

RISK MANAGEMENT

Date: July 8, 2024

Subject: Q2 2024 Quarterly Risk Update

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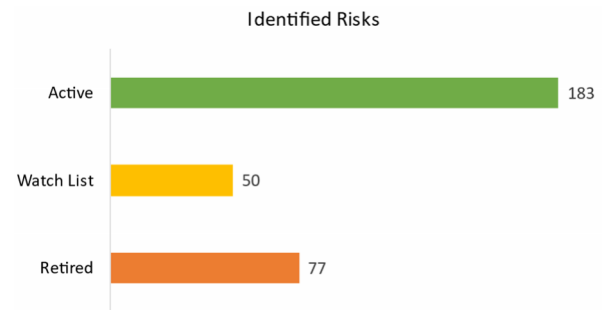
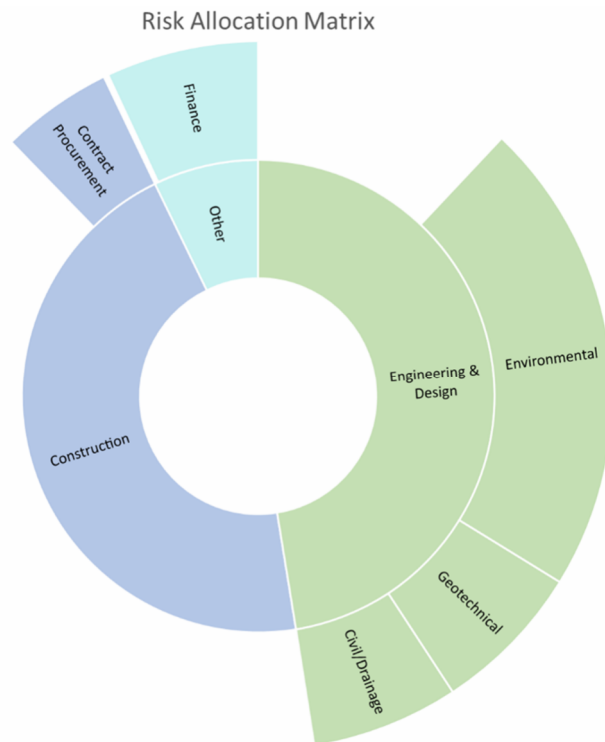
PURPOSE

Risk Management of the Interstate Bridge Replacement (IBR) Program is essential for timely decision making and to reduce the impacts of risks and uncertainties that may significantly impact the program's progression and cost. During June 2024, working sessions were coordinated and held with IBR leadership and technical leads to identify new risks, develop risk management strategies and action plans, re-evaluate the risk probabilities and cost/schedule impacts with information available at the time of the work sessions, and retire risks that were no longer relevant (e.g., realized, duplicate, had been mitigated, etc.). This memorandum highlights the status of the IBR program risk register, key risk management priorities, and the top program risks. Many of the risks facing the program are dependent upon actions that must be put into place or decisions needed by certain deadlines, as identified in the risk response strategies and action plans.

RISK REGISTER STATUS

During the working sessions the team identified 12 new risks that could impact the program; six were related to Contract Procurement, three to Environmental, two to Structures, and one to Finance. Key concerns addressed by the new risks include new Buy America/Buy American Act (BABAA) requirements, known and unknown cultural resource discoveries, the revised Preliminary Navigation Clearance Determination (PNCD) for the fixed span bridge, the approach fill north of Hayden Island Drive, the Evergreen Complex scope, and Bridge Investment Program (BIP)/Mega Grant agreement execution timelines. For more information on the new risks identified this quarter, please see the *New Risks* section of this memorandum.

The charts on the following page delineate both the total number of identified risks and the allocation of risk severity based on the relative severity in the risk managed state, for Engineering and Design, Construction, and Other Risks categories. Construction, including Contract Procurement and Delivery Method risks, accounts for 46% of the risk exposure currently identified, driven by the potential of material procurement delays, existing conditions and demolition, construction scheduling and staging, and uncertainties with contract packaging. Engineering and Design risks (e.g., Civil/Drainage, Environmental, Geotechnical, Structural, and Transit) represent 48% of the relative degree of risk exposure identified for the IBR program thus far, primarily driven by the risks categorized as Environmental. Key risk drivers in the Environmental category include cultural resource findings and natural resource conservation, delays to timelines for processes such as Section 106, 4(f), 6(f), and Federal Lands to Parks (FLP), and external agency review times for technical reports such as the Draft Supplemental Environmental Impact Statement (DSEIS) and NEPA analysis.



Watch List: Considered issues that will be addressed through normal project delivery circumstances. Items on the watch list are tracked throughout project delivery. If more information emerges that indicates that this could become a risk to the project, they are quantified in the Risk Register.

Risk Management and Priorities

It is imperative that the IBR program continues to engage in active risk management to minimize the threats, and maximize the opportunities, the program may be exposed to. Continuing to utilize the risk management process to identify, analyze, respond to, and monitor and control risk will support effective program management, as well as provide information for action in the proper handling of risk effects.

Risk management is a collaborative and continuous process that requires input from key program partners and interested parties. Future risk management activities will include focusing on risks with the highest relative risk severity identified and monitoring risks at consistent intervals. If risks begin to materialize, the execution of risk response strategies as early as possible is imperative. If risks fully materialize, it is recommended to identify and evaluate impacts and appropriate response mechanisms as documented in the program's risk register.

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To facilitate the continuous application of proactive risk response planning, the IBR program technical leads will provide updates to the risk register monthly, and the IBR program team, with key interested parties, will meet quarterly. Routine risk monitoring and control will ensure timely decision making and aid in the continued acknowledgment of uncertainties that may significantly impact the program's progression and cost. If action to manage risk is not taken and decisions are not made in a timely fashion, the impacts of the risks may be incurred, particularly in the form of schedule delays; however, if the necessary risk response strategies and action plans are proactively deployed, the impacts of the associated risks can be minimized to the extent feasible.

Quarterly Risk Update

In June 2024, 14 working sessions were held with IBR leadership and technical leads to review and update key risks for the Q2 quarterly risk update. The teams reviewed risk descriptions and actions to be taken, adjusted cost and schedule impacts as appropriate, and noted timelines for revisiting risks. This memo summarizes major changes made and updates captured during this series of meetings. For the full details of all updates, please see the IBR Risk Register.

Key Themes

- The Environmental team has developed a high-level schedule called the “executive roadmap” in conjunction with the Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) which contains milestones for key NEPA deliverables. The team is engaged in continuous check-ins and coordination with both agencies to ensure compliance with the roadmap.
- The Draft Supplemental Environmental Impact Statement (DSEIS) is moving forward now that the additional analysis identified in Q1 has been resolved. The DSEIS is expected to be released in September 2024.
- Utility coordination is ongoing, and the Subsurface Utility Engineering (SUE) is to be completed early summer 2024. Work has begun on the Utility Impact Matrix and utility notifications for early packages.
- The development of the Program Management Office (PMO)/Organizational Chart is underway and is anticipated to be completed by Q4 2024 which will support the mitigation of Program Management risks.
- The tolling authority has changed from Oregon Department of Transportation (ODOT) to Washington State Department of Transportation (WSDOT). A WSDOT tolling consultant will be coming on board in July of this year.
- Six new Contract Procurement risks were identified as a result of new BABAA requirements. These include concerns regarding obtaining waivers, conflicting requirements, and procurement of various BABAA-defined materials.
- Two new Environmental risks were identified for both known and unknown cemetery de-dedication.

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Risk Updates

The following details the major risk updates made during the quarterly update meetings by discipline category. The risk number, title, and relevant management comments are listed below.

Civil/Drainage

Risk #1: Stormwater Facilities

Risk #2: Use of Existing Pipes

Risk #3: Lack of Downstream Conveyance Capacity

- For the three above risks, it was noted that the drainage process is still ongoing. The finalization of the footprint will influence the impact of these risks.

Risk #65: Modification of 60" Culvert Beneath I-5

- It has been determined that the segments toward the downstream end of I-5 will need to be lowered. Coordination with the Utility team will be continued throughout Q3 to decide potential impacts.

Construction

Risk #7: River Bridge Final Design/Mobilization Schedule too Aggressive

- The in-water work window is now expected in September 2027 (previously September 2026).

Risk #273: Trestle Connection to Hayden Island

- It has been determined that there may be room (30 feet) for access in the parcel parallel to the bridge within the ROW. It will need to be verified if this is adequate to place a trestle adjacent to the property.

Contract Procurement

Risk #102: Conflicts Among IBR Contracts (SR-14 Package A and Approaches)

Risk #282: Conflicts Among IBR Contracts (Mill Plain and Washington North)

Risk #283: Conflicts Among IBR Contracts (Other)

- These risks were re-classified from Maintenance of Traffic (MOT) risks to Contract Procurement risks.

Environmental

Risk #39: Section 106 – Analysis

- The Environmental team is currently working with federal partners on a constrained agreement document schedule to ensure execution prior to NEPA FEIS.

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Risk #44: Supplemental EIS (SEIS)

Risk #47: FHWA and FTA NEPA Review/Participation

- Additional analysis identified in Q1 2024 has been resolved and the DSEIS is now moving forward. A high-level schedule called the “executive roadmap” has been developed in conjunction with the FTA and FHWA which contains milestone dates for key NEPA deliverables.
- Daily check-ins are now being held to ensure compliance with the roadmap, and executives from all three parties are now meeting bi-weekly. The DSEIS is now expected to go public in September 2024.

Risk #46: External Agency NEPA Reviews

- Agency reviews with the Army Corps of Engineers (USACE) are currently up to date; however, delays are still being experienced with the Coast Guard (USCG).
- Updates based on updated traffic analyses will need to be sent to cooperating agencies, which may result in further delays.

Risk #52: USACE Permitting Delays (Levee)

- Transit improvements will be requested to be separated from Highway improvements for the levee permitting.

Risk #53: USCG Bridge Permit Delay

- Meetings have been held with the USCG this quarter. The Navigation Impact Report is currently being revised, with the intent to submit by the end of summer 2024.
- Mitigation Action #3, to investigate the potential for two separate bridge permits, has been completed.

Risk #246: DSEIS Released Early Before Finalizing

- Given that some documents were released in Q1 2024 and there was no delay experienced, the likelihood for this risk was reduced from 10% to 5%.

Risk #285: Unanticipated Mitigations Needed

- Mitigations will include flood plain fill mitigation for the City of Portland (COP). COP will be requiring offset of net fill from the program, primarily from the pile caps for the new bridge.
- A likelihood of 75% was assigned, as well as a cost impact rating of \$1-3M, most likely \$2M.

Finance

Risk #67: FTA Approval Delayed for Entry into Engineering or FFGA

- At least six months of delay is currently expected; the likelihood of this risk was increased from 25% to 95%.

Risk #258: Pre-Completion Tolling

- It has been determined that civil construction needed for pre-completion tolling can be performed prior, but pre-completion tolling itself cannot start before the ROD. Currently, the ROD is expected before pre-completion tolling, so the risk is minor.

Risk #274: IBR Program Seeks Federal Funding – CIG

- The likelihood for this risk was reduced from 50% to 15% as the team does not see this as a large risk.

Geotechnical

Risk #78: Bridge Foundation Changes – Construction

- The Geotechnical Data Report was received last month and is currently under review.

Risk #79: Additional or Changed Method of Ground Improvement

- The Draft GI Demonstration Program has been submitted to ODOT, and ODOT has provided comments. An initial call was held to discuss ODOT's comments, and coordination will continue to resolve questions.

Other

Risk #122: Community Workforce Agreement (CWA) / PLA

- Currently engaging in monthly coordination and still awaiting decisions regarding agreements.

Program Management

Risk #115: Late Decisions on Program Elements (Other)

- The development of the Program Management Office (PMO)/Organizational Chart is underway and is anticipated to be completed by Q4 2024.

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Risk #117: Contract Administration Issues

- Agency determination (Mitigation Action #3) has been completed.
- The governance agreement is anticipated to be executed in 2025. Review of the first draft will inform this risk.

Railroad

Risk #129: BNSF Agreement Delays

Risk #130: Railroad Agreement Term Sheets Delays

- The Agreements team met with BNSF in June 2024 and have gained clarity on expected timelines.

Right-of-Way (ROW)

Risk #135: ROW Cost Increases

- The real estate team has been updating cost calculations and identifying priority parcels. The team has begun developing an advanced acquisition approach.

Risk #136: Need for Additional ROW Acquisition Identified (Other)

- Coordination with Design and Geographic Information System (GIS) teams is underway to ensure all properties within the footprints are being captured.

Risk #145: Late Changes in Design - ROW Schedule (Other)

- Utility surveys and mapping are ongoing.
- A new mitigation action to be taken was added: *ROW engineering, survey, design, and real estate teams to work together to identify the ROW layout workflow process.*

Roadway Design

Risk #86: Partner Agency Design Review Processes - 30% Design Package

- A new mitigation action to be taken was added: *Begin working with internal PA team to develop a strategy to normalize the 30% CRBA design with partners.*

Risk #87: Partner Agency Design Review Processes - Subsequent Packages, 60%, 90%

- A new mitigation action to be taken was added: *Coordinate with Procurement team to inform RFP language with respect to partner review cycles.*

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Traffic

Risk #189: Additional ATMS / Toll Infrastructure

- The tolling authority has changed from ODOT to WSDOT.
- A WSDOT tolling consultant will come on board in July 2024 and is anticipated to provide more clarity on requirements.

Transit

Risk #202: Evergreen Park-and-Ride Design/Scope Changes

- The likelihood for this risk was reduced from 60% to 25% because the Evergreen Park and Ride is needed for the Capital Investment Grant (CIG).

Risk #203: Waterfront Park-and-Ride Design/Scope Changes

- It has been determined for 30% design that a Waterfront Park and Ride may not be included for the Transit project. Once an official decision is made, this risk may be able to be retired.

Risk #218: Systems Testing or Start-Up Delays

- This risk was moved to the Watch List. It is considered to be part of a standard transit project and is a minor risk at this time.

Utilities Relocation

Risk #225: Delayed Completion of Utility Agreements and Permits

Risk #233: Unidentified Utilities Encountered During Construction

- Coordination between Utilities and Agreements groups is ongoing.
- The SUE is expected to be completed in June 2024.
- Utility Notifications for early packages have been started.

Risk #226: Utilities Take Longer Than Anticipated to Implement Relocation Plan (CRB)

- Outreach to private utilities is beginning, starting with introductory emails.
- An “early” SUE area was identified to accelerate working on early packages.

Risk #227: Utility Relocation Delays (Program-Wide)

- There was a coordination meeting with state Departments of Transportations (DOTs) to discuss format and requirements for Utility Notification Letters.
- Utility Notification Letters for Highway Improvements and Pre-Completion Tolling Packages have been started.

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New Risks

12 new risks were identified during the quarterly risk update working sessions. These new risks and their descriptions are listed below.

Risk #299: Revised PNCD for Fixed-Span Bridge – The USCG may not issue a revised PNCD, which is needed for a fixed-span bridge. If a revised PNCD is not issued, the program will need to elevate the decision which may delay the program schedule.

Risk #300: Approach Fill North of Hayden Island Drive – There is a risk that the Approach fill north of Hayden Island Drive is converted to structure. The base currently assumes fill. This could be an opportunity or a threat; this risk will be monitored as design progresses.

Risk #301: Decision on Evergreen Complex – There is a threat or opportunity that Evergreen scope could change from what is in the base estimate. This risk will be monitored as design progresses.

Risk #302: Expiration of Manufactured Products Waiver – There is a risk that the FHWA allows its waiver for manufactured products to expire.

Risk #303: Conflicting BABAA Requirements – BABAA requirements may be in conflict due to concurrent FHWA and FTA funding for specific packages.

Risk #304: BABAA-Defined Steel & Iron Products – There is a risk of higher cost and lack of availability for BABAA-defined steel and iron products. Waivers must now be administered at the federal level, resulting in long delays for reviews and uncertain outcomes.

Risk #305: BABAA-Defined (Permanently Installed) Construction Materials – There is a risk of higher cost and lack of availability for BABAA-defined (permanently installed) construction materials. This requirement is new as of October 2023 and impacts are unclear at this time.

Risk #306: BABAA-Defined Fabricated Materials – There is a risk of higher cost and lack of availability for BABAA-defined fabricated materials.

Risk #307: Non-Domestic Materials Waivers – Contractors may depend on being able to obtain waivers for non-domestic materials. If waivers are not able to be obtained, this may cause delay to the project.

Risk #308: Post-Review Discoveries - Known Cemetery De-Dedication – The process for cemetery de-dedication may take longer than anticipated and could result in lengthy legal processes.

Risk #309: Post-Review Discoveries - Unknown Cemetery De-Dedication – There is a risk of discovering ancestral findings or encountering a cemetery during construction or excavation activities. Such discoveries can lead to complex legal and regulatory processes, in particular the de-dedication of a cemetery. The discovery may stop work, potentially resulting in significant project delays. The legal and court proceedings for cemetery de-dedication can take 2-3 years.

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Risk #310: BIP/Mega Grant Agreement Execution – If the BIP and/or Mega Grant agreement(s) are not signed prior to January 20, 2025, there is a risk of delay to receipt of funding.

Retired Risks

2 risks were retired during the quarterly update working sessions. These risks and the rationale for why they were retired are listed below.

Risk #29: Impact of New Buy America / Buy American Act (BABAA) Requirements – New risks (#302-307) were identified that capture specific impacts of this risk in greater detail and replaced risk #29.

Risk #73: Changes to IBR Toll Operations (Administration) Assumptions – Both states have agreed to the tolling administration changes and this is no longer expected to be a risk. Additionally, the cost estimates were lower than expected with this risk.

Priority Watch List Items

Watch List risks are considered issues that should be monitored and tracked throughout project delivery, but that may not necessarily have a quantifiable cost or schedule impact. The following Watch List items have been noted as priority risks for tracking and monitoring. The risk number, title, and description for each priority Watch List item are listed below.

Risk #30: Claims Associated with Third Party Agreements – Agreements with utilities and other interested parties do not have enforceable provisions that clearly establish third-party requirements (i.e., design specs, notification requirements, etc.) and third-party commitments, especially for time-sensitive obligations (i.e., design review, construction inspection, self-performed work, etc.)

Risk #72: ODOT Toll Operations Schedule – Assuming the approach to toll implementation does not change (Risk 73), ODOT Toll Program toll operations schedule may not align with IBR toll schedule, either due to delays in toll procurements or due to Toll System contractor delays. This could result in delay to the start of tolling and reduce the overall toll funding contribution.

Risk #137: Additional Condemnation – Oregon – The base estimate and schedule include typical condemnation assumptions for ODOT. If condemnation rates exceed that assumption, then costs and schedule could be impacted.

Risk #138: Additional Condemnation – Washington – The base estimate and schedule include typical condemnation assumptions for WSDOT. If condemnation rates exceed that assumption, then costs and schedule could be impacted.

Risk #156: Community Connector Size Reduction – Potential opportunity to reduce the size of the Evergreen Community Connector through discussion with interested parties.

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Risk #207: Added Aesthetics to Station Features – Hayden Island and City of Vancouver areas require more architectural improvements to stations than those provided in the base case, this could result in increased cost and delays to the program.

Risk #248: Work Package Sequencing Impacts Financial Plan – If there are changes in work package sequencing, then it may impact the financial plan and could impact the different types of funding sources.

Risk #260: Interim Marine Drive Design – There is a risk of not progressing enough of the Marine Drive interim interchange (west approach) as it relates to the transit design and having enough design around the levees to obtain permits. Risk of being unable to meet permit schedule and potentially missing permit window, causing delays.

Risk #269: Third Party Agreements Process – Delays to third-party agreements or the third-party agreements process results in procurement delays.

Risk #279: Critical Utilities – Critical utilities identified late in design might impact design or construction schedule and cost.

Top Risks

The top ten combined cost and schedule risks to the IBR Program (in the managed state) and their primary action plans are:

1. Risk #7: River Bridge Final Design/Mobilization Schedule too Aggressive

The base schedule for river bridge final design, mobilization, and permitting has been compressed to show the contractor utilizing the first in-water work window (starting September 2026). This compression may not be feasible and additional time may be required to prepare for in-water work.

- When preparing RFP, identify opportunities to facilitate Final Design process for contractor.
- Identify permitting needs and requirements to mitigate risk (i.e., stormwater, USCG). Consider owner procurement of critical permits.
- Perform industry outreach and engage early with contractors to highlight risk.
- Consider transferring risk to contractor (potential for increased bid costs).
- Proposing supplemental geotechnical investigations in Task AE to take advantage of the 2023-2024 and 2024-2025 IWWW to provide prerequisite information for proposers in advance of procurement.

2. Risk #39: Section 106 – Analysis

Section 106 data collection, analysis, documentation, and approvals by SHPOs and tribes as well as a signed Programmatic Agreement needs to be completed prior to updated NEPA ROD (from Supplemental FEIS) being issued.

- Complete Programmatic Agreement mitigation updates as early as possible.
- Engage in early coordination and consultation with Tribes and other interested parties/agencies.
- Add resources for investigations (Task AD) to support Section 106 analysis.
- Add resource for consulting party communication.
- Investigate opportunities to define contracts, clearing specialty consultants, and sequencing activities to mitigate potential schedule constraints.
- Frequent coordination with federal co-leads to ensure timely review and turn-around of Section 106.
- Engage in ongoing coordination with sequencing and packaging to understand when analysis will occur.

3. Risk #78: Bridge Foundation Changes – Construction

Unforeseen/differing site conditions result in deeper and/or different shafts/foundations than anticipated. This could result from changed conditions triggered by construction.

- Consider supplemental subsurface investigations.
- Agency to implement proposal requirement that Bidders demonstrate ability to install foundations of the sizes and depths in the contract with similar environmental constraints.
- Consider requiring the contractor to include a test shaft.

4. Risk #275: Limited Bid Responses Result in Re-Procurement: Approaches Contract

Limited bid responses result in a non-competitive procurement and possible need to rebid.

- Proactively engage the industry early and often, especially through the systematic use of RFIs and follow-up meetings prior to initiation of formal procurement, and preferably prior to deciding on the contracting methods.
- Ensure that risk transfer provisions are reasonable, and if risks are transferred to the contractor where the contractor has less than complete control, include an allowance or other cost-sharing mechanism. Regardless of delivery method, use a contractor selection process that maximizes ability to screen for quality.
- Conduct workshop/analysis to determine optimal river bridge contract packaging and delivery methods.
- Consider including consultant contractor SMEs in next workshop.
- Early issuance of draft RFP.

5. Risk #47: FHWA and FTA NEPA Review/Participation

Timely reviews and direction are needed from FHWA and FTA to support the NEPA documentation and process, including ESA, Section 106, Section 4(f), etc. compliance and legal sufficiency reviews.

- Identify staff resource as a point of contact (139j, other) for FHWA and FTA to engage in communication and coordination throughout NEPA process.
- Work with agencies to develop informal agreements to work on internal agreement process that IBR follows.
- Coordinate with FHWA and FTA on their availability and schedule meetings/deliverables as to not overload their teams.
- Continue executive focus on the schedule between the DOTs and federal partners.
- USDOT requests to add program to executive roadmap.

6. Risk #67: FTA Approval Delayed for Entry into Engineering or FFGA

FTA approvals for entry to engineering and/or FFGA may be delayed for procedural reasons. The most likely cause of delay is tied to completeness of the required deliverables to move through Engineering and FFGA. This could trigger additional delays to FTA approvals for Entry into Engineering and/or FFGA.

- Monitor and track the status and completeness of required deliverables to move through Engineering and FFGA.
- Engage in early coordination with Partner Transit Agencies and FTA.
- Coordinate FTA approval activities with the program scheduling team.

7. Risk #68: Transit O&M Funding

Transit O&M funding source has not been identified. Without a committed source of operating funds, transit elements of IBR will not be able to secure FTA FFGA capital funding. Lack of a comprehensive funding plan may delay construction contract procurement.

- Transit O&M workgroup has been established and is meeting regularly to identify issues and assist with drafting scope of agreement.
- Identify key milestone dates.
- Coordinate early with Legislature to identify required statutory changes for transit O&M funding.
- Fallback action is to engage working group/interested parties early to agree on a plan of action in case of delays in Transit O&M Funding and quantify required efforts.
- Develop a 2025 legislative plan.

8. Risk #185: Changes to Travel Demand Modeling Parameters

Changes to current travel demand modeling parameters (2045 time period) or changes to model standard practices lead to a new model runs required; pre-ROD leads to delays. Land use changes in the program year may trigger additional analysis (i.e., Hayden Island).

- Ensure that incorporation of travel analysis numbers is not required at the DSEIS.
- Continue to track policy changes that may impact travel demand modeling requirements.
- Plan for updated Metro RTP model in 2023.
- Confirm with RTC on cross river land use and forecast.
- If changes could result in delays, do not use them.

9. Risk #250: IBR Program Seeks Federal Funding - Non-CIG

The IBR program seeks \$1.5B in federal discretionary funding (from the BIP and Mega Programs). Failure to secure federal funding may result in delays to and/or down-scoping of the IBR program. The BIL expires at the end of 2026.

- Work toward a path that meets grant funding's project readiness criteria, including beginning construction as soon as possible.
- Apply lessons learned from other applicants to make IBR's applications successful.
- Look for ways to advocate through Congressional delegation to fully fund the BIL program.
- Identify early work packages to secure funding (i.e., east/west walls, work associated with the river bridge).

10. Risk #261: Contract Interfaces

There is a risk from including adequate contract interfacing between each work package. As work is broken down into more contracts, more schedule contingency may be needed between each one, potentially impacting the schedule.

- Confirm the contract packaging strategy and approach.
- Incorporate the approach into the master schedule and identify mitigations.

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Risks to Manage

To identify the risks with the largest cost and schedule impacts, the Risk Management team has developed several plots referred to as Tornado Diagrams. In a Tornado Diagram, threats are plotted to the right of the central axis, while opportunities are plotted to the left. These diagrams present the relative degree of risk exposure from threats and the relative degree of benefits from opportunities.

The highest relative impact risks are located at the top of the diagram, and the lowest relative impact risks are at the bottom. The highest risk threats require the most management and have the highest need for appropriate risk response. The risks at the bottom of the Tornado Diagram are not insignificant relative to project cost and schedule and will still require management and risk response strategies.

The degree of risk portrayed in the Tornado Diagram is based on a calculated value that determines relative risk by multiplying the probability of occurrence and the most likely impact to generate the expected value of impact. The **orange** bar of the two-bar pair shown below for each risk represents the degree of risk in the unmanaged state. The bottom half of the pair (the **blue** bar) represents the estimated change in risk severity when the risk is in a managed state. Four types of Tornado Diagrams have been developed. The first is the cost risk exposure (in dollars), the second is schedule delay risk exposure (in months), and the third is combined effect of cost and schedule risk exposure (in scalar values). It should be noted that the risk rankings in the first three diagrams are based on the pre-managed state, while the fourth tornado diagram shows the top 15 risks to the program based on the managed state only.

The information contained in the Tornado Diagram provides an idea of how much focus and attention is needed for managing individual risks and being able to continue to manage allocated contingency and schedule slack. Risks with a very high likelihood and very high impact will require continuous attention and review and may adversely impact pools of contingency reserves and schedule buffer if they are not managed proactively. In summary, the risks that need the most focus of management are the risks that pose the most relative threat to the project, which reside at the top of the chart.

If the proposed risk response strategies are fully implemented within the risk register, the potential impact of event risk to the IBR Program could be significantly reduced. Of these, it is essential that the response strategies for the topmost risks identified in the following tornado diagrams and throughout the report are pursued in order to manage the greatest risks to the project.

