



## SCOPE OF WORK BASIC CONTRACT

**Contract Type:** Cost Plus Fixed Fee

**SOW Date:** July 16, 2020  
**Project Number:** C 0252-485 / FBR 0252-487 (Bridge Enterprise)  
**Project Location:** I-25 between 23rd Avenue and Speer Boulevard, Denver  
**Project Code:** 22838 / 22969 (BE)

The complete scope of work includes this document attached to the contract for Consultant services.

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## **I-25 Speer and 23<sup>rd</sup> Interchange – Scope of Work**

### **INSTRUCTIONS**

This Scope of Work is based on a template for Colorado Department of Transportation (CDOT) to develop and negotiate solid contracts with Consultant teams on projects and tasks. The Consultant shall coordinate all activities, tasks, meetings, communications and deliverables with the CDOT/ Project Manager (PM) (or his or her designee) for this project. All submittals will be through the CDOT/PM or a designee, who will make appropriate distribution. Upon notice to proceed, the Consultant shall be responsible and must account for all effort contained in the Final Scope of Work.

This Scope of Work has been reviewed by the Department and reflects a plan of approach based on the known goals. One factor determining the selection of a Consultant is the ability of that Consultant to analyze the project goals, evaluate the work elements, and formulate a work plan. This process may produce new approaches or modification to the project work elements. Because of that, all Consultants should be aware that the Final Scope of Work for a project will be produced with input from the selected Consultant. The Final Scope of Work submitted will be generated by CDOT personnel and be on CDOT letterhead.

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## SECTION 1 PROJECT SPECIFIC INFORMATION

### 1. PROJECT BACKGROUND

Project C 0252-485 / FBR 0252-487 (BE) consists of replacing the bridges at 23rd Avenue and I 25, and Speer Boulevard and I-25, including necessary improvements related to these replacements, and the interchange complex at Speer and 23<sup>rd</sup> Avenues. This scope of work is for preliminary investigation and design plans for both a conceptual and 30% (FIR) level, and development and completion of a NEPA decision document, as well as supporting documentation for policy compliance.

The 23rd Avenue bridge over I-25 (F-16-DA) and the eastbound and westbound Speer Boulevard bridges over I-25 (E-16-EO and E-16-EW, respectively) were built in 1952 and are in poor condition. The bridges do not meet current vertical clearance standards, and have experienced multiple vehicular impacts resulting in damaged girders and exposed primary reinforcing. Additionally, cracking, heavy efflorescence, and spalled concrete with exposed rebar are present throughout the concrete deck of each bridge. These bridges were repaired in 2015 to extend their lifespans.

CDOT and FHWA have completed the I-25 Central Planning and Environmental Linkages (PEL) Study to identify transportation improvements on the corridor that are needed to address safety concerns, recurring congestion, and poor operational performance. The study area for the PEL is I-25 between Santa Fe Drive and 20th Street. This project's bridges fall within the study area of the PEL. The PEL Study examined transportation needs and strategies across the study area. Consideration and integration of the recommendations from the PEL Study shall be considered as part of this project.

This work will consider the options for this interchange area as outlined in the PEL, including the possible extension of the managed lane system from 20th Street south through the corridor as well as a possible managed lane direct connection to Speer or other location. The proposed design of the bridges will be designed to not preclude the ultimate vision for the area. The ultimate Preferred Alternative components will be that which is fiscally constrained. Given the need to not preclude future projects, evaluation of the need and value of such broader improvements will likely be accomplished through a pre-NEPA step that evaluates fiscal constraint while maximizing available opportunities to advance the transportation vision for the area. The documentation of this pre-NEPA work may be in the form of technical memos or a separate formal document, such as a System Level Study for use in the CDOT 1601 process.

### 2. PROJECT GOALS

#### A. System Functionality

- a. Produce a project that is consistent with the vision and commitments in place from surrounding planning and studies.
- b. Deliver a project that is consistent with and building upon other CDOT endeavors including system management, corridor management, and technology initiatives.
- c. Evaluate accommodation of future managed lane system

#### B. Improved safety – Improve the safety of all travelers in the corridor fully supporting CDOT's strategy Whole System. Whole Safety. *Bringing everyone home safely.*

#### C. Schedule – With the goal to construct improvements as soon as possible, incorporate previous work from the I-25 Central PEL and accelerate environmental processes to quickly obtain a NEPA decision document.

#### D. Environmental

- a. Adhere to all environmental compliance requirements and regulations.
- b. Implement innovative methods for environmental stewardship and community supported enhancements within the project scope, schedule, and budget

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### E. Communication

- a. Develop and execute a thoughtful and efficient communication plan showing how and when the stakeholders and public will be engaged in a manner that is effective and meets NEPA requirements.

In achieving these project goals, this project is intended to:

1. Replace structurally deficient bridge at 23<sup>rd</sup> Ave
2. Replace structurally deficient bridges at Speer Blvd.
3. Reconfigure interchanges at Speer Blvd and 23<sup>rd</sup> Ave.
4. Interconnect Speer Blvd and 23<sup>rd</sup> Ave with a collector/distributor road system
5. Designing not to preclude and to potentially accommodate in the future:
  - i. Collector/distributor system to 20<sup>th</sup> Avenue
  - ii. Managed lane access to Speer Blvd and points south.

While considering:

- A. Aesthetic and context-sensitive design
- B. Pedestrian and bicycle connectivity, both across the corridor and interfacing with existing features, developing a safe walkable and bikeable experience in the area.
- C. Local connectivity (east-west across I-25)
- D. Freight access and considerations
- E. Special event access
- F. Downtown and planned development access
- G. City and County of Denver plans and projects

The Consultant shall deliver a project that is consistent with and builds upon other CDOT endeavors, including system management, corridor management, and technology initiatives. The project must conform to the vision and commitments in place from previous and ongoing projects within the project area.

The work includes conceptual and preliminary design and the NEPA environmental process for the replacement of the bridges and reconfiguration of the interchange. Accurate, meaningful, organized, and timely public communication to the public is essential.

### 3. PROJECT LIMITS

This project is located on Interstate 25 between mileposts 210 and 212 in the City and County of Denver

### 4. PROJECT COSTS

The construction cost of this project is estimated to be \$80,000,000.

### 5. WORK DURATION

The time for the work described in this scope is approximately 730 calendar days.

### 6. CONSULTANT RESPONSIBILITY AND DUTIES

The Consultant is responsible for site investigation, survey, geotechnical investigation, and conceptual design required for alternative evaluation required by the NEPA process. This work will include agency coordination, project coordination, public participation, environmental design and data collection and analysis. Following completion of the NEPA process and conceptual design, the preliminary design must be completed to the FIR level, approximately 30%.

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### **7. WORK PRODUCT**

The Consultant work products are:

- A. Engineering reports, including traffic & safety, pavement design, geotechnical and structure selection reports.
- B. Subsurface utilities investigation
- C. Design survey data and property ownership information
- D. Interstate access request and 1601 process
- E. Environmental Assessment associated supporting technical reports, including a technical summary of the engineering and environmental considerations, assumptions, analysis methodologies, and graphic displays of the recommended alternative(s).
- F. National Environmental Policy Act decision document
- G. Field Inspection Review (FIR) plans, specifications and estimates
- H. Project coordination
- I. Project schedules
- J. Meeting minutes
- K. Public meeting materials
- L. Project delivery selection matrix support

Requirements are further described in the sections that follow. All work required to complete this work requires the use of English units.

### **8. WORK PRODUCT COMPLETION**

All submittals must be accepted by the CDOT contract administrator or designee.

### **9. ADDITIONAL PROJECT INFORMATION**

It is the intent of this project to utilize previously-completed work to the maximum extent practical going forward into the NEPA and 30% design process. Additional information regarding this project is included in the following documents. Copies of these documents may be requested from CDOT.

- A. CDOT accident history data
  - B. FEMA Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies (FISs)
  - C. MS4 boundary information
  - D. Receiving Water Status (303(d)), TMDL, TMAL
  - E. Traffic and Traffic Modeling data
  - F. As-constructed roadway, structure, and survey and ROW information
  - G. I-25 Central Planning and Environmental Linkages (PEL) Study
  - H. I-25 Central Planning and Environmental Linkages Corridor Conditions Report, including Appendices
- The PEL Study completed review of existing corridor conditions in the study area of the bridges. These findings are documented in the PEL Study. Findings include regional plans, roadway conditions, roadway characteristics, existing structures, major utilities, traffic operations, crash history and corridor multi-modal mobility. The Existing Conditions Report also identified environmental resources and environmentally-sensitive areas. Information in the report is composed of readily-available data and limited field-survey information.

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## SECTION 2 PROJECT MANAGEMENT AND COORDINATION

### 1. CDOT CONTACT

The Contract Administrator for this project is:

**Steve Sherman**, Resident Engineer  
2829 West Howard Place  
Denver CO 80204  
303 512-5986

Active day-to-day administration of the contract will be delegated to the CDOT/PM:

**Chris Enright**, Project Manager  
2829 West Howard Place  
Denver CO 80204  
303 512-5985 (w), 408 898-0541 (c)

### 2. PROJECT COORDINATION

Coordination will be required with the following:

- A. Colorado Department of Transportation
  - a. Central Program Engineering and
  - b. All specialty groups
- B. Federal Highway Administration (FHWA)
- C. City and County of Denver, including
  - a. Department of Transportation and Infrastructure (DOTI)
  - b. Parks and Recreation
  - c. Community Planning and Development (CPD)
  - d. Denver Office of Economic Development and Opportunity
- D. HPTE (CDOT High Performance Transportation Enterprise)
- E. Regional Transportation District (RTD)
- F. Denver Regional Council of Governments (DRCOG)
- G. Colorado Motor Carriers Association (CMCA)
- H. Utilities
- I. Other environmental resource agencies

The Consultant should anticipate that a design that affects another agency has to be accepted by that agency prior to its acceptance by CDOT. Submittals to affected agencies must be coordinated with CDOT.

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## SECTION 3 EXISTING FEATURES

This Section lists known features in the area. It should not be considered as complete, and should include, as appropriate, information from Section 2 Project Management and Coordination. The Consultant should be alert to the existence of other possible conflicts.

### 1. STRUCTURES

Structure Number	Feature Intersected	Facility Carried
F-16-DA	I-25 mainline	23rd Avenue
F-16-IR	Speer entrance	I 25 ramp
E-16-EO	I-25 mainline	Southbound Speer Boulevard
E-16-EW	I-25 mainline	Northbound Speer Boulevard
E-16-QR	I-25 mainline	Speer bike/pedestrian path
E-16-YA	I-25 mainline	15th Street
D-02-PR-090A	South Platte River	Westbound Speer Boulevard
D-02-PR-100A	South Platte River	Eastbound Speer Boulevard

Note: this is not an exhaustive list of all structures within project limits.

### 2. UTILITIES

Contact Utility Notification Center of Colorado (UNCC) at 800 922-1987 or 811.

### 3. PERMANENT WATER QUALITY CONTROL MEASURES

The above is a list of the known features in this area. It is not to be considered as complete. More detailed information is provided in the I-25 Central PEL Study report. The Consultant should be alert to the existence of other possible conflicts not discussed in this RFP or the PEL report.

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## SECTION 4 GENERAL INFORMATION

### 1. NOTICE TO PROCEED

Work shall not commence until a written Notice to Proceed is issued by CDOT. Work may be required, night or day, and/or weekends, and/or holidays, and/or split shifts. CDOT must concur in time-lost reports prior to the time-lost delays being subtracted from time charges. Subject to CDOT prior approval, the time charged may exclude time lost for:

- A. Reviews and approvals
- B. Response and direction

### 2. PROJECT COORDINATION

- A. Routine working contact shall be between the CDOT/PM and the Consultant Project Manager (C/PM) as defined in Appendix C.
- B. Project manager requirement - each project manager shall provide the others with the following:
  - 1. A written synopsis or copy of their respective contacts by telephone and in person with others
  - 2. Copies of pertinent written communications

### 3. ROUTINE REPORTING AND BILLING

The Consultant shall provide the following on a routine basis:

- A. Coordination: coordination of all contract activities by the C/PM
- B. Periodic reports and billings: the periodic reports and billings required by CDOT Procedural Directive 400.2 (Monitoring Consultant Contracts), including monthly drawdown schedules.
- C. General reports and submittals: In general, all reports and submittals must be approved by CDOT prior to their content being utilized in follow-up work effort.

### 4. PERSONNEL QUALIFICATIONS

The C/PM must be approved by the CDOT Contract Administrator. Certain tasks must be done by Licensed Professional Engineers or Professional Land Surveyors who are registered with the Colorado State Board of Registration for Professional Engineers and Land Surveyors. National Institute for Certification in Engineering Technology (NICET) certification or other certifications may be required for project inspectors and testers.

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. A qualified person is a professional with the necessary education, certifications (including registrations and licenses), skills, experience, qualities, or attributes to complete a particular task. Design of any special project features must be directed, completed, and overseen by a professional engineer with significant experience in design of those special project features.

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: architecture, bridge design, bridge inspection, civil engineering, electrical engineering, environmental engineering, geotechnical engineering, highway and street design, hydrology and hydraulics (including permanent water quality), landscape architecture, management (contract administration), management (construction), mechanical engineering, materials testing, soils engineering, structural engineering, surveying, transportation engineering, traffic engineering, and water quality.

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It is the intent of CDOT that all key personnel be engaged to perform their specialty for all services required by this contract, and that the Consultant's key personnel be retained for the life of this contract to the extent practicable and to the extent that such services maximize the quality of work hereunder.

If the Consultant or a subconsultant decides to replace any of its key personnel, the Consultant shall notify the Project Manager in writing of the desired change. No such changes shall be made until at least two qualified replacement candidates are recommended by the Consultant and a replacement is approved in writing by the Project Manager. The Project Manager's approval shall not be unreasonably withheld. Failure of the Consultant to comply with the requirements of this provision may be the basis for CDOT's termination of this contract.

The Project Manager shall respond to the Consultant's written notice regarding replacement of key personnel within fifteen working days after the Project Manager receives the list of proposed changes. If the Project Manager or its designated representative does not respond within that time, the listed changes shall be deemed to be approved.

If, during the term of the contract, the Project Manager determines that the performance of approved key personnel is not acceptable, he shall notify the Consultant and give the Consultant the time which the Project Manager considers reasonable to correct such performance. Thereafter he may require the Consultant to reassign or replace such key personnel. If the Project Manager notifies the Consultant that certain of their key personnel or the key personnel of a subconsultant should be replaced, the Consultant shall use its best efforts to replace such key personnel within a reasonable time, but not to exceed thirty calendar days from the date of the Project Manager's notice.

### 5. CDOT COMPUTER/SOFTWARE INFORMATION

The Consultant shall utilize the most recent CDOT-adopted software. The primary software used by CDOT is as follows:

A. Earthwork	OpenRoads Designer
B. Drafting/CADD	OpenRoads Designer with CDOT Workspace
C. Survey/Photogrammetry	Mobile and Terrestrial Lidar, CDOT TMOSS, MicroStation / InRoads
D. Bridge	CDOT Staff Bridge software
E. Estimating	Trns•port (an AASHTO-sponsored software) as used by CDOT
F. Specifications	Microsoft Word
G. Scheduling	Microsoft Project
H. Water Quality Data	ArcView
I. Traffic Modeling	TransModeler
J. Pavement Design	AASHTOWare Pavement ME Design

### 6. COMPUTER DATA COMPATIBILITY

The data format for submitting design computer files shall be compatible with the latest version of the adopted CDOT software as of Notice to Proceed for the contract. The Consultant shall immediately notify the CDOT/PM if the firm is unable to produce the desired format for any reason and cease work until the problem is resolved. Refer to Section 8, Table 1 - Submittals, for additional information regarding current formats and the acceptable transmittal media.

### 7. PROJECT DESIGN DATA AND STANDARDS

A. General: Appendix A provides a comprehensive list of state and federal reference material. However, Appendix A does not contain local agency reference material that may be pertinent to some projects. The Consultant is responsible for obtaining and ensuring compliance with the most recent version adopted by CDOT of the listed references including standards and specifications, manuals, and software, or as directed by the CDOT/PM. Conflicts in criteria will be resolved by the CDOT/PM.

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- B. Specific Design Criteria: Appendix B is a list of specific project criteria. The list is comprehensive and may include items that are not required for tasks defined in this scope. The Consultant shall submit for approval any proposed changes to the pertinent criteria to the CDOT/PM at one of the periodic progress meetings prior to initiating design.
- C. Construction Materials/Methods: The materials and methods specified for construction must be selected to minimize the initial construction and long-term maintenance cost to the State of Colorado. Non-typical construction materials and methods must be approved in writing by CDOT.

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### SECTION 5 PROJECT INITIATION AND CONTINUING REQUIREMENTS

This list establishes the individual task responsibility. Those tasks identified as CDOT/Other should utilize an abbreviation system to indicate whether the task will be completed by CDOT or another. The Consultant shall maintain the ability to perform all work tasks that are indicated below by an 'X' in the Consultant column, in accordance with the forms and conditions contained herein, and the applicable CDOT standards.

	CDOT	Consultant	Not Applicable
<p><b>A. PROJECT MEETINGS</b></p> <p>The types and numbers of meetings shall be flexible and determined by an interactive process as approved by the CDOT/PM. Public hearing efforts are accounted for in Section 5.</p>	X	X	
<p><b>1. Initial Project Meeting</b></p> <p>Schedule and facilitate initial project kick-off meeting. All appropriate disciplines should be included in the scoping meeting. Create an invitation list, send notices with a draft agenda prior to the meeting, and provide meeting minutes to all those invited. Whenever possible, the kick-off meeting will include an on-site inspection to familiarize the entire project team with the character and conditions of the area. The scoping meeting will also be used to clearly identify scope elements, responsibilities and coordination necessary to complete the work.</p>	X	X	
<p><b>2. Progress Meetings</b></p> <p>CDOT and Consultant team will meet periodically as required (typically at two-week intervals). The meetings will review activities required to be complete since the last meeting, problems encountered/anticipated and potential solutions, project schedule update, action items, and coordination required with other agencies.</p>	X	X	
<p><b>3. Public Meetings</b></p> <p>The Consultant shall provide the presentation aids, and help conduct the meeting.</p>			
<p>a. Small Group Meetings (one-on-one)</p> <p>Meet with property and business owners or others directly affected by the project work to identify likely impacts and discuss possible mitigation or resolutions.</p>	X	X	
<p>b. General Public Meetings (information and workshops)</p> <p>The format of these meetings will be dictated by the project and goals for the meetings. These meetings may be used to establish communications with the public, add to the contact list, and gather information regarding local concerns. The meetings may also take the form of a work session or workshop with the affected parties.</p>	X	X	
<p>c. Public Review Meetings</p> <p>These meetings are intended to disseminate project progress information to the public and representatives of local entities. Notices will be</p>	X	X	

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<p>provided at least 14 days in advance of these meetings to those on the contact list.</p>			
<p><b>4. Meeting Minutes</b></p> <p>Project meeting minutes shall be completed by the Consultant and provided to the CDOT/PM within one week of the actual meeting. When a definable task is discussed during a meeting, the minutes will identify the “Action Item”, the party responsible for accomplishing it, and the proposed completion date.</p>		X	
<p><b>5. Contact List</b></p> <p>Establish and maintain a computerized list of all appropriate interested parties for the communication process.</p>		X	
<p>a. The information on the list shall include as a minimum:</p> <ul style="list-style-type: none"> <li>i. Name</li> <li>ii. Firm (if any)</li> <li>iii. Mailing/email address</li> <li>iv. Phone/Fax number</li> </ul>		X	
<p>b. The contacts will be compiled from the list below, as supplemented by the Project Team and the attendees at public meetings:</p> <ul style="list-style-type: none"> <li>i. Public Agencies</li> <li>ii. Elected/Appointed Officials</li> <li>iii. Neighborhood Groups</li> <li>iv. Property Owners/Tenants</li> <li>v. Business Interests</li> <li>vi. Special Interests</li> <li>vii. Media Contacts</li> </ul>		X	
<p><b>6. Public Notices/Advertisements</b></p> <p>Publicize the proposed project in accordance with the CDOT policies and procedures. Copies of the publication shall also be mailed to the individuals on the contact list.</p>		X	
<p><b>7. Communication Aids</b></p>		X	
<p>a. Graphics Support - provide graphics for presentations and project documents. This may include slides, overhead projector slides, maps and plan views of conceptual design, 3D modeling and visualization, computerized presentations and other displays for visual presentations at meetings.</p>		X	
<p>b. Newsletter - a newsletter which will contain project progress information and announcements will be published at the specified interval and will be distributed to those on the contact list specified by the CDOT/PM.</p>		X	
<p>c. Local Office - obtain and maintain an office within the project area to conduct small group meetings and provide displays/information to the public.</p>			

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<p>d. Internet Web Pages - all external CDOT-related websites shall be hosted on CDOT's server and developed in-house with assistance from the Web Team and the Office of Public Relations. The use of all Web 2.0 and similar social-marketing applications on behalf of CDOT (including all regions, divisions and offices) is strictly prohibited unless authorized by the Director of the Office of Public Relations. No CDOT employee, contractor or Consultant working for CDOT will post material on behalf of the agency on such applications without expressed written consent of the Director of the Office of Public Relations.</p>	X	X	
<p><b>B. PROJECT MANAGEMENT</b></p> <p>a. At the kick-off meeting, or shortly thereafter, create and provide an approach for managing the project (i.e. involved staff, key team positions), including task orders, a schedule, document and agency reviews and other project needs.</p>	X	X	
<p>b. Prepare and submit a Project Management Plan in accordance with FHWA regulation and CDOT guidance.</p>		X	
<p>c. Prepare a critical path method schedule for delivery of the project using Microsoft Project. This schedule shall be regularly updated by the C/PM and provided to the CDOT/PM on a regular basis.</p>		X	
<p><b>C. DEVELOP A PROJECT SCHEDULE AND ASSIGN TASKS</b></p> <p>The Consultant is responsible for coordinating the required work schedule for tasks accomplished by CDOT and other agencies. Prepare the initial project schedule for review by the CDOT/PM and Consultant team, and refine to provide detail as requested. Modifications will be made as necessary in collaboration with CDOT and appropriate justification. The tasks covered by this Scope of Work are expected to take approximately 730 days to complete.</p>		X	
<p><b>D. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)</b></p> <p>Prepare and submit a QA/QC plan as part of the planning documents noted above, and commit to adhering to the QA/QC process throughout the project.</p>		X	
<p><b>E. PROJECT DELIVERY METHOD SELECTION SUPPORT</b></p> <p>This project shall complete a Project Delivery Method Selection workshop with support from HQ where the CDOT project staff select which project delivery and contracting mechanism will be used to continue the effort beyond the scope of this initial contract.</p> <p>The consultant shall both assist the CDOT project team in developing supporting materials for the workshop and participate in the workshop from a technical and supporting role. Required data will be inherently generated by tasks detailed throughout this scope of work, however separately organized information to meet these process requirements will be required.</p>	X	X	
<p><b>F. 1601 PROCESS AND INTERCHANGE ACCESS REQUEST (IAR)</b></p> <p>The CDOT 1601 Process and the FHWA Interchange Access Request will require general support. Required data will be inherently generated by tasks detailed throughout this scope of work, however separately organized information to meet these process requirements will be required.</p>		X	
<p><b>G. VALUE ENGINEERING (VE) STUDY</b></p> <p>A team of transportation design and construction experts will perform a Value Engineering (VE) study. The VE study will be conducted early enough in the project development process to allow evaluation and incorporation of VE</p>		X	

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<p>recommendations in the NEPA document or design process, as appropriate. The VE study shall be performed in accordance with Federal Highway Administration’s (FHWA) current guidelines and recognized techniques and will identify possible alternatives that may save the project cost, time, or other resources. An individual with prior experience and certification in facilitating VE studies (the VE facilitator) shall conduct each VE session. VE facilitators shall be qualified VE practitioners, experienced in performing and leading VE studies (have participated in several VE studies as a team member and several as a team leader), and have sufficient VE training, education, and experience to be recognized by the Society of American Value Engineers (SAVE) International as meeting the requirements for certification.</p> <p>The VE team will consist of individuals with no prior exposure to the project. Individuals that have some familiarity and history with the project shall provide briefings to the team. Consultants or firms shall not conduct studies of their own designs unless they maintain distinct organizational separation of their VE and design sections. The VE team will be assembled to review the Conceptual Background information and plans shall be provided to the team at least three weeks in advance of VE sessions. The VE facilitator will coordinate the study with CDOT, appropriate entities, and FHWA.</p> <p>The VE review team will formally evaluate each VE recommendation, and sufficient justification will be made for the acceptance or rejection of each. The VE facilitator will produce a document that summarizes the results, as well as the project elements investigated.</p> <p>The Consultant/PM shall prepare a written response detailing which recommendations were not included, the reasons for exclusion, and how all approved VE results will be incorporated into subsequent engineering efforts. These responses shall be forwarded to the CDOT/PM for distribution to the CDOT Region Transportation Director, FHWA, and other appropriate entities. All approved VE proposals shall be incorporated into the final design plans.</p>			
<p><b>H. OBTAIN NECESSARY RIGHT-OF-ENTRY AND PERMITS</b></p> <p>Some activities may require work on land not controlled by CDOT. In such cases the Consultant shall obtain the necessary written permission to enter the premises. Written permission shall be coordinated with other CDOT staff and Consultants that may need right-of-entry such as for geotechnical and environmental personnel. Included in this written permission will be the names and telephone numbers of persons to contact should notification prior to entry be necessary.</p>		X	
<p><b>1. Signature Copies</b></p> <p>Permissions apply to CDOT personnel as well as Consultant personnel. CDOT Form 730 may be used for this purpose. Signed copies of written permission will be submitted to the CDOT/PM prior to entering private property for survey work.</p>		X	
<p><b>2. Permits</b></p> <p>Some activities such as materials testing on existing pavement and structures may require a permit. Permits will be obtained and copies submitted to the CDOT/PM.</p>		X	

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**SECTION 6  
ENVIRONMENTAL WORK TASK DESCRIPTIONS**

	CDOT	Consultant	Not Applicable
<b>A. CONSULTANT DISCLOSURE STATEMENT</b>			
40 Code of Federal Regulations (CFR) Section 1506.5(c) specifies that a disclosure statement to avoid conflict of interest must be prepared. If an environmental document is prepared with the assistance of a consulting firm, the firm must execute a disclosure statement.		X	
<b>B. PROJECT INITIATION</b>			
<b>1. Environmental Scoping Task</b>  An early environmental coordination/scoping task will occur as directed by the CDOT/PM. An environmental scoping meeting should be held with the Regional Environmental Project Manager, the Regional Water Quality Specialist/Water Pollution Control Manager, the Regional Project Manager, appropriate members of the Environmental Programs Branch (EPB), C/PM, and staff from Right-of-Way, Maintenance, Hydraulics, Traffic, Property Management, and Utilities, as appropriate. This task will include a meeting with CDOT and the local agency representatives to discuss the initial work efforts of the project.		X	
<b>2. Review Applicable Existing Documents</b>  Review the recently completed I-25 Central PEL Study and all associated Final Reports produced during the PEL Study process. Examples of relevant documents are previous studies, planning efforts, access management plans, safety assessments, and other traffic studies. These resources may be CDOT documents or may have been created by local planning agencies or municipalities.		X	
<b>3. Extent of Study Required for Resources</b>  Utilize work previously completed in the PEL Study to determine the extent of study required for each resource to minimize rework and next steps for each resource category.		X	
<b>4. Preparation and Coordination of Requirements</b>  During the early coordination/ scoping process, determine the effort required for the preparation and coordination requirements to allocate: 1) work to be completed by CDOT Region Staff; 2) work to be completed by CDOT Headquarters Staff; 3) work to be completed by Consultant or project partners; and 4) outside agency concurrence or approvals required.	X	X	
<b>5. Extent of Narrative Required</b>  Utilize work previously completed in the PEL Study to determine during the scoping phase the extent to which documentation is required for each resource. The level of documentation can be included in several ways, such as: 1) a complete analysis/ documentation included in the text; 2) a summary of the analysis performed included in the text; 3) a statement that no impacts are		X	

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<p>expected; or 4) including information and documentation (technical memoranda, references, annotated bibliography) in an appendix of the document with reference to the appendix in the body of the text. This will be detailed to the extent possible using information available during the scoping phase.</p>			
<p><b>6. Project Study Area Limits/Logical Termini</b></p> <p>Preliminary project study area limits are established in Section 1. Perform necessary research and data collection to propose a study area boundary for environmental resources and logical termini for use in scoping. In coordination with the CDOT/PM, prepare a recommendation to the FHWA for approval of the logical termini, if applicable.</p>	X		
<p><b>7. Administrative Record</b></p> <p>Maintain a NEPA Administrative Record that adheres to the established process. Make available all parts of this Administrative Record to the CDOT/PM (or his or her designee), or to the Colorado Attorney General’s office (as requested) at any time during the project’s duration. All materials associated with the project Administrative Record will be delivered in the format specified by the CDOT/PM when closing the project. Final project invoice payments to the Consultant are conditional upon the professional and complete delivery of these materials to CDOT. Given the extent of documentation collected for the NEPA process, the Consultant must update the record regularly and provide information to CDOT electronically.</p>		X	
<b>C. ENVIRONMENTAL ANALYSIS AND DOCUMENTATION</b>			
<p>Determine the effort required to examine the transportation needs in the project area definitively and completely, to develop and evaluate transportation alternatives following the NEPA process, and to develop the appropriate NEPA documents. All environmental documentation, technical reports and technical memos will be submitted to CDOT, and may be required to be supplied to reviewers at CDOT EPB, FHWA, and the relevant cooperating and participating agencies for early review as appropriate and necessary.</p>		X	
<p><b>1. Purpose and Need</b></p> <p>Develop a Purpose and Need statement, reviewed, and approved by appropriate parties. The objectives of the project should be clearly identified and agreed upon early in the project process to prevent backtracking and limit schedule changes. Develop and refine, as necessary, to address information collected on the project during data collection, transportation analysis, and public and agency scoping and involvement. Review the information from the PEL study to help direct Purpose and Need information as appropriate (e.g., local planning studies, engineering feasibility studies, etc.).</p>	X	X	
<p><b>2. Traffic Engineering - Alternatives Development and Evaluation</b></p> <p>Develop a technical report from the PEL to NEPA that identifies the range of reasonable alternatives that will satisfy the Purpose and Need requirements of the project, including, but not limited to, those identified in earlier and ongoing studies of the area. Review and utilize the alternatives development and evaluation work in the PEL Study. This will include all relevant data collected during the PEL process. The Existing Conditions PEL Model will need to be downsized and re-calibrated. The Model will also need to be brought to the 20-year condition using the DRCOG TDM Model for review and approval by FHWA, in order to be NEPA compliant. Model calibration methodologies will</p>	X	X	

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<p>follow the requirements outlined in the CDOT Traffic Analysis and Forecasting Guidelines.</p>			
<p><b>3. Evaluate Alternatives Impacts</b></p> <p>The Consultant shall take into account the projected design-year traffic volumes and projected opening-day traffic volumes for new facilities as developed for this Scope of Work, or as modified through later studies and calculations by CDOT. Evaluate the impacts of these alternatives according to established guidelines and examine the degree to which these alternatives satisfy the Purpose and Need requirements of the project. The Consultant shall utilize previously developed conceptual schematic and narrative form for alternatives already developed during the PEL Study</p>		X	
<p><b>4. Alternatives Screening Process</b></p> <p>Using revised model and modeling data that was developed for the PEL Study and any newly developed alternative(s), apply an alternatives-screening process to identify reasonable alternatives (practical or feasible from a technical and economic standpoint), to select a preferred alternative to move forward into NEPA. Develop NEPA-appropriate evaluation criteria, and measures of effectiveness, and submit them for review and approval by CDOT and FHWA and review by CCD before beginning the screening process. The rationale for eliminating alternatives shall be thoroughly discussed within the technical report listed in B above.</p>		X	
<p><b>5. Preliminary Design of Alternatives</b></p> <p>For each of the alternatives in the screening process, additional conceptual design beyond what was completed in the PEL Study may be required to come to a determination of the preferred alternative for analysis of resource impacts during NEPA. During NEPA, conceptual design for one preferred alternative will be advanced to a level that clearly allows the identification of impacts within each environmental resource area.</p>		X	
<b>D. COST ESTIMATES AND FINANCIAL ANALYSIS</b>			
<p><b>1. Develop Cost Estimates and Financial Analyses</b></p> <p>Develop cost estimates and financial analyses for inclusion in the NEPA document. Conceptual cost estimates will need to be developed for any alternative developed, including what was not considered in the PEL Study. Utilize research and information previously developed in the PEL Study. Basic engineering, preliminary engineering, construction engineering, construction, and operating/maintenance for the design life will also be analyzed. A funding package identifying the funding sources necessary to construct and maintain the projects will be developed.</p>		X	
<p><b>2. Incorporate into NEPA Document</b></p> <p>Review the cost estimates and financial analysis, provide supplemental analysis as needed to support the Preferred Alternative, and incorporate findings into the draft NEPA document.</p>		X	
<p><b>3. Preliminary Construction Cost Estimates</b></p> <p>Prepare preliminary construction estimates based on the 30% design developed for the preferred alternative during the NEPA process. Project right of way acquisition and project environmental mitigation costs shall be included within the cost estimate. Include enough detail to ensure a reasonable degree of accuracy for the level of design performed. Submit the format of estimates, including the year from which the unit costs were assumed, to CDOT's Project</p>		X	

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<p>Engineer for review and approval. Incorporate the analysis into the NEPA document.</p>			
<p><b>4. Bridge Enterprise Cost Estimate</b></p> <p>Prepare a cost estimate based on the 30% design for the preferred alternative that divides construction costs between items that are eligible for Colorado Bridge Enterprise funding and those that are not. Project right of way acquisition and project environmental mitigation costs shall be included within the cost estimate. Include enough detail to ensure a reasonable degree of accuracy for the level of design performed. Submit the format of estimates, including the year from which the unit costs were assumed, to CDOT’s Project Engineer for review and approval. Include necessary exhibits and drawings as needed to delineate the bridge elements from non-bridge elements.</p>		X	
<p><b>E. DATA COLLECTION, FIELD INVESTIGATION, MITIGATION MEASURES</b></p>			
<p>The following analyses are required for the preferred alternative. Each resource will be summarized concisely, focusing on the project issues of concern in the NEPA document. The scope shall define the level of documentation, project tasks, and project deliverables for each of the resource areas. Identify the required area and resources to evaluate and determine the early coordination/scoping process as discussed above, but which may evolve over the life of the project as new information is discovered through analysis. Reference other projects within the study area to ensure existing conditions are alike between both projects, understand future planned conditions within the study area, and to appropriately evaluate cumulative impacts to resources; these projects may be related to transportation, but may also be entirely unrelated to transportation (such as a new strip mall, school, park, apartment building, for example). As determined by the Consultant team, the Region, and EPB, a larger area is typically evaluated for cumulative effects. It is expected that the level of detail for this NEPA document will be as appropriate for a Template EA and utilize all appropriate information from the PEL Study as to not re-create efforts that have previously been completed. Use of Geographic Information Systems (GIS) for environmental data is required to comply with CDOT GIS standards. All GIS data shall be provided to CDOT in electronic format with annual updates for the administrative record.</p> <p>Relevant information will be incorporated in the NEPA document sections such as: Affected Environment, Environmental Consequences, and Mitigation Measures. In addition, technical reports may be prepared in support of the project and shall be reviewed and referenced as appropriate in the NEPA document. If new or unique resources are identified during scoping, this Scope of Work will be modified to include these, as appropriate.</p>		X	
<p><b>1. Existing Roadway and Structures</b></p> <p>Review and utilize information from the PEL Study including the Corridor Conditions Report and other supporting documentation.</p>		X	
<p>a. Evaluate existing conditions to assess the proposed design relative to the following:</p> <ul style="list-style-type: none"> <li>i) Existing roadway safety and structure condition</li> <li>ii) General traffic concerns</li> <li>iii) Geometry and conditions including cross-sections, shoulders, medians and lane widths</li> <li>iv) Noise walls</li> </ul>		X	

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<ul style="list-style-type: none"> <li>v) Americans with Disabilities Act (ADA) accommodations and compliance</li> <li>vi) Guardrail</li> <li>vii) Lighting</li> <li>viii) Traffic Signal Devices - signage, signals, lighting, grades, speeds, components, and structures should be included in the effort.</li> </ul>			
<ul style="list-style-type: none"> <li>b. Construction Requirements: <ul style="list-style-type: none"> <li>i) General construction impact (of temporary nature)</li> <li>ii) Material pits</li> <li>iii) Haul roads</li> </ul> </li> </ul>		X	
<p><b>2. Geospatial Data</b></p> <p>Review and utilize information from the PEL Study Existing Conditions Assessment to determine available data and work with applicable CDOT data managers (resource specialists, DTD GIS etc.) prior to initiating geospatial tasks and document path-forward decision in a brief Geospatial Data Memo. This should document at a minimum, expected feature datasets, attribute schemas, coordinate systems, deliverable formats, data hosting locations, and CDOT review timelines. The memo is intended to be brief. CDOT concurrence is required. Online geospatial data accessed and downloaded should be sourced from authoritative agencies only. All finalized data outputs for use in NEPA documentation are to be delivered to CDOT and stored for project record. All final deliverables will be reviewed by applicable CDOT data managers and determined to be sufficient prior to closing geospatial data tasks.</p>	X	X	
<p><b>3. Air Quality</b></p> <p>Review and utilize information from the PEL Study Existing Conditions Assessment to determine the necessary air quality assessment or modeling as required and provide the results for integration into the NEPA document and Air Quality Technical Report (with modeling data assumptions). These will include, but are not limited to, analysis or discussion of: NAAQS, carbon monoxide (CO) hot spots, PM 10 hot spot analysis, regional emissions analysis, Mobile source air toxics (MSAT) - qualitative or quantitative, greenhouse gases (GHG), climate change, construction issues such as fugitive dust emissions, and mitigation measures to demonstrate air quality conformity.</p> <p>CDOT staff will lead coordination with the Colorado Department of Public Health and Environment Air Pollution Control Division (CDPHE-APCD) and U.S. Environmental Protection Agency (EPA) as necessary. The analytical methodologies, including number of intersections to be modeled, will be determined through the coordination. The preferred alternative and the No-Action Alternative will be analyzed for impacts through the appropriate design year. Mitigation commitments will be developed, as necessary. The Consultant must get approval from the CDOT Region air specialist (and possibly FHWA staff) for any methodologies to evaluate hazardous air pollutants. Utilize the most current standard, accepted FHWA language for MSATs.</p> <p><b>Deliverable:</b> Air Quality Technical Report</p>	X	X	
<p><b>4. Water Quality</b></p>		X	
<ul style="list-style-type: none"> <li>a. Review and utilize information from the PEL Study Existing Conditions Assessment to determine and document the status of the water resources (quality, etc.) for the purposes of describing the existing condition or</li> </ul>		X	

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	“affected environment” before construction: ground water/aquifers, lakes, rivers, streams, and springs, locations of drinking water treatment plants, Permanent Water Quality Control Measures and locations of sewage-treatment facilities.			
	b. Investigate and document the impacts of the project, to water resources (quality, etc.) and quality impacts of the project during and following construction. Water Quality Modeling will be used for this task, determined by considering the project location and design concepts in relation to existing water resources including groundwater or alluvial waters or aquifers (particularly sole source), drainage ditches and other State Waters as defined by CDPHE Water Quality Control Division, aquatic as well as riparian habitat, and Sensitive Waters (Class 1 Aquatic Life, Recreation 1, and Water Supply, 303[d] listed, etc.).		X	
	c. MS4 Permit requirements will apply to this project. Determine the requirements, including Municipal Separate Storm Sewer System (MS4), Colorado Discharge Permit System (CDPS), and design and permitting issues per the CDOT PWQ program.		X	
	d. Recommend appropriate Water Quality mitigation measures as necessary. Develop a mitigation plan that includes conclusions of effects, permanent best management practices (BMPs), temporary/construction BMPs, erosion control measures, and definition of maintenance responsibilities. Water quality will be documented in a water quality technical report.		X	
	e. Deliverable: Water Quality Technical Report		X	
	<b>5. Floodplains Assessment</b>			
	a. Review and utilize information from the PEL Study Existing Conditions Assessment to identify location of regulatory floodplains and floodways published by FEMA and local agencies, and assess impacts of planned changes to those boundaries from CDOT activities or planned map revisions by others.		X	
	b. Add information to environmental resource mapping of existing conditions.		X	
	c. Determine the adverse impacts each alternative with respect to the base flood elevation (BFE), floodway boundary, and local drainage. This must include the impacts of construction and other “temporary” activities.		X	
	d. Identify adverse effects on the project area with respect to floodplains and drainage for each alternative (including during construction and relative to actual operating conditions).		X	
	e. Develop possible actions to mitigate for the adverse impacts and coordinate with roadway and structural designers.		X	
	f. Deliverable: Prepare floodplain and drainage assessment information as outlined in the CDOT NEPA Manual.		X	
	<b>6. Wetlands Determination/Delineation</b>			
	a. Review and utilize information from the PEL Study Existing Conditions Assessment to determine need for field evaluation for the presence of wetlands within the project study area. Global Positioning System (GPS) should be used for this activity.		X	
	i) Delineate the boundaries and size of all anticipated jurisdictional and non-jurisdictional wetlands and waters of the US within the project		X	

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area. using United States Army Corps of Engineers (USACE) guidance listed in Appendix A.			
ii) Prepare wetlands maps that delineate the wetland boundaries within the corridor. GPS will be used for this mapping		X	
iii) Coordinate the findings with the CDOT Region and the USACE. Obtain jurisdictional determination of the wetlands from the USACE.		X	
iv) Deliverable: Inclusion in the Biological Resources Report		X	
a. Wetland Finding Report  Prepare a Wetland Finding Report. The Functional Assessment of Colorado Wetlands (FACWet) should be used, as appropriate according to current CDOT procedures. Conduct a wetland assessment based on the NEPA document addressing the amount of permanent and temporary wetlands impacts and mitigation. Wetland mitigation should be identified as early as possible in the NEPA process. Mitigation sites must be evaluated for availability and suitability for wetland habitat.		X	
<b>7. Vegetation and Noxious Weeds</b>  Review and utilize information from the PEL Study Existing Conditions Assessment to determine necessary field surveys and identify vegetation and noxious weeds within the project area. GPS will be used for this activity. Plot major vegetation zones/ecosystems, and weed locations and densities on a map.		X	
a. Investigate and document the impacts of the project, to vegetation habitat and noxious weeds during and following construction. Include information in Biological Resources Report.		X	
<b>8. Fish and Wildlife</b>  Review and utilize information from the PEL Study Existing Conditions Assessment to determine necessary field surveys and identify fish and wildlife and their habitat within the project area. As appropriate, GPS will be used to identify habitat.		X	
a. Coordination with the Colorado Division of Wildlife (CDOW) and US Fish and Wildlife Service (USFWS)		X	
b. Perform an impact analysis.		X	
c. Develop appropriate mitigation measures		X	
d. Deliverable: Biological Resources Report		X	
<b>9. Threatened and Endangered (T&amp;E) Species</b>			
a. Review and utilize information from the PEL Study Existing Conditions Assessment to determine if T&E species exist in the project area and as necessary engage the USFWS. Compile information into Biological Resources Report.	X	X	
b. Conduct necessary desktop and field surveys and identify T&E species and/or Designated Critical Habitat.		X	
c. Review existing planning documents to determine any existing Habitat Conservation Plans (HCP) for T&E species.		X	
d. Identify impacts to species and recommend mitigation.		X	

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e.	Based on affected environment and habitat, prepare the T&E species impact assessment.		X	
f.	Identify any impacts and develop a mitigation plan to conform to requirements of the Endangered Species Act.		X	
<b>10. Historic Properties</b>				
a.	Determine the project Area of Potential Effects (APE)		X	
b.	Collection and Evaluation of Baseline Information as defined by Section 106 of the National Historic Preservation Act of 1966, as amended, including but not limited to COMPASS data, Assessor data, information from Denver Landmarks, historic bridge inventories and studies (including 2019 preservation plan).		X	
<b>11. Historic Clearance</b>				
a.	Determine the area of potential effects (APE), in coordination with CDOT and the State Historic Preservation Officer (SHPO).		X	
b.	Review and utilize information from the PEL Study Existing Conditions Assessment, information gathering per task 10.b. above and consultation with project engineers and CDOT historian to determine APE and level of survey effort required. An early scoping meeting with CDOT history is required prior to initiating historic property survey work.		X	
c.	Conduct an intensive architectural field survey of the APE and determine National Register of Historic Places (NRHP) eligibility for each resource 45 years old or older using the appropriate Office of Archaeology and Historic Preservation (OAHP) survey forms. Potential resources include man-made structures, roads railroads, etc. It is anticipated that up to 40 properties will require intensive architectural survey (1403 form), 3 linear properties will require survey (1400/1418), and up to 10 properties will require a revisitation survey effort (1405). Some revisitation forms will be needed for previously evaluated properties that are no longer extant. This survey effort also includes four National Register listed extant properties (one is a historic district), and Speer Boulevard. In some cases, a 1403 form will be required for National Register listed properties given the obsolescence of the prior forms. Allow one review by CDOT Region 1 historian.		X	
d.	Identify and coordinate with consulting parties (e.g., public, historic preservation groups, local historical societies, museums) regarding historic properties in the project area.	X	X	
e.	Historic stakeholder’s meetings. CDOT may need to sponsor up to 3 meetings with historic consulting parties and other stakeholders. While CDOT will be the lead on these meetings, the consultant may need to attend, and provide information.	X	X	
f.	Conduct and participate in up to 5 historic problem-solving meetings on National Register eligibility and effects with CDOT’s Region 1 historian in addition to the initial scoping meeting indicated above.	X	X	
g.	Write a comprehensive Historic Resources Survey Report according to guidelines established by the OAHP and consistent with CDOT policy and templates to submit for review to the CDOT Region 1 Historian. Allow up to 2 reviews by CDOT’s Region 1 historian.		X	

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h.	Determine potential impacts, both direct and indirect, to historic resources and recommend mitigation strategies to avoid, minimize, or mitigate impacts. This could involve investigation into relocation of creative mitigation strategies such as mitigation by design, and possible relocation of historic buildings.		X	
i.	A detailed analysis of bridge condition and rehabilitation options, and their feasibility, will be needed for the three exceptionally significant historic bridges (two over Speer and one over 23rd Avenue). This analysis should investigate the possibility of repairs, strengthening, widening, changing vertical grade to increase clearance, etc. in coordination with project engineers.		X	
j.	Write a comprehensive Historic Resources Effects Report consistent with CDOT policy and templates to submit for review by the CDOT Region 1 History.		X	
k.	Prepare correspondence as necessary for the CDOT Region Staff Historian to submit to the SHPO. Three coordination letters with the SHPO are anticipated - one for APE/ NRHP eligibility, and up to two for effects.		X	
l.	Collaborate with the CDOT Region Historian to develop a Memorandum of Agreement, if necessary, with recommended mitigation strategies for adverse effects for agency review and execution.	X	X	
m.	Prepare Section 4(f) documents as required. It is anticipated that a Programmatic Section 4(f) for historic bridges will be required for the three extant National Register historic bridges.		X	
n.	Work with the CDOT Region historian or EPB Staff Historian to obtain any necessary approvals.		X	
o.	If necessary, prepare archival documentation or other creative mitigation of the bridge to mitigate adverse effects according to standards established by the OAHF. CDOT anticipates Level II documentation will be required for the three extant National Register listed historic bridges.	X	X	
<b>12. Archaeology</b>				
a.	A review of historic Sanborn Fire Insurance maps and other appropriate archival sources will be completed to determine if the area may contain significant archaeological sites or features.	X	X	
b.	Conduct an intensive field survey of the project corridor(s) and undertake site-specific test excavations, as necessary and appropriate, to determine NRHP eligibility. The Consultant shall not undertake test excavations before consulting with CDOT.	X	X	
c.	Coordinate Tribal consultation and support EPB Senior Staff Archaeologist as needed.	X	X	
d.	Prepare Section 4(f) documents as required.	X	X	
<b>13. Paleontological Resources</b>				
a.	Perform a literature and museum fossil database search and field assessment.	X	X	
b.	Determine the presence or absence of paleontological resources.	X	X	
c.	Conduct analysis to determine the scientific significance (research and/or educational value) of the resource.	X	X	

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<p>d. Write the paleontological technical report, including mitigation proposals, if necessary. The assessment report will be reviewed by the EPB Staff Paleontologist for adequacy.</p>	<p align="center">X</p>	<p align="center">X</p>	
<p>e. Coordinate the mitigation plan with the EPB Staff Paleontologist.</p>	<p align="center">X</p>	<p align="center">X</p>	
<p><b>14. Community Understanding Report</b></p>			
<p><b>Land Use</b></p>			
<p>Collect, map and evaluate baseline information. Prepare information on land use and zoning, including maps of existing, planned and future uses. Prepare land use mapping. Mapping may include parcel use categories such as: land in public ownership, commercial, retail, wholesale, industrial, residential, vacant, mixed etc. which identifies jurisdictional boundaries and land usage along each alternative. (Information may be obtained from Department of Local Affairs, from old Sanborn maps, from archival aerial photos, from the local city, town or County, and/or from field verification.) Identify any impacts or consequences to land uses and recommend appropriate mitigation measures as necessary.</p>			
<p><b>Social and Economic Resources</b></p>			
<p>Collect, map, and evaluate baseline information to investigate and document the effects of the project alternatives on community cohesion, safety and security, neighborhoods, and accessibility of facilities and services. Investigate the effects of the project alternatives on commercial and industrial enterprises, employment, local tax base, regional earnings, etc. When relevant, recent Census data shall be utilized. This will be done at the regional and corridor level, as well as part of a cumulative effects analysis, as appropriate. Identify any impacts or consequences and recommend appropriate mitigation measures as necessary.</p>			
<p><b>Environmental Justice</b></p>			
<p>As needed, collect the necessary U.S. Census and other applicable data to identify existing low-income and minority populations, as well as adverse effects and mitigation measures or alternatives that would avoid or reduce the impacts according to environmental justice guidelines. Impacts to these communities will be evaluated using CDOT and FHWA guidance in accordance with Executive Order 12898. Beneficial effects of the project on these populations will also be identified. The analysis will cross-reference other resources as appropriate (e.g., noise, air and water pollution, aesthetics, community cohesion, relocation impacts).</p>			
<p><b>15. Transportation Resources</b></p>			
<p>During the alternatives development and evaluation process, the appropriate level of operations analysis will also be conducted on the alternatives being considered. The results of the operations analysis are documented into a Transportation Technical Report.</p>			
<p>Leverage the data from the PEL. Research and identify existing and future planned bicycle and pedestrian facilities in the project area. The necessary data will be collected from project design documents, community transportation plans, local land developers, open space and park trails, or local governmental agency or community interest groups to determine if any facilities will be impacted, and as a result what mitigation is necessary. If the corridor is a heavily traveled biking facility, the scope of work shall include meetings to coordinate with bike users throughout the NEPA process. (If Section 4(f) resources are impacted, see Section 4(f) and 6(f) Evaluation.)</p>			
		<p align="center">X</p>	

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This information should be compiled in the Social Resources Technical Report.			
<b>16. Non-Historic Section 4(f) and Section 6(f) Evaluation</b>			
a. Inventory and map project area for Section 4(f) and/or 6(f) facilities.	X		
b. Determine if any potential impacts or ROW acquisitions include Section 4(f) properties (e.g., publicly-owned parks, recreational facilities, nationally-significant historic sites, wildlife refuges) or Section 6(f) properties (those that have received Land and Water Conservation Funds).	X	X	
c. Determine and evaluate project impacts on Section 4(f) and/or 6(f) properties using conceptual design information, and the necessary commitments for mitigation measures. Determine whether impacts qualify under the “De Minimis” 4(f) use. Prepare an analysis that includes avoidance alternatives, discussion of prudent and feasible, least harm (if necessary), minimization, and mitigation related to Section 4(f) properties. This may include the development of a new alternative(s) as an avoidance alternative(s)	X	X	
d. Determine if the Section 4(f) use could be evaluated as a <i>De Minimis</i> Finding. If so, prepare that documentation in consultation with CDOT Region or EPB Staff.	X	X	
e. Prepare the Draft and Final documentation for Section 4(f) and/or 6(f) evaluation. This will go through the Region Section 4(f)/6(f) Technical Manager for review.	X	X	
f. Compile information into a Parks Recreation and Open Spaces Technical Report.			
<b>17. Noise</b> Prepare a technical noise assessment in accordance with the most recent CDOT Noise Analysis and Abatement Guidelines and submit a comprehensive noise assessment document to CDOT for review and acceptance. The analysis will consist of the following, each of which must be covered in the noise assessment document:		X	
a. Definition of relevant noise abatement criteria and identification of noise-sensitive land uses		X	
b. Determination of existing noise levels (by measurement and/or modeling).		X	
c. Prediction of future traffic noise levels for all alternatives, including the No-Action Alternative, using FHWA’s current Traffic Noise Model.		X	
d. Determination of traffic-noise impacts including construction-related noise.		X	
e. Identify and evaluate feasibility and reasonableness of noise abatement measures. Coordinate with Project Engineer with regard to locations and heights of proposed abatement measures		X	
f. Development of recommendations regarding noise abatement measures		X	
g. Assessment of construction-related noise issues.		X	
h. The above items will be addressed and documented in a Noise Technical Report, which will be prepared and submitted to CDOT for review and acceptance. Prior to beginning this work, the Consultant shall meet with		X	

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<p>CDOT to review the appropriate noise methodology. The draft and final technical report will be completed and made available to the CDOT Noise Specialist for review. The findings will be incorporated into the NEPA document.</p> <p>Deliverable: Noise Technical Report</p>			
<p><b>18. Visual Resources</b></p> <p>Using the new CDOT Visual Guidance, assume preparation of a Visual Impact Assessment Memo. This memo will identify one (1) landscape unit. When specified, the following will be investigated: natural areas (e.g. scenic landscapes, wildlife habitat, topography, major drainages, unique land forms, soil types, plant communities. Quality (including vividness, intactness, and unity); viewer sensitivity/exposure (over space and time) and existing aesthetic liabilities.</p>	X	X	
<p><b>19. Hazardous Materials</b></p> <p>Perform and document the following Initial Site Assessment (ISA) and/or Modified Environmental Site Assessment (MESA) activities:</p>			
<p>a. Request regulatory research data base report from CDOT</p>	X	X	
<p>i) Available historic tax records which indicate past land use (coordinate with property ownership and land-use data research), such as Sanborn Fire Insurance Maps</p>		X	
<p>ii) Available historic aerial photos of the corridor (e.g., United States Geological Survey, public libraries, etc.)</p>		X	
<p>iii) Historic topographic maps</p>		X	
<p>iv) Any pertinent records maintained by CDOT</p>		X	
<p>v) Documented personal interviews, if approved by CDOT/PM</p>		X	
<p>vi) Agency file reviews</p>		X	
<p>b. Analyze results of regulatory research and records review and identify potential impacts construction activities may have on existing hazardous waste sites. Assess potential liability issues and hazards to the public and construction workers and develop potential mitigation options. Prepare the ISA/MESA Document to include the following:</p>		X	
<p>i) Prepare the draft and subsequent final ISAs to address comments provided by CDOT.</p>		X	
<p>ii) ISAs will conform to American Society for Testing and Materials (ASTM) standards for Phase I reports (with limitations), and make a determination of the necessity of a Phase II report.</p>		X	
<p>iii) Identify how the presence of hazardous waste locations may impact each alternative, including the no-action alternative. GIS mapping will be desired.</p>		X	
<p><b>20. Cumulative Impacts</b></p> <p>Consistent with CEQ regulations, the cumulative effects of each proposed action on a resource, ecosystem or human community will be evaluated for each alternative. The analysis will both list and consider incremental impacts of each alternative in conjunction with all past, present, and reasonably foreseeable future actions, no matter what entity (federal, non-federal, local government, or private) is taking or has taken the action; but the analysis should only focus on</p>		X	

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<p>meaningful effects. Develop the scope of the analysis in consultation with FHWA and CDOT, and, in general, will base temporal and spatial boundaries on the natural boundaries of resources of concern and the period of time that the proposed action’s impacts will persist. The analysis will be incorporated into the NEPA document, and mitigation measures specific to cumulative impacts, if needed, will be identified. Standard FHWA global climate change language is to be incorporated within every cumulative impacts section of a NEPA document.</p>			
<p><b>F. DELIVERABLES</b></p>			
<p>The following documents will be considered as official deliverables as either technical reports or memos. Deliverables to CDOT will occur at the dates agreed to within the project contract and related agreements. Note, as part of the blended team, some documents will be prepared by CDOT staff as indicated above.</p>		X	
<p>Geospatial Data          Alternatives          Air Quality          Water Quality          Wetland Report          Biological Resources Report          Historic APE, Eligibility and Effects Package          Section 4(f) documentation historic          Community Understanding Report (land use, social, economic, EJ, bicycle and pedestrian)          Traffic Technical Report          Parks Recreation and Open Space (includes Section 6(f), non-historic Section 4(f))          Noise          Visual Impact Assessment          Hazardous Materials Initial Site Assessment          Cumulative Impact</p>		X	
<p><b>G. PUBLIC AND AGENCY INVOLVEMENT</b></p>			
<p>This section identifies public and agency involvement tasks anticipated for the project.</p>		X	
<p><b>1. Stakeholder Involvement Plan</b>          Prepare a Stakeholder Involvement Plan specific to the nature of this project. Leverage to the maximum extent possible, the work completed as part of the PEL. The level of effort included in the plan will be in keeping with the complexity and expected controversy of the project. Coordinate with the CDOT/PM and project team to identify the level of effort to be documented in the plan. At a minimum, the plan should:</p>		X	
<p>a. Develop a stakeholder database based on what was done in PEL</p>		X	

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<ul style="list-style-type: none"> <li>b. Identify methods for public notification and dissemination of information, such as newsletters, flyers, postcards, web site, press releases, miscellaneous informational materials, etc.</li> </ul>		X	
<p><b>H. NEPA DOCUMENTATION PROCESS</b></p> <p>Develop, coordinate, write, review, conduct QA/QC and finalize the appropriate NEPA document, assumed to be a Template EA with supporting technical reports referenced above, in accordance with the current provisions of the following laws, regulations, and standards. Reference the current version of the CDOT NEPA Manual available online for appropriate number of review cycles and number of copies to reproduce.</p>		X	
<p><b>1. Public Meeting</b></p> <p>Provide the following services, in coordination with the CDOT Region and EPB, for no more than 2 public meetings:</p>		X	
<ul style="list-style-type: none"> <li>a. Determine location for public meeting and ascertain that facilities are ADA compliant</li> </ul>		X	
<ul style="list-style-type: none"> <li>b. Advertise the public hearing/meeting date and location.</li> </ul>		X	
<ul style="list-style-type: none"> <li>c. Hire translator, or sign language communicator, as needed</li> </ul>		X	
<ul style="list-style-type: none"> <li>d. Provide audio/visual equipment and support for presentations, as needed</li> </ul>		X	
<ul style="list-style-type: none"> <li>e. Prepare the graphics/display boards to include, at a minimum, the following features: <ul style="list-style-type: none"> <li>i. Purpose of and need for project</li> <li>ii. Maps showing alternatives</li> <li>iii. Description of social, environmental and economic impacts</li> <li>iv. Design features</li> <li>v. Consistency with federal and local plans</li> <li>vi. Right-of-way information, acquisition, and construction</li> <li>vii. Source and amount of funding</li> <li>viii. Location of 4(f) properties if required</li> <li>ix. Any other project-specific resource impacts deemed appropriate</li> <li>x. Mitigation measures that warrant public disclosure or relevance</li> <li>xi. Anticipated project schedule and next steps</li> <li>xii. How and where the public can provide comments</li> </ul> </li> </ul>		X	
<p><b>2. Decision Document (FONSI/ROD) Preparation</b></p> <p>There is no guarantee of the outcome of the NEPA process in order to determine next steps after an EA, and therefore a scope of work cannot be prematurely developed for the NEPA decision document. This scope of work and contract will be reevaluated once the EA process is complete and the lead agency has made a decision on how to proceed.</p> <p>In the event that significant impacts are identified in the EA, the NEPA process would be required to continue to the preparation of an EIS rather than a FONSI. Continuing to prepare an EIS after completion of an EA is at CDOT's and FHWA's discretion and should not be considered part of the initial EA scope of</p>		X	

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<p>work. At this point, a separate Consultant contract would be required, with a new scope of work.</p> <p>In the event that a decision document is deemed necessary, this contract and scope of work would be amended with the concurrence and agreement of both CDOT and FHWA (and other applicable agencies). At the conclusion of the public comment period, (if the project is determined to have no significant impact, a Finding of No Significant Impact (FONSI)) (if determined to have a significant impact then a Record of Decision (ROD)] document may be prepared. In the event a scope of work is prepared for a NEPA decision document to be drafted, the following services would be addressed in coordination with the Region and EPB:</p>			
<p>a. Prepare draft NEPA decision document and relevant supporting documentation for incorporating comments received at the public hearing/meeting or from the NEPA document public review period. Follow guidelines in the CDOT NEPA Manual online.</p>		X	
<p>b. This Scope of Work could be supplemented for additional as-yet unidentified work, if CDOT determines additional work is warranted or needed. In the event that none of the alternatives is selected at the conclusion of the [EA/EIS] process, this portion of the scope and contract will be voided.</p>		X	

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### SECTION 7 PRECONSTRUCTION WORK TASK DESCRIPTIONS

The following activities of communication, consensus building, project team reviews, conceptual design, data gathering, documentation, and formal public notice shall be planned by the Consultant and coordinated with the CDOT/PM. The time of their accomplishment will overlap and parallel paths of activity should be planned to finish the development phase in accordance with the shortest possible schedule. A project plan shall be developed by the Consultant that satisfies the requirements of the project development. This plan must be approved by the Contract Administrator before starting the work.

This list establishes the individual task responsibility. Those tasks identified as CDOT/Other should utilize an abbreviation system to indicate whether the task will be completed by CDOT or another agency. The Consultant shall maintain the ability to perform all work tasks indicated below by an 'X' in the Consultant column, in accordance with the forms and conditions contained herein, and the applicable CDOT standards.

	CDOT	Consultant	Not Applicable
<b>A. PROJECT INITIATION AND CONTINUING REQUIREMENTS</b>			
1. Environmental Mitigation and Requirements Ensure that any mitigation commitments within the NEPA documentation are incorporated into the project.		X	
2. Independent Design Review An independent design review shall be performed on any design accomplished by others that will be used in this project. A report identifying the results of these reviews shall be submitted to the CDOT/PM within one week of the review.		X	
3. Identify Design Criteria Submit a copy of Appendix B - Specific Design Criteria with the appropriate items completed.		X	
4. Initiate Survey Arrange Preliminary Field Survey per this scope of work. CDOT Form 1217a may be used as a supplemental outline of a complete survey request and may be used as a guide for completing the survey plan		X	
5. Traffic Control Consultant field activities that interfere with traffic operations within existing roadways will require control of traffic. The Consultant shall plan and provide any required traffic control for the survey, testing, or the design process. Traffic control operations will be in accordance with the MUTCD, CDOT Standard Plans and the Region 1 Lane Closure Strategy. The proposed Method for Handling Traffic (MHT) must be submitted to the CDOT/PM. Also, certification of the Traffic Control Supervisor as a Worksite Traffic Supervisor by the American Traffic Safety Services Association (ATSSA) or as a TCS (Traffic Control Supervisor) by the Colorado Contractors Association (CCA) is required.		X	
6. Structure Review Meeting		X	

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<p>While the major structural design work is progressing, the Consultant shall meet periodically with the CDOT Structure Reviewer to review the work. These meetings may be in addition to, or in conjunction with, the Project Progress Meetings. The complexity of the structure shall be considered by the CDOT Structure Reviewer to determine the frequency of review meetings. Other required meetings are described in subsequent sections.</p>			
<p>7. Initial Submittals</p> <p>Submit the following samples to the CDOT/PM for approval:</p>		X	
<p>a. An original plan sheet that complies with this scope of work</p>		X	
<p>b. Mobile and Terrestrial Lidar and topographic survey data, MicroStation drawings and InRoads Digital Terrain Modeling (DTM) in accordance with the requirements specified in this scope of work. <b>No original plan sheets or survey work shall be accomplished until satisfactory samples have been received and approved by the CDOT/PM.</b></p>			
<b>B. PROJECT DEVELOPMENT</b>			
<p>1. <b>Survey and Right of Way (ROW)</b></p> <p>All surveying will be conducted and produced in accordance with the CDOT Survey Manual, the latest addendum thereof, and applicable state statutes. The completed survey shall be reviewed by the Region survey unit. Two weeks should be provided in the schedule to complete the review and sufficient time should be provided to address all comments provided by this review. Design shall not proceed until all comments resulting from this review have been satisfactorily addressed.</p> <p>A monumented ROW Survey with final set of ROW Plans that define the existing ROW is included in this scope of work. See the ROW Survey and ROW Plans section for additional information.</p>		X	
<p>a. Pre-survey Meeting</p> <p>Prior to the start of any surveying a Pre-survey Meeting shall be held. The Consultant along with its field and office surveyor(s) in responsible charge shall attend the Pre-survey Meeting.</p> <p>Permission to Enter Properties shall be discussed during the pre-survey meeting. The consultant shall provide any and all permission to enter properties prior to entering any privately held properties to conduct any field surveying, and provide the completed forms to the CDOT project engineer.</p>		X	
<p>b. Survey Data Research</p> <p>Prior to the start of conducting any field surveying research shall be done of CDOT's records to include but not limited to: Project Control Diagrams, Land Survey Control Diagrams, ROW Plans, Deeds, Construction, As-Constructed plans, bridge plans.</p> <p>County records shall be researched for but not limited to obtaining ROW and property boundary information, Subdivision and Land Survey Plats, ROW Plans, Permanent Easements, aliquot and City and County of Denver survey plats, tie books, and monument records.</p> <p>The National Geodetic Survey records shall be researched for any horizontal or vertical control marks, stations, benchmarks, datum, data sheets, information, procedures and processes that will used in any survey.</p>		X	

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c. Project Control Survey:			
<p data-bbox="396 247 630 275">i) Geodetic Datums</p> <p data-bbox="444 296 1179 380">A Static Global Navigation Satellite System (GNSS) primary control survey shall be performed to include all NGS, CDOT, City and County of Denver control monuments and marks.</p> <p data-bbox="444 401 1143 579">The primary control survey shall be post processed in compliance with CDOT’s Survey Manual horizontal tolerance CLASS A – Primary Control Survey using a precise ephemeris, relative to the NGS monuments or marks used to reference the Primary Control Survey to the Colorado High Accuracy Network (CHARN) or National Spatial Reference Network (NSRN).</p> <p data-bbox="444 600 1187 716">The primary control survey shall be tied to a minimum of five (5) National Geodetic Survey (NGS) Colorado High Accuracy Reference Network (HARN) horizontal and vertical marks that surround the project location.</p> <p data-bbox="444 737 1143 789">NGS Continuously Operating Station may be used in conjunction with HARN marks for horizontal ties only.</p> <p data-bbox="444 810 1179 894">The most recent NGS North American Datum of 1983, 2011 adjustment (NAD83 (2011), shall be used for the horizontal geodetic datum.</p> <p data-bbox="444 915 1114 968">The most recent NGS North American Vertical Datum of 1988 (NAVD 88), shall be used for the vertical geodetic datum.</p> <p data-bbox="444 989 1133 1041">The most recent NGS Geoid18 model shall be used for the geoid model.</p> <p data-bbox="444 1062 1187 1157">NGS Online Positioning User Service (OPUS) shall NOT be used to establish either the horizontal or vertical geodetic datums, but may be used in the validation or checking of existing monuments.</p> <p data-bbox="444 1178 1182 1230">Colorado State Plane Central Zone coordinates shall be computed for all NGS and CDOT primary control monuments.</p> <p data-bbox="444 1251 1122 1346">State Plane Coordinates shall be converted to Modified Project Ground Coordinates using a scale and combined factors that are specific to the project.</p> <p data-bbox="444 1367 1187 1419">The U.S Survey foot shall be used to convert from meters to feet. The conversion factor is: One meter equals 3937/1200 feet.</p> <p data-bbox="444 1440 1182 1493">Modified Project Ground Coordinates shall be truncated to avoid any confusion with State Plane coordinates.</p> <p data-bbox="444 1514 1187 1671">The primary control survey shall include a minimum of three (3) City and County of Denver control monuments as necessary to facilitate the conversion from State Plane Coordinates to the City and County of Denver’s control datums. Additional control monuments may be required by the City and County of Denver.</p> <p data-bbox="444 1692 1166 1829">GNSS elevations shall be derived for all CDOT Primary Control Monuments either found or set. Closed level loops shall then be ran from/to the NGS vertical benchmarks to each Primary Control Monument per CDOT’s Survey Manual with the leveled elevations being held as the final project elevations. A detailed description of</p>		X	

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<p>how the level loops were ran and how the final elevations were derived shall be included on the Project Control Diagram.</p> <p>All level loops ran shall have an unadjusted closure no greater than that stated in the CDOT Survey Manual of <i>“the square root of the total horizontal distance of the differential level loop in miles multiplied by multiplied by 0.035 feet.”</i></p> <p>A detailed description of how the Primary Control Survey was performed, how the horizontal coordinates, level loops, and final elevations were derived, shall be included in the Survey Report.</p> <p>A KML file for importing in to Google Earth all NGS, City and County of Denver, and CDOT Primary Control Point locations shall be provided.</p> <p><u>Note:</u> See the ROW Survey and ROW Plans section of this scope of work for requirements regarding any City and County of Denver range points, monuments or block corners, and any other boundary monuments either found or set used to define the existing CDOT ROW tabulated with their respective City and County of Denver horizontal positional data listed. A clear statement on how to convert from the project geodetic horizontal control datum to the CCD horizontal datum shall be included in the ROW plans.</p>			
<p>ii) Primary Control Monumentation</p> <p>Type II, Type 5, or Type 5S monument materials per CDOT’s M&amp;S Standards will be supplied by CDOT for any Primary Control Monuments to be set. Care is to be taken to install monumentation in locations that are readily usable for the project and in a safe location so that they can be utilized throughout construction (no monumentation shall be set on or near the centerline of the proposed roadway, or in areas of active traffic).</p> <p>Primary Control Monuments shall be found or set for use in locations that will allow direct line of sight between one monument to the next to allow for the use of Total Stations or terrestrial Lidar scanners that may require direct line of sight.</p> <p>Any set Primary Control Monuments shall be named by their Mile Post number relative to the Mile Post of I-25 for which they are being set to the nearest one tenth of a mile (example Mile Post 211.1 = Control Monument CM 2111). Any existing control monuments found and used in the Primary Control Survey shall be named by their existing name or number.</p>		X	
<p>iii) Final Project Control Diagram</p> <p>A complete, final, electronically signed and sealed Project Control Diagram shall be produced per CDOT’s Survey Manual to include all NGS, CDOT, City and County of Denver primary control monuments and marks that were used in the Primary Control Survey to produce the Project Control Diagram.</p>		X	

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	<p>A detailed and complete statement of how to convert from Geodetic to State Plane, to Modified Project Ground Coordinates shall be provided on the Project Control Diagram.</p> <p>A detailed and complete statement of how to convert from State Plane to the City and County of Denver control datum shall be provided on the Project Control Diagram, along with a coordinate table of the Modified Project Ground Coordinates for all of the primary control monuments on the City and County of Denver’s control datum. This may be a supplemental sheet including in Project Control Diagram.</p> <p>A detailed and complete statement of how elevations were derived shall be provided on the Project Control Diagram.</p> <p>The topographic survey data and aerial background shall be included in the Project Control Diagram plan sheets with major highways, mile post, street names, and other notable landmarks labeled as to readily identify them.</p>			
<p>d.</p>	<p><b>Land Survey Control Diagram</b></p> <p>A complete, final, electronically signed and sealed Land Survey Control Diagram shall be produced per CDOT’s Survey Manual and ROW Manual Chapter 2 – Plans.</p> <p>All monuments used to define the existing CDOT ROW either found or set, including but not limited to ROW, CCD, aliquot, boundary, and permanent easements, and others, shall be tabulated and shown on the LSCD.</p> <p>Section breakdowns shall be included on the Land Survey Control Diagram sheets with Section, Township and Range clearly labeled, and bearings and distance between aliquot monuments labeled.</p>		<p align="center">X</p>	
<p>e.</p>	<p><b>Topographic Survey</b></p> <p>The topographic survey will consist primarily of Mobile Lidar, with a combination of supplemental surveying methods performed in those areas where mobile LIDAR cannot be used including but not limited to: Terrestrial Lidar, Total Stations, and GNSS Real Time Kinematic (RTK) to produce a planimetric 3D topographic map and InRoads Digital Terrain Model (DTM) of all features, improvements, terrain relief, line work and symbology.</p> <p>Regardless of the method used, all topographic survey data collected and processed shall meet CDOT’s Survey Manual horizontal tolerance of a CLASS C (hard surfaces or structures) or Class D (earth terrain) – TMOSS Survey.</p> <p>Regardless of the method used, all CLASS C survey vertical tolerances shall meet CDOT’s Survey Manual of <i>“all elevations collected must be within +/- one tenth foot (0.10’) of the true elevation at a ninety-five percent (95%) confidence level in relation to the primary control monuments.”</i> When Mobile Lidar is used this shall be in relation to the Mobile Liar Control Points. See Mobile Lidar section of this scope of work for additional information.</p> <p>Regardless of the method used, all CLASS D survey vertical tolerances shall meet CDOT’s Survey Manual of <i>“ninety-five percent (95%) of the</i></p>		<p align="center">X</p>	

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<p><i>elevations collected by topographic survey data shall have an accuracy with respect to the true elevation of one half (1/2) contour interval or better at the ninety-five percent (95%) confidence level in relation the primary control monuments.”</i> When Mobile Lidar is used this shall be in relation to the Mobile Liar Control Points. See Mobile Lidar section of this scope of work for additional information.</p> <p>The topographic contour interval for this project is 1 foot.</p> <p>Topographic features to be surveyed shall include, but not be limited to <i>everything in sight</i> including all roadway edge of asphalt or concrete, crowns, lane widths, super elevations, stripping, cross walks, stop bars, medians, gores, shoulders, guard rail, barriers, noise or MSE walls, traffic control devices with labeling, signal and light poles, cabinets, boxes, curb and gutter, cross pans, sidewalks, ADA ramps, bike paths, ditches, rivers, streams, all visible surface, day lighted or above ground and overhead utilities and hydraulic features and improvements, water quality features, environmental features, ditches, irrigation canals, pipes or structures, bridge decks and super structures, piers, caissons, pilings, aprons and abutments, approach slabs, manholes, water and gas valves, electrical, cable and T.V. poles and boxes, mailboxes, fences, billboards, fire hydrants, outdoor advertising signs, retaining walls, buildings, driveways, curb cuts, Regional Transportation District light rail, signage, features and facilities, ITS devices, tolling lanes, signage and devices.</p> <p>Edited and final TMOSS Field Books are not required for any Mobile or Terrestrial Lidar products. They are however required for any Total Station or RTK survey methods used to collect topographic survey data. TMOSS field books shall be edited and free of coding errors.</p> <p>The topographic survey will include a seamless, error free, fully merged 3D planimetric MicroStation drawing and InRoads Digital Terrain Model (DTM) of all the topographic data collected regardless of the collection method used. Reference files may be used to combine and merge all of the data together.</p> <p>A detailed description of how the Topographic Survey was performed, which areas were collected by which method, and the horizontal and vertical tolerances achieved by each method shall be included in the Survey Report.</p>			
<p>f. Mobile LIDAR Survey</p> <p>There are five distinct phases of a Mobile Lidar Survey 1) Control 2) Data Collection 3) Data Processing 4) Feature Extraction 5) QC and Survey Report. This scope of work includes all five of these phases.</p> <p>1) <u>Control</u></p> <p>Mobile Lidar control points shall include at a minimum: A) Control Points B) Verification Points.</p> <p>A) Control Points</p> <p>Mobile Lidar Control Points shall consist of semi-permanent targets set at five hundred (500) foot station intervals on alternating sides of the</p>		X	

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roadway, with no greater than one thousand (1,000) feet of stationing in between each secondary control point set. Where the roadway exceeds 500' in width an additional Mobile Lidar Control Point shall be set nearest to the center of the roadway in a location as safe as possible.

Where the roadway intersects another roadway or a bridge structure, a minimum of four (4) Mobile Lidar Control Points shall be set in a manner that will allow one target to be set at each quadrant of the intersection or at each corner of the bridge structure at its approach. Bridge structures shall have at a minimum two (2) additional Mobile Lidar Control Points set near the mid-point of the structure.

Mobile Lidar Control Points shall have been surveyed to meet CDOT's Survey Manual horizontal tolerance of a CLASS B – Secondary Survey, relative to the Primary Control Monuments.

As long as the horizontal tolerance stated in this scope of work are achieved, three-minute control quality GNSS Real Time Kinematic (RTK) positioning may be used to establish the horizontal coordinate of any Mobile Lidar Control Point in relation to the Primary Control Monuments.

Elevations of Mobile Lidar Control Points shall be derived from closed level loops ran from/to the CDOT Primary Control Monuments to each Mobile Lidar Control Point.

All Mobile Lidar Control Point level loops ran shall have an unadjusted closure no greater than that stated in the CDOT Survey Manual relative to the Primary Control Monuments of *"the square root of the total horizontal distance of the differential level loop in miles multiplied by multiplied by 0.035 feet."* Any deviation from this tolerance shall be brought to the immediate attention of the CDOT Project Engineer and Survey unit for review and acceptance.

In the rare instance a closed level loop cannot be ran between a set of two Mobile Lidar Control Points, a Total Station may be used to collect trigonometric elevation differences from both directions of the set of Mobile Lidar Control Point with their differences averaged. Advanced approval from the CDOT Project Engineer and Survey unit shall be sought prior to the use of any trigonometric methods being used.

A detailed description of how the Mobile Lidar Control Points coordinates, level loops, and final elevations were derived shall be included in the Survey Report.

A KML file for importing in to Google Earth all Mobile Lidar Control Points shall be provided.

### B) Verification Points

Mobile Lidar Verification Points shall consist of photo identifiable points that stand out when viewed graphically in MicroStation, such as the corner of roadway lane stripping or cross walks. These points shall be used as an independent verification and check of both the horizontal coordinates and elevations of the collected and processed Mobile Lidar data relative to the Mobile Lidar Control Points.

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Mobile Lidar Verification Points shall have been surveyed to meet CDOT's Survey Manual horizontal tolerance of a CLASS B – Secondary Survey, relative to the Mobile Lidar Control Points.

Mobile Lidar Verification Points vertical tolerance shall be within +/- one tenth foot (0.10') of the true elevation at a ninety-five percent (95%) confidence level in relation to the Mobile Lidar Control Points.

As long as the horizontal and vertical tolerances stated in this scope of work are achieved, three-minute control quality GNSS Real Time Kinematic (RTK) positioning may be used to establish the horizontal coordinate and elevation of any Mobile Lidar Verification Point in relation to the Mobile Lidar Control Point.

A detailed description of how the Mobile Lidar Verification Points final coordinates and elevations were derived, and how well the horizontal and vertical tolerances of the Mobile Lidar topographic data checked that was collected and processed shall be included in the Survey Report.

### 2) Data Collection

All topographic survey data collected and processed with Mobile Lidar shall meet CDOT's Survey Manual horizontal tolerance of a CLASS C (hard surfaces or structures) or Class D (earth terrain) – TMOSS Survey.

All Mobile Lidar CLASS C survey data collected and processed shall meet CDOT's vertical tolerance of: all elevations collected must be within +/- one tenth foot (0.10') of the true elevation at a ninety-five percent (95%) confidence level in relation to the Mobile Lidar Control Points.

All Mobile Lidar CLASS D survey data collected and processed shall meet CDOT's vertical tolerance of: ninety-five percent (95%) of the elevations collected by topographic survey data shall have an accuracy with respect to the true elevation of one half (1/2) contour interval or better at the ninety-five percent (95%) confidence level in relation the Mobile Lidar Control Points.

The topographic contour interval for this project is 1 foot.

A detailed description of how the Mobile Lidar topographic data was collected and how well it checks with the Mobile Lidar Verification and Control Points shall be included in the Survey Report.

### 3) Data Processing

Mobile Lidar topographic survey data processing shall be done in such a manner as to provide a seamless, error free, fully merged 3D planimetric MicroStation drawing and InRoads Digital Terrain Model (DTM) of all the topographic data collected regardless of the collection method used. Reference files may be used to combine and merge all of the data together.

A detailed description of how the Mobile Lidar topographic survey data was processed and quality controlled shall be included in the Survey Report.

### 4) Feature Extraction

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<p>Features shall be extracted from the Mobile Lidar topographic survey data to include but not be limited to all roadway edge of asphalt or concrete, crowns, super elevations, stripping, cross walks, stop bars, medians, guard rail, barriers, traffic control devices with labeling, signal and light poles, cabinets, boxes, curb and gutter, cross pans, sidewalks, bike paths, ditches, rivers, streams, all visible above ground and overhead utilities, manholes, water and gas valves, electrical, cable and T.V. poles and boxes, mailboxes, fences, billboards, fire hydrants, outdoor advertising signs, retaining walls, buildings, driveways, and curb cuts.</p> <p>The Mobile Lidar topographic survey data extraction process shall include a seamless, error free, fully merged 3D planimetric MicroStation drawing and InRoads Digital Terrain Model (DTM) of all the topographic data collected regardless of the collection method used. Reference files may be used to combine and merge all of the data together.</p> <p>A detailed description of how features from the Mobile Lidar topographic survey data were extracted and quality controlled shall be included in the Survey Report.</p> <p>5) <u>QC and Survey Report</u>  A detailed description of the Quality Controls used throughout any and all Mobile Lidar topographic survey data collection, processing, and feature extraction, shall be included in the Survey Report.</p>			
<p>g. <u>Monumented ROW Survey and ROW Plans</u></p> <p><u>ROW Survey</u>  A monumented ROW Survey of the existing CDOT ROW with monuments either found or set that mark the boundary of the existing CDOT ROW will be performed in accordance with CDOT’s Survey and ROW Manual.</p> <p>The ROW survey shall be tied to the Primary Project Control monuments using their associated horizontal and vertical datums for this project to meet a CDOT Class B – ROW Survey.</p> <p>Any City and County of Denver range point, monument or block corner used to define the existing CDOT ROW shall be perpetuated and rehabilitated as necessary to meet CCD policy and procedure. Any CCD monument either found or set shall meet CCD physical standards and shall have the appropriate number of tie monuments either found or set, and shall have a new monument tie off sheet filed per CCD policy and procedure.</p> <p>Any aliquot monument, reference, or accessory used to define the existing CDOT ROW shall be perpetuated and rehabilitated as necessary to meet State Board policy and procedure. Any aliquot monument either found or set shall meet the State Board’s physical standards and shall have the appropriate number of tie monuments either found or set, and shall have a new monument record filed with the State Board per their policy and procedure.</p> <p>Type I, Type 5, or Type 5S monument materials per CDOT’s M&amp;S Standard M-629-1 will be supplied by CDOT for any CDOT ROW</p>		X	

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	<p>Monuments needing to be set at every angle point, curve, and at distances not to exceed 1400 feet.</p> <p><u>ROW Plans</u> A complete, final, electronically signed and sealed ROW Plan set that defines the existing CDOT ROW shall be produced per CDOT’s ROW Manual Chapter 2 – Plans.</p> <p>Prior to finalizing the ROW plans a draft plan set shall be provided to CDOT and to the CCD for review and acceptance. Once accepted the ROW plans shall be deposited in the appropriate county records per CDOT, and the CCD policy and procedures.</p> <p>The ROW Plan set shall include:          Sheet 1.01 – Title Sheet          Sheets 2.0X – Tabulation of Properties          Sheets 3.0X – Project Control Diagram          Sheet 4.0X – Land Survey Control Diagram          Sheet 5.0X – Monumentation Sheets          Sheet 6.0X – Tabulation of Approach Roads (may excluded)          Sheet 7.0X – Plan Sheets          Sheet 8.0X – Ownership Map</p> <p>The first tier of properties that abut the existing CDOT ROW shall have their respective boundaries shown on the ROW plan sheets, with the property site address, owners’ name(s) and mailing address, and the books and pages and/or reception numbers of the owner’s recorded deeds shown on the plan sheets and tabulated on the Tabulation of Properties sheets.</p> <p>All monuments used to define the existing CDOT ROW either found or set, including but not limited to ROW, CCD, aliquot, boundary, and permanent easements, shall be tabulated on the monumentation plan sheets and shown on the plan sheets with detailed notes if the monument was accepted, rejected, or found to be in conflict with any other boundary monuments.</p> <p><u>Note:</u> The ROW Plans produced for this project shall contain a separate sheet with the Primary Project Control, CDOT ROW monuments, City and County of Denver range points, monuments or block corners, and any other boundary monuments either found or set used to define the existing CDOT ROW tabulated with their respective City and County of Denver horizontal positional data listed. A clear statement on how to convert from the project geodetic horizontal control datum to the CCD horizontal datum shall be included on the sheet.</p> <p>The ROW Plans shall include an aerial background with the existing topographic feature shown, with major highways, mile post, street names, and other notable landmarks labeled as to readily identify them.</p>			
h.	<p><b>Ownership Map</b></p> <p>A final, full and complete Ownership Map of the CDOT existing ROW and the first tier of abutting properties shall be included in the ROW Plan set.</p>		X	

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i.	<p><b>Preliminary Utility Survey</b></p> <p>A Preliminary Utility Survey shall be conducted as part of the topographic and mobile Lidar survey to locate any visible surface, above ground, or overhead utilities.</p> <p>The preliminary utility survey data shall be provided in its own MicroStation drawing in a manner that will provide a seamless, error free, fully merged 3D planimetric MicroStation drawing and InRoads Digital Terrain Model (DTM) that includes all the utility survey data collected regardless of the collection method used. Reference files may be used to combine and merge all of the data together.</p> <p>The preliminary utility survey MicroStation drawing and report shall include a note similar to the following: <i>This drawing does not comply with the subsurface utility engineering (SUE) requirements under Colorado SB-18-167. If this project is required to meet the requirements of SB-18-167 then a separate SUE survey must be performed under the supervision of a licensed engineer qualified to determine and meet these requirements.</i></p> <p>A detailed description of how the preliminary utility survey was performed shall be included in the Survey Report.</p> <p>The marking of underground utility locates by a private utility location services is not included in this scope of work and shall not be performed, produced, provided, or delivered.</p>	X
j.	<p><b>Preliminary Hydraulic Survey</b></p> <p>A Preliminary Hydraulic Survey shall be conducted as part of the topographic and mobile Lidar survey to locate any visible surface or day lighted underground hydraulic features including but not limited to: culverts, ditches, storm sewers, inlets, vaults, manholes, water quality structures, and any drainage improvements that provide flow or detention / retention of water.</p> <p>The Hydraulic survey data shall be provided in its own MicroStation drawing in a manner that will provide a seamless, error free, fully merged 3D planimetric MicroStation drawing and InRoads Digital Terrain Model (DTM) that includes all the hydraulic survey data collected regardless of the collection method used. Reference files may be used to combine and merge all of the data together.</p> <p>A detailed description of how the preliminary hydraulic survey was performed shall be included in the Survey Report.</p>	X
k.	<p><b>Bridge Structure Survey</b></p> <p>Bridge Structure Surveys shall be performed for all bridges included in this scope of work with a combination of survey methods including: Mobile or Terrestrial Lidar above (bridge deck and surface) and Terrestrial Lidar underneath (superstructure).</p> <p>Regardless of the method used, all bridge structure survey data collected and processed shall meet CDOT’s Survey Manual horizontal tolerance of a CLASS C (hard surfaces or structures) TMOSS Survey in relation to the Primary Control Monuments.</p>	X

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<p>Regardless of the method used, all Bridge Structure surveys shall meet CDOT’s CLASS C survey vertical tolerance of “<i>all elevations collected must be within +/- one tenth foot (0.10’) of the true elevation at a ninety-five percent (95%) confidence level in relation to the primary control monuments.</i>”</p> <p>The bridge structure survey data shall be provided in its own MicroStation drawing in a manner that will provide a seamless, error free, fully merged 3D planimetric MicroStation drawing and InRoads Digital Terrain Model (DTM) that includes all the bridge structure survey data collected regardless of the collection method used. Reference files may be used to combine and merge all of the data together.</p> <p>Discussion about the bridge structure surveys shall be held during the pre-survey meeting to ensure everything related to the superstructure that needs to be surveyed is included in the scope of work and gets surveyed.</p>			
<p>1. Supplemental Survey</p> <p>It is anticipated that the topographic survey will consist primarily of Mobile Lidar, with a combination of supplemental surveying methods performed in those areas where mobile LIDAR cannot be used including but not limited to: Terrestrial Lidar, Total Stations, and GNSS Real Time Kinematic (RTK) to produce a planimetric 3D topographic map and InRoads Digital Terrain Model (DTM) of all features, improvements, terrain relief, line work and symbology.</p> <p>Regardless of the survey data collection method used for any supplemental surveying, the same horizontal and vertical tolerances and deliverables stated throughout this scope of work shall be adhered to.</p>			
<p>k. Survey Report</p> <p>A detailed and complete Survey Report shall be provided for all of the survey and plans work and deliverables included in this scope of work. Quality Assurance and Quality Control methods used to ensure error free deliverables will be noted.</p> <p>The Survey Report shall include a KML file for importing in to Google Earth all NGS, City and County of Denver, and CDOT Primary Control Monument locations, as well as any Mobile Lidar Control Points.</p>		X	
<b>C. PRELIMINARY DESIGN</b>			
<p>1. Traffic Engineering</p>			
<p>a. Review locations with potential for accident reduction map and or traffic operations analysis and/or the safety assessment report as provided by CDOT to determine which safety improvements will be incorporated into the project.</p>		X	
<p>b. Use TransModeler software for a project traffic analysis given that congestion is anticipated to increase in this project area. Include both uninterrupted flow facilities (freeway segment, ramp merge/diverge segment and weave segment), and interrupted flow facilities (interchange ramp terminal intersections) for the existing year and a long range forecast (20+ years) in the development of the model. The PEL model</p>		X	

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	(TransModeler) will need to be modified and re-calibrated to the established logical termini at a minimum.			
	c. Using the calibrated existing conditions model, evaluate four proposed design alternatives for the 20-year design horizon. It may be necessary for the Consultant to perform sensitivity analyses due to new or anticipated land uses. The evaluation of alternatives is performed by assessing all selected measure of effectiveness (MOEs) for the project using proper analysis tools as approved in the traffic-analysis methodology. MOEs will be determined by the Project Team and will be calculated and compared for each alternative for each analysis year. No-build alternative MOEs will be used as the basis for comparison.		X	
	d. Recommend the appropriate geometry (i.e., number of lanes, auxiliary lanes, storage lengths, weaving distances, etc.) in accordance with the current version of Highway Capacity Manual.		X	
	e. The proposed design shall be reviewed to ensure compatibility with existing signing procedures throughout the preliminary roadway design process		X	
	f. Use traffic data appropriate to the anticipated construction timing in developing detour alternatives.		X	
	g. Develop the total ESAL for the design life and submit to the CDOT/PM for the pavement design.		X	
	h. Submit the traffic data and recommendations to the CDOT/PM for review.		X	
<b>2.</b>	<b>Materials Engineering</b> A preliminary soil investigation should be conducted.	X		
	a. Determine test hole locations (horizontal and vertical) and coordinate with the CDOT/PM.	X		
	b. Collect soil samples and test for: i) Classification ii) Moisture - Density Relationship iii) Resistance Value iv) Corrosiveness - Note locations of high corrosiveness with recommendations; see CDOT pipe material selection policy. v) Bearing Capacity	X		
	c. Prepare and submit a soils investigation report.	X		
	d. Prepare and submit pipe material selection report.	X		
<b>3.</b>	<b>Pavement</b>		X	
	a. <b>New Pavement Structure</b> The feasible alternatives of new pavement structure shall be designed utilizing procedures accepted by the CDOT/PM. New pavement designs for widening shall be compatible with adjacent rehabilitated existing pavement.		X	
	b. <b>Pavement Justification</b>		X	
	i) <b>Basic factors:</b>		X	

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	<ul style="list-style-type: none"> <li>a) Desired life expectancy (obtain design life from CDOT).</li> <li>b) Required maintenance activities intervals.</li> <li>c) Basis for performance life.</li> </ul>			
	<ul style="list-style-type: none"> <li>ii) Analyze life cycle cost of the selected alternatives                             <ul style="list-style-type: none"> <li>a) Perform analysis with unit and maintenance costs from CDOT. Determine present worth and annual costs in accordance with the procedures in the CDOT Pavement Design Guide.</li> <li>b) Compare alternatives over the same life span.</li> <li>c) Recommend the pavement structure and provide the basis for the recommendations.</li> </ul> </li> </ul>		X	
	<ul style="list-style-type: none"> <li>c. Pavement Design Report Include all the above tests, investigations, analyses, and calculations performed. Submit to the CDOT/PM for acceptance.</li> </ul>		X	
4.	Existing Structures and Foundation		X	
	<ul style="list-style-type: none"> <li>a. Existing bridge condition investigation Determine condition of existing bridge deck, superstructure and substructure material as required.</li> </ul>		X	
	<ul style="list-style-type: none"> <li>b. Foundation Investigation Report</li> </ul>	X		
	<ul style="list-style-type: none"> <li>i) Prepare a Foundation Investigation Request showing requested test hole locations.</li> </ul>	X		
	<ul style="list-style-type: none"> <li>ii) Formulate drilling pattern, perform the necessary subsurface investigation and collect samples as required.</li> </ul>	X		
	<ul style="list-style-type: none"> <li>iii) Perform the appropriate laboratory tests and analyze the data. Determine strength, allowable bearing capacity and corrosiveness of foundation material.</li> </ul>	X		
	<ul style="list-style-type: none"> <li>iv) Perform lateral analyses (deformation, moment, and shear) for the caissons and/or piles which are subjected to lateral loadings. This may be a computer analysis which will consider the group effect and selection of the soil parameters.</li> </ul>	X		
	<ul style="list-style-type: none"> <li>v) If appropriate, a pile-driving analysis using a wave equation will be accomplished.</li> </ul>	X		
	<ul style="list-style-type: none"> <li>vi) Submit the Foundation Investigation Report to the CDOT/PM for approval.</li> </ul>	X		
	<ul style="list-style-type: none"> <li>vii) Prepare engineering geology plan sheet and copies of the Foundation Investigation Report foundation report with recommendations for type, size, and tip (bottom) elevation of the required foundation. Specify if pre-drilling, pile tip, casing, dewatering, etc., are needed for foundation construction.</li> </ul>	X		
5.	Hydrology/Hydraulic Engineering		X	
	<ul style="list-style-type: none"> <li>a. Data Collection and Hydrology</li> </ul>		X	
	<ul style="list-style-type: none"> <li>i) Establish drainage basin data: delineate and determine size, waterway geometrics, vegetation cover, and land use.</li> </ul>		X	

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ii)	Collect historical data: research flood history and previous designs in the project proximity; obtain data from other sources (e.g., UDFCD, CWCB, CDOT Maintenance, and local residents).		X	
iii)	Complete a project site visit to evaluate channel/overbank roughness coefficients, channel stability, vegetation, condition/adequacy of existing structures, Ordinary High Water, allowable high water, etc. Document the site visit with photos.		X	
iv)	Select a design storm frequency based on the established criteria.		X	
v)	Complete a hydrological analysis using existing studies or approved methods.		X	
vi)	Perform a risk analysis.		X	
b.	Hydraulics		X	
i)	Complete preliminary design of minor drainage structures: <ul style="list-style-type: none"> <li>a) Determine locations, sizes, and alignment based on preliminary hydraulic design. Identify locations by highway station or coordinates, as appropriate.</li> <li>b) Determine the allowable headwater.</li> <li>c) Assess the degree of sediment and debris problems to be encountered</li> <li>d) Assess abrasion and corrosion levels based on CDOT Pipe Material Selection Policy.</li> <li>e) Prepare preliminary structure cross-sections and determine elevations, flow lines, slopes and lengths of the structures.</li> </ul>		X	
ii)	Complete preliminary design of major drainage structures: <ul style="list-style-type: none"> <li>a) Complete hydraulic analysis and water surface profiles.</li> <li>b) Determine required hydraulic size/skew of major structures/channels</li> <li>c) Determine minimum low chord elevation per CDOT criteria</li> <li>d) Determine design storm and 500-yr water surface elevations.</li> <li>e) Determine scour for design storm and 500-yr event</li> <li>f) Assess channel erosion protection for structures.</li> </ul>		X	
iii)	Complete preliminary design for PWQ CMs and outlet structures with details as needed. Adequate detail should be included in the FIR construction plan set if FIR-level decisions are required with respect to right-of-way, easements, maintenance, etc. to move to final design.		X	
iv)	If required, identify and assist CDOT in coordinating potential funding participation of local municipalities or agencies.		X	
c.	Prepare preliminary construction plans that include:		X	
i)	Drainage Plan Sheets		X	
ii)	Drainage Detail Sheets as needed			
i)	Prepare preliminary Hydraulic Design Report in accordance with the CDOT Drainage Design Manual Introduction, Hydrology, Existing Structures and Design Discussion		X	

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<p>sections should be close to final at this level. Design Discussion should include CDOT and local criteria the project intends to meet.</p> <p>ii) Recommended design should be preliminary at this level and progress through final design.</p> <p>iii) All design assumptions and related design decisions shall be documented.</p> <p>iv) The Appendix shall contain:</p> <ul style="list-style-type: none"> <li>a) Drainage basin maps</li> <li>b) Hydrology/hydraulic worksheets</li> <li>c) Drainage construction plan sheets.</li> <li>d) CDOT pipe material selection documentation</li> <li>e) Water Quality report and PWQ worksheets</li> </ul>			
d. Perform internal QA/QC prior to submittal to CDOT.			X
6. Environmental - Water Quality			
a. Storm Water Management Plan Initiate a Storm Water Management Plan in accordance with:			X
<ul style="list-style-type: none"> <li>i) Municipal Separate Storm Sewer Systems (MS4)</li> <li>ii) CDPHE's Construction Discharge Permit System requirements</li> <li>iii) CDOT's Erosion Control and Storm Water Quality Guide</li> <li>iv) Local agency SWMP/GESC/EC requirements</li> <li>v) CDOT's Standard Specifications</li> <li>vi) CDOT Standard Plans</li> <li>vii) Other appropriate documents</li> </ul>			
b. Prepare preliminary Permanent Water Quality (PWQ) plans in conjunction with Section 7.C.5.b.iii of this document.			X
<ul style="list-style-type: none"> <li>i) Determine PWQ requirements (local agency MS4 requirements, CDOT requirements, etc.)</li> <li>ii) Develop PWQ alternatives that will meet CDOT and local agency MS4 requirements</li> <li>iii) Identify right-of-way requirements and utility impacts for alternatives</li> <li>iv) Identify all entities and</li> <li>v) Other appropriate documents</li> </ul>			X
c. Prepare preliminary water quality report as an appendix to the Hydraulic Design Report to include PWQ Evaluation and Tracking Forms, cost estimate for PWQ CMs, etc.			X
d. Conduct a PWQ meeting just prior to FIR to discuss alternatives with CDOT PWQ Specialist/Water Pollution Control Manager, Hydraulics Engineer, and Project manager.			X
e. Perform internal QA/QC prior to submittal to CDOT.			X
7. Utility Coordination and Subsurface Utilities Engineering (SUE)			

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<p>a. Location Maps Obtain utility location maps from the utility companies which identify utility features in the project area. Requests and receipt of maps will be coordinated with the Region Utility Engineer via copies of request and transmittal letters.</p>	X	X	
<p>b. Provide Subsurface Utilities Engineering (SUE) to the standard of care applicable in the Subsurface Utility Engineering profession. The services meet the standard guidelines of ASCE CI 38 (latest edition) for “Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.”</p>		X	
<p>i) Quality Level D (QL-D)</p>		X	
<p>(1) Collect existing utility records information (as-builts) from utility providers, municipalities, counties, and other agency suppliers within the area of investigation. Review records for indications of additional available records, duplicate information, and a need for clarifications by utility owners. These utilities could include but are not limited to electrical, telephone, cable TV, fiber optic, gas, petroleum, water, wastewater, steam, and storm drain systems.</p>		X	
<p>(2) Utility providers, counties and other agency suppliers identified through the utility easement information, Colorado 811, and via vehicle reconnaissance and inventory of utility marker posts along adjacent roadways will be contacted. The sole purpose of this activity is to collect existing record information of utility systems that may have an impact on this project. Any utility that is found in the field by use of designating geophysical equipment and is not evident on any collected record information will be shown in the QL-B utility file as an unknown utility as required by ASCE CI 38.</p>		X	
<p>ii) Quality Level C (QL-C)</p>		X	
<p>(1) Field survey to obtain accurate horizontal position of visible utility surface appurtenances of existing subsurface utility systems located within the project limits. Management staff will determine when records and features do not agree and resolve discrepancies using professional judgment.</p>		X	
<p>iii) Quality Level B (QL-B) Designating</p>		X	
<p>(1) Designate, by marking with paint and/or flags, the presence, and approximate horizontal location of subsurface utilities using a suite of geophysical methods including, without limitations, electromagnetic, sonic, acoustical, and radar techniques.</p>		X	
<p>(a) Designate the underground utilities, which may consist of but are not limited to water, wastewater, gas, petroleum pipelines, telephone, fiber optics, cable TV, and electrical utilities within the project area previously described</p> <p>(b) Conduct appropriate investigation of site conditions</p> <p>(c) Mark the utilities on the ground using paint and/or flags</p> <p>(d) Analyze and correlate all of the field-collected information with the collected record information for ensuring continuity of the information collected, and resolve conflicts with Level D, C, and B information</p>		X	

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<ul style="list-style-type: none"> <li>(e) Utilities will be marked at maximum 50-foot intervals and at all changes in direction</li> <li>(f) Water lines, force mains, and other non-tonable utilities may be able to be designated using ground penetrating radar and will be marked as Quality Level B in these areas. When the ground penetrating radar is not effective, these utilities will be marked as Quality Level D.</li> </ul>			
(2) The designated utilities will be surveyed and included in the deliverable drawings depicting type, owner, and any other attributes ascertainable during the investigation		X	
iv) Work Products		X	
1. Digital 2D or 3D MicroStation file, compliant with CDOT standards, depicting the utilities within the area of investigation at their achieved quality levels		X	
<ul style="list-style-type: none"> <li>(a) File will clearly identify all utilities discovered from QL-D and QL- C investigation that could not be designated in the field as QL-B.</li> <li>(b) Utility lines will have a unique line style and symbology in the deliverables.</li> <li>(c) Utilities will be referenced by the type of utility, color coded to American Public Works Association standards, utility company or agency name, address, telephone number and contact person.</li> </ul>		X	
(2) A signed and sealed plan view drawing will also be provided based upon the utility results outlined above.		X	
<p>c. Reviews and Investigation</p> <p>Conduct field reviews and utility investigations with the Region Utility Engineer and Utility companies, as required, to ensure correct horizontal and vertical utility data. When possible this will be done utilizing non-destructive investigative techniques. The horizontal and vertical locations will be shown in the FIR plans and cross sections. When “potholing” is required, the Consultant shall be responsible for all necessary excavations.</p>		X	
<p>d. Relocation Recommendations</p> <p>Submit necessary information for the relocation or adjustments of affected utilities to the Region Utility Engineer. The Region Utility Engineer will process the required agreements.</p>		X	
<p>8. Roadway Design and Roadside Development</p> <p>Coordinate all design activities with required CDOT specialty units and other outside entities.</p>		X	
a. Roadway Design		X	
i) Input, check, and plot survey data		X	
ii) Verify that a project-specific coordinate system approved by CDOT is used to identify the horizontal locations of key points. The coordinate systems used for roadway design and ROW shall be compatible.		X	

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iii)	Input and check horizontal and vertical alignments against all design criteria. Necessary variances and/or design decisions will be identified with justification and concurrence by CDOT and FHWA.		X	
iv)	Provide alignments, toes of slope and pertinent design features, including permanent and temporary impacts to the ROW, Utility and Environmental Managers.		X	
v)	Plot/develop all required information on the plans in accordance with all applicable CDOT policies and procedures.		X	
vi)	Using current approved CDOT software, generate a 3- dimensional design model and produce preliminary quantities		X	
b.	<b>Roadside Development:</b> For roadside items including but not limited to, guardrails, delineators, ditches, PWQ CMs, landscaping, sprinkler systems, sound barriers, bike paths, sidewalks, lighting, curb ramps, truck escape ramps, and rest areas provide the following layouts in the plans:		X	
i)	Critical locations in the plans for irrigation sleeves and other utility conduits underneath the proposed roadways.		X	
ii)	Coordinate the roadside items with the Storm Water Management Plan (SWMP).			
9.	<b>Bicycle and Pedestrian Facility Design</b> Coordinate this activity with the City and County of Denver		X	
i)	Develop conceptual and preliminary designs of proposed bicycle and pedestrian facilities serving and crossing the interchange complex.		X	
ii)	Develop typical sections for bicycle and pedestrian paths, and plan sheets for the FIR set.		X	
10.	<b>Structural Design</b> The CDOT Structure Reviewer will participate in coordinating this activity.		X	
a.	<b>Structural Data Collection</b>		X	
i)	Obtain the structure site data. The following data, as applicable, shall be collected: (Typical roadway section, roadway plan and profile sheets showing all alignment data, topography, utilities, preliminary design plan) right-of-way restrictions, preliminary hydraulics and geology information, environmental constraints, lighting requirements, guardrail types, recommendations for structure type, and architectural recommendations.		X	
ii)	Obtain data on existing structures. When applicable, collect items such as existing plans, inspection reports, structure ratings, foundation information, and shop drawings. A field investigation of existing structures will be made with notification to the Resident Engineer.		X	
b.	<b>Structure Selection and Layout</b>		X	
i)	Review the structure site data to determine the requirements that will control the structure size, layout, type, and rehabilitation alternatives. On a continuing basis, provide support data and recommendations as necessary to finalize the structure site data.		X	
ii)	Determine the structure layout alternatives. For bridges, determine the structure length, width, and span configurations that satisfy all		X	

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	horizontal and vertical clearance criteria. For walls, determine the necessary top and bottom of wall profiles.			
	iii) Determine the structure type alternatives. For bridges, consider precast and cast-in-place concrete and steel superstructures and determine the spans and depths for each. For walls, determine the feasible wall types.		X	
	iv) Determine the foundation alternatives. Consider piles, drilled caissons, spread footings, and mechanically stabilized earth foundations based on geology information from existing structures and early estimates from the project geologist. To obtain supporting information, initiate the foundation investigation as early as possible during the preliminary design phase.		X	
	v) Determine the rehabilitation alternatives. Continued use of all or parts of existing structures shall be considered as applicable. The condition of existing structures shall be investigated and reported. Determine the modifications and rehabilitation necessary to use all or parts of existing structures and the associated costs.		X	
	vi) Develop the staged construction phasing plan, as necessary for traffic control and detours, in conjunction with the parties performing the roadway design and traffic control plan. The impact of staged construction on the structure alternatives shall be considered and reported on.		X	
	vii) Compute preliminary quantities and preliminary cost estimates as necessary to evaluate and compare the structure layout, type, and rehabilitation alternatives.		X	
	viii) Evaluate the structure alternatives. Establish the criteria for evaluating and comparing the structure alternatives that, in addition to cost, encompass all aspects of the project's objectives. Based on these criteria, select the optimum structure layout, type, and rehabilitation alternative, as applicable, for recommendation to CDOT.		X	
	ix) Prepare preliminary general layout for the recommended structure. Prepare structure layouts in accordance with current standards. Special detail drawings and a detailed preliminary cost estimate shall accompany the general layout. The special detail drawings shall include the architectural treatment. Perform an independent design and detail check of the general layout.		X	
	c. Structure Selection Report  Prepare a structure selection report to document, and obtain approval for, the structure preliminary design. Structure Selection Reports are required for Major Structures, Minor Structures, Retaining and Noise Walls, Pedestrian Structures, and Tunnels. By means of the structure general layout, with supporting drawings, tables, and discussion, provide for the following:		X	
	i) Summarize the structure site data used to select and layout the structures. Include the following:  a) Existing structure data, including sufficiency rating and whether or not the structure is on the poor list.  b) Project site plan		X	

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<ul style="list-style-type: none"> <li>c) Roadway vertical and horizontal alignments and cross sections at the structure</li> <li>d) Construction phasing</li> <li>e) Utilities on, below, and adjacent to the structure</li> <li>f) Hydraulics:</li> <li>g) Channel size and skew, design year frequency, minimum low girder elevation, design year and 500-yr high water elevations, estimated design year and 500-yr scour profiles, and channel erosion protection</li> <li>h) Preliminary geology information for structure foundation</li> <li>i) Accelerated bridge construction opportunities</li> <li>j) Life-Cycle maintenance considerations</li> <li>k) Architectural requirements</li> </ul>			
<ul style="list-style-type: none"> <li>ii) Report on the structure selection and layout process. Include the following: <ul style="list-style-type: none"> <li>a) Discuss the structure layout, type, and rehabilitation alternatives considered</li> <li>b) Define the criteria used to evaluate the structure alternatives and how the recommended structure was selected</li> <li>c) Provide a detailed preliminary cost estimate and general layout of the recommended structure</li> </ul> </li> </ul>		X	
<ul style="list-style-type: none"> <li>iii) Obtain acceptance by CDOT on the recommended structure and its layout. Allow approximately two weeks for review of the structure selection report. The associated general layout, with the revisions required by the CDOT review, will be included in the FIR plans. The structure selection report, with the associated general layout, must be accepted in writing by CDOT prior to the commencement of further design activities.</li> </ul>		X	
<ul style="list-style-type: none"> <li>d. Foundation Investigation Request Initiate the foundation investigation as early in the preliminary design phase as is practical. On plan sheets showing the project control line, its stations and coordinates, utilities, identify the test holes needed and submit them to the project geologist. The available general layout information for the new structure shall be included in the investigation request.</li> </ul>		X	
<ul style="list-style-type: none"> <li>e. Bridge Enterprise Eligibility Conduct an analysis and prepare exhibits detailing boundaries of the sections of the project that are eligible for funding from Colorado Bridge Enterprise.</li> </ul>		X	
<p>11. Construction Phasing Plan</p> <p>A construction phasing plan shall be developed for all projects which integrates the construction of all the project work elements into a practical and feasible sequence. This plan shall accommodate the existing traffic movements during construction (detours). A preliminary traffic control plan will also be developed which will be compatible with the phasing plan.</p>		X	
<p>12. Preparation for the Field Inspection Review (FIR)</p>		X	

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a.	Coordinate, complete, and compile the plan inputs from other branches: Materials, Hydraulics, Traffic, Right-of-Way, Environmental and Water Quality, and Staff Bridge.		X	
b.	If a major structure is included in the project, including a PWQ CM, a general layout (which has been accepted by CDOT) will be included in the FIR plans.		X	
c.	Prepare the preliminary cost estimate for the work described in the FIR plans based on estimated quantities.		X	
d.	The FIR plans shall comply with CDOT requirements and shall include a title sheet, typical sections, general notes, plan/profile sheets, and preliminary layouts of interchanges/intersections. The plan/profile sheets will include all existing topography, survey alignments, projected alignments, profile grades, ground line, existing ROW, rough structure notes (preliminary drainage design notes, including pipes, inlets, ditches and channels), and existing utility locations.		X	
i)	The following items will be mandatory for the FIR plans:		X	
a)	Preliminary earthwork (plotted cross sections at critical points with roadway template and existing utility lines at known or estimated depths)			
b)	Catch points			
c)	Approximate proposed right-of-way			
d)	Pit data (if required)			
e)	Soil profile and stabilization data			
f)	Structure general layouts (if applicable)			
ii)	Typical plan sheet scales will be as follows:		X	
a)	Plan and Profile: 1 inch = 50 feet (urban) 1 inch = 100 feet (rural) Intersections: 1 inch = 20 feet			
e.	The ownership map shall be included in the FIR plan set		X	
f.	The plans shall be submitted to the CDOT/PM for a preliminary review prior to the FIR.		X	
g.	FIR plan reproduction not to exceed eight sets		X	
h.	The preliminary construction phasing including preliminary traffic control plan with proposed detours will be included in the FIR plan set.		X	
i.	CDOT form 1048 - project scoping procedures completion checklist		X	
13.	Field Inspection Review		X	
a.	Attend the FIR		X	
b.	The FIR meeting minutes shall be prepared by the C/PM, approved by the CDOT/PM, and distributed as directed.		X	
c.	The FIR original plan sheets shall be revised/corrected in accordance with the FIR meeting comments within thirty working days.		X	

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d. Design decisions concerning questions raised by the FIR will be resolved in cooperation with the CDOT/PM. The C/PM shall document the decision and transmit the documentation to the CDOT/PM for approval.		X	
e. A list of all deviations from standard design criteria along with the written justification for each one shall be submitted to the CDOT/PM.		X	
14. Post-FIR Revisions  The Consultant shall complete the revisions required by the FIR before this phase of work is considered to be complete		X	
a. Update project schedule		X	
b. Coordinate activities		X	
c. Finalize design decisions, variances, justification process, and traffic signal warrants		X	

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## SECTION 8 CONTRACT CONCLUSION (CHECKLIST)

### 1. SUPPLEMENTAL WORK

It is anticipated that this contract may be supplemented for:

- A. Final design
- B. Construction services
- C. Construction engineering
- D. Final earthwork determination
- E. Completion of the as-built plans and/or final ROW plans
- F. Preparation of Design-Build procurement documentation (if D-B is selected)
- G. Value Engineering Study as required by FHWA

### 2. CONTRACT COMPLETION

This Contract will be satisfied upon acceptance of the following items if applicable:

- A. Project schedule
- B. Project progress meeting minutes
- C. Traffic control plan(s)
- D. All documents found in research
- E. All Permission to Enter Property forms
- F. Final electronically signed and sealed Project Control Diagram
- G. Final electronically signed and sealed Land Survey Control Diagram
- H. Final electronically signed and sealed ROW Plan set
- I. Seamless, error free, fully merged topographic 3D planimetric MicroStation drawing and InRoads Digital Terrain Model (DTM) of all topographic data regardless of collection method
- J. Mobile and Terrestrial Lidar Point Cloud Data
- K. Edited TMOSS field books
- L. Survey Reports
- M. Survey KML Files
- N. Ownership Map
- O. Tabulation of Properties
- P. Completion of review of contract submittals
- Q. Design plans, specifications, and final estimate
- R. All environmental permits
- S. All environmental, utility, and ROW clearances
- T. Floodplain report
- U. Hydraulic design report (signed and sealed)
- V. Structural report
- W. Materials report
- X. Environmental technical resource reports
- Y. Environmental NEPA documents
- Z. Floodplain development permit and no-rise documents

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**TABLE 1 - SUBMITTALS**

This list establishes the individual task responsibility. Those tasks identified as CDOT/Other should utilize an abbreviation system to indicate whether the task will be completed by CDOT or another. The Consultant shall maintain the ability to perform all work tasks which are indicated below by an ‘X’ in the Consultant column, in accordance with the forms and conditions contained herein, and the applicable CDOT standards.

Hard Copy	Electronic Copy		Work Tasks	CDOT	Consultant	Not Applicable
	PDF	Orig.				
	X		Periodic Reports		X	
	X		Billings		X	
	X		Meeting Minutes		X	
	X		Project Schedule		X	
		X	Completed Specific Design Criteria		X	
	X		Survey Plan		X	
	X		Approved MHTs		X	
	X		Traffic Control Supervisor Certification		X	
X	X		Permissions to Enter		X	
		X	Initial Submittal of TMOSS and or MOSS Compatible Data		X	
		X	Initial Submittal of an Original Plan Sheet		X	
			<b>PROJECT DEVELOPMENT</b>			
	X		Public Communication Contact List		X	
			<b>Route Location Survey</b>			
	X		Traffic Control Supervisor Certification		X	
	X		Approved MHTs		X	
		X	Survey data in processed MicroStation/OpenRoads format		X	
		X	Pothole data including invert elevations		X	
	X		Existing culverts report		X	
	X		Access report		X	
	X	X	Topographic survey notes (within DGN and PDF)		X	
	X	X	Contour plan checked for errors		X	
	X	X	Project control diagram		X	
		X	Field books: CONSTRUCTION		X	
		X	Electronic Survey Files .DGN FILES		X	
		X	Survey TMOSS Data (.DGN Format)		X	
	X	X	Ownership and Tabulation of Properties Sheets		X	
	X	X	Project Control Diagram and Land Survey Control Diagram		X	
	X	X	ROW Plans		X	
	X	X	City and County of Denver tie out sheets		X	
	X		Aliquot monument records		X	
	X	X	LiDAR specifications, leveled elevations not GPS derived		X	

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			<b>Permits</b>		
	X	X	401 Permit		X
	X	X	Dewatering / 402 Permit		X
	X	X	404 Permit		X
	X	X	SB 40 Permit		X
	X	X	Wildlife Certification		X
	X	X	CDPS Storm Water Permit		X
	X	X	CDPHE Discharge Permit		X
	X	X	Floodplain Development Permit (approved)		X
	X	X	No-Rise Certification (approved)		X
	X	X	No-Rise Recertification at As-Built (approved)		X
			<b>Environmental Work Tasks</b>		
X	X	X	Appropriate NEPA Document (CatEx, EA, EIS, FONSI or ROD)		X
	X	X	Figures and Exhibits from NEPA Document		X
	X	X	Air Quality Technical Report		X
	X	X	Geologic Technical Report	X	
	X	X	NEPA Water Quality Technical Report		X
	X	X	Wetland Finding Report		X
	X	X	Integrated Noxious Weed Management Plan		X
	X	X	Biological Resources Report		X
	X	X	Biological Assessment		X
	X	X	Historic Resource Technical Reports		X
	X	X	Section 4(f) Documents		X
	X	X	Paleontological Technical Report		X
	X	X	Environmental Justice Technical Report		X
	X	X	Transportation Technical Report		X
	X	X	Noise Technical Report		X
	X	X	Hazardous Materials Documentation (ISA/MESA)		X
			<b>PRELIMINARY DESIGN</b>		
		X	Electronic Survey Data		X
	X		Traffic Report and Recommendations		X
	X		Geology and Soils Investigation Report	X	
	X		Pavement Design Report		X
	X		Existing Bridge Condition Report		X
	X		Foundation Investigation Report		X
	X		Engineering Geology Plan Sheet(s)	X	
	X		Preliminary Hydraulic Design Report		X
	X		Preliminary Floodplain Report		X
	X	X	Preliminary Storm Water Management Plan		X
	X		Utility Relocation Recommendations		X
	X		Structural Selection Report		X
	X		Foundation Investigation Request		X

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	X		Final Materials Recommendations		X
	X		Final Pavement Selection Report		X
	X		Intersection Traffic Report		X
	X		Traffic Report		X
	X		Preliminary Cost Estimate		X
X	X	X	FIR Plan Set		X
	X		List of deviations from Standard Design Criteria		X
X	X	X	Corrected FIR Plan Set		X
	X		Final Floodplain Report		X
			<b>FINAL DESIGN</b>		
			ROW Authorization Plans		X
			Final Hydraulic Design Report		X
			Final Utility Plan Set		X
			Final Railroad Plan Set		X
			PUC Exhibit		X
			Bound Final Geotechnical Report _____ copies		X
			Correspondence with Agencies, Entities, and Public		X
			<b>Traffic Engineering</b>		
			Safety Assessment		X
			Signing/Pavement Marking Plans		X
			Signal Warrant Study		X
			Signalized Intersection Plans & Specifications		X
			Traffic Control Plan		X
			<b>Roadside Planning</b>		
			Landscape Plan & Specifications		X
			Certification of Plant Availability		X
			Irrigation Plans and Specifications		X
			Bike path Plans and Specifications		X
			Sound Barrier Plans and Specifications		X
			Truck Escape Ramp Plans and Specifications		X
			Rest Area Plans and Specifications		X
			Lighting Plans and Specifications		X
			Structure Final Review Plans & Specifications		X
			Construction Phasing Plan		X
			Storm Water Management Plan		X
			FOR Plans and Specifications		X
			FOR Cost Estimate		X
			Final Review Revisions		X
			<b>Construction Plan Package</b>		
			Final Plans (11x17), Specifications (duplex) and Estimate Package for Ad.		X
			Final Cross Sections		X
			Schedule of Quantities		X

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			Design Decisions			X
			Variances			X
			Original Surface Digital Terrain			X
			Final Surface Digital Terrain Model			X
			Design Digital Terrain Model			X
			Staking Data			X
			Earthwork Quantities			X
			Mass/Haul diagram			X
			Project Calculations (2 copies)			X
			Worksheets (2 copies)			X
			Design Notes			X
			Independent Design Review Reports			X
			Roadway Design Data Submittal			X
			Major Structure Design Final Submittal			X
			Bridge Construction Pack			X
			Record Plan Sets			X
			Final Hydraulic Design Report			X

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## APPENDIX A REFERENCES

### 1. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) PUBLICATIONS (using latest approved versions):

- A. A Policy on Design Standards-Interstate System
- B. A Policy on Geometric Design of Highways and Streets
- C. Guide for Design of Pavement Structure
- D. LRFD Bridge Design Specifications
- E. Guide for the Design of High Occupancy Vehicle and Public Transfer Facilities
- F. Guide for the Development of Bicycle Facilities
- G. Standard Specifications for Transportation Materials and Methods of Sampling and Testing - Part I, Specifications and Part II, Tests
- H. Highway Design and Operational Practices Related to Highway Safety
- I. Roadside Design Guide

### 2. COLORADO DEPARTMENT OF TRANSPORTATION PUBLICATIONS (using latest approved versions):

- A. Design Guide (all volumes)
- B. Bridge Design Manual
- C. Bridge Detailing Manual
- D. Bridge Rating Manual
- E. Project Development Manual
- F. Erosion Control and Stormwater Quality Guide
- G. Field Log of Structures
- H. Pavement ME Design Manual
- I. Cost Data Book
- J. Drainage Design Manual
- K. Geotechnical Design Manual
- L. NEPA Manual
- M. Environmental Stewardship Guide
- N. Quality Manual
- O. Survey Manual
- P. Field Materials Manual
- Q. Standard Plans, M & S Standards
- R. Standard Specifications for Road and Bridge Construction and Supplemental Specifications
- S. Item Description and Abbreviations (with code number) compiled by Engineering Estimates and Market Analysis Unit (“Item Book”)
- T. Right-of-Way Manual

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- U. The State Highway Access Code
- V. Utility Manual
- W. Utility Accommodation Code
- X. TMOSS Generic Format
- Y. Field TMOSS Topography Coding
- Z. Topography Modeling Survey System User Manual
- AA. Interactive Graphics System Symbol Table

### **3. CDOT PROCEDURAL DIRECTIVES** (using latest approved versions):

- A. No. 27.1 - Social Marketing - Use of Web 2.0 and Similar Applications
- B. No. 31.1 - Web Site Development
- C. No. 400.2 - Monitoring Consultant Contracts
- D. No. 501.2 - Cooperative Storm Drainage System
- E. No. 514.1 - Field Inspection Review (FIR)
- F. No. 516.1 - Final Office Review (FOR)
- G. No. 1217a - Survey Request
- H. No. 1304.1 - Right-of-Way Plan Revisions
- I. No. 1305.1 - Land Surveys
- J. No. 1601 - Interchange Approval Process
- K. No. 1700.1 - Certification Acceptance (CA) Procedures for Location and Design Approval
- L. No. 1700.3 - Plans, Specifications and Estimates (PS and E) and Authorization to Advertise for Bids under Certifications Acceptance (CA)
- M. No. 1700.5 - Local Entity/State Contracts and Local Entity/Consultant Contracts and Local Entity/R.R. Contracts under C.A
- N. No. 1700.6 - Railroad/Highway Contracts (Under Certification Acceptance)

### **4. FEDERAL PUBLICATIONS** (using latest approved versions):

- A. Manual on Uniform Traffic Control Devices
- B. Highway Capacity Manual
- C. Urban Transportation Operations Training - Design of Urban Streets, Student Workbook
- D. Reference Guide Outline - Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways
- E. Executive Order 12898
- F. Executive Order 11988 and 13690 FHWA Federal-Aid Policy Guide
- G. FHWA NHI Hydraulic Circular (HEC) and Hydraulic Design Series (HDS) Reports
- H. Technical Advisory T6640.8A
- I. U.S. Department of Transportation Order 5610.1E
- J. Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques
- K. ADAAG Americans With Disabilities Act Accessibility Guidelines

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- L. 23 CFR 771, the FHWA Technical Advisory T6640.8A
- M. 44 CFR 59-72, standards of the National Flood Insurance Program (NFIP)

### **5. OTHER PUBLICATIONS AND STANDARDS (using latest approved versions):**

- A. Urban Storm Drainage Criteria Manual (UDFCD)
- B. CI/ASCE Standard 38: Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data
- C. Any appropriate local agencies references as appropriate

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## APPENDIX B SPECIFIC DESIGN CRITERIA

**Note:** The following criteria will be developed by the Consultant and coordinated with the CDOT/PM prior to starting the design. The Consultant shall develop the CDOT Form 463 and insert a copy upon completion.

### 1. ROADWAY

#### A. Basic Design

The basis for design will be the data in CDOT Form 463, Design Data. A copy of the latest applicable design Data form will be furnished to the Consultant.

#### B. Geometric and Structure Standards

1. Design Speed, horizontal alignment, curvature, vertical alignment, sight distance and superelevation is specified in Form 463.
2. Use of Spirals
3. Passing Sight Distance
4. Decision Sight Distance
5. Frontage Roads, Separation Width
6. CDOT Access Code
7. Airway - Highway Clearances Design Guide
8. Bridges and Grade Separation Structures, Clearances to Structures and Obstructions, CDOT Design Guide
9. Curb and Gutters, Type

#### C. Geometric Cross Section as specified in Form 463

#### D. Intersections at Grade

1. Type
2. Special Considerations

#### E. Traffic Interchanges

1. Type
2. Ramp Type
3. Special Considerations

#### F. Design of Pavement Structure

1. Pavement Type and Percent Trucks are as specified in Form 463
2. Economic Analysis Period
3. Design Life

#### G. Miscellaneous Design Considerations

1. Fence Type
2. FEMA Flood Zone
3. Design Flood Frequency

#### H. Roadside Development

1. Landscaping

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2. Specifications for Revegetating Disturbed Areas to be provided by CDOT
  3. Noise Control
  4. Type
  5. Guardrail and End Treatments
- I. Lighting
1. Type

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### APPENDIX C DEFINITIONS

**Note: For other definitions and terms, refer to Section 101 of the CDOT Standard Specifications for Road and Bridge Construction and the CDOT Design Guide.**

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average two-way 24-hour Traffic in Number of Vehicles
AREA	American Railway Engineering Association
ATSSA	American Traffic Safety Services Association
AT&SF	Atchison, Topeka and Santa Fe Railway Company
ADAAG	Americans with Disabilities Accessibility Act Guidelines
BAMS	Bid Analysis and Management Systems
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BNRR	Burlington Northern Railroad
CAP	CDOT's Action Plan
CBC	Concrete Box Culvert
CDOT	Colorado Department of Transportation
CDOT/PM	Colorado Department of Transportation Project Manager - the CDOT Engineer responsible for the day-to-day direction and CDOT Consultant coordination of the design effort (as defined in Section 2 of this document)
CDOT/STR	Colorado Department of Transportation Structure Reviewer - the CDOT Engineer responsible for reviewing and coordinating major structural design
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
COG	Council of Governments
COGO	Coordinate Geometry Output
Consultant	Consultant for the project
Contract Administrator	Typically, a Region Engineer or Branch Head. The CDOT employee directly responsible for the satisfactory completion of the contract by the Consultant. The contract administration is usually delegated to a CDOT Project Manager (as defined in Section 2 of this document).
C/PM	Consultant Project Manager - The Consultant Engineer responsible for combining the various inputs in the process of completing the project plans and managing the Consultant design effort.
CWCB	Colorado Water Conservation Board
DEIS	Draft Environmental Impact Statement
DHV	Future Design Hourly Volume (two-way unless specified otherwise)
DRCOG	Denver Regional Council of Governments
D&RGW	Denver & Rio Grande Western Railroad

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EA	Environmental Assessment
EIS	Environmental Impact Statement
ESAL	Equivalent Single Axle Load
ESE	Economic, Social and Environmental
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHPG	Federal Aid Highway Policy Guide
FHWA	Federal Highway Administration
FIPI	Finding In Public Interest
FIR	Field Inspection Review
FONSI	Finding of No Significant Impact
FOR	Final Office Review
GPS	Global Positioning System
Major Structures	Bridges and culverts carrying vehicular traffic with a total length greater than 20 ft. measured along the centerline of the roadway between the inside face of abutments, inside faces of the outermost walls of culverts, or spring lines of arches. Major Structures also include culverts with multiple pipes where the clear distance between the centerlines of the exterior pipes, plus the radius of each of the exterior pipes, is greater than 20 ft.
MPO	Metropolitan Planning Organization (i.e. Denver Regional Council of Governments, Pikes Peak Area Council of Governments, Grand Junction MPO, Pueblo MPO, and North Front Range Council of Governments).
MS4	Municipal Separate Storm Sewer System
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGS	National Geodetic Survey
NICET	National Institute for Certification in Technology
NOAA	National Oceanic and Atmospheric Administration
Paper Sizes	See Computer-Aided Drafting Manual (CDOT); Table 6-13 and Table 8-1
PE	Professional Engineer registered in Colorado
PM	Program Manager
PLS	Professional Land Surveyor registered in Colorado
PRT	Project Review Team
PS&E	Plans, Specifications and Estimate
Project	The work defined by this scope
PWQ CM	Permanent Water Quality Control Measure
ROR	Region Office Review
ROW	Right-of-Way: A general term denoting land, property, or interest therein, usually in a strip acquired for or devoted to a highway

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ROWPR	Right-of-Way Plan Review
RTD	Regional Transportation Director
T/E	Threatened and/or Endangered Species
SFHA	Special Flood Hazard Area
SH	State Highway Numbers
TMOSS	Terrain Modeling Survey System
Topography	In the context of CDOT plans, topography normally refers to existing cultural or manmade details.
UDFCD	Urban Drainage and Flood Control District
USCOE	United States Army Corp of Engineers