

The many benefits of **SUBSURFACE UTILITY ENGINEERING**

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Workers prepare to expose utilities using vacuum excavation

Engineers have been using Subsurface Utility Engineering (SUE) for more than 20 years to aid in the development of highway projects. The right of way benefits of such use are well documented.

The benefits of using SUE include fewer delays to highway contractors, avoided utility relocations, fewer costly, time-consuming conflicts during construction, and much more. The much more includes numerous right of way benefits. To take advantage of opportunities to benefit from using SUE, right of way professionals need to understand what SUE is and how it can help them do a better job.

What is SUE?

SUE is an engineering process that has evolved in the United States over the past few decades. It involves the combination of civil engineering, surveying and geophysics with surface geophysical methods, vacuum excavation and computer technologies to collect and depict information about existing subsurface utilities.

The use of SUE has become a routine requirement on many highway projects and is strongly advocated by the Federal Highway Administration. It is recognized in a national standard developed by the American Society of Civil Engineers¹ (ASCE) and was the subject of a study by Purdue University that quantified a savings of \$4.62 for every \$1 spent on SUE².

The ASCE standard closely follows concepts already in place in the subsurface utility engineering profession. Nicholas Zembillas, a nationally recognized authority on SUE and a member of the ASCE committee that developed the standard, says, "Many state and local highway agencies and/or their design consultants use SUE routinely in the early development of highway projects. They do so by employing the services of SUE consultants to identify the quality of subsurface utility information needed for highway plans and to acquire and manage that level of information during the development of projects. This enables designers to prepare plans

with thorough and comprehensive knowledge of the exact locations of underground utilities, and enables excavators to avoid damaging underground assets."

What are the Right of Way Benefits?

SUE provides accurate and comprehensive information about subsurface utilities early in the development of projects. Utilizing SUE information, designers can identify all potential conflicts and "design around" many of them, thus avoiding costly utility relocations and minimizing potential utility conflicts during construction. This, in turn, results in right of way benefits.

For example:

- ▶ SUE enhances the decision making process for project development purposes. Decision-makers know early in the design phase which utilities must be relocated and where they must go. This enables right of way professionals to develop realistic project schedules for the acquisition of right of way for the relocation of existing utilities. Thus, last minute utility conflicts and design changes requiring additional right of way are substantially reduced; projects are delivered on-time for construction authorization; and project delays during construction and subsequent contractor claims are reduced.
- ▶ SUE reduces right of way needs by providing information needed to establish more exact right of way limits, to enhance right of way scheduling and staging for needed relocations, and to cost-out right of way needs.
- ▶ SUE provides an excellent permanent record of utility data that can be integrated into the plan development process for future projects.

THE SUE PROCESS

- ▶ SUE assists with right of way valuation. Utility investigations are often not made in conjunction with the appraisal process, especially when commercial properties are involved. Missing some of these concerns may result in the need for after-the-fact utility coordination, relocation and reimbursement, as well as project delays. Incorporating a SUE report as an addendum to the appraisal may present a more complete and effective acquisition package.

These are just a few of the many right of way benefits. The TBE Group's Right of Way Division Leader, Rich Doyle, P.E., AICP, has this to say about SUE: "Think outside the box in the use of SUE for locating underground features. SUE has been used to locate and design around facilities ranging from a septic system to the anchors of a multi-user radio tower. Millions of dollars have been saved by a few hundred dollars of SUE."



Workers use 3-D underground imaging to designate subsurface utilities.

In Summary

Subsurface Utility Engineering provides accurate and comprehensive information about subsurface utilities early in the development of projects. This results in time and cost savings to projects, as well as many related benefits. Right of way benefits include an enhanced decision-making process for project development purposes; reduced right of way needs; a permanent record of utility data that can be integrated into the plan development process for future projects; assistance with right of way valuation, and more. It behooves all right of way professionals to learn more about SUE and how it can help them acquire needed right of way in a timelier manner. ■

References

¹ *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data*, CI/ASCE 38-02, American Society of Civil Engineers, 2003.

² *Cost Savings on Highway Projects Utilizing Subsurface Utility Engineering*, FHWA Publication No. FHWA-IF-00-014, Purdue University, 2000.

- Identify and contact affected utility owners.
- Provide plans to utility owners when they are about 30% completed or sooner; request pertinent as-built information; obtain existing utility information from other sources; review all information obtained; and plot on a utility composite drawing. This is Quality Level D (QL-D) information.
- Make field observations to identify visible above-ground utility features; survey; and plot. This is Quality Level C (QL-C) information.
- Use appropriate surface geophysical methods (i.e., pipe and cable locators, terrain conductivity, resistivity measurements, metal detectors, ground-penetrating radar, etc.) to designate existing subsurface utilities or to trace a particular utility system; and depict resulting information in the client's computer-aided design and drafting (CADD) system, Geographic Information System (GIS), and/or on manually-plotted plan sheets. This is Quality Level B (QL-B) information.
- Resolve differences between QL-B, C and D information
- Develop a conflict matrix showing all possible highway/utility conflicts
- Convene and facilitate a meeting with utility companies to discuss potential conflicts and other aspects of the project; and to discuss possible strategies to avoid conflicts and identify locations where additional three-dimensional information is needed.
- Expose selected subsurface utilities to obtain three-dimensional information using minimally intrusive excavation methods, such as vacuum excavation; and depict resulting information in CADD or GIS systems and/or on plan sheets. This is Quality Level A (QL-A) information.
- Resolve differences between QL-A information and the previously obtained QL-B, C, and D information; depict new and corrected information; go back to the conflict matrix with the new QL-A information to determine the status of conflicts requiring additional information; and meet with utility companies to discuss these conflicts and possible strategies to avoid utility relocations.
- Deliver depicted information to the project owner.
- Work with the project owner's designers to be sure they understand the information provided and to suggest possible ways to avoid conflicts.
- Where conflicts cannot be avoided and utilities will have to be relocated:
 - Determine prior rights
 - Obtain relocation cost estimates and plans from utility companies
 - Prepare utility relocation agreements
 - Provide utility relocation design
 - Acquire necessary right of way
- Store pipe location and condition information in a database for asset management.
- Work with utility companies, one-call centers and contractors during construction as needed.
- Continue to represent the utility owner in all utility-related activities as the project progresses.