Background Geological Information

YUKON CALL FOR BIDS
DISPOSITION #4

Parcel Nominated in the Peel Plateau

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PEEL PLATEAU BACKGROUND GEOLOGY

Introduction
Yukon’s fourth call for bids for oil and gas rights was announced on August 18, 2004 and closes on October 20, 2004. This Call involves one parcel in the Peel Plateau Basin. A Public Review of the nominated parcel took place between May 26 and July 23 to determine any environmental, socio-economic or surface access concerns. The current Call for Bids takes these concerns into account.

The Call for Bids package is available from the Oil and Gas Management Branch web site at www.yukonoilandgas.com. It is also available in hard copy by phoning, faxing, writing or visiting the Branch as follows:

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The following documentation is designed to assist exploration companies by providing basic exploration information and directions on how to obtain further geological data.

Geographic Description
Figure 1 shows the location of the nominated parcel relative to existing oil and gas wells, seismic lines and settled land claims. The parcel occupies an area near 66° north latitude and 134° 45’ west longitude, just south of the Arctic Circle. The selected parcel consists of 148 sections with an area of approximately 397 square kilometres. There are no towns or permanently inhabited areas within the parcel. The closest permanent settlement is Eagle Plains, approximately 100 km to the northwest of the parcel. Fort McPherson lies on the Peel River approximately 150 km to the north of the parcel.

Wetlands are present on over 25% of the Peel Plateau. The region has a high subarctic ecolclimate with continuous permafrost and low annual precipitation. Primary vegetation consists of open, stunted stands of black spruce and tamarack. Terraces and rounded plateaus with little topographic relief characterize Peel Plateau. Most of the region is covered by thin, discontinuous, hummocky to dissected glacial drift and organic deposits, although some portions escaped glaciation.

Peel Plateau is bound on the west by the Richardson Mountains and by the Mackenzie Mountains to the south. The eastern and northern portions of the Peel Plateau extend into the Northwest Territories.

Regional Geology
The Peel Plateau lies at the northwest extent of the Western Canada Sedimentary Basin. It is underlain by a wedge of Cretaceous sedimentary rocks deposited in a foreland basin setting that unconformably overlie Paleozoic strata deposited in a continental margin setting. Strata of the
Peel Plateau range from Cambrian to Lower Cretaceous in age with a total thickness of four kilometres. An outline of the stratigraphy is shown in Figure 2.

The Peel Plateau region can be separated into two distinct geological regimes based on structural complexity: structural belts on the fringes of the mountains and a plains region. Strata adjacent to the Mackenzie and Richardson mountains have been disturbed by the Columbian and Laramide orogenic events. These disturbed strata occurring within an interval 10 to 45 km wide offer a diversity of structural traps. Beyond this area, strata are relatively undisturbed and blanketed by Cretaceous cover. A geological cross-section extending east-west through the plains region of the Peel Plateau shows the distribution of the units under the Cretaceous cover (Fig. 3).

**Exploration History**

**Seismic Surveys**
During the mid-1960’s through to the mid-1970’s over 3,000 line-kilometres of two-dimensional seismic data were acquired in the Yukon portion of the Peel Plateau. Seismic lines were concentrated within the disturbed strata zone flanking the Richardson and Mackenzie mountains. Digital data from the National Energy Board indicate two of these seismic lines enter the north east portion of the nominated parcel (Fig. 1). No three-dimensional seismic has been run to date. The Peel Plateau has remained inactive for the past 25 years.

**Exploratory Drilling**
Exploratory drilling in Yukon’s Peel region concentrated along the Peel River drainage outboard of the disturbed zone, with no significant success. The first well (Shell Peel River YT J-21) drilled in the Peel Plateau, in 1965, was dry and abandoned. Eighteen additional wells, also abandoned, were drilled between 1965 and 1977, intersecting approximately 42 km of strata. There were no wells drilled in the nominated parcel. However, one well (Toltec Peel River YT N-77) is located adjacent to the parcel; this well was drilled in 1968 and abandoned in 1970.

**Access**
Due to extensive wetlands and drainage features, surface access is most feasible during the winter when the ground, watercourses and water bodies are frozen. A network of historic trails and cut-lines were established during oil and gas seismic and well exploration in the 1960’s and 1970’s. The current condition of most of these is unknown. Most historic winter overland exploration access to this locality was from Fort McPherson, NWT.

Barges were also used to transport equipment and supplies to this region up the Peel River. However, lack of barges of appropriate size and antedotal evidence of lower water levels will make this option less viable.

During the winter of 2002/03, the Department of Indian and Northern Development and the Rat River Development Corporation of the Gwich’in Tribal Council constructed a winter road north east of the nominated parcel to a site on the Peel River. The road was built to access a waste site near the Shell Peel River YT J-21 well for clean up purposes.

The recent issuance of an Exploration Licence (EL 415) on the NWT side of the border may also provide alternate access options to this region.

Access from the Dempster Highway, through passes in the Richardson Mountains, has not been explored as an option.
**Geological Mapping**

**Resource Assessments**
An assessment of petroleum resource potential in the Peel Plateau was completed in 1999 by the National Energy Board and updated in November 2000. This report noted the following:

- Six conceptual plays, defined on the basis of structural complexity and lithology, are outlined and analyzed in the resource assessment. Five are oil and gas plays, one is gas only.
- The assessment identified the mean potential for 2.29 Tcf of marketable gas and 21.3 million barrels of recoverable oil in Peel Plateau.
- Paleozoic carbonate reservoirs are expected to contain over 80% of the marketable gas and over 88% of the recoverable oil.


**Reservoirs, Traps and Source**
There are no producing zones in the Yukon’s Peel Plateau; thus no proven reservoirs.

**Reservoirs**
There are several potential reservoir types in the Peel Plateau region including:
- fractured or vuggy carbonates,
- fractured or porous clastics,
- isolated porous carbonate buildups, and
- pinch-outs of conglomerate and sandstone in a dominantly shale succession.

**Traps**
Structural, stratigraphic and combination traps occurring in the Peel region include:
- broad, low-amplitude anticlines associated with the Late Cretaceous to early Tertiary Laramide Orogeny,
- thrust structures identified in the disturbed belt on the fringe of the plains,
- faulted coarse clastic rocks, and
- stratigraphic traps (i.e. carbonate to shale transitions).

**Sources**
Source rocks identified in the Peel Basin include (youngest to oldest) (NEB, 2000):

<table>
<thead>
<tr>
<th>Stratigraphic Unit</th>
<th>Average %TOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cretaceous Arctic Red Formation</td>
<td>1.17</td>
</tr>
<tr>
<td>Carboniferous Tuttle Formation</td>
<td>1.79</td>
</tr>
<tr>
<td>Devonian Imperial Formation/Ford Lake Shale</td>
<td>1.19</td>
</tr>
<tr>
<td>Devonian Canol Formation</td>
<td>3.73</td>
</tr>
<tr>
<td>Devonian Hare Indian Formation (Bluefish Member)</td>
<td>2.90</td>
</tr>
<tr>
<td>Devonian Hume Formation</td>
<td>1.92</td>
</tr>
</tbody>
</table>
**Data Sources**

- **Landsat Images** – available from the Canada Centre for Remote Sensing (CCRS) ([http://www.ccrs.nrcan.gc.ca](http://www.ccrs.nrcan.gc.ca)).

- **Base Maps** – topographic base map NTS 106 L can be obtained from Natural Resources Canada ([http://maps.nrcan.gc.ca/topographic.html](http://maps.nrcan.gc.ca/topographic.html)).

- **Geological Information**: the Geological Survey of Canada has recently produced a CD-ROM in conjunction with the Yukon government with 1:250,000 scale data. Contact the Whitehorse Mining Recorder, phone (867)-667-3190.


- **Well Information** is available from the National Energy Board and the Yukon government. Wells are named by operator/grid block name/unit letter – number – grid area (for example, Shell Peel River I-21-66-20-134-15). Peel River applies to a grid described by the northeast corner latitude (66ºN) in 10 degree increments and the longitude (134ºW) in 15 degree west increments. The grid area is further divided into 80 sections, and the section is divided into 16 lettered units. (See location scheme, Fig. 4).


- **Cores** are stored at the Geological Survey of Canada Calgary Core Facility (phone: 403-292-7000).

- **Seismic Information** is available from the National Energy Board in microfiche form. See Figure 1 for a map of seismic lines-project numbers. (Commercial vendors also maintain data sets:)
  - **SEG-Y (seismic) Data** available from Lynx Canada Information Systems. Phone (403)-269-7255 or email: lynxcanada@home.com.
Key Publications


CD or paper copies can be obtained by contacting the Oil and Gas Resources Branch or visiting our website at [www.yukonoilandgas.com](http://www.yukonoilandgas.com).


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### Figure 2: Stratigraphic Column

<table>
<thead>
<tr>
<th>Era</th>
<th>System</th>
<th>W</th>
<th>Formation and Lithology</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesozoic</td>
<td>Cretaceous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jurassic</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Triassic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paleozoic</td>
<td>Permian</td>
<td></td>
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<tr>
<td></td>
<td>Carboniferous</td>
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<tr>
<td></td>
<td>Devonian</td>
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<tr>
<td></td>
<td>Silurian</td>
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<tr>
<td></td>
<td>Ordovician</td>
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<tr>
<td></td>
<td>Cambrian</td>
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<td></td>
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<tr>
<td></td>
<td>Precambrian</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Proterozoic</td>
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<td></td>
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<td></td>
<td><strong>Peel Plateau Stratigraphic Column</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Legend**
- Clastics, predominantly shale
- Clastics, predominantly sand
- Limestone
- Dolomite
- Cherty Shale
- Conglomerate / Sandstone

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Figure 3. Diagrammatic cross-section through Peel Plateau (NEB,
Figure 4. Yukon Well Location

**EXAMPLE:** N-27-61-10-134-30

**GRID AREA**
61-10-134-30
(10' N-S x 15' E-W)

**NTS QUAD 105E**
(1:250,000)

NOTE:
Grid areas are 80 sections from 60° to 68°N.
Grid areas are 60 sections from 68° to 70°N.