

smart-Project Management Inc.

## TRIAGE – Pipeline Risk Assessment + Mitigation Guidelines

- Implementation of a Quality Pipeline Integrity Management Program
  - Internal Corrosion Risk
  - Internal Corrosion Mitigation Guidelines



ACCESS WITHIN ABADATA



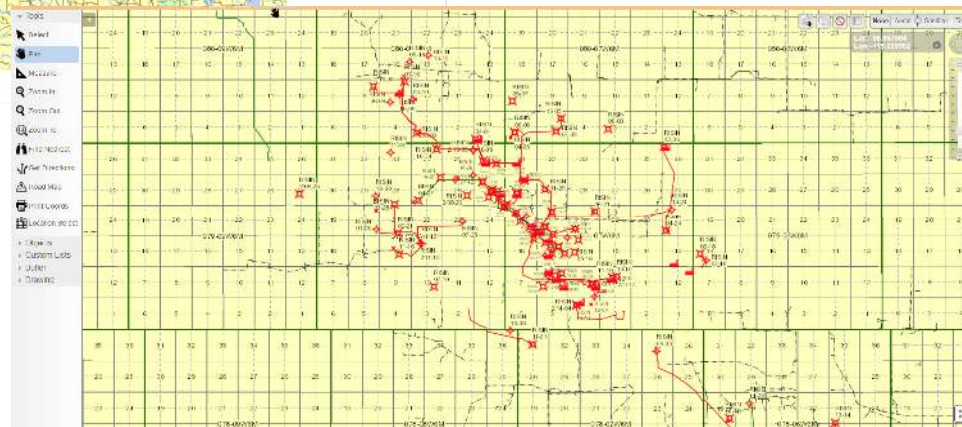
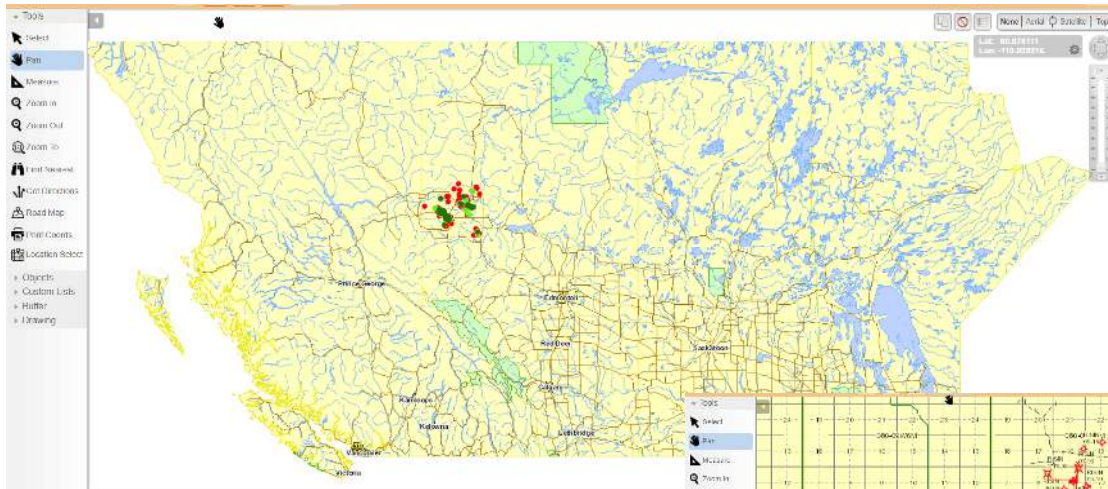
# TRIAGE Engineering Assessment + Reporting

## Pipeline Information Cards

- Detail Information Pop-Up  
*(double-click a pipe)*

## Reporting Options

- From Map Selection
- From Global Report Query  
*(no map needed)*

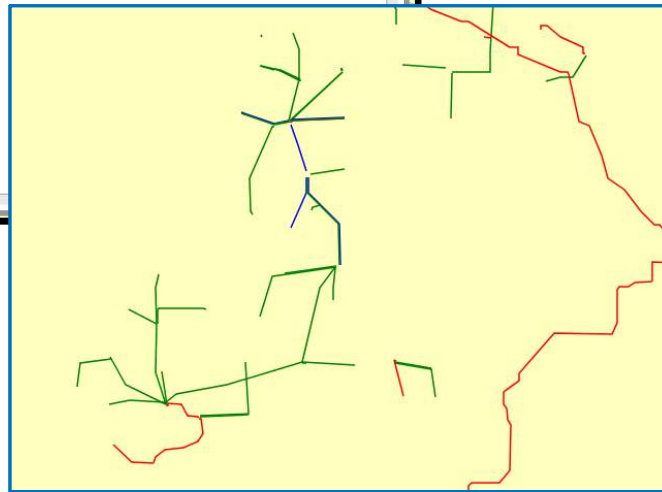
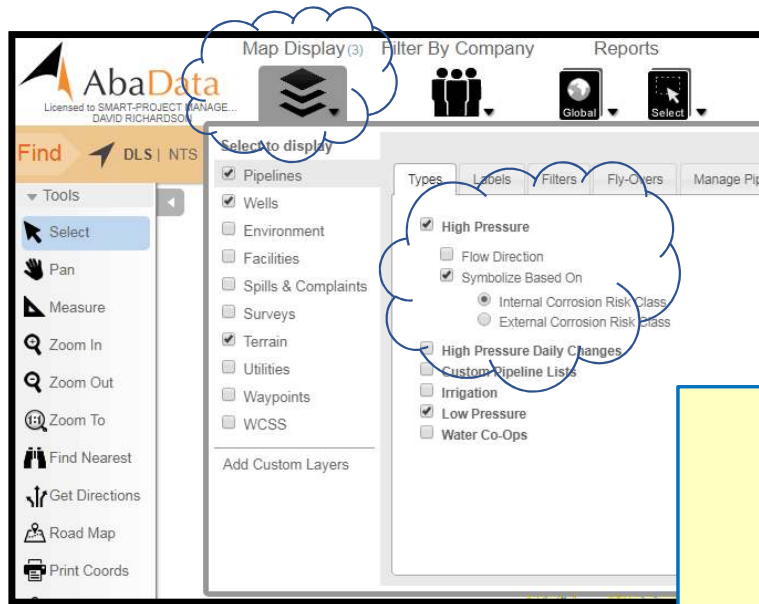




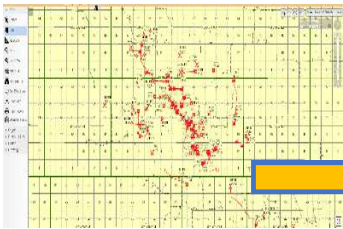
## TRIAGE – View Risk Assessment Classification on MapView

- Map Display / Pipelines / Types

- **Display Pipeline Risk Results in MapView**
  - Symbolize pipelines according to TRIAGE risk classification
    - Internal Corrosion
    - External Corrosion



- Risk Classification**
- **Low** █
  - **Moderate** █
  - **Serious** █



- Pipeline Information Cards within MapView
  - “double-click” single pipeline within MapView
  - Engineering Assessment Data Tabs (x3)

Information | More Info | Elevation Profile | Engineering Assessment | Attachments

Risk - Internal | Risk - External | Mitigation - Internal

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**INTERNAL CORROSION (IC) LIKELIHOOD PROFILE**

Operating Pressure - kPa: 2728	Gas Velocity (superficial) - m/s: 0.01
CO <sub>2</sub> - mol fraction: 0.02	Critical Upwards Angle - degrees: 0.36
Partial Pressure CO <sub>2</sub> - kPa: 7.86	Fluid Flow Severity (max 100): 5
NACE Maximum Corrosion - mmly: 0.42	

**IN-LINE INSPECTION CLASSIFICATION:** NO DATA

(1: no defects | 2: < 20% Wall Loss | 3: 20% - 50% Wall Loss | 4: > 50% Wall Loss)

RISK - INTERNAL CORROSION				
1	2	3	4	5
X				

SCORE A - HISTORICAL WELL PERFORMANCE INDEX (max 1.0): 0.46	5X5 MATRIX: 1-3
SCORE B - HISTORICAL IC SPATIAL FAILURE INDEX (max 1.0): 0.18	RISK CLASS: Low
SCORE C - FINAL IC SEVERITY INDEX (max 1.0): 0.5	RISK COST: \$141,740

**CONSEQUENCE PROFILE**

Leak Detection Time: 30 to 60 days	Pipeline Repair Time: 7 to 30 Days
Water Separation: No	Potential Water Body: No
BOE / Day: 11	BOE / Day Revenue: \$231

- Risk Assessment Summary

Print Close

Information | More Info | Elevation Profile | Engineering Assessment | Attachments

Risk - Internal | Risk - External | Mitigation - Internal

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**INTERNAL CORROSION - MITIGATION GUIDELINE**

STEP 1 - CHOOSE SINGLE ACTION FROM OPTION "A" OR OPTION "B"

STEP 2 - IF PIGGING IS NOT POSSIBLE - CHOOSE SINGLE ACTION FROM OPTION "C"

<b>OPTION A: PIGGING TO REMOVE CORROSIVE WATER TRAPS - Prevent Corrosion from Starting</b>		<table border="1" style="border-collapse: collapse; text-align: center; font-size: 0.8em;"> <thead> <tr><th colspan="5">RISK - INTERNAL CORROSION</th></tr> <tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr> </thead> <tbody> <tr><td style="background-color: yellow;"></td><td style="background-color: orange;"></td><td style="background-color: red;"></td><td style="background-color: red;"></td><td style="background-color: red;"></td></tr> <tr><td style="background-color: yellow;"></td><td style="background-color: orange;"></td><td style="background-color: red;"></td><td style="background-color: red;"></td><td style="background-color: red;"></td></tr> <tr><td style="background-color: green; text-align: center;">X</td><td style="background-color: yellow;"></td><td style="background-color: orange;"></td><td style="background-color: red;"></td><td style="background-color: red;"></td></tr> <tr><td style="background-color: green;"></td><td style="background-color: green;"></td><td style="background-color: orange;"></td><td style="background-color: red;"></td><td style="background-color: red;"></td></tr> <tr><td style="background-color: green;"></td><td style="background-color: green;"></td><td style="background-color: green;"></td><td style="background-color: orange;"></td><td style="background-color: red;"></td></tr> </tbody> </table>	RISK - INTERNAL CORROSION					1	2	3	4	5											X														
RISK - INTERNAL CORROSION																																					
1	2		3	4	5																																
X																																					
A1. Reliable Over-Life Pigging - If "YES" Continue as Single Option	30 days																																				
A2. Consider Pigging if A1 = "FALSE"	30 days																																				
<b>OPTION B: APPLY BATCH-FILM WITH MECHANICAL PIGS - Stop Existing Corrosion from Growing</b>																																					
B1. BATCH INHIBITION INTERVAL:	"not applicable" days																																				
B1. BATCH INHIBITOR VOLUME:	"not applicable" litres																																				
B1. HYDROCARBON DILUENT VOLUME:	"not applicable" litres																																				

5X5 MATRIX: 1-3  
RISK CLASS: Low

<b>OPTION C: MODIFY CORROSIVE ENVIRONMENT - Prevent in-Situ Water from being Corrosive</b>		RISK COST: \$141,740
C1. CONTINUOUS INHIBITOR RATE:	5.44 litres / day	
C2. VAPOUR PHASE AMINE RATE:	"not applicable" litres / day	
C3. BATCH GLYCOL SLUG INTERVAL:	"not applicable" days	
C3. BATCH GLYCOL SLUG VOLUME:	"not applicable" litres	

**PIPELINE STATUS CHANGE**

Pipeline Lay-up Mothballing / Volatile Amine Inhibitor - litres	40	litres
Dead-Leg Mitigation Glycol Slug Volume - litres / slug	20	litres / slug
Dead-Leg Mitigation Glycol Slug Frequency - days	90	days

- Corrosion Mitigation Guide

Print Close



**Pipeline Information**

Information | More Info | **Elevation Profile** | Engineering Assessment | Attachments

Risk - Internal | **Risk - External** | Mitigation - Internal

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**EXTERNAL CORROSION (EC) LIKELIHOOD PROFILE**

**STEP 1 - DEFECT INITIATION**

1A. COATING SYSTEM DISBONDMENT	1B. INEFFECTIVE INSTALLATION PRACTICE	
Elevated Operating Temp (max 10): 3	Ineffective Backfill (max 50): 1	
On-Off Frequency (max 10): 1	Field-Applied Coating System (max 50): 1	
Exposure Time at Elevated Temp (max 5): 3	Construction Practices (max 100): 65	
<b>SUB-SCORE A (max 100): 12</b>	<b>SUB-SCORE B (max 100): 67</b>	

RISK - EXTERNAL CORROSION				
1	2	3	4	5
5	4	3	2	1
4	3	2	1	1
3	2	1	1	1
2	1	1	1	1
1	1	1	1	1

**STEP 2 - DEFECT GROWTH**

2A. CATHODIC PROTECTION EFFECTIVENESS	2B. CORROSIVE ENVIRONMENT	5X5 MATRIX: 1-1
C.P. Not Applied (max 100): 65	Conductive Soil (max 50): 1	<b>RISK CLASS: LOW</b>
Inadequate C.P. Maintenance (max 50): 1	Elevated Operating Temp (max 10): 3	<b>RISK COST: \$141,740</b>
Inadequate C.P. Design (max 50): 17.5	Exposure Time at Elevated Temp (max 40): 3	
Localized C.P. Shielding (max 50): 1		
Soil - Moisture Content (max 100): 1		
<b>SUB-SCORE C (max 100): 85.5</b>	<b>SUB-SCORE D (max 100): 7</b>	

**STEP 3 - SUB-TOTAL LIKELIHOOD SCORE "A"+"B"+"C"+"D" (max 400): 172**

**STEP 4 - APPLY HAZARD EXPOSURE INDICES - BIAS FACTORS (range 0.1 - 1.0)**

4A. Line Length (# of pipeline joints):	0.1
4B. Operating Life vs. Average Failure Time:	0.25
4C. Failure Patterns Similar Population:	0.5
<b>SUB-SCORE E (max 3.0)</b>	<b>MULTIPLIER BIAS 0.1</b>

**STEP 5 - TOTAL LIKELIHOOD SCORE (max 1000): FINAL SCORE - STEP 3 \* STEP 4 (max 1000): 17**

Print | Close



- Utilize External Corrosion Risk Assessment as foundation of quality Safety + Loss Management System (SLMS)
  - optimize CP system adjustive survey frequency
  - optimize over-the-line coating surveys / in-line inspection candidate selection



## Engineering Assessment – Reporting (X5)

CREATE REPORTS FROM MAP SELECTION

REPORT CREATOR – MAP SELECTION

5 NEW ENGINEERING ASSESSMENT REPORTS

- Pipeline Inventory Summary Report
- Engineering Assessment / Risk Assessment
  - Internal Corrosion
  - External Corrosion
- Mitigation Guidelines for Field, Operations
  - Internal Corrosion
- Data Validation Form



## GLOBAL REPORT CREATOR

- Construct a Custom Query / Company / Status / Substance / Material / Internal Coating

Filter By Company: Global

Reports: Select

**Select Report**

- Pipelines
- Wells
- Well Production
- AER Plats
- Board Order System
- Dispositions
- Facilities
- Land Status
- Spills & Complaints
- Water Wells
- Waypoints
- Waypoint Signs
- Monthly Packaged

**Company Filter**

OBSIDIAN Search

OBSIDIAN  
OBSIDIAN ENERGY LTD.  
OBSIDIAN ENERGY LTD.

Add Selected + Clear Selected -

**Within Boundary Filter**

-- Search Counties --

**Substance Filter**

- Air (AI)
- Butane (BU)
- Condensate (CN)
- Crude Oil (CO)
- Diesel Fuel (DF)
- Ethylene (ET)
- Fresh Water (FW)
- Fuel Gas (FG)
- Hydrocarbon Diluents (HD)
- LV Other (VO)
- LVP Products (LV)
- MG Carbon Dioxide (GC)
- MG Other (GO)
- Misc. Gases (MG)
- Misc. Liquids (ML)
- Natural Gas (NG)
- Pentanes (PE)
- Polymer (PO)
- Propane (PR)
- Salt Water (SW)
- Solvents (SO)
- Sour Natural Gas (SG)

Engineering Assessment Reports

- Pipeline License Data
- Internal Corrosion
- External Corrosion
- Mitigation Guidelines
- Data Validation

Import to Pipeline List Run Report

5 NEW  
ENGINEERING ASSESSMENT  
REPORTS

- Pipeline Inventory Summary Report
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5 NEW "SELECTION"  
REPORTS

### EXPORT REPORTS TO MSEXCEL INSTANTLY

1.

2.

ENGINEERING ASSESSMENT - Mitigation Guidelines - Internal Corrosion

Select a format  
 Select a format  
 XML file with report data  
 CSV (comma delimited)  
 PDF  
 MHTML (web archive)  
**Excel**  
 TIFF file  
 Word

Step 1. Select “EXCEL” from dropdown list; and,  
 Step 2. Activate the “Export” button ..

LICENSE LINE #	AREA	FIELD	TWP-RDE	LOCATION	LOCATION	SUBSTANCE	STATUS	DIAMETER (mm)	LEN (ft)
31-1	CA	PEMBINA	050-09W5	07-07-049-09W5	15-08-050-09W5	Natural Gas	Abandoned	114.3	0
31-2	CA	PEMBINA	050-09W5	15-08-050-09W5	02-08-050-09W5	Natural Gas	Abandoned	168.3	0
31-4	CA	PEMBINA	049-09W5	01-31-049-09W5	08-30-049-09W5	Natural Gas	Operating	168.3	0
31-5	CA	PEMBINA	049-09W5	16-19-049-09W5	13-05-049-09W5	Natural Gas	Operating	219	4
31-7	CA	PEMBINA	049-09W5	13-05-049-09W5	04-05-049-09W5	Natural Gas	Operating	219	0
31-8	CA	PEMBINA	050-09W5	02-06-050-09W5	02-06-050-09W5	Natural Gas	Operating	114.3	0
31-10	CA	PEMBINA	049-10W5	08-24-049-10W5	06-19-049-09W5	Natural Gas	Discontinued	114.3	0
31-12	CA	PEMBINA	049-10W5	06-13-049-10W5	06-13-049-09W5	Natural Gas	Abandoned	88.9	0
31-14	CA	PEMBINA	049-10W5	08-13-049-10W5	08-13-049-09W5	Natural Gas	Abandoned	88.9	0
31-15	CA	PEMBINA	049-09W5	09-03-049		Natural Gas	Operating	168.3	2
31-17	CA	PEMBINA	049-09W5	08-15-049		Natural Gas	Operating	168.3	1
31-24	CA	PEMBINA	049-09W5	09-03-049		Natural Gas	Operating	168.3	0
31-26	CA	PEMBINA	049-09W5	14-09-049-09W5	14-09-049-09W5	Natural Gas	Abandoned	88.9	0
31-28	CA	PEMBINA	049-09W5	13-16-049-09W5	07-16-049-09W5	Natural Gas	Operating	168.3	0
31-27	CA	PEMBINA	049-09W5	11-22-049-09W5	11-22-049-09W5	Natural Gas	Operating	168.3	0
31-28	CA	PEMBINA	049-09W5	14-07-049-09W5	11-22-049-09W5	Natural Gas	Operating	168.3	0
31-33	CA	PEMBINA	049-09W5	16-04-049-09W5	07-05-049-09W5	Natural Gas	Operating	168.3	1
31-35	CA	PEMBINA	049-09W5	07-05-049-09W5	04-05-049-09W5	Natural Gas	Operating	168.3	0
31-33	CA	PEMBINA	049-09W5	11-03-049-09W5	16-04-049-09W5	Natural Gas	Operating	114.3	1
31-33	CA	PEMBINA	049-09W5	14-04-049-09W5	11-04-049-09W5	Natural Gas	Operating	88.9	0
31-33	CA	PEMBINA	048-09W5	16-19-048-09W5	04-05-049-09W5	Natural Gas	Operating	219	3
31-33	CA	PEMBINA	048-09W5	08-31-048-09W5	08-31-048-09W5	Natural Gas	Operating	114.3	0
31-33	CA	PEMBINA	048-09W5	16-19-048-09W5	16-19-048-09W5	Natural Gas	Operating	114.3	0
31-33	CA	PEMBINA	048-09W5	12-31-048-09W5	04-05-049-09W5	Natural Gas	Operating	273.1	1
31-33	CA	PEMBINA	048-10W5	08-27-048-10W5	12-31-048-09W5	Natural Gas	Operating	219	5
31-33	CA	PEMBINA	048-10W5	02-35-048-10W5	12-31-048-09W5	Natural Gas	Operating	219	2
31-33	CA	PEMBINA	048-10W5	06-36-048-10W5	06-36-048-10W5	Natural Gas	Operating	114.3	0
31-33	CA	PEMBINA	048-10W5	11-26-048-10W5	14-26-048-10W5	Natural Gas	Operating	88.9	0
31-33	CA	PEMBINA	048-10W5	05-34-048-10W5	02-35-048-10W5	Natural Gas	Operating	168.3	2
31-33	CA	PEMBINA	048-10W5	08-33-048-10W5	05-34-048-10W5	Natural Gas	Operating	114.3	0
31-33	CA	PEMBINA	048-10W5	09-34-048-10W5	08-34-048-10W5	Natural Gas	Operating	88.9	0

Download / Save / MExcel Report

