



Data Management within a Total Pipeline Integrity Management Program

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**NACE Northern Area
Integrity Management Seminar**

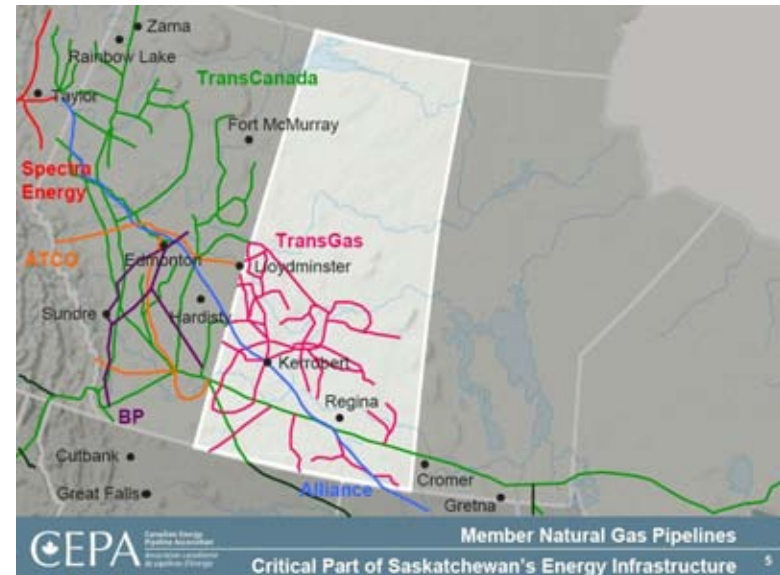
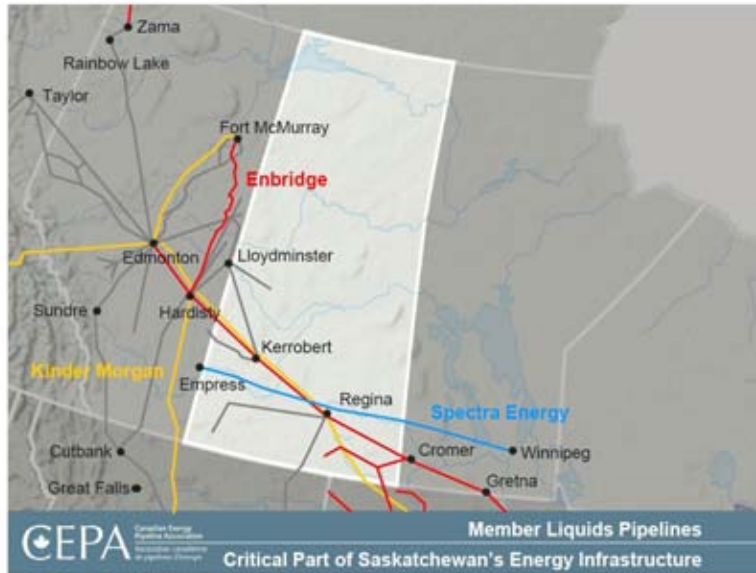


**April 22, 2010
Days Inn and Conference Center
Estevan, SK**

Introduction

- Saskatchewan Transmission Pipelines
- Pipeline Integrity Management Overview
- Role of Data Management
- ILI Data Assessment
- Repair and Remediation Plan
- Field Feedback
- Q and A

Saskatchewan Transmission Pipelines



* Pictures and Statistics courtesy of CEPA, Jan 2008

- 23, 236 km of transmission pipeline.
- 20% of production used to meet SK energy needs
- 10% sold to Eastern Canada and AB markets
- 70% exported to the United States

Pipeline Integrity – Operator CTQ's

- 1. Safety**.....prevent damage to people or the environment, meet regulations.
- 2. Line availability**.....maintain throughput, meet production and customer demands.
- 3. Minimise Spend**.....focus spend and maximize gain.



Causes of Pipeline Failure

•Time Dependent

- External Corrosion
- Internal Corrosion
- Stress Corrosion Cracking

•Stable

- Manufacturing Defects (defective pipe/seam)
- Welding/Fabrication Related
- Equipment Failure

•Time Independent

- 3rd party damage/vandalism/terrorism
- Incorrect Operations
- Weather Related/Geotechnical



Pipeline Integrity Management

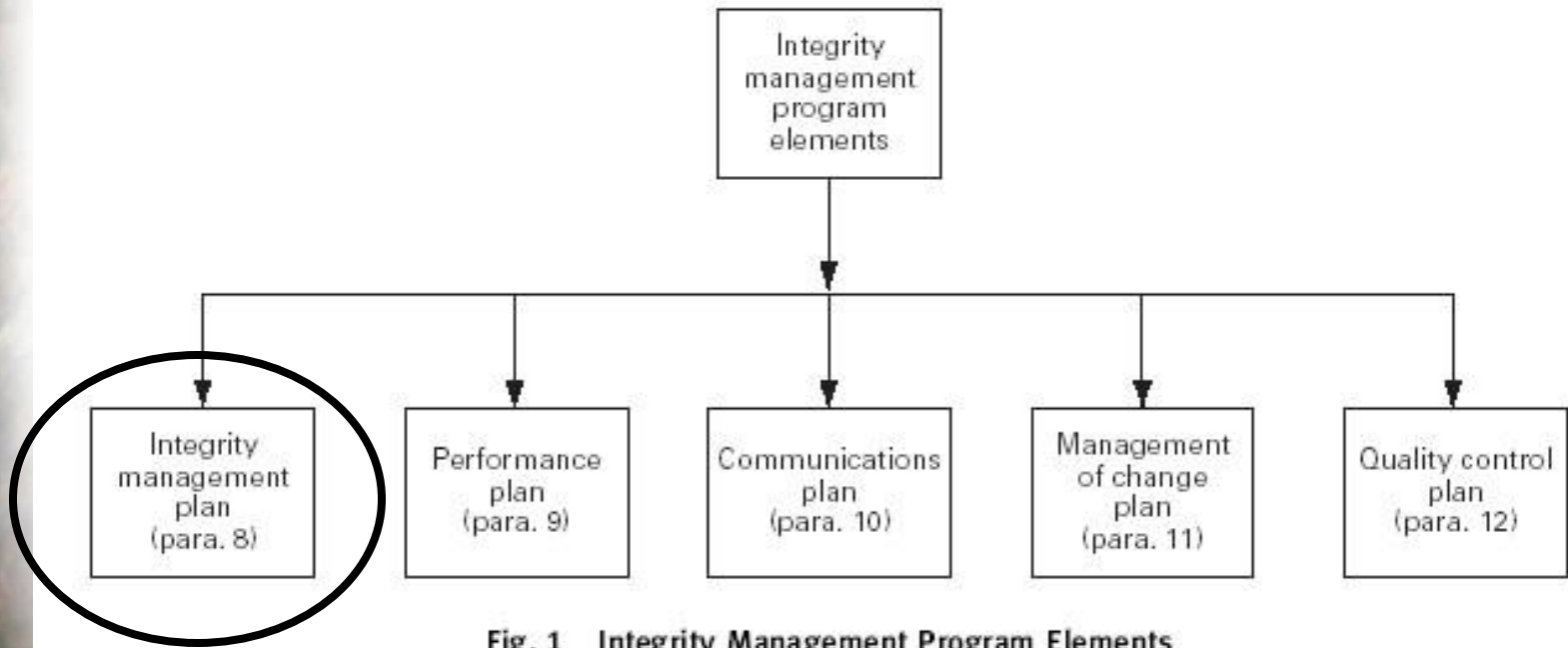
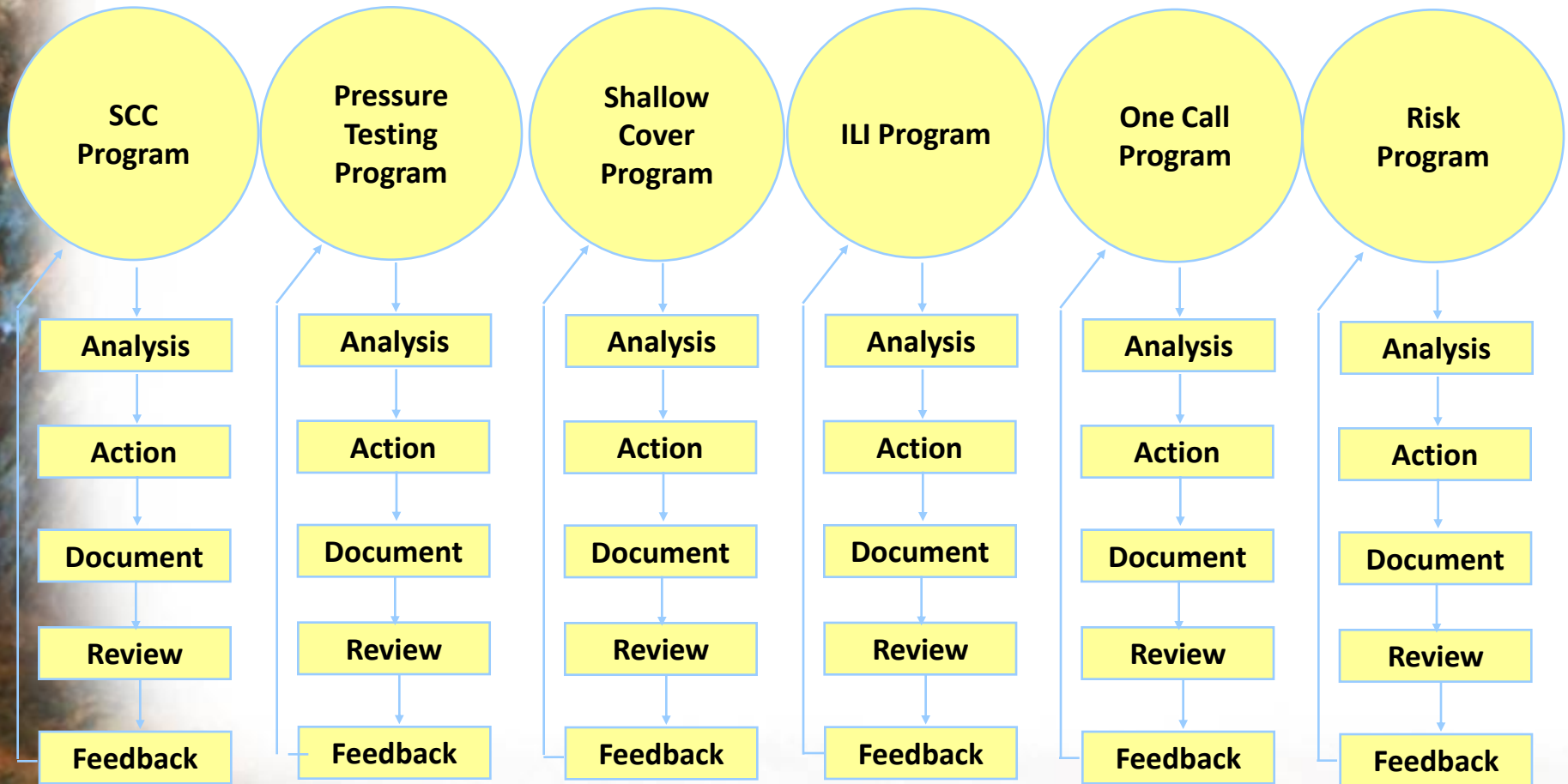
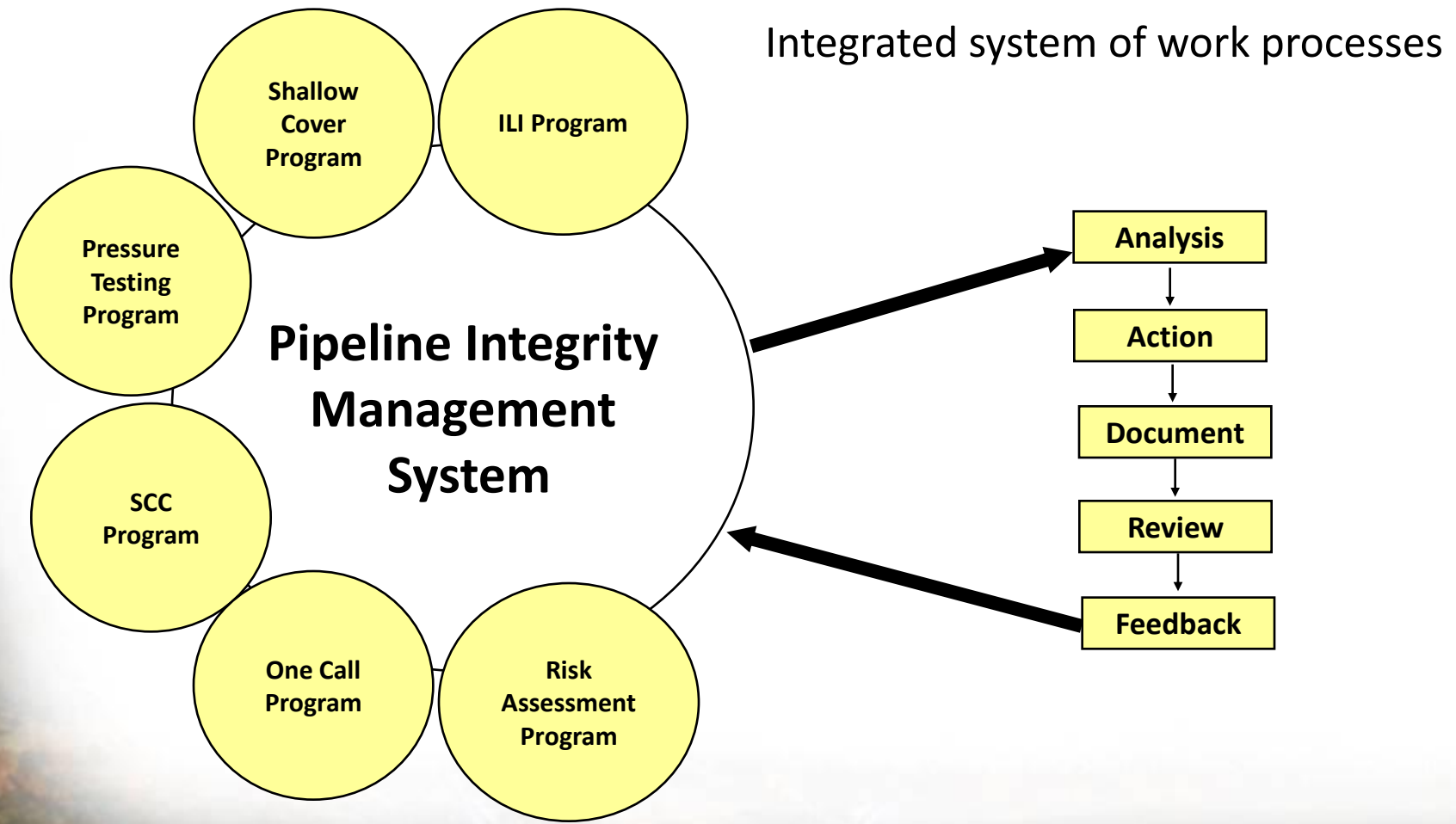


Fig. 1 Integrity Management Program Elements

Traditional Model of Pipeline Management



“Idealized” Model of Pipeline Management



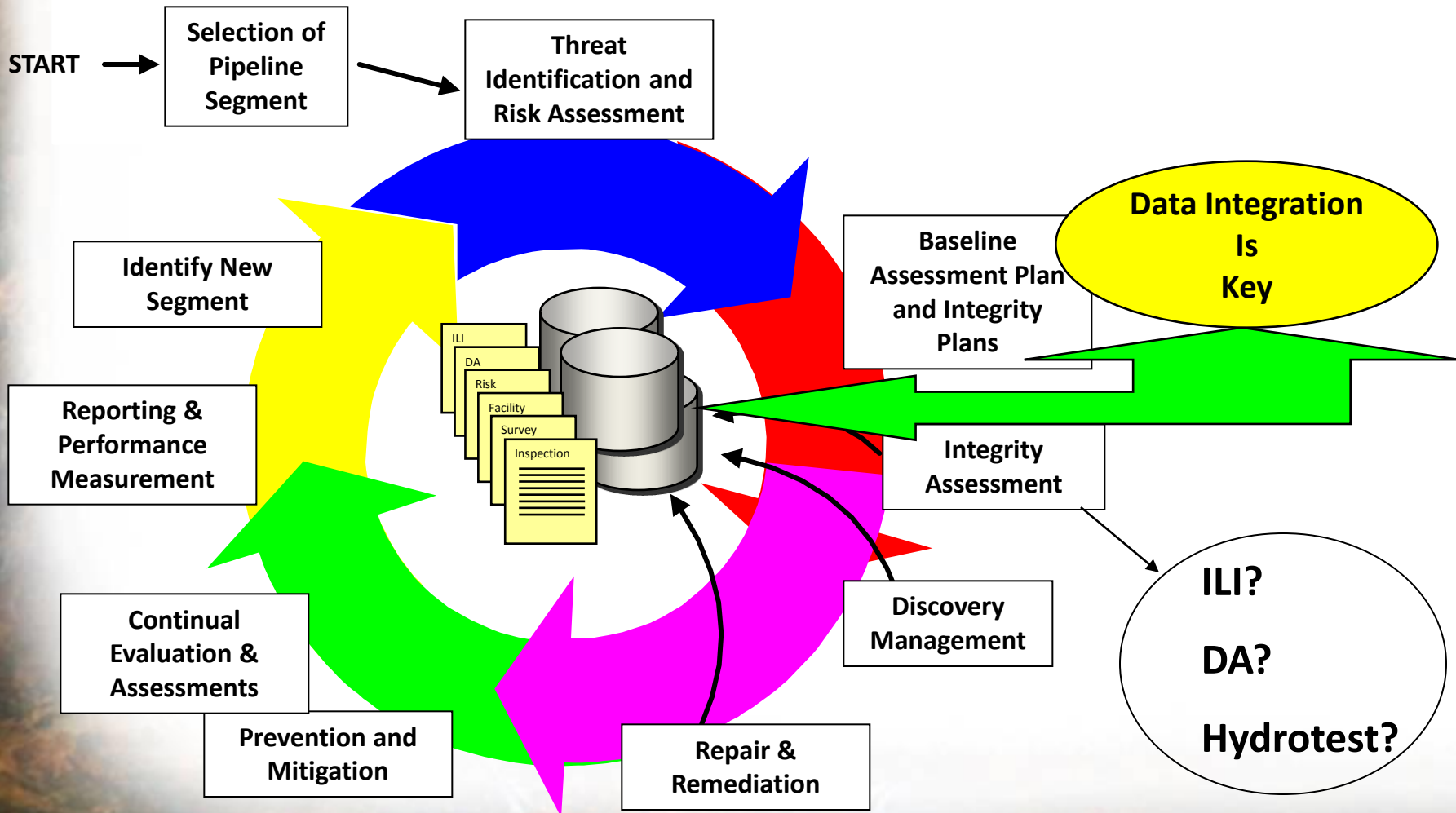
Key Components of Data Management



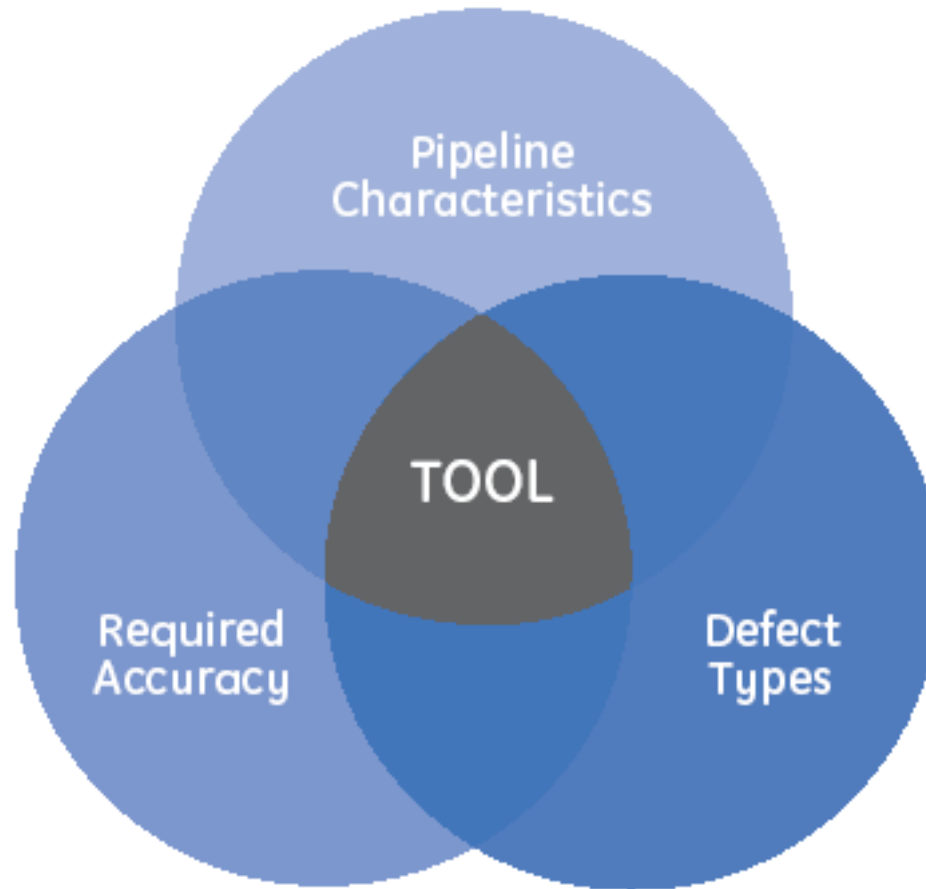
- Data Models
- Data Integration
- Linear Referencing
- Data Alignment
- Data Analysis
- Data Sharing
- Data Maintenance
- Data Control/QC

The Pipeline Integrity Management Process

Core Process



Correctly Selecting an ILI tool



In-Line-Inspection Tools must address 3 key parameters

ILI Data Assessment

Modern High-Res ILI tools can accurately detect, report and size even the smallest pipeline imperfections.

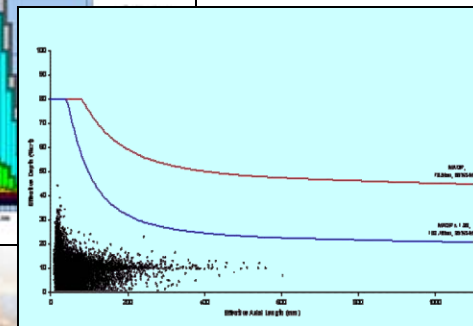
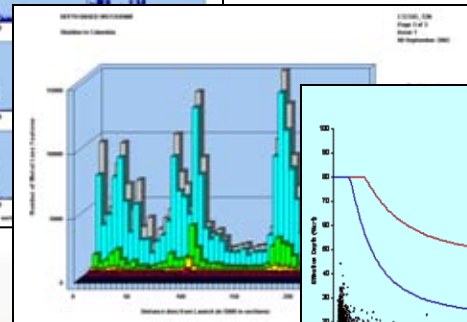
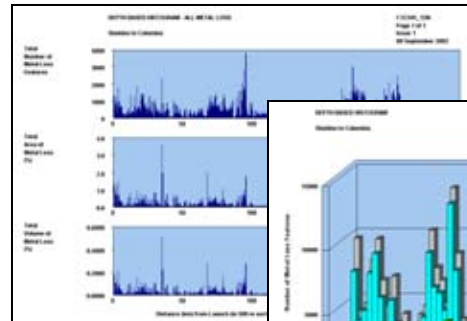
As such an ILI report may contain several thousand anomalies.

Effectively managing ILI data is essential in determining an economic repair program.

Pipeline Listing

Shelter-to-Columbs	Gain Yield Number	Relative Distance (Feet)	Abnormal Distance (Feet)	Shelter-to-Columbs	Gain Yield Number	Relative Distance (Feet)	Abnormal Distance (Feet)	Comment	Peak Depth	Length	RFR	Duration (Minutes)
7900		48.0	13073.0									
7900	276	51.7	13073.0									
7900	279	52.0	13073.0									
7900	280	52.2	13073.0									
7900	281	52.4	13073.0									
7900	282	52.6	13073.0									
7900	283	52.8	13073.0									
7900	284	53.0	13073.0									
7900	285	53.2	13073.0									
7900	286	53.4	13073.0									
7900	287	53.6	13073.0									
7900	288	53.8	13073.0									
7900	289	54.0	13073.0									
7900	290	54.2	13073.0									
7900	291	54.4	13073.0									
7900	292	54.6	13073.0									
7900	293	54.8	13073.0									
7900	294	55.0	13073.0									
7900	295	55.2	13073.0									
7900	296	55.4	13073.0									
7900	297	55.6	13073.0									
7900	298	55.8	13073.0									
7900	299	56.0	13073.0									
7900	300	56.2	13073.0									
7900	301	56.4	13073.0									
7900	302	56.6	13073.0									
7900	303	56.8	13073.0									
7900	304	57.0	13073.0									
7900	305	57.2	13073.0									
7900	306	57.4	13073.0									
7900	307	57.6	13073.0									
7900	308	57.8	13073.0									
7900	309	58.0	13073.0									
7900	310	58.2	13073.0									
7900	311	58.4	13073.0									
7900	312	58.6	13073.0									
7900	313	58.8	13073.0									
7900	314	59.0	13073.0									
7900	315	59.2	13073.0									
7900	316	59.4	13073.0									
7900	317	59.6	13073.0									
7900	318	59.8	13073.0									
7900	319	60.0	13073.0									
7900	320	60.2	13073.0									
7900	321	60.4	13073.0									
7900	322	60.6	13073.0									
7900	323	60.8	13073.0									
7900	324	61.0	13073.0									
7900	325	61.2	13073.0									
7900	326	61.4	13073.0									
7900	327	61.6	13073.0									
7900	328	61.8	13073.0									
7900	329	62.0	13073.0									
7900	330	62.2	13073.0									
7900	331	62.4	13073.0									
7900	332	62.6	13073.0									
7900	333	62.8	13073.0									
7900	334	63.0	13073.0									
7900	335	63.2	13073.0									
7900	336	63.4	13073.0									
7900	337	63.6	13073.0									
7900	338	63.8	13073.0									
7900	339	64.0	13073.0									
7900	340	64.2	13073.0									
7900	341	64.4	13073.0									
7900	342	64.6	13073.0									
7900	343	64.8	13073.0									
7900	344	65.0	13073.0									
7900	345	65.2	13073.0									
7900	346	65.4	13073.0									
7900	347	65.6	13073.0									
7900	348	65.8	13073.0									
7900	349	66.0	13073.0									
7900	350	66.2	13073.0									
7900	351	66.4	13073.0									
7900	352	66.6	13073.0									
7900	353	66.8	13073.0									
7900	354	67.0	13073.0									
7900	355	67.2	13073.0									
7900	356	67.4	13073.0									
7900	357	67.6	13073.0									
7900	358	67.8	13073.0									
7900	359	68.0	13073.0									
7900	360	68.2	13073.0									
7900	361	68.4	13073.0									
7900	362	68.6	13073.0									
7900	363	68.8	13073.0									
7900	364	69.0	13073.0									
7900	365	69.2	13073.0									
7900	366	69.4	13073.0									
7900	367	69.6	13073.0									
7900	368	69.8	13073.0									
7900	369	70.0	13073.0									
7900	370	70.2	13073.0									

MEMO, CN, Sess 1
28 June 2012



ILI Data Assessment

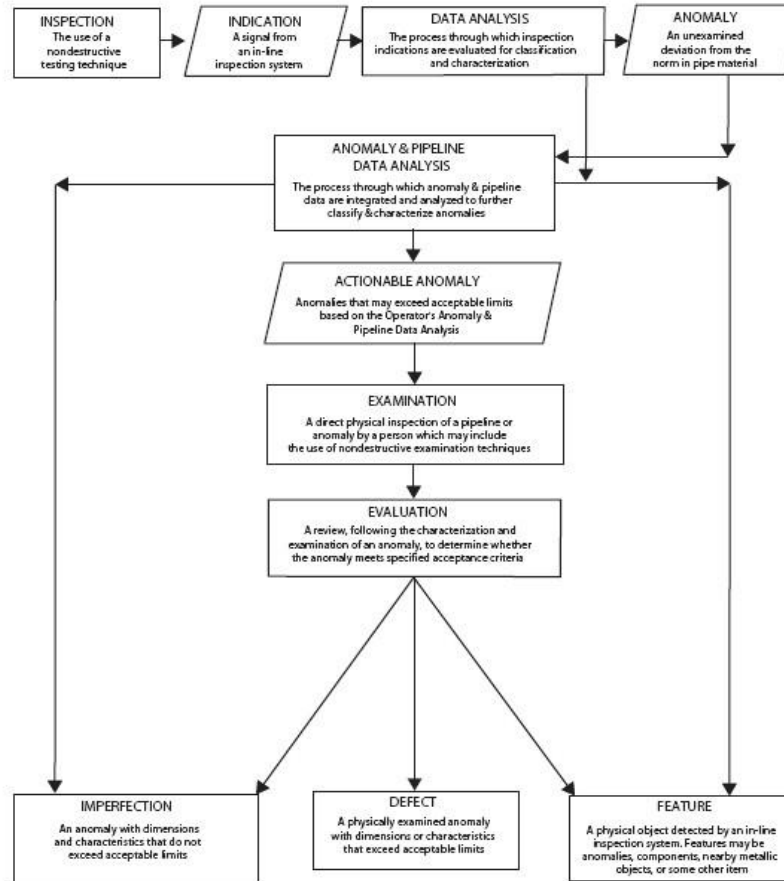
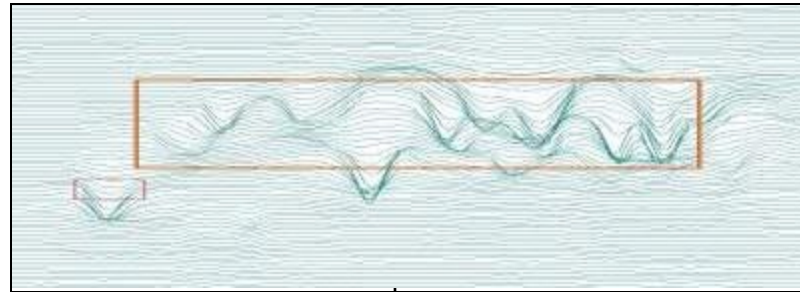


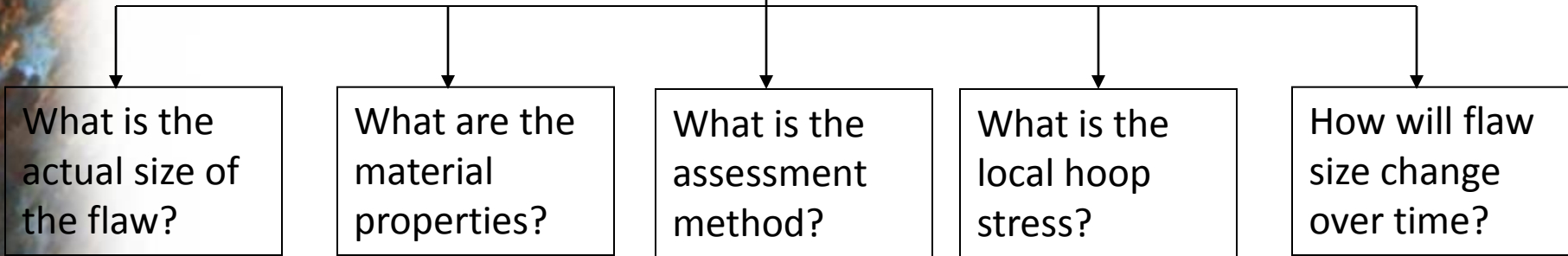
Figure 1—Inspection Terminology

Courtesy API STD 1163: In-line Inspection Systems Qualification Standard – First Edition

Is this ILI reported anomaly actionable?

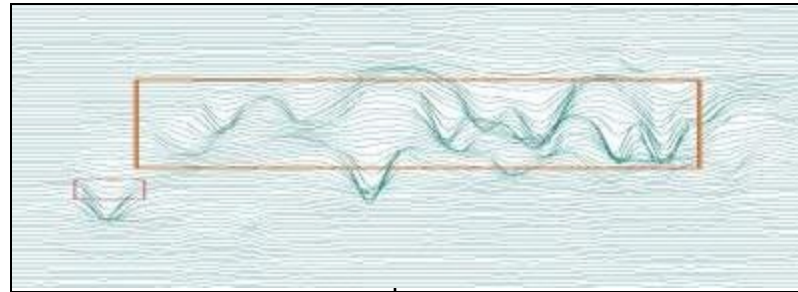


ILI Reported at 49% wt x
125 mm

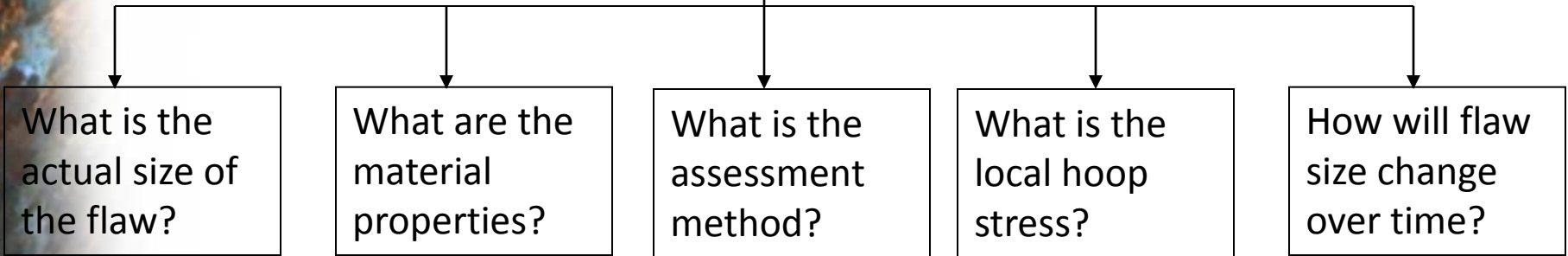


This answer is not a simple Yes/No.

Is this ILI reported anomaly actionable?



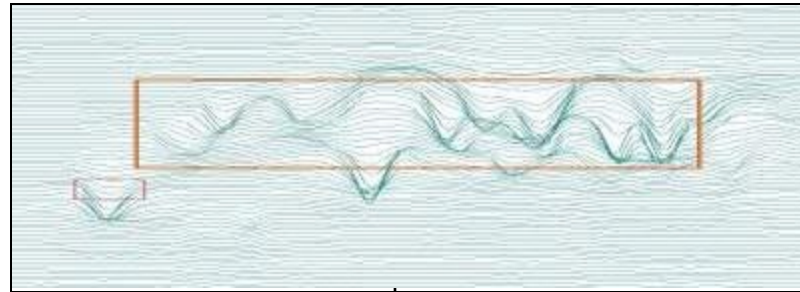
ILI Reported at 49% wt x
125 mm



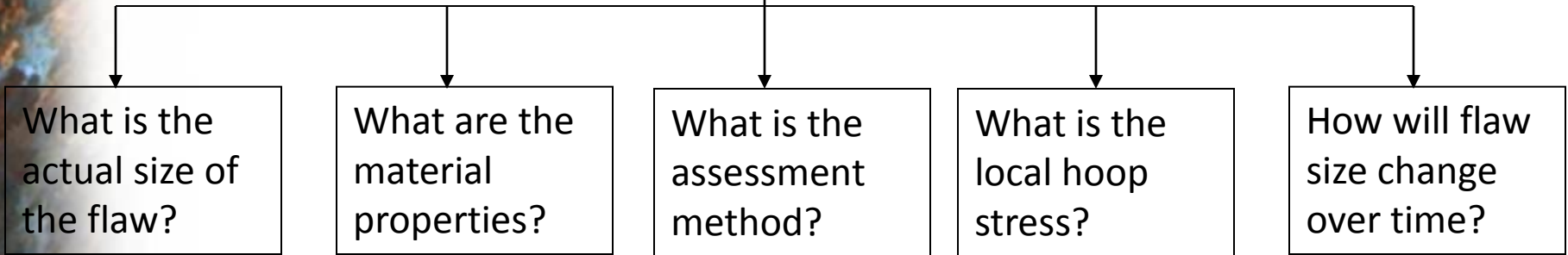
The inputs to the question are random variables.

The inputs to the question are random variables but random within a predictable range.

Is this ILI reported anomaly actionable?



ILI Reported at 49% wt x
125 mm



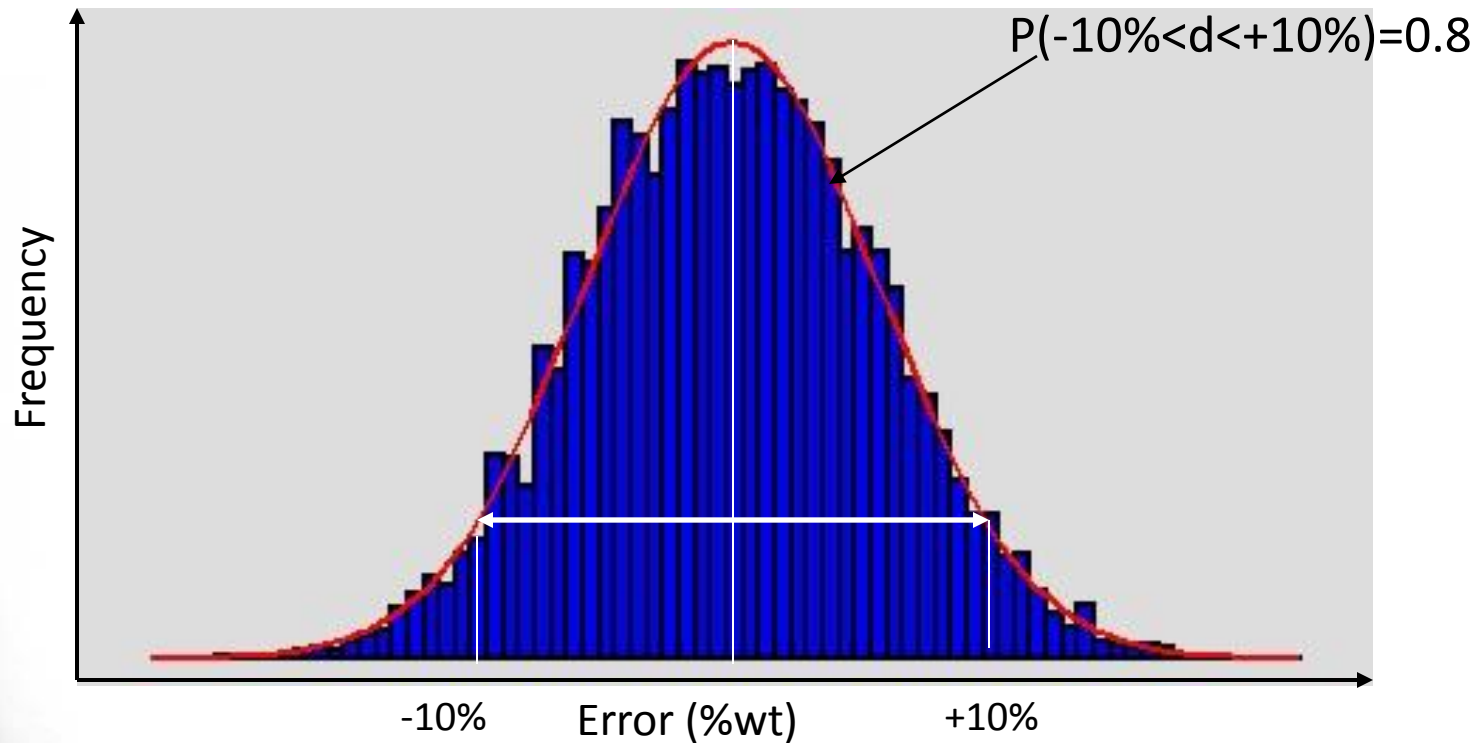
Deterministic Assessments account for uncertainty by using conservative values, e.g., adding a blanket tool tolerance, using minimum material property values, adding safety factors.

Probabilistic Assessments quantify uncertainty by defining the probability distribution associated with unknown values.

Understanding ILI Tolerances

Sizing Tolerances

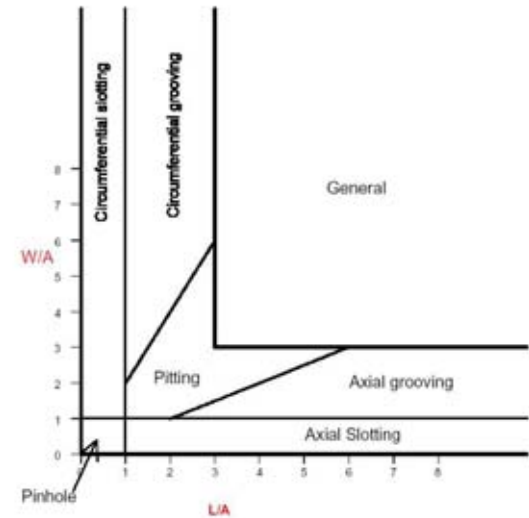
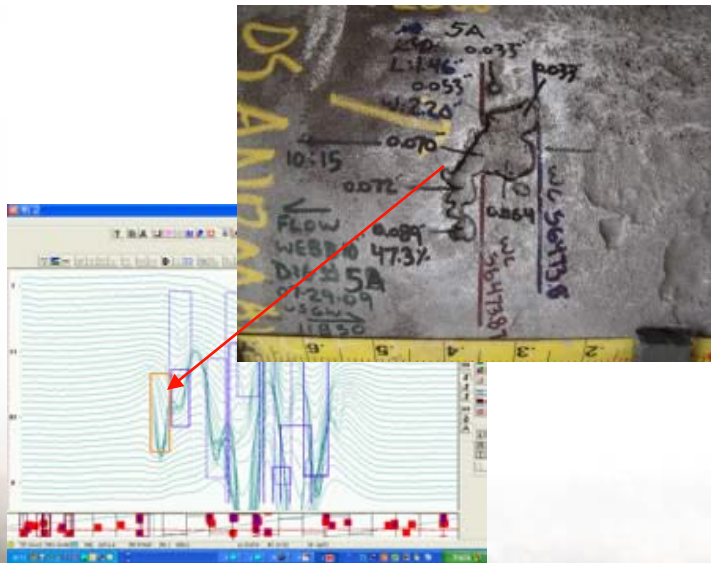
Tool tolerances are defined during pull through testing



This describes the tool specific tolerances but there maybe run specific tolerances

Measurement Uncertainty of ILI Tools

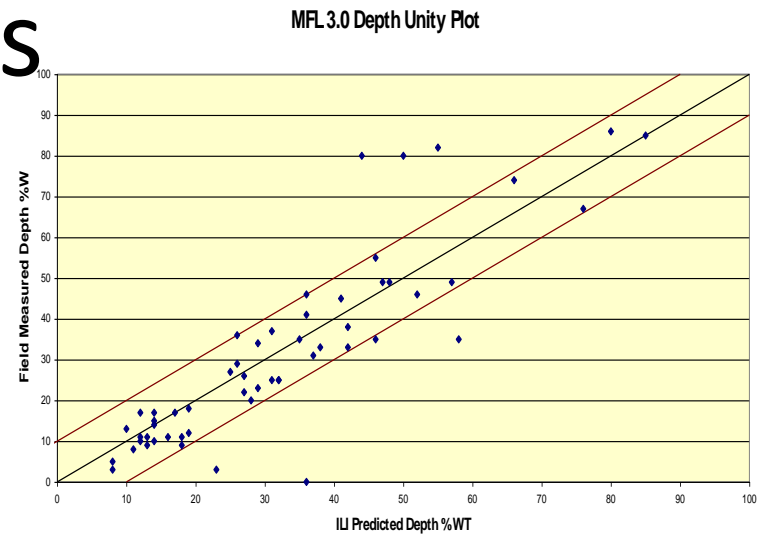
- In absence of field results vendor supplied tolerances can be used, e.g. +/- 10%, 80% confidence.



- ILI uncertainty will vary based on defect geometry, e.g., NAEC vs. Pitting. ILI uncertainty will vary based on defect location, e.g., proximity to welds, bends, WT changes.

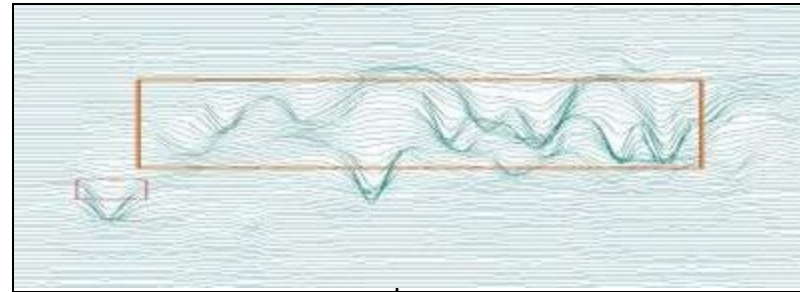
Measurement Uncertainty of ILI Tools

- Run specific tolerances can be quantified by comparing field vs. ILI results.

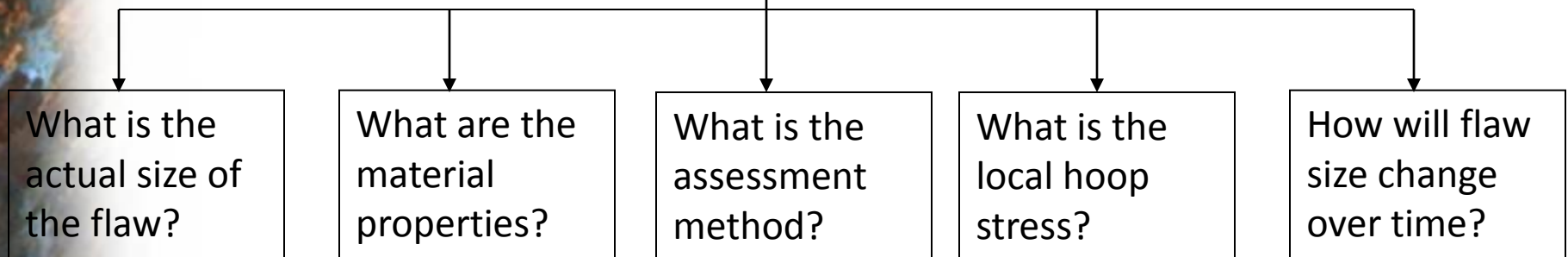


- Results must be carefully analysed, NDE tolerances accounted for, outlier results studied and statistical testing of results performed.

Is this ILI reported anomaly actionable?



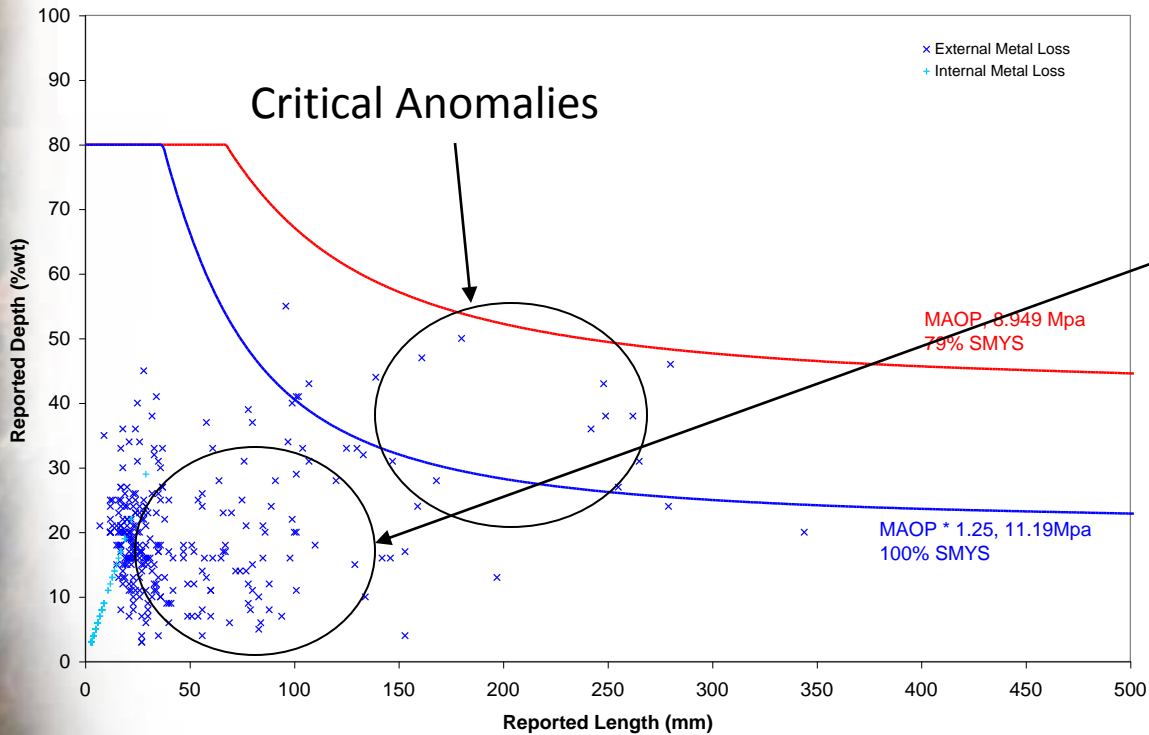
ILI Reported at 49% wt x
2.1 inches



Once all the relevant information is collected then actionable anomalies can be identified in the ILI data.

Accurate data is a key element in ILI interpretation.

Remediation Schedule Assessment



When will these sub-critical anomalies become critical?

Calculating scheduled response dates requires accurate corrosion growth rate information.

Corrosion Growth Rates from Repeat

ILI Data

- Feature matching from spreadsheet data
- Feature matching using visual display software
- Box matching
- Signal matching (RunCom™)

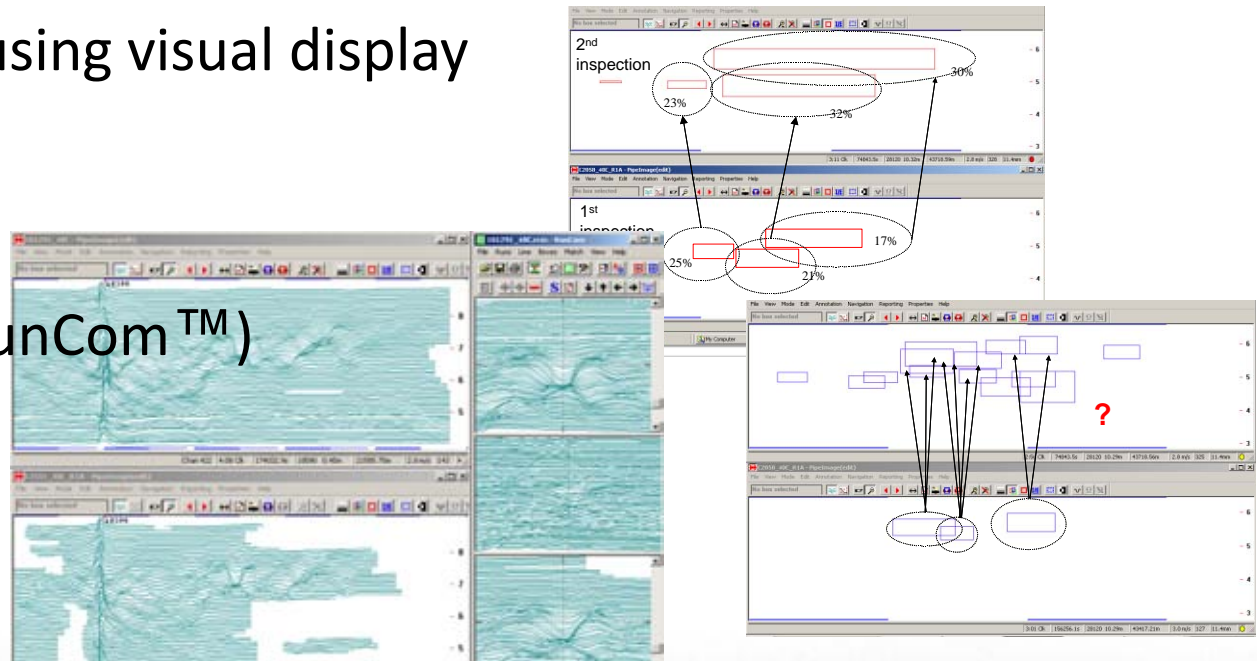
*Increasing level
of accuracy*

Run 1

GRID NO.	RELATIVE ELEVATION (FEET)	ABSOLUTE ELEVATION (FEET)	CORROSION RATE (MPY)	PEAK CORROSION RATE (MPY)	LOC	DEF	ORIENTATION
38880	17.9	43205.5					
38890	17.9	43203.4					
38280	17.26	43197.2					
38130	17.8	43188.0					
38230	17.9	43186.9					
5.3	43142.0	46.037	279				
8.1	43141.0	46.037	279				
8.4	43141.0	46.037	279				
19.2	43141.0	46.037	279				
19.3	43141.0	46.037	279				
19.4	43141.0	46.037	279				
19.5	43141.0	46.037	279				
19.6	43141.0	46.037	279				
38230	17.9	43186.9	46.037	279			

Run 2

Grid No.	Elevation (Feet)	Absolute Elevation (Feet)	Corrosion Rate (MPY)	Peak Corrosion Rate (MPY)	Length	Def	Orientation
38880	17.9	43205.5					
38890	17.9	43203.4					
38280	17.26	43197.2					
38130	17.8	43188.0					
38230	17.9	43186.9					
5.3	43142.0	46.037	279				
8.1	43141.0	46.037	279				
8.4	43141.0	46.037	279				
19.2	43141.0	46.037	279				
19.3	43141.0	46.037	279				
19.4	43141.0	46.037	279				
19.5	43141.0	46.037	279				
19.6	43141.0	46.037	279				
38230	17.9	43186.9	46.037	279			



Signal Matching software

At least 3 times more accurate, >3 if matching difficult

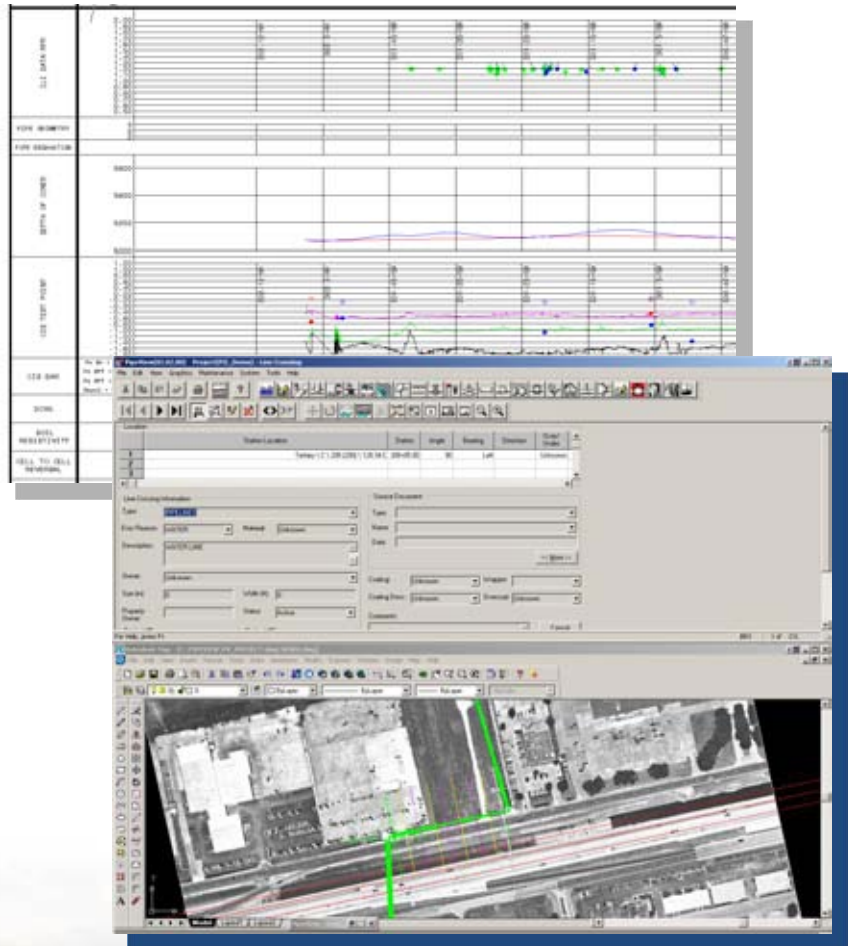
Data Aligning

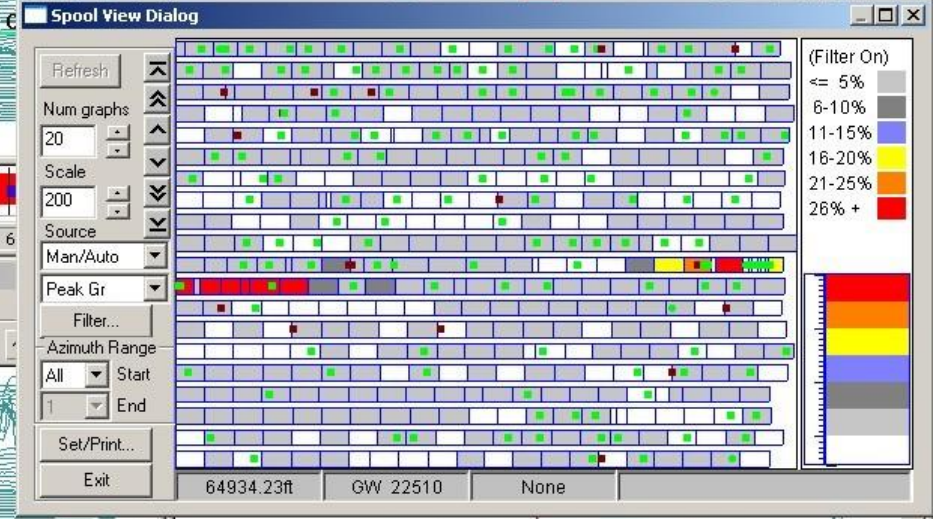
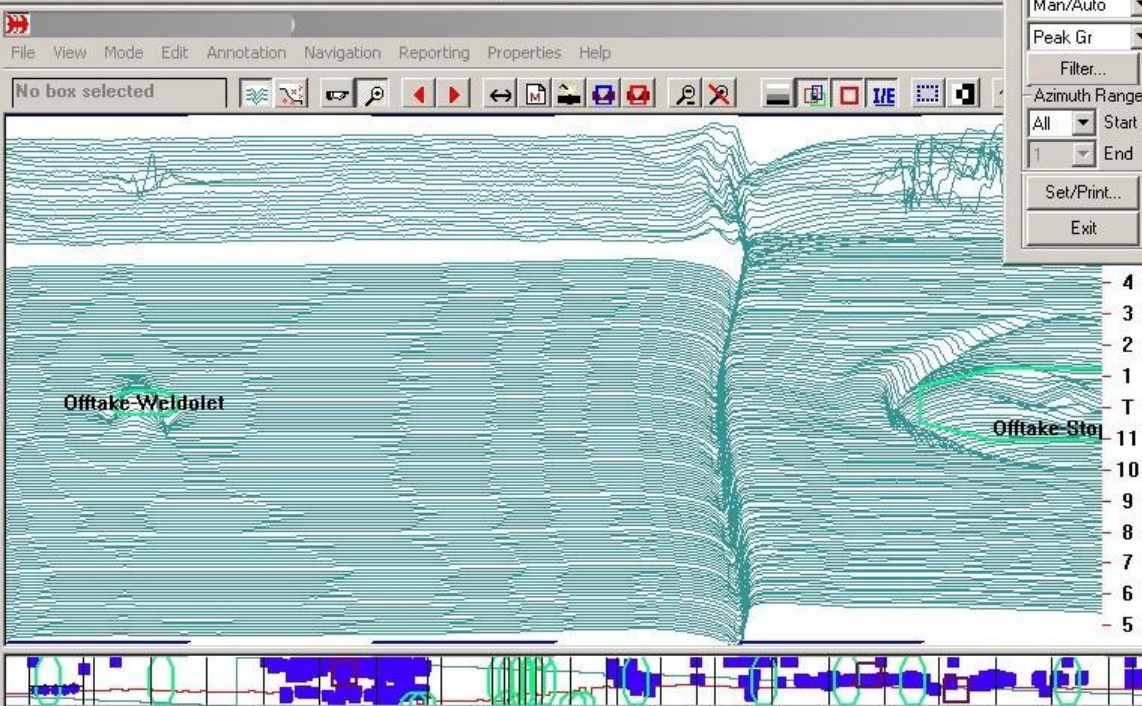
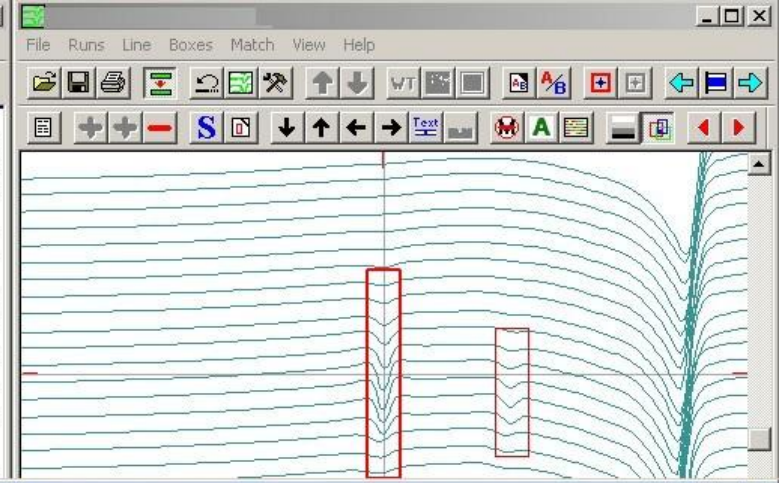
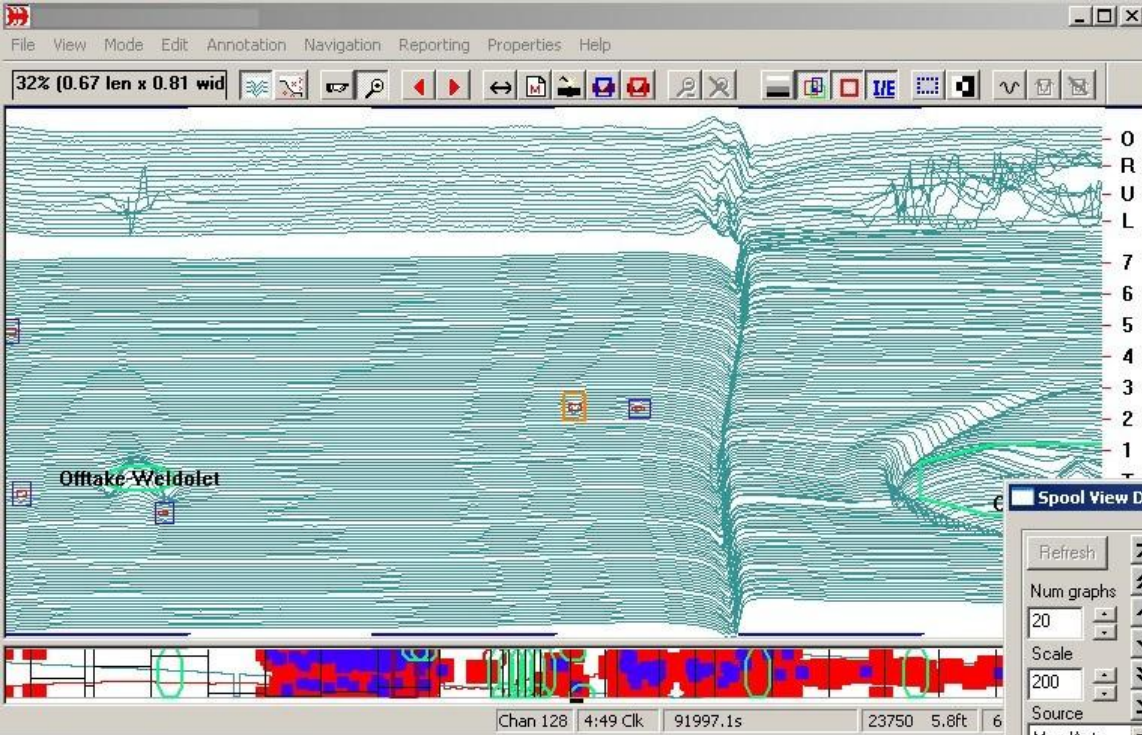
Data Alignment and Linear Referencing

For transmission pipeline systems, the accuracy with which data can be aligned and located is critical for success.

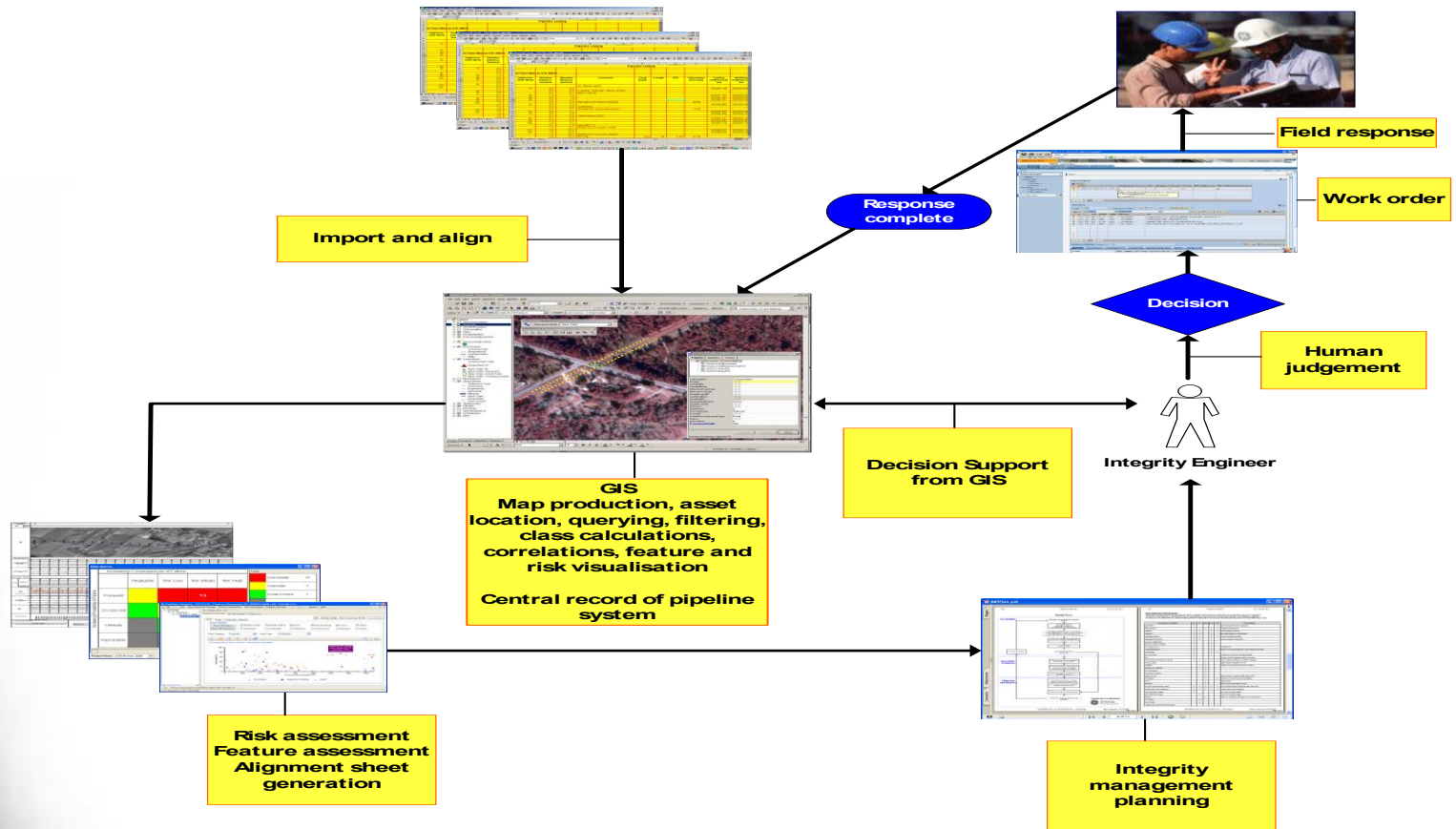
ILI data must be aligned to other pertinent pipeline data, other ILI runs, CP data, ROW, terrain, etc.

Keeping the data centralized ensures that accurate and current information is available to everyone.





Implementing a Repair and Remediation Schedule

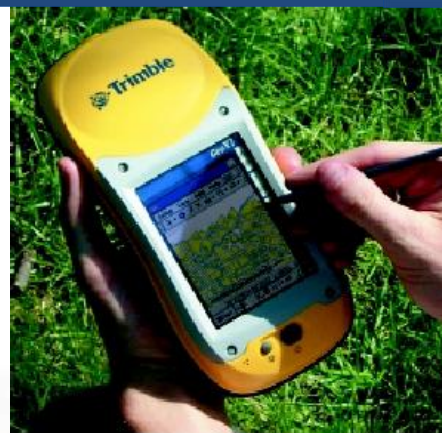
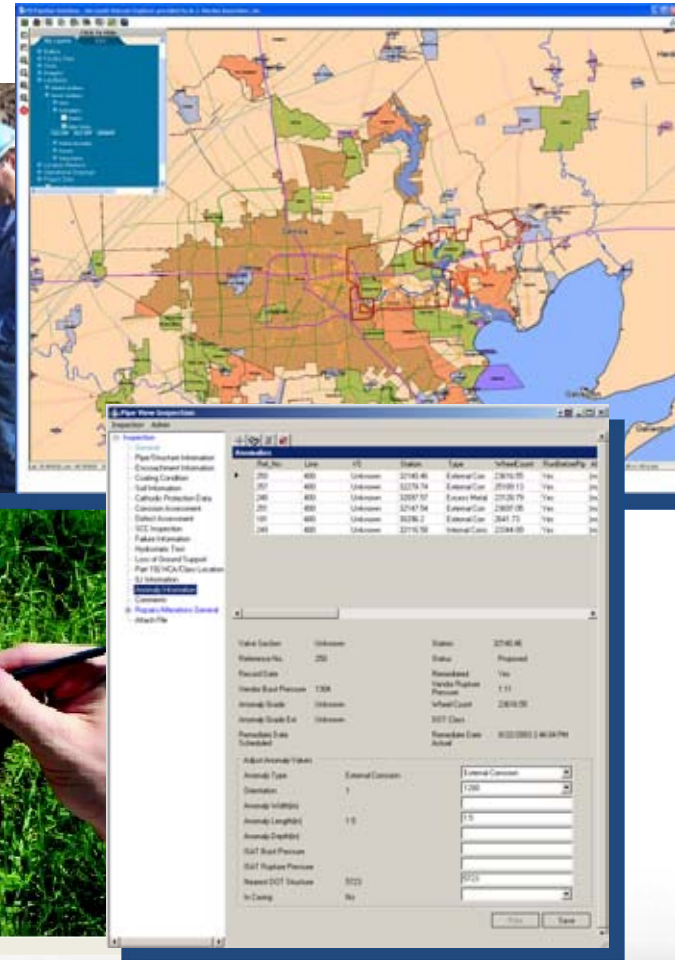


Multiple levels of organizational information rolled into one centralized system

Uploading Field and Repair Information

Ability to:

- Work in a disconnected-mode
- Record actual defect characteristics while comparing against data in database
- Update anomaly status
- Capture repair information
- Sync data collected/recorded in the field back to corporate database once back in the office



Benefits of Centralized Data Management

- Common platform
- Allows efficient and consistent decision making
- Quality control can be built into the system
- Data format is the same every time
- Changes are system wide and can be implemented rapidly
- Ensures standardization of process
- Same answer regardless of who performs the analysis
- Ability to measure performance
- Immediate system-wide implementation of upgrades
- Communication!!!!

Efficiency

Quality

Consistency

Questions?

