

# Iowa DOT FHWA 2023-2027 Safety Targets

August 2026

In June 2026, the Iowa DOT began the process of reviewing data to set performance targets for the five safety performance measures required by FHWA in 23 CFR 490 (also referred to as "PM1"). For the traffic safety area, these targets are required to be five-year rolling averages and must be set annually. The five required measures are:

- Number of fatalities
- Rate of fatalities per 100 million vehicle miles traveled (VMT)
- Number of serious injuries
- Rate of serious injuries per 100 million VMT
- Number of non-motorized fatalities and non-motorized serious injuries

These targets must be set as five-year rolling averages for 2023-2027 and will be submitted as part of the State's Highway Safety Improvement Program (HSIP) annual report, due August 31, 2026. The first round of target setting for these measures occurred in 2017 using time-series modeling. A similar approach has been used each year since. Because of the relatively short-term nature of the targets, the methodology being utilized uses historical information and creates a forecast based on trends. The approach relies on the use of prediction intervals around the trend model forecast to inform a "risk-based" target setting method.

A prediction interval is an estimate of a range within which future data points will occur, with a specific probability, based on past data. A prediction interval approach enables a focus on the acceptable risk of meeting or failing to meet a target.

To help set data-driven safety targets, ARIMA (AutoRegressive Integrated Moving Average) models were applied to forecast a range of transportation safety outcomes. The forecasting analysis used ARIMA models with model specifications selected through the analysis and evaluation process. In some cases, the models were adjusted to account for upward or downward trends. When data showed unusual patterns, or large swings, mathematical adjustments such as taking log of values were used to stabilize the results and improve accuracy.

The selected ARIMA models were reviewed to assess model behavior and forecast reasonableness before being used for the final target-setting analysis.

Forecasts were generated for a five-year horizon. For fatalities and serious injuries, the upper bound of the 85% prediction interval is used for both future years. For the non-motorized measure, non-motorized fatalities and non-motorized serious injuries are modeled separately; since these have the smallest values with the most variability the upper 85% prediction interval is used for the first future year and the upper 95%

prediction interval is used for the second future year. The two non-motorized component targets are then added to obtain Measure 5.

Descriptions for figures:

- Annual observed: black markers show the historical annual values. Three circled values are used in the 5-year target setting average.
- 5-Year Moving Average: the black line smooths annual fluctuations.
- Point Forecast: the red dashed line shows the model point forecasts.
- Values used for target: dark-red star markers show the future values selected for the target calculation.
- Prediction Intervals (PI): shaded bands show forecast uncertainty; additional 95% bands are shown a lighter shade for the non-motorized component models.

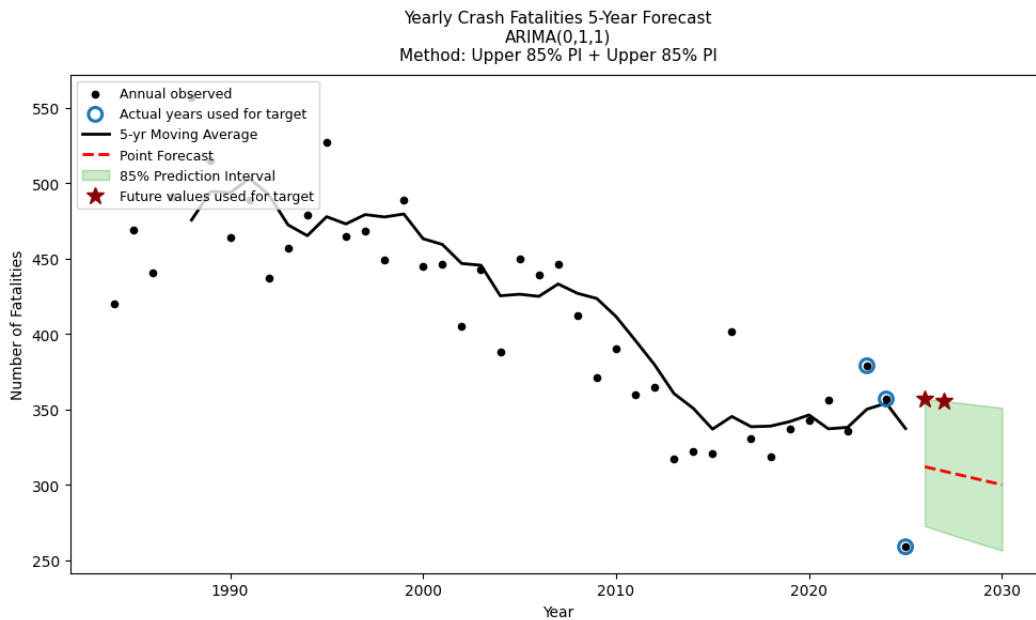
The finalized risk-based method uses upper prediction-interval values rather than point forecasts for both target years: 85%/85% for fatalities and serious injuries, and 85%/95% for each non-motorized component.

The safety data used can be obtained from the Iowa Crash Analysis Tool (ICAT, <https://icat.iowadot.gov/>) and Motor Vehicle Division daily fatality count (<https://iowadot.gov/media/7221/download?inline=v>).

## Measure 1: Number of Fatalities

A log-transformed ARIMA (0,1,1) model was used for the fatalities forecast to help stabilize variance and support the target-setting analysis. This model looks at how fatalities are changing over time and makes forecast for the next 5 years. It does not just look at the numbers — it learns from past patterns and mistakes. The model suggests fatalities are going down by 1.0% per year. This estimate is significant with a p-value of 0.041. The forecast for the next 5 years shows a gentle decline. However, the prediction interval is wide indicating potential variability. The values from this model will be incorporated into the 5-year target as shown in the table below.

**Figure 1: Fatalities – annual observed, 5-year rolling average, and forecast**



**Table 1: Historical and forecast traffic fatalities**

| Year | Fatalities | Forecast | Upper 85% PI |
|------|------------|----------|--------------|
| 2023 | 379        |          |              |
| 2024 | 357        |          |              |
| 2025 | 259        |          |              |
| 2026 |            | 312.11   | 356.97       |
| 2027 |            | 309.08   | 355.60       |

**5-Year Rolling Average Target: 341.5**

The 5-Year rolling average target for 2023-2027 was set using the following:

- Actual data for the three most recent years (2023-2025)
- The upper bound of the 85% prediction interval for year 2026
- The upper bound of the 85% prediction interval for year 2027

This method looks 3 years back and 2 years into the future to estimate a conservative performance target of 341.5 fatalities for 2023-2027.

The 5-year rolling average target for fatalities is presented in Table 1 and all targets are presented in Table 7.

## Measure 2: Fatalities per Hundred Million Vehicle Miles Traveled

This measure is a rate conversion, using the forecast developed for Measure 1 and the estimated Vehicle Miles Traveled (VMT) for the forecast period. The forecast values of VMT were provided by the Systems Planning Bureau using their preferred methodology, linear ETS, which is an exponential smoothing approach. The linear ETS method provides the most reasonable results and adjusts for seasonality or fluctuations in the data. The annual VMT forecast by this method for 2027 is expected to be 34.5 billion (34,518,492,621).

**Table 2: Historical & forecast traffic fatality rate**

| Year | Fatalities | HMVMT<br>(In 100 Millions) | Actual Rate / Forecast Rate | Upper 85% PI Rate |
|------|------------|----------------------------|-----------------------------|-------------------|
| 2023 | 379        | 336.25                     | 1.127                       |                   |
| 2024 | 357        | 343.97                     | 1.038                       |                   |
| 2025 | 259        | 344.84                     | 0.751                       |                   |
| 2026 |            | 345.01                     | 0.905                       | 1.035             |
| 2027 |            | 345.18                     | 0.895                       | 1.030             |

**5-Year Rolling Average Target: 0.996**

\*Per Hundred Million Vehicle Miles Traveled (HMVMT).

The 5-Year rolling average target for 2023-2027 was set using the following:

- Actual data for the three most recent years (2023-2025)
- The upper bound of the 85% prediction interval for year 2026
- The upper bound of the 85% prediction interval for year 2027

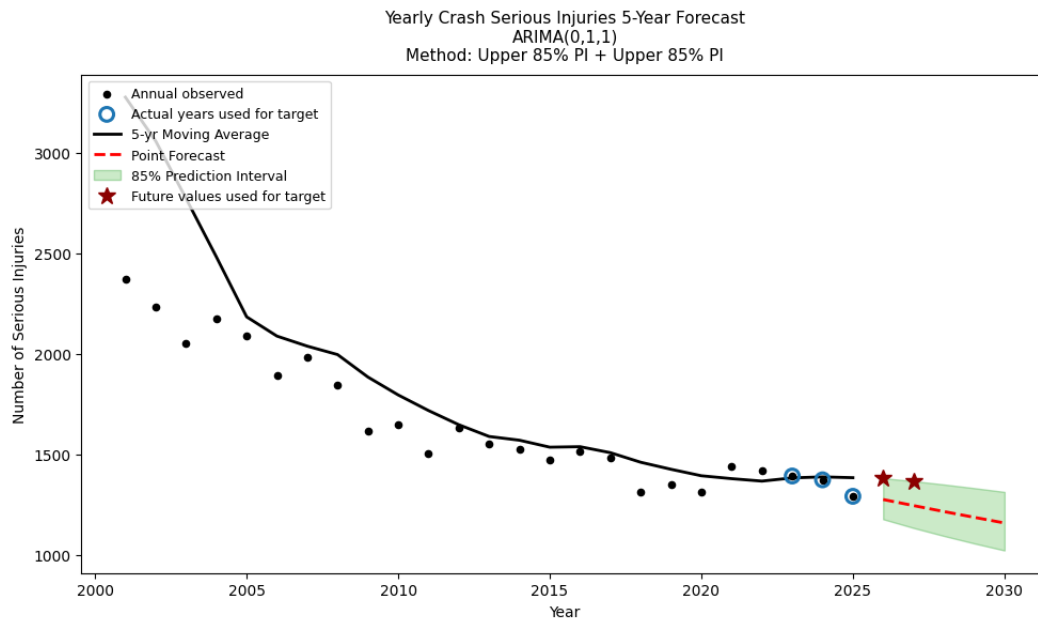
This method looks 3 years back and 2 years into the future to estimate a conservative performance target of 0.996 fatality rate for 2023-2027.

The 5-year rolling average target for fatality rate is presented in Table 2 and all targets are presented in Table 7

### Measure 3: Number of Serious Injuries

The log-transformed ARIMA (0,1,1) model is used for serious injuries. The model suggests serious injuries are going down by 2.4% per year. This estimate is highly significant with a p-value of 0.001. The forecast for the next five years shows a decline, with prediction intervals reflecting uncertainty in the forecast. These values will be incorporated into the 5-year target.

**Figure 2: Serious Injuries – annual observed, 5-year rolling average, and forecast**



**Table 3: Historical and forecast serious injuries**

| Year | Serious Injuries | Forecast | Upper 85% PI |
|------|------------------|----------|--------------|
| 2023 | 1,391            |          |              |
| 2024 | 1,372            |          |              |
| 2025 | 1,290            |          |              |
| 2026 |                  | 1,274.12 | 1,379.97     |
| 2027 |                  | 1,243.87 | 1,365.45     |

**5-Year Rolling Average Target: 1,359.7**

The 5-Year rolling average target for 2023-2027 was set using the following:

- Actual data for the three most recent years (2023-2025)
- The upper bound of the 85% prediction interval for year 2026
- The upper bound of the 85% prediction interval for year 2027

This method looks 3 years back and 2 years into the future to estimate a conservative performance target of 1,359.7 suspected serious injuries for 2023-2027.

The 5-year rolling average target for suspected serious injuries is presented in Table 3 and all targets are presented in Table 7.

## Measure 4: Serious Injury Rate per Hundred Million Vehicle Miles Traveled

This measure is a rate conversion, using the forecast developed for Measure 3 and the estimated VMT for the forecast period. The forecast values of VMT were provided by the Systems Planning Bureau using their preferred methodology, linear ETS, which is an exponential smoothing approach. The linear ETS method provides the most reasonable results and adjusts for seasonality or fluctuations in the data. The annual VMT forecast by this method for 2027 is expected to be 34.5 billion (34,518,492,621).

**Table 4: Historical & forecast serious injury rate**

| Year | Serious Injuries | HMVMT<br>(In 100 Millions) | Actual Rate / Forecast Rate | Upper 85% PI Rate |
|------|------------------|----------------------------|-----------------------------|-------------------|
| 2023 | 1,391            | 336.25                     | 4.137                       |                   |
| 2024 | 1,372            | 343.97                     | 3.989                       |                   |
| 2025 | 1,290            | 344.84                     | 3.741                       |                   |
| 2026 |                  | 345.01                     | 3.693                       | 4.000             |
| 2027 |                  | 345.18                     | 3.603                       | 3.956             |

**5-Year Rolling Average Target: 3.964**

\*Per Hundred Million Vehicle Miles Traveled (HMVMT).

The 5-Year rolling average target for 2023-2027 was set using the following:

- Actual data for the three most recent years (2023-2025)
- The upper bound of the 85% prediction interval for year 2026
- The upper bound of the 85% prediction interval for year 2027

This method looks 3 years back and 2 years into the future to estimate a conservative performance target of 3.964 serious injury rate for 2023-2027.

The 5-year rolling average target for serious injury rate is presented in Table 4 and all targets are presented in Table 7.

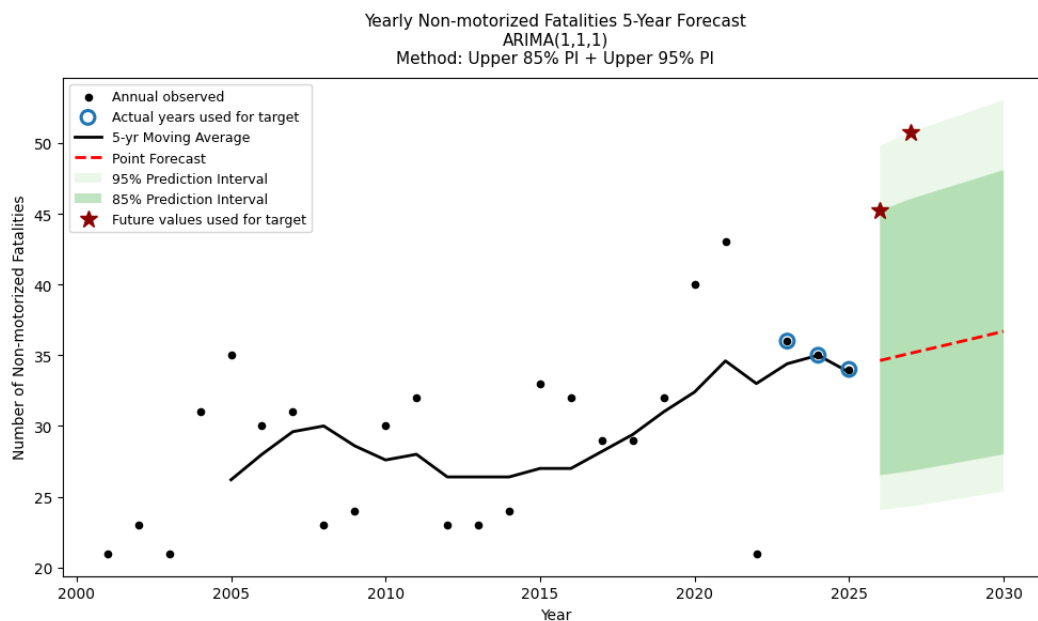
## Measure 5: Number of Non-Motorized Fatalities & Serious Injuries

### Number of Non-Motorized Fatalities

A log-transformed ARIMA (1,1,1) model was used to forecast non-motorized fatalities. The fitted model indicates an increasing trend over time. The model suggests non-motorized fatalities are going up by 1.4% per year. This estimate is significant with a p-value of 0.034.

The values from this model will be incorporated into the 5-year target as shown in the tables below. The NM measures use a mix of Upper 85<sup>th</sup> and 95<sup>th</sup> PI due to smaller values and higher variability.

**Figure 3A: Non-motorized fatalities – annual observed, 5-year rolling average, and forecast**



**Table 5A: Historical and forecast non-motorized fatalities**

| Year | Non-Motorized Fatalities | Forecast | Upper 85% PI | Upper 95% PI |
|------|--------------------------|----------|--------------|--------------|
| 2023 | 36                       |          |              |              |
| 2024 | 35                       |          |              |              |
| 2025 | 34                       |          |              |              |
| 2026 |                          | 34.63    | 45.21        | 49.79        |
| 2027 |                          | 35.15    | 46.05        | 50.77        |

The 5-Year rolling average target for 2023-2027 was set using the following:

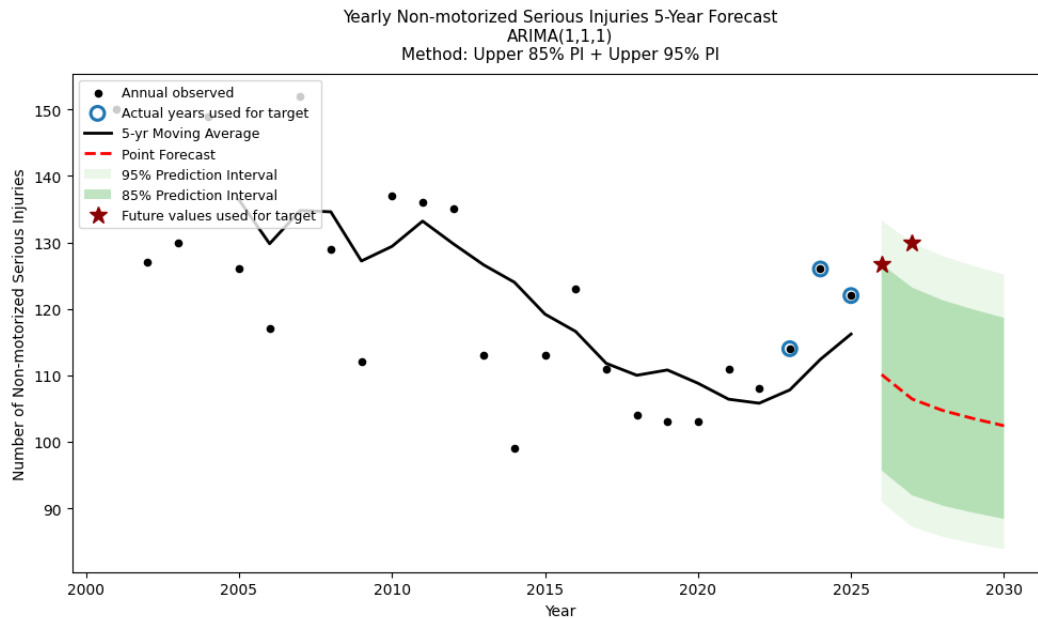
- Actual data for the three most recent years (2023-2025)
- The upper bound of the 85% prediction interval for year 2026
- The upper bound of the 95% prediction interval for year 2027

## Number of Non-Motorized Serious Injuries

The log transformed ARIMA (1,1,1) model forecasts a decreasing trend over time for the overall trend, but an increase in the most recent years. This is consistent with emerging trends associated with increased use of e-scooters, e-bikes, and associated risks. The model suggests non-motorized serious injuries are going down by 1.0% per year. This trend has a p-value of 0.075 and is not statistically significant at the 0.05 level.

The values from this model will be incorporated into the 5-year target as shown in the tables below. The NM measures use a mix of Upper 85<sup>th</sup> and 95<sup>th</sup> PI due to smaller values and higher variability.

**Figure 3B: Non-motorized serious injuries – annual observed, 5-year rolling average, and forecast**



**Table 5B: Historical and forecast non-motorized serious injuries**

| Year | Non-Motorized Serious Injuries | Forecast | Upper 85% PI | Upper 95% PI |
|------|--------------------------------|----------|--------------|--------------|
| 2023 | 114                            |          |              |              |
| 2024 | 126                            |          |              |              |
| 2025 | 122                            |          |              |              |
| 2026 |                                | 110.11   | 126.70       | 133.29       |
| 2027 |                                | 106.42   | 123.19       | 129.88       |

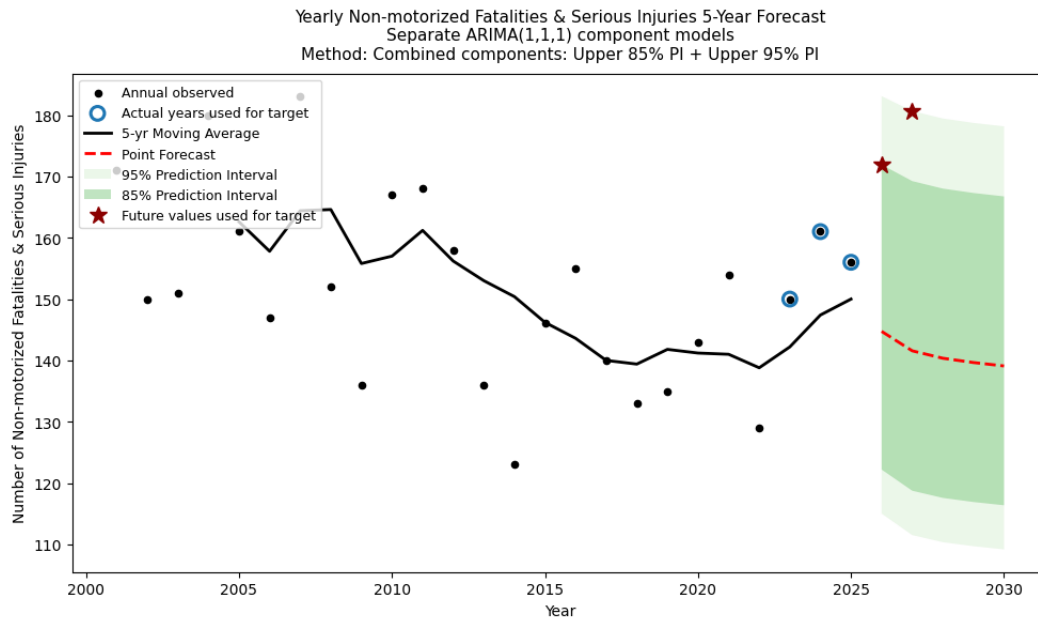
The 5-Year rolling average target for 2023-2027 was set using the following:

- Actual data for the three most recent years (2023-2025)
- The upper bound of the 85% prediction interval for year 2026
- The upper bound of the 95% prediction interval for year 2027

## Combined Number of Non-Motorized Fatalities & Serious Injuries

The combined non-motorized measure is derived directly from the separate models for fatalities and serious injuries. The values from these models are summed and incorporated into the 5-year target as shown in the tables below. The NM measures use a mix of Upper 85<sup>th</sup> and 95<sup>th</sup> PI due to smaller values and higher variability.

**Figure 3C: Combined non-motorized fatalities and serious injuries – annual observed, 5-year rolling average, and forecast**



**Table 5C: Historical and forecast combined non-motorized fatalities and serious injuries**

| Year | Combined Non-Motorized | Forecast | Upper 85% PI | Upper 95% PI |
|------|------------------------|----------|--------------|--------------|
| 2023 | 150                    |          |              |              |
| 2024 | 161                    |          |              |              |
| 2025 | 156                    |          |              |              |
| 2026 |                        | 144.74   | 171.91       | 183.08       |
| 2027 |                        | 141.56   | 169.23       | 180.65       |

**5-Year Rolling Average Target: 163.9**

The 5-Year rolling average target for 2023-2027 was set using the following:

- Actual data for the three most recent years (2023-2025)
- The upper bound of the 85% prediction interval for year 2026
- The upper bound of the 95% prediction interval for year 2027

To satisfy the requirement of Measure 5 representing a combined number of non-motorized fatalities and non-motorized serious injuries, 40.20 and 123.71 are combined for a 5-year rolling average of 163.9.

This method looks 3 years back and 2 years into the future to estimate a conservative performance target of 163.9 non-motorized fatalities and serious injuries for 2023-2027.

The 5-year rolling average target for non-motorized fatalities and serious injuries is presented in Table 5C and all targets are presented in Table 7.

### Iowa DOT 2023-2027 Safety Performance Targets

While the preceding forecasts were developed for each year, the targets are required to be set as five-year rolling averages, as crashes are subject to significant year-to-year variability. The following table gives the actual numbers of fatalities, fatality rate, serious injuries, serious injury rate, non-motorized serious injuries and fatalities, and the vehicle miles traveled (VMT, in millions) for each respective year, which are the basis for the five-year rolling averages presented in Table 7.

**Table 6: Annual data summary**

| Year | Fatalities | Fatality Rate | Serious Injuries | Serious Injury Rate | Non-Motorized Fatalities & Serious Injuries | VMT (millions) |
|------|------------|---------------|------------------|---------------------|---------------------------------------------|----------------|
| 2015 | 321        | 0.970         | 1,471            | 4.443               | 146                                         | 33,109         |
| 2016 | 402        | 1.209         | 1,513            | 4.549               | 155                                         | 33,263         |
| 2017 | 331        | 0.981         | 1,480            | 4.385               | 140                                         | 33,751         |
| 2018 | 319        | 0.952         | 1,311            | 3.913               | 133                                         | 33,507         |
| 2019 | 337        | 0.998         | 1,347            | 3.988               | 135                                         | 33,779         |
| 2020 | 343        | 1.148         | 1,310            | 4.384               | 143                                         | 29,882         |
| 2021 | 356        | 1.066         | 1,441            | 4.316               | 154                                         | 33,384         |
| 2022 | 336        | 1.010         | 1,419            | 4.266               | 129                                         | 33,266         |
| 2023 | 379        | 1.127         | 1,391            | 4.137               | 150                                         | 33,625         |
| 2024 | 357        | 1.038         | 1,372            | 3.989               | 161                                         | 34,397         |
| 2025 | 259        | 0.751         | 1,290            | 3.741               | 156                                         | 34,484         |

Table 7 presents historical five-year rolling average data from Table 6 through 2021-2025, along with the 2022-2026 and 2023-2027 safety performance targets. These five-year rolling averages have been recalculated using the updated authoritative data source that will continually provide the final data. The 2022-2026 row is retained as the target reported

by Iowa DOT in CY 2025 based on the prior official analysis. The final 2023-2027 row represents the proposed 2023-2027 target from the current analysis.

**Table 7: Five-Year Rolling Average Data (Actual) and Safety Performance Targets**

| Year                                            | Fatalities   | Fatalities per<br>HVMVT | Serious<br>Injuries | Serious Injuries<br>per HVMVT | Non-Motorized<br>Fatalities & Serious<br>Injuries |
|-------------------------------------------------|--------------|-------------------------|---------------------|-------------------------------|---------------------------------------------------|
| 2015-2019                                       | 342.0        | 1.022                   | 1,424.4             | 4.255                         | 141.8                                             |
| 2016-2020                                       | 346.4        | 1.057                   | 1,392.2             | 4.244                         | 141.2                                             |
| 2017-2021                                       | 337.2        | 1.029                   | 1,377.8             | 4.197                         | 141.0                                             |
| 2018-2022                                       | 338.2        | 1.035                   | 1,365.6             | 4.173                         | 138.8                                             |
| 2019-2023                                       | 350.2        | 1.070                   | 1,381.6             | 4.218                         | 142.2                                             |
| 2020-2024                                       | 354.2        | 1.078                   | 1,386.6             | 4.218                         | 147.4                                             |
| 2021-2025                                       | 337.4        | 0.999                   | 1,382.6             | 4.090                         | 150.0                                             |
| 2022-2026<br>(Target as Reported<br>in CY 2025) | 364.6        | 1.092                   | 1,385.3             | 4.126                         | 149.8                                             |
| <b>2023-2027<br/>Targets</b>                    | <b>341.5</b> | <b>0.996</b>            | <b>1,359.7</b>      | <b>3.964</b>                  | <b>163.9</b>                                      |