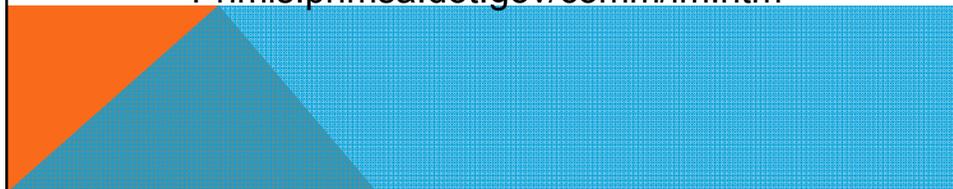




### WHAT IS AN INTEGRITY MANAGEMENT PROGRAM?

A set of safety management, analytical, operations and maintenance processes that are implemented in an integrated and rigorous manner to assure operators provide protection for HCAs. While the rules provide some flexibility for an operator to develop a program best suited for its pipeline system(s) and operations, there are certain required features – called “program elements” – which each IM program must have.

[Primis.phmsa.dot.gov/comm/lm.htm](http://Primis.phmsa.dot.gov/comm/lm.htm)



## WHAT IS AN INTEGRITY MANAGEMENT PROGRAM?

ASME B31.8S defines as:

- Integrity management describes a process that an operator of a pipeline system can use to assess and mitigate risks in order to reduce both the likelihood and consequences of incidents. It covers both a prescriptive- and a performance-based IM program.
- A comprehensive, systematic and integrated IM program provides the means to improve the safety of pipeline systems.

## WHAT IS AN INTEGRITY MANAGEMENT PROGRAM?

Integrity management program means an overall approach by an operator to ensure the integrity of its gas distribution system. (§192.1001)

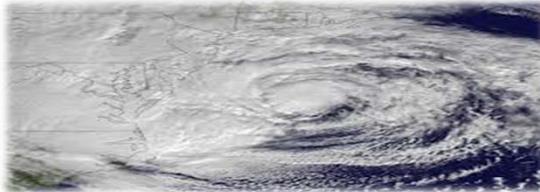
Integrity management plan means a written explanation of the mechanisms or procedures the operator will use to implement its integrity management program and to ensure compliance with this subpart. (§192.1001)

## INTEGRITY MANAGEMENT

- **Principles or theory the same**
- **Related to pipe, not the product**
- **Regulatory differences between gas transmission, HL and distribution programs**
- **Common elements**

## COMMONALITIES OF IM

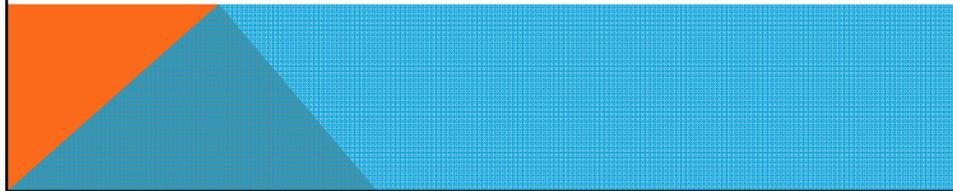
- **Identify risks or threats**



## COMMONALITIES OF IM

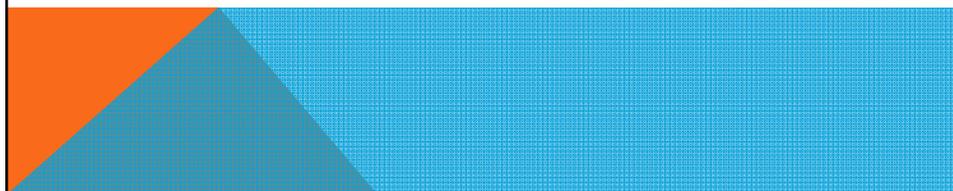
- **Evaluate risk/risk ranking**

**Risk = Likelihood X Consequences**



## COMMONALITIES OF IM

- **Preventative and mitigative (P&M) measures**
- **Continual evaluation (and assessment), including performance measures**



## UNIQUE TO TRANSMISSION LINES

**HCA identification**

**Baseline assessment plan (BAP)**

**Assessments**

**Repair and  
remediation**



**Case Studies to determine  
impact to integrity programs**

## CHANGING THREATS

- **Gas distribution system on New Jersey shore**
  - Both barrier islands and mainland
- **Superstorm Sandy**
  - Landfall on 10/29/2012
  - Storm surge  $\geq 13.3$  feet
  - System pressurized during storm



## CHANGING THREATS

### After storm hit

- Curtailed service to 31,000 customers
- Repressurized or replaced 270 miles of main in less than 6 weeks
- Installed one mile of new 12" steel main in three weeks





## CHANGING THREATS

- **Roads and bridges washed away**
- **Sand drifts 7 feet tall**
- **Debris and flooding**
- **Leaks**
- **Valves and other equipment buried**



## CHANGING THREATS

- **Threats have changed**
- **Corrosion threats**
  - External
  - Internal



## CHANGING THREATS

- **Threats have changed**
  - Outside force damage
  - Third party damage
  - Materials and construction



## PLAN EVALUATION

**Identified threats and therefore risk rankings should change**

**Plan evaluation frequency**

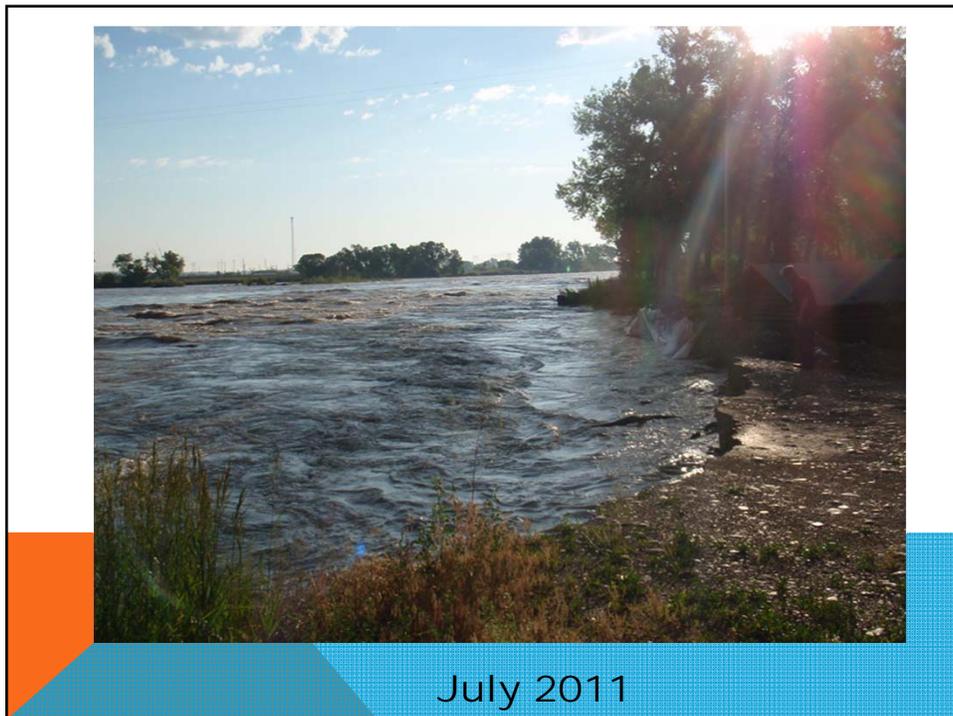
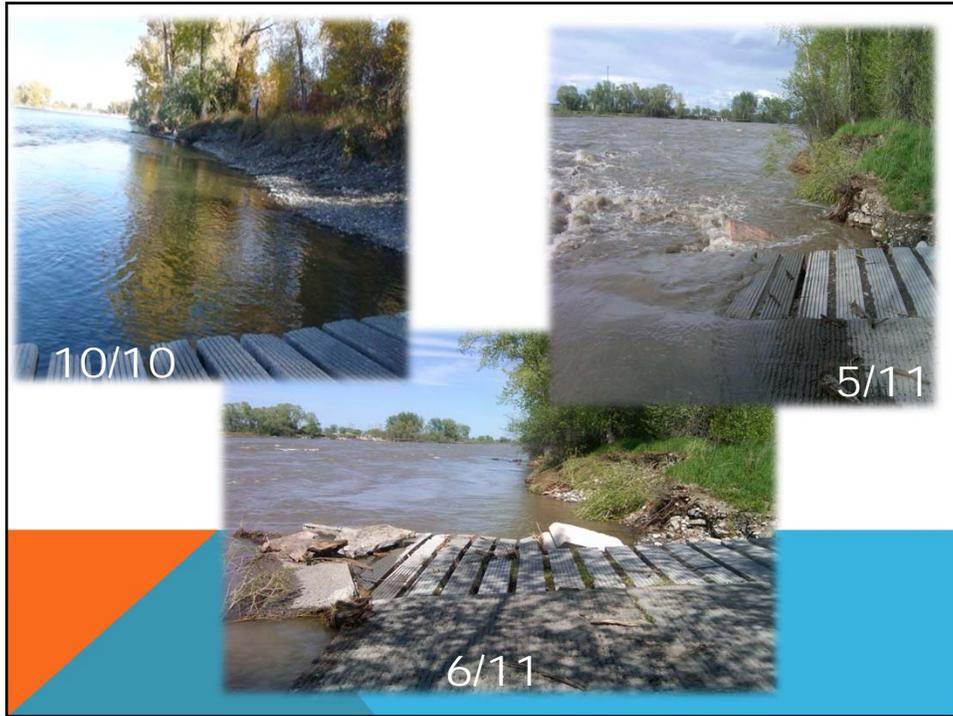
- Long enough for meaningful changes
- Short enough to recognize trends
- Additional evaluations as needed

**Should this event trigger an integrity management evaluation?**

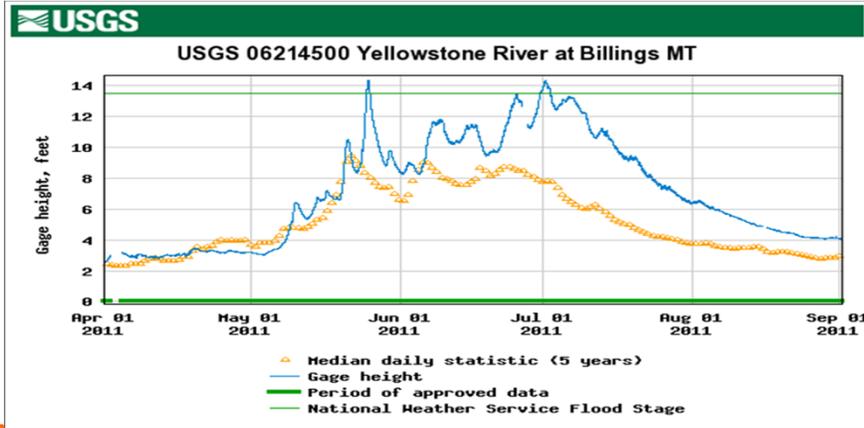
## CHANGING THREATS

**Pipeline crossing failure on the  
Yellowstone River July 1, 2011**





## YELLOWSTONE RIVER GAUGE HEIGHT



Graph of gauge height April 1, 2011 through September 1, 2011.

## MONTANA WATER CROSSING SURVEY

**Collaborate with State of Montana to compile an inventory of petroleum pipelines at major water crossings, determine if they are currently safe and ensure the integrity of the petroleum pipelines.**



MONTANA RIVER CROSSINGS			
Major River Crossings (open-cut, > 100 feet)	Remediation Not Necessary	Remediation to be Completed by 2012	2013 and beyond Remediation (Lower Priority)
4	1	3	N/A
3	1	1	1
16	4	3	9
0	0	N/A	N/A
3	3	N/A	N/A
4	4	N/A	N/A
1 (HVL)	1	N/A	N/A
2	2	N/A	N/A

## P&M MEASURES

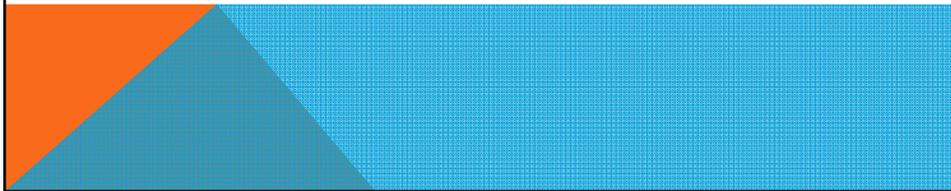
**Task force revealed few pipeline companies incorporate river and geotechnical risks when determining P&M measures**

**Potential for Damage to Pipeline Facilities Caused by Severe Flooding (ADB-2013-02, July 12, 2013)**



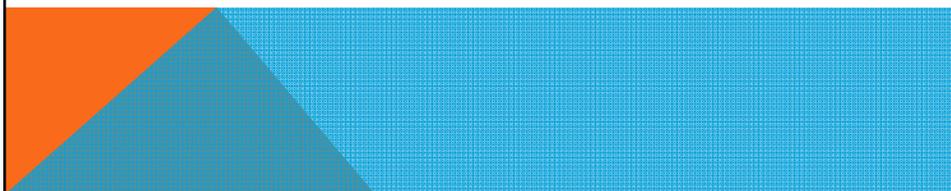
POTENTIAL FOR DAMAGE TO PIPELINE FACILITIES CAUSED BY SEVERE FLOODING (ADB-2013-02, JULY 12, 2013)

- Evaluate the accessibility of pipeline facilities that may be in jeopardy,**
- Extend regulator vents and relief stacks**
- Coordinate with emergency and spill responders on pipeline location and condition**
- Deploy personnel so that they will be in position to take emergency actions, such as shut down, isolation, or containment.**



POTENTIAL FOR DAMAGE TO PIPELINE FACILITIES CAUSED BY SEVERE FLOODING (ADB-2013-02, JULY 12, 2013)

- Perform frequent patrols, including appropriate overflights, to evaluate right-of-way conditions at water crossings during flooding and after waters subside.**
- Determine if flooding has exposed or undermined pipelines**



## POTENTIAL FOR DAMAGE TO PIPELINE FACILITIES CAUSED BY SEVERE FLOODING (ADB-2013-02, JULY 12, 2013)

**Perform surveys to determine the depth of cover over pipelines and the visual condition of any exposed pipelines**

**Ensure that line markers are still in place or replaced in a timely manner.**

**Notify contractors, highway departments, and others involved in post-flood restoration activities of the presence of pipelines and the risks posed by reduced cover.**

## P&M MEASURES

### ➤ Ideas for P&M Measures

- Yearly visual inspection of crossing
- Additional inspections as needed
- Periodic depth of cover surveys
- Replacement or remediation of crossing
- Changing or relocating facilities
- Extending stacks
- Properly marked



## PERFORMANCE MEASURES

**The P&M measures may also be rolled into performance measures**

- **Short-term measures**
  - Number of crossings replaced according to plan
- **Long-term measures**
  - Number of crossings inspections
  - Number of additional inspections
  - Number of depth of cover surveys

## CHANGING THREATS

- **Inspector watching a saddle fusion in the field**
- **Identified that joiner was not following company procedures**
- **Inspector asked to cut out and test fusion**



## BACKGROUND

**Joint passed visual examination**



## BACKGROUND

**Joint after testing**



## BACKGROUND

- **Joiner worked for 5 years**
- **At least 135 installations in past 2 years – known locations**
- **No location or number history for other 3 years**



## IMPACT ON IM

### **Change in threats**

- Incorrect operations
- Construction/joining
- Once all bad joints removed does the threat decrease?

### **Change in risk**

- Risk increases for system because of unknown number and locations

## IMPACT ON IM

### **P&M measures**

- Remove all known fusions by joiner
- Determine other potential locations
- Monitor other installations

### **Performance measures**

- Number of fusions removed

## BACKGROUND

- As performance measure for damage prevention and public awareness, operator wanted to reduce third-party hits
- Study discovered large percentage of damage caused by city/ county/ township/ parish activities with no one call

## BACKGROUND

- **Met with government officials as line hits occurred**
- **Resulted in a reduction in the number of third party damage by government entities**

## IMPACT ON IM

### **Threats**

- reduced risk of third party damage

### **Performance measure**

- used for integrity management and public awareness

## CHANGING THREATS

### Sissonville WV

- Not in HCA
- Common right-of-way



## CHANGING THREATS

- External corrosion on bottom of pipeline
- Other locations with similar conditions
  - Pipe characteristics, soil conditions, coating
- Adjacent pipelines



## IMPACT ON IM

### Changing threats

#### P&M measures

- Review of corrosion records
- More frequent readings, including other electrical surveys
- Changes in procedures for IR drop



## PERFORMANCE MEASURES

### Review of corrosion readings

- Number of low readings/number of low readings corrected
- Number of electrical surveys conducted
- New rectifiers/ground beds/anodes installed
- Ratio of repaired to unrepaired issues
- Recoating similar pipelines

## CHANGING THREATS

- **ADB – 2013-04**
  - July 17, 2013, TDS issued a recall of their Leak Repair Clamp (LRC)
  - Covers all pressure classes and sizes
  - Manufactured between 9/02 and 8/12
  - Contact TDW to follow up on recall

## IMPACT ON IM

### Changing threats

#### P&M measures

- Review of leak repairs records
- More frequent leak surveys at known locations
- Replacement of these clamps as per TDW recommendations

## PERFORMANCE MEASURES

- Number of LRCs repaired or replaced



## REVIEW

## CHANGING THREATS

- Identify threats to pipelines
- Threats, and therefore risk, is not constant
- Can diminish through construction or P&M measures
- Can increase through environmental events
- Cannot entirely remove threat
- Changes can occur very quickly!

## RISK AND P&M MEASURES

**Risk = Likelihood X Consequences**

**Reduce risk by changing  
likelihood or consequence**

## P&M MEASURES

- **Additional actions to enhance public safety or environmental protection**
- **Prevent the occurrence of events contributing to the likelihood of an event**
- **Serve to mitigate (reduce) the consequences**

## P&M MEASURES

- **Tied to specific pipelines or conditions**
- **Short term or long term measures**
- **Additional patrols, inspections, or measurements**

**DOCUMENT!**

## PLAN EVALUATION

### **Plan evaluation frequency**

- **Long enough for meaningful changes**
- **Short enough to recognize trends**
- **Additional evaluations as needed**

### **Modifications to assessment intervals**

## PERFORMANCE MEASURES

- **Were all integrity management program objectives accomplished?**
- **Were pipeline integrity and safety effectively improved through the integrity management program?**

## PERFORMANCE MEASURES

**Certain measures required to be reported annually as part of annual report and include**

- **Leaks**
- **Miles assessed and remediated**
- **One call tickets and third party damage**

## ADB 2012-10 – USING MEANINGFUL METRICS IN CONDUCTING IM PROGRAM EVALUATIONS

- Clear performance goals and objectives to measure the effectiveness of key integrity activities
- Assure measures are providing useful information about the effectiveness of integrity management program activities
- Review and follow-up of program evaluation results, findings, and recommendations

## PERFORMANCE MEASURES

### **Activity measures**

- Monitor surveillance and preventative activities
- How well the plan is being implemented

### **Deterioration measures**

- Monitor O&M trends
- Is desired outcome being achieved?

## PERFORMANCE MEASURES

### **Failure measures**

- Program achieving the objective of improving integrity
- Lagging indicators such as number of leaks or failures
- **Challenge to define performance measures**

## PERFORMANCE MEASURES

- **Short and long term measures**
- **Can share measures with other programs (public awareness)**
- **Tied to O&M activities or P&M measures**
- **More prescriptive performance measures may be coming**

MARY FRIEND  
405-686-2332  
mary.friend@dot.gov