

CONCEPTUAL ALIGNMENT SCREENING TECH MEMO

Blatnik Bridge Project

June 23, 2021

Table of Contents

Project Introduction	1
Project Purpose and Need	1
Proposed Evaluation Methodology.....	2
Evaluation Criteria Technical Memo.....	2
Overview of Alternatives Development, Screening, and Evaluation Processes.....	2
Purpose and Need Performance Measures (Step 1)	4
High Level Impact Performance Measures (Step 2)	6
Asset Management.....	6
Asset Security Concern	6
Operational Requirements.....	6
Conceptual Alignments.....	8
No Build Alternative	8
Bridge Rehab Concept	8
Conceptual Alignment 1 – Garfield Ave to Hammond Ave Connection	9
Conceptual Alignment 2 – Garfield Ave to US 53 Connection	9
Conceptual Alignment 3 – Garfield Ave to US 53 Along Connors Point	9
Purpose and Need Performance Screening - Step 1	9
Conceptual Alignments Recommended for Further Evaluation	9
No Build Alternative.....	9
Conceptual Alignments 1, 2, and 3	10
Concept Not Recommended for Further Evaluation.....	12
Bridge Rehab Concept	12
Purpose and Need Performance Screening – Step 1 Summary	13
Conceptual Sub-Alignments.....	13
Concept 1: Garfield to Hammond - Alignments.....	14
Sub-Alignments 1a, 1b and 1c	14
Sub-Alignments 1d and 1e	15
Sub-Alignments 1f and 1g	15
Concept 2: Garfield to US 53 - Alignments	15
Sub-Alignments 2a, 2b, and 2c	15
Sub-Alignments 2d and 2e	15
Sub-Alignment 2f.....	16

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

Concept 3: Garfield to US 53 Along Connors Point - Alignments 16

 Sub-Alignments 3a, 3b, and 3c 16

 Sub-Alignments 3d and 3e 16

High Level Impact Performance Screening – Step 2..... 16

 Conceptual Sub-Alignments Recommended for Further Evaluation 16

 No Build Alternative..... 16

 Conceptual Sub-Alignments 1a through e and 2a through e..... 17

 Conceptual Sub-Alignments Not Recommended for Further Evaluation..... 19

 Conceptual Tunnel Sub-Alignments 1f, 1g, 2f, 3d, and 3e 19

 Conceptual Bridge Sub-Alignments 3a, 3b, and 3c..... 21

 High Level Impact Performance Screening – Step 2 Summary 22

Step 1 and Step 2 Summary 23

Next Steps 23

Appendix A: Performance Screening Matrices 25

Appendix B: Conceptual Alignment Exhibits..... 26

Project Introduction

The Minnesota Department of Transportation (MnDOT), in partnership with the Wisconsin Department of Transportation (WisDOT), has initiated the planning for improvements to the John A. Blatnik Bridge (Minnesota Bridge 9030, Wisconsin Bridge B-16-5, hereafter called the Blatnik Bridge). The Blatnik Bridge on Interstate 535 (I-535) connects the two communities of Duluth, Minn., and Superior, Wis., across the St. Louis Bay. The Blatnik Bridge is 7,975 feet long (about 1.5 miles) and consists of a main truss unit (three-span continuous truss) flanked by steel beam approach span units (referred to as the Minnesota and Wisconsin approach spans), with a total of 52 spans.

The Blatnik Bridge serves as a local, regional, and international connection for vehicle and freight traffic on I-535 / U.S. Highway 53 (US 53) between Minnesota and Wisconsin. The Blatnik Bridge sits at the epicenter of the Port of Duluth-Superior, which accommodates the maritime transportation needs of a wide range of industries including agriculture, forestry, mining and manufacturing, construction, power generation, and passenger cruising. It also is crucial to maintaining local mobility. Geometric deficiencies in the bridge design and access interchanges, along with adverse weather conditions, influence poor traffic operations during peak periods and contribute to a high critical crash history. The unique setting of I-535 terminating in a neighborhood in Wisconsin complicates the traffic operations in the nearby local road network.

Project Purpose and Need

The project purpose statement is to:

Provide an interstate highway connection across the St. Louis Bay that does not restrict the movements for freight and provides local, regional, and international movement in a reliable and efficient manner.

MnDOT, in cooperation with WisDOT, has identified a number of factors justifying the need for the Blatnik Bridge project. The needs have been categorized as primary or secondary as defined below.

Primary needs include the primary transportation problems that led to the initiation of the project. Three primary needs have been identified:

- Bridge condition
- Vehicle safety
- Vehicle mobility

Secondary needs are other transportation problems that may be able to be addressed at the same time as primary needs. One secondary need has been identified: walkability/bikeability.

Additional considerations are elements that are not central to the purpose and need of the project but are important criteria for developing build alternatives. The additional considerations identified for this project initially included four criteria:

- Maritime freight navigation
- Connectivity and redundancy
- Regulatory requirements

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

- Railroad crossings

FHWA concurred with the purpose and needs of the project as described in the Feb. 23, 2021 Draft Purpose and Need Statement Tech Memo.

Through development of conceptual alignments, three additional considerations were added. These are discussed in Section 3.4 and include:

- Asset Management
- Asset Security Concern
- Operational Requirements

Proposed Evaluation Methodology

Evaluation Criteria Technical Memo

Initially, the alternatives evaluation methodology proposed for the Blatnik Bridge Project assigned three levels to the evaluation criteria, in an attempt to prioritize or weight criteria based on the need categories. As project conceptual alignments and evaluation criteria were developed, assigning levels to the evaluation criteria did not provide as much value as anticipated. That method was useful for prioritizing the primary project needs. However, as purpose and need criteria were applied to the conceptual alignments and alternatives, any concept or alternative that does not address project needs (Step 1) will not be recommended for further evaluation. The screening and evaluation process will follow a four-step process, as described in Section 3.2.

Overview of Alternatives Development, Screening, and Evaluation Processes

The alternatives development, screening, and evaluation processes for the Blatnik Bridge project consists of four basic steps that become more detailed as design advances and environmental studies are conducted. The goal of the processes is to identify a preferred alternative while documenting what alternatives are eliminated from further consideration through rigorous screening and evaluation. Figure 1 depicts a generalized flow chart of the Blatnik Bridge project alternatives development, screening, and evaluation processes. For the purposes of this project, screening is defined as a high level (i.e. qualitative) assessment of conceptual alignments (which provides enough design detail to identify benefits and flaws to meeting purpose and need and some comparison of additional considerations, social, economic, and environmental impacts). Evaluation is defined as a detailed assessment (i.e. qualitative and quantitative) of project alternatives (which provide more detail such as connections to the local transportation system). This tech memo summarizes the Step 1 and 2 screening process for conceptual alignment and recommendations for development of alternatives and further evaluation. The recommendations of this screening tech memo will be vetted with agencies, the Project Advisory Committee, and the public before project alternatives are advanced.

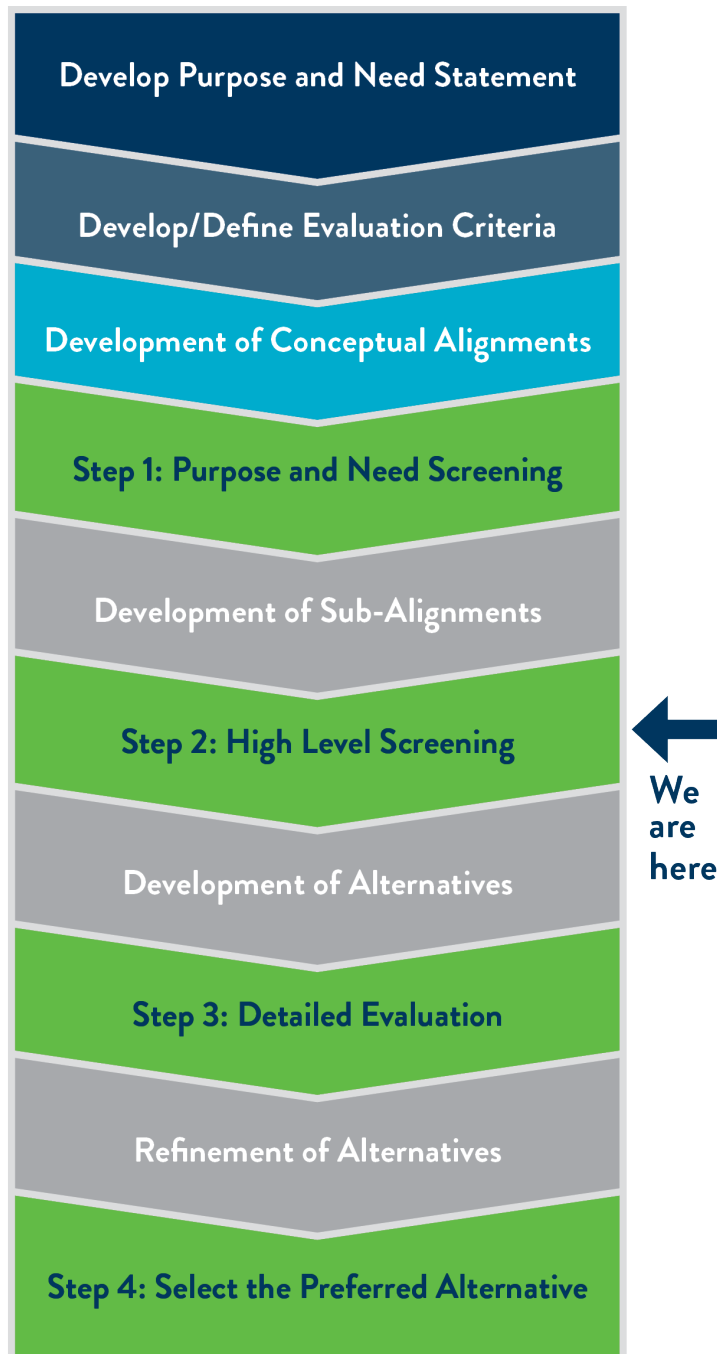
After vetting the recommendations of this screening, alignments that passed Steps 1 and 2 will undergo further design, including (but not limited to) the development of intersection/interchange concept layouts, local road connections, and cost estimation. This is identified as “Development of Alternatives” in the process flow chart (see Figure 1). Simultaneously, social, economic, and environmental studies will be conducted, in accordance with the methodology identified in the Feb. 23, 2021 Draft Evaluation

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

Criteria Tech Memo, to provide additional existing conditions information with which to evaluate impacts of the alternatives. This is identified as “Step 3: Detailed Evaluation” in Figure 1 After this evaluation, recommendations will be made to either eliminate alternatives that perform poorly as compared to others or advance alternatives for further evaluation.

Due to the large scale and complexities of the project, it is likely that there may be multiple iterations of analysis and review during Step 3 “Detailed Evaluation” and “Refinement of Alternatives” before “Step 4: Selection of the Preferred Alternative” is initiated. This sequence will be documented in subsequent tech memos for further vetting with agencies, the Project Advisory Committee, and the public before project alternatives are advanced.

Figure 1: Alternatives Development, and Screening, and Evaluation Processes



Purpose and Need Performance Measures (Step 1)

The Step 1 screening is intended to compare each conceptual alignment with the project needs and determine to what degree those needs could be met. The performance measures used for Step 1 are defined in Table 1. The logic to how these measures were applied is covered in Section 5, and results are shown in a screening matrix provided in Appendix A: Performance Screening Matrices.

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

TABLE 1. PURPOSE AND NEED PERFORMANCE MEASURES FOR STEP 1

Category	Evaluation Criteria	Performance Measures	Poor Performance	Fair Performance	Good Performance
Primary Need: Bridge Condition	Bridge Condition	Does the concept extend service life of the structure?	No reasonable opportunity to extend service life	Some opportunity to extend service life	Opportunity to maximize service life
Primary Need: Bridge Condition	Structure Robustness ¹	Does the concept improve structural robustness? Robustness includes factors such as environmental demands, structural redundancy, materials, ease of maintenance and inspection, and need for element replacement or repair over the life of the structure.	No reasonable opportunity to improve structure	Opportunity for improved ² or new structure	Opportunity for all new structure
Primary Need: Vehicle Safety	Crash Rate Reduction Potential	Does the concept have the potential to improve roadway deficiencies (i.e. short deceleration lane, steep slopes with speed differential, reduced weaving, and number of conflict points at intersection of Hammond and 5th) and bridge deficiencies (i.e. inside and outside shoulder widths) that contribute to safety problems?	No opportunity for deficiency improvement	Opportunity for some deficiencies to be improved	Opportunity to improve most deficiencies
Primary Need: Vehicle Mobility	Traffic Operations	Does the concept have the potential to improve traffic operations (i.e. overall system delay, capacity, intersection level of service, improvement of Wisconsin operational deficiencies)?	No opportunity for traffic operation improvement	Opportunity for some traffic operation improvement	Opportunity to improve most traffic operations
Primary Need: Vehicle Mobility	Oversize Overweight (OSOW) (e.g. specialized equipment such as wind turbines getting to and from ports) and Freight Mobility	Does the concept increase the intended freight movements of the crossing (i.e. original operational performance)? Does the concept maintain access to ports?	No opportunity for improved large freight movements across St. Louis Bay and/or most access impacts to ports	Opportunity for some improved large freight movements across St. Louis Bay and/or some access to the ports	Opportunity to improve most large freight movements across the St. Louis Bay and/or no access impacts to the ports
Secondary Need	Walkability/Bikeability	Does the concept have the potential to improve bike and pedestrian network connectivity?	No opportunity to improve bike and pedestrian connectivity	Opportunity for some improvement for bike and pedestrian connectivity	Opportunity for most improvement for bike and pedestrian connectivity

¹ The robustness of the structure is essential for the long term demands and the operational needs by the owners. The operational importance and significant investment for this project requires the owners to critically evaluate all aspects of robustness over the life of the structure.

² Improved means concepts that address this need by replacement of the existing truss spans while rehabilitating portions of the existing approach spans through the end of their service life in 2045; provides owners with intermediate rehab options to address bridge condition using a phased approach while meeting project needs.

High Level Impact Performance Measures (Step 2)

Step 2 screening is also general but focuses on a comparison of each conceptual alignment with the potential for impacts to known resources using existing data. Detailed evaluation will be conducted in Step 3 and 4 of the alternatives development, screening, and evaluation processes. Social, Economic, Environmental (SEE) Considerations selected for Step 2 screening included those that would help identify differences between concepts. The performance measures used for this general resource impact evaluation are defined in Table 2. The logic to how these measures were applied is covered in Section 7, and results are shown in an evaluation matrix provided in Appendix A: Performance Screening Matrices.

Three additional considerations were identified since the Feb. 23, 2021 Draft Evaluation Criteria Tech Memo was published. These measures were added to help distinguish differences between conceptual alignments in this step and are included in Table 2:

Asset Management

The ability to cost-effectively operate, maintain, and upgrade the physical assets throughout its life-cycle. Typically seen as life-cycle cost accounting for initial capital investment, operational costs, and maintenance cost over the service life of the asset. The magnitude of the asset is indicative of the overall impact to an owner to effectively manage the asset and is included as a relative measure between concepts.

Asset Security Concern

The owner's responsibility to protect critical highway infrastructure and minimize risk from intentional or related multi-threats. Bridge and tunnel safety are achieved by providing and maintaining a facility that meets both security and resiliency. A secured facility is one that is protected against intentional hazards, a resilient facility absorbs credible threats and returns to function. This measure is included to allow the differentiation of classes or configuration of the facility related to the owner's ability to manage its security.

Operational Requirements

Certain classes of assets require operational systems over their service life such as mechanical/electrical facilities, ventilation, fire suppression, communications, traffic incident management or drainage. These unique features require specialized continuous maintenance and reinvestment to ensure safety and reliable levels of service. This measure is included to allow the differentiation of classes of facilities to effectively manage the life-cycle investment impacts for asset operation.

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

TABLE 2. HIGH LEVEL IMPACT PERFORMANCE MEASURES FOR STEP 2

Category	Evaluation Criteria	Performance Measures	Poor Performance	Fair Performance	Good Performance
Social, Economic, Environmental Considerations (SEE)	Potential Section 4(f) ³	Number of parcels with public park, recreational areas, wildlife/waterfowl refuges, and/or public/private historic properties that may be impacted based on conceptual alignment	Potential impacts anticipated to be greater than <i>de minimis</i>	Potential impacts anticipated to be <i>de minimis</i> or to be a temporary occupancy not considered a use	No potential for Section 4(f) impact
Social, Economic, Environmental Considerations (SEE)	Wetland and waterway impacts	Comparison of wetland and waterway impacts based on best available aquatic resource surveys	Most potential to impact identified aquatic resources	Some potential to impact identified aquatic resources	Least potential to impact identified aquatic resources
Social, Economic, Environmental Considerations (SEE)	Right of way needs	Potential need for new right of way and or relocations/displacements based on the concept alignment (not including interchange) ⁴ Potential impacts to railroad track and/or right of way.	Greatest potential for right of way impacts Greatest potential for impacts to railroad tracks and/or right of way	Some potential for right of way impacts Some potential for impacts to railroad tracks and/or right of way	Least potential for right of way impacts Least potential for impacts to railroad tracks and/or right of way
Social, Economic, Environmental Considerations (SEE)	Economic Impacts	Business impacts or user delay due to construction closures Volume of bridge traffic to and through the City of Superior central business district	Longest closure Substantial redirection to motorists originating/destined to and through the central business district	Longer closure Minor redirection to motorists originating/destined to and through the central business district	Long closure Little or no redirection to motorists originating/destined to and through the central business district
Additional Considerations	Asset Management	Ability to cost-effectively operate, maintain, and upgrade the physical assets throughout its life-cycle	Greatest amount of asset to be managed	Some increase in amount of asset to be managed	Little to no change in amount of asset to be managed

³ Through coordination with the respective Minnesota and Wisconsin Department of Natural Resources, it was determined there are no Section 6(f) properties within the project study area; see Figure 2 of Appendix B for map of the project study area.

⁴ The potential for right of way impacts due to proposed interchanges will be evaluated as part of the detailed evaluation of alternatives under Step 3, as there is not enough engineering detail to evaluate new interchanges during Step 2.

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

Category	Evaluation Criteria	Performance Measures	Poor Performance	Fair Performance	Good Performance
Additional Considerations	Asset security concern	Asset security concern (i.e. roads under structure, enclosed space)	Greatest security issues to manage	Some additional security issues to manage	Similar security issues to manage as existing
Additional Considerations	Operational Requirements	Special requirements needed to operate the new system or structure (i.e. ventilation, fire suppression, communications, traffic incident management, drainage)	Many new systems required	Some new systems required	No new systems required

Conceptual Alignments

Due to the large scale of the project and the nature of the needs, the ‘universe’ of potential alternatives is vast. In order to narrow the scope of potential alternatives for evaluation under Step 3, the project team identified Conceptual Alignments which present reasonable opportunities to meet the purpose and needs of the project.

The Conceptual Alignments include general connection points between the logical termini of the project (i.e. the I-535/US 53/Garfield Avenue Interchange, I-535/Hammond Avenue and 5th Street intersection, and a US 53 connection somewhere east of I-535 to US 2). **They do not include design details such as geometrics of intersection/interchanges required at ends of connections or modifications needed to tie into the local road system.** The project study area is shown in Figure 1 of Appendix B: Conceptual Alignment Exhibits. The connections are shown in Figure 2 of Appendix B: Conceptual Alignment Exhibits and are described in the following sections.

In addition to the Conceptual Alignments, a No Build (or do nothing) alternative has also been considered. Although not considered a reasonable concept, the No Build alternative provides the baseline for comparison of all conceptual alignments. The No Build alternative is shown in Figure 3 of Appendix B: Conceptual Alignment Exhibits. A bridge rehabilitation (referred to as Bridge Rehab in this document) alternative was also considered based on previous analysis completed by MnDOT. The Bridge Rehab concept is shown in Figure 4 of Appendix B: Conceptual Alignment Exhibits.

No Build Alternative

The No Build alternative would continue routine maintenance until end of service life of the truss spans in 2030.

Bridge Rehab Concept

The Bridge Rehab concept considers rehabilitation of the entire bridge structure, including the truss and both approach spans, to restore original load capacity and maintain function through the end of the approach service life in 2045. Per the *2017 Blatnik Bridge Management Study*, there is no reasonable opportunity to improve robustness or extend the service life of the entire structure beyond 2045.

Conceptual Alignment 1 – Garfield Ave to Hammond Ave Connection

Conceptual Alignment 1 makes a connection between the I-535/US 53/Garfield Avenue Interchange and I-535/Hammond Avenue and 5th Street intersection. This alignment is being considered as an opportunity to match the existing connection points in Minnesota and Wisconsin. The connection could be accommodated via bridge or tunnel.

Conceptual Alignment 2 – Garfield Ave to US 53 Connection

Conceptual Alignment 2 makes a connection between the I-535/US 53/Garfield Avenue Interchange and US 53. This alignment would maintain the existing connection point in Minnesota and create a new connection point in Wisconsin directly into US 53. This alignment is being considered as an opportunity to improve traffic operations and freight mobility that is complicated by the nature of the existing connection (i.e. transition from freeway to city street system). The connection could be accommodated via bridge or tunnel.

Conceptual Alignment 3 – Garfield Ave to US 53 Along Connors Point

Conceptual Alignment 3 makes a connection between the I-535/US 53/Garfield Avenue Interchange and US 53 along Connors Point, a peninsula on the Wisconsin side of the bridge. The alignment is being considered for two reasons: first, a bridge that preceded the Blatnik Bridge's construction in the 1960s followed an alignment that more closely followed Connors Point and, second, the alignment reflects potential alternatives that would shift the Wisconsin connection point substantially further east than the existing connection at Hammond Avenue. The connection could be accommodated via bridge or tunnel.

Purpose and Need Performance Screening - Step 1

Step 1 of the screening and evaluation process involved a high level screening of the Conceptual Alignments, the No Build alternative, and the Bridge Rehab concept against the needs of the project. The screening utilizes all evaluation criteria listed in Table 1. The goal of this screening is to determine which concepts present at least an opportunity for addressing each of the project needs and to recommend those that do for further evaluation.

- Concepts 1, 2, and 3, and the No Build alternative - recommended for further evaluation in Step 2
- Bridge Rehab concept - not recommended for further evaluation in Step 2.

The results of this screening are summarized in Appendix A: Performance Screening Matrices. An explanation of the reasoning for these recommendations is described for each concept in the following sections.

Conceptual Alignments Recommended for Further Evaluation

No Build Alternative

Although the No Build does not address the project's purpose and need, the concept is carried forward for evaluation as it serves as the baseline condition against which other build concepts are compared.

Conceptual Alignments 1, 2, and 3

All conceptual alignments are recommended for further evaluation as they each provide a reasonable opportunity to maximize the service life of the structure, at least some opportunity for improved vehicle safety and mobility, and opportunity to accommodate bike and pedestrian connectivity.

Bridge Condition: Service Life

The bridge and tunnel structure provide for an opportunity to maximize the service life of the structure, either through extension of target service life for existing elements (i.e. replacement of the truss span and rehabilitation of the approach span) and maximum service life of new elements (i.e. for all new bridge or tunnel structure); therefore, each conceptual alignment was assigned a good performance rating for the bridge condition criteria.

Bridge Condition: Structure Robustness

The bridge and tunnel structure provide the opportunity for an improved or new structure. A bridge structure following Conceptual Alignment 1 or 2 would replace the existing truss span, the highest priority component of the Blatnik Bridge condition, and either completely replace the approach spans or repair and maintain portions of the existing approach spans. Conceptual alignments that result in all new structure were assigned a good performance rating for structure robustness and those that rehab all or portions of the approaches were assigned fair performance ratings (based on the substantial maintenance and safety investment needed to extend service life).⁵

A bridge structure following Conceptual Alignment 3 would require a new approach span on the Wisconsin side of the bridge in addition to the truss span; therefore, it was assigned a good performance rating for structure robustness.

Similarly, tunnels that follow any of the concept alignments would result in an all new structure; therefore, they were assigned good performance ratings for structure robustness.

Vehicle Safety: Crash Rate Reduction Potential

The bridge and tunnel structure provide the opportunity for at least some of the roadway or bridge deficiencies that contribute to high crash rates to be improved. Multiple factors would potentially limit the crash reduction opportunities of the build alignments. As described in the Feb. 23, 2021 Draft Purpose and Need Statement Tech Memo, the existing roadway on the approach spans have narrow shoulder widths and roadway geometric influences (i.e. short deceleration lane, steep slopes with speed differential) which contribute to high crash rates. Conceptual alignments which could maintain portions of the existing approach spans would not address these deficiencies;

⁵ This differentiation is not reflected in the purpose and need performance evaluation matrix (Table 3) because the various sub-alignments are defined as part of this step in the screening process. The differentiation has been included in the screening summary (Table 6) . See Appendix B: Conceptual Alignment Exhibits for screening matrices.

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

therefore, Conceptual Alignment 1 and 2 were assigned a fair performance rating for crash rate reduction potential.

A bridge structure following Conceptual Alignment 3 would require a new approach span on the Wisconsin side of the bridge which would provide an opportunity to improve most deficiencies; therefore, it was assigned a good performance rating for crash rate reduction potential.

Similarly, tunnels that follow any of the concept alignments would result in a new structure that provides opportunity to improve most deficiencies; therefore, they were assigned a good performance rating for crash rate reduction potential.

Vehicle Mobility: Traffic Operations

The bridge and tunnel structure provide the opportunity for at least some traffic operations improvements. As described in the Feb. 23, 2021 Draft Purpose and Need Statement Tech Memo, the traffic operational problems are concentrated at or in the vicinity of the I-535/Hammond Avenue and 5th Street intersection in Superior. A bridge structure following Conceptual Alignment 1 would require modification to this intersection to improve traffic safety, but some of the operational improvements may be limited due to space constraints; therefore, it was assigned a fair performance rating for traffic operations.

The bridge and tunnel structure would require a new interchange structure at I-535/Hammond Avenue and 5th Street intersection or elsewhere at US 53 in Superior; therefore, they were assigned good performance ratings for traffic operations assuming greater potential to address current traffic safety issues.

Vehicle Mobility: OSOW and Freight Mobility

The bridge structure would replace the existing truss span which would provide some opportunity to improve the weight restrictions of the existing crossing. A bridge structure following Conceptual Alignment 1 would only modify the existing interchange at I-535/Hammond Avenue and 5th Street intersection, which may not be able to address the tight curve at the I-535 southbound exit ramp to US 53 southbound; therefore, it was assigned a fair performance rating for OSOW and freight mobility. Bridge structures following Conceptual Alignment 2 and 3 would provide a new intersection at US 53 in Superior; therefore, they were assigned good performance ratings for OSOW and freight mobility assuming greater potential to address current OSOW constraints.

While a tunnel structure would provide for a new structure and opportunity to eliminate weight restrictions, it also may restrict some oversize loads or movement of hazardous materials; therefore, it was assigned fair performance ratings for OSOW and freight mobility.

Bikeability/Walkability

The bridge structure would replace the existing truss span which would provide opportunity for bike and pedestrian connectivity over the main navigation channel with

wider structure. That opportunity is potentially limited in Conceptual Alignment 1 and 2 if the approach spans are not completely replaced as continuity in the connection could not be extended over the existing approaches. Additionally, the opportunity is potentially limited in Conceptual Alignment 3 due to the much longer length of the crossing, likely over one mile longer than an existing connection might be; therefore, all conceptual alignments utilizing a bridge structure were assigned fair performance ratings for walkability/bikeability.

A tunnel structure could provide the opportunity to accommodate bike and pedestrian connectivity; however, the opportunity could be limited by desirability given the confined nature, poor air quality, and long distances; therefore, all conceptual alignments utilizing a tunnel structure were assigned fair performance ratings for walkability/bikeability.

Concept Not Recommended for Further Evaluation

Bridge Rehab Concept

Per the *Blatnik Bridge Management Study (2017)*, rehabilitation of the entire bridge is not recommended for further evaluation as it does not meet the purpose and need of the project. It does not provide for reasonable opportunity to improve service life, structural robustness, vehicle safety, vehicle mobility, nor accommodate bike and pedestrian connectivity. The 2017 study focused on the main truss portion of the bridge and found that rehabilitation of the main truss was not a reasonable investment. This evaluation agreed with the findings on the 2017 study. Truss rehabilitation was rated poor in comparison to truss replacement in meeting project needs based on the following findings:

Bridge Condition: Service Life

The rehabilitation of the bridge could extend the service life 20-30 years at which time a full bridge replacement will need to be considered as the approaches reach the end of its service life. When compared to replacement, rehabilitation does not provide a reasonable opportunity to extend comparable service life of the bridge.

Bridge Condition: Structural Robustness

The rehabilitation of the main truss unit retains a bridge type that is more susceptible to adverse weather demands of northern Minnesota (i.e. wind, snow) resulting in future corrosion and deterioration. The susceptible components include truss members, gusset plates, and suspender cables). Such a bridge type does not provide for a reasonable opportunity for improving structure robustness.

The rehabilitation of the main truss unit retains a bridge type that requires yearly and specialty inspections if the structural redundancy is not addressed by truss rehabilitation; therefore, does not provide a reasonable opportunity for improving structure robustness.

The full removal of chloride contamination and pack rust from the main truss unit cannot be achieved in a rehabilitation alternative. This will result in continued investment in maintenance and impacts to users (reduced lanes, closures) to perform

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

the regular maintenance; therefore, does not provide a reasonable opportunity for improving structure robustness.

Vehicle safety: Crash Rate Reduction Potential

The main truss unit cannot be widened to improve the substandard deck and roadway width geometrics; therefore, does not provide an opportunity to address deficiencies which contribute to high crash rates.

Vehicle Mobility: Traffic Operations

This concept is concentrated on the bridge and which does provide opportunity to improve the traffic operational problems of the existing Wisconsin connection.

Vehicle Mobility: OSOW and Freight Mobility

The rehabilitation of the main truss could require robust temporary shoring systems that could impact the navigable waterway and require long-term closures to traffic on and under the main truss unit; therefore, could hinder freight mobility.

Bikeability/Walkability

The geometrics of the existing bridge do not allow for additional bike/ped infrastructure to be added; therefore, the bridge rehab concept does not provide an opportunity to improve bike and pedestrian connectivity.

Purpose and Need Performance Screening – Step 1 Summary

The recommendations of the purpose and need performance screening are shown in a matrix in Table 3 of Appendix A: Performance Screening Matrices. Conceptual alignments 1, 2 and 3 are recommended for further screening as conceptual sub-alignments via Step 2. The Bridge Rehab concept is recommended to be eliminated from further evaluation.

Conceptual Sub-Alignments

Conceptual alignments 1, 2, and 3 that advanced through Step 1 were developed into sub-alignments.

The sub-alignments represent various combinations (following the existing bridge or offset east or west) and structure types (bridge vs. tunnel). Table 3 lists the resulting sub-alignments. Corresponding exhibits are included in Appendix B: Conceptual Alignment Exhibits.

TABLE 3: CONCEPTUAL SUB-ALIGNMENTS

Conceptual Alignment	Sub	Short Description	Appendix B: Conceptual Alignment Exhibits Figure #
1 (Garfield Ave to Hammond Ave)	a	Bridge: Existing Alignment – Hammond Connection	5
	b	Bridge: West Alignment – Hammond Connection	5
	c	Bridge: East Alignment – Hammond Connection	5
	d	Bridge: West /Existing Combination Alignment – Hammond Connection	6
	e	Bridge: East /Existing Combination Alignment – Hammond Connection	6
	f	Tunnel: Garfield to Hammond - West	7
	g	Tunnel: Garfield to Hammond - East	7
2 (Garfield to US 53)	a	Bridge: Existing Alignment – US 53 Connection	8
	b	Bridge: West Alignment – US 53 Connection	8
	c	Bridge: East Alignment – US 53 Connection	8
	d	Bridge: West /Existing Combination Alignment – US 53 Connection	9
	e	Bridge: East /Existing Combination Alignment – US 53 Connection	9
	f	Tunnel: Garfield to US 53	10
3 (Garfield to US 53 along Connors Point)	a	Bridge: Connors Point Central Alignment – US 53 Connection	11
	b	Bridge: Connors Point West Alignment – US 53 Connection	11
	c	Bridge: Connors Point East Alignment – US 53 Connection	11
	d	Tunnel: Garfield to US 53 Along Connors Point	12
	e	Tunnel: Garfield to US 53 Along Bay	12

Concept 1: Garfield to Hammond - Alignments

Seven sub-alignments were developed that maintain the current connection between the Minnesota touchdown at the Garfield Interchange and the Wisconsin touchdown interchange into Hammond Avenue.

Sub-Alignments 1a, 1b and 1c

- Sub-Alignment 1a - Bridge: Existing Alignment (Hammond Connection)
- Sub-Alignment 1b - Bridge: West Alignment (Hammond Connection)
- Sub-Alignment 1c - Bridge: East Alignment (Hammond Connection)

These sub-alignments propose replacing the existing bridge with a new bridge or combination of new and existing bridge on the same alignment or a new bridge on a completely offset alignment. Sub-Alignment 1A allows for rehabilitating portions of the existing approach spans through the end of their service life in 2045 and provides intermediate rehab options to address bridge condition using a phased approach while meeting project needs.

Sub-Alignments 1d and 1e

- Sub-Alignment 1d – Bridge: West /Existing Combination Alignment (Hammond Connection)
- Sub-Alignment 1e – Bridge: Bridge: East /Existing Combination Alignment (Hammond Connection)

These sub-alignments propose replacing the existing bridge with a new offset structure over the main navigation channel and a new structure or combination of new and existing bridge on the existing alignment for the Wisconsin approach. These sub-alignments allow for rehabilitating portions of the existing approach spans through the end of their service life in 2045 and provides intermediate rehab options to address bridge condition using a phased approach while meeting project needs.

Sub-Alignments 1f and 1g

- Sub-Alignment 1f - Tunnel: Garfield to Hammond - West
- Sub-Alignment 1g - Tunnel: Garfield to Hammond - East

These sub-alignments propose replacing the existing bridge with twin tube bored tunnels and entry portals following adjacent to the east or west of the existing alignment.

Concept 2: Garfield to US 53 - Alignments

Six sub-alignments were developed from Conceptual Alignment 2 that connect the Minnesota touchdown at the Garfield Interchange with a new Wisconsin touchdown directly into US 53 and with interchange connections to STH 35 and Hammond Avenue.

Sub-Alignments 2a, 2b, and 2c

- Sub-Alignment 2a - Bridge: Existing Alignment (US 53 Connection)
- Sub-Alignment 2b - Bridge: West Alignment (US 53 Connection)
- Sub-Alignment 2c - Bridge: East Alignment (US 53 Connection)

These sub-alignments replace the existing bridge with a new bridge or combination of new and existing bridge on the same alignment or new bridge on a completely offset alignment. Sub-Alignment 2a also allows for rehabilitating portions of the existing approach spans through the end of their service life in 2045 and provides intermediate rehab options to address bridge condition using a phased approach while meeting project needs.

Sub-Alignments 2d and 2e

- Sub-Alignment 2d - Bridge: West /Existing Combination Alignment (US 53 Connection)
- Sub-Alignment 2e - Bridge: East /Existing Combination Alignment (US 53 Connection)

These sub-alignments replace the existing bridge with a new offset structure over the main navigation channel and a new structure or combination of new and existing bridge on the existing alignment for the Wisconsin approach. These sub-alignments allow for rehabilitating portions of the existing approach spans through the end of their service life in 2045 and provides intermediate rehab options to address bridge condition using a phased approach while meeting project needs.

Sub-Alignment 2f

- Sub-Alignment 2f - Tunnel: Garfield to US 53

This sub-alignment utilizes twin tube bored tunnels and entry portals to make the connection.

Concept 3: Garfield to US 53 Along Connors Point - Alignments

Five sub-alignments were developed from Conceptual Alignment 3 that connect the Minnesota touchdown at the Garfield Interchange with a new Wisconsin connection directly into US 53 along Connors Point or across the St. Louis Bay.

Sub-Alignments 3a, 3b, and 3c

- Sub-Alignment 3a - Bridge: Connors Point Central Alignment (US 53 Connection)
- Sub-Alignment 3b - Bridge: Connors Point West Alignment (US 53 Connection)
- Sub-Alignment 3c - Bridge: Connors Point East Alignment (US 53 Connection)

These sub-alignments replace the existing bridge with a new bridge or combination of new and existing bridge on the same alignment or new bridge on a completely offset alignment.

Sub-Alignments 3d and 3e

- Sub-Alignment 3d - Tunnel: Garfield to US 53 Along Connors Point
- Sub-Alignment 3e - Tunnel: Garfield to US 53 Along Bay

These sub-alignment utilizes twin tube bored tunnels and entry portals to make the connection directly to US 53 (with tunnel aligned along Connors Point) or US 53/US 2 (with tunnel aligned along St. Louis Bay).

High Level Impact Performance Screening – Step 2

Step 2 of the screening and evaluation process involved screening the conceptual sub-alignments using a high-level desktop review of existing data. The intent of this screening was to identify sub-alignments that have readily identifiable benefits and flaws (i.e. potential for environmental, economic, and/or social impacts). A more detailed evaluation will be conducted in Step 3 and 4 of the alternatives development, screening, and evaluation processes, which will be documented as part of separate tech memo.

Conceptual Sub-Alignments Recommended for Further Evaluation

No Build Alternative

The No Build alternative would require continued repairs and enhanced maintenance that ultimately cannot prevent decommission of the structure; therefore, has been rated as poor for economic impacts due to closure and operational requirements. The No Build alternative would not result in any other changes to existing conditions. The concept will continue to be carried forward for evaluation as it serves as the baseline condition against which other sub-alignments are compared.

Conceptual Sub-Alignments 1a through e and 2a through e Section 4(f)

The Minnesota Department of Natural Resources (MnDNR) operates a Public Water Access on land owned by the Duluth Superior Port Authority located under the Minnesota approach spans of the existing bridge. The property may meet the definition of a Section 4(f) property depending on permits and lease agreements. All bridge sub-alignments following Conceptual Alignment 1 or 2 will likely result in some impact to the potential Section 4(f) property. It is anticipated that these sub-alignments would result in *de minimis* impacts or a temporary occupancy not considered a use of the Section 4(f) property; therefore, they were assigned fair performance ratings for potential Section 4(f) impacts.

Wetland and waterway impacts

National Wetland Inventory (NWI) mapping, available from the MnDNR, and Wisconsin Wetland Inventory (WWI) mapping available from the Wisconsin DNR, were reviewed for the project study area. Both inventories depict potential wetland areas and waterbodies based on stereoscopic analysis of high altitude and aerial photographs. All data is anticipated to be field verified during Step 3 evaluation.

All bridge sub-alignments will likely result in some impact to wetlands and waterways. Concepts following an existing alignment (sub-alignment 1a and 2a) are within and/or near identified aquatic resources are anticipated to result in the least aquatic resource impacts and were assigned a good performance rating. Concepts following a new alignment (sub-alignments 1 [b - e] and 2 [b - e]) either via truss or approach span offset are anticipated to result in the most potential for aquatic resource impacts and were assigned a poor performance rating.

Right of way needs

The Superior/Douglas County, WI Geographic Information Web Server⁶ was reviewed to determine potential right of way impacts (i.e. the potential impact due to relocation or displacement of existing landowners or potential for new railroad track crossings) across the various sub-alignments. Step 3 will evaluate potential right of way needs for interchange footprints, included a breakdown of permanent vs temporary and right of way vs easements.

Relocation/Displacement

Generally, alignments that more closely follow the existing alignment are anticipated to result in less right of way impacts that result in relocation/displacement. Sub-Alignment 1a is anticipated to follow the existing alignment of the bridge (both via bridge truss and approaches and connection in Superior Wisconsin); therefore, was assigned a good performance rating for least potential to result in relocation/displacement. Concepts following a new alignment (sub-alignments 1 [b - e] and 2 [a - e]) either via truss or approach span offset have the potential to result in some potential to result in

⁶ Available at <https://douglascowi.wgxtreme.com/>

relocation/displacement; therefore, they were assigned a fair performance rating for potential to result in relocation/displacement.

Railroads

All bridge alignments following Conceptual Alignment 1 or 2 cross existing railroads; however, they do not add additional crossing locations. Therefore, they all were assigned a good performance rating for potential railroad impacts.

Economic Impacts

Two measures of economic impact were applied across the various sub-alignments: impacts due to anticipated construction closure and traffic volume impacts to the city of Superior central business district (CBD). For the purposes of this analysis the CBD is generally defined as the district along:

- STH 35/Tower Avenue from 3rd Street to N. 21st Street
- Hammond Avenue from 5th Street to Belknap Avenue
- US 2/Belknap Avenue from Banks Avenue to Catlin Avenue

Construction Closure

Bridge sub-alignments that follow the existing truss and approach span alignment will result in longer construction periods based closure of the bridge during construction than those that follow a new alignment because a portion of the bridge could remain in operation while the new structure is constructed. Therefore, sub-alignments 1a and 2a were assigned poor performance rating for economic impacts related to construction closure. Sub-alignments 1d, 1e, 2d, and 2e would utilize the existing approach alignments; therefore, they were assigned a fair performance rating for economic impacts related to construction closure. Sub-alignments 1b, 1c, 2b, and 2c would utilize a new alignment throughout; therefore, they were assigned a good performance rating for economic impacts related to construction closure.

Traffic Volume Impacts to the City of Superior Central Business District

Sub-alignments 1 (a - e) were assigned a good performance rating since they would result in little or no redirection to motorists originating/destined to and through the CBD. This rating was based on the urban development patterns along and adjacent to the primary roadways connecting to the sub-alignments. This rating also considered travel demand patterns of the motorists traveling to and from Superior over the Blatnik Bridge, which indicate that about 25% of that traffic is originating from or destined for the CBD area. An additional 30% is originating from or destined for points west of the CBD. Sub-alignments 1 (a - e) would continue the existing traffic patterns to the CBD, resulting in almost no redirection for these movements.

Sub-alignments 2 (a - e) were assigned a fair performance rating since they would have more redirection to motorists originating/destined to and through the CBD than sub-alignments 1 (a - e). Since these sub-alignments move the local network connection to the east, further away from the CBD, there is redirection to the overall traffic stream for the approximately 55% of the Blatnik Bridge traffic originating from or destined for the

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

CBD or points west of the CBD. The rating of fair indicates the redirection in the traffic stream is more than for sub-alignments 1 (a - e) but less than sub-alignments 3 (a - e).

Asset Management

This is a comparison of expected increase or decrease in the amount of asset requiring future management. Sub-alignments 1 (a - e) were assigned a good performance rating for asset management since they present the least amount of asset to maintain based on overall bridge length. Sub-alignments 2 (a - e) were assigned a fair performance rating since these concepts would increase the amount of asset to be maintained over sub-alignments 1 (a - e) based on overall bridge length.

Asset Security Concern

All sub-alignments 1 (a - e) and sub-alignments 2 (a - e) were assigned a good performance rating for asset security concern because these sub-alignments lie in the same general configuration as the existing bridge, representing an asset exposure that can be managed through traditional means.

Operational requirements

All sub-alignments 1 (a - e) and sub-alignments 2 (a - e) were assigned a good performance rating for operational requirements since these sub-alignments represent opportunities for traditional passive bridge systems requiring minimal maintenance and operating demands between biennial inspections.

Conceptual Sub-Alignments Not Recommended for Further Evaluation

The results of this screening show that the tunnel and Connor's Point sub-alignments have potential for substantial impact when considering water resources, construction timing, economic impacts, asset management, asset security, and/or operational requirements.

Conceptual Tunnel Sub-Alignments 1f, 1g, 2f, 3d, and 3e

Section 4(f)

The public water access described in 7.1.2.1 would also be affected by all tunnel concepts. It is anticipated all sub-alignments result in *de minimis* impacts or a temporary occupancy not considered a use of the Section 4(f) property; therefore, were assigned a fair performance rating for potential Section 4(f) impacts. Additionally, Sub-Alignment 3e would require a portal that is anticipated to result in greater than *de minimis* impact to the Bong Veterans Historical Center and Osaugie Trail, which likely each meet the definition of a Section 4(f) property; therefore Sub-Alignment 3e was assigned a poor performance rating for potential Section 4(f) impacts.

Wetland and waterway impacts

All tunnel sub-alignments will likely result in some impact to wetlands and waterways, much of which is anticipated to be temporary impact under the St. Louis Bay. All tunnel sub-alignments have portals that avoid land based identified wetlands and waterways; therefore, were assigned good performance ratings for wetland and waterway impacts.

Right of way needs

Relocation/Displacement

All tunnel sub-alignments will require some new right of way, for both twin tube bored tunnels across the St. Louis Bay and portal locations. Sub-alignments 1f, 1g, 2f, and 3e were assigned a fair performance rating for potential to result in relocation/displacement. Sub-Alignment 3d would require potential relocation/displacement of substantially more property due to businesses along Connors Point; therefore, was assigned a poor performance rating for potential to result in relocation/displacement.

Railroads

Sub-alignments 1f, 1g, and 2f cross existing railroads; however, they do not add additional crossing locations. Therefore, they were assigned a good performance rating for potential railroad impacts. Sub-alignments 3d and 3e would require a number of new crossings of existing railroad lines along Connors Point; therefore, they were assigned fair performance ratings for potential railroad impacts.

Economic Impacts

Construction Closure

All tunnel sub-alignments could be constructed while allowing the existing the bridge to remain open for some period of time; therefore, they were assigned a good performance rating for economic impacts due to construction closure.

Traffic Volume Impacts to the City of Superior Central Business District

Sub-alignment 1f and 1g were assigned a good performance rating since they have little or no redirection to motorists originating or destined to the CBD. This rating was based on the urban development patterns along and adjacent to the primary roadways connecting to the sub-alignments. This rating also considered travel demand patterns of the motorists traveling to and from Superior over the Blatnik Bridge, which indicate that about 25% of that traffic is originating from or destined for the CBD area. An additional 30% is originating from or destined for points west of the CBD. Sub-alignments 1f and 1g would continue the existing traffic patterns to this significant destination area, resulting in almost no redirection for these movements.

Sub-Alignment 2f was assigned a fair performance rating since it would have more redirection to motorists originating/destined to and through the CBD than sub-alignments 1f and 1g. Since this sub-alignment moves the local network connection to the east, further away from the CBD, there is redirection to the overall traffic stream for the approximately 55% of the Blatnik Bridge traffic originating from or destined for the CBD or points west of the CBD. The rating of fair indicates the redirection in the traffic stream is more than sub-alignments 1f and 1g but less than sub-alignments 3d and 3e.

Sub-alignments 3d and 3e were assigned a poor performance rating since the sub-alignment would have more CBD redirection than any other. Since this sub-alignment moves the local network connection the furthest to the east, farthest away from the CBD of all other sub-alignments, there is the most added redirection to the overall

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

traffic stream for the approximately 55% of the Blatnik Bridge originating or destined to the CBD or points west of the CBD.

Asset Management

All tunnel sub-alignments were assigned a poor performance rating for asset management since they represent the most significant amount of asset to manage while providing no opportunity for improvement or expansion as compared to bridges. Tunnels also deteriorate at accelerated levels due to the harsh environments requiring more costly repairs over their life span than other structures.

Asset Security Concern

All tunnel sub-alignments were assigned a poor performance rating for asset security concern due to the underground and confined nature of tunnels as compared to bridges. They represent unique and substantial security concerns that require restrictions on the transport of hazardous and flammable materials and load size.

Operational Requirements

All tunnel sub-alignments were assigned a poor performance rating for operational requirements since they have complicated functional systems such as lighting, ventilation, drainage, fire detection and alarms, fire suppression, communication, and traffic control. These systems require continuous, active maintenance to be kept in good working order to ensure their safety.

Conceptual Bridge Sub-Alignments 3a, 3b, and 3c

Section 4(f)

The public water access described in 7.1.2.1 would also be affected by sub-alignments 3a, 3b, and 3c and result in *de minimis* impacts or a temporary occupancy not considered a use of the Section 4(f) property; therefore, they were assigned a fair performance rating for potential Section 4(f) impacts.

Wetland and waterway impacts

Sub-alignments 3a, 3b, and 3c intersect the most identified wetlands and waterways, located along Connors Point; therefore, were assigned poor performance ratings for wetland and waterway impacts.

Right of way needs

Relocation/Displacement

Sub-alignments 3a, 3b, and 3c would require potential relocation/displacement of substantially more property than other sub-alignments due to businesses along Connors Point; therefore, were assigned poor performance ratings for potential relocation/displacement for potential to result in relocation/displacement.

Railroads

Sub-alignments 3a, 3b, and 3c would cross several existing railroads along Connors Point on land; therefore, were assigned poor performance ratings for potential railroad impacts.

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

Economic Impacts

Construction Closure

Sub-alignment 3a would follow the existing truss alignment, requiring the longest potential construction closure; therefore, it was assigned a poor performance rating for economic impacts related to construction closure. Sub-alignments 3b and 3c would utilize a new alignment throughout; therefore, was assigned a good performance rating for economic impacts related to construction closure.

Traffic Volume Impacts to the City of Superior Central Business District

Sub-alignments 3a, 3b, and 3c were assigned a poor performance rating since they would have more CBD redirection than any other sub-alignments. Since this sub-alignment moves the local network connection the furthest to the east, farthest away from the CBD of all other sub-alignments, there is the most added redirection to the overall traffic stream for the approximately 55% of the Blatnik Bridge originating or destined to the CBD or points west of the CBD.

Asset Management

Sub-alignments 3a, 3b, and 3c were assigned a poor performance rating for asset management since they represent the greatest amount of asset to maintain based on overall bridge length.

Asset security concern

Sub-alignments 3a, 3b, and 3c were assigned a fair performance rating for asset security concern since they represent a heightened exposure of the asset through continuous close proximity to traffic under the length of the structure.

Operational requirements

Sub-alignments 3a, 3b, and 3c were assigned a fair performance rating for operational requirements due to the increased amount of asset to be maintained over other concepts even though they represent opportunities for traditional passive bridge systems requiring minimal maintenance and operating demands between biennial inspections.

High Level Impact Performance Screening – Step 2 Summary

The recommendations of the high level impact performance screening are shown in Table 5 of Appendix A.

- Conceptual sub-alignments 1 (a – e) and 2(a – e) are recommended for development as alternatives and further detailed evaluation via Step 3.
- Conceptual sub-alignments 1f, 1g, 2f, 3d, and 3e (tunnels) and sub-alignments 3a, 3b, and 3c (bridges following Connors Point), are recommended to be eliminated from further evaluation.

Step 1 and Step 2 Summary

The conceptual sub-alignments that are recommended for further study are shown in Table 6 of Appendix A. Alignments recommended for further development and evaluation in Step 3 are:

- No Build alternative
- Sub-alignment 1a - Bridge: Existing Alignment (Hammond Connection)
- Sub-alignment 1b - Bridge: West Alignment (Hammond Connection)
- Sub-alignment 1c - Bridge: East Alignment (Hammond Connection)
- Sub-alignment 1d – Bridge: West /Existing Combination Alignment (Hammond Connection)
- Sub-alignment 1e – Bridge: Bridge: East /Existing Combination Alignment (Hammond Connection)
- Sub-alignment 2a - Bridge: Existing Alignment (US 53 Connection)
- Sub-alignment 2b - Bridge: West Alignment (US 53 Connection)
- Sub-alignment 2c - Bridge: East Alignment (US 53 Connection)
- Sub-alignment 2d - Bridge: West /Existing Combination Alignment (US 53 Connection)
- Sub-alignment 2e - Bridge: East /Existing Combination Alignment (US 53 Connection)

The sub-alignments/concept that are not recommended to be evaluated any further include:

- Bridge Rehab concept
- Sub-alignments 1f - Tunnel: Garfield to Hammond - West
- Sub-alignments 1g - Tunnel: Garfield to Hammond - East
- Sub-alignments 2f - Tunnel: Garfield to US 53
- Sub-alignments 3a - Bridge: Connors Point Central Alignment – US 53 Connection
- Sub-alignments 3b - Bridge: Connors Point West Alignment – US 53 Connection
- Sub-alignments 3c - Bridge: Connors Point East Alignment – US 53 Connection
- Sub-alignments 3d - Tunnel: Garfield to US 53 Along Connors Point
- Sub-alignments 3e - Tunnel: Garfield to US 53 Along Bay

The recommendations of this screening tech memo will be vetted with agencies, the Project Advisory Committee, and the public before additional alternative development continues.

Next Steps

After vetting the recommendations of this screening, alignments that passed Step 1 and 2 will undergo further design, including, but not limited to, the development of intersection/interchange concept layouts, local road connections, and cost estimation. This is identified as “Development of Alternatives” in the process flow chart in Figure 1. Simultaneously, social, economic, and environmental (SEE) studies will be conducted to provide additional information with which to evaluate impacts of the alternatives. After this evaluation, identified as “Step 3: Detailed Evaluation” in Figure 1, recommendations will be made to either eliminate alternatives that perform poorly as compared to others or refine alternatives for further evaluation. Due to the large scale and complexities of the project, it is likely that “Step 3: Detailed Evaluation” and “Refinement of Alternatives” occur multiple times before “Step 4: Selection of the Preferred Alternative.” This sequence will be documented in subsequent tech memos for further

ALIGNMENT SCREENING TECH MEMO (Steps 1 & 2)

vetting with agencies, the Project Advisory Committee, and the public before project alternatives are advanced.

Appendix A: Performance Screening Matrices

Table 1. Conceptual Alignment Descriptions

Conceptual Alignment	Sub	Short Description	Figure	Long Description
No Build	-	Perpetual maintenance	3	The No Build concept continues routine maintenance until end of service life in 2030. Not feasible but included as the baseline reference condition as required under NEPA.
Bridge Rehab	-	Rehabilitation of the entire structure	4	The Full Rehab concept rehabilitates the entire bridge structure to restore original load capacity and maintains function until the end of the approach service life in 2045.
1 (Garfield Ave to Hammond Ave)	a	Bridge: Existing Alignment – Hammond Connection	5	These Concept 1 alignments replace the existing bridge with a new bridge or combination of new and existing bridge on the same alignment or a new bridge on a completely offset alignment and maintains the current connection between the Minnesota touchdown at the Garfield Interchange and the Wisconsin touchdown interchange into Hammond Avenue.
	b	Bridge: West Alignment – Hammond Connection	5	
	c	Bridge: East Alignment – Hammond Connection	5	
	d	Bridge: West /Existing Combination Alignment – Hammond Connection	6	These Concept 1 alignments replace the existing bridge with a new offset structure over the main navigation channel and a new structure or combination of new and existing bridge on the existing alignment for the Wisconsin approach. These alignments maintain the existing touchdowns for both a MN and WI at Garfield and Hammond, respectively.
	e	Bridge: East /Existing Combination Alignment – Hammond Connection	6	
	f	Tunnel: Garfield to Hammond - West	7	These Concept 1 alignments utilize twin tube bored tunnels and entry portals to make a connection between the current Minnesota touchdown at the Garfield Interchange and Wisconsin connection at the existing Hammond Interchange.
	g	Tunnel: Garfield to Hammond - East	7	
2 (Garfield Ave to US 53)	a	Bridge: Existing Alignment – US 53 Connection	8	These Concept 2 alignments replace the existing bridge with a new bridge or combination of new and existing bridge on the same alignment or new bridge on a completely offset alignment with a connection between the current Minnesota touchdown at the Garfield Interchange and a new Wisconsin connection directly into US 53 and with interchange connections to STH 35 and Hammond Avenue.
	b	Bridge: West Alignment – US 53 Connection	8	
	c	Bridge: East Alignment – US 53 Connection	8	
	d	Bridge: West /Existing Combination Alignment – US 53 Connection	9	These Concept 2 alignments replace the existing bridge with a new offset structure over the main navigation channel and a new structure or combination of new and existing bridge on the existing alignment for the Wisconsin approach. These alignments maintain the existing touchdown for MN at Garfield and provide a new Wisconsin connection directly into US 53 with an interchange connecting to STH 35 and Hammond Avenue.
	e	Bridge: East /Existing Combination Alignment – US 53 Connection	9	
	f	Tunnel: Garfield to US 53	10	This Concept 2 alignment utilize twin tube bored tunnels and entry portals to make a connection between the current Minnesota touchdown at the Garfield Interchange a new Wisconsin connection directly into US 53
3 (Garfield Ave to US 53 along Connors Point)	a	Bridge: Connors Point Central Alignment – US 53 Connection	11	Concept 3 completely replaces the existing bridge with a new bridge on the same or completely offset alignment over the main navigation channel and a single alignment along Connors Point on the Wisconsin approach with a connection between the current Minnesota touchdown at the Garfield Interchange and a new Wisconsin connection directly into US 53 with an interchange connection to STH 35 via local street.
	b	Bridge: Connors Point West Alignment – US 53 Connection	11	
	c	Bridge: Connors Point East Alignment – US 53 Connection	11	
	d	Tunnel: Garfield to US 53 Along Connors Point	12	These Concept 3 alignments utilize twin tube bored tunnels and entry portals to make a connection between the current Minnesota touchdown at the Garfield Interchange and a new Wisconsin connection directly to US 53 (with tunnel aligned along Connors Point) or US 53/US 2 (with tunnel aligned along St. Louis Bay)
	e	Tunnel: Garfield to US 53 Along Bay	12	

Table 2. Purpose and Need Performance Measures for Step 1¹

Category	Evaluation Criteria	Performance Measures	Poor Performance	Fair Performance	Good Performance
Primary Need: Bridge Condition	Bridge Condition	Does the concept extend service life of the structure?	No reasonable opportunity to extend service life	Some opportunity to extend service life	Opportunity to maximize service life
Primary Need: Bridge Condition	Structure Robustness ²	Does the concept improve structural robustness? Robustness includes factors such as environmental demands, structural redundancy, materials, ease of maintenance and inspection, and need for element replacement or repair over the life of the structure.	No reasonable opportunity to improve structure	Opportunity for improved or new structure ³	Opportunity for all new structure
Primary Need: Vehicle Safety	Crash Rate Reduction Potential	Does the concept have the potential to improve roadway deficiencies (i.e. short deceleration lane, steep slopes with speed differential, reduced weaving, and number of conflict points at intersection of Hammond and 5th) and bridge deficiencies (i.e. inside and outside shoulder widths) that contribute to safety problems?	No opportunity for deficiency improvement	Opportunity for some of the deficiencies to be improved	Opportunity to improve most deficiencies
Primary Need: Vehicle Mobility	Traffic Operations	Does the concept have the potential to improve traffic operations (i.e. overall system delay; movement delay; capacity; intersection level of service, improvement of Wisconsin operational deficiencies)?	No opportunity for traffic operation improvement	Opportunity for some traffic operation improvement	Opportunity to improve most traffic operations
Primary Need: Vehicle Mobility	Oversize Overweight (OSOW) (e.g. specialized equipment such as wind turbines getting to and from ports) and Freight Mobility	Does the concept increase the intended freight movements of the crossing (i.e. original operational performance)? Does the concept maintain access to ports?	No opportunity for improved large freight movements across St. Louis Bay and/or most access impacts to ports	Opportunity for some improved large freight movements across St. Louis Bay and/or some access impacts to the ports	Opportunity to improve most large freight movements across the St. Louis Bay and/or no access impacts to the ports
Secondary Need	Walkability/Bikeability	Does the concept have the potential to improve bike and pedestrian network connectivity?	No opportunity to improve bike and pedestrian connectivity	Opportunity for some improvement for bike and pedestrian connectivity	Opportunity for most improvement for bike and pedestrian connectivity

¹ The purpose of Step 1 is to compare each conceptual alignment with the project needs and determine to what degree those needs could be met.

² The robustness of the structure is essential for the long term demands and the operational needs by the owners. The operational importance and significant investment for this project requires the owners to critically evaluate all aspects of robustness over the life of the structure

³ Improved means concepts that address this need by replacement of the existing truss spans while rehabilitating portions of the existing approach spans through the end of their service life in 2045; provides owners with intermediate rehab options to address bridge condition using a phased approach while meeting project needs

Table 3. Purpose and Need Performance Screening Matrix - Step 1

Conceptual Alignment	Description	Bridge Condition	Bridge Condition	Vehicle Safety	Vehicle Mobility	Vehicle Mobility	Secondary Need	Recommended Next Steps	Primary category where purpose and need not met
		Service Life	Robustness	Crash rate reduction potential	Traffic Operations	OSOW and Freight Mobility	Walkability/ Bikeability		
No Build	Perpetual maintenance	End of service life 2030 with current maintenance plans	No reasonable opportunity to improve structure	No opportunity for deficiency improvement	No opportunity for traffic operation improvement	No opportunity for improved large freight movements across St. Louis Bay or anticipated access impacts to ports	No opportunity to improve bike and pedestrian connectivity	Carried Forward (serves as the baseline condition against which other alternatives are compared)	Service Life Robustness Crash rate reduction potential Traffic Operations OSOW and Freight Mobility
Bridge Rehab	Rehabilitation of the entire structure	No reasonable opportunity to extend service life	No reasonable opportunity to improve structure	No opportunity for deficiency improvement	No opportunity for traffic operation improvement	No opportunity for improved large freight movements across St. Louis Bay or anticipated access impacts to ports	No opportunity to improve bike and pedestrian connectivity	Not recommended for further evaluation (not feasible per 2017 Blatnik Bridge Management Study)	Service Life Robustness Crash rate reduction potential Traffic Operations OSOW and Freight Mobility
1 (Garfield Ave to Hammond Ave)	Bridge: Hammond Connection	Opportunity to maximize service life	Opportunity for improved or new structure ⁴	Opportunity for some of the deficiencies to be improved	Opportunity for some traffic operation improvement	Opportunity for some improved large freight movements across St. Louis Bay and maintenance of access to the ports	Opportunity for some improvement for bike and pedestrian connectivity	Evaluate Further	
	Tunnel: Garfield to Hammond	Opportunity to maximize service life	Opportunity for all new structure	Opportunity to improve most deficiencies	Opportunity to improve most traffic operations	Opportunity for some improved large freight movements across St. Louis Bay and maintenance of access to the ports	Opportunity for some improvement for bike and pedestrian connectivity	Evaluate Further	
2 (Garfield Ave to US 53)	Bridge: US 53 Connection	Opportunity to maximize service life	Opportunity for improved or new structure ⁴	Opportunity for some of the deficiencies to be improved	Opportunity to improve most traffic operations	Opportunity to improve most large freight movements across the St. Louis Bay and maintenance of access to the ports	Opportunity for some improvement for bike and pedestrian connectivity	Evaluate Further	
	Tunnel: Garfield to US 53	Opportunity to maximize service life	Opportunity for all new structure	Opportunity to improve most deficiencies	Opportunity to improve most traffic operations	Opportunity for some improved large freight movements across St. Louis Bay and maintenance of access to the ports	Opportunity for some improvement for bike and pedestrian connectivity	Evaluate Further	
3 (Garfield Ave to US 53 along Connors Point)	Bridge: Connors Point Central Alignment – US 53 Connection	Opportunity to maximize service life	Opportunity for all new structure	Opportunity to improve most deficiencies	Opportunity to improve most traffic operations	Opportunity to improve most large freight movements across the St. Louis Bay and maintenance of access to the ports	Opportunity for some improvement for bike and pedestrian connectivity	Evaluate Further	
	Tunnel: Garfield to US 53 Along Connors Point	Opportunity to maximize service life	Opportunity for all new structure	Opportunity to improve most deficiencies	Opportunity to improve most traffic operations	Opportunity for some improved large freight movements across St. Louis Bay and maintenance of access to the ports	Opportunity for some improvement for bike and pedestrian connectivity	Evaluate Further	
	Tunnel: Garfield to US 53 Along Bay	Opportunity to maximize service life	Opportunity for all new structure	Opportunity to improve most deficiencies	Opportunity to improve most traffic operations	Opportunity for some improved large freight movements across St. Louis Bay and maintenance of access to the ports	Opportunity for some improvement for bike and pedestrian connectivity	Evaluate Further	

⁴ Ratings based on “worst-case” scenario. Sub-alignments 1a, 1d, 1e, 2a, 2d, and 2e would provide opportunity to rehab all or portions of the approaches and were assigned fair performance ratings (based on the substantial maintenance and safety investment needed to extend service life). Sub-alignments 1b, 1c, 2b, and 2c would require an all new structure These rating differentiations are shown in Table 6.

Table 4. High Level Impact Performance Measures for Step 2⁵

Category	Evaluation Criteria	Performance Measures	Poor Performance	Fair Performance	Good Performance
Social, Economic, Environmental Considerations (SEE)	Potential Section 4(f)	Number of parcels with public park, recreational areas, wildlife/waterfowl refuges, and/or public/private historic properties that may be impacted based on conceptual alignment	Potential impacts anticipated to be greater than de minimis	Potential impacts anticipated to be de minimis or to be a temporary occupancy not considered a use	No potential for Section 4(f) impact
Social, Economic, Environmental Considerations (SEE)	Wetland and waterway impacts	Comparison of wetland and waterway impacts based on best available aquatic resource surveys	Most potential to impact identified aquatic resources	Some potential to impact identified aquatic resources	Least potential to impact identified aquatic resources
Social, Economic, Environmental Considerations (SEE)	Right of way needs	Potential need for new right of way and or relocations/displacements based on the concept alignment (not including interchange) ⁶ Potential impacts to railroad tracks and/or right of way.	Greatest potential for right of way impacts Greatest potential for impacts to railroad tracks and/or right of way	Some potential for right of way impacts Some potential for impacts to railroad tracks and/or right of way	Least potential for right of way impacts Least potential for impacts to railroad tracks and/or right of way
Social, Economic, Environmental Considerations (SEE)	Economic Impacts	Business impacts or user delay due to construction closures Volume of bridge traffic to and through the City of Superior central business district	Longest closure Substantial redirection to motorists originating/destined to and through the central business district	Longer closure Minor redirection to motorists originating/destined to and through the central business district	Long closure Little or no redirection to motorists originating/destined to and through the central business district
Additional Considerations ⁷	Asset Management	Ability to cost-effectively operate, maintain, and upgrade the physical asset throughout its life-cycle	Greatest amount of asset to be managed	Some increase in amount of asset to be managed	Little to no change in amount of asset to be managed
Additional Considerations	Asset security concern	Asset security concern (i.e. roads under structure, enclosed space)	Greatest security issues to manage	Some additional security issues to manage	Similar security issues to manage as existing
Additional Considerations	Operational Requirements	Special requirements needed to operate the asset (i.e. ventilation, fire suppression, communications, traffic incident management, drainage)	Many new systems required	Some new systems required	No new systems required

⁵ The purpose of Step 2 is to compare each conceptual alignment with the potential for impacts to known resources and existing data using existing data and identify readily identifiable benefits and flaws.

⁶ The potential for right of way impacts due to proposed interchanges will be evaluated as part of the detailed evaluation of alternatives under Step 3, as there is not enough engineering detail to evaluate new interchanges during Step 2

⁷ The additional considerations identified for this project initially included four criteria: maritime freight navigation, connectivity and redundancy, regulatory requirements, and railroad crossings. These are not included as evaluation criteria in Step 2 because they do not represent differentiators at this level of design. Three new additional considerations have been identified which do represent differentiators at this stage. These are described in detail in the Blatnik Alignment Screening Tech Memo.

Table 5. High Level Impact Performance Screening Matrix – Step 2

Conceptual Alignments	Sub	Description	SEE	SEE	SEE	SEE	SEE	SEE	Additional Considerations	Additional Considerations	Additional Considerations	Recommended Next Steps
			Potential Section 4(f)	Wetland and waterway impacts	Right of way needs (relocations/displacements)	Right of way needs (railroad)	Economic Impacts (closure)	Economic Impacts (traffic volume to business district)	Asset Management	Asset Security	Operational Requirements	
No Build	-	Perpetual maintenance	No change	No change	No change	No change	Decommission structure	No change	No change	No change	Continued repairs and enhanced maintenance	Carried Forward as baseline condition
1 (Garfield Ave to Hammond Ave)	a	Bridge: Existing Alignment – Hammond Connection	Potential de minimis impact to MnDNR Boat Landing	Some	Least	Least	Longest	Little or no redirection	Good	Normal	Good	Evaluate Further
	b	Bridge: West Alignment – Hammond Connection	Potential de minimis impact to MnDNR Boat Landing	More	Some	Least	Long	Little or no redirection	Good	Normal	Good	Evaluate Further
	c	Bridge: East Alignment – Hammond Connection	Potential de minimis impact to MnDNR Boat Landing	More	Some	Least	Long	Little or no redirection	Good	Normal	Good	Evaluate Further
	d	Bridge: West /Existing Combination Alignment – Hammond Connection	Potential de minimis impact to MnDNR Boat Landing	More	Some	Least	Longer	Little or no redirection	Good	Normal	Good	Evaluate Further
	e	Bridge: East /Existing Combination Alignment – Hammond Connection	Potential de minimis impact to MnDNR Boat Landing	More	Some	Least	Longer	Little or no redirection	Good	Normal	Good	Evaluate Further
	f	Tunnel: West Alignment - Garfield to Hammond	Potential de minimis impact to MnDNR Boat Landing	Some	Some	Least	Long	Little or no redirection	Poor	High	Poor	Not Recommended for Further Evaluation
	g	Tunnel: East Alignment - Garfield to Hammond	Potential de minimis impact to MnDNR Boat Landing	Some	Some	Least	Long	Little or no redirection	Poor	High	Poor	Not Recommended for Further Evaluation
2 (Garfield Ave to US 53)	a	Bridge: Existing Alignment – US 53 Connection	Potential de minimis impact to MnDNR Boat Landing	Some	Some	Least	Longest	Minor redirection	Fair	Normal	Good	Evaluate Further
	b	Bridge: West Alignment – US 53 Connection	Potential de minimis impact to MnDNR Boat Landing	More	Some	Least	Long	Minor redirection	Fair	Normal	Good	Evaluate Further
	c	Bridge: East Alignment – US 53 Connection	Potential de minimis impact to MnDNR Boat Landing	More	Some	Least	Long	Minor redirection	Fair	Normal	Good	Evaluate Further
	d	Bridge: West/Existing Combination Alignment – US 53 Connection	Potential de minimis impact to MnDNR Boat Landing	More	Some	Least	Longer	Minor redirection	Fair	Normal	Good	Evaluate Further
	e	Bridge: East/Existing Combination Alignment – US 53 Connection	Potential de minimis impact to MnDNR Boat Landing	More	Some	Least	Longer	Minor redirection	Fair	Normal	Good	Evaluate Further
	f	Tunnel: Garfield to US 53	Potential de minimis impact to MnDNR Boat Landing	Some	Some	Least	Long	Minor redirection	Poor	High	Poor	Not Recommended for Further Evaluation
3 (Garfield Ave to US 53 along Connors Point)	a	Bridge: Connors Point Central Alignment – US 53 Connection	Potential de minimis impact to MnDNR Boat Landing	Most	Greatest	Greatest	Longest	Substantial redirection	Poor	Moderate	Fair	Not Recommended for Further Evaluation
	b	Bridge: Connors Point West Alignment – US 53 Connection	Potential de minimis impact to MnDNR Boat Landing	Most	Greatest	Greatest	Long	Substantial redirection	Poor	Moderate	Fair	Not Recommended for Further Evaluation
	c	Bridge: Connors Point East Alignment – US 53 Connection	Potential de minimis impact to MnDNR Boat Landing	Most	Greatest	Greatest	Long	Substantial redirection	Poor	Moderate	Fair	Not Recommended for Further Evaluation
	d	Tunnel: Garfield to US 53 Along Connors Point	Potential de minimis impact to MnDNR Boat Landing	Some	Greatest	Some	Long	Substantial redirection	Poor	High	Poor	Not Recommended for Further Evaluation
	e	Tunnel: Garfield to US 53 Along Bay	Potential for greater than de minimis impacts to Bong Veterans Historical Center and/or Osage Trail	Some	Some	Some	Long	Substantial redirection	Poor	High	Poor	Not Recommended for Further Evaluation

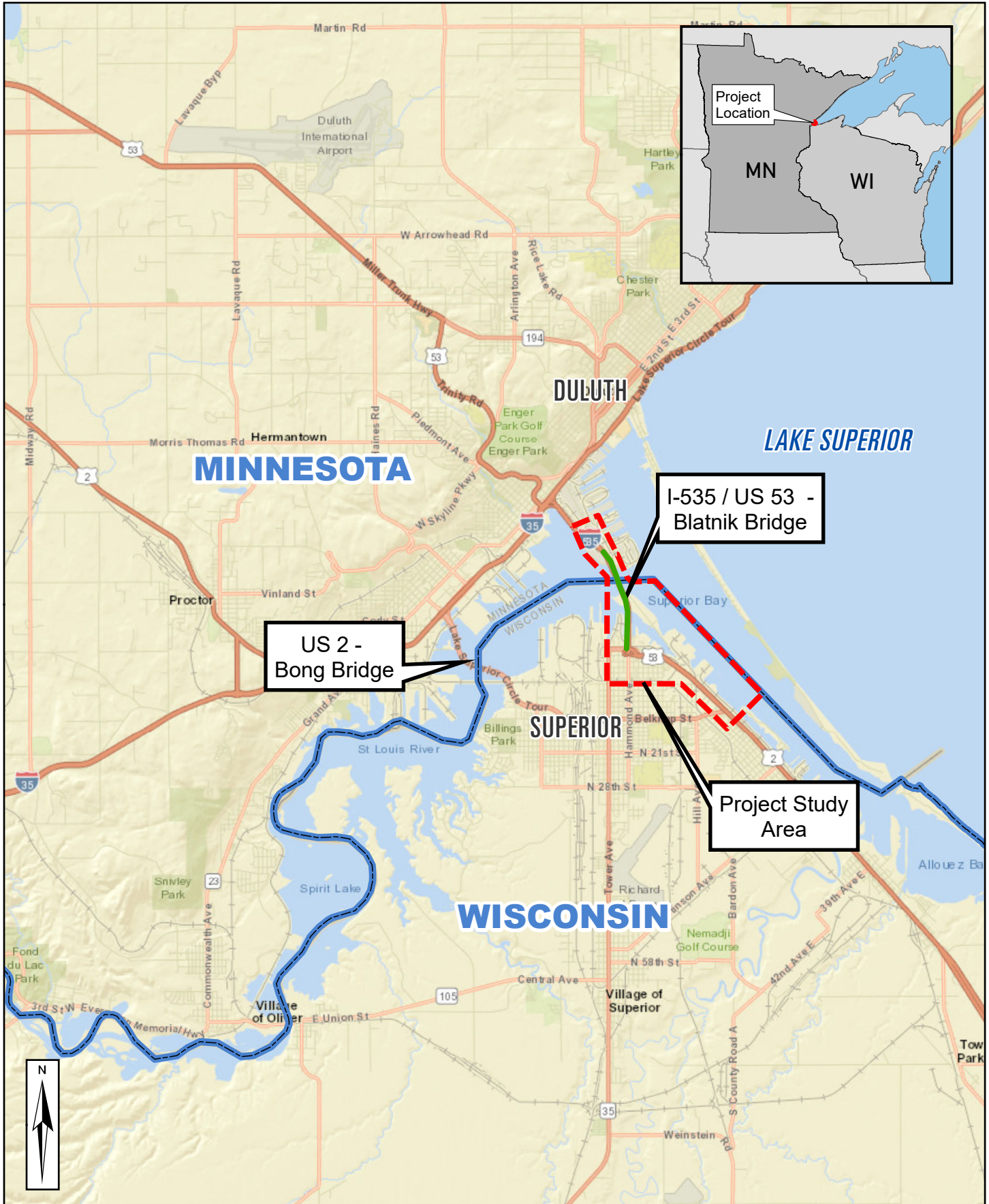
Table 6. Screening Summary of Steps 1 and 2

Conceptual Alignment	Sub	Description	STEP 1 ⁸						STEP 2						Recommendations									
			Bridge Condition	Bridge Condition	Vehicle Safety	Vehicle Mobility	Vehicle Mobility	Secondary Need	SEE	SEE	SEE	SEE	SEE	SEE		Additional Considerations	Additional Considerations	Additional Considerations						
			Service Life	Robustness ⁹	Crash rate reduction potential	Traffic Operations	OSOW and Freight Mobility	Walkability/Bikeability	Potential Section 4(f)	Wetland and waterway impacts	Right of way needs (relocations/displacements)	Right of way needs (railroad)	Economic Impacts (closure)	Economic Impacts (traffic redirection)		Asset Management	Asset Security	Operational Requirements						
No Build	-	Perpetual maintenance	Poor	Poor	Poor	Poor	Poor	Poor	No change	No change	No change	No change	Poor	No change	No change	No change	No change	Poor	Baseline Condition					
Bridge Rehab	-	Rehabilitation of the entire structure	Poor	Poor	Poor	Poor	Poor	Poor	-	-	-	-	-	-	-	-	-	-	Not Recommended for Further Evaluation					
1 (Garfield Ave to Hammond Ave)	a	Existing Alignment – Hammond Connection	Good	Fair	Fair	Fair	Fair	Fair	Fair	Good	Good	Good	Poor	Good	Good	Good	Good	Good	Evaluate Further					
	b	West Alignment – Hammond Connection		Good					Fair	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Evaluate Further	
	c	East Alignment – Hammond Connection		Good					Fair	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Evaluate Further
	d	West /Existing Combination Alignment – Hammond Connection		Fair					Fair	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good	Good	Good	Good	Good	Evaluate Further
	e	East /Existing Combination Alignment – Hammond Connection		Fair					Fair	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good	Good	Good	Good	Good	Evaluate Further
	f	Tunnel: West Alignment - Garfield to Hammond	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Good	Good	Good	Good	Poor	Poor	Poor	Poor	Not Recommended for Further Evaluation				
	g	Tunnel: East Alignment - Garfield to Hammond	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Good	Good	Good	Good	Poor	Poor	Poor	Poor	Not Recommended for Further Evaluation				
2 (Garfield Ave to US 53)	a	Existing Alignment – US 53 Connection	Good	Fair	Fair	Good	Good	Fair	Fair	Good	Fair	Good	Poor	Fair	Fair	Good	Good	Good	Evaluate Further					
	b	West Alignment – US 53 Connection		Good					Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Good	Good	Good	Good	Good	Evaluate Further	
	c	East Alignment – US 53 Connection		Good					Fair	Good	Good	Good	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Good	Good	Evaluate Further	
	d	West /Existing Combination Alignment – US 53 Connection		Fair					Fair	Good	Good	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Good	Good	Evaluate Further	
	e	East /Existing Combination Alignment – US 53 Connection		Fair					Fair	Good	Good	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Good	Good	Evaluate Further	
	f	Tunnel: Garfield to US 53	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Poor	Poor	Poor	Poor	Poor	Not Recommended for Further Evaluation					
3 (Garfield Ave to US 53 along Connors Point)	a	Connors Point Central Alignment – US 53 Connection	Good	Good	Good	Good	Good	Fair	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Fair	Fair	Not Recommended for Further Evaluation					
	b	Connors Point West Alignment – US 53 Connection		Good					Good	Good	Good	Good	Fair	Poor	Poor	Poor	Good	Poor	Poor	Poor	Fair	Fair	Not Recommended for Further Evaluation	
	c	Connors Point East Alignment – US 53 Connection		Good					Good	Good	Good	Good	Fair	Poor	Poor	Poor	Good	Poor	Poor	Poor	Fair	Fair	Not Recommended for Further Evaluation	
	d	Tunnel: Garfield to US 53 Along Connors Point	Good	Good	Good	Good	Fair	Fair	Fair	Good	Poor	Fair	Good	Poor	Poor	Poor	Poor	Poor	Poor	Not Recommended for Further Evaluation				
	e	Tunnel: Garfield to US 53 Along Bay		Good					Good	Fair	Fair	Poor	Good	Fair	Good	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Not Recommended for Further Evaluation	

⁸ Step 1 included the screening of the general Conceptual Alignments, not the sub-alignments, which were developed after Step 1. The exception is bridge robustness which was screened again as part of Step 2.

⁹ The differentiation shown in this table is not reflected in Table 3 as the sub-alignments are not listed out separately. See footnote 4 for more information.

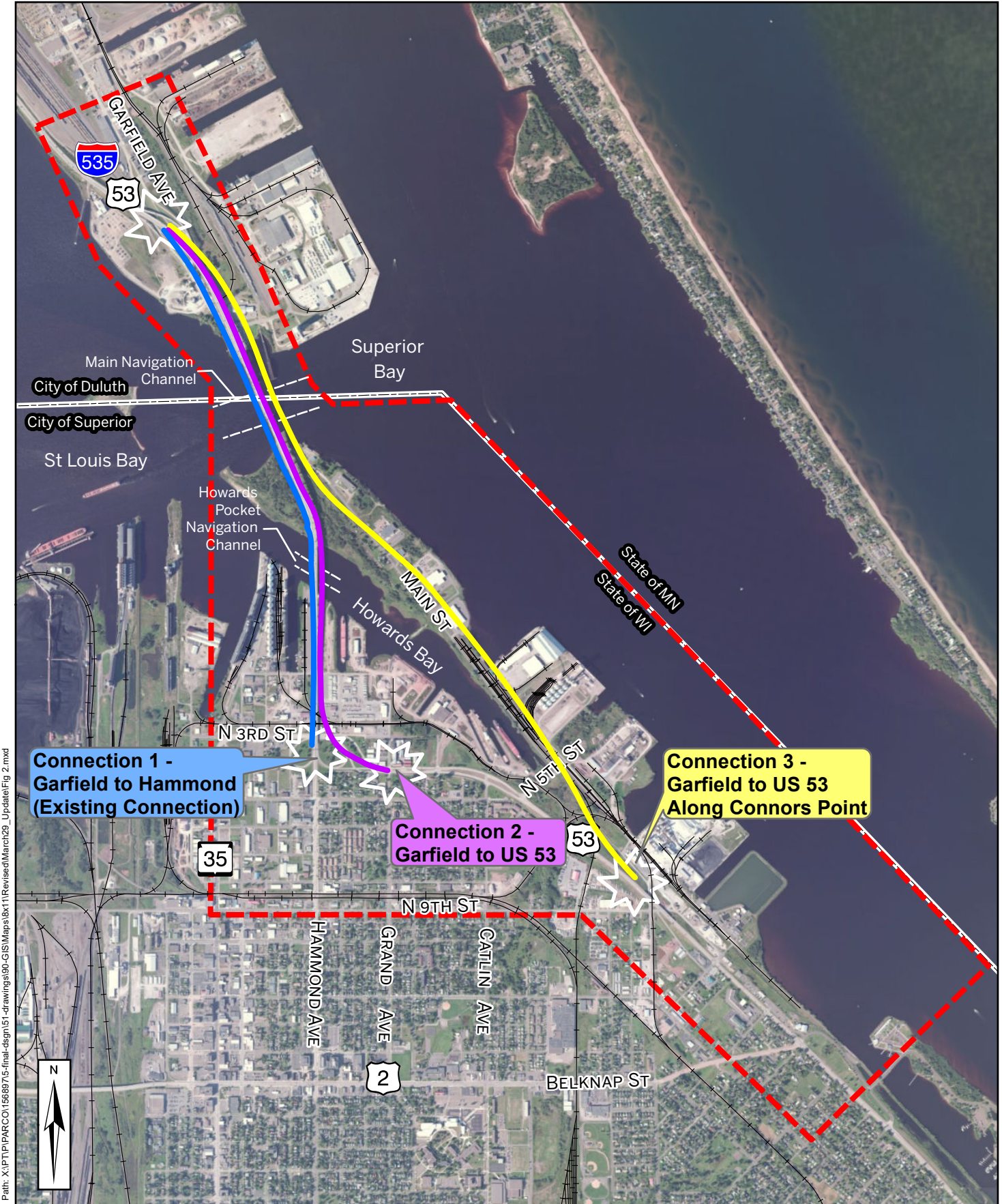
Appendix B: Conceptual Alignment Exhibits



Path: X:\PT\PARCO\156897\5-final-dsgn\51-drawings\90-GIS\Maps\8x11\Revised\March29_Update\Fig 1.mxd

		<p>Project: PARCO 156897 Print Date: 3/29/2021 Map by: mstuemagel Projection: St Louis County South Source: ESRI, Douglas County, St Louis County, MnGeo</p>	<p>PROJECT LOCATION MAP I-535 / US 53 BLATNIK BRIDGE PROJECT St Louis County, MN & Douglas County, WI</p>	<p>Figure 1</p>
--	--	---	--	------------------------------------

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Path: X:\PTP\PARCO\156897\5-final-dsgn\51-drawings\51-GIS\Maps\8x11\Revised\March\29_Update\Fig 2.mxd

**Connection 1 -
Garfield to Hammond
(Existing Connection)**

**Connection 2 -
Garfield to US 53**

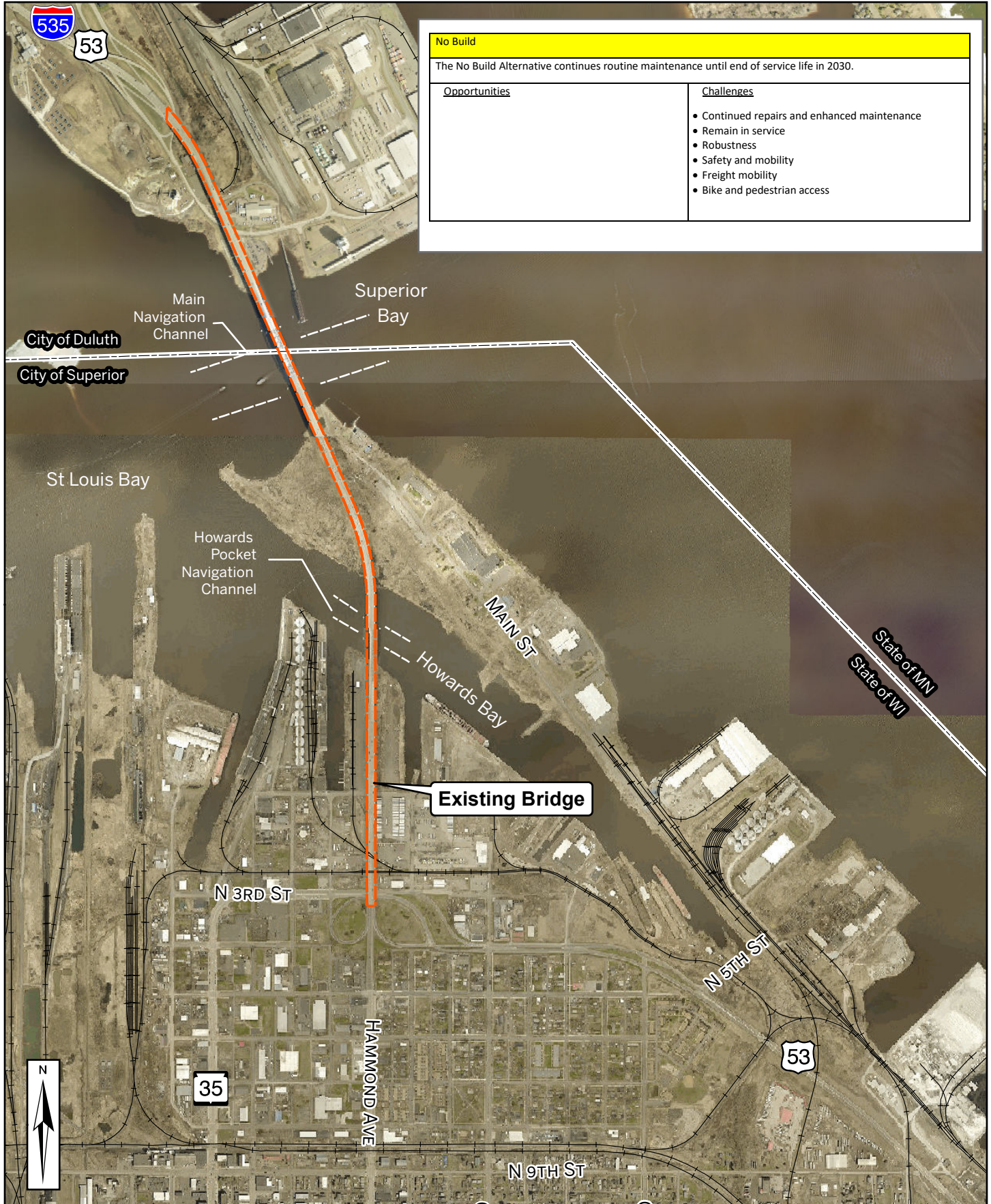
**Connection 3 -
Garfield to US 53
Along Connors Point**



		<p>Project: PARCO 156897 Print Date: 4/27/2021</p> <p>Map by: msteuernagel Projection: St Louis County South Source: ESRI, Douglas County, St Louis County, MnGeo</p>	<p>CONNECTION STUDIES</p> <p>St Louis County, MN & Douglas County, WI</p>	<p>Figure 2</p>
--	--	---	---	----------------------------

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

No Build	
The No Build Alternative continues routine maintenance until end of service life in 2030.	
<p><u>Opportunities</u></p>	<p><u>Challenges</u></p> <ul style="list-style-type: none"> • Continued repairs and enhanced maintenance • Remain in service • Robustness • Safety and mobility • Freight mobility • Bike and pedestrian access



Path: X:\PTP\PARCO\156897\5-final-dsgn\51-drawings\90-GIS\Maps\8x11\Revised\March29_Update\Fig 3.mxd

	<p>Project: PARCO 156897 Print Date: 4/27/2021</p> <p>Map by: msteuernagel Projection: St Louis County South Source: ESRI, Douglas County, St Louis County, MnGeo</p>	<p>NO BUILD</p>	<p>Figure 3</p>
<p>St Louis County, MN & Douglas County, WI</p>			

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Connect Into Existing Garfield Interchange

Rehabilitation of Entire Structure

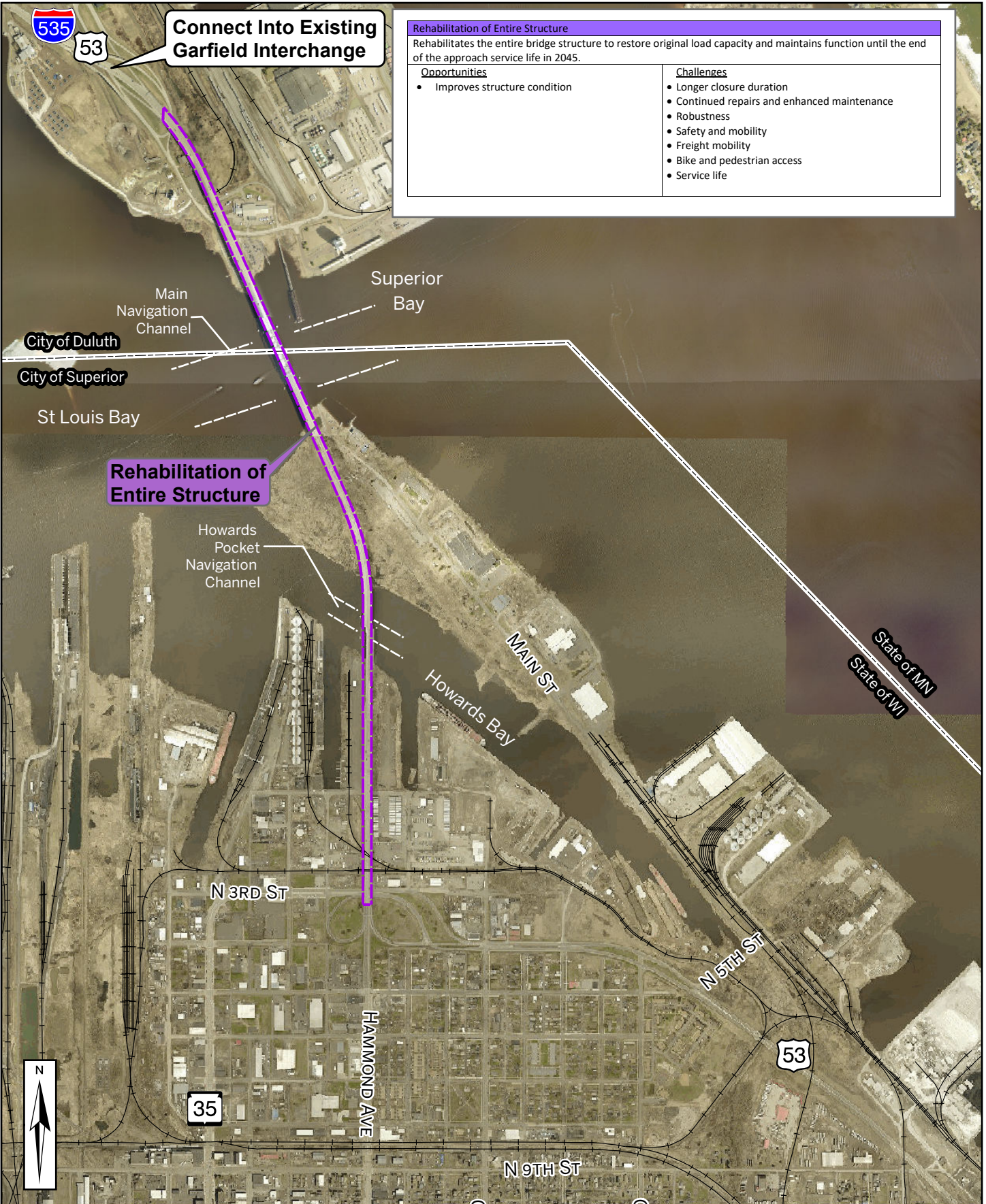
Rehabilitates the entire bridge structure to restore original load capacity and maintains function until the end of the approach service life in 2045.

Opportunities

- Improves structure condition

Challenges

- Longer closure duration
- Continued repairs and enhanced maintenance
- Robustness
- Safety and mobility
- Freight mobility
- Bike and pedestrian access
- Service life



Path: X:\PT\PARCO\156897\5-final-dsgn\51-drawings\00-GIS\Maps\8x11\Revised\March29_Update\Fig 4.mxd



Project: PARCO 156897
Print Date: 3/30/2021

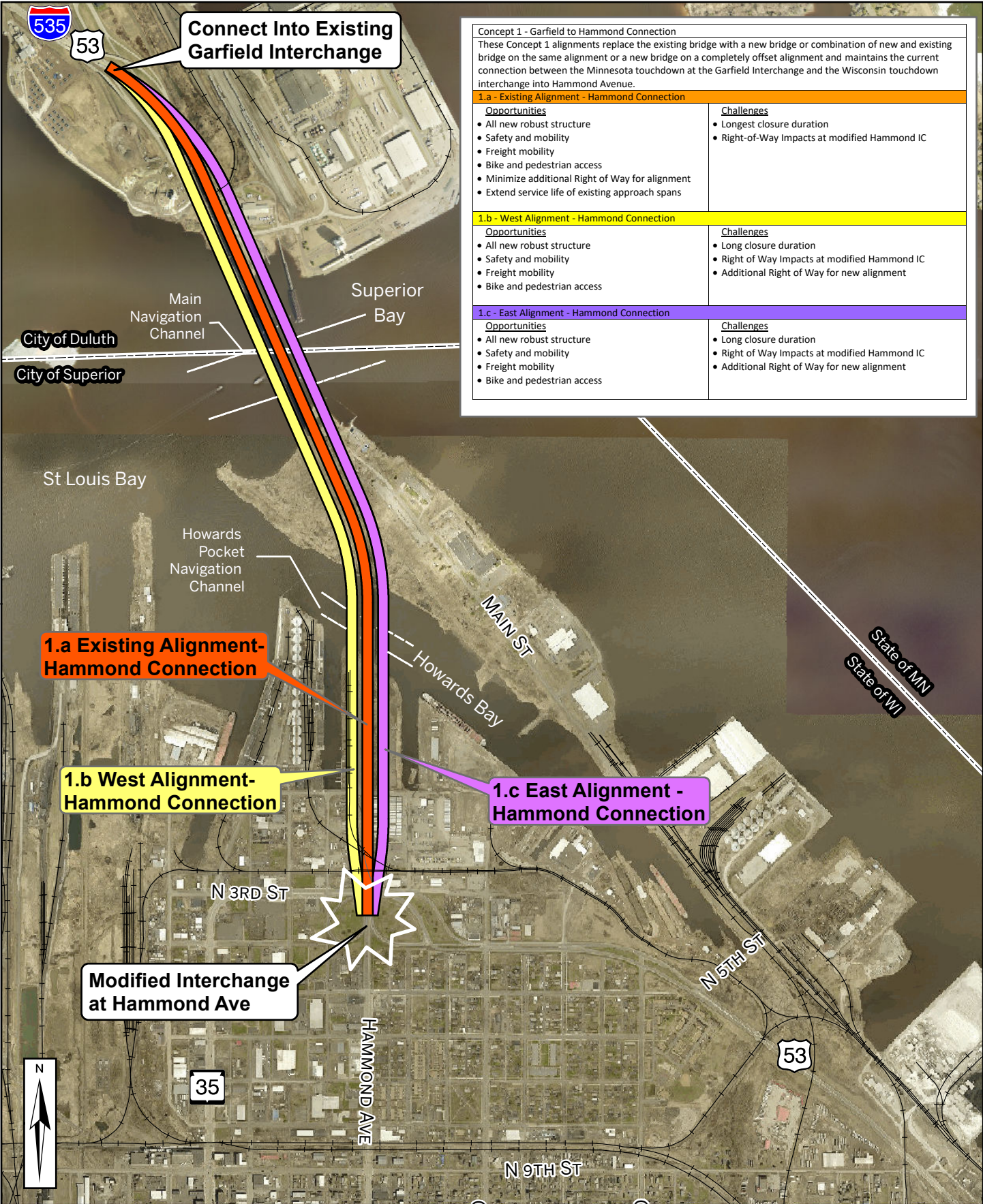
Map by: msteuermagel
Projection: St Louis County South
Source: ESRI, Douglas County,
St Louis County, MnGeo

REHABILITATION OF ENTIRE STRUCTURE

St Louis County, MN & Douglas County, WI

Figure 4

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

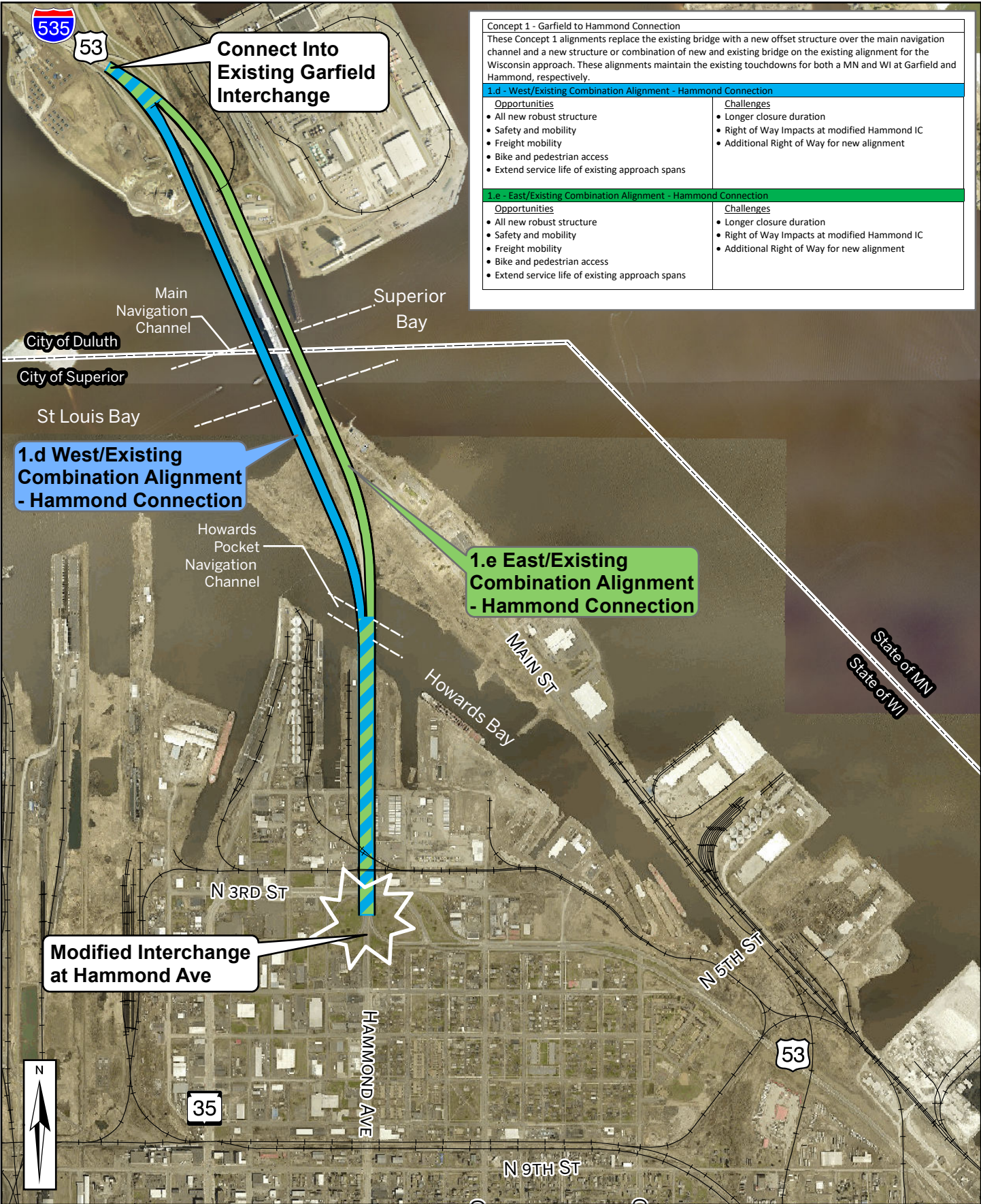


Concept 1 - Garfield to Hammond Connection	
These Concept 1 alignments replace the existing bridge with a new bridge or combination of new and existing bridge on the same alignment or a new bridge on a completely offset alignment and maintains the current connection between the Minnesota touchdown at the Garfield Interchange and the Wisconsin touchdown interchange into Hammond Avenue.	
1.a - Existing Alignment - Hammond Connection	
Opportunities <ul style="list-style-type: none"> • All new robust structure • Safety and mobility • Freight mobility • Bike and pedestrian access • Minimize additional Right of Way for alignment • Extend service life of existing approach spans 	Challenges <ul style="list-style-type: none"> • Longest closure duration • Right-of-Way Impacts at modified Hammond IC
1.b - West Alignment - Hammond Connection	
Opportunities <ul style="list-style-type: none"> • All new robust structure • Safety and mobility • Freight mobility • Bike and pedestrian access 	Challenges <ul style="list-style-type: none"> • Long closure duration • Right of Way Impacts at modified Hammond IC • Additional Right of Way for new alignment
1.c - East Alignment - Hammond Connection	
Opportunities <ul style="list-style-type: none"> • All new robust structure • Safety and mobility • Freight mobility • Bike and pedestrian access 	Challenges <ul style="list-style-type: none"> • Long closure duration • Right of Way Impacts at modified Hammond IC • Additional Right of Way for new alignment

Path: X:\PT\PA\PARCO156897\5-final-dsgn\51-drawings\50-GIS\Maps\8x11\Revised\March29_Update\Fig 5.mxd

	Project: PARCO 156897 Print Date: 4/1/2021	CONCEPT 1 REPLACEMENT - GARFIELD TO HAMMOND	Figure 5
	Map by: msteuernagel Projection: St Louis County South Source: ESRI, Douglas County, St Louis County, MnGeo		

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Concept 1 - Garfield to Hammond Connection	
These Concept 1 alignments replace the existing bridge with a new offset structure over the main navigation channel and a new structure or combination of new and existing bridge on the existing alignment for the Wisconsin approach. These alignments maintain the existing touchdowns for both a MN and WI at Garfield and Hammond, respectively.	
1.d - West/Existing Combination Alignment - Hammond Connection	
Opportunities <ul style="list-style-type: none"> All new robust structure Safety and mobility Freight mobility Bike and pedestrian access Extend service life of existing approach spans 	Challenges <ul style="list-style-type: none"> Longer closure duration Right of Way Impacts at modified Hammond IC Additional Right of Way for new alignment
1.e - East/Existing Combination Alignment - Hammond Connection	
Opportunities <ul style="list-style-type: none"> All new robust structure Safety and mobility Freight mobility Bike and pedestrian access Extend service life of existing approach spans 	Challenges <ul style="list-style-type: none"> Longer closure duration Right of Way Impacts at modified Hammond IC Additional Right of Way for new alignment

Path: X:\PT\PA\PARCO156897\5-final-dsgn\51-drawings\90-GIS\Maps\8x11\Revised\March29_Update\Fig 6.mxd

		Project: PARCO 156897 Print Date: 4/1/2021	CONCEPT 1 REPLACEMENT - GARFIELD TO HAMMOND (EXIST S. ALIGNMENT) St Louis County, MN & Douglas County, WI	Figure 6
	Map by: msteuernagel Projection: St Louis County South Source: ESRI, Douglas County, St Louis County, MnGeo			

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Concept 1 - Tunnel (All sub options have similar opportunities and challenges)
 These Concept 1 alignments utilize twin tube bored tunnels and entry portals to make a connection between the current Minnesota touchdown at the Garfield Interchange and Wisconsin connection at the existing Hammond Interchange.

1.f - Garfield to Hammond West	
Opportunities	Challenges
<ul style="list-style-type: none"> All new robust structure Eliminates all navigation crossings 	<ul style="list-style-type: none"> Long closure duration Safety and mobility-Hazardous materials Freight mobility-Oversized loads Bike and pedestrian access Facility needs-Ventilation and pumping Additional Right of Way over tunnel alignment Additional Right of Way at tunnel portals and interchanges Local roads modifications at tunnel portals and interchanges Excavation disposal
1.g - Garfield to Hammond East	
Opportunities	Challenges
<ul style="list-style-type: none"> All new robust structure Eliminates all navigation crossings 	<ul style="list-style-type: none"> Long closure duration Safety and mobility-Hazardous materials Freight mobility-Oversized loads Bike and pedestrian access Facility needs-Ventilation and pumping Additional Right of Way over tunnel alignment Additional Right of Way at tunnel portals and interchanges Local roads modifications at tunnel portals and interchanges Excavation disposal

Path: X:\PTP\PARCO\156897\5-final-dsgn\51-drawings\90-GIS\Maps\8x11\Revised\March29_Update\Fig 7.mxd



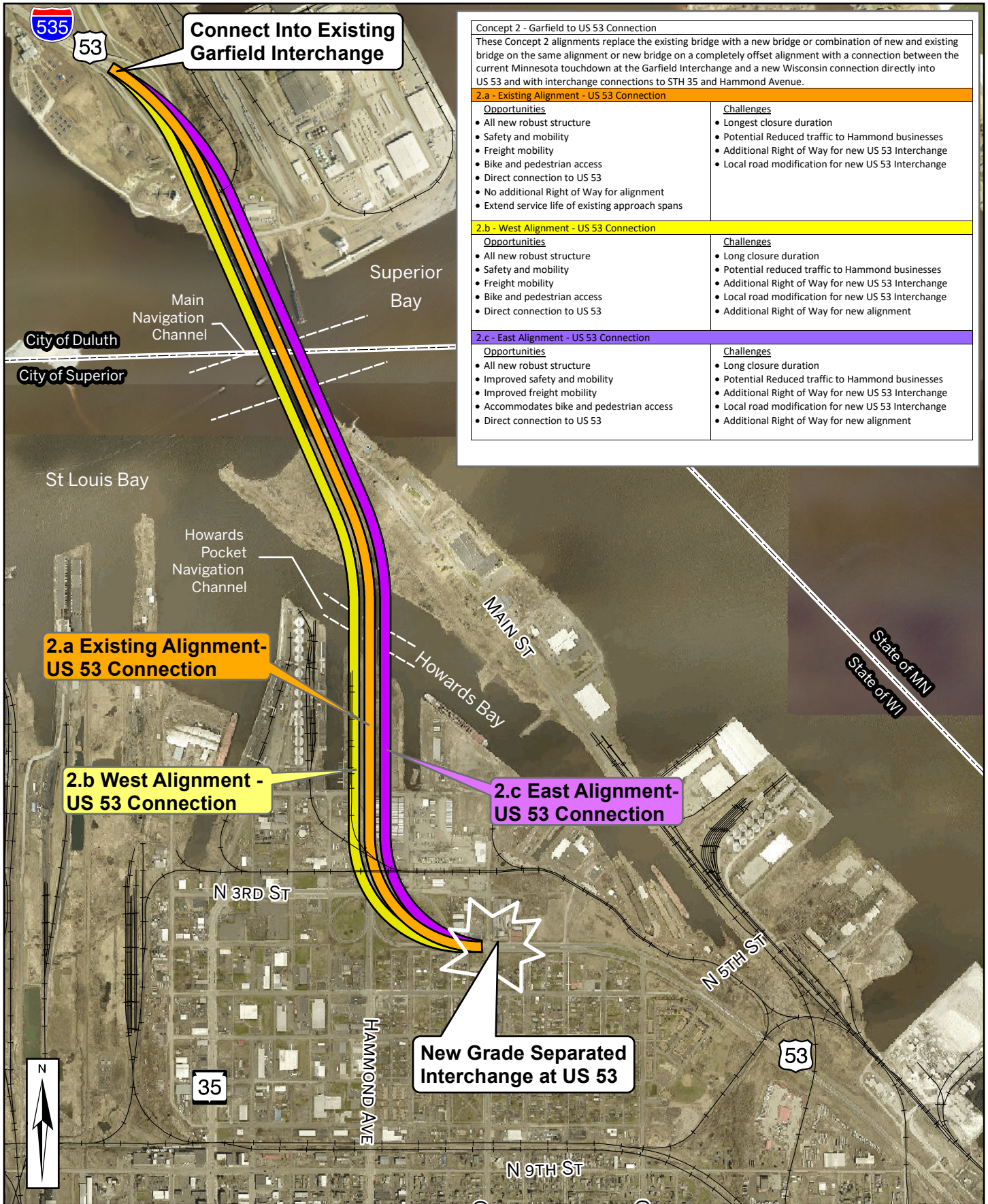
35

Project: PARCO 156897
 Print Date: 4/1/2021
 Map by: msteuernagel
 Projection: St Louis County South
 Source: ESRI, Douglas County, St Louis County, MnGeo

**CONCEPT 1
 REPLACEMENT - TUNNEL**
 St Louis County, MN & Douglas County, WI

**Figure
 7**

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Concept 2 - Garfield to US 53 Connection
 These Concept 2 alignments replace the existing bridge with a new bridge or combination of new and existing bridge on the same alignment or new bridge on a completely offset alignment with a connection between the current Minnesota touchdown at the Garfield Interchange and a new Wisconsin connection directly into US 53 and with interchange connections to STH 35 and Hammond Avenue.

2.a - Existing Alignment - US 53 Connection

Opportunities	Challenges
<ul style="list-style-type: none"> All new robust structure Safety and mobility Freight mobility Bike and pedestrian access Direct connection to US 53 No additional Right of Way for alignment Extend service life of existing approach spans 	<ul style="list-style-type: none"> Longest closure duration Potential Reduced traffic to Hammond businesses Additional Right of Way for new US 53 Interchange Local road modification for new US 53 Interchange

2.b - West Alignment - US 53 Connection

Opportunities	Challenges
<ul style="list-style-type: none"> All new robust structure Safety and mobility Freight mobility Bike and pedestrian access Direct connection to US 53 	<ul style="list-style-type: none"> Long closure duration Potential reduced traffic to Hammond businesses Additional Right of Way for new US 53 Interchange Local road modification for new US 53 Interchange Additional Right of Way for new alignment

2.c - East Alignment - US 53 Connection

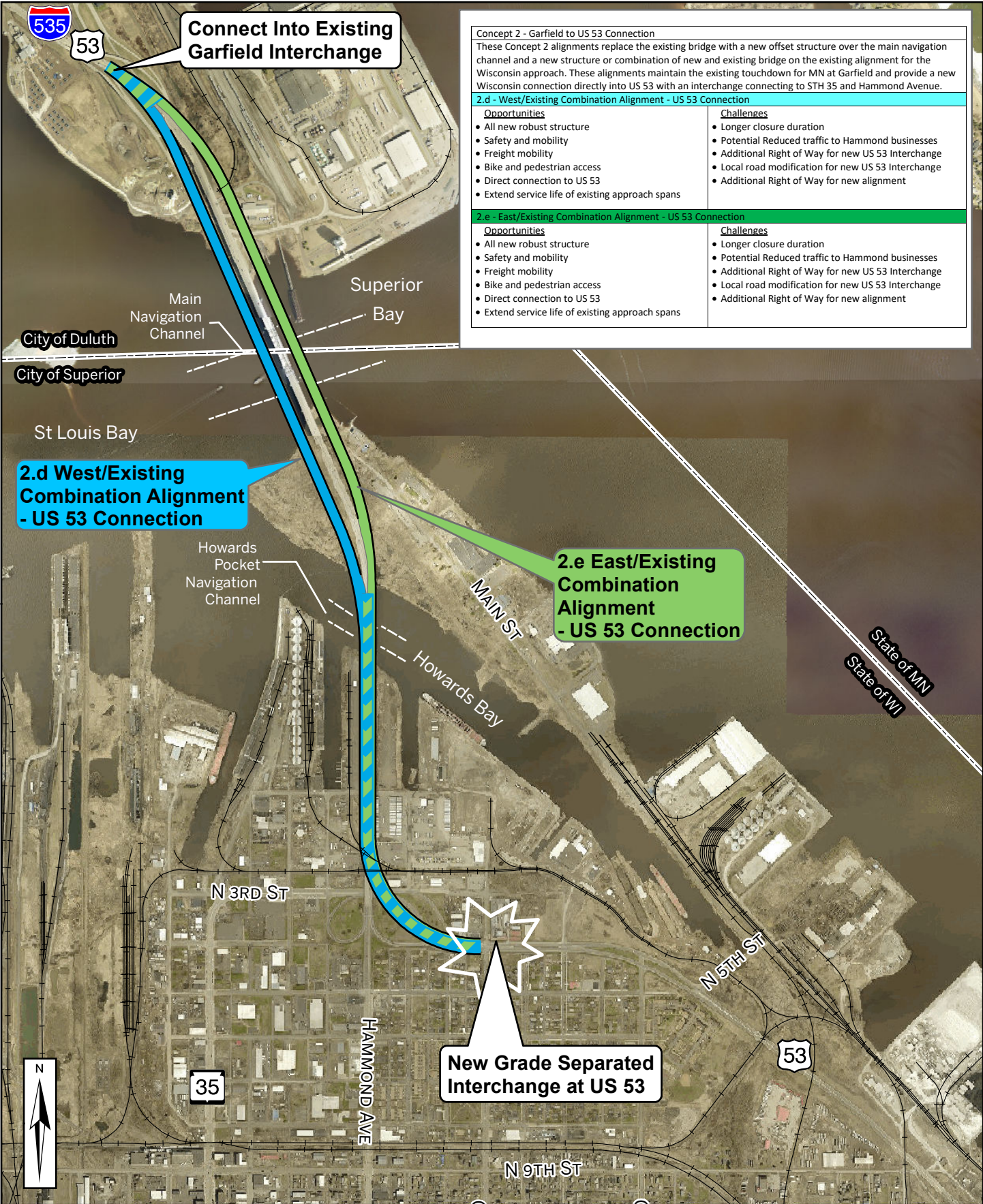
Opportunities	Challenges
<ul style="list-style-type: none"> All new robust structure Improved safety and mobility Improved freight mobility Accommodates bike and pedestrian access Direct connection to US 53 	<ul style="list-style-type: none"> Long closure duration Potential Reduced traffic to Hammond businesses Additional Right of Way for new US 53 Interchange Local road modification for new US 53 Interchange Additional Right of Way for new alignment

Path: X:\PT\PARCO\156897\5-final-dsgn\51-drawings\100-GIS\Maps\8x11\Revised\March29_Update\Fig 8.mxd



		Project: PARCO 156897 Print Date: 4/1/2021	CONCEPT 2 REPLACEMENT - GARFIELD TO US 53 CONNECTION St Louis County, MN & Douglas County, WI	Figure 8
	Map by: msteuernagel Projection: St Louis County South Source: ESRI, Douglas County, St Louis County, MnGeo			

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Concept 2 - Garfield to US 53 Connection

These Concept 2 alignments replace the existing bridge with a new offset structure over the main navigation channel and a new structure or combination of new and existing bridge on the existing alignment for the Wisconsin approach. These alignments maintain the existing touchdown for MN at Garfield and provide a new Wisconsin connection directly into US 53 with an interchange connecting to STH 35 and Hammond Avenue.

2.d - West/Existing Combination Alignment - US 53 Connection

- Opportunities**
- All new robust structure
 - Safety and mobility
 - Freight mobility
 - Bike and pedestrian access
 - Direct connection to US 53
 - Extend service life of existing approach spans

- Challenges**
- Longer closure duration
 - Potential Reduced traffic to Hammond businesses
 - Additional Right of Way for new US 53 Interchange
 - Local road modification for new US 53 Interchange
 - Additional Right of Way for new alignment

2.e - East/Existing Combination Alignment - US 53 Connection

- Opportunities**
- All new robust structure
 - Safety and mobility
 - Freight mobility
 - Bike and pedestrian access
 - Direct connection to US 53
 - Extend service life of existing approach spans

- Challenges**
- Longer closure duration
 - Potential Reduced traffic to Hammond businesses
 - Additional Right of Way for new US 53 Interchange
 - Local road modification for new US 53 Interchange
 - Additional Right of Way for new alignment

Path: X:\PT\PARCO\156897\5-final-dsgn\51-drawings\90-GIS\Maps\8x11\Revised\March29_Update\Fig 9.mxd



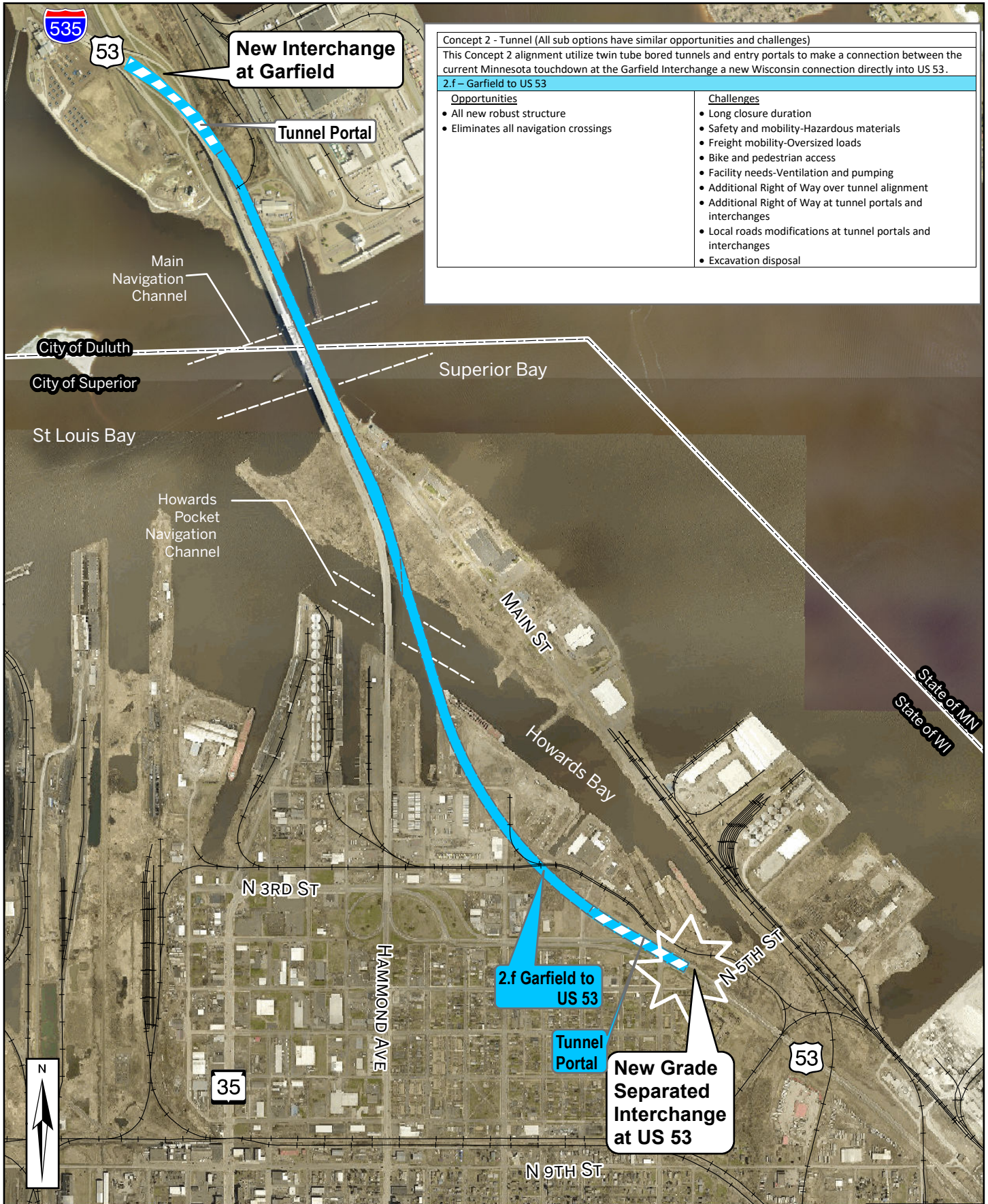
Project: PARCO 156897
Print Date: 4/1/2021

Map by: msteuernagel
Projection: St Louis County South
Source: ESRI, Douglas County, St Louis County, MnGeo

**CONCEPT 2
REPLACEMENT - GARFIELD TO
US 53 CONNECTION (EXIST S. ALIGNMENT)
St Louis County, MN & Douglas County, WI**


**Figure
9**

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

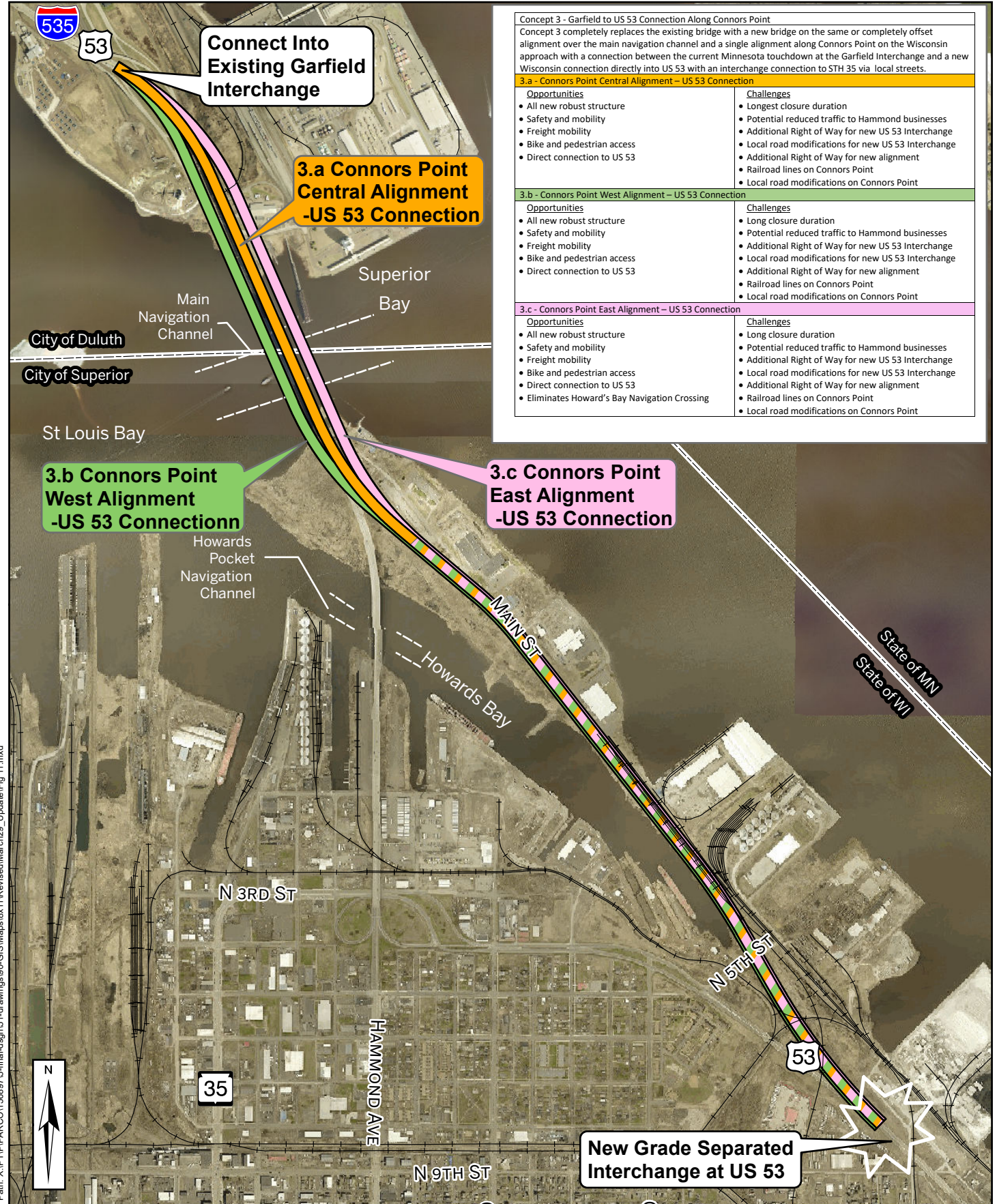


Concept 2 - Tunnel (All sub options have similar opportunities and challenges)	
This Concept 2 alignment utilize twin tube bored tunnels and entry portals to make a connection between the current Minnesota touchdown at the Garfield Interchange a new Wisconsin connection directly into US 53.	
2.f - Garfield to US 53	
Opportunities	Challenges
<ul style="list-style-type: none"> All new robust structure Eliminates all navigation crossings 	<ul style="list-style-type: none"> Long closure duration Safety and mobility-Hazardous materials Freight mobility-Oversized loads Bike and pedestrian access Facility needs-Ventilation and pumping Additional Right of Way over tunnel alignment Additional Right of Way at tunnel portals and interchanges Local roads modifications at tunnel portals and interchanges Excavation disposal

Path: X:\PT\PARCO\156897\5-final-dsgn\51-drawings\90-GIS\Maps\8x11\Revised\March29_Update\Fig 10.mxd

 	Project: PARCO 156897 Print Date: 4/20/2021	CONCEPT 2 REPLACEMENT - TUNNEL	Figure 10
	Map by: msteuermagel Projection: St Louis County South Source: ESRI, Douglas County, St Louis County, MnGeo		

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



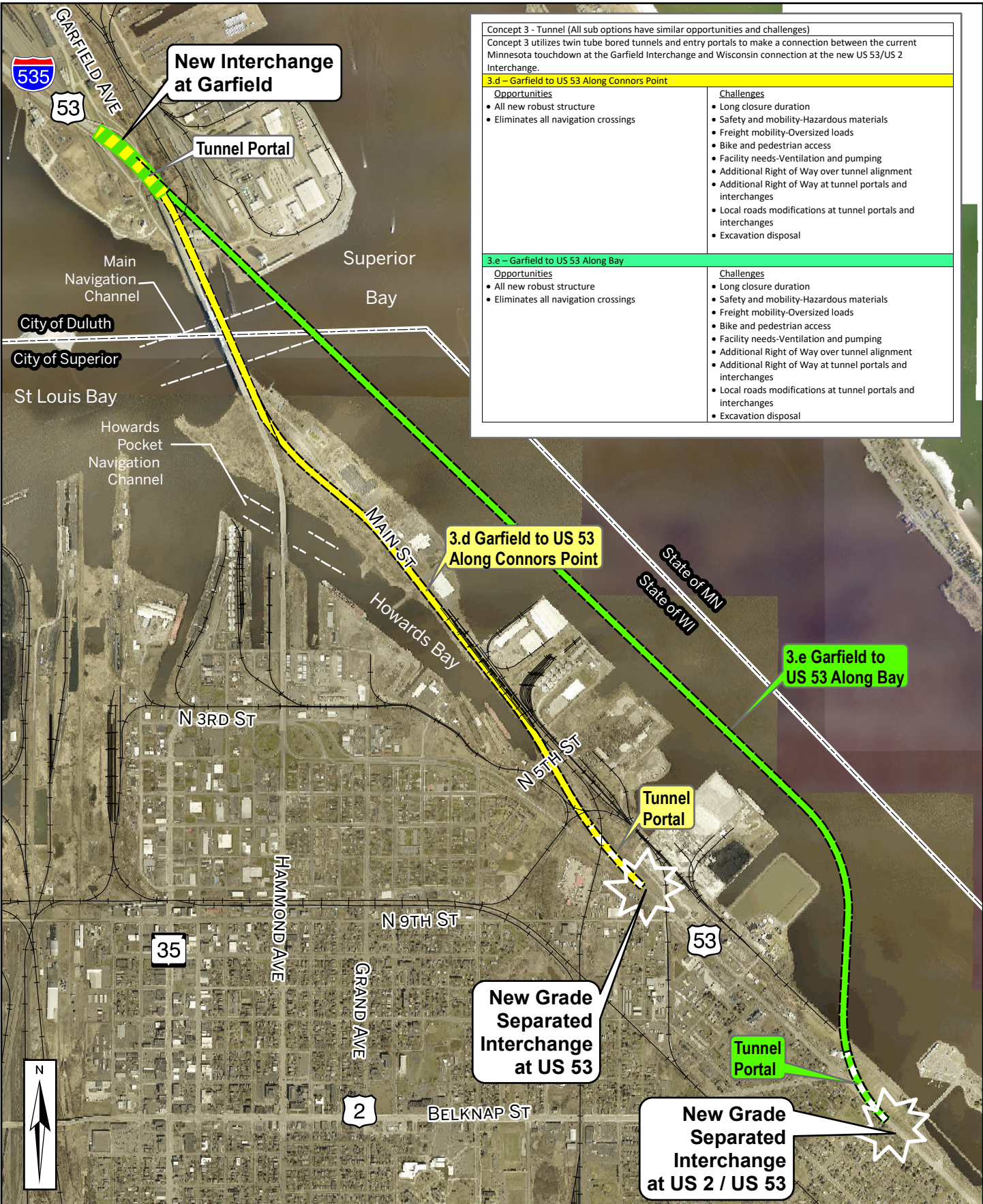
Concept 3 - Garfield to US 53 Connection Along Connors Point	
Concept 3 completely replaces the existing bridge with a new bridge on the same or completely offset alignment over the main navigation channel and a single alignment along Connors Point on the Wisconsin approach with a connection between the current Minnesota touchdown at the Garfield Interchange and a new Wisconsin connection directly into US 53 with an interchange connection to STH 35 via local streets.	
3.a - Connors Point Central Alignment - US 53 Connection	
Opportunities <ul style="list-style-type: none"> All new robust structure Safety and mobility Freight mobility Bike and pedestrian access Direct connection to US 53 	Challenges <ul style="list-style-type: none"> Longest closure duration Potential reduced traffic to Hammond businesses Additional Right of Way for new US 53 Interchange Local road modifications for new US 53 Interchange Additional Right of Way for new alignment Railroad lines on Connors Point Local road modifications on Connors Point
3.b - Connors Point West Alignment - US 53 Connection	
Opportunities <ul style="list-style-type: none"> All new robust structure Safety and mobility Freight mobility Bike and pedestrian access Direct connection to US 53 	Challenges <ul style="list-style-type: none"> Long closure duration Potential reduced traffic to Hammond businesses Additional Right of Way for new US 53 Interchange Local road modifications for new US 53 Interchange Additional Right of Way for new alignment Railroad lines on Connors Point Local road modifications on Connors Point
3.c - Connors Point East Alignment - US 53 Connection	
Opportunities <ul style="list-style-type: none"> All new robust structure Safety and mobility Freight mobility Bike and pedestrian access Direct connection to US 53 Eliminates Howard's Bay Navigation Crossing 	Challenges <ul style="list-style-type: none"> Long closure duration Potential reduced traffic to Hammond businesses Additional Right of Way for new US 53 Interchange Local road modifications for new US 53 Interchange Additional Right of Way for new alignment Railroad lines on Connors Point Local road modifications on Connors Point

Path: X:\PT\PARCO\156897\5-final-dsgn\51-drawings\90-GIS\Maps\8x11\Revised\March29_Update\Fig 11.mxd



		Project: PARCO 156897 Print Date: 3/30/2021	CONCEPT 3 REPLACEMENT - GARFIELD TO US 53 CONNECTION ALONG CONNORS POINT St Louis County, MN & Douglas County, WI	Figure 11
	Map by: msteuermagel Projection: St Louis County South Source: ESRI, Douglas County, St Louis County, MnGeo			

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



<p>Concept 3 - Tunnel (All sub options have similar opportunities and challenges)</p> <p>Concept 3 utilizes twin tube bored tunnels and entry portals to make a connection between the current Minnesota touchdown at the Garfield Interchange and Wisconsin connection at the new US 53/US 2 Interchange.</p>	
<p>3.d – Garfield to US 53 Along Connors Point</p>	
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> All new robust structure Eliminates all navigation crossings 	<p><u>Challenges</u></p> <ul style="list-style-type: none"> Long closure duration Safety and mobility-Hazardous materials Freight mobility-Oversized loads Bike and pedestrian access Facility needs-Ventilation and pumping Additional Right of Way over tunnel alignment Additional Right of Way at tunnel portals and interchanges Local roads modifications at tunnel portals and interchanges Excavation disposal
<p>3.e – Garfield to US 53 Along Bay</p>	
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> All new robust structure Eliminates all navigation crossings 	<p><u>Challenges</u></p> <ul style="list-style-type: none"> Long closure duration Safety and mobility-Hazardous materials Freight mobility-Oversized loads Bike and pedestrian access Facility needs-Ventilation and pumping Additional Right of Way over tunnel alignment Additional Right of Way at tunnel portals and interchanges Local roads modifications at tunnel portals and interchanges Excavation disposal

Path: X:\PT\PARCO\156897\5-final-dsgn\51-drawings\90-GIS\Maps\8x11\Revised\March29_Update\Fig 12.mxd

		<p>Project: PARCO 156897 Print Date: 3/30/2021</p> <p>Map by: msteuermagel Projection: St Louis County South Source: ESRI, Douglas County, St Louis County, MnGeo</p>	<p>CONCEPT 3 REPLACEMENT - TUNNEL</p> <p>St Louis County, MN & Douglas County, WI</p>	<p>Figure 12</p>
--	--	---	--	-----------------------------

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.