2022 State Long Range Transportation Plan (SLRTP)

Needs and Risks Analysis Overview

The 2022 SLRTP included statewide analysis of five needs and five risks for the Primary Highway System. The SLRTP includes a full description of each analysis, maps showing its results, and a matrix showing the needs and risks identified for each planning corridor across the system.

This document provides a one-page overview of each layer, including the key points for Iowa DOT staff interested in reviewing a specific location's needs and risks.

Click on a layer's name to jump to its description.

Needs

- Bottlenecks
- Pavement Condition
- Super-2
- Bridge Condition
- Capacity

Risks

- Flood Resiliency
- Safety
- Bicyclists
- Operations
- Pedestrians

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

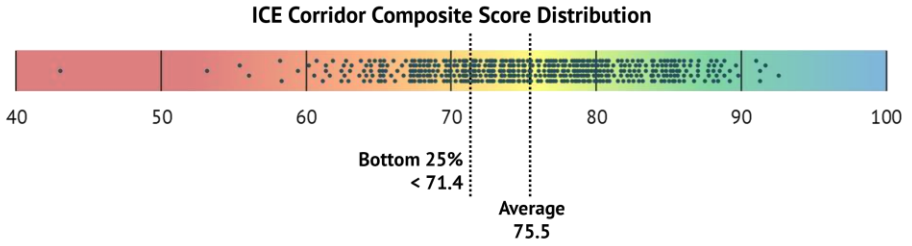
Key Points

- This analysis of needs is based on the **Infrastructure Condition Evaluation (ICE) tool**.
- The analysis is available at both the **segment and planning corridor levels**.
- In the **SLRTP matrix**, the planning corridor is highlighted for pavement condition if the corridor is in the bottom 25% of corridors for ICE composite score.
- **For Iowa DOT staff reviewing a location's needs/risks:**
  - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP Condition.**"
  - The **Composite Score field** shows the analysis output on a 0-100 scale – lower scores mean higher needs.
  - An entry of **"Yes" in the Need field** means the overall planning corridor is currently in the **bottom 25% statewide**.
  - This **PP&S data is live**, meaning it has been updated since the SLRTP was adopted and may not match the SLRTP.

Additional Detail

The ICE tool combines the following seven criteria to evaluate the structural and service condition of roadway segments with a single composite rating. The percentage shown is the weighting that is applied.

- Pavement Condition Index (PCI) rating (25%)
- Bridge Condition Index (BCI) rating (25%)
- International Roughness Index (IRI) value (15%)
- Annual Average Daily Traffic (AADT), combination truck count (15%)
- AADT, single-unit truck count (5%)
- AADT, passenger count (5%)
- Congestion Index value (10%)



For each roadway segment, the value for each factor was normalized on a 1 (worst) to 10 (best) scale. The seven normalized values were weighted based on the percentages noted above and added together to determine a composite rating for the segment. The composite score had a maximum value of 100, which means the highest possible score was assigned for each factor.

ICE segments were aggregated into planning analysis corridors. Each corridor was assigned a composite ICE rating based on an average of the composite ratings for its individual segments, weighted by length. The 464 corridors were sorted based on their overall composite ratings and the lowest rated 25% of the system by mileage were identified as needs. For the SLRTP, segment-level ICE composite ratings ranged from a low of 29.5 to 100, with a system-wide average of 76.3. Corridor composite scores range from 43.1 to 92.6, with an average corridor-level composite score of 75.5. The bottom 25% were those that had a score of 71.4 or less.

For more information: Pavement condition maps in SLRTP SLRTP matrix

Infrastructure Condition Evaluation: Web Map Annual Report Technical Memo

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

Key Points

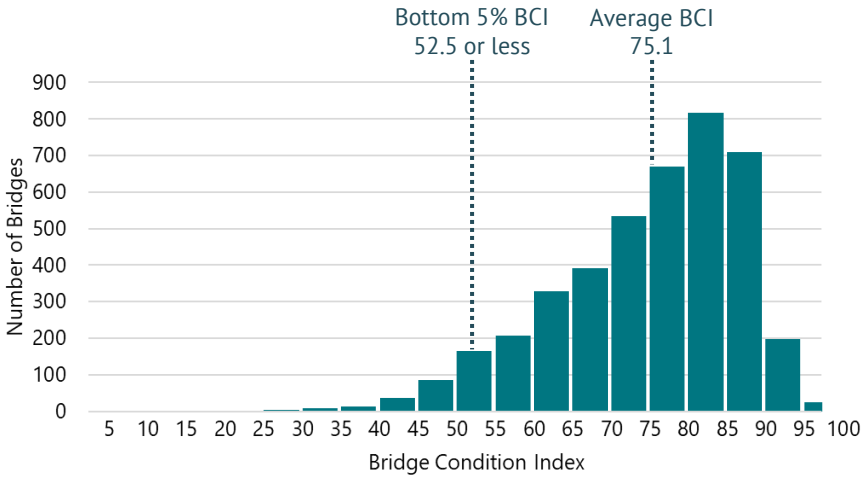
- This analysis of needs is based on the **Bridge Condition Index (BCI)**.
- In the **SLRTP matrix**, the planning corridor is highlighted for bridge condition if the corridor has one or more bridge in the bottom 5% of bridges by BCI.
    - Numbers are the ranks out of the 216 bridges in the bottom 5%. Numbers appearing in parentheses mean that the two structures are at the same location (e.g., the eastbound and westbound lanes of an Interstate). Numbers followed by "L" mean the structure is owned and maintained by the Iowa DOT but is on a local (county or municipal) route.
- **For Iowa DOT staff reviewing a location's needs/risks:**
    - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP Bridges.**"
    - The **Overall Rank field** and **Percent Rank field** shows the bridge's rank – lower ranks mean higher needs.
    - This **PP&S data is live**, meaning it has been updated since the SLRTP was adopted and may not match the SLRTP.

Additional Detail

The BCI evaluates roadway bridge structures by combining multiple factors to indicate a structure's overall condition/sufficiency. These factors include:

- Structural condition
- Load carrying capacity
- Horizontal and vertical clearances
- Width
- Traffic levels
- Type of roadway served
- Length of out-of-distance travel if bridge closes
- Reductions for specific vulnerabilities

The BCI is measured on a 0-100 scale, with 100 being the best possible rating. Lower BCI indicates higher need. The data reviewed for this SLRTP showed the BCI of Iowa DOT bridges ranged from 11.0 to 99.9, with a per-bridge average of 75.1. The bottom 5% were flagged in the SLRTP and included bridges with a BCI of 52.5 or less.



For more information: Bridge condition maps in SLRTP SLRTP matrix

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

Key Points

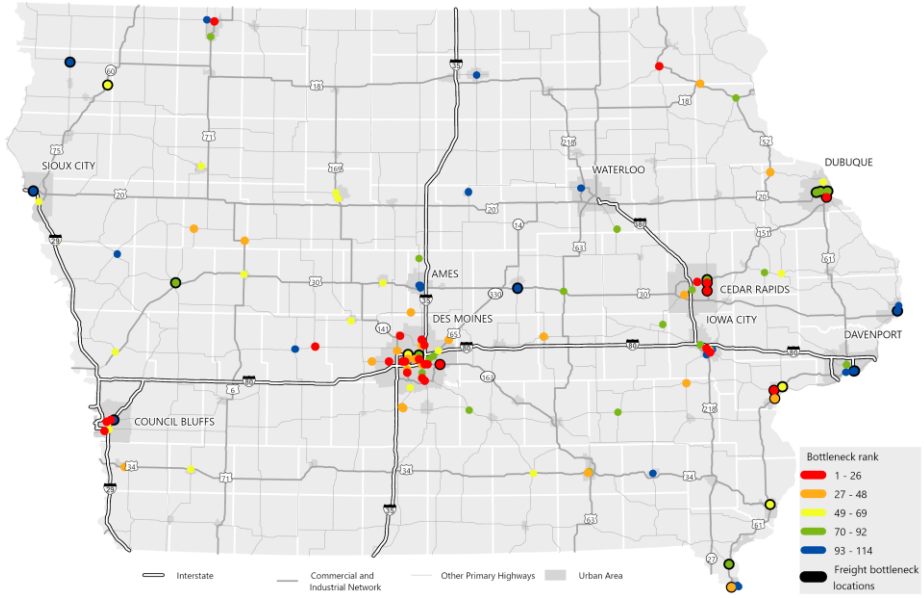
- This analysis of needs is based on **INRIX travel time data**.
- The analysis is available at the **segment (individual bottleneck) level**.
- In the **SLRTP matrix**, the planning corridor is highlighted for bottlenecks if the corridor has one or more bottleneck identified. The numbers are the ranks out of the 114 bottlenecks.
- **For Iowa DOT staff reviewing a location's needs/risks:**
  - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP Bottlenecks**" and only shows the locations flagged for bottlenecks in the SLRTP.
  - The **Rank All field** shows the bottleneck's rank – lower ranks mean higher needs.
  - An entry of **"Yes" in the Freight Bottleneck field** means the bottleneck is on the Iowa Multimodal Freight Network.
  - This **PP&S data is static**, meaning it has not been updated since the SLRTP was adopted.

Additional Detail

Bottlenecks, or recurring slow-downs, were identified through INRIX travel speed data, derived from cellphone and global positioning systems data. The process to determine segment-level bottleneck needs for the SLRTP was:

1. Compare reported speeds to reference speeds, defined as the 85th percentile observed speed for all time periods (maximum value of 65 mph).
2. Determine time intervals where the average traffic speed is less than or equal to 60% of the reference speed. This is measured in bottleneck minutes per mile.
3. Calculate recurring congestion by summing the total bottleneck duration per mile per year.
4. Identify the worst 5% of the overall network for recurring congestion.
5. Determine the locations among the worst 5% where the duration of recurring congestion was one standard deviation or higher than the statewide average.

A total of 114 bottlenecks were identified, 24 of which are on the Iowa Multimodal Freight Network and of particular concern for freight traffic.



For more information: Bottleneck maps in SLRTP SLRTP matrix

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

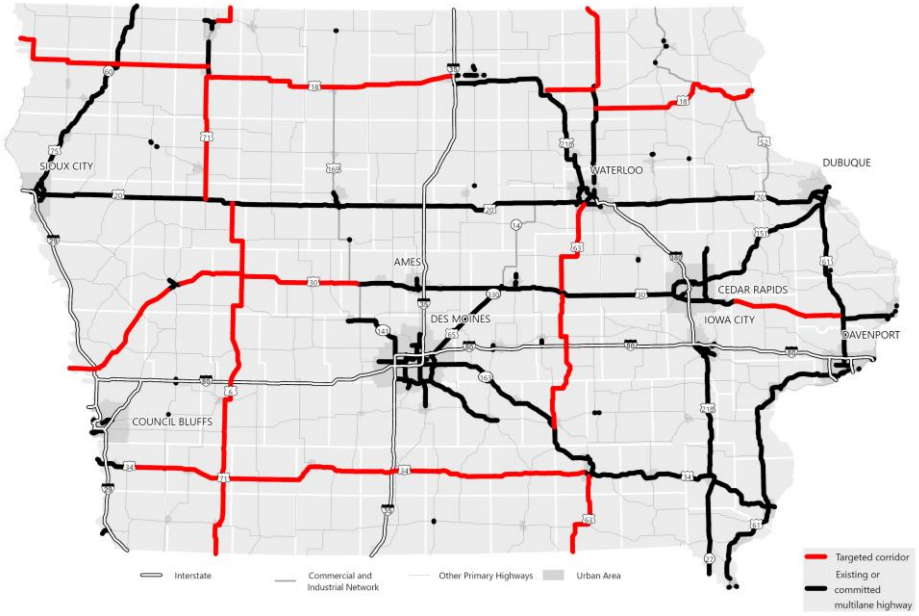
Key Points

- This analysis of needs is based on the **Super-2 corridors identified in the 2017 SLRTP**.
- In the **SLRTP matrix**, the planning corridor is highlighted if it is on a targeted Super-2 route. A note of "4LC" means that particular corridor is a 4-lane corridor and would not be targeted for Super-2 improvements.
- **For Iowa DOT staff reviewing a location's needs/risks:**
  - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP Super-2 Corridors**" and only shows the corridors flagged for Super-2 needs in the SLRTP.
  - The entry of **"Yes" in the Need field** means the overall planning corridor is currently a **targeted Super-2 corridor**. This includes all portions of US 18, 30, 34, 63, and 71 that are not 4-lane and not yet improved with Super-2 elements.
  - This **PP&S data is static**, meaning it has not been updated since the SLRTP was adopted.

Additional Detail

Five statewide corridors – US Highways 18, 30, 34, 63, and 71 – have been identified for Super-2 improvements across their 2-lane portions. This will enhance the operation of the network in particular corridors where capacity expansion needs do not exist, but operational improvements would help the corridors compliment the state's multilane highway network. A defining feature of Super-2 improvements is the addition of passing lanes, which improve roadway operation by providing opportunities to pass slower-moving vehicles. Other examples of Super-2 design elements include wider paved shoulders, left and right turn lanes, acceleration lanes, limited access, and geometric improvements.

The appropriate mix of passing lanes and other Super-2 elements should be implemented in a targeted and opportunistic fashion when work is being planned on these corridors to address needs such as safety or condition improvements. While only the five statewide routes are targeted for Super-2 improvements across their 2-lane portions, this does not preclude the use of these types of treatments in other locations to address mobility and safety needs.



For more information: Super-2 map in SLRTP SLRTP matrix Super-2 Design Guidelines

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

Key Points

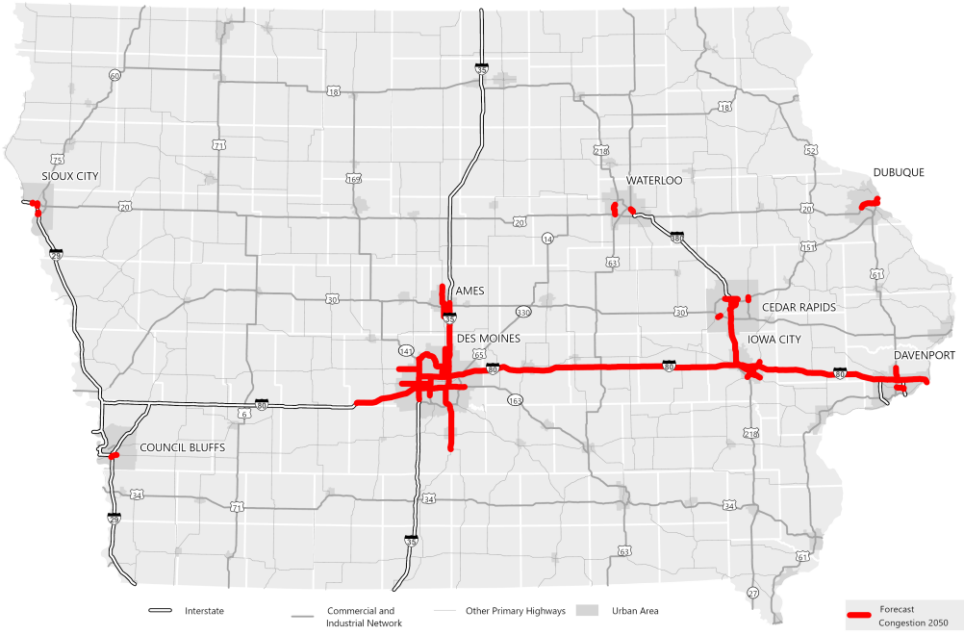
- This analysis of needs is based on **current traffic information and forecasted traffic conditions**.
- The analysis is available at the **planning corridor level**.
- In the **SLRTP matrix**, the planning corridor is highlighted for capacity if the corridor has been identified as a capacity need. "Partial" is noted if only a portion of the corridor was identified as a need.
- **For Iowa DOT staff reviewing a location's needs/risks:**
  - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP Capacity**" and only shows the corridors flagged for capacity needs in the SLRTP.
  - The entry of **"Yes" in the Need field** means the location was identified as having an **existing or future capacity need**.
  - This **PP&S data is static**, meaning it has not been updated since the SLRTP was adopted.

Additional Detail

Capacity needs were analyzed by reviewing the following.

- Statewide volume-to-capacity (V/C) conditions from the Infrastructure Condition Evaluation (ICE) tool.
- A forecast of future statewide V/C conditions utilizing the Iowa Travel Analysis Model (iTRAM).
- Forecasts for future traffic based on Iowa's nine metropolitan planning organization (MPO) travel demand models.
- Traffic forecasts conducted for corridors or specific locations.

Capacity needs were identified at a corridor level if, in general, current or forecast V/C ratios were 0.7 or higher. This involved professional judgment since existing or forecasted V/C ratios throughout a corridor could vary substantially. A corridor being identified as a capacity need does not necessarily mean that it is forecasted to be approaching or over capacity for its entire length; likewise, corridors that have not been identified may have spot locations that are forecast to have congestion issues.



For more information: Capacity maps in SLRTP SLRTP matrix

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

Key Points

- This analysis of risks is based on a location's **Potential for Crash Reduction (PCR)**.
- The analysis is available at both the **segment and planning corridor levels**.
- In the **SLRTP matrix**, the planning corridor is highlighted for safety if it has a PCR of at least one crash per mile.
- **For Iowa DOT staff reviewing a location's needs/risks:**
  - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP PCR Targeted Corridors.**"
  - The **PCR Per Year field** shows the PCR per mile per year for the planning corridor– higher numbers mean higher risks.
  - An entry of **"Y" in the Risk field** means the overall planning corridor has a **PCR of at least one crash per mile per year**.
  - This **PP&S data is static**, meaning it has not been updated since the SLRTP was adopted.

Additional Detail

The safety analysis screened the Primary Highway System for the greatest PCR on highway segments. Highway segments were divided into eight classes of roadways for the analysis; crash history, traffic volumes, and other roadway characteristics were used to develop a predicted number of crashes for these categories.

- Divided high speed
- Divided low speed
- Freeway high speed
- Freeway low speed
- Undivided high speed
- Undivided low speed
- Undivided multilane high speed
- Undivided multilane low speed

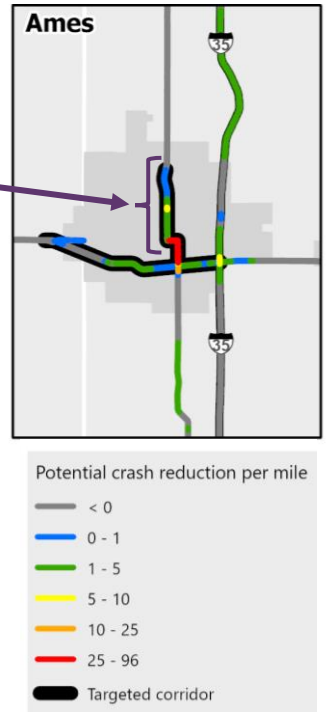
The PCR was calculated by comparing the actual number of crashes of a location to the number that would be predicted based on the location's category. A high PCR indicates a poorly performing roadway and more potential room for improvement. For the SLRTP, positive PCR per mile per year was used to gauge risk, with higher values equating to higher risks and thus more potential for improvements to help reduce future crashes.

The overall distribution of corridor-level positive PCR per mile ranged from 0.0 to 27.7, with a corridor-level average of 0.7. To identify corridors of most concern from a long-range planning standpoint, the 61 corridors that had 1.0 PCR per mile or more were identified, which would mean there is the potential to reduce crashes by at least one per mile per year throughout the corridor.

Example of how to interpret SLRTP maps

Corridor: US 69 from US 30 to Ames north city limit

- Individual segments (various colors) range from 0 to 39 PCR per mile per year.
- As a whole, the overall corridor averages 8.7 PCR per mile per year, meaning it is outlined in black as a targeted corridor in the SLRTP.



For more information:

Safety risk maps in SLRTP

SLRTP matrix

Potential for Crash Reduction web map

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

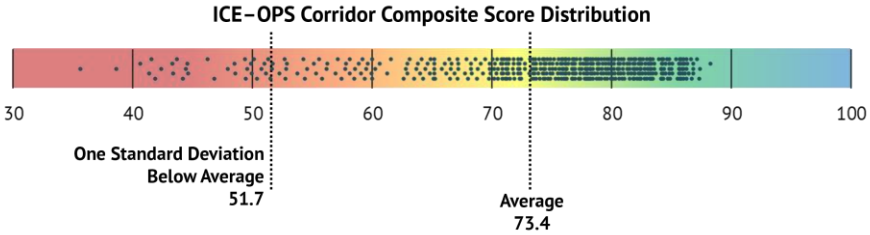
Key Points

- This analysis of risks is based on the **Infrastructure Condition Evaluation – Operations (ICE-OPS) tool**.
- The analysis is available at the **planning corridor level**.
- In the **SLRTP matrix**, the planning corridor is highlighted for operations if the corridor is one or more standard deviation below the statewide average composite score based on the ICE-OPS tool.
- **For Iowa DOT staff reviewing a location's needs/risks:**
  - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP Operations.**"
  - The **ICE OPS Composite Score field** shows the analysis output on a 0-100 scale – lower scores mean higher risks.
  - An entry of **"Y" in the Risk field** means the planning corridor is one or more standard deviation below the statewide average composite score.
  - This **PP&S data is static**, meaning it has not been updated since the SLRTP was adopted.

Additional Detail

ICE-OPS is a system screening that combines ten factors to quantify the relative risk to the safe and reliable operation of the Primary Highway System. The percentage shown is the weighting that is applied.

- Annual average daily traffic (AADT) (20%)
- Annual bottleneck duration (15%)
- Incident density (15%)
- Crash rate (15%)
- Buffer time index (10%)
- Event center proximity (5%)
- Flood event density (5%)
- Winter weather sensitive mileage (5%)
- Freight network mileage (5%)
- ICE infrastructure score (5%)



For each roadway corridor, the value for each factor was normalized on a 1 (worst) to 10 (best) scale. The ten normalized values were weighted as noted above and added together to determine a composite rating. The composite score had a maximum of 100, which means the highest possible score was assigned for each factor. Lower composite scores indicate higher risks.

The overall distribution of ICE-OPS composite ratings ranged from 35.6 to 88.2, with an average of 73.4. For the SLRTP, corridors that had a composite score that was one or more standard deviation below the statewide average were identified as risks. There are 33 such corridors which have a composite score of 51.7 or less.

For more information:

Operations risk maps in SLRTP

SLRTP matrix

Transportation Systems Management & Operations (TSMO) Plan

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

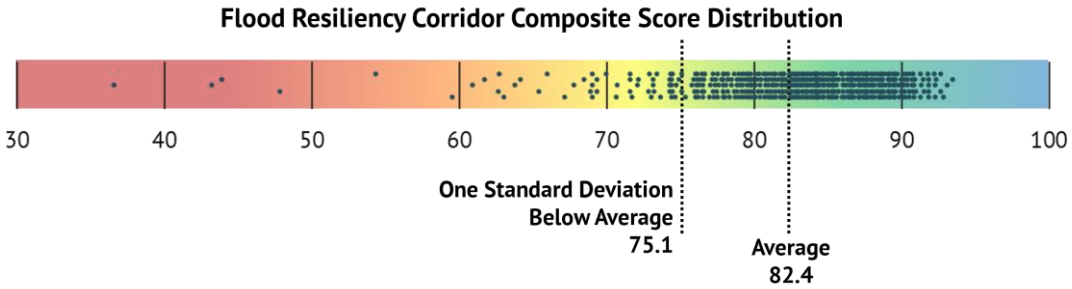
Key Points

- This analysis of risks is based on the **Flood Resiliency Analysis**.
- The analysis is available at the **planning corridor level**.
- In the **SLRTP matrix**, the planning corridor is highlighted for flood resiliency if the corridor is one or more standard deviation below the statewide average composite score based on the flood resiliency analysis.
- **For Iowa DOT staff reviewing a location's needs/risks:**
  - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP Flood Resiliency.**"
  - The **Resiliency Composite Score field** shows the analysis output on a 0-100 scale – lower scores mean higher risks.
  - An entry of **"Yes" in the Risk field** means the planning corridor is one or more standard deviation below the statewide average composite score.
  - This **PP&S data is static**, meaning it has not been updated since the SLRTP was adopted.

Additional Detail

The resiliency analysis screened the Primary Highway System to identify locations vulnerable to a 100-year flood event. The analysis included the following broad components and individual factors.

- **Robustness**: Vulnerability to a 100-year flood event
  - 100-year flood exposure and bridge scour (45%)
  - Evaluation of past flood events (15%)
  - Roadway resistance (10%)
- **Redundancy**: Extent of alternative routes
  - System availability (20%)
- **Criticality**: The most operationally important assets
  - Federal functional classification (4%)
  - Annual average daily truck traffic (4%)
  - Social vulnerability index (2%)



The value for each factor was normalized on a one (worst) to ten (best) scale, then combined based on the weighting identified above. The maximum composite score is 100; higher scores indicate greater resiliency towards a 100-year flood event, whereas lower scores indicate greater vulnerability to those events.

The overall distribution of corridor-level composite ratings ranged from 36.6 to 93.4, with an average of 82.4. For the SLRTP, corridors that had a composite score that was one or more standard deviation below the statewide average were identified as risks. There are 72 such corridors which have a composite score of 75.1 or less.

For more information: Flood resiliency risk maps in SLRTP | SLRTP matrix | Resiliency Working Group

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

Key Points

- This analysis of risks is based on the **Bicycle & Pedestrian Systemic Safety Analysis**.
- The analysis is available at the **segment level**.
- In the **SLRTP matrix**, the planning corridor percentage indicates the percent of the corridor that is one or more standard deviation below the statewide average composite score for bicyclists.
- **For Iowa DOT staff reviewing a location's needs/risks:**
  - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP Bicycle Safety.**"
  - The **Urban/Rural Bicyclist Composite Score field** shows the analysis output on a 0-100 scale – lower scores mean higher risks.
  - This **PP&S data is static**, meaning it has not been updated since the SLRTP was adopted.

Additional Detail

This systemic safety analysis estimated the relative risk to bicyclists associated with roadway features of the Primary Highway System. Past crashes involving bicyclists were analyzed to identify attributes that are correlated with a high frequency or rate of that crash type. These eight attributes were used to identify and prioritize similar roadway locations that have the greatest risk for these types of crashes, whether or not they have a history of bicyclist crashes.

- Annual average daily traffic (AADT)
- Median type
- Number of lanes
- Parking type (urban only)
- Shoulder rumble
- Shoulder type
- Shoulder width
- Speed limit

For each roadway segment, the value for each factor was normalized on a 1 (worst) to 10 (best) scale. To translate the normalized values to a composite scale, each of the normalized values were weighted equally and added together. The composite score had a maximum value of 100, which would mean the highest possible score was assigned for each factor. The lower the composite score, the higher the risk.

Interstate highways and minimum-speed corridors are excluded from the analysis. To gauge corridor-level risk, the segments were aggregated into corridors and the percentage of each corridor's length that is one or more standard deviation below the statewide average for composite scores was identified. Corridor percentages range from 0.0 to 99.7%, with an average of 10.0%.

For more information:

Bicyclist risk maps in SLRTP SLRTP matrix

Bicyclist & Pedestrian Systemic Safety Analysis: Report Story Map

Example of how to interpret SLRTP map and matrix
Corridor: US 69 from US 30 to Ames north city limit

Map: the individual segment composite scores range from 29-73.

Matrix: the entry of 61.1% means that 61.1% of the overall corridor has composite scores that are one or more standard deviation below the statewide average.

		Bike	Ped
Route	Corridor	Risks	
US 69	US 30 to Ames N CL	61.1%	66.2%

2022 State Long Range Transportation Plan (SLRTP)

Analysis Overview

Key Points

- This analysis of risks is based on the **Bicycle & Pedestrian Systemic Safety Analysis**.
- The analysis is available at the **segment level**.
- In the **SLRTP matrix**, the planning corridor percentage indicates the percent of the corridor that is one or more standard deviation below the statewide average composite score for pedestrians.
- **For Iowa DOT staff reviewing a location's needs/risks:**
  - In the Project Prioritization and Scoping (PP&S) tool, the layer name is "**LRTP Pedestrian Safety.**"
  - The **Urban/Rural Pedestrian Composite Score field** shows the analysis output on a 0-100 scale – lower scores mean higher risks.
  - This **PP&S data is static**, meaning it has not been updated since the SLRTP was adopted.

Additional Detail

This systemic safety analysis estimated the relative risk to pedestrians associated with roadway features of the Primary Highway System. Past crashes involving pedestrians were analyzed to identify attributes that are correlated with a high frequency or rate of that crash type. These eight attributes were used to identify and prioritize similar roadway locations that have the greatest risk for these types of crashes, whether or not they have a history of pedestrian crashes.

- Annual average daily traffic (AADT)
- Median type
- Number of lanes
- Parking type (urban only)
- Shoulder rumble
- Shoulder type
- Shoulder width
- Speed limit

For each roadway segment, the value for each factor was normalized on a 1 (worst) to 10 (best) scale. To translate the normalized values to a composite scale, each of the normalized values were weighted equally and added together. The composite score had a maximum value of 100, which would mean the highest possible score was assigned for each factor. The lower the composite score, the higher the risk.

Interstate highways and minimum-speed corridors are excluded from the analysis. To gauge corridor-level risk, the segments were aggregated into corridors and the percentage of each corridor's length that is one or more standard deviation below the statewide average for composite scores was identified. Corridor percentages range from 0.0 to 99.7%, with an average of 12.0%.

Example of how to interpret SLRTP map and matrix
Corridor: US 69 from US 30 to Ames north city limit

Map: the individual segment composite scores range from 23-84.

Matrix: the entry of 66.2% means that 66.2% of the overall corridor has composite scores that are one or more standard deviation below the statewide average.

		Bike	Ped
Route	Corridor	Risks	
US 69	US 30 to Ames N CL	61.1%	66.2%

For more information:

Pedestrian risk maps in SLRTP SLRTP matrix

Bicyclist & Pedestrian Systemic Safety Analysis: Report Story Map