

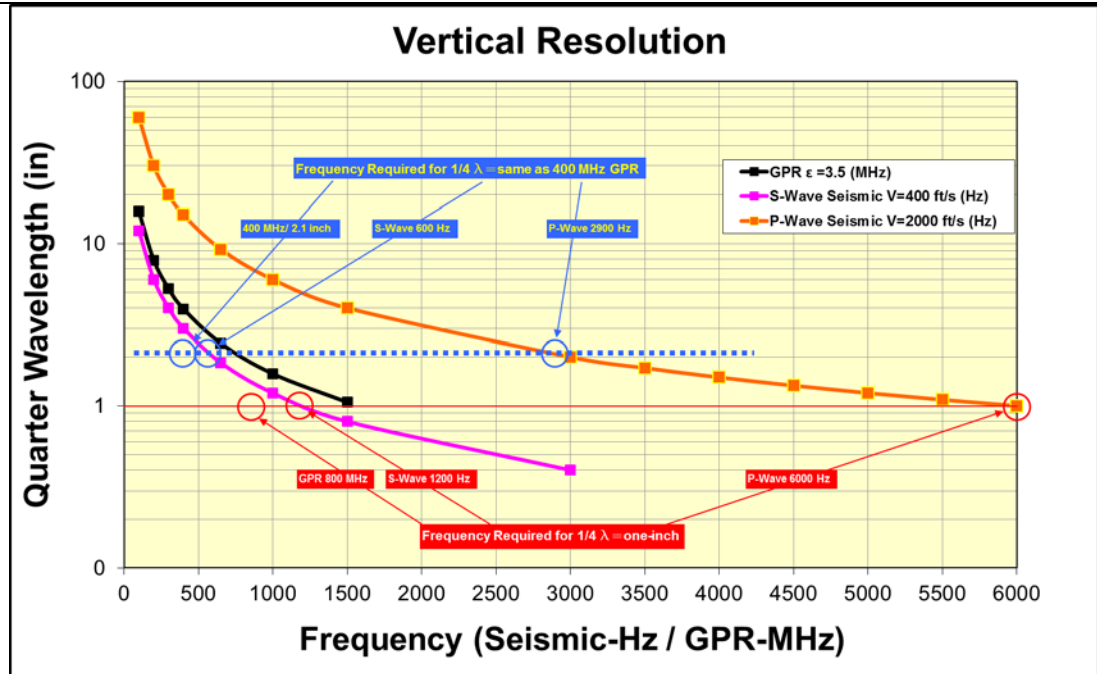
Webinar: Advanced Technologies for Working with Underground Utilities: Current SHRP 2 Research

August 10, 2011

Responses to Questions and Comments

	Question or Comment	Responder	Response
1	There was a lot of repetition among the first three speakers that limited the amount of information to be given in the time allowed.	Chuck Taylor	We attempted to achieve a balance between repeating important points early in the webinar, and not taking up too much time doing it. We'll certainly keep this in mind when we prepare future webinars.
2	In an ideal world (going forward from today), would you say that the most efficient and inexpensive (regardless of who pays that cost) would be for every installation underground must be mapped/surveyed at the time of installation, and then re-surveyed at any time repairs or modifications are made to the facility?	Jim Anspach	Yes, absolutely, but of course the real problem is all of the legacy utilities in the ground on which this has not been done. Even in jurisdictions that have such requirements, this effort is usually not done with regularity or sufficient quality of results. ASCE is looking into developing a national standard, similar to Canada's CSA 250, that could be used as a specification by permit agencies.
3	The comment was made "shear wave depth of	Gary Young	Depth of penetration is tricky in this environment. It is a matter of getting signals of sufficiently high frequency down to the target and back to the receiver with enough

	<p>penetration was superior to compressional wave" ... not sure that is correct. Also, shear waves do not transmit through water; does shear wave method break down if facilities lie below groundwater table?</p>		<p>amplitude remaining to detect the target and be measured upon their return by modern data acquisition systems. It has proven, for UIT and others, in past tests to be very difficult to impart compression wave signals to the ground at high enough frequencies to detect utility targets and still be able to measure them at the surface. The graph below shows comparisons between quarter wavelengths for the GPR signals we would like to mimic and compression and shear wave seismic signals. Quarter wavelength is a rule of thumb estimate of detection capability. Shear waves have a smaller wavelength for a given frequency because they travel from two to six times slower than compression waves. What you can see from the graph is that compression waves of 3000 Hz are required to detect a 2-inch pipe in the ground while the same quarter wavelength can be attained with shear waves of about 700 Hz. No researcher as been able to get compression waves much over 1200 Hz into the ground and back at detectable levels. The shear wave source planned for use in the R01-B project has demonstrated capability to get greater than 1000 Hz shear waves into the ground. Our initial work is aimed at testing signal attenuation to ensure that we can measure the signals that come back.</p>
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Shear waves don't transmit through water, or any liquid, when that is the transmission medium. However in rocks and soils it is the matrix that carries the signals, so transmission works fine. Soil moisture can certainly affect signal attenuation and that is one thing that we are aware of as we test the shear wave imaging system.

4 How do you handle utilities that do not want to release location due to security reasons?

Alicia Farag

One potential solution to address this issue would be to develop the ability to model the location, and perhaps size, of sensitive utility lines without disclosing information on the specific features. This may convince some utilities to provide such data, but probably not all utilities.

If you are interested in receiving periodic updates on the project including information about demonstrations please contact Alicia Farag at alicia.farag@gastechnology.org.

	How can one get involved? We are doing quite a few changes to processes with permits in the NCDOT or at least get into the loop....		
5	For future webinars it would be nice if the questions at the end could appear on the screen.	Pat Zelinski	GoToWebinar software does not allow everyone to view the questions. Questions can only be viewed by webinar organizers.
6	What is the possibility of designing roadways with specific utility corridors already set up with limitations etc?	Jim Anspach	The possibility not only exists, but is increasingly being used in some new construction. Separation distance between utilities can sometimes be a limiting factor as are the sheer numbers of utilities that currently exist. It is hard to have an utilidor large enough in many streets that can accommodate sanitary, storm, ITS, telecom, water, gas, power, etc. Plus you have necessary services going in all directions from these mains. While utilidors are great concepts, their use even in newer construction will be limited to a small percentage of projects.
7	Will all of the technologies presented be integrated in this program?	Chuck Taylor	We will attempt to integrate these products to the extent possible. The technologies under investigation to increase the locatable zone of underground utilities (R01-C) will be examined to determine if some are logical candidates for incorporation into the multi-sensor platforms underdevelopment in R01-B, and vice versa. Project R01-A on 3-D utility data will be providing data formatting guidelines that will provide guidance for all the other projects. Extensive integration is beyond the scope and budgets for the current projects. However, once these initial product prototypes have been developed, we will revisit the need for further integration in a follow-on implementation phase.
8	Any chance that the FHWA may do grant to set up	Answer provided by Dominic	Federal-aid highway funds may be used to reimburse State transportation departments for the use of SUE. There are no special or earmarked funds for SUE, but regular funds may be used (i.e., funds available for National Highway System, Surface Transportation Program, Interstate

	mapping of utilities?	Indelicato	<p>Maintenance, and possibly other Federal-aid highway programs).</p> <p>In accordance with normal Federal-aid procedures, States must first pay for SUE with their own funds and then request Federal reimbursement at the normal pro rata share for the project or projects for which it was used. The Federal pro rata share will be either 80% for non-Interstate or 90% for Interstate projects.</p> <p>State contracts with SUE providers are subject to Brooks Bill procedures if Federal-aid highway funds are used. Hence, SUE providers must be selected by evaluating and ranking interested firms based on their qualifications to perform the requested work, and then, starting with the highest ranked firm, negotiating with them until (?)</p>
9	Are there any efforts underway to assess technical qualifications/ capabilities of SUE firms or to provide them with guidance or ultimately some form of accreditation?	Jim Anspach	<p>No. Since SUE is actually a recognized branch of civil engineering practice, it is up to state boards of registration to accredit individuals, and then state corporation commissions to accredit firms. Some state DOTs have excellent prequalification criteria for the ability to allow firms to contract with the DOT, but the vast majority of state DOTs do not. There are several experts in the field of SUE who do provide qualifications assessments to project owners and engineers, and provide guidance to SUE firms. Most states except California do not create niche PE licensure requirements and accreditation.</p>
10	Is there a specific study highlighting the percentage of utilities that can be found with existing instruments/skilled technicians? (slides from J. Anspach)	Jim Anspach	<p>None that are published in a paper or report to my knowledge other than the MTU early justification for research. The key here is the size of the toolbox, the skill of the user, and the project budget. Without limits to these three, my estimate is that 80–90% of all utilities can be found with existing surface geophysical techniques in existence today. This is based upon my 33 years of experience doing this work, and tracking the results of construction on those projects.</p>

11	I saw a presentation at an IRWA meeting from a company called UltiScan presently selling its Ground Penetration Radar detection product claiming they can work with metallic and non-metal targets and some clay soils. Any comments?	Gary Young	<p>On their website Utiliscan makes no extraordinary claims that I saw. They are using equipment from mainstream GPR manufacturers. I would expect that performance in soils with some clay to be acceptable, but in others it would not be. We find that soils in general seem to be more favorable for GPR in UK than broadly in the US. The danger is in translating that experience to the U.S. Many of our U.S. clay soils are from younger rocks and are more electrically conductive. As far as non-metallic targets, GPR is the only generally available tool that can detect them. We expect our shear wave seismic tool to have similar capability.</p>
12	How does a high ground water table affect the different technologies to determine the location and depth of utilities?	Gary Young/Chris Ziolkowski	<p>High groundwater can make it more difficult to map utilities with generally available geophysical tools such as EM locators or GPR. However, the presence of groundwater does not out of hand preclude success. If the water is fresh, then often the tools work adequately, but if the water is brackish or salty, then GPR will have trouble. We believe the new seismic tool will have minimal degradation from the presence of water.</p> <p>The depth of EM penetration into a medium scales inversely with frequency and with conductivity. This fact gives designers another degree of freedom when looking at EM solutions; it is possible to drop the operating frequency to take back what is lost to conductivity. In a highly conductive soil, the skin depth (point at which the power has dropped by 1/e) is 1.25 meters at 100kHz; at 10kHz it is 4 meters. One must also note that the EM wave does not stop abruptly at the top of the water table; it attenuates gradually. The signal strength at depth may be perfectly adequate if the initial signal was large.</p> <p>All evidence would suggest that the acoustic tools will perform better in wet soils rather than</p>

			be degraded.
13	Florida Dept of Transportation (D4) in South Florida has been using the utility conflict matrix for the utility certification process during the design phase for many years. We are now starting to use this information for creating a web-based platform for the contractors as well as the CEI folks during the construction phase. Has the utility conflict matrix been used in this manner anywhere else?	Cesar Quiroga	<p>I am not aware of any other state DOT using a web-based application for the management of utility conflicts. Increasingly, states are using web-based applications to manage specific aspects of the utility process, e.g., to track utility owners, facilities, contracts, agreements, and payments. However, this is not the case for utility conflicts.</p> <p>About three years ago, TTI completed a research project for TxDOT, which resulted in a prototype web-based application that could track the entire utility process, including utility conflicts. Unfortunately, due to budgetary constraints, the department decided not to implement the research product. We used the data model from that research as the starting point for the utility conflict data model and database we developed as part of the SHRP 2 R15-B project.</p>
14	Will the RO1 B & C projects use the Virginia Pilot project for their demonstrations of the prototypes?	Jim Anspach	Yes, it is our intent to do so.

15	I recommend forwarding the screen shots PRIOR to the webinar to allow making notes on those pages.	Pat Zelinski	For some TRB webinars, PDFs of slides are sent to the audience the day before the webinar. When I handle a webinar, I do not send out the slides until after the webinar to give the presenters more time to modify their presentations. I will reevaluate this practice before my next webinar.
16	It would be interesting to know how other states handle utility notification and conflicts during the design phase of a DOT project.	Cesar Quiroga	The SHRP 2 R15-B final report (Volume 2) includes a description of specific practices at 20 state DOTs around the country. The content in Volume 2 was the result of an online survey of all 50 states, follow-up interviews, and sample documentation received from state DOTs.
17	This webinar seemed to have good content. I enjoyed hearing about the research that is being conducted with underground utilities. It is a very difficult problem with highway projects. I am interested in the details of the data repository. How to store the maps of the utilities.	Alicia Farag	The details of the data repository are being developed and will not be available until the project is completed. Maps and other related documents will be stored in the spatial document management system.

18	<p>How does UIT compensate for the latency in GPS data receipt and collection when the cart is moving, or for issues when GPS coverage is suspect as in scenarios where tall buildings or trees obscure the GPS signals?</p> <p>How do you qualify "excellent positioning"?</p> <p>During Gary's presentation he indicated specific differential locations of subsurface facilities when comparing "One Call" data to field collected data but did not indicate the quality of the data with regard to survey accuracy. Also, who certifies the quality of the data in regard to survey accuracy?</p>	Gary Young	<p>UIT compensates for GPS time delay with a special hardware module on which we have an issued patent. In areas of tree cover or tall buildings we use a laser robotic total survey station such as a Trimble S-6.</p> <p>"Excellent Positioning" is really judged by the needs of the project. Using tools that are pretty standard nowadays it is possible to get accuracy from a decimeter to a couple of millimeters. However, this only applies to knowing the position of the instruments when the measurements are made. The targets interpreted from the data have their own associated accuracy that is dependent on the method, the noise in the geophysical data and the size and type of target. When checked our results have always been within a few inches and with GPR usually better.</p> <p>For the survey accuracy part of this third question, refer to above. Certifying accuracy of results is a mixed bag in the U.S. these days. We recommend using the Subsurface Utility Engineering standard guideline from ASCE (ASCE 38-02). That guideline specifies that a registered professional oversee the project and seal the documents. In those cases certification is agreed upon by the engineer and owner. In other cases the accuracy is given as a best effort. UIT has developed and continues to improve our QA/QC process and documentation to ensure that our results meet our stated best effort specifications.</p>

19	Are there plans for a comprehensive guide to tie all of these technologies and practices together for DOT utility staff?	Chuck Taylor	We will examine the feasibility and practicality of such a guide as we move further into the implementation phase for these products. It's likely that such a guide would make good sense for some combinations of these technologies, but a single guide for all of them may not be practical.
20	Alicia mentioned there would be beta testing and a pilot project in late 2011. Are there screenshots or software to be viewed available now?	Chuck Taylor	There are currently no screenshots or software available for viewing, as it's too early in the development process. Access to such screenshots or software is normally provided only to members of relevant SHRP 2 committees under strict confidentiality requirements, until such research products have been reviewed and authorized for general distribution.
21	Ultimately, who would pay for the 3-D utility mapping?	Jim Anspach	Good question without an easy answer. On the SHRP 2 R01-A project, we have found that the DOT is willing to pay for the 3-D mapping of new utilities during the project, and require the utility owner to do so for new or relocated utilities after the project. So in this case, ultimately it is the citizen in the form of ratepayer or taxpayer who is paying.
22	In mapping utilities in a GIS, what consideration is given to visually identify accuracy? For example, there is a uniform color code for utilities. What about putting a stripe or	Jim Anspach	That is a very important issue that the R01-A project is working on. They are concerned with accuracy and source of the data so that a user of the database can judge how much they should rely on specific data. ASCE 38 uses 4 Utility Quality Levels to show reliability, but not accuracy. Accuracy can only be developed for directly-measured utilities, such as at time of exposure or installation. We have looked at the concept of developing translucent "clouds" around utilities shown in GIS for both reliability and/or accuracy. Specific methods of differentiation, such as

	circular band around the utility to designate accuracy?		your striping, are welcome ideas.
23	Since these projects were funded through SHRP 2, who gets the patent rights for these discoveries? This applies to all technologies presented here.	Chuck Taylor	SHRP 2 contractors have the right to file for patents for any inventions developed during contracts, subject to the U.S. Government acquiring a nonexclusive, nontransferable, irrevocable license to implement or have implemented any such patents. The contractor is required to provide third-party access to any product developed under a SHRP 2 contract via reasonable license or royalty agreements.
24	Water DOES NOT affect shear wave propagation.	Gary Young	This is from John Clark, an R01-B team member. He is reiterating my response to the question earlier about shear waves not traveling through water. They do travel through soils, even wet soils, just fine.
25	What is a Certified Record Drawing? Isn't this by an Engineer of Record?	Jim Anspach	Yes, or any registered professional allowed by state statute to do so. Unfortunately, we use the term "as-built" to mean any drawing. We should be replacing the undefined as-built term with Certified Record Drawing, or non-certified record drawing to differentiate the level of reliability.
26	I believe all states have legislation that deals with protecting underground utility installations...placing much of this type of conflict resolution in the language of the law would	Cesar Quiroga	At the federal level, 23 CFR 645 describes requirements that apply to federal-aid projects regarding the accommodation and relocation of utility facilities. State rules and guidelines prescribe minimums relative to the accommodation, location, installation, adjustment, and maintenance of utility facilities on the state right-of-way. The rules and guidelines can be traced to model policies and guides developed by AASHTO. Although the language in current regulations and guidelines is sufficiently general, the underlying assumption in many cases is that utilities that are in conflict need to be relocated. I

	strengthen the process...has any of these study processes explored that concept?		<p>am not sure that placing utility conflict resolution language in statutes will strengthen the process. However, based on what we learned in SHRP 2 R15-B and other research projects, I agree that the process could be strengthened by including provisions in 23 CFR 645 and state rules and guidelines to the effect that utility conflict resolution is not just about relocating utilities. It is about finding the optimal resolution strategy to utility conflicts, which could be one or a combination of the following:</p> <ul style="list-style-type: none"> • Remove, abandon, or relocate utility facilities in conflict. • Change the horizontal and/or vertical alignment of the proposed transportation facility. • Implement an engineering (protect-in-place) countermeasure that does not involve utility relocation or changes to the transportation project alignment. • Accept an exception to policy. <p>The utility conflict matrix prototypes and training course developed in SHRP 2 R15-B are consistent with this approach.</p>
27	With your system it seems imperative that metadata standards on qualifying how data is stored, retrieved and applied be implemented and agreed upon by everyone feeding data into this system. How is this issue being addressed?	Alicia Farag	Yes, metadata and data quality level information are essential to this system. The DOT may be able to specify metadata and quality requirements as part of the permit process. At a minimum, the DOT should be able to know and record this information so that data users understand the quality of the data.
28	Is there currently any prototype of the seismic technology to locate deep	Gary Young	No prototype is available. Older methodology is available but is very expensive. We are modifying both technology and the methodology with the new systems. In a situation where

	utilities now on a pilot project?		risk justifies the cost, contact Bay Geophysical in Traverse City, Michigan.
29	General question to everyone: Is there presently any ongoing concerted effort by a PAC or other lobbying group representing the interests of this issue? If not, I would be interested in forming a coalition of interested parties who want to participate in such an effort. Upcoming infrastructure legislation is expected by the spring of 2012 and now is the time to start such an effort to integrate these innovations into the upcoming bill in order to mandate/pay for the integration of these processes into the design/build system nationwide including and not limited to the 811 system and overall	Jim Anspach	No. I applaud the effort.

	planning/design/build community.		
30	Suggested improvement: short (5-minute) question and answer after each presentation to break up so many presentations in a row.	Pat Zelinski	We tried to do short question-and-answer sessions after individual presentations in a previous webinar. Unfortunately, each question-and-answer session ran long and the last presenter was forced to do his entire presentation in two minutes. Though it is not perfect, our current practice appears to be the best method, given current time constraints.