

## **1.0 PURPOSE**

Subsurface Utility Engineering (SUE) is the engineering processes that accurately and comprehensively identifies, characterizes, and maps underground utility facilities. Accurate utility investigation can prevent construction delays, claims, and accidents, and can be used as an early design tool to avoid major utility conflicts. The purpose of this procedure is to describe methods to:

- Acquire locate, pothole, and survey of subsurface utilities and collect other information such as ground appurtenances and overhead facilities as needed to successfully complete the design of RTD projects.
- Provide locates of RTD-owned utility facilities.

## **2.0 SCOPE**

The Subsurface Utility Investigation procedure provides definitions of the three SUE investigation services (locates, potholes, surveys), outlines the appropriate circumstances under which to proceed with the acquisition of each service and the procedure by which to acquire the information. In addition, this procedure explains the requirements and outlines the procedures that RTD shall follow in order to provide RTD locates to others for RTD-owned facilities.

## **3.0 RESPONSIBILITY**

### **3.1 Engineering Technical Support Staff**

The ETS staff responsibilities include:

- A. Develop and update the requirements and procedures for SUE investigation.
- B. Coordinate with Project design team in efforts to identify the appropriate subsurface information needed for design.
- C. Assist Project design team in acquiring the subsurface information as needed to resolve design issues.
- D. Manage the request, collection, and distribution of subsurface information for in-house designs efforts.
- E. Field verify SUE information submitted by the Contracted Consultant Design Team.
- F. Assist in identifying and locating RTD owned facilities for others.
- G. If required, write a contract for an RTD SUE Contractor to provide SUE services directly to RTD and manage the contract after awarded.

### **3.2 Document Control Staff**

The document control staff responsibilities include:

- A. Maintains as-built drawings of each RTD facility.
- B. Maintains and updates library copy and distributes procedure updates to individuals issued copies of the EDG.

### **3.3 Contracted Consultant Design Team**

The contracted consultant design team responsibilities include:

- A. Identify all subsurface information needed to successfully design the project.
- B. Acquire all subsurface information needed to successfully design the project through a SUE contract (including locates, potholes, and survey).

### **3.4 Locate, Pothole, and Survey Contractors**

The SUE contractor responsibilities include:

- A. Perform utility locates.
- B. Perform utility potholing.
- C. Perform utility survey of painted locates and potholes.
- D. Locate RTD owned utility facilities as requested by RTD.
- E. Complete RTD and other Railroad owner On-Track Safety Training if required.
- F. Acquire all necessary permits to access project area and perform work.

## **4.0 REFERENCES**

- A. Engineering Design Guidelines Manual – EDG-1 Existing Field Conditions
- B. ASCE Standards – Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.

## **5.0 PROCEDURES**

### **5.1 SUE Investigation Services**

- A. Locates:
  - Locates are surface markings that indicate the horizontal location of underground utilities and structures and are marked in the field by utility owner companies as per the UNCC color designation.
  - Locate services should be used to locate existing utilities as early as possible in the design process.
  - Locate information should be used to confirm the horizontal location of all utilities in the project area.
  - Locates of facilities are requested by contacting the Utility Notification Center of Colorado (UNCC) and utility owners directly.

- Careful coordination is required between the Locate Contractor and the Survey Contractor to guarantee that all painted locates are surveyed within a timely manner.
  - Locate information shall be provided to RTD in electronic (CADD) and tabulated on the RTD Utility Matrix (see EDG-4).
- B. Pothole:
- Potholes verify the following information of underground utilities and structures:
    - horizontal location
    - vertical location
    - size of pipe or encasement, ductbank, etc.(identify top, bottom, and side locations of underground the utility or structure)
    - material of facility
    - apparent age and/or condition if possible
  - Pothole services should be used to locate existing utilities after a full Locate/Paint Survey has been completed, after design of the project has reach a point where major alignment changes are unlikely, and after preliminary utility relocation designs have been analyzed.
  - Pothole information should be obtained where this information would make a difference to the treatment of the utility conflict.
  - A Pothole Plan shall be prepared by the Designer and submitted to RTD for review and approval prior to contracting Pothole services. The Pothole Plan shall identify each pothole being requested (utility type, owner, location, etc.) and the reason for needing each. The Pothole Plan shall consist of drawings showing each proposed and numbered pothole and a corresponding tabulated list using the RTD Utility Matrix format (see EDG-4).
  - The Pothole Contractor shall pothole each proposed pothole listed in the Pothole Plan. In the event that a utility cannot be located, the Pothole Contractor shall abandon the process after several attempts and as directed by RTD.
  - Careful coordination is required between the Pothole Contractor and the Survey Contractor to guarantee that all potholes are surveyed within a timely manner.
  - Pothole information shall be provided to RTD in both electronic (CADD) and tabulated on a Pothole Log.
- C. Survey:
- Surveys shall be conducted in accordance with the CDOT Survey Manual and the latest addendum thereof, and may include any the following work:
    - Presurvey Conference
    - Global Positioning Surveys
    - Monumentation
    - Accuracy Tests
    - Data Reduction
    - Topography (contours)

- Planimetric (topo)
- Photogrammetric Mapping
- Aerial Photography
- Map Compilation, Index and Finished Maps
- Surveys may acquire the following information:
  - Project control, land monuments, and property corners as they tie to center/control line.
  - Radial (topographic) information including but not limited to signs, mailboxes, fences, driveways, curbs, sidewalks, edge of pavements, existing rails tracks, existing major and minor structures, all surveyed to the nearest one foot.
  - Vertical relief or elevations including natural ground elevations surveyed to the nearest one-tenth foot and man made features surveyed to the nearest one-hundredth foot.
  - Above Ground Drainage and Utilities facilities including but not limited to utility poles, overhead wires (such as electric, t.v. cable, and phone), manholes, valves, vaults, pedestals, guy wires, irrigation ditches, drainage culverts, inlets, outfalls, and other visible utility features.
  - Underground Drainage and Utilities facilities including but not limited to communication, electric, gas, sanitary sewer, storm drains, steam, and water pipes and conduits. Determine invert elevations of underground structures such as manholes and vaults. Establish connections of utility lines to appurtenances. Survey the location of located (painted) and potholed underground utilities.
- Digital Terrain Modeling.
- Survey services shall be used directly following Locate and Pothole services to record Locate and Pothole information. Survey services should also be utilized to obtain other non-subsurface utility information such as ground appurtenances and overhead facilities as well as any other structure or feature that may interfere with the action/resolution proposed for a given utility conflict.
- For large projects as determined by RTD, survey information shall be provided in CAD format to the Project design team and to RTD in segments and after each project segment survey is complete.
- The Project Utility Base File shall be updated in CAD and provided to the Project design team and to RTD as surveying and supplemental surveying work is complete.

## **5.2 Using SUE Contract Services**

- A. SUE contract services shall be used for the following:
  - To locate, pothole, and survey existing utility information required for project design and to identify utilities that may be in conflict with the project and that may require action/resolution.
  - Clarify confusing or conflicting existing information.

- Establish locations of newly discovered or installed facilities.
  - Identify existing utility information in new areas due to changes in project alignment, increase in project boundaries, or new scope of work.
  - Resolve design issues.
  - Mark RTD owned utility facilities.
- B. RTD staff shall coordinate with the Project design team to identify specific SUE needs for each project. The Design Consultant shall review SUE plan with RTD prior to authorizing work, and shall update RTD staff on progress of SUE investigation activities.
- C. Contracted Consultant Design Teams shall use their own SUE Contractors to locate, pothole, and survey the utility information needed for specific RTD projects, and shall submit survey drawings to RTD.
- D. RTD shall perform a quality review of the SUE information obtained thru a site-walk of the project immediately after field locates are painted and survey drawings are submitted to RTD.
- E. If RTD staff requires SUE services separate from those connected with a specific RTD project or for a smaller RTD project that does not have a SUE contractor associated with it through the Contracted Consultant Design Team then SUE requests shall be submitted using the Request For Subsurface Utility Engineering (Form 2-1) or via email to the Manager of an existing RTD On-Call Contract or a new short-term SUE contract shall be issued for the specific needs. A short Scope-of-Work and Minimum Qualifications will have to be prepared and submitted for approval.

### **5.3 Providing RTD-Owned Utility Locates**

- A. RTD Operations and Engineering shall work together to compile, maintain, and update accurate and all inclusive plans of RTD owned facilities, and may need to provide this information upon request to designers and construction contractors (requests may come from outside contractors for non-RTD projects).
- B. RTD Owned Facility Locate Tickets (Form 2-2) shall be provided to and the top portion of the form shall be filled out by any designer or construction contractor requesting RTD owned utilities be located and submitted to the RTD Utility/Drainage team lead. These requests may come from non-RTD project designers and consultants and shall include written descriptions and sketches of project limits.
- C. RTD shall fill out all detail information as indicated on the bottom half of the RTD-Owned Facility Locate Ticket (Form 2-2) including horizontal location, type, size, and depth of the RTD-owned facilities, attach a drawing showing the facilities, and return it to the designer or construction contractor.

## **6.0 ATTACHMENTS**


**Form 2-1:** Request For Subsurface Utility Engineering



**EDG – 2 SUBSURFACE UTILITY ENGINEERING  
ENGINEERING DESIGN GUIDELINES**

**Form 2-2: RTD Facility Owned Locate Ticket**

**7.0 APPROVAL**

| <b>Revision Level:</b> | <b>Approved By:</b>  | <b>Signature</b>  | <b>Date</b> |
|------------------------|--|---|-------------|
| Major Revision         | John Shonsey, Senior Manager<br>Engineering                      |  | 10-16-07    |
| Minor Revision         | Henry Stoppolecamp,<br>Engineering Technical Services<br>Manager |  | 10/16/07    |

**8.0 REVISION RECORD**

| <b>Revision Level</b> | <b>Revision Date</b> | <b>Summary</b>         | <b>Approval Date</b> |
|-----------------------|----------------------|------------------------|----------------------|
| 0                     | 10/12/07             | Initial Baseline Issue |                      |
|                       |                      |                        |                      |



Project Charge No:

\_\_\_\_\_  
(Internal only)

## REQUEST FOR SUBSURFACE UTILITY ENGINEERING

RTD PROJECT: \_\_\_\_\_ DATE SUBMITTED: \_\_\_\_\_

CONTACT NAME: \_\_\_\_\_ DESIRED RESPONSE DATE: \_\_\_\_\_

CONTACT EMAIL: \_\_\_\_\_ CONTACT PHONE: \_\_\_\_\_

LOCATION:

\_\_\_\_\_  
\_\_\_\_\_

DESCRIPTION OF SUBSURFACE UTILITY ENGINEERING WORK NEEDED: (Attach drawings)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

UTILITIES TO INVESTIGATE (check all applicable):

- |   |                                   |   |  |
|---|-----------------------------------|---|--|
| <input type="checkbox"/> ALL UTILITIES  | <input type="checkbox"/> Drainage | <input type="checkbox"/> Electric       | <input type="checkbox"/> Gas/Petroleum |
| <input type="checkbox"/> Communications | <input type="checkbox"/> Steam    | <input type="checkbox"/> Sanitary Sewer | <input type="checkbox"/> Water         |
| <input type="checkbox"/> Irrigation     |                                   |   |  |

Specifics:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

LEVEL OF INVESTIGATION (check all applicable):     Locate     Pothole     Survey

Specifics:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

This form is for Locate, Pothole, and Survey services, and other investigation requests pertaining to FasTracks projects made by RTD employees when utilizing RTD SUE Contract Services.



FOLT Request No:

(Internal only)

### RTD FACILITY OWNED LOCATE TICKET

#### DESIGNER OR CONTRACTOR INFORMATION

COMPANY: \_\_\_\_\_ DATE SUBMITTED: \_\_\_\_\_

CONTACT NAME: \_\_\_\_\_ DESIRED RESPONSE DATE: \_\_\_\_\_

CONTACT EMAIL: \_\_\_\_\_ CONTACT PHONE: \_\_\_\_\_

PROJECT PHASE:

Design       Construction, Date of Excavation \_\_\_\_\_

LOCATION BOUNDARIES: (Indicate N, S, E, W, NE, NW, SE, SW and Streets or Landmark)

N: \_\_\_\_\_

S: \_\_\_\_\_

E: \_\_\_\_\_

W: \_\_\_\_\_

#### RTD INFORMATION

RTD UTILITIES FOUND IN THE LOCATION BOUNDARIES (check all applicable):

Communication: Number \_\_\_ Size(s) \_\_\_\_\_ Type(s) \_\_\_\_\_ Depth(s) \_\_\_\_\_  
Location(s) \_\_\_\_\_

Drainage: Number \_\_\_ Size(s) \_\_\_\_\_ Type(s) \_\_\_\_\_ Depth(s) \_\_\_\_\_  
Location(s) \_\_\_\_\_

Electric: Number \_\_\_ Size(s) \_\_\_\_\_ Type(s) \_\_\_\_\_ Depth(s) \_\_\_\_\_  
Location(s) \_\_\_\_\_

Irrigation: Number \_\_\_ Size(s) \_\_\_\_\_ Type(s) \_\_\_\_\_ Depth(s) \_\_\_\_\_  
Location(s) \_\_\_\_\_

Sanitary: Number \_\_\_ Size(s) \_\_\_\_\_ Type(s) \_\_\_\_\_ Depth(s) \_\_\_\_\_  
Location(s) \_\_\_\_\_

Storm: Number \_\_\_ Size(s) \_\_\_\_\_ Type(s) \_\_\_\_\_ Depth(s) \_\_\_\_\_  
Location(s) \_\_\_\_\_

Water: Number \_\_\_ Size(s) \_\_\_\_\_ Type(s) \_\_\_\_\_ Depth(s) \_\_\_\_\_  
Location(s) \_\_\_\_\_

SEE ATTACHED DRAWING(S)

JOB REQUEST COMPLETED: RTD SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

This form is required for all RTD owned facility Locates.