



SHRP2 Round 7

Implementation Assistance Program Webinar

Utility Bundle (R01A, R01B, R15B)

March 8, 2016



U.S. Department of Transportation
Federal Highway Administration

AMERICAN ASSOCIATION
OF STATE HIGHWAY AND
TRANSPORTATION OFFICIALS

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Agenda

- SHRP2 overview
 - SHRP2 at a glance
 - Focus areas
 - Implementation assistance
- Product overview
 - *3D Utility Location Data Repository (R01A)*
 - *Utility Locating Technologies (R01B)*
 - *Identifying and Managing Utility Conflicts (R15B)*
- Implementation assistance opportunities
- Implementation timeline
- Questions



SHRP2 at a Glance

- **SHRP2 Solutions** – 63 products
- **Solution Development** – processes, software, testing procedures, and specifications
- **Field Testing** – refined in the field
- **Implementation** – 350 transportation projects; adopt as standard practice
- **SHRP2 Education Connection** – connecting next-generation professionals with next-generation innovations



Focus Areas



Safety: fostering safer driving through analysis of driver, roadway, and vehicle factors in crashes, near crashes, and ordinary driving



Reliability: reducing congestion and creating more predictable travel times through better operations

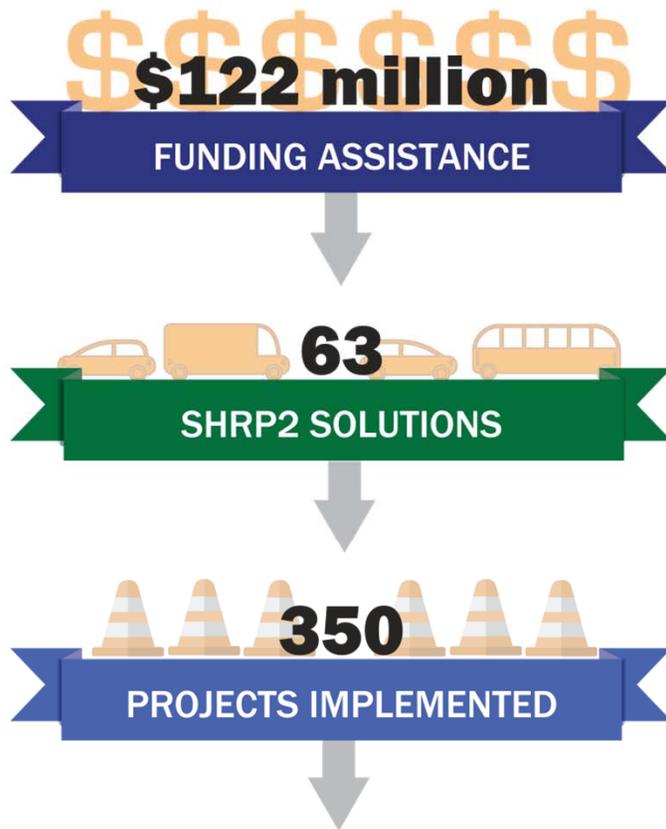


Capacity: planning and designing a highway system that offers minimum disruption and meets the environmental and economic needs of the community

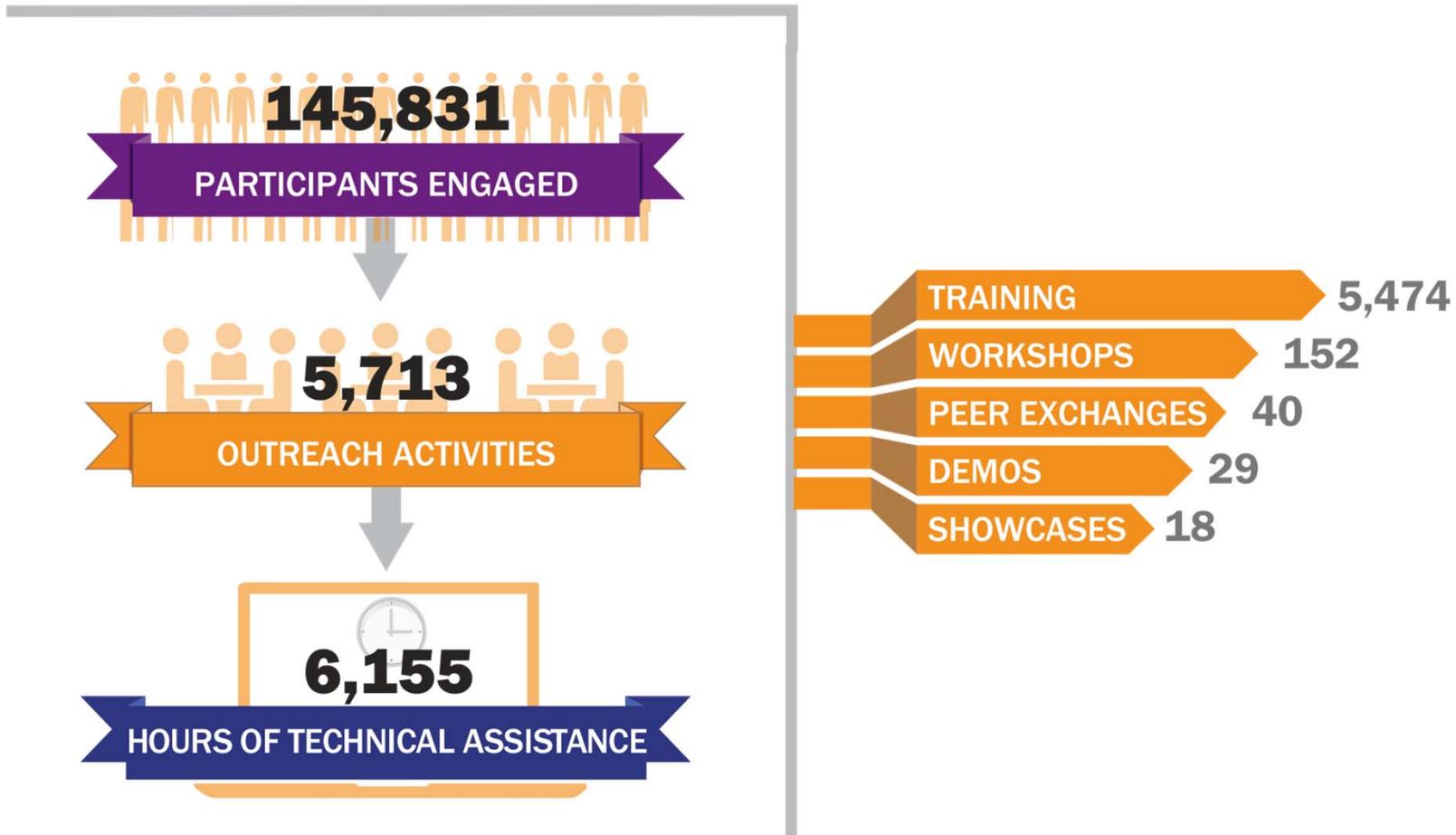


Renewal: rapid maintenance and repair of the deteriorating infrastructure using already-available resources, innovations, and technologies

SHRP2 Implementation: Moving Us Forward



SHRP2 Implementation: Moving Us Forward



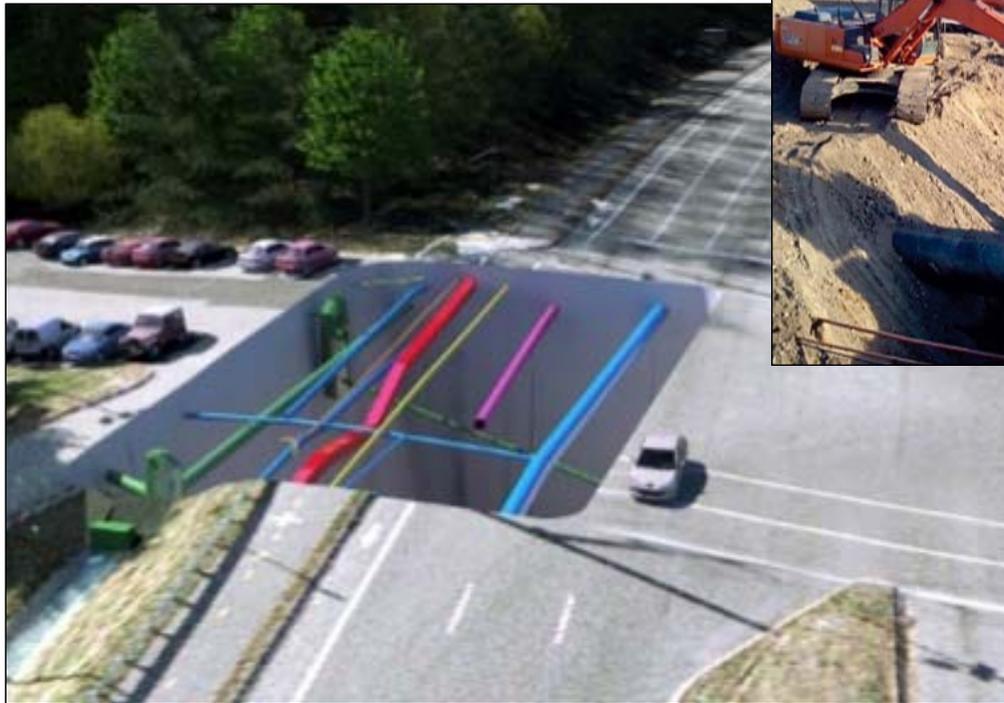
SHRP2 Implementation Assistance Program

- Designed to help State DOTs, MPOs, local agencies, and other interested organizations deploy SHRP2 Solutions.

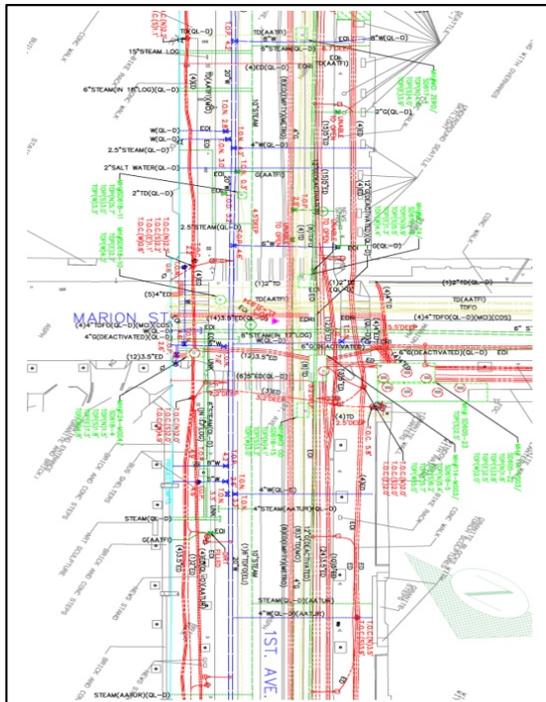
Proof of Concept Pilot	Lead Adopter Incentive	User Incentive
To evaluate product readiness.	To help offset costs associated with product implementation and risk mitigation.	To support implementation activities, such as conducting internal assessments, changing processes, and organizing peer exchanges.

Utility Bundle (R01A/R01B/R15B)

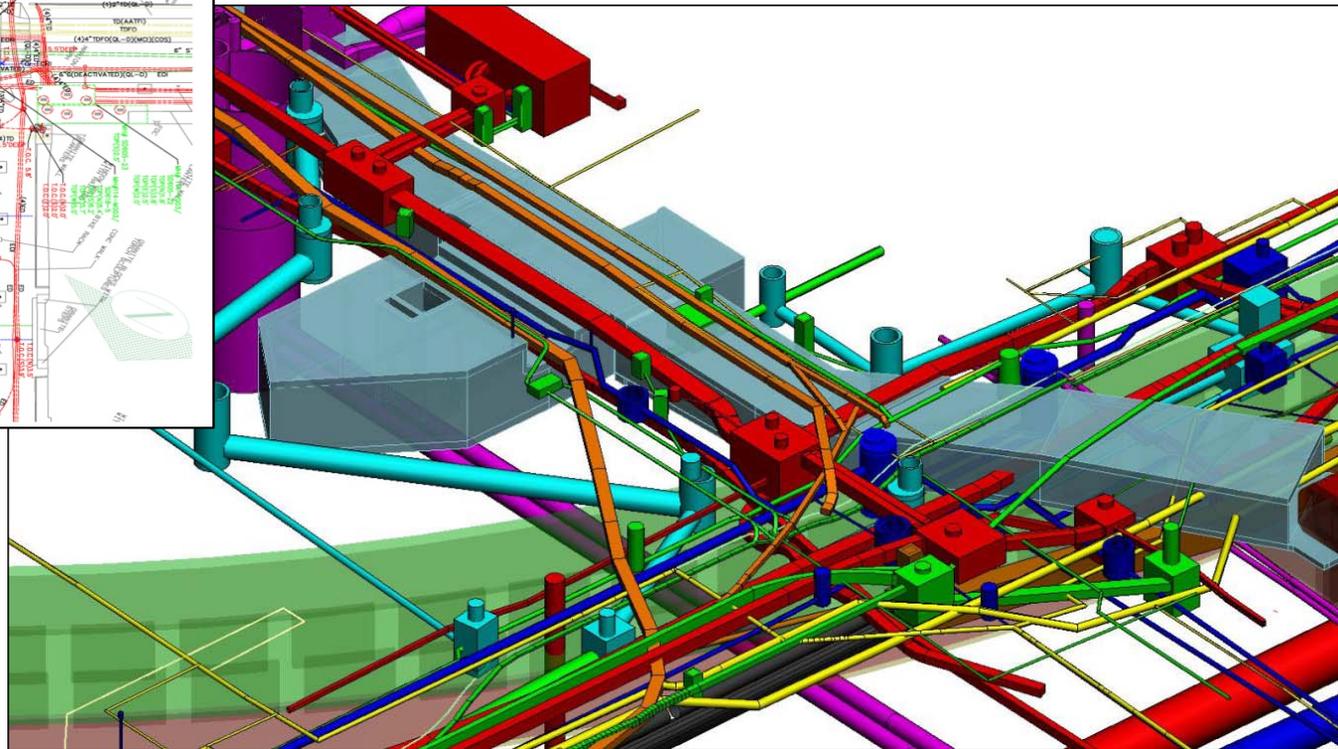
Challenge: Locating and Managing Utilities



3D Utility Location Data Repository (R01A)



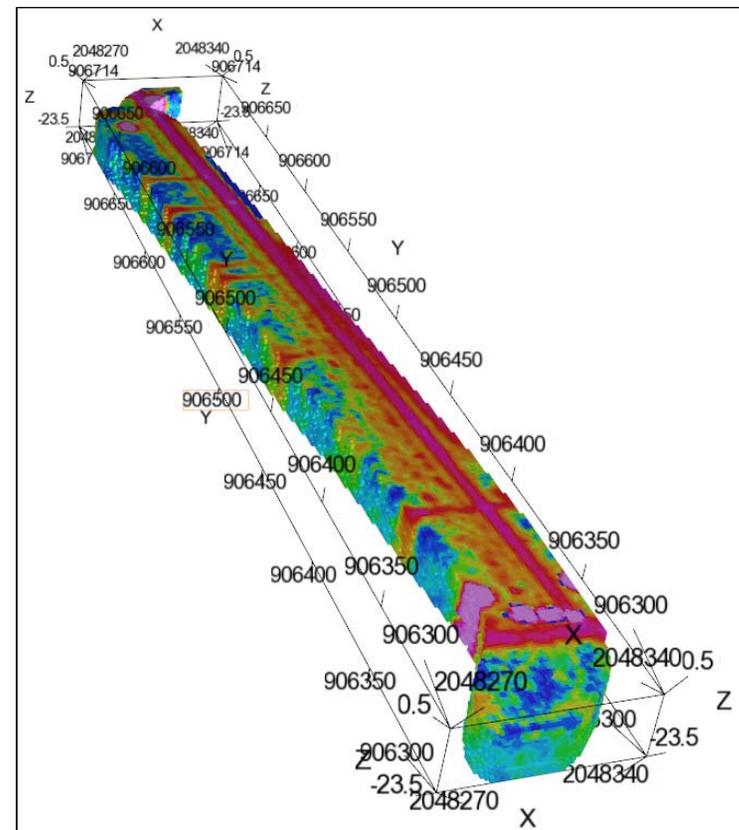
Moving from 2D to 3D utility management.



Utility Locating Technologies (R01B)

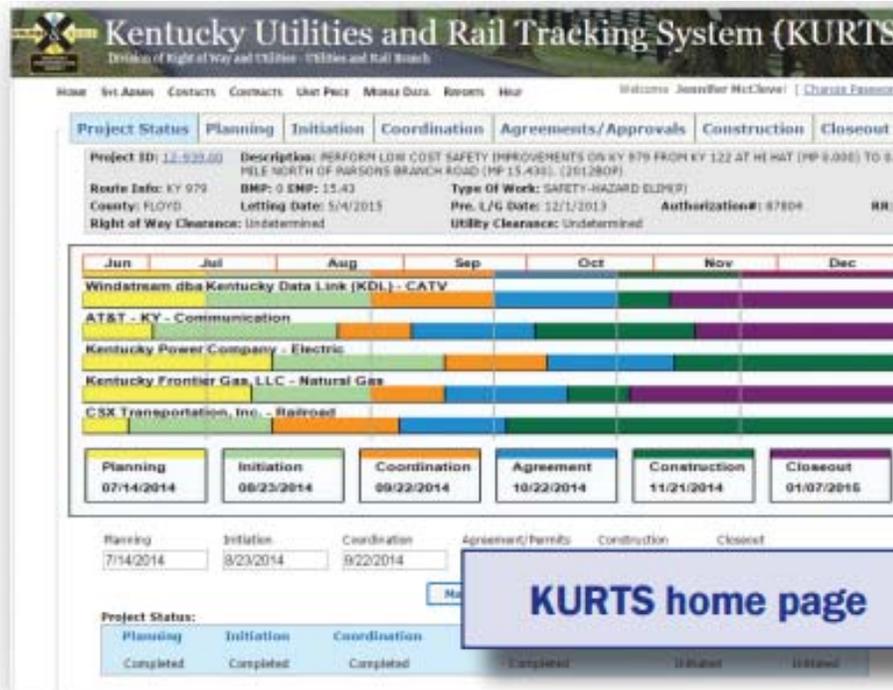


TDEMI and MCGPR for 3D Utility Location



Identifying and Managing Utility Conflicts (R15B)

Managing Utility Conflicts Ahead of Construction





3D Utility Location Data Repository (R01A)

Cesar Quiroga
Senior Research Engineer
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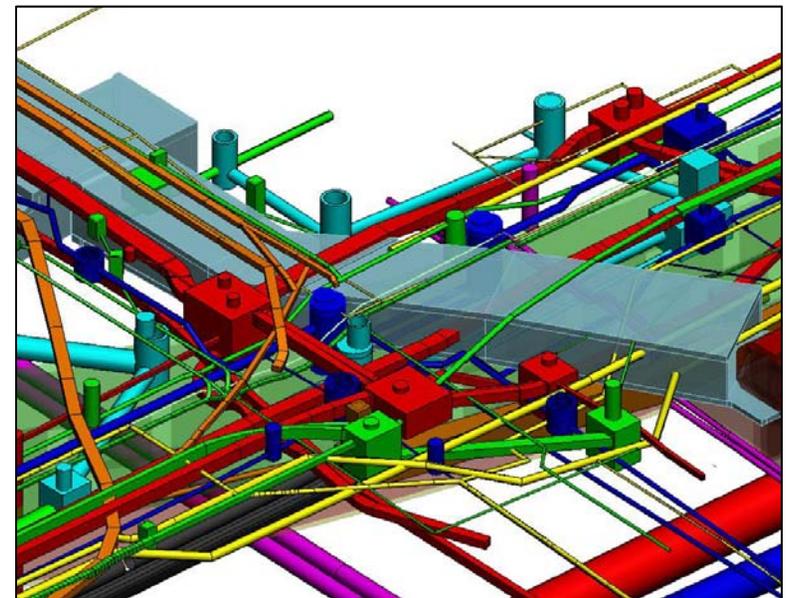
3D Utility Location Data Repository (R01A)

Challenge

- A critical factor that contributes to utility inefficiencies is the lack of adequate information about the location and attributes of utility facilities that might be affected by a transportation project. This challenge is more significant as transportation agencies migrate to 3D design and construction workflows.

Solution

- R01A's 3D storage/retrieval data model as well as parallel initiatives (e.g., FHWA 3D utility research, ASCE data standards, some state DOTs) provide the framework to help agencies develop 3D repositories of utility location and attribute data.



2D Utility Mapping

- Utility location services: X, Y
- Test holes at specified locations: Z (X, Y if surveyed)
- American Society of Civil Engineers (ASCE) /CI 38-02 Standard Guideline:
 - Quality Level D: Review of existing records: X, Y
 - Quality Level C: Survey of visible appurtenances: X, Y
 - Quality Level B: Geophysical methods for underground utilities: X, Y
 - Quality Level A: Exposed utilities at specified locations: X, Y, Z
 - » Test holes
 - » Valves
 - » Manholes
 - » Vaults
 - » Building basement walls

GPR and EMI Arrays

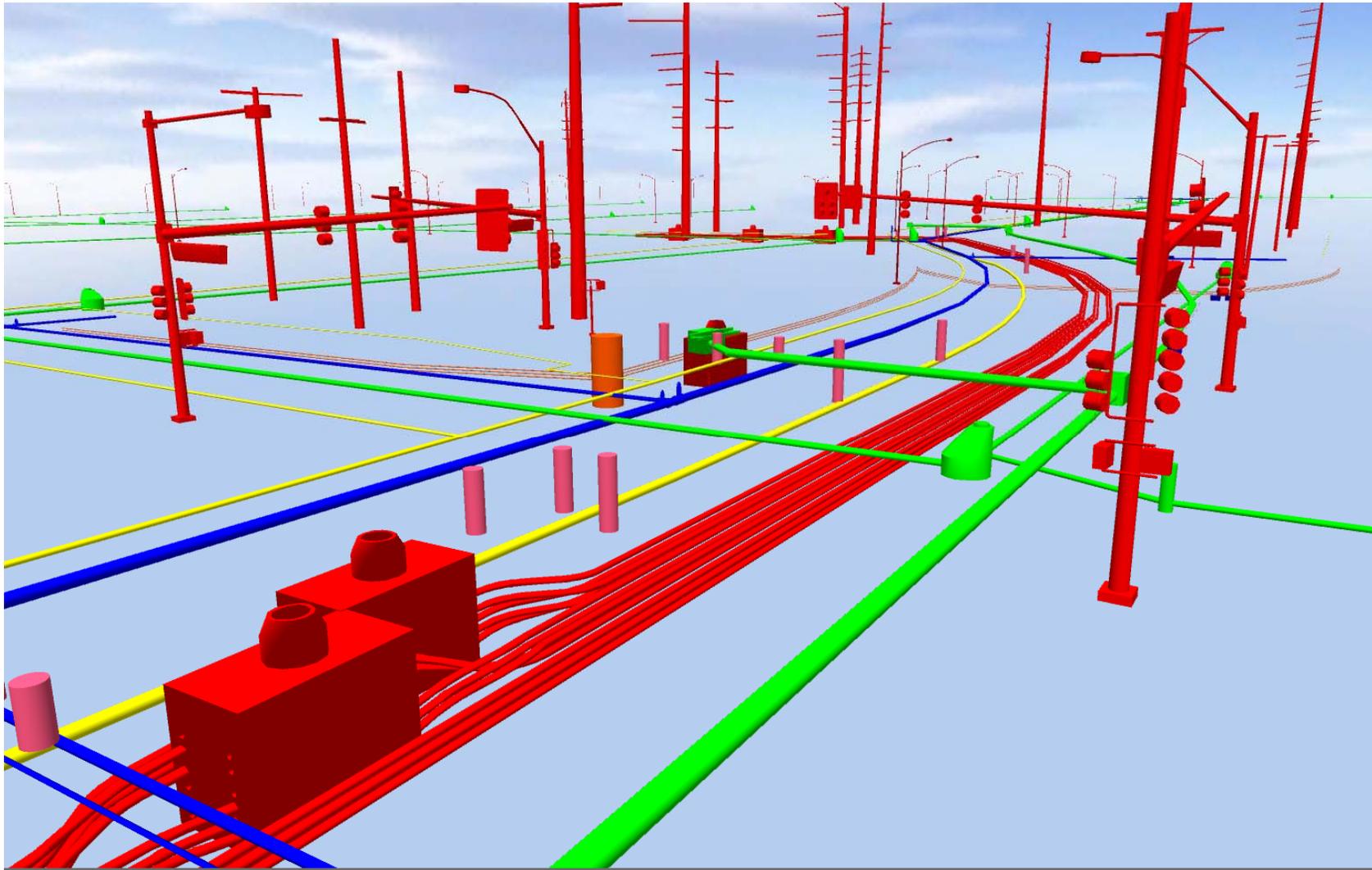
GPR array



EMI array



3D Model of Existing Facilities



R01A 3D Utility Data Model

Field (Property)
LABEL
DESCRIPTION
COMMENTS
UTILITYOWNER
GASNETWORKTYPE
GASNODETYPE
QUALITYLEVEL (ASCE 38)
OPERATIONALSTATUS
INVESTIGATIONLEVEL
CONFLICTID
RESOLUTION
RESOLUTIONSTATUS
DATEINSTALLED
DATECHANGED
SOURCEFILE
SITEID

General Properties

Utility-specific Properties

Data Relationships, Quality, & Conflict Resolution Properties common to all features

Field (Property) [cont.]
OBJECTID
UTILITYNODETYPE
FITTINGTYPE
VOLUMETYPE
NODESHAPETYPE
LENGTH
WIDTH
HEIGHT
ELEVATION
ELEVATIONACCURACY
BOTTOMDIAMETER
TOPDIAMETER

Civil Design-specific Properties

Recent FHWA Research Project

- Research Contract DTFH61-12-C-00025, *Feasibility of Mapping and Marking Underground Utilities by State Highway Agencies*
 - Feasibility of having SHAs as the central repository of utility data within the state highway right-of-way
 - Potential benefits of having accurate utility data available during project development and delivery
 - Barriers for collecting and managing utility location data, as well as strategies to overcome those barriers
 - Cost to manage 3D utility location data and mark utilities with RFID technology

Case Studies

- California: Data model, 3D modeling, 3D utility inventory
- Connecticut: Guidelines for use of 3D in projects
- Florida: Radar tomography for 3D utility mapping
- Iowa: 3D for design and grading and paving AMG
- North Carolina: data collection costs, 3D visualization
- ➔ • Texas: 3D for design and construction, utility conflict
- ➔ • Virginia: RFID for utility monitoring and inventory
- ➔ • Washington State: 3D for design and visualization
- Wisconsin: 3D utility data collection

3D utility model and utility conflict resolution:

- Review all previous utility information, including Quality Level B data.
- Collect additional Quality Level B and Quality Level A data.
 - New utility installations on the ground after bidding.
- Strengthen utility permitting process.
 - PE signature and seal required.
 - Field inspection and surveying required.
- Build 3D utility model and integrate into main 3D model.
- Conduct “hard” and “soft” clash detections.
- Use UCM approach from SHRP2 R15B.

Washington State – WSDOT

Process to develop 3D utility model:

- Calculate spot utility elevations from data gathered at points such as vaults, valves, basements, and records
- Use subject matter experts to estimate depths between spot locations
- Develop 3D utility model
- Collect QLA data at critical locations
- Update 3D utility model as needed

Virginia – VDOT

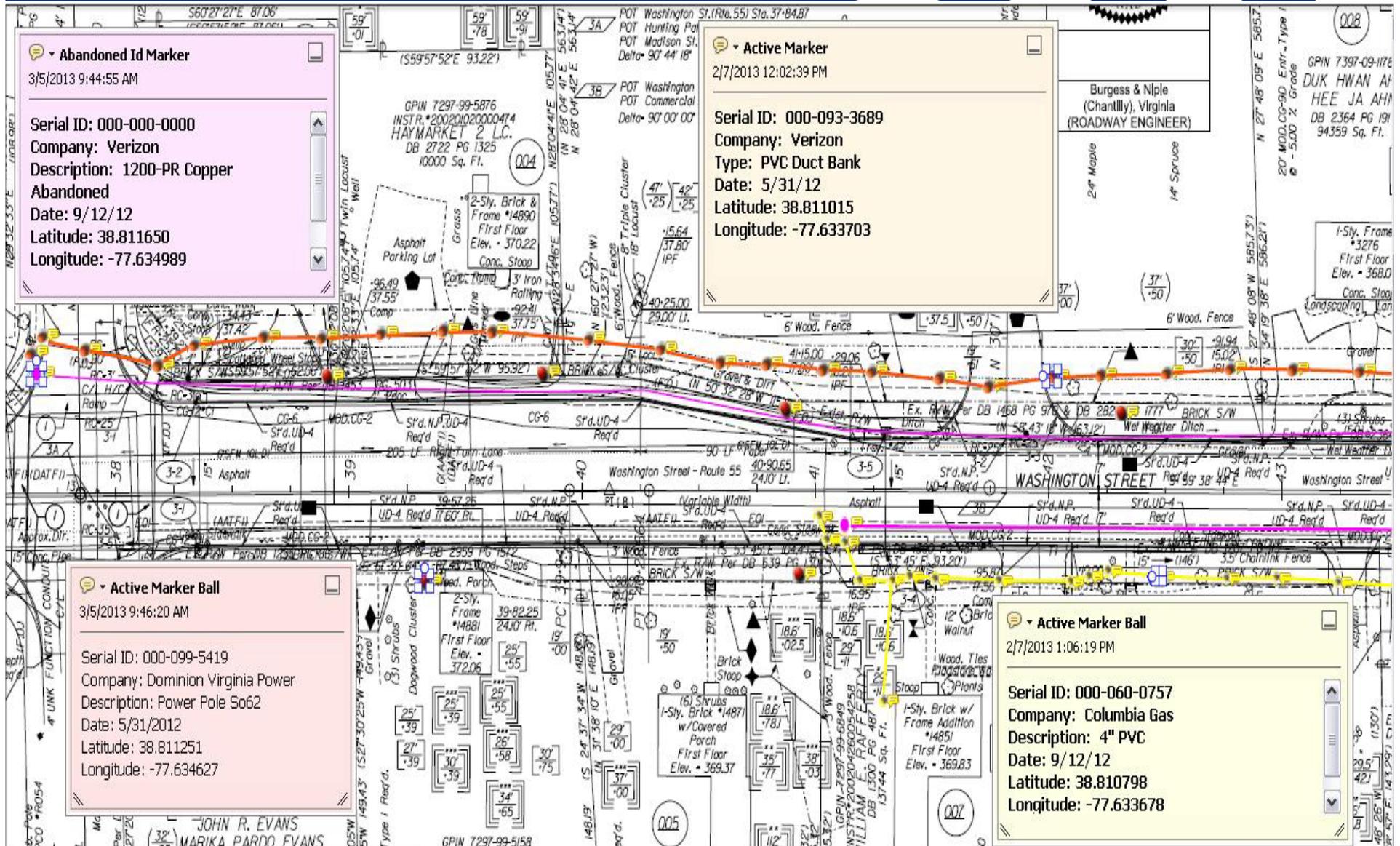
Radio frequency identification (RFID) marker implementation:

- Mainly at VDOT's Northern Virginia District
 - 40% of construction projects at VDOT
- Some at Fredericksburg District
- Purpose:
 - Damage prevention
 - Evolved to support utility asset inventory and management
- Motivation:
 - Changes to utility installations after initial Quality Level B investigation
 - Changes to VDOT's own underground installations

Virginia – VDOT



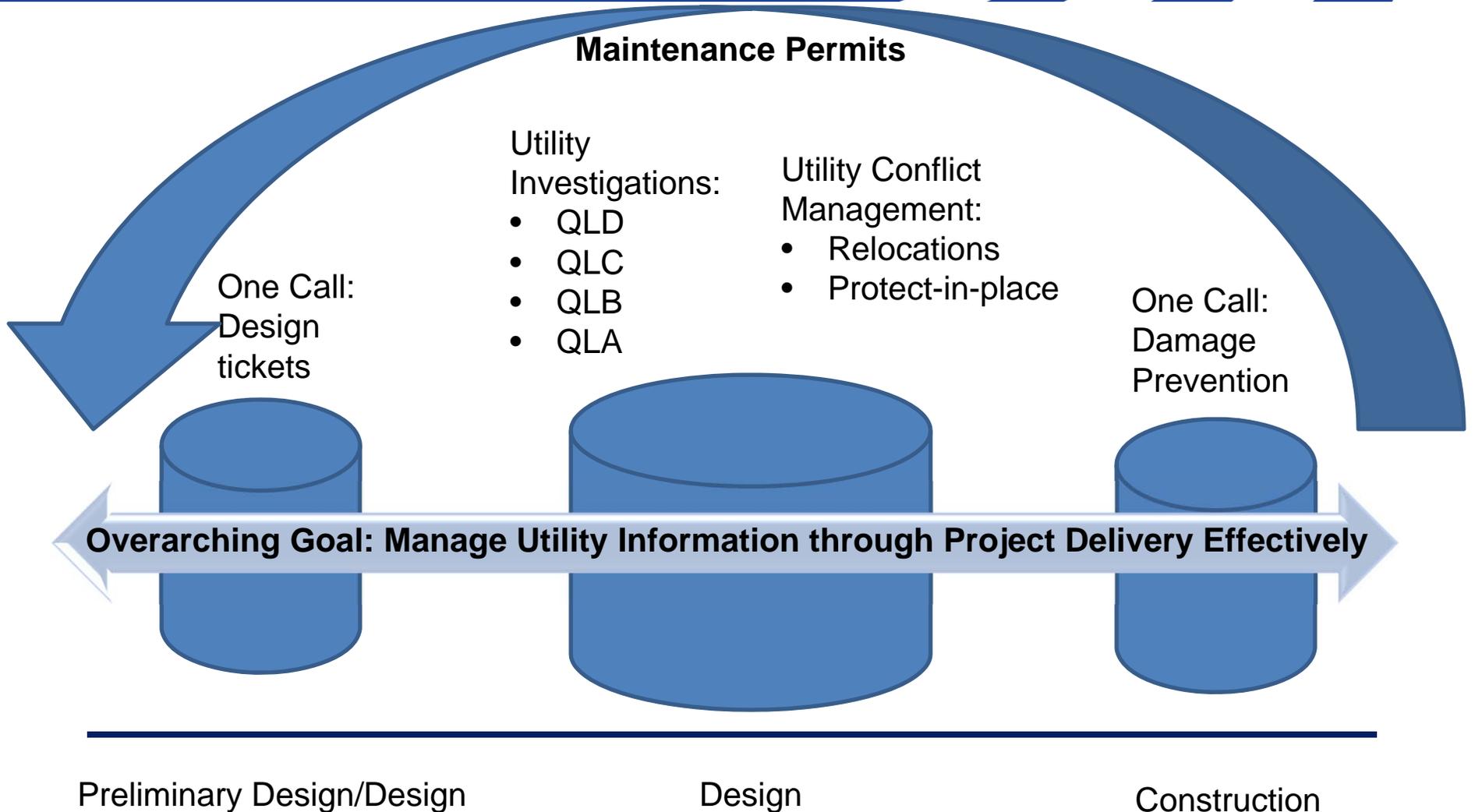
Virginia - VDOT



Virginia – VDOT



Effective Utility Data Management



American Society of Civil Engineers (ASCE) Standards

- ASCE 38
 - Industry standard for collection and depiction of utility data
 - Focus on process to collect data about existing installations
 - Focus on underground facilities
 - Current version: ASCE/CI 38-02
 - Update expected later in 2016
- ASCE Utility “As-Built” Data Standard
 - Currently under development
 - Expected release later in 2016
 - Focus on new or exposed utility installations
 - Covers both underground and aboveground facilities
 - Focus on positional accuracy and attribute data

Positional Accuracy Requirements

Level	Positional Accuracy ¹	Applies to	Comment
1	±15 mm (±0.05 feet) Vertical	Z data	Coincides with requirements in ASCE 38 quality level A (QLA)
	±50 mm (±0.2 feet) Horizontal	X and Y data	
2	±50 mm (±0.2 feet)	X, Y, and Z data	
3	±150 mm (±0.5 feet)	X, Y, and Z data	
4	±300 mm (±1 foot)	X, Y, and Z data	
5	±1000 mm (±3+ feet)	X, Y, and Z data	
6	±1000 mm (±3+ feet)	X and Y data	Positional accuracy of the Z data is unreliable or not available
9	Indeterminate		Positional accuracy of the X, Y, and Z data is indeterminate.

¹ At the 95% confidence level, using the root-mean-square error (RMSE) in accordance with FGDC-STD-007.3-1998.

- Level 1 is designed specifically to match up with QLA as defined in ASCE 38.
- Level 2 is substantially identical to Level 1, but removes the close tolerance on vertical methods and thus can be generally achieved without the need for survey bench leveling.
- Level 3 is generally possible using GPS equipment and RTK methods.
- Level 4 is provided as an additional breakpoint between levels 3 and 5.
- Level 5 is generally achievable by post-processed mapping grade GPS equipment.

Feature Classes and Attributes

GIS Feature Class	Geometry	id	utilityType	deviceType	material	matterConveyed	conveyancePurpos	conveyanceMethod	diameter	length	width	height	owner	instDate	isCathProt	isEncassed	descrip	providerDef	X	Y	Z
Communications																					
CommDuct	LineString	x	x		x		x		x	x	x	x	x	x			x	x			
CommLine	LineString	x	x		x		x		x	x			x	x		x	x	x			
CommDevice	Point	x	x	x			x							x			x	x	x	x	x
Electric																					
ElecDuct	LineString	x	x		x		x		x	x	x	x	x	x			x	x			
ElecLine	LineString	x	x		x		x		x	x			x	x		x	x	x			
ElecDevice	Point	x	x	x			x							x			x	x	x	x	x
Gas																					
GasLine	LineString	x	x		x	x	x		x	x			x	x	x	x	x	x			
GasDevice	Point	x	x	x		x	x							x			x	x	x	x	x
Fuel																					
FuelLine	LineString	x	x		x	x	x		x	x			x	x	x	x	x	x			
FuelDevice	Point	x	x	x		x	x							x			x	x	x	x	x
SanitarySewer																					
SanitaryLine	LineString	x	x		x		x	x	x	x			x	x	x	x	x	x			
SanitaryDevice	Point	x	x	x			x	x						x			x	x	x	x	x

Round 5 Implementation Awards

- Lead Adopter incentives
- Up to \$400,000 for technical and funding assistance
- Began in late 2015
- Five state DOTs received awards:
 - California Department of Transportation
 - District of Columbia Department of Transportation
 - Kentucky Transportation Cabinet
 - Texas Department of Transportation
 - Utah Department of Transportation



Utility Locating Technologies (R01B)

Phil Sirles

Chief Operating Officer and Principal Geophysicist
Olson Engineering



U.S. Department of Transportation
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Utility Locating Technologies (R01B)

Challenge

- Locating utilities (in 3D) to meet Quality Level B standards
- Understanding the technologies and how geology affects them
- Determining your agency's desire – in-house or IQ contract(s)
- Progressing from traditional SUE technologies
- Accepting when, where and how to apply advanced geophysical technologies

Solution

- Round 7 IAP for the R01B product will take a two-step process: Training and Demonstration and Project Evaluation; confirmed with Quality Level A methods.

R01B Implementation - Outline

1. Traditional multi-sensor systems
2. Summarization of the technologies developed for implementation
 - a. Definitions
 - b. Instrumentation
 - c. Software
3. Benefits of implementation
 - Benefits beyond utilities
4. Site parameters/geologic implications
5. Examples of: Merging data and GPR deployment
6. Round 6 Status

Traditional Multi-Sensor/ Technology Toolbox



GPR



RF Locators

Many types of systems:

- ✓ Radio-Frequency (RF)
- ✓ Electromagnetic Induction (EMI)
- ✓ Ground Penetrating Radar (GPR)
- ✓ Magnetometers (Mag)
- ✓ Acoustic sensors
- ✓ Inertial mapping inside pipes
- ✓ Use of sondes inside pipes



RTS & GPS Systems



**V
A
C
-
E
X**

Technologies Developed

Advanced Geophysical Hardware

- Multi-Channel Ground Penetrating Radar (MCGPR)
- Time-Domain Electromagnetic Induction (TDEMI)

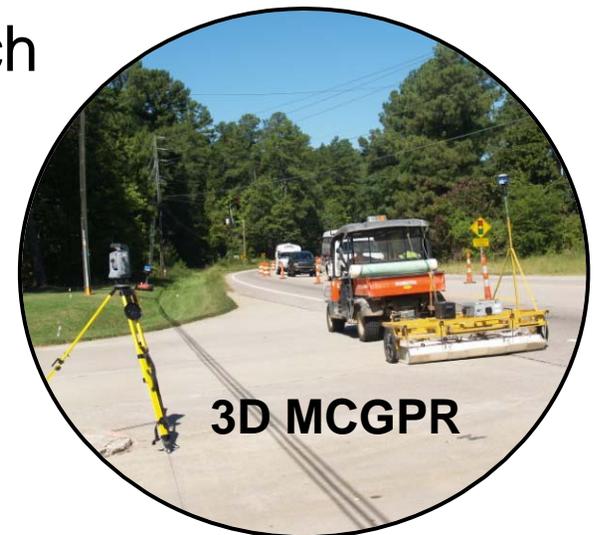
Advanced Software

- Software for processing, interpretation and visualization of MCGPR and TDEMI data in **3D**

Definitions for MCGPR

Multi-Channel GPR

- “Multi”-channel hardware is a minimum of 4 antennas
- Multiple/variable frequency antennas
- Frequencies between 200 to 800 MHz
- Hardware to receive concurrent position control
- Scans every 6-square inches with 6-inch positional accuracy
- Compatible software to field unit output



Instrumentation for MCGPR

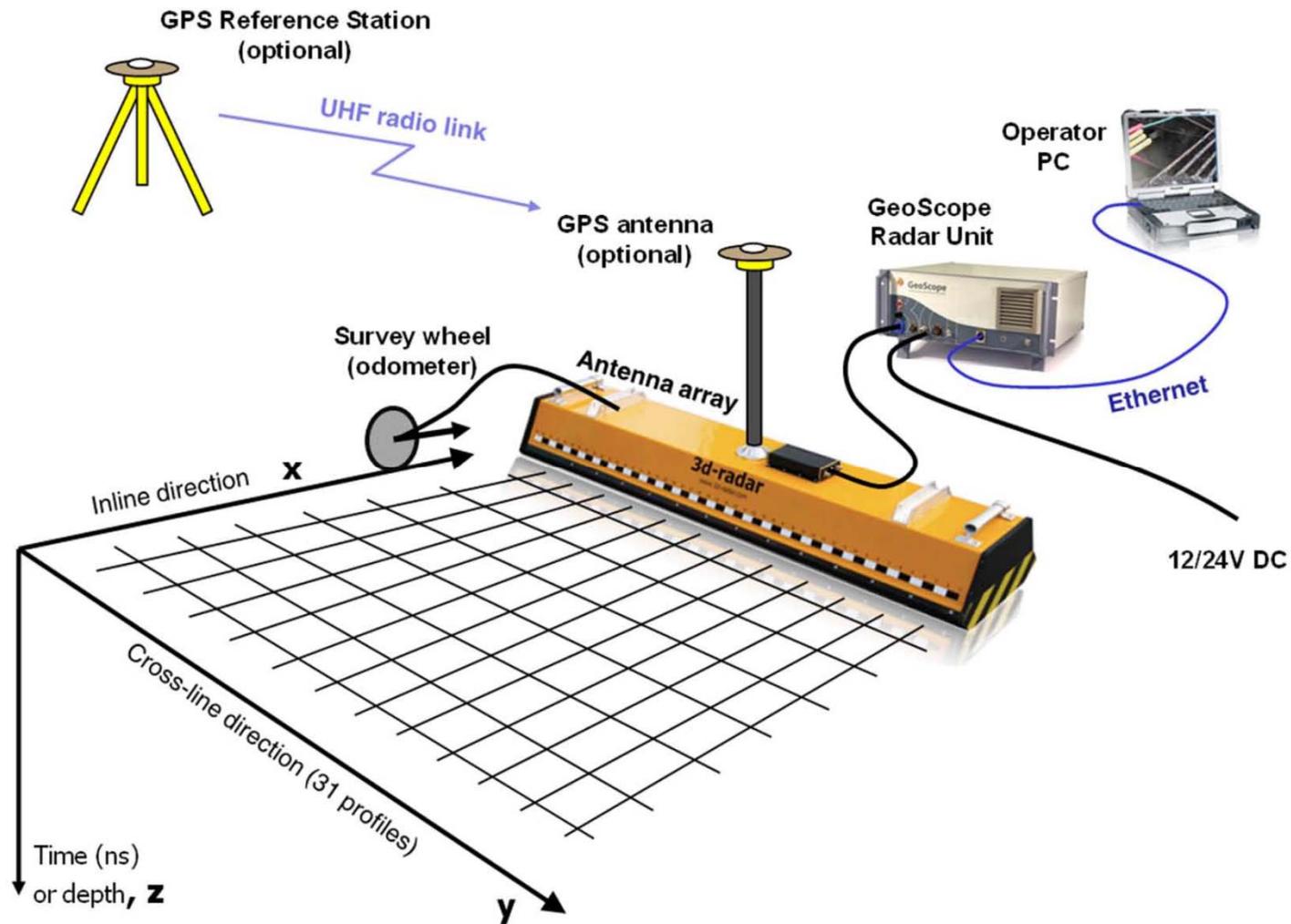
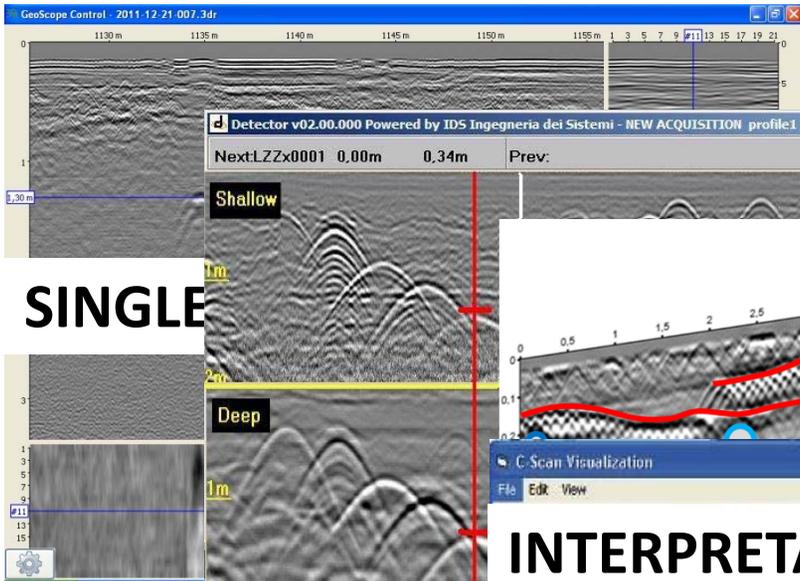


Image from www.3d-radar.com

Instrumentation for MCGPR

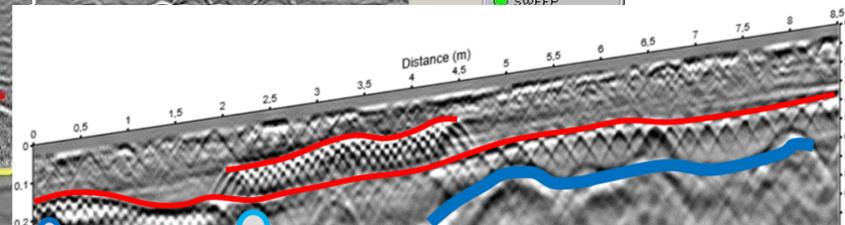


Software for MCGPR

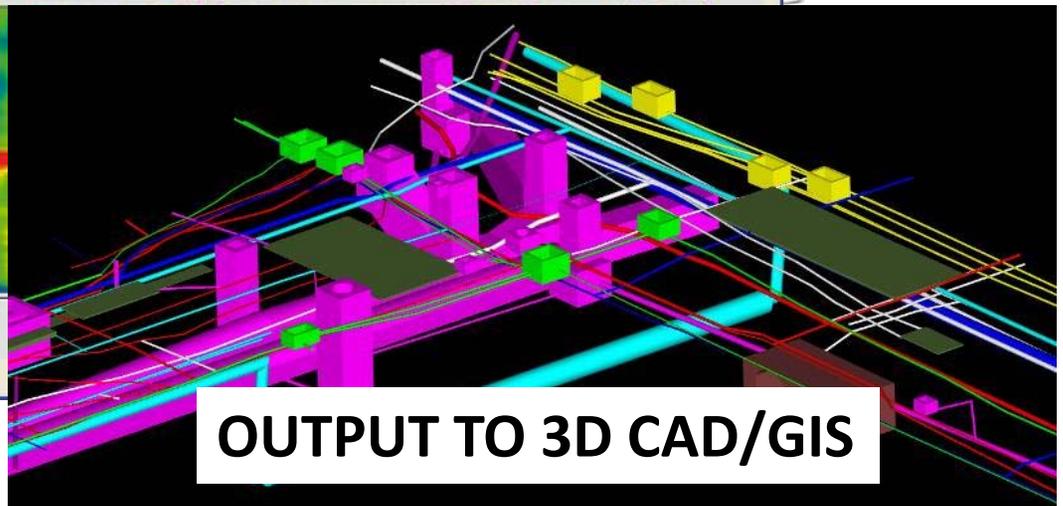
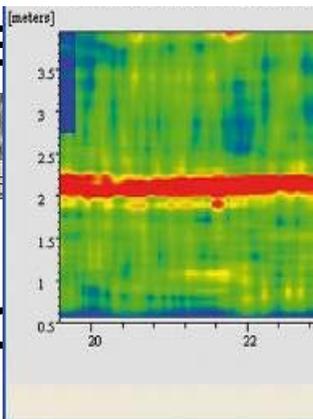


SINGLE

COMPLE



INTERPRETATION OF SCANS – PLAN VIEW



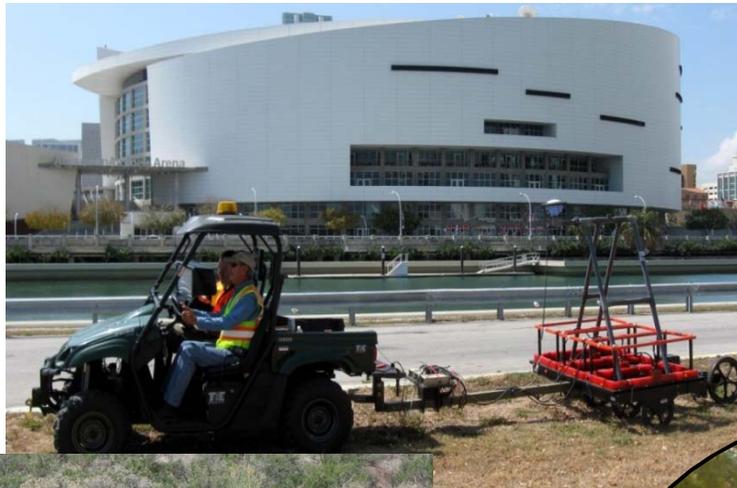
Definitions for TDEMI

Time-Domain Electromagnetic Induction

- A multi-coil system with synchronized sensors
- Instrumentation must receive concurrent position control (i.e, GPS or RTS)
- System adjustable/variable time gates for sampling
- Less than 12-inch positional accuracy
- Software compatible with specific unit

Instrumentation for TDEMI

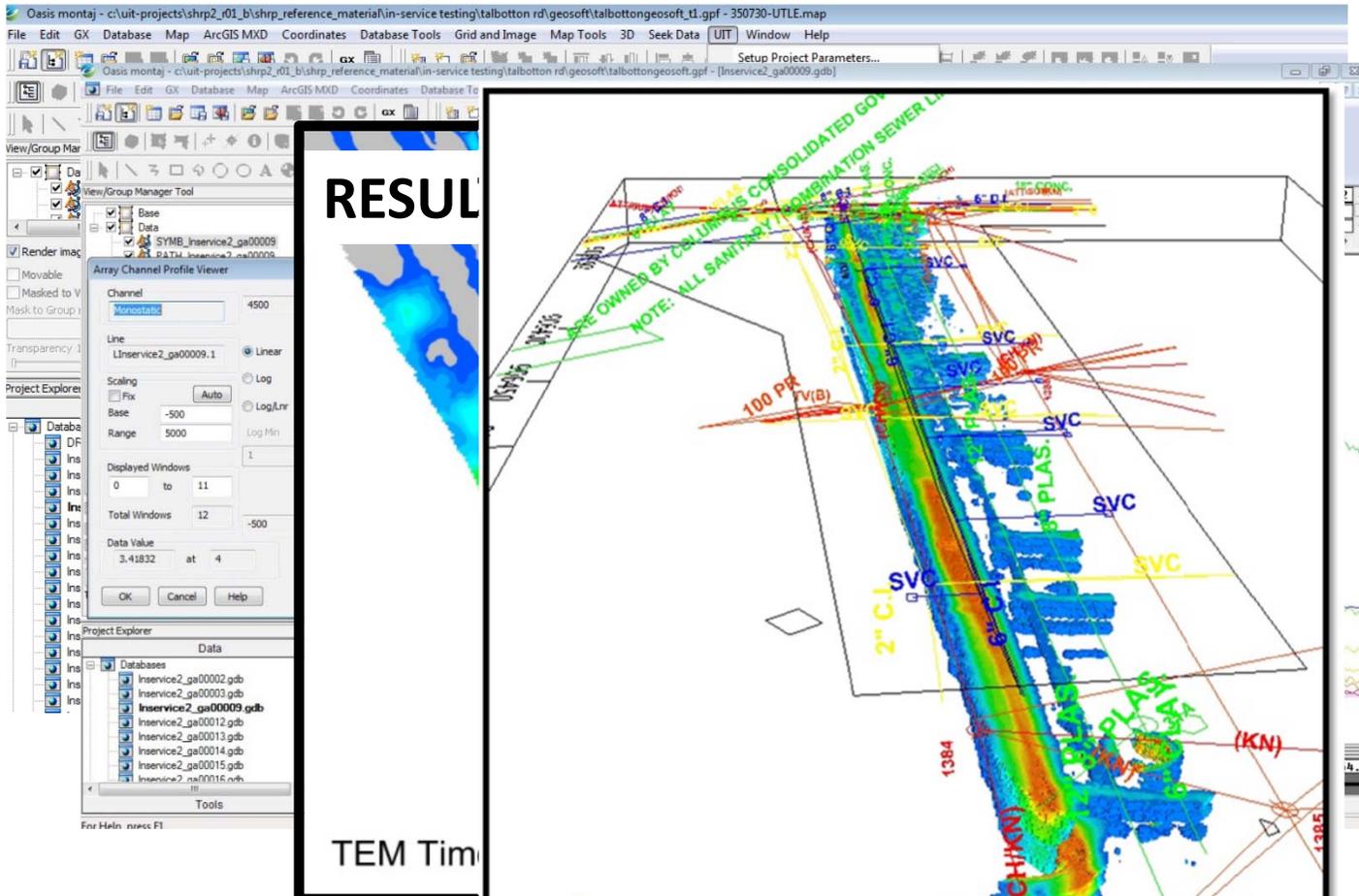
- Commercial TDEMI systems (*multi-coil array w/ GPS*)
- Commercial Software (*database management*)



Advanced TDEMI Systems



Software for TDEMI



RESULTS – INTEGRATED WITH RECORDS

Benefits of Implementation

- **Develop more “complete” digital and 3D utility maps**
 - Traditional geophysical technologies used on SUE projects can normally find about 80% of buried utilities (*mostly in plan*)
 - Advanced geophysical technologies may help get the remaining utilities imaged, and help interpretation of existing detects
 - Lines not on the records/no surface appurtenances
 - Plastic lines with no tracer
 - Help to separate intricate networks using 3D imaging
- 3D GPR: foot-by-foot ***depth information***
- TDEMI: very accurate ***plan-view information***
 - Works in clay-rich soils

Technology Benefits Beyond Utilities

MCGPR & TDEMI as geophysical technologies

- Map buried structures and obtain geotechnical information
 - Vaults and duct banks
 - Foundations for old structures
 - Old RR structures and “facilities”
 - Bridge foundation and thrust blocks
 - Pipe trenches
 - Environmental hazards
 - Voids/Karst
 - Soil layering
 - Soil/Bedrock interface
 - Bedrock geometry

Implementation Parameters

What sites should the “advanced geophysical technologies” be used?

- Larger projects
- Complicated projects
- Lots of unknown utilities
- Consequential un-toneable utilities are expected
- Sites with high utility risk
- A lot of pot-holing would be required
- Projects with highly consequential & complex design needs

Site Parameters (MCGPR)

What are limiting site conditions for MCGPR?

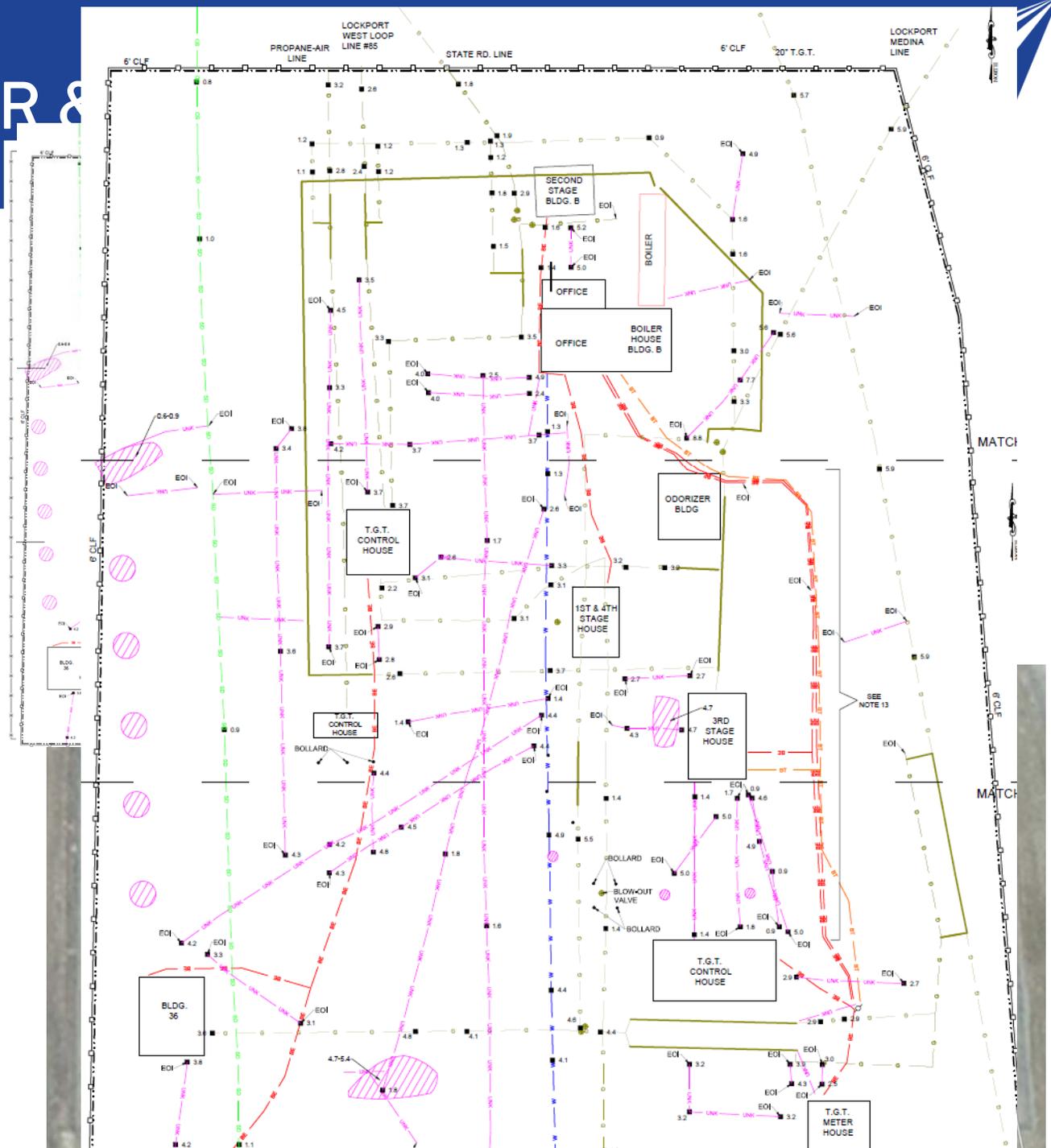
- Sites where:
 - The soils have greater than 20% to 30% clay.
 - The application of road salt has made the subgrade conductive.
 - The road base includes mineralized materials.
 - Trenches were backfilled with flowable-fill or clayey material.
 - The surface access does not allow for adequate coverage.
 - TCP's that must be in place to provide safe access, become prohibitive.
 - The surface conditions (e.g., slopes, vegetation, obstructions etc.) cannot be changed.
- The common approach is to make test runs with a portable, single-channel GPR system to ensure adequate signal response, as well as to determine the maximum depth of penetration.

Site Parameters (TDEMI)

What are benefits and limitations for TDEMI?

- Works in any soil conditions.
- RCP or other metal pipes are easy targets.
- Ductile iron and cast iron pipes are easy targets.
- Metallic (ferrous or non-ferrous) utilities only.
- Induction (!)
- Important un-toneable pipes.
- Rebar and other reinforcement can effect data (>but can be mapped!)
- Sites with **dense** rebar in the roadway will be a problem.
- No vehicles or guardrails within ~15 feet.
- When pipes are too close together, it is difficult to distinguish 1 by 1.

Merging MCGPR &

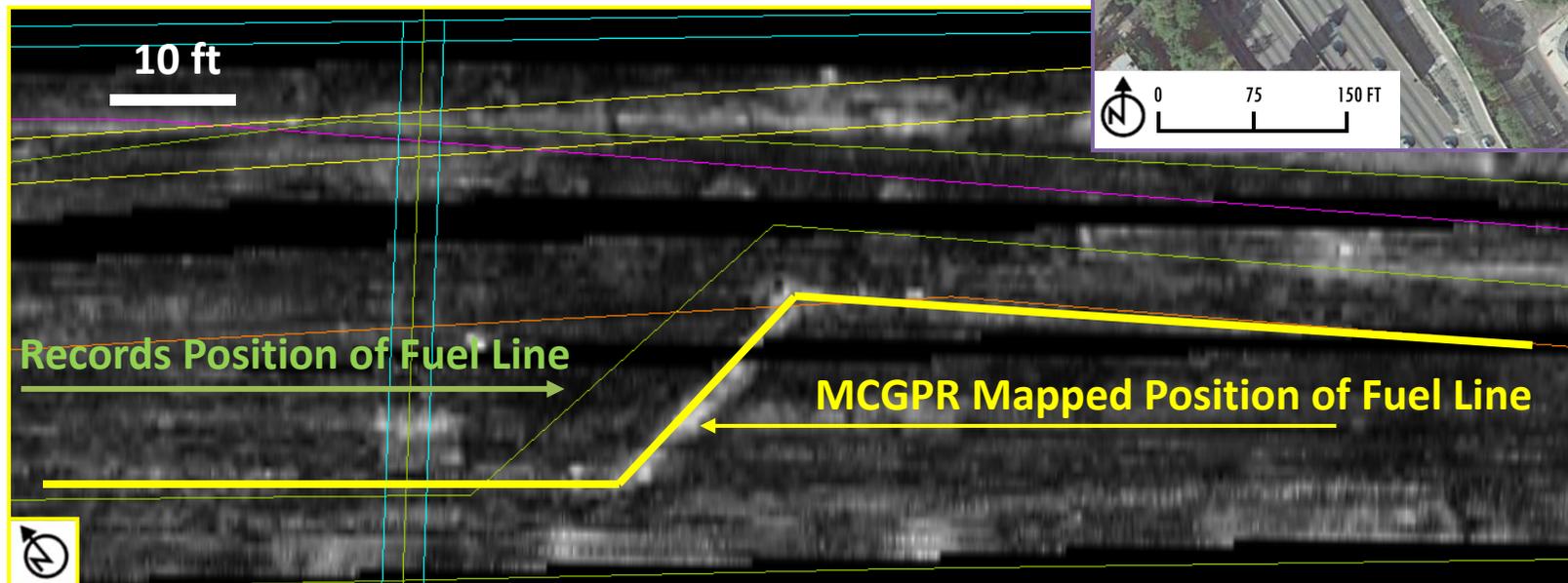


Example CalTrans Project

Correctly mapped a high-impact utility that was mis-located on records

An example of utility detection in the “*unlocatable*” 20% based on traditional SUE methods.

Fuel pipeline detected with 3D GPR.



Note: Image above is displayed as a *DEPTH SLICE* at 7 ft

Utility Locating Technologies (R01B)

Current Status

- Five (5) IAP States awarded in Round 6:
 - **Ohio, Arkansas, Virginia, Oregon, and California**
- Plan for training and on-site demonstrations.
- In-house capabilities versus contracting SUE providers to assist with Quality Level B investigation.
- Currently identifying equipment needs and/or software needs.

Solution

- Apply for Round 7 funding!



Identifying and Managing Utility Conflicts (R15B)

Cesar Quiroga

Senior Research Engineer

Texas A&M Transportation Institute



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Identifying and Managing Utility Conflicts (R15B)

Challenge

- Two critical factors that contribute to utility inefficiencies are: (a) the lack of adequate information about the location and attributes of utility facilities that might be affected by a transportation project, and (b) how to manage conflicts between those facilities and transportation project features and phases.

Solution

- R15B resulted in three products that use a utility conflict management (UCM)-based engineering approach, which are designed to help agencies and utility companies manage utility conflicts effectively during all phases of project delivery.



Identifying and Managing Utility Conflicts (R15B)

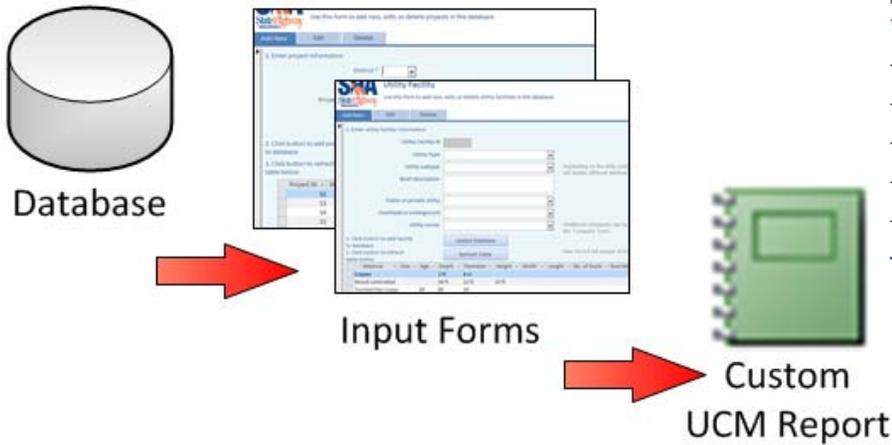
SHRP2 R15B Products

- Product 1: Compact, standalone utility conflict matrix
- Product 2: Utility conflict data model and database
- Product 3: One-day UCM training course



Products 1 and 2

Product 1: Connect



- UCM cost estimate analysis
- Process embedded in table structure

Project Owner: _____
 Project No.: _____
 Project Description: _____
 Highway or Route: _____

Note: refer to subsheet for utility conflict cost analysis.

Contract	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	Cost

Cost Estimate

Project Owner: _____
 Project No.: _____
 Project Description: _____
 Highway or Route: _____

Utility Conflict ID: _____
 Utility Owner: _____
 Utility Type: _____
 Size and/or Material: _____
 Project Phase: _____

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)

Product 3: One-Day UCM Training Course

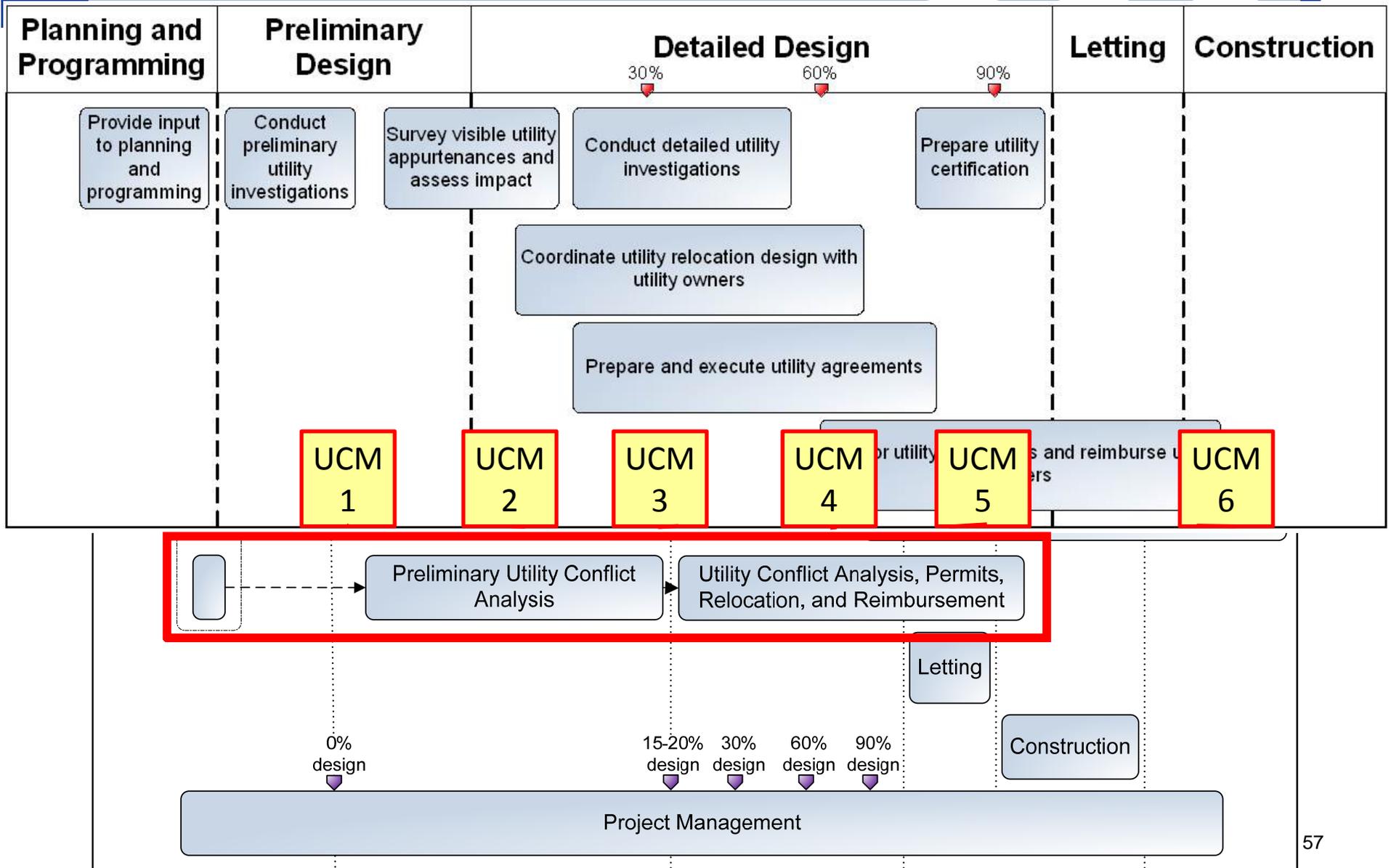
- Lesson plan (6 lessons)
- Training course binder:
 - PowerPoint files
 - Presenter notes
 - Participant handouts
 - Sample project plans
 - UCM templates
 - Companion CD:
 - All training materials + Products 1 and 2

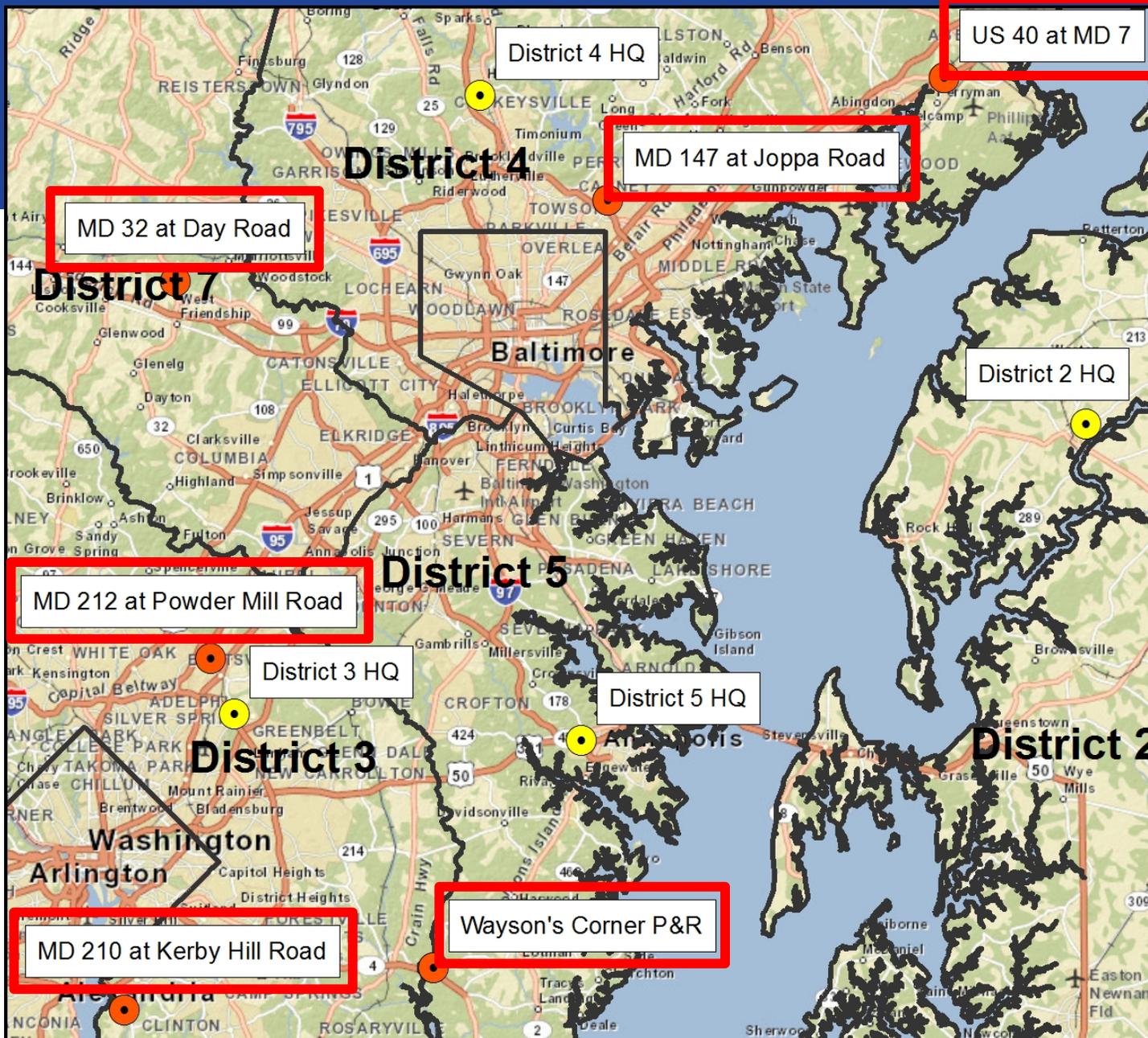


Benefits, Limitations, and Challenges

Product	Benefits	Limitations/Challenges
<u>Product 1</u> Compact, standalone UCM table	<ul style="list-style-type: none"> • Systematic management of utility conflicts • Improved tracking and accountability • Cost estimate analysis spreadsheet • No IT support needed 	<ul style="list-style-type: none"> • Scalability • Variety of UCM structures in use
<u>Product 2</u> Utility conflict data model and database	<ul style="list-style-type: none"> • Efficient management of utility conflicts • Automated tracking and accountability • Wide range of queries and reports • More effective use of staff and other resources 	<ul style="list-style-type: none"> • IT support depending on implementation level/path • Higher initial investment • Need to develop user interface
<u>Product 3</u> One-day UCM training course	<ul style="list-style-type: none"> • Comprehensive training for Product 1 • Full benefit by including interactive utility conflict resolution module • Paradigm shift for managing utility conflicts • Promotes collaboration and coordination among internal and external stakeholders 	<ul style="list-style-type: none"> • Introduction to Product 2 • Willingness to invest in full one-day training course • Need to include project managers, designers, utility coordinators, and other stakeholders

Using the UCM for Project Delivery





UCM Training Course



MD 32 Road Widening: Lessons Learned

- Avoided \$500,000 gas line relocation, resolved utility conflicts by changing drainage design.
- 4-6 months' time savings.
- Changed construction sequencing, which avoided other conflicts.
- UCM challenged designers to think outside the box.
 - Made designers aware of utility issues on the project.
 - Helped utility coordinators understand design process better.

Overall Lessons Learned

- UCM is useful for documenting utility conflicts and for discussing and resolving utility conflicts.
- UCM raises awareness about utility impacts.
- UCM helps to avoid utility relocations.
- Tangible economic and time benefits.
- UCM facilitates coordination with utilities and contributes to better working relationships.
- UCM process facilitates agency's internal teamwork.
- Front-end investment with expectation of benefits later during the PDP.
- Limit UCM updates to major milestones.

Round 3 Implementations

- Lead Adopter incentives
- Up to \$150,000 in funding and technical assistance
- Began in 2014
- Seven state DOTs received awards:
 - Iowa Department of Transportation
 - Kentucky Transportation Cabinet
 - Michigan Department of Transportation
 - New Hampshire Department of Transportation
 - Oklahoma Department of Transportation
 - South Dakota Department of Transportation
 - Texas Department of Transportation

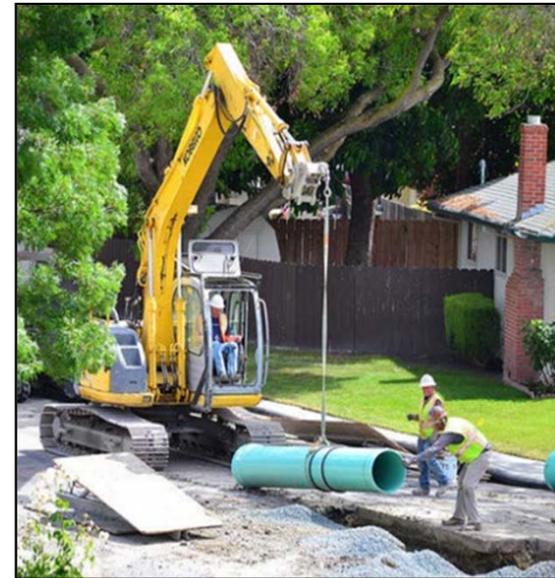
Round 6 Implementations

- Lead Adopter incentives
- Up to \$100,000 in funding and technical assistance
- Began in late 2015
- Six State DOTs received awards:
 - California Department of Transportation
 - Delaware Department of Transportation
 - Indiana Department of Transportation
 - Maryland State Highway Administration
 - Oregon Department of Transportation
 - Utah Department of Transportation

Utility Bundle Assistance Opportunities

Type of assistance	Number of awards	Amount of assistance
Lead adopter	Up to 15	R01B: Up to \$100,000 per award R15B: Up to \$100,000 per award R01A: Up to \$150,000 per award

Who can apply: State DOTs, MPOs, local and tribal agencies. Local agencies must coordinate application submittals with their state DOTs.



Additional Utility Bundle Information

Simply Google “**SHRP2**” for the FHWA and AASHTO SHRP2 product websites.

SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

Three Keys to a Smarter Utility Program

Moving utilities out of the way may not always be the most cost-effective solution. It might be more efficient to protect the existing infrastructure or redesign the project. Even a slight alteration in design may be sufficient.

A suite of new tools from SHRP2 addresses the biggest challenges presented by underground utilities: how to more accurately locate utilities; how to manage potential conflicts to minimize delays and disruptions to the public; and how to ensure data is stored for current and future projects.

Each of these three SHRP2 Solutions can be used on its own, or can be bundled together to maximize their efficiencies. The products can be used in any order. The progression outlined below is just one approach to using these tools.

1 Finding and Tracking Underground Utilities: Knowing What Lurks Beneath

Utility Locating Technologies (R01B)

The first key to a more efficient utility program is to know what's underground. The process usually begins with a visual survey, followed by a physical investigation. With more sophisticated detection, mapping, and database technologies, transportation agencies and utility companies can do a better job of tracking the location of most existing utilities. Given that many of these facilities were put in the ground 50 – 60 years ago, however, they are not always clearly identified or even marked on utility record drawings.

The benefits of incorporating a utility conflict matrix into your utility program

- Reduces project costs and schedules
- Offers more predictable project development schedules
- Results in fewer contractor delay claims
- Reduces disruptions to highway users
- Helps build uniformity to highway design
- Enhances coordination and working relationships

Knowing the location, depth, and important attributes of underground utilities enables more efficient and productive coordination with utility owners during the design process while minimizing overall utility conflicts.

Utility Locating Technologies (R01B) has identified multiple types of geophysical devices to detect, locate, and characterize subsurface utilities in conjunction with existing tools.

As a result, two advanced utility identification technologies will be evaluated in the field by transportation agencies in the coming months. The first is Multi-Channel Ground Penetrating Radar (MCGPR). MCGPR, however, does not work well in clay soils, so another technology has also been identified. Time Domain Electromagnetic Induction (TDEM) can work in highly conductive soils, but cannot detect non-metallic utilities without a tracer wire.

Limitations in these technologies indicate that soil type, terrain, and other geophysical attributes will help determine which technologies are appropriate for a given location.

The best overall practice is to employ multiple types of geophysical technologies, deployed in multiple channel modes when possible. Using

digital geophysical mapping in locating tools enhances utility combined approach produces more targeted and less expensive. These advanced technologies significant benefits not just to the subsurface utility engineer undertake this work.

2 Building Resilient and Managing Utility Conflicts (R15B)

Identifying and Managing Utility Conflicts (R15B)

The second key is to identify any potential conflicts that might exist within the right of way for a planned construction or rehabilitation project. Utility conflict management is an engineering process that includes coordination and data management, as well as the application of sound engineering principles to analyze and resolve utility conflicts effectively.

Identifying and resolving potential utility conflicts early in the design process can minimize delay and costs. The management of these conflicts through effective communication among stakeholders, therefore, is a critical mechanism to avoid these problems and keep transportation projects on schedule.

Another critical factor is the documentation and management of enormous amounts of data and supporting documents, including schematics, design files, agreements, and certifications.

The SHRP2 product, **Identifying and Managing Utility Conflicts (R15B)**, can be used at every step in the utility process. The Utility Conflict Matrix (UCM) enables an agency to conduct a preliminary investigation, assess utility impacts, and then make a record of the activity or activities needed.

The tools and strategies include:

- Compact, stand-alone Utility Conflict Matrix (UCM);
- Utility conflict data model and database; and

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SHRP2 Moving Us Forward

The Second Strategic Highway Research Program (SHRP2)

Implementation Highlights 2015

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Timeline

- Product-specific webinars
 - March 8 – March 22, 2016
- Round 7 Application Period
 - April 1– April 29, 2016
- Round 7 Recipients Announced
 - June 2016



For More Information

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Additional Resources:

GoSHRP2

Website:

fhwa.dot.gov/GoSHRP2

AASHTO SHRP2 <http://shrp2.transportation.org>

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GoSHRP2

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Download now:

- Copy of this presentation
- Product webinar schedule and registration information
- Links to Round 7 product research recordings (SHRP2 Tuesdays)
- Round 7 assistance opportunities