

# Bridge SCOUR Plan of Action (POA) - Scope of Work

## Background

FHWA has required a Plan of Action (POA) be completed for all of CDOT's on-system scour critical bridges. Between FY 2011 and FY 2013, 243 scour critical bridges and bridges with unknown foundations were evaluated for scour risk. For bridges with excessive scour profiles, a conceptual level scour countermeasure design was completed. Scour countermeasures recommendation along with a conceptual level estimate were included in the Drainage Report POA for each scour critical bridge that was evaluated.

In 2014 an Implementation phase was started. It consisted of taking the conceptual scour countermeasure design and developing final scour countermeasure designs and putting them into standalone, existing bridge or roadway projects (overlays).

This Scope of Work (SOW) focuses on providing final hydraulic and hydrologic analysis, scour analysis, scour countermeasure design (hydraulic and structural) with preliminary estimates, permits and clearances, required construction drawings, and where necessary, bid packages for the scour critical bridges. Included in this Scope of Work are provisions for pre-scoping to add plan level services and construction related support services for bridge scour countermeasure installations planned for construction.

## 1. Program Support

Provide support to Staff Hydraulics, Staff Bridge and the Regions on various aspects of the CDOT Scour Critical Bridge Program.

Activities to include:

- Coordinate with Staff Bridge and the Regions regarding overall scour critical bridge list statewide and Regional prioritization. This may include strategic planning to prioritize higher risk structures or identify candidates for 2D Quick Checks.
- Provide support to CDOT Staff regarding scour monitoring and maintenance of scour repaired structures
- Provide updated scour critical bridge information including hydrology, hydraulics, existing scour profile, highest probable return interval of concern, and estimated scour countermeasures construction costs for inclusion in SAM planning.
- Support Staff Hydraulics and Staff Bridge with Statewide and Federal scour activities

- Support Staff Hydraulics and Staff Bridge with clearances and permit acquisition, especially relating to regulatory floodplains
- Support Staff Hydraulics/Staff Bridge with presentations covering CDOT Scour Critical Bridge Program e.g. CASFM, Bridge Communication Days, Annual CDOT Hydraulic Meeting, FHWA Peer Exchanges, ASFPM, TRB, ACEC, etc.

## 2. Design & Construction Plan Preparation

### Coordination, CDOT Process, and Bid Package Preparation

The following activities related to the coordination, the CDOT project development process, and bid plan preparation will be completed:

- Prepare and hold project initiation meeting with CDOT PM, Staff Bridge and Region personnel
- At pre-scoping and/or scoping,
  - Identify if and where 1D hydraulic analysis benefit from updating to 2D hydraulic analysis.
    - In cases where it is not clear, the CDOT PM may request a 2D Quick Check (2dQC) be prepared and reviewed with the Team.
    - 2D hydraulic analysis will be done using SRH-2D coding in Aquaveo's SMS software interface. The most recent version of the software at the time of analysis will be used in all cases.
    - In cases where a 1D model is necessary or advantageous for expediency or regulatory purposes, 1D models may still require updating depending on changed conditions or regulations, as applicable.
  - Identify where hydrology shall be reviewed and updated.
  - Verify the appropriate material sizes are used in scour computations and identify where they shall be reviewed and updated.
  - Verify the existing condition scour computation used FHWA recommended methods in HEC-18. Computations shall be updated if necessary
  - Verify the highest probable return interval of concern is identified
- Develop schedule for completing designs and plans for the designated number of scour critical bridges.
- Provide overall project management
- Prepare and send quarterly progress report
- Provide a semi-monthly update meeting with CDOT PM and Staff Bridge
- Coordinate with CDOT HQ POA and Region POA team
- Assist CDOT PM with compiling meeting materials, preparing agenda, presenting at meetings and preparing meeting minutes. Examples include semi-monthly update meeting

with CDOT PM and Staff Bridge as well as meetings with the Regions on scour countermeasure designs implemented into Region projects.

- Prepare preliminary cost estimates for viable options for final selection in concert with structural, hydraulic, environmental, right-of-way, materials and other CDOT Specialty Unit considerations identified in the CDOT Project Development Manual (PDM).
- Prepare preliminary (FIR & FOR) and final plans for preliminary and final review meetings
- Coordinate with CDOT Region and HQ personnel as needed on surveying, traffic control, ROW, environmental permitting, floodplain permitting, construction plan requirements, and project clearances.
- Prepare bid package which includes plan sheets, details/drawings, and specifications. Depending upon construction funding the bid package will be advertised or shelved.

## Surveying

Design Level survey will be completed by a Professional Land Surveyor (PLS) and the survey limits will be as per the CDOT Drainage Design Manual Requirement. Incorporate State LIDAR resources hosted and managed by the Colorado Water Conservation (CWCB) where available for modeling purposes, especially outside existing rights-of-way and limits of typical survey acquisition areas.

## Hydraulic Design – Scour Countermeasures

Preliminary and final hydraulic design of scour countermeasures will be completed. This includes necessary alignments, profiles, cross sections, grading and details to successfully construct the countermeasure.

The following preliminary Hydraulic Tasks will be completed:

- Review and finalize bridge hydraulic analysis, hydrologic analysis, and scour depth estimates per HEC-18 *Evaluating Scour at Bridges*.
- Complete scour countermeasure design as per HEC-23 *Countermeasure Design For Bridge Scour and Stream Instability* and prepare related construction plans and details.
- Prepare Bridge Hydraulic Information sheet.
- Prepare a Storm Water Management Plan (SWMP) that shall include:
  - Erosion control plans
  - Stream diversion plan (if required)
  - Temporary construction BMP's
- Where the Bridge site lies within FEMA regulatory floodplain or locally-adopted floodplains acknowledged by the CWCB, impacts from the countermeasures installation will be identified. It is anticipated there should not be adverse impacts at most sites. Only in the case of guide bank, grade control, or similar measures is there potential for adverse floodplain impacts, specifically rises in the base flood elevation (BFE) in areas identified as

floodways, or rises in BFE greater than 0.3 ft for non-floodway special flood hazard areas (SFHAs). For these situations, a Conditional Letter of Map Revision (CLOMR) will be prepared and submitted to FEMA, and shall be followed with a Letter of Map Revision (LOMR) supported by certified as-built survey.

- Determine and tabulate project quantities and develop construction cost estimate. Prepare specification package.
- Prepare preliminary plans (approx. 30% level) and distribute to CDOT PM, Staff Bridge and Region personnel.
- Attend Preliminary Plan Review Meeting and take meeting minutes.
- Address Preliminary Plan Review Meeting review comments and send out meeting minutes.

The following Hydraulic Design task will be completed:

- Finalize scour countermeasure design and related construction plan detail
- Finalize Hydraulic Design report
- Finalize SWMP
- Finalize quantities and construction cost estimate
- Finalize specification package
- Acquire floodplain permits and CLOMRs from local agencies for any affected FEMA-regulatory floodplains and locally-adopted floodplains acknowledged by the CWCB.
- Prepare final plans and distribute to CDOT PM, Staff Bridge, and Region personnel.
- Prepare action plans for transfer of conditional approvals from floodplain permits or CLOMRs to a post-construction project effort at the Region level.
- Attend Final Plan Review meeting and take meeting minutes for stand-alone projects
- Address Final Plan Review Meeting review comments and distribute meeting minutes.

## Structural Design – Scour Countermeasures

For bridges requiring installation of a structural countermeasure, the required design and plans will be prepared. CDOT's Bridge Design Guide and Bridge Detailing Manual will be used for design. In addition to the relevant items outlined in the Hydraulic Design task, the following will be completed:

- Provide stamped designs for existing piers and abutments to extend the foundation depth or lateral extents to provide bridge stability at the 500-yr. scour depth.
- Furnish detailing services to include drafting and quantity calculations
- Provide wall and drop structure design
- Prepare preliminary construction cost estimate and provide specifications
- Provide design report that outlines design concept, calculations and recommendations

## Permitting Support

Working in conjunction with Region Environmental personnel, required environmental and local agency permits will be identified. Provide support for Region personnel in acquisition of required permits. This may include preparing and putting together various exhibits for meeting with environmental agencies. The following permits may be required:

- US Army Corp of Engineers 404 Nationwide or General Permit covering bridge maintenance activities
- Senate Bill 40 Certification
- Floodplain Development Permits with local agencies
- C/LOMRs with local agencies, FEMA and CWCB

## Traffic Control Plan

Using the Manual on Uniform Traffic Control Devices (MUTCD) a traffic control plan will be prepared as needed to facilitate countermeasure installation and contractor site access. This may include the following activities:

- Prepare construction signing plan, schedules and quantity calculations
- Furnish detailing and drafting services
- Prepare final plans and specifications

## 3. Conversion of Shelf Plans to Advertisement Plans

Plans that were shelved will be refined to prepare them for advertisement. Conduct a review of the existing plan to ensure best HH practices are met; hydrology, scour was computed using FHWA recommended methods in HEC-18. In the event updates are needed, revisit with HQ hydraulics and appropriate personnel (as directed by HQ hydraulics). These services may include support for environmental permitting and clearances and floodplain permitting and clearances. ROW/Easement acquisition support, traffic control plans, SWMP plan revision and other associated activities in support of preparing bi-ready plans and specifications. It is anticipated that approximately (41) bridges will require these services in the FY ('23-'25).

## 4. Construction Phase Services

Bid and construction phase support will be provided for scour countermeasures that will go to construction and Ad during FY '23-'25. It is anticipated that approximately (9) bridges will require these services in FY '22-'23. The following task will be completed for each bridge:

- Coordination – On-going coordination with the contractor, CDOT, local governments and other agencies, as required.
- Preconstruction Site Walk- Attend initial, preconstruction site visits to each of the structures.

- Submittal review-Provide review of contractor submittals for the following items: riprap, concrete, reinforcement, grout, flow fill, geotextile and others.
- Site visits – provide periodic visits to each site during the construction period to ensure that the scour countermeasures are installed in accordance with the design.
- Plan revisions – develop revisions to design and issue revised plans and estimated quantities based on changes to scour repairs dues to required modifications based on site conditions.
- Code revision memorandum – prepare an NBI Item 113 Code revision recommendation memorandum for submittal to Staff Bridge. The memo will include documentation of installation of scour countermeasure design plans for each of the structures based on information provided by the contractor and observations during construction.

## 5. CDOT Additions / Region Requests

Based on previous implementation Task Order experience, CDOT and / or the Regions may request additional structures be addressed due to upcoming projects or changes in a particular structures scour condition. Scope of Services for these structures will vary from performing scour analysis and development of Plan of Action drainage reports, to review of existing reports and designs and clearances and permits, to full scour countermeasure implementation design. Region may also request help with setting up a scour monitoring system on a structure while awaiting funding. This may include a recommendation on type of monitoring equipment, signage, or alert systems and where to install them on the structure.

## 6. Structures Remaining

The following table provides an estimate of the number and type of structures presently remaining that will need work performed on.

Table 1 – Scour Critical Structures Remaining\*

Structure Category	Comment	Nbr
New Structures	No work completed except for Plan of Action (POA) report	51
Shelf Structures	Shelf level plans completed and waiting to be included in a project	41
Structures in Project -1	Structures in active Region projects awaiting construction	12
Structures in a Project -2	Structure in Region project awaiting funding	9
<b>Structures Remaining</b>		<b>113</b>

\* Estimate as of the end of 2022

## *Assumptions:*

- After consultation with the Regions and Staff Bridge, the CDOT PM at his/her discretion may remove or add bridges to the list. Further, the countermeasure type may need to be refined based on the final design process. The CDOT PM will approve changes to the countermeasure type. The CDOT PM will work with Consultant to ensure the level of effort for bid package preparation resulting from any changes will be commensurate with the original scope and fee estimate.
- CDOT will pay for scour monitoring equipment and installation.
- Within a Region, consideration will be given to combining bridge sites that are located near each other and /or have similar countermeasure types (i.e. riprap) into a single bid package.
- Benchmark or physical feature at/near the bridge will be used for survey control. Control will not be transferred in from a remote location.
- T&E species clearance will be provided by Region Environmental personnel.
- An individual 404 permit will not be required. Nationwide or RGP will be used.
- Region environmental personnel will provide wetland delineation and services required to obtain environmental permits or clearances. Consultant will provide the required support to the Regions.
- Utility potholing will be provided by the Regions.
- CDOT will be responsible for the following if required:
  - ROW/Easements
  - Applying for and acquiring floodplain development permit
  - Applying for and acquiring construction storm water permit with CDPHE
  - Payment for floodplain review (permit and C/LOMR) fees
- Geotechnical investigations may be necessary for hydraulic countermeasures. If so, CDOT will provide geotechnical investigations and findings for structural or grade control countermeasures. This may include borings at various locations at the bridge site.