Chicago Metropolitan Agency for Planning

233 S. Wacker Drive, Suite 800
Chicago, IL 60606

www.cmap.illinois.gov

Intermodal Freight Connectors: Pavement Condition Overview

as of 2006

November 2009

CMAP Congestion Management Process

Author: Dan Rice

TABLE OF CONTENTS

1 Executive Summary 1

2 Introduction 1

3 Background on the NHS and Intermodal Freight Connectors 2

4 Intermodal Connectors Roadway Characteristics 3

4.1 Jurisdiction Trends 4

4.2 Functional Classification Trends 5

5 Overview of Conditions as of 2006 6

5.1 Regional Conditions 6

5.2 Facility Level Overview 10

Appendix A: Intermodal Freight Facility Pavement Condition Tables

Appendix B: Intermodal Connector Review Map Series
CRS Ratings from IRIS 2006

Appendix C: Intermodal Connector Review Map Series
IRIS 2006 IRI & CRS Rating Comparison

LIST OF EXHIBITS

Exhibit 1: Connector Status in the Chicago Region 3
Exhibit 2: Jurisdiction Responsibility of Connectors in the Chicago Region 4
Exhibit 3: Maintenance Responsibility of Connectors in the Chicago Region 4
Exhibit 4: Functional Classification Codes for HPMS and IRIS 5
Exhibit 5: Functional Classifications for Connectors in the Chicago Region 5
Exhibit 6: CRS Condition Ratings and IRI Criteria for Acceptable Ride Quality 6
Exhibit 7: Intermodal Freight Connectors - Regional CRS Conditions 7
Exhibit 8: Intermodal Freight Connectors - Regional IRI Ride Quality 8
Exhibit 9: Regional Connectors CRS Condition by Status 9
Exhibit 10: Regional Connectors CRS Condition by Jurisdiction 9
Exhibit 11: Regional Connectors CRS Condition by Functional Class 10
Exhibit 12: Facility Connector Conditions by % Route-miles CRS Rating Good + ... 10
Exhibit 13: Facility Connector Conditions by % Route-miles IRI Acceptable Ride Quality ..11

Intermodal Connectors Pavement Condition Overview

1 Executive Summary

CMAP has compiled an overview of pavement conditions for *intermodal freight connectors* in the Chicago region, using Condition Rating Survey (CRS) data from the year 2006. The freight connectors were added to the National Highway System (NHS) between 1996 and 1999, based on FHWA guidelines to identify roadways that provide access between major intermodal freight facilities, and the principal arterials and expressways of the NHS. The importance of the freight connectors from the perspective of the FHWA has been summarized on the Office of Operations - Freight Management and Operations webpage as follows:

> *Intermodal connectors are short but important highways that connect America's most important seaports, airports, rail yards, and pipeline facilities to the NHS, a 161,000-mile network that includes the interstate system and other key roads. … Although they account for less than 1 percent of NHS mileage, NHS Connectors are key conduits for the timely and reliable delivery of goods. Hence it is important to evaluate the condition and performance of connectors and related investment needs.*

CMAP staff conducted a review of Condition Rating Survey (CRS) data contained within IDOT's Illinois Roadway Information System (IRIS) 2006 end of year GIS database for all roadways identified as intermodal freight connectors in the Chicago region. This data will support CMAP's congestion management process performance measurement system.

Initially this paper intended to focus on IRI ride quality data, since that measure is used by FHWA to describe ride quality/pavement conditions on a national level. However, based on the limited data availability of IRI data for roadways at these lower functional classes, this review relied on the more current and more complete CRS data. Since there is no available comparison data for freight connector pavement condition on the national level, observations from this analysis can only serve as benchmarks for future review.

As of 1999, there were 26 major intermodal freight facilities in the Chicago region, with one additional proposed major intermodal facility that opened in 2002. From a regional perspective, as of 2006, approximately 47% of intermodal freight connectors route-miles in the Chicago region showed CRS values greater than or equal to 7.0, which translates to Good or better (Good +) pavement conditions. At the facility level, eight (8) facilities showed less than 30% of connector route-mile pavement conditions of Good +; eleven (11) facilities showed between 30% and 70% of Good + route-miles; and eight (8) facilities showed more than 70% of route-miles in Good + condition.

A review of 2008 data is currently underway, but is not yet complete. Preliminary analyses indicate similar to slightly deteriorating conditions; however, additional site specific review of eligible facilities and associated connectors will be needed.

2 Introduction

The purpose of this report is to describe overall roadway system characteristics, and to provide an overview of pavement conditions for *intermodal freight connectors* (connectors) to the National Highway System (NHS) in the Chicago region. In order to

compile this overview, CMAP staff conducted a review of Condition Rating Survey (CRS) data contained within IDOT's Illinois Roadway Information System (IRIS) 2006 end of year GIS database. Staff extracted data for the Chicago region in order to develop a Microsoft Access database for analysis purposes, and to generate preliminary GIS applications. In CMAP's *Highway Ride Quality in the Chicago Region* report, November 2009, analysis focused on International Roughness Index (IRI) data from IRIS 2006 and Highway Performance Monitoring System (HPMS) 2003. Due to the limited data availability of IRI data for roadways at the lower functional classes, this report only focused on CRS data, with brief references to IRI data.

This report is intended to provide a preliminary snapshot of pavement conditions as of 2006, and to offer background for the development of performance measures related to pavement conditions for the intermodal freight connectors to the NHS in the Chicago region. Please note that analysis in this report relied on data quality in the IRIS 2006 end of year GIS database, and did not involve field observation.

3 Background on NHS and Intermodal Freight Connectors

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) established the National Highway System (NHS) to be the focus for federal aid highway programs into the 21st century. The issue of providing effective access to major intermodal facilities from the NHS was recognized by the Federal Highway Administration (FHWA), specifically because it opened additional options for identifying and funding roadway improvements which would enhance access to these facilities. In the case of freight, this meant providing for improved roadway access to major intermodal freight facilities for trucking operations.

The NHS was initially defined as a national network of 155,000 miles consisting of principal urban and rural arterials, the Strategic Highway network, and the 44,000 miles from the former Interstate System. In December 1993, CATS submitted *Proposed NHS for Northeastern Illinois*, to the Illinois Department of Transportation (IDOT) with the recommendation that the 1,300 mile Strategic Regional Arterials (SRA) system serve as the arterial component of the NHS in northeastern Illinois. Ultimately, most but not all of the SRA system was selected for the NHS. By 1994, the NHS mileage allocation was expanded to 159,000 miles nationally, with 3.5% or 5,553 miles within the state of Illinois, and 1,700 miles in N.E. Illinois. By 1996, more than 1,000 miles of intermodal freight connectors were added to the NHS nationally, including 60 miles in the state of Illinois, with almost 50 of those connector miles in the Chicago region. For a complete listing of intermodal connectors in Illinois refer to the FHWA web page listing at http://www.fhwa.dot.gov/planning/nhs/intermodalconnectors/illinois.html .

FHWA Memorandum *Guidelines for Identifying NHS Connections to Major Intermodal Terminals (April 14, 1995)* established the criteria and guidelines that were used by state DOTs, in cooperation with MPOs, to identify intermodal connectors. These FHWA guidelines were utilized by the Chicago Area Transportation Study's (CATS) Intermodal Advisory Task Force (IATF) to develop a regional review process to identify eligible major intermodal freight facilities, and the roadway links which provide primary connection to the NHS.

The goal for establishing intermodal connectors was to facilitate improved access between major intermodal facilities and the principal arterials of the NHS. The physical characteristics of the roadway design and its operational features are especially important in terms of maintaining and enhancing current levels of intermodal service, as well as improving the environment for more efficient intermodal transfer in the future. Roadway design can have a significant impact on vehicular access to intermodal facilities, and on roadway congestion in general. Once a roadway link was approved as a connector, then related improvement projects would become eligible to compete for NHS funding. It should be noted that the potential for NHS funding applies only to public roadways, and does not apply to the associated private freight facility.

The FHWA Office of Operations - Freight Management and Operations described the importance of the intermodal freight connectors as follows:

> *Intermodal connectors are short but important highways that connect Americas most important seaports, airports, rail yards, and pipeline facilities to the NHS, a 161,000-mile network that includes the interstate system and other key roads. Congress designated the NHS network in the National Highway System Designation Act of 1995, which President Clinton signed into law on Nov. 28, 1995. Although they account for less than 1 percent of NHS mileage, NHS Connectors are key conduits for the timely and reliable delivery of goods. Hence it is important to evaluate the condition and performance of connectors and related investment needs.*
>
> For more information or links from the Freight Management and Operations website please refer to http://ops.fhwa.dot.gov/freight/infrastructure/nhs_connect/index.htm

According to the FY2006 C&P Report, while the NHS makes up only 4% of total U.S. mileage, the NHS carried more than 44% of total U.S. travel in 2004. As a result, FHWA has emphasized NHS roadways with regards to national performance measures. As part of the NHS, and as vital links in the freight network, pavement condition of the intermodal freight connectors is an important consideration in the region.

4 Intermodal Connectors Roadway Characteristics

Key data items discussed in the *FY2006 C&P Report* related to roadway ownership and functional classification, with a particular focus on National Highway System (NHS) routes. For the purposes of this paper, analysis focused on the following four categories of roadways shown in Exhibit1, previously identified as intermodal freight connectors:

Exhibit 1: Connector Status in the Chicago Region

Status	Total Route-miles	% of Total
Connector Previously identified as a connector - no expected change	48.13	71.9%
Proposed Connector to be proposed - new facility.	9.84	14.7%
Review Previously identified as a connector - review may be warranted	7.17	10.7%
Withdrawn Previously identified as a connector - subsequently withdrawn	1.84	2.7%
Grand Total	66.98	100.0%

Currently, the official FHWA inventory of Intermodal Freight Connectors for the Chicago region essentially includes the *connector* and *review* categories. This represents approximately 55 miles of previously identified connectors that serve rail/truck and port facilities in the Chicago region. A preliminary CMAP review has indicated that qualification reviews may be warranted for approximately 7 miles of the regional connectors, while there is no expected change for the remaining 48 miles. Approximately 2 miles of *withdrawn* connectors, which were previously identified and subsequently withdrawn, were included as another category since there may be a possibility for reinstatement. Finally, there is a category for *proposed* connectors due to the on-going work related to the formal proposal process for documenting connector roadways for the BNSF rail/truck facility in Elwood, Illinois that opened for business in 2002. Although approximately 15 miles have been proposed, only about 10 miles were included in the IRIS database. Appendix A includes detailed breakdowns for individual facilities and connector categories.

4.1 Jurisdictional Trends

While the *FY2006 C&P Report* discussed ownership, the IRIS database included data items for Jurisdiction *(data item 12)* and Maintenance Responsibility *(data item 13)*. As shown in Exhibit 2, more than 80% of connectors in the region were under two jurisdictions either IDOT or municipal. The major agency responsibilities lie with IDOT District 1, City of Chicago and Cook County; to a lesser degree the municipalities of Bedford Park (3.8 miles) and Hodgkins (1.8 miles); and potentially, Will County with a few miles of proposed connectors.

Exhibit 2: Jurisdiction Responsibility of Connectors in the Chicago Region

Jurisdiction	Total Route-miles	% of Total
IDOT	27.57	41.2%
County	10.63	15.9%
Municipality	28.25	42.1%
Township	0.53	0.8%
Grand Total	66.98	100.0%

A review of Exhibit 3, indicates that there is only a small degree of variation between jurisdiction and maintenance responsibilities. There were only a few cases in which maintenance responsibilities have been transferred from the county to the municipal level.

Exhibit 3: Maintenance Responsibility of Connectors in the Chicago Region

Maintenance	Total Route-miles	% of Total
IDOT	27.37	40.9%
County	5.17	7.7%
Municipality	33.89	50.6%
Township	0.53	0.8%
Grand Total	66.98	100.0%

Even in cases where maintenance may have been contractually shifted to another agency, primary responsibility remains with the jurisdictional agency.

4.2 Functional Classification Trends

A comparison between the HPMS and IRIS Functional Classification coding systems is shown in Exhibit 4. Since the primary data source was the IDOT 2006 IRIS GIS database, this paper will only refer to the IRIS coding system. However, since the intermodal freight connectors are part of the NHS, this table may be a useful reference in future updates which may involve HPMS database information.

Exhibit 4: Functional Classification Codes for HPMS and IRIS

HPMS Codes		Functional Classification	IRIS Code
Rural	Urban		
01	11	Interstate	10
	12	Freeway / Expressway	20
02	14	Other Principal Arterials	30
06		Minor Arterials (Non-Urban)	40
07		Major Collector (Non-Urban)	50
08		Minor Collector (Non-Urban)	55
09		Local Road or Street (Non-Urban)	60
	16	Minor Arterial (Urban)	70
	17	Collector (Urban)	80
	19	Local Road or Street	90

In the *FY2006 C&P Report,* the primary emphasis was on the higher functional classes of Interstate, Freeway/Expressway, and Principal Arterials; which clearly serve as the most vital roadways in any region. However, by definition, connectors needed to be identified and added to the NHS, because they were mostly lower functional classification roadways that would not normally qualify for the NHS. As a result, as shown in Exhibit 5, more than 70% of intermodal freight connectors were classified as minor arterials and collectors in the IRIS database.

Exhibit 5: Functional Class for Connectors in the Chicago Region

Functional Class	Total Route-miles	% of Total
30 Principal Arterials	15.01	22.4%
70 Minor Arterial (Urban)	27.40	40.9%
80 Collector (Urban)	20.13	30.1%
90 Local Road or Street	4.44	6.6%
Grand Total	66.98	100.0%

5 Overview of Conditions as of 2006

IDOT utilizes the Condition Rating Survey (CRS) system to assess pavement quality state-wide. The CRS system includes numerous inputs, including IRI data, to develop comprehensive pavement condition assessments. IDOT reports the IRI values to the FHWA, who in turns incorporates the data into the HPMS. FHWA then uses this data to assess ride quality as a measure of pavement condition on a national level that is reported in the C&P Reports. Ride quality is measured with IRI data and discussed in terms of pavement ride quality that is either acceptable or not acceptable, as shown in Exhibit 6.

Exhibit 6: CRS Condition Rating and IRI Criteria for Acceptable Ride Quality

CRS Pavement Condition Ratings	
CRS	General Condition
9.0	Awarded, new or near new
8.0	Excellent
7.0	Good
6.0	Fair
5.0	Marginal
4.0	Poor
3.0	Intolerable
2.0	Crucial
1.0	Critical
0.0	Not collected

IRI Ride Quality Criteria	
Ride Quality	IRI Rating
Acceptable	≤ 170
Not Acceptable	> 170

Source: IRIS Manual

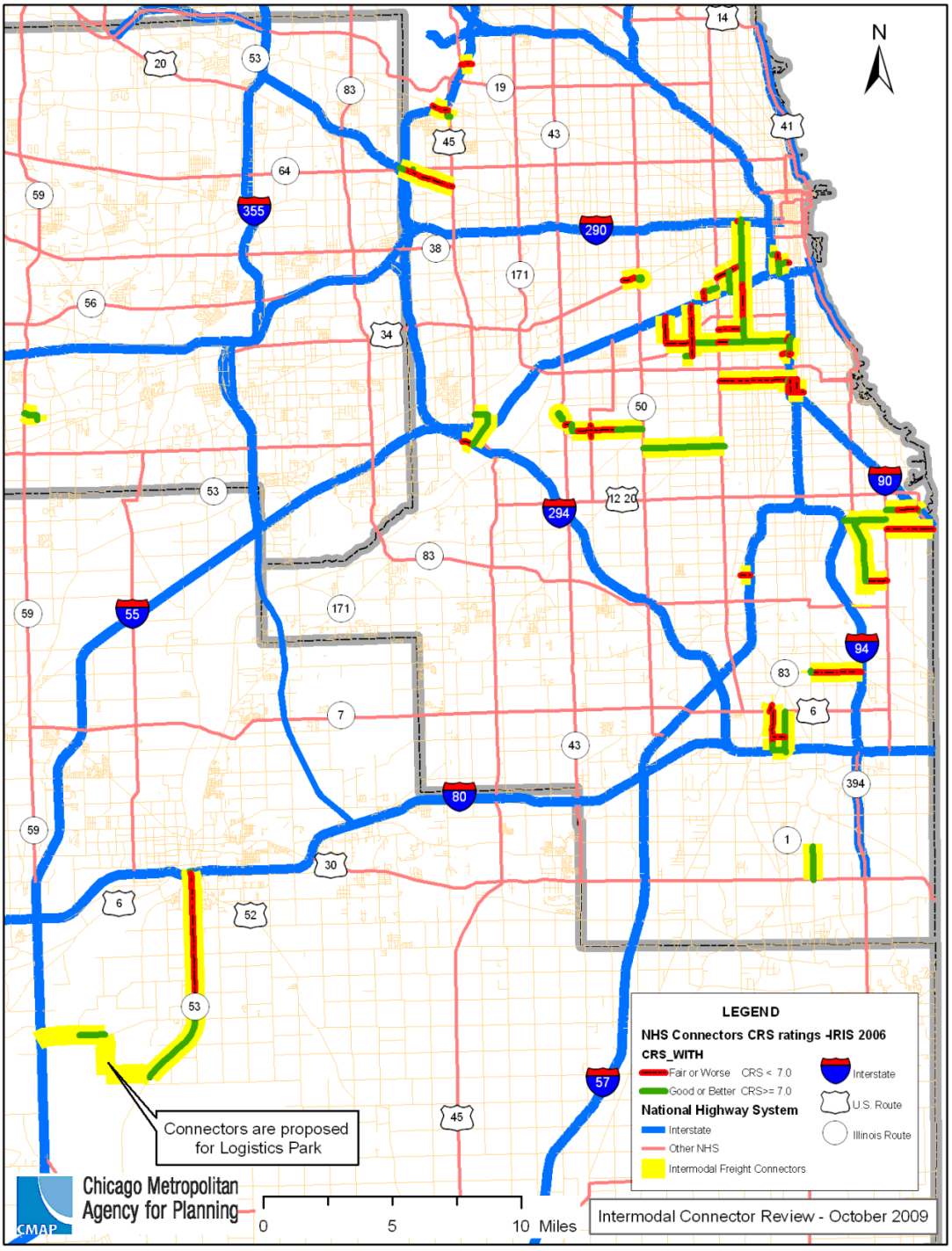
For the purposes of this paper a logical, but somewhat arbitrary, comparison was implied between Good or better (Good +) CRS pavement conditions (CRS ≥ 7.0), and acceptable Ride Quality (IRI ≤ 170). In fact, IRI is only one of the factors considered in the more comprehensive CRS pavement condition system.

5.1 Regional Conditions

Exhibits 7 and 8 represent available CRS and IRI data from the IRIS 2006 GIS database. Based on available CRS data, 46.8% of the regional intermodal freight connector route-miles show pavement condition of Good +. Based on available IRI data, only 34.3% of connector route-miles show acceptable ride quality. However, there were several issues observed with the connector IRI route-mile data:

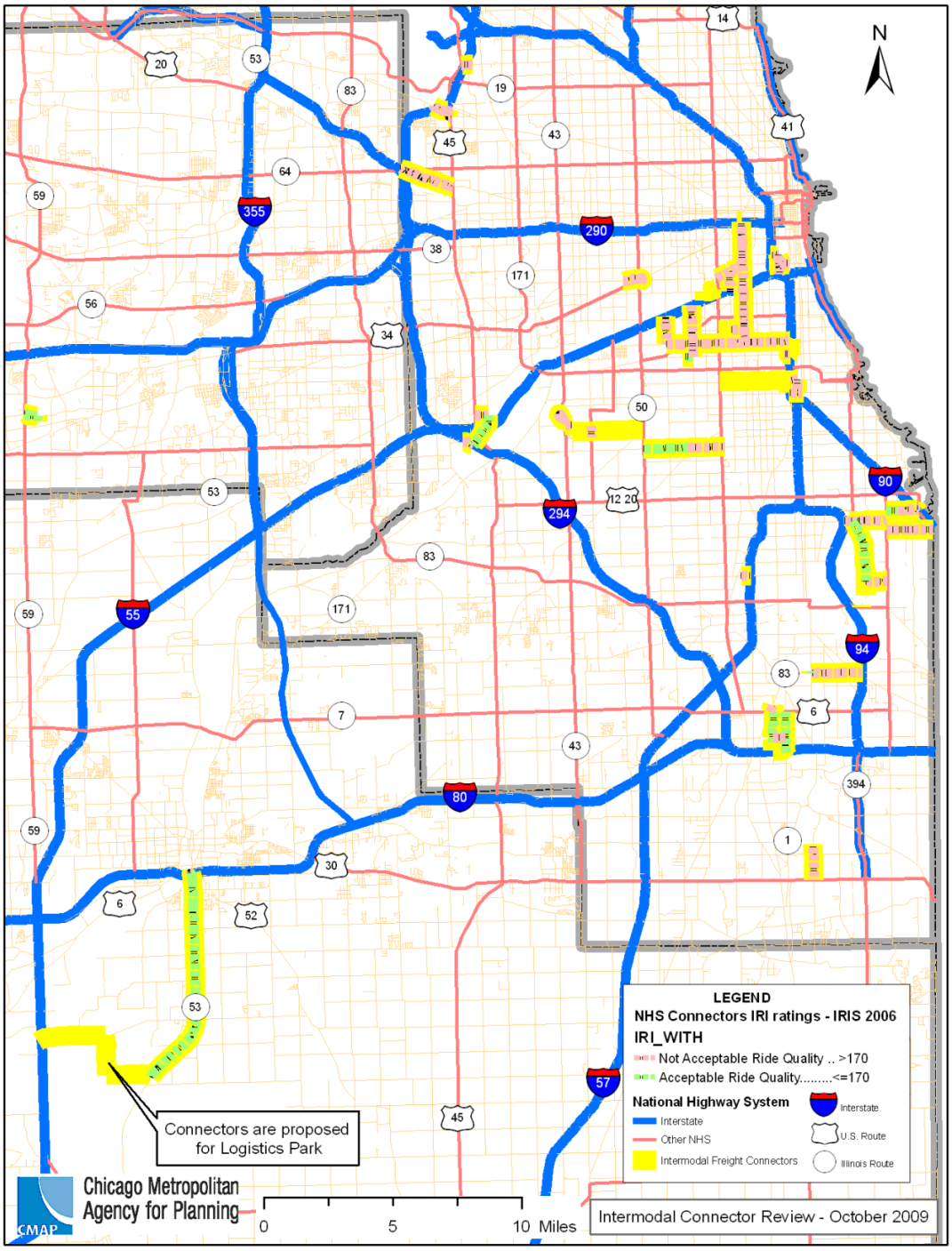
- 11.34 route-miles (17.8% of connector route-miles) lacked IRI data;
- numerous instances in which the IRI data appeared to be inconsistent with the year dated CRS data, with 80% of pavement ratings from the years 2005 or 2006;
- the IRI data was not year dated in the IRIS 2006 GIS database.

Exhibit 7: Intermodal Freight Connectors - Regional CRS Conditions



Intermodal Connector Route-miles	2006 Route-miles			2006 Percentages	
	CRS < 7.0 < Good	CRS >= 7.0 Good +	Grand Total	CRS < 7.0 < Good	CRS < 7.0 < Good
Grand Total	35.63	31.35	66.98	53.2%	46.8%

Exhibit 8: Intermodal Freight Connectors - Regional IRI Acceptable Ride Quality



Intermodal Connector Route-miles	2006 Route-miles			2006 Percentages	
	IRI ≤ 170 Acceptable	IRI > 170 Not Acceptable	Grand Total	IRI ≤ 170 Acceptable	IRI > 170 Not Acceptable
Grand Total	18.50	35.44	53.94	34.3 %	65.7%

Initially this paper was intended to focus on IRI ride quality data, since that measure is used by FHWA to describe pavement conditions on a national level. However, based on these issues, the focus of this paper shifted to rely on the more current and more complete CRS data. Since there is no available comparison data for CRS pavement condition ratings on the national level, observations from this analysis can only serve as benchmarks for future regional reviews. Appendix C includes a map series with facility level maps to compare both IRI and CRS data.

A review of pavement condition by connector status is shown in Exhibit 9. Most notably, the *connector* category (previously identified as a connector - no expected change) showed 45.6% of route-miles as Good + pavement condition; while the *review* category (previously identified as a connector – review may be warranted) showed 53.0% of route-miles as Good + pavement condition.

Exhibit 9: Regional Connectors CRS Condition by Status

Connector Status	2006 Route-miles			2006 Percentages	
	CRS < 7.0 < Good	CRS ≥ 7.0 Good +	Grand Total	CRS < 7.0 < Good	CRS ≥ 7.0 Good +
Connector	26.19	21.94	48.13	54.4%	45.6%
Proposed	5.82	4.02	9.84	59.1%	40.9%
Review	3.37	3.80	7.17	47.0%	53.0%
Withdrawn	0.25	1.59	1.84	13.6%	86.4%
Grand Total	35.63	31.35	66.98	53.2%	46.8%

The *proposed* connector category pertained exclusively to connectors that have been proposed for the Logistics Park BNSF facility in Elwood, Illinois. The 40.9% Good + related only to the 9.84 route-miles with CRS ratings. There were an additional 4.79 miles of *proposed* connectors that were not included in the IRIS 2006 GIS database and/or did not show CRS or IRI data.

A review of pavement condition by jurisdiction is shown in Exhibit 10. Over 80% of connector route-miles are under IDOT and Municipal jurisdiction. IDOT jurisdictions showed 37.9% of route-miles as Good +, and municipal jurisdictions showed 45.6% of route-miles as Good + pavement condition. County jurisdictions showed the best with 73.1% of route-miles as Good + pavement condition.

Exhibit 10: Regional Connectors CRS Condition by Jurisdiction

Jurisdiction	2006 Route-miles			2006 Percentages	
	CRS < 7.0 < Good	CRS ≥ 7.0 Good +	Grand Total	CRS < 7.0 < Good	CRS ≥ 7.0 Good +
IDOT	17.12	10.45	27.57	62.1%	37.9%
County	2.86	7.77	10.63	26.9%	73.1%
Municipality	15.37	12.88	28.25	54.4%	45.6%
Township	0.28	0.25	0.53	52.8%	47.2%
Grand Total	35.63	31.35	66.98	53.2%	46.8%

A review of pavement condition by functional classification is shown in Exhibit 11. Over 70% of regional connectors were classified as minor arterial or collector with Good + pavement condition ratings of 58.5% and 43.8% respectively. Connectors that were classified as principal arterials showed only 37.9% of route-miles as Good +. Connectors classified as local roads showed the worst conditions with only 18.5%

Exhibit 11: Regional Connectors CRS Condition by Functional Class

Functional Class	Route-miles			Percentages	
	CRS < 7.0 < Good	CRS ≥ 7.0 Good +	Grand Total	CRS < 7.0 < Good	CRS ≥ 7.0 Good +
30 Principal Arterials	9.32	5.69	15.01	62.1%	37.9%
70 Minor Arterial (Urban)	11.37	16.03	27.40	41.5%	58.5%
80 Collector (Urban)	11.32	8.81	20.13	56.2%	43.8%
90 Local Road or Street	3.62	0.82	4.44	81.5%	18.5%
Grand Total	35.63	31.35	66.98	53.2%	46.8%

5.2 Facility Level Overview

This section presents a facility level overview of pavement conditions for intermodal freight connector in the Chicago region. The analysis in this report relied on data quality of the IDOT IRIS 2006 end of year GIS database for both CRS pavement condition and IRI ride quality.

Exhibit 12: Facility Connector Conditions by % Route-miles
CRS Rating Good +

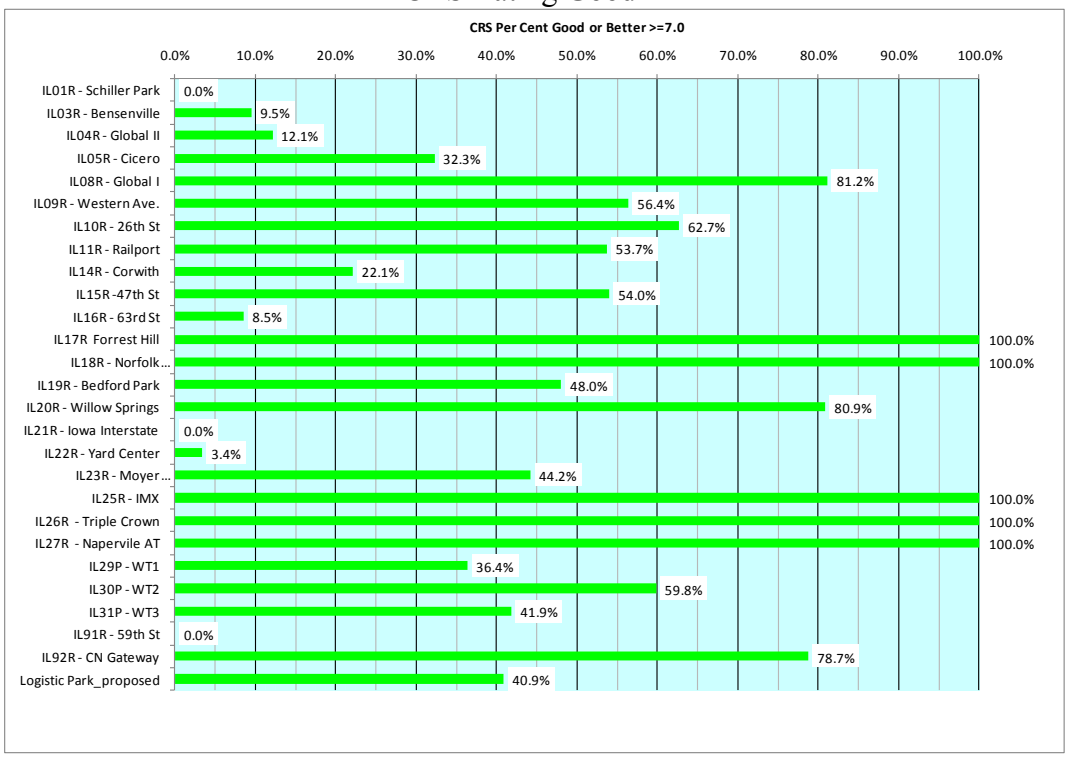
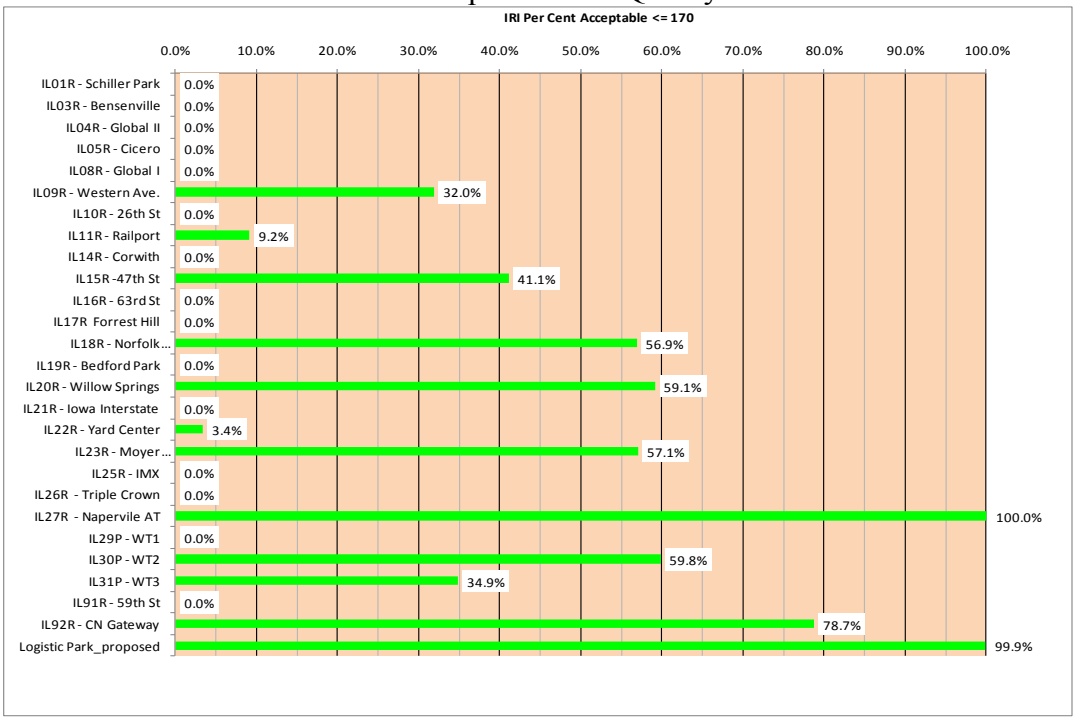


Exhibit 12, shows all 27 qualified major intermodal freight facilities in the Chicago region (including one currently proposed); and the % of route-miles rated as Good + (CRS ≥ 7.0) for all associated connectors. Three facilities (IL01R, IL21R and IL91R) show 0.0% of Good + route-miles, and five (IL17R, IL18R, IL25R, IL26R,IL27R) in which 100.0 % of connector route-miles were reported as Good + in the IRIS 2006 GIS database. Of the 27 intermodal facilities shown on this exhibit, most are active operational facilities, some warrant review (inactive/closed or may no longer qualify as major intermodal facilities), and one facility is proposed. For additional detailed information on the individual facilities and the formal FHWA process, please refer to CATS report: *Proposed Intermodal Connectors to the NHS for Northeastern Illinois*, Version 3, June 1999.

Appendix A includes detailed breakout tables for each intermodal freight facility and each associated connector roadway based on CRS pavement condition ratings. Appendix B consists of a map series showing all facilities with CRS pavement condition coded as *Good* + (CRS≥7.0) or *Fair or Worse* (CRS<7.0) for all connector status levels. Appendix C consists of a map series for easy comparison of IRI and CRS data on a facility by facility basis.

Exhibit 13: Facility Connector Conditions by % Route-miles
IRI Acceptable Ride Quality



As previously mentioned, IRI ride quality was not discussed in detail in this report; and a review of facility level data indicates additional reasons for that decision. As shown in Exhibit 13, 15 of the 27 facilities showed 0.0% of route-miles with IRI acceptable ride quality, which appeared to be inconsistent with the more current, year dated and more complete CRS data in numerous instances. The IL27R facility, which showed 100.0% acceptable ride quality, has been closed and the site razed; so accordingly it is considered

in the *review* status category. The 99.9% of acceptable ride quality route-miles for the Logistics Park essentially pertains to sections of IL 53, and is not consistent with the 2006 CRS data. Furthermore, another 4.79 miles of *proposed* connectors Logistics Park have no IRI or CRS data.

In summary, the facility level CRS pavement conditions represented in this report relied on data quality in the IRIS 2006 end of year GIS database, are no more current than 2006, and did not involve field observation. Conditions reported in this paper should be considered as a preliminary benchmark for future reference and comparison once updated information is reviewed. Future facility level analysis should include some basic level of field review, and consideration should be given to the following issues:

- obtain an updated IRIS GIS database with complete CRS and IRI data,
- conduct a formal regional qualification review process to verify major intermodal freight facilities (and associated connectors) that currently meet FHWA criteria as major intermodal facilities, and
- identify additional parameters using data such as twenty-foot equivalent units (TEUs) for calculation of TEU/route-mile or other performance measures that incorporate freight traffic volumes.