the Energy to Lead

CALIFORNIA NATURAL GAS PIPELINE ASSESSMENT
CEC #500-10-050

GTI Project Joint PAC Meeting

May 7, 2012

REVIEW OF TASKS and DELIVERABLES

> Baseline Technology Assessment for Pipeline Integrity and Monitoring Technology in the State of California
  - Deliverables – Review of current state of technologies being used
  - Scheduled Completion Date – April 30, 2012

> Assessment of Currently Available Pipeline Integrity Assessment and Monitoring Technology
  - Deliverables – Catalogue of available technologies and gap analysis
  - Scheduled Completion Date – July 31, 2012

> Evaluate Emerging Pipeline Integrity Assessment and Monitoring Technology
  - Deliverables – identification of technologies that could be developed or enhanced in the next 2-4 years with emphasis on integration with the AMI communications backbone
  - Scheduled Completion Date – October 31, 2012

Status and Next Steps (May and June) – Task 2

- Status
  - Completed and Submit Draft Report, Currently under Review by CEC
  - Accelerated Development of Preliminary Results for Implementation Plan Based on CEC Request
  - Provided High Level Summaries of Recommended Technologies for Inclusion in Workshop and Solicitation (Next Slides)
- Next Steps
  - Provide Final to Joint PAC

Survey Results and Key Findings

- Expert's Develop and Maintain Integrity Management Program's Specific to the Needs of Each Operator
- Not Every Technology is Appropriate or Provides Value in Every Instance
- Technologies Identified as needed by some were in use by others
  - Crack Detection and Evaluation Measurement in the Ditch
  - Hand-Held Field Data Collection Devices
- A Lessons Learned/Brainstorming Workshop Should Have Immediate Benefits
- Facilities Are Available for Testing and Verification

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Preliminary Technology Recommendations*

- Less than 12 months to deploy:
  - Data Collection and Communication Techniques
    - Hand-held devices for field use
    - Survey grade GPS without post-processing
    - Bar coding to optimize field data collection and automate data entry
  - Risk-Modeling and Incident Prediction Tools
    - Create an industry database as the first step toward the development of a predictive performance based (proactive) modeling tool

*Final Gap Analysis and Technology Implementation Plan are to Be Completed Q1 2013

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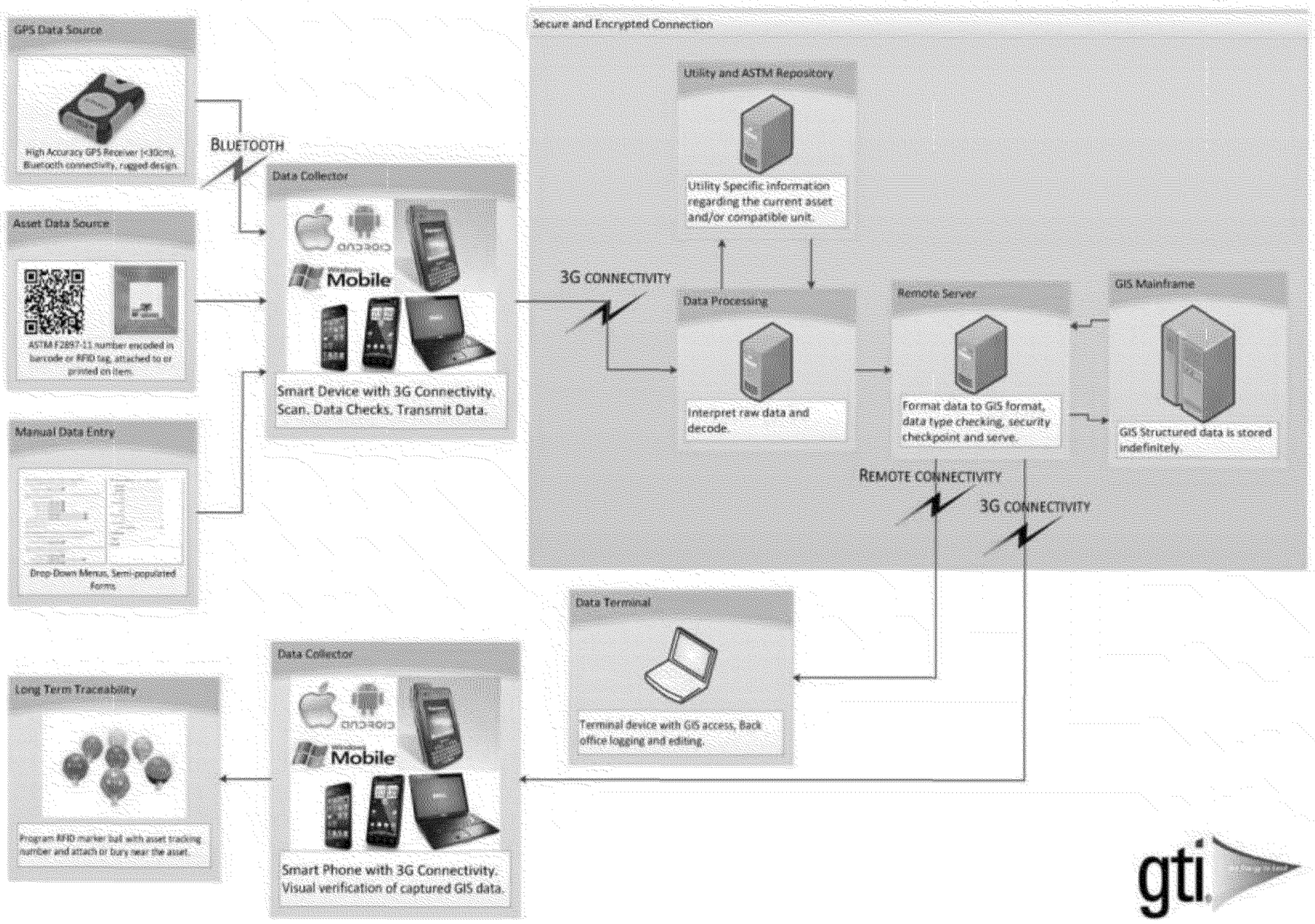
GPS Data Source
High Accuracy GPS Receiver (<30cm), Bluetooth connectivity, rugged design.
BLUETOOTH
Asset Data Source
ASTM F2897-11 number encoded in barcode or RFID tag, attached to or printed on item.
Manual Data Entry
Drop-Down Menus, Semi-populated Forms
Data Collector
Smart Device with 3G Connectivity. Scan. Data Checks. Transmit Data.
Secure and Encrypted Connection
Utility and ASTM Repository
Utility Specific information regarding the current asset and/or compatible unit.
3G CONNECTIVITY
Data Processing
Interpret raw data and decode.
Remote Server
Format data to GIS format, data type checking, security checkpoint and serve.
GIS Mainframe
GIS Structured data is stored indefinitely.
REMOTE CONNECTIVITY
3G CONNECTIVITY
Data Terminal
Terminal device with GIS access, Back office logging and editing.
Data Collector
Smart Phone with 3G Connectivity. Visual verification of captured GIS data.
Long Term Traceability
Program RFID marker ball with asset tracking number and attach or bury near the asset.

Preliminary Technology Recommendations

> Internal Inspection Optimization, Phase 2

— A program to facilitate targeted ILI technology development. Phase 1 underway.

Threats	Parameters of Interest	Sensor Technology	Platforms	Overarching Influencers / Other Considerations
• External Corrosion • Internal Corrosion • Stress Corrosion Cracking (surface and subsurface) • 3rd Party Damage • Fabrication / Weld Quality • Wrinkle Bends / Miter Bend • Residual Stresses • Soil and Other Superimposed Stresses	• Wall Thickness and Loss • Cracking • Residual Stress Levels • Hardness and Ultimate Strength • Yield Strength • Toughness • Physical Dimensions (ID) • Internal Defects (Porosity, Laminations, etc.) • Physical Contact to Other Structures	• Ultrasonic/microwave • Eddy Current/RFEC • Guided Wave UT • X-Rays • Magnetic Flux Leakage • Magnetic Field Strength • Electromagnetic • Optical/IR/UV • Video/Stills • Caliper • Hardness • Modulus • Stress-Strain Probe	• Tethered (e.g., mechanical cable or coiled tube pulled) • Push Rod (e.g., coiled tube pushed) • Robotic Tethered (e.g., self-driven brush drive but with trailing power cord) • Robotic Autonomous (no tether for power, etc.) • Flowable Sensors (e.g., Fluidized Sensors, Smart Balls, etc.)	• Existing and Impending Regulations (i.e., Post San Bruno) • Market Size (diameters, distances, obstructions) • Cost (development and per inspection unit) • Time to market • Sponsors • Repeatability of Inspections • Commercializers

FACETS OF THE PROGRAM

PHASE - 1
1. **Perform overlap analysis** of sensors and platform capabilities.
2. **Determine current state** of sensor and platform development.
3. **Perform gap analysis**: Threats and Parameters of Interest ⇔ Sensor and Platforms in existence.

PHASE - 2
4. **Identify off-the-shelf manufacturers and commercializers** (short and long-term view).
5. **Fund technical development** in critical gap areas.
6. **Work with regulators and SDOs** on acceptable internal inspection technologies.

Preliminary Technology Recommendations

> Understanding Threat Interactions for Risk Analysis - Implementation

- This program is developing a methodology for calculating the risk associated with a superimposed set of threats as well as a process for addressing unknown threats.
- The deliverable (FTA based software program) will ultimately lead to an enhanced level of understanding and safety in the operation of natural gas transmission infrastructure. For operators, the developed method to identify, rank, mitigate, and continually track threat interactions will demonstrate continual improvement to the pipeline integrity process.

Preliminary Technology Recommendations*

- 12 to 24 months to deploy are:
  - Risk-Modeling and Incident Prediction Tools
    - Upgrading and integrating GIS with various software
    - Predictive performance based modeling tool integrated with an industry database to supplement man-made decision making
  - Non-Destructive Examination and Testing
    - Accurate measurement of crack length and depth in the ditch with transmittal to the back office
  - Use of AMI to Create or Enhance the Ability to Provide Two-Way Communications, Monitoring and Control Resulting in:
    - Redundant paths for data flow
    - Low cost approach for data collection and system monitoring as new low cost/low power technologies are developed – Ex. Right-of-Way (ROW) intrusion, third party damage, leak detection
    - Improved pipeline monitoring of flow and pressure in real-time
    - Improved operation of selected valves

*Final Gap Analysis and Technology Implementation Plan are to Be Completed Q1 2013

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Status and Next Steps (May and June) – Task 3

- Status
  - Initiated Draft of Task Report
  - Submitted Catalogue for Review of Copyright Status and Obtaining Permissions
  - Confirmed the Capability to Include SME's in Brainstorming Session
- Next Steps
  - Complete Review of Copyright Status and Obtain Permissions
  - Create Editable and PDF Versions of Catalogue
  - Conduct Brainstorming Session(s)
  - Conduct Gap Analysis, Including Ability to Use or be Modified to Use AMI

Status and Next Steps (May and June) – Task 4

- Status
  - Not Emphasized To-date, Occurring in Parallel with Tasks 2 and 3
- Next Steps
  - Initiate Identification of Emerging Technologies by June, 2012
  - Use Task 2 and 3 as Reference
  - Provide Gap Analysis, Including Ability to Use or be Modify to Use AMI

Status and Next Steps (May and June) – Implementation Plan

- Status
  - Accelerated Development of Preliminary Results Based on CEC Request
  - Provided High Level Summaries of Recommended Technologies for Inclusion in Workshop and Solicitation
- Next Steps
  - Finalize Information for Submittal to CPUC on Technology Summaries for Workshop
  - Attend CEC Workshop
  - Initiate Plan Preparation in 4th Quarter 2012

Discussion

- Questions
- Comments
- Recommendations