ASSESSMENT OF THE CZECH REPUBLIC'S CRASH DATA COLLECTION THROUGJ A CASE STUDY

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ASSESSMENT OF THE CZECH REPUBLIC'S CRASH DATA COLLECTION SYSTEM THROUGH A CASE STUDY

by

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THESIS

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(PROJECT, WORK OF ART)

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Larisssa L Lara Olivas, B.S.CE

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Guidelines for elaboration

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- To identify crash patterns at Vitezne Namesti roundabout
- Propose a safety improvement plan
- Evaluate the safety impacts of the improvement plan
- Propose improvement to captuew crash data in the Czech Republic

Graphical work range: ---

Accompanying report length: At least 55 pages.

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Ashutosh Arun, Md. Mazharul Haque, Simon Washington, Tarek Sayed, Fred Mannering. (2021). "A systematic review of traffic conflic-based safety measures with a focus on application context"

Mohamed Essa, Tarek Sayed. (2018)"Traffic conflict models to evaluate the safety of signalized intersections at the cycle level"

Master's thesis supervisor: **Dr. Kelvin Cheu**

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dean of the faculty

I confirm assumption of master's thesis assignment.

- student's name from the first page -
Student's name and signature

Prague .....June 30, 2022

Declaration

This report is an output of the International Dual Master Degree Program in Smart Cities Science and Engineering, a collaboration between Czech Technical University, Czech Republic, and the University of Texas at El Paso, USA.

This research is jointly supervised by the following faculty members"

Ruey Long Cheu, PhD, The University of Texas at El Paso

Jeffrey Weidner, PhD, The University of Texas at El Paso

Tomas Horak, PhD, Czech Technical University in Prague

I declare that this Master´s thesis is my own work and that I list all references in compliance with ethical guidelines on elaboration of Master´s thesis.

I have no relevant reason against using this work in the sense of § 60 of Act No. 121/2000, on the copyright law.

Prague, Czech Republic

May 8, 2023

…….

Larissa L Lara Olivas

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Abstract

Road safety is a crucial issue in the Czech Republic and the United States. This thesis evaluates the crash data collection system in the Czech Republic by conducting a safety analysis on a specific area of Prague. The Vítězné Náměstí Roundabout, a major and complex intersection, was selected as the case study area. Crash data from 2016 to 2022 were collected and analyzed, resulting in a proposed safety improvement for the intersection. A comparative assessment was also conducted, comparing the crash records, forms, databases, crash types and severities, and collision diagrams, between the Czech Republic and Texas. The analysis provides insights into the current state of crash data collection in the Czech Republic and identifies challenges and opportunities for improvement.

Keywords: crash data, safety assessment, multi lane roundabout, collision diagrams, cost-benefit analysis, comparative assessment, crash types, crash severities

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Chapter 1: Introduction

Road safety is a major concern in both the Czech Republic and the United States, with traffic crashes resulting in significant human and economic losses. In order to address this issue, it is essential to have accurate and comprehensive crash data that can be used to identify problem areas, evaluate countermeasures, and monitor progress over time. However, the collection and management of crash data can vary significantly between different countries and jurisdictions. In Prague, the capital city of the Czech Republic, crash data are collected by the police and reported to the Ministry of the Interior, which maintains a national database of all traffic accidents. In contrast, in El Paso, Texas, crash data are collected and managed by the Texas Department of Transportation (TxDOT) in the Texas Crash Records Information System (CRIS).Despite these differences, both Prague and El Paso face similar challenges in collecting and analyzing crash data, including ensuring data quality, improving data sharing among agencies, and addressing privacy concerns related to personal information. This thesis aims to conduct an assessment of the Czech Republic's crash data collection system by performing safety analysis on a specific area of Prague The analysis, which is based on the procedure commonly used in Texas, will provide insights into the safety conditions of the area and identify potential hazards and risk factors. More importantly, the analysis provides insights on the practice of crash data collection in the Czech Republic. By drawing upon previous knowledge and expertise, this thesis compares the states of crash data collection in Czech Republic and in Texas. The analysis will also consider best practices and innovative solutions to purpose targeted improvements that enhance overall safety.

1.1 BACKGROUND

Roundabouts are a common type of intersection in the Czech Republic. They are circular intersections that allow traffic to flow continuously, without the need for traffic signals. Roundabouts are often used to improve traffic safety and efficient, reduce congestion, and improve overall traffic flow. Most roundabouts are designed with central island, which helps to separate and control the flow of traffic. The design of roundabouts in the Czech Republic varies, depending on the size and location of the intersection, some roundabouts have multiple lanes, while others can have only one. Some are simple and small, while others are large and complex, with multiple exits and access points.

According to the Federal Highway Administration (FHWA), in the United States, a roundabout is a type of intersection with yield control of entering traffic, islands on the approach, and appropriate roadway curvature to reduce vehicles speeds. Figure 1 illustrates a standard roundabout design in the United States, featuring yield signs and designated makings to efficiently achieve its primary goal of traffic calming.

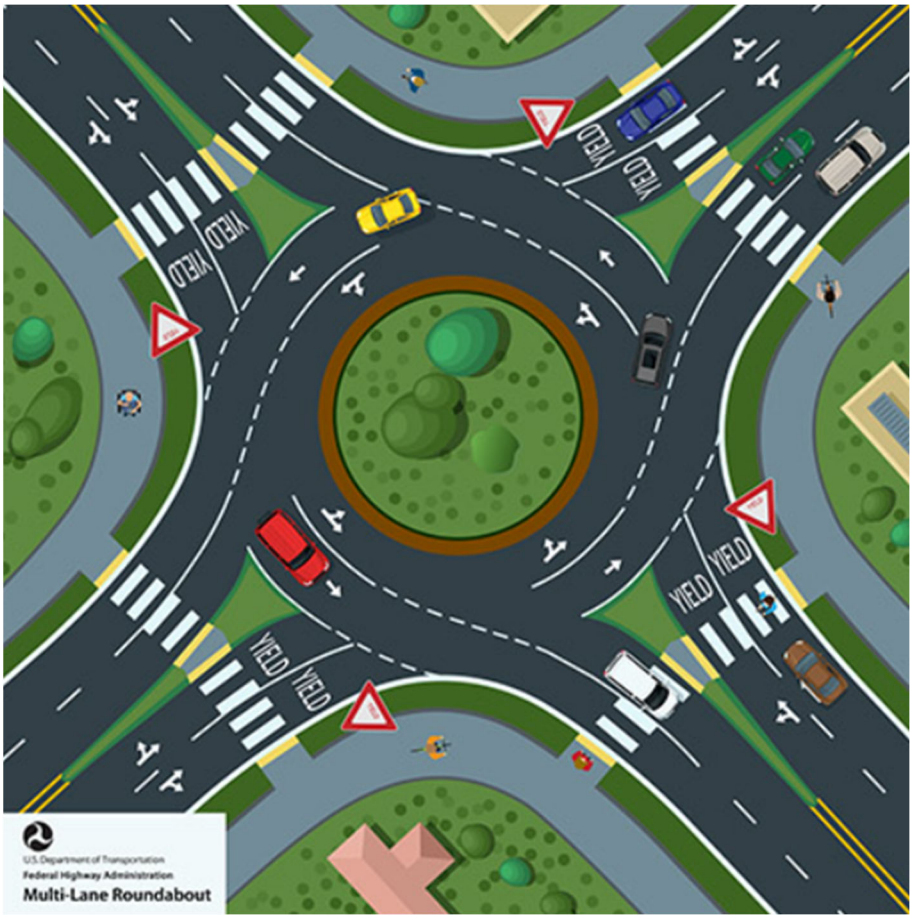

Figure 1: Example of a Multi-Lane Roundabout (FHWA, 2022)

Vítězné Náměstí roundabout is a large, multi-lane roundabout located in the western part of Prague, Czech Republic. It is a key intersection that connects several major roads, including Evropská Street, Bělohorská Street and Vítězné Náměstí (Victory Square). Due to its location near major landmarks and residential areas, the intersection is also popular for public transport and pedestrians. The roundabout has six entry and six exit points, and it is designed to accommodate high volumes of traffic, including busses and trams as shown in Figure 1.1.

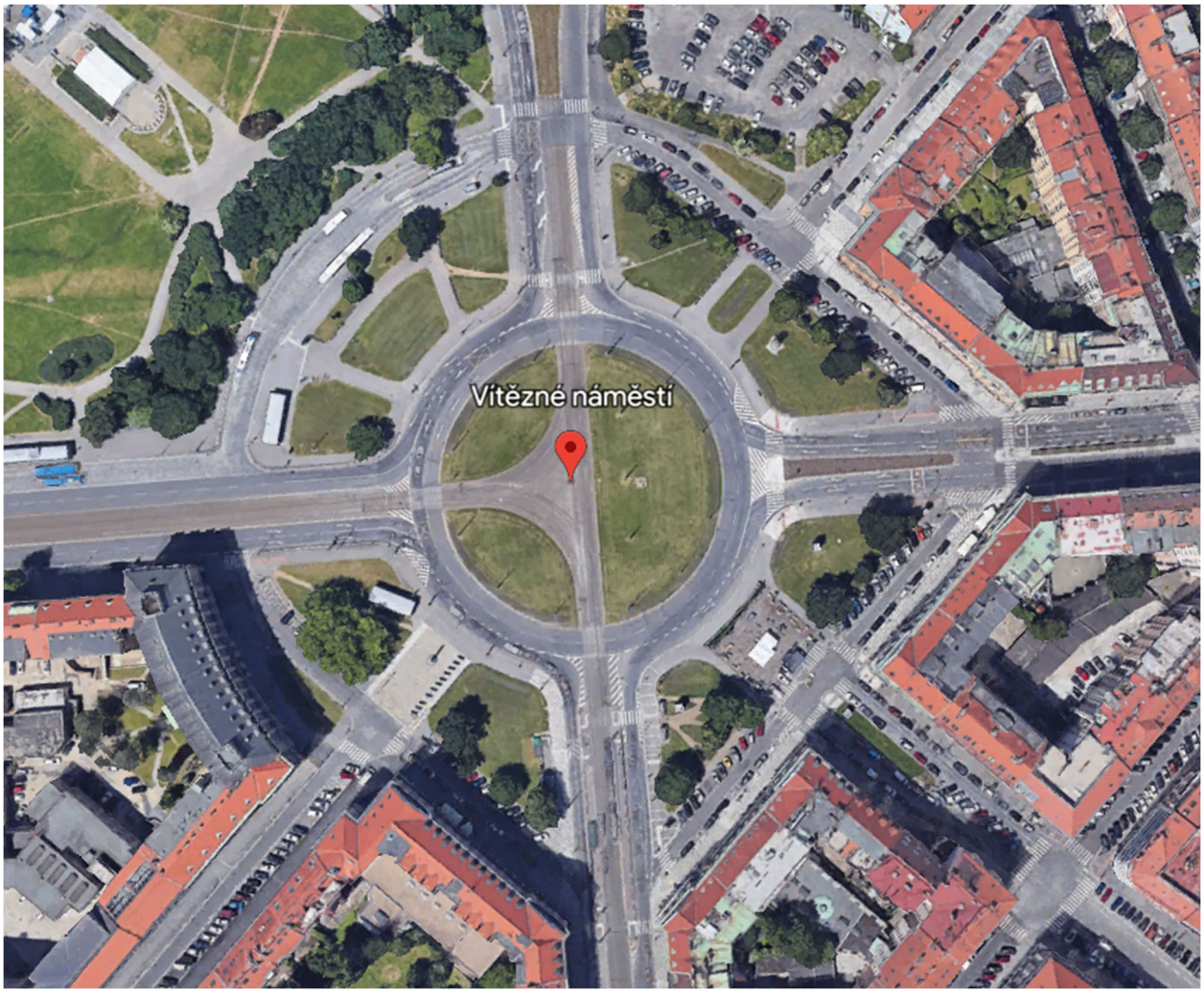

Figure 1.1: Google Earth View of Vítězné Náměstí

According to data from the Czech Ministry of Transport from January 1, 2016 to December 31, 2022 there were a total of 311 accidents at Vítězné Náměstí. There were no fatalities reported during this period and the most common type of accident at the roundabout was collisions between vehicles. The Vítězné Náměstí roundabout has been subject to some criticism for its complexity, leading to concerns about the safety of drivers and pedestrians. In this roundabout, the northern entrance poses a significant challenge due to the merging of traffic from two lanes into one lane. This design creates a situation where drivers are required to make sudden lane changes as they attempt to navigate the busy roundabout. Furthermore, the high traffic volume during peak hours

is a notable and observable issue. To address these concerns, a safety analysis of the roundabout will be conducted to identify high-risk zones and suggest intersection improvements to increase overall safety.

1.2 THESIS OBJECTIVES

The objective of this thesis were to evaluate the Czech Republic's crash data collection system. To achieve the objective, the following tasks were performed: (1) apply the Texas methodology of crash data analysis to the Vítězné Náměstí roundabout; (2) Identify crash patterns at Vítězné Náměstí roundabout and based on a proposed improvement plan, estimate the improvement in safety; (3) compare the safety data collection practice between Czech Republic and Texas and make recommendations for improvements in data collection.

The analysis included:

- Vítězné Náměstí roundabout
- Crashes that occurred from January 1, 2016 to December 31, 2022
- Crashes that involved all types of vehicle and modes, including pedestrians and public transportation
- Different manner of crashes: side swipe, rear end, right angle, pedestrians, reversing

1.3 THESIS OUTLINE

This master thesis is structured into five chapters. The chapters are as follow:

Chapter 1 introduces the background, objectives, and report outline.

Chapter 2 provides a review of the current crash data collection practices in both Texas and the Czech Republic.

Chapter 3 presents a case study of Vítězné Náměstí, including a description of the crash data, data analysis, and safety improvement recommendations, along with a benefit cost analysis.

Chapter 4 offers a comparative assessment of various aspects of crash records, including forms, databases, crash types, crash severities, and collision diagrams.

Chapter 5 provides a summary of the work undertaken in this thesis, including key recommendations, contributions, limitations, and future research directions.

Chapter 2: Review of Existing Crash Data Collection Methods

Crash data is a crucial tool for improving road safety. By collecting accurate and comprehensive information about road accidents, transportation professionals can identify patterns, trends, crash types and contributing factors to develop targeted interventions that will reduce the frequency and severity of accidents. This chapter reviews the existing crash data collection methods in both Texas and Czech Republic.

2.1 Crash Data Collection in Texas

Crash data in Texas is primarily collected by law enforcement officers who respond to the scene of the accident. Officers complete a standardized crash report form, which includes detailed information on the, date, time, and contributing factors of the accident, as well as information on the vehicles and drivers involved. This information is entered into the Crash Report Information System (CRIS), an electronic database managed by the Texas Department of Transportation (TxDOT), which stores and manages detailed information about road accidents. The CRIS includes information on the number of fatalities and injuries resulting from the accident, as well as the severity of the injuries. In addition to law enforcement data, TxDOT also collects crash data from hospitals, emergency medical services, and other sources to ensure that a comprehensive and accurate picture of road safety is available.

The crash data collected Texas is used to identify trends and patterns in road accidents, prioritize safety improvements, and monitor progress towards achieving road safety goals. Overall, the crash data collection process in Texas is comprehensive and detailed, providing valuable information for transportation professionals and stakeholders in the region.

2.2 Crash Data Collection in Czech Republic

The crash data used for this analysis was gather from the website of Traffic Accidents in the Czech Republic (https://nehody.cdv.cz/), which is maintained by the Ministry of interior. Figure 2 is a screenshot of the website's homepage, which illustrates the Czech Republic and its crash data. The website provides access to detailed data on traffic accidents, including their location, type, severity and number of people involved. The information is regularly updated and covers a wide range of accidents, from minor incidents to serious crashes resulting in fatalities.

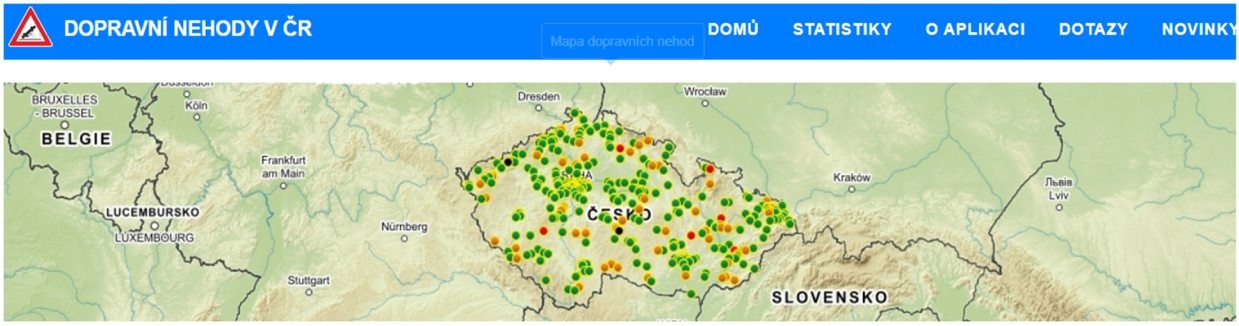

Figure 2: Traffic Accidents in the Czech Republic website's home page

The website is a user-friendly interface that allows for easy access to a wealth of data on road accidents in the country, however is only available in Czech and not English. Therefore, researchers and stakeholders who do not speak Czech may face challenges in accessing and utilizing the data provided by the website. Despite the language barriers, with the help of translation tools and local collaborators, it is still possible to extract valuable insights from the data and use it to inform road safety polices and initiatives.

The Traffic Accidents website in the Czech Republic offers users the ability to set various parameters to filter and analyze crash data. This feature allows users to tailor their analysis to specific regions, time periods, and type of accidents. One important feature of this website is the legend that accompanies the map as shown in Figure 2.1. This legend provides key information

about the colors, symbols, and data points used to represent different types of crashes and their severity.

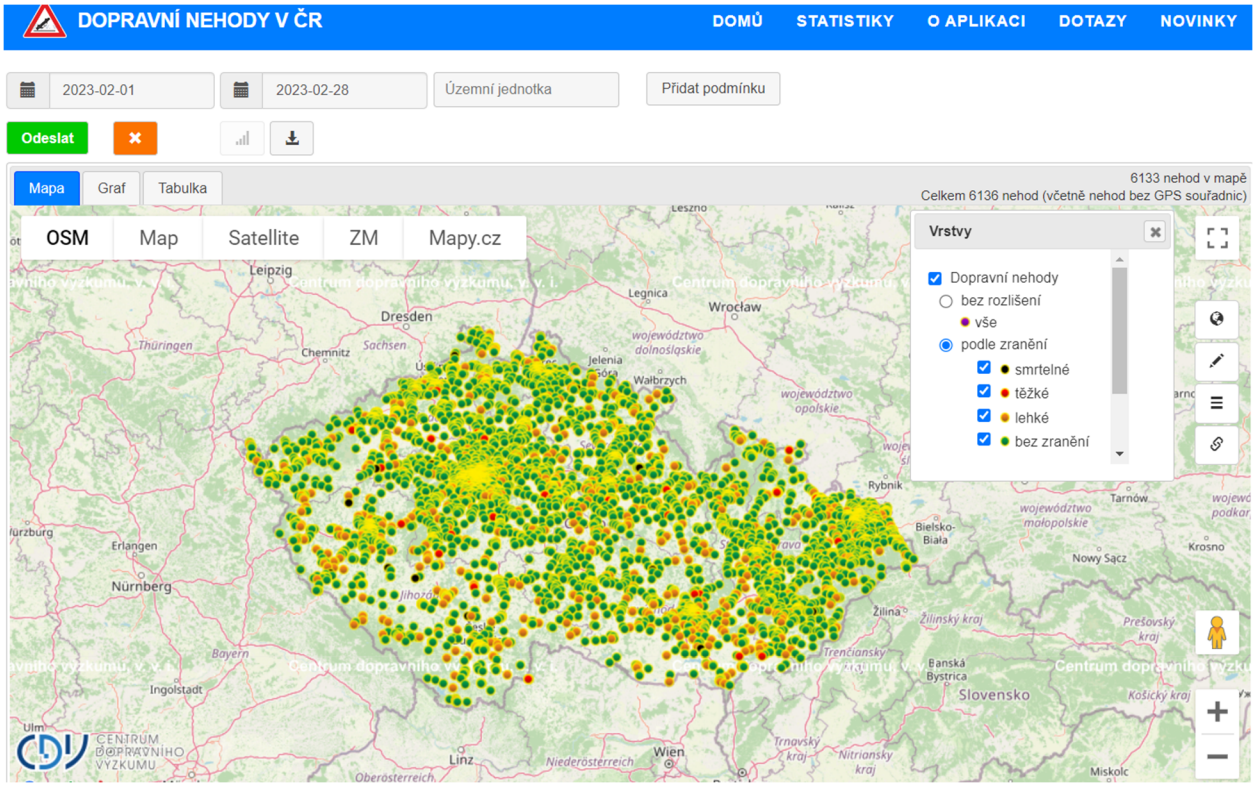

Figure 2.1: Traffic Accidents in the Czech Republic

Understanding the website and its legend is crucial for accurately interpreting the data presented on the website and drawing meaningful conclusions about road safety in the country. The legend and tabs of the website were translated to English using a translation tool as shown in Figure 2.3. While Google Translate provides an option to translate the webpage, it only translates the main tabs and not the crash data. Additionally, the translation may not always be completely accurate, which poses a significant challenge for those collecting or analyzing data from this website. Table 1 displays the key terms that were manually translated to obtain a more appropriate terminology than that provided by Google Translate.

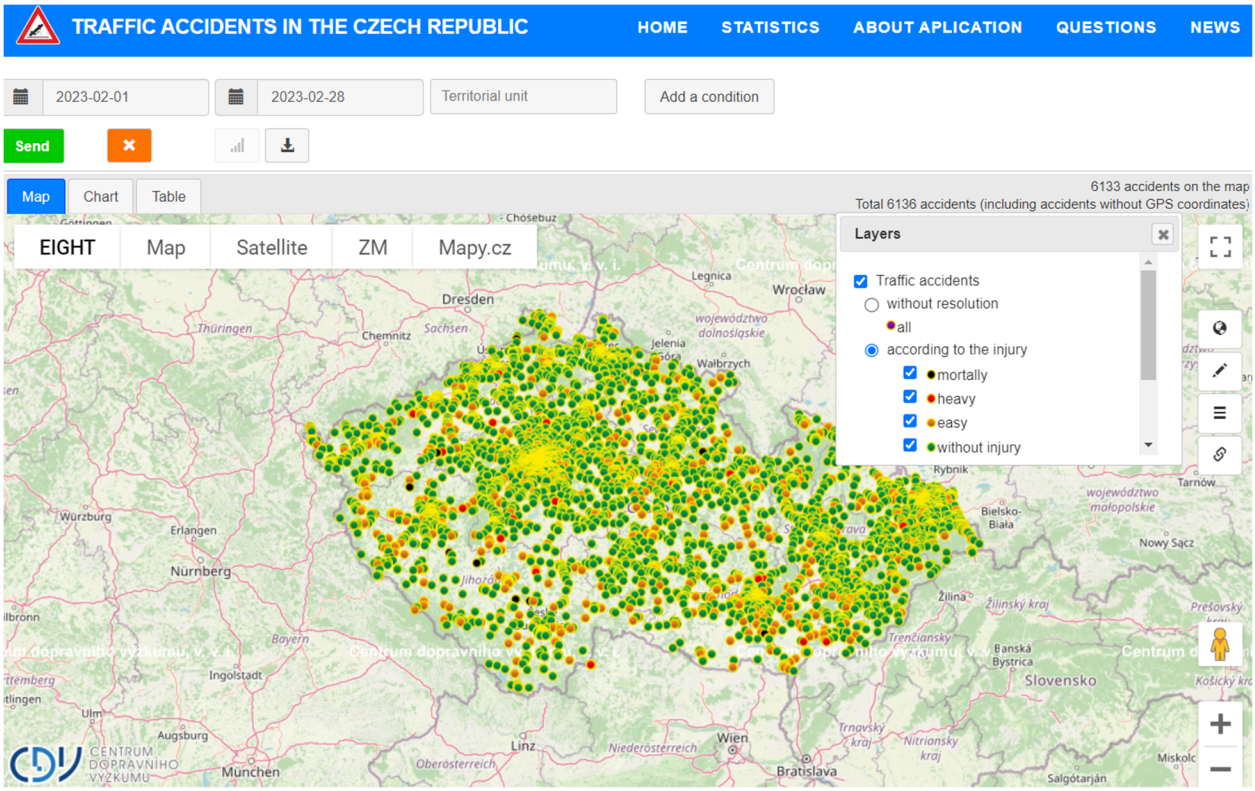

Figure 2.3: Traffic Accidents in the Czech Republic (English Version)

By utilizing the various filter options, users can gain a more comprehensive understanding of road safety in the Czech Republic. Table 2.1 displays the icons featured on the map and their corresponding functions.

Table 2.1: Traffic Accidents in the Czech Republic Maps Icon and Function

Icon	Function
	Display entire Czech Republic
	Filter Area
	Map Key
	Create Link

By utilizing this data source, the necessary crash data was obtained to conduct a safety analysis of the selected location in Prague. The aim of this analysis is to identify the primary causes of accidents, and the first step towards achieving this objective is to analyze the crash data. Processing the crash data might involve several steps, particularly if the data is only available in a foreign language. The subsequent chapter will detail the steps taken to examine the available public crash data.

Collision data in Prague is primarily collected by the Prague City Police. When a crash occurs, the police officer who responds to the scene is responsible for completing a paper form documenting the details of the crash, including the date, time, location, and description of the incident. The form also includes details about the involved vehicles, drivers, and nature of the accident. Once the paper form is completed, the police enter the information into their computer system. This data is then utilized to generate statistical reports on traffic accidents not just in Prague, but also throughout the country. Researchers and the public can access the data for analysis and research purposes. While statistical reports on traffic accidents are produced using the data collected by the police, the police report themselves are not generally available to the public. Some information, such as the number of injuries, fatalities, and type of accidents, is made public through the Traffic Accidents website, but more detailed information may only be accessible to authorized personnel. The analysis presented in this thesis relied solely on crash data that has been made available to the public at Traffic Accidents in the Czech Republic website shown in Figure 2.4, which will be fully described in Chapter 3. Utilizing this data, the study aimed to obtain valuable insights into the primary causes of accidents and identify areas that require the most attention for improving safety.

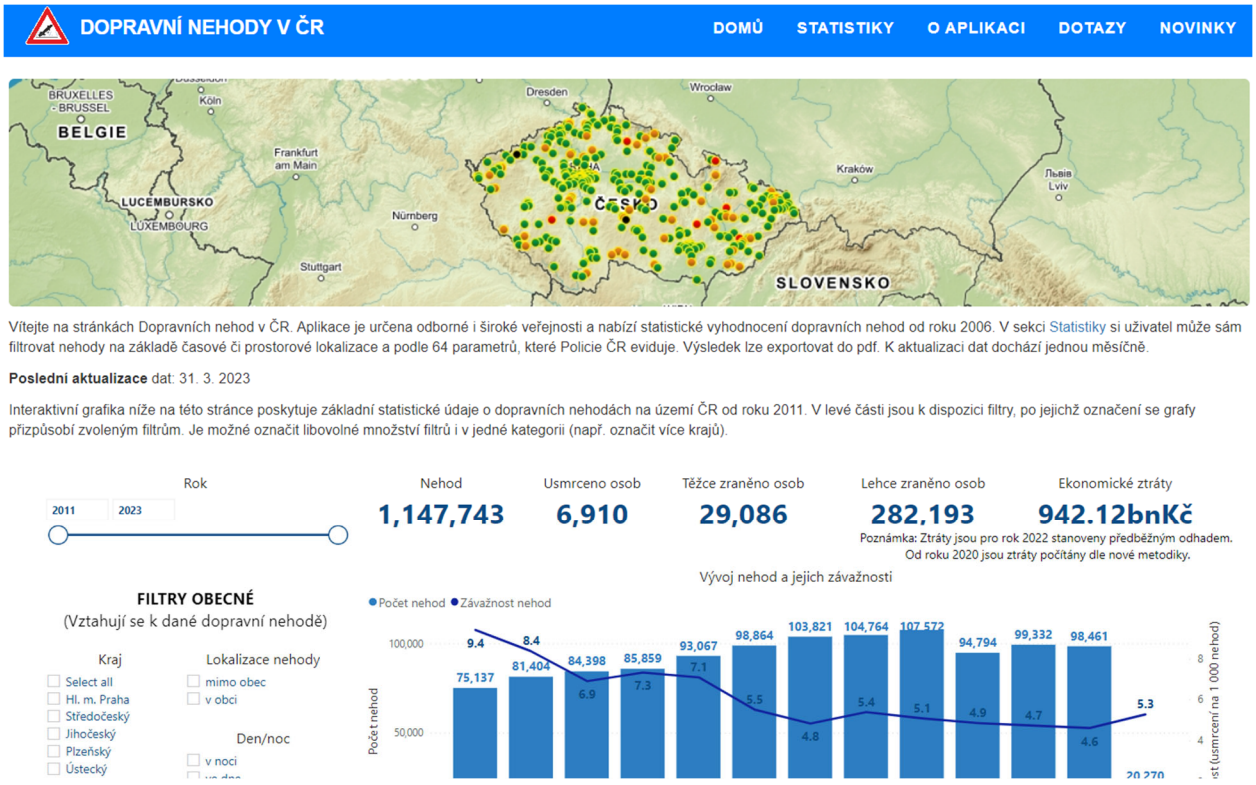

Figure 2.4: Screenshot of Traffic Accidents in the Czech Republic website

Chapter 3: Case Study

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This chapter seeks to understand the crash data collection in the Czech Republic by performing a case study at a site in Prague.

3.1 Site Description

Roundabouts have become increasingly popular in the Czech Republic as a means of improving traffic flow and reducing the number of accidents at intersections. The basic principle behind a roundabout is that traffic moves counterclockwise around a central island, with vehicles entering and exiting at designated points. This study focuses on Vítězné Náměstí roundabout, a significant roundabout with three lanes and six entry and exit points. Figure 3 illustrates the current

design and lane measurements of Vítězné Náměstí roundabout. Additionally, there are surrounding streets with parking areas and bus stop station located on the north-western side of the roundabout. The presence of a tram line passing through the roundabout further complicates the traffic flow. This roundabout experiences high volumes of public transportation, pedestrian, and vehicular traffic, making it a particularly busy intersection.

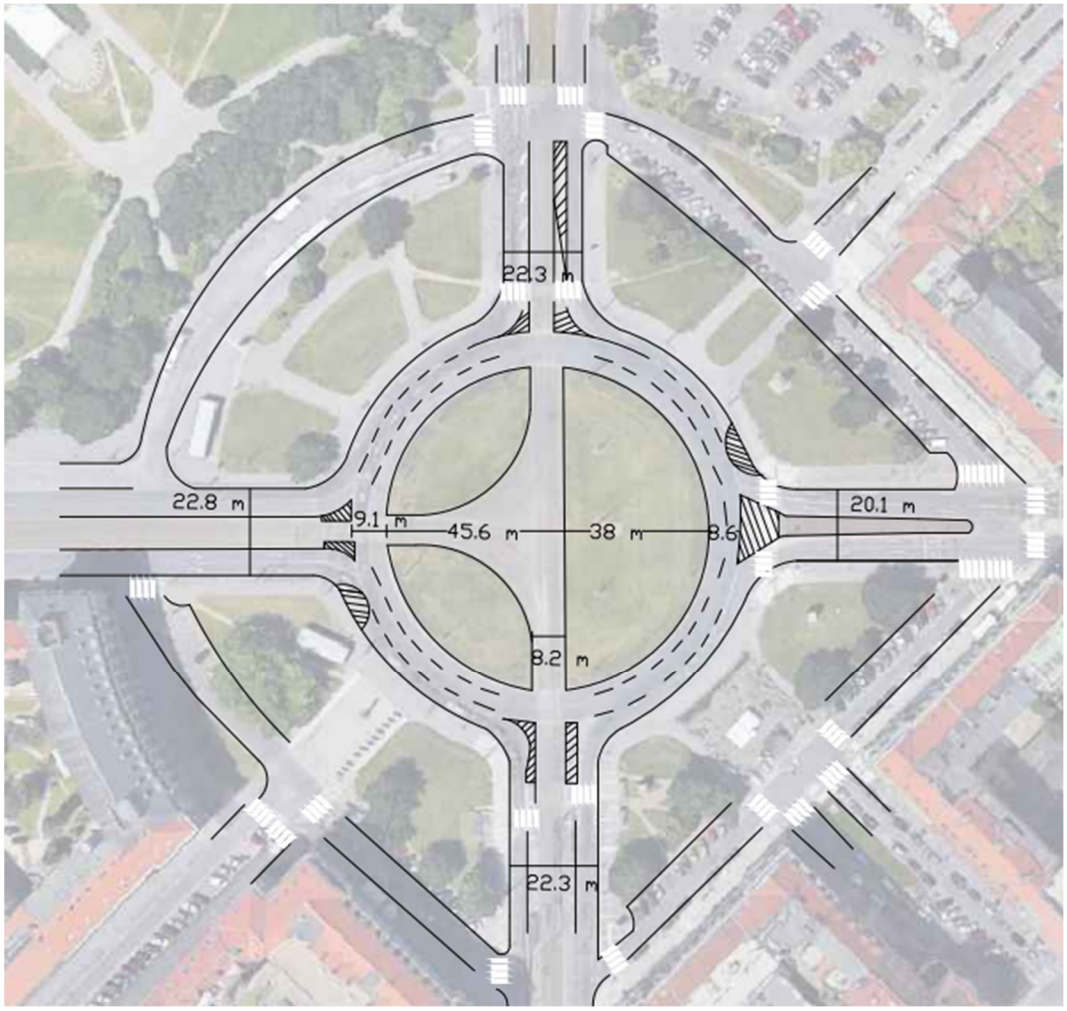


Figure 3: Current Design of Vítězné Náměstí

3.2 CRASH DATA SET

All the data analyzed in this study was obtained from the Traffic Accidents website, and it covers the period 2016 to 2022. To process this data, several steps were taken, which are described below for better understanding. The purpose of these steps was to filter the crash data and focus solely on the desired area, which is the roundabout.

Step 1: Filter Area of Interest

This step removed records of all the crashes that did not occur at the Vítězné Náměstí roundabout. To do this the pencil icon on the map was used, and with it a polygon was drawn to include the entire roundabout and some of the small streets that surround it as shown in Figure 3.1. The picture below shows how the interest area was selected and it includes crash accidents from January 1, 2016 to December 3, 2022.

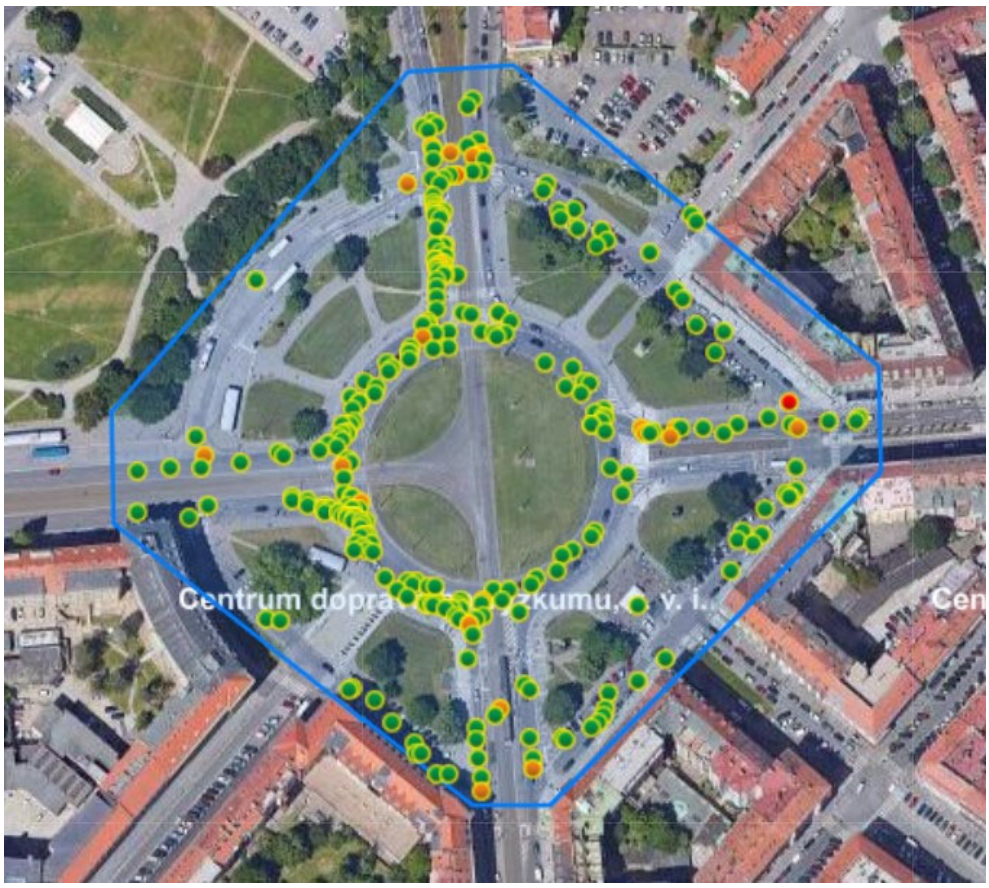


Figure 3.1: Study Area for Crash Analysis

Step 2: Filter Crash Data by Year

In this step crash data is filtered by year on the previously selected area. The desired start and end dates are entered next to the calendar icons highlighted in Figure 3.4 . As a result, only corresponding crash data is displayed on the map. The start date for this analysis is January 1, 2016 and the end date is December 31, 2016.

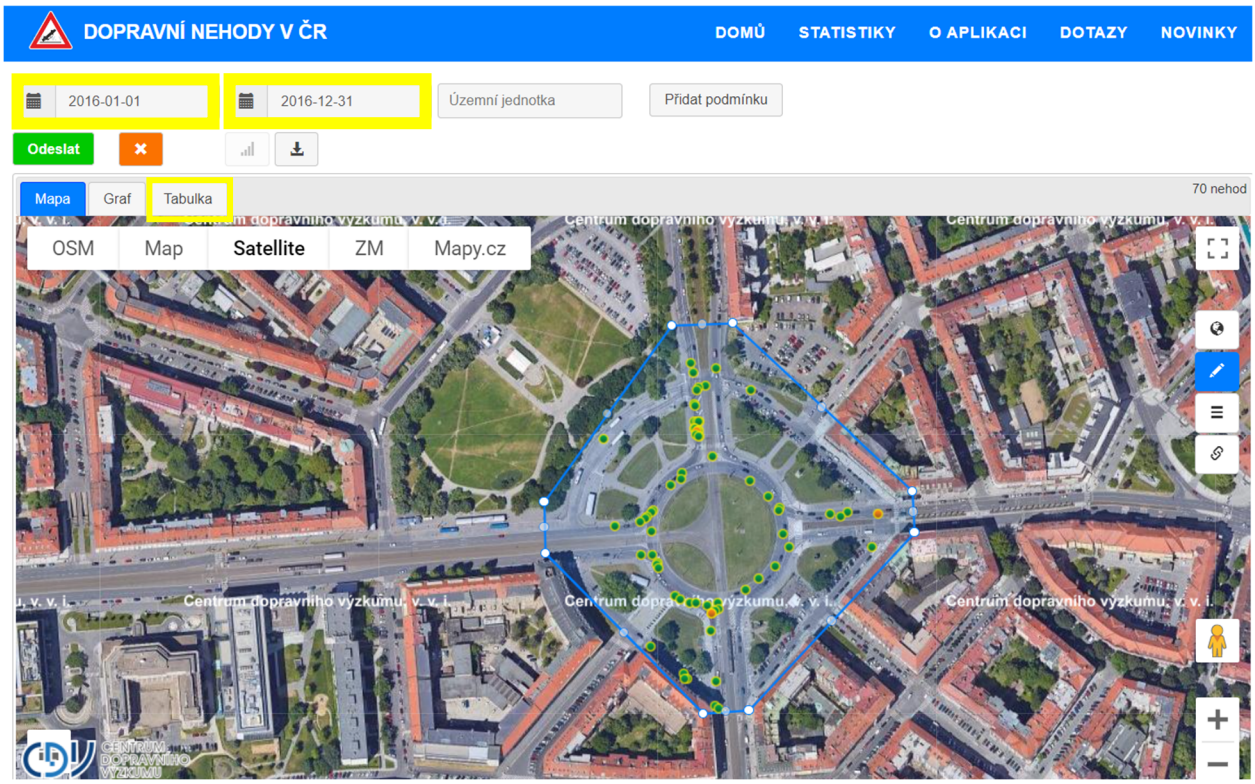
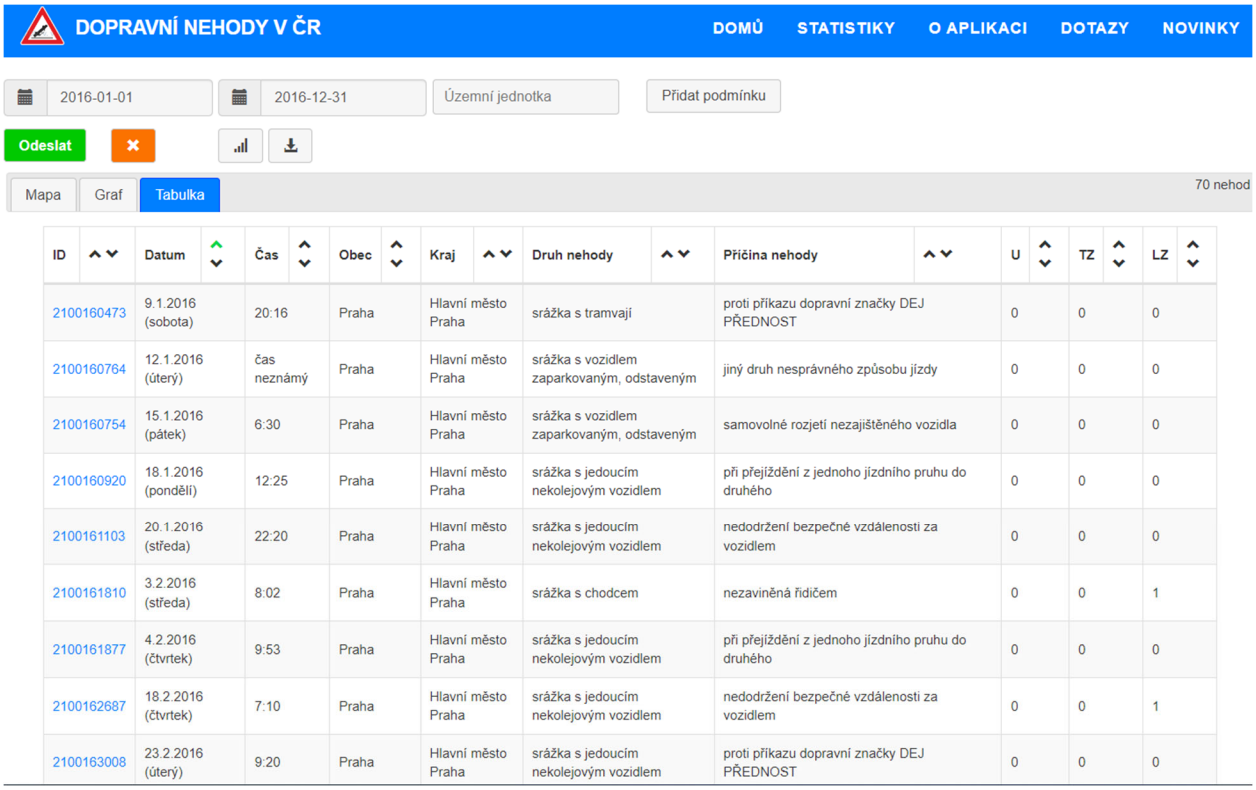


Figure 3.4: Crash Data in 2016

Step 3: Present data in table

For this step the “Tabulka” icon, which is highlighted in Figure 3.4, will be selected. This icon displays the crash data in a table format as shown in Figure 3.5. This format makes it easier to go through the crash data since its sorted by date and it is easy to keep track on which crashes have been already reviewed.



ID	Datum	Čas	Obec	Kraj	Druh nehody	Příčina nehody	U	TZ	LZ
2100160473	9.1.2016 (sobota)	20:16	Praha	Hlavní město Praha	srážka s tramvají	proti příkazu dopravní značky DEJ PŘEDNOST	0	0	0
2100160764	12.1.2016 (úterý)	čas neznámý	Praha	Hlavní město Praha	srážka s vozidlem zaparkovaným, odstaveným	jiný druh nesprávného způsobu jízdy	0	0	0
2100160754	15.1.2016 (pátek)	6:30	Praha	Hlavní město Praha	srážka s vozidlem zaparkovaným, odstaveným	samovolné rozjetí nezajištěného vozidla	0	0	0
2100160920	18.1.2016 (pondělí)	12:25	Praha	Hlavní město Praha	srážka s jedoucím nekolejovým vozidlem	při přejíždění z jednoho jízdního pruhu do druhého	0	0	0
2100161103	20.1.2016 (středa)	22:20	Praha	Hlavní město Praha	srážka s jedoucím nekolejovým vozidlem	nedodržení bezpečné vzdálenosti za vozidlem	0	0	0
2100161810	3.2.2016 (středa)	8:02	Praha	Hlavní město Praha	srážka s chodcem	nezaviněná řidičem	0	0	1
2100161877	4.2.2016 (čtvrtek)	9:53	Praha	Hlavní město Praha	srážka s jedoucím nekolejovým vozidlem	při přejíždění z jednoho jízdního pruhu do druhého	0	0	0
2100162687	18.2.2016 (čtvrtek)	7:10	Praha	Hlavní město Praha	srážka s jedoucím nekolejovým vozidlem	nedodržení bezpečné vzdálenosti za vozidlem	0	0	1
2100163008	23.2.2016 (úterý)	9:20	Praha	Hlavní město Praha	srážka s jedoucím nekolejovým vozidlem	proti příkazu dopravní značky DEJ PŘEDNOST	0	0	0

Figure 3.5: Crash data in Table Format

Step 4: Analyze each individual crash case

In this step, each individual crash record was reviewed. Each accident has an individual and unique crash ID number. After selecting the Crash ID, which are the blue numbers in Figure 3.5, the website opens a new tab with detailed information on the accident selected as illustrated in Figure 3.6. It is important to mention that all detailed information is provided only in Czech. After using reliable translation resources and help from advisors, the important information for this analysis was identified. For this analysis it was important to identify date, time, location type of accident and severity. The date and time are stated below the case ID, the exact location is displayed on the map, and the type of accident is on the second column next to “Hlavni pricina nehody”, highlighted in Figure 3.6, which translates to main cause of accident. There is more information available like information on the cars and persons involved but that information was

not necessary in this analysis. Once the necessary information was localized, google translate was used to translate in order to determine the type of accident of each crash.

NEHODA 2100161103

ID nehody	2100161103	Obec	Praha (Hlavní město Praha)
Datum	20.1.2016 (středa), 22:20	Druh komunikace	komunikace sledovaná (ve vybraných městech) (do 12/2022)
Druh nehody	srážka s jedoucím nekolejovým vozidlem	Číslo komunikace	

Druh srážky jedoucích vozidel	zezadu	Povětrnostní podmínky v době nehody	neztížené
Druh pevné překážky	nepřichází v úvahu, nejedná se o srážku s pevnou překážkou	Viditelnost	v noci - s veřejným osvětlením, viditelnost nezhoršená vlivem povětrnostních podmínek
Charakter nehody	nehoda pouze s hmotnou škodou	Rozhledové poměry	dobré
Zavinění nehody	řidičem motorového vozidla	Dělení komunikace	třípruhová
Přítomnost alkoholu u viníka nehody	ne	Situování nehody na komunikaci	na jízdním pruhu
Hlavní příčina nehody	nedodržení bezpečné vzdálenosti za vozidlem	Řízení provozu v době nehody	žádný způsob řízení provozu
Usmrceno osob	0	Místní úprava přednosti v jízdě	žádná místní úprava
Těžce zraněno osob	0	Specifická místa a objekty v místě nehody	žádné nebo žádné z uvedených
Lehce zraněno osob	0	Směrové poměry	přímý úsek
Celková hmotná škoda (Kč)	90000	Počet zúčastněných vozidel	2
Druh povrchu vozovky	živice	Místo dopravní nehody	mimo křižovatku
Stav povrchu vozovky v době nehody	na vozovce je náledí, ujetý sníh - posypané	Druh křižující komunikace	
Stav komunikace	dobrý, bez závad		

Figure 3.6: Individual Crash Report

Once the main cause of accident was known, each crash was drawn in auto cad to create the crash diagrams that will be explain in detailed in the next chapter. Figure 3.7 illustrates how a crash and its corresponding data its translated into the collision diagram. Since the collision diagrams were drawn per year, only the month and day are shown, and since the crash ID's all start with the same five digits only the last six digits are displayed on the crash diagrams.

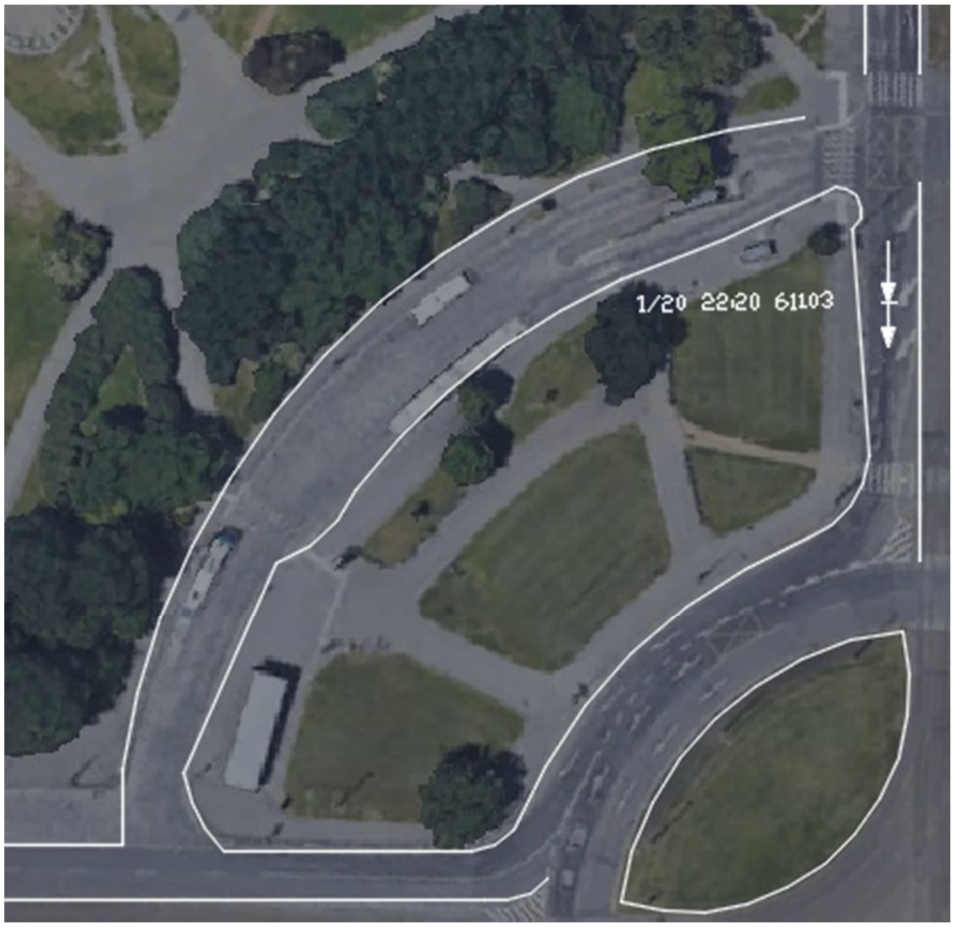


Figure 3.7: AutoCAD crash drawing

Step 5: Repeat the previous steps

The previous steps need to be repeated until all crashes in the selected area, from 2016 to 22, are analyzed.

3.3 CRASH ANALYSIS

The present study analyzed 311 crashes occurring over a period of seven years (2016 to 2022); however, only 253 of them were included in the analysis due to issues with data accuracy. The excluded 58 crashes were not reflected in the crash diagrams because they lacked information on the type of collision, which is a critical factor in identifying high-risk areas. To provide a comprehensive understanding, Table 3.3 summarizes the number and types of collisions that occurred during the seven-year window. The unspecified crashes were categorized as "other" due to their unknown cause, leaving a total of 253 crashes.

Table 3.3: Total Number of Accidents

Year	Side Swipe	Rear End	Reversing	Fixed Object	Pedestrians	Right Angle	Other	Total
2016	28	20	3	0	1	2	16	70
2017	27	8	2	0	4	2	10	53
2018	21	11	1	0	2	0	4	39
2019	28	16	1	0	1	1	5	52
2020	14	6	3	0	0	0	9	32
2021	17	3	5	3	0	1	6	35
2022	10	9	0	1	2	0	8	30
Total	146	74	14	4	10	5	58	311

To enhance the visibility and comprehensively of the crash diagrams, the roundabout was divided into four quadrants for the safety analysis. The quadrants are numbered in counterclockwise direction starting from the North East side of the roundabout. The individual crash diagrams, included in the appendix, have been summarized on the following pages (Figures 3.8 – 3.11), revealing that Quadrants 2 and 3 have reported more accidents. The distribution of accidents per quadrant is presented in the subsequent table, Table 3.3.1, with the sideswipe being the most frequent type of accident, particularly in Quadrant 2. This high number of sideswipe accidents in Quadrant 2 (North East approach) may be attributed to the roundabout design, as discussed in Section 1,1, which involves two lanes merging into one to access the roundabout. The majority of these accidents occurred in the North East part of the roundabout, where drivers

frequently change lanes as they enter or exit the roundabout. The second most frequent type of crash is rear-end collision, which could be attributed to the significant volume of traffic at the roundabout, resulting in drivers' inability to maintain a safe following distance. This type of collision is also observed to be most prevalent in Quadrant 2.

Table 3.3.1: Number of Accidents per Quadrant

	Side Swipe	Rear End	Reversing	Fixed Object	Pedestrian	Right Angle	Total
Quadrant 1	15	17	4	2	7	6	51
Quadrant 2	54	19	1	2	3	0	79
Quadrant 3	45	30	3	1	2	3	84
Quadrant 4	12	7	7	1	5	0	32

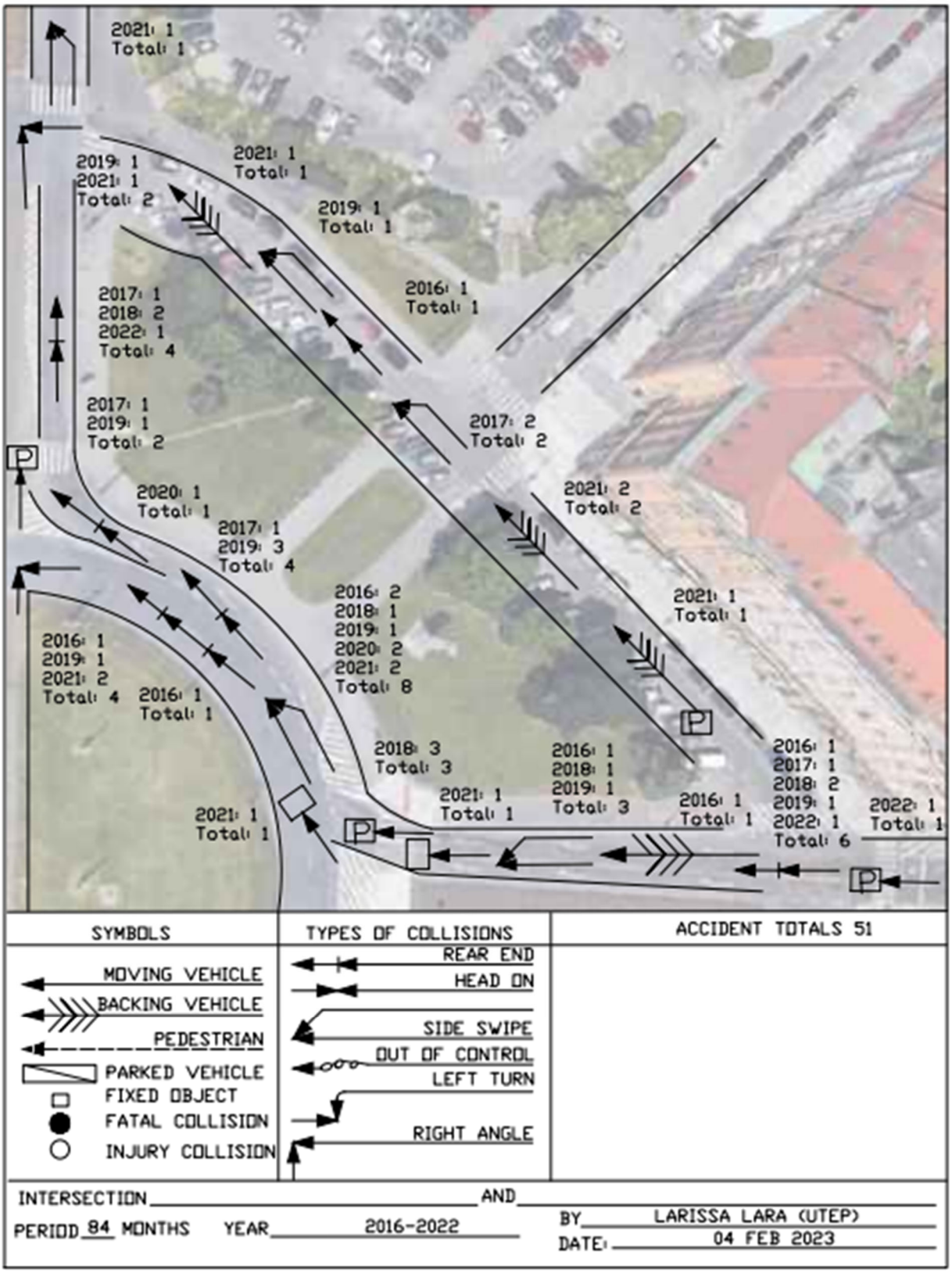


Figure 3.8: Quadrant 1 Crash Diagram Summary

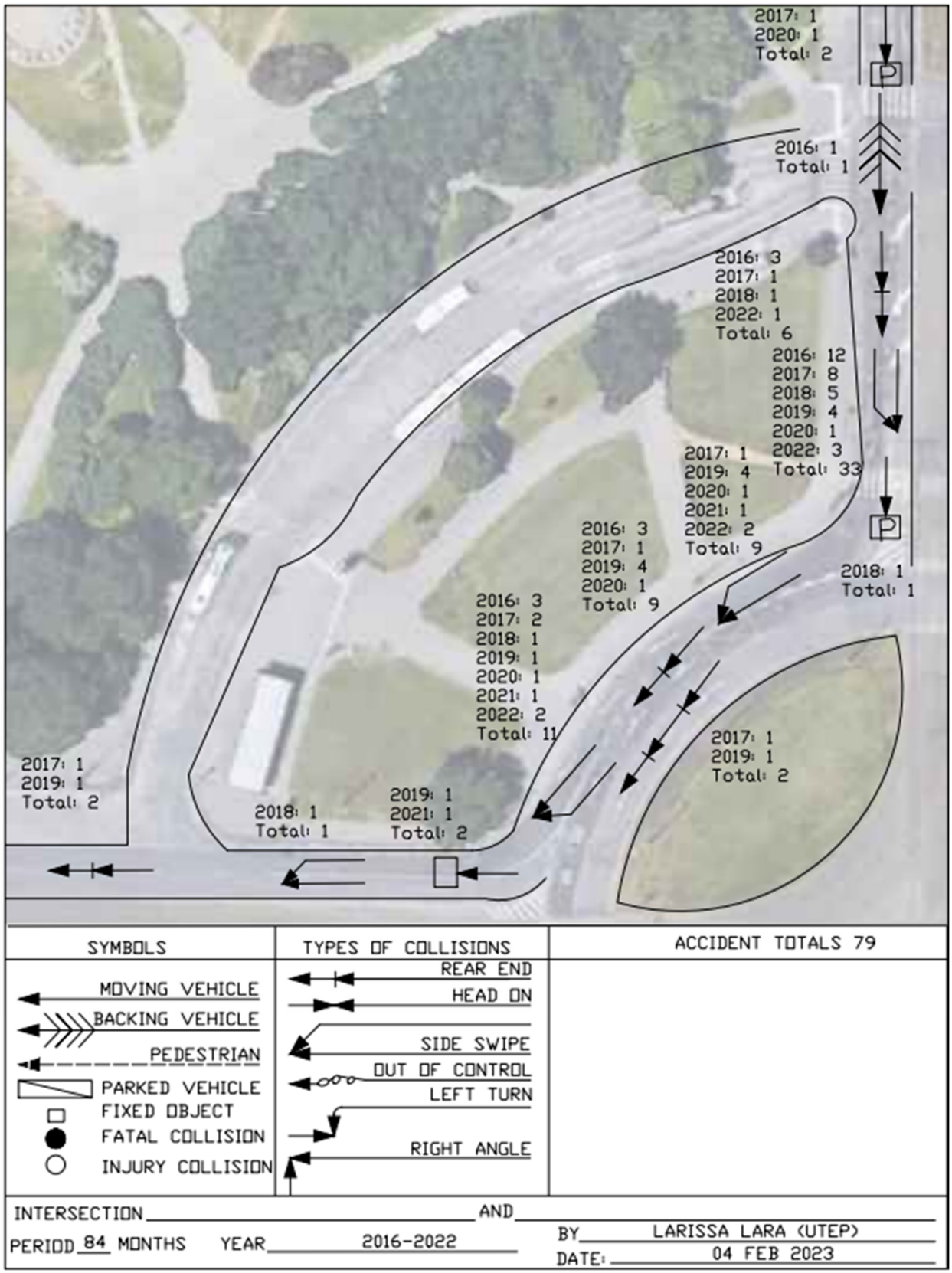


Figure 3.9: Quadrant 2 Crash Diagram Summary

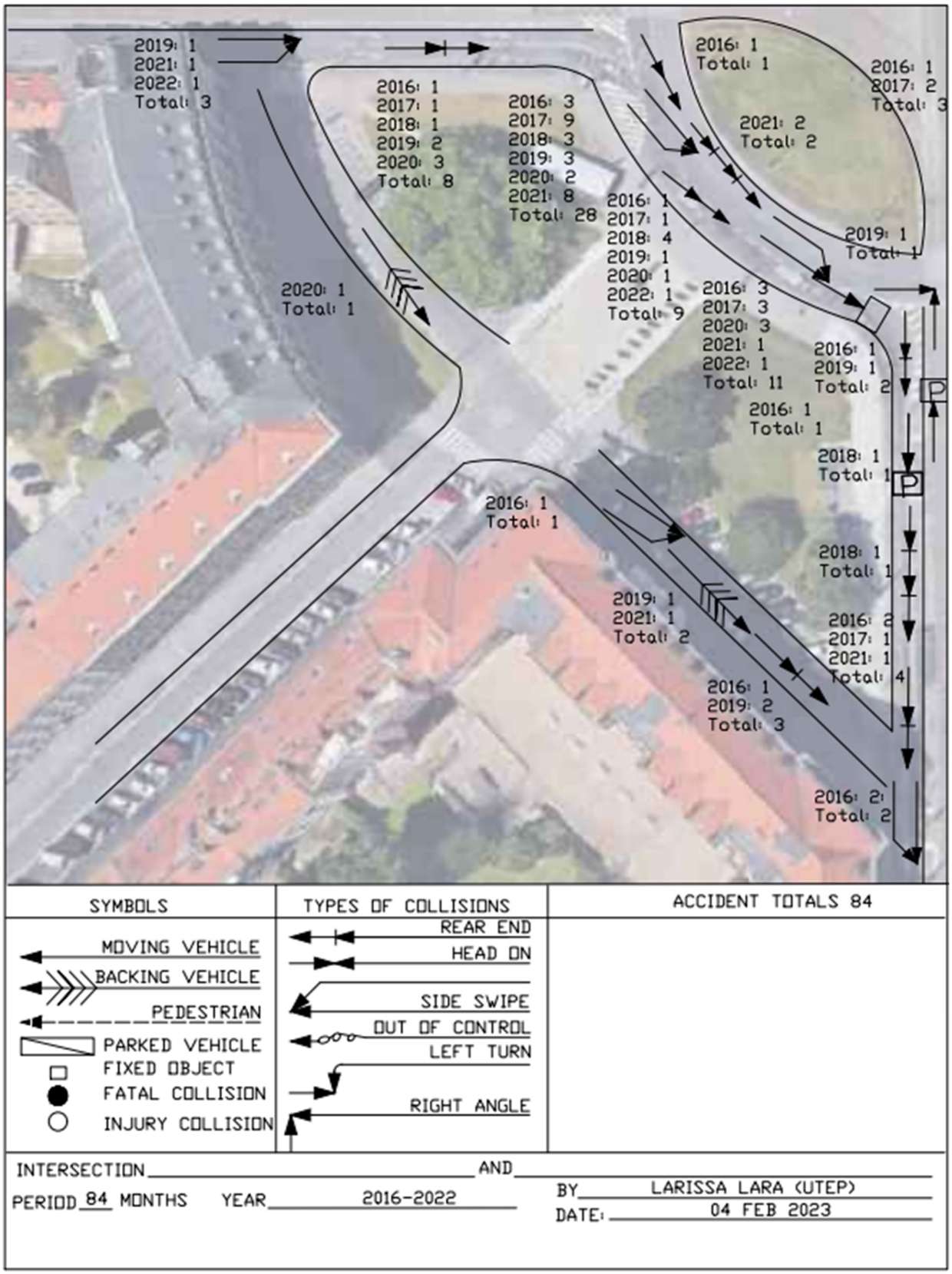


Figure 3.10: Quadrant 3 Crash Diagram Summary

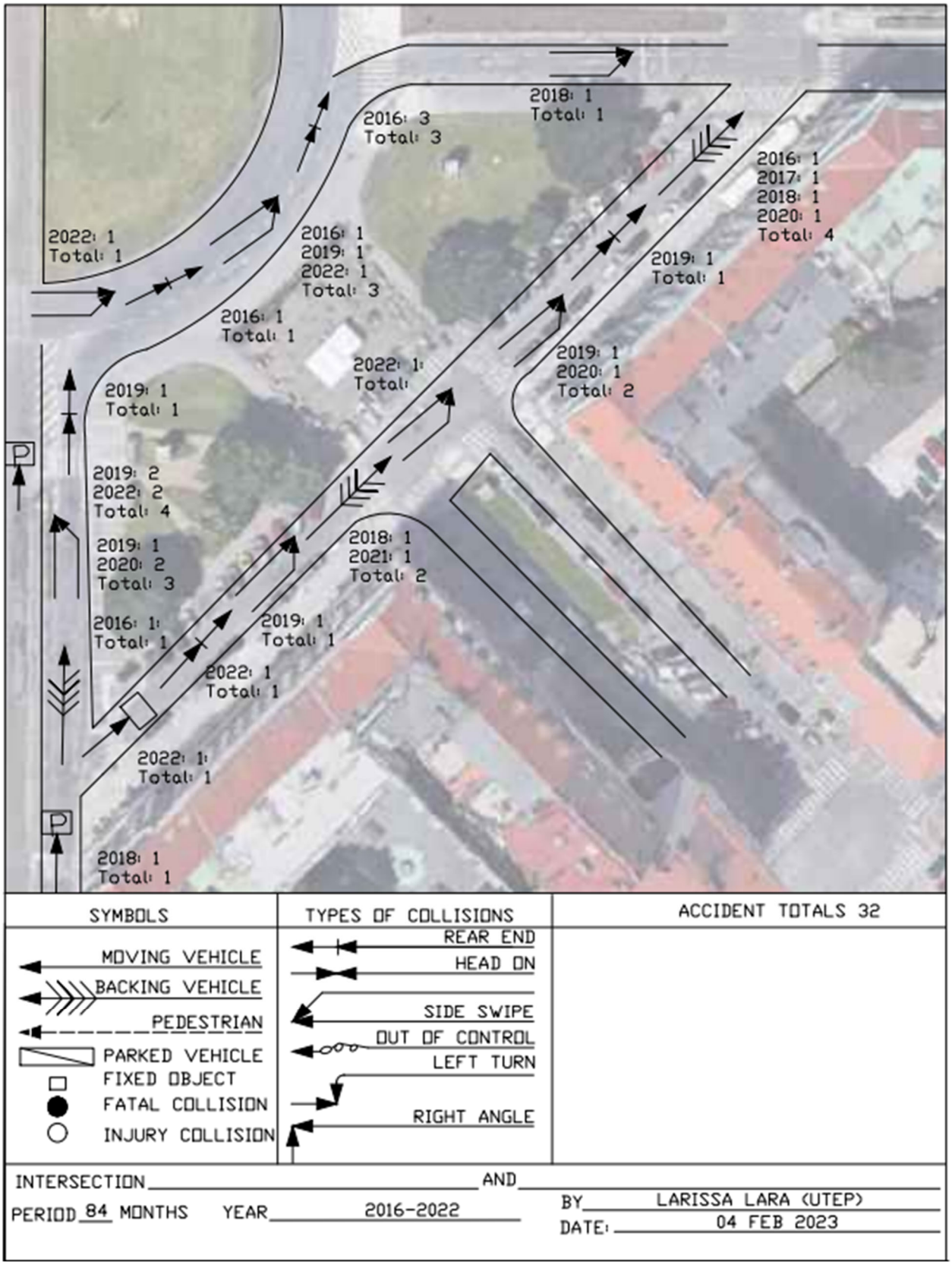


Figure 3.11: Quadrant 4 Crash Diagram Summary

3.4 BENEFIT-COST ANALYSIS AND SAFETY IMPROVEMENTS

Cost-Analysis

For the purpose of calculating the cost per crash, this study only considered crash data from 2016 to 2021. This is because the cost per crash data for the year 2022 has not yet been released. It is important to note that the next step in the analysis was to categorize the data by severity. Table 3.4 provides a summary of the number of crashes and their severity levels, while the detailed information for each year is included in the appendix. As a result of excluding the crash data from 2022 for the cost benefit analysis, the total number of crashes considered in this study was reduced to 231.

Table 3.4: Number of Crashes per Severity

	Side Swipe	Rear End	Reversing	Fixed Object	Pedestrians	Right Angle	Total
Fatalities	0	0	0	0	0	0	0
Severe Injuries	0	0	0	0	1	1	2
Minor Injuries	0	2	0	0	12	0	14
Material Damage	123	62	15	5	3	7	215
TOTAL							231

After the severity of the crashes was determined, the analysis proceeded to calculate the cost per crash. The cost per crash data used in this study was obtained from Dr. Josef Kocourek, who used the "Updated Methodology for calculating Losses from Road Traffic Accidents" to provide this information. The given costs per accidents are displayed in Table 3.4.1.

Table 3.4.1: Cost per Accident

	Fatalities		Severe Injuries		Minor Injuries		Material Damage	
	Kc	USD	Kc	USD	Kc	USD	Kc	USD
2016	19,411,000	860,989	5,094,200	225,957	668,500	29,652	364,500	16,168
2017	19,784,000	877,534	5,097,500	226,103	716,700	31,790	386,400	17,139
2018	22,534,000	999,512	5,983,000	265,380	739,700	32,810	389,800	17,290
2019	25,041,000	1,110,712	5,567,000	246,928	809,000	35,884	405,000	17,964
2020	35,021,000	1,553,382	5,800,000	257,263	603,300	26,760	415,800	18,443
2021	58,235,000	2,583,056	12,211,000	541,628	713,500	31,648	474,800	21,060

To determine the cost per accident in US dollars, the exchange rate between Czech Crowns and US Dollars was obtained from the website (https://www.kurzy.cz/kurzy-men/kurzy.asp?a=X&mena1=CZK&mena2=USD&c=1&d=17.3.2023&convert=P%F8eve%EF+m%ECnu) and used for conversion. Based on this calculation, the cost per accident for each year was determined and is presented in Table 3.4.2 through Table 3.4.7.

Table 3.4.2: 2016-Cost per Accident

Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,411,000	860,989	0	0
Severe Injuries	0	5,094,200	225,957	0	0
Minor Injuries	2	668,500	29,652	1,337,000	59,304
Material Damage	52	364,500	16,168	18,954,000	840,719
TOTAL				20,291,000	900,022

Table 3.4.3: 2017-Cost per Accident

Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,784,000	877,534	0	0
Severe Injuries	0	5,097,500	226,103	0	0
Minor Injuries	4	716,700	31,790	2,866,800	127,159
Material Damage	39	386,400	17,139	15,069,600	668,423
TOTAL				17,936,400	795,582

Table 3.4.4: 2018-Cost per Accident

Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	22,534,000	999,512	0	0
Severe Injuries	0	5,938,000	265,380	0	0
Minor Injuries	4	739,700	32,810	2,958,800	131,240
Material Damage	29	389,800	17,290	11,304,200	501,406
TOTAL				14,263,000	632,646

Table 3.4.5: 2019-Cost per Accident

Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	25,041,000	1,110,712	0	0
Severe Injuries	0	5,567,000	246,928	0	0
Minor Injuries	3	809,000	35,884	2,427,000	107,651
Material Damage	45	405,000	17,964	18,225,000	808,383
TOTAL				20,652,000	916,035

Table 3.4.6: 2020-Cost per Accident

Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	35,021,000	1,553,382	0	0
Severe Injuries	0	5,800,000	257,263	0	0
Minor Injuries	1	603,300	26,760	603,300	26,760
Material Damage	22	415,800	18,443	9,147,600	405,749
TOTAL				9,750,900	432,508

Table 3.4.7: 2021-Cost per Accident

Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	58,235,000	2,583,056	0	0
Severe Injuries	2	12,211,000	541,628	24,422,000	1,083,256
Minor Injuries	0	713,500	31,648	0	0
Material Damage	28	474,800	21,060	13,294,400	589,683
TOTAL				37,716,400	1,672,939

A summary of the cost per accident is presented in Table 3.4.8, which displays the total cost per accident in the six -year period, accounting for the variation in cost per accident over the years.

Table 3.4.8: 2016-2022 Cost Per Accident

Severity	Number of Accidents	Total (Kc)	Total (USD)
Fatalities	0	0	0
Severe Injuries	2	24,422,000	1,083,256
Minor Injuries	14	10,192,900	452,114
Material Damage	215	85,994,800	3,814,362
TOTAL	231	120,609,700	5,349,732

Safety Improvements

Upon completion of the crash diagrams and cost-per-accident calculations, the next step was to propose improvements to enhance safety. In collaboration with Lauren Brown, a colleague working on Traffic Analysis and Operational Improvements for Vítězné Náměstí in Prague, it was suggested that Vítězné Náměstí be transformed into a two-lane roundabout based on U.S guidelines. The objective of this proposal is to address the main conflict area at the North Entrance where vehicles merge into a single lane to enter the roundabout, resulting in side swipe accidents. This improvement aims to mitigate such incidents by allowing users to enter and maintain the desired lane without having to change lanes within the roundabout. However, the southern entrance and exit would remain a single lane due to the tram stop that limits the available space for a two-lane entrance or exit. An AutoCAD drawing of the suggested safety improvement design is illustrated in Figure 3.12.

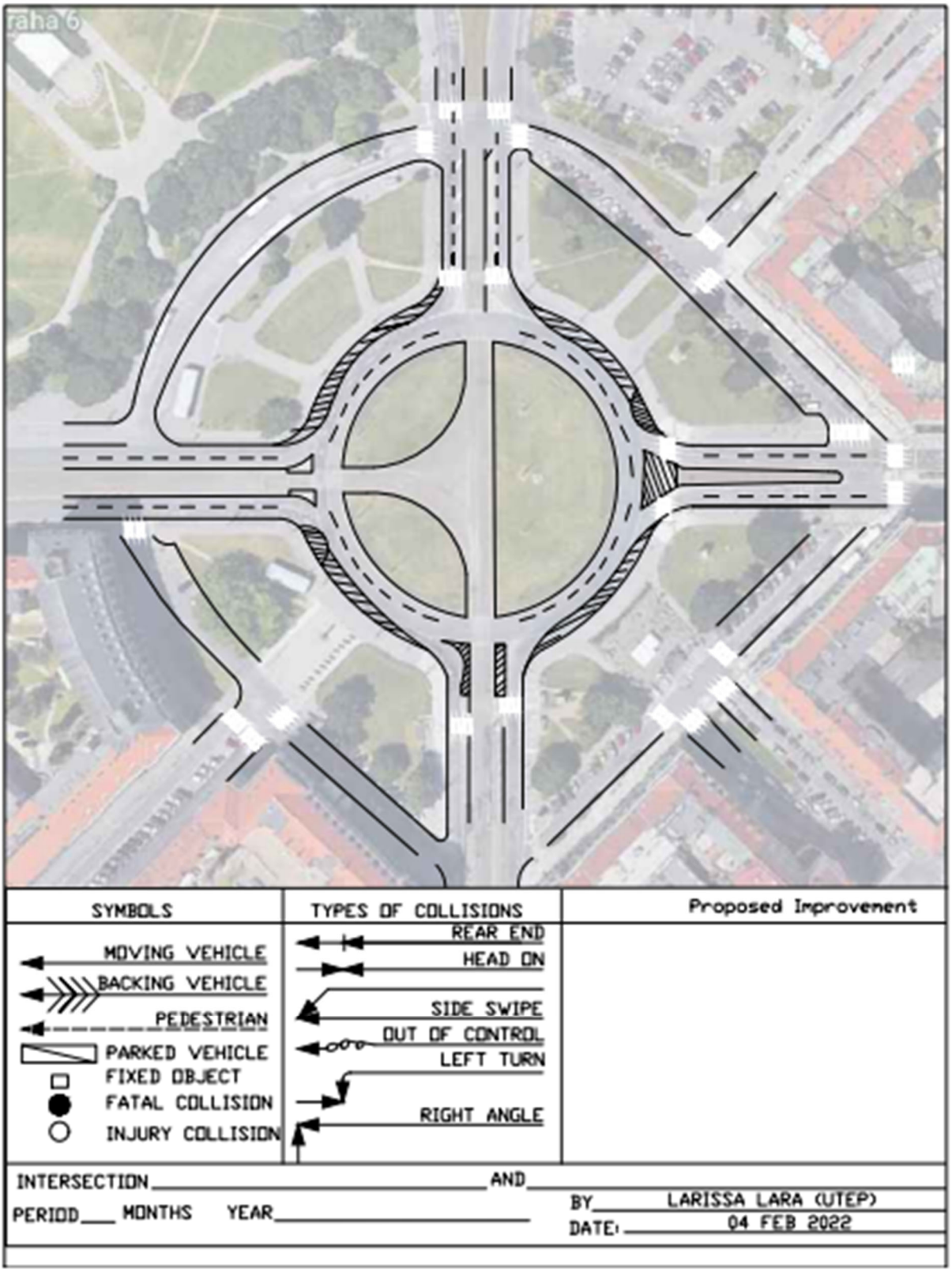


Figure 3.12: Proposed Improvement

After the improvement suggestion was chosen and the cost per accident was calculated, the subsequent step is to conduct a cost-benefit analysis. In order to execute this analysis, it was essential to determine which accidents could potentially be reduced by implementing the selected improvement. To provide better visualization 3.12 (Quadrant 1), Figure 3.14 (Quadrant 2) and Figure 3.15 (Quadrant 4) are included in the report. It is worth noting that the proposed improvement, a conversion to a two-lane roundabout, does not affect quadrant 3. This is due to the fact that the southern exit of the roundabout cannot be modified to accommodate a two-lane configuration. These figures show a crash summary for the years 2016-20221, which serves as the basis for the benefit-cost analysis. The potential prevented accidents are highlighted in green in these figures to make them easily identifiable.

A total of 61 sideswipe accidents have the potential to be reduced by the proposed improvement. Detailed tables for each year are listed in the appendix, but Table 3.4.9 provides a summary of the potential prevented accidents by quadrant including their associated costs accounting for variations in cost per accident over the years.

Table 3.4.9: Potential Prevented Accidents (2016-2021)

Location	Provable Prevented Accidents	Cost of Accidents (Kc)	Cost of Accidents (USD)
Quadrant 1	11	4,464,300	198,017
Quadrant 2	46	17,898,700	793,910
Quadrant 3	0	0	0
Quadrant 4	4	1,579,500	70,060
Total	61	23,942,500	1,061,987

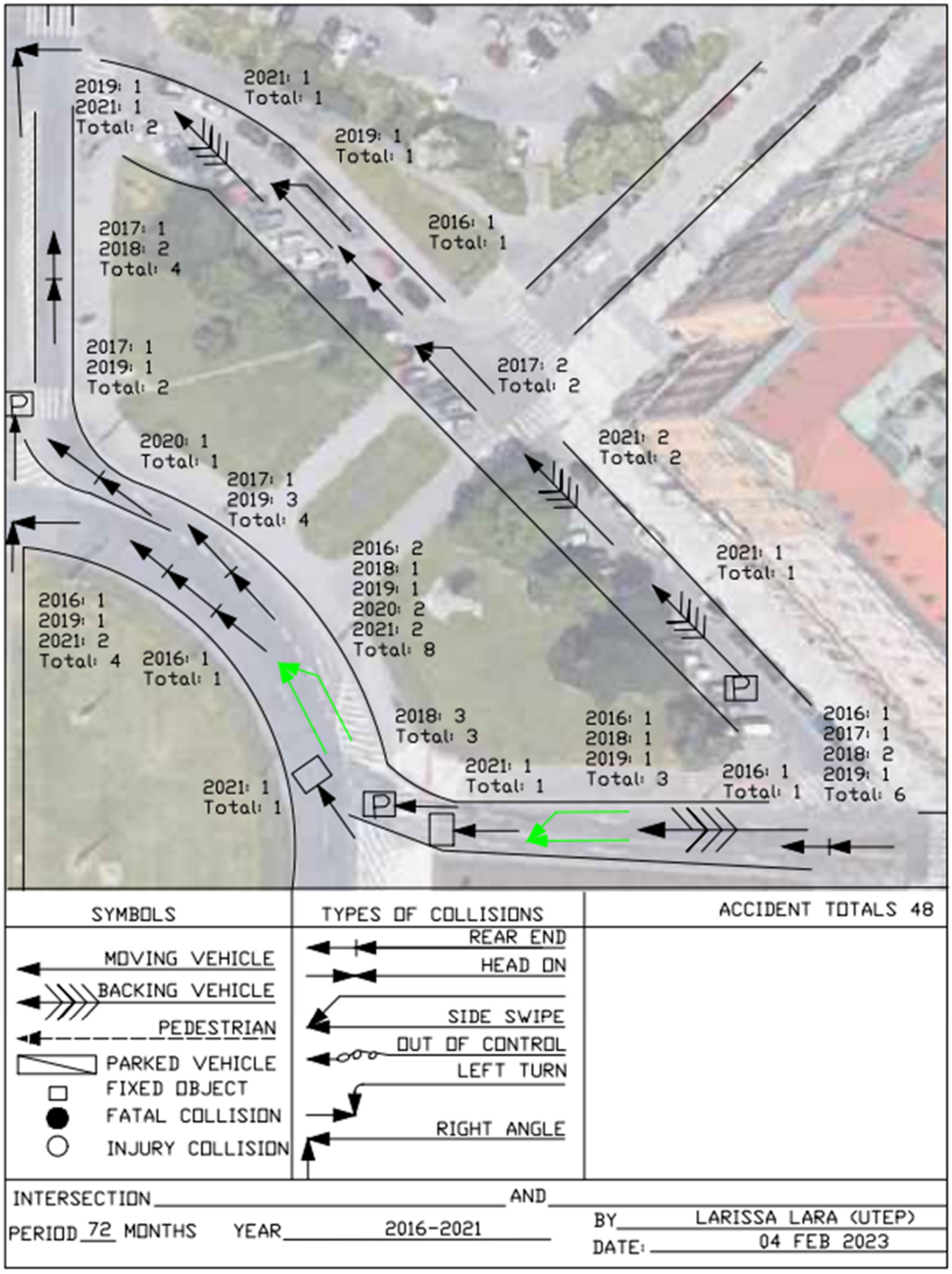


Figure 3.13: Potential Prevented Accidents (Quadrant 1)

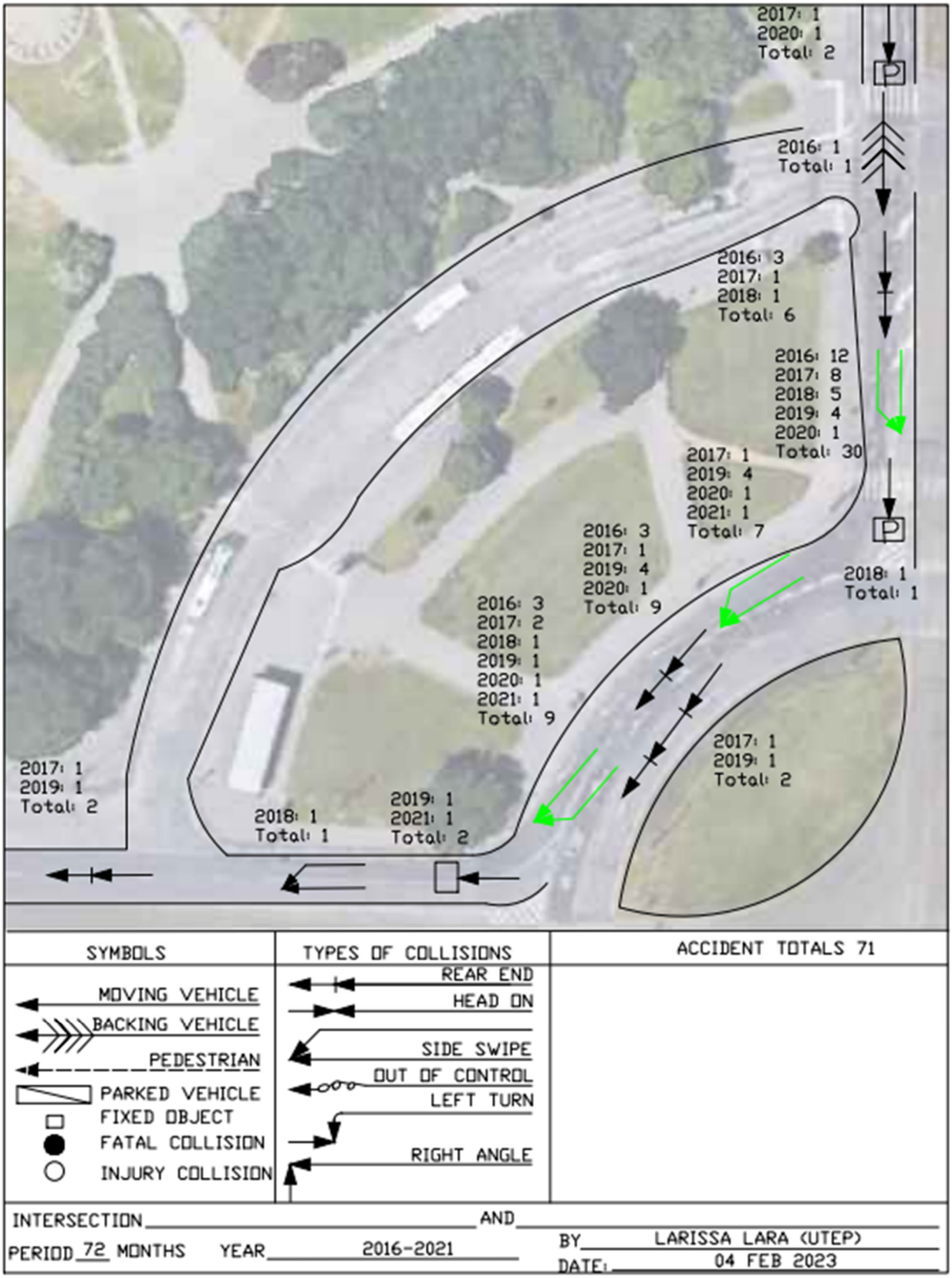


Figure 3.14: Potential Prevented Accidents (Quadrant 2)

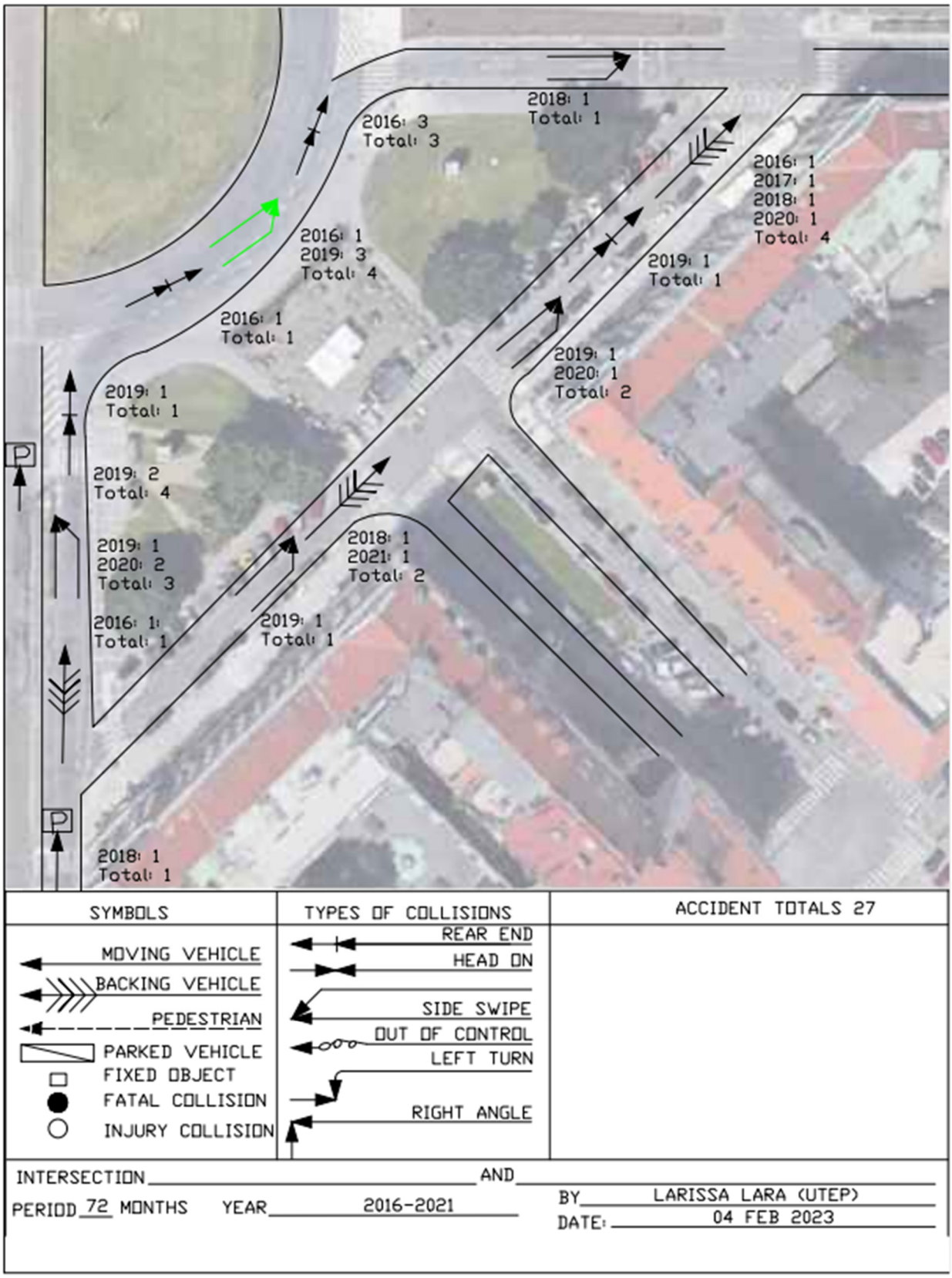


Figure 3.15: Potential Prevented Accidents (Quadrant 4)

Chapter 4: Comparative Assessment

This chapter outlines the steps taken to process the crash data, including filtering, and the tools and techniques used to analyze and visualize the data.

4.1 Crash Record Forms

In accordance with Texas Law (TxDOT, 2013), Texas crash reports are not publicly available for online viewing due to their confidential nature. The Texas Peace Officers Crash Report (CR-3) serves as a vital document that contains comprehensive information about the crash such as the date, time, and location, as well as the type of crash It also includes a section dedicated to vehicle information, including the make and model of the vehicles, license plate numbers, and the names and addresses of drivers. To aid comprehension, visual representation of the CR-3 form has been included in this report. These can be found in Figures 4.2 through 4.4. Based on prior experience with safety analysis and exposure to CR-3 forms the clarity of the diagram is evident in its ability to effectively illustrate the details of the crash scene. However, due to confidentiality, a completed CR-3 form cannot be provided. Nevertheless, a screenshot of one of the CR-3 diagram and its corresponding narrative description, prepared by peace officer is shown in Figure 4 and Figure 4.1.

NARRATIVE AND DIAGRAM

Investigator's Narrative Opinion of What Happened
(Attach Additional Sheets if Necessary)

The 1100 block of Robert E. Lee is a two lane two way roadway that runs north and south. The 6600 block of Gateway West is a two lane one way roadway that runs west and intersects with the 1100 block of Robert E. Lee. The intersection is controlled by 2 stop signs for the north and south bound traffic on Robert E. Lee. Unit 1 was traveling north bound on the 1100 block of Robert E. Lee and came to the intersection with gateway West. The driver of Unit 1 stopped and then proceeded through the intersection. Unit 1 drove into the path of Unit 2 who was traveling in the left lane on 6600 Gateway West. Unit 2 struck Unit 1 in the intersection. The driver of Unit 1 advised that she checked the roadway before she went but did not see Unit 2. The driver of Unit 2 has the right of way due to Unit 1 having a stop sign. The driver of Unit 1 is at fault for the collision. The driver of Unit 2 complained of pain to his left arm and shoulder but refused medical transport. The driver of Unit 1 complained of pain from her mid back to her lower back (right side) but refused medical treatment. There were no reported witnesses to this collision. The Officer cited the driver of Unit 1 for causing the collision. The Officer exchanged the drivers information and advised them. Both vehicles had to be towed from the scene due to damage. The scene was cleared.

Figure 4: Narrative Description Example (CR-3)

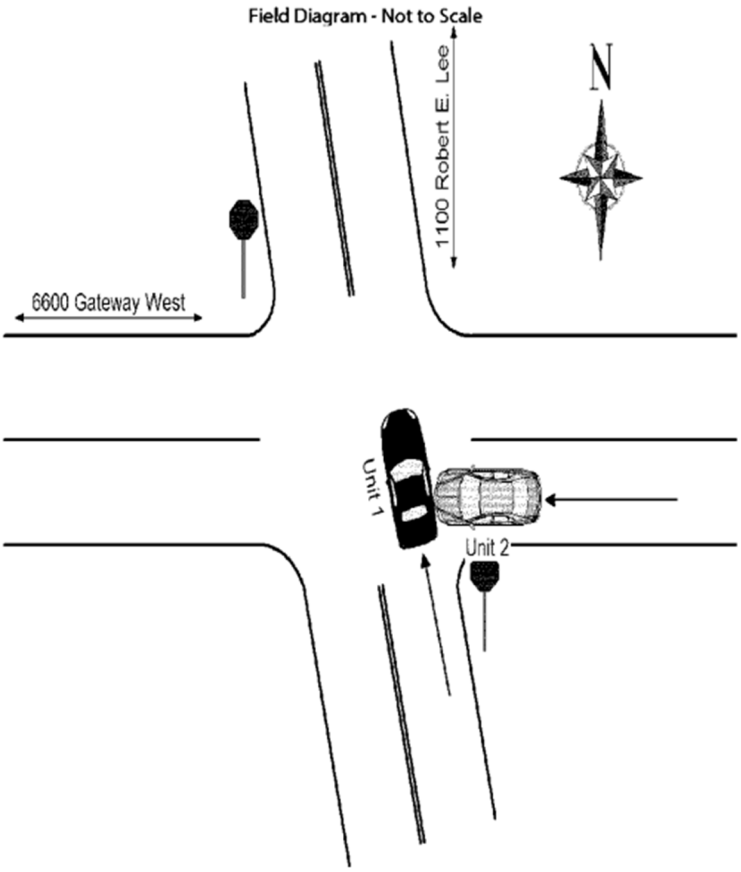


Figure 4.1: Field Diagram Example (CR-3)

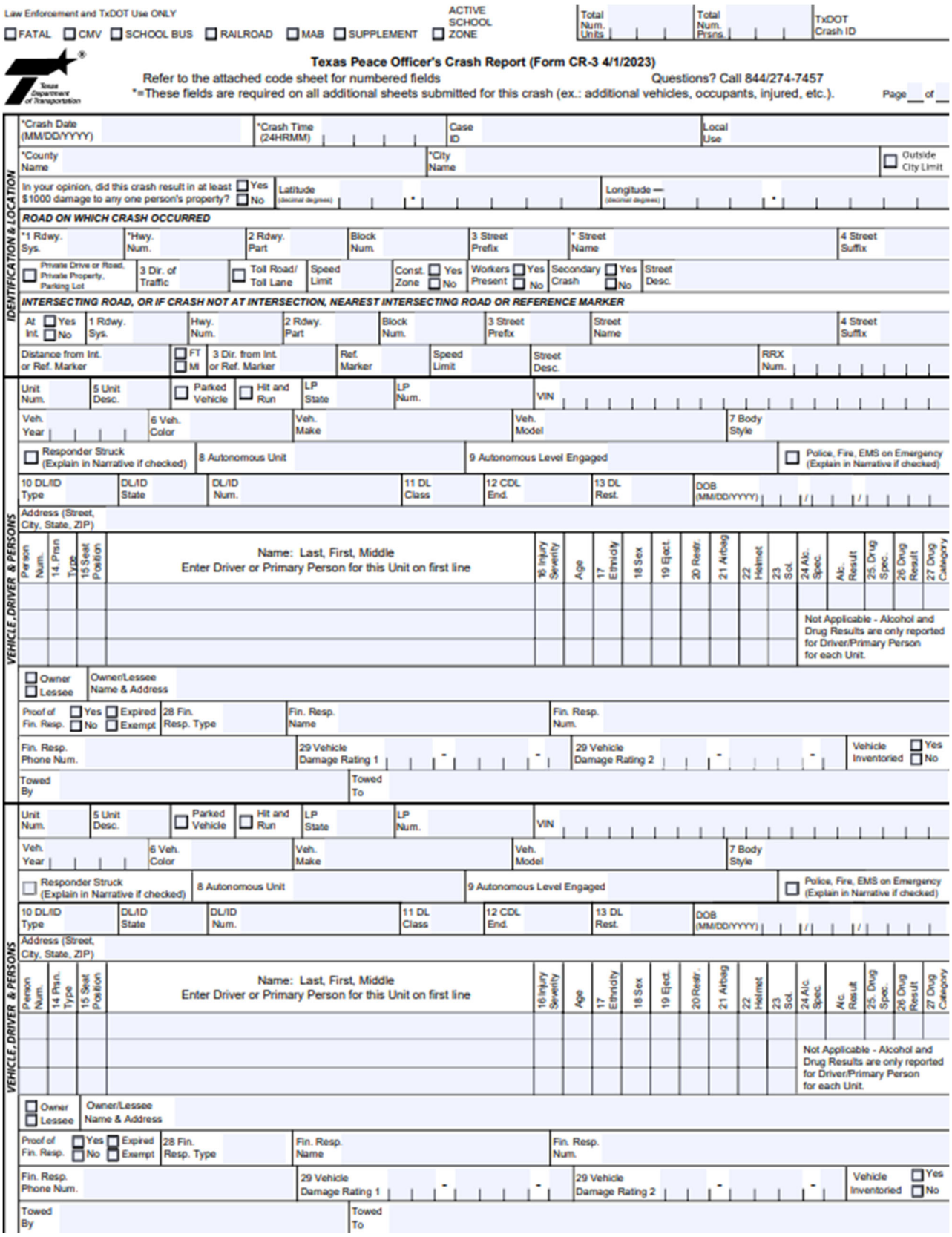


Figure 4.2: CR-3's First Page

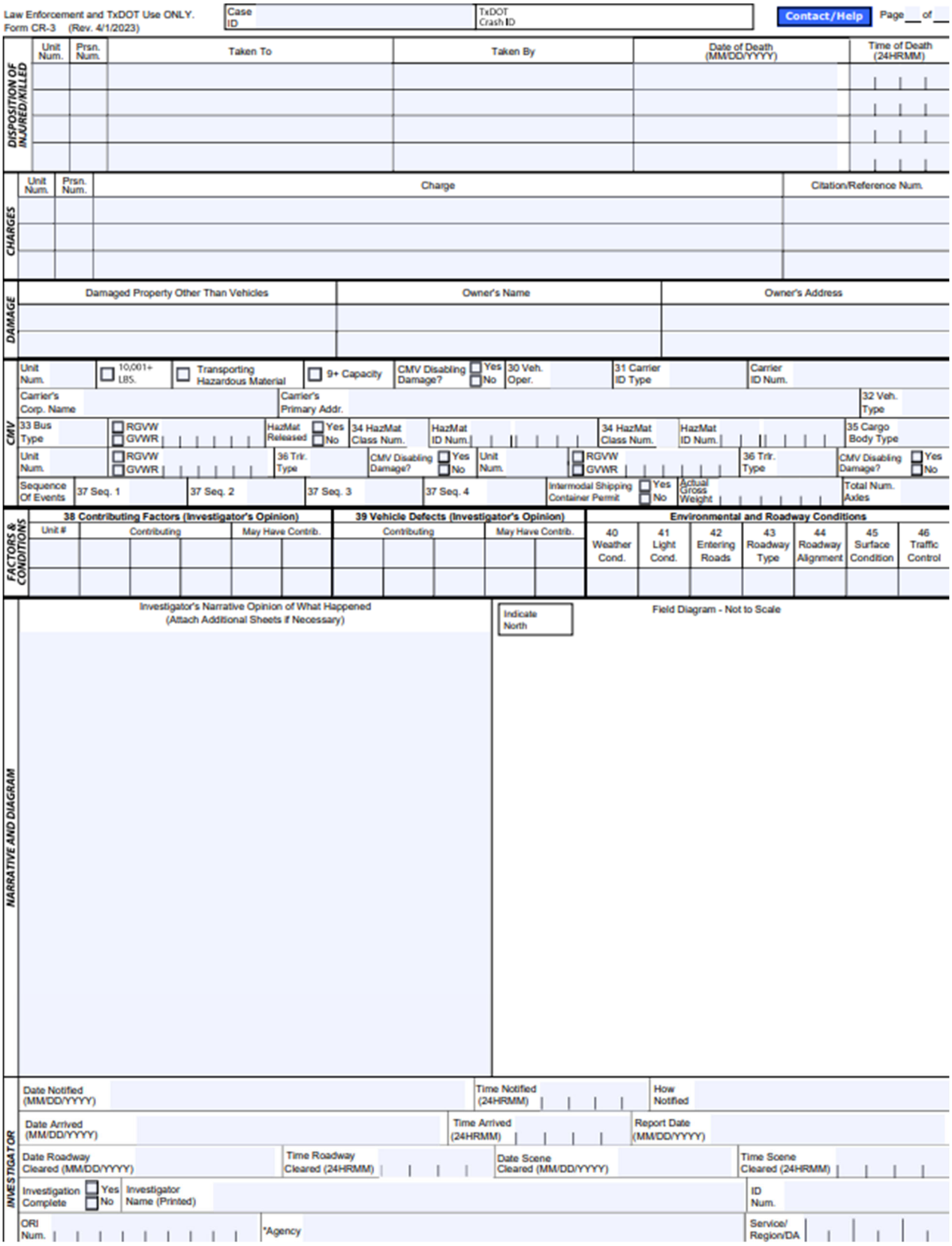


Figure 4.3: CR-3's Second Page

Figure 4.4: CR-3's Third Page

Finding the Czech crash report form proved to be more challenging, as the form was not readily available on the Ministry of Transport's website, even though crash data in the Czech Republic is publicly accessible. A through internet search revealed that Figure 4.5 is likely the accident report form used by insurance agencies.

The form bears similarity to the CR-3 forms in terms of its content. It includes personal information on the individuals involved in the accident, as well as basic information on the vehicles and details such as the date, time, location, and circumstances of the accident. Additionally, it includes insurance information and a designated section for a sketch of the accident. Determining the clarity of these drawings in comparison to the CR-3 diagrams is challenging due to the lack of prior experience with this form.

Table 4 presents a comparative analysis of the selected items included in the CR-3 crash report form used in Texas and the Czech accident report form. The purpose of this table is to highlight similarities and differences between the two forms.

Table 4: CR-3 vs. the Czech Accident report form

Item	**CR-3 Form**	**Czech Accident Report Form**
Crash ID	Yes	No
Case ID	Yes	No
Date & Time	Yes	Yes
Location (Streets Names)	Yes	Yes
Latitude & Longitude	Yes	No
Injuries	Yes	Yes
Witness	Yes	Yes
Speed Limit	Yes	No
Circumstances (what happen?)	Yes	Yes
Number of vehicles involved	Yes	Yes
Vehicle identification number	Yes	Yes
Vehicle color & model	Yes	No
Vehicle Make	Yes	Yes
Name of persons involved	Yes	Yes
Age of persons involved	Yes	No
Phone/email of persons involved	Yes	Yes
Driver license	Yes	Yes
Insurance Information	No	Yes
Charges	Yes	No
Damage	Yes	Yes
Narrative	Yes	No
Diagram	Yes	Yes
Investigators' information: • Date & time notified • Date & time arrived	Yes	No

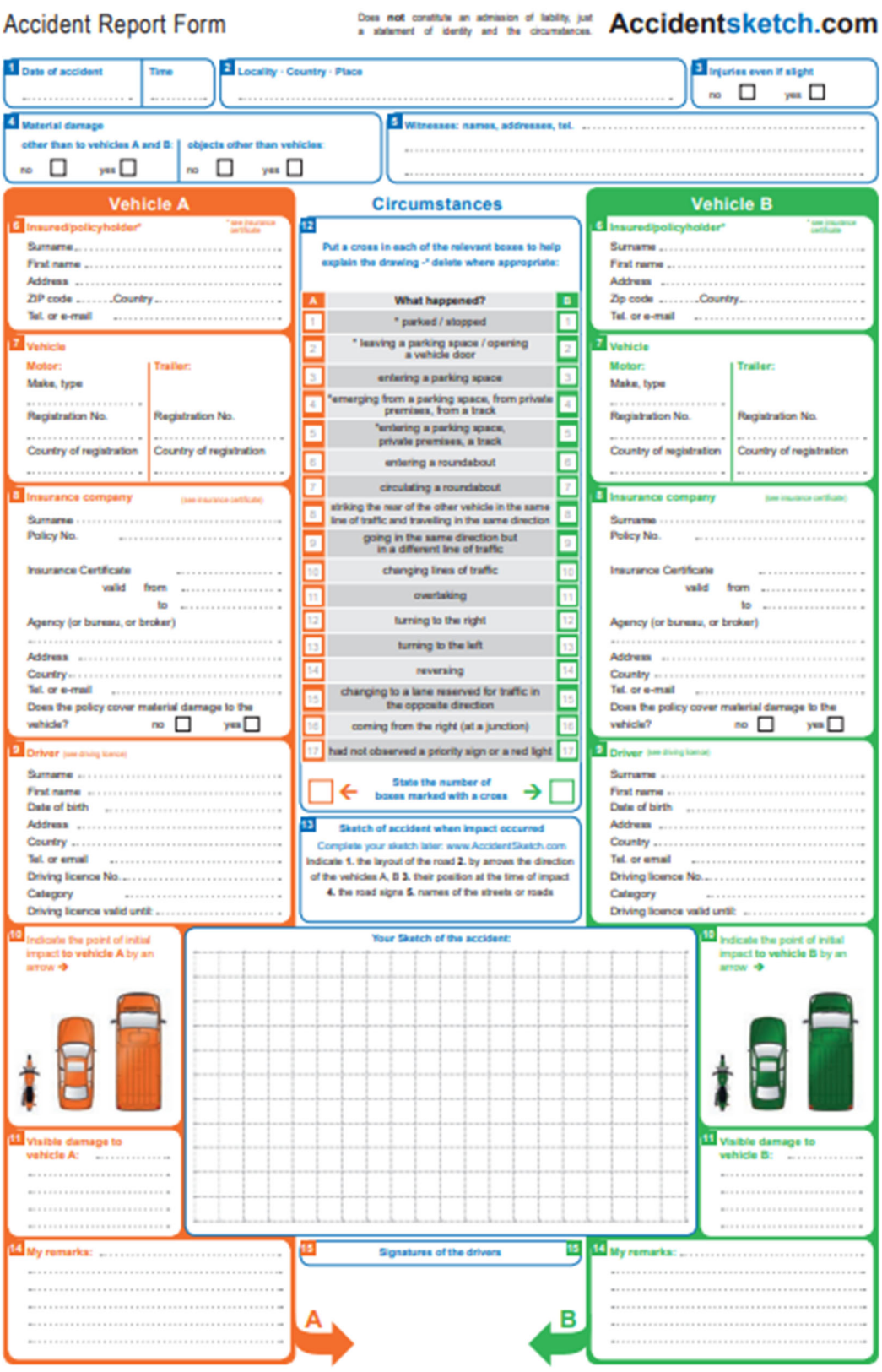


Figure 4.5: Czech Crash Report Form

4.2 DATABASES

The Crash Record Information System (CRIS) website in Texas is an online platform that provides access to crash data, crash reports and crash statistics. It is operated by the Texas Department of Transportation (TxDOT) and is designed to be a comprehensive tool for analyzing and understanding crashes that occur on Texas roadways. Authorized users can search for and download crash reports and view crash statistics and trends. Although the CRIS is a publicly available online, access to the database is restricted to registered users or organizations with authorized permission to view the information. Previous experience with the City of El Paso on Safety Analysis provided familiarity with the CRIS database and its functionality. A screenshot of the CRIS database homepage, depicted in Figure 4.6, displays a prompt for user information to confirm authorization to access the database. The CRIS Launch interface is presented in Figure 4.7, which provides users with the ability to search for reports. Figure 4.8 displays the available filtering fields to narrow down the data search. Finally, Figure 4.9 shows the results of the search criteria entered, and from this screen, users can view or download the CR-3 forms.

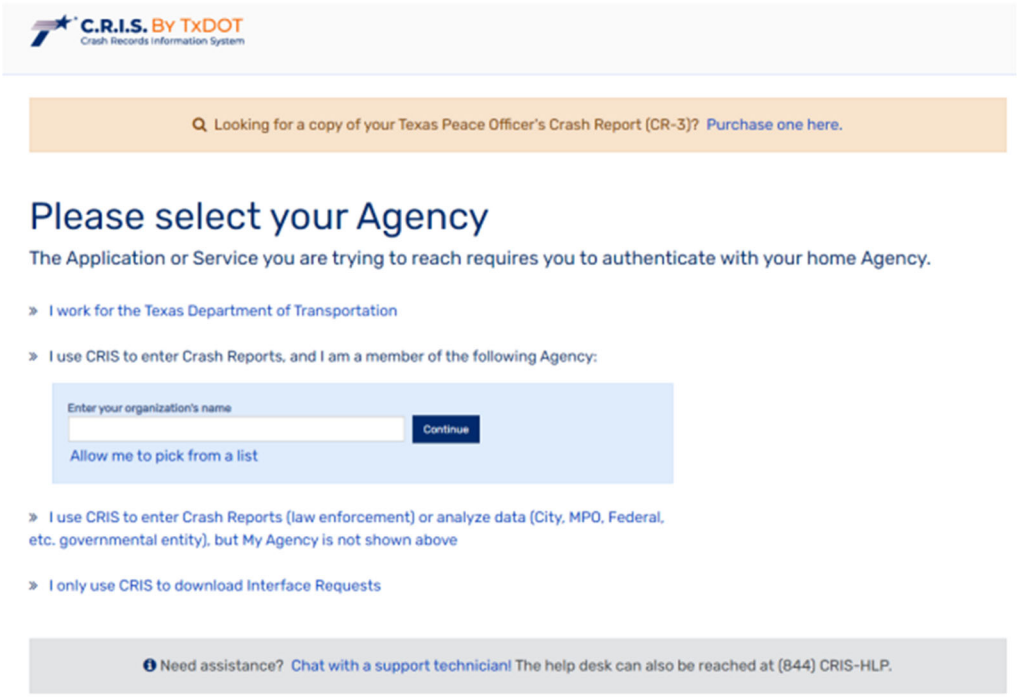


Figure 4.6: CRIS Homepage

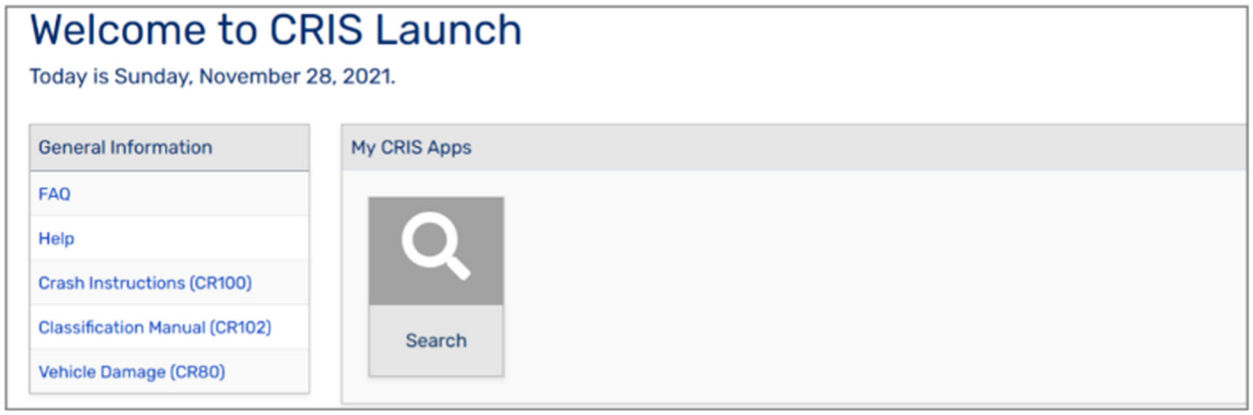


Figure 4.7: CRIS Launch Interface

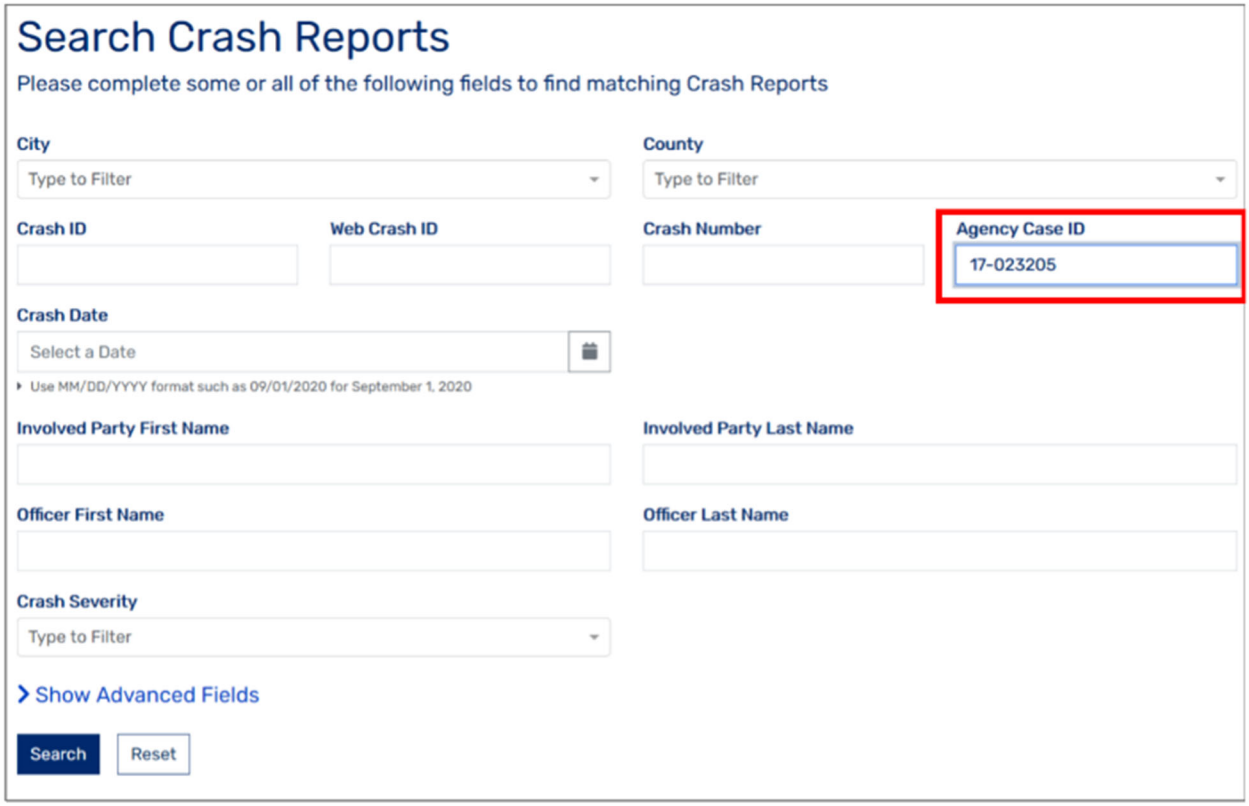


Figure 4.8: CRIS Search Criteria

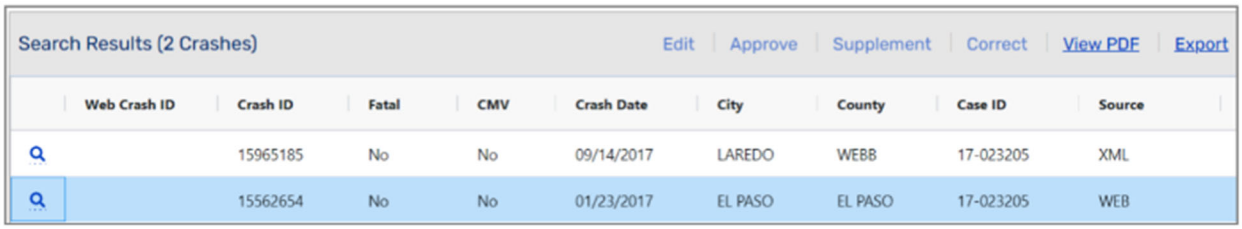


Figure 4.9: CRIS Results

The crash database in the Czech Republic operates differently from that in Texas. As mentioned in Section 3.2, the Traffic Accidents in the Czech Republic website (https://nehody.cdv.cz/) is a public database managed by the Ministry of Transport of the Czech Republic. It provides statistical data on traffic accidents that occur in the country, and users can filter data by location, date, time or even type of accident. Figure 4.10 depicts the homepage of the Traffic Accidents in the Czech Republic website, which provides access to crash data from the entire country. However, as shown in another screenshot of the same website (4.11), all data is provided solely in the Czech language, which may present challenges for non-Czech speakers seeking to use or analyze the data.

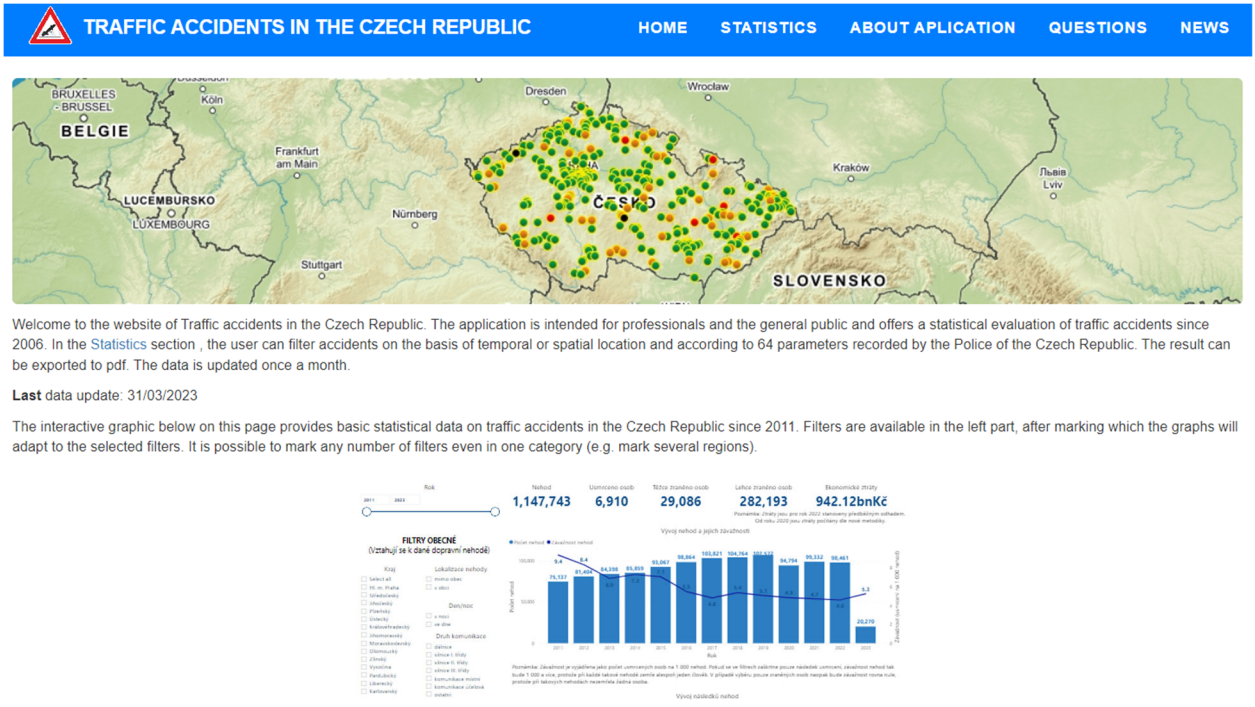


Figure 4.10: Traffic Accidents in the Czech Republic Website

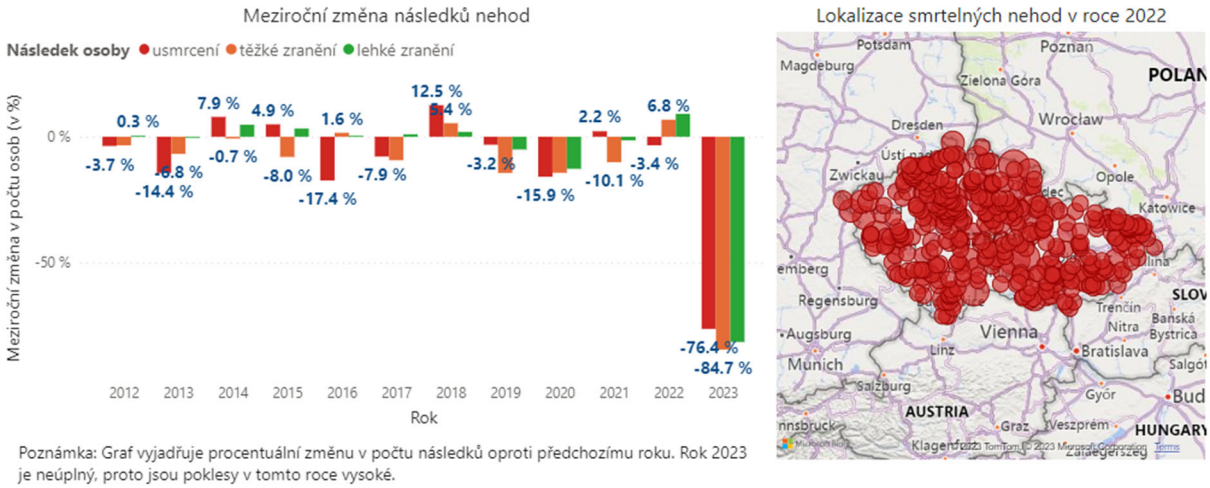


Figure 4.11: Traffic Accidents in the Czech Republic Website Data

Both the CRIS and Traffic Accidents in the Czech Republic website serve information sources on crash data, and allow users to filter and download data. However, the restrictions on the CRIS database are imposed to safeguard the personal and detailed information on the CR-3 forms, which are not publicly available. Conversely, the Traffic of Accidents in the Czech Republic website is a public platform that provides access to statistical data on traffic accidents, but in some cases may lack important detailed information on the type of accident and fault attribution.

4.3 Crash Types, Crash severities, Collision Diagrams

The frequency of crash types may vary depending on the location of analysis; never the less, the classification of crashes in both Texas and the Czech Republic is comparable. The crashes are classified as follows:

- Side Swipe
- Rear End
- Reversing
- Fixed Object
- Pedestrians
- Right Angle
- Head On
- Out of Control
- Left Turn
- Pedestrian
- Cyclist

Moreover, the Vítězné Náměstí Roundabout, which is a major public transportation hub, adds two unique types of collisions to the analysis involving:

- Tram and Vehicles
- Tram and Pedestrians

Both the Czech Republic and Texas classify their crash data by severity, but they differ in the levels of severity. In the Czech Republic, severities are categorized as follow:

- Fatalities
- Severe Injuries
- Minor Injuries
- Material Damage

On the other hand, Texas categorizes accident severities in the following levels:

- Fatal Injury
- Suspected Serious Injury
- Possible Injury
- Suspected Minor Injury
- Not Injured
- Unknown

Collision diagrams may differ depending on the practices and regulations in each location. For this analysis, the crash diagram template used is based on a Texas template provided by the City of El Paso. This template includes a designated key section that describes the meaning of the symbols used in the drawing for better understanding. Additionally, this template includes the date, time and case ID next to the drawing, as shown in Figure 4.13 to ensure easy identification of each crash. A visual representation of this template can be found in Figure 4.12 on the following page.

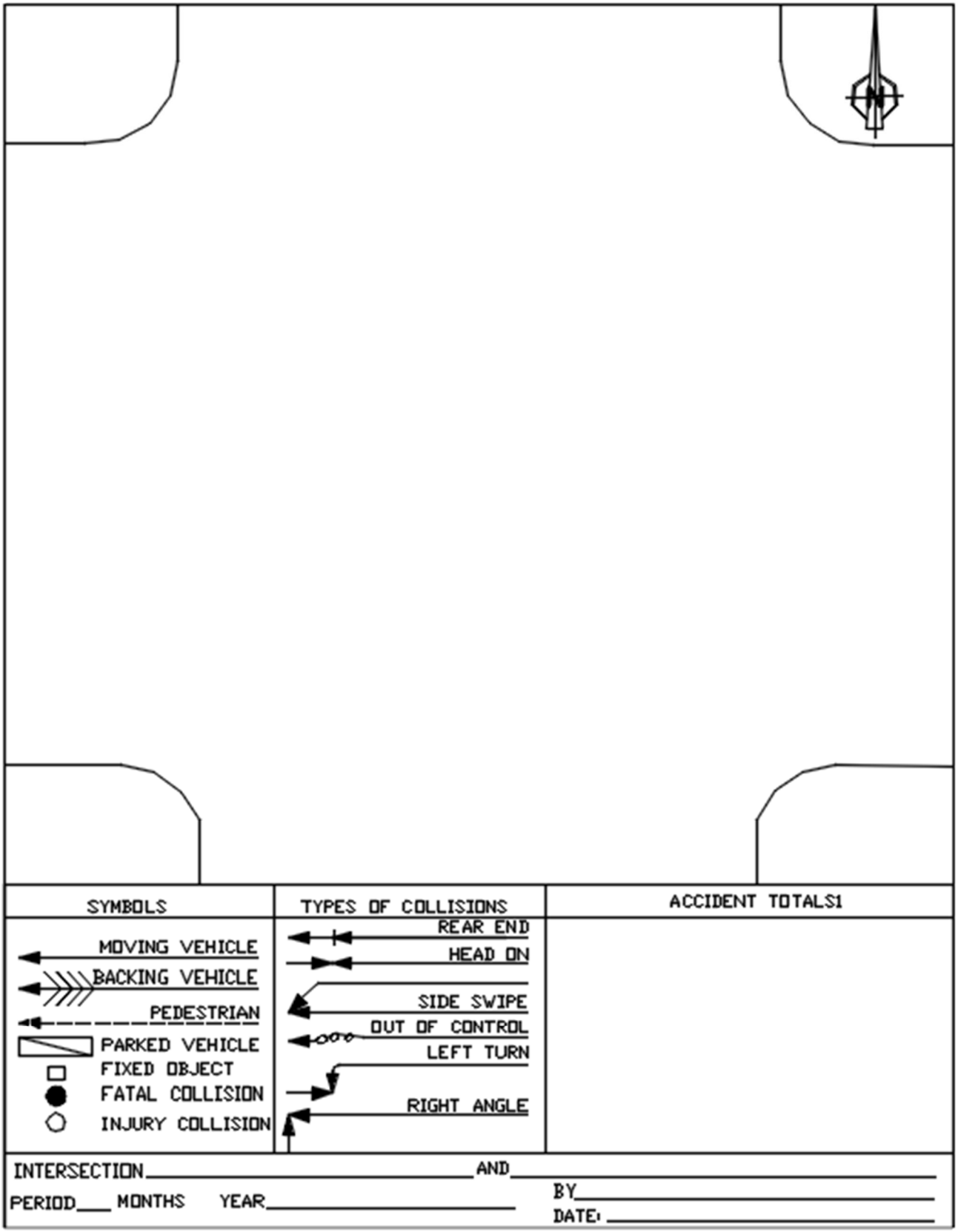


Figure 4.12: Collision Diagram Template (Texas)

Figure 4.13: Data information on collision diagram

To obtain information on Czech collision diagrams for this master thesis, an example of a conflict diagram was provided as there was no access to any Czech collision diagrams. Conflict diagrams are similar to collision diagrams, but instead of depicting actual crashes, they display conflict areas. The diagram (Figure 4.14) depicts a roundabout with various connected streets and used arrows to indicate the type of accidents similar to the Texas template. However, the presentation of information in the Czech collision diagram is different. The diagram displays the number of accidents categorized by levels.

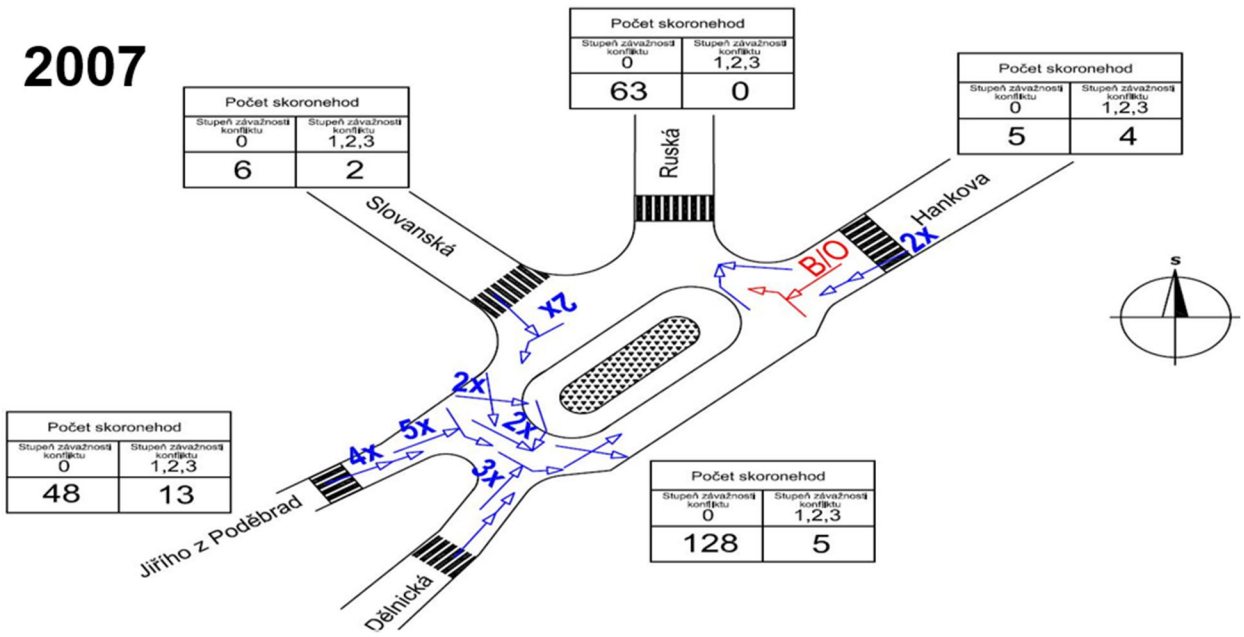


Figure 4.14: Example of Conflict Drawing (Kocourek, 2023)

Dr. Josef Kocourek introduced the concept of conflict severity used in Figure 4.14, which includes the following examples as shown in Figure 4.15:

- Level 0: This involves a minor conflict, such as a car occupying the cyclist lane or a truck not opening enough for a turn.
- Level 1: This occurs when cars obstruct a sidewalk, but the pedestrian still manages to cross the street
- Level 2: This includes a car scraping another car
- Level 3: This refers to a near accident situation in which the car was able to stop.
- Level 4: This is an actual crash

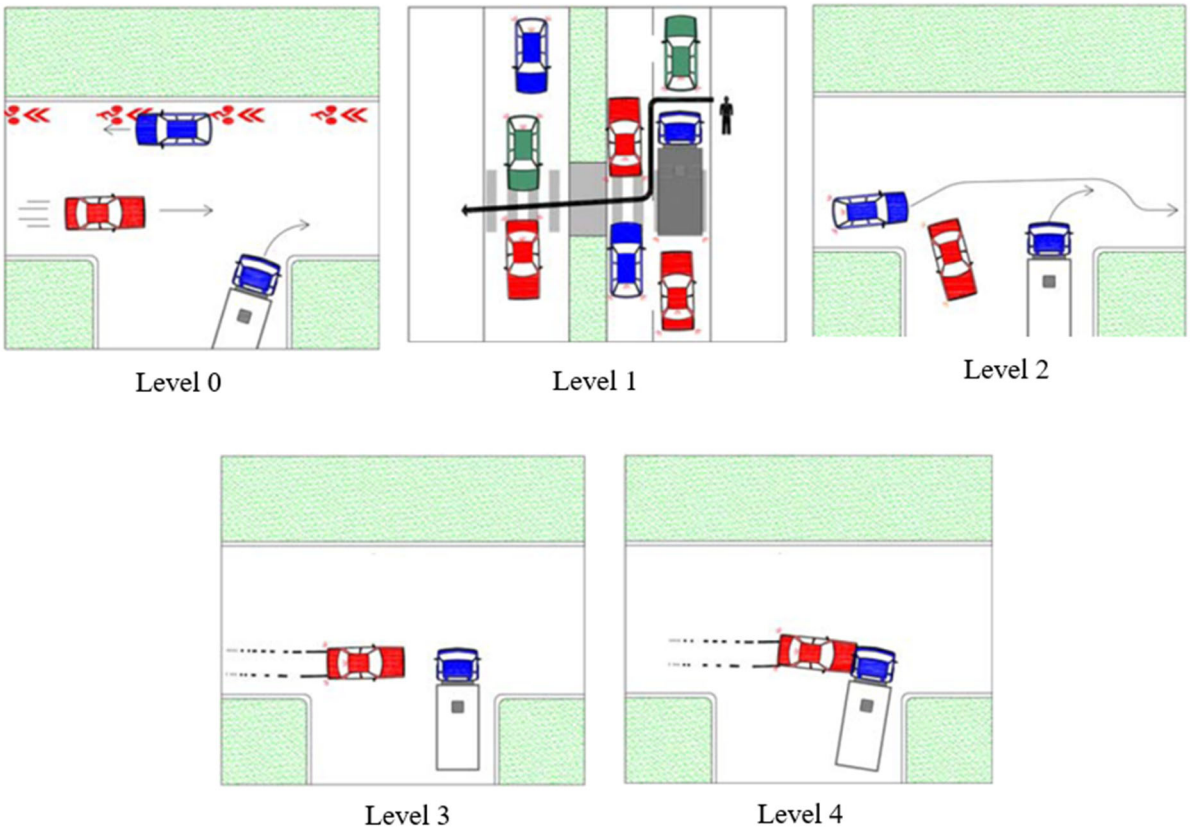


Figure 4.15: Levels of Severity (Kocourek, 2023)

4.4 Cost of Crashes

During the cost analysis conducted in this thesis, a significant difference between Texas and the Czech Republic's crash data analysis was observed. Texas has a feature known as the reduction factor, which was identified due to previous experience in analyzing Texas crash data. The reduction factor is a percentage of crashes that can be avoided by implementing a countermeasures. The reduction factor varies depending on the safety improvement. Table 4.4 presents a list of crash countermeasures along with their corresponding reduction factors, which were collected from the Highway Safety Improvement Program Guidelines published by the Texas Department of Transportation in 2021. In contrast, the Czech Republic does not have an equivalent feature to the reduction factor.

Table 4.4: Reduction Factor Example (TxDOT, 2021)

Crash Countermeasures	Reduction Factor
Install Pedestrian Crosswalk	10%
Construct Pedestrian Over/Under Pass	95%
Increase Turning Radius	10%
Add Right Turn Lane	25%
Lengthen Left Turn Lane	40%
Widen Lane(s)	30%
Construct a Roundabout	62%

Chapter 5: Conclusion

5.1 Summary of Work

This thesis presents an evaluation of the crash data collection system in the Czech Republic, with a specific case study conducted in Prague. A comprehensive review of crash data collection was conducted, comparing the approaches taken by both Texas and the Czech Republic. The Vítězné Náměstí Roundabout was selected as the case study area due to its complexity and unique design. Traffic accident data from 2016 to 2022 was collected and analyzed, resulting in a proposed safety improvement in collaboration with Lauren Brown, who specialized in traffic analysis at Vítězné Náměstí. The proposed improvement is the implementation of a two-lane roundabout based on U.S design guidelines, and a benefit cost analysis was performed to assess its potential impact. A comparative assessment was also conducted, comparing crash records forms, databases, crash types and severities, and collision diagrams. Notably, the Czech Republic lacks a reduction factor which is an important factor in the benefit-cost analyses in the United States.

5.2 RECOMMENDATIONS

The availability of publicly crash data is a notable advantage of the Czech Republic's data collection system compared to Texas. However, the efficacy of Texas' method, which employs the CR-3 form, is noteworthy. Thus, a recommendation would be to introduce a similar form in the Czech Republic, with a clear narrative description from police officers to ensure the accuracy of crash data. Furthermore, it is recommended to incorporate reduction factors in the analysis, as their inclusion can enhance the precision of benefit cost analysis.

5.3 CONTRIBUTIONS

This master thesis makes important contributions to the field of traffic safety by providing a comprehensive assessment of the Czech Republic's crash data collection system and proposing improvement plan for a high-risk traffic area in Prague. By comparing the Czech Republic's crash data collection method to Texas, this study offers valuable insights into how the collection method can be improved in the Czech Republic. These contributions have significant implications for improving the overall accuracy and efficiency of crash data collection, which in turn can help inform evidence-based traffic safety policies and interventions

5.4 LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Although this study has contributed significantly to the understanding of the crash data collection system in the Czech Republic, it is important to acknowledge its limitations. One major challenge was the language barrier, as the crash data was only available in Czech and the use of machine translation tools like Google Translate did not always provide accurate translations, hindering proper data analysis. Additionally, the lack of precision in the crash data posed a

challenge in categorizing accidents by type, and some crashes could not be clearly categorized, making them unsuitable for further analysis.

The findings of this study open several avenues for future research. One possible direction could be to evaluate the effectiveness of the proposed safety improvement at Vítězné Náměstí and to further refine it based on the results. Additionally, future studies could focus on investigating the benefits and challenges of adopting a reduction factor in the Czech Republic's benefit-cost analyses. Another possible future study could focus on the development of a standardized crash data collection system. Furthermore, there is a potential for future research to investigate the benefits of incorporating emerging technologies such as artificial intelligence and machine learning into crash data analysis to improve accuracy and efficiency. Such studies could help to advance the understanding of crash data collection and improve road safety in the Czech Republic and beyond.

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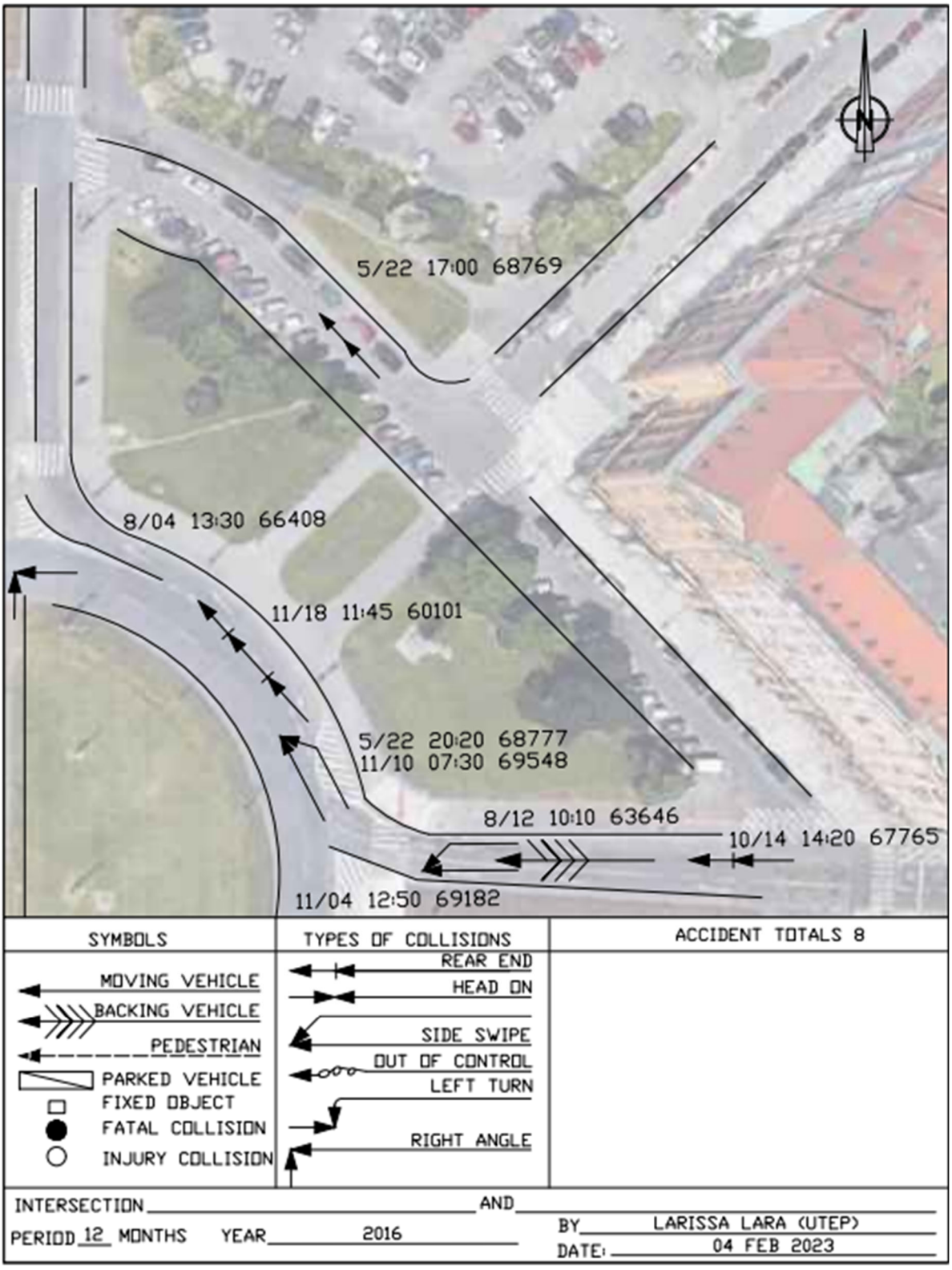
Vyskočilová A., Tecl J., Valach O., Ambros J.: *Updated Methodology for Calculating Losses from Road Traffic Accidents* (orig. "*Aktualizovaná metodika výpočtu ztrát z dopravní nehodovosti na pozemních komunikacích*"), Transport research center (CDV), 2017, ISBN 978-80-88074-50-2

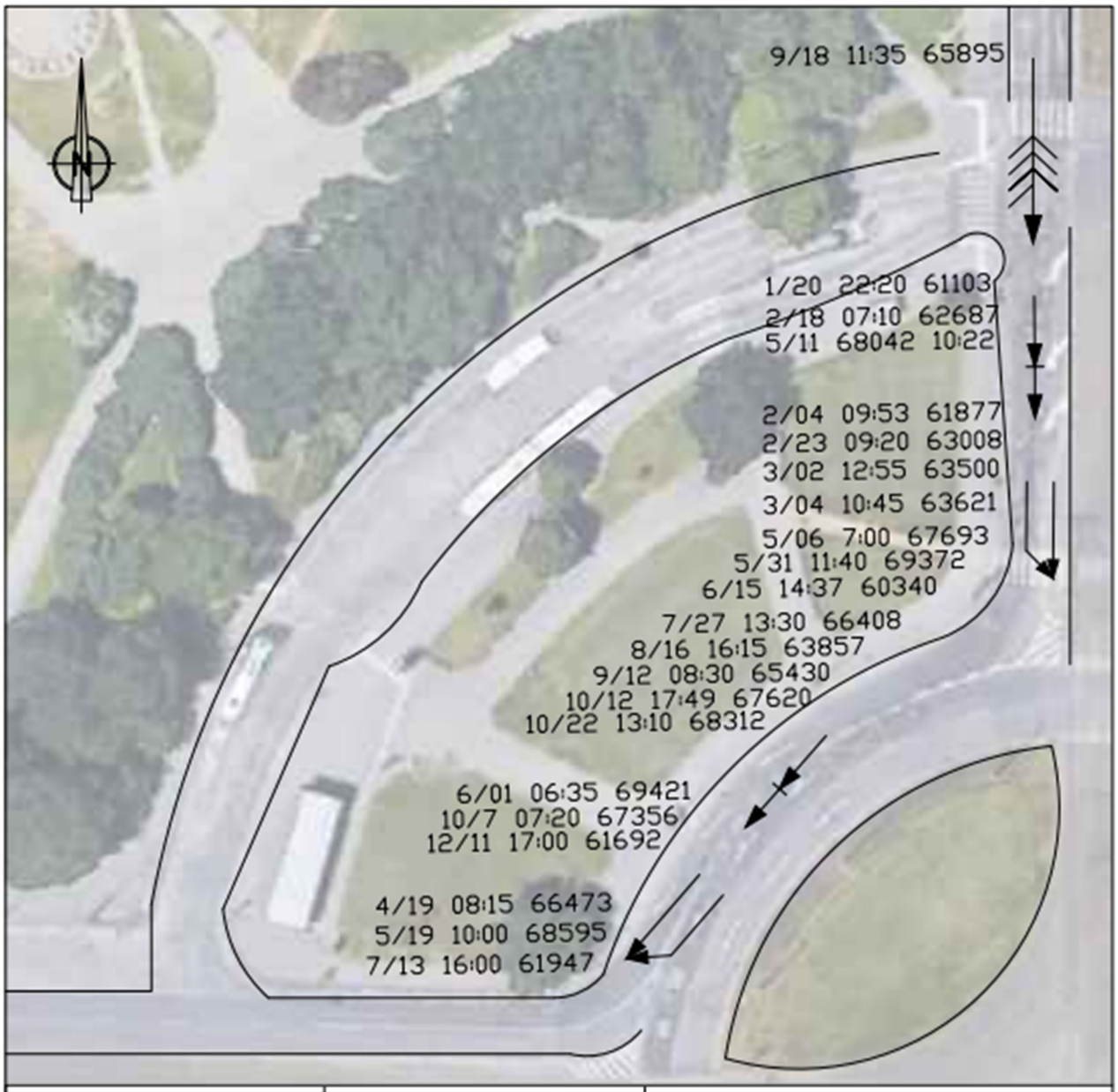
Appendix A

This appendix lists collision diagrams for Vitezne Namesti Roundabout. Each year has 4 collision diagrams, arranged in the following order:

- Quadrant 1: North East (crashes that occur from January 1 to December 31)
- Quadrant 2 North West (crashes that occur from January 1 to December 31)
- Quadrant 3 South West (crashes that occur from January 1 to December 31)
- Quadrant 4 South East (crashes that occur from January 1 to December 31)

A.1 2016 COLLISION DIAGRAM





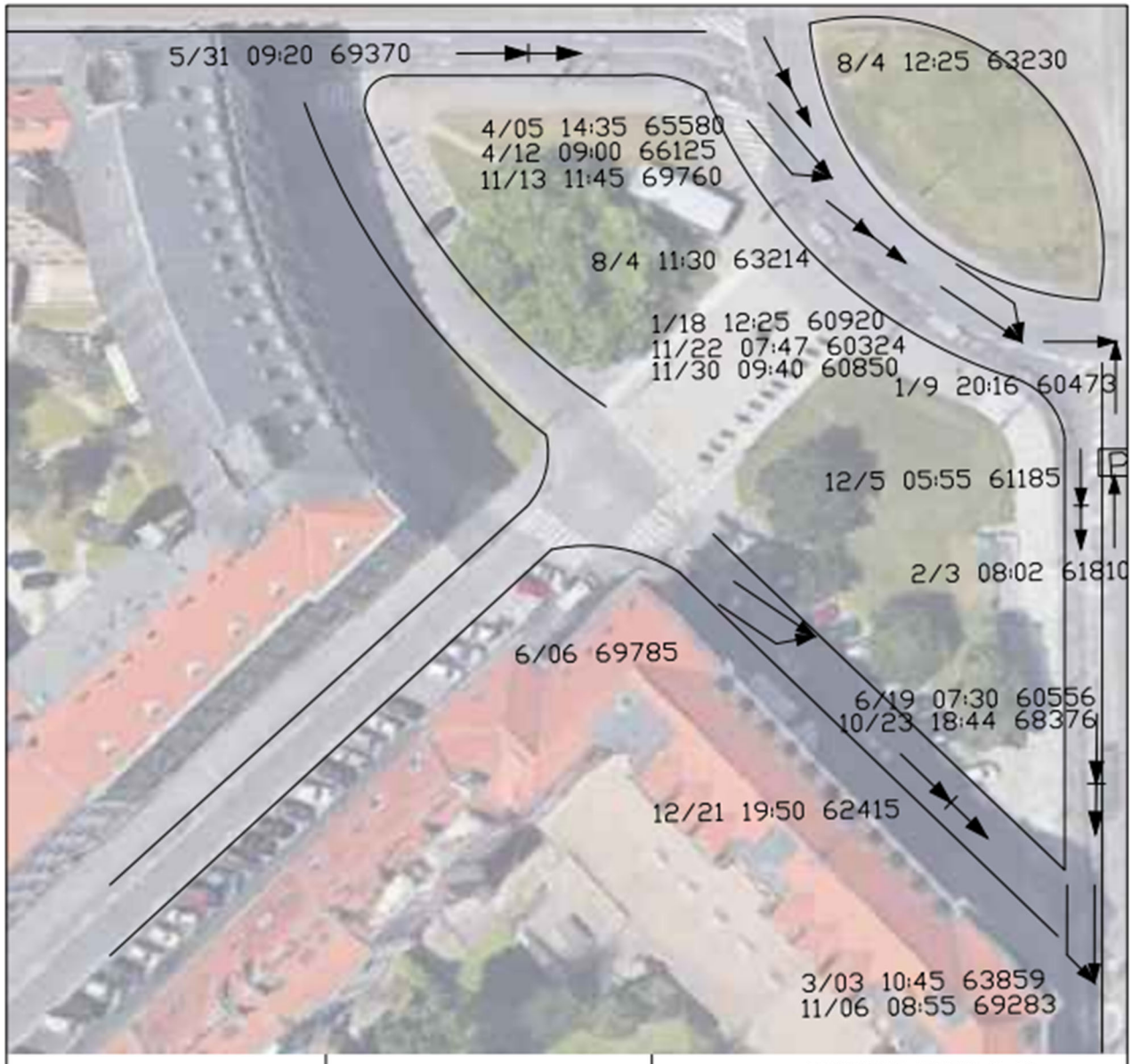
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 22
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2016

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 18
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2016

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DATE: 04 FEB 2023

SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 6
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2016

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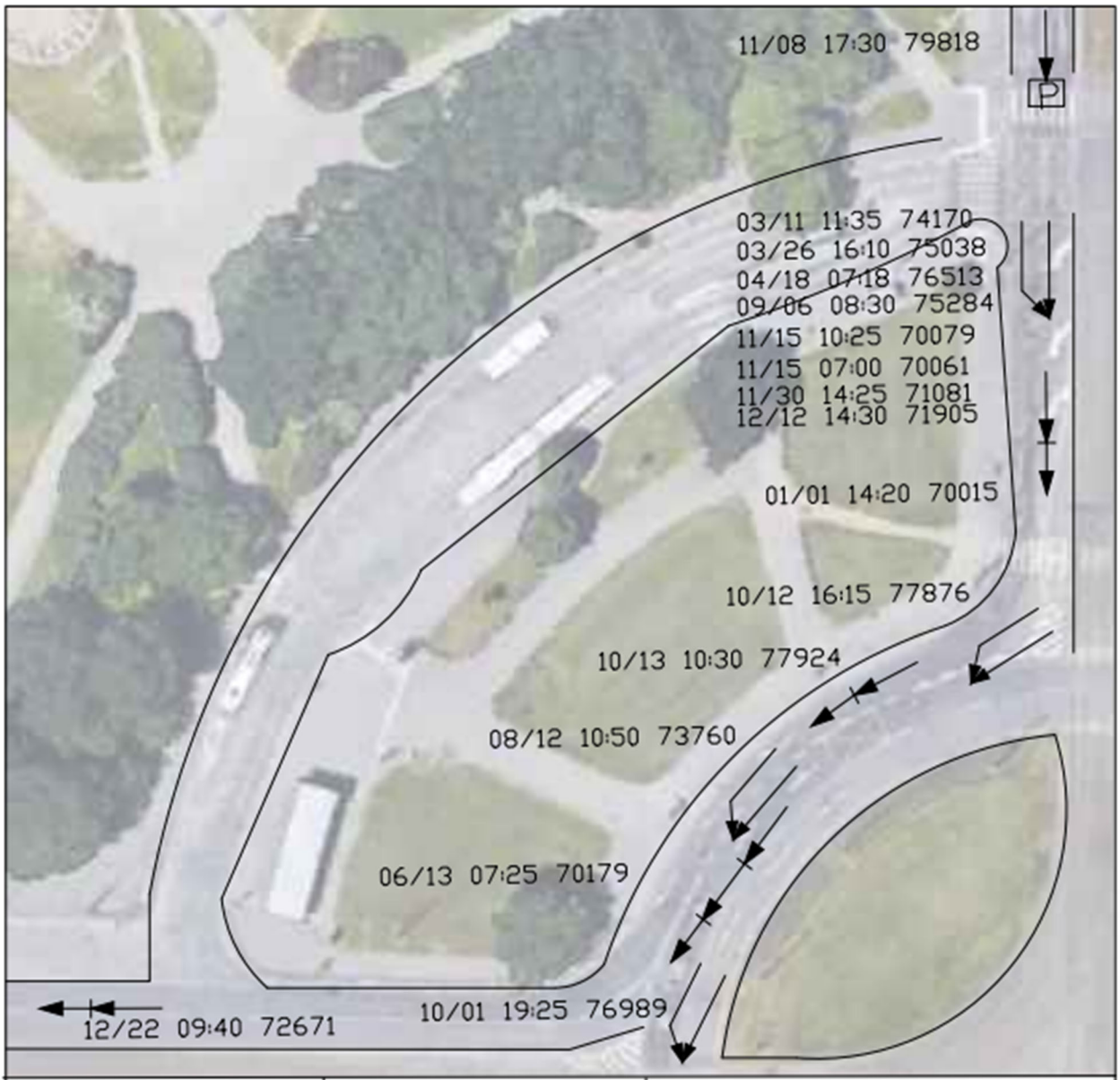
A.2 2017 COLLISION DIAGRAM



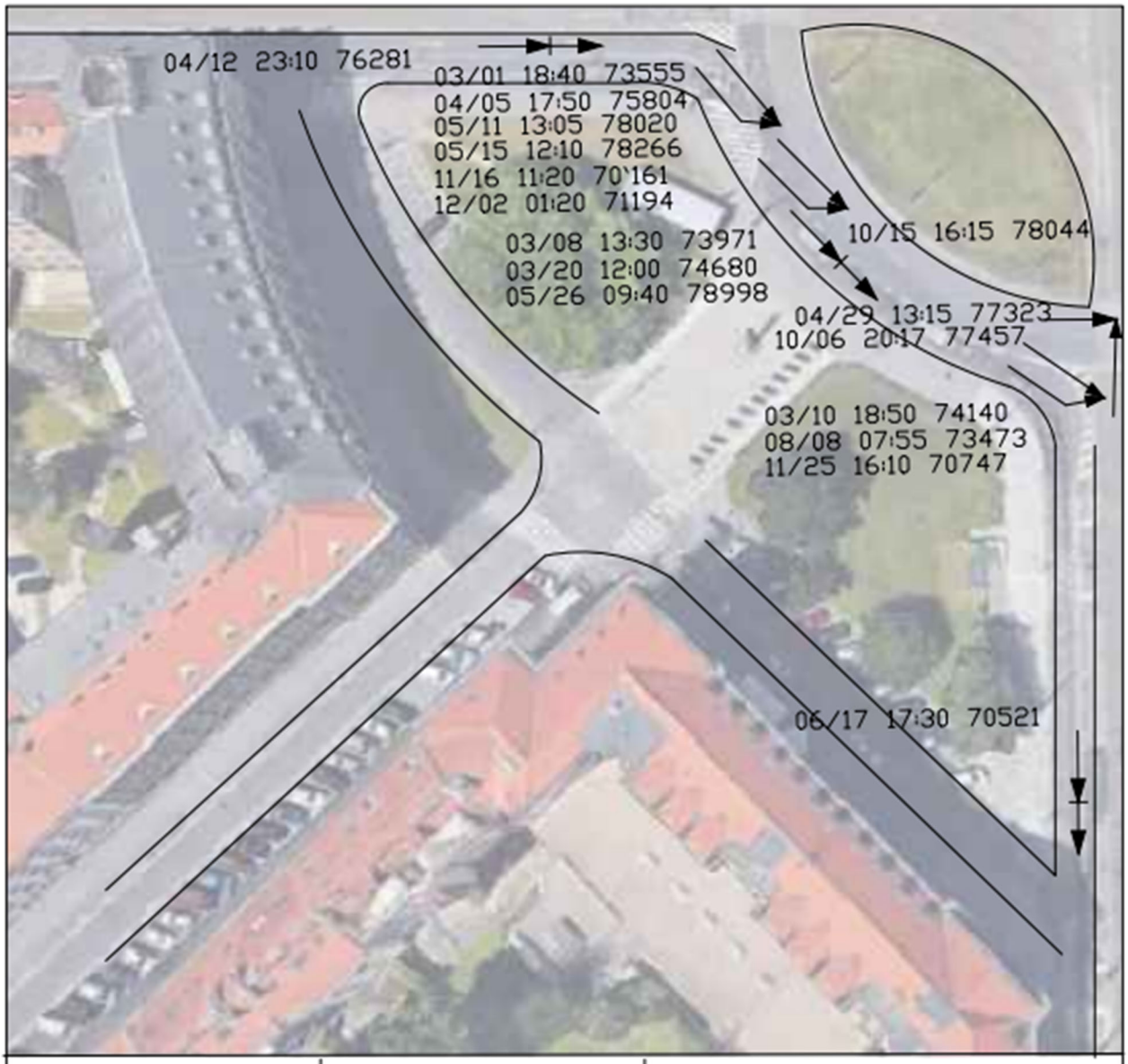
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 16
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2017

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



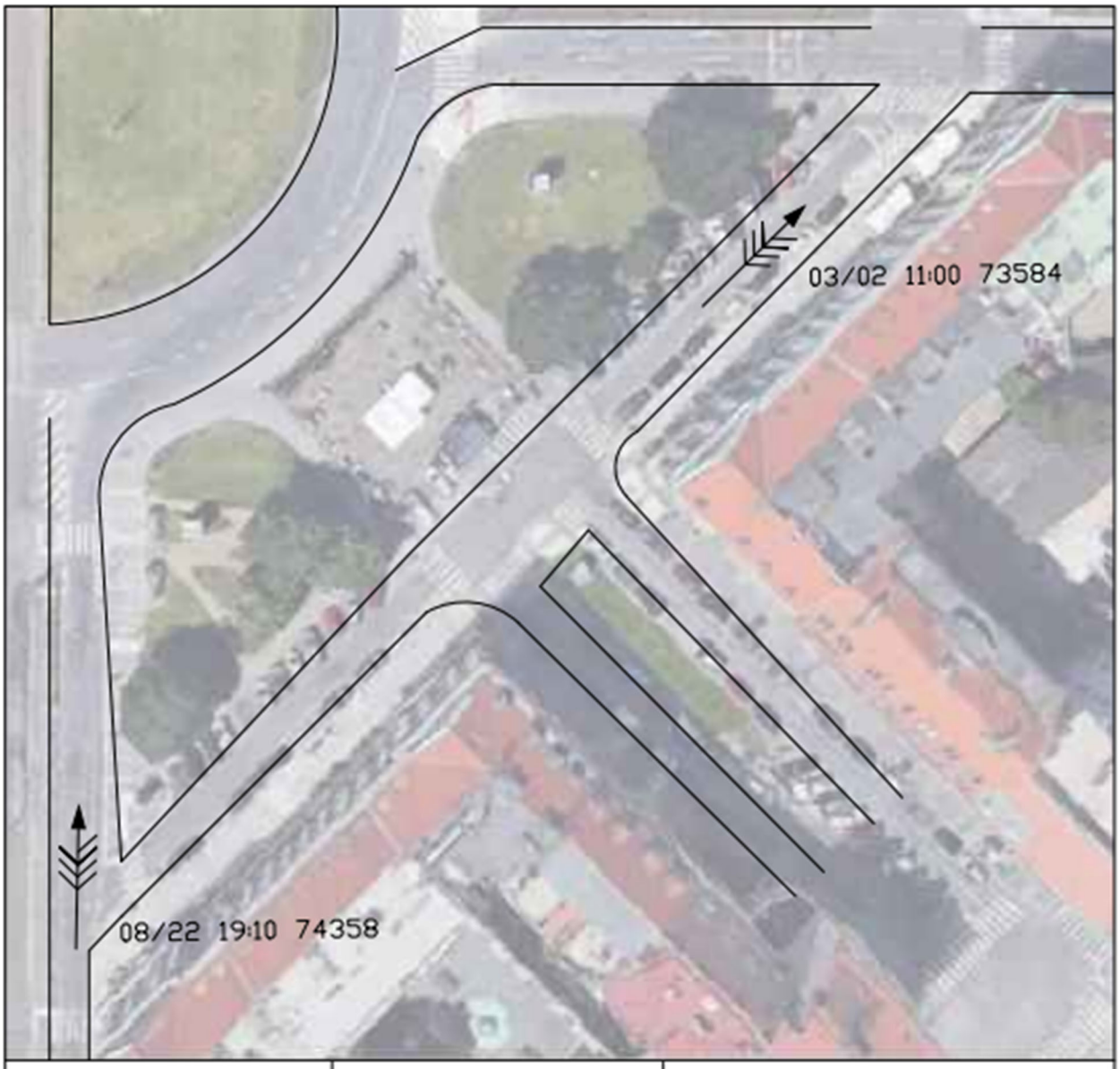
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 17
MOVING VEHICLE	REAR END	
BACKING VEHICLE	HEAD ON	
PEDESTRIAN	SIDE SWIPE	
PARKED VEHICLE	OUT OF CONTROL	
FIXED OBJECT	LEFT TURN	
FATAL COLLISION	RIGHT ANGLE	
INJURY COLLISION		

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2017

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 2
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

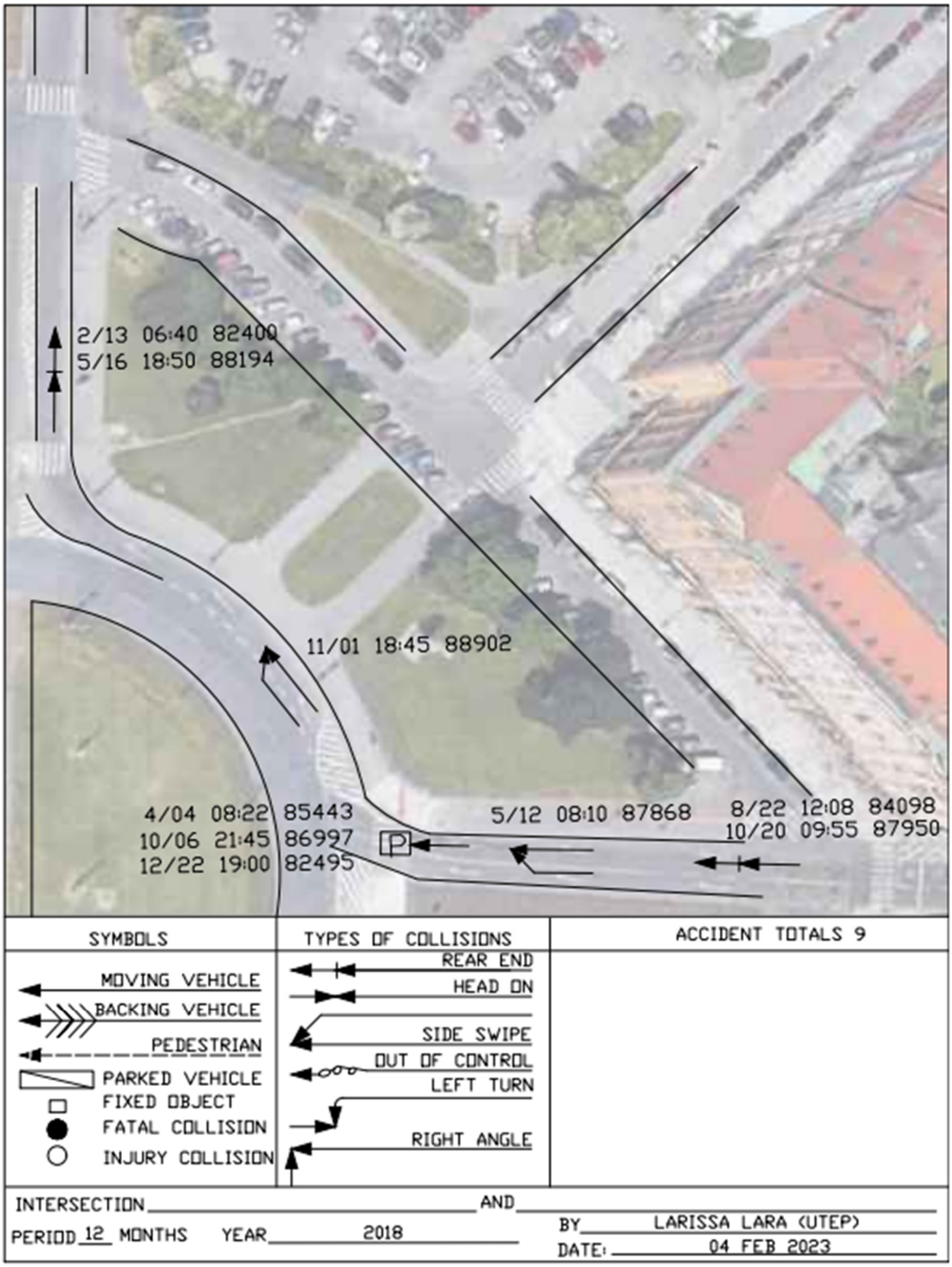
INTERSECTION _____ AND _____

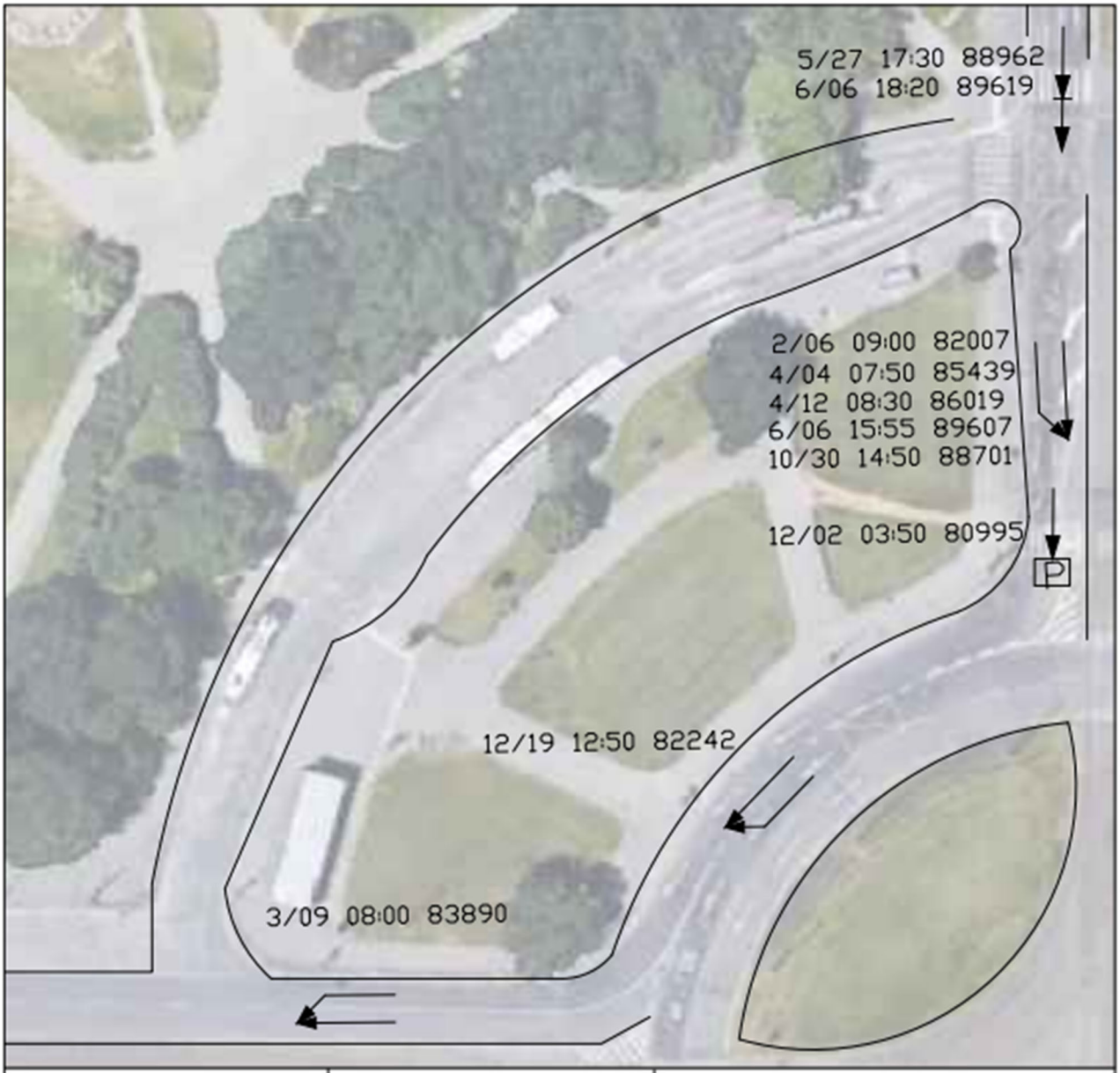
PERIOD 12 MONTHS YEAR 2017

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023

A.3 2018 COLLISION DIAGRAM





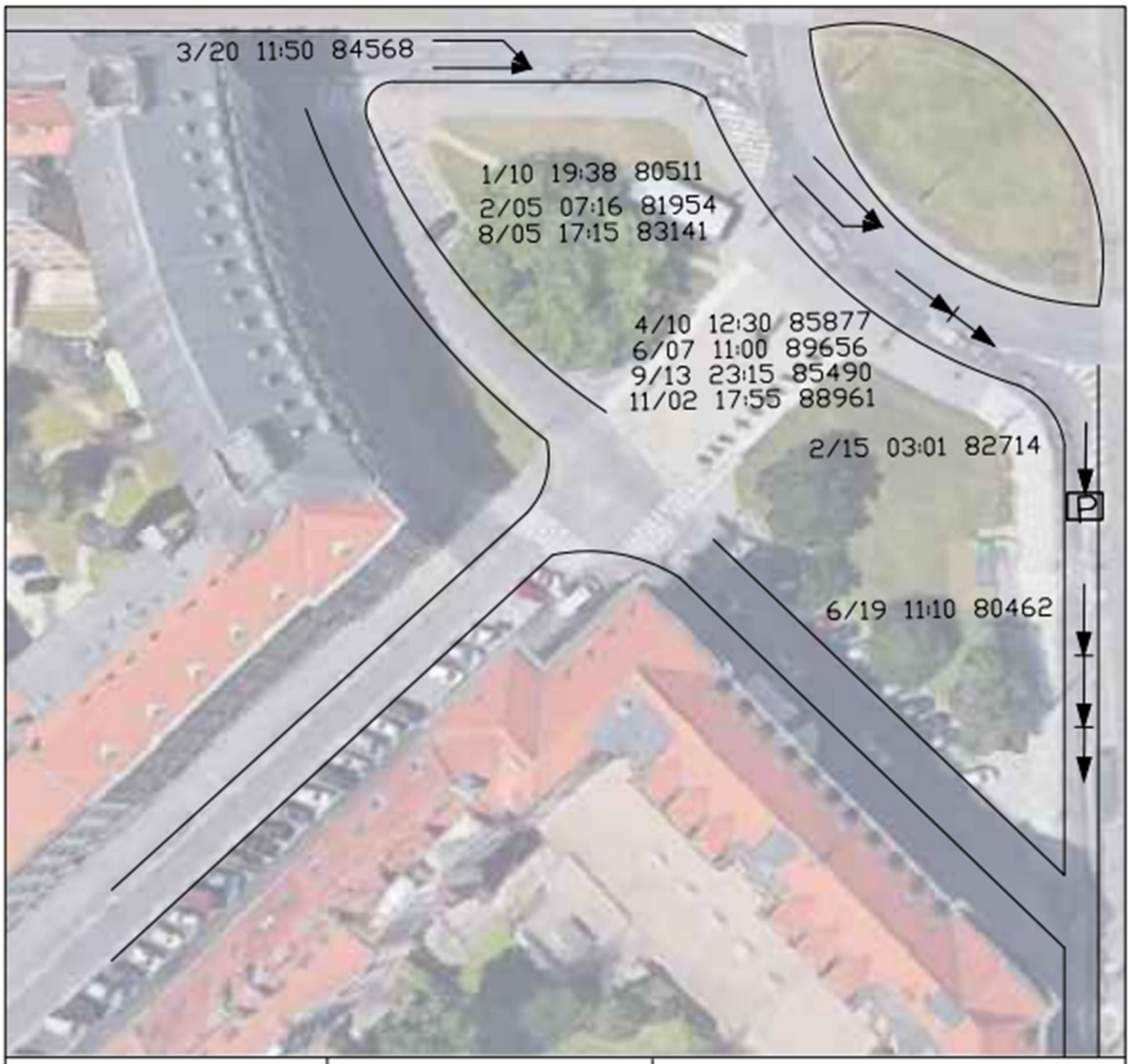
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 10
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2018

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



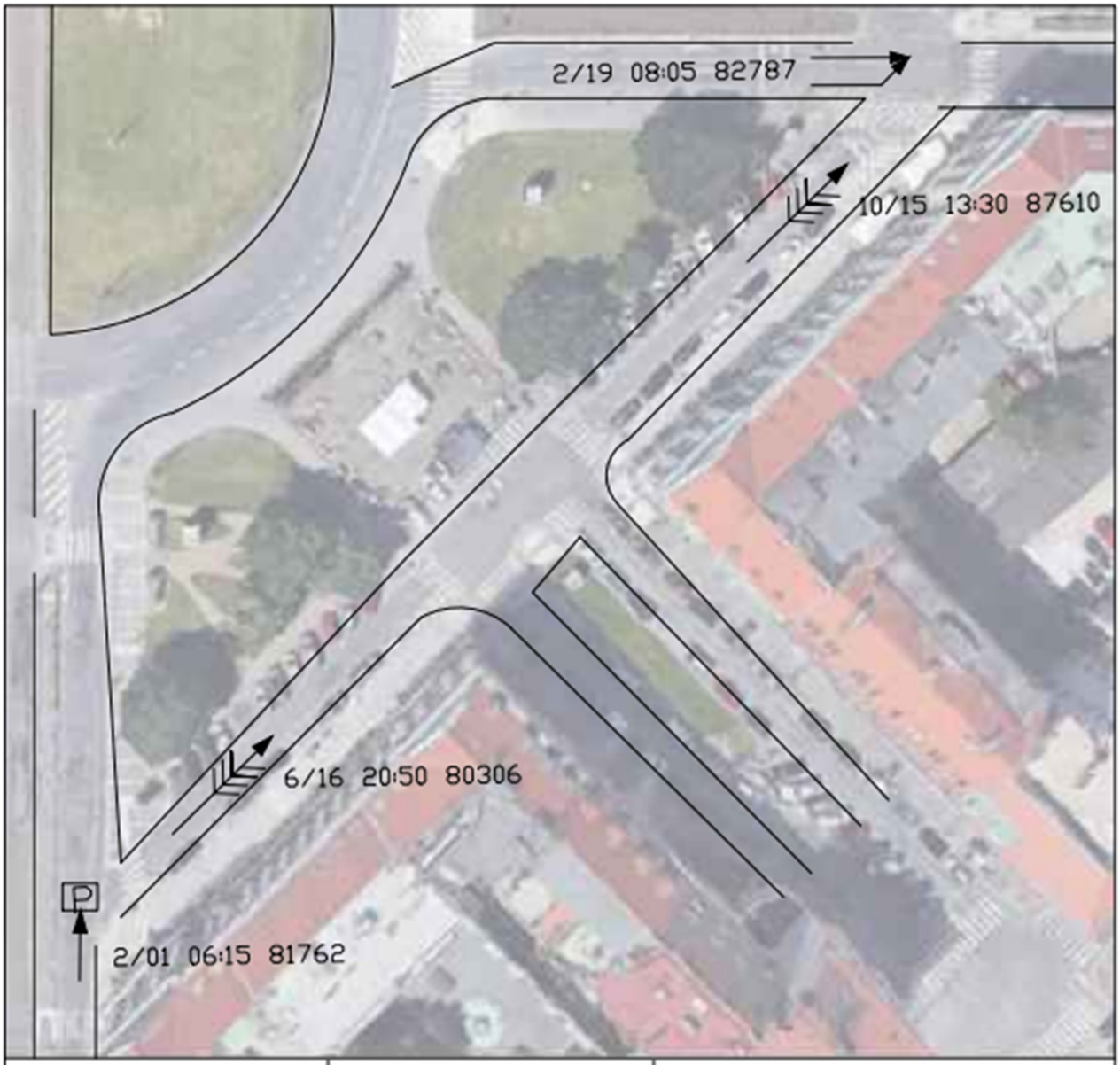
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 10
MOVING VEHICLE	REAR END	
BACKING VEHICLE	HEAD ON	
PEDESTRIAN	SIDE SWIPE	
PARKED VEHICLE	OUT OF CONTROL	
FIXED OBJECT	LEFT TURN	
FATAL COLLISION	RIGHT ANGLE	
INJURY COLLISION		

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2018

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 4
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

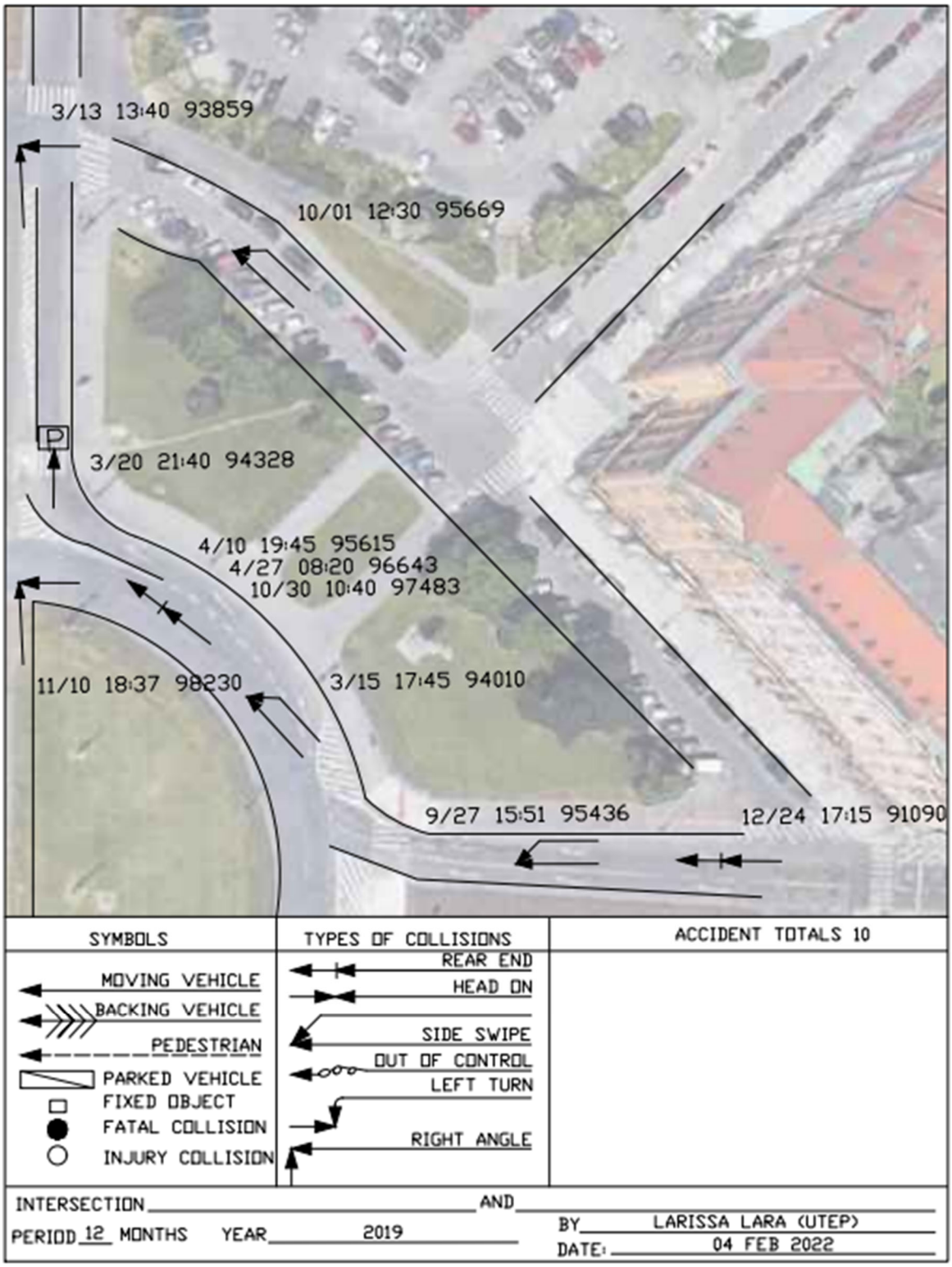
INTERSECTION _____ AND _____

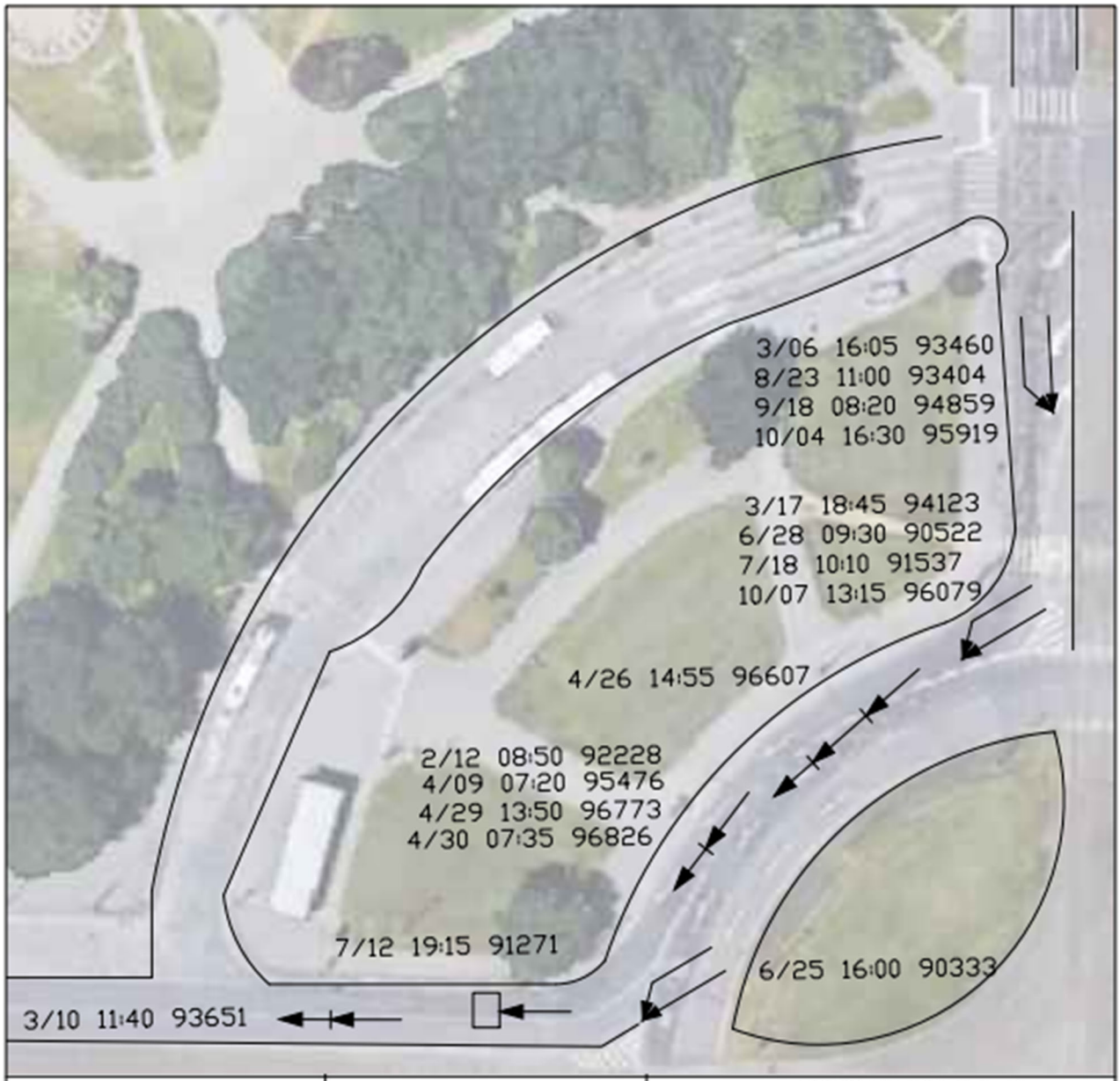
PERIOD 12 MONTHS YEAR 2018

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023

A.4 2019 COLLISION DIAGRAM





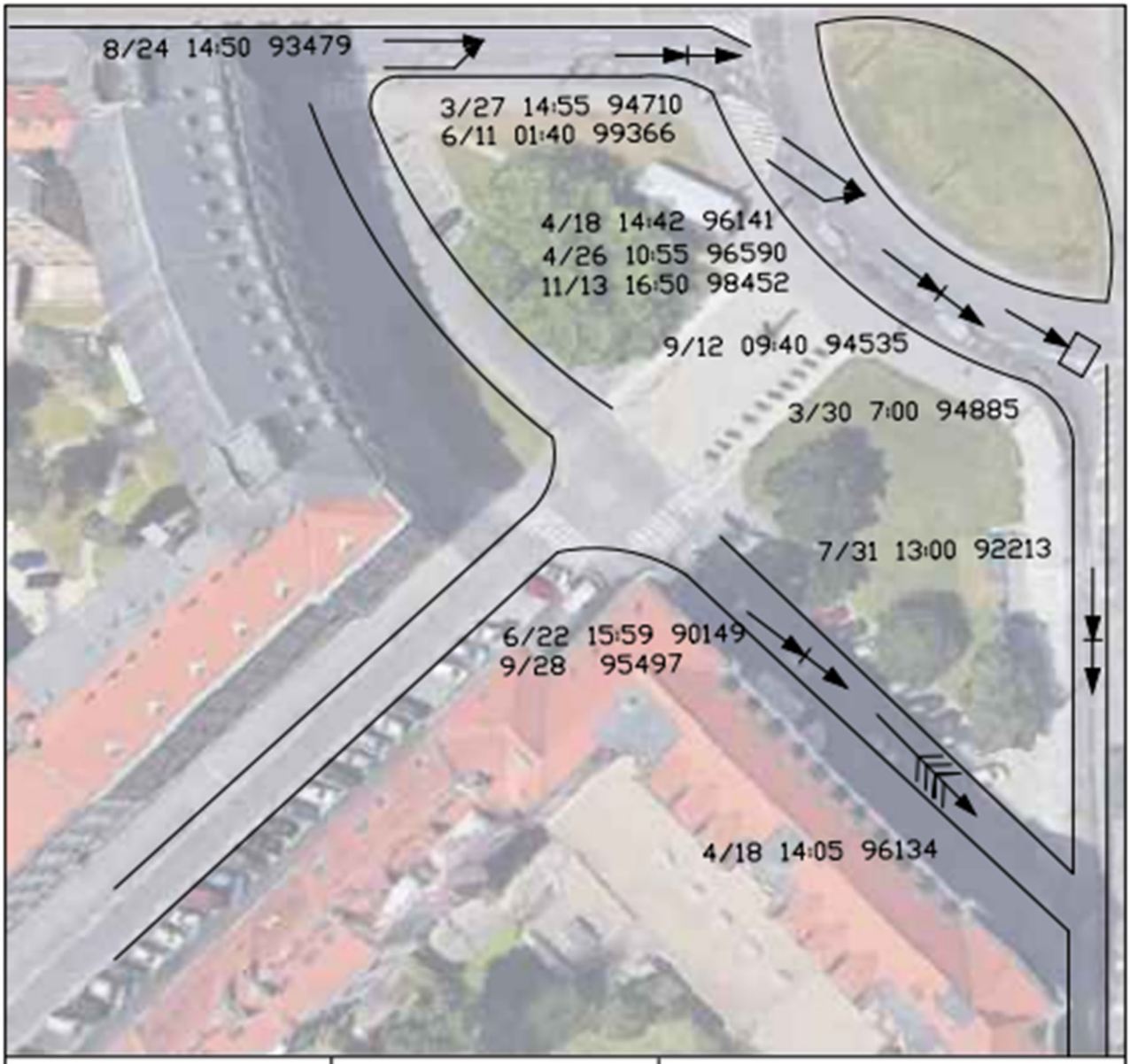
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 16
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2019

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



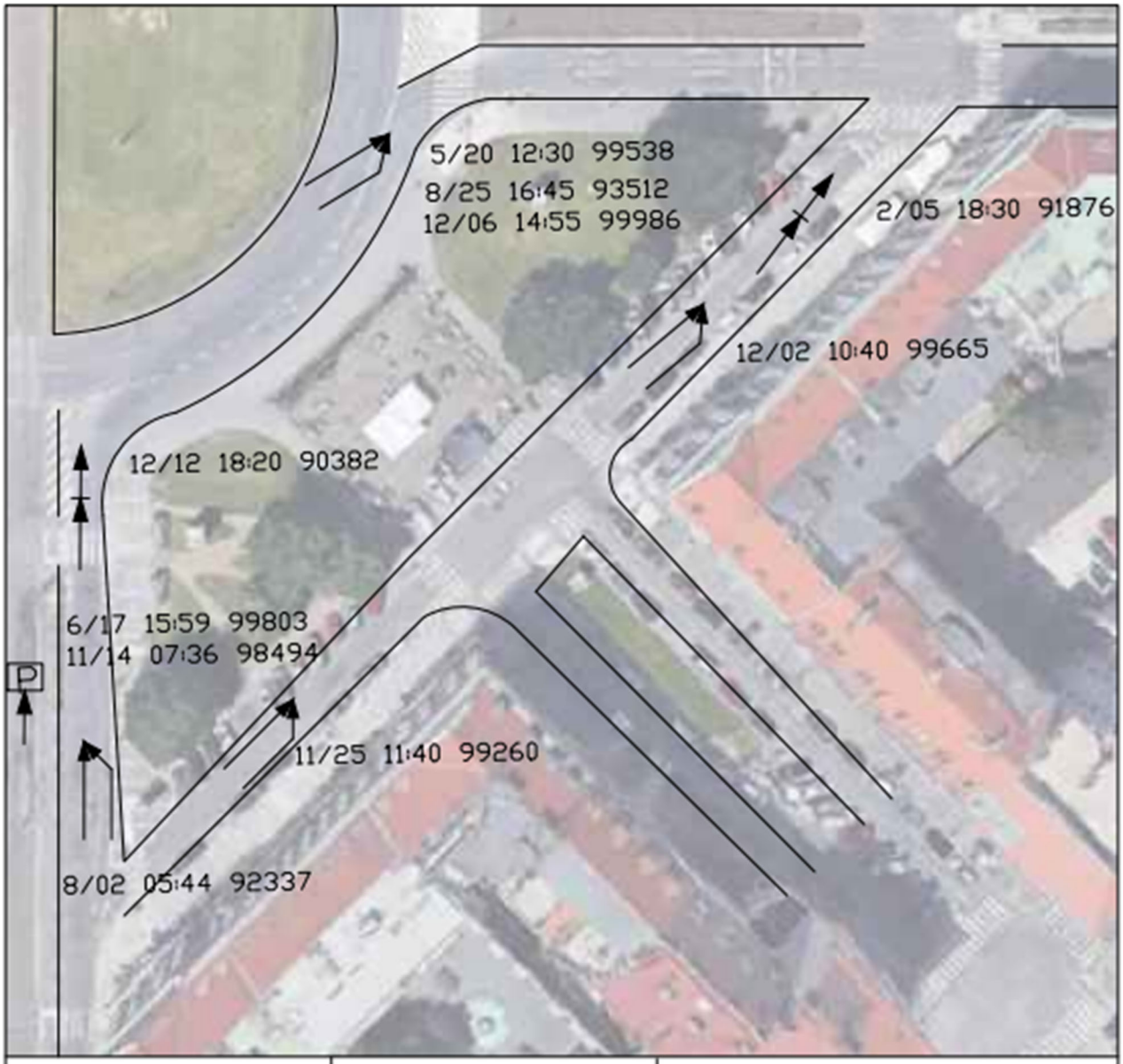
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 12
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2019

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 10
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

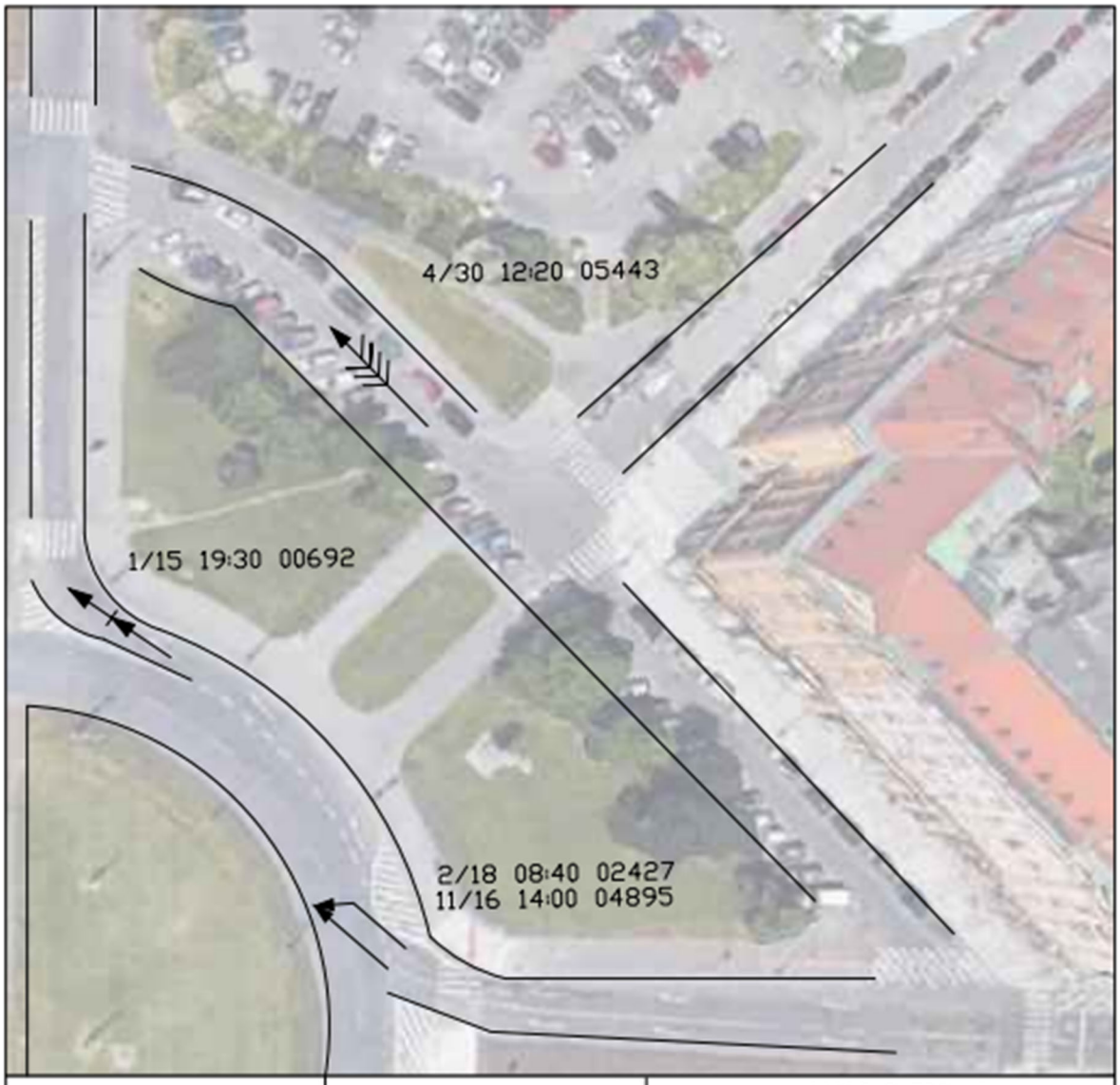
INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2019

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023

A.5 2020 COLLISION DIAGRAM



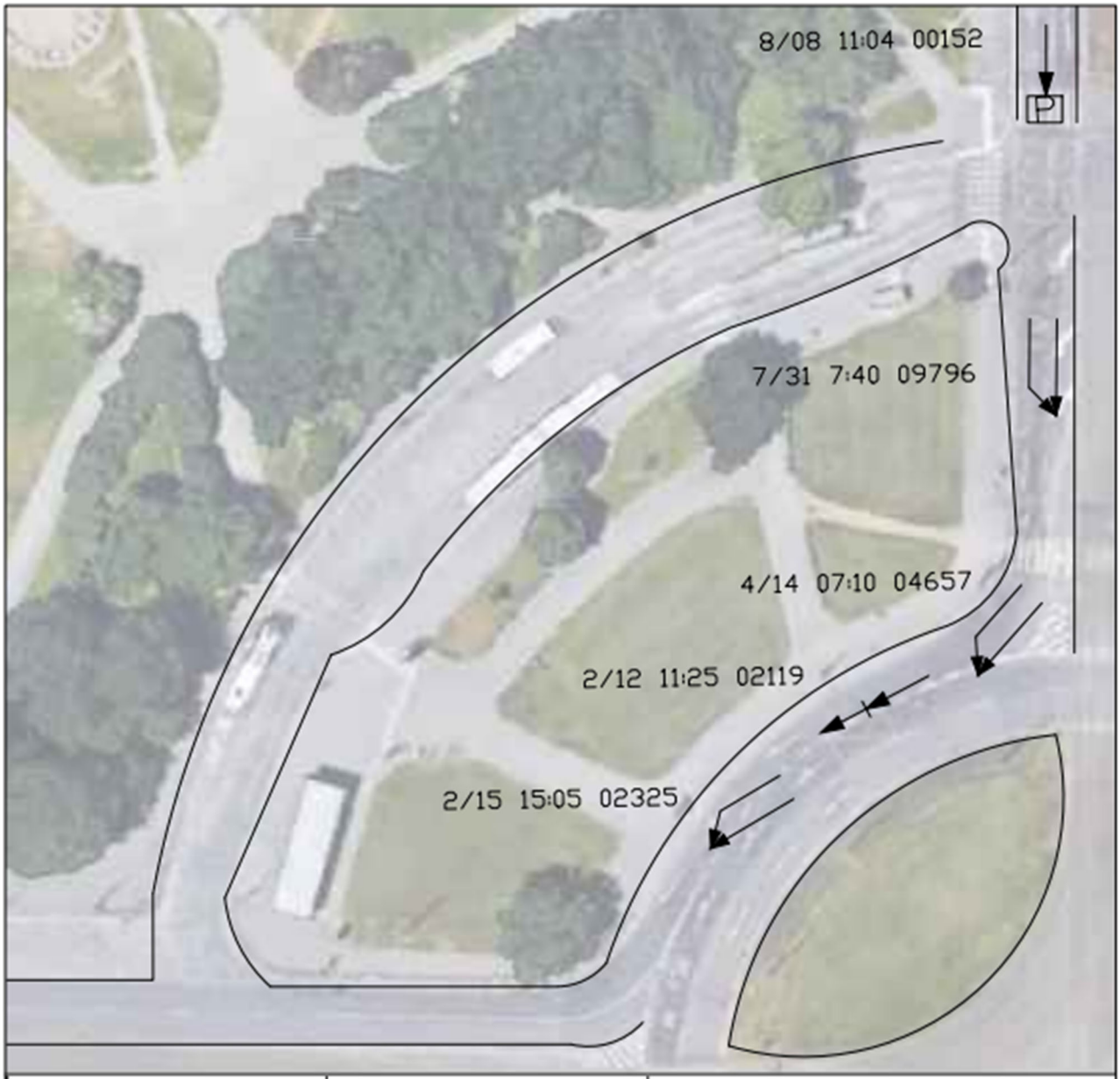
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 4
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2020

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



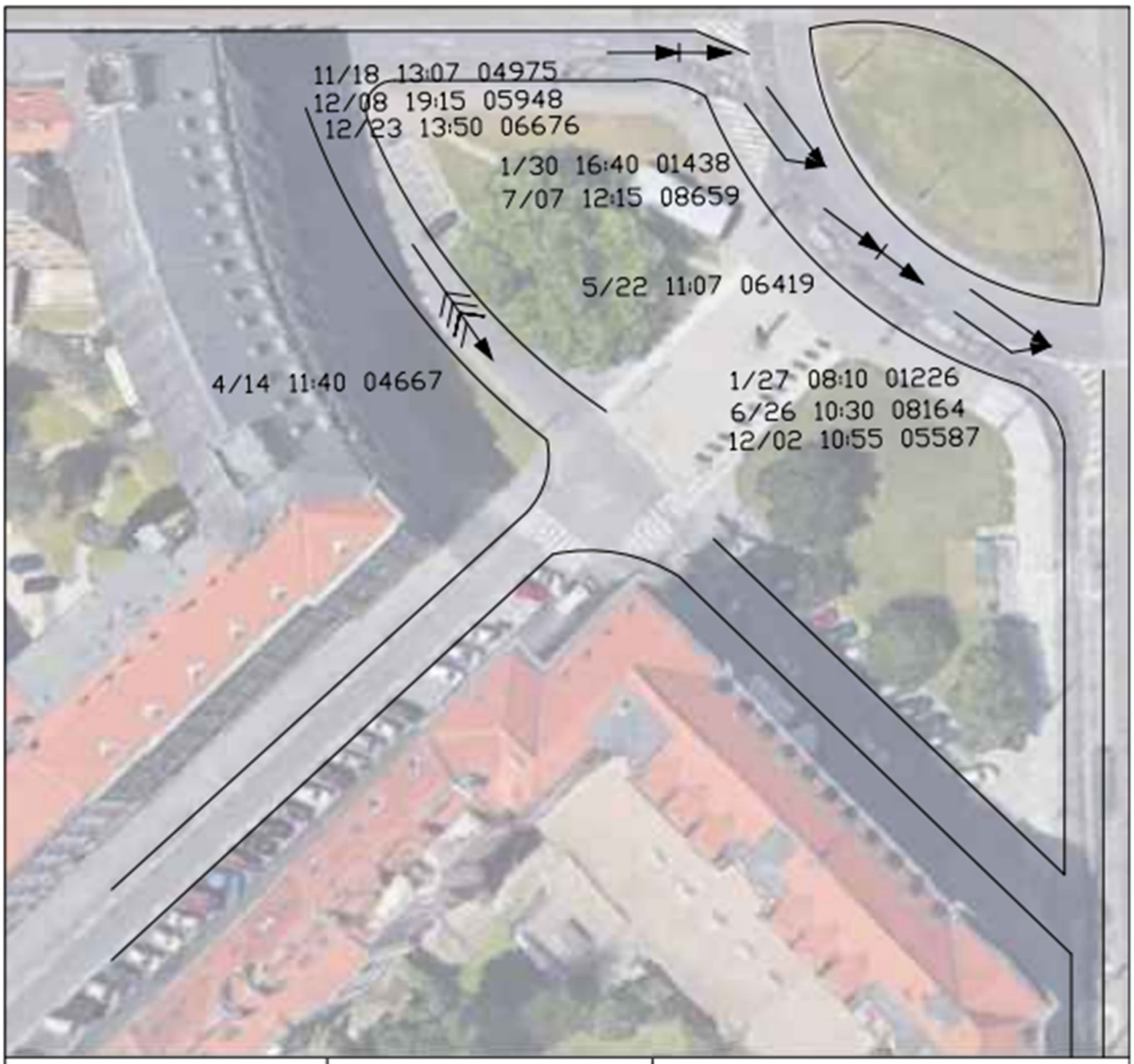
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 5
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2020

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 10
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2020

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023

SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 4
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

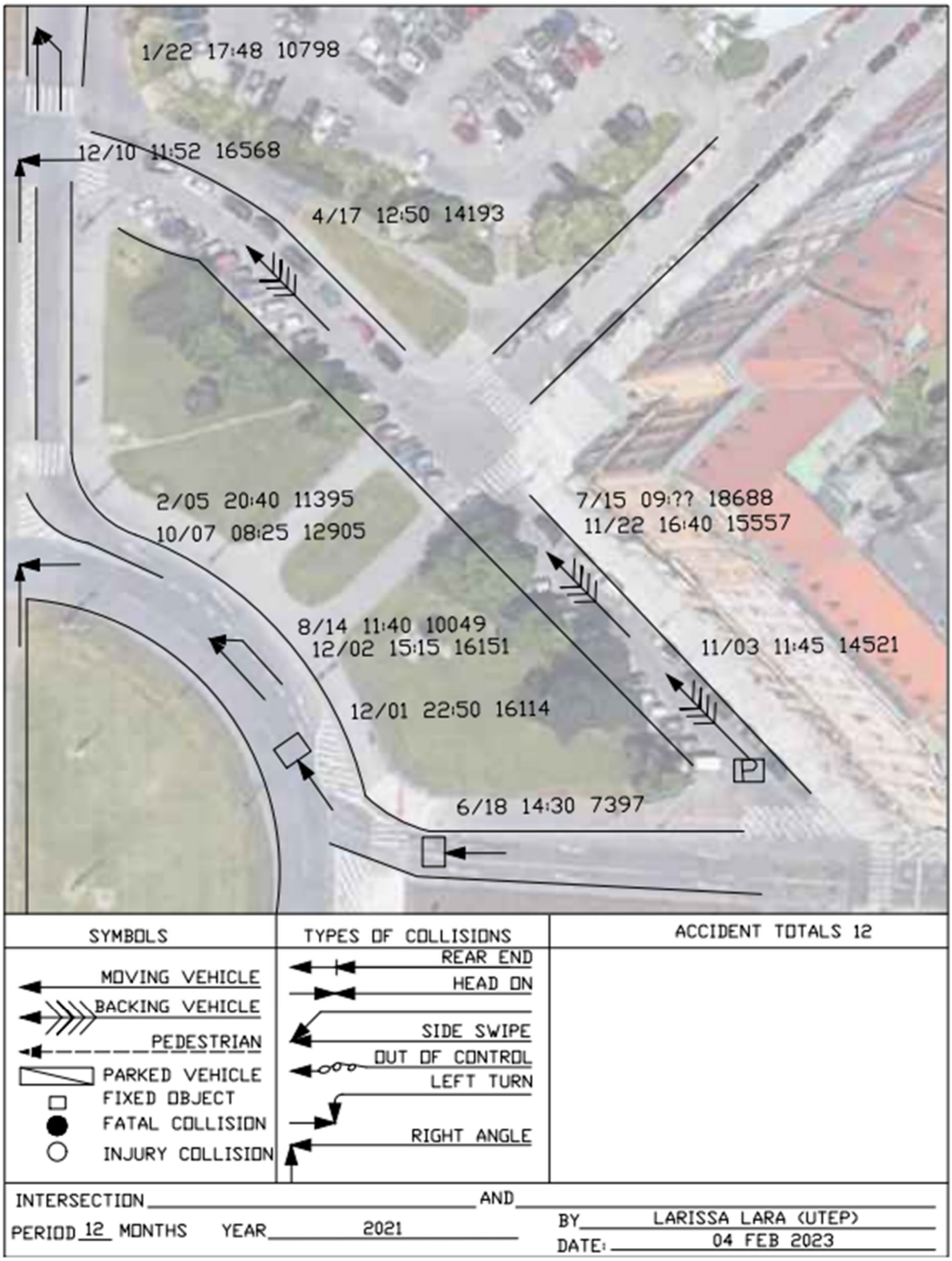
INTERSECTION _____ AND _____

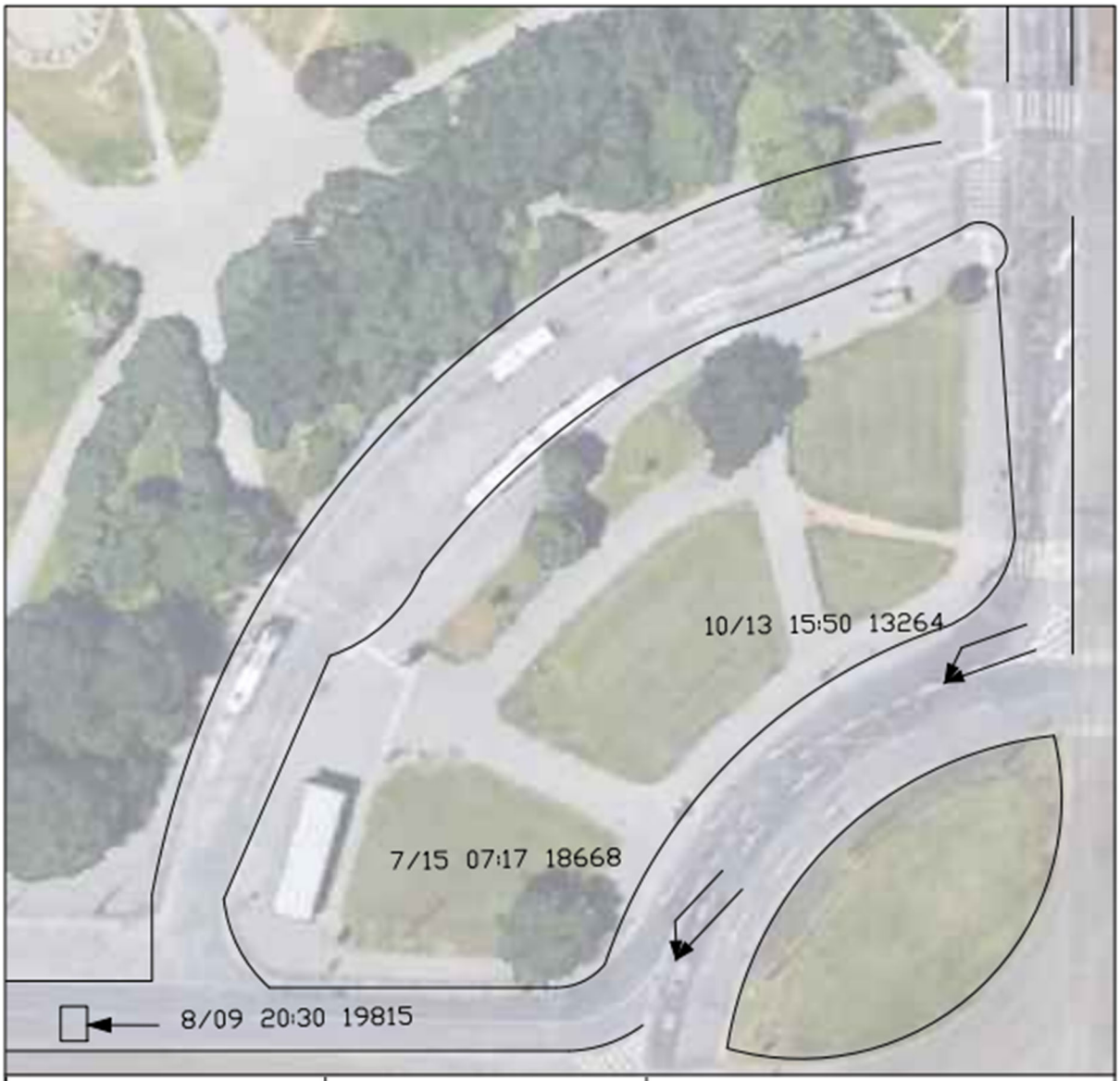
PERIOD 12 MONTHS YEAR 2020

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023

A.6 2021 COLLISION DIAGRAM





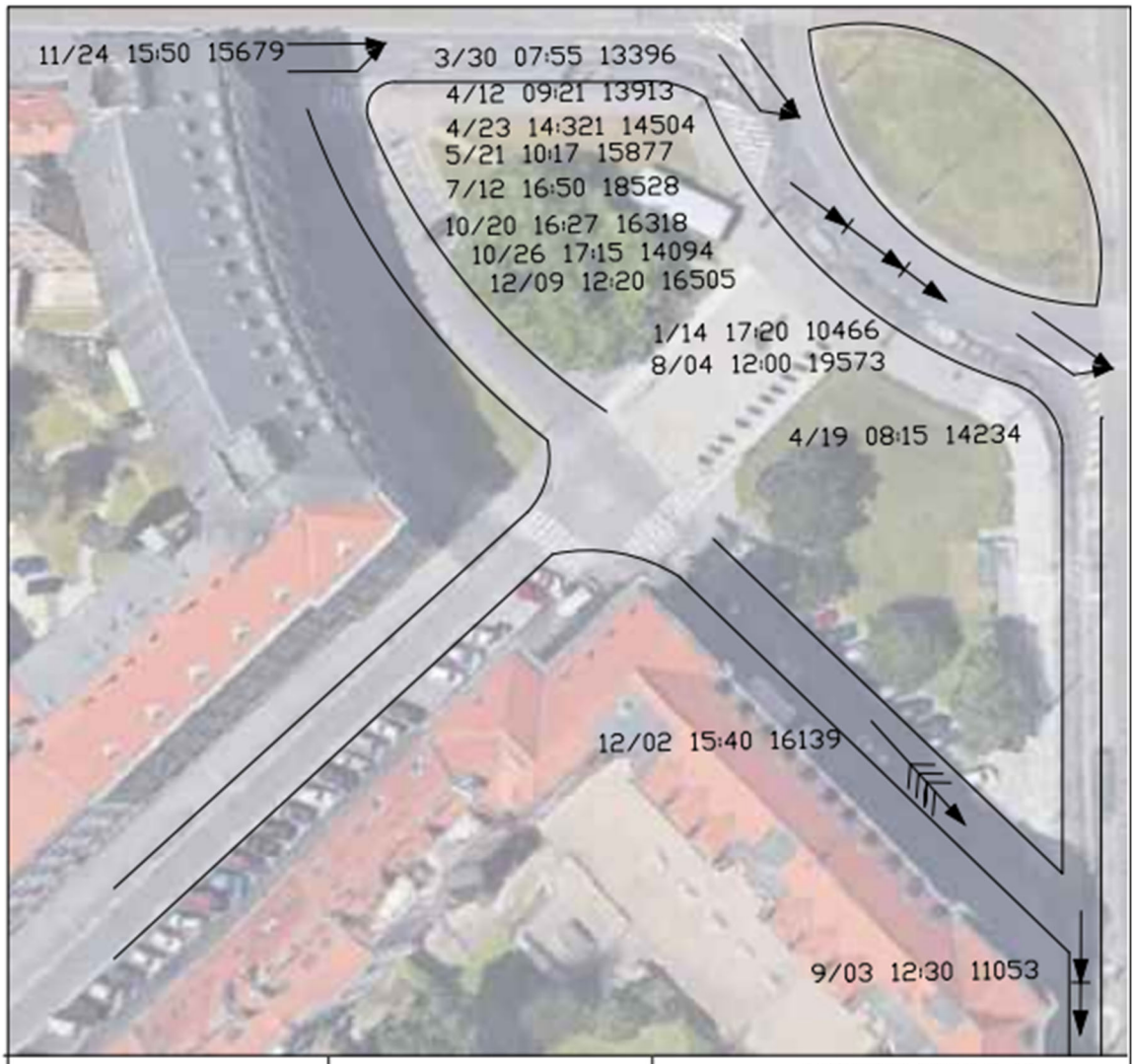
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 3
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2021

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 14
MOVING VEHICLE	REAR END	
BACKING VEHICLE	HEAD ON	
PEDESTRIAN	SIDE SWIPE	
PARKED VEHICLE	OUT OF CONTROL	
FIXED OBJECT	LEFT TURN	
FATAL COLLISION	RIGHT ANGLE	
INJURY COLLISION		

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2021

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023

SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 1
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

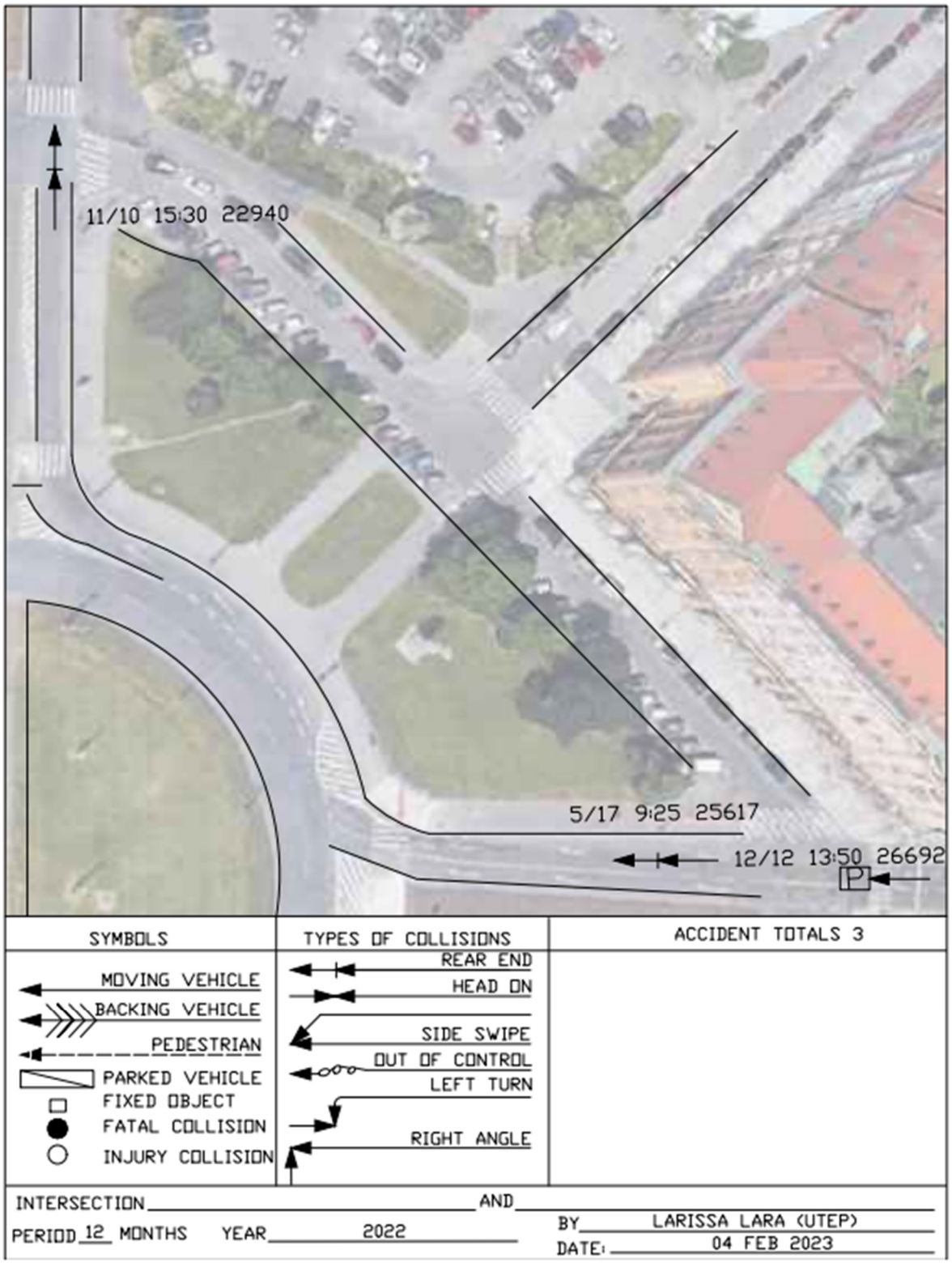
INTERSECTION _____ AND _____

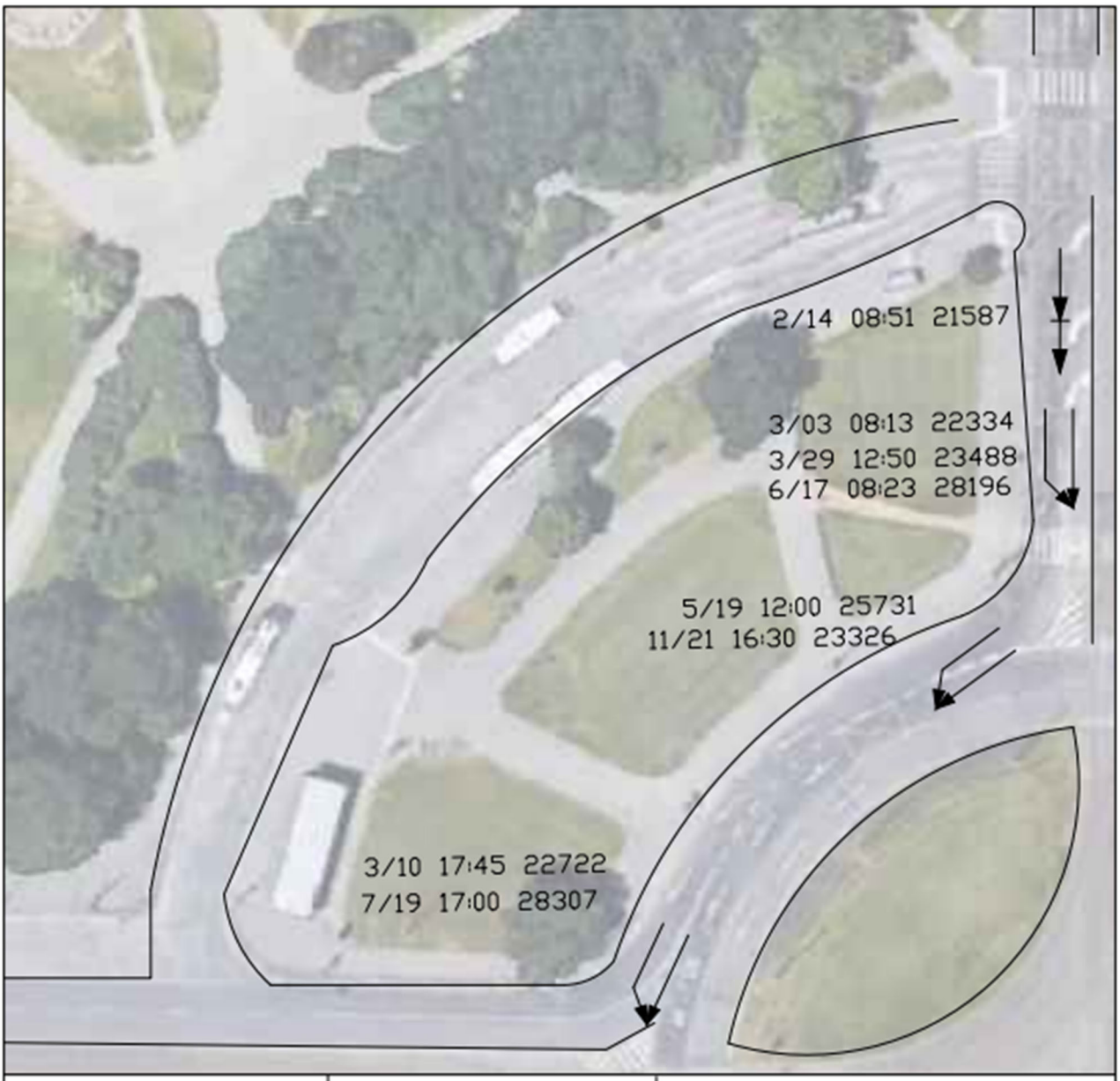
PERIOD 12 MONTHS YEAR 2021

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023

A.7 2022 COLLISION DIAGRAM





SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 8
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2022

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2022

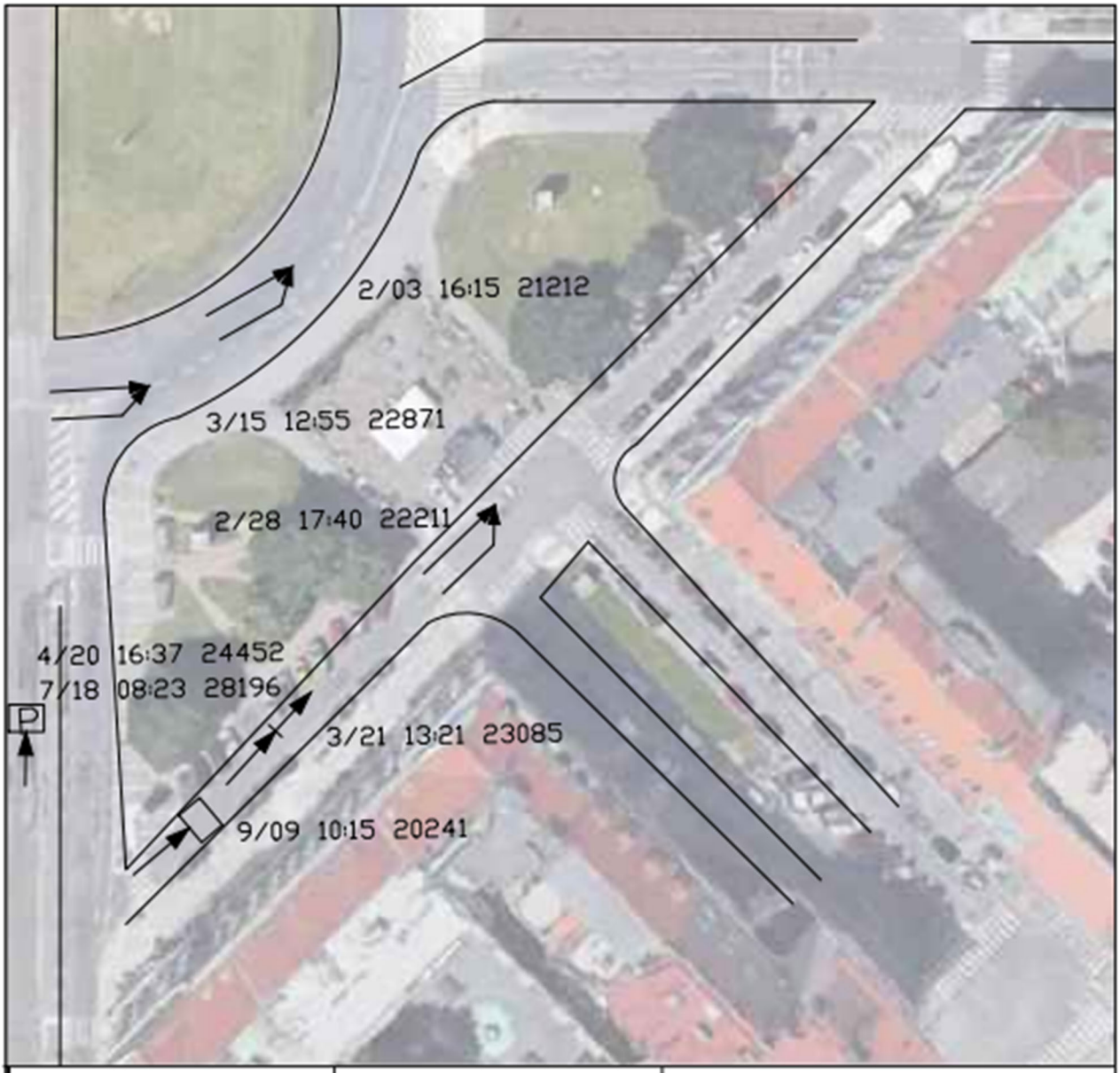
SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 3
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2022

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023



SYMBOLS	TYPES OF COLLISIONS	ACCIDENT TOTALS 7
MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL COLLISION INJURY COLLISION	REAR END HEAD ON SIDE SWIPE OUT OF CONTROL LEFT TURN RIGHT ANGLE	

INTERSECTION _____ AND _____

PERIOD 12 MONTHS YEAR 2022

BY LARISSA LARA (UTEP)

DATE: 04 FEB 2023

Appendix B

This appendix list screenshots of the excel used for all the calculations performed in this analysis.

B.1 Crash Data by Accident Type and Severity

2016							
	Side Swipe	Rear End	Reversing	Fixed Object	Pedestrians	Right Angle	Total
Fatalities	0	0	0	0	0	0	0
Severe Injuries	0	0	0	0	0	0	0
Minor Injuries	0	1	0	0	1	0	2
Material Damage	28	19	3	0	0	2	52
TOTAL							54

2017							
	Side Swipe	Rear End	Reversing	Fixed Object	Pedestrians	Right Angle	Total
Fatalities	0	0	0	0	0	0	0
Severe Injuries	0	0	0	0	0	0	0
Minor Injuries	0	0	0	0	4	0	4
Material Damage	27	8	2	0	0	2	39
TOTAL							43

2018							
	Side Swipe	Rear End	Reversing	Fixed Object	Pedestrians	Right Angle	Total
Fatalities	0	0	0	0	0	0	0
Severe Injuries	0	0	0	0	0	0	0
Minor Injuries	0	0	0	0	4	0	4
Material Damage	14	11	2	0	2	0	29
TOTAL							33

2019							
	Side Swipe	Rear End	Reversing	Fixed Object	Pedestrians	Right Angle	Total
Fatalities	0	0	0	0	0	0	0
Severe Injuries	0	0	0	0	0	0	0
Minor Injuries	0	1	0	0	2	0	3
Material Damage	23	16	1	2	1	2	45
TOTAL							48

2020							
	Side Swipe	Rear End	Reversing	Fixed Object	Pedestrians	Right Angle	Total
Fatalities	0	0	0	0	0	0	0
Severe Injuries	0	0	0	0	0	0	0
Minor Injuries	0	1	0	0	0	0	1
Material Damage	14	5	3	0	0	0	22
TOTAL							23

2021							
	Side Swipe	Rear End	Reversing	Fixed Object	Pedestrians	Right Angle	Total
Fatalities	0	0	0	0	0	0	0
Severe Injuries	0	0	0	0	1	1	2
Minor Injuries	0	0	0	0	0	0	0
Material Damage	17	3	4	3	0	1	28
TOTAL							30

B.2 Crash Data by Accident Type and Severity Percentages

2016						
	Side Swipe (%)	Rear End (%)	Reversing (%)	Fixed Object (%)	Pedestrians (%)	Right Angle (%)
Fatalities	0	0	0	0	0	0
Severe Inju	0	0	0	0	0	0
Minor Inju	0.00	1.85	0	0	1.85	0
Material D	51.85	35.19	5.56	0	0	3.70

2017						
	Side Swipe (%)	Rear End (%)	Reversing (%)	Fixed Object (%)	Pedestrians (%)	Right Angle (%)
Fatalities	0	0	0	0	0	0
Severe Inju	0	0	0	0	0	0
Minor Inju	0	0	0	0	9.30	0
Material D	62.79	18.60	4.65	0	0	4.65

2018						
	Side Swipe (%)	Rear End (%)	Reversing (%)	Fixed Object (%)	Pedestrians (%)	Right Angle (%)
Fatalities	0	0	0	0	0	0
Severe Inju	0	0	0	0	0	0
Minor Inju	0	0	0	0	12.12	0
Material D	42.42	33.33	6.06	0	6.06	0

2019						
	Side Swipe (%)	Rear End (%)	Reversing (%)	Fixed Object (%)	Pedestrians (%)	Right Angle (%)
Fatalities	0	0	0	0	0	0
Severe Inju	0	0	0	0	0	0
Minor Inju	0	2.08	0	0	4.17	0
Material D	47.92	33.33	2.08	4.17	2.08	4.17

2020						
	Side Swipe (%)	Rear End (%)	Reversing (%)	Fixed Object (%)	Pedestrians (%)	Right Angle (%)
Fatalities	0	0	0	0	0	0
Severe Inju	0	0	0	0	0	0
Minor Inju	0	4.35	0	0	0	0
Material D	60.87	21.74	13.04	0	0	0

2021						
	Side Swipe (%)	Rear End (%)	Reversing (%)	Fixed Object (%)	Pedestrians (%)	Right Angle (%)
Fatalities	0	0	0	0	0	0
Severe Inju	0	0	0	0	1	3.33
Minor Inju	0	0	0	0	0	0
Material D	56.67	10.00	13.33	10.00	0	3.33

B.3 COST PER ACCIDENT

2016					
Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,411,000	860,989	0	0
Severe Injuries	0	5,094,200	225,957	0	0
Minor Injuries	2	668,500	29,652	1,337,000	59,304
Material Damage	52	364,500	16,168	18,954,000	840,719
TOTAL				20,291,000.00	900,022
2017					
Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,784,000	877,534	0	0
Severe Injuries	0	5,097,500	226,103	0	0
Minor Injuries	4	716,700	31,790	2,866,800.00	127,159
Material Damage	39	386,400	17,139	15,069,600.00	668,423
TOTAL				17,936,400.00	795,582
2018					
Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	22,534,000	999,512	0	0
Severe Injuries	0	5,983,000	265,380	0	0
Minor Injuries	4	739,700	32,810	2,958,800	131,240
Material Damage	29	389,800	17,290	11,304,200	501,406
TOTAL				14,263,000	632,646
2019					
Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	25,041,000	1,110,712	0	0
Severe Injuries	0	5,567,000	246,928	0	0
Minor Injuries	3	809,000	35,884	2,427,000	107,651
Material Damage	45	405,000	17,964	18,225,000	808,383
TOTAL				20,652,000	916,035
2020					
Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	35,021,000	1,553,382	0	0
Severe Injuries	0	5,800,000	257,263	0	0
Minor Injuries	1	603,300	26,760	603,300	26,760
Material Damage	22	415,800	18,443	9,147,600	405,749
TOTAL				9,750,900	432,508
2021					
Severity	Number of Accidents	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	58,235,000	2,583,056	0	0
Severe Injuries	2	12,211,000	541,628	24,422,000	1,083,256
Minor Injuries	0	713,500	31,648	0	0
Material Damage	28	474,800	21,060	13,294,400	589,683
TOTAL				37,716,400	1,672,939

B.4 COST PER ACCIDENT (SIDE SWIPE)

2016					
	Side Swipe	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,411,000	860,989	0	0
Severe Injuries	0	5,094,200	225,957	0	0
Minor Injuries	0	668,500	29,652	0	0
Material Damage	28	364,500	16,168	10,206,000	452,695
Total				10,206,000	452,695

2017					
	Side Swipe	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,784,000	877,534	0	0
Severe Injuries	0	5,097,500	226,103	0	0
Minor Injuries	0	716,700	31,790	0	0
Material Damage	27	386,400	17,139	10,432,800	462,754
TOTAL				10,432,800	462,754

2018					
	Side Swipe	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	22,534,000	999,512	0	0
Severe Injuries	0	5,983,000	265,380	0	0
Minor Injuries	0	739,700	32,810	0	0
Material Damage	14	389,800	17,290	5,457,200	242,058
TOTAL				5,457,200	242,058

2019					
	Side Swipe	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	25,041,000	1,110,712	0	0
Severe Injuries	0	5,567,000	246,928	0	0
Minor Injuries	0	809,000	35,884	0	0
Material Damage	23	405,000	17,964	9,315,000	413,174
TOTAL				9,315,000	413,174

2020					
	Side Swipe	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	35,021,000	1,553,382	0	0
Severe Injuries	0	5,800,000	257,263	0	0
Minor Injuries	0	603,300	26,760	0	0
Material Damage	14	415,800	18,443	5,821,200	258,204
TOTAL				5,821,200	258,204

2021					
	Side Swipe	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	58,235,000	2,583,056	0	0
Severe Injuries	0	12,211,000	541,628	0	0
Minor Injuries	0	713,500	31,648	0	0
Material Damage	17	474,800	21,060	8,071,600	358,022
TOTAL				8,071,600	358,022

B.5 COST PER ACCIDENT (REAR END)

2016					
	Rear End	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,411,000	860,989	0	0
Severe Injuries	0	5,094,200	225,957	0	0
Minor Injuries	1	668,500	29,652	668,500	29,652
Material Damage	19	364,500	16,168	6,925,500	307,186
Total				7,594,000	336,837
2017					
	Rear End	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,784,000	877,534	0	0
Severe Injuries	0	5,097,500	226,103	0	0
Minor Injuries	0	716,700	31,790	0	0
Material Damage	8	386,400	17,139	3,091,200	137,112
TOTAL				3,091,200	137,112
2018					
	Rear End	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	22,534,000	999,512	0	0
Severe Injuries	0	5,983,000	265,380	0	0
Minor Injuries	0	739,700	32,810	0	0
Material Damage	11	389,800	17,290	4,287,800	190,189
TOTAL				4,287,800	190,189
2019					
	Rear End	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	25,041,000	1,110,712	0	0
Severe Injuries	0	5,567,000	246,928	0	0
Minor Injuries	1	809,000	35,884	809,000	35,884
Material Damage	16	405,000	17,964	6,480,000	287,425
TOTAL				7,289,000	323,309
2020					
	Rear End	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	35,021,000	1,553,382	0	0
Severe Injuries	0	5,800,000	257,263	0	0
Minor Injuries	1	603,300	26,760	603,300	26,760
Material Damage	5	415,800	18,443	2,079,000	92,216
TOTAL				2,682,300	118,975
2021					
	Rear End	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	58,235,000	2,583,056	0	0
Severe Injuries	0	12,211,000	541,628	0	0
Minor Injuries	0	713,500	31,648	0	0
Material Damage	3	474,800	21,060	1,424,400	63,180
TOTAL				1,424,400	63,180

B.6 COST PER ACCIDENT (REVERSING)

2016					
	Reversing	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,411,000	860,989	0	0
Severe Injuries	0	5,094,200	225,957	0	0
Minor Injuries	0	668,500	29,652	0	0
Material Damage	3	364,500	16,168	1,093,500	48,503
Total				1,093,500	48,503

2017					
	Reversing	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,784,000	877,534	0	0
Severe Injuries	0	5,097,500	226,103	0	0
Minor Injuries	0	716,700	31,790	0	0
Material Damage	2	386,400	17,139	772,800	34,278
TOTAL				772,800	34,278

2018					
	Reversing	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	22,534,000	999,512	0	0
Severe Injuries	0	5,983,000	265,380	0	0
Minor Injuries	0	739,700	32,810	0	0
Material Damage	2	389,800	17,290	779,600	34,580
TOTAL				779,600	34,580

2019					
	Reversing	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	25,041,000	1,110,712	0	0
Severe Injuries	0	5,567,000	246,928	0	0
Minor Injuries	0	809,000	35,884	0	0
Material Damage	1	405,000	17,964	405000	17964.07186
TOTAL				405000	17964.07186

2020					
	Reversing	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	35,021,000	1,553,382	0	0
Severe Injuries	0	5,800,000	257,263	0	0
Minor Injuries	0	603,300	26,760	0	0
Material Damage	3	415,800	18,443	1,247,400	55,329
TOTAL				1,247,400	55,329

2021					
	Reversing	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	58,235,000	2,583,056	0	0
Severe Injuries	0	12,211,000	541,628	0	0
Minor Injuries	0	713,500	31,648	0	0
Material Damage	4	474,800	21,060	1,899,200	84,240
TOTAL				1,899,200	84,240

B.7 COST PER ACCIDENT (FIXED OBJECT)

2016					
	Fixed Object	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,411,000	860,989	0	0
Severe Injuries	0	5,094,200	225,957	0	0
Minor Injuries	0	668,500	29,652	0	0
Material Damage	0	364,500	16,168	0	0
Total				0	0
2017					
	Fixed Object	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,784,000	877,534	0	0
Severe Injuries	0	5,097,500	226,103	0	0
Minor Injuries	0	716,700	31,790	0	0
Material Damage	0	386,400	17,139	0	0
TOTAL				0	0
2018					
	Fixed Object	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	22,534,000	999,512	0	0
Severe Injuries	0	5,983,000	265,380	0	0
Minor Injuries	0	739,700	32,810	0	0
Material Damage	0	389,800	17,290	0	0
TOTAL				0	0
2019					
	Fixed Object	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	25,041,000	1,110,712	0	0
Severe Injuries	0	5,567,000	246,928	0	0
Minor Injuries	0	809,000	35,884	0	0
Material Damage	2	405,000	17,964	810,000	35,928
TOTAL				810,000	35,928
2020					
	Fixed Object	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	35,021,000	1,553,382	0	0
Severe Injuries	0	5,800,000	257,263	0	0
Minor Injuries	0	603,300	26,760	0	0
Material Damage	0	415,800	18,443	0	0
TOTAL				0	0
2021					
	Fixed Object	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	58,235,000	2,583,056	0	0
Severe Injuries	0	12,211,000	541,628	0	0
Minor Injuries	0	713,500	31,648	0	0
Material Damage	3	474,800	21,060	1,424,400	63,180
TOTAL				1,424,400	63,180

B.8 COST PER ACCIDENT (PEDESTRIANS)

2016					
	Pedestrians	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,411,000	860,989	0	0
Severe Injuries	0	5,094,200	225,957	0	0
Minor Injuries	1	668,500	29,652	668,500	29,652
Material Damage	0	364,500	16,168	0	0
Total				668,500	29,652
2017					
	Pedestrians	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,784,000	877,534	0	0
Severe Injuries	0	5,097,500	226,103	0	0
Minor Injuries	4	716,700	31,790	2,866,800	127,159
Material Damage	0	386,400	17,139	0	0
TOTAL				2,866,800	127,159
2018					
	Pedestrians	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	22,534,000	999,512	0	0
Severe Injuries	0	5,983,000	265,380	0	0
Minor Injuries	4	739,700	32,810	2,958,800	131,240
Material Damage	2	389,800	17,290	779,600	34,580
TOTAL				3,738,400	165,819
2019					
	Pedestrians	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	25,041,000	1,110,712	0	0
Severe Injuries	0	5,567,000	246,928	0	0
Minor Injuries	2	809,000	35,884	1,618,000	71,768
Material Damage	1	405,000	17,964	405,000	17,964
TOTAL				2,023,000	89,732
2020					
	Pedestrians	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	35,021,000	1,553,382	0	0
Severe Injuries	0	5,800,000	257,263	0	0
Minor Injuries	0	603,300	26,760	0	0
Material Damage	0	415,800	18,443	0	0
TOTAL				0	0
2021					
	Pedestrians	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	58,235,000	2,583,056	0	0
Severe Injuries	1	12,211,000	541,628	12,211,000	541,628
Minor Injuries	0	713,500	31,648	0	0
Material Damage	0	474,800	21,060	0	0
TOTAL				12,211,000	541,628

B.9 COST PER ACCIDENT (RIGHT ANGLE)

2016					
	Right Angle	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,411,000	860,989	0	0
Severe Injuries	0	5,094,200	225,957	0	0
Minor Injuries	0	668,500	29,652	0	0
Material Damage	2	364,500	16,168	729,000	32,335
TOTAL				729,000	32,335

2017					
	Right Angle	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	19,784,000	877,534	0	0
Severe Injuries	0	5,097,500	226,103	0	0
Minor Injuries	0	716,700	31,790	0	0
Material Damage	2	386,400	17,139	772,800	34,278
TOTAL				772,800	34,278

2018					
	Right Angle	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	22,534,000	999,512	0	0
Severe Injuries	0	5,983,000	265,380	0	0
Minor Injuries	0	739,700	32,810	0	0
Material Damage	0	389,800	17,290	0	0
TOTAL				0	0

2019					
	Right Angle	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	25,041,000	1,110,712	0	0
Severe Injuries	0	5,567,000	246,928	0	0
Minor Injuries	0	809,000	35,884	0	0
Material Damage	2	405,000	17,964	810,000	35,928
TOTAL				810,000	35,928

2020					
	Right Angle	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	35,021,000	1,553,382	0	0
Severe Injuries	0	5,800,000	257,263	0	0
Minor Injuries	0	603,300	26,760	0	0
Material Damage	0	415,800	18,443	0	0
TOTAL				0	0

2021					
	Right Angle	Cost Per Accident (Kc)	Cost Per Accident (USD)	Total (Kc)	Total (USD)
Fatalities	0	58,235,000	2,583,056	0	0
Severe Injuries	1	12,211,000	541,628	12,211,000	541,628
Minor Injuries	0	713,500	31,648	0	0
Material Damage	1	474,800	21,060	474,800	21,060
TOTAL				12,685,800	562,688

B.10 EXPECTED COST SAVINGS

2016			
Location	Expected Reduction of Crases	Expected Cost Savings (Kc)	Expected Cost Savings (USD)
Quadrant 1	3	1,093,500	48,503
Quadrant 2	15	5,467,500	242,515
Quadrant 3	0	0	0
Quadrant 4	1	364,500	16,168
		6,925,500	307,186
2017			
Location	Expected Reduction of Crases	Expected Cost Savings (Kc)	Expected Cost Savings (USD)
Quadrant 1	0	0	0
Quadrant 2	11	4,250,400	188,530
Quadrant 3	0	0	0
Quadrant 4	0	0	0
		4,250,400	188,530
2018			
Location	Expected Reduction of Crases	Expected Cost Savings (Kc)	Expected Cost Savings (USD)
Quadrant 1	2	779,600	34,580
Quadrant 2	6	2,338,800	103,739
Quadrant 3	0	0	0
Quadrant 4	0	0	0
		3,118,400	138,319
2019			
Location	Expected Reduction of Crases	Expected Cost Savings (Kc)	Expected Cost Savings (USD)
Quadrant 1	2	810,000	35,928
Quadrant 2	9	3,645,000	161,677
Quadrant 3	0	0	0
Quadrant 4	3	1,215,000	53,892
		5,670,000	251,497
2020			
Location	Expected Reduction of Crases	Expected Cost Savings (Kc)	Expected Cost Savings (USD)
Quadrant 1	2	831,600	36,886
Quadrant 2	3	1,247,400	55,329
Quadrant 3	0	0	0
Quadrant 4	0	0	0
		2,079,000	92,216
2021			
Location	Expected Reduction of Crases	Expected Cost Savings (Kc)	Expected Cost Savings (USD)
Quadrant 1	2	949,600	42,120
Quadrant 2	2	949,600	42,120
Quadrant 3	0	0	0
	0	0	0
		1,899,200	84,240

VITA

Larissa L Lara Olivas was born in Camargo Chihuahua, Mexico in 1998, and grew up in El Paso, Texas. She pursued a career in civil engineering, eventually earning a Bachelor of Science in Civil Engineering from the University of Texas at El Paso (UTEP) in 2021.

After completing her undergraduate degree, Larissa enrolled in the Dual Master Degree Program in Smart Cities, a collaborative effort between Czech Technical University (CTU)and the University of Texas at El Paso. In the program, Larissa spent the first year at UTEP and then continued her studies at CTU.

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