

SCOPE OF WORK

CONTRACT TYPE: **NON-PROJECT SPECIFIC for REGION 3 & REGION 5**

CONTRACT DATE: SEPTEMBER 2017

PROJECT NUMBER: Non-Project Specific Right of Way/Survey

PROJECT LOCATION: Region 3 and Region 5 (and statewide with Region 3 and Region 5 approval)

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SECTION 1 PROJECT SPECIFIC INFORMATION

- 1.01 Project Goal** - This project intends to provide support to the Region 3 and Region 5 Right-of-Way/Survey Units for specific surveying and right-of-way activities.
- 1.02 Project Location** - Consultant activities will be in all areas of Region 3 and Region 5. This area will include counties: Jackson, Routt, Moffat, Rio Blanco, Grand, Summit, Eagle, Garfield, Mesa, Delta, Hinsdale, Pitkin, Lake, Montrose, San Miguel, Dolores, Montezuma, La Plata, Archuleta, San Juan, Mineral, Gunnison, Saguache, Rio Grande, Conejos, Costilla, Alamosa, Chaffee, and Fremont. The project may be applicable in other regions within the State of Colorado if necessary.
- 1.03 Work Duration** - This contract will be subject to supplements for specific work tasks for a period of five years.
- 1.04 Consultant Responsibility** - The Consultant is responsible for the following:
- Presurvey Conference
 - Progress Meetings
 - Secure Right of Entry
 - Traffic Control and Traffic Control Plan
 - Underground Utility Locates
 - Survey Data Research
 - Establish Ground Control
 - Property/Boundary Surveys as needed
 - Photogrammetry utilizing CDOT's Terrain Modeling Survey System (TMOSS)
 - TMOSS (Topographic) Survey
 - Map Compilation
 - Right-of-Way Research including: adjoiner's vesting deeds, title commitments, or memorandums of ownership
 - Right-of-Way Plan/Map Preparation
 - Right-of-Way Staking (Existing ROW, new ROW, TEs, and PEs delineated for Appraisal)
 - Right-of-Way Monumentation (CDOT Monument)
 - Properly Monumented Survey (As required per Colorado Revised Statutes)
 - Review By Registered Professional Surveyor
 - Construction Layout Staking
 - As-built TMOSS (Topographic) Survey
- 1.05 Work Product** - The Consultant work products are:
- Project Schedule
 - Man-Hour Proposal
 - Cost Proposal
 - Project Progress Meeting Minutes
 - Traffic Control Plan(s)

Monumented & Surveyed Ground Control
NGS Blue Book(s)
Project Control Diagram(s)
Land Survey Control Diagram(s) (legally filed)
Digital TMOSS Data
Digital Terrain Model(s)
Digital Contour File(s)
Digital Ortho-Photos
Digital Photos
All Documents Found In Research
Title Work (Memos of Ownership of Title Commitments)
Preliminary and Final Ownership Map(s)
Legal Description(s) (signed and sealed)
Monumented Right of Way
Final Right of Way Plans (signed and sealed)
Original Field Notes
Survey Report (Including monument recovery forms)
Quality Control Report(s)
Final Earthwork Quantities

The following sections describe the detailed work product requirements. In addition to the following sections, the Preconstruction Work Tasks also describes detailed work product requirements.

1.06 Work Product Completion - The CDOT Contract Administrator or his designee must accept all submittals.

1.07 Additional Project Information - Additional information regarding this project is included in the following documents:

CDOT Survey Manual (Current Ed.)
CDOT Right-of-Way Manual (Current Ed.)
CDOT Standard Specifications for Road and Bridge Construction (Current Ed.)
CDOT CADD Manual (Current Ed.)
CDOT M & S Standards (Current Ed.)
CDOT Procedural Directives
FHWA Manual on Uniform Traffic Control Devices for streets and roads (MUTCD)
CDOT TMOSS Coding Book (Current Ed.)
CDOT Task Order Manual (Current Ed.)

Copies of most of these documents are available for free download on the CDOT website, the other documents may be obtained from CDOT Reproduction, 4201 East Arkansas Avenue, Room 107, Denver, Colorado 80222. A moderate fee will be charged and based on the document size. There will be a \$3.00 additional charge for shipping and billing. Please provide a notice of two working days prior to obtaining the document(s) in person.

The most recent edition of any CDOT publication will apply to individual task orders issued under this contract and new editions will apply to new task orders issued after the release of a new manual or publication.

1.08 Scope of Work Organization - The Project Scopes of Work are divided into seven sections:

1. Project Specific Information
2. Project Management and Coordination
3. Project Description
4. General Information
5. Work Activity Assignments
6. Submittals
7. Contract Conclusion

The Department carefully reviewed this draft scope of work, which 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 these possible modifications, all consultants should be aware that input from the selected Consultant would be required in developing the Final Scope of Work for a project.

SECTION 2

PROJECT MANAGEMENT AND COORDINATION

2.01 CDOT Contacts - The Contract Administrators for this project is:

David Eller
Regional Transportation Director, Region 3

and

Michael D. McVaugh
Regional Transportation Director, Region 5

Mr. Eller and Mr. McVaugh will delegate active day-to-day administration of this contract to the following:

Leslie Doehling, PLS
Region 3 PLS II
Telephone (970) 683-6234
222 S. 6th St., Room 317
Grand Junction, CO 81501

and

Todd C. Johnston, PLS
Region 5 PLS II
Telephone (970) 385-1419
3803 North Main Avenue, Suite 300
Durango, CO 81301
FAX (970) 385-1419

SECTION 3 PROJECT DESCRIPTION

The consultant will provide support in the following work disciplines:

3.01 SURVEYING

- Perform survey data research and preliminary field reconnaissance
- Secure right of entry using CDOT form 730
- Perform Geodetic surveys using Federal Geodetic Control Subcommittee (FGCS) Standards & Techniques including Blue Booking
- Establish Horizontal Control Networks tied to Geodetic surveys (Conventional & GPS)
- Establish Vertical Control based on NAVD88 datum
- Locate BLM Public Land Survey System (PLSS) Corners
- Perform TMOSS survey in Inroads format (Total Station, GPS, etc.)
- Locate existing CDOT R.O.W. Markers within project limits
- Locate all private property pins required to resolve property ownerships and locations and their intersections with the existing CDOT Right-of-Way within project limits
- Set CDOT maintenance pit boundary corners
- Perform monumented survey for CDOT maintenance sites
- Prepare preliminary ownership map
- Prepare monument recovery forms and records (CDOT, NGS, USGS, & BLM)
- Stake ROW Parcels, TEs, and PEs for appraisers (using electronic data)
- Monument ROW Line (using electronic data)
- Comply with all applicable Colorado Revised Statutes
- Prepare survey report using currently acceptable software including MicroStation And Inroads with CDOT's Configuration
- Prepare quality control reports
- Set layout stakes using design data for construction. (Post-design/Pre-construction)
- Perform As-Constructed TMOSS survey and calculate final earthwork totals. (Post Const.)

3.02 RIGHT-OF-WAY PLANS PREPARATION

- Perform research, calculations and drafting to determine existing CDOT Right-of-Way within project limits
- Calculate the position of all required angle points (corner) within project limits on the project coordinate system.
- Resolve private property / boundary locations and the intersection of these boundary lines with the existing CDOT Right-of-Ways.
- Prepare Right-of-Way Plans and Legal Descriptions. See - Preconstruction Work Tasks for more detail.
- Provide MicroStation drawings and Adobe PDF files of Right-of-Way plans

3.03 PHOTOGRAMMETRY (TMOSS)

- Layout and tie aerial survey panel points to project control network
- Perform aerial Photogrammetry surveys
- Compile XYZ data using TMOSS methodology. Scanning is allowed if approved by the CDOT PM. CDOT does not permit the following: converting third party codes to CDOT TMOSS codes, gathering data using the grid method.
- Perform a through ground supplemental survey
 - Find & locate any ROW Markers and property corners
 - Define all features on the project - fences, signs, culverts, all underground features (utilities, etc.), etc.

3.04 ADMINISTRATIVE SUPPORT

- Performs clerical or word processing duties

3.05 TRAFFIC CONTROL

- Utilization of procedures outlined in the MUTCD manual is required, to ensure that properly trained personnel plan and sign accordingly.

3.06 QUALITY CONTROL

- Prepare a report that describes the procedures incorporated into the work to assure and control the quality. A sample outline of a quality control report is included as attachment C.

3.07 TITLE COMMITMENTS

- Provide title research and prepare memorandum of ownerships and/or title commitments for properties that may be acquired by CDOT
- Arrange for title policies for and on behalf of the Colorado Department of Transportation

SECTION 4 GENERAL INFORMATION

4.01 Contract Provisions - The contract between CDOT and the Consultant shall be a Cost Plus Fixed Fee contract. This basic non-project specific contract will set up the framework for project specific task orders. Funds for actual work will be committed by task order and not by the NPS contract. The task order shall be initiated by:

- a. Negotiating the number of hours by classification for each work element
- b. Identifying the other direct costs needed to accomplish the scope of work
- c. Applying the pre-approved rates as established in the basic contract
- d. Identifying the total cost of work and resources needed to complete the work.

Each task order shall include a Scope of Work specifically describing anticipated tasks. This Scope of Work shall be in specific detail providing a basis for the negotiation of the number of work hours.

In the event the consultant experiences unexpected cost/rate changes, annual rate changes, changes in the project team and/or costs or delays during the term of the task order that require that the performance time of the task order be extended, the consultant shall request an amendment to the task order. The consultant shall submit three copies of an amended task order request letter with original signatures to the project manager as outlined in the "Task Order Manual". This letter will specify the items to amend and the reasons for the amendment. Back up documentation supporting the request such as certified payroll reports detailing the salary or personnel change or documentation that substantiates any delays are required with the request. The CDOT Project Manager then requests an amended task order from the CDOT agreements and consultant management section. Approval of the amended task order is by the chief engineer or designee. All amendments to the task order require this formal process. CDOT will allow changes during the course of a task order only if the consultant has requested an amendment. There will be no compensation for work accomplished after the expiration date of the task order. CDOT cannot make payments of rates differing from or not included in the original task order without a formal amendment to the task order.

4.02 Authorization to Proceed - Work will not commence until the written notice-to-proceed is issued by the state with certification from the consultant that the work will be completed within the allotted time. Specification of the work completion date is required in the project specific task order. There will be no compensation for work accomplished outside the time limits of the task order.

4.03 Project Coordination - The routine working contact will be between the CDOT Project Manager (CDOT/PM) and the Consultant Project Manager (C/PM) as defined in this Scoping and Special Provisions section. Each Project Manager will provide the other with:

- a. Written synopses of their respective contacts (both by telephone and in person) with others
- b. Copies of pertinent written communications

The consultant is responsible for coordinating all sub-consultants and team members

4.04 Routine Reporting and Billing - The Consultant will provide the following on a routine basis:

- a. Coordination of all contract activities by the C/PM
- b. The periodic reports and billings required by CDOT Procedural Directive 400.2

- c. Minutes of all meetings - The minutes will be completed and provided to the CDOT/PM within five (5) working days after the meeting. When discussing a definable task in a meeting, the minutes will identify the "Action Item", the agency responsible for accomplishing it, and the proposed completion date.
- d. In general, CDOT must accept and approve all reports and submittals prior to utilization of their content in following work efforts.
- e. The consultant shall submit a progress report with each billing. The progress report shall include a statement addressing the project schedule and any delays encountered.
- f. The primary consultant shall be responsible for checking and verifying all sub-consultant and team member billings for compliance with the contract before submitting to CDOT for payment.
- g. The consultant must use the following personnel classifications for their firms personnel when submitting task order proposals and billings to CDOT:

- Professional Land Surveyor II
- Professional Land Surveyor I
- Engineering/Physical Science Technician I (Survey)
- Engineering/Physical Science Technician II (Survey)
- Engineering/Physical Science Technician III (Survey)
- Engineering/Physical Science Assistant I (Survey)
- Engineering/Physical Science Assistant II (Survey)
- Engineering/Physical Science Assistant II (Survey)

The consultant shall assign each employee a title from the preceding list in lieu of the terms Project Manager, Party Chief, Instrument Operator, Draftsman, Cad Operator, Office Tech, etc.

4.05 Personnel Qualifications - The CDOT Contract Administrator must approve the Consultant Project Manager (C/PM). A Licensed Professional Surveyors licensed by the Colorado State Board of Licensure for Architects, Professional Engineers and Professional Land Surveyors must supervise all tasks.

4.06 CDOT Computer/Software Information - The primary hardware used by CDOT is a PC-MS Windows system, and the types of software are:

- Earthwork - Inroads
- Drafting - MicroStation with CDOT configuration
- Survey - Inroads (CDOT TMOSS configuration), Trimble Business Center
- Geometry - Inroads COGO
- Other - Microsoft Office products: Word, Excel, Access, Outlook, Power Point, Project, Etc.

4.07 Computer Data Compatibility - CDOT presently utilizes the TMOSS (Topography Modeling Survey System) CDOT configuration for Inroads.

The data format used by the consultant to submit surveying and photogrammetric data shall be as determined by the CDOT/PM. The data format for submitting design computer files shall be compatible with the CDOT's configuration of Inroads. The data format shall be submitted in U.S. Survey Feet Units unless otherwise determined by the CDOT/PM.

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(s) is (are) resolved.

Refer to the Submittals in the Preconstruction Work Task section for additional information regarding Inroads, MicroStation, and TMOSS.

4.08 Project Standards.

General - Attachment A is a list of technical references applicable to CDOT work. The Consultant is responsible for ensuring compliance with the listed references. The CDOT/PM shall resolve conflicts in criteria.

Specific Criteria - Attachment 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 the pertinent criteria to the CDOT/PM at one of the periodic progress meetings prior to initiating work.

**SECTION 5
WORK ACTIVITY ASSIGNMENTS**

This list establishes the consultant's individual task responsibility. The consultant shall perform all work tasks indicated below by an 'X' mark in the consultant column. After coordination and consultation with CDOT, performance of these tasks must be in accordance with the forms and conditions of Project Scoping and Special Provisions section, Preconstruction Work Tasks section, and the standards described in Attachment A. The Consultant is also responsible for coordinating the required work schedule for those tasks accomplished by CDOT and other agencies.

PRECONSTRUCTION - See Preconstruction Work Task Descriptions.

	<u>CDOT/OTHER</u>	<u>CONSULTANT &/or SUBS</u>
A. <u>Project Initiation and Continuing Requirements</u>		
1. Initial Project Meeting	<u>X</u>	<u>X</u>
2. Project Schedule (Deliverables Deadlines)	<u>X</u>	<u>X</u>
3. Initiate Survey	<u> </u>	<u>X</u>
4. Right of Entry & Permits	<u> </u>	<u>X</u>
5. Traffic Control	<u> </u>	<u>X</u>
6. Initial Submittals	<u> </u>	<u>X</u>
7. Progress Meetings	<u> </u>	<u>X</u>
8. Safety	<u> </u>	<u>X</u>
9. Project Management	<u> </u>	<u>X</u>
B. <u>Project Development</u>		
1. Communication and Consensus Building		
- Contact List	<u> </u>	<u>X</u>
- General Meetings	<u> </u>	<u>X</u>
- Communication Aids	<u> </u>	<u>X</u>
2. Route Location Surveys		
a. General Procedures		
- Survey Scope	<u>X</u>	<u>X</u>
- Presurvey Conference	<u>X</u>	<u>X</u>
- Survey Data Research	<u> </u>	<u>X</u>
- Permission to Enter	<u> </u>	<u>X</u>
- Special use permits	<u> </u>	<u>X</u>
- Equipment Checks	<u> </u>	<u>X</u>
- Calibrations	<u> </u>	<u>X</u>
- Error reduction	<u> </u>	<u>X</u>
- Traffic Control	<u> </u>	<u>X</u>
- Under Ground Utility Locates	<u> </u>	<u>X</u>
- Progress Meetings	<u>X</u>	<u>X</u>
- Field Notes	<u> </u>	<u>X</u>
b. Establish Ground Control		
- Instrument Calibration	<u> </u>	<u>X</u>
- Primary Horizontal	<u> </u>	<u>X</u>
- Project Horizontal	<u> </u>	<u>X</u>
- Project Vertical	<u> </u>	<u>X</u>

-	Public Land Survey System Corners Survey	_____	<u>X</u>
-	Property / ROW Monument Corners	_____	<u>X</u>
c.	Global Positioning System (GPS) Surveys		
-	GPS Survey Specifications	_____	<u>X</u>
-	Error Reduction	_____	<u>X</u>
-	Equipment Checking and Calibration	_____	<u>X</u>
-	GPS Survey Methods	_____	<u>X</u>
-	Static and Fast Static Network Design	_____	<u>X</u>
-	GPS Planning Procedures	_____	<u>X</u>
-	GPS Vertical Procedures	_____	<u>X</u>
-	GPS Horizontal Procedures	_____	<u>X</u>
-	Project Control Diagram	_____	<u>X</u>
-	Continually Operating Reference Station	_____	<u>X</u>
-	On-Line Positioning	_____	<u>X</u>
d.	Aerial Surveys		
-	General	_____	<u>X</u>
-	Ground Control	_____	<u>X</u>
-	Photo Control Horizontal	_____	<u>X</u>
-	Photo Control Vertical	_____	<u>X</u>
-	Photo Control Survey Report	_____	<u>X</u>
-	TMOSS / Inroads	_____	<u>X</u>
-	Photo Index	_____	<u>X</u>
-	Photogrammetry Specifications	_____	<u>X</u>
-	Deliverables	_____	<u>X</u>
e.	TMOSS Survey (Field Survey)	_____	<u>X</u>
f.	Review (by Registered Professional Surveyor)		
-	Field notes	_____	<u>X</u>
-	Control diagram	_____	<u>X</u>
-	Survey Report	_____	<u>X</u>

C. Preliminary Design

1. Field Survey

-	Pre-survey Conference	_____	<u>X</u>
-	Survey Data Research	_____	<u>X</u>
-	Railroad Research and Permission to Enter RR	_____	<u>X</u>
-	Permission to Entry	_____	<u>X</u>
-	Establish Ground Control	_____	<u>X</u>
-	Public Land Survey System Survey	_____	<u>X</u>
-	Property / Right of Way Survey	_____	<u>X</u>
-	Tmoss Survey	_____	<u>X</u>
-	Drainage Survey	_____	<u>X</u>
-	Utility Survey	_____	<u>X</u>
-	Control Survey Diagram	_____	<u>X</u>
-	Ownership Map	_____	<u>X</u>
-	Review by Professional Land Surveyor	_____	<u>X</u>
-	Staking for Appraisal	_____	<u>X</u>
-	Monumentation	_____	<u>X</u>
-	Accuracy Tests	_____	<u>X</u>

2.	Photogrammetric Mapping		
	a. Aerial Photography	_____	<u> X </u>
	b. Data reduction		
	- Topography (Contours)	_____	<u> X </u>
	- Planimetrics (Topo)	_____	<u> X </u>
	c. Map Compilation		
	- Index Maps	_____	<u> X </u>
	- Finished Maps	_____	<u> X </u>
3.	Utility Coordination		
	- Location Maps	_____	<u> X </u>
	- Potholing	_____	<u> X </u>
	- Contact Locate Services	_____	<u> X </u>
	- Ditch Co. Contact Information	_____	<u> X </u>
	- Field Locate Utilities	_____	<u> X </u>
4.	Maintenance Sites / Materials Pits		
	a. Research		
	- Identify Affected Ownership	_____	<u> X </u>
	- Obtain Right of Entry	_____	<u> X </u>
	- Identify Control Corners for Property	_____	<u> X </u>
	- Obtain Title Commitments	_____	<u> X </u>
	b. Field Survey Maintenance Site		
	- Perform TMOSS Survey	_____	<u> X </u>
	- Perform Monumented Land Survey	_____	<u> X </u>
	c. Field Survey Materials Pit		
	- Perform TMOSS Survey	_____	<u> X </u>
	- Establish Pit Boundaries	_____	<u> X </u>
	d. Plats, Descriptions & Monumentation		
	- Deposit Plats	_____	<u> X </u>
	e. Miscellaneous TMOSS	_____	<u> X </u>
5.	Right of Way		
	a. Research		
	- Identify Affected Ownership	_____	<u> X </u>
	- Obtain assessors map	_____	<u> X </u>
	- Obtain "To be determined" Title Commitments or		
	- Vesting deeds	_____	<u> X </u>
	- Prepare Chain of Title	_____	<u> X </u>
	- Make Physical Inspection	_____	<u> X </u>
	- Check for Location of Existing Roads	_____	<u> X </u>
	- Obtain Plats, Street Vacations Info.	_____	<u> X </u>
	- Locate Improvements	_____	<u> X </u>
	b. Ownership Map		
	- Review Preliminary Design	_____	<u> X </u>
	- Review Project Control	_____	<u> X </u>
	- Compute Alignments	_____	<u> X </u>
	- Obtain/Review Ownership Documents	_____	<u> X </u>
	- Calculate Lost Corner Coordinates	_____	<u> X </u>
	- Establish Section Subdivisions	_____	<u> X </u>
	- Determine Existing Right of Way	_____	<u> X </u>
	- Resolve Ownerships	_____	<u> X </u>

- Secure Additional Ties/Topo	_____	<u>X</u>
- Reconcile Overlaps and Gaps	_____	<u>X</u>
- Plot Ownership Map	_____	<u>X</u>
- Label All Monuments	_____	<u>X</u>
- Show Improvements	_____	<u>X</u>
- Number Ownerships	_____	<u>X</u>
- Calculate Ownership Areas	_____	<u>X</u>
- Cross Hatch Land Uses	_____	<u>X</u>
- PLS Signature and Seal	_____	<u>X</u>
- Transmit Ownership Map	_____	<u>X</u>
- Ownership Map in Electronic Format	_____	<u>X</u>
6. Post Field Inspection Review Revisions	_____	<u>X</u>

D. ROW Plans / Authorization Plans

- Verify Toes of Slope	_____	<u>X</u>
- Plot Existing Ownerships	_____	<u>X</u>
- Plot New Right of Way Requirements	_____	<u>X</u>
- Calculate Areas	_____	<u>X</u>
- Prepare ROW Plans	_____	<u>X</u>
- Prepare Legal Descriptions	_____	<u>X</u>
- Prepare Tabulation of Properties	_____	<u>X</u>
- Plot New Right of Way	_____	<u>X</u>
- Prepare Title Sheet	_____	<u>X</u>
- Prepare Control Survey Diagram	_____	<u>X</u>
- Prepare Control and Monumentation Sheet	_____	<u>X</u>
- Prepare Tabulation of Road Approaches	_____	<u>X</u>
- Transmit Originals	_____	<u>X</u>

SERVICES AFTER DESIGN - See the Services After Design section for Task Descriptions.

A. Post Design

- Survey services for Plan Modifications	_____	<u>X</u>
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B. Pre-Construction Services

- Centerline Staking	_____	<u>X</u>
- Slope Staking	_____	<u>X</u>
- Stake Clearing Line	_____	<u>X</u>
- Stake Minor Structures	_____	<u>X</u>
- Stake Major Structure	_____	<u>X</u>
- Stake ROW Parcel and Easements	_____	<u>X</u>
- Re-staking As Requires	_____	<u>X</u>

C. Post Construction Services

- Final Earthwork	_____	<u>X</u>
- As-Built Plans	_____	<u>X</u>
- Final Right of Way Plan Revisions	_____	<u>X</u>
- Monument Right of Way	_____	<u>X</u>

- Set Property Corners _____ X
- Record Plan Set _____ X
- Sign Construction Plan Set Control Diagram _____ X

**SECTION 6
SUBMITTALS**

Project Scoping

	CDOT/OTHER	CONSULTANT
<u>Project Initiation and Continuing Requirements</u>		
- Work Products	_____	_____X
- Routine Reporting and Billing	_____	_____X

Preconstruction Work Tasks

A. Project Initiation and Continuing Requirements

- Meeting Minutes	_____	_____X
- Project Schedule	_____	_____X
- Survey Plan	_____	_____X
- Permission to Enter Forms	_____	_____X
- Traffic Control Plan	_____	_____X
- Initial Submittal of an Original Plan Sheet	_____	_____X
- Initial Submittal of TMOSS and/or		
- Inroads Compatible Data	_____	_____X
- Meeting Minutes	_____	_____X

B. Project Development

- Contact List		
2. Route Location Survey		
- Survey Scope	_____	_____X
- Per-survey Conference Form	_____	_____X
- Data Research Documents	_____	_____X
- Permission to Enter Forms	_____	_____X
- Equipment Check Notes	_____	_____X
- Calibration Certifications	_____	_____X
- Traffic Control Plan	_____	_____X
- Project Meeting Minutes	_____	_____X
- Survey Control Diagram	_____	_____X
- Survey Field Notes	_____	_____X
- Survey TMOSS Data	_____	_____X
- Monument Records	_____	_____X
- Control & Monumentation Plan Sheets	_____	_____X
- Survey Report	_____	_____X
- Aerial Photography Index Map Sheets	_____	_____X
- Aerial Photography Contact Prints	_____	_____X
- Aerial Photography Negatives	_____	_____X
- Photogrammetry		
Electronic Data	_____	_____X
Base Map Sheets	_____	_____X
Base Map Index Sheet(s)	_____	_____X
Rectified Photos with Mylar Originals	_____	_____X

C. Preliminary Design

1.	Field Surveys		
-	Pre-Survey Conference From	_____	<u> X </u>
-	Research Documents	_____	<u> X </u>
-	Survey Field Notes (Hardcopy and/or Electronic)	_____	<u> X </u>
2.	Photogrammetry		
-	Electronic Data	_____	<u> X </u>
-	Base Map Sheets	_____	<u> X </u>
-	Base Map Index Sheet(s)	_____	<u> X </u>
4.	Maintenance Sites/Materials Pits & Misc.		
-	Research Documents	_____	<u> X </u>
-	Survey Field Notes (Hardcopy and/or Electronic)	_____	<u> X </u>
-	Plats and Descriptions	_____	<u> X </u>
5.	Right of Way		
-	Memoranda of Ownership/Title Commitments	_____	<u> X </u>
-	Preliminary Ownership Map (for Field Inspection Review plan set)	_____	<u> X </u>
6.	Corrected FIR Plan Set	_____	<u> X </u>
D.	<u>ROW Plans/Authorization Plans</u>		
-	Area Calculations	_____	<u> X </u>
-	Authorization Plans	_____	<u> X </u>
-	Legal Descriptions	_____	<u> X </u>
<u>Submittals</u>			
A.	Reports	_____	<u> X </u>
B.	Data	_____	<u> X </u>
C.	Plans	_____	<u> X </u>
D.	Electronic Data Submittals	_____	<u> X </u>
E.	Title Commitments _____		<u> X </u>

Services After Design

A.	Post Design		
	- Modified Plans	_____	<u> X </u>
B.	Pre-construction		
	- Centerline Staking Book	_____	<u> X </u>
	- Slope Staking Books	_____	<u> X </u>
	- Structure Staking Book	_____	<u> X </u>
C.	Post Construction		
	- Right of Way Monument Book	_____	<u> X </u>
	- Record Plan Set (ROW)	_____	<u> X </u>
	- As-Constructed T-MOSS Survey	_____	<u> X </u>
	- Final Earthwork quantities Computation	_____	<u> X </u>

**SECTION 7
CONTRACT CONCLUSION**

7.01 Supplemental Work. This contract will be supplemented for specific tasks during a two year period.

7.02 Contract Completion. This Contract will be satisfied upon acceptance of the following items if applicable to supplement(s):

- Project Schedule
- Project Progress Meeting Minutes
- Traffic Control Plan(s)
- All Documents Found In Research
- All Permission to Enter Forms
- Monumented & Surveyed Ground Control
- Digital TMOSS Data
- Photography Products
- Legally Filed Survey Plans
- Preliminary Ownership Map
- Original Field Notes
- Sealed Control Survey Diagram(s)
- Survey Report (To include monument recovery forms and copies of Colorado Land Survey Monument Records).
- Legal Descriptions, Signed and Sealed
- NOAA - NGS Blue Book

and the completion of review of contract submittals.

PRECONSTRUCTION WORK TASK DESCRIPTIONS

The following includes work descriptions for all tasks normally accomplished during this phase of the work.

Identified in the Project Scoping and Special Provision section of this scope are the tasks that are the consultant's responsibility. The Consultant should review this entire section to identify applicable material. Contact the CDOT/PM if clarification is required. The Consultant should plan the following activities of communication and consensus building, project team reviews, conceptual design, data gathering, documentation, and formal public notice. These activities must be coordinated with the CDOT/PM to satisfy the requirements of the "Procedures for Public Involvement and Participation in the Project Development and Environmental Analysis Process." These activities will also overlap and follow parallel paths. The Consultant must develop a schedule incorporating these activities insuring activities are to finish the development phase in accordance with the shortest possible schedule.

The type and number of meetings, documents, etc. will depend on the category and characteristics of the project work. The Consultant that satisfies the requirements of the project will develop a project plan. The Contract Administrator must approve this plan before starting the work.

A. Project Initiation and Continuing Requirements

1. Initial Project Meeting - An initial meeting and an on-site inspection (when appropriate) is required to ensure that the Consultant is familiar with the existing conditions as well as the project requirements. The coordination of this meeting, which the CDOT/PM will conduct, is the Consultant's responsibility. The Consultant will send notices for this meeting to stakeholders identified by the CDOT/PM.
 - a. If this contract is for the production of Right of Way plans, the consultant or sub-consultant actually designing the Right of Way plans shall attend a "pre-survey" conference with the CDOT/PM.
 - b. The consultant and the CDOT/PM will hold a "Pre-Survey" conference prior to any survey work performed. The Survey Manual provides an agenda for the Pre-Survey Conference.
2. Project Schedule - Develop a Project Schedule and assign tasks. The Contractor shall prepare and submit a Gantt chart showing all work tasks, the duration of each task, the resources assigned to each task, and the relationship of each dependent task. It is the consultant's responsibility to communicate and document any delays or set backs in the schedule in the monthly status reports and submit a revised schedule Gantt chart which includes actual start and actual work complete entries.
3. Initiate survey - Arrange Preliminary Field Survey and/or Aerial Survey. A CDOT form 1217, survey scope may be used as a guide for completing the survey scope. An example of the 1217 is included in the survey manual.
4. Permission to Enter - Obtain necessary right of entry (Permission to Enter - Form 730) and permits.
 - a. 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. Included in this written permission will be the names and telephone numbers of persons to contact should notification prior to entry be necessary. These written permissions will apply to CDOT personnel as well as Consultant personnel. The use of CDOT Form 730 is required for this purpose. The Contractor must submit signed copies of the written permission forms to the

CDOT/PM prior to entering private property for survey work. Include County Tax Plat parcel number on Form 730 when submitting to CDOT so that these parcels can be located on County Tax Plat.

- b. Some activities such as materials testing on existing pavement and structures or proposed structure locations may require a special use permit or temporary easement from the landowner. Permits and temporary easements will be obtained by the consultant and copies submitted to the CDOT/PM.
5. Traffic Control - Consultant field activities that interfere with traffic operation within existing roadways will require control of existing traffic. The Consultant will plan and provide any required traffic control for the survey, testing, or design processes. Traffic control operations will be in accordance with the MUTCD. The Consultant will note that the proposed method for handling traffic be acknowledged in writing by the CDOT/PM. A certification of the Traffic Control Supervisor as a Worksite Traffic Supervisor by the American Traffic Safety Services Association (ATSSA) will also be required.
 6. Initial Submittals - Submit the following samples to the CDOT/PM for approval:
 - a. An original plan sheet complying with components defined in the Preconstruction Work Task Submittal section.
 - b. Photogrammetric and/or survey data and a drawing or photograph in accordance with the requirements specified in the Preconstruction Work Task Submittal section.

NO ORIGINAL PLAN SHEETS OR PHOTOGRAMMETRIC SURVEY WORK WILL BE COMPLETED UNTIL SATISFACTORY SAMPLES HAVE BEEN RECEIVED AND APPROVED BY THE CDOT/PM.

7. Progress Meetings
 - a. The CDOT and Consultant Project Managers will meet periodically as required (typically at two-week intervals). These Progress Meetings are to coordinate the work effort and resolve problems. The meetings will review the following:
 - (1) Activities completed since the last meeting.
 - (2) Problems encountered.
 - (3) Delayed and behind schedule activities.
 - (4) Activities required by the next progress meeting.
 - (5) Determining solutions to unresolved and anticipated problems.
 - (6) Information or items required from other agencies.
 - b. Described in the following sections are other required meetings.
8. Safety - Consultants working within the CDOT ROW are subject to all safety requirements of the department and OSHA. See chapter 7 of the CDOT Survey Manual for a list of the CDOT policy and procedural directives and other references to CDOT safety manuals and guides. The consultants engaged by this non-project specific contract shall assume the responsibilities listed in the survey manual for the region survey coordinator for all consultant employees and crewmembers.
9. Project Management - The Consultant will coordinate all the work tasks for the project by all parties to ensure project work completion is on schedule.

B. Project Development

1. Communication and Consensus Building – The Contractor shall establish and maintain a computerized list or database of all appropriate receptors for the communication process. The data shall be in Microsoft Excel compatible format.

The Contractor will compile contacts from the general list below including those supplemented by the Project Review Team and the attendees at public meetings.

The list will be used for notices regarding public meetings, mailing newsletters, or other communications as appropriate.

The information on the list shall include as a minimum:

- Name
- Firm (if any)
- Mailing address
- Phone number

- a. Contact List:

- Property owners adjoining the project
- Public Agencies
- Neighborhood Groups
- Property Owners/Tenants
- Business Interests
- Special Interests
- Railroads

The Contractor shall deliver the contact list to CDOT in MS Excel electronic format.

- b. General Meetings. The types and number of meetings shall be flexible and determined by an interactive process as approved by the CDOT/PM.
 - (1) Small Group Meetings (one-on-one) - Meet with property and business owners or others directly affected by the project work to identify likely impacts and discuss possible mitigation or resolutions. The consultant will provide meeting minutes to all participants.
 - (2) Project Review Meetings – The intention of these meetings is to disseminate project progress information to the public and representatives of local entities. This contract requires that notices are mailed at least 14 days in advance of these meetings to those on the contact list. The Consultant will provide the presentation aids, conduct the meeting, and provide complete minutes of the meetings to CDOT.
- c. Communication Aids
 - (1) Graphics Support. Provide the graphics for public presentations and environmental documents. This may include 35mm slides, overhead projector slides, maps and plan views of conceptual design, and other displays for visual presentations at meetings.

2. Route Location Surveys - Surveys will be conducted in accordance with the CDOT Survey Manual and the latest addendum thereof.
 - a. General Procedures (refer to the CDOT Survey Manual for a detailed description of work tasks and elements)
 - (1) Survey scope
 - (2) Pre-survey Conference (See Survey Manual)
 - (3) Survey Data Research
 - (4) Permission to Entry none CDOT property
 - (5) Special use permits
 - (6) Equipment checks
 - (7) Calibrations
 - (8) Error reduction
 - (9) Traffic control - according to the Manual of Uniform Traffic Control Devices (MUTCD)
 - (10) Underground utility locates
 - (11) Progress Meeting
 - (12) Field notes
 - b. Establish Ground Control (refer to the CDOT Survey Manual for a detailed description of work tasks and elements)
 - (1) Instrument Calibration Reports
 - (2) Primary Horizontal
 - (3) Project Horizontal
 - (4) Project Vertical
 - (5) Public Land Survey System (PLSS) Monument Survey
 - (6) Property / Right of Way Monument Survey
 - c. Global Positioning System (GPS) Surveys
 - (1) GPS survey specifications. This includes GPS reports and a submittal for the CDOT GPS control monument database and specifications for blue book data for submittal to the NSRS. The appropriate GPS report is required for each survey performed.
 - (2) Error reduction - Procedures are required to reduce errors.
 - (3) GPS Equipment checking and calibrations - CDOT approved method.
 - (4) GPS survey methods - survey scope will specify the survey requirements.
 - (5) Static and fast static network design is the consultant's responsibility.
 - (6) Adhere to GPS planning procedures.
 - (7) GPS vertical procedures - GPS derived orthometric heights are used to check and trouble

- shoot differential leveling on CDOT control monuments. The consultant shall not establishing elevations by GPS vertical procedures.
- (8) GPS horizontal procedures shall follow the survey type requested.
 - (9) Project control diagram and land survey control diagram shall be prepared for the survey performed.
 - (10) Continually Operating Reference Stations (CORS). The consultant must supply the eight items listed in the CDOT Survey Manual Chapter 3 to the survey coordinator for prior approval for the use of CORS stations. The consultant must also provide the final constrained adjustment.
 - (11) Use on-line positioning user service (OPUS) to check prior processing.
- d. Aerial Surveys (refer to the CDOT Survey Manual for a detailed description of work tasks and elements)
 - (1) General
 - (2) Ground control
 - (3) Photo control horizontal
 - (4) Photo control vertical
 - (5) Photo control survey report
 - (6) TMOSS / Inroads
 - (7) Tolerance verification
 - (8) Photogrammetry specifications
 - (9) Deliverables
 - e. Perform and Check TMOSS Survey (Field topographic Survey)
 - f. Review by Registered Professional Surveyor
 - (1) Field Notes
 - (2) Control Survey Diagram
 - (3) Survey Report

C. Preliminary Design

This work shall be in accordance with the CDOT Survey Manual and applicable state statutes.

- 1. Field Surveys (refer to the CDOT Survey Manual for a detailed description of work tasks and elements)
 - a. Pre-survey Conference
 - b. Survey Data Research
 - c. Railroad research and permission to enter the railroad
 - d. Permission to Enter none CDOT property

- e. Establish Ground Control
 - f. Public Land Survey System (PLSS) Monument Survey
 - g. Property / Right of Way Monument Survey
 - h. TMOSS Survey
 - i. Drainage Survey
 - j. Utility survey to include all underground utilities from surface markings
 - k. Control Survey Diagram
 - l. Ownership Map (See 5b under Right of Way)
 - m. Review by Professional Surveyor
 - n. Staking for appraisal
 - o. Monumentation
 - p. Accuracy Tests
2. Photogrammetric Mapping
- a. Aerial Photography
 - b. Data Reduction
 - (1) Topography (Contours)
 - (2) Planimetrics (Topo)
 - c. Map Compilation
 - (1) Index Maps
 - (2) Finished Maps
3. Utility Coordination
- a. Coordinate with Region and procure utility locating services.
 - b. Include any location maps obtained from utility companies/locators in the survey report.
 - c. The Consultant is responsible for the excavation and surveying utility locations, including “potholing” if designated.
 - d. Contact Utilities and Utility Notification Center of Colorado to field mark utilities for TMOSS Surveying.
 - e. The Consultant shall compile and deliver ditch company contact information to CDOT. The Consultant must also perform research into the title, rights and interest of the ditch companies and provide this information to CDOT.
4. Maintenance Sites/Materials Pits & Miscellaneous topography
- Supervision of a PLS registered in the State of Colorado is required for the following tasks. All work shall conform to the requirements of article 50 and 51, title 38, C.R.S.
- a. Research
 - (1) Identify affected ownership

- (2) Obtain Right of Entry
 - (3) Identify control corners for property
 - (4) Obtain title commitments for surface and/or mineral ownerships and encumbrances directed by the CDOT/PM.
 - b. Field Survey Maintenance Site
 - (1) Perform a TMOSS survey of the site
 - (2) Perform a monumented land survey to establish the boundaries of a maintenance site.
 - c. Field Survey Materials Pit
 - (1) Perform TMOSS survey of the site
 - (2) Establish pit boundaries as directed by CDOT/PM.
 - d. Plats, descriptions & monumentation
 - (1) Deposit plats for maintenance sites and materials pits with the respective county. Provide copies of plats and descriptions to CDOT.
 - e. Miscellaneous TMOSS as directed by the CDOT/PM
- 5. Right of Way - The following work shall be by or under the responsible charge of a Professional Land Surveyor registered in Colorado. The following work may be included as part of a Surveying Task Order. The following work may also be included as part of Right of Way Plans preparation Task Order.
 - a. Research - See Right of Way Manual
 - (1) Identify affected ownership from preliminary design plans or site map.
 - (2) Obtain assessors map, through the project limits.
 - (3) Obtain documents that transfer title to properties through the project.
 - (4) Coordinate with Region and procure title services.
 - (5) Prepare 60 year- chain of title and encumbrance report by obtaining title insurance or memorandums of ownership (Consultant must attach copies of all referenced documents as directed by the CDOT/PM). Do not list released encumbrances.
 - (6) Make physical inspection of property. Note any physical evidence of easements, wells, ditches, ingress and egress improvements
 - (7) Check with County Road Department or County Engineer for location of existing roads.
 - (8) Obtain the latest subdivision plats and vacations of streets information.
 - (9) Locate ditches, irrigation systems, fences, wells, leach fields, pumps, septic tanks, signs, road approaches, landscaping, culverts, cattle crossings, over/under passes, gates, and buildings.
 - b. Ownership Map - See Right of Way Manual

For additional detail on required drafting software, COGO, and project coordinate system, see SECTION 2 - SUBMITTALS.

Ownership map shall be submitted along with a "Project Narrative" see SUBMITTALS - B.3.a.

- (1) Review preliminary design centerline, toes of slope and field survey.
- (2) Review Basis of Bearing and Project Coordinate system from the Control Survey prior to calculations.
- (3) Compute alignment of ROW and store coordinates of all found legal monuments within the first tier of properties within the project limits.
- (4) Obtain and review Memorandums of Ownership and/or title commitments and supporting plats and maps.
- (5) Calculate coordinates of lost or obliterated section corners using guidelines established by the Bureau of Land Management. (To be used by field surveyor in resetting the monuments.)
- (6) Establish subdivisions of sections using Bureau of Land Management Guidelines. Show all Section Lines and Aliquot Parts on the ownership map and ROW plan sheets.
- (7) Determine existing right of way limits from deeds of record, CDOT plans and found ROW markers. CDOT will provide previous right of way plans, if available.
- (8) Resolve ownerships and their property/boundary locations. Determine the intersection of these property boundary lines with the existing CDOT Right of Way. Resolve location and ownership of existing easements of record. Show as measured dimensions and record dimensions where they differ.
- (9) Secure additional property owner ties and additional topography where the highway improvement may affect improvements adjacent to the right of way. This additional topography should include:
 - (a) Underground cables and conduits
 - (b) Wells
 - (c) Irrigation ditches and systems
 - (d) Septic tanks, cesspools, and leaching fields.
 - (e) Fences
 - (f) Pumps
 - (g) Signs
 - (h) Road approaches
 - (i) Landscaping
 - (j) Culverts
 - (k) Cattle crossings
 - (l) Over/underpasses
 - (m) Gates
 - (n) Buildings
- (10) Reconcile overlaps and gaps in ownerships as required by CDOT, documenting method used (may require additional fieldwork). Include reasons and supporting evidence in the project narrative.
- (11) Plot OWNERSHIP MAP on 11 inch x 17-inch paper sheets or as directed by CDOT/PM in a Bentley's MicroStation V8i Edition or newer drawing and produced by methods

described in the CDOT CADD Manual workflow. The normal scale is 1" = 400' in rural areas and 1" = 200' in urban areas. If entire ownership will not fit on the sheet at this scale, an additional abbreviated OWNERSHIP MAP may be at a scale of 1" = 1 mile, or other suitable scale, to show the configuration of large ownerships. Metric equivalents may be required.

- (12) Label all monuments found with description of monument and project coordinates.
- (13) Show improvements and topography within the ownerships as well as existing access to the street system.
- (14) Number ownerships alternately as they occur along the Centerline from south to north or west to east in the same direction as the stationing. Show current names of owners and lessees as directed in Chapter 2 of CDOT ROW Manual.
- (15) Calculate the total area of all ownerships affected. Deduct areas for existing road right of ways. Establishing bearings and distances on all ownership lines, and coordinates on all property corners.
- (16) Show areas of complex ownership's graphically by cross hatching different land uses.
- (17) In the lower right corner of the PRELIMINARY OWNERSHIP MAP, show seal, number, and name of Professional Land Surveyor responsible for the work.
- (18) Transmit finished reproducible OWNERSHIP MAP and Memorandums of Ownership or Title Commitments to CDOT along with all calculations, field notes and Bentley's MicroStation V8i Edition drawings, which must conform to the Printable Standards Manual located in the CDOT CADD Manual. The OWNERSHIP MAP will include a control and monument sheet. Note that only the project control data needs to be completed at this time.
- (19) The ownership Map in electronic format shall be delivered and be suitable as the base map or master drawing from which all right of way plans and exhibits are developed in the next phase of the project.

NOTE: The ROW Ownership Map shall be available for review at the time of the FIR.

6. Post-FIR Revisions - When specified by Project Scoping and Special Provisions, the Consultant shall complete the revisions required by the FIR before this phase of work is considered to be complete

D. ROW Plans/Authorization Plans

1. Verify toes of slope on base map from data provided by the roadway designer.
2. Plot existing ownership lines from preliminary ownership map.
3. Plot new right of way requirements and access control from post FIR design plans on base map. The normal scale is 1" = 50' in urban areas and 1" = 100' in rural areas.
4. Calculate areas of parcels, easements, and remainders in accordance with CDOT Right of Way Manual.
5. Prepare ROW plan sheets as outlined in CDOT Right of Way Manual. Note that distances on parcels shall be given in feet or as directed by CDOT P.M.

6. Prepare legal descriptions of parcels, easements, and access control as described in the CDOT Right of Way Manual and directed by CDOT PM/ROW Manager.
7. Prepare Tabulation of Properties sheet as described by CDOT Right of Way Manual.
8. Plot new Right of Way, Access Control, new easements, and lane lines on the preliminary ownership map. Revise numbering of ownerships to correspond to ROW acquisitions.
9. Prepare Right of Way Title Sheet as described by CDOT Right of Way Manual.
10. Prepare Control Survey diagram for inclusion in plans. See Survey Manual for a sample.
11. Prepare Control and Monumentation Sheet (Survey Manual) including a complete list of Right of Way points to be set (i.e. ROW Angle Points), Permanent and Slope Easement points, Section Corner, Control Monuments, found property corners and found ROW markers per CDOT Right of Way Manual.
12. Prepare Right of Way Tabulation of Road Approaches, if applicable, show Owner, Milepost/Station, Rt. or Lt. of Centerline, Width of Approach, Skew Angle, and any Remarks as directed by the CDOT Right of Way Manual.
13. Transmit originals of the plan sheets, title sheet, tabulation of properties sheet, tabulation of road approaches and revised ownership map to CDOT. Transmit current updated title work (Memoranda of Ownership and/or Title Commitments per CDOT PM/ROW manager), calculations and supporting data (i.e. parcel diaries). Original sheets shall comply with those defined in the Preconstruction Work Task Submittals section. The project narrative is included in this submittal.

SUBMITTALS

A. Reports

1. Project Control Diagram
2. Survey Plats. The Professional Land Surveyor Consultant who sets a monument shall prepare and file a plat in accordance with Section 1, 38-51-107 Colorado Revised Statutes, as amended. The Consultant shall submit a copy of the plat and filing information to the CDOT/PM.
3. Preliminary Survey Report
4. Right of Way Plans. Submit a progress report detailing the percentage of completion. Attach the "Project Narrative" (see below) along with the progress report. Submit a progress report and narrative, as well as any other attachments, no less than bi-weekly.

B. Data

1. Project Development
 - b. Submit the following field survey data, if produced during the work. Three copies of the Survey Report as described in the CDOT Survey Manual. (Sealed and signed by PLS.) The following will be included in the report or as attachments:
 - (1) Handwritten field notes. These shall include sealed and signed original notes by the supervising Professional Land Surveyor registered with the Colorado State Board for Professional Engineers and Land Surveyors. The Consultant may submit legible sealed and signed copies of the original field notes in lieu of the original field notes only if approved by the CDOT/PM.
 - (2) Electronic field data - Prior to collecting data by electronic means the Consultant shall submit a sample and receive approval to continue the work. Submit a sealed and signed hard copy with all electronic data. Electronic data shall comply with the requirements outlined below.
 - (3) One three-ring binder that contains GPS Bluebook information and one bound copy for submission to NGS.
 - (4) Opus Project data sheets/reports.
 - (5) Photogrammetric Data - Prior to generating mapping data the Consultant shall submit a sample of data and receive approval to continue the work. Submit a sealed and signed hard copy (map sheets when appropriate) with all electronic data.
 - (6) Photographs showing details of caps and locations of tied section and property corners.
2. Right of Way Geometry and Survey
 - a. Submit InRoads V8i or newer alignment and .FWD files. This is the basis of the ROW plan development and shall be "built" in a logical sequential order paralleling the plan development. Use methods described in Chapter 9 CDOT Survey Manual in assigning point numbers used in the geometry alignment files.
3. Right of Way Plans
 - a. Submit a project narrative of the plan development. Items to be included in these narratives are:

- (1) Procedures, monuments/points used as basis for establishing existing alignment and Right of Way limits.
- (2) Procedures, property pins/points used to resolve ownership and property/boundary locations.
- (3) Procedures, property pins/points used to resolve or identify any Gaps or Overlaps discovered.
- (4) Date, details and reasoning for any requests for additional survey data or ties.
- (5) Two copies of each applicable subdivision plat.
- (6) Submit three copies of memorandums of ownership/title commitments with supporting record documents.

4. Parcel Descriptions/Access Descriptions

CDOT/PM approved format for Exhibit A & B in Microsoft Word Format.

C. Plans

1. Project Control Diagram. Submit a Project Control Diagram for each task order that included a project control survey and /or a Land Survey Control diagram if the project makes ties to property corners or public land survey monuments. See CDOT survey manual for requirements for the diagrams. Submit the control survey diagram before the FIR for the first project in the corridor.
2. Right of Way Authorization Plans. Submit a progress report detailing the percentage of completion. Attach the Project Narrative (see above) along with the progress report. Submit at least monthly a progress report and narrative, as well as any other attachments.
3. Plan and map sheets shall comply with the following requirements:
 - a. The original plan sheets shall be 11" X 17".
 - b. Ten color copies and three black and white copies of each plan sheet shall be part of the final submittal package.
 - c. Right of Way plans, Title Sheet, and Tabulation Sheets shall be provided as pre-setup Right of Way MicroStation drawings. All plan sheets shall utilize this drawing format and have an assigned project datum Microstation Geographics Coordinate System. (See Electronic Data Submittals).
 - d. The Consultant shall submit an example of an original plan sheet and receive approval from the CDOT/PM prior to drafting the plans.
 - e. Plot one set of 24" x 36" mylars for filing in the county records. This set is to be signed and sealed by the PLS in responsible charge of the work.
4. Legal Descriptions - Submitted signed and sealed by the PLS in responsible charge of the work as called for in the Right of Way Manual Chapter 2.
5. When designated in the Project Scoping and Special Provisions the Consultant shall submit rectified photography (at the designated approximate scale) with Mylar original plan sheets.

D. Electronic Data Submittals

1. Submit all materials to the CDOT Project Manager. Acceptance of submitted material is the sole responsibility of the CDOT Project Manager.
2. Photogrammetric Data - Prior to generating mapping data the Consultant shall submit a sample of data and receive approval to continue the work. Also, submit a sealed and signed hard copy (map sheets when appropriate) with all electronic data.
3. TMOSS data - Submittal of TMOSS data shall be on a CD-Rom or compact drive and files must be inserted in the appropriate file locations in CDOT's ProjectWise software system. The final TMOSS data shall include the raw data collector files, the Inroads fieldbook and an Inroads digitized terrain model with no errors. The data shall produce an accurate contour model of the actual ground with no elevation or rod height busts. The codes and notes shall be sufficient to allow a design engineer to identify every feature surveyed accurately without returning to the field. Attach notes to all items per the CDOT Survey and TMOSS manuals. Road approach and culvert reports are part of this submittal. Name the TMOSS data files to follow the naming conventions called for in the TMOSS manual.
4. Right of Way Plans. Plans shall be submitted as *.dgn electronic drawings prepared using Bentley's MicroStation V8i Edition or newer in a format complying with the CDOT CADD Manual. The Consultant will supply seed files.
5. Control Diagrams. Diagrams shall be submitted as *.dgn electronic drawings prepared using Bentley's MicroStation V8i Edition or newer in a format complying with the CDOT CADD Manual. Also, supply seed files.
6. Final Electronic Drawing submittals shall have attachments displayed. Assemble the final submittal as described above. All attachment files must also be included as separate files. All levels in the drawings shall be consistent with CDOT CADD Manual standards where applicable.
7. Create in "World Coordinates" (same as project coordinates used in the survey) Right of Way Plan drawings.
8. Adobe Acrobat .PDF files of all drawings shall also be provided.
9. Submit parcel descriptions in Microsoft Word format.
10. All other electronic files (spreadsheets, databases, etc.) created during the tasks shall be submitted.
11. Submit all electronic files on a CD ROM disk or compact drive and files must be inserted in the appropriate file locations in CDOT's ProjectWise software system.. Prior to creation of magnetic media to comply with the current submittal requirements or to discuss any questions concerning the ability to satisfy the current submittal requirements contact the CDOT Project Manager.
 - a. CDOT Computer/Software Information - The primary hardware used by CDOT is a PC MS Windows system, and the types of software are:
 - (1) Drafting - Bentley's MicroStation V8i Edition
 - (2) Survey - InRoads TMOSS CDOT coding system - InRoads V8.05 Service Pack 5 or newer
 - (3) Geometry - InRoads V8.05 Service Pack 5 or newer
 - (4) Bentley's ProjectWise Explorer V8i SS4 or newer
 - b. Computer Data Compatibility.
 - (1) Survey information - For all terrain and topographic surveys the distances between shots

on any given string and between any two strings will not exceed 50 feet. The TMOSS survey raw data will be submitted in a .SDR (Sokkia SDR 33 format) file, .DC (Trimble Data Collector) file and a .fwd (Inroads Field Book) file that includes all data collector files and produces no crossing segments or mismatched elevations when written to surface. Submit files on a CD ROM or compact drive.

- (2) The original and design contoured Digital Terrain Models shall be provided in an acceptable electronic format (Inroads V8.05 Service Pack 5 or newer at approved scale and contour intervals).

c. Magnetic media submittals shall be on CD ROM.

12. Required documentation.

- a. CDOT requires that each unit of the magnetic media submitted be identified with adhesive labels affixed to the media containing the following MINIMUM information as applicable, depending on the media, format, etc. used to create the magnetic media being submitted:
 - (1) Computer make, model and operating system
 - (2) Recording method, format and density
 - (3) Blocking factor and record lengths
 - (4) CDOT Project Number and CDOT project Manager name
 - (5) Files name(s) and type(s) {ex. 15106all.fwd, 15106all.alg, 15106all.dtm, 15106all.dgn}
 - (6) Date created
 - (7) Contact Person and Telephone number

SERVICES AFTER DESIGN

A. Post Design Plan Modifications

When requested by the CDOT/PM, the Consultant shall provide survey services as needed for plan modifications required by unforeseen field conditions.

B. Pre-Construction Services

When requested by the CDOT/PM, the Consultant shall provide the following surveying services in a timely manner prior to the project ad date:

1. Stake the project centerline alignment.
2. Slope stake.
3. Stake clearing line.
4. Stake minor structures (pipes).
5. Stake major structures (CBC's & bridges).
6. Stake ROW parcels and easements required for appraisal & acquisition tasks.
7. Re-stake above items as required due to revisions.

C. Post Construction Services

1. Final Earthwork Determination - Compute the final as-built earthwork quantities. This will include the required surveying, and computer support.
2. "As-Built" Plans - Modify the original plans so that the plans will agree with actual construction results, or provide TMOSS survey of actual construction.
3. Revisions to the Final Right of Way Plans - This will normally occur following construction and after ROW acquisitions are resolved.
 - (a) Review changes in design affecting the Right of Way Limits including updated information on alignment, slope requirements, structures, easements and access. Make necessary revisions to the plans and ownership map.
 - (b) Review changes brought about by the appraisers and negotiators. Make necessary revisions to the plans, descriptions and ownership map.
 - (c) Review changes brought about by updated Memoranda of ownership and/or Title Commitments. Make necessary revisions to the Plans, descriptions, Tabulation of Properties Sheet, and the Ownership Map.
 - (d) Revise Calculations and Legal Descriptions if necessitated by revisions.
 - (e) Submit 11 x 17 inch paper revised ROW sheets and electronic files for Title Sheet, Plan Sheets, Monumentation Sheet, Control Survey Plot, Tabulation of Properties, Tabulation of Road Approaches, and Ownership Map) to CDOT. Submit Final Calculations, Legal Descriptions, current Memoranda of Ownership and or Title Commitments, and Supporting Data (i.e. parcel diaries) to CDOT.
4. Monument the Right of Way lines according to State Statutes and the CDOT Survey Manual.
 - (a) Reset all monuments referenced prior to construction that are.
 - (b) Reset any control monuments disturbed or destroyed by construction that are necessary to set right of way monuments.
 - (c) Set all new right of way monuments (or reference monuments to them) as shown on final plans.
5. Set property corners on all remainder parcels. Required monumentation will be as directed by the CDOT PM.
6. A Record Plan Set on 24 inch by 36 inch mylar, updated for revisions and showing all monuments set subsequent to construction, must be signed and sealed by the Professional Land Surveyor responsible for the work. Deposit the Record Plan Set in the appropriate county office in accordance with CRS 38-50-101 and CRS 38-51-107. Deliver a copy of the deposited plan set to the CDOT PM on size and media specified by the CDOT/PM.

7. Reviewing, signing and sealing the record set of construction plans. Include signed and sealed control diagrams by the P.L.S. in responsible charge of the work in the construction set of plans. The consultant will review, sign and seal the project control diagram.

ATTACHMENTS

- A. References
- B. Definitions
- C. Quality Control Report

ATTACHMENT A
REFERENCES

- A. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) PUBLICATIONS (Using Latest Approved Versions):
1. "A Policy on Design Standards-Interstate System"
 2. "A Policy on Geometric Design of Highways and Streets"
 3. "Guide for Design of Pavement Structures"
 4. Standard Specifications for Highway Bridges"
 5. "Guide for the Design of High Occupancy Vehicle and Public Transfer Facilities"
 6. "Guide for Development on New Bicycle Facilities"
 7. "Standard Specifications for Transportation Materials and Methods of Sampling and Testing - Part I, Specifications and Part II, Tests"
 8. "Highway Design and Operational Practices Related to Highway Safety"
 9. "Guide for Selecting, Locating, and Designing Traffic Barriers"
- B. COLORADO DEPT. OF TRANSPORTATION PUBLICATIONS (Using Latest Approved Versions):
1. CDOT Action Plan
 2. CADD Manual
 3. CDOT Bridge Design Manual
 4. CDOT Bridge Detailing Manual
 5. Field Log of Structures
 6. Bridge Rating Manual
 7. Survey Manual
 8. Materials Manual
 9. Drafting Manual
 10. Erosion Control Manual
 11. Standard Plans, M & S Standards (also avail. on the Internet)
 12. Standard Specifications for Road and Bridge Construction
 13. Item Description and Abbreviations (with code numbers)" compiled by Cost Estimate

ATTACHMENT A
REFERENCES

Squad, CDOT (also available on the Internet)

14. Right-of-Way Manual, Chapter 2, Plans and Descriptions Procedures and General Information"
15. The State Highway Access Code, 2 CCR 601-1 Adopted August 31, 1998
16. Utility Manual
17. CDOT Supplemental Provisions to the Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways - 1968 (See No. 4 under Federal Publications)
18. Field INROADS TMOSS Topography Coding
19. Terrain Modeling Survey System User Manual

C. CDOT PROCEDURAL DIRECTIVES (Using Latest Approved Versions):

- | | |
|------------|--|
| No. 400.2 | Monitoring Consultant Contracts |
| No. 501.2 | Cooperative Storm Drainage System |
| No. 514.1 | Field Inspection Review (FIR) |
| No. 516.1 | Final Office Review (FOR) |
| No. 1304.1 | Right-of-Way Plan Revisions |
| No. 1305.1 | Land Surveys |
| No. 1601 | Interchange Approval Process |
| No. 1700.3 | Plans, Specifications and Estimates (P.S. & E) and Authorization to Advertise for Bids under Certification Acceptance (CA) |
| No. 1700.7 | Plans and Specifications for Structure Plans under CA No. |
| No. 1700.8 | Plans and Specifications for Traffic Engineering Plans under Certifications Acceptance.No. |
| 1905.1 | Preparation of Plans and Specifications for Structures prepared by Staff Bridge Branch |

D. FEDERAL PUBLICATIONS (Using Latest Approved Versions):

1. "Manual on Uniform Traffic Control Devices"
2. "Highway Capacity Manual"
3. "Urban Transportation Operations Training - Design of Urban Streets, Student Workbook"
4. "Reference Guide Outline - Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways"
5. FHWA Federal-Aid Program Manual (FHPM)
6. Technical Advisory T6640.8A
7. U.S. Department of Transportation Order 5610.1E

ATTACHMENT A
REFERENCES

8. "Geometric Geodetic Accuracy Standards and Specifications for Using G.P.S. Relative Positioning Techniques," Federal Geodetic Control Committee, Version 5.0.

E. AREA:

1. Manual for Railway Engineering

F. AMERICAN SOCIETY OF PHOTOGRAMMETRY (Using Latest Approved Versions):

1. Manual of Photogrammetry

ATTACHMENT B
DEFINITIONS

ATTACHMENT B

DEFINITIONS

AASHTO - American Association of State Highway & Transportation Officials

ADT - Average Two-way Daily Traffic in Number of Vehicles

AREA - American Railway Engineering Association

AT&SF - Atchison, Topeka & Santa Fe Railway Company

BLM - Bureau of Land Management

BAMS - Bid Analysis and Management System

BNRR - Burlington Northern Railroad

CA - Contract Administrator. The CDOT Manager responsible for the satisfactory completion of the contract by the consultant

CBC - Concrete Box Culvert

CDOT - Colorado Department of Transportation

CDOT/PE - Colorado Department of Transportation Project Manager. The CDOT Engineer responsible for the day to day direction and CDOT-Consultant coordination of the design effort.

CDOT/STR - Colorado Department of Transportation Structure Reviewer - The CDOT Engineer responsible for reviewing and coordinating major structural design. This individual may be the CDOT/PM or may be in addition to the CDOT/PM if warranted by the project work.

COG - Council of Governments

COGO - Coordinate Geometry Output

CONSULTANT - Consultant for this 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.

C/PM - Consultant Project Manager - The Consultant Engineer responsible for combining the various puts in the process of completing the project plans and managing the Consultant design effort.

DEIS - Draft Environmental Impact Statement

DHV - Future Design Hourly Volume (two-way unless specified otherwise)

DOR - Region Office Review

DRCOG - Denver Regional Council of Governments

ATTACHMENT B
DEFINITIONS

D&RGW - Denver & Rio Grande Western Railroad

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

FHPM - Federal-Aid Highway Program Manual

FHWA - Federal Highway Administration

FIR - Field Inspection Review

FONSI - Finding of No Significant Impact

FOR - Final Office Review

GPS - Global Positioning System

MAJOR STRUCTURES - Bridges and culverts with a total length greater than twenty feet - retaining walls with a total length greater than fifty feet. The size of bridges and culverts is measured along the centerline of roadway, and the horizontal distance along the top of wall for retaining walls.

MOSS - Modeling of Surfaces and Strings

MPO - Metropolitan Planning Organization

Denver Regional Council of Governments

Pikes Peak Area Council of Governments

Grand Junction MPO

Pueblo MPO

North Front Range Council of Governments

NEPA - National Environment Policy Act

NGS - National Geodetic Survey

NICET - National Institute for Certification in Technology

NOAA - National Oceanic and Atmospheric Administration

ATTACHMENT B
DEFINITIONS

Paper Sizes:

A: 8 1/2 inch x 11 inch

B: 11 inch x 17 inch

C: 17 inch x 22 inch

D: 24 inch x 36 inch

PE - Professional Engineer registered in Colorado

PICS - Project Item Coding System

PLS - Professional Land Surveyor registered in Colorado

PM - Project Manager

PRT - Project Review Team

P,S&E - Plans, Specifications and Estimate

PROJECT - The work defined by this scope

ROW - Right-of-Way: A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to a highway.

ROWPR - Right of Way Plan Review

RTD - Regional Transportation Director

T/E Species -Threatened and/or Endangered Species

S.H. - State Highway Numbers

TMOSS - Terrain Modeling Survey System

TOPOGRAPHY - In the context of CDOT plans, topography normally refers to existing cultural or man-made details.

UD & FCD - Urban Drainage and Flood Control Region

UPRR - Union Pacific Railroad

For other definitions and terms, refer to Section 101 of the CDOT Division of Highways Standard Specifications for Road and Bridge Construction and the CDOT Design Manual.

ATTACHMENT C

Quality Control Report
CDOT Project #
CDOT Project Code

Surveyed by:

Company Name

Company Address

Company Phone

Overview of Project

CDOT Project Name

Location of Project

SH # Beginning at MP # and Ending at MP #
Section, Township, Range locations

Description of work included in the project.

Horizontal Control

GPS Densification

Prepare a statement identifying the horizontal control used on the project.

If the project included GPS densification then refer to the blue book report.

If the GPS densification was accomplished by others describe how the densification survey was used in establishing the project control.

GPS Fast Static

Statement of the basis of the GPS fast static control.

Explain the decisions that you made to accept the quality of the GPS fast static fieldwork. Some examples include the following:

Reference variances are less than or equal to 1.

Work was performed when PDOP was below 7.

Ratios are greater than 1 .5.

RMS's are small less than .015 M.

Attach a copy of the baseline solution summary report.

The global network closure report, which quickly analyzes internal loop closures at random.

Explain the decisions that went into the adjustment of the baseline vectors.

Minimally constrained results show a reference factor of near 1. Chi square test passed. Apply the resulting scalar to the data and rerun.

Attach the adjustment statistic summary.

Constrained results show a reference factor of 1. The chi square test passed. The following were not included in the adjustment.

The summary of covariance vectors show that all baselines have a stated horizontal precision of greater than 1:?????

Attached is a copy of the summary of covariance vectors.

ATTACHMENT C
EXAMPLE
QUALITY CONTROL REPORT

Attached are copies of the histograms of the final adjustment are attached.
Also attached are copies of the error ellipses are attached.

Conventional Traverse

Statement of the basis of the horizontal control NAD 83 (1992)
Closures for each individual traverse were as follows:

Report traverse length, distance of misclosure, azimuth of misclosure, and precision for each traverse. For example, traverse #1 was 10536 meters long with a distance misclosure of .015 M and an azimuth misclosure of 45° 35' 12" yielding a precision of 1:700,000.

Analysis of the horizontal angles revealed a standard deviation of less than +/- 5".
Analysis of the horizontal distance revealed a standard deviation of less than .006 M.
Describe the methods applied for error analysis.

Vertical Control

Statement of the basis of the vertical control - NAVD 1988
Differential level loop closures

Report the length of the level line, the vertical misclosure, the calculated tolerance, and a conclusion that the work was acceptable. For example, Level loop #1 was 3200 meters long, the loop misclosed by .008 M, the tolerance was 0.011 M therefore the fieldwork was acceptable.

Report any adjustments made to the observed data.

Report on the condition of any found federal' bench marks using the NGS form.

Aliquot Corner Ties

Description of procedure used to search for corners. Including measures taken to locate the corners searched for but not found.

Description of the field procedures used to make the ties.

Explain checking procedures of the ties.

Attach any monument records, photos, etc on corners updated or referenced.

Right of Way Ties and Property Pin Ties

Description of procedure used to search for corners. Include the procedures used and the measures taken to search for corners reported as not found.

Description of the field procedures used to tie the corners.

Explain checking procedures of the ties.

Include copies of assessors' maps, plats, and deeds used to locate the corners.

TMOSS

Summarize the back-sight and foresight data during TMOSS that further verifies the control survey. Summarize the differences.

Report on how the project calibration matched the existing control.

Report on any additional checks made on the overall vertical accuracy of the TMOSS operations.

If GPS was used report on the method used to gather the data. Was it by the continuous method or the single point method? Explain the procedures. Describe the accuracy of the TMOSS survey. Explain the intended use of this data.

Describe any procedures developed to verify and check elevations of the TMOSS data.

ATTACHMENT C
EXAMPLE
QUALITY CONTROL REPORT

Certification

I hereby certify to the Colorado Department of Transportation that the information in this report is true and correct.

Apply Colorado LS seal.
Sign and Date through seal.