

The background of the entire page is a photograph of a train at a station during twilight. The train is silver with multiple windows and doors. The number "7334" is visible on the side of one of the cars. The train is blurred, suggesting it is moving. In the foreground, a person's legs and feet are also blurred, indicating they are walking. The sky is a mix of blue and purple, and there are some lights visible in the distance.

Systemwide Cost Benefit Analysis of Major Capital Improvements

Final Report

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Abbreviations and Acronyms

AA	Alternatives Analysis
BUILD	Better Utilizing Investments to Leverage Development grants (replaced TIGER)
CATS	Chicago Area Transportation Study (replaced by CMAP)
CBA	Cost Benefit Analysis
CIG	Capital Investment Grants
CIP	Corridor Improvement Program
CMAP	Chicago Metropolitan Agency for Planning
CN	Canadian National Railway Company
CP	Canadian Pacific Railway
CREATE	Chicago Region Environmental and Transportation Efficiency
CUS	Chicago Union Station
DMU	diesel multiple unit
EJ&E	Elgin Joliet & Eastern (now part of CN Railway)
EMU	electric multiple unit
FAA	Federal Aviation Administration
FAST	Future Agenda for Suburban Transportation
FTA	Federal Transit Administration
GTFS	General Transit Feed Specification
HC	Metra Heritage Corridor Line
MD-N	Metra Milwaukee District North Line
MD-W	Metra Milwaukee District West Line
MED	Metra Electric District Line
MIS	Major Investment Studies
MPO	metropolitan planning organization
MSF	Maintenance & Storage Facilities
NCS	Metra North Central Service Line
NICTD	Northern Indiana Commuter Transportation District
O&M	Operating & Maintenance
Off-Pk	Off-Peak Period
P-3	Public-Private Partnership
PTC	Positive Train Control
Rev	Reverse Peak Period
RID	Metra Rock Island District Line
ROW	right-of-way
RTA	Regional Transportation Authority
SCC	Standard Cost Category (FTA's capital cost workbook)
SES	SouthEast Service
SGR	State of Good Repair
SSA	South Suburban Airport
STAR Line	Suburban Transit Access Route
STOPS	Simplified Trips-on-Project Software ridership model
SWS	Metra SouthWest Service Line
TIGER	Transportation Investment Generating Economic Recovery
UP-N	Metra Union Pacific North Line
UP-NW	Metra Union Pacific Northwest Line
UP-W	Metra Union Pacific West Line
US DOT	United States Department of Transportation
WSOR	Wisconsin & Southern Railroad Co.

1. Introduction

Since the introduction of passenger rail service in the mid nineteenth century, the rail system in Chicago has grown to take its current shape. As the region's travel market evolves and changes, Metra, the commuter rail operator for Northeast Illinois, must position itself to best respond to those changes. One of the greatest needs for this legacy system is to maintain the existing assets, and current funding does not fully support that. However, it is important to look to the future with a balanced approach to capital investment. If sufficient capital funding from state, federal, or other sources is provided to both maintain the existing system and grow it to meet the needs of the future, Metra could entertain some of these improvements so long as funding is also available to operate and maintain them. In this time of decreasing capital budgets, it is more important than ever to evaluate the potential uses of scarce capital funds and determine the best uses of those funds. To this end, Metra commissioned this study, the *Systemwide Cost Benefit Analysis of Major Capital Improvements*.

Over the years, dozens of potential major expansions of Metra service have been suggested or proposed by Metra and local stakeholders. The list of projects evaluated in this study was drawn from past Metra plans, regional transportation plans, and feedback received during Metra's strategic planning process. These potential projects had been evaluated at different times under different methodologies, ranging from feasibility studies and alternatives analyses, to environmental assessments and some level of engineering. However, they were never evaluated all at once, making it difficult to compare the results between projects. The *Systemwide Cost Benefit Analysis of Major Capital Improvements* brings all of these potential projects into a single analysis on a level playing field. A consistent set of assumptions was used across all the potential projects to ensure that apples-to-apples comparisons could be made.

The study examined a total of 38 projects including improvements to each of Metra's existing rail lines as well as all feasible extensions and new lines within the seven counties of the Chicago Metropolitan Agency for Planning (CMAP) region. Proposed line extensions to areas beyond the CMAP region were not evaluated. In

The study examined a total of 38 projects including improvements to each of Metra's existing rail lines as well as all feasible extensions and new lines within the seven counties of the Chicago Metropolitan Agency for Planning (CMAP) region.

some cases, lines have multiple proposals that were analyzed during this study as separate projects. A map and list of the potential projects that were evaluated are represented in Figure 1-1. The potential projects are organized into two tiers:

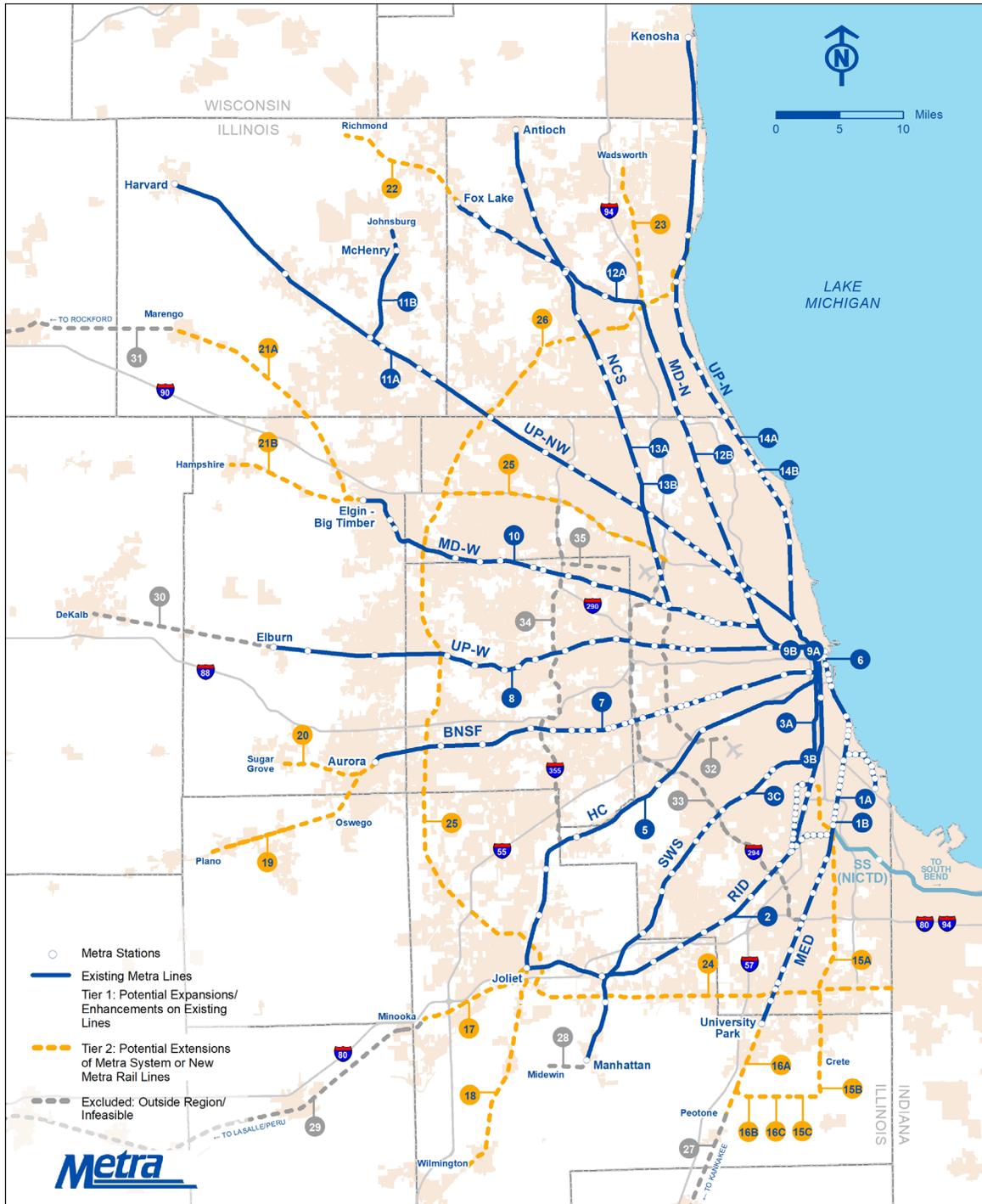
1. Improvements to the existing network of Metra routes (21 projects), and
2. Network expansions through extensions of existing lines or new lines (17 projects)

While this study does not, by itself, set priorities for future spending for Metra or for future capital programming, it endeavors to provide decision makers with the necessary information to assist in such a prioritization process. The results highlight the tradeoffs between different investment choices. Note that Metra has not yet completed this prioritization, so there is no commitment by Metra to act on any of the evaluated projects, as Metra's focus for the foreseeable future is to work toward achieving a state of good repair for its existing assets. Also note that this report was an internal process completed by Metra staff and the consultant team. The study did not include coordination with freight railroads or other stakeholders, but such coordination will proceed as Metra moves forward with project prioritization.

As priorities for future investment are established, the results of this analysis will help to inform future funding decisions. The project definitions and results from this study have already informed *ON TO 2050*, CMAP's next regional comprehensive plan and the 2018-2023 Regional Transit Strategic Plan, *Invest in Transit*. Having solid data that defines the projects and clearly illustrates the costs and benefits of each one is critical to developing plans, securing grant funding and attracting funding partners. The priorities that are set will help identify the most effective services to move Metra forward. Metra anticipates that the results of this study will help identify a subset of projects to be studied in more detail and more fully developed for possible long term implementation. While the potential projects were defined as independent sets of improvements, it is clear that improvements to one line may benefit or reduce the cost of one or more projects on another line. These effects will be considered as priorities are established based on the study results. However, it must be stressed that before any of these projects will proceed, they will be subject to further detailed study.

The following Section 2 provides a description of the technical process, including data inputs and assumptions, used to define and analyze the potential projects. Section 3 presents further details on the list of projects analyzed. Section 4 defines the performance metrics employed in the analysis. A total of 25 metrics offer 25 options by which to compare the projects to one another. Project results, in the form of a table summary of the metrics and their values for each project, are presented in Section 5. The Appendix includes maps and details of the specific investments and changes to the infrastructure, service and rolling stock that make up the project definition for each of the potential projects.

Figure 1-1. Metra Improvement and Expansion Projects Evaluated



<p>21 TIER 1: EXPANSIONS/ ENHANCEMENTS</p> <ul style="list-style-type: none"> 1A MED Modest Service Increase 1B MED Modern Metra Electric 2 RID Improvements 3A SWS Speed Improvements 3B SWS Intermediate Improvements 3C SWS Full Service 5 HC Improvements 6 CUS Improvements 7 BNSF Improvements 8 UP-W Improvements 9A A-2 Relocated At-Grade Crossing 9B A-2 Flyover 	<ul style="list-style-type: none"> 10 MD-W Improvements 11A UP-NW Mainline Improvements 11B UP-NW ML/Branch Improvements 12A MD-N 2-Track Improvements 12B MD-N 3-Track Improvements 13A NCS Intermediate Improvements 13B NCS Full Service Improvements 14A UP-N 2-Track Improvements 14B UP-N 3-Track Improvements <p>17 TIER 2: EXTENSIONS/ NEW LINES</p> <ul style="list-style-type: none"> 15A SES Separate Operations 15B SES Extended to SSA 15C SES MED Loop to SSA 	<ul style="list-style-type: none"> 16A MED Extension to Peotone 16B MED Extension to SSA Full Svc. 16C MED Extension to SSA Express 17 RID Extension to Minooka 18 HC Extension to Wilmington 19 BNSF Ext. to Kendall County 20 BNSF Extension to Sugar Grove 21A MD-W Extension to Marengo 21B MD-W Extension to Hampshire 22 MD-N Extension to Richmond 23 MD-N Extension to Wadsworth 24 STAR East - Joliet-Lynwood 25 STAR West - Rosemont-Joliet 26 STAR North - Waukegan-Prairie Stone 	<p>9 EXCLUDED: OUTSIDE REGION/INFEASIBLE</p> <ul style="list-style-type: none"> 27 MED Extension to Kankakee 28 SWS Extension to Midewin 29 RID Extension to LaSalle/Peru 30 UP-W Extension to DeKalb 31 MD-W Extension to Rockford 32 Inner Circumferential Rail Service 33 Rail Service along I-294 34 Rail Service along I-355 35 O'Hare-Schaumburg Transit Ext.
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2. Data Inputs, Assumptions and Methodology

The Cost Benefit Analysis involved data inputs and assumptions organized by the following twelve elements of study. Descriptions of each element follow:

1. Project Definition
2. Operating Plans
3. Capital Improvement Plans
4. O&M Costs
5. Capital Costs
6. Ridership
7. State of Good Repair Impacts
8. Reliability Impacts
9. Project Timeframe
10. Potential Funding Sources
11. Connecting Services
12. Tier 1 and 2 Synergies

In order to conduct the large number of evaluations needed to complete the Cost Benefit Analysis, the methodology applied is high-level and did not have the benefit of engineering designs. Furthermore, the assumptions and methods were selected to facilitate apples-to-apples comparisons of the potential projects. As such, the products of this research should be viewed as an initial screening, with more in-depth analysis of the most deserving projects performed subsequently on a smaller portfolio of potential investments.

2.1 Project Definition

The identification of projects for inclusion in the Cost-Benefit Analysis are based on prior Metra planning studies or capital initiatives, including the following:

- The Future Agenda for Suburban Transportation (FAST) Plan of 1992
- New Start Initiatives (i.e., Alternative Analysis and Major Investment Studies)
- Projects proposed for inclusion in MPO long range transportation plans (i.e., CATS and CMAP)
- CREATE initiatives

- High speed rail planning efforts (e.g., Chicago-St. Louis, Chicago-Milwaukee)
- Special purpose studies (e.g., Union Station Master Plan, Heritage Corridor Capacity Study)
- Metra reports on service reliability and ridership
- Metra internal report on State of the System
- Feasibility studies of expansions
- Public comment received during Metra's strategic planning process

Project improvements were identified collaboratively with Metra staff and sought to address the following eight areas of focus:

1. Comparatively lower levels of peak and off-peak service
2. Comparatively slow scheduled speed of service
3. Crowding on trains
4. Operational bottlenecks, causing lower levels of reliability
5. Mainline track and signal capacity constraints
6. Capacity constraints of vehicle storage yards and maintenance facilities
7. Station and parking constraints
8. Opportunities to expand service coverage

Each project was defined by the following:

Service Levels, Hours and Schedule Patterns – For each potential project, a proposed draft schedule was developed to address shortcomings in the existing schedule and align with projected market demand. The schedule development focused on adding service frequency as well as improving train speed both in the traditional commute market and the reverse commute market. Proposed service plans only altered weekday schedules. If any of the potential projects were to be pursued, weekend and off peak service would be part of a more detailed service planning effort. Once draft schedules were developed, they were further refined in concert with the evaluation of the infrastructure necessary to operate the proposed schedules.

Alignment – The study team identified the project limits and alignment for each potential project. The projects were generally assumed to operate within existing railroad or other transportation corridors. Many of the project alignments had been previously defined, but all of them were re-examined and confirmed. This included identifying terminals and interface points with current Metra service.

Vehicle Types – Most projects assumed use of conventional push-pull diesel-propelled train-sets (like Metra currently uses on its ten diesel lines), although electric multiple-units (EMU) were used for Metra Electric District (MED) projects. The use of diesel multiple unit (DMU) equipment was assumed for STAR Line projects, as had been previously identified during studies for this project.

Track & Systems – The study team assessed the improvements to track and signal systems needed to operate the proposed schedule. These requirements came from an understanding of the current physical plant, available right-of-way, and service levels, as well as each project's service/operating needs. Basic assumptions were made on the number of tracks, interlockings, control points, and signaling systems.

Maintenance & Storage Facilities (MSF) – Outlying coach yards to store trains overnight near the end of the line and maintenance and storage facilities near the downtown terminal stations that will be needed to support projects in the study were identified. The study team evaluated the ability for existing facilities to accommodate potential projects, and determined if facility expansions or entirely new facilities would be required.

Stations and Parking – The study team determined the stations that would be assumed for each project. Only a very small number of new stations were proposed for improvements to existing lines, but station locations, including the location and sizing of parking facilities, needed to be identified for all extensions and new rail lines. For projects that have not had station locations identified in previous studies, recommendations were made based on access, activity centers, spacing, development patterns, availability of land, etc. In most cases, uniform assumptions were made on the size of the station building, length of platforms, and capacity of parking lots. In several cases, other improvements, for example the addition of a new mainline track, required the reconfiguration of platforms at existing stations. Several programmed stations were assumed as existing for the purpose of this analysis, including Romeoville,

Auburn Park, and Peterson/Ridge (Romeoville was opened in February 2018).

Operational Arrangements – The operational and maintenance arrangement expected for each project were identified, which factored into the estimates of Operating & Maintenance (O&M) costs. This included the following arrangements:

- Metra-owned or leased, and directly operated (e.g. MED, SWS, RID, MD-W, MD-N)
- Metra-operated under a trackage-rights agreement (e.g. HC, NCS)
- Owned and operated by freight railroad under a Purchase of Service Agreement (PSA) (e.g. BNSF, UP-W, UP-NW, UP-N)

2.2 Operating Plans

This task identifies operating parameters for each project that establish what infrastructure is required to operate the proposed service (including vehicle requirements), O&M costs of the proposed services, and potential to attract additional riders to the proposed service. As noted previously, these operating plans were developed without the input of the freight railroad operators.

For projects to improve existing lines, existing train schedules were evaluated and opportunities sought to, where possible, accomplish the following:

- Address existing crowding situations and areas of growing demand
- Reduce travel times by expanding express service
- Introduce or expand off-peak service (service in midday, in evenings, and in the reverse direction during the peak period)

In developing potential operating schedules, a general guide of 20-minute headways at stations for peak period/peak direction trains, and 60 minutes off-peak was used. Variations were also evaluated, including, for example, operating 30-minute service during midday periods on certain lines, where little to no freight service operates. Because the ridership models used in this analysis only forecast weekday service periods, weekend schedules were not examined. Note that the schedules developed for this study were purely conceptual. They would still require a good deal of vetting and refining before moving forward into design or implementation, but they provide

a high-level input to be able to compare the potential benefits of each proposal.

For Metra line extension and new-line projects, prior studies provided guidance on appropriate operating plan characteristics, such as travel times and frequencies. In instances where prior study information was not available, station mileposts and a 45 mph average travel speed between station stops were assumed in order to estimate travel times and frequencies. Train schedules for line extensions were generally assumed to be peak period/direction only. For new Metra lines, a service plan was defined based on current Metra service levels in comparable corridors/areas.

Draft schedules were based on General Transit Feed Specification (GTFS) files of current Metra service, and included the application of consistent times between stations, the “blocking” of trains to estimate vehicle requirements, and calculation of operating statistics used in O&M costing (e.g., train revenue miles).

2.3 Capital Improvement Plans

The defined elements of each project were subjected to an early concept engineering step that was in sufficient detail to develop estimated capital costs on a unit-cost basis. Proposed infrastructure elements were organized to best align with the FTA’s Standard Cost Category (SCC) capital cost workbook. The following describes the principal activities of the capital planning work.

Added Track – The length of the improvement in miles was estimated by a review of aerial photography, Metra track charts, and right-of-way property maps to determine the need for raising the roadbed (graded fill or retaining walls), acquiring right-of-way, and widening existing bridges over roads, rails and waterways.

Stations and Parking – The identification of new stations mostly occurred with Tier 2 projects. Parking at new stations was assumed to be 500 spaces. Expansion of parking at existing stations considered current utilization and ridership forecasts. The siting of stations and parking for building size and platform length was generally of standard dimensions. Platform access requirements were based on the unique characteristics of recommended sites (e.g., at-grade or elevated right-of-way).

Maintenance & Storage Facilities – The location, size and space required for maintenance and storage

facilities (MSF) was identified. Metra has traditionally located its heavy vehicle repair facilities in and around downtown Chicago with overnight layover facilities near the outer end of lines. The number of trainsets required by projects determined the need to expand facility capacity, and many project definitions included expansions of existing Metra maintenance facilities. Consideration of MSF expansion or siting of new MSFs included a desktop review of environmental constraints, such as the presence of wetlands and floodplains.

The Elburn Yard, Metra’s newest coach yard, served as the prototype to develop key design assumptions for new yards, including the number of storage tracks, and train length inputs into track length, track footprint and total site area calculations.

Necessary expansion of downtown vehicle storage (linear feet of track) and maintenance facilities (square feet of buildings) was also identified, and documented on aerial photos.

Vehicles – The number of new trainsets required was estimated in the operating plans. For diesel-propelled equipment, trainsets were uniformly assumed at eight cars plus one locomotive. A ten percent spare ratio was also assumed, rounding up to the nearest whole rail car or locomotive. The MED assumed six-car trainsets plus spares at a ten percent ratio.

2.4 O&M Costs

A consistent method for estimating annual O&M costs associated with each project was developed and applied. An operating cost model was developed using two primary sources of input data: 2016 operating statistics, and 2016 annual financial data.

The model uses six cost drivers and seven cost categories, shown in **Table 2-1**, to estimate the impact of changes in service on the cost of O&M. Each of the eight Metra lines or line groupings received a tailored version of the model.

The model uses one or two cost drivers for each of the cost categories. For example, Car Miles was the driver for estimating Fuel costs. Unit costs were developed for each cost item by dividing the total 2016 cost for each category by the total 2016 operating statistic for the appropriate cost driver(s). Operating costs are then estimated by multiplying the service statistics for the

Table 2-1. O&M Cost Model Elements

Cost Drivers	Cost Categories	Metra Lines
<ul style="list-style-type: none"> ▪ Car Miles ▪ Passenger Cars ▪ Route Miles ▪ Track Miles ▪ Train Hours ▪ Train Trips 	<ul style="list-style-type: none"> ▪ Transportation ▪ Maintenance of Way ▪ Maintenance of Equipment ▪ Administration 	<ul style="list-style-type: none"> ▪ Fuel/Electricity ▪ Downtown Stations ▪ Claims, Risk Management, Property & Liability Insurance ▪ BNSF ▪ MED ▪ HC ▪ Milwaukee District (MD-W & MD-N) ▪ NCS ▪ RID ▪ SWS ▪ UP (UP-N, UP-NW, & UP-W)

proposed alternatives by the appropriate unit costs for the given Metra line. This level of detail provides results that are appropriate for planning efforts and for making high level comparisons between alternatives.

basis with a factor of seven percent. This approach permits performance indices that are comparable to those used in the FTA's Capital Investment Grants (CIG) Program.

2.5 Capital Costs

Capital costing generally followed the Federal Transit Administration's (FTA) SCC structure. Relevant and applicable unit costs were drawn from:

- Metra project and cost experience, where available
- Metra's Capital Asset Condition Assessment, and
- FTA's Capital Cost Database.

All construction labor costs assume the prevailing wage rate for the Chicago area. Railroad alignments with typical sections use similar unit costs (such as ballasted track, retained fill sections, elevated structure, etc.). Any alignment requiring a special structure has separate cost estimates. Per FTA SCC procedures, there are two types of contingencies: Allocated and Unallocated. Allocated contingencies apply to the specific SCC item representing the relative risks associated with that work, and range between 10 and 40 percent. An Unallocated contingency applies to all project elements at an assumed 10 percent. Any cost data used from geographic areas outside of the Chicago area are adjusted by location factors published by R. S. Means. All costs are expressed in 2016 dollars.

Professional Service cost estimates assume a percentage factor applied to all estimated costs not including real estate and vehicles. The factors for eight Professional Service sub-categories total 30 percent.

In addition to capital cost estimates for the base year, each of the project estimates use an annualized cost

2.6 Ridership

Project ridership are estimated using a version of FTA's Simplified Trips-on-Project Software (STOPS) model adapted to the Chicago metropolitan area by the Regional Transportation Authority (RTA). Forecasts are for the planning horizon year of 2040, using Chicago Metropolitan Agency for Planning (CMAP) socio-economic forecasts. Forecasts reflect the No-build scenario and each project scenario. Revenues are estimated for Tier 1 projects using line-level average fares; for Tier 2 extensions using affected outer zone average fares; and for the Tier 2 STAR and SES projects using Metra system-wide average fare. The following are the outputs generated for each project:

- Total boardings
- Boardings by access mode (i.e., Walk, Drop Off, Park-n-Ride)
- Comparison to latest Metra boarding counts (fall 2016)
- Difference in boardings from the No-build scenario
- Impacts/changes in boardings on nearby lines
- Estimated fare revenue (calculated based on outputs from ridership model and average fares)

2.7 State of Good Repair Impacts

Projects that involve use of existing Metra assets were identified during the development of the Capital Improvement Plans and Capital Costs. For example, the addition of a second mainline track would require

modification to roadway crossings, which would involve some renewal of the existing single-track crossing. The renewal or improvements to existing assets that a new project would require were expressed as a percentage of the total project element cost. The application of this percentage to the element costs are summed for all affected assets to yield the project investment amount that would benefit Metra's State of Good Repair (SGR). These estimates apply to Tier 1 projects (improvements to existing lines) to a much greater extent than the Tier 2 projects (extensions or new lines). **Table 2-2** shows examples of the percentages that were assumed. Depending on the circumstances of an individual project's interface with existing assets, some minor variations to these may have applied.

Table 2-2. State of Good Repair Percentages of Project Improvements

Capital Improvement Element	% SGR
Rehab / Upgrade Track	100%
Added 2nd, 3rd, or 4th Track	10%
Relocate Track	30%
New Turnouts, Switches, Crossovers, Diamonds	10%
Power Manual Switch	40%
Rebuild Interlocking	50%
Viaduct Expansion	25%
New Flyover	5%
Station Improvements/Expansion	50%
Platform Extension, Added Platform	10%
Added Platform	10%
Outlying Yard Expansion	10%
Maintenance Facility Expansion	10%
Replace Wheel Truing Machine / Train Washer	100%
Train Control/Signal Expansion	20%
Central Control Expansion	25%
Communication System Expansion	20%
Crossing Protection for Added Track	50%
Expand Power Distribution / Catenary	20%

2.8 Reliability Impacts

Metra riders consistently indicate that getting to their destination on time is one of the most important reasons why they ride Metra. With that in mind,

projects that have the potential to eliminate chronic sources of delay by reducing or eliminating conflicts can have significant benefits to Metra riders. Potential projects that improve or expand existing lines could address some of the root causes of delay.

To determine the reliability impacts of the potential projects, average annual reported delays by location were tabulated based on historic delay data from January 2010 to August 2015. If an upgrade was proposed at a location that has historically had delays, it was assumed that these delays would be eliminated. The resultant metric is an estimate of annual delays eliminated by project. Similar to State of Good Repair Impacts, this analysis impacted Tier 1 projects more than Tier 2 since most Tier 2 improvements are outside the existing Metra system.

2.9 Project Timeframe

The likelihood of advancing a project is affected by the timeframe anticipated for development, including project cost, complexity, land acquisition, anticipated environmental issues, coordination with other infrastructure initiatives, design and eventual construction. The potential projects are grouped into one of three timeframes:

- Less than five years
- Five to ten years
- More than ten years

Note that these timeframes begin after a funding plan is in place.

2.10 Potential Funding Sources

In order to move any of the potential projects forward, additional funding will be required. The study team examined several potential funding programs and assessed the degree of compatibility of each potential project with the funding sources. Funding programs include both federal funding opportunities as well as the potential to work with other partners or take advantage of financing mechanisms:

- FTA Section 5309 Capital Investment Grants (CIG), including New Starts and Core Capacity
- US DOT Better Utilizing Investments to Leverage Development (BUILD) grants, which replaced

Transportation Investment Generating Economic Recovery (TIGER) grants

- Federal Aviation Administration (FAA) grants
- Bonding
- Public-Private Partnership (P-3)

An evaluation matrix assesses program compatibility using the following variables for each project:

- New rolling stock required
- Shared freight operations
- Shared Amtrak operations
- Owner of corridor right-of-way and assets
- Peak period percent of seat use
- Number of trains over 90% utilization
- Line extension
- Speed increase due to improvements

2.11 Connecting Services

This task identified the percent of a project's stations that are served by connecting public transit, including Pace bus, CTA bus and/or rapid transit, Amtrak, or another Metra line. This metric serves as an indicator of how connected the specific project is to the broader transit network. Projects with a greater number of connections are better at serving transit dependent populations that do not have access to an auto to access the commuter rail service. Findings from this task can help to identify potential partners that may also benefit from the project.

2.12 Tier 1 and 2 Synergies

This task reviewed Tier 1 and 2 projects to identify investments that would benefit more than one of the potential projects and increase the impact of that single investment. For instance, the addition of overnight yard space to support a service expansion on an existing line could also provide additional capacity for an extension of the same line. This measure indicates whether the project is focused on providing standalone benefits or whether its benefits can be further extended if paired with another project.

3. Projects Analyzed

Projects fall under one of three groups:

- Tier 1 Existing line improvements (18 projects)
- Tier 1 Existing facility improvements impacting multiple lines (3 projects)
- Tier 2 Proposed extensions and new lines (17 projects)

Table 3-1 lists the 38 projects included in the Cost-Benefit Analysis. In some cases, lines include variations that are analyzed as separate projects. The detailed project definitions for each project are included in the appendix to this report.

Table 3-1. Cost Benefit Analysis Projects

Group	Project ID	Line	Project	
TIER 1 Line	1A	MED	Modest Service Increase	
	1B	MED	Modern Metra Electric	
	2	RID	Improvements	
	3A	SWS	Speed Improvements	
	3B	SWS	Intermediate Improvements	
	3C	SWS	Full Service	
	5	HC	Improvements	
	7	BNSF	Improvements	
	8	UP-W	Improvements	
	10	MD-W	Improvements	
	11A	UP-NW	Mainline Improvements	
	11B	UP-NW	Mainline & Branch Improvements	
	12A	MD-N	2-Track Improvements	
	12B	MD-N	3-Track Improvements	
	13A	NCS	Intermediate Improvements	
	13B	NCS	Full Service	
	TIER 1 Multi-Line	14A	UP-N	2-Track Improvements
		14B	UP-N	3-Track Improvements
6		CUS	Improvements	
TIER 2	9A	A-2	Relocated At-Grade Crossing	
	9B	A-2	Flyover Crossing	
	15A	SES	SES Separate Operations	
	15B	SES	SES Extended to SSA	
	15C	SES	SES MED Loop to SSA	
	16A	MED	Extension to Peotone	
	16B	MED	Extension to SSA Full Service	
	16C	MED	Extension to SSA Express	
	17	RID	Extension to Minooka	
	18	HC	Extension to Wilmington	
	19	BNSF	Extension to Kendall County	
	20	BNSF	Extension to Sugar Grove	
	21A	MD-W	Extension to Marengo	
	21B	MD-W	Extension to Hampshire	
	22	MD-N	Extension to Richmond	
	23	MD-N	Extension to Wadsworth	
	24	STAR	East, Joliet-Lynwood	
25	STAR	West, Rosemont-Joliet		
26	STAR	North, Waukegan-Prairie Stone		

The list of projects includes:

- At least one improvement project on each of Metra's existing rail lines, including several lines with multiple variations of improvement projects.
- Two highly problematic infrastructure challenges (Chicago Union Station and the A-2 Interlocking) that affect multiple lines.
- Extensions of six lines, including eleven separate projects.
- Two new routes – SouthEast Service (SES) and STAR Line. These two routes are evaluated as part of six separate projects, including one SES variation that is combined with the MED.

As noted previously, projects are defined to address specific areas that would improve performance. In many cases, higher service levels would be a key driver of ridership growth, but operating more service would require infrastructure investment and raise operating costs. Table 3-2 illustrates the degree that projects address each of eight focus areas listed in Section 2.1 of this report. Note that extended or new lines only impact the first seven areas if there is a need to use existing Metra infrastructure or service.

Table 3-2. Cost Benefit Analysis Project by Focus Area

				Service Level	Speed	Crowded Trains	Bottle-necks	Track & Systems	MSFs	Station & Parking	Service Coverage
	Proj ID	Line	Project								
TIER 1 Line	1A	MED	Modest Service Increase	Minor Impact					Some Impact	Minor Impact	
	1B	MED	Modern Metra Electric	Major Impact					Major Impact		
	2	RID	Improvements	Minor Impact	Some Impact		Some Impact	Some Impact	Some Impact	Minor Impact	
	3A	SWS	Speed Improvements		Major Impact		Major Impact	Major Impact	Some Impact		
	3B	SWS	Intermediate Improvements	Some Impact	Major Impact		Major Impact	Major Impact	Major Impact	Some Impact	
	3C	SWS	Full Service	Major Impact	Major Impact		Major Impact	Major Impact	Major Impact	Some Impact	
	5	HC	Improvements	Major Impact			Major Impact			Some Impact	
	7	BNSF	Improvements	Some Impact		Major Impact	Some Impact	Minor Impact		Major Impact	
	8	UP-W	Improvements	Some Impact	Some Impact		Some Impact	Some Impact	Some Impact	Some Impact	
	10	MD-W	Improvements	Some Impact			Minor Impact	Minor Impact	Some Impact		
	11A	UP-NW	Mainline Improvements	Some Impact	Some Impact				Some Impact	Some Impact	
	11B	UP-NW	ML & Branch Improvements	Some Impact	Some Impact			Some Impact	Some Impact	Some Impact	Minor Impact
	12A	MD-N	2-Track Improvements	Some Impact	Some Impact		Some Impact	Some Impact	Some Impact	Some Impact	
	12B	MD-N	3-Track Improvements	Some Impact	Some Impact		Some Impact	Major Impact	Some Impact	Some Impact	
13A	NCS	Intermediate Improvements	Some Impact			Some Impact	Minor Impact	Some Impact			
13B	NCS	Full Service	Major Impact	Some Impact		Some Impact	Some Impact	Some Impact			
14A	UP-N	2-Track Improvements	Some Impact	Some Impact	Some Impact			Major Impact	Some Impact		
14B	UP-N	3-Track Improvements	Some Impact	Some Impact	Some Impact		Major Impact	Major Impact	Some Impact		
TIER 1 Multi-Line	6	CUS	Improvements		Some Impact					Major Impact	
	9A	A-2	Relocated At-Grade Crossing				Major Impact				
	9B	A-2	Flyover Crossing		Some Impact		Major Impact				

LEGEND: Major Impact (Dark Green), Some Impact (Light Green), Minor Impact (Yellow), No Impact (White)

	Proj ID	Line	Project	Service Level	Speed	Crowded Trains	Bottle-necks	Track & Systems	MSFs	Station & Parking	Service Coverage
TIER 2	15A	SES	SES Separate Operations					Major Impact	Major Impact	Some Impact	Major Impact
	15B	SES	SES Extended to SSA	Minor Impact					Major Impact	Some Impact	Major Impact
	15C	SES	SES MED Loop	Major Impact					Major Impact	Some Impact	Major Impact
	16A	MED	Extension to Peotone					Minor Impact	Minor Impact		Major Impact
	16B	MED	Extension to SSA Full Serv.					Some Impact	Some Impact		Major Impact
	16C	MED	Extension to SSA Express					Some Impact			Major Impact
	17	RID	Extension to Minooka								Major Impact
	18	HC	Extension to Wilmington								Major Impact
	19	BNSF	Extension to Kendall County								Major Impact
	20	BNSF	Extension to Sugar Grove								Major Impact
	21A	MD-W	Extension to Marengo								Major Impact
	21B	MD-W	Extension to Hampshire								Major Impact
	22	MD-N	Extension to Richmond								Major Impact
	23	MD-N	Extension to Wadsworth		Minor Impact				Some Impact		Major Impact
	24	STAR	East – Joliet-Lynwood							Minor Impact	Major Impact
	25	STAR	West – Rosemont-Joliet							Minor Impact	Major Impact
26	STAR	North – Wauk-Prairie Stone							Minor Impact	Major Impact	

LEGEND: Major Impact (Dark Green), Some Impact (Light Green), Minor Impact (Yellow), No Impact (White)

The level of service measure is the proposed number of trains to be operated per day. As shown in **Table 3-3**, the study examined increasing service levels on Metra’s three limited service lines (NCS, HC, and SWS) to evaluate the impact. Many improvement projects would provide additional express trains to reduce travel times for riders from more distant stations. The MED was tested with greatly expanded off-peak service (233 added trains). Finally, the MD-N and UP-N include projects to evaluate operating 30-minute off-peak service. Note that the number of existing trains represents service in effect at the time of the analysis in 2016. Changes of varying degrees have

been implemented on several lines subsequent to the analysis, including a major service revision on the MED in fall 2017, which is not reflected in the analysis. Weekend service was not considered as part of this analysis, due to the fact that the ridership modeling only forecasts weekday demand. In addition, most infrastructure improvements would address the need to accommodate weekday peak period train frequencies.

Table 3-3. Tier 1 Weekday Trains by Project

Existing Rail Line				Weekday Trains by Time Period				Change in Total
#	Proposed Project	Status	Peak	Reverse Peak	Off-Peak	Total		
	MED	Existing	75	23	72	170		
1A	Modest Service Improvements	Proposed	83	27	82	192	22	
1B	Modern Metra Service	Proposed	83	79	294	456	286	
	RID	Existing	36	10	23	69		
2	Improvements	Proposed	41	10	38	89	20	
	SWS	Existing	11	6	13	30		
3A	Speed Improvements	Proposed	11	6	13	30	0	
3B	Intermediate	Proposed	17	6	15	38	8	
3C	Full Service	Proposed	19	6	21	46	16	
	HC	Existing	6	0	1	7		
5	Improvements	Proposed	10	7	13	30	23	
	CUS	Existing	133	46	92	271		
6	Improvements	Proposed	133	46	92	271	0	
	BNSF	Existing	54	16	24	94		
7	Improvements	Proposed	62	16	34	112	18	
	UP-W	Existing	26	9	24	59		
8	Improvements	Proposed	38	16	26	80	21	
	A-2	Existing	88	33	78	199		
9A	At-Grade	Proposed	88	33	78	199	0	
9B	Flyover	Proposed	88	33	78	199	0	
	MD-W	Existing	27	9	22	58		
10	Improvements	Proposed	34	12	25	71	13	
	UP-NW	Existing	33	9	23	65		
11A	Mainline Improvements	Proposed	38	14	23	75	10	
11B	ML & Branch Improvements	Proposed	44	14	26	84	19	
	MD-N	Existing	24	11	25	60		
12A	2-Track Improvements	Proposed	33	14	26	73	13	
12B	3-Track Improvements	Proposed	33	17	37	87	27	
	NCS	Existing	11	4	7	22		
13A	Intermediate	Proposed	12	7	17	36	14	
13B	Full Service	Proposed	16	9	27	52	30	
	UP-N	Existing	29	15	26	70		
14A	2-Track	Proposed	33	20	35	88	18	
14B	3-Track	Proposed	37	20	41	98	28	

Table 3-4 shows the number of trains proposed for Tier 2 projects. Since extension projects generally assumed that existing trains would be extended, there

was no change in the number of trains operated. Proposed train counts are included for the two proposed lines, SES and STAR.

Table 3-4. Tier 2 Weekday Trains by Project

Existing Rail Line		Weekday Trains	Change from	
#	Proposed Project		Existing	Extended Trains
15A	SES Shared Operations	28	28	--
15B	SES Extended to SSA	28	28	--
	MED	170		
15C	SES/MED Loop	297	127	--
16A	Extension to Peotone	170	0	8
16B	Extension to SSA Full Service	170	0	54
16C	Extension to SSA Express	192	22	76
	RID	69		
17	Extension to Minooka	69	0	8
	HC	7		
18	Extension to Wilmington	7	0	6
	BNSF	94		
19	Extension to Kendall County	94	0	8
20	Extension to Sugar Grove	94	0	8
	MD-W	58		
21A	Extension to Marengo	58	0	8
21B	Extension to Hampshire	58	0	8
	MD-N	60		
22	Extension to Richmond	60	0	8
23	Extension to Wadsworth	68	8	8
24	STAR East – Joliet-Lynwood	54	54	--
25	STAR West – Rosemont-Joliet	107	107	--
26	STAR North – Wauk-Prairie Stone	54	54	--

4. Analysis Metrics

The primary product of this study is a set of metrics to analyze the potential projects from several perspectives, including:

- Ridership and Revenue
- Costs - Capital and O&M
- Cost-Effectiveness
- Other Metrics
 - State of Good Repair
 - Reliability
 - Time required to implement
 - Potential funding sources
 - Transit connectivity
 - Synergy between Tier 1 and 2

The following describes each of measures that were used.

4.1 Ridership and Revenue

Modeled Weekday Passenger Trips – Results of the application of the STOPS model for 2040 passenger trips for a No-Build scenario and each individual project were documented. Forecasted weekday passenger trips were broken down by access mode (i.e., walk, drop-off, and park-n-ride), and included passenger trips on all other Metra lines. The difference from the No-Build ridership is a measure of the impact of the improvement.

Ridership Impacts on other Lines – For rail lines that parallel a given project line, the measure calculated change in the nearby line's passenger trips. The impacted rail lines are documented, and the rail line showing the greatest loss, or least gain, is highlighted in the results table.

Net Passenger Trips – To account for diversions, ridership change on nearby lines was removed from the modeled difference between No-Build and Project passenger trips. Thus, the key measure is the change in passenger use of the system. Weekday net

boardings were annualized based on factors derived from current Metra service.

Revenue – Annual project fare revenue was estimated by applying current average fares to estimated annual net boardings.

4.2 Costs

Capital Costs – Capital costs were estimated in 2016 dollars.

Annualized Capital Costs – A simplifying assumption was used to convert total capital costs into an annual number (i.e., annual costs represent seven percent of capital costs).

O&M Costs – Estimates were made for the No-Build scenario and for each project, stated in 2016 dollars. The difference was used as the estimated cost associated with the project improvements. The difference was expressed as a percentage.

Annual Cost – The sum of annualized capital costs and O&M cost.

4.3 Cost-Effectiveness

Farebox Recovery Ratio – This is derived by dividing annual net O&M costs into estimated revenue based on net passenger trips, expressed as a percentage. The RTA and the operating agencies (CTA, Metra and Pace) are required to have at least 50 percent total farebox recovery; the RTA sets individual recovery ratios for each of the operating agencies to achieve this. Metra's 2018 mark is 52.5 percent. Note that this measure does not include capital investment so some projects that have high capital costs and limited additional operating costs show very high ratios. Of course, these do not convey the full picture of a project's success..

Cost per New Trip – This is FTA's cost-effectiveness measure, used to evaluate grant applications for major capital expansion federal funding programs. This

measure divides annual costs (O&M + annualized capital) by net ridership gain. FTA publishes breakpoints that rate outcomes to five levels of performance (High, Medium-High, Medium, Medium-Low, and Low).

Net Cost per New Trip – Similar to Cost per New Trip, this measure reduces annual cost by estimated revenue representing the estimated subsidy per new trip.

4.4 Other Metrics

State of Good Repair (SGR) – Percentage of capital costs that benefit Metra's existing assets. Higher percentages translate to greater contributions toward improving the system's SGR.

Reliability – Annual delays that would be potentially eliminated with the implementation of a project. Lines that currently report higher levels of delay have the potential to perform better under this measure. The measure impacted Tier 1 projects to a much greater extent than Tier 2 projects.

Project Timeline – Projects were assigned one of three timeframes estimated to be required to plan, design, and build projects (less than 5 years, 5 – 10 years, and more than 10 years). This characterizes a project's size and complexity.

Funding Programs – Identifies potential programs that could be used to fund the project.

Connecting Service – The percent of stations that have connections with other transit services. The higher the percentage, the more a given project would benefit the region's transit network.

Tier 1 and 2 Synergy – Projects in one group that relate to other projects in the second group can offer coordination opportunities, such as initial phased implementation, joint funding, or to prevent a decision that would complicate development of another initiative in the future.

5. Analysis Results

The performance results for the Tier 1 and Tier 2 projects are presented in **Table 5-1 (Tier 1)** and **Table 5-2 (Tier 2)**. Tier 1 projects are grouped by improvements to individual Metra lines and to facilities impacting multiple lines (CUS and A-2), then by project number. Tier 2 projects are listed in order of project number.

The results are presented without direct comparisons between projects, consistent with the intent of the study. That is, Metra staff can use these results to make informed recommendations on the priority of projects to advance for more detailed study, exploration of potential funding sources, and solicitation of feedback from Metra policy-makers and key stakeholders.

Table 5-1. Tier 1 Project Summaries

Projects Impacting a Single Rail Line with Additional Service			Weekday Revenue Trains		Ridership (All in year 2040, except as noted)							Capital Costs (2016)		O&M Costs (2016)			Annual Cost (2016)	Estimated Revenue	Farebox Recovery Ratio	Cost Per New Trip		SGR Impact	Reliability Impact	Project Time-frame	Funding Program ^c	Connecting Services	Other Factors and Notes	
#	Proposed Project	Status	Total	Change from Existing	Existing Weekday Passenger Trips (2016)	Modeled Weekday Passenger Trips	Difference from No-Build Wkdy %	Impacted Lines ^a	Difference on Adjacent Lines	Net Passenger Trips Gain/Loss	Total (\$M)	Annualized (\$M) ^b	Estimated Annual (\$M)	Difference from No-Build (\$M) %	Annualized Capital + Net O&M Cost (\$M)	Estimated Annual (\$M)	Net Revenue / Net O&M Costs (%)	Total - Only Includes Costs [FTA metric] (\$/new trip)	Net Cost/ New Trip [i.e. Subsidy] (\$/new trip)	How Much of Project is SGR (\$M) %	Projected # of Delays / Year Eliminated	Years to Complete Project	Compatible Programs	% of Stations with Connections				
1A	MED Improvements	No-Build	170	-	30,000	37,300	-		-	-	-	-	102.8	-	-	-	-	-	-	-	-	-	-	-	92%	-		
		Proposed	192	22		42,000	4,700	13%	RID	-400	4,300	27.7	1.9	109.1	6.3	6%	8.2	5.1	80%	\$6.97	\$2.69	1.9	7%	40	<5	-	-	30 min off-peak mainline
1B	20-Min All-Day Headways	Proposed	456	286		46,500	9,200	25%		9,700	931.1	65.2	192.2	89.4	82%	154.6	11.4	13%	\$57.95	\$53.67	46.2	5%	0	>10	-	-	20 min all day service	
2	RID Improvements	No-Build	69	-	27,000	33,700	-		-	-	-	-	77.1	-	-	-	-	-	-	-	-	-	-	-	81%	-		
		Proposed	89	20		37,100	3,400	10%	MED, SWS	600	4,000	563.1	39.4	87.2	10.1	13%	49.5	4.7	47%	\$45.01	\$40.71	31.9	6%	220	5 - 10	B, T	-	3rd Main included
3A	SWS Speed Improvements	No-Build	30	-	9,100	10,000	-		-	-	-	-	31.8	-	-	-	-	-	-	-	-	-	-	-	62%	-		
		Proposed	30	0		20,700	10,700	107%		-3,700	7,000	1,386.2	97.0	32.7	0.9	3%	97.9	7.9	882%	\$50.87	\$46.75	79.3	6%	330	>10	B, T	-	75th CIP+RID included
		Intermediate	Proposed	38	8		23,500	13,500	135%	RID, HC	-5,100	8,400	1,533.2	107.3	37.4	5.6	18%	112.9	9.5	170%	\$48.89	\$44.76	80.2	5%	337	>10	B, T	-
3C	Full Service	Proposed	46	16		27,800	17,800	178%		-6,900	10,900	1,669.0	116.8	42.3	10.5	33%	127.3	12.4	118%	\$42.48	\$38.36	85.7	5%	366	>10	B, T	-	75th CIP+RID included
5	HC Improvements	No-Build	7	-	2,500	3,000	-		-	-	-	-	5.4	-	-	-	-	-	-	-	-	-	-	-	83%	-		
		Proposed	30	23		9,400	6,400	213%	RID, SWS, BNSF	-3,900	2,500	270.7	19.0	15.3	9.9	183%	28.9	3.1	32%	\$41.97	\$37.39	13.7	5%	20	>10	B, T	-	Relieves BNSF
7	BNSF Improvements	No-Build	94	-	54,800	68,300	-		-	-	-	-	69.4	-	-	-	-	-	-	-	-	-	-	-	81%	-		
		Proposed	112	18		76,800	8,500	12%	HC, UP-W	100	8,600	268.2	18.8	79.9	10.5	15%	29.3	11.0	105%	\$12.38	\$7.71	3.1	1%	99	5 - 10	P3, B, T	-	New Eola Station
8	UP-W Improvements	No-Build	59	-	27,400	31,400	-		-	-	-	-	67.5	-	-	-	-	-	-	-	-	-	-	-	79%	-		
		Proposed	80	21		47,100	15,700	50%	BNSF, MD-W	-5,200	10,500	385.2	27.0	80.1	12.6	19%	39.6	13.6	108%	\$13.70	\$8.98	27.0	7%	139	5 - 10	B, T	-	Relieves BNSF
10	MD-W Improvements	No-Build	58	-	22,400	25,900	-		-	-	-	-	58.3	-	-	-	-	-	-	-	-	-	-	-	82%	-		
		Proposed	71	13		29,500	3,600	14%	UP-W, UP-NW	-300	3,300	629.3	44.1	65.5	7.2	12%	51.3	4.4	61%	\$56.48	\$51.66	118.1	19%	130	5 - 10	B	-	4th main A-5 to CUS included
11A	UP-NW Mainline Improvements	No-Build	65	-	36,900	51,000	-		-	-	-	-	84.2	-	-	-	-	-	-	-	-	-	-	-	78%	-		
		Proposed	75	10		55,400	4,400	9%	MD-W, MD-N, NCS	-1,300	3,100	453.7	31.8	90.0	5.8	7%	37.6	4.2	73%	\$44.06	\$39.10	49.7	11%	29	5 - 10	B	-	Relieves MD-N
11B	Mainline & Branch Imprvs.	Proposed	84	19		57,600	6,600	13%		-2,200	4,400	703.2	49.2	97.5	13.3	16%	62.5	6.0	45%	\$51.67	\$46.71	53.2	8%	58	5 - 10	NS, B, T	-	Relieves MD-N
12A	MD-N 2-Track Improvements	No-Build	60	-	23,400	32,700	-		-	-	-	-	60.7	-	-	-	-	-	-	-	-	-	-	-	91%	-		
		Proposed	73	13		36,500	3,800	12%	UP-NW, NCS, UP-N	-300	3,500	680.7	47.7	68.7	8.0	13%	55.7	4.6	57%	\$57.82	\$53.05	118.8	17%	157	5 - 10	T	-	new Rondout Coach Yard
12B	3-Track Improvements	Proposed	87	27		39,800	7,100	22%		-800	6,300	1,830.7	128.1	73.3	12.6	21%	140.7	8.3	66%	\$81.24	\$76.47	152.9	8%	399	5 - 10	CC, B, T	-	Added main Rondout to CUS
13A	NCS Intermediate	No-Build	22	-	6,100	9,800	-		-	-	-	-	24.6	-	-	-	-	-	-	-	-	-	-	-	83%	-		
		Proposed	36	14		12,800	3,000	31%	UP-NW, MD-N, UP-N	-1,400	1,600	451.5	31.6	35.1	10.5	43%	42.1	2.2	21%	\$95.69	\$90.68	108.6	24%	85	5 - 10	B	-	4th main A-5 to CUS included
13B	Full Service	Proposed	52	30		13,800	4,000	41%		-1,700	2,300	500.7	35.1	42.6	18.0	73%	53.1	3.2	18%	\$83.87	\$78.86	109.1	22%	128	5 - 10	B	-	4th main A-5 to CUS included
14A	UP-N 2-Track	No-Build	70	-	32,000	44,000	-		-	-	-	-	67.0	-	-	-	-	-	-	-	-	-	-	-	92%	-		
		Proposed	88	18		48,900	4,900	11%	MD-N, NCS	-1,100	3,800	338.2	23.7	77.2	10.2	15%	33.9	4.5	44%	\$32.41	\$28.11	19.0	6%	113	5 - 10	B, T	-	3rd Main NOT included
14B	3-Track	Proposed	98	28		58,600	14,600	33%		-2,700	11,900	961.2	67.3	81.1	14.1	21%	81.4	14.1	100%	\$24.87	\$20.56	49.8	5%	267	5 - 10	CC, B, T	-	3rd Main included
Projects Impacting Multiple Lines with No Additional Service																												
6	CUS Improvements	No-Build	271	-	118,300	149,800	-		-	-	-	-	254.3	-	-	-	-	-	-	-	-	-	-	-	-	80%	-	
		Proposed	271	0		153,100	3,300	2%	RID, UP-W, -NW, -N	-1,200	2,100	500.0	35.0	254.3	0.0	0%	35.0	2.7	-	\$60.61	\$55.92	50.0	10%	286	5 - 10	-	-	Assumed 1 minute saved/trip
9A	A-2 At-Grade	No-Build	199	-	79,300	99,800	-		-	-	-	-	211.0	-	-	-	-	-	-	-	-	-	-	-	-	83%	-	
		Proposed	199	0		107,000	7,200	7%	BNSF, UP-NW, UP-N	-3,800	3,400	227.1	15.9	209.9	-1.1	-1%	14.8	4.5	n/a	\$15.82	\$11.04	170.3	75%	198	5 - 10	T	-	A-2 sits on bridge at end of life
9B	Flyover	Proposed	199	0		111,000	11,200	11%		-3,700	7,500	702.5	49.2	209.2	-1.8	-1%	258.4	9.9	n/a	\$125.27	\$120.49	582.8	83%	198	>10	-	-	A-2 sits on bridge at end of life

n/a=not applicable

NOTES: ^a Line in blue font showed greatest loss or least gain.
^b Total capital cost on an annual basis using a factor of 7%
^c Funding Programs: NS=New Starts, CC=Core Capacity, B=Bonding, T=TIGER (now BUILD), P3 = Public-Private Partnership.
 High Viability = Green / Moderate Viability = Orange

METHODOLOGY: Ridership was estimated using the FTA STOPS Model and is shown in year 2040 estimates.
 Capital Costs were developed in FTA's Standard Cost Categories and escalated to current year (2016) costs.
 Operating Costs were developed using a model developed based on recent Metra operating costs.
 Cost per New Rider was calculated dividing annual cost by net ridership gain (annualized by 275).
 Estimated Revenue was calculated using line-specific 2017 average fares.

FTA Breakpoints for Cost Per New Trip (from: www.transit.dot.gov/grants)	
High	<\$4.00
Medium-High	\$4.00-\$5.99
Medium	\$6.00-\$9.99
Medium-Low	\$10.00-\$14.99
Low	>\$15.00

Table 5-2. Tier 2 Project Summaries

#	Existing Rail Line	Proposed Project	Status	Weekday Trains		Ridership (2040)					Capital Costs (2016)		O&M Costs (2016)			Annual Cost (2016)	Estimated Revenue	Farebox Recovery Ratio	Cost Per New Trip		SGR Impact		Reliability Impact	Project Time-frame	Funding Program ^d	Synergies with Tier 1	Misc. Notes			
				Total (x) ^a	Change from Existing	Weekday Passenger Trips	Difference from No-Build Wkdy	%	Impacted Lines ^b	Difference on Adjacent Lines	Net Passenger Trips Gain/Loss	Total (\$M)	Annualized (\$M) ^c	Estimated Annual (\$M)	Difference from No-Build (\$M)	%	Annualized Capital + Net O&M Cost (\$M)	Estimated Annual (\$M)	Net Revenue / Net O&M Costs (%)	Total - Only Includes Costs [FTA metric] (\$/new trip)	Net Cost/ New Trip [i.e. Subsidy] (\$/new trip)	How Much of Project is SGR (\$M)	%	Projected # of Delays / Year Eliminated	Years to Complete Project	Compatible Programs	Coordination Opportunities			
15A		SouthEast Service (SES)	Proposed	28	28	17,100	17,100	--	MED, RID, SWS	-7,600	9,500	3,593.0	251.5	46.1	46.1	0%	297.6	11.1	24%	\$122.85	\$118.25	30.6	1%	143	>10	CC, NS, B, T	RID 3rd Main, Shops, Vehicles	AA: 18.7k trips \$778M		
15B		SES Extended to SSA	Proposed	28	28	17,000	17,000	--		-7,700	9,300	3,954.0	276.8	50.1	50.1	0%	326.9	10.9	22%	\$137.84	\$133.24	31.9	1%	143	>10	CC, NS, B, T, P3, A		east side Airport access		
	MED		No-Build	170	-	37,300								102.8	--	--														
15C		SES + MED via SSA	Proposed	297	127	53,200	15,900	43%	RID, SWS	-800	15,100	4,797.0	335.8	226.1	123.3	120%	459.1	17.7	14%	\$119.23	\$114.63	17.6	0%	68	>10	CC, NS, B, T, P3, A	Yards, Shops, Vehicles	route thru Airport		
16A		Extension to Peotone	Proposed	170 (8)	0	37,900	600	2%	RID, SWS	0	600	364.0	25.5	106.5	3.7	4%	29.2	0.9	24%	\$190.72	\$184.93	2.1	1%	0	5-10	NS, B, T	Outlying Yards, Vehicles	west side Airport access		
16B		Extension to SSA Full Serv.	Proposed	170 (54)	0	37,900	600	2%	RID, SWS	100	700	934.0	65.4	113.7	10.9	11%	76.3	1.1	10%	\$427.34	\$421.28	4.4	0%	68	>10	NS, B, T, P3, A	Outlying Yards, Shoos.	addition of Airport exress trains		
16C		Extension to SSA Express	Proposed	192 (76)	22	41,500	4,200	11%	RID, SWS	-100	4,100	1,153.0	80.7	123.2	20.4	20%	101.1	6.3	31%	\$96.71	\$90.65	4.4	0%	68	>10					
	RID		No-Build	69	-	33,700								77.1	--	--														
17		Extension to Minooka	Proposed	69 (8)	0	34,200	500	1%	SWS,HC,BN	-100	400	487.0	34.1	81.9	4.8	6%	38.9	0.7	14%	\$381.27	\$374.52	0.9	0%	0	5-10	NS, B, T	Outlying Yards	extension from Joliet		
	HC		No-Build	7	-	3,000								20.4	--	--														
18		Extension to Wilmington	Proposed	7 (6)	0	3,500	500	17%	Ri,SWS,BN	-200	300	168.0	11.8	24.4	4.0	20%	15.8	0.5	13%	\$206.01	\$199.26	1.0	1%	0	5-10	NS, B, T	Outlying Yards	extension from Joliet		
	BNSF		No-Build	94	-	68,300								69.4	--	--														
19		Extension to Kendall County	Proposed	94 (8)	0	70,500	2,200	3%	HC, UP-W	-200	2,000	439.0	30.7	74.5	5.1	7%	35.8	3.4	68%	\$70.25	\$63.50	0.9	0%	0	5-10	NS, B, T	Outlying Yards	extension from Aurora		
20		Extension to Sugar Grove	Proposed	94 (8)	0	69,300	1,000	1%	HC, UP-W	-200	800	368.0	25.8	73.9	4.5	6%	30.3	1.4	31%	\$148.33	\$141.58	0.8	0%	0	5-10	NS, B, T	Outlying Yards	extension from Aurora		
	MD-W		No-Build	58	-	25,900								65.3	--	--														
21A		Extension to Marengo	Proposed	58 (8)	0	26,700	800	3%	UPW/NW	300	1,100	660.0	46.2	75.1	9.8	15%	56.0	2.0	21%	\$199.64	\$192.46	5.1	1%	0	5-10	NS, B, T	Yards, Vehicles	extension from Elgin		
21B		Extension to Hampshire	Proposed	58 (8)	0	26,300	400	2%	UPW/NW	0	400	436.0	30.5	70.2	4.9	8%	35.4	0.7	14%	\$347.25	\$340.70	4.4	1%	0	5-10	NS, B, T		extension from Elgin		
	MD-N		No-Build	60	-	32,700								67.5	--	--														
22		Extension to Richmond	Proposed	60 (8)	0	34,100	1,400	4%	UPNW, NCS	-100	1,300	358.0	25.1	71.7	4.2	6%	29.3	2.6	61%	\$88.27	\$80.54	0.8	0%	0	5-10	NS, B, T	Outlying Yard	extension from Fox Lake		
23		Extension to Wadsworth	Proposed	68 (8)	8	38,200	5,500	17%	UPN, NCS	-2,700	2,800	457.0	32.0	81.5	14.0	21%	46.0	4.5	32%	\$64.41	\$58.13	5.0	1%	0	5-10	NS, B, T	Yards, Vehicles	Rondout-Wadsworth		
24		STAR East (Joliet-Lynwood)	Proposed	54	54	3,900	3,900	--	ME,RI,SW,HC,BN	2,900	6,800	1691.0	118.4	23.6	23.6	0%	142.0	8.0	34%	\$81.87	\$77.27	0.0	0.0	--	>10	NS, B, T				
25		STAR West (Rosemont-Joliet)	Proposed	107	107	22,000	22,000	--	BN,MDW,UPW/NW	3,800	25,800	3,071.0	215.0	44.5	44.5	0%	259.5	30.3	68%	\$39.44	\$34.84	0.0	0%	--	>10	NS, B, T	no opportunities	AA: 21.7k trips \$2.7B		
26		STAR N (Wauk.-Pra. Stone)	Proposed	54	54	4,700	4,700	--	MDW/N,UPNW/N, NC	3,900	8,600	1,378.0	96.5	18.9	18.9	0%	115.4	10.1	53%	\$52.60	\$48.00	0.0	0%	--	>10	NS, B, T				

n/a=not applicable

NOTES: ^a Number of Trains on line / (number of trains on extension)

^b Line in blue font showed greatest loss or least gain.

^c Total capital cost on an annual basis using a factor of 7%.

^d Funding Programs: NS=New Starts, CC=Core Capacity, B=Bonding, T=TIGER (now BUILD),

P3 = Public-Private Partnership, A=FAA. High Viability = Green / Moderate Viability = Orange

METHODOLOGY: Ridership was estimated using the FTA STOPS Model and is shown in year 2040 estimates.

Capital Costs were developed in FTA's Standard Cost Categories and escalated to current year (2016) costs.

Operating Costs were developed using a model developed by CS based on recent Metra operating costs.

Cost per New Rider was calculated dividing annual cost by net ridership gain (annualized by 255).

Estimated Revenue was calculated using line-specific 2017 average fares.

FTA Breakpoints for Cost Per New Trip (from: www.transit.dot.gov/grants)	
High	<\$4.00
Medium-High	\$4.00-\$5.99
Medium	\$6.00-\$9.99
Medium-Low	\$10.00-\$14.99
Low	>\$15.00

Appendix

Project Description Index

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1A. MED Modest Service Increase

Service

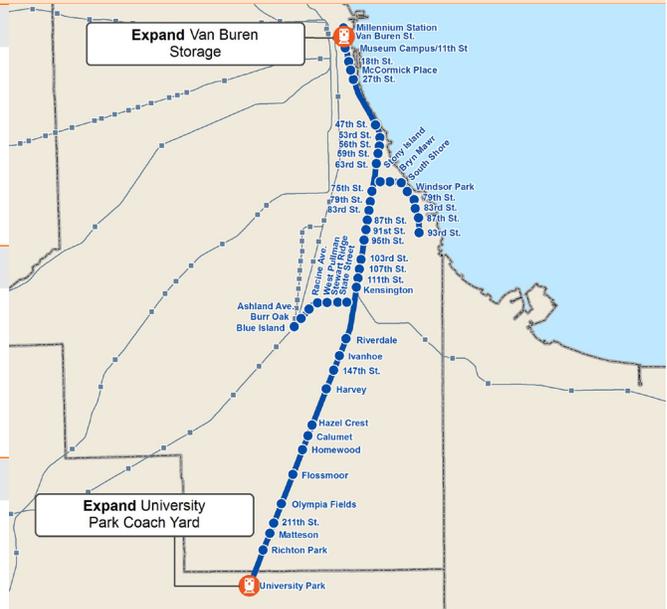
- 4 new peak period/direction trains
- 1 new round-trip each on Branches; 2 new round-trips on Main Line
- Adds midday Main Line trips (30 min. headways)

Infrastructure

- Expand trainset storage at Van Buren
- Expand trainset storage at University Park
- 500 new parking spaces

Rolling Stock

- EMUs for new service available from recent delivery of new cars



1B. MED Modern Metra Electric

Service

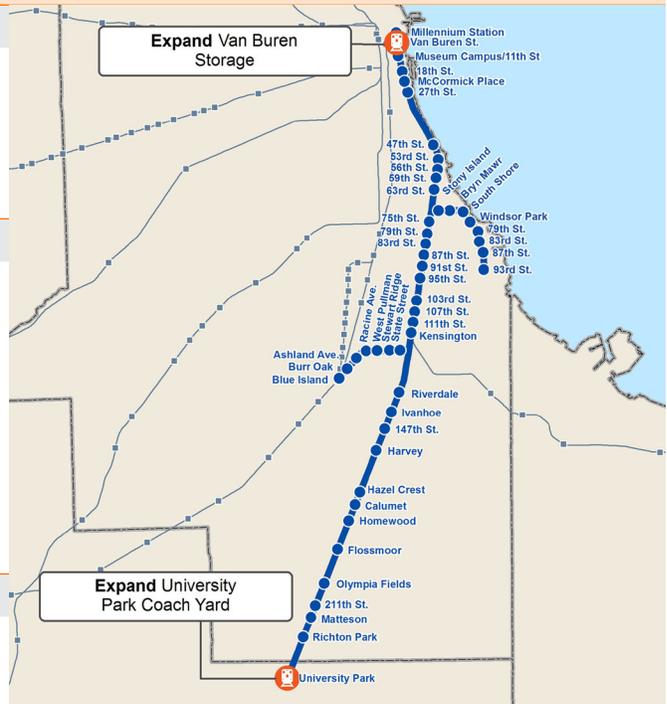
- 20-minute headway service throughout the day (peak and off-peak) on both branches and two main line suburban zones

Infrastructure

- Expand trainset storage at Van Buren
- Double track Blue Island Branch
- New 4th track north of 11th Place
- Expand trainset storage at University Park and Van Buren
- 500 new parking spaces

Rolling Stock

- 16 New Trainsets



2. RID Improvements

Service

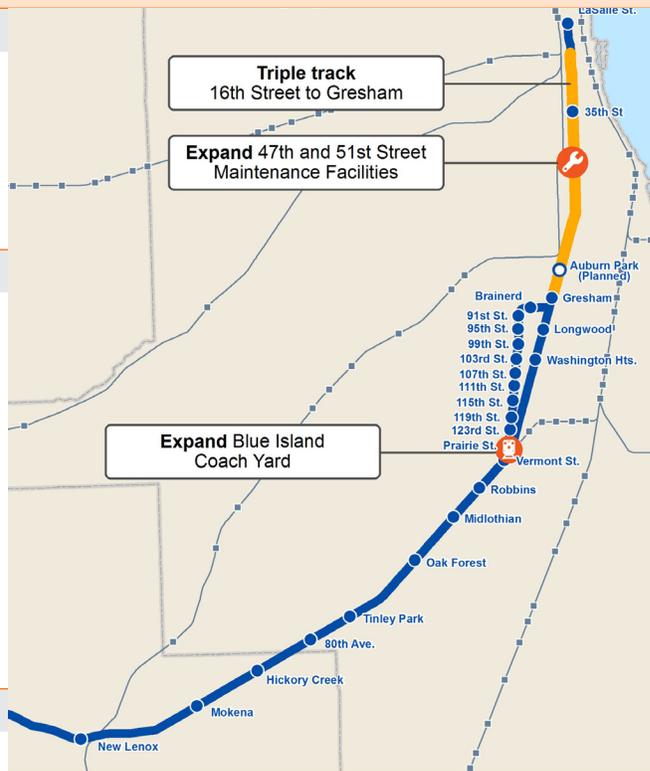
- Split Joliet-Blue Island into two express zones for some Peak trips
- Split Beverly and Mainline trips for midday and evening
- New Auburn Park Station (funded)

Infrastructure

- Add 3rd track north of Gresham
- New high-speed crossover on 3-track segment
- Add 4 storage tracks at Blue Island
- Expand 47th St. Diesel Shops
- Expand 51st St. daytime storage capacity and add new car maintenance facility
- LaSalle Street Station improvements
- Reconfigure 35th St. Station Platforms
- Extend Mokena Platforms

Rolling Stock

- 4 new trainsets



3A. SWS Speed Improvements

Service

- 7- to 12-minute time savings to/from downtown by using RID north of 75th St. & from 75th St. CIP
- Shift terminal to LaSalle St. Station

Infrastructure

- Triple track RID north of 75th Street
- 75th St. CIP improvements, including RID connection at 75th
- New high-speed crossover on 3-track RID segment
- Shift maintenance and daytime storage to RID (same improvements as for RID)

Rolling Stock

- No Change



3B. SWS Intermediate Improvements

Service

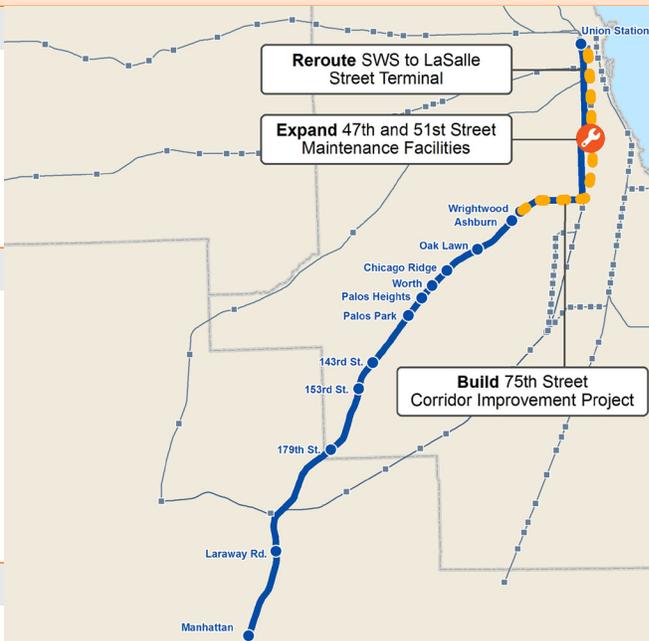
- Add peak direction service
- Shift terminal to LaSalle St. Station
- 7- to 12-minute time savings by using RID and from CIP improvements

Infrastructure

- Triple track RID north of 75th St.
- 75th St. CIP improvements, including connection to RID at 75th St.
- New high-speed crossover on 3-track RID segment
- Shift maintenance and daytime storage to RID (same improvements as for RID)
- 400 new parking spaces

Rolling Stock

- 3 new trainsets



3C. SWS Full Service

Service

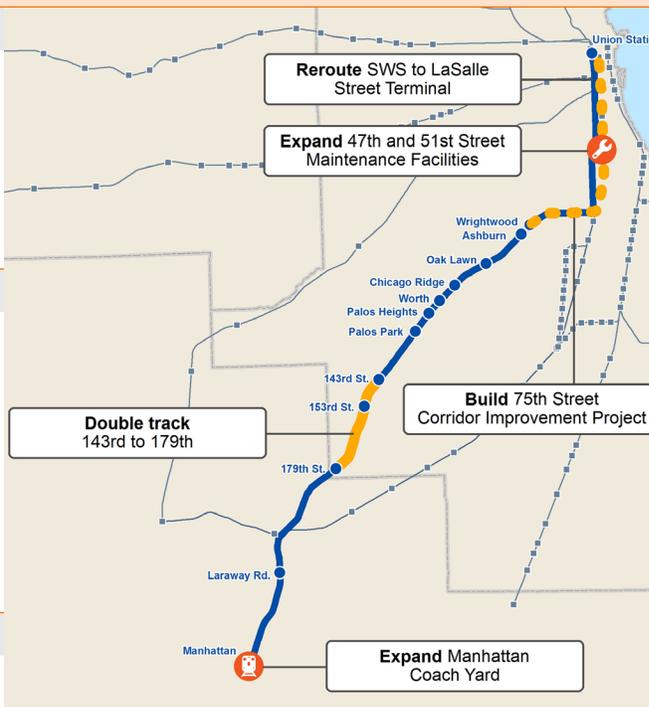
- Fill out midday and evening schedule
- Add 2 skip-stop pairs in peaks
- Shift terminal to LaSalle St. Station
- 7- to 12-minute time savings using RID and from 75th St. CIP improvements

Infrastructure

- Triple track RID north of 75th St.
- 75th St. CIP improvements & RID connection
- New RID high-speed crossover
- Second track 143rd to 179th
- Shift maintenance and storage to RID (same improvements as for RID)
- 400 new parking spaces

Rolling Stock

- 4 new trainsets



5. HC Improvements

Service

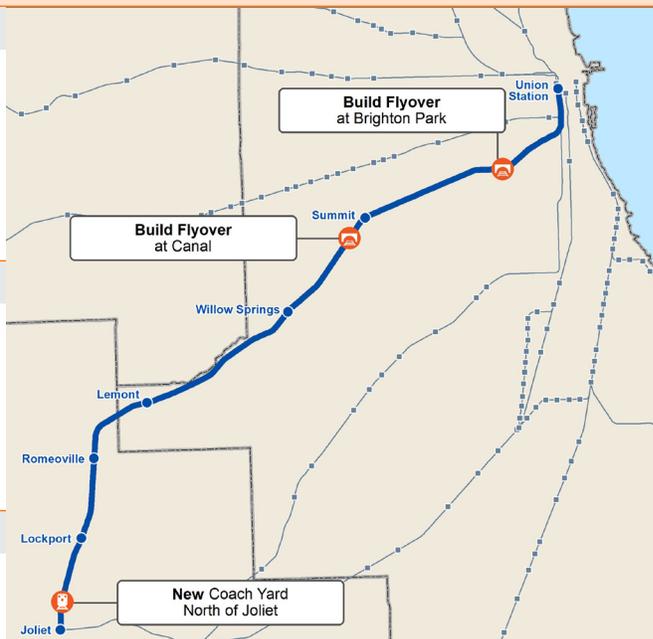
- Upgrade to all-day hourly service
- 5-minute time savings between Summit & CUS with two new grade separations
- New station at Romeoville (opened in February 2018)

Infrastructure

- New rail-to-rail grade separations of Brighton Park & Canal crossings
- New Joliet overnight storage yard
- 595 new parking spaces

Rolling Stock

- 2 new trainsets



6. CUS Improvements

Improvements

- Proposed CUS Phase 1A projects recommended in CUS Master Plan result in pedestrian access/egress time savings and improved overall fluidity of Station
- To simulate access improvements, ridership modeling assumed one-minute travel time savings for all Metra trains in/out of CUS.



7. BNSF Improvements

Service

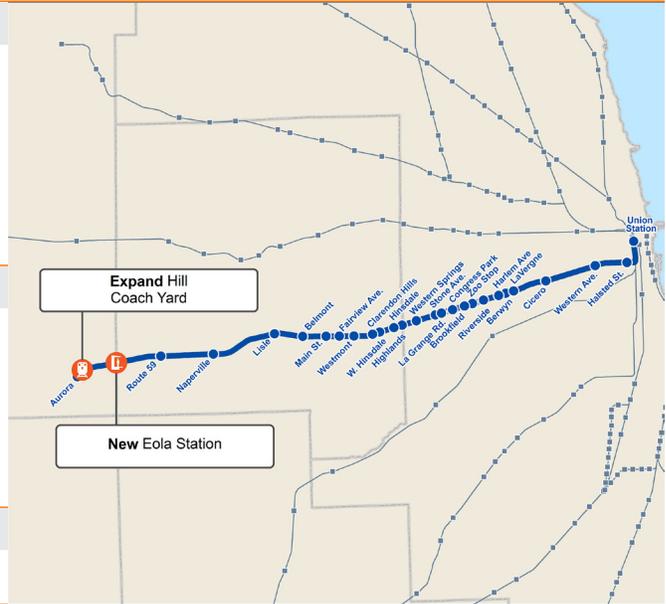
- Peak direction Aurora-Naperville zone split to alleviate crowding
- New express pattern for Inbound & Outbound midday trips
- Assume new Eola Station in Naperville between Rt. 59 & Aurora Stations

Infrastructure

- High Speed Crossover between Eola and West Naperville
- Expansion of Hill Yard in Aurora
- New Eola Station
- 2,150 new parking spaces

Rolling Stock

- 4 new trainsets



8. UP-W Improvements

Service

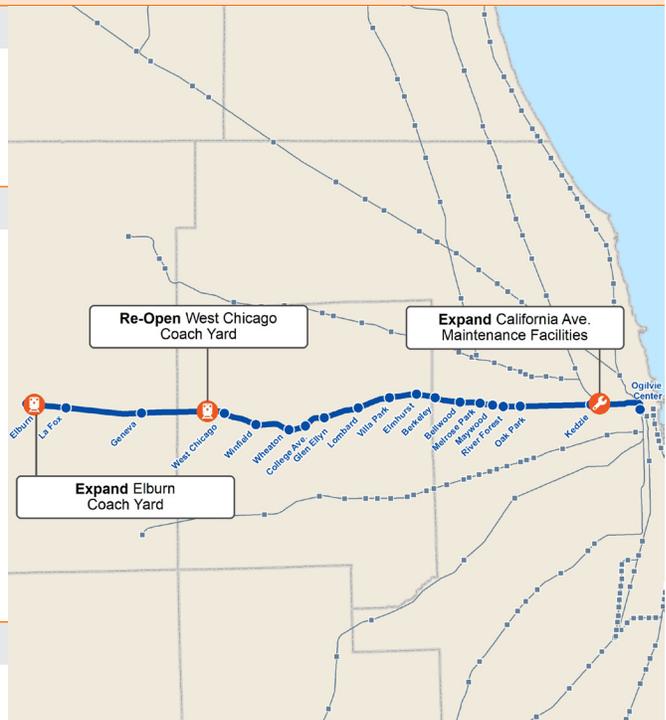
- Add express trips for peak direction
- Changes consistent with project previously proposed in Alternatives Analysis

Infrastructure

- Third mainline track for entire route, including Des Plaines and Fox Rivers bridges (previously funded)
- New crossovers at Elmhurst and West Chicago (previously funded)
- Build-out Elburn Coach Yard to accommodate 4 new trainsets
- Re-open West Chicago Coach Yard to store 2 trainsets
- Expand California Ave. Coach Yard
- 1,500 new parking spaces

Rolling Stock

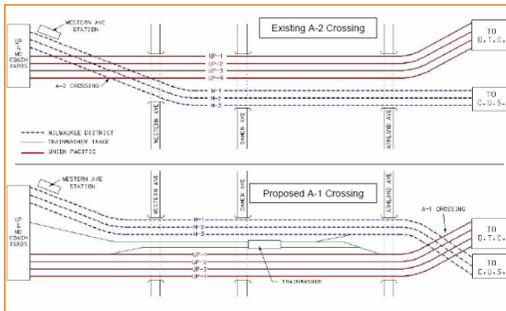
- 6 new trainsets



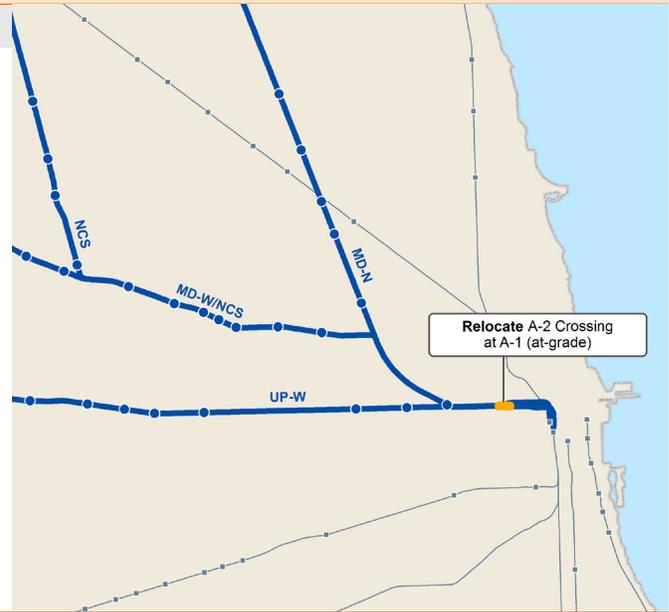
9A. A-2 Relocated Crossing

Improvements

- At-Grade Relocated Crossing at A-1: one-minute time savings for trains stopping at Western, two-minute time savings for other trains
- Half of Western Avenue Station stops eliminated to maximize travel time benefit



At-Grade Relocated Crossing (A-1) Proposal



9B. A-2 Flyover

Improvements

- Flyover: two-minute time savings for trains stopping at Western, three-minute time savings for other trains
- Half of Western Avenue Station stops eliminated to maximize travel time benefit



10. MD-W Improvements

Service

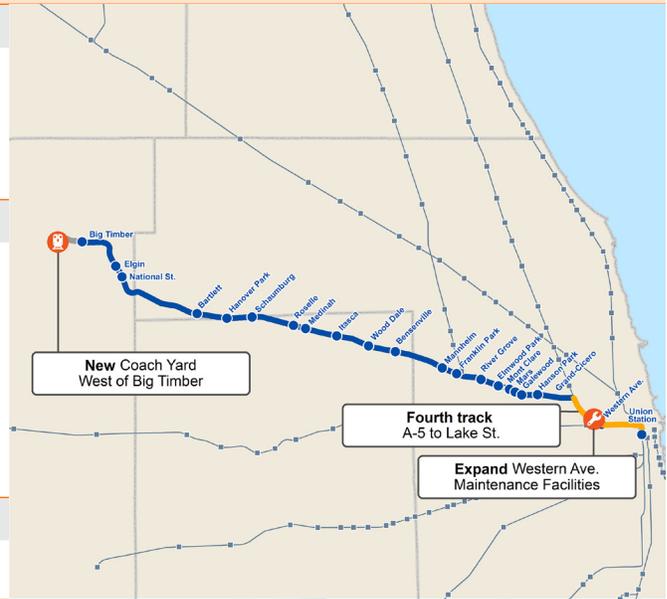
- New express pattern for peak direction service
- Add 2 new reverse commute trips

Infrastructure

- 4th track A-5 to Randolph St. in Chicago (also in MD-N & NCS Improvements)
- New overnight storage yard west of Big Timber
- Expand Western Avenue Maintenance and Storage Facility

Rolling Stock

- 4 new trainsets



11A. UP-NW Mainline Improvements

Service

- Add short-turn trains at Des Plaines, increasing inner zone service
- Peak-period express service to outer part of Line
- New East Woodstock Station

Infrastructure

- Add crossovers at Woodstock, Palatine and Des Plaines
- New West Woodstock Coach Yard
- Expand California Ave. Coach Yard
- New East Woodstock Station
- 2,300 new parking spaces
- Improved signaling

Rolling Stock

- 2 new trainsets



11B. UP-NW ML & Branch Improvements

Service

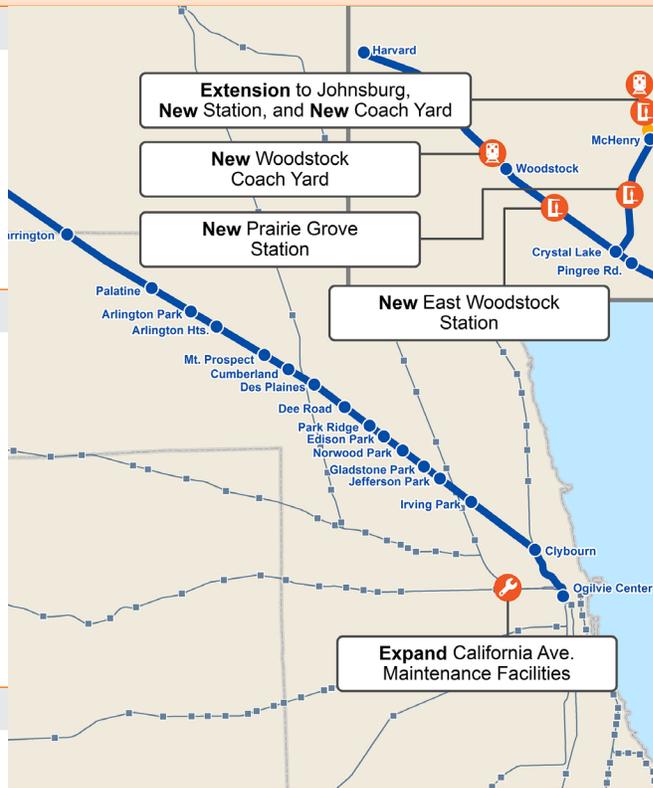
- Add short-turn trains at Des Plaines, increasing inner zone service
- Outer zone peak expresses
- 3 new stations
- Extension to Johnsburg
- Consistent with prior Alternatives Analysis

Infrastructure

- New McHenry Branch sidings
- 3 new crossovers
- New Coach Yards in Woodstock & Johnsburg; Harvard Coach Yard expanded
- Expand California Ave. Coach Yard
- Add East Woodstock, Prairie Grove and Johnsburg Stations
- 3,300 new parking spaces
- Improved signaling

Rolling Stock

- 4 new trainsets



12A. MD-N 2-Track Improvements

Service

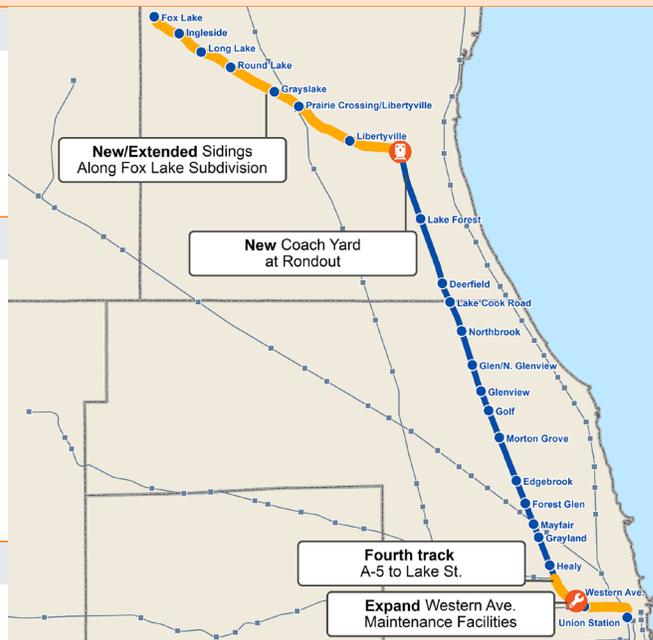
- Add express pattern for peak period/direction
- Add 3 reverse commute trips (extended to Fox Lake)
- 3 middays extended to Fox Lake
- Better spacing of peak service

Infrastructure

- New and lengthened Fox Lake Branch sidings
- Add 4th track A-5 to Randolph St. (also in MD-W & NCS Improvements)
- Add Rondout Coach Yard
- Expand Western Ave. MSF
- 400 new parking spaces

Rolling Stock

- 5 new trainsets



12B. MD-N 3-Track Improvements

Service

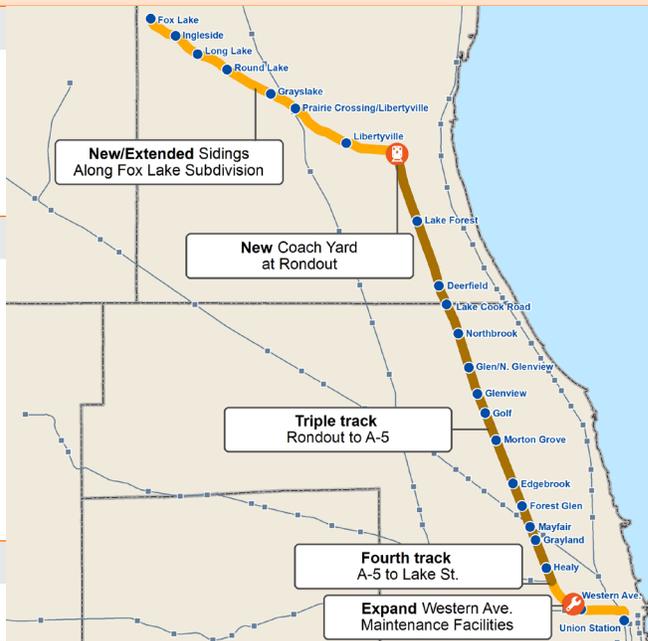
- Add express pattern for peak period/direction
- Add 3 reverse commute trips (extended to Fox Lake)
- Half-hourly off-peak service
- Better spacing of peak service

Infrastructure

- Add 3rd Track Rondout to A-5
- New and lengthened Fox Lake Branch sidings
- Add 4th track A-5 to Randolph St. (also in MD-W & NCS Improvements)
- Add Rondout Coach Yard
- Expand Western Ave. MSF
- 400 new parking spaces

Rolling Stock

- 5 new trainsets



13A. NCS Intermediate

Service

- Fill in gaps in NCS midday and evening service
- Add reverse commute service

Infrastructure

- Add 2nd track through Deval Interlocking
- Expand Antioch Coach Yard

Rolling Stock

- 2 new trainsets



13B. NCS Full Service

Service

- Fill in gaps in NCS midday and evening service
- Add reverse commute service
- Add additional express trips between Downtown and Mundelein, including O'Hare

Infrastructure

- Add 2nd track through Deval Interlocking
- Add siding north of Mundelein Station
- Expand Antioch Coach Yard

Rolling Stock

- 5 new trainsets



14A. UP-N 2-Track Improvements

Service

- Establish 2 express zones for peak period/direction service
- Add reverse commute trips

Infrastructure

- Power up Highland Park Crossover
- New Waukegan Coach Yard, replacing current yard
- Expand California Ave. Coach Yard
- New Peterson/Ridge Station (funded)
- 900 new parking spaces

Rolling Stock

- 2 new trainsets



14B. UP-N 3-Track Improvements

Service

- Establish 2 express zones for peak period/direction service
- Add reverse commute trips
- Upgrade midday service to 30-minute frequency

Infrastructure

- Add 11.7 miles of 3rd track in 3 segments south of Glencoe
- Power up Highland Park Crossover
- New Waukegan storage yard
- Expand California Ave. Coach Yard
- Reconfigure station platforms in added 3rd track sections
- New Peterson/Ridge Station (funded)
- 900 new parking spaces

Rolling Stock

- 3 new trainsets



15A. SES – Separate Operations

Proposed line between Crete and LaSalle St. Station adjacent to existing UP/CSX freight lines and on the RID from Gresham north. Assumes operations are independent from UP/CSX.

Service

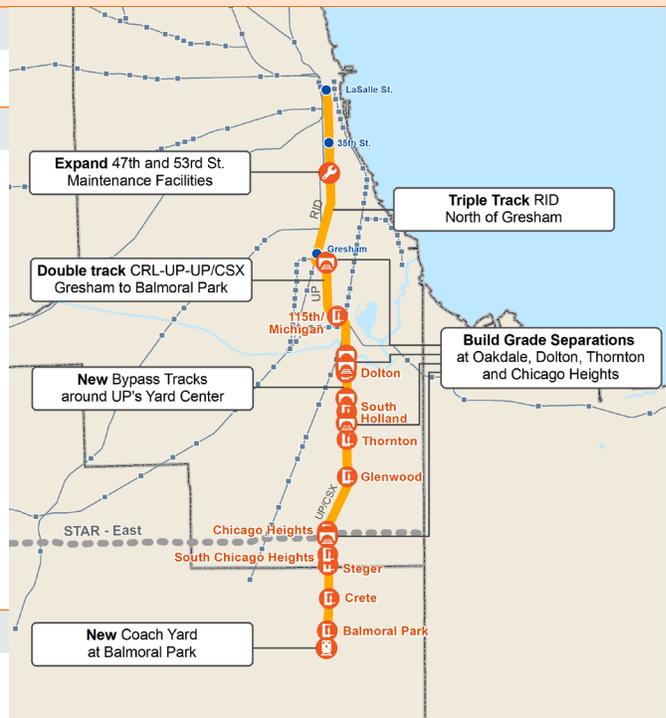
- 28 trains per weekday

Infrastructure

- Add new double track to entire route from Gresham to Balmoral Park
- New bypass tracks around UP's Yard Center
- Flyovers/Grade Separations at UP, Dolton, Thornton, and CN (former EJ&E)
- Add 3rd main line track on RID north of Gresham
- 10 new stations
- New bridges over: Calumet & Little Calumet Rivers, 162nd St., I-80/294, Joe Orr Rd, US-30, & IL-1
- Expand RID maintenance & day-time storage facilities
- New overnight layover at Balmoral Park

Rolling Stock

- Nine locomotives and 72 coaches, including spares



15B. SES – Extended to SSA

Same as 15A, but extended from Crete to SSA. Terminal station would provide direct access to airport gates.

Service

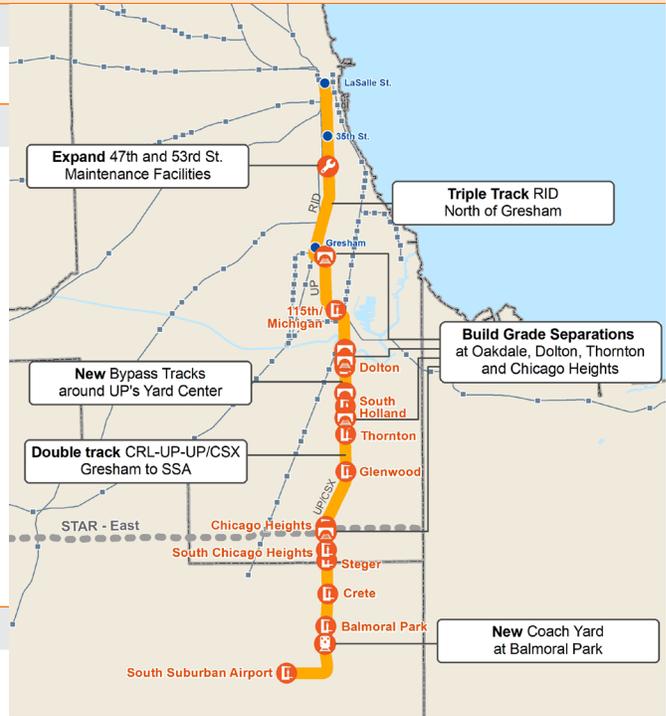
- 28 trains per weekday

Infrastructure

- Add new double track to entire CRL – UP - UP/CSX route Gresham to SSA
- New 2-track bypass around UP’s Yard Center
- Grade Separations at UP, Dolton, Thornton, CN, & UP/CSX
- Add 3rd main line track on RID north of Gresham
- 11 new stations
- New bridges over Calumet & Little Calumet Rivers, 162nd St., I-80/294, Joe Orr Rd, US-30, & IL-1
- Expand RID maintenance & day-time storage facilities
- New Overnight Layover Yard at Balmoral Park

Rolling Stock

- Nine locomotives and 72 coaches, including spares



15C. SES/MED Loop to SSA

Proposed connection of SES to MED through SSA. Trains would loop in each direction through airport and to/from Millennium.

Service

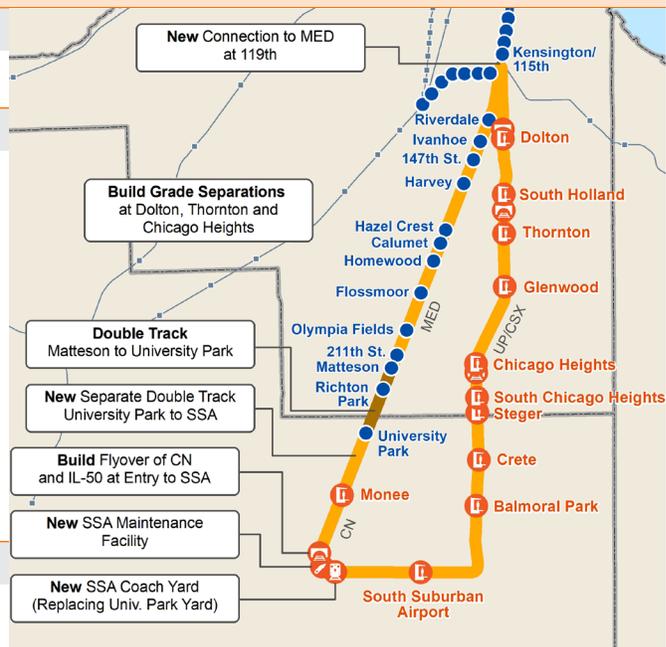
- 20 minute headways in each direction

Infrastructure

- Add new electrified double track to entire SES route from MED connection to SSA.
- Add MED 4th main north of 11 Pl.
- Flyovers/Grade Separations at UP, Dolton, Thornton, and EJ&E
- New connection to MED at 119th
- New bridges over: Calumet & Little Calumet Rivers, 162nd St., I-80/294, Joe Orr Rd, US-30, & IL-1
- 11 new stations
- New MED Maintenance and Layover Facility at SSA

Rolling Stock

- 126 EMUs plus 13 spares



16A. MED Extension to Peotone

Proposed 8-mile extension of MED to Peotone. ROW would be acquired to build a new single track on the west side of the CN freight line.

Service

- Four AM Peak inbound & four PM Peak outbound
- Trains would be extensions of existing MED trains

Infrastructure

- Acquire ROW (for double track) and build new single track with passing siding on the west side of CN freight line, Stuenkel Road to N. Peotone Rd.
- Extend MED Signals including PTC
- Overhead wire system & 2 new substations
- 2 new stations at Peotone & Monee
- New Coach Yard in Peotone for the equipment assigned to this extension

Rolling Stock

- No additional rolling stock required



16B. MED Extension to SSA, Full Service

Proposed 9-mile extension of MED to proposed SSA. New ROW would be acquired for two new tracks west of the CN freight line.

Service

- Extend all University Park trains (54) to SSA, providing headways of approximately 20 minutes peak and 60 minutes off peak

Infrastructure

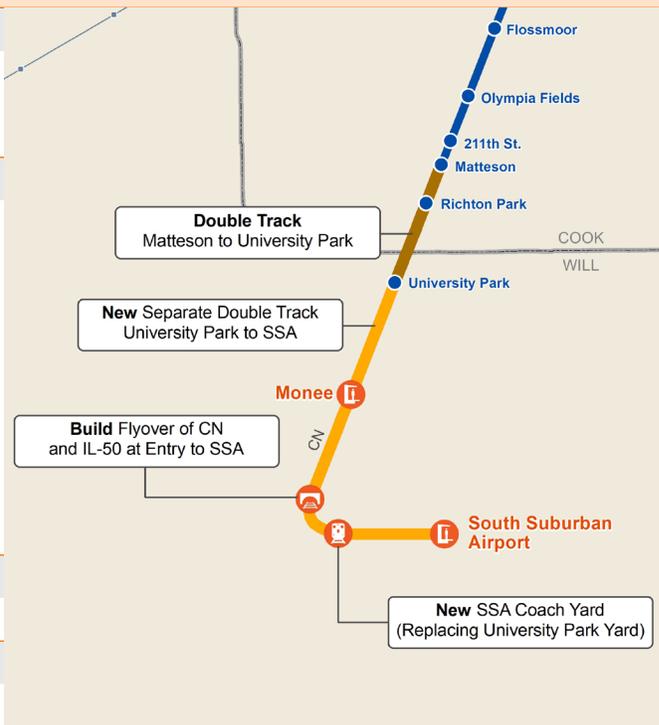
- Acquire ROW and build two tracks on west side of the CN freight line
- Add second track Matteson to University Park
- Extend MED Signals including PTC
- Overhead wire system & two new substations
- 2 new stations at SSA & Monee
- Flyover of CN & IL-50 at entry into SSA
- New Coach Yard at SSA replacing University Park Coach Yard

Environmental

- Raccoon Grove Preserve, including reservoir

Rolling Stock

- No additional rolling stock required



16C. MED Extension to SSA, Express Service

9-mile extension to proposed SSA. New ROW would be acquired to build two tracks west of the CN freight line.

Service

- Extend University Park trains to SSA, 20-minute peak / 60-minute off-peak headways; an overlay schedule of express trains for 30-minute off-peak service.

Infrastructure

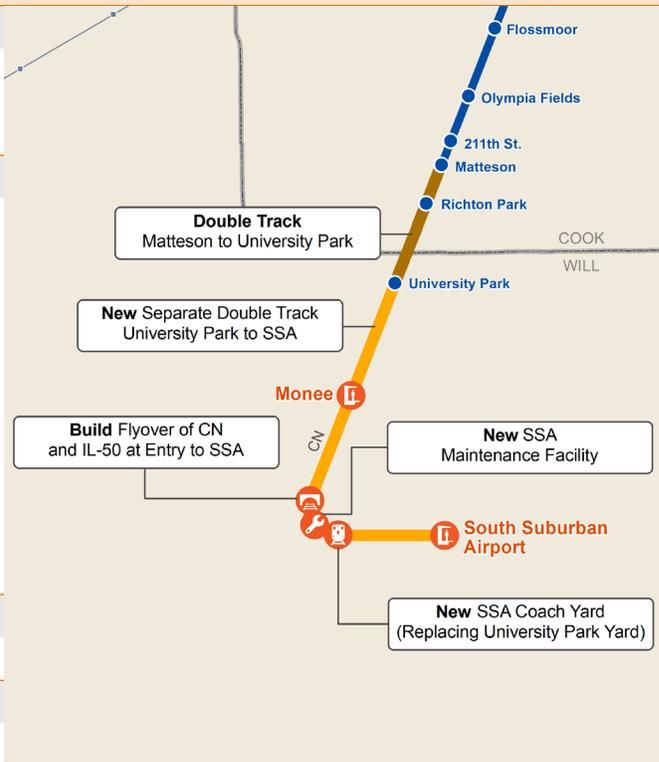
- Acquire ROW and build two tracks to SSA on west side of the CN
- Add 2nd track Matteson to University Park
- Extend MED Signals including PTC
- Overhead wire & 2 substations
- Flyover of CN & IL-50 at SSA entry
- New stations at SSA & Monee
- New Coach Yard at SSA replacing University Park Coach Yard
- Maintenance Facility at layover location at SSA

Environmental

- Raccoon Grove Preserve, including reservoir

Rolling Stock

- 24 additional EMUs required



17. RID Extension to Minooka

11-mile extension of the RID from Joliet to Minooka. Existing freight in the CSX corridor is 1 to 3 trains per day.

Service

- Four AM Peak inbound, four PM Peak outbound
- Trains would extend existing RID trains

Infrastructure

- Acquire needed ROW and assets from CSX
- 2 stations at Minooka & Hollywood Rd
- New Coach Yard west of Minooka Station
- Replace 12 miles of track (assume purchase of ROW from CSX)
- Install new signals
- Improvements to Des Plaines River lift bridge

Environmental

- Potential impacts along the Illinois & Michigan Canal

Rolling Stock

- No additional rolling stock required



18. HC Extension to Wilmington

15-mile extension of the HC to Wilmington using the UP. This route is part of the Chicago-St. Louis High Speed Rail project, which has made recent infrastructure improvements. Existing train traffic in the UP corridor is 27 freight and 10 Amtrak trains per day.

Service

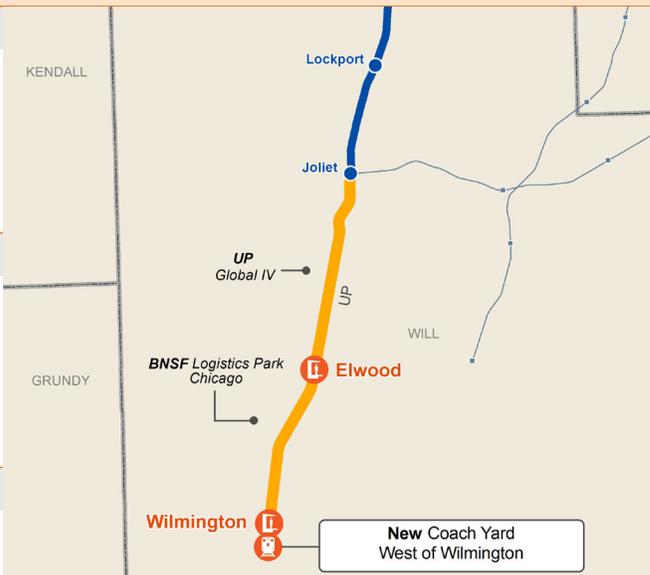
- Three AM Peak inbound & three PM Peak outbound
- Trains would be extensions of existing HC trains

Infrastructure

- 2 new stations at Wilmington & Elwood
- New Coach Yard for the rolling stock assigned to this extension

Rolling Stock

- No additional rolling stock required



19. BNSF Extension to Kendall

14-mile extension of BNSF service to Kendall County. The entire length is currently double-track. Amtrak runs on this subdivision of BNSF.

Service

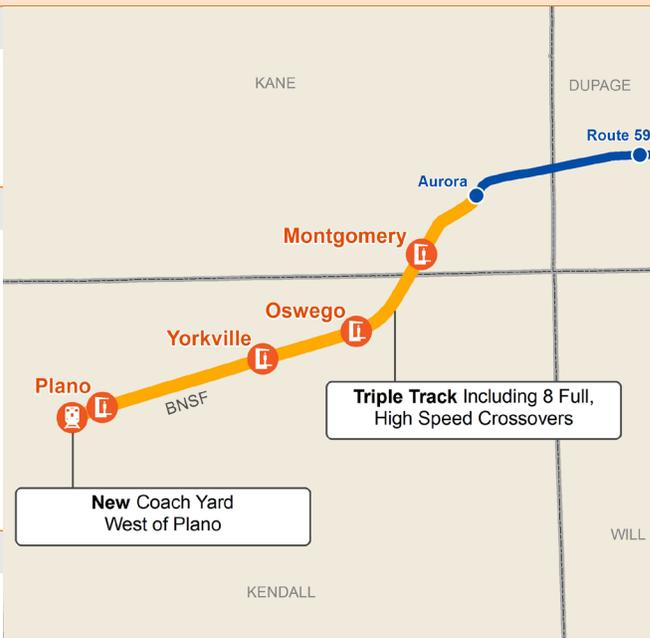
- Four AM Peak inbound and four PM Peak outbound
- Service would be extensions of existing BNSF trains

Infrastructure

- Add 3rd track, including 8 full, high-speed crossovers and other improvements defined by BNSF
- 4 new stations at Plano, Yorkville, Oswego, & Montgomery
- New Coach Yard west of Plano for the equipment assigned to this extension

Rolling Stock

- No additional rolling stock required



20. BNSF Extension to Sugar Grove

13-mile extension of BNSF from Aurora to Sugar Grove and Big Rock using the upgraded single-track BNSF Aurora Subdivision.

Service

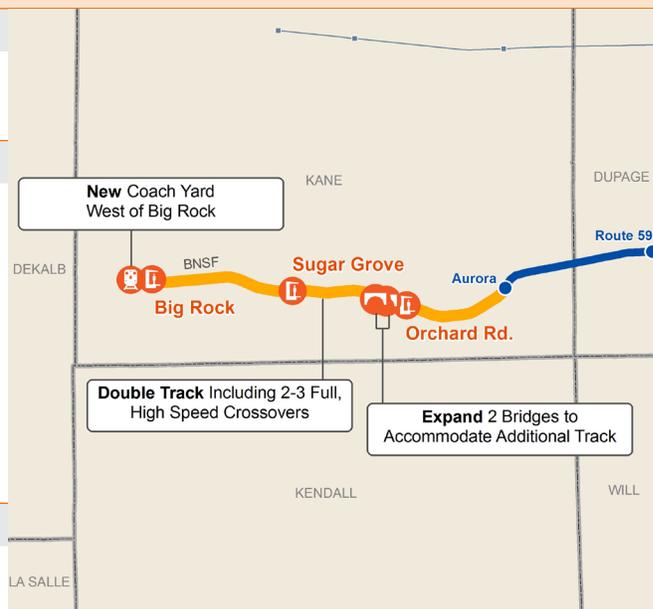
- 8 peak trains, all extensions of existing BNSF trains

Infrastructure

- Extend recently installed track sidings to provide full double-tracking, including 2-3 high speed crossovers
- Expand 2 bridges to accommodate additional track.
- 3 new stations at Big Rock, Sugar Grove, and Orchard Road in Aurora
- New Coach Yard west of Big Rock for the rolling stock assigned to this extension

Rolling Stock

- No additional rolling stock required



21A. MD-W Extension to Marengo

28-mile extension of MD-W service west of Big Timber Station, using the single-track UPRR Belvidere Subdivision to Marengo.

Service

- Four AM Peak inbound and four PM Peak outbound
- Considered only extending to Huntley, but ridership was promising west to Marengo.

Infrastructure

- Replace and signalize existing track and add two passing sidings
- New connection to UPRR required at Alмора
- 5 new stations
- New Coach Yard west of Marengo, for the rolling stock assigned to this extension
- Expanded Western Ave Maintenance Facility

Rolling Stock

- Two locomotives and 10 coaches required, including spares



21B. MD-W Extension to Hampshire

7-mile extension of the MD-W service using the CP freight tracks to Hampshire (2 miles double-track, 5 miles single-track).

Service

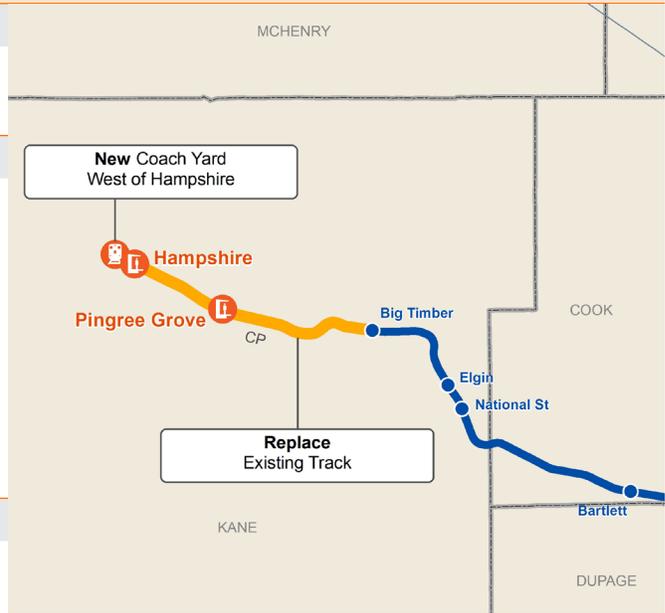
- Four AM Peak inbound and four PM Peak outbound

Infrastructure

- Due to condition of track, replace one track for the entire length of the extension
- Upgrade signals
- 2 new stations at Hampshire & Pingree Grove
- New Coach Yard west of Hampshire for 4 trainsets assigned to extension service
- Expanded Western Ave Maintenance Facility

Rolling Stock

- Two locomotives and 10 coach cars required, including spares.



22. MD-N Extension to Richmond

10-mile extension of the MD-N service from Fox Lake to Richmond. Existing single-track Wisconsin & Southern Railroad freight service is less than 5 trains per day.

Service

- 8 peak trains per day
- All trains would be extensions of existing MD-N trains
- Considered only extending to Spring Grove, but ridership was promising west to Richmond.

Infrastructure

- Replace one existing track for entire length of the extension and add passing siding
- Upgrade signaling system
- Renew of Fox River and Nippersink Creek bridges, replacement of Nippersink Channel bridge
- Stations at Richmond and Spring Grove
- New Coach Yard west of the Richmond Station for the rolling stock assigned to the extension service

Rolling Stock

- No additional rolling stock required



23. MD-N Extension to Wadsworth

13-mile branch of the MD-N, Rondout to Wadsworth. Service would use the existing CP freight line, which is double-track for the entire length with 13-24 freight trains per day plus Amtrak trains (Hiawatha & Empire Builder).

Service

- 8 peak; all would be new MD-N

Infrastructure

- Replace portions of existing jointed track with continuously welded track
- 4 new stations at Wadsworth, Gurnee, Waukegan, and Green Oaks
- New Coach Yard north of the Wadsworth Station for vehicles assigned to this Branch
- Capacity increase to the Western Avenue Maintenance Facility in Chicago

Rolling Stock

- 5 locomotives and 40 coaches, including spares



24. STAR East

39-mile route adjacent to the CN freight line from Renwick Road in Joliet to Lynwood. Connections with HC, RID, SWS, and MED.

Service

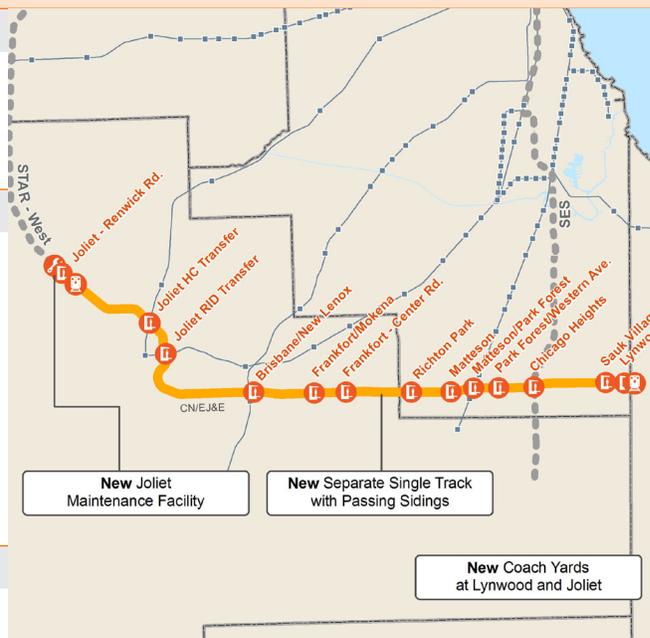
- 30-minute peak headways in each direction
- 60-minute off-peak
- 54 trains per weekday

Infrastructure

- Add new signalized parallel track for the entire length
- Add passing sidings at the schedule meets
- 13 new stations
- Radial line transfer stations on HC and RID in Joliet
- New maintenance facility
- New Coach Yards for the assigned rolling stock at Renwick Road and Lynwood

Rolling Stock

- No additional rolling stock required



25. STAR West

55-mile route Rosemont to Joliet. Two segments: east-west along I-90 and north-south along the CN freight line. Connecting service with Metra radial lines: MD-W, UP-W, and BNSF.

Service

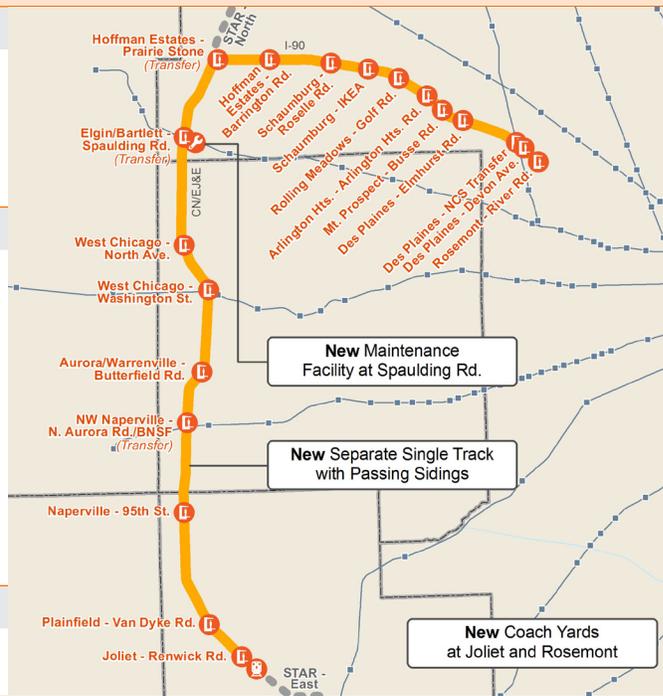
- 30/60-minute headways peak/off-peak along the CN
- 15/30 min. headways peak/off-peak along I-90
- 107 trains per weekday

Infrastructure

- Additional track on north-south segment
- 9 new stations on north-south segment
- Dedicated double-track on I-90
- 10 new stations on the I-90 segment
- 3 new transfer stations at BNSF, MD-W, & NCS
- Maintenance facility at Spaulding Road in Elgin
- New Coach Yards at Rosemont and Renwick Road

Rolling Stock

- 48 Diesel Multiple Units (DMUs), including spares



26. STAR North

32-mile route along CN freight from Waukegan to Hoffman Estates. Connections with: UPNW, NCS, MDN, and UPN.

Service

- 30-minute peak headways
- 60-minute off-peak

Infrastructure

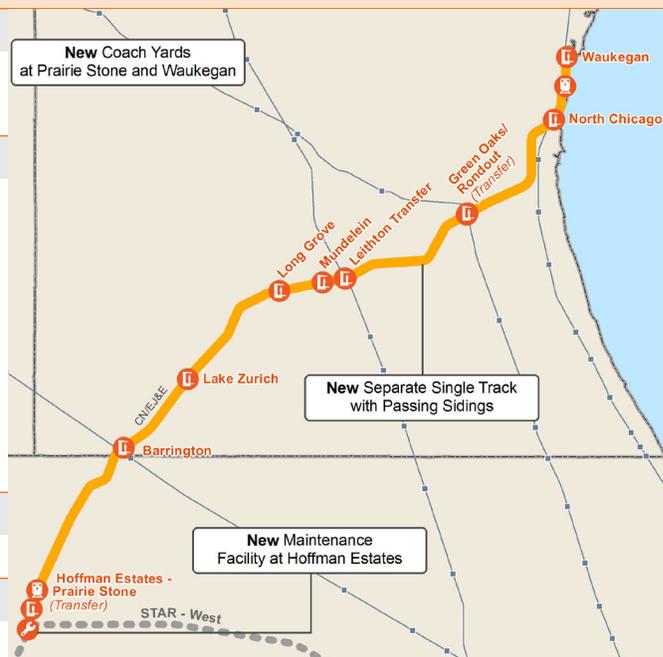
- Add signalized parallel track to the CN for the entire length
- Add passing sidings at meets
- 9 stations
- 2 new radial line transfer stations on NCS and MD-N
- New Maintenance facility
- New Coach Yards at Waukegan & Prairie Stone

Environmental

- Numerous wetlands, ponds, and creeks impacted

Rolling Stock

- 20 DMUs, w/spares



Metra

