

DOCKETED

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CALIFORNIA ENERGY COMMISSION

High Accuracy Mapping for Excavation Damage Prevention and Emergency Response (PIR-15-014)

**Gas Technology Institute (GTI)
LocusView (LVS)**

**Natural Gas Infrastructure Safety and
Integrity Research Program Workshop
CALIFORNIA ENERGY COMMISSION
July 7, 2017**



WHO WE ARE



GTI is a not-for-profit organization providing R&D services for the natural gas industry through collaborative programs

LocusView is a GTI subsidiary providing commercial-scale technology and services for advanced geospatial and mobile solutions



PROJECT STRUCTURE

- Funding from California Energy Commission
- GTI is the prime contractor
- LVS is sub-contractor to GTI
- Pacific Gas and Electric (PG&E) is utility partner and potential technology end-user



PROJECT GOALS - SUMMARY

- To support implementation of technology to create and display asset maps for situational awareness during routine and emergency events using recent advances in mobile, Geographic Information System (GIS), and Global Positioning System (GPS) technology
- Project plan includes implementation of the system in the PG&E service territory



PROJECT OBJECTIVES

1. Deploy 20 high accuracy mapping systems in the PG&E service territory to support enterprise adoption by developing workflows to support business processes and identifying barriers to full deployment.
 - Performance metric – time required to get map data from the field to the enterprise GIS.
2. Deploy a situational awareness tool to present asset maps to 20 field crews based on their location and permission levels.
 - Performance metric – accuracy and completeness of the map data presented to each user group.



BENEFITS

- Improve public safety and system integrity by reducing excavation damage
- Improve public safety by promoting situational awareness through the visualization of high accuracy maps and related information during emergencies
- Increase operational efficiencies by reducing the amount of time required to locate assets for engineering, operations, and one-call activities
- Reduce methane emissions by preventing pipe damage and reducing leaks



TECHNOLOGY SUMMARY

- Technology to create spatially accurate maps populated with traceability data
 - Mobile GIS applications
 - High accuracy GPS
 - Barcode scanning
 - Sensor based data collection
- Data captured in field during construction, repairs, other operations
- Traceability data for:
 - Materials
 - Joints
 - Operator Qualifications (OQ) Status
 - Pressure Tests



MATERIAL TRACKING & TRACEABILITY

- Reads and decodes ASTM F2897 (or other) barcodes
- Creates GIS features and populates attribute information
- Performs real-time validations of material properties (recalls, UV exposure)
- Maps assets with high-accuracy GPS



Work Request # New

3/4" PE4710 Coupling

2nd size

Location	
Size Diameter	3/4
Size Standard	IPS
SDR	11
Wall Thickness	0.095
Manufacturer	Elster Perfection
Category Type	Coupling
Subcategory Type	Mechanical stab with EPV
Material	PE4710
Lot Code	2509921
Production Date	04/27/2016
Comments	





JOINT TRACEABILITY

- Creates joint (weld, fusion, or mechanical fitting) traceability barcode
- Captures machine make, model, and calibration date
- Captures parameter data from fusion machines



The image shows a mobile application interface for joint traceability. The top screen displays "Work Request # Default" and has three tabs: Ernest Grass, MSA 340, and Electro (C). The bottom screen shows a "SCAN" button and a "Machine Barcode" field. Below this, there are two sections: "MACHINE PROPERTIES" and "FUSION PROPERTIES".

MACHINE PROPERTIES	
Serial	24243
Brand*	GF central
Model*	MSA 340
Fusion Type*	Electro

FUSION PROPERTIES	
Connected	<input checked="" type="checkbox"/>
Fusion Date/Time	04/18/2016 5:24 AM
Job/Ident No.	NA
Arbitration Temperature (°C)	+27
Actual Heating Time	107
Actual Resistance	0.919
Minimum Voltage	55.4
Actual Voltage	NA
Current Time	NA
Total Energy	1
Clear Codes	117
GF Joint Barcode Value	961612318303400836110111

There is a "CONTINUE" button in the bottom left of the fusion properties section. A "Clear All" link is in the top right of the fusion properties section. A barcode icon is in the bottom right corner.



OQ TRACEABILITY

- Uses third-party or custom OQ cards
- Performs real-time validations of OQ status
- Records OQ status for various field activities

Work Request # Default

Full Name Machine Fusion

SCAN
Operator Barcode

OPERATOR IDENTIFICATION [Clear All](#)

Operator Name

Operator Company

Inspector

CONTINUE



Fusion Traceability

John Smith Machine Fusion

SCAN
Operator Barcode

OPERATOR IDENTIFICATION [Clear All](#)

Operator Name **John Smith**

Qualified
Electrofusion
Butt Hydraulic
Butt Manual
Mechanical

Operator Company **LocusView**

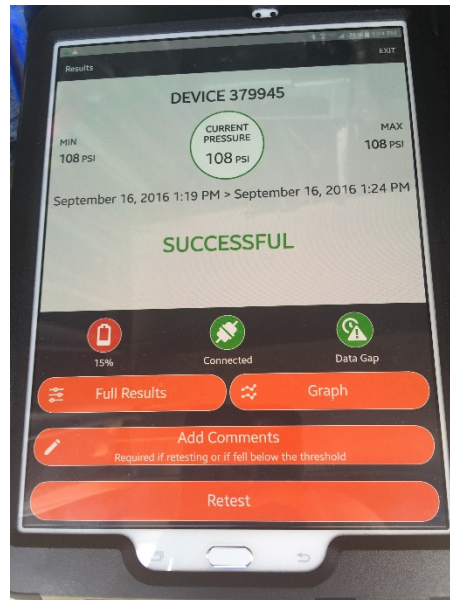
Inspector

CONTINUE



PRESSURE TEST TRACEABILITY

- Creates a verifiable pressure test record that is associated with specific assets or project numbers
- Monitors tests against pre-defined requirements
- Provides real-time monitoring and alerts





PROJECT TASKS

1. General Project Project Tasks
2. High Accuracy mapping Configuration
3. High Accuracy Mapping Pilot Project
4. Situational Awareness Tool Configuration
5. Situational Awareness Tool Pilot Project
6. Evaluation of Project Benefits
7. Technology Transfer Activities



Task 2. HIGH ACCURACY MAPPING CONFIGURATION

Scope:

- Conduct workshops/demonstrations with key stakeholders
- Create and configure data model, software, hardware, and hosted mapping environment
- Perform internal testing on entire solution
- Perform User Acceptance Testing with PG&E

Products:

- User Acceptance Test Plan
- User Acceptance Test Report

Status: COMPLETE

- Procured tablets, GPS Units, Real Time Kinematic (RTK) base station materials and accessories for pilot project
- Prepared detailed design document together with PG&E
- Completed design and configuration for the data collection software
- Held weekly stakeholder conference call with PG&E
- Completed User Acceptance Test Plans with PG&E input
- Completed User Acceptance Testing and Test Report



Task 2: HIGH ACCURACY MAPPING CONFIGURATION

Mapping Hardware/Equipment

- Tablet: iPad mini
- Barcode Scanner: Zebra
- GPS: EOS Arrow Gold GNSS Receiver
- Survey Pole
- Charging cables & accessories
- Carrying case

Software Configuration

- Data model customization
- Materials list
- Workflow/User Interface customization and improvements





Task 2: HIGH ACCURACY MAPPING CONFIGURATION

RTK Base Stations

Hardware/Equipment

- EOS Arrow Gold GNSS Receiver
- Hemisphere A45 GNSS Antenna
- Intel NUC Mini PC
- Low-Loss Antennae Cable
- Web power switch
- 4G/LTE Router
- Lightning protector
- Miscellaneous Peripherals

Software

- Windows 10 Professional
- EOS Utility Desktop
- AGG Software TCP COM Bridge





Task 3. HIGH ACCURACY MAPPING PILOT PROJECT

Scope:

- Prepare training materials: manuals, field guides, and a video
- Onsite testing, training and support
- Weekly status calls during first 2 months – user feedback
- Bi-weekly status calls for following 4 months
- Modify/update software on a monthly basis – based on end user feedback

Products:

- Draft Pilot Project Report
- Final Pilot Project Report
- Critical Project Review (CPR) Report

Status: IN PROGRESS

• Completed:

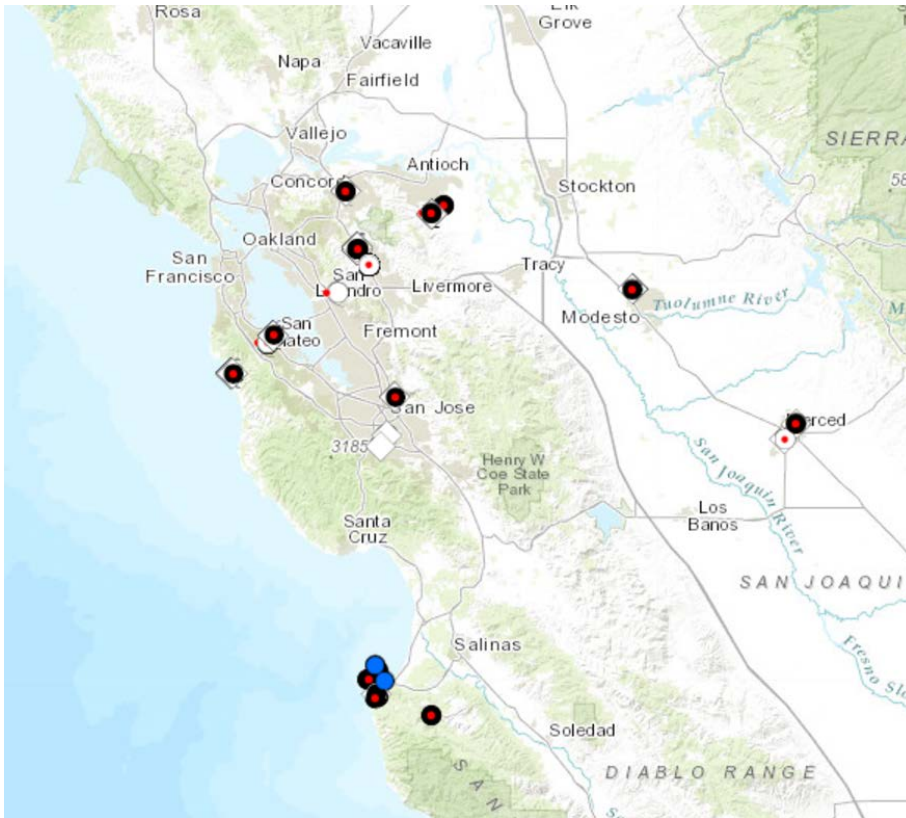
- Provided training and deployed 18 units
- Installed 8 RTK base stations in PG&E service territory

• On-going/Next Steps:

- Weekly status calls
- Monthly software updates
- Train/deploy final 2 units, addition of Joint and Pressure Test Module



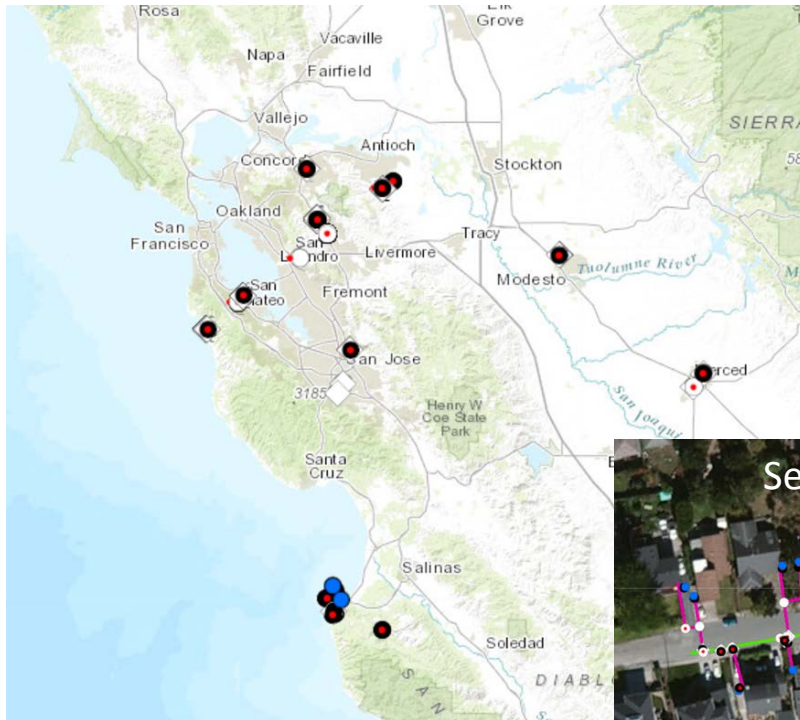
Task 3: HIGH ACCURACY MAPPING PILOT PROJECT



- Trained/deployed 18 units
- 8 locations in the Bay Area



Task 3: HIGH ACCURACY MAPPING PILOT PROJECT



- Data Collection Summary (to date):
 - >500 fittings
 - >9,000 ft pipe
 - Avg. GPS Accuracy: 10.58 in
 - Median GPS Accuracy: 1.73 in





CHALLENGES & LESSONS LEARNED

- GPS/RTK Connectivity Bug
 - Mapping application had difficulties maintaining a fixed connection
 - LVS made software improvements to fix problem including better on-screen messaging for GPS accuracy
- iOS Application Updates
 - Unknown complexities between iOS and LVS technology resulted in LVS needing to manually push updates to each tablet
 - LVS working on implementing mobile device management (MDM) solution for iPads



Task 4. SITUATIONAL AWARENESS TOOL CONFIGURATION

Scope:

- Define map data to be displayed based on a permission level
- Configure the GIS tool to display the defined data
- Perform internal testing
- Prepare a User Acceptance Test Plan
- Perform User Acceptance Testing with PG&E
- Prepare the User Acceptance Testing Report

Products:

- User Acceptance Test Plan
- User Acceptance Testing Report

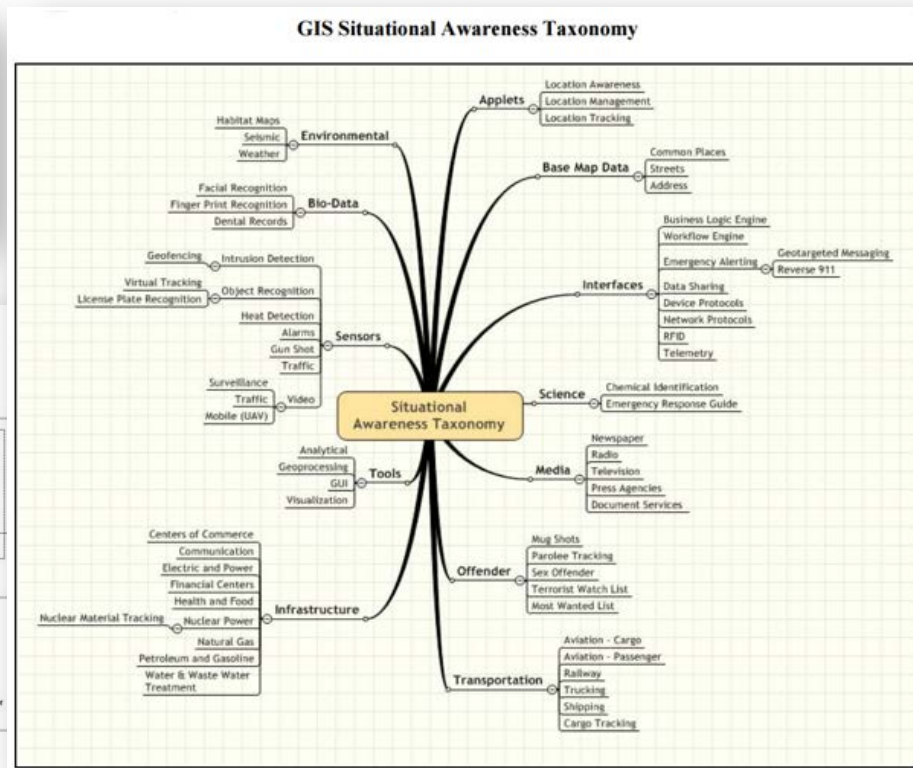
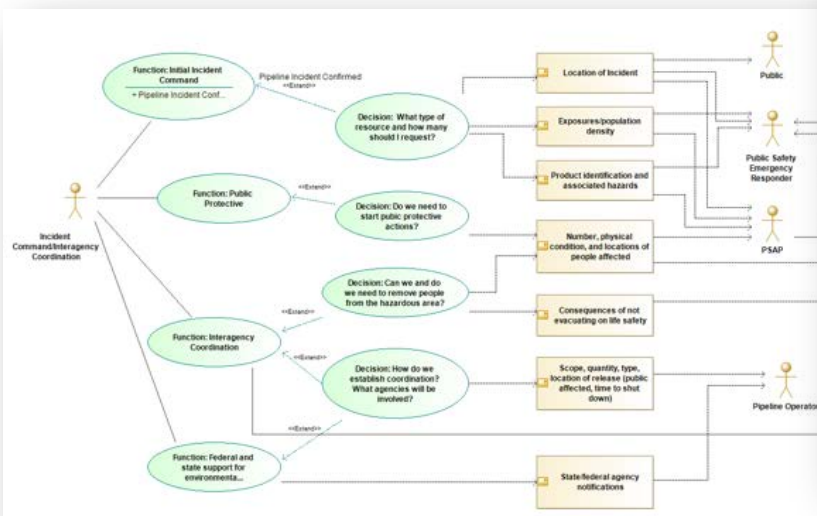
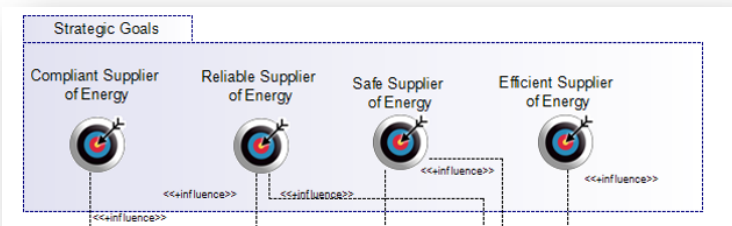
Status:

- Developed Use Cases and documented the required functionality
- Developed Process and Workflow diagrams
- Developed draft of User Acceptance Test Plan
- Sent User Acceptance Test Plan to PG&E for comments
- Reviewed current platforms and assessed requirements for the situational awareness process



USE CASE & PROCESS DEVELOPMENT

- Identified goals of Situational Awareness related to the Gas Industry
- Developed an Inter-Agency Coordination Use Case Model
- Compiled a taxonomy of datasets appropriate for Situational Awareness





Task 5. SITUATIONAL AWARENESS TOOL PILOT PROJECT

Scope:

- Prepare training materials and mobile devices for 20 end-users
- Perform on-site testing and provide training to PG&E staff
- Provide on-site monitoring and support for sixty days
- Conduct bi-weekly status calls with selected users to obtain feedback
- Modify and update the software on a monthly basis based on user feedback

Products:

- Draft Pilot Project Report
- Final Pilot Project report
- CPR Report

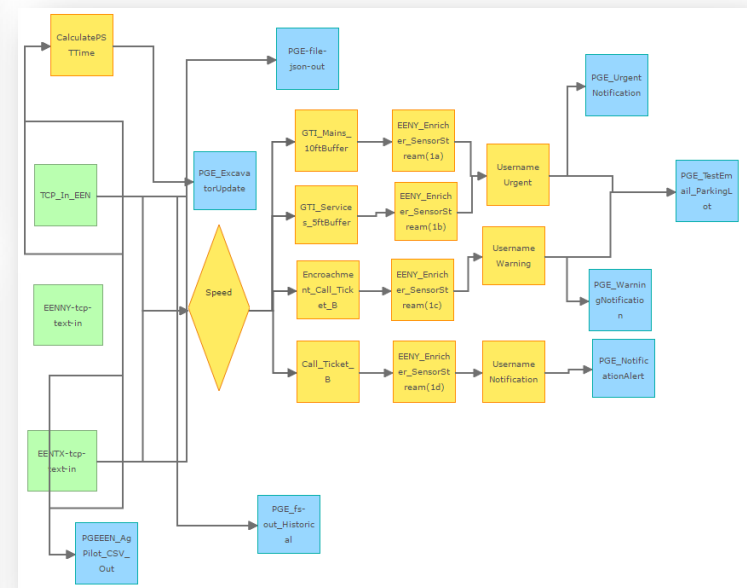
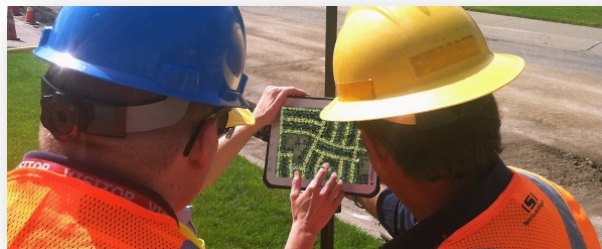
Status:

- Identified Esri-based web application for configuration and use in pilot on iOS devices
- Currently configuring functionality for situational awareness use case/app
- Identified integration points for TAMI (Tactical Awareness Mapping Integration)



PILOT PROJECT CONFIGURATION

- Gathering requirements and defining PG&E-specific Situational Awareness stakeholders
- Technology configuration will incorporate PG&E feedback to incorporate real-time GIS data





Task 6. EVALUATION OF PROJECT BENEFITS

Scope:

- Complete three Project Benefits Questionnaires that correspond to three main intervals in the Agreement:
- Provide all key assumptions used to estimate projected benefits
- Respond to CAM questions regarding responses to the questionnaires

Products:

- Kick-off Meeting Benefits Questionnaire
- Mid-term Benefits Questionnaire
- Final Meeting Benefits Questionnaire



Task 7. TECHNOLOGY TRANSFER ACTIVITIES

Scope:

- Prepare an Initial Fact Sheet at start of the project that describes the project. Use the format provided by the CAM.
- Prepare a Final Project Fact Sheet at the project's conclusion that discusses results. Use the format provided by the CAM.
- Prepare a Technology/Knowledge Transfer Plan that includes:

Products:

- Initial Fact Sheet (draft and final)
- Final Project Fact Sheet (draft and final)
- Presentation Materials (draft and final)
- Technology/Knowledge Transfer Plan (draft and final)
- Technology/Knowledge Transfer Report (draft and final)



KEY TARGETS

Task/Activity	Delivery/Target Date
SA Configuration	7/14/2017
SA Training & Deployment	7/31/2017
TAC Meeting #2	Summer 2017
HAM Pilot Project Success Metric Data	8/30/2017
SA Pilot Project Success metric Data	9/30/2017
Pilot Project Completion	11/28/2017



Questions