Operational Resiliency of Beloit-Hudson Interstate Highway Corridor

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WisDOT 0092-09-10, CFIRE 01-09
May 2010

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Technical Report Documentation

<table>
<tr><td>1. Report No. CFIRE 01-09 / WisDOT 0092-09-10</td><td>2. Government Accession No.</td><td>3. Recipient's Catalog No. CFDA 20.701</td></tr>
<tr><td colspan="2" rowspan="2">4. Title and Subtitle
Operational Resiliency of the Beloit-Hudson Interstate Highway Corridor</td><td>5. Report Date May 2010</td></tr>
<tr><td>6. Performing Organization Code</td></tr>
<tr><td colspan="2">7. Author/s
Teresa M. Adams, Kaushik Bekkem, and Vicki M. Bier</td><td>8. Performing Organization Report No.
CFIRE 01-09</td></tr>
<tr><td colspan="2" rowspan="2">9. Performing Organization Name and Address
National Center for Freight & Infrastructure Research & Education (CFIRE)
University of Wisconsin-Madison
1415 Engineering Drive, 2205 EH
Madison, WI 53706</td><td>10. Work Unit No. (TRAIS)</td></tr>
<tr><td>11. Contract or Grant No. 0092-09-10</td></tr>
<tr><td colspan="2" rowspan="2">12. Sponsoring Organization Name and Address
Wisconsin Department of Transportation
Hill Farms State Transportation Building
4802 Sheboygan Avenue
Madison, WI 53707</td><td>13. Type of Report and Period Covered
Final Report [10/01/2008–04/30/2010]</td></tr>
<tr><td>14. Sponsoring Agency Code</td></tr>
<tr><td colspan="3">15. Supplementary Notes
Project completed by CFIRE with support from the Wisconsin Department of Transportation.</td></tr>
<tr><td colspan="3">16. Abstract
This research identified the top 10 high-risk (low operational resilience) segments along the I-90/94 Interstate Highway Corridor from Hudson to Beloit, Wisconsin. Resiliency in this project is a function of the vulnerability, economic importance and the alternate routes. The analysis considered both freight trucks carrying top 10 commodities and passenger vehicles. The corridor was divided into 43 segments, each starting and ending at interchanges with the state trunk highway. The evaluation metrics included alternate route distance, alternate route travel time, change in traffic volumes on the alternate routes and the change in level of service for the traffic. The vulnerabilities of the bridges, culverts, and road segments of each corridor segment were assessed for various failures modes ranging from scouring, flood scouring, traffic overloads, snow storms, and ice accumulation using a basic analysis method of FMEA (failure mode and effects analysis). The FMEA analysis resulted in risk priority numbers, which provided a rating for each corridor segment on a scale of 10 (high) to 1 (low). The evaluation metrics, along with vulnerability ratings were used to determine an overall resiliency rating for each corridor segment, thus resulting in a prioritization of the segments based on their risk resiliency.</td></tr>
<tr><td>17. Key Words
Resiliency, vulnerability, risk, commodity flows, FMEA, freight systems</td><td colspan="2">18. Distribution Statement
No restrictions. This report is available through the Transportation Research Information Services of the National Transportation Library.</td></tr>
<tr><td>19. Security Classification (of this report)
Unclassified</td><td>20. Security Classification (of this page)
Unclassified</td><td>21. No. of Pages
99

22. Price
-0-</td></tr>
</table>

Form DOT F 1700.7 (8-72) Reproduction of form and completed page is authorized.

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Table of Contents

List of Figures

List of Tables

Executive Summary

On February 6, 2008, a severe winter storm hit Wisconsin and dropped more than 13 inches of snow and ice. As the weather deteriorated, more than a thousand vehicles became stranded on a 17-mile segment of I-90 and brought movement through the corridor to a standstill. The National Guard was mobilized to deliver food and water to stranded drivers. In June of the same year excessive rains caused flooding and long detours along the I-90/94 corridor.

In 2008, Wisconsin's freight transportation system moved more than $300 billion in goods. Freight volumes in Wisconsin are projected to increase another 70 percent by 2025. Disruptions to freight movements caused by unplanned emergencies, disruptions, and disasters in the state's transportation systems have a direct and immediate effect on the economy of Wisconsin, the Midwest, and the nation as a whole by constraining the efficient flow of commodities.

These disruptions and their potential economic impact clearly demonstrate both the vulnerability of sections of the corridor and the need for a recovery strategy that includes freight system resiliency plans.

The Operational Resilience of the I-90/94 Corridor project, conducted by CFIRE in conjunction with the Wisconsin Department of Transportation, aims to provide information that will help the State of Wisconsin ensure reliable function of the major corridor between Hudson and Beloit, Wisconsin, while maintaining the normal pass-through capacity for the entire corridor. The corridor supports high volumes of freight and passenger travel and serves as a critical backbone for both freight and passenger mobility and accessibility in Wisconsin, Illinois, and Minnesota.

Transportation infrastructure resilience provides a method for mitigating vulnerabilities in transportation systems, for fortifying against disruptions, and for recovering from major natural or man-induced disasters. Resiliency measures assess the availability of alternate routes, the reduction in total delay, the adaptive use of high occupancy vehicle lanes, and the ability to transfer passenger travel to other non-single occupancy vehicles to free highway capacity and maintain freight mobility. In a freight context, resiliency is defined as the ability for the transportation system to absorb the consequences of disruptions, to reduce the impact of disruptions, and to maintain freight mobility in the face of such disruptions.

In order to study the resiliency of the I-90/94 corridor, CFIRE researchers divided the corridor into 45 segments based on the location of major state highway truck network interchanges. Each segment is the stretch of road between two such interchanges and is assigned the following attributes: route sign, length, one-way, county, annual average daily traffic, percentage of trucks, the direction or heading, and the commodity flows of the segment.

Commodity flows through the I-90/94 corridor and through each segment were ranked according to the number of truckloads per year, the number of truck tons per year and the total goods value per year. The top ten commodities were selected for further study based on value and the number of trucks flowing through the corridor. These commodities included non-metallic minerals; farm products; wood and lumber products; food and kindred products; clay, concrete, glass, or stone; pulp, paper, or allied products; petroleum or coal products; rubber or plastic products; primary metal products; and, chemicals.

Researchers performed a network analysis using ArcGIS to identify alternate routes and then scripted the analysis process to generate alternate routes for multiple segment disruptions. Alternate routes were generated for both contiguous and non-contiguous disruptions.

The project team then assessed the vulnerability of each segment by analyzing the segment's bridges, culverts, and roadway and probable failure modes (hydrologic, overload, and weather) and the probable severity of disruption in order to compute a Risk Priority Number (RPN) on a scale of 1-10. This study considered hydraulic factors such as scouring, scouring due to floods, overload factors such as traffic volumes and bridge functional classifications, and functional factors such as snow and ice accumulation, snowstorms, tornadoes, and severe winter storms.

The resiliency score for each segment was calculated using three variables: the value of the economic activity of the top ten commodities flowing through the segment; the segment's RPN; and, the availability, length, and volumes of alternate routes. Based on these calculations, CFIRE researchers identified the ten most vulnerable segments of the I-90/94 corridor.

The 10 Most Vulnerable Segments of the I-90/94 Corridor

Rank	To Intersection	From Intersection
1	I90E: 60E, M108A, Columbia Co.	I90E: 39N, M115, Columbia Co.
2	I90E: 60E, M108A, Columbia Co.	I90E: 12N, Lake Delton, Sauk Co.
3	I90E: 19E, Windsor, Dane Co.	Lodi: E, M115, Columbia Co.
4	I90E: 12E, New Lisbon, Juneau Co.	I94E: I90E, Tomah, Monroe Co.
5	I90E: 51N, M156, Dane Co.	I90E: 12E, M142, Dane Co.
6	I90E: 73N, M157, Dane County	I90E: 51N, M156, Dane County
7	I94E: 10E, M098, Jackson Co.	I94E: 121E, Osseo, Trempealeau Co.
8	I94E: 12E, M90, Eau Claire Co.	I94E: 12E, M059, Elk Mound, Dunn Co.
9	I94E: 12E, M041, Menomonie, Dunn Co.	I94E: 128N, M028, Spring Valley, St. Croix Co.
10	I90E: I94E, M142, Madison, Dane Co.	I90E: 12E, M138, Madison, Dane Co.

CFIRE researchers presented a draft report of these results to the Wisconsin DOT in February 2010. In the light of these results, the working group will: review existing and pending agency plans and the emergency procedures of trucking companies; open a discussion with agency personnel at traffic management and emergency response centers; and, identify strategically weak sections of the corridor for future network enhancements.

This project also forms the basis for future research on the operational resiliency of the I-90/94 corridor and other freight transportation corridors. Some possible future research directions include: a comparison of commodity flow data with real-time data provided by the American Transport Research Institute (ATRI) during major disruption events; traffic routing models that account for origin-destination data and the actual flow of vehicles through the corridor; and, an analysis of the transfer of response to recovery to provide strategies for re-routing traffic during disruptions.

Implementation of the research results will require the Wisconsin DOT to define infrastructure countermeasure and partnerships with local governments to satisfy six properties of freight system resiliency. *Redundancy* promotes flexibility and supports the robustness of the freight transportation system. The *autonomy of components* supports system operability when individual system components fail. *Collaboration* supports innovative problem solving, reduces miscommunication, spreads risk across stakeholder groups, and promotes network optimization. *Efficiency* allows resources to be spent on activities or projects that provide the most benefit to system users. *Adaptability* also promotes flexibility and the robustness of the transportation system. *Interdependence* spreads risk across the entire system, promotes smooth transitions across parts of the system, and promotes system efficiency.

Introduction

Transportation systems are susceptible to unplanned emergencies, disruptions, and disasters. There is often a time lag, sometimes significant, between the disruption's occurrence and the system's return to equilibrium. Transportation disruptions affect the overall economy by constraining the free and efficient flow of raw materials, work in process, and finished goods. Indirect impacts from disruptions may adversely affect the economy for years.

Very little research has been conducted on how transportation agencies should plan to facilitate economic recovery after a disaster, and few states have resiliency plans for their freight systems. The 2004 National Response Plan (NRP) calls for each state to have a full complement of plans for response to domestic incidents that encompass all hazards. Specific to transportation, it defines Emergency Support Functions (ESF) in ESF#1–Transportation and ESF#14–Long-term Community Recovery and Mitigation (MIT, 2008). But, the ESF documents only provide a general framework for recovery studies. In order to study the freight system resiliency, it is incumbent upon the states to define the resiliency studies and detailed response plan for their transportation system's recovery.

Disruptions that affect the transportation infrastructure systems ultimately constrain freight movements, and without freight movement economic productivity stops. Wisconsin's freight transportation system moves over $300 billion in goods and is critical for linking local, national, and international consumers and producers (Cambridge Systematics, 2009). Freight demand has grown significantly over the last few decades and freight is projected to further increase another 70 percent by 2025. While this level of growth is slightly lower than in other areas of the country, the projected increased usage of the state's freight system may present significant transportation challenges, particularly while revenues are down and construction costs are increasing.

Transportation infrastructure resilience is a way to mitigate vulnerabilities in transportation networks and to guide investment in transportation infrastructure to fortify against disruptions and speed recovery after a major natural or man-induced disaster (Giuliano & Golob, 1998; Chang et al., 2003). Resiliency analyses can assess the availability of alternate routes, potential total delay, the adaptive use of high occupancy vehicle lanes, and the ability to transfer passenger travel to other non-single occupancy vehicle modes in order to free highway and roadway capacity to maintain freight mobility (Giuliano & Golob, 1998).

This report presents a resiliency study of the Hudson to Beloit Interstate Highway Corridor (referred to as the "Hudson to Beloit Corridor" or simply the "corridor") that runs along I-94 in Wisconsin from Hudson to Tomah and continues along I-90 to Beloit. The corridor supports high volumes of freight and passenger travel. Recent events have shown us how truly fragile sections of the corridor can be. On February 6, 2008, a severe winter storm hit Wisconsin and resulted in over 13 inches of snow and ice. As the weather deteriorated, 1050 stranded vehicles on a 17-mile segment of I-90 severely impaired movement through the corridor. Similarly in June 2008, excessive rains caused flooding and long detours along the corridor (Figure 1). Such events plainly demonstrate the importance of understanding the resiliency of this corridor. This study is a key step for preparedness for and resiliency to unanticipated events.

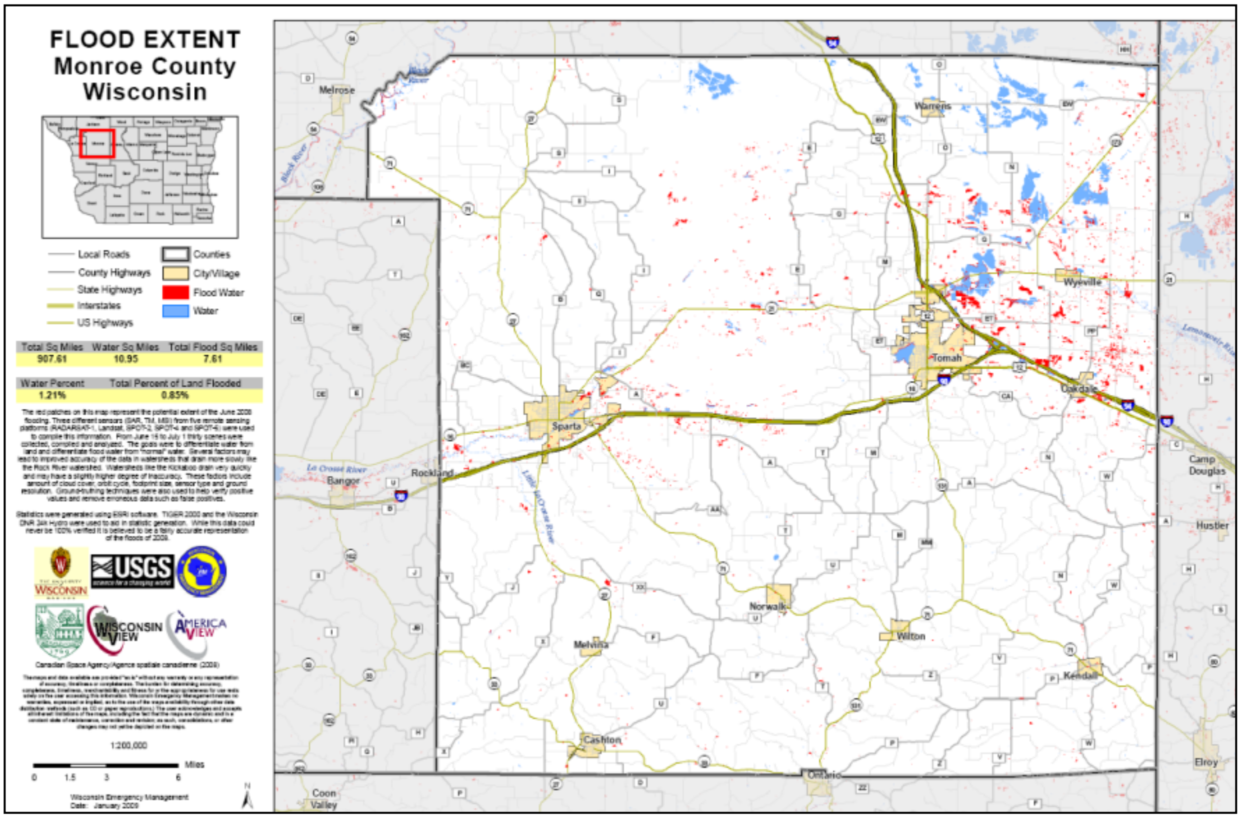

Figure 1: Flood Covering the Interstate Highways in June 2008

Literature Review

Defining Resiliency of the Freight Transportation System

The "ability for the system to absorb the impacts from a disruption and continue moving traffic in an uninhibited manner" is one definition of freight transportation system resilience (Bruneau et al., 2003). This simple definition is derived from the dictionary definition of resilience, which defines resilience as "an ability to recover from or adjust easily to misfortune or change." Goodchild et al. (2009) defined freight transportation system resilience as the ability for the system to absorb the consequences of disruptions, to reduce the impacts of disruptions, and maintain freight mobility.

Table 1 lists the broad freight system elements to be considered in a study of freight transportation resiliency (Goodchild et al., 2009). The physical freight infrastructure consists of the network of nodes and links (e.g. port facilities, freight distribution centers, warehouses, intermodal yards, bridges, rail lines, and roadways) that support freight transportation and travel. The physical network is supported by an information infrastructure connecting shippers, carriers, and customers. It must be recognized that the decisions and actions of shippers, carriers and operators affect the overall system resiliency. Various properties of resiliency are specific to the elements of a freight transportation system. The framework in Table 2 defines those properties of resiliency.

Table 1: Elements in the Freight Transportation System (Goodchild et al., 2009)

Elements Classification	Definition
Physical Infrastructure	The system of network of nodes and links (e.g., port facilities, distribution centers, warehouses, intermodal yards, bridges, rail lines, and roadways) sensors, and information technology infrastructure that support freight transportation and travel.
Managing Organization	The unit that oversees the construction, maintenance, and performance of the freight transportation physical infrastructure.
System Users	Business enterprises that move goods on the transportation infrastructure and utilize roadway information.

Table 2: Properties of Freight Transportation System Resiliency (Goodchild et al., 2009)

Properties	Physical Infrastructure Dimension	Managing Organization Dimension	User Dimension	Contribution to Freight Transportation System Resilience
Redundancy	Availability of multiple and alternate routing options.	Multiple information sources and points of delivery.	Multiple parts and materials suppliers; information backed up on distributed servers.	Promotes flexibility; supports robustness.

Properties	Physical Infrastructure Dimension	Managing Organization Dimension	User Dimension	Contribution to Freight Transportation System Resilience
Autonomy of Components	The ability of highway system to function when air space closed; independent signal controls for each intersection.	Independence of functional units in an organization, e.g. approvals and decision making can be independent of established hierarchies.	Independence of functional units in an enterprise, e.g. procurement, billing, manufacturing, and distribution.	Supports system operability despite the failure of individual system components; supports robustness.
Collaboration	Working partnership between federal, state, regional and local public agencies to plan, construct and operate the full freight transportation network to optimize system use.	Good internal communication across divisions and external communication with system users; leadership across all levels of the organization.	Public-private partnerships to build relationships between organizations.	Supports innovative problem solving, reduces miscommunications, spreads risk across groups Promotes network, versus local, freight system optimization and resiliency.
Efficiency	Network designs that reduce travel time between origin and destination.	Use of effective mechanisms to prioritize spending within the organization and on infrastructure.	Coordination across the supply chain with relationships built across the different parties.	Allows resources to be spent on activities or projects that provide most benefit to the users.
Adaptability	Designed with short life-spans and the intent for regular replacement or for the capability to expand capacity without total facility.	Familiarity of roles and responsibilities across levels of the organization; cross-trained employees; leadership can be engaged at all levels.	Ability to postpone decision making and shipping; build-to order business model.	Promotes flexibility and system efficiency; supports robustness.

Properties	Physical Infrastructure Dimension	Managing Organization Dimension	User Dimension	Contribution to Freight Transportation System Resilience
Interdependence	Seamless mode transfers; intermodal facilities.	Relationships are established across separate, but related agencies and within agencies; mutual understanding of the value and benefit from interaction.	Standardization of parts and interchangeability.	Exhibits smooth connections and transitions across parts of the system; promotes system efficiency; spreads risk across the system to reduce risk.

Measuring Resiliency

Within the literature, there are several concepts for measuring resiliency. The resilience triangle quantifies the loss of functionality from damage and disruption emerges from disaster research (Tierney & Bruneau, 2007). The resilience triangle helps to visualize the magnitude of the impacts of a disruption on the infrastructure. The depth of the triangle shows the severity of damage and the length of the triangle shows the time to recovery. One representation of the resilience triangle is shown in Figure 2 (Sheffi, 2005).

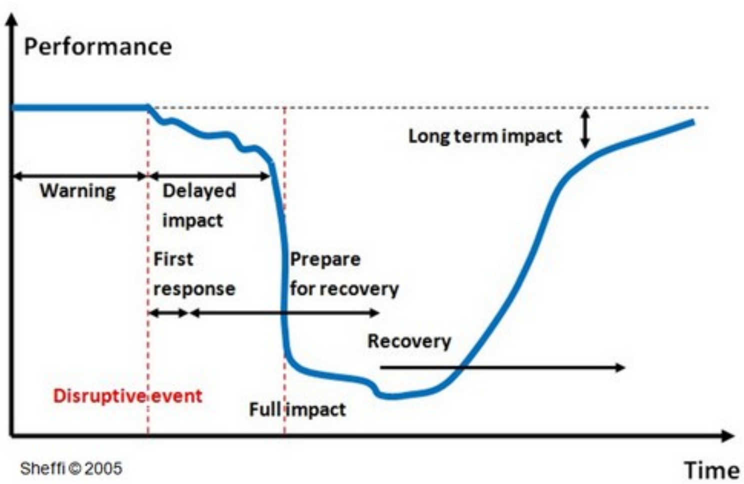

Figure 2: Resiliency Defined as Performance with Time (Sheffi, 2005)

The R4 framework of resiliency (Bruneau et al., 2003) defined four measures for resiliency.

- *Robustness*. The ability of systems, system elements and other units of analysis to withstand disaster forces without significant degradation or loss of performance.
- *Redundancy*. The extent to which systems, system elements, or other units are substitutable if significant degradation or loss of functionality occurs.
- *Resourcefulness*. The ability to diagnose and prioritize problems and to initiate solutions by identifying and mobilizing material, monetary, informational, technological, and human resources.

- *Rapidity*. The capacity to restore functionality in a timely way, containing losses and avoiding disruptions.

For transportation infrastructure, resiliency measures assess the availability of alternate routes, the reduction in total delay, the adaptive use of high occupancy vehicle lanes, and the ability to transfer passenger travel to other non-single occupancy vehicle modes so as to free highway and roadway capacity to maintain freight mobility (Giuliano & Golob, 1998).

Statewide Freight System Resiliency Planning

A process for developing a statewide freight system resiliency plan was developed for the Washington DOT (Caplice et al., 2008). The tasks for creating a resiliency plan may be grouped under three general phases, as shown in Figure 3. The phases consist of specific steps that vary from state to state.

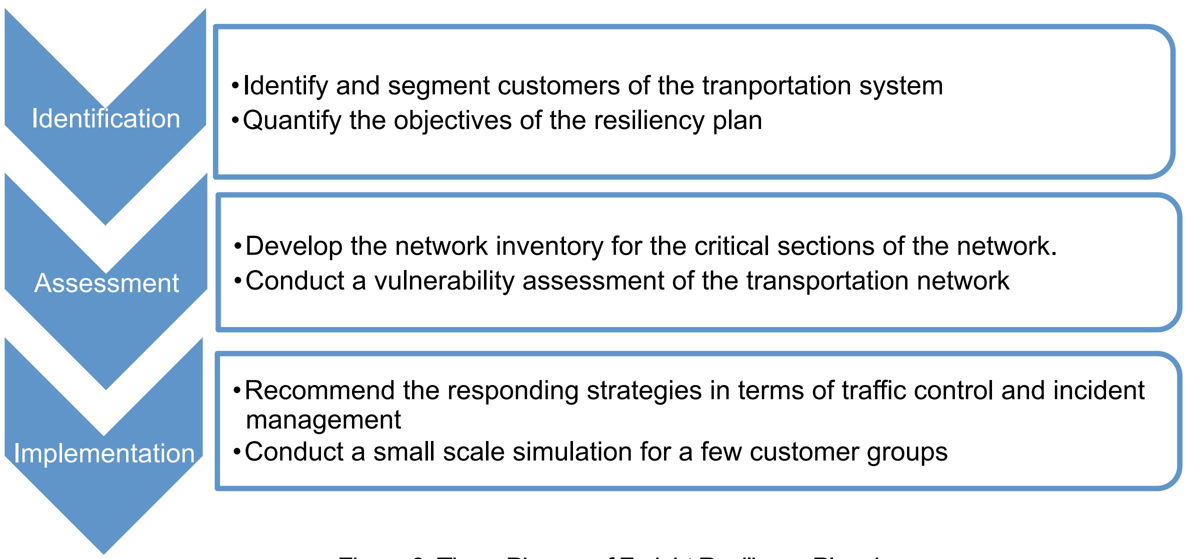

Figure 3: Three Phases of Freight Resiliency Planning

The first step is to identify and quantify the freight flows. Central players in the freight shipping community include the carriers, freight forwarders, and other agents that facilitate the movement of freight and use of the freight transportation system.

The economic cost of any disruption is conceptually measured as the time that the level of service is below the established benchmark. It is necessary to segment the study area such that the resiliency objectives for each segment can be articulated. The metrics should focus on the transportation network capabilities, not on the economic output that is out of state DOT's control. The choice of the metrics depends on the scope of the application. Caplice et al. (2008) provides examples of potential metrics which include:

- Return total commodity flow through the corridor up to X percent of the previous level within 3 days of the event.
- Identify detours that are available that will not exceed route miles or time by more than Y percent.

Or:

- Restore truck access across the entire state to X percent of the previous level.
- Restore truck access within each region of the state to X percent of previous level.
- Restore traffic congestion levels on the corridor segments within a certain service limits.

The vulnerability assessment should focus on the consequences of failure instead of the causes of the disruption. The tasks for the vulnerability assessment are:

- Identify the segments that are more vulnerable for becoming a bottleneck in the case of any disruption.
- Estimate cost of countermeasures.
- Develop a network analysis for alternate routes.
- Analyze traffic on the alternate routes and measure the resiliency along the respective segment.

George et al. (2005) suggest the following procedure for assigning risk priority numbers to the infrastructure components:

1. Brainstorm a list of potential ways that the freight system can fail. These are called failure modes. This should focus on the specific infrastructure failures, not root causes.
2. For each failure mode, identify the potential failure effects. Failure effects are simply consequences of a specific failure.
3. For each failure mode assign three rankings on a scale of 1 to 10 where 10 is most severe, most likely, and the least detectable:
   a) Severity of failure.
   b) Likeliness of failure.
   c) Detect-ability of failure.
4. Calculate a risk priority number (RPN) for each failure mode by multiplying the three rankings together. The RPN for the failure modes range from 1000 to 1, which are then converted to a range of 10 to 1.
5. Prioritize the failure modes by ranking them from highest to lowest RPN.

Freight Network Models

The resiliency for this project focuses on the restoration or recovery of the state's economy as it is affected, enabled, or disabled by the performance of the freight system. The users of the freight system include the shippers, carriers, and consumers. The Identification Phase of the Freight System Resiliency Planning process requires the profiles of freight movements segmented by mode and flow of various materials and commodities shipped (Caplice et al., 2008). A freight network model can be used to compute the flow of goods along the transportation infrastructure, and the resiliency is measured based on the specified metrics considered. Horowitz (1999) details the involved in defining the freight network model:

1. *Obtain Freight Modal Networks.* Networks are required for freight models. Networks consisting of mathematical descriptions of routes, links, and intersections are required for each mode receiving complete analysis. Networks are drawn from scratch or modified from existing sources.
2. *Develop Commodity Groups.* Vehicle traffic levels are derived from the movement of commodities. Thus, a good understanding of commodities is necessary. Because there are a very large number of commodity categories, commodities are grouped to facilitate the analysis. A large number of groups gives precision, but increases the complexity of the modeling process.
3. *Relate Commodity Groups to Industrial Sectors or Economic Indicators.* Separate economic indicators should be adopted for production and consumption of each commodity. It is easier to relate commodities to industrial indicators at the production end of the shipment. Input-output (I-O) tables can bridge the relationship to consumption of commodities.

4. *Find Base Year Commodity Flows.* Origin and destination data for commodities must be obtained to build a factual model.
5. *Forecast Growth in Industrial Sectors.* Forecasts can be obtained from a variety of governmental, private, and educational organizations.
6. *Factor Commodity Flows.* Industry forecasts can be used to forecast commodities. These forecasts can be applied to production, to consumption or to a whole commodity flow table.
7. *Develop Modal Cost for Commodities and Split Commodities by Mode.* Mode split is determined, to a large extent, by cost considerations. A cost model is the primary way to determine the impact of public policies on modal choice.
8. *Assign Vehicles to Modal Networks.* Flow matrices, by themselves, are of limited value for planning. More important are the number of vehicles that use each link, intersection, and terminal. A traffic assignment algorithm provides this information.

Figure 4 shows the structure of most freight network model methodologies (Cambridge Systematics, 1997). State level freight models provide outputs ranging from the assigned truck flow volumes by commodity to the forecasted volumes for future years. Other sources of commodity flows are the commodity flow data obtained from the US census bureau, a private freight database (TRANSEARCH ®), and input-output (I-O) coefficients (Sorratini & Smith, 2000).

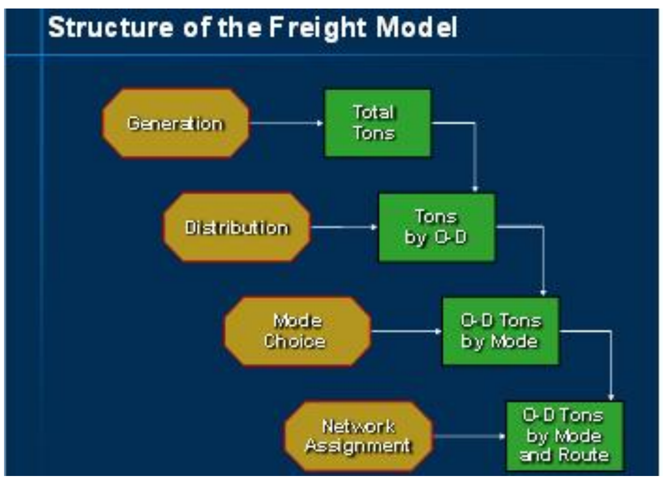

Figure 4: Freight 4-step Network Assignment Model (Cambridge Systematics, 1997)

A framework for storing and representing the flow of goods, and for considering the impact of changes to the infrastructure is necessary for a vulnerability assessment. Goodchild et al. (2008) selected a GIS framework, shown in Figure 5, for which shape files were obtained for all modes. In order to understand the economic consequences of disruption it is necessary to understand the nature of goods moving on a transportation link at a fairly detailed level.

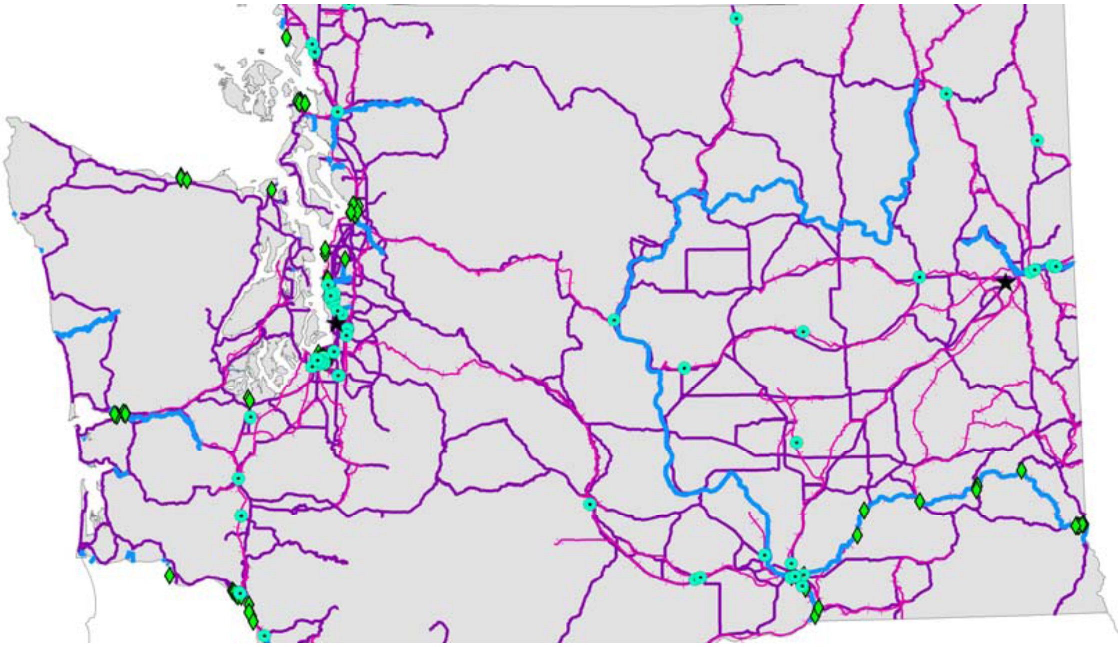

Figure 5: A Multi-modal Network for Resiliency Analysis (Goodchild et al., 2009)

Transportation network vulnerability assessment is a complex and non-linear problem (Srinivasan, 2004). The factors that affected the link level assessment are network attributes, threat attributes, flow attributes, and neighborhood attributes. It is therefore essential to obtain data quantifying the nature and extent of failure on links under the various types of failures (i.e., whether failure is defined in terms of capacity reduction or complete blockage/disruption).

Data on available alternatives to the given link is also necessary. The extent of redundancy in the system and network design configuration (e.g., the role of a link as a connector in a hub and spoke system) is also critical data elements. Further, information on the number of paths that share the given link and the availability of alternative links for certain origin-destination pairs is needed to assess the extent of disruption on the given link. A “hubs, corridors, and connectors” analysis can be used to identify the elements of the transportation system and methods for measuring vulnerability for the network links (Caplice et al., 2008). This analysis has the following steps:

1. Collect available truck count data for various highway routes and the volumes of various agricultural commodities transferred and then map them in order to find out the truck volumes for each agricultural commodity type.
2. Find the detour paths (shortest paths) where alternate paths are determined by the resiliency metrics, such as by limiting the length of shortest path with respect to original path, or restricting the percentage commodity flow.
3. Based on suitable algorithm, to find the alternate routes for each segmented corridor disruption event.

A similar methodology by Bråthen et al. (2004) revealed some of the effects of a sudden and unforeseeable incident that led to the closure of two routes.

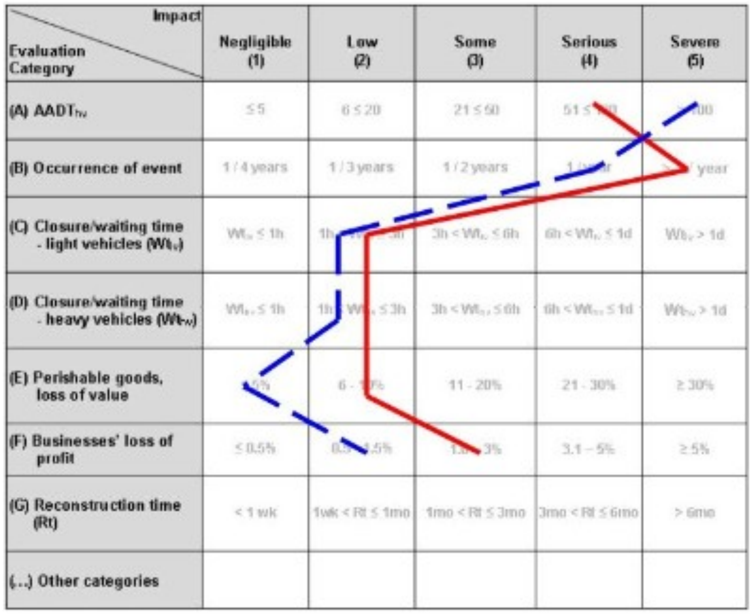

Figure 6: A Vulnerability Assessment Metrics (Bråthen et al., 2004)

In Figure 6, the evaluation metrics (A–Z) are listed on the rows. The metrics are weighted on a 0-1 scale, such that the sum of the category weights equals 1. Each weight is multiplied with the impact value 1-5. The average annual daily traffic serves as the first criteria of demand, to assess the number of users that is affected. The third and fourth criteria are waiting time or delay time, or the time it takes to drive the detour for light and heavy-duty vehicles. These categories roughly account for the difference in time values for business and leisure trips. The fifth category is the lost value of perishable goods if they are not delivered on time. Sixth, some businesses may experience a loss of profit, because important deliveries or shipments are not made. Finally, combined with the other criteria, the time (and cost) of reconstruction of this particular link serves as an additional criterion. The number of evaluation criteria must be adapted to the scenario that is investigated. With this approach it is possible to compare and evaluate a number of vulnerabilities and to find the most critical link or most vulnerable point according to the criteria used.

Methodology

The research approach is based on the framework for preparing a Statewide Freight System Resiliency plan (Caplice et al., 2008) described in Section 2.3. The approach for evaluating resiliency adapts various methods for vulnerability assessment and ranking for other literature sources. This section presents details on the research approach and intermediate results of the analysis.

Objectives and Focus

The study focuses on resiliency along the Hudson to Beloit Interstate Highway Corridor while considering the four major types of commodity flows through the corridor (E=external; I=internal):

- E-E traffic: Originates from and is destined to locations outside the corridor.
- I-E traffic: Originates along the corridor but is destined for locations outside the corridor.
- E-I traffic: Originates outside the corridor but is destined for a location along the corridor.
- I-I traffic: Starts and ends at locations along the corridor.

The objectives of the study are to evaluate the freight system resiliency along the corridor. The research recognizes the state's dependence on certain freight movements to maintain basic sustenance and the importance of the corridor to the state's economy. The study follows from the ranking of the freight commodities according to their economic importance to the state.

TRANSEARCH Commodity Flows

Regional freight modeling makes use of network models that have been populated with aggregated data to represent the modal share of freight at a certain geographic level. Network models take into account the logistics decisions of shippers and carriers for moving freight based on the commodity type and network characteristics. In practice the use of a network model requires some tradeoff decisions regarding availability of data and complexity of the models.

This research used the REEBIE TRANSEARCH® database of freight flows for the state of Wisconsin, obtained for the project analysis from the Wisconsin DOT. TRANSEARCH is a database of freight traffic flows. It utilizes a multitude of mode-specific data sources to create a picture of the nation's freight traffic flows on a market-to-market commodity basis. TRANSEARCH further refines the geographic market identification to the county level.

TRANSEARCH's county-to-county market detail is developed through the use of the Global Insight® Motor Carrier Data Exchange inputs and the Global Insight® Freight Locator database of shipping establishments. The Global Insight® proprietary Motor Carrier Data Exchange program provides information on actual market-to-market trucking industry movement activity. The Data Exchange program includes carriers from both the private and for-hire segments of the industry and both the truckload (TL) and less-than-truckload (LTL) sectors. The truckload sample covers about six percent of the market, and the Global Insight® LTL sample is about 40 percent. The samples represent over 75 million individual truck shipments. By way of comparison, the government's Commodity Flow Survey covers about 12 million shipments, spread across all modes, and the Rail Waybill's sample rate is about 2.5 percent of all rail freight movements.

The network used for this study is FHWA's National Highway Planning Network (NHPN), which is compatible with TRANSEARCH. The observed truck counts data from the Wisconsin DOT were mapped to the NHPN for Wisconsin using ArcGIS.

The research study requires the tonnage between various origins and destinations to be converted to daily trucks and then mapped to Wisconsin's roadways. TRANSEARCH has the assigned freight truck volumes that are consistent with the pattern of observed truck counts. Beagan & Grenzeback (2002), in a study for the Ohio DOT, favorably compared the pattern of truck volumes estimated by TRANSEARCH and the pattern of observed truck counts. For example, Figure 7 shows the GIS map of the calculated overall flows of 'farm products' along the network.

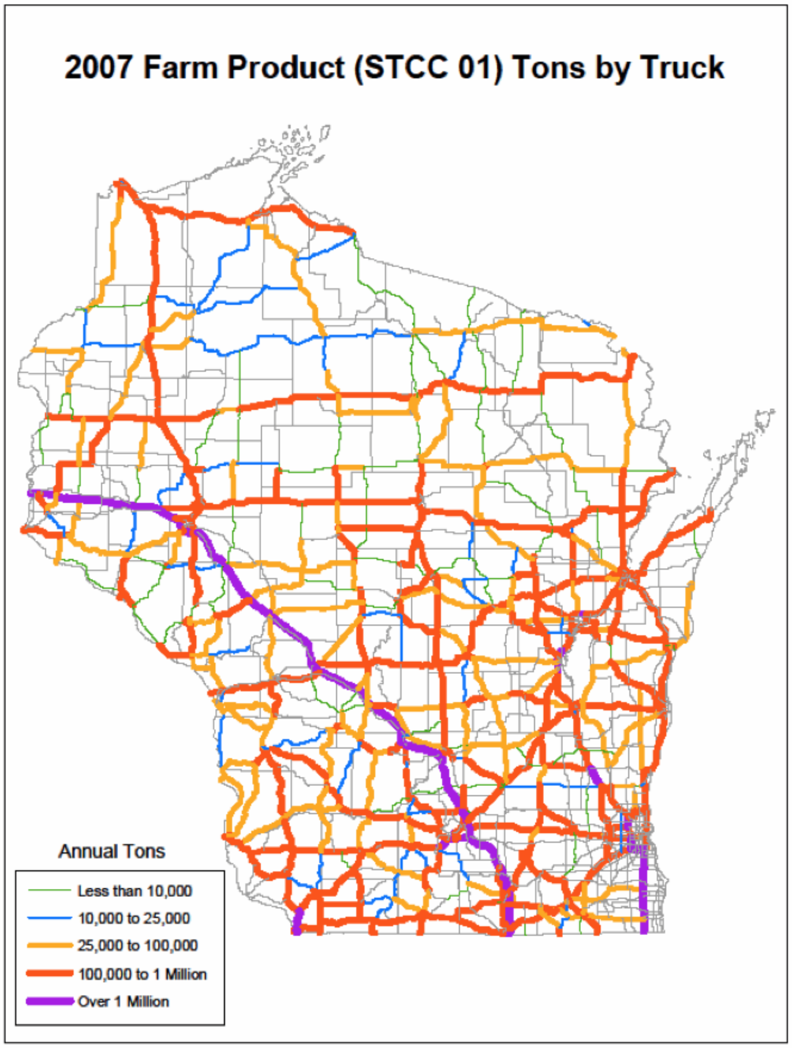

Figure 7: Calculated Flows of Farm Products along the Network

Queries extracted from the TRANSEARCH database the total value of goods carried on the trucks throughout the state of Wisconsin. Using these queries, Table 3 lists the truckloads, tonnage, and value of the top commodities for the state. Figure 8 shows the truck volume flows for two of the commodities. The maps clearly show the Hudson to Beloit Interstate Corridor is an important freight route. It carries large volumes of the state's high valued commodities.

Table 3: Truck Loads, Tonnage, and Value of Top 15 Commodities by Economic Value

STCC 2	Commodity Name	Sum of Truck Loads	Truck Tons (000's per year)	Total Goods Value (Million $/year)
50	Drayage	2260882.951	46358.24	359820.00
36	Electrical Mach/Equip/Su	458953.7947	7096.14	94212.06
35	Machinery Exc Electrical	547980.3376	7363.05	77647.52
37	Transportation Equipment	817759.0634	11314.39	64225.84
34	Fabricated Metal	630061.8202	11289.72	52601.61
33	Primary Metal	737504.4575	18053.15	48355.54
28	Chemicals/Allied	840104.3512	17221.74	46552.25
39	Miscellaneous Manufacturing	94836.63851	1837.30	38271.33
20	Food/Kindred	1513431.054	34360.09	38152.50
01	Farm	2461333.174	39363.78	23705.93
38	Instr/Optical/Watches/Clo	54796.46441	690.55	21897.00
27	Printed Matter	224022.6771	3991.55	20773.25
24	Lumber/Wood	1015926.954	26027.18	20366.98
30	Rubber/Plastics	394560.2823	5251.62	20069.18
26	Pulp/Paper/Allied	556480.0698	13172.84	17656.65

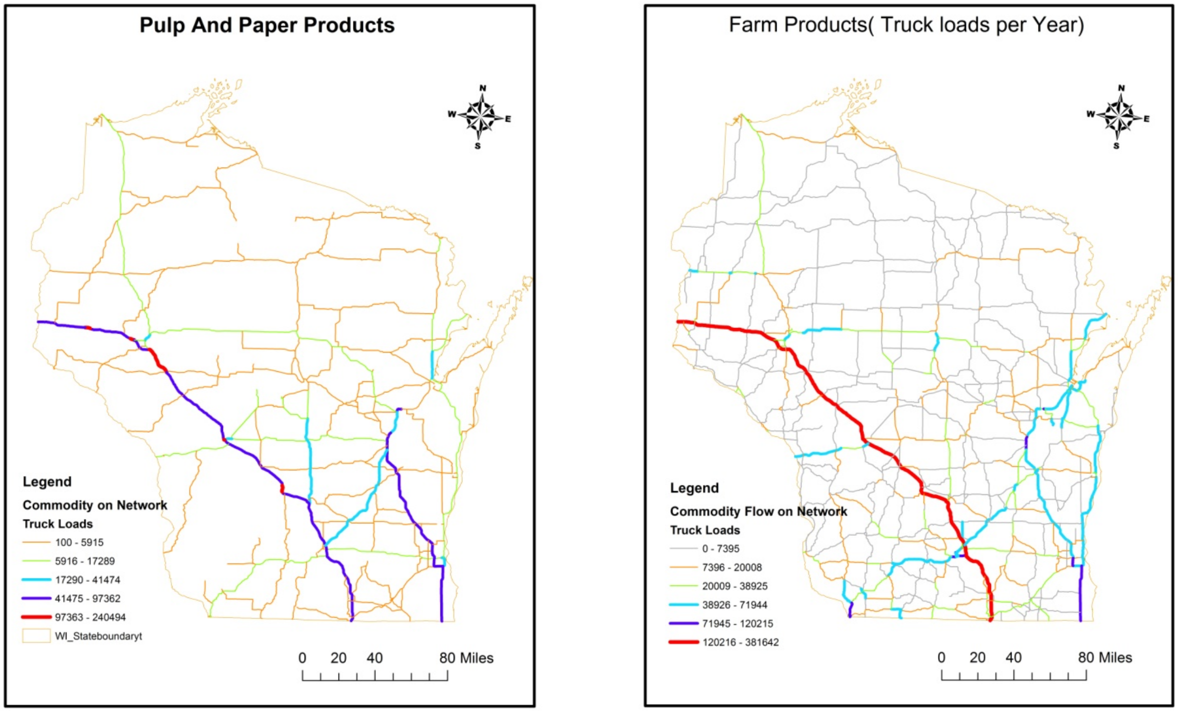

Figure 8: Truck Traffic Volumes for two of Wisconsin's High Valued Commodities

Analysis of Alternate Routes

The network analysis for this study was accomplished using ArcGIS for analyzing the network and performing spatial queries. Figure 9 shows the base network for commodity flows that was created from a spatial overlay of the state's traffic counts and the TRANSEARCH database.

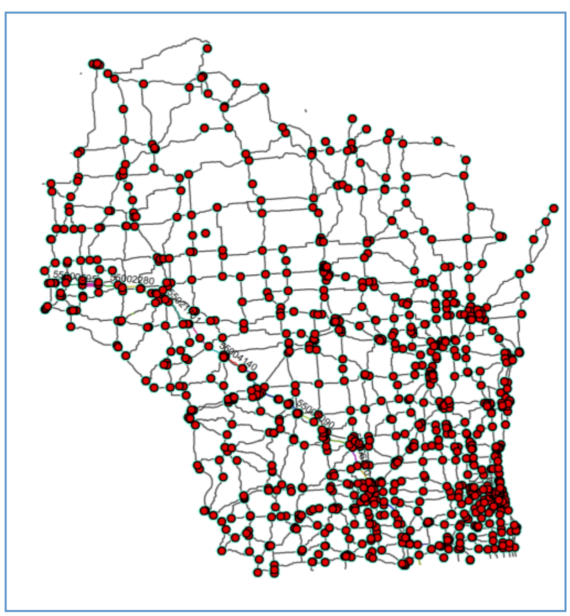

Figure 9: The Wisconsin Highway Network for use in ArcGIS®

This network has commodity flows on the individual links but does not contain enough information for network analysis to find alternate freight routes.

Figure 10 shows a screenshot of the network for route analysis built using ArcCatalog®. This network incorporates various connectivity factors and constraints of one-way, minutes/meters based shortest path, and hierarchy of roads based on the functional classes. The ArcGIS Network Analyst was used for routing considering travel directions, closest facility, and the service area origin-destination cost matrix (ArcGIS Network Analyst, ArcGIS® extensions).

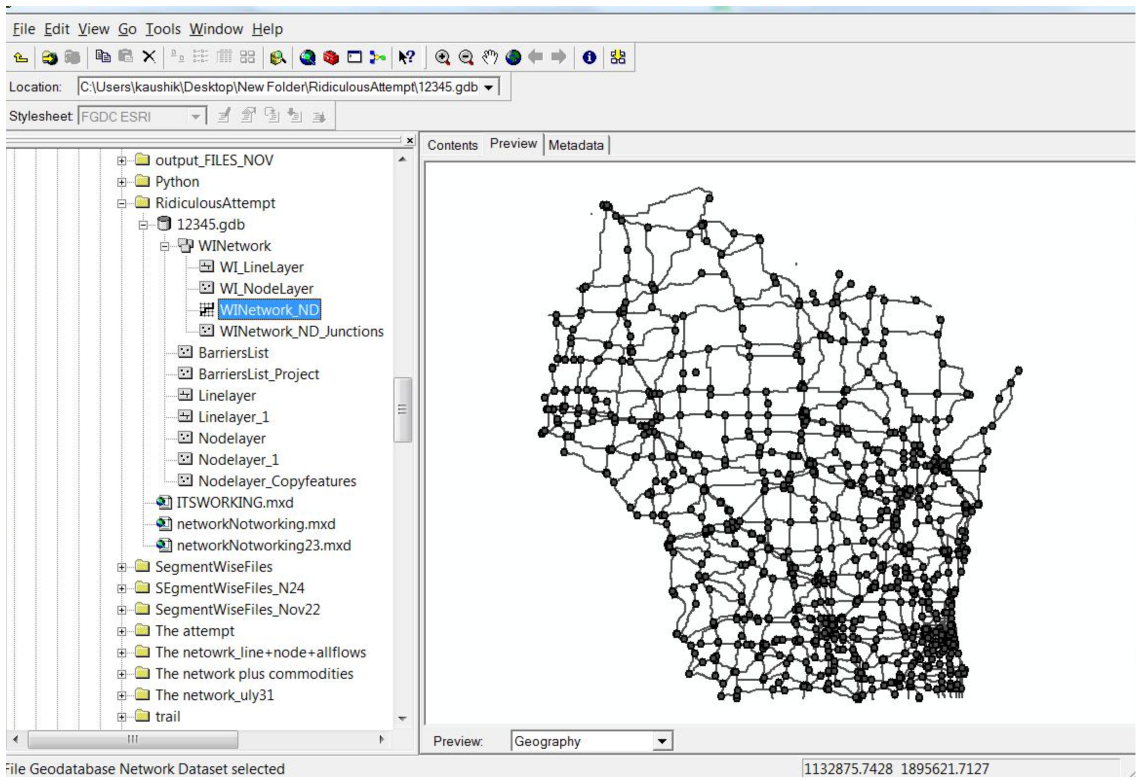

Figure 10: ArcGIS Screenshot of the Network for Analyzing Alternate Routes

Figure 11 shows the Network Analyst algorithm used for finding the alternate routes for the highway segments along the corridor. The algorithm, when provided with a list of disrupted route segments, finds the shortest path between given pairs of origin and destination points. This process creates a *route layer*, which depicts the shortest paths. The next step is to perform a spatial join of these route layers and the Wisconsin highways shape file, so that the highway attributes are joined to the alternate shortest path. These generated *shortest alternate route* shape files were then exported to MS Excel for analysis of the path length and travel time. Python scripts were written to batch process the analysis of alternative routes along the corridor. The Python scripting was also used to automate the output of the analysis results into an MS Excel worksheet.

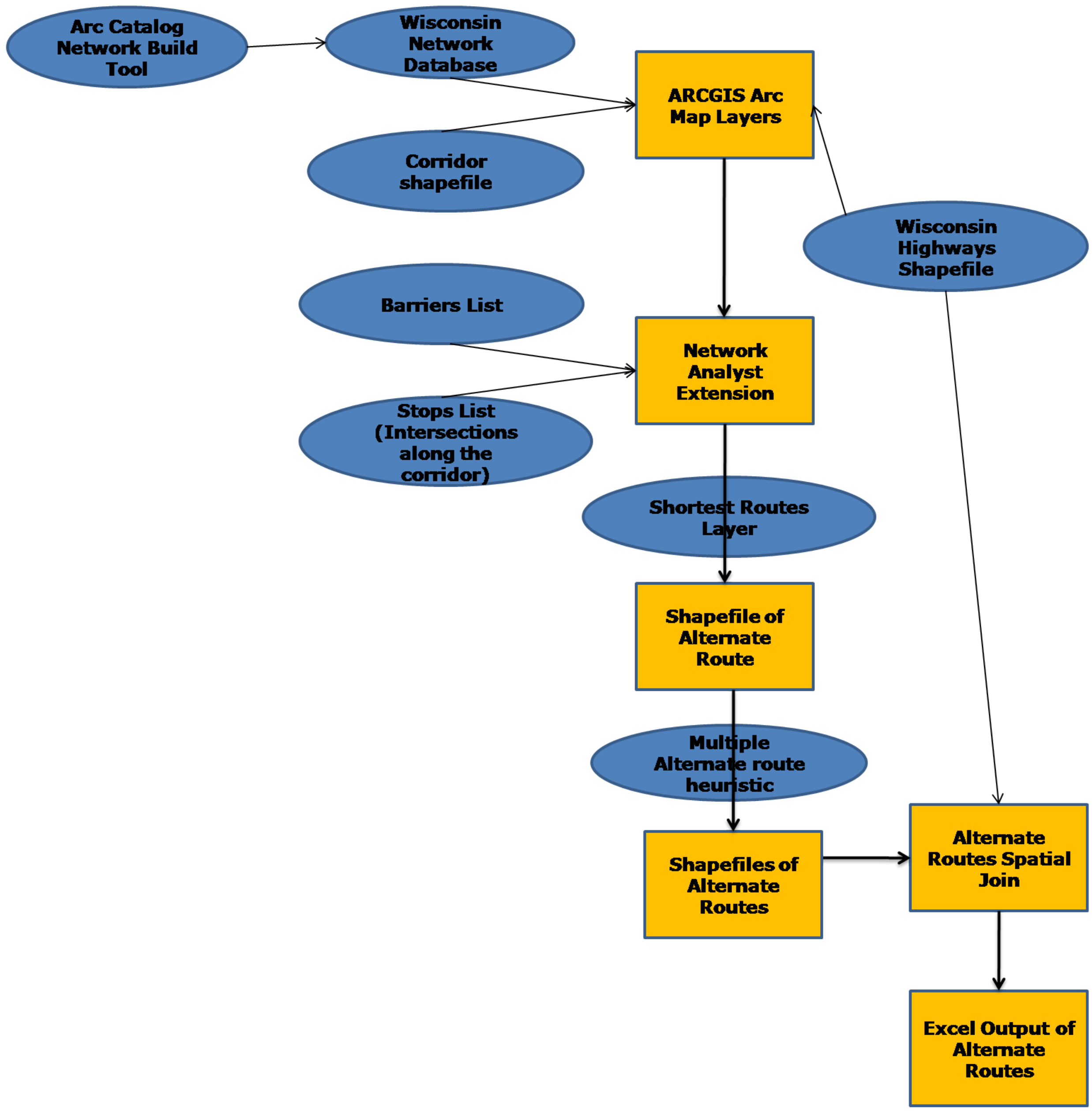

Figure 11: Algorithm for Finding Alternate Routes for O-D pairs along the Interstate Corridor

Figure 12 shows three alternate routes found using the algorithm shown in Figure 11, for the origin-destination end points of a single segment on the corridor.

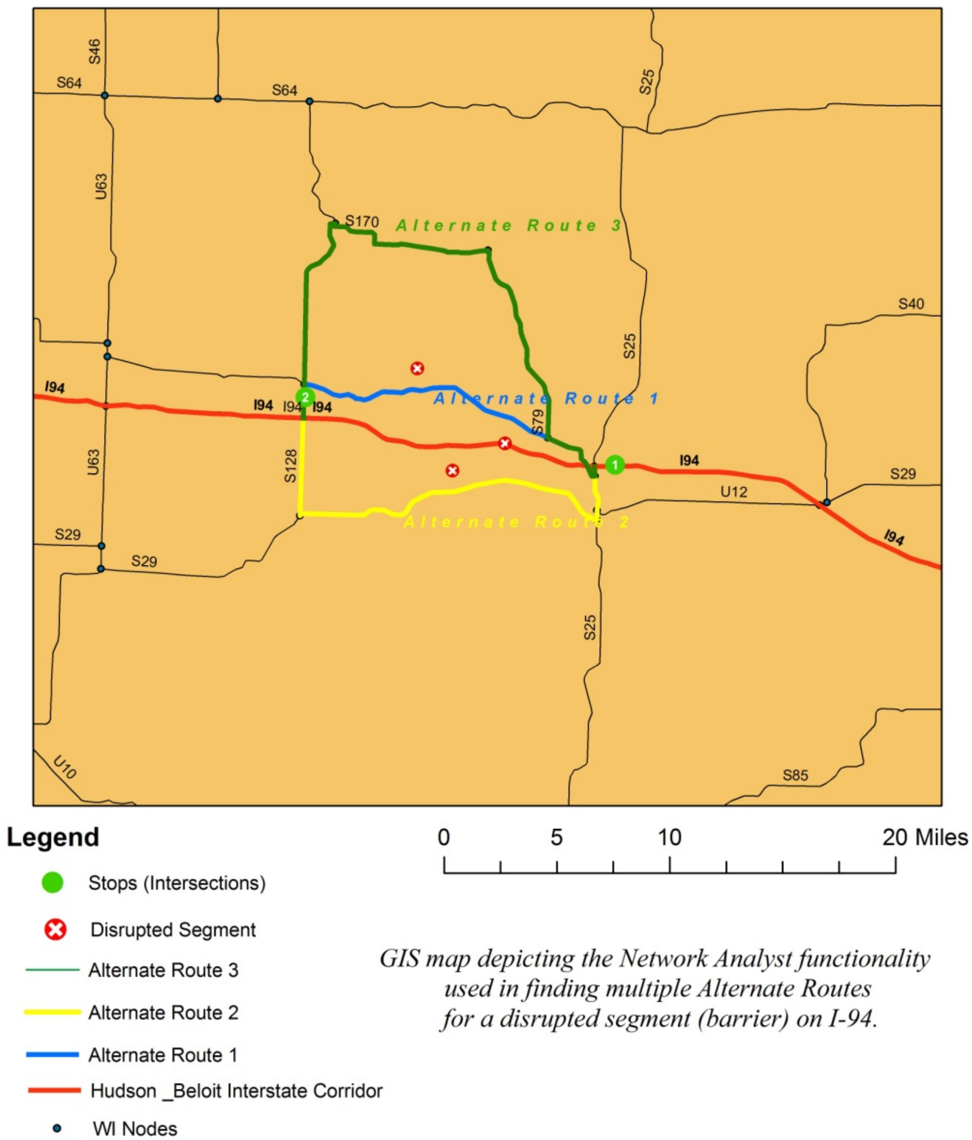

Figure 12: GIS Illustration of Alternate Routes

This analysis looked for two satisfactory alternate routes for each segment along the corridor in order to re-route the heavy volumes of traffic. Multiple detour routes improve the corridor resiliency because there is less chance of a bottleneck on the detour. Heuristics were used to find the second shortest alternate route. Both the first and second shortest alternate routes were checked against the resiliency metrics. The heuristic approach disabled each adjacent highway link progressively and checked for the shortest distance among them. This is a common method used for a sparse network.

Table 4 shows a sample analysis and output of an alternate route. The output data was analyzed to evaluate the total length and the travel time based on average speeds over the corridor segments (see Appendix B for the complete table).

Table 4: Sample Output and Analysis of an Alternate Route

SEGMENT ID	AADT	Travel time minutes	Route Length (Meters)	Functional class
Alternate Route				
55002910	5435.00	1.42	2469.22	02
55021740	4040.00	0.53	916.86	02
55021741	3153.75	8.90	15512.19	02
55021745	4180.00	0.43	747.99	02
55021746	4180.00	0.41	718.15	02
55021825	1545.71	5.90	10278.35	06
55021826	1501.67	3.86	6722.62	06
55021742	2810.00	0.44	758.56	02
55021743	2810.00	0.01	16.57	02
55021744	4180.00	0.90	1573.14	02
Net totals		22.79	39713.64	
Corridor Segment				
12	21787.27	12.30	21437.98	01

The following criteria were used to assess the feasibility of the alternative routes:

1. Route distance on the alternate route should not exceed more than twice the route distance on the corridor segment.
2. Travel time on the alternate routes should not exceed more than twice the travel time on the corridor segment.
3. The alternate routes must be able to accommodate the expected traffic volume of the corridor segment.

The analysis of alternate routes was carried out considering the top ten commodities that move through the corridor segments. Hence, the segments were prioritized according to economic importance and potential for bottlenecks on the alternate routes. In addition, the economic cost of any disruption is related to the duration of time the level of service falls below an established threshold.

Vulnerability Analysis

Several resources influenced our methodology for assessing vulnerability. Figure 13 shows the vulnerability assessment process defined by SAIC (2002). The process is consistent with the steps recommended by Caplice et al. (2008) for preparing a statewide Freight System Resiliency plan.

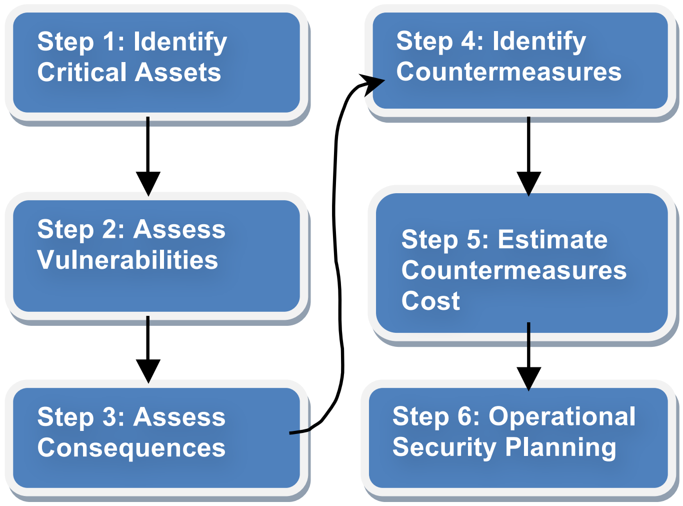

Figure 13: Vulnerability Assessment Process (SAIC, 2002)

Each segment on the corridor consists of components including bridges, culverts, and paved highway segments. Various literature resources suggest methods to assess the vulnerability of these components, especially the bridges.

The vulnerability assessment for the bridges provides a uniform measure of the structures' vulnerability to failure on the basis of the likelihood of failure occurring and consequences of the failure. The New York State DOT developed vulnerability assessment screening and evaluation procedures for its bridges as shown in Figure 14 (NYSDOT, 1996).

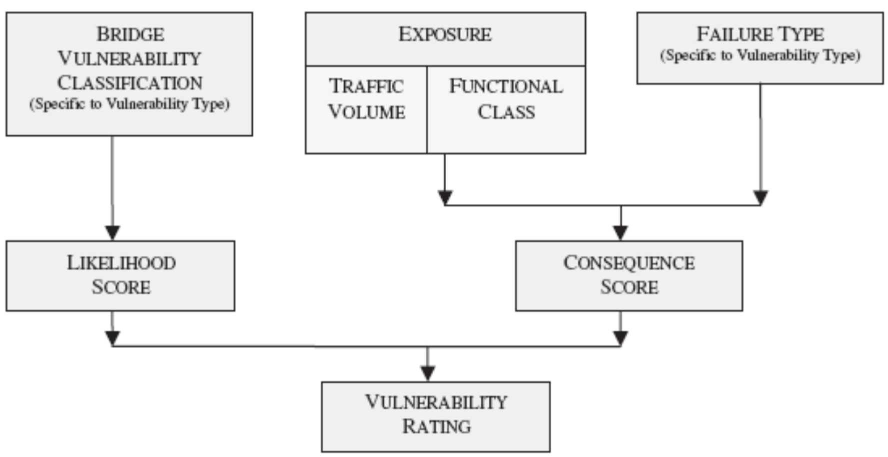

Figure 14: Vulnerability Rating Procedure (NYSDOT, 1996)

The New York State DOT uses a vulnerability rating (VR), which is the sum of likelihood and consequence scores (O'Conner, 2000). The subjective measures for likelihood (high, medium, low, or not vulnerable) are based on a classifying process that is specific to the type of vulnerability being considered. For example, if a bridge's vulnerability is low, the likelihood score is 2. The consequence score is based on the type of bridge failure (catastrophic, partial collapse, or structural damage) and the exposure to the public from that failure. Table 5 lists five vulnerability ratings used in New York State. A more detailed description of VR is available in NCHRP Report 590 (Patidar et al., 2007).

Table 5: Vulnerability Ratings used in New York State

Vulnerability Rating	Definition
1	Designates a vulnerability to failure resulting from loads or events that are likely to occur. Remedial work to reduce the vulnerability is an immediate priority.
2	Designates a vulnerability to failure resulting from load or events that may occur. Remedial work to reduce the vulnerability is not an immediate priority but may be needed in the near future.
3	Designates a vulnerability to failure resulting from load or events that are possible but not likely. This risk can be tolerated until a normal capital project can be implemented.
4	Designates a vulnerability to failure presenting minimal risk providing that anticipated conditions do not change. Unexpected failure can be avoided during the remaining service life of the bridge by performing normal scheduled inspections, with attention to factors influencing the vulnerability.
5	Designates a vulnerability to failure that is less than or equal to the vulnerability of a structure built to the current design standards. Likelihood of failure is remote.

The National Bridge Inventory (NBI) condition ratings for the decks, superstructures, substructures, and the culverts, as well as vulnerabilities to floods and scour and weather events were used to determine the vulnerability ratings for bridges and culverts. Each corridor segment was assigned a vulnerability rating considering the failure modes and disruption effects.

The procedure adopted from NYSDOT report as described above, was applied to the bridges in the Wisconsin. The final vulnerability rating was calculated using the bridge vulnerability classification (specific to vulnerability type) and exposure ratings from the historic traffic flows. The data was collected from the highway structures information (HIS) inventory of the bridges in Wisconsin. The Wisconsin DOT maintains the inventory of the bridges along the corridors of Wisconsin, and it also calculates indexes for the bridges. Bridge load ratings are performed for specific purposes, such as: NBI reporting, overweight permit load checks, and bridge maintenance planning.

Some hazardous events occur on an almost annual basis while others may not happen within the space of a lifetime. Additionally, not every hazardous event occurs with notable damage. For bridges or other critical assets, factors contributing to each of the different failure modes are generally so unique and diverse that no meaningful relations exist between them (NYSDOT, 1996). Therefore, it is necessary to rate the vulnerability of structures across different failure modes based on the type of action needed. For this reason, we used a Failure Mode and Effect Analysis (FMEA) approach to analyze the potential impacts that may result from a failure. This general method, described below, can be used for all critical assets and components. The process of conducting a vulnerability assessment is based on a review of the intensity and frequency of hazards and an analysis of the physical, economic dimensions of vulnerability and exposure, while taking into account the coping capabilities pertinent to the risk scenarios (ISDR, 2004).

The priority of each segment is based on a normalized *risk priority rating*. The risk priority number (RPN) is calculated by using standard FMEA, which analyzes a design by identifying individual components, determining potential failure modes of these components, determining the effects, and then determining the cost of these effects. The procedure is shown in Figure 15.

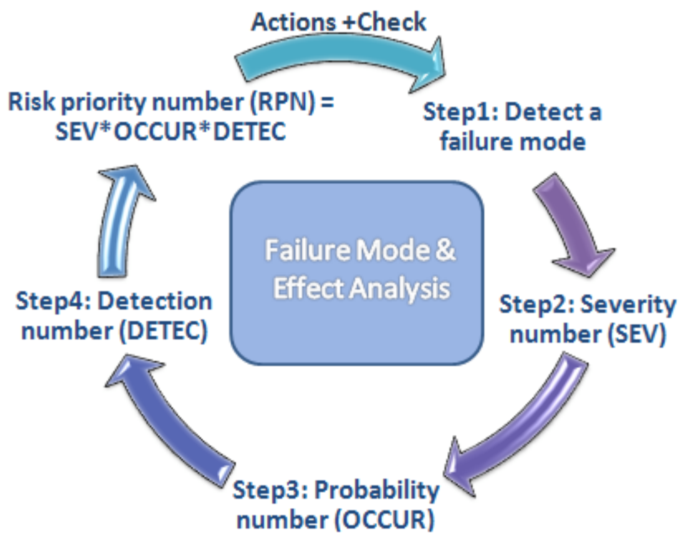

Figure 15: FMEA Procedure for Calculating the Risk Priority Number

For this project, we analyzed the segments of the corridor considering different type of disruptions that might occur including the following:

1. Hydraulic Factors
    a. Scouring
    b. Flood scouring
2. Bridge Overload
    a. Traffic volumes
    b. Functional class
3. Weather
    a. Snow or ice
    b. Snow storms
    c. Tornadoes
    d. Severe storms

The Wisconsin State Emergency Response Management Center maintains a map showing the historic frequency of environmental emergencies at the county level (Figure 16).

Figure 16: Natural Disaster Events in Wisconsin by County 1990-2002

Shanely et al. (2006) describe a methodology for vulnerability assessment due to flooding disruptions in Wisconsin. The research follows Shanely et al.'s methodology to perform the vulnerability assessment for the corridor. The most important spatial data sets for the analysis are flood hazard maps from the Federal Emergency Management Administration (FEMA, 2004), digital elevation models (DEMs), road centerlines, and bridges.

Figure 17 shows the location of major water bodies along the corridor. Flooding is one of the major causes of disruption along the corridor. The data was utilized along with DEM maps to perform the vulnerability assessment.

Figure 17: Locations of Bodies of Water along the Corridor

For snow related failures, winter severity data was used. The data was obtained from the Wisconsin DOT's Annual Winter Maintenance Report (2008). Developed in 1995, the severity index is a function of:

- Number of snow events
- Number of freezing rain events
- Total snow amount

Alternate Routes, Vulnerability and Resiliency Assessments

The methodology described in Section 3 was the basis for assessing the corridor segments. This section provides detailed results of the overall resiliency assessment.

The Corridor

Figure 18 shows the study consisting of 44 corridor segments, numbered from 0 to 43, occurring between consecutive interchanges.

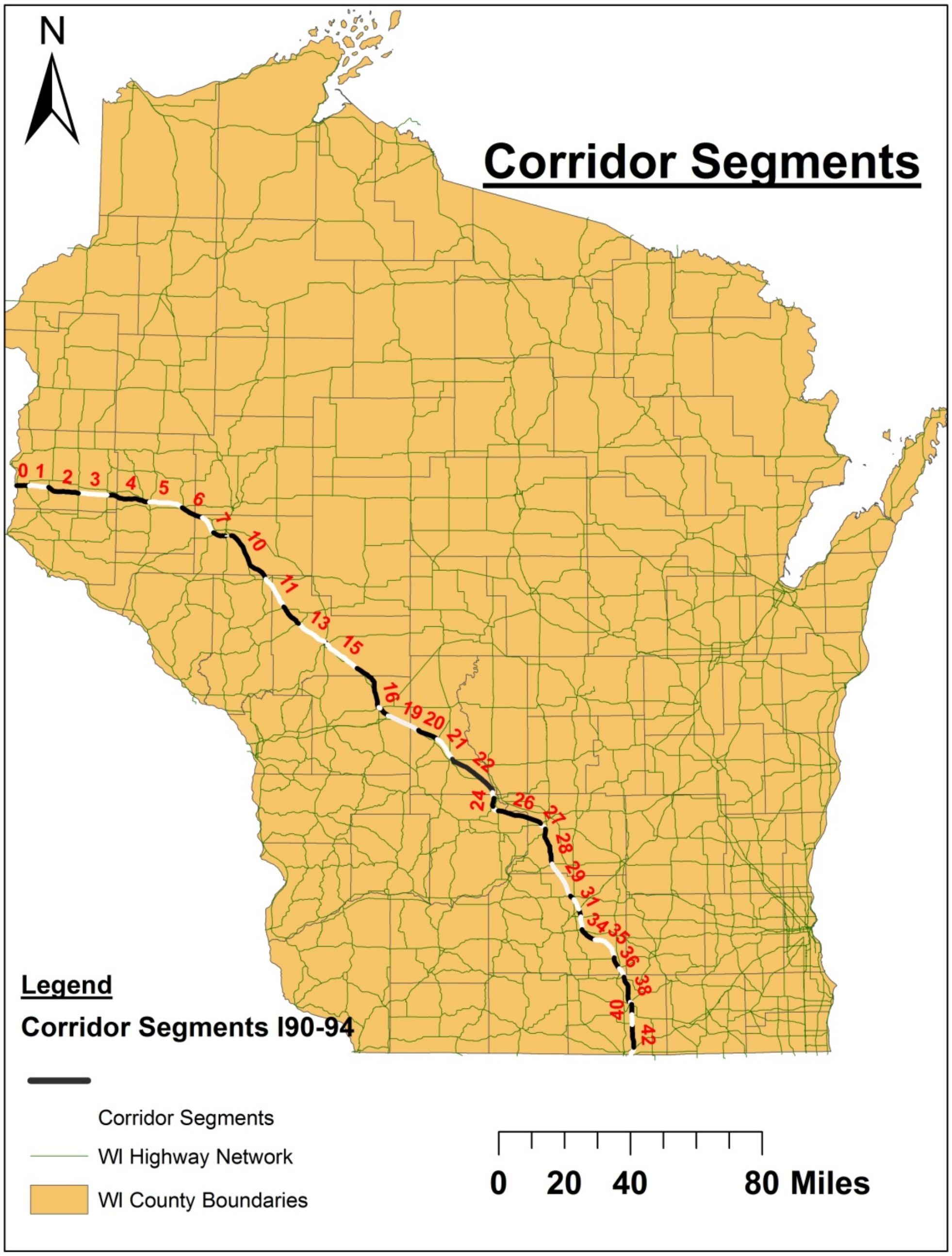

Figure 18: Segment Numbering along the Hudson to Beloit Interstate Corridor

Table 6 lists the attributes of each segment (see Appendix A for additional attributes of each corridor segment).

Table 6: Attributes of the Corridor Segments

Corridor Segment ID	Wisconsin Segment ID	County
0	55000570	St Croix
1	55000591	St Croix
2	55000595	St Croix
3	55000490	St Croix
4	55021480	St Croix
5	55002280	Dunn
6	55021691	Dunn
7	55002410	Eau Claire
8	55002461	Eau Claire
9	55002474	Eau Claire
10	55021701	Eau Claire
11	55021834	Trempealeau
12	55021834	Jackson
13	55004130	Jackson
14	55004100	Jackson
15	55004140	Jackson
16	55021836	Jackson
17	55010750	Monroe
18	55004170	Monroe
19	55021892	Juneau
20	55005070	Juneau
21	55005080	Juneau
22	55005090	Juneau
23	55009970	Juneau
24	55009980	Sauk
25	55005200	Sauk

Corridor Segment ID	Wisconsin Segment ID	County
26	55021999	Columbia
27	55006680	Columbia
28	55006830	Columbia
29	55022066	Columbia
30	55007870	Dane
31	55008801	Dane
32	55007894	Dane
33	55008020	Dane
34	55008211	Dane
35	55008218	Dane
36	55008220	Dane
37	55022097	Dane
38	55008561	Rock
39	55008580	Rock
40	55009190	Rock
41	55008931	Rock
42	55008931	Rock
43	55008780	Rock

Alternate Routes

Table 7 shows an excerpt of the assessment of alternative routes along the corridor. This table was obtained from GIS analysis of Wisconsin's highway network model as described in Section 3.3 (see Appendix C for the full table of alternate routes). The percent change rows contain the results from evaluating an alternative route according the assessment criteria described above. The table columns include:

- *Truck %*. Percentage of trucks in the traffic stream.
- *AADT*. Average Annual Daily Traffic.
- *Length*. Length of the highway feature, in feet
- *Travel Time*. Time in minutes required to travel per the posted average speed.
- *Total Truck Tons*, *Total Truck Loads*, and *Total Truck Value* of the top ten commodities passing over the highway segment.

The analysis of alternate routes was carried out considering the top ten commodities on each of the corridor segments. The alternate routes are considered for resiliency assessment using the metrics designated in the methodology section. The segment is defined as the section of the corridor in between two consecutive interchanges.

Table 7: Evaluation of Alternate Routes

Corridor Segment ID	Alternate Route	Alternate Route ID	Truck %	AADT	Length (ft)	Travel Time (min)	Total Truck Tons	Total Truck Loads	Total Truck Value ($)
1			0.127	40201	9041.762	5.188	42876487	2254299	2.40E+11
	1	55000581	0.0988	18557	11648.05	6.684	0	0	0
		55010960	0.0505	11395	3481.624	1.997	626956	34469	2611872993
		2	0.0842	31032	802.2121	0.460	43653928	2300945	2.42E+11
	Alternative 1		0.0988	31032	15931.88	9.142			
	Difference		0.02813	9169	-6890.12	-3.953			
	% change			22.808	-76.203	-76.203			
	2	55000601	0.17066	28773	10601.1	6.0833	289593	19426	183623158
		55011690	0.08422	13306	11338.74	6.506	39502	2694	8557139
	Alternative 2		0.171	28773	21939.84	12.590			
	Difference		-0.0437	11428	-142.65	-7.401			
	% change			28.427	-142.65	-142.65			

Vulnerability Assessment

A vulnerability rating was computed for each corridor segment following the methodology described in the Section 3.4. The vulnerability rating is expressed as a risk priority number (RPN) on a relative scale of 1-10.

The vulnerability assessment considered a range of failure modes that might occur on the roadway and bridge/culvert elements comprising the corridor segments. The following is a list of the failures modes considered.

- Scouring
- Scouring due to Floods
- Traffic volumes
- Functional classification and traffic exposure of bridge
- Snow and ice accumulation
- Tornadoes
- Severe winter storms

The vulnerability assessment of the bridges considered the Sufficiency and NBI ratings (FHWA, 1995), which were extracted from Wisconsin DOT Highway Structures Inventory (HIS). Appendix C lists the bridges and culverts along the corridor that were included in the vulnerability assessment.

The vulnerability assessment of the roadways considered the potential for flooding and severe winter storms. The roadway along the corridor was divided into 350 one-mile sections. The location of the center point of each roadway section determined the corridor segments to which it was assigned. The vulnerability to flooding considered the elevation and distance from nearby rivers, creeks or lakes. The vulnerability for snow events considered the Winter Severity Index.

The net rating for each corridor segment was calculated by averaging the risk priority number for the individual elements on the segment.

Average Risk Priority Number = Average (Ratings of Bridges + Rating of Roadway Elements

The average priority numbers for the corridor segments, based on the vulnerability of the bridges and roadway elements, are listed in column 4 of Table 8.

Resiliency Assessment

The resiliency assessment depends on disruption-related risks. The risk assessment is based on both the vulnerability and the exposure of the infrastructure. The analysis entails identification of the various elements of the transportation system, and the corresponding vulnerabilities and the disruption effects.

Table 8 summarizes the assessment characteristics for each segment on the corridor including: economic activity on the segment, risk priority number (RPN) obtained from the vulnerability assessment, segment length, and length of the alternative routes available for the segments.

Table 8: Resiliency Performance Measures for Corridor Segments

Corridor Segment ID (1)	STHN Segment ID (2)	Economic Activity ($M/day) (3)	Risk Priority Number (10=High) (4)	Length (meters) (5)	Alternative Route (6)	Alternative Length (m) (7)
1	55000591	658.1086	6.00	9041.76	1	15931.88
					2	21939.84
2	55000595	653.8179	6.15	14400.91	1	22642.17
					2	40621.96
3	55000490	654.5898	6.33	13270.44	1	19102.88
					2	31223.85
4	55021480	686.8686	8.43	15530.74	1	25162.36
					2	31225.26
5	55002280	646.4308	9.40	15682.98	1	18229.42
					2	92843.24
6	55021691	646.7793	7.33	6751.91	1	42929.77
					2	51933.58
7	55002410	620.8091	4.42	8856.70	1	11860.57
					2	19247.55

Corridor Segment ID (1)	STHN Segment ID (2)	Economic Activity ($M/day) (3)	Risk Priority Number (10=High) (4)	Length (meters) (5)	Alternative Route (6)	Alternative Length (m) (7)
8	55002461	615.8543	4.57	5812.90	1	9441.00
9	55002474	613.6574	3.75	2777.78	1	5984.99
10	55021701	813.2806	4.75	24562.05	1	29089.78
					2	43787.84
11	55021834	751.8051	6.07	10437.98	1	51822.02
					2	62793.05
12	55021834	751.8051	5.00	10938.98	1	51822.02
					2	62793.05
13	55004130	664.0051	6.11	14676.90	1	31006.43
14	55004100	665.9607	6.00	2035.43	1	3476.31
15	55004140	663.7934	6.21	17705.87	1	20734.57
					2	87783.78
16	55021836	716.4767	7.00	16242.63	1	22265.11
					2	90626.66
17	55010750	809.5292	7.25	620.80	1	946.40
18	55004170	671.9690	7.50	5205.97	1	10143.02
19	55021892	766.0396	7.17	11217.61	1	19403.27
					2	62162.38
20	55005070	713.3563	6.31	9684.36	1	10424.79
					2	68836.82
21	55005080	707.2032	6.33	11511.64	1	13165.99
					2	30046.58
22	55005090	703.4161	6.25	24766.06	1	28160.93
					2	37807.48
23	55009970	833.4282	7.91	1837.26	1	4685.01
24	55009980	833.5560	8.14	3874.80	1	6690.89
25	55005200	700.6581	7.78	3508.66	1	3997.45

Corridor Segment ID (1)	STHN Segment ID (2)	Economic Activity ($M/day) (3)	Risk Priority Number (10=High) (4)	Length (meters) (5)	Alternative Route (6)	Alternative Length (m) (7)
					2	25835.09
26	55021999	795.5134	7.94	14051.63	1	31257.16
					2	28619.70
27	55006680	695.1750	8.00	3615.54	1	7110.23
28	55006830	724.1036	7.68	16741.60	1	34117.18
					2	57056.98
29	55022066	753.1934	7.08	11932.91	1	24425.29
					2	31817.22
30	55007870	730.0630	6.86	2255.44	1	3189.42
31	55008801	817.9029	6.40	4897.48	1	8710.95
					2	15947.14
32	55007894	760.5846	6.75	2306.47	1	6852.58
					2	8758.51
33	55008020	649.5510	6.35	5954.11	1	11273.55
					2	21039.71
34	55008211	633.0614	6.53	7861.24	1	9222.95
					2	30335.48
35	55008218	633.0614	6.50	13624.77	1	34468.08
36	55008220	633.0614	6.60	5636.59	1	28831.48
37	55022097	650.6523	5.69	3263.99	1	7752.96
38	55008561	650.6523	5.04	12389.06	1	17918.30
					2	18950.31
39	55008580	712.5319	4.86	1197.02	1	1701.69
40	55009190	727.2971	5.14	4760.61	1	8745.71
					2	9485.03
41	55008931	699.1768	4.56	3053.27	1	25440.18
					2	27848.72

Corridor Segment ID (1)	STHN Segment ID (2)	Economic Activity ($M/day) (3)	Risk Priority Number (10=High) (4)	Length (meters) (5)	Alternative Route (6)	Alternative Length (m) (7)
42	55008931	699.1762	4.56	12053.36	1	25440.18
					2	27848.72

The corridor segments were ranked according to their *Inverse Resiliency Value.* The inverse resiliency value for each segment, *cs*, is a dimensionless measure computed as follows:

$$(\text{Resiliency Value})_{cs}^{-1} = RPN_{cs} * \left(\frac{\$}{day}\right)_{cs} * \sum_{i} \Delta VMT_i$$

Where, ΔVMT_i is the extra vehicle miles travelled on each alternate route, *i*,

$$\Delta VMT_i = \left(AADT_{cs} - AADT_i\right) * \left(L_i - L_{cs}\right)$$

And $\left(\frac{\$}{day}\right)_{cs}$ is the average economic activity on the Corridor segment, *cs*,

$$\left(\frac{\$}{day}\right)_{cs} = \frac{\text{total annual value of commodities flowing on segment cs}}{365}$$

Table 9 lists the inverse resiliency value for each segment. The higher the inverse resiliency value, the more resilient the segment is. The ten segments with lowest inverse resiliency value, and thus classified as high priority, are highlighted in Table 10. These top ten high-risk segments are identified in Table 10 by their end point intersections on the Hudson to Beloit Interstate Corridor. The relative magnitudes of the inverse resiliency values indicate the relative priority. For example, the top ranked segment has an inverse resiliency value more than three times greater than the lowest ranked segment. This indicates a wide range of resiliency among these least resilient segments. Note that corridor segments 12 and 41 are not shown in Table 9 due to the lack of commodity flow information (TRANSEARCH) for highway segments along STH-121 and a recently constructed southern bypass of WI-11 around Janesville.

Table 9: Resiliency Value and Risk Priority Segments

Corridor Segment ID	Average Economic Activity ($M/day)	Vulnerability Rating (Scale of 10)	Alternate Route	Extra Vehicle Miles Travelled	Inverse Resiliency Value 1,000,000
1	658.1086	6.00	1	173120.9	683.5943
			2	324076.5	
2	653.8179	6.15	1	195762.8	787.6505
			2	622854.2	
3	654.5898	6.33	1	128454.2	532.5372

Corridor Segment ID	Average Economic Activity ($M/day)	Vulnerability Rating (Scale of 10)	Alternate Route	Extra Vehicle Miles Travelled	Inverse Resiliency Value 1,000,000
			2	395407.9	
4	686.8686	8.43	1	190244.6	1101.387
			2	309999.6	
5	646.4308	9.40	1	57690.6	350.5541
			2	1748093.3	
6	646.7793	7.33	1	333198.1	1580.375
			2	416123.1	
7	620.8091	4.42	1	22670.8	62.22296
			2	78422.0	
8	615.8543	4.57	1	67165.2	189.0924
9	613.6574	3.75	1	41924.4	96.47699
10	813.2806	4.75	1	77104.9	297.8625
			2	327404.9	
11	751.8051	6.07	1	413741.0	1888.533
			2	563134.0	
13	664.0051	6.11	1	241549.5	980.1618
14	665.9607	6.00	1	22979.5	91.82064
15	663.7934	6.21	1	50049.2	206.4532
			2	1158037.4	
16	716.4767	7.00	1	78989.8	396.1603
			2	975606.8	
17	809.5292	7.25	1	4270.6	25.06431
18	671.9690	7.50	1	70860.1	357.1182
19	766.0396	7.17	1	193829.7	1064.116
			2	1206329.7	
20	713.3563	6.31	1	15354.2	69.08832

Corridor Segment ID	Average Economic Activity ($M/day)	Vulnerability Rating (Scale of 10)	Alternate Route	Extra Vehicle Miles Travelled	Inverse Resiliency Value 1,000,000
			2	1226647.6	
21	707.2032	6.33	1	29499.8	132.128
			2	330508.8	
22	703.4161	6.25	1	78002.9	342.928
			2	299648.0	
23	833.4282	7.91	1	58944.0	388.5385
24	833.5560	8.14	1	49750.2	337.6806
25	700.6581	7.78	1	9944.2	54.19137
			2	454223.3	
26	795.5134	7.94	1	456376.6	2884.26
			2	386418.1	
27	695.1750	8.00	1	81897.6	455.4651
28	724.1036	7.68	1	564000.2	3136.47
			2	1308611.9	
29	753.1934	7.08	1	528805.8	2821.242
			2	841708.7	
30	730.0630	6.86	1	22061.4	110.4428
31	817.9029	6.40	1	163788.4	857.3633
			2	474583.0	
32	760.5846	6.75	1	188159.1	965.9989
			2	267043.8	
33	649.5510	6.35	1	250769.8	1034.816
			2	711168.1	
34	633.0614	6.53	1	43530.2	180.0409
			2	718438.4	
35	633.0614	6.50	1	641137.9	2638.217

Corridor Segment ID	Average Economic Activity ($M/day)	Vulnerability Rating (Scale of 10)	Alternate Route	Extra Vehicle Miles Travelled	Inverse Resiliency Value 1,000,000
36	633.0614	6.60	1	549815.5	2297.242
37	650.6523	5.69	1	118200.1	437.7793
38	650.6523	5.04	1	156987.7	514.8078
			2	186288.8	
39	712.5319	4.86	1	13837.3	47.88903
40	727.2971	5.14	1	113603.2	424.9195
			2	134679.0	
42	699.1762	4.56	1	294083.3	936.6953
			2	362276.5	

Table 10: Ten Least Resilient Segments on the I-90/94 Hudson to Beloit Interstate Corridor

Rank	Corridor Segment ID	Inverse Resiliency Value 1,000,000	To Intersection	From Intersection
1	28	3136.5	I90E: 60E, M108A, Columbia Co.	I90E: 39N, M115, Columbia Co.
2	26	2884.3	I90E: 60E, M108A, Columbia Co.	I90E: 12N, Lake Delton, Sauk Co.
3	29	2821.2	I90E: 19E, Windsor, Dane Co.	Lodi: E, M115, Columbia Co.
4	35	2638.2	I90E: 12E, New Lisbon, Juneau Co.	I94E:I90E, Tomah, Monroe Co.
5	36	2297.2	I90E: 51N, M156, Dane Co.	I90E: 12E, M142, Dane Co.
6	11	1888.5	I90E: 73N,M157, Dane County	I90E: 51N, M156, Dane County
7	6	1580.4	I94E: 10E,M098, Jackson Co.	I94E: 121E, Osseo, Trempealeau Co.
8	4	1101.4	I94E: 12E, M90, Eau Claire Co.	I94E: 12E, M059, Elk Mound, Dunn Co.
9	19	1064.1	I94E: 12E, M041, Menomonie, Dunn Co.	I94E: 128N, M028 Spring Valley, St. Croix Co.
10	33	1034.8	I90E:I94E, M142 Madison, Dane Co.	I90E: 12E, M138 Madison, Dane Co.

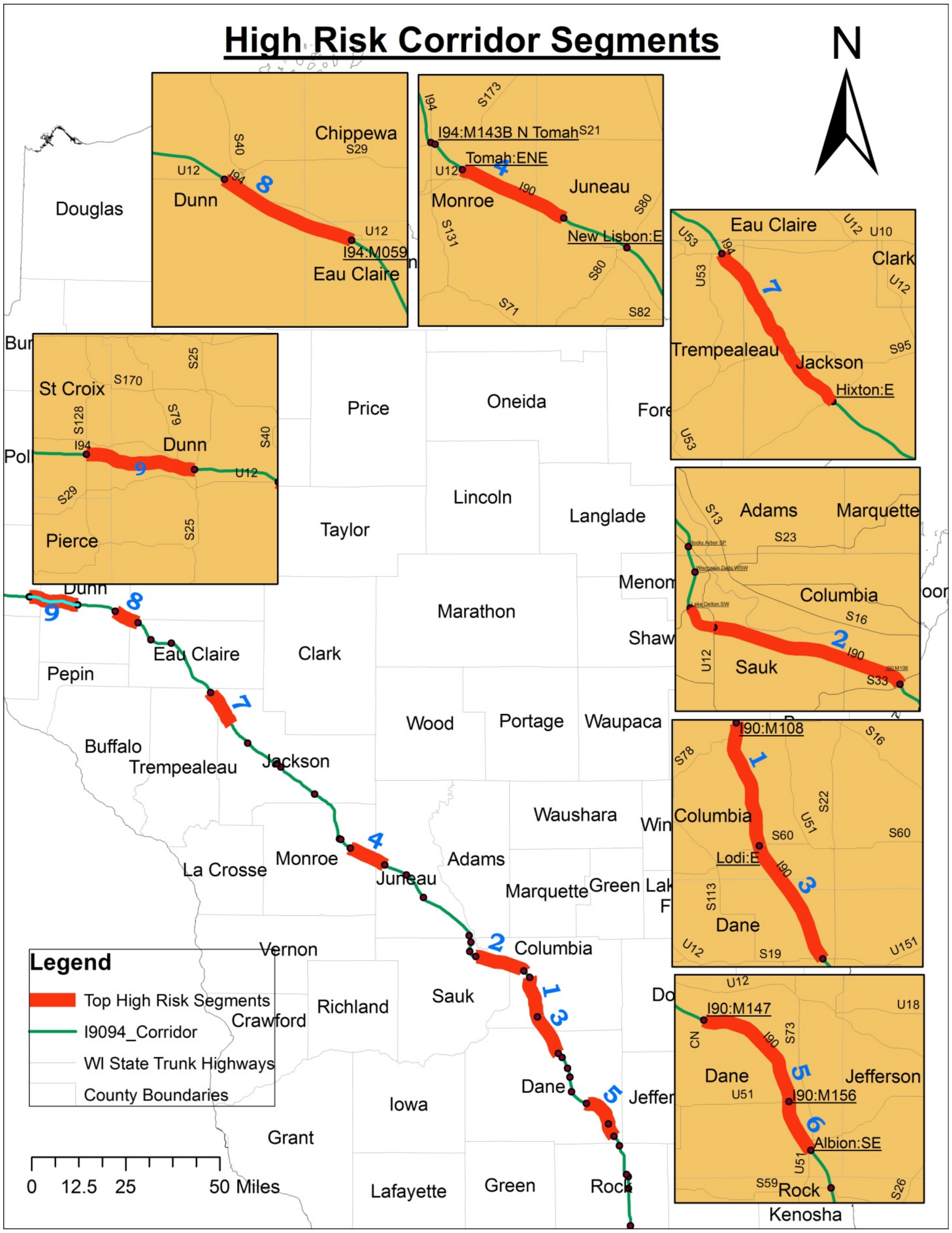

Figure 19: Top 10 High Priority Segments

Summary and Suggested Next Steps

Summary

Various transportation systems, including the corridors that support high volumes of freight and passenger vehicles, are faced with unplanned emergencies, disruptions, and disasters. These disruptions affect the overall economy by constraining the free and efficient flow of commodities, and have a significant impact on travelers. Transportation system resilience analysis provides a way to assess the vulnerabilities in transportation networks and improve recovery after the natural or man-made disasters guiding investment plans to fortify against disruptions. This research provides decision makers with operational resilience information that will help ensure reliable function of the Beloit to Hudson Interstate Highway Corridor while maintaining the normal pass through capacity.

Recent examples of disruptions in Wisconsin along an interstate corridor from Hudson to Beloit include a severe winter storm (February 2008) and flooding (June 2008). On February 6, 2008, a severe winter storm hit Wisconsin and resulted in over 13 inches of snow and ice. Difficult travel conditions caused multiple tractor-trailers to lose traction and block the road. The conditions proved difficult for the cleanup personnel, and traffic backed up to over 1050 vehicles. This 17-mile backup brought movement through this region to a standstill. Such events demonstrate the importance of studying the corridor.

The corridor's operational impacts—including both economic and service level—are measured for the critical segment disruptions along the corridor, based on resilience metrics including travel distance, travel times, traffic volumes, and level of service. The more resilient an affected highway segment is, the less significant the disruption will be and the quicker the area economy can return to business as usual.

The project followed a framework for developing a statewide freight system resiliency plan to identify the top ten high-risk (low operational resilience) segments along the I-90/94 Interstate Highway Corridor from Hudson to Beloit, Wisconsin. Resiliency in this project is a function of the vulnerability, economic importance, and the alternate routes. The analysis considered both freight trucks carrying top ten commodities and passenger vehicles. The corridor was divided into 43 segments, each starting and ending at interchanges with state trunk highways. The evaluation metrics included alternate route distance and travel time, change in traffic volumes on the alternate routes, and the change in level of service for the traffic. The vulnerabilities of the bridges, culverts, and road segments of each corridor segment were assessed for various failures modes ranging from scouring, flood scouring, traffic overloads, snow storms, and ice accumulation using a basic failure mode and effects (FMEA) analysis. The FMEA analysis resulted in risk priority numbers, which provided a rating for each corridor segment on a scale of 10 (high) to 1 (low). The evaluation metrics, along with vulnerability ratings, were used to determine an overall resiliency rating for each corridor segment, thus resulting in a prioritization of the segments based on their resiliency risk.

The resiliency assessment in this project calculates the resiliency risk using the vulnerability rating, economic rating related to top ten commodity traffic, and the alternate routes, all bound to the resiliency metrics developed for the project's resiliency objectives. A segment with a high vulnerability rating could be highly risky (less resilient) even though it carries modest freight traffic and there are feasible alternate routes. The resulting relative risk assessment was used to prioritize the corridor segments.

Recommendations for Next Steps

This project provided the preliminary research for prioritizing the corridor segments according to their resiliency ratings. These resiliency rates can be used by the Wisconsin DOT to review the response plans for the high-risk corridor segments.

This study might be extended with an analysis of the transfer of response to recovery. This includes recommended strategies for directing traffic onto the alternate routes. The impact on the urban and rural systems and the corresponding responding strategies in terms of traffic control and incident management might also be studied. Mixing these study results with the regulatory and policy procedures, including public/private partnerships, will help reduce the economic impact of disruptions on the transportation system of Wisconsin.

The response would be at two different levels: operational and strategic planning. The former deals with advance traffic information deployment along the corridors, and the latter deals with policy issues for consideration of alternative capacities for high priority and vulnerable regions for a future network development plan.

The results of this research suggest several basic mitigation actions. At the operational level, the Wisconsin DOT could implement the traffic management and communication plans with the help of agency personnel at the regional traffic management and emergency response centers. These plans should include advance traffic information deployment using intelligent transportation systems (ITS) and traffic navigation information. At the strategic level, the Wisconsin DOT could review regulatory and policy procedures for communicating with local jurisdictions along the high-risk corridor segments. At the investment level, the Wisconsin DOT should consider mitigation strategies to be included in the future network development plans.

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Appendix A: Operational Characteristics of the Corridor Segments

Table 11 lists the operational characteristics for each segment along the Hudson-Beloit Interstate Highway Corridor. The segments occur between consecutive interchanges of the corridor. The entire corridor has four travel lanes divided by a median—two lanes in each direction.

Table 11: Operational Characteristics of the Corridor Segments

Segment ID	Route SIGN	Average Speed	ADT Historic	% of Trucks	Annual Average Daily Traffic	Travel Length (Meters)	Travel Time (Minutes)
0	I94	32.50	31050	0.084	31033	802.21	0.46
1	I94	64.23	41631	0.127	40202	9041.76	5.19
2	I94	64.09	36118	0.127	38006	14400.91	8.26
3	I94	65.00	33700	0.132	35239	13270.44	7.62
4	I94	61.67	30814	0.121	31603	15530.73	8.91
5	I94	65.00	36000	0.132	36249	15682.98	9.00
6	I94	26.00	15020	0.097	14736	6751.91	3.87
7	I94	33.89	11737	0.060	12076	8856.70	5.08
8	I94	65.00	28500	0.132	29620	5812.90	3.34
9	I94	55.00	18930	0.096	20915	2777.78	1.59
10	I94	60.36	26297	0.130	27247	24562.05	14.09
11	I94	62.27	21113	0.124	21787	21437.98	12.30
13	I94	63.13	24438	0.125	23668	14676.90	8.42
14	I94	59.29	21314	0.117	25517	2035.43	1.17
15	I94	65.00	23600	0.132	26440	17705.87	10.16
16	I94	63.24	18284	0.118	20985	16242.63	9.32
17	I94	63.24	18284	0.118	20985	620.80	0.36
18	I94	43.57	19586	0.123	22964	5205.96	2.99
19	I90	57.78	33711	0.132	37887	11217.61	6.44
20	I90	64.29	31071	0.127	33179	9684.36	5.56
21	I90	60.33	26933	0.126	28531	11511.64	6.61
22	I90	65.00	33335	0.132	36763	24766.05	14.21
23	I90	58.75	29115	0.107	33118	1837.26	1.05
24	I90	59.38	26015	0.101	28266	3874.80	2.22
25	I90	54.29	29444	0.106	32551	3508.66	2.01
26	I90	65.00	39340	0.132	42440	14051.63	8.06
27	I90	65.00	33486	0.146	37496	3615.54	2.07
28	I90	63.93	44012	0.220	51935	16741.60	9.61

Segment ID	Route SIGN	Average Speed	ADT Historic	% of Trucks	Annual Average Daily Traffic	Travel Length (Meters)	Travel Time (Minutes)
29	I90	65.00	63646	0.243	67728	11932.91	6.85
30	I90	58.33	35067	0.114	37793	2255.44	1.29
31	I90	65.00	71400	0.243	68720	4897.48	2.81
32	I90	62.50	60925	0.169	66223	2306.47	1.32
33	I90	62.50	70700	0.205	75428	5954.11	3.42
34	I90	63.75	47175	0.225	51148	7861.24	4.51
35	I90	64.17	48617	0.229	49216	13624.77	7.82
36	I90	61.67	37868	0.189	37927	5636.59	3.23
37	I90	61.67	37633	0.181	42130	3263.99	1.87
38	I90	64.41	44453	0.232	45428	12389.06	7.11
39	I90	52.50	38700	0.146	43870	1197.02	0.69
40	I90	52.22	40933	0.173	45611	4760.61	2.73
42	I90	58.00	39785	0.213	45301	15053.36	8.64
43	I90	52.00	34240	0.194	40464	3707.79	2.13

Appendix B: Analysis of Alternate Routes for the Corridor Segments

Table 12 lists the available alternate routes for each of the corridor segments, along with the respective calculated metrics for each route.

The major fields of interest for each highway feature are:

1. *TRKYR*. The percentage of trucks per year in the traffic.
2. *AADT*. Average Annual Daily Traffic.
3. *Length*. The length of the highway feature, in feet.
4. *Minutes*. The expected travel time based on the average speed.
5. *Total Truck Tons*, *Truck Loads*, and *Truck Val* are the annual amounts for the top ten commodities using the highway segment.

The additional measures calculated are:

1. *Alternate 1*. The sum of lengths of individual highway segments that make up the alternative, the sum of travel time for those individual highway segments, the maximum AADT among the segments, and the maximum TRKYR percentage among the segments.
2. *Difference*. The calculated difference in the net measures between the corridor segment and the alternate routes considered.
3. *% change*.
   - Percentage change in the AADT relative to the original corridor segment; the value is positive for decrease in maximum AADT and negative for increase in maximum AADT.
   - Percentage change in the detour length relative to the original corridor segment; positive values for decrease, negative values for increase in length.

Table 12: Corridor Segments and Corresponding Alternate Routes

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
1			0.127	40202	9041.76	5.19	42876487	2254300	2.40E+11
	Alternate 1	55000581	0.099	18558	11648.05	6.68	0	0	0
		55010960	0.051	11395	3481.62	2.00	626956	34469	2611872993
		2	0.084	31033	802.21	0.46	43653928	2300946	2.42E+11
	Total 1		**0.099**	**31033**	**15931.88**	**9.14**			
	Difference		**0.028**	**9169**	**-6890.12**	**-3.95**			
	% change			**23**	**-76.20**	**-76.20**			
	Alternate 2	55000601	0.171	28773	10601.10	6.08	289593	19426	183623158.3
		55011690	0.084	13307	11338.74	6.51	39502	2694	8557139.485
	Total 2		**0.171**	**28773**	**21939.84**	**12.59**			
	Difference		**-0.044**	**11428**	**12898.84**	**-7.40**			
	% change			**28**	**-142.65**	**-142.65**			
2			0.127	38006	14400.91	8.26	42750322	2249404	2.39E+11
	Alternate 1	55010960	0.051	11395	3481.62	2.00	626956	34469	2611872993
		55000583	0.053	9530	1534.89	0.88	356810	18335	2084708675
		55000587	0.087	3413	13397.41	7.69	0	0	0

Corridor Segment ID	Alternate Route: Routes	Alternate Route: Segment ID	% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
		55000677	0.090	6070	921.86	0.53	12737	753	40481260.58
		55000500	0.095	19868	3306.39	1.90	12737	753	40481260.58
	Total 1		**0.095**	**19868**	**22642.17**	**12.99**			
	Difference		**0.032**	**18138**	**-8241.26**	**-4.73**			
	% change			**48**	**-57.23**	**-57.23**			
	Alternate 2	55011690	0.084	13307	11338.74	6.51	39502	2694	8557139.485
		55021486	0.049	6870	1981.85	1.14	329096	22120	192180297.8
		55000639	0.097	6680	1488.70	0.85	13349	880	13583944.81
		55000610	0.114	3297	17918.67	10.28	0	0	0
		55021484	0.170	3978	7894.00	4.53	76597	4344	319638266.9
	Total 2		**0.170**	**13307**	**40621.96**	**23.31**			
	Difference		**-0.043**	**24700**	**-26221.00**	**-15.05**			
	% change			**65**	**-182.08**	**-182.08**			
3			0.132	35239	13270.44	7.62	42801127	2252066	2.39E+11
	Alternate 1	55000500	0.095	19868	3306.39	1.90	12737	753	40481260.58
		55000482	0.060	2818	13540.68	7.77	0	0	0
		55012290	0.088	3320	2255.81	1.29	0	0	0
	Total 1		**0.095**	**19868**	**19102.88**	**10.96**			
	Difference		**0.037**	**15371**	**-5832.44**	**-3.35**			
	% change			**44**	**-44**	**-44**			
	Alternate 2	55021484	0.170	3978	7894.00	4.53	76597	4344	319638266.9
		55000520	0.163	2757	1531.55	0.88	76597	4344	319638266.9
		55021476	0.104	2585	13177.07	7.56	0	0	0
		55021477	0.112	2310	2081.33	1.19	0	0	0
		55012240	0.124	17960	6539.90	3.75	0	0	0
	Total 2		**0.170**	**17960**	**31223.85**	**17.92**			
	Difference		**-0.038**	**17279**	**-17953.40**	**-10.30**			
	% change			**49**	**-135**	**-135**			
4			0.121	31603	15530.73	8.91	44286796	2325227	2.51E+11
	Alternate 1	55012290	0.088	3320	2255.81	1.29	0	0	0
		55021482	0.063	1570	4802.12	2.76	0	0	0
		55021483	0.063	2247	12887.12	7.40	0	0	0
		55000487	0.081	14870	4566.18	2.62	0	0	0
		55000458	0.093	29490	651.13	0.37	27704	1835	26708941.2
	Total 1		0.093	51497	25162.36	14.44			
	Difference		0.028	19893	-9631.62	-5.53			
	% change			**63**	**-62**	**-62**			
	Alternate 2	55012240	0.124	17960	6539.90	3.75	0	0	0
		55021478	0.137	1725	4636.76	2.66	0	0	0

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
		55021479	0.096	3245	17044.64	9.78	0	0	0
		55000453	0.055	21685	2352.85	1.35	27704	1835	26708941.2
		55000458	0.093	29490	651.13	0.37	27704	1835	26708941.2
	Total 2		**0.137**	**74105**	**31225.26**	**17.92**			
	Difference		**-0.015**	**42502**	**-15694.50**	**-9.01**			
	% change			**134**	**-101**	**-101**			
5			0.132	36249	15682.98	9.00	41883168	2200212	2.36E+11
	Alternate 1	55000458	0.093	29490	651.13	0.37	27704	1835	26708941.2
		55000453	0.055	21685	2352.85	1.35	27704	1835	26708941.2
		55002290	0.074	12934	15225.45	8.74	0	0	0
	Total 1		**0.093**	**29490**	**18229.42**	**10.46**			
	Difference		**0.039**	**6759**	**-2546.44**	**-1.46**			
	% change			**19**	**-16**	**-16**			
	Alternate 2	55000458	0.093	29490	651.13	0.37	27704	1835	26708941.2
		55000453	0.055	21685	2352.85	1.35	27704	1835	26708941.2
		55000384	0.065	10610	1621.02	0.93	27704	1835	26708941.2
		55021472	0.175	4035	19466.45	11.17	27704	1835	26708941.2
		55021473	0.219	2390	6403.32	3.67	27704	1835	26708941.2
		55000390	0.102	6675	2500.17	1.43	144152	7334	593381454.6
		55011680	0.069	7315	1211.33	0.70	814683	38909	2460217502
		55022261	0.091	3294	10571.74	6.07	694386	33236	1874797229
		55022263	0.095	2950	1689.94	0.97	694386	33236	1874797229
		55022264	0.093	3080	17141.83	9.84	694386	33236	1874797229
		55022265	0.080	4905	6656.80	3.82	694386	33236	1874797229
		55002481	0.078	17097	3376.77	1.94	795407	39994	1933975904
		7	0.060	12076	8856.71	5.08	39410469	2073615	2.27E+11
		55021692	0.044	10390	3636.82	2.09	57360968	2950667	2.91E+11
		6	0.097	14736	6751.91	3.87	41742464	2190608	2.36E+11
	Total 2		**0.219**	**29490**	**92888.78**	**53.30**			
	Difference		**-0.087**	**6759**	**-77205.80**	**-44.30**			
	% change			**19**	**-492**	**-492**			
6			0.097	14736	6751.91	3.87	41742464	2190608	2.36E+11
	Alternate 1	55002300	0.219	11340	539.23	0.31	509366	28061	831069809.2
		55021680	0.034	2057	5667.54	3.25	462460	25413	683344518.2
		55021681	0.110	12947	18259.96	10.48	462460	25413	683344518.2
		55004770	0.098	21085	3444.15	1.98	2807465	140559	11709230690
		55004781	0.049	5990	4089.59	2.35	5180420	259992	20574472675
		55021873	0.049	5990	1076.83	0.62	5180420	259992	20574472675
		55004785	0.097	25780	855.12	0.49	5180420	259992	20574472675

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
		55012540	0.097	25780	4741.17	2.72	2331995	116994	9479124886
		55002434	0.073	15855	1187.27	0.68	2331995	116994	9479124886
		55002432	0.049	10275	3068.91	1.76	2331995	116994	9479124886
	Total 1		**0.219**	**25780**	**42929.77**	**24.64**			
	Difference		**-0.122**	**-11044**	**-36177.90**	**-20.76**			
	% change			**-75**	**-535.82**	**-535.82**			
	Alternate 2	55002300	0.219	11340	539.23	0.31	509366	28061	831069809.2
		55021680	0.034	2057	5667.54	3.25	462460	25413	683344518.2
		55021681	0.110	12947	18259.96	10.48	462460	25413	683344518.2
		55004770	0.098	21085	3444.15	1.98	2807465	140559	11709230690
		55004781	0.049	5990	4089.59	2.35	5180420	259992	20574472675
		55021873	0.049	5990	1076.83	0.62	5180420	259992	20574472675
		55004785	0.097	25780	855.12	0.49	5180420	259992	20574472675
		55004786	0.097	25780	2330.20	1.34	2848424	142998	11095347777
		55012610	0.097	21500	2214.17	1.27	0	0	0
		55012640	0.000	0	1087.31	0.62	0	0	0
		55002441	0.073	23560	1433.24	0.82	1156011	59508	3736697146
		55002420	0.081	12800	2079.55	1.19	1156011	59508	3736697146
		7	0.060	12076	8856.71	5.08	39410469	2073615	2.27E+11
	Total 2		**0.219**	**25780**	**51933.58**	**29.80**			
	Difference		**-0.122**	**-11044**	**-45181.70**	**-25.93**			
	%change			**-75**	**-669.17**	**-669.17**			
7			0.060	12076	8856.71	5.08	39410469	2073615	2.27E+11
	Alternate 1	55002432	0.049	10275	3068.91	1.76	2331995	116994	9479124886
		55002434	0.073	15855	1187.27	0.68	2331995	116994	9479124886
		55002436	0.097	29173	4134.28	2.37	0	0	0
		55002438	0.049	15220	1390.56	0.80	0	0	0
		55002420	0.081	12800	2079.55	1.19	1156011	59508	3736697146
	Total 1		**0.097**	**29173**	**11860.57**	**6.81**			
	Difference		**-0.037**	**-17097**	**-3003.86**	**-1.72**			
	% change			**-142**	**-33.92**	**-33.92**			
	Alternate 2	55002432	0.049	10275	3068.91	1.76	2331995	116994	9479124886
		55002434	0.073	15855	1187.27	0.68	2331995	116994	9479124886
		55012540	0.097	25780	4741.17	2.72	2331995	116994	9479124886
		55004786	0.097	25780	2330.20	1.34	2848424	142998	11095347777
		55012610	0.097	21500	2214.17	1.27	0	0	0
		55012640	0.000	0	1087.31	0.62	0	0	0
		55012770	0.073	23560	1105.73	0.63	0	0	0
		55002441	0.073	23560	1433.24	0.82	1156011	59508	3736697146

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
		55002420	0.081	12800	2079.55	1.19	1156011	59508	3736697146
	Total 2		**0.097**	**25780**	**19247.55**	**11.05**			
	Difference		**-0.037**	**-13704**	**-10390.80**	**-5.96**			
	% change			**-113**	**-117.32**	**-117.32**			
8			0.132	29620	5812.91	3.34	39025339	2052457	2.25E+11
	Alternate 1	55002420	0.081	12800	2079.55	1.19	1156011	59508	3736697146
		55002441	0.073	23560	1433.24	0.82	1156011	59508	3736697146
		55002445	0.064	33280	2589.61	1.49	1156011	59508	3736697146
		55002521	0.072	18597	2586.90	1.48	123957	7060	419018440.2
		55002451	0.064	33280	751.72	0.43	2252488	109966	9110208404
	Total 1		**0.081**	**33280**	**9441.00**	**5.42**			
	Difference		**0.051**	**-3660**	**-3628.10**	**-2.08**			
	%c hange			**-12**	**-62.41**	**-62.41**			
9			0.096	20915	2777.78	1.59	38520965	2027209	2.24E+11
	Alternate 1	55002521	0.072	18597	2586.90	1.48	123957	7060	419018440.2
		55002454	0.105	17862	3397.89	1.95	3656115	176895	18051012684
	Total 1		**0.105**	**18597**	**5984.79**	**3.43**			
	Difference		**-0.009**	**2318**	**-3207.01**	**-1.84**			
	% change			**11**	**-115.45**	**-115.45**			
10			0.130	27247	24562.05	14.09	57795584	2964164	2.97E+11
	Alternate 1	55021699	0.065	3112	21234.67	12.19	0	0	0
		55021700	0.069	1240	2790.81	1.60	0	0	0
		55002890	0.079	4193	3658.92	2.10	136049	6737	588604291.7
		55002900	0.090	13888	1405.39	0.81	151700	7514	682211313.2
	Total 1		**0.090**	**13888**	**29089.78**	**16.69**			
	Difference		**0.040**	**13359**	**-4527.73**	**-2.60**			
	% change			**49**	**-18.43**				
	Alternate 2	9	0.096	20915	2777.78	1.59	38520965	2027209	2.24E+11
		55021697	0.115	7700	18121.25	10.40	628331	32308	1220900772
		55021698	0.160	4220	2160.12	1.24	628331	32308	1220900772
		55002870	0.086	3460	6206.10	3.56	136049	6737	588604291.7
		55002880	0.105	2593	9458.28	5.43	136049	6737	588604291.7
		55002890	0.079	4193	3658.92	2.10	136049	6737	588604291.7
		55002900	0.090	13888	1405.39	0.81	151700	7514	682211313.2
	Total 2		**0.160**	**20915**	**43787.84**	**25.13**			
	Difference		**-0.031**	**6332**	**-19225.80**	**-11.03**			
	% change			**23**	**-78.27**	**-78.27**			
11			0.124	21787	21437.98	12.30	46309953	2455449	2.74E+11
	Alternate 1	55002910	0.101	5435	2469.22	1.42	327748	16298	1881092923

Corridor Segment ID	Alternate Route								
	Routes	Segment ID	% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
		55021741	0.206	3154	15512.19	8.90	274130	13817	1672470171
		55021744	0.161	4180	1573.14	0.90	274130	13817	1672470171
		55021825	0.135	1546	10278.35	5.90	0	0	0
		55021826	0.138	1502	6722.62	3.86	0	0	0
		55004060	0.109	2303	15266.50	8.76	122111	6680	174119000
	Total 1		**0.206**	**5435**	**51822.02**	**29.74**			
	Difference		**-0.082**	**16352**	**-30384.00**	**-17.44**			
	% change			**75**	**-141.73**	**-141.73**			
	Alternate 2	55002900	0.090	13888	1405.39	0.81	151700	7514	682211313.2
		55004201	0.082	6046	27991.61	16.06	15651	776	93607021.48
		55004206	0.077	4273	8874.24	5.09	15320	762	92968394.83
		55004790	0.081	4123	2467.10	1.42	603855	33517	1579162746
		55021837	0.084	4053	6867.91	3.94	652640	35427	1571865476
		55021838	0.102	6299	15186.80	8.71	652640	35427	1571865476
	Total 2		**0.102**	**13888**	**62793.05**	**36.03**			
	Difference		**0.023**	**7899**	**-41355.10**	**-23.73**			
	% change			**36**	**-192.91**	**-192.91**			
13			0.125	23668	14676.90	8.42	42440799	2216434	2.42E+11
	Alternate 1	55004060	0.109	2303	15266.50	8.76	122111	6680	174119000
		55004070	0.085	3723	15739.93	9.03	42064	2622	95428732.76
	Total 1		**0.109**	**3723**	**31006.43**	**17.79**			
	Difference		**0.016**	**19945**	**-16329.50**	**-9.37**			
	%change			**84**	**-111.26**	**-111.26**			
14			0.117	25517	2035.43	1.17	42709270	2232732	2.43E+11
	Alternate 1	55004080	0.097	16885	1596.05	0.92	0	0	0
		55004090	0.101	20020	1580.78	0.91	123740	6726	508188610.1
		55004753	0.079	16970	299.50	0.17	5076	314	7773721.38
	Total 1		**0.101**	**20020**	**3476.32**	**1.99**			
	Difference		**0.016**	**5497**	**-1440.89**	**-0.83**			
	% change			**22**	**-70.79**	**-70.79**			
15			0.132	26440	17705.87	10.16	42470235	2218964	2.42E+11
	Alternate 1	55004090	0.101	20020	1580.78	0.91	123740	6726	508188610.1
		55004381	0.085	947	18348.82	10.53	0	0	0
		55004757	0.074	7597	804.98	0.46	128816	7039	515962331.5
	Total 1		**0.132**	**20020**	**20734.57**	**11.90**			
	Difference		**-0.031**	**6420**	**-3028.70**	**-1.74**			
	%change			**24**	**-17.11**	**-17.11**			
	Alternate 2	55004090	0.101	20020	1580.78	0.91	123740	6726	508188610.1
		55004757	0.074	7597	804.98	0.46	128816	7039	515962331.5

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
		55021855	0.206	3110	13773.71	7.90	128816	7039	515962331.5
		55021856	0.195	3338	11344.03	6.51	128816	7039	515962331.5
		55004413	0.163	4176	12576.16	7.22	128816	7039	515962331.5
		55004513	0.070	5030	3400.95	1.95	0	0	0
		55004515	0.065	8127	22038.07	12.65	0	0	0
		55009110	0.076	7926	6759.18	3.88	0	0	0
		55021854	0.076	1064	10380.01	5.96	0	0	0
		55021853	0.083	870	5125.92	2.94	0	0	0
	Total 2		**0.206**	**20020**	**87783.78**	**50.37**			
	Difference		**-0.074**	**6420**	**-70077.90**	**-40.21**			
	% change			**24**	**-395.79**	**-395.79**			
16			0.118	20985	16242.63	9.32	45309300	2389938	2.62E+11
	Alternate 1	55021853	0.083	870	5125.92	2.94	0	0	0
		55021854	0.076	1064	10380.01	5.96	0	0	0
		55009110	0.076	7926	6759.18	3.88	0	0	0
	Total 1		**0.083**	**7926**	**22265.11**	**12.78**			
	Difference		**0.035**	**13059**	**-6022.49**	**-3.46**			
	%change			**62**	**-37.08**	**-37.08**			
	Alternate 2	55004090	0.101	20020	1580.78	0.91	123740	6726	508188610.1
		55004757	0.074	7597	804.98	0.46	128816	7039	515962331.5
		55021855	0.206	3110	13773.71	7.90	128816	7039	515962331.5
		55021856	0.195	3338	11344.03	6.51	128816	7039	515962331.5
		55004413	0.163	4176	12576.16	7.22	128816	7039	515962331.5
		55004515	0.065	8127	22038.07	12.65	0	0	0
		55009110	0.076	7926	6759.18	3.88	0	0	0
		55004381	0.085	947	18348.82	10.53	0	0	0
		55004513	0.070	5030	3400.95	1.95	0	0	0
	Total 2		**0.206**	**20020**	**90626.66**	**52.01**			
	Difference		**-0.088**	**965**	**-74384.00**	**-42.69**			
	% change			**5**	**-457.96**	**-457.96**			
17			0.118	20985	620.80	0.36	57341641	2948124	2.95E+11
	Alternate 1	55009120	0.132	22930	353.37	0.20	0	0	0
		55010740	0.132	22930	593.04	0.34	0	0	0
	Total 1		**0.132**	**22930**	**946.40**	**0.54**			
	Difference		**-0.014**	**-1945**	**-1404.36**	**-0.54**			
	% change			**-9**	**-52.45**				
18			0.123	22964	5205.96	2.99	43301295	2262732	2.45E+11
	Alternate 1	55010740	0.132	22930	593.04	0.34	0	0	0
		55010031	0.062	15915	1771.70	1.02	0	0	0

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
		55010035	0.052	13983	3014.22	1.73	0	0	0
		55010050	0.112	10631	2405.71	1.38	0	0	0
		55010020	0.169	17154	2358.35	1.35	7944458	423816	26424349317
	Total 1		**0.169**	**22930**	**10143.02**	**5.82**			
	Difference		**-0.047**	**34**	**-4937.06**	**-2.83**			
	% change			**0**	**-94.83**	**-94.83**			
19			0.132	37887	11217.61	6.44	51112261	2709167	2.80E+11
	Alternate 1	55010020	0.169	17154	2358.35	1.35	7944458	423816	26424349317
		55022238	0.057	3814	12939.20	7.43	0	0	0
		55022239	0.058	1870	3442.34	1.98	0	0	0
		55005102	0.057	3055	663.39	0.38	0	0	0
	Total 1		**0.169**	**17154**	**19403.27**	**11.13**			
	Difference		**-0.037**	**20732**	**-8185.67**	**-4.70**			
	% change			**55**	**-72.97**	**-72.97**			
	Alternate 2	55010020	0.169	17154	2358.35	1.35	7944458	423816	26424349317
		55010760	0.243	16380	2882.10	1.65	7944458	423816	26424349317
		55011080	0.084	3799	13503.11	7.75	21217	1184	58753802.53
		55021890	0.101	2723	14753.61	8.47	21217	1184	58753802.53
		55005120	0.065	1471	15826.12	9.08	6136	398	5547412.535
		55005106	0.056	2378	8886.77	5.10	0	0	0
		55021891	0.100	2750	3952.32	2.27	21217	1184	58753802.53
	Total 2		**0.243**	**17154**	**62162.38**	**35.67**			
	Difference		**-0.111**	**20732**	**-50944.80**	**-29.23**			
	% change			**55**	**-454.15**	**-454.15**			
20			0.127	33179	9684.37	5.56	48273195	2538193	2.60E+11
	Alternate 1	55005106	0.056	2378	8886.77	5.10	0	0	0
		55005110	0.086	16078	1538.02	0.88	6136	398	5547412.535
	Total 1		**0.086**	**16078**	**10424.79**	**5.98**			
	Difference		**0.041**	**17101**	**-10878.90**	**-5.98**			
	% change			**52**	**-7.65**				
	Alternate 2	55022239	0.058	1870	3442.34	1.98	0	0	0
		55022238	0.057	3814	12939.20	7.43	0	0	0
		55010760	0.243	16380	2882.10	1.65	7944458	423816	26424349317
		55011080	0.084	3799	13503.11	7.75	21217	1184	58753802.53
		55021890	0.101	2723	14753.61	8.47	21217	1184	58753802.53
		55021891	0.100	2750	3952.32	2.27	21217	1184	58753802.53
		55005120	0.065	1471	15826.12	9.08	6136	398	5547412.535
		55005110	0.086	16078	1538.02	0.88	6136	398	5547412.535
	Total 2		**0.243**	**16380**	**68836.82**	**39.50**			

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
	Difference		**-0.117**	**16799**	**-59152.50**	**-33.94**			
	% change			**51**	**-610.80**	**-610.80**			
21			0.126	28531	11511.64	6.61	47858587	2512084	2.58E+11
	Alternate 1	55005110	0.086	16078	1538.02	0.88	6136	398	5547412.535
		55006260	0.055	3123	10559.88	6.06	0	0	0
		55006280	0.094	21181	1068.08	0.61	301973	15861	984602433.7
	Total 1		**0.094**	**21181**	**13165.99**	**7.56**			
	Difference		**0.032**	**7349**	**-1654.35**	**-0.95**			
	% change			**26**	**-14.37**	**-14.37**			
	Alternate 2	55006245	0.080	2489	10907.42	6.26	83145	5570	45923625.63
		55011490	0.132	10772	18071.07	10.37	296404	15643	1019705413
		55006280	0.094	21181	1068.08	0.61	301973	15861	984602433.7
	Total 2		**0.132**	**21181**	**30046.58**	**17.24**			
	Difference		**-0.006**	**7349**	**-18534.90**	**-10.64**			
	% change			**26**	**-161.01**	**-161.01**			
22			0.132	36763	24766.05	14.21	47712764	2511883	2.57E+11
	Alternate 1	55006280	0.094	21181	1068.08	0.61	301973	15861	984602433.7
		55011470	0.048	16630	435.85	0.25	68003	3608	225729432.4
		55005170	0.064	7137	26657.00	15.30	0	0	0
	Total 1		**0.094**	**21181**	**28160.93**	**16.16**			
	Difference		**0.038**	**15581**	**-3394.88**	**-1.95**			
	% change			**42**	**-13.71**	**-13.71**			
	Alternate 2	55021898	0.143	7466	14236.89	8.17	958535	46764	4088537477
		55021899	0.110	4640	3047.39	1.75	958535	46764	4088537477
		55021896	0.079	5902	15525.48	8.91	75166	4216	96599840.68
		55021897	0.063	6500	1547.00	0.89	75166	4216	96599840.68
		55022210	0.032	8100	1613.47	0.93	27425	1705	46644267.19
		39	0.107	33118	1837.26	1.05	60245028	3144056	3.04E+11
	Total 2		**0.143**	**33118**	**37807.48**	**21.70**			
	Difference		**-0.011**	**3645**	**-13041.40**	**-7.48**			
	% change			**10**	**-52.66**	**-52.66**			
23			0.107	33118	1837.26	1.05	60245028	3144056	3.04E+11
	Alternate 1	55022207	0.055	4390	1266.33	0.73	0	0	0
		55022208	0.031	10943	2051.81	1.18	0	0	0
		55009990	0.020	9633	1384.26	0.79	27425	1705	46644267.19
	Total 1		**0.055**	**10943**	**4702.40**	**2.70**			
	Difference		**0.052**	**22175**	**-2865.14**	**-1.64**			
	% change			**67**	**-155.95**	**-155.95**			
24			0.101	28266	3874.80	2.22	60272453	3145761	3.04E+11

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
	Alternate 1	55009990	0.020	9633	1384.26	0.79	27425	1705	46644267.19
		55009960	0.024	10565	4036.03	2.32	0	0	0
		55005190	0.054	11538	1270.60	0.73	0	0	0
	Total 1		**0.054**	**11538**	**6690.89**	**3.84**			
	Difference		**0.047**	**16729**	**-2816.09**	**-1.62**			
	% change			**59**	**-72.68**	**-72.68**			
25			0.106	32551	3508.66	2.01	47487191	2499673	2.56E+11
	Alternate 1	55005190	0.054	11538	1270.60	0.73	0	0	0
		55005210	0.073	22885	2726.85	1.56	0	0	0
	Total 1		**0.073**	**22885**	**3997.45**	**2.29**			
	Difference		**0.032**	**9666**	**-488.79**	**-0.28**			
	% change			**30**	**-13.93**	**-13.93**			
	Alternate 2	55005320	0.105	15041	11028.13	6.33	283738	15940	1075861514
		55005330	0.086	12580	8947.66	5.13	0	0	0
		55005340	0.106	32551	5859.31	3.36	471959	24658	2060667186
	Total 2		**0.106**	**32551**	**25835.09**	**14.83**			
	Difference		**0.000**	**0**	**-22326.40**	**-12.81**			
	% change			**0**	**-636.32**				
26			0.132	42440	14051.63	8.06	51921550	2768066	2.90E+11
	Alternate 1	55005340	0.106	32551	5859.31	3.36	471959	24658	2060667186
		55005350	0.069	20705	4227.88	2.43	471959	24658	2060667186
		55006723	0.060	18029	3822.67	2.19	0	0	0
		55022001	0.058	7628	11278.30	6.47	0	0	0
		55022002	0.077	18116	6068.99	3.48	0	0	0
	Total 1		**0.106**	**32551**	**31257.16**	**17.94**			
	Difference		**0.026**	**9889**	**-17205.50**	**-9.87**			
	% change			**23**	**-122.45**	**-122.45**			
	Alternate 2	55009960	0.024	10565	4036.03	2.32	0	0	0
		55002209	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
		55006700	0.091	6439	21983.49	12.62	60541	3263	76279742.48
		55006660	0.190	17005	3672.65	2.11	3333737	152795	11748648470
		55006690	0.141	14003	2963.57	1.70	813659	42564	3281769684
	Total 2		**0.190**	**17005**	**28619.70**	**16.42**			
	Difference		**-0.058**	**25435**	**-14568.10**	**-8.36**			
	% change			**60**	**-103.68**	**-103.68**			
27			0.146	37496	3615.54	2.07	46874902	2468782	2.54E+11
	Alternate 1	55006670	0.189	13770	4146.67	2.38	3161733	144455	10558927666
		55006690	0.141	14003	2963.57	1.70	813659	42564	3281769684
	Total 1		**0.189**	**14003**	**7110.24**	**4.08**			

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
	Difference		**-0.043**	**23493**	**-3494.70**	**-2.01**			
	% change			**63**	**-96.66**	**-96.66**			
28			0.220	51935	16741.60	9.61	50036635	2613237	2.64E+11
	Alternate 1	55006670	0.189	13770	4146.67	2.38	3161733	144455	10558927666
		55006794	0.072	12963	3896.18	2.24	761294	40927	2589567707
		55006798	0.071	4950	2435.13	1.40	761294	40927	2589567707
		55006800	0.070	5022	17027.74	9.77	0	0	0
		55006820	0.057	2342	6611.46	3.79	218528	10537	1173578934
	Total 1		**0.189**	**13770**	**34117.18**	**19.58**			
	Difference		**0.032**	**38165**	**-17375.60**	**-9.97**			
	% change			**73**	**-103.79**	**-103.79**			
	Alternate 2	55022279	0.145	9435	12853.58	7.38	0	0	0
		55022277	0.138	450	1872.63	1.07	0	0	0
		55022276	0.111	2613	19081.15	10.95	0	0	0
		55022006	0.082	3470	16907.36	9.70	6202	380	9612751.657
		55006849	0.107	21420	6342.27	3.64	6202	380	9612751.657
	Total 2		**0.145**	**21420**	**57056.98**	**32.74**			
	Difference		**0.075**	**30515**	**-40315.40**	**-23.13**			
	% change			**59**	**-240.81**	**-240.81**			
29			0.243	67728	11932.91	6.85	51309978	2676242	2.75E+11
	Alternate 1	55006820	0.057	2342	6611.46	3.79	218528	10537	1173578934
		55006810	0.063	4467	3426.24	1.97	212326	10157	1163966183
		55022067	0.060	7945	5348.88	3.07	1105658	62822	1172095378
		55022068	0.071	15034	9038.71	5.19	1105658	62822	1172095378
	Total 1		**0.071**	**15034**	**24425.29**	**14.02**			
	Difference		**0.173**	**52694**	**-12492.40**	**-7.17**			
	% change			**78**	**-104.69**	**-104.69**			
	Alternate 2	55006849	0.107	21420	6342.27	3.64	6202	380	9612751.657
		55022280	0.064	6000	2318.77	1.33	0	0	0
		55022281	0.064	4931	13903.13	7.98	0	0	0
		55007725	0.063	16343	3501.23	2.01	780228	38296	3469992054
		55007722	0.073	20225	5751.82	3.30	780228	38296	3469992054
	Total 2		**0.107**	**21420**	**31817.22**	**18.26**			
	Difference		**0.136**	**46308**	**-19884.30**	**-11.41**			
	% change			**68**	**-166.63**	**-166.63**			
30			0.114	37793	2255.44	1.29	50580386	2640146	2.66E+11
	Alternate 1	55007730	0.060	18515	1544.36	0.89	24152	1231	130850135.5
		55007860	0.056	21380	1645.06	0.94	1105658	62822	1172095378
	Total 1		**0.060**	**21380**	**3189.42**	**1.83**			

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
	Difference		**0.054**	**16413**	**-933.98**	**-0.54**			
	% change			**43**	**-41.41**	**-41.41**			
31			0.243	68720	4897.48	2.81	54784751	2897235	2.99E+11
	Alternate 1	55007858	0.120	37253	2955.74	1.70	1134281	62453	2452278839
		55007853	0.000	0	1119.08	0.64	1134281	62453	2452278839
		55007852	0.049	41780	1602.73	0.92	1134281	62453	2452278839
		55007880	0.087	52050	3033.39	1.74	869577	47586	2423264607
	Total 1		**0.120**	**52050**	**8710.95**	**5.00**			
	Difference		**0.123**	**16670**	**-3813.47**	**-2.19**			
	% change			**24**	**-77.87**	**-77.87**			
	Alternate 2	55007860	0.056	21380	1645.06	0.94	1105658	62822	1172095378
		55007740	0.070	18068	7169.15	4.11	24152	1231	130850135.5
		55010230	0.076	29235	1716.90	0.99	4009086	202306	14843855519
		55010221	0.079	52880	5416.04	3.11	4009086	202306	14843855519
	Total 2		**0.079**	**52880**	**15947.14**	**9.15**			
	Difference		**0.164**	**15840**	**-11049.70**	**-6.34**			
	% change			**23**	**-225.62**	**-225.62**			
32			0.169	66223	2306.48	1.32	53691271	2795235	2.78E+11
	Alternate 1	55007880	0.087	52050	3033.39	1.74	869577	47586	2423264607
		55007900	0.094	37740	1280.26	0.73	0	0	0
		55007920	0.127	55490	2538.93	1.46	758748	37856	1923911275
	Total 1		**0.127**	**55490**	**6852.58**	**3.93**			
	Difference		**0.042**	**10733**	**-4546.11**	**-2.61**			
	% change			**16**	**-197.10**	**-197.10**			
	Alternate 2	55007880	0.087	52050	3033.39	1.74	869577	47586	2423264607
		55007840	0.064	34600	1473.03	0.85	2003858	110039	4875543457
		55007910	0.095	37655	1713.16	0.98	758748	37856	1923911275
		55007920	0.127	55490	2538.93	1.46	758748	37856	1923911275
	Total 2		**0.127**	**55490**	**8758.51**	**5.03**			
	Difference		**0.042**	**10733**	**-6452.04**	**-3.70**			
	% change			**16**	**-279.74**	**-279.74**			
33			0.205	75428	5954.12	3.42	48563973	2541173	2.37E+11
	Alternate 1	55007920	0.127	55490	2538.93	1.46	758748	37856	1923911275
		55008010	0.077	49819	6391.00	3.67	0	0	0
		55008030	0.122	85400	2343.62	1.34	5124002	259622	15947519837
	Total 1		**0.127**	**85400**	**11273.55**	**6.47**			
	Difference		**0.079**	**-9973**	**-5319.43**	**-3.05**			
	% change			**-13**	**-89.34**	**-89.34**			
	Alternate 2	55007931	0.148	64240	969.38	0.56	7121726	353795	49228002230

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
		55007932	0.100	51050	5612.09	3.22	7121726	353795	49228002230
		55017630	0.079	11280	8262.22	4.74	0	0	0
		55008043	0.196	14700	3856.39	2.21	0	0	0
		55008041	0.134	25985	2339.64	1.34	0	0	0
	Total 2		**0.196**	**64240**	**21039.71**	**12.07**			
	Difference		**0.009**	**11188**	**-15085.60**	**-8.66**			
	% change			**15**	**-253.36**	**-253.36**			
34			0.225	51148	7861.24	4.51	48593182	2547737	2.31E+11
	Alternate 1	55008041	0.134	25985	2339.64	1.34	0	0	0
		55008043	0.196	14700	3856.39	2.21	0	0	0
		55016960	0.196	14700	3026.93	1.74	0	0	0
	Total 1		**0.196**	**25985**	**9222.95**	**5.29**			
	Difference		**0.029**	**25163**	**-1361.71**	**-0.78**			
	% change			**49**	**-17.32**	**-17.32**			
	Alternate 2	55008030	0.122	85400	2343.62	1.34	5124002	259622	15947519837
		55008201	0.059	39218	3604.96	2.07	0	0	0
		55008204	0.069	11093	11968.67	6.87	0	0	0
		55017310	0.243	53240	8632.71	4.95	0	0	0
		55008207	0.069	14487	3785.52	2.17	0	0	0
	Total 2		**0.243**	**85400**	**30335.48**	**17.41**			
	Difference		**-0.018**	**-34253**	**-22474.20**	**-12.90**			
	% change			**-67**	**-285.89**	**-285.89**			
35			0.229	49216	13624.77	7.82	48593182	2547737	2.31E+11
	Alternate 1	55016960	0.196	14700	3026.93	1.74	0	0	0
		55008044	0.078	8847	9815.38	5.63	0	0	0
		55011560	0.094	3841	15989.18	9.18	0	0	0
		31	0.189	37927	5636.59	3.23	48593182	2547737	2.31E+11
	Total 1		**0.196**	**37927**	**34468.08**	**19.78**			
	Difference		**0.033**	**11289**	**-20843.30**	**-11.96**			
	% change			**23**	**-152.98**	**-152.98**			
36			0.189	37927	5636.59	3.23	48593182	2547737	2.31E+11
	Alternate 1	30	0.229	49216	13624.77	7.82	48593182	2547737	2.31E+11
		55011560	0.094	3841	15989.18	9.18	0	0	0
		55016960	0.196	14700	3026.93	1.74	0	0	0
		55008044	0.078	8847	9815.38	5.63	0	0	0
	Total 1		**0.229**	**49216**	**28831.48**	**24.36**			
	Difference		**-0.040**	**-11289**	**-23194.90**	**-21.13**			
	% change			**-30**	**-411.51**	**-411.51**			
37			0.181	42130	3263.99	1.87	48887950	2559186	2.37E+11

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
	Alternate 1	55022099	0.160	32058	2751.47	1.58	1190900	61714	5361039638
		55022100	0.085	9485	1704.00	0.98	1190900	61714	5361039638
		55008250	0.121	23760	3297.50	1.89	0	0	0
	Total 1		**0.160**	**32058**	**7752.97**	**4.45**			
	Difference		**0.021**	**10073**	**-4488.98**	**-2.58**			
	% change			**24**	**-137.53**	**-137.53**			
38			0.232	45428	12389.06	7.11	48887950	2559186	2.37E+11
	Alternate 1	55008260	0.069	6620	11098.11	6.37	0	0	0
		55008575	0.050	17953	5161.91	2.96	669355	36994	1373983085
		55008571	0.048	32840	1658.73	0.95	669355	36994	1373983085
	Total 1		**0.069**	**32840**	**17918.75**	**10.28**			
	Difference		**0.163**	**12588**	**-5529.68**	**-3.17**			
	% change			**28**	**-44.63**				
	Alternate 2	55008250	0.121	23760	3297.50	1.89	0	0	0
		55008550	0.070	8881	11951.19	6.86	1190900	61714	5361039638
		55008874	0.048	28800	3010.72	1.73	192920	11776	347945981.3
		55011550	0.113	35107	691.54	0.40	192920	11776	347945981.3
	Total 2		**0.121**	**35107**	**18950.94**	**10.87**			
	Difference		**0.111**	**10321**	**-6561.88**	**-3.77**			
	% change			**23**	**-52.97**	**-52.97**			
39			0.146	43870	1197.02	0.69	52111704	2767962	2.60E+11
	Alternate 1	55011550	0.113	35107	691.54	0.40	192920	11776	347945981.3
		55008877	0.146	41938	1010.16	0.58	0	0	0
	Total 1		**0.146**	**41938**	**1701.69**	**0.98**			
	Difference		**0.000**	**1933**	**-504.67**	**-0.29**			
	% change			**4**	**-42.16**	**-42.16**			
40			0.173	45611	4760.61	2.73	55531091	2928349	2.65E+11
	Alternate 1	55009181	0.048	15579	6397.85	3.67	757096	38395	4874829858
		55008905	0.061	5768	767.16	0.44	0	0	0
		55008901	0.065	4760	1580.95	0.91	0	0	0
	Alternate 1		**0.065**	**15579**	**8745.96**	**5.02**			
	Difference		**0.108**	**30032**	**-3985.35**	**-2.29**			
	% change			**-353559**	**20844.47**	**20844.5**			
	Alternate 2	55008877	0.146	41938	1010.16	0.58	0	0	0
		55010640	0.055	24611	4307.11	2.47	0	0	0
		55008737	0.068	14030	895.47	0.51	1391748	74170	5706540798
		55008896	0.162	37413	2400.61	1.38	0	0	0
		55008893	0.059	18780	871.62	0.50	0	0	0
	Alternate 2		**0.162**	**41938**	**9484.96**	**5.44**			

Corridor Segment ID	Alternate Route		% Trucks	AADT	Length	Travel time (min)	Total Truck Tons	Total Truck Loads	Total Value ($)
	Routes	Segment ID							
	Difference		**0.011**	**3674**	**-4724.36**	**-2.71**			
	% change			**8**	**-99.24**	**-99.24**			
42			0.213	45301	15053.36	8.64	51354608	2729567	2.55E+11
	Alternate 1	55021100	0.243	52460	5848.56	3.36	1165589	58369	3946550957
		55008743	0.061	17415	2550.37	1.46	1165589	58369	3946550957
		55008744	0.074	11583	6270.26	3.60	2015204	112128	7162224675
		55008746	0.086	9670	3443.11	1.98	2015204	112128	7162224675
		55020070	0.086	9670	2148.47	1.23	2015204	112128	7162224675
		55016920	0.000	0	2286.89	1.31	2015204	112128	7162224675
		55020860	0.066	13193	2919.99	1.68	2015204	112128	7162224675
	Total 1		**0.243**	**52460**	**25467.66**	**14.61**			
	Difference		**-0.030**	**-7159**	**-10414.30**	**-5.98**			
	% change			**-16**	**-69.18**	**-69.18**			
	Alternate 2	55009731	0.203	18075	10104.64	5.80	3520381	174875	11205119318
		55009710	0.129	6126	9084.99	5.21	0	0	0
		55008886	0.085	8733	6399.31	3.67	1922685	96765	8821380822
		55008901	0.065	4760	1580.95	0.91	0	0	0
		55008905	0.061	5768	767.16	0.44	0	0	0
	Total 2		**0.203**	**18075**	**27937.06**	**16.03**			
	Difference		**0.011**	**27226**	**-12883.70**	**-7.39**			
	% change			**60**	**-85.59**	**-85.59**			

Appendix C: Bridges and Culverts on the Corridor

Table 13 shows the information related to the bridges along the corridor. All the information was obtained from WisDOT's Highway Structures Information (Source: http://on.dot.wi.gov/dtid_bos/extranet/structures/LRFD/index.htm).

Table 13: Bridges on the Study Corridors

Corridor Segment ID	Bridge ID	Year built	Feature on	Feature Under	Scour Code (N=N/A)	Sufficiency Rating	ADT	TRUCK %	NBI Rating			
									DECK	SUPER	SUB	CULV
0	B550147	2000	IH 94 EB	STH 35	N	98	16280	13	7	7	7	N
	B550148	2000	IH 94 WB	STH 35	N	96	40080	13	7	7	7	N
1	B550031	1958	IH 94 WB	KINNEY RD	N	97	28000	26	6	6	7	N
	B550032	1958	IH 94 EB	KINNEY RD	N	97	26420	13	6	6	7	N
	B550033	1958	IH 94 WB	TWIN LAKE RD	N	90.50	28000	26	6	6	7	N
	B550034	1958	IH 94 EB	TWIN LAKE RD	N	97	26420	13	6	6	7	N
2	B550036	1958	IH 94 WB	3RD AVE S	N	97	19060	13	6	6	7	N
	B550037	1958	IH 94 EB	3RD AVE SOUTH	N	97	19060	13	6	6	7	N
	B550038	1958	IH 94 WB	KINNICKINNIC RIVER	8	87	19060	13	7	6	5	N
	B550039	1958	IH 94 EB	KINNICKINNIC RIVER	8	87	19060	13	7	6	5	N
	B550044	1958	IH 94 WB	RUSH RIVER	5	87	17970	14	6	6	5	N
	B550045	1958	IH 94 EB	RUSH RIVER	5	87	17970	14	6	6	5	N
	B550202	2004	USH 63N	IH 94 E	N	96	0	0	7	8	8	N
3	B550012	1958	IH 94 EB	CARR CREEK	8	86	22900	26	5	5	6	N
	B550013	1958	IH 94 WB	CARR CREEK	8	86	22900	26	5	5	6	N
	B550015	1958	IH 94 EB	EAU GALLE RIVER	5	87	16840	14	6	6	5	N
	B550016	1958	IH 94 WB	EAU GALLE RIVER	8	87	16840	14	7	6	5	N
	B550017	1958	IH 94 EB	NN	N	96	16840	14	6	6	6	N
	B550018	1958	IH 94 WB	NN	N	96	16840	14	6	6	6	N
4	B550019	1958	IH 94 EB	NORSEMAN DR	N	93.10	20730	14	5	6	7	N
	B550020	1959	IH 94 WB	NORSEMAN DR	N	95	20730	14	5	6	7	N
	B550022	1958	IH 94 EB	WILSON RD	N	84	20730	14	5	5	6	N
	B550023	1958	IH 94 WB	WILSON RD	N	93	20730	14	5	6	7	N
	B170051	1959	IH 94	E BR WILSON CREEK	8	76.60	27470	14	N	N	N	6
	B170174	2006	IH 94 WB	WILSON CREEK	8	93.90	21800	26	8	8	8	N
	B170175	2004	IH 94 EB	WILSON CREEK	8	93.90	21800	26	8	8	8	N
	B170054	1959	IH 94 WB	USH 12	N	89.50	21800	26	6	6	6	N
	B170055	1958	IH 94 EB	USH 12	N	97	21800	26	6	6	6	N
	B170018	1958	IH 94 EB	Q	N	89.50	21800	26	7	7	7	N
	B170019	1958	IH 94 WB	Q	N	91.40	21800	26	7	7	6	N
	B170021	1959	IH 94 EB	VALLEY RD	N	92.50	21800	26	7	7	7	N
	B170022	1959	IH 94 WB	VALLEY RD	N	96	21800	26	7	7	7	N
	B170023	1959	IH 94 EB	K	N	97	21800	26	7	7	7	N
	B170024	1959	IH 94 WB	K	N	97	21800	26	7	7	7	N
	B170025	1959	IH 94 EB	STEWARD RD	N	97	21800	26	7	7	7	N

Corridor Segment ID	Bridge ID	Year built	Feature on	Feature Under	Scour Code (N=N/A)	Sufficiency Rating	ADT	TRUCK %	NBI Rating			
									DECK	SUPER	SUB	CULV
	B170026	1959	IH 94 WB	STEWARD RD	N	86.10	21800	26	6	6	7	N
	B170027	1958	IH 94 EB	RUDINGER RD	N	96	21800	26	6	6	6	N
	B170028	1958	IH 94 WB	RUDINGER RD	N	90.50	21800	26	7	7	7	N
5	**B170059**	1959	IH 94 WB	USH 12-STH 29	N	95.30	21800	26	6	6	6	N
	B170060	1959	IH 94 EB	USH 12-STH 29	N	95.50	16060	14	6	6	6	N
	B170063	1959	IH 94	MUDDY CREEK	8	63.70	30530	14	N	N	N	5
	B170052	1958	IH 94	BR MUDDY CREEK	8	76	30530	14	N	N	N	6
	B170032	1957	IH 94 WB	RED CEDAR RIVER	8	78.10	16800	26	6	5	7	N
	B170033	1957	IH 94 EB	RED CEDAR RIVER	8	62.10	19201	37	6	4	7	N
	B170034	1958	IH 94 WB	ELK MOUND MARSH EQUALIZR	5	98	24100	26	6	6	6	N
	B170035	1958	IH 94 EB	ELK MOUND MARSH EQUALIZR	5	98	24100	26	6	6	6	N
	B170036	1958	IH 94 WB	ELK MOUND MARSH EQUALIZR	8	98	24100	26	6	6	6	N
	B170037	1959	IH 94 EB	ELK MOUND MARSH EQUALIZR	8	98	24100	26	6	6	6	N
	B170038	1958	IH 94 WB	ELK MOUND MARSH EQUALIZR	8	98	24100	26	6	6	6	N
	B170039	1958	IH 94 EB	ELK MOUND MARSH EQUALIZR	8	97	24100	26	6	6	6	N
6	**B170050**	1959	IH 94	E BR MUDDY CREEK	8	74	26420	14	N	N	N	6
	B170057	1958	IH 94 WB	EVERGREEN RD	N	33	32200	26	6	6	3	N
	B170058	1960	IH 94 EB	EVERGREEN RD	N	33	32200	26	6	6	3	N
	B180011	1959	IH 94 WB	ELK CREEK	5	98	13700	26	6	7	7	N
	B180012	1959	IH 94 EB	ELK CREEK	5	98	14300	26	6	7	7	N
	B180015	1967	CONNECTOR USH 12-IH 94	IH 94	N	93.50	9960	3	5	6	6	N
7	**B270039**	1967	IH 94 EB	BLACK RIVER	8	91	17340	16	6	7	7	N
	B270040	1967	IH 94 WB	BLACK RIVER	8	91	13220	15	6	7	7	N
	B270041	1968	IH 94 EB	WINNEBAGO AVE	N	88	13220	15	7	6	7	N
	B270042	1968	IH 94 WB	WINNEBAGO AVE	N	81	32000	0	7	6	7	N
	B180151	1996	IH 94 EB	OTTER CREEK	8	98	14260	15	7	8	8	N
	B180152	1996	IH 94 WB	OTTER CREEK	8	98	11960	15	7	8	8	N
	B180203	2008	IH 94 EB	LOWE CREEK	8	93.40	32400	0	9	8	9	N
	B180204	2008	IH 94	Lowes Creek		94.40	32400	0	9	9	9	N
	B270021	1966	IH 94 EB	TREMPEALEAU RIVER	8	98	10950	16	6	6	7	N
	B270022	1966	IH 94 WB	TREMPEALEAU RIVER	8	98	10950	16	6	6	7	N
	B270024	1966	IH 94 EB	STH 95	N	90.80	17340	16	7	7	6	N
	B270025	1966	IH 94 WB	STH 95	N	94.90	5000	16	7	7	6	N
	B270027	1966	IH 94 EB	CHARCOAL RD	N	92.50	17340	16	6	6	7	N
	B270028	1966	IH 94 WB	CHARCOAL RD	N	91.50	9300	36	6	6	7	N
	B270029	1966	IH 94 EB	F	N	92.50	17340	16	6	6	7	N
	B270030	1966	IH 94 WB	F	N	93	17340	16	6	6	7	N
	B270031	1966	IH 94 EB	MCNULTY RD	N	93	17340	16	6	6	7	N

Corridor Segment ID	Bridge ID	Year built	Feature on	Feature Under	Scour Code (N=N/A)	Sufficiency Rating	ADT	TRUCK %	NBI Rating			
									DECK	SUPER	SUB	CULV
	B270032	1966	IH 94 WB	MCNULTY RD	N	85	9750	43	6	6	7	N
	B180019	1965	IH 94 EB	E	N	97	11900	26	5	6	7	N
	B180020	1965	IH 94 WB	E	N	97	11300	26	5	6	7	N
	B180021	1965	IH 94 EB	C	N	84	11900	26	5	5	7	N
	B180022	1965	IH 94 WB	C	N	84	11300	26	5	5	7	N
	B180023	1965	IH 94 EB	CHIPPEWA RIVER 04	5	86.50	11900	26	5	6	6	N
	B180024	1965	IH 94 WB	CHIPPEWA RIVER 05	5	87.50	11300	26	6	6	6	N
	B180025	1966	IH 94 EB	STH 37-STH 85	N	96.40	11900	15	6	6	6	N
	B180026	1966	IH 94 WB	STH 37-STH 85	N	98	11300	15	7	6	6	N
	B180029	1965	IH 94 EB	F	N	97	13100	15	6	6	6	N
	B180030	1965	IH 94 WB	F	N	97	12800	15	6	6	6	N
	B180032	1965	IH 94 WB	LOWE CREEK	5	96	12800	15	6	6	7	N
	B180033	1965	IH 94 EB	LOWE CREEK	5	98	13100	15	6	6	7	N
	B180044	1965	IH 94 WB	CHIPPEWA RIVER OVERFLOW	8	75.50	11300	26	5	5	7	N
	B180045	1965	IH 94 EB	CHIPPEWA RIVER OVERFLOW	5	86.50	11900	26	5	7	7	N
10	**B610041**	1965	IH 94 EB	NN	N	94.50	12470	14	7	7	7	N
	B610042	1965	IH 94 WB	NN	N	91.50	15690	14	7	7	7	N
	B610043	1965	IH 94 EB	BUFFALO RIVER	5	94	12470	14	7	7	7	N
	B180051	1966	IH 94 EB	J	N	96	20700	26	6	7	7	N
	B180052	1966	IH 94 WB	J	N	96	20700	26	6	7	7	N
	B180053	1966	IH 94 EB	D	N	96	20700	26	6	6	7	N
	B180054	1966	IH 94 WB	D	N	96	20700	26	6	6	7	N
	B180055	1966	IH 94 EB	OTTER CREEK	5	96.10	20700	26	6	6	7	N
	B180056	1966	IH 94 WB	OTTER CREEK	5	95.10	20700	26	6	6	7	N
	B180057	1966	IH 94 EB	E MALLARD RD	N	94.10	20700	26	6	7	7	N
	B180058	1966	IH 94 WB	E MALLARD RD	N	94.10	20700	26	6	7	7	N
	B180063	1966	IH 94 EB	HH	N	96.10	19900	26	6	6	6	N
	B180064	1966	IH 94 WB	HH	N	96.30	15690	14	6	6	6	N
11	**B270148**	2005	IH 94 EB	PIGEON CREEK	8	93.60	23325	37	8	8	7	N
	B270149	2005	IH 94 WB	PIGEON CREEK	8	93.60	23325	37	7	7	7	N
	B270035	1966	IH 94 EB	S FK BUFFALO RIVER	8	79.50	10900	16	6	5	6	N
	B270036	1966	IH 94 WB	S FK BUFFALO RIVER	8	70.80	10300	16	8	5	7	N
	B270037	1966	IH 94 EB	B	N	79.80	10900	16	6	6	7	N
	B270038	1966	IH 94 WB	B	N	79.80	10300	16	7	7	7	N
15	**B270043**	1968	IH 94 EB	Union Pacific RR	N	95	11935	15	6	6	7	N
	B270044	1968	IH 94 WB	Union Pacific RR	N	95	11935	15	6	6	7	N
	B270054	1968	IH 94 EB	LAMBERT RD	N	95.30	11935	15	7	7	7	N
	B270055	1968	IH 94 WB	LAMBERT RD	N	96	27000	15	7	7	7	N
	B270059	1968	IH 94 EB	O	N	96.40	12650	15	8	6	6	N
	B270060	1968	IH 94 WB	O	N	62	25300	15	9	6	7	N

Corridor Segment ID	Bridge ID	Year built	Feature on	Feature Under	Scour Code (N=N/A)	Sufficiency Rating	ADT	TRUCK %	NBI Rating			
									DECK	SUPER	SUB	CULV
	B270063	1968	IH 94 EB	GLENN CREEK	8	92.80	11935	15	N	N	N	6
	B270064	1968	IH 94 WB	GLENN CREEK	8	92.80	11935	15	N	N	N	6
16	**B410033**	1968	IH 94 WB	USH 12	N	97.50	10500	16	7	7	6	N
	B410032	1968	IH 94 EB	USH 12	N	78.50	9800	16	4	7	5	N
	B410059	1963	IH 94	MUD CREEK	8	74.70	23300	15	N	N	N	6
	B410062	1968	IH 94 EB	UP RR	N	96	10650	15	7	7	6	N
	B410063	1968	IH 94 WB	UP RR	N	94	10650	15	9	9	9	N
	B410064	1968	IH 94 EB	ABBEY LANE	N	96	10800	15	8	8	8	N
	B410065	1968	IH 94 WB	ASPEN ROAD	N	65	10650	15	9	9	9	N
	B410066	1968	IH 94 EB	CTH EW	N	97.50	10650	16	8	8	7	N
	B410067	1968	IH 94 WB	CTH EW	N	82.40	10800	16	9	9	9	N
	B410070	1968	IH 94 EB	USH 12	N	78.60	10800	16	7	5	7	N
	B410071	1968	IH 94 WB	USH 12	N	78.50	9090	16	7	5	7	N
	B410072	1968	IH 94 EB	MILL CREEK	5	91.50	10800	16	6	6	7	N
	B410073	1968	IH 94 WB	MILL CREEK	5	91.50	10800	16	6	6	7	N
	B410074	1968	IH 94 EB	EMPIRE AVENUE	N	81	10800	16	5	5	7	N
	B410075	1968	IH 94 WB	SIDE RD M	N	81	10650	16	5	5	7	N
17	**B410028**	1963	IH 94 EB	Foley Avenue	N	86.30	11650	15	7	6	5	N
	B410029	1963	IH 94 WB	Foley Avenue	N	67	11650	15	7	5	7	N
18	**B410245**	2003	NW RAMP IH 94	LEMONWEIR RIVER	5	99.80	970	0	8	9	9	N
	B410044	1963	IH 94 EB	IH 90 WB	N	93	15100	22	7	6	7	N
	B410055	1963	IH 94 EB	KREYER CREEK	8	92.80	11650	22	N	N	N	7
	B410024	1963	IH 94 EB	RAMP IH 90EB-IH 94WB	N	94.90	1800	22	7	7	7	N
	B410056	1964	IH 94 WB	KREYER CREEK	8	92.30	14440	15	N	N	N	7
	B410057	1963	IH 94 EB	LEMONWEIR CREEK	5	97.30	15100	15	8	7	7	N
	B410058	1963	IH 94 WB	LEMONWEIR CREEK	5	97.30	15100	15	8	8	7	N
19	**B410045**	1963	IH 90 EB-IH 94 EB	BR ALLEN CREEK	8	91.80	17300	14	N	N	N	7
	B410046	1963	IH 90 WB-IH 94 WB	BR ALLEN CREEK	8	91.80	17300	41	N	N	N	6
	B410049	1963	IH 90 EB-IH 94 EB	ALLEN CREEK	8	91.80	17300	14	N	N	N	7
	B410050	1963	IH 90 WB-IH 94 WB	ALLEN CREEK	8	91.80	16850	41	N	N	N	7
	B410051	1963	IH 90-IH 94	BEAR CREEK	8	72.30	33700	14	N	N	N	7
	B410053	1963	IH 90-IH 94	W FK BEAR CREEK	8	72.30	33700	14	N	N	N	7
	B410035	1963	IH 90 WB-IH 94 WB	MILL BLUFF RD	N	78.80	16850	41	5	5	6	N
	B290051	1964	IH 90 EB-IH 94 EB	C	N	89.60	16600	14	4	6	7	N
	B290052	1964	IH 90 WB-IH 94 WB	C	N	78.60	16600	14	4	5	5	N
	B290053	1964	IH 90 EB-IH 94 EB	CTH H/UP RR/WIS ST	N	97.30	16600	14	7	8	7	N
	B290054	1964	IH 90 WB-IH 94 WB	H	N	95.10	16600	14	6	8	6	N

Corridor Segment ID	Bridge ID	Year built	Feature on	Feature Under	Scour Code (N=N/A)	Sufficiency Rating	ADT	TRUCK %	NBI Rating			
									DECK	SUPER	SUB	CULV
	B290058	1964	IH 90-IH 94	BR LEMONWEIR RIVER	8	72.10	34600	14	N	N	N	7
20	**B290044**	1964	IH 90 EB-IH 94 EB	HOG ISLAND RD/UP RR	N	97	16600	27	7	7	7	N
	B290045	1964	IH 90 WB-IH 94 WB	HOG ISLAND RD/UP RR	N	98	16600	27	7	7	8	N
	B290046	1964	IH 90 EB-IH 94 EB	LEMONWEIR RIVER	5	98	16600	27	7	7	6	N
	B290047	1964	IH 90 WB-IH 94 WB	LEMONWEIR RIVER	5	87	16600	27	7	6	5	N
21	**B290032**	1964	IH 90 EB-IH 94 EB	LEMONWEIR RIVER	5	98	17800	27	7	7	6	N
	B290033	1964	IH 90 WB-IH 94 WB	LEMONWIER RIVER	5	98	17000	14	7	7	6	N
	B290034	1964	IH 90 EB-IH 94 EB	STH 82	N	92.70	15450	27	7	6	7	N
	B290035	1964	IH 90 WB-IH 94 WB	STH 82	N	92.70	15450	14	7	7	7	N
	B290036	1964	IH 90 EB-IH 94 EB	CTH G	N	97.30	15450	27	7	8	7	N
	B290037	1964	IH 90 WB-IH 94 WB	G	N	97.30	15450	27	7	7	7	N
22	**B290016**	1964	IH 90 EB-IH 94 EB	USH 12-STH 16	N	95.10	18050	27	7	7	7	N
	B290017	1964	IH 90 WB-IH 94 WB	USH 12-STH 16	N	97.20	18050	27	7	7	7	N
	B290018	1964	IH 90 EB-IH 94 EB	CP RR	N	96.10	17800	27	7	7	7	N
	B290019	1964	IH 90 WB-IH 94 WB	CP RR	N	96.10	18050	14	7	7	7	N
	B290029	1964	IH 90 EB-IH 94 EB	SEVEN MILE CREEK	8	94.70	17800	27	N	N	N	7
	B290030	1964	IH 90 WB-IH 94 WB	SEVEN MILE CREEK	8	91.80	17000	14	N	N	N	7
23	**B560037**	1960	IH 90 EB-IH 94 EB	H	N	96	19500	20	7	7	6	N
	B560038	1961	IH 90 WB-IH 94 WB	H	N	94	18200	13	7	7	7	N
	B560039	1961	IH 90 EB-IH 94 EB	STH 13 NB	8	77.60	19500	20	6	7	5	N
	B560040	1961	IH 90 WB-IH 94 WB	STH 13 NB	8	91	18720	13	7	7	7	N
24	**B560042**	1961	IH 90 EB-IH 94 EB	SPRING BROOK	8	98	18900	20	7	7	6	N
	B560043	1961	IH 90 WB-IH 94 WB	SPRING BROOK	8	98	17600	13	7	7	7	N
	B560044	1961	IH 90 EB-IH 94 EB	STH 23	N	95.10	17300	13	7	7	7	N
	B560045	1961	IH 90 WB-IH 94 WB	STH 23	N	95.20	16100	13	7	7	7	N
	B560047	1961	IH 90 EB-IH 94 EB	MIRROR LAKE	8	91	19300	13	6	6	6	N
	B560048	1961	IH 90 WB-IH 94 WB	MIRROR LAKE	8	91	18900	13	6	6	6	N
25	**B560049**	1961	IH 90 EB-IH 94 EB	ISHNALA RD	N	96	19300	13	7	7	7	N
	B560050	1961	IH 90 WB-IH 94	ISHNALA RD	N	96	18900	13	7	7	7	N

Corridor Segment ID	Bridge ID	Year built	Feature on	Feature Under	Scour Code (N=N/A)	Sufficiency Rating	ADT	TRUCK %	NBI Rating			
									DECK	SUPER	SUB	CULV
			WB									
	B560030	1960	IH 90 EB-IH 94 EB	USH 12	N	96.10	16600	14	6	7	7	N
	B560031	1960	IH 90 WB-IH 94 WB	USH 12	N	93.20	17100	20	7	7	7	N
26	**B560024**	1961	IH 90 EB-IH 94 EB	SCHEPPS RD	N	97	17500	18	7	7	7	N
	B560025	1961	IH 90 WB-IH 94 WB	SCHEPPS RD	N	96	21800	18	7	7	7	N
	B110138	2004	IH 90 WB-IH 94 WB	BARABOO RIVER	5	92.10	16700	18	8	8	7	N
28	**B110015**	1961	IH 90 EB-IH 94 EB	STH 60	N	65.00	27300	16	4	4	6	N
	B110016	1961	IH 90 WB-IH 94 WB	STH 60	N	83.00	35500	16	5	5	5	N
	B110022	1961	IH 90 EB-IH 94 EB	WISCONSIN RIVER 10	5	80.50	26900	17	5	5	6	N
	B110023	1961	IH 90 WB-IH 94 WB	WISCONSIN RIVER 11	5	80.50	26900	17	5	5	6	N
	B110024	1961	IH 90 EB-IH 94 EB	SMOKEY HOLLOW RD	N	78.60	33050	16	5	6	5	N
	B110040	1961	IH 90 EB-IH 94 EB	ROWAN CREEK	5	98.00	26900	17	6	6	7	N
	B110041	1961	IH 90 WB-IH 94 WB	ROWAN CREEK	5	98.00	26900	17	6	6	7	N
	B110042	1961	IH 90 WB-IH 94 WB	BR ROWAN CREEK	8	74.40	24700	17	N	N	N	7
	B110043	1961	IH 90 WB-IH 94 WB	BR ROWAN CREEK	8	74.40	24700	17	N	N	N	7
	B110044	1961	IH 90 WB-IH 94 WB	BR ROWAN CREEK	8	74.40	24700	17	N	N	N	8
	B110045	1961	IH 90 WB-IH 94 WB	BR ROWAN CREEK	8	74.50	24300	17	N	N	N	7
29	**B130297**	1971	RAMP STH 19-IH 90EB	CMSTPP RR	N	70.60	6400	16	5	5	7	N
	B130119	1959	IH 90-IH 94	BR YAHARA RIVER	8	67.00	63800	17	N	N	N	8
	B130087	1960	IH 90 EB-IH 94 EB	CUBA VALLEY RD	N	67.00	33200	16	4	4	4	N
	B130088	1960	IH 90 WB-IH 94 WB	CUBA VALLEY RD	N	67.00	30600	16	4	4	5	N
	B130090	1959	IH 90-IH 94	YAHARA RIVER	8	67.00	63800	17	N	N	N	6
	B130091	1960	IH 90 EB-IH 94 EB	STH 19	N	80.20	33200	17	5	5	5	N
	B130092	1960	IH 90 WB-IH 94 WB	STH 19	N	80.30	30600	16	5	5	6	N
	B130093	1959	IH 90 EB-IH 94 EB	CMSTPP RR	N	80.60	29900	16	5	7	5	N
	B130094	1959	IH 90 WB-IH 94 WB	CMSTPP RR	N	81.50	24300	16	6	5	6	N
30	**B130095**	1959	IH 90-IH 94	TOKEN CREEK	8	67.00	66900	16	N	N	N	6
	B130098	1960	IH 90 EB-IH 94 EB	USH 51	N	80.50	34600	17	6	7	5	N
	B130099	1960	IH 90 WB-IH 94 WB	USH 51	N	78.00	24700	16	4	6	5	N
31	**B130102**	1961	IH 90 EB-IH 94 EB	USH 151	N	75.50	49300	16	5	8	5	N

Corridor Segment ID	Bridge ID	Year built	Feature on	Feature Under	Scour Code (N=N/A)	Sufficiency Rating	ADT	TRUCK %	NBI Rating			
									DECK	SUPER	SUB	CULV
	B130103	1961	IH 90 WB-IH 94 WB	USH 151	N	76.60	34000	17	5	6	5	N
32	**B130289**	1997	IH 90 WB-IH 94 WB	T	N	97.00	37100	10	7	8	7	N
	B130307	1997	IH 90 EB	STH 30 WB	N	94.80	24200	10	7	8	8	N
	B130308	1997	IH 90 WB	STH 30 WB	N	93.90	23100	11	7	8	7	N
	B130309	1997	IH 90 WB	STH 30 EB	N	96.30	35700	11	7	8	7	N
	B130334	1997	IH 90 EB	STH 30 EB	N	90.40	30800	0	8	8	8	N
	B130400	1994	RAMP IH 90 WB-STH 30 WB	IH 90 EB	N	93.60	5300	21	8	8	8	N
	B130438	1996	IH 94 EB	IH 90 WB	N	95.60	6600	17	7	8	6	N
	B130448	1997	IH 90 EB	T	N	97	37100	10	7	8	8	N
	B130450	1996	IH 94 EB	T	N	98	42100	17	7	8	8	N
	B130104	1960	IH 90 EB-IH 94 EB	CMSTPP RR	N	98.00	42100	17	7	8	8	N
	B130105	1960	IH 90 WB-IH 94 WB	CMSTPP RR	N	98.00	37100	17	8	8	7	N
	B130107	1961	IH 90 EB-IH 94 EB	LIEN RD	N	63.50	42100	17	4	4	5	N
	B130108	1961	IH 90 WB-IH 94 WB	LIEN RD	N	63.50	37100	17	4	4	7	N
	B130118	1959	IH 90-IH 94	STARKWEATHER CREEK	8	69.00	79200	17	N	N	N	6
33	**B130458**	1997	IH 90 EB	CNW RR	N	83	42700	11	8	8	7	N
	B130459	1997	IH 90 WB	CNW RR	N	93.70	4300	11	8	8	8	N
	B130460	1997	RAMP USH 12 EB-IH 90 WB	USH 12 WB-USH 18 WB	N	97.90	2700	0	8	8	8	N
	B130461	1997	IH 90 EB	RAMP IH 90WB-USH 12WB	N	97.20	17000	11	8	8	8	N
	B130462	1997	IH 90 EB	FEMRITE RD	N	85	42700	11	8	8	8	N
	B130463	1997	IH 90 WB	FEMRITE RD	N	84	43000	11	7	8	8	N
	B130464	1997	IH 90 EB	USH 12 WB-USH 18 WB	N	96.10	17300	11	7	8	8	N
	B130465	1997	IH 90 WB	USH 12 WB-USH 18 WB	N	94.60	26470	16	8	8	8	N
	B130466	1997	IH 90 EB	USH 12 EB-USH 18 EB	N	96.10	17460	11	7	8	8	N
	B130467	1997	IH 90 WB	USH 12 EB-USH 18 EB	N	96.80	26470	16	8	8	8	N
34	**B130160**	1961	IH 90 EB	DOOR CREEK	8	96.60	27200	15	8	7	7	N
	B130161	1962	IH 90 WB	DOOR CREEK	8	96.80	24600	15	8	7	7	N
	B130137	1961	IH 90 EB	SIGGELKOW RD	N	78.60	27200	16	5	5	6	N
	B130138	1961	IH 90 WB	SIGGELKOW RD	N	79.50	24600	15	6	5	6	N
	B130140	1961	IH 90 EB	MN	N	97.00	27200	15	6	6	7	N
	B130141	1961	IH 90 WB	MN	N	97.00	24600	15	6	7	7	N
35	**B130146**	1961	IH 90 EB	DROTNING RD	N	96.00	27200	17	7	7	7	N
	B130147	1961	IH 90 WB	DROTNING RD	N	96.00	25300	15	6	7	6	N
	B130148	1961	IH 90 EB	W	N	97.00	27200	17	7	8	7	N
	B130149	1961	IH 90 WB	W	N	97.00	25300	15	7	8	6	N
	B130164	1961	IH 90 EB	B	N	96.00	18100	17	6	8	7	N
	B130165	1961	IH 90 WB	B	N	96.00	16500	15	5	8	7	N
	B130168	1961	IH 90 EB	CHURCH RD	N	85.00	18100	17	5	5	6	N

Corridor Segment ID	Bridge ID	Year built	Feature on	Feature Under	Scour Code (N=N/A)	Sufficiency Rating	ADT	TRUCK %	NBI Rating			
									DECK	SUPER	SUB	CULV
	B130169	1961	IH 90 WB	CHURCH RD	N	85.00	16500	15	5	5	5	N
	B130171	1961	IH 90 EB	USH 51 NB	N	82.00	27680	17	5	5	5	N
	B130172	1961	IH 90 WB	USH 51 NB	N	94.00	25800	15	6	6	6	N
36	**B130208**	1961	IH 90 EB-USH 51 SB	BR SAUNDERS CREEK	5	93.50	29100	17	6	6	6	N
	B130209	1961	IH 90 WB-USH 51 NB	BR SAUNDERS CREEK	5	79.50	25800	15	4	5	6	N
37	**B530088**	1961	IH 90 EB	ELLENDALE RD--ROCK RIVER	5	91	19000	16	6	7	7	N
	B530089	1961	IH 90 WB	ELLENDALE RD--ROCK RIVER	5	91	19700	16	6	7	7	N
	B130176	1961	IH 90 EB	LAKE DRIVE RD	N	88.50	28200	17	3	6	6	N
	B130177	1961	IH 90 WB	LAKE DRIVE RD	N	79.10	24500	16	3	6	5	N
38	**B530072**	1961	IH 90 EB	NEWVILLE RD	N	83	23000	16	4	6	5	N
	B530073	1961	IH 90 WB	NEWVILLE RD	N	97	19700	17	6	7	6	N
	B530074	1961	IH 90 EB	M	N	97	19000	16	6	6	7	N
	B530075	1961	IH 90 WB	M	N	97	19700	19	6	6	6	N
	B530076	1961	IH 90 EB	CMSTPP RR	N	98	23000	16	6	6	6	N
	B530077	1961	IH 90 WB	WSOR Railroad	N	54	19700	16	7	6	3	N
	B530079	1961	IH 90 EB	TOWN LINE RD	N	97	19000	14	7	7	7	N
	B530080	1961	IH 90 WB	TOWN LINE RD	N	97	19700	19	7	7	7	N
	B530081	1962	IH 90 EB	KENNEDY RD	N	94	19000	14	8	7	8	N
	B530082	1962	IH 90 WB	KENNEDY RD	N	97	19700	19	8	7	8	N
	B530083	1961	IH 90 EB	WIS & CALUMET RR	N	97	19000	14	8	8	8	N
	B530084	1961	IH 90 WB	WIS & CALUMET RR	N	98	19000	19	8	8	7	N
	B530085	1962	IH 90 EB	STH 26-MILTON AVE	N	83.60	25200	14	7	6	5	N
	B530086	1962	IH 90 WB	STH 26-MILTON AVE	N	91	21200	14	6	6	6	N
39	**B530065**	1961	IH 90 EB	USH 14	N	56.40	19700	17	5	5	4	N
	B530066	1961	IH 90 WB	USH 14	N	80.90	19700	17	5	5	5	N
40	**B530214**	2003	IH 90 EB	MILWAUKEE STREET	N	92.30	30500	0	8	8	8	N
	B530215	2004	IH 90 WB	MILWAUKEE STREET	N	89.90	32000	0	8	9	9	N
	B530059	1959	IH 90 EB	MT ZION AVE	N	92.50	30500	16	8	8	7	N
	B530060	1959	IH 90 WB	MT ZION AVE	N	94	32000	16	8	8	8	N
	B530061	1959	IH 90 EB	PALMER PARK DR	N	94.50	30500	16	7	7	7	N
	B530062	1959	IH 90 WB	PALMER PARK DR	N	94	32000	16	8	7	7	N
	B530063	1959	IH 90 EB	SPRING BROOK	8	96.50	30500	16	8	8	8	N
	B530064	1959	IH 90 WB	SPRING BROOK	8	98	32000	16	8	8	8	N
	B530029	1959	IH 90 EB	RUGER ST	N	96.30	30500	16	7	6	7	N
	B530030	1959	IH 90 WB	RUGER ST	N	96.30	32000	16	7	6	6	N
42	**B530036**	1958	IH 90 EB	CNW RR	N	96.30	23900	16	8	7	8	N
	B530037	1958	IH 90 WB	CNW RR	N	92	22800	16	7	7	7	N
	B530039	1959	IH 90 EB	TOWN LINE RD	N	92.80	23900	16	8	8	8	N
	B530040	1959	IH 90 WB	TOWN LINE RD	N	96	22800	16	7	8	8	N

Corridor Segment ID	Bridge ID	Year built	Feature on	Feature Under	Scour Code (N=N/A)	Sufficiency Rating	ADT	TRUCK %	NBI Rating			
									DECK	SUPER	SUB	CULV
	B530042	1959	IH 90 EB	TURTLE CREEK	8	96.90	23900	16	7	8	7	N
	B530043	1959	IH 90 WB	TURTLE CREEK	8	98	22800	16	8	8	8	N
	B530056	1958	IH 90	BR ROCK RIVER	8	69	48400	0	N	N	N	6
43	**B530048**	1959	IH 90 EB	CMSTPP RR	8	94.60	27000	14	8	8	8	N
	B530051	1959	IH 90 WB	CMSTPP RR	8	98	24600	14	7	8	8	N
	B530216	2003	IH 90 EB	COLLEY ROAD	N	92.90	27000	0	8	7	8	N
	B530217	2004	IH 90 WB	COLLEY RD	N	93.40	24600	0	8	9	9	N

Appendix D: Vulnerability Ratings of Corridor Segments

Table 14 lists the vulnerability ratings for each corridor segment.

- *Segment ID.* The ID of individual corridor segment being studied.
- *Bridge ID.* The WisDOT bridge number.
- *Point FID.* The ID given to the equal length highway segments, other than bridge structures along the selected corridor segment.
- *Winter Severity Index*. The severity values used for snow/ice functional failure mode.

Table 14: The Corridor Segments with Vulnerability Assessment

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
0		0	70	90	230	0	0	0	0
		1	70	70	90	36.43	3	3	6
		2	70	70	90	36.43	3	3	6
	B550147		42	42	54	36.43	3	3	6
	B550148		42	42	54	36.43	3	3	6
1		3	70	70	90	36.43	3	3	6
		4	70	70	90	36.43	3	3	6
		5	70	70	90	36.43	3	3	6
		6	70	70	90	36.43	3	3	6
		13	70	70	90	36.43	3	3	6
	B550031		42	51	66	36.43	3	3	6
	B550032		42	51	66	36.43	3	3	6
	B550033		42	51	66	36.43	3	3	6
	B550034		42	51	66	36.43	3	3	6
2		14	70	70	90	36.43	3	3	6
		15	70	70	90	36.43	3	3	6
		16	70	70	90	36.43	3	3	6
		17	70	70	90	36.43	3	3	6
		18	70	70	90	36.43	3	3	6
		19	70	70	90	36.43	3	3	6
	B550036		42	51	66	36.43	3	3	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B550037		42	51	66	36.43	3	3	6
	B550038		70	56	72	36.43	3	3	6
	B550039		70	56	72	36.43	3	3	6
	B550044		70	61	78	36.43	4	3	7
	B550045		70	61	78	36.43	4	3	7
	B550202		28	33	42	36.43	3	3	6
3		8	70	70	90	36.43	3	3	6
		9	70	70	90	36.43	3	3	6
		10	70	70	90	36.43	3	3	6
	B550012		56	65	84	36.43	4	3	7
	B550013		56	65	84	36.43	4	3	7
	B550015		70	61	78	36.43	4	3	7
	B550016		70	56	72	36.43	3	3	6
	B550017		56	56	72	36.43	3	3	6
	B550018		56	56	72	36.43	3	3	6
4		11	70	70	90	36.43	3	3	6
		12	70	70	90	36.43	3	3	6
		20	140	70	135	36.43	3	3	6
		21	140	70	135	66.9	5	5	10
		22	140	70	135	66.9	5	5	10
		23	140	70	135	66.9	5	5	10
		24	140	70	135	66.9	5	5	10
		25	140	70	135	66.9	5	5	10
		26	140	70	135	66.9	5	5	10
	B170018		84	42	81	66.9	4	5	9
	B170019		112	47	90	66.9	4	5	9
	B170021		84	42	81	66.9	4	5	9
	B170022		84	42	81	66.9	4	5	9

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B170023		84	42	81	66.9	4	5	9
	B170024		84	42	81	66.9	4	5	9
	B170025		84	42	81	66.9	4	5	9
	B170026		84	51	99	66.9	4	5	9
	B170027		112	56	108	66.9	4	5	9
	B170028		84	42	81	66.9	4	5	9
	B170051		112	56	108	66.9	4	5	9
	B170054		112	56	108	66.9	4	5	9
	B170055		112	56	108	66.9	4	5	9
	B170174		56	28	54	66.9	3	5	8
	B170175		56	28	54	66.9	3	5	8
	B550019		42	56	72	36.43	3	3	6
	B550020		42	56	72	36.43	3	3	6
	B550022		56	65	84	36.43	4	3	7
	B550023		42	56	72	36.43	3	3	6
5		27	140	70	135	66.9	5	5	10
		28	140	70	135	66.9	5	5	10
		29	140	70	135	66.9	5	5	10
		30	140	70	135	66.9	5	5	10
		31	140	70	135	66.9	5	5	10
		32	140	70	135	66.9	5	5	10
		33	140	70	135	66.9	5	5	10
		34	140	70	135	66.9	5	5	10
	B170032		84	56	108	66.9	4	5	9
	B170033		84	61	117	66.9	4	5	9
	B170034		112	56	108	66.9	4	5	9
	B170035		112	56	108	66.9	4	5	9
	B170036		112	56	108	66.9	4	5	9

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B170037		112	56	108	66.9	4	5	9
	B170038		112	56	108	66.9	4	5	9
	B170039		112	56	108	66.9	4	5	9
	B170052		112	56	108	66.9	4	5	9
	B170059		112	56	108	66.9	4	5	9
	B170060		112	56	108	66.9	4	5	9
	B170063		140	70	135	66.9	4	5	9
6		35	140	70	135	66.9	5	5	10
		36	140	70	135	66.9	5	5	10
		37	140	70	135	66.9	5	5	10
		38	140	70	135	66.9	5	5	10
		39	35	105	45	66.9	5	5	10
		40	35	105	45	26.71	2	2	4
		41	35	105	45	26.71	2	2	4
		42	35	105	45	26.71	2	2	4
		47	35	105	45	29.31	2	2	4
	B170050		112	56	108	66.9	4	5	9
	B170057		196	70	135	66.9	5	5	10
	B170058		196	70	135	66.9	5	5	10
	B180011		21	70	30	26.71	3	2	5
	B180012		21	70	30	26.71	3	2	5
	B180015		28	91	39	26.71	3	2	5
7		43	35	105	45	26.71	2	2	4
		44	35	105	45	26.71	2	2	4
		45	35	105	45	26.71	2	2	4
		46	35	105	45	26.71	2	2	4
		48	35	105	45	26.71	2	2	4
		49	35	105	45	26.71	2	2	4

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
		57	35	105	45	26.71	2	2	4
	B180019		21	84	36	26.71	3	2	5
	B180020		21	84	36	26.71	3	2	5
	B180021		21	91	39	26.71	3	2	5
	B180022		21	91	39	26.71	3	2	5
	B180023		28	91	39	26.71	3	2	5
	B180024		28	84	36	26.71	3	2	5
	B180025		28	84	36	26.71	3	2	5
	B180026		28	77	33	26.71	3	2	5
	B180044		21	91	39	26.71	3	2	5
	B180045		21	77	33	26.71	3	2	5
	B180203		7	28	12	26.71	1	2	3
	B180204		7	21	9	26.71	1	2	3
8		54	35	105	45	26.71	2	2	4
		55	35	105	45	26.71	2	2	4
		56	35	105	45	26.71	2	2	4
	B180029		28	84	36	26.71	3	2	5
	B180030		28	84	36	26.71	3	2	5
	B180032		21	77	33	26.71	3	2	5
	B180033		21	77	33	26.71	3	2	5
9		50	35	105	45	26.71	2	2	4
		51	35	105	45	26.71	2	2	4
		52	35	105	45	26.71	2	2	4
		53	35	105	45	26.71	2	2	4
		58	35	105	45	26.71	2	2	4
		59	35	105	45	26.71	2	2	4
	B180151		14	49	21	26.71	1	2	3
	B180152		14	49	21	26.71	1	2	3

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
10		60	35	105	45	26.71	2	2	4
		61	35	105	45	26.71	2	2	4
		62	35	105	45	26.71	2	2	4
		63	35	105	45	26.71	2	2	4
		64	35	105	45	26.71	2	2	4
		65	35	105	45	26.71	2	2	4
		66	35	105	45	26.71	2	2	4
		67	35	105	45	26.71	2	2	4
		68	35	105	45	26.71	2	2	4
		69	35	105	45	26.71	2	2	4
		72	140	105	45	33.37	3	3	6
	B180051		21	70	30	26.71	3	2	5
	B180052		21	70	30	26.71	3	2	5
	B180053		21	77	33	26.71	3	2	5
	B180054		21	77	33	26.71	3	2	5
	B180055		21	77	33	26.71	3	2	5
	B180056		21	77	33	26.71	3	2	5
	B180057		21	70	30	26.71	3	2	5
	B180058		21	70	30	26.71	3	2	5
	B180063		28	84	36	26.71	3	2	5
	B180064		28	84	36	26.71	3	2	5
	B610041		21	63	27	32.41	3	3	6
	B610042		21	63	27	32.41	3	3	6
	B610043		21	63	27	32.41	3	3	6
11		71	35	105	45	32.41	3	3	6
		73	140	105	45	32.41	3	3	6
		74	140	105	45	33.37	3	3	6
		75	140	105	45	33.37	3	3	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
		76	140	105	45	33.37	3	3	6
		77	140	105	45	33.37	3	3	6
		78	140	105	45	33.37	3	3	6
		79	140	105	45	33.37	3	3	6
	B270035		112	91	39	33.37	4	3	7
	B270036		84	70	30	33.37	3	3	6
	B270037		84	77	33	33.37	3	3	6
	B270038		84	63	27	33.37	3	3	6
	B270148		84	49	21	33.37	3	3	6
	B270149		84	63	27	33.37	3	3	6
13		80	140	105	45	33.37	3	3	6
		81	140	105	45	33.37	3	3	6
		82	140	105	45	33.37	3	3	6
		83	140	105	45	33.37	3	3	6
		84	140	105	45	33.37	3	3	6
		85	140	105	45	33.37	3	3	6
		86	140	105	45	34.98	3	3	6
		90	140	105	45	33.37	3	3	6
	B270021		84	77	33	33.37	3	3	6
	B270022		84	77	33	33.37	3	3	6
	B270024		112	70	30	33.37	4	3	7
	B270025		112	70	30	33.37	4	3	7
	B270027		84	77	33	33.37	3	3	6
	B270028		84	77	33	33.37	3	3	6
	B270029		84	77	33	33.37	3	3	6
	B270030		84	77	33	33.37	3	3	6
	B270031		84	77	33	33.37	3	3	6
	B270032		84	77	33	33.37	3	3	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
14		87	140	105	45	33.37	3	3	6
		88	140	105	45	33.37	3	3	6
		89	140	105	45	33.37	3	3	6
		93	140	105	45	33.37	3	3	6
	B270039		84	70	30	33.37	3	3	6
	B270040		84	70	30	33.37	3	3	6
	B270041		84	70	30	33.37	3	3	6
	B270042		84	70	30	33.37	3	3	6
15		91	140	105	45	33.37	3	3	6
		92	140	105	45	33.37	3	3	6
		94	140	105	45	33.37	3	3	6
		95	140	105	45	33.37	3	3	6
		96	140	105	45	33.37	3	3	6
		97	140	105	45	33.37	3	3	6
	B270043		84	77	33	33.37	3	3	6
	B270044		84	77	33	33.37	3	3	6
	B270054		84	63	27	33.37	3	3	6
	B270055		84	63	27	33.37	3	3	6
	B270059		112	70	30	33.37	4	3	7
	B270060		84	56	24	33.37	3	3	6
	B270063		112	84	36	33.37	4	3	7
	B270064		112	84	36	33.37	4	3	7
16		98	140	105	45	33.37	3	3	6
		99	140	105	45	33.37	3	3	6
		100	140	105	45	33.37	3	3	6
		144	175	70	45	34.98	3	3	6
		145	175	70	45	37.05	4	4	8
		146	175	70	45	37.05	4	4	8

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
		147	175	70	45	37.05	4	4	8
		148	175	70	45	37.05	4	4	8
		149	175	70	45	37.05	4	4	8
		150	175	70	45	37.05	4	4	8
		151	175	70	45	37.05	4	4	8
		152	175	70	45	37.05	4	4	8
		153	175	70	45	37.05	4	4	8
		154	175	70	45	37.05	4	4	8
		155	175	70	45	37.05	4	4	8
		156	175	70	45	32.89	3	3	6
		158	175	70	45	37.05	4	4	8
	B410032		140	98	42	37.05	4	4	8
	B410033		140	47	30	37.05	4	4	8
	B410059		140	56	36	37.05	4	4	8
	B410062		112	70	30	37.05	4	4	8
	B410063		28	21	9	37.05	1	4	5
	B410064		56	42	18	37.05	3	4	7
	B410065		28	21	9	37.05	1	4	5
	B410066		84	49	21	37.05	3	4	7
	B410067		28	21	9	37.05	1	4	5
	B410070		84	77	33	37.05	3	4	7
	B410071		84	77	33	37.05	3	4	7
	B410072		84	77	33	37.05	3	4	7
	B410073		84	77	33	37.05	3	4	7
	B410074		84	91	39	37.05	4	4	8
	B410075		84	91	39	37.05	4	4	8
17		157	175	70	45	37.05	4	4	8
		164	175	70	45	33.37	3	3	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B410028		175	56	36	37.05	4	4	8
	B410029		105	51	33	37.05	3	4	7
18		159	175	70	45	37.05	4	4	8
		160	175	70	45	37.05	4	4	8
		161	175	70	45	37.05	4	4	8
		162	175	70	45	37.05	4	4	8
		163	175	70	45	37.05	4	4	8
		165	175	70	45	37.05	4	4	8
		166	175	70	45	37.05	4	4	8
		167	175	70	45	37.05	4	4	8
		168	175	70	45	37.05	4	4	8
		169	175	70	45	37.05	4	4	8
		170	175	70	45	37.05	4	4	8
	B410024		105	42	27	37.05	3	4	7
	B410044		105	47	30	37.05	3	4	7
	B410055		105	42	27	37.05	3	4	7
	B410056		105	42	27	37.05	3	4	7
	B410057		105	37	24	37.05	3	4	7
	B410058		105	33	21	37.05	3	4	7
	B410245		35	19	12	37.05	1	4	5
19		101	245	70	90	33.37	3	3	6
		102	245	70	90	37.05	4	4	8
		103	245	70	90	34.98	3	3	6
		104	245	70	90	34.98	3	3	6
		171	175	70	45	37.05	4	4	8
		172	175	70	45	37.05	4	4	8
	B290051		147	61	78	34.98	4	3	7
	B290052		245	75	96	34.98	5	3	8

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B290053		147	37	48	34.98	4	3	7
	B290054		196	47	60	34.98	4	3	7
	B290058		147	42	54	34.98	4	3	7
	B410035		140	65	42	37.05	4	4	8
	B410045		105	42	27	37.05	3	4	7
	B410046		140	56	36	37.05	4	4	8
	B410049		105	42	27	37.05	3	4	7
	B410050		105	42	27	37.05	3	4	7
	B410051		105	42	27	37.05	3	4	7
	B410053		105	42	27	37.05	3	4	7
20		105	245	70	90	34.98	3	3	6
		106	245	70	90	34.98	3	3	6
		107	245	70	90	26.71	2	2	4
		108	245	70	90	34.98	3	3	6
		109	245	70	90	34.98	3	3	6
		110	245	70	90	34.98	3	3	6
		111	245	70	90	34.98	3	3	6
		112	245	70	90	34.98	3	3	6
		118	245	70	90	37.05	4	4	8
	B290044		147	42	54	34.98	4	3	7
	B290045		98	37	48	34.98	3	3	6
	B290046		196	47	60	34.98	4	3	7
	B290047		245	56	72	34.98	5	3	8
21		113	245	70	90	34.98	3	3	6
		114	245	70	90	34.98	3	3	6
		115	245	70	90	34.98	3	3	6
		116	245	70	90	34.98	3	3	6
		117	245	70	90	34.98	3	3	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
		119	245	70	90	34.98	3	3	6
		120	245	70	90	34.98	3	3	6
		121	245	70	90	34.98	3	3	6
		122	245	70	90	34.98	3	3	6
		123	245	70	90	34.98	3	3	6
		124	245	70	90	34.98	3	3	6
		125	245	70	90	34.98	3	3	6
	B290032		196	47	60	34.98	4	3	7
	B290033		196	47	60	34.98	4	3	7
	B290034		147	47	60	34.98	4	3	7
	B290035		147	42	54	34.98	4	3	7
	B290036		147	37	48	34.98	4	3	7
	B290037		147	42	54	34.98	4	3	7
22		126	245	70	90	34.98	3	3	6
		127	245	70	90	34.98	3	3	6
		128	245	70	90	34.98	3	3	6
		129	245	70	90	34.98	3	3	6
		130	245	70	90	34.98	3	3	6
		131	245	70	90	34.98	3	3	6
		132	245	70	90	34.98	3	3	6
		133	245	70	90	34.98	3	3	6
		134	245	70	90	34.98	3	3	6
		135	245	70	90	34.98	3	3	6
		136	245	70	90	34.98	3	3	6
		137	245	70	90	34.98	3	3	6
		138	245	70	90	34.98	3	3	6
		139	245	70	90	34.98	3	3	6
		140	245	70	90	34.98	3	3	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
		141	245	70	90	34.98	3	3	6
		142	245	70	90	34.98	3	3	6
		143	245	70	90	34.98	3	3	6
	B290016		147	42	54	34.98	4	3	7
	B290017		147	42	54	34.98	4	3	7
	B290018		147	42	54	34.98	4	3	7
	B290019		147	42	54	34.98	4	3	7
	B290029		147	42	54	34.98	4	3	7
	B290030		147	42	54	34.98	4	3	7
23		204	280	140	45	36.86	4	4	8
		205	280	140	45	39.5	4	4	8
		206	280	140	45	39.5	4	4	8
		207	280	140	45	39.5	4	4	8
		208	280	140	45	39.5	4	4	8
		209	280	140	45	39.5	4	4	8
		212	280	140	45	34.98	3	3	6
	B560037		224	93	30	39.5	4	4	8
	B560038		168	84	27	39.5	4	4	8
	B560039		280	112	36	39.5	5	4	9
	B560040		168	84	27	39.5	4	4	8
24		210	280	140	45	39.5	4	4	8
		211	280	140	45	39.5	4	4	8
		213	280	140	45	39.5	4	4	8
		214	280	140	45	39.5	4	4	8
		215	280	140	45	39.5	4	4	8
		216	280	140	45	39.5	4	4	8
		217	280	140	45	39.5	4	4	8
		218	280	140	45	39.5	4	4	8

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B560042		224	93	30	39.5	4	4	8
	B560043		168	84	27	39.5	4	4	8
	B560044		168	84	27	39.5	4	4	8
	B560045		168	84	27	39.5	4	4	8
	B560047		224	112	36	39.5	5	4	9
	B560048		224	112	36	39.5	5	4	9
25		174	175	105	45	34.98	3	3	6
		219	280	140	45	39.5	4	4	8
		220	280	140	45	39.5	4	4	8
		221	280	140	45	39.5	4	4	8
		222	280	140	45	39.5	4	4	8
	B560030		168	93	30	39.5	4	4	8
	B560031		168	84	27	39.5	4	4	8
	B560049		168	84	27	39.5	4	4	8
	B560050		168	84	27	39.5	4	4	8
26		173	175	105	45	37.05	4	4	8
		175	175	105	45	36.86	4	4	8
		176	175	105	45	36.86	4	4	8
		177	175	105	45	36.86	4	4	8
		178	175	105	45	36.86	4	4	8
		180	175	105	45	36.86	4	4	8
		223	280	140	45	39.5	4	4	8
		224	280	140	45	39.5	4	4	8
		225	280	140	45	39.5	4	4	8
		226	280	140	45	39.5	4	4	8
		227	280	140	45	39.5	4	4	8
		228	280	140	45	39.5	4	4	8
		229	280	140	45	39.5	4	4	8

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
		230	280	140	45	39.5	4	4	8
		231	280	140	45	39.5	4	4	8
	B110138		105	49	21	36.86	3	4	7
	B560024		168	84	27	39.5	4	4	8
	B560025		168	84	27	39.5	4	4	8
27		179	175	105	45	36.86	4	4	8
		181	175	105	45	36.86	4	4	8
		182	175	105	45	36.86	4	4	8
		183	175	105	45	36.86	4	4	8
		184	175	105	45	36.86	4	4	8
		191	175	105	45	39.5	4	4	8
28		185	175	105	45	36.86	4	4	8
		186	175	105	45	36.86	4	4	8
		187	175	105	45	29.31	2	2	4
		188	175	105	45	36.86	4	4	8
		189	175	105	45	36.86	4	4	8
		190	175	105	45	36.86	4	4	8
		192	175	105	45	36.86	4	4	8
		193	175	105	45	36.86	4	4	8
		194	175	105	45	36.86	4	4	8
		195	175	105	45	36.86	4	4	8
		196	175	105	45	36.86	4	4	8
		197	175	105	45	36.86	4	4	8
		198	175	105	45	36.86	4	4	8
		199	175	105	45	36.86	4	4	8
	B110015		140	112	48	36.86	4	4	8
	B110016		175	105	45	36.86	4	4	8
	B110022		140	98	42	36.86	4	4	8

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B110023		140	98	42	36.86	4	4	8
	B110024		175	98	42	36.86	4	4	8
	B110040		105	77	33	36.86	4	4	8
	B110041		105	77	33	36.86	4	4	8
	B110042		105	63	27	36.86	3	4	7
	B110043		105	63	27	36.86	3	4	7
	B110044		70	42	18	36.86	3	4	7
	B110045		105	63	27	36.86	3	4	7
29		200	175	105	45	36.86	4	4	8
		201	175	105	45	36.86	4	4	8
		202	175	105	45	36.86	4	4	8
		203	175	105	45	36.86	4	4	8
		232	210	140	135	39.5	4	4	8
		233	210	140	135	32.89	3	3	6
		234	210	140	135	32.89	3	3	6
		235	210	140	135	32.89	3	3	6
		236	210	140	135	32.89	3	3	6
		237	210	140	135	32.89	3	3	6
		238	210	140	135	32.89	3	3	6
		239	210	140	135	32.89	3	3	6
		240	210	140	135	32.89	3	3	6
		241	210	140	135	32.89	3	3	6
		242	210	140	135	32.89	3	3	6
	B130087		252	168	162	32.89	5	3	8
	B130088		210	159	153	32.89	5	3	8
	B130090		168	112	108	32.89	5	3	8
	B130091		210	140	135	32.89	5	3	8
	B130092		168	131	126	32.89	5	3	8

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B130093		210	121	117	32.89	5	3	8
	B130094		168	121	117	32.89	5	3	8
	B130119		84	56	54	32.89	3	3	6
	B130297		126	121	117	32.89	5	3	8
30		243	210	140	135	32.89	3	3	6
		244	210	140	135	32.89	3	3	6
		245	210	140	135	32.89	3	3	6
		246	210	140	135	32.89	3	3	6
	B130095		168	112	108	32.89	5	3	8
	B130098		210	112	108	32.89	5	3	8
	B130099		210	140	135	32.89	5	3	8
31		247	210	140	135	32.89	3	3	6
		248	210	140	135	32.89	3	3	6
		249	210	140	135	32.89	3	3	6
		250	210	140	135	32.89	3	3	6
		251	210	140	135	32.89	3	3	6
		252	210	140	135	32.89	3	3	6
		253	210	140	135	32.89	3	3	6
		254	210	140	135	32.89	3	3	6
	B130102		210	112	108	32.89	5	3	8
	B130103		210	131	126	32.89	5	3	8
32		255	210	140	135	32.89	3	3	6
		256	210	140	135	32.89	3	3	6
		257	210	140	135	32.89	3	3	6
		258	210	140	135	32.89	3	3	6
		259	210	140	135	32.89	3	3	6
		260	210	140	135	32.89	3	3	6
	B130104		84	65	63	32.89	4	3	7

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B130105		126	65	63	32.89	4	3	7
	B130107		210	159	153	32.89	5	3	8
	B130108		126	140	135	32.89	5	3	8
	B130118		168	112	108	32.89	5	3	8
	B130289		126	75	72	32.89	4	3	7
	B130307		84	65	63	32.89	4	3	7
	B130308		126	75	72	32.89	4	3	7
	B130309		126	75	72	32.89	4	3	7
	B130334		84	56	54	32.89	3	3	6
	B130400		84	56	54	32.89	3	3	6
	B130438		168	84	81	32.89	4	3	7
	B130448		84	65	63	32.89	4	3	7
	B130450		84	65	63	32.89	4	3	7
33		261	210	140	135	32.89	3	3	6
		262	210	140	135	32.89	3	3	6
		263	210	140	135	32.89	3	3	6
		264	210	140	135	32.89	3	3	6
		265	210	140	135	32.89	3	3	6
		266	210	140	135	32.89	3	3	6
		273	210	140	135	36.86	4	4	8
	B130458		126	65	63	32.89	4	3	7
	B130459		84	56	54	32.89	3	3	6
	B130460		84	56	54	32.89	3	3	6
	B130461		84	56	54	32.89	3	3	6
	B130462		84	56	54	32.89	3	3	6
	B130463		84	65	63	32.89	4	3	7
	B130464		84	65	63	32.89	4	3	7
	B130465		84	56	54	32.89	3	3	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B130466		84	65	63	32.89	4	3	7
	B130467		84	56	54	32.89	3	3	6
34		267	210	140	135	32.89	3	3	6
		268	210	140	135	32.89	3	3	6
		269	210	140	135	32.89	3	3	6
		270	210	140	135	32.89	3	3	6
		271	210	140	135	32.89	3	3	6
		272	210	140	135	32.89	3	3	6
		274	210	140	135	32.89	3	3	6
		275	210	140	135	32.89	3	3	6
		276	210	140	135	32.89	3	3	6
	B130137		168	131	126	32.89	5	3	8
	B130138		168	121	117	32.89	5	3	8
	B130140		126	103	99	32.89	4	3	7
	B130141		126	93	90	32.89	4	3	7
	B130160		126	75	72	32.89	4	3	7
	B130161		126	75	72	32.89	4	3	7
35		277	210	140	135	32.89	3	3	6
		278	210	140	135	32.89	3	3	6
		279	210	140	135	32.89	3	3	6
		280	210	140	135	32.89	3	3	6
		281	210	140	135	32.89	3	3	6
		282	210	140	135	32.89	3	3	6
		283	210	140	135	32.89	3	3	6
		284	210	140	135	32.89	3	3	6
		285	210	140	135	32.89	3	3	6
		286	210	140	135	32.89	3	3	6
		287	210	140	135	32.89	3	3	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
		288	210	140	135	32.89	3	3	6
		289	210	140	135	32.89	3	3	6
		290	210	140	135	32.89	3	3	6
		291	210	140	135	32.89	3	3	6
		292	210	140	135	32.89	3	3	6
		293	210	140	135	32.89	3	3	6
		294	210	140	135	32.89	3	3	6
		295	210	140	135	32.89	3	3	6
		296	210	140	135	32.89	3	3	6
	B130146		126	84	81	32.89	4	3	7
	B130147		168	103	99	32.89	5	3	8
	B130148		126	75	72	32.89	4	3	7
	B130149		168	84	81	32.89	4	3	7
	B130164		126	84	81	32.89	4	3	7
	B130165		126	93	90	32.89	4	3	7
	B130168		168	131	126	32.89	5	3	8
	B130169		210	140	135	32.89	5	3	8
	B130171		210	140	135	32.89	5	3	8
	B130172		168	112	108	32.89	5	3	8
36		297	210	140	135	32.89	3	3	6
		298	210	140	135	32.89	3	3	6
		299	210	140	135	32.89	3	3	6
		300	210	140	135	32.89	3	3	6
		301	210	140	135	32.89	3	3	6
		302	210	140	135	32.89	3	3	6
		303	210	140	135	32.89	3	3	6
		309	210	105	45	36.86	4	4	8
	B130208		168	112	108	32.89	5	3	8

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B130209		168	140	135	32.89	5	3	8
37		304	210	140	135	32.89	3	3	6
		305	210	140	135	32.89	3	3	6
		306	210	140	135	32.89	3	3	6
		307	210	140	135	32.89	3	3	6
		308	210	105	45	32.89	3	3	6
		310	210	105	45	29.31	2	2	4
		311	210	105	45	29.31	2	2	4
		312	210	105	45	29.31	2	2	4
		313	210	105	45	29.31	2	2	4
	B130176		168	140	135	32.89	5	3	8
	B130177		210	149	144	32.89	5	3	8
	B530088		126	70	30	29.31	4	2	6
	B530089		126	70	30	29.31	4	2	6
38		314	210	105	45	29.31	2	2	4
		315	210	105	45	29.31	2	2	4
		316	210	105	45	29.31	2	2	4
		317	210	105	45	29.31	2	2	4
		318	210	105	45	29.31	2	2	4
		319	210	105	45	29.31	2	2	4
		320	210	105	45	29.31	2	2	4
		321	210	105	45	29.31	2	2	4
		322	210	105	45	29.31	2	2	4
		323	210	105	45	29.31	2	2	4
		328	210	105	45	29.31	2	2	4
	B530072		210	105	45	29.31	5	2	7
	B530073		168	77	33	29.31	4	2	6
	B530074		126	77	33	29.31	4	2	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B530075		168	84	36	29.31	4	2	6
	B530076		168	84	36	29.31	4	2	6
	B530077		294	98	42	29.31	5	2	7
	B530079		126	63	27	29.31	4	2	6
	B530080		126	63	27	29.31	4	2	6
	B530081		84	49	21	29.31	3	2	5
	B530082		84	49	21	29.31	3	2	5
	B530083		84	42	18	29.31	3	2	5
	B530084		126	49	21	29.31	3	2	5
	B530085		210	84	36	29.31	4	2	6
	B530086		168	84	36	29.31	4	2	6
39		324	210	105	45	29.31	2	2	4
		325	210	105	45	29.31	2	2	4
		326	210	105	45	29.31	2	2	4
		327	210	105	45	29.31	2	2	4
		329	210	105	45	29.31	2	2	4
	B530065		252	112	48	29.31	5	2	7
	B530066		210	105	45	29.31	5	2	7
40		330	210	105	45	29.31	2	2	4
		331	210	105	45	29.31	2	2	4
		332	210	105	45	29.31	2	2	4
		340	210	105	45	36.86	4	4	8
	B530029		126	70	30	29.31	4	2	6
	B530030		168	77	33	29.31	4	2	6
	B530059		126	49	21	29.31	3	2	5
	B530060		84	42	18	29.31	3	2	5
	B530061		126	63	27	29.31	4	2	6
	B530062		126	56	24	29.31	4	2	6

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
	B530063		84	42	18	29.31	3	2	5
	B530064		84	42	18	29.31	3	2	5
	B530214		84	42	18	29.31	3	2	5
	B530215		42	28	12	29.31	1	2	3
41		333	210	105	45	29.31	2	2	4
		341	210	105	45	29.31	2	2	4
	B530229		84	42	18	29.31	3	2	5
	B530230		42	28	12	29.31	1	2	3
42		334	210	105	45	29.31	2	2	4
		335	210	105	45	29.31	2	2	4
		336	210	105	45	29.31	2	2	4
		337	210	105	45	29.31	2	2	4
		338	210	105	45	29.31	2	2	4
		339	210	105	45	29.31	2	2	4
		342	210	105	45	29.31	2	2	4
		343	210	105	45	29.31	2	2	4
		344	210	105	45	29.31	2	2	4
		345	210	105	45	29.31	2	2	4
		346	210	105	45	29.31	2	2	4
	B530036		84	49	21	29.31	3	2	5
	B530037		126	63	27	29.31	4	2	6
	B530039		84	42	18	29.31	3	2	5
	B530040		84	49	21	29.31	3	2	5
	B530042		126	56	24	29.31	4	2	6
	B530043		84	42	18	29.31	3	2	5
	B530056		168	84	36	29.31	4	2	6
43		347	210	105	45	29.31	2	2	4
		348	210	105	45	29.31	2	2	4

Corridor Segment ID	Bridge ID	Point FID	RPN Floods	RPN Storms	RPN Tornadoes	Winter Severity Index	Rating Combined	Rating Snow	Net Rating
		349	210	105	45	29.31	2	2	4
		350	210	105	45	29.31	2	2	4
		351	210	105	45	29.31	2	2	4
	B530048		84	42	18	29.31	3	2	5
	B530051		84	49	21	29.31	3	2	5
	B530216		84	49	21	29.31	3	2	5
	B530217		42	28	12	29.31	1	2	3

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