

Multnomah County

Earthquake Ready Burnside Bridge Project

Preliminary Project Risk Register

March 17, 2022

Disclaimer: *The preliminary draft analysis and information provided below are subject to change pending the A&E design process projected to start in 2023.*

PROJECT: Multnomah County EQRB

Earthquake Ready Burnside Bridge Project

Project Risk Register

REV : 0

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| Score | 1 | 2 | 3 | 4 | 5 |
| Probability | < 10% | <> 10% -50% | <> 50% -75% | <> 75% -90% | > 90% |
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| 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 | | |
| 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 | | |
| 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 eight 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 | | |
| 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 | | |
| 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 occurrence. Model for cost only. | Do not model | model | | |
| 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 | | |
| 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 | | |

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| 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 | | |
| 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 | | |
| 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. | | |
| 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 | | |
| 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 | | |

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| 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 | | |
| 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 | | |
| 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, 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 | | |
| 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 | | |
| 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 | | |

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| 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. Assume up to 15% higher costs at the high end, 10% most likely, 5% on the low. | 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 | | |
| 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 | | |
| 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 surprises 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 | | |
| 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 | | |

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| 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 | 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |

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| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |

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| 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 | | |
| 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 mitigation 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |

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| 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 | | |
| 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 displaces being able to find a location to relocate where their operation is permissible (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 | | |
| 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 | | |
| 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. | | |
| 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 | | |
| 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 | | |

PROJECT: Multnomah County EQRB

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) |
|--------|-----------|--------------------|--------------|
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| WkSh Risk ID | Option | Status | RBS | Risk | Risk Description | Notes/Mitigation | Risk Modeling Notes | Schedule Model | Cost Model | Risk Owner | Due Date |
|--------------|----------|--------|----------------------------|---|--|--|---|----------------|---------------------|------------|----------|
| 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. At this point, the movable bridge system costs include the Buy America component pricing. Should the ability to get a waiver be easier in the future, there may be opportunity to save some cost without risk to lower quality or longevity of 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 | | |
| 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 | | |
| 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 | | |
| 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 duplicate. | Do not model | in cost uncertainty | | |

PROJECT: Multnomah County EQRB

Earthquake Ready Burnside Bridge Project

Project Risk Register

REV : 0

DATE : January 16, 2022

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|--------------------|-----------|-----------------|-----------------|----------------|-------------|
| Score | 1 | 2 | 3 | 4 | 5 |
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|--------------|----------|--------|----------------------|---|---|---|---|----------------|---------------------|------------|----------|
| 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 system will be required to accommodate large impacts that requires heavy reinforcement. Cellular cofferdam or additional shafts at approximately \$2M each would be required. | | Minor risk to model for cost. | Do not model | model | | |
| 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 | 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 assumption is 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 | | |
| 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 occurring. 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 | | |
| 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 | | |
| 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 | | |

PROJECT: Multnomah County EQRB

Earthquake Ready Burnside Bridge Project

Project Risk Register

REV : 0

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|--------------------|-----------|-----------------|-----------------|----------------|-------------|
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Rating

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DATE : Jauary 16, 2022

| WkSh Risk ID | Option | Status | RBS | Risk | Risk Description | Notes/Mitigation | Risk Modeling Notes | Schedule Model | Cost Model | Risk Owner | Due Date |
|--------------|--------|--------|-------------------------------|--|--|---|---|----------------|-----------------------|------------|----------|
| 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 | | |
| 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 | | |
| 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 | | |
| 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 possible to avoid delays. Specify as a long-lead item | Minor time risk. Cost in uncertainty ranges. | Model | in cost uncertainty | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |

PROJECT: Multnomah County EQRB

Earthquake Ready Burnside Bridge Project

Project Risk Register

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DATE : January 16, 2022

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| WkSh Risk ID | Option | Status | RBS | Risk | Risk Description | Notes/Mitigation | Risk Modeling Notes | Schedule Model | Cost Model | Risk Owner | Due Date |
|--------------|----------|--------|-----------------------------|---|---|---|--|----------------|--------------|------------|----------|
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 high-capacity crane. Will ODOT require highway closures while erecting, and what will be the time restrictions? Note that cable-stay segment erection can be transferred across the deck and erected from the deck, avoiding this risk. Limited times allowed to close highway. | | Model minor time impact. | Model | in SDF | | |
| 86 | Both | Open | Right-of-Way | ROW acquisition | ROW acquisition and certification are not complete in time to demo AMR building for 2025 IWWW/Early work. Missed IWWW for 2025. Schedule is delayed by one year. | Start ROW design and appraisals in early 2023. | Risk impact in 44. Duplicate impact. Do not model. | Do not model | Do not model | | |

PROJECT: Multnomah County EQRB

Earthquake Ready Burnside Bridge Project

Project Risk Register

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| Score | 1 | 2 | 3 | 4 | 5 |
|-------------|-----------|-----------------|-----------------|----------------|-------------|
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DATE : January 16, 2022

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|--------------|----------|--------|----------------------------|---|---|--|--|----------------|--------------|------------|----------|
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 92 | Both | Open | Design / Civil | Reversible Lane Design | Additional time, cost and permitting risk to finalize design and install reversible 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 | | |
| 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 potentially 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 103 | Both | Open | Right-of-Way | Encroachment 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 | | |
| 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 | | |

PROJECT: Multnomah County EQRB

Earthquake Ready Burnside Bridge Project

Project Risk Register

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|--------------------|-----------|-----------------|------------------|----------------|-------------|
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|--------------|----------|--------|-----------------------------|---|---|--|---|----------------|--------------|------------|----------|
| 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 utilities. 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 | | |
| 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 | | |
| 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 | | |
| 111 | Both | Open | Utilities | Utility Planning Delay due to Funding | Currently, planning to start discussion and planning with utilities 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 occurrence. Model to superstructure of east long span and bascule bridges. Cost in time. | Model | in SDF | | |
| 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 saving. | Do not model | model | | |

PROJECT: Multnomah County EQRB

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|--|-------------|-----------|-----------------|--------------------|----------------|--------------|
| Earthquake Ready Burnside Bridge Project | | | | | | |
| Project Risk Register | 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 |
| REV : 0 | Rating | < 3 (Low) | | 3 > < 9.5 (Medium) | | > 9.5 (High) |
| DATE : Jauary 16, 2022 | | | | | | |

| WkSh Risk ID | Option | Status | RBS | Risk | Risk Description | Notes/Mitigation | Risk Modeling Notes | Schedule Model | Cost Model | Risk Owner | Due Date |
|--------------|--------|--------|----------------------|-----------------|---|--|--|----------------|--------------|------------|----------|
| 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 | | |
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PROJECT: Multnomah County EQRB

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 | Risk Owner | Due Date |
|--------------|----------|--------|----------------------------|--|--|------------------|--|-------------------------|--------------|------------|----------|
| 165 | | | | | | | | | | | |
| 166 | | | | | | | | | | | |
| 167 | | | | | | | | | | | |
| 168 | | | | | | | | | | | |
| 130 | Both | Open | Environmental & Hydraulics | Scour contaminated sediments | Contamination would incur higher cost. | | 20% chance. Model for cost only. | Do not model | model | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |
| 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 | | |