

# Waskada Unit No. 1

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## Waterflood Progress Report

**January 1<sup>st</sup> – December 31<sup>st</sup>, 2013**

**PennWest**

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## **Introduction:**

The Waskada Unit No.1 pressure maintenance project commenced water injection into the Mission Canyon designed and in accordance with Manitoba Energy and Mines Approval No. PM 47.

Please refer to Attachment 1 – Area Map.

PRESSURE MAINTENANCE: Governed by Board Order No. PM 47

## **Unit Information**

UNITIZED ZONE: Mission Canyon  
Original Unit, June 1, 1976 Board Order; Unitization Order No. 22

POOL: Waskada Mission Canyon 3b A (03 42A)

This report documents the performance of the Waskada Unit No.1 pressure maintenance project for the period of January 1 to December 31, 2013. The Unit had no production or injection in 2013.

Unit 1 is part of the main Waskada field. The Waskada field is situated on the northeast rim of the Williston Basin in southern Manitoba. It comprises a large portion of Township 1 and 2, Ranges 25 and 26 W1.

## **Geology**

The Mission Canyon in the Waskada area produces light density crude (approximately 36° API). Stratigraphically the Mission Canyon can be divided up into various members and marker beds (ie. MC3b, MC3a, MC2, MC1). It is overlain by the Charles Formation or the angular Paleozoic/Mississippian Unconformity, with beds dipping to the southwest. The lithology consists of complex interbedded grainstones, packstones, wackestones, and mudstones with some members consisting of predominantly primary anhydrite (ie. MC2). Porous members typically have porosity of 13-15% and permeabilities of 20-40 mD), although localized alteration due to the truncating Mississippian Unconformity can significantly reduce or eliminate those values in certain areas. Oil accumulation is generally found on isolated structural highs or areas with associated updip permeability degradation.

## **Discussion**

### **Production and Injection Performance**

Board Order No. PM 47 provided for pressure maintenance operations in Waskada Unit No.1. The Unit includes one injection well, 00/06-30-001-25W1/0, abandoned since September 2001, and five producers. None are currently active. Pressure maintenance by water injection began in 1976 until 1983 and ceased in until May 1991 when injection was restarted for 2 months. Injection

reoccurred from Jan 1995 to March 1996. Gas injection was conducted from March 1986 to December 1994.

Please refer to Attachment 2 – A summary of the Unit Well List and History.

Please refer to Attachment 3 – A Production and Injection plot of the Unit.

Please refer to Attachment 4 – A summary of Unit Annual Volumes and Rates.

Please refer to Attachment 5 – A Cumulative Production and Injection plot of the Unit.

### **Voidage Replacement Ratio Calculation:**

The Cumulative VRR from production start reached 1.0 in 1986 and continued to increase reaching a maximum value of 4.7 in 1994. By lowering injection rates, until suspending and abandoning the injector, the cum VRR stabilized to a value of 4.3. Currently there is no active injector in this Unit and PennWest has no plans to reactivate injection.

Please refer to Attachment 6 – A Unit Voidage Replacement Ratio Plot.

Please refer to Attachment 7 – Individual Injection Well Performance Plots (1)

### **Pressure Surveys:**

No pressure surveys were conducted in 2013.

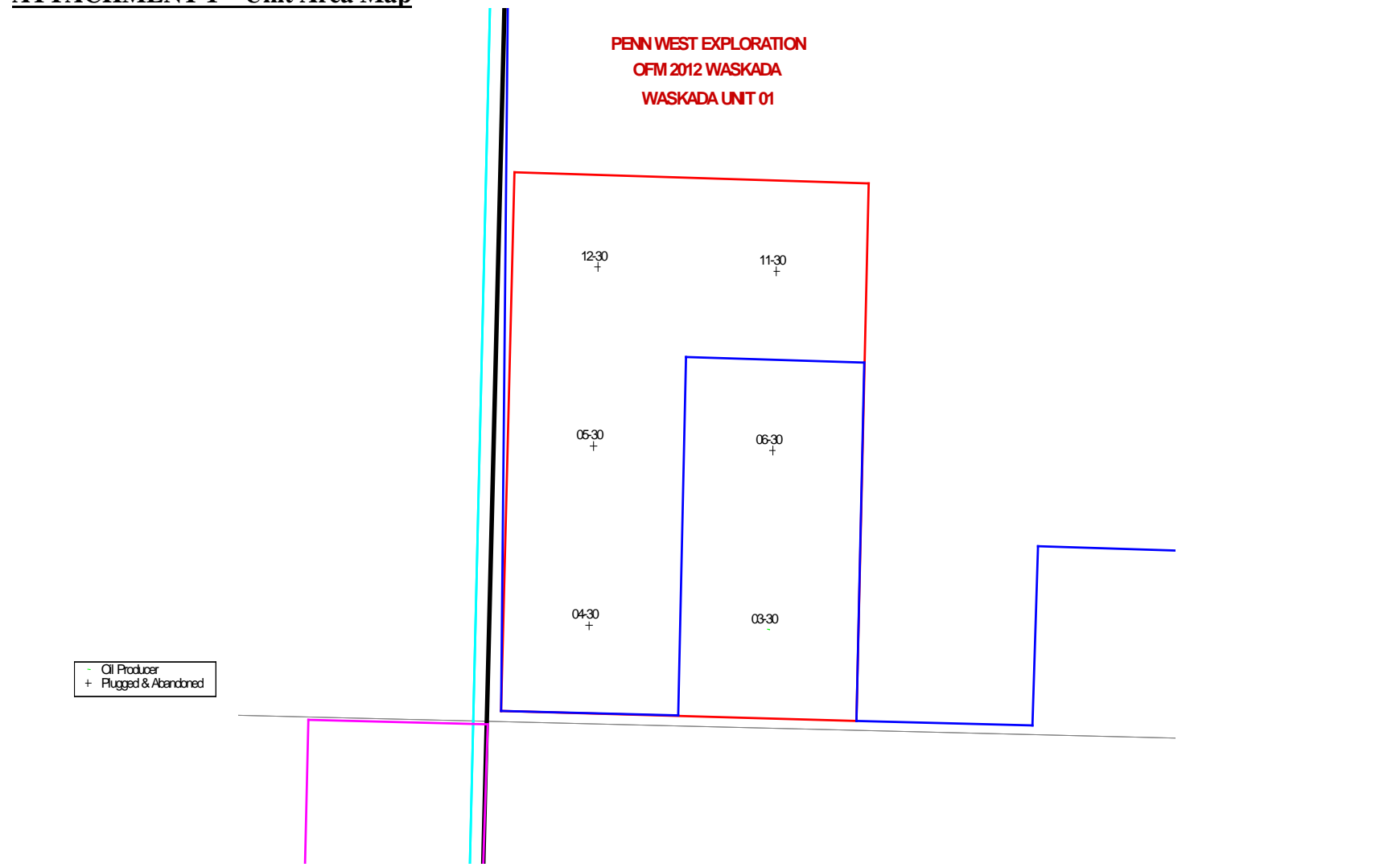
### **Corrosion and Scale Prevention Program:**

We currently inject ScalCor down all the new horizontal wells. PennWest will be installing cathodic protection on the wells. The new gathering system is Fibreglass and as such is not susceptible to corrosion.

### **Summary and Recommendations**

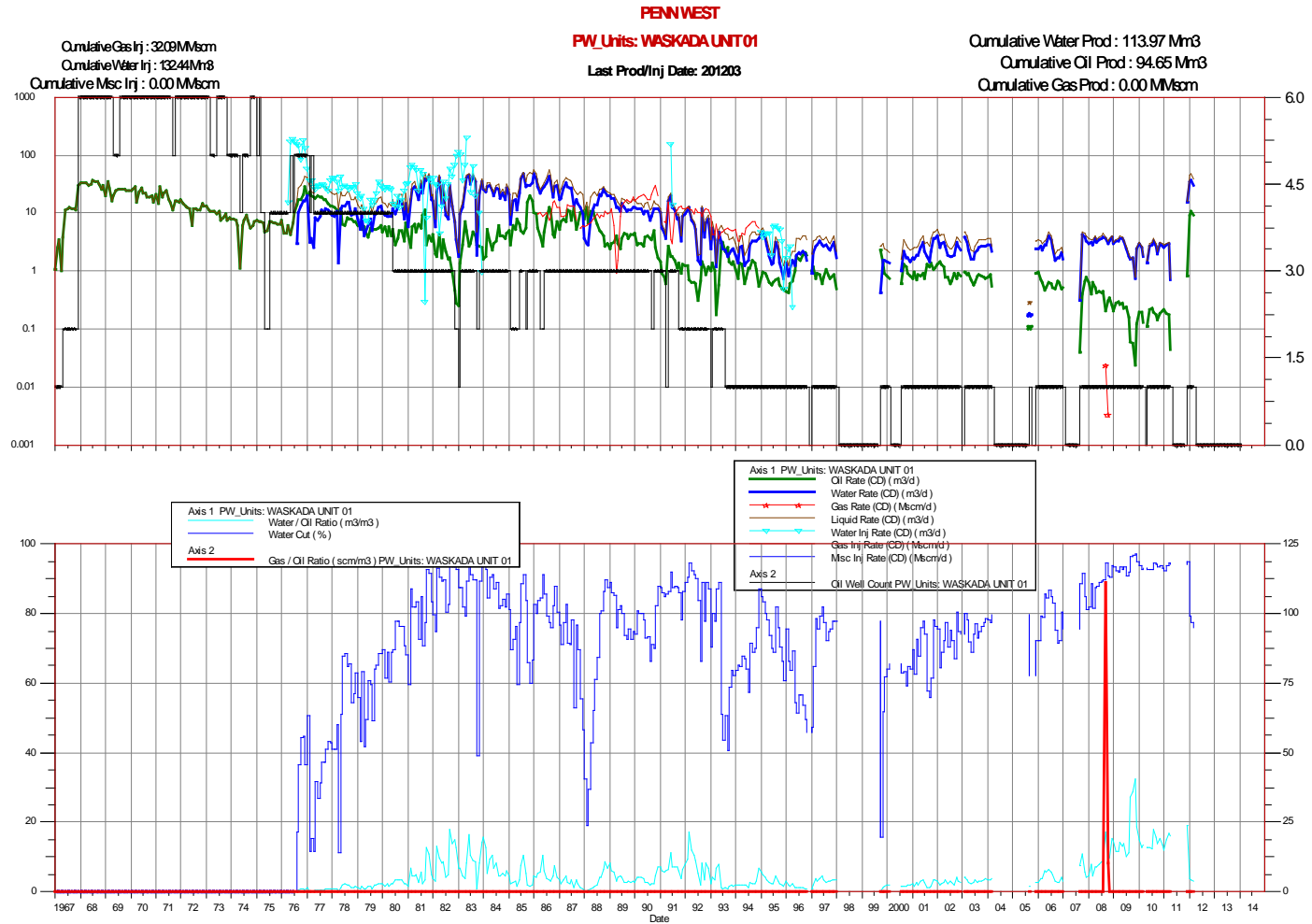
There are currently no active producers or injectors in Waskada Unit 1. Production ended in March 2012 and no plans are in place to reactivate injection or production. PennWest's plan is to concentrate on the Lower Amaranth formation for now.

## ATTACHMENT 1 – Unit Area Map



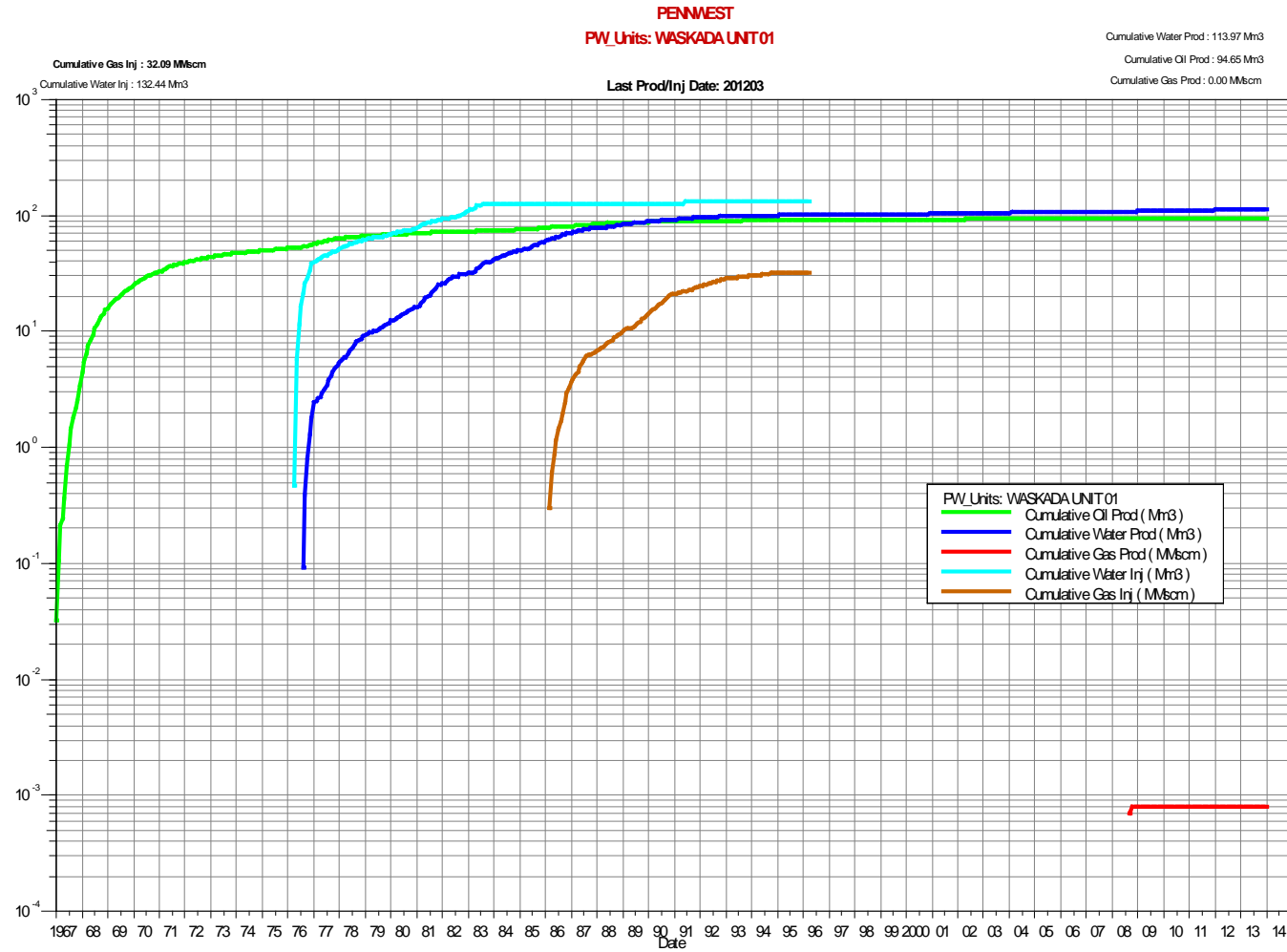
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## ATTACHMENT 3 – Unit Production and Injection Plot

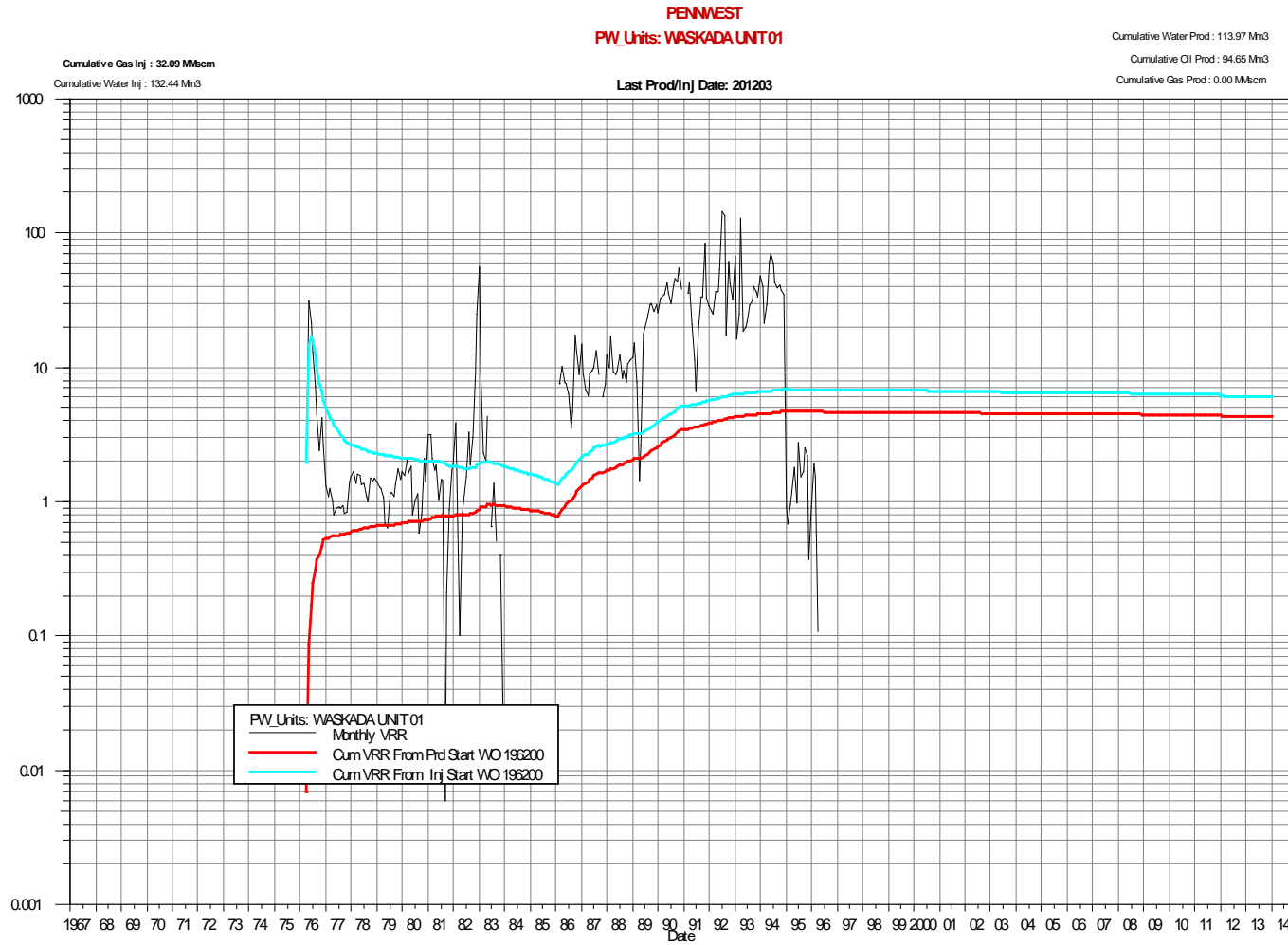




## ATTACHMENT 5 – Unit Cumulative Production and Injection Plot



## ATTACHMENT 6 – Unit Voidage Replacement Ratio Plot



## ATTACHMENT 7 – Individual Injection Well performance Plots (1 Well)

