Multnomah County

Earthquake Ready Burnside Bridge Project

Risk Assesssment Report

March 17, 2022

EARTHQUAKE READY BURNSIDE BRIDGE

Risk Assesssment Report

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VMS Project # 2788-001

Date:

March 17, 2022

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VERSION CONTROL

Issue	Revision No	Date Issued	Page No	Description	Reviewed by
	1	Feb 28, 2022		Internal Draft	Mariah Brink
	2	Mar 01, 2022		Internal Draft	DEA, Inc.
	3	Mar 04, 2022		Internal Draft	DEA, Inc.
	4	March 17, 2022		External Draft	Multnomah County

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ACRONYMS AND ABBREVIATIONS

A&E	Architect/Engineer
CE	Construction Engineering
CMGC	Construction Manager/General Contractor
CPM	Critical Path Method
CRA	Cost Risk Assessment
DEA	David Evans and Associates, Inc.
EQRB	Earthquake Ready Burnside Bridge
FRP	Form, Reinforce, Pour
GMP	Guaranteed Maximum Price
HDR	HDR, Inc.
IGA	Intergovernmental Agreements
IWWW	In-Water-Work-Windows
MC	Multnomah County
NEPA	National Environmental Policy Act
NTP	Notice to Proceed
Option 1	Cable Stay, East Side Long Span
Option 2	Tied Arch, East Side Long Span
ODOT	Oregon Department of Transportation
O&M	Operations and Maintenance
PBOT	Portland Bureau of Transportation
P0	0% Confidence Level
P6	Primavera P6 Scheduling Software
P10	10% Confidence Level
P50	50% Confidence Level
P70	70% Confidence Level
P73	73% Confidence Level
P90	90% Confidence Level
PE	Preliminary Engineering
RFP	Request for Proposal
ROD	Record of Decision
ROW	Right of Way
SABCE	Stripped and Adjusted Base Cost Estimate
SDF	Schedule Delay Factor
USACE	United States Army Corps of Engineers
VMS	Value Management Strategies, Inc.
YOE$	Year of Expenditure

PREFACE

David Evans and Associates, Inc. (DEA), as the Owner's Representative for the Earthquake Ready Burnside Bridge (EQRB) Project, has been engaged by the project owner, Multnomah County (MC) to conduct a Cost Risk Assessment (CRA) of the project. Value Management Strategies, Inc. (VMS), as the risk subconsultant on the DEA Owner's Rep team, was responsible for conducting the CRA.

The objective of the CRA is to support MC's decision-making process, as it relates to the project's funding, delivery, and design determination.

As of January 2022, the project design was at approximately 25% design. For the CRA, two bridge type alternatives for the East span were considered: Cable Stay, East Side Long Span (Option 1) and Tied Arch, East Side Long Span (Option 2). Both Option 1 and Option 2 assume steel plate girders on the west approach and bascule type bridge for the movable span. The National Environmental Policy Act (NEPA) process is well underway and expected to be complete in late 2022 or early 2023. The project is close to issuing two separate Request for Proposals (RFP): one for an Architect/Engineer (A&E) firm and a second for a Construction Manager/General Contractor (CMGC) in preparation for the final design phase.

The CRA scope is confined to the EQRB project as defined by MC. This does not include any adjacent projects that could impact the EQRB project as it is currently understood, unless specifically identified in the risk report.

THIRD-PARTY DISCLAIMER

The structured process used during this study – with the involvement, consideration, and agreement in the analysis and results of the study by participants – provides an assessment of the current risk exposure for MC. The degree of risk exposure is subjective, and risk assessment information and models reflect the views of the project team during the January 2022 Risk Workshop.

This risk assessment addresses risks and uncertainties that could arise during the project given the experiences of the project team members and is limited in scope with respect to the time allotted to the study, information available at the time of the study, and the availability of the project team during the study. The risk exposure of the project will continuously evolve, and this report represents the current assessment of the status as of January 2022.

There is no guarantee that all risks have been identified or that the quantification of the risks is a guarantee of limit of exposure to schedule delay or cost over-run or under-run to MC.

1 EXECUTIVE SUMMARY

A CRA, sponsored by MC and conducted by VMS for the EQRB project was performed January 10-14, 2022, remotely via Zoom videoconferencing. The intent of the risk analysis is to support the MC cost basis determination process through a contingency analysis for both project cost and schedule pertaining towards the two alternative options: Option 1 and Option 2. In addition, the risk analysis provides details of the likely most significant risks that could result in a divergence from the final cost and/or schedule unless mitigated, and hence an opportunity for the project team to mitigate or reduce the potential impacts. Total anticipated costs, including contingencies, escalation, and project reserve are provided in Table 3 and Table 4.

1.1 Schedule Risk Analysis Summary

The schedule risk assessment analyzes the substantial completion date of the EQRB project. The deterministic schedules projected a substantial completion date for Option 1 as August 8, 2029 and Option 2 for October 17, 2029. The deterministic schedules did not include schedule contingencies.

Figure 1 below shows the overall risk assessment to the project's substantial completion for both Option 1 and Option 2. Based on the risk assessment for Option 1, there is a 50% Confidence Level (P50) that the project will be completed by August 30, 2030, and 70% Confidence Level (P70) that the project will be completed by September 13, 2030.

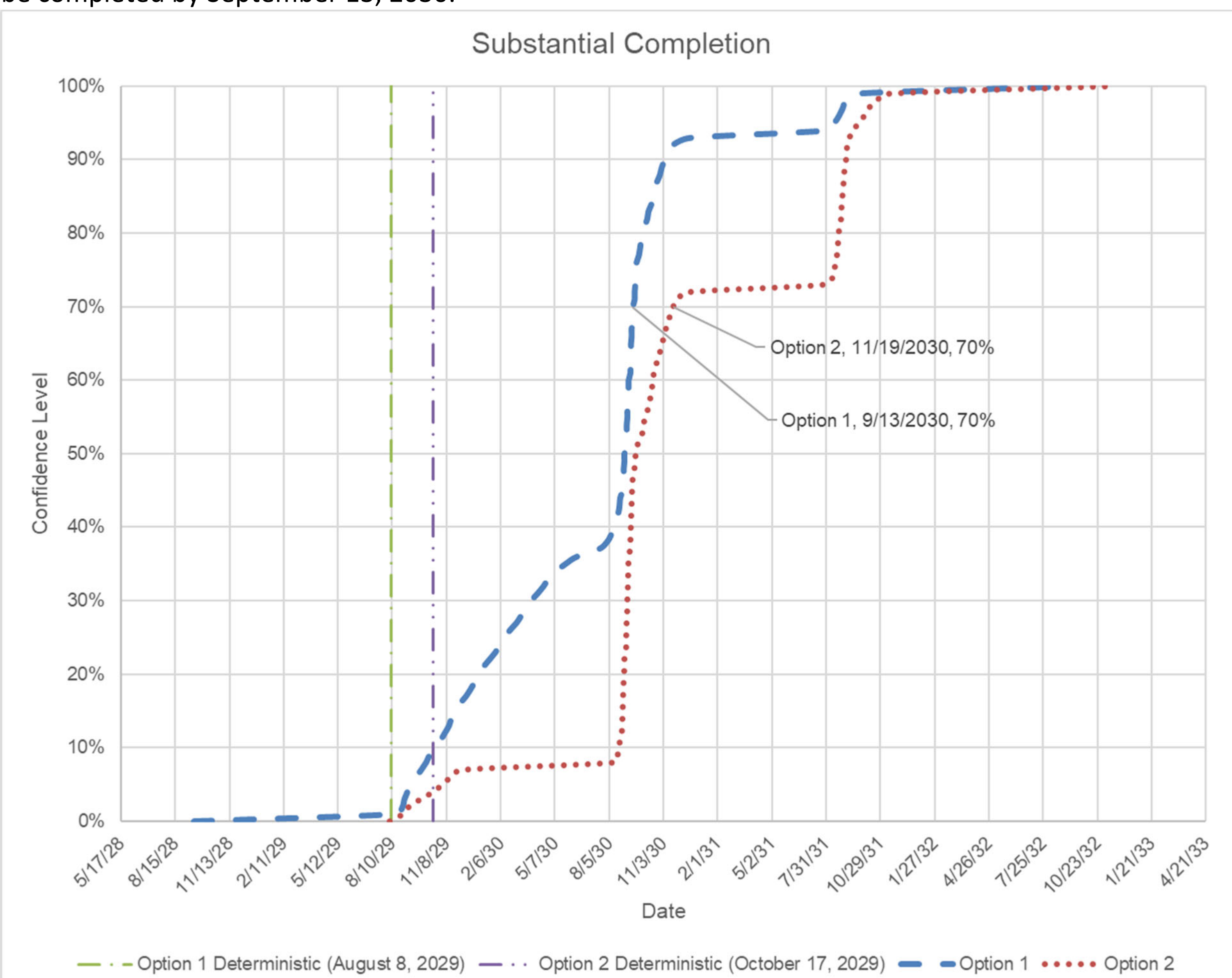

Figure 1. Schedule Risk Analysis for Substantial Completion

For Option 2, there is a P50 that the project will be completed by September 18, 2030, and P70 that the project will be completed by November 19, 2030.

Table 1 and Table 2 provide a summary of the schedule risk analysis showing results at specific confidence levels reflected from Figure 1. Both options show an approximate 13.5-month schedule contingency requirement at the P70 confidence level.

Substantial Completion	Finish Date	Delta to Deterministic	
Confidence Level	Date	Day	Month
Deterministic Date	8/8/2029		
0%	9/15/2028	-327	-10.9
10%	10/22/2029	75	2.5
20%	1/1/2030	146	4.9
30%	3/28/2030	232	7.7
40%	8/13/2030	370	12.3
50%	8/30/2030	387	12.9
60%	9/6/2030	394	13.1
70%	9/13/2030	401	13.4
80%	10/1/2030	419	14.0
90%	11/5/2030	454	15.1
100%	9/7/2032	1126	37.5

Table 1. Schedule Contingency Recommendation for Option 1

Substantial Completion	Finish Date	Delta to Deterministic	
Confidence Level	Date	Day	Month
Deterministic Date	10/17/2029		
0%	8/6/2029	-72	-2.4
10%	8/21/2030	308	10.3
20%	8/30/2030	317	10.6
30%	9/4/2030	322	10.7
40%	9/10/2030	328	10.9
50%	9/18/2030	336	11.2
60%	10/17/2030	365	12.2
70%	11/19/2030	398	13.3
80%	8/21/2031	673	22.4
90%	9/2/2031	685	22.8
100%	11/11/2032	1121	37.4

Table 2. Schedule Contingency Recommendation for Option 2

The reader is directed to Section 2 of this report where qualifications and exclusions are more specifically defined. Section 6.2 contains the detailed risk analysis of the schedule, which explains how the risks impact the CRA, as well as additional schedule analysis, including delays to construction Notice to Proceed (NTP).

1.2 Top Schedule Risks and Opportunities

The top schedule risks and uncertainties based on the sensitivity analysis at the P70 for Option 1 are as follows:

1. Opportunity 12 – CMGC Project Innovation
2. Risk 14a – Drilled Shaft Obstruction – River Span
3. Risk 88 – Wire-Saw Demolition Obstructions
4. Form, Reinforce, Pour (FRP) Bent 6 Footing Duration Uncertainty
5. Risk 53 – Movable Bridge – Buy America

The top schedule risks and uncertainties based on the sensitivity analysis at the P70 for Option 2 are as follows:

1. Opportunity 12 – CMGC Project Innovation
2. East Arch Superstructure Uncertainty

3. Risk 14a – Drilled Shaft Obstruction – River Span
4. FRP Bent 6 Footing Duration Uncertainty
5. Risk 88 – Wire-Saw Demolition Obstructions

Note that opportunity #47 (Reduced Foundations) is not included in this group, as this opportunity is treated as essentially part of the current scope and is thus considered a realized opportunity. Section 6.2 contains additional information on the sensitivity analysis.

1.3 Cost Risk Analysis Summary

The full project cost etimate is currently calculated to be $603 million for Option 1 and $581 million for Option 2. These estimates are in 2021 dollars, and include no cost contingency or escalation. The scope included in these estimates include construction, Right of Way (ROW), Preliminary Engineering (PE), and Construction Engineering (CE). This cost basis was determined using bottom-up estimates based on the current designs of both alternatives. Base costs were reasonably verified by an independent cost estimator.

Figure 2 and Table 3 show that without mitigation at P70, the cost basis including all risk, contingencies, and escalation for the project is projected at $917.73 million for Option 1 and $906.77 million for Option 2. The difference in the risk based cost bases between the two options is minimal with a difference of about $11 million.

The full cost risk analysis is included in Section 6.3 of this report.

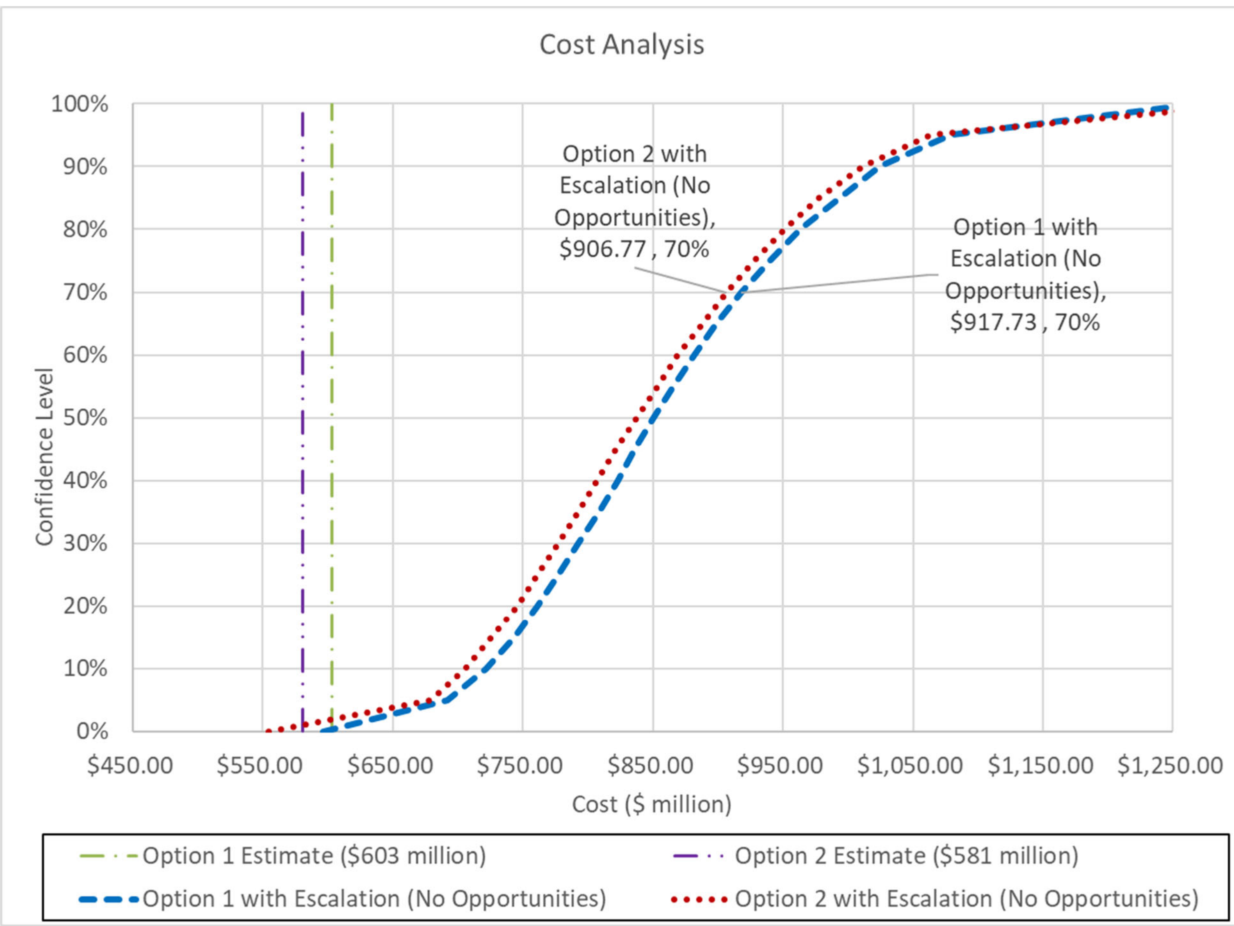

Figure 2. Cost Risk Analysis

1.4 Top Cost Risks and Opportunities

The top cost risks and uncertainties based on the sensitivity analysis for Option 1 are as follows:

1. Market Forces Uncertainty
2. Opportunity 47 – Reduce Foundation Through Seismic Design Refinement
3. Opportunity 12 – CMGC Project Innovation
4. Risk 14a – Drilled Shaft Obstruction – River Span
5. Risk 49 – Alternatives to Ground Improvement

The top cost risks and uncertainties based on the sensitivity analysis for Option 2 are as follows:

1. Market Forces Uncertainty
2. Risk 14a – Drilled Shaft Obstruction – River Span
3. Opportunity 47 – Reduce Foundation Through Seismic Design Refinement
4. Change Orders Uncertainty
5. Cost & Estimating Uncertainty

Note that opportunity #47 (Reduced Foundations) are not included in this group, as this opportunity is treated as essentially part of the current scope and is thus considered a realized opportunity. Section 6.2 contains additional information on the sensitivity analysis.

1.5 Recommended Cost Bases at P70

Since the deterministic estimate and schedule do not include contingencies or escalations, this section provides recommendations to the two options if the project were to cost basis at the P70 confidence level.

	Estimate	Percent	Source
Construction			
Construction	$422.08		Base Estimate
Construction Contingency	$94.72	22%	Risk based P70
Construction Total	$516.80		
Non-Construction			
ROW	$27.78		Base Estimate
PE	$90.00		Base Estimate
CE	$63.31		Base Estimate
Non-Construction Contingency	$31.26	17%	Risk based P70
Non-Construction Total	$212.36		
Escalation	$152.52		Risk based P70
Project Reserve	$36.05	4%	Risk based P70 (Opportunity Calculation)
Risk Based Cost Basis	$917.73		

Table 3. P70 Recommended Cost Basis of Option 1 in $ Million

Table 3 above shows that at P70, the project would require a $94.72 million construction contingency, $31.26 million non-construction contingency, $152.52 million for escalation, and $36.05 million for project reserve. This would result in a recommended total cost basis of $917.73 million.

	Estimate	Percent	Source
Construction			
Construction	$402.97		Base Estimate
Construction Contingency	$99.19	25%	Risk based P70
Construction Total	$502.16		
Non-Construction			
ROW	$27.78		Base Estimate
PE	$90.00		Base Estimate
CE	$60.45		Base Estimate
Non-Construction Contingency	$33.12	19%	Risk based P70
Non-Construction Total	$211.34		
Escalation	$155.48		Risk based P70
Project Reserve	$37.79	4%	Risk based P70 (Opportunity Calculation)
Risk Based Cost Basis	$906.77		

Table 4. P70 Recommended Cost Basis of Option 2 in $ Million

Table 4 above shows that at P70, the project would require a $99.19 million construction contingency, $33.12 million non-construction contingency, $155.48 million for escalation, and $37.79 million for project reserve. This would result in a recommended total cost basis of $906.77 million.

1.6 Conclusions

When comparing the cost and schedule risk analysis for the two design options, several conclusions can be made. For the schedule analysis, the delay is impacted due in part to both construction risks as well as pre-construction risks. For both options, the P70 substantial completion dates are very similar. However, starting at the 73% Confidence Level (P73), the results begin to diverge where Option 2 has an increase of more than eight months compared to Option 1. This is because Option 2 has inherently more exposure to in-water-work-windows (IWWW). So depending on when risks occur on certain activities, it could result in Option 2 encountering additional IWWWs, thereby causing time jumps of multiple seasons. Regarding the cost analysis, both options produce very similar results. Therefore, the conclusion from a risk analysis when comparing the two options is that they are very similar, however, there are more schedule exposure risks to Option 2.

It should be emphasized though that the recommended contingencies listed in Section 1.5 are based on the assumption that Opportunity 47 (Reduced foundation sizes of the bridge structure) will become actualized. For the purpose of the CRA, this opportunity is treated as nearly certain to occur. This opportunity is providing a very outsized benefit to both cost and schedule in the risk analysis. So if this opportunity is overestimated, then the contingency recommendations in Section 1.5 would need to be revised. In addition, as part of the risk workshop, the review of the deterministic estimate and schedule revealed that they were inherently conservative as part of the uncertainty ranging review. If the project team were to revise the estimate and schedule based on this feedback, then the contingnency recommendations for cost and schedule would need to increase to match the conclusions reached in this Executive Summary.

Section 6.2.3 also shows that there are significant concerns with delays to construction NTP. The challenge during the CRA process was that there is no detailed pre-construction Critical Path Method (CPM) schedule. The CRA model had to improvise with a high level summary CPM schedule developed during the CRA process. It is highly recommended that a detailed schedule be developed to better manage and predict the impact of pre-construction activities. This would include activities for the scope of ROW, NEPA, Record of Decision (ROD), funding, design, design procurement, CMGC procurement, early design package, long lead procurement, and contractor/subcontractor procurement.

The reader should also know that all analysis results in this report is in the pre-mitigation state. For determining cost bases, including the determination of appropriate schedule and cost contingencies, it is not recommened to use post-mitigation risk analysis results as the basis.

2 EXCLUSIONS AND ASSUMPTIONS

2.1 Exclusions and Qualifications

The CRA is based on credible ranges of potential schedule and cost deviations. The following exclusions were applied for the purposes of the risk analysis.

General Exclusions:

- The scope of the risk assessment did not include validation of the current project estimate, quantities, or pricing. VMS was not asked to provide benchmark data from similar projects or undertake any parametric comparison with other projects. VMS was not copied or provided any written information on quotations that may have been submitted by prospective suppliers or contractors as part of the sourcing data work packages that have yet to be procured.
- VMS was supplied with information from the project team, prior to the risk assessment as part of the pre-workshop activities and project familiarization. These included the EQRB contract package estimates for Option 1 and Option 2, EQRB consolidated risk register, project schedules, and plans for both alternatives. Study time permitted only an overview of this considerable documentation. VMS is grateful for the feedback and assistance from the project team during the preparation period as well as during the risk workshop in assessing the risk exposure of the project.
- The risk registers used for the risk workshop and analysis is based primarily on the project team's risk registers for EQRB that have been maintained throughout the EQRB project.
- The primary purpose of the risk workshop was to quantify risk exposure for cost and schedule in determining the project's cost cap. Therefore, VMS did not undertake significant time in the workshop to discuss risk mitigation. The CRA in this report reflects the pre-mitigated state.
- Impacts from liquidated damages for contractors are excluded from the CRA.
- The risk assessment does not deal with extreme events such as war, natural disaster, stock market crashes, multiple deaths or injuries from site accident(s), or other external, uncontrollable risk events. The exception being COVID-19 risks.

Specific Scope Exclusions:

- The cost risk analysis does not include re-design costs except those identified in the risk register. For example, if the project were to significantly change the design from the currently identified options, that additional re-design cost is excluded.
- The risk analysis only includes work up to the substantial completion of the project. Any post-completion scope of work, including remaining contractor closeout, is not part of the schedule risk assessment. The cost estimate includes costs for the contractor closeout period; however, delay costs during the post substantial completion phase(s) are not quantified in the CRA.
- Catastrophic failure risks of the design are excluded from the CRA since the cost to redesign and rebuild the project could be exorbitant.
- Long-term performance and operating cost risks to the project are excluded from the CRA.
- Alternate project delivery workarounds to expedite the schedule, such as additional early work packages, are excluded. The risk model only assumes the current schedule logic.
- Deviations to the current IWWW assumptions are excluded. Therefore, Risk #69 is excluded.

- Deviations to the current delivery assumptions are excluded. Risk #54 identifies the concern that the United States Army Corps of Engineers (USACE) or others would require more demolition of the existing bridge foundation than currently assumed. This risk would result in significant cost and schedule impacts during construction, as well as additional permitting time.
- Risk #90 identifies the risk that the bridge/roadway cross section design would change, such as adding a 5th lane. This is a deviation from the current assumption and is excluded.
- Risk #64 is included in the model to reflect the concern that it could take up to six more months to obtain project funding. However, significant funding delays beyond six months are excluded from the risk model.

2.2 Project Specific Assumptions

General Assumptions:

- The assumptions used for the risk assessment were generated during the risk workshop. The cost and schedule risk analysis includes a combination of uncertainty on estimate pricing and base schedule durations. Specific risk information was gathered by the project team and documented in the risk register. Many factors can influence the commencement and completion of the project, such as access restraints from other related projects. The 'ranges' applied to both cost and time durations on the base estimate and schedule, and the ranges applied to identified discrete risk events as recorded in the risk workshop, provide some allowance in the risk analyst's experience for historic unforeseen potential risk exposure.

Base Schedule and Cost Estimate Assumptions:

- The Owner's Rep team provided the base construction schedule and estimate at the beginning of the risk workshop to inform and stimulate discussion. This information was supplemented by a high level pre-construction schedule provided by the NEPA design team. The combined information forms the foundation of the based cost and schedule information for the CRA.
- The cost estimate only includes costs for construction, ROW, PE (Architecture and Engineering cost, CMGC pre-construction cost, Owner Rep Cost, Agency Cost, Intergovernmental Agreements (IGAs) for Oregon Department of Transportation (ODOT) and Portland Bureau of Transportation (PBOT) costs, misc cost), and CE (owner admin cost and design support cost during construction). Excluded costs include NEPA Phase project cost, since that cost is funded by a different source. Other costs not included include Operations and Maintenance (O&M) costs, financing costs, fees to agencies or third parties not currently identified.

Project Specific Assumptions:

- ROW – The base assumption is that it will take two years to complete ROW, starting from when the project reaches the 30% design milestone. ROW acquisition is required before construction NTP.
- IWWW – IWWW assumption is that work in the river is allowed annually from July to December for shaft and footing installation activities. For demolition and pile driving activities, the work time frame is from July to October.
- Shaft Design – The assumption of the estimated schedule and cost are based on thirteen pier shafts per river pier foundation.

3 PROJECT DETAILS

This section establishes the broad parameters and scope of the project for the purposes of the risk assessment. Figure 3 below shows the project location map.

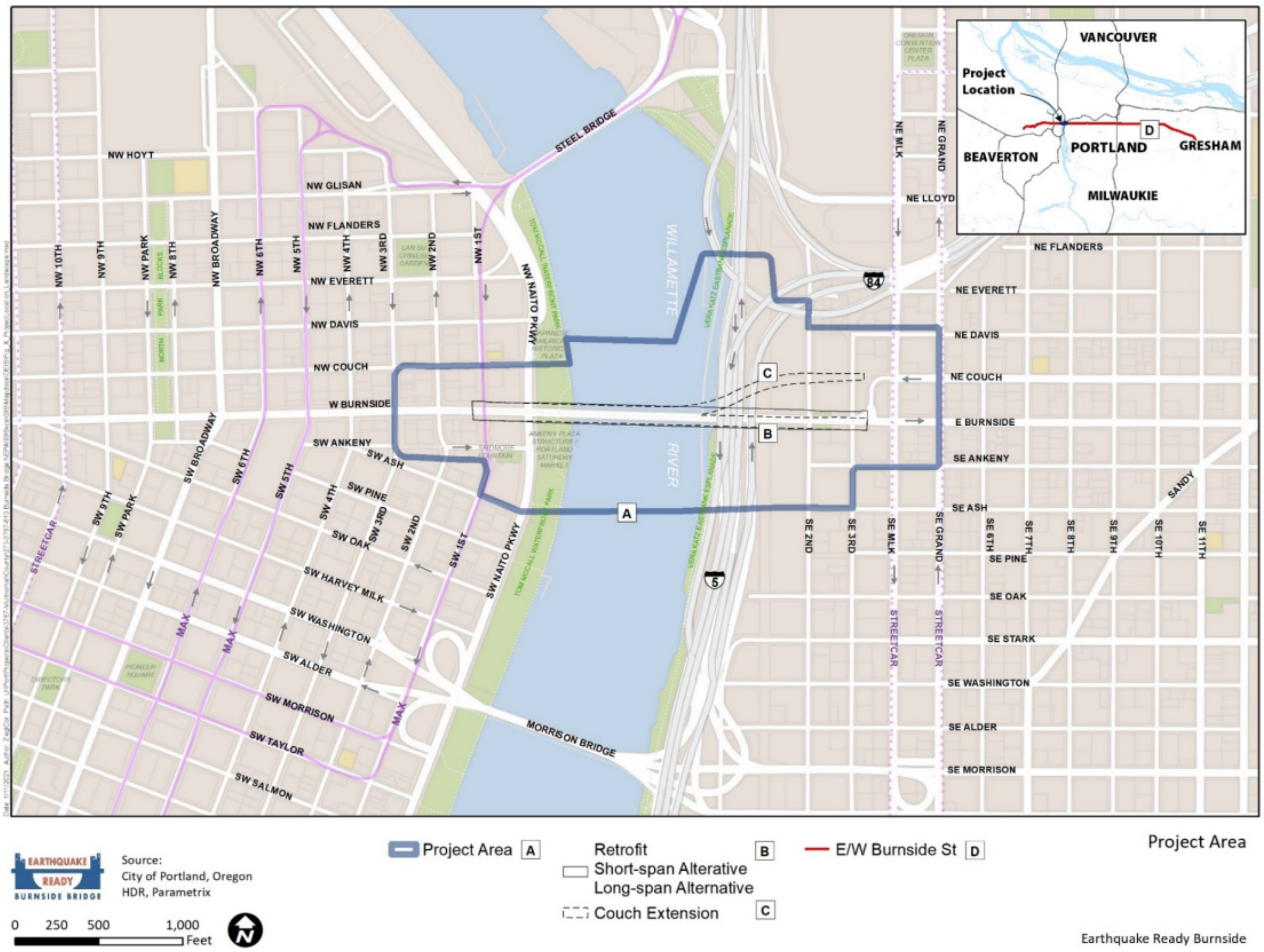

Figure 3. EQRB Project Location Map

The Burnside Bridge crosses the Willamette River, which is in the center of Portland, Oregon. The purpose of the EQRB project is to create a seismically resilient Burnside Street lifeline crossing the river. The north-south street address baseline is Burnside Street, while the Willamette River is the east-west address baseline. For the CRA, two alternative East side approaches for the bascule bridge, Option 1 and Option 2, were investigated in terms of both their unique and shared risks.

Option 1 (Cable Stay) – Total deterministic estimated cost is $603 million with a substantial completion date of August 8, 2029. Reference Figure 4 below for the conceptual plan of Option 1.

Option 2 (Tied Arch) – Total deterministic estimated cost is $581 million with a substantial completion date of October 17, 2029. Reference Figure 5 below for the conceptual plan of Option 2.

For both options, the west approach is assumed to be steel plate girders, with the main river span being a bascule with two in-water piers.

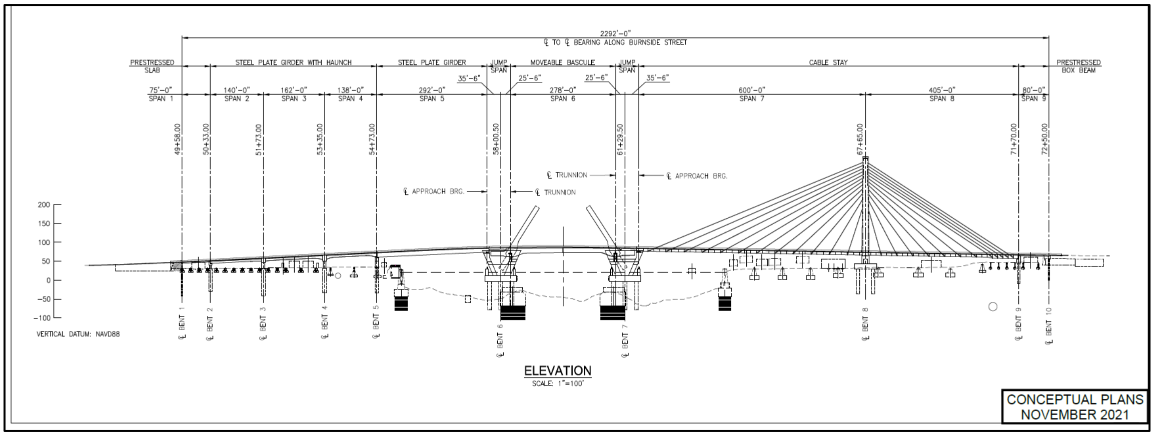

Figure 4. Option 1 Cable Stay Plan

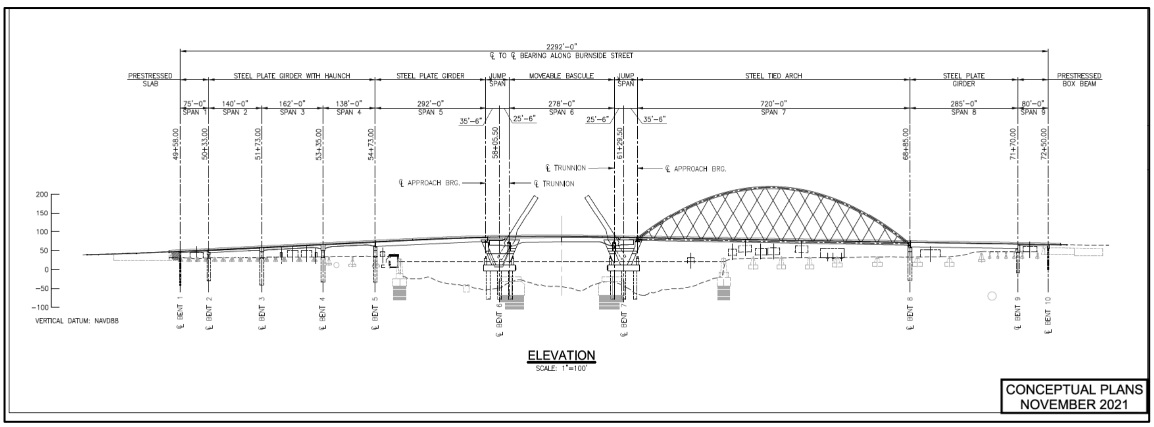

Figure 5. Option 2 Tied Arch Plan

3.1 Deterministic Estimate and Stripped and Adjusted Base Cost Estimate (SABCE)

The deterministic estimate is $603 million for Option 1 and for Option 2 is $581 million. These include all-inclusive project costs considering construction, ROW, PE, and CE. Both deterministic estimates will be referred to as the “baseline estimate” in their regard for the risk report. However, these estimates do not include for contingencies or escalation.

3.2 Deterministic Schedule

The deterministic schedule includes the following pre-construction dates based on the NEPA design team (HDR)’s schedule (*Appendix F*) as well as input from the Owner’s Representative:

- Issue Final Design RFP – March 15, 2022
- Procurement of Final Design – July 15, 2022
- Final Design NTP – July 18, 2022
- Final Design 30% - March 15, 2023

- Final Design 98% Bid – July 15, 2024
- Final Design 100% – November 15, 2024
- Guaranteed Maximum Price (GMP) Negotiation Period – February 28, 2025
- Construction Notice to Proceed – March 3, 2025

The pre-construction schedule is the same for both design options.

The construction schedule developed by Owner's Representative has a substantial completion date for Option 1 as August 8, 2029, and a substantial completion date for Option 2 is as October 17, 2029. These dates do not include schedule contingency.

4 RISK ASSESSMENT METHODOLOGY

The risk assessment workshop was structured to methodically discuss the project's risks and uncertainties to determine cost and schedule base estimates for the bottom-up risk analysis. Cost ranges were applied on the SABCE estimate, which removed patent and latent contingency from the construction base estimate. A deterministic schedule was developed, which included no schedule contingency. The CRA was performed using Monte Carlo analysis and applying probabilistic uncertainty and risk events on the baseline cost estimate and schedule. The risk analysis was undertaken by evaluating uncertainty within the deterministic estimate and then adding the potential cost and schedule impact identified in the risk assessment process. This section includes the inputs to the risk model for adjustments to cost schedule and uncertainty ranges. The risk events are documented in Section 5.

4.1 Cost Risk Model Inputs

4.1.1 SABCE

The first part of the cost review was to look at individual line items in the cost estimate and make revisions through a process called SABCE. This is done in two parts, the first being stripping of the estimate for patent or latent contingencies, and the second being adjustments to reflect any changes in scope from when the estimate was last updated.

For both options, no latent contingencies were identified in the workshop, but a deduction of $3,245,593 is included in both for salvage and reuse of the existing pedestrian access. This change references the reduced scope to the pedestrian connection line item as shown in Table 5 and Table 6. The adjustment was based from input by the project cost estimator. Table 5 and Table 6 below illustrates the change to the estimate from the base to the SABCE.

ITEM	BASE	SABCE		
Preparation		Stripping	Adjustment	Revised Cost
Mobilization	$ 2,067,757			$ 2,067,757
Temp Erosion & Sediment Control	$ -			$ -
Temp. Protection and Direction of Traffic	$ 11,898,873			$ 11,898,873
Removal of Existing Structure and Obstruction	$ 15,168,812			$ 15,168,812
Removal of Existing Buildings	$ 1,125,000			$ 1,125,000
Site Preparation	$ 2,196,900			$ 2,196,900
Civil/Roadwork				
Roadway Surface	$ 1,038,600			$ 1,038,600
Traffic Signals	$ 1,080,000			$ 1,080,000
Illumination	$ 833,400			$ 833,400
Earthwork	$ 2,169,965			$ 2,169,965
Storm Water & Drainage	$ 288,700			$ 288,700
Erosion Control & Planting	$ 2,865,913			$ 2,865,913
Pedestrian Connection	$ 5,245,593		$ (3,245,593)	$ 2,000,000
Drilling Subcontractor Support	$ -			$ -
Utilities	$ 1,260,000			$ 1,260,000
Bridge Structure				
West Approach Conventional	$ 14,942,788			$ 14,942,788
West Approach Long	$ 9,668,138			$ 9,668,138
Main River Movable Span	$ 110,170,247			$ 110,170,247
East Approach Long	$ 54,638,797			$ 54,638,797
East Approach Conventional	$ 7,736,542			$ 7,736,542
Pier Protection - Debris Nose	$ -			$ -
Harbor Wall Reconstruction	$ -			$ -
Existing Pier Rip-Rap Removal	$ 5,771,837			$ 5,771,837
Temporary Construction				
~~Temporary Diversion Bridge~~	$ -			$ -
~~Staged Construction Premium~~	$ -			$ -
Temporary Marine Works (work bridges, cofferdams, etc.)	$ 18,230,626			$ 18,230,626
Geotechnical Hazard Mitigation				
East Approach Ground Improvment	$ 23,248,602			$ 23,248,602
West Approach Ground Improvment	$ -			$ -
Other Related Items				
Aesthetics Premium	$ 5,000,000			$ 5,000,000
Willamette River Mitigation (floodway, habitat)	$ 412,500			$ 412,500
Contractor Access Premium (barges, RR, parks, off-site staging)	$ 3,000,000			$ 3,000,000
Facility Impacts (classroom, Esplanade, Sat. Mkt, skatepark, Japa	$ 2,000,000			$ 2,000,000
Sewer pipe relocation (west bank)	$ -			$ -
TriMet (temporary catenary, bus bridge)	$ -			$ -
UPRR Protection and Flagging	$ 1,840,320			$ 1,840,320
Market Conditions	$ -			$ -
Contractor Work Zone Security	$ 3,000,000			$ 3,000,000
Tug Assists	$ -			$ -
River Patrol	$ -			$ -
General Conditions	$ 115,179,772			$ 115,179,772
Construction Total without Contingency	$ 422,079,683	$ -	$ (3,245,593)	$ 418,834,090
Contingency	$ -			$ -
Construction Total with Contingency	$ 422,079,683			$ 418,834,090
Right of Way	$ 27,781,000			$ 27,781,000
Engineering & Project Delivery				
NEPA Phase				
PE (Incl. Design, PI, ROW Acquisition)	$ 90,000,000			$ 90,000,000
CM/GC Precon				
IGAs (ODOT, PBOT)				
Construction Engineering **15%**	$ 63,311,952			$ 62,825,114
Total Project Cost before Inflation (2021 $)	$ 603,172,636	$ -	$ -	$ 599,440,204

Table 5. SABCE Estimate for Option 1

ITEM		BASE	SABCE		
			Stripping	Adjustment	Revised Cost
Preparation					
Mobilization		$ 2,067,757			$ 2,067,757
Temp Erosion & Sediment Control		$ -			$ -
Temp. Protection and Direction of Traffic		$ 11,898,873			$ 11,898,873
Removal of Existing Structure and Obstruction		$ 15,168,812			$ 15,168,812
Removal of Existing Buildings		$ 1,125,000			$ 1,125,000
Site Preparation		$ 2,196,900			$ 2,196,900
Civil/Roadwork					
Roadway Surface		$ 1,038,600			$ 1,038,600
Traffic Signals		$ 1,080,000			$ 1,080,000
Illumination		$ 833,400			$ 833,400
Earthwork		$ 2,169,965			$ 2,169,965
Storm Water & Drainage		$ 288,700			$ 288,700
Erosion Control & Planting		$ 2,865,913			$ 2,865,913
Pedestrian Connection		$ 5,245,593		$ (3,245,593)	$ 2,000,000
Drilling Subcontractor Support		$ -			$ -
Utilities		$ 1,260,000			$ 1,260,000
Bridge Structure					
West Approach Conventional		$ 14,840,683			$ 14,840,683
West Approach Long		$ 9,747,575			$ 9,747,575
Main River Movable Span		$ 109,681,578			$ 109,681,578
East Approach Long		$ 50,667,717			$ 50,667,717
East Approach Conventional		$ 16,327,012			$ 16,327,012
Pier Protection - Debris Nose		$ -			$ -
Harbor Wall Reconstruction		$ -			$ -
Existing Pier Rip-Rap Removal		$ 5,771,837			$ 5,771,837
Temporary Construction					
~~Temporary Diversion Bridge~~		$ -			$ -
~~Staged Construction Premium~~		$ -			$ -
Temporary Marine Works (work bridges, cofferdams, etc.)		$ 18,258,819			$ 18,258,819
Geotechnical Hazard Mitigation					
East Approach Ground Improvment		$ -			$ -
West Approach Ground Improvment		$ -			$ -
Other Related Items					
Aesthetics Premium		$ 5,000,000			$ 5,000,000
Willamette River Mitigation (floodway, habitat)		$ 412,500			$ 412,500
Contractor Access Premium (barges, RR, parks, off-site staging)		$ 3,000,000			$ 3,000,000
Facility Impacts (classroom, Esplanade, Sat. Mkt, skatepark)		$ 2,000,000			$ 2,000,000
Sewer pipe relocation (west bank)		$ -			$ -
TriMet (temporary catenary, bus bridge)		$ -			$ -
UPRR Protection and Flagging		$ 1,840,320			$ 1,840,320
Market Conditions		$ -			$ -
Contractor Work Zone Security		$ 3,000,000			$ 3,000,000
Tug Assists		$ -			$ -
River Patrol		$ -			$ -
General Conditions		$ 115,179,772			$ 115,179,772
Construction Total without Contingency		$ 402,967,327	$ -	$ (3,245,593)	$ 399,721,734
Contingency	**0%**	$ -			$ -
Construction Total with Contingency		$ 402,967,327			$ 399,721,734
Right of Way		$ 27,781,000			$ 27,781,000
Engineering & Project Delivery					
NEPA Phase					
PE (Incl. Design, PI, ROW Acquisition)		$ 90,000,000			$ 90,000,000
CM/GC Precon					
IGAs (ODOT, PBOT)					
Construction Engineering	**15%**	$ 60,445,099			$ 59,958,260
Total Project Cost before Inflation (2021 $)		$ 581,193,426	$ -	$ -	$ 577,460,995

Table 6. SABCE Estimate for Option 2

4.1.2 Design and Estimating Uncertainty

After the SABCE process, the cost uncertainty ranges were discussed for design and estimating uncertainty for the cost line items. The categories were ranged using a three-point estimate and were applied to the SABCE for the cost model. The ranges do not include market conditions, change orders, risks, or escalation. Table 7 and Table 8 below show the low, most likely, and high ranges agreed during the different options. The uncertainty is to reflect general changes to the cost estimate up to 100% design from both a design uncertainty and inherent estimating uncertainty perspective.

The percentages in the tables reflect the direct multiplying percentage to the SABCE value for that line item. This means that 100% would have no impact to the SABCE value, while a 110% would increase the SABCE value by 10%. The ranges for the most part reflects how conservative each line item is in relation to the current understanding of the scope. For the PE line item range, the low reflects the NEPA team's estimate, while the high reflects the Owner's Rep's estimate.

Estimate and Design Uncertainty	Low	Most Likely	High
Mobilization	95%	100%	110%
Temp. Protection and Direction of Traffic	80%	100%	105%
Removal of Existing Structure and Obstruction	95%	100%	110%
Removal of Existing Buildings	100%	110%	120%
Site Preparation	75%	100%	110%
Roadway Surface	90%	100%	110%
Traffic Signals	90%	100%	110%
Illumination	90%	100%	110%
Earthwork	90%	100%	110%
Storm Water & Drainage	90%	100%	150%
Erosion Control & Planting	90%	100%	110%
Pedestrian Connection	70%	100%	115%
Utilities	90%	100%	130%
West Approach Conventional	80%	90%	105%
West Approach Long	80%	90%	105%
Main River Movable Span	90%	100%	115%
East Approach Long	75%	95%	110%
East Approach Conventional	80%	90%	105%
Existing Pier Rip-Rap Removal	80%	100%	120%
Temporary Marine Works (work bridges, cofferdams, etc.)	90%	100%	110%
East Approach Ground Improvment	90%	100%	105%
Aesthetics Premium	100%	100%	100%
Willamette River Mitigation (floodway, habitat)	85%	100%	115%
Contractor Access Premium (barges, RR, parks, off-site staging)	80%	100%	120%
Facility Impacts	80%	100%	150%
UPRR Protection and Flagging	90%	100%	110%
Contractor Work Zone Security	80%	100%	120%
General Conditions	95%	100%	120%
Right of Way	75%	88%	100%
PE (Incl. Design, PI, ROW Acquisition)	94%	100%	129%
Construction Engineering	15%	16%	17%

Table 7. Design and Estimating Uncertainty Ranges of Option 1

Estimate and Design Uncertainty	Low	Most Likely	High
Mobilization	95%	100%	110%
Temp. Protection and Direction of Traffic	90%	100%	115%
Removal of Existing Structure and Obstruction	95%	100%	110%
Removal of Existing Buildings	100%	110%	120%
Site Preparation	75%	100%	110%
Roadway Surface	90%	100%	110%
Traffic Signals	90%	100%	110%
Illumination	90%	100%	110%
Earthwork	90%	100%	110%
Storm Water & Drainage	90%	100%	150%
Erosion Control & Planting	90%	100%	110%
Pedestrian Connection	70%	100%	115%
Utilities	90%	100%	130%
West Approach Conventional	80%	90%	105%
West Approach Long	80%	90%	105%
Main River Movable Span	90%	100%	115%
East Approach Long	80%	90%	105%
East Approach Conventional	80%	90%	105%
Existing Pier Rip-Rap Removal	80%	100%	120%
Temporary Marine Works (work bridges, cofferdams, etc.)	90%	100%	110%
Aesthetics Premium	100%	100%	100%
Willamette River Mitigation (floodway, habitat)	85%	100%	115%
Contractor Access Premium (barges, RR, parks, off-site staging)	80%	100%	120%
Facility Impacts	80%	100%	150%
UPRR Protection and Flagging	90%	100%	110%
Contractor Work Zone Security	80%	100%	120%
General Conditions	95%	100%	120%
Right of Way	75%	88%	100%
PE (Incl. Design, PI, ROW Acquisition)	94%	100%	129%
Construction Engineering	15%	16%	17%

Table 8. Design and Estimating Uncertainty Ranges of Option 2

4.1.3 Market Forces Uncertainty

The ranges factor the number of bidders, specialty subcontractor premiums, and other competing projects. Table 9 shows the very high range of market forces uncertainty to be 120% because of a likely constrained market such as the Rose Quarter that will be a competing project at the concurrent time. The low range of 95% would result from the likelihood of six competitive bidders. The market forces uncertainty range is applied to the construction cost line items from the estimate to provide an uncertainty at time of bid and procurement, and it does not include escalation.

Market Forces Uncertainty	Very Low	Most Likely	Very High
OPTION 1	95%	100%	120%
OPTION 2	95%	100%	120%

Table 9. Market Forces Uncertainty Ranges

4.1.4 Escalation Rate Uncertainty

The deterministic base estimate was developed in 2021, and includes no escalation. Specifically, the date of the estimate was set at September 1, 2021. For the risk model, a dynamic escalation rate is used which would change in each iteration of the Monte Carlo simulation. The escalation rate used for the risk model is based on a range of possible annual escalation rates, to which a compounding formula is applied.

$$Construction\ Escalation = ((1 + Construction\ Escalation\ Rate)^{Duration\ to\ Midpoint} - 1)$$

For the construction escalation uncertainty, the calculation of the escalation rate percentage is multifold. For each iteration of the Monte Carlo simulation, the model first picks an annual escalation rate from the uncertainty range. Then it compounds the annual escalation rate from September 1, 2021 (the date of the estimate) to the midpoint of construction, where the midpoint is based on the integrated cost and schedule model. The final compounded construction escalation rate is then applied to the construction cost line items as well as the CE cost. Table 10 includes the agreed upon ranges for construction escalation rate uncertainty:

Escalation Rate Uncertainty	Low	Most Likely	High
OPTION 1	2%	3%	6%
OPTION 2	2%	3%	6%

Table 10. Construction Escalation Rate Uncertainty Ranges

Note that the construction escalation range included in this section excludes market conditions, as that factor is already addressed in Section 4.1.3. Therefore, this escalation rate largely reflects general construction material and labor inflation.

For the ROW uncertainty, the calculation method is similar to the construction escalation methodology above. However, instead of compounding to the midpoint of construction, it compounds the escalation rate from September 1, 2021 to one year prior to the completion of ROW acquisitions. This assumes that the value of the ROW acquisitions will be mostly concluded at that time. The ROW acquisition date is also based on the integrated cost and schedule model. No escalation factors were appled to the PE cost. Table 11 includes the agreed upon ranges for ROW escalation rate uncertainty.

$$ROW\ Escalation = ((1 + ROW\ Escalation\ Rate)^{Duration\ to\ One\ Year\ Prior\ to\ ROW\ Completion} - 1)$$

Escalation Rate Uncertainty	Low	Most Likely	High
OPTION 1	3%	4%	5%
OPTION 2	3%	4%	5%

Table 11. ROW Escalation Rate Uncertainty Ranges

4.1.5 Change Order and Claim Ranging

The change order and claims ranging was discussed for EQRB based on recent MC projects and other similar projects. This ranging excludes delay claims since delay claims are calculated using the schedule delay factor (SDF) (discussed Section 4.1.6). The change order and claim uncertainty ranges from 102% to 108% with 104% being the most likely. With this project being CMGC, it is expected that there will be lower ranges overall for change order uncertainties. The intent of this factor is to account for general and miscellaneous change orders and claims that are not specifically identified in the risk register. Table 12 shows the agreed-upon change order ranges:

Change Order Uncertainty	Very Low	Most Likely	Very High
OPTION 1	102%	104%	108%
OPTION 2	102%	104%	108%

Table 12. Change Order Uncertainty Ranges

4.1.6 Schedule Delay Factor

A SDF was used to calculate the potential for contractor delay claims and project team staffing costs. The integrated cost and schedule model calculates that each day of project schedule delay will result in a potential additional time-based cost for the cost estimate. For this model, the contractor's indirect costs (general conditions) divided by the deterministic construction duration of 54.5 months was used for calculating the cost per day of delay for construction. The CE cost per day is based on the CE estimate divided by the deterministic construction duration of 54.5 months. These separate costs are then consolidated into a delay cost prior to NTP and a delay cost during construction.

Delay Uncertainty	Low	Most Likely	High
Blended Contractor Cost per Day	$47,736.00	$ 68,194.00	$102,291.00
Construction Engineering	$26,239.00	$ 37,485.00	$ 56,227.00
Total	$73,975.00	$105,679.00	$158,518.00

Table 13. Schedule Delay Factor Total Cost Per Day

4.2 Schedule Risk Model Inputs

4.2.1 Schedule Uncertainty Ranges

Having established a deterministic schedule before risk, variability was placed around activity base durations. The variability on the durations is based on the workshop discussions on the critical path activities. The workshop participants provided feedback on a three-point estimate on the activities with a low, most likely, and high duration. The variability is based on potential issues with productivity, logistics, and other risks that are exclusive of discrete risks in the risk register. The three-point estimates on the durations were then incorporated in the schedule risk model. Table 14 and Table 15 below depict the specific schedule uncertainty ranges regarding the different options.

Schedule Uncertainty Ranges	Min	Most Likely	Max
Final Design Duration Uncertainty	-60 days	0 days	40 days
GMP Negotiation Duration Uncertainty	-60 days	0 days	20 days
Early Submittal Duration Uncertainty	-10 days	-5 days	0 days
Procure Work Bridge Piling Duration Uncertainty	90%	95%	100%
Procure Structural Steel Duration Uncertainty	-200 days	-160 days	-120 days
West Approach Substructure Duration Uncertainty	67%	83%	100%
River Span Demolition Duration Uncertainty	95%	100%	105%
Bent 6 Shaft Duration Uncertainty	67%	83%	100%
Bent 7 Shaft Duration Uncertainty	67%	83%	100%
FRP Bent 6 Footing Duration Uncertainty	20 days	30 days	40 days
FRP Bent 6 Pier Walls Duration Uncertainty	0 days	20 days	40 days
West Approach Superstructure Duration Uncertainty	60%	80%	100%
River Span Superstructure Duration Uncertainty	95%	100%	105%
East Approach Demolition Duration Uncertainty	100%	150%	200%

Table 14. Schedule Uncertainty Ranges for Option 1

Schedule Uncertainty Ranges	Min	Most Likely	Max
Final Design Duration Uncertainty	-40 days	0 days	40 days
GMP Negotiation Duration Uncertainty	-60 days	0 days	20 days
Early Submittal Duration Uncertainty	-10 days	-5 days	0 days
Procure Work Bridge Piling Duration Uncertainty	90%	95%	100%
Procure Structural Steel Duration Uncertainty	-200 days	-160 days	-120 days
West Approach Substructure Duration Uncertainty	67%	83%	100%
River Span Demolition Duration Uncertainty	95%	100%	105%
Bent 6 Shaft Duration Uncertainty	67%	83%	100%
Bent 7 Shaft Duration Uncertainty	67%	83%	100%
FRP Bent 6 Footing Duration Uncertainty	20 days	30 days	40 days
FRP Bent 6 Pier Walls Duration Uncertainty	0 days	20 days	40 days
West Approach Superstructure Duration Uncertainty	60%	80%	100%
River Span Superstructure Duration Uncertainty	95%	100%	105%
East Approach Demolition Duration Uncertainty	100%	150%	200%
East Arch Superstructure Uncertainty	80%	90%	100%

Table 15. Schedule Uncertainty Ranges for Option 2

The tables include ranges both with absolute numbers (impact days based on the activity's assigned calendar) and percentages. The percentages in the tables reflect the direct multiplying percentage to the SABCE value for those activities. This means that 100% would have no impact to the activity duration, while a 110% would increase the activity duration value by 10%. The ranges for the most part reflects how conservative each line item is in relation to the current understanding of the scope. Not all activity durations were ranged if the workshop participants felt that ranging was unnecessary.

4.3 Integrated Cost and Schedule Model

In a purely academic environment, the integration of cost and schedule requires that schedule activities be cost-loaded such that as the schedule moves under a Monte Carlo simulation, the variable costs also move and are reflected in the combined cost and schedule analysis results.

Once a contract is awarded (and even at the estimate stage) schedule reduction does not correlate to cost reduction in running costs unless the contract is one of cost reimbursement where only actual costs incurred are paid for plus normally an allowance for supervisory overheads, home office overheads and profit. In addition, if a project is delayed through risks and / or other events there is most often a 'disruption element' not included in the pure extension of estimated running costs.

To correctly cost load a schedule activity, it requires an estimate that is accurately resource-based with fixed and variable costs clearly split. This becomes increasingly difficult where works are sub-contracted and breakdown of costs is at best summarized, and are also highly influenced by individual contractor's and sub-contractors' means and methods. Cost allocation becomes inaccurate and cost loading and linkage to schedule variability becomes increasingly inaccurate.

Risks tend to influence the schedule and estimate both independently and collectively. The risk model will reflect the characterization of risk as a whole, modeling where more than one risk happens at the same time and trying to anticipate and avoid duplication and overlap. This is more prevalent in schedule risk analysis than cost risk analysis since the occurrence of a high impact risk, even if of low probability, can immediately cause other risks (should they be happening at the same time) to be cancelled out altogether. With the restrictive nature of any schedule model; where to tie risks into the schedule then becomes less than accurate from a detailed level due to the modelers constraints in creating an overall result that is reflective of the risks identified the omission of one or more risks. This may therefore result in the need to reassess how the model is constructed to then correctly reflect the revised exposure and risk profile.

Taking the above limitations and constraints and notwithstanding the time it would take to build what mathematically may be viewed as an 'exact' model if indeed the detailed cost information was available; the analysis in this project contained in Section 6.2 (schedule) and Section 6.3 (cost) approaches the integration of cost and schedule in a manner than is reflective of the level of information available and level of effort commensurate with the accuracy of input data. The estimate/schedule for this project is not resource based, and ultimately depends on the contractor's means and methods. The cost input information available therefore is not suitable to accurately load to schedule tasks in a manner that could be taken as providing a truly integrated cost analysis mirroring schedule uncertainty.

The approach to integrating cost and schedule, therefore, entails a three-stage modeling effort:

- Stage 1: Variability is allocated to base schedule durations and risks taken from the risk register are assigned to one or more schedule activities to create a schedule risk model. The model is run through sufficient iterations to provide a simulation result generating detailed sensitivity analysis. The cost model also contains uncertainty on estimating line items, allowances for uncertainty in market forces, design change orders, construction and change orders. This is accomplished using the Safran Risk software:
    - For schedule delay and prolongation, the impact being on running costs both at the hard cost (contractor) working level and the soft cost (owner management, design, etc.) level is used seamlessly linking the results from the schedule model to the cost model. The calculation (called the 'schedule delay factor' or SDF) further addresses prolongation and the non-productive element of disruptive influence on construction activities over and above the more easily measured direct costs of standing time and physical lost shifts.
- Stage 2: Due to software limitations with Safran Risk, the escalation calculation is calculated using Palisades @Risk software:

- The cost and schedule output from Safran Risk is exported to @Risk. This is combined with a range of the possible escalation rate per annum, which is then applied to the mid-point of construction based on the probable schedule range from the schedule analysis. This combination calculates the escalation cost that is then combined to the overall CRA results.

5 RISK IDENTIFICATION AND ASSESSMENT

5.1 Process Overview

VMS was provided project information prior to the risk assessment as part of the pre-workshop activities and project familiarization. This information included the EQRB Pre-Construction Schedule and for both alternatives: EQRB Base Cost Detailed, EQRB Base Cost Summary, schedule, and plans. This documentation allowed VMS to commence the preparation of the risk workshop and the risk model. A full list of materials received is included in the *Appendices* to this report.

The risk identification was conducted by VMS during the preparation period leading up to the risk workshop. Prior to the workshop, VMS distributed a Top 5 Risk Questionnaire to project stakeholders. The risks generated by the questionnaire were compiled and added to the previous list of risks tracked by the NEPA team, which was last updated on February 15, 2021. This consolidated risk register was then used as the initial basis of the risk discussion during the risk workshop.

The virtual risk workshop was held on January 10-14, 2022, via Zoom videoconferencing. During the risk workshop, each risk was discussed and assigned a risk score for probability, cost impact, and time impact. Each risk was scored separately for Option 1 and Option 2. Throughout the workshop and upon further revisions to the schedule, additional risks were identified and added to the risk register. There were a total of 101 risks that were identified and confirmed with the project team. The list of workshop attendees is included in *Appendix B.* Identified subject matter experts attended sessions specific to their areas of expertise.

Initial results and sensitivities analysis as a draft report output were delivered to MC via videoconference on January 21, 2022. After further discussion and analysis from the initial outbrief, a final outbrief was held January 28, 2022. In all the outbrief sessions, VMS included the full cost and schedule CRA outputs, and a list of the top cost and schedule risks from sensitivity analysis.

5.2 Scoring of Risks

Risks have been scored as to potential likelihood of happening (probability), estimated most likely schedule impact and estimated most likely cost impact in accordance with the matrix below in Table 16. The matrix was confirmed at the start of workshop with workshop participants. The scale is based on values 1-5 where 1 is equal to a low impact and progresses to moderate, high, very high and extremely high impacts.

Score	1	2	3	4	5
Probability	< 10%	<> 10% -50%	<> 50% -75%	<> 75% -90%	> 90%
Cost	< $5m	< > $5m-$10m	< > $10m-$15m	< > $15m-$25m	> $ 25m
Schedule	< 1 month	< > 1 - 3 months	< > 3 - 6 months	< > 6-12 months	> 12 months

Table 16. Risk Scoring Matrix

Once a risk has been scored for probability, cost impact, and schedule impact, its overall risk score is then calculated using the following formula:

$$Risk\ Score = \frac{(Time\ Impact\ Rating + Cost\ Impact\ Rating)}{2} \times Probability\ Score$$

The overall risk score is then used to score it as a high (red), medium (yellow), or low (green) risk.

Rating	< 3 (Low)	3 > < 9.5 (Medium)	> 9.5 (High)

Table 17. Risk Classification Chart

Note that the overall risk score is purely for qualitative scoring of the risks to help sort the risks in the risk register. It is not used in the risk modelling process.

5.3 Top Qualitative Risks

The top-rated qualitative risks that were identified on the EQRB risk register are outlined below. The full risk register is included in *Appendix A* of this report.

Note that some of the risks in the risk register are duplicate impacts to the schedule and cost uncertaintities listed in Section 4.1.2 and 4.2.1. Care was taken as to not double count the impacts in the risk modelling. The reason why duplicated risks were not deleted in the risk register is to provide a complete picture of the list of risks and uncertainties from a project management perspective for ongoing risk tracking and management.

Risk ID	Risk Score	Description	Probability	Schedule Rating	Cost Rating
13	13	A number of the risks fall into this category however there are still a number of unquantified issues that could result in additional change orders.	5	0	5
11	10	There is a risk associated with the complexity of this project, design tolerances, field design change requests, change orders, access, work over live roadways, railroads, in water work ect., that may cause a premium to bid prices. The estimate buildup considers many of these complexities. There may be mitigation measures associated with design tolerances and other methods that may increase constructability. This is currently a non-quantified watch list item.	4	0	5
20	10	Right now there should be at least three contractors interested in CMGC, but there are a number of specialty subs and suppliers that could create a premium. Increased cost will attract workforce in general, meet DBE availability, and workforce/apprentice goals. Other potential risks include DMWESB, SDV availability, equipment availability, general labor availability, material availability, increased material costs, inflation, labor strikes, and other general market conditions risks. Assume up to 15% higher costs at the high end, 10% most likely, 5% on the low.	4	0	5
65	10	Impacts include higher material prices and potential schedule implications.	4	0	5
64	9	Scenario where it takes up to 6 more months to obtain funding. Design would still progress, would still impact NTP. Excludes the risk that lack of funding will "kill the project."	3	3	3
73	9	Due to ongoing pandemic and lack of urgency for earthquake threat, there is a risk of public pushback against local vehicle registration fee; weak support for project funding requests.	2	4	5
24	8	At this level of design and estimating, not all items have been completely identified. There is potential of design scope creep as the project progresses, and life cycle and maintenance considerations for different materials and methods that may change specific elements, thereby increasing costs. There may also be an opportunity throughout design and changes that may occur to refine the approach that may result in a cost and schedule savings.	4	0	4
14	8	There is a risk associated with drilled shaft obstructions/differing site conditions especially where there are overlaps with existing piers that may be encountered resulting in added costs and/or delays. Drilling could possibly encounter portions of previous cofferdams and add additional drilling time and associated costs to clear the obstructions. There are approximately 50 drilled shafts throughout the project. Assume a potential $5M to $10M to pay for claims or change orders associated with shaft obstructions and differing site conditions associated with deep foundation/shaft installation.	5	2	1

Table 18. Top Qualitative Risks in EQRB Risk Register for Option 1

Risk ID	Risk Score	Description	Probability	Schedule Rating	Cost Rating
13	13	A number of the risks fall into this category however there are still a number of unquantified issues that could result in additional change orders.	5	0	5
11	10	There is a risk associated with the complexity of this project, design tolerances, field design change requests, change orders, access, work over live roadways, railroads, in water work ect., that may cause a premium to bid prices. The estimate buildup considers many of these complexities. There may be mitigation measures associated with design tolerances and other methods that may increase constructability. This is currently a non-quantified watch list item.	4	0	5
20	10	Right now there should be at least three contractors interested in CMGC, but there are a number of specialty subs and suppliers that could create a premium. Increased cost will attract workforce in general, meet DBE availability, and workforce/apprentice goals. Other potential risks include DMWESB, SDV availability, equipment availability, general labor availability, material availability, increased material costs, inflation, labor strikes, and other general market conditions risks. Assume up to 15% higher costs at the high end, 10% most likely, 5% on the low.	4	0	5
65	10	Impacts include higher material prices and potential schedule implications.	4	0	5
64	9	Scenario where it takes up to 6 more months to obtain funding. Design would still progress, would still impact NTP. Excludes the risk that lack of funding will "kill the project."	3	3	3
73	9	Due to ongoing pandemic and lack of urgency for earthquake threat, there is a risk of public pushback against local vehicle registration fee; weak support for project funding requests.	2	4	5
24	8	At this level of design and estimating, not all items have been completely identified. There is potential of design scope creep as the project progresses, and life cycle and maintenance considerations for different materials and methods that may change specific elements, thereby increasing costs. There may also be an opportunity throughout design and changes that may occur to refine the approach that may result in a cost and schedule savings.	4	0	4
14	8	There is a risk associated with drilled shaft obstructions/differing site conditions especially where there are overlaps with existing piers that may be encountered resulting in added costs and/or delays. Drilling could possibly encounter portions of previous cofferdams and add additional drilling time and associated costs to clear the obstructions. There are approximately 50 drilled shafts throughout the project. Assume a potential $5M to $10M to pay for claims or change orders associated with shaft obstructions and differing site conditions associated with deep foundation/shaft installation.	5	2	1

Table 19. Top Qualitative Risks in EQRB Risk Register for Option 2

5.4 Risk Register Breakdown

Based on the risk scoring during the workshop, the overall breakdown of the risks by severity is shown below. In total, 101 risks for both options with the difference that Option 2 offers one additional opportunity, has one more medium risk, and two less low risks items than Option 1.

Option 1 Cable Stay					
Cost Categories	Low Risk	Medium Risk	High Risk	Opportunity	Total
Construction	16	4	0	1	21
Construction - Market	2	1	2	1	6
Contracting and Procurement	3	2	2	1	8
Design / Civil	5	2	0	0	7
Environmental & Hydraulics	23	1	0	2	26
Funding	0	2	0	0	2
Partnerships and Stakeholders	3	0	0	0	3
Right-of-Way	7	2	0	0	9
Structures & Geotech	7	3	0	3	13
Utilities	5	1	0	0	6
Total	71	18	4	8	101

Table 20. Risk Register Breakdown of Option 1

Option 2 Arch					
Cost Categories	Low Risk	Medium Risk	High Risk	Opportunity	Total
Construction	14	6	0	1	21
Construction - Market	2	1	2	1	6
Contracting and Procurement	3	2	2	1	8
Design / Civil	5	2	0	0	7
Environmental & Hydraulics	23	1	0	2	26
Funding	0	2	0	0	2
Partnerships and Stakeholders	3	0	0	0	3
Right-of-Way	7	2	0	0	9
Structures & Geotech	7	2	0	4	13
Utilities	5	1	0	0	6
Total	69	19	4	9	101

Table 21. Risk Register Breakdown of Option 2

6 SCHEDULE AND COST RISK ANALYSIS

6.1 Introduction

This section of the report provides a more detailed summary of the risk analysis results for both schedule and cost. The reader's attention is particularly directed toward the list of assumptions and exclusions in Section 2. The results in the analysis are all pre-mitigation.

6.2 Schedule Risk Analysis

6.2.1 Schedule Risk Model

For the risk analysis, the software used was Safran Risk. Safran Risk is a simulation tool which takes the Primavera P6 Scheduling Software (P6) schedule and incorporates probabilistic data (activity risk ranges, probabilities of risk occurring, and correlations) and runs thousands of iterations on the data to calculate float and critical paths. The software program summarizes the input data providing various graphical and tabular reports including the most familiar cumulative 'S' curve, providing varying confidence levels against associated start and/or completion dates.

6.2.2 Schedule Risk Model Inputs

Having established a deterministic schedule before risk, variability was placed around activity base durations. The variability on the durations is based on the workshop discussions on the critical path activities. The workshop participants provided feedback on a three-point estimate on the activities with a low, most likely, and high duration. The variability is based on potential issues with productivity, logistics, and other risks that are exclusive of discrete risks in the risk register. The three-point estimates on the durations were then incorporated in the schedule risk model. Discrete risks were then added from the risk register to the schedule where their impacts were believed not to be covered by the normal range of uncertainty applied. See Section 4.2, Section 5.1, and Section 4.2 for the inputs to the schedule risk model.

6.2.3 Construction Notice to Proceed Analysis

The deterministic schedule indicates that EQRB will reach CMGC Construction NTP by March 3, 2025, for both options. Table 22 for Option 1 depicts at the P70 that the Construction NTP date will be reached by December 25, 2025, which results in an approximate ten-month delay against the deterministic date. Table 23 shows that there is at the P70 the CMGC NTP date will be reached by December 22, 2025, for Option 2 which is an approximate ten-month delay when compared to the deterministic date. The Option 1 projection is therefore very similar to the Option 2 counterpart. Figure 6 and Figure 7 show that at the P70, the CMGC NTP date for both options will surpass that deterministic date of March 3, 2025. When looking at the sensitivity analysis in Section 6.2.5, the most sensitive risks and uncertainties causing the delay at P70 are very similar for both options. This is in alignment to the workshop which reflects that both design options have very similar schedules and risks.

NTP Construction	Start Date	Delta to Deterministic	
Confidence Level	Date	Day	Month
Deterministic Date	3/3/2025		
0%	3/2/2025	-1	0.0
10%	6/17/2025	106	3.5
20%	8/17/2025	167	5.6
30%	9/23/2025	204	6.8
40%	10/20/2025	231	7.7
50%	11/10/2025	252	8.4
60%	12/2/2025	274	9.1
70%	12/25/2025	297	9.9
80%	1/18/2026	321	10.7
90%	2/18/2026	352	11.7
100%	10/27/2026	603	20.1

Table 22. CMGC Construction NTP Analysis of Option 1

NTP Construction	Start Date	Delta to Deterministic	
Confidence Level	Date	Day	Month
Deterministic Date	3/3/2025		
0%	3/2/2025	-1	0.0
10%	6/17/2025	106	3.5
20%	8/18/2025	168	5.6
30%	9/21/2025	202	6.7
40%	10/20/2025	231	7.7
50%	11/10/2025	252	8.4
60%	11/30/2025	272	9.1
70%	12/22/2025	294	9.8
80%	1/15/2026	318	10.6
90%	2/16/2026	350	11.7
100%	10/7/2026	583	19.4

Table 23. CMGC Construction NTP Analysis of Option 2

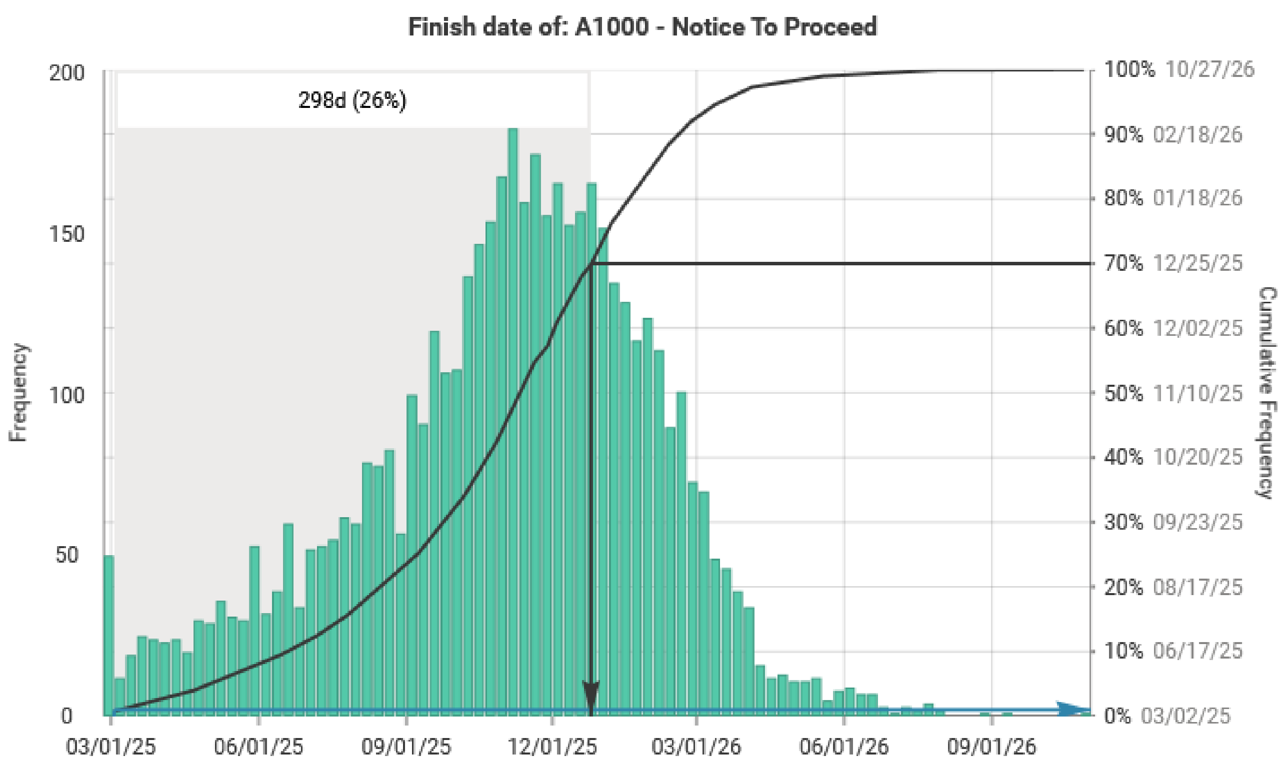

Figure 6. Schedule Quantitative Risk Analysis for CMGC Construction NTP of Option 1

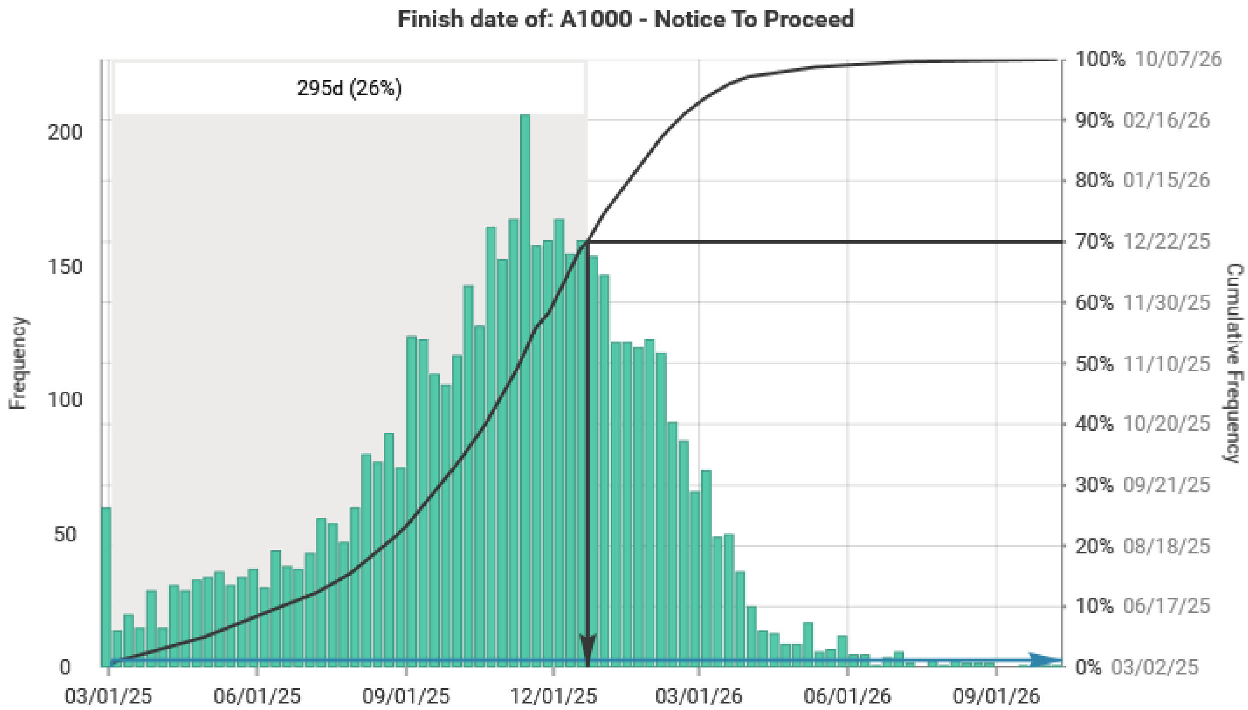

Figure 7. Schedule Quantitative Risk Analysis for CMGC Construction NTP of Option 2

6.2.4 Substantial Completion Analysis

The deterministic substantial completion date in the EQRB schedule has a completion date without schedule contingency of August 8, 2029, for Option 1 and October 17, 2029, for Option 2. The Schedule CRAs from Table 24 and Table 25 show that there is an 70% confidence level the substantial completion date will be obtained by September 13, 2030, for Option 1 and November 19, 2030 for Option 2. Both options incur an approximate thirteen-month delay. The total recommended schedule contingency at the P70 level would be 13.4 months.

Substantial Completion	Finish Date	Delta to Deterministic	
Confidence Level	Date	Day	Month
Deterministic Date	8/8/2029		
0%	9/15/2028	-327	-10.9
10%	10/22/2029	75	2.5
20%	1/1/2030	146	4.9
30%	3/28/2030	232	7.7
40%	8/13/2030	370	12.3
50%	8/30/2030	387	12.9
60%	9/6/2030	394	13.1
70%	9/13/2030	401	13.4
80%	10/1/2030	419	14.0
90%	11/5/2030	454	15.1
100%	9/7/2032	1126	37.5

Table 24. Substantial Completion Analysis of Option 1

Substantial Completion	Finish Date	Delta to Deterministic	
Confidence Level	Date	Day	Month
Deterministic Date	10/17/2029		
0%	8/6/2029	-72	-2.4
10%	8/21/2030	308	10.3
20%	8/30/2030	317	10.6
30%	9/4/2030	322	10.7
40%	9/10/2030	328	10.9
50%	9/18/2030	336	11.2
60%	10/17/2030	365	12.2
70%	11/19/2030	398	13.3
80%	8/21/2031	673	22.4
90%	9/2/2031	685	22.8
100%	11/11/2032	1121	37.4

Table 25. Substantial Completion Analysis of Option 2

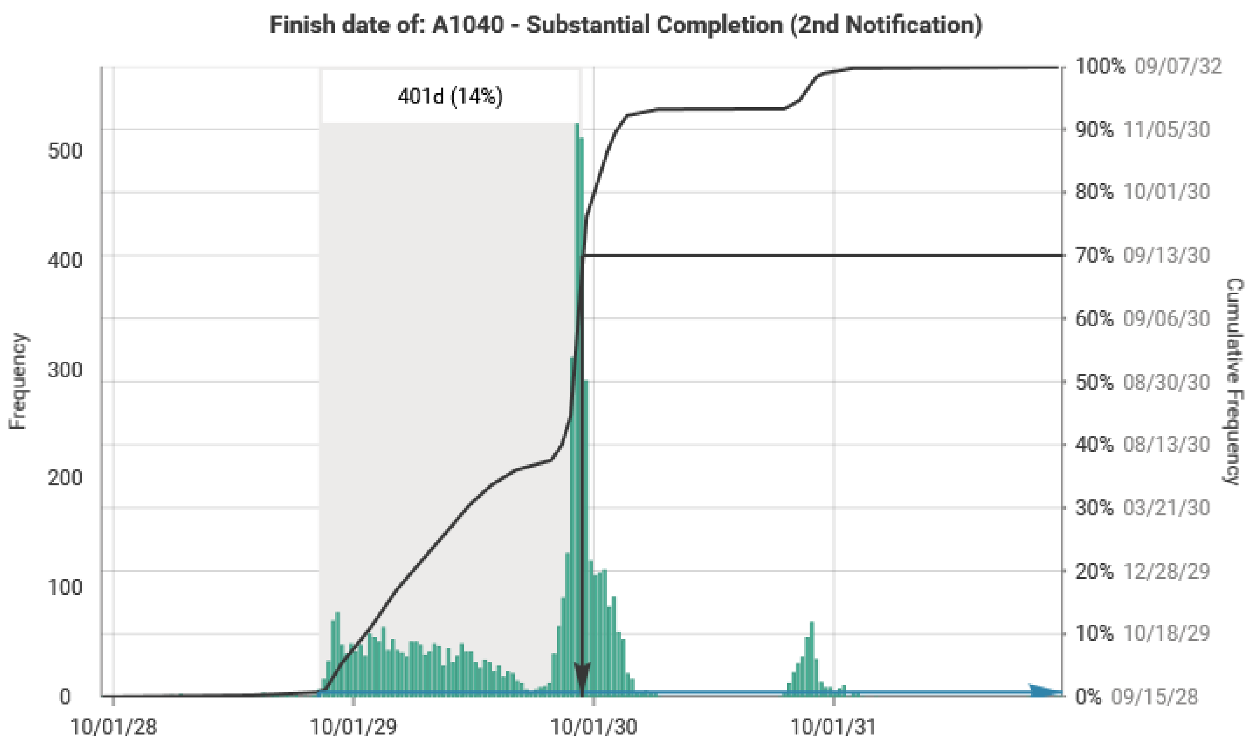

Figure 8. Schedule Quantitative Risk Analysis for Substantial Completion Date of Option 1

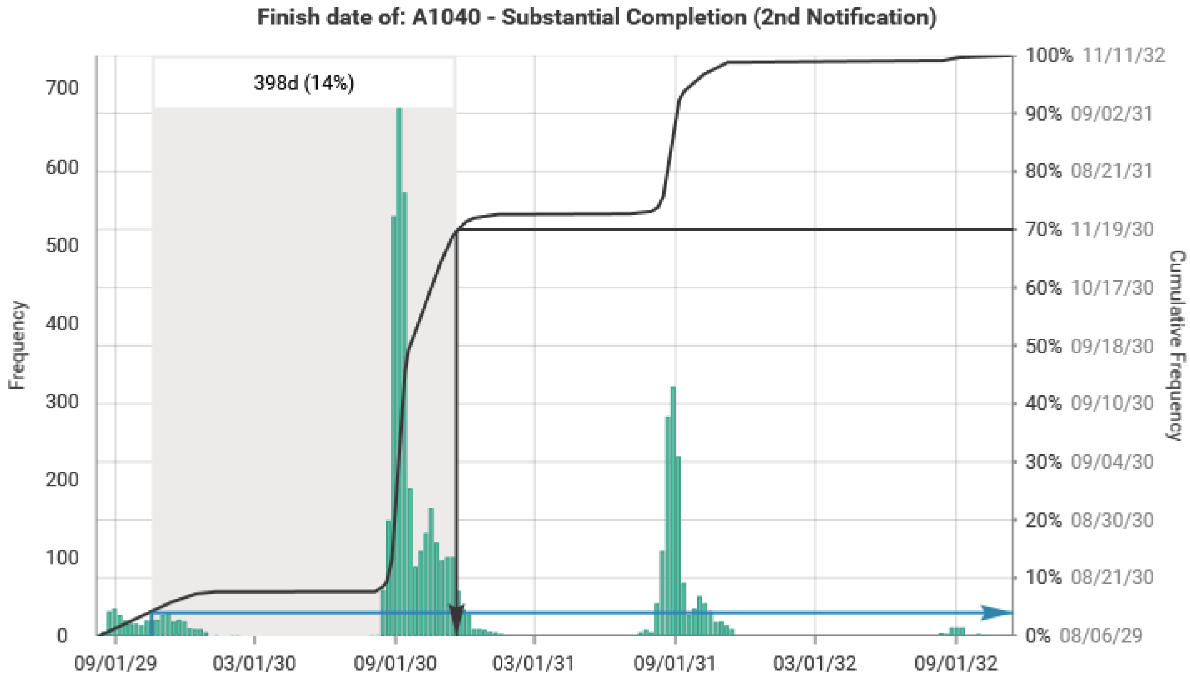

Figure 9. Schedule Quantitative Risk Analysis for Substantial Completion Date of Option 2

For Figure 8 and Figure 9 above, the histograms display multiple bell curves. This is caused by the multiple IWWW calendars built into the schedule model. As risks and uncertainties delay activities, the IWWW calendars would result in outsized shifts to the substantial completion of the project.

6.2.5 Construction Duration Analysis

Table 26 and Table 27 allow comparison of the construction duration from construction NTP to substantial completion. As the delta column indicates, the risk analysis shows that there are relatively few months of delays during the construction phase, when compared to the delay to construction NTP. This reflects that most of the largest schedule risks are to construction NTP, rather than in construction. Also, this reflects the dialogue during the workshop that durations for construction activities are generally conservative, whereas the durations for pre-construction activities are less conservative.

Construction Duration			Delta to Deterministic	
Confidence Level	Day	Month	Day	Month
Deterministic Date	1,619	54.0		
0%	1,293	43.1	(326)	-10.9
10%	1,588	52.9	(31)	-1.0
20%	1,598	53.3	(21)	-0.7
30%	1,647	54.9	28	0.9
40%	1,758	58.6	139	4.6
50%	1,754	58.5	135	4.5
60%	1,739	58.0	120	4.0
70%	1,723	57.4	104	3.5
80%	1,717	57.2	98	3.3
90%	1,721	57.4	102	3.4
100%	2,142	71.4	523	17.4

Table 26. Construction Duration Analysis for Option 1

Construction Duration			Delta to Deterministic	
Confidence Level	Day	Month	Day	Month
Deterministic Date	1,689	56.3		
0%	1,618	53.9	(71)	-2.4
10%	1,891	63.0	202	6.7
20%	1,838	61.3	149	5.0
30%	1,809	60.3	120	4.0
40%	1,786	59.5	97	3.2
50%	1,773	59.1	84	2.8
60%	1,782	59.4	93	3.1
70%	1,793	59.8	104	3.5
80%	2,044	68.1	355	11.8
90%	2,024	67.5	335	11.2
100%	2,227	74.2	538	17.9

Table 27. Construction Duration Analysis for Option 2

6.2.6 Schedule Risk Sensitivity Analysis

The schedule risk sensitivity analysis uses the exclusion method to determine how each risk or uncertainty impacts the risk analysis results. In this method, the analysis is first run with all risks and uncertainties included. It is then systematically re-run multiple times, excluding one risk/uncertainty at a time to demonstrate how each risk/uncertainty impacts the overall analysis. The figures below show the top risks and uncertainties that are calculated through this sensitivity analysis at the P70. The values presented at each bar is the approximate delay in calendar days that the risk or uncertainty contributes to the overall delay calculation.

For the construction NTP analysis as shown in Figure 10 and Figure 11, the largest drivers to the schedule delay relates to ROW and funding risks, for example Risk #102 (Title Clearing Delay), Risk #64 (Funding Delay), and Risk #44 (Relocation Delays). This reflects that the ROW schedule is the critical path in the current understanding of the pre-construction schedule.

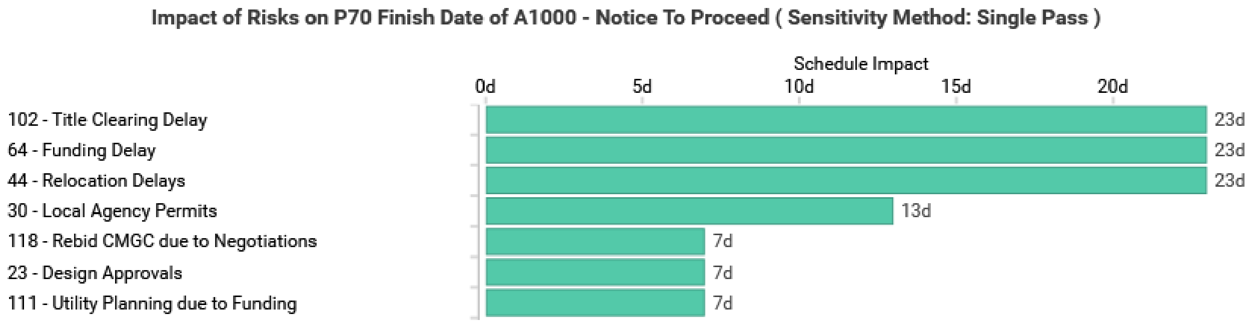

Figure 10. Schedule Risk Sensitivity Analysis Construction NTP of Option 1

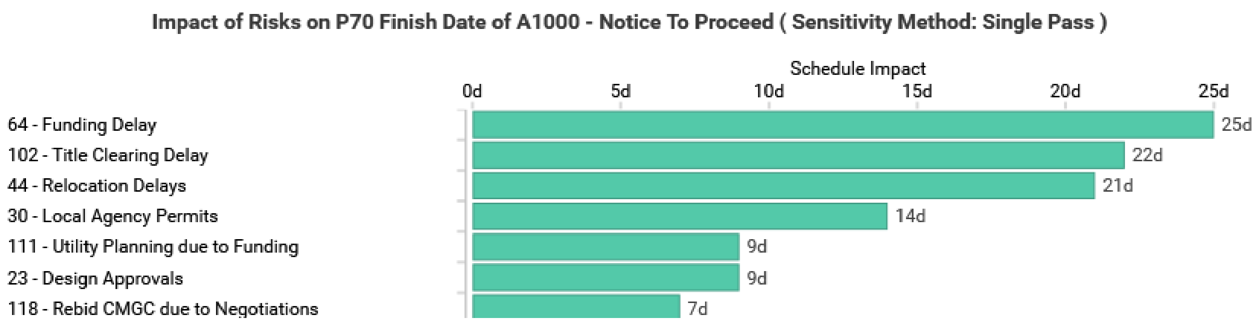

Figure 11. Schedule Risk Sensitivity Analysis Construction NTP of Option 2

Figure 12 and Figure 13 below show the most sensitive risks and uncertainties to the substantial completion date. Note that although there are differences between the two different options related to the schedule and risks, this sensitivity analysis is also influenced significantly by the IWWW calendar constraints. Therefore, the impact durations do factor in time savings or additions with the IWWW periods.

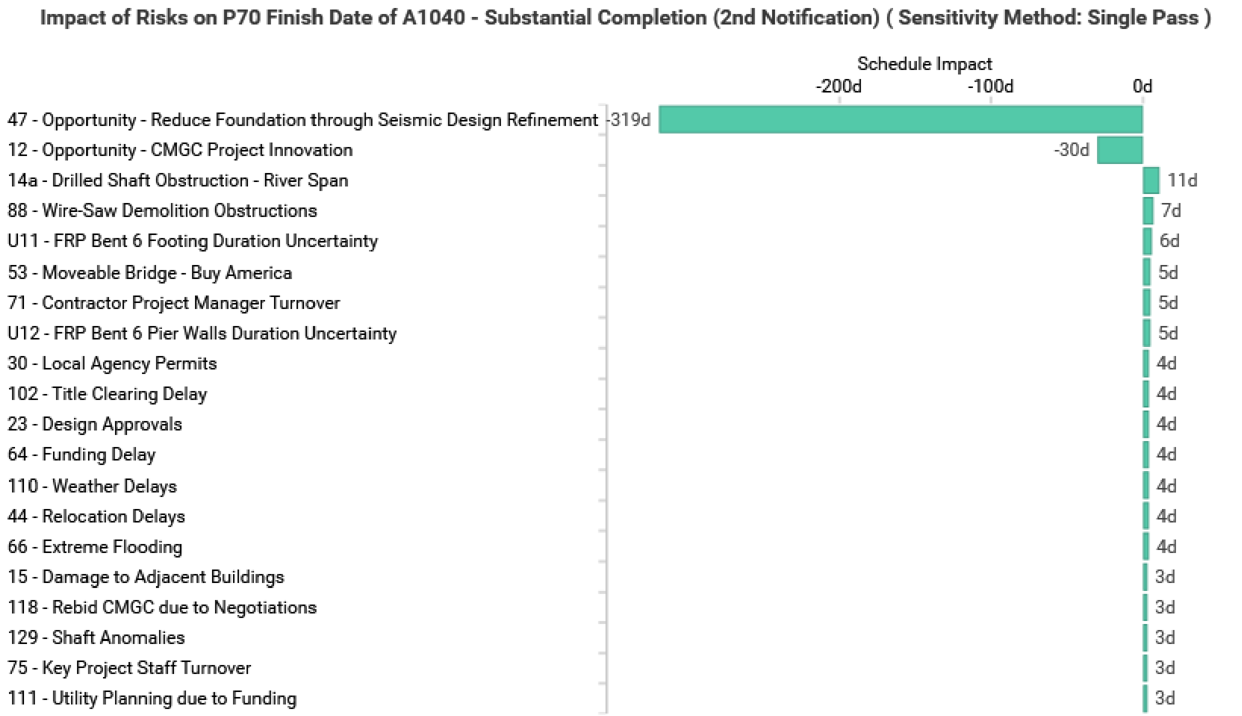

Figure 12. Schedule Risk Sensitivity Analysis Substantial Completion of Option 1

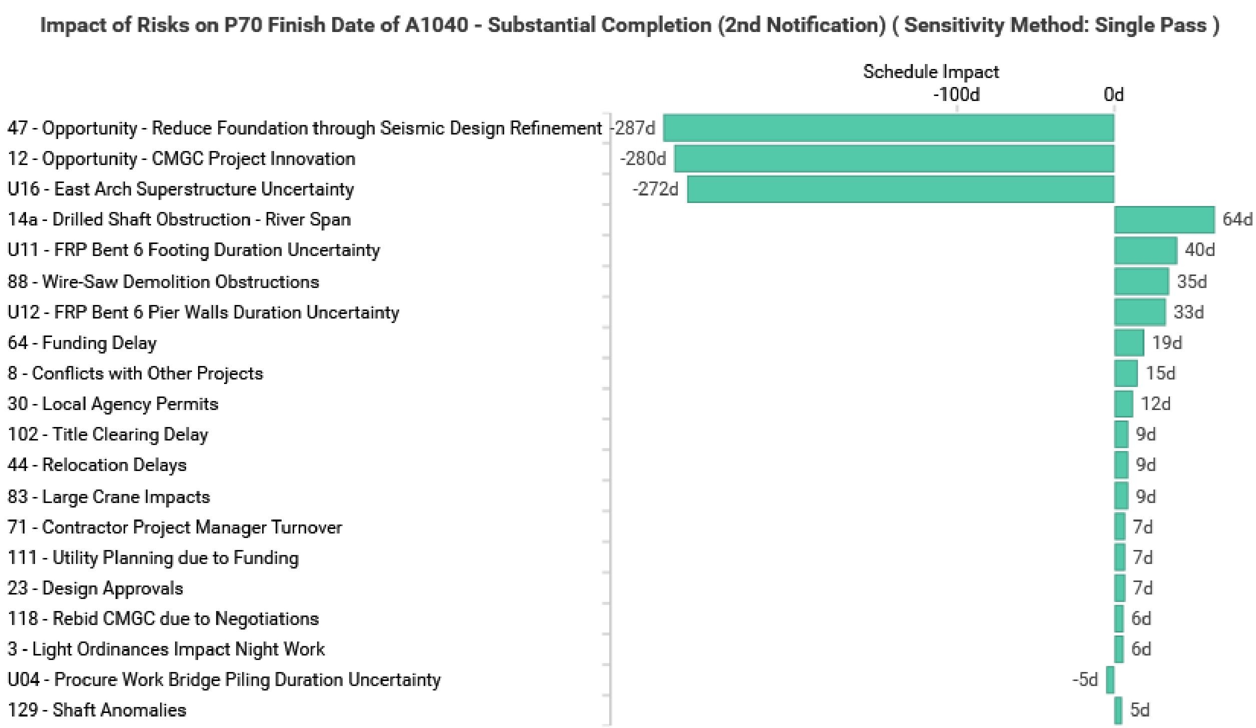

Figure 13. Schedule Risk Sensitivity Analysis Substantial Completion of Option 2

6.3 Cost Risk Analysis

6.3.1 Cost Risk Model

A cost risk analysis was developed using Safran Risk software and Palisade @Risk software. The cost risk model applies estimating uncertainty around the main estimate sections and, in addition, has probabilistic discrete risks identified through the risk register where risk is better modelled outside of a 'range' on the estimate line item. The likely outcomes of the combined risk events identified in the risk register were determined by probability simulation with the risk software utilizing Monte Carlo simulation methods. The Latin Hypercube method of sampling has been adopted.

The software is set to run numerous iterations, each representing a single execution of the entire project. For each of the iterations considered in the simulation, the potential risk events are combined randomly and considered to occur (or conversely not occur) in proportion to the estimated probability of occurrence. For example, the impacts of an event that has a 10% probability of occurrence will be triggered approximately 5,000 times in 50,000 iterations or project executions. The model was run through 50,000 iterations to provide representative results and the 10% Confidence Level (P10), P50, P70, and 90% Confidence Level (P90) figures were extracted for reporting purposes (where P = Probability of occurrence or confidence level). Various outputs are produced from the analysis software and are contained in the *Executive Summary* and within this section of the report.

6.3.2 Cost Risk Model Input Overview

The cost risk analysis was undertaken by evaluating uncertainty within the current project estimate and then adding to this the potential cost and schedule impacts identified in the risk assessment process. The cost risk analysis addresses:

- Estimating uncertainty by applying a minimum, most likely, and maximum range estimate around the current projects estimate for each major estimate component.
- Market conditions risk by applying a percentage addition.
- Escalation rate as a result of the integrated schedule risk analysis.
- Change orders and claims during construction by applying a percentage addition.
- Cost of schedule delay as a result of risk events by applying a 'schedule delay factor' to the results of the schedule risk analysis.
- Discrete risk events through a range estimate of the potential cost impact as agreed at the risk workshop and applying the agreed likelihood of occurrence as recorded in the risk register (percent probability of risk occurring).

The input data for the above is recorded and reproduced in Section 4.1 of this report**.**

6.3.3 Cost Risk Analysis – Option 1

As detailed in Section 1 of this report, the CRA shows that the P70 confidence level requires a cost basis of $917.73 million. This section will breakdown that value into its component parts. Figure 14 and Table 28 below show the detailed CRA results. As a walkthrough of Figure 14, the CRA process begins with the Base Estimate with no escalation or contingencies of $603.17 million. When all risks, uncertainties (excluding escalation), and opportunities of the project are inserted into the risk model, the P70 value of the project is projected not to exceed $729.16 million. By adding escalation uncertainty to the model, the P70 value increases to $881.68 million. There are several opportunities in the risk model that are potentially speculative without specific details, which are normally not part of the CRA to help determine cost bases. These opportunties are #12 (Opportunity for Project Innovation), #49 (Opportunity for Alternatives to Ground Improvements), #128 (Soil Mixing), and #133 (US Coast Guard more Accommodating). If these opportunities are removed from the risk model, it would increase the P70 value to $917.73 million. [Note that opportunity #47 (Reduced Foundations) are not included in this group, as this opportunity is treated as essentially part of the current scope and is thus considered a realized opportunity.]

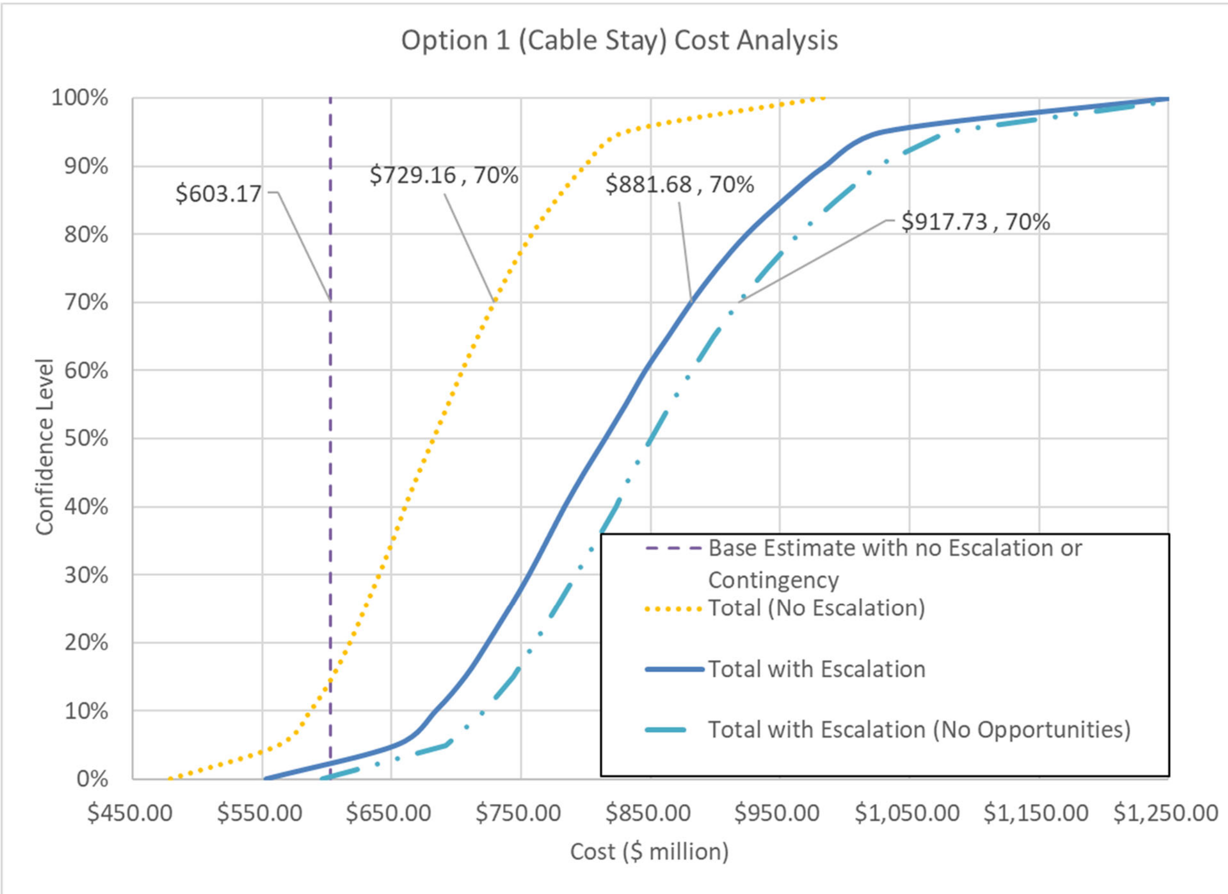

Figure 14. Cost Risk Analysis of Option 1

	Construction (no Escalation)	ROW (no Escalation)	PE (no Escalation)	CE (no Escalation)	Total (no Escalation)	Escalation	Total with Escalation	Total with Escalation (No Opportunities)
	a	b	c	d	e	f	g	h
Base Estimate	$422.08	$27.78	$90.00	$63.31	$603.17	$0.00	$603.17	603.17
0%	$344.78	$18.60	$75.74	$40.18	$479.31	$73.54	$552.85	596.17
5%	$407.07	$21.43	$82.53	$52.29	$563.32	$90.78	$654.11	692.03
10%	$423.58	$22.51	$85.12	$56.21	$587.42	$96.71	$684.13	721.74
15%	$435.10	$23.33	$87.23	$58.80	$604.46	$102.53	$706.99	743.90
20%	$444.02	$23.88	$88.80	$61.15	$617.85	$106.58	$724.43	761.09
25%	$451.45	$24.45	$90.31	$63.08	$629.29	$111.52	$740.81	777.26
30%	$459.10	$24.96	$91.66	$64.71	$640.44	$115.68	$756.12	792.21
35%	$465.96	$25.42	$93.06	$66.42	$650.86	$119.11	$769.97	808.20
40%	$472.06	$25.89	$94.40	$68.04	$660.39	$123.27	$783.66	823.10
45%	$479.16	$26.36	$95.97	$69.51	$671.00	$127.85	$798.85	835.73
50%	$486.72	$26.82	$97.73	$71.05	$682.31	$132.81	$815.12	850.44
55%	$493.94	$27.27	$99.72	$72.65	$693.58	$137.34	$830.93	865.44
60%	$500.96	$27.78	$101.50	$74.29	$704.54	$141.55	$846.09	882.08
65%	$509.14	$28.24	$103.31	$76.03	$716.72	$147.13	$863.84	898.83
70%	$516.80	$28.81	$105.43	$78.12	$729.16	$152.52	$881.68	917.73
75%	$525.15	$29.29	$107.78	$80.22	$742.44	$159.19	$901.64	940.54
80%	$535.48	$29.91	$110.39	$82.49	$758.26	$166.39	$924.65	963.64
85%	$547.84	$30.65	$113.40	$85.00	$776.88	$176.14	$953.02	993.79
90%	$562.46	$31.61	$116.76	$88.48	$799.32	$185.88	$985.20	1024.44
95%	$583.05	$33.10	$121.17	$93.62	$830.93	$199.81	$1,030.74	1079.64
100%	$683.27	$39.56	$131.45	$129.22	$983.50	$272.60	$1,256.11	1270.93

Costs in $ million

Table 28. Detailed Cost Risk Analysis of Option 1

	Estimate	Percent	Source
Construction			
Construction	$422.08		Base Estimate
Construction Contingency	$94.72	22%	Risk based P70
Construction Total	$516.80		
Non-Construction			
ROW	$27.78		Base Estimate
PE	$90.00		Base Estimate
CE	$63.31		Base Estimate
Non-Construction Contingency	$31.26	17%	Risk based P70
Non-Construction Total	$212.36		
Escalation	$152.52		Risk based P70
Project Reserve	$36.05	4%	Risk based P70 (Opportunity Calculation)
Risk Based Cost Basis	$917.73		

Table 29. P70 Recommended Cost Basis of Option 1 in $ Million

Table 29 above inserts the results of the CRA into the baseline cost estimates to reach a P70 confidence level. This table shows that it is recommended to add a 22% construction contingency to the $422.08 base estimate to obtain a $516.80 million construction budget. Similarly, the non-construction line items would require a $31.26 million (17%) contingency. The total escalation required for the project is $152.52 million to move the estimate from 2021 costs to Year of Expenditure (YOE$). It is also recommended to have a project reserve of $36.05 million (4%), which is the potential cost saving obtained from the potentially speculative opportunities.

6.3.4 Cost Risk Analysis – Option 2

In the case of Option 2, as detailed in Section 1 of this report, the CRA shows that the P70 confidence level requires a cost basis of $906.77 million. This section will breakdown that value into its component parts. Figure 15 and Table 30 below show the detailed CRA results. As a walkthrough of Figure 15, the CRA process begins with the Base Estimate with no escalation or contingencies of $581.19 million. When all risks, uncertainties (excluding escalation), and opportunities of the project are inserted into the risk model, the P70 value of the project is projected not to exceed $713.50 million. By adding escalation uncertainty to the model, the P70 value increases to $868.98 million. Option 2 also contains several opportunities in the risk model that are potentially speculative without specific details, which are normally not part of the CRA to help determine cost bases. These opportunities are #12 (Opportunity for project innovation), #48 (Opportunity to use full depth precast deck panels in lieu of cast in place deck for arch option), #97 (Reduction in tied arch length), #126 (Removal of base isolation bearings), and #133 (US Coast Guard more accommodating). If these opportunities are removed from the risk model, it would increase the P70 value to $906.77 million. [Note that opportunity #47 (reduced foundations) are not included in this group, as this opportunity is treated as essentially part of the current scope and is considered a realized opportunity.]

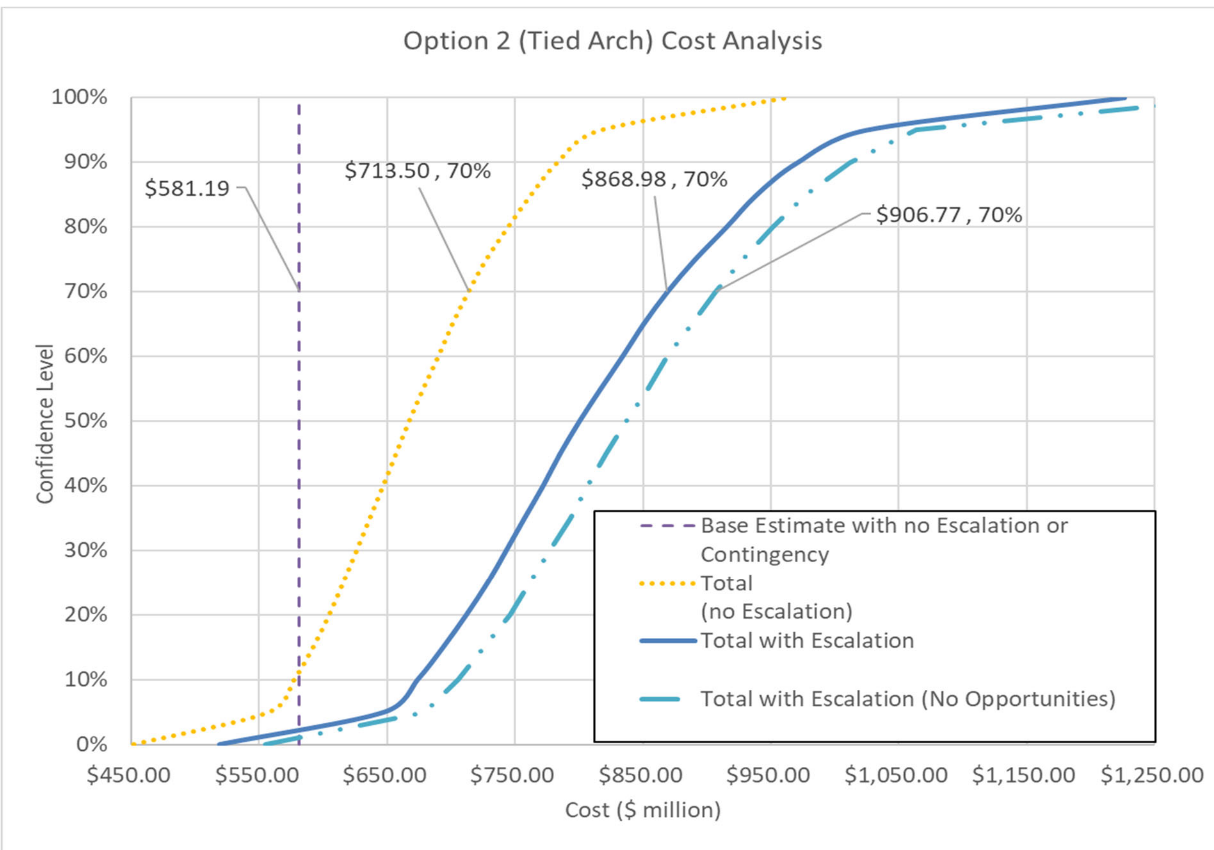

Figure 15. Cost Risk Analysis of Option 2

	Construction (no Escalation)	ROW (no Escalation)	PE (no Escalation)	CE (no Escalation)	Total (no Escalation)	Escalation	Total with Escalation	Total with Escalation (No Opportunities)
	a	b	c	d	e	f	g	h
Base Estimate	$402.97	$27.78	$90.00	$60.45	$581.19	$0.00	$581.19	581.19
0%	$319.56	$18.30	$75.73	$38.23	$451.82	$66.72	$518.54	554.57
5%	$400.55	$21.32	$82.73	$53.11	$557.70	$89.86	$647.55	678.96
10%	$413.35	$22.40	$85.34	$56.12	$577.21	$96.29	$673.51	705.80
15%	$422.65	$23.25	$87.39	$58.72	$592.01	$101.43	$693.45	725.54
20%	$431.03	$23.91	$88.95	$60.69	$604.58	$107.03	$711.60	746.24
25%	$438.39	$24.44	$90.25	$62.49	$615.57	$112.75	$728.32	761.32
30%	$445.49	$24.90	$91.68	$64.00	$626.08	$116.77	$742.85	777.04
35%	$452.31	$25.42	$92.96	$65.71	$636.41	$120.72	$757.12	792.90
40%	$458.97	$25.94	$94.48	$67.38	$646.78	$124.94	$771.71	806.81
45%	$465.71	$26.41	$96.03	$68.79	$656.94	$128.10	$785.04	821.45
50%	$472.18	$26.87	$97.60	$70.43	$667.08	$133.11	$800.20	837.20
55%	$479.49	$27.32	$99.31	$71.97	$678.09	$138.66	$816.74	853.86
60%	$487.28	$27.78	$101.24	$73.63	$689.92	$143.93	$833.85	868.71
65%	$494.03	$28.25	$103.16	$75.47	$700.91	$149.35	$850.25	888.18
70%	$502.16	$28.80	$105.34	$77.20	$713.50	$155.48	$868.98	906.77
75%	$511.28	$29.31	$107.35	$79.47	$727.41	$163.22	$890.63	928.27
80%	$522.60	$29.95	$110.11	$81.75	$744.41	$170.77	$915.18	951.36
85%	$534.72	$30.71	$112.83	$84.17	$762.43	$176.36	$938.79	977.82
90%	$547.88	$31.69	$116.19	$87.38	$783.15	$187.79	$970.93	1011.77
95%	$569.82	$32.99	$120.73	$93.14	$816.68	$207.81	$1,024.50	1063.81
100%	$662.24	$40.44	$132.24	$127.55	$962.47	$264.06	$1,226.53	1315.53

Costs in $ million

Table 30. Detailed Cost Risk Analysis of Option 2

	Estimate	Percent	Source
Construction			
Construction	$402.97		Base Estimate
Construction Contingency	$99.19	25%	Risk based P70
Construction Total	$502.16		
Non-Construction			
ROW	$27.78		Base Estimate
PE	$90.00		Base Estimate
CE	$60.45		Base Estimate
Non-Construction Contingency	$33.12	19%	Risk based P70
Non-Construction Total	$211.34		
Escalation	$155.48		Risk based P70
Project Reserve	$37.79	4%	Risk based P70 (Opportunity Calculation)
Risk Based Cost Basis	$906.77		

Table 31. P70 Recommended Cost of Option 2 in $ Million

Table 31 above inserts the results of the CRA into the baseline cost estimates to reach a P70 confidence level. This table shows that it is recommended to add a 25% construction contingency to the $402.97 base estimate to obtain a $502.16 million construction budget. Similarly, the non-construction line items would require a $33.12 million (19%) contingency. The total escalation required for the project is $155.48 million to move the estimate from 2021 costs to YOE$. It is also recommended to have a project reserve of $37.79 million (4%), which is the potential cost saving obtained from the potentially speculative opportunities.

6.3.5 Cost Risk Sensitivity Analysis

The following Figure 16 and Figure 17 show the sensitivity analyses for the cost risk model and the ranking of identified risks and uncertainties using the exclusion method to determine how each risk or uncertainty impacts the risk analysis results. In this method, the analysis is first run with all risks and uncertainties included. It is then systematically re-run multiple times, excluding one risk/uncertainty at a time to demonstrate how each risk/uncertainty impacts the overall analysis. The values presented at each bar reflect the approximate cost impact that the risk or uncertainty contributes to the overall cost QRA calculation. Negative values reflect cost savings. The values shown are using the P70 confidence level analysis.

Note that opportunity #47 (reduced foundations) is modelled as an opportunity in the risk model, despite being a near certainty. Since the base estimate and schedule at the time of the workshop has not included the update of this scope change, the CRA treats this as an opportunity.

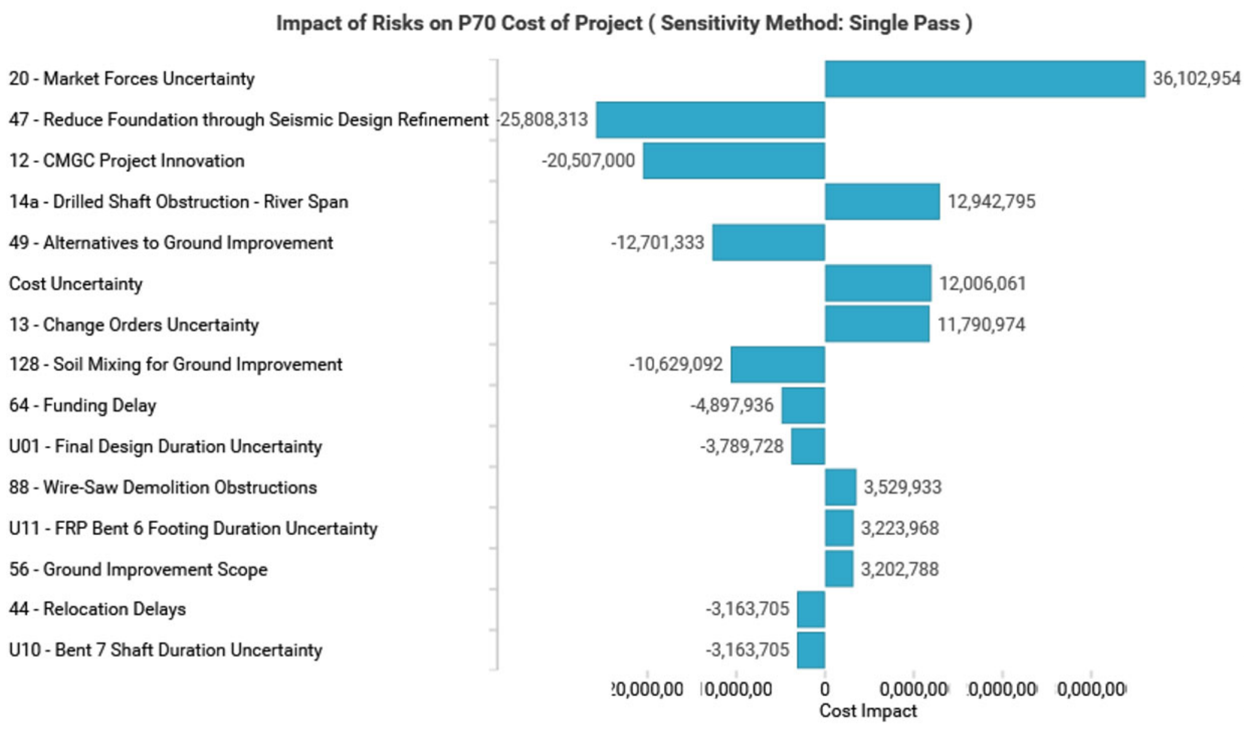

Figure 16. Cost Risk Sensitivity Analysis of Option 1

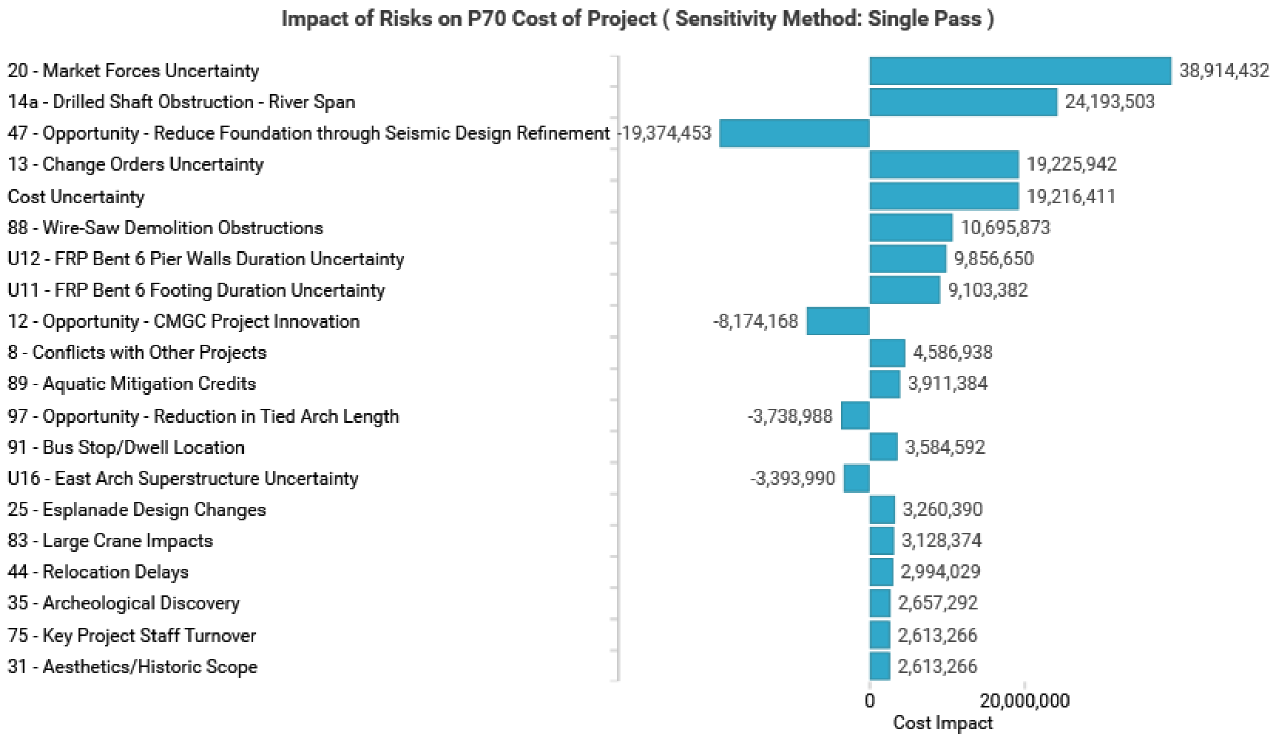

Figure 17. Cost Risk Sensitivity Analysis of Option 2

APPENDIX A

A - Risk Register

Earthquake Ready Burnside Bridge Project

Project Risk Register

REV : 0

DATE : January 16, 2022

Score	1	2	3	4	5
Probability	< 10%	<> 10% -50%	<> 50% -75%	<> 75% -90%	> 90%
Cost	< $5m	< > $5m-$10m	< > $10m-$15m	< > $15m-$25m	> $ 25m
Schedule	< 1 month	< > 1 - 3 months	< > 3 - 6 months	< > 6-12 months	> 12 months

Rating	< 3 (Low)	3 > < 9.5 (Medium)	> 9.5 (High)

WkSh Risk ID	Option	Status	RBS	Risk	Risk Description	Notes/Mitigation	Risk Modeling Notes	Schedule Model	Cost Model	Option 1 Risk Score: Probability Score	Option 1: Time Impact Rating (A)	Option 1: Cost Impact Rating (B)	Option 1: Current RR Rating	Option 2 Risk Score: Probability Score	Option 2: Time Impact Rating (A)2	Option 2: Cost Impact Rating (B)2	Option 2: Current RR Rating2
3	Both	Open	Environmental & Hydraulics	Light ordinances	There is a risk of light ordinances that may impact night work. Ensure appropriate specifications are included in the contract documents regarding ordinances and variances that may be allowed.		Model to east superstructure construction completion, as that part of the project has more night work that impacts residential. Cost in time delay.	Model	in SDF	2	2	1	3	2	2	1	3
4	Both	Open	Environmental & Hydraulics	Main pier shafts not installed within IWWW	There is a risk associated with the main pier shafts not installed within the in water work window. The work window for the shaft construction is assumed to be from July 1 through December 31, resulting in an 6- month delay. Possible additional in-water work windows.	The mitigation is to incorporate this work into an early work package to begin shaft construction prior to the main work package. This shift may place more pressure on the design task as foundation design criteria is established. Use 8 ft shafts instead of 10 ft. Employ two drill rigs installing shafts in same duration. Careful schedule development and buffer for critical path items. Moving piers or contractual mitigation.	Do not model. This is a statement. Other risks will factor into this.	Do not model	Do not model	0	0	0	0	0	0	0	0
5	Both	Open	Environmental & Hydraulics	Work bridge not completed within in-water work window	There is a risk associated with the work bridge not completed within in-water work window. This would cause a delay into the next in water work period. The work window is assumed to be from July 15th to October 15th every season. Assume an 8-month delay into the next season.	Careful schedule development and buffer for critical path items.	Do not model. This is a statement. Other risks will factor into this.	Do not model	Do not model	0	0	0	0	0	0	0	0
6	Both	Open	Construction	Opportunity to Ask USCG for partial navigation channel closure for bascule span construction	There is an opportunity for approval from the USCG for partial navigation channel closure for bascule span construction. There may also be an opportunity to get half channel closure approval for multiple months that would save time and cost. This cost savings assumes that full bascule placement at the same time is not required and the bascule may be able to be installed in stages in place.		Minor cost saving. Impact in 133, do not duplicate.	Do not model	Do not model	1	0	-1	-1	1	0	-1	-1
7	Both	Open	Environmental & Hydraulics	Issues with river users / high water events	High water events in the spring, fall, and winter could cause delays to the project. Debris may be an issue for the work platforms and other structures in the river may require removal to avoid failures during spring and fall high water events.	Include historical river data and transfer to contractor.	This is not in the current estimate. The contractor will probably price for some occurance. Model for cost only.	Do not model	model	2	0	1	1	2	0	1	1
8	Both	Open	Construction	Conflicts with other projects during construction (MOT)	There are multiple large transportation projects anticipated to be going during the timeframe of this project. Significant projects include Rose Quarter on I-5, I-205 Abernethy Bridge, Interstate Bridge, other city projects, and miscellaneous utility and development that may be in conflict. There may be an risk if closures and MOT may be coordinated with these projects.	Modify proposed traffic sequence or traffic control footprint. Perform a regional view of MOT of other projects and adjust schedule accordingly. (Continue coordination with ODOT MOT).	Model for time only to the superstructure main work deck.	Model	in SDF	3	1	1	3	4	2	1	6
9	Both	Open	Construction	Trimet Coordination	Base assumes there is coordination with Trimet and this project but this project doesn't control Trimet's. Coordination with Trimet is necessary. May result in additonal cost to this project with bus bridging and relocation of OCS.		Model cost impact of additional scope for this project.	Do not model	model	2	0	1	1	2	0	1	1
10	Both	Open	Contracting and Procurement	Restriction of contractor storage and access, parking	Contractor may bid a premium due to the urban area and not having storage and access to the site. Laydown and staging will be difficult and the contractor may need to rent private lots or haul materials longer distances than originally planned. The base estimate includes $3M for off site access and storage. This would include temporary parking offsite with shuttle.	Adjust base cost accordingly.	This is on top of the cost uncertainty.	Do not model	in cost uncertainty	2	0	2	2	2	0	2	2
11	Both	Open	Construction - Market	Constructability	There is a risk associated with the complexity of this project, design tolerances, field design change requests, change orders, access, work over live roadways, railroads, in water work ect., that may cause a premium to bid prices. The estimate buildup considers many of these complexities. There may be mitigation measures associated with design tolerances and other methods that may increase constructability. This is currently a non-quantified watch list item.	Focused constructability reviews, 3D designs, and BIM, that support higher level conflict identification during design.	This is accounted for in the market conditions uncertainty. Do not model seperately.	Do not model	In Market uncertainty	4	0	5	10	4	0	5	10

Earthquake Ready Burnside Bridge Project

Project Risk Register

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										Probability Score	Time Impact Rating (A)	Cost Impact Rating (B)	Current RR Rating	Probability Score	Time Impact Rating (A)2	Cost Impact Rating (B)2	Current RR Rating2
12	Both	Open	Construction - Market	Opportunity for project innovation	Based on the delivery method and coordination with the contractor, design refinements, and exploration of other opportunities to mitigate risks there is an opportunity for cost and or schedule savings for the project. This is in addition to other VE opportunities that are established based on risk mitigation strategies for other identified risks.		Model opportunity for cost and time. Cost is $5 to $15m.	model	do not model, the sensitivity analysis shows that time saving equates to about the $5-$15 saving to be modelled.	3	-3	-3	-9	3	-3	-3	-9
13	Both	Open	Contracting and Procurement	Unknown / unknown change orders	A number of the risks fall into this category however there are still a number of unquantified issues that could result in additional change orders.	Retain risk reserve for unknown change orders. Additional constructability reviews can reduce change orders.	In change order uncertainty. Do not model seperately.	Do not model	In CO uncertainty	5	0	5	13	5	0	5	13
14	Both	Open	Construction	Drilled shaft obstructions/differing site conditions	There is a risk associated with drilled shaft obstructions/differing site conditions especially where there are overlaps with existing piers that may be encountered resulting in added costs and/or delays. Drilling could possibly encounter portions of previous cofferdams and add additional drilling time and associated costs to clear the obstructions. There are approximately 50 drilled shafts throughout the project. Assume a potential $5M to $10M to pay for claims or change orders associated with shaft obstructions and differing site conditions associated with deep foundation/shaft installation.	Build into the contract a differing site conditions risk to initially be the responsibility of the contractor and to have qualification-based selection of contractor to include technical proposal on construction of similar foundation types. Minimize shaft overlap with existing piers and if possible, avoid overlap completely. Possibly use a provisional sum item in the bid schedule. Use an early work package for riprap removal around the piers prior to drilled shaft activities and cofferdam activities. Continue to refine foundation design to reduce number of shafts and/or shaft diameter and collect more geotechnical borings at foundation locations to assess obstruction risks. Have GC directly contract with geotech for drilling samples.	Model river span impact: 90%; +2wk/+1m/+3months; $5/$6/10m range for cost above the general CO range and time impact. For non-river span: 75-90%; 6 month total of all shafts; cost is elsewhere.	Model	model	5	2	1	8	5	2	1	8
15	Both	Open	Construction	Adjacent buildings damaged during construction	There is a risk that adjacent buildings may be damaged during construction due to vibration, pile driving, and other activities. There are costs associated with building surveys, building monitoring, and claims associated with this risk. The low end P1 accommodates additional surveys and monitoring, P2 accommodates added costs for potential minor claims, and the high end P2 may be substantial claims for building repair.		Risk of an impact to overall project completion is low. Worst case is there could be a lawsuit and injunction. Cost in time delay. Model to substantial completion.	Model	in SDF	1	1	1	1	1	1	1	1
16	Both	Open	Construction	Damage to city streets beneath or adjacent to bridge as a result of construction activities	There may be damage to city streets beneath or adjacent to the bridge as a result of construction activities that may require replacement of curbs, drainage, sidewalks/driveways, and pavement.		Model minor cost risk to repair roads.	Do not model	model	1	0	1	1	1	0	1	1
17	Both	Open	Construction	Demolition/construction of existing bridge over the railroad	There is a risk associated with the restrictions over the railroad during bridge removal activities. This may limit production and require special accommodations and innovative methods to remove the portion of the structure over the railroad. This may also be a schedule delay although not from a critical path standpoint. There is $2M for protection included in the base plus $1M for flagging. Cost impacts are associated with damage that may occur and require repair. There are also risks associated to accidents and harm to users of assets.	Careful detailed planning, checklists, and buy in from stakeholders. Qualification based selection of contractor to include technical proposal on construction of similar structure types. Early coordination with agencies to manage expectations.	Model to the demo activities of the east approach.	Model	Do not model	3	3	0	5	3	3	0	5
18	Both	Open	Construction	Demolition/construction damages I-5 ramps	There is a risk that demolition damages I-5/ramps for cost of repair. There are also risks associated to accidents and harm to users of assets.	Careful detailed planning, checklists, buy in from stakeholders. Qualification based selection of contractor to include technical proposal on construction of similar structure types. Early coordination with agencies to manage expectations.	Minor cost to model.	Do not model	model	1	1	1	1	1	1	1	1

Earthquake Ready Burnside Bridge Project

Project Risk Register

REV : 0

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19	Both	Open	Construction - Market	Construction oversight costs	There is a risk associated with additional oversight and management costs that may go beyond the 15% costs for CE currently assumed in the base estimate. After evaluation of the base costs and assumptions, it was determined that this amount was sufficient at this time as the model and risk analysis will add the time related delay costs as a result. This is currently a watch list item.		This is in the CE estimating uncertainty range and the schedule delay calculation. Do not duplicate.	Do not model	Do not model	5	0	2	5	5	0	2	5
20	Both	Open	Contracting and Procurement	Market conditions	Right now there should be at least three contractors interested in CMGC, but there are a number of specialty subs and suppliers that could create a premium. Increased cost will attract workforce in general, meet DBE availability, and workforce/apprentice goals. Other potential risks include DMWESB, SDV availability, equipment availability, general labor availability, material availability, increased material costs, inflation, labor strikes, and other general market conditions risks.	Engage the contractor community early. Make adjustments to specs and plans to remove or lower barriers to contracting due to contractor feedback and incorporate into plans and specifications. Carrying contingency to cover increased labor, material costs, and inflation. Work early with CMGC to identify potential subs and identify areas to train DBE/small contractors. Consider bargaining agreements, option pricing on materials, etc.	This is accounted for in the market conditions uncertainty. Do not model seperately.	Do not model	In Market uncertainty	4	0	5	10	4	0	5	10
21	Both	Open	Contracting and Procurement	Long lead items - early work packages	There may be an opportunity to incorporate early work packages to expedite the process for long lead items, including long span arch, mechanical/electrical systems, base isolation devices, expansion joints, steel girders, etc. Potential benefit to lock in early pricing. This is currently a non-quantified watch list risk.		Do not model. Currently LL items are not on the critical path. Exclude	Do not model	Do not model	3	-3	-2	-8	3	-3	-2	-8
23	Both	Open	Design / Civil	Design approvals	There are multiple design approvals including MOT with ODOT, PBOT, FHWA, Coast Guard, TriMet, railroad that may cause a delay during the design phase. Contractor selection/NTP is delayed and contractor input during design phase is minimized necessitating design changes. An example would be a change in the vertical clearance requirements and ODOT approval for enough closure windows to erect the structure over I-5, which could delay superstructure work of the east approach long span. The design schedule is approximately 54 months. Assume a 1-3 month delay.	Scope stability, strategize around discussions with agencies to minimize surpises during design reviews, and have a plan to obtain approvals prior to design turn in. Pre-review workshop to present the design and answer questions prior to agency reviews. Regular workshops during design to make sure agency staff are familiar with design before the formal review starts. Ongoing coordination with ODOT early, and once contractor is onboard.	Cost due to time.	Model	Do not model	2	2	1	3	2	2	1	3
24	Both	Open	Design / Civil	Design changes/allowance/ scope creep	At this level of design and estimating, not all items have been completely identified. There is potential of design scope creep as the project progresses, and life cycle and maintenance considerations for different materials and methods that may change specific elements, thereby increasing costs. There may also be an opportunity throughout design and changes that may occur to refine the approach that may result in a cost and schedule savings.		In design uncertainty range.	Do not model	in cost uncertainty	4	0	4	8	4	0	4	8
25	Both	Open	Design / Civil	Esplanade design changes	There is a risk that the current assumption of stairs and elevators as the connection from the east bridge approach (both sides) to the east esplanade may change as a result of third party input and design requirements - ramps. This would result in added costs not included in the current base estimate. The current estimate includes $5M in the base. A ramp configuration may cost as much as $14M. This is in addition to mitigation costs to accommodate ancillary costs not included the current estimate. The City may want acceleration or something else to mitigate esplanade closure.	Work with City to come to agreement on design.	This is on top of the cost uncertainty. This risk reflects the County accepting a major change. Most likely this risk will not occur, because the County will expect the City to pay for this.	Do not model	model	1	0	3	2	1	0	3	2
26	Both	Open	Environmental & Hydraulics	Sustainability requirements	There is a risk associated with additional elements required to meet sustainability requirements that may increase costs. Assume a $1M to $5M increase to meet sustainability goals. Example includes for green roads.		Model for cost.	Do not model	model	3	0	1	2	3	0	1	2

Earthquake Ready Burnside Bridge Project

Project Risk Register

REV : 0

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27	Both	Open	Environmental & Hydraulics	NEPA documentation	The base schedule includes about 14 months to get to a ROD. The risk is that this may be delayed as a result of FHWA approval and other agency agreements and processes, including the One Federal Decision process. The preferred alternative decision has been deferred to final design; this needs to be approved by the policy group and other stakeholders that need to approve through their own process (city council, county, metro, etc.) in addition to the Board and FHWA. Based on all of the check points and other approvals that need to occur, this process may be delayed. Other requirements include 4f, ESA, and Section 106 that require city approval.		Minor fluctuation to the current ROD milestone (+/-1 month). However, this will not delay 30% design. Do not model, to track.	Do not model	Do not model	1	1	1	1	1	1	1	1
28	Both	Open	Environmental & Hydraulics	NEPA / 4f : Coordination with parks and Saturday Market	Obtaining the 4f permit could have an impact to schedule or may have an impact on mitigation costs associated with the current plan. The base costs have approximately $1M associated with mitigation for the Saturday Market, esplanade, Japanese Garden, and impacts to events and associated revenues as a result.	Perform early and often coordination with stable construction scope and timing, and communicate within the contract documents.	Delaying 4f will delay NEPA/ROD. Duration uncertainty is within #27, so do not duplicate as it will not delay 30% design. Cost is due to time.	Do not model	Do not model	1	1	1	1	1	1	1	1
29	Both	Open	Environmental & Hydraulics	Additional mitigation based on NEPA tech reports	Additional mitigation based on NEPA tech reports. This risk is associated with additional social service, tribe, bike/ped, and transit mitigation measures.		This is a cost impact, not schedule. Model for cost. ($1M-$2M).	Do not model	model	2	0	1	1	2	0	1	1
30	Both	Open	Environmental & Hydraulics	Local agency permits	Other stakeholder approvals are required including with the City of Portland and other local agencies. A land use process, NPUP, and permitting process is required that may result in a delay. Multiple reviews and requests for information may result in delays and potential design re-work. Permit conditions may drive project costs associated with mitigation measures to address the comments prior to approval. ~~Costs are associated with direct impacts associated with mitigation measures that may be required between ROD and the end of construction. Early work packages cannot be proceeded without local agency partial permits.~~ Demoing AMR building is also delayed. Missed IWW for 2025 causing schedule to delay by one year. Approval of City of Portland permits will affect removing the existing bridge.	Clear understanding of permitting process. Early work on demo plans and permits. Continue communication and coordination with city staff.	Delay to construction NTP (3/25). 15%, no schedule delay, 50% of 1 month delay, 25% for up to 3 month delay, 10% up to 5 month delay.	Model	in SDF	3	2	0	3	3	2	0	3
31	Both	Open	Environmental & Hydraulics	Local jurisdictional approvals for aesthetics/architectural/historic related items delay schedule or drive cost increases	Local jurisdictional approvals for aesthetics/architectural/historic related items delay schedule or drive cost increases. The base includes a markup for aesthetics - $5M. An example, aesthetic lighting on similar structures could be a multi-million dollar cost increase. Other examples may include ornamental or special materials for railing, incorporation of artwork, and other features that will add cost. There may be a potential for historic salvage that could also be incorporated.	Mitigation is to go through the design review board and if the applicant is denied, then it may go through the city council. Having the county define a budget and design to the budget.	Model cost of up to $5M more than the current budget. Biggest concern is with the historic district requirements.	Do not model	model	2	0	1	1	2	0	1	1
34	Both	Open	Environmental & Hydraulics	Section 106 Consultation: Historical Bridge	This risk is associated with a change in requirements that could result in added costs or delays specific for this project. This is currently a non-quantified watch list risk.	Continue to design sensitive to key features. The scope has been reduced to minimize impacts to key historical features. Coordination with ODOT environmental.	Minor risk for tracking. Impact in other ROD NEPA risks. Do not model.	Do not model	Do not model	1	1	1	1	1	1	1	1
35	Both	Open	Environmental & Hydraulics	Archeological/cultural discovery	There is a risk associated with discovery of cultural/archeological resources that may cause a schedule delay. Additional costs for equipment standby time and the treatment plan may add costs.		Model for cost and time. Delay to substantial completion.	Model	model	2	1	1	2	2	1	1	2

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36	Both	Open	Environmental & Hydraulics	Unforeseen hazmat	There are items in the estimate to cover for known hazmat for the top 15 feet of excavation in the river - approximately $2.2M in the base including haul. The estimate also includes for costs for asbestos abatement, lead paint. The risk is the discovery of unknown hazmat or additional contaminated materials. There is a risk of additional asbestos and lead paint, contaminated material excavation associated with cofferdam and pier construction, and other unforeseen hazmat/contaminated material issues that may increase costs.	Include a work safety plan as part of the pre-construction submittals. Hold a reserve if this occurs. Implement robust Phase II testing after NEPA phase.	Model above and beyond base change order range.	Do not model	model	1	0	1	1	1	0	1	1
37	Both	Open	Environmental & Hydraulics	Temporary hydraulic rise impacts due to construction access / work bridges	Temporary hydraulic rise impacts due to construction access/work bridges. The base does not currently account for any hydraulic rise at this time. A hydraulic analysis is anticipated following the preferred alternative decision to determine the impacts. Phasing impacts including pier construction assumption changes, limitations of in water work, and other factors may impact project costs. There is a low probability of a schedule delay risk; but a high probability of a cost impact risk.		Minor cost risk to model.	Do not model	model	1	0	1	1	1	0	1	1
38	Both	Open	Environmental & Hydraulics	Risk of environmental containment failure	Paint containment failure, Pier 1 containment failure, or any falsework containment failure. Any area where there is containment of materials if it fails there would be a cost. ~~Scour resulting in hazardous sediment distribution which requires mitgation measures requiring additional permitting.~~ Department of Environmental Quality could assess a fine of up to $20k per day. This is currently a non-quantified watch list at this time.	Specify rigid containment systems versus flexible and tight specifications for enforcement. Additional scour analysis early to allow for mitigation and permit modifications if necessary.	Contractor risk, no cost to project. Model for time only in case of stop work order. Model to substantial completion, 10%, up to a week of delay.	Model	Do not model	1	1	0	1	1	1	0	1
39	Both	Open	Environmental & Hydraulics	Potential legal challenge to ROD	There is a risk that legal challenges may cause a delay. The high schedule impact would be caused by (potentially missing in-water work window), extended PE cost, and escalation.	Accelerate PE phase; EWPs for work bridge and shaft work.	Minor schedule. But in theory, legal challenge will not delay design. For tracking.	Do not model	Do not model	1	1	1	1	1	1	1	1
40	Both	Open	Environmental & Hydraulics	Noise variance	City of Portland may not issue number noise variance for night work as requested. If restrictions are imposed, there may be some mitigation costs associated with noise, dust, etc. for adjacent buildings and receptors. This includes for complaints that could add additional constraints.	Obtain noise permit and include conditions in contract.	Model for time and cost (for mitigation cost).	Model	model	1	1	1	1	1	1	1	1
41	Both	Open	Partnerships and Stakeholders	Accommodating community events	There is a potential of schedule impacts to accommodate community events over the life of this project. Examples include the Saturday Market, marathons, bike events, Rose Festival, walks, etc. Work with the contractor during the CMGC process to avoid or work around these events if restrictions limit construction activity. This is currently a watch list item.	Coordinate with the community and list events in the contract and adjust schedule accordingly.	Do not model. Very low risk.	Do not model	Do not model	1	1	1	1	1	1	1	1
42	Both	Open	Design / Civil	Other ODOT/State approval requirements - Archeological	If approval is not reached on the I-5 closure approval or this changes there could be delay to the project. Much of this risk is covered in adjacent projects and MOT risks. This risk may occur beyond MOT issues based on other ODOT/state approval requirements. This is a watch list risk.	Work with ODOT to finalize closures and obtain approvals. Risk if the closure request will be more than ODOT wants.	Duplicate with #23, do not model seperately.	Do not model	Do not model	2	1	1	2	2	1	1	2
43	Both	Open	Partnerships and Stakeholders	Local business impacts and staging durations	There is a risk that impacts to local businesses that require revisions to the staging and durations during construction. Continue business outreach and include items such as wayfinding for businesses that remain open during construction.	Actively work with business owners in advance of and during construction.	Currently not in estimate. Model $1million for cost risk.	Do not model	model	4	0	1	2	4	0	1	2

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44	Both	Open	Right-of-Way	Relocation delay	There is a risk associated with the relocation of AMR and Pacific Fruit Company that may cause a delay. AMR must maintain all operations and maintenance through the transition that may complicate logistics. This is tied to Early Work Package #2. Also displacees being able to find a location to relocate where their operation is permittable (AMR has specific requirement for their relocated building).	This work item may be shifted to a subsequent work package to mitigate the delay. Early Notice of Intent (NOI) to property owners where acquisition and relocation will take place no matter what and begin working with those property owners and/or tenants to establish a new location two years in advance. NOI will require pre-approval.	Impact to start of construction NTP. Model for cost and time.	Model	model	2	4	1	5	2	4	1	5
46	Both	Open	Right-of-Way	ROW escalation	The base escalation factor assumes 0% for ROW. There may be up to 10% escalation for ROW. Assume an additional 3% to 5% additional escalation on top of the base ROW cost per annum from 2021.		Use 3%-5% per annum in escalation calculation	Do not model	use escalation calculation	5	0	1	3	5	0	1	3
47	Both	Open	Structures & Geotech	Opportunity to reduce foundation sizes/cost/type through seismic design refinement	There may be an opportunity to reduce foundation sizes/cost/type through seismic design refinement. 40% to 50% of the cost of the bridge is associated with the substructure. There may be up to a 15% savings on the foundation costs on the high end. There are currently 13 shafts at each bascule pier; this may be reduced as the design is refined. Other piers/bents may also see a reduction associated with foundation refinements.		Based on Bing Ma's current analysis, potential cost saving of $5M (Drilled shaft), $3.6M (concrete). Model total cost savings can take it up to $15-20M saving. Save 100 work days on critical path substructure.	Model	do not model, the sensitivity analysis shows that time saving equates to about the $15-$20 saving to be modelled.	5	-4	-4	-20	5	-4	-4	-20
48	Option 2	Open	Structures & Geotech	Opportunity to use full depth precast deck panels in lieu of CIP deck for Arch option	There may be an opportunity to use full depth precast deck panels in lieu of a CIP deck. Precast deck segments are assumed in the base costs for the cable stay. This may reduce risk of material availability and have a potential schedule savings; assume cost is about the same versus a CIP deck. The baseline assumes 120 days for deck placement (6 months). This may require diamond grinding and an overlay. Productivity of CIP deck and weather conditions may increase the schedule opportunity.		Model cost and time. Time impact saving of deck work on east approach critical path.	Model	model	0	0	0	0	1	-3	-1	-2
49	Option 1	Open	Structures & Geotech	Opportunity for alternatives to ground improvements	There may be cost saving alternative to ground improvements associated with soil structure interaction options and a reduction in quantity. Consider pier foundation refinements (longitudinal versus transverse approach), evaluation of a secant pile wall on the west side, and/or potentially reduce depth of GI based on refined geotechnical data (pending). Base cost estimate for arch assumes no ground improvements are necessary.		40% chance that the current ground improvement scope not required. Would need additional analysis that is currently in progress. Tie to Jet grouting on A1815 in schedule.	Model	model	2	-2	-4	-6	0	0	0	0
53	Both	Open	Structures & Geotech	Moveable Bridge - Buy America Requirements	Buy America requirements for movable bridge machinery and electrical system components. In the past, a number of equipment manufacturers could not certify their equipment to the Buy America provisions, so waivers or cost caps were a challenge in movable bridge projects especially projects with predominantly movable bridge scope. Currently, a number of manufacturers are offering components that are Buy America certified and have the appropriate material tracing to meet the requirements. These components, however, are typically double the non-certified components.	Assess current market pricing and Buy America cost cap provisions for non-compliant components to overall bridge project cost. Buy America limits are based on total project cost, so cap of potential costs of non-compliant material may exceed the cost of the movable bridge components for this project and a waiver may not be required.	Model for time. Time impact to mechanical install activities. Uncertainties in the cost model cover for the cost impact.	Model	in cost uncertainty	3	2	1	5	3	2	1	5
54	Both	Open	Environmental & Hydraulics	Existing bridge removal	Partial removal of the existing foundation to a el. -55.0 (NAVD'88) via underwater wire saw has been implemented into the design. Preliminary indications for Army Corp is this is an acceptable approach. Risks are associated with a change in direction from Army Corp/other to removal at a lower elevation, possibly complete removal, or if required by hydraulic analysis. Impact could be renegotiations of permits during construction and/or cost/schedule delays resulting from more complicated removal to achieve permit requirements.	Qualification-based selection of Contractor to include technical proposal on removal of similar foundation types.	Do not model. Monitor. Change to the current assumption could result in drastic change to the project. Exclude.	Do not model	Do not model	1	5	5	5	1	5	5	5

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56	Option 1	Open	Structures & Geotech	Ground improvement Scope	There is a risk that the ground improvement costs may increase beyond the amount assumed in the base. The current base estimate includes around $28.5M for the cable stay associated with the GI activities. It is assumed that arch option does not have GI. This could increase 20-70% beyond the base assumption on the high end. There is a risk of claims associated with ground improvements that may increase costs.		Model of $1-5M above and beyond the general change order range. For time, add up to 2 more months to the GI activity (jet grouting).	Model	model	4	2	1	6	0	0	0	0
58	Both	Open	Structures & Geotech	Moveable Bridge Seismic Performance Requirements - Base Input Increases	There may be cost implications associated with additional features that may be required for the movable bridge portion of the structure as a result of the seismic resiliency requirements. Seismic performance requirements may influence additional costs not included in the base estimate at this time. This risk may also be associated with the base input increases. Assume an additional $1M to $5M.		Impact in uncertainty ranges, do not dupplicate.	Do not model	in cost uncertainty	3	0	4	6	3	0	4	6
59	Both	Open	Structures & Geotech	Vessel protection	There is a risk associated with additional vessel protection that will increase costs. The base has no cost for a debris nose. The risk is that a full vessel protection		Minor risk to model for cost.	Do not model	model	1	0	2	1	1	0	2	1
60	Both	Open	Utilities	Removal and relocation of utilities take longer	There are numerous utilities from different owners that need to be coordinated with the construction activities. The utility owners can take up to three years to establish a re-location plan and 12 months for relocation. If the re-location plan conflicts with the new construction and is already re-located, any secondary re-location maybe are reimbursable. The majority of the risk is on the west side. Major utilities include Lumen/CenturyLink Fiber, PGE, CoP Water Bureau, Trimet traction power and communications, Parks (utility in the parks that is owned by the park). Biggest risk is the Lumen/CenturyLink, as that is on the bridge. The delay quantification is assuming that NTP will be issued even if utility relocation is not completed.	Early engagement, incorporating relocation into design. Some utilities such as University of Oregon and Trimet would prefer that the contractor does the relocation which would minimize the conflicts. Develop agreements with utility owners on the responsibility of timing and payment.	Current assumptionis that there is enough time to complete relocations prior to NTP (March 2025). Small risk of delay to NTP at this moment. Cost risk is in the estimating uncertainty.	Model	in cost uncertainty	2	1	1	2	2	1	1	2
61	Both	Open	Utilities	CSO force main	There is an existing 30" and 42" force main that is in the proximity of the west bridge approach that goes across the Willamette River. Impacts due to work bridge construction may damage the existing pipes. A portion of the CSO cannot be simply relocated and if one portion is impacted, then the entire system needs to be replaced. The plan is to project the force main to prevent damage during construction.		Low risk of occuring. Damage would result in potential replacement of the whole line, which would result in more than a year of replacement in place. However, there would be temporary solutions. So there would be minimal delay to the project itself. Model minor risk to west side demo. Cost is on the contractor.	Model	Do not model	1	1	0	1	1	1	0	1
62	Option 1	Open	Utilities	Ground improvements leads to additional utility relocation requirements	There is a risk associated with the ground improvements that may damage the existing utilities. Could result in relocation of outfall. Outfall serves BES and ODOT.		If GI required, then this risk occurs. Tie to GI probability risk. Cost impact would be $225k. Not a schedule risk.	Do not model	model	2	1	1	2	0	0	0	0
63	Both	Open	Utilities	Additional reimbursable utility relocation costs	There may be additional costs associated with reimbursable utility relocations that are not accommodated in the current base estimate. Design costs, agency overhead, staff, and other ancillary costs may not be captured at this time. There is a risk up to 50% additional costs of the $1.26M included in the base estimate.		For tracking. At this point, not a big risk. Cost is already in the utility uncertainty range.	Do not model	in cost uncertainty	1	1	1	1	1	1	1	1
64	Both	Open	Funding	Lack of full project funding	Scenario where it takes up to 6 more months to obtain funding. Design would still progress, would still impact NTP. Excludes the risk that lack of funding will "kill the project."	Increase focus on securing funds during 2022 and forward. Continue to seek federal, state, regional and local funding sources. Secure funding for the entire project or greater percentage of project before the beginning. An alternative is to downsize the project. Early advancement of type selection, refinement of the extent of GI, and reduction of long-span bridge length.	Time related cost only. Only model for time. (Cost impact is due to escalation calculation)	Model	in SDF	3	3	3	9	3	3	3	9
65	Both	Open	Construction - Market	Infrastructure package causes strain on supply chain	Impacts include higher material prices and potential schedule implications.	Lock up fabricator during design: likely pay more due to negotiated price but can get schedule surety. Potential early material procurement.	Assume this is within the uncertainty range for market conditions and escalation.	Do not model	In Market uncertainty	4	0	5	10	4	0	5	10

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66	Both	Open	Environmental & Hydraulics	Extreme flood event damages	Destroys portions of contractor's workbridge access to Piers 6 & 7. Cannot install replacement pile until next "fish window". Additional time waiting for fish window and the repair time.	Specify a minimum flood event (ie. 10 year flood) for the contractor to use as basis of design for workbridge.	Less than 5% probability. Time delay to substantial completion.	Model	Do not model	1	2	0	1	1	2	0	1
67	Both	Open	Construction - Market	Steel material cost and availability	Temporary steel for workbridge and perched cofferdam material cost increases and availability. This leads to increased costs and delays in obtaining materials due to supply chain issues.	The CMGC contractor needs to expedite the submittal/approval or design schedule of workbridge and cofferdams and order the materials as soon as	Minor time risk. Cost in uncertainty ranges.	Model	in cost uncertainty	1	2	2	2	1	2	2	2
69	Both	Open	Environmental & Hydraulics	Shaft installation during fish window - Opportunity.	Current assumptions are Pier 6 & 7 shafts can be installed during an extended in-water work window in open water. The schedule will be delayed waiting for the "fish window". Added cost of "containment" is required.	Work with permitting agencies to validate current assumptions.	Exclude from analysis as this would deviate from the current model. Keep in RR to monitor.	Do not model	Do not model	1	-1	-1	-1	1	-1	-1	-1
70	Both	Open	Right-of-Way	Property acquisition issues	Increases costs.	Early start on condemnation activities, target property needs narrowly.	Do not model. Estimate range sufficient. Keep in RR to track.	Do not model	in cost uncertainty	1	1	1	1	1	1	1	1
71	Both	Open	Contracting and Procurement	GC project manager turnover	Potential cost and time impacts due to loss of continuity.	Add GC contract disincentives for replacing key positions.	20% chance. Model for time only.	Model	in SDF	2	2	2	4	2	2	2	4
73	Both	Open	Funding	Public support lessening	Due to ongoing pandemic and lack of urgency for earthquake threat, there is a risk of public pushback against local vehicle registration fee; weak support for project funding requests.	Maintain and increase public engagement with project through communications, activities, briefings.	$150M may be the amount of local funding required. Impact in #64, so do not model and duplicate.	Do not model	Do not model	2	4	5	9	2	4	5	9
75	Both	Open	Partnerships and Stakeholders	Departure of key project staff from team	Leads to a drop-off in project's effectiveness in engaging public. Staff changes (such as Mike Pullen's retirement in March 2022) could lead to reduced effectiveness.	Provide adequate time to recruit and train new project staff.	Model for cost and time.	Model	model	3	1	1	3	3	1	1	3
79	Option 2	Open	Construction	Arch rib construction	Arch superstructure construction schedule is on the project critical path. This is because arch rib erection has a finish-start tie with the bent 7 bascule pier (as compared to a finish-finish tie with the cable-stay superstructure option). This delays the start of arch rib erection until April of '28. The stick erected arch and deck and finish work over highway, ramps, and railroad has an aggressive 16 month duration. Because of the potential risks of delay working over highway and railway, there is risk of delay to project completion. Note that the presented schedules show 4 months of float for the cable stay option and finishes 2 months earlier than the arch option.	Temporary arch support at bent 6 to start arch rib construction earlier.	Statement, not risk. The highway risk and IWWW windows will address this risk.	Do not model	Do not model	0	0	0	0	1	2	2	2
80	Both	Open	Construction - Market	Pipeline challenges	Risk of material delays due to pipeline challenges. Delays to construction and higher material prices.	Strong "Buy America" spec language. Market should be corrected by bid time.	Keep in RR to monitor. Impacts modeled elsewhere.	Do not model	Do not model	1	2	2	2	1	2	2	2
82	Both	Open	Contracting and Procurement	International contractors	The Burnside Bridge will likely attract international contractors. Includes concern with COVID international travel restrictions may make it difficult for senior management to travel to and from the jobsite. It will be difficult to manage the work.	Restrictions that will be in place when Burnside Bridge is bidding and under construction involves ambiguity.	Model time and cost.	Model	in SDF	1	1	2	2	1	1	2	2
83	Both	Open	Construction	Erecting steel arch alongside the UPRR live tracks with large crane	Risk of delay erecting the steel arch over and alongside the UPRR live tracks. Erecting the steel arch rib will require a high-capacity crane with a boom height of 250'-300'. UPRR will not allow erection with an oncoming train if the boom could fall and foul the tracks. This would cover much of the arch span erection. Note that cable-stay segment erection can be transferred across the deck and erected from the deck, limiting this risk to only when erecting directly over tracks. Delays to arch construction impacting schedule and cost.		Model to arch superstructure work. Cost in time delay.	Model	in SDF	2	1	1	2	3	2	2	6

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84	**Both**	Open	Construction	Construction during live traffic due to crane	Same concerns as above with UPRR. Risk of live traffic on I5NB & SB and 3 ramps in reach of falling crane boom while hoisting arch ribs and bracing with a long boom		Model minor time impact.	Model	in SDF	1	1	1	**1**	1	1	1	**1**
86	**Both**	Open	Right-of-Way	ROW acquisition	ROW acquisition and certification are not complete in time to demo AMR building for 2025 IWW/Early work.	Start ROW design and appraisals in early 2023.	Risk impact in 44. Duplicate impact. Do not model.	Do not model	Do not model	1	1	1	**1**	1	1	1	**1**
87	**Both**	Open	Environmental & Hydraulics	Pile driving not being done within IWWW	Complete in-water work (especially pile driving) during approved IWW. Schedule delay. NMFS unlikely to approve an IWW extension for pile driving.	Contractual incentives to meet IWW schedule.	Statement, not risk.	Do not model	Do not model	1	1	1	**1**	1	1	1	**1**
88	**Both**	Open	Environmental & Hydraulics	Wire-saw demolition obstructions	Wire-saw demolition obstructions (wood forms) and highwater conditions that could risk delay of schedule and having cost increase.	Potential exploration of working year-round. (Currently activity not on critical path.	Model for time. Cost in CO.	Model	in CO	2	2	1	**3**	2	2	1	**3**
89	**Both**	Open	Environmental & Hydraulics	Aquatic mitigation credits	Loss of local service area mitigation bank that could risk cost increase.	Secure mitigation credits.	Extremely unlikely to delay construction in water permit. More likely would be a cost increase/negotiation. Model on top of river mitigation cost line item.	Do not model	model	2	0	2	**2**	2	0	2	**2**
90	**Both**	Open	Design / Civil	Bridge/roadway cross section design changes	Risk that current assumption (4 lanes w/ reversible lane) may change as a result of 3rd party input/design requirements. Adding the 5th lane back into the design would add cost.		Low risk due to budget constraints. If this risk occurs, there will not be a project. Do not model. Exclude.	Do not model	Do not model	1	5	5	**5**	1	5	5	**5**
91	**Both**	Open	Design / Civil	Bus stop/dwell location	The current assumption assumes that both move off of the bridge. There seems to be consensus about our proposed bus stop west of the bridge, but the decision is not set yet. We have not identified a bus dwell location off of the bridge. Adding it to bridge design would add cost.		Bus stop will not be a risk. Bus dwell could occur. Cost is $1m-$3m range. Model for cost only.	Do not model	model	5	0	1	**3**	5	0	1	**3**
92	**Both**	Open	Design / Civil	Reversable Lane Design	Additional time, cost and permitting risk to finalize design and install reversable lane.	Work with city and ODOT to come to agreement on facility design that would receive approvals.	20% likelihood. Cost would be $1m-$2m. Will not delay NEPA process.	Do not model	model	2	0	1	**1**	2	0	1	**1**
97	**Option 2**	Open	Structures & Geotech	Reduction in tied arch length - Opportunity	Reduction in tied arch length offset with increased conventional girder approach span length that could porentially reduce base cost. Tied with Ground Improvement design.	Additional engineering investigation, input from CMGC team.	Model for cost saving. Model time saving to arch superstructure.	Do not model	model	0	0	0	**0**	4	-2	-2	**-8**
100	**Both**	Open	Structures & Geotech	Refinement and optimization of in-water bascule pier substructure	Continued refinement and optimization of in-water bascule pier substructure (shape, configuration, etc.) to potentially reduce base cost.	Additional engineering investigation, input from CMGC team.	Monitor for now. Need more analysis. Do not model.	Do not model	Do not model	1	1	1	**1**	1	1	1	**1**
101	**Both**	Open	Right-of-Way	Appraisals	Workload/timeline for appraisers. Appraisals are taking between 90 and 150 days before approved by client.	Have as much of a timeline as possible.	Model to ROW delay. Cost is in time delay.	Model	in SDF	1	2	1	**2**	1	2	1	**2**
102	**Both**	Open	Right-of-Way	Title clearing	Lenders are taking longer to review and release liens to closing agencies in order to be able to record and obtain possession.	Have as much of a timeline as possible.	Model to construction NTP. Model time and cost. Similar type of risk as #44. Cost for workarounds.	Model	model	2	4	1	**5**	2	4	1	**5**
103	**Both**	Open	Right-of-Way	Enchroachment impacts	Where adjoining property owners are utilizing the existing ROW and there are improvements located within the existing ROW.	Work with project and ROW owner and determine steps to clear ROW for project and begin working with the encroachment as quickly as possible.	Not a time risk, as there is enough time within the 2 year ROW period to resolve issues. There will likely be a cost impact to resolve the issues. Cost is up to $1M.	Do not model	model	2	0	1	**1**	2	0	1	**1**
105	**Option 1**	Open	Environmental & Hydraulics	New river outfall required	Additional cost for relocation of outfall.	Provide space to accommodate partial relocation and maintain current outfall location.	Model minor cost risk of up to $500k.	Do not model	model	1	0	1	**1**	0	0	0	**0**
107	**Both**	Open	Utilities	Unforeseen utility conflicts with construction	There is a risk of increased cost and schedule.	Some is currently doing investigative work right now to identify unforeseen utlities. This work should greatly reduce the risk.	Risk is biggest in the park, so tie risk to demo/site/foundation work near park (which is not on the critical path). Model for both cost and time.	Model	model	1	1	1	**1**	1	1	1	**1**

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108	Both	Open	Right-of-Way	Easement acquisition	Temporary easements delayed or difficult to obtain. This will impact schedule.	Early procurement of easements.	Very low risk. Should not impact schedule. There are workarounds to mitigate. Keep in RR to track.	Do not model	Do not model	1	1	1	1	1	1	1	1
110	Both	Open	Construction	Weather delays	Weather delays would increase the schedule of the project.	Add to contingency (there will be delays). Provide protection for MC in contracts.	Model for time impact (assume 1 week of delay per year->up to 4 weeks for total project).	Model	in SDF	5	1	1	5	5	1	1	5
111	Both	Open	Utilities	Utility Planning Delay due to Funding	Currently, planning to start discussion and planning with utilitities for relocation. Risk that utilities will not even start planning until project funds are in place.	To mitigate, project would pay the utilities to start working now.	Cost impact due to time delay only (escalation). For modeling, this will simply be tied to the overall funding delay risk (#64), so do not double count. (Only model the time difference gap between funding and today's date).	Model	in SDF	1	5	5	5	1	5	5	5
112	Option 2	Open	Construction	Accelerated bridge construction ABC	Accelerated Bridge Construction ABC of eastside arch over interstate highways and over railroads. This would potentially save time on the project, but increase direct cost (which may lead to time cost saving).	Early meetings and simulated "walk-thru" of construction staging with contractor.	Cost range is $5m-$15m. Model opportunity/risk for time and cost.	Model	model	0	0	0	0	1	-2	3	1
114	Both	Open	Structures & Geotech	Geotechnical inputs not approved	Seismic SSI geotechnical inputs and TH data are not approved by ODOT/ FHWA. This would lead to re-design, and perhaps a more expensive structure required.	Determine if "buyoff" to seismic geotechnical input and design approach is needed from ODOT and FHWA and if so, obtain early.	Monitor. Impact in risk 23.	Do not model	Do not model	1	1	-1	0	1	1	-1	0
117	Both	Open	Contracting and Procurement	Contractor Delay Design	CMGC is onboard too late. Thereby delaying completion of 30% design. Risk is getting ODOT onboard.	Mitigation to carry design for both selections longer.	50% chance CMGC NTP will be delayed. Model cost only to PE (A&E). A&E would increase current cost by a few months and up to $2.5M.	Do not model	model	2	0	1	1	2	0	1	1
118	Both	Open	Contracting and Procurement	Need to Rebid CMGC due to GMP Negotiations	Failing to come to an agreed on GMP price. The project would then change to Design-Bid-Build. This would add time to change to DB procurement.		Model time impact GMP negotiation activity. Cost in time.	Model	in SDF	1	4	4	4	1	4	4	4
122	Both	Open	Construction	Harbor Wall Reconstruction is currently not in the estimate	Potential for damager to the harbor wall by contractor. Not a risk to the owner, but the contractor could price this into their bid.		Model for cost at $1M-$2M range.	Do not model	model	2	0	1	1	2	0	1	1
124	Both	Open	Construction	UPRR May Require Double Flaggers	Current estimate assumes one flagger. RR may request more.		Model for cost impact ($1.8M).	Do not model	model	2	0	1	1	2	0	1	1
126	Option 2	Open	Structures & Geotech	Removal of Base Isolation Bearings	Remove of isolation bearings with standard bearings.		Model cost opportunity for Option 2.	Do not model	model	0	0	0	0	5	0	-1	-3
127	Both	Open	Construction	Quality Risk of Steel Fabrication	Steel fabrication quality issues. Would result in delay to completion of long span bridge and bascule bridge.		20% risk of occurance. Model to superstructure of east long span and bascule bridges. Cost in time.	Model	in SDF	2	2	2	4	2	2	2	4
128	Option 1	Open	Structures & Geotech	Soil mixing	Opportunity to use soil mixing instead of jet grouting in Option 1 ground improvement.		This is a negative correlation to opportunity #49. Range of $10-15 million savings.	Do not model	model	3	0	-3	-5	0	0	0	0
129	Both	Open	Structures & Geotech	Shaft anomalies	Shaft anomalies will increase schedule and cost of the project.	Specs to control quality; csl tube placement; at worst, shaft must be abandoned and redesigned / replaced. Usually, repairs can be affected.	Model time impact to overall project. Could be on any drilled shaft.	Model	Do not model	1	2	0	1	1	2	0	1
130	Both	Open	Environmental & Hydraulics	Scour contaminated sediments	Contamination would incur higher cost.		20% chance. Model for cost only.	Do not model	model	2	0	1	1	2	0	1	1

Earthquake Ready Burnside Bridge Project

Project Risk Register

REV : 0

DATE : January 16, 2022

Score	1	2	3	4	5
Probability	< 10%	<> 10% -50%	<> 50% -75%	<> 75% -90%	> 90%
Cost	< $5m	< > $5m-$10m	< > $10m-$15m	< > $15m-$25m	> $ 25m
Schedule	< 1 month	< > 1 - 3 months	< > 3 - 6 months	< > 6-12 months	> 12 months

Rating	< 3 (Low)	3 > < 9.5 (Medium)	> 9.5 (High)

WkSh Risk ID	Option	Status	RBS	Risk	Risk Description	Notes/Mitigation	Risk Modeling Notes	Schedule Model	Cost Model	Option 1 Risk Score				Option 2 Risk Score			
										Probability Score	Time Impact Rating (A)	Cost Impact Rating (B)	Current RR Rating	Probability Score	Time Impact Rating (A)2	Cost Impact Rating (B)2	Current RR Rating2
131	**Both**	Open	Construction	Vibration	Vibration monitoring requirements impacts could result in additional work constraints and claims to the project.		Model for cost of vibration mitigation measures (currently not in estimate).	Do not model	model	1	0	1	**1**	1	0	1	**1**
132	**Option 1**	Open	Construction	Type of Crane next to RR	Risk of tower crane may not be allowed by the RR.		Model for cost impact.	Do not model	model	2	0	1	**1**	0	0	0	**0**
133	**Both**	Open	Environmental & Hydraulics	US Coast Guard more accommodating	US Coast Guard more accommodating. Opportunity such as allowing single leaf demo; additional flexibility, etc.		Model for cost saving. Use 15% probability.	Do not model	model	2	0	-2	**-2**	2	0	-2	**-2**
134	**Both**	Open	Right-of-Way	Saturday Market Relocation	Saturday Market Relocation costs and scope may increase.		More of a public relation risk.	Do not model	Do not model	1	1	1	**1**	1	1	1	**1**
135	**Both**	Open	Construction	Adjacent Project - City Ramp to Esplanade	City's ramp project occurs at the same time. Resulting in additional coordination during construction.		Currently, this project should occur after EQRB, so the risk of happening is low. Potential impact to east approach critical activities. Cost in time.	Model	Do not model	1	1	1	**1**	1	1	1	**1**
136	**Both**	Open	Construction	Pandemic Impact on Field Construction	Includes for lack of workers due to vaccine requirements.		Model for time. Cost in time.	Model	in SDF	1	1	1	**1**	1	1	1	**1**
138	**Both**	Open	Construction	Work Bridge takes longer due to pile driving	Pile driving takes longer.		Model for time to work bridge. Cost is with time delay.	in duration uncertainty	in SDF	1	2	2	**2**	1	2	2	**2**

APPENDIX B

B - Risk Workshop Attendees

Earthquake Ready Burnside Bridge	Earthquake Ready Burnside Bridge CRA Workshop Attendees		Day 1		Day 2	Day 3			Day 4			Day 5		
Name	**Role**	**E-mail Address**	**Kickoff Presentation**	**Schedule/Cost Estimate Review & Ranging**	**Cost Estimate Review & Ranging**	**Risk Register: Risks & Scoring Review (Transporation/ Traffic Design)**	**Risk Register: Risks & Scoring Review (Geotechnical Risks)**	**Risk Register: Risks & Scoring Review (Environmental /Permitting**	**Risk Register: Risks & Scoring Review (Third Party/Political Risks)**	**Risk Register: Risks & Scoring Review (Utility Risks)**	**Risk Register: Risks & Scoring Review (ROW & Legal Risks)**	**Risk Register: Risks & Scoring Review (Construction Risks)**	**Risk Register: Risks & Scoring Review**	**Workshop Summary**
Eric Ho	Risk Lead	ericho@vms-inc.com	X	X	X	X	X	X	X	X	X	X	X	X
Desmond Dam	Risk Assistant	desmond.dam@vms-inc.com	X	X	X	X	X	X	X	X	X	X	X	X
Brett Schneider	Construction LD	brett.scllc@gmail.com	X	X	X	X	X	X	X	X	X	x	x	X
Megan Neill	Project Manager	megan.neill@multco.us	X	X	X	X			X	X	X	X	X	X
Jon Henrichsen	Transport Director	jon.p.henrichsen@multco.us	X		X	X	X	X				X	X	X
Andrew MacKendrick	Legal	andrew.mackendrick@multco.us	X							X	X			
Emily Miletich	Construction Manager	emily.miletich@multco.us		X	X	X	X	X	X	X	X			X
Mike Pullen	Public Outreach	mike.j.pullen@multco.us	X			X				X	X	X	X	X
Nick Baldwin-Sayre	Legal	nick.baldwin-sayre@multco.us	X							X	X			
Courtney Lords	Legal	courtney.lords@multco.us	X							X	X			
Mike Baker	Project Manager	Mjba@deainc.com	X	X	X	X	X	X	X	X	X	X	X	X
Suzanne Carey	Deputy Project Manager	sxc@deainc.com	X	X	X	X	X	X	X	X	X	X	X	X
Gavin Oien	Civil Lead	gjo@deainc.com	X	X	X	X	X	X	X		X	X	X	
Kevin Sakai	Ind Estimator	kevin@ott-sakai.com	X	X		X	X	X	X	X	X	X	X	
Charlie McCoy	Ind Estimator	charlie@ott-sakai.com	X	X	X	X	X	X	X	X	X	X	X	
Bing Ma	Ind Estimator	bing@bingmaconsultant.com	X	X	X	X	X	X	X	X	X	X	X	
John Armeni	Ind Estimator	john.armeni@armeniconsulting.com	X	X	X				X	X	X	X	X	
Brian Gensheimer	Ind Estimator	brian.gensheimer@armeniconsulting.com												
Scott Phelan	Structures Lead	scott.phelan@deainc.com	X	X	X	X	X	X	X	X	X	X	X	X
Nick Altebrando	Moveable Lead	Nicholas.Altebrando@stvinc.com	X		X	X	X	X	X	X	X	X	X	X
Mark Dorn	SME	mark.dorn@deainc.com	X	X	X	X	X	X	X	X	X	X	X	
Greg Griffin	SME (Structures)	greg.griffin@deainc.com	X											
Jake Menard	SME (Structures)	jake.menard@deainc.com												
Scott Schlechter	Geotechnical	sschlechter@gri.com	X				X	X						
Kristine Marshall	Environment	kristine.marshall@deainc.com	X											
Shelly Alexander	Traffic	sma@deainc.com	X			X								
Christina Weber	Utilities & ROW	cmw@deainc.com	X						X	X				
Barbara Moffat	Technical Lead	barbara.moffat@deainc.com	X	X	X	X	X	X	X	X	X	X	X	X
Heather Catron	Policy Advisor	heather.catron@hdrinc.com												
Steve Drahota	Project Manager	steven.drahota@hdrinc.com	X	X	X	X	X	X		X	X	X	X	X
Eric Rau	Tied Arch Lead	eric.rau@hdrinc.com	X	X	X	X	X	X	X	X	X	X	X	
Tony Messemer	Cable Stay Lead	anthony.messmer@hdrinc.com	X	X	X		X	X				X	X	X
Michael Lamont	Structures Lead	michael.lamont@hdrinc.com	X	X	X		X	X				X	X	X
Keith Griesing	Moveable Lead	kgriesing@hardestyhanover.com												
Peter Roody	Moveable Lead	proody@hardestyhanover.com;	X	X	X							X	X	
Rebecca Bautista	Structures	rebecca.bautista@hdrinc.com	X				X	X				X	X	
Victoria Morris	Design Lead	victoria.morris@hdrinc.com	X	X	X		X	X	X	X	X	X	X	
Reg Carson	Constructability	reg@kmccostandrisk.com	X	X		X	X	X	X	X	X	X	X	X
Ralph Salamie	Constructability	ralph@kmccostandrisk.com	X	X	X	X	X	X	X	X	X	X	X	X
Brian Bauman	Environmental	brian.bauman@hdrinc.com												
Steve Dickenson	Geotechnical	sed@newalbiongeotechnical.com	X			X	X	X						
Park Piao	Geotechnical	rpp@shanwil.com					X	X						
Ryan LeProwse	Traffic	rleprowse@parametrix.com				X								
Cory Burlingame	Utilities	cory.burlingame@cassoinc.com	X						X					
Leigh Enger	ROW	leigh.enger@hdrinc.com	X											
Jason Ruth	Peer Review/Economist	jason.ruth@jacobs.com	X	X	X	X								
Nurez Damani	Peer Review/Economist	nurez.damani@jacobs.com	X	X	X	X			X			X	X	
Ben Kamph	Peer Review/Economist	ben.kamph@jacobs.com	X	X	X	X			X	X	X	X	X	
Rick Hults	Estimator	rick.hults@jacobs.com	X	X	X	X	X	X	X			X	X	X
Keith Griesing	Movable Lead	kgriesing@hardestyhanover.com	X	X	X							X	X	
Steve Katko	Senior Project Manager	skatko@parametrix.com			X	X								
James Shamrell	Senior Engineer	jshamrell@parametrix.com				X								
Pat Thayer	ROW Lead	Patricia.Thayer@hdrinc.com								X				

APPENDIX C

C - Risk Workshop Agenda

EARTHQUAKE READY BURNSIDE BRIDGE

BETTER – SAFER – CONNECTED

Multnomah County is creating an earthquake-ready downtown river crossing.

COST RISK ASSESSMENT WORKSHOP

Project:	Earthquake Ready Burnside Bridge
Subject:	CRA Workshop
Date:	**January 10-14, 2022**
Time:	Varies by Day (noted in agenda below)
Location:	Zoom Virtual Meeting

ATTENDEES:

Multnomah County		
Megan Neill, Project Manager	Emily Miletich, Construct. Mgr.	Nick Baldwin-Sayre, Legal
Jon Henrichsen, Transport. Dir	Mike Pullen, Public Outreach	Courtney Lords, Legal
Andrew MacKendrick, Legal		
Owner Representative		
Mike Baker, Project Manager	Charlie McCoy, Ind Estimator	Greg Griffin, SME (structures)
Suzanne Carey, Deputy Proj. Mgr.	Bing Ma, Ind Estimator	Jake Menard, SME (structures)
Gavin Oien, Civil Lead	John Armeni, Ind Estimator	Scott Schlechter, Geotechnical
Brett Schneider, Construction LD	Brian Gensheimer, Ind Estimator	Kristine Marshall, Environment
Eric Ho, Risk Lead	Scott Phelan, Structures Lead	Shelley Alexander, Traffic
Desmond Dam, Risk	Nick Altebrando, Moveable Lead	Chris Weber, Utilities & ROW
Kevin Sakai, Ind Estimator	Mark Dorn, SME	Barbara Moffat, Technical Lead
NEPA		
Heather Catron, Policy Advisor	Peter Roody, Moveable	Brian Bauman, Environmental
Steve Drahota, Project Manager	Rebecca Bautista, Structures	Steve Dickenson, Geotech
Eric Rau, Tied Arch Lead	Victoria Morris, Design Lead	Park Piao, Geotech
Tony Messemer, Cable Stay Ld	Steve Katko, Civil Lead	Ryan LeProwse, Traffic
Michael Lamont, Structures Ld	Reg Carlson, Constructability	Cory Burlingame, Utilities
Keith Griesing, Moveable Lead	Ralph Salamie, Constructability	Leigh Enger, ROW
3rd Party Peer Review/Economist		
Jason Ruth	Nurez Damani	Ben Kamph

PURPOSE:

Update Project risks and associated costs to arrive at an overall project cost and risk profile that is consistent with where the project is today.

EARTHQUAKE READY
BURNSIDE BRIDGE

Multnomah County is creating an earthquake-ready downtown river crossing.

BETTER – SAFER – CONNECTED

AGENDA:

Date	Time	Agenda Topic	Topic Lead
Monday **1/10** 8:00 AM- 4:30 PM	8:00 AM - 8:15 AM	**Welcome & Introductions**	Megan Neill and Mike Baker
	8:15 AM - 8:45 AM	**Workshop Overview** • Goals & Objectives • Risk Process Overview • Review of Reference Materials	Eric Ho
	8:45 AM - 9:45 AM	**Project Overview** • Design • Cost and Schedule Overview	Steve Drahota Eric Ho and Brett Schneider
	9:45 AM - 10:00 AM	**Overview of Cost Estimate Peer Review Results**	Jason Ruth
	10:00 AM - 10:15 AM 15-minute break		
	10:15 AM - Noon	**Schedule Review & Ranging** • Schedule Basis, Assumptions, Constraints, Critical Path	Eric Ho and Brett Schneider
	Noon -1:00 PM Lunch Break		
	1:00 PM - 4:30 PM	Continue **Schedule Review & Ranging** **Cost Estimate Review & Ranging** *NOTE: 15-minute break around 2:45 PM.*	Eric Ho and Brett Schneider
Tuesday **1/11** 1:00 PM - 4:30 PM	1:00 PM - 4:30 PM	Continue **Cost Estimate Review & Ranging** *NOTE: 10-minute break around 2:45 PM.*	Eric Ho
Wed. **1/12** 8:00 AM - 4:30 PM	8:00 AM - 9:30 AM	**Risk Register:** Risks & Scoring Review • **Transportation/Traffic Design:** Discipline Specific Attendees: Shelly Alexander (OR) and Ryan LeProwse (NEPA)	Eric Ho
	9:30 AM -9:40 AM Transition of meeting participants; 10-minute break		
	9:40 AM - Noon	**Risk Register:** Risks & Scoring Review • **Geotechnical Risks:** Discipline Specific Attendees: Scott Schlechter (OR), Steve Dickenson (NEPA), Park Piao (NEPA)	Eric Ho

Date	Time	Agenda Topic	Topic Lead
	Noon -1:00 PM Lunch Break		
	1:00 PM – 2:30 PM	**Risk Register:** Risks & Scoring Review • **Environmental/Permitting Risks:** Discipline Specific Attendees: Kristine Marshall (OR), Brian Bauman (NEPA)	Eric Ho
	2:30-2:40 Transition of meeting participants; 10-minute break		
	2:40 PM - 4:30 PM	**Risk Register:** Risks & Scoring Review • **Third Party/Political Risks**	Eric Ho
Thursday **1/13** 1:00 PM - 4:30 PM	1:00 PM - 2:30 PM	**Risk Register:** Risks & Scoring Review • **Utility Risks:** Discipline Specific Attendees: Chris Weber (OR), Cory Burlingame (NEPA)	Eric Ho
	2:30-2:40 Transition of meeting participants; 10-minute break		
	2:40 PM - 4:30 PM	**Risk Register:** Risks & Scoring Review • **ROW & Legal Risks:** Discipline Specific Attendees: Chris Weber (OR), Leigh Enger (NEPA), Nick Baldwin-Sayre (MC Attorney), Courtney Lords (MC Attorney), Andrew MacKendrick (MC Attorney)	Eric Ho
Friday **1/14** 8:00 AM - 4:30 PM	8:00 AM - noon	**Risk Register:** Risks & Scoring Review – Construction Risks *NOTE: 15-minute break around 9:45 AM.*	Eric Ho
	Noon - 1:00 PM Lunch Break		
	1:00 PM - 2:30 PM	**Risk Register**: Risks & Scoring Review	Eric Ho
	2:30-2:40 Transition of meeting participants; 10-minute break		
	2:40 PM - 4:30 PM	**Workshop Summary:** Major Preliminary Observations, Action Items, Reports Timelines, Close Out	Eric Ho

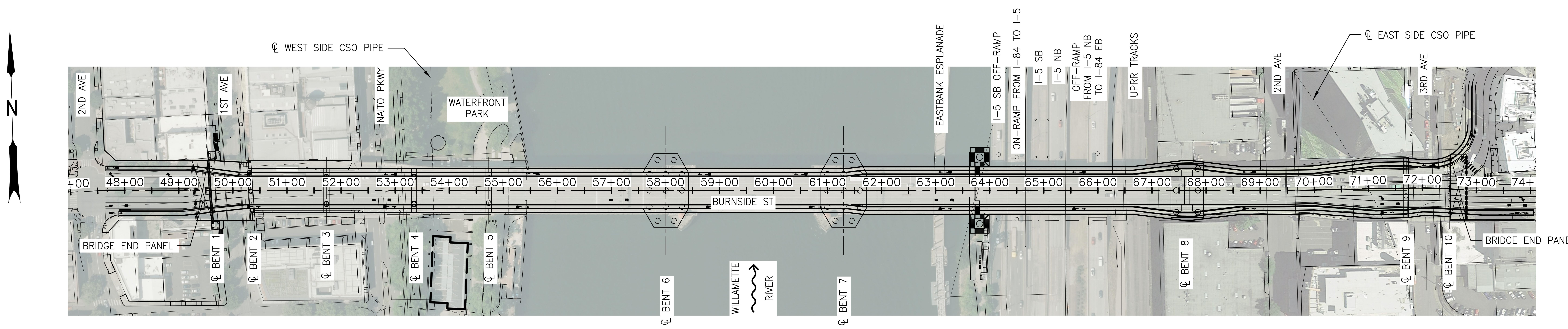
REFERENCE DOCUMENTS:

The following documents will be available prior to the workshop:

- NEPA Risk Register and questionnaire for new risks (Mid-December)
- Current Design Plan Sheets (Mid-December)
- Current Base Costs and Project Schedule
- NEPA reports
- Cost Estimate Peer Review Documents

APPENDIX D

D - Option 1 Plans



PLAN

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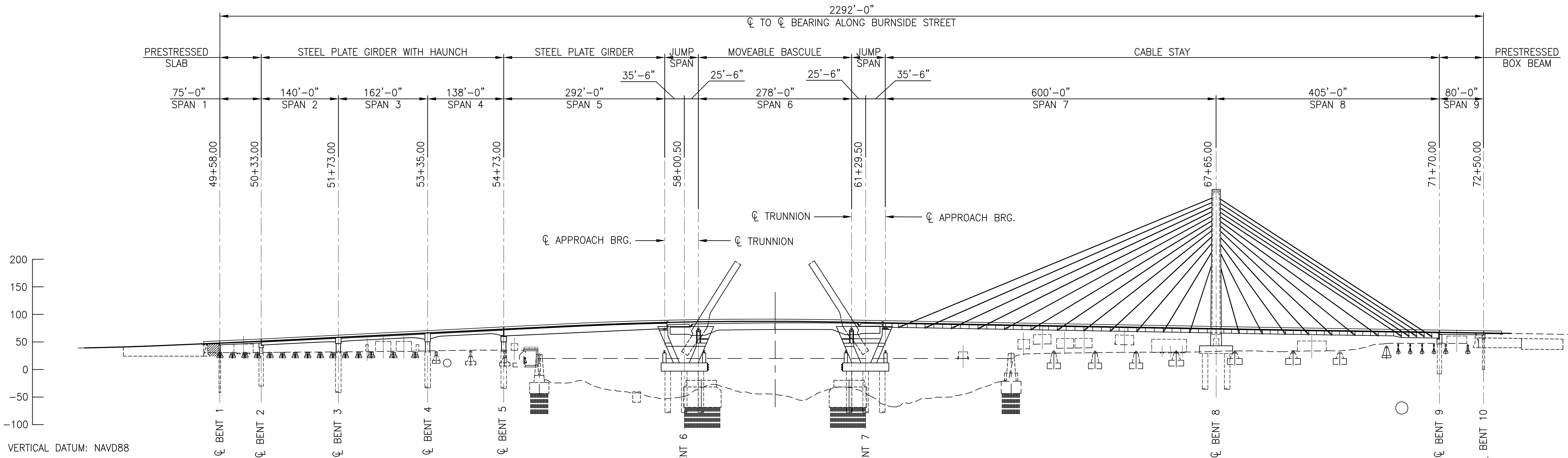


ELEVATION

SCALE: 1"=100'

CONCEPTUAL PLANS
NOVEMBER 2021

Earthquake Ready Burnside Bridge

Replacement Movable Bridge (Bascule)
With Refined Long-Span Cable Approach
MULTNOMAH COUNTY

DATE: *11/2021* PROJECT NO.:

MULTNOMAH COUNTY
DEPARTMENT OF COMMUNITY SERVICES
TRANSPORTATION DIVISION
1620 S.E. 190th AVE. PORTLAND, ORE. 97233-5999

COUNTY ENGINEER

DESIGNED BY: –
DRAFTED BY: –
CHECKED BY: –

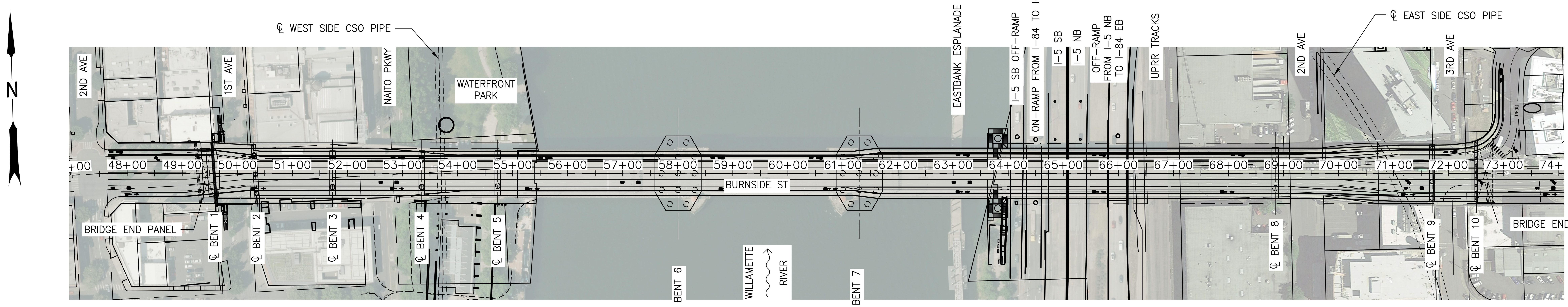
REVISIONS

NO.	DATE:	

Sheet No. *BR01*

APPENDIX E

E - Option 2 Plans



PLAN
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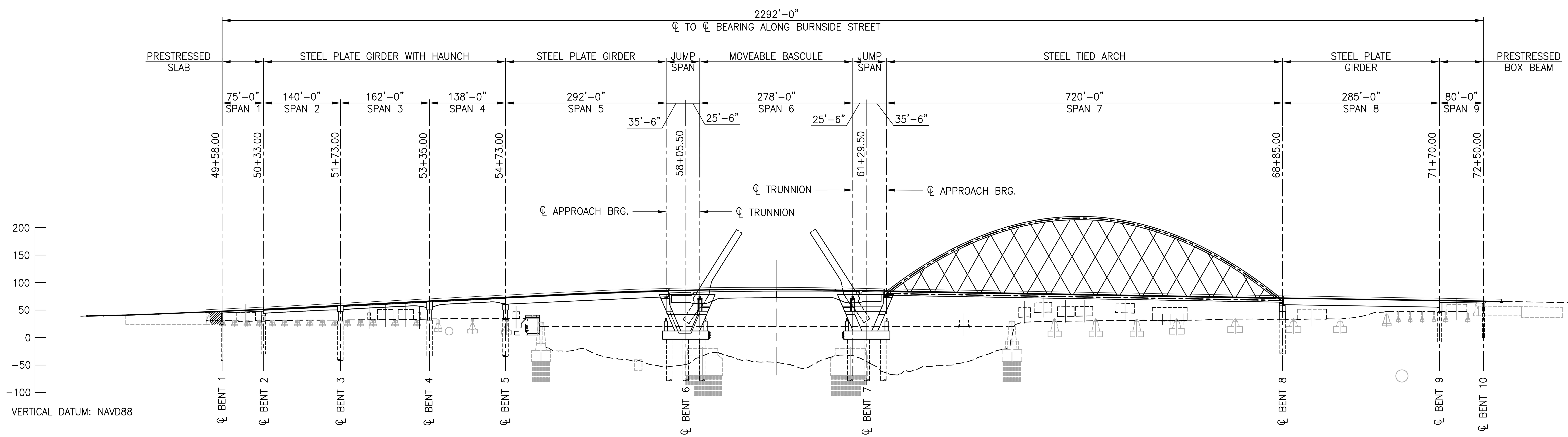


ELEVATION
SCALE: 1"=100'

CONCEPTUAL PLANS
NOVEMBER 2021

Earthquake Ready Burnside Bridge

Replacement Movable Bridge (Bascule) With Refined Long-Span Arch Approach

MULTNOMAH COUNTY

DATE: *11/2021* PROJECT NO.:

MULTNOMAH COUNTY
DEPARTMENT OF COMMUNITY SERVICES
TRANSPORTATION DIVISION
1620 S.E. 190th AVE. PORTLAND, ORE. 97233-5999

COUNTY ENGINEER

DESIGNED BY: –
DRAFTED BY: –
CHECKED BY: –

REVISIONS

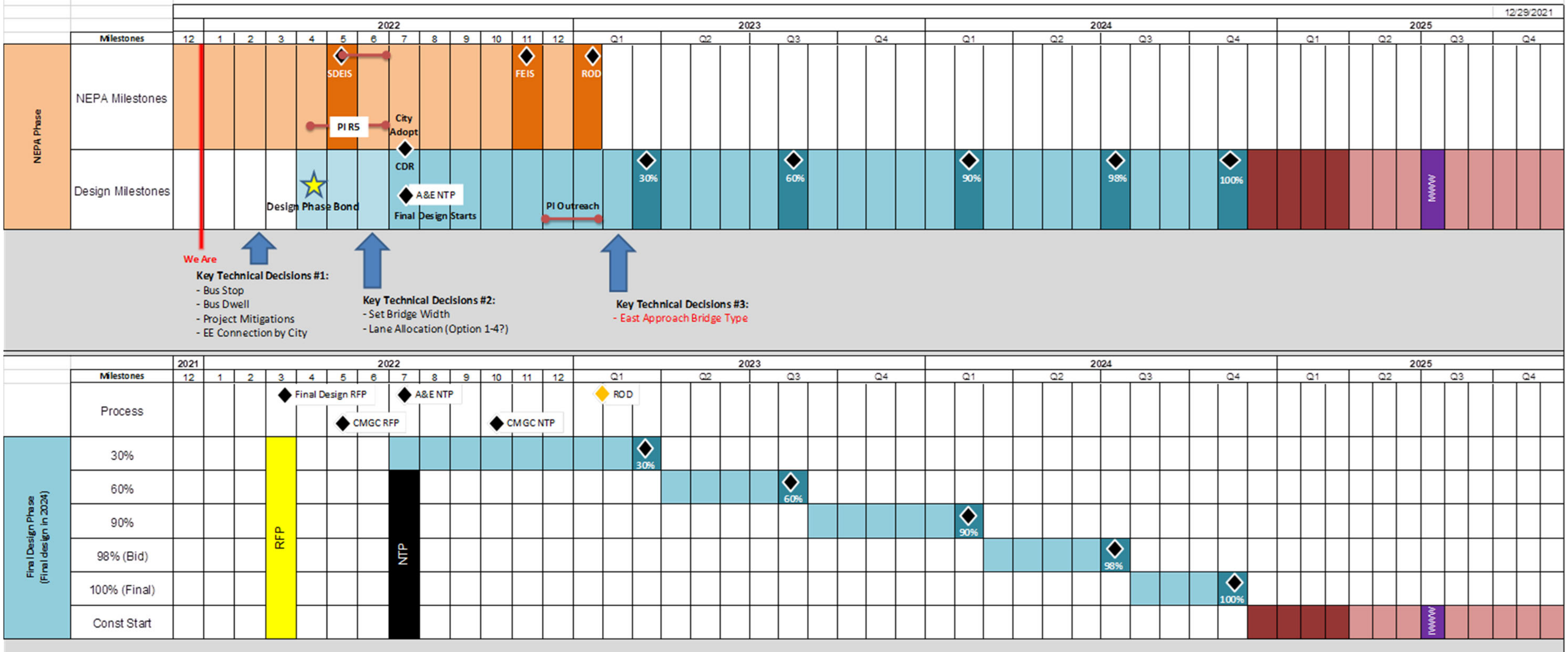
NO.	DATE:				

Sheet No. *BR01*

APPENDIX F

F - Pre-Construction Schedule

MASTER Final Design Delivery Schedule



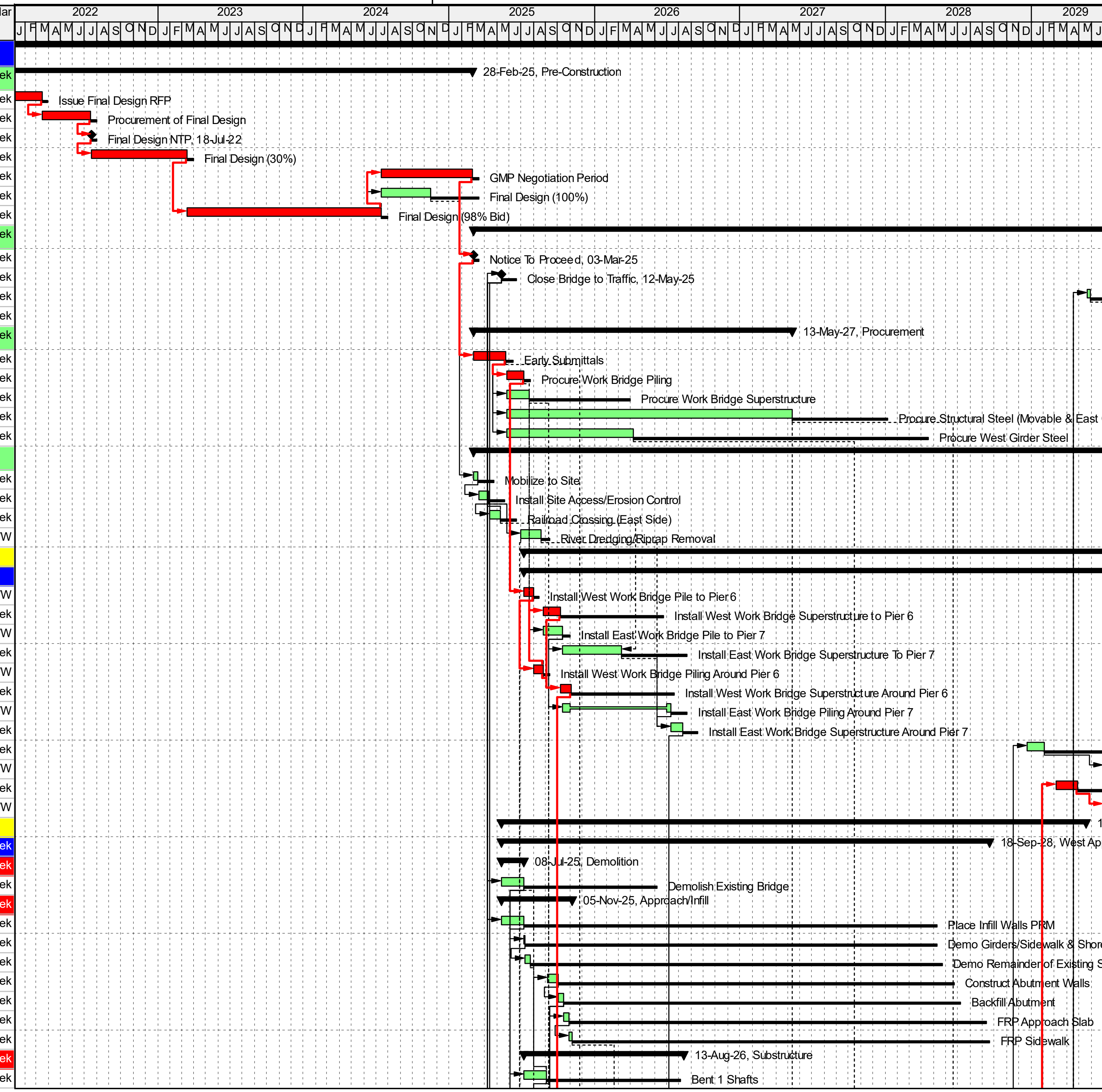
Preconstruction Schedule by HDR

PRELIMINARY FOR CRA USE ONLY

APPENDIX G

G - Option 1 Construction Schedule

Activity ID	Activity Name	Original Duration	Total Float	Start	Finish	Calendar
3A: EQRB NEPA Bascule With East Cable Stay w/Precon		1937	0	03-Jan-22	08-Aug-29	
Pre-Construction		808	11	03-Jan-22	28-Feb-25	Standard 5 Day Workweek
P1000	Issue Final Design RFP	52	11	03-Jan-22	15-Mar-22	Standard 5 Day Workweek
P1010	Procurement of Final Design	88	11	16-Mar-22	15-Jul-22	Standard 5 Day Workweek
P1020	Final Design NTP	0	11	18-Jul-22		Standard 5 Day Workweek
P1030	Final Design (30%)	170	11	18-Jul-22	15-Mar-23	Standard 5 Day Workweek
P1040	GMP Negotiation Period	159	11	16-Jul-24	28-Feb-25	Standard 5 Day Workweek
P1050	Final Design (100%)	88	82	16-Jul-24	15-Nov-24	Standard 5 Day Workweek
P1060	Final Design (98% Bid)	339	11	16-Mar-23	15-Jul-24	Standard 5 Day Workweek
General/Milestones		1129	0	03-Mar-25	08-Aug-29	Standard 5-day Workweek
A1000	Notice To Proceed	0	11	03-Mar-25		Standard 5-day Workweek
A1010	Close Bridge to Traffic	0	28	12-May-25		Standard 5-day Workweek
A1030	Open New Bridge to Traffic	7	50	21-May-29	29-May-29	Standard 5-day Workweek
A1040	Substantial Completion (2nd Notification)	0	0		08-Aug-29	Standard 5-day Workweek
Procurement		560	237	03-Mar-25	13-May-27	Standard 5-day Workweek
A1050	Early Submittals	60	11	03-Mar-25	23-May-25	Standard 5-day Workweek
A1060	Procure Work Bridge Piling	30	11	27-May-25	08-Jul-25	Standard 5-day Workweek
A1070	Procure Work Bridge Superstructure	40	174	27-May-25	22-Jul-25	Standard 5-day Workweek
A1080	Procure Structural Steel (Movable & East Cable Stay)	500	162	27-May-25	13-May-27	Standard 5-day Workweek
A1130	Procure West Girder Steel	220	517	27-May-25	07-Apr-26	Standard 5-day Workweek
Construction		1129	0	03-Mar-25	08-Aug-29	
A1090	Mobilize to Site	10	28	03-Mar-25	14-Mar-25	Standard 5-day Workweek
A1100	Install Site Access/Erosion Control	20	28	17-Mar-25	11-Apr-25	Standard 5-day Workweek
A1110	Railroad Crossing (East Side)	20	28	14-Apr-25	09-May-25	Standard 5-day Workweek
A1120	River Dredging/Riprap Removal	40	16	01-Jul-25	20-Aug-25	6x10 IWW
Temporary Works		1039	0	09-Jul-25	08-Aug-29	
Work Bridges		1039	0	09-Jul-25	08-Aug-29	
A1160	Install West Work Bridge Pile to Pier 6	20	12	09-Jul-25	01-Aug-25	6x10 IWW
A1170	Install West Work Bridge Superstructure to Pier 6	30	180	25-Aug-25	07-Oct-25	Standard 5-day Workweek
A1180	Install East Work Bridge Pile to Pier 7	39	12	25-Aug-25	14-Oct-25	6x10 IWW
A1190	Install East Work Bridge Superstructure To Pier 7	100	116	14-Oct-25	09-Mar-26	Standard 5-day Workweek
A1660	Install West Work Bridge Piling Around Pier 6	20	12	01-Aug-25	25-Aug-25	6x10 IWW
A1665	Install West Work Bridge Superstructure Around Pier 6	20	180	07-Oct-25	04-Nov-25	Standard 5-day Workweek
A2415	Install East Work Bridge Piling Around Pier 7	20	33	14-Oct-25	13-Jul-26	6x10 IWW
A2416	Install East Work Bridge Superstructure Around Pier 7	20	28	13-Jul-26	10-Aug-26	Standard 5-day Workweek
A2420	Remove West Work Bridge Superstructure	30	115	21-Dec-28	02-Feb-29	Standard 5-day Workweek
A2430	Remove West Work Bridge Piling	20	10	02-Jul-29	27-Jul-29	6x10 IWW
A2440	Remove East Work Bridge Superstructure	40	45	05-Mar-29	27-Apr-29	Standard 5-day Workweek
A2450	Remove East Work Bridge Piling	30	0	02-Jul-29	08-Aug-29	6x10 IWW
New Bridge		1022	50	12-May-25	18-May-29	
West Approach		852	220	12-May-25	18-Sep-28	Standard 5-day Workweek
Demolition		40	232	12-May-25	08-Jul-25	Standard 5-day Workweek
A1220	Demolish Existing Bridge	40	232	12-May-25	08-Jul-25	Standard 5-day Workweek
Approach/Infill		125	727	12-May-25	05-Nov-25	Standard 5-day Workweek
A2780	Place Infill Walls PRM	40	721	12-May-25	08-Jul-25	Standard 5-day Workweek
A2790	Demo Girders/Sidewalk & Shore In Front of PRM	1	721	09-Jul-25	09-Jul-25	Standard 5-day Workweek
A2800	Demo Remainder of Existing Span 1	10	721	10-Jul-25	23-Jul-25	Standard 5-day Workweek
A2810	Construct Abutment Walls	20	692	04-Sep-25	01-Oct-25	Standard 5-day Workweek
A2820	Backfill Abutment	10	692	02-Oct-25	15-Oct-25	Standard 5-day Workweek
A2830	FRP Approach Slab	10	727	16-Oct-25	29-Oct-25	Standard 5-day Workweek
A2840	FRP Sidewalk	5	727	30-Oct-25	05-Nov-25	Standard 5-day Workweek
Substructure		280	532	09-Jul-25	13-Aug-26	Standard 5-day Workweek
A1230	Bent 1 Shafts	40	232	09-Jul-25	03-Sep-25	Standard 5-day Workweek



Actual Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work | summary

TASK filter: All Activities

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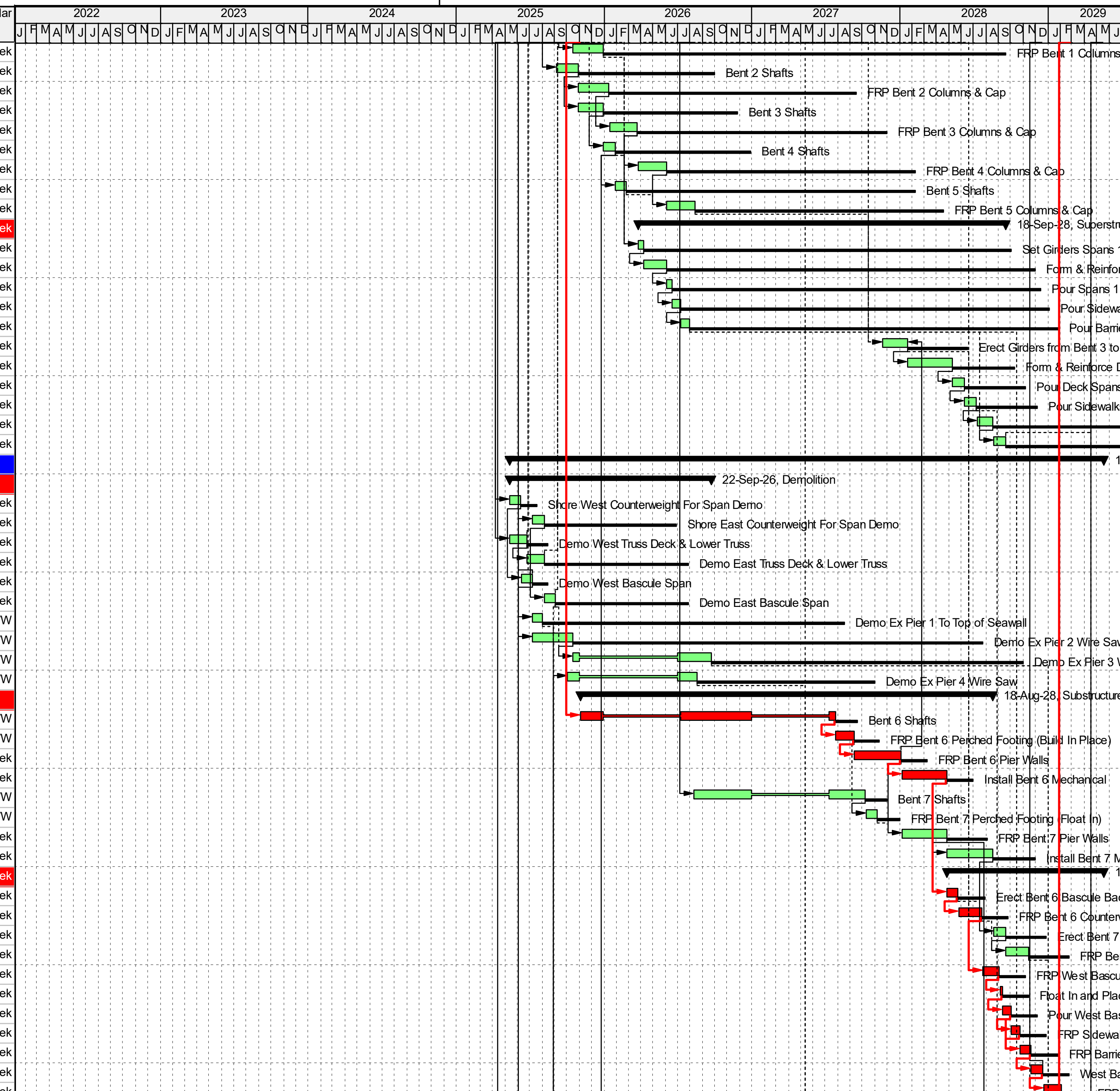
EARTHQUAKE READY BURNSIDE BRIDGE

3A: EQRB NEPA Bascule With East Cable Stay w/Precon

10-Jan-22 20:26

Activity ID	Activity Name	Original Duration	Total Float	Start	Finish	Calendar
A1240	FRP Bent 1 Columns & Cap	50	692	16-Oct-25	29-Dec-25	Standard 5-day Workweek
A1250	Bent 2 Shafts	40	232	04-Sep-25	29-Oct-25	Standard 5-day Workweek
A1260	FRP Bent 2 Columns & Cap	50	427	30-Oct-25	13-Jan-26	Standard 5-day Workweek
A1270	Bent 3 Shafts	40	232	30-Oct-25	29-Dec-25	Standard 5-day Workweek
A1280	FRP Bent 3 Columns & Cap	50	427	14-Jan-26	24-Mar-26	Standard 5-day Workweek
A1671	Bent 4 Shafts	20	232	30-Dec-25	27-Jan-26	Standard 5-day Workweek
A1672	FRP Bent 4 Columns & Cap	50	427	25-Mar-26	03-Jun-26	Standard 5-day Workweek
A1674	Bent 5 Shafts	20	497	28-Jan-26	24-Feb-26	Standard 5-day Workweek
A2850	FRP Bent 5 Columns & Cap	50	427	04-Jun-26	13-Aug-26	Standard 5-day Workweek
Superstructure		632	220	25-Mar-26	18-Sep-28	Standard 5-day Workweek
A1350	Set Girders Spans 1 to 2	10	632	25-Mar-26	07-Apr-26	Standard 5-day Workweek
A1360	Form & Reinforce Spans 1 to 2	40	632	08-Apr-26	03-Jun-26	Standard 5-day Workweek
A1370	Pour Spans 1 to 2 (Incl Cure)	10	632	04-Jun-26	17-Jun-26	Standard 5-day Workweek
A1380	Pour Sidewalks Spans 1 to 2	15	632	18-Jun-26	09-Jul-26	Standard 5-day Workweek
A1390	Pour Barrier/Ped Rail Spans 1 to 2	15	632	10-Jul-26	30-Jul-26	Standard 5-day Workweek
A1840	Erect Girders from Bent 3 to Bent 5	40	105	19-Nov-27	19-Jan-28	Standard 5-day Workweek
A1851	Form & Reinforce Deck Spans 3 to 5	80	105	20-Jan-28	10-May-28	Standard 5-day Workweek
A1855	Pour Deck Spans 3 to 5	20	105	11-May-28	08-Jun-28	Standard 5-day Workweek
A1861	Pour Sidewalks Spans 3 to 5	20	105	09-Jun-28	07-Jul-28	Standard 5-day Workweek
A1871	Pour Barrier/Ped Rail Spans 3 to 5	30	220	10-Jul-28	18-Aug-28	Standard 5-day Workweek
A2480	Miscellaneous/Striping, etc	20	220	21-Aug-28	18-Sep-28	Standard 5-day Workweek
River Spans		1022	50	12-May-25	18-May-29	
Demolition		347	536	12-May-25	22-Sep-26	
A1590	Shore West Counterweight For Span Demo	20	28	12-May-25	09-Jun-25	Standard 5-day Workweek
A1595	Shore East Counterweight For Span Demo	20	227	09-Jul-25	05-Aug-25	Standard 5-day Workweek
A1600	Demo West Truss Deck & Lower Truss	30	38	12-May-25	23-Jun-25	Standard 5-day Workweek
A1610	Demo East Truss Deck & Lower Truss	30	247	24-Jun-25	05-Aug-25	Standard 5-day Workweek
A1620	Demo West Bascule Span	20	28	10-Jun-25	08-Jul-25	Standard 5-day Workweek
A1630	Demo East Bascule Span	20	227	06-Aug-25	03-Sep-25	Standard 5-day Workweek
A1635	Demo Ex Pier 1 To Top of Seawall	20	205	09-Jul-25	01-Aug-25	6x10 IWW
A1640	Demo Ex Pier 2 Wire Saw	80	223	09-Jul-25	15-Oct-25	6x10 IWW
A1650	Demo Ex Pier 3 Wire Saw	80	223	15-Oct-25	22-Sep-26	6x10 IWW
A1670	Demo Ex Pier 4 Wire Saw	60	155	02-Oct-25	19-Aug-26	6x10 IWW
Substructure		709	70	04-Nov-25	18-Aug-28	
A1700	Bent 6 Shafts	180	47	04-Nov-25	26-Jul-27	EQRB Ext IWWW
A1710	FRP Bent 6 Perched Footing (Build In Place)	40	47	26-Jul-27	10-Sep-27	EQRB Ext IWWW
A1720	FRP Bent 6 Pier Walls	80	45	10-Sep-27	05-Jan-28	Standard 5-day Workweek
A1730	Install Bent 6 Mechanical	80	45	06-Jan-28	26-Apr-28	Standard 5-day Workweek
A1760	Bent 7 Shafts	180	34	10-Aug-26	08-Oct-27	EQRB Ext IWWW
A1770	FRP Bent 7 Perched Footing (Float In)	20	34	09-Oct-27	06-Nov-27	EQRB Ext IWWW
A1780	FRP Bent 7 Pier Walls	80	70	06-Jan-28	26-Apr-28	Standard 5-day Workweek
A1790	Install Bent 7 Mechanical	80	70	27-Apr-28	18-Aug-28	Standard 5-day Workweek
Superstructure		270	50	27-Apr-28	18-May-29	Standard 5-day Workweek
A1740	Erect Bent 6 Bascule Backspan	20	45	27-Apr-28	24-May-28	Standard 5-day Workweek
A1750	FRP Bent 6 Counterweight	40	45	25-May-28	21-Jul-28	Standard 5-day Workweek
A1800	Erect Bent 7 Bascule Backspan	20	70	21-Aug-28	18-Sep-28	Standard 5-day Workweek
A1810	FRP Bent 7 Counterweight	40	70	19-Sep-28	13-Nov-28	Standard 5-day Workweek
A1860	FRP West Bascule Span Offsite	30	45	24-Jul-28	01-Sep-28	Standard 5-day Workweek
A1870	Float In and Place West Bascule Span	5	45	05-Sep-28	11-Sep-28	Standard 5-day Workweek
A1880	Pour West Bascule Closure (Incl Cure)	15	45	12-Sep-28	02-Oct-28	Standard 5-day Workweek
A1890	FRP Sidewalk West Bascule	15	45	03-Oct-28	23-Oct-28	Standard 5-day Workweek
A1900	FRP Barrier West Bascule	20	45	24-Oct-28	20-Nov-28	Standard 5-day Workweek
A1910	West Bascule Testing	20	45	21-Nov-28	20-Dec-28	Standard 5-day Workweek
A1940	FRP East Bascule Span Offsite	30	45	21-Dec-28	02-Feb-29	Standard 5-day Workweek



Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
summary

TASK filter: All Activities

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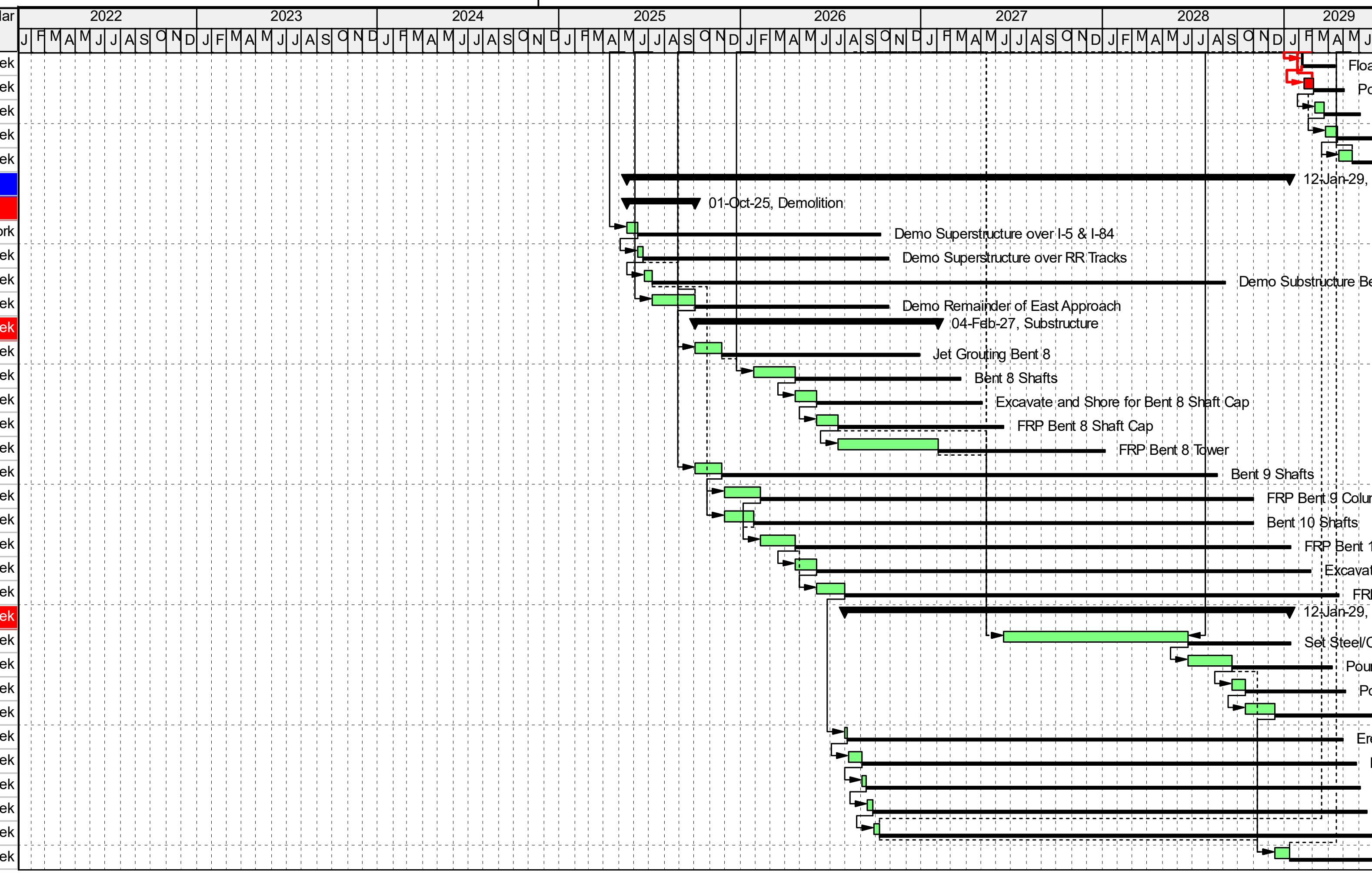
3A: EQRB NEPA Bascule With East Cable Stay w/Precon

10-Jan-22 20:26

EARTHQUAKE READY BURNSIDE BRIDGE

Activity ID	Activity Name	Original Duration	Total Float	Start	Finish	Calendar
A1950	Float In and Place East Bascule Span	5	45	05-Feb-29	09-Feb-29	Standard 5-day Workweek
A1960	Pour East Bascule Closure (Incl Cure)	15	45	12-Feb-29	02-Mar-29	Standard 5-day Workweek
A1970	FRP Sidewalk East Bascule	15	50	05-Mar-29	23-Mar-29	Standard 5-day Workweek
A1980	FRP Barrier East Bascule	20	50	26-Mar-29	20-Apr-29	Standard 5-day Workweek
A1990	East Bascule Testing	20	50	23-Apr-29	18-May-29	Standard 5-day Workweek
East Approach		927	140	17-May-25	12-Jan-29	
Demolition		95	742	17-May-25	01-Oct-25	
A2000	Demo Superstructure over I-5 & I-84	8	140	17-May-25	08-Jun-25	Weekend Only Work
A2010	Demo Superstructure over RR Tracks	10	343	09-Jun-25	20-Jun-25	Standard 5-day Workweek
A2020	Demo Substructure Bents 21 through 24	10	803	23-Jun-25	07-Jul-25	Standard 5-day Workweek
A2030	Demo Remainder of East Approach	60	272	09-Jul-25	01-Oct-25	Standard 5-day Workweek
Substructure		340	562	02-Oct-25	04-Feb-27	Standard 5-day Workweek
A1815	Jet Grouting Bent 8	40	272	02-Oct-25	26-Nov-25	Standard 5-day Workweek
A1820	Bent 8 Shafts	60	232	28-Jan-26	21-Apr-26	Standard 5-day Workweek
A1825	Excavate and Shore for Bent 8 Shaft Cap	30	232	22-Apr-26	03-Jun-26	Standard 5-day Workweek
A1830	FRP Bent 8 Shaft Cap	30	232	04-Jun-26	16-Jul-26	Standard 5-day Workweek
A2040	FRP Bent 8 Tower	140	232	17-Jul-26	04-Feb-27	Standard 5-day Workweek
A2080	Bent 9 Shafts	40	692	02-Oct-25	26-Nov-25	Standard 5-day Workweek
A2090	FRP Bent 9 Columns & Cap	50	692	01-Dec-25	10-Feb-26	Standard 5-day Workweek
A2120	Bent 10 Shafts	40	702	01-Dec-25	27-Jan-26	Standard 5-day Workweek
A2130	FRP Bent 10 Columns & Cap	50	692	11-Feb-26	21-Apr-26	Standard 5-day Workweek
A2140	Excavate & Shoring Bent 10	30	692	22-Apr-26	03-Jun-26	Standard 5-day Workweek
A2150	FRP Bent 10	40	692	04-Jun-26	30-Jul-26	Standard 5-day Workweek
Superstructure		622	140	31-Jul-26	12-Jan-29	Standard 5-day Workweek
A1920	Set Steel/Cables/Precast Slabs From Bent 6 to Bent 8 (East Ca	260	140	16-Jun-27	22-Jun-28	Standard 5-day Workweek
A1931	Pour Overlay From Bent 8 to Bent 6	60	140	23-Jun-28	18-Sep-28	Standard 5-day Workweek
A1932	Pour Sidewalks Spans 3 to 5	20	140	19-Sep-28	16-Oct-28	Standard 5-day Workweek
A1933	Pour Overlay Spans 3 to 5	40	140	17-Oct-28	13-Dec-28	Standard 5-day Workweek
A2160	Erect Girders Span 9	5	692	31-Jul-26	06-Aug-26	Standard 5-day Workweek
A2170	Form & Reinforce Deck Span 9	20	692	07-Aug-26	03-Sep-26	Standard 5-day Workweek
A2180	Pour Deck Span 9 (Incl Cure)	5	692	04-Sep-26	11-Sep-26	Standard 5-day Workweek
A2190	FRP Sidewalk Span 9	10	692	14-Sep-26	25-Sep-26	Standard 5-day Workweek
A2200	FRP Barrier Span 9	10	692	28-Sep-26	09-Oct-26	Standard 5-day Workweek
A2490	Miscellaneous/Striping, etc	20	140	14-Dec-28	12-Jan-29	Standard 5-day Workweek



Actual Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work | summary

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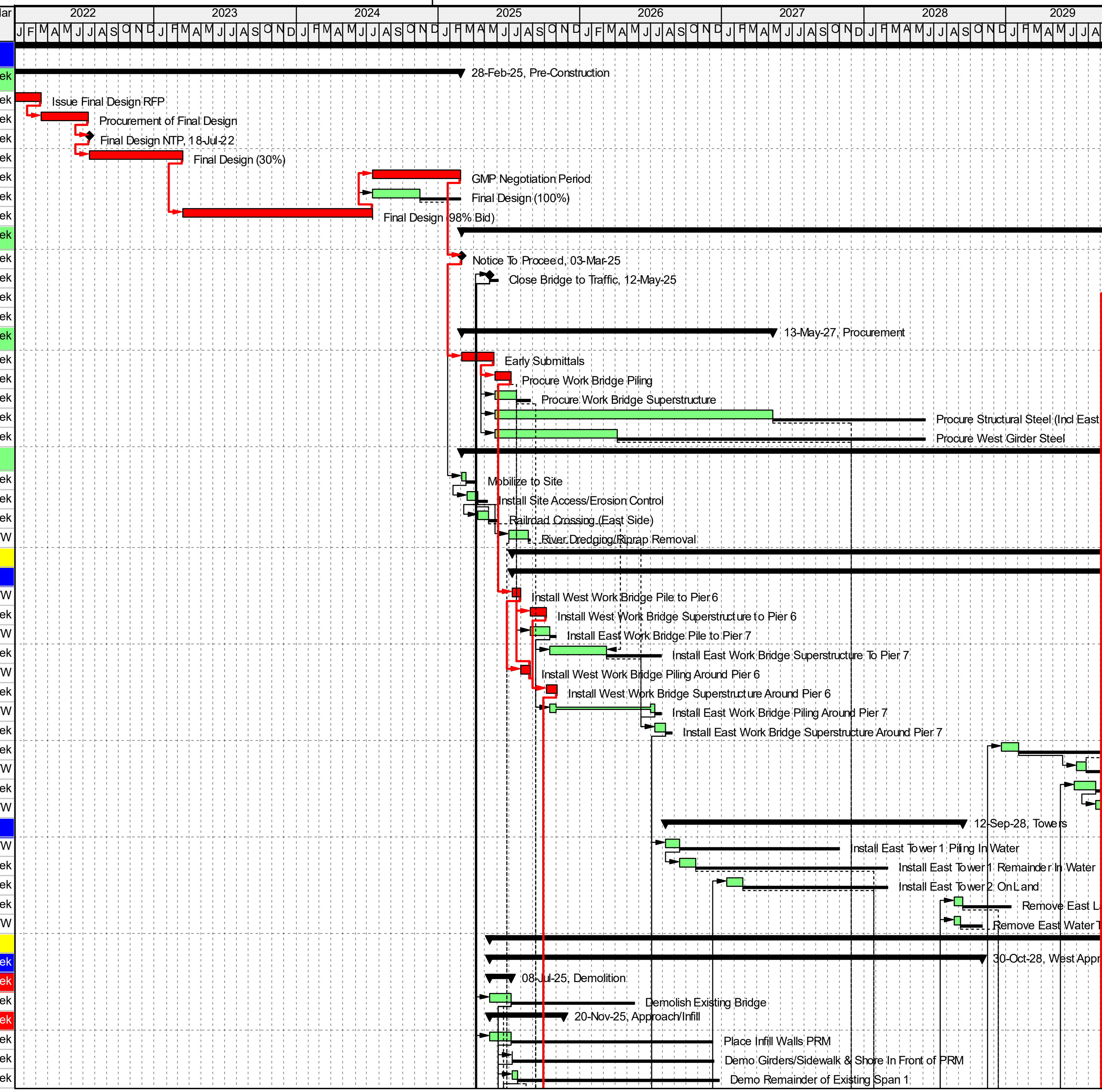
APPENDIX H

H - Option 2 Construction Schedule

Activity ID	Activity Name	Original Duration	Total Float	Start	Finish	Calendar
5A: EQRB NEPA Bascule With East Arch w/Precon		1988	0	03-Jan-22	17-Oct-29	
Pre-Construction		808	0	03-Jan-22	28-Feb-25	Standard 5 Day Workweek
P1000	Issue Final Design RFP	52	0	03-Jan-22	15-Mar-22	Standard 5 Day Workweek
P1010	Procurement of Final Design	88	0	16-Mar-22	15-Jul-22	Standard 5 Day Workweek
P1020	Final Design NTP	0	0	18-Jul-22		Standard 5 Day Workweek
P1030	Final Design (30%)	170	0	18-Jul-22	15-Mar-23	Standard 5 Day Workweek
P1040	GMP Negotiation Period	159	0	16-Jul-24	28-Feb-25	Standard 5 Day Workweek
P1050	Final Design (100%)	88	71	16-Jul-24	15-Nov-24	Standard 5 Day Workweek
P1060	Final Design (98% Bid)	339	0	16-Mar-23	15-Jul-24	Standard 5 Day Workweek
General/Milestones		1180	0	03-Mar-25	17-Oct-29	Standard 5-day Workweek
A1000	Notice To Proceed	0	0	03-Mar-25		Standard 5-day Workweek
A1010	Close Bridge to Traffic	0	17	12-May-25		Standard 5-day Workweek
A1030	Open New Bridge to Traffic	7	0	09-Oct-29	17-Oct-29	Standard 5-day Workweek
A1040	Substantial Completion (2nd Notification)	0	0		17-Oct-29	Standard 5-day Workweek
Procurement		560	272	03-Mar-25	13-May-27	Standard 5-day Workweek
A1050	Early Submittals	60	0	03-Mar-25	23-May-25	Standard 5-day Workweek
A1060	Procure Work Bridge Piling	30	0	27-May-25	08-Jul-25	Standard 5-day Workweek
A1070	Procure Work Bridge Superstructure	40	23	27-May-25	22-Jul-25	Standard 5-day Workweek
A1080	Procure Structural Steel (Incl East Arch)	500	272	27-May-25	13-May-27	Standard 5-day Workweek
A1130	Procure West Girder Steel	220	552	27-May-25	07-Apr-26	Standard 5-day Workweek
Construction		1173	7	03-Mar-25	08-Oct-29	
A1090	Mobilize to Site	10	17	03-Mar-25	14-Mar-25	Standard 5-day Workweek
A1100	Install Site Access/Erosion Control	20	17	17-Mar-25	11-Apr-25	Standard 5-day Workweek
A1110	Railroad Crossing (East Side)	20	17	14-Apr-25	09-May-25	Standard 5-day Workweek
A1120	River Dredging/Riprap Removal	40	4	01-Jul-25	20-Aug-25	6x10 IWW
Temporary Works		1073	17	09-Jul-25	24-Sep-29	
Work Bridges		1073	17	09-Jul-25	24-Sep-29	
A1160	Install West Work Bridge Pile to Pier 6	20	0	09-Jul-25	01-Aug-25	6x10 IWW
A1170	Install West Work Bridge Superstructure to Pier 6	30	0	25-Aug-25	07-Oct-25	Standard 5-day Workweek
A1180	Install East Work Bridge Pile to Pier 7	39	12	25-Aug-25	14-Oct-25	6x10 IWW
A1190	Install East Work Bridge Superstructure To Pier 7	100	100	14-Oct-25	09-Mar-26	Standard 5-day Workweek
A1660	Install West Work Bridge Piling Around Pier 6	20	0	01-Aug-25	25-Aug-25	6x10 IWW
A1665	Install West Work Bridge Superstructure Around Pier 6	20	0	07-Oct-25	04-Nov-25	Standard 5-day Workweek
A2415	Install East Work Bridge Piling Around Pier 7	20	14	14-Oct-25	13-Jul-26	6x10 IWW
A2416	Install East Work Bridge Superstructure Around Pier 7	20	12	13-Jul-26	10-Aug-26	Standard 5-day Workweek
A2420	Remove West Work Bridge Superstructure	30	164	21-Dec-28	02-Feb-29	Standard 5-day Workweek
A2430	Remove West Work Bridge Piling	20	68	02-Jul-29	27-Jul-29	6x10 IWW
A2440	Remove East Work Bridge Superstructure	40	14	26-Jun-29	20-Aug-29	Standard 5-day Workweek
A2450	Remove East Work Bridge Piling	30	17	21-Aug-29	24-Sep-29	6x10 IWW
Towers		531	85	10-Aug-26	12-Sep-28	
A2530	Install East Tower 1 Piling In Water	30	132	10-Aug-26	14-Sep-26	6x10 IWW
A2540	Install East Tower 1 Remainder In Water	30	342	14-Sep-26	26-Oct-26	Standard 5-day Workweek
A2550	Install East Tower 2 On Land	30	260	13-Jan-27	24-Feb-27	Standard 5-day Workweek
A2580	Remove East Land Tower	15	85	22-Aug-28	12-Sep-28	Standard 5-day Workweek
A2590	Remove East Water Tower	15	41	22-Aug-28	07-Sep-28	6x10 IWW
New Bridge		1123	0	12-May-25	08-Oct-29	
West Approach		882	241	12-May-25	30-Oct-28	Standard 5-day Workweek
Demolition		40	222	12-May-25	08-Jul-25	Standard 5-day Workweek
A1220	Demolish Existing Bridge	40	222	12-May-25	08-Jul-25	Standard 5-day Workweek
Approach/Infill		136	716	12-May-25	20-Nov-25	Standard 5-day Workweek
A2780	Place Infill Walls PRM	40	361	12-May-25	08-Jul-25	Standard 5-day Workweek
A2790	Demo Girders/Sidewalk & Shore In Front of PRM	1	361	09-Jul-25	09-Jul-25	Standard 5-day Workweek
A2800	Demo Remainder of Existing Span 1	10	361	10-Jul-25	23-Jul-25	Standard 5-day Workweek



Actual Level of Effort — Remaining Work — Milestone
Actual Work — Critical Remaining Work — summary

TASK filter: All Activities

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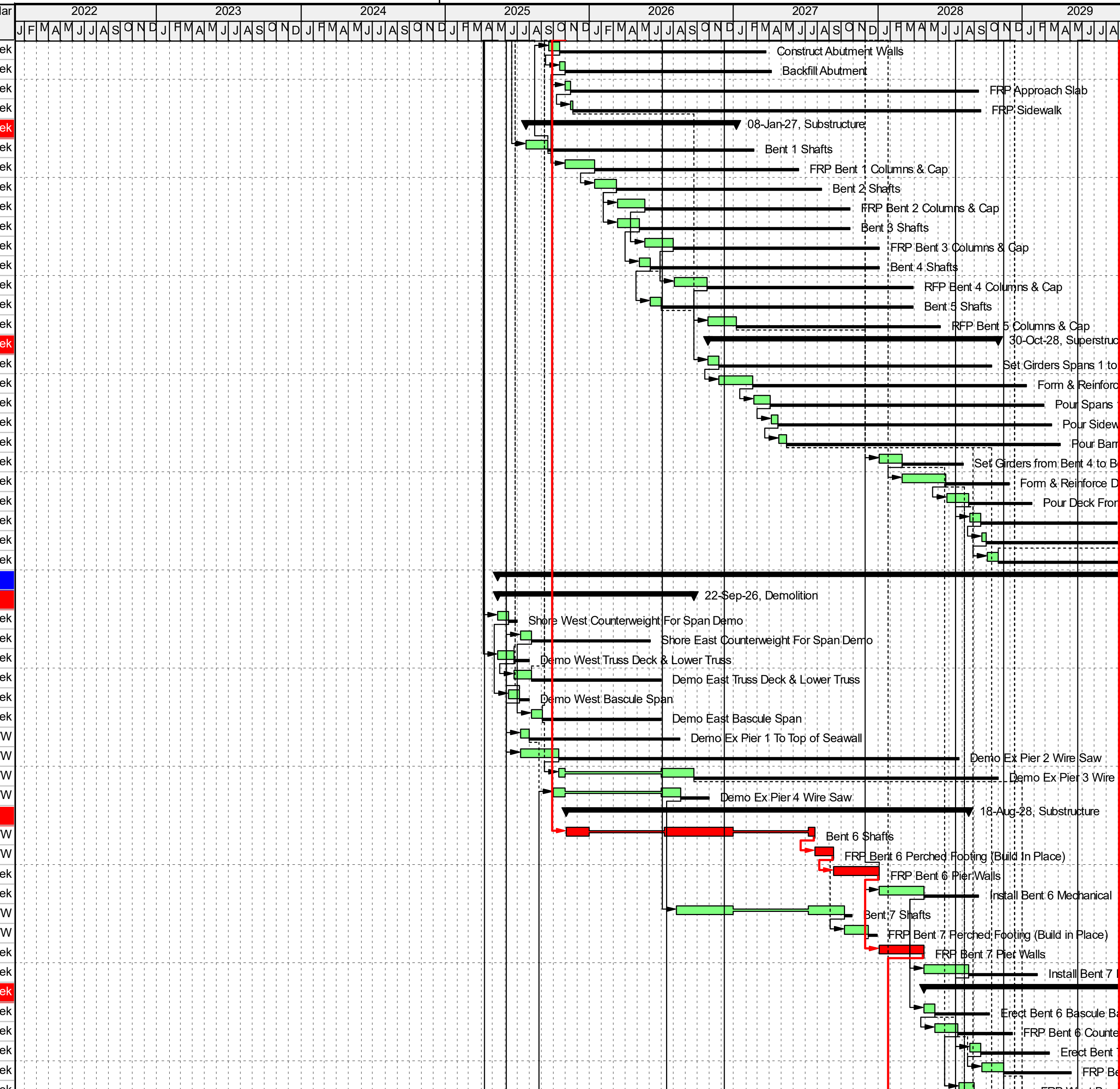
EARTHQUAKE READY BURNSIDE BRIDGE

Activity ID	Activity Name	Original Duration	Total Float	Start	Finish	Calendar
A2810	Construct Abutment Walls	20	361	19-Sep-25	16-Oct-25	Standard 5-day Workweek
A2820	Backfill Abutment	10	361	17-Oct-25	30-Oct-25	Standard 5-day Workweek
A2830	FRP Approach Slab	10	716	31-Oct-25	13-Nov-25	Standard 5-day Workweek
A2840	FRP Sidewalk	5	716	14-Nov-25	20-Nov-25	Standard 5-day Workweek
Substructure		370	361	24-Jul-25	08-Jan-27	Standard 5-day Workweek
A1230	Bent 1 Shafts	40	361	24-Jul-25	18-Sep-25	Standard 5-day Workweek
A1240	FRP Bent 1 Columns & Cap	50	361	31-Oct-25	14-Jan-26	Standard 5-day Workweek
A1250	Bent 2 Shafts	40	361	15-Jan-26	11-Mar-26	Standard 5-day Workweek
A1260	FRP Bent 2 Columns & Cap	50	361	12-Mar-26	20-May-26	Standard 5-day Workweek
A1270	Bent 3 Shafts	40	371	12-Mar-26	06-May-26	Standard 5-day Workweek
A1280	FRP Bent 3 Columns & Cap	50	361	21-May-26	31-Jul-26	Standard 5-day Workweek
A1310	Bent 4 Shafts	20	401	07-May-26	04-Jun-26	Standard 5-day Workweek
A1341	RFP Bent 4 Columns & Cap	60	361	03-Aug-26	26-Oct-26	Standard 5-day Workweek
A2850	Bent 5 Shafts	20	441	05-Jun-26	02-Jul-26	Standard 5-day Workweek
A2860	RFP Bent 5 Columns & Cap	50	361	27-Oct-26	08-Jan-27	Standard 5-day Workweek
Superstructure		511	241	27-Oct-26	30-Oct-28	Standard 5-day Workweek
A1350	Set Girders Spans 1 to 4	20	481	27-Oct-26	23-Nov-26	Standard 5-day Workweek
A1360	Form & Reinforce Spans 1 to Span 4	60	481	24-Nov-26	19-Feb-27	Standard 5-day Workweek
A1370	Pour Spans 1 to 4 (Incl Cure)	30	481	22-Feb-27	02-Apr-27	Standard 5-day Workweek
A1380	Pour Sidewalks Spans 1 to 4	15	481	05-Apr-27	23-Apr-27	Standard 5-day Workweek
A1390	Pour Barrier/Ped Rail Spans 1 to 4	15	481	26-Apr-27	14-May-27	Standard 5-day Workweek
A1840	Set Girders from Bent 4 to Bent 5	40	110	06-Jan-28	01-Mar-28	Standard 5-day Workweek
A1850	Form & Reinforce Deck From Bent 4 to Bent 5	80	110	02-Mar-28	22-Jun-28	Standard 5-day Workweek
A1851	Pour Deck From Bent 4 to Bent 5	40	110	23-Jun-28	18-Aug-28	Standard 5-day Workweek
A1861	Pour Sidewalks Bent 4 to 5	20	241	21-Aug-28	18-Sep-28	Standard 5-day Workweek
A1871	Place Barrier/Ped Rail Bent 4 to 5	10	241	19-Sep-28	02-Oct-28	Standard 5-day Workweek
A2480	Miscellaneous/Striping, etc	20	241	03-Oct-28	30-Oct-28	Standard 5-day Workweek
River Spans		1123	0	12-May-25	08-Oct-29	
Demolition		347	536	12-May-25	22-Sep-26	
A1590	Shore West Counterweight For Span Demo	20	17	12-May-25	09-Jun-25	Standard 5-day Workweek
A1595	Shore East Counterweight For Span Demo	20	211	09-Jul-25	05-Aug-25	Standard 5-day Workweek
A1600	Demo West Truss Deck & Lower Truss	30	27	12-May-25	23-Jun-25	Standard 5-day Workweek
A1610	Demo East Truss Deck & Lower Truss	30	231	24-Jun-25	05-Aug-25	Standard 5-day Workweek
A1620	Demo West Bascule Span	20	17	10-Jun-25	08-Jul-25	Standard 5-day Workweek
A1630	Demo East Bascule Span	20	211	06-Aug-25	03-Sep-25	Standard 5-day Workweek
A1635	Demo Ex Pier 1 To Top of Seawall	20	109	09-Jul-25	01-Aug-25	6x10 IWW
A1640	Demo Ex Pier 2 Wire Saw	80	223	09-Jul-25	15-Oct-25	6x10 IWW
A1650	Demo Ex Pier 3 Wire Saw	80	223	15-Oct-25	22-Sep-26	6x10 IWW
A1670	Demo Ex Pier 4 Wire Saw	60	58	02-Oct-25	19-Aug-26	6x10 IWW
Substructure		709	120	04-Nov-25	18-Aug-28	
A1700	Bent 6 Shafts	180	0	04-Nov-25	26-Jul-27	EQRB Ext IWWW
A1710	FRP Bent 6 Perched Footing (Build In Place)	40	0	26-Jul-27	10-Sep-27	EQRB Ext IWWW
A1720	FRP Bent 6 Pier Walls	80	0	10-Sep-27	05-Jan-28	Standard 5-day Workweek
A1730	Install Bent 6 Mechanical	80	95	06-Jan-28	26-Apr-28	Standard 5-day Workweek
A1760	Bent 7 Shafts	180	14	10-Aug-26	08-Oct-27	EQRB Ext IWWW
A1770	FRP Bent 7 Perched Footing (Build in Place)	40	14	09-Oct-27	09-Dec-27	EQRB Ext IWWW
A1780	FRP Bent 7 Pier Walls	80	0	06-Jan-28	26-Apr-28	Standard 5-day Workweek
A1790	Install Bent 7 Mechanical	80	120	27-Apr-28	18-Aug-28	Standard 5-day Workweek
Superstructure		371	0	27-Apr-28	08-Oct-29	Standard 5-day Workweek
A1740	Erect Bent 6 Bascule Backspan	20	95	27-Apr-28	24-May-28	Standard 5-day Workweek
A1750	FRP Bent 6 Counterweight	40	95	25-May-28	21-Jul-28	Standard 5-day Workweek
A1800	Erect Bent 7 Bascule Backspan	20	120	21-Aug-28	18-Sep-28	Standard 5-day Workweek
A1810	FRP Bent 7 Counterweight	40	120	19-Sep-28	13-Nov-28	Standard 5-day Workweek
A1860	FRP West Bascule Span Offsite	30	95	24-Jul-28	01-Sep-28	Standard 5-day Workweek



Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
summary

TASK filter: All Activities

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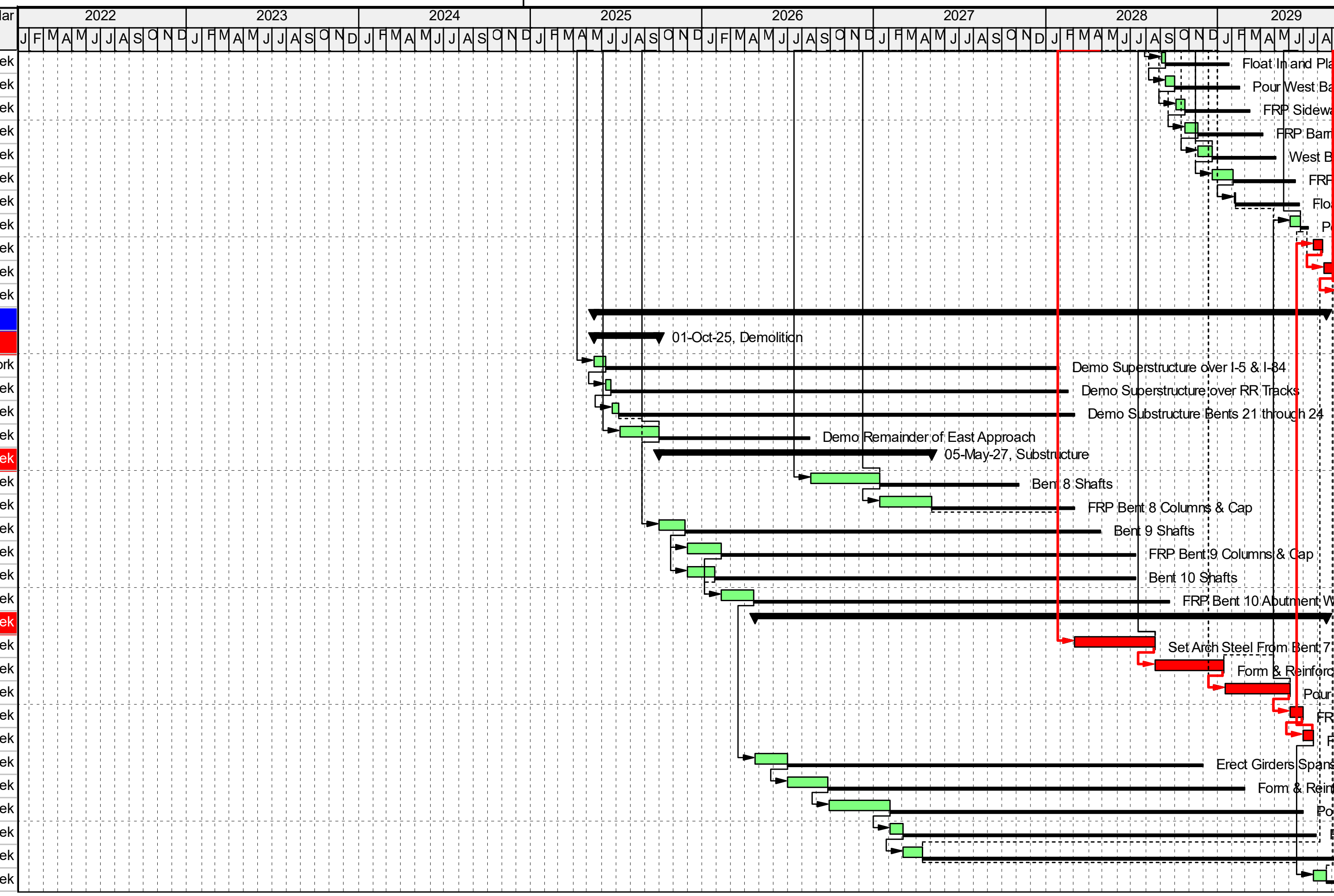
Activity ID	Activity Name	Original Duration	Total Float	Start	Finish	Calendar
A1870	Float In and Place West Bascule Span	5	95	05-Sep-28	11-Sep-28	Standard 5-day Workweek
A1880	Pour West Bascule Closure (Incl Cure)	15	95	12-Sep-28	02-Oct-28	Standard 5-day Workweek
A1890	FRP Sidewalk West Bascule	15	95	03-Oct-28	23-Oct-28	Standard 5-day Workweek
A1900	FRP Barrier West Bascule	20	95	24-Oct-28	20-Nov-28	Standard 5-day Workweek
A1910	West Bascule Testing	20	95	21-Nov-28	20-Dec-28	Standard 5-day Workweek
A1940	FRP East Bascule Span Offsite	30	95	21-Dec-28	02-Feb-29	Standard 5-day Workweek
A1950	Float In and Place East Bascule Span	5	95	05-Feb-29	09-Feb-29	Standard 5-day Workweek
A1960	Pour East Bascule Closure (Incl Cure)	15	14	05-Jun-29	25-Jun-29	Standard 5-day Workweek
A1970	FRP Sidewalk East Bascule	15	0	24-Jul-29	13-Aug-29	Standard 5-day Workweek
A1980	FRP Barrier East Bascule	20	0	14-Aug-29	10-Sep-29	Standard 5-day Workweek
A1990	East Bascule Testing	20	0	11-Sep-29	08-Oct-29	Standard 5-day Workweek
East Approach		1083	35	17-May-25	20-Aug-29	
Demolition		95	613	17-May-25	01-Oct-25	
A2000	Demo Superstructure over I-5 & I-84	8	276	17-May-25	08-Jun-25	Weekend Only Work
A2010	Demo Superstructure over RR Tracks	10	674	09-Jun-25	20-Jun-25	Standard 5-day Workweek
A2020	Demo Substructure Bents 21 through 24	10	674	23-Jun-25	07-Jul-25	Standard 5-day Workweek
A2030	Demo Remainder of East Approach	60	222	09-Jul-25	01-Oct-25	Standard 5-day Workweek
Substructure		403	350	02-Oct-25	05-May-27	Standard 5-day Workweek
A1820	Bent 8 Shafts	100	210	19-Aug-26	13-Jan-27	Standard 5-day Workweek
A1830	FRP Bent 8 Columns & Cap	80	210	13-Jan-27	05-May-27	Standard 5-day Workweek
A2080	Bent 9 Shafts	40	613	02-Oct-25	26-Nov-25	Standard 5-day Workweek
A2090	FRP Bent 9 Columns & Cap	50	613	01-Dec-25	10-Feb-26	Standard 5-day Workweek
A2120	Bent 10 Shafts	40	623	01-Dec-25	27-Jan-26	Standard 5-day Workweek
A2130	FRP Bent 10 Abutment Wall	50	613	11-Feb-26	21-Apr-26	Standard 5-day Workweek
Superstructure		848	35	22-Apr-26	20-Aug-29	Standard 5-day Workweek
A1920	Set Arch Steel From Bent 7 to Bent 8 (East Arch)	120	0	03-Mar-28	21-Aug-28	Standard 5-day Workweek
A1930	Form & Reinforce Deck From Bent 7 to Bent 8	100	0	22-Aug-28	15-Jan-29	Standard 5-day Workweek
A1931	Pour Deck From Bent 8 to Bent 7	100	0	16-Jan-29	04-Jun-29	Standard 5-day Workweek
A1932	FRP Sidewalk Span 7	20	0	05-Jun-29	02-Jul-29	Standard 5-day Workweek
A1933	FRP Parapets & Ped Barrier Span 7	15	0	03-Jul-29	23-Jul-29	Standard 5-day Workweek
A2160	Erect Girders Spans 8 to 9	50	613	22-Apr-26	01-Jul-26	Standard 5-day Workweek
A2170	Form & Reinforce Deck Spans 8 to 9	60	613	02-Jul-26	25-Sep-26	Standard 5-day Workweek
A2180	Pour Deck Spans 8 to 9 (Incl Cure)	90	613	28-Sep-26	04-Feb-27	Standard 5-day Workweek
A2190	FRP Sidewalk Spans 8 to 9	20	613	05-Feb-27	04-Mar-27	Standard 5-day Workweek
A2200	FRP Barrier Spans 8 to 9	30	613	05-Mar-27	15-Apr-27	Standard 5-day Workweek
A2490	Miscellaneous/Striping, etc	20	35	24-Jul-29	20-Aug-29	Standard 5-day Workweek



Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
summary

TASK filter: All Activities

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APPENDIX I

I - Option 1 Summary Cost

EARTHQUAKE READY BURNSIDE BRIDGE COST ESTIMATE WORKSHEET

Option 3A: Bascule with East Cable Stay

BRIDGE NUMBER		00511, 00511A, 00511B
BRIDGE NAME Burnside Bridge		STATE HIGHWAY NUMBER N/A
Mile Post	SCOPE	REFERENCE NAME/PHONE

No.	ITEM	BASE	Notes
	Preparation		
	Mobilization	$ 2,067,757	
	Temp Erosion & Sediment Control	$ -	Included with erosion control and planting
	Temp. Protection and Direction of Traffic	$ 11,898,873	
	Removal of Existing Structure and Obstruction	$ 15,168,812	
	Removal of Existing Buildings	$ 1,125,000	
	Site Preparation	$ 2,196,900	
	Civil/Roadwork		
	Roadway Surface	$ 1,038,600	
	Traffic Signals	$ 1,080,000	
	Illumination	$ 833,400	
	Earthwork	$ 2,169,965	
	Storm Water & Drainage	$ 288,700	
	Erosion Control & Planting	$ 2,865,913	
	Pedestrian Connection	$ 5,245,593	
	Drilling Subcontractor Support	$ -	Incl In drilling items
	Utilities	$ 1,260,000	
	Bridge Structure		
	West Approach Conventional	$ 14,942,788	
	West Approach Long	$ 9,668,138	
	Main River Movable Span	$ 110,170,247	
	East Approach Long	$ 54,638,797	
	East Approach Conventional	$ 7,736,542	Incl bridge rail, bridge drains & misc
	Pier Protection - Debris Nose	$ -	
	Harbor Wall Reconstruction	$ -	
	Existing Pier Rip-Rap Removal	$ 5,771,837	
	Temporary Construction		
	~~Temporary Diversion Bridge~~	$ -	
	~~Staged Construction Premium~~	$ -	
	Temporary Marine Works (work bridges, cofferdams, etc.)	$ 18,230,626	Included with bridge items
	Geotechnical Hazard Mitigation		
	East Approach Ground Improvment	$ 23,248,602	
	West Approach Ground Improvment	$ -	
	Other Related Items		
	Aesthetics Premium	$ 5,000,000	
	Willamette River Mitigation (floodway, habitat)	$ 412,500	
	Contractor Access Premium (barges, RR, parks, off-site staging)	$ 3,000,000	
	Facility Impacts (classroom, Esplanade, Sat. Mkt, skatepark)	$ 2,000,000	
	Sewer pipe relocation (west bank)	$ -	Not included with current scope
	TriMet (temporary catenary, bus bridge)	$ -	Deleted per 9/17 Meeting
	UPRR Protection and Flagging	$ 1,840,320	
	Market Conditions	$ -	
	Contractor Work Zone Security	$ 3,000,000	
	Tug Assists	$ -	
	River Patrol	$ -	
	General Conditions	$ 115,179,772	
	Construction Total without Contingency	$ 422,079,683	
	Contingency 0%	$ -	Includes market conditions (subs, material fluctuations, etc.)
	Construction Total with Contingency	$ 422,079,683	
	Right of Way	$ 27,781,000	
	Engineering & Project Delivery		
	NEPA Phase		Not included (Different funding source): $37,282,000 removed
	PE (Incl. Design, PI, ROW Acquisition)	$ 90,000,000	Changed to $90m per County cost buildup (incl CMGC and IGA)
	CM/GC Precon		Incl with PE
	IGAs (ODOT, PBOT)		Incl with PE
	Construction Engineering 15%	$ 63,311,952	
	Total Project Cost before Inflation (2021 $)	$ 603,172,636	

APPENDIX J

J - Option 2 Summary Cost

EARTHQUAKE READY BURNSIDE BRIDGE COST ESTIMATE WORKSHEET

Option 5A: Bascule with East Arch

BRIDGE NUMBER	00511, 00511A, 00511B	
BRIDGE NAME Burnside Bridge	**STATE HIGHWAY NUMBER** N/A	
Mile Post	**SCOPE**	**REFERENCE NAME/PHONE**

No.	ITEM	BASE		NOTES
	Preparation			
	Mobilization	$	2,067,757	
	Temp Erosion & Sediment Control	$	-	Included with erosion control and planting
	Temp. Protection and Direction of Traffic	$	11,898,873	
	Removal of Existing Structure and Obstruction	$	15,168,812	
	Removal of Existing Buildings	$	1,125,000	
	Site Preparation	$	2,196,900	
	Civil/Roadwork			
	Roadway Surface	$	1,038,600	
	Traffic Signals	$	1,080,000	
	Illumination	$	833,400	
	Earthwork	$	2,169,965	
	Storm Water & Drainage	$	288,700	
	Erosion Control & Planting	$	2,865,913	
	Pedestrian Connection	$	5,245,593	
	Drilling Subcontractor Support	$	-	Incl In drilling items
	Utilities	$	1,260,000	
	Bridge Structure			
	West Approach Conventional	$	14,840,683	
	West Approach Long	$	9,747,575	
	Main River Movable Span	$	109,681,578	
	East Approach Long	$	50,667,717	
	East Approach Conventional	$	16,327,012	Incl bridge rail, bridge drains & misc
	Pier Protection - Debris Nose	$	-	
	Harbor Wall Reconstruction	$	-	
	Existing Pier Rip-Rap Removal	$	5,771,837	
	Temporary Construction			
	~~Temporary Diversion Bridge~~	$	-	
	~~Staged Construction Premium~~	$	-	
	Temporary Marine Works (work bridges, cofferdams, etc.)	$	18,258,819	Included with bridge items
	Geotechnical Hazard Mitigation			
	East Approach Ground Improvment	$	-	Not included In Arch
	West Approach Ground Improvment	$	-	
	Other Related Items			
	Aesthetics Premium	$	5,000,000	
	Willamette River Mitigation (floodway, habitat)	$	412,500	
	Contractor Access Premium (barges, RR, parks, off-site staging)	$	3,000,000	
	Facility Impacts (classroom, Esplanade, Sat. Mkt, skatepark)	$	2,000,000	
	Sewer pipe relocation (west bank)	$	-	Not included with current scope
	TriMet (temporary catenary, bus bridge)	$	-	Deleted per 9/17 Meeting
	UPRR Protection and Flagging	$	1,840,320	
	Market Conditions	$	-	
	Contractor Work Zone Security	$	3,000,000	
	Tug Assists	$	-	
	River Patrol	$	-	
	General Conditions	$	115,179,772	
	Construction Total without Contingency	$	402,967,327	
	Contingency **0%**	$	-	Includes market conditions (subs, material fluctuations, etc.)
	Construction Total with Contingency	$	402,967,327	
	Right of Way	$	27,781,000	
	Engineering & Project Delivery			
	NEPA Phase			Not included (Different funding source): $37,282,000 removed
	PE (Incl. Design, PI, ROW Acquisition)	$	90,000,000	Changed to $90m per County cost buildup (incl CMGC and IGA)
	CM/GC Precon			Incl with PE
	IGAs (ODOT, PBOT)			Incl with PE
	Construction Engineering **15%**	$	60,445,099	
	Total Project Cost before Inflation (2021 $)	$	581,193,426	

APPENDIX K

K - Option 1 Risk Model

Safran Risk 21.1.12 Risk Import Template

This template can be used to import risk data into version 21.1.12. If you need to import into another version of Safran Risk, export a new template from that version and copy the data over making sure the data matches the columns.

						PreMitigated Position				
						Schedule Impact			Cost Impact	
Id	Description	Type	Probability	Color	Impact Act. Ind.	Impact Type	Distribution	Days/Hours	Impact Type	Distribution
15	Damage to Adjacent Buildings	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
25	Esplanade Design Changes	Standard	10 %		FALSE				Absolute	Trigen(10000000 ; 12500000 ; 15000000 ; 10 ; 90)
40	Noise Variance	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
48	Full Depth Precast Deck Panels	Standard	10 %		FALSE	Absolute	Trigen(-120d ; -90d ; -60d ; 10 ; 90)	Days	Absolute	Trigen(-5000000 ; -2500000 ; 0 ; 10 ; 100)
20	Change Orders Uncertainty	Standard	100 %		FALSE				Relative	Trigen(102% ; 104% ; 108% ; 10 ; 90)
103	Encroachment Impacts	Standard	40 %		FALSE				Absolute	Trigen(0 ; 500000 ; 1000000 ; 0 ; 90)
U06	Procure Structural Steel Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(-200d ; -160d ; -120d ; 10 ; 90)	Days		
129	Shaft Anomalies	Standard	10 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
112	Accelerated Bridge Construction	Standard	10 %		FALSE					
16	Damage to Streets	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U12	FRP Bent 6 Pier Walls Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(0d ; 20d ; 40d ; 0 ; 90)	Days		
31	Aesthetics/Historic Scope	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
64	Funding Delay	Standard	60 %		FALSE	Absolute	Trigen(60d ; 90d ; 120d ; 10 ; 90)	Days		
110	Weather Delays	Standard	90 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
U03	Early Submittal Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(-10d ; -5d ; 0d ; 10 ; 100)	Days		
36	Hazmat	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U01	Final Design Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(-40d ; 0d ; 40d ; 10 ; 90)	Days		
12	CMGC Project Innovation	Standard	60 %		FALSE	Absolute	Trigen(-120d ; -90d ; -60d ; 10 ; 90)	Days	Absolute	Trigen(-15 ; -10 ; -5 ; 10 ; 90)
U14	River Span Superstructure Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(95% ; 100% ; 105% ; 10 ; 90)			
66	Extreme Flooding	Standard	5 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
56	Ground Improvement Scope	Standard	80 %		FALSE	Absolute	Trigen(20d ; 30d ; 40d ; 10 ; 90)	Days	Absolute	Trigen(1000000 ; 3000000 ; 5000000 ; 10 ; 90)
30	Local Agency Permits	Standard	100 %		FALSE	Absolute	Discrete({0d ; 60d ; 100d ; 20d}{15 ; 25 ; 10 ; 50})	Days		
132	Tower Crane not Allowed	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U02	GMP Negotiation Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(-60d ; 0d ; 20d ; 10 ; 90)	Days		
130	Scour Contaminated Sediments	Standard	20 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
8	Conflicts with Other Projects	Standard	60 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
102	Title Clearing Delay	Standard	40 %		FALSE	Absolute	Trigen(120d ; 180d ; 240d ; 10 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
117	CMGC Late Onboard	Standard	40 %		FALSE				Absolute	Trigen(0 ; 1000000 ; 2500000 ; 0 ; 90)
82	International Contractors	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
75	Key Project Staff Turnover	Standard	60 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
23	Design Approvals	Standard	40 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
128	Soil Mixing for Ground Improvement	Standard	60 %		FALSE				Absolute	Trigen(-15000000 ; -12500000 ; -10000000 ; 10 ; 90)
29	NEPA Tech Reports	Standard	40 %		FALSE				Absolute	Trigen(1000000 ; 1500000 ; 2000000 ; 10 ; 90)
U08	River Span Demolition Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(95% ; 100% ; 105% ; 10 ; 90)			
3	Light Ordinances Impact Night Work	Standard	40 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
111	Utility Planning due to Funding	Standard	10 %		FALSE	Absolute	Trigen(60d ; 80d ; 120d ; 10 ; 90)	Days		
126	Removal of Base Isolation Bearings	Standard	90 %		FALSE				Absolute	Trigen(-1000000 ; -500000 ; 0 ; 10 ; 100)
107	Unforseen Utility Conflicts	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
37	Temporary Hydraulic Rise	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
133	USCG Accomodating	Standard	15 %		FALSE				Absolute	Trigen(5000000 ; 7500000 ; 10000000 ; 10 ; 90)
59	Vessel Protection	Standard	10 %		FALSE				Absolute	Trigen(5000000 ; 7500000 ; 10000000 ; 10 ; 90)
38	Environmental Containment Failure	Standard	10 %		FALSE	Absolute	Trigen(0d ; 3d ; 5d ; 0 ; 90)	Days		
13	Market Forces Uncertainty	Standard	100 %		FALSE				Relative	Trigen(95% ; 100% ; 120% ; 10 ; 90)
62	Ground Improvements Damage Utilities	Standard	40 %		FALSE				Absolute	Trigen(200000 ; 225000 ; 250000 ; 10 ; 90)
14b	Drilled Shaft Obstruction - East/West Approach	Standard	82 %		FALSE	Absolute	Trigen(100d ; 120d ; 140d ; 0 ; 90)	Days		
U09	Bent 6 Shaft Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(67% ; 83% ; 100% ; 10 ; 100)			
U15	East Approach Demolition Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(100% ; 150% ; 200% ; 0 ; 90)			
26	Sustainability Requirements	Standard	60 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
71	Contractor Project Manager Turnover	Standard	20 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
122	Harbor Wall Reconstruction	Standard	40 %		FALSE				Absolute	Trigen(1000000 ; 1500000 ; 2000000 ; 10 ; 90)
67	Workbridge Steel Delay	Standard	100 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
9	Trimet Coordination	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
83	Large Crane Impacts	Standard	40 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
91	Bus Stop/Dwell Location	Standard	90 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
84	Live Traffic and Crane	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
U04	Procure Work Bridge Piling Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(-10% ; -5% ; -0% ; 10 ; 100)			
49	Alternatives to Ground Improvement	Standard	40 %		FALSE	Absolute	Trigen(-60d ; -40d ; -20d ; 10 ; 90)	Days	Absolute	Trigen(-25000000 ; -20000000 ; -15000000 ; 10 ; 90)
43	Local Business Impacts	Standard	80 %		FALSE				Absolute	Trigen(0 ; 500000 ; 1000000 ; 0 ; 90)
124	Double Flaggers	Standard	40 %		FALSE				Absolute	Trigen(1000000 ; 1500000 ; 2000000 ; 10 ; 90)
18	Damage to I-5 Ramps	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)

Safran Risk 21.1.12 Risk Import Template

This template can be used to import risk data into version 21.1.12. If you need to import into another version of Safran Risk, export a new template from that version and copy the data over making sure the data matches the columns.

						PreMitigated Position				
						Schedule Impact			Cost Impact	
Id	Description	Type	Probability	Color	Impact Act. Ind.	Impact Type	Distribution	Days/Hours	Impact Type	Distribution
97	Reduction in Tied Arch Length	Standard	80 %		FALSE				Absolute	Trigen(-10000000 ; -7500000 ; -5000000 ; 10 ; 90)
35	Archeological Discovery	Standard	40 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U10	Bent 7 Shaft Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(67% ; 83% ; 100% ; 10 ; 100)			
U13	West Approach Superstructure Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(60% ; 80% ; 100% ; 10 ; 100)			
53	Moveable Bridge - Buy America	Standard	60 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
14a	Drilled Shaft Obstruction - River Span	Standard	90 %		FALSE	Absolute	Trigen(10d ; 20d ; 60d ; 0 ; 90)	Days	Absolute	Trigen(5000000 ; 6000000 ; 10000000 ; 10 ; 90)
101	Appraisals Delay	Standard	10 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
136	Pandemic impacts Productivity	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
89	Aquatic Mitigation Credits	Standard	40 %		FALSE				Absolute	Trigen(5000000 ; 7500000 ; 10000000 ; 10 ; 90)
118	Rebid CMGC due to Negotiations	Standard	10 %		FALSE	Absolute	Trigen(120d ; 132d ; 144d ; 10 ; 90)	Days		
47	Reduce Foundation through Seismic Design Refinement	Standard	90 %		FALSE	Absolute	Trigen(-120d ; -100d ; -80d ; 10 ; 90)	Days	Absolute	Trigen(-20 ; -17.5 ; -15 ; 10 ; 90)
60	Utility Relocation Delay	Standard	40 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
17	Demolition over Railroad	Standard	60 %		FALSE	Absolute	Trigen(60d ; 90d ; 120d ; 10 ; 90)	Days		
92	Reversable Lane Design	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
88	Wire-Saw Demolition Obstructions	Standard	40 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
7	High Water Events	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
61	CSO Force Main Damage	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
127	Steel Quality	Standard	40 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
135	City Ramp Project	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
131	Vibration Monitoring	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U11	FRP Bent 6 Footing Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(20d ; 30d ; 40d ; 10 ; 90)	Days		
105	New River Outfall	Standard	10 %		FALSE				Absolute	Trigen(0 ; 250000 ; 500000 ; 0 ; 90)
44	Relocation Delays	Standard	40 %		FALSE	Absolute	Trigen(120d ; 180d ; 240d ; 10 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U07	West Approach Substructure Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(67% ; 83% ; 100% ; 10 ; 100)			

Safran Risk 21.1.12 Activity To Risk Mappings Import Template

Activity Id	Activity Description	Mapped Risks
P1000	Issue Final Design RFP	
P1010	Procurement of Final Design	
P1020	Final Design NTP	
P1030	Final Design (30%)	
P1070	ROW	[101;Parallel];[44;Parallel];[102;Parallel]
P1060	Final Design (98% Bid)	[23;Series];[U01;Parallel]
P1040	GMP Negotiation Period	[U02;Parallel];[64;Series];[111;Series];[60;Parallel];[118;Parallel];[30;Parallel]
P1050	Final Design (100%)	
A1000	Notice To Proceed	
R01	Total Construction Duration	
A1010	Close Bridge to Traffic	
A1030	Open New Bridge to Traffic	
A1040	Substantial Completion (2nd Notification)	[15;Parallel];[71;Parallel];[38;Parallel];[110;Parallel];[40;Parallel];[35;Parallel];[136;Parallel];[66;Parallel];[75;Parallel];[82;Parallel]
A1050	Early Submittals	[U03;Series]
A1080	Procure Structural Steel (Movable & East Cable Stay)	[U06;Series]
A1060	Procure Work Bridge Piling	[U04;Series]
A1070	Procure Work Bridge Superstructure	[67;Series]
A1130	Procure West Girder Steel	
A1090	Mobilize to Site	
A1100	Install Site Access/Erosion Control	
A1110	Railroad Crossing (East Side)	
A1120	River Dredging/Riprap Removal	
A1160	Install West Work Bridge Pile to Pier 6	
A1660	Install West Work Bridge Piling Around Pier 6	
A1170	Install West Work Bridge Superstructure to Pier 6	
A1180	Install East Work Bridge Pile to Pier 7	
A1665	Install West Work Bridge Superstructure Around Pier 6	
A2415	Install East Work Bridge Piling Around Pier 7	
A1190	Install East Work Bridge Superstructure To Pier 7	
A2416	Install East Work Bridge Superstructure Around Pier 7	
A2420	Remove West Work Bridge Superstructure	
A2440	Remove East Work Bridge Superstructure	
A2430	Remove West Work Bridge Piling	
A2450	Remove East Work Bridge Piling	
A1220	Demolish Existing Bridge	[61;Parallel];[107;Parallel]
A2780	Place Infill Walls PRM	
A2790	Demo Girders/Sidewalk & Shore In Front of PRM	
A2800	Demo Remainder of Existing Span 1	
A2810	Construct Abutment Walls	
A2820	Backfill Abutment	
A2830	FRP Approach Slab	
A2840	FRP Sidewalk	
A1230	Bent 1 Shafts	[U07;Series]
A1250	Bent 2 Shafts	[U07;Series]
A1240	FRP Bent 1 Columns & Cap	[U07;Series]
A1260	FRP Bent 2 Columns & Cap	[U07;Series]
A1270	Bent 3 Shafts	[U07;Series]
A1671	Bent 4 Shafts	[U07;Series]
A1280	FRP Bent 3 Columns & Cap	[U07;Series]
A1674	Bent 5 Shafts	[U07;Series]
A1672	FRP Bent 4 Columns & Cap	[U07;Series]
A2850	FRP Bent 5 Columns & Cap	[U07;Series]
A1350	Set Girders Spans 1 to 2	
A1360	Form & Reinforce Spans 1 to 2	
A1370	Pour Spans 1 to 2 (Incl Cure)	
A1380	Pour Sidewalks Spans 1 to 2	
A1390	Pour Barrier/Ped Rail Spans 1 to 2	
A1840	Erect Girders from Bent 3 to Bent 5	[U13;Series]
A1851	Form & Reinforce Deck Spans 3 to 5	[U13;Series]
A1855	Pour Deck Spans 3 to 5	[U13;Series]
A1861	Pour Sidewalks Spans 3 to 5	[U13;Series]
A1871	Pour Barrier/Ped Rail Spans 3 to 5	[U13;Series]
A2480	Miscellaneous/Striping, etc	[U13;Series]
A1590	Shore West Counterweight For Span Demo	[U08;Series]

Safran Risk 21.1.12 Activity To Risk Mappings Import Template

Activity Id	Activity Description	Mapped Risks
A1600	Demo West Truss Deck & Lower Truss	[U08;Series]
A1620	Demo West Bascule Span	[U08;Series]
A1610	Demo East Truss Deck & Lower Truss	[U08;Series]
A1595	Shore East Counterweight For Span Demo	[U08;Series]
A1635	Demo Ex Pier 1 To Top of Seawall	[U08;Series]
A1640	Demo Ex Pier 2 Wire Saw	[U08;Parallel];[88;Parallel]
A1630	Demo East Bascule Span	[U08;Series]
A1650	Demo Ex Pier 3 Wire Saw	[88;Parallel];[U08;Parallel]
A1670	Demo Ex Pier 4 Wire Saw	[88;Parallel];[U08;Parallel]
A1700	Bent 6 Shafts	[U09;Parallel];[129;Parallel];[14a;Parallel];[47;Series];[12;Series]
A1760	Bent 7 Shafts	[U10;Parallel];[12;Series]
A1710	FRP Bent 6 Perched Footing (Build In Place)	[U11;Series]
A1720	FRP Bent 6 Pier Walls	[U12;Parallel]
A1770	FRP Bent 7 Perched Footing (Float In)	
A1730	Install Bent 6 Mechanical	[53;Parallel]
A1780	FRP Bent 7 Pier Walls	
A1790	Install Bent 7 Mechanical	
A1740	Erect Bent 6 Bascule Backspan	[U14;Series]
A1750	FRP Bent 6 Counterweight	[U14;Series]
A1860	FRP West Bascule Span Offsite	[U14;Series]
A1800	Erect Bent 7 Bascule Backspan	[U14;Series]
A1870	Float In and Place West Bascule Span	[U14;Series]
A1880	Pour West Bascule Closure (Incl Cure)	[U14;Series]
A1810	FRP Bent 7 Counterweight	[U14;Series]
A1890	FRP Sidewalk West Bascule	[U14;Series]
A1900	FRP Barrier West Bascule	[U14;Series]
A1910	West Bascule Testing	[U14;Series]
A1940	FRP East Bascule Span Offsite	[U14;Series]
A1950	Float In and Place East Bascule Span	[U14;Series]
A1960	Pour East Bascule Closure (Incl Cure)	[U14;Series]
A1970	FRP Sidewalk East Bascule	[U14;Series]
A1980	FRP Barrier East Bascule	[U14;Series]
A1990	East Bascule Testing	[U14;Series]
A2000	Demo Superstructure over I-5 & I-84	[U15;Series]
A2010	Demo Superstructure over RR Tracks	[U15;Parallel];[17;Parallel]
A2020	Demo Substructure Bents 21 through 24	[U15;Series]
A2030	Demo Remainder of East Approach	
A2080	Bent 9 Shafts	
A1815	Jet Grouting Bent 8	[56;Parallel];[49;Parallel]
A2090	FRP Bent 9 Columns & Cap	
A2120	Bent 10 Shafts	
A1820	Bent 8 Shafts	[14b;Series]
A2130	FRP Bent 10 Columns & Cap	
A1825	Excavate and Shore for Bent 8 Shaft Cap	
A2140	Excavate & Shoring Bent 10	
A2150	FRP Bent 10	
A1830	FRP Bent 8 Shaft Cap	
A2040	FRP Bent 8 Tower	
A2160	Erect Girders Span 9	
A2170	Form & Reinforce Deck Span 9	
A2180	Pour Deck Span 9 (Incl Cure)	
A2190	FRP Sidewalk Span 9	
A2200	FRP Barrier Span 9	
A1920	Set Steel/Cables/Precast Slabs From Bent 6 to Bent 8 (East Cable St	[127;Parallel];[3;Parallel];[83;Parallel];[84;Parallel];[8;Parallel]
A1931	Pour Overlay From Bent 8 to Bent 6	
A1932	Pour Sidewalks Spans 3 to 5	
A1933	Pour Overlay Spans 3 to 5	
A2490	Miscellaneous/Striping, etc	[135;Series]

Safran Risk 21.1.12 Cost Import Template

This template can be used to import cost data into version 21.1.12. If you need to import into another version of Safran Risk, export a new template and copy the data over to it making sure the data matches the columns.

								Time				
									Start		Finish	
Outline	Id	Description	Base Value	Uncertainty	Schedule Connection	Activities	Risks	Use Sched Conn	Type	Calculated	Type	Calculated
Project.Con	00010	Prep	32457343	Trigen(28666515 ; 32569843 ; 35220633 ; 10 ; 90)	FALSE		[20;Series];[37;Series];[13;Series];[43;Series];[131;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00020	Civil/Roadwork	14782171	Trigen(9982920 ; 11536578 ; 13157716 ; 10 ; 90)	FALSE		[20;Series];[107;Series];[13;Series];[105;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00030	Bridge Structure	2.03E+08	Trigen(170627764 ; 196961663 ; 227689507 ; 10 ; 90)	FALSE		[40;Series];[20;Series];[36;Series];[12;Series];[132;Series];[130;Series];[133;Series];[59;Series];[13;Series];[14a;Series];[47;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00040	Temp Construction	18230626	Trigen(16407564 ; 18230626 ; 20053689 ; 10 ; 90)	FALSE		[20;Series];[13;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00050	Geotech Hazard Mitigation	23248601	Trigen(20923741 ; 23248602 ; 24411032 ; 10 ; 90)	FALSE		[20;Series];[56;Series];[128;Series];[13;Series];[62;Series];[49;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00060	Other Costs	15252820	Trigen(13406913 ; 15252820 ; 17698727 ; 10 ; 90)	FALSE		[25;Series];[20;Series];[16;Series];[31;Series];[75;Series];[29;Series];[13;Series];[26;Series];[122;Series];[9;Series];[91;Series];[124;Series];[18;Series];[35;Series];[89;Series];[92;Series];[7;	FALSE		1/1/2022		1/1/2022
Project.Con	00070	General Conditions	1.15E+08	Trigen(95% ; 100% ; 120% ; 10 ; 90)	TRUE	[R01;100]	[13;Series]	TRUE		3/3/2025		8/8/2029
Project.ROW	00080	ROW Costs	27781000	Trigen(20835750 ; 24308375 ; 27781000 ; 10 ; 90)	FALSE		[103;Series];[102;Series];[44;Series]	FALSE		1/1/2022		1/1/2022
Project.EPD	00090	PE	90000000	Trigen(84500000 ; 90000000 ; 116200000 ; 10 ; 90)	FALSE		[117;Series]	FALSE		1/1/2022		1/1/2022
Project.EPD	00100	CE	63311952	Trigen(55415430 ; 66958146.56 ; 81932442.28 ; 10 ; 90)	TRUE	[R01;100]		TRUE		3/3/2025		8/8/2029

APPENDIX L

L - Option 2 Risk Model

Safran Risk 21.1.12 Risk Import Template

This template can be used to import risk data into version 21.1.12. If you need to import into another version of Safran Risk, export a new template from that version and copy the data over making sure the data matches the columns.

						PreMitigated Position Schedule Impact			Cost Impact	
Id	**Description**	**Type**	**Probability**	**Color**	**Impact Act. Ind.**	**Impact Type**	**Distribution**	**Days/Hours**	**Impact Type**	**Distribution**
U02	GMP Negotiation Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(-60d ; 0d ; 20d ; 10 ; 90)	Days		
89	Aquatic Mitigation Credits	Standard	40 %		FALSE				Absolute	Trigen(5000000 ; 7500000 ; 10000000 ; 10 ; 90)
103	Encroachment Impacts	Standard	40 %		FALSE				Absolute	Trigen(0 ; 500000 ; 1000000 ; 0 ; 90)
111	Utility Planning due to Funding	Standard	10 %		FALSE	Absolute	Trigen(60d ; 80d ; 120d ; 10 ; 90)	Days		
117	CMGC Late Onboard	Standard	40 %		FALSE				Absolute	Trigen(0 ; 1000000 ; 2500000 ; 0 ; 90)
U04	Procure Work Bridge Piling Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(-10% ; -5% ; -0% ; 10 ; 100)			
16	Damage to Streets	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
122	Harbor Wall Reconstruction	Standard	40 %		FALSE				Absolute	Trigen(1000000 ; 1500000 ; 2000000 ; 10 ; 90)
44	Relocation Delays	Standard	40 %		FALSE	Absolute	Trigen(120d ; 180d ; 240d ; 10 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
47	Opportunity - Reduce Foundation through Seismic Des	Standard	90 %		FALSE	Absolute	Trigen(-120d ; -100d ; -80d ; 10 ; 90)	Days	Absolute	Trigen(-20 ; -17.5 ; -15 ; 10 ; 90)
43	Local Business Impacts	Standard	80 %		FALSE				Absolute	Trigen(0 ; 500000 ; 1000000 ; 0 ; 90)
82	International Contractors	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
88	Wire-Saw Demolition Obstructions	Standard	40 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
12	Opportunity - CMGC Project Innovation	Standard	60 %		FALSE	Absolute	Trigen(-120d ; -90d ; -60d ; 10 ; 90)	Days	Absolute	Trigen(-15 ; -10 ; -5 ; 10 ; 90)
9	Trimet Coordination	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
105	New River Outfall	Standard	10 %		FALSE				Absolute	Trigen(0 ; 250000 ; 500000 ; 0 ; 90)
U08	River Span Demolition Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(95% ; 100% ; 105% ; 10 ; 90)			
132	Tower Crane not Allowed	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
17	Demolition over Railroad	Standard	60 %		FALSE	Absolute	Trigen(60d ; 90d ; 120d ; 10 ; 90)	Days		
U16	East Arch Superstructure Uncertainty	Standard	100 %		FALSE	Relative	Trigen(80% ; 90% ; 100% ; 10 ; 100)			
67	Workbridge Steel Delay	Standard	100 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
U07	West Approach Substructure Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(67% ; 83% ; 100% ; 10 ; 100)			
84	Live Traffic and Crane	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
38	Environmental Containment Failure	Standard	10 %		FALSE	Absolute	Trigen(0d ; 3d ; 5d ; 0 ; 90)	Days		
102	Title Clearing Delay	Standard	40 %		FALSE	Absolute	Trigen(120d ; 180d ; 240d ; 10 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
3	Light Ordinances Impact Night Work	Standard	40 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
48	Opportunity - Full Depth Precast Deck Panels	Standard	10 %		FALSE	Absolute	Trigen(-60d ; -45d ; -30d ; 10 ; 90)	Days	Absolute	Trigen(-5000000 ; -2500000 ; 0 ; 10 ; 100)
128	Soil Mixing for Ground Improvement	Standard	60 %		FALSE				Absolute	Trigen(-15000000 ; -12500000 ; -10000000 ; 10 ; 90)
97	Opportunity - Reduction in Tied Arch Length	Standard	80 %		FALSE	Absolute	Trigen(-60d ; -40d ; -20d ; 10 ; 90)	Days	Absolute	Trigen(-10000000 ; -7500000 ; -5000000 ; 10 ; 90)
35	Archeological Discovery	Standard	40 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
136	Pandemic impacts Productivity	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
8	Conflicts with Other Projects	Standard	80 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
30	Local Agency Permits	Standard	100 %		FALSE	Absolute	Discrete({0d ; 60d ; 100d ; 20d}{15 ; 25 ; 10 ; 50})	Days		
135	City Ramp Project	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
130	Scour Contaminated Sediments	Standard	20 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
126	Opportunity - Removal of Base Isolation Bearings	Standard	90 %		FALSE				Absolute	Trigen(-5000000 ; -2500000 ; 0 ; 10 ; 100)
23	Design Approvals	Standard	40 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
37	Temporary Hydraulic Rise	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
60	Utility Relocation Delay	Standard	40 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
14b	Drilled Shaft Obstruction - East/West Approach	Standard	82 %		FALSE	Absolute	Trigen(100d ; 120d ; 140d ; 0 ; 90)	Days		
25	Esplanade Design Changes	Standard	10 %		FALSE				Absolute	Trigen(10000000 ; 12500000 ; 15000000 ; 10 ; 90)
13	Change Orders Uncertainty	Standard	100 %		FALSE				Relative	Trigen(102% ; 104% ; 108% ; 10 ; 90)
36	Hazmat	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
59	Vessel Protection	Standard	10 %		FALSE				Absolute	Trigen(5000000 ; 7500000 ; 10000000 ; 10 ; 90)
U06	Procure Structural Steel Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(-200d ; -160d ; -120d ; 10 ; 90)	Days		
15	Damage to Adjacent Buildings	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
20	Market Forces Uncertainty	Standard	100 %		FALSE				Relative	Trigen(95% ; 100% ; 120% ; 10 ; 90)
49	Alternatives to Ground Improvement	Standard	40 %		FALSE	Absolute	Trigen(-60d ; -40d ; -20d ; 10 ; 90)	Days	Absolute	Trigen(-25000000 ; -20000000 ; -15000000 ; 10 ; 90)
107	Unforseen Utility Conflicts	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
129	Shaft Anomalies	Standard	10 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
124	Double Flaggers	Standard	40 %		FALSE				Absolute	Trigen(1000000 ; 1500000 ; 2000000 ; 10 ; 90)
64	Funding Delay	Standard	60 %		FALSE	Absolute	Trigen(60d ; 90d ; 120d ; 10 ; 90)	Days		
U14	River Span Superstructure Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(95% ; 100% ; 105% ; 10 ; 90)			
83	Large Crane Impacts	Standard	60 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
18	Damage to I-5 Ramps	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U11	FRP Bent 6 Footing Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(20d ; 30d ; 40d ; 10 ; 90)	Days		
29	NEPA Tech Reports	Standard	40 %		FALSE				Absolute	Trigen(1000000 ; 1500000 ; 2000000 ; 10 ; 90)
92	Reversable Lane Design	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
66	Extreme Flooding	Standard	5 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
U01	Final Design Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(-40d ; 0d ; 40d ; 10 ; 90)	Days		

Safran Risk 21.1.12 Risk Import Template

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						PreMitigated Position				
						Schedule Impact			Cost Impact	
Id	Description	Type	Probability	Color	Impact Act. Ind.	Impact Type	Distribution	Days/Hours	Impact Type	Distribution
7	High Water Events	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U15	East Approach Demolition Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(100% ; 150% ; 200% ; 0 ; 90)			
127	Steel Quality	Standard	20 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
71	Contractor Project Manager Turnover	Standard	20 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
112	Accelerated Bridge Construction	Standard	10 %		FALSE	Absolute	Trigen(-60d ; -40d ; -20d ; 10 ; 90)	Days	Absolute	Trigen(5000000 ; 10000000 ; 15000000 ; 10 ; 90)
118	Rebid CMGC due to Negotiations	Standard	10 %		FALSE	Absolute	Trigen(120d ; 132d ; 144d ; 10 ; 90)	Days		
75	Key Project Staff Turnover	Standard	60 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
26	Sustainability Requirements	Standard	60 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U10	Bent 7 Shaft Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(67% ; 83% ; 100% ; 10 ; 100)			
U12	FRP Bent 6 Pier Walls Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(0d ; 20d ; 40d ; 0 ; 90)	Days		
62	Ground Improvements Damage Utilities	Standard	40 %		FALSE				Absolute	Trigen(200000 ; 225000 ; 250000 ; 10 ; 90)
31	Aesthetics/Historic Scope	Standard	40 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
40	Noise Variance	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days	Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
U09	Bent 6 Shaft Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(67% ; 83% ; 100% ; 10 ; 100)			
53	Moveable Bridge - Buy America	Standard	60 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
91	Bus Stop/Dwell Location	Standard	90 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
101	Appraisals Delay	Standard	10 %		FALSE	Absolute	Trigen(20d ; 40d ; 60d ; 10 ; 90)	Days		
131	Vibration Monitoring	Standard	10 %		FALSE				Absolute	Trigen(0 ; 2500000 ; 5000000 ; 0 ; 90)
110	Weather Delays	Standard	90 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
133	Opportunity - USCG Accomodating	Standard	15 %		FALSE				Absolute	Trigen(-10000000 ; -7500000 ; -5000000 ; 10 ; 90)
56	Ground Improvement Scope	Standard	80 %		FALSE	Absolute	Trigen(20d ; 30d ; 40d ; 10 ; 90)	Days	Absolute	Trigen(1000000 ; 3000000 ; 5000000 ; 10 ; 90)
U13	West Approach Superstructure Duration Uncertainty	Standard	100 %		FALSE	Relative	Trigen(60% ; 80% ; 100% ; 10 ; 100)			
14a	Drilled Shaft Obstruction - River Span	Standard	90 %		FALSE	Absolute	Trigen(10d ; 20d ; 60d ; 0 ; 90)	Days	Absolute	Trigen(5000000 ; 6000000 ; 10000000 ; 10 ; 90)
61	CSO Force Main Damage	Standard	10 %		FALSE	Absolute	Trigen(0d ; 10d ; 20d ; 0 ; 90)	Days		
U03	Early Submittal Duration Uncertainty	Standard	100 %		FALSE	Absolute	Trigen(-10d ; -5d ; 0d ; 10 ; 100)	Days		

Safran Risk 21.1.12 Activity To Risk Mappings Import Template

Activity Id	Activity Description	Mapped Risks
P1000	Issue Final Design RFP	
P1010	Procurement of Final Design	
P1020	Final Design NTP	
P1030	Final Design (30%)	
P1070	ROW	[102;Parallel];[44;Parallel];[101;Parallel]
P1060	Final Design (98% Bid)	[23;Series];[U01;Parallel]
P1040	GMP Negotiation Period	[U02;Parallel];[64;Series];[30;Parallel];[111;Series];[60;Parallel];[118;Parallel]
P1050	Final Design (100%)	
A1000	Notice To Proceed	
R01	Total Construction Duration	
A1010	Close Bridge to Traffic	
A1030	Open New Bridge to Traffic	
A1040	Substantial Completion (2nd Notification)	[82;Parallel];[35;Parallel];[75;Parallel];[110;Parallel];[66;Parallel];[40;Parallel];[15;Parallel];[71;Parallel];[136;Parallel];[38;Parallel]
A1050	Early Submittals	[U03;Series]
A1060	Procure Work Bridge Piling	[U04;Series]
A1130	Procure West Girder Steel	
A1080	Procure Structural Steel (Incl East Arch)	[U06;Series]
A1070	Procure Work Bridge Superstructure	[67;Series]
A1090	Mobilize to Site	
A1100	Install Site Access/Erosion Control	
A1110	Railroad Crossing (East Side)	
A1120	River Dredging/Riprap Removal	
A1160	Install West Work Bridge Pile to Pier 6	
A1660	Install West Work Bridge Piling Around Pier 6	
A1180	Install East Work Bridge Pile to Pier 7	
A1170	Install West Work Bridge Superstructure to Pier 6	
A1665	Install West Work Bridge Superstructure Around Pier 6	
A2415	Install East Work Bridge Piling Around Pier 7	
A1190	Install East Work Bridge Superstructure To Pier 7	
A2416	Install East Work Bridge Superstructure Around Pier 7	
A2420	Remove West Work Bridge Superstructure	
A2440	Remove East Work Bridge Superstructure	
A2430	Remove West Work Bridge Piling	
A2450	Remove East Work Bridge Piling	
A2530	Install East Tower 1 Piling In Water	
A2540	Install East Tower 1 Remainder In Water	
A2550	Install East Tower 2 On Land	
A2590	Remove East Water Tower	
A2580	Remove East Land Tower	
A1220	Demolish Existing Bridge	[107;Parallel];[61;Parallel]
A2780	Place Infill Walls PRM	
A2790	Demo Girders/Sidewalk & Shore In Front of PRM	
A2800	Demo Remainder of Existing Span 1	
A2810	Construct Abutment Walls	

Safran Risk 21.1.12 Activity To Risk Mappings Import Template

Activity Id	Activity Description	Mapped Risks
A2820	Backfill Abutment	
A2830	FRP Approach Slab	
A2840	FRP Sidewalk	
A1230	Bent 1 Shafts	[U07;Series]
A1240	FRP Bent 1 Columns & Cap	[U07;Series]
A1250	Bent 2 Shafts	[U07;Series]
A1260	FRP Bent 2 Columns & Cap	[U07;Series]
A1270	Bent 3 Shafts	[U07;Series]
A1310	Bent 4 Shafts	
A1280	FRP Bent 3 Columns & Cap	[U07;Series]
A2850	Bent 5 Shafts	[U07;Series]
A1341	RFP Bent 4 Columns & Cap	
A2860	RFP Bent 5 Columns & Cap	
A1350	Set Girders Spans 1 to 4	
A1360	Form & Reinforce Spans 1 to Span 4	
A1370	Pour Spans 1 to 4 (Incl Cure)	
A1380	Pour Sidewalks Spans 1 to 4	
A1390	Pour Barrier/Ped Rail Spans 1 to 4	
A1840	Set Girders from Bent 4 to Bent 5	[U13;Series]
A1850	Form & Reinforce Deck From Bent 4 to Bent 5	
A1851	Pour Deck From Bent 4 to Bent 5	[U13;Series]
A1861	Pour Sidewalks Bent 4 to 5	[U13;Series]
A1871	Place Barrier/Ped Rail Bent 4 to 5	[U13;Series]
A2480	Miscellaneous/Striping, etc	[U13;Series]
A1590	Shore West Counterweight For Span Demo	[U08;Series]
A1600	Demo West Truss Deck & Lower Truss	[U08;Series]
A1620	Demo West Bascule Span	[U08;Series]
A1610	Demo East Truss Deck & Lower Truss	[U08;Series]
A1635	Demo Ex Pier 1 To Top of Seawall	[U08;Series]
A1640	Demo Ex Pier 2 Wire Saw	[88;Parallel];[U08;Parallel]
A1595	Shore East Counterweight For Span Demo	[U08;Series]
A1630	Demo East Bascule Span	[U08;Series]
A1670	Demo Ex Pier 4 Wire Saw	[U08;Parallel];[88;Parallel]
A1650	Demo Ex Pier 3 Wire Saw	[U08;Parallel];[88;Parallel]
A1700	Bent 6 Shafts	[12;Series];[U09;Parallel];[47;Series];[14a;Parallel];[129;Parallel]
A1760	Bent 7 Shafts	[12;Series];[U10;Parallel]
A1710	FRP Bent 6 Perched Footing (Build In Place)	[U11;Series]
A1720	FRP Bent 6 Pier Walls	[U12;Parallel]
A1770	FRP Bent 7 Perched Footing (Build in Place)	
A1730	Install Bent 6 Mechanical	[53;Parallel]
A1780	FRP Bent 7 Pier Walls	
A1790	Install Bent 7 Mechanical	
A1740	Erect Bent 6 Bascule Backspan	[U14;Series]
A1750	FRP Bent 6 Counterweight	[U14;Series]

Safran Risk 21.1.12 Activity To Risk Mappings Import Template

Activity Id	Activity Description	Mapped Risks
A1860	FRP West Bascule Span Offsite	[U14;Series]
A1800	Erect Bent 7 Bascule Backspan	[U14;Series]
A1870	Float In and Place West Bascule Span	[U14;Series]
A1880	Pour West Bascule Closure (Incl Cure)	[U14;Series]
A1810	FRP Bent 7 Counterweight	[U14;Series]
A1890	FRP Sidewalk West Bascule	[U14;Series]
A1900	FRP Barrier West Bascule	[U14;Series]
A1910	West Bascule Testing	[U14;Series]
A1940	FRP East Bascule Span Offsite	[U14;Series]
A1950	Float In and Place East Bascule Span	[U14;Series]
A1960	Pour East Bascule Closure (Incl Cure)	[U14;Series]
A1970	FRP Sidewalk East Bascule	[U14;Series]
A1980	FRP Barrier East Bascule	[U14;Series]
A1990	East Bascule Testing	[U14;Series]
A2000	Demo Superstructure over I-5 & I-84	[U15;Series]
A2010	Demo Superstructure over RR Tracks	[17;Parallel];[U15;Parallel]
A2020	Demo Substructure Bents 21 through 24	[U15;Series]
A2030	Demo Remainder of East Approach	
A2080	Bent 9 Shafts	
A2090	FRP Bent 9 Columns & Cap	
A2120	Bent 10 Shafts	
A2130	FRP Bent 10 Abutment Wall	
A1820	Bent 8 Shafts	[14b;Series]
A1830	FRP Bent 8 Columns & Cap	
A2160	Erect Girders Spans 8 to 9	
A2170	Form & Reinforce Deck Spans 8 to 9	
A2180	Pour Deck Spans 8 to 9 (Incl Cure)	
A2190	FRP Sidewalk Spans 8 to 9	
A2200	FRP Barrier Spans 8 to 9	
A1920	Set Arch Steel From Bent 7 to Bent 8 (East Arch)	[8;Parallel];[97;Parallel];[83;Parallel];[84;Parallel];[127;Parallel];[U16;Series];[3;Parallel]
A1930	Form & Reinforce Deck From Bent 7 to Bent 8	[48;Parallel];[U16;Series];[112;Parallel]
A1931	Pour Deck From Bent 8 to Bent 7	[U16;Series];[48;Parallel]
A1932	FRP Sidewalk Span 7	
A1933	FRP Parapets & Ped Barrier Span 7	
A2490	Miscellaneous/Striping, etc	[135;Series]

Safran Risk 21.1.12 Cost Import Template

This template can be used to import cost data into version 21.1.12. If you need to import into another version of Safran Risk, export a new template and copy the data over to it making sure the data matches the columns.

								Time				
			Base						Start		Finish	
Outline	Id	Description	Value	Uncertainty	Schedul	Activities	Risks	Use Sched Conn	Type	Calculated	Type	Calculated
Project.Con	00010	Prep	32457343	Trigen(29856402 ; 32569843 ; 36410521 ; 10 ; 90)	FALSE		[43;Series];[37;Series];[13;Series];[20;Series];[131;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00020	Civil/Roadwork	14782171	Trigen(9982920 ; 11536578 ; 13157716 ; 10 ; 90)	FALSE		[13;Series];[20;Series];[107;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00030	Bridge Structure	2.07E+08	Trigen(176597280 ; 197878104 ; 229222156 ; 10 ; 90)	FALSE		[47;Series];[12;Series];[48;Series];[97;Series];[130;Series];[126;Series];[13;Series];[36;Series];[59;Series];[20;Series];[112;Series];[40;Series];[133;Series];[14a;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00040	Temp Construction	18258819	Trigen(16432937 ; 18258819 ; 20084701 ; 10 ; 90)	FALSE		[13;Series];[20;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00050	Geotech Hazard Mitigation	0	Discrete({0}{100})	FALSE		[13;Series];[20;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00060	Other Costs	15252820	Trigen(13406913 ; 15252820 ; 17698727 ; 10 ; 90)	FALSE		[89;Series];[16;Series];[122;Series];[9;Series];[35;Series];[25;Series];[13;Series];[20;Series];[124;Series];[18;Series];[29;Series];[92;Series];[7;Series];[75;Series];[26;Series];[31;Series];[91;Series]	FALSE		1/1/2022		1/1/2022
Project.Con	00070	General Conditions	1.15E+08	Trigen(95% ; 100% ; 120% ; 10 ; 90)	TRUE	[R01;100]	[20;Series]	TRUE		3/3/2025		10/17/2029
Project.ROW	00080	ROW Costs	27781000	Trigen(20835750 ; 24308375 ; 27781000 ; 10 ; 90)	FALSE		[103;Series];[44;Series];[102;Series]	FALSE		1/1/2022		1/1/2022
Project.EPD	00090	PE	90000000	Trigen(84500000 ; 90000000 ; 116200000 ; 10 ; 90)	FALSE		[117;Series]	FALSE		1/1/2022		1/1/2022
Project.EPD	00100	CE	60445099	Trigen(53354585 ; 62508150 ; 77314223 ; 10 ; 90)	TRUE	[R01;100]		TRUE		3/3/2025		10/17/2029