Northwest Region
ITS Benefit/Cost Analysis Final Report

prepared for
Wisconsin Department of Transportation

prepared by
SRF Consulting Group, Inc.

in conjunction with
Cambridge Systematics, Inc.

May 2010

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1.0 Introduction and Background

1.1 PROJECT OBJECTIVES

The objective of this project was to complete a moderately-detailed planning-level analysis of the benefits and costs of deploying selected Intelligent Transportation System (ITS) elements along roadway segments in the Wisconsin Department of Transportation (WisDOT) Northwest Region. The analysis helped determine which ITS elements should be considered for deployment. The ITS elements currently being discussed for possible implementation in this region include:

- Closed-circuit television (CCTV)
- System detector stations (SDS)
- Conversion of automated traffic recorder stations (ATR) to SDS
- Semi-permanent sites for portable changeable message signs (PCMS)
- Dynamic message signs (DMS)
- Ramp closure gates

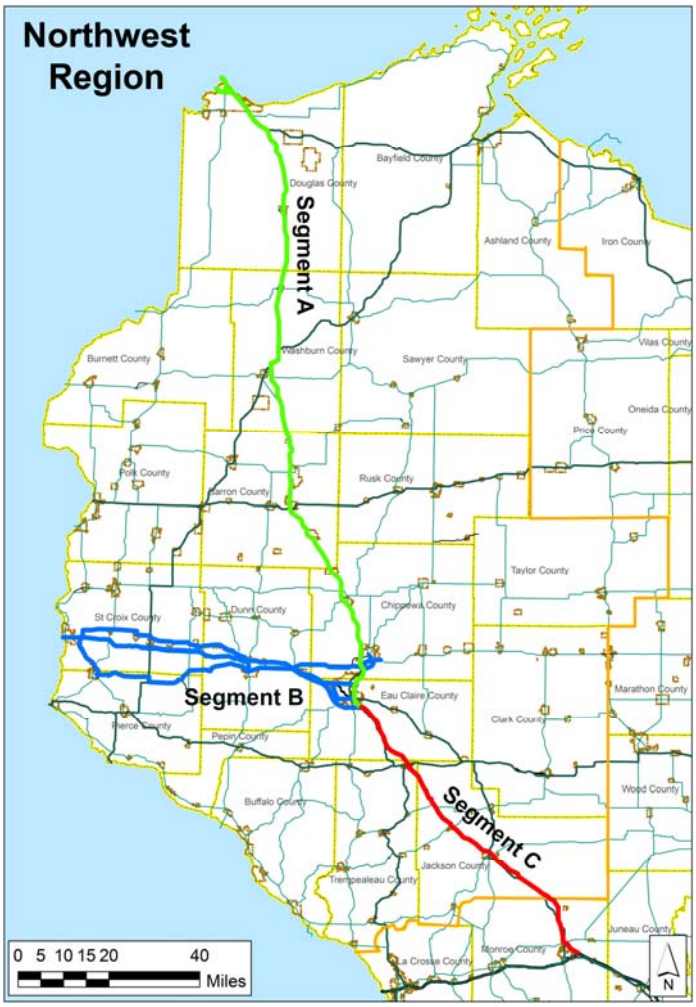
The analysis used the ITS Deployment Analysis System (IDAS) to determine benefit/cost (B/C) ratios at various levels of ITS deployment intensity for both present and future conditions. ITS elements were proposed based on guidance from the WisDOT Traffic Operations Infrastructure Plan (TOIP), while considering existing ITS deployments as well as future predictions. Future traffic conditions were predicted using the Statewide Planning Model. The final benefit/cost ratios may then be used by WisDOT to determine which ITS elements should be considered for deployment.

1.2 PROJECT CORRIDORS

The analysis was performed for routes falling within three WisDOT TOIP Corridors: Peace Memorial Corridor, Chippewa Valley Corridor and Badger State Corridor. The following segments within these TOIP corridors were evaluated:

- **Segment A -** USH 53 from the IH 94 interchange to the Minnesota state line.
- **Segment B –** IH 94 from the Minnesota state line to the USH 53 interchange with arterial routes USH 12 and STH 35/STH 29.
- **Segment C –** IH 94 from the USH 53 interchange to the IH 94/90 split.

Figure 1.1 WisDOT NW Region Segment Map



1.3 CORRIDOR CHARACTERISTICS

The three analysis segments fall within the following WisDOT TOIP corridors:

- **Peace Memorial Corridor –** The Peace Memorial Corridor includes a portion of the Eau Claire - Chippewa Falls MPO Region as well as US 53 from Eau Claire (I-94) to the Minnesota border (Duluth/Superior).

  Segment A falls entirely within the Peace Memorial Corridor.

- **Chippewa Valley Corridor –** The Chippewa Valley Corridor includes I-94 from the Minnesota border (Hudson) to Eau Claire as well as the parallel routes of US 12 and WIS 29 as well as the Eau Claire – Chippewa Falls MPO Region. Major traffic generators in this corridor are the Twin Cities metropolitan area and the Eau Claire/Chippewa Falls region. Over half of Minnesota's population resides in the Twin Cities metropolitan area, with growth encompassing the western portion of the Chippewa Valley Corridor. The Corridor experiences significant regional traffic, high peaking on weekends (Friday afternoon and evening and Sunday afternoon), recurring congestion westbound into Minneapolis during the daily peak periods and weather disturbances during the winter months.

  Segment B falls entirely within the Chippewa Valley Corridor.

- **Badger State Corridor –** The Badger State Corridor includes the Madison MPO and Chippewa Falls – Eau Claire MPO Regions as well as I-94 from Eau Claire to Madison, I-90 from Tomah to Madison and I-39 from Portage to Madison. The Corridor includes a system interchange with I-90 and I-94 near Tomah. The Corridor experiences significant regional traffic, high peeking on weekends (Friday afternoon and evening and Sunday afternoon), and weather disturbances during the winter months.

  Segment C falls entirely within the Badger State Corridor.

TOIP corridor recommendations are presented in Appendix A.

The eleven counties of the NW Region ITS Benefit/Cost Analysis are projected to grow at a pace exceeding that of Wisconsin as a whole from 2005 to 2030. According to projections by the Wisconsin Department of Administration, the combined total population of the study area is expected to grow 34.3% from 2005-2035. The Wisconsin growth rate for the same period of time is projected to be 19.0%. St Croix County leads the projected 2005-2035 growth at 94.1%, followed by its eastern neighbor, Dunn County. Table 1.1 summarizes population projections for the analysis area and the State of Wisconsin.

Table 1.1 Population Projections for Barron, Chippewa, Douglas, Dunn, Eau Claire, Jackson, Monroe, Pierce, St Croix, Trempeleau and Washburn Counties

	Population				Growth
County	**2005**	**2015**	**2025**	**2035**	**2005 to 2035**
Barron	46,915	50,137	53,173	54,463	16.1%
Chippewa	60,495	66,709	72,823	76,910	27.1%
Douglas	43,885	45,292	46,763	47,207	7.6%
Dunn	42,342	46,975	51,911	56,073	32.4%
Eau Claire	97,299	105,570	114,623	122,486	25.9%
Jackson	19,865	21,339	22,860	23,879	20.2%
Monroe	43,189	47,507	51,743	54,682	26.6%
Pierce	39,447	44,306	49,608	54,094	37.1%
St Croix	76,265	99,965	125,736	148,043	94.1%
Trempeleau	28,013	29,789	31,577	32,668	16.6%
Washburn	17,056	18,549	19,950	20,609	20.8%
Study Area Total	514,771	576,138	640,767	691,114	34.3%
Wisconsin	5,589,920	5,988,420	6,390,900	6,653,970	19.0%
Study Area as % of State	9.2%	9.6%	10.0%	10.4%	

Source: State of Wisconsin – Department of Administration

1.4 TOIP RECOMMENDATIONS

The TOIP recommends deployment density classes for the level of ITS element deployments that should be considered for a given segment of roadway. The deployment density classes, ranging from baseline to high, were identified based on a variety of operational performance measures including traffic volumes and patterns, safety and the impacts of weather and special events. The TOIP Spectrum of Deployment Density provides planners and designers with a range of ITS options for each deployment density class. The Spectrum of Deployment Density charts as presented in the WisDOT TOIP are shown in Appendix B.

The TOIP also prioritized corridors by their need for ITS investment on three levels: Priority, Emerging Priority and Remaining. The Badger State Corridor is the first corridor on the priority list. Chippewa Valley and Peace Memorial Corridors were listed as Emerging Priority Corridors.

The Badger State Corridor has recommended ranges from low to medium deployment densities within the study area. The Chippewa Valley Corridor has

recommended ranges from baseline to medium. On IH 94, medium deployment density is recommended. On the arterial route roadways that parallel IH 94, baseline to low deployments are generally recommended. The Peace Memorial Corridor has a recommended baseline to medium deployment density within the study area, with the medium deployment density level appearing through Eau Claire. Further details on the recommendations of the TOIP can be found on the project's website: http:// www.topslab.wisc.edu/workgroups/toip.html.

2.0 Description of Alternatives

In order to determine benefit/cost ratios for the deployment of varying levels of ITS intensity, three alternatives were created for each segment. The alternatives were created and analyzed to recommend an appropriate level of ITS intensity to meet long-term infrastructure goals. Currently, ITS is deployed in various intensities throughout the study area. In order to enable an accurate IDAS analysis, the study area was broken into segments consisting of similar deployment densities.

Three ITS deployment intensity alternatives were developed for each of the three Northwest Region segments. ITS deployments for the lowest level alternative were based on existing ITS infrastructure. The medium and high alternatives were developed based on the TOIP recommendation and adjusting this by either increasing or decreasing deployment intensity levels.

Two additional options were added as alternatives to Segment A:

- Segment A Option 1: No roadside mounted DMS along USH 53 within one mile of USH 8. USH 8 in Barron County, although not a freeway, is often considered a system to system movement with USH 53. In the Segment A Medium and High deployment scenarios, roadside mounted DMS are proposed along USH 53 both one mile north and one mile south of the USH 53/USH 8 interchange. This option removes these DMS.
- Segment A Option 2: No roadside mounted DMS in Washburn County. Just north of Spooner, USH 53 and USH 63 share a section of roadway. Two roadside mounted DMS are proposed here to be located 0.3 miles south of Stub Road. One DMS is proposed to face northbound while the second is proposed to face southbound. Segment A Option 2 removes these two roadside mounted DMS from the analysis.

During the project analysis one additional Segment A alternative was presented for analysis:

- Segment A Urban: This scenario isolates the southernmost section of Segment A in the Eau Claire area. Limits of analysis are from the IH 94 interchange to CTH X. The level of deployments in this section increased substantially from low intensity to high intensity due to the addition of nine CCTV surveillance deployments and three roadside mounted DMS and it was desired to independently consider this section.

Both Segment A Options 1 and 2 were analyzed for the Medium and High deployment scenarios. The additional urban alternative was analyzed for all three intensity levels. Thus, a total of 16 alternatives were analyzed. The basis of each alternative is presented in Table 2.1.

Table 2.1 Basis of Alternatives

NW Region Segment	Alternative	Description
A	Low ITS Deployment Intensity	Existing ITS elements
	Medium ITS Deployment Intensity	Decrease of the TOIP based intensity with DMS option
	High ITS Deployment Intensity	TOIP based intensity with DMS option
B	Low ITS Deployment Intensity	Existing ITS elements
	Medium ITS Deployment Intensity	TOIP based intensity
	High ITS Deployment Intensity	Increase of the TOIP based intensity including planned ITS elements with no timetable for deployment
C	Low ITS Deployment Intensity	Existing ITS elements
	Medium ITS Deployment Intensity	Decrease of the TOIP based intensity
	High ITS Deployment Intensity	TOIP based intensity
A Option 1	Medium ITS Deployment Intensity	DMS option in Barron County
	High ITS Deployment Intensity	DMS option in Barron County
A Option 2	Medium ITS Deployment Intensity	DMS option in Washburn County
	High ITS Deployment Intensity	DMS option in Washburn County
A Urban southernmost section; Eau Claire area	Low ITS Deployment Intensity	Existing ITS elements
	Medium ITS Deployment Intensity	Decrease of the TOIP based intensity with DMS option
	High ITS Deployment Intensity	TOIP based intensity with DMS option

Proposed ITS deployments were based on the WisDOT TOIP recommendations along with input from the Northwest Region. Locations of individual elements were recommended based on the TOIP Spectrum of Deployment Density and from Region input.

The table in Appendix C lists a detailed breakdown of elements and field approaches analyzed per ITS deployment. With this information, a series of figures were created to present the alternatives. Each figure shows ITS deployments with locations of individual elements. Figure 2.1 shows a low level of ITS deployment intensity for the Hudson area in Segment B, corresponding to the existing ITS deployment. Figure 2.2 shows a medium ITS deployment intensity and Figure 2.3 shows a high ITS deployment intensity. A complete set of figures for the alternatives is located in Appendix D, while the corresponding ITS element data is presented in Appendix E.

Figure 2.1 Hudson Area Segment B – Low ITS Deployment Intensity

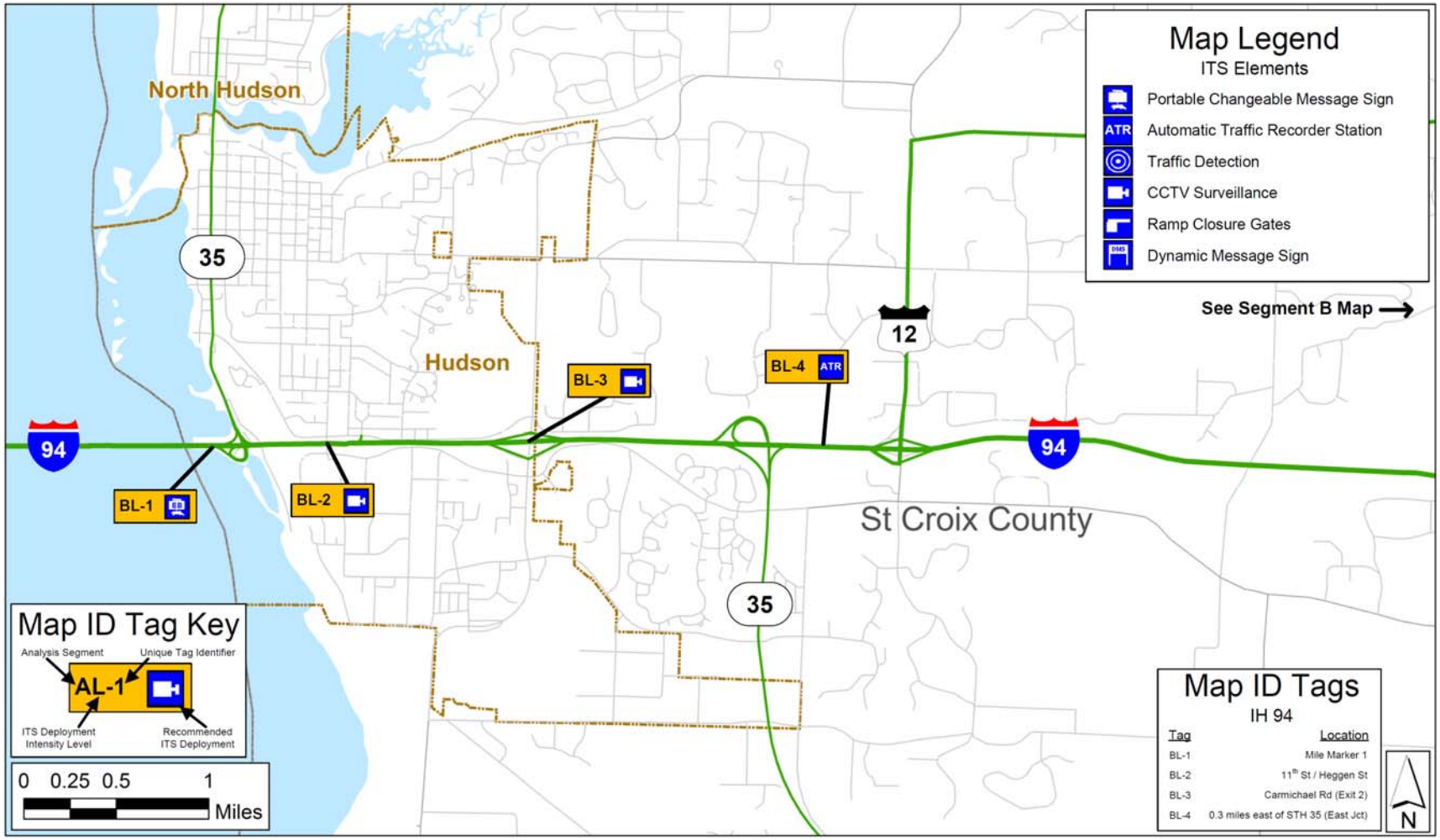


Figure 2.2 Hudson Area Segment B – Medium ITS Deployment Intensity

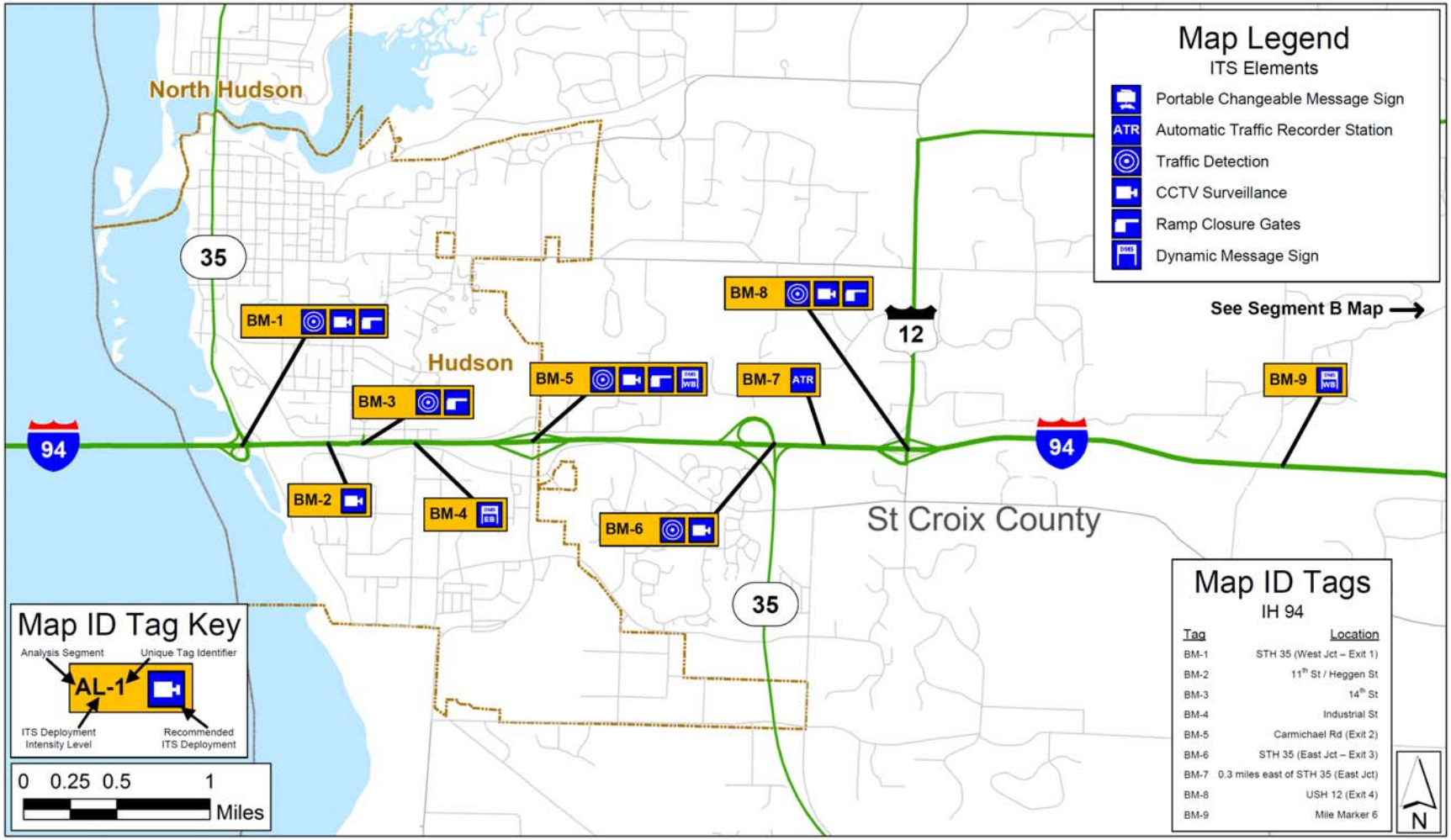
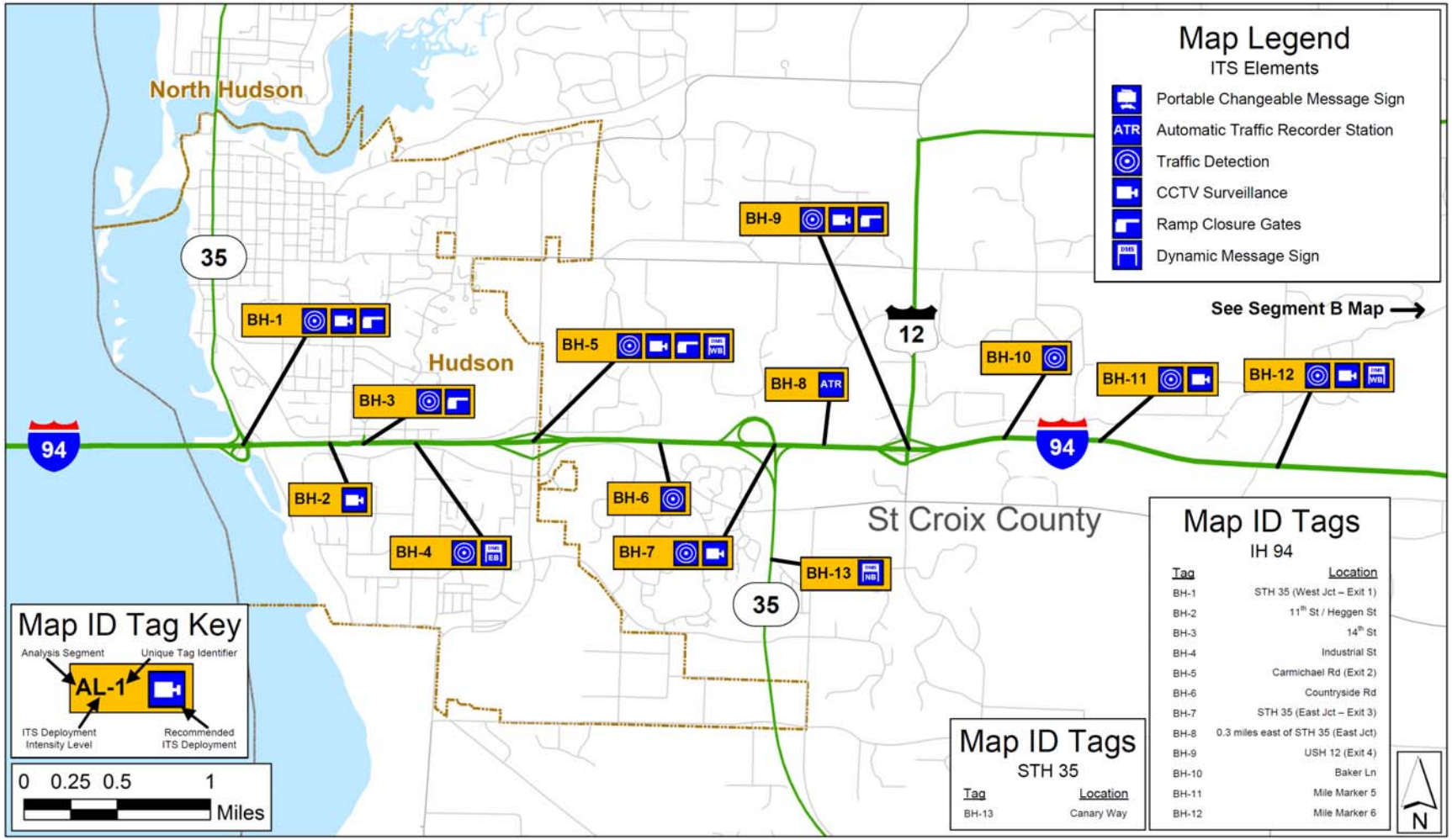


Figure 2.3 Hudson Area Segment B – High ITS Deployment Intensity



2.1 COST ASSUMPTIONS

Initial capital costs, annual operations and maintenance (O&M) costs and useful lives were assigned to each ITS element based on information from the IDAS database, project experience, the TOIP and the Research and Innovative Technology Administration (RITA) of the USDOT. A summary of this information is presented in Table 2.2. Basic capital cost assumptions and quantities for each alternative are presented in Table 2.3.

Table 2.2 ITS Deployment Cost Assumptions

ITS Element	Unit Capital Cost (2007 Dollars)	Unit Annual Operations & Maintenance Cost (2007 Dollars)	Estimated Useful Life	Cost Assumption Source
Traffic Detection				
ATR Station Upgrade	$10,000	$600	10	WisDOT
Mainline	$25,000	$800	10	Derived*
Diamond Interchange	$79,000	$2,500	10	Derived*
Cloverleaf or Nontraditional Interchange	$153,000	$4,900	10	Derived*
CCTV Surveillance	$40,000	$2,300	10	TOIP Appendix A – Traffic Management and Surveillance Operations Infrastructure Plan and Cost Estimates, Derived
Ramp Closure Gates				
Vertical Drop Gate	$19,000	$1,900	10	WisDOT
Dynamic Message Sign (Roadside Mount)	$83,000	$9,400	10	TOIP Implementation Plan
Dynamic Message Sign (Overhead)	$197,000	$19,700	10	Derived*
Portable Changeable Message Sign + Pad	$32,000	$3,200	10	Derived*

*Derived: Determined from ITS and Transportation Project Experience

Table 2.3 Basic Capital Cost Assumptions and Quantities

Device	Unit Cost	Unit	Quantities by Segment																Estimated Life
			A L	**A** M	**A** H	**B** L	**B** M	**B** H	**C** L	**C** M	**C** H	**A** Option 1 M	**A** Option 1 H	**A** Option 2 M	**A** Option 2 H	**A** Urban L	**A** Urban M	**A** Urban H	
ATR Station Upgrade to Detection Station	$10,000	station	6	6	6	4	4	4	2	2	2	6	6	6	6	1	1	1	10
Mainline Traffic Detection	$25,000	2 radar sensors	0	0	0	0	5	39	0	0	1	0	0	0	0	0	0	0	10
Diamond Interchange Traffic Detection	$79,000	4 radar sensors	0	0	7	0	7	9	0	2	3	0	7	0	7	0	0	7	10
Cloverleaf/Nontraditional Interchange Traffic Detection	$153,000	8 radar sensors	0	0	1	0	0	0	0	1	1	0	1	0	1	0	0	1	10
CCTV Surveillance	$40,000	camera	3	11	17	2	17	52	0	3	13	11	17	11	17	3	11	12	10
Vertical Drop Ramp Closure Gates	$19,000	gate	0	49	49	0	50	50	0	25	25	49	49	49	49	0	23	23	10
DMS (Roadside Mount)	$83,000	sign	3	7	14	0	14	26	0	6	8	5	12	5	12	0	0	3	10
DMS (Overhead)	$197,000	sign	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	10
PCMS	$32,000	sign	0	0	0	4	0	0	2	0	0	0	0	0	0	0	0	0	10

2.2 BENEFIT ASSUMPTIONS

In calculating benefits, there are several key inputs to the IDAS modeling. A description of key inputs of IDAS is found in Appendix H. The WisDOT Statewide Planning Model for the years 2000 and 2030 were used in this study. For the 2000 model, the volumes were grown to 2005 using the differences between the 2030 and 2000 daily traffic model. The daily results were annualized. The model was run for a future year (2030) scenario which is the long-term planning horizon year. Due to the size and resource requirements of the statewide model, the IDAS analysis was conducted using a spreadsheet technique, rather than running the network model. It should be noted that this technique does not incorporate analysis of air quality benefits. While these benefits are generally a very small proportion of the total, the benefits may be slightly underestimated.

Both costs and benefits were calculated for a base year of 2005 and a future year of 2030. An annual adjustment rate of five percent was used and the costs and benefits were presented in 2007 dollars.

IDAS utilizes benefit parameters to estimate the impacts of various deployments. While IDAS includes default parameters based on national studies; it also can accommodate information from other sources. Benefit parameters in this project were similar to those used in previous WisDOT ITS benefit/cost studies and represent a variety of sources including the FHWA ITS Benefits database and the results of research in Wisconsin and other states. The parameters used are shown in Table 2.4 below.

Table 2.4 Comparison of Impact Parameters Used for IDAS Analysis

Deployment	Benefit	Parameter
ATR Conversion or New Detector only[a]	Reduction in incident duration.	1%
	Reduction in fuel consumption.	0.1%
	Reduction in fatality rate.	1%
CCTV only[a]	Reduction in incident duration.	4%
	Reduction in fuel consumption.	0.5%
	Reduction in fatality rate.	0.5%
Detector/CCTV Combination	Reduction in incident duration.	5%
	Reduction in fuel consumption.	0.7%
	Reduction in fatality rate.	0.7%
Ramp Closure Gates[b]	Crash reduction – Fatality.	80%
	Crash reduction – Injury.	80%
	Crash reduction – PDO.	80%
	Reduced operating costs through reduction in police presence.	$50/hour
	Annual factor based on 28 annual hours of use	0. 30%
Dynamic Message Sign	Percent of drivers who divert.	25%
	Percent of time useful information is provided.	5%
	Estimated time saved.	5 minutes
Portable Dynamic Message Sign	Percent of drivers who divert.	15%
	Percent of time useful information is provided.	5%
	Estimated time saved.	5 minutes

[a] IDAS defaults modified based on initial runs.

[b] *Desktop Reference for Crash Reduction Factors* Report No. FHWA-SA-07-015, Federal Highway Administration, U.S. DOT, September, 2007, p.89.

Once benefit parameters were calculated, they were monetized in order to permit direct comparison of the various benefit categories. Although IDAS contains default economic parameters, WisDOT provided a set of economic parameters documented at the following website:

http://www.wisdot.info/economics/index.php?title+Financial_Assumptions_and_Parameters. Titled: *Transportation Engineering Economic Analysis Manual, Chapter 3 Valuation of Costs and Benefits, Topic 1 Financial Assumptions and Parameters,* retrieved February 2010. These parameters were incorporated into the analysis and are shown in Table 2.5. All dollar values used in the analysis are in 2007 dollars, in order to facilitate comparison of alternatives across different years.

Table 2.5 Economic Parameters

General Parameters	Value
Number of travel days in a year	286
Year of dollar values	2007
Inflation rate	3%
Discount rate	2.5%
Average vehicle occupancy	1.25
Value of Time (Dollars per Hour)	
Value of in-vehicle time	$9.18
Value of in-vehicle time (commercial)	$28.87
Value of out-vehicle time (commercial)	$28.95
Value of reduced delay time	$9.14
Emission Cost (Dollars per Ton)	
HC/ROG	$2,763.83
NOX	$5,812.78
CO	$6,058.94
PM_{10}	$17,240.47
CO_2	$5.55
SO_2	$5.55
GW	$0.00
Accident Cost (Dollars per Accident)	
Fatality	$3,985,759.26
Injury	$202,690.17
Property damage	$2,235.84
Operating Costs	
Fuel costs (gallon)	$2.21
Nonfuel operating costs (dollars per mile)	$0.11
Noise damage Costs (dollars per mile)	$0.009

3.0 Results of Analysis

This section includes maps and descriptions of the alternatives evaluated along with the results of the IDAS analysis. The financial results of the benefit/cost analysis are presented in both graphic and tabular format. Monetized benefits and costs are presented on an annual basis. The benefit/cost analysis was developed by monetizing different types of benefits including travel time savings, in vehicle-hours of travel, reduction in accidents, fuel cost savings and various types of emissions. These benefit measures are presented in tabular format and are expressed as daily totals. Performance Impacts are presented in Appendix F; Benefits and life cycle costs over the life of the project are presented in Appendix G.

3.1 SEGMENT A

The benefit/cost results for Segment A deployments are shown graphically in Figure 3.1 and in tabular format in Tables 3.1 and 3.2. Net benefits and benefit/cost ratios are relatively low for all scenarios for Segment A. The 2005 Low deployment scenario produces net benefits of roughly $40,000 annually in the base year, increasing to just over $500,000 for the High deployment scenario. Benefit/cost ratios for the three scenarios range from 1.3 to 1.8.

By 2030, the net benefits under the Low deployment scenario increase to roughly $90,000 annually while net benefits under the Medium and High deployment scenarios increase to just under $700,000 and $1 million respectively. Benefit/cost ratios for all three scenarios are in the range between 1.6 and 2.3. In both 2005 and 2030, the benefit/cost ratio for the Medium deployment scenario is slightly higher than the other deployment levels.

Capital costs jumped from roughly $600,000 for the Low deployment scenario to $2.2 million for the Medium deployment scenario and $3.7 million for the High deployment scenario. While the increase from Low to Medium results in an increase in net benefits, the additional money spent for the High deployment scenario does not yield significant additional benefits either in the present or in the future.

The majority of benefits in 2005 and 2030 are in accident reduction and travel time savings with the greatest percentage of benefits coming from accident reduction in both the Medium and High deployment scenarios.

Two additional options were added to the Segment A analysis. Two variations, the Medium and High deployment scenarios, were added to both options. Option 1 eliminates two roadside DMS along USH 53 in Barron County, while Option 2 eliminates two roadside DMS further north in Washburn County. Both of these options had a minimal impact on benefit/cost ratios and net benefits,

indicating that the benefits and costs of the eliminated devices were roughly equal.

An additional alternative was created during the analysis. The southernmost section of Segment A, (A Urban) was analyzed on its own to provide a comparison of this portion of Segment A to Segment A as a whole. This area contains a high percentage of CCTV surveillance deployments when compared to Segment A as a whole. 2005 benefit/cost ratios for Segment A Urban range from 2.8 for the Low deployment scenario, 2.0 for the Medium deployment scenario and 1.5 for the High deployment scenario. Net benefits range from just under $50,000 for the Low deployment scenario to just about $200,000 for the Medium and High deployment scenario. These represent a slight increase in benefit/cost for the Low and Medium scenarios when compared to Segment A as a whole.

The 2030 results for Segment A Urban show the benefit/cost ratio of 4.0 for the Low deployment scenario. The Medium deployment scenario benefit/cost is 2.8 and the High deployment scenario is 2.1. Net benefits range from $80,000 for the Low deployment scenario to just over $400,000 for the High deployment scenario. These also represent a slight increase in the net benefits realized as compared to Segment A as a whole.

Figure 3.1 Segment A - IDAS Results

Segment A - IDAS Results

IH 94 Interchange to MN State Line

Description

Segment A consists of USH 53 between Eau Claire-Chippewa Falls and Superior and a portion of USH 2 in Superior. The Segment begins at the IH 94 interchange and ends at the MN state line. ITS deployment options (ranging from Low to High) are briefly described below, including several options for Medium and High deployment. The benefit/cost ratios for each option (for the base year 2005 and forecast year 2030) are found to the right, showing how much value will be returned for each dollar spent.

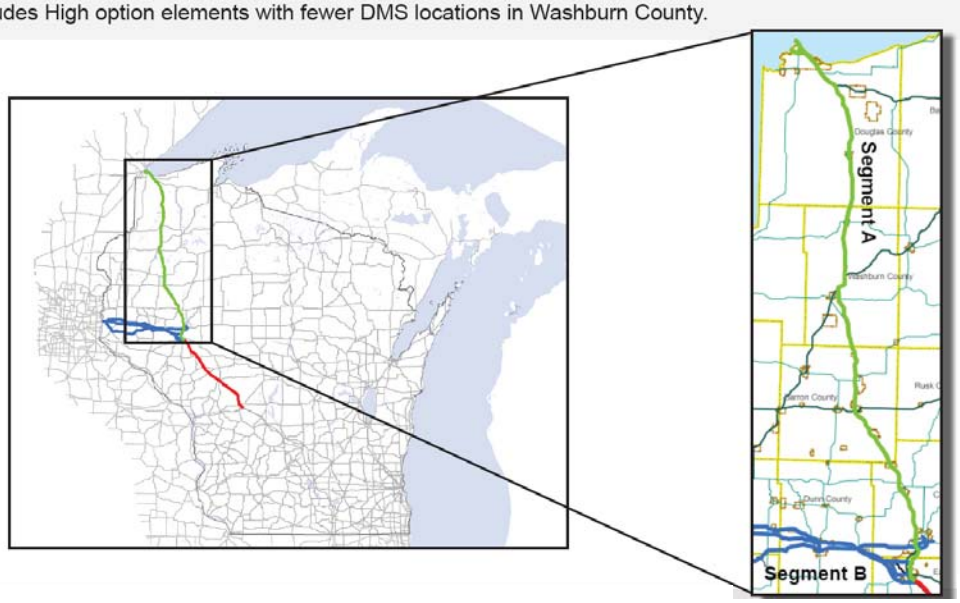
Low Includes several ATR and CCTV for a low level of detection. DMS locations are found in Superior.

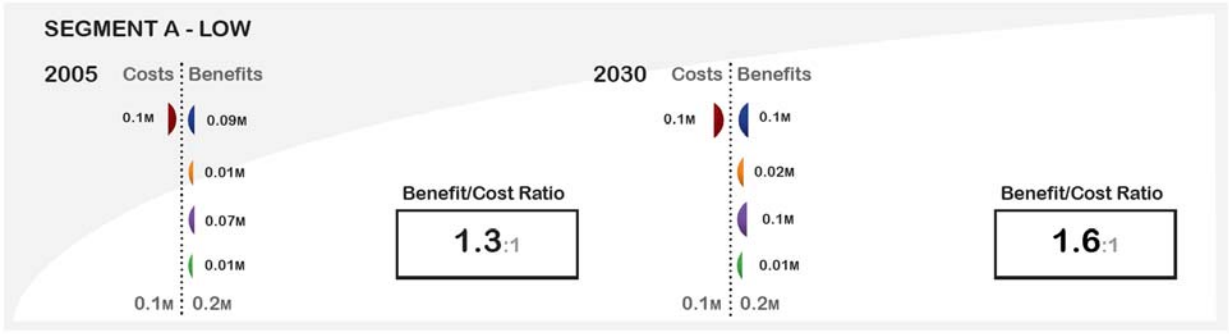
Medium Includes Low option elements plus additional DMS locations and ramp closure gates. CCTV surveillance is expanded in Eau Claire-Chippewa Falls.

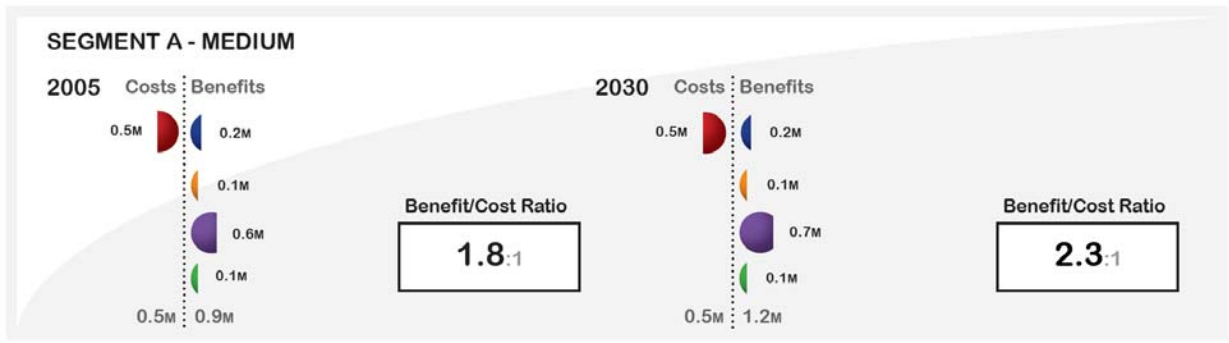
Medium - Option 1 Includes Medium option elements with fewer DMS locations in Barron County.
Medium - Option 2 Includes Medium option elements with fewer DMS locations in Washburn County.

High Includes Medium option elements plus additional DMS locations and detection in Eau Claire-Chippewa Falls. CCTV surveillance is added to Superior.

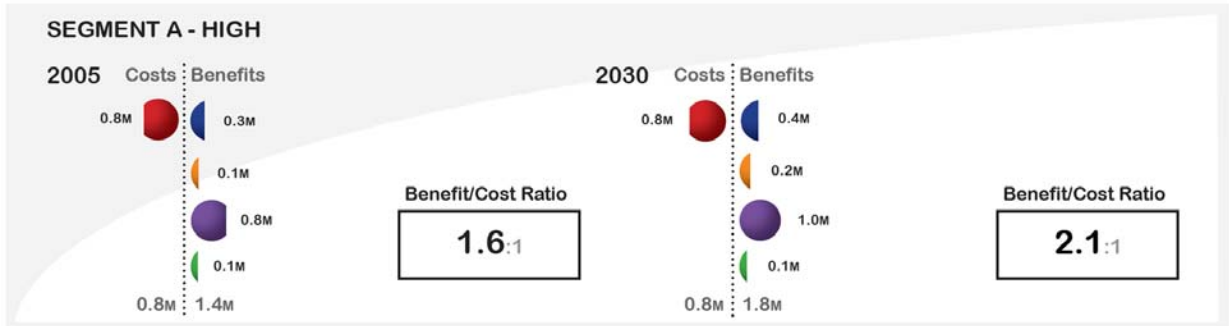
High - Option 1 Includes High option elements with fewer DMS locations in Barron County.
High - Option 2 Includes High option elements with fewer DMS locations in Washburn County.

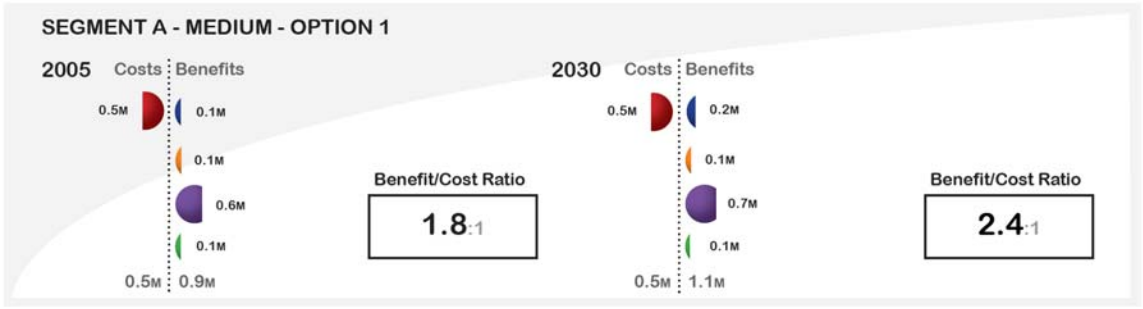


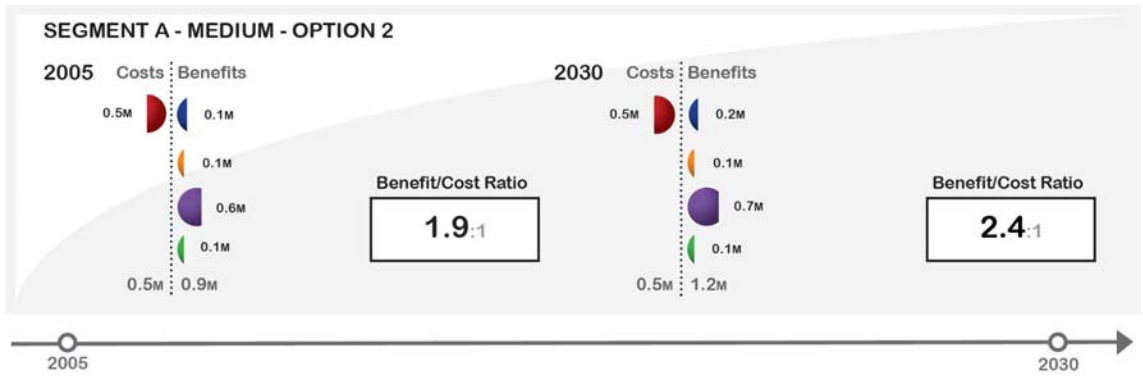


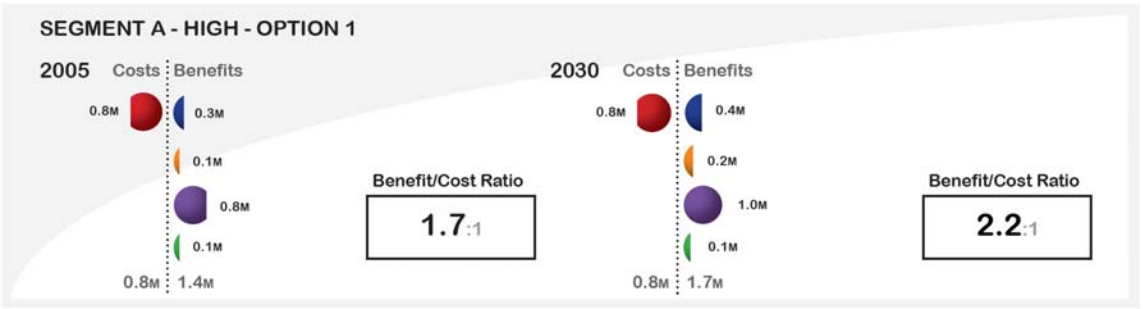


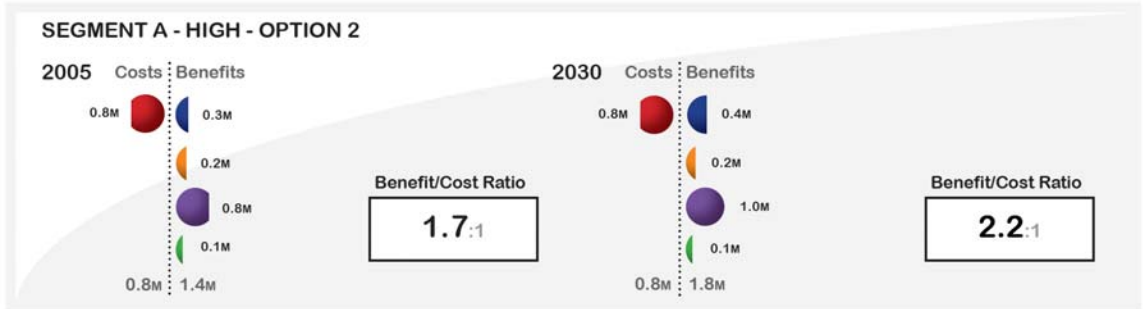
See other page for additional Medium options...




SEGMENT A - MEDIUM - OPTION 1
2005 Costs Benefits
0.5M
0.1M
0.1M
0.6M
0.1M
0.5M 0.9M
Benefit/Cost Ratio
1.8:1
2030 Costs Benefits
0.5M
0.2M
0.1M
0.7M
0.1M
0.5M 1.1M
Benefit/Cost Ratio
2.4:1


SEGMENT A - MEDIUM - OPTION 2
2005 Costs Benefits
0.5M
0.1M
0.1M
0.6M
0.1M
0.5M 0.9M
Benefit/Cost Ratio
1.9:1
2030 Costs Benefits
0.5M
0.2M
0.1M
0.7M
0.1M
0.5M 1.2M
Benefit/Cost Ratio
2.4:1
2005
2030


SEGMENT A - HIGH - OPTION 1
2005 Costs Benefits
0.8M
0.3M
0.1M
0.8M
0.1M
0.8M 1.4M
Benefit/Cost Ratio
1.7:1
2030 Costs Benefits
0.8M
0.4M
0.2M
1.0M
0.1M
0.8M 1.7M
Benefit/Cost Ratio
2.2:1


SEGMENT A - HIGH - OPTION 2
2005 Costs Benefits
0.8M
0.3M
0.2M
0.8M
0.1M
0.8M 1.4M
Benefit/Cost Ratio
1.7:1
2030 Costs Benefits
0.8M
0.4M
0.2M
1.0M
0.1M
0.8M 1.8M
Benefit/Cost Ratio
2.2:1


KEY
Each circle represents $1M in value (in 2007 dollars).
Benefits
Travel Time
Time saved by drivers due to reduced congestion
Crash Reduction
Elevated safety levels reduce secondary crashes
Operating Cost
Fuel savings
Environmental
Reductions in carbon emissions
Costs
Annualized Costs
Costs to build and maintain infrastructure on an annual basis (includes O & M as well as annualized capital costs)

Table 3.1 Segment A 2005 Monetized Benefits

Deployments	Travel Time	Accident Reduction	Operating Cost	Environmental	Agency Savings	Total	Annualized Cost	O&M Costs	Initial Capital	Net Benefits	B/C Ratio
Segment A Low	$90,000	$74,000	$14,000	$10,000	$0	$188,000	$149,000	$58,400	$626,000	$39,000	1.3
Segment A Medium	$171,000	$570,000	$110,000	$75,000	$2,000	$928,000	$524,000	$207,500	$2,209,000	$404,000	1.8
Segment A High	$349,000	$784,000	$149,000	$101,000	$2,000	$1,385,000	$843,000	$309,500	$3,736,000	$542,000	1.6
Segment A Option 1 Medium	$126,000	$570,000	$110,000	$75,000	$2,000	$883,000	$481,000	$188,700	$2,043,000	$402,000	1.8
Segment A Option 1 High	$303,000	$784,000	$149,000	$101,000	$2,000	$1,339,000	$801,000	$290,700	$3,570,000	$538,000	1.7
Segment A Option 2 Medium	$136,000	$570,000	$110,000	$75,000	$2,000	$893,000	$481,000	$188,700	$2,043,000	$412,000	1.9
Segment A Option 2 High	$314,000	$784,000	$149,000	$101,000	$2,000	$1,350,000	$801,000	$290,700	$3,570,000	$549,000	1.7
Segment A Urban Low	$2,000	$56,000	$10,000	$8,000	$0	$76,000	$27,000	$7,500	$130,000	$49,000	2.8
Segment A Urban Medium	$3,000	$308,000	$52,000	$38,000	$2,000	$403,000	$197,000	$69,600	$887,000	$206,000	2.0
Segment A Urban High	$104,000	$374,000	$63,000	$46,000	$2,000	$589,000	$392,000	$122,500	$1,882,000	$197,000	1.5

All values are dollars per year except Initial Capital Cost

Table 3.2 Segment A 2030 Monetized Benefits

Deployments	Travel Time	Accident Reduction	Operating Cost	Environmental	Agency Savings	Total	Annualized Cost	O&M Costs	Initial Capital	Net Benefits	B/C Ratio
Segment A Low	$108,000	$103,000	$18,000	$13,000	$0	$242,000	$149,000	$58,400	$626,000	$93,000	1.6
Segment A Medium	$211,000	$748,000	$142,000	$98,000	$2,000	$1,201,000	$524,000	$207,500	$2,209,000	$677,000	2.3
Segment A High	$445,000	$1,030,000	$194,000	$133,000	$2,000	$1,804,000	$843,000	$309,500	$3,736,000	$961,000	2.1
Segment A Option 1 Medium	$154,000	$748,000	$142,000	$98,000	$2,000	$1,144,000	$481,000	$188,700	$2,043,000	$663,000	2.4
Segment A Option 1 High	$388,000	$1,030,000	$194,000	$133,000	$2,000	$1,747,000	$801,000	$290,700	$3,570,000	$946,000	2.2
Segment A Option 2 Medium	$166,000	$748,000	$142,000	$98,000	$2,000	$1,156,000	$481,000	$188,700	$2,043,000	$675,000	2.4
Segment A Option 2 High	$399,000	$1,030,000	$194,000	$133,000	$2,000	$1,758,000	$801,000	$290,700	$3,570,000	$957,000	2.2
Segment A Urban Low	$2,000	$81,000	$14,000	$10,000	$0	$107,000	$27,000	$7,500	$130,000	$80,000	4.0
Segment A Urban Medium	$3,000	$423,000	$71,000	$51,000	$2,000	$550,000	$197,000	$69,600	$887,000	$353,000	2.8
Segment A Urban High	$142,000	$517,000	$87,000	$63,000	$2,000	$811,000	$392,000	$122,500	$1,882,000	$419,000	2.1

All values are dollars per year except Initial Capital Cost

3.2 SEGMENT B

The benefit/cost results for Segment B deployments are shown graphically in Figure 3.2 and in tabular format in Tables 3.3 and 3.4. This segment includes the Hudson area as well as the Eau Claire area. Benefit/cost ratios are highly positive for all scenarios. In the 2005 base year, the Low deployment scenario benefit/cost ratio is the highest but provides very little infrastructure. The return on investment in deployments for both the Medium and High deployment scenarios is proportionally similar. Annual net benefits are approximately $300,000 for the Low deployment scenario, $2.3 million for the Medium deployment scenario and $4.1 million for the High deployment scenario. Benefit/cost ratio for the Low deployment scenario is 6.3 while the Medium and High are very close, 3.9 and 3.7 respectively.

By 2030 the larger investments in the Medium and High deployment scenarios begin to yield greater net benefits and higher benefit/cost ratios. Under the Low deployment scenario, net benefits increase to roughly $460,000 annually while under the Medium and High deployment scenarios the increase is greater in percentage terms to $3.8 million and $7.1 million respectively. The benefit/cost ratio for the Low deployment scenario again is the highest at 9.1 but provides little infrastructure while the Medium and High ratios increase to 5.8 and 5.7.

Capital costs jumped from roughly $250,000 for the Low deployment scenario to $3.5 million for the Medium deployment scenario and $6.9 million for the High. The additional money spent for the High scenario does not yield significant additional benefits either in the present or in the future year.

The majority of benefits in 2005 and 2030 are in accident reduction and travel time savings. Again, the greatest percentage of benefits came from accident reduction in both the Medium and High deployment scenarios.

Figure 3.2 Segment B - IDAS Results

Segment B - IDAS Results

MN State Line to USH 53 Interchange

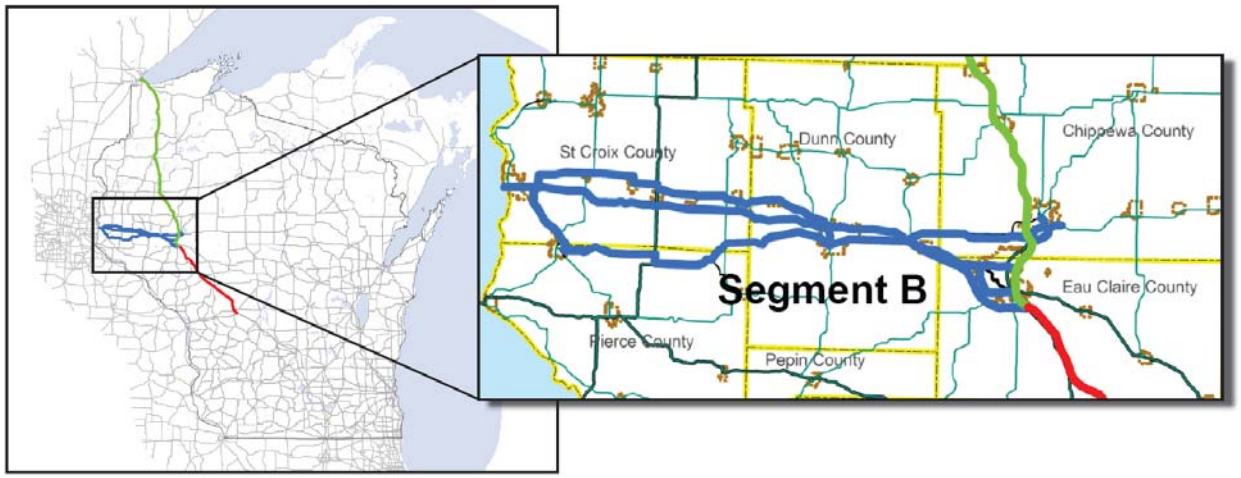
Description

Segment B consists of IH 94 between Hudson and Eau Claire-Chippewa Falls with arterial routes USH 12 and STH 35/STH 29. The Segment begins at the MN state line and ends at the USH 53 interchange. ITS deployment options (ranging from Low to High) are briefly described below. The benefit/cost ratios for each option (for the base year 2005 and forecast year 2030) are found to the right, showing how much value will be returned for each dollar spent.

Low — Includes low-density deployment of PCMS, CCTV surveillance, and ATR.

Medium — Includes Low option elements and adds detection, ramp closure gates, and expanded CCTV surveillance. Expanded fixed DMS is proposed and replaces PCMS locations.

High — Includes Medium option elements with higher deployment density throughout the Segment.



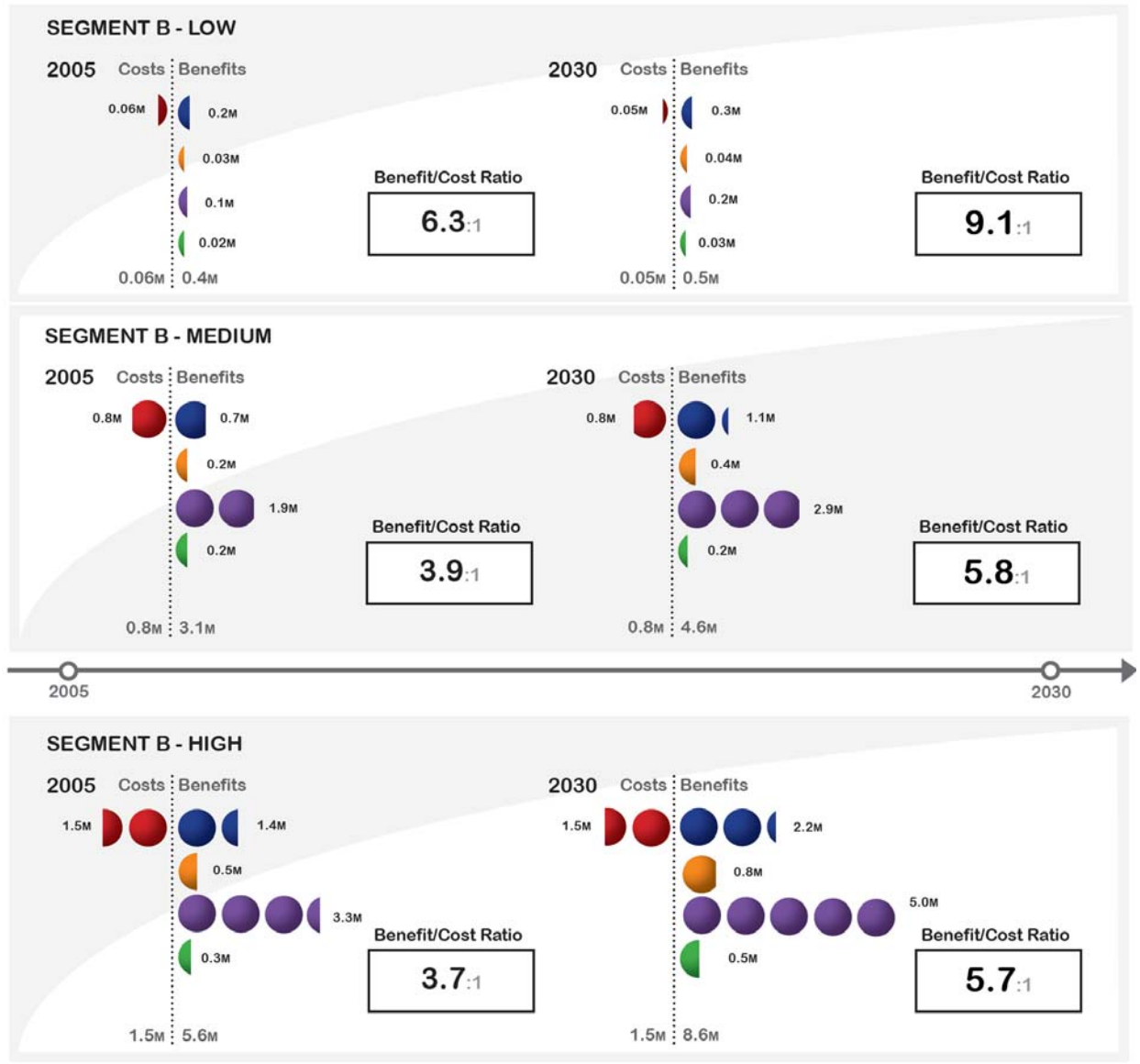

SEGMENT B - LOW
2005
Costs
Benefits
0.06M
0.2M
0.03M
0.1M
0.02M
0.06M
0.4M
Benefit/Cost Ratio
6.3:1
2030
Costs
Benefits
0.05M
0.3M
0.04M
0.2M
0.03M
0.05M
0.5M
Benefit/Cost Ratio
9.1:1
SEGMENT B - MEDIUM
2005
Costs
Benefits
0.8M
0.7M
0.2M
1.9M
0.2M
0.8M
3.1M
Benefit/Cost Ratio
3.9:1
2030
Costs
Benefits
0.8M
1.1M
0.4M
2.9M
0.2M
0.8M
4.6M
Benefit/Cost Ratio
5.8:1
2005
2030
SEGMENT B - HIGH
2005
Costs
Benefits
1.5M
1.4M
0.5M
3.3M
0.3M
1.5M
5.6M
Benefit/Cost Ratio
3.7:1
2030
Costs
Benefits
1.5M
2.2M
0.8M
5.0M
0.5M
1.5M
8.6M
Benefit/Cost Ratio
5.7:1
KEY
Each circle represents $1M in value (in 2007 dollars).
Benefits
Travel Time
Time saved by drivers due to reduced congestion
Crash Reduction
Elevated safety levels reduce secondary crashes
Operating Cost
Fuel savings
Environmental
Reductions in carbon emissions
Costs
Annualized Costs
Costs to build and maintain infrastructure on an annual basis (includes O & M as well as annualized capital costs)

Table 3.3 Segment B 2005 Monetized Benefits

Deployments	Travel Time	Accident Reduction	Operating Cost	Environmental	Agency Savings	Total	Annualized Cost	O&M Costs	Initial Capital	Net Benefits	B/C Ratio
Segment B Low	$166,000	$142,000	$30,000	$21,000	$0	$359,000	$57,000	$19,800	$248,000	$302,000	6.3
Segment B Medium	$731,000	$1,943,000	$237,000	$154,000	$2,000	$3,067,000	$793,000	$289,600	$3,510,000	$2,274,000	3.9
Segment B High	$1,445,000	$3,283,000	$532,000	$347,000	$2,000	$5,609,000	$1,502,000	$515,100	$6,914,000	$4,107,000	3.7

All values are dollars per year except Initial Capital Cost

Table 3.4 Segment B 2030 Monetized Benefits

Deployments	Travel Time	Accident Reduction	Operating Cost	Environmental	Agency Savings	Total	Annualized Cost	O&M Costs	Initial Capital	Net Benefits	B/C Ratio
Segment B Low	$253,000	$198,000	$42,000	$28,000	$0	$521,000	$57,000	$19,800	$248,000	$464,000	9.1
Segment B Medium	$1,093,000	$2,922,000	$351,000	$229,000	$2,000	$4,597,000	$793,000	$289,600	$3,510,000	$3,804,000	5.8
Segment B High	$2,239,000	$5,020,000	$814,000	$529,000	$2,000	$8,604,000	$1,502,000	$515,100	$6,914,000	$7,102,000	5.7

All values are dollars per year except Initial Capital Cost

3.3 SEGMENT C

The benefit/cost results for Segment C deployments are shown graphically in Figure 3.3 and in tabular format in Tables 3.5 and 3.6. Segment C includes the section of IH 94 south of Eau Claire. Levels of investment proposed for this segment range from $84,000 for the Low deployment scenario to just over $2 million for the High deployment scenario. 2005 net benefits are minimal under the Low deployment scenario at $100,000, but rise to about $1 million under the Medium deployment scenario and $3 million under the High deployment scenario. The highest benefit/cost ratio is 7.3 for the High deployment scenario. The Low deployment scenario benefit/cost is 6.0 and the Medium deployment scenario benefit/cost is 4.0.

The 2030 results show that the High deployment scenario has the highest net benefit at $4.3 million and the highest benefit/cost ratio at 10.2. The net benefits for the Low deployment scenario is $150,000 with a benefit/cost ratio of 8.2. The Medium deployment scenario shows a net benefit of $1.5 million while the benefit/cost ratio is 5.6.

In both the 2005 base year and the 2030 future year, the Low deployment scenario savings are from travel time. Accident reduction dominates the benefits in both the Medium and High deployment scenarios for both the base year and future year with a percentage of 70% benefit.

Figure 3.3 Segment C - IDAS Results

Segment C - IDAS Results

USH 53 Interchange to IH 94/90 Split

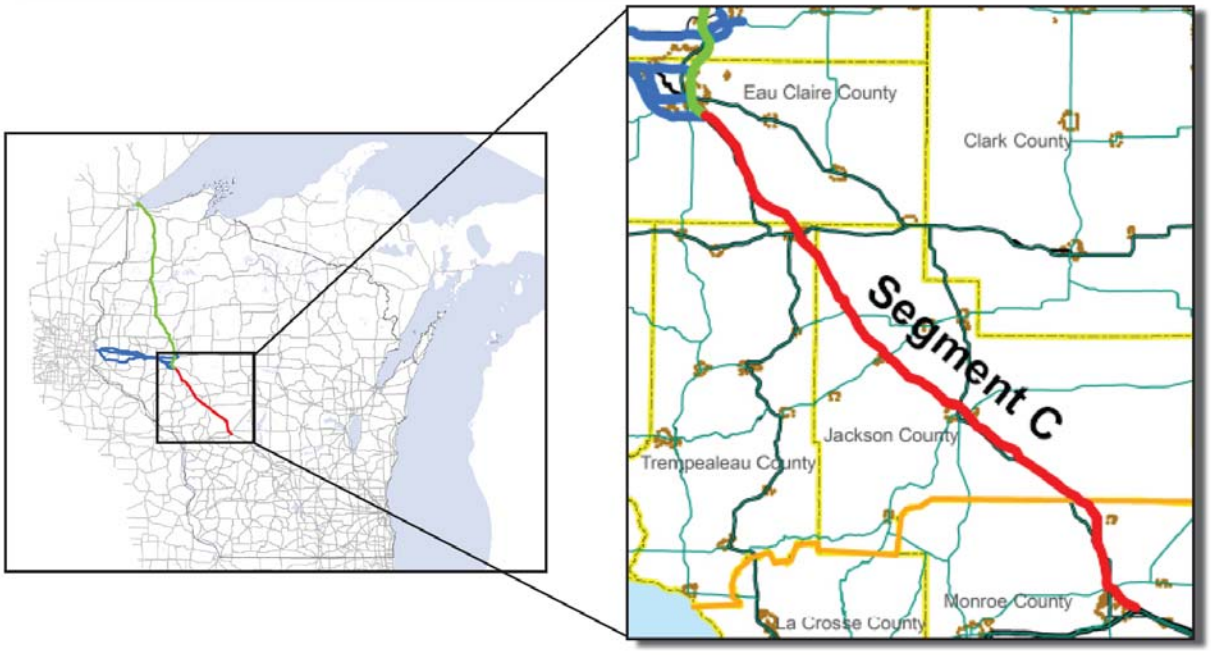
Description

Segment C consists of IH 94 between its split with IH 90 in Monroe County and Eau Claire-Chippewa Falls. The Segment begins at the USH 53 interchange and ends at the IH 94/90 split. ITS deployment options (ranging from Low to High) are briefly described below. The benefit/cost ratios for each option (for the base year 2005 and forecast year 2030) are found to the right, showing how much value will be returned for each dollar spent.

Low — Includes PCMS and ATR locations.

Medium — Includes Low option elements plus ramp closure gates, detection, and CCTV surveillance locations. Expanded fixed DMS is proposed and replaces PCMS locations.

High — Includes Medium option elements plus expanded detection, CCTV surveillance, and DMS.




SEGMENT C - LOW
2005
Costs
Benefits
0.02M
0.06M
0.02M
0.04M
0.01M
0.02M
0.1M
Benefit/Cost Ratio
6.0:1
2030
Costs
Benefits
0.02M
0.09M
0.02M
0.02M
0.01M
0.02M
0.2M
Benefit/Cost Ratio
8.2:1
SEGMENT C - MEDIUM
2005
Costs
Benefits
0.3M
0.3M
0.04M
0.9M
0.03M
0.3M
1.3M
Benefit/Cost Ratio
4.0:1
2030
Costs
Benefits
0.3M
0.4M
0.06M
1.3M
0.04M
0.3M
1.8M
Benefit/Cost Ratio
5.6:1
2005
2030
SEGMENT C - HIGH
2005
Costs
Benefits
0.5M
0.4M
0.4M
2.4M
0.3M
0.5M
3.4M
Benefit/Cost Ratio
7.3:1
2030
Costs
Benefits
0.5M
0.5M
0.5M
3.4M
0.4M
0.5M
4.8M
Benefit/Cost Ratio
10.2:1
KEY
Each circle represents $1M in value (in 2007 dollars).
Benefits
Travel Time
Time saved by drivers due to reduced congestion
Operating Cost
Fuel savings
Crash Reduction
Elevated safety levels reduce secondary crashes
Environmental
Reductions in carbon emissions
Costs
Annualized Costs
Costs to build and maintain infrastructure on an annual basis (includes O & M as well as annualized capital costs)

Table 3.5 Segment C 2005 Monetized Benefits

Deployments	Travel Time	Accident Reduction	Operating Cost	Environmental	Agency Savings	Total	Annualized Cost	O&M Costs	Initial Capital	Net Benefits	B/C Ratio
Segment C Low	$64,000	$35,000	$15,000	$11,000	$0	$125,000	$21,000	$7,600	$84,000	$104,000	6.0
Segment C Medium	$300,000	$937,000	$43,000	$29,000	$2,000	$1,311,000	$328,000	$121,900	$1,424,000	$983,000	4.0
Segment C High	$360,000	$2,415,000	$373,000	$243,000	$2,000	$3,393,000	$468,000	$167,000	$2,094,000	$2,925,000	7.3

All values are dollars per year except Initial Capital Cost

Table 3.6 Segment C 2030 Monetized Benefits

Deployments	Travel Time	Accident Reduction	Operating Cost	Environmental	Agency Savings	Total	Annualized Cost	O&M Costs	Initial Capital	Net Benefits	B/C Ratio
Segment C Low	$87,000	$50,000	$22,000	$14,000	$0	$173,000	$21,000	$7,600	$84,000	$152,000	8.2
Segment C Medium	$419,000	$1,318,000	$61,000	$41,000	$2,000	$1,841,000	$328,000	$121,900	$1,424,000	$1,513,000	5.6
Segment C High	$505,000	$3,394,000	$525,000	$340,000	$2,000	$4,766,000	$468,000	$167,000	$2,094,000	$4,298,000	10.2

All values are dollars per year except Initial Capital Cost

3.4 SUMMARY OF RESULTS

Based on the analysis conducted, all scenarios have benefit/cost ratios greater than 1. Both net benefits and benefit/cost ratios are significantly higher in Segments B and C than in Segment A. This result is expected due to the higher volumes of traffic found along Segments B and C.

For Segment A, the Medium level deployment scenario provides the optimal investment in ITS over the 25-year period. The elimination of specific DMS in Segment A Option 1 and Option 2 had a small impact on the benefit/cost ratios and net benefits. These results indicate that the DMS removed from these scenarios are less beneficial than the other recommended deployments as a whole. Segment A Urban showed a slight increase in benefit/cost ratios as compared to Segment A as a whole, suggesting that the recommended deployments on the urban segment are slightly more beneficial than the recommended deployments on Segment A as a whole.

For Segment B, the Medium level deployment scenario again appears to provide the optimal 25-year investment. However, due to the high traffic volumes, the High level deployment scenario is recommend as funding becomes available. For Segment C, the High level deployment scenario appears to provide the optimal investment. While the Low scenarios are cost-effective, they tend to produce a small level of net benefits with very little infrastructure. The High investment scenarios always increase the net benefits, but do not always provide a level of additional benefit commensurate with the additional investment.

Based on a combination of net benefit and benefit/cost ratio, Segment B is the highest priority for short-term investment followed by Segments C and A. Projected growth levels in all segments over time are high enough to justify ITS investments in all segments included in the study.

4.0 Recommendation

4.1 METHODOLOGY AND RECOMMENDATION

The following methodology guided the systematic approach in choosing a recommended deployment density for each segment.

- Consider the benefit/cost ratios in both 2005 and 2030.
- Compare the initial capital cost between the scenarios to determine how much additional capital cost is required to advance from a low to medium and medium to high scenario.
- Compare the annualized net benefits to determine how much benefit is gained by advancing from a low to medium and a medium to high deployment density.
- Consider the realized benefits influencing the B/C ratio.

Table 4.1 Recommended Deployment

Recommended Deployment	IDAS Initial Capital Cost	IDAS O & M Cost	2005 Net Benefits	2030 Net Benefits
Segment A Medium	$2,209,000	$207,500	$404,000	$677,000
Segment B Medium*	$3,510,000	$289,600	$2,274,000	$3,804,000
Segment C High	$2,094,000	$167,000	$2,925,000	$4,298,000

All values are dollars per year except Initial Capital Cost

* Due to high traffic volumes, the high level deployment scenario is recommend as funding becomes available.

A. TOIP Corridor Recommendations

Figure A.1 Badger State Corridor TOIP Recommendations

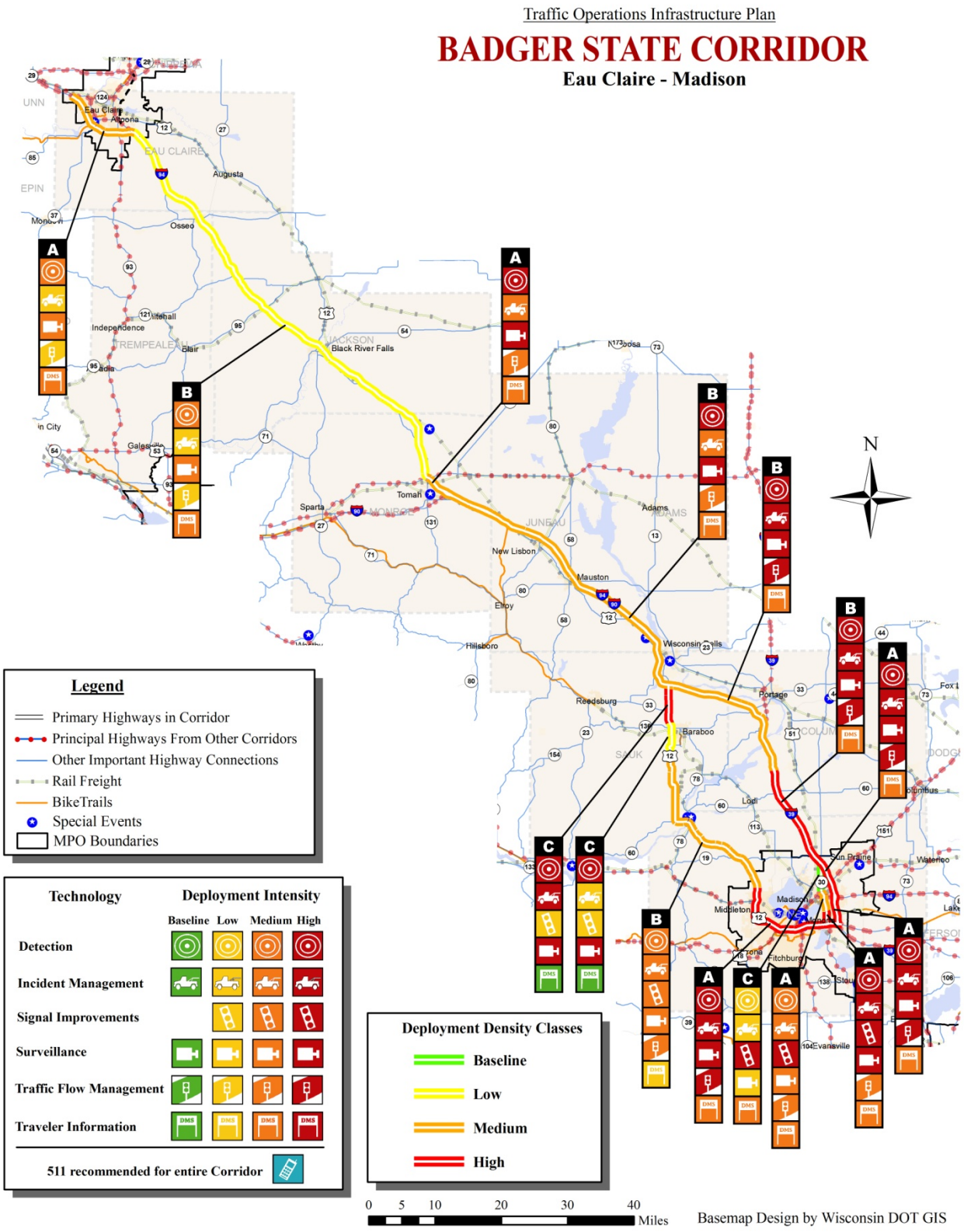


Figure A.2 Chippewa Valley Corridor TOIP Recommendations

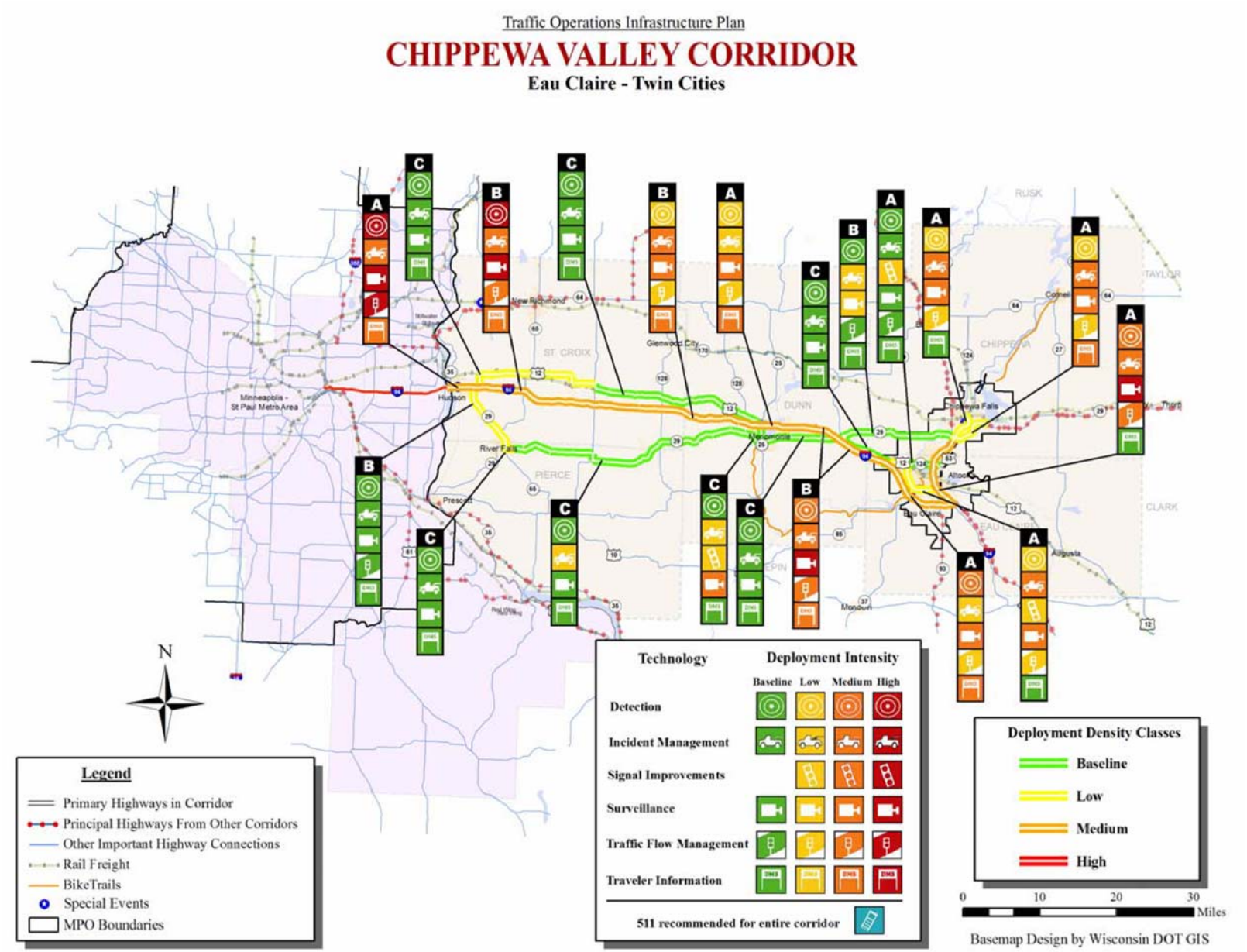
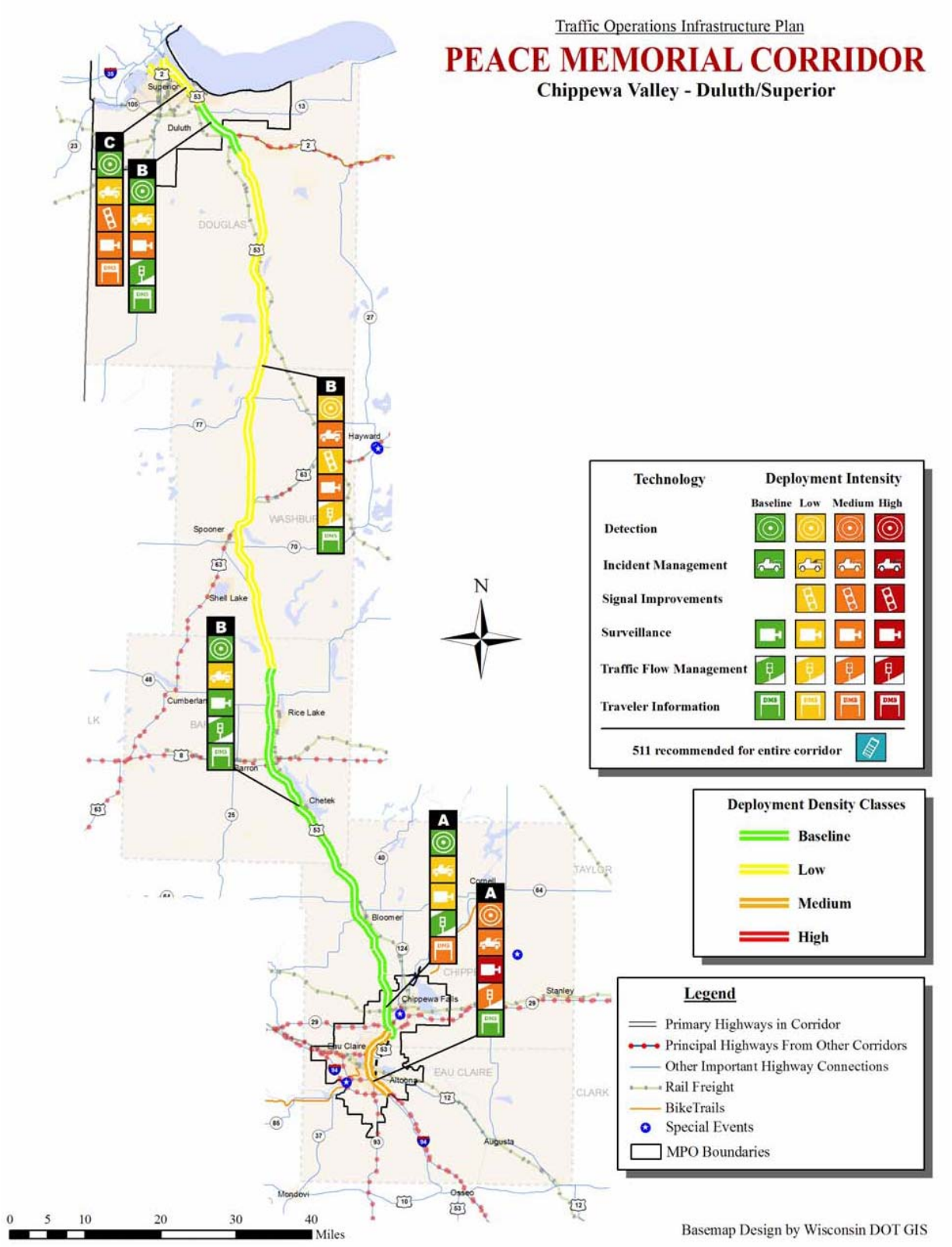
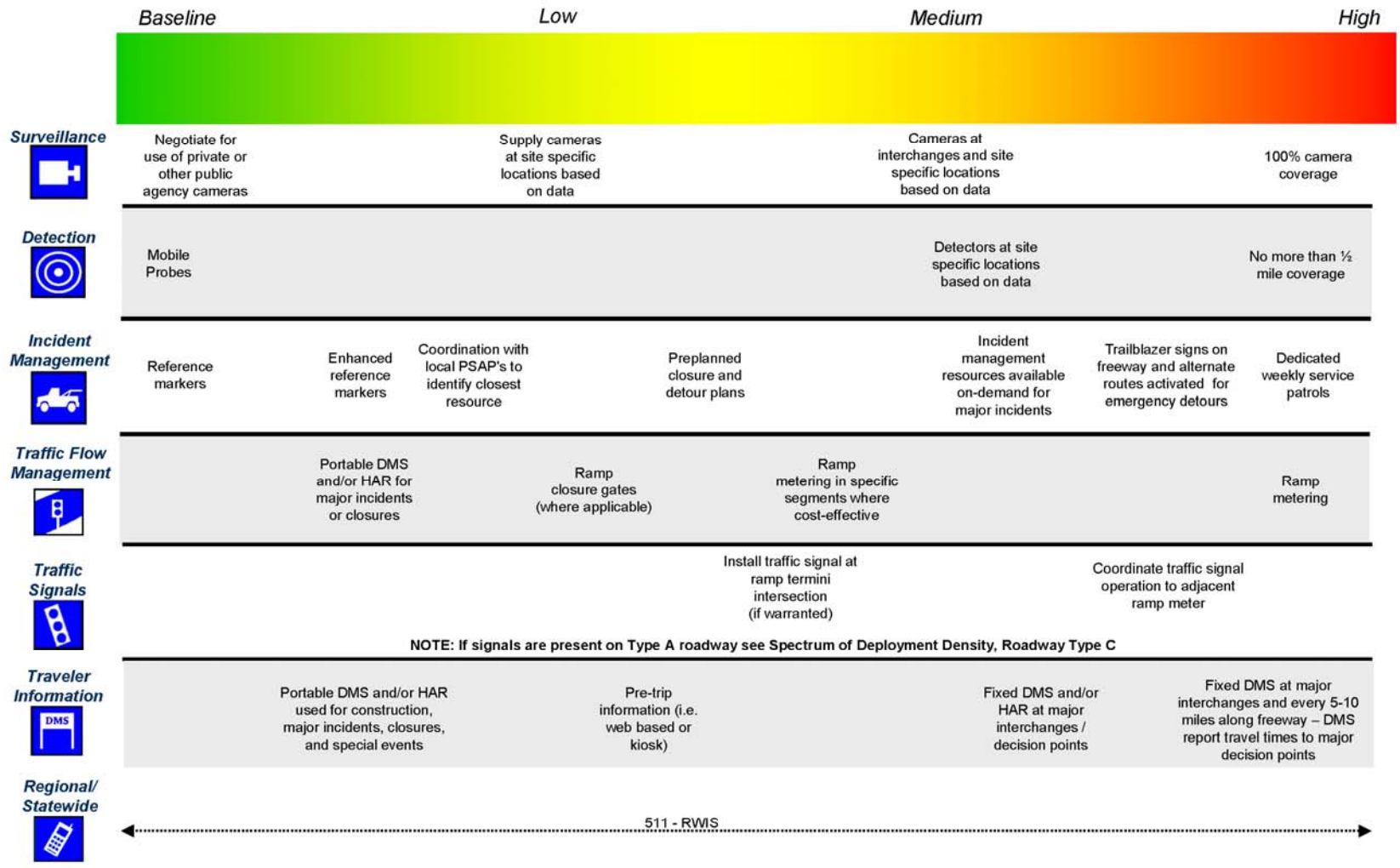


Figure A.3 Peace Memorial Corridor TOIP Recommendation



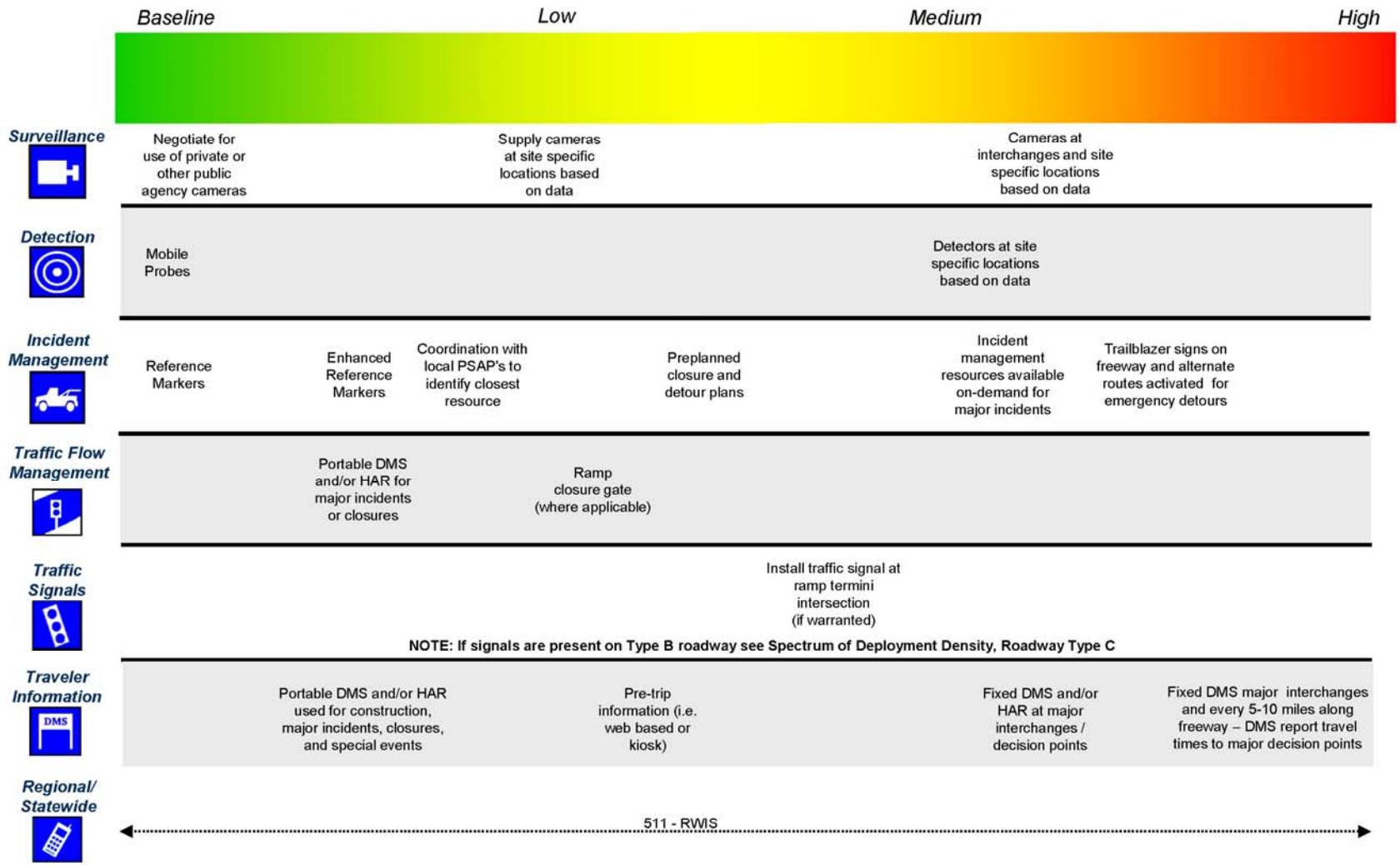
B. Spectrum of Deployment Density

Figure B.1 Spectrum of Deployment Density (Roadway Type A)



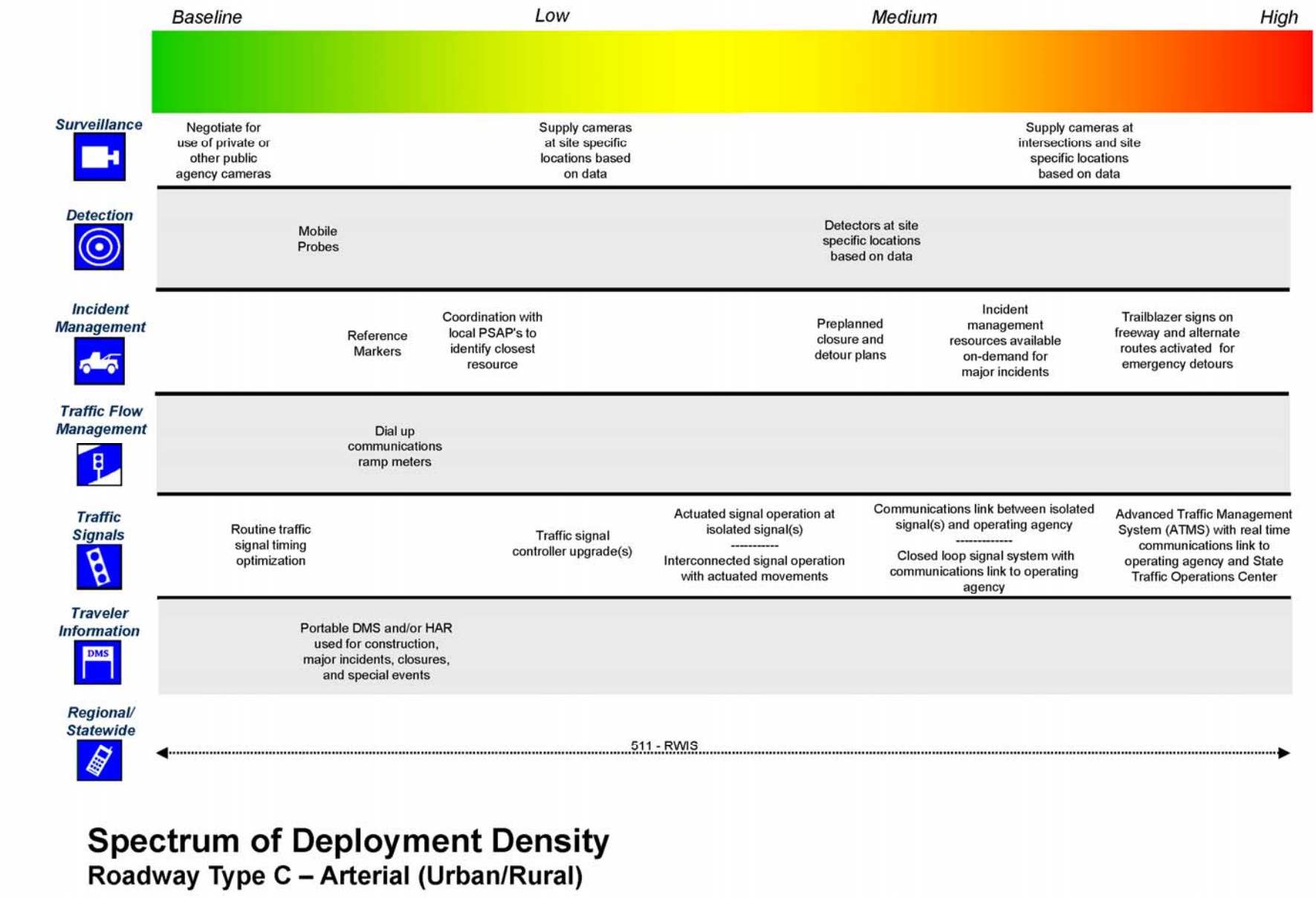
Spectrum of Deployment Density
Roadway Type A – Urban Interstate/Expressway

Figure B.2 Spectrum of Deployment Density (Roadway Type B)



Spectrum of Deployment Density
Roadway Type B – Rural Interstate/Expressway

Figure B.3 Spectrum of Deployment Density (Roadway Type C)

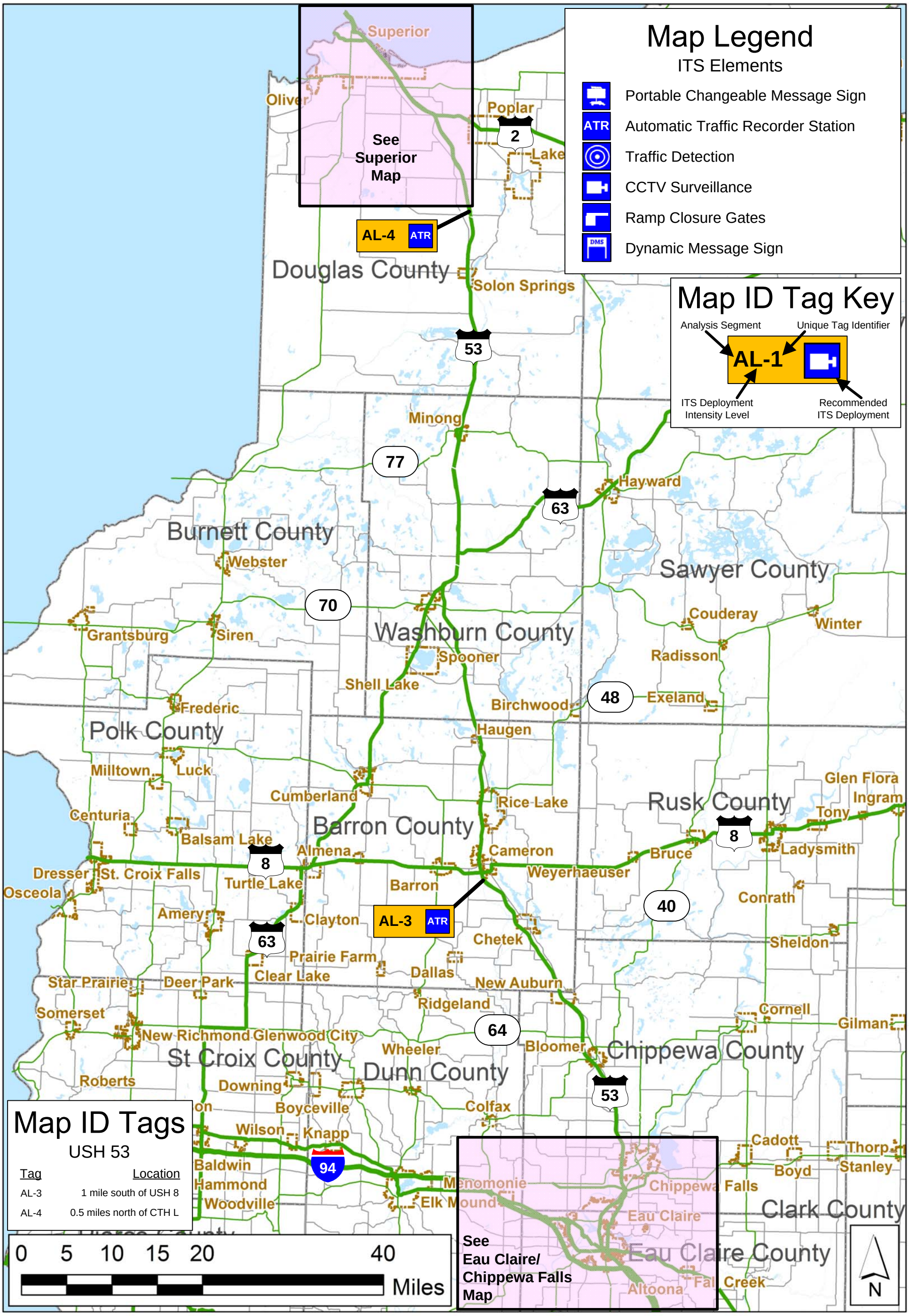


C. Proposed ITS Elements and Field Approach

Table C.1 Proposed ITS Elements and Field Approach

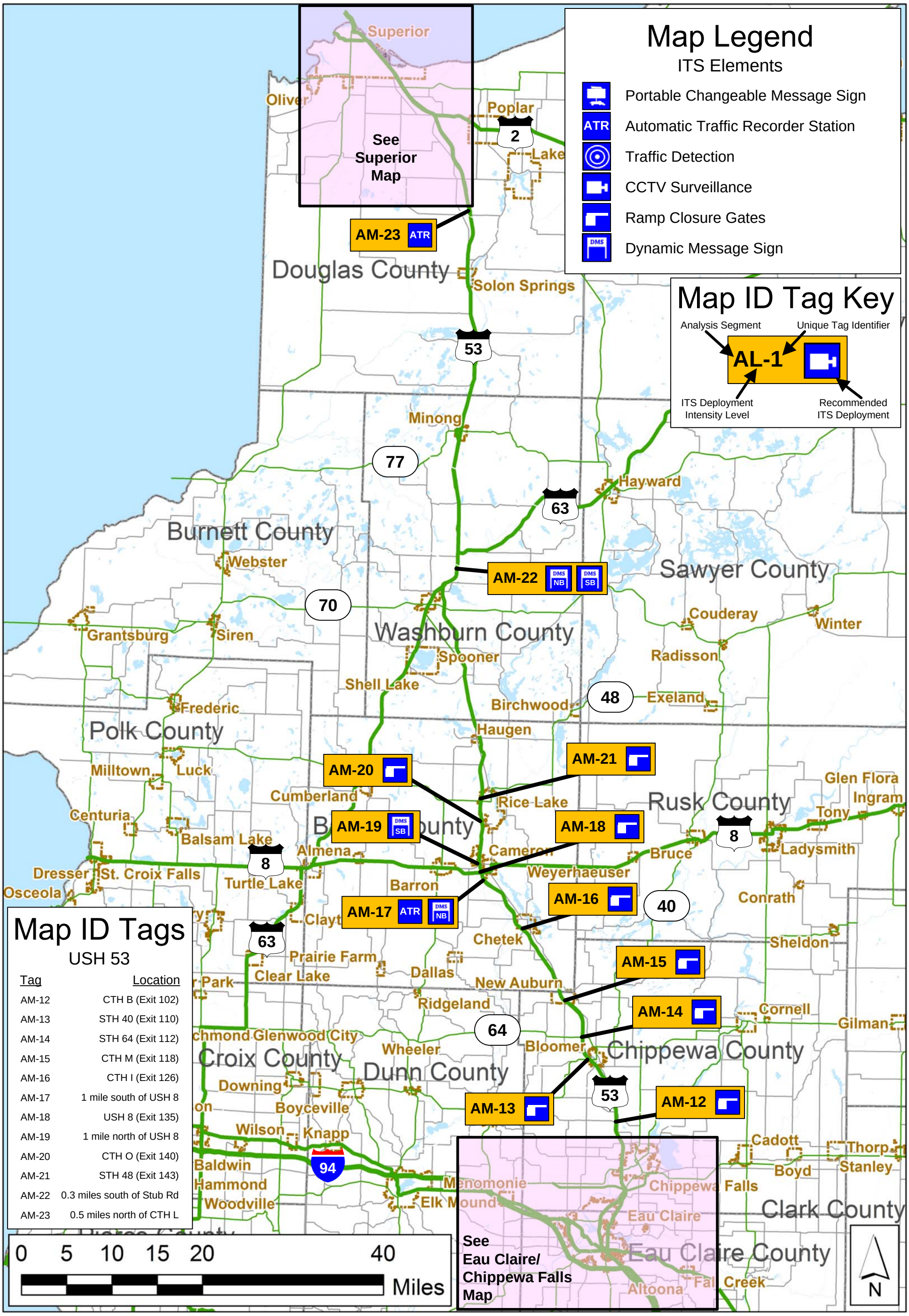
ITS Deployment	Equivalent Map Title	Elements per Deployment	Field Approach	Notes
Traffic volume and speed detection systems	**Traffic Detection**	Mainline non-intrusive detection (2) radar sensors including poles, foundations, cabling, conduit, etc.	Detection between interchanges (urban and rural) Detection at interchanges of all types (rural only)	A two sensor approach is conservative. The majority of Wisconsin's non-intrusive freeway system detector stations (SDS) involve a single radar sensor. Two sensors are used where the freeway is too wide for a single detector.
		Diamond interchange non-intrusive detection (4) radar sensors including poles, foundations, cabling, conduit, etc.	Detection at diamond, or equivalent, interchanges where no ramp metering is expected prior to 2030 (urban)	Due to the planning nature of the TOIP, the document did not specify exact locations for detection or specify a system-wide detection approach. Non-intrusive detection for this B/C analysis has been broken into three categories (mainline, diamond interchange and cloverleaf or non-traditional interchange).
		Cloverleaf or non-traditional interchange detection (8) radar sensors including poles, foundations, cabling, conduit, etc.	Detection at cloverleaf, or non-traditional, interchanges where ramp metering is not expected prior to 2030 (urban)	An eight sensor approach is conservative.
Closed-Circuit Television	**CCTV Surveillance**	(1) complete camera system including pole, foundation, pole-mounted cabinet, cabling, conduit, video codec, etc.	Cameras proposed at specific locations based on a 1-mile viewing radius assumption Multiple cameras proposed at a number of system-to-system interchanges and urban areas (per recommendation of WisDOT Region) at high deployment intensity levels	
Ramp Gates	**Ramp Closure Gates**	Vertical Drop Gate (1) manually operated vertical drop gate per interchange onramp	Proposed at Interstate interchange onramps with mainline volumes greater than 35,000 (Based on Traffic Incident Management Enhancement – Gate and Barricade Deployment Recommendations) also proposed at locations recommended by the Region	
Dynamic Message Signs	**Dynamic Message Sign**	Overhead mounted DMS (1) overhead dynamic message sign including sign bridge, cabling, conduit, etc. Roadside mounted DMS (1) roadside dynamic message sign including roadside mount, cabling, conduit, etc.	Proposed at specific locations based on alternate routes, volume and need for region to get information to the traveling public Multiple DMS proposed at a number of system-to-system interchanges and urban areas (per recommendation of WisDOT region)	
Portable Changeable Message Signs	**Portable Changeable Message Sign**	(1) Portable changeable message sign and pad	Proposed at existing urban/rural locations at the low deployment intensity level only	Existing sites are semi-permanent sites
Automatic Traffic Recorder Station	**Automatic Traffic Recorder Station**	Upgrade ATR station to detection station; provide real time information	Upgrade all existing ATR stations within segment limits	

D. ITS Elements Maps



Segment A (Low ITS Deployment Intensity)

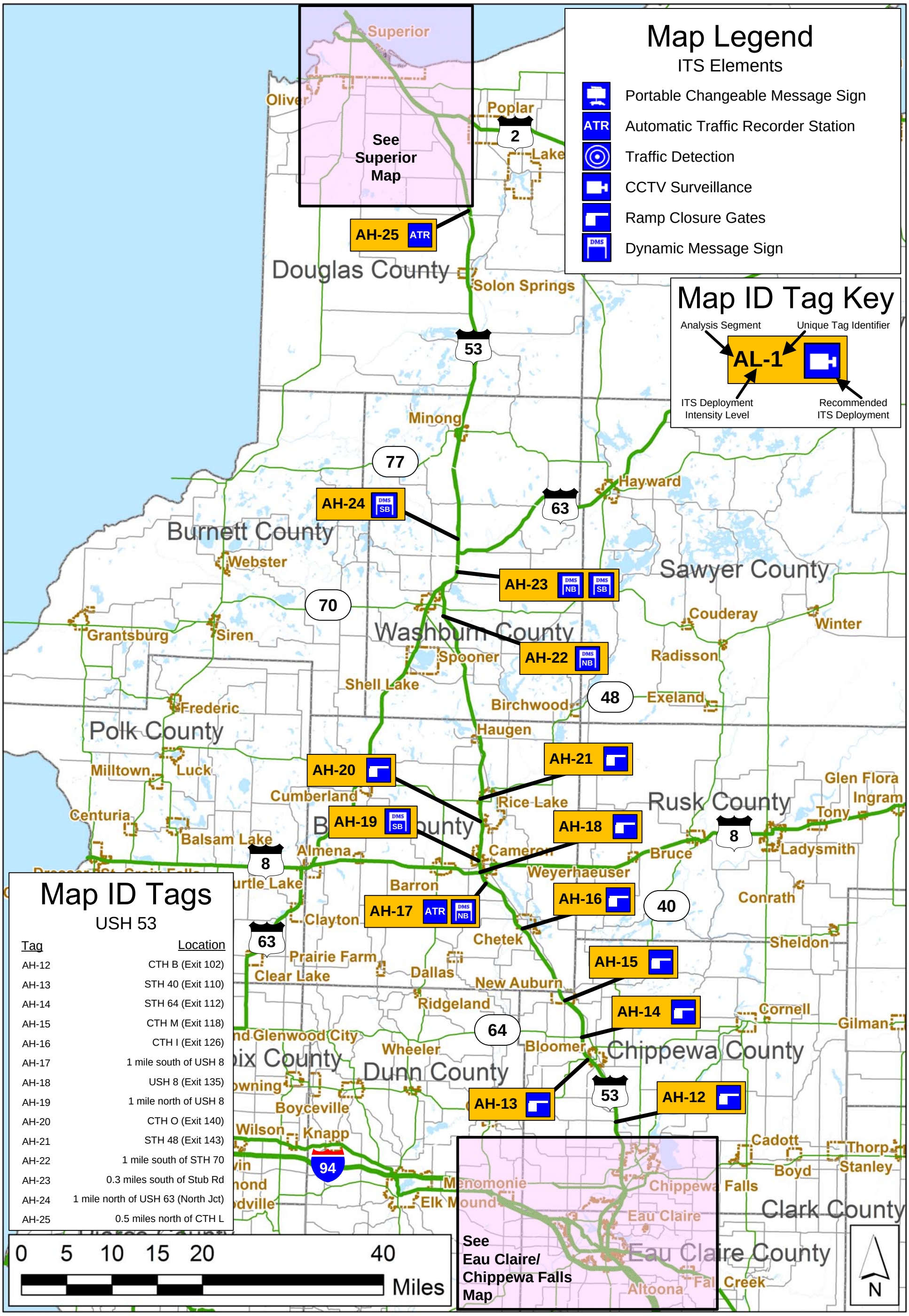
Figure D.1



Segment A (Medium ITS Deployment Intensity)

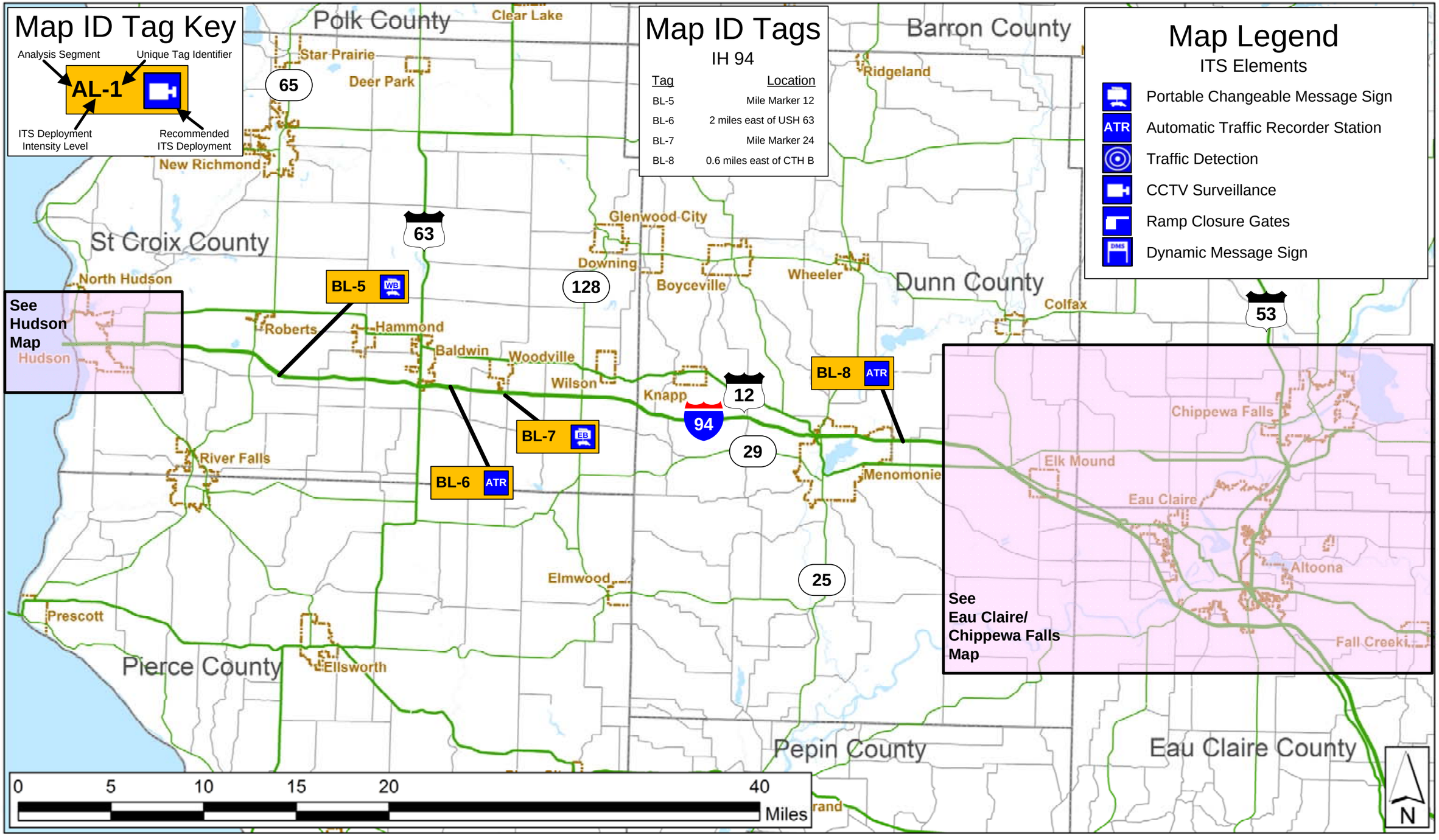
Figure D.2

Northwest Region ITS Benefit/Cost Analysis



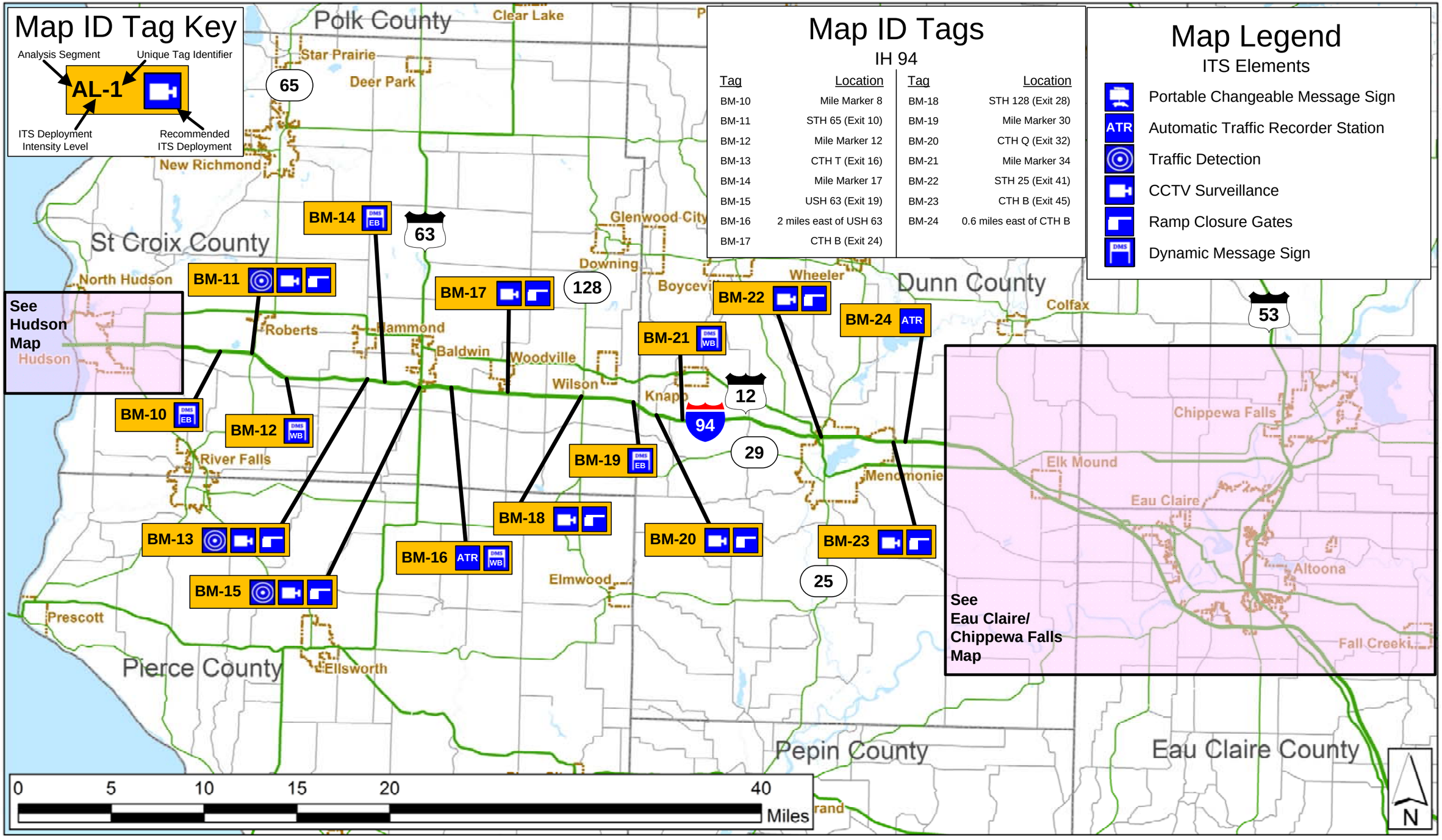
Segment A (High ITS Deployment Intensity – TOIP Based)

Figure D.3



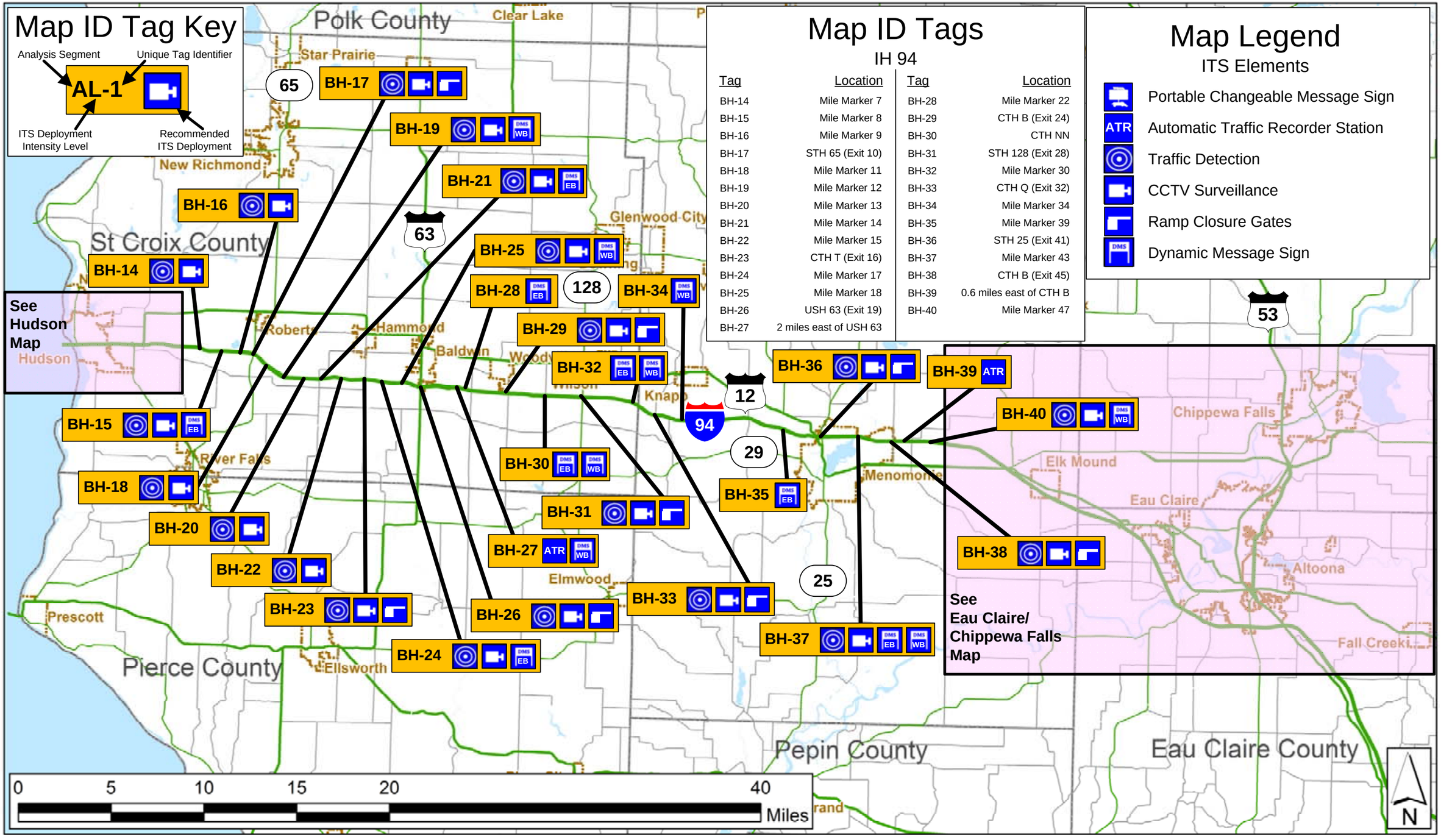
Segment B (Low ITS Deployment Intensity)

Figure D.4



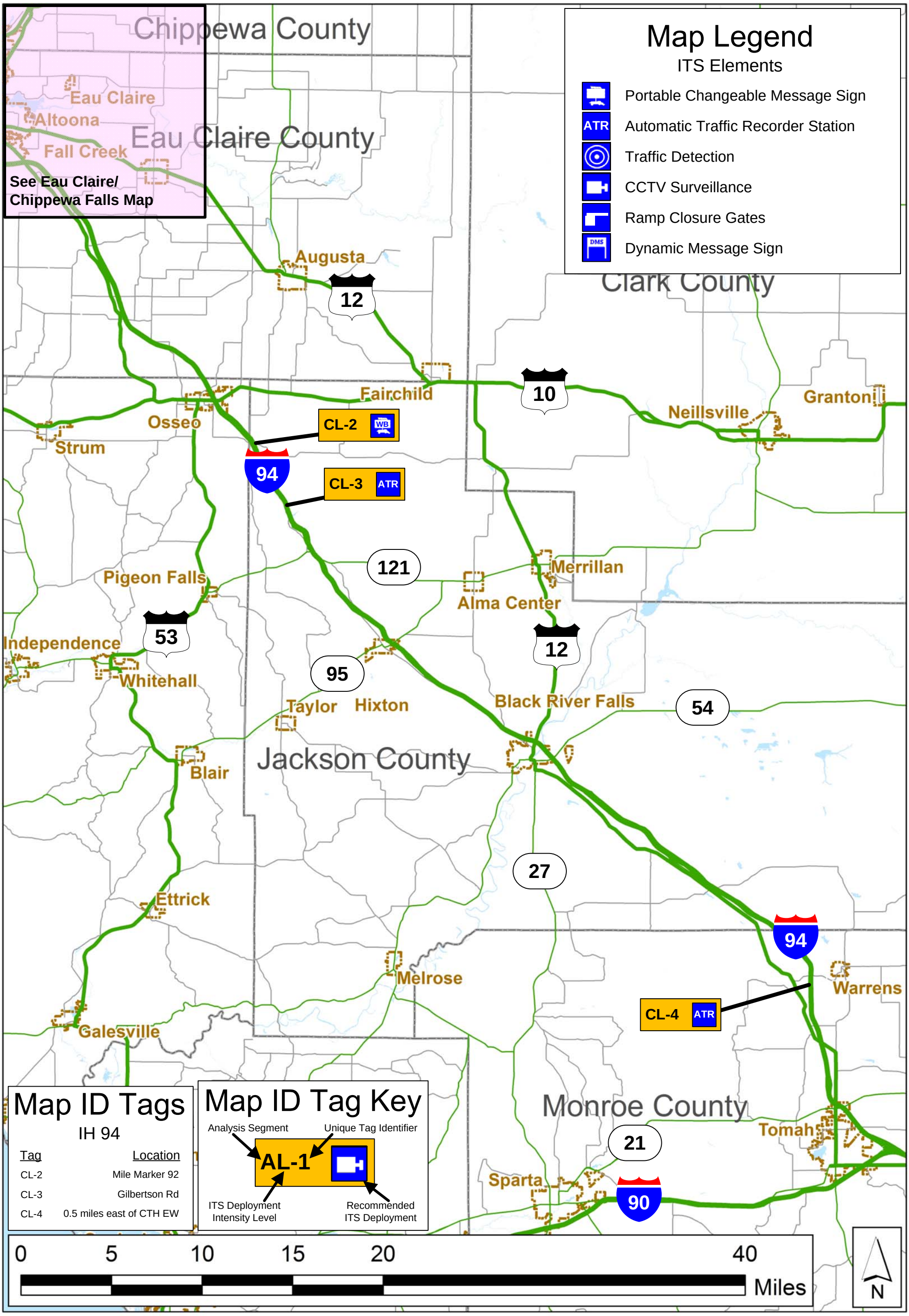
Segment B (Medium ITS Deployment Intensity – TOIP Based)

Figure D.5



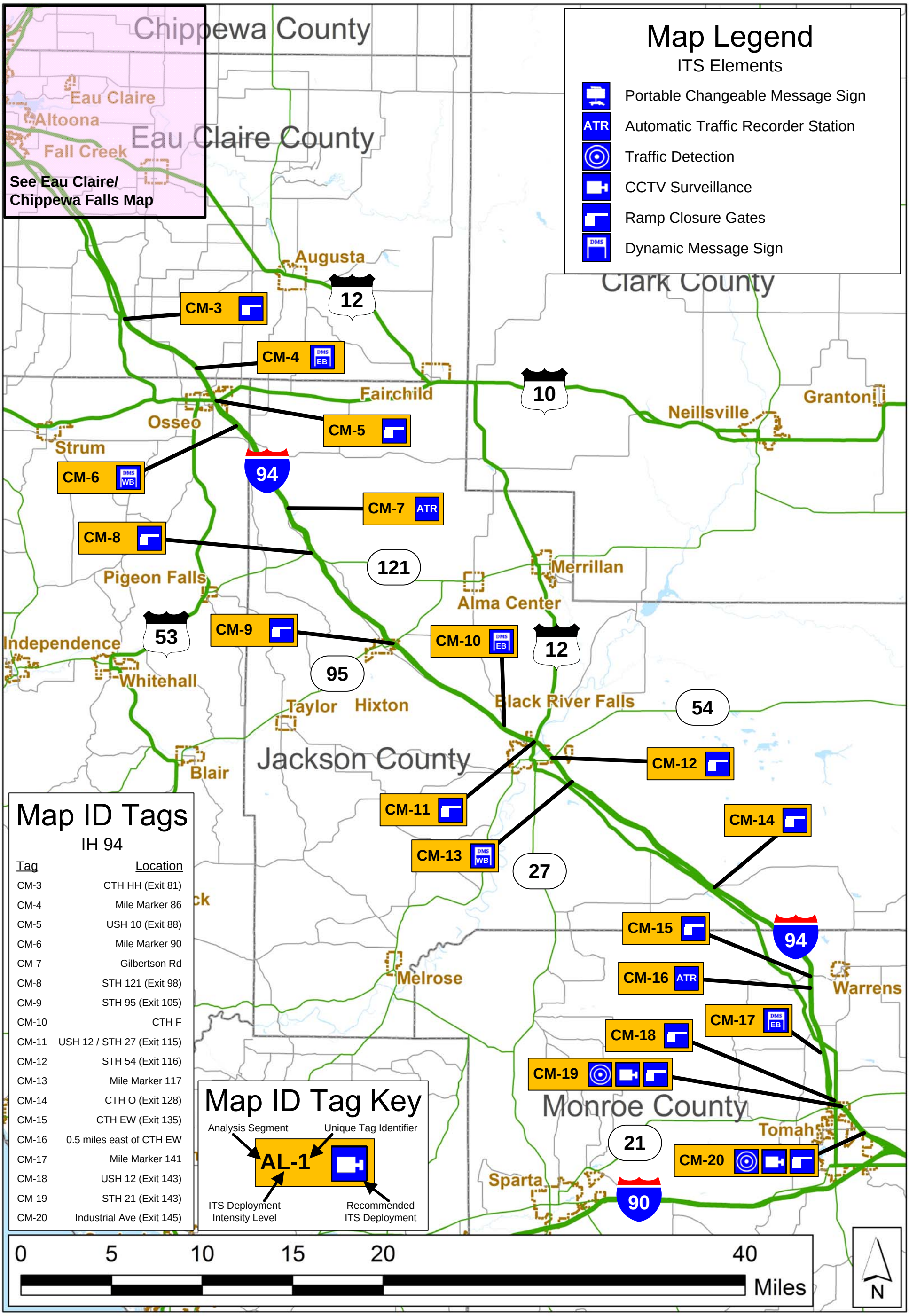
Segment B (High ITS Deployment Intensity)

Figure D.6



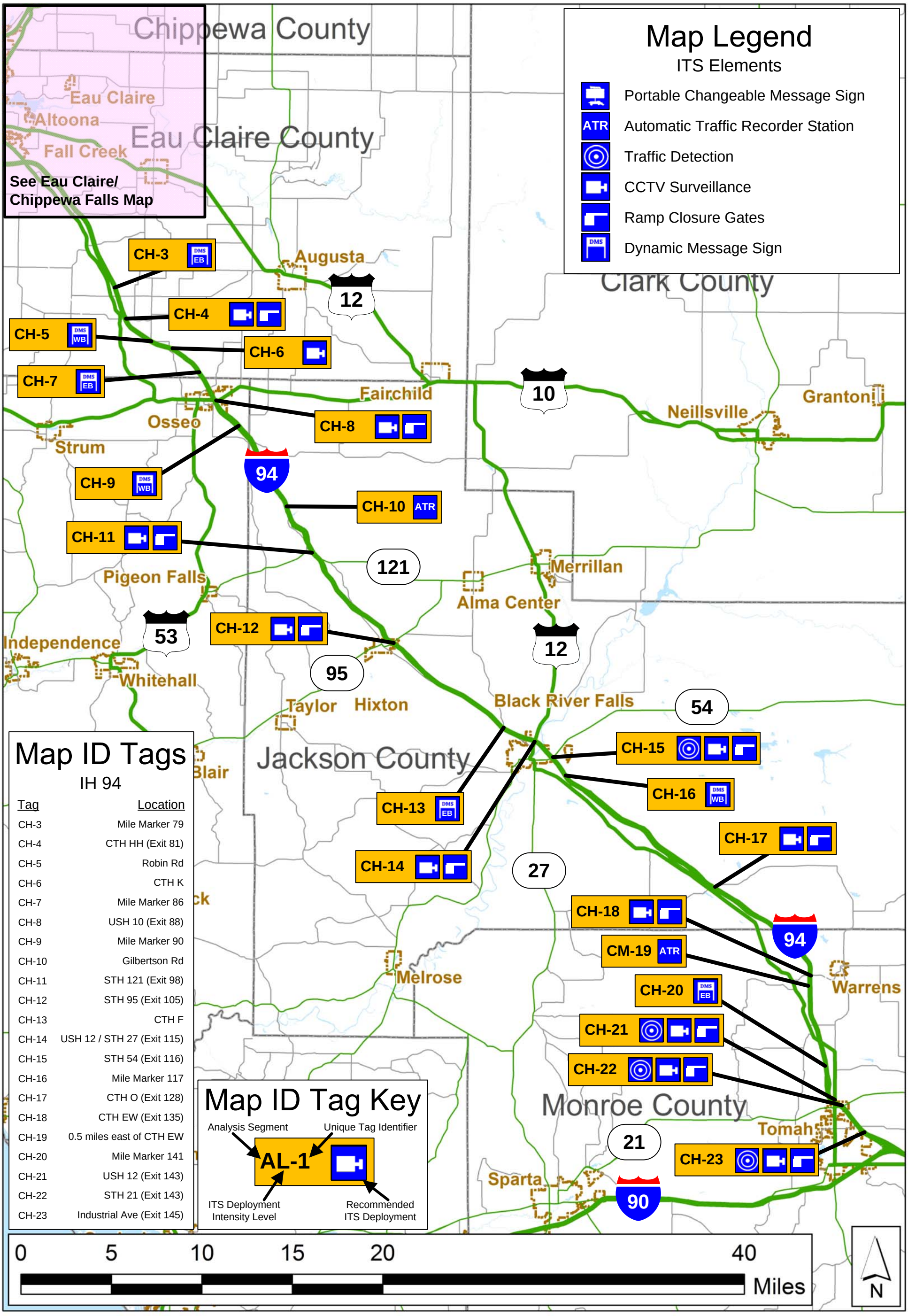
Segment C (Low ITS Deployment Intensity)

Figure D.7



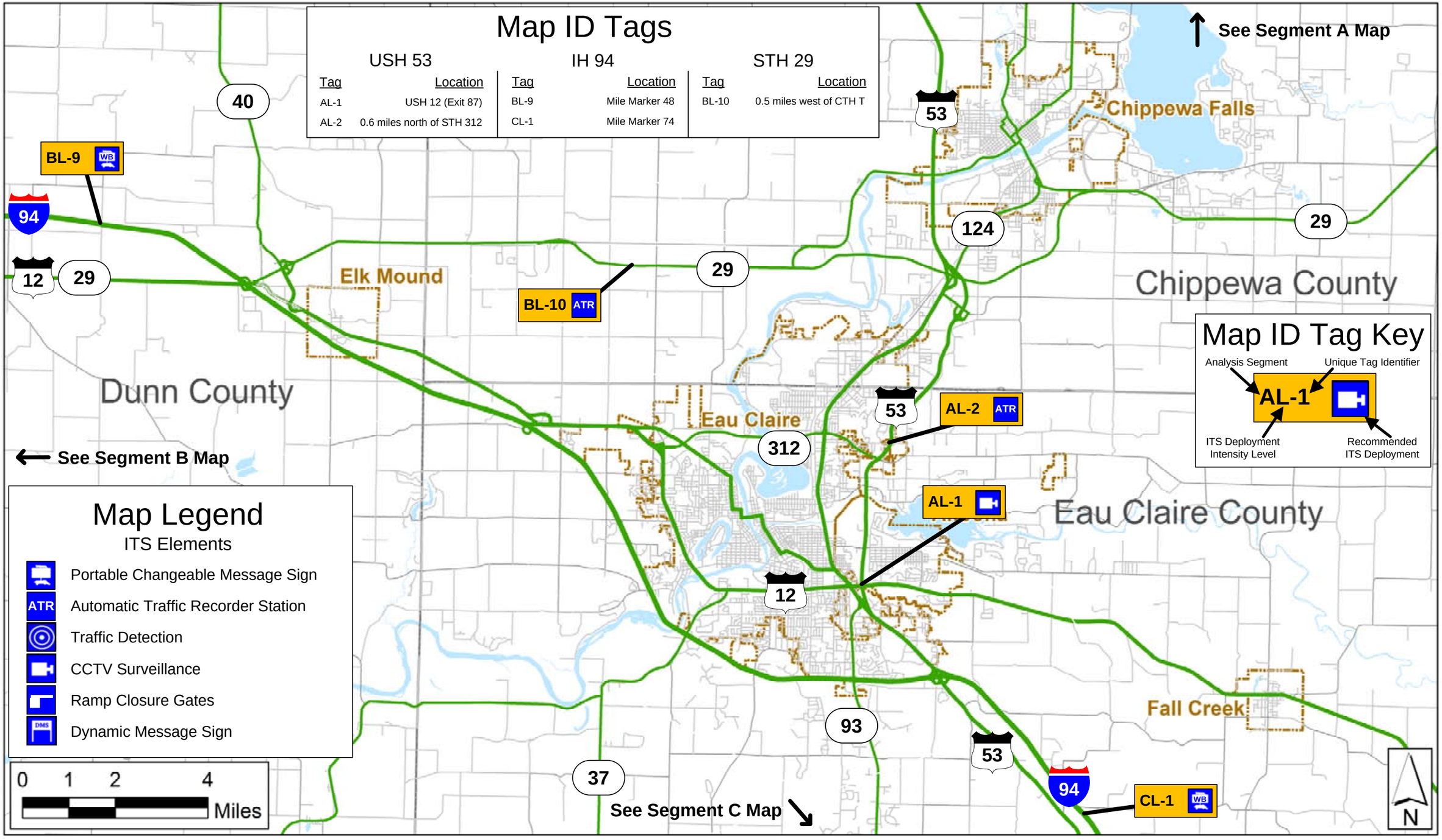
Segment C (Medium ITS Deployment Intensity)

Figure D.8



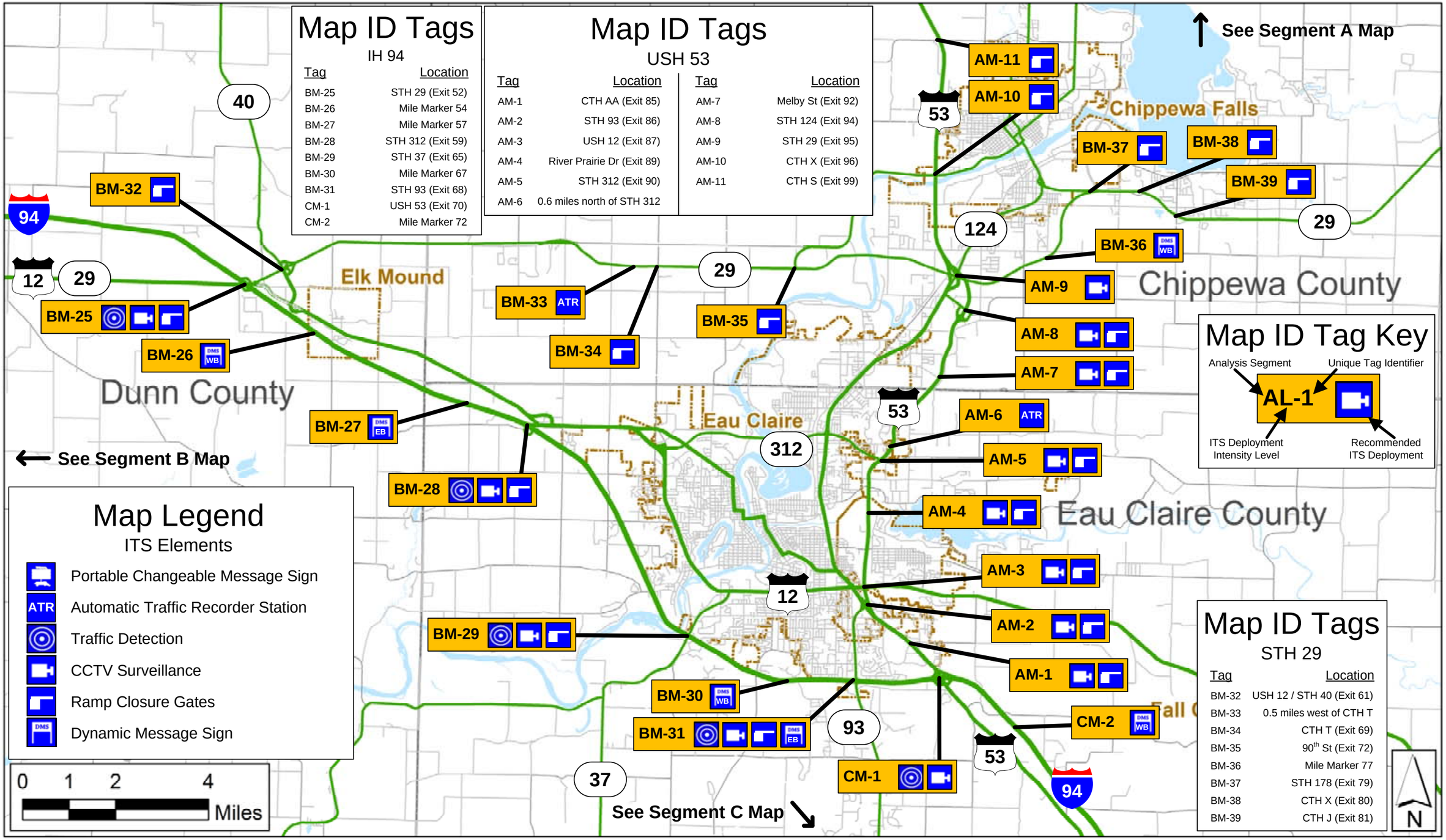
Segment C (High ITS Deployment Intensity – TOIP Based)

Figure D.9



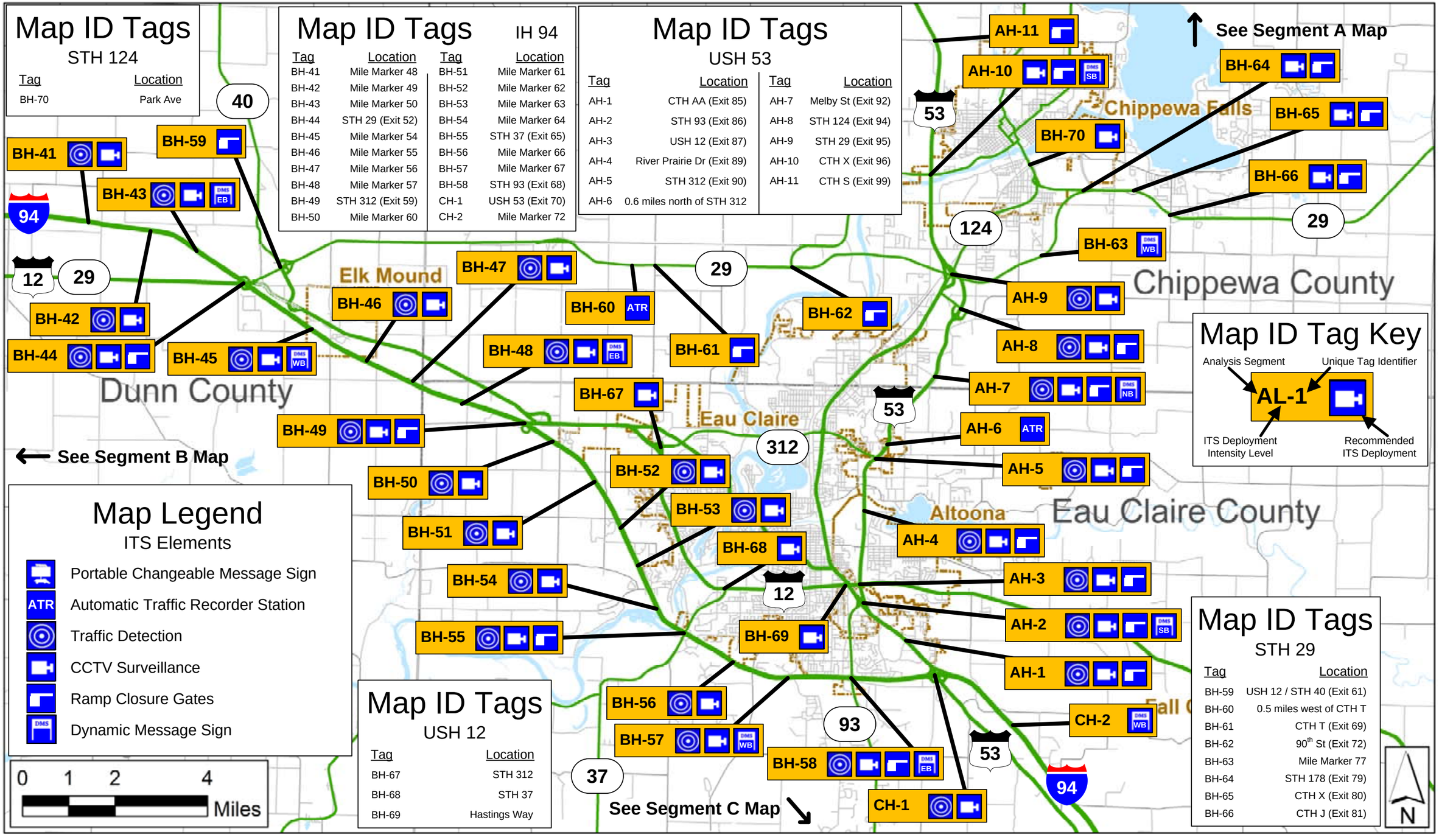
Eau Claire – Chippewa Falls (Low ITS Deployment Intensity)

Figure D.10



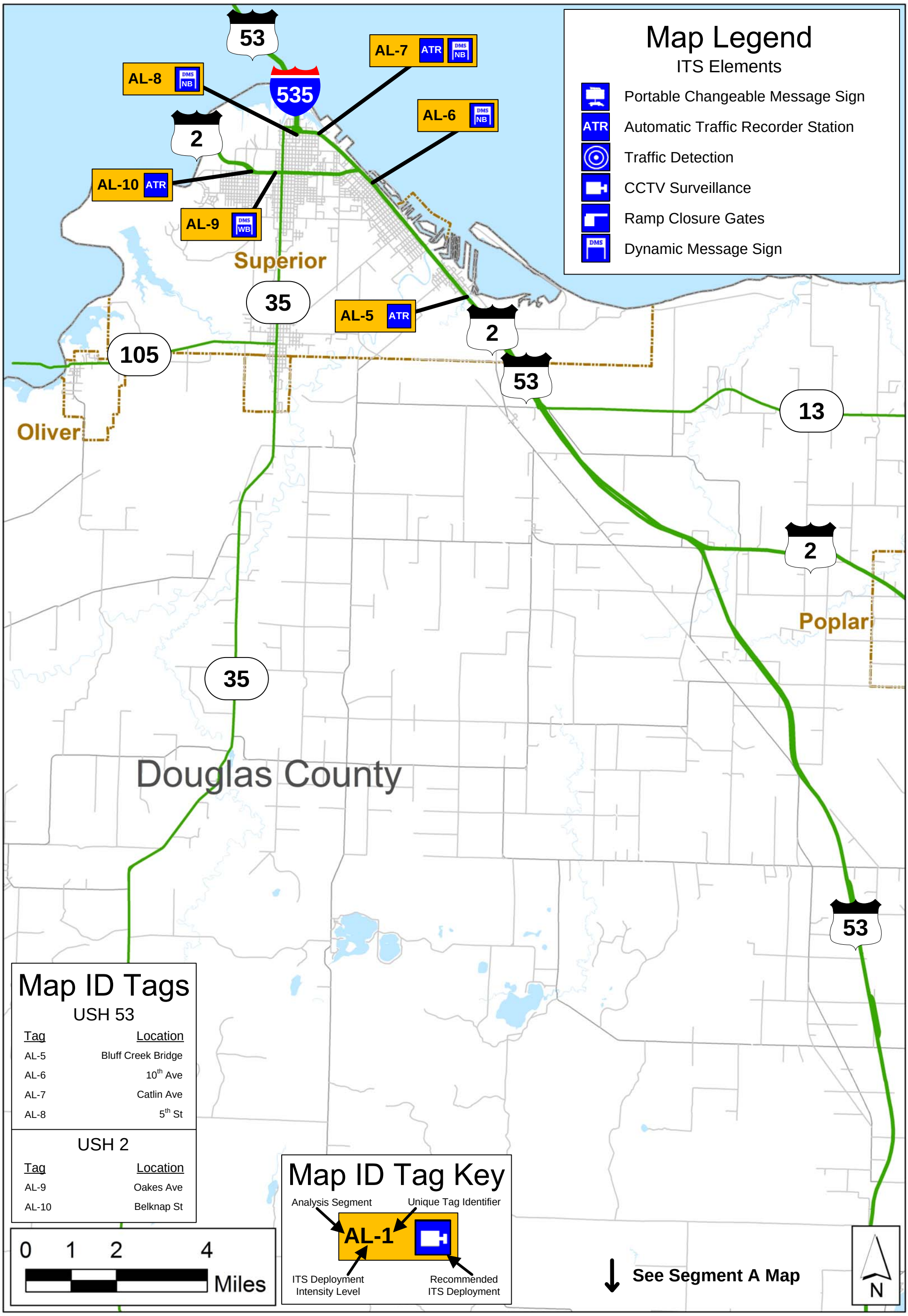
Eau Claire – Chippewa Falls (Medium ITS Deployment Intensity)

Figure D.11



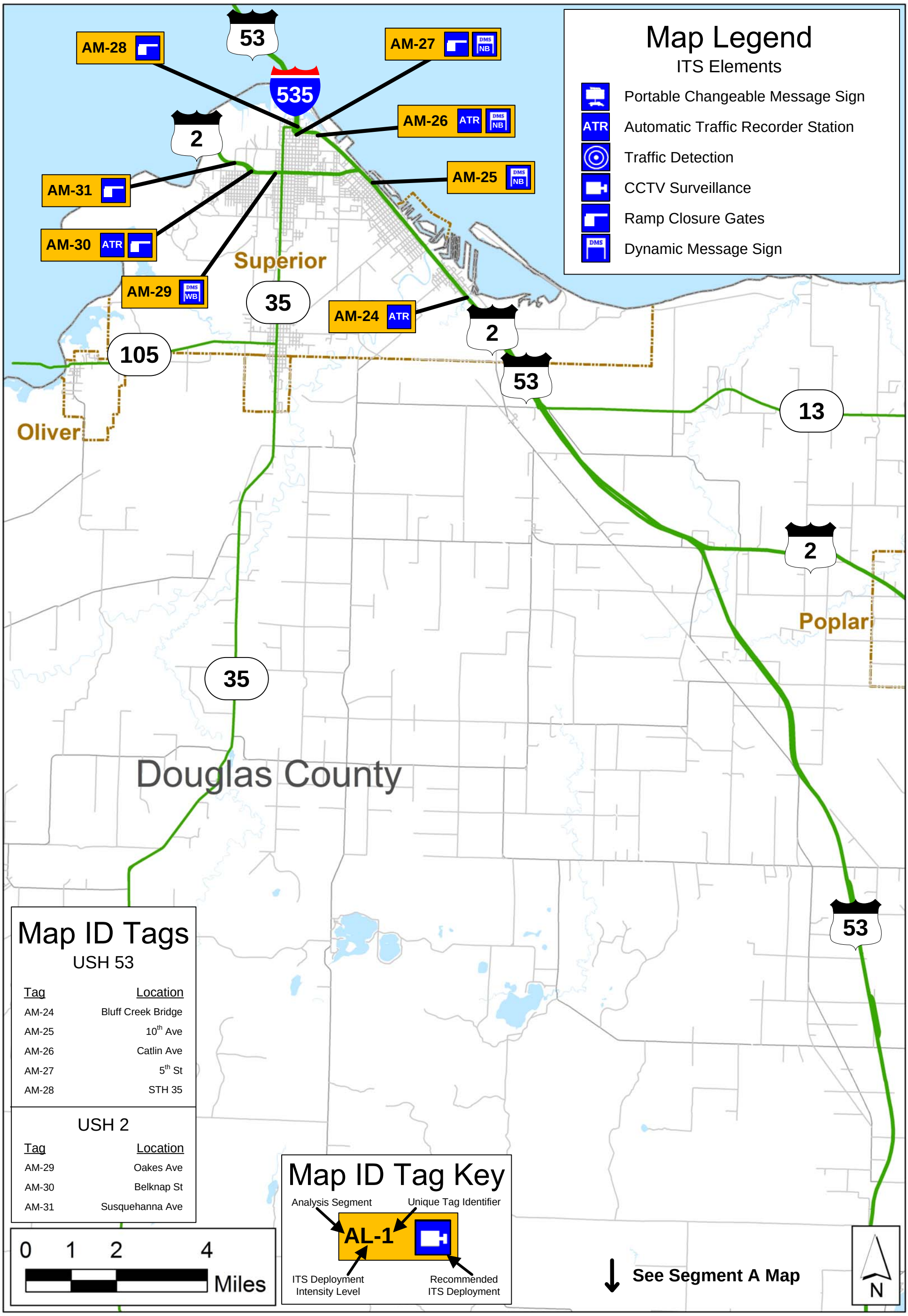
Eau Claire – Chippewa Falls (High ITS Deployment Intensity)

Figure D.12



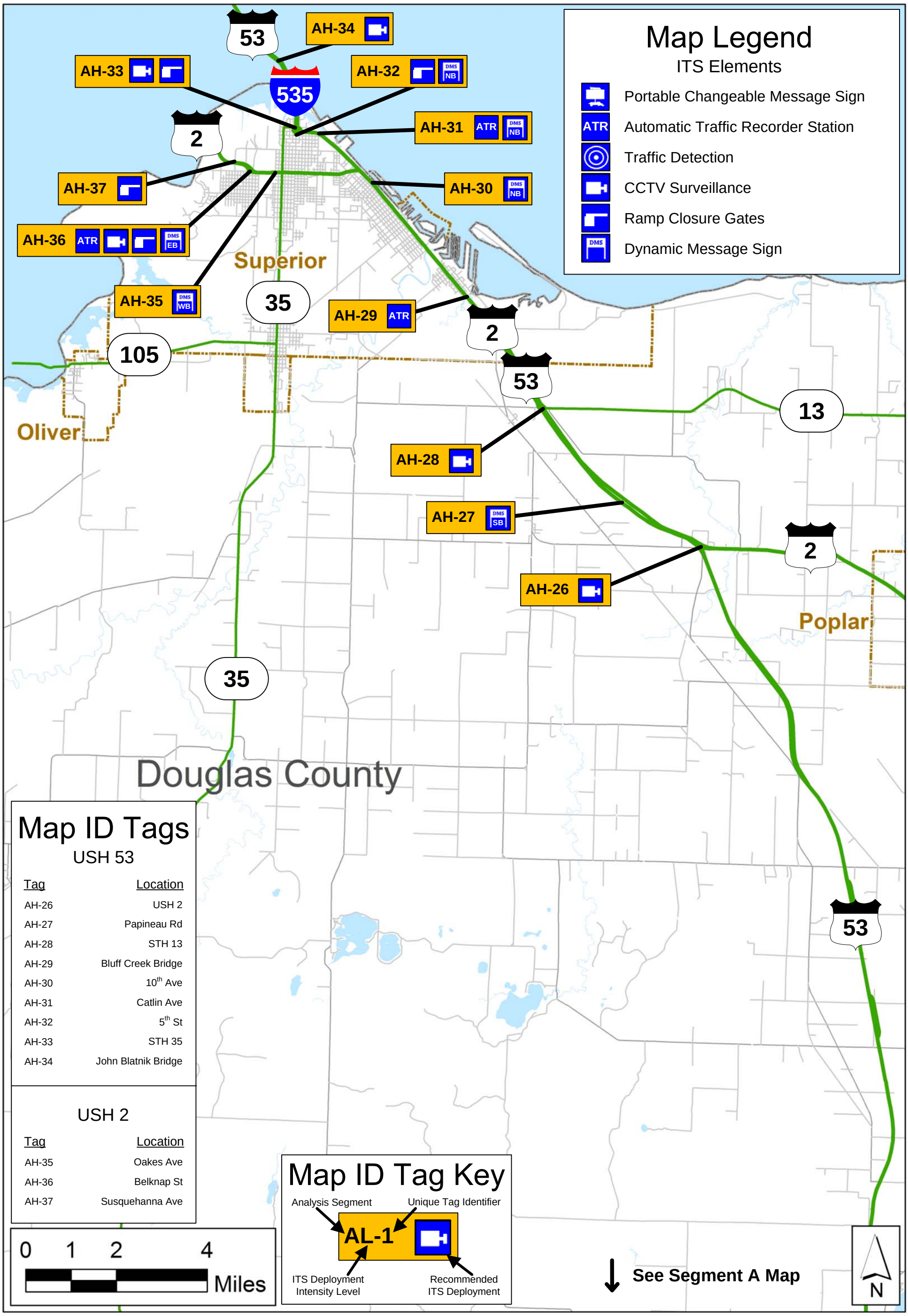
Superior (Low ITS Deployment Intensity)

Figure D.13



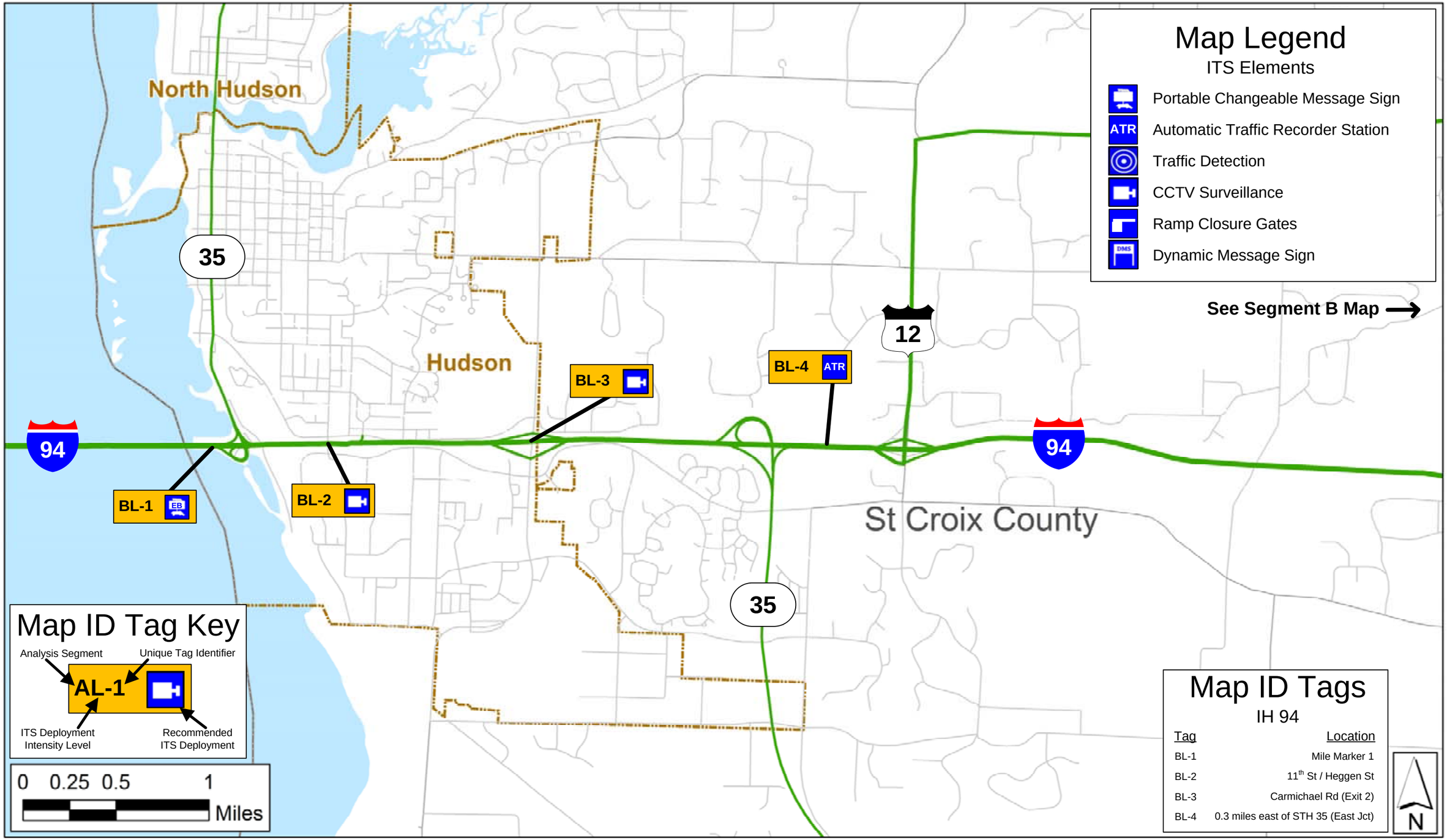
Superior (Medium ITS Deployment Intensity)

Figure D.14



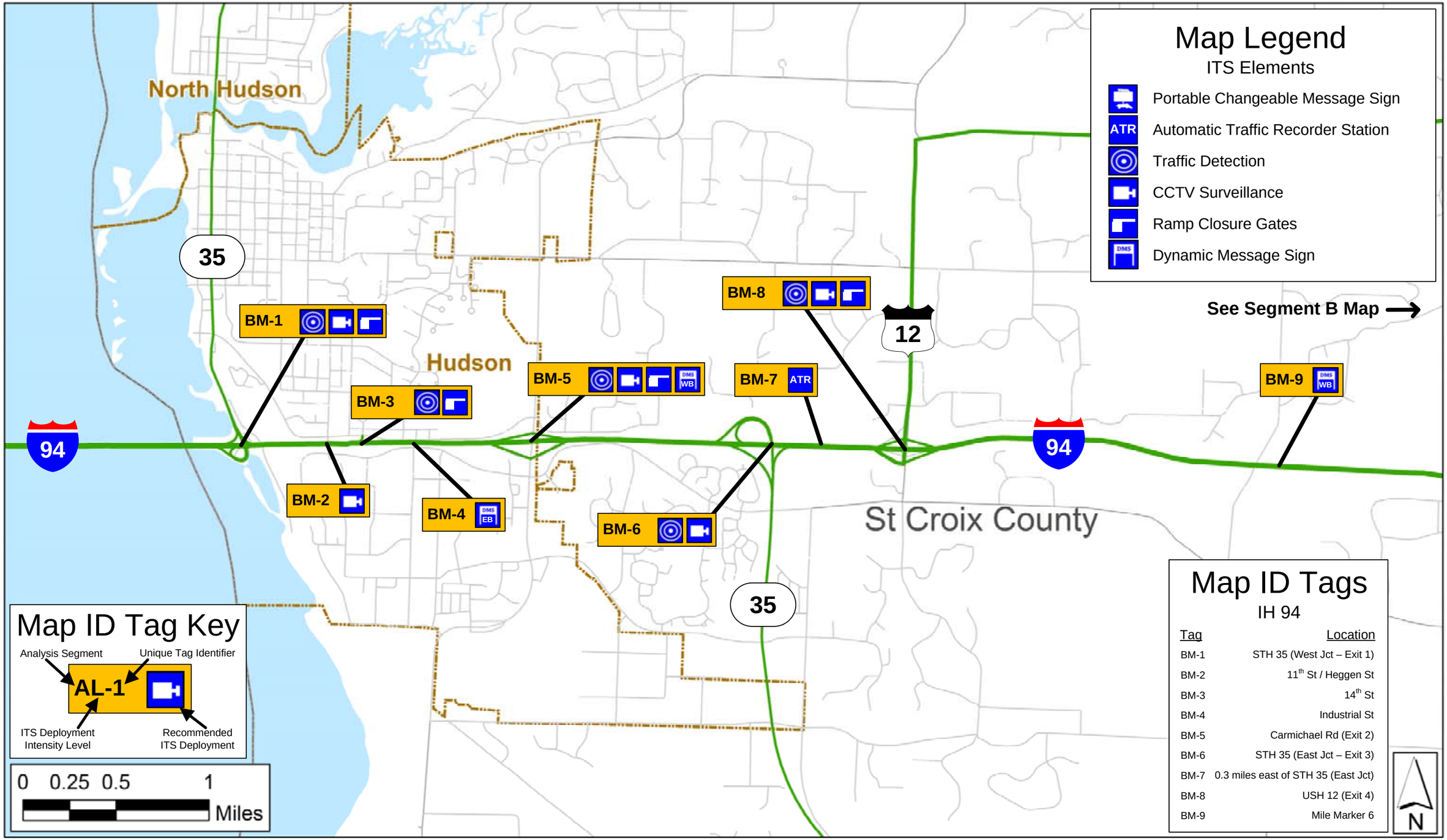
Superior (High ITS Deployment Intensity)

Figure D.15



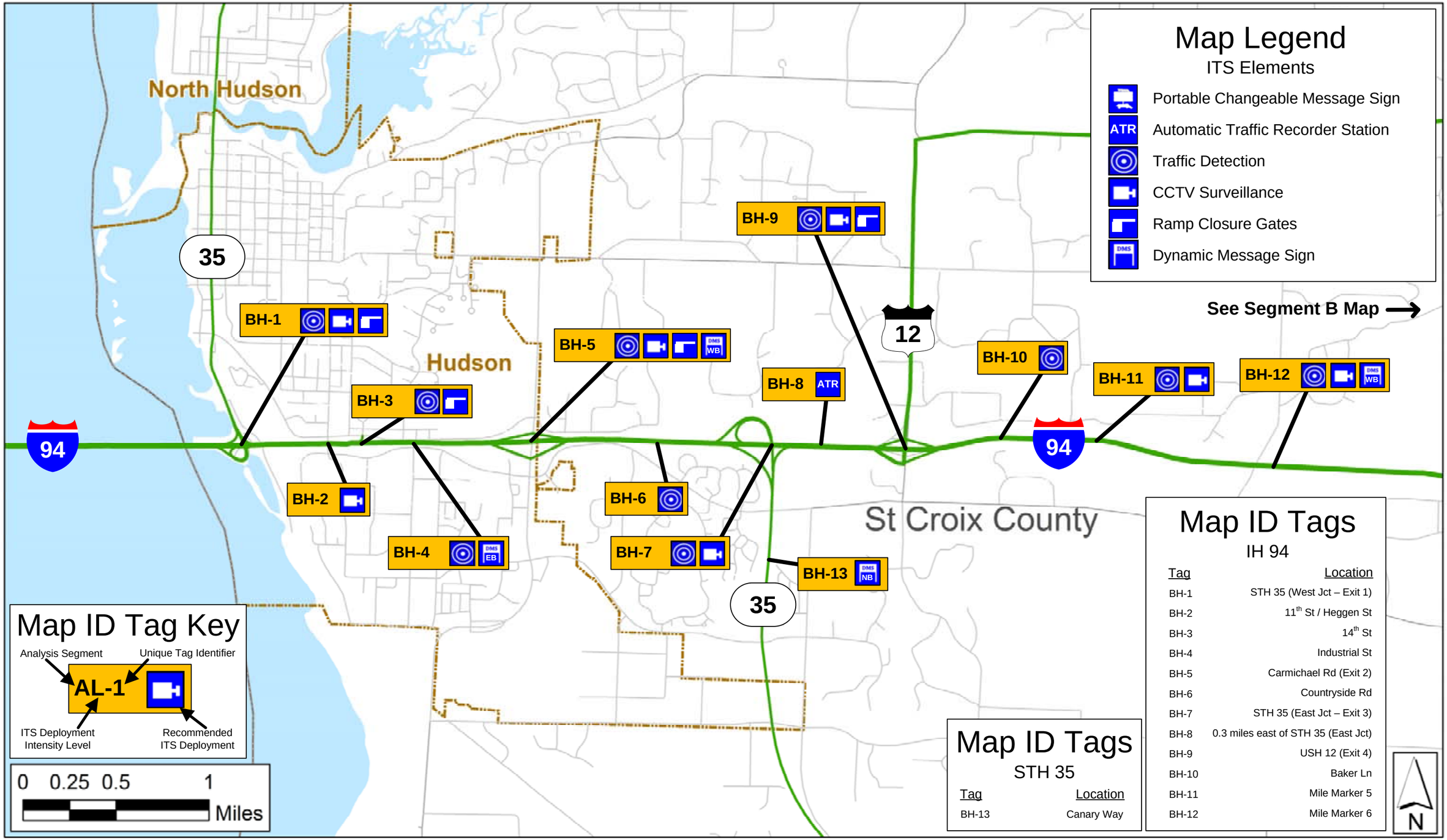
Hudson (Low ITS Deployment Intensity)

Figure D.16



Hudson (Medium ITS Deployment Intensity)

Figure D.17



Hudson (High ITS Deployment Intensity)

Figure D.18

E. ITS Elements Spreadsheets

Segment A - Low ITS Deployment Intensity

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Portable Changeable Message Sign	N/A				N/A	N/A	
					$0	$0	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Automatic Traffic Recorder Station	AL-2	USH 53	0.6 miles north of STH 312	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AL-3	USH 53	1 mile south of USH 8	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AL-4	USH 53	0.5 miles north of CTH L, Douglas County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AL-5	USH 2 / USH 53	Bluff Creek Bridge, Superior	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AL-7	USH 53	Catlin Avenue, Superior	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AL-10	USH 2	Belknap Street, Superior	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
						$60,000	$3,600	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Traffic Detection	N/A					N/A	N/A	
						$0	$0	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
CCTV Surveillance	AL-1	USH 53	USH 12 (Clairemont Avenue)	Existing (3 cameras)	$120,000	$6,900	Tunnel Cameras
					$120,000	$6,900	

ITS Element	Map ID	Roadway	At	Onramp From	Onramp To	Category	Capital Cost	Annual O & M	Note
Ramp Closure Gates	N/A						N/A	N/A	
							$0	$0	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Dynamic Message Sign	AL-6	USH 2 / USH 53	10th Avenue, Superior (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AL-7	USH 2 / USH 53	Caitlin Avenue, Superior (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AL-8	IH 535 / USH 53	5th Street, Superior (NB)	Overhead-mounted DMS	$197,000	$19,700	
	AL-9	USH 2	Oakes Avenue, Superior (WB)	Roadside-mounted DMS	$83,000	$9,400	
					$446,000	$47,900	

Approximate Corridor Capital Cost
$626,000
Approximate Corridor Annual O & M Cost
$58,400

Segment A - Medium ITS Deployment Intensity

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Portable Changeable Message Sign	N/A				N/A	N/A	
					$0	$0	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Automatic Traffic Recorder Station	AM-6	USH 53	0.6 miles north of STH 312	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AM-17	USH 53	1 mile south of USH 8	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AM-23	USH 53	0.5 miles north of CTH L, Douglas County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AM-24	USH 2 / USH 53	Bluff Creek Bridge, Superior	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AM-26	USH 53	Catlin Avenue, Superior	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AM-30	USH 2	Belknap Street, Superior	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
						$60,000	$3,600	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Traffic Detection	N/A					N/A	N/A	
						$0	$0	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
CCTV Surveillance	AM-1	USH 53	CTH AA (Golf Road) Interchange, Eau Claire	New	$40,000	$2,300	
	AM-2	USH 53	STH 93 / Hastings Way Interchange	New	$40,000	$2,300	
	AM-3	USH 53	USH 12 (Clairemont Avenue) Interchange	Existing (3 cameras)	$120,000	$6,900	Tunnel Cameras
	AM-3	USH 53	USH 12 (Clairemont Avenue) Interchange	New	$40,000	$2,300	
	AM-4	USH 53	River Prairie Drive Interchange, Eau Claire	New	$40,000	$2,300	
	AM-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	New	$40,000	$2,300	
	AM-7	USH 53	Melby Street Interchange, Lake Hallie	New	$40,000	$2,300	
	AM-8	USH 53	STH 124 / CTH OO Interchange	New	$40,000	$2,300	
	AM-9	USH 53	STH 29 Interchange	New	$40,000	$2,300	
					$440,000	$25,300	

ITS Element	Map ID	Roadway	At	Onramp From	Onramp To	Category	Capital Cost	Annual O & M	Note
Ramp Closure Gates	AM-1	USH 53	CTH AA (Golf Road) Interchange	CTH AA (Golf Road)	SB USH 53	New	$19,000	$1,900	
	AM-1	USH 53	CTH AA (Golf Road) Interchange	CTH AA (Golf Road)	NB USH 52	New	$19,000	$1,900	
	AM-1	USH 53	CTH AA (Golf Road) Interchange	CTH AA (Golf Road)	NB USH 53	New	$19,000	$1,900	
	AM-2	USH 53	STH 93 / Hastings Way Interchange	Hastings Way	SB USH 53	New	$19,000	$1,900	
	AM-2	USH 53	STH 93 / Hastings Way Interchange	STH 93	SB USH 53	New	$19,000	$1,900	
	AM-2	USH 53	STH 93 / Hastings Way Interchange	STH 93	NB USH 53	New	$19,000	$1,900	
	AM-3	USH 53	USH 12 (Clairemont Avenue) Interchange	USH 12 (Clairemont Avenue)	SB USH 53	New	$19,000	$1,900	
	AM-3	USH 53	USH 12 (Clairemont Avenue) Interchange	USH 12 (Clairemont Avenue)	SB USH 53	New	$19,000	$1,900	
	AM-3	USH 53	USH 12 (Clairemont Avenue) Interchange	USH 12 (Clairemont Avenue)	NB USH 53	New	$19,000	$1,900	
	AM-3	USH 53	USH 12 (Clairemont Avenue) Interchange	USH 12 (Clairemont Avenue)	NB USH 53	New	$19,000	$1,900	
	AM-4	USH 53	River Prairie Drive Interchange	River Prairie Drive	SB USH 53	New	$19,000	$1,900	
	AM-4	USH 53	River Prairie Drive Interchange	River Prairie Drive	NB USH 53	New	$19,000	$1,900	
	AM-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	STH 312 / CTH Q (North Crossing)	SB USH 53	New	$19,000	$1,900	
	AM-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	STH 312 / CTH Q (North Crossing)	SB USH 53	New	$19,000	$1,900	
	AM-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	STH 312 / CTH Q (North Crossing)	NB USH 53	New	$19,000	$1,900	
	AM-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	STH 312 / CTH Q (North Crossing)	NB USH 53	New	$19,000	$1,900	
	AM-7	USH 53	Melby Street Interchange	Melby Street	SB USH 53	New	$19,000	$1,900	
	AM-7	USH 53	Melby Street Interchange	Melby Street	SB USH 53	New	$19,000	$1,900	
	AM-7	USH 53	Melby Street Interchange	Melby Street	NB USH 53	New	$19,000	$1,900	
	AM-8	USH 53	STH 124 / CTH OO Interchange	STH 124 / CTH OO	SB USH 53	New	$19,000	$1,900	
	AM-8	USH 53	STH 124 / CTH OO Interchange	STH 124 / CTH OO	NB USH 53	New	$19,000	$1,900	
	AM-10	USH 53	CTH X (Chippewa Falls) Interchange	CTH X, Chippewa Falls	SB USH 53	New	$19,000	$1,900	
	AM-10	USH 53	CTH X (Chippewa Falls) Interchange	CTH X, Chippewa Falls	NB USH 53	New	$19,000	$1,900	
	AM-11	USH 53	CTH S (Chippewa Falls) Interchange	CTH S, Chippewa Falls	SB USH 53	New	$19,000	$1,900	
	AM-11	USH 53	CTH S (Chippewa Falls) Interchange	CTH S, Chippewa Falls	NB USH 53	New	$19,000	$1,900	
	AM-12	USH 53	CTH B (Tilden) Interchange	CTH B, Tilden	SB USH 53	New	$19,000	$1,900	
	AM-12	USH 53	CTH B (Tilden) Interchange	CTH B, Tilden	NB USH 53	New	$19,000	$1,900	
	AM-13	USH 53	STH 40 Interchange	STH 40	SB USH 53	New	$19,000	$1,900	
	AM-13	USH 53	STH 40 Interchange	STH 40	NB USH 53	New	$19,000	$1,900	
	AM-14	USH 53	STH 64 Interchange	STH 64	SB USH 53	New	$19,000	$1,900	
	AM-14	USH 53	STH 64 Interchange	STH 64	NB USH 53	New	$19,000	$1,900	
	AM-15	USH 53	CTH M (New Auburn) Interchange	CTH M, New Auburn	SB USH 53	New	$19,000	$1,900	
	AM-15	USH 53	CTH M (New Auburn) Interchange	CTH M, New Auburn	NB USH 53	New	$19,000	$1,900	
	AM-16	USH 53	CTH I (Chetek) Interchange	CTH I, Chetek	SB USH 53	New	$19,000	$1,900	
	AM-16	USH 53	CTH I (Chetek) Interchange	CTH I, Chetek	NB USH 53	New	$19,000	$1,900	
	AM-18	USH 53	USH 8 Interchange	USH 8	SB USH 53	New	$19,000	$1,900	
	AM-18	USH 53	USH 8 Interchange	USH 8	SB USH 53	New	$19,000	$1,900	
	AM-18	USH 53	USH 8 Interchange	USH 8	NB USH 53	New	$19,000	$1,900	
	AM-18	USH 53	USH 8 Interchange	USH 8	NB USH 53	New	$19,000	$1,900	
	AM-20	USH 53	CTH O (Rice Lake) Interchange	CTH O, Rice Lake	SB USH 53	New	$19,000	$1,900	
	AM-20	USH 53	CTH O (Rice Lake) Interchange	CTH O, Rice Lake	NB USH 53	New	$19,000	$1,900	
	AM-21	USH 53	STH 48 Interchange	STH 48	SB USH 53	New	$19,000	$1,900	
	AM-21	USH 53	STH 48 Interchange	STH 48	NB USH 53	New	$19,000	$1,900	
	AM-27	IH 535 / USH 53	5th Street, Superior	5th Street, Superior	NB IH 535 / USH 53	New	$19,000	$1,900	
	AM-28	IH 535 / USH 53	STH 35 (3rd Street) Interchange	STH 35 (3rd Street)	NB IH 535 / USH 53	New	$19,000	$1,900	
	AM-28	IH 535 / USH 53	STH 35 (3rd Street) Interchange	USH 53 (2nd Street)	NB IH 535 / USH 53	New	$19,000	$1,900	
	AM-30	USH 2	Belknap Street (Superior) Interchange	Belknap Street, Superior	WB USH 2	New	$19,000	$1,900	
	AM-30	USH 2	Belknap Street (Superior) Interchange	Belknap Street, Superior	WB USH 2	New	$19,000	$1,900	
	AM-31	USH 2	Susquehanna Avenue (Superior) Interchange	Susquehanna Avenue, Superior	WB USH 2	New	$19,000	$1,900	
							$931,000	$93,100	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Dynamic Message Sign	AM-17	USH 53	1 mile south of USH 8 Interchange (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AM-19	USH 53	1 mile north of USH 8 Interchange (SB)	Roadside-mounted DMS	$83,000	$9,400	
	AM-22	USH 53	0.3 miles south of Stub Road, Washburn County (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AM-22	USH 53	0.3 miles south of Stub Road, Washburn County (SB)	Roadside-mounted DMS	$83,000	$9,400	
	AM-25	USH 2 / USH 53	10th Avenue, Superior (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AM-26	USH 2 / USH 53	Caitlin Avenue, Superior (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AM-27	IH 535 / USH 53	5th Street, Superior (NB)	Overhead-mounted DMS	$197,000	$19,700	
	AM-29	USH 2	Oakes Avenue, Superior (WB)	Roadside-mounted DMS	$83,000	$9,400	
					$778,000	$85,500	

Approximate Corridor Capital Cost
$2,209,000
Approximate Corridor Annual O & M Cost
$207,500

Segment A - High Deployment Intensity (TOIP Based)

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Portable Changeable Message Sign	N/A				N/A	N/A	
					$0	$0	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Automatic Traffic Recorder Station	AH-6	USH 53	0.6 miles north of STH 312	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AH-17	USH 53	1 mile south of USH 8	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AH-25	USH 53	0.5 miles north of CTH L, Douglas County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AH-29	USH 2 / USH 53	Bluff Creek Bridge, Superior	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AH-31	USH 53	Catlin Avenue, Superior	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	AH-36	USH 2	Belknap Street, Superior	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
						$60,000	$3,600	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Traffic Detection	AH-1	USH 53	CTH AA (Golf Road), Eau Claire	New	Diamond Interchange	$79,000	$2,500	
	AH-2	USH 53	STH 93 / Hastings Way	New	Diamond Interchange	$79,000	$2,500	
	AH-3	USH 53	USH 12 (Clairemont Avenue)	New	Diamond Interchange	$79,000	$2,500	
	AH-4	USH 53	River Prairie Drive, Eau Claire	New	Diamond Interchange	$79,000	$2,500	
	AH-5	USH 53	STH 312 / CTH Q (North Crossing)	New	Diamond Interchange	$79,000	$2,500	
	AH-7	USH 53	Melby Street, Lake Hallie	New	Diamond Interchange	$79,000	$2,500	
	AH-8	USH 53	STH 124 / CTH OO	New	Diamond Interchange	$79,000	$2,500	
	AH-9	USH 53	STH 29	New	Cloverleaf or Non-traditional Interchange	$153,000	$4,900	
						$706,000	$22,400	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
CCTV Surveillance	AH-1	USH 53	CTH AA (Golf Road) Interchange, Eau Claire	New	$40,000	$2,300	
	AH-2	USH 53	STH 93 / Hastings Way Interchange	New	$40,000	$2,300	
	AH-3	USH 53	USH 12 (Clairemont Avenue) Interchange	Existing (3 cameras)	$120,000	$6,900	Tunnel Cameras
	AH-3	USH 53	USH 12 (Clairemont Avenue) Interchange	New	$40,000	$2,300	
	AH-4	USH 53	River Prairie Drive Interchange, Eau Claire	New	$40,000	$2,300	
	AH-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	New	$40,000	$2,300	
	AH-7	USH 53	Melby Street Interchange, Lake Hallie	New	$40,000	$2,300	
	AH-8	USH 53	STH 124 / CTH OO Interchange	New	$40,000	$2,300	
	AH-9	USH 53	STH 29 Interchange	New	$40,000	$2,300	
	AH-10	USH 53	CTH X (Chippewa Falls) Interchange	New	$40,000	$2,300	
	AH-26	USH 53	USH 2 (South Junction) Interchange	New	$40,000	$2,300	
	AH-28	USH 2 / USH 53	STH 13 Interchange	New	$40,000	$2,300	
	AH-33	IH 535 / USH 53	STH 35 (5th Street), Superior	New	$40,000	$2,300	
	AH-34	IH 535 / USH 53	John Blatnik Bridge, Superior	New	$40,000	$2,300	
	AH-36	USH 2	Belknap Street, Superior	New	$40,000	$2,300	
					$680,000	$39,100	

ITS Element	Map ID	Roadway	At	Onramp From	Onramp To	Category	Capital Cost	Annual O & M	Note
Ramp Closure Gates	AH-1	USH 53	CTH AA (Golf Road) Interchange	CTH AA (Golf Road)	SB USH 53	New	$19,000	$1,900	
	AH-1	USH 53	CTH AA (Golf Road) Interchange	CTH AA (Golf Road)	NB USH 52	New	$19,000	$1,900	
	AH-1	USH 53	CTH AA (Golf Road) Interchange	CTH AA (Golf Road)	NB USH 53	New	$19,000	$1,900	
	AH-2	USH 53	STH 93 / Hastings Way Interchange	Hastings Way	SB USH 53	New	$19,000	$1,900	
	AH-2	USH 53	STH 93 / Hastings Way Interchange	STH 93	SB USH 53	New	$19,000	$1,900	
	AH-2	USH 53	STH 93 / Hastings Way Interchange	STH 93	NB USH 53	New	$19,000	$1,900	
	AH-3	USH 53	USH 12 (Clairemont Avenue) Interchange	USH 12 (Clairemont Avenue)	SB USH 53	New	$19,000	$1,900	
	AH-3	USH 53	USH 12 (Clairemont Avenue) Interchange	USH 12 (Clairemont Avenue)	SB USH 53	New	$19,000	$1,900	
	AH-3	USH 53	USH 12 (Clairemont Avenue) Interchange	USH 12 (Clairemont Avenue)	NB USH 53	New	$19,000	$1,900	
	AH-3	USH 53	USH 12 (Clairemont Avenue) Interchange	USH 12 (Clairemont Avenue)	NB USH 53	New	$19,000	$1,900	
	AH-4	USH 53	River Prairie Drive Interchange	River Prairie Drive	SB USH 53	New	$19,000	$1,900	
	AH-4	USH 53	River Prairie Drive Interchange	River Prairie Drive	NB USH 53	New	$19,000	$1,900	
	AH-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	STH 312 / CTH Q (North Crossing)	SB USH 53	New	$19,000	$1,900	
	AH-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	STH 312 / CTH Q (North Crossing)	SB USH 53	New	$19,000	$1,900	
	AH-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	STH 312 / CTH Q (North Crossing)	NB USH 53	New	$19,000	$1,900	
	AH-5	USH 53	STH 312 / CTH Q (North Crossing) Interchange	STH 312 / CTH Q (North Crossing)	NB USH 53	New	$19,000	$1,900	
	AH-7	USH 53	Melby Street Interchange	Melby Street	SB USH 53	New	$19,000	$1,900	
	AH-7	USH 53	Melby Street Interchange	Melby Street	SB USH 53	New	$19,000	$1,900	
	AH-7	USH 53	Melby Street Interchange	Melby Street	NB USH 53	New	$19,000	$1,900	
	AH-8	USH 53	STH 124 / CTH OO Interchange	STH 124 / CTH OO	SB USH 53	New	$19,000	$1,900	
	AH-8	USH 53	STH 124 / CTH OO Interchange	STH 124 / CTH OO	NB USH 53	New	$19,000	$1,900	
	AH-10	USH 53	CTH X (Chippewa Falls) Interchange	CTH X, Chippewa Falls	SB USH 53	New	$19,000	$1,900	
	AH-10	USH 53	CTH X (Chippewa Falls) Interchange	CTH X, Chippewa Falls	NB USH 53	New	$19,000	$1,900	
	AH-11	USH 53	CTH S (Chippewa Falls) Interchange	CTH S, Chippewa Falls	SB USH 53	New	$19,000	$1,900	
	AH-11	USH 53	CTH S (Chippewa Falls) Interchange	CTH S, Chippewa Falls	NB USH 53	New	$19,000	$1,900	
	AH-12	USH 53	CTH B (Tilden) Interchange	CTH B, Tilden	SB USH 53	New	$19,000	$1,900	
	AH-12	USH 53	CTH B (Tilden) Interchange	CTH B, Tilden	NB USH 53	New	$19,000	$1,900	
	AH-13	USH 53	STH 40 Interchange	STH 40	SB USH 53	New	$19,000	$1,900	
	AH-13	USH 53	STH 40 Interchange	STH 40	NB USH 53	New	$19,000	$1,900	
	AH-14	USH 53	STH 64 Interchange	STH 64	SB USH 53	New	$19,000	$1,900	
	AH-14	USH 53	STH 64 Interchange	STH 64	NB USH 53	New	$19,000	$1,900	
	AH-15	USH 53	CTH M (New Auburn) Interchange	CTH M, New Auburn	SB USH 53	New	$19,000	$1,900	
	AH-15	USH 53	CTH M (New Auburn) Interchange	CTH M, New Auburn	NB USH 53	New	$19,000	$1,900	
	AH-16	USH 53	CTH I (Chetek) Interchange	CTH I, Chetek	SB USH 53	New	$19,000	$1,900	
	AH-16	USH 53	CTH I (Chetek) Interchange	CTH I, Chetek	NB USH 53	New	$19,000	$1,900	
	AH-18	USH 53	USH 8 Interchange	USH 8	SB USH 53	New	$19,000	$1,900	
	AH-18	USH 53	USH 8 Interchange	USH 8	SB USH 53	New	$19,000	$1,900	
	AH-18	USH 53	USH 8 Interchange	USH 8	NB USH 53	New	$19,000	$1,900	
	AH-18	USH 53	USH 8 Interchange	USH 8	NB USH 53	New	$19,000	$1,900	
	AH-20	USH 53	CTH O (Rice Lake) Interchange	CTH O, Rice Lake	SB USH 53	New	$19,000	$1,900	
	AH-20	USH 53	CTH O (Rice Lake) Interchange	CTH O, Rice Lake	NB USH 53	New	$19,000	$1,900	
	AH-21	USH 53	STH 48 Interchange	STH 48	SB USH 53	New	$19,000	$1,900	
	AH-21	USH 53	STH 48 Interchange	STH 48	NB USH 53	New	$19,000	$1,900	
	AH-32	IH 535 / USH 53	5th Street, Superior	5th Street, Superior	NB IH 535 / USH 53	New	$19,000	$1,900	

	AH-33	IH 535 / USH 53	STH 35 (3rd Street) Interchange	STH 35 (3rd Street)	NB IH 535 / USH 53	New	$19,000	$1,900
	AH-33	IH 535 / USH 53	STH 35 (3rd Street) Interchange	USH 53 (2nd Street)	NB IH 535 / USH 53	New	$19,000	$1,900
	AH-36	USH 2	Belknap Street (Superior) Interchange	Belknap Street, Superior	WB USH 2	New	$19,000	$1,900
	AH-36	USH 2	Belknap Street (Superior) Interchange	Belknap Street, Superior	WB USH 2	New	$19,000	$1,900
	AH-37	USH 2	Susquehanna Avenue (Superior) Interchange	Susquehanna Avenue, Superior	WB USH 2	New	$19,000	$1,900
							$931,000	$93,100

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
	AH-2	USH 53	STH 93 (Golf Road) Interchange (SB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-7	USH 53	STH 312 / CTH OO (North Crossing) Interchange (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-10	USH 53	CTH S (Chippewa Falls) Interchange (SB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-17	USH 53	1 mile south of USH 8 Interchange (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-19	USH 53	1 mile north of USH 8 Interchange (SB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-22	USH 53	1 mile south of STH 70 Interchange (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-23	USH 53	0.3 miles south of Stub Road, Washburn County (NB)	Roadside-mounted DMS	$83,000	$9,400	
Dynamic Message Sign	AH-23	USH 53	0.3 miles south of Stub Road, Washburn County (SB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-24	USH 53	1 mile north of USH 63 (North Junction) Interchange (SB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-27	USH 53	Papineau Road, Douglas County (SB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-30	USH 2 / USH 53	10th Avenue, Superior (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-31	USH 2 / USH 53	Caitlin Avenue, Superior (NB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-32	IH 535 / USH 53	5th Street, Superior (NB)	Overhead-mounted DMS	$197,000	$19,700	
	AH-35	USH 2	Oakes Avenue, Superior (WB)	Roadside-mounted DMS	$83,000	$9,400	
	AH-36	USH 2	Belknap Street, Superior (EB)	Roadside-mounted DMS	$83,000	$9,400	
					$1,359,000	$151,300	

Approximate Corridor Capital Cost
$3,736,000
Approximate Corridor Annual O & M Cost
$309,500

Segment B - Low Deployment Intensity

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Portable Changeable Message Sign	BL-1	IH 94	Mile Marker 1, Saint Croix County (EB)	Existing PCMS	$32,000	$3,200	
	BL-5	IH 94	Mile Marker 12, Saint Croix County (WB)	Existing PCMS	$32,000	$3,200	
	BL-7	IH 94	Mile Marker 24, Saint Croix County (EB)	Existing PCMS	$32,000	$3,200	
	BL-9	IH 94	Mile Marker 48, Dunn County (WB)	Existing PCMS	$32,000	$3,200	
					$128,000	$12,800	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Automatic Traffic Recorder Station	BL-4	IH 94	0.3 miles east of STH 35 (East Junction)	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	BL-6	IH 94	2 miles east of USH 63, Saint Croix County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	BL-8	IH 94	0.6 miles east of CTH B, Dunn County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	BL-10	STH 29	0.5 miles west of CTH T, Chippewa County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
						$40,000	$2,400	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Traffic Detection	N/A					N/A	N/A	
						$0	$0	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
CCTV Surveillance	BL-2	IH 94	11th Street / Heggen Street, Hudson	Existing	$40,000	$2,300	
	BL-3	IH 94	CTH F (Carmichael Road), Hudson	Existing	$40,000	$2,300	
					$80,000	$4,600	

ITS Element	Map ID	Roadway	At	Onramp From	Onramp To	Category	Capital Cost	Annual O & M	Note
Ramp Closure Gates	N/A						N/A	N/A	
							$0	$0	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Dynamic Message Sign	N/A				N/A	N/A	
					$0	$0	

Approximate Corridor Capital Cost
$248,000
Approximate Corridor Annual O & M Cost
$19,800

Segment B - Medium Deployment Intensity (TOIP Based)

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Portable Changeable Message Sign	N/A				N/A	N/A	
					$0	$0	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Automatic Traffic Recorder Station	BM-7	IH 94	0.3 miles east of STH 35 (East Junction)	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	BM-16	IH 94	2 miles east of USH 63, Saint Croix County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	BM-24	IH 94	0.6 miles east of CTH B, Dunn County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	BM-33	STH 29	0.5 miles west of CTH T, Chippewa County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
						$40,000	$2,400	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Traffic Detection	BM-1	IH 94	STH 35 (West Junction) Interchange	New	Diamond Interchange	$79,000	$2,500	
	BM-3	IH 94	14th Street Interchange	New	Mainline	$25,000	$800	
	BM-5	IH 94	CTH F (Carmichael Road) Interchange	New	Diamond Interchange	$79,000	$2,500	
	BM-6	IH 94	STH 35 (East Junction) Interchange	New	Diamond Interchange	$79,000	$2,500	
	BM-8	IH 94	USH 12 / CTH U Interchange	New	Diamond Interchange	$79,000	$2,500	
	BM-11	IH 94	STH 65 Interchange	New	Mainline	$25,000	$800	
	BM-13	IH 94	CTH T (Hammond) Interchange	New	Mainline	$25,000	$800	
	BM-15	IH 94	USH 63 Interchange	New	Mainline	$25,000	$800	
	BM-25	IH 94	USH 12 / STH 29 Interchange	New	Mainline	$25,000	$800	
	BM-28	IH 94	STH 312 / CTH EE Interchange	New	Diamond Interchange	$79,000	$2,500	
	BM-29	IH 94	STH 37 / STH 85 Interchange	New	Diamond Interchange	$79,000	$2,500	
	BM-31	IH 94	STH 93 Interchange	New	Diamond Interchange	$79,000	$2,500	
						$678,000	$21,500	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
CCTV Surveillance	BM-1	IH 94	STH 35 (West Junction) Interchange	New	$40,000	$2,300	
	BM-2	IH 94	11th Street / Heggen Street, Hudson	Existing	$40,000	$2,300	
	BM-5	IH 94	CTH F (Carmichael Road) Interchange	Existing	$40,000	$2,300	
	BM-6	IH 94	STH 35 (East Junction) Interchange	New	$40,000	$2,300	
	BM-8	IH 94	USH 12 / CTH U Interchange	New	$40,000	$2,300	
	BM-11	IH 94	STH 65 Interchange	New	$40,000	$2,300	
	BM-13	IH 94	CTH T (Hammond) Interchange	New	$40,000	$2,300	
	BM-15	IH 94	USH 63 Interchange	New	$40,000	$2,300	
	BM-17	IH 94	CTH B (Woodville) Interchange	New	$40,000	$2,300	
	BM-18	IH 94	STH 128 Interchange	New	$40,000	$2,300	
	BM-20	IH 94	CTH Q (Knapp) Interchange	New	$40,000	$2,300	
	BM-22	IH 94	STH 25 Interchange	New	$40,000	$2,300	
	BM-23	IH 94	CTH B (Menomonie) Interchange	New	$40,000	$2,300	
	BM-25	IH 94	USH 12 / STH 29 Interchange	New	$40,000	$2,300	
	BM-28	IH 94	STH 312 / CTH EE Interchange	New	$40,000	$2,300	
	BM-29	IH 94	STH 37 / STH 85 Interchange	New	$40,000	$2,300	
	BM-31	IH 94	STH 93 Interchange	New	$40,000	$2,300	
					$680,000	$39,100	

ITS Element	Map ID	Roadway	At	Onramp From	Onramp To	Category	Capital Cost	Annual O & M	Note
Ramp Closure Gates	BM-1	IH 94	STH 35 (West Junction) Interchange	STH 35 (2nd St)	IH 94	New	$19,000	$1,900	
	BM-3	IH 94	14th Street Interchange	14th Street	IH 94 WB	New	$19,000	$1,900	
	BM-5	IH 94	CTH F (Carmichael Road) Interchange	CTH F (Carmichael Road)	IH 94 EB	New	$19,000	$1,900	
	BM-5	IH 94	CTH F (Carmichael Road) Interchange	CTH F (Carmichael Road)	IH 94 WB	New	$19,000	$1,900	
	BM-8	IH 94	USH 12 / CTH U Interchange	CTH U	IH 94 EB	New	$19,000	$1,900	
	BM-8	IH 94	USH 12 / CTH U Interchange	USH 12	IH 94 WB	New	$19,000	$1,900	
	BM-11	IH 94	STH 65 Interchange	STH 65	IH 94 EB	New	$19,000	$1,900	
	BM-11	IH 94	STH 65 Interchange	STH 65	IH 94 EB	New	$19,000	$1,900	
	BM-11	IH 94	STH 65 Interchange	STH 65	IH 94 WB	New	$19,000	$1,900	
	BM-11	IH 94	STH 65 Interchange	STH 65	IH 94 WB	New	$19,000	$1,900	
	BM-13	IH 94	CTH T (Hammond) Interchange	CTH T (Hammond)	IH 94 EB	New	$19,000	$1,900	
	BM-13	IH 94	CTH T (Hammond) Interchange	CTH T (Hammond)	IH 94 WB	New	$19,000	$1,900	
	BM-15	IH 94	USH 63 Interchange	USH 63	IH 94 EB	New	$19,000	$1,900	
	BM-15	IH 94	USH 63 Interchange	USH 63	IH 94 EB	New	$19,000	$1,900	
	BM-15	IH 94	USH 63 Interchange	USH 63	IH 94 WB	New	$19,000	$1,900	
	BM-15	IH 94	USH 63 Interchange	USH 63	IH 94 WB	New	$19,000	$1,900	
	BM-17	IH 94	CTH B (Woodville) Interchange	CTH B (Woodville)	IH 94 EB	New	$19,000	$1,900	
	BM-17	IH 94	CTH B (Woodville) Interchange	CTH B (Woodville)	IH 94 WB	New	$19,000	$1,900	
	BM-18	IH 94	STH 128 Interchange	STH 128	IH 94 EB	New	$19,000	$1,900	
	BM-18	IH 94	STH 128 Interchange	STH 128	IH 94 WB	New	$19,000	$1,900	
	BM-20	IH 94	CTH Q (Knapp) Interchange	CTH Q (Knapp)	IH 94 EB	New	$19,000	$1,900	
	BM-20	IH 94	CTH Q (Knapp) Interchange	CTH Q (Knapp)	IH 94 WB	New	$19,000	$1,900	
	BM-22	IH 94	STH 25 Interchange	STH 25	IH 94 EB	New	$19,000	$1,900	
	BM-22	IH 94	STH 25 Interchange	STH 25	IH 94 EB	New	$19,000	$1,900	
	BM-22	IH 94	STH 25 Interchange	STH 25	IH 94 WB	New	$19,000	$1,900	
	BM-22	IH 94	STH 25 Interchange	STH 25	IH 94 WB	New	$19,000	$1,900	
	BM-23	IH 94	CTH B (Menomonie) Interchange	CTH B (Menomonie)	IH 94 EB	New	$19,000	$1,900	
	BM-23	IH 94	CTH B (Menomonie) Interchange	CTH B (Menomonie)	IH 94 WB	New	$19,000	$1,900	
	BM-25	IH 94	USH 12 / STH 29 Interchange	USH 12 / STH 29	IH 94 EB	New	$19,000	$1,900	
	BM-25	IH 94	USH 12 / STH 29 Interchange	USH 12 / STH 29	IH 94 WB	New	$19,000	$1,900	
	BM-25	IH 94	USH 12 / STH 29 Interchange	USH 12 / STH 29	IH 94 WB	New	$19,000	$1,900	
	BM-28	IH 94	STH 312 / CTH EE Interchange	CTH EE	IH 94 EB	New	$19,000	$1,900	
	BM-28	IH 94	STH 312 / CTH EE Interchange	STH 312	IH 94 WB	New	$19,000	$1,900	
	BM-29	IH 94	STH 37 / STH 85 Interchange	STH 37 / STH 85	IH 94 EB	New	$19,000	$1,900	
	BM-29	IH 94	STH 37 / STH 85 Interchange	STH 37 / STH 85	IH 94 WB	New	$19,000	$1,900	
	BM-31	IH 94	STH 93 Interchange	STH 93	IH 94 EB	New	$19,000	$1,900	

	BM-31	IH 94	STH 93 Interchange	STH 93	IH 94 WB	New	$19,000	$1,900
	BM-32	STH 29	USH 12 / STH 40 Interchange	USH 12	STH 29 EB	New	$19,000	$1,900
	BM-32	STH 29	USH 12 / STH 40 Interchange	STH 40	STH 29 WB	New	$19,000	$1,900
	BM-34	STH 29	CTH T (Eau Claire) Interchange	CTH T (Eau Claire)	STH 29 EB	New	$19,000	$1,900
	BM-34	STH 29	CTH T (Eau Claire) Interchange	CTH T (Eau Claire)	STH 29 WB	New	$19,000	$1,900
	BM-35	STH 29	90th Street (Chippewa Falls) Interchange	90th Street (Chippewa Falls)	STH 29 EB	New	$19,000	$1,900
	BM-35	STH 29	90th Street (Chippewa Falls) Interchange	90th Street (Chippewa Falls)	STH 29 WB	New	$19,000	$1,900
	BM-37	STH 29	STH 178 (Cray Boulevard) Interchange	STH 178 (Cray Boulevard)	STH 29 EB	New	$19,000	$1,900
	BM-37	STH 29	STH 178 (Cray Boulevard) Interchange	STH 178 (Cray Boulevard)	STH 29 EB	New	$19,000	$1,900
	BM-37	STH 29	STH 178 (Cray Boulevard) Interchange	STH 178 (Cray Boulevard)	STH 29 WB	New	$19,000	$1,900
	BM-37	STH 29	STH 178 (Cray Boulevard) Interchange	STH 178 (Cray Boulevard)	STH 29 WB	New	$19,000	$1,900
	BM-38	STH 29	CTH X (Lake Wissota) Interchange	CTH X (Lake Wissota)	STH 29 WB	New	$19,000	$1,900
	BM-39	STH 29	CTH J (Lake Wissota) Interchange	CTH J (Lake Wissota)	STH 29 EB	New	$19,000	$1,900
	BM-39	STH 29	CTH J (Lake Wissota) Interchange	50th Avenue	STH 29 WB	New	$19,000	$1,900
							$950,000	$95,000

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Dynamic Message Sign	BM-4	IH 94	Industrial Street, Hudson (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-5	IH 94	CTH F (Carmichael Road) Interchange (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-9	IH 94	Mile Marker 6, Saint Croix County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-10	IH 94	Mile Marker 8, Saint Croix County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-12	IH 94	Mile Marker 12, Saint Croix County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-14	IH 94	Mile Marker 17, Saint Croix County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-16	IH 94	2 miles east of USH 63, Saint Croix County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-19	IH 94	Mile Marker 30, Dunn County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-21	IH 94	Mile Marker 34, Dunn County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-26	IH 94	Mile Marker 54, Dunn County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-27	IH 94	Mile Marker 57, Eau Claire County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-30	IH 94	Mile Marker 67, Eau Claire County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-31	IH 94	STH 93 Interchange (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BM-36	STH 29	Mile Marker 77, Chippewa County (WB)	Roadside-mounted DMS	$83,000	$9,400	
					$1,162,000	$131,600	

Approximate Corridor Capital Cost
$3,510,000
Approximate Corridor Annual O & M Cost
$289,600

Segment B - High Deployment Intensity

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Portable Changeable Message Sign	N/A				N/A	N/A	
					$0	$0	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Automatic Traffic Recorder Station	BH-8	IH 94	0.3 miles east of STH 35 (East Junction)	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	BH-27	IH 94	2 miles east of USH 63, Saint Croix County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	BH-39	IH 94	0.6 miles east of CTH B, Dunn County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	BH-60	STH 29	0.5 miles west of CTH T, Chippewa County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
						$40,000	$2,400	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Traffic Detection	BH-1	IH 94	STH 35 (West Junction) Interchange	New	Diamond Interchange	$79,000	$2,500	
	BH-3	IH 94	14th Street Interchange	New	Mainline	$25,000	$800	
	BH-4	IH 94	Industrial Street, Hudson	New	Mainline	$25,000	$800	
	BH-5	IH 94	CTH F (Carmichael Road) Interchange	New	Diamond Interchange	$79,000	$2,500	
	BH-6	IH 94	Countryside Road, Hudson	New	Mainline	$25,000	$800	
	BH-7	IH 94	STH 35 (East Junction) Interchange	New	Diamond Interchange	$79,000	$2,500	
	BH-9	IH 94	USH 12 / CTH U Interchange	New	Diamond Interchange	$79,000	$2,500	
	BH-10	IH 94	Baker Lane, Saint Croix County	New	Mainline	$25,000	$800	
	BH-11	IH 94	Mile Marker 5, Saint Croix County	New	Mainline	$25,000	$800	
	BH-12	IH 94	Mile Marker 6, Saint Croix County	New	Mainline	$25,000	$800	
	BH-14	IH 94	Mile Marker 7, Saint Croix County	New	Mainline	$25,000	$800	
	BH-15	IH 94	Mile Marker 8, Saint Croix County	New	Mainline	$25,000	$800	
	BH-16	IH 94	Mile Marker 9, Saint Croix County	New	Mainline	$25,000	$800	
	BH-17	IH 94	STH 65 Interchange	New	Mainline	$25,000	$800	
	BH-18	IH 94	Mile Marker 11, Saint Croix County	New	Mainline	$25,000	$800	
	BH-19	IH 94	Mile Marker 12, Saint Croix County	New	Mainline	$25,000	$800	
	BH-20	IH 94	Mile Marker 13, Saint Croix County	New	Mainline	$25,000	$800	
	BH-21	IH 94	Mile Marker 14, Saint Croix County	New	Mainline	$25,000	$800	
	BH-22	IH 94	Mile Marker 15, Saint Croix County	New	Mainline	$25,000	$800	
	BH-23	IH 94	CTH T (Hammond) Interchange	New	Mainline	$25,000	$800	
	BH-24	IH 94	Mile Marker 17, Saint Croix County	New	Mainline	$25,000	$800	
	BH-25	IH 94	Mile Marker 18, Saint Croix County	New	Mainline	$25,000	$800	
	BH-26	IH 94	USH 63 Interchange	New	Mainline	$25,000	$800	
	BH-29	IH 94	CTH B (Woodville) Interchange	New	Mainline	$25,000	$800	
	BH-31	IH 94	STH 128 Interchange	New	Mainline	$25,000	$800	
	BH-33	IH 94	CTH Q (Knapp) Interchange	New	Mainline	$25,000	$800	
	BH-36	IH 94	STH 25 Interchange	New	Diamond Interchange	$79,000	$2,500	
	BH-37	IH 94	Mile Marker 43, Dunn County	New	Mainline	$25,000	$800	
	BH-38	IH 94	CTH B (Menomonie) Interchange	New	Diamond Interchange	$79,000	$2,500	
	BH-40	IH 94	Mile Marker 47, Eau Claire County	New	Mainline	$25,000	$800	
	BH-41	IH 94	Mile Marker 48, Eau Claire County	New	Mainline	$25,000	$800	
	BH-42	IH 94	Mile Marker 49, Eau Claire County	New	Mainline	$25,000	$800	
	BH-43	IH 94	Mile Marker 50, Eau Claire County	New	Mainline	$25,000	$800	
	BH-44	IH 94	USH 12 / STH 29 Interchange	New	Mainline	$25,000	$800	
	BH-45	IH 94	Mile Marker 54, Eau Claire County	New	Mainline	$25,000	$800	
	BH-46	IH 94	Mile Marker 55, Eau Claire County	New	Mainline	$25,000	$800	
	BH-47	IH 94	Mile Marker 56, Eau Claire County	New	Mainline	$25,000	$800	
	BH-48	IH 94	Mile Marker 57, Eau Claire County	New	Mainline	$25,000	$800	
	BH-49	IH 94	STH 312 / CTH EE Interchange	New	Diamond Interchange	$79,000	$2,500	
	BH-50	IH 94	Mile Marker 60, Eau Claire County	New	Mainline	$25,000	$800	
	BH-51	IH 94	Mile Marker 61, Eau Claire County	New	Mainline	$25,000	$800	
	BH-52	IH 94	Mile Marker 62, Eau Claire County	New	Mainline	$25,000	$800	
	BH-53	IH 94	Mile Marker 63, Eau Claire County	New	Mainline	$25,000	$800	
	BH-54	IH 94	Mile Marker 64, Eau Claire County	New	Mainline	$25,000	$800	
	BH-55	IH 94	STH 37 / STH 85 Interchange	New	Diamond Interchange	$79,000	$2,500	
	BH-56	IH 94	Mile Marker 66, Eau Claire County	New	Mainline	$25,000	$800	
	BH-57	IH 94	Mile Marker 67, Eau Claire County	New	Mainline	$25,000	$800	
	BH-58	IH 94	STH 93 Interchange	New	Diamond Interchange	$79,000	$2,500	
						$1,686,000	$53,700	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
	BH-1	IH 94	STH 35 (West Junction) Interchange	New	$40,000	$2,300	
	BH-2	IH 94	11th Street / Heggen Street, Hudson	Existing	$40,000	$2,300	
	BH-5	IH 94	CTH F (Carmichael Road) Interchange	Existing	$40,000	$2,300	
	BH-7	IH 94	STH 35 (East Junction) Interchange	New	$40,000	$2,300	
	BH-9	IH 94	USH 12 / CTH U Interchange	New	$40,000	$2,300	
	BH-11	IH 94	Mile Marker 5, Saint Croix County	New	$40,000	$2,300	
	BH-12	IH 94	Mile Marker 6, Saint Croix County	New	$40,000	$2,300	
	BH-14	IH 94	Mile Marker 7, Saint Croix County	New	$40,000	$2,300	
	BH-15	IH 94	Mile Marker 8, Saint Croix County	New	$40,000	$2,300	
	BH-16	IH 94	Mile Marker 9, Saint Croix County	New	$40,000	$2,300	
	BH-17	IH 94	STH 65 Interchange	New	$40,000	$2,300	
	BH-18	IH 94	Mile Marker 11, Saint Croix County	New	$40,000	$2,300	
	BH-19	IH 94	Mile Marker 12, Saint Croix County	New	$40,000	$2,300	
	BH-20	IH 94	Mile Marker 13, Saint Croix County	New	$40,000	$2,300	
	BH-21	IH 94	Mile Marker 14, Saint Croix County	New	$40,000	$2,300	
	BH-22	IH 94	Mile Marker 15, Saint Croix County	New	$40,000	$2,300	
	BH-23	IH 94	CTH T (Hammond) Interchange	New	$40,000	$2,300	
	BH-24	IH 94	Mile Marker 17, Saint Croix County	New	$40,000	$2,300	

	BH-25	IH 94	Mile Marker 18, Saint Croix County	New	$40,000	$2,300		
	BH-26	IH 94	USH 63 Interchange	New	$40,000	$2,300		
	BH-29	IH 94	CTH B (Woodville) Interchange	New	$40,000	$2,300		
	BH-31	IH 94	STH 128 Interchange	New	$40,000	$2,300		
	BH-33	IH 94	CTH Q (Knapp) Interchange	New	$40,000	$2,300		
	BH-36	IH 94	STH 25 Interchange	New	$40,000	$2,300		
	BH-37	IH 94	Mile Marker 43, Dunn County	New	$40,000	$2,300		
CCTV Surveillance	BH-38	IH 94	CTH B (Menomonie) Interchange	New	$40,000	$2,300		
	BH-40	IH 94	Mile Marker 47, Dunn County	New	$40,000	$2,300		
	BH-41	IH 94	Mile Marker 48, Eau Claire County	New	$40,000	$2,300		
	BH-42	IH 94	Mile Marker 49, Eau Claire County	New	$40,000	$2,300		
	BH-43	IH 94	Mile Marker 50, Eau Claire County	New	$40,000	$2,300		
	BH-44	IH 94	USH 12 / STH 29 Interchange	New	$40,000	$2,300		
	BH-45	IH 94	Mile Marker 54, Eau Claire County	New	$40,000	$2,300		
	BH-46	IH 94	Mile Marker 55, Eau Claire County	New	$40,000	$2,300		
	BH-47	IH 94	Mile Marker 56, Eau Claire County	New	$40,000	$2,300		
	BH-48	IH 94	Mile Marker 57, Eau Claire County	New	$40,000	$2,300		
	BH-49	IH 94	STH 312 / CTH EE Interchange	New	$40,000	$2,300		
	BH-50	IH 94	Mile Marker 60, Eau Claire County	New	$40,000	$2,300		
	BH-51	IH 94	Mile Marker 61, Eau Claire County	New	$40,000	$2,300		
	BH-52	IH 94	Mile Marker 62, Eau Claire County	New	$40,000	$2,300		
	BH-53	IH 94	Mile Marker 63, Eau Claire County	New	$40,000	$2,300		
	BH-54	IH 94	Mile Marker 64, Eau Claire County	New	$40,000	$2,300		
	BH-55	IH 94	STH 37 / STH 85 Interchange	New	$40,000	$2,300		
	BH-56	IH 94	Mile Marker 66, Eau Claire County	New	$40,000	$2,300		
	BH-57	IH 94	Mile Marker 67, Eau Claire County	New	$40,000	$2,300		
	BH-58	IH 94	STH 93 Interchange	New	$40,000	$2,300		
	BH-64	STH 29	STH 178 (Cray Boulevard) Interchange	New	$40,000	$2,300		
	BH-65	STH 29	CTH X (Lake Wissota) Interchange	New	$40,000	$2,300		
	BH-66	STH 29	CTH J (Lake Wissota) Interchange	New	$40,000	$2,300		
	BH-67	USH 12	STH 312 (North Crossing) Interchange	New	$40,000	$2,300		
	BH-68	USH 12	STH 37 / STH 85	New	$40,000	$2,300		
	BH-69	USH 12	Hastings Way (Eau Claire) Interchange	New	$40,000	$2,300		
	BH-70	STH 124	Park Avenue (Chippewa Falls) Interchange	New	$40,000	$2,300		
					$2,080,000	$119,600		

ITS Element	Map ID	Roadway	At	Onramp From	Onramp To	Category	Capital Cost	Annual O & M	Note
	BH-1	IH 94	STH 35 (West Junction) Interchange	STH 35 (2nd St)	IH 94	New	$19,000	$1,900	
	BH-3	IH 94	14th Street Interchange	14th Street	IH 94 WB	New	$19,000	$1,900	
	BH-5	IH 94	CTH F (Carmichael Road) Interchange	CTH F (Carmichael Road)	IH 94 EB	New	$19,000	$1,900	
	BH-5	IH 94	CTH F (Carmichael Road) Interchange	CTH F (Carmichael Road)	IH 94 WB	New	$19,000	$1,900	
	BH-9	IH 94	USH 12 / CTH U Interchange	CTH U	IH 94 EB	New	$19,000	$1,900	
	BH-9	IH 94	USH 12 / CTH U Interchange	USH 12	IH 94 WB	New	$19,000	$1,900	
	BH-17	IH 94	STH 65 Interchange	STH 65	IH 94 EB	New	$19,000	$1,900	
	BH-17	IH 94	STH 65 Interchange	STH 65	IH 94 EB	New	$19,000	$1,900	
	BH-17	IH 94	STH 65 Interchange	STH 65	IH 94 WB	New	$19,000	$1,900	
	BH-17	IH 94	STH 65 Interchange	STH 65	IH 94 WB	New	$19,000	$1,900	
	BH-23	IH 94	CTH T (Hammond) Interchange	CTH T (Hammond)	IH 94 EB	New	$19,000	$1,900	
	BH-23	IH 94	CTH T (Hammond) Interchange	CTH T (Hammond)	IH 94 WB	New	$19,000	$1,900	
	BH-26	IH 94	USH 63 Interchange	USH 63	IH 94 EB	New	$19,000	$1,900	
	BH-26	IH 94	USH 63 Interchange	USH 63	IH 94 EB	New	$19,000	$1,900	
	BH-26	IH 94	USH 63 Interchange	USH 63	IH 94 WB	New	$19,000	$1,900	
	BH-26	IH 94	USH 63 Interchange	USH 63	IH 94 WB	New	$19,000	$1,900	
	BH-29	IH 94	CTH B (Woodville) Interchange	CTH B (Woodville)	IH 94 EB	New	$19,000	$1,900	
	BH-29	IH 94	CTH B (Woodville) Interchange	CTH B (Woodville)	IH 94 WB	New	$19,000	$1,900	
	BH-31	IH 94	STH 128 Interchange	STH 128	IH 94 EB	New	$19,000	$1,900	
	BH-31	IH 94	STH 128 Interchange	STH 128	IH 94 WB	New	$19,000	$1,900	
	BH-33	IH 94	CTH Q (Knapp) Interchange	CTH Q (Knapp)	IH 94 EB	New	$19,000	$1,900	
	BH-33	IH 94	CTH Q (Knapp) Interchange	CTH Q (Knapp)	IH 94 WB	New	$19,000	$1,900	
	BH-36	IH 94	STH 25 Interchange	STH 25	IH 94 EB	New	$19,000	$1,900	
	BH-36	IH 94	STH 25 Interchange	STH 25	IH 94 EB	New	$19,000	$1,900	
Ramp Closure Gates	BH-36	IH 94	STH 25 Interchange	STH 25	IH 94 WB	New	$19,000	$1,900	
	BH-36	IH 94	STH 25 Interchange	STH 25	IH 94 WB	New	$19,000	$1,900	
	BH-38	IH 94	CTH B (Menomonie) Interchange	CTH B (Menomonie)	IH 94 EB	New	$19,000	$1,900	
	BH-38	IH 94	CTH B (Menomonie) Interchange	CTH B (Menomonie)	IH 94 WB	New	$19,000	$1,900	
	BH-44	IH 94	USH 12 / STH 29 Interchange	USH 12 / STH 29	IH 94 EB	New	$19,000	$1,900	
	BH-44	IH 94	USH 12 / STH 29 Interchange	USH 12 / STH 29	IH 94 WB	New	$19,000	$1,900	
	BH-44	IH 94	USH 12 / STH 29 Interchange	USH 12 / STH 29	IH 94 WB	New	$19,000	$1,900	
	BH-49	IH 94	STH 312 / CTH EE Interchange	CTH EE	IH 94 EB	New	$19,000	$1,900	
	BH-49	IH 94	STH 312 / CTH EE Interchange	STH 312	IH 94 WB	New	$19,000	$1,900	
	BH-55	IH 94	STH 37 / STH 85 Interchange	STH 37 / STH 85	IH 94 EB	New	$19,000	$1,900	
	BH-55	IH 94	STH 37 / STH 85 Interchange	STH 37 / STH 85	IH 94 WB	New	$19,000	$1,900	
	BH-58	IH 94	STH 93 Interchange	STH 93	IH 94 EB	New	$19,000	$1,900	
	BH-58	IH 94	STH 93 Interchange	STH 93	IH 94 WB	New	$19,000	$1,900	
	BH-59	STH 29	USH 12 / STH 40 Interchange	USH 12	STH 29 EB	New	$19,000	$1,900	
	BH-59	STH 29	USH 12 / STH 40 Interchange	STH 40	STH 29 WB	New	$19,000	$1,900	
	BH-61	STH 29	CTH T (Eau Claire) Interchange	CTH T (Eau Claire)	STH 29 EB	New	$19,000	$1,900	
	BH-61	STH 29	CTH T (Eau Claire) Interchange	CTH T (Eau Claire)	STH 29 WB	New	$19,000	$1,900	
	BH-62	STH 29	90th Street (Chippewa Falls) Interchange	90th Street (Chippewa Falls)	STH 29 EB	New	$19,000	$1,900	
	BH-62	STH 29	90th Street (Chippewa Falls) Interchange	90th Street (Chippewa Falls)	STH 29 WB	New	$19,000	$1,900	
	BH-64	STH 29	STH 178 (Cray Boulevard) Interchange	STH 178 (Cray Boulevard)	STH 29 EB	New	$19,000	$1,900	
	BH-64	STH 29	STH 178 (Cray Boulevard) Interchange	STH 178 (Cray Boulevard)	STH 29 EB	New	$19,000	$1,900	
	BH-64	STH 29	STH 178 (Cray Boulevard) Interchange	STH 178 (Cray Boulevard)	STH 29 WB	New	$19,000	$1,900	

	BH-64	STH 29	STH 178 (Cray Boulevard) Interchange	STH 178 (Cray Boulevard)	STH 29 WB	New	$19,000	$1,900
	BH-65	STH 29	CTH X (Lake Wissota) Interchange	CTH X (Lake Wissota)	STH 29 WB	New	$19,000	$1,900
	BH-66	STH 29	CTH J (Lake Wissota) Interchange	CTH J (Lake Wissota)	STH 29 EB	New	$19,000	$1,900
	BH-66	STH 29	CTH J (Lake Wissota) Interchange	50th Avenue	STH 29 WB	New	$19,000	$1,900
							$950,000	$95,000

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Dynamic Message Sign	BH-4	IH 94	Industrial Street, Hudson (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-5	IH 94	CTH F (Carmichael Road) Interchange (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-12	IH 94	Mile Marker 6, Saint Croix County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-13	STH 35	Canary Way, Saint Croix County (NB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-15	IH 94	Mile Marker 8, Saint Croix County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-19	IH 94	Mile Marker 12, Saint Croix County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-21	IH 94	Mile Marker 14, Saint Croix County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-24	IH 94	Mile Marker 17, Saint Croix County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-25	IH 94	Mile Marker 18, Saint Croix County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-27	IH 94	2 miles east of USH 63, Saint Croix County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-28	IH 94	Mile Marker 22, Saint Croix County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-30	IH 94	CTH NN, Saint Croix County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-30	IH 94	CTH NN, Saint Croix County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-32	IH 94	Mile Marker 30, Dunn County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-32	IH 94	Mile Marker 30, Dunn County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-34	IH 94	Mile Marker 34, Dunn County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-35	IH 94	Mile Marker 39, Dunn County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-37	IH 94	Mile Marker 43, Dunn County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-37	IH 94	Mile Marker 43, Dunn County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-40	IH 94	Mile Marker 47, Dunn County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-43	IH 94	Mile Marker 50, Dunn County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-45	IH 94	Mile Marker 54, Dunn County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-48	IH 94	Mile Marker 57, Eau Claire County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-57	IH 94	Mile Marker 67, Eau Claire County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-58	IH 94	STH 93 Interchange (EB)	Roadside-mounted DMS	$83,000	$9,400	
	BH-63	STH 29	Mile Marker 77, Chippewa County (WB)	Roadside-mounted DMS	$83,000	$9,400	
					$2,158,000	$244,400	

Approximate Corridor Capital Cost
$6,914,000
Approximate Corridor Annual O & M Cost
$515,100

Segment C - Low Deployment Intensity

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Portable Changeable Message Sign	CL-1	IH 94	Mile Marker 74, Eau Claire County (WB)	Existing PCMS	$32,000	$3,200	
	CL-2	IH 94	Mile Marker 92, Jackson County (WB)	Existing PCMS	$32,000	$3,200	
					$64,000	$6,400	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Automatic Traffic Recorder Station	CL-3	IH 94	Gilbertson Road, Jackson County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	CL-4	IH 94	0.5 miles east of CTH EW, Monroe County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
						$20,000	$1,200	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Traffic Detection	N/A					N/A	N/A	
						$0	$0	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
CCTV Surveillance	N/A				N/A	N/A	
					$0	$0	

ITS Element	Map ID	Roadway	At	Onramp From	Onramp To	Category	Capital Cost	Annual O & M	Note
Ramp Closure Gates	N/A						N/A	N/A	
							$0	$0	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Dynamic Message Sign	N/A				N/A	N/A	
					$0	$0	

Approximate Corridor Capital Cost
$84,000
Approximate Corridor Annual O & M Cost
$7,600

Segment C - Medium Deployment Intensity

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Portable Changeable Message Sign	N/A				N/A	N/A	
					$0	$0	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Automatic Traffic Recorder Station	CM-7	IH 94	Gilbertson Road, Jackson County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	CM-16	IH 94	0.5 miles east of CTH EW, Monroe County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
						$20,000	$1,200	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Traffic Detection	CM-1	IH 94	USH 53 Interchange	New	Cloverleaf or Non-traditional Interchange	$153,000	$4,900	
	CM-19	IH 94	STH 21 Interchange	New	Diamond Interchange	$79,000	$2,500	
	CM-20	IH 94	Industrial Avenue (Tomah) Interchange	New	Diamond Interchange	$79,000	$2,500	
						$311,000	$9,900	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
CCTV Surveillance	CM-1	IH 94	USH 53 Interchange	New	$40,000	$2,300	
	CM-19	IH 94	STH 21 Interchange	New	$40,000	$2,300	
	CM-20	IH 94	Industrial Avenue (Tomah) Interchange	New	$40,000	$2,300	
					$120,000	$6,900	

ITS Element	Map ID	Roadway	At	Onramp From	Onramp To	Category	Capital Cost	Annual O & M	Note
Ramp Closure Gates	CM-3	IH 94	CTH HH (Foster) Interchange	CTH HH (Foster)	IH 94 EB	New	$19,000	$1,900	
	CM-3	IH 94	CTH HH (Foster) Interchange	CTH HH (Foster)	IH 94 WB	New	$19,000	$1,900	
	CM-5	IH 94	USH 10 Interchange	USH 10	IH 94 EB	New	$19,000	$1,900	
	CM-5	IH 94	USH 10 Interchange	USH 10	IH 94 WB	New	$19,000	$1,900	
	CM-8	IH 94	STH 121 Interchange	STH 121	IH 94 EB	New	$19,000	$1,900	
	CM-8	IH 94	STH 121 Interchange	STH 121	IH 94 WB	New	$19,000	$1,900	
	CM-9	IH 94	STH 95 Interchange	STH 95	IH 94 EB	New	$19,000	$1,900	
	CM-9	IH 94	STH 95 Interchange	STH 95	IH 94 WB	New	$19,000	$1,900	
	CM-11	IH 94	USH 12 / STH 27 Interchange	USH 12 / STH 27 NB	IH 94 EB	New	$19,000	$1,900	
	CM-11	IH 94	USH 12 / STH 27 Interchange	USH 12 / STH 27 NB	IH 94 WB	New	$19,000	$1,900	
	CM-11	IH 94	USH 12 / STH 27 Interchange	USH 12 / STH 27 SB	IH 94 WB	New	$19,000	$1,900	
	CM-11	IH 94	USH 12 / STH 27 Interchange	USH 12 / STH 27 SB	IH 94 EB	New	$19,000	$1,900	
	CM-12	IH 94	STH 54 Interchange	STH 54	IH 94 EB	New	$19,000	$1,900	
	CM-12	IH 94	STH 54 Interchange	STH 54	IH 94 EB	New	$19,000	$1,900	
	CM-12	IH 94	STH 54 Interchange	STH 54	IH 94 WB	New	$19,000	$1,900	
	CM-14	IH 94	CTH O (Millston) Interchange	CTH O (Millston)	IH 94 EB	New	$19,000	$1,900	
	CM-14	IH 94	CTH O (Millston) Interchange	CTH O (Millston)	IH 94 WB	New	$19,000	$1,900	
	CM-15	IH 94	CTH EW (Warrens) Interchange	CTH EW (Warrens)	IH 94 EB	New	$19,000	$1,900	
	CM-15	IH 94	CTH EW (Warrens) Interchange	CTH EW (Warrens)	IH 94 WB	New	$19,000	$1,900	
	CM-18	IH 94	USH 12 Interchange	USH 12	IH 94 WB	New	$19,000	$1,900	
	CM-18	IH 94	USH 12 Interchange	USH 12	IH 94 EB	New	$19,000	$1,900	
	CM-19	IH 94	STH 21 Interchange	STH 21	IH 94 EB	New	$19,000	$1,900	
	CM-19	IH 94	STH 21 Interchange	STH 21	IH 94 WB	New	$19,000	$1,900	
	CM-20	IH 94	Industrial Avenue (Tomah) Interchange	Industrial Avenue (Tomah)	IH 94 EB	New	$19,000	$1,900	
	CM-20	IH 94	Industrial Avenue (Tomah) Interchange	Industrial Avenue (Tomah)	IH 94 WB	New	$19,000	$1,900	
							$475,000	$47,500	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Dynamic Message Sign	CM-2	IH 94	Mile Marker 72, Eau Claire County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	CM-4	IH 94	Mile Marker 86, Eau Claire County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	CM-6	IH 94	Mile Marker 90, Trempealeau County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	CM-10	IH 94	CTH F, Jackson County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	CM-13	IH 94	Mile Marker 117, Jackson County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	CM-17	IH 94	Mile Marker 141, Monroe County (EB)	Roadside-mounted DMS	$83,000	$9,400	
					$498,000	$56,400	

Approximate Corridor Capital Cost
$1,424,000
Approximate Corridor Annual O & M Cost
$121,900

Segment C - High Deployment Intensity (TOIP Based)

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Portable Changeable Message Sign	N/A				N/A	N/A	
					$0	$0	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Automatic Traffic Recorder Station	CH-10	IH 94	Gilbertson Road, Jackson County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
	CH-19	IH 94	0.5 miles east of CTH EW, Monroe County	Existing ATR Station	ATR Station Upgrade	$10,000	$600	
						$20,000	$1,200	

ITS Element	Map ID	Roadway	At	Category	Type	Capital Cost	Annual O & M	Note
Traffic Detection	CH-1	IH 94	USH 53 Interchange	New	Cloverleaf or Non-traditional Interchange	$153,000	$4,900	
	CH-15	IH 94	STH 54 Interchange	New	Mainline	$25,000	$800	
	CH-21	IH 94	USH 12 Interchange	New	Diamond Interchange	$79,000	$2,500	
	CH-22	IH 94	STH 21 Interchange	New	Diamond Interchange	$79,000	$2,500	
	CH-23	IH 94	Industrial Avenue (Tomah) Interchange	New	Diamond Interchange	$79,000	$2,500	
						$415,000	$13,200	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
CCTV Surveillance	CH-1	IH 94	USH 53 Interchange	New	$40,000	$2,300	
	CH-4	IH 94	CTH HH (Foster) Interchange	New	$40,000	$2,300	
	CH-6	IH 94	CTH K, Eau Claire County	New	$40,000	$2,300	
	CH-8	IH 94	USH 10 Interchange	New	$40,000	$2,300	
	CH-11	IH 94	STH 121 Interchange	New	$40,000	$2,300	
	CH-12	IH 94	STH 95 Interchange	New	$40,000	$2,300	
	CH-14	IH 94	USH 12 / STH 27 Interchange	New	$40,000	$2,300	
	CH-15	IH 94	STH 54 Interchange	New	$40,000	$2,300	
	CH-17	IH 94	CTH O (Millston) Interchange	New	$40,000	$2,300	
	CH-18	IH 94	CTH EW (Warrens) Interchange	New	$40,000	$2,300	
	CH-21	IH 94	USH 12 Interchange	New	$40,000	$2,300	
	CH-22	IH 94	STH 21 Interchange	New	$40,000	$2,300	
	CH-23	IH 94	Industrial Avenue (Tomah) Interchange	New	$40,000	$2,300	
					$520,000	$29,900	

ITS Element	Map ID	Roadway	At	Onramp From	Onramp To	Category	Capital Cost	Annual O & M	Note
Ramp Closure Gates	CH-4	IH 94	CTH HH (Foster) Interchange	CTH HH (Foster)	IH 94 EB	New	$19,000	$1,900	
	CH-4	IH 94	CTH HH (Foster) Interchange	CTH HH (Foster)	IH 94 WB	New	$19,000	$1,900	
	CH-8	IH 94	USH 10 Interchange	USH 10	IH 94 EB	New	$19,000	$1,900	
	CH-8	IH 94	USH 10 Interchange	USH 10	IH 94 WB	New	$19,000	$1,900	
	CH-11	IH 94	STH 121 Interchange	STH 121	IH 94 EB	New	$19,000	$1,900	
	CH-11	IH 94	STH 121 Interchange	STH 121	IH 94 WB	New	$19,000	$1,900	
	CH-12	IH 94	STH 95 Interchange	STH 95	IH 94 EB	New	$19,000	$1,900	
	CH-12	IH 94	STH 95 Interchange	STH 95	IH 94 WB	New	$19,000	$1,900	
	CH-14	IH 94	USH 12 / STH 27 Interchange	USH 12 / STH 27 NB	IH 94 EB	New	$19,000	$1,900	
	CH-14	IH 94	USH 12 / STH 27 Interchange	USH 12 / STH 27 NB	IH 94 WB	New	$19,000	$1,900	
	CH-14	IH 94	USH 12 / STH 27 Interchange	USH 12 / STH 27 SB	IH 94 WB	New	$19,000	$1,900	
	CH-14	IH 94	USH 12 / STH 27 Interchange	USH 12 / STH 27 SB	IH 94 EB	New	$19,000	$1,900	
	CH-15	IH 94	STH 54 Interchange	STH 54	IH 94 EB	New	$19,000	$1,900	
	CH-15	IH 94	STH 54 Interchange	STH 54	IH 94 EB	New	$19,000	$1,900	
	CH-15	IH 94	STH 54 Interchange	STH 54	IH 94 WB	New	$19,000	$1,900	
	CH-17	IH 94	CTH O (Millston) Interchange	CTH O (Millston)	IH 94 EB	New	$19,000	$1,900	
	CH-17	IH 94	CTH O (Millston) Interchange	CTH O (Millston)	IH 94 WB	New	$19,000	$1,900	
	CH-18	IH 94	CTH EW (Warrens) Interchange	CTH EW (Warrens)	IH 94 EB	New	$19,000	$1,900	
	CH-18	IH 94	CTH EW (Warrens) Interchange	CTH EW (Warrens)	IH 94 WB	New	$19,000	$1,900	
	CH-21	IH 94	USH 12 Interchange	USH 12	IH 94 WB	New	$19,000	$1,900	
	CH-21	IH 94	USH 12 Interchange	USH 12	IH 94 EB	New	$19,000	$1,900	
	CH-22	IH 94	STH 21 Interchange	STH 21	IH 94 EB	New	$19,000	$1,900	
	CH-22	IH 94	STH 21 Interchange	STH 21	IH 94 WB	New	$19,000	$1,900	
	CH-23	IH 94	Industrial Avenue (Tomah) Interchange	Industrial Avenue (Tomah)	IH 94 EB	New	$19,000	$1,900	
	CH-23	IH 94	Industrial Avenue (Tomah) Interchange	Industrial Avenue (Tomah)	IH 94 WB	New	$19,000	$1,900	
							$475,000	$47,500	

ITS Element	Map ID	Roadway	At	Category	Capital Cost	Annual O & M	Note
Dynamic Message Sign	CH-2	IH 94	Mile Marker 72, Eau Claire County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	CH-3	IH 94	Mile Marker 79, Eau Claire County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	CH-5	IH 94	Robin Road, Eau Claire County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	CH-7	IH 94	Mile Marker 86, Eau Claire County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	CH-9	IH 94	Mile Marker 90, Trempealeau County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	CH-13	IH 94	CTH F, Jackson County (EB)	Roadside-mounted DMS	$83,000	$9,400	
	CH-16	IH 94	Mile Marker 117, Jackson County (WB)	Roadside-mounted DMS	$83,000	$9,400	
	CH-20	IH 94	Mile Marker 141, Monroe County (EB)	Roadside-mounted DMS	$83,000	$9,400	
					$664,000	$75,200	

Approximate Corridor Capital Cost
$2,094,000
Approximate Corridor Annual O & M Cost
$167,000

F. Performance Impacts

Table F.1 2005 Segment A Performance Impacts

	Segment A		
	Low	**Medium**	**High**
Change in VMT	0	0	0
Baseline VMT	253,066	1,530,797	2,064,382
Improvement VMT	253,066	1,530,797	2,064,382
ATIS Savings (hours)	26.70	51.10	104.80
Baseline Delay (hours)	0.32	5.97	6.44
Improved Delay (hours)	0.30	4.17	4.62
Delay Reduction	-0.01	-1.80	-1.81
Baseline Fatalities	0.004479	0.027095	0.036540
Improved Fatalities	0.004471	0.012684	0.022102
Fatality Reduction	-8.738E-06	-0.014411461	-0.014437288
Baseline Injuries	0.429960	2.600825	3.507385
Improved Injuries	0.429130	1.231899	2.136006
Injury Reduction	-0.000830007	-1.368926044	-1.37137925
Baseline Fuel	10,463.21	69,970.01	92,677.04
Improved Fuel	10,443.84	30,919.08	53,564.08
Fuel Reduction	-19.37324152	-39050.93792	-39112.96398
Baseline HC/ROG (tons)	0.22	1.37	1.83
Improved HC/ROG (tons)	0.22	0.63	1.10
HC/ROG Reduction	-0.000426927	-0.736443626	-0.737708758
Baseline NO_x (tons)	0.70	4.46	5.97
Improved NO_x (tons)	0.70	2.04	3.54
NO_x Reduction	-0.00135138	-2.42485669	-2.42891984
Baseline CO (tons)	1.86	12.25	16.2
Improved CO (tons)	1.86	5.47	9.41
CO Reduction	-0.0035	-6.77482	-6.78532

Table F.2 2005 Segment A Options Performance Impacts

	Segment A Options			
	Option 1 Medium	**Option 1 High**	**Option 2 Medium**	**Option 2 High**
Change in VMT	0	0	0	0
Baseline VMT	1,468,462	1,974,949	1,490,507	1,996,994
Improvement VMT	1,468,462	91.00	40.50	1,996,994
ATIS Savings (hours)	37.30	6.28	5.90	94.20
Baseline Delay (hours)	5.89	4.47	4.10	6.28
Improved Delay (hours)	4.09	-1.81	-1.80	4.47
Delay Reduction	-1.80	0.034957	0.026382	-1.81
Baseline Fatalities	0.025992	0.034957	0.011971	0.035347
Improved Fatalities	0.011580	0.020519	-0.014411461	0.020910
Fatality Reduction	-0.014411461	-0.014437287	2.532371	-0.014437287
Baseline Injuries	2.494917	3.355438	2.532371	3.392892
Improved Injuries	1.125991	1.984059	1.163445	2.021513
Injury Reduction	-1.368926044	-1.371379249	-1.368926044	-1.371379249
Baseline Fuel	66,728.57	88,026.52	68,072.79	89,370.74
Improved Fuel	27,677.64	48,913.56	29,021.85	50,257.77
Fuel Reduction	-39050.93792	-39112.96398	-39050.93792	-39112.96398
BaselineHC/ROG(tons)	1.31	1.75	1.33	1.77
Improved HC/ROG (tons)	0.58	1.01	0.60	1.04
HC/ROG Reduction	-0.736443626	-0.737708758	-0.736443626	-0.737708758
Baseline NO_x (tons)	4.27	5.69	4.34	5.76
Improved NO_x (tons)	1.84	3.26	1.92	3.33
NO_x Reduction	-2.42485669	-2.42891984	-2.42485669	-2.42891984
Baseline CO (tons)	11.70	15.40	11.92	15.63
Improved CO (tons)	4.92	8.62	5.14	8.84
CO Reduction	-6.77482	-6.78532	-6.77482	-6.78532

Table F.3 2005 Segment A Urban Performance Impacts

	Segment A Urban		
	Low	**Medium**	**High**
Change in VMT	0	0	0
Baseline VMT	129,271	638,740	902,119
Improvement VMT	129,721	638,740	902,119
ATIS Savings (hours)	0.00	0.00	30.20
Baseline Delay (hours)	0.22	5.56	5.90
Improved Delay (hours)	0.21	3.84	4.17
Delay Reduction	-0.01	-1.72	-1.73
Baseline Fatalities	0.002288	0.011306	0.015968
Improved Fatalities	0.002281	0.006705	0.011359
Fatality Reduction	-6.642E-06	-0.004600258	-0.004608171
Baseline Injuries	0.219631	1.085219	1.532700
Improved Injuries	0.219000	0.648247	1.094976
Injury Reduction	-0.000630933	-0.436972674	-0.437724632
Baseline Fuel	4,783.02	24,558.53	34,904.97
Improved Fuel	4,769.13	14,314.45	24,643.74
Fuel Reduction	-13.88479848	-10244.08744	-10261.22472
Baseline HC/ROG (tons)	0.11	0.55	0.78
Improved HC/ROG (tons)	0.11	0.33	0.55
HC/ROG Reduction	-0.000320172	-0.22673985	-0.227125399
Baseline NO_x (tons)	0.35	1.74	2.47
Improved NO_x (tons)	0.35	1.03	1.76
NO_x Reduction	-0.00101222	-0.71049684	-0.71172746
Baseline CO (tons)	0.88	4.49	6.39
Improved CO (tons)	0.88	2.63	4.52
CO Reduction	-0.00255	-1.86708	-1.87025

Table F.4 2030 Segment A Performance Impacts

	Segment A		
	Low	**Medium**	**High**
Change in VMT	0	0	0
Baseline VMT	340,957	1,989,418	2,706,556
Improvement VMT	340,957	1,989,418	2,706,556
ATIS Savings (hours)	32.20	63.10	134.10
Baseline Delay (hours)	1.47	9.80	12.11
Improved Delay (hours)	1.39	7.31	9.58
Delay Reduction	-0.08	-2.49	-2.53
Baseline Fatalities	0.006035	0.035213	0.047906
Improved Fatalities	0.006023	0.016828	0.029487
Fatality Reduction	-1.2237E-05	-0.018384712	-0.01841862
Baseline Injuries	0.579286	3.380021	4.598439
Improved Injuries	0.578123	1.633681	2.848878
Injury Reduction	-0.001162404	-1.746339878	-1.749560871
Baseline Fuel	13,988.91	90,223.90	120,606.32
Improved Fuel	19,961.94	40,727.34	71,028.47
Fuel Reduction	-26.96469951	-49496.56102	-49577.84722
Baseline HC/ROG (tons)	0.30	1.78	2.40
Improved HC/ROG (tons)	0.30	0.84	1.46
HC/ROG Reduction	-0.000597025	-0.937541126	-0.93920268
Baseline NO_x (tons)	0.94	5.79	7.80
Improved NO_x (tons)	0.94	2.70	4.71
NO_x Reduction	-0.0018894	-3.08793889	-3.09327507
Baseline CO (tons)	2.49	15.83	21.12
Improved CO (tons)	2.49	7.23	12.51
CO Reduction	-0.00488	-8.59919	-8.613

Table F.5 2030 Segment A Options Performance Impacts

	Segment A Options			
	Option 1 Medium	**Option 1 High**	**Option 2 Medium**	**Option 2 High**
Change in VMT	0	0	0	0
Baseline VMT	1,908,097	2,587,736	1,934,902	2,614,541
Improvement VMT	1,908,097	2,587,736	1,934,902	2,614,541
ATIS Savings (hours)	45.90	116.90	49.40	120.30
Baseline Delay (hours)	9.46	11.45	9.48	11.47
Improved Delay (hours)	6.98	8.92	6.99	8.93
Delay Reduction	-2.49	-2.53	-2.49	-2.53
Baseline Fatalities	0.033773	0.045803	0.034248	0.046277
Improved Fatalities	0.015389	0.027384	0.015863	0.027859
Fatality Reduction	-0.018384711	-0.018418619	-0.018384711	-0.018418619
Baseline Injuries	3.241856	4.396563	3.287399	4.442105
Improved Injuries	1.495516	2.647002	1.541059	2.692544
Injury Reduction	-1.746339787	-1.749560871	-1.746339878	-1.749560871
Baseline Fuel	85,995.19	114,427.64	87,644.32	116,076.77
Improved Fuel	36,498.63	64,849.80	38,147.76	66,498.92
Fuel Reduction	-49496.56102	-49577.84722	-49496.56102	-49577.84722
BaselineHC/ROG(tons)	1.70	2.29	1.73	2.32
Improved HC/ROG (tons)	0.76	1.35	0.79	1.38
HC/ROG Reduction	-0.937541127	-0.939202682	-0.937541127	-0.939202682
Baseline NO_x (tons)	5.53	7.44	5.62	7.53
Improved NO_x (tons)	2.45	4.34	2.54	4.43
NO_x Reduction	-3.08793889	-3.09327507	-3.08793889	-3.09327507
Baseline CO (tons)	15.11	20.07	15.38	20.34
Improved CO (tons)	6.51	11.46	6.78	11.73
CO Reduction	-8.59919	-8.613	-8.59919	-8.613

Table F.6 2030 Segment A Urban Performance Impacts

	Segment A Urban		
	Low	**Medium**	**High**
Change in VMT	0	0	0
Baseline VMT	187,565	880,643	1,253,273
Improvement VMT	187,565	880,643	1,253,273
ATIS Savings (hours)	0.00	0.00	41.90
Baseline Delay (hours)	1.24	8.60	10.44
Improved Delay (hours)	1.17	6.32	8.13
Delay Reduction	-0.08	-2.28	-2.31
Baseline Fatalities	0.003320	0.015587	0.022183
Improved Fatalities	0.003310	0.009341	0.015925
Fatality Reduction	-9.638E-06	-0.006246352	-0.006257634
Baseline Injuries	0.318673	1.496212	2.129310
Improved Injuries	0.317757	0.902879	1.534906
Injury Reduction	-0.000915448	-0.593332809	-0.594404498
Baseline Fuel	6,939.90	33,767.34	48,314.94
Improved Fuel	6,919.75	19,916.98	34,440.23
Fuel Reduction	-20.14608414	-13850.36542	-13874.70491
Baseline HC/ROG (tons)	0.16	0.76	1.08
Improved HC/ROG (tons)	0.16	0.45	0.77
HC/ROG Reduction	-0.000464552	-0.306985669	-0.307534708
Baseline NO_x (tons)	0.51	2.40	3.43
Improved NO_x (tons)	0.50	1.43	2.46
NO_x Reduction	-0.00146868	-0.96640522	-0.96815586
Baseline CO (tons)	1.28	6.19	8.86
Improved CO (tons)	1.27	3.66	6.32
CO Reduction	-0.00371	-2.52669	-2.53119

Table F.7 2005 Segment B Performance Impacts

	Segment B		
	Low	**Medium**	**High**
Change in VMT	0	0	0
Baseline VMT	685,286	5,334,173	8,594,723
Improvement VMT	685,286	5,334,173	8,594,723
ATIS Savings (hours)	49.80	221.40	438.50
Baseline Delay (hours)	2.26	15.58	26.37
Improved Delay (hours)	2.23	12.89	23.29
Delay Reduction	-0.03	-2.68	-3.09
Baseline Fatalities	0.012130	0.094415	0.152127
Improved Fatalities	0.012113	0.059708	0.117259
Fatality Reduction	-1.6977E-05	-0.034706597	-0.034867769
Baseline Injuries	1.164301	9.062760	14.602435
Improved Injuries	1.162688	5.766026	11.290391
Injury Reduction	-0.001612609	-3.296734488	-3.312043997
Baseline Fuel	34,655.75	270,481013	438,841.01
Improved Fuel	34,609.33	270,108.50	438,000.27
Fuel Reduction	-46.41818064	-372.6260341	-840.7374227
Baseline HC/ROG (tons)	0.63	4.88	7.87
Improved HC/ROG (tons)	0.63	4.87	7.86
HC/ROG Reduction	-0.000874661	-0.006720518	-0.015067663
Baseline NO_x (tons)	2.11	16.34	26.39
Improved NO_x (tons)	2.10	16.31	26.34
NO_x Reduction	-0.002924	-0.02249596	-0.05052059
Baseline CO (tons)	5.99	46.41	75.11
Improved CO (tons)	5.98	46.34	74.97
CO Reduction	-0.00827	-0.06399	-0.14386

Table F.8 2030 Segment B Performance Impacts

	Segment B		
	Low	**Medium**	**High**
Change in VMT	0	0	0
Baseline VMT	1,026,271	8,077,850	13,180,284
Improvement VMT	1,026,271	8,077,850	13,180,284
ATIS Savings (hours)	76.30	329.40	675.50
Baseline Delay (hours)	16.39	116.11	204.13
Improved Delay (hours)	16.17	95.80	180.44
Delay Reduction	-0.21	-20.31	-23.69
Baseline Fatalities	0.018165	0.142978	0.233291
Improved Fatalities	0.018141	0.089809	0.179870
Fatality Reduction	-2.37E-05	-0.053168507	-0.053421093
Baseline Injuries	1.743635	13.724267	22.393303
Improved Injuries	1.741384	8.673859	17.318902
Injury Reduction	-0.002251151	-5.050407411	-5.074400258
Baseline Fuel	52,054.80	410,172.41	673,763.19
Improved Fuel	51,989.80	409,619.65	672,476.13
Fuel Reduction	-65.00477648	-552.7682517	-1287.057215
Baseline HC/ROG (tons)	0.94	7.39	12.07
Improved HC/ROG (tons)	0.94	7.38	12.05
HC/ROG Reduction	-0.001221362	-0.009951816	-0.023036037
Baseline NO_x (tons)	3.16	24.75	40.49
Improved NO_x (tons)	3.15	24.72	40.42
NO_x Reduction	-0.0040841	-0.0333094	-0.07727534
Baseline CO (tons)	8.99	70.34	115.27
Improved CO (tons)	8.97	70.24	115.05
CO Reduction	-0.01156	-0.09486	-0.22013

Table F.9 2005 Segment C Performance Impacts

	Segment C		
	Low	**Medium**	**High**
Change in VMT	0	0	0
Baseline VMT	438,971	3,297,299	5,479,601
Improvement VMT	438,971	3,297,299	5,479,601
ATIS Savings (hours)	18.90	90.00	108.10
Baseline Delay (hours)	0.85	6.07	10.66
Improved Delay (hours)	0.84	4.68	8.95
Delay Reduction	-0.01	-1.39	-1.71
Baseline Fatalities	0.007770	0.058362	0.096989
Improved Fatalities	0.007766	0.028437	0.066886
Fatality Reduction	-4.179E-06	-0.029925534	-0.030103422
Baseline Injuries	0.745811	5.602111	9.309842
Improved Injuries	0.745415	2.759523	6.450357
Injury Reduction	-0.000396966	-2.842587743	-2.859485052
Baseline Fuel	22,826.48	171,356.96	284,734.10
Improved Fuel	22,803.66	171,289.96	284,145.00
Fuel Reduction	-22.82648444	-67.00531578	-589.0999427
Baseline HC/ROG (tons)	0.40	3.03	5.04
Improved HC/ROG (tons)	0.40	3.03	5.03
HC/ROG Reduction	-0.000403558	-0.001184611	-0.010423585
Baseline NO_x (tons)	1.36	10.20	16.95
Improved NO_x (tons)	1.36	10.20	16.92
NO_x Reduction	-0.00135874	-0.00398848	-0.03507
Baseline CO (tons)	3.89	29.19	48.50
Improved CO (tons)	3.88	29.18	48.40
CO Reduction	-0.00389	-0.01141	-0.10035

Table F.10 2030 Segment C Performance Impacts

	Segment C		
	Low	**Medium**	**High**
Change in VMT	0	0	0
Baseline VMT	614,210	4,641,212	15,001,878
Improvement VMT	641,210	4,641,212	15,001,878
ATIS Savings (hours)	26.10	126.10	302.00
Baseline Delay (hours)	3.89	28.45	96.65
Improved Delay (hours)	3.86	22.03	76.16
Delay Reduction	-0.04	-6.42	-20.49
Baseline Fatalities	0.010872	0.082149	0.265533
Improved Fatalities	0.010866	0.040090	0.139162
Fatality Reduction	-5.967E-06	-0.042059488	-0.126371215
Baseline Injuries	1.043543	7.885420	25.488191
Improved Injuries	1.042977	3.890243	13.484354
Injury Reduction	-0.000566754	-3.995176285	-12.00383783
Baseline Fuel	31,938.94	241,227.04	779,633.68
Improved Fuel	31,907.00	241,132.05	778,783.02
Fuel Reduction	-31.93894097	-94.99206152	-850.6643993
Baseline HC/ROG (tons)	0.56	4.27	13.79
Improved HC/ROG (tons)	0.56	4.27	13.78
HC/ROG Reduction	-0.00056466	-0.001679399	-0.0150491
Baseline NO_x (tons)	1.90	14.36	46.41
Improved NO_x (tons)	1.90	14.35	46.36
NO_x Reduction	-0.00190116	-0.00565439	-0.05063977
Baseline CO (tons)	5.44	41.09	132.80
Improved CO (tons)	5.43	41.07	132.66
CO Reduction	-0.00544	-0.01618	-0.14491

G. Life-Cycle Benefit/Costs

Table G.1 Life-Cycle Benefit/Costs

Deployments	B/C Ratio
Segment A Low	1.18
Segment A Medium	1.68
Segment A High	1.57
Segment A Urban Low	2.81
Segment A Urban Medium	2.00
Segment A Urban High	1.49
Segment B Low	6.58
Segment B Medium	4.02
Segment B High	3.95
Segment C Low	6.13
Segment C Medium	4.01
Segment C High	7.30

This Table represents the calculated benefit cost for the improvements over the life of the project. Life cycles costs including capital costs, replacement costs and operation and maintenance costs are included.

H. IDAS Description

IDAS Description

This section presents a brief overview of the ITS Deployment Analysis (IDAS) system software used to conduct the benefit/cost analysis for this project. More detail on IDAS can be found at http://idas.camsys.com/. The tool being used in the evaluation is the. This software package was used to conduct the benefit-cost analysis of ITS alternatives. IDAS is a sketch-planning software and analysis methodology developed by Cambridge Systematics for the Federal Highway Administration (FHWA).

IDAS was developed to assist state, regional and local agencies in integrating ITS into the transportation planning process. Planners and others can use IDAS to calculate relative costs and benefits of ITS investments. IDAS currently can predict costs, benefits and impacts for more than 60 types of ITS investments in combination or isolation.

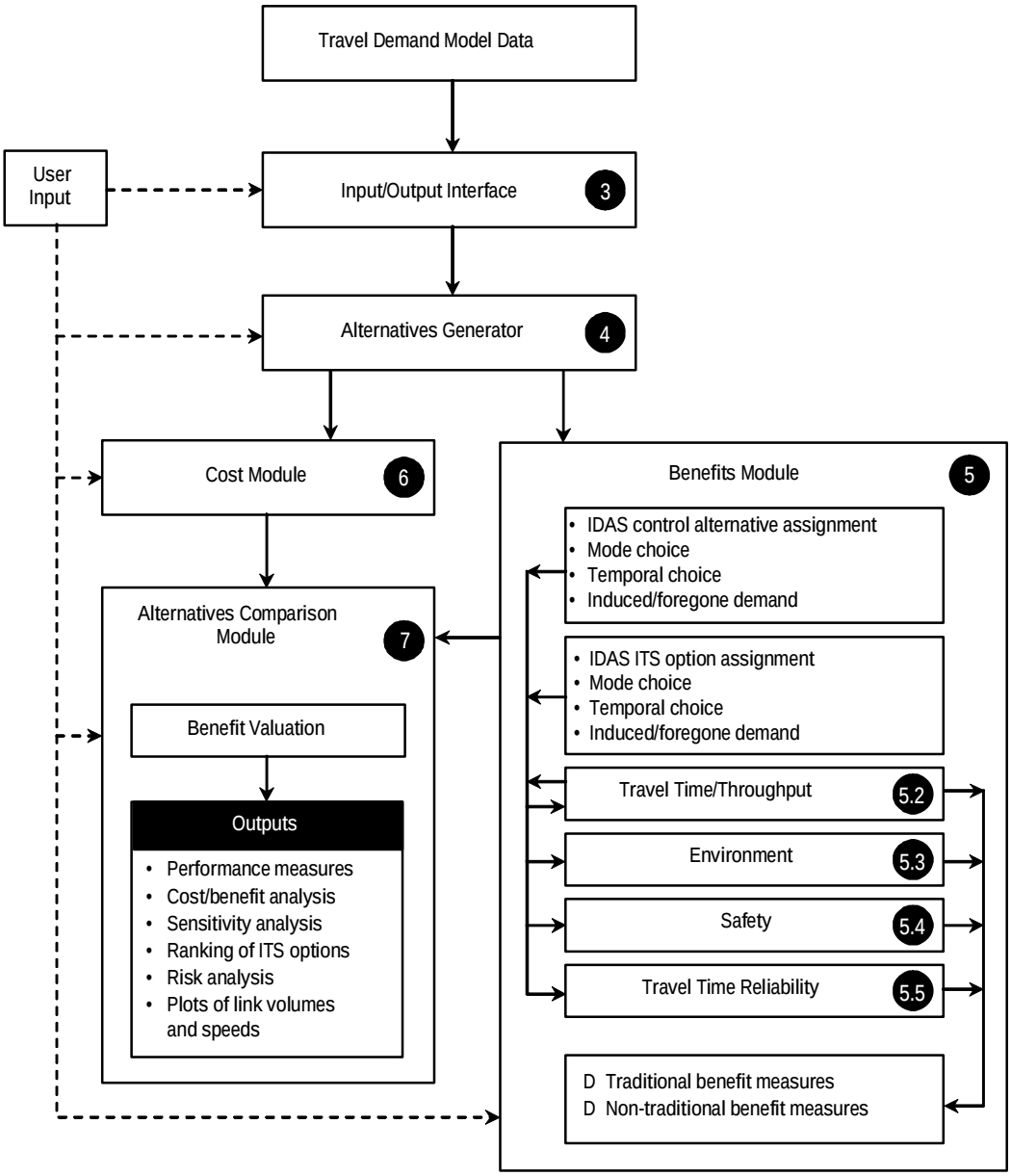
In order to be consistent with current transportation planning processes, IDAS operates as a postprocessor to travel demand models used by Metropolitan Planning Organizations (MPO) and by state Departments of Transportation (DOT). Although IDAS is a sketch-planning tool, it can implement the modal split and/or traffic assignment steps associated with a traditional planning model. These steps are key to estimating the changes in modal, route and temporal decisions of travelers resulting from ITS technologies. For this analysis, the Statewide Planning Model was utilized. Since this model was developed as part of a statewide model development effort, the methodology used is consistent.

There are a wide range of ITS improvements that can be assessed in IDAS, including Freeway Management Systems, Advanced Public Transit Systems, Incident Management, Emergency Management, Advanced Traveler Information Systems and many others. The set of impacts evaluated by IDAS included changes in user mobility, travel time/speed, travel time reliability, fuel costs, operating costs, accident costs, emissions and noise. The performance of selected ITS options can be viewed by market sector, facility type and district. IDAS is comprised of the following five different analysis modules:

- Input/output interface module (IOM)
- Alternatives generator module (AGM)
- Benefits module
- Cost module
- Alternatives comparison module (ACM)

The input/output interface is used to specify and translate the data files provided by the regional travel demand models and convert the data into a format that can be used internally by the IDAS model. The alternatives generator module allows an analyst to use a graphical user interface (GUI) to define and code ITS improvements into IDAS.

IDAS estimates both traditional benefits of ITS deployment, such as, improvement in average travel time and nontraditional benefits, such as reduction in travel time variability. The cost module allows the user to define the incremental costs of the various ITS deployments being studied, including capital costs and operating and maintenance costs. The user can modify IDAS-supplied default values for the proportion of the costs borne by the public and private sectors. Finally, the alternative comparison module provides the analyst with information regarding the value of user benefits from ITS deployments, the associated costs of the deployments and a comparison of the benefits and costs for different ITS deployment options.



The specific performance measures generated by IDAS include the following:

- Vehicle hours of travel (VHT)

- Average speed
- Person hours of travel (PHT)
- Number of person trips
- Number of accidents
  - Fatality
  - Injury
  - Property damage only
- Travel time reliability (hours of unexpected delay)
- Fuel consumption (gallons)
- Emissions:
  - Hydrocarbon and reactive organic gases
  - Carbon monoxide
  - Nitrous oxides
  - PM_{10}

The IDAS benefit/cost summary, details the results of the benefits valuation (value of time saved, value of accident reductions, etc.), cost analysis of the ITS option, net annual benefit and benefit-cost ratio. These include the following:

- Annual Benefits:
  - Change in user mobility
  - Change in user travel time (in-vehicle, out-of-vehicle and travel time reliability)
  - Change in costs paid by users (fuel costs, nonfuel operating costs and accident costs – internal only)
  - Change in external costs (accident costs – external only, HC/ROG, NO_x, CO, PM_{10}, CO_2, global warming, noise, other mileage-based external costs and other trip-based external costs)
  - Change in public agencies costs (efficiency included)
  - Other calculated benefits
  - User-defined additional benefits
- Annual costs:
  - Average annual private sector costs
  - Average annual public sector costs
  - Net benefit (annual benefit minus annual cost)
  - B/C ratio (annual benefit/annual cost)

I. References

1. State of Wisconsin – Department of Administration
   Population & household projections: 2000-2035. Retrieved March 2010 from http://www.doa.state.wi.us/section_detail.asp?linkcatid=11&linkid=64&locid=9

2. State of Wisconsin – Department of Transportation
   Traffic guidelines manual, 16-20-70, financial assumptions for engineering economic analysis, January 2008

3. State of Wisconsin – Department of Transportation
   Transportation engineering economic analysis manual, chapter 3 valuation of costs and benefits, topic 1 financial assumptions and parameters, Retrieved February 2010. http://www.wisdot.info/economics/index.php?title+Financial_Assumptions_and_Paramerters

4. Wisconsin Traffic Operations and Safety Laboratory
   Wisconsin traffic operations infrastructure plan. Retrieved March 2009 from http://www.topslab.wisc.edu/workgroups/toip.html

5. Cambridge Systematics, Inc.
   Intelligent transportation systems deployment analysis system. Retrieved March 2010 from http://idas.camsys.com/