



Reducing Excavation Damage in the Natural Gas Industry Using Real-Time GIS and Sensors

Robert J. Marros, GISP, Manager - GIS
Gas Technology Institute

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How can excavation damage be reduced?

- What is excavation damage?
- Can technology help reduce excavation damage?
- Excavation Encroachment Notification Technology
- Pilot Project & Field Testing
- Results
- Next Steps

What is excavation damage?

- Damage occurring when an excavator **strikes** an underground utility
- Potentially resulting in **fatalities**, serious injury, property damage
- According to the Common Ground Alliance – **the leading causes of excavation damage are excavators that don't utilize the one-call center and excavators that dig carelessly near underground pipes**



What is excavation damage?

- Over **91,000** damages occurred in 2016
(Common Ground Alliance - <http://commongroundalliance.com/dirt-2016-interactive-report>)
- Every **9** minutes an underground utility is damaged because someone didn't call 811
- Excavation damage is estimated to have risen **20%** over the prior year
- Conservatively cost stakeholders **\$1.5 billion**

Can technology help reduce excavation damage?

Data Collection



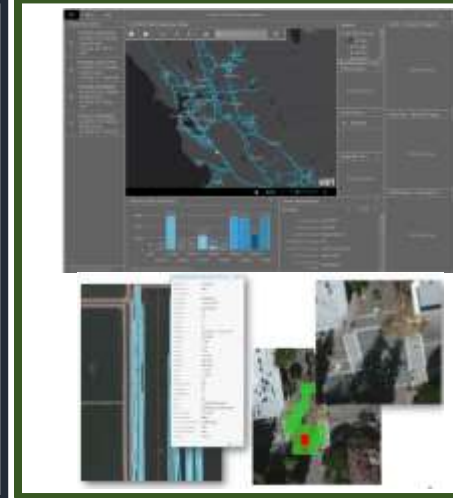
- Dedicated Device
- GPS/GNSS
- Motion Sensors
- Cellular

Analysis



- Data Management
- GIS Processing
- Activity Analysis
- Threat Analysis

Awareness



- Utility Dashboard
- Operator Alerts
- Cell Phone Alerts

GTI's Excavation Encroachment Notification Technology

- Black Box Device
- Esri ArcGIS Server & GeoEvent Server
- Apache Kafka & Apache Spark
 - Machine Learning
 - Characterization Algorithms
- GeoFence Boundaries define areas to trigger alerts



Pilot Projects & Field Testing

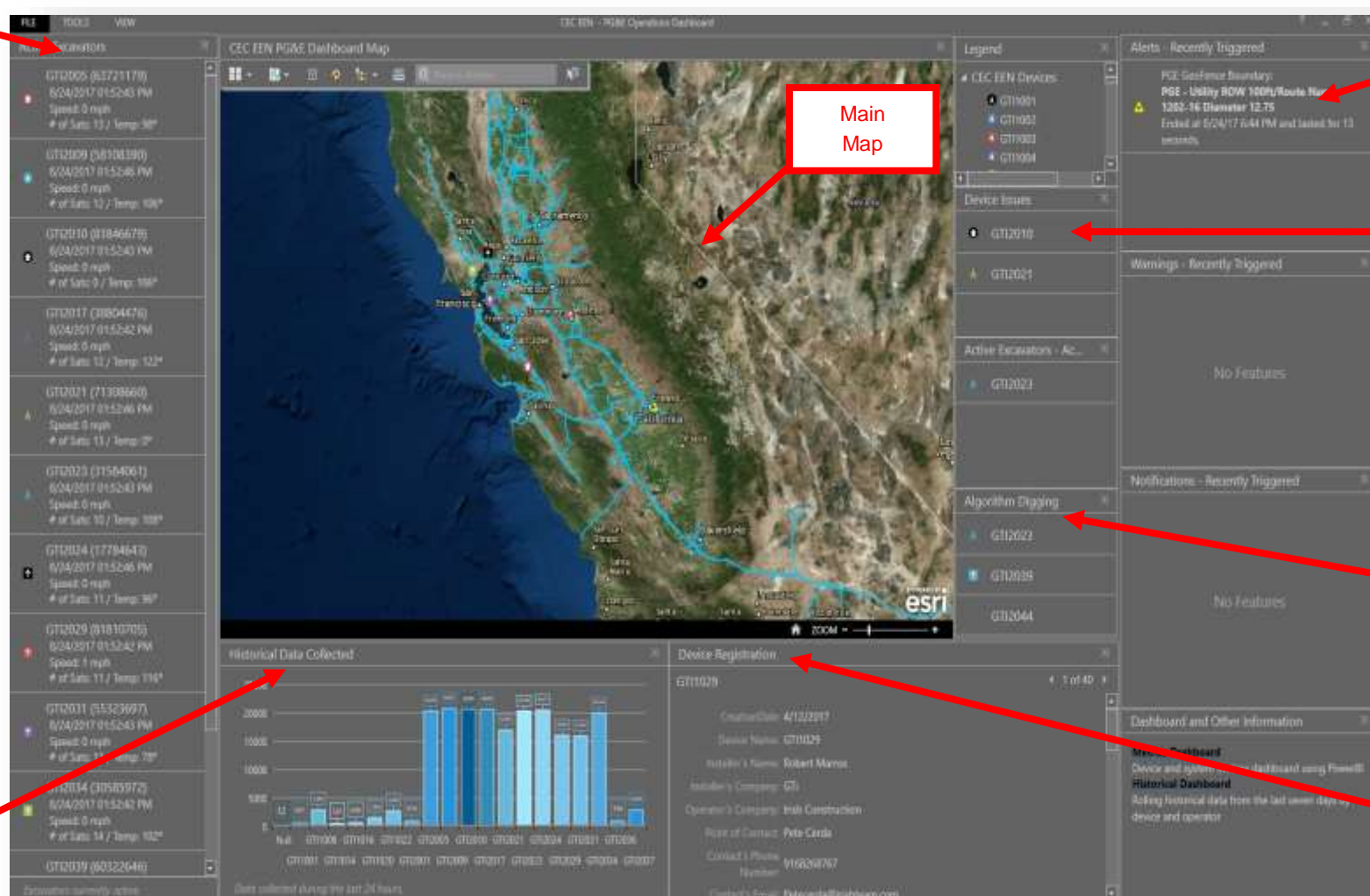
- Initial Technology Development
 - Android phones and app
 - Proved concept of streaming data into GIS
- Pacific Gas & Electric/California Energy Commission Grant
 - 150 Dig-In Devices Deployed to Date
 - 13 Total Participants:
 - Five PGE Subcontractors, all Gold Shovel Standard Certified
 - Seven Third party participants (Agriculture, Municipality)
 - 12+ Months of Field Experience
 - 40+ million data points collected (April 2018)



Pilot Projects & Field Testing



Pilot Projects & Field Testing

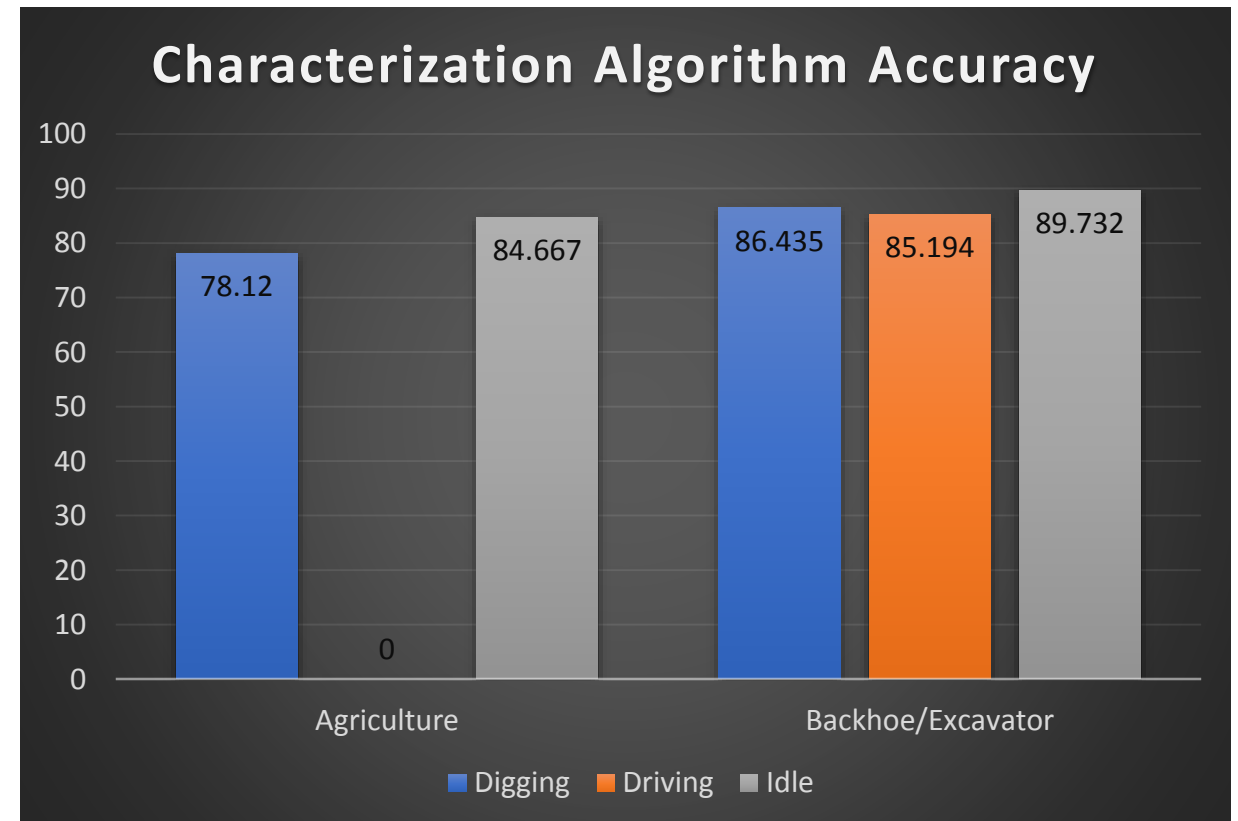


The screenshot displays the CEC EEN PG&E Dashboard Map interface. The main map shows a geographical area with blue lines representing gas pipelines. The interface includes several panels:

- Devices Online:** A list on the left side showing device IDs (e.g., GT1005, GT1009, GT1010, GT1017, GT1021, GT1023, GT1024, GT1029, GT1031, GT1034, GT1039) and their status (e.g., Speed: 0 mph, # of Sats: 12, Temp: 30°).
- Main Map:** The central map area showing the pipeline network and surrounding terrain.
- Alerts - Recently Triggered:** A panel on the right showing a warning for a gas fence boundary violation: "PG&E GasFence Boundary: PG&E - Utility BOW 100ft/Route No. 1202-16 Diameter 12.75 Entered at 6/24/17 6:44 PM and lasted for 13 seconds."
- Devices Issues:** A panel on the right showing a list of device issues, including GT1020 and GT1021.
- Historical Data Counts:** A bar chart at the bottom left showing data collected over a 24-hour period.
- Device Registration:** A panel at the bottom right showing details for device GT1029, including creation date (4/12/2017), device name, installer name (Robert Mann), installer company (GT), operator company (Inch Construction), pipe of contact (Pete Cardo), contact phone number (916204767), and contact email (P.Mann@inch.com).

Results

- Characterization Accuracy
 - Backhoe/Excavator – 86%
 - Agriculture – 78%
- No known dig-ins while devices utilized
- 40+ Million data points



Next Steps

- Pursue additional pilot project opportunities
- Discuss commercialization with potential partners
- Thank You!

For more information, contact:

Rob Marros

Gas Technology Institute

robert.marros@gastechnology.org