Investigation Summary Report 2013-004: Apache Canada Ltd.

Licence No. P36753-33

October 2015

Investigation number:	2013-004
Responsible parties:	Apache Canada Ltd., BA code 0JL8
Field centre of origin:	High Level
Incident location (nearest town):	15-09-116-06W6, about 18 km SW of Zama City
Contravention date:	June 1, 2013 (reported)
Authorization numbers and relevant legislation, regulations, and rules:	Licence No. P36753-33, *EPEA*, *PLA*, *Pipeline Rules*, CSA Z662-11

Alberta Energy Regulator
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Executive Summary

This investigation relates to a pipeline failure that was reported by Apache Canada Ltd. (Apache) on June 1, 2013, that resulted in a release to the environment of 15 363 cubic metres of produced water and impacted 42 hectares of Crown land. The release volume and area impacted was the result of inadequate leak detection, allowing the release to continue undetected for 27 days.

This incident occurred before the Alberta Energy Regulator (AER) was established; therefore, investigators from both the AER and Environment and Sustainable Resource Development (ESRD, now Alberta Environment and Parks) conducted investigations. The ESRD investigation file was transferred to the AER in July 2014.

The following investigation findings are based upon information from both the AER and ESRD. This investigation report is a summary of the relevant information and findings and does not encompass the entirety of the information gathered during the investigation. The investigation summary report is used to determine the appropriate enforcement response, if any, that will be taken by the AER.

Summary of Facts

Company Overview

Apache Corporation is an oil and gas exploration and production company with operations in the United States, Canada, Egypt, the United Kingdom, and Australia. Apache Canada Ltd. (Apache) is a Calgary-based, wholly owned subsidiary of Apache Corporation, with exploration and development activity in Canada concentrated in the provinces of Alberta, British Columbia, and Saskatchewan.

Incident Overview

On June 1, 2013, at 13:40 Mountain Daylight Time (MDT), an Apache contractor performing a site inspection prior to well servicing notified Apache of a release and H_2S odour approximately 160 metres (m) from the well site along the pipeline right-of-way. The well is located at Legal Subdivision 15, Section 9, Township 116, Range 6, West of the 6th Meridian (15-09) approximately 18 kilometres (km) SW of Zama City, Alberta.

Apache activated their corporate emergency response plan (ERP) and the ERP for the Zama area operations (both ERPs were activated by 14:00). The pipeline was also shut in at a riser located approximately 1.4 km to the southeast of the release location and at the associated water injection well at the 15-09 location. The pipeline was isolated by 14:33.

At 15:02, Apache notified the AER's High Level Field Centre of a pipeline release. The spill location covered an area of about 42 hectares on public land. The closest water bodies in the area are the Zama River (1.3 km south) and a number of small unnamed creeks that are tributaries of the Zama River. There are no ecological reserves, wildlife management areas, parks, First Nation lands, Métis settlements, or residences in the immediate area.

By June 5, 2013, Environment and Sustainable Resource Development (ESRD) and Environment Canada were notified of the incident through the Government of Alberta Communication Information Centre. On June 5, 2013, Apache notified the local oil and gas representative of the Dene Tha First Nation of the incident. There was a registered trap line in proximity to the release. The Dene Tha oil and gas representative toured the site on June 6, 2013.

Apache originally reported a spill volume of 30 cubic metres (m^3) produced water; however, on June 12, 2013, after further study, they revised the spill volume to 9480 m^3. On October 18, 2013, after reviewing data from their water injection monitoring system, Apache again revised the spill volume to 15 363 m^3 and estimated that the pipeline failure actually occurred at approximately 14:33 on May 5, 2013.

On October 16, 2013, Apache issued a report on their investigation into the pipeline failure, which stated the following:

- The release started May 5, 2013 and was not discovered until 27 days later on June 1, 2013, by visual observations of the produced water release and detection of an H_2S odour.
- After reviewing the pressure profile from the injection pumps at 14-12, Apache was able to verify that the initial pipeline break occurred about 14:33 on May 5, 2013. This was evident by the change in pump pressure profile recorded by the monitoring system.

Investigation Findings

Failure Analysis

The failed pipeline segment was excavated on June 25, 2013, and two three-metre segments were sent to Skystone Engineering (Skystone) in Calgary for analysis. An AER subject matter expert concluded that several factors contributed to the pipeline rupture:

- There was a breach in the polyethylene exterior jacket of the pipeline allowing water to enter, resulting in stress corrosion cracking in the steel strips.
- The cause of the breach in the polyethylene jacket cannot be conclusively determined but may have been due to a manufacturing defect, internal gas pressure building up at the steel strip layer, or mechanical damage to the jacket during construction or from electric discharge.
- Reduction of steel strip thickness and hydrogen damage to the strips eventually resulted in overload and sequential failure of some of the steel strips.
- Once the strength of the steel strips was insufficient to support the load from internal pressure, the remaining steel strips failed and the pipeline ruptured. The inner polyethylene liner was forced outward through the gaps in the steel strips, tore open, and containment was lost.

Pipeline Pressure Loss

The Apache investigation report indicated that, unaware of the pipeline break, operators observed a pressure loss and attempted to regain normal operating pressure by activating a second pump. The system did not increase to normal operating pressure when the second pump was activated, indicating a change in the system behavior.

A reasonable response to the inability to regain normal operating pressure would have been to initiate further investigation by notifying the production foreman of the anomaly, as per section 14 of Apache's Pipeline Integrity Management System (PIMS) manual:

> The Production Foreman is responsible to ensure that: Any abnormal operation which may affect the integrity of a pipeline is relayed to the Facility Engineering Manager.

By failing to follow the procedure, the facility engineering manager was not advised of the anomaly, and no additional follow-up was conducted until the release came to surface and an H_2S odour was discovered by an Apache contractor on June 1.

It was not until May 18 that operators started shutting in various wells in an attempt to raise the system pressure. These efforts also did not restore operating pressure, and again there was no further investigation. Even though the system did not regain operating pressure, Apache continued to operate the pipeline water injection network.

Daily Meter Log Discrepancy

The Apache investigation report also indicated that reduced volume throughput at each of the injection wells was apparent when reviewing the daily meter logs. Despite the discrepancy in the meter logs, no further investigation was conducted by operators. Any prudent and reasonable operator would be aware that one cause of a meter log discrepancy could be a potential pipeline failure

Pipeline pressure loss, in conjunction with the daily meter log discrepancy, ought to have been cause for the operators to notify the production foreman.

The Apache investigation report, section 6.2, "Other Findings and Recommendations arising from the Investigation," item 4, states the following:

> The operations personnel did not fully investigate the possibility of a leak arising from the pressure anomalies.

This was confirmed in section 4.4, "Discovery of the Release," page 11, paragraph 5, of the Apache investigation report:

> The operators noted they had not received formal training from Apache on requirements for, and methods to detect and evaluate possible leaks in the system for which they are responsible.

On February 20, 2015, AER investigators conducted interviews with the staff who authored Apache's investigation report. These interviews verified the statements made in the report.

On February 20, 2015, AER investigators interviewed the production foreman. The following information was obtained during the interview:

- The production foreman's primary responsibilities are to oversee production operations and maintenance of equipment.
- The pressure anomalies were never brought to his attention.
- If he had been made aware of the pressure anomalies, he would have taken steps to investigate the cause.
- Surveillance of right-of-way is done annually for leak detection, but if he had been made aware of the anomalies, he has the authority to direct additional flights.
- Operators do not have access to any type of equipment to check on pipelines during the winter and have only quads for summer.

Contraventions

The investigation has uncovered contraventions of legislation under the jurisdiction of the AER, some of which are also offences that can be prosecuted by the Crown. The following establishes the contraventions that are also offences:

- Section 227(j) of the *Environmental Protection and Enhancement Act* (*EPEA*)
- Section 56(1) of the *Public Lands Act* (*PLA*)
- Section 52 of the *Pipeline Act*

Contravention 1: Duty to Report a Release (*EPEA*, section 110(1))

> A person who releases or causes or permits the release of a substance into the environment that may cause, is causing or has caused an adverse effect shall, as soon as that person knows or ought to know of the release, report it to (a) the Director…

In this incident, Apache ought to have known of the pipeline break. If the pipeline pressure anomaly and meter log discrepancies would have been acted upon, it is likely that Apache would have discovered the pipeline break sooner and reported it as required by section 110(1) of the act.

Contravention 2: Duty to Take Remedial Measures (*EPEA*, section 112(1))

> Where a substance that may cause, is causing or has caused an adverse effect is released into the environment, the person responsible for the substance shall, as soon as that person becomes aware of or ought to have become aware of the release (a) take all reasonable measures to (i) repair, remedy and confine the effects of the substance, and (ii) remediate, manage, remove or otherwise

> dispose of the substance in such a manner as to prevent an adverse effect or further adverse effect…

Apache ought to have been aware of the release and therefore should have taken reasonable measures to take remedial actions to confine the effects of the substance and prevent further adverse effect. No steps were taken until June 1, 2013.

Contravention 3: Loss or Damage to Public Land (*PLA*, section 54(1)(a.1))

> No person shall cause, permit or suffer (a.1) loss or damage to public land…

The release impacted 42 hectares of public land, and no remedial actions were taken until June 1, 2013, when the release came to surface.

Contravention 4: Leak Detection Capability (CSA Z662-11, section 4.20.2)

Section 9(1)(2) of the *Pipelines Rules* incorporates CSA Z662 standards as statutory requirements.

> Where a leak from an oilfield water pipeline system can be harmful to the environment, a leak detection system shall be incorporated in the design of the pipeline system. Leak detection devices and procedures shall be capable of providing early detection of leaks. Material balance methods may be used.

Before May 5, 2013, Apache had no leak detection program in place for their operators to use nor did the operators receive any formal training in detecting leaks in the pipeline.

Contravention 5: Leak Detection for Oilfield Water Pipeline Systems (CSA Z662-11, section 10.3.5.1)

Section 9(1)(2) of the *Pipelines Rules* incorporates CSA Z662 standards as statutory requirements.

> Where a leak from an oilfield water pipeline system can be harmful to the environment, operating companies shall perform regular surveys or analyses for evidence of leaks. Such leak-detection surveys or analyses may consist of right-of-way surveys, aerial surveys, vegetation surveys, volume monitoring analyses, bar-hole surveys, surface detection surveys, service tests, hydrostatic pressure tests, mathematical modelling analyses, or any other method that the operating company has determined to be effective.

There was no program of increased aerial surveys, vegetation surveys, or volume monitoring put in place after the drop in pressure recorded by the operators on May 5, 2013, and the subsequent inability of the operators to return the pipeline to the normal range of operating pressures.

Due Diligence

EPEA (section 229), *PLA* (section 59(3)), and the *Pipeline Act* (section 54(2)) each provide a defence to certain offences—namely, if an operator takes all reasonable steps to prevent the commission of an

offence, they will not be convicted. This is what we call “due diligence.” Having established the contraventions above, it is necessary to determine whether the facts establish a defence to the contraventions.

After a review of all information available, there is no evidence to support due diligence by Apache in regards to leak detection with respect to any of the five contraventions established above. The need for adequate procedures, training, communication, and supervision of employees is an expectation that the AER has for all of industry. Procedure enhancement and training must be ongoing to ensure that they are still relevant and current. It is imperative that chain of command and communication procedures are in place and followed at all times, especially during abnormal operating conditions when coordination and discipline are needed the most. Staff training must go beyond that of reading and following procedures. It must also include verifying competencies in the field.

Compliance History

A report compiled by AER High Level staff from January 25, 2010, to October 26, 2014, shows that Apache has had 29 pipeline failures registered in FIS, specifically identified as 3 pipeline hits and 26 leaks.

An FIS report also shows that between January 23, 2009, and November 6, 2013, Apache was issued 12 High Risk Enforcement Actions and 7 Notices of High Risk Noncompliance.

Apache has not been subject to any enforcement actions issued under the authority of *EPEA* or *PLA* for the types of contraventions identified above. Apache was issued an administrative penalty for failing to follow the conditions of an approval issued under *EPEA* on June 27, 2011. Under *PLA*, Apache was issued administrative penalties on November 25, 2010, for unauthorized use of public land and on May 14, 2013, for contravening terms and conditions of a disposition.

Conclusion and Recommended Counts

The investigation into the pipeline failure reported on June 1, 2013, has identified contributing factors leading to the pipeline failure and five potential contraventions of *EPEA*, the *PLA*, and CSA Z662. The investigation also found that Apache did not take all reasonable measures to prevent the continued release (over the course of 27 days) of produced water from the pipeline.

If the director decides that an enforcement response is appropriate, the following counts are recommended.

Count 1

On or about May 5, 2013, in the Province of Alberta, Apache Canada Ltd. permitted the release of 15 363 m^3 of produced water with a concentration of 79 000 milligrams/litre of chlorides into the environment that did cause an adverse effect and failed to report that release to the director until June 1, 2013, contrary to section 110(1), which is an offence under 227(j) of the *Environmental Protection and Enhancement Act*.

Count 2

On or about May 5, 2013, in the Province of Alberta, Apache Canada Ltd. released 15 363 m^3 of produced water with a concentration of 79 000 milligrams/litre of chlorides into the environment that did cause an adverse effect. Apache failed to take all reasonable measures to repair, remedy and confine the effects of the produced water until June 1, 2013, contrary to section 112(1), which is an offence under 227(j) of the *Environmental Protection and Enhancement Act*.

Count 3

On or about May 5, 2013, in the Province of Alberta, Apache Canada Ltd. released 15 363 m^3 of produced water with a concentration of 79 000 milligrams/litre of chlorides onto public land that caused damage to an area of approximately 42 hectares, contrary to section 54(1)(a.1), which is an offence under 56(1)(g) of the *Public Lands Act*.