Integration at its best

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Non Believers – in DI

- I was a non believer
- PHMSA told us what to pig and when to pig it
- PHMSA told us what to dig and when to dig it
- How will integrating data help anymore than PHMSA?
- Stack's boss "Where is our DI program?"

What is the whole Story?

- How did DI add value to our program?
- Yes it can help you prioritize within priorities – what I already was about to dig
- But, what was I about to leave out there?
- Was that OK to leave them?
- Can I retell the story at a later date?

One concept

- Dig it or Forget it?
  - ILI tool called a dent
  - Non HCA, 1.9%
  - Topside, DOC is 1-2 feet, one call density
  - Previous results, Correlation
  - Raw Data, %SMYS, D/T, pressure cycles
- Put together the whole story – don't pick your digs blind

Integration at its best

How ILI can be a catalyst for DI

How DI fits into a phased risk program

How DI is used in Facility IMP

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Data Management for Pipeline Integrity

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Overview

- ILI Program
- Change Management
- Integration Methodologies
- Model versus Solution
- Data Collection Processes

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ILI Programs

- Timely utilization and validation of data
- Efficient and comprehensive prioritization of indications based Liquid and Gas criteria
- Reduced excavation costs
- Timely utilization of excavation data to validate survey data

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Change Management

- Efficient update/replacement of pipeline centerline model based on improved of revised information (re-routes)
- Maintain access to information associated with pipe removed from service (cut-out)
- Efficient and accurate repositioning of features along the line as additional information becomes available (welds exposed in excavations)
- Integrate and prioritize new ILI data with old ILI data based on various rules and considerations

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Integration Methodologies

- Centerline Model

- “Original Line” shown in Red is within the tolerance of the government guidelines (+/- 500 ft).
- Recognize the limitations of all the data sources, and be willing to update them accordingly.

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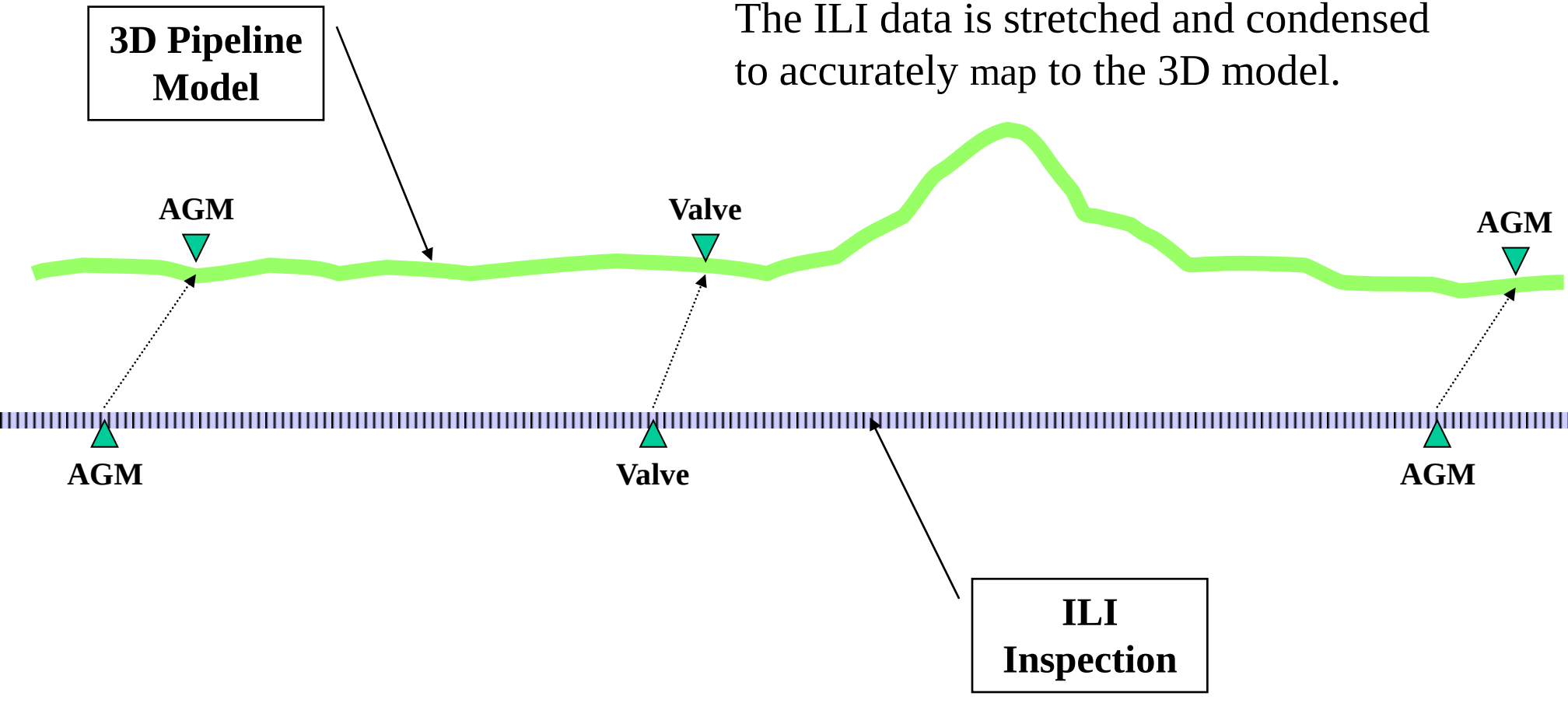
Integration Methodologies

- Centerline Model
- Accurate location of ILI

Accurate Alignment of Survey Data



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Integration Methodologies

- Centerline Model
- Accurate location of ILI
- Integration of multiple ILI surveys

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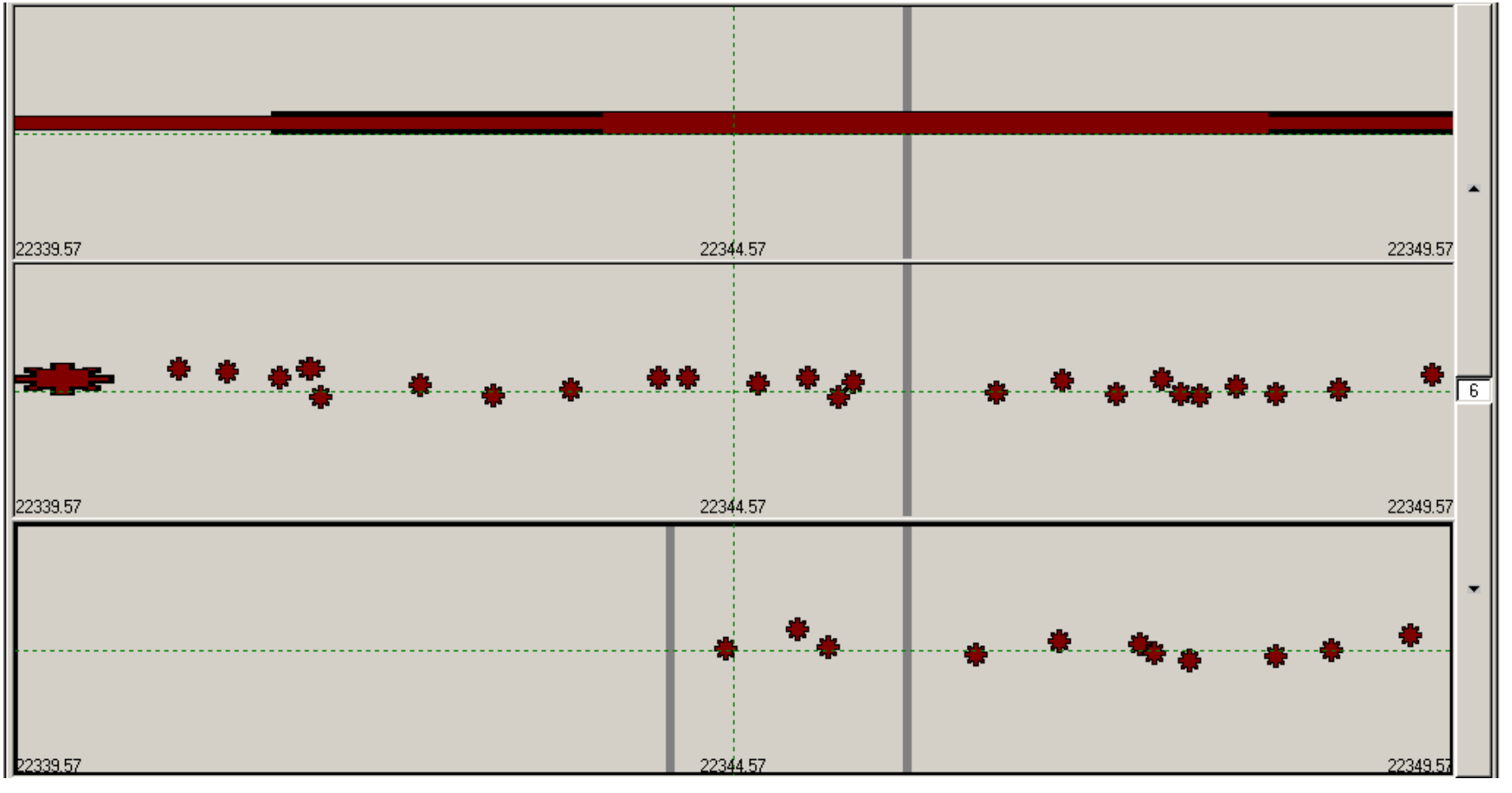
Multiple ILI Run Integration



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Integration Methodologies

- Centerline Model
- Accurate location of ILI
- Integration of multiple ILI surveys
- Spatial Integration of over the line and ILI surveys

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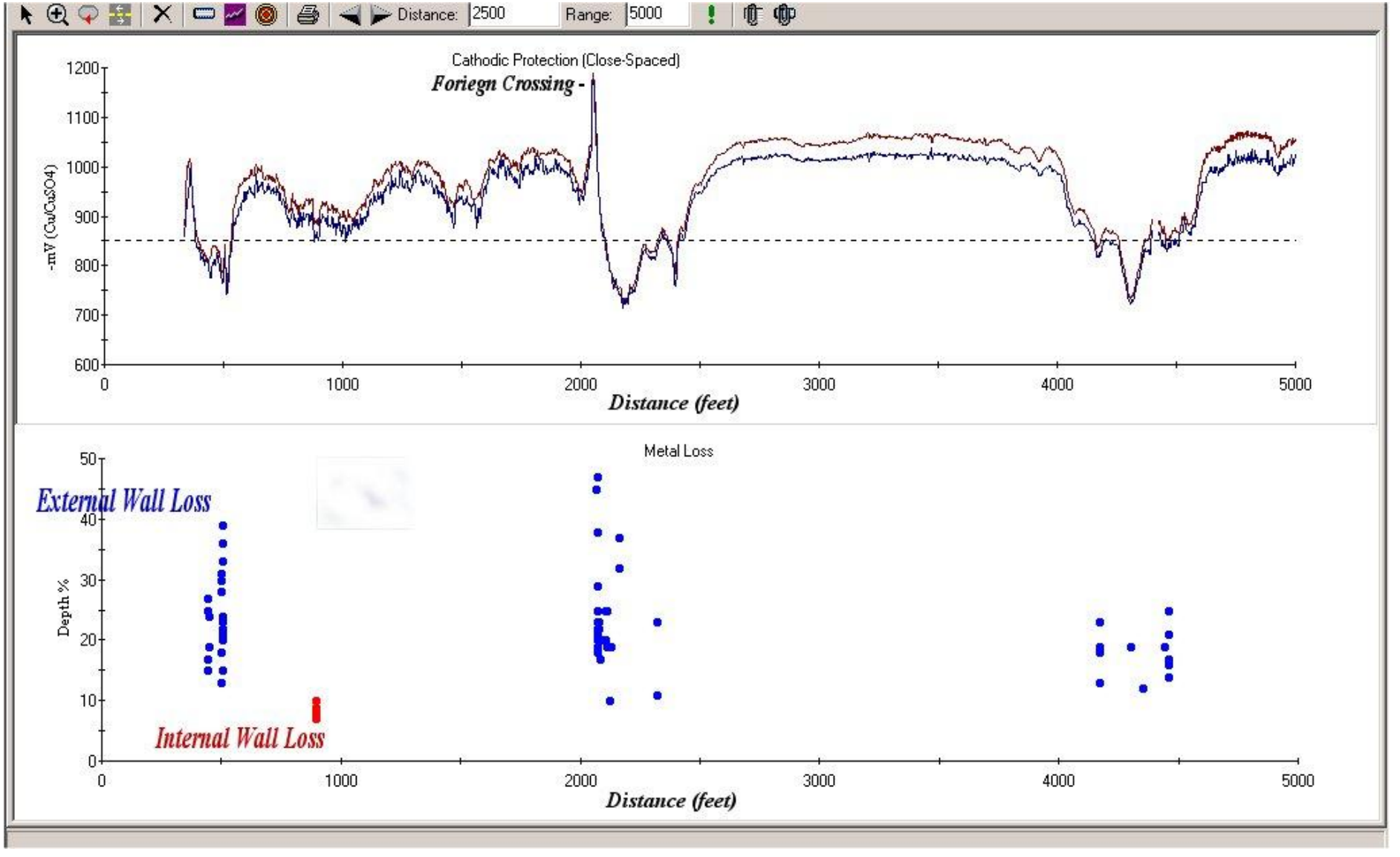
Spatial Normalization of Above Ground Survey and ILI Data



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Integration Methodologies

- Centerline Model
- Accurate location of ILI
- Integration of multiple ILI surveys
- Spatial Integration of over the line and ILI surveys
- Integration of pipe property data to ILI weld data sets
- Timely integration of excavation results

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Model versus Solution

- Database model by itself is merely an unfilled container
- Model has no inherent functionality, really just a set of rules and tables
- Purpose built data models work the best in conjunction with purpose built software

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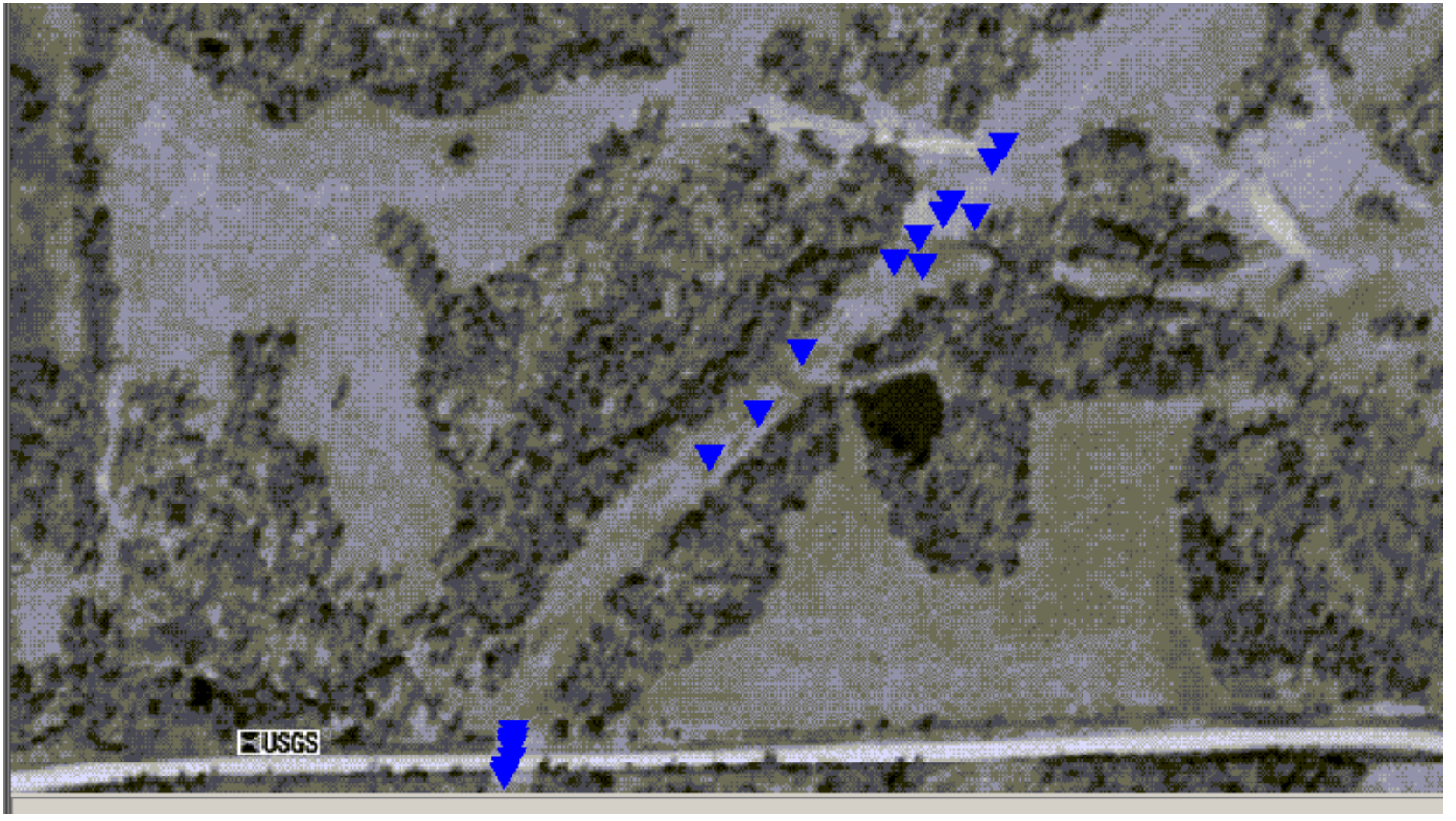
Data Collection Processes

- Restricted Vocabulary
- Use of N/A or other
- Comment fields
- Unambiguous reference point descriptions



Shots taken from side to side in the Right-of-way.

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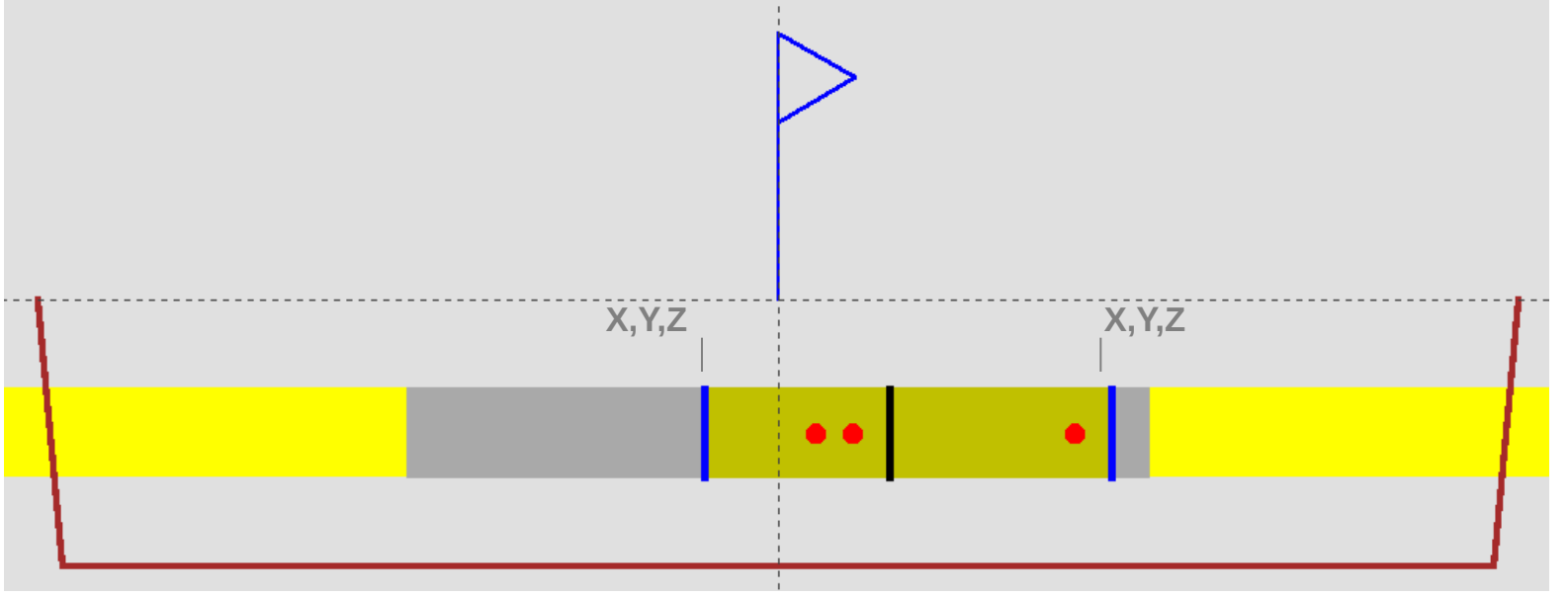
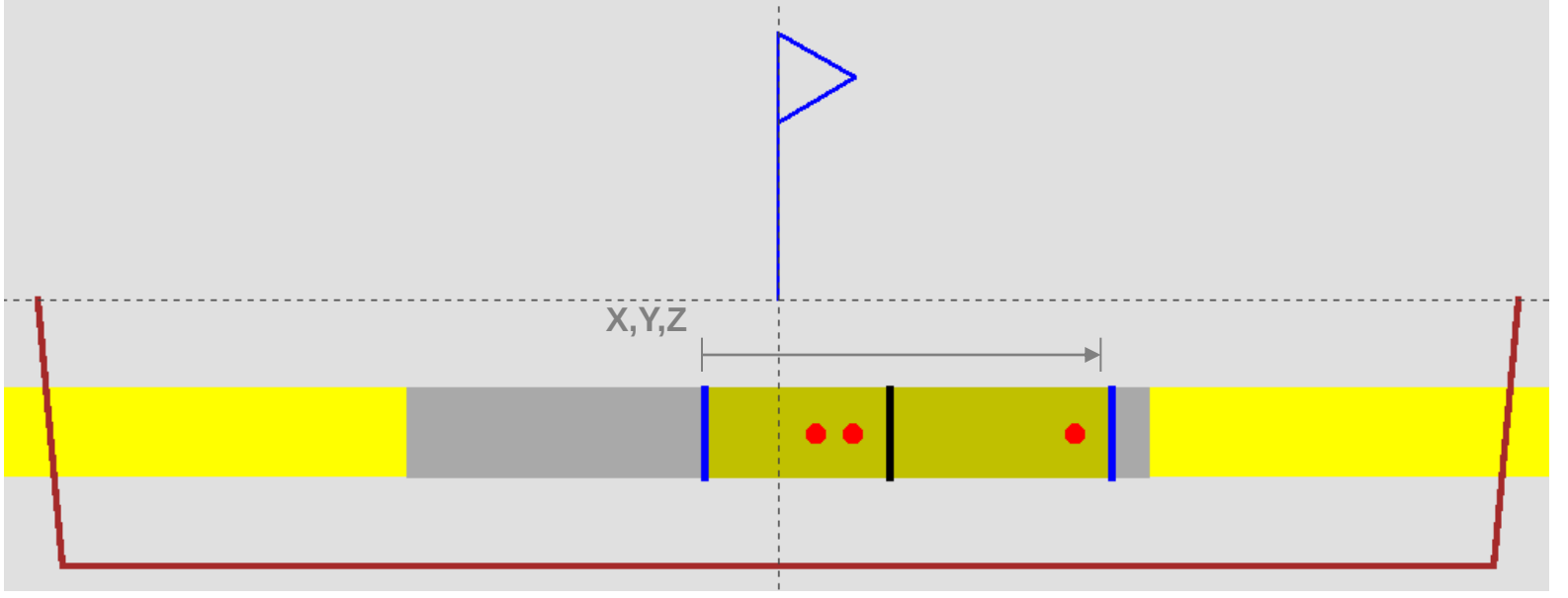
Data Collection Processes

- Restricted Vocabulary
- Use of N/A or other
- Comment fields
- Unambiguous reference point descriptions
- Processes should minimize introduction of error

Misuse of GPS



Effective use of GPS



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Data Collection Processes

- Restricted Vocabulary
- Use of N/A or other
- Comment fields
- Unambiguous reference point descriptions
- Processes should minimize introduction of error
- Always QC your data

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Data Management for Pipeline Integrity

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April 21st

Dynamic Risk

Risk Analysis – a phased approach

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Trevor MacFarlane
April 21, 2010

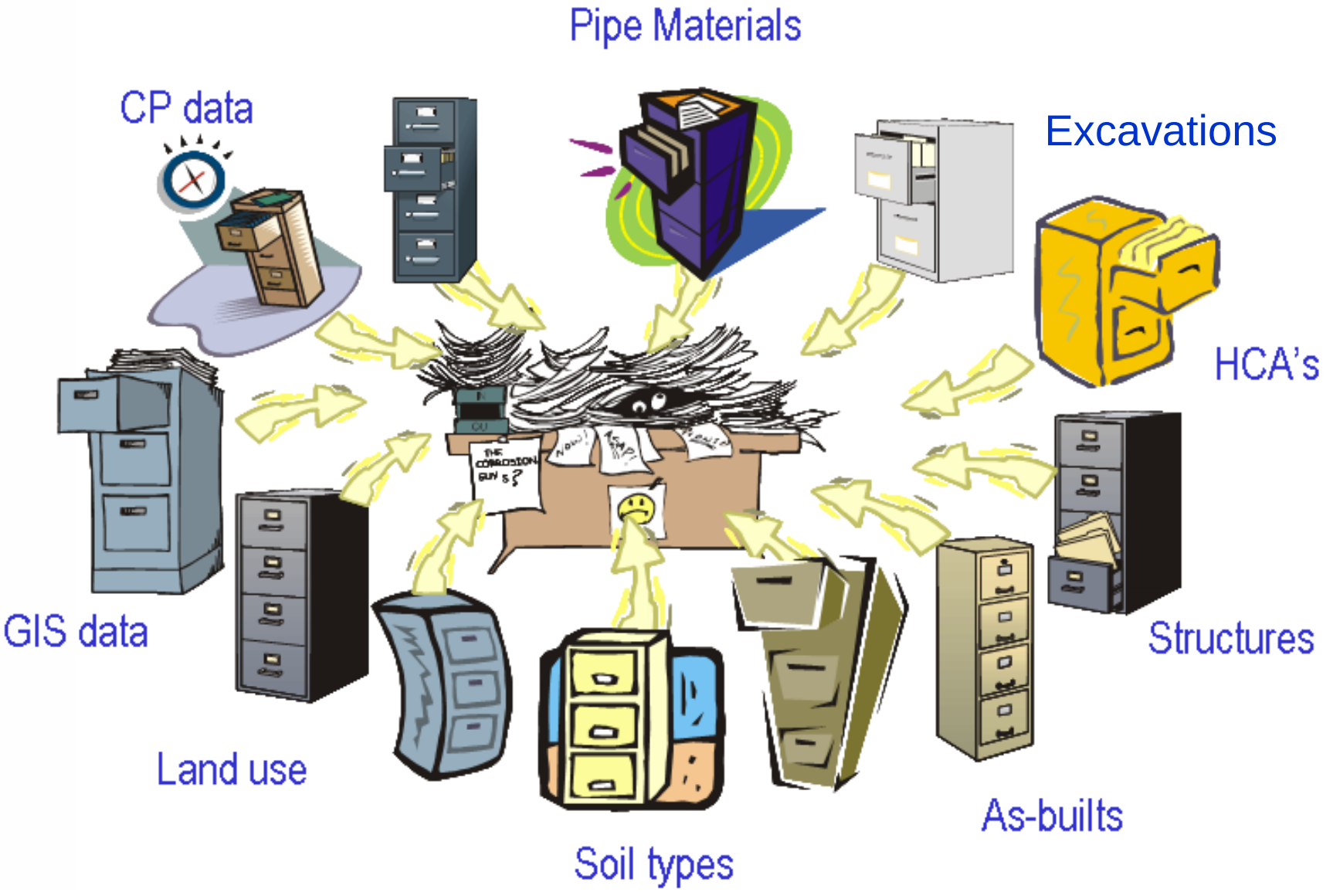
Overview

- Risk assessment – goals and objectives
- Industry-wide Challenges
- Introduction to a phased approach
- Integration vs Aggregation
- Risk Model considerations
- Continuous Improvement

Risk Assessment - Goals

- Data → Information → Decision-making
- Improved pipeline reliability and increased deliverability
- Timing – process needs to be efficient
- Assessment of the benefits of mitigation (P&M)
- Repeatable
  - Different people getting the same answer!

Reality?


Pipe Materials
CP data
Excavations
HCA's
GIS data
Structures
Land use
As-builts
Soil types

Dynamic Risk

Phased Approach

Priority 1:

Minimum analysis
- Pipeline centerlines
- Install Date
- MOP / Actual
- Diameter
- Wall Thickness
- HCA's
- Product type
- Flow rates

Step I - Regulator Compliance
Priority 1 + Public Data Sources
- Initial risk complete – operator compliant

Priority 2:

Improved analysis
- ILI data
- Coating Type (Mainline)
- Coating Installation Date
- Compressor Station Locations
- Road Crossings
- Casings
- Test Post Locations
- Sleeves and Repairs
- Dwelling Structures
- Hydrostatic test pressure
- Hydrostatic test date
- Depth of cover
- Pipe Grade
- Pipe Toughness
- Pipe Manufacturer
- Seam Type

Step II - Risk-based Decision Making
Priority 1 & 2 + Public Data Sources
- Primary risk assessment complete

Priority 3:

Complete analysis
- Operating Temperature
- Surface loading
- Blasting activity
- Low lateral stability
- Internal Corrosion Coupon Data
- Above-Ground Segments/Assessment
- Joining method and coating
- X-Ray Inspection
- Pressure Cycling
- Wrinkle Bends
- Coating condition
- Excavation data
- Patrol Frequency
- Incident Records
- Chemical Inhibition
- Cleaning Pig Program
- Flow Rate and Flow Stream Analysis
- Bacteria Count
- Audit Findings
- Overpressure
- Soil Resistivity
- Stray Current
- One-Call
- Right-of-Way Signs
- Third Party Notification
- Response Time
- Location Method
- Alignment Marked Method
- Dynamic water environment

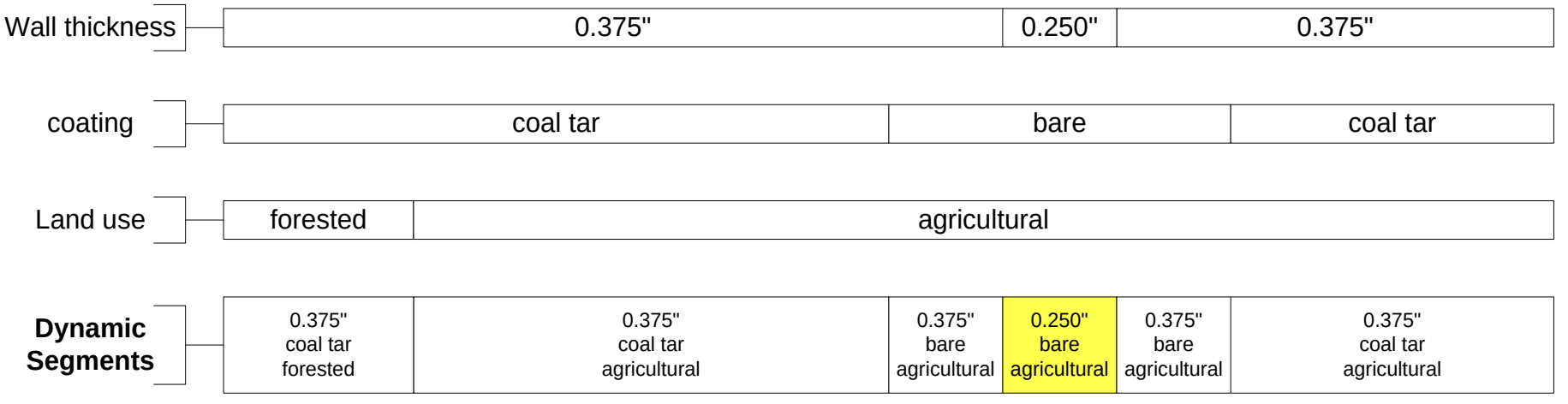
Step III - Long-term Approach
Priority 1, 2 and 3 + Public Data Sources
- Ongoing multi-year "as needed" collection program

Public Data sources

- Elevation Profile (from DEM)
- Lightning Strike Density
- Segments in seismic areas / fault lines
- Unstable slopes
- Seismic zones
- Frost heave
- Soil type
- Land Use

Dynamic Risk

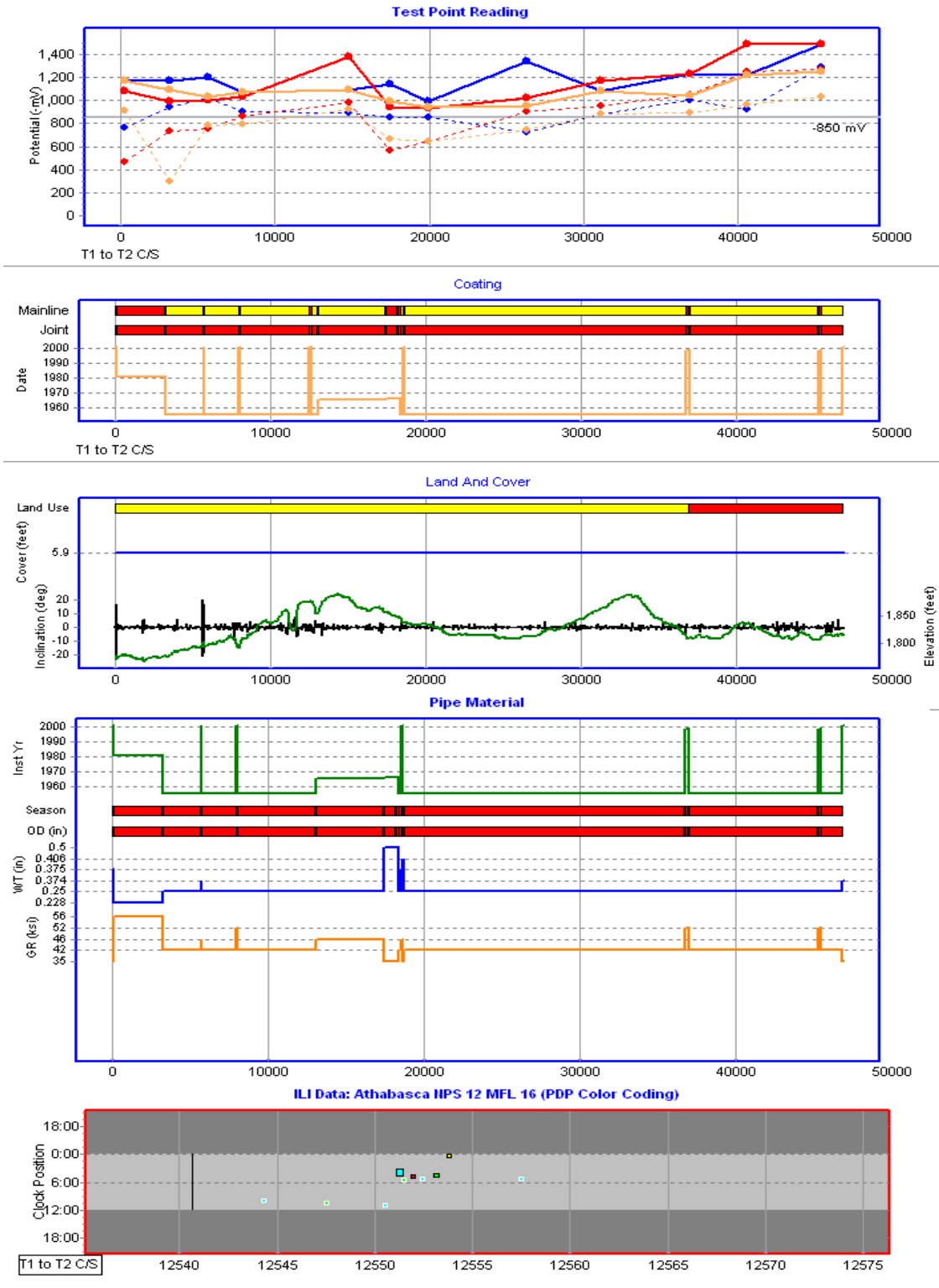
Segmentation

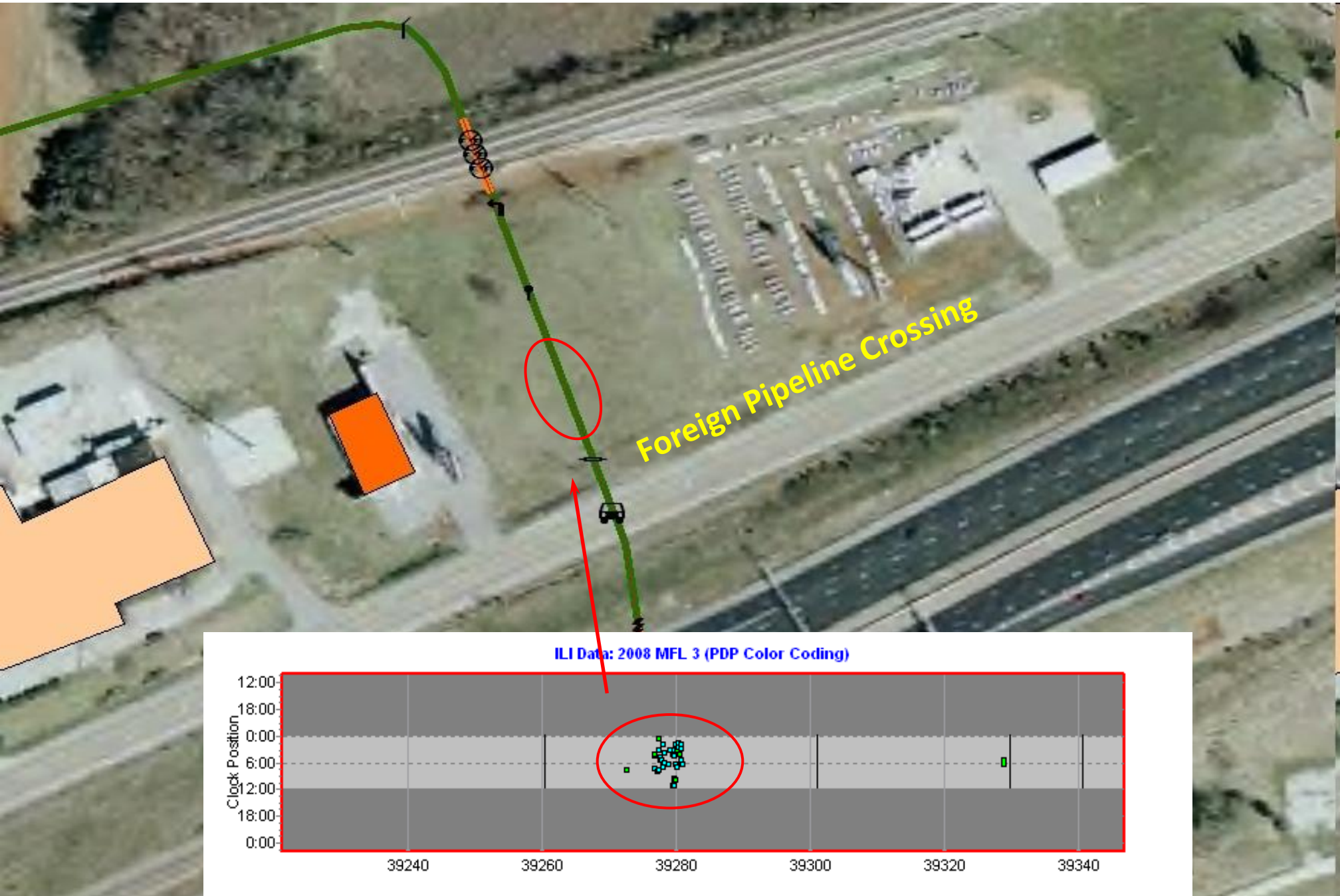


- Accounts for variability along length of pipeline
- Ensures that risk at any point is a reflection of the pipeline attributes at that location
- Facilitates identification of risk drivers & optimal mitigation options

Dynamic Risk

Aggregation vs Integration?

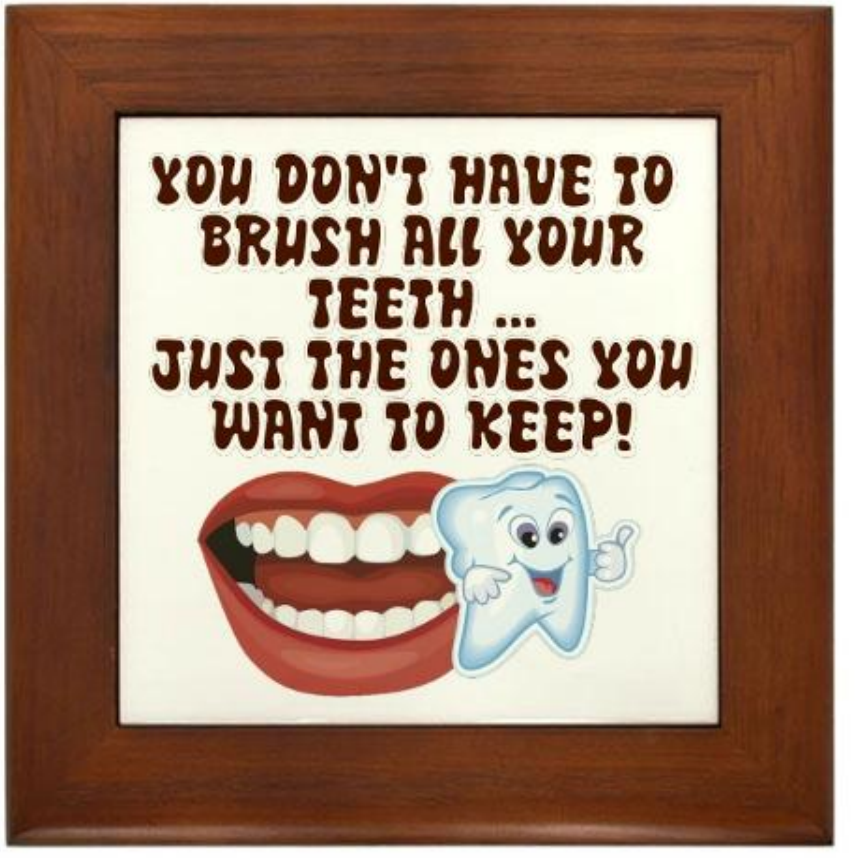



Foreign Pipeline Crossing
ILI Data: 2008 MFL 3 (PDP Color Coding)
Clock Position
12:00
18:00
0:00
6:00
12:00
18:00
0:00
39240
39260
39280
39300
39320
39340

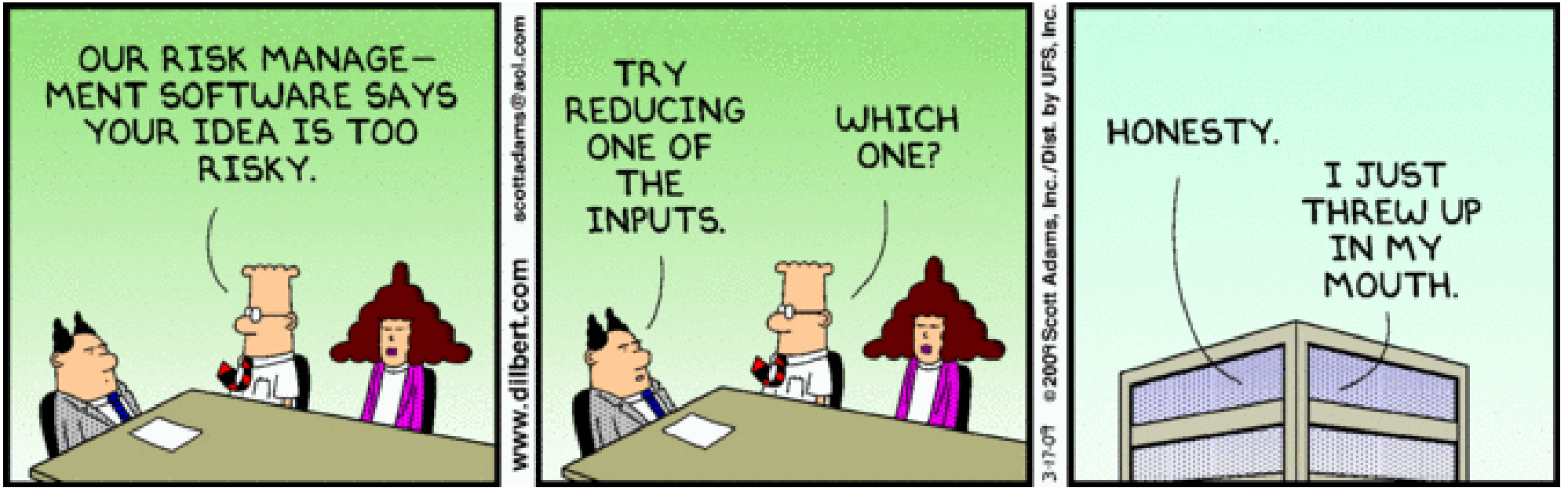
A Process…not an Event

1. **Things Change!** – New assessment data, changes in HCAs, changes in operating conditions, etc.
2. **Risk Trending** – §195.452 (k) requires measurement of program effectiveness. Enables cause and effect relationship between IM strategies and risk reduction.
3. **Continuous Improvement** – Refinement through data collection and validation.
4. **Flexibility** – Assessment Plans should evolve with understanding of risk and adoption of specific P&M measures.

You've brushed your teeth more than once, haven't you?



Dynamic Risk



Risk Analysis – a phased approach

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April 21, 2010

Sunoco Logistics

FACILITY DATA INTEGRATION

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April 21, 2010

Sunoco Logistics

Overview

- Facility Integrity Program
- Facility Data Characterization
- Facility Data Specifics
- Path Forward – Use of Integrated Data

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Facility Integrity Program

- Few prescriptive regulatory items
- High degree of Facility individuality
- Common risks identified through API & PPTS surveys
- PHMSA direction to Integrate “all available data”

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Facility Data Characterization

- Different data issues compared to R/W pipe
- Historical data is similar
- Detailed data for Facility assets is different.

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Facility Data Specifics

- Internal Data sources
  - Historical Releases & Near Misses
  - Root Cause Analysis
  - Risk Model – Ranking of Facilities
  - Test & Maintenance Data
- External Data sources
  - PPTS Industry Data & Advisories
  - PHMSA Alerts
  - Shared Industry experiences

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Facility Data Specifics

- Approach to Data collection
  - Non-linear, equipment specific items
  - Unique identification system required
  - Prioritization of data collection based on prior models

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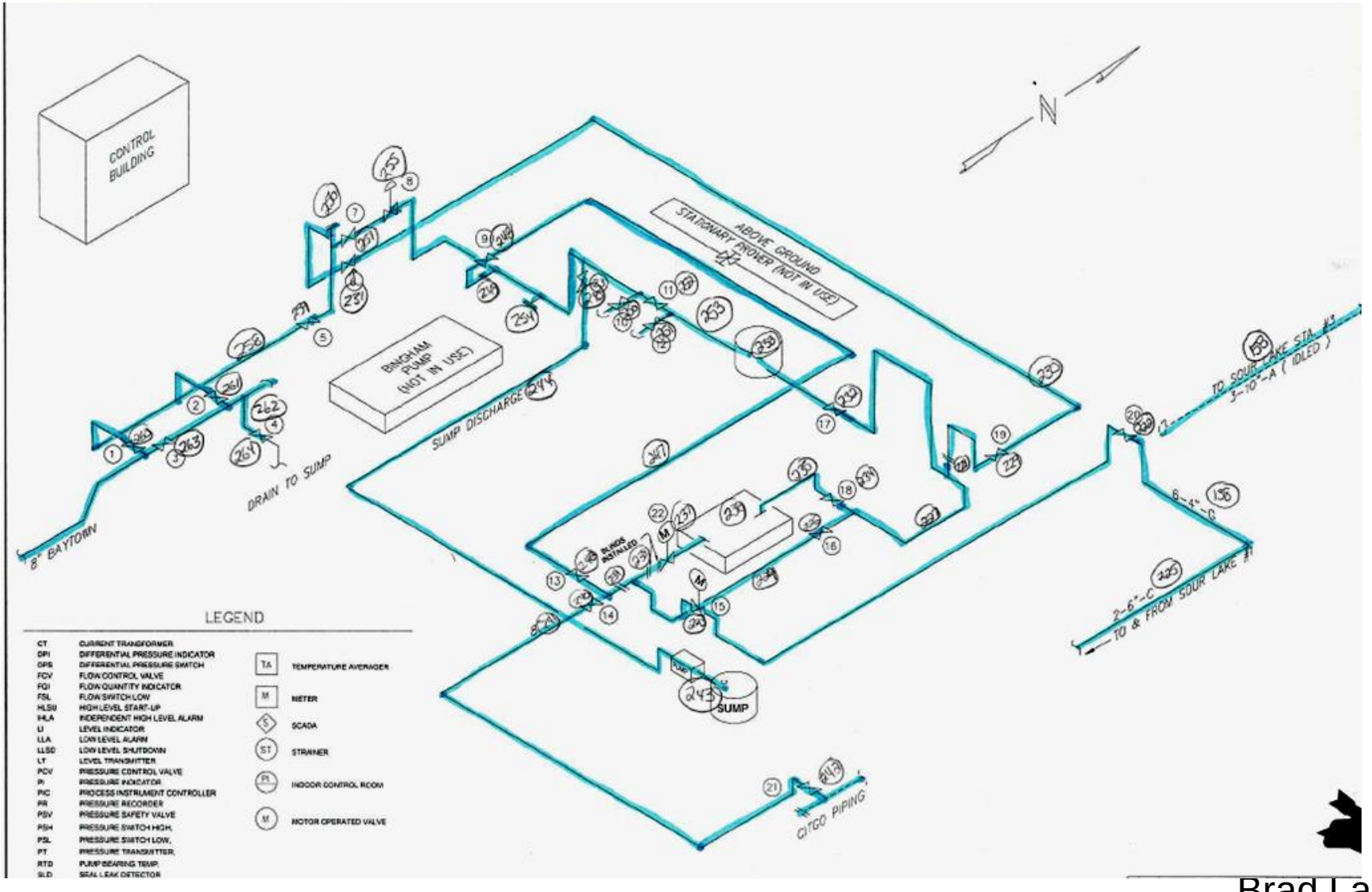

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Path Forward – Use of Data

- Risk Model
  - "Second Generation" model for SXL
  - More robust model, drill down capability
  - What If analysis
- Dead-Leg Program
  - Purge and Isolate unused line segments
  - Multi-year program
  - Primary ranking of field actions

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Path Forward – Use of Data

- Preventive Maintenance
  - Identify Facilities most at risk
  - Identify Equipment most at risk
  - Base information for PM program
- Drawing Review
  - Not a direct use of Facility data
  - During effort to gather data, opportunity to review and update drawings

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