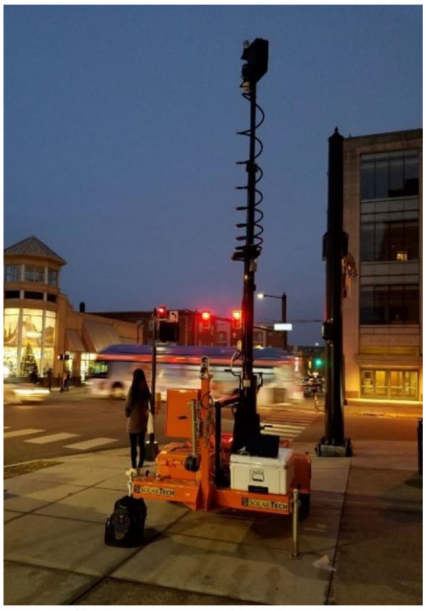
Data was collected for 3 days for several hours each. Summary of data collection effort is shown in Table 4.2. On September 18th, 2024, the intersection conflict warning system was found to be offline situation that gives the opportunity to capture traffic interactions at the intersection with and without the ICWS in service and to compare drivers' behavior in order to understand the impact of the system at the same location.

4.3 Results

ICWS systems installed in Indiana warn the vehicles on the major road about the presence of a vehicle at the stop line on a crossroad. This warning alerts drivers on the major road and prepares the drivers to take defensive action such as slowing down or braking, if needed. By analyzing the speed of the vehicles on the major road with and without a vehicle present on the crossroad, it is possible to quantify the impact if the ICWS on driver's behavior.

ICWS systems also warn vehicles at the crossroads about oncoming traffic on the major road. This warning provides additional information to stopped vehicles on the crossroads and helps them safely navigate the intersection.

(a) TScan head unit containing



(b) TScan trailer in the field

Figure 4.1 TScan machine.

4.3.1 Speed Analysis

The speed of the vehicles on the major road while passing through the intersection could be affected by whether the user saw the flashing light of ICWS system. For this analysis, only vehicles on the major road that are not in a car following scenario when approaching the intersection and going straight through the intersection were considered.

Depending on when the flashing lights were flashing and the actions taken by the crossroad vehicle, the following scenarios are possible.

A. *Lights not flashing, no crossroad vehicle:* The lights on the major road were *not flashing* when the major road passed them and *no crossroad vehicle* was at the stop line, until the vehicle on the major road reached the intersection area.
B. *Lights not flashing, crossroad vehicle stationary:* The lights on the major road were *not flashing* when the major road passed them, and a *crossroad vehicle appeared* at the stop line before the major road vehicle reached the intersection area. Further the crossroad vehicle *stayed at the stop line* until the major road vehicle passed it.
C. *Lights not flashing, crossroad vehicle moved:* The lights on the major road were *not flashing* when the major road passed them, and a *crossroad vehicle appeared* at the stop line and entered the intersection before the major road vehicle reached the intersection area.
D. *Lights flashing, crossroad vehicle stationary:* The lights on the major road were *flashing* when the major road passed it and the crossroad vehicle that triggered it *continued to wait* until the vehicle on the major road passed through the intersection area.
E. *Lights flashing, crossroad vehicle moved:* The lights on the major road were *flashing* when the major road passed it and the crossroad vehicle that triggered them *entered the intersection area* before the vehicle on the major road arrives.

Table 4.3 shows a summary of data collected at the intersection of SR 47 and CR 625 E. In the data recorded, there were no interactions that fit the description of scenario C and hence it is not shown in the plot. This is understandable as it takes the vehicle on the major road travelling at the speed limit approximately 5 seconds to travel from the flashing lights post to the intersection. That is a short amount of time for the crossroad vehicle to come to a complete stop and then perform the desired maneuver.

Figure 4.4 shows the box plot of speed of vehicles on SR 47 measured as the vehicle enters the field of view of TScan before they entered the intersection area (entry speed), for each of the scenarios described previously. There is a small noticeable pattern in these box plots. The two scenarios where the lights were not flashing at the time the vehicle on the major road passed it (scenarios A and B), had the highest median (50th percentile) speeds. The two scenarios where the lights were flashing at the time the vehicle on the major road passed it, scenarios D and E had lower speeds than A and B.

Figure 4.5 shows the box plot of speed of vehicles on SR 47 measured while they were passing through the intersection area, for the same set of scenarios. The intersection speeds follow the same pattern as entry speeds (Figure 4.4). Vehicles in scenario A and B had higher median (50th percentile) speeds than vehicles in scenario D and E. Though these differences in intersections speeds were statistically significant, the magnitude of the difference is less than three miles per hour. Such a low magnitude will have a negligible effect on the severity outcome of crashes.

(a) Google Maps image of the intersection

(b) Google Maps Street View image of the site where TScan unit was installed

Figure 4.2 Intersection of SR 47 and CR 625 E in Darlington, IN.

TABLE 4.1
Traffic counts at the intersection of SR 47 and CR 625 E

Maneuver	NT	NR	NL	ST	SL	SR	EL	ER	ET	WL	WT
Count	319	126	53	73	94	162	135	83	382	50	632
85th Percentile Speed (mph)	15.4	17.6	15.4	14.8	13.4	16.8	19.0	15.7	55.8	22.5	57.6
Avg Speed (mph)	13.1	15.8	13.7	12.8	11.9	15.0	16.5	14.2	47.5	18.3	51.6

Scenario E has the lowest speeds among the four scenarios for both entry speeds and intersection speeds. This is because the main road vehicle, which was in a free flow state, enters car-following mode, due to the crossroad vehicle entering the intersection first.

Another possible metric to measure the impact of ICWS is the difference between speed deltas (difference between speed at entry and speed at intersection). Two sample t-tests were performed to ascertain if there was a statistically significant difference in speed deltas between any pair of scenarios. The test results (shown in Table 4.4) show that there is no statistically significant difference in speed deltas between scenarios.

4.3.2 Post Encroachment Time Analysis

Post encroachment time (PET) measures the time interval between when one vehicle leaves a potential collision point and when another vehicle arrives at that same point (Figure 4.6). It helps assess the risk of

conflicts between vehicles by indicating how close they come to colliding without doing so.

The ideal methodology for assessing the impact of a safety intervention, such as an intersection conflict warning system (ICWS), is a controlled *before-and-after* analysis. This approach enables researchers to directly measure changes in safety performance by comparing the distribution of PET values before and after the intervention's implementation. However, in this study, a traditional *before-and-after* analysis was not feasible, as the ICWS systems had already been installed and operational prior to the commencement of the research effort.

At a Terre Haute intersection, two comparisons were made. (1) using a nearby intersections with certain commonality in traffic, and (2) using the studied intersections with the system On and Off switch removes the uncertainties regarding the geometry effect on the observations.

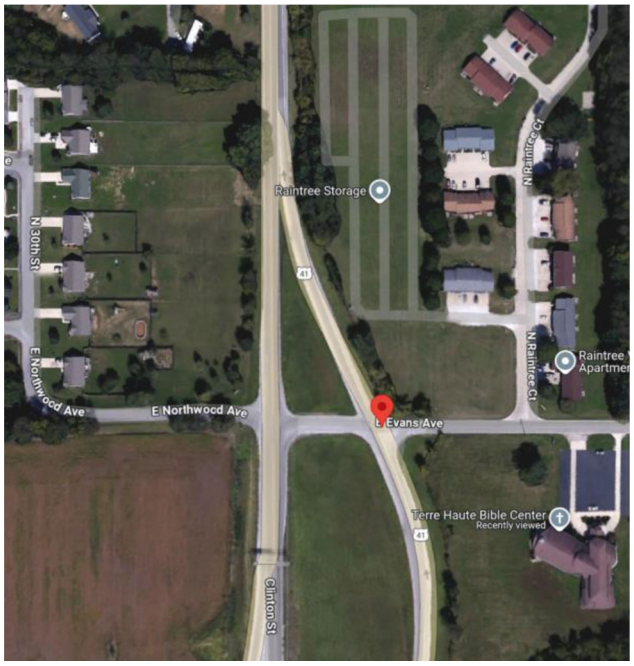


Figure 4.3 Intersection of US 41 and Evans Ave, north of Terre Haute, IN.

TABLE 4.2
Traffic counts at the intersection of US 41 and Evans Ave

Date	Hours	Weather	ICWS Status
August 19, 2023	6	63°F–83°F, Clear	Online
September 18, 2024	7	69°F–90°F, Clear	Offline
October 25, 2024	7.5	62°F–73°F, Clear	Online

4.3.2.1 Control intersection comparison. In the first case, since US 41 northbound and southbound segments split from each other and two intersections namely, intersection of northbound US 41 and Evans Avenue (with ICWS installed) and intersection of East Northwood Avenue with southbound US 41 (without ICWS system) were used. Comparing these two intersections is better than comparing two different intersections along the same major road but different crossroads. Data collected using TScan on August 19, 2023, was used for this comparison. The recorded trajectories were analyzed and right-angle interactions at both intersections with PET values of less than 5 seconds were extracted.

The geometry and traffic flow pattern of the two intersections are not identical. Therefore, only the following interactions were considered for comparison (Figure 4.7).

- For the west intersection without ICWS system (control intersections), the following two right angled interactions were considered.
  - Southbound through with eastbound through.
  - Northbound through with westbound through.
- For the east intersection with ICWS system (treated intersection).
  - Northbound through with westbound through.

Due to different traffic volumes at the two intersections, instead of comparing the total number of interactions with a PET value below a certain threshold, the cumulative distribution of PET values for interactions with a PET value is used less than the threshold. For this study, a threshold of 5 seconds is used. The interactions can be classified into two groups based on whether the vehicle on the main road or the vehicle from the crossroad entered the conflict area first.

Figure 4.8 shows the cumulative distribution of PET values less than 5 seconds for the case where the main road vehicle enters the conflict area first. There were 70 interactions recorded at the treated intersection, and the corresponding number was 89 at the control intersection. The graph shows that, in the presence of ICWS system, there is a slight increase in PET values indicated by the fact that the blue curve is present to the left of

TABLE 4.3
Summary statistics for each scenario

Scenario	Number of Interactions	Median Speed at Entry (mph)	Median Speed at Intersection (mph)
Lights not flashing, no crossroad vehicle	74	53.0655	53.8734
Lights not flashing, crossroad vehicle stationary	457	52.2851	52.7836
Lights not flashing, crossroad vehicle moved	0	–	–
Lights flashing, crossroad vehicle stationary	81	50.9482	51.702
Lights flashing, crossroad vehicle moved	88	50.4925	50.9691

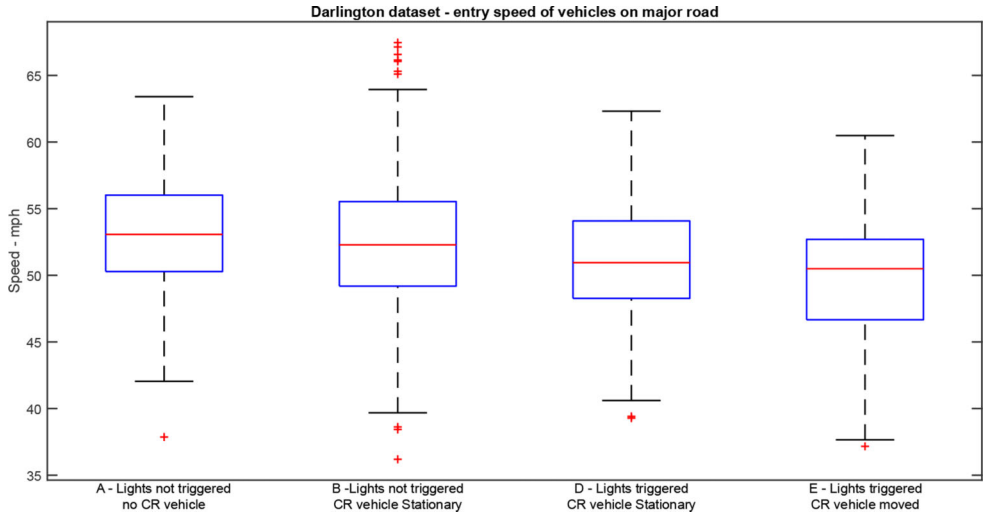


Figure 4.4 Box plot vehicle speeds on SR 47 before entering intersection in Darlington, IN.

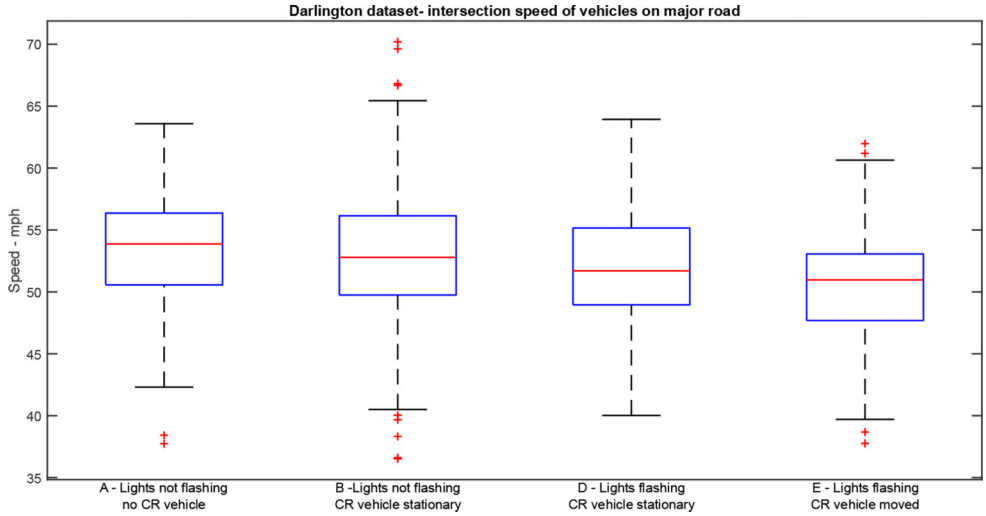


Figure 4.5 Box plot of vehicle speeds on SR 47 when passing through an intersection in Darlington, IN.

TABLE 4.4
Two sample t-test for comparing mean speed deltas across scenarios

Scenario 1	Scenario 2	p-value	Test Result
Lights not triggered, no crossroad vehicle	Lights not triggered, crossroad vehicle stationary	0.2065	No difference in delta
Lights not triggered, no crossroad vehicle	Lights triggered, crossroad vehicle stationary	0.1456	No difference in delta
Lights not triggered, no crossroad vehicle	Lights triggered, crossroad vehicle moved	0.3369	No difference in delta
Lights not triggered, crossroad vehicle stationary	Lights triggered, crossroad vehicle stationary	0.1102	No difference in delta
Lights not triggered, crossroad vehicle stationary	Lights triggered, crossroad vehicle moved	0.7799	No difference in delta
Lights triggered, crossroad vehicle stationary	Lights triggered, crossroad vehicle moved	0.1001	No difference in delta

the red curve. A two-sample t-test showed that there was no difference between the mean PET values of the two sets of data. Furthermore, the Kolmogorov-Smirnov test and the Mann-Whitney U test (also known as Wilcoxon rank sum test) showed that there was no statistically significant difference between the two distributions. Thus, it can be concluded that the presence of ICWS system had no effect on the distribution of PET values in the interactions where the vehicle on the major road enters the intersection area first.

Similar tests were conducted for the case where the crossroad vehicle enters the intersection first and the major road vehicle was in a free flow state. There were 38 right-angle interactions at the treated intersection and 37 interactions at the control intersection.

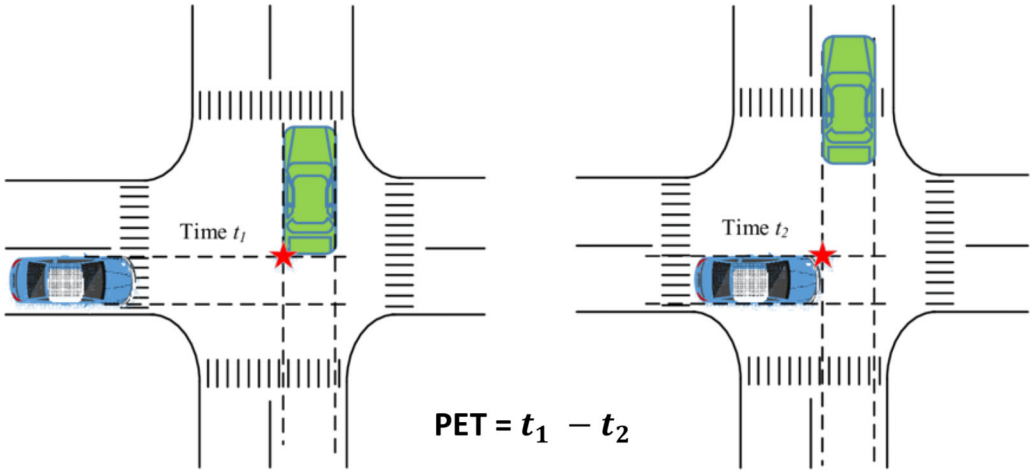


Figure 4.6 Illustration of post encroachment time (Lyu et al., 2021).

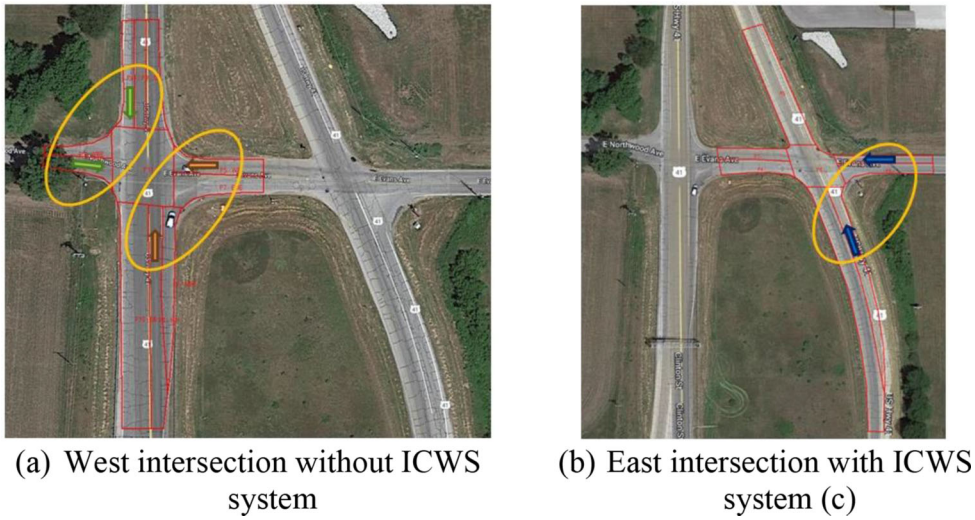


Figure 4.7 Comparison of interactions at the two intersections on US 41.

The cumulative distribution of PET values obtained at the treated (blue) and control (red) intersections are shown in Figure 4.9. Two different statistical tests, namely Kolmogorov-Smirnov test and Mann-Whitney U test were used to test the hypothesis that the two distributions are different from one another. Both the tests rejected the hypothesis at a significance level of 0.05, indicating that there was no statistically significant difference between the two distributions.

4.3.2.2 Same intersection comparison system on and off. Figure 4.10 shows the distribution of PET values with the system not in working condition versus system being in a working condition for the case of right-angle interactions shown in Figure 4.7b with the main road vehicle entering the intersection area first. Figure 4.11 is the corresponding figure for the case where crossroad vehicle enters first. In both cases, the Kolmogorov-Smirnov test and Mann Whitney U test showed that there is no statistical difference between the two distributions.

Critical interactions, those with PET values less than 2 seconds, are more closely related to crashes (Tarko, 2020). Due to the random nature of traffic interactions and relatively low volumes on the crossroads, very few such critical interactions were present in the data. In order to gather sufficient number of interactions to make a statistically sound comparison, a much longer data collection effort in the order of 3 weeks or more would be needed. Such an effort was beyond the scope and budget of this project.

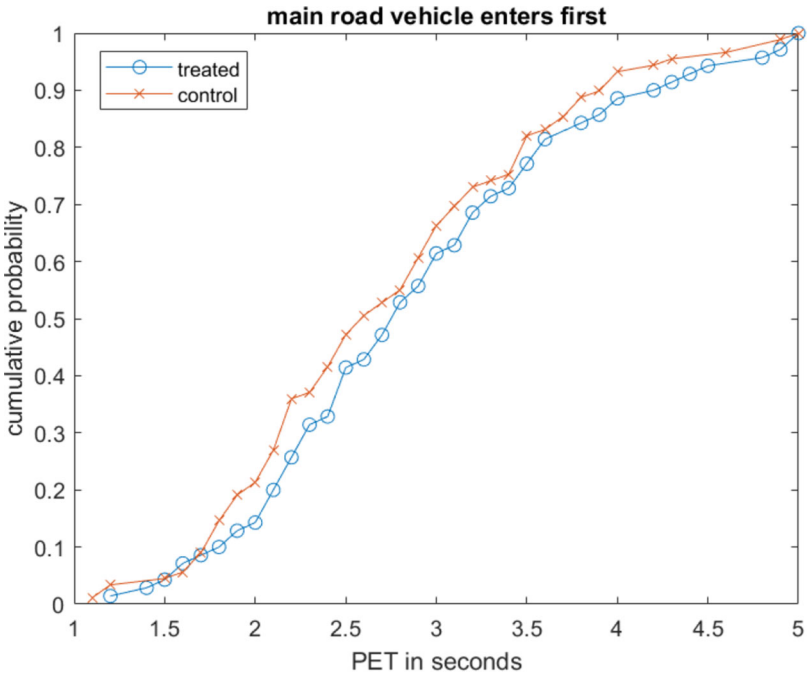


Figure 4.8 Treated vs. control: cumulative distribution of PET values with main road vehicles entering first.

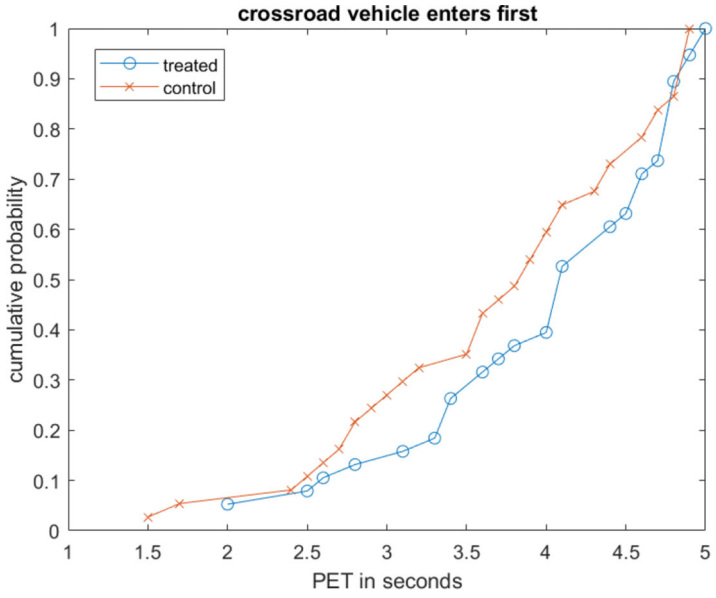


Figure 4.9 Treated vs. control: cumulative distribution of PET values with crossroad vehicles entering first.

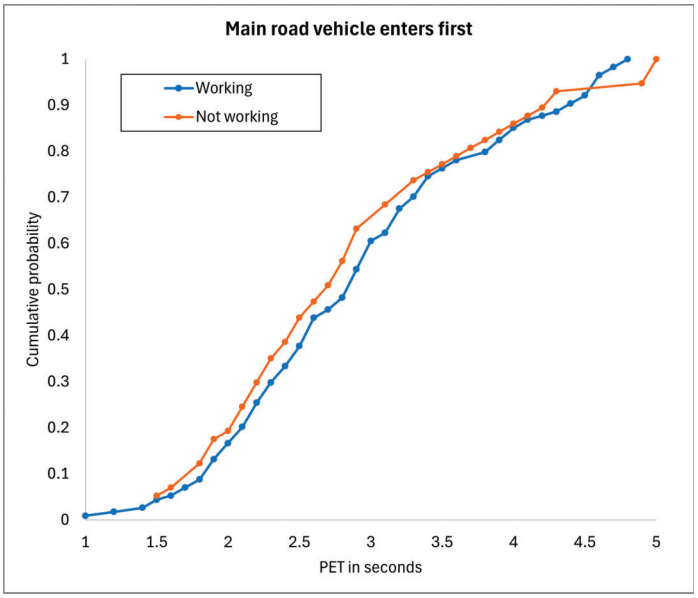


Figure 4.10 ICWS system working vs. not working cumulative distribution of PET values with main road vehicles entering first.

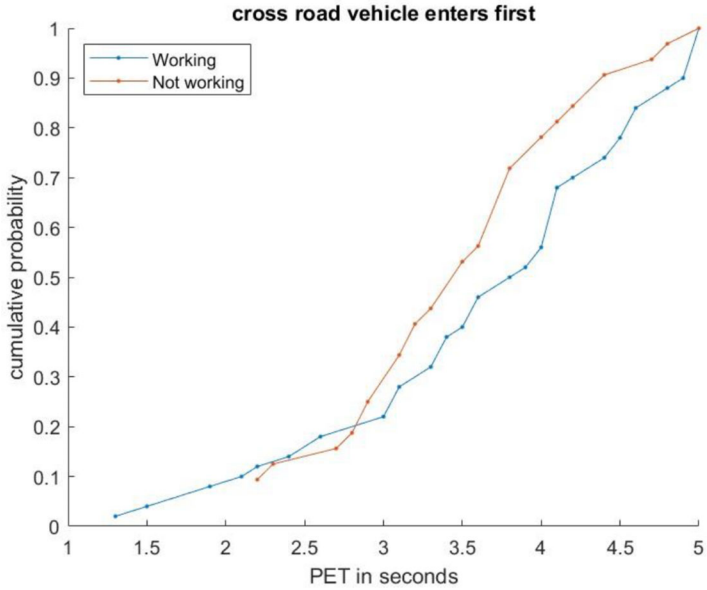


Figure 4.11 ICWS system working vs. not working cumulative distribution of PET values with crossroad vehicles entering first.

5. IMPLEMENTATION

5.1 Crash Frequency

The statistical analysis presented in Section 3 confirmed the crash reduction at the rural TWSC intersections where the ICWS was installed. Another important finding was that this safety benefit tends to be smaller at intersections with high AADT on the major road (Figure 5.1). It is presumed that this trend is caused by the growing frequency of warnings that may make drivers waiting for a gap, impatient and prone to ignoring the warnings.

The CMFs are estimated based on the model fit to the entire sample while at the high end only three locations had their major road AADTs higher than 9,000 veh/day. Thus, the part of the trend beyond this point is not as trustworthy as the part for lower AADTs. It is marked with a dashed line. The recommended CMF factor applicable to the major road AADT between 2,000 and 9,000 vehicles per day can be calculated as follows.

$$CMF = 4.41 \cdot 10^{-3} \cdot AADT^{0.595}$$

5.2 Crash Severity

The analysis of crash severity in relation to the presence of ICWS did not confirm that the crash reduction varies with the crash severity. It means that the same CMF should be used for each crash severity level if the cost of saved crashes is to be estimated in the benefit-cost analysis. Nevertheless, the benefit-cost analysis is recommended to estimate the annual monetary savings by the system to compare it to the annualized cost of the system installation and operation.

5.2.1 Benefit-Cost Analysis

Determining the AADT threshold for ICWS installation may be guided by a benefit-cost (B-C) analysis rather than relying on fixed values, such as the mentioned 9,000 vehicles per day (the value at which CMF approximately 1). The B-C analysis would evaluate the costs of installation and maintenance (obtained from engineering practice) against the anticipated safety benefits (calculated using the estimated crash reduction factors) achieved by the system. By balancing these factors, the threshold can be tailored to ensure maximum safety benefits and cost efficiency. This approach enables transportation planners to identify locations where ICWS will deliver the most value. The threshold major road AADT is expected to be lower than the postulated above breakpoint volume of 9,000 veh/day. An example benefit cost calculation is shown later in this chapter.

RoadHat economic analysis is designed to calculate the annualized costs and benefits of a project or countermeasure, assuming they extend "to infinity." This means it treats costs and benefits as if they will last indefinitely or for an extended period. In contrast, ICWS has a changing CMF that loses effectiveness as traffic volume increases. Over time, the CMF approaches one. This decline means the ICWS countermeasure has a finite time limit; beyond that point, it no longer provides safety improvements compared to the baseline.

Instead of planning for continuous renewal to project its benefits "to infinity," ICWS should be treated as a one-time investment that will not be renewed or replaced after it loses effectiveness.

These differences highlight a conflict between the assumptions of RoadHat analysis and the character-

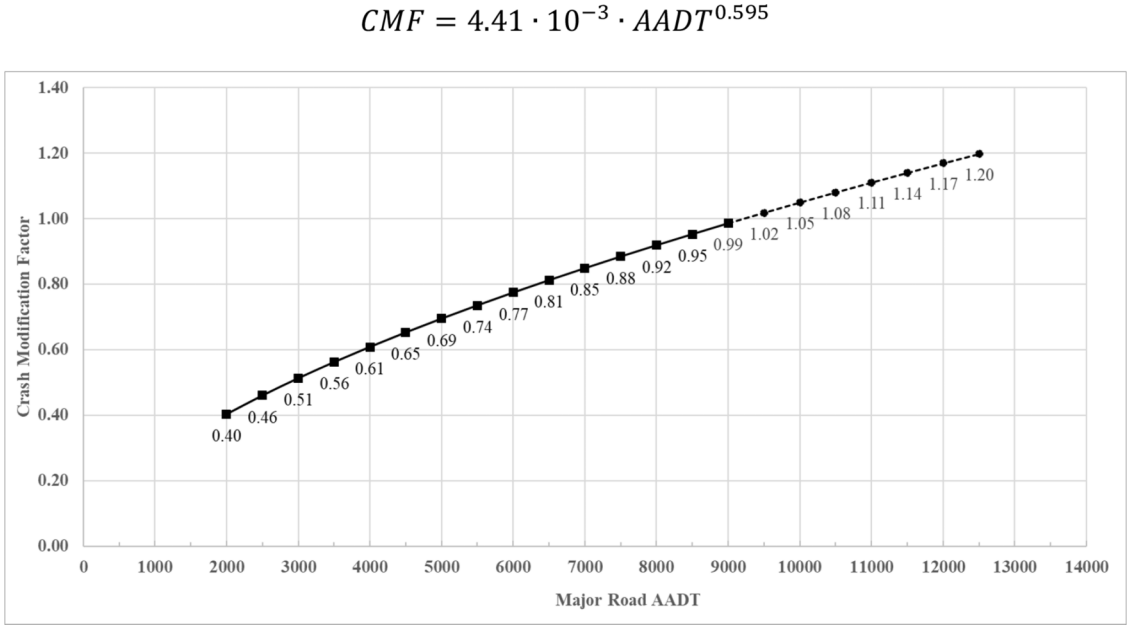


Figure 5.1 Crash modification factors (all crashes) dependent on the major road AADT.

istics of ICWS. RoadHat does not account for the finite time limit or diminishing effectiveness of the countermeasure, making it necessary to adopt an alternative approach.

The following section provides an example of a benefit-cost analysis to support the installation of an ICWS at a rural four-leg intersection.

5.2.2 Benefit-Cost Analysis Example

A rural four-leg intersection of an Indiana four-lane divided road, and a two-lane county road was selected for the analysis. The median is 30 ft wide with an opening at the considered interstation. The intersection includes auxiliary single left-turning lanes on both approaches of the state road. The state road has a posted speed limit of 45 mph. The minor road functional class is collector. The traffic and safety data apply to the 5 years before the year considered for installing the ICWS. The average AADT over the 5 years for the major road was 6,990 veh/day and for the minor road it was 2,300 veh/day. The intersection experienced a number of crashes during the 5 years analyzed. Seventy-five percent of these crashes occurred between vehicles entering the intersection from the major and vehicles entering from the crossing road. Only crashes that arise from such vehicle-vehicle corner interactions are reduced by the considered improvement. Intersection crashes arising from vehicle-vehicle corner interactions are summarized in Table 5.1 by severity level.

The installation cost of the ICWS is $75,000 with the annual maintenance cost expected to be $2,000. The system is assumed to be installed in 2024. The costs of crashes by severity in 2022, are given in Table 5.2 (Romero, Bandaru, & Tarko, 2024).

The annual traffic growth rate is 2%. The interest rate is at 4% and the inflation rate is at 2%.

5.2.3 Calculations

Assume that the installation year is 2024. The service life of the treatment for the purposes of the calculations starts in 2025. AADT for the year 2025 is obtained by increasing the 2024 AADT by the growth rate (R).

TABLE 5.1
Corner approach crash counts during the 5 years prior to ICWS installation

Crash Severity	PDO	B-C	KA
Crash Count	6	4	8

TABLE 5.2
Cost of crashes by severity in 2022 ($1,000)

	PDO	B-C	KA
Crash Cost	46.50	295.00	3,090.10

$$AADT_n = AADT_{n-1} \cdot \left(1 + \frac{R}{100}\right)$$

$$AADT_{maj_{2025}} = 6{,}990 \cdot \left(1 + \frac{2}{100}\right) = 7{,}129.8 \qquad \text{(Eq. 5.1)}$$

$$AADT_{min_{2025}} = 2{,}300 \cdot \left(1 + \frac{2}{100}\right) = 2{,}346.0$$

The Indiana safety performance functions for TWSC four-legged state-administered rural intersections at three severity levels for Indiana are presented in Table 5.3 (Romero, Bandaru, & Tarko, 2024).

The numbers of annual crashes calculated with the INDOT safety performance functions for 2025 are presented in Table 5.4, For example, the PDO crashes were calculated as follows.

$$a_{PDO} = 4.032 \cdot 10^{-4} \cdot (AADT_{maj})^{0.6382} \cdot (AADT_{min})^{0.3619}$$

$$a_{PDO} = 4.032 \cdot 10^{-4} \cdot (7{,}129)^{0.6382} \cdot (2{,}300)^{0.3619}$$

$$a_{PDO} = 1.9003$$

The ICWS system only reduces crashes arising from vehicle-vehicle corner interactions. Such crashes make up 75% of the total number of crashes at the intersections. Therefore, the estimates presented in Table 5.4 need to be scaled by this factor and the results are shown in Table 5.5.

The target crashes shown in Table 5.6 for 5 years prior to ICWS installation. For the year 2025, these target crashes also increase by the same growth factor (R) as shown for PDO below.

TABLE 5.3
Safety performance functions

Severity	SPF	Dispersion (α)
PDO	$4.032 \cdot 10^{-4} \cdot (AADT_{maj})^{0.6382} \cdot (AADT_{min})^{0.3619}$	0.5511
B-C	$9.4099 \cdot 10^{-5} \cdot (AADT_{maj})^{0.6616} \cdot (AADT_{min})^{0.3301}$	0.7740
KA	$8.0298 \cdot 10^{-5} \cdot (AADT_{maj})^{0.6630} \cdot (AADT_{min})^{0.2750}$	1.0619

TABLE 5.4
SPR-estimated annual crash frequencies during the 5 years before ICWS installation

Crash Severity	PDO	B-C	KA
SPF Estimated Crashes (a)	1.9244	0.4316	0.2432

TABLE 5.5
SPR-estimated annual corner-approach crash frequencies during the 5 years before ICWS installation

Crash Severity	PDO	B-C	KA
SPF Estimated Crashes (a)	1.4433	0.3238	0.1824

TABLE 5.6
Observed corner-approach crashes over 5 years prior to ICWS installation scaled with growth factor

Crash Severity	PDO	B-C	KA
Target Crashes (C)	6.2424	4.1616	8.3232

TABLE 5.7
Combined estimate of annual crash frequencies during the 5 years before ICWS installation was obtained using the Empirical Bayes method

	PDO	B-C	KA
Combined Estimated Annual Crashes (a_2)	1.2876	0.6016	0.9116

$$C_n = C_{n-1} \cdot \left(1 + \frac{R}{100}\right)$$

$$C_{2025} = 6 \cdot \left(1 + \frac{2}{100}\right)^{2025-2023} = 6.2424$$

The Empirical Bayes method is used to combine SPF estimates of corner crashes with observed crashes over 5 years and the results are presented in Table 5.7. The calculations for PDO are shown below.

$$a_{EB} = \frac{C + \frac{1}{\alpha}}{Y + \frac{1}{\alpha\alpha}} \qquad \text{(Eq. 5.2)}$$

$$a_{EB_{PDO}} = \frac{6.2424 + \frac{1}{0.5511}}{5 + \frac{1}{0.5511 \cdot 1.4433}} = 1.2876$$

Where,
a_{EB} is the EB estimate.
C is the number of target crashes in the preceding Y years.
α is the dispersion parameter value from the safety performance function.
a is the safety performance function estimate of annual crashes.

The estimated crash modification factor (CMF) for ICWS is calculated using Equation 3.2. For the first year, the calculation is as follows.

$$CMF = 4.384 \cdot 10^{-3} \cdot AADT_{maj}{}^{0.5947}$$

$$CMF = 4.384 \cdot 10^{-3} \cdot 7{,}129.8^{0.5947} = 0.8577$$

Using the CMF from the previous step, the estimated PDO crashes saved or prevented can be calculated as follows.

$$b_{PDO} = 1.2457 \cdot (1 - 0.8477) = 0.1898$$

Following the same procedure, the estimated reduction in annual crashes for all severity levels is shown in Table 5.8.

TABLE 5.8
Estimated reduction in crashes for 2025

	PDO	B-C	KA
Reduction in Crashes (b)	0.1832	0.0856	0.1297

TABLE 5.9
Crash costs for each severity level in 2025 dollars

	PDO	B-C	KA
Crash Cost ($1,000)	49.346	313.056	3,279.239

The cost of crashes increases with inflation every year. Thus, the cost of crashes for the year 2025 is calculated as using the formula given below is shown in Table 5.9.

$$C_{DY} = \left(1 + \frac{F}{100}\right)^{Y_3} \cdot C_{CY} \qquad \text{(Eq. 5.3)}$$

Where,
C_{DY} is the average crash cost of j severity in the desired year.
F is the inflation rate.
Y_3 is the of years between the crash cost year and the desired year, $Y_3 = DY - CY$.
C_{CY} is average crash cost of j severity in crash cost year dollars.

For example, the calculations for cost of PDO crashes in 2025 dollars are as follows.

$$C_{2025} = \left(1 + \frac{2}{100}\right)^{3} \cdot C_{2022}$$

$$C_{2025} = \left(1 + \frac{2}{100}\right)^{3} \cdot 46{,}500 = 49{,}346$$

Safety benefit for the year 2025 at each severity level is the product of the estimated number of crashes reduced for that each severity level in 2025 and its corresponding crash cost in 2025 dollars. The results are shown in Table 5.10.

Present worth of 2025 crash benefits is obtained by converting the dollar amounts shown in Table 5.10 to 2024 dollars using the formula shown in Equation 5.3 but interest rate (I) is used instead of inflation rate. Example calculation for PDO crashes is shown.

$$C_{2024} = C_{2025}\left(1 + \frac{I}{100}\right)^{2024-2025}$$

$$C_{2024} = 9.042\left(1 + \frac{4}{100}\right)^{-1} = 8.694$$

The present worth of crash benefits for each severity level along with the total for the year 2025 is shown in Table 5.11.

This procedure is repeated for several years, until the CMF is equal to or greater than one, at which point the

TABLE 5.10
Safety benefit in reduced crash costs for each severity level in 2025 dollars

	PDO	B-C	KA
Crash Cost ($1,000)	9.042	26.800	425.395

TABLE 5.11
Present worth of crash benefits for the year 2025 (2024 dollars)

	PDO	B-C	KA	Total
Crash Cost ($1,000)	8.694	25.769	409.034	443.497

ICWS system is no longer effective and must be removed. For this chosen example the service life is 14 years. For the year 2040, CMF is greater than one. The estimated benefits for PDO, B-C, and KA crashes are shown in Table 5.12, Table 5.13, and Table 5.14 respectively. The total present worth crash benefit estimated to be realized throughout the 14-year life of the system is approximately *$3,339,965*. This value is obtained by summing up the present worth crash benefit for each severity over the 14-year period.

The added maintenance cost of the system (M_a) is $2,000 per year. The present worth added maintenance cost of the system for each year over the entire lifetime of the system is shown in Table 5.15. An example calculation is shown below.

$$M_{PY} = M_a \left(\frac{\left(1 + \frac{F}{100}\right)}{\left(1 + \frac{I}{100}\right)} \right)^{Y_4}$$

Where,

M_{PY} is the maintenance cost in present year (PY) dollars.

M_a is the annual maintenance cost in present year dollars.

Y_4 is the difference between desired year and present year ($DY - PY$).

F and I are inflation and interest rates, respectively.

For the year 2025, the cost of maintenance in 2024 dollars is calculated as follows.

$$M_{PY} = 2{,}000 \left(\frac{\left(1 + \frac{2}{100}\right)}{\left(1 + \frac{4}{100}\right)} \right)^{1} = 1{,}962$$

Thus, the present worth of total agency cost is the sum of the present worth of capital cost (PWCC) of construction incurred in the implementation year 2024 and the present worth of the maintenance cost over the service life of the ICWS system.

$$PWC = PWCC + PWM$$

$$PWC = 75{,}000 + 24{,}279 = 99{,}279$$

Finally, the benefit-cost ratio is calculated as shown.

$$\frac{B}{C} = \frac{3{,}339{,}965}{99{,}279} = 34.14$$

Since the B-C ratio is much higher than the one, the project is economically viable based on safety benefits alone.

TABLE 5.12
Crash benefit estimation for PDO crashes for each year up to the life of the system

Year	Main Road AADT (veh/day)	Crossroad AADT (veh/day)	SPF Estimate	Target Crashes	EB Estimate	CMF	Number of Crashes Saved	Crash Cost ($1,000)	Present Worth of Crash Benefits ($1,000)
2025	6,990.00	1,300	1.4433	6.2424	1.2876	0.8577	0.1832	49.346	8.694
2026	7,129.80	1,326	1.4722	6.3672	1.3128	0.8679	0.1735	51.340	8.234
2027	7,272.40	1,352.52	1.5017	6.4946	1.3384	0.8781	0.1631	52.367	7.592
2028	7,417.84	1,379.57	1.5317	6.6245	1.3645	0.8885	0.1521	53.414	6.944
2029	7,566.20	1,407.162	1.5623	6.7570	1.3912	0.8991	0.1404	54.482	6.287
2030	7,717.52	1,435.305	1.5936	6.8921	1.4183	0.9097	0.1280	55.572	5.624
2031	7,871.88	1,464.011	1.6255	7.0300	1.4460	0.9205	0.1150	56.683	4.952
2032	8,029.31	1,493.291	1.6580	7.1706	1.4743	0.9314	0.1011	57.817	4.272
2033	8,189.90	1,523.157	1.6911	7.3140	1.5031	0.9424	0.0865	58.973	3.585
2034	8,353.70	1,553.62	1.7250	7.4602	1.5325	0.9536	0.0711	60.153	2.890
2035	8,520.77	1,584.693	1.7595	7.6095	1.5625	0.9649	0.0548	61.356	2.186
2036	8,691.19	1,616.387	1.7947	7.7616	1.5931	0.9763	0.0377	62.583	1.474
2037	8,865.01	1,648.714	1.8306	7.9169	1.6243	0.9879	0.0197	63.835	0.754
2038	9,042.31	1,681.689	1.8672	8.0752	1.6561	0.9996	0.0007	65.111	0.025
2039	9,223.16	1,715.322	1.9045	8.2367	1.6885	1.0114	–	–	–

TABLE 5.13
Crash benefit estimation for B-C crashes for each year up to the life of the system

Year	Main Road AADT (veh/day)	Crossroad AADT (veh/day)	SPF Estimate	Target Crashes	EB Estimate	CMF	Number of Crashes Saved	Crash Cost ($1,000)	Present Worth of Crash Benefits ($1,000)
2025	6,990.00	1,300	0.3238	4.1616	0.6016	0.8577	0.0856	313.056	25.769
2026	7,129.80	1,326	0.3302	4.2448	0.6161	0.8679	0.0814	325.704	24.517
2027	7,272.40	1,352.52	0.3367	4.3297	0.6310	0.8781	0.0769	332.218	22.709
2028	7,417.84	1,379.57	0.3434	4.4163	0.6462	0.8885	0.0720	338.862	20.862
2029	7,566.20	1,407.162	0.3502	4.5046	0.6618	0.8991	0.0668	345.640	18.975
2030	7,717.52	1,435.305	0.3572	4.5947	0.6777	0.9097	0.0612	352.552	17.047
2031	7,871.88	1,464.011	0.3642	4.6866	0.6940	0.9205	0.0552	359.603	15.077
2032	8,029.31	1,493.291	0.3715	4.7804	0.7106	0.9314	0.0487	366.795	13.065
2033	8,189.90	1,523.157	0.3788	4.8760	0.7277	0.9424	0.0419	374.131	11.010
2034	8,353.70	1,553.62	0.3863	4.9735	0.7451	0.9536	0.0346	381.614	8.912
2035	8,520.77	1,584.693	0.3940	5.0730	0.7629	0.9649	0.0268	389.246	6.771
2036	8,691.19	1,616.387	0.4018	5.1744	0.7811	0.9763	0.0185	397.031	4.585
2037	8,865.01	1,648.714	0.4098	5.2779	0.7998	0.9879	0.0097	404.972	2.355
2038	9,042.31	1,681.689	0.4179	5.3835	0.8188	0.9996	0.0003	413.071	0.079
2039	9,223.16	1,715.322	0.4262	5.4911	0.8383	1.0114	–	–	–

TABLE 5.14
Crash benefit estimation for KA crashes for each year up to the life of the system

Year	Main Road AADT (veh/day)	Crossroad AADT (veh/day)	SPF Estimate	Target Crashes	EB Estimate	CMF	Number of Crashes Saved	Crash Cost ($1,000)	Present Worth of Crash Benefits ($1,000)
2025	6,990.00	1,300	0.1824	8.3232	0.9116	0.8577	0.1297	3,279.239	409.034
2026	7,129.80	1,326	0.1858	8.4897	0.9368	0.8679	0.1238	3,411.720	390.451
2027	7,272.40	1,352.52	0.1893	8.6595	0.9626	0.8781	0.1173	3,479.954	362.866
2028	7,417.84	1,379.57	0.1928	8.8326	0.9890	0.8885	0.1102	3,549.554	334.448
2029	7,566.20	1,407.162	0.1965	9.0093	1.0161	0.8991	0.1026	3,620.545	305.181
2030	7,717.52	1,435.305	0.2001	9.1895	1.0439	0.9097	0.0942	3,692.956	275.052
2031	7,871.88	1,464.011	0.2039	9.3733	1.0724	0.9205	0.0853	3,766.815	244.046
2032	8,029.31	1,493.291	0.2077	9.5607	1.1016	0.9314	0.0756	3,842.151	212.151
2033	8,189.90	1,523.157	0.2116	9.7520	1.1316	0.9424	0.0651	3,918.994	179.352
2034	8,353.70	1,553.62	0.2156	9.9470	1.1623	0.9536	0.0539	3,997.374	145.634
2035	8,520.77	1,584.693	0.2196	10.1459	1.1938	0.9649	0.0419	4,077.321	110.984
2036	8,691.19	1,616.387	0.2237	10.3489	1.2260	0.9763	0.0290	4,158.868	75.388
2037	8,865.01	1,648.714	0.2279	10.5558	1.2591	0.9879	0.0152	4,242.045	38.832
2038	9,042.31	1,681.689	0.2322	10.7669	1.2930	0.9996	0.0005	4,326.886	1.301
2039	9,223.16	1,715.322	0.2366	10.9823	1.3277	1.0114	–	–	–

TABLE 5.15
Present worth benefit: cost summary for each year over the service life of the system (in $1,000)

Year	Present Worth of Crash Benefits				Maintenance Cost
	PDO	B-C	KA	Total	
2025	8.694	25.769	409.034	443.497	1.962
2026	8.234	24.517	390.451	423.201	1.924
2027	7.592	22.709	362.866	393.168	1.887
2028	6.944	20.862	334.448	362.254	1.851
2029	6.287	18.975	305.181	330.443	1.815
2030	5.624	17.047	275.052	297.722	1.780
2031	4.952	15.077	244.046	264.075	1.746
2032	4.272	13.065	212.151	229.488	1.712
2033	3.585	11.010	179.352	193.947	1.679
2034	2.890	8.912	145.634	157.436	1.647
2035	2.186	6.771	110.984	119.941	1.615
2036	1.474	4.585	75.388	81.448	1.584
2037	0.754	2.355	38.832	41.940	1.554
2038	0.025	0.079	1.301	1.404	1.2930
Total	–	–	–	*3,339.965*	*24.279*

6. CLOSURE

This study investigated the effectiveness of Intersection Conflict Warning Systems (ICWS) installed at unsignalized two-way stop controlled (TWSC) intersections in Indiana. Since the ICWS systems were only installed at high-crash locations, several intersections along the same major roads where ICWS systems were installed, were used as control intersections to adjust for the expected selection bias.

A negative binomial model was used to identify and quantify several important factors that affect safety at TWSC intersections. These include traffic volume (increases crash risk), three-legged intersections (decreases crash risk), and the presence of medians with speed limits under 45 mph (decreases crash risk).

While previous studies have reported mixed results regarding the effectiveness of ICWS across different states, they did not explore the relationship between system performance and AADT levels. By focusing on this factor, this research offers a novel perspective, demonstrating how the system's effectiveness declines as traffic volume increases. This insight calls for a more customized criteria for installation thresholds. The final decision to install the system must be made using a comprehensive benefit cost analysis. The safety benefits come from reducing the number of crashes, which can be estimated using the statistical model developed.

The analysis of field observations from TScan found no statistical evidence of speed reductions on the main road when the system is activated, which explains the lack of any statistically significant decrease in crash severity. Since no mechanisms were in place to reduce crash severity, it is confirmed that the same crash modification factor (CMF) obtained from the crash count model applies consistently across all severity levels.

Post encroachment time (PET) analysis was inconclusive. Though the cumulative distributions showed an increased proportion of high PET values, there was a lack of sufficient number of interactions with low PET values of less than 2 seconds which are more closely related to crashes. A much longer field data collection effort is needed to gather a larger number of interactions with low PET values and perform a sound statistical analysis.

The report includes an example benefit-cost calculation that is a more accurate way of determining the system need at a specific rural intersection in the implementation chapter.

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APPENDICES

Appendix A. ICWS Intersections: Satellite View and Street View from Google Maps

Appendix B. Control Intersections: Satellite View and Street View from Google Maps

Appendix C. Crash Count Model Input Data

Appendix D. Crash Severity Model Input Data

APPENDIX A. ICWS INTERSECTIONS: SATELLITE VIEW AND STREET VIEW FROM GOOGLE MAPS

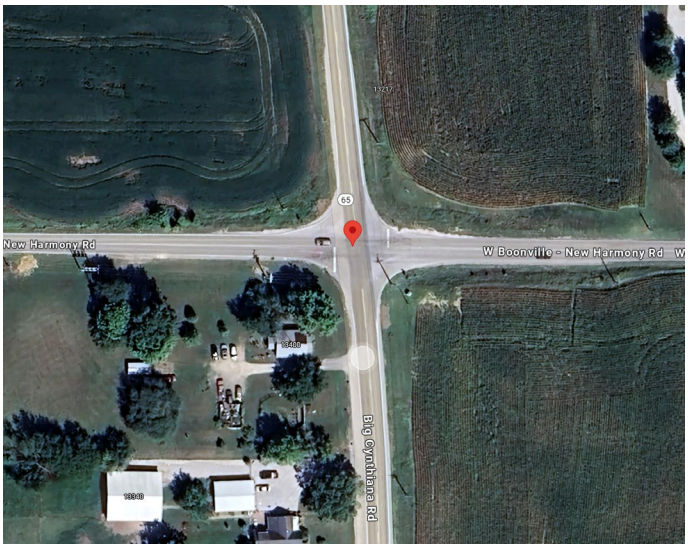
1A – US 27 and SR 28

2A – SR 38 and Hinkle Rd

3A – US 40 and CR 600 E

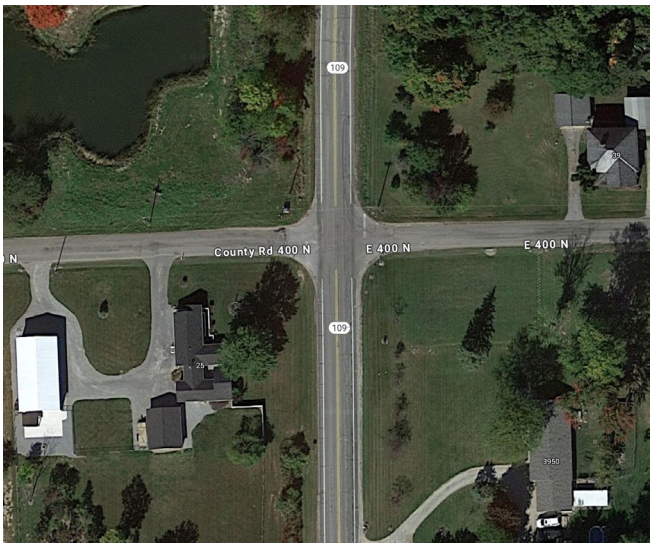
4A – US 40 and SR 3 W jct

5A – SR 70 and SR 245



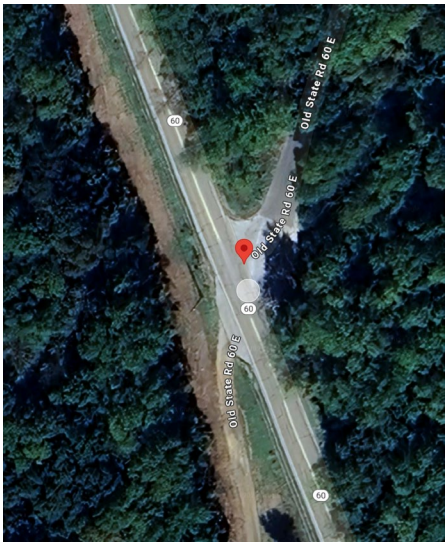
6A – SR 65 and Boonville–New Harmony Rd

7A – SR 45 and SR 54



8A – SR 109 and CR 400N

9A – SR 26 and CR 900S & CR 950 E

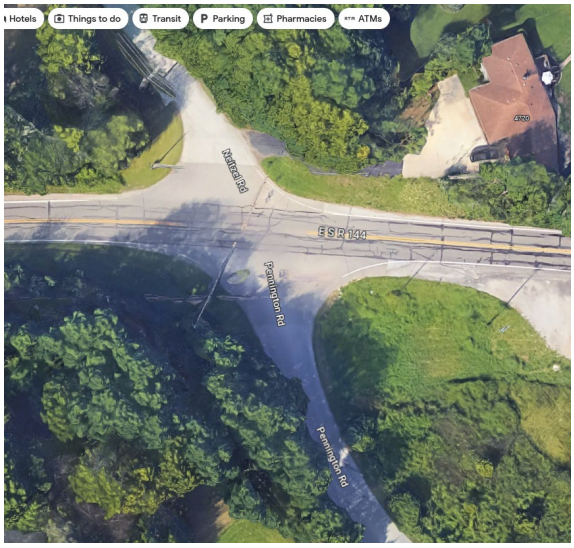


10A – SR 60 and Old SR 60

11A SR 60 and Ebenezer Church Rd

12A – SR 46 and Lower Schooner Rd

13A – SR 46 and Sewell Rd, 5.52 miles E of SR 446



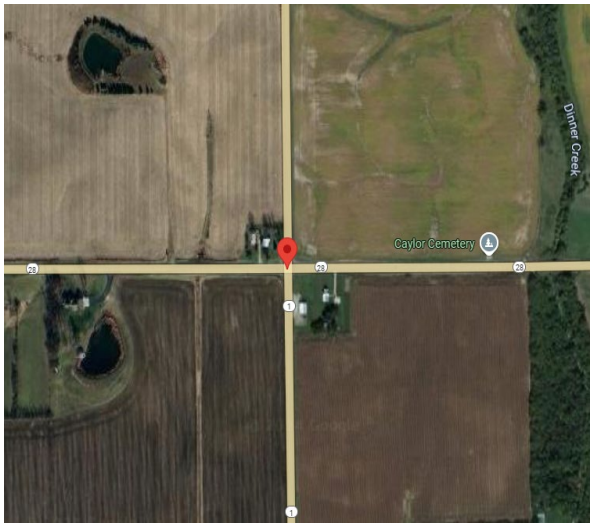
14A – SR 144 and Pennington Rd/Neitzel Rd

15A – US 24 and CR600E

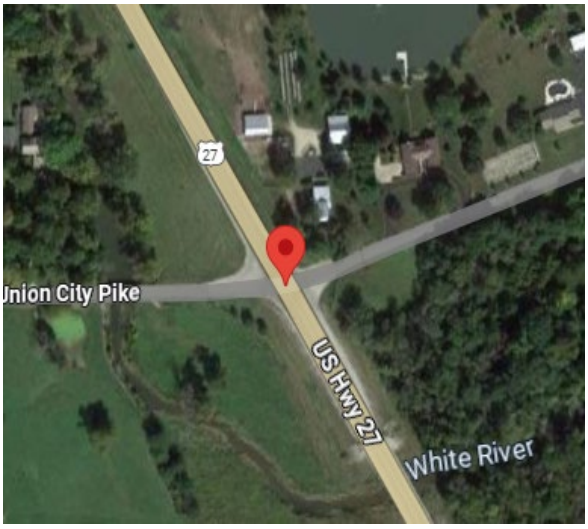
16A – US 41 and Evans Ave E jct

17A US 63 and US 28

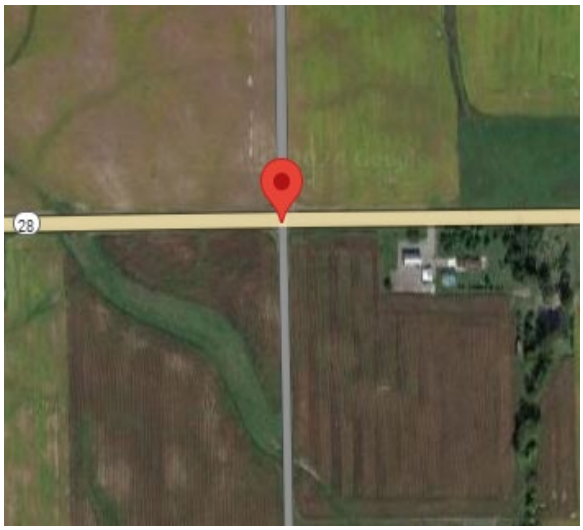
APPENDIX B. CONTROL INTERSECTIONS: SATELLITE VIEW AND STREET VIEW FROM GOOGLE MAPS



1B – US 28 and US 1

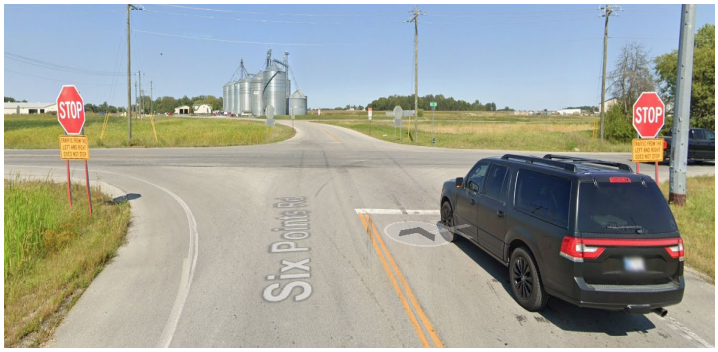


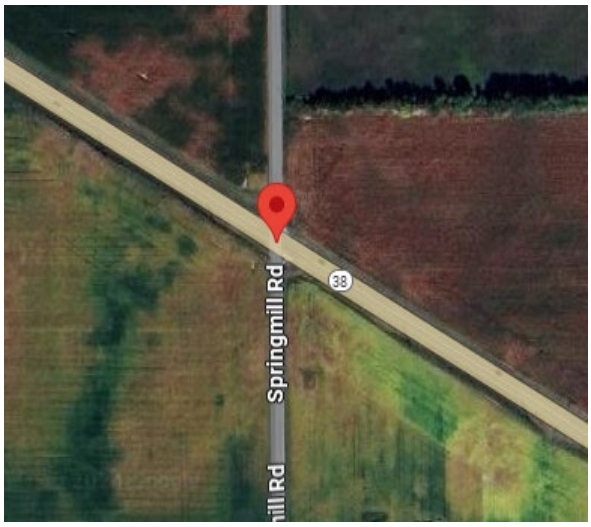
1C – US 27 and Union City Pike



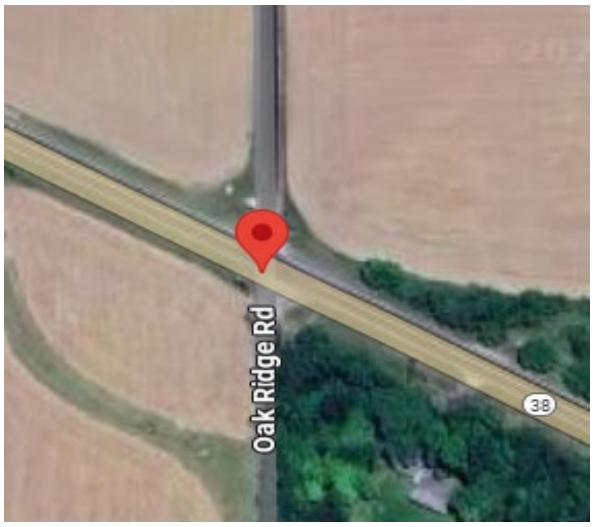
1D – US 28 and County Rd 600 W

2B – SR 38 and Six Points Rd

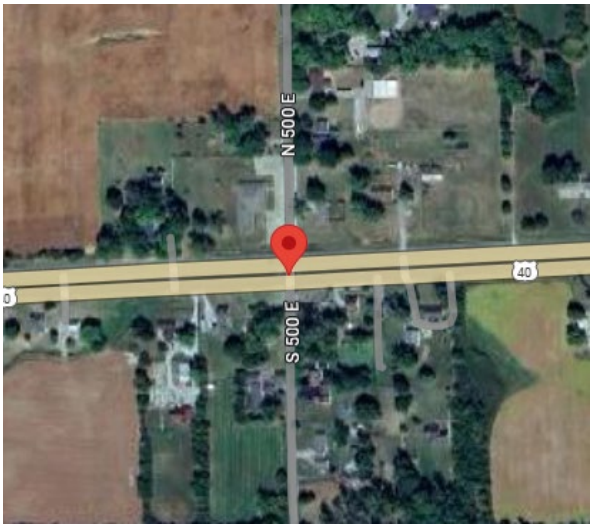




2C – SR 38 and Springmill Rd

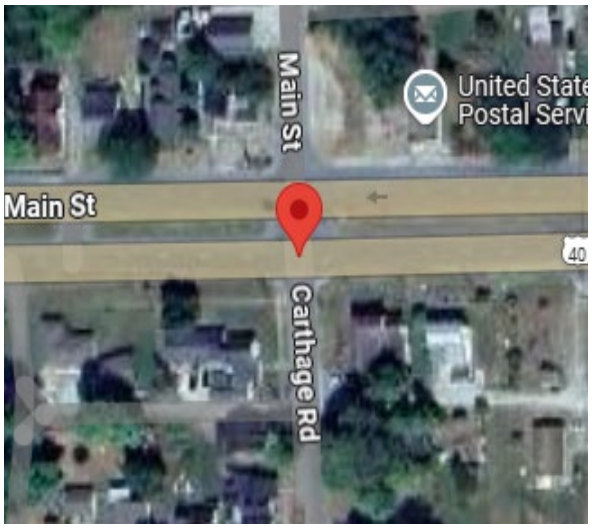


2D – SR 38 and Oakridge Rd



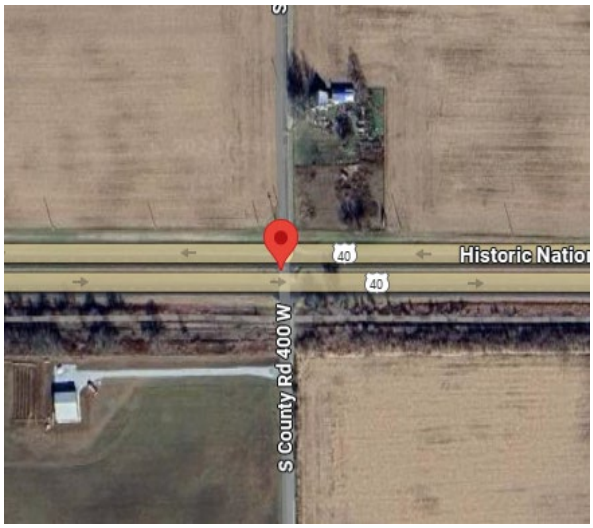
3B – US 40 and CR 500 E

3C – US 40 and CR 400 E



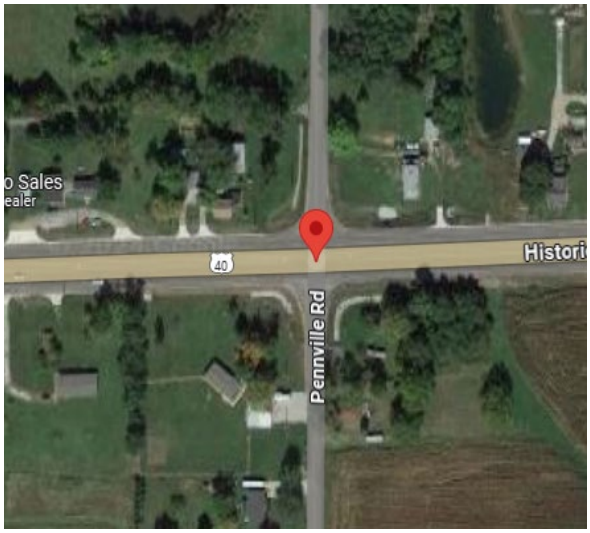
3D – US 40 and Main St.

4B – US 40 and SR 3 E JCT

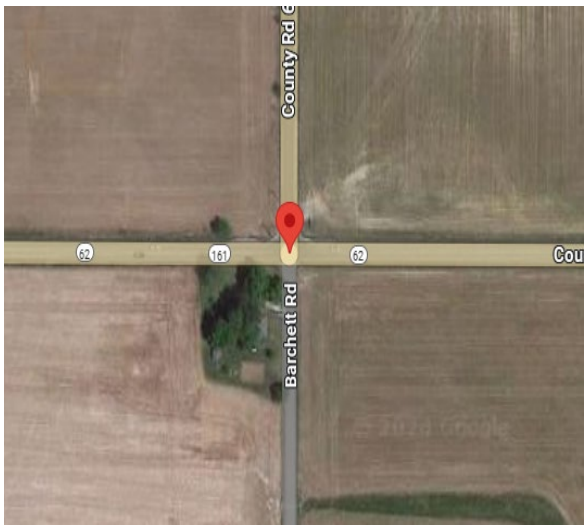


4C – US 40 and S CR 400 W

4D – US 40 and S CR 425 W

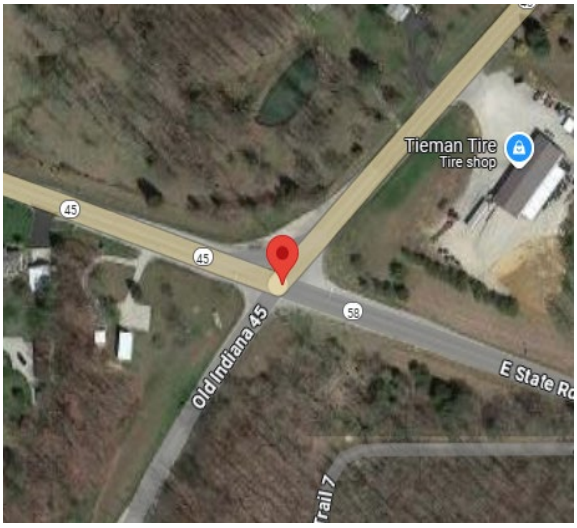


4E – US 40 and Pennville Rd

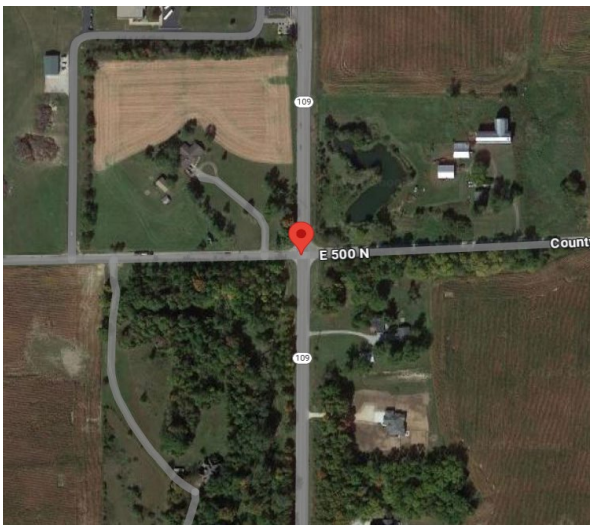


5B – SR 62/161 and CR 650 E

6B – SR 65 and W Baseline Rd

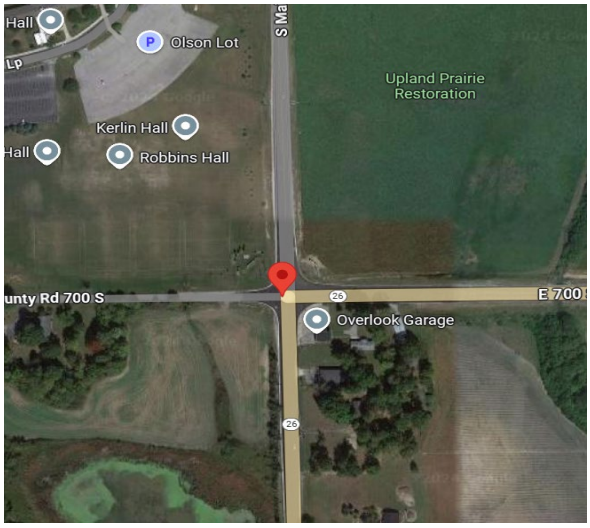


7B – SR 45 and SR 58



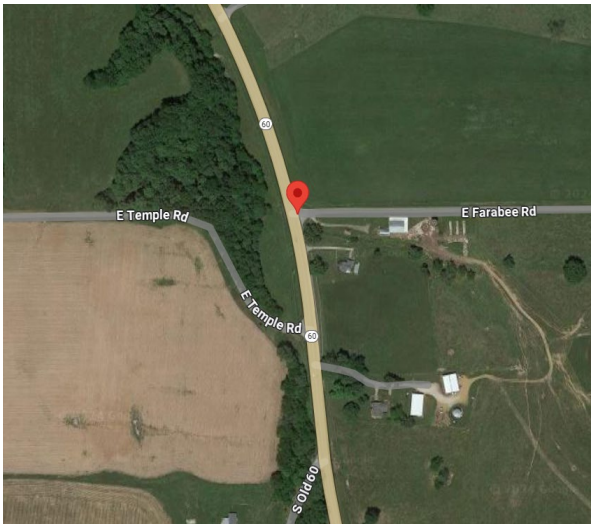
8B – SR 109 and CR 500 N

8C – SR 109 and CR 600 N



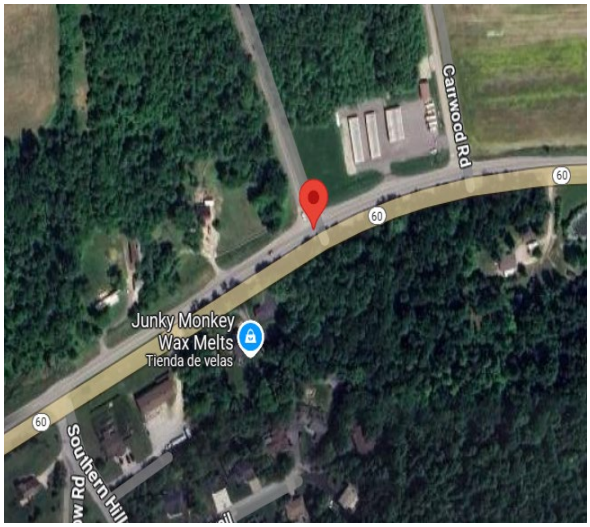
9B – SR 26 and CR 700 S & S Main St

10B – SR 60 and Old SR 60



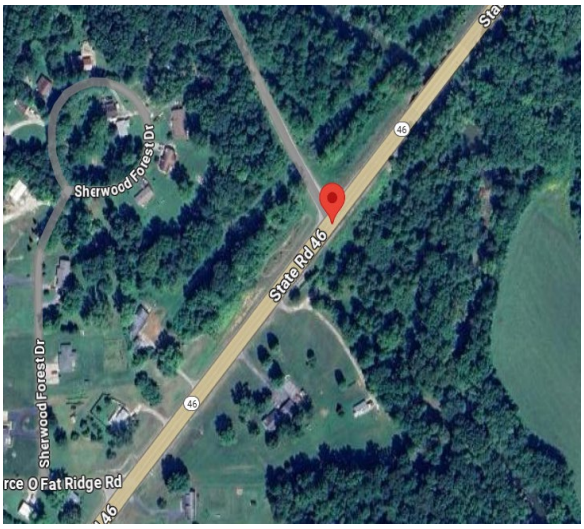
10C – SR 60 and Farabee Rd

11B – SR 60 and Wilson Switch Rd



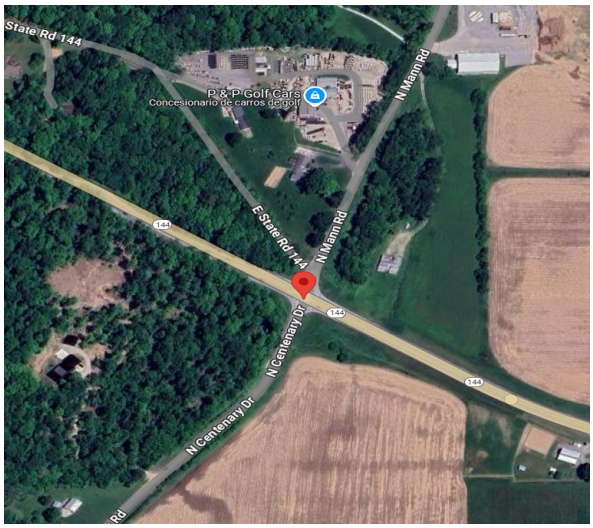
11C – SR 60 and Dean Lake Rd

12B – SR 46 and Upper Schooner Rd

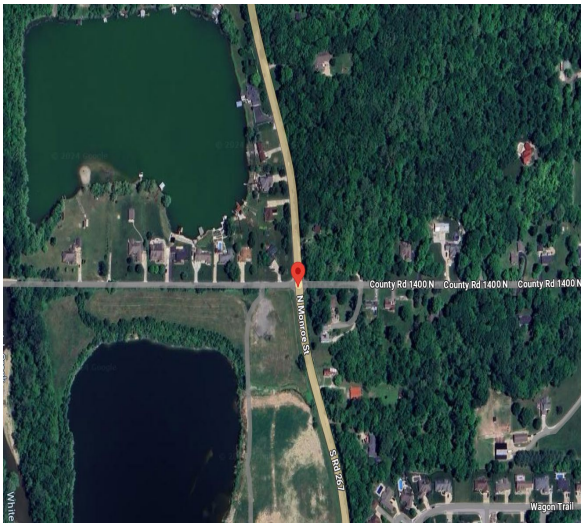


12C – SR 46 and Jackson Creek Rd

13B – SR 46 and N Brummette Creek Rd

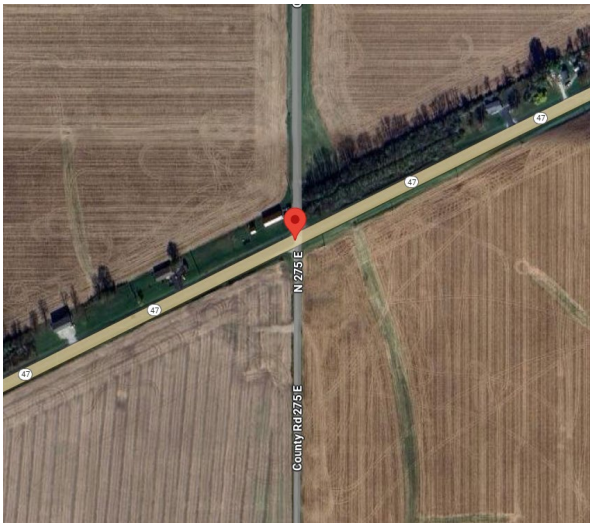


14B – SR 144 and N Centenary Rd and N Mann Rd

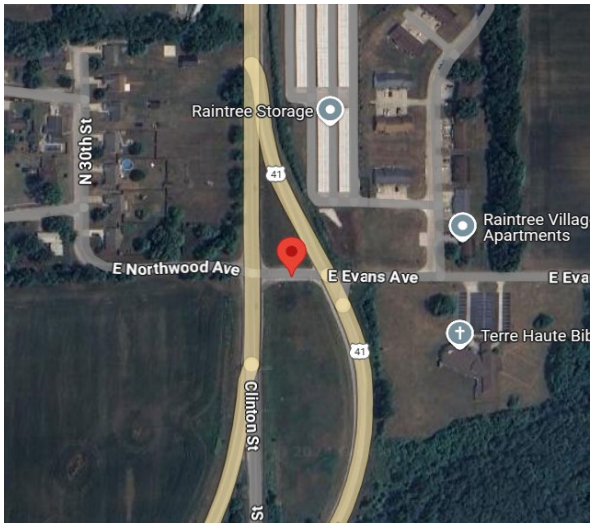


14C – SR 267 and E Hendricks County Rd

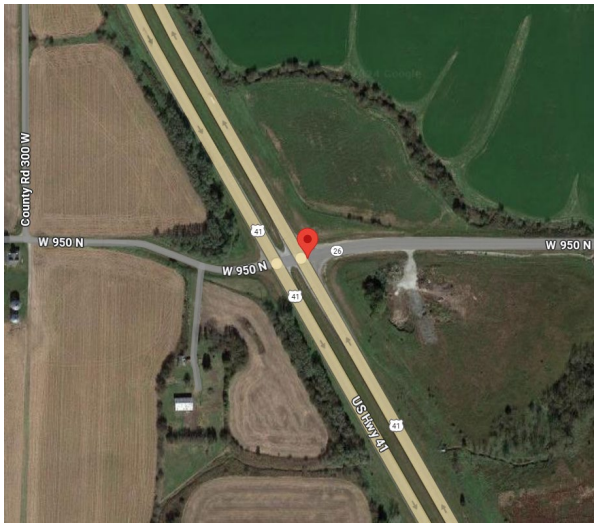
15B – SR 47 and CR 500 E



15C – SR 47 and CR 275 E



US 41 and Evans Av W



17B – US 41 and SR 26

17C – SR 63 and SR 234

APPENDIX C. CRASH COUNT MODEL INPUT DATA

Data Dictionary

Variable	Description
ID	Unique identifier for each intersection.
INT_Group	Identifier for intersections along the same major road (treated + control).
Year	Year.
Selected	Binary variable: 1 if the intersection was selected for treatment. 0 otherwise.
Control	Binary variable: 1 if the intersection is a control intersection. 0 otherwise.
Urban	Binary variable: 1 if the intersection is in an urban area. 0 otherwise.
Three_leg_Intersection	Binary variable: 1 if the intersection is a three–leg intersection. 0 otherwise.
MR_Median_Undivided	Binary variable: 1 if the median treatment on main road is of the undivided type. 0 otherwise.
MR_Median_Grass_or_sod	Binary variable: 1 if the major road has a median separating the two traffic streams. 0 otherwise.
MR_Median_Width	Width of median in feet. 0 for undivided median type.
MR_2_Lanes	Binary variable: 1 if major road has two lanes. 0 otherwise.
MR_4_Lanes	Binary variable: 1 if major road has four lanes. 0 otherwise.
MR_4_Lanes_div_median_strip	Binary variable: 1 if major road has four lanes and has a divided median treatment. 0 otherwise.
MR_numLanes	Number of lanes on the major road.
CR_Median_Undivided	Binary variable: 1 if the median treatment on minor road is of the undivided type. 0 otherwise.
CR_2_Lanes	Binary variable: 1 if minor road has two lanes. 0 otherwise.
CR_4_Lanes	Binary variable: 1 if minor road has four lanes. 0 otherwise.

Variable	Description
Speed Limit	Speed limit on major road in mph.
LowSpeedLim_withMedian	Binary variable: 1 if speed limit on major road is ≤45 mph and a median is present. 0 otherwise.
Channelization	Binary variable: 1 if channelization is present for turning maneuvers on major road.
Left turn lanes	The number of dedicated left turn lanes on major road. If each travel direction has one dedicated left turn lane each, then this variable takes a value of 2.
Right turn lanes	The number of dedicated right turn lanes on major road. If each travel direction has one dedicated right turn lane each, then this variable takes a value of 2.
Right_Left_Turn_Lane	Binary variable: 1 indicating the presence of dedicated turning lanes
MR_Functional_Class	Functional class of the major road
MR_AADT	Annual Average Daily Traffic in vehicles per day on the major road
CR_1_Approach_Direction	Approach direction for crossroad 1.
Vis_Index_Left_1	Visibility Index for crossroad 1, when viewing left from the stop line.
Vis_Index_Right_1	Visibility Index for crossroad 1, when viewing right from the stop line.
CR_1_Functional_Class	Functional class of crossroad 1
CR_2_Approach_Direction	Approach direction for crossroad 2.
Vis_Index_Left_2	Visibility Index for crossroad 2, when viewing left from the stop line.
Vis_Index_Right_2	Visibility Index for crossroad 2, when viewing right from the stop line.
CR_2_Functional_Class	Functional class of crossroad 2
CR_AADT	Annual average daily traffic in vehicles per day on the crossroads
KA	Number of fatal and incapacitating injury crashes
BC	Number of non–incapacitating injury crashes
PDO	Number of property damage only crashes
ICWS_installed	Binary variable. 1 if the ICWS was installed at that location and operational in that year 0 otherwise.
covid	Binary variable. 1 if the year variable is 2020 0 otherwise.

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
1	1	2015	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	OP Art	3257	E	3	1	Collector	W	2	3	Collector	1759	1	1	4	0	0
1	1	2016	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	OP Art	3312	E	3	1	Collector	W	2	3	Collector	1768	2	0	0	0	0
1	1	2017	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	OP Art	3329	E	3	1	Collector	W	2	3	Collector	1759	0	0	1	0	0
1	1	2018	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	OP Art	3324	E	3	1	Collector	W	2	3	Collector	1649	2	0	0	0	0
1	1	2019	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	OP Art	3340	E	3	1	Collector	W	2	3	Collector	1652	1	0	2	0	0
1	1	2020	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	OP Art	3093	E	3	1	Collector	W	2	3	Collector	1510	0	0	1	0	1
1	1	2022	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	OP Art	3218	E	3	1	Collector	W	2	3	Collector	1453	0	1	1	1	0
1	1	2023	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	OP Art	3392	E	3	1	Collector	W	2	3	Collector	1469	0	0	0	1	0
2	1	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Collector	1334	S	2	3	Collector	N	2	3	Collector	893	0	0	0	0	0
2	1	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Collector	1341	S	2	3	Collector	N	2	3	Collector	897	0	0	0	0	0
2	1	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Collector	1334	S	2	3	Collector	N	2	3	Collector	893	0	0	0	0	0
2	1	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Collector	1394	S	2	3	Collector	N	2	3	Collector	1107	0	0	0	0	0
2	1	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Collector	1397	S	2	3	Collector	N	2	3	Collector	1109	0	0	0	0	0
2	1	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Collector	1277	S	2	3	Collector	N	2	3	Collector	1014	0	0	0	0	1
2	1	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Collector	1358	S	2	3	Collector	N	2	3	Collector	1079	0	0	0	0	0
2	1	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Collector	1358	S	2	3	Collector	N	2	3	Collector	1506	0	0	0	0	0
2	1	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Collector	1630	S	2	3	Collector	N	2	3	Collector	1523	0	0	0	0	0
3	1	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	OP Art	6368	W	2	2	Collector	E	3	2	Min Art	1103	0	0	2	0	0
3	1	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	OP Art	4139	W	2	2	Collector	E	3	2	Min Art	1103	1	0	0	0	0
3	1	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	OP Art	4176	W	2	2	Collector	E	3	2	Min Art	1118	0	0	1	0	0
3	1	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	OP Art	4276	W	2	2	Collector	E	3	2	Min Art	1122	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
3	1	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	OP Art	4301	W	2	2	Collector	E	3	2	Min Art	1129	0	0	0	0	0
3	1	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	OP Art	3798	W	2	2	Collector	E	3	2	Min Art	997	1	0	1	0	1
3	1	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	OP Art	4041	W	2	2	Collector	E	3	2	Min Art	1060	1	0	1	0	0
3	1	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	OP Art	3887	W	2	2	Collector	E	3	2	Min Art	1045	0	0	1	0	0
3	1	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	OP Art	3973	W	2	2	Collector	E	3	2	Min Art	1068	0	0	0	0	0
4	1	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1489	S	3	3	Collector	N	3	3	Collector	0	0	0	0	0	0
4	1	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1490	S	3	3	Collector	N	3	3	Collector	0	0	0	0	0	0
4	1	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1483	S	3	3	Collector	N	3	3	Collector	525	0	0	0	0	0
4	1	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1487	S	3	3	Collector	N	3	3	Collector	388	0	0	0	0	0
4	1	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1490	S	3	3	Collector	N	3	3	Collector	388	0	0	0	0	0
4	1	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1362	S	3	3	Collector	N	3	3	Collector	388	0	0	0	0	1
4	1	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1449	S	3	3	Collector	N	3	3	Collector	338	0	0	0	0	0
4	1	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1449	S	3	3	Collector	N	3	3	Collector	338	0	0	0	0	0
4	1	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1330	S	3	3	Collector	N	3	3	Collector	338	0	0	0	0	0
5	2	2015	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Min Art	11000	S	1	1	Collector	N	1	2	Collector	1271	3	0	2	0	0
5	2	2016	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Min Art	8921	S	1	1	Collector	N	1	2	Collector	1271	0	0	0	0	0
5	2	2017	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Min Art	8921	S	1	1	Collector	N	1	2	Collector	1286	0	1	1	0	0
5	2	2018	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Min Art	11133	S	1	1	Collector	N	1	2	Collector	1289	0	0	4	0	0
5	2	2019	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Min Art	11133	S	1	1	Collector	N	1	2	Collector	1294	0	0	3	0	0
5	2	2020	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Min Art	11206	S	1	1	Collector	N	1	2	Collector	1404	0	1	3	0	1
5	2	2022	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Min Art	9450	S	1	1	Collector	N	1	2	Collector	1494	1	0	3	1	0
5	2	2023	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	2	1	Min Art	11871	S	1	1	Collector	N	1	2	Collector	863	2	0	4	1	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
6	2	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Min Art	5456	S	2	3	Collector	N	3	3	Collector	0	2	0	1	0	0
6	2	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Min Art	5483	S	2	3	Collector	N	3	3	Collector	0	3	0	1	0	0
6	2	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Min Art	7100	S	2	3	Collector	N	3	3	Collector	0	1	0	0	0	0
6	2	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Min Art	6965	S	2	3	Collector	N	3	3	Collector	0	0	0	1	0	0
6	2	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Min Art	6979	S	2	3	Collector	N	3	3	Collector	0	1	0	1	0	0
6	2	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Min Art	6393	S	2	3	Collector	N	3	3	Collector	0	0	0	1	0	1
6	2	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Min Art	6802	S	2	3	Collector	N	3	3	Collector	0	0	0	0	0	0
6	2	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Min Art	6741	S	2	3	Collector	N	3	3	Collector	0	2	0	0	0	0
6	2	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Min Art	9754	S	2	3	Collector	N	3	3	Collector	0	0	0	1	0	0
7	2	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	5456	S	3	3	Collector	N	3	3	Collector	0	0	0	0	0	0
7	2	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	5483	S	3	3	Collector	N	3	3	Collector	0	0	0	2	0	0
7	2	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	7100	S	3	3	Collector	N	3	3	Collector	1000	0	0	0	0	0
7	2	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6965	S	3	3	Collector	N	3	3	Collector	1000	0	0	0	0	0
7	2	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6979	S	3	3	Collector	N	3	3	Collector	1000	0	0	0	0	0
7	2	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6393	S	3	3	Collector	N	3	3	Collector	1000	0	0	0	0	1
7	2	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6802	S	3	3	Collector	N	3	3	Collector	450	0	0	0	0	0
7	2	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6741	S	3	3	Collector	N	3	3	Collector	900	0	0	0	0	0
7	2	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	9754	S	3	3	Collector	N	3	3	Collector	0	0	0	0	0	0
8	2	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	5456	S	1	3	Locals	N	3	2	Locals	0	1	0	0	0	0
8	2	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	5483	S	1	3	Locals	N	3	2	Locals	0	0	0	1	0	0
8	2	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	7100	S	1	3	Locals	N	3	2	Locals	0	0	0	0	0	0
8	2	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6965	S	1	3	Locals	N	3	2	Locals	0	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
8	2	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6979	S	1	3	Locals	N	3	2	Locals	0	0	0	1	0	0
8	2	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6393	S	1	3	Locals	N	3	2	Locals	0	0	0	0	0	1
8	2	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6802	S	1	3	Locals	N	3	2	Locals	0	0	0	0	0	0
8	2	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	6741	S	1	3	Locals	N	3	2	Locals	0	0	1	0	0	0
8	2	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	9754	S	1	3	Locals	N	3	2	Locals	0	0	0	1	0	0
9	3	2015	1	0	0	0	0	1	30	0	0	1	4	1	1	0	60	0	0	2	0	1	Collector	6055	S	3	3	Collector	N	3	3	Collector	1861	1	0	3	0	0
9	3	2016	1	0	0	0	0	1	30	0	0	1	4	1	1	0	60	0	0	2	0	1	Collector	6747	S	3	3	Collector	N	3	3	Collector	1926	1	1	3	0	0
9	3	2017	1	0	0	0	0	1	30	0	0	1	4	1	1	0	60	0	0	2	0	1	Collector	8000	S	3	3	Collector	N	3	3	Collector	2045	1	1	0	0	0
9	3	2018	1	0	0	0	0	1	30	0	0	1	4	1	1	0	60	0	0	2	0	1	Collector	7184	S	3	3	Collector	N	3	3	Collector	2217	0	1	0	0	0
9	3	2019	1	0	0	0	0	1	30	0	0	1	4	1	1	0	60	0	0	2	0	1	Collector	6990	S	3	3	Collector	N	3	3	Collector	2300	1	0	2	0	0
9	3	2020	1	0	0	0	0	1	30	0	0	1	4	1	1	0	60	0	0	2	0	1	Collector	6741	S	3	3	Collector	N	3	3	Collector	2355	1	2	2	0	1
9	3	2022	1	0	0	0	0	1	30	0	0	1	4	1	1	0	60	0	0	2	0	1	Collector	6553	S	3	3	Collector	N	3	3	Collector	2499	0	1	1	1	0
9	3	2023	1	0	0	0	0	1	30	0	0	1	4	1	1	0	60	0	0	2	0	1	Collector	6640	S	3	3	Collector	N	3	3	Collector	2526	0	2	5	1	0
10	3	2015	0	1	0	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6913	S	3	3	Locals	N	2	2	Locals	0	0	0	0	0	0
10	3	2016	0	1	0	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6879	S	3	3	Locals	N	2	2	Locals	0	0	0	0	0	0
10	3	2017	0	1	0	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6913	S	3	3	Locals	N	2	2	Locals	0	0	0	0	0	0
10	3	2018	0	1	0	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6913	S	3	3	Locals	N	2	2	Locals	0	0	0	0	0	0
10	3	2019	0	1	0	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	7575	S	3	3	Locals	N	2	2	Locals	0	0	0	0	0	0
10	3	2020	0	1	0	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6913	S	3	3	Locals	N	2	2	Locals	0	0	0	0	0	1
10	3	2021	0	1	0	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6835	S	3	3	Locals	N	2	2	Locals	0	0	1	0	0	0
10	3	2022	0	1	0	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6504	S	3	3	Locals	N	2	2	Locals	0	0	0	1	0	0
10	3	2023	0	1	0	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6576	S	3	3	Locals	N	2	2	Locals	0	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
11	3	2015	0	1	1	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6913	S	2	3	Collector	N	3	3	Collector	2346	0	0	0	0	0
11	3	2016	0	1	1	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	5802	S	2	3	Collector	N	3	3	Collector	1808	1	0	3	0	0
11	3	2017	0	1	1	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6913	S	2	3	Collector	N	3	3	Collector	2491	0	0	1	0	0
11	3	2018	0	1	1	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6913	S	2	3	Collector	N	3	3	Collector	1214	1	0	0	0	0
11	3	2019	0	1	1	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6913	S	2	3	Collector	N	3	3	Collector	1288	0	0	0	0	0
11	3	2020	0	1	1	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	6913	S	2	3	Collector	N	3	3	Collector	1161	0	0	1	0	1
11	3	2021	0	1	1	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	9450	S	2	3	Collector	N	3	3	Collector	1984	1	1	1	0	0
11	3	2022	0	1	1	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	9450	S	2	3	Collector	N	3	3	Collector	2092	0	1	0	0	0
11	3	2023	0	1	1	0	0	1	30	0	0	1	4	1	1	0	0	0	0	0	0	0	Min Art	10329	S	2	3	Collector	N	3	3	Collector	1670	0	0	1	0	0
12	3	2015	0	1	0	0	0	1	30	0	0	1	4	1	1	0	45	1	0	0	0	0	Collector	5536	N	2	2	Collector	S	2	2	Collector	1489	2	0	0	0	0
12	3	2016	0	1	0	0	0	1	30	0	0	1	4	1	1	0	45	1	0	0	0	0	Collector	6231	N	2	2	Collector	S	2	2	Collector	1489	0	0	0	0	0
12	3	2017	0	1	0	0	0	1	30	0	0	1	4	1	1	0	45	1	0	0	0	0	Collector	7790	N	2	2	Collector	S	2	2	Collector	1274	0	0	0	0	0
12	3	2018	0	1	0	0	0	1	30	0	0	1	4	1	1	0	45	1	0	0	0	0	Collector	6978	N	2	2	Collector	S	2	2	Collector	1250	0	0	0	0	0
12	3	2019	0	1	0	0	0	1	30	0	0	1	4	1	1	0	45	1	0	0	0	0	Collector	6559	N	2	2	Collector	S	2	2	Collector	1324	0	0	0	0	0
12	3	2020	0	1	0	0	0	1	30	0	0	1	4	1	1	0	45	1	0	0	0	0	Collector	6347	N	2	2	Collector	S	2	2	Collector	1210	0	0	0	0	1
12	3	2021	0	1	0	0	0	1	30	0	0	1	4	1	1	0	45	1	0	0	0	0	Collector	7503	N	2	2	Collector	S	2	2	Collector	1287	0	0	0	0	0
12	3	2022	0	1	0	0	0	1	30	0	0	1	4	1	1	0	45	1	0	0	0	0	Collector	6263	N	2	2	Collector	S	2	2	Collector	1001	0	0	1	0	0
12	3	2023	0	1	0	0	0	1	30	0	0	1	4	1	1	0	45	1	0	0	0	0	Collector	6346	N	2	2	Collector	S	2	2	Collector	1012	1	0	0	0	0
13	4	2015	1	0	0	0	0	1	40	0	0	1	4	1	1	0	45	1	1	2	0	1	OP Art	5601	N	3	3	OP Art	S	2	3	0	5378	0	0	0	0	0
13	4	2016	1	0	0	0	0	1	40	0	0	1	4	1	1	0	45	1	1	2	0	1	OP Art	5532	N	3	3	OP Art	S	2	3	0	5282	0	0	0	0	0
13	4	2017	1	0	0	0	0	1	40	0	0	1	4	1	1	0	45	1	1	2	0	1	OP Art	5608	N	3	3	OP Art	S	2	3	0	5399	0	0	0	0	0
13	4	2018	1	0	0	0	0	1	40	0	0	1	4	1	1	0	45	1	1	2	0	1	OP Art	5704	N	3	3	OP Art	S	2	3	0	4483	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
13	4	2019	1	0	0	0	0	1	40	0	0	1	4	1	1	0	45	1	1	2	0	1	OP Art	5725	N	3	3	OP Art	S	2	3	0	4505	0	0	0	0	0
13	4	2020	1	0	0	0	0	1	40	0	0	1	4	1	1	0	45	1	1	2	0	1	OP Art	5273	N	3	3	OP Art	S	2	3	0	4172	0	0	0	0	1
13	4	2022	1	0	0	0	0	1	40	0	0	1	4	1	1	0	45	1	1	2	0	1	OP Art	5880	N	3	3	OP Art	S	2	3	0	4608	0	0	0	1	0
13	4	2023	1	0	0	0	0	1	40	0	0	1	4	1	1	0	45	1	1	2	0	1	OP Art	6089	N	3	3	OP Art	S	2	3	0	4587	0	2	1	1	0
14	4	2015	0	1	1	1	1	0	0	0	0	1	4	1	0	1	35		0	0	0	0	OP Art	4838	S	3	2	OP Art	0	4	4	0	5670	1	0	3	0	0
14	4	2016	0	1	1	1	1	0	0	0	0	1	4	1	0	1	35		0	0	0	0	OP Art	4774	S	3	2	OP Art	0	4	4	0	5575	0	0	1	0	0
14	4	2017	0	1	1	1	1	0	0	0	0	1	4	1	0	1	35		0	0	0	0	OP Art	4847	S	3	2	OP Art	0	4	4	0	5698	0	0	2	0	0
14	4	2018	0	1	1	1	1	0	0	0	0	1	4	1	0	1	35		0	0	0	0	OP Art	4753	S	3	2	OP Art	0	4	4	0	5195	0	0	0	0	0
14	4	2019	0	1	1	1	1	0	0	0	0	1	4	1	0	1	35		0	0	0	0	OP Art	4772	S	3	2	OP Art	0	4	4	0	5221	1	0	2	0	0
14	4	2020	0	1	1	1	1	0	0	0	0	1	4	1	0	1	35		0	0	0	0	OP Art	4402	S	3	2	OP Art	0	4	4	0	4835	3	2	0	0	1
14	4	2021	0	1	1	1	1	0	0	0	0	1	4	1	0	1	35		0	0	0	0	OP Art	4790	S	3	2	OP Art	0	4	4	0	5261	0	0	3	0	0
14	4	2022	0	1	1	1	1	0	0	0	0	1	4	1	0	1	35		0	0	0	0	OP Art	4717	S	3	2	OP Art	0	4	4	0	5166	0	0	0	0	0
14	4	2023	0	1	1	1	1	0	0	0	0	1	4	1	0	1	35		0	0	0	0	OP Art	4910	S	3	3	OP Art	0	4	4	0	5445	0	0	0	0	0
15	4	2015	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4207	S	3	3	Locals	N	3	1	Locals	0	0	0	0	0	0
15	4	2016	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4186	S	3	3	Locals	N	3	1	Locals	0	0	0	0	0	0
15	4	2017	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4186	S	3	3	Locals	N	3	1	Locals	0	0	0	0	0	0
15	4	2018	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4782	S	3	3	Locals	N	3	1	Locals	0	0	0	0	0	0
15	4	2019	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4792	S	3	3	Locals	N	3	1	Locals	0	0	0	0	0	0
15	4	2020	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4380	S	3	3	Locals	N	3	1	Locals	0	0	0	0	0	1
15	4	2021	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	5105	S	3	3	Locals	N	3	1	Locals	0	0	0	0	0	0
15	4	2022	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	5059	S	3	3	Locals	N	3	1	Locals	0	0	0	0	0	0
15	4	2023	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	5115	S	3	3	Locals	N	3	1	Locals	0	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
16	4	2015	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4445	S	3	3	Locals	NW	1	1	Locals	0	0	0	0	0	0
16	4	2016	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4423	S	3	3	Locals	NW	1	1	Locals	0	0	0	0	0	0
16	4	2017	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4423	S	3	3	Locals	NW	1	1	Locals	0	0	0	0	0	0
16	4	2018	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4863	S	3	3	Locals	NW	1	1	Locals	0	0	0	0	0	0
16	4	2019	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4873	S	3	3	Locals	NW	1	1	Locals	0	0	0	0	0	0
16	4	2020	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	4454	S	3	3	Locals	NW	1	1	Locals	0	0	0	0	0	1
16	4	2021	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	5244	S	3	3	Locals	NW	1	1	Locals	0	0	0	0	0	0
16	4	2022	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	5197	S	3	3	Locals	NW	1	1	Locals	0	0	0	0	0	0
16	4	2023	0	1	0	0	0	1	40	0	0	1	4	1	1	0	60	0	0	0	0	0	Collector	5254	S	3	3	Locals	NW	1	1	Locals	0	0	0	0	0	0
17	4	2015	0	1	0	0	1	0	0	0	1	0	4	1	1	0	0	0	0	2	0	1	Collector	5436	S	3	1	Collector	N	3	2	Collector	899	0	0	0	0	0
17	4	2016	0	1	0	0	1	0	0	0	1	0	4	1	1	0	0	0	0	2	0	1	Collector	5422	S	3	1	Collector	N	3	2	Collector	899	0	0	0	0	0
17	4	2017	0	1	0	0	1	0	0	0	1	0	4	1	1	0	0	0	0	2	0	1	Collector	5409	S	3	1	Collector	N	3	2	Collector	1005	0	0	0	0	0
17	4	2018	0	1	0	0	1	0	0	0	1	0	4	1	1	0	0	0	0	2	0	1	Collector	5062	S	3	1	Collector	N	3	2	Collector	986	0	0	0	0	0
17	4	2019	0	1	0	0	1	0	0	0	1	0	4	1	1	0	0	0	0	2	0	1	Collector	5072	S	3	1	Collector	N	3	2	Collector	988	0	0	0	0	0
17	4	2020	0	1	0	0	1	0	0	0	1	0	4	1	1	0	0	0	0	2	0	1	Collector	4636	S	3	1	Collector	N	3	2	Collector	903	0	0	0	0	1
17	4	2021	0	1	0	0	1	0	0	0	1	0	4	1	1	0	0	0	0	2	0	1	Collector	4933	S	3	1	Collector	N	3	2	Collector	961	0	0	0	0	0
17	4	2022	0	1	0	0	1	0	0	0	1	0	4	1	1	0	0	0	0	2	0	1	Collector	5525	S	3	1	Collector	N	3	2	Collector	1277	0	0	0	0	0
17	4	2023	0	1	0	0	1	0	0	0	1	0	4	1	1	0	0	0	0	2	0	1	Collector	5586	S	3	1	Collector	N	3	2	Collector	1291	0	0	0	0	0
18	5	2015	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	1	1	Collector	1765	S	1	1	Collector	N	1	1	Collector	866	1	0	0	0	0
18	5	2016	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	1	1	Collector	2059	S	1	1	Collector	N	1	1	Collector	769	0	0	0	0	0
18	5	2017	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	1	1	Collector	2049	S	1	1	Collector	N	1	1	Collector	765	0	0	2	0	0
18	5	2018	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	1	1	Collector	2010	S	1	1	Collector	N	1	1	Collector	751	0	0	1	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
18	5	2019	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	1	1	Collector	2014	S	1	1	Collector	N	1	1	Collector	752	0	0	0	0	0
18	5	2020	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	1	1	Collector	1217	S	1	1	Collector	N	1	1	Collector	778	0	0	0	0	1
18	5	2022	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	1	1	Collector	1283	S	1	1	Collector	N	1	1	Collector	821	0	0	0	1	0
18	5	2023	1	0	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	1	1	Collector	1696	S	1	1	Collector	N	1	1	Collector	905	0	0	1	1	0
19	5	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1947	S	3	2	Collector	N	3	3	Collector	576	0	0	0	0	0
19	5	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1957	S	3	2	Collector	N	3	3	Collector	578	0	0	0	0	0
19	5	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2011	S	3	2	Collector	N	3	3	Collector	544	0	0	0	0	0
19	5	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1760	S	3	2	Collector	N	3	3	Collector	534	0	0	0	0	0
19	5	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1968	S	3	2	Collector	N	3	3	Collector	535	0	0	0	0	0
19	5	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1807	S	3	2	Collector	N	3	3	Collector	489	0	0	0	0	1
19	5	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1969	S	3	2	Collector	N	3	3	Collector	454	0	0	0	0	0
19	5	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1951	S	3	2	Collector	N	3	3	Collector	450	0	0	0	0	0
19	5	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1973	S	3	2	Collector	N	3	3	Collector	455	0	0	0	0	0
20	6	2015	1	0	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2256	E	3	3	Collector	W	3	3	0	1462	0	1	1	0	0
20	6	2016	1	0	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2731	E	3	3	Collector	W	3	3	0	1462	0	1	0	0	0
20	6	2017	1	0	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2723	E	3	3	Collector	W	3	3	0	1570	0	0	2	0	0
20	6	2018	1	0	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2765	E	3	3	Collector	W	3	3	0	1641	0	0	2	0	0
20	6	2019	1	0	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2768	E	3	3	Collector	W	3	3	0	1644	1	1	4	0	0
20	6	2020	1	0	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2638	E	3	3	Collector	W	3	3	0	1503	0	0	2	0	1
20	6	2022	1	0	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2780	E	3	3	Collector	W	3	3	0	1585	0	0	0	1	0
20	6	2023	1	0	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	3472	E	3	3	Collector	W	3	3	0	1523	1	2	1	1	0
21	6	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2229	W	1	2	Collector	E	1	2	Collector	0	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
21	6	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2323	W	1	2	Collector	E	1	2	Collector	0	0	1	0	0	0
21	6	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2323	W	1	2	Collector	E	1	2	Collector	1000	0	0	0	0	0
21	6	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2331	W	1	2	Collector	E	1	2	Collector	854	0	0	0	0	0
21	6	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2338	W	1	2	Collector	E	1	2	Collector	707	0	0	0	0	0
21	6	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2240	W	1	2	Collector	E	1	2	Collector	609	0	0	0	0	1
21	6	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2202	W	1	2	Collector	E	1	2	Collector	900	0	0	0	0	0
21	6	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2084	W	1	2	Collector	E	1	2	Collector	900	0	0	0	0	0
21	6	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	2768	W	1	2	Collector	E	1	2	Collector	655	0	0	0	0	0
22	7	2015	1	0	0	1	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	7394	NE	3	3	Collector	0	4	4	0	1891	2	0	2	0	0
22	7	2016	1	0	0	1	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	3479	NE	3	3	Collector	0	4	4	0	2087	0	0	0	0	0
22	7	2017	1	0	0	1	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	3462	NE	3	3	Collector	0	4	4	0	2077	0	0	0	0	0
22	7	2018	1	0	0	1	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	3396	NE	3	3	Collector	0	4	4	0	2038	1	0	1	0	0
22	7	2019	1	0	0	1	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	3369	NE	3	3	Collector	0	4	4	0	2042	0	0	0	0	0
22	7	2020	1	0	0	1	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	3075	NE	3	3	Collector	0	4	4	0	2850	0	0	0	0	1
22	7	2022	1	0	0	1	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	3242	NE	3	3	Collector	0	4	4	0	3005	0	0	0	1	0
22	7	2023	1	0	0	1	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	0	Collector	3278	NE	3	3	Collector	0	4	4	0	3038	0	0	0	1	0
23	7	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	1	0	2	1	Collector	5491	W	2	2	Collector	NE	2	3	Locals	4413	1	0	0	0	0
23	7	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	1	0	2	1	Collector	2940	W	2	2	Collector	NE	2	3	Locals	2038	0	0	0	0	0
23	7	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	1	0	2	1	Collector	2925	W	2	2	Collector	NE	2	3	Locals	2028	0	0	2	0	0
23	7	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	1	0	2	1	Collector	2869	W	2	2	Collector	NE	2	3	Locals	1989	0	0	0	0	0
23	7	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	1	0	2	1	Collector	2875	W	2	2	Collector	NE	2	3	Locals	1993	0	0	0	0	0
23	7	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	1	0	2	1	Collector	3678	W	2	2	Collector	NE	2	3	Locals	2549	0	0	0	0	1

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
23	7	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	1	0	2	1	Collector	3913	W	2	2	Collector	NE	2	3	Locals	2713	0	0	0	0	0
23	7	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	1	0	2	1	Collector	3878	W	2	2	Collector	NE	2	3	Locals	2688	0	0	0	0	0
23	7	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	1	0	2	1	Collector	3921	W	2	2	Collector	NE	2	3	Locals	2718	0	0	1	0	0
24	8	2015	1	0	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4231	W	2	3	0	E	2	2	0	0	0	0	0	0	0
24	8	2016	1	0	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4252	W	2	3	0	E	2	2	0	0	0	0	0	0	0
24	8	2017	1	0	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4682	W	2	3	0	E	2	2	0	0	0	0	1	0	0
24	8	2018	1	0	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4593	W	2	3	0	E	2	2	0	0	0	0	0	0	0
24	8	2019	1	0	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4760	W	2	3	0	E	2	2	0	0	0	0	0	0	0
24	8	2020	1	0	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4351	W	2	3	0	E	2	2	0	0	0	0	0	0	1
24	8	2022	1	0	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4587	W	2	3	0	E	2	2	0	0	0	0	0	1	0
24	8	2023	1	0	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4280	W	2	3	0	E	2	2	0	0	0	0	0	1	0
25	8	2015	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3941	E	2	2	Collector	W	2	1	Collector	757	0	0	0	0	0
25	8	2016	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3961	E	2	2	Collector	W	2	1	Collector	757	0	0	0	0	0
25	8	2017	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4237	E	2	2	Collector	W	2	1	Collector	757	0	0	0	0	0
25	8	2018	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4157	E	2	2	Collector	W	2	1	Collector	821	0	0	0	0	0
25	8	2019	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4274	E	2	2	Collector	W	2	1	Collector	822	0	0	0	0	0
25	8	2020	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3906	E	2	2	Collector	W	2	1	Collector	847	0	0	0	0	1
25	8	2021	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4156	E	2	2	Collector	W	2	1	Collector	656	0	0	0	0	0
25	8	2022	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4119	E	2	2	Collector	W	2	1	Collector	767	0	0	0	0	0
25	8	2023	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	4150	E	2	2	Collector	W	2	1	Collector	1096	0	0	0	0	0
26	8	2015	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3554	W	3	3	Locals	E	2	3	Locals	0	0	0	0	0	0
26	8	2016	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3572	W	3	3	Locals	E	2	3	Locals	0	0	0	1	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
26	8	2017	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3712	W	3	3	Locals	E	2	3	Locals	0	0	0	0	0	0
26	8	2018	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3641	W	3	3	Locals	E	2	3	Locals	0	0	0	0	0	0
26	8	2019	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3826	W	3	3	Locals	E	2	3	Locals	0	0	0	0	0	0
26	8	2020	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3497	W	3	3	Locals	E	2	3	Locals	0	0	0	0	0	1
26	8	2021	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3721	W	3	3	Locals	E	2	3	Locals	0	0	0	0	0	0
26	8	2022	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3688	W	3	3	Locals	E	2	3	Locals	0	0	0	1	0	0
26	8	2023	0	1	1	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	Collector	3737	W	3	3	Locals	E	2	3	Locals	0	0	0	0	0	0
27	9	2015	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2536	W	2	3	Min Art	E	2	3	Locals	892	0	0	2	0	0
27	9	2016	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2563	W	2	3	Min Art	E	2	3	Locals	1138	0	0	0	0	0
27	9	2017	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2571	W	2	3	Min Art	E	2	3	Locals	1143	1	0	0	0	0
27	9	2018	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2604	W	2	3	Min Art	E	2	3	Locals	1024	1	0	0	0	0
27	9	2019	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2614	W	2	3	Min Art	E	2	3	Locals	1029	1	0	0	0	0
27	9	2020	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2408	W	2	3	Min Art	E	2	3	Locals	951	0	0	2	0	1
27	9	2022	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2594	W	2	3	Min Art	E	2	3	Locals	1034	0	1	0	1	0
27	9	2023	1	0	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2692	W	2	3	Min Art	E	2	3	Locals	1085	0	1	0	1	0
28	9	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	1	1	1	Min Art	2974	S	3	3	Collector	E	3	2	Collector	3817	1	0	0	0	0
28	9	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	1	1	1	Min Art	3025	S	3	3	Collector	E	3	2	Collector	3836	0	0	0	0	0
28	9	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	1	1	1	Min Art	3040	S	3	3	Collector	E	3	2	Collector	2159	0	0	0	0	0
28	9	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	1	1	1	Min Art	2967	S	3	3	Collector	E	3	2	Collector	2057	1	0	2	0	0
28	9	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	1	1	1	Min Art	2981	S	3	3	Collector	E	3	2	Collector	2060	0	0	1	0	0
28	9	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	1	1	1	Min Art	2761	S	3	3	Collector	E	3	2	Collector	1905	0	0	0	0	1
28	9	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	1	1	1	Min Art	3070	S	3	3	Collector	E	3	2	Collector	1986	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
28	9	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	1	1	1	Min Art	3509	S	3	3	Collector	E	3	2	Collector	2499	0	1	0	0	0
28	9	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	1	1	1	Min Art	3624	S	3	3	Collector	E	3	2	Collector	2634	0	0	1	0	0
29	10	2015	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6978	S	2	1	0	0	4	4	0	0	0	0	0	0	0
29	10	2016	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8778	S	2	1	0	0	4	4	0	0	0	0	0	0	0
29	10	2017	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8800	S	2	1	0	0	4	4	0	0	0	0	0	0	0
29	10	2018	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8901	S	2	1	0	0	4	4	0	0	0	0	0	0	0
29	10	2019	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8923	S	2	1	0	0	4	4	0	0	0	0	0	0	0
29	10	2020	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8588	S	2	1	0	0	4	4	0	0	0	0	0	0	1
29	10	2022	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	9065	S	2	1	0	0	4	4	0	0	0	0	0	1	0
29	10	2023	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8252	S	2	1	0	0	4	4	0	0	0	0	0	1	0
30	10	2015	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	5325	SW	3	2	Locals	0	4	4	Locals	0	0	0	0	0	0
30	10	2016	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8778	SW	3	2	Locals	0	4	4	Locals	0	0	0	0	0	0
30	10	2017	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8778	SW	3	2	Locals	0	4	4	Locals	0	0	0	0	0	0
30	10	2018	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8778	SW	3	2	Locals	0	4	4	Locals	0	0	0	0	0	0
30	10	2019	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8778	SW	3	2	Locals	0	4	4	Locals	0	0	0	0	0	0
30	10	2020	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8778	SW	3	2	Locals	0	4	4	Locals	0	0	0	0	0	1
30	10	2021	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	10300	SW	3	2	Locals	0	4	4	Locals	0	0	0	0	0	0
30	10	2022	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	10300	SW	3	2	Locals	0	4	4	Locals	0	0	0	0	0	0
30	10	2023	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8252	SW	3	2	Locals	0	4	4	Locals	0	0	0	0	0	0
31	10	2015	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8631	W	2	2	Locals	0	4	4	Locals	0	0	0	0	0	0
31	10	2016	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8778	W	2	2	Locals	0	4	4	Locals	0	0	0	0	0	0
31	10	2017	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8822	W	2	2	Locals	0	4	4	Locals	0	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
31	10	2018	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	9023	W	2	2	Locals	0	4	4	Locals	0	0	0	0	0	0
31	10	2019	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	9068	W	2	2	Locals	0	4	4	Locals	0	0	0	0	0	0
31	10	2020	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8397	W	2	2	Locals	0	4	4	Locals	0	0	0	0	0	1
31	10	2021	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	9337	W	2	2	Locals	0	4	4	Locals	0	0	0	0	0	0
31	10	2022	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	7829	W	2	2	Locals	0	4	4	Locals	0	0	0	0	0	0
31	10	2023	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8252	W	2	2	Locals	0	4	4	Locals	0	0	0	0	0	0
32	11	2015	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	11841	S	1	1	0	0	4	4	0	0	0	0	0	0	0
32	11	2016	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	11193	S	1	1	0	0	4	4	0	0	0	0	0	0	0
32	11	2017	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	11249	S	1	1	0	0	4	4	0	0	0	0	0	0	0
32	11	2018	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	11294	S	1	1	0	0	4	4	0	0	0	0	0	0	0
32	11	2019	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	11350	S	1	1	0	0	4	4	0	0	0	0	0	0	0
32	11	2020	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	9193	S	1	1	0	0	4	4	0	0	0	0	0	0	1
32	11	2022	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	10039	S	1	1	0	0	4	4	0	0	0	0	0	1	0
32	11	2023	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	11096	S	1	1	0	0	4	4	0	0	0	0	0	1	0
33	11	2015	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	11037	S	2	2	Locals	0	4	4	0	497	0	0	0	0	0
33	11	2016	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	10800	S	2	2	Locals	0	4	4	0	497	0	0	0	0	0
33	11	2017	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	10312	S	2	2	Locals	0	4	4	0	497	0	0	0	0	0
33	11	2018	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	10354	S	2	2	Locals	0	4	4	0	488	0	0	0	0	0
33	11	2019	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	10405	S	2	2	Locals	0	4	4	0	489	0	1	0	0	0
33	11	2020	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	8494	S	2	2	Locals	0	4	4	0	435	0	0	0	0	1
33	11	2021	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	9445	S	2	2	Locals	0	4	4	0	463	0	0	0	0	0
33	11	2022	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	9275	S	2	2	Locals	0	4	4	0	459	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
33	11	2023	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	9565	S	2	2	Locals	0	4	4	0	475	0	0	1	0	0
34	11	2015	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	1	1	OP Art	10233	SE	3	2	Collector	0	4	4	0	0	0	0	0	0	0
34	11	2016	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	1	1	OP Art	10407	SE	3	2	Collector	0	4	4	0	0	0	0	0	0	0
34	11	2017	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	1	1	OP Art	9375	SE	3	2	Collector	0	4	4	0	0	0	0	0	0	0
34	11	2018	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	1	1	OP Art	9413	SE	3	2	Collector	0	4	4	0	0	0	0	0	0	0
34	11	2019	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	1	1	OP Art	9460	SE	3	2	Collector	0	4	4	0	0	0	0	0	0	0
34	11	2020	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	1	1	OP Art	7794	SE	3	2	Collector	0	4	4	0	0	0	0	0	0	1
34	11	2021	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	1	1	OP Art	8667	SE	3	2	Collector	0	4	4	0	0	0	0	0	0	0
34	11	2022	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	1	1	OP Art	8511	SE	3	2	Collector	0	4	4	0	0	0	0	0	0	0
34	11	2023	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	1	1	OP Art	8034	SE	3	2	Collector	0	4	4	0	0	0	1	0	0	0
35	12	2015	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6002	E	1	2	0	0	4	4	0	0	0	0	0	0	0
35	12	2016	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6821	E	1	2	0	0	4	4	0	0	0	0	0	0	0
35	12	2017	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6855	E	1	2	0	0	4	4	0	0	0	0	0	0	0
35	12	2018	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6882	E	1	2	0	0	4	4	0	0	0	0	0	0	0
35	12	2019	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6410	E	1	2	0	0	4	4	0	0	0	1	0	0	0
35	12	2020	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	5936	E	1	2	0	0	4	4	0	0	0	0	0	0	1
35	12	2022	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6482	E	1	2	0	0	4	4	0	0	0	0	0	1	0
35	12	2023	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	5751	E	1	2	0	0	4	4	0	0	0	0	0	1	0
36	12	2015	0	1	0	1	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	OP Art	6614	NW	2	1	Locals	0	4	4	0	0	0	0	0	0	0
36	12	2016	0	1	0	1	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	OP Art	7143	NW	2	1	Locals	0	4	4	0	0	0	0	1	0	0
36	12	2017	0	1	0	1	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	OP Art	7178	NW	2	1	Locals	0	4	4	0	0	0	0	0	0	0
36	12	2018	0	1	0	1	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	OP Art	7207	NW	2	1	Locals	0	4	4	0	0	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
36	12	2019	0	1	0	1	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	OP Art	6694	NW	2	1	Locals	0	4	4	0	0	0	0	0	0	0
36	12	2020	0	1	0	1	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	OP Art	6199	NW	2	1	Locals	0	4	4	0	0	0	0	0	0	1
36	12	2021	0	1	0	1	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	OP Art	6893	NW	2	1	Locals	0	4	4	0	0	0	0	0	0	0
36	12	2022	0	1	0	1	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	OP Art	6769	NW	2	1	Locals	0	4	4	0	0	0	0	0	0	0
36	12	2023	0	1	0	1	1	0	0	1	0	0	2	1	1	0	40	0	0	0	0	0	OP Art	6394	NW	2	1	Locals	0	4	4	0	0	0	0	0	0	0
37	12	2015	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6320	SE	3	3	Locals	0	4	4	Locals	0	0	0	0	0	0
37	12	2016	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6327	SE	3	3	Locals	0	4	4	Locals	0	0	0	0	0	0
37	12	2017	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6752	SE	3	3	Locals	0	4	4	Locals	0	0	0	0	0	0
37	12	2018	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6779	SE	3	3	Locals	0	4	4	Locals	0	0	0	0	0	0
37	12	2019	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6296	SE	3	3	Locals	0	4	4	Locals	0	0	0	1	0	0
37	12	2020	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	5830	SE	3	3	Locals	0	4	4	Locals	0	0	0	0	0	1
37	12	2021	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6256	SE	3	3	Locals	0	4	4	Locals	0	0	0	0	0	0
37	12	2022	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6476	SE	3	3	Locals	0	4	4	Locals	0	0	0	0	0	0
37	12	2023	0	1	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6285	SE	3	3	Locals	0	4	4	Locals	0	0	0	0	0	0
38	13	2015	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6155	S	2	1	0	0	4	4	0	0	0	0	0	0	0
38	13	2016	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	5833	S	2	1	0	0	4	4	0	0	0	0	0	0	0
38	13	2017	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6649	S	2	1	0	0	4	4	0	0	0	0	0	0	0
38	13	2018	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6676	S	2	1	0	0	4	4	0	0	0	0	0	0	0
38	13	2019	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6181	S	2	1	0	0	4	4	0	0	0	1	0	0	0
38	13	2020	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	5724	S	2	1	0	0	4	4	0	0	0	0	0	0	1
38	13	2022	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6469	S	2	1	0	0	4	4	0	0	0	0	0	1	0
38	13	2023	1	0	0	1	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	OP Art	6818	S	2	1	0	0	4	4	0	0	0	0	0	1	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
39	13	2015	0	1	0	1	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	6155	SE	1	2	Locals	0	4	4	0	0	0	0	0	0	0
39	13	2016	0	1	0	1	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	5833	SE	1	2	Locals	0	4	4	0	0	0	0	0	0	0
39	13	2017	0	1	0	1	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	6649	SE	1	2	Locals	0	4	4	0	0	0	0	0	0	0
39	13	2018	0	1	0	1	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	6676	SE	1	2	Locals	0	4	4	0	0	0	0	0	0	0
39	13	2019	0	1	0	1	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	6181	SE	1	2	Locals	0	4	4	0	0	0	0	0	0	0
39	13	2020	0	1	0	1	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	5724	SE	1	2	Locals	0	4	4	0	0	0	0	0	0	1
39	13	2021	0	1	0	1	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	5910	SE	1	2	Locals	0	4	4	0	0	0	0	0	0	0
39	13	2022	0	1	0	1	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	6469	SE	1	2	Locals	0	4	4	0	0	0	0	0	0	0
39	13	2023	0	1	0	1	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	6818	SE	1	2	Locals	0	4	4	0	0	0	0	0	0	0
40	14	2015	1	0	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	10392	S	1	1	0	N	1	2	0	0	2	0	0	0	0
40	14	2016	1	0	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	12656	S	1	1	0	N	1	2	0	0	1	0	1	0	0
40	14	2017	1	0	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	12770	S	1	1	0	N	1	2	0	0	0	0	0	0	0
40	14	2018	1	0	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	12821	S	1	1	0	N	1	2	0	0	3	0	0	0	0
40	14	2019	1	0	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	12898	S	1	1	0	N	1	2	0	0	2	0	0	0	0
40	14	2020	1	0	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	9976	S	1	1	0	N	1	2	0	0	1	0	2	0	1
40	14	2022	1	0	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	12409	S	1	1	0	N	1	2	0	0	2	0	0	1	0
40	14	2023	1	0	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	12682	S	1	1	0	N	1	2	0	0	0	0	0	1	0
41	14	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	2	0	1	OP Art	10894	S	3	2	Min Art	N	1	3	Collector	3209	0	0	1	0	0
41	14	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	2	0	1	OP Art	12523	S	3	2	Min Art	N	1	3	Collector	6346	0	0	1	0	0
41	14	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	2	0	1	OP Art	12635	S	3	2	Min Art	N	1	3	Collector	6356	0	0	0	0	0
41	14	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	2	0	1	OP Art	12686	S	3	2	Min Art	N	1	3	Collector	1706	0	2	1	0	0
41	14	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	2	0	1	OP Art	12762	S	3	2	Min Art	N	1	3	Collector	1711	0	0	2	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
41	14	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	2	0	1	OP Art	11137	S	3	2	Min Art	N	1	3	Collector	1748	1	1	1	0	1
41	14	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	2	0	1	OP Art	11849	S	3	2	Min Art	N	1	3	Collector	5670	1	2	3	0	0
41	14	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	2	0	1	OP Art	9777	S	3	2	Min Art	N	1	3	Collector	2943	0	1	1	0	0
41	14	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	2	0	1	OP Art	9992	S	3	2	Min Art	N	1	3	Collector	6812	0	0	0	0	0
42	14	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	7087	E	2	3	Min Art	W	1	2	Collector	1015	0	0	0	0	0
42	14	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	7087	E	2	3	Min Art	W	1	2	Collector	1015	0	0	0	0	0
42	14	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	8613	E	2	3	Min Art	W	1	2	Collector	1027	0	0	0	0	0
42	14	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	8613	E	2	3	Min Art	W	1	2	Collector	1094	0	0	0	0	0
42	14	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	8613	E	2	3	Min Art	W	1	2	Collector	1094	0	0	0	0	0
42	14	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	7604	E	2	3	Min Art	W	1	2	Collector	998	0	0	0	0	1
42	14	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	8826	E	2	3	Min Art	W	1	2	Collector	1530	2	0	2	0	0
42	14	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	7926	E	2	3	Min Art	W	1	2	Collector	1530	0	0	0	0	0
42	14	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	45	0	0	0	0	0	OP Art	8100	E	2	3	Min Art	W	1	2	Collector	1563	0	1	0	0	0
43	15	2015	1	0	1	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	1	Collector	2310	S	3	3	Collector	N	2	3	Collector	1166	2	0	0	0	0
43	15	2016	1	0	1	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	1	Collector	2436	S	3	3	Collector	N	2	3	Collector	1166	2	0	0	0	0
43	15	2017	1	0	1	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	1	Collector	2424	S	3	3	Collector	N	2	3	Collector	1166	2	0	1	0	0
43	15	2018	1	0	1	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	1	Collector	2180	S	3	3	Collector	N	2	3	Collector	1147	2	0	3	0	0
43	15	2019	1	0	1	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	1	Collector	1716	S	3	3	Collector	N	2	3	Collector	1245	0	0	2	0	0
43	15	2020	1	0	1	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	1	Collector	1568	S	3	3	Collector	N	2	3	Collector	1138	1	0	1	0	1
43	15	2022	1	0	1	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	1	Collector	2793	S	3	3	Collector	N	2	3	Collector	1149	0	1	0	1	0
43	15	2023	1	0	1	0	1	0	0	1	0	0	2	1	1	0	105	0	0	0	0	1	Collector	2824	S	3	3	Collector	N	2	3	Collector	1162	0	0	0	1	0
44	15	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2613	S	2	2	Locals	N	2	3	Locals	0	0	0	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
44	15	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2693	S	2	2	Locals	N	2	3	Locals	0	0	0	0	0	0
44	15	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2679	S	2	2	Locals	N	2	3	Locals	0	0	0	0	0	0
44	15	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2157	S	2	2	Locals	N	2	3	Locals	0	0	0	0	0	0
44	15	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1949	S	2	2	Locals	N	2	3	Locals	0	0	0	0	0	0
44	15	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1782	S	2	2	Locals	N	2	3	Locals	0	0	0	0	0	1
44	15	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	1896	S	2	2	Locals	N	2	3	Locals	0	0	0	0	0	0
44	15	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2583	S	2	2	Locals	N	2	3	Locals	0	0	0	0	0	0
44	15	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2938	S	2	2	Locals	N	2	3	Locals	0	0	0	1	0	0
45	15	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2975	S	3	3	Collector	N	3	3	Locals	0	0	0	0	0	0
45	15	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	3047	S	3	3	Collector	N	3	3	Locals	0	0	0	0	0	0
45	15	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	3031	S	3	3	Collector	N	3	3	Locals	525	0	0	0	0	0
45	15	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2517	S	3	3	Collector	N	3	3	Locals	207	0	0	0	0	0
45	15	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2522	S	3	3	Collector	N	3	3	Locals	207	0	0	0	0	0
45	15	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2305	S	3	3	Collector	N	3	3	Locals	207	0	0	0	0	1
45	15	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2453	S	3	3	Collector	N	3	3	Locals	425	0	0	0	0	0
45	15	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	2431	S	3	3	Collector	N	3	3	Locals	425	0	0	0	0	0
45	15	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0	Collector	3029	S	3	3	Collector	N	3	3	Locals	758	0	0	0	0	0
46	16	2015	1	0	0	1	1	0	0	0	0	0	1	1	1	0	40	0	0	0	1	1	Min Art	8390	W	2	4	Collector	E	4	2	0	2199	0	1	5	0	0
46	16	2016	1	0	0	1	1	0	0	0	0	0	1	1	1	0	40	0	0	0	1	1	Min Art	8092	W	2	4	Collector	E	4	2	0	2199	1	0	2	0	0
46	16	2017	1	0	0	1	1	0	0	0	0	0	1	1	1	0	40	0	0	0	1	1	Min Art	8165	W	2	4	Collector	E	4	2	0	2226	2	0	4	0	0
46	16	2018	1	0	0	1	1	0	0	0	0	0	1	1	1	0	40	0	0	0	1	1	Min Art	8198	W	2	4	Collector	E	4	2	0	2235	4	0	4	0	0
46	16	2019	1	0	0	1	1	0	0	0	0	0	1	1	1	0	40	0	0	0	1	1	Min Art	8247	W	2	4	Collector	E	4	2	0	2248	0	3	4	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
46	16	2020	1	0	0	1	1	0	0	0	0	0	1	1	1	0	40	0	0	0	1	1	Min Art	7372	W	2	4	Collector	E	4	2	0	1814	1	2	1	0	1
46	16	2022	1	0	0	1	1	0	0	0	0	0	1	1	1	0	40	0	0	0	1	1	Min Art	7844	W	2	4	Collector	E	4	2	0	1930	1	0	3	1	0
46	16	2023	1	0	0	1	1	0	0	0	0	0	1	1	1	0	40	0	0	0	1	1	Min Art	8017	W	2	4	Collector	E	4	2	0	1972	0	1	1	1	0
47	16	2015	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	Min Art	3483	E	3	3	Locals	W	3	3	Collector	0	0	0	0	0	0
47	16	2016	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	Min Art	3145	E	3	3	Locals	W	3	3	Collector	0	0	0	0	0	0
47	16	2017	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	Min Art	3173	E	3	3	Locals	W	3	3	Collector	1113	0	0	0	0	0
47	16	2018	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	Min Art	3186	E	3	3	Locals	W	3	3	Collector	1118	0	0	0	0	0
47	16	2019	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	Min Art	3205	E	3	3	Locals	W	3	3	Collector	1124	0	0	0	0	0
47	16	2020	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	Min Art	2754	E	3	3	Locals	W	3	3	Collector	907	0	0	0	0	1
47	16	2021	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	Min Art	2930	E	3	3	Locals	W	3	3	Collector	965	0	0	0	0	0
47	16	2022	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	Min Art	2873	E	3	3	Locals	W	3	3	Collector	965	0	0	0	0	0
47	16	2023	0	1	0	0	1	0	0	1	0	0	2	1	1	0	40	0	0	0	2	1	Min Art	2873	E	3	3	Locals	W	3	3	Collector	986	0	1	0	0	0
48	17	2015	1	0	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	2	1	OP Art	4359	E	3	3	Min Art	W	3	3	Min Art	1352	0	0	2	0	0
48	17	2016	1	0	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	2	1	OP Art	4433	E	3	3	Min Art	W	3	3	Min Art	1375	2	0	1	0	0
48	17	2017	1	0	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	2	1	OP Art	4545	E	3	3	Min Art	W	3	3	Min Art	1745	0	0	0	0	0
48	17	2018	1	0	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	2	1	OP Art	4563	E	3	3	Min Art	W	3	3	Min Art	1752	2	0	1	0	0
48	17	2019	1	0	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	2	1	OP Art	4585	E	3	3	Min Art	W	3	3	Min Art	1761	0	0	0	0	0
48	17	2020	1	0	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	2	1	OP Art	3015	E	3	3	Min Art	W	3	3	Min Art	1558	0	2	0	0	1
48	17	2022	1	0	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	2	1	OP Art	3293	E	3	3	Min Art	W	3	3	Min Art	1701	1	0	0	1	0
48	17	2023	1	0	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	2	1	OP Art	3471	E	3	3	Min Art	W	3	3	Min Art	1793	0	0	0	1	0
49	17	2015	0	1	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	1	1	OP Art	5554	W	3	3	Collector	E	2	2	Collector	529	0	0	0	0	0
49	17	2016	0	1	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	1	1	OP Art	5648	W	3	3	Collector	E	2	2	Collector	532	0	2	0	0	0

ID	INT_Group	Year	Selected	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_Median_Undivided	CR_2_Lanes	CR_4_Lanes	Speed Limit	LowSpeedLim_withMedian	Channelization	Left turn lanes	Right turn lanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	KA	BC	PDO	ICWS_installed	covid
49	17	2017	0	1	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	1	1	OP Art	4446	W	3	3	Collector	E	2	2	Collector	285	0	0	0	0	0
49	17	2018	0	1	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	1	1	OP Art	4464	W	3	3	Collector	E	2	2	Collector	280	0	0	0	0	0
49	17	2019	0	1	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	1	1	OP Art	4486	W	3	3	Collector	E	2	2	Collector	281	0	0	1	0	0
49	17	2020	0	1	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	1	1	OP Art	3703	W	3	3	Collector	E	2	2	Collector	893	0	0	1	0	1
49	17	2021	0	1	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	1	1	OP Art	4118	W	3	3	Collector	E	2	2	Collector	950	0	0	0	0	0
49	17	2022	0	1	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	1	1	OP Art	4043	W	3	3	Collector	E	2	2	Collector	941	0	1	0	0	0
49	17	2023	0	1	0	0	0	1	60	0	0	1	4	1	1	0	60	0	0	2	1	1	OP Art	4262	W	3	3	Collector	E	2	2	Collector	951	0	0	0	0	0
50	17	2015	0	1	0	0	0	1	60	0	0	1	4	1	1	0	0	0	0	2	2	1	OP Art	7230	W	3	3	Collector	E	3	3	Collector	1383	0	0	0	0	0
50	17	2016	0	1	0	0	0	1	60	0	0	1	4	1	1	0	0	0	0	2	2	1	OP Art	7353	W	3	3	Collector	E	3	3	Collector	2471	1	0	0	0	0
50	17	2017	0	1	0	0	0	1	60	0	0	1	4	1	1	0	0	0	0	2	2	1	OP Art	7390	W	3	3	Collector	E	3	3	Collector	2639	1	0	1	0	0
50	17	2018	0	1	0	0	0	1	60	0	0	1	4	1	1	0	0	0	0	2	2	1	OP Art	6588	W	3	3	Collector	E	3	3	Collector	1240	0	0	0	0	0
50	17	2019	0	1	0	0	0	1	60	0	0	1	4	1	1	0	0	0	0	2	2	1	OP Art	6621	W	3	3	Collector	E	3	3	Collector	1243	2	0	0	0	0
50	17	2020	0	1	0	0	0	1	60	0	0	1	4	1	1	0	0	0	0	2	2	1	OP Art	5816	W	3	3	Collector	E	3	3	Collector	940	2	0	0	0	1
50	17	2021	0	1	0	0	0	1	60	0	0	1	4	1	1	0	0	0	0	2	2	1	OP Art	6468	W	3	3	Collector	E	3	3	Collector	1000	0	0	2	0	0
50	17	2022	0	1	0	0	0	1	60	0	0	1	4	1	1	0	0	0	0	2	2	1	OP Art	7026	W	3	3	Collector	E	3	3	Collector	2521	1	1	0	0	0
50	17	2023	0	1	0	0	0	1	60	0	0	1	4	1	1	0	0	0	0	2	2	1	OP Art	7405	W	3	3	Collector	E	3	3	Collector	1958	0	0	0	0	0

APPENDIX D. CRASH SEVERITY MODEL INPUT DATA

Data Dictionary

Variable	Description
ID	Unique identifier for each intersection.
INT_Group	Identifier for intersections along the same major road (treated + control).
Year	Year.
Selected	Binary variable: 1 if the intersection was selected for treatment. 0 otherwise.
Control	Binary variable: 1 if the intersection is a control intersection. 0 otherwise.
Urban	Binary variable: 1 if the intersection is in an urban area. 0 otherwise.
Three_leg_Intersection	Binary variable: 1 if the intersection is a three–leg intersection. 0 otherwise.
MR_Median_Undivided	Binary variable: 1 if the median treatment on main road is of the undivided type. 0 otherwise.
MR_Median_Grass_or_sod	Binary variable: 1 if the major road has a median separating the two traffic streams. 0 otherwise.
MR_Median_Width	Width of median in feet. 0 for undivided median type.
MR_2_Lanes	Binary variable: 1 if major road has two lanes. 0 otherwise.
MR_4_Lanes_div_median_strip	Binary variable: 1 if major road has four lanes and has a divided median treatment. 0 otherwise.
MR_numLanes	Number of lanes on the major road.
CR_2_Lanes	Binary variable: 1 if minor road has two lanes. 0 otherwise.
CR_4_Lanes	Binary variable: 1 if minor road has four lanes. 0 otherwise.
Speed Limit	Speed limit on major road in mph.
Channelization	Binary variable: 1 if channelization is present for turning maneuvers on major road.
Left turn lanes	The number of dedicated left turn lanes on major road. If each travel direction has one dedicated left turn lane each, then this variable takes a value of 2.

Variable	Description
Right turn lanes	The number of dedicated right turn lanes on major road. If each travel direction has one dedicated right turn lane each, then this variable takes a value of 2.
Right_Left_Turn_Lane	Binary variable: 1 indicating the presence of dedicated turning lanes
MR_Functional_Class	Functional class of the major road
MR_AADT	Annual Average Daily Traffic in vehicles per day on the major road
CR_1_Approach_Direction	Approach direction for crossroad 1.
Vis_Index_Left_1	Visibility Index for crossroad 1, when viewing left from the stop line.
Vis_Index_Right_1	Visibility Index for crossroad 1, when viewing right from the stop line.
CR_1_Functional_Class	Functional class of crossroad 1
CR_2_Approach_Direction	Approach direction for crossroad 2.
Vis_Index_Left_2	Visibility Index for crossroad 2, when viewing left from the stop line.
Vis_Index_Right_2	Visibility Index for crossroad 2, when viewing right from the stop line.
CR_2_Functional_Class	Functional class of crossroad 2
CR_AADT	Annual average daily traffic in vehicles per day on the crossroads
Severity	Categorical variable: KA – if the crash resulted in a fatality or incapacitating injury BC – if the crash resulted in a non–incapacitating injury PDO – if the crash resulted in property damage only.
ICWS_installed	Binary variable. 1 if the ICWS was installed at that location and operational in that year 0 otherwise.
covid	Binary variable. 1 if the year variable is 2020 0 otherwise.

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
1	1	2015	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3257	E	3	1	Collector	W	2	3	Collector	1759	KA	0	0
1	1	2015	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3257	E	3	1	Collector	W	2	3	Collector	1759	BC	0	0
1	1	2015	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3257	E	3	1	Collector	W	2	3	Collector	1759	PDO	0	0
1	1	2015	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3257	E	3	1	Collector	W	2	3	Collector	1759	PDO	0	0
1	1	2015	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3257	E	3	1	Collector	W	2	3	Collector	1759	PDO	0	0
1	1	2015	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3257	E	3	1	Collector	W	2	3	Collector	1759	PDO	0	0
1	1	2016	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3312	E	3	1	Collector	W	2	3	Collector	1768	KA	0	0
1	1	2016	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3312	E	3	1	Collector	W	2	3	Collector	1768	KA	0	0
1	1	2017	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3329	E	3	1	Collector	W	2	3	Collector	1759	PDO	0	0
1	1	2018	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3324	E	3	1	Collector	W	2	3	Collector	1649	KA	0	0
1	1	2018	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3324	E	3	1	Collector	W	2	3	Collector	1649	KA	0	0
1	1	2019	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3340	E	3	1	Collector	W	2	3	Collector	1652	KA	0	0
1	1	2019	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3340	E	3	1	Collector	W	2	3	Collector	1652	PDO	0	0
1	1	2019	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3340	E	3	1	Collector	W	2	3	Collector	1652	PDO	0	0
1	1	2020	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3093	E	3	1	Collector	W	2	3	Collector	1510	PDO	0	1
1	1	2022	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3218	E	3	1	Collector	W	2	3	Collector	1453	BC	1	0
1	1	2022	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	OP Art	3218	E	3	1	Collector	W	2	3	Collector	1453	PDO	1	0
3	1	2015	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	OP Art	6368	W	2	2	Collector	E	3	2	Min Art	1103	PDO	0	0
3	1	2015	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	OP Art	6368	W	2	2	Collector	E	3	2	Min Art	1103	PDO	0	0
3	1	2016	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	OP Art	4139	W	2	2	Collector	E	3	2	Min Art	1103	KA	0	0
3	1	2017	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	OP Art	4176	W	2	2	Collector	E	3	2	Min Art	1118	PDO	0	0
3	1	2020	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	OP Art	3798	W	2	2	Collector	E	3	2	Min Art	997	KA	0	1

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
3	1	2020	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	OP Art	3798	W	2	2	Collector	E	3	2	Min Art	997	PDO	0	1
3	1	2021	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	OP Art	4041	W	2	2	Collector	E	3	2	Min Art	1060	KA	0	0
3	1	2021	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	OP Art	4041	W	2	2	Collector	E	3	2	Min Art	1060	PDO	0	0
3	1	2022	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	OP Art	3887	W	2	2	Collector	E	3	2	Min Art	1045	PDO	0	0
5	2	2015	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11000	S	1	1	Collector	N	1	2	Collector	1271	KA	0	0
5	2	2015	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11000	S	1	1	Collector	N	1	2	Collector	1271	KA	0	0
5	2	2015	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11000	S	1	1	Collector	N	1	2	Collector	1271	KA	0	0
5	2	2015	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11000	S	1	1	Collector	N	1	2	Collector	1271	PDO	0	0
5	2	2015	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11000	S	1	1	Collector	N	1	2	Collector	1271	PDO	0	0
5	2	2017	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	8921	S	1	1	Collector	N	1	2	Collector	1286	BC	0	0
5	2	2017	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	8921	S	1	1	Collector	N	1	2	Collector	1286	PDO	0	0
5	2	2018	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11133	S	1	1	Collector	N	1	2	Collector	1289	PDO	0	0
5	2	2018	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11133	S	1	1	Collector	N	1	2	Collector	1289	PDO	0	0
5	2	2018	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11133	S	1	1	Collector	N	1	2	Collector	1289	PDO	0	0
5	2	2018	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11133	S	1	1	Collector	N	1	2	Collector	1289	PDO	0	0
5	2	2019	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11133	S	1	1	Collector	N	1	2	Collector	1294	PDO	0	0
5	2	2019	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11133	S	1	1	Collector	N	1	2	Collector	1294	PDO	0	0
5	2	2019	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11133	S	1	1	Collector	N	1	2	Collector	1294	PDO	0	0
5	2	2020	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11206	S	1	1	Collector	N	1	2	Collector	1404	BC	0	1
5	2	2020	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11206	S	1	1	Collector	N	1	2	Collector	1404	PDO	0	1
5	2	2020	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11206	S	1	1	Collector	N	1	2	Collector	1404	PDO	0	1
5	2	2020	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11206	S	1	1	Collector	N	1	2	Collector	1404	PDO	0	1

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
5	2	2022	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	9450	S	1	1	Collector	N	1	2	Collector	1494	KA	1	0
5	2	2022	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	9450	S	1	1	Collector	N	1	2	Collector	1494	PDO	1	0
5	2	2022	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	9450	S	1	1	Collector	N	1	2	Collector	1494	PDO	1	0
5	2	2022	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	9450	S	1	1	Collector	N	1	2	Collector	1494	PDO	1	0
5	2	2023	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11871	S	1	1	Collector	N	1	2	Collector	863	KA	1	0
5	2	2023	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11871	S	1	1	Collector	N	1	2	Collector	863	KA	1	0
5	2	2023	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11871	S	1	1	Collector	N	1	2	Collector	863	PDO	1	0
5	2	2023	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11871	S	1	1	Collector	N	1	2	Collector	863	PDO	1	0
5	2	2023	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11871	S	1	1	Collector	N	1	2	Collector	863	PDO	1	0
5	2	2023	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	2	1	Min Art	11871	S	1	1	Collector	N	1	2	Collector	863	PDO	1	0
6	2	2015	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	5456	S	2	3	Collector	N	3	3	Collector	0	KA	0	0
6	2	2015	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	5456	S	2	3	Collector	N	3	3	Collector	0	KA	0	0
6	2	2015	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	5456	S	2	3	Collector	N	3	3	Collector	0	PDO	0	0
6	2	2016	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	5483	S	2	3	Collector	N	3	3	Collector	0	KA	0	0
6	2	2016	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	5483	S	2	3	Collector	N	3	3	Collector	0	KA	0	0
6	2	2016	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	5483	S	2	3	Collector	N	3	3	Collector	0	KA	0	0
6	2	2016	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	5483	S	2	3	Collector	N	3	3	Collector	0	PDO	0	0
6	2	2017	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	7100	S	2	3	Collector	N	3	3	Collector	0	KA	0	0
6	2	2018	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	6965	S	2	3	Collector	N	3	3	Collector	0	PDO	0	0
6	2	2019	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	6979	S	2	3	Collector	N	3	3	Collector	0	KA	0	0
6	2	2019	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	6979	S	2	3	Collector	N	3	3	Collector	0	PDO	0	0
6	2	2020	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	6393	S	2	3	Collector	N	3	3	Collector	0	PDO	0	1

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
6	2	2022	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	6741	S	2	3	Collector	N	3	3	Collector	0	KA	0	0
6	2	2022	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	6741	S	2	3	Collector	N	3	3	Collector	0	KA	0	0
6	2	2023	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Min Art	9754	S	2	3	Collector	N	3	3	Collector	0	PDO	0	0
7	2	2016	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	5483	S	3	3	Collector	N	3	3	Collector	0	PDO	0	0
7	2	2016	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	5483	S	3	3	Collector	N	3	3	Collector	0	PDO	0	0
8	2	2015	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	5456	S	1	3	Locals	N	3	2	Locals	0	KA	0	0
8	2	2016	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	5483	S	1	3	Locals	N	3	2	Locals	0	PDO	0	0
8	2	2019	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	6979	S	1	3	Locals	N	3	2	Locals	0	PDO	0	0
8	2	2022	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	6741	S	1	3	Locals	N	3	2	Locals	0	BC	0	0
8	2	2023	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	9754	S	1	3	Locals	N	3	2	Locals	0	PDO	0	0
9	3	2015	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6055	S	3	3	Collector	N	3	3	Collector	1861	KA	0	0
9	3	2015	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6055	S	3	3	Collector	N	3	3	Collector	1861	PDO	0	0
9	3	2015	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6055	S	3	3	Collector	N	3	3	Collector	1861	PDO	0	0
9	3	2015	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6055	S	3	3	Collector	N	3	3	Collector	1861	PDO	0	0
9	3	2016	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6747	S	3	3	Collector	N	3	3	Collector	1926	KA	0	0
9	3	2016	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6747	S	3	3	Collector	N	3	3	Collector	1926	BC	0	0
9	3	2016	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6747	S	3	3	Collector	N	3	3	Collector	1926	PDO	0	0
9	3	2016	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6747	S	3	3	Collector	N	3	3	Collector	1926	PDO	0	0
9	3	2016	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6747	S	3	3	Collector	N	3	3	Collector	1926	PDO	0	0
9	3	2017	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	8000	S	3	3	Collector	N	3	3	Collector	2045	KA	0	0
9	3	2017	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	8000	S	3	3	Collector	N	3	3	Collector	2045	BC	0	0
9	3	2018	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	7184	S	3	3	Collector	N	3	3	Collector	2217	BC	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
9	3	2019	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6990	S	3	3	Collector	N	3	3	Collector	2300	KA	0	0
9	3	2019	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6990	S	3	3	Collector	N	3	3	Collector	2300	PDO	0	0
9	3	2019	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6990	S	3	3	Collector	N	3	3	Collector	2300	PDO	0	0
9	3	2020	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6741	S	3	3	Collector	N	3	3	Collector	2355	KA	0	1
9	3	2020	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6741	S	3	3	Collector	N	3	3	Collector	2355	BC	0	1
9	3	2020	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6741	S	3	3	Collector	N	3	3	Collector	2355	BC	0	1
9	3	2020	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6741	S	3	3	Collector	N	3	3	Collector	2355	PDO	0	1
9	3	2020	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6741	S	3	3	Collector	N	3	3	Collector	2355	PDO	0	1
9	3	2022	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6553	S	3	3	Collector	N	3	3	Collector	2499	BC	1	0
9	3	2022	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6553	S	3	3	Collector	N	3	3	Collector	2499	PDO	1	0
9	3	2023	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6640	S	3	3	Collector	N	3	3	Collector	2526	BC	1	0
9	3	2023	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6640	S	3	3	Collector	N	3	3	Collector	2526	BC	1	0
9	3	2023	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6640	S	3	3	Collector	N	3	3	Collector	2526	PDO	1	0
9	3	2023	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6640	S	3	3	Collector	N	3	3	Collector	2526	PDO	1	0
9	3	2023	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6640	S	3	3	Collector	N	3	3	Collector	2526	PDO	1	0
9	3	2023	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6640	S	3	3	Collector	N	3	3	Collector	2526	PDO	1	0
9	3	2023	1	0	0	0	0	1	30	0	1	4	1	0	60	0	2	0	1	Collector	6640	S	3	3	Collector	N	3	3	Collector	2526	PDO	1	0
10	3	2021	0	1	0	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	6835	S	3	3	Locals	N	2	2	Locals	0	BC	0	0
10	3	2022	0	1	0	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	6504	S	3	3	Locals	N	2	2	Locals	0	PDO	0	0
11	3	2016	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	5802	S	2	3	Collector	N	3	3	Collector	1808	KA	0	0
11	3	2016	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	5802	S	2	3	Collector	N	3	3	Collector	1808	PDO	0	0
11	3	2016	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	5802	S	2	3	Collector	N	3	3	Collector	1808	PDO	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
11	3	2016	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	5802	S	2	3	Collector	N	3	3	Collector	1808	PDO	0	0
11	3	2017	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	6913	S	2	3	Collector	N	3	3	Collector	2491	PDO	0	0
11	3	2018	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	6913	S	2	3	Collector	N	3	3	Collector	1214	KA	0	0
11	3	2020	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	6913	S	2	3	Collector	N	3	3	Collector	1161	PDO	0	1
11	3	2021	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	9450	S	2	3	Collector	N	3	3	Collector	1984	KA	0	0
11	3	2021	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	9450	S	2	3	Collector	N	3	3	Collector	1984	BC	0	0
11	3	2021	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	9450	S	2	3	Collector	N	3	3	Collector	1984	PDO	0	0
11	3	2022	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	9450	S	2	3	Collector	N	3	3	Collector	2092	BC	0	0
11	3	2023	0	1	1	0	0	1	30	0	1	4	1	0	55	0	0	0	0	Min Art	10329	S	2	3	Collector	N	3	3	Collector	1670	PDO	0	0
12	3	2015	0	1	0	0	0	1	30	0	1	4	1	0	45	0	0	0	0	Collector	5536	N	2	2	Collector	S	2	2	Collector	1489	KA	0	0
12	3	2015	0	1	0	0	0	1	30	0	1	4	1	0	45	0	0	0	0	Collector	5536	N	2	2	Collector	S	2	2	Collector	1489	KA	0	0
12	3	2022	0	1	0	0	0	1	30	0	1	4	1	0	45	0	0	0	0	Collector	6263	N	2	2	Collector	S	2	2	Collector	1001	PDO	0	0
12	3	2023	0	1	0	0	0	1	30	0	1	4	1	0	45	0	0	0	0	Collector	6346	N	2	2	Collector	S	2	2	Collector	1012	KA	0	0
13	4	2023	1	0	0	0	0	1	40	0	1	4	1	0	45	1	2	0	1	OP Art	6089	N	3	3	OP Art	S	2	3	0	4587	BC	1	0
13	4	2023	1	0	0	0	0	1	40	0	1	4	1	0	45	1	2	0	1	OP Art	6089	N	3	3	OP Art	S	2	3	0	4587	BC	1	0
13	4	2023	1	0	0	0	0	1	40	0	1	4	1	0	45	1	2	0	1	OP Art	6089	N	3	3	OP Art	S	2	3	0	4587	PDO	1	0
14	4	2015	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4838	S	3	2	OP Art	0	4	4	0	5670	KA	0	0
14	4	2015	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4838	S	3	2	OP Art	0	4	4	0	5670	PDO	0	0
14	4	2015	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4838	S	3	2	OP Art	0	4	4	0	5670	PDO	0	0
14	4	2015	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4838	S	3	2	OP Art	0	4	4	0	5670	PDO	0	0
14	4	2016	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4774	S	3	2	OP Art	0	4	4	0	5575	PDO	0	0
14	4	2017	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4847	S	3	2	OP Art	0	4	4	0	5698	PDO	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
14	4	2017	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4847	S	3	2	OP Art	0	4	4	0	5698	PDO	0	0
14	4	2019	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4772	S	3	2	OP Art	0	4	4	0	5221	KA	0	0
14	4	2019	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4772	S	3	2	OP Art	0	4	4	0	5221	PDO	0	0
14	4	2019	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4772	S	3	2	OP Art	0	4	4	0	5221	PDO	0	0
14	4	2020	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4402	S	3	2	OP Art	0	4	4	0	4835	KA	0	1
14	4	2020	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4402	S	3	2	OP Art	0	4	4	0	4835	KA	0	1
14	4	2020	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4402	S	3	2	OP Art	0	4	4	0	4835	KA	0	1
14	4	2020	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4402	S	3	2	OP Art	0	4	4	0	4835	BC	0	1
14	4	2020	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4402	S	3	2	OP Art	0	4	4	0	4835	BC	0	1
14	4	2021	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4790	S	3	2	OP Art	0	4	4	0	5261	PDO	0	0
14	4	2021	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4790	S	3	2	OP Art	0	4	4	0	5261	PDO	0	0
14	4	2021	0	1	1	1	1	0	0	0	1	4	0	1	35	0	0	0	0	OP Art	4790	S	3	2	OP Art	0	4	4	0	5261	PDO	0	0
18	5	2015	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	1	1	Collector	1765	S	1	1	Collector	N	1	1	Collector	866	KA	0	0
18	5	2017	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	1	1	Collector	2049	S	1	1	Collector	N	1	1	Collector	765	PDO	0	0
18	5	2017	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	1	1	Collector	2049	S	1	1	Collector	N	1	1	Collector	765	PDO	0	0
18	5	2018	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	1	1	Collector	2010	S	1	1	Collector	N	1	1	Collector	751	PDO	0	0
18	5	2023	1	0	0	0	1	0	0	1	0	2	1	0	40	0	0	1	1	Collector	1696	S	1	1	Collector	N	1	1	Collector	905	PDO	1	0
20	6	2015	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2256	E	3	3	Collector	W	3	3	0	1462	BC	0	0
20	6	2015	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2256	E	3	3	Collector	W	3	3	0	1462	PDO	0	0
20	6	2016	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2731	E	3	3	Collector	W	3	3	0	1462	BC	0	0
20	6	2017	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2723	E	3	3	Collector	W	3	3	0	1570	PDO	0	0
20	6	2017	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2723	E	3	3	Collector	W	3	3	0	1570	PDO	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
20	6	2018	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2765	E	3	3	Collector	W	3	3	0	1641	PDO	0	0
20	6	2018	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2765	E	3	3	Collector	W	3	3	0	1641	PDO	0	0
20	6	2019	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2768	E	3	3	Collector	W	3	3	0	1644	KA	0	0
20	6	2019	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2768	E	3	3	Collector	W	3	3	0	1644	BC	0	0
20	6	2019	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2768	E	3	3	Collector	W	3	3	0	1644	PDO	0	0
20	6	2019	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2768	E	3	3	Collector	W	3	3	0	1644	PDO	0	0
20	6	2019	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2768	E	3	3	Collector	W	3	3	0	1644	PDO	0	0
20	6	2019	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2768	E	3	3	Collector	W	3	3	0	1644	PDO	0	0
20	6	2020	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2638	E	3	3	Collector	W	3	3	0	1503	PDO	0	1
20	6	2020	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2638	E	3	3	Collector	W	3	3	0	1503	PDO	0	1
20	6	2023	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	3472	E	3	3	Collector	W	3	3	0	1523	KA	1	0
20	6	2023	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	3472	E	3	3	Collector	W	3	3	0	1523	BC	1	0
20	6	2023	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	3472	E	3	3	Collector	W	3	3	0	1523	BC	1	0
20	6	2023	1	0	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	3472	E	3	3	Collector	W	3	3	0	1523	PDO	1	0
21	6	2016	0	1	0	0	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	2323	W	1	2	Collector	E	1	2	Collector	0	BC	0	0
22	7	2015	1	0	0	1	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	7394	NE	3	3	Collector	0	4	4	0	1891	KA	0	0
22	7	2015	1	0	0	1	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	7394	NE	3	3	Collector	0	4	4	0	1891	KA	0	0
22	7	2015	1	0	0	1	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	7394	NE	3	3	Collector	0	4	4	0	1891	PDO	0	0
22	7	2015	1	0	0	1	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	7394	NE	3	3	Collector	0	4	4	0	1891	PDO	0	0
22	7	2018	1	0	0	1	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	3396	NE	3	3	Collector	0	4	4	0	2038	KA	0	0
22	7	2018	1	0	0	1	1	0	0	1	0	2	1	0	50	0	0	0	0	Collector	3396	NE	3	3	Collector	0	4	4	0	2038	PDO	0	0
23	7	2015	0	1	0	0	1	0	0	1	0	2	1	0	55	1	0	2	1	Collector	5491	W	2	2	Collector	NE	2	3	Locals	4413	KA	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
23	7	2017	0	1	0	0	1	0	0	1	0	2	1	0	55	1	0	2	1	Collector	2925	W	2	2	Collector	NE	2	3	Locals	2028	PDO	0	0
23	7	2017	0	1	0	0	1	0	0	1	0	2	1	0	55	1	0	2	1	Collector	2925	W	2	2	Collector	NE	2	3	Locals	2028	PDO	0	0
23	7	2023	0	1	0	0	1	0	0	1	0	2	1	0	55	1	0	2	1	Collector	3921	W	2	2	Collector	NE	2	3	Locals	2718	PDO	0	0
24	8	2017	1	0	1	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Collector	4682	W	2	3	0	E	2	2	0	0	PDO	0	0
26	8	2016	0	1	1	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Collector	3572	W	3	3	Locals	E	2	3	Locals	0	PDO	0	0
26	8	2022	0	1	1	0	1	0	0	1	0	2	1	0	40	0	0	0	0	Collector	3688	W	3	3	Locals	E	2	3	Locals	0	PDO	0	0
27	9	2015	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2536	W	2	3	Min Art	E	2	3	Locals	892	PDO	0	0
27	9	2015	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2536	W	2	3	Min Art	E	2	3	Locals	892	PDO	0	0
27	9	2017	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2571	W	2	3	Min Art	E	2	3	Locals	1143	KA	0	0
27	9	2018	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2604	W	2	3	Min Art	E	2	3	Locals	1024	KA	0	0
27	9	2019	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2614	W	2	3	Min Art	E	2	3	Locals	1029	KA	0	0
27	9	2020	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2408	W	2	3	Min Art	E	2	3	Locals	951	PDO	0	1
27	9	2020	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2408	W	2	3	Min Art	E	2	3	Locals	951	PDO	0	1
27	9	2022	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2594	W	2	3	Min Art	E	2	3	Locals	1034	BC	1	0
27	9	2023	1	0	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2692	W	2	3	Min Art	E	2	3	Locals	1085	BC	1	0
28	9	2015	0	1	0	0	1	0	0	1	0	2	1	0	45	0	1	1	1	Min Art	2974	S	3	3	Collector	E	3	2	Collector	3817	KA	0	0
28	9	2018	0	1	0	0	1	0	0	1	0	2	1	0	45	0	1	1	1	Min Art	2967	S	3	3	Collector	E	3	2	Collector	2057	KA	0	0
28	9	2018	0	1	0	0	1	0	0	1	0	2	1	0	45	0	1	1	1	Min Art	2967	S	3	3	Collector	E	3	2	Collector	2057	PDO	0	0
28	9	2018	0	1	0	0	1	0	0	1	0	2	1	0	45	0	1	1	1	Min Art	2967	S	3	3	Collector	E	3	2	Collector	2057	PDO	0	0
28	9	2019	0	1	0	0	1	0	0	1	0	2	1	0	45	0	1	1	1	Min Art	2981	S	3	3	Collector	E	3	2	Collector	2060	PDO	0	0
28	9	2022	0	1	0	0	1	0	0	1	0	2	1	0	45	0	1	1	1	Min Art	3509	S	3	3	Collector	E	3	2	Collector	2499	BC	0	0
28	9	2023	0	1	0	0	1	0	0	1	0	2	1	0	45	0	1	1	1	Min Art	3624	S	3	3	Collector	E	3	2	Collector	2634	PDO	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
33	11	2019	0	1	0	1	1	0	0	1	0	2	1	0	55	0	0	0	0	OP Art	10405	S	2	2	Locals	0	4	4	0	489	BC	0	0
33	11	2023	0	1	0	1	1	0	0	1	0	2	1	0	55	0	0	0	0	OP Art	9565	S	2	2	Locals	0	4	4	0	475	PDO	0	0
34	11	2023	0	1	0	1	1	0	0	1	0	2	1	0	55	0	0	1	1	OP Art	8034	SE	3	2	Collector	0	4	4	0	0	BC	0	0
35	12	2019	1	0	0	1	1	0	0	1	0	2	1	0	55	0	0	0	0	OP Art	6410	E	1	2	0	0	4	4	0	0	BC	0	0
36	12	2016	0	1	0	1	1	0	0	1	0	2	1	0	40	0	0	0	0	OP Art	7143	NW	2	1	Locals	0	4	4	0	0	PDO	0	0
37	12	2019	0	1	0	1	1	0	0	1	0	2	1	0	55	0	0	0	0	OP Art	6296	SE	3	3	Locals	0	4	4	Locals	0	PDO	0	0
38	13	2019	1	0	0	1	1	0	0	1	0	2	1	0	55	0	0	0	0	OP Art	6181	S	2	1	0	0	4	4	0	0	BC	0	0
40	14	2015	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	10392	S	1	1	0	N	1	2	0	0	KA	0	0
40	14	2015	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	10392	S	1	1	0	N	1	2	0	0	KA	0	0
40	14	2016	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	12656	S	1	1	0	N	1	2	0	0	KA	0	0
40	14	2016	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	12656	S	1	1	0	N	1	2	0	0	PDO	0	0
40	14	2018	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	12821	S	1	1	0	N	1	2	0	0	KA	0	0
40	14	2018	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	12821	S	1	1	0	N	1	2	0	0	KA	0	0
40	14	2018	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	12821	S	1	1	0	N	1	2	0	0	KA	0	0
40	14	2019	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	12898	S	1	1	0	N	1	2	0	0	KA	0	0
40	14	2019	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	12898	S	1	1	0	N	1	2	0	0	KA	0	0
40	14	2020	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	9976	S	1	1	0	N	1	2	0	0	KA	0	1
40	14	2020	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	9976	S	1	1	0	N	1	2	0	0	PDO	0	1
40	14	2020	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	9976	S	1	1	0	N	1	2	0	0	PDO	0	1
40	14	2022	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	12409	S	1	1	0	N	1	2	0	0	KA	1	0
40	14	2022	1	0	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	12409	S	1	1	0	N	1	2	0	0	KA	1	0
41	14	2015	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	10894	S	3	2	Min Art	N	1	3	Collector	3209	PDO	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
41	14	2016	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	12523	S	3	2	Min Art	N	1	3	Collector	6346	PDO	0	0
41	14	2018	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	12686	S	3	2	Min Art	N	1	3	Collector	1706	BC	0	0
41	14	2018	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	12686	S	3	2	Min Art	N	1	3	Collector	1706	BC	0	0
41	14	2018	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	12686	S	3	2	Min Art	N	1	3	Collector	1706	PDO	0	0
41	14	2019	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	12762	S	3	2	Min Art	N	1	3	Collector	1711	PDO	0	0
41	14	2019	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	12762	S	3	2	Min Art	N	1	3	Collector	1711	PDO	0	0
41	14	2020	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	11137	S	3	2	Min Art	N	1	3	Collector	1748	KA	0	1
41	14	2020	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	11137	S	3	2	Min Art	N	1	3	Collector	1748	BC	0	1
41	14	2020	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	11137	S	3	2	Min Art	N	1	3	Collector	1748	PDO	0	1
41	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	11849	S	3	2	Min Art	N	1	3	Collector	5670	KA	0	0
41	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	11849	S	3	2	Min Art	N	1	3	Collector	5670	BC	0	0
41	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	11849	S	3	2	Min Art	N	1	3	Collector	5670	BC	0	0
41	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	11849	S	3	2	Min Art	N	1	3	Collector	5670	PDO	0	0
41	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	11849	S	3	2	Min Art	N	1	3	Collector	5670	PDO	0	0
41	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	11849	S	3	2	Min Art	N	1	3	Collector	5670	PDO	0	0
41	14	2022	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	9777	S	3	2	Min Art	N	1	3	Collector	2943	BC	0	0
41	14	2022	0	1	0	0	1	0	0	1	0	2	1	0	55	0	2	0	1	OP Art	9777	S	3	2	Min Art	N	1	3	Collector	2943	PDO	0	0
42	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	8826	E	2	3	Min Art	W	1	2	Collector	1530	KA	0	0
42	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	8826	E	2	3	Min Art	W	1	2	Collector	1530	KA	0	0
42	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	8826	E	2	3	Min Art	W	1	2	Collector	1530	PDO	0	0
42	14	2021	0	1	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	8826	E	2	3	Min Art	W	1	2	Collector	1530	PDO	0	0
42	14	2023	0	1	0	0	1	0	0	1	0	2	1	0	45	0	0	0	0	OP Art	8100	E	2	3	Min Art	W	1	2	Collector	1563	BC	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
43	15	2015	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2310	S	3	3	Collector	N	2	3	Collector	1166	KA	0	0
43	15	2015	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2310	S	3	3	Collector	N	2	3	Collector	1166	KA	0	0
43	15	2016	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2436	S	3	3	Collector	N	2	3	Collector	1166	KA	0	0
43	15	2016	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2436	S	3	3	Collector	N	2	3	Collector	1166	KA	0	0
43	15	2017	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2424	S	3	3	Collector	N	2	3	Collector	1166	KA	0	0
43	15	2017	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2424	S	3	3	Collector	N	2	3	Collector	1166	KA	0	0
43	15	2017	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2424	S	3	3	Collector	N	2	3	Collector	1166	PDO	0	0
43	15	2018	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2180	S	3	3	Collector	N	2	3	Collector	1147	KA	0	0
43	15	2018	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2180	S	3	3	Collector	N	2	3	Collector	1147	KA	0	0
43	15	2018	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2180	S	3	3	Collector	N	2	3	Collector	1147	PDO	0	0
43	15	2018	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2180	S	3	3	Collector	N	2	3	Collector	1147	PDO	0	0
43	15	2018	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2180	S	3	3	Collector	N	2	3	Collector	1147	PDO	0	0
43	15	2019	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	1716	S	3	3	Collector	N	2	3	Collector	1245	PDO	0	0
43	15	2019	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	1716	S	3	3	Collector	N	2	3	Collector	1245	PDO	0	0
43	15	2020	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	1568	S	3	3	Collector	N	2	3	Collector	1138	KA	0	1
43	15	2020	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	1568	S	3	3	Collector	N	2	3	Collector	1138	PDO	0	1
43	15	2022	1	0	1	0	1	0	0	1	0	2	1	0	50	0	0	0	1	Collector	2793	S	3	3	Collector	N	2	3	Collector	1149	BC	1	0
44	15	2023	0	1	0	0	1	0	0	1	0	2	1	0	55	0	0	0	0	Collector	2938	S	2	2	Locals	N	2	3	Locals	0	PDO	0	0
46	16	2015	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8390	W	2	4	Collector	E	4	2	0	2199	BC	0	0
46	16	2015	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8390	W	2	4	Collector	E	4	2	0	2199	PDO	0	0
46	16	2015	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8390	W	2	4	Collector	E	4	2	0	2199	PDO	0	0
46	16	2015	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8390	W	2	4	Collector	E	4	2	0	2199	PDO	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
46	16	2015	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8390	W	2	4	Collector	E	4	2	0	2199	PDO	0	0
46	16	2015	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8390	W	2	4	Collector	E	4	2	0	2199	PDO	0	0
46	16	2016	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8092	W	2	4	Collector	E	4	2	0	2199	KA	0	0
46	16	2016	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8092	W	2	4	Collector	E	4	2	0	2199	PDO	0	0
46	16	2016	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8092	W	2	4	Collector	E	4	2	0	2199	PDO	0	0
46	16	2017	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8165	W	2	4	Collector	E	4	2	0	2226	KA	0	0
46	16	2017	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8165	W	2	4	Collector	E	4	2	0	2226	KA	0	0
46	16	2017	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8165	W	2	4	Collector	E	4	2	0	2226	PDO	0	0
46	16	2017	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8165	W	2	4	Collector	E	4	2	0	2226	PDO	0	0
46	16	2017	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8165	W	2	4	Collector	E	4	2	0	2226	PDO	0	0
46	16	2017	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8165	W	2	4	Collector	E	4	2	0	2226	PDO	0	0
46	16	2018	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8198	W	2	4	Collector	E	4	2	0	2235	KA	0	0
46	16	2018	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8198	W	2	4	Collector	E	4	2	0	2235	KA	0	0
46	16	2018	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8198	W	2	4	Collector	E	4	2	0	2235	KA	0	0
46	16	2018	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8198	W	2	4	Collector	E	4	2	0	2235	KA	0	0
46	16	2018	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8198	W	2	4	Collector	E	4	2	0	2235	PDO	0	0
46	16	2018	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8198	W	2	4	Collector	E	4	2	0	2235	PDO	0	0
46	16	2018	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8198	W	2	4	Collector	E	4	2	0	2235	PDO	0	0
46	16	2018	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8198	W	2	4	Collector	E	4	2	0	2235	PDO	0	0
46	16	2019	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8247	W	2	4	Collector	E	4	2	0	2248	BC	0	0
46	16	2019	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8247	W	2	4	Collector	E	4	2	0	2248	BC	0	0
46	16	2019	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8247	W	2	4	Collector	E	4	2	0	2248	BC	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
46	16	2019	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8247	W	2	4	Collector	E	4	2	0	2248	PDO	0	0
46	16	2019	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8247	W	2	4	Collector	E	4	2	0	2248	PDO	0	0
46	16	2019	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8247	W	2	4	Collector	E	4	2	0	2248	PDO	0	0
46	16	2019	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8247	W	2	4	Collector	E	4	2	0	2248	PDO	0	0
46	16	2020	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	7372	W	2	4	Collector	E	4	2	0	1814	KA	0	1
46	16	2020	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	7372	W	2	4	Collector	E	4	2	0	1814	BC	0	1
46	16	2020	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	7372	W	2	4	Collector	E	4	2	0	1814	BC	0	1
46	16	2020	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	7372	W	2	4	Collector	E	4	2	0	1814	PDO	0	1
46	16	2022	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	7844	W	2	4	Collector	E	4	2	0	1930	KA	1	0
46	16	2022	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	7844	W	2	4	Collector	E	4	2	0	1930	PDO	1	0
46	16	2022	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	7844	W	2	4	Collector	E	4	2	0	1930	PDO	1	0
46	16	2022	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	7844	W	2	4	Collector	E	4	2	0	1930	PDO	1	0
46	16	2023	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8017	W	2	4	Collector	E	4	2	0	1972	BC	1	0
46	16	2023	1	0	0	1	1	0	0	0	0	1	1	0	40	0	0	1	1	Min Art	8017	W	2	4	Collector	E	4	2	0	1972	PDO	1	0
47	16	2023	0	1	0	0	1	0	0	1	0	2	1	0	40	0	0	2	1	Min Art	2873	E	3	3	Locals	W	3	3	Collector	986	BC	0	0
48	17	2015	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	4359	E	3	3	Min Art	W	3	3	Min Art	1352	PDO	0	0
48	17	2015	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	4359	E	3	3	Min Art	W	3	3	Min Art	1352	PDO	0	0
48	17	2016	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	4433	E	3	3	Min Art	W	3	3	Min Art	1375	KA	0	0
48	17	2016	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	4433	E	3	3	Min Art	W	3	3	Min Art	1375	KA	0	0
48	17	2016	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	4433	E	3	3	Min Art	W	3	3	Min Art	1375	PDO	0	0
48	17	2018	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	4563	E	3	3	Min Art	W	3	3	Min Art	1752	KA	0	0
48	17	2018	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	4563	E	3	3	Min Art	W	3	3	Min Art	1752	KA	0	0

ID	INT_Group	Year	Treated_Intersection	Control	Urban	Three_leg_Intersection	MR_Median_Undivided	MR_Median_Grass_or_sod	MR_Median_Width	MR_2_Lanes	MR_4_Lanes_div_median_strip	MR_numLanes	CR_2_Lanes	CR_4_Lanes	Speed Limit	Channelization	LeftTurnLanes	RightTurnLanes	Right_Left_Turn_Lane	MR_Functional_Class	MR_AADT	CR_1_Approach_Direction	Vis_Index_Left_1	Vis_Index_Right_1	CR_1_Functional_Class	CR_2_Approach_Direction	Vis_Index_Left_2	Vis_Index_Right_2	CR_2_Functional_Class	CR_AADT	Severity	Treatment	covid
48	17	2018	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	4563	E	3	3	Min Art	W	3	3	Min Art	1752	PDO	0	0
48	17	2020	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	3015	E	3	3	Min Art	W	3	3	Min Art	1558	BC	0	1
48	17	2020	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	3015	E	3	3	Min Art	W	3	3	Min Art	1558	BC	0	1
48	17	2022	1	0	0	0	0	1	60	0	1	4	1	0	60	0	2	2	1	OP Art	3293	E	3	3	Min Art	W	3	3	Min Art	1701	KA	1	0
49	17	2016	0	1	0	0	0	1	60	0	1	4	1	0	60	0	2	1	1	OP Art	5648	W	3	3	Collector	E	2	2	Collector	532	BC	0	0
49	17	2016	0	1	0	0	0	1	60	0	1	4	1	0	60	0	2	1	1	OP Art	5648	W	3	3	Collector	E	2	2	Collector	532	BC	0	0
49	17	2019	0	1	0	0	0	1	60	0	1	4	1	0	60	0	2	1	1	OP Art	4486	W	3	3	Collector	E	2	2	Collector	281	PDO	0	0
49	17	2020	0	1	0	0	0	1	60	0	1	4	1	0	60	0	2	1	1	OP Art	3703	W	3	3	Collector	E	2	2	Collector	893	PDO	0	1
49	17	2022	0	1	0	0	0	1	60	0	1	4	1	0	60	0	2	1	1	OP Art	4043	W	3	3	Collector	E	2	2	Collector	941	BC	0	0
50	17	2016	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	7353	W	3	3	Collector	E	3	3	Collector	2471	KA	0	0
50	17	2017	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	7390	W	3	3	Collector	E	3	3	Collector	2639	KA	0	0
50	17	2017	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	7390	W	3	3	Collector	E	3	3	Collector	2639	PDO	0	0
50	17	2019	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	6621	W	3	3	Collector	E	3	3	Collector	1243	KA	0	0
50	17	2019	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	6621	W	3	3	Collector	E	3	3	Collector	1243	KA	0	0
50	17	2020	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	5816	W	3	3	Collector	E	3	3	Collector	940	KA	0	1
50	17	2020	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	5816	W	3	3	Collector	E	3	3	Collector	940	KA	0	1
50	17	2021	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	6468	W	3	3	Collector	E	3	3	Collector	1000	PDO	0	0
50	17	2021	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	6468	W	3	3	Collector	E	3	3	Collector	1000	PDO	0	0
50	17	2022	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	7026	W	3	3	Collector	E	3	3	Collector	2521	KA	0	0
50	17	2022	0	1	0	0	0	1	60	0	1	4	1	0	55	0	2	2	1	OP Art	7026	W	3	3	Collector	E	3	3	Collector	2521	BC	0	0

About the Joint Transportation Research Program (JTRP)

On March 11, 1937, the Indiana Legislature passed an act which authorized the Indiana State Highway Commission to cooperate with and assist Purdue University in developing the best methods of improving and maintaining the highways of the state and the respective counties thereof. That collaborative effort was called the Joint Highway Research Project (JHRP). In 1997 the collaborative venture was renamed as the Joint Transportation Research Program (JTRP) to reflect the state and national efforts to integrate the management and operation of various transportation modes.

The first studies of JHRP were concerned with Test Road No. 1—evaluation of the weathering characteristics of stabilized materials. After World War II, the JHRP program grew substantially and was regularly producing technical reports. Over 1,600 technical reports are now available, published as part of the JHRP and subsequently JTRP collaborative venture between Purdue University and what is now the Indiana Department of Transportation.

Free online access to all reports is provided through a unique collaboration between JTRP and Purdue Libraries. These are available at http://docs.lib.purdue.edu/jtrp.

Further information about JTRP and its current research program is available at http://www.purdue.edu/jtrp.

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