Illinois Department of Transportation
Office of Project Implementation
Bureau of Safety Programs and Engineering

# Road Safety Assessment Report

***Intersection of IL 32 and Bruce-Findlay/800 North Road***
***Moultrie County, Illinois***

**Prepared by: IDOT Bureau of Safety Programs and Engineering**
**12/19/2019**

# *Message from the Illinois State Safety Engineer*

Dear Safety Stakeholder

The Illinois Department of Transportation continually strives to provide a safe and reliable transportation system. Among the many efforts performed to keep our roadways safe is the preparation of the Illinois Strategic Highway Safety Plan (SHSP). The SHSP outlines a clear set of actions and proposed strategies to address fatalities and serious injuries on our roadways. The SHSP is developed in partnership with multi-disciplined safety stakeholders that share a vision to eliminate roadway fatalities and serious injuries. Achieving that vision requires collaboration, cooperation and the sharing of knowledge and resources.

A Road Safety Assessment (RSA) is an independent safety review of a roadway and is an integral part of the ISHSP. We appreciate your help in implementing projects and programs that will help to save lives on Illinois roadways and help to achieve our goal of zero fatalities.

Thank you for taking the time to read this RSA report. Engineers and a variety of safety stakeholders have collaborated to prepare this report. The report includes an assessment of safety needs and recommended strategies and countermeasures that, if implemented, may help to reduce severe and fatal crashes.

The observations, findings, conclusions, and recommendations of this report are protected under 23 CFR 409 which states these shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in this report or documents associated with this review.

For additional information about the Safety Review program or other support the Bureau of Safety Programs and Engineering provides, please see our website: http://www.idot.illinois.gov/transportation-system/transportation-management/planning/SHSP or contact my office.

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| A | Incapacitating injury |
| AADT | Annual Average Daily Traffic |
| B | Non-incapacitating injury |
| BSPE | Bureau of Safety Programs and Engineering |
| C | Reported, but not evident injury |
| CoT | Class of Trafficway |
| FHWA | Federal Highway Administration |
| HMEV | Hundred Million Entering Vehicles |
| IDOT | Illinois Department of Transportation |
| K | Fatal |
| KAB | Fatal, Incapacitating, and Non-incapacitating crashes |
| PDO/O | Property Damage Only |
| PSI | Potential for Safety Improvement |
| RSA | Road Safety Assessment |
| SCAT | Signal Coordination And Timing |

# INTRODUCTION

## DEFINITION

A Road Safety Assessment (RSA) is a formal, independent and comprehensive safety performance review of a road transportation project conducted by an experienced team of safety specialists to maximize safety of the roadway environment for all road users.

## PROCESS OUTLINE

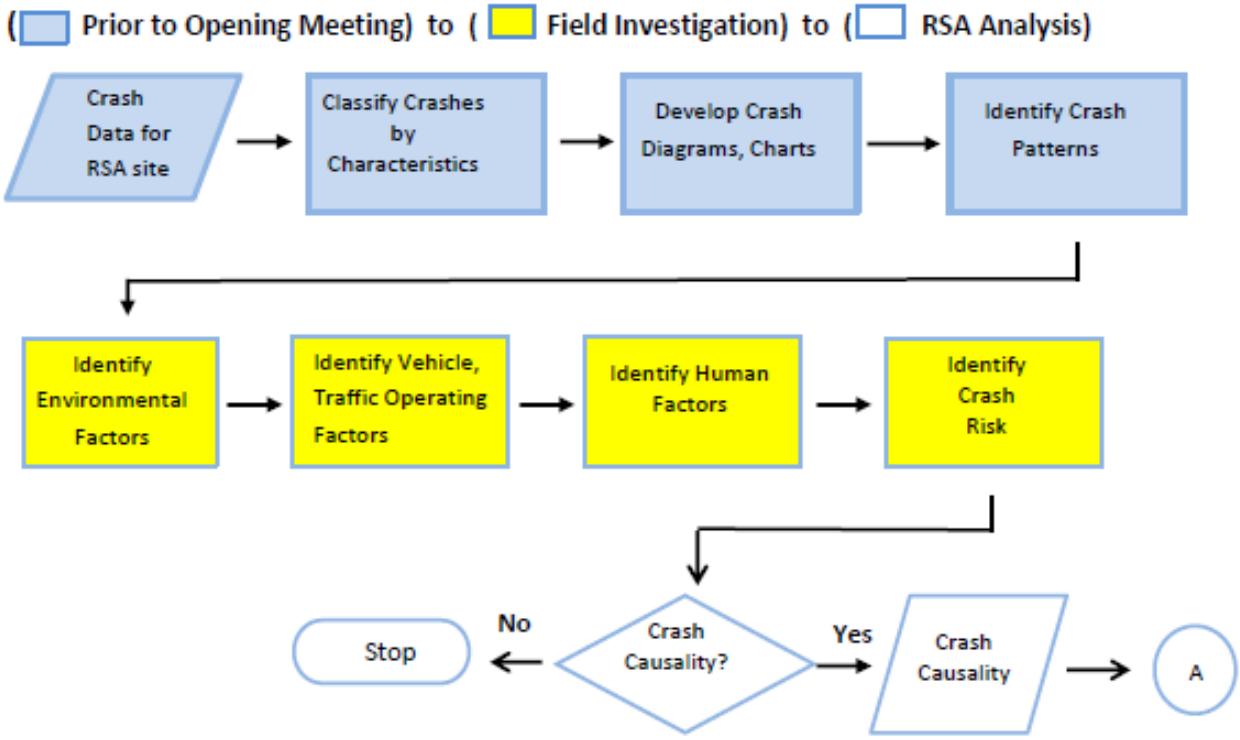


*Figure 1 - RSA FLOW CHART TO CAUSALITY*

Figure 1 shows the RSA process outline from data gathering to decision on causality of crashes. The RSA team, with members having no direct involvement with the location, is assembled upon approval for an RSA request. The first phase of the assessment begins with crash data assembled and reviewed to formulate the answer to the what, where, and when of crashes that are occurring. A time and location are set for an introductory meeting with the owner. At this meeting, the RSA team explains the RSA process to the owner and the design team (if applicable). If the site has been requested to assess a planned project, the design team and owners provide all pertinent project information about existing site conditions and the proposed project plan. Otherwise, the owners will provide any pertinent information relative to the assessment. With this information in hand, the RSA team visits the site to observe, investigate, and document existing safety risks and safety factors under various traffic, lighting, and weather conditions. The RSA team becomes virtual drivers at the site to observe drivers' needs and limitations with the roadway environment and other vehicles. Awareness of human factors helps answer how we react and why these crashes occurred at the RSA site.

Next, the RSA team evaluates how the proposed project improvements, if applicable, will impact existing safety conditions. It is then determined if identified safety hazards are addressed, worsened, or remedied by the proposed design. Another key component is the identification of safety hazards that will be introduced to the site by the proposed design. As a result, a list of all present and predicted safety issues is developed and evaluated according to the expected safety risk of associated crashes. Risk is defined by the degree of frequency and severity of expected crashes for each safety issue and given an overall rating level as present in the matrix below

*Risk* = f(E, P, C)

*E* = *Exposure* – How many users are exposed to the specific risk being assessed

*P* = *Probability* – The likelihood of a crash occurring

*C* = *Consequence* – How many users are exposed to the specific risk being assessed

*E* + *P* = *Frequency*

*C* = *Severity*

| **RISK CATEGORY** | | ***Severity*** | | | |
|---|---|---|---|---|---|
| | | **Low** | **Medium** | **High** | **Severe** |
| ***Crash Frequency Category*** | **Frequent** | C | D | E | F |
| | **Occasional** | B | C | D | E |
| | **Infrequent** | A | B | C | D |
| | **Rare** | A | A | B | C |

| ***RISK LEVEL*** | | | |
|---|---|---|---|
| **A** | **Minimal** | **D** | **Significant** |
| **B** | **Low** | **E** | **High** |
| **C** | **Moderate** | **F** | **Extreme** |

***Figure 2 - RISK RATING LEVELS***

Risk identification is a tool to identify significance of the safety concerns. The human, environmental, and vehicle factors identified are used to explain why and how these are safety concerns. The greater the significance, the more attention that should be given to addressing the identified safety concern. After each safety issue is identified, evaluated, and assigned a risk rating, the team selects countermeasures that will be suggested to the owner and design team for mitigating future hazards.

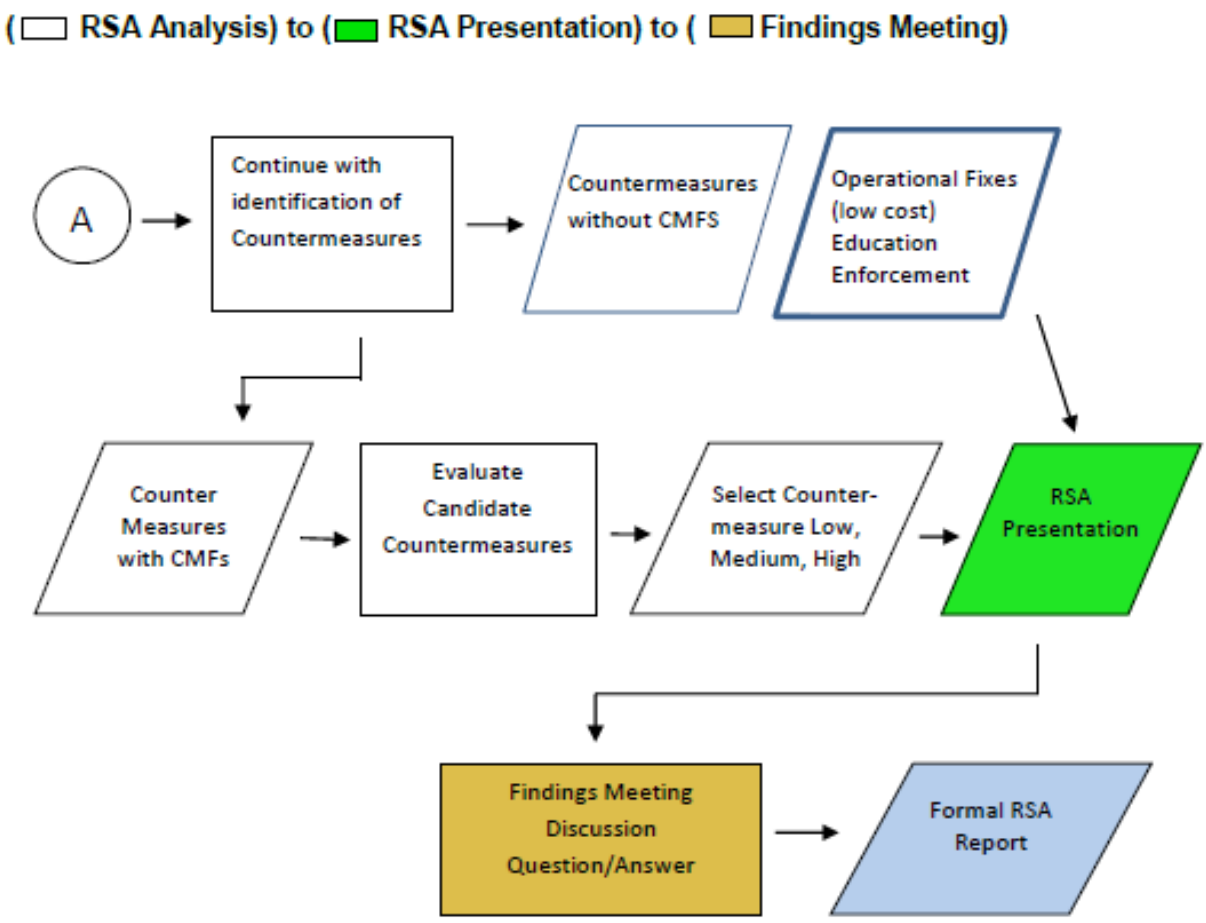


*Figure 3 - RSA FLOW CHART*

Upon completion of the assessment (Figure 3), the RSA team presents the identified safety issues, along with corresponding suggested countermeasures, to the owner and design team in a clear and simplified manner during a project close-out meeting. Following the close-out meeting, the RSA team prepares and submits a formal written report to the owner summarizing all identified safety issues and suggested countermeasures, as well as all individual risk significance and crash causality for the project.

After reviewing the final report and taking available resources, constraints, and commitments into consideration, the owner must respond to the suggested countermeasures in reference to any action that will be taken.

The Response Report should be concise, may be a brief letter or memorandum, and should include at least the following information:

- Name and position (author),
- Signature and date at Response Report completion,
- Completion date of RSA or RSR,

- List of each safety concern identified in the RSA and a point-by-point response and justification of the response, either agreement with the suggestion and action that is to be taken or reason why no action will be taken. Where recommendations are beyond the jurisdiction of the owner (Enforcement, Education, Emergency Response), the Response Report should note what contacts were made, and any decisions and reasons; and,

- Define how multiple mitigation strategies will be coordinated. For example, "The low-cost mitigation for double-up advance warning signs will be implemented while we pursue funding to re-grade the approach profile to the intersection."

The final report and Response Report are components of the RSA documentation, which becomes part of the project files.

## RSA PARTICIPANTS

On October 8th and October 9th, 2019, the RSA team participants conducted an RSA at the intersection of IL 32 at Bruce-Findlay/800 North Road in Moultrie County. The intersection is owned and maintained by the Illinois Department of Transportation (IDOT) on the north, east and south legs while the west leg is owned and maintained by Moultrie County. The RSA team had representatives from IDOT, the Federal Highway Administration (FHWA), and Illinois State Police (ISP).

The RSA Team included staff members from IDOT Bureau of Safety Programs & Engineering (BSPE), IDOT Bureau of Data Collection, IDOT Bureau of Operations, Federal Highway Administration and Illinois State Police.

Additional observers in the opening and close-out meetings included staff members from IDOT District 7 and Moultrie County.

## PRE-ASSESSMENT AND MEETINGS

An initial review of the crash data was performed in advance of the site observation to identify the crash types, crash severities, and crash patterns along the corridor. The RSA began with a kick-off meeting at the Moultrie County Sheriff's office in Sullivan, Illinois, which included the RSA team as well as the owners of the roadways.

At the kick-off meeting, owners and participants provided roadway information for the RSA team to consider. Summary items from the kick-off meeting are listed below.

- Intersection Stop-Control Warrant analysis
- Turning movement projections

The kick-off meeting was followed by site reviews to observe traffic behavior, identify potential safety issues at or near the intersection, and recommend safety countermeasures to reduce the number of fatal and serious crashes. A close-out meeting was held on Tuesday, October 9th, 2019 to discuss the findings following the site visits.

## LOCATION & DESCRIPTION

The intersection of IL 32 and Bruce-Findlay/800 North Road, as shown in Figure 4, is located just south of Sullivan, Illinois and to the east of Shelbyville Lake. Dedicated left turn lanes are present on the north and southbound approaches on IL 32. Right turn lanes are present on the west and east approaches on Bruce-Findlay/800 North Road. The minor approaches of Bruce-Findlay/800 North Road are stop-controlled while IL 32 is free flow with no stop control.

The Annual Average Daily Traffic (AADT) for the intersection is as followed: west leg AADT is 2,200; east leg AADT is 2,250; north leg AADT is 4,400 and south leg AADT is 2,650. The combined AADT of the intersection is 11,500. The posted speed limit on all approaches is 55 MPH.

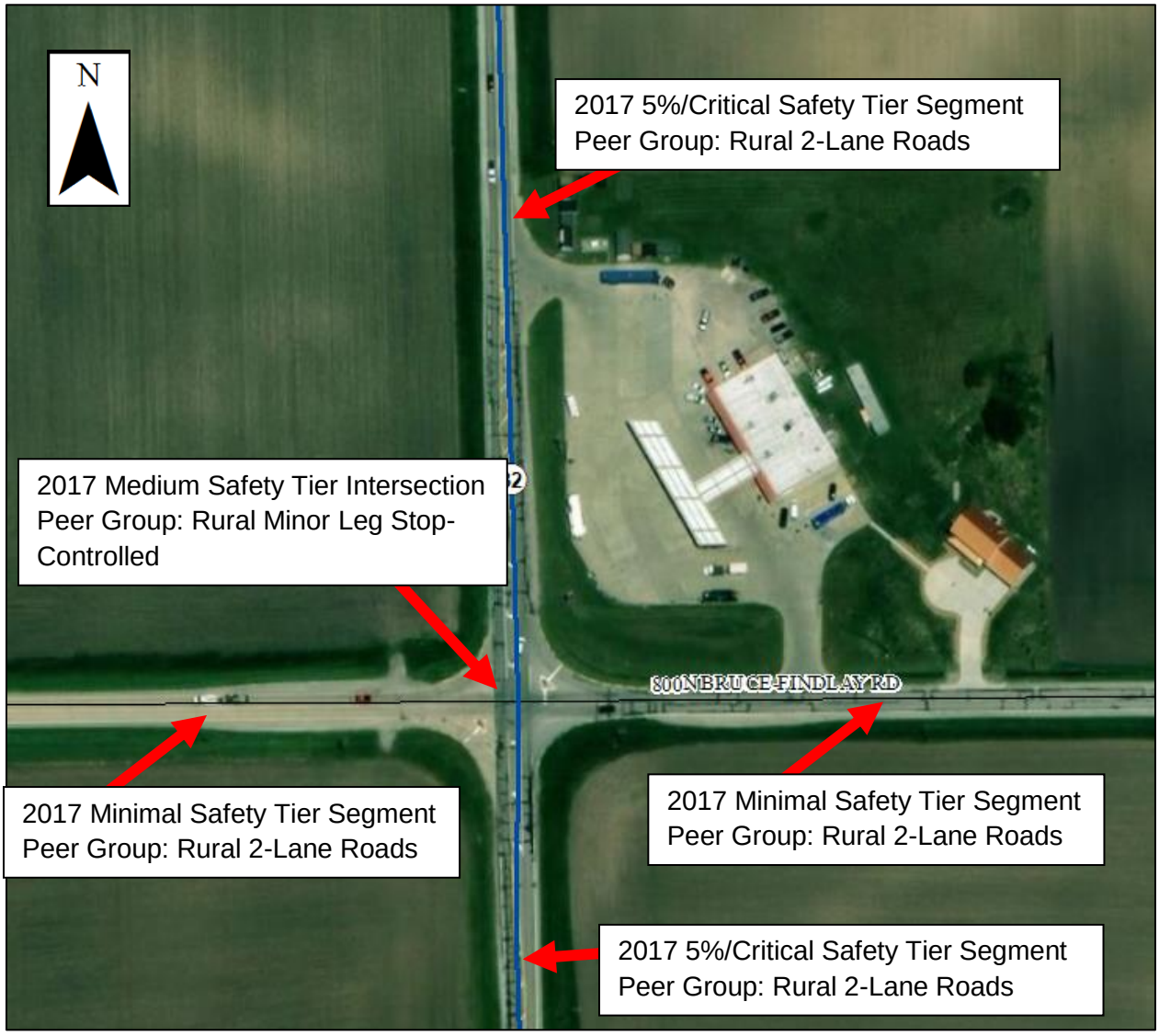


*Figure 4 - RSA LOCATION IN MOULTRIE COUNTY*

## SAFETY PERFORMANCE

Crash data for the RSA corridor was analyzed by the RSA team from 2010 – 2018, and 2019 (Provisional). Details on the crashes reviewed for the RSA have been provided as follows.

The data includes crashes that were reported to have occurred within a 250-foot range of the intersection. A total of 28 crashes were reported in 2010 to 2019 as shown in Table 1.

### CRASH ANALYSIS

Crash severity is measured within the crash data by the KABCO scale, a scale adopted by many safety agencies. The definitions of these crash severities are listed in the Acronyms and Abbreviations section on page 3. Table 1 - CRASH TYPE AND SEVERITY OF ALL CRASHES (2010-2019 PROVISIONAL)1 shows a distribution of crash types by severities for the entire 28 crash data set while Table 2 shows only KAB crashes. Both tables only show the number of crashes, not the total number of injuries received per crash.

| COLL_TYPE | Fatal | A-Injury | B-Injury | C-injury | PDO | Total |
|---|---|---|---|---|---|---|
| **Angle** | 1 | 1 | 5 | 1 | 4 | 12 |
| **Turning** | 0 | 2 | 2 | 0 | 6 | 10 |
| **Animal** | 0 | 0 | 0 | 0 | 2 | 2 |
| **Rear End** | 0 | 0 | 0 | 0 | 2 | 2 |
| **Sideswipe Opposite Direction** | 0 | 0 | 1 | 0 | 0 | 1 |
| **Fixed Object** | 0 | 0 | 0 | 0 | 1 | 1 |
| **Total** | 1 | 3 | 8 | 1 | 15 | 28 |

*Table 1 - CRASH TYPE AND SEVERITY OF ALL CRASHES (2010-2019 PROVISIONAL)*

| COLL_TYPE | Fatal | A-Injury | B-Injury | Total | RSA KAB % |
|---|---|---|---|---|---|
| **Angle** | **1** | **1** | **5** | **7** | **58%** |
| **Turning** | **0** | **2** | **2** | **4** | **33%** |
| **Sideswipe Opposite Direction** | **0** | **0** | **1** | **1** | **8%** |
| **Animal** | **0** | **0** | **0** | **0** | **0%** |
| **Rear End** | **0** | **0** | **0** | **0** | **0%** |
| **Fixed Object** | **0** | **0** | **0** | **0** | **0%** |
| **Total** | **1** | **3** | **8** | **12** | **100%** |

*Table 2 - CRASH TYPE AND SEVERITY OF KAB CRASHES OF THE INTERSECTION (2010-2019 PROVISIONAL)*

**KAB Crashes:** Angle and turning crash types were the most prevalent KAB crashes, accounting for 58% and 33% of the KAB crashes, respectively.

**Fatalities:** During the nine-year completed period from 2010 -2018 and one-year provisional data period of 2019 (Preliminary) in which crashes were analyzed for the RSA intersection, there was 1 fatal crash resulting in 1 fatality. However, there was a more recent fatality crash that resulted in 2 fatalities which is not represented in the crash data tables. Both fatal crashes were angle crashes where both at fault vehicles were headed eastbound failing to stop at the intersection on the minor approach. The fatal crash in 2010 was due to an eastbound intoxicated person failing to stop or slow down at the stop sign and getting struck at an angle by

a southbound vehicle. The most current fatal crash occurring in 2019 was due to the eastbound vehicle that appeared to slow down but not stop proceeding into the intersection and colliding with a school bus. This crash resulted in the death of a child and the eastbound driver due to the angle impact.

**FIVE PERCENT Locations**: The RSA intersection was also screened to determine if it was listed as a FIVE PERCENT location from 2015 to 2017. The FHWA's Highway Safety Improvement Program's FIVE PERCENT Report is "an annual report to the Federal Highway Administration describing at least five percent of highway locations exhibiting the most pressing safety needs". The 2017 FIVE PERCENT report is the most recent report.

Reviews of the FIVE PERCENT reports from 2015 to 2017 indicate that the intersection was not listed as a FIVE PERCENT location, it was listed as a Safety Tier of Medium. However, a review of the segments approaching the intersection indicated that the north and south legs were listed as a Safety Tier of Critical or a FIVE PERCENT Location. The west and east legs were listed as minimal safety tier segments (see Figure 4).

Since the RSA intersection was not a FIVE PERCENT location, the 100% location list was reviewed to determine the Potential for Safety Improvement (PSI) value. The intersection has a 2.497 PSI value. A positive PSI value indicates that there is potential for improvement at the location and if the value is negative then there is no potential for improvement based on similar locations. The 2.497 PSI value indicates the intersection is performing slightly worse when compared to other intersections in the rural, minor leg stop control intersection peer group.

**Surface Conditions:** Figure 5 shows the distribution of the different road surface conditions reported at the crash. It shows that 78% of the crashes occurred with dry roadway conditions and 22% occurred when the roadway was either wet or ice-covered.

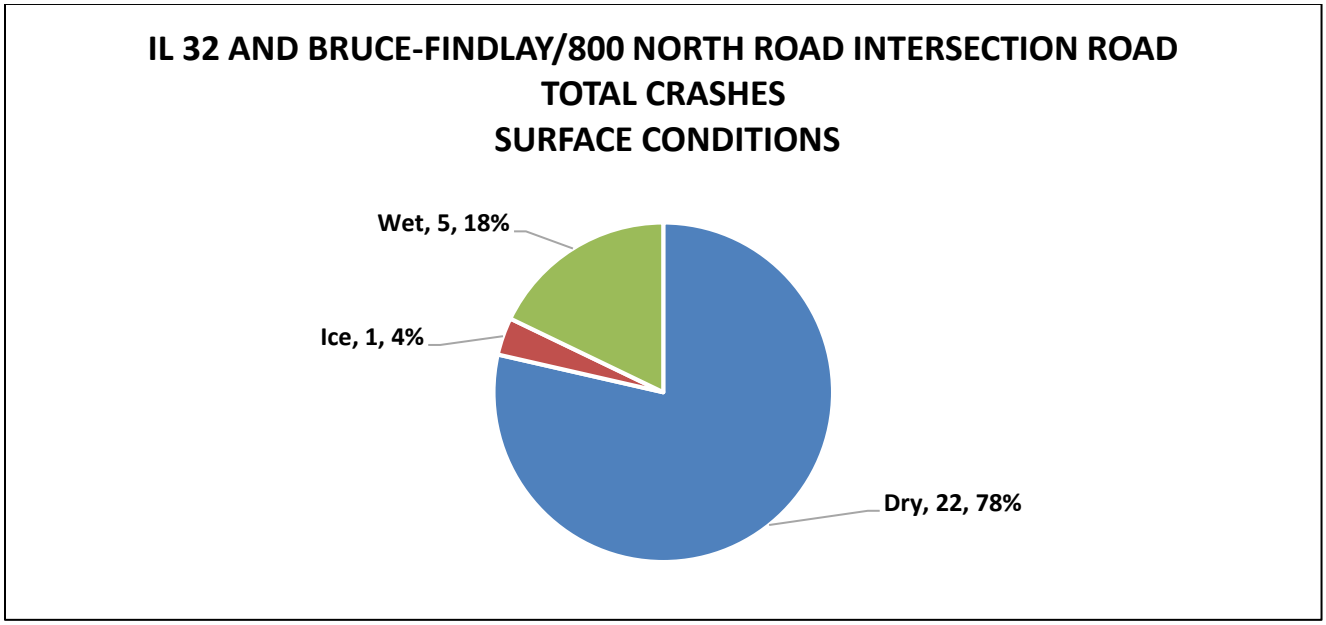


*Figure 5 - ROAD SURFACE CONDITIONS*

**Weather Conditions:** Figure 6 shows the weather conditions at the time of each crash. Clear weather conditions were reported in 82% of total crashes while 18% of the crashes occurred during a rainfall event.

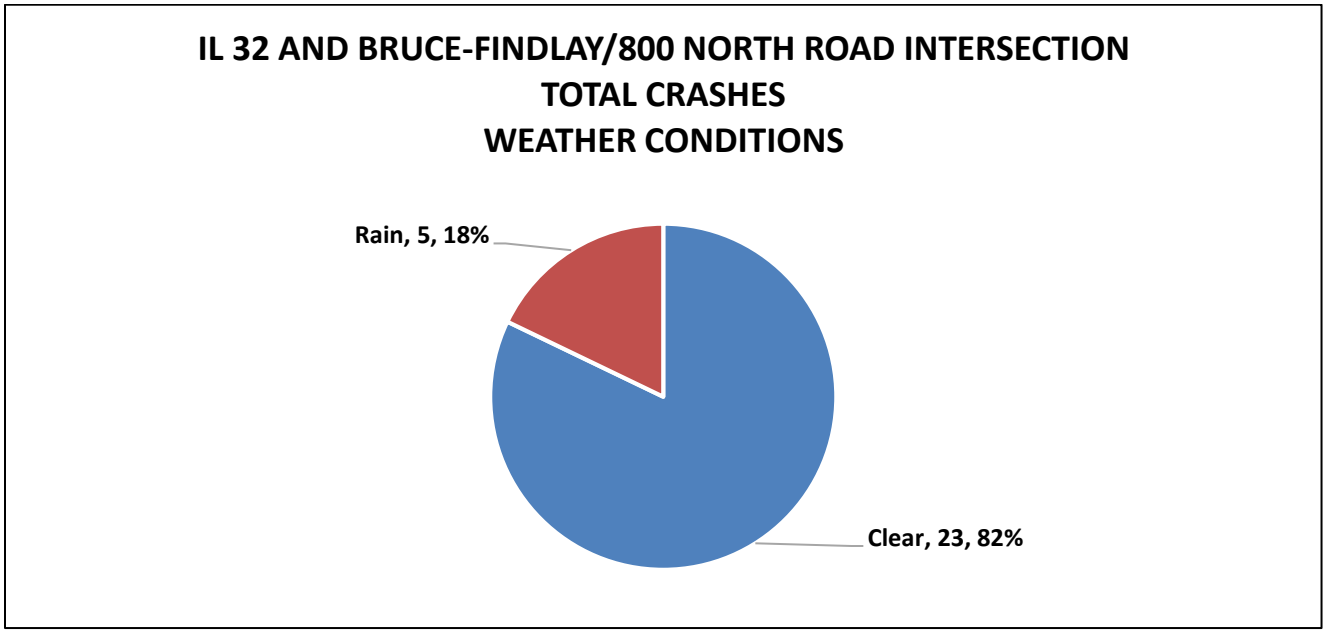


*Figure 6 - WEATHER CONDITIONS*

**Lighting Conditions:** 75% of crashes occurred during the day, and the remaining 25% occurred during dawn, dusk, or darkness. Figure 7 shows the lighting conditions at the time of each crash.

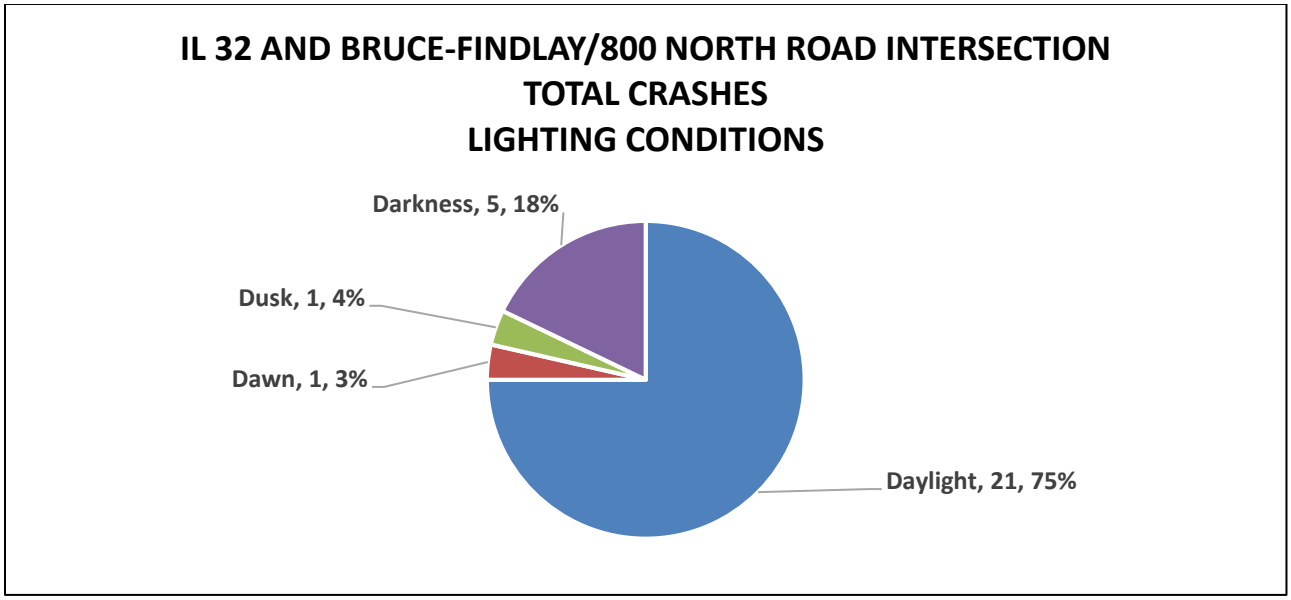


*Figure 7 - LIGHTING CONDITIONS*

**Time of Day:** According to Figure 8, crashes are most prevalent from 9 AM to 10 AM and during the 4 PM and 5 PM hours with a small peak during 2 PM.

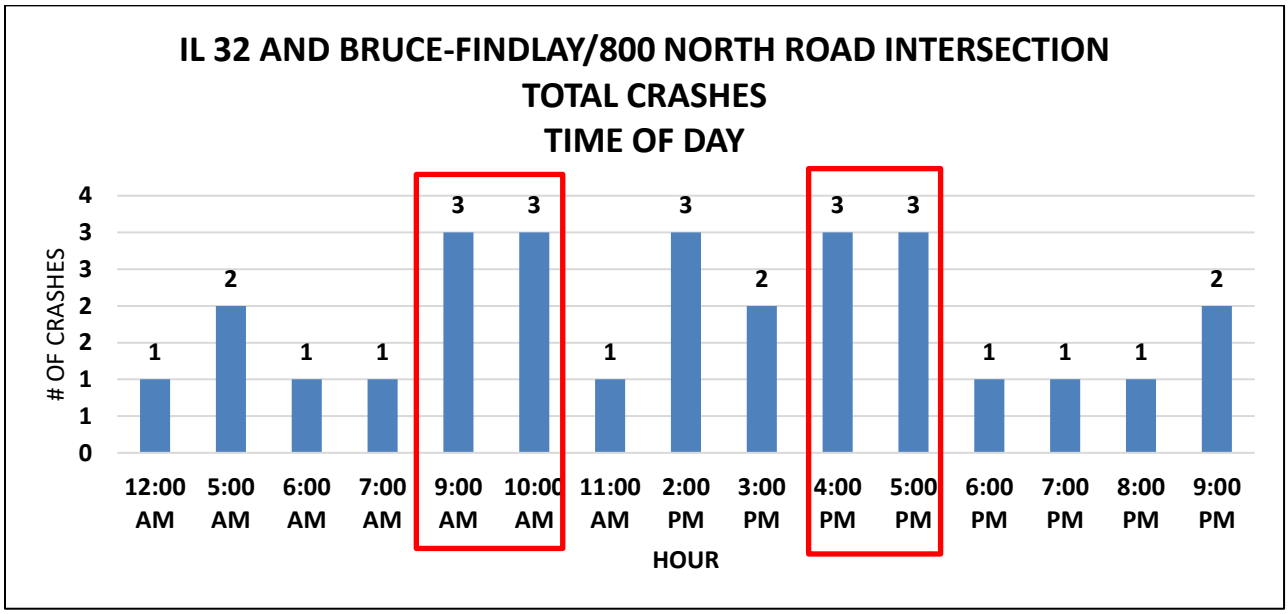


*Figure 8 - CRASHES BY TIME OF DAY*

**Day of Week:** As shown in Figure 9, Friday, Saturday and Sunday account for biggest increases in crashes compared to the rest of the week. Roughly 64.3% of the RSA's KAB crashes occurred on the weekend.

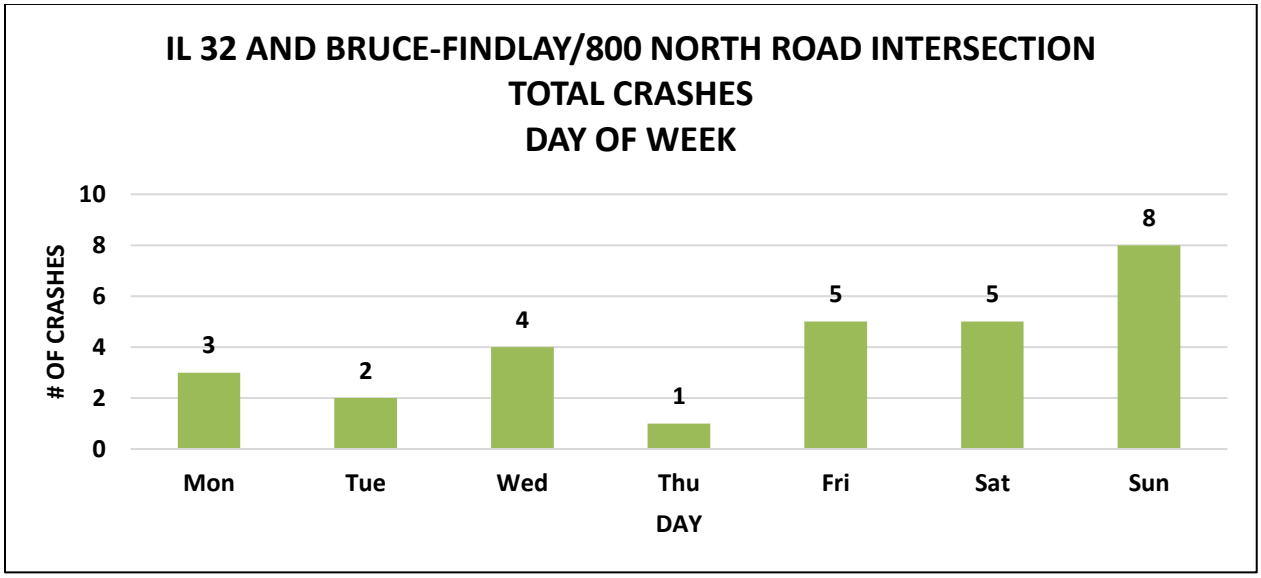


*Figure 9 - CRASHES BY DAY OF THE WEEK*

**Month:** Figure 10 shows the distribution of crashes by month. There was a spike in crashes during July. This may be due to the increase in road users traveling to the nearby Lake Shelbyville. The other months are evenly distributed with the months of February, May and November being slightly higher in crashes.

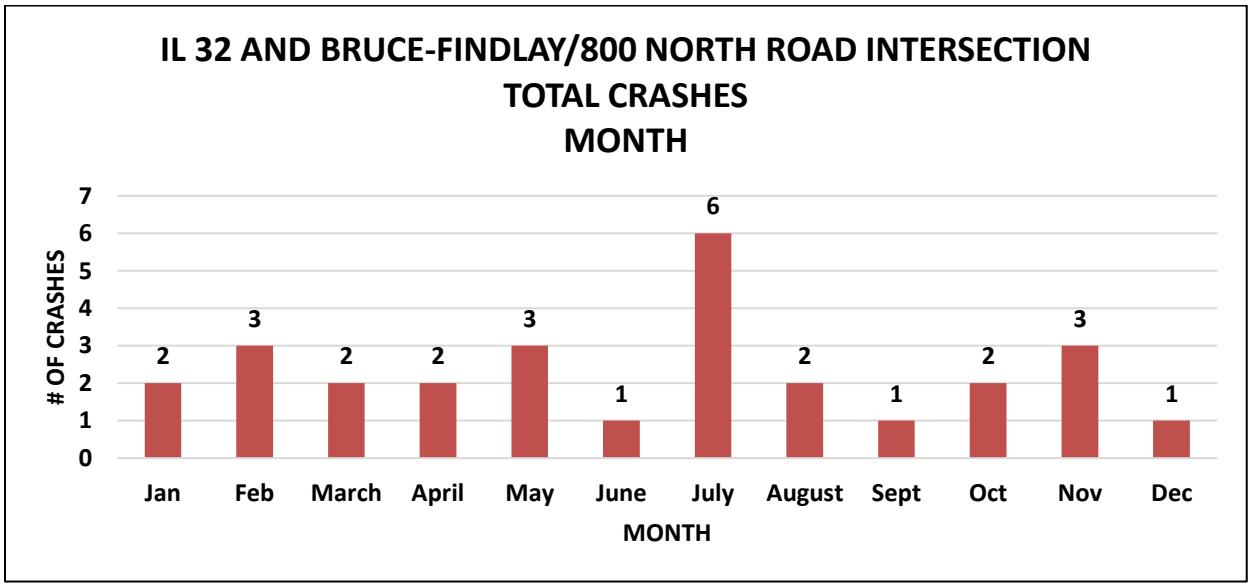


*Figure 10 - CRASHES BY MONTH*

**Year of all crashes:** A breakdown of the crashes per year are shown in Figure 11. As shown, the number of crashes tend to fluctuate. However, there was a drop in 2014, matching statewide trends.

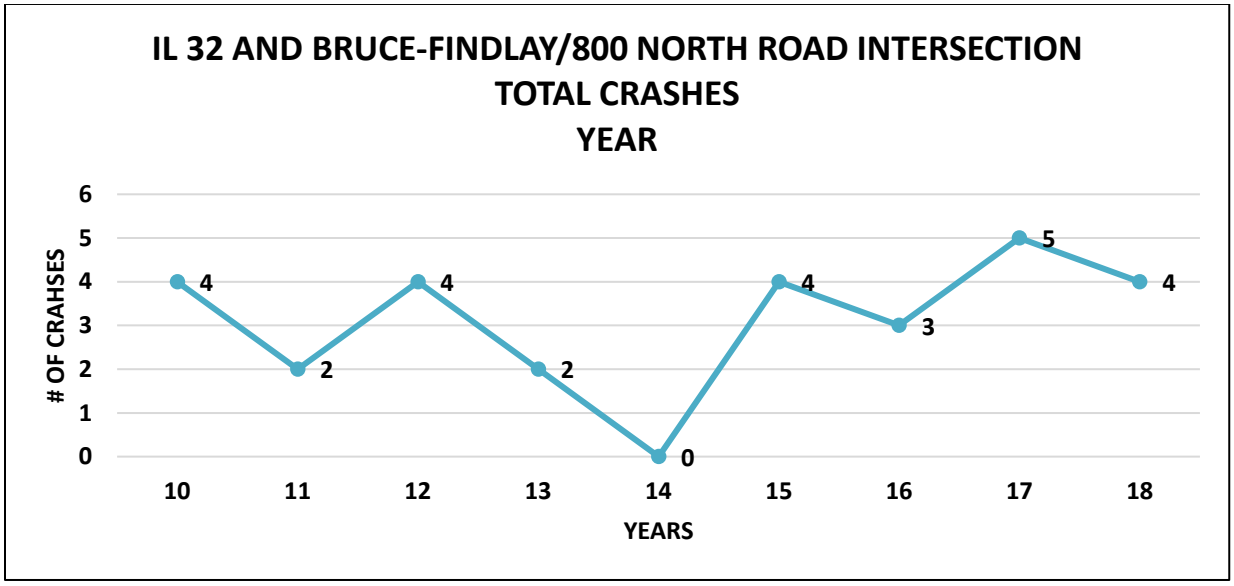


*Figure 11 - CRASHES PER YEAR*

**Crash Types:** The crash types are shown in Figure 9. The predominant crash type was angle and turning accounting for 78.5% of the total crashes. The majority were vehicles traveling eastbound crashing into southbound vehicles as they were turning from the minor leg onto IL 32.

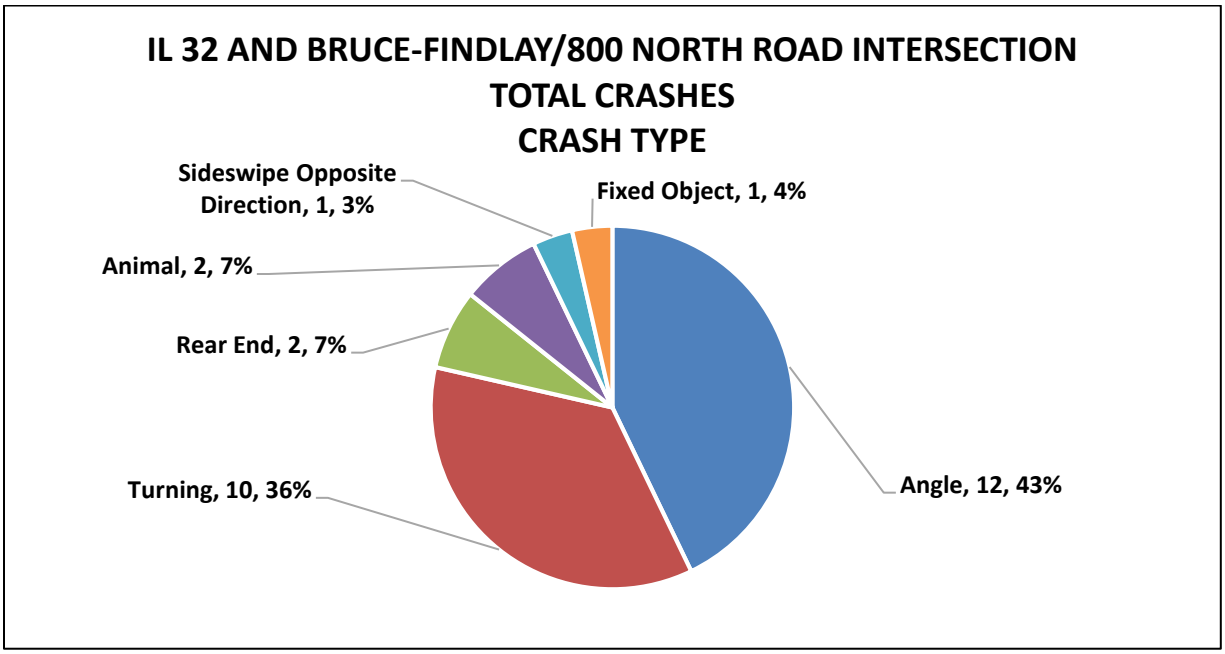


*Figure 12 - CRASH TYPES*

## SUMMARY

Analysis of the 2010 to 2019 (Provisional) crashes for the intersection of IL 32 at Bruce-Findlay/800 North Road indicates angle crashes and turning crashes are the overrepresented crash types. In addition to these types of crashes, another overrepresentation of the RSA corridor crashes involved the time of day which included both midmorning (between the hours of 9:00 am – 10:00 am) and early evening (between the hours of 4:00 pm – 5:00 pm). Weather, roadway surface and lighting conditions did not show any trends that appeared to influence the crash occurrences.

Recommendations from the RSA team to reduce the frequency of angle, turning, and sideswipe same direction crashes, along with other proposals are provided in the following sections. A detailed table of all the crashes for the intersection is also included in Appendix A.

## FIELD OBSERVATIONS

After completing the RSA kick-off meeting and reviewing crash data, the RSA team performed a site review of the intersection to investigate the various aspects of safety performance. Observations of the intersection elements that may be contributing factors to crashes were noted and compiled. Suggested countermeasures were then developed to address issues identified from the crash history and observations noted. The following section discusses these observations and suggested countermeasures. Each observation includes a summary with a description of any potential safety issues, pictures when possible, and suggestions to mitigate the identified issues. Both substantive concerns based on crash history, and nominal concerns based on common industry practice, were observed.

Suggested countermeasures are grouped within each section according to their perceived magnitude on the safety performance of the corridor, coupled with the cost to implement the proposed countermeasure. Groupings include short-term, intermediate, and long-term. A short-term countermeasure is one that may have a smaller safety benefit than intermediate or long-term countermeasures but likely costs less than the longer-term countermeasures and often can be implemented in a timely manner. Intermediate and long-term countermeasures will typically have a progressively larger impact on the magnitude of the safety performance; the trade-off with this added benefit is typically increased cost and increased time to implement.

The following observations and suggested countermeasures are for site specific intersection locations. In instances where previously discussed corridor-wide countermeasures apply to these specific locations, reference to the previously suggested recommendations will be made prior to the short-term/intermediate/long-term suggested countermeasures.

## INTERSECTION CONTROL

| *Expected Frequency* | *Crash Type* | *Risk Severity* | *Risk Level* | **F** |
|---|---|---|---|---|
| Frequent | Angle and Turning | Severe | High | |

The RSA team discussed alternative intersection control types to the existing configuration (Figure 4). An Intersection Conflict Warning System (ICWS) was discussed. An ICWS reduces right angle crashes at rural intersection as its primary goal of the system and consists of three parts: static signing, detection, and dynamic elements. However, it was not recommended for this intersection as recent research indicates they are not effective (A study of the Rural Intersection Conflict Warning System, MnDOT, 09/13/2019). The RSA team discussed signalizing the intersection as an alternative solution but determined that federal warrants for traffic signals contained in the Manual on Uniform Traffic Control Devices (MUTCD) were not met. Therefore, this alternative was not recommended. Due to most of the crash types being angle and turning as well as looking at traffic volumes for all approaches of the intersection, the RSA team recommended two alternative intersection control designs, 4-way stop control and a roundabout design. Figure 13 shows an example of a roundabout design which can be found here: https://safety.fhwa.dot.gov/intersection/innovative/roundabouts/

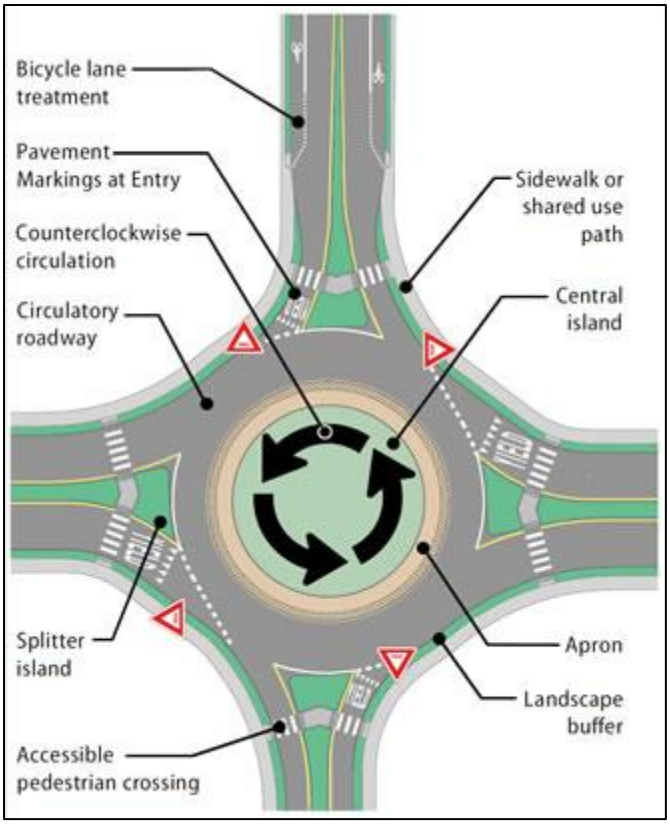


*Figure 13 - ROUNDABOUT EXAMPLE*

The other recommended alternative intersection design is converting the intersection into a four-way stop-controlled intersection. As noted later under Education, the RSA team noticed a pattern in the crash reports where drivers on Bruce-Findlay/800 North Road stopped but continued into the intersection believing cross traffic on IL 32 were required to stop as well. Only twenty miles northwest of the intersection, is a four-way stop-controlled intersection at IL 121 and IL 128 with only one minor injury crash and zero fatalities in the past five years. The northbound approach is shown below in Figure 14.


*Figure 14 - NORTHBOUND IL 128 AT FOUR-WAY STOP-CONTROLLED INTERSECTION WITH IL 121, NORTHWEST OF RSA LOCATION*

**RECOMMENDATIONS:**

| | |
|---|---|
| Short-Term: | None |
| Intermediate: | 4-way stop control |
| Long-Term: | Roundabout |

## GEOMETRICS

| *Expected Frequency* | *Crash Type* | *Risk Severity* | *Risk Level* | **F** |
|---|---|---|---|---|
| Frequent | Angle and Turning | Severe | High | |

As noted later in Pavement Markings, the RSA team observed that the right turn lane on both east and west approaches had a steep right turn angle approach causing motorist to have to excessively turn their heads to see if oncoming traffic is approaching. To improve the line of sight for the motorist, the RSA team recommends a re-design of the right turn lanes. Figure 15 illustrates the existing traditional right turn design. Figure 16 provides depictions of the existing design along with two modified designs to improve the line of sight angle (https://ict.illinois.edu/2016/10/17/modified-right%e2%80%90turn-lane-design-improves-road-safety-and-operations/).


*Figure 15 - ON EAST LEG LOOKING NORTHBOUND FROM RIGHT TURN LANE*

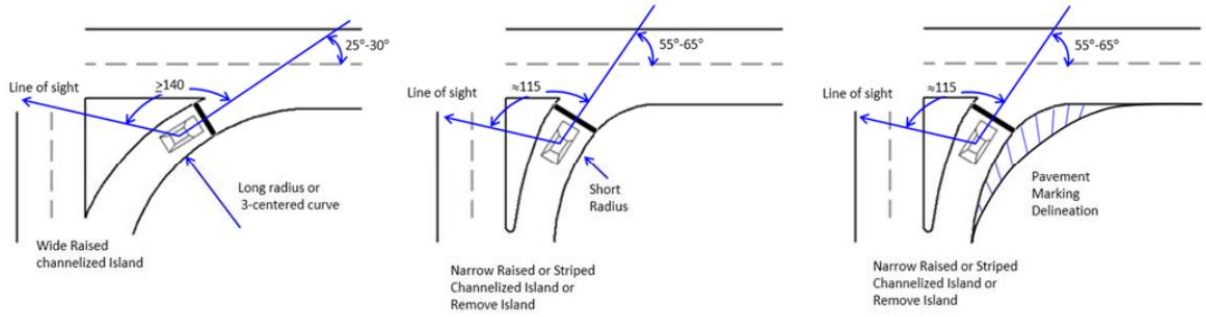


*Figure 16 - EXAMPLES OF RIGHT TURN ANGLE DESIGNS*

The RSA also discussed splitter islands to be placed on IL 32 as you approach the intersection. This recommendation would be only if the owners were to convert it to a 4-way stop controlled intersection.

**RECOMMENDATIONS:**

| | |
|---|---|
| Short-Term: | None |
| Intermediate: | Redesign of the right turn lanes |
| Long-Term: | Splitter medians on IL 32 |

## EDUCATION

| *Expected Frequency* | *Crash Type* | *Risk Severity* | *Risk Level* | **C** |
|---|---|---|---|---|
| Infrequent | All | High | High | |

The RSA team believes that education is needed for the traveling public. While reviewing the crash reports it was noted that most of the crashes were local people who lived in or around the area and are assumed to be familiar with this intersection. It was also noted that many people believe the intersection was a four-way stop-controlled intersection instead of two-way stop-controlled. This was also observed in the field review where vehicles stopped and proceeded on while vehicles approached the intersection on the main line. Examples of possible education strategies are shown in Figure 17, but it is left to the owners to determine what kind of education they would do for the public. The link for the example below can be found here: https://safety.fhwa.dot.gov/intersection/conventional/signalized/FHWA-SA-15-085_Strategies_2.pdf.


*Figure 17 - SAMPLE OF EDUCATIONAL STRATEGIES*

**RECOMMENDATIONS:**

| | |
|---|---|
| Short-Term: | Consider educating public on minor stop control intersections similar to the IL 32 at Bruce-Findlay/800 North Road |
| Intermediate: | None |
| Long-Term: | None |

## ENFORCEMENT

| *Expected Frequency* | *Crash Type* | *Risk Severity* | *Risk Level* | **C** |
|---|---|---|---|---|
| Infrequent | All | High | High | |

The RSA team recommended an enforcement campaign at this intersection focusing on peak hours to let the public know that enforcement is present. The enforcement could either be local law enforcement and/or Illinois State Police.

*Figure 18 - EXAMPLE OF ENFORCEMENT*

**RECOMMENDATIONS:**

Short-Term: Increase patrols during peak hours as needed

Intermediate: None

Long-Term: None

## PAVEMENT MARKINGS

| *Expected Frequency* | *Crash Type* | *Risk Severity* | *Risk Level* | **C** |
|---|---|---|---|---|
| Infrequent | All | High | High | |

During the field visit the RSA team observed the pavement markings to be deteriorating or not visible as shown in Figure 19. On the West side of the intersection the pavement stop bar is not present for through traffic. The RSA team also noticed that the transverse rumble strips in the westbound lane on Bruce-Findlay 800 North Road approaching the intersection were worn and not as effective to warn the drivers of the intersection. Figure 20 illustrates what is remaining of the transverse rumble strips.

It was also observed by the RSA team that the right turn lane angles drivers at a steep degree where drivers must turn their heads a lot further to see if oncoming traffic is approaching. In order to address the driver's visual angle, the RSA team recommends retrofitting pavement markings to square up the right turn.


*Figure 19 - EXAMPLE OF DETERIORATING PAVEMENT MARKINGS AND NO STOP BAR PRESENT*

*Figure 20 - DETERIORATED TRANSVERSE RUMBLE STRIPS*

**RECOMMENDATIONS:**

| | |
|---|---|
| Short-Term: | Add stop bar on west approach, add stop ahead pavement marking, stop marking at stop bar, square up right turn markings on east/west, re-cut transverse rumble strips |
| Intermediate: | None |
| Long-Term: | None |

## SIGNAGE

| *Expected Frequency* | *Crash Type* | *Risk Severity* | *Risk Level* | C |
|---|---|---|---|---|
| Infrequent | All | High | High | |

During the field visit, the RSA team observed several low-cost improvements already implemented by the owner such as: doubled up stop signs, advance warning signs, and “cross traffic does not stop” plaques below stop signs. There were some minor changes that the RSA team recommends supplementing the current signage in place. The stop sign assemblies are not consistent as the driver approaches the intersection as shown in Figure 21. The advance warning signs in Figure 22 are great countermeasures to alert drivers that they are approaching a stop-controlled intersection.


*Figure 21 - SIGNAGE ON BRUCE ROAD LOOKING WESTBOUND*

*Figure 22 - ADVANCE WARNING SIGNS APPROACHING IL 32*

The RSA team looked at the guide signs on IL 32 to see if they would be obstructing sight distance for vehicles stopping on Bruce-Findlay North Road looking north. As shown in Figure 23 the guide signs do not appear to create a visibility issue, but some minor recommendations were provided to enhance the visibility of oncoming traffic.

*Figure 23 - LOOKING NORTH AT GUIDE SIGNS FROM FINDLAY ROAD AND IL 32, ON FINDLAY/ 800 NORTH ROAD*

**RECOMMENDATIONS:**

| | |
|---|---|
| Short-Term: | Simplify and standardize sign assemblies, add yellow beacon to advance warning signs, move guide signs to other side of ditch and reevaluate spacing, declutter business signs |
| Intermediate: | Remove blinking LED stop signs and install standard red flashing beacons on stop signs |
| Long-Term: | None |

## SUMMARY OF SUGGESTIONS

***Short Term/Lower Cost***

- Consider educating public on minor stop control intersections similar to the IL 32 at Bruce-Findlay/800 North Road intersection
- Enforcement during peak hours as needed
- Add stop bar on west approach
- Add “STOP AHEAD” pavement markings
- Add “STOP” marking at stop bar
- Square up right turn markings on east/west approach
- Recut transverse rumble strips
- Simplify and standardize sign assemblies
- Add Yellow beacons to advance warning signs
- Move guide signs to other side of ditch and re-evaluate spacing
- Declutter business signs

***Intermediate***

- Remove flashing LED stop signs and replace with red flashing beacons on stop signs
- Convert to a four-way stop-controlled intersection
    - If convert to a four-way stop-controlled intersection, reconfigure splitter median on IL 32, consider span wire flashing beacons, and dual stop signs for each approach
- Redesign of the right turn lanes on east and west approach only

***Long Term/Higher Cost***

- Convert to a roundabout

## APPENDIX A: TOTAL CRASH DATA

| CASE_ID | YEAR | MONTH | DAY | HOUR | DAY_O_WEEK | NUM_VEH | INJURIES | COLL_TYPE | WEATHER | LIGHTING | SURF_COND | TRAF_CNTRL | MILE | DRIVER_1 | VEH1_TYPE | VEH1_DIR | VEH1_MANUV | VEH1_EVNT1 | VEH1_LOC1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201801437132 | 18 | 04 | 29 | 16 | Sun | 2 | 1 | Turning | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Emotional | Pickup | Northeast | Turning Left | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201801456686 | 18 | 07 | 23 | 06 | Mon | 1 | 0 | Animal | Clear | Daylight | Dry | No Controls | 30.02 | Normal | Passenger | North | Straight Ahead | Other Animal | On Pavement (Roadway) |
| 201801462020 | 18 | 08 | 17 | 14 | Fri | 2 | 1 | Angle | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Normal | Passenger | East | Starting In Traffic | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201801472713 | 18 | 09 | 28 | 18 | Fri | 2 | 2 | Angle | Clear | Dawn | Dry | Stop Sign/Flasher | 30.07 | Normal | Van/Mini-Van | East | Straight Ahead | Motor Vehicle In Traffic | Intersection |
| 201701061834 | 17 | 02 | 10 | 15 | Fri | 2 | 1 | Angle | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Alcohol Impaired | Van/Mini-Van | East | Starting In Traffic | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201701180189 | 17 | 07 | 17 | 20 | Mon | 2 | 2 | Turning | Clear | Dusk | Dry | Stop Sign/Flasher | 0.00 | Removed By EMS | Passenger | East | Turning Left | Motor Vehicle In Traffic | Intersection |
| 201701365752 | 17 | 01 | 11 | 07 | Wed | 3 | 2 | Turning | Clear | Daylight | Ice | Stop Sign/Flasher | 30.07 | Other/Unknown | Passenger | North | Turning Left | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201701445793 | 17 | 07 | 21 | 16 | Fri | 2 | 0 | Turning | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Normal | Pickup | West | Straight Ahead | Motor Vehicle In Traffic | Intersection |
| 201701472644 | 17 | 10 | 25 | 14 | Wed | 2 | 0 | Turning | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Normal | Pickup | South | Turning Left | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201601412725 | 16 | 06 | 06 | 15 | Mon | 2 | 2 | Turning | Clear | Daylight | Dry | No Controls | 30.07 | Normal | Passenger | Southeast | Turning Left | Motor Vehicle In Traffic | Intersection |
| 201601486356 | 16 | 11 | 15 | 17 | Tue | 2 | 0 | Turning | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Normal | Passenger | East | Turning Left | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201601487396 | 16 | 11 | 16 | 05 | Wed | 2 | 0 | Turning | Clear | Darkness | Dry | Stop Sign/Flasher | 30.07 | Had Been Drinking | Passenger | Southwest | Turning Right | Motor Vehicle In Traffic | Intersection |
| 201501176274 | 15 | 01 | 08 | 09 | Thu | 2 | 0 | Angle | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Normal | SUV | West | Straight Ahead | Motor Vehicle In Traffic | Intersection |
| 201501315521 | 15 | 03 | 21 | 11 | Sat | 3 | 1 | Sideswipe Opposite Direction | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Normal | Pickup | West | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201501319257 | 15 | 04 | 25 | 21 | Sat | 2 | 3 | Angle | Rain | Darkness | Wet | Stop Sign/Flasher | 30.07 | Normal | Van/Mini-Van | East | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201501460971 | 15 | 08 | 15 | 17 | Sat | 2 | 0 | Turning | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Normal | Passenger | East | Straight Ahead | Motor Vehicle In Traffic | Intersection |
| 201301126981 | 13 | 07 | 27 | 09 | Sat | 2 | 0 | Rear End | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Other/Unknown | Truck Single Unit | West | Backing | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201301221012 | 13 | 05 | 26 | 10 | Sun | 1 | 0 | Fixed Object | Rain | Daylight | Wet | No Controls | 30.07 | Normal | SUV | North | Avoiding Vehicle/Objects | Ran Off Roadway | Off Pavement - Right |
| 201201086786 | 12 | 02 | 22 | 16 | Wed | 2 | 0 | Rear End | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Other/Unknown | Van/Mini-Van | East | Backing | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201201121669 | 12 | 03 | 20 | 05 | Tue | 2 | 0 | Angle | Clear | Darkness | Dry | Stop Sign/Flasher | 30.07 | Normal | SUV | West | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201201282630 | 12 | 07 | 29 | 14 | Sun | 2 | 0 | Angle | Clear | Daylight | Dry | Stop Sign/Flasher | 30.07 | Normal | Pickup | East | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201201396822 | 12 | 11 | 03 | 10 | Sat | 2 | 0 | Angle | Rain | Daylight | Wet | Stop Sign/Flasher | 29.95 | Normal | Pickup | East | Slow/Stop In Traffic | Motor Vehicle In Traffic | Other |
| 201101070424 | 11 | 02 | 20 | 00 | Sun | 1 | 0 | Animal | Rain | Darkness | Wet | No Controls | 0.00 | Normal | Passenger | West | Straight Ahead | Deer | On Pavement (Roadway) |
| 201101374576 | 11 | 10 | 23 | 09 | Sun | 2 | 1 | Angle | Rain | Daylight | Wet | Stop Sign/Flasher | 30.07 | Normal | Passenger | East | Straight Ahead | Motor Vehicle In Traffic | Off Pavement - Right |
| 201001168572 | 10 | 05 | 09 | 17 | Sun | 3 | 1 | Angle | Clear | Daylight | Dry | Stop Sign/Flasher | 29.95 | Normal | Passenger | West | Starting In Traffic | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201001182688 | 10 | 05 | 30 | 21 | Sun | 2 | 0 | Turning | Clear | Darkness | Dry | No Controls | 29.95 | Normal | Passenger | East | Turning Left | Motor Vehicle In Traffic | On Pavement (Roadway) |
| 201001224576 | 10 | 07 | 25 | 19 | Sun | 2 | 1 | Angle | Clear | Daylight | Dry | Stop Sign/Flasher | 29.95 | Normal | Pickup | East | Straight Ahead | Motor Vehicle In Traffic | Intersection |
| 201001458682 | 10 | 12 | 31 | 10 | Fri | 2 | 2 | Angle | Clear | Daylight | Dry | Stop Sign/Flasher | 29.95 | Normal | Passenger | West | Straight Ahead | Motor Vehicle In Traffic | Intersection |

| VEH1_EVNT2 | VEH1_LOC2 | DRIVER_2 | VEH2_TYPE | VEH2_DIR | VEH2_MANUV | VEH2_EVNT1 | VEH2_LOC1 | REC_TYPE | XCOORD | YCOORD | INTERSEC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Emotional | Passenger | West | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | B-Injury | 2736146.93600 | 1043156.74767 | Y |
| | | | | | | | | PDO | 2736146.20089 | 1042891.93029 | N |
| | | Normal | Passenger | South | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | B-Injury | 2736146.67255 | 1043156.74597 | Y |
| | | Normal | Pickup | North | Straight Ahead | Motor Vehicle In Traffic | Intersection | B-Injury | 2736146.99945 | 1043156.74808 | Y |
| | | Normal | Bus Over 15 Passengers | North | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | B-Injury | 2736146.76867 | 1043156.74659 | Y |
| | | Normal | Pickup | South | Straight Ahead | Motor Vehicle In Traffic | Intersection | A-Injury | 2736116.52038 | 1043123.41018 | Y |
| | | Normal | Pickup | South | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | A-Injury | 2736146.96799 | 1043156.74788 | Y |
| | | Normal | Van/Mini-Van | East | Turning Left | Motor Vehicle In Traffic | Intersection | PDO | 2736146.99945 | 1043156.74808 | Y |
| | | Normal | Passenger | West | Slow/Stop In Traffic | Motor Vehicle In Traffic | On Pavement (Roadway) | PDO | 2736146.80331 | 1043156.74681 | Y |
| | | Normal | SUV | North | Straight Ahead | Motor Vehicle In Traffic | Intersection | B-Injury | 2736147.42599 | 1043156.75147 | Y |
| | | Normal | Pickup | North | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | PDO | 2736146.99945 | 1043156.74808 | Y |
| | | Normal | SUV | East | Slow/Stop In Traffic | Motor Vehicle In Traffic | Intersection | PDO | 2736146.99945 | 1043156.74808 | N |
| | | Normal | Passenger | South | Straight Ahead | Motor Vehicle In Traffic | Intersection | PDO | 2736147.94775 | 1043156.48012 | Y |
| | | Normal | Pickup | East | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | B-Injury | 2736146.99945 | 1043156.74808 | Y |
| | | Removed By EMS | SUV | South | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | A-Injury | 2736146.79541 | 1043156.74676 | Y |
| | | Normal | Passenger | Southeast | Turning Left | Motor Vehicle In Traffic | Intersection | PDO | 2736146.82656 | 1043156.74696 | Y |
| | | Normal | Pickup | West | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | PDO | 2736146.98594 | 1043157.20217 | Y |
| Other Pole or Post | Off Pavement - Right | | | | | | | PDO | 2736146.96268 | 1043157.98430 | Y |
| | | Normal | Passenger | East | Slow/Stop In Traffic | Motor Vehicle In Traffic | On Pavement (Roadway) | PDO | 2736146.99945 | 1043156.74808 | Y |
| | | Normal | Passenger | North | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | PDO | 2736146.99945 | 1043156.74808 | Y |
| | | Normal | Pickup | South | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | PDO | 2736146.95216 | 1043158.33779 | Y |
| | | Normal | Passenger | South | Straight Ahead | Motor Vehicle In Traffic | Other | PDO | 2736146.99945 | 1043156.74808 | Y |
| | | | | | | | | PDO | 2736072.20982 | 1043156.44605 | N |
| | | Normal | SUV | North | Skidding/Control Loss | Motor Vehicle In Traffic | Off Pavement - Right | B-Injury | 2736147.00011 | 1043157.00005 | Y |
| Traffic Signal | On Pavement (Roadway) | Normal | SUV | South | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | B-Injury | 2736147.29723 | 1043157.00235 | Y |
| | | Normal | Passenger | South | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | PDO | 2736147.00011 | 1043157.00005 | Y |
| Traffic Signal | On Pavement (Roadway) | Normal | SUV | South | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | B-Injury | 2736147.29723 | 1043157.00235 | Y |
| | | Normal | Passenger | South | Straight Ahead | Motor Vehicle In Traffic | On Pavement (Roadway) | PDO | 2736147.00011 | 1043157.00005 | Y |
| Ran Off Roadway | Off Pavement - Left | Normal | Passenger | North | Straight Ahead | Motor Vehicle In Traffic | Intersection | Fatal | 2736147.00011 | 1043157.00005 | Y |
| Ran Off Roadway | Off Pavement - Right | Normal | SUV | North | Straight Ahead | Motor Vehicle In Traffic | Intersection | C-Injury | 2736146.99596 | 1043156.52319 | Y |