City of Snoqualmie Parks and Public Works
On-Call Professional Services
Task Order 3
Meadowbrook Bridge (1726A) Load Rating

SCOPE OF WORK

Project Objective and Goals

Tetra Tech (CONSULTANT) will perform a load rating the for the Meadowbrook Bridge (1726A) and its approach structures for the City of Snoqualmie Parks and Public Works (CITY). The most recent load rating for Meadowbrook Bridge was performed in 2006 after a major rehabilitation of the bridge and assumed all the bridge superstructure elements were in new condition. The 2006 load rating did not load rate the gusset plates and connections because at that time gusset plates were not considered part of the load rating and connections were not rated unless there was evidence of deterioration. The 2021 bridge inspection report for Meadowbrook Bridge (1726A) identifies deterioration at the lower chords and gusset plates that require reevaluation of the load rating to ensure the current condition of the bridge has sufficient structural load carrying capacity. Also, since the previous load rating, the FHWA has added requirements for load rating the gusset plates and additional load rating vehicles that include Specialized Hauling Vehicles (SHV) and Emergency Vehicles (EV) must be evaluated by December 31, 2022.

A new load rating analysis will be performed that considers the current condition of the bridge and includes the gusset plates and the FHWA and WSDOT loading requirements for the Notional Rating Load (NRL), Specialized Hauling Vehicles (SHV) and Emergency Vehicles (EV). The load rating will also include rating factors for the City of Seattle's under bridge inspection truck (UBIT) (used in the 2021 inspection) (for approximately 16 vehicle configurations in total.) The bridge load rating will use the Load and Resistance Factor Rating (LRFR) as allowed per WSDOT and FHWA for bridges that were designed prior to October 1, 2010. The load rating analysis will follow the guidance of the most current WSDOT Bridge Design Manual (BDM), AASHTO Manual for Bridge Evaluation (MBE) 3nd Edition (2018) and all interims up to 2022, and the AASHTO LRFD Bridge Design Specification 9th Edition.

The key elements for this project are anticipated to be:

- **Bridge Data Collection & Site Visit**
- **Draft Load Rating Results Report**
- **Final Load Rating Results Report**

The scope of services will be divided into the following work elements.

1.0 Project Management
2.0 Bridge Data Collection
3.0 Draft Load Rating Results Report
4.0 Final Load Rating Results Report

Task Order Assumptions:

Load ratings will be provided for the main span steel truss and the cast-in-place concrete approach structures. The work performed will be based on the following assumptions.

Main Span: Steel Riveted Pratt Through Truss (220 foot Span.)

- Per the BDM, steel trusses shall be rated on a per truss basis assuming all truss members have pinned connections. Rating factors will be provided for the chords, diagonals, verticals, gusset plates, stringers and floor beams. The steel truss will be modeled as a 2D truss with pinned connections using SAP2000 V23.
- Per the BDM, gusset plates of non-state bridges shall be evaluated per the latest version of the Manual for Bridge Evaluation. Assume gusset plate connections are symmetric about midspan therefor there are 11 gusset plate configurations.
- Per the BDM, structural pins (isolation bearings) shall be rated for shear and their side plates for bearing.
- Per the BDM, for members that show deterioration, the resistance factors will be reduced based on the BMS condition factors provided in the inspection report or the structural cross section will be reduced based on the deterioration documented in the inspection report.
- The 2021 Inspection Report and Fracture Critical documents 32 gusset plates, 22 lower cord members, 9 diagonals, 4 verticals that show signs of deterioration. The load carrying capacity of each of these members will be evaluated as part of the load rating.
- Geometry will be based on the 1921 bridge plans and the 2006 rehabilitation plans.
- The live load will be distributed to each truss and other members per the live load distribution factors in the AASHTO LRFD Bridge Design Specification 9th Edition.
- The steel truss will be rated for one lane.
- Per the BDM, the bridge deck will not be rated since the NBI condition is greater than 4.
- Per the BDM, fatigue is not part of the rating evaluation.
- Load rating the bridge substructure elements is not included in the scope of work but can be added if requested by the CITY. Current WSDOT guidance is to load rate only the superstructure elements which are all elements above the columns.
- All structural analysis will be performed using SAP2000 V23 and Excel spreadsheets will be used to determine the load rating factors.
- CITY to confirm existing and proposed utilities on bridge within 10 days of NTP for work order. Current understand is that there is no water or sewer attached to the bridge and no plans for such.

Approach Structures: Continuous cast-in-place (CIP) concrete flat slab with cap beams supported on piles and simple transition span at the truss. There are four approach structures: a 2-span South Approach Structure, a 4-span North Approach Structure, and one simple span transition span at each side of truss span.

- Load ratings for the simple span transition span, continuous concrete deck slab and cap beams will be performed using BRIDG software for load rating concrete structures.
- Load rating the bridge substructure elements is not included in the scope of work but can be added if requested by the CITY.
- The approach structure geometry will be based on the 2006 rehabilitation plans which constructed new approach structures including new piles. The 2021 inspection report shows that the approach structures are in good condition (Condition State 1).

General Assumptions:

- The load rating is dependent on the geometry shown on the existing bridge plans, provided by King County, and the most current Bridge Inspection Report, provided by the CITY. CONSULTANT shall reasonably rely on and shall not be responsible for the accuracy and completeness of the information furnished by the CITY and King County. The CONSULTANT shall provide prompt written notice to the CITY if the CONSULTANT becomes aware of any error, omission, or inconsistency in the furnished information.
- CITY will review CONSULTANT's draft report, and render, in writing, comments required in timely manner.
- Document review and resolution of conflicting comments from CITY staff or stakeholders will be managed by CITY
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- Document review and resolution of conflicting comments from CITY staff or stakeholders will be managed by CITY.
- Based on preliminary review of available information during scoping, no addition bridge inspection/survey is anticipated. If determined that additional bridge inspection is required then the CONSULTANT shall notify the CITY.

The CONSULTANT will retrieve from the King County and CITY records the following information, as available:

- Bridge as-built drawings
- Latest Bridge Inspection Report
- Past Bridge Load Rating Result Report(s)
- Under Bridge Inspection Truck (UBIT) axle load and spacing.

TASK 1.0 PROJECT MANAGEMENT

The CONSULTANT shall provide overall project management, administration and coordination of activities necessary for completion of the work

1.1 Schedule

The CONSULTANT will prepare and submit a baseline project schedule to the CITY that details activities and clearly defines the critical path work elements. The schedule shall be updated as needed by the CONSULTANT if agreed by the CITY.

1.2 Project Meetings

The CONSULTANT shall prepare for and lead project meetings, including preparation of an agenda and the meeting minutes. Four (4) two (2) hour virtual meetings are assumed.

1.3 Invoicing and Progress Reporting

The CONSULTANT shall prepare monthly invoices updates and progress reports for the duration of the project in accordance with the terms of the contract.

1.4 Project Coordination

The CONSULTANT will coordinate with the CITY and project team members to conduct necessary work and maintain project schedule. Budget for this task assumes a three (3) month project duration and approximately four (4) coordination hours a month.

Task 1.0 Deliverables:

- Schedule/ Schedule updates
- Meeting Agendas
- Meeting Minutes and Correspondence
- Invoices and Progress Reports (Monthly)
- QA/QC Documentation

TASK 2.0 BRIDGE DATA COLLECTION

2.1 Collection and Review of CITY and County Documents

The CONSULTANT will collect the as-built drawings, and past load rating reports from the King County and CITY files.

2.2 Site Visit

After review and familiarization of the available bridge information, the CONSULTANT will visit the bridge site to become familiar with the major bridge elements and deficiencies noted on the inspection report. This will not be a full periodic inspection and will only include items that can be observed by foot from the bridge deck and ground surface. The purpose of the site visit is to become familiar with the bridge site and its overall condition. A brief site visit report memo will be provided which confirms or suggests revised condition ratings for the accessible deficiencies noted in the inspection report.

Task 2.0 Deliverables:

- List of documents/information recovered from the King County files for the bridge
- Electronic copy of files retrieved from King County for the CITY Records
- Site Visit Report Memo

TASK 3.0 DRAFT LOAD RATING RESULTS REPORT

3.1 Draft Load Rating Results Report

The CONSULTANT will perform the load rating analyses and prepare a results report. The load rating results report will include a Load Rating Data and Assumption Memo that summarizes the key information required to perform the load rating (i.e. load rated members, structural condition codes, average daily traffic and condition and resistant factors), all data collected and used to perform the load rating (as-builts, inspection reports, photographs, etc.), structural analysis models input and output, sketches, spreadsheets, hand calculations, QC documentation and the WSDOT BDM LRFR Bridge Rating Summary form. If required, recommendations for load posting will also be provided. The Draft Load Rating Results Report shall be essentially complete and reviewed (QA/QC'ed) by a licensed Structural Engineer prior to submitting to the CITY for review and comment.

Task 3.0 Deliverables:

- Draft Load Rating Results Report (Electronic)

TASK 4.0 FINAL LOAD RATING RESULTS REPORT

4.1 Final Load Rating Results Report

The CONSULTANT will review and address comments from the CITY on the Draft Load Rating Results Report. After all comments are addressed a Final Load Rating Results Report will be submitted to the CITY. The Final Load Rating Results Report will include comment responses to the CITY comments and will be stamped and signed by a licensed Structural Engineer prior to submitting to the CITY.

Task 4.0 Deliverables:

- Final Load Rating Results Report with electronic input/output (SAP2000 files, Excel files, BRIDG files and any other software files used for the load rating) and the LRFR Bridge Rating Summary form. The report and analysis files will be provided to the CITY electronically.
- Responses to Draft Load Rating Result Report Review Comments