
GPRS
SUBSURFACE
SCANNING
SOLUTIONS
WHEN YOU NEED TO KNOW WHAT’S BELOW

UTILITY STRIKE STATISTICS

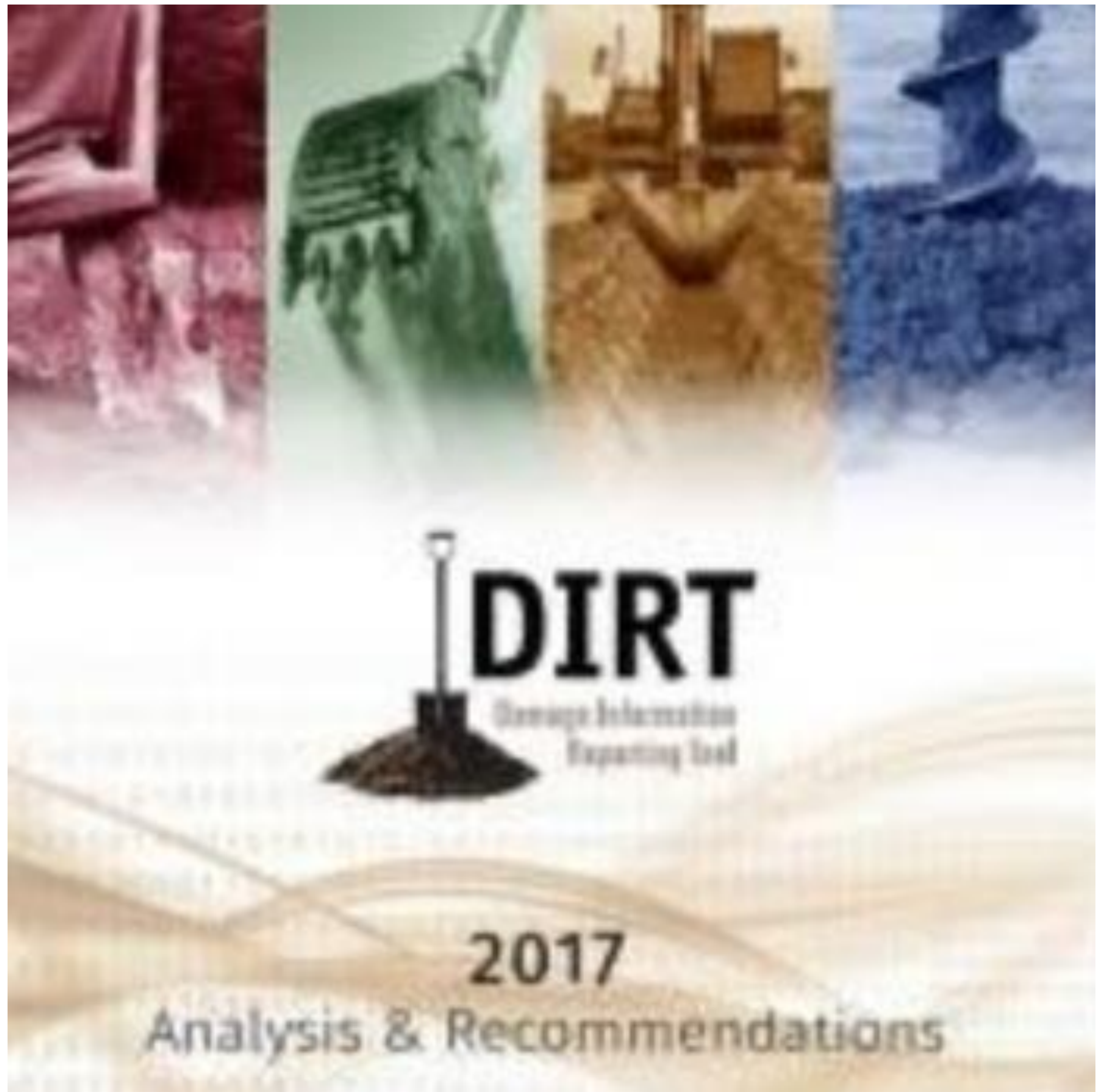
- Estimated over **20 million miles of active underground utilities throughout the United States**
- The U.S. has the largest network of energy pipelines in the world, with **more than 2.4 million miles of pipeline**.
- On average, it is estimated a utility line is damaged **every six minutes** in the United States
- The CGA came out with a 20 year study that showed utility strikes have resulted in **1906 injuries and 421 deaths**

CGA™
Common Ground Alliance

UTILITY STRIKE STATISTICS - NATIONAL

Utility strikes are reported using the Damage Information Reporting Tool (DIRT) provided by the CGA. Annual reports are compiled and shows the following information for 2017:

- **4th year in a row number of incidents reported increased**
- More than **411,000 incidents** reported in the US in 2017
- **5% increase in utility damages on a National level** from 2016 – 2017
- Stakeholders direct cost related to damages alone was approximately **$1.5 billion**



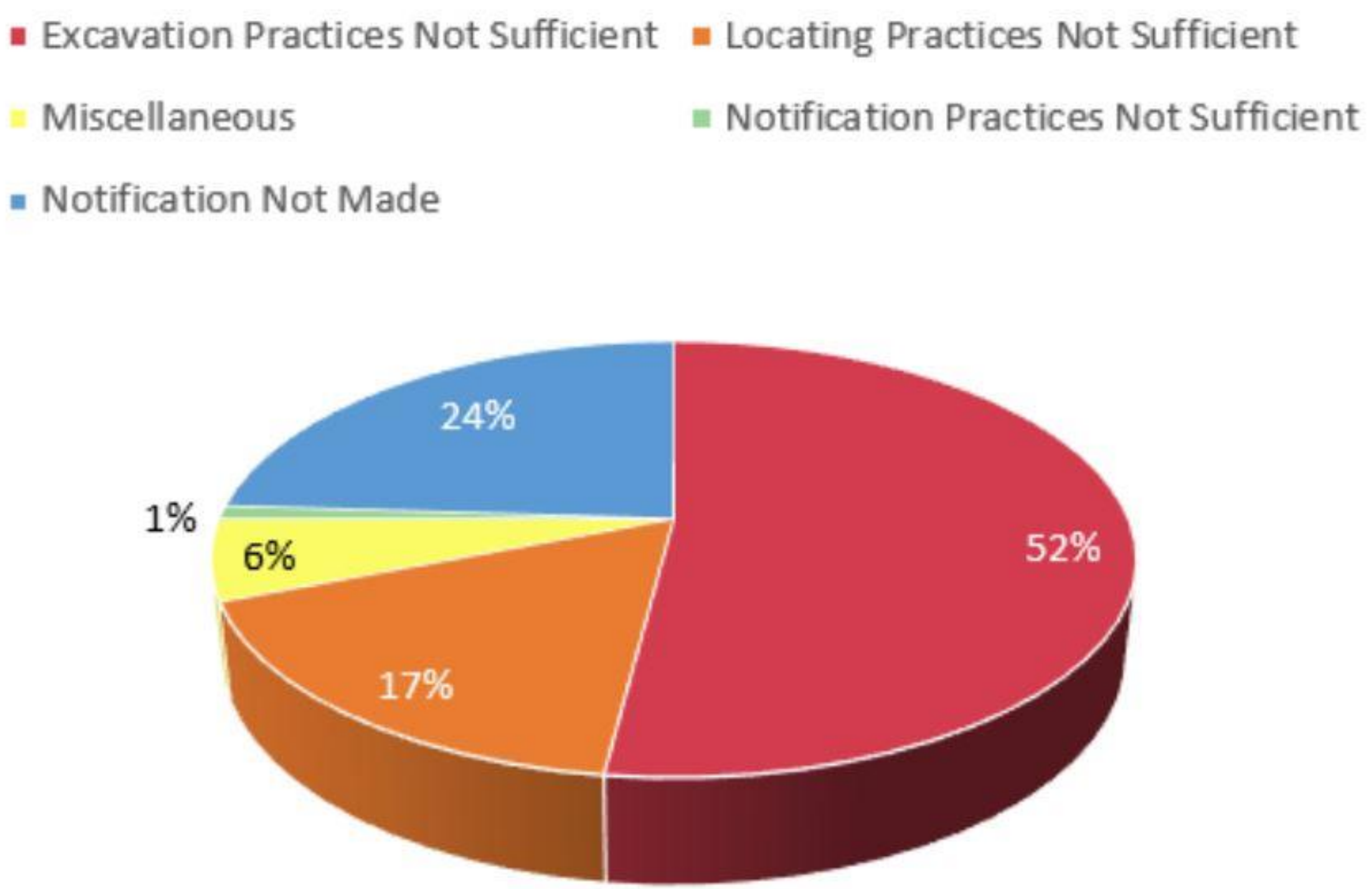
UTILITY STRIKE STATISTICS - NATIONAL

<u>Top Four Utilities Damaged</u>

1) Communication Lines (47%)
2) Natural Gas Lines (26%)
3) Cable TV Lines (11%)
4) Electric (9%)

<u>Top Three Root Cause Groups</u>

1) Excavating practices Not sufficient
2) **Notification was Not made**
3) Locating practices Not sufficient



UTILITY STRIKE STATISTICS - OHIO

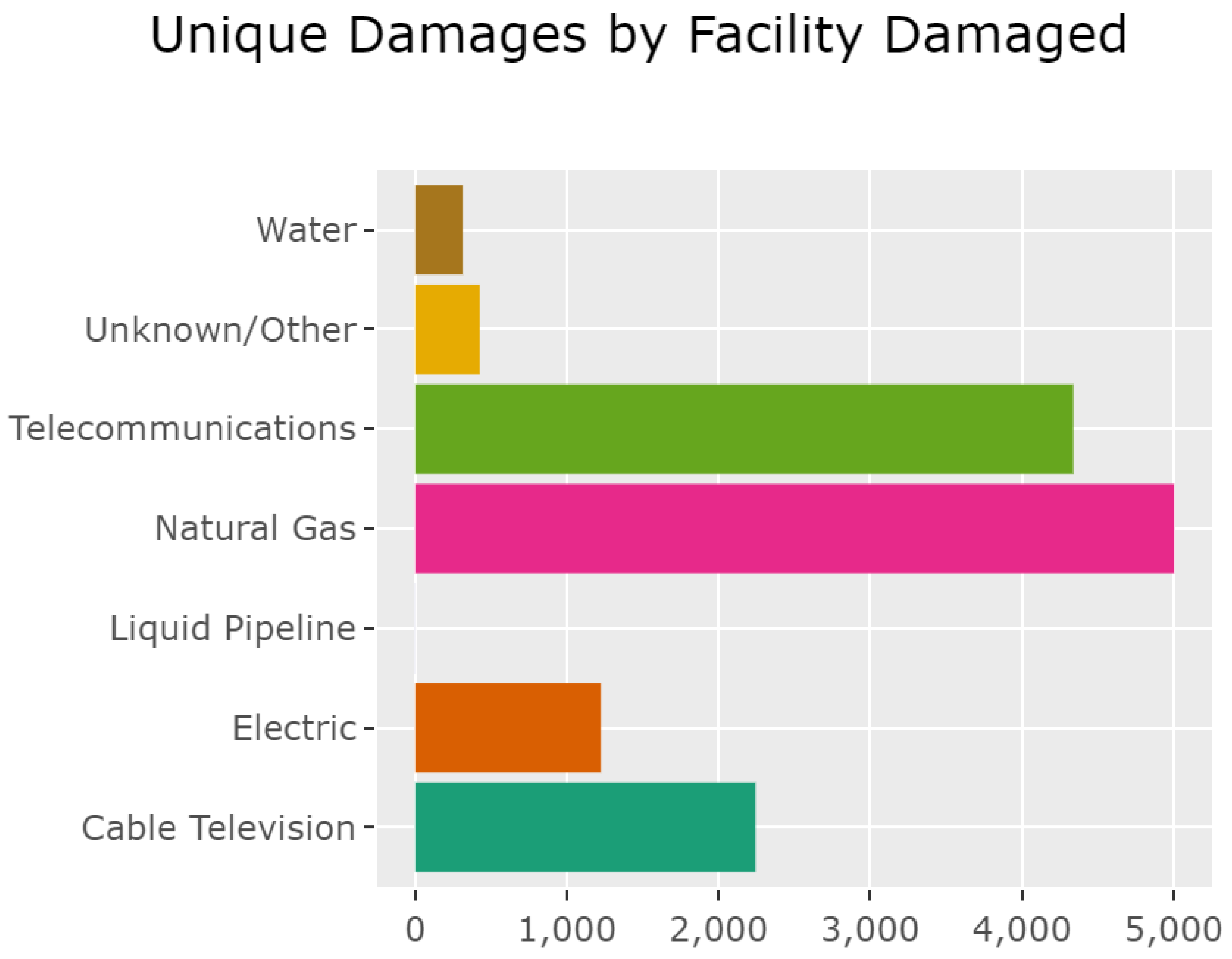
- Total of **13,549 incidents** in 2017
- 6.8% decrease from 2016!

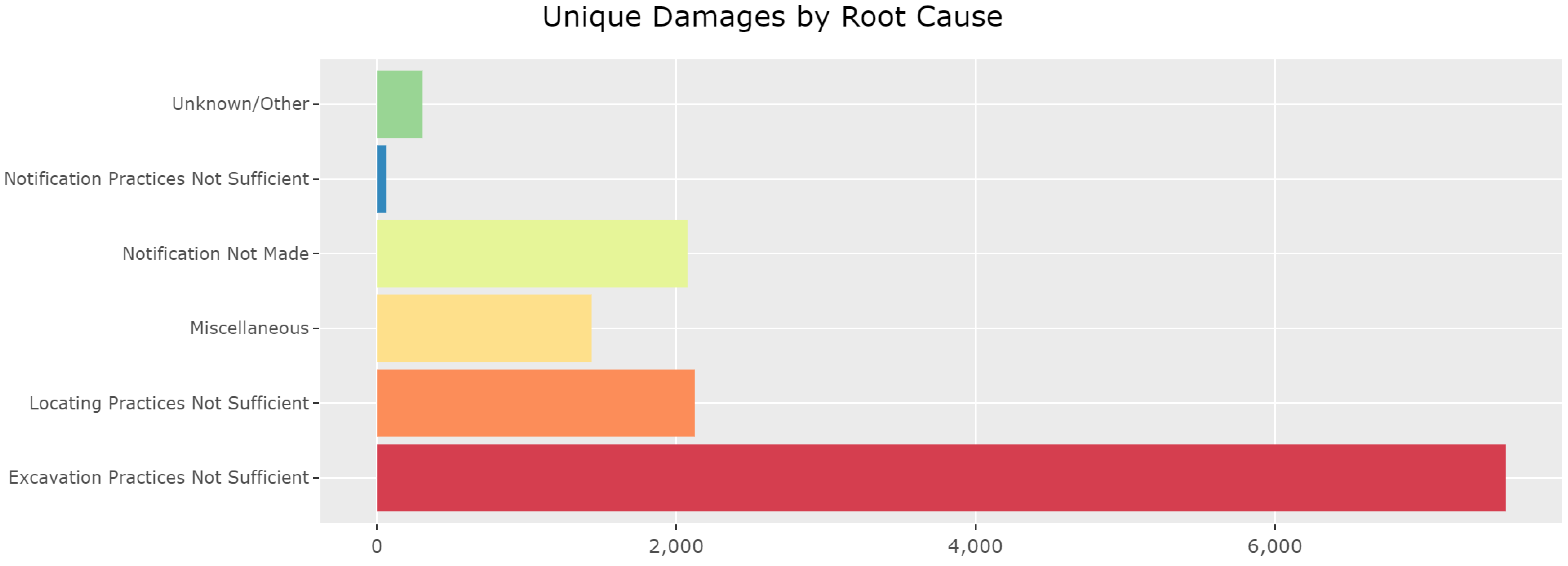
Top Four Utilities Damaged

1) Natural Gas Line (37%)
2) Telecommunication Lines (32%)
3) Cable TV (17%)
4) Electric (9%)

Top Three Root Causes

1) Excavating practices Not sufficient
2) **Notification was Not made**
3) Locating practices Not sufficient





WHOOPS!


PROCHAN
9/25/2013
6:55:51 PM
viralvideos.prochan.com/entertainment

Failure to detect unknowns beneath the surface

damages

delays

injuries

PUBLIC vs PRIVATE UTILITIES

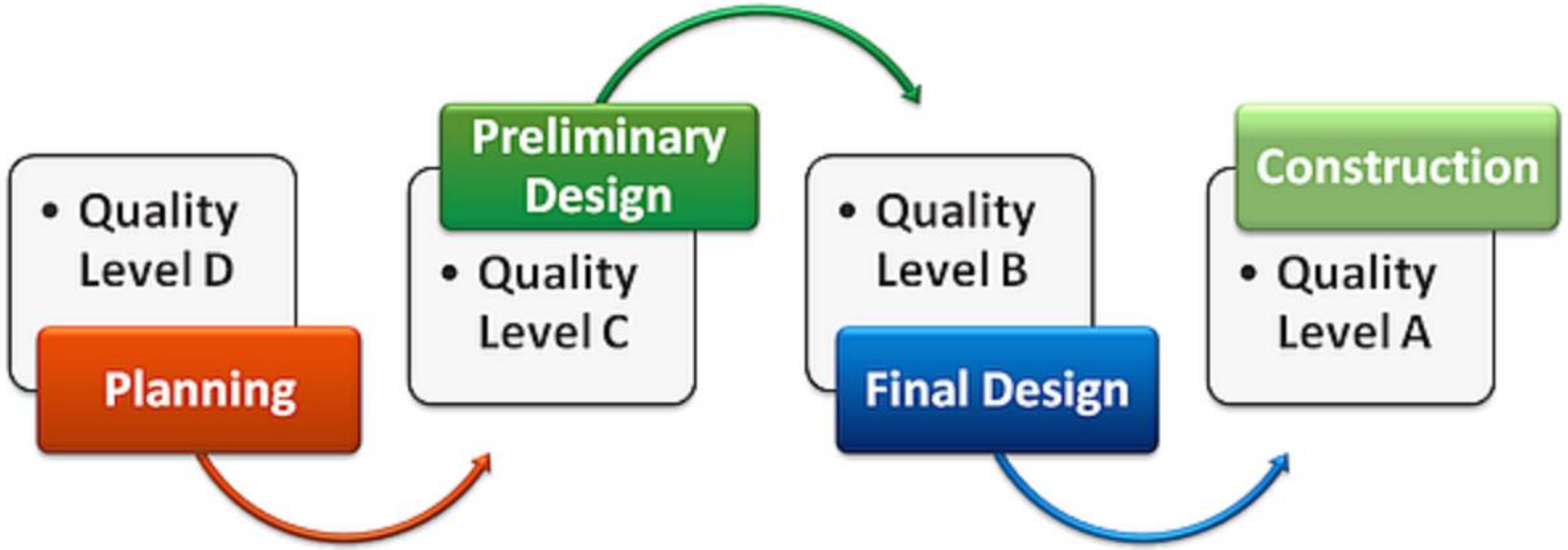
“ I notified 811, won’t they mark out all the utilities on my jobsite”

- A common misconception - **811 services are only going to mark public utilities, NOT private!**

  - A public utility line is owned and maintained by a utility company
  - A private utility line is owned and maintained by the property owner themselves

CALL 811 – IT’S THE LAW

WHAT ARE THE LEVELS OF SUE (SUBSURFACE UTILTIY ENGINEERING)?



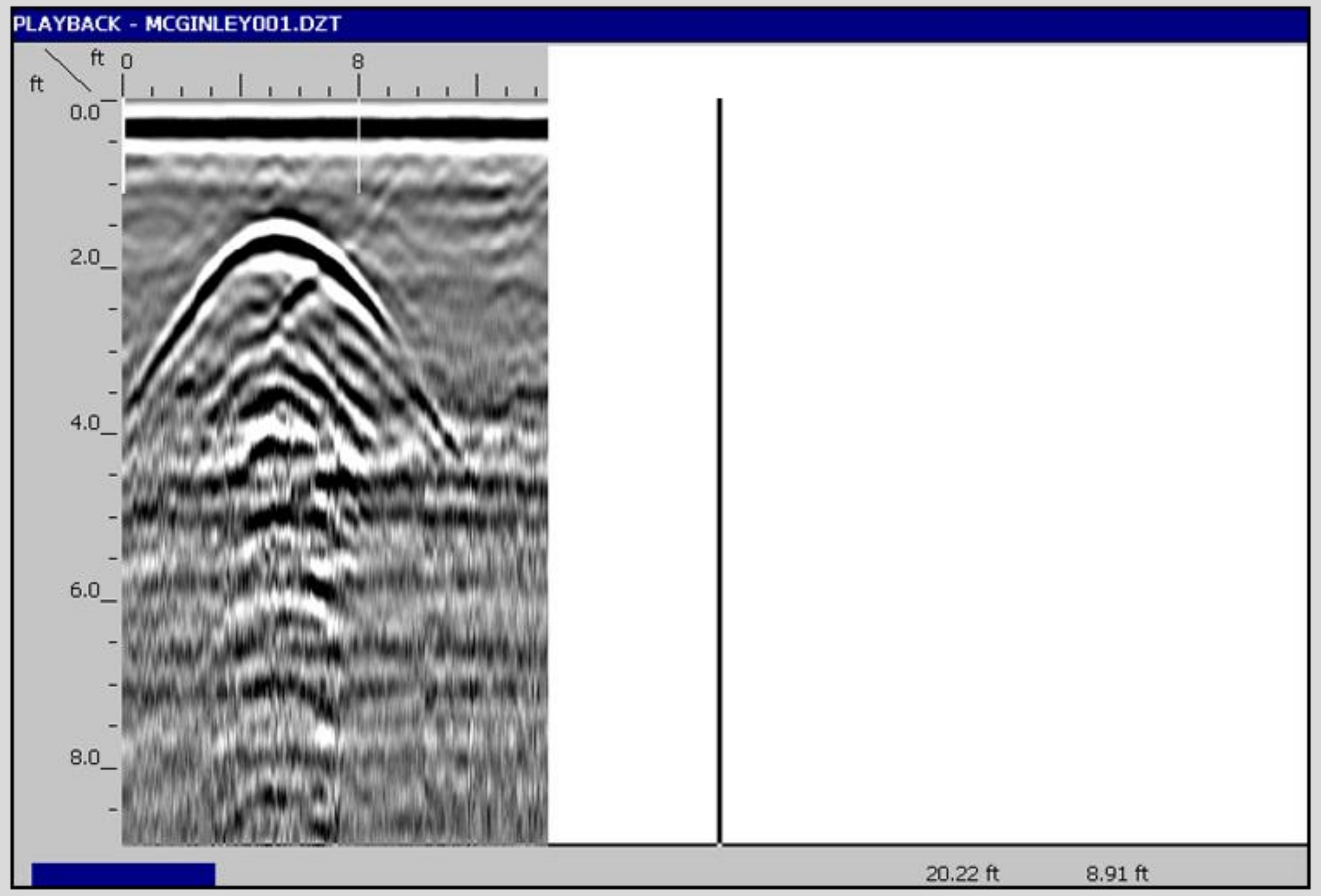
Subsurface Utility Engineering (SUE) is the investigation of underground utilities to help aid in design on a site. There are four quality levels of SUE:

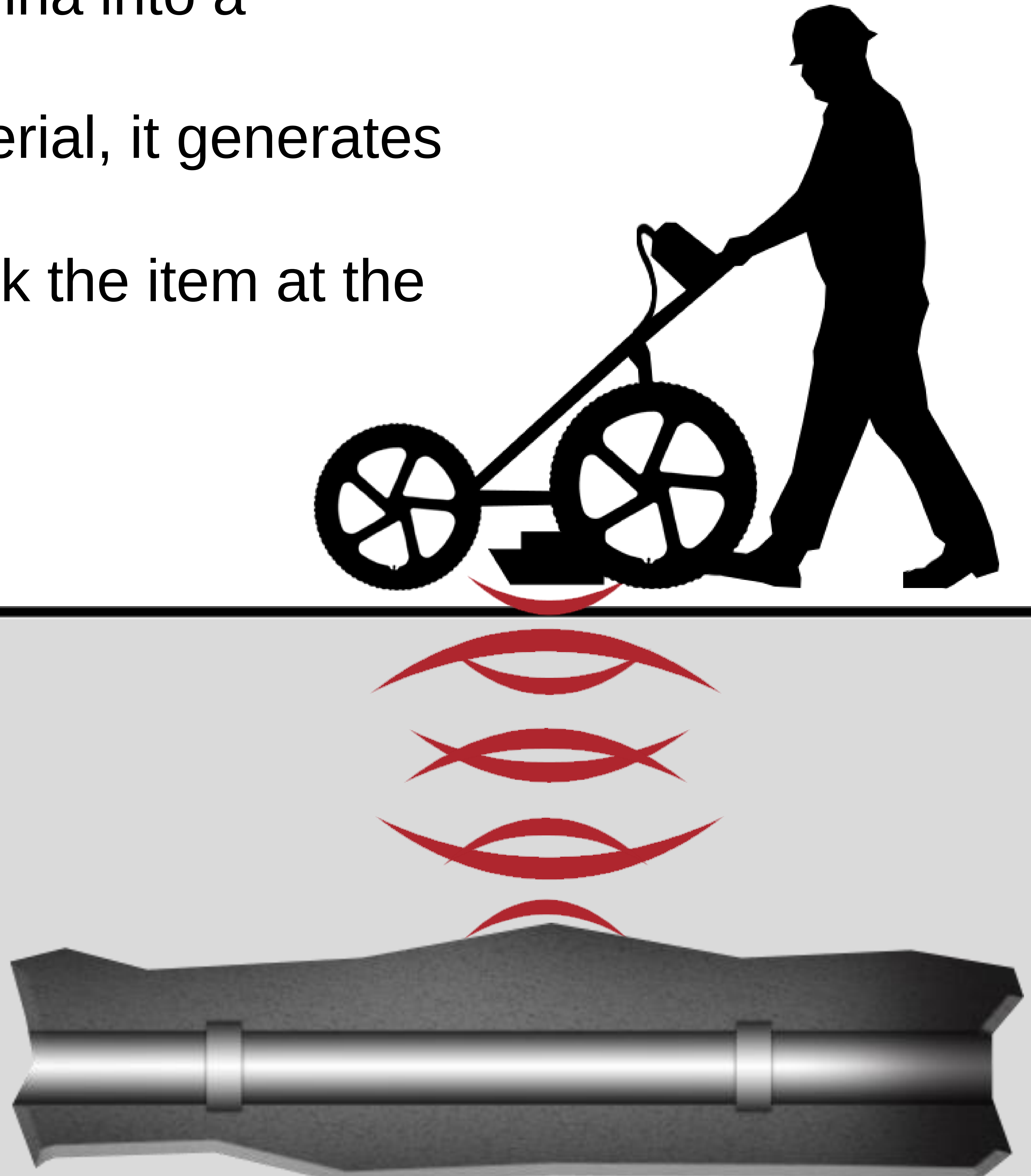
- Quality Level D (Records Research / Data Collection)
- Quality Level C (Above ground survey)
- Quality Level B (Utility Designation)
- Quality Level A (Test Hole / Pot Holing)

EQUIPMENT & APPLICATIONS

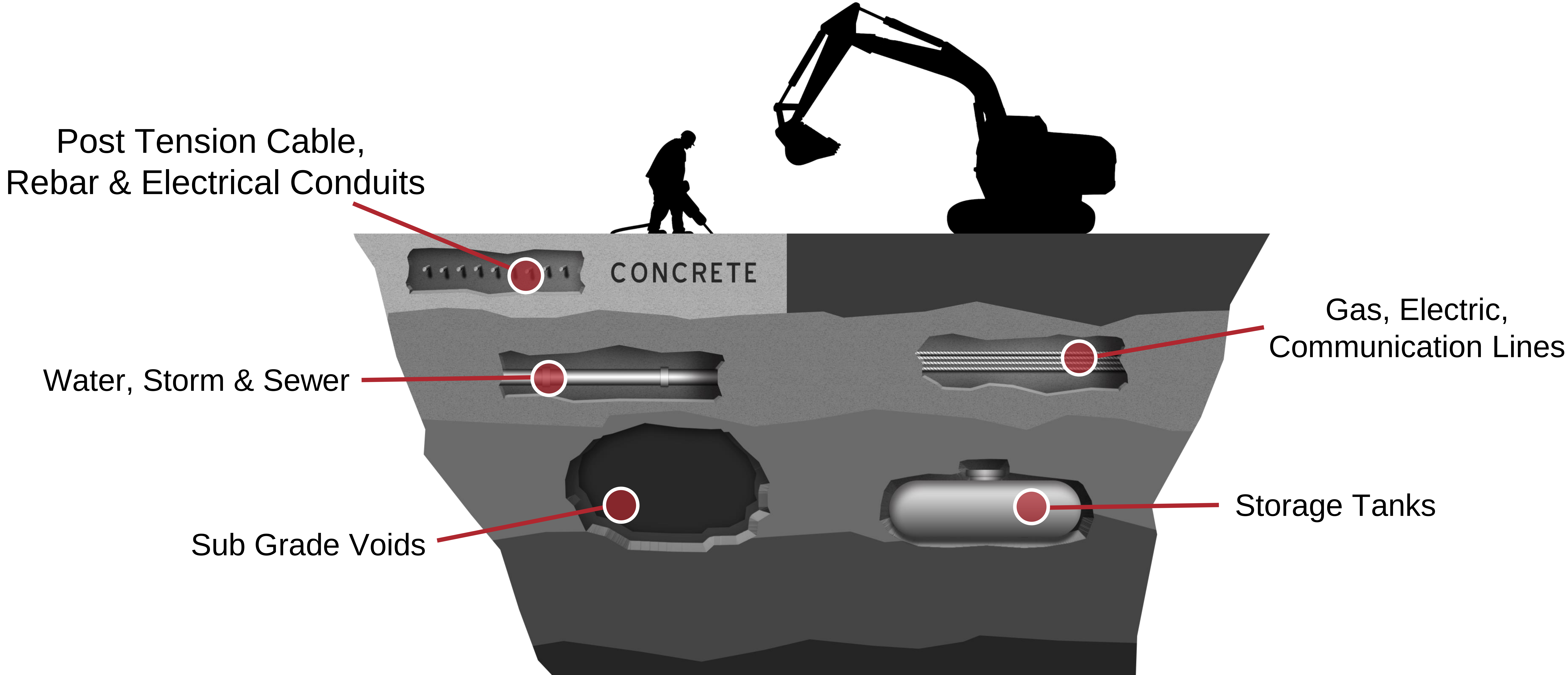
GROUND PENETRATING RADAR

- GPR works by sending electro magnetic pulses from an antenna into a particular medium
- When the radar pulse contacts something other than the material, it generates a reflection back to the antenna.
- This reflection is displayed in real time for the operator to mark the item at the surface.
- Item depth and reflection strength are noted





Unknowns beneath the surface



GROUND PENETRATING RADAR - CONCRETE

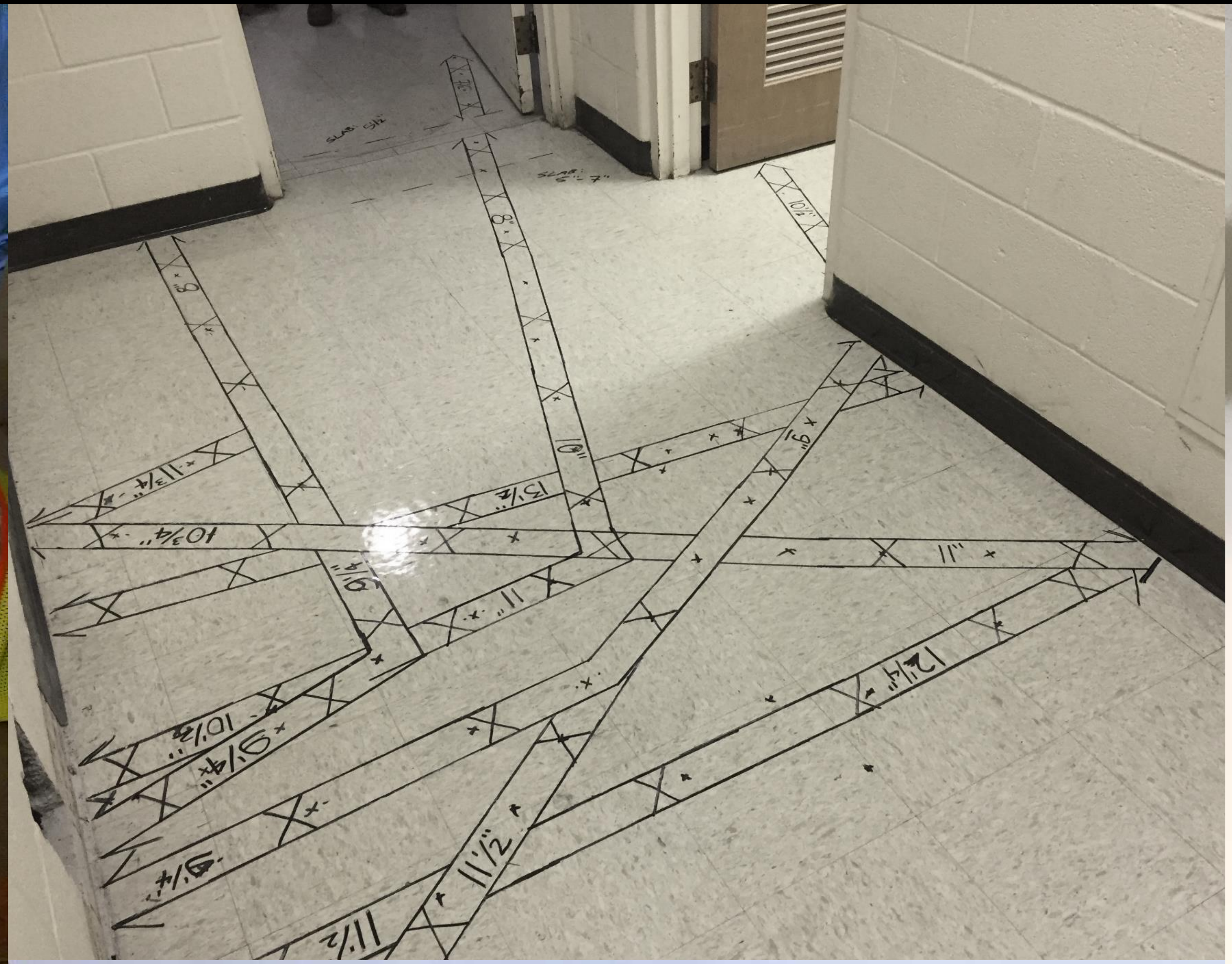
Targets

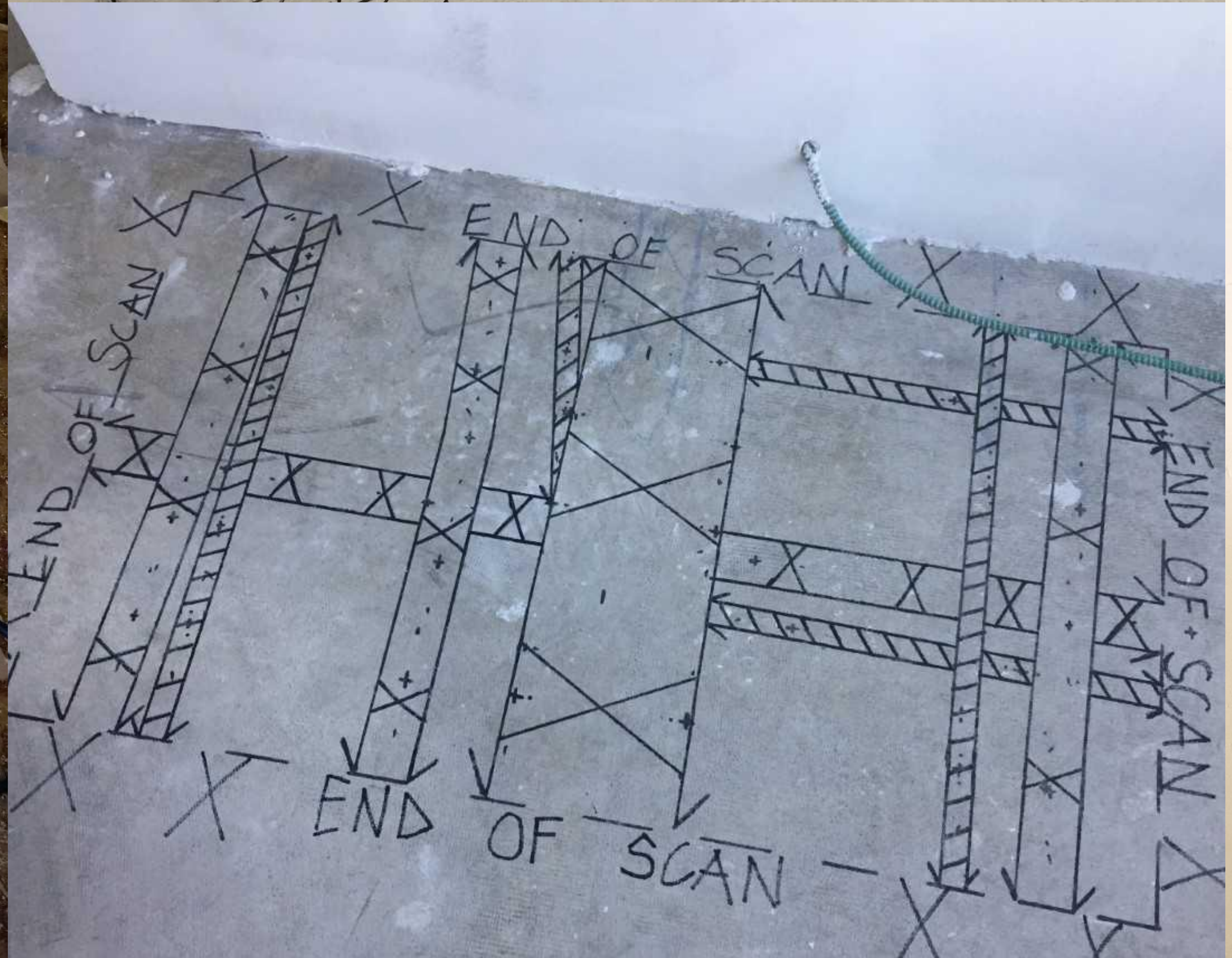
- Reinforcing Steel
- PT Cables
- Electrical Conduits
- Structural Beams
- Concrete Thickness
- Voids in or under the slab

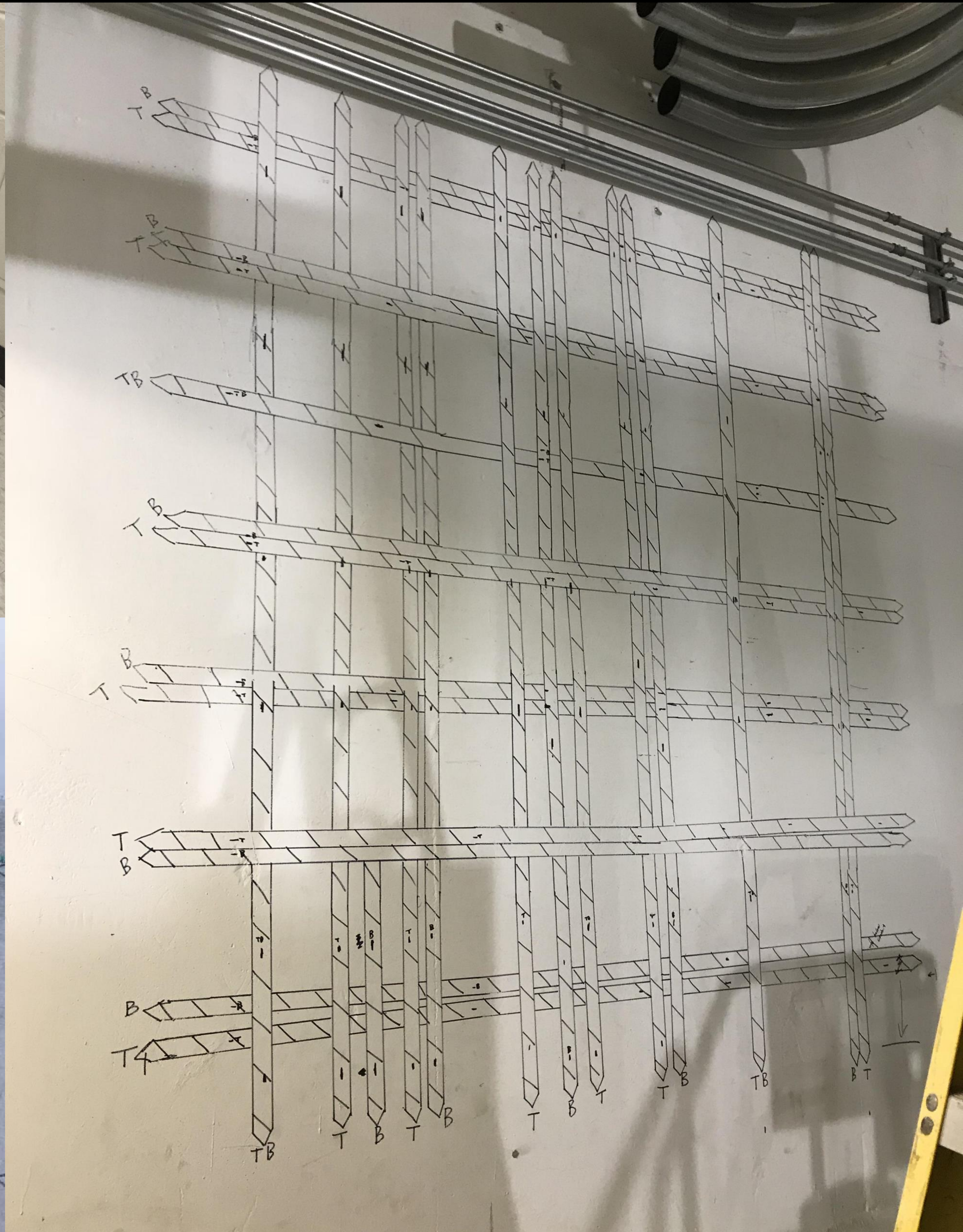
Limitations

- Typically 15”- 18” depth penetration
- Estimated (+/-) ¼” from center
- Estimated (+/-) ½” depth
- Green or wet concrete limits effectiveness
- Cannot determine size of reinforcing steel

GROUND PENETRATING RADAR - CONCRETE







GROUND PENETRATING RADAR

Ground Penetrating Radar:

- Utility locating, large obstruction/debris identifying, voids
- Standard GPR System has a 4’- 7’ depth penetration throughout Ohio (site dependent)

Limitations:

- **Size of target** – typically, a target (utility) must be at least 1” in diameter per 1’ of depth in order for it to be located with GPR.
- **Soil conditions** – clay soils, wet soil or soil which contains high amounts of debris can limit the effectiveness of GPR.
- **Surface conditions** – brush, standing water, metal plating, or anything which blocks direct access to the area to be scanned will limit the ability to perform GPR

ELECTROMAGNETIC LOCATOR

Electromagnetic Locator

- Used for tracing known metallic utility lines and pipes
- Consist of a transmitter and a receiver and detects utilities via induction, conduction and passive modes with known utilities
- Detects live power and RF signals underground

Limitations:

- **Poor Conductors** - Detected Electromagnetic Signals are dependent on the ability of facilities or tracer wires to conduct electrical current
- **Interfering Sources** - Interference makes it difficult to identify Signals. Common sources of interference are: power lines, congestion, and conductive above ground features.

ARSENAL OF TOOLS

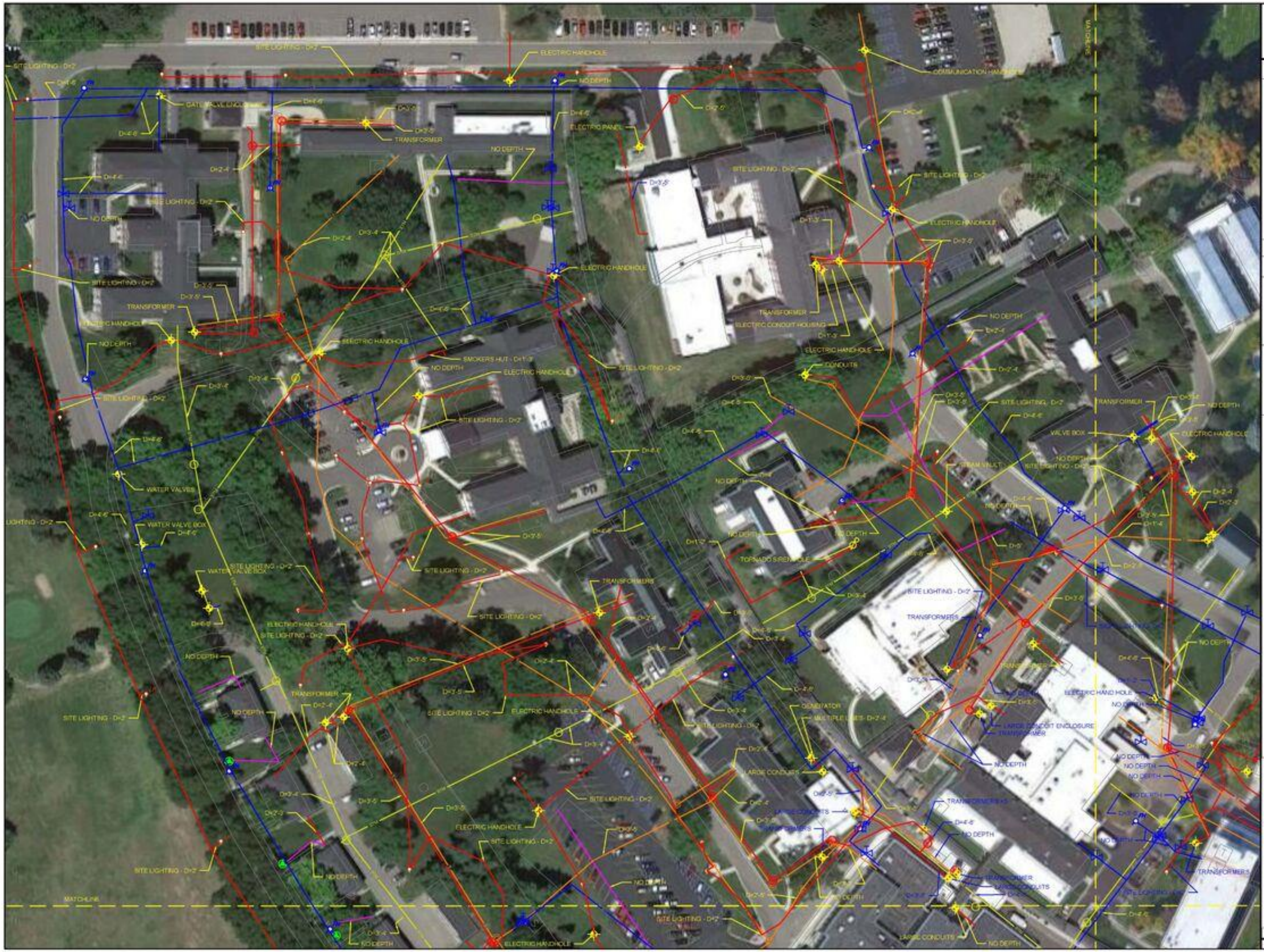
<u>Additional Tool Often Utilized</u>

- Locating Sondes
- Duct Rodders
- Sewer Cameras
- Acoustic - Pulse Thumper
- Electromagnetic Induction (EMI)
- Thermal Imaging - Radiant Heating Tubes Within Concrete

WHAT’S YOUR DESIRED DELIVERABLE?

REPORTING

In conjunction with our GPR locate, we can additionally use a hand-held GPS device to collect our finding and overlay them onto an existing CAD document and or Google Earth image for your records.



GPRS
SUBSURFACE SCANNING SOLUTIONS

TERMS AND CONDITIONS

1. THIS DRAWING IS INTENDED TO DOCUMENT MARKINGS AND COMMENTS AS INTERPRETED BY GROUND PENETRATING RADAR SYSTEMS (GPRS). GPRS PROVIDES UTILITY LOCATION SERVICES IN ACCORDANCE WITH ASCE STANDARD 38-02, QUALITY LEVEL "B" THAT INCLUDES GROUND PENETRATING RADAR (GPR) SERVICES. GPR IS A GOOD TOOL FOR UTILITY LOCATING; HOWEVER, IT IS NOT WITHOUT ITS LIMITATIONS. IN GENERAL, THE MAXIMUM DEPTH PENETRATION IS 3-7' DEEP, HOWEVER, THIS DEPTH IS COMPLETELY DEPENDENT ON THE COMPOSITION OF SOILS IN THE AREA BEING SURVEYED. CUSTOMER FULLY UNDERSTANDS THAT FOR EVERY FOOT IN DEPTH PENETRATION WITH THE GPR EQUIPMENT, THE PIPE/UTILITY MUST BE AT LEAST 1" IN DIAMETER TO BE LOCATED. FOR EXAMPLE, AT 4 FEET IN DEPTH, THE PIPE/UTILITY MUST BE 4" OR LARGER TO BE DETECTED. SOME TYPES OF PIPES ARE VERY DIFFICULT TO LOCATE, SUCH AS CLAY OR CONCRETE PIPES, AND EMPTY PVC TYPE PIPES. GIVEN THESE FACTORS, GPRS CANNOT GUARANTEE IT WILL BE ABLE TO LOCATE ALL UTILITIES ON SITE.
2. GPRS DOES NOT PROVIDE LAND SURVEY, OR CIVIL ENGINEERING DATA COLLECTION OR DOCUMENTATION.
3. COLLECTED INFORMATION IS SUBJECT TO GPS/GIS HAND HELD MAPPING UNIT ACCURACY (SUB-METER).
4. OUR GOAL IS TO PROVIDE YOU WITH THE ANSWERS TO YOUR QUESTIONS REGARDING WHAT LIES BELOW THE SURFACE, AND WHERE IT IS LOCATED. CUSTOMER ACKNOWLEDGES IT UNDERSTANDS THAT OUR ANSWERS ARE BASED UPON AN INTERPRETATION OF RETRIEVED DATA AND ARE WHAT GPRS BELIEVES LIES BELOW THE SURFACE. THE DECISION TO PROCEED WITH CUTTING, CORING, DRILLING, BORING, OR EXCAVATION IS LEFT ENTIRELY UP TO THE CUSTOMER.
5. GPRS DOES NOT ACCEPT LIABILITY FOR AN INACCURATE INTERPRETATION OR ANY OTHER REASON, AND CUSTOMER AGREES TO RELEASE AND INDEMNIFY GPRS AND ITS OWNERS AND AGENTS FROM ALL LOSSES AND DAMAGES FROM ALL ALLEGED NEGLIGENCE AND/OR CONTRACT CLAIMS BY CUSTOMER OR ANY THIRD PARTY. THESE TERMS AND CONDITIONS SUPERSEDE ANY/ALL OTHER TERMS AND CONDITIONS EITHER ORAL OR WRITTEN.

LEGEND

- STEAM
- DATA/COMMUNICATION
- ELECTRICAL
- WATER
- STORM SEWER
- SANITARY SEWER
- UNKNOWN
- LIGHT POLE
- STEAM MH
- ELEC MH
- SAN SEWER MH
- COMM MH
- CATCH BASIN
- WATER MH
- WATER VALVE
- HYDRANT
- POINT
- D= DEPTH

DATE	8/22/2017
DRAWING NO.	3 REV.

SUBSURFACE INVESTIGATION METHODOLOGY

Subsurface Investigation Methodology, (SIM) – Represents a set of methods, required training, apprenticeship hours, and equipment that will yield the best possible results from a non destructive underground utility locate or scan for structural and utility embedment's in concrete.

SUBSURFACE INVESTIGATION METHODOLOGY -

Subsurface Investigation Methodology, SIM

- Apprenticeship and classroom training exceeding, ASNT Practice SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing, Level 1 for ground penetrating RADAR.

- Proven set of methods and best practices for the best non destructive underground utility locating and concrete scanning results.

- Application of multiple technologies yielding redundant results increasing accuracy in each subsurface investigation.

SIM- SITE METHODS

2.5.1.4 Miscellaneous hardware, cables, hand cart, marking tape and power supply.

2.6 Electromagnetic Locating Equipment:

2.6.1.1 Capable of receiving electromagnetic and communication line frequencies passively or induced from potentially imbedded power or communication lines.

3. Investigation Scope

3.0 Scanning contractor will utilize job site information, available as-builts and prints/plans and previously detailed equipment to locate and mark out steel reinforcement, conduits and other anomalies within slab.

3.1 This mark out may include depth estimates of targets.

3.2 If the scan area includes a slab on grade and the post scan work requires trenching a lower frequency antenna may be used to locate targets in the backfill material under the slab.

3.3 Review of equipment capabilities and potential job-site performance impedances.

4. SIM Pre-scan Investigation

4.0 SIM Pre-investigation Steps :

4.1 Job Hazard Analysis, form review, or equal site safety review documentation. Review and sign site safety plan if applicable.

4.2 Site walk and project scope meeting, review scan locations. Note: Look for visible clues such as electrical rooms, service access ports like manholes and other utility boxes, visible conduits, etc.

4.3 Site contact interview, review known utilities, discuss possible unknowns, and anticipated critical targets. Review site post scan scope of work. Suggest scan area options.

4.4 Will GPR data samples be required for reporting.

4.5 Type of markings (paint, flags, other)

4.6 Client deliverable requirements, report format/documentation. GPS Mapping of site findings.

5. SIM Scanning Procedures

5.0 Quality of scan data

5.1 It is recommended that the scanning contractor calibrate the GPR system to the conditions at each site. This calibration may be estimated or a test performed to determine the correct dielectric of the soil using hyperbola matching or calibrating to an object at a known depth.

5.2 Perform several test scans through the scan area to determine the approximate maximum depth penetration and to gauge the probability of success in finding the desired targets.

5.3 Review the clarity of the scan data. Adjustments in gain, depth range, filters, and other settings may be necessary.

Complete Investigation

nd document the SIM methods applied.

Confirm information collected from section 4.2 and 4.3.

6.1.1 As-built site plans, original design plans.
6.1.2 Site walk aboveground utility indicators.

Scan and mark with electromagnetic locator.

6.2.1 Trace all known utilities. Typical known utility list includes five primary utilities to any building, water, electric, gas, sanitary sewer, and communication lines. Additionally, all utilities identified on a drawing not on list, any that have been communicated verbally, and any utility for which a feature can be observed.
6.2.2 Use EM Locator at visible features valve, manhole, riser, etc.
6.2.3 Use direct connection method when possible (Note: Do not connect directly to any potentially live electrical wires)
6.2.4 Use induction clamp if directi connection is not possible
6.2.5 Use induction method if induction clamp is not possible
6.2.6 After connecting or inducing with the transmitter, use the receiver to complete a full 360° sweep around the connection point.
6.2.7 Mark and trace all potential fields that are detected.
6.2.8 During this sweep, measure mA levels on the receiver in order to assist in correctly identifying the target line.
6.2.9 Identify the target line by tracing it to the connection point and at least to the next feature.
6.2.10 After tracing and marking any utility, sweep parallel to the utility on both sides in order to check for laterals/T's.
6.2.11 Insert traceable rodder or sonde into known sewer, storm and drain lines.
6.2.12 Trace the rodder or sonde using the receiver.
6.2.13 Use EM receiver to attempt to locate any unidentified, known utilities from features using passive modes (Power/Radio).
6.2.14 Sweep using passive modes parallel to the utility on both sides in order to check for laterals/T's.

Scan with GPR standard utility antenna, typical frequency 400 MHz or 350 Hyper stacking antenna.

6.3.1 Calibrate GPR settings to current site conditions.
6.3.2 Use GPR to attempt to locate any unidentified, known utilities.
6.3.3 Collect scans with GPR parallel to any marked utility in order to check for laterals/T's.
6.3.4 Document any known utilities that could not be located.
6.3.5 Perform passive sweeps with electromagnetic locator to locate unknown utilities.
6.3.6 Sweep all areas in a grid with spacing determined by site conditions.
6.3.7 Sweep separately with Power mode and Radio mode (and Cathodic Protection mode when applicable)
6.3.8 Collect GPR scans to locate unknown utilities.
6.3.9 Scan all areas in a grid with spacing determined by site conditions.
6.3.10 Collect GPR scans across all previously located utilities to confirm locations and approximate depths.
6.3.11 Document findings with photos and additional reporting/mapping if required.

gation hand off

le, conduct a recap and review of findings with site contact

Explain scan findings—Where did the technologies work well and where results were inconclusive due to interference and or soil conditions.

Explain markings and depth estimates.

Review original scope to confirm expectations were met/exceeded.


LIMIT YOUR RISK
• AVOID COSTLY REPAIRS
• MAINTAIN PROJECT SCHEDULE
• AVOID JOB SITE INJURIES