Technical Memo C – Crash Data Analysis

This ***Crash Data Analysis*** memo provides in-depth background and additional analysis information that was used to develop the Central Ohio Regional Planning Organization (CORPO) Safety Action Plan and its priorities. Below are the key components included in this memo:

- **Crash Data Details** – Background information regarding the source of the crash data utilized in developing the plan, including how it is collected and processed as well as its key limitations.
- **Crash Type Definitions** – Detailed explanations of each of the crash types included in the OH-1 Crash Report form and in the data analysis behind the *Current Conditions* and *Regional Safety Priorities* chapters of this plan.
- **Roadway Functional Classification Definitions** – Descriptions of the main categories used to categorize roadway types according to their functions in the roadway network.
- **Emphasis Crash Types** – Following the initial crash data analysis, certain crash types were identified as particularly severe. This section details supplemental analyses that were conducted to identify where these crash types occurred in terms of roadway types and counties along with the proportions of each in terms of maintenance authorities.

Memo Contents

1.1 Crash Data Details

Crash data was integral to the development of the CORPO Safety Action Plan. All crash data used in developing the plan were sourced from the Ohio Department of Transportation (ODOT). ODOT maintains an online database called the Transportation Information Mapping System (TIMS), which includes the GIS Crash Analysis Tool (GCAT) that was the source for the crash data used in this plan.

When crashes occur, responding law enforcement officers use the OH-1 Crash Report to collect and report the locations and details of crashes. Officers then upload the information reported in the OH-1 to the Ohio Department of Public Safety (ODPS). ODPS then sends these crash data to ODOT on a weekly basis. ODOT reviews and revises these crash data every two weeks, correcting spelling errors and filling in missing information. At the end of March, ODOT receives the final batch of crash data for the previous year from ODPS and then conducts a more comprehensive data cleaning process for that entire year of crash data. This includes accurately geolocating misplaced crashes and other more detailed data cleaning operations. To use only crash data that went through this robust cleaning process, and to use multiple years of crash data to average out any single-year anomalies, the most complete and processed previous five years of crash data from the years 2018 to 2022 was used in the development of this plan.

However, there are still notable limitations of reported crash data. This data only includes *reported* crashes, and not all crashes that occurred during the period studied. Non-motorized crashes, or crashes involving pedestrians or bicyclists, are particularly underreported (Smart Growth America). Additionally, the geolocations or reported locations of crashes are not always accurately mapped to the location where the crash occurred. While ODOT's annual cleaning process may correct some of these instances, there may still be some crashes included in the data for this plan that were inaccurately located during the reporting process. Finally, in addition to crash underreporting and crash reporting errors, crash data only provides historical information, and thus only tells part of the story regarding transportation safety. Importantly, crash data alone cannot sufficiently enable forecasting of future crashes, particularly in terms of the locations of future severe crashes. Instead, an understanding of the roadway factors and types most associated with severe crashes is needed to develop a systemic and proactive approach to safety improvements, as described in the *Current Conditions* and *Regional Safety Priorities* chapters of this Safety Action Plan.

1.2 Crash Type Definitions

Table C.1 on the following page lists descriptions for each crash type identified in the crash data used throughout the CORPO Safety Action Plan. These descriptions were created based on definitions provided by the NCDOT Traffic Safety Unit and revised to fit criteria used by ODOT and ODPS for Ohio crash reporting.

Table C.1 Crash Type Definitions

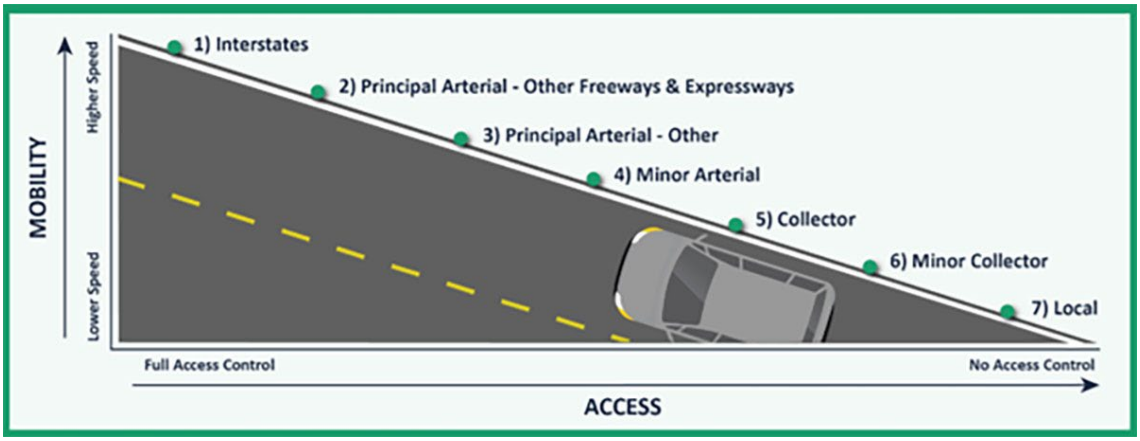
Crash Type	Crash Type Definition
Angle	Any collision resulting in the involved vehicles hitting at or near right angles, with the front of one vehicle striking the side of the other vehicle. Most often occurs at an intersection when two vehicles are going straight on intersecting roads and neither vehicle is turning.
Animal	Any collision involving a vehicle and an animal, herded or unattended.
Backing	Any collision in which one vehicle backs into another, generally stopped or parked vehicle.
Fixed Object	Any collision involving a motor vehicle in transport and any object, which is fixed (not movable).
Head On	Any collision of motor vehicles moving in opposite directions in which initial contact is on the fronts of both vehicles.
Left Turn	Any collision of motor vehicles in which one or both vehicles were turning left.
Other Non-Collision	Any other event involving only the motor vehicle in transport, that is of a non-collision nature.
Other Non-Vehicle	Any collision in which there is only one unit involved in the crash and it is designated as a non-vehicle unit type.
Other Object	Any collision involving a motor vehicle in transport and any other object which is movable or moving, but not fixed.
Overturning	Any event in which a motor vehicle in transport overturns for any reason.
Parked Vehicle	Any collision involving a motor vehicle in transport and a motor vehicle *not* in transport.
Pedalcycles	Any collision involving a vehicle and a pedalcyclist, including devices known as bicycles, pedalcycles, etc.
Pedestrian	Any collision involving a motor vehicle in transport and a pedestrian.
Rear End	Any collision involving one vehicle striking the rear of another vehicle.
Right Turn	Any collision of motor vehicles in which one or both vehicles were turning right.
Sideswipe - Meeting	Any collision of motor vehicles, traveling in *opposite* directions, in which contact usually results from attempting to pass too closely, skidding, or other side-to-side initial contact.
Sideswipe - Passing	Any collision of motor vehicles, traveling in the *same* direction, in which contact usually results from attempting to pass too closely, skidding, or other side-to-side initial contact.
Train	Any collision involving a motor vehicle in transport and a railway train or railway vehicle.
Unknown	Any collision in which the crash type has not been determined.

1.3 Roadway Functional Classifications

"Functional Class is the grouping of roads, streets, and highways in a hierarchy based on the type of highway service they provide" (ODOT). Functional classifications are used to determine federal transportation funding eligibility, establish design criteria, measure route importance, and approximate roadway characteristics and user functions (which is the primary use for this plan). As shown in **Figure C.1** below, functional classification is largely a function of speed and access control.

FUNCTIONAL CLASSIFICATION AS A BALANCE OF SPEED AND ACCESS CONTROL

Figure C.1 Ohio Roadway Functional Classifications



Source: ODOT, Ohio Roadway Functional Class

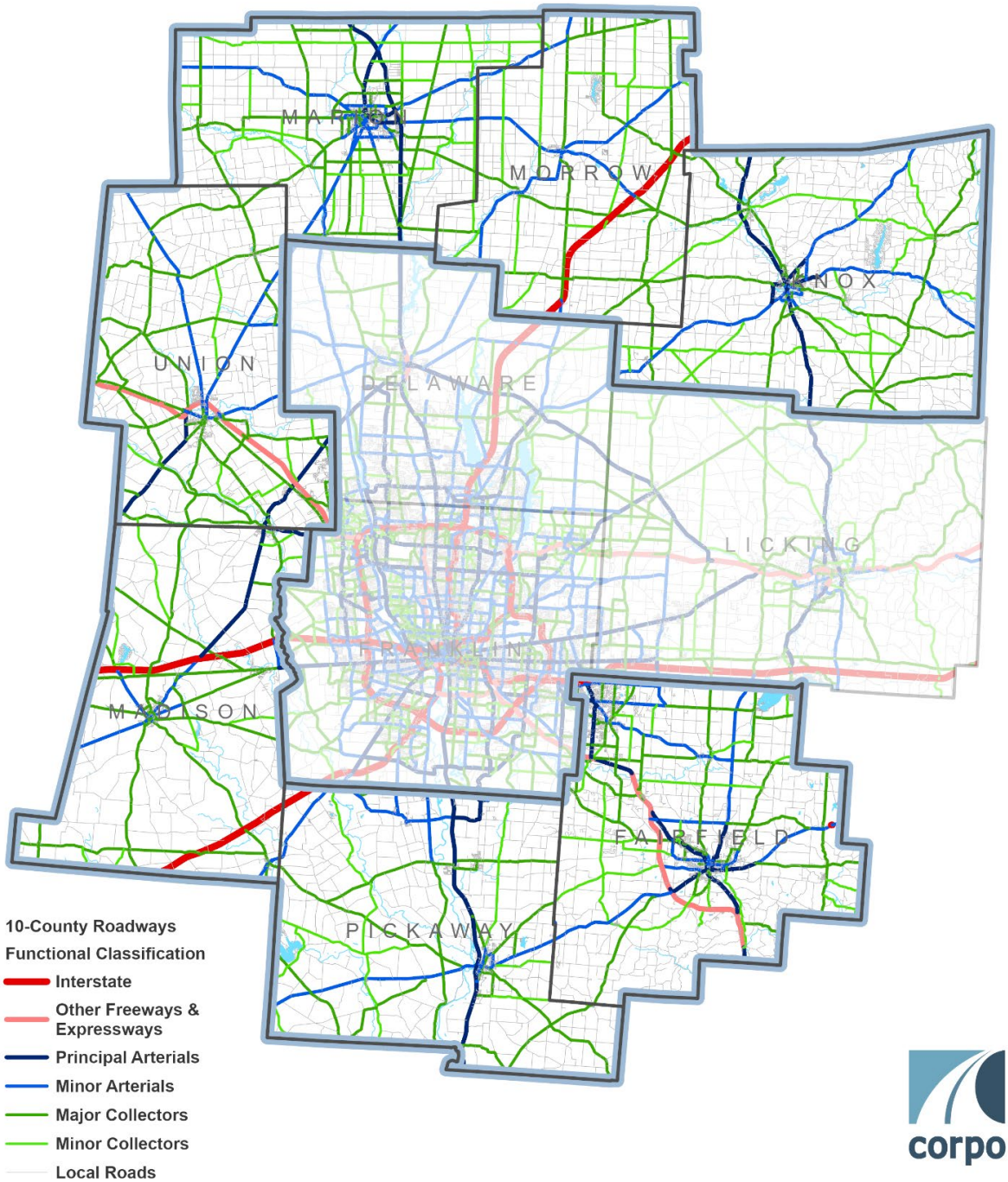
Below are brief definitions sourced from the Federal Highway Administration's (FHWA) Highway Functional Classification Concepts, Criteria, and Procedures guidebook for each of the functional classifications cited in this plan:

- **Interstate Route** – The highest classification of arterials that are officially designated as Interstates by the US Department of Transportation (USDOT) and comprise the National System of Interstate Highways.
- **Other Freeways & Expressways** – Roads with directional travel lanes usually separated by a physical barrier, and access and egress points limited to on- and off-ramp locations or a very limited number of at-grade intersections.
- **Principal Arterial Roads** – Roads that serve major activity centers and/or long-trip, substantial travel, connect all or nearly all urbanized areas and a large majority of urban clusters with 25,000 or greater population, and comprise an integrated network of continuous routes without stubs.

- **Minor Arterial Roads** – Roads that link cities and larger towns and form an integrated interstate and inter-county network, are spaced at intervals consistent with population density, and provide levels of service for trip lengths and travel densities greater than those associated with collector and local roads and with relatively high travel speeds and minimum interference to through movement.
- **Major Collector Roads** – Roads that link to county seats not serviced by arterial routes, larger towns not directly served by a higher-class road, and to other traffic generators of equivalent intra-county importance; connect the aforementioned places with nearby larger towns and cities and/or with arterial routes; and serve the most important intra-county travel corridors.
- **Minor Collector Roads** – Roads that are spaced at intervals consistent with population density, collect traffic from local roads, and bring all developed areas within reasonable distance of a major collector; provide service to smaller communities not served by a higher-class road; and link locally important traffic generators to rural peripheral areas.
- **Local Roads** – Roads that account for the largest percentage of roadway miles, or in other words all other full access roads not classified as arterials or collectors. They are not intended for long distance travel, but to provide access to adjacent lands, linking travelers over short distances from their origins and to their destinations.

These definitions emphasize the importance of function and service as well as the influence of the intensity and distribution of land development patterns in road classification decisions. Given the importance of roadway classifications in enabling federal funding eligibility and establishing design criteria, they are critically relevant to the transportation safety of roadway users. A map of the CORPO roadways by functional classification is shown in **Figure C.2** on the following page.

Figure C.2 Functional Classification of CORPO Roadways



1.4 Emphasis Crash Types

As mentioned in the “Emphasis Areas” section of the *Regional Safety Priorities* chapter, three **emphasis crash types** were identified from the initial crash analysis as causing disproportionately higher shares of severe outcomes:

- **Roadway Departure Crashes** made up less than a third of all crashes but were the cause of nearly 50% of all fatalities and serious injuries sustained in crashes.
- **Angle Crashes** comprised 20% of all fatal and serious injury (FSI) crashes.
- **Vulnerable Road Users (VRU):** nearly 20% of bicyclists and 33% of pedestrians involved in crashes sustained fatal or serious injuries.

Given the severity of these crash types, additional statistics were calculated to identify where the highest proportion of severe crashes of these emphasis types occurred in the CORPO area between 2018 and 2022. For one, certain categories of roadways – i.e., based on functional classification, numbers of lanes, and maintenance authority – had particularly high proportions of total FSIs:

- **Major, 2-lane collector roads maintained by ODOT** experienced 23%, 19%, and 16% of all FSIs for roadway departure, angle, and VRU-involved crashes, respectively.
- **Minor, 2-lane arterial roads maintained by ODOT** saw 16%, 18%, and 9% of the FSIs resulting from each crash type, respectively.
- **Local, 2-lane roads maintained by a County** accounted for 9%, 14%, and 9% of the FSIs caused by each crash type, respectively.

The full list of the proportions of FSIs by each emphasis crash type and roadway category is shown in **Table C.2** on the following page.

Table C.2 Percentage of FSIs by Emphasis Crash Types and Roadway Types

	ROADWAY DEPARTURE 	ANGLE CRASHES 	VULNERABLE ROAD USERS 
ODOT Maintained, Major Collectors, 2 lanes	**23%**	**19%**	**16%**
ODOT Maintained, Minor Arterials, 2 lanes	**16%**	**18%**	**9%**
County Maintained, Local Roads, 2 lanes	**8%**	**14%**	**9%**
Township Maintained, Local Roads, 2 lanes	**6%**	**7%**	**5%**
City Maintained, Local Roads, 2 lanes	**4%**	**3%**	**9%**
County Maintained, Major Collectors, 2 lanes	**4%**	**6%**	**5%**
City Maintained, Major Collectors, 2 lanes	**4%**	**3%**	**7%**
County Maintained, Minor Collectors, 2 lanes	**3%**	**5%**	**4%**
ODOT Maintained, Principal Arterials, 4 lanes	**6%**	**3%**	**2%**
City Maintained, Principal Arterials, 4 lanes	**2%**	**1%**	**6%**
City Maintained, Minor Arterials, 2 lanes	**3%**	**2%**	**4%**
ODOT Maintained, Interstate, 6 lanes	**0%**	**4%**	**2%**

Each of the four (4) major roadway maintenance authorities in the CORPO area share responsibilities for addressing these emphasis areas, with some having jurisdiction over higher proportions of these emphasis areas based on the 2018-2022 crash history. **Table C.3** below summarizes each maintenance authority's average proportions of emphasis area FSIs.

Table C.3 Percentage of FSIs in Emphasis Areas by Maintenance Authority

Emphasis Areas	ODOT	County	City	Township
TOTAL MILEAGE	**17%**	**17%**	**37%**	**22%**
	**54%**	**17%**	**22%**	**7%**
	**54%**	**26%**	**12%**	**8%**
	**36%**	**20%**	**37%**	**6%**

As shown above, roadways where ODOT is the main maintenance authority had disproportionately high proportions of FSIs relative to their mileage: while state-maintained roadways make up less than a fifth of all roadway miles in the CORPO area, they contributed to more than a third of all VRU-involved FSIs and greater than half of all FSIs resulting from roadway departure and angle crashes. Additionally, county-maintained roadways made up a disproportionately high share of severe outcomes resulting from angle crashes: more than a quarter of the FSIs that resulted from angle crashes occurred on these roadways, yet they make up less than a fifth of the CORPO area's total roadway miles. Finally, roadways maintained by municipalities made up the largest share of FSIs resulting from VRU-involved crashes, as these types of roadways tend to be in denser, more pedestrian-rich environments.

Discrepancies in the proportions of severe outcomes resulting from emphasis area crashes are also seen across the counties in the CORPO area. If there was an even distribution of these outcomes, the proportions of FSIs resulting from these crash types would generally equal the proportions of population. **Table C.4** below shows where each county's proportions of FSIs resulting from these emphasis crash types exceed those of their estimated population shares, indicating overrepresentation.

Table C.4 Comparison of County Proportions of FSIs by Emphasis Area to Population

	Share of CORPO Population						
		Proportion of FSIs	Deviation	Proportion of FSIs	Deviation	Proportion of FSIs	Deviation
Fairfield	32.7%	9.1%	-16.67%	9.6%	-16.28%	12.9%	-13.96%
Knox	12.8%	13.6%	0.63%	10.7%	-1.45%	10.0%	-1.92%
Madison	9.0%	**18.8%**	**6.94%**	**18.7%**	**6.84%**	**19.8%**	**7.63%**
Marion	13.2%	10.9%	-1.68%	**17.1%**	**2.70%**	**17.5%**	**2.99%**
Morrow	7.1%	**17.7%**	**7.51%**	**16.9%**	**6.94%**	**16.7%**	**6.74%**
Pickaway	12.0%	**17.9%**	**4.18%**	**17.0%**	3.53%	12.2%	0.12%
Union	13.2%	11.9%	-0.91%	10.0%	-2.27%	10.9%	-1.60%

As shown in the table above, Madison, Marion, and Morrow counties had disproportionately high percentages of FSIs resulting from the emphasis crash types as compared to their population in the 2018 to 2022 period, with the exception of Marion County in terms of FSIs resulting from roadway departure crashes. Pickaway County also had relatively high proportions of emphasis crash type FSIs, particularly for those resulting from roadway departure and angle crashes. **Figure C.3** on the following page also shows a map of the CORPO counties and which are overrepresented in each of the emphasis areas.

Figure C.3 Emphasis Area Overrepresentation by County