Background

A large multi-national energy company desired to establish a comprehensive Inspection Program for its natural gas operations facilities. The objective was to establish a program that minimized the company’s exposure to damage caused by CUI. The fixed facilities included:

• 30 – Gas Processing Facilities
• 2 – Terminals and Other Storage Facilities
• 100 – Compressor Stations
• 12 – Laterals and Delivery / Receipt Facilities in HCAs

Scope

Studies indicate that Corrosion Costs and Preventive Strategies in the United States will have a direct cost, due to corrosion, of $276 billion per year, with that number potentially doubling when indirect costs are also considered.

A study commissioned by ExxonMobil demonstrated that the highest incidence of leaks in the refining and chemical industries is due to CUI and not to process corrosion.

• Most piping leaks – 81% – occur in diameters smaller than 4-inch nominal pipe size
• Between 40% and 60% of piping maintenance costs are related to CUI

As a result of the Facilities Assessment review at 23 gas facilities, many of which were identified as candidates for CUI, a CUI inspection protocol was generated for the use of the energy company.

Results

As a result of the above activities, the client now has:

• An established and documented policy with inspection procedures to locate, identify and remediate CUI; thereby minimizing the impact and reducing damage and associated costs.
• A foundation to track CUI and maximize efficiency (reduce down days) to establish the results and value of the program.
• The protocol was established to move the client from a prescriptive to a predictive maintenance and inspection program, allowing them to allocate resources and capital more proportional to risks.
Background
A large multinational energy company desired to establish a comprehensive Integrity Management Program for its natural gas operations facilities. The objective was to establish a program that paralleled the company’s Pipeline Integrity Management Program. The fixed facilities included:

- 30 – Gas Processing Facilities
- 2 – Terminals and Other Storage Facilities
- 100 – Compressor Stations
- 12 – Laterals and Delivery / Receipt Facilities in HCAs

Scope
To satisfy the client’s objectives, G2 Integrated Solutions was retained to utilize the concepts of (1) 49 CFR 192, Subpart O, Gas Transmission Pipeline Integrity Management, (2) ASME B 31.8S-2010, Managing System Integrity of Gas Pipelines, and (3) API RP 580 Risk Based Inspection, 2009 and other industry standards to accomplish the following:

- Complete an initial screening of all of its gas processing facilities to quantify the potential risk related to each.
- Conduct risk-based inspections (RBIs) at the three highest risk gas processing facilities to better define risks and establish mitigating actions.
- Conduct risk evaluations at the 12 facilities located in HCAs to better define risks and mitigating actions.
- Evaluate asset integrity management software programs and assist in the procurement and pilot study implementation.
- Pre mid-long term strategic plans for the FIM Program to communicate to Board of Directors and Senior Executive Management.
Results

As a result of the above activities, the client now has:

• A documented and established continually improving Facilities Integrity Management Program fully integrated with operations and other stakeholders.

• A foundation to track risk management (# of incidents), compliance (# of violations) and efficiency (# down days) to establish the results and value of the program.

• A program to move the client from a prescriptive to a predictive maintenance and inspection program, allowing them to allocate resources and capital more proportional to risks.

• A facility integrity software management system to house equipment records, RBI’s, inspection data, conclusions of risks, inspection recommendations, and work orders (Maximo interface).
Pipeline Data and MAOP Validation

**Background:**

Following a major rupture and release incident from a large diameter natural gas transmission pipeline, the National Transportation Safety Board (NTSB) issued urgent safety recommendations with respect to validating the Maximum Allowable Operating Pressure (MAOP) of our client’s gas transmission lines. The client implemented several steps to address these recommendations:

- Use traceable, verifiable, and complete records to determine MAOP for gas transmission pipelines in Class 3 and Class 4 locations as well as those in Class 1 and Class 2 high consequence areas (HCAs) that do not have MAOP established through hydrostatic testing;
- Expand MAOP validation to their entire gas transmission system using the same rigorous records analysis; and
- Integrate critical information into a component-based Geographic Information Systems (GIS) database.

**Scope**

G2 Integrated Solutions, LLC was retained by one of the country’s largest combination natural gas and electric utilities to support their project to:

- Comprehensively research pipeline attribute documentation, including as-built drawings, pressure test reports, alignment sheets, material purchase records and pipeline leak reports.
- For every component on the pipeline, comprehensively verify and document key specifications impacting MAOP (wall thickness, grade, seam type, SMYS, rating, etc.).
- Identify and annotate all records meeting “traceable, verifiable, and complete” requirements.
- Perform initial Quality Assurance / Quality Control on deliverables used by engineering team, regulatory agencies and GIS data migration teams.
Results
At the completion of this project, the client will have valid MAOP information for their entire gas transmission system and an accurate GIS database that will:

- Improve the quality of integrity management analyses;
- Allow prioritization of capital projects based on threats to the transmission system; and
- Support compliance with current and emerging regulations.
Background
Following a recent acquisition of a major liquid pipeline system, the acquiring pipeline operator was struggling to conduct mandatory pipeline compliance business processes (a major corporate concern was establishing traceable, verifiable, and complete records to confirm MOP). Critical pipeline records were transferred in the acquisition, but were not indexed nor in hardcopy format that could not be easily leveraged. Our client wanted to quantify and integrate these records into a GIS database and other pipeline safety and integrity datasets. Follow-up compliance business processes were to be executed on the resulting pipeline data / records with a comprehensive remediation strategy for deficient results.

Scope
To support the development of their pipeline compliance system, G2 Integrated Solutions was retained by one of the country’s premier liquid pipeline companies to:

- Perform comprehensive comparison of pipeline records received against the “traceable, verifiable, and complete” benchmark set by PHMSA Docket No. PHMSA-2010-0381, measuring the impact and scale of deficient or missing documentation.
- Determine a practical hierarchy to select pipeline records to establish MOP. Focus was to use “next-best” existing records / data to fill any record deficiencies.
- Integrate acquired pipeline data and link corresponding scanned record images into an industry standard GIS database.
- Execute pipeline compliance business processes and refine results for decision maker consumption. In particular, confirm MOP via: 1) design pressure, 2) pressure tests and 3) highest historic operating pressure requirements and also integrate risk-based alternative to pressure test provisions.
Pipeline Compliance System Development

MOP Confirmation 2/2

Results

At completion of this project, the client has a GIS database of the acquired pipeline system, with pipeline records linked, as well as:

- Confirmed MOP;
- A detailed process / work flow for establishing records supporting MOP and other business compliance functions (i.e., ‘story to demonstrate compliance’); and
- Significant cost savings through using off-the-shelf software, clear guidance on records to be used in compliance processes and a means of efficiently integrating compliance functions (e.g., MOP calculations).
Background

Approximately ten years ago our client initiated a pipeline records verification program in response to a notice of probable violation (NOPV). After the National Transportation Safety Board (NTSB) issued specific guidance on the use of traceable, verifiable, and complete records to determine maximum allowable operating pressure (MAOP) for gas transmission lines in Class 3, Class 4 and high consequence areas (HCAs,) the client retained G2 Integrated Solutions to:

- Provide detailed insight on the limitations of, and gaps in, historic pipeline records and pressure tests.
- Support revised annual reporting requirements.
- Establish a foundation for addressing records gaps through other means.

Scope

In order to meet the client’s objectives, G2 Integrated Solutions:

- Developed matrices to consistently define the confidence level of pressure tests and various types of pipeline records, from all phases of pipeline construction (design / early intent; construction / witness of installation; component manufacturing / materials testing).
- Built a data / records capture tool that, in conjunction with the matrices, provides a qualitative confidence in the records supporting MAOP determination.
- Researched pipeline attribute documentation, including as-built drawings, pressure test reports, alignment sheets, material purchase records, and maintenance / inspection reports.
- Annotated all records supporting MAOP calculations that meet “traceable, verifiable, and complete” requirements.
- Documented key specifications impacting MAOP calculations (wall thickness, grade, seam type, SMYS, rating, etc.) and the quality of records for each of these attributes.
- Performed Quality Assurance / Quality Control on deliverables.
- Provided a written report of systemic issues and potential solutions.
Results

At the completion of this project, the client will have detailed information on the records supporting MAOP calculations for their Class 3, Class 4, and HCA locations that will:

• Allow targeted remediation of data gaps and records deficiencies.
• Support compliance with current and emerging regulations.
• Enhance existing and future pipeline integrity management programs.
Pipeline and Facility As-Built Services 1/2

Client
Interstate Natural Gas Pipeline Transmission Company

Location
Houston, Texas

Background
Following construction and field inspection of a large-scale pipeline expansion project, our client sought to coordinate, measure, and quality control the resulting as-constructed records against traceable, verifiable, and complete benchmarks set in PHMSA Docket No. PHMSA-2010-0381. The as-constructed records were then to be integrated into existing database and drawing systems that were critical to safe pipeline operation, compliance determination, and business decision making.

The pipeline expansion project included construction of 50+ miles of loop lines and four supporting fixed facilities (compression and metering). The client implemented the following steps to address their record as-builting requirements:

- Comprehensive reviews of project documentation with ongoing coordination of project stakeholders.
- Interpret redline marks into existing drawing systems and integrate critical information into a component-based Geographic Information Systems (GIS) database.

Scope
G2 Integrated Solutions was retained by one of the country’s largest natural gas pipeline companies to support their as-built project to:

- Verify key DOT records were present and accurate with auditable proof of compliance conducting any material reconciliation (i.e., warehouse transfers).
- Perform comprehensive reporting that details the impact of deficient or missing project documentation and establishes a communication rhythm with stakeholders.
- Revise CAD drawings working within client document management systems.
- Update GIS database/maps via detail workflows and versioning structures.
- Perform QA/QC on final as-built deliverables.
Results
At completion of this project, the client had an organized and integrated dataset of project and DOT records with updated and accurate GIS database that will:
• Improve the quality of pipeline/facility integrity management analyses;
• Support compliance business processes with current and quality data; and
• Allow prioritization of capital projects based on threats to the transmission system.
Pipeline and Facility As-Built Services 1/2

Client
Interstate Natural Gas Pipeline Transmission Company

Location
Houston, Texas

Background
Following construction and field inspection of a large-scale pipeline expansion project, our client sought to coordinate, measure, and quality control the resulting as-constructed records against traceable, verifiable, and complete benchmarks set in PHMSA Docket No. PHMSA-2010-0381. The as-constructed records were then to be integrated into existing database and drawing systems that were critical to safe pipeline operation, compliance determination, and business decision making.

The pipeline expansion project included construction of 50+ miles of loop lines and four supporting fixed facilities (compression and metering). The client implemented the following steps to address their record as-built requirements:

- Comprehensive reviews of project documentation with ongoing coordination of project stakeholders.
- Interpret redline marks into existing drawing systems and integrate critical information into a component-based Geographic Information Systems (GIS) database.

Scope
G2 Integrated Solutions was retained by one of the country’s largest natural gas pipeline companies to support their as-built project to:

- Verify key DOT records were present and accurate with auditable proof of compliance conducting any material reconciliation (i.e., warehouse transfers).
- Perform comprehensive reporting that details the impact of deficient or missing project documentation and establishes a communication rhythm with stakeholders.
- Revise CAD drawings working within client document management systems.
- Update GIS database/maps via detail workflows and versioning structures.
- Perform QA/QC on final as-built deliverables.