

Straits of Mackinac and Line 5 Pipeline

Stakeholder Briefing



Corporate Enbridge



Agenda

Meeting Time 0900 – 1200 hours

- Meeting Administration
- Safety Moment
- Public Affairs
- Risk Management
- Integrity
- Marine Pollution Control
- T&T Marine
- Emergency Management
- Questions

Meeting Administration

- Sign-in sheet
- Agenda
- Information Brochures
- Fire Alarm/Exits/Muster Point
- Refreshments/Snacks
- Restrooms

Safety Moment

Reminders for Spring Driving

— Sun Rise and Set is Low on the Horizon

- Wear sunglasses
- Use a visor
- Keep your windshield clean
- Pullover until you can see properly

— Kids on the Move

- Scan for kids
- Slow down in neighborhoods, parks, and schools

— Animals on the Move

- Scan for animals
- Slow down in rural areas or where animal traffic is high



Safety Moment Continued

Reminders for Spring Driving

- Construction is Back in Full Swing
 - Slow down in construction zones
 - Be aware of people and equipment
 - Plan ahead to avoid construction or have extra time to get through construction zones
- Motorcycles are back on the Streets
 - Beware of your surroundings and blind spots
 - If you ride, be aware of your surroundings and wear proper safety gear

Enbridge In Michigan Line 5



Enbridge: A Vital Link to Energy Supply



- Enbridge Energy has been delivering energy reliably since 1949 on what was originally referred to as the Lakehead System.
- About 15% of total U.S. petroleum imports arrives via Enbridge's Lakehead System.
- Enbridge meets more than 50% of crude oil needs of all Great Lakes refineries.

Liquids Pipelines in Michigan

Line 6B:

Griffith, IN to Marysville, MI

- 235 miles in MI
- 30-36-inch pipe
- Capacity 500,000 bpd
- Medium & heavy crude

Line 79:

Stockbridge to Romulus, MI

- 64 miles in MI
- 16-20-inch pipe
- Capacity 80,000 bpd
- Light & heavy crude

Line 17:

Stockbridge, MI to Toledo, OH

- 77 miles in MI
- 16-inch pipe
- 8 • Capacity 100,000 bpd
- Heavy crude



Line 5:

Superior, WI to Sarnia, ON, Canada

- 645 miles (554 miles in MI)
- 30-inch pipe (2, 20-inch heavy-walled and seamless pipelines under Straits)
- Capacity 540,000 bpd
- Light crude (also NGL & others)

Benefits to State Add Up to Millions

Supporting Michigan's Economy

In 2013, Enbridge paid nearly **\$21 million** in state property, sales, use and income taxes.

Employ approximately **250 employees & contractors** in **24 locations** – average annual salary: **\$82,000**

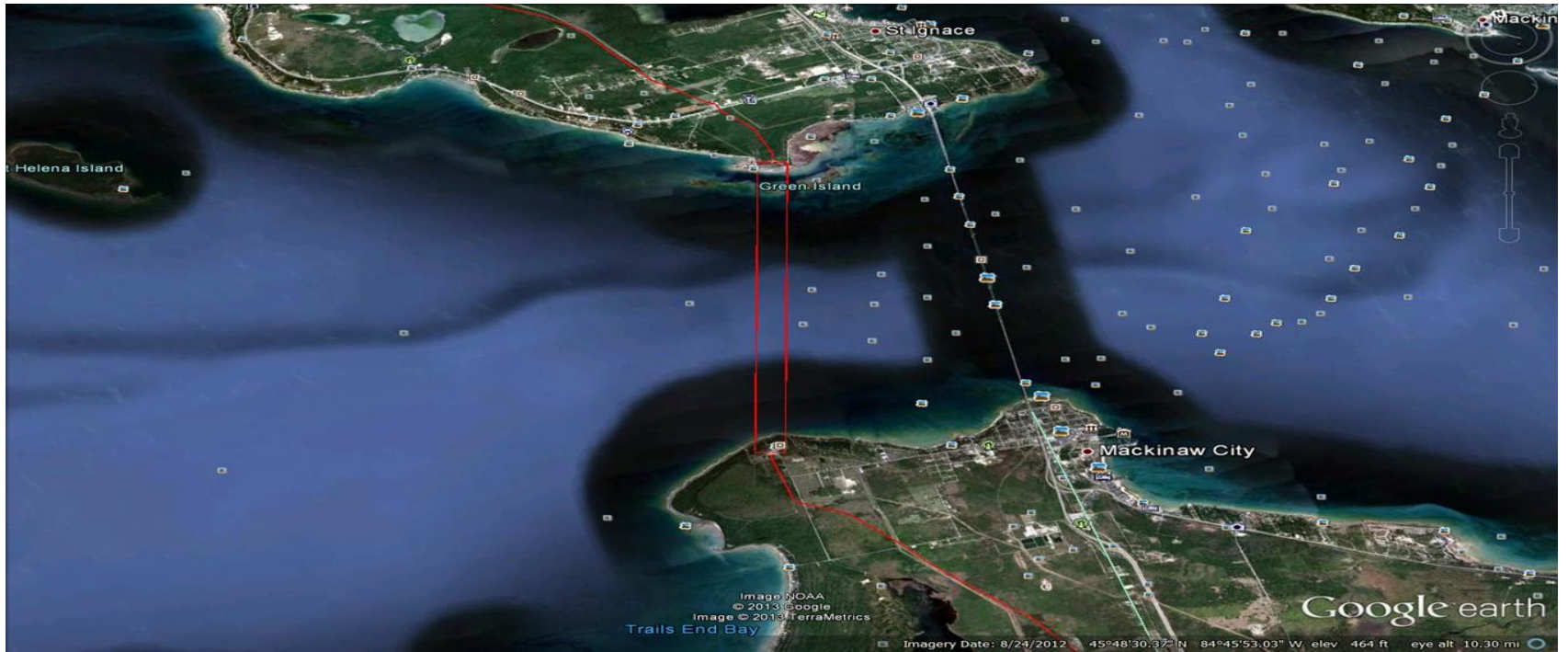


Line 5 - Fueling Michigan's Economy



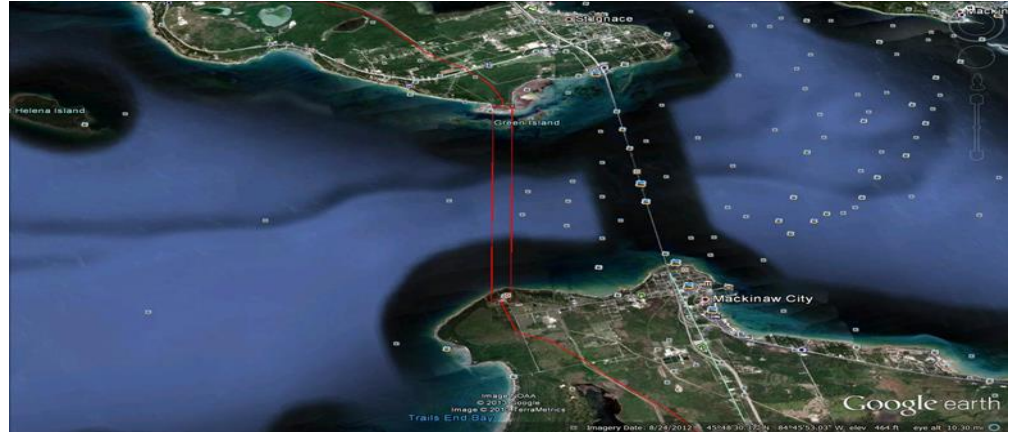
- **Propane** – critical to meeting needs of northern Michigan home owners
- **30% of light crude** to Detroit area refineries
- **Transporting Michigan production**
 - 14,000 bpd
 - 80 million bbls total

Straits Crossing



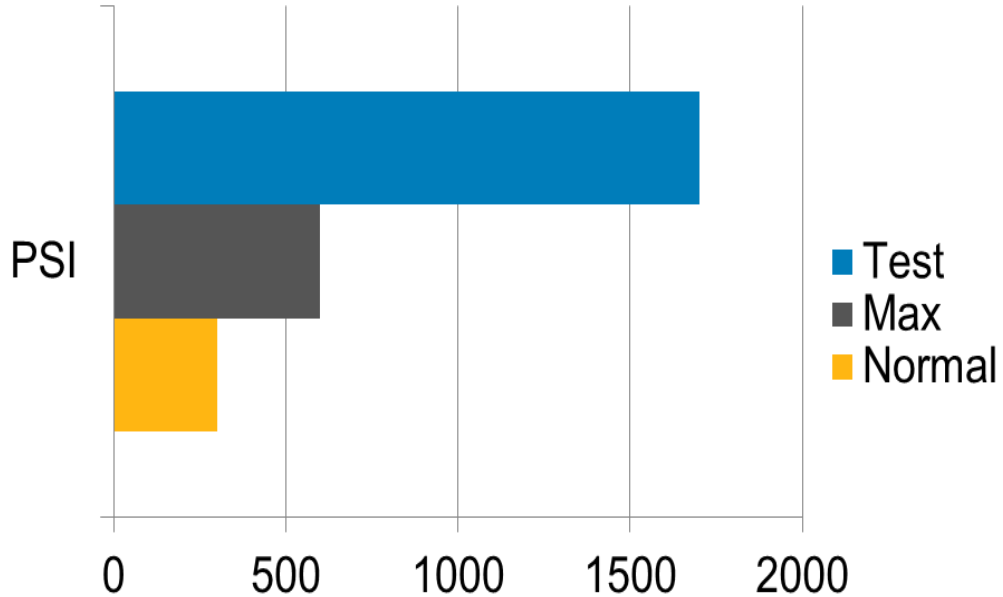
Safety in the Straits of Mackinac

- Design
- Inspections
- Automatic Shut-off Valves
- Electric Back-up Generator
- 24/7 Monitoring



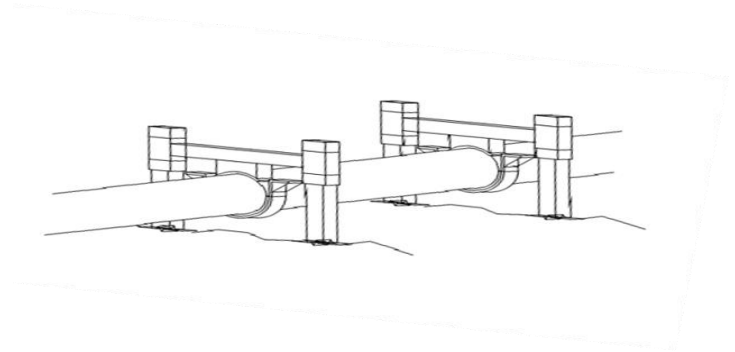
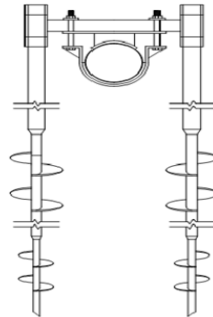
Safety in the Straits of Mackinac

Line 5 Straits Pressure



Straits of Mackinac Bracket Supports

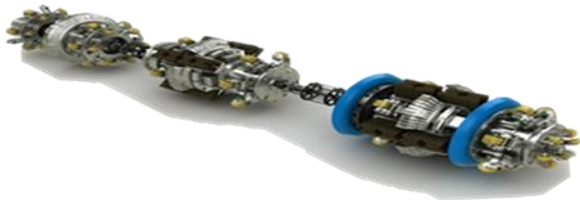
- Beyond 50 ft. depth secured in brackets screwed into the lake bottom
- Originally engineered for sand bag supports
- Enbridge began installing permanent steel screw anchors in 2002
- 40 supports installed summer 2014
- 124 total supports
- Program on-going



Internal Inspections

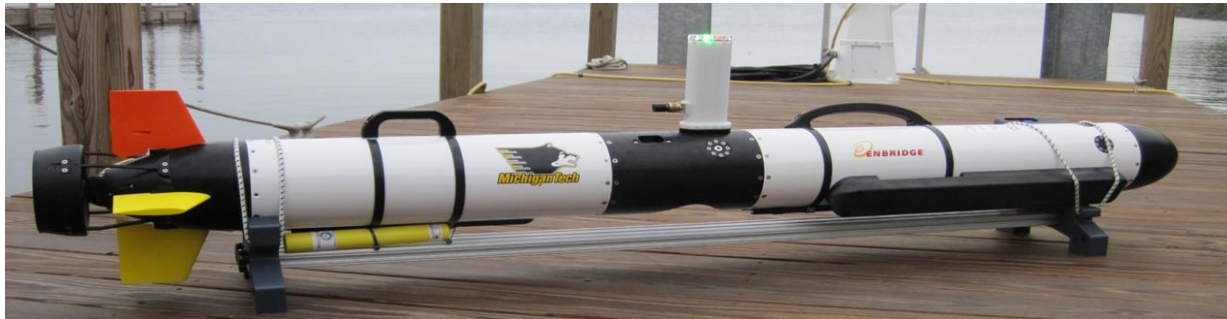
Sophisticated electronic vehicles move inside the pipe along with the oil to obtain detailed measurements of the pipe condition including:

- internal corrosion
- external corrosion
- dents, buckles, gouges



External Inspections

- Frequent Underwater Autonomous Vehicle and Remote Operated Vehicle inspections.
- Routine aerial and right-of-way patrols are conducted for buried pipelines.
- Visually patrolled at least 26 times a year.



Enbridge Liquid Pipelines Risk Management Overview

Risk Management

Dan Ferguson

Liquids Pipelines Risk Management



Topics

1. Risk Basics
2. Understanding Pipeline Risk
3. Managing Pipeline Risk

Risk Basics



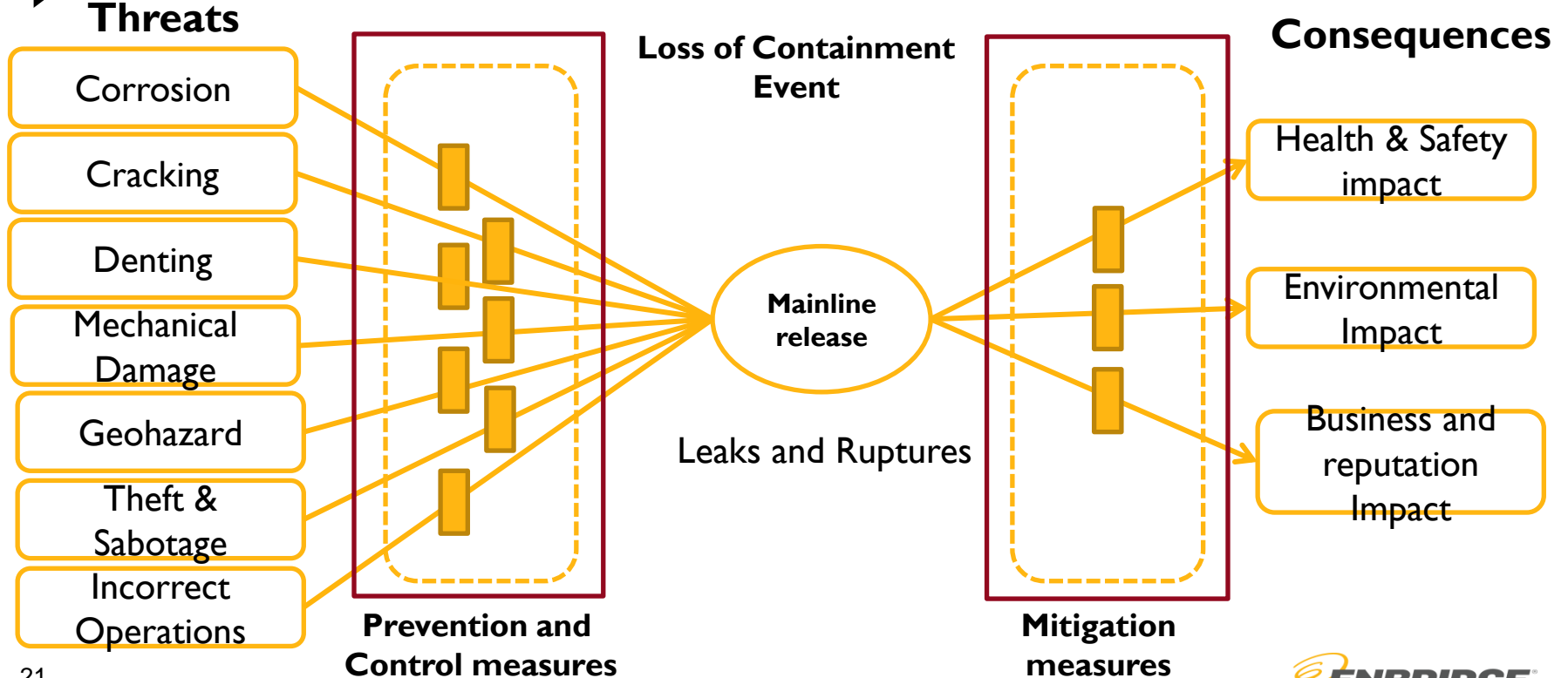
Risk Basics

$$\text{Risk} = \text{Likelihood} \times \text{Consequence}$$

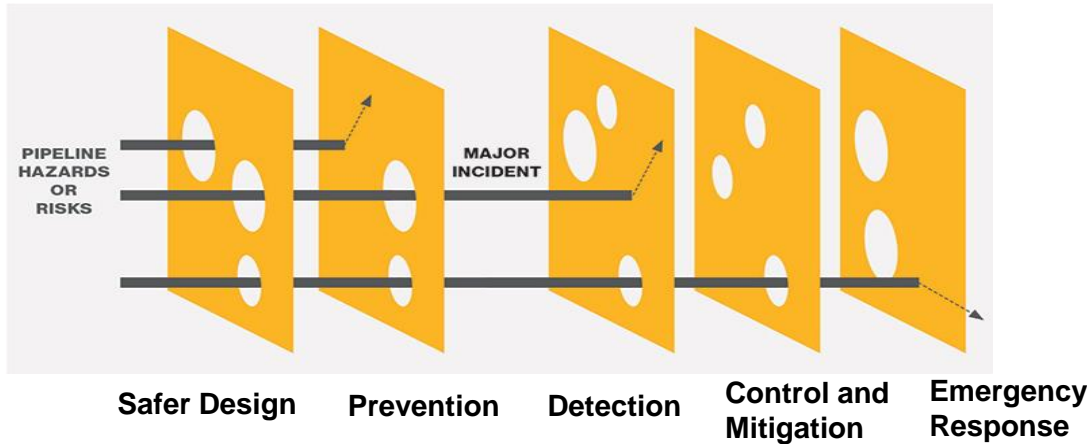
Likelihood	7	I	I	II	IV	IV	IV	IV
	6	I	I	I	II	IV	IV	IV
	5	I	I	I	II	II	IV	IV
	4	I	I	I	II	II	II	IV
	3	I	I	I	II	II	II	II
	2	I	I	I	I	II	II	II
	1	I	I	I	I	I	II	II
		1	2	3	4	5	6	7
		Consequence						

Understanding Pipeline Risk

How does Enbridge assess risk?



Managing Pipeline Risk



Preventative Measures

- Inherently safer design and construction
- Public Awareness
- Damage Prevention
- In Line Inspection
- Preventative maintenance
- Right of Way Monitoring

Response Measures

- Leak Detection
- Control Center
- Remote Controlled Valves
- Emergency Response

Pipeline Integrity: Technology and Practices

Pipeline Integrity

Lorna Harron

Senior Manager, Integrity Technology Advancement

Pipeline Integrity



Guiding Principles

Enbridge Integrity Philosophy

Safe Energy Delivery

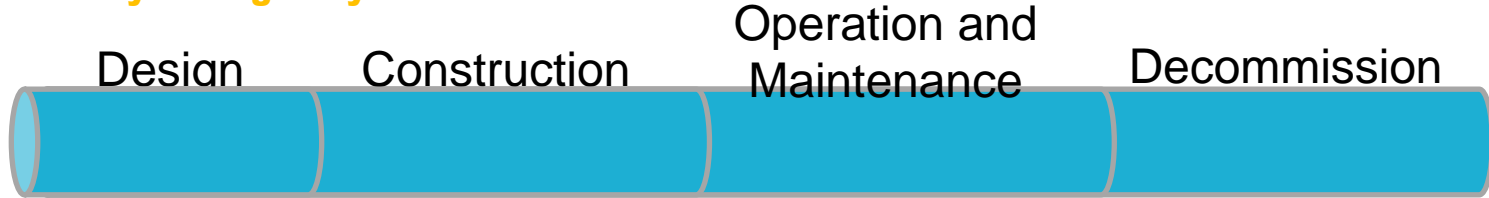


- Prevent any leaks caused by service exposures
- Maintain the system as a long life asset
- Optimize maintenance programs to assure safety margins, regulatory targets, customer expectations

Through **World Class** Pipeline Integrity

Approach to Integrity Management - Lifecycle

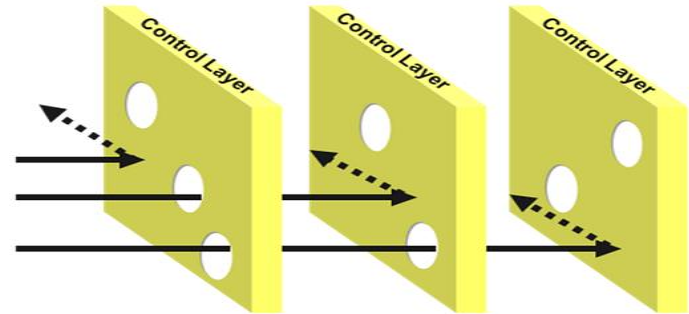
Assure Safety through Layers of Protection



Pipeline Integrity = End-to-End Engagement

— Pipeline Integrity Management Framework

- **Prevent** threats
- **Monitor** condition
- **Mitigate** to maintain fitness



Enbridge Line 5 Straits of Mackinac – Best Practice from the Start

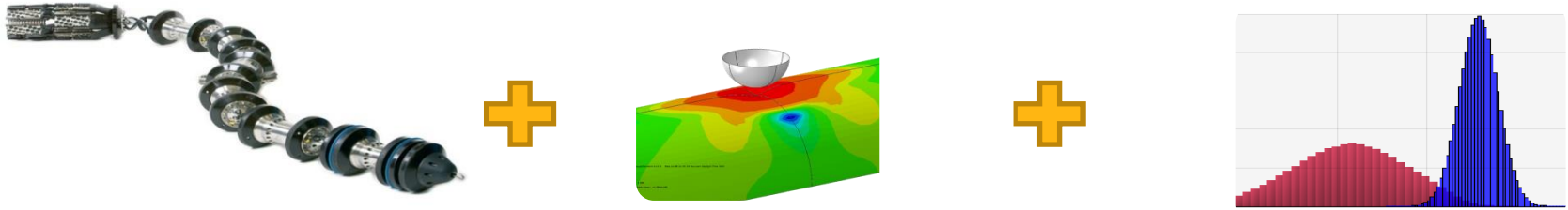
Design and Construction Best Practices Beyond Industry Norm

Straits of Mackinac Crossing Welding and Testing

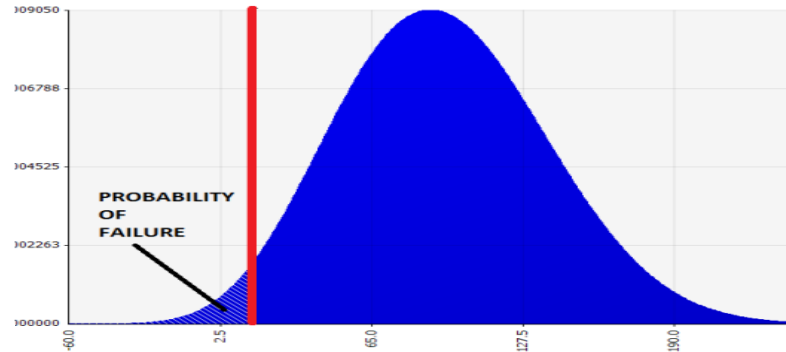
- 20in. Grade A Seamless pipe
- WT 0.812in.
- A total of 2031 girth welds (100%) were X rayed by Merritt-Chapman & Scott
 - Two welds among these welds were rejected during X-ray. They were cut-out re-welded and re-tested; all final welds passed X-ray test.
- SMYS equivalent to 2400psi
- An installation hydro-test of 1200psi (2.0 x MOP)
- MOP-setting hydro-test of 790psi on final placement
- MOP set at 600psi (~25% SMYS)
- NOP is typically between ~10-15% SMYS (35 mi. from pump station)

Data Driven Integrity Management – Reliability Science Best Practice

Integrity Activities Conducted based on Calculated Intervals



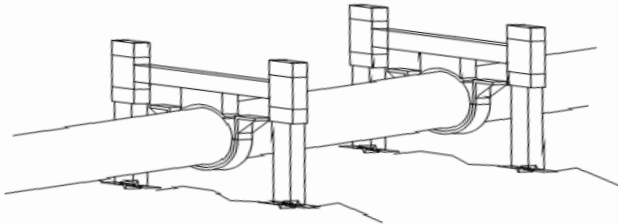
Limit state



Prevention and Monitoring

Defense in Depth

Threat	Prevention & Monitoring
Corrosion	<ul style="list-style-type: none">• Coating & Cathodic Protection• Heavy Wall Pipe• Regular ILI Program• Biota Study
Cracking	<ul style="list-style-type: none">• Seamless Pipe & Construction Quality• Coating & Cathodic Protection• Low Stress / Cycling• Span Management Program• ILI Program



Support Anchors



Corrosion Inspection Tool

Prevention and Monitoring

Defense in Depth

Threat	Prevention & Monitoring
Ice Scour	<ul style="list-style-type: none">• Burial Depth• Heavy Wall Pipe• Regular ILI Program
Anchor Strike	<ul style="list-style-type: none">• Heavy Wall Pipe• Location Not Conducive to Anchoring• Signs / Public Awareness (Marine)
Incorrect Operation	<ul style="list-style-type: none">• Training / Qualifications / Fatigue Mgt.• Alarms• Design Stress to Operating Ratio
Sabotage	<ul style="list-style-type: none">• Cameras at site



Line 5 Straits Integrity management plan

Use of Best Available Technologies to Manage Integrity

- **Corrosion (MFL):**
 - Previous – 2013
 - Next – 2018 (5yr interval)
- **Circumferential Cracks at Girth Welds** (UT “free swimming” Circumferential Crack Tool + Tethered UT Circumferential Crack Tool):
 - Previous – 2014
 - Next – 2018 (5yr interval)
- **Dent (Geopig):**
 - Previous – 2013
 - Next – 2018 (5yr interval)
- **External Visual Inspection** – spans, coating, supports (Divers + Remote Operated Vehicle (ROV) + Side Scan Sonar):
 - Previous – 2014
 - 30– Next – 2016 (2yr interval)

Summary

Assuring Pipeline Safety Through Integrity Management

- **Commitment to 0 leaks**
- **Focus on long life critical infrastructure management**
- **Comprehensive and mature Integrity Management System**
- **Increased program reliability since 2010**
- **Close interaction with all stakeholders, including regulators, researchers, industry agencies, and public**

Emergency Management

Stephen Lloyd
Senior Manager Emergency Response

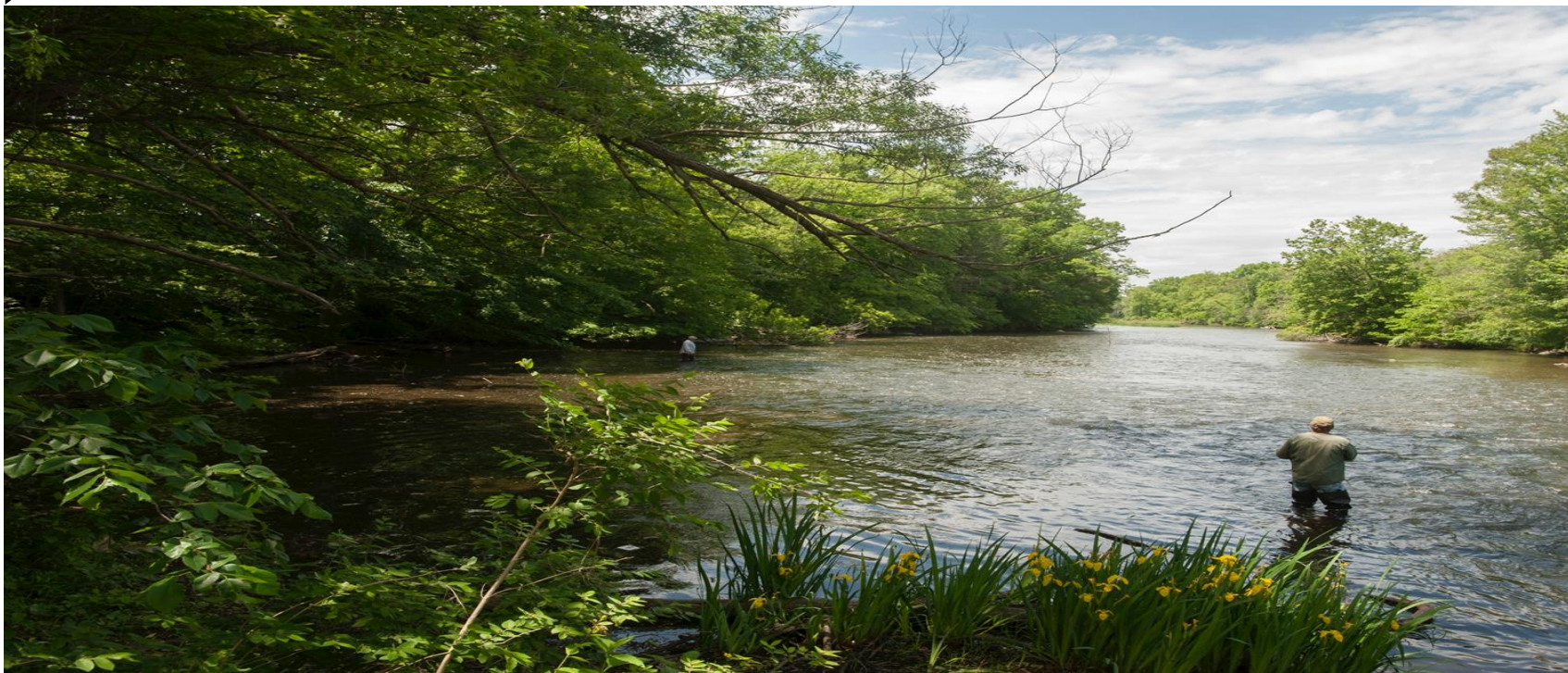


Agenda

- History
- Current Status
- Enhanced Capability
- Next Steps



Line 5: Vital to the State of Michigan



History

Exercises

- Annual inspections of Response Trailer caches
- Annual notification activation.
- 2011 – Boom deployment on Cut River in Naubinway Region, MI
- 2011 – Ice slotting in Straits.
- 2011 – Boom training on Escanaba River with SWAT.
- 2012 – ice slotting in Straits
- 2012 – Straits Functional Exercise OSROS and USCG.
- 2014 – Response Boat/ boom training Escanaba River
- 2014 – ICS 320 table top exercise near Indian River.
- 2014 – Indian River FSE.
- 2015 – USCG and EPA north shore of Lake Michigan to include the Cut/Brevort/Manistique Rivers.
- 2015 Straits Full Scale Exercise



Current Status

Plans

— Integrated Contingency Plan (ICP)

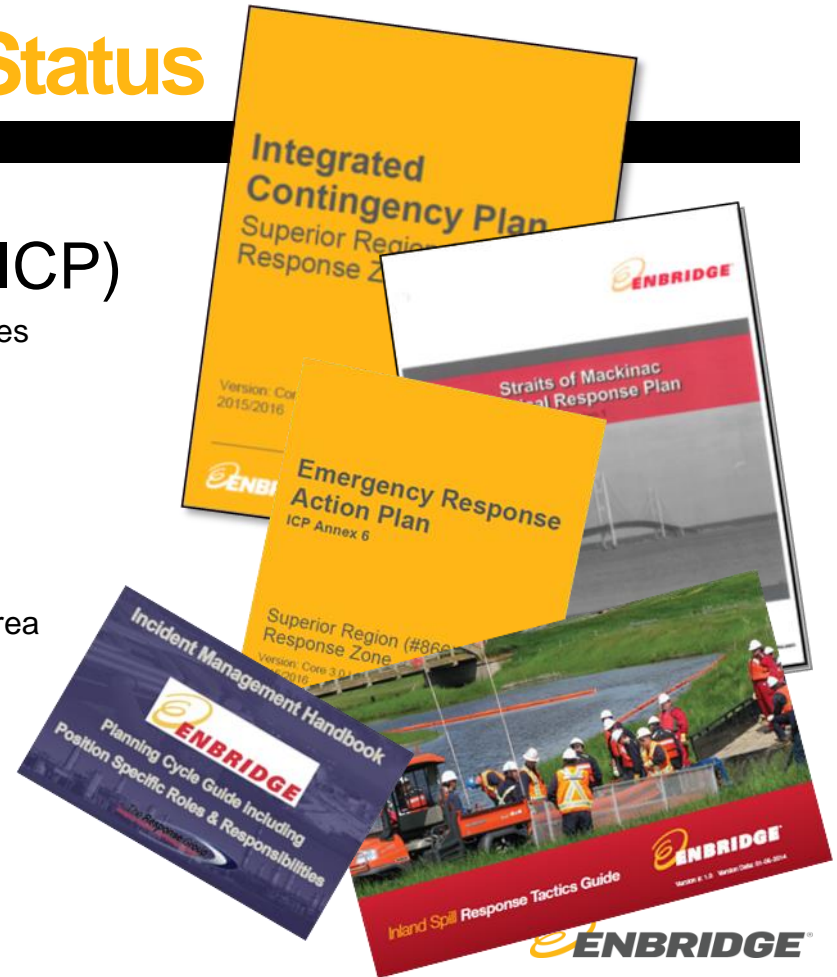
- Guides Corporate and Regional Response process / Annexes specific to region
- Includes condensed Emergency Response Action Plan for Responders

— Tactical Response Plan (TRP)

- Guides tactical response specific to the Straits of Mackinac area

— Additional Guides

- Inland Spill Response Tactics Guide
- Incident Management Handbook



Current - Oil Spill Response Organizations (OSRO)



Current Tactical Capability

- Compliant to Regulatory Requirements
- Above requirements, Enbridge owns and stages response equipment across its system
 - Shoreline Oil Recovery Capability 40% of TRP
 - Open Water Oil Recovery Capability Rely on OSRO/MPC capability
 - Winter/Ice Oil Recovery Capability ice slotting, deflection etc.



Model utilized during the September, 2015 Exercise

- After 24 hours
 - Oil landing on South Side of Mackinac Bridge and moving east, under bridge and towards Mackinac Island
- After 34 hours
 - Oil landing on Southwestern Shores of Mackinac Island and Bois Blanc Island



Improvements - Methodology

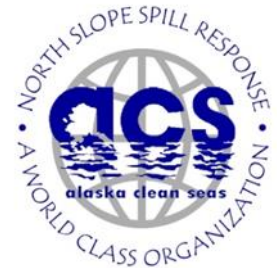
Questions we asked ourselves and our consultant:

- What should a response look like
- What is the “Right thing to do”
- How to benchmark capability
- What is best available technology & practice



Engaging with additional Oil Spill Response Organization (OSRO)

Ongoing discussions regarding expertise capability and support



Improvements

High speed open water recovery

- Enbridge is focused on continual improvement to benefit our system and the Straits/ surrounding areas.
- Shoreline
 - Containment Boom, Sorbet Boom, Anchors, Stakes, etc.
- Securing best available technology and practices that apply to;
 - Open Water Recovery
 - Response in winter conditions

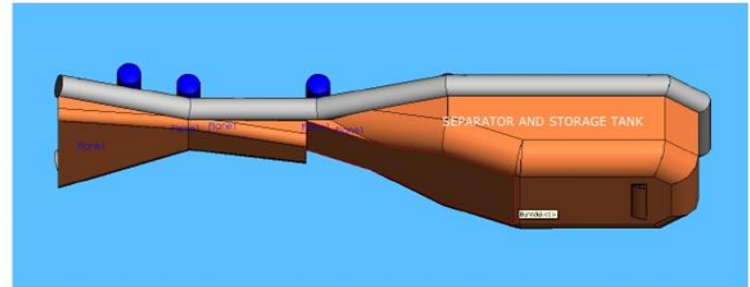


Open Water Recovery



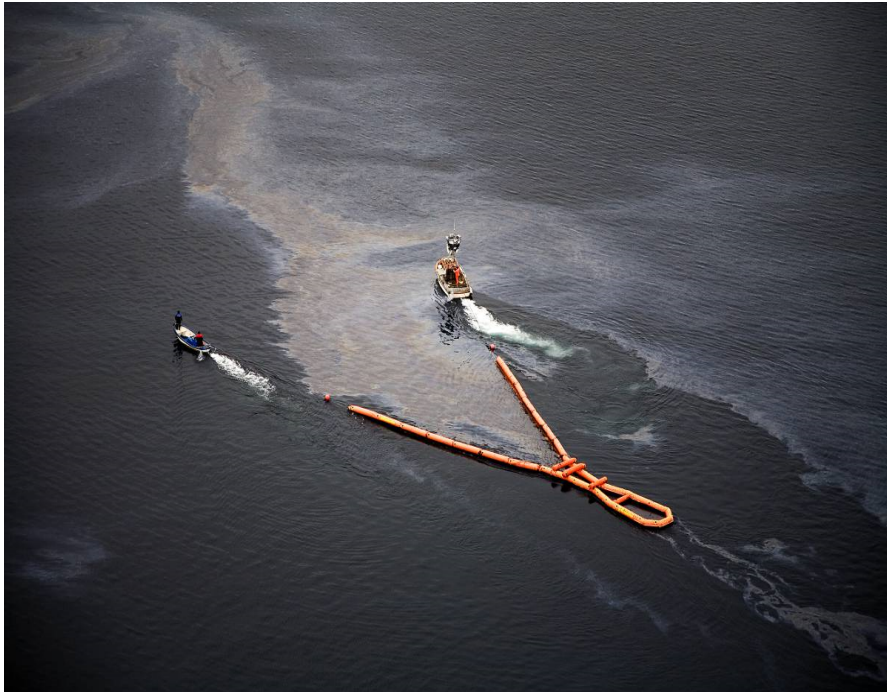
 NOFI

NOFI CURRENT BUSTER TEKNOLOGI



Current Busters Recovery System

- Current Busters towed by two vessels or single vessel with Boom Vane.



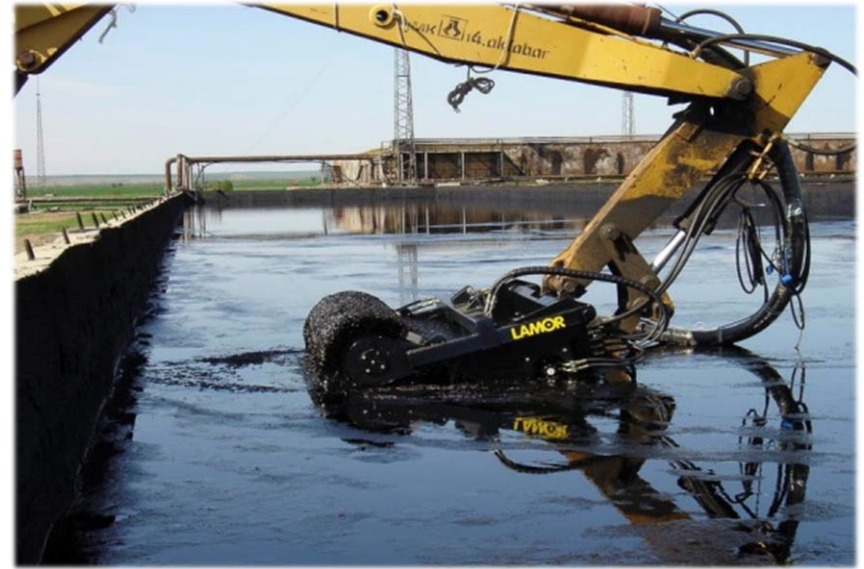
Current Buster Recovery System

Current Busters stowed on hydraulic reels in containers for safe storage and transport.



Open Water Ice Response Technology

Lamor LRB 150 Arctic Brush Bucket System



Straits of Mackinac Response

- 10,000 feet heavy duty OPA 90 offshore containment boom



Straits of Mackinac Response

Viscous Oil Pumping



Straits of Mackinac Recovery

- Foilex TDS 150 systems can be used in “U” or “J” Configuration for open water recovery.
- 4 x systems being purchased with conservative recovery rate of 144 bbl each for total of 576 bbl



Next Steps

1. Continued Enbridge outreach
2. Purchase of additional resources
3. Equipment deployment
4. Training

Summary

- Enbridge is working to enhance capabilities
- Open Water/ Ice response is a primary focus
- Equipment staging will enhance response in the area
- Continuing the conversation and communication

- This is important to Enbridge

Questions

