Welcome & Introductions
## Project Schedule

We are here

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<th>Month</th>
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<td>Task 1: Work Plan</td>
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<td>Task 2: Stakeholder Outreach</td>
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<td>Task 7: Costs, Benefit, Funding</td>
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<td>Task 8: Draft Regional Plan</td>
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<td>Task 10: Lessons Learned</td>
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Work Plan Approach

- Engage key stakeholders
- Catalogue and summarize existing rail and transportation plans
- Assess existing and potential future travel demand
- Analyze performance
- Provide a benefit-cost analysis for the regional network
- Formulate a high-level prioritization of the Midwest corridors
- Validate a governance structure
- Complete a final regional plan
- Document lessons learned
• **Technical Analysis**
  • Detailed review of building block questions, developing answers for each through iterative analysis using CONNECT
  • Refinement & update of sub-regional networks and begin to identify draft elements of proposed rail network

• **Governance**
  • Prep for Lead Stakeholder Session, September 12
    • Case study
    • Midwest rail brand
    • MIPRC status

• **Stakeholder Outreach**
  • Website updates
  • Newsletter Issue #2
  • Eau Claire Meeting, July 25
  • Midwest Rail Conference
    • Tech Session, August 15
    • General project overview session August 16
  • Railroad webinar, September 1
Today’s Meeting Objectives

- Review Stakeholder Meeting #2 and interim efforts
- Present a recap of the Lead Stakeholders Governance workshop
- Review and discuss network element answers
  - More conclusive
  - Less conclusive
- Obtain input on network elements as input for full network draft
- Outline next steps
  - Draft prioritized rail network
  - Governance
Workshop #2 Summary
St. Paul, MN
June 7, 2017
Stakeholder Meeting #2 Summary

- Introduce strategic approach to scenario development and Major Market Analysis
- Introduce Building Block Analysis with five sub-regions and questions to frame analysis
- Provide CONNECT demo
- Review of capital cost elements
- Define O&M methodology
- Present initial results of capital and O&M model runs
- Present and discuss sub-regional network configurations
Key Takeaways

• Governance items to move forward
  • Case study examination, e.g., South of the Lake
  • Optimization of Midwest rail service and brand
  • Elevation of MIPRC standing

• Large amount of technical information provided
  • Major market analysis
  • Defining the building blocks

• Review of technical approach needed
  • Scenario development
  • Initial network concepts
  • Major market analysis
  • Subnetwork configurations
Technical Analysis – Flow Chart

- **Assess Existing Market Data**
  - Stakeholder Workshop 1
  - Major Market Analysis

- **CONNECT Demand Calibration / Validation**
  - Stakeholder Workshop 2
  - Define Building Blocks

- **CONNECT Cost Calibration / Validation**
  - Stakeholder Workshop 3
  - Run Building Block Analysis

- **Clear Answers – Draft Network Elements**
  - Stakeholder Workshop 4

- **Ambiguous Answers – Need Stakeholder Input**

- **Final Network Vision**
Governance Discussion Summary

- **Reviewed Previous Governance Discussion**
- **Case Study—Governance Aspects of a Major Capital Investment Program**
  - Reviewed relevant aspects of the Midwest Fleet Ownership Agreement
  - Discussed other considerations
- **Governance Aspects of Optimizing Midwest Operations**
  - How to continue and further advance progress towards performing as a Midwest Brand
- **Evolving the Midwest’s Overarching Governance Structure**
  - How to evolve and elevate the status of MIPRC
Overview

• **Morning Technical Overview**
  • Overview of Technical Process – Where we’ve been, Where we’re going
  • Introduce Elements of Building Block Analysis:
    • Question Categories
    • Data Types / Metrics

• **Morning Break-Out**
  • Two Groups – East and West – Walk Through Results of Analysis
  • Proposed Network Elements – Trade Offs - Input

• **Afternoon Break-Out**
  • Continuation of Morning Session. Return to Key Areas for input.
Technical Analysis Process
Technical Analysis – Flow Chart

Stakeholder Workshop 1
- Assess Existing Market Data
- CONNECT Demand Calibration / Validation

Stakeholder Workshop 2
- Major Market Analysis
- Define Building Blocks
- CONNECT Cost Calibration / Validation

Stakeholder Workshop 3
- Run Building Block Analysis
- Clear Answers – Draft Network Elements
- Ambiguous Answers - Need Stakeholder Input

Stakeholder Workshop 4
- Draft Network Vision
- Final Network Vision
Technical Analysis – Flow Chart

Assess Existing Market Data
- Travel Flows Between All CBSAs
- Identification of Growth Trends

Stakeholder Workshop 1

Major Market Analysis

Define Building Blocks

CONNECT Cost Calibration / Validation

Calibration / Validation
- Replicate Existing and MWRRI Service Characteristics

Stakeholder Workshop 2

Run Building Block Analysis

Clear Answers – Draft Network Elements

Ambiguous Answers – Need Stakeholder Input

Stakeholder Workshop 3

Draft Network Vision

Stakeholder Workshop 4

Final Network Vision

Market Assessment
CONNECT Calibration
Technical Analysis – Flow Chart

Stakeholder Workshop 1
- Assess Existing Market Data
- Major Market Analysis
  - St Louis
  - Kansas City
  - Minneapolis
  - Detroit
  - Indianapolis
  - Milwaukee
- Building Block Analysis
  - Define Five Sub-Regions
  - Develop Questions to
  - Develop Sub-Regional Networks
- Calibration / Validation
  - Replicate Existing and MWRRI Infrastructure
- Review with Stakeholders
- Assumptions for Capital Inputs
- Develop Methodology for Draft Inf Inputs
- Connect Demand Calibration / Validation

Stakeholder Workshop 2
- Run Building Block Analysis
- Clear Answers – Draft Network Elements
- Ambiguous Answers - Need Stakeholder Input

Stakeholder Workshop 3
- Draft Network Vision
- Stakeholder Workshop 4
- Final Network Vision

Stakeholder Workshop 4
- Market Assessment
- Connect Calibration
- Network Development
Technical Analysis – Flow Chart

**Stakeholder Workshop 1**
- Assess Existing Market Data
- CONNECT Demand Calibration / Validation

**Major Market Analysis**
- Define Building Blocks
- CONNECT Cost Calibration / Validation

**Stakeholder Workshop 2**
- Identify:
  - Preferred Routes
  - Key Hubs
  - Appropriate Service Tiers
  - Network Interactions

- Assess Results at Various Scales:
  - Origin-Destination
  - Segment
  - Corridor
  - Network

**Run Building Block Analysis**
- Clear Answers – Draft Network Elements
- Ambiguous Answers – Need Stakeholder Input

**Iterative Analysis**

**Stakeholder Workshop 3**
- Draft Network Vision
- Stakeholder Workshop 4

**Final Network Vision**
Technical Analysis – Flow Chart

1. **Assess Existing Market Data**
   - Stakeholder Workshop 1
   - Major Market Analysis

2. **Connect Demand Calibration / Validation**
   - Define Building Blocks
   - Run Building Block Analysis

3. **Connect Cost Calibration / Validation**
   - Clear Answers – Draft Network Elements
   - Ambiguous Answers - Need Stakeholder Input

4. **Market Assessment**
   - Stakeholder Workshop 2
   - Design Draft Full Network

5. **Run Full Network**
   - Stakeholder Workshop 3
   - Refine Network

6. **Final Network Vision**
   - Stakeholder Workshop 4
   - Final Output
Building Block Analysis
A total of 53 questions helped frame the sub-regional networks

Questions designed to ensure a range of service types, service volumes, and network configurations, to markets

Questions can be grouped by type with specific set of data and metrics to address questions.
A total of 53 questions helped frame the sub-regional networks.

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Questions That Frame Analysis

A total of 53 questions helped frame the sub-regional networks

Questions designed to ensure a range of service types, service volumes, and network configurations, to markets

Questions can be grouped by type with specific set of data and metrics to address questions.

Network Configuration Categories

- Aggregator Cities (11)
- Regional Gateways (8)
- Main Line Route (18)
- Branch vs. Main Line (6)
- Market Specific Consideration (10)

Sub Analysis considers matching service tier / frequency to market in all categories
Data & Metrics
## Data & Metrics

### Ridership / Revenue

<table>
<thead>
<tr>
<th>Data/Metric</th>
<th>What</th>
<th>How</th>
<th>When</th>
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</thead>
<tbody>
<tr>
<td>OD Ridership</td>
<td>Ridership from single origin-destination CBSA pair</td>
<td>Used to understand how changes in service characteristics affects specific market pairs</td>
<td>Across all analyses</td>
</tr>
<tr>
<td>CBSA Boardings</td>
<td>Total boardings to all destinations from a single CBSA</td>
<td>Used to understand the total market from a given CBSA and how that changes with different service offerings</td>
<td>Primarily used for mid and minor market to address market specific questions and analyzing appropriate service tier</td>
</tr>
<tr>
<td>Segment Ridership</td>
<td>Total ridership on the network between two consecutive CBSA pairs</td>
<td>Used to understand how volumes on specific segments change in a network vs. a stand alone context</td>
<td>Used primarily in analysis of Aggregator Cities</td>
</tr>
<tr>
<td>Corridor Ridership</td>
<td>Sum of total ridership of all ODs on corridor</td>
<td>Used to understand the total response on corridor levels to a service offering</td>
<td>Main line route analysis as well as matching service tier / frequency to markets</td>
</tr>
<tr>
<td>Corridor Revenue</td>
<td>Sum of total revenue of all ODs on corridor</td>
<td>Used in combination with O&amp;M costs to calculate Operating Recovery Ratio</td>
<td>Used primarily in matching service tier / frequency to markets</td>
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Direct CONNECT Output
Calculated based on CONNECT Outputs
### Data & Metrics

#### Costs

<table>
<thead>
<tr>
<th>Data/Metric</th>
<th>What</th>
<th>How</th>
<th>When</th>
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<tbody>
<tr>
<td>Corridor Capital Cost</td>
<td>Total Capital Cost for corridor including infrastructure, fleet, and stations and facilities</td>
<td>Used as relative measure in comparing one route option vs. another as well as input in other cost metrics</td>
<td>Across all analyses</td>
</tr>
<tr>
<td>Corridor Operating &amp; Maintenance Cost</td>
<td>Total operating cost of the service defined for a corridor</td>
<td>Used in combination with revenue to calculate Operating Recovery Ratio</td>
<td>Used primarily in matching service tier / frequency to markets</td>
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### Other Metrics

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<th>Data/Metric</th>
<th>What</th>
<th>How</th>
<th>When</th>
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<tr>
<td>Train Load Equivalents</td>
<td>“Train Load Equivalents” factors two-way annual ridership outputs into daily one direction service equivalents</td>
<td>Used as standard measure of how much additional service can be sustained in network vs. stand-alone context</td>
<td>Used primarily in analysis of Aggregator Cities</td>
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<tr>
<td>Capital Cost Per Passenger Mile</td>
<td>Total corridor capital expense divided by total passenger miles operated over the corridor (stand-alone context)</td>
<td>Used as a comparative measure of efficacy of capital expenditure</td>
<td>Used primarily in Main Line Route Analysis</td>
</tr>
<tr>
<td>Operating Recovery Ratio</td>
<td>Total revenue divided by total operating costs by corridor</td>
<td>Used as a measure of financial viability proposed service. RR of &gt; 1 indicates a profitable corridor</td>
<td>Used in Main Line Route Analysis, as well as all analysis assessing impact of network vs. stand alone</td>
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Network Configuration Categories
Question Categories

Aggregator Cities

How much additional service can a corridor sustain with other corridors feeding it vs. as a stand alone corridor?

Can the network sustain the same or greater ridership with less capital by consolidating corridors through an aggregator city?

- Assess segment ridership in stand-alone context (i.e. without other network connections) and then compare to network context with branches beyond aggregator city.
- Compare capital on separate corridors vs. consolidated corridor.

Network Examples:

Data / Metrics

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Regional Gateways

What is the potential demand coming from complementary jurisdictions feeding into the 12-state Midwest network?

- Assess the total demand coming from select markets beyond the network to the point of contact with the network (i.e. to the “Regional Gateway”)
- Assess ridership to vs. through the Regional Gateway;
  - What is the incremental ridership?
  - How does that translate to additional incremental service?
  - How much benefit to network?

Data / Metrics

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Network Examples:

South Bend  →  Cleveland  →  Pittsburgh  →  Louisville  →  Nashville  →  Indianapolis
Question Categories

Main Line Route

What is the best route between major markets (Chicago – Milwaukee, Twin Cities, Kansas City, St Louis, Indianapolis, and Detroit)?

• Assess/compare the total demand between end point markets, potential intermediate markets, other network markets on various alignments between major markets.
• Assess differences in potential capital cost on various alignments;
  • What is the ridership per capital dollar for major markets? Intermediate markets?
  • Which route maximizes ridership? Most cost-effective? Most viable in terms of recovery ratios?

Network Examples:

<table>
<thead>
<tr>
<th>Data / Metrics</th>
<th>Corridor Ridership</th>
<th>Corridor Capital Cost</th>
<th>Capital Cost Per Passenger Mile</th>
<th>Operating Recovery Ratio</th>
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Network Diagrams:

- Network A: MSP → MAD → ROC → MKE → CHI
- Network B: MSP → GBY → SHB → MKE → CHI
- Network C: MSP → GBY → FDL → MKE → CHI
- Network D: MSP → ROC → FDL → MKE → RCK → CHI
Question Categories

Branch vs. Main Line

What is the performance difference of major intermediate markets connected to a single major market as a branch vs. as an intermediate stop on a mainline?

- Assess/compare the demand to other network markets between the branch and main line configurations.
- What is the total cost differential between direct main line plus branch vs. longer main line with branch market included?
  - What is the incremental ridership?
  - What is the cost per incremental rider compared to network average?

Network Examples:

1. Twin Cities
   - Rochester
   - Milwaukee
   vs.
2. Twin Cities
   - Madison
   - Milwaukee

...
Question Categories

Market Specific Consideration

What is the performance of a specific market, O-D pair, or set of O-Ds?

• Assess the market demand and performance characteristics of potential service to specific markets.
• Assess the impacts of network configurations - additional ridership on corridor in question.
  • What is the total ridership?
  • What's the incremental affects of network connections?
  • Do these markets drive network configuration decisions?

Data / Metrics

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Network Elements

Iterative Analysis

Clear Answers

Draft Elements of Proposed Network

No Clear Answers / Tradeoffs Exist

Requires Stakeholder Input
Group Breakouts

- West
- East
## Goals and Principles

### Service Principles – Service Tiers

<table>
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<tr>
<th>Corridors</th>
<th>Top Speeds (mph)</th>
<th>Other Common Characteristics</th>
<th>Primary Markets Served</th>
<th>Minimum Reliability Target (On-time Performance)</th>
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<tr>
<td>Core Express</td>
<td>over 125</td>
<td>Frequent service; dedicated tracks, except in terminal areas; electric-powered</td>
<td>Serving major metropolitan centers</td>
<td>99%</td>
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<td>90–125</td>
<td>Frequent service; dedicated and shared tracks; electric- and diesel-powered</td>
<td>Connecting mid-sized urban areas with each other or with larger metropolitan areas</td>
<td>95%</td>
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<td>Emerging / Feeder</td>
<td>Up to 90</td>
<td>Shared tracks</td>
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QLINE Detroit: A National Model for Public Private Partnership

Paul Childs Chief Operations Officer M-1 RAIL

September, 13, 2017
PROJECT HISTORY

- The non-profit M-1 RAIL was established after Detroit hosted the Super Bowl in 2006.
- First major transit project being led and funded by private businesses, philanthropic organizations, in partnership with local government, the State of Michigan, and U.S. Department of Transportation.
- Construction began in June 2014.
- QLINE opened to the public May 2017.
- Revenue operations began September 2017.
INFRASTRUCTURE INVESTMENT

• Powering growth of the Woodward Corridor for a generation.
• 3 miles curb-to-curb roadway rebuild in partnership with MDOT.
• New streetlights and traffic lights.
• New utility lines and drainage system.
QLINE DETROIT FACTS AND FIGURES

- A 6.6 mile route on Woodward Ave.
- 20 stations serving 12 stops connecting Downtown, Midtown, New Center & North End.
- Traveling with traffic up to 30 mph.
- Powered by 750 volt battery and running 80% off-wire, the greatest portion of any streetcar in the country.
ENGAGING PRIVATE PARTNERS

• Leverage relationships locally and nationally
• Naming Sponsorship & Station Recognition
  • Over $100 million in support from private and philanthropic sources
• Approach stakeholders, employers, investors and government to create a “win-win”
  • Spur Investment
  • Infrastructure Upgrades
  • Support Regional Transit
A CATALYST FOR INVESTMENT

- The QLINE connects Downtown CBD, stadium and cultural district, hospitals, two universities and neighborhoods along the Woodward Corridor.

- Since 2013, the $140 million capital project has generated more than $7 billion in projects completed, under construction or in the pipeline.
CONNECTING PEOPLE & COMMUNITIES

• Leverage QLINE success to change perceptions about regional transit.

• More than 500,000 trips taken during complimentary ride promotion.

• Averaged 5,500 daily rides during August 2017.

• Piloting transfer program with transit partners to improve connectivity.
LESSONS LEARNED

• QLINE peak ridership from 10 am - 4 pm.
• Transit education is essential.
• Collaboration with City of Detroit and MDOT to prioritize traffic signals.
THANK YOU

Questions
## Service Principles – Service Tiers

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Northwest
Northwest: Major Corridor - Chicago-Twin Cities

Preliminary Proposed Network Options:

- Service Tier CHI-MSP: Core Express
- Route: via MKE and MAD
- Routing option either via Rochester or with Rochester as branch from MSP
- Green Bay as connecting Emerging service from MKE
- Duluth as connecting service from MSP

Legend:
- Core Express
- Regional w/ Core Express Potential
- Regional
- Emerging-Integral to Network
- Emerging-Independent of Network
- Small Market-Independent of Network
Mainline Route Analysis

5 Routes Considered

- 3 Eliminated
  - Via Green Bay (2 routes)
  - Via Rockford
- 2 Retained
  - Via Milwaukee
  - Via Milwaukee and Rochester

Milwaukee and Madison are significant markets and are critical to the operational viability of a Core Express line between Chicago and the Twin Cities.

Rochester is also a major market and should be considered as an intermediate market in further analysis.
Northwest: Route Service Tier

Service Tier – CHI-MSP

Options
- Emerging, Regional and Core Express service tested for representative route

Analysis Findings
- Strong ridership growth at each incremental service tier

Conclusion
- Core Express is warranted based on incremental ridership
- Business case for high capital investment to be confirmed
Northwest: Route Service Tier

Service Tier: CHI - MSP

- The CHI-MSP corridor sees significant ridership gains moving from Emerging to Regional and from Regional to Core Express.
- Core Express service has an operating recovery ratio of 1.17 in a standalone context and 1.32 in a network context.
- Core Express service is recommended for the CHI-MSP mainline

- Bar charts showing:
  - CHI – MSP O/D Ridership
  - Corridor Ridership (Network)
  - Operating Recovery Ratio (Network)
  - Total Corridor Capital Cost ($B)

Emerging – 8 TPD, 617 Min
Regional – 16 TPD, 379 Min
Core Express – 24 TPD, 213 Min
Northwest: Aggregator

Milwaukee

Options
• Milwaukee as independent corridor or as connection point for Green Bay, Madison, and Twin Cities service

Analysis Findings
• Green Bay, Madison, and Twin Cities contribute significant ridership onto Milwaukee to Chicago Corridor
• Increase of up to 2 million annual riders, makes a material impact on service in the Milwaukee to Chicago corridor

Conclusion
• Madison and Green Bay markets best served by routing to Chicago via Milwaukee
• Strong benefits to Chicago to Milwaukee by aggregating Twin Cities, Madison, and Green Bay service at Milwaukee
Northeast: Market Specific

Green Bay

Options

- Green Bay tested with direct service at all three service tiers as well as Emerging connecting to Core Express at Milwaukee.

Analysis Findings

- An Emerging connection to Core Express in Milwaukee serves the Green Bay market better than direct Regional service from Chicago.

Conclusion

- Best solution for Green Bay and for the network is Milwaukee to Green Bay as Emerging service, connecting with Core Express service at Milwaukee to Chicago.

![Diagram showing Green Bay connections]

### Total Green Bay CBSA Boarding with subset GBY to CHI

- **Emerging (to REG)**
- **Emerging to CE**
- **Regional**
- **Core Express**

- **Total CBSA Boardings**
- **GBY - CHI**

- **Total CBSA Boardings**
- **GBY - CHI**
Northeast: Branch vs mainline

Madison

Options
• Madison tested as branch service to Milwaukee, as branch service to Rockford, as well as on the mainline to Twin Cities.

Analysis Findings
• Madison ridership increases 50 percent when included on the Core Express mainline vs Emerging branch connecting in Milwaukee.
• Total CBSA boardings in Madison peak at over 1.3 M, contributing significant riders to mainline.

Conclusion
• Best solution for Madison and for the network is to route the Core Express mainline between Milwaukee and Twin Cities via Madison
Northwest: Branch vs mainline

Rochester

Options

• On high-speed mainline or branch from Twin Cities with connection.

Analysis Findings

• Ridership increases marginally when included on Mainline. > 80% of total CBSA boardings from Rochester are to Twin Cities.
• The capital expense for either option with Rochester on the mainline or as a branch regional connections is overall approximately the same.

Conclusion

• Both options are feasible – no clear preference.
• Important to make Rochester decision as part of overall decision on CHI-MSP route and service tier.
Connections beyond Twin Cities

Duluth
- Strong demand to MSP supports Emerging/Regional service
- Limited through ridership to Milwaukee and Chicago
- Investment decision independent of network

Fargo / Sioux Falls
- Small markets
- Investment decision independent of network

Total CBSA Boardings w/ Emerging Service w/ Connections to Core Express.
Northwest: Major Corridor - Chicago-Twin Cities

Preliminary Proposed Network Options:

- Service Tier CHI-MSP: Core Express
- Route: via MKE and MAD
- Routing option either via Rochester or with Rochester as branch from MSP
- Green Bay as connecting Emerging service from MKE
- Duluth as connecting service from MSP

Core Express
Regional w/ Core Express Potential
Regional
Emerging-Integral to Network
Emerging-Independent of Network
Small Market-Independent of Network

Duluth
Fargo
Sioux Falls
MSP
ROC
MAD
MKE
GBY
CHI
Southwest
Southwest: Major Corridor – STL/KC - Chicago

**Preliminary Proposed Network Options:**

- Service Tier STL-CHI: Regional with Potential for Core Express
- Route via Bloomington/Springfield
- Regional service St Louis to Kansas City; Kansas City – Chicago market served via St Louis
- Emerging circumferential route once mainline is built out
- Other corridors recommended as Emerging and somewhat independent of other network considerations
Mainline Route Analysis

Two Routes Considered
- Eliminated – Direct to Chicago
- Retained – Service to Chicago via St Louis

Analysis Findings
- Relatively small size for Kansas City market, distance from Chicago, and lack of any major destination in between render a direct high-speed connection infeasible.

Conclusions
- Connect Kansas City to the rest of the Midwest network via St Louis
Mainline Route Analysis

Two Routes Considered

- Eliminated – via Champaign
- Retained – via Bloomington

Analysis Findings

- Route via Champaign is longer (likely more expensive) and does not offer sufficient network benefits.
- Via Champaign creates longer trips for St Louis and Kansas City; and inferior for potential connections from major market on circumferential route (Peoria).

Conclusions

- Eliminate Core Exp. alignment via Champaign, assess viability of Core Exp. service on existing route.

*Trade-Off of where riders come from, not total corridor riders*

<table>
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Southwest: Route Service Tier

Service Tier: CHI - STL

- The CHI-STL corridor sees significant ridership gains moving from Emerging to Regional with limited ridership gains moving from Regional to Core Express service.
- Regional & Core Express have operating recovery ratio of ~ 1.0 in network context.
- Regional is more cost effective; Core Express does not appear to offer significant additional network benefits.

*Emerging not shown because load factors were well above one so Op RR wasn’t relevant
Southwest: Route Service Tier

Kansas City – St. Louis

Options
- Emerging, Regional and Core Express service tested for representative route

Analysis Findings
- Growth at each level but overall demand is limited
- Kansas City – Chicago market not served well without full Core Express on both KC – STL and STL - CHI

Conclusion
- Regional service likely the maximum that the KSC-STL corridor could sustain.

Total Ridership on Kansas City - St. Louis Corridor by Service Tier
Kansas City

Options

• Assess how markets beyond 12 state region (Wichita/Topeka) may affect service between Kansas City and St Louis.

Analysis Findings

• Rail travel demand from Wichita and Topeka to markets beyond Kansas City is limited.
• Nearly 70% of trips from Wichita and Topeka terminate in KSC.

Conclusion

• Markets beyond Kansas City do not materially affect service in the Midwest network.
Southwest: Aggregator

Rockford

Options
- Aggregate all service west of Chicago through Rockford or on separate alignments.

Analysis Findings
- The Iowa and Nebraska markets are best served by split corridors.
- The Rockford market benefits from the aggregated corridors, but the market is not of sufficient size to outweigh the negatives to Des Moines and Omaha.
- There are no capital savings to aggregating service.

Conclusion
- Rockford-Dubuque alignment was dropped as mainline option Chicago to Twin Cities.
- Pursue independent corridors west of Chicago, all of which are somewhat independent of other network decisions.
Southwest: Branch vs mainline

Circumferential Route

Options
- Connect markets between Davenport and Champaign with a circumferential route connecting to mainline in Bloomington.

Analysis Findings
- The circumferential route has significant ridership, amounting to 2 to 3 daily train load equivalents of service.
- When connecting to Core Express at Bloomington, the ridership jumps significantly.
- Most corridor ridership is connecting, meaning most riders are transferring to their final destination.

Conclusion
- Potential integral part of network once mainline built out to its maximum level.
Memphis

Options

• What is the ridership demand from Memphis and how does that impact service consideration onto the Midwest Network.

Analysis Findings

• There are about 250,000 boardings in Memphis when service extends from Carbondale, as well as when there is a direct connection to St. Louis.
• Approximately 50 percent of those boarding's are coming onto the Midwest network north of Carbondale and St. Louis.

Conclusion

• Relatively small market without large impacts on network service or configuration considerations.
Southwest: Major Corridor – STL/KC - Chicago

Recommended Network:

- Service Tier STL-CHI: Regional
- Route via Bloomington/Springfield
- Regional service St Louis to Kansas City; Kansas City – Chicago service via St Louis
- Emerging circumferential route once mainline is built out
- Other corridors recommended as Emerging and somewhat independent of other network considerations
Northeast
Network Options / Tradeoffs:

- Service Tier: Regional or Core Express
- Routing Options
  - Core Express via South Bend or
  - Regional via existing mainline
- Regional Service to Toronto
- Regional service Cleveland/Toledo – Detroit (Independent of whether that is route to Chicago)
- Tradeoffs for route Toledo/Cleveland to Chicago (but rule out connection point at Ann Arbor)
- Tradeoffs with how to serve Fort Wayne
- Coast-to-Coast route with Regional mainline or connections to mainline with Core Express
Service Tier – CHI-DET

Options
- Emerging, Regional and Core Express service tested for representative route

Analysis Findings
- Strong ridership growth Emerging to Regional more modest growth Regional to Core Express

Conclusion
- Minimum of Regional service warranted in corridor.
- Business case for high capital investment for Core Express relies of compounding network benefits
Service Tier: CHI - DET

- The CHI-DET corridor sees significant ridership gains moving from Emerging to Regional with more modest gains from Regional to Core Express service.
- Regional & Core Express have operating recovery ration of ~ 1.1 in network context.
- Regional more cost effective; Core Express could offer more network benefit options.

**CHI – DET O/D Ridership**

**Corridor Ridership (Network)**

**Operating Recovery Ratio (Network)**

**Total Corridor Capital Cost ($B)**
South Bend

Options
- If Core Express investment is made to Detroit – better to go via South Bend or along existing corridor?

Analysis Findings
- Alignment through South Bend increases ridership on mainline by 500,000.
- Small ridership losses in the Michigan markets are made up for by significant ridership gains from South Bend.

Conclusion
- If Core Exp. investment is going to be justified, additional ridership from South Bend is helpful
- South Bend alignment opens up additional network opportunities

Northeast: Route Service Tier

Toronto
Options
- Emerging, Regional and Core Express service tested for representative route

Analysis Findings
- Strong ridership growth Emerging to Regional very modest growth Regional to Core Express
- Strong ridership onto the Midwest Network beyond Detroit. Up to 5 – 6 TLEs coming onto the Midwest Network from Canada

Conclusion
- Serve Toronto market with at least Regional service with connection in Detroit.
- Service from Canada has big impact on justifying Core Express mainline west of Detroit.
Northeast: Branch vs mainline

Coast-to-Coast

Options
- Serve Lansing and Grand Rapids markets to Detroit with direct connection or with connecting service via branch connection to mainline

Analysis Findings
- Marginally better ridership with direct Coast-to-Coast connection from GRR and LAN to Detroit
- Better Chicago connections with perpendicular route

Conclusion
- If Core Express investment is going to be justified, additional ridership from Grand Rapids and Lansing may be necessary, and the GRR and LAN markets are well served with connections to a high volume mainline to both Chicago and Detroit
- If regional mainline then, GRR and LAN to Detroit are better served by a Coast-to-Coast route and that decision can be independent of other network investments
Ann Arbor

Options
- Make Ann Arbor a hub with service from Lansing, Flint, and Toledo/Cleveland connecting in Ann Arbor vs direct route to Detroit and Chicago

Analysis Findings
- Ann Arbor connections do not provide significant benefits to any market or segment of the network and has negative value to service to certain markets (Toledo/Cleveland)

Conclusion
- Rule out Ann Arbor hub configuration
Northeast: Aggregator

Fort Wayne

Options

• Direct service to Chicago.
• Connecting to Core Express mainline in South Bend.

Analysis Findings

• Fort Wayne could add an additional 250,000 passengers to Core Express mainline west of South Bend.
• Fort Wayne – Chicago alone is not enough to justify regional service, but through service to Cleveland and Columbus makes this a more viable option.

Conclusion

• Connection to Fort Wayne helps justify Core Express service via South Bend, but extension to South Bend is expensive and probably not warranted as Core Express.
• A direct regional connection from CHI-FTW has the best ridership potential, with connections to Columbus and Cleveland.
Northeast: mainline vs Branch

Cleveland / Toledo

Options

- Direct Core Express via South Bend
- Via Fort Wayne
- Toledo/Cleveland service connecting via Detroit to Core Express mainline.

Analysis Findings

- Direct Core Express through South Bend has the best Chicago to Cleveland ridership.
- Regional service via Fort Wayne captures 70% of maximum ridership on Core Exp. via South Bend.
- There is strong travel demand to Detroit, but this route significantly reduces through ridership to Chicago.

Conclusion

- The capital expense of direct Core Express through South Bend is not justified.
- Regional service CLE/TOL to Detroit is justified even when it’s not the route to Chicago.
Northeast: Route Service Tier

O&M Cost Recovery Ratio mainline:

- Chicago – Detroit Stand Alone: 0.94
- w/ Fort Wayne: 1.05
- w/ Toronto: 1.24
- w/ Perpendicular Routes: 1.41
- w/ Cleveland and Toledo: 1.57

Incremental Ridership Gains on mainline:

- Chicago – Detroit Stand Alone: 3,900,000
- w/ Fort Wayne: +500,000
- w/ Toronto: +800,000
- w/ Perpendicular Routes: +1,300,000
- w/ Cleveland and Toledo: +700,000
Northeast: Major Corridor – CHI-DET

Preliminary Proposed Network Options:

- Service Tier: Regional or Core Express
- Routing Options
  - Core Express via South Bend or
  - Regional via existing mainline
- Regional Service to Toronto
- Regional service Cleveland/Toledo – Detroit (Independent of whether that is route to Chicago)
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- Coast-to-Coast route with Regional mainline or connections to mainline with Core Express
Southeast
Southeast: Major Corridor – Indianapolis - Chicago

Preliminary Proposed Network Options:

- **Service Tier:** Regional with Core Express Potential
- **Route direct via Lafayette**
- **Tradeoff with how Columbus market is served.**
- **Emerging to Regional service to Louisville, Cincinnati and Columbus with connections at Indianapolis**

![Network Diagram]

- **Core Express**
- **Regional w/ Core Express Potential**
- **Regional**
- **Emerging-Integral to Network**
- **Emerging-Independent of Network**
- **Small Market-Independent of Network**
mainline Route Analysis

2 Routes Considered
- Via Kankakee
- Direct via Lafayette

Analysis Findings
- Kankakee route creates longer trip times and lowers ridership from IND and potential connecting market to the south and east (LVL, CIN, COL)
- Route does not offer consolidation benefits with potential St. Louis route and Kankakee market can be adequately served with separate corridor
- Kankakee route misses Gary and NW Indiana

Conclusions
- Connect Indianapolis and Chicago with a direct route.
Service Tier: CHI - IND

- Corridor sees significant ridership gains moving from Emerging to Regional and from Regional to Core Express service.
- Core Express has operating recovery ratio of > 1.0 in network context.
- Core Express is needed to unlock network benefits from COL, CIN, LVL
Indianapolis - Cincinnati

Options
- Emerging, Regional service tested for representative route.

Analysis Findings
- Cincinnati is a big market and has significant ridership to justify regional service to Indianapolis.
- The through ridership from Cincinnati to Chicago adds up to 700,000 riders to the Indianapolis to Chicago corridor, helping to justify Core Express investment.

Conclusion
- Regional service warranted and is integral to justifying Core Express investment Chicago to Indianapolis.
Indianapolis - Louisville

Options
- Emerging, Regional service tested for representative route

Analysis Findings
- Louisville is a moderate sized market whose demand is largely captured by Emerging service.

Conclusion
- Emerging service warranted and integral to justifying Core Express Indianapolis to Chicago.
- Additional investment to Regional service does not make meaningful contribution to CHI-IND mainline.
Southeast: Regional Gateway

Louisville

Options

• Assess how markets beyond 12 state region (Nashville) may affect service between Louisville and Indianapolis / Chicago.

Analysis Findings

• ~500,000 boardings in Nashville, ~75% are traveling through Louisville onto the Midwest network, and ~50% onto the Chicago – Indianapolis mainline.

Conclusion

• Emerging service to Nashville could provide some additional ridership on the Midwest network and could have an incremental positive effect on the amount of service in the network on the margins.
Southeast: Branch vs mainline

Columbus

Options
- Via Indianapolis
- Via South Bend & Fort Wayne
- Via Fort Wayne

Analysis Findings
- South Bend is a small market from Columbus and Fort Wayne.
- Significant ridership gains by moving from Emerging to Regional service into Columbus.
- Columbus to Chicago market is best served via Fort Wayne. The intermediate markets are better served via Dayton and Indianapolis.
- The Indianapolis connection has greater network ridership. But the COL connection is more important to the Fort Wayne business case.

Conclusion
- Dayton is best served through IND, and Columbus is best served through FTW.
- Trade-offs exist between IND and FTW alignments.
Southeast: Aggregator

Fort Wayne

Trade Offs

- Regional service from COL, TOL, CLE via FTW to CHI is close to optimal ridership for those four markets.
- Columbus is vital to the Fort Wayne – Chicago corridor, but the corridor volume is low relative to other corridors in the network.
- Columbus is also a key market for Indianapolis, but investment from Indianapolis to Chicago might be justified without Columbus.
- If the 3C Corridor is built, then the connection to Indianapolis is just the incremental cost of building Indianapolis to Dayton.
Southeast: Route Service Tier

O&M Cost Recovery Ratio mainline:

Chicago – Indianapolis Stand Alone: 0.55
  w/ Cincinnati (Reg.): 0.78
  w/ Louisville (Emg.): 0.89
  w/ Nashville (Emg.): 0.97
  w/ Columbus (Reg.) 1.30

Incremental Ridership Gains on mainline:

Chicago – Indianapolis Stand Alone: 1,500,000
  w/ Cincinnati (Reg.): +730,000
  w/ Louisville (Emg.): +510,000
  w/ Nashville (Emg.): +120,000
  w/ Columbus (Reg.)  +820,000
3C Corridor

Options

- Emerging and Regional service tested with and without emerging connections to FTW, IND, and DET.

Analysis Findings

- Without connections, 3C ridership increases from 1.1 M to 2.0 M going from Emerging to Regional service.
- Corridor ridership is nearly double in a network context, but the increment from Emerging to Regional is the same.

Conclusion

- These moderately sized markets should be connected via Regional service.
- There is a better business case for the 3C Corridor in a network context than in a standalone context.
Cleveland

Options
- An emerging connection to BUF was tested.
- Emerging and Regional connections to Pittsburgh were tested.

Analysis Findings
- Buffalo – Cleveland corridor has approx. 500,000 passengers with less than half coming onto the Midwest Network.
- Pittsburgh corridor has up to 2.6 M passengers with Regional Service, nearly half coming onto the Midwest network contributing significant volume to the Cleveland – Detroit corridor and 3C corridor.

Conclusion
- An emerging connection to Buffalo should be considered independent of the network.
- Pittsburgh should be included in the network vision with connection at Cleveland to the 3C corridor and connecting service to Detroit.

Best Buffalo connection is via Hamilton to both Toronto and Detroit.
Detroit - Indianapolis

Options
- Emerging, Regional, Core Express Service

Analysis Findings
- Core Express maximizes ridership from Indianapolis to Detroit, but regional service captures 85% of those riders (250,000).
- Detroit to Toledo riders account for around 50% of travel between Indianapolis and Detroit.
- Core Express service from Indianapolis to Chicago, transferring to Core Express to Detroit captures 59% of direct Core Express market.

Conclusion
- Detroit to Toledo service and Toledo to Fort Wayne service are separately justified. The only new segment required is Indianapolis to Fort Wayne.
- The Indianapolis to Fort Wayne connection is not critical to network performance and can be decided independently.
Southeast: Major Corridor – Indianapolis - Chicago

Preliminary Proposed Network Options:

- Service Tier: Regional with Core Express Potential
- Route direct via Lafayette
- Tradeoff with how Columbus market is served.
- Emerging to Regional service to Louisville, Cincinnati and Columbus with connections at Indianapolis
Action Items and Next Steps
End Result of Technical Efforts

• Proposed regional high-performance rail network including:
  • Corridors with proposed levels of service
  • Potential stations
  • Capital costs, O&M costs
  • Prioritized phasing
## Technical Efforts “in a Nutshell”

<table>
<thead>
<tr>
<th>ANALYSIS ROUND</th>
<th>EFFORT/ RESULT</th>
<th>WORKSHOP</th>
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</table>
| 1              | Baseline analysis and validation/calibration:  
|                | • Corridor identification  
|                | • Market opportunities  
|                | • Existing infrastructure conditions  
|                | • Validation/calibration | 1 |
| 2              | Further refinement:  
|                | • OD demand  
|                | Future corridor framework:  
|                | • Initial network scenarios  
|                | • Initial service plan concepts | 2 |
| 3              | Network design and service plan concepts  
|                | • Answers to questions  
|                | • Resolution of ambiguity and conflict in answers | 3 |
| 4              | Draft prioritized network  
|                | Benefit-cost analysis:  
|                | • User benefits (existing and new passengers)  
|                | • Societal benefits for non-users | 4 |
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Technical Analysis – Flow Chart

Assess Existing Market Data

Major Market Analysis

Define Building Blocks

CONNECT Demand Calibration / Validation

CONNECT Cost Calibration / Validation

Run Building Block Analysis

Clear Answers – Draft Network Elements

Ambiguous Answers – Need Stakeholder Input

Stakeholder Workshop 1

Stakeholder Workshop 2

Stakeholder Workshop 3

Stakeholder Workshop 4

Draft Network Vision

Final Network Vision
Action Items

• Summarize Workshop #3 discussions and key outcomes
  • Post the presentations to the website
  • Incorporate the meeting summary and outcomes into third electronic newsletter to broader interested parties list

• Apply the input from the workshop to the technical analysis using CONNECT for the next phase:
  • Design draft full prioritized network with ridership, O&M and capital cost outputs
  • Run full draft network to determine cost recovery ratio and benefit cost analysis

• Other actions based on meeting discussion and outcomes
Next Steps

• Incorporate answers and feedback from stakeholders on ambiguous answers

• Develop Draft Full Network via CONNECT to determine ridership, O&M cost, capital cost, cost recovery ratio, benefit/cost analysis

• Prepare draft Governance Report to potentially include:
  • Draft Chicago to Detroit CIP Governance Agreement
  • Draft agreement for Midwest Services Operations Council

• Continued outreach to stakeholders

• Begin planning for Workshop #4
Future Stakeholder Workshop

Workshop #4 (December 6, 2017)
Chicago, IL

- Present Full Draft Midwest network analysis (regional rail network service plan concept)
- Present prioritized plan and map
- Present and discuss revised (2nd) analysis of costs, benefits and funding
- Finalize and discuss final input on draft study recommendations
- Finalize development of vision including potential high-level governance implementation plan
- Identify initial lessons learned
- Additional input from Interested Parties - Topic – TBD
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<th>Yoav Hagler</th>
<th>Anna Lynn Smith</th>
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Questions/Discussion
Thank You!