Introduction

The Milk River Formation in southeast Alberta and southwest Saskatchewan forms one of the true giants among North American gas fields. Discovered nearly 100 years ago, the field has been under continual development.

With over 30,000 producing wells, the play is still considered immature as many aspects are poorly understood, including:

- What controls the traps - stratigraphy, structure, lithology or hydrodynamics?
- Where are the potential play extensions likely to occur?

With extensions such as Abbey/Shackleton and frenzied land sale activity, there appears to much more gas to the play than previously considered.

However, distinctive log signatures for pay are subtle. Traditional petrophysics is hampered by the shaly lithology causing a negligible separation from pay zones to wet zones. Porosity logs are often invalid due to a tendency for wellbore caving through the zone.

Past studies of the Milk River Formation have shown the regional stratigraphic complexity of an updip ‘dynamic’ aquifer system. How does all of this inter-relate?
**Original Milk River Study Objectives**

The 2003 non-exclusive Milk River hydrodynamic study levered the substantial expertise RPCL has developed using integrated geoscience analysis for the purpose of defining unconventional gas resources.

This exploration oriented study focuses on defining the boundaries of the unconventional (gas-saturated), transitional (gas and water) and conventional (water wet) portions of the play. Detailed stratigraphic analysis and hydrodynamic modelling is used to determine the trapping mechanisms, play limits and exploration fairways.

Some of the key questions addressed by the study are:

- What is the relationship between sequence stratigraphy, hydrodynamics and trapping?
- Where are the recharge points and how active is the aquifer system?
- What is the relationship between aquifer recharge zones and topography?
- What are the downdip and updip extents of the play?
- Is there a petrophysical model that will identify pay intervals?
- What is the relationship between reservoir quality (porosity/permeability) and gas pay?
- What are the source rocks and is the gas of biogenic origin?
- What are the effective gas migration patterns, in both the conventional and unconventional play types?
- Are there systematic controls on water cuts?
**2005 Milk Update Update**

Since the original Milk River study, extensive activity has occurred. Thousands of new wells have been drilled or completed in the Milk River, many of which are outside of the originally defined pool boundaries.

The update will incorporate the data from key wells released since the May 2003 cut-off date. Special attention will be paid to where new discoveries have been made or where existing pool boundaries have been extended by recent activity.

All new reservoir pressure, fluid chemistry and production data for the Milk River will also be analysed and the original hydrogeological model will be updated.

A focus area centered on the Abbey/Shackleton play will also be part of the update. In this area, the original geological model for the Milk River, Alderson member has been further developed to give new insights as to how this play is evolving and where it is going.

More petrophysical analysis has also been conducted on key wells using the shaly sand model developed in the original study. The results of further analysis will be provided in the 2005 Milk River update with a discussion of the efficacy of the model for identifying reservoir.
2005 Milk River Update Deliverables

Geology:
- Series of regional geologic cross-sections
- Pressure data wells correlated
- Regional geologic interpretation
- New geologic maps for focus area

Hydrodynamics:
- Detailed pressure versus elevation graphs
- DST and AOF data analyses
- Pressure systems related to regional geology, topography and outcrop
- Analysis of gas distribution, hydrocarbon column heights, sequence relationships, downdip(?) and updip water
- Hydraulic head and gas head maps
- Gas migration modelling

Hydrochemistry:
- Gas chemistry composition and distribution
- Water chemistry composition and distribution
- Gas source and generation analyses
- Secondary and primary biogenic gas analysis

Petrophysics:
- Log analysis report and petrophysical model

Technical Report:
- Illustrated technical report with discussion of gas source, trapping and history evolution
- Bound hard copy of maps, graphs and figures
- Digital data
- Digital PDF report on CD

2005 Update study area showing over 8,000 new wells drilled and Milk River completions since April 2003