Motorist Delay at Public Highway – Rail Grade Crossings In Northeastern Illinois

Research & Analysis Section
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EXECUTIVE SUMMARY

Northeastern Illinois, with approximately 1,500 daily trains operating in the six counties of Cook, DuPage, Kane, Lake, McHenry and Will, is the nation's rail capital.[1] Metra operates approximately 660 daily trains, Amtrak another 100 daily trains, and 19 freight railroads operate an additional 740 trains each weekday. According to the 2000 Census, northeastern Illinois is also home to approximately 8 million individuals who make about 22 million trips each day on the region's multi-modal transportation system.[2] The railroad and highway systems intersect at 1,732 public at-grade highway-rail crossings where the motoring public may be delayed while waiting for a train to pass.

Congestion and other community impacts from rail operations are perceived to be a significant threat to the long term vibrancy of the region's economy as well as a daily threat to life and limb.[3] Members of Illinois' congressional delegation requested the Federal Railroad Administration (FRA) to conduct a study of rail operations in northeastern Illinois in order to identify systemic deficiencies and to suggest solutions to identified bottlenecks.[4] In turn, FRA asked the Commerce Commission (ICC) to assist FRA in one component of the study; estimating the magnitude of grade crossing related delays in the region.

The ICC analysis found that railroad crossings are in use by the railroads for a total of approximately 1,509 hours on a typical weekday. This "gate down" time directly affects 463,438 motorists who are collectively delayed a total of 10,982 hours on a typical weekday. At a nominal value of $30 per hour, the delay costs the region almost $330,000 each weekday, or between $74 and $120 million annually.

Grade crossing delays are concentrated at a relatively few locations. Table E-1 illustrates that 69 percent of the region's grade crossings delay 100 or fewer vehicles on a typical weekday.

Table E-1. Number of vehicles delayed summary.

Number of Vehicles Delayed	Crossings	Percent
Zero	319	18.4%
1 to 100	887	51.2%
101 to 250	143	8.3%
251 to 500	112	6.5%
501 to 1000	128	7.4%
1001 to 2000	92	5.3%
2000 or greater	51	2.9%
Total	**1,732**	**100.0%**

Likewise, Table E-2 indicates that 64 percent of the region's crossings experience less than one hour of total motorist delay per weekday. Grade crossing delay is largely concentrated at 139 locations where there are at least 1,000 vehicles delayed each day, or motorists experience 21 hours or more of total delay per weekday.

Table E-2. Total minutes of motorist delay summary.

Hours of Total Motorist Delay	Crossings	Percent
Zero	139	8.0%
Less than 1	973	56.2%
1 to 5	275	15.9%
6 to 10	104	6.0%
11 to 20	102	5.9%
21 to 50	87	5.0%
51 or greater	52	3.0%
Total	**1732**	**100.0%**

Efforts to reduce grade crossing delay in the future are likely to be focused on separating the rail traffic from the highway traffic by constructing grade separations at the locations that delay the greatest number of vehicles. Sixty percent of the 139 grade crossings with a significant number of delay events are located on the highway system that is maintained by the Illinois Department of Transportation (IDOT). Many of these locations are in heavily developed urban areas where construction of a grade separation is likely to be extremely expensive and disruptive to the community. Table E-3 provides a list of the ten locations that experience the greatest total amount of motorist delay.

Table E-3. Ten grade crossings with the most total motorist delay.

Rank	City	Street	Hours of Delay	Device	Lanes	On ST HWY?
1	BLUE ISLAND	127TH ST	278	Gates	4	Yes
2	DIXMOOR	WESTERN AV	222	Gates	4	Yes
3	CHICAGO	130TH ST	191	Gates	4	No
4	RIVERDALE	INDIANA AVE	184	Gates	4	Yes
5	CHICAGO RIDGE	RIDGELAND AV	173	Gates	4	No
6	FRANKLIN PARK	GRAND AVE	171	Gates	4	No
7	CHICAGO	MARQUETTE RD	162	Gates	4	No
8	CHICAGO	ARCHER AV	158	Gates	4	Yes
9	CHICAGO	63RD ST	154	Gates	4	No
10	CHICAGO	TORRENCE AVE	151	Gates	4	No

In many cases, the majority of the benefit of a grade separation lies in improved traffic flow and reduced air emissions. Congestion Mitigation and Air Quality (CMAQ) program funds are ideally suited for grade crossing separation projects. Unfortunately, CMAQ funds amount to only $70 to $80 million dollars per year in northeastern Illinois.

The ICC is currently required to commit at least $6 million per year to grade separation projects. This amount includes new construction projects, as well as reconstruction and pavement-lowering projects. Given that a typical grade separation in a densely developed urban area can cost as much as $25 million, neither CMAQ or ICC funds alone or together, will make a substantial dent in reducing the amount of grade crossing delay in northeastern Illinois in the foreseeable future.

Neither IDOT, the ICC, the railroads, or the affected communities, have the financial resources necessary to significantly reduce the amount of delay currently being experienced at grade crossings. As highway and train traffic continues to increase at a steady rate, the grade crossing delay problem is likely to worsen. Relying on the current grade crossing improvement programs of the ICC and IDOT is not a realistic answer to the grade crossing delay problem. A new program that does not take away from the current improvement programs of the ICC and IDOT is necessary in order to reduce delays at grade crossings in northeastern Illinois.

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INTRODUCTION

Each day, approximately 1,500 trains operate over approximately 4,000 miles of railroad infrastructure in northeastern Illinois.[1] Metra, with approximately 660 daily trains, Amtrak, with another 100 daily trains and 19 freight railroads, operate an additional 740 trains within the region. According to the 2000 Census, northeastern Illinois is also home to 8,091,720 individuals who make approximately 22 million trips each day on the region's multi-modal transportation system.[2] There are 1,732 locations where railroads and publicly owned highways intersect at grade. Each of these public at-grade crossings holds the potential for delaying the motoring public while a railroad train is operating over the crossing.

Congestion and other community impacts from rail operations are perceived to be a significant threat to the long term vibrancy of the region's economy as well as a daily threat to public safety.[3] Members of Illinois' congressional delegation requested the Federal Railroad Administration (FRA) to conduct a study of rail operations in northeastern Illinois in order to identify systemic deficiencies and to suggest solutions to identified bottlenecks.[4] In turn, FRA asked the Commerce Commission (ICC) to assist FRA in one component of the study; estimating the magnitude of grade crossing related delays in the region.

This study uses a three-step process to estimate grade crossing delay. The first step is estimating the total amount of time that the railroad crossing is in use. This is referred to as the "gate down" time. Next, the gate down time is used to estimate the number of vehicles that would have attempted to use that crossing while the gates were down. Finally, the amount of time that all motorists collectively are delayed at each grade crossing is estimated. Discussion focuses on the number of vehicles delayed and the amount of total delay to the motorist.

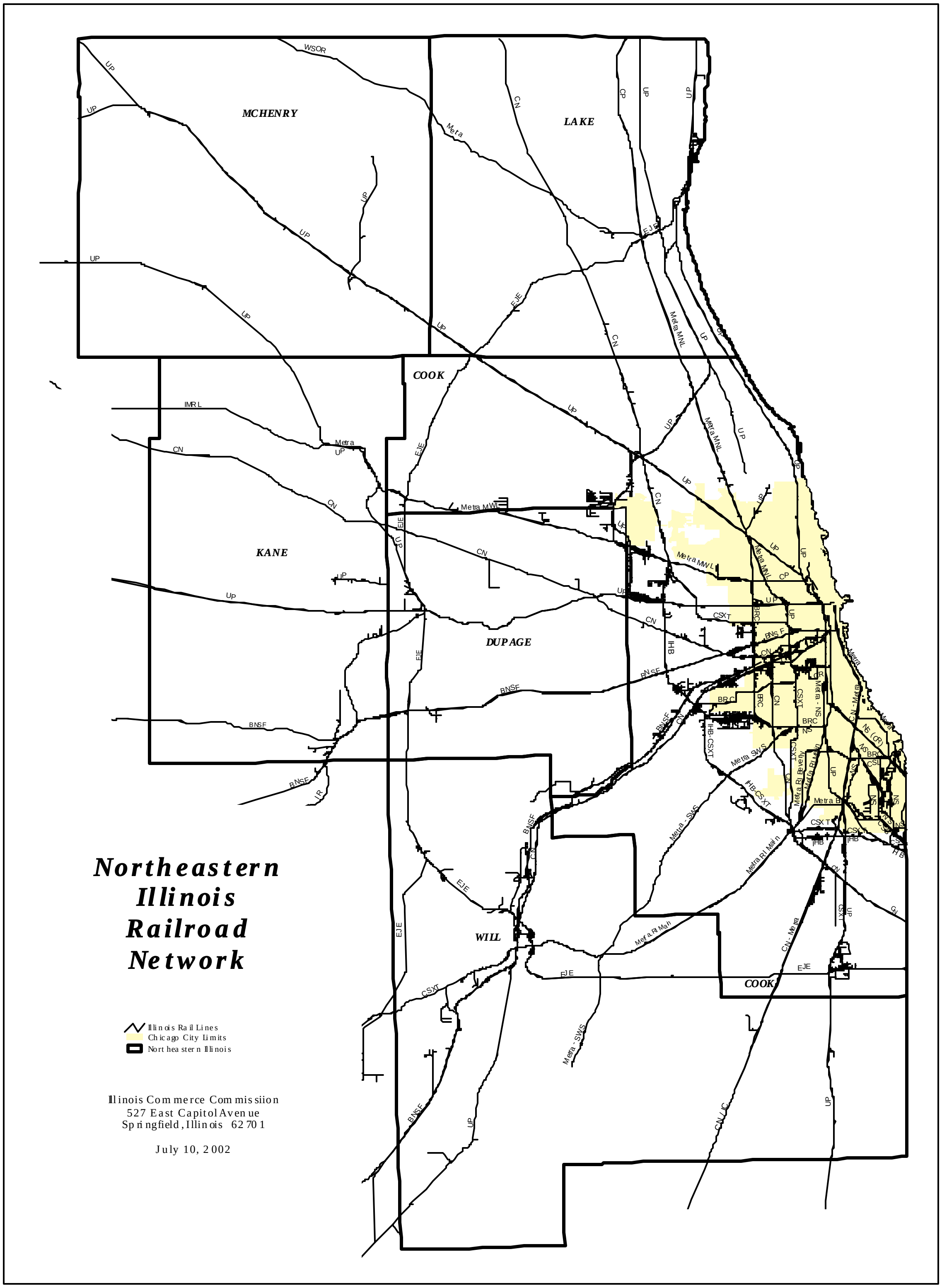
BACKGROUND

Much of the data for this study is drawn from the ICC's grade crossing information system known as CRISIS. Key items, such as, rail line name, number of daily trains, train speed and the number of highway vehicles are currently in CRISIS. However, the quality of these data items is suspect so staff has reviewed and edited these items extensively in order to produce an estimate that reflects the current railroad operating environment.

This study covers all railroad lines within Cook, DuPage, Kane, Lake, McHenry, and Will counties in northeastern Illinois. There are approximately 4,000 miles of railroad infrastructure and 1,732 public at-grade crossings which are the focus of this study. Figure 1 provides a map of the study area.

The goal of this analysis is to estimate the number of vehicles that are delayed each weekday, as well as the total amount of time that all motorists are collectively delayed at each grade crossing. The total amount of time that all motorists are collectively delayed at each grade crossing is the focus of this analysis.

Figure 1. Study area.



METHODOLOGY

This section describes the procedures used to estimate the amount of "gate down" time, the number of vehicles delayed, and the total amount of time all motorists are collectively delayed at grade crossings on a typical weekday. The data utilized has been reviewed and the methods employed to enhance the basic quality of the data are discussed. This section also discusses the selection of a set of 20 grade crossings used as control crossings. The control crossings are used to validate the outcome of the model to ensure that the results are reasonable. The basic approach was to compile and analyze the data in a spreadsheet format. The ICC's geographic information system (GIS) was also used to review and enhance the quality of the basic data, as well as produce line density and congestion maps.

ICC maintains a database describing the physical, administrative and operational characteristics of all public, private and pedestrian at-grade crossings and grade separated structures in Illinois. The grade crossing inventory and statistical information system (CRISIS) provided the basic data used in this analysis. CRISIS contains railroad subdivision and branch line data that can be used to identify crossings which are on a specific line segment and would experience similar train operations. CRISIS also contains information describing the maximum, minimum and timetable authorized train speeds. Finally, CRISIS also contains average annual daily traffic (AADT) for highway vehicles. These data items are the basic building blocks that are used to construct a model of grade crossing delay.

The railroad line name data item was the first item that needed review and verification. Not all grade crossing data records had a line name, and many that did, were not consistent with adjacent grade crossings. After review and editing, a total of 115 unique railroad line segments were identified. All grade crossings located on local industry service tracks were aggregated together into one line segment per railroad. Table 1 shows that the majority of line segments are industrial service line segments; however, the majority of grade crossings are located on main lines.

Table 1. Number of main line, branch line, and industry service line segments and grade crossings.

Line Type	Segments	Percent	Crossings	Percent
Branch	12	10.4%	134	7.7%
Industry	59	51.3%	600	34.6%
Main	44	38.3%	998	57.6%
Total	115	100.0%	1,732	100.0%

It was important to go through the line and branch data in CRISIS and develop a consistent route system in order to apply train and speed data to a collection of crossings that all belong to the same route. For example; the BNSF from Cicero to Aurora is one route over which the number of trains and train speed is relatively constant. However, in CRISIS, there is a range of train speeds and train volumes that are inconsistent.

Each type of route has a specific set of operating characteristics that was assigned to each crossing based on whether the route was a main line, branch line, or industry route. Main line freight trains were estimated to be 7,000 feet in length and to operate at the average speed that was derived from CRISIS. Branch line trains were estimated to be 3,500 feet in length and also assumed to be operated at the speed derived from CRISIS data. Industry trains, or local switching trains, were estimated to be 1,000 feet in length and operate at either 5 or 10 miles per hour, or as indicated in CRISIS.

Once each crossing was assigned to a route, staff applied the new route structure to the railroad network that is maintained in the ICC's geographic information system (GIS). This enabled staff to create route density maps of the railroad network in northeastern Illinois and to verify that train volumes and speed are logical and consistent from one route segment to the next. Table 2 provides a list of the data processing steps taken to produce the basic database used in this analysis.

Table 2. Data processing steps.

1. Build route structure out of crossing data in CRISIS.
2. Build route structure out of rail network in GIS.
3. Verify accuracy of route structure by overlaying grade crossings on to the GIS theme of the rail network and verify that the route structure created for the crossings, mirrors the route structure of the rail network.
4. Classify routes as being main line, branch line, or industrial service spurs.
5. Review average number of train data and assign the most likely value to all crossings on that particular line segment.
6. Of the total number of daily trains, determine the number of trains which are Metra and Amtrak trains and subtract from total leaving new values for total daily freight, Metra and Amtrak trains.
7. Review speed data and assign the most likely value to all crossings on that particular line segment.
8. Assign highest permitted speed to Metra and Amtrak trains and a slower speed to freight trains.
9. For freight trains, apply standard length factors for type of rail line. Main line trains are assigned length values of 7,000 feet, branch line trains are assigned length value of 3,500 feet and industrial service spur trains are assigned train length values of 1,000 feet.
10. Verify that correct train and speed values have been assigned to each crossing based on the type of crossing and the type of trains that operate over the crossing.
11. Using GIS, identify crossings that are within 4 blocks, or one-half mile of a major freight yard.
12. Assign a weight of 1.65 to these crossings to be used to factor the delay values upwards.
13. Using GIS, identify crossings that are within 4 blocks, or one-half mile of a Metra station.
14. Assign a weight of 1.65 to these crossings to be used to factor the delay values upwards.
15. Review AADT values in CRISIS. Crossings which have zero values for AADT, are changed to a value of 1.
16. Review train count values in CRISIS. Crossings which have zero values for daily trains are left as such unless certain that a different value is appropriate.

In order to validate the CRISIS data and the outcome of the model, staff desired to obtain empirical data. In northeastern Illinois, 71 percent of the grade crossings have active warning devices consisting of either flashing lights or flashing lights and gates. These grade crossings generally have event recorders that record the initiation of the warning device and the speed of the train as it approaches the grade crossing. Many event recorders also provide the time that the gates returned to the upright position following the passing of a train, thus providing the total "gate down" time. Unfortunately, event recorder data can only be obtained by visiting the crossing and manually downloading the data to a diskette.

Since the Commission does not have the staff resources necessary to visit all 1,244 grade crossings equipped with active warning devices, staff decided that data from a sample of 20 grade crossings would be sufficient to validate the data within CRISIS and the conclusions of this analysis. For these 20 control crossings, staff will utilize the event recorder data to calculate the length of time the gates are down and compare that time against the estimate produced by the delay model. The 20 control crossings are listed in Table 3.

Table 3. Twenty control crossings.

CROSSING	AAR	NEAR	CITY	STREET	DEVICE	AADT	TRAINS
079493L	BNSF	In	RIVERSIDE	HARLEM AV	Gates	39,500	140
079530L	BNSF	In	WESTMONT	CASS AVE	Gates	18,900	147
163415H	CSX	In	BLUE ISLAND	WESTERN AV	Gates	9,900	60
163433F	CSX	In	EVERGREEN PARK	95TH ST	Gates	33,500	41
163419K	CSX	In	BLUE ISLAND	127TH ST	Gates	24,700	41
163580T	CSX	In	CHICAGO RIDGE	RIDGELAND AV	Gates	24,200	85
173887G	UP	In	CHICAGO	NAGLE AV	Gates	27,800	64
174010L	UP	In	BELLWOOD	25TH AV	Gates	28,300	100
174087Y	UP	In	DES PLAINES	TOUHY AV	Gates	40,900	47
174945D	UP	In	LOMBARD	FINLEY RD	Gates	22,900	100
174983M	UP	Near	WEST CHICAGO	ROOSEVELT RD	Gates	22,500	75
176923K	UP	In	ARLINGTON HTS	ARLINGTON HTS RD	Gates	22,500	64
289536G	NIRC	In	CHICAGO	STONY ISLAND AV	Gates	37,000	58
326905D	IHB	In	DIXMOOR	WESTERN AV	Gates	9,900	87
372133T	NIRC	In	RIVER GROVE	CUMBERLAND AV	Gates	37,900	64
372177T	NIRC	In	WOOD DALE	IRVING PARK RD	Gates	25,600	46
386381H	NIRC	In	NILES	TOUHY AV	Gates	35,400	56
388037N	NIRC	In	NORTHBROOK	DUNDEE RD	Gates	31,000	70
609011A	NIRC	In	CHICAGO	95TH ST	Gates	21,100	64
843806F	BRC	In	CHICAGO	ARCHER AV	Gates	18,000	63

Once staff selected the control locations, each of the railroads that owned the grade crossing warning devices was contacted to request a dump of the event recorder data for a 24-hour week-day period. Staff also contacted the Association of American Railroad's Chicago Transportation Coordinating Office to request the most current train count data available.

Once the data had been formatted, a spreadsheet model of grade crossing delay was constructed. The estimation process was broken down into three steps:

1. Estimate the amount of time that gates are down and blocking highway travel
    a. Minutes of delay by train type: Freight, Metra and Amtrak

   b. Output is total number of minutes of "gate down" time
2. Estimate the number of vehicles impacted by the "gate down" time
   a. Apply total number of minutes against number of vehicles per minute
   b. Output is total number of vehicles delayed
3. Estimate the total amount of time that all motorists are collectively delayed
   a. Divide number of vehicles into 10 time intervals and sum minutes
   b. Output is total amount of collective delay experienced by all motorists

In step 1, the amount of "gate down" time is estimated separately for the three types of train traffic: freight, Metra, and Amtrak. Freight traffic is divided into three types based on the type of line segment: branch, industrial service, or main line. For each line type; train lengths and speeds were estimated. The goal was to determine the total number of train movements over a crossing, their average length and speed and then use these two pieces of information to estimate the total time in minutes that a grade crossing is in use by the railroad. Table 4 provides an illustration of the process used to estimate freight train "gate down" time.

Table 4. Example calculation of freight train "gate down" time.

GX ID	RR	Total Daily Trains	Total Daily Frts	Individual Train Length	Average Freight Speed	Speed in Feet per Minute	Total Length of All Freights	Minutes of Gate Down Time	Is a freight yard w/in 1/2 mile?	If yes, then factor by 1.65	Total Gate Down Time
163419K	CSX	41	41	7,000	20	1,760	287,000	163	Yes	1.65	269
326905D	IHB	87	87	7,000	20	1,760	609,000	346	Yes	1.65	571
478713F	NS	52	52	7,000	25	2,200	364,000	165	Yes	1.65	273
326894T	IHB	87	87	7,000	20	1,760	609,000	346	Yes	1.65	571
163580T	CSX	80	80	7,000	35	3,080	560,000	182	Yes	1.65	300
326729H	IHB	76	76	7,000	35	3,080	532,000	173	Yes	1.65	285
843811C	BRC	32	32	7,000	20	1,760	224,000	127	Yes	1.65	210
843806F	BRC	32	32	7,000	20	1,760	224,000	127	Yes	1.65	210
843810V	BRC	32	32	7,000	20	1,760	224,000	127	Yes	1.65	210
478712Y	NS	52	52	7,000	25	2,200	364,000	165	Yes	1.65	273
843807M	BRC	32	32	7,000	20	1,760	224,000	127	Yes	1.65	210
163422T	CSX	41	41	7,000	20	1,760	287,000	163	Yes	1.65	269
163433F	CSX	41	41	7,000	20	1,760	287,000	163	No	1.00	163
163431S	CSX	41	41	7,000	20	1,760	287,000	163	No	1.00	163
867231E	UP	51	51	7,000	35	3,080	357,000	116	Yes	1.65	191
163437H	CSX	41	41	7,000	20	1,760	287,000	163	No	1.00	163
326901B	IHB	87	87	7,000	20	1,760	609,000	346	Yes	1.65	571
174010L	UP	52	52	7,000	40	3,520	364,000	103	Yes	1.65	171
163612W	CSX	41	41	7,000	20	1,760	287,000	163	Yes	1.65	269

A similar method was applied to estimate the "gate down" time for Metra and Amtrak trains, however due to the high speed and short length of Metra and Amtrak trains, this approach did not produce valid results. Therefore, a standard delay of 60 seconds was adopted for all Metra and Amtrak train movements. Table 5 provides an example of how Metra and Amtrak "gate down" time was estimated.

Table 5. Example calculation of Metra and Amtrak “gate down” time.

GX ID	RR	Total Daily Trains	Total Daily Frts	Total Daily Metras	Metra Delay Minutes	Is a Metra Stop w/in 1/2 mile?	If yes, then factor by 1.65	Total Metra Gate Down Time Minutes	Total Daily Amtraks	Total Amtrak Gate Down Time Minutes
163419K	CSX	41	41	0	0	No	1.00	0	0	0
326905D	IHB	87	87	0	0	No	1.00	0	0	0
478713F	NS	52	52	0	0	No	1.00	0	0	0
326894T	IHB	87	87	0	0	No	1.00	0	0	0
163580T	CSX	80	80	0	0	No	1.00	0	0	0
326729H	IHB	76	76	0	0	No	1.00	0	0	0
843811C	BRC	32	32	0	0	No	1.00	0	0	0
843806F	BRC	32	32	0	0	No	1.00	0	0	0
843810V	BRC	32	32	0	0	No	1.00	0	0	0
478712Y	NS	52	52	0	0	No	1.00	0	0	0
843807M	BRC	32	32	0	0	No	1.00	0	0	0
163422T	CSX	41	41	0	0	No	1.00	0	0	0
163433F	CSX	41	41	0	0	No	1.00	0	0	0
163431S	CSX	41	41	0	0	No	1.00	0	0	0
867231E	UP	57	51	0	0	No	1.00	0	6	6
163437H	CSX	41	41	0	0	No	1.00	0	0	0
326901B	IHB	87	87	0	0	No	1.00	0	0	0
174010L	UP	110	52	58	58	Yes	1.65	96	0	0
163612W	CSX	41	41	0	0	No	1.00	0	0	0

The estimation of “gate down” time was enhanced by using a factor to weight the amount of time crossings are occupied if they are near a major freight yard or a Metra passenger terminal. A value of 1.5 was first applied, however, that value did not yield a result equal to the actual amount of “gate down” time recorded at two crossings for which event recorder data was available. After raising the value to 1.65, a more reasonable fit between the predicted “gate down” time and that observed empirically, was achieved.

Once the “gate down” time in minutes was estimated for freight, Metra and Amtrak trains per grade crossing, the total “gate down” time was calculated as the sum of the three individual totals. In order to estimate the number of vehicles impacted by the total “gate down” time, the annual average daily traffic (AADT) was divided by the number of minutes in a day (1,440), to derive the number of vehicles per minute. The number of vehicles per minute was then multiplied times the number of total number of “gate down” minutes to estimate the number of vehicles impacted. Table 6 provides an example of this procedure.

Table 6. Example calculation of total "gate down" time and number of vehicles impacted.

GX ID	RR	Total Daily Trains	Total Daily Frts	Freight Gate Down Time	Total Daily Metras	Metra Gate Down Time	Total Daily Amtraks	Amtrak Gate Down Time	AADT Total	AADT Per Minute	Total Gate Down Time	Total Vehicles Delayed
163419K	CSX	41	41	269	0	0	0	0	24,700	17.2	269	4,615
326905D	IHB	87	87	571	0	0	0	0	9,300	6.5	571	3,687
478713F	NS	52	52	273	0	0	0	0	20,900	14.5	273	3,962
326894T	IHB	87	87	571	0	0	0	0	7,700	5.3	571	3,053
163580T	CSX	80	80	300	0	0	0	0	24,200	16.8	300	5,042
326729H	IHB	76	76	285	0	0	0	0	25,200	17.5	285	4,988
843811C	BRC	32	32	210	0	0	0	0	18,509	12.9	210	2,699
843806F	BRC	32	32	210	0	0	0	0	18,000	12.5	210	2,625
843810V	BRC	32	32	210	0	0	0	0	17,600	12.2	210	2,567
478712Y	NS	52	52	273	0	0	0	0	16,600	11.5	273	3,147
843807M	BRC	32	32	210	0	0	0	0	15,400	10.7	210	2,246
163422T	CSX	41	41	269	0	0	0	0	11,700	8.1	269	2,186
163433F	CSX	41	41	163	0	0	0	0	30,900	21.5	163	3,499
163431S	CSX	41	41	163	0	0	0	0	30,100	20.9	163	3,409
867231E	UP	57	51	191	0	0	6	6	27,500	19.1	197	3,767
163437H	CSX	41	41	163	0	0	0	0	28,500	19.8	163	3,227
326901B	IHB	87	87	571	0	0	0	0	4,900	3.4	571	1,943
174010L	UP	110	52	171	58	96	0	0	28,300	19.7	266	5,234
163612W	CSX	41	41	269	0	0	0	0	9,400	6.5	269	1,756
079493L	BNSF	140	40	91	94	155	6	6	36,300	25.2	252	6,353

- Freight "gate down" time = total length of all freights / speed in feet per minute
- Metra "gate down" time = number of Metra trains x 1 minute
- Amtrak "gate down" time = number of Amtrak trains x 1 minute
- Total "gate down" time = sum of Freight, Metra and Amtrak "gate down" time
- Total vehicles delayed = total "gate down" time x AADT per minute

Once the estimate of the total amount of time that the gates are down and the number of vehicles impacted by the "gate down" time was made, the total amount of time that all motorists are collectively delayed at each grade crossing was estimated.

In order to estimate the total delay to all motorists, two assumptions were made, the first was that vehicles will arrive at the grade crossing in a steady stream and the second was that the time of day does not have an influence on the nature of traffic queues. The first assumption seems plausible, yet the second does not. However, data from detailed traffic studies was not available to provide insight into the nature of traffic queues at highway-rail grade crossings by time-of-day.

The approach taken here is to assume that traffic does flow over the crossing in a steady manner and is not affected by the time of day. Therefore, it is possible to divide the total number of vehicles delayed into ten equal intervals and allocate ten percent of the delay to each interval. The amount of delay per interval can then be summed up to provide the total amount of time that all motorists are collectively delayed at each grade crossing. Table 7 provides an example of how motorist delay was calculated.

Table 7. Example calculation of total delay experienced by all motorists collectively.

GX ID	Total Gate Down Time (Minutes)	Total Vehicles Delayed	Average Delay Per Train (Minutes)	10% of Vehicles Delayed 100% of Avg. Delay / Train (Minutes)	10% of Vehicles Delayed 90% of Avg. Delay / Train (Minutes)	10% of Vehicles Delayed 80% of Avg. Delay / Train (Minutes)	10% of Vehicles Delayed 70% of Avg. Delay / Train (Minutes)	10% of Vehicles Delayed 60% of Avg. Delay / Train (Minutes)	10% of Vehicles Delayed 50% of Avg. Delay / Train (Minutes)	10% of Vehicles Delayed 40% of Avg. Delay / Train (Minutes)	10% of Vehicles Delayed 30% of Avg. Delay / Train (Minutes)	10% of Vehicles Delayed 20% of Avg. Delay / Train (Minutes)	10% of Vehicles Delayed 10% of Avg. Delay / Train (Minutes)	Total Delay Experienced by All Motorists Collectively (Minutes)	Average Delay Experienced by Each Motorist (Minutes)	Total Delay Experienced by All Motorists Collectively (Hours)
163419K	269	4,615	6.6	3,029	2,726	2,423	2,120	1,817	1,514	1,211	909	606	303	16,658	3.6	278
326905D	571	3,687	6.6	2,420	2,178	1,936	1,694	1,452	1,210	968	726	484	242	13,309	3.6	222
478713F	273	3,962	5.3	2,080	1,872	1,664	1,456	1,248	1,040	832	624	416	208	11,441	2.9	191
326894T	571	3,053	6.6	2,003	1,803	1,603	1,402	1,202	1,002	801	601	401	200	11,019	3.6	184
163580T	300	5,042	3.8	1,891	1,702	1,513	1,323	1,134	945	756	567	378	189	10,398	2.1	173
326729H	285	4,988	3.8	1,870	1,683	1,496	1,309	1,122	935	748	561	374	187	10,287	2.1	171
843811C	210	2,699	6.6	1,771	1,594	1,417	1,240	1,063	886	709	531	354	177	9,743	3.6	162
843806F	210	2,625	6.6	1,723	1,550	1,378	1,206	1,034	861	689	517	345	172	9,475	3.6	158
843810V	210	2,567	6.6	1,684	1,516	1,348	1,179	1,011	842	674	505	337	168	9,264	3.6	154
478712Y	273	3,147	5.3	1,652	1,487	1,322	1,157	991	826	661	496	330	165	9,087	2.9	151
843807M	210	2,246	6.6	1,474	1,326	1,179	1,032	884	737	590	442	295	147	8,106	3.6	135
163422T	269	2,186	6.6	1,435	1,291	1,148	1,004	861	717	574	430	287	143	7,891	3.6	132
163433F	163	3,499	4.0	1,392	1,253	1,113	974	835	696	557	418	278	139	7,654	2.2	128
163431S	163	3,409	4.0	1,356	1,220	1,085	949	813	678	542	407	271	136	7,456	2.2	124
867231E	197	3,767	3.5	1,304	1,173	1,043	912	782	652	521	391	261	130	7,170	1.9	119
163437H	163	3,227	4.0	1,284	1,155	1,027	899	770	642	513	385	257	128	7,060	2.2	118
326901B	571	1,943	6.6	1,275	1,147	1,020	892	765	637	510	382	255	127	7,012	3.6	117
174010L	266	5,234	2.4	1,267	1,141	1,014	887	760	634	507	380	253	127	6,970	1.3	116
163612W	269	1,756	6.6	1,153	1,037	922	807	692	576	461	346	231	115	6,339	3.6	106
079493L	252	6,353	1.8	1,144	1,029	915	800	686	572	457	343	229	114	6,289	1.0	105

It is assumed that the vehicles in the first decile will remain at the crossing for the entire amount of the average delay per train. The vehicles in the second decile will be at the crossing for 90 percent of the total per train average delay, vehicles in the third decile will be at the crossing for 80 percent of the average per train delay, etc. Using this approach, the total collective delay experienced by all motorists in northeastern Illinois was estimated to be 10,982 hours on an average weekday. The average delay experienced by each motorist is 1.42 minutes, or 85 seconds.

This section has provided a review of the steps employed to prepare and enhance the quality of the basic data required to conduct an analysis of motorist delay at grade crossings. The next section provides a series of tables that highlight the significant results of this analysis.

RESULTS

On a typical weekday approximately 10,982 hours of delay are experienced by 463,438 motorists at public highway-rail grade crossings in northeastern Illinois. Freight trains are estimated to be responsible for approximately 60 percent of the total delay while Metra and Amtrak trains account for the remaining 40 percent. Table 8 indicates that the majority of grade crossings (69.6 percent) cause a delay to fewer than 100 vehicles per day. Likewise, Table 8 also indicates that the majority of grade crossings (64.2 percent) cause one or fewer hours of total delay to all motorists collectively per weekday. Grade crossing delay is concentrated at a relatively small number of individual locations (139).

Table 8. Majority of grade crossings experience little delay.

Number of Vehicles Delayed	Crossings	Percent
Zero	319	18.4%
1 to 100	887	51.2%
101 to 250	143	8.3%
251 to 500	112	6.5%
501 to 1000	128	7.4%
1001 to 2000	92	5.3%
2000 or greater	51	2.9%
Total	**1,732**	**100.0%**

Hours of Total Motorist Delay	Crossings	Percent
Zero	139	8.0%
Less than 1	973	56.2%
1 to 5	275	15.9%
6 to 10	104	6.0%
11 to 20	102	5.9%
21 to 50	87	5.0%
51 or greater	52	3.0%
Total	**1732**	**100.0%**

Of the twenty-one railroads operating in northeastern Illinois, in the aggregate, grade crossings on the Union Pacific Railroad account for the largest amount of delay. Table 9 shows that while the UP experiences the greatest amount of motorist delay, this is only natural since the UP also owns the largest number of grade crossings in northeastern Illinois. CSX, however, which owns relatively few grade crossings (only 96 as opposed to UP's 492), experiences the second greatest amount of motorist delay (2,102 hours compared to UP's 2,477 hours). This underscores the fact that the motorist delay model is very sensitive to average freight train speed and length so railroads that operate a large number of long slow trains should produce a greater amount of the region's total delay.

Table 9. Motorist delay by railroad.

AAR	Number of Crossings	"Gate Down" Hours	Vehicles Delayed	Motorist Hours of Delay	% of Motorist Hours of Delay	Avg. Delay Per Vehicle
BNSF	200	192	59,313	1,054	9.6%	1.07
BRC	43	39	17,621	972	8.9%	3.31
CC	63	15	6,491	135	1.2%	1.25
CRL	10	1	216	3	0.0%	0.86
CSL	2	1	606	31	0.3%	3.10
CSS	3	3	801	8	0.1%	0.58
CSX	96	136	49,682	2,102	19.1%	2.54
CWP	9	0	0	0	0.0%	0.00
EJE	133	37	9,378	231	2.1%	1.48
GTW	45	42	20,699	541	4.9%	1.57
IC	45	22	3,407	58	0.5%	1.02
IHB	37	103	25,952	1,107	10.1%	2.56
Metra	228	328	100,228	1,420	12.9%	0.85
MJ	1	0	22	0	0.0%	0.94
NS	111	41	11,768	453	4.1%	2.31
SOO	110	11	2,344	48	0.4%	1.22
UP	492	493	135,209	2,477	22.6%	1.10
WC	82	45	19,682	339	3.1%	1.03
WSOR	13	0	19	0	0.0%	0.63
XXXX	9	0	0	0	0.0%	0.94
Total	**1,732**	**1,509**	**463,438**	**10,982**	**100.0%**	**1.42**

The thirty railroad line segments that delay the most vehicles are presented in Table 10. The BNSF line between Cicero and Aurora delays the single greatest number of motor vehicles on a typical weekday. The UP Metra West Line to Geneva and the UP Metra Northwest line to Harvard also delay a substantial number of motor vehicles on a daily basis.

Table 10. Number of vehicles delayed by railroad line segment.

Railroad Line	Number of Crossings	"Gate Down" Hours	Vehicles Delayed	Motorist Hours of Delay
BNSF-[BN]-AURORA TO CICERO	37	154	51,664	868
UP-[CNW]-METRA HARVARD SUB	77	129	39,289	534
UP-[CNW]-METRA WEST LINE	39	130	38,344	645
CSX-MAIN LINE BLUE ISLAND TO 59TH ST	32	108	35,974	1,699
METRA-MILWAUKEE NORTH LINE	25	58	29,186	387
METRA-MILWAUKEE WEST LINE	50	83	27,417	408
UP-[CWI-CEI]-MAIN LINE	51	111	23,726	617
CN/IC-[GTW] MAIN LINE	45	42	20,699	541
UP-[CNW]-VALLEY LINE	13	24	19,514	455
CN/IC-[WC] NCS MAIN LINE	56	34	17,235	268
IHB-MCCOOK TO FRANKLIN PARK	12	55	15,882	513
BELT-CLEARING TO CRAGIN	6	21	12,864	774
CSX-CSX/IHB BLUE ISLAND TO MCCOOK	6	24	12,650	382
METRA-ELECTRIC-SOUTH CHICAGO	38	55	10,319	156
IHB-CALUMET PARK TO BLUE ISLAND	5	48	9,737	586
METRA-ROCK MAIN Joliet to Vermont St	17	23	9,565	141
METRA-RI BEVERLY DIST Vermont St to 103rd St	27	32	7,533	112
CN/IC-[CCP]-MAIN LINE WEST	50	15	7,395	155
NS-MAIN LINE	6	24	7,391	352
UP-[CNW]-METRA NORTH LINE	32	46	6,654	88
BNSF-[ATSF]-COAL CITY TO JOLIET	15	24	6,066	157
METRA-MILWAUKEE FOX LAKE LINE	19	15	5,262	65
EJE-WEST MAIN LINE	74	19	4,761	118
METRA-ELECTRIC-BLUE ISLAND	27	28	4,424	65
EJE-EAST MAIN LINE	32	16	4,418	109
METRA-ROCK MAIN Vermont St to 103rd St	14	11	4,167	65
UP-[CNW]-MILWAUKEE LINE	17	12	3,510	64
METRA-WABASH LINE - Chicago to Orland Park	23	6	2,804	33
CN/IC-[WC] MAIN LINE	18	11	2,418	71
METRA/AMTRAK-UNION STATION NORTHSIDE	9	24	2,355	22
Total	**872**	**1,381**	**443,222**	**10,450**
Percent of Top 30 Out of Total	**50.3%**	**91.5%**	**95.6%**	**95.2%**
Total of All Railroad Lines	**1,732**	**1,510**	**463,438**	**10,982**

The thirty rail line segments that delay the most vehicles account for approximately 96 percent of all the vehicles delayed in the region. Table 11 provides a summary of the amount of motorist delay for the top thirty rail lines. The top line segments in Table 11 are similar to those presented in Table 10. The BNSF's Cicero to Aurora main line is number two when measured in terms of total motorist delay instead of number one when measured in just the number of vehicles impacted, while CSX's Blue Island to 59th Street main line has the greatest amount of motorist delay, yet is number four when measured in terms of just the number of vehicles impacted.

Table 11. Amount of motorist delay by railroad line segment.

Railroad Line	Number of Crossings	"Gate Down" Hours	Vehicles Delayed	Motorist Hours of Delay
CSX-MAIN LINE BLUE ISLAND TO 59TH ST	32	108	35,974	1,699
BNSF-[BN]-AURORA TO CICERO	37	154	51,664	868
BELT-CLEARING TO CRAGIN	6	21	12,864	774
UP-[CNW]-METRA WEST LINE	39	130	38,344	645
UP-[CWI-CEI]-MAIN LINE	51	111	23,726	617
IHB-CALUMET PARK TO BLUE ISLAND	5	48	9,737	586
CN/IC-[GTW] MAIN LINE	45	42	20,699	541
UP-[CNW]-METRA HARVARD SUB	77	129	39,289	534
IHB-MCCOOK TO FRANKLIN PARK	12	55	15,882	513
UP-[CNW]-VALLEY LINE	13	24	19,514	455
METRA-MILWAUKEE WEST LINE	50	83	27,417	408
METRA-MILWAUKEE NORTH LINE	25	58	29,186	387
CSX-CSX/IHB BLUE ISLAND TO MCCOOK	6	24	12,650	382
NS-MAIN LINE	6	24	7,391	352
CN/IC-[WC] NCS MAIN LINE	56	34	17,235	268
BNSF-[ATSF]-COAL CITY TO JOLIET	15	24	6,066	157
METRA-ELECTRIC-SOUTH CHICAGO	38	55	10,319	156
CN/IC-[CCP]-MAIN LINE WEST	50	15	7,395	155
METRA-ROCK MAIN Joliet to Vermont St	17	23	9,565	141
EJE-WEST MAIN LINE	74	19	4,761	118
METRA-RI BEVERLY DIST Vermont St to 103rd S	27	32	7,533	112
EJE-EAST MAIN LINE	32	16	4,418	109
UP-[CNW]-METRA NORTH LINE	32	46	6,654	88
BELT-ELSDON BRANCH	7	5	1,767	81
CN/IC-[WC] MAIN LINE	18	11	2,418	71
METRA-ELECTRIC-BLUE ISLAND	27	28	4,424	65
METRA-ROCK MAIN Vermont St to 103rd St	14	11	4,167	65
METRA-MILWAUKEE FOX LAKE LINE	19	15	5,262	65
UP-[CNW]-MILWAUKEE LINE	17	12	3,510	64
BELT-ARGO TO OAKLEY	7	5	1,977	59
Total	**854**	**1,362**	**441,807**	**10,536**
Percent of Top 30 Out of Total	**49.3%**	**90.2%**	**95.3%**	**95.9%**
Total of All Railroad Lines	**1,732**	**1,510**	**463,438**	**10,982**

The thirty rail line segments that cause the greatest amount of motorist delay account for almost 96 percent of all motorist delay in northeastern Illinois. The first three tables in the results section examined delay by railroad and by line segment; the next two tables identify the individual grade crossings that account for the greatest amount of grade crossing delay.

Table 12 indicates that Harlem Avenue and La Grange Road, both on BNSF's main line from Cicero to Aurora, delay the greatest number of vehicles. The thirty grade crossings that delay the most vehicles account for about one-fourth of all the vehicles delayed at public grade crossings in northeastern Illinois.

Table 12. Thirty grade crossings that delay the greatest number of vehicles.

GX ID	RR	City	Street	Vehicles Delayed	Motorist Hours of Delay	Total Daily Trains	Total Daily Freights	Total Daily Metras	AADT	Traffic Lanes	On a St Hwy?
079493L	BNSF	RIVERSIDE	HARLEM AV	6,353	105	140	40	94	36,300	4	Yes
079508Y	BNSF	LAGRANGE	LA GRANGE RD	5,408	89	140	40	94	30,900	4	Yes
174010L	UP	BELLWOOD	25TH AV	5,234	116	110	52	58	28,300	4	No
163580T	CSX	CHICAGO RIDGE	RIDGELAND AV	5,042	173	80	80	0	24,200	4	No
326729H	IHB	FRANKLIN PARK	GRAND AVE	4,988	171	76	76	0	25,200	4	No
163419K	CSX	BLUE ISLAND	127TH ST	4,615	278	41	41	0	24,700	4	Yes
079530L	BNSF	WESTMONT	CASS AVE	4,393	72	140	40	94	25,100	4	No
478713F	NS	CHICAGO	130TH ST	3,962	191	52	52	0	20,900	4	No
173996K	UP	MAYWOOD	1ST AVE	3,955	66	110	52	58	28,600	4	Yes
174983M	UP	WEST CHICAGO	ROOSEVELT RD	3,833	52	110	52	58	34,200	4	Yes
867231E	UP	CHICAGO	95TH ST	3,767	119	57	51	0	27,500	4	Yes
326905D	IHB	DIXMOOR	WESTERN AV	3,687	222	87	87	0	9,300	4	Yes
163433F	CSX	EVERGREEN PARK	95TH ST	3,499	128	41	41	0	30,900	6	Yes
079537J	BNSF	DOWNERS GROVE	BELMONT RD	3,465	57	140	40	94	19,800	4	Yes
163431S	CSX	CHICAGO	103RD ST	3,409	124	41	41	0	30,100	4	Yes
372133T	Metra	RIVER GROVE	CUMBERLAND AV	3,244	52	69	11	58	38,700	4	Yes
163437H	CSX	EVERGREEN PARK	87TH ST	3,227	118	41	41	0	28,500	4	Yes
478712Y	NS	CHICAGO	TORRENCE AV	3,147	151	52	52	0	16,600	4	Yes
386399T	Metra	MORTON GROVE	DEMPSTER ST	3,136	37	94	20	58	37,800	4	Yes
326894T	IHB	RIVERDALE	INDIANA AVE	3,053	184	87	87	0	7,700	4	Yes
386381H	Metra	NILES	TOUHY AV	2,937	34	94	20	58	35,400	5	Yes
079489W	BNSF	BERWYN	OAK PARK AV	2,917	59	140	40	94	13,500	4	Yes
174087Y	UP	DES PLAINES	TOUHY AV	2,869	52	47	47	0	44,200	6	Yes
840144X	UP	CHICAGO	130TH ST	2,863	91	57	51	0	20,900	4	Yes
163576D	CSX	ALSIP	115TH ST	2,833	97	80	80	0	13,600	4	No
174106B	UP	DES PLAINES	RAND RD	2,774	83	47	47	0	25,900	4	Yes
843811C	BRC	CHICAGO	MARQUETTE RD	2,699	162	32	32	0	18,509	4	No
163578S	CSX	OAK LAWN	CENTRAL AV	2,689	56	80	80	0	21,300	4	No
388037N	Metra	NORTHBROOK	DUNDEE RD	2,679	31	94	20	58	32,300	4	Yes
386379G	Metra	CHICAGO	DEVON AV	2,630	40	94	20	58	24,100	4	Yes
			Total	109,306	3,212						

Table 13 indicates that the thirty grade crossings that account for the most hours of motorist delay account for approximately 36 percent of the entire amount of system-wide motorist delay. Tables 12 and 13 confirm that grade crossing delay is concentrated at a few high volume locations. This would suggest that grade separations at these thirty locations will yield a significant improvement in traffic flow and consequent reduction in vehicle emissions.

Table 13. Thirty grade crossings that cause the greatest amount of motorist delay.

GX ID	RR	City	Street	Motorist Hours of Delay	Vehicles Delayed	Total Daily Trains	Total Daily Freights	Total Daily Metras	AADT	Traffic Lanes	On a St Hwy?
163419K	CSX	BLUE ISLAND	127TH ST	278	4,615	41	41	0	24,700	4	Yes
326905D	IHB	DIXMOOR	WESTERN AV	222	3,687	87	87	0	9,300	4	Yes
478713F	NS	CHICAGO	130TH ST	191	3,962	52	52	0	20,900	4	No
326894T	IHB	RIVERDALE	INDIANA AVE	184	3,053	87	87	0	7,700	4	Yes
163580T	CSX	CHICAGO RIDGE	RIDGELAND AV	173	5,042	80	80	0	24,200	4	No
326729H	IHB	FRANKLIN PARK	GRAND AVE	171	4,988	76	76	0	25,200	4	No
843811C	BRC	CHICAGO	MARQUETTE RD	162	2,699	32	32	0	18,509	4	No
843806F	BRC	CHICAGO	ARCHER AV	158	2,625	32	32	0	18,000	4	Yes
843810V	BRC	CHICAGO	63RD ST	154	2,567	32	32	0	17,600	4	No
478712Y	NS	CHICAGO	TORRENCE AV	151	3,147	52	52	0	16,600	4	Yes
843807M	BRC	CHICAGO	55TH ST	135	2,246	32	32	0	15,400	4	No
163422T	CSX	CHICAGO	119TH ST	132	2,186	41	41	0	11,700	2	No
163433F	CSX	EVERGREEN PARK	95TH ST	128	3,499	41	41	0	30,900	6	Yes
163431S	CSX	CHICAGO	103RD ST	124	3,409	41	41	0	30,100	4	Yes
867231E	UP	CHICAGO	95TH ST	119	3,767	57	51	0	27,500	4	Yes
163437H	CSX	EVERGREEN PARK	87TH ST	118	3,227	41	41	0	28,500	4	Yes
326901B	IHB	DIXMOOR	THORNTON RD	117	1,943	87	87	0	4,900	2	No
174010L	UP	BELLWOOD	25TH AV	116	5,234	110	52	58	28,300	4	No
163612W	CSX	DOLTON	LINCOLN AVE	106	1,756	41	41	0	9,400	2	Yes
079493L	BNSF	RIVERSIDE	HARLEM AV	105	6,353	140	40	94	36,300	4	Yes
163415H	CSX	BLUE ISLAND	WESTERN AV	105	1,738	41	41	0	9,300	4	Yes
163576D	CSX	ALSIP	115TH ST	97	2,833	80	80	0	13,600	4	No
163611P	CSX	CHICAGO	138TH ST	95	1,571	41	41	0	8,409	4	No
843808U	BRC	CHICAGO	59TH ST	92	1,531	32	32	0	10,500	4	No
840144X	UP	CHICAGO	130TH ST	91	2,863	57	51	0	20,900	4	Yes
163425N	CSX	CHICAGO	111TH ST	90	2,480	41	41	0	21,900	2	Yes
163416P	CSX	BLUE ISLAND	BROADWAY	90	1,495	41	41	0	8,000	2	Yes
326851A	IHB	LAGRANGE	47TH ST	90	2,613	76	76	0	13,200	4	Yes
079508Y	BNSF	LAGRANGE	LA GRANGE RD	89	5,408	140	40	94	30,900	4	Yes
174106B	UP	DES PLAINES	RAND RD	83	2,774	47	47	0	25,900	4	Yes
			Total	3,966	95,310						

Approximately two-thirds of the thirty grade crossings that experience the greatest amount of grade crossing delay are on the State maintained highway system, even though only about 18 percent of all grade crossings in northeastern Illinois are on the State maintained highway system. This is a logical finding since the Illinois Department of Transportation is primarily responsible for roadways that are regional or interstate in nature. These roadways will naturally carry more motor vehicles and are more likely to be congestion points.

Grade crossing delay, like the railroad network itself, is concentrated in Cook County. Cook County has approximately 57 percent of the region's grade crossings (993) and approximately 81 percent of the total motorist delay. Table 14 provides a summary of the number of grade crossings and amount of delay by county.

Table 14. Delay by county.

Warning Device	Number of Crossings	Percent of Crossings	Total Number of Vehicles Delayed	Percent of Vehicles Delayed	Total Amount of Motorist Delay	Percent of Motorist Delay	AADT	Percent of AADT
Cook	993	57.3%	333,133	71.9%	8,884	80.9%	7,237,715	66.0%
Du Page	176	10.2%	64,519	13.9%	1,052	9.6%	1,069,101	9.7%
Kane	144	8.3%	9,219	2.0%	152	1.4%	538,763	4.9%
Lake	161	9.3%	34,195	7.4%	529	4.8%	1,189,794	10.8%
Mc Henry	89	5.1%	7,909	1.7%	110	1.0%	282,025	2.6%
Will	169	9.8%	14,463	3.1%	256	2.3%	653,378	6.0%
Total	**1,732**	**100.0%**	**463,438**	**100.0%**	**10,982**	**100.0%**	**10,970,776**	**100.0%**

Finally, the last portion of the results section summarizes the amount of delay by city. The residents and municipal officials of several cities, such as Blue Island Maywood and Des Plaines, have a perception that the grade crossings in those communities experience a great amount of delay and associated community disruption. This analysis has found that perception is closely tied to reality in this case. The City of Chicago has the greatest amount of delay when measured in terms of both the number of vehicles delayed and the total amount of motorist delay. This is to be expected since Chicago has about one-fourth of all the grade crossings in the region. Table 15 illustrates that Des Plaines, Downers Grove, Blue Island and La Grange are the other cities that experience significant numbers of vehicles being delayed on a typical weekday.

Table 15. Thirty cities with the greatest number of vehicles delayed.

Rank	City	Total Number of Vehicles Delayed	Percent of Vehicles Delayed	Total Hours of Motorist Delay	Percent of Motorist Delay	Total Amount of AADT	Percent of AADT
1	CHICAGO	111,466	24.1%	3,356	30.6%	2,748,930	25.1%
2	DES PLAINES	26,783	5.8%	546	5.0%	610,649	5.6%
3	DOWNERS GROVE	12,365	2.7%	198	1.8%	73,301	0.7%
4	BLUE ISLAND	12,304	2.7%	626	5.7%	135,446	1.2%
5	LAGRANGE	11,409	2.5%	258	2.3%	61,794	0.6%
6	FRANKLIN PARK	9,399	2.0%	299	2.7%	151,667	1.4%
7	EVERGREEN PARK	8,357	1.8%	276	2.5%	117,646	1.1%
8	MORTON GROVE	7,322	1.6%	89	0.8%	85,209	0.8%
9	RIVERSIDE	7,238	1.6%	121	1.1%	75,236	0.7%
10	WEST CHICAGO	7,225	1.6%	120	1.1%	104,876	1.0%
11	NORTHBROOK	6,703	1.4%	104	1.0%	126,800	1.2%
12	DIXMOOR	6,172	1.3%	358	3.3%	28,888	0.3%
13	MAYWOOD	6,037	1.3%	100	0.9%	43,627	0.4%
14	WHEATON	5,764	1.2%	90	0.8%	44,945	0.4%
15	WESTERN SPRINGS	5,740	1.2%	87	0.8%	36,218	0.3%
16	BARRINGTON	5,624	1.2%	91	0.8%	122,818	1.1%
17	BERWYN	5,520	1.2%	112	1.0%	25,986	0.2%
18	CHICAGO RIDGE	5,429	1.2%	179	1.6%	54,909	0.5%
19	RIVER GROVE	5,417	1.2%	86	0.8%	98,018	0.9%
20	BELLWOOD	5,268	1.1%	117	1.1%	57,009	0.5%
21	CRYSTAL LAKE	4,549	1.0%	61	0.6%	129,686	1.2%
22	ELGIN	4,518	1.0%	69	0.6%	111,267	1.0%
23	ARLINGTON HTS	4,394	0.9%	66	0.6%	85,174	0.8%
24	WESTMONT	4,393	0.9%	72	0.7%	25,100	0.2%
25	LAKE FOREST	4,335	0.9%	65	0.6%	54,635	0.5%
26	CHICAGO HEIGHTS	4,306	0.9%	119	1.1%	212,026	1.9%
27	DOLTON	4,305	0.9%	212	1.9%	27,209	0.2%
28	PALATINE	4,241	0.9%	58	0.5%	58,680	0.5%
29	MC COOK	4,165	0.9%	142	1.3%	94,318	0.9%
30	VILLA PARK	4,147	0.9%	65	0.6%	90,800	0.8%
	Total	**314,894**	**67.9%**	**8,143**	**74.1%**	**5,692,867**	**51.9%**

The thirty cities with the greatest number of vehicles delayed account for approximately 68 percent of all the vehicles delayed. Likewise Table 16 indicates that the thirty cities with the greatest amount of motorist delay account for approximately 77 percent of the total motorist delay in northeastern Illinois.

Table 16. Thirty cities with the greatest amount of motorist delay.

Rank	City	Total Hours of Motorist Delay	Percent of Motorist Delay	Total Number of Vehicles Delayed	Percent of Vehicles Delayed	Total Amount of AADT	Percent of AADT
1	CHICAGO	3,356	30.6%	111,466	24.1%	2,748,930	25.1%
2	BLUE ISLAND	626	5.7%	12,304	2.7%	135,446	1.2%
3	DES PLAINES	546	5.0%	26,783	5.8%	610,649	5.6%
4	DIXMOOR	358	3.3%	6,172	1.3%	28,888	0.3%
5	FRANKLIN PARK	299	2.7%	9,399	2.0%	151,667	1.4%
6	EVERGREEN PARK	276	2.5%	8,357	1.8%	117,646	1.1%
7	LAGRANGE	258	2.3%	11,409	2.5%	61,794	0.6%
8	RIVERDALE	228	2.1%	3,798	0.8%	11,688	0.1%
9	DOLTON	212	1.9%	4,305	0.9%	27,209	0.2%
10	DOWNERS GROVE	198	1.8%	12,365	2.7%	73,301	0.7%
11	CHICAGO RIDGE	179	1.6%	5,429	1.2%	54,909	0.5%
12	MC COOK	142	1.3%	4,165	0.9%	94,318	0.9%
13	ALSIP	123	1.1%	4,089	0.9%	67,504	0.6%
14	RIVERSIDE	121	1.1%	7,238	1.6%	75,236	0.7%
15	HARVEY	120	1.1%	4,031	0.9%	178,608	1.6%
16	WEST CHICAGO	120	1.1%	7,225	1.6%	104,876	1.0%
17	CHICAGO HEIGHTS	119	1.1%	4,306	0.9%	212,026	1.9%
18	BELLWOOD	117	1.1%	5,268	1.1%	57,009	0.5%
19	BERWYN	112	1.0%	5,520	1.2%	25,986	0.2%
20	NORTHBROOK	104	1.0%	6,703	1.4%	126,800	1.2%
21	MAYWOOD	100	0.9%	6,037	1.3%	43,627	0.4%
22	BARRINGTON	91	0.8%	5,624	1.2%	122,818	1.1%
23	SOUTH HOLLAND	90	0.8%	3,220	0.7%	107,913	1.0%
24	WHEATON	90	0.8%	5,764	1.2%	44,945	0.4%
25	MORTON GROVE	89	0.8%	7,322	1.6%	85,209	0.8%
26	WESTERN SPRINGS	87	0.8%	5,740	1.2%	36,218	0.3%
27	RIVER GROVE	86	0.8%	5,417	1.2%	98,018	0.9%
28	LA GRANGE PARK	77	0.7%	3,187	0.7%	24,059	0.2%
29	WESTMONT	72	0.7%	4,393	0.9%	25,100	0.2%
30	ELGIN	69	0.6%	4,518	1.0%	111,267	1.0%
	Total	**8,467**	**77.1%**	**311,553**	**67.2%**	**5,663,664**	**51.6%**

Figure 2 provides an illustration of the locations where a large number of vehicles are delayed. Figure 3 provides a map showing the number of hours of motorist delay. Both figures highlight in red octagons the grade crossings that account for the greatest amount of motorist delay.

Figure 2. Map of number of vehicles delayed.

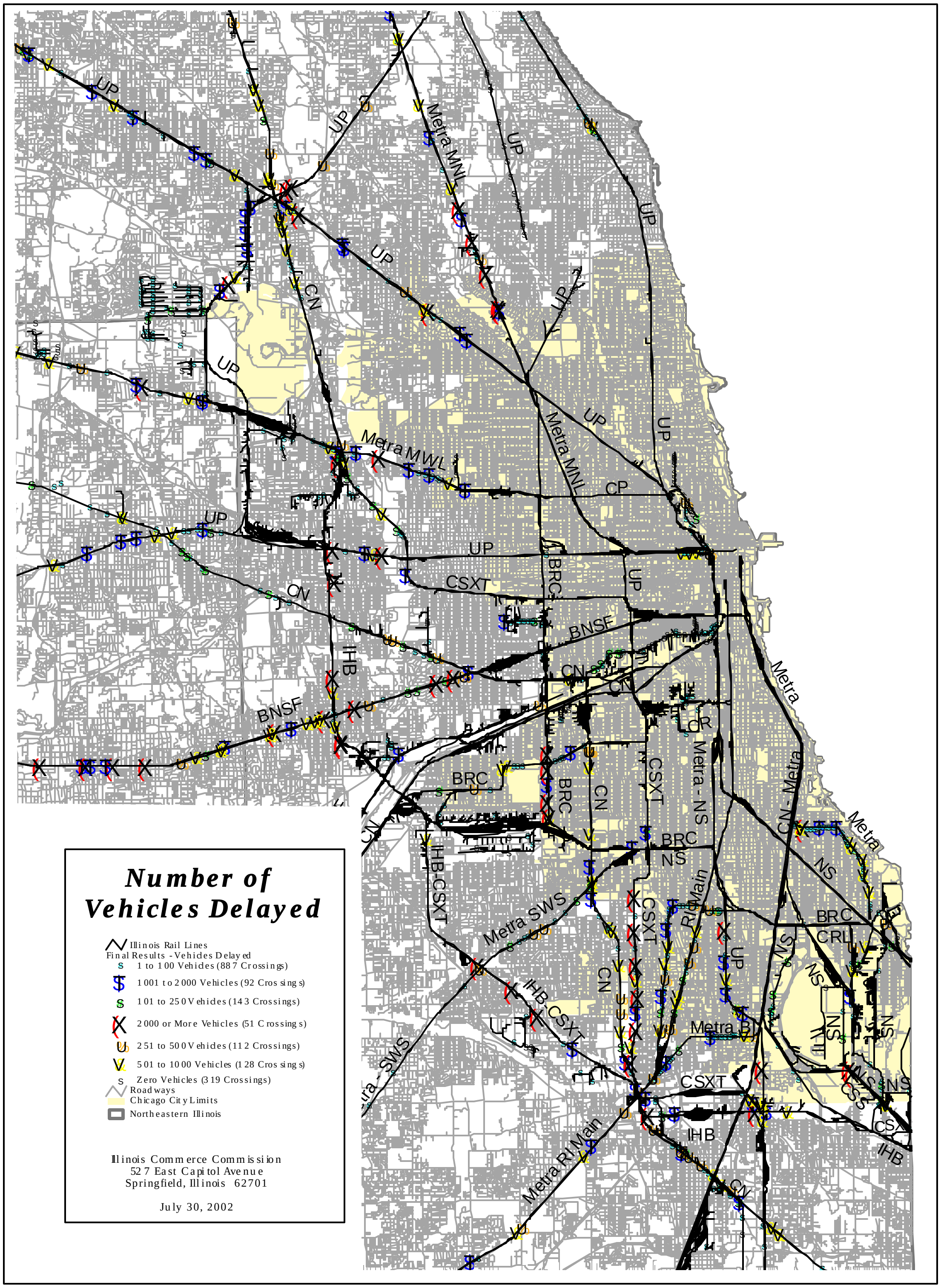
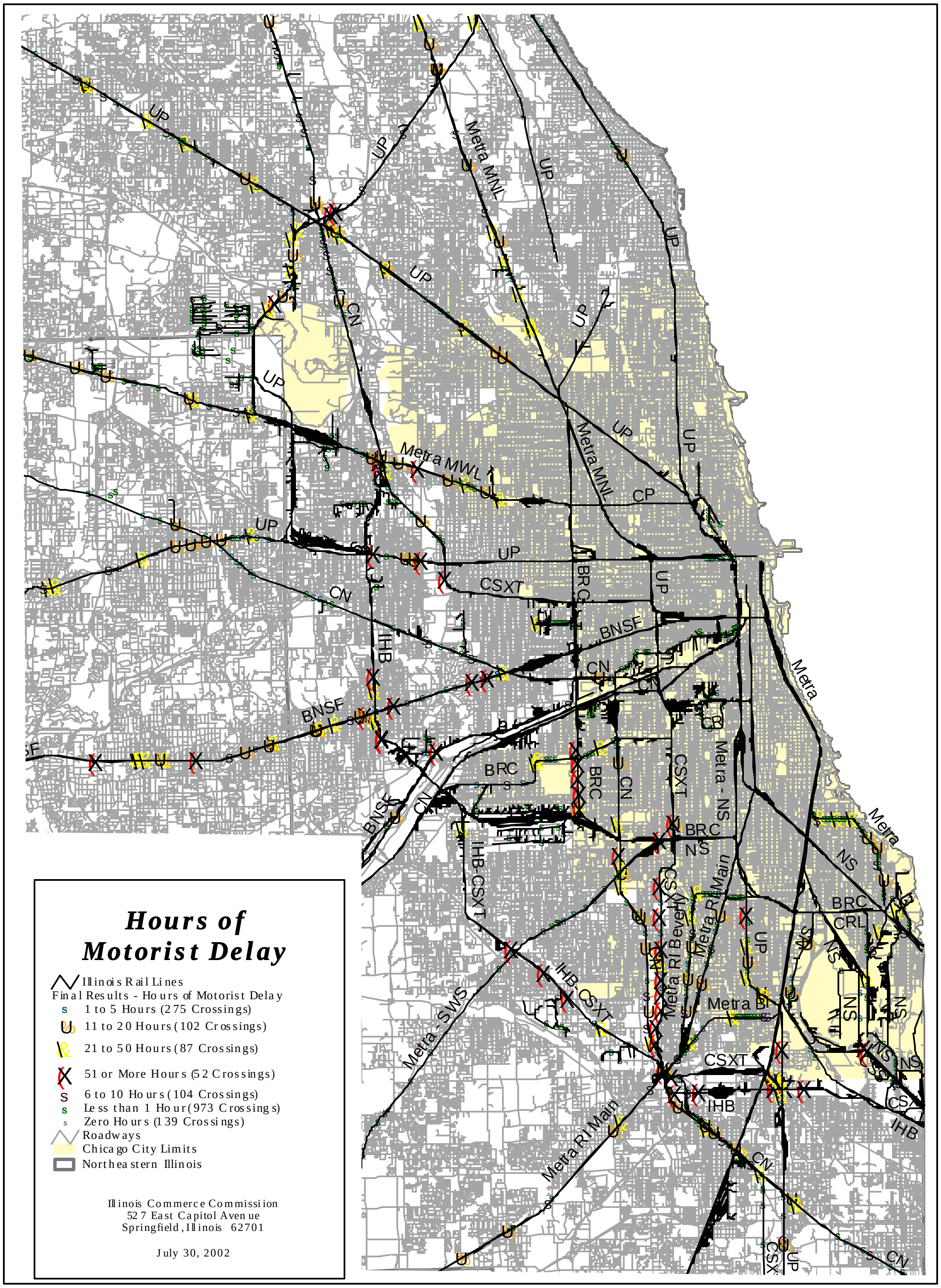


Figure 3. Map of hours of motorist delay.



The event recorder data that was collected was used to examine the validity of the results of this analysis. Unfortunately, event recorder data was only obtained for two locations: Cass Avenue and Harlem Avenue on the BNSF. The data showed that approximately 140 trains per day use these grade crossings and that the average "gate down" time was 260 minutes. This analysis predicted that there would be 252 minutes of "gate down" time. The model provides an overall goodness of fit of 97 percent. However, this result is only valid for grade crossings on the BNSF main line between Cicero and Aurora. Additional event recorder data is required in order to validate the results of this analysis on other line segments.

The preceding section summarized the significant findings from the grade crossing delay analysis. Among the most relevant findings were:

- That grade crossing delay is largely incurred at a relatively small number of grade crossings in the region.
- That the grade crossings with the greatest amount of delay are found along the BNSF Metra corridor between Cicero and Aurora, the UP Metra West and Northwest Lines, the BRC north of Clearing Yard, and along the CSX main line between Blue Island and 59^{th} Street in Chicago.
- That approximately 60 percent of the grade crossings that account for the greatest amount of delay are found on the State maintained highway system, as opposed to being on locally maintained streets and roads.
- That the perception of where congestion exists, corresponded closely to the cities where significant amounts of grade crossing delay occur, namely, Des Plaines, Downers Grove, and Blue Island.

CONCLUSION

This analysis presents the first attempt by ICC staff to use data available within the ICC's grade crossing information system to estimate the amount of grade crossing delay experienced by motorists in northeastern Illinois on a typical weekday. The data required extensive manipulation before it could be used in this analysis to resolve discrepancies in train count, train speed and the number of highway vehicles using a grade crossing. Much more improvement in the quality of the data is possible and desirable before a definitive analysis of grade crossing delay can be conducted.

The Chicago Transportation Coordinating Office of the Association of American Railroads has indicated that they will be providing new train count data to the ICC staff for many of the critical railroad line segments identified in this report. ICC staff is continuing to work with several railroads to obtain additional grade crossing event recorder data which is essential in order to validate the results of this, or any other analysis. Validation of the model output based on event recorder data from Cass and Harlem Avenues on the BNSF, indicates a 97 percent model fit for crossings on BNSF's Cicero to Aurora line. Additional control data is required to validate the model outcome on other rail line segments.

This method of quantifying grade crossing delay utilized a three-step process in which the amount of time a grade crossing is not available to the public is estimated This has been referred to as the “gate down” time. Next, the “gate down” time is applied to derive the number of motor vehicles that are delayed by the “gate down” time. Finally, the total amount of delay that all motorists collectively experience is estimated This has been referred to as “motorist delay” throughout this analysis. This analysis estimated that a total of 10,982 hours of motorist delay is experienced on a typical weekday and impacts 463,438 motor vehicles.

A relatively small number of grade crossings account for a relatively large percentage of the total grade crossing delay. Table 17 lists the ten crossings that delay the greatest number of vehicles on a typical weekday in northeastern Illinois. These ten grade crossings alone account for slightly over ten percent of all the motor vehicles delayed (47,783 of 463,438).

Table 17. Ten grade crossings that delay the most vehicles.

GX ID	RR	City	Street	Vehicles Delayed
079493L	BNSF	RIVERSIDE	HARLEM AV	6,353
079508Y	BNSF	LAGRANGE	LA GRANGE RD	5,408
174010L	UP	BELLWOOD	25TH AV	5,234
163580T	CSX	CHICAGO RIDGE	RIDGELAND AV	5,042
326729H	IHB	FRANKLIN PARK	GRAND AVE	4,988
163419K	CSX	BLUE ISLAND	127TH ST	4,615
079530L	BNSF	WESTMONT	CASS AVE	4,393
478713F	NS	CHICAGO	130TH ST	3,962
173996K	UP	MAYWOOD	1ST AVE	3,955
174983M	UP	WEST CHICAGO	ROOSEVELT RD	3,833

Efforts to reduce grade crossing delay in the future are likely to be focused on grade crossings which carry the largest number of highway vehicles. Approximately 60 percent of these grade crossings are on the highway system that is maintained by the Illinois Department of Transportation (IDOT) and located in developed urban areas where grade separations are likely to be extremely expensive and disruptive to the community to construct.

Grade separations are primarily traffic flow improvements that provide a large benefit to the region in terms of air quality and a smaller benefit in terms of safety. Congestion Mitigation and Air Quality (CMAQ) program funds are ideally suited for grade crossing separation projects. Unfortunately, CMAQ funds only amount to about $80 million dollars per year in northeastern Illinois and there is a large demand for these funds already.

Neither IDOT, ICC, the railroads, or the affected communities alone, or in combination, have the financial resources necessary to make a significant improvement in the amount of delay currently being experienced at grade crossings. As highway and train traffic continues to increase at a steady rate, the grade crossing delay problem is likely to worsen. Relying on the current grade crossing improvement programs of the ICC and IDOT is not a realistic answer to the grade crossing delay problem. A new program that does not take away from the current improvement programs of ICC and IDOT is necessary in order to reduce delays at grade crossings in northeastern Illinois.

SOURCES CITED

(1) Laffey, Steve. *Chicago Area Transportation Study Working Paper 99-04*. Grade Crossings of Northeastern Illinois. Chicago Area Transportation Study. Chicago, Illinois. 1999.

(2) Chicago Area Transportation Study. *Destination 2020 Regional Transportation Plan.* Chicago Area Transportation Study. Chicago, Illinois. 2000.

(3) Metropolitan Planning Council. *Critical Cargo.* Chicago, Illinois. April 2002.

(4) 107th United States Congress House Resolution 2299. *Department of Transportation and Related Agencies Appropriations Act, 2002*. USGPO. Washington, DC. November 30, 2001.

"The conferees are aware of significant delays currently affecting railroad freight in and around Chicago, Illinois. It is not uncommon for freight trains in and around Chicago, Illinois to take 72 hours or more to move cargo through the metropolitan area. The conferees direct the Administrator, in cooperation with the Surface Transportation Board, to prepare a comprehensive analysis of the railroad freight congestion problems in the Chicago region, including possible administrative and legislative solutions, and report back to the House and Senate Committees on Appropriations no later than January 15, 2002."