

NEW TECHNOLOGY FOR DAMAGE PREVENTION AND MAINS REMAPPING

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ULC

PIPELINE ROBOTICS
ENERGY SERVICES
RESEARCH AND DEVELOPMENT

WHO IS ULC ROBOTICS

R&D

- Concept to commercialization development of robotic systems, no-dig processes and tooling

Pipeline Robotics

- CISBOT
- Live Gas Main Inspection
- Robotic Cased Pipeline Inspection
- DWX200

Energy Services

- Meter Exchanges
- Technical Services
- Emergency Response



WHO IS ULC ROBOTICS

Some of Our Clients



CHALLENGES AND RISKS OF PIPELINE REPLACEMENT

Traditional mark out techniques rely on utility records and maps to determine where the mains and services are located

- Incomplete or missing maps are common
- Unmapped services are a leading cause of damage when excavating around mains.
- Changes in the roadway and surroundings may not have been recorded to utility maps (street widened, utility pole moved, additions to houses)

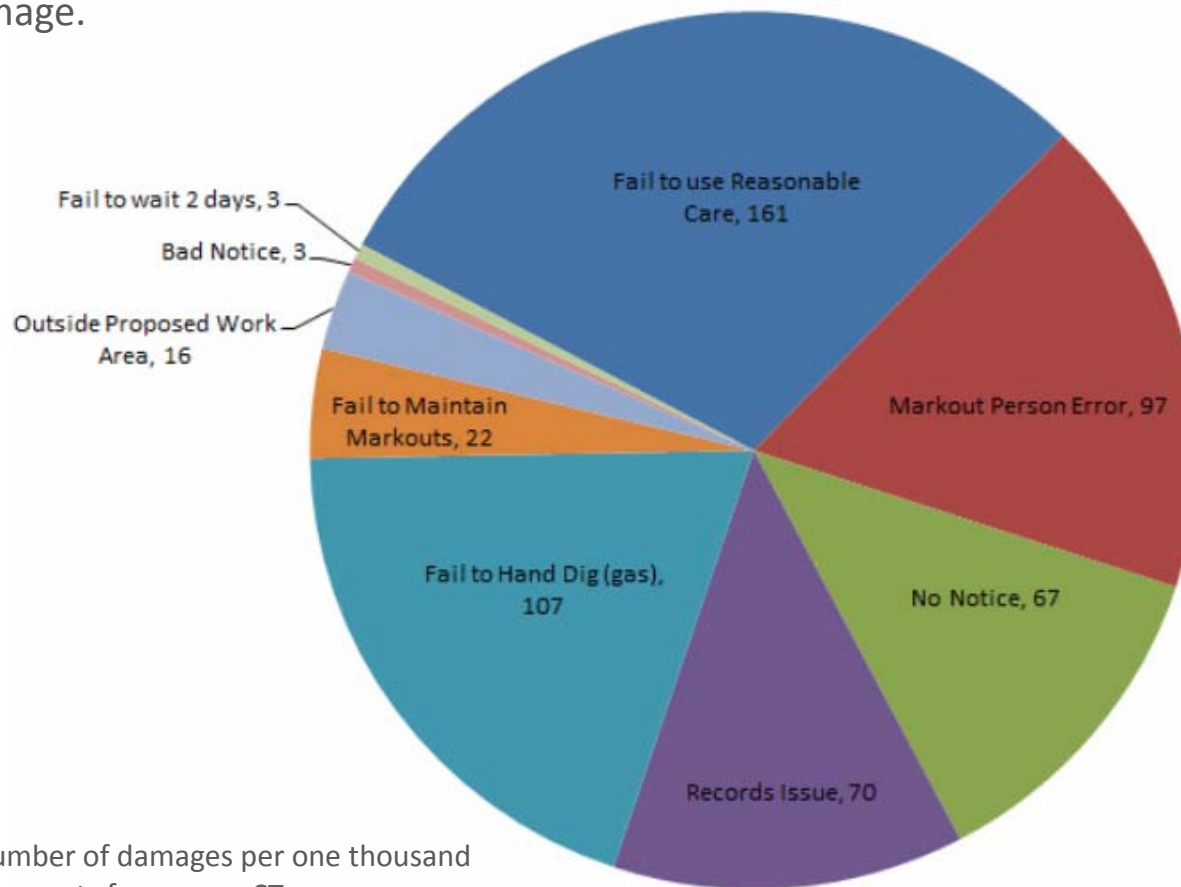
Other advances in mark out technology attempt to detect what is underground

- Not able to provide enough data to ensure all features are marked out
- Unreliable results



CHALLENGES AND RISKS OF PIPELINE REPLACEMENT

The causes of damage to utility facilities despite technological developments to avoid damage.



*The number of damages per one thousand locate requests from www.CT.gov

CHALLENGES AND RISKS OF PIPELINE REPLACEMENT

These challenges pose multiple problems that directly impact the way gas utilities operate

- In 2014, more than 270,000 underground pipeline events were reported to DIRT*
- In Connecticut in 2014 alone, 97 out of every 1,000 recorded underground events were due to mark out error

Industry is in need of a reliable technology that can ensure the safety of excavating and help make mark out work a high quality operation.

*According to 2014 DIRT Report found at www.cga-dirt.com



SOLUTION: IN-PIPE LOCATING

The only way to know with 100% assurance where gas mains are buried, what features are in the pipe and where services connect to the main is with internal pipeline inspections:

- Visual inspection of gas mains under live conditions
- Procedure is conducted with no interruption of service to customers
- Custom developed sonde capable of penetration in all gas pipeline materials, including double-walled steel
- Sonde is embedded in camera head and enables detection of main, depth of main and its features from above ground
- Locates are marked out or captured using measurements or GPS



SOLUTION: IN-PIPE LOCATING

No other locating method provides the same level of detail and accuracy as In-pipe Locating.

The use of In-pipe Locating reduces:

- Project engineering: Projects with poor mapping may result in require various engineering changes
- Damages to mains and services result in fines, increased scrutiny and put the public at risk
- Utility hits are bad for public image: Gas-related incidents, no matter how small, create a negative public image



WHAT OUR TECHNOLOGY CAN LOCATE

Pinpoint location and depth in PE, steel and cast iron mains of:



Taps for services and stubs



Cross tees, branches and old bypass stubs



Change in direction and depth



Valves



Drip pots



Joints



PE Fusions



Plugs



Couplings and reducers

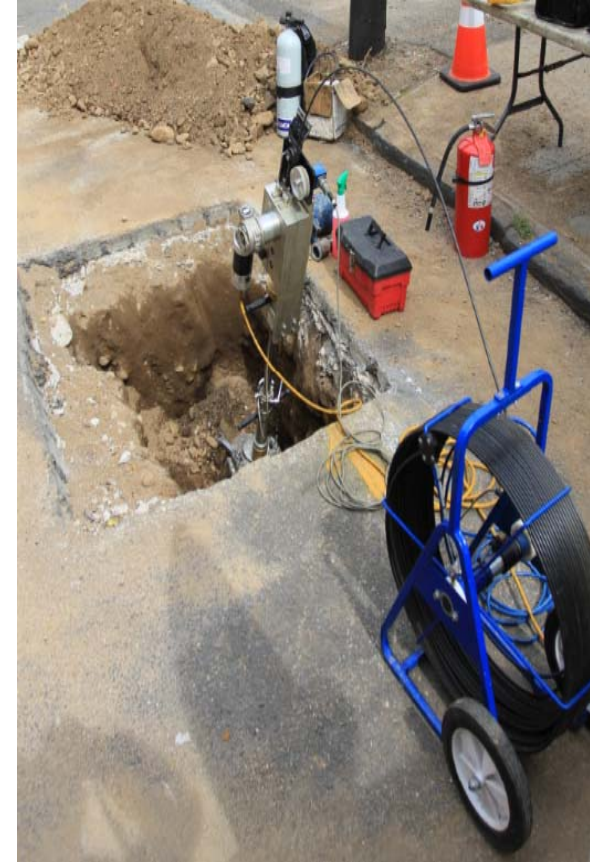


Damage / Water

IN-PIPE LOCATING: EQUIPMENT

Patented Cameras and Crawlers used for In-Pipe Locating:

- Minimal site footprint
- Live, no-blow launch, operation and retrieval
- No disruption of gas service
- Travel distances range from 200' to 750' in either direction
- Adapts to a wide variety of industry standard fittings and valves
- Keyhole launch capabilities
- High quality and well-lit video
 - 2"-12" forward facing wide angle
 - 12"-48" pan/tilt camera



IN-PIPE LOCATING: EQUIPMENT

ULC Robotics patented PRX250 Camera System and VGC Crawler Systems



U.S. Patent 7,551,197, 8,723,943 and 7,940,297

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IN-PIPE LOCATING: ACCURACY

- By using ULC's custom sonde technology and GPS coordinates we are able to ensure pinpoint accuracy
- Information gathered is returned the utility to update mapping systems
- Cameras identify the location and features in the main and are then pinpointed from the street surface.

The result is highly detailed mark out and mapping:

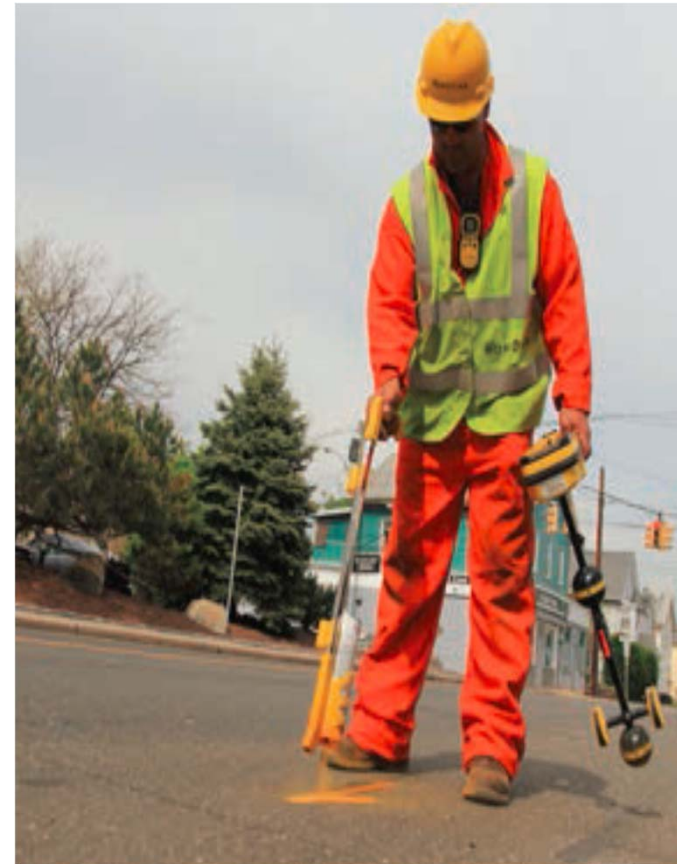
- Position and depth of main
- All features and changes in direction
- All features and changes in direction
- Highly detailed and extremely accurate mark out



MAINS REPLACEMENT PROGRAMS

In-Pipe Locating benefits mains replacement programs by providing a roadmap to excavation contractors to ensure a safe and efficient excavation around mains and services

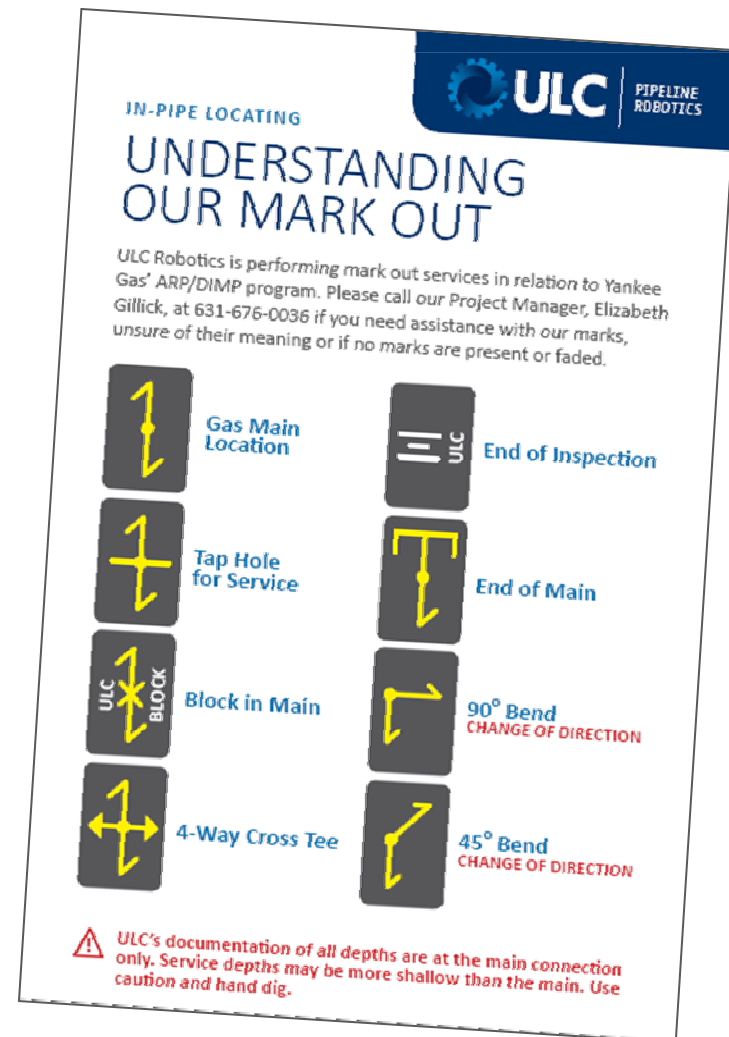
- Location and depth of:
 - Cast iron, steel and PE mains
 - Tees
 - Tap holes for services and stubs
 - Offsets
 - Changes in directions
 - Valves



MAINS REPLACEMENT PROGRAMS

The value of In-Pipe Locating:

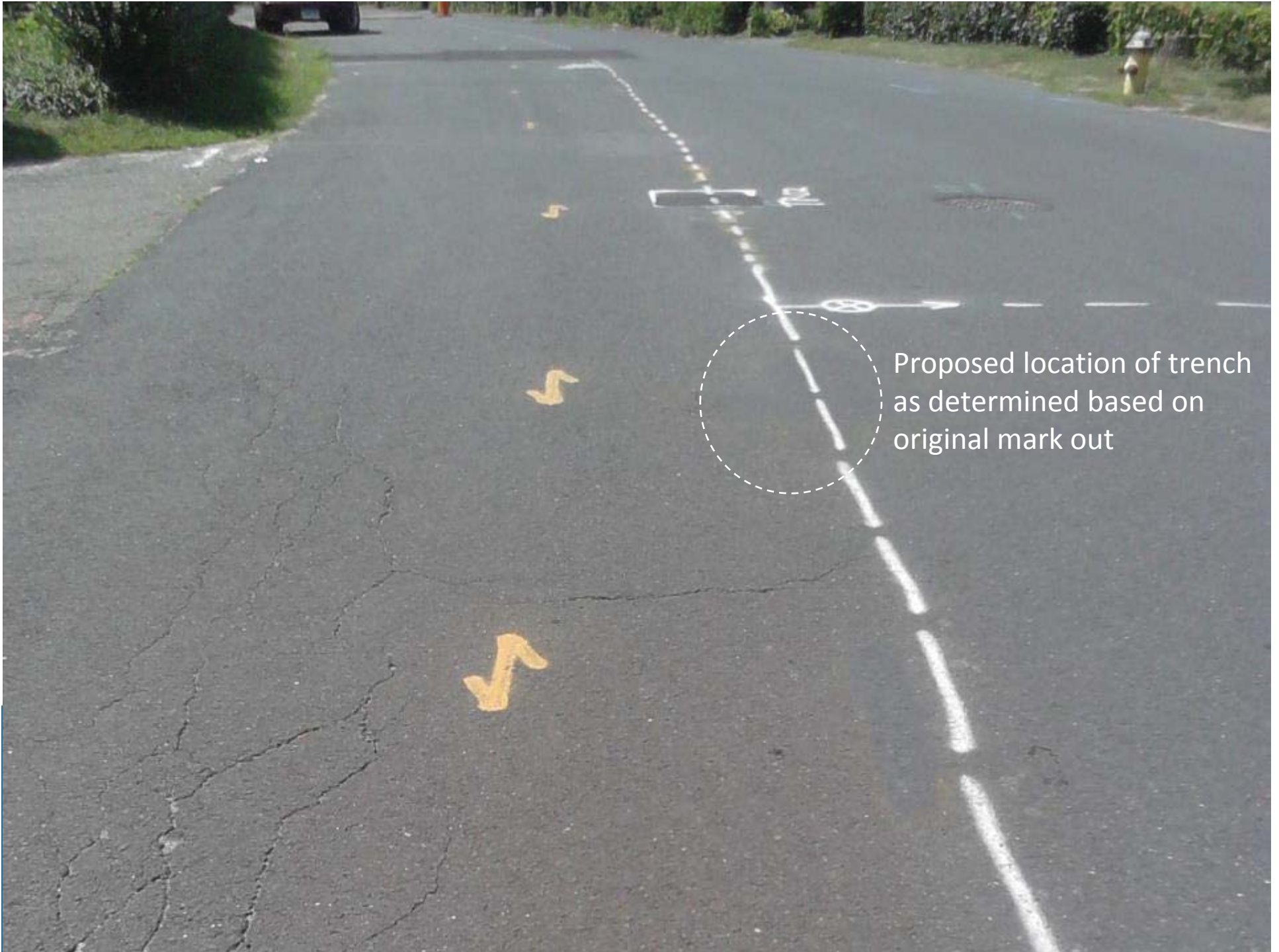
ULC Robotics has put in outstanding efforts to improve communication between our technicians, project managers, excavating contractors and the utility to ensure that the excavation operator has every opportunity available to carry out their work with great care.



Use Case: Mains Replacement Program



Location of gas main as
marked out by original
locating contractor



Proposed location of trench
as determined based on
original mark out



Actual location of main as marked
out by ULC using In-Pipe Locating
process



Unmapped cross tee ...

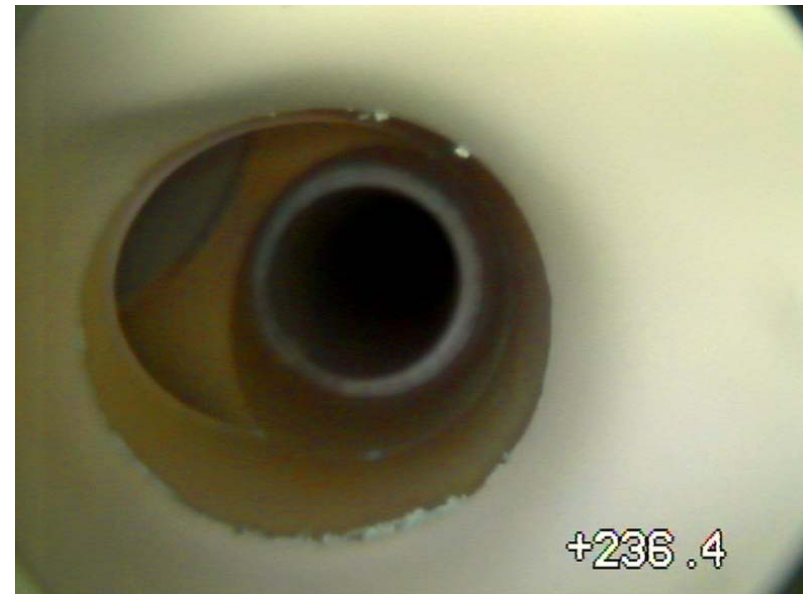


No cross tee present
in original mark out



UNLOCATABLE ALDYL-A AND PE

Plastic mains with no tracer wire or broken tracer wire



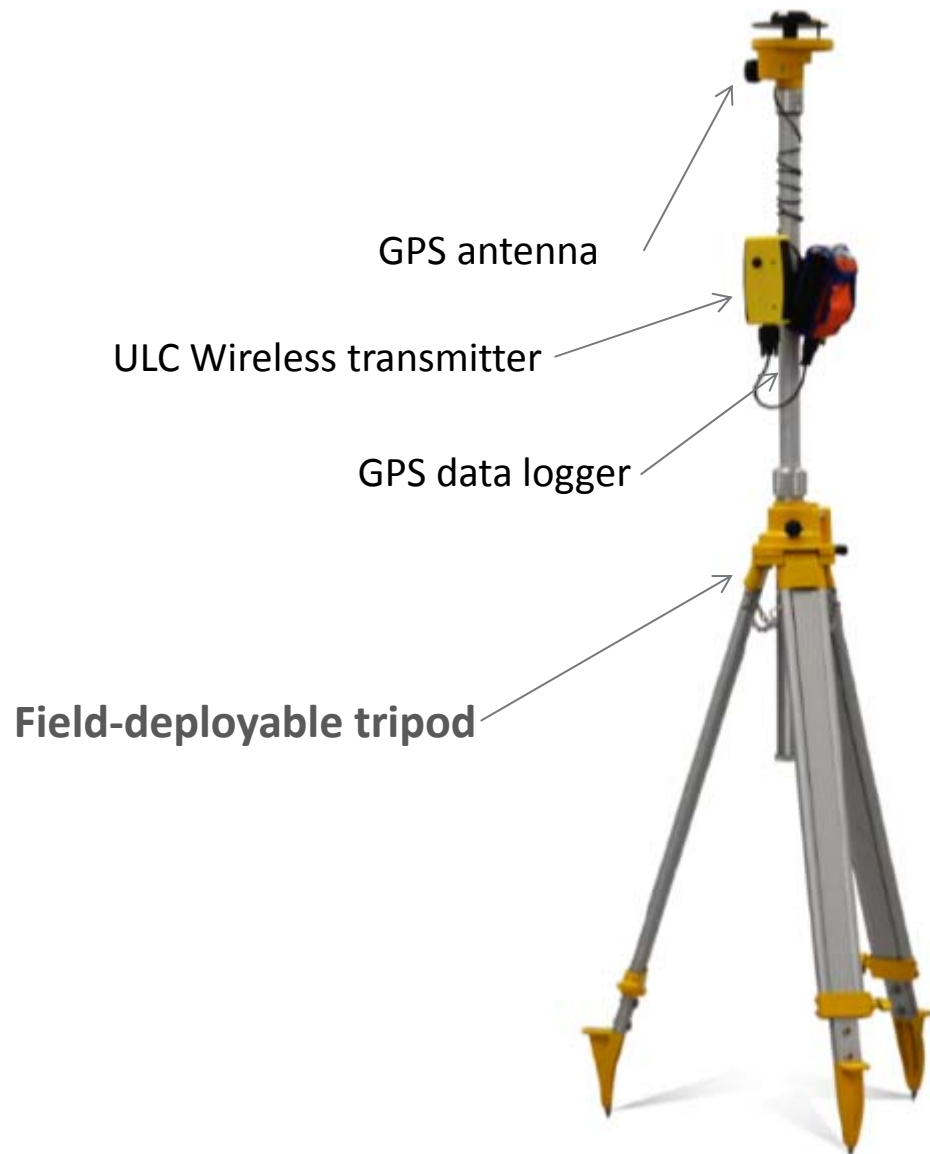
SOUTH JERSEY GAS: ALDYL-A LOCATING



REMAPPING MAINS

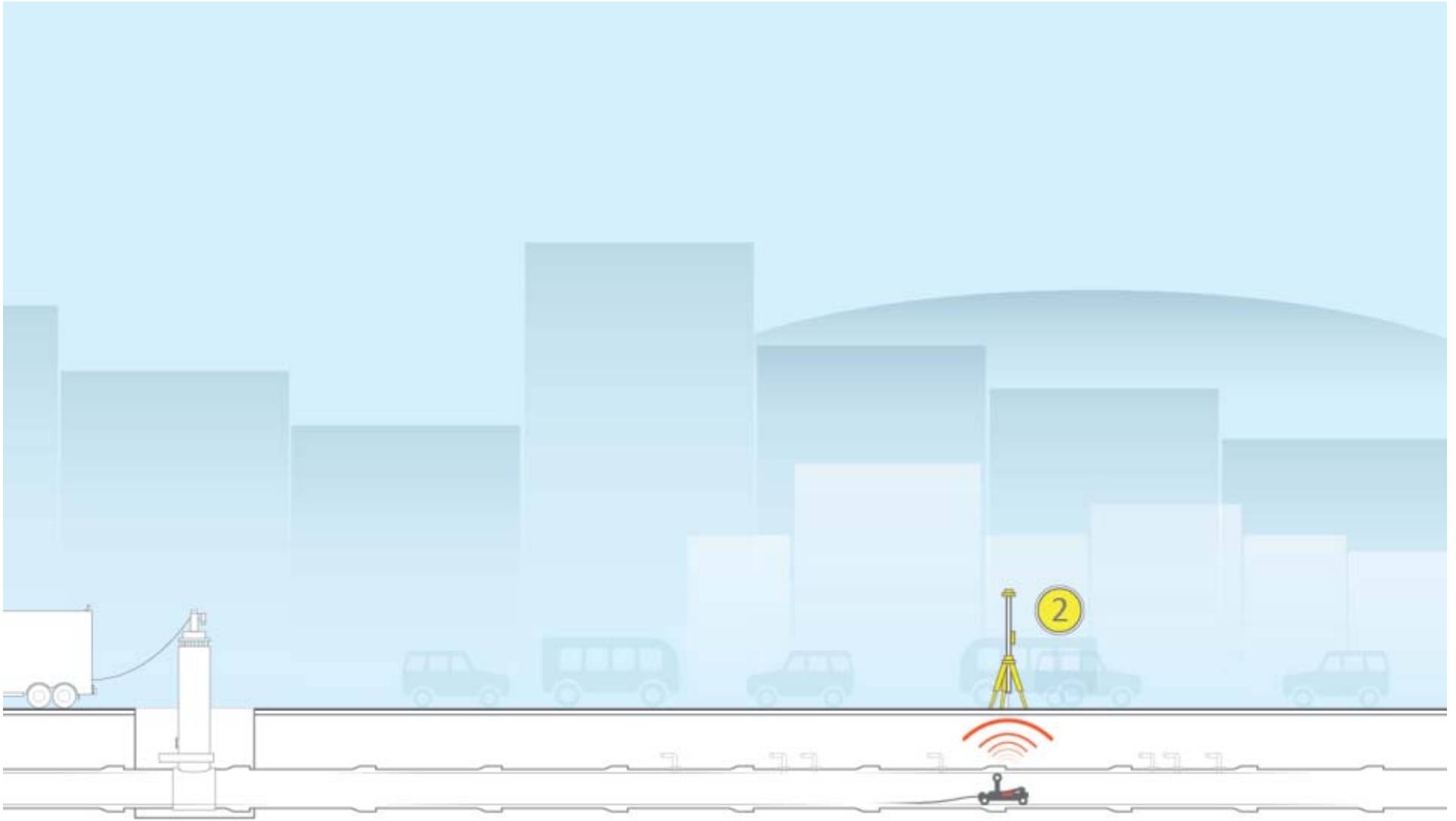
In-Pipe Locating can be used as a means to update and refresh utility GIS systems

- Locating method produces a highly accurate locate, which should be recorded using an equally accurate method
- Custom developed GPS system
 - Capture sub-centimeter GPS coordinates
 - Transmits coordinates to turn-key reporting method which helps to eliminate human error





1. Visually Identify Path of Main or Feature: ULC Operator positions sonde-enabled VGC robot, patented PRX250 camera or CISBOT robot below pipeline feature



2. Technician positions tripod: ULC Technician positions the tripod directly over the locate point using an integrated laser to ensure accurate positioning.



3. Obtain GPS Location: GPS tripod communicates directly with satellites and reference stations to obtain 1-2cm accurate GPS location.

GPS LOCATION RECORDING

- Description: Tap hole, valve, cross tee, etc.
- Mark Number: References the mark on the street
- Footage: Distance from point-of-entry
- GPS Coordinates: Expressed along with accuracy of the coordinates; typically 1-2cm

Description	Mark No	Footage	GPS Coordinates	Accuracy = 1-2cm
JOINT	1	12	N 40°48.7854462,W 073°15.2756434	

Excel Setup	Open Excel	Add or Find Data	Replace Data
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Comm Status : Connected	New Data Added
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GPS LOCATION RECORDING



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Project: Locate Stubs & Services

Address of Pit Location: 276 Liberty Street

Project Pit #: 1

Direction: South



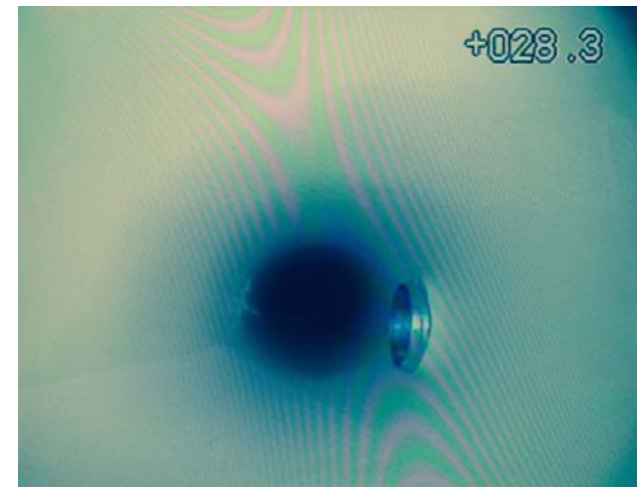
Central Hudson		
Distance (Feet)	Depth	Observations
9.07	2'8"	Tap
11.1	2'8"	Tap
12.2	2'8"	Tap
15.5	2'8"	Tap
16.4	2'8"	Tap
17.5	2'8"	Tap
18.5	2'8"	CI → PE
39	2'8"	Main
46.2	2'8"	PE → CI

IN-PIPE LOCATING: ADDITIONAL BENEFITS

Locating Features

Any features visible within the pipe can be verified, located and marked out on the street surface

- In-Pipe Locating used to verify installation of tapping tees in 2014 due to suspected installation issues
- Inspected 286 tees through 38 excavations; 20,000' of PE main
- 35% of tee installation failed the test and were able to be efficiently remediated.
- Overall project resulted in a 50% reduction in excavation.



IN-PIPE LOCATING: ADDITIONAL BENEFITS

Insertion projects

In-Pipe Locating benefits insertion programs by

- Identifying protruding services, offset joints or unknown changes in direction that may hinder the ability to the PE pipe to be inserted
- Location of features can be marked out on street surface for efficient excavation
- Reduce downtime and project delays caused by unknown restrictions in main
- Protect the newly inserted PE pipe from damage



IN-PIPE LOCATING: ADDITIONAL BENEFITS

- Water detection
- Leak location
- Emergency damage identification of anomalies
- Service stubs
- Poor pressure/Blockage
- Integrity of main or pipeline
- Specific project validation
- Mapping for As builds
- Electric conduit inspection



Q&A
THANK YOU



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