



**Midway Energy Ltd.
Hydraulic Fracturing Incident:
Interwellbore Communication
January 13, 2012**

**ERCB Investigation Report
Red Deer Field Centre**

December 12, 2012

ENERGY RESOURCES CONSERVATION BOARD

ERCB Investigation Report, Red Deer Field Centre: Midway Energy Ltd. Hydraulic Fracturing Incident:
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1 Incident Overview

On January 13, 2012, hydraulic fracturing operations conducted by Midway Energy Ltd. (Midway)¹ at surface location Legal Subdivision (LSD) 3, Section 16, Township 35, Range 3, West of the 5th Meridian (Midway well) affected a nearby producing oil well operated by Wild Stream Exploration Inc. (Wild Stream)² at surface location LSD 06-09-035-03W5M (Wild Stream well). This resulted in a release of hydraulic fracturing and formation fluids (crude oil, produced water, and natural gas) at the surface of the Wild Stream well.

2 Initial Notification

On January 13, 2012, at approximately 4:30 p.m., a member of the public noticed fluids being discharged from the Wild Stream wellhead. This person immediately proceeded to the Midway site at LSD 03-09-035-03W5M to inform them of the event and contacted the Wild Stream emergency contact centre at 4:46 p.m. A Wild Stream operator was en route and, after completing an initial inspection and attempting to isolate the wellhead, the operator called the Wild Stream production manager at 5:10 p.m. to confirm an uncontrolled release of fluid.

The Energy Resources Conservation Board (ERCB) received three telephone calls: one from a member of the public at 5:27 p.m., one from Wild Stream at 5:40 p.m., and one from Midway at 6:30 p.m. regarding an oil spill at a well site licensed to and operated by Wild Stream. An ERCB inspector arrived to the site at 7:32 p.m.

Alberta Health Services, Alberta Environment and Water (now Alberta Environment and Sustainable Resource Development [ESRD]), Alberta Emergency Management Agency, and Red Deer County were notified by the ERCB Emergency Response Group, the licensees, or by both the licensee and ERCB.

Media reported that a member of the public was unable to access the ERCB's 24-hour emergency number. It was noted that the ERCB Red Deer Field Centre received a call from a member of the public at 5:27 p.m. Further, to verify that the ERCB emergency number was operational, daily logs were reviewed for the date of Friday January 13, 2012. Three unrelated calls were received that day at 12:22 p.m., 5:20 p.m., and 10:29 p.m., which indicated that the ERCB's 24-hour emergency number was operating normally. Therefore, the ERCB has concluded that any issues associated with accessing the emergency operator were unrelated to the ERCB's communication operating systems.

3 Cause of the Well Control Incident

The Wild Stream well is a vertical wellbore with a surface and bottomhole location at LSD 06-09-035-03W5M. The Midway well is a horizontal wellbore drilled to a bottomhole location of LSD 03-09-035-03W5M. The two wells were targeting the same geological formation, and communication between the two wells occurred within this formation at a depth of approximately 1850 metres (m) below the surface.

¹ As a result of a plan of arrangement between Whitecap Resources Inc. (Whitecap) and Midway completed on April 20, 2012, Whitecap is the current licensee of the Midway Well.

² As a result of a plan of arrangement between Crescent Point Energy Corp. (Crescent Point) and Wild Stream on March 15, 2012, Crescent Point is the current licensee of the Wild Stream Well.

The root cause of this incident was the fact that the planned fracture stimulation size was too large for the separation distance between the two wells. At the closest point, the two wellbores are 129 m apart, but the fracture half length was modelled at 90 m. Given the company's protocol of spacing at 1.5 times the half length, a minimum distance of 135 m should have been maintained.

4 Release Cleanup

The majority of the cleanup operations were complete within 72 hours. Frozen ground conditions prevented much of the fluid from seeping into the ground. A fine misting of the released fluids sprayed east of the well site due to the added pressure of the hydraulic fracturing operation. A grove of approximately 75–100 trees had traces of mist on them; however, after examination by Peregrine Environmental Services—an environmental company contracted by Wild Stream—it was determined that there would be no adverse effects, but they suggested continued monitoring. Ongoing monitoring and reclamation is under the jurisdiction of ESRD.

The total area potentially affected was estimated to be 225 metres by 200 metres. Vacuum trucks were on site on the evening of January 13, 2012, collecting fluids that flowed down a hillside and pooled in a natural depression off lease. The initial volume of fluid released was reported to be 75 cubic metres. Approximately 68 cubic metres of hydraulic fracturing and formation fluids were recovered from the spill site and sent to the Newalta Stauffer Waste Management Facility. Any free product and affected soil and snow was placed in a temporary recovery area with an approved liner located on lease. The cleanup crew collected 1010 tonnes of snow/soil mix, which was disposed of at the CCS-Rocky Mountain House Waste Management Facility.

To ensure that the surrounding groundwater sources had not been compromised, the integrity of the Wild Stream wellbore was tested by Westrock Energy Consultants and Galleon Well Servicing on behalf of Wild Stream for hydraulic isolation. Casing integrity and cement bond logs were run by Baker Hughes, and definitive results showed that there was no casing or cement compromise. ERCB staff reviewed test results and are satisfied with the conclusions of the consultants.

Further, on behalf of Midway, Peregrine Environmental Services met with Alberta Health Services representatives to collect samples from eight water wells within 1300 m of the spill site, which were analyzed for hydrocarbons (F1–F4 and BTEX), nitrates, and nitrites. The samples were tested for hydrocarbons because the hydraulic fracturing fluid was diesel-based, and nitrate and nitrite tests were requested by Alberta Health Services. The results indicated no elevated levels, and the data was shared with the landowners.

Water and soil testing, as well as other remediation operations, are ongoing and under the jurisdiction of ESRD, whose own investigation has not yet been completed at the time of this report.

5 Significant Findings

5.1 ERCB Investigation

The ERCB conducted two investigations into this incident (one for each licensee involved). These included four site inspections by Red Deer Field Centre inspectors with assistance from the ERCB Field Surveillance and Operations Branch, Well Operation Section, the Field

Operations Provincial Drilling Technical Specialist, and staff from the ERCB Emergency Management Group.

Ongoing communication continued with both licensees until the investigations were completed. Inspections of the Wild Stream well confirmed that the damaged well site components had been repaired, and casing integrity and cement integrity logging confirmed that wellbore integrity met ERCB regulatory requirements.

It is noted that the segments of the Midway wellbore where fracture stages 2, 3, 4, and 5 were conducted are the closest in proximity to the Wild Stream bottomhole location. The ERCB determined through its investigation that fracture treatments on stages 3, 4, and 5 took place between approximately 12:08 p.m. and 1:17 p.m., and one of these stages was most likely to have communicated with the Wild Stream well. The first signs of communication did not occur until approximately 3:00 p.m. at the connected Wild Stream production battery. The actual surface failure of the hose and piping on the Wild Stream well did not occur until later and was discovered at approximately 4:30 p.m.

Significant decreases in hydraulic fracturing pumping pressure can be an early indication of interwellbore communication. During stimulation of stages 3, 4, and 5, there was not a significant decrease in pressure during the fracturing operation. This is likely due to the fact that the actual breakthrough which resulted in the communication event did not occur until approximately 1 hour and 45 minutes later.

The communication from the Midway fracturing treatment caused an increase in pressure and flow rates in the Wild Stream well. At the closest downhole point, the wellbores were approximately 129 m apart. For this situation, the downhole separation was not sufficient to prevent pressure communication between the two wells during the Midway hydraulic fracturing operations.

The surface piping, discharge hoses, fuel gas lines, and the pressure relief valve associated with compression at the Wild Stream well were not pressure rated to withstand pressures required for hydraulic fracturing. The increased pressure and flow rates caused components of the Wild Stream surface equipment to fail, releasing hydraulic fracturing and formation fluids at the surface. Hydraulic fracturing and formation fluids were only released to the surface at the Wild Stream well.

The ERCB inspection of the wellhead revealed that the main source of the release was a one-inch fuel supply line feeding back to the pumpjack engine and walking beam compressor coming from the casing side of the wellhead.

Although there was damage to valves and piping, the Wild Stream wellhead components maintained integrity and were used to shut in and stop the release at 9:01 p.m. on January 13, 2012.

The ERCB has concluded that both companies appropriately responded to and managed the incident, took all necessary steps to minimize potential environmental damage, and disposed of the resulting oilfield waste product in compliance with regulatory standards. The incident did not impact any member of the public, wildlife, livestock, groundwater, or surface water bodies. Misting on the grove of trees, potential damage to other vegetation, soil, surface, and groundwater continues to be monitored under the jurisdiction of ESRD.

Through inspections and subsequent analysis, the ERCB has concluded that both Midway and Wild Stream were compliant with the ERCB's regulatory requirements with respect to their responses to the incident.

However, for reasons noted below, the ERCB has concluded that Midway did not conduct the fracturing operation in compliance with its own internal procedures. Further details of this finding and the reasons for it are outlined in sections 6 and 9 below.

Midway submitted investigation reports to the ERCB on February 21 and March 22, 2012. Midway reported that it did not complete a specific fracture model for the subject well. Rather, Midway indicated that it used a general model for the Garrington Field. The model provided to the ERCB was completed for another well in the Garrington Field that indicated a fracture half length of 94 m. Midway reported that its protocol was to space fractures from adjacent wells at 1.5 times the modelled half length of the fracture. For the subject well, Midway used an estimated 80–90 m fracture half length. When using its protocol of spacing at 1.5 the distance of the half length, Midway determined 135 m spacing was required between the fracturing points and the adjacent well. The two wellbores at the closest point are approximately 129 m apart. Hence, it is apparent from the information provided by Midway that it did not allow sufficient spacing between its fractures and the closest distance of the nearest adjacent well. This was contrary to Midway's own internal protocols that outlined minimum spacing of its fracturing operations. The ERCB notes there were no regulatory requirements for spacing of fracturing operations in effect at the time of the incident.

5.2 Information submitted by Wild Stream

Wild Stream submitted an investigation report to the ERCB on February 21, 2012. The Wild Stream LSD 06-09-035-03W5M well is connected by a pipeline to the Wild Stream production battery located at LSD 06-35-034-03W5M. Wild Stream reported that although the release at their well was not identified until approximately 4:45 p.m. on January 13, there were events at the connected battery at approximately 3:00 p.m. earlier that day that suggest there was communication between the Midway and Wild Stream wells earlier in the day prior to the surface release.

Wild Stream noticed that the inlet gas measurement at the battery recorded a sudden increase in gas production at the battery at 3:00 p.m. The compressor went down and could not be restarted. It was later determined that the fuel gas supply had been contaminated with nitrogen gas, which was a component of the Midway fracturing fluids. Soon after, the oil treater vessel was unable to maintain an oil/water interface and started dumping emulsion through the water leg into the produced water tank at the battery. Treater samples collected later that evening revealed indicated that it had been contaminated with fracturing fluids, causing it not to function properly.

Midway did not notify Wild Stream before beginning its fracturing operations at the Midway well. If the horizontal well path based on the survey was known, Wild Stream would have evaluated the horizontal leg against existing production facilities and shut in those locations during fracturing operations. The ERCB notes that at the time of the incident, there was no regulatory requirement mandating that Midway notify licensees of nearby wells of its intent to conduct fracturing operations.

6 Investigation Findings

Midway was clearly aware of the existence and operating status of the Wild Stream well as well as its proximity to the Midway well. At the time of the incident, Midway maintained an internal protocol which, if followed, would have spaced the fractures at least 135 m from the nearest well. Midway did not follow its own internal protocol in this case. The ERCB finds that, had Midway used its modelling and calculations, followed its own internal protocol, and notified Wild Stream of its fracturing operations, the incident may have been prevented altogether or the impact may have been reduced.

The ERCB finds that, had Midway notified Wild Stream of its intentions, Wild Stream would have had the opportunity to

- shut in its nearby wells,
- ensure its operators were aware of the activities, allowing them to pay closer attention to any operational anomalies at nearby wells or facilities, or
- influence Midway to modify its fracturing operations so as to prevent or mitigate any impacts on its wells and facilities.

Despite these findings, the ERCB has concluded it would not be appropriate to issue enforcement action against Midway for failing to notify Wild Stream of its fracturing operations. This is because, at the time of the incident, there were no existing regulatory requirements governing spacing of fracturing operations in relation to nearby wells or requiring notification of licensees of nearby wells of impending fracturing operations.

7 Company Actions

Midway indicated it would continue to use fracturing modelling as a guideline. Subsequent to the incident, Midway changed its internal policy to increase the distance between fractures and nearby wells from 1.5 times to 2 times the modelled half length distance or a minimum of 200 m. Since the incident, Midway has also changed its internal procedures for fracturing operations to ensure that any wells within 500 m are shut in during fracturing operations. Further, Midway policies were revised such that it will avoid fracturing operations within 1000 m of a drilling operation and 500 m of any completion operations.

Wild Stream has supported Midway's procedure in the Garrington Field and has changed its own provincial process to ensure that all wells within 200 m of a fracturing operation are shut in during fracturing operations.

On April 11, 2012, *Enform Safety Alert #04-2012 – Over Pressured Fracture Operation Results in Spill* was issued. This is a communication tool for industry to bring better awareness of potential safety hazards. The alert described the incident and shared corrective and preventive actions.

8 ERCB Actions

The ERCB notes that throughout drilling, testing, completion, and reconditioning operations, licensees are required to maintain well control and take immediate steps to contain and

remedy any spill from wellheads.³ The ERCB believes that if Midway had followed its own fracturing protocol and taken a precautionary and proactive role in notifying Wild Stream of its fracturing operation plans, the incident could have either been prevented altogether or its impact reduced. However, the ERCB also notes that at the time of the incident there were no existing regulatory requirements mandating minimum spacing of fracturing operations or notification requirements of licensees of nearby wells and facilities.

The ERCB requested that Midway post an Enform safety bulletin to share the details and findings from this incident with other industry operators.

Further, as a direct result of this incident, the ERCB released *Bulletin 2012-02 – Hydraulic Fracturing: Interwellbore Communication between Energy Well* dated January 23, 2012, outlining the ERCB's expectation of licensees to

- maintain well control at all times and assess the risks that hydraulic fracturing may have on offset energy wellbores and how those risks are influenced by geology and the completion practices being employed,
- undertake fracture propagation modelling prior to fracturing operations to assist in determining the potential area of influence,
- understand the area of influence that may be affected by well stimulation operations and identify all wellbores, including abandoned and suspended wells, that may be in close subsurface proximity,
- notify offset well licensees of pending hydraulic fracturing that may impact offset wellbores,
- collaborate with offset well licensees to ensure effective control of all wells, and
- immediately report any instance of unintended interwell communication to the nearest ERCB field centre.

9 ERCB Follow-up

As noted in section 6, the ERCB finds that Midway failed to comply with its own internal protocol with respect to the fracturing operation, which caused Midway to not effectively control oil, gas, or water encountered during drilling, testing, completing, or reconditioning operations at its well. Under different circumstances, this finding may have resulted in issuance of an enforcement action against Midway. This is a unique situation in that the incident itself is a very uncommon occurrence and did not, in the ERCB's opinion, result from or indicate an ongoing systemic deficiency in the operations of either licensee involved. It is also unique in that both licensees have since been acquired by other ERCB licensees and therefore no longer exist as corporate entities (see footnotes 1 and 2). For these reasons, the ERCB sees little merit or fairness in issuing enforcement action against Midway's successor (Whitecap) in relation to Midway's actions (or inactions) in relation to this incident. However, the ERCB has consulted with Whitecap (as the legal successor to Midway) to ensure that they have appropriate internal procedures in place to prevent future occurrences (see section 7).

As noted above, at the time of the incident, the ERCB did not prescribe any requirements governing spacing of fracturing operations in relation to nearby wells or requiring notification of

³ Sections 6.050 and 8.050 of the *Oil and Gas Conservation Regulations*.

licensees of nearby wells of fracturing operations. As a result of this incident, the ERCB issued *Bulletin 2012-02*, which reiterated that the ERCB expects licensees to manage risks, plan appropriately, and communicate and collaborate with offset well owners when conducting hydraulic fracturing operations. Also, the ERCB has examined its current requirements regarding hydraulic fracturing operations and potential interwellbore communication incidents resulting from fracturing operations and has introduced new requirements and made modifications to its existing regulatory requirements in the form of a new directive (currently in draft). In addition, the ERCB will continue to monitor all interwellbore communication incidents to improve its understanding of causes, impacts, and appropriate mitigation measures to be taken by licensees to prevent further incidents of interwellbore communications caused by fracturing operations.