

## SCOPE OF WORK (SOW)

Bridge UT Pin Inspections, ADT's, Scour Evaluation and Load Rating Services  
Colorado Department of Transportation

### I. GENERAL

There are four main goals of this work:

1. Update the National Bridge Inventory (NBI) through Ultrasonic Testing (UT) Pin inspection of bridges owned by local governments (cities and counties) or the state of Colorado, and to inform the bridge owners and the Colorado Department of Transportation (CDOT) of the conditions of the bridges.
2. Update Average Daily Traffic (ADT) counts.
3. Perform scour review / analysis on selected bridges.
4. Load Rate selected bridges.

The local agencies and state of Colorado may be referred to as the "owner" hereinafter in this Scope.

The National Bridge Inspection Standards (NBIS) require all public bridges with pins or hangers to have UT Bridge pin inspections every five years, CDOT inspects them every four years.

### II. DEFINITIONS

- A. **CDOT ENGINEER** – CDOT Bridge and Structures Inspection Engineer or designee.
- B. **FHWA** – Federal Highway Administration.
- C. **OFF-SYSTEM** – Those public bridges that are owned and maintained by local governments and not by the Colorado Department of Transportation.
- D. **ON-SYSTEM** - Those public bridges that are owned and maintained by the Colorado Department of Transportation.
- E. **NEW STRUCTURES** – Structures not previously inspected such as newly constructed structures requiring initial inspection or structures found to be qualifying and without prior inspections.
- F. **TEMPORARY BRIDGE** – A structure with temporary shoring or temporary repairs or a structure erected to maintain traffic, for the short term, pending permanent repair or replacement.

### III. INSPECTION STANDARDS

The work shall be performed in accordance with the following documents and revisions thereto:

- A. National Bridge Inspection Standards (NBIS) Title 23 Code of Federal Regulations 650 Subpart C
- B. Bridge Ratings, Inspections and Records (BRIAR Manual)
- C. Pontis Bridge Inspection Coding Guide

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- D. Colorado NBI Coding Guide
- E. AASHTO Manual for Bridge Element Inspection
- F. AASHTO Manual for Bridge Evaluation
- G. Bridge Inspection Reference Manual
- H. Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (Report No. FHWA-PD-96-001)
- I. Inspection of Fracture Critical Bridge Members (Report No. FHWA-IP-86-26)
- J. Culvert Inspection Manual, (Report No. FHWA-IP-86-2)
- K. Hydraulic Engineering Circular No. 18 (HEC-18, Publication No. FHWA-IP-90-017)
- L. Hydraulic Engineering Circular No. 20 (HEC-20, Publication No. FHWA-IP-90-014)
- M. CDOT Construction Manual
- N. CDOT Bridge Rating Manual
- O. Other documents as specified by the CDOT Engineer.

The documents listed above may be updated at any time by the CDOT Engineer.

## IV. CONSULTANT QUALIFICATIONS

The consulting firm shall be pre-qualified to conduct work for the State of Colorado, Department of Transportation.

The Consultant will also need a comprehensive knowledge of CDOT manuals, guidelines, policies and procedures.

All tasks assigned to the Consultant must be conducted by a person on the Consultant team that is qualified and has specific expertise in that task. The qualified person is a professional with the necessary education, certifications (including registrations and licenses), skills, experience, qualities, or attributes to complete a particular task. See below for specific required qualifications.

For inspection related tasks, the individual in charge of the organizational unit, in charge of the inspection team, and the structure inspectors, shall meet the qualifications as stated in the Code of Federal Regulations, 23 CFR, 650.309.

Individuals performing Nondestructive Testing (NDT) shall be qualified in accordance with the current edition of the American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A. The testing program shall be administered by an ASNT certified Level III.

This contract requires that the prime firm or any member of its team be pre-qualified in the following disciplines for the entire length of the contract:

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1. Bridge Inspection
2. Bridge Design (for Bridge Ratings)
3. Hydraulics (for Scour/POA evaluations)

### V. PROJECT MANAGEMENT AND COORDINATION

The Contract Administrator for the work is:

Lynn E. Crowell, P.E., Bridge & Structures Inspection Engineer  
Colorado Department of Transportation  
2829 West Howard Place  
Denver, Colorado 80204  
(303) 757-9188

Project Management activities will be coordinated by:

Andrew Brown, PM I, Statewide Bridge Inspection Coordinator  
Colorado Department of Transportation  
2829 West Howard Place  
Denver, Colorado 80204  
(303) 512-4172

### VI. PROJECT LOCATION

For off-system structures, the state is divided into three horizontal bands with one consultant contracted to perform miscellaneous tasks throughout the entire state. On-system structures are throughout the entire state.

See Appendix A for the counties, which include the cities within these counties, currently in each of the three areas.

### VII. PROJECT QUANTITIES AND DURATION

The work shall commence on the date specified in the Notice To Proceed (NTP) and shall be completed as specified in the individual task orders. Completion is defined as (1) having submitted all reports in the required format to the CDOT Engineer for review, (2) the CDOT Engineer having reviewed and approved the reports for distribution to the owners.

The maximum term for this agreement shall be for five years. The term shall be divided into the approximate time frames as follows:

- Period 1: July 1, 2021 through December 31, 2022
- Period 2: July 1, 2022 through December 31, 2023
- Period 3: July 1, 2023 through December 31, 2024

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Period 4: July 1, 2024 through December 31, 2025

Task orders may be written as follows (quantities are approximate and actual quantities will be listed in the Task Order SOW's):

Period 1: 1,650 South Area ADT's

Statewide Scour evaluation and verification (quantity will vary based on need and funding)

175 Load rating updates Statewide

Period 2: 1,750 North Area ADT's

Statewide Scour evaluation and verification (quantity will vary based on need and funding)

175 Load rating updates Statewide

Period 3: 1,850 Central Area ADT's

Statewide Scour evaluation and verification (quantity will vary based on need and funding)

175 Load rating updates Statewide

Period 4: 296 (14 bridges) On-system UT Pin Inspections  
475 (25 bridges) Off-system UT Pin Inspections

Statewide Scour evaluation and verification (quantity will vary based on need and funding)

175 Load rating updates Statewide

The list of structures to collect ADT, Load Ratings to complete, and bridge pins to UT during each period will be identified prior to writing the Task Order (TO). These lists will be attached to the request for the Project Cost Worksheet (PCW) for each TO. The CDOT Engineer may also direct the consultant to inspect other bridges as necessary.

Additional Task Orders may be written for On-System structure inspections.

## VIII. CONSULTANT RESPONSIBILITY

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The consultant shall be responsible for the complete UT Pin inspections, ratings, Scour evaluation, and collection of ADT data of qualifying on-system and off-system bridges. Bridge Pin inspections shall be conducted at regular intervals not to exceed the specified inspection frequency from the time the structures were last inspected. When this timing requirement cannot be met, written notification shall be given to the CDOT Engineer and documented in the Inspection Notes for that inspection in the bridge inspection report.

The consultant shall submit completed UT Pin inspection reports and Scour analysis reports to the CDOT Engineer for review prior to submitting the reports to the owner.

The consultant shall submit complete bridge rating packages to the CDOT Asset Management team and to the CDOT Engineer for off-system bridges. On-System structures shall be submitted to the CDOT Rating Unit and to the CDOT Engineer.

The consultant shall submit ADT data to the CDOT Asset Management team and to the CDOT Engineer.

The consultant shall conduct the work in accordance with all governing safety rules and regulations applicable to the work.

The consultant shall provide verification of Consultant Qualifications to the CDOT Engineer at minimum annually. The CDOT Engineer may request verification at any time.

The consultant shall contact each bridge owner prior to beginning work in the owner's area. The consultant shall meet with the bridge owner at the owner's request. The purpose of this contact or meeting is to identify themselves to the owner and to present their plan of action to the owner, and to obtain information pertinent to the inspection such as plans, maps, etc.

## **IX. INSPECTION REQUIREMENTS**

All bridge coding items shall be completed per the requirements of all documents listed in Section III (Inspection Standards)

Supplemental photographs, sketches, tally sheets or other documents shall be completed to give a clear understanding and documentation of distressed bridge conditions.

The Element condition states and comments and the SI&A items shall be reported using the report format as directed by the CDOT Engineer in each task order.

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Essential Repair Findings will be documented and monitored in accordance with CDOT memorandums and manuals.

Completed inspection reports shall be submitted to the CDOT Engineer within 90 days of the date of the inspection or at the end of the contract period whichever is earlier.

If, during additional routine bridge inspection, cracks or other flaws are suspected in steel members, non-destructive testing (NDT) (dye-penetrant, magnetic particle, or ultrasonic) shall be performed on the suspected portion to accurately determine if cracks or other flaws are present. Consultants shall have the appropriate NDT equipment present at each steel structure inspection site.

Each inspected bridge shall be located using GPS equipment or web based mapping, i.e. Google Maps, Google Earth, etc., to obtain longitudes and latitudes at Abutment 1 left.

The consultant shall meet with the CDOT Engineer each quarter to discuss changes to the program, changes in coding, and to discuss any issues or to get clarification for the good of the program.

The consultant shall present a progress report monthly to the CDOT Engineer. The progress report shall list the entities inspected, rated, ADT's collected, or scour analysis performed. This information must also be included in each invoice.

## **X. STRUCTURAL ANALYSIS REQUIREMENTS**

Each structure shall be rated in accordance with the current American Association of State Highway and Transportation Officials (AASHTO) Manual for Bridge Evaluation, AASHTO Standard Specifications for Highway Bridges, and CDOT Staff Bridge Load Rating Manual. The load rating capacity shall be reported on the Load Rating Summary Sheet.

The consultant shall employ the computer programs currently used by CDOT bridge rating unit unless otherwise approved to evaluate the load carrying capacity. Any re-rates or new ratings shall be performed using AASHTOWare BrR or other industry software approved by CDOT as applicable. Ratings shall be complete and independent of any previous analysis.

## **XI. SCOUR EVALUATION / ANALYSIS REPORT / POA**

The scour analysis report shall be sealed by the professional engineer performing the analysis.

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Scour depth shall be determined per the guidelines documented in the HEC-18 manual.

If a local scour analysis has not previously been conducted for structures over a watercourse, a depth of scour prediction shall be made in accordance with HEC-18. A reasonable effort shall be made to determine the foundation type, e.g. spread footing, piling, caisson, etc, so that a risk factor may be determined. Canal crossings and shale stream bottoms are examples of conditions where scour analysis may not be necessary. The CDOT Engineer shall approve the scour analysis prior to it being performed for structures with a low scour potential (i.e., structures over lined channels, canals, or other controlled waterways).

For each bridge analyzed for scour, the consultant shall submit a table showing structure number; feature crossed; calculated scour depth for a 500-year flood; distance to bottom of bridge footing, piles or other foundation type referenced to the bottom of the upstream girder (bridge foundation type may be unknown); type of streambed foundation material; velocity of stream; pier dimensions; pier type, slope of the streambed, depth of flow. The procedure for conducting this work is as follows:

1. Make visual observation of bridge site relative to the drainage basin.
2. Probe at abutments and piers to identify and record scour and undercutting.
3. Measure and record pier width, length, and pier nosing. Determine angle of flood flow to pier centerline.
4. Determine streambed top of water elevation or bottom of dry channel elevation 500' upstream and 500' downstream, as site features will allow.
5. Identify streambed material types e.g. boulders, cobbles, gravel, sand, silt, etc.
6. Take a minimum of two photographs looking upstream and two photographs looking downstream in a panoramic manner to get as much of a view of the contributing area as possible.
7. When practical, discuss stream flow history with local people.
8. Estimate the depth of maximum flow considering one of the following:
  - a. Depth of flow equal to the vertical distance from flow line to bottom of girder.
  - b. Depth of flow equal to the vertical distance from flow line to top of channel banks where visual inspection indicates water will flow away from the bridge.
  - c. Depth of flow equal to the vertical distance from flow line to 3 feet above the channel banks when visual inspection does not indicate where water will flow away from the bridge.
9. Where bridges are determined to be scour critical or have unknown foundations, report the water surface level at one foot below the low bottom chord (one foot of freeboard). This is the water elevation at which the bridge should be recommended for closure.

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10. If the depth of scour is below the foundation, then the bridge is considered to be scour-critical. If there is calculable scour, but not below the bottom of the foundation, perform a structural analysis to determine whether or not the bridge is unstable. The scour analysis shall be included in the report and shall be used for coding Item 113.

### **XII. REPORTING and DELIVERABLES**

The consultant shall use a CDOT-provided computer program for reporting Structure Inventory, Appraisal, and Element inspection data. The consultant shall provide final reports, with original signatures, to the owner and to the CDOT Engineer. Final reports shall be submitted either hard copy, electronic copy or both to the owner and electronic copy only to CDOT. The report format will be detailed in the task order SOW.

All forms shall include the inspector's and/or rater's original signature and the appropriate date.

Overwriting of previous reports is not acceptable.

If a bridge is rated or re-rated, all rating calculations and a new load rating summary sheet shall be submitted as part of the final report. An electronic copy of the input file and a PDF file of the load rating summary sheet shall be submitted to the CDOT Engineer.

### **XIII. SERVICES AND MATERIALS AVAILABLE FROM CDOT**

The following services and materials will be available to the consultant from CDOT:

- A. All forms required to be completed for each inspection.
- B. Colorado NBI Coding Guide
- C. Bridge Rating, Inspection and Records (BRIAR Manual)
- D. CDOT Staff will be available for reference on coding, rating, computer use, or other related concerns.
- E. ADT adjustment tables.

### **XIV. FINAL REVIEW**

Each inspection report will be reviewed by the project manager for completeness and consistency. Each incomplete or inconsistent report will be returned to the consultant for review and for corrections.



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The CDOT Engineer may accompany the consultant during field inspections or visit the office of the consultant to review procedures and inspection reports and to verify billings.

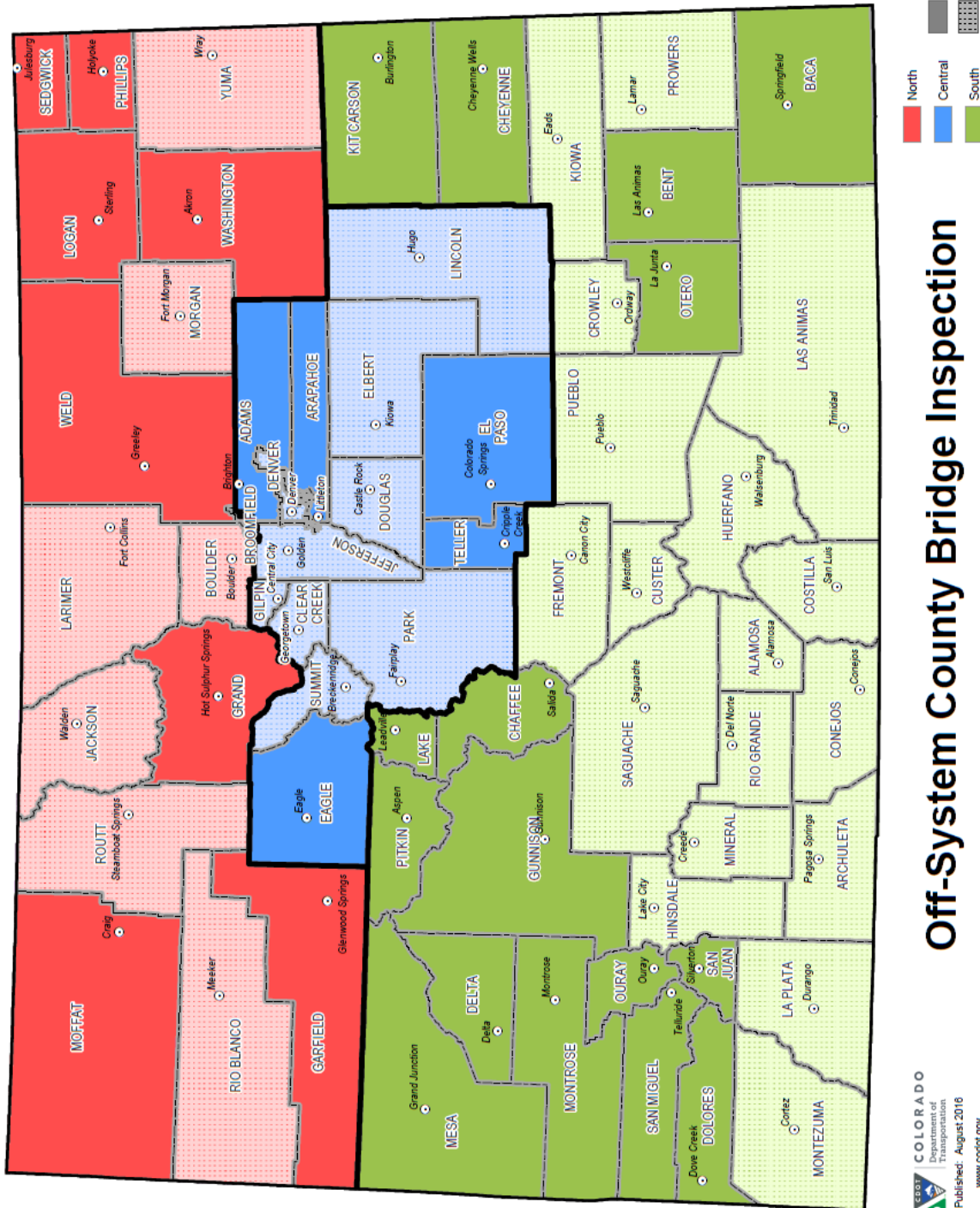
### **XV. METHOD OF PAYMENT**

These contracts will be paid for on a cost plus fixed fee basis. The consulting firms will bill for their actual costs, using the negotiated rates, incurred while performing the work. Consultants will bill monthly and include a progress report with each billing. The progress report shall list the entities inspected, rated, ADT's collected, or scour evaluations / analysis performed.

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**APPENDIX A**  
 NORTH – CENTRAL – SOUTH BREAKDOWN

1" = 40 Miles



**Off-System County Bridge Inspection**

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NORTH AREA	CENTRAL AREA	SOUTH AREA																											
Approximately 1,700 Bridges (includes 22 F/C Bridges) Approximately 4,574,000 SF Deck Area	Approximately 1,800 Bridges (includes 19 F/C Bridges) Approximately 10,693,000 SF Deck Area	Approximately 1,600 Bridges (includes 50 F/C Bridges) Approximately 3,764,000 SF Deck Area																											
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Data Date: July 2020

FY2022 is an EVN Fiscal Year and runs from July 1, 2021 to June 30, 2022  
 FY2023 is an ODD Fiscal Year and runs from July 1, 2022 to June 30, 2023  
 FY2024 is an EVN Fiscal Year and runs from July 1, 2023 to June 30, 2024  
 FY2025 is an ODD Fiscal Year and runs from July 1, 2024 to June 30, 2025

F/C = Fracture Critical  
 County Name Format = County Name (County Code)