



4400, 525 8th Avenue SW
Calgary, AB
T2P 1G1

December 10, 2013

Manitoba Petroleum Branch
3660-1395 Ellice Avenue
Winnipeg, Manitoba
R3G 3P2
Attention: Leo Leonen

Dear Mr. Leonen

RE: Application for Enhanced Oil Recovery Waterflood Project
Lower Amaranth Formation, Lower Amaranth B (0) Pool
Proposed North Pierson Unit 2
S ½ of Section 08-002-28W1, Pierson Field

Pursuant to Section 17(1) of the Drilling and Production Regulations of Manitoba, Legacy Oil + Gas Incorporated ("Legacy") hereby applies for approval to conduct a Waterflood Project for the Lower Amaranth formation in the South ½ of Section 08-002-28W1.

The proposed south ½ Sec 08-002-28W1 Waterflood area has been developed with 4 horizontal wells since February 2010. Legacy intends to convert the Legacy Pierson HZNTL A1-8-2-28 (WPM) well to a water injection well.

In accordance with the requirements under section 116 of the Act, we submit the following data in support of our application.

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Introduction

Pursuant to Section 17(1) of the Drilling and Production Regulations of Manitoba, Legacy Oil + Gas Incorporated ("Legacy") hereby applies for approval to conduct a Waterflood Project for the Lower Amaranth (Spearfish) formation in the South ½ of Section 08-002-28W1 of the Pierson Field. The project area and proposed North Pierson Unit 2 boundaries are shown in *Appendix A, Figure 1*.

In the proposed South ½ Sec 08-002-28W1 Waterflood area, potential exists for incremental production and reserves from a Waterflood EOR project in the Lower Amaranth (Spearfish) oil reservoir. The proposed half section has been developed with 4 horizontal wells since February 2010. Legacy intends to convert the Legacy Pierson HZNTL A1-8-2-28 (WPM) (License number 008160) well to an injector.

In accordance with the requirements under section 116 of the Act, we submit the following data in support of our application.

Summary

1. The proposed North Pierson Unit 2 will include 4 existing horizontal wells that are producing from the Lower Amaranth (Spearfish) formation.
2. The North Pierson Unit 2 will include 8 Legal Sub Divisions (LSD), of which all have had wells drilled through them. The boundary of the proposed Unit is shown in *Appendix A, Figure 1*.
3. The Original Oil in Place (OOIP) in the project area has been calculated to be approximately $650 \text{ E}^3\text{m}^3$ for an average of $80.8 \text{ E}^3\text{m}^3$ OOIP per 40 acre LSD.
4. Cumulative production to the end of October 2013 from the 4 wells within the proposed North Pierson Unit 2 project area has been calculated to be approximately $14 \text{ E}^3\text{m}^3$ of Oil, representing a 2.1% current Recovery Factor (RF) of OOIP.
5. Ultimate oil recovery of the proposed North Pierson Unit 2 OOIP, under the current Primary Production method is forecasted to be 4.1% of the OOIP.
6. *Appendix C, Figure 2* shows the production from the proposed area which peaked in Aug 2012 at $31.56 \text{ m}^3/\text{d}$ of oil. As of October 2013, the average oil production rate was $6.81 \text{ m}^3/\text{d}$ and $5.13 \text{ m}^3/\text{d}$ of water representing a 43% water cut.
7. Decline analysis of the group primary production data total oil forecasts the area declining at an annual rate of approximately 28%.
8. Based on the Recovery Factor vs HCPVI chart of the other Units within the general area shown in *Appendix C, Figure 7*, the estimated total RF under Secondary Recovery in the proposed North Pierson Unit 2 is estimated to be 18-25%.
9. One horizontal injector will be converted from a current horizontal producer, as shown in *Appendix D, Figure 1*, within the proposed North Pierson Unit 2.

Resource Properties and Technical Discussion

Geology

Regional Geology

The Triassic Lower Watrous/Red Beds (Saskatchewan Terminology) – Lower Amaranth (Manitoba Terminology) – Spearfish (North Dakota Terminology) Formation is situated on the north-eastern margin of the Williston Basin. For the purpose of consistency and simplification, the term “Spearfish Formation” will be used throughout this discussion.

During Triassic times, the Williston Basin was cut off from most normal marine influence and was dominated by the deposition of continental to restricted-marine red beds. These comprise a relatively thin succession up to 100m thick in places, and are truncated towards the edge of the basin by non-deposition and pre-Jurassic erosion.

Spearfish deposits onlapping the Paleozoic surface represent the initiation of a major transgressive event in the Williston Basin and are the precursors to extensive Jurassic marine flooding that created a much enlarged Williston Basin. The Paleoclimate is interpreted as having been arid. These formations onlap, with significant unconformity, the underlying eroded Paleozoic surface. The formations occur throughout southern Saskatchewan and southern Manitoba and extend southward into North Dakota, South Dakota, Wyoming and north-eastern Montana.

Stratigraphy

The stratigraphy in S/2-8-2-28W1M is defined by the stratigraphic cross-section A – A', seen in *Appendix B, Figure 2*.

The Spearfish Formation is about 30m thick on average, and consists of a basal unit, the Manor Zone, which overlies the Mississippian Alida Formation. This zone is predominantly sandstone interbedded with siltstone. Overlying the Manor Zone is the Waskada Zone, which is the main reservoir interval. It consists predominantly of interbedded porous siltstone and fine grained sandstone. The Marine A Zone overlies the Waskada Zone and is in turn overlain by the Marine B Zone. Both zones consist predominantly of siltstone grading in part to very fine grained sandstone with occasional patches and blebs of anhydrite. Overlying this is the upper Spearfish unit which has similar lithology.

Overlying the Spearfish Formation is the Upper Amaranth Formation which consists of massive anhydrite with minor carbonate and shale interbeds.

Reservoir Geology

The top of the reservoir is the top of the Spearfish Formation. Legacy has sub divided the Spearfish formation into different zones. The main reservoir zone within these sub-divisions is the Waskada. The upper portion of the underlying Manor Zone also contains hydrocarbons.

Reservoirs are developed in the thin, discontinuous porous siltstones and sandstones that were deposited as subtidal bars or shoals in a low-energy, marginal marine environment. These sediments accumulated in broad structural depressions on the underlying Mississippian unconformity surface. The hydrocarbons were sourced

from the underlying Mississippian producing beds, where the cap rock that normally separates the Spearfish from the underlying Mississippian carbonates is absent. Stratigraphic traps form as the lower porous siltstones and sandstones pinch out into shales and mudstones.

Essentially the Spearfish Formation is a low permeability, poor quality interlaminated sandy siltstone of Triassic age sitting on Mississippian water bearing strata. Downdip, the Spearfish has an active water drive, but quality degrades to the north-east with oil being trapped between the water and areas of reservoir quality degradation updip.

Structure

The Spearfish structure map shown in *Appendix B, Figure 1*, shows the formation trending northwest/southeast with a gentle dip to the southwest.

Hydrocarbon accumulations in the Spearfish Formation are stratigraphically trapped and are not tied to structure.

Reservoir Continuity

The cross-section A-A' (*Appendix B, Figure 2*) shows that the Spearfish Formation and the individual zones exhibit consistent thickness across the area. Consequently the top of the Spearfish structure map exhibits the same structure as any of the individual zones within the Spearfish formation.

The main reservoir zone within the Spearfish formation (Waskada Zone) is approximately 11m thick. Horizontal well targets are 2.5 to 3.0m below the top of this zone.

Reservoir Quality

Porosity and permeability values were derived from core analysis where stratigraphic test holes were drilled. Additional porosity data was derived from neutron-density and sonic logs. In addition, water saturation values were determined from the porosity logs and core samples.

Average parameters for the south ½ of section 08-002-28W1 are shown below:

Porosity: 14%

Water Saturation: 50%

Net Pay: 7.7 m/LSD Average (25.2 ft/LSD)

Permeability: 1 md (range 0.1 – 10md)

Shrinkage: 0.9345

$$\begin{aligned}\text{Hydrocarbon Pore Volume (HCPV)} &= \text{Porosity} * \text{Net Pay} * (1 - S_w) * 1 / FVF \\ &= 0.14 * 25.2 * 0.5 * 0.9345\end{aligned}$$

$$\text{HCPV} = 1.64$$

$$\begin{aligned}\text{Oil in Place (OOIP) (Per Section)} &= 1.64 * 7758 * 640 \\ &= 8.14 \text{ MMSTB or } 1,294 \text{ E}^3\text{m}^3\end{aligned}$$

$$\text{Per half Section} = 4.07 \text{ MMSTB or } 647 \text{ E}^3\text{m}^3$$

$$\text{Per LSD} = 508.8 \text{ MSTB or } 80.9 \text{ E}^3\text{M}^3$$

Pore Volume and Permeability Capacity of the Reservoir

Due to the stratified nature of the reservoir, conventional well log analysis is difficult. In order to establish net pay, a sonic log cut-off of 270 usec/m seems to give the best results from well to well over the area. This 270 usec/m works well over various different pools in the area. A 9% limestone density cut-off gives variable results from well to well. Core analysis also does not seem to accurately reflect net pay with oven dried cores. The net pay varies from 0 to 50 feet. The average porosity has been calculated to be 14 percent. The water saturation is very difficult to calculate due to the laminated reservoir and has been assumed to be 50 percent based on literature for the area. All available geological data (logs, cores, well tests and DST's) for the Spearfish formation was evaluated and a net oil pay map was created, *Appendix B, Figure 3*. In the calculation of discovered oil initially-in-place (DOIP), an average net pay was determined from the net pay map for each section of land. As discussed previously, a 14% average porosity and 50% water saturation were also used in the DOIP calculations.

As shown under the previous heading "Reservoir Quality", the hydrocarbon pore volume (HCPV) has been calculated using the reservoir parameters as determined above. The Oil in Place (OOIP) per section (and per half section for the proposed waterflood) has been calculated using the HCPV value and the acreage. The net oil pay map is the equivalent of the pore volume map; it is not meaningful to attempt to create a HCPV map of the half of the proposed waterflood area. The net oil pay map and the HCPV and OOIP calculations should suffice.

As also indicated in the previous section "Reservoir Quality" the permeability of the Spearfish formation is highly variable. There is very limited core analysis data available for permeability determinations but the average permeability is around 1 md, with the range being 0.1-10 md.

K*h maps were not attempted due to the lack of meaningful data. These would be difficult to compile over the proposed half section waterflood area.

Suffice to say that through the overall Spearfish trend where other reservoir parameters meet the porosity cut-offs, the permeability capacity of the reservoir is sufficient to allow for the flow of fluids.

Fluid Contacts

There is no apparent "oil-water contact" within the Waskada reservoir zone. The lower part of the underlying Manor Zone appears to be wet and may provide a weak bottom water drive.

OOIP Estimates

Based on the core and log analysis results the total volumetric OOIP for the Spearfish formation, for the south half of Section 08-002-28W1 as previously calculated is approximately 650 E³m³. *Appendix C, Figure 1* includes the Estimate of Oil Reserves.

Historical Production/Primary Production Forecast

A historical group production history plot for the proposed Waterflood is shown in *Appendix C, Figure 2*. Oil production commenced in the S ½ of section 8 in May 2010 from the 00/01-08-002-28W1/0 HZ oil well. This well was the only producer in the S ½ of this section until June 2012 when the 00/08-08-002-28W1/0 came on production, shortly followed by the 02/01-08-002-28W1/0 in July 2012, and then the 02/08-08-002-28W1/0 in Dec 2012.

Production from the four wells peaked in Aug 2012 at 31.56 m³/d of oil. As of October 2013, the average oil production rate was 6.81 m³/d and 5.13 m³/d of water representing a 43% water cut.

From peak production in August 2012 to date, oil production is declining at an annual rate of approximately 28% under the current primary production method.

Cumulative production to the end of October 2013 from the 4 wells within the proposed North Pierson Unit 2 project area has been calculated to be approximately 14.0 E³m³ of Oil, representing a 2.1% current Recovery Factor (RF) of OOIP

Future production rates under the existing primary drive mechanisms for the 4 wells currently producing in the proposed project are included in *Appendix C, Figures 3, 4, 5 & 6*. Individual decline curves for the four wells in the proposed section indicate ultimate oil recoveries ranging from 3.2 to 14.6 E³m³ of oil. Ultimate primary recoveries for the 4 existing wells in the section vary as a function of well length and stimulated intervals.

Secondary EOR Production Forecast

Based on other waterflood results and studies within the Pierson field, Legacy expects an increased ultimate recovery factor with secondary recovery to be around 18-25%. A graph showing other waterflood recoveries within the Pierson field can be found in *Appendix C, Figure 7*.

Unitization

The basis for unitization is to develop the lands in an effective and equitable manner that will be conducive to waterflooding. Unitizing will enable the reservoir to have the greatest recovery possible by allowing the development of additional drilling and injector conversions over time, in order to maintain reservoir pressure and increase oil production. A copy of the Unit Agreement executed by Legacy for the proposed North Pierson Unit 2 can be found in *Appendix 1, Figure 2*.

Unit Name

Legacy proposes that the official name of the new Unit be the North Pierson Unit 2.

Unit Operator

Legacy Oil and Gas Inc. (Legacy) will be Operator of record for the proposed North Pierson Unit 2.

Unitized Zone(s)

The unitized zone to be waterflooded in the proposed North Pierson Unit 2 will be the Waskada (Spearfish).

Unit Wells

The wells to be included in the proposed North Pierson Unit #2 are outlined below:

Well UWI	License #	On Prod Date
00/01-08-002-28W1/0	007225	5/1/2010
02/01-08-002-28W1/0	008160	7/1/2012
00/08-08-002-28W1/0	008468	6/1/2012
02/08-08-002-28W1/0	008940	12/1/2012

Unit Lands

The North Pierson Unit #2 will consist of one half section of land as follows:

LSD 1-8 of Section 8 of Township 2, Range 28, W1M

Tract Factors

The proposed North Pierson Unit 2 will consist of 8 tracts, based on 40 acre LSD's containing the 4 horizontal producing wells.

The 50% OOIP by LSD and 50% First 90 Days of Cumulative Production Method was used to allocate tract factors to individual LSD's.

Tract Factor calculations for all individual LSD's based on the above methodology are outlined in *Appendix 1, Figure 3*.

Working Interest Owners

Exhibit "A" of the attached Unit Agreement (*Appendix A, Figure 2*), outlines the working interest (WI) for each recommended tract within the proposed North Pierson Unit 2. Legacy holds a 100% WI ownership in the proposed tracts.

Waterflood EOR Development

Technical Studies

Due to the unconventional nature of the reservoir, Legacy has not been able to use reservoir simulation to accurately predict recoveries and sweep efficiency of the proposed waterflood.

Current Reservoir Pressure Predictions

In early November 2013, Legacy performed a Build Up test on the Legacy Pierson. HZNTL 8-8-2-28W1/0 well. The Spearfish formation was tested over 31 stages within the horizontal length of the well. The resulting pressure from this test was 2481 kPa(a). Based on these results Legacy estimates that the current pressure in the S ½ of section 08-002-28W1 to be between 2400-2500 kPa(a). A copy of the Build-up test results page can be found in *Appendix C, Figure 8*.

Initial/original reservoir pressure is estimated to be around 8600 – 10,700 kPa. Legacy estimates these values based on the PVT Parameters for the Spearfish Formation from correlations and Gaffney, Cline and Associates Waterflood Pilot Feasibility Study prepared for Surge Energy on the Waskada Lower Amaranth Unit #15 and a Reservoir Fluid study performed by Molopo Energy on the offsetting Pierson well 100/12-27-001-28W1/00. Copies of the PVT parameters and the pressure results from Molopo's study have been included in *Appendix C, Figure 9*.

Criteria for Conversion to Water Injection Wells

Legacy plans to convert one of the existing horizontal producers within the project area to a water injection well.

As previously mentioned this well is Legacy Pierson HZNTL A1-8-2-28 (WPM).

This well was decided upon based on the following parameters

- Fluid production rates and changes in the decline rate
- Any observed production interference effects with adjacent vertical wells
- Pattern mass balance

Pre-Production Schedule/Timing for Conversion of Horizontal Wells to Water Injection

Upon approval, Legacy plans to start converting the producing horizontal well in February 2013.

Secondary oil rate response at the producing horizontal wells is expected to begin within 2-4 months following the conversion of the horizontal to water injection service.

Estimated Fracture Pressure

Completion data from the existing producing wells within the project area indicate an actual fracture pressure gradient range of 15.0-17.0 kPa/m true vertical depth (TVD). Legacy expects the fracture gradient encountered during completion of the proposed horizontal injection wells will be somewhat lower than these values due to expected reservoir pressure depletion.

Waterflood Operating Strategy

Water Source and Injection Wells

The injection water for the waterflood project will be supplied from the existing Battery at 09-32-001-28W1. The produced water is from existing Spearfish producers within the area, therefore there should not be any compatibility issues.

Legacy plans to initially inject approximately 40 m³/day of this water into the injection well. Maximum injection surface pressure will be regulated to maintain a bottom hole pressure below fracture pressure.

The water injection well will be surface equipped with injection volume metering and rate/pressure control. An operating procedure for monitoring water injection volumes and meter balancing will also be utilized to monitor the entire system measurement and integrity on a daily basis.

Reservoir Pressure Management during Waterflood

Legacy expects to inject water for a minimum 2-3 year period to re-pressurize the reservoir due to cumulative primary production voidage and pressure depletion. Initial monthly Voidage Replacement Ratio (VRR) is expected to be approximately 3.5-4.0 within the pattern during the fill up period. As the cumulative VRR approaches 1, target reservoir operating pressure for waterflood operations will be 80-90% of the original reservoir pressure.

Waterflood Surveillance and Optimization

The proposed waterflood project's EOR response and waterflood surveillance will consist of the following:

- Regular production well rate and water cut (WCT) testing
- Daily water injection rate and pressure monitoring vs. target
- Water injection rate/pressure/time vs. cumulative injection plot
- Reservoir pressure surveys as required to establish pressure trends
- Pattern VRR
- Potential use of chemical tracers to track water injector/producer response
- Use of some or all of: Water Oil Ratio (WOR) trends, Log WOR vs. Cumulative Oil, Hydrocarbon Pore Volume Injected, and Conformance Plots.

The above surveillance methods will provide an ever increasing understanding of reservoir performance, and provide data to control and optimize the waterflood operation. Controlling the waterflood operation will significantly reduce or eliminate the potential for out-of-zone injection, undesired channeling or water breakthrough. The monitoring and surveillance will also provide early indicators of any such issues so that waterflood operations may be altered to maximize ultimate secondary reserves recovery from the proposed project area.

On Going Reservoir Pressure Surveys

Legacy expects that useful reservoir pressure data may be obtained from the existing wells within the project area after WF start up. These pressures will be reported in the Annual Progress Reports for North Pierson Unit 2 as per Section 73 of the Drilling and Production Regulation.

Economic Limits

Under the current primary recovery method, existing wells within the proposed project area will be deemed uneconomic when the net oil rate and net oil in place revenue stream becomes less than the current producing operating costs. With any positive oil response under the proposed Secondary Recovery method, the economic limit will be significantly pushed out into the future. The actual economic cut off point will be a function of net oil price, the magnitude and duration of production rate response to the waterflood, and then the current operating costs. Waterflood projects generally become uneconomic to operate when Water Oil Ratios (WOR's) exceed 100.

Water Injection Facilities

A complete description of all planned system figure design and operational practices to prevent corrosion related failures is shown in *Appendix D, Figure 2*, along with a copy of a typical injection wellbore diagram for the area as *Figure 1*.

Notification of Mineral and Surface Owners

Legacy has sent out notification letters to all surface rights owners and mineral owners of the proposed Waterflood Project and the formation of the North Pierson Unit 2. Copies of these notices and proof of service to all of the surface owners have been attached in *Appendix A, Figure 4*. A map showing the names and addresses of the surrounding surface rights owners can be found in *Appendix A, Figure 5*.

North Pierson Unit 2 Unitization and execution of the formal Unit 2 Agreement by affected Mineral Owners, is expected before the end of December 2013. A copy of the executed agreement by Legacy has been attached in *Appendix A, Figure 2*. Once a copy of the executed agreement is received by the Mineral Owners a copy will be forwarded to the Petroleum Branch to complete the Unit 2 Agreement.

Should you have any concerns regarding the proposed waterflood pilot project application please contact the undersigned at 403-441-2341 or by email at jperry@legacyoilandgas.com.

Sincerely,
Legacy Oil + Gas Inc



Jennifer Perry, P.Eng
Sr. Exploitation Engineer