

Des Moines Area MPO Safety Performance Targets and Methodology

February 2021

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BACKGROUND

In April 2016, the Federal Highway Administration (FHWA) released the final rulemaking for safety performance measures for the Highway Safety Improvement Program (HSIP). Included in the rulemaking are definitions of key terms, the applicability of the rule, and guidance on how to establish performance targets, determine if progress is achieved, and report targets for the HSIP.

The safety measures required to be reported annually include:

1. Number of Fatalities
2. Rate of Fatalities per 100 million Vehicle Miles Traveled (VMT)
3. Number of Serious Injuries
4. Rate of Serious Injuries per 100 million Vehicle Miles Traveled (VMT)
5. Number of Non-motorized Fatalities and Non-motorized Serious Injuries

Performance targets were established by states beginning in August 2017. A Metropolitan Planning Organization (MPO) has 180 days after the state sets its targets to either:

- 1) Agree to support the State Department of Transportation (DOT) target
- 2) Establish a target for each of the five performance measures specific to the MPO planning area

MPO target achievement will be monitored through the continued planning efforts of the MPO, including through long-range planning, project evaluation, and performance monitoring reports.

Safety Goals in *Mobilizing Tomorrow*

Mobilizing Tomorrow, approved in 2014 and updated in 2019, is the Des Moines Area MPO's long-range, regional transportation plan for the year 2050. *Mobilizing Tomorrow* outlines four high-level goals to direct Greater Des Moines toward an enhanced transportation system. Each of the goals identified several performance measures to help track the plan's implementation. Goal 4 in *Mobilizing Tomorrow* seeks to "further the health, safety, and well-being of all residents in the region" and includes four of the five measures required by federal rulemaking.

In addition to setting baseline values for tracking performance in the long-range plan, a target was set for the year 2050 to be used to evaluate the ongoing performance of the transportation system. In *Mobilizing Tomorrow*, each of the four measures has a 2050 target of decreasing from the baseline.

The Des Moines Area MPO Committees do not approve of using the term "target" in the context of crashes, fatalities, and serious injuries. However, because current federal regulation requires MPOs to set so-called "targets", MPO Committees have agreed while maintaining that references to fatalities, serious injuries, and crashes in targeted amounts are not appropriate. Continuing to monitor crashes, fatalities, and serious injuries within the Des Moines Area MPO planning area contributes toward regional traffic safety and Vision Zero initiatives.

STATEWIDE TARGETS

At the end of August 2020, the Iowa DOT established statewide safety performance targets for the 2017-2021 period as shown in the following Table. A fatality is defined as “any injury that results in death within 30 days after the motor vehicle crash in which the injury occurred”, and a major or serious injury is defined as “any injury, other than a fatality, which prevents the injured person from walking, driving, or normally continuing the activities the person was capable of before the injury occurred.”¹

Table 1: Iowa DOT Safety Performance Targets

Performance Measures	Five-Year Rolling Averages	
	2015-2019 Baseline	2017-2021 Target
Number of Fatalities	342.0	336.8
Fatality Rate*	1.019	0.983
Number of Serious Injuries	1,420.0	1,370.8
Serious Injury Rate*	4.230	4.002
Non-Motorized Fatalities and Serious Injuries	132.6	131.0

*Rates are per 100 million vehicle miles traveled (VMT)

Per [23 § 490.209](#), the Des Moines Area MPO must establish safety targets within 180 days of the statewide targets being established by February 27, 2021. The Des Moines Area MPO maintains two options for setting regional performance targets:

1. Support the Iowa DOT’s targets by agreeing to plan and program projects so that they contribute toward the accomplishment of the State DOT safety target for that performance measure
2. Set a quantifiable target for that performance measure for the MPO

Based on discussion with the Des Moines Area MPO Committees and the established safety performance targets for 2050 in *Mobilizing Tomorrow*, the Des Moines Area MPO determined that setting safety targets for its planning area was the appropriate action for the 2017-2021 period.

The Des Moines Area MPO first reviewed its draft 2017-2021 safety targets and methodology in November 2020 with its Engineering Subcommittee and with the Iowa DOT. In January 2020, the draft 2017-2021 safety targets were presented to the Des Moines Area MPO Technical, Executive, and Policy Committees. The Des Moines Area MPO Committees voted on and approved the final 2017-2021 safety targets in February 2021.

¹ Performance. Iowa Department of Transportation. <https://iowadot.gov/performance/safety>.

DES MOINES AREA MPO SAFETY PERFORMANCE METHODOLOGY

Des Moines Area MPO 2015-2019 Baseline

Safety performance targets for the Des Moines Area MPO planning area were established with consideration of the 2015-2019 baseline measures. Utilizing crash report data collected by the Iowa DOT for the most recent 10-year period, the Des Moines Area MPO calculated the five-year rolling average for the number and rate of fatalities, number and rate of serious injuries, and the number of non-motorized fatalities and serious injuries. Appendix A provides additional details on the fatalities, serious injuries, and non-motorized fatalities and serious injuries as well as their five-year rolling averages.

The 2015-2019 baseline values for the five safety performance measures for the Des Moines Area MPO planning area are shown in the following Table. The Iowa DOT provided the estimated vehicle miles traveled data for the MPO Planning Area.

Table 2: Des Moines Area MPO Safety Performance Baselines

Performance Measure	Five-Year Rolling Averages
	2015-2019 Baseline
Number of Fatalities	29.2
Fatality Rate*	0.600
Number of Serious Injuries	175.2
Serious Injury Rate*	3.607
Non-Motorized Fatalities and Serious Injuries	25.4

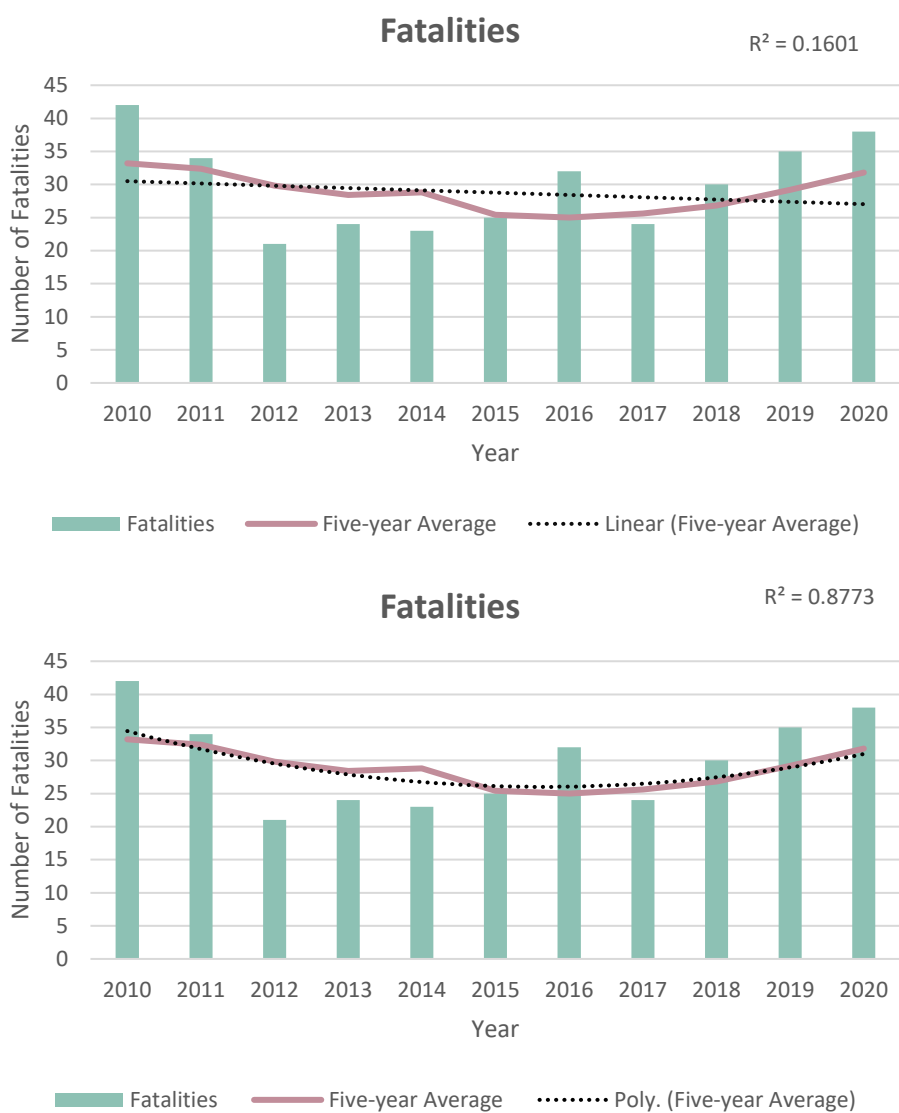
*Rates are per 100 million vehicle miles traveled (VMT)

Safety Performance Forecast – Fatalities

The Des Moines Area MPO used reported crash fatalities from the Iowa DOT’s Iowa Crash Analysis Tool (ICAT)² in reviewing historic crash fatalities data and in setting future targets.

In 2020, there were **38** fatalities from crashes within the Des Moines MPO planning area. To illustrate current trends, the five-year rolling averages for crash fatalities within the MPO planning area were calculated and then trends were applied to the five-year rolling averages. The number of fatalities, the five-year rolling averages, and the linear and polynomial trends for the five-year rolling averages are shown in Figure 1.

Figure 1: Historic Crash Fatalities



² <https://icat.iowadot.gov/>

The Des Moines Area MPO forecasted the number of fatalities for the year 2021 based on historic crash data and the 2020 value using the AAA version of the Exponential Smoothing (ETS) algorithm with the upper bounds of the 50th, 75th, 85th, and 90th prediction intervals. The Iowa DOT utilizes prediction intervals in their integrated moving average (IMA) model when setting their required targets. To maintain consistency with Iowa DOT analysis, the Des Moines Area MPO also analyzed crash data with prediction intervals.

The upper bounds of the forecasted number of fatalities for the year 2021 are shown in the following Table.

Table 3: 2021 Crash Scenario Forecasts, Number of Fatalities

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Number of Fatalities	42	45	47	48	31

Safety Performance Target – Fatalities

Using the 2020 crash fatalities and the forecasted values above, forecasted five-year averages were developed. The forecasted five-year averages for crash fatalities in the Des Moines Area MPO Planning Area for 2017-2021 are shown in the following Table.

Table 4: 2021 Crash Scenario Forecasts, Fatalities Five-Year Average

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Five-Year Average of Fatalities	33.8	34.4	34.8	35.0	31.6

After reviewing the forecasted five-year averages and the trendline projections, the Des Moines Area MPO determined that to continue to achieve improvement toward the goal set in *Mobilizing Tomorrow*, a 2017-2021 safety performance target should follow the linear trendline. The five-year average fatalities target is shown in the following Table.

Table 5: 2017-2021 Number of Fatalities Target Five-Year Average

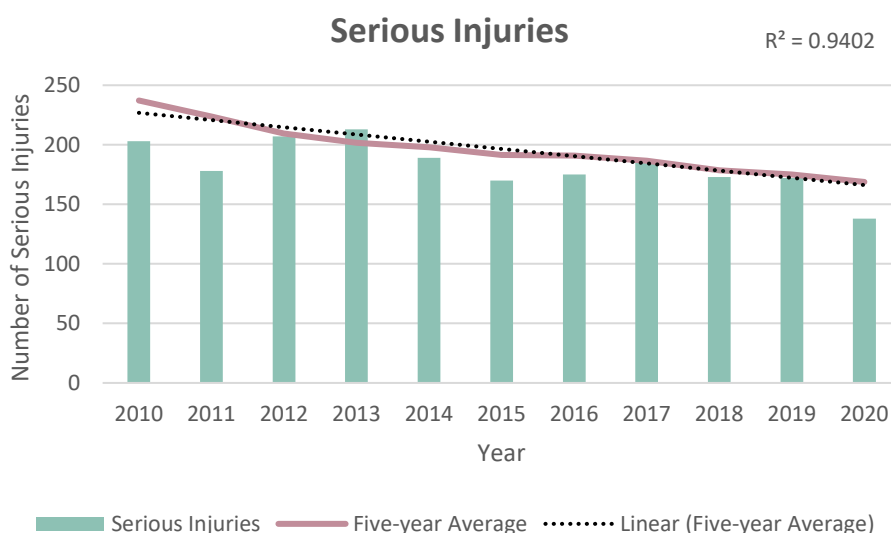
Performance Measure	Five-Year Rolling Averages	
	2015-2019 Baseline	2017-2021 Target
Number of Fatalities	29.2	31.6

Safety Performance Forecast – Serious Injuries

The Des Moines Area MPO reported crash serious injuries from the Iowa DOT's Iowa Crash Analysis Tool (ICAT) in reviewing historic crash serious injuries data and in setting future targets.

In 2020, there were **138** serious injuries from crashes in the Des Moines Area MPO planning area. To illustrate current trends, the five-year rolling averages for crash serious injuries within the MPO planning area were calculated and then a linear trendline was applied to the five-year rolling averages. The number of serious injuries, the five-year rolling averages, and the linear trendline for the five-year rolling averages are shown in Figure 2.

Figure 2: Historic Crash Serious Injuries



The Des Moines Area MPO forecasted the number of serious injuries for the year 2021 based on historic crash data and the 2020 value using the AAA version of the Exponential Smoothing (ETS) algorithm with the upper bounds of the 50th, 75th, 85th, and 90th prediction intervals. The Iowa DOT utilizes prediction intervals in their integrated moving average (IMA) model when setting their required targets. To maintain consistency with Iowa DOT analysis, the Des Moines Area MPO also analyzed crash data with prediction intervals.

The upper bounds of the forecasted number of serious injuries for the year 2021 are shown in the following Table.

Table 6: 2021 Crash Scenario Forecasts, Number of Serious Injuries

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Number of Serious Injuries	161	167	171	174	154

Safety Performance Target – Serious Injuries

Using the 2020 crash serious injuries and the forecasted values above, forecasted five-year averages were developed. The forecasted five-year averages for crash serious injuries in the Des Moines Area MPO Planning Area for 2017-2021 are shown in the following Table.

Table 7: 2021 Crash Scenario Forecasts, Serious Injuries Five-Year Average

	Prediction Interval Percentiles				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Five-Year Average of Serious Injuries	165.9	167.2	168.0	168.6	164.6

After reviewing the forecasted five-year averages and the linear trendline projection, the Des Moines Area MPO determined that to continue to achieve improvement toward the goal set in *Mobilizing Tomorrow*, a 2017-2021 safety performance target should follow the linear trendline. The five-year average serious injuries target is shown in the following Table.

Table 8: 2017-2021 Number of Serious Injuries Target Five-Year Average

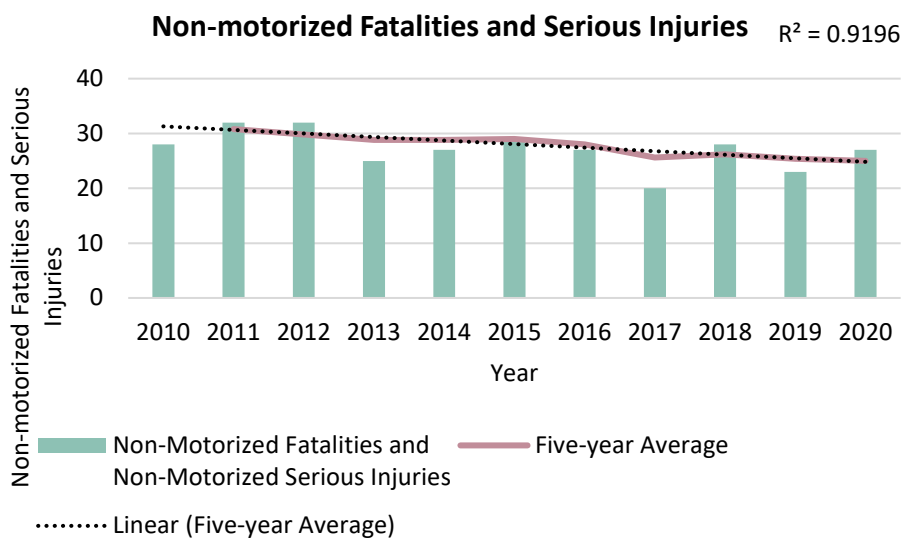
Performance Measure	Five-Year Rolling Averages	
	2015-2019 Baseline	2017-2021 Target
Number of Serious Injuries	175.2	164.6

Safety Performance Forecast – Non-Motorized Fatalities and Serious Injuries

The Des Moines Area MPO used reported crash non-motorized fatalities and serious injuries from the Iowa DOT's Iowa Crash Analysis Tool (ICAT) in reviewing historic crash non-motorized fatalities and serious injuries data and in setting future targets.

In 2020, there were **27** non-motorized fatalities and serious injuries from crashes in the Des Moines Area MPO planning area. Of which, **6** were fatalities and **21** were serious injuries. To illustrate current trends, the five-year rolling averages for non-motorized fatalities and serious injuries within the MPO planning area were calculated and then a linear trendline was applied to the five-year rolling averages. The number of non-motorized fatalities and serious injuries, the five-year rolling averages, and the linear trendline for the five-year rolling averages are shown in Figure 3.

Figure 3: Historic Non-Motorized Fatal and Serious Injury Crashes



The Des Moines Area MPO forecasted the number of non-motorized fatalities and serious injuries for the year 2021 based on historic crash data and the 2020 value using the AAA version of the Exponential Smoothing (ETS) algorithm with the upper bounds of the 50th, 75th, 85th, and 90th prediction intervals. The Iowa DOT utilizes prediction intervals in their integrated moving average (IMA) model when setting their required targets. To maintain consistency with Iowa DOT analysis, the Des Moines Area MPO also analyzed crash data with prediction intervals.

The upper bounds of the forecasted number of non-motorized fatalities and serious injuries for the year 2021 are shown in the following Table.

Table 9: 2021 Crash Scenario Forecasts, Number of Non-Motorized Fatalities & Serious Injuries

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Number of Non-motorized Fatalities and Serious Injuries	26	28	29	29	24

Safety Performance Target – Non-Motorized Fatalities and Serious Injuries

Using the 2020 crash non-motorized fatalities and serious injuries and the forecasted values above, forecasted five-year averages were developed. The forecasted five-year averages for crash fatalities in the Des Moines Area MPO Planning Area for 2017-2021 are shown in the following Table.

Table 10: 2021 Crash Scenario Forecasts, Non-Motorized Fatalities & Serious Injuries Five-Year Average

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Five-Year Average of Non-motorized Fatalities and Serious Injuries	24.8	25.1	25.3	25.5	24.3

After reviewing the forecasted five-year averages and the linear trendline projection, the Des Moines Area MPO determined that to continue to achieve improvement toward the goal set in *Mobilizing Tomorrow*, a 2017-2021 safety performance target should follow the linear trendline. The five-year average non-motorized fatalities and serious injuries target is shown in the following Table.

Table 11: 2017-2021 Non-Motorized Fatalities & Serious Injuries Target Five-Year Average

Performance Measure	Five-Year Rolling Averages	
	2015-2019 Baseline	2017-2021 Target
Number of Non-Motorized Fatalities and Serious Injuries	25.4	24.3

Vehicle Miles Traveled Forecasting

Vehicle miles traveled (VMT) forecasting was completed using historic traffic count data provided in the Iowa DOT GIMS dataset through 2016. Based on the historic VMT between 2014 and 2016, the Des Moines Area MPO saw approximately 2% VMT growth per year. As the Des Moines Area MPO planning area has continued to increase in population during that time-period and future growth projections are consistent with the 2% growth per year, the VMT estimates for 2017-2019 followed a similar growth assumption.

Resulting from the COVID-19 pandemic and the reduction in travel in 2020, the Des Moines Area MPO requested assistance from the Iowa DOT in estimating the 2020 VMT for its planning area. The Iowa DOT recorded year-to-date (2019 to 2020) traffic volume variations across Iowa of:

- -15.3% on all Iowa Interstates
- -11.1% on all Iowa Primary Roads
- -9.2% on all Iowa Rural Roads and City Streets
- -13.0% on all Iowa Municipal Roads
- -10.4% on all Iowa Rural Roads
- **-11.5% on all Iowa Roads**

Additionally, the Iowa DOT recorded 2019 to 2020 AADT (Annual Average Daily Traffic) changes from its continuous traffic count stations within the Des Moines Area MPO planning area:

- Station 116-25 (Waukee): -12.5%
- Station 117-77 (Altoona): -12.4%
- Station 250-77 (Pleasant Hill): -10.2%
- Station 278-77 (Grimes): -6.9%
- Station 503-77 (Polk City): -2.7%
- Station 714-77 (Des Moines): -19.1%
- Station 716-77 (Des Moines): -14.3%
- Station 806-77 (Windsor Heights): -14.3%
- Station 831-92 (Des Moines): -21.3%
- **Average: -12.6%**

Due to limitations needed for additional data processing, a **12% reduction (average of -11.5% and -12.6%)** in 2020 VMT from 2019 VMT was estimated for the Des Moines Area MPO. 2021 VMT for the Des Moines Area MPO was estimated to be the average of the linear forecast and exponential smoothing (ETS) forecast using historic VMT from 2010 to 2020.

Table 12: Estimated Vehicle Miles Traveled

Year	Estimated Vehicle Miles Traveled	Year	Estimated Vehicle Miles Traveled
2010	4,369,665,072	2011	4,363,487,765
2012	4,479,189,115	2013	4,467,722,275
2014	4,558,909,249	2015	4,666,797,655
2016	4,764,701,540	2017	4,859,995,570
2018	4,957,195,482	2019	5,056,339,392
2020	4,449,578,665	2021	4,926,157,532

2017-2021 Safety Targets

Based on historic crash data in the Des Moines Area MPO planning area, the final safety targets for the 2017-2021 period are shown in the Table below.

Table 13: 2017-2021 Safety Performance Targets

Performance Measures	Five-Year Rolling Averages	
	2015-2019 Baseline	2017-2021 Target
Number of Fatalities	29.2	31.6
Fatality Rate*	0.600	0.655
Number of Serious Injuries	175.2	164.6
Serious Injury Rate*	3.607	3.389
Non-Motorized Fatalities and Serious Injuries	25.4	24.3

*Rates are per 100 million vehicle miles traveled (VMT)

Appendix A: Historic Crash Data

Table on next page.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Last Updated 1/18/2021	Linear Estimate	Exponential Smoothing AAA Estimates (Upper Bounds)			
													2021			
	2020	2021	50%	75%	85%	90%										
Fatalities	42	34	21	24	23	25	32	24	30	35	38	31	42	45	47	48
Five-year Average	33.2	32.4	29.8	28.4	28.8	25.4	25.0	25.6	26.8	29.2	31.8	31.6	33.8	34.4	34.8	35.0
Fatalities Rate (per 100 million VMT)	0.961	0.779	0.469	0.537	0.505	0.536	0.672	0.494	0.605	0.692	0.854	0.627	0.855	0.916	0.953	0.979
Five-year Average	0.770	0.748	0.683	0.646	0.650	0.565	0.544	0.549	0.562	0.600	0.663	0.655	0.700	0.712	0.720	0.725

Serious Injuries	203	178	207	213	189	170	175	186	173	172	138	154	161	167	171	174
Five-year Average	237.2	223.8	209.6	201.8	198.0	191.4	190.8	186.6	178.6	175.2	168.8	164.6	165.9	167.2	168.0	168.6
Serious Injuries Rate (per 100 million VMT)	4.646	4.079	4.621	4.768	4.146	3.643	3.673	3.827	3.490	3.402	3.101	3.124	3.260	3.392	3.472	3.529
Five-year Average	5.508	5.178	4.801	4.584	4.452	4.251	4.170	4.011	3.756	3.607	3.499	3.389	3.416	3.442	3.458	3.470

Non-Motorized Fatalities and Non-Motorized Serious Injuries	28	32	32	25	27	29	27	20	28	23	27	24	26	28	29	29
Non-Motorized Fatalities	6	6	3	2	5	6	6	5	4	7	6					
Non-Motorized Serious Injuries	22	26	29	23	22	23	21	15	24	16	21					
Five-year Average		30.8	29.8	28.8	28.8	29.0	28.0	25.6	26.2	25.4	25.0	24.3	24.8	25.1	25.3	25.5

VMT Estimates	Year
4,369,665,072	2010
4,363,487,765	2011
4,479,189,115	2012
4,467,722,275	2013
4,558,909,249	2014
4,666,797,655	2015
4,764,701,540	2016
4,859,995,570	2017
4,957,195,482	2018
5,056,339,392	2019
4,449,578,665	2020
4,926,157,532	2021




Ever mindful of future generations,

we collaborate across
political boundaries

to achieve social, economic, and
environmental resilience for

Greater Des Moines



Altoona • Ankeny • Bondurant • Carlisle • Clive • Dallas County • Des Moines • DART
Grimes • Johnston • Mitchellville • Norwalk • Pleasant Hill • Polk City • Polk County
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