Norman Wells Operations Flowline Integrity Management Plan (2022)

December 2021

Imperial Oil Resources NWT Limited
Bag 5000, 1001 Canol Drive,
Norman Wells, Northwest Territories
X0E 0V0, Canada

Switch Board: (867) 587-3100

Photo courtesy of Ron Powder

TABLE OF CONTENTS

REVISION HISTORY

This section lists the dates on which any version of the plan has been submitted to a board, as well as outlines the notable revisions compared to the previous version. This section provides a table showing where the plan addresses permit and license conditions, and if necessary, a separate section for how the plan has addressed directives from the Board if revisions were required.

Revision History

Date	Version	Revision	Details of Revision	Pages
September 2014	1	1	Flowline Integrity Management Plan for submission to SLWB	All
March 2015	1	2	Added freshwater injection system to 7.6	All
December 2015	1	3	Annual review and update	All
December 2016	1	4	Annual review and update	All
December 2017	1	5	Annual review and update. Updated remote field tool capability. Updated progress on 1980s OE lines	All 2.3 6
December 2018	1	6	Annual review and update.	All
December 2019	1	1	2.5.4 Surveillance Annual review and update.	14 All
December 2020	1	1	Annual review.	All
December 2021	1	1	Annual Review	All

GLOSSARY

Term	Description
Artificial Lift / Gas Lift	Method of injecting production gas in production wells for oil recovery assistance.
Biocide	Corrosion management chemical that is designed to control microbial activity.
Critical Equipment	A device, system or subsystem functioning to prevent a significant safety, security or environmental incident.
Corrosion Coupon	Small pieces of metal that are available in varying shapes, sizes and materials. They are composed of the same chemical composition as the equipment to be monitored. Corrosion coupons are exposed to a corrosive solution similar to that in process facilities for a specified period of time, and can give visual signs of the corrosion mechanism and rate.
Flowline	Any pipe or any system or arrangement of pipes by which oil, gas or any substance, including water, incidental to the drilling for or production of oil or gas is conveyed from one place to another (eg. well head to a processing facility).
Heat Trace	Heating metal tubing (either electric or glycol fed) that is designed to warm flowlines to prevent freezing conditions.
Hydrotest	A pressure test using water.
Inhibition	In corrosion management it refers to application of chemical to prevent corrosion.
Integrity	Refers to unimpaired or undamaged condition.
Maintenance Pigging	An activity to assist in removal of wax deposits in oil emulsion flowlines and to apply chemical inhibition programs.
Pig	Typically a flowline sized ball or scraper that is inserted into a flowline to remove wax buildup.
Terminal	A facility where various flowlines may enter and exit.
Weephole / Liner Vent	A small port which allows observation of the annulus between the liner and carrier pipe.

ACRONYMS

API	American Petroleum Institute
AC	Alternating Current
CER	Canada Energy Regulator
CP	Cathodic Protection
CPF	Central Processing Facility
CSA	Canadian Standards Association
DC	Direct Current
ERP	Emergency Response Plan
FIMS	Facility Integrity Management System
GIT	Goose Island Terminal
HDPE	High Density Polyethylene
ILI	Inline Inspection
Imperial	Imperial Oil Resources NWT Limited
LPI	Liquid Penetrant Inspection
MIC	Microbial Induced Corrosion
MFL	Magnetic Flux Leakage
MPI	Magnetic Particle Inspection
NEB	National Energy Board
NWO	Norman Wells Operations
OFC	Oil Field Chemical
OIMS	Operations Integrity Management System
OTLS	Over the Line Survey
PPE	Personal Protective Equipment
PM	Preventive Maintenance
RT	Radiographic Thickness
SCADA	Supervisory Control and Data Acquisition System
SLWB	Sahtu Land and Water Board
SSHE	Safety, Security, Health and Environment
UT	Ultrasonic Thickness

1 INTRODUCTION

Imperial Oil Resources N.W.T. Limited (Imperial) is an upstream oil and gas facility located approximately 700 km northwest of Yellowknife, Northwest Territories (NT). Operations include a central processing facility, which receives production from the mainland (along the north-eastern shore of the Mackenzie River), natural islands (Bear and Goose Island), and six artificial islands.

Imperial holds a Type A Water Licence S13L1-007 which was issued by the Sahtu Land and Water Board (SLWB) and is effective as of March 5, 2015. The license serves to regulate the use of water and the deposits of waste as it relates to Imperial's site. Imperial also holds a Canada Energy Regulator Operations Authorization 1210-001 which was issued December 31, 2014. This authorization serves to regulate the oil and gas activity on Imperial's federally regulated site.

The *Norman Wells Flowline Integrity Management Plan (FIMP)* was developed in accordance with Imperial's Environmental Standards and the Mackenzie Valley Land and Water Board's (MVLWB) guiding document titled, Sahtu Land and Water Boards Standard Outline for Management Plans.

The FIMP summarizes the control strategies and the corrosion control maintenance program details used for Imperial's flowlines and their related facilities. The plan includes corrosion monitoring strategies (type and frequency), corrosion control philosophies, maintenance plans, and risk management strategies for each system that ensure the integrity of Imperial's flowline to avoid safety and environmental impacts.

1.1 Company Information

Norman Wells Operations:
Imperial's Norman Wells site is located at Latitude 65^0 17' N., Longitude -126 ^{0} 51' W., in Norman Wells, NT. The facility is owned and operated by:

Imperial Oil Resources N.W.T. Limited:
Bag 5000, 1001 Canol Drive,
Norman Wells, Northwest Territories
X0E 0V0, Canada

1.2 Objective of the Flowline Integrity Management Plan

The purpose of this plan is to outline the flowline integrity management programs at Imperial. The flowline integrity program on site includes the following:

- Corrosion mitigation – minimize corrosion and associated failures by implementing and monitoring effective mitigation programs.
- Corrosion monitoring – monitor corrosion rates, fluid composition, chemical residuals and overall system corrosivity.
- Surveillance – periodic examination of pipeline and right of ways to ensure condition and containment.
- Inspections – detailed examination and documentation of corrosion and material degradation, including detailed engineering analysis.
- Stewardship – regular program assessments and optimization.

This plan is one of many management plans annually reviewed and updated as per SLWB and CER licenses. For a list of all plans please refer to Water Licence S13L1-007 posted on the SLWB's public registry.

1.3 Flowline Integrity Overview

Flowline integrity is developed and managed using a variety of tools and information, such as, flowline history, corrosion coupon data, flowline inspection data, fluid analysis results, regulatory compliance, and cost. The program is regularly evaluated as new data becomes available and as company risks are assessed to ensure the flowline integrity program meets internal and external requirements.

Changes to this plan are stewarded through Imperial's Operations Integrity Management System (OIMS) and Facility Integrity Management System (FIMS).

OIMS is a global management system that provides Imperial with tools necessary for identifying hazards, assessing consequences and probabilities, and evaluating and implementing prevention and mitigation measures.

FIMS is a subset of OIMS that utilizes a systematic, risk-based approach to identify critical equipment for developing equipment management strategies. Equipment management strategies typically include equipment condition monitoring, preventive maintenance and inspections and testing which are designed to minimize the impact of failure. For example, all of Imperial's cross-river flowlines are identified as critical equipment and therefore have management strategies in place.

Any adjustments made will be reflected annually in this *Flowline Integrity Management Plan.*

2 NORMAN WELLS FLOWLINE INTREGRITY PROGRAM

2.1 System Description

The Norman Wells flowline system includes the network of flowlines used to connect the mainland and cross-river operations to the Central Processing Facility (CPF). The products transported in the flowlines are as follows:

- Production flowlines – transport oil emulsion and produced gas from the production wells to the CPF
- Injection flowlines – transport freshwater, produced water, and propane from the CPF to injection wells on mainland and across river
- Natural gas flowlines – transport fuel gas and artificial lift gas from the CPF to gas lift wells on mainland and across river.

2.2 Production Flowlines

2.2.1 Oil Emulsion

Oil emulsion flowlines consist of flowlines that travel from the wellhead to flowline gathering systems commonly referred to in the field as “group flowlines”. Oil emulsion group flowlines carry the accumulated production from the mainland and cross-river operations to the CPF. These flowlines are installed both above and below ground and include the major flowlines trenched into the river bed beneath the Mackenzie River.

2.2.2 Produced Gas

The produced gas flowline gathering system consists of a 3.2 km long (2.5 km under river) 14” cross-river flowline. Production gas enters the 14” flowline from various locations before making its way to the CPF.

As a FIMS critical flowline, the 14” flowline is part of an in-line inspection (ILI) program and is inspected on a regular basis. The 14" flowline is regularly maintenance pigged to rid the line of excess water and condensate.

Additionally, a corrosion prevention chemical is continuously injected at GIT# 4 to provide added protection to the 14” produced gas flowline.

2.3 Injection Flowlines

2.3.1 Produced Water

The produced water system consists of a series of injection flowlines that distribute produced water from the CPF to injection wells located on the mainland, natural islands and artificial islands. The majority of the produced water flowlines are internally coated or lined with a high density polyethylene liner (plastic).

Lined or internally coated flowlines are difficult to inspect with traditional ILI tools. Imperial has completed some recent inspections of the produced water system through the use of remote field eddy current technology. These trials suggest that the technology is capable of identifying features including corrosion, deformations, weld anomalies, and mechanical stresses.

Liner vents on lined flowlines are checked quarterly to ensure continued liner integrity.

2.3.2 Freshwater

The freshwater system consists of a series of injection flowlines that distribute freshwater from the CPF facility (originally from the Mackenzie River, refer to the SNP Program as outlined in Water License S13L1-007) to injection wells located on the mainland and across river.

2.3.3 Propane Injection

Propane injection flowlines distribute propane from the CPF to the mainland and across river for injection to maintain reservoir pressure and increase oil recovery. Since the propane does not contain water, very low internal corrosion rates are anticipated.

2.3.4 Comingled Produced / Fresh Water

As a means of managing reservoir pressure effectively, produced/fresh water streams are comingled within the Mainland west injection system. In Q4 2021 a comingling trial on Bear Island was also initiated. The combination of both products occurs over on Goose Island, specifically GIT# 4 before the comingle product travels to Bear Island and gets distributed throughout the injection system. As part of this trial, bench testing was completed to understand compatibilities of injecting both products and enhanced water sampling is being conducted to test for corrosion & scaling tendencies throughout the trial with 3 sample locations on Bear and two sample location on GIT# 4.

2.4 Natural Gas Flowlines

2.4.1 Gas Lift and Fuel Gas

The gas lift and fuel gas system consists of flowlines from the CPF to gas lift wells located on mainland and across the river. The gas lift system is used for producing wells to assist in oil recovery by lifting fluids from wells to surface. The fuel gas system flowlines are different in that they supply gas for heating, instrumentation and controls throughout the mainland and across the river.

Once production gas reaches the CPF it is dehydrated and distributed to one of the abovementioned gas systems. Since the natural gas for the gas lift system is dehydrated below the dew point very low internal corrosion rates are anticipated. Previous in-line inspections have found no evidence of internal corrosion.

2.5 Flowline Integrity System Features

Imperial has a variety of flowline integrity system features that complement the integrity program to ensure safe operations of the flowline systems.

2.5.1 Pressure Relief

The production flowline systems were designed, constructed and hydro-tested to permit operation at up to 5100 kPa. Pressure relief is controlled through high pressure shutdown switches.

The injection flowline systems were designed, constructed and hydro-tested to permit operation at up to 8965 kPa. Pressure relief for the water and propane flowlines is controlled at the pumping facilities.

The natural gas flowline system was designed, constructed and hydro-tested to permit operation up to 5100 kPa. Pressure relief valves protect the fuel gas system.

2.5.2 Leak Detection

All cross- river group flowlines are monitored to detect leaks through a Supervisory Control and Data Acquisition (SCADA) system.

Pressure transmitters are installed on the group flowlines to monitor fluctuations in flowline pressure. If a pressure change outside of the normal operating parameters is detected, an advisory alarm is initiated and the CPF will investigate. If the cause of the imbalance cannot be determined action is taken to identify and detect a possible leak. The CPF has the ability to remotely isolate group flowlines

if necessary. Remote shutdown and isolation of a group flowline will automatically occur if a low pressure alarm below a set threshold is detected.

The injection flowline system utilizes material balances to detect for leaks.

In 2021 the leak detection system was upgraded to allow operations to interface with each leak detection segment alarm in more detail, allowing them to better understand any balance discrepancies that occur. Operations can now see these discrepancies in 10min & 1hr intervals, which could not be viewed before but also allows the operation to reset segment alarms instantly when an adjustment of water is made in the field, instead of waiting for the system to update itself, providing better accuracy on the case a leak was to develop.

2.5.3 Group Flowline Alarms

All cross-river flowlines are monitored by remote and master terminal units which:

- Monitor various alarm conditions and report their status to the CPF, and;
- Generate internal alarms based on pressure changes which are used as system warnings

The flowlines are equipped with transducers that are monitored by the remote terminal unit. The remote terminal unit sends warnings to the CPF and next steps are determined. Other alarms on the flowlines can be determined by visual checks at the site.

2.5.4 Surveillance

Surveillance is conducted using a combination of aerial, shoreline and ground surveillance techniques.

Beginning in Q3 2020, drones were used as the method of aerial surveillance. Besides routine aerial surveillance, drones will specifically be used for monitoring river seepage, pipes jacked up/down on their supports and hard to reach locations on the natural islands. Helicopters are used for aerial surveillance in Q1 and Q4 as they are already at site during this time for transportation to and from the islands during spring break-up and thaw.

For ground surveillance techniques operators complete visual site inspections of well sites, flowlines and associated facilities on a regular basis to monitor for potential leaks or abnormal situations.

3 CORROSION CONTROL MAINTENANCE PROGRAM

3.1 Corrosion Coupons

Corrosion coupons are used to evaluate the internal conditions (corrosion conditions) of various flowline systems to monitor the effectiveness of corrosion mitigation programs, and to evaluate the suitability of different metals for specific systems and environments.

Imperial uses weight loss corrosion coupons to monitor corrosion rates in select freshwater flowlines, produced water flowlines, oil emulsion flowlines and at the CPF. The location of these coupons is determined based on an assessment of the flowlines by a qualified engineer. The engineer would look at criteria such as the internal corrosivity of the fluids present in the flowline, physical ability of the flowline to accept a corrosion coupon, whether corrosion coupons exist elsewhere in the system that are representative, and the ability for operations personnel to change the coupon at an acceptable frequency.

Corrosion coupons are placed in flowlines and are pulled and replaced by trained operators. Coupons are packaged and then sent to a 3rd party consultant for cleaning, analysis, and corrosion rate calculations. The cleaned coupons and a summary report including the assessment of overall conditions and comments on observable pitting are reviewed by qualified Imperial engineers. These results allow the engineer and Imperial's consultants to verify the effectiveness of internal corrosion mitigation programs and recommend, if required, changes to the chemical and/or maintenance pigging programs.

3.2 Internal Coatings and Liners

Internal coatings and liners are utilized to protect flowlines from internal corrosion by providing a protective layer between the metal pipes internal surface and the corrosive fluids. Lined flowlines are less susceptible to internal corrosion as high density polyethylene liners do not corrode. Some produced water and freshwater injection flowlines utilize internal coatings and liners to prevent internal corrosion.

Imperial has an active surveillance program which includes quarterly liner vent checks and weephole monitoring to check internal liner integrity.

Internal coatings or liners are typically placed in systems with higher potential for internal corrosion such as the produced water injection flowlines. When repairing or replacing a flowline the potential internal corrosion conditions of the system are evaluated. For example, the replacement of produced water injection flowlines

on Goose Island in 2014 and on Bear Island in 2017 specified flowline replacement with an internal high density polyethylene liner as a means to prevent internal corrosion.

3.3 External Coatings

All buried flowlines are heat traced, insulated and covered with a protective external HDPE coating. The heat trace and insulation prevent freezing of the pipelines. The purpose of the coating is to prevent damage to the flowline during burial and prevent water entry to the external surface of the flowline. This is a method that reduces the risk of external corrosion.

3.4 Cathodic Protection

Cathodic protection (CP) is technique to control the corrosion of a metal surface. The purpose of the CP system is to enhance coatings and external corrosion protection for underground flowlines.

The Norman Wells CP system consists of the following installations:

- River system – to protect the cross river flowlines.
- Land system – to protect other flowlines and well casings on land.

Cathodic protection levels are checked and adjusted once a year during the annual adjustive surveys. Repairs and alterations to CP systems are conducted accordingly.

Monthly maintenance checks are conducted to ensure operational integrity of the CP system between the annual adjustment surveys.

3.5 Maintenance Pigging

Maintenance pigging is conducted to assist in removal of wax deposits in oil emulsion flowlines and to increase the effectiveness of batch applications of corrosion inhibitors. Not all flowlines have maintenance pigging capabilities.

Pigging involves inserting a full flowline-size ball or scraper pig into the flowline at the wellhead or facility. As the pig obstructs flow in the line, backpressure behind the pig increases, and the pigging device is pushed down the flowline. The extremely tight tolerance between the outside diameter of the pig and the inside diameter of the pipe provides the means for which debris is removed from the flowline wall. A larger pig must be inserted at each location where the line size

increases in diameter. The pigs are launched into the line by pig senders and retrieved by pig receivers.

Flowlines are maintenance pigged based on a review of the likelihood of solids buildup, the internal corrosivity of the fluid, and the flowline configuration.

3.6 Chemical Programs

A chemical program refers to the injection or addition of chemical into a flowline for the purpose of corrosion prevention.

The addition of the chemical can be batch applied or continuously injected and it assists or helps to form a protective film in the flowline. This results in the potential inhibition or prevention of corrosion that is caused by naturally occurring bacteria and production fluids. Imperial utilizes corrosion prevention chemicals to mitigate internal corrosion on most internally bare carbon steel flowline systems that are subject to corrosive fluids, specifically oil effluent flowlines, three phase group lines, wet gas streams and the freshwater injection system.

In addition, biocide chemical is injected into the injection flowline system in conjunction with pigging to kill bacteria and inhibit Microbial Induced Corrosion (MIC).

4 FLOWLINE INSPECTION METHODS

There are a number of inspection methods and technologies currently used to assess the overall extent and severity of flowline corrosion. The main methods used in Norman Wells are:

- external coating integrity surveys/close interval surveys (OTLS),
- in-line inspections, and
- integrity digs

4.1 Over the Line Surveys (OTLS)

An over the line survey (OTLS) is an inspection which assesses the external coating integrity of a flowline. Depth of cover and over the line surveys (OTLS) have been conducted in the past on several lines in Norman Wells. These surveys indicate external coating features on a flowline. External coating features may result in varying degrees of external corrosion of the flowline.

This technique applies electrical current (AC or DC) to the steel pipe and measures the current leakage through damaged coating and insulation on the flowline. This type of survey is used as an indirect method of identifying potential problem areas that may exist under the coating or insulation. The technique is used as a screening tool to help prioritize and select lines or areas for further inspection and feature characterization.

These inspections are conducted on critical gas lift or fuel gas flowlines on a five year frequency. The inspection interval may be adjusted after reviewing inspection results.

4.2 In-Line Inspection (ILI)

An in-line inspection is completed using a tool which travels through a flowline gathering data on the flowline condition. It digitally measures depth, width, length and the location of corrosion features in a flowline. This inspection data is then reviewed by a qualified engineer who assesses if the flowline is fit for service. Magnetic Flux Leakage (MFL), Ultrasonic Thickness (UT), Caliper, and Remote Eddy Current ILI tools are typically used to inspect the Norman Wells flowlines.

Imperial has conducted ILIs on several flowlines and often, flowline integrity digs are conducted to calibrate the inspection data and assess the overall condition of the flowline.

Flowline in-line inspections are stewarded through Imperial's FIMS program. FIMS specifies that baseline ILIs shall be conducted within two years of startup on a flowline. FIMS also specifies that ILIs initially need to be conducted on a five year frequency and that the frequency be adjusted based on inspection results.

Imperial may at times conduct ILIs on flowlines which have not been deemed critical based on new information and technologies. In 2012 and 2013 Imperial conducted 20 ultrasonic thickness in-line inspections on 3" oil emulsion flowlines because it was identified that a subset of these flowlines were susceptible to external corrosion. A new technology became available which allowed ILI of these 3" oil emulsion flowlines to be completed. These flowlines were not previously capable of inspection with an ILI tool as the bends in the flowlines did not allow navigation of inspection tools.

Imperial continuously evaluates new technology and information to determine which flowlines require ILI. This process is stewarded through OIMS and FIMS (Section 1.3).

4.3 Flowline Integrity Digs

A flowline integrity dig is the excavation or direct inspection of a flowline. This type of inspection is directed to localized areas of interest on the flowline. Depending on the number of excavations completed and the type of data gathered, a statistical analysis may be used to estimate the condition of the remainder of the flowline or other flowlines in similar service conditions.

Flowline integrity digs are typically conducted following an inline inspection (ILI) to review an area of interest on a flowline. For flowlines which are not capable of inspection due to configuration, flowline integrity digs may be specified as an alternate means to assess flowline condition.

Other types of field data which may be obtained by integrity digs include:

- External coating/insulation condition
- Characterization of corrosion rates
- Metal loss corrosion feature mapping
- Non-Destructive Examinations (NDE)
- Corrosion product classification

4.4 Magnetic Particle Inspection

Magnetic particle inspection (MPI) is used to locate surface defects, primarily cracking, associated with welds in magnetic materials such as carbon steel. The

technique is commonly used for stress corrosion cracking inspections. MPI is conducted during flowline integrity digs where external corrosion is observed.

4.5 Liquid Penetrant Inspection

Liquid penetrant inspection (LPI) is used to locate surface defects, primarily cracks, in the flowline wall. Liquid penetrant inspection is conducted during flowline integrity digs where external corrosion is observed. This technique may be substituted for MPI.

4.6 Radiographic Thickness Testing

Radiographic thickness testing (RT) is used to detect anomalies in welds and for metal loss caused by corrosion and erosion. This technique is primarily used to confirm weld quality for all activities involving flowline repair and new construction.

4.7 Ultrasonic Thickness Testing

Ultrasonic thickness testing (UT) is used to determine the wall thickness of piping, flowlines, tanks, and vessels, and to investigate internal defects in welds and materials. This is the primary technique used to determine pipeline wall thickness during flowline integrity digs.

5 DEFECT ASSESSMENT

If defects are identified using any of the inspection methods listed in Section 4 above, defect assessments are completed based on calculations and methodologies from CSA Z662-19 *Oil and Gas Pipeline Systems* which allows for certain configurations of defect depth and length. The severity of each defect that exceeds the code allowance is assessed through remaining strength analysis. Further engineering assessments using fracture mechanics may be used on critical size defects. This is considered along with the flowline's assessed risk to determine its fitness for service.

Flowline segments deemed fit for service will not require further evaluation until the next inspection interval but may require repairs to reduce further corrosion prior to the next inspection.

Flowline segments deemed not fit for service will be shut-in and evaluated for further mitigative action.

6 MITIGATION PROGRAMS

Flowline segments that require increased risk management may be subject to one or more of the following mitigative actions:

- Increased surveillance
- Re-coating
- Sleeve repairs (i.e. clockspring)
- Cut-out repairs
- Cathodic protection system modifications
- Isolation
- Flowline replacement
- Flowline suspension or abandonment
- Further investigations/excavations, and
- Periodic pressure tests

An example of Imperial applying mitigative actions is the enhanced integrity program applied to 1980's and 1990's vintage oil emulsion flowlines and 1980's produced water injection flowlines. Imperial identified these flowlines to be susceptible to external corrosion and took additional measures to reduce the risk of a loss of containment.

In 2012, due to advancement in available technology and with approval from the National Energy Board (NEB), Imperial implemented an improved flowline integrity program for the 1980's vintage small diameter flowlines mentioned above. Previously, in-line inspection tools were unable to navigate the small radius bends in the small diameter oil emulsion flowlines. Imperial began utilizing an ultrasonic thickness inspection tool capable of navigating small diameter oil emulsion flowlines and has conducted twenty in-line inspections since 2012 to assess the integrity of these flowlines. If a flowline was determined to be not fit for service it was shut in. When a flowline was shut in the flowline was pigged clean to remove residual production fluids remaining in the line, and a metal blind was placed on each end of the flowline restricting any fluid to flow in or out of the flowline. As of year-end 2017, Imperial considers the risks associated with these lines to be mitigated.

7 REGULATORY OVERVIEW

The Canada Energy Regulator (CER) regulates the Norman Wells facility and its flowlines under the Canada Oil and Gas Operations Act and through Imperial's CER Operations Authorization.

Imperial utilizes the Canadian Standards Association (CSA) Z662 – 19 *Oil and Gas Pipeline Systems* as a guidance document to provide the essential requirements and minimum standards for the design, construction, operation and maintenance of oil and gas industry flowline systems. Imperial maintains all of its flowlines to applicable regulatory standards and codes.

8 CONTINGENCIES

Flowlines which pass through environmentally sensitive areas are deemed "critical". All of Imperial's cross-river flowlines have been deemed critical. As such, planned maintenance on these flowlines is tracked for schedule adherence and completion quarterly. Deviations require a risk assessment, mitigation plan, and management approval.