To: *John Benda*

From: *Jeff Hochmuth, P.E., PTOE*
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Date: *March 11, 2015*

Study: *Recommendations on Speed Limits System Wide*

INTRODUCTION

Based on direction received from the Traffic Operations Safety Committee (TOSC) over the last few years and in response to recent legislation, CDM Smith has reviewed speed limits on the entire Illinois Tollway (Tollway) system. Draft recommendations from these studies have been reviewed by the Tollway. At the February 2015 TOSC meeting, CDM Smith was requested to submit their final recommendations.

Data were collected across the Tollway system at various times over the last three years, as required by the previous draft studies. The data were collected in accordance with the Illinois Department of Transportation (IDOT) procedures for speed studies. In addition, in January 2014, IDOT released a new methodology for determining speed limits specifically for interstates (the previous methodology was generic to all roads). The new methodology considers recurring congestion and other concerns specific to suburban and urban interstates.

Because IDOT must approve speed limit changes on the Tollway prior to adoption, CDM Smith applied IDOT's methodology on setting speed limits to its review of interstate sections at issue. Per IDOT and the Federal Highway Administration (FHWA) recommendations, sections were approximately five to ten miles in length and matched logical transition points. The sections analyzed included:

1. The entire Tri-State Tollway (I-94/I-294), from IL 394 on the south end to Stearns School Road on the north end, broken into nine separate sections
2. Reagan Memorial (I-88) from the Eisenhower Expressway (I-290)on the east to Orchard Road on the west, broken into three separate sections
3. Veterans Memorial (I-355) from Army Trail Road on the north to I-55, broken into two separate sections.

Exceptions to this review include sections where speed limits were already increased to 65 or 70 mph, and on sections with recent and ongoing construction. The speed limit on the Jane Addams Memorial Tollway (I-90) in the Rockford area was increased to 70 mph two years ago. The recently completed section of I-90 from the Elgin area west to I-39 will be studied later in 2015. The eastern section will be reviewed after construction is complete. A valid engineering study requires that

crash and operational data be collected post construction, so the studies will be completed after sufficient data has been collected. This is a minimum of six to nine months after construction is complete.

The rural sections not included in the studies were those sections where the Tollway had already increased the speed limit to 65 or 70.The northern end of the Tri-State Tollway (I-94) and the southern end of Veterans Memorial (I-355) were previously studied with the methodology supporting speed limits up to 70 mph. Both sections are limited to 65 based on other operational considerations – primarily consistency with adjacent roadways. As these other operational issues have not changed with the new law, these sections were not reviewed against the new methodology.

The sections included in the current review are all posted at 55 mph with one exception on western I-88, which is posted as 65 mph. A critical assumption to this process was that speed limits should be changed relatively infrequently and only at logical transition points that reflect changes in roadway character in terms of volume and geometrics.

Tables 1 through 4 at the end of this report detail the various sections of the entire Illinois Tollway system, when the speed limits were last studied for those sections, and what the current recommendations are. Maps of current and recommended speed limits are provided in Figures 1 through 5 following the tables at the end of the report.

SPEED ANALYSIS USING IDOT 2014 METHODOLOGY

Released on January 1, 2014, IDOT's *Policy on Establishing and Posting Speed Limits on the State Highway System* provides a methodology for setting speed limits specific to interstate highways. The methodology comprises three major components: establishment of the prevailing speed, application of prescribed adjustment factors, and final engineering analysis. After performing an extensive review of academic and practical research as well as the speed limit setting policies of various states, CDM Smith has come to the conclusion that the IDOT methodology is a comprehensive and thorough methodology providing practical guidance for setting safe and efficient speed limits on interstate highways.

For an interstate facility, the prevailing speed is an average of the 85th percentile speed, upper limit of the 10 mph pace (10 mph speed range with highest proportion of traffic), and average test run speed. The IDOT methodology requires the use of spot speed studies of at least 100 vehicles per lane per location, and at least five vehicle test runs in each direction along the study area, both in uncongested free-flow conditions.

There are a series of six adjustment factors that may be applied to the prevailing speed. Adjustment factors consider geometric and other physical attributes of the road as well as typical operational conditions. The application of adjustment factors is common among the majority of states with published speed limit setting policies. The adjustments in the IDOT 2014 methodology take into consideration the following factors:

- High crash location

- Access point density and number of interchanges
- Average Daily Traffic (ADT) and number of lanes
- Exit ramps with advisory speed of 30 mph or less, where traffic routinely slows down on the mainline while approaching the exit
- Exit ramps where traffic routinely queues back onto the interstate mainline
- Areas where traffic routinely travels at less than 45 mph for at least four hours a day

Determining and applying adjustment factors results in adjusted prevailing speeds for each section. These adjustments and speeds are detailed in the various backup reports to this memorandum.

The third step in the methodology is the application of engineering analysis. This is discussed individually for each portion of the Tollway in the "Results" section below.

Since this is the first time using the new methodology, the six adjustment factors are discussed below to help understand the process. An adjustment either applies or does not apply depending on whether or not an evaluation criterion is met.

High Crash Location

Per the IDOT formula, a section of road is a high crash segment if it is on IDOT's top five percent list, a catalog of high crash locations that IDOT maintains for roads in Illinois. Urban interstates, including the entire Tollway system, are excluded from this list. Therefore, another approach must be used to identify high crash locations on the Tollway. CDM Smith applied the approach used in the previous IDOT methodology that compared the crash rates on the section with average statewide interstate crash rates. A location was considered a high crash segment if it was at least 50 percent higher than the statewide average.

Access Point Density

The IDOT formula is specific about how to count access points within a section. Access points include all ramp exits and entrances for both directions, including oases. The number of access points is then divided by the length of the section, resulting in a density value.

ADT

A table of ADT by number of lanes was provided by IDOT. The IDOT procedure states that all portions of the section must be above an ADT threshold for the adjustment to apply. CDM Smith agrees that traffic volumes and volume-to-capacity ratios are important considerations, and believes the table created by IDOT is generally sound. However, there is considerable uncertainty built into the ADT table. By definition, the rates are a yearly average, which includes weekdays and weekends as well as seasonal variation, and the expected traffic on any day can vary considerably. Given this built-in variability and rounding of ADT thresholds to the nearest 25,000, CDM Smith believes there should be some engineering judgment applied. If the vast majority of a section under study was near or above the threshold, CMD Smith assumed the section met the criterion.

Sharp Ramps

The next criterion applies to ramps with advisory speeds of 30 mph and below, for which traffic on the mainline slows down to a speed that allows drivers to safely exit the highway and negotiate the ramp. The Tollway provided a list of all ramps with advisory speed signs of 30 mph and below. The criterion, however, does not clearly define the threshold for traffic slowing down on the mainline. CDM Smith judged that the best way to identify traffic slowing down on the mainline was to examine the speed detectors before the exit, and determine if the average speed in the outside lane routinely fell 15 mph below the average speed in the adjacent lanes. Weekdays in June 2013 were selected as a representative sample. As detector locations and spacing did not always provide sufficient data, observational information was also used to complete and complement the findings. Sections with one or more affected ramps then had the corresponding adjustment factor applied.

Ramp Queues on Mainline

The Tollway automates ramp queue detection on a select few ramps. Observational evidence was substituted where necessary. The Traffic Operations Center (TOC) staff were interviewed, along with maintenance supervisors. As the information was not quantifiable, no rules were created. The sections analyzed in this study were adjusted where CDM Smith and Tollway staff identified one or more ramps with recurring queue issues.

Congestion

The congestion threshold is fairly specific (45 mph for four hours a day) and includes “on a routine basis” in the IDOT formula. Without a definition of “routine,” CDM Smith examined congestion areas and chose to define “routine” as “at least five days a month over two sample months.” June and September 2013 were selected as representative months.

Overall Application

Each of the adjustment factors was applied with a reduction in prevailing speeds of up to 5 percent. The cumulative maximum reduction for all six factors is 15 mph or 25 percent, whichever is less.

RESULTS

Tables 1 through 4 summarize the speed limit recommendations across the Illinois Tollway system. The following discussion is provided for each analysis section.

Tri-State Tollway between Deerfield Road and North Limit

One post-analysis adjustment was made to the IDOT formula. The high crash rate condition used in the analysis considers the entire segment. The short northbound section that approaches Grand Avenue remains a high severity crash rate and operational problem segment. This interchange is currently under construction, with the intent to mitigate the ramp queues that have caused these safety issues. Because of the historic high crash rate for this particular section, and the uncertainty about how the final ramp configuration will change operations, CDM Smith recommends erring on the side of caution and including the crash reduction factor for the time being. Also because of the extensive weaving near the I-94/I-294 interchange at Lake Cook Road, CDM Smith recommends moving the increased speed limit north of Deerfield Road.

The adjusted prevailing speed after applying the IDOT formula results in a recommended 65 mph from Grand Avenue to north of Deerfield Road. This recommendation is in line with the operational observations of CDM Smith. To be consistent, the speed limit should change north of Deerfield Road, matching the limits of the section to the south. We remain concerned over the safety and operations of the short northbound segment from Milwaukee Avenue to Grand Avenue, but believe the queue warning system installed by the Tollway, potentially combined with other measures, will help address this issue. We recommend the Tollway monitor this section after construction to determine if additional safety or operational improvements are still required.

North of Grand Avenue, the recommendation is to maintain a speed limit of 65 mph. This is in agreement with the previous recommendations and consistent with adjacent IDOT and Wisconsin Department of Transportation (WisDOT) speed limits.

North Central Tri-State (I-294) from I-90 to Deerfield Road

The IDOT methodology results in an adjusted prevailing speed of 64.3 mph. However, the IDOT procedure states that the speed limit should not exceed the design speed and this section has a design speed of 60 mph. Therefore, the recommendation is a 60 mph speed limit. The speed limit increase should be made north of Touhy Avenue to avoid the congestion and weaving at the O'Hare interchange. This increased speed limit will also continue on the northern end through the I-94/I-294 interchange to north of Deerfield Road where the speed limit will change to 65 mph.

Central Tri-State Tollway between I-90 and I-55

This section was long enough to break into two segments – from I-90 to I-290, and from I-290 to I-55. The northern section contains the complex O'Hare and Eisenhower interchanges. Both segments contain high crash rate sections. Using the IDOT formula for access points, the northern segment does not meet the criterion, but the southern segment does. The southern segment also has issues with several ramps including the I-55 ramps and the connector ramps to I-88. Both segments experience significant congestion.

The adjusted prevailing speed resulting from the application of the IDOT formula supports 60 mph from I-90 to I-290, and 55 mph from I-290 to I-55. On the north end is the O'Hare interchange. The Kennedy Expressway (I-90) is expected to remain at 55 mph. The Tri-State Tollway north of this interchange is recommended to increase to 60 mph. The section of I-90 to the west is just beginning major reconstruction and should be in a decreased construction speed zone for the majority of the next few years. In the middle of this section, I-290 is expected to remain at 55 mph east of the Tri-State, and at the south end, I-55 will remain 55 mph. In view of the operational problems in large portions of this section and the desire for consistency at the many system interchanges, the recommendation is to maintain a 55 mph speed limit for the entire section.

The central Tri-State is scheduled for major reconstruction after completion of current major Tollway work on I-90 and other facilities. After the central Tri-State is reconstructed, it should be re-evaluated for a potential speed limit increase.

South Central Tri-State (I-294) from I-55 to 95th Street

This section does not contain a high crash segment, but does meet the ADT criterion and has several ramp issues. Applying the IDOT formula results in an adjusted prevailing speed of over 65 mph. However, the IDOT procedure states that the speed limit should not exceed the design speed and this section has a design speed of 60 mph. The recommendation therefore is a 60 mph speed limit.

South Central Tri-State (I-294) from 95th Street to I-80

The IDOT formula produces an adjusted prevailing speed greater than 65 mph. However, the IDOT procedure states that the speed limit should not exceed the design speed and this section has a design speed of 60 mph. The recommendation is a 60 mph speed limit.

As of November 2014, there are new ramps open between I-294 and I-57. On I-57 north and south of the I-294 interchange, the current speed limit is 55 mph, and the I-80/I-294 section to the south is recommended to be posted at 55 mph. It is therefore recommended to begin the new 60 mph speed limit north of the I-57 ramps to allow for transition to the 55 mph speed limit on both I-57 and I-80.

South Tri-State (I-294/80)

This section of the Tollway carries joint interstate designations of I-294 and I-80. At just over 5 miles long, this is short enough to be studied as a single section. The section contains high crash locations and meets the ADT criterion and the interchange spacing criterion. The IDOT formula produces an adjusted prevailing speed of 57.1 mph. Similar to the north central portion, this short section transitions on each end at system interchanges. Additionally, I-80 will remain 55 mph either side of this section. CDM Smith has commented previously on the complexity of this section with the close interchange spacing and the fact that for many of the travelers, this is the only section where they will pay a toll in Illinois. The recommendation therefore is to maintain the 55 mph speed limit.

Eastern Reagan Memorial (I-88) from I-294 to I-355

The adjusted prevailing speed from the IDOT process is calculated as 63.7 mph, which would normally be rounded up to 65 mph. However, portions of this section have a design speed of 60 mph. In addition, all adjacent sections on the east end are currently expected to remain at 55 mph, and the recommendation for the west end is to increase to only 60 mph. Operational concerns are limited to potential ramp queues at Highland Avenue and where I-88 connects to I-290. In order to match design speed, to address some recurring operational concerns, and for consistency, CDM Smith recommends the speed limit increase in this section to 60 mph.

Central Reagan Memorial (I-88) from I-355 to Illinois Route 47

The current speed limit increases to 70 mph just west of Illinois Route 47 and is 65 mph from Illinois Route 47 to Orchard Road. This section was broken into three study segments: I-355 to Illinois Route 59, Illinois Route 59 to about Illinois Route 31, and Illinois Route 31 to Illinois Route 47. As a result of applying the IDOT method, recommended speeds are 60 mph for the two eastern segments, and 65 mph for the western segment. CDM Smith judges that a transition at Illinois Route 31 results in the most logical break point. Therefore, the recommendation is to increase the speed limit to 60 mph east of Illinois Route 31 and to65 mph just to the west of Illinois Route 31. This moves the current 65 mph end point at Orchard Road a short distance to the east.

Northern Veterans Memorial (I-355) from Army Trail to I-88

This section has an adjusted prevailing speed slightly below 60 mph, and it is CDM Smith's understanding that IDOT intends to increase the speed limit on I-290 north of this section to 60 mph. Additionally, the eastern and central sections of I-88 at the southern end of this section are recommended to a 60 mph speed limit. The final recommendation for this section thus is 60 mph.

Central Veterans Memorial (I-355) from I-88 to I-55

The adjusted prevailing speed on this section using the IDOT methodology is 58.1 mph, which results in a recommendation of 60 mph. Congestion-related operational concerns remain for this section, and most of the adjacent and connecting roadways will be 60 or 65 mph. CDM Smith recommends a speed limit of 60 mph for this section.

RECOMMENDATIONS

CDM Smith reviewed the results of the application of the new IDOT methodology and then matched limits to logical transition points. Tables 1through 4 following this report provide summaries of each section, the study timeframe, and recommendations. The following bullet points are a summary of the CDM Smith recommendations for adjusting speed limits across the system:

- I-94 from just north of Deerfield Road to Stearns School Road (just north of Grand Avenue) – increase to 65 mph (joins existing 65 mph speed limit section to the north)
- I-294 from Touhy Avenue (just north of I-90) to Deerfield Road – increase to 60 mph
- Central I-294 from I-90 to I-55 – remain at 55 mph
- Central I-294 from I-55 to I-57 – increase to 60 mph from just south of the I-55 interchange to just north of the I-57 ramps
- South I-294 on the section concurrent with I-80 – remain at 55 mph
- I-88 from I-294 to just west of Illinois Route 31– increase to 60 mph
- I-88 from just west of Illinois Route 31 to Orchard Road – increase to 65 mph (joins existing 65 mph speed limit section to the west)
- I-355 from the northern terminus to the current 65 mph zone south of I-55 – increase to 60 mph,

As with any major operational change, CDM Smith further recommends observation of spot locations (e.g., northbound Tri-State approaching Grand Avenue) for potential new operational concerns. If safety or operational concerns develop in spot locations, the Tollway should be prepared to consider spot treatments, including queue warnings, advisory speed limits, and related measures.

Please let us know if you have any questions or wish to discuss any points.

cc: Paul Kovacs
Adam Lintner
Jim Powell

Table 1: Summary of Current Speed Limits and Recommendations for the Tri-State Tollway

Cross Streets	Current Speed Limit	Last Studied	Future Plans	Recommended Speed Limit	Approximate Mileage
I-80/I-94/IL 394 Interchange to I-80/I-294 Interchange	55 mph	Fall 2014	Study results recommend 55 mph which is consistent with all connecting interstates (I-80 to the west, I-94 Bishop Ford, Borman Expressway, IL 394).	55 mph	6.0 miles
I-80/I-294 Interchange to 95th Street	55 mph	Summer 2014	Study results support 65 mph, but design speed is 60 mph. Because of new I-57 ramps, change to 60 mph should occur north of I-57 ramps. I-57 is 55 mph	60 mph	12.5 miles
95th Street to I-55 Interchange	55 mph	Fall 2014	Design speed is 60 mph. Consistent with recommendation to the south. Both directions of I-55 are remaining 55 mph. Change should be near where Willow Springs Road crosses the Tri-State	60 mph	6.5 miles
I-55 Interchange to I-290 Interchange	55 mph	Fall 2014	Study results support 55 mph. Speed limits are 55 mph both directions on I-55 and I-290 at I-294.	55 mph	8.0 miles
I-290 Interchange to Touhy Avenue	55 mph	Fall 2014	Study results support 60 mph. Although the middle 4 miles may be capable of 60 mph, but both ends have significant operational and safety problems with high volume weaves and high crash rate. 55 mph to the east and west on I-290. 55 mph to the east on I-90, to the west will be under construction the next few years. High crash locations on both ends of this segment.	55 mph	9.0 miles

Cross Streets	Current Speed Limit	Last Studied	Future Plans	Recommended Speed Limit	Approximate Mileage
Touhy Avenue to Deerfield Road	55 mph	Summer 2014	Study results support 65 mph, but design speed is 60 mph. In addition, severe daily congestion on south end, as well as 55 mph connecting roads to the south, and 55 mph on the Edens Spur to the north result in a recommendation of 60 mph.	60 mph	12.0 miles
Deerfield to IL 132 Grand Avenue	55 mph	Summer 2014	Study results support 65 mph. CDM Smith concurs with 65 mph starting north of Deerfield Road due to weaving issues at the south end from the merge between the Tri-States and Edens Spur. Concerns remain over the high crash rate approach to Grand Ave. from the south, which are to be addressed in a pending improvement.	65 mph	20.0 miles
IL 132 Grand Avenue to North terminus	55/65 mph	Fall 2013	Study results support up to 70 mph starting north of IL 132 around Stearns School Road. CDM Smith recommended 65 mph to match IDOT and Wisconsin DOT. Going up to 70 mph for a short distance and then back down to 65 mph would be inconsistent.	65 mph	7.0 miles
Edens Spur	55 mph	n/a	The Edens Expressway to the east will remain 55 mph. The Tri-State to the west will be 60 mph then change to 65 mph north of Deerfield Road. Considering the very short length of this segment, and that this section has remained a high crash location with many operational issues on the eastbound side (such as the lane drop before the Edens Expressway), no changes are recommended.	55 mph	4.0 miles

The Edens Spur has some unique operating characteristics. For the westbound section, traffic will leave the Edens Expressway at 55 mph, and will increase to 65 mph shortly after traffic has completed weaving with the northbound Tri-State traffic. For such a short section, the speed limit would need to be consistent with either the Edens or the Tri-State. With a design speed of 60 mph, the Edens Spur cannot go to 65 mph, thus, the westbound side of the Edens Spur should remain 55 mph. On the eastbound side, traffic will have just been stepped down from 65 mph north of Deerfield Road to 60 mph before the split with the Edens Spur. With the operational and safety issues primarily due to the lane drop ahead on eastbound (southbound) I-94, a further reduction of the speed limit to 55 mph just west of the toll plaza on the Edens Spur is recommended.

Table 2: Summary of Current Speed Limits and Recommendations for the Reagan Memorial Tollway

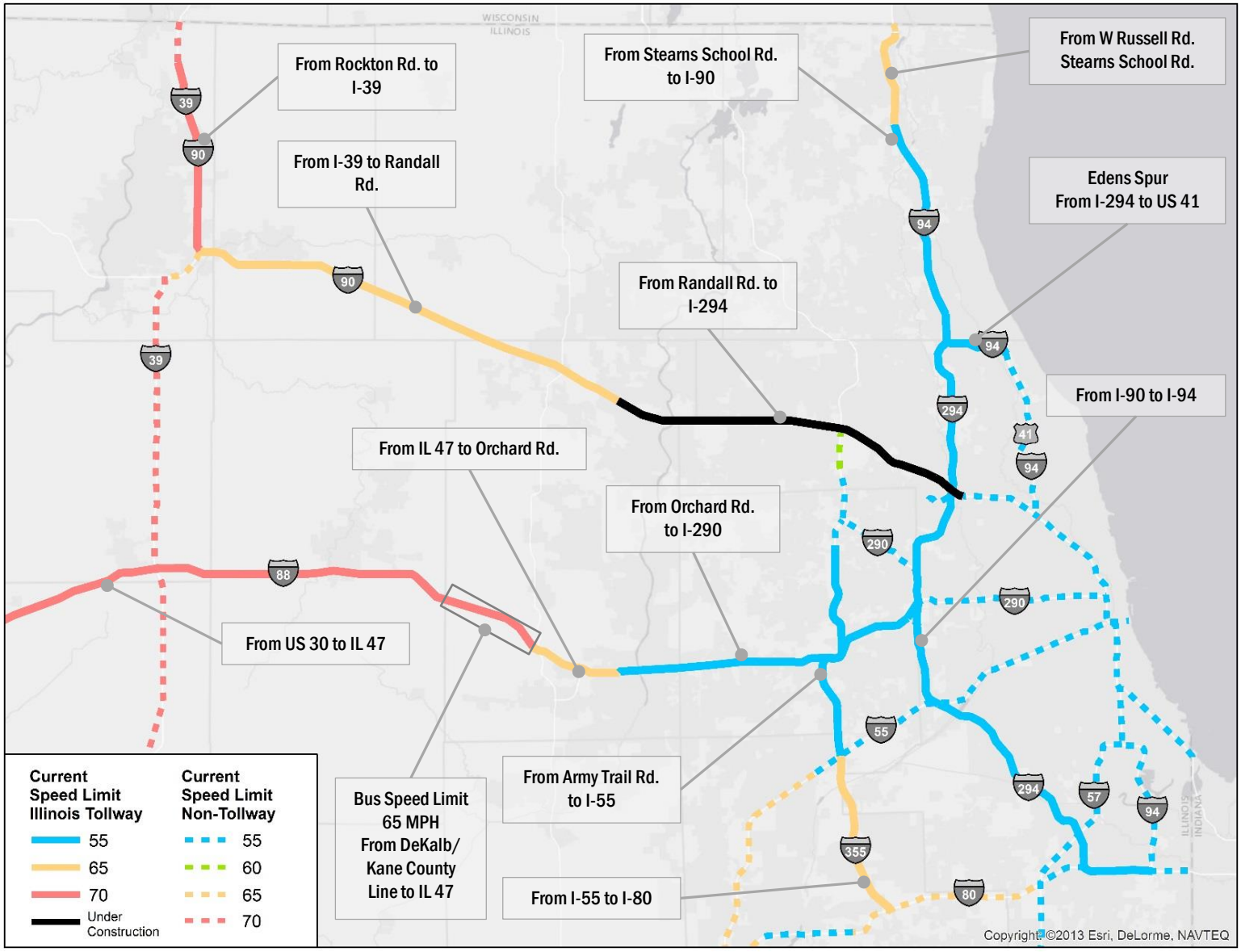
Cross Streets	Current Speed Limit	Last Studied	Future Plans	Recommended Speed Limit	Approximate Mileage
I-290 Interchange to I-355 Interchange	55 mph	Summer 2014	The study results support up to 65 mph. There are 60 mph design speed issues in this section. Also, on the east end I-290 to the east and I-294 will remain 55 mph, and all connecting interstates to the west will be 60 mph.	60 mph	9.0 miles
I-355 Interchange to IL Route 31	55 mph	Summer 2014	Study results support 60 mph. There is significant recurring congestion and weaving issues at interchanges. The western terminus of this section was reviewed in detail to best determine the appropriate breakpoint between 60 and 65 mph at IL Route 31.	60 mph	14.0 miles
IL Route 31 to West of IL Route 47	65/55 mph	Fall 2013 and Summer 2014	Study results support 65 mph. Previous 2013 study raised the car speed limit to 65 from Orchard Road west to just west of Route 47, where it increased to 70 mph for cars. Higher crash rates in the Kane County section limited the higher speed limit to west of IL 47. Current analysis moves the 65 mph transition point to just west of IL 31, but maintains the 70 mph to west of IL 47. Trucks currently limited to 60 mph until DeKalb County line.	65 mph	9.0 miles
West of IL Route 47 to western terminus	70 mph	Fall 2013	No changes planned.	70 mph	64.0 miles

Table 3: Summary of Current Speed Limits and Recommendations for the Veterans Memorial Tollway

Cross Streets	Current Speed Limit	Last Studied	Future Plans	Recommended Speed Limit	Approximate Mileage
North terminus to I-88 Interchange	55 mph	Summer 2014	Study results support 60 mph. All connecting interstates on both ends are at, or recommended to be, 60 mph.	60 mph	8.0 miles
I-88 Interchange to I-55 Interchange	55 mph	Summer 2014	Study results support 60 mph. Adjacent sections on the north end are all 60 mph or recommended 60 mph. To the south I-55 remains at 55 mph. I-355 itself increases to 65 mph south of I-55.	60 mph	10.0 miles
I-55 Interchange to I-80 Interchange	65 mph	Fall 2013	Study results support up to 70 mph; CDM Smith at that time recommended 65 mph based on all connecting interstates to the north being 55 mph, and I-80 to the south at 65 mph. No further change recommended.	65 mph	12.5 miles

Table 4: Summary of Current Speed Limits and Recommendations for the Jane Addams Tollway

Cross Streets	Current Speed Limit	Last Studied	Future Plans	Recommended Speed Limit	Approximate Mileage
Northern Terminus to I-39 Interchange	70 mph	Fall 2013	Study results supported 70 mph. Trucks are allowed at 70 mph.	70 mph	15.0 miles
I-39 Interchange to Randall Road	65 mph	None within last 5 years	Just completing major widening and construction	65 mph	35.0 miles
Randall Road to I-290/IL 53 Interchange	55 mph	None within last 5 years	Not studied recently due to construction	55 mph	16.0 miles
I-290/IL 53 Interchange to I-294 Interchange	55 mph	None within last 5 years	Not studied recently due to construction	55 mph	10.0 miles



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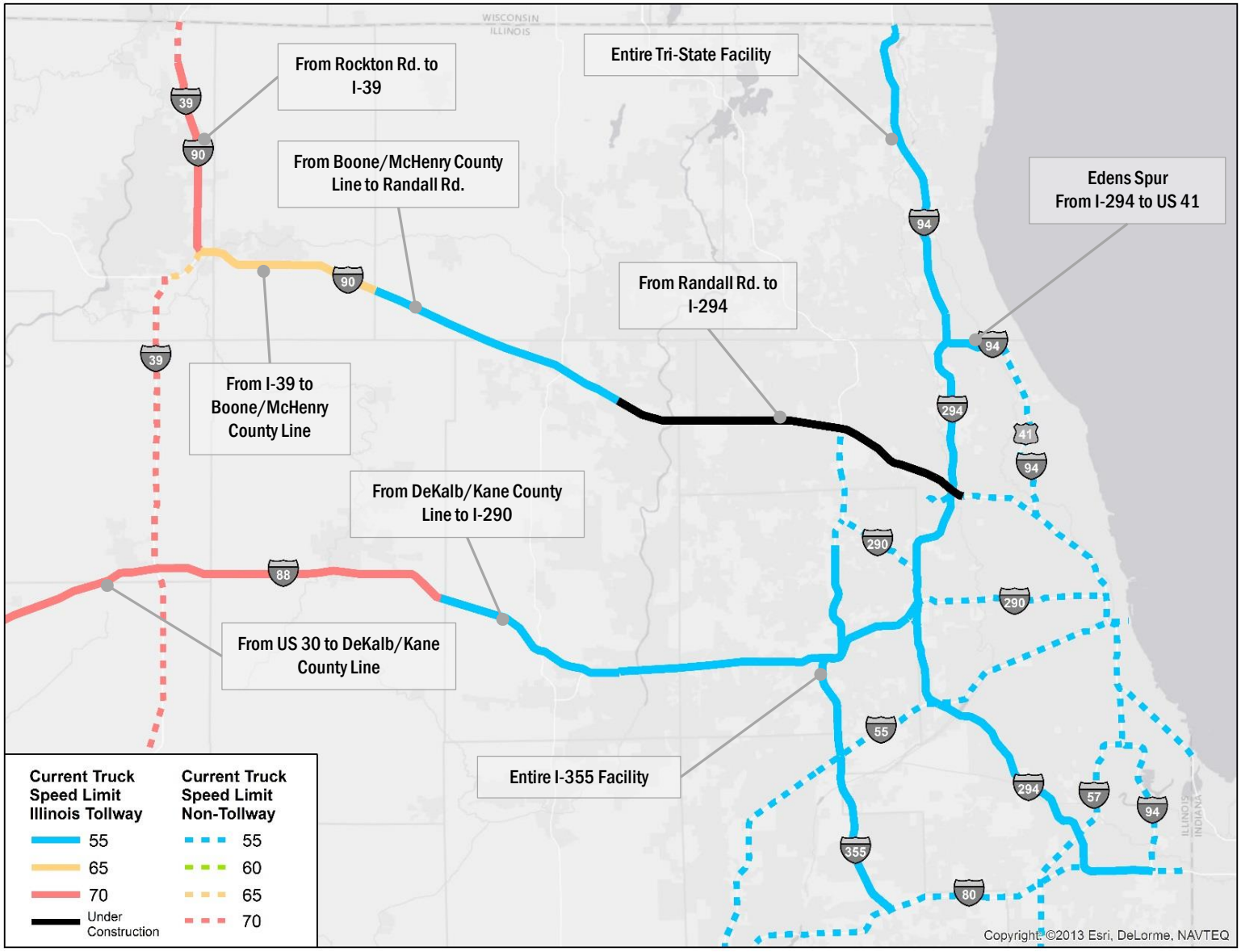
Current Speed Limit – Cars and Buses

FIGURE 1



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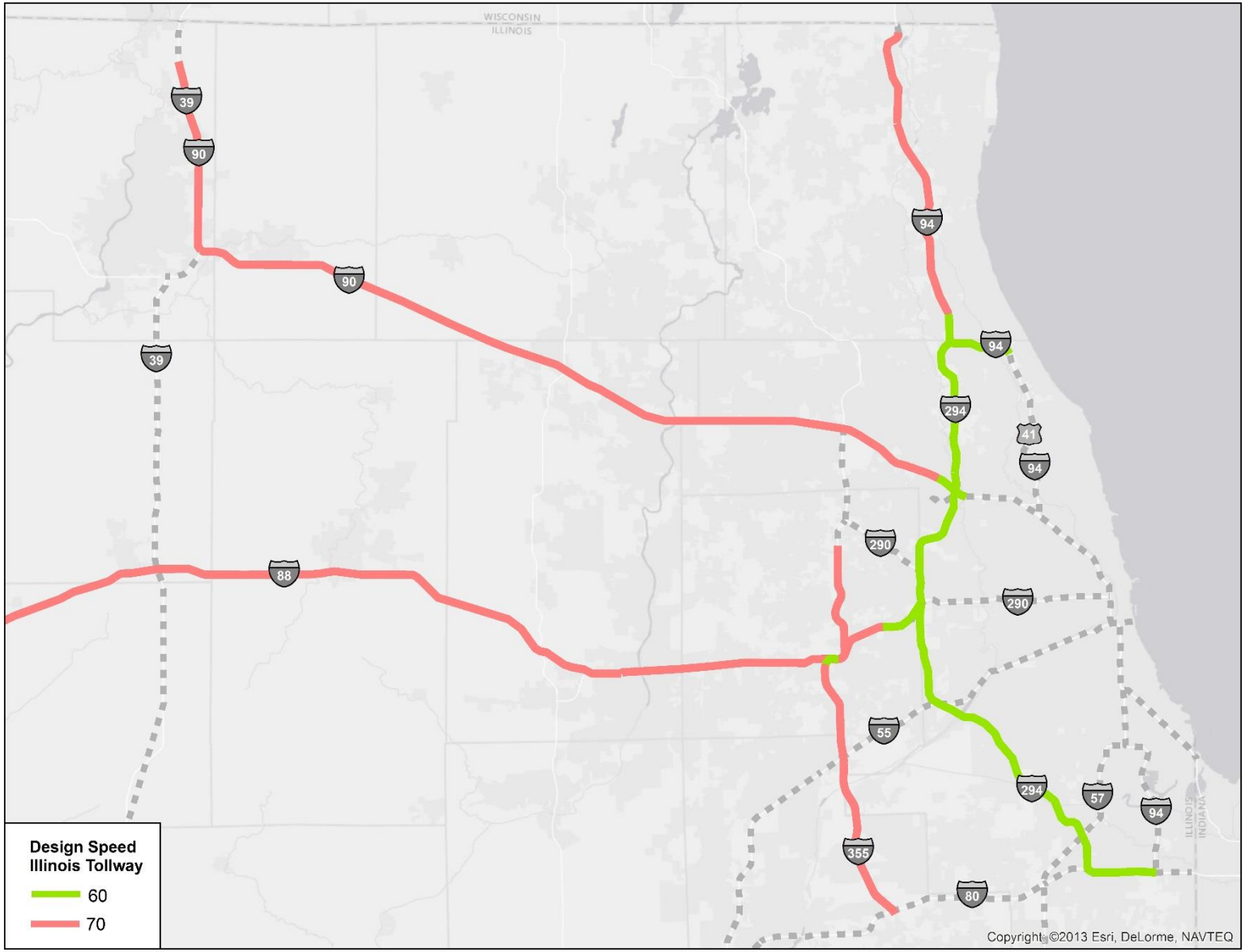
Current Speed Limit – Trucks

FIGURE 2



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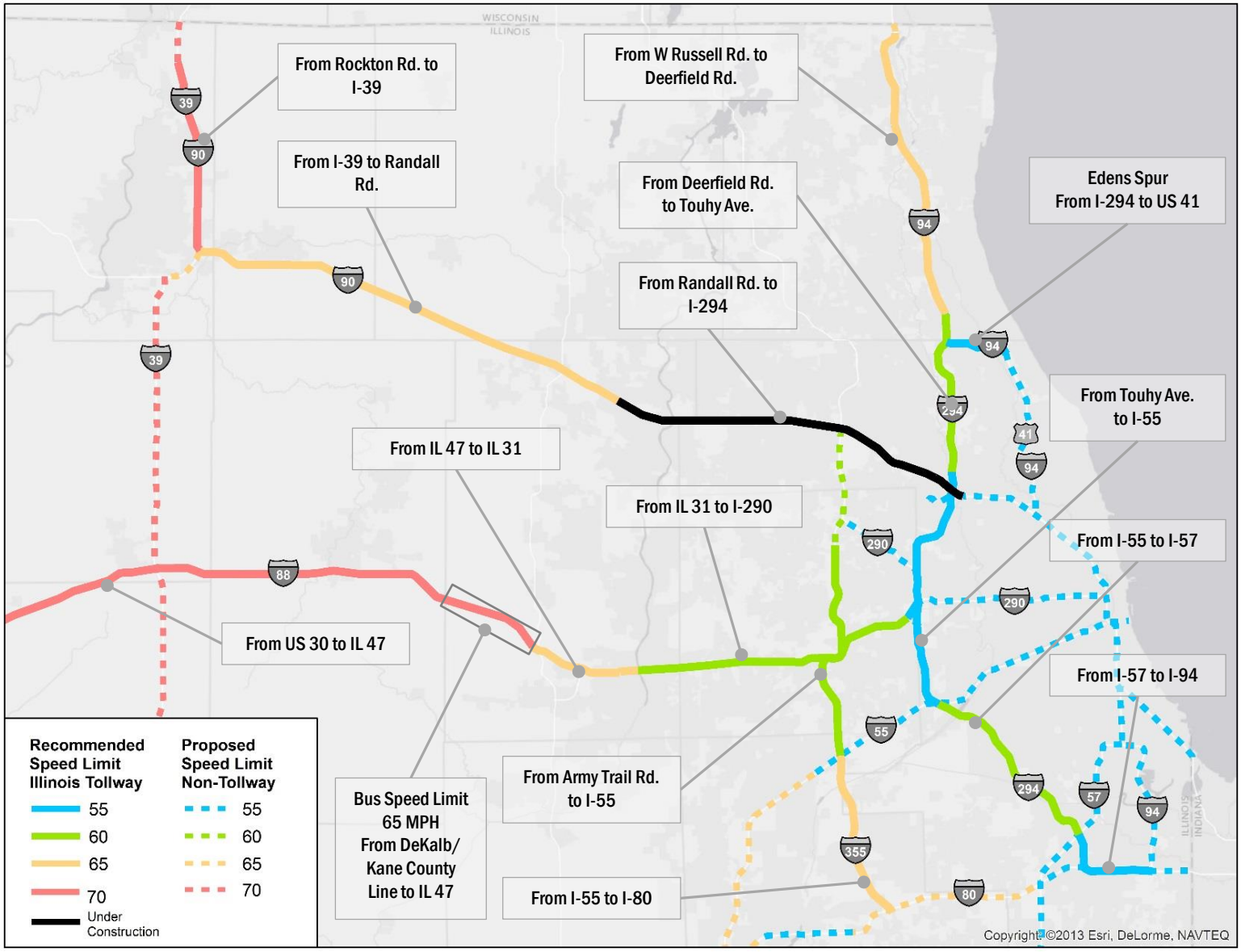
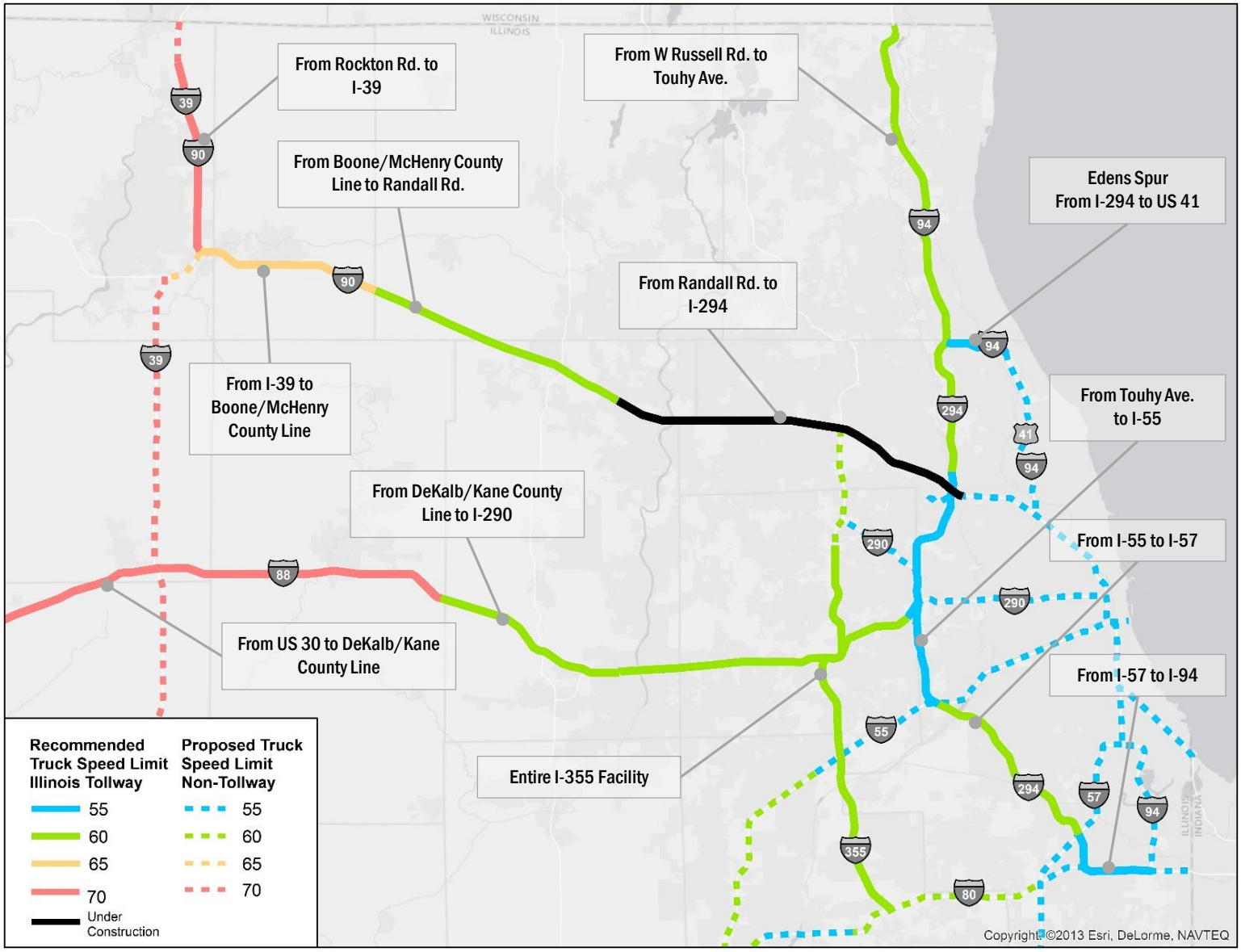
Design Speeds

FIGURE 3



Speed Limit Recommendations – Cars and Buses

FIGURE 4



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Speed Limit Recommendations – Trucks

FIGURE 5