Federal Highway Administration (FHWA)
SHRP2 Renewal - Round 6 Implementation Assistance Program

Implementation Assistance Application Guidance

Utility Locating Technologies (R01B), also known as Utility Investigation Technologies or Utility Identification Technologies

Contents

Important Note: Not all agencies will be able to implement the R01B Advanced Utility Locating Technologies due to geophysical limitations. Please see page 3 for more information before starting the application.

Goals of the Round 6 R01B Implementation Assistance Program (IAP)

The products stemming from the R01B research are now being implemented by the American Association of State Highway and Transportation Officials (AASHTO) and Federal Highway Administration (FHWA) under Round 6 of the SHRP2 IAP. The Transportation Research Board (TRB), AASHTO and FHWA are the SHRP2 Project Partners.

The R01B products are advanced applications of Subsurface Utility Engineering (SUE) techniques which may or may not be successful in all locations due to soil characteristics, utility materials, etc. Accurately identifying the location of the utilities is important to enable more efficient and productive coordination with utility owners during the design process. The main goal of the Proof of Concept pilots is for an agency to use advanced utility locating technologies to help advance the state of the SUE practice.

The R01B deliverables and products have specific implementation limitations that need to be considered. There is a need for further evaluation and refinement of the products prior to national deployment to other transportation agencies.

AASHTO and FHWA are providing implementation assistance in the form of technical assistance explained later in these FAQs, as well as providing direct financial assistance to awardees.

Some of the activities that agencies will be required to do include, but are not limited to:

1. Attend a kick off meeting with SHRP2 partners (project support from FHWA consultants).
2. Testing one, but preferably two, specific types of advance utility locating technologies on pilot project(s) as explained under “Advanced Utility Locating Technologies” and “Characteristics for Successful SHRP2 R01B Pilot Projects” below.
3. Develop guidelines and specifications to integrate the technology in existing utility/design business processes, if the agency chooses to adopt the technologies after successful implementation.
4. Collect subsurface utility data in accordance with the American Society of Civil Engineers (ASCE) 38 standards.
5. Assist the SHRP2 partners perform outreach to agencies highlighting benefits of the R01B product (project support from FHWA consultants).
6. Provide input to the SHRP2 partners and FHWA consultants, so they can develop materials or generic specifications for future users of the R01B products (project support from FHWA consultants).
7. Share lessons learned/peer-to-peer exchange using support from the SHRP2 team (project support from FHWA consultants).
8. Provide updates on the agency’s status of the scope, schedule and budget monthly (project support from FHWA consultants).

Characteristics for Successful SHRP2 R01B Pilot Projects

The following physical characteristics describe what is necessary to pilot the R01B product:

- Sites that are complicated, i.e., road intersections
- Sites where a lot of unknown utilities may be present
- Sites where consequential un-toneable utilities are expected, e.g., large water or gas transmission lines
- Sites with high utility risk:
  - There is a very high consequence from a utility strike
  - Projects with highly consequential design, e.g., bridge piers/footings
- Sites where many test holes would normally be required:
  - Sites where 15' of clearance from metal can be provided, such as parked or moving vehicles
  - Sites that do not have clay soils (Note, the National Resources Conservation Service (NRCS) map is just a guide. Site conditions will probably vary a bit from those maps, especially in more built environments).

Implementing the SHRP2 Advanced Utility Locating Technologies

For the purposes of the SHRP2 implementation of the R01B products, only two advanced utility locating technologies will be explored. The two technologies include Multi-Channel Ground Penetrating Radar (MCGPR) and Time Domain Electromagnetic Induction (TDEMI).The reasoning behind this approach is to limit the pilot testing to the technologies that were successfully researched by TRB and their principle investigators under the SHPR2 program. Please note that agencies may want to consider a broader spectrum of utility locating technologies to compliment the two technologies explained below.

There are two specific types of geophysics that can be utilized for this implementation: Multi-Channel Ground Penetrating Radar (MCGPR) and Time Domain Electromagnetic Induction (TDEMI). Appropriate software will be necessary to process the collected data, and it is anticipated that the SUE providers for the agency will already have the necessary processing software. Half (0.5) foot horizontal spatial accuracy will need to be achieved through standard survey techniques.

There are multiple manufacturers of MCGPR with associated software. For SHRP2 implementation, MCGPR requires a minimum of four coupled sensors, with an approximate range between 200MHZ-800MHZ. Data collected will be at a minimum spacing of a half (0.5) foot. TDEMI surveys must be accomplished by using at least one EM61 or UIT's TEM system or equivalent sensor, and using Oasis Montaj or equivalent software.

Important Limitations and Geophysical Requirements for Implementing the Advanced Utility Locating Technologies

MCGPR and TDEMI each have their own advantages and disadvantages, so knowledge of their capabilities and limitations and types/areas of a project are an important component of project success. Each method has the ability when conditions are favorable to provide information on utilities and other structural elements. Soil and site conditions may eliminate the usefulness of either technique. Please see the soils suitability maps (organized by state) for Ground Penetrating Radar (GPR) suitability on the following link:
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/maps/?cid=nrcs142p2_053622

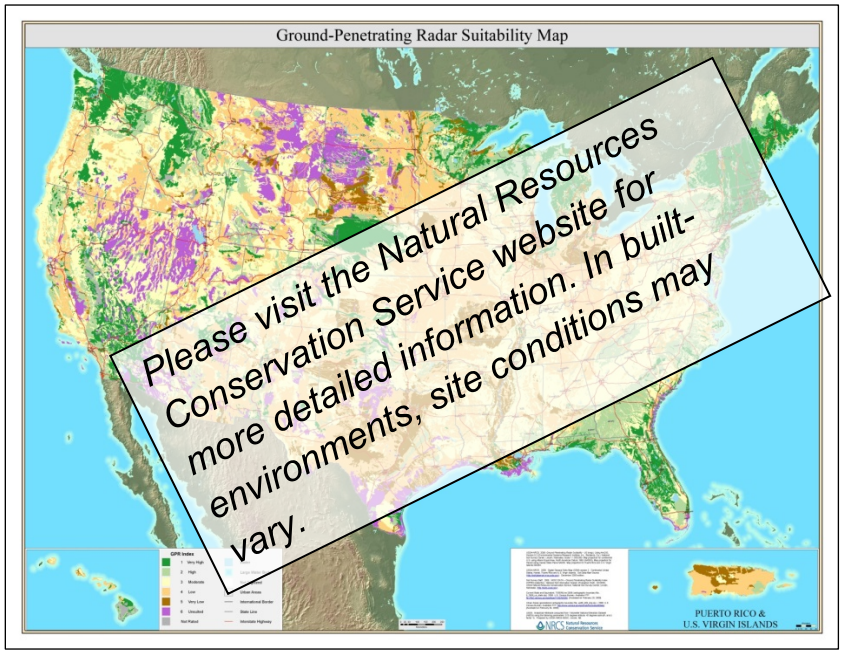

Figure 1. Ground Penetrating Radar Suitability Map.

MCGPR works best in non-clay soils. Clay soils may hinder depth of penetration to mere inches, which has little benefit for this implementation. Other factors hindering depth of penetration are the application of road salts for de-icing, or salty soils near shorelines. Generally flat unobstructed surfaces are best, such as areas of paving/shoulders or flat grassy/dirt areas. MCGPR, when it works, gives a quite reliable depth to the imaged object. Therefore, when the vertical position of a utility or structure is important, MCGPR might be a good tool. Major intersections where utilities are changing vertical and horizontal direction are good project candidates, especially if the project includes new drainage or other structures.

MCGPR also has the ability to image utilities and structures of any type of material. Therefore, if a project area has a good potential for the presence of non-metallic utilities, or abandoned or unknown utilities, MCGPR may be a good choice to augment the traditional utility mapping tools. Some non-utility geotechnical considerations may be of value on a project. Examples include the

presence and extent of rebar, thrust blocks, depth to shallow bedrock, depth to water table, paving/substrate thickness, and pavement voids.

With multiple channels/sensors, MCGPR has the ability to cover more area in less time than single channel GPR. Therefore, MCGPR may have good application in high traffic areas; although traffic control will still be necessary, it may be shorter in duration for the same project coverage than with single channel GPR. When coupled with simultaneous survey, the Maintenance of Traffic (MOT) and subsequent traffic stoppage will be significantly reduced; in many cases to just one pass.

TDEMI will only detect metallic utilities and structures. It can collect data at a faster speed than MCGPR and is not as limited to flat unencumbered surfaces. High voltage electric lines, parked cars, moving cars, dumpsters, metallic fences and other sources of nearby metal or electric current typically within 15 feet will negatively influence the ability to collect meaningful data.

Site Characteristics for MCGPR

- Minimal clay (<50%)
- Where road salt has not made the soils too conductive
- Where road base does not include mineralized materials such as iron slag
- Where trenches were not backfilled with flowable fill
- Where surface access allows for adequate coverage by instruments
- Where MOT can be used effectively to allow appropriate access
- Where surface conditions are minimally sloped and vegetation and surface obstructions can be removed, if necessary

Site Characteristics for TDEMI

- Most any soil condition is okay
- Sites with dense roadway rebar can be a problem
- Metallic utilities only, but do not have to hook them
- Metal could be within reinforced concrete pipe or concrete cylinder pipe
- Ductile iron and cast iron pipes are good targets
- When pipes are too close together, they often cannot be distinguished
- Surface features that are metal can contaminate the signal if too close to the utilities being sought (best if >15 ft.)
- Important un-toneable pipes
- Rebar mapping as a result

Things to Consider Prior to Completing an Application

- Please keep applications concise and succinct – estimate roughly 2,500 words. Please do not copy and paste portions of reports.
- SUE providers are a major stakeholder in locating subsurface utilities. Therefore, the applicants are being required to reach out to their SUE provider in advance of submitting an application. Please include in your application a description of the coordination efforts with the agency's SUE providers.
- Include in the application the full breakdown of financial assistance being requested. The cost breakdown should include: the cost of SUE providers to pilot the 1-2 advanced utility locating technologies, cost of evaluating the R01B technologies in comparison to the

agency's conventional methods, training, outreach, case studies, etc. As described above, please note that all agencies may not be well-suited for implementing these advanced utility locating technologies due to geophysical limitations. Applicants will be required to describe the pilot project characteristics that make it a successful candidate.

- Beyond the financial incentives being offered, the applicant should explain what type of assistance would be needed by the agency. Or if the agency only needs some technical assistance and not financial assistance, please let us know.
- The following types of agencies are encouraged to apply: State Departments of Transportation (DOTs), State Tollway and Thruway authorities, local agencies and tribal agencies.
- Local agencies and toll agencies will ultimately receive funding through FHWA division office allocations to State Departments of Transportation. Therefore, applicants must coordinate with their State DOTs and receive their endorsement when submitting an application.
- If an agency is submitting multiple SHRP2 applications, the endorsement letter should rank the priority of the potential awards for their agency.

What Type of Technical Assistance Support Will FHWA Consultants Provide Through R01B IAP?

Technical Assistance from independent consultants working for FHWA will help agencies with utility-related questions, IT questions and support, and help with the other items bulleted below. (Awardees would not be required to cover these costs using their allocations.) Direct funding to support time for staff and/or contractors to implement the products (test, evaluate, and based upon result, adopt) would also be provided based upon the need outlined in the scope of the application. The following bullets outline the technical assistance support agencies may request:

- Subject Matter Expert (SME) support implementing the product, not including procuring SUE providers.
- Project support for status meeting facilitation, note taking, lessons learned/peer to-peer-exchanges, etc.

Why Do Applicants Need to Prepare a Scope of Work and Estimated Cost?

- The evaluation of an application will be easier if it contains complete information for how the agency will implement the R01B product into existing business processes.
- The cost estimate is necessary to help us determine the level of funding we can provide each applicant. Funding will vary for each applicant, based upon their needs, and based on available funding.

Please note the following:

1. For the general cost estimate of how the awarded funding would be used by the agency, please consider aligning the tasks and deliverables of the scope with their associated cost, and anticipated start date (assuming an estimated award date of August 3, 2015). Please consider attaching a simple table or Gantt chart with your application, if that is less burdensome on your agency.

2. Technical Assistance from independent consultants working for FHWA will help agencies with utility-related questions, IT questions and support, and assistance with setting up meetings, taking notes, developing case studies and marketing materials, etc. (Awardees would not be required to cover these costs using their allocations).

Please note: The full implementation of the product should be done within a 3-year time period from the start of the funding allocation date.