HGS HAWAII GEOPHYSICAL SERVICES

Clearing a path for your success

Subsurface Utility Engineering

Hawaii Geophysical Services efforts to Implement Common Ground Practices for Hawaii and the Pacific Rim

PRESENTERS

- Paul Vierling
  - Hawaii Geophysical Services

HGS HAWAII GEOPHYSICAL SERVICES
Clearing a path for your success

Who

- Hawaii Geopysical Services, LLC is a small business that provides
- geophysical engineering, underground surveying, utility locating,
- air excavation, pot holing, key holing, and leak detection.

WHAT

- HGS LLC Utilities Locator service identifies, locates, and maps existing underground utilities using state-of-the-art geophysical sensing equipment and nondestructive excavation techniques. Experienced professional technicians perform all research, field surveys, data management, and quality control, for the most demanding underground utility locating and utility survey projects.

Standards defined by the ASCE.

- **Quality Level D:**
  Record Research/Data Collection
- Information derived from records research or oral history. This level of service can provide a "feel" for the overall congestion of utilities, but is often limited in terms of comprehensiveness and accuracy.

.

Standards defined by the ASCE continued

- **Quality Level C:**
  Visible Surface Feature Utility Survey
- Utility surface feature data is obtained from surveying and plotting above ground utility features. Level C data supplements Level B data and finds omissions and errors in record information.

Standards defined by the ASCE continued

- **Quality Level B:**
  Utility Designation
- Designation data is collected by thorough applications of appropriate surface geophysical sensing technology. Located utilities are marked, field-tied to project monumentation, and mapped onto plan documents.

Standards defined by the ASCE continued

- **Quality Level A:**
  Underground Utility Locating (Test Hole)
- For this highest confidence level, precise horizontal and vertical location of utilities is obtained using nondestructive vacuum equipment excavation to safely expose, measure and map utilities. Includes all other Quality Level tasks and conflict resolution.

BACKGROUND

- Telecom Boom
  - Multiple entrants into the right-of-way leads to multiple cuts
    - Customer service issue
    - Safety issue (school gas pipe incident)
  - Local governments responsible for regulating and monitoring activities in the right-of-way
  - Special issue with the relatively new trenchless technology (trend toward coring/potholing)

Electro Magnetic Locating

- HGS uses the Radio Detection RD4000, Vivax VLocPro, and the Metrotech EZLoc locators. Additionally we employ a variety of sondes and cameras to locate and inspect sewer lines. Our top of the line electromagnetic, high powered listening, and camera equipment allow for precision locates yielding both depth and lateral measurements.

Electro Magnetic Locating continued

- Electro-magnetic locating works by sending a signal along a metal line that is tracked using a receiver. It's generally called toning, which is a carryover to the past, when the equipment was much more basic and locators listened for a tone to know they were tracking a line. Now the equipment provides a tone, but also provides visual cues as to the strength of the signal. Modern equipment can also provide estimated depths for the utilities.

Ground Penetrating Radar

- Hawaii Geophysical Services, LLC offers a wide range of Ground Penetrating Radar (GPR) services in industries such as construction, geotechnical, environmental, and archaeological. Since its inception in 2003, HGS has employed GPR for subsurface surveys that involved finding the locations of USTs (underground storage tanks) at over 80 gas stations on Oahu and neighboring Hawaiian Islands and locating a over 2 miles of a buried Army communication line under a dirt road .

Ground Penetrating Radar continued

- With much success in this application, HGS began to expand GPR services and worked on the pre-construction underground clearance of cell towers. Additionally, the GPR is frequently to clear the area for environmental borings.
- **HGS operates USRADAR SBR Scan Ground Penetrating Radars. We utilize a variety of antennas in the following applications:**

Ground Penetrating Radar continued

- **Utility detection** – metal pipes, PVC, fiber optic lines, manholes
- **Structural**-Rebar in concrete, load beams in floors
- **Geotechnical** – infrastructure, void detection, asphalt layer thickness, concrete stability

Ground Penetrating Radar continued

- **Geologic interpretation** - stratigraphy, hydrologic investigation, karst caves, bedrock, mining
- **Archaeological investigations** – subsurface structures, ancient living surface topography
- **Law Enforcement** – forensic investigation, tunnel mapping
- **Unexploded Ordnance** - buried military hardware

Ground Penetrating Radar continued

- **Environmental studies** – bore hole sites, landfill, groundwater flow, sink holes, subsidence
- **Misc. applications** – agriculture, demining (find landmines), graves and burials

Coring and Keyholing

- Potholing is more specifically known as SUE (subsurface utility engineering). It is the only way to know exactly where buried utilities are. Hawaii Geophysical Services is the only utility locating company in Hawaii to utilize this technology. We use a vac truck that employs air to excavate. Using air means there is no waste. The excavated earth can be placed right back into the hole. Hawaii Geophysical Services utilizes keyhole technology to pothole.

Coring and Keyholing continued

- When it comes to making holes, smaller is better. Surgeons have recognized this fact for years. Keyhole surgery is less intrusive and causes less trauma and tissue damage to the patient, which contributes to a shorter recovery period. The same holds true for cutting holes in roads to access, repair or view buried infrastructure.
- .

Benefits of Keyhole Technology

- Keyhole methods can cut excavation, repair and restoration costs in half. With keyhole techniques, maintenance activities are conducted through small pavement openings, resulting in significant cost savings, reduced public inconvenience, and more efficient repairs

Coring and Keyholing continued

- Keyhole technology provides a cost-saving alternative to common excavation and repair methods, which often require large "open" holes, followed by the removal and disposal of unwanted pavements and soils. These conventional practices – which involve several large pieces of equipment (backhoes, dump trucks, pavement breakers) - can account for 80% of the total cost of a job.

Benefits of Keyhole Technology

- **Reduced Traffic Disruption:** Faster one-step permanent pavement repair means reduced traffic disruption with fewer and shorter road closings with no repeat visits. Roads are open for traffic just 30 minutes after the repair.
- **Saves Dollars:** Less intrusive, more precise, pavement coring and reinstatement process means less structural damage to road system, longer pavement life and reduced maintenance. Saves dollars.

Benefits of Keyhole Technology continued

- **Reduced Footprint:** Neat, almost invisible, 18 inch diameter circular, keyhole core (area: 1.75 sq. ft.) vs. 2 ft. x 4 ft. conventional rectangular road cut (area: 8 sq. ft.) means reduced ‘scarring’ of the community landscape.
- **Environmentally Friendly:** No road-cut spoil to be disposed of and no temporary patching compounds with volatile organic compounds (VOC’s) to escape into the atmosphere.

Benefits of Keyhole Technology continued

- **Cleaner, Safer, Less Intrusive Worksite:** No jackhammers or large excavation equipment means less mess during and after the excavation and reduced disruption for neighbors
- See The Process
- http://www.utilicor.ca/pgs/media.html

BACKGROUND

- Common Ground
  - Effort of USDOT to convene stakeholders in underground facilities to identify and develop best practices
  - Stakeholders divided into nine functional areas to develop best practices
  - Report issued in February 2009
  - Mainly focuses on areas of consensus
  - Common Ground Alliance (www.commongroundalliance.com)

CITIES and COMMON GROUND

- Common Ground and Cities
  - Stakeholders included utilities, engineering firms, contractors, locaters, the federal government, and states
  - Only two municipal utility reps out of over 160 participants
  - How do cities apply common ground best practices?
  - Are there best practices that local governments can use that were not a part of the Common Ground practices?

CITIES and COMMON GROUND

- Cities can be important agents in preventing damage to underground facilities because:
  - Cities are where there is the greatest density of underground facilities,
  - Cities are where there is the greatest amount of activity,
  - Cities are where there is the greatest number of underground facility incidents,
  - Cities have local regulatory and inspection powers that can set development standards to prevent damage to underground facilities.

CITIES and COMMON GROUND

- Cities are in a position to implement many of the best practices identified in Common Ground
  - Design and location considerations
  - Marking of underground facilities
  - Excavation practices
  - Improve communications and coordination
  - Facilitate compliance with the state's one-call program

SELECTING BEST PRACTICES

- The Final Best Practices
  - Black & Veatch, working with the Steering Committee, through combining some practices and eliminating others reduced the final list to five best practices
  - B&V then developed detailed descriptions for each of the five practices

REVIEW & TESTING OF PRACTICES

- Testing of Best Practices
  - Cities are implementing some or all of the practices on a one-year test basis
  - A reporting form is being established
  - At the conclusion of the construction season interviews with stakeholders to develop a final assessment of the practices can occur.

THE BEST PRACTICES

- The Five Final Best Practices
  - Design Drawings and SUE
  - In-Ground Facility Identification
  - Potholing
  - Strategic Relationships
  - HDD Guidelines

THE BEST PRACTICES

- Design Drawings and SUE
  - Objective is to define collection and depiction of underground utility data on design drawings for construction projects in public ROW
  - Based on CI/ASCE 38-02, Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data

THE BEST PRACTICES

- Design Drawings and SUE
  - Collection of Data
    - Preparation of scaled base maps
    - Construction limits of project
    - ROW limits
    - Notable surface features and facilities
    - Existing subsurface facilities within construction limits of project… through the SUE process

THE BEST PRACTICES

- Design Drawings and SUE
  - SUE is Subsurface Utility Engineering – An engineering process to identify and map ug utilities as well as assign a quality level to data
    - Quality Level A – highest level – **locating or potholing** – precise plan and profile info
    - Quality Level B – **designating** horizontal position through surface detection methods and collecting info through survey method
    - Quality Level C – surveying visible subsurface structures and correlate with existing utility records
    - Quality Level D – most basic level – collect data from existing records

THE BEST PRACTICES

- Design Drawings and SUE
  - Selecting SUE Quality Level
    - Joint decision between project owner, engineer, and governing authority
    - Factors include project location, utility congestion, ROW width, size of project
    - Variable SUE levels on a project

THE BEST PRACTICES

- Design Drawings and SUE
  - Design Drawings
    - Design = Base maps + SUE data + best design (minimize conflicts)
    - Electronic drawing format
    - To scale with drawing legend
    - Distinct line types, symbols, and notes
    - Identify SUE quality level
    - Identify facility data information source
    - Plan and profiles

THE BEST PRACTICES

- Design Drawings and SUE
  - This was the one practice that produced comments from private sector stakeholders
    - Concern about time and cost of providing such information
    - Since there is not a single GIS database with existing utilities, engineers will end up duplicating a lot of work
    - It is more effective providing this information right before construction or during construction

THE BEST PRACTICES

- In-Ground Facility Identification
  - Objective is to identify and recommend permanent devices be installed with buried non-conductive facilities to allow facility detection through non-invasive methods
  - For new as well as replacement facilities

THE BEST PRACTICES

- In-Ground Facility Identification
  - Recommendation to install tracer wire with access points every 300 feet maximum
  - Additional use of plastic warning tape
  - For direct buried and HDD applications
  - Can be supplemented with markers

THE BEST PRACTICES

- Potholing
  - Objective is to ascertain horizontal and vertical location of facility
  - Methods
    - Air vacuum excavation (preferred)
    - Water vacuum excavation
    - Hand digging
    - Backhoe (discouraged)

THE BEST PRACTICES

- Potholing
  - Conditions requiring potholing include:
    - Any excavation within utility tolerance zone
    - Any utility crossings of HDD
    - Every 50 feet for HDD paralleling a utility within 3 feet
    - Every 200 feet for HDD paralleling a utility within 5 feet
    - Excavations near congested utility areas
    - Excavations within 3 feet of hazardous or vital systems
  - Backfill and restoration

THE BEST PRACTICES

- Strategic Relationships
  - Objective is to develop goodwill and positive relationships between key stakeholders that results in the exchange of useful information regarding facility location and protection
  - All stakeholders share a common goal
    - Municipal
    - Facility Owner
    - Project Owner
    - Contractors
    - One-call

THE BEST PRACTICES

- Strategic Relationships
  - Totally dependent on voluntary participation
  - Identification of stakeholders/communication information distribution
  - Having a voice to impact is the motivation
  - Meetings
    - ULCC (Utility Location Coordinating Committee)
    - Damage Prevention Roundtable
    - Educational Seminars
    - Industry-Sponsored Conferences
    - Pre-Construction Meetings
    - Meet and Greet Socials
  - More deliberate and structured in approach

THE BEST PRACTICES

- HDD Guidelines
  - Objective is to provide basic guidelines/fundamental elements of HDD process to ensure public safety and protect existing utilities
  - The guidelines are based on two sources:
    - City of Overland Park Horizontal Directional Drilling Guidelines Handbook (http://www.opkansas.org/Documents_&_Forms/hdd_guidelines.pdf)
    - Horizontal Directional Drilling Good Practices Guidelines by the HDD Consortium

THE BEST PRACTICES

- HDD Guidelines
  - HDD Attributes
    - Trenchless installation technique developed to install pipe under natural or man-made obstacles (crossings)
    - Also used for parallel installations
    - Used extensively in the following industries:
      - Gas
      - Water and Sewer
      - Pipelines
      - Electric
      - Communications

THE BEST PRACTICES

- HDD Guidelines
  - Requirements addressed:
    - Planning and Design
    - Permitting
    - Construction Safety
    - Construction Guidelines
    - Drilling Fluid Containment and Disposal
    - Storm Water Pollution Prevention
    - Construction Records

THE BEST PRACTICES

- Summary Observations
  - Common goal: damage prevention
  - Synergy between 5 practices, especially Design Drawings, Potholing, and HDD Guidelines
  - Practices available in hard copy and electronically (www.marc.org/damprev/DamagePrev.htm)

CITY EXPERIENCE

- Some cities have already used some of these practices
- Some cities are trying them for the first time
- Trying to get as much uniformity in practices as possible
- Some cities are still in adoption phase

CITY EXPERIENCE

- Murvyn Morehead
  - City of Overland Park, HDD Handbook & recent experience with cable overbuilder
- Monty Zimmerman
  - City of Lenexa, Potholing & recent experience with cable overbuilder
- Glenn Martin & Jerry Smith
  - City of Lee's Summit, recent experience

ONE CALL

- The primary objective of project has been on developing and testing best practices
- A second objective is to improve communication between local governments and the Missouri and Kansas One-Call programs

ONE CALL

- Meeting between Missouri One-Call, Kansas One-Call, One-Call Concepts, the service provider for both programs, the KCC, PSC, and local governments
  - Exchange of up-to-date GIS information
  - Mutual support
  - Public education focused on homeowners

ONE CALL

- Exchange of GIS Information
  - One-call programs have challenge in keeping base maps up to date, especially in developing areas
  - Have to deal with a large number of cities to get data
  - MARC has just developed a GIS base map of the entire region for Enhanced 9-1-1 which is kept up to date
  - MARC can transfer this updated base map information to One-Call Concepts in a digital format they can use
  - This will ease burden on cities and one-call programs and contribute to more accurate locates, especially in rapidly developing areas

ONE CALL

- Mutual Support
  - Local governments can:
    - Distribute one-call information
    - Can require a one-call tickets before issuing a permit
  - One-Call can:
    - Provide information on local contacts
    - Provide inquiry information to cities
  - Both have the same interest, to reduce damage to underground facilities

ONE CALL

- Homeowner Public Education
  - A big problem is homeowner damage to underground facilities
  - They are not reached in the same manner as the professional stakeholders and often are unaware of one-call requirements and local permitting requirements
  - Called on regional Public Information Officer group to help design campaign

ONE CALL

- Homeowner Public Education (cont.)
  - Program included:
    - Brochures distributed through permitting offices, county extension offices, libraries, equipment rental companies, and nurseries
    - Placards at same locations
    - Public Service Announcements on cable channels
    - Articles in city newsletters and on city web sites
    - Web site: http://www.marc.org/onecall/

REGIONAL UTILITY MAP

- Important Potential Initiative
  - Developing a single, regional utility location map would be a great asset
    - Cited during interviews
    - Cited in discussion of design drawing practice
  - The beginnings of such a system is under development in Johnson County

REGIONAL UTILITY MAP

- Key Issues
  - **Liability** for sharing information
  - **Security**
  - **Business information**
  - **Technical,** in creating single regional GIS map that is compatible across jurisdictions and utilities
- Steering Committee has authorized a preliminary study of these issues

CONCLUSION

- What is Next?
  - Complete testing of the practices
  - Evaluate practices
  - Conduct regional utility map study
  - Produce a report
  - Formally promote and adopt practices
  - Continue to work on one-call and utility map issues