



**uniongas**

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January 19, 2011

BY RESS & COURIER

Ms. Kirsten Walli, Board Secretary  
Ontario Energy Board  
2300 Yonge Street, Suite 2700  
Toronto, Ontario  
M4P 1E4

Dear Ms. Walli:

**Re: Union Gas Limited  
Jacob Pool Storage Development  
EB-2011-0013, EB-2011-0014, EB-2011-0015**

Please find enclosing Union's Application and pre-filed evidence with respect to the above project.

Two hard copies of same will follow by courier.

Sincerely,

"original signed by"

Mary Jane Patrick,  
Administrative Analyst, Regulatory Projects  
:mjp  
Encl.

cc. Zorz Crnojacki, Project Advisor



## **ONTARIO ENERGY BOARD**

IN THE MATTER OF the Ontario Energy Board Act, 1998, S.O. 1998, c.15, Schedule B; and in particular sections 90, 36.1(1), 38(1) and 40(1) thereof.

AND IN THE MATTER OF an Application by Union Gas Limited for a regulation designating the area known as the Jacob Pool, in the Municipality of Chatham-Kent, as a gas storage area;

AND IN THE MATTER OF an Application by Union Gas Limited for authority to inject gas into, store gas in and remove gas from the Jacob Pool, and to enter into and upon the lands in the said area and use the said lands for such purposes;

AND IN THE MATTER OF an Application by Union Gas Limited to the Ministry of Natural Resources for licences to drill wells in the said area;

AND IN THE MATTER OF an Application by Union Gas Limited for leave to construct a natural gas pipeline and ancillary facilities in the Municipality of Chatham-Kent

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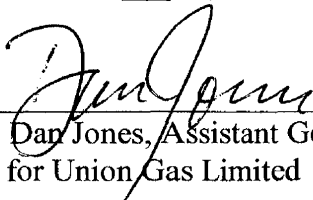
### **UNION GAS LIMITED**

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1. Union Gas Limited (the "Applicant") is seeking an Order designating as a gas storage area, the lands which contain the geological formation in the Municipality of Chatham-Kent, referred to as the Jacob Pool.
2. The Applicant is also applying for an Order for leave to construct approximately 4,712 metres of NPS 8 transmission pipeline and 1,829 metres of NPS 6 and 8 gathering pipelines.
3. The Applicant also applies to the Board pursuant to section 38(1) of the Act for an order granting the right to inject gas into, store gas in and remove gas from the Jacob Pool, and enter into and upon the lands in the area for such purposes.

4. Pursuant to section 40(1) of the Act, the Applicant seeks a favourable report from the Board to the Ministry of Natural Resources to which Union has applied for licences to drill three (3) injection/withdrawal wells within the proposed designated storage areas of the Jacob Pool.
5. Attached hereto as Schedule "A" is the description of the lands within the Jacob Pool for which designation is sought.
6. Attached hereto as Schedule "B" is a map showing the general location of the proposed designated storage areas for the Jacob Pool, the proposed gathering pipelines, and the proposed transmission pipelines.
7. In order to meet the proposed in-service date of August 3, 2012 for the Jacob Pool, the Applicant must order pipeline materials by August of 2011. The Applicant therefore applies to the Board for a timely approval of this Application.

Dated at the Municipality of Chatham-Kent, Ontario this 17<sup>th</sup> day of January, 2011.

  
Per: Dan Jones, Assistant General Counsel  
for Union Gas Limited

Comments respecting this Application should be directed to:

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Manager, Regulatory Projects & Lands Acquisition  
Union Gas Limited  
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## **SCHEDULE A**

ALL AND SINGULAR that certain parcel or tract of land in the Geographical Township of Dover, now in the Municipality of Chatham-Kent and being composed of part of Lots 4 and 5, Concession 5 and part of Lots 4, 5, 6 and 7, Concession 4, part of the road allowance between Lots 5 and 6, Concession 4 and part of the road allowance between Concession 4 and 5 all in the Geographical Township of Dover, now in the Municipality of Chatham-Kent, which said parcel may be more particularly described as follows...

COMMENCING at the north-westerly corner of Lot 4, Concession 4. Thence south-easterly along the line between Lots 3 and 4, on a bearing of south 41 degrees 20 minutes and 10 seconds east, a distance of 345.50 metres to the line between the north and south half of the north half of Lot 4, Concession 4;

THENCE north-easterly along the line between the north and south half of the north half of Lot 4 Concession 4, on a bearing of north 48 degrees 56 minutes and 30 second east, a distance of 618.92 metres to the line between Lots 4 and 5, Concession 4;

THENCE south-easterly along the line between Lots 4 and 5, Concession 4 on a bearing of south 41 degrees 41 minutes 40 seconds east, a distance of 346.83 metres to the line between the north and south half of Lot 5, Concession 4;

THENCE north-easterly along the line between the north and south half of Lot 5, Concession 4, on a bearing of north 48 degrees 18 minutes and 0 seconds east, a distance of 313.35 metres to the line between the east and west half of Lot 5, Concession 4;

THENCE south-easterly along the line between the east and west half of Lot 5, Concession 4 on a bearing of south 41 degrees 26 minutes 20 seconds east, a distance of 345.22 metres to the line between the north and south half of the south half of Lot 5, Concession 4;

THENCE north-easterly along the line between the north and south half of the south half of Lot 5, Concession 4, continuing across the road allowance between Lots 5 and 6, Concession 4, and continuing on the line between the north and south half of the south half of Lot 6, Concession 4, on a bearing of north 48 degrees 5 minutes and 50 seconds east, a distance of 646.84 metres to the line between the east and west half of Lot 6, Concession 4;

THENCE south-easterly along the line between the east and west half of Lot 6, Concession 4, on a bearing of south 41 degrees 59 minutes 30 seconds east, a distance of 345.42 metres to a point in the northerly limit of the road allowance between Concessions 3 and 4 being Pain Court Line;

THENCE north-easterly along the northerly limit of the road allowance between Concessions 3 and 4 being Pain Court Line on a bearing of north 48 degrees 17 minutes 40 seconds east, a distance of 952.84 metres to the south easterly corner of Lot 7, Concession 4;

THENCE north-westerly along the line between Lots 7 and 8, Concession 4, on a bearing of north 41 degrees 31 minutes and 30 seconds west, a distance of 677.36 metres to the line between the north and south half of Lot 7, Concession 4;

THENCE south-westerly along the line between the north and south half of Lot 7, Concession 4, on a bearing of south 48 degrees 50 minutes 10 seconds west, a distance of 315.83 metres to the line between the east and west half of Lot 7, Concession 4;

THENCE north-westerly along the line between the east and west half of Lot 7, Concession 4, on a bearing of north 41 degrees 31 minutes 30 seconds west, a distance of 342.04 metres to the line between the north and south half of the north half of Lot 7, Concession 4;

THENCE south-westerly along the line between the north and south half of the north half of Lot 7, Concession 4 and continuing on along the line between the north and south half of the north half of Lot 6, Concession 4, on a bearing of south 48 degrees 50 minutes 10 seconds west, a distance of 641.42 metres to the line between the east and west half of Lot 6, Concession 4;

THENCE north-westerly along the line between the east and west half of Lot 6, Concession 4, on a bearing of north 41 degrees 29 minutes 10 seconds west, a distance of 342.04 metres to the southerly limit of the road allowance between Concessions 4 and 5, being Maple Line.

THENCE south-westerly along the southerly limit of the road allowance between Concessions 4 and 5, being Maple Line, on a bearing of south 48 degrees 53 minutes 40 seconds west, a distance of 340.25 metres to a point in the southerly limit of said road allowance in the northerly limit of Lot 5, Concession 4;

THENCE north-westerly crossing the road allowance between Concessions 4 and 5, being Maple Line and continuing along the widened limit of the road allowance between Lots 5 and 6, Concession 5, on a bearing of north 40 degrees 17 minutes and 20 seconds west, a distance of 369.05 metres to a point in that widened limit to the line between the north and south half of the south half of Lot 5, Concession 5;

THENCE south-westerly along the line between the north and south half of the south half of Lot 5, Concession 5, on a bearing of south 48 degrees 59 minutes 50 seconds west, a distance of 298.41 metres to a point in the east and west half of Lot 5, Concession 5;

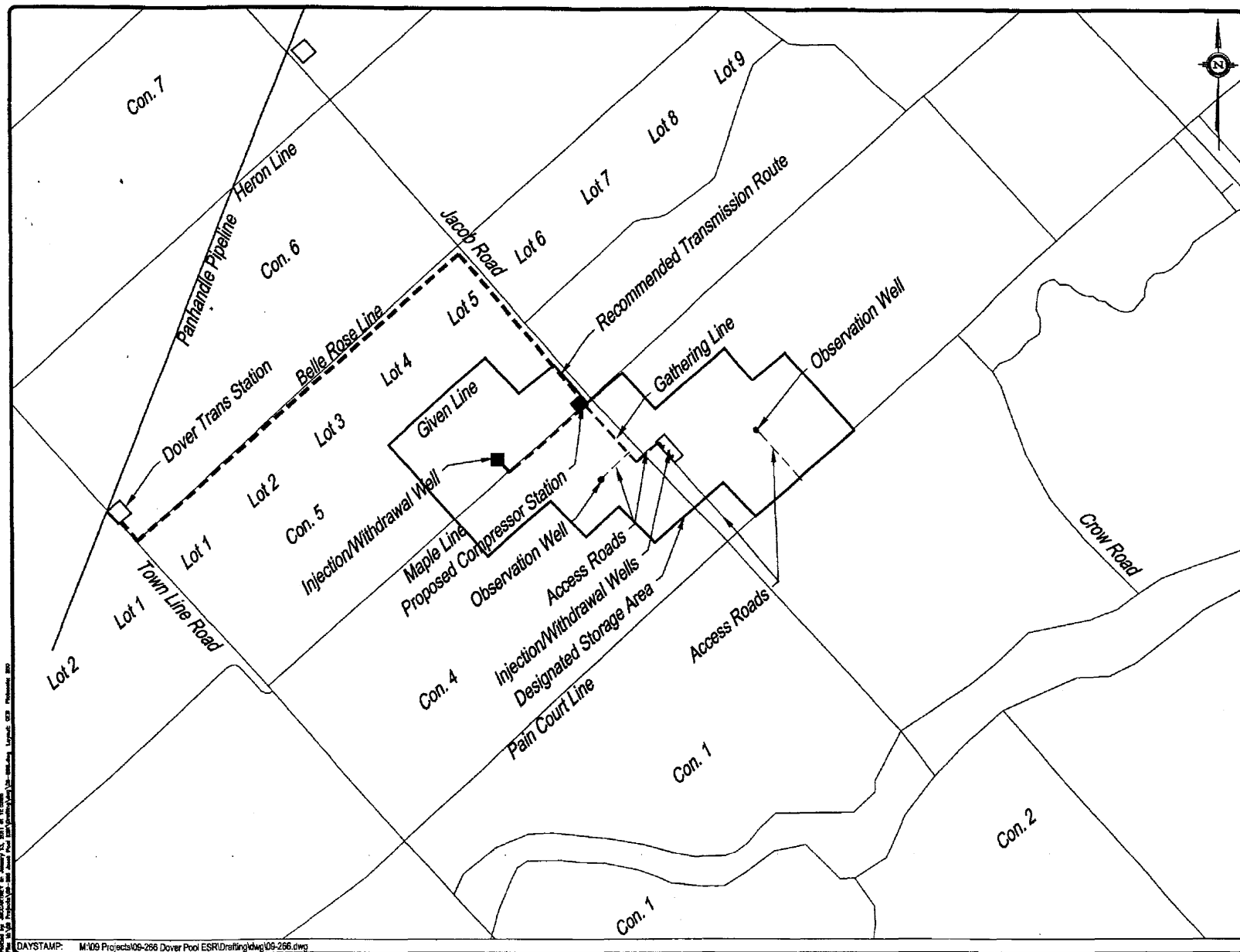
THENCE north-westerly along the line between the east and west half of Lot 5, Concession 5, on a bearing of north 41 degrees 1 minute 40 seconds west, a distance of 344.56 metres to a point in the southerly limit of Given Line;

THENCE south-westerly along the southerly limit of Given Line, on a bearing of south 48 degrees 59 minutes 50 seconds west, a distance of 921.90 metres to the line between Lots 3 and 4, Concession 5;

THENCE south-westerly along the line between Lots 3 and 4, Concession 5, on a bearing of south 41 degrees 10 minutes 10 seconds east, a distance of 694.92 metres to the south-west corner of Lot 4, Concession 5;

THENCE southerly crossing the road allowance between Concessions 4 and 5, being Maple Line, on a bearing of south 7 degrees 54 minutes 0 seconds west, a distance of 30.64 metres to the point of commencement.





LEGEND:

250m 0 750m  
HORIZONTAL SCALE 1:25,000

**AZIMUTH ENVIRONMENTAL CONSULTING, INC.**

**Proposed Facilities**

**Jacob Storage Pool Project**

|                            |            |
|----------------------------|------------|
| DATE ISSUED: November 2010 | Figure No. |
| CREATED BY: JLM            | X          |
| PROJECT NO.: 09-266        |            |
| REFERENCE: Union Gas       |            |

Schedule B

Plotted by: JLM on 11/12/2010 at 11:00am. Plot size: 11.00x17.00. Plot scale: 1:25,000. Plot title: Jacob Storage Pool Project. Plot path: M:\09 Projects\09-266 Jacob Storage Pool\ESR\Drafting\dwg\09-266.dwg. Plot date: 11/12/2010. Plot time: 11:00am.

DAYSTAMP: M:\09 Projects\09-266 Jacob Storage Pool\ESR\Drafting\dwg\09-266.dwg







**March 15, 2011**

**NOTATION:** The application and pre-filed evidence on public record were modified so that any personal (i.e. not business) contact information (i.e. the address, fax number, phone number and email address of the individuals) are not included in the public record. Accordingly the Schedules as noted below and marked with an “X” have been made confidential.

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## **SECTION 1**

### **PROJECT SUMMARY**

1. The Jacob Pool (“Jacob Pool”) will add an additional 2.45 Bcf of storage capacity to Union Gas Limited’s (“Union”) integrated storage system.
2. The proposed facilities include:
  - a) One new single leg horizontal injection/withdrawal ("I/W") well;
  - b) One new horizontal multilateral I/W well with two legs;
  - c) Converting the existing stratigraphic test well drilled in 2010 to an I/W well;
  - d) Converting one existing well to an I/W well;
  - e) Converting two existing wells to observation wells;
  - f) 4,712 metres of NPS 8 transmission pipeline from the existing Dover Transmission Station to the Jacob Pool compressor station;
  - g) 1,829 metres of NPS 6 and NPS 8 gathering pipelines to transport natural gas from the new compressor station to the I/W wells that will be used to inject and withdraw natural gas; and,
  - h) Modifications at the existing Dover Transmission Station to tie into the Panhandle system and a new compressor and metering station at the corner of Maple Line and Jacob Road.
3. Union will be the owner, operator and developer of the Jacob Pool and related storage facilities.
4. Union is seeking an Order designating as a gas storage area, the lands which contain the geological formation in the Municipality of Chatham-Kent, referred to as the Jacob Pool. Union is seeking an Order from the Board granting the right to inject gas into, store gas in and remove gas from the Jacob Pool

5. Union is also applying to the Board for leave to construct approximately 4,712 metres of NPS 8 transmission pipeline and 1,829 metres of NPS 6 and 8 gathering pipelines.
6. Union is also requesting that the Board issue a favourable report to the Minister of Natural Resources to enable the Minister to issue licenses to drill a total of three natural gas storage wells within the lands that comprise the Jacob Pool. Union has applied to the Ministry of Natural Resources ("MNR") for these licenses.
7. An Environmental Report ("ER") has been prepared for the proposed facilities. The ER will be provided to the Ontario Pipeline Coordination Committee ("OPCC"), local municipalities, the St. Clair Region Conservation Authority, local First Nations and Metis. Directly affected landowners received a copy of the Executive Summary of the ER and will be provided with a copy of the ER upon request. The ER outlines a number of environmental mitigation measures that, in conjunction with Union's standard pipeline construction and well drilling specifications, will allow construction of the proposed facilities with minimal impact to the environment.
8. Operation of the Jacob Pool is scheduled to begin no later than August 3, 2012. In order to meet this in-service date, Union plans to order well casing, wellhead and gathering pipeline materials in November, 2011. Union plans to order pipeline materials from August 22, 2011 to February 17, 2012. Well drilling is scheduled to begin on January 9, 2012 and Union plans to commence construction of the pipelines by April 27, 2012.
9. In order to meet this construction timetable, a Board Decision and a favourable report to the Minister of Natural Resources by August 1, 2011 is respectfully requested.



## SECTION 2

### NEED FOR FACILITIES

1. Union believes that storage expansion is necessary to efficiently serve growing natural gas demand in the Ontario, eastern Canadian and U.S. Northeast markets, and that the long term demand for storage exceeds the available supply.
2. A number of authorities have identified the need to develop additional storage<sup>1</sup>.
  - The National Energy Board<sup>2</sup> identified several factors supporting the need for more storage, including growing needs for gas fired power generation, and balancing LNG deliveries (primarily due to LNG arriving in North America in the summer).
  - The Federal Energy Regulatory Commission noted that natural gas storage expansion will act to reduce price volatility and assure that peak demand can be met<sup>3</sup> and
  - The Interstate Natural Gas Association of America noted that a significant increase in the amount of gas storage capacity will be required to meet growing peak month demand and the need for high deliverability storage to serve the requirements of power generation.<sup>4</sup>
3. During its Natural Gas Market Review, the Boards study concluded that by 2020, the power sector is projected to make up nearly one-third of the total Ontario demand.<sup>5</sup> Ontario storage will continue to provide daily balancing services to manage swing load requirements for power generation.
4. The Board has previously recognized the value of Ontario storage. In its Natural Gas Electricity Interface Review decision the Board stated that the further development of

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<sup>1</sup> NGEIR Decision, at p. 48.

<sup>2</sup> National Supply & Demand Scenarios: Putting Gas Storage Into Context, NEB Presentation, Sheila Leggett, Vice-Chair National Energy Board, October 1, 2008 as posted at <http://www.neb-one.gc.ca/clf-nsi/rpblctn/spchsndprsntrn/spchsndprsntrn2008-eng.html>

<sup>3</sup> Rate Regulation of Certain Underground Storage Facilities, "Notice of Proposed Rulemaking", FERC Stats. & Regs. 113 FERC\*\*61,306 (2005), pp. 7-10; and Rate Regulation of Certain Underground Storage Facilities, Final Rule, Order No. 678, 115 FERC\*\*61,343 (June 19, 2006), at pp. 5 and 6.

<sup>4</sup> Pipeline and Storage Infrastructure for a 30 Tcf Market, Interstate Natural Gas Association of America, January 2002, at p 43.

<sup>5</sup> 2010 Natural Gas Market Review, ICF International, August 18, 2010, p. 8.

storage would benefit Ontario consumers in terms of reduced price volatility, enhanced security of supply and an overall enhanced competitive market at Dawn.<sup>6</sup>

5. Union Gas believes that demand for storage in the geographic region of Michigan, and parts of Illinois, Indiana, New York, Pennsylvania and Ontario will continue to grow for the foreseeable future and views Dawn, to be well positioned to meet future storage demand.
6. Union Gas will manage the sale of the storage capacity and deliverability created by the completion of the Jacob Pool consistent with the sale of the rest of Union's ex-franchise storage. This incremental capacity and deliverability will be integrated into the overall Union Gas storage portfolio. Storage services will be marketed through either: i) open season; ii) direct negotiation with a customer; and/or iii) through response to a request for proposal initiated by a customer. Contracts for storage in the Jacob Pool will comply with applicable sections of the Storage and Transportation Access Rule.
7. Union Gas is confident that storage will remain a strategic asset in Ontario and that there will be sufficient market demand for the storage services created by the development of the Jacob Pool. Union believes that the facilities proposed and the designation of the lands sought is therefore in the public interest and should proceed as proposed.

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<sup>6</sup> NGEIR Decision, at p. 50.





### SECTION 3

#### GEOLOGY AND RESERVOIR ENGINEERING

1. The Jacob Pool is a depleted natural gas reservoir located in the municipality of Chatham-Kent, north of the Thames River and 10 kilometers west of Chatham, Ontario (Figure 1).

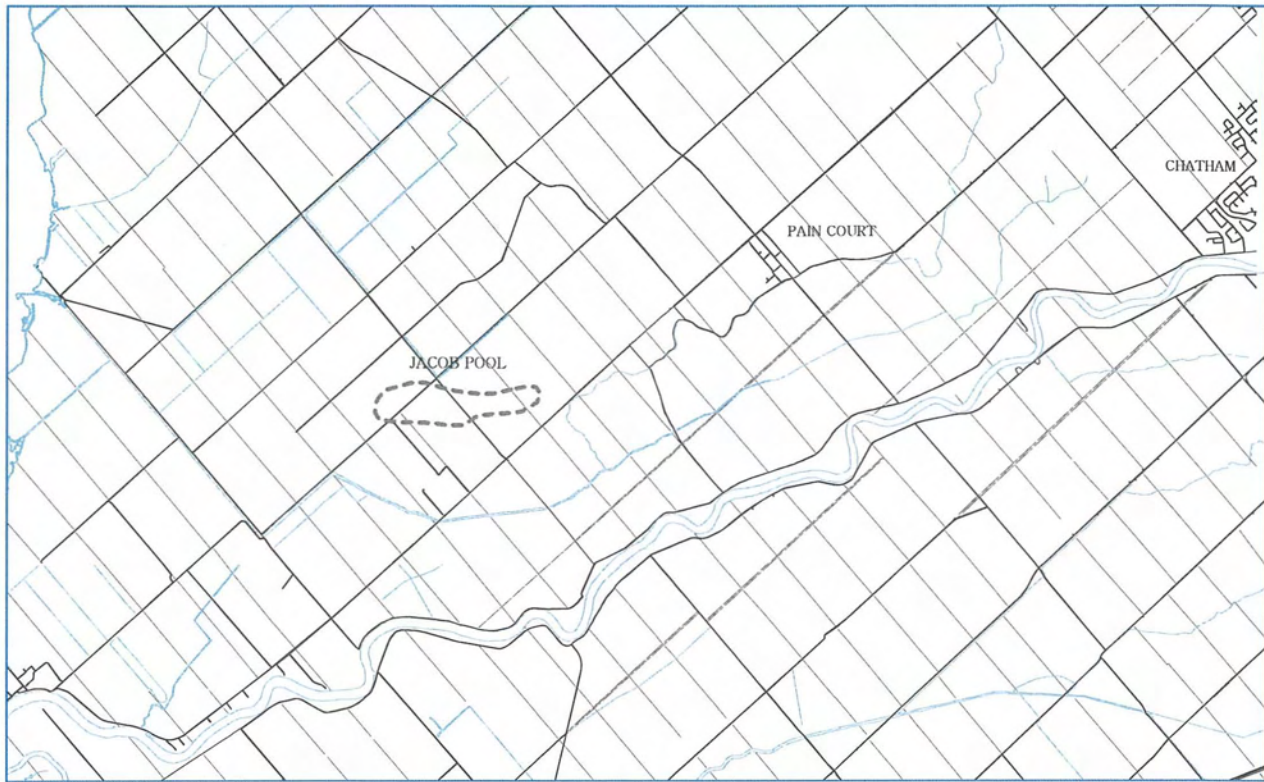


Figure 1: General location map of the Jacob Pool

2. The Jacob Pool is the largest gas reservoir within the Dover 7-5-VE Field (Section 3 - Schedule 1). The Dover 7-5-VE Field is a series of seven Ordovician Trenton Group reservoirs created by hydrothermal dolomitization along East-West trending fault blocks. The reservoirs are narrow, heterogeneous and elongate along fault trends. The field was discovered in 1983 by E.P. Rowe Oil Limited.
3. During the development of the Dover 7-5-VE Field numerous wells targeting both Trenton and Black River Group reservoirs were drilled. The Trenton and Black River Group reservoirs are not connected vertically and overlie one another spatially (Section 3 - Schedule 2). Liberty Oil and

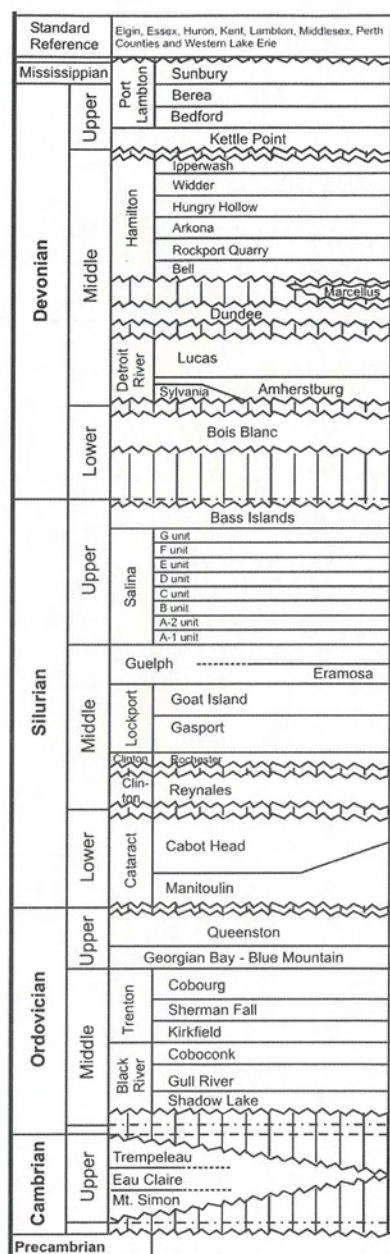


Figure 2: Stratigraphic column for the subsurface of south-western Ontario (modified after Winder and Sanford 1972)

Gas ("Liberty") operates several active wells through and around the proposed Jacob storage pool that produce both oil and/or gas from the Black River Group. Once the Jacob Pool is converted to natural gas storage, Liberty will continue to produce hydrocarbons from the Black River Group.

4. The Middle Ordovician rocks in the sub-surface of south-western Ontario are a succession of shallow-water marine carbonates subdivided into the Trenton Group and the Black River Group (Figure 2). These rocks were deposited during a regional marine transgression on a shallowly dipping ramp.

5. The Black River Group ranges in thickness to over 150 metres and is located below the targeted storage zone within the Trenton Group. It is comprised of the Shadow Lake, Gull River and Coboconk Formations. The Shadow Lake Formation is a relatively thin unit composed of siliclastic rocks. The Gull River Formation overlies the Shadow Lake and represents the onset of shallow water carbonate deposition. It is typically a fine grained light grey to brown limestone which may be slightly argillaceous or dolomitic. The Coboconk overlies the Gull River and consists of light brown fossiliferous limestone with varying amounts of argillaceous content.

6. Moving up through the sequence, the Trenton Group (targeted storage zone) ranges to over 170 metres thick and is comprised of the Kirkfield, Sherman Fall, and Cobourg Formations. The onset of deposition of Trenton sediments is characterized by an abrupt deepening of water on the carbonate ramp. The Kirkfield Formation consists of bedded fossiliferous limestones with shaly partings. The Sherman Fall

Formation is composed of a lower shaly limestone unit and an upper bioclastic/fragmental limestone unit. The Cobourg Formation overlies the Sherman Fall and is composed of argillaceous light to medium blue/grey/brown limestone.



7. Regionally, the limestones of the Trenton and Black River Groups are not significant producers of oil, natural gas or water unless altered to dolomite. Dolomitization of these limestones occurred when hot basinal brines migrated through the regionally porous Cambrian sandstones and upwards into Trenton and Black River through faults and fractures. This hydrothermal fluid has altered the limestone and locally replaced it with dolomite. The process of dolomitization created porosity and permeability in the rock which forms the reservoirs that subsequently trapped oil and natural gas. Based on the nature of creation of these reservoirs, the distribution of dolomite and porosity is extremely heterogeneous. The most pervasive dolomitization is typically developed in the fragmental portion of the Sherman Fall since it contained more primary porosity than other formations. These reservoirs are vertically confined beneath thick non-porous shales of the Blue Mountain Formation and laterally confined by non-porous limestone. Figure 3 is a model showing the spatial distribution of reservoir rock created by hydrothermal dolomitization.

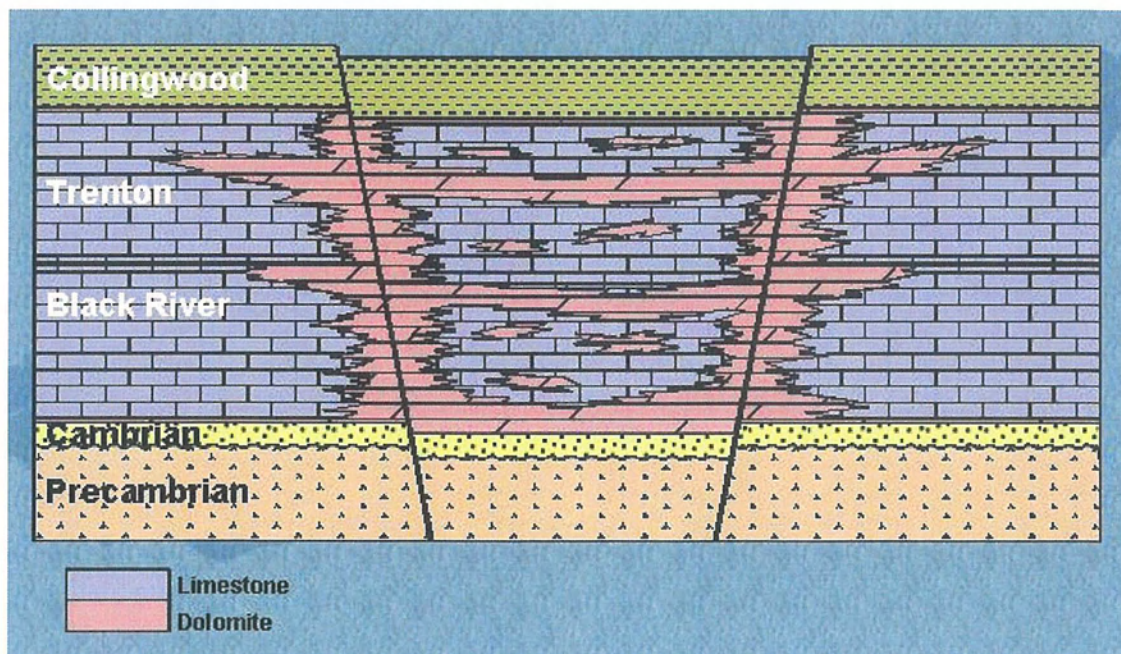


Figure 3: Hydrothermal dolomitization model (Coulter and Waugh, 2002)

### Reservoir Description

8. The Jacob Pool is a hydrothermal dolomite reservoir that produced gas from the Middle Ordovician aged carbonates of the Trenton Group. The geometry and internal characteristics of

the Jacob Pool and surrounding formations were interpreted from the 3D seismic survey, 2D seismic lines and well data. The resulting structural map for the top of the Trenton Group is illustrated in Section 3 - Schedule 3. The Jacob Pool reservoir is approximately two kilometres long and 250 - 525 metres in width. The reservoir is confined by faults to the north and south whereas the west and east boundaries are defined by the transition to the regional non-porous limestone.

9. Section 3 - Schedule 4 contains a cross section through the reservoir. The cross section illustrates the dolomitization within the Trenton and Black River Groups. The Trenton Group, including all three formations, is the targeted storage zone for the Jacob Pool. The sequence is 115 metres thick. The Sherman Fall Formation tends to be preferentially dolomitized however reservoir quality rocks may be present throughout the entire Trenton section. Porosity and permeability are extremely variable within the reservoir. Dolomitization decreases away from the faults and the regionally non-porous unaltered carbonate rocks of the Trenton Group provide the lateral seals for the reservoir. The caprock is comprised of the Queenston and Blue Mountain shales overlying the Trenton Group which provide a thick (>225m) impermeable vertical seal to hydrocarbon migration. The shaly limestones at the bottom of the Kirkfield Formation isolate the Trenton Group from the underlying hydrocarbon producing Black River Group. There is no evidence that the Jacob Pool is in communication with the Black River Group below or with adjacent reservoirs in the Trenton Group.

### **Exploration and Development History**

10. E.P. Rowe Oil Limited discovered the Dover 7-5-VE Field in February 1983 with the drilling of the Rowe Ram #1 ("RR1") well. The well encountered oil shows in the Coboconk Formation (Black River Group) but was uneconomical to produce.
11. The Jacob Pool was discovered in May 1985 with the drilling of Rowe Ram 9 ("RR9"). The well was drilled to a total depth of 1163.0 metres into the PreCambrian Formation. There were gas shows in both the Sherman Fall (Trenton) and Coboconk (Black River) formations but no gas pressures were recorded. The well was originally completed as a Black River gas producer. It produced  $301 \times 10^3 \text{ m}^3$  of gas before being converted to a Trenton gas producer in 1988. During this



conversion, the well was plugged back to a depth of 987.0 metres and subsequently produced 9,348  $10^3\text{m}^3$  of gas. Production ceased in 1999 and the well was converted to a Trenton observation well in 2008.

12. Between 1988 and 1992, an additional three Trenton gas wells were drilled into the Jacob Pool. The PPC #14 ("PPC14") well was drilled in January 1988 to a total depth of 1159.2 metres in the PreCambrian Formation. The well was completed as a Trenton gas producer and produced a total of 16,341  $10^3\text{m}^3$ . The well ceased production in 1999 and was abandoned in May 2002 in accordance with Provincial Operating Standards.
13. PPC/Ram 34 ("PPCR34") was drilled in August 1991 to a total depth of 1078.0 metres in the Gull River Formation (Black River). The well was completed as a Trenton gas producer and has produced a total of 40,000  $10^3\text{m}^3$ .
14. PPC/Ram 39 ("PPCR39") was drilled in May 1992 to a total depth of 1091.0 metres in the Gull River Formation. It produced a total of 383  $10^3\text{m}^3$  from the Trenton. The well was abandoned in June 2002 in accordance with Provincial Operating Standards.
15. In addition to the above, several active wells through and around the proposed Jacob storage pool produce both oil and/or gas from the Black River Group. The wells that are within the reservoir boundary for the Jacob Pool are PPC/Ram 31 ("PPCR31"), Rowe/Ram #8A ("RR8A") and VRI #5 ("VRI5"). The wells that are outside of the Jacob Pool but fall within the proposed Designated Storage Area (DSA) are PPC15 and Rowe/Ram # 4 ("RR4").
16. The location of each well is shown in Section 3 – Schedule 5. Well information and schematics for each well are included in Section 3 - Schedule 6.
17. A 5.2  $\text{km}^2$  3D seismic survey was acquired in 1991. The Jacob Pool is covered by the 3D survey. The 3D seismic survey was a Megabin design with a bin size of 15 metres by 30 metres. The source was 25 grams of dynamite per hole set at approximately 4.5 metres below surface. Source lines and receiver lines ran SW-NE and were set 120 metres apart. Shot intervals were 70 metres along each line and receiver interval was 30 metres. Multiple 2D seismic lines were reprocessed and incorporated into the final interpretation of the seismic data. A seismic coverage map is

included as Section 3 - Schedule 7. Boyd PetroSearch of Calgary completed the interpretation of the seismic data.

18. In August 2010, Union drilled a horizontal stratigraphic test well to evaluate the reservoir for potential conversion to storage. Pain Court 1 (Horiz. #1) ("PC1") was drilled to a total measured depth of 1903.0 metres (925.3 metres TVD). A caprock core was retrieved from the lower portion of the Blue Mountain from 903.0 to 911.6 metres measured depth. Results from this well were used to refine the geological and geophysical interpretations. Well information and a schematic of PC1 are included in Section 3 - Schedule 8.
19. The Blue Mountain shale is a thick (130 - 140 metres over the Jacob Pool) and competent formation providing excellent sealing properties. However, due to the fissile nature of the caprock, core samples removed during drilling operations have a tendency to break up along the natural bedding planes. As a result a limited number of test samples were available for testing. Three samples were extracted from the core to measure the permeability and threshold pressures. The permeability ranged from 0.0004 mD to 0.0066 mD. The threshold pressure ranged from 439 kPa to 1543 kPa. The test results (Section 3 – Schedule 9) for two of the three samples tested are believed to have been adversely affected by poor sample quality.
20. The tests results were reviewed with the Ministry of Natural Resources on December 8, 2010. At the Ministry's recommendation Union reviewed other publically available studies conducted for Ontario Power Generation ("OPG") dated November 30, 2008.<sup>5</sup> Testing conducted for OPG was done to evaluate the construction of a deep geologic repository for radioactive waste at the Bruce site in Southwestern Ontario. The project included: testing, model development, and the completion of several publicly available studies covering the geology of the region. Hydraulic testing was performed as part of these studies on two wells at the Bruce site to determine the hydraulic conductivity (K) coefficient of the underlying formations, including the Blue Mountain shale. The results of the OPG study indicate that the Blue Mountain shale has a hydraulic conductivity value of less than  $1.0 \times 10^{-11}$  m/s. These tests demonstrate that the Blue Mountain Shale provides an excellent caprock seal above the Jacob Pool.

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<sup>5</sup> OPG's Deep Geologic Repository for Low & Intermediate level Waste – Supporting Technical Report – Phase I Regional Hydrogeochemistry, Southern Ontario November 30, 2008 Prepared by M.Y. Hoobs, S.K. Frappe, O. Shouakar-Stash, L.R. Kennel, Ontario Power Generation, Department of Earth and Environmental Science, University of Waterloo



### **Reservoir Deliverability**

21. A transient pressure test was completed on well PPCR34 by Eastern Reservoir Services in June 1990. The well test consisted of a modified isochronal test followed by an extended buildup. The test results were used to calculate a permeability of 38 millidarcies and an absolute open flow (“AOF”) of  $105 \times 10^3 \text{m}^3$  per day. The results of the deliverability test indicate that the well is suitable for conversion to an I/W well.
22. A transient pressure test was completed by Genco Engineering in June 1990 on the RR9 well. The test results calculated a permeability of 6.2 millidarcies and an AOF of  $3 \times 10^3 \text{m}^3$  per day. The deliverability of RR9 is not suitable for an I/W well and it will be converted to an observation well.
23. Due to the large variation in deliverability across the pool, a stratigraphic test well was drilled to further evaluate the potential deliverability, refine the seismic interpretation, and identify the porosity target zones within the reservoir. During the drilling of PC1, high fluid losses indicative of high permeability were encountered starting at 1793 mKB. Results from the PC1 well drilling supports the deliverability potential and that the proposed I/W wells will be able to cycle the entire working inventory on an annual basis.

### **Designated Storage Area**

24. The proposed DSA for the Jacob Pool comprises 273 hectares (675 acres) in Dover Township, Kent County. Section 3 – Schedule 10 shows the reservoir outline and the boundary of the proposed DSA in relation to the MNR drilling tracts. The 3D seismic survey and well control to the north, west and south of the pool assisted with determining reservoir boundaries. Since there is no well control to the east of the reservoir, additional 2D seismic lines were reprocessed Section 3 – Schedule 7 and interpreted to confirm the reservoir extents beyond the edge of the 3D seismic survey.
25. The proposed DSA boundary is larger than the existing Unit Agreement. Additional lands to the north, south, east and west were included in the proposed DSA to adequately protect the storage reservoir. These lands are identified on Section 3 - Schedule 11. Distances from the reservoir



boundary to the proposed DSA are shown in Section 3 - Schedule 10. The proposed DSA was discussed and confirmed with MNR staff on December 8<sup>th</sup>, 2010. MNR review and acceptance of the proposed DSA is included in Section 3 - Schedule 12.

### Original Gas In Place

26. The original gas in place (“OGIP”) of the Jacob Pool was determined using historical pressure versus cumulative production technique. A total of 66,745  $10^3\text{m}^3$  of gas was produced from PPCR34, PPCR14, RR9 and PPCR39. A table of the gas production and pressure history is included as Section 3 - Schedule 13.
27. The OGIP was determined using the discovery pressure of 8,026 kPaa bottom hole recorded from PPCR14 in January 1988 and a depleted reservoir pressure of 280 kPaa recorded from well PPCR34 in November 2009. The OGIP was established at 68,130  $10^3\text{m}^3$  as shown in Schedule 3 - Schedule 14. The remaining gas in place is estimated at 1,385  $10^3\text{m}^3$ .

### Storage Inventory

28. In the first year of operation, Union is proposing to operate the Jacob Pool to 9,150 kPaa bottom hole. This equates to a pressure gradient of 10.55 kPaa/m. In the second year, the maximum operating pressure will be increased to 10,280 kPaa bottom hole or 11.85 kPaa/m. Union will operate the Jacob Pool at a cushion pressure of 2,170 kPaa. A summary of the estimated storage inventories are shown in Table 1.

| Inventory ( $10^3\text{m}^3$ ) | Year 1 | Year 2 |
|--------------------------------|--------|--------|
| Cushion                        | 15,200 | 15,200 |
| Working                        | 58,800 | 69,400 |
| Total                          | 74,000 | 84,700 |

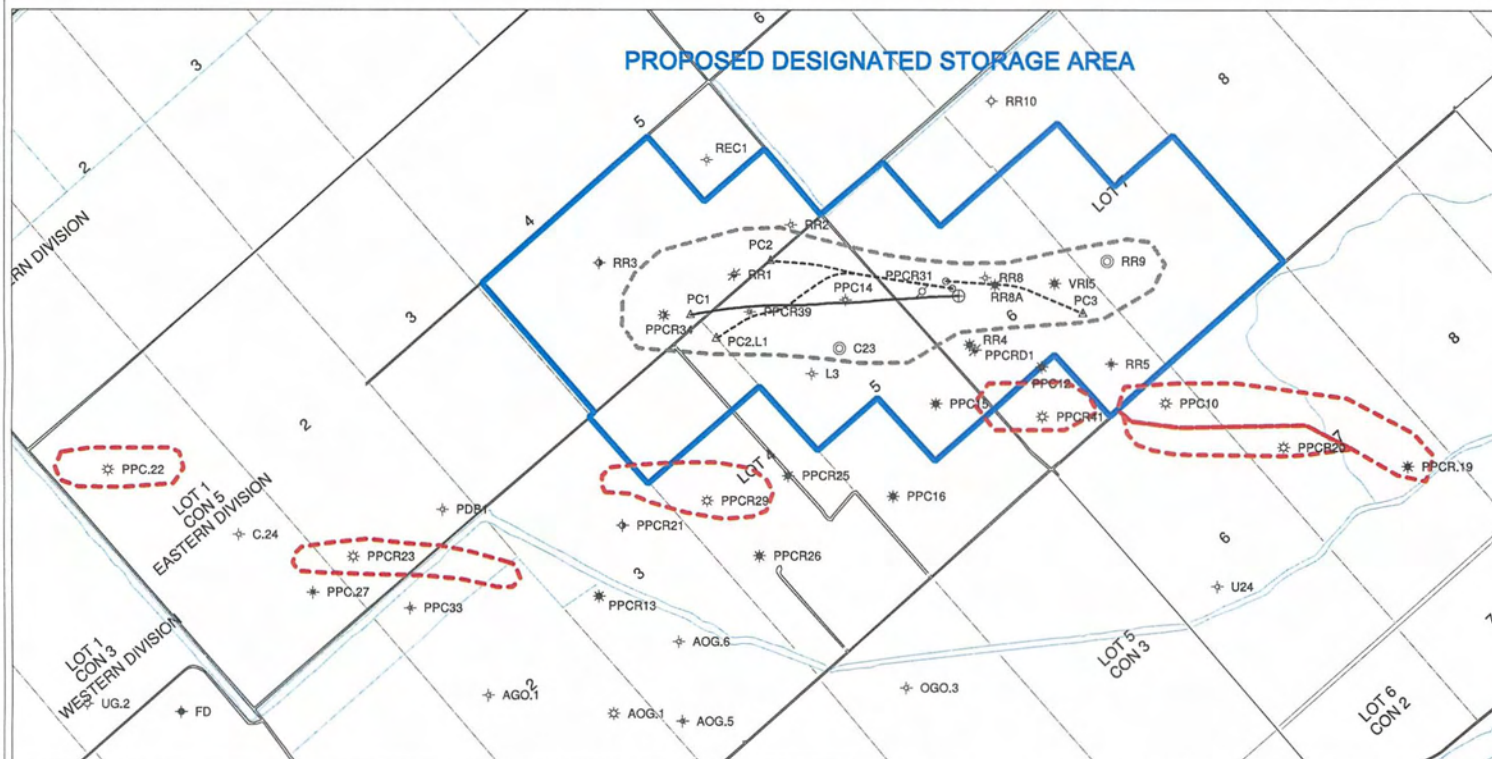
Table 1: Estimated Storage Inventories

### **Assessment of Neighbouring Activities**

29. An assessment of neighbouring activities within one kilometre and 5 kilometres of the Jacob Pool was conducted to comply with Clause 7.2 of CSA Z341.1-10 and has been submitted to the MNR. The assessment includes an evaluation of existing or abandoned wells within a 1 kilometre radius of the subsurface perimeter of the storage zone, including activities such as fracture treatments that took place within the wells; existing subsurface operations within a 5 kilometre radius of the proposed storage scheme; including their purpose, mode of operation, and minimum and maximum operating pressures; and the integrity of any existing well that penetrates the storage zone, including casing, cement, and the hydraulic isolation of the storage zone from any overlying porous zones.
30. The Jacob Pool reservoir has excellent containment properties and will be protected by an approved DSA. The wells and facilities will be designed, constructed, operated, maintained and abandoned in accordance with CSA Z341.1-10 Storage of Hydrocarbons in Underground Formations and in accordance with the *Oil, Gas and Salt Resources Act*, its regulations and Provincial Operating Standards. The technical information reviewed indicates that there is minimal risk with respect to the potential migration of natural gas between any known existing or abandoned wells within 1 km, or any existing subsurface operations within 5 km of the Jacob Pool. All existing wells that are completed within the Trenton Group in the storage zone will be utilized for the Project.



 BRINE DISPOSAL, ABANDONED  
 DRY HOLE, ABANDONED  
 GAS PRODUCER  
 GAS PRODUCER, ABANDONED  
 GAS PRODUCER, OIL SHOW  
 GAS PRODUCER, OIL SHOW, ABANDONED  
 GAS SHOW, ABANDONED  
 INJECTION WELL  
  
 PROPOSED HORIZONTAL WELL  
  
 HORIZONTAL WELL  
  
 OBSERVATION  
 OIL PRODUCER, GAS PRODUCER  
 OIL PRODUCER, GAS PRODUCER, ABANDONED  
 OIL SHOW, GAS SHOW, ABANDONED  
 OIL SHOW, ABANDONED  
 STRATIGRAPHIC TEST WELL  
  
 JACOB POOL BOUNDARY  
 DOVER 7-5-VE GAS RESERVOIRS













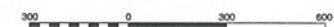


# JACOB POOL TRENTON STRUCTURE MAP

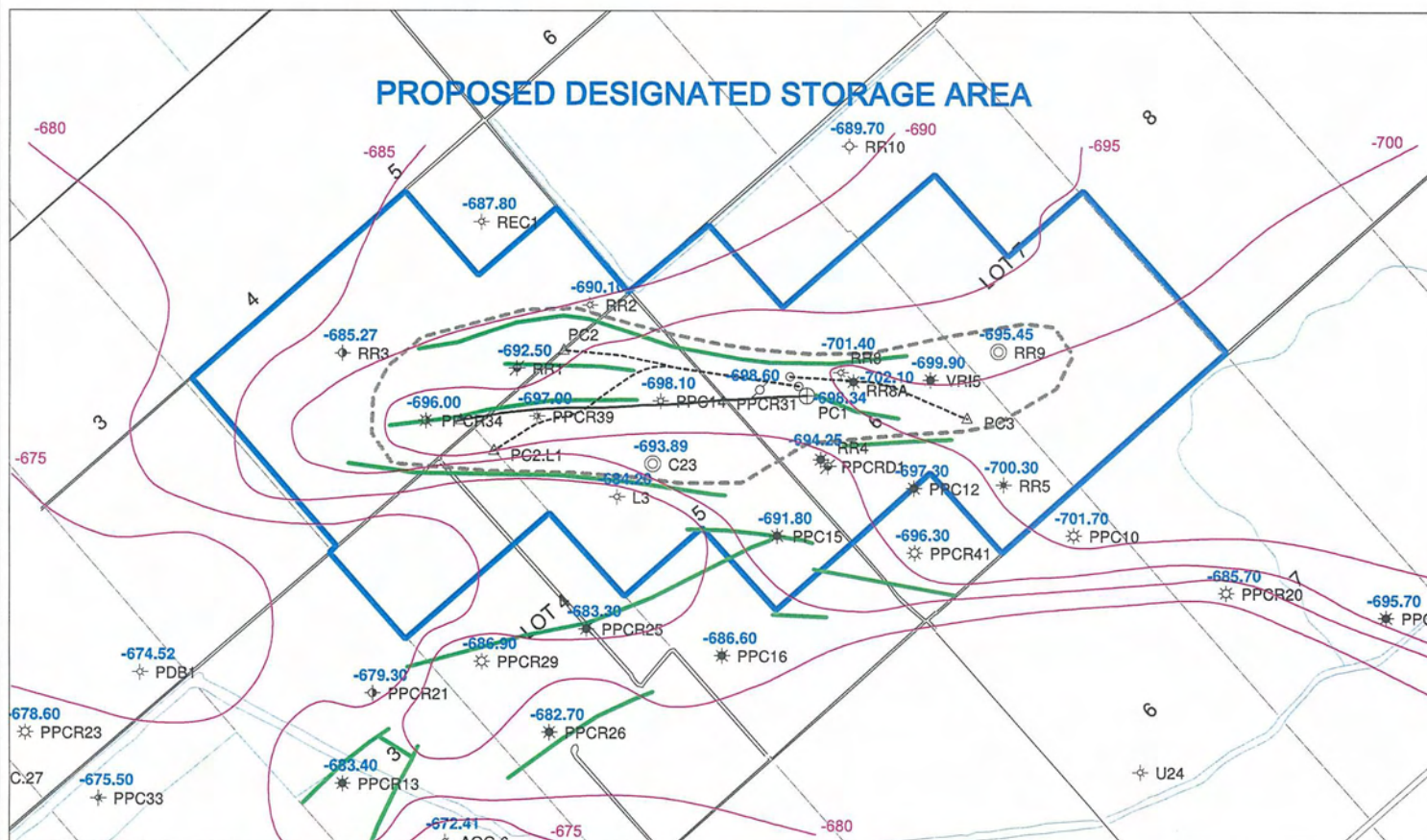
## LEGEND

- BRINE DISPOSAL, ABANDONED
- DRY HOLE, ABANDONED
- GAS PRODUCER
- GAS PRODUCER, ABANDONED
- GAS PRODUCER, OIL SHOW
- GAS PRODUCER, OIL SHOW, ABANDONED
- GAS SHOW, ABANDONED
- INJECTION WELL
- PROPOSED HORIZONTAL WELL
- HORIZONTAL WELL
- OBSERVATION
- OIL PRODUCER, GAS PRODUCER
- OIL PRODUCER, GAS PRODUCER, ABANDONED
- OIL SHOW, GAS SHOW, ABANDONED
- OIL SHOW, ABANDONED
- STRATIGRAPHIC TEST WELL
- CONTOUR INTERVAL - 5 METRES
- TRENTON FAULTS
- JACOB POOL BOUNDARY

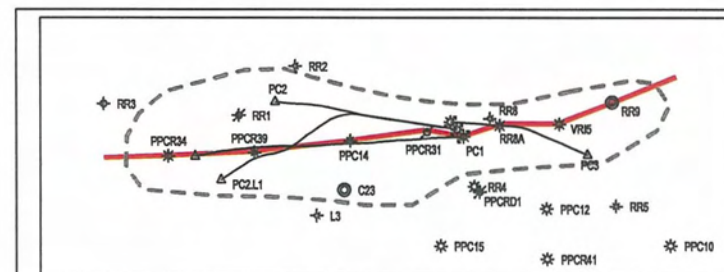
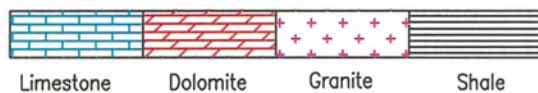
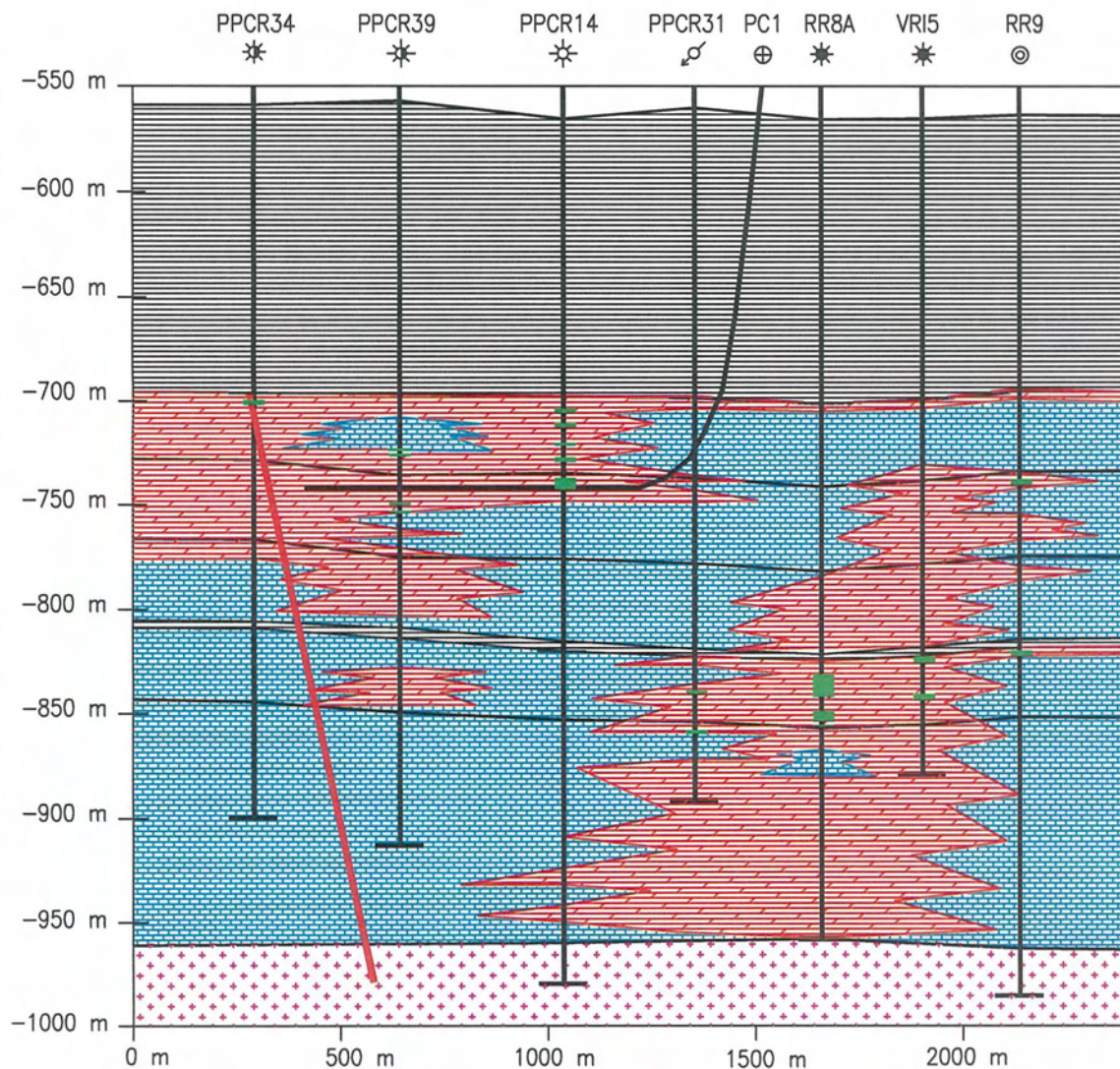
## SCALE



## PROPOSED DESIGNATED STORAGE AREA







KEY PLAN

BLUE MOUNTAIN

COBOURG

SHERMAN FALL

TRENTON GROUP

KIRKFIELD

COBOCONK

GULL RIVER

BLACK RIVER GROUP

SHADOW LAKE  
CAMBRIAN  
PRECAMBRIAN

# LEGEND

- \* GAS PRODUCER, ABANDONED
- \* GAS PRODUCER, OIL SHOW
- \* GAS PRODUCER, OIL SHOW, ABANDONED
- \* INJECTION
- \* OIL PRODUCER, GAS PRODUCER
- ⊙ OBSERVATION
- ⊕ STRATIGRAPHIC TEST
- FAULT
- PERFORATED ZONE

## REMARKS

5x Vertical Exaggeration

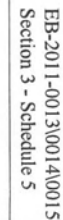
Shadow Lake and Cambrian are too thin to be seen on cross section

JACOB POOL  
CROSS SECTION

EB-2011-0013\0014\0015  
Section 3 - Schedule 4









**WELL TICKET**

|             |                         |               |            |
|-------------|-------------------------|---------------|------------|
| WELL ID:    | 4039                    | SPUD DATE:    | 1982-11-30 |
| WELL NAME:  | ROWE RAM 1 DOVER 7-5-VE | COMPLETED:    | 1983-02-08 |
| SHORT NAME: | RR1                     | SURFACE ELEV: | 175.00 m   |
| COUNTY:     | KENT                    | KB ELEV:      | 176.50 m   |
| TOWNSHIP:   | DOVER                   | TD:           | 1028.00 m  |
| TRACT:      | 7                       | WELL STATUS:  | BD-ABD     |
| LOT:        | 5                       |               |            |
| CONC:       | VE                      |               |            |
| OPERATOR:   |                         | LATITUDE:     | 42.37565   |
| PERMIT:     | T006059                 | LONGITUDE:    | -82.35207  |

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TVD (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 1.50             | 1.50           | 175.00         | GEOBASE       |
| HAMILTON         | 30.00            | 30.00          | 146.50         | GEOBASE       |
| DUNDEE           | 84.00            | 84.00          | 92.50          | GEOBASE       |
| LUCAS            | 122.00           | 122.00         | 54.50          | GEOBASE       |
| AMHERBRG         | 177.00           | 177.00         | -0.50          | GEOBASE       |
| BOISBLAC         | 220.00           | 220.00         | -43.50         | GEOBASE       |
| BASSISLD         | 257.30           | 257.30         | -80.80         | GEOBASE       |
| GSHALE           | 304.70           | 304.70         | -128.20        | GEOBASE       |
| FSHALE           | 311.70           | 311.70         | -135.20        | GEOBASE       |
| ECARB            | 340.00           | 340.00         | -163.50        | GEOBASE       |
| CSHALE           | 387.60           | 387.60         | -211.10        | GEOBASE       |
| BMARKER          | 401.60           | 401.60         | -225.10        | GEOBASE       |
| BSALT            | 419.00           | 419.00         | -242.50        | GEOBASE       |
| BANHY            | 454.70           | 454.70         | -278.20        | GEOBASE       |
| A2CARB           | 458.20           | 458.20         | -281.70        | GEOBASE       |
| A2ANHY           | 488.20           | 488.20         | -311.70        | GEOBASE       |
| A1CARB           | 490.80           | 490.80         | -314.30        | GEOBASE       |
| GUELPH           | 503.00           | 503.00         | -326.50        | GEOBASE       |
| GOATISL          | 527.00           | 527.00         | -350.50        | GEOBASE       |
| GASPORT          | 574.40           | 574.40         | -397.90        | GEOBASE       |
| ROCHESTR         | 589.00           | 589.00         | -412.50        | GEOBASE       |
| REYNALES         | 595.00           | 595.00         | -418.50        | GEOBASE       |
| CABTHEAD         | 597.30           | 597.30         | -420.80        | GEOBASE       |
| MANITOUL         | 631.00           | 631.00         | -454.50        | GEOBASE       |
| QUEENSTN         | 643.80           | 643.80         | -467.30        | GEOBASE       |
| BLUEMTN          | 742.00           | 742.00         | -565.50        | GEOBASE       |
| COBOURG          | 869.00           | 869.00         | -692.50        | GEOBASE       |
| SHERMANFALL      | 907.00           | 907.00         | -730.50        | GEOBASE       |
| KIRKFLD          | 949.50           | 949.50         | -773.00        | GEOBASE       |
| COBOCONK         | 994.00           | 994.00         | -817.50        | GEOBASE       |
| GULLRIVR         | 1,007.40         | 1,007.40       | -830.90        | GEOBASE       |
| FTD              | 1,028.00         | 1,028.00       | -851.50        | GEOBASE       |

END OF WELL TICKET

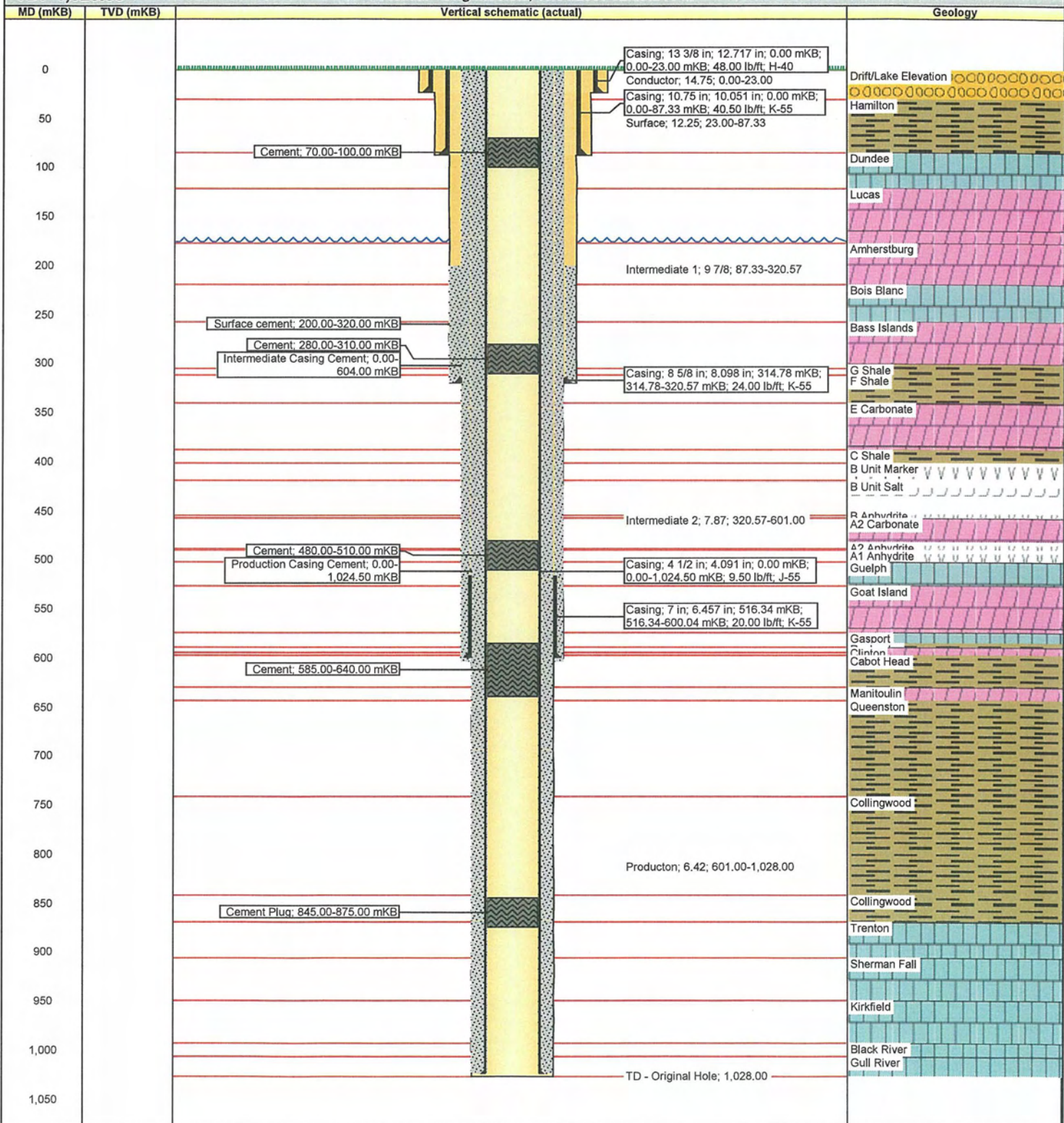


Well Name: Rowe-Ram #1

|                                     |                                         |                                |                               |                             |
|-------------------------------------|-----------------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>4039                         | Surface Legal Location<br>Dover 7-5-VE  | License #<br>T006059           | Pool<br>Dover                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Vertical | KB Elevation (m)<br>176.50              | KB-Ground Distance (m)<br>0.00 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>              |                                         |                                |                               |                             |
| Job Category<br>Drilling            | Primary Job Type<br>Drilling - original | Secondary Job Type             | Start Date<br>30/11/1982      | End Date<br>08/02/1983      |

TD: 1,028.00

Vertical - Original Hole, 13/01/2011 12:39:24 PM



**WELL TICKET**

WELL ID: 3988  
 WELL NAME: ROWE RAM 9 DOVER 6-7-IVE  
 SHORT NAME: RR9  
 COUNTY: KENT  
 TOWNSHIP: DOVER  
 TRACT: 6  
 LOT: 7  
 CONC: IVE  
 OPERATOR: LIBERTY OIL & GAS  
 PERMIT: T006778

SPUD DATE: 1985-05-06  
 COMPLETED: 1985-05-14  
 SURFACE ELEV: 176.05 m  
 KB ELEV: 177.60 m  
 TD: 1163.00 m  
 WELL STATUS: OBS  
 LATITUDE: 42.37641  
 LONGITUDE: -82.33339

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TVD (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 1.50             | 1.50           | 176.05         | GEOBASE       |
| KETTLEPT         | 22.50            | 22.50          | 155.10         | GEOBASE       |
| HAMILTON         | 30.00            | 30.00          | 147.60         | GEOBASE       |
| DUNDEE           | 89.60            | 89.60          | 87.95          | GEOBASE       |
| LUCAS            | 128.00           | 128.00         | 49.55          | GEOBASE       |
| AMHERBRG         | 182.30           | 182.30         | -4.75          | GEOBASE       |
| BOISBLAC         | 228.20           | 228.20         | -50.65         | GEOBASE       |
| BASSISLD         | 255.30           | 255.30         | -77.75         | GEOBASE       |
| GSHALE           | 304.80           | 304.80         | -127.25        | GEOBASE       |
| FSHALE           | 311.30           | 311.30         | -133.75        | GEOBASE       |
| ECARB            | 343.00           | 343.00         | -165.45        | GEOBASE       |
| DSALT            | 374.10           | 374.10         | -196.55        | GEOBASE       |
| CSHALE           | 385.70           | 385.70         | -208.15        | GEOBASE       |
| BMARKER          | 400.60           | 400.60         | -223.05        | GEOBASE       |
| BSALT            | 412.00           | 412.00         | -234.45        | GEOBASE       |
| A2CARB           | 460.00           | 460.00         | -282.45        | GEOBASE       |
| A2ANHY           | 490.50           | 490.50         | -312.95        | GEOBASE       |
| A1CARB           | 493.60           | 493.60         | -316.05        | GEOBASE       |
| GUELPH           | 502.30           | 502.30         | -324.75        | GEOBASE       |
| GOATISL          | 531.00           | 531.00         | -353.45        | GEOBASE       |
| GASPORT          | 578.70           | 578.70         | -401.15        | GEOBASE       |
| ROCHESTR         | 588.60           | 588.60         | -411.05        | GEOBASE       |
| REYNALES         | 596.00           | 596.00         | -418.45        | GEOBASE       |
| CABTHEAD         | 597.70           | 597.70         | -420.15        | GEOBASE       |
| MANITOL          | 637.00           | 637.00         | -459.45        | GEOBASE       |
| QUEENSTN         | 647.00           | 647.00         | -469.45        | GEOBASE       |
| BLUEMTN          | 741.20           | 741.20         | -563.65        | GEOBASE       |
| COBOURG          | 873.00           | 873.00         | -695.45        | GEOBASE       |
| SHERMANFALL      | 911.70           | 911.70         | -734.15        | BOB COCHRANE  |
| KIRKFLD          | 952.10           | 952.10         | -774.55        | GEOBASE       |
| COBOCONK         | 996.00           | 996.00         | -818.45        | GEOBASE       |
| GULLRIVR         | 1,029.30         | 1,029.30       | -851.75        | GEOBASE       |
| SHADLAKE         | 1,140.00         | 1,140.00       | -962.45        | GEOBASE       |
| CAMBRIAN         | 1,142.00         | 1,142.00       | -964.45        | GEOBASE       |
| PRECAMB          | 1,145.00         | 1,145.00       | -967.45        | GEOBASE       |
| FTD              | 1,163.00         | 1,163.00       | -985.45        | GEOBASE       |

END OF WELL TICKET

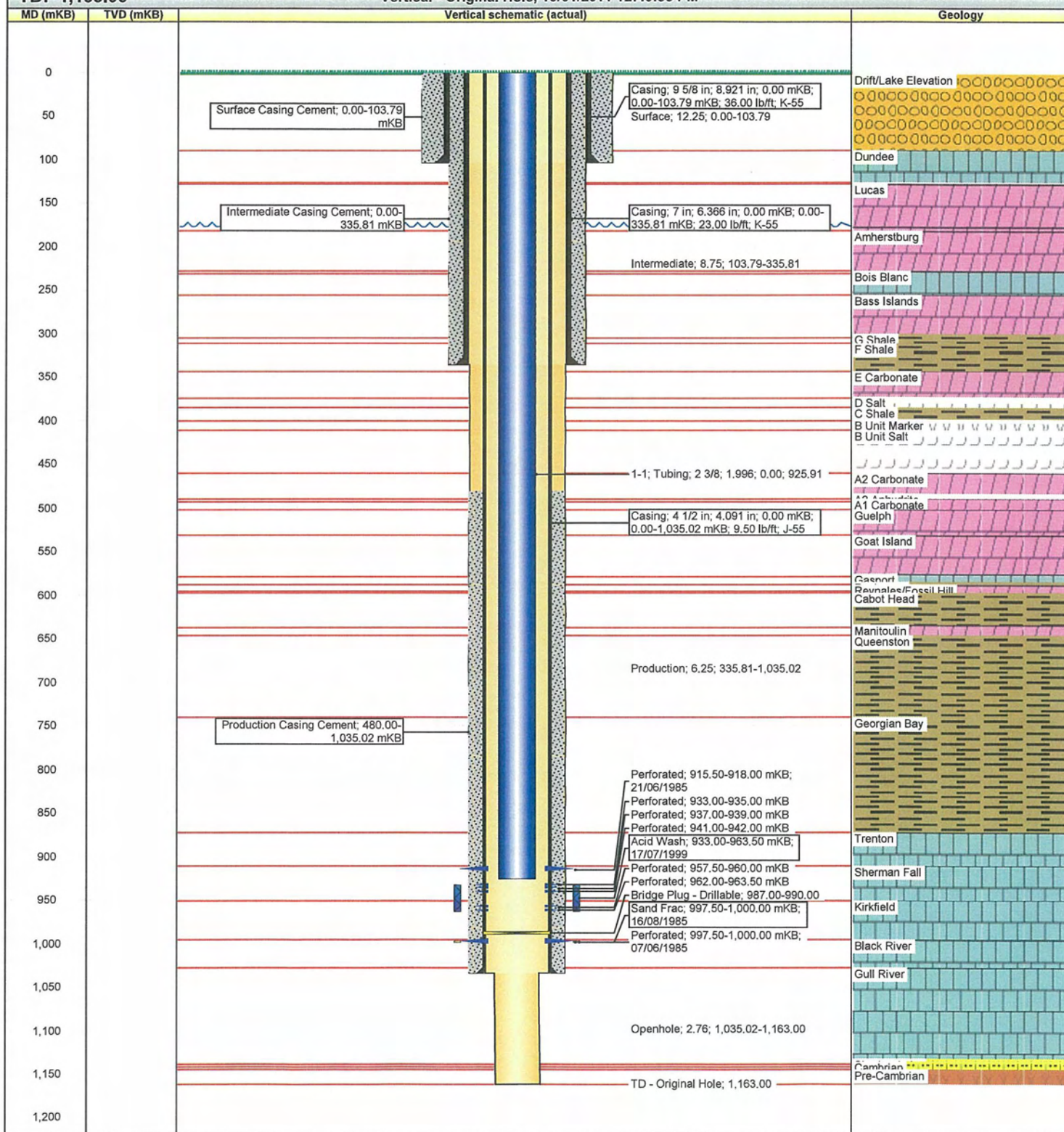


Well Name: Rowe Ram 9

|                                     |                                         |                                |                               |                             |
|-------------------------------------|-----------------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>3988                         | Surface Legal Location<br>Dover 6-7-IVE | License #<br>T006778           | Pool<br>Dover                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Vertical | KB Elevation (m)<br>177.55              | KB-Ground Distance (m)<br>1.50 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>              |                                         |                                |                               |                             |
| Job Category<br>Completion/Workover | Primary Job Type<br>Workover            | Secondary Job Type             | Start Date<br>15/02/2010      | End Date<br>02/03/2010      |

TD: 1,163.00

Vertical - Original Hole, 13/01/2011 12:40:36 PM



**WELL TICKET**

|             |                      |               |            |
|-------------|----------------------|---------------|------------|
| WELL ID:    | 7954                 | SPUD DATE:    | 1987-12-19 |
| WELL NAME:  | PPC 14 DOVER 1-5-IVE | COMPLETED:    | 1988-01-14 |
| SHORT NAME: | PPC14                | SURFACE ELEV: | 175.00 m   |
| COUNTY:     | KENT                 | KB ELEV:      | 179.70 m   |
| TOWNSHIP:   | DOVER                | TD:           | 1159.20 m  |
| TRACT:      | 1                    | WELL STATUS:  | GPSA       |
| LOT:        | 5                    |               |            |
| CONC:       | IVE                  |               |            |
| OPERATOR:   |                      | LATITUDE:     | 42.37491   |
| PERMIT:     | T007210              | LONGITUDE:    | -82.34641  |

| <b><u>FORMATION</u></b> | <b><u>DEPTH (m)</u></b> | <b><u>TVL (m)</u></b> | <b><u>TVE (m)</u></b> | <b><u>SOURCE</u></b> |
|-------------------------|-------------------------|-----------------------|-----------------------|----------------------|
| DRFTLKL                 | 4.70                    | 4.70                  | 175.00                | GEOBASE              |
| KETTLEPT                | 22.00                   | 22.00                 | 157.70                | GEOBASE              |
| HAMILTON                | 28.80                   | 28.80                 | 150.90                | GEOBASE              |
| DUNDEE                  | 88.20                   | 88.20                 | 91.50                 | GEOBASE              |
| COLUMBUS                | 129.00                  | 129.00                | 50.70                 | GEOBASE              |
| LUCAS                   | 145.00                  | 145.00                | 34.70                 | GEOBASE              |
| AMHERBRG                | 180.00                  | 180.00                | -0.30                 | GEOBASE              |
| BOISBLAC                | 228.00                  | 228.00                | -48.30                | GEOBASE              |
| BASSISLD                | 260.00                  | 260.00                | -80.30                | GEOBASE              |
| GSHALE                  | 308.30                  | 308.30                | -128.60               | GEOBASE              |
| FSHALE                  | 315.20                  | 315.20                | -135.50               | GEOBASE              |
| ECARB                   | 361.00                  | 361.00                | -181.30               | GEOBASE              |
| CSHALE                  | 391.90                  | 391.90                | -212.20               | GEOBASE              |
| BMARKER                 | 405.90                  | 405.90                | -226.20               | GEOBASE              |
| BEQUIV                  | 411.50                  | 411.50                | -231.80               | GEOBASE              |
| BSALT                   | 417.20                  | 417.20                | -237.50               | GEOBASE              |
| A2CARB                  | 460.50                  | 460.50                | -280.80               | GEOBASE              |
| A2SHALE                 | 486.30                  | 486.30                | -306.60               | GEOBASE              |
| A2ANHY                  | 493.00                  | 493.00                | -313.30               | GEOBASE              |
| A1CARB                  | 495.70                  | 495.70                | -316.00               | GEOBASE              |
| GUELPH                  | 506.80                  | 506.80                | -327.10               | GEOBASE              |
| GOATISL                 | 532.80                  | 532.80                | -353.10               | GEOBASE              |
| GASPORT                 | 580.60                  | 580.60                | -400.90               | GEOBASE              |
| ROCHESTR                | 591.90                  | 591.90                | -412.20               | GEOBASE              |
| REYNALES                | 599.90                  | 599.90                | -420.20               | GEOBASE              |
| CABTHEAD                | 601.10                  | 601.10                | -421.40               | GEOBASE              |
| MANITOU                 | 637.00                  | 637.00                | -457.30               | GEOBASE              |
| QUEENSTN                | 651.10                  | 651.10                | -471.40               | GEOBASE              |
| BLUEMTN                 | 745.20                  | 745.20                | -565.50               | GEOBASE              |
| COBOURG                 | 877.80                  | 877.80                | -698.10               | GEOBASE              |
| SHERMANFALL             | 914.50                  | 914.50                | -734.80               | GEOBASE              |
| KIRKFLD                 | 955.50                  | 955.50                | -775.80               | GEOBASE              |
| COBOCONK                | 999.80                  | 999.80                | -820.10               | GEOBASE              |
| GULLRIVR                | 1,032.60                | 1,032.60              | -852.90               | GEOBASE              |
| SHADLAKE                | 1,139.50                | 1,139.50              | -959.80               | GEOBASE              |
| CAMBRIAN                | 1,142.00                | 1,142.00              | -962.30               | GEOBASE              |
| PRECAMB                 | 1,144.30                | 1,144.30              | -964.60               | GEOBASE              |
| FTD                     | 1,159.20                | 1,159.20              | -979.50               | GEOBASE              |

END OF WELL TICKET

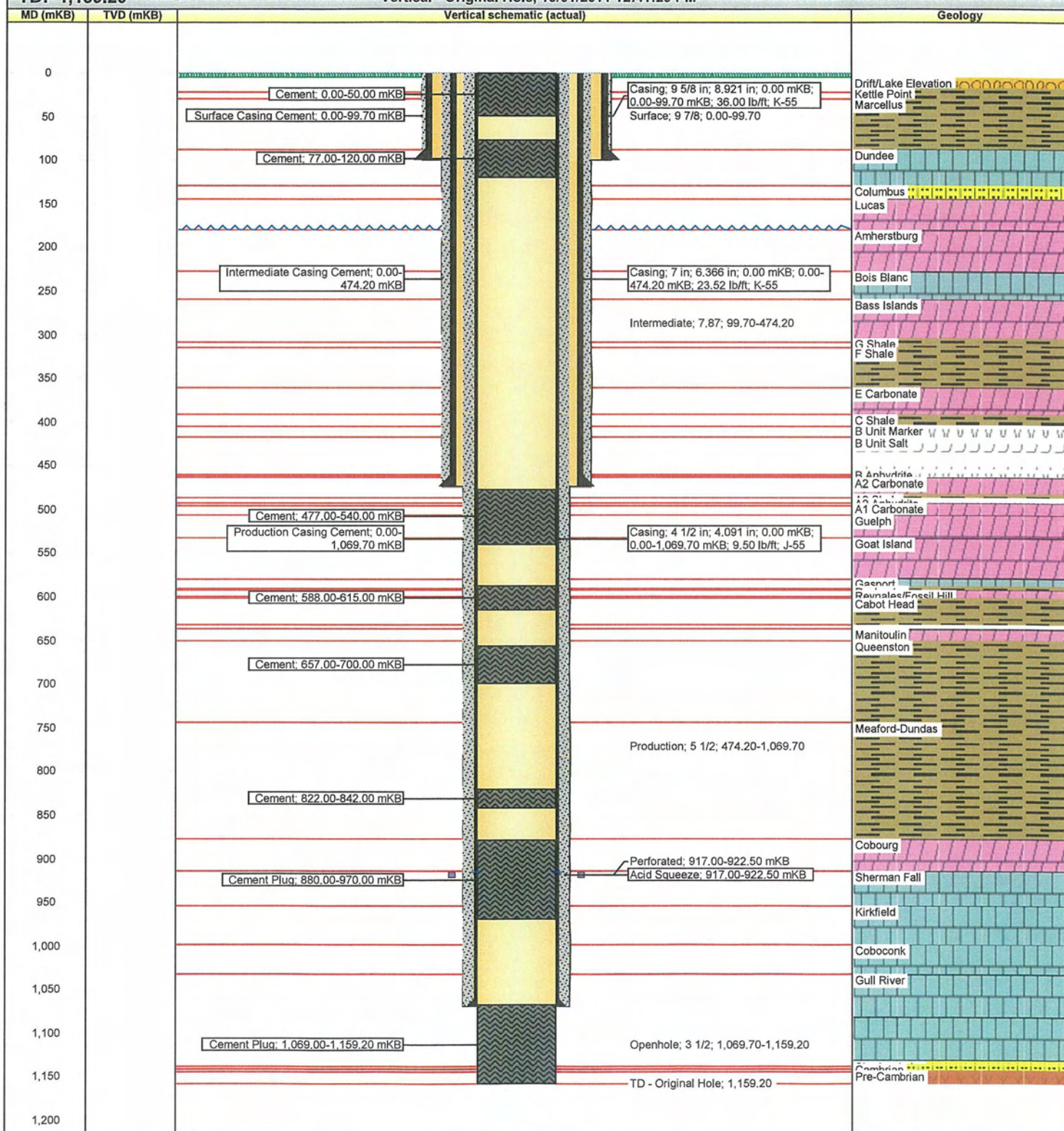


Well Name: PPC 14 Dover 1 - 5 - IVE

|                                     |                                         |                                |                               |                             |
|-------------------------------------|-----------------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>7954                         | Surface Legal Location<br>Dover 1-5-IVE | License #<br>T007210           | Pool<br>Dover                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Vertical | KB Elevation (m)<br>179.70              | KB-Ground Distance (m)<br>4.70 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>              |                                         |                                |                               |                             |
| Job Category<br>Drilling            | Primary Job Type<br>Drilling - original | Secondary Job Type             | Start Date<br>19/12/1987      | End Date<br>14/01/1988      |

TD: 1,159.20

Vertical - Original Hole, 13/01/2011 12:41:20 PM



**WELL TICKET**

|             |                     |               |            |
|-------------|---------------------|---------------|------------|
| WELL ID:    | 8351                | SPUD DATE:    | 1991-08-01 |
| WELL NAME:  | PPC RAM 34          | COMPLETED:    | 1991-08-12 |
| SHORT NAME: | PPCR34              | SURFACE ELEV: | 174.80 m   |
| COUNTY:     | KENT                | KB ELEV:      | 178.30 m   |
| TOWNSHIP:   | DOVER               | TD:           | 1078.00 m  |
| TRACT:      | 8                   | WELL STATUS:  | GPOS       |
| LOT:        | 4                   |               |            |
| CONC:       | VE                  |               |            |
| OPERATOR:   | LIBERTY OIL AND GAS | LATITUDE:     | 42.37413   |
| PERMIT:     | T007811             | LONGITUDE:    | -82.35553  |

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TYD (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 3.50             | 3.50           | 174.80         | GEOBASE       |
| DUNDEE           | 84.30            | 84.30          | 94.00          | GEOBASE       |
| LUCAS            | 116.70           | 116.70         | 61.60          | GEOBASE       |
| AMHERBRG         | 178.00           | 178.00         | 0.30           | GEOBASE       |
| BOISBLAC         | 218.50           | 218.50         | -40.20         | GEOBASE       |
| BASSISLD         | 269.70           | 269.70         | -91.40         | GEOBASE       |
| GSHALE           | 306.30           | 306.30         | -128.00        | GEOBASE       |
| FSHALE           | 313.60           | 313.60         | -135.30        | GEOBASE       |
| ECARB            | 341.80           | 341.80         | -163.50        | GEOBASE       |
| DSALT            | 382.60           | 382.60         | -204.30        | GEOBASE       |
| CSHALE           | 390.00           | 390.00         | -211.70        | GEOBASE       |
| BMARKER          | 404.00           | 404.00         | -225.70        | GEOBASE       |
| BSALT            | 416.30           | 416.30         | -238.00        | GEOBASE       |
| BANHY            | 454.30           | 454.30         | -276.00        | GEOBASE       |
| A2CARB           | 459.40           | 459.40         | -281.10        | GEOBASE       |
| A2ANHY           | 486.30           | 486.30         | -308.00        | GEOBASE       |
| A1CARB           | 489.20           | 489.20         | -310.90        | GEOBASE       |
| GUELPH           | 500.40           | 500.40         | -322.10        | GEOBASE       |
| GOATISL          | 527.00           | 527.00         | -348.70        | GEOBASE       |
| GASPORT          | 570.00           | 570.00         | -391.70        | GEOBASE       |
| ROCHESTR         | 584.00           | 584.00         | -405.70        | GEOBASE       |
| REYNALES         | 591.20           | 591.20         | -412.90        | GEOBASE       |
| CABTHEAD         | 593.80           | 593.80         | -415.50        | GEOBASE       |
| MANITOU          | 628.70           | 628.70         | -450.40        | GEOBASE       |
| QUEENSTN         | 643.00           | 643.00         | -464.70        | GEOBASE       |
| BLUEMTN          | 737.30           | 737.30         | -559.00        | GEOBASE       |
| COBOURG          | 874.30           | 874.30         | -696.00        | GEOBASE       |
| SHERMANFALL      | 906.80           | 906.80         | -728.50        | GEOBASE       |
| KIRKFLD          | 944.80           | 944.80         | -766.50        | GEOBASE       |
| COBOCONK         | 987.40           | 987.40         | -809.10        | GEOBASE       |
| GULLRIVR         | 1,022.70         | 1,022.70       | -844.40        | GEOBASE       |
| FTD              | 1,078.00         | 1,078.00       | -899.70        | GEOBASE       |

END OF WELL TICKET

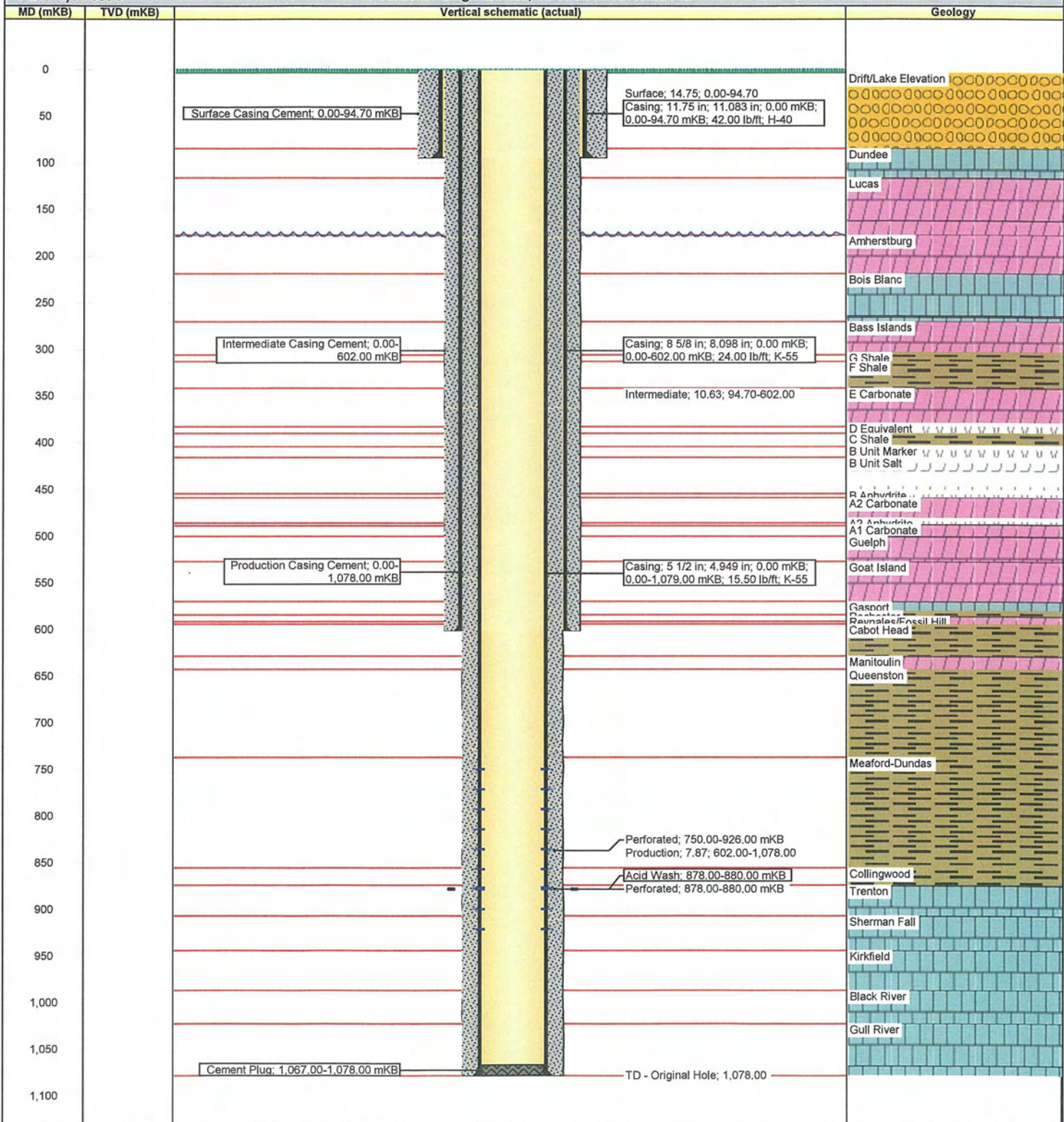


Well Name: PPC Ram 34

|                                     |                              |                                |                               |                             |
|-------------------------------------|------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>8351                         | Surface Legal Location       | License #<br>T007811           | Pool<br>Dover                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Vertical | KB Elevation (m)<br>178.30   | KB-Ground Distance (m)<br>3.50 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>              |                              |                                |                               |                             |
| Job Category<br>Completion/Workover | Primary Job Type<br>Workover | Secondary Job Type             | Start Date<br>02/04/2010      | End Date<br>04/04/2010      |

TD: 1,078.00

Vertical - Original Hole, 13/01/2011 12:41:50 PM



**WELL TICKET**

|             |            |               |            |
|-------------|------------|---------------|------------|
| WELL ID:    | 9057       | SPUD DATE:    | 1992-02-24 |
| WELL NAME:  | PPC RAM 39 | COMPLETED:    | 1992-05-29 |
| SHORT NAME: | PPCR39     | SURFACE ELEV: | 174.90 m   |
| COUNTY:     | KENT       | KB ELEV:      | 178.10 m   |
| TOWNSHIP:   | DOVER      | TD:           | 1091.00 m  |
| TRACT:      | 2          | WELL STATUS:  | GPOSSA     |
| LOT:        | 5          |               |            |
| CONC:       | IVE        |               |            |
| OPERATOR:   |            | LATITUDE:     | 42.37430   |
| PERMIT:     | T007859    | LONGITUDE:    | -82.3512   |

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TVD (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 3.20             | 3.20           | 174.90         | GEOBASE       |
| KETTLEPT         | 23.40            | 23.40          | 154.70         | GEOBASE       |
| MARCELLS         | 24.60            | 24.60          | 153.50         | GEOBASE       |
| DUNDEE           | 87.20            | 87.20          | 90.90          | GEOBASE       |
| LUCAS            | 123.70           | 123.70         | 54.40          | GEOBASE       |
| AMHERBRG         | 180.00           | 180.00         | -1.90          | GEOBASE       |
| BOISBLAC         | 226.80           | 226.80         | -48.70         | GEOBASE       |
| BASSISLD         | 270.20           | 270.20         | -92.10         | GEOBASE       |
| GSHALE           | 308.10           | 308.10         | -130.00        | GEOBASE       |
| FSHALE           | 315.00           | 315.00         | -136.90        | GEOBASE       |
| ECARB            | 342.60           | 342.60         | -164.50        | GEOBASE       |
| DSALT            | 383.40           | 383.40         | -205.30        | GEOBASE       |
| CSHALE           | 390.10           | 390.10         | -212.00        | GEOBASE       |
| BMARKER          | 403.90           | 403.90         | -225.80        | GEOBASE       |
| BSALT            | 416.20           | 416.20         | -238.10        | GEOBASE       |
| BANHY            | 457.60           | 457.60         | -279.50        | GEOBASE       |
| A2CARB           | 459.40           | 459.40         | -281.30        | GEOBASE       |
| A2ANHY           | 491.70           | 491.70         | -313.60        | GEOBASE       |
| A1CARB           | 494.40           | 494.40         | -316.30        | GEOBASE       |
| A1ANHY           | 504.50           | 504.50         | -326.40        | GEOBASE       |
| GUELPH           | 506.40           | 506.40         | -328.30        | GEOBASE       |
| GOATISL          | 529.50           | 529.50         | -351.40        | GEOBASE       |
| GASPORT          | 576.60           | 576.60         | -398.50        | GEOBASE       |
| ROCHESTR         | 589.30           | 589.30         | -411.20        | GEOBASE       |
| REYNALES         | 597.00           | 597.00         | -418.90        | GEOBASE       |
| CABTHEAD         | 598.80           | 598.80         | -420.70        | GEOBASE       |
| MANITOUL         | 629.30           | 629.30         | -451.20        | GEOBASE       |
| QUEENSTN         | 648.30           | 648.30         | -470.20        | GEOBASE       |
| BLUEMTN          | 742.50           | 742.50         | -564.40        | GEOBASE       |
| COBOURG          | 875.10           | 875.10         | -697.00        | GEOBASE       |
| SHERMANFALL      | 914.00           | 914.00         | -735.90        | BOB COCHRANE  |
| KIRKFLD          | 953.00           | 953.00         | -774.90        | GEOBASE       |
| COBOCONK         | 995.00           | 995.00         | -816.90        | GEOBASE       |
| GULLRIVR         | 1,027.50         | 1,027.50       | -849.40        | GEOBASE       |
| FTD              | 1,091.00         | 1,091.00       | -912.90        | GEOBASE       |

END OF WELL TICKET

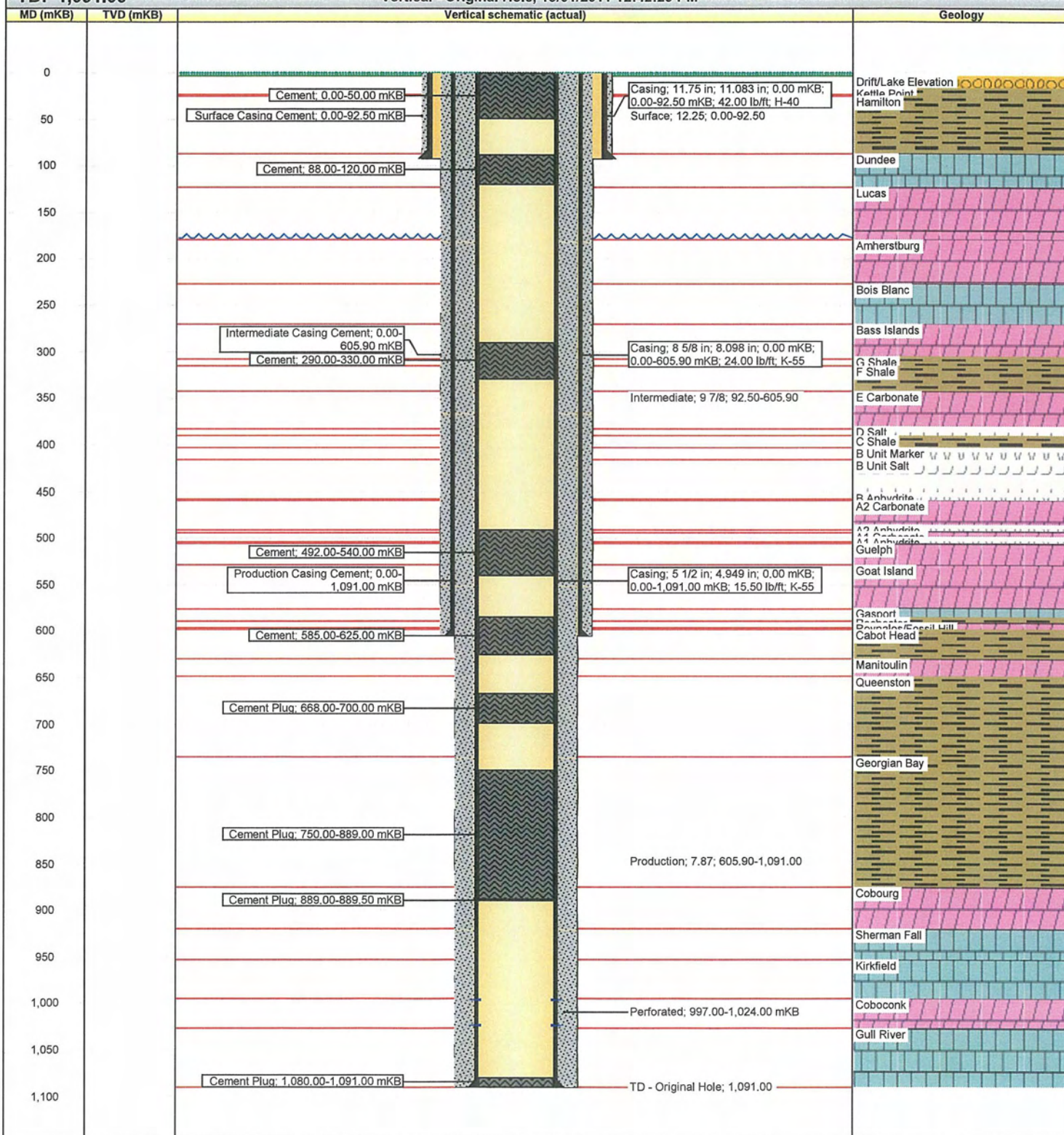


Well Name: PPC Ram 39

|                                     |                                         |                                |                               |                             |
|-------------------------------------|-----------------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>9057                         | Surface Legal Location<br>Dover 2-5-IVE | License #<br>T007859           | Pool<br>Dover                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Vertical | KB Elevation (m)<br>178.10              | KB-Ground Distance (m)<br>3.20 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>              |                                         |                                |                               |                             |
| Job Category<br>Drilling            | Primary Job Type<br>Drilling - original | Secondary Job Type             | Start Date<br>24/02/1992      | End Date<br>29/05/1992      |

TD: 1,091.00

Vertical - Original Hole, 13/01/2011 12:42:29 PM



**WELL TICKET**

|             |                   |               |            |
|-------------|-------------------|---------------|------------|
| WELL ID:    | 8352              | SPUD DATE:    | 1991-06-12 |
| WELL NAME:  | PPC RAM 31        | COMPLETED:    | 1991-06-21 |
| SHORT NAME: | PPCR31            | SURFACE ELEV: | 175.57 m   |
| COUNTY:     | KENT              | KB ELEV:      | 179.00 m   |
| TOWNSHIP:   | DOVER             | TD:           | 1070.00 m  |
| TRACT:      | 3                 | WELL STATUS:  | INJECTION  |
| LOT:        | 6                 |               |            |
| CONC:       | IVE               |               |            |
| OPERATOR:   | LIBERTY OIL & GAS | LATITUDE:     | 42.37525   |
| PERMIT:     | T007802           | LONGITUDE:    | -82.34266  |

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TVL (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 3.50             | 3.50           | 175.50         | GEOBASE       |
| KETTLEPT         | 20.00            | 20.00          | 159.00         | GEOBASE       |
| HAMILTON         | 29.60            | 29.60          | 149.40         | GEOBASE       |
| DUNDEE           | 89.40            | 89.40          | 89.60          | GEOBASE       |
| LUCAS            | 125.00           | 125.00         | 54.00          | GEOBASE       |
| AMHERBRG         | 157.90           | 157.90         | 21.10          | GEOBASE       |
| BOISBLAC         | 201.80           | 201.80         | -22.80         | GEOBASE       |
| BASSISLD         | 244.20           | 244.20         | -65.20         | GEOBASE       |
| GSHALE           | 312.50           | 312.50         | -133.50        | GEOBASE       |
| FSHALE           | 317.80           | 317.80         | -138.80        | GEOBASE       |
| ECARB            | 344.70           | 344.70         | -165.70        | GEOBASE       |
| DSALT            | 382.60           | 382.60         | -203.60        | GEOBASE       |
| CSHALE           | 385.50           | 385.50         | -206.50        | GEOBASE       |
| BMARKER          | 403.00           | 403.00         | -224.00        | GEOBASE       |
| BSALT            | 414.20           | 414.20         | -235.20        | GEOBASE       |
| BANHY            | 463.30           | 463.30         | -284.30        | GEOBASE       |
| A2CARB           | 465.50           | 465.50         | -286.50        | GEOBASE       |
| A2ANHY           | 493.80           | 493.80         | -314.80        | GEOBASE       |
| A1CARB           | 496.00           | 496.00         | -317.00        | GEOBASE       |
| A1ANHY           | 523.20           | 523.20         | -344.20        | GEOBASE       |
| GUELPH           | 527.00           | 527.00         | -348.00        | GEOBASE       |
| GOATISL          | 533.50           | 533.50         | -354.50        | GEOBASE       |
| GASPORT          | 581.60           | 581.60         | -402.60        | GEOBASE       |
| ROCHESTR         | 592.00           | 592.00         | -413.00        | GEOBASE       |
| REYNALES         | 600.00           | 600.00         | -421.00        | GEOBASE       |
| CABTHEAD         | 601.60           | 601.60         | -422.60        | GEOBASE       |
| MANITOU          | 641.00           | 641.00         | -462.00        | GEOBASE       |
| QUEENSTN         | 651.00           | 651.00         | -472.00        | GEOBASE       |
| BLUEMTN          | 739.40           | 739.40         | -560.40        | GEOBASE       |
| COBOURG          | 877.60           | 877.60         | -698.60        | GEOBASE       |
| SHERMANFALL      | 916.20           | 916.20         | -737.20        | BOB COCHRANE  |
| KIRKFLD          | 957.00           | 957.00         | -778.00        | GEOBASE       |
| COBOCONK         | 1,001.70         | 1,001.70       | -822.70        | GEOBASE       |
| GULLRIVR         | 1,032.90         | 1,032.90       | -853.90        | GEOBASE       |
| FTD              | 1,070.50         | 1,070.50       | -891.50        | GEOBASE       |

END OF WELL TICKET

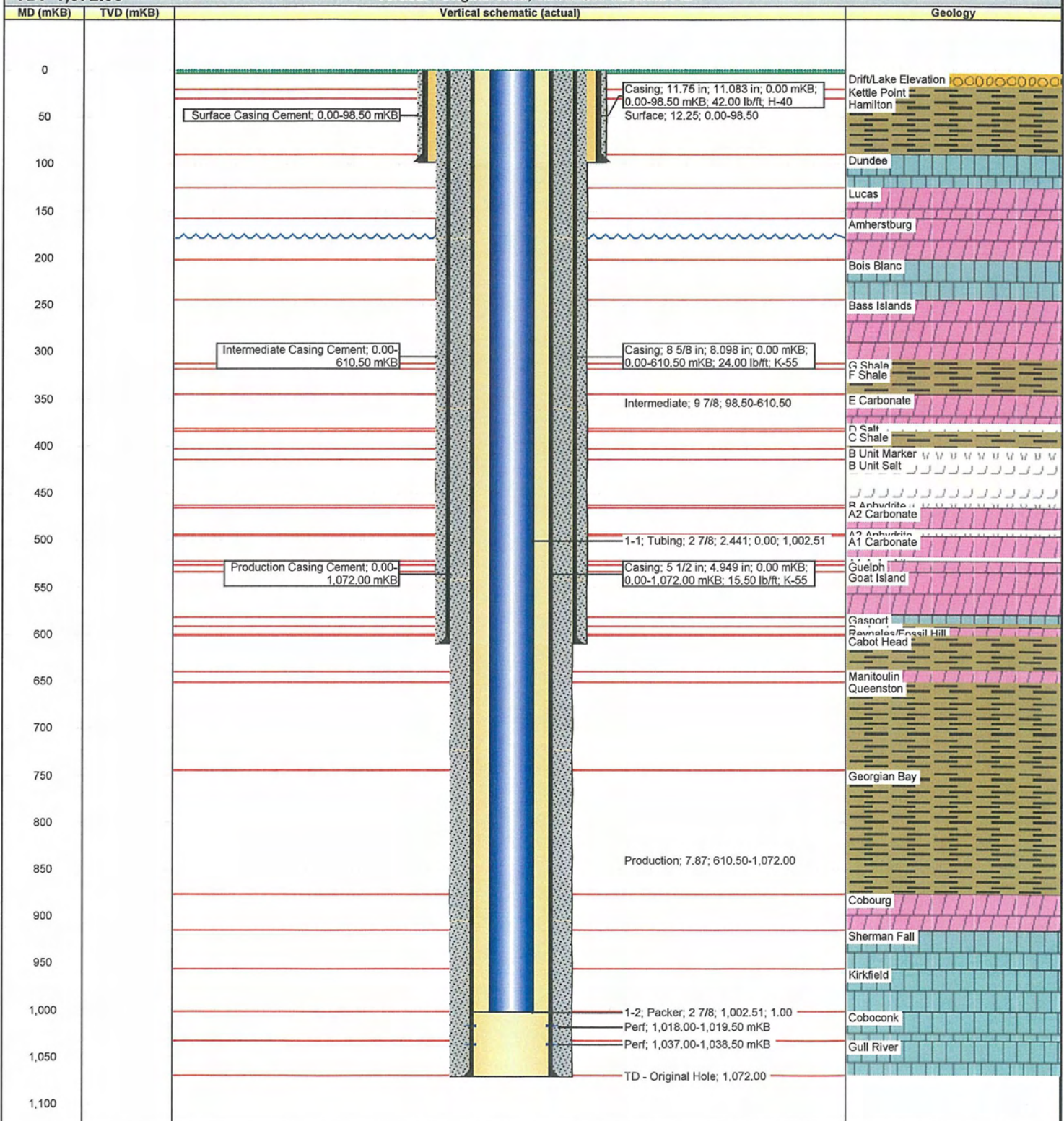


Well Name: PPC Ram 31

|                                     |                                         |                                |                               |                             |
|-------------------------------------|-----------------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>8352                         | Surface Legal Location<br>Dover 3-6-IVE | License #<br>T007802           | Pool<br>Dover                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Vertical | KB Elevation (m)<br>179.00              | KB-Ground Distance (m)<br>3.43 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>              |                                         |                                |                               |                             |
| Job Category<br>Drilling            | Primary Job Type<br>Drilling - original | Secondary Job Type             | Start Date<br>12/06/1991      | End Date<br>21/06/1991      |

TD: 1,072.00

Vertical - Original Hole, 13/01/2011 12:43:05 PM





**WELL TICKET**

WELL ID: 4020  
 WELL NAME: ROWE RAM 8A DOVER 4-6-IVE  
 SHORT NAME: RR8A  
 COUNTY: KENT  
 TOWNSHIP: DOVER  
 TRACT: 4  
 LOT: 6  
 CONC: IVE  
 OPERATOR: LIBERTY OIL & GAS  
 PERMIT: T006658A

SPUD DATE: NA  
 COMPLETED: 1985-01-18  
 SURFACE ELEV: 175.70 m  
 KB ELEV: 177.50 m  
 TD: 1136.00 m  
 WELL STATUS: OPGP  
  
 LATITUDE: 42.37547  
 LONGITUDE: -82.33900

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TVD (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 1.80             | 1.80           | 175.70         | GEOBASE       |
| HAMILTON         | 28.90            | 28.90          | 148.60         | GEOBASE       |
| DUNDEE           | 88.60            | 88.60          | 88.90          | GEOBASE       |
| LUCAS            | 125.50           | 125.50         | 52.00          | GEOBASE       |
| AMHERBRG         | 182.00           | 182.00         | -4.50          | GEOBASE       |
| BOISBLAC         | 227.40           | 227.40         | -49.90         | GEOBASE       |
| BASSISLD         | 254.10           | 254.10         | -76.60         | GEOBASE       |
| GSHALE           | 303.30           | 303.30         | -125.80        | GEOBASE       |
| FSHALE           | 310.30           | 310.30         | -132.80        | GEOBASE       |
| ECARB            | 342.50           | 342.50         | -165.00        | GEOBASE       |
| DSALT            | 383.70           | 383.70         | -206.20        | GEOBASE       |
| CSHALE           | 386.70           | 386.70         | -209.20        | GEOBASE       |
| BMARKER          | 401.70           | 401.70         | -224.20        | GEOBASE       |
| BSALT            | 413.20           | 413.20         | -235.70        | GEOBASE       |
| A2CARB           | 462.00           | 462.00         | -284.50        | GEOBASE       |
| A2ANHY           | 493.00           | 493.00         | -315.50        | GEOBASE       |
| A1CARB           | 496.20           | 496.20         | -318.70        | GEOBASE       |
| GUELPH           | 506.10           | 506.10         | -328.60        | GEOBASE       |
| GOATISL          | 531.70           | 531.70         | -354.20        | GEOBASE       |
| GASPORT          | 580.30           | 580.30         | -402.80        | GEOBASE       |
| ROCHESTR         | 590.70           | 590.70         | -413.20        | GEOBASE       |
| REYNALES         | 598.50           | 598.50         | -421.00        | GEOBASE       |
| CABTHEAD         | 600.20           | 600.20         | -422.70        | GEOBASE       |
| MANITOUL         | 640.00           | 640.00         | -462.50        | GEOBASE       |
| QUEENSTN         | 650.10           | 650.10         | -472.60        | GEOBASE       |
| BLUEMTN          | 744.50           | 744.50         | -567.00        | GEOBASE       |
| COBOURG          | 879.60           | 879.60         | -702.10        | GEOBASE       |
| SHERMANFALL      | 918.90           | 918.90         | -741.40        | GEOBASE       |
| KIRKFLD          | 959.30           | 959.30         | -781.80        | GEOBASE       |
| COBOCONK         | 1,001.30         | 1,001.30       | -823.80        | GEOBASE       |
| GULLRIVR         | 1,034.40         | 1,034.40       | -856.90        | GEOBASE       |
| SHADLAKE         | 1,135.30         | 1,135.30       | -957.80        | GEOBASE       |
| FTD              | 1,136.00         | 1,136.00       | -958.50        | GEOBASE       |

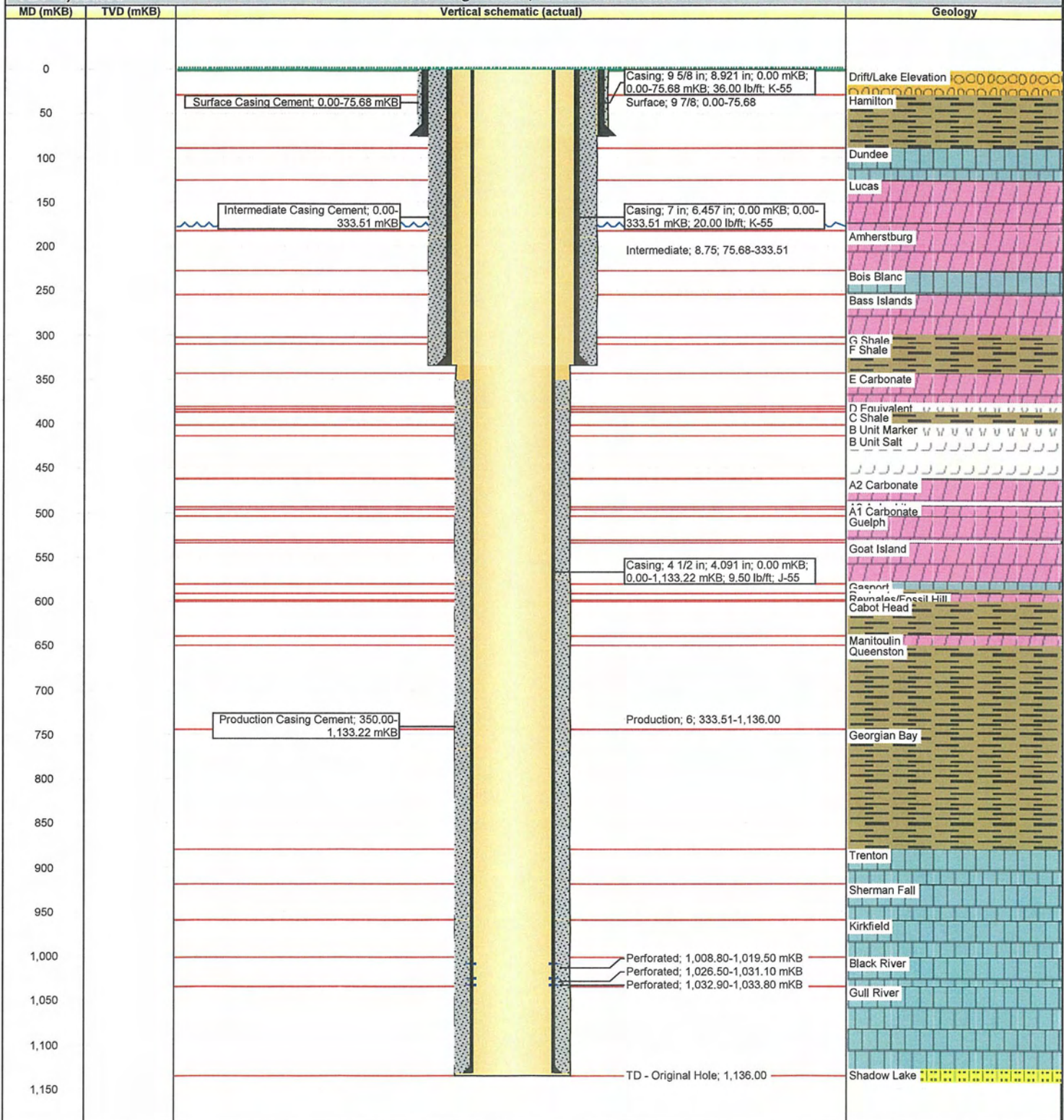
END OF WELL TICKET

Well Name: Rowe/Ram #8A

|                                     |                                         |                                |                               |                             |
|-------------------------------------|-----------------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>4020                         | Surface Legal Location<br>Dover 4-6-IVE | License #<br>T006658A          | Pool<br>Dover                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Vertical | KB Elevation (m)<br>177.50              | KB-Ground Distance (m)<br>1.80 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>              |                                         |                                |                               |                             |
| Job Category<br>Drilling            | Primary Job Type<br>Drilling - original | Secondary Job Type             | Start Date                    | End Date<br>18/01/1985      |

TD: 1,136.00

Vertical - Original Hole, 13/01/2011 12:43:39 PM





**WELL TICKET**

|             |                   |               |            |
|-------------|-------------------|---------------|------------|
| WELL ID:    | 10685             | SPUD DATE:    | 2003-10-21 |
| WELL NAME:  | VRI 5             | COMPLETED:    | 2003-11-03 |
| SHORT NAME: | VRI5              | SURFACE ELEV: | 175.60 m   |
| COUNTY:     | KENT              | KB ELEV:      | 179.90 m   |
| TOWNSHIP:   | DOVER             | TD:           | 1158.80 m  |
| TRACT:      | 5                 | WELL STATUS:  | OPGP       |
| LOT:        | 6                 |               |            |
| CONC:       | IVE               |               |            |
| OPERATOR:   | LIBERTY OIL & GAS | LATITUDE:     | 42.37553   |
| PERMIT:     | T010665           | LONGITUDE:    | -82.33603  |

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TVD (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 4.30             | 4.30           | 175.60         | GEOBASE       |
| KETTLEPT         | 25.90            | 25.90          | 154.00         | GEOBASE       |
| DUNDEE           | 90.60            | 90.60          | 89.30          | GEOBASE       |
| LUCAS            | 142.60           | 142.60         | 37.30          | GEOBASE       |
| AMHERBRG         | 184.60           | 184.60         | -4.70          | GEOBASE       |
| BOISBLAC         | 225.20           | 225.20         | -45.30         | GEOBASE       |
| BASSISLD         | 263.80           | 263.80         | -83.90         | GEOBASE       |
| GSHALE           | 305.70           | 305.70         | -125.80        | GEOBASE       |
| FSHALE           | 314.10           | 314.10         | -134.20        | GEOBASE       |
| ECARB            | 339.00           | 339.00         | -159.10        | GEOBASE       |
| DSALT            | 380.50           | 380.50         | -200.60        | GEOBASE       |
| CSHALE           | 386.40           | 386.40         | -206.50        | GEOBASE       |
| BMARKER          | 400.80           | 400.80         | -220.90        | GEOBASE       |
| BSALT            | 411.90           | 411.90         | -232.00        | GEOBASE       |
| A2CARB           | 461.70           | 461.70         | -281.80        | GEOBASE       |
| A2SHALE          | 487.40           | 487.40         | -307.50        | GEOBASE       |
| A2ANHY           | 494.00           | 494.00         | -314.10        | GEOBASE       |
| A1CARB           | 497.40           | 497.40         | -317.50        | GEOBASE       |
| GUELPH           | 506.30           | 506.30         | -326.40        | GEOBASE       |
| GOATISL          | 533.00           | 533.00         | -353.10        | GEOBASE       |
| GASPORT          | 583.20           | 583.20         | -403.30        | GEOBASE       |
| ROCHESTR         | 593.00           | 593.00         | -413.10        | GEOBASE       |
| REYNALES         | 599.70           | 599.70         | -419.80        | GEOBASE       |
| CABTHEAD         | 601.40           | 601.40         | -421.50        | GEOBASE       |
| MANITOU          | 641.00           | 641.00         | -461.10        | GEOBASE       |
| QUEENSTN         | 651.20           | 651.20         | -471.30        | GEOBASE       |
| BLUEMTN          | 745.30           | 745.30         | -565.40        | GEOBASE       |
| COBOURG          | 879.80           | 879.80         | -699.90        | GEOBASE       |
| SHERMANFALL      | 918.50           | 918.50         | -738.60        | GEOBASE       |
| KIRKFLD          | 958.30           | 958.30         | -778.40        | GEOBASE       |
| COBOCONK         | 1,002.10         | 1,002.10       | -822.20        | GEOBASE       |
| GULLRIVR         | 1,035.30         | 1,035.30       | -855.40        | GEOBASE       |
| FTD              | 1,058.80         | 1,058.80       | -878.90        | GEOBASE       |

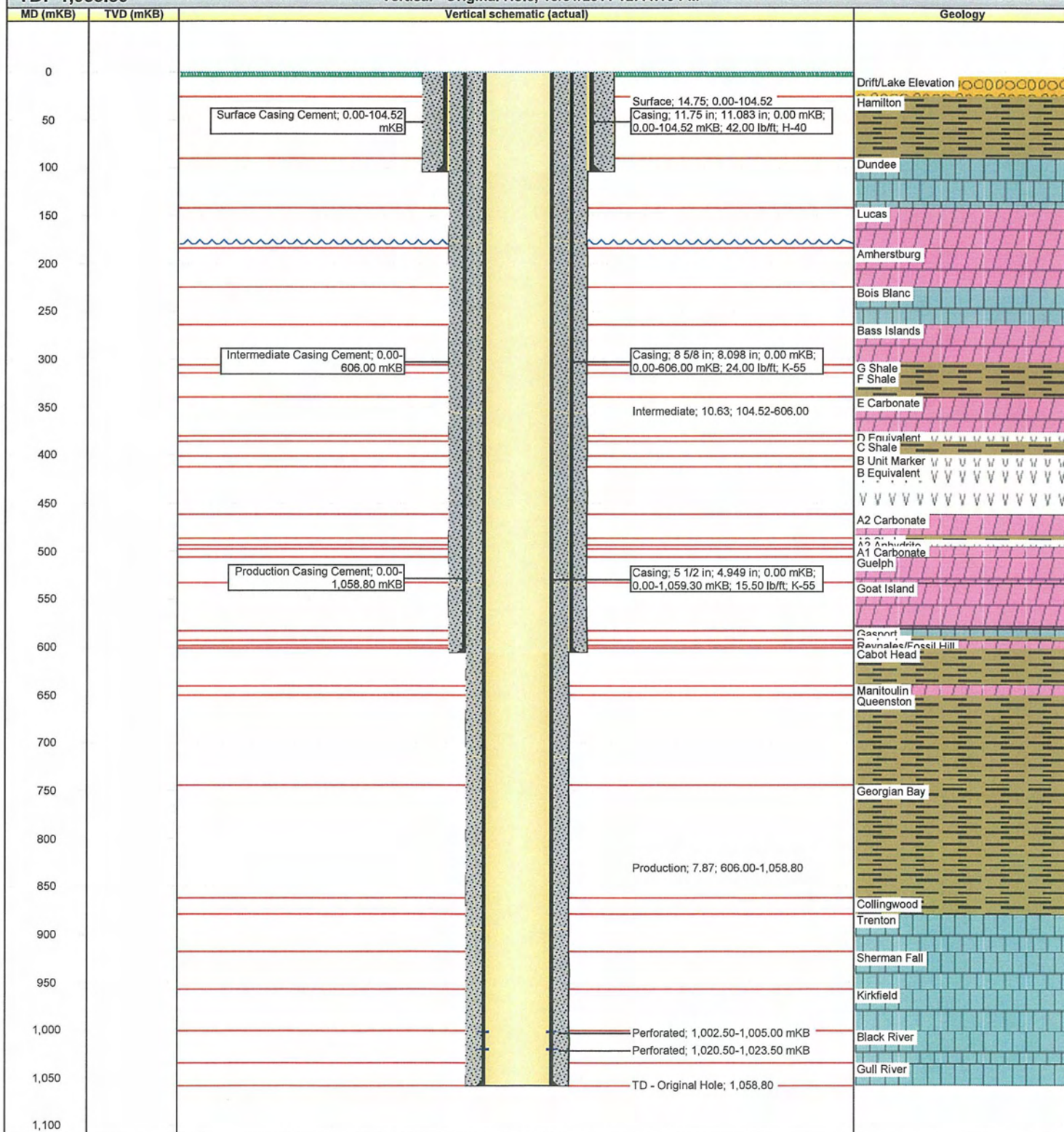
END OF WELL TICKET

Well Name: VRI #5

|                                     |                                         |                                |                               |                             |
|-------------------------------------|-----------------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>10685                        | Surface Legal Location<br>Dover 5-6-IVE | License #<br>T010665           | Pool<br>Dover                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Vertical | KB Elevation (m)<br>179.90              | KB-Ground Distance (m)<br>4.30 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>              |                                         |                                |                               |                             |
| Job Category<br>Drilling            | Primary Job Type<br>Drilling - original | Secondary Job Type             | Start Date<br>24/10/2003      | End Date<br>03/11/2003      |

TD: 1,058.80

Vertical - Original Hole, 13/01/2011 12:44:16 PM





**WELL TICKET**

WELL ID: 8515  
 WELL NAME: PPC 15 DOVER 5-5-IVE  
 SHORT NAME: PPC15  
 COUNTY: KENT  
 TOWNSHIP: DOVER  
 TRACT: 5  
 LOT: 5  
 CONC: IVE  
 OPERATOR: LIBERTY OIL & GAS  
 PERMIT: T007240

SPUD DATE: 1988-02-14  
 COMPLETED: 1988-02-23  
 SURFACE ELEV: 176.30 m  
 KB ELEV: 180.00 m  
 TD: 1067.00 m  
 WELL STATUS: OPGP

LATITUDE: 42.37103  
 LONGITUDE: -82.34195

| <b><u>FORMATION</u></b> | <b><u>DEPTH (m)</u></b> | <b><u>TVD (m)</u></b> | <b><u>TVE (m)</u></b> | <b><u>SOURCE</u></b> |
|-------------------------|-------------------------|-----------------------|-----------------------|----------------------|
| DRFTLKL                 | 3.70                    | 3.70                  | 176.30                | GEOBASE              |
| KETTLEPT                | 22.50                   | 22.50                 | 157.50                | GEOBASE              |
| HAMILTON                | 25.50                   | 25.50                 | 154.50                | GEOBASE              |
| DUNDEE                  | 89.20                   | 89.20                 | 90.80                 | GEOBASE              |
| LUCAS                   | 125.00                  | 125.00                | 55.00                 | GEOBASE              |
| AMHERBRG                | 170.00                  | 170.00                | 10.00                 | GEOBASE              |
| BOISBLAC                | 225.00                  | 225.00                | -45.00                | GEOBASE              |
| BASSISLD                | 264.50                  | 264.50                | -84.50                | GEOBASE              |
| GSHALE                  | 308.80                  | 308.80                | -128.80               | GEOBASE              |
| FSHALE                  | 315.40                  | 315.40                | -135.40               | GEOBASE              |
| ECARB                   | 359.10                  | 359.10                | -179.10               | GEOBASE              |
| CSHALE                  | 390.60                  | 390.60                | -210.60               | GEOBASE              |
| BMARKER                 | 405.80                  | 405.80                | -225.80               | GEOBASE              |
| BEQUIV                  | 411.20                  | 411.20                | -231.20               | GEOBASE              |
| BSALT                   | 418.60                  | 418.60                | -238.60               | GEOBASE              |
| A2CARB                  | 452.00                  | 452.00                | -272.00               | GEOBASE              |
| A2SHALE                 | 485.00                  | 485.00                | -305.00               | GEOBASE              |
| A2ANHY                  | 491.40                  | 491.40                | -311.40               | GEOBASE              |
| A1CARB                  | 493.90                  | 493.90                | -313.90               | GEOBASE              |
| GUELPH                  | 510.90                  | 510.90                | -330.90               | GEOBASE              |
| GOATISL                 | 530.30                  | 530.30                | -350.30               | GEOBASE              |
| GASPORT                 | 579.40                  | 579.40                | -399.40               | GEOBASE              |
| ROCHESTR                | 590.00                  | 590.00                | -410.00               | GEOBASE              |
| REYNALES                | 597.70                  | 597.70                | -417.70               | GEOBASE              |
| CABTHEAD                | 599.30                  | 599.30                | -419.30               | GEOBASE              |
| MANITOU                 | 634.90                  | 634.90                | -454.90               | GEOBASE              |
| QUEENSTN                | 648.90                  | 648.90                | -468.90               | GEOBASE              |
| BLUEMTN                 | 741.70                  | 741.70                | -561.70               | GEOBASE              |
| COBOURG                 | 871.80                  | 871.80                | -691.80               | GEOBASE              |
| SHERMANFALL             | 908.90                  | 908.90                | -728.90               | GEOBASE              |
| KIRKFLD                 | 950.00                  | 950.00                | -770.00               | GEOBASE              |
| COBOCONK                | 994.00                  | 994.00                | -814.00               | GEOBASE              |
| GULLRIVR                | 1,025.90                | 1,025.90              | -845.90               | GEOBASE              |
| FTD                     | 1,067.00                | 1,067.00              | -887.00               | GEOBASE              |

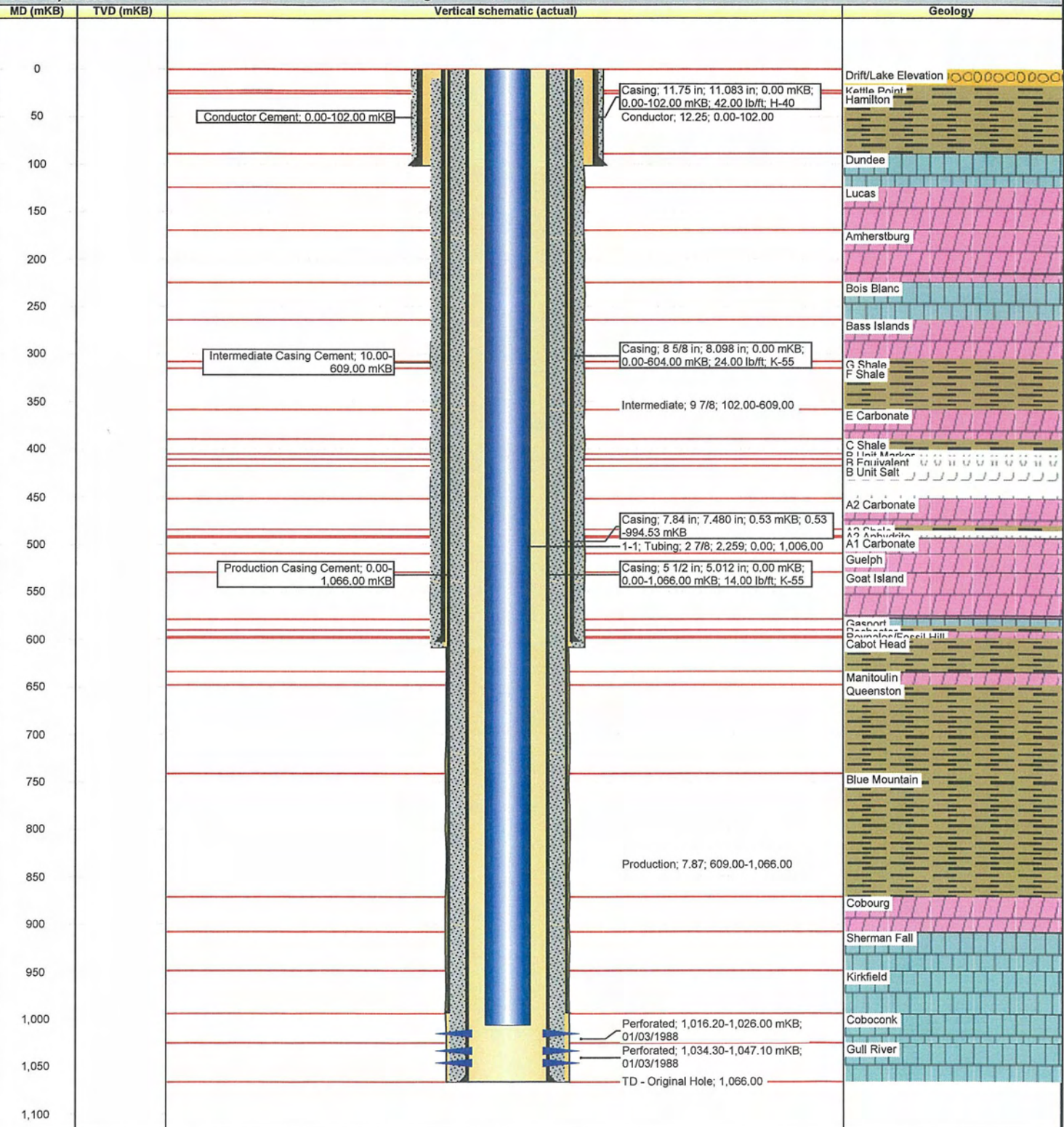
END OF WELL TICKET

Well Name: PPC 15 Dover 5-5-IVE

|                          |                                         |                        |                               |                             |
|--------------------------|-----------------------------------------|------------------------|-------------------------------|-----------------------------|
| UWI<br>8515              | Surface Legal Location<br>Dover 5-5-IVE | License #<br>T007240   | Pool<br>Dover                 | State/Province              |
| Well Configuration Type  | KB Elevation (m)                        | KB-Ground Distance (m) | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>   |                                         |                        |                               |                             |
| Job Category<br>Drilling | Primary Job Type<br>Drilling - original | Secondary Job Type     | Start Date<br>14/02/1988      | End Date<br>23/02/1988      |

TD: 1,066.00

Original Hole, 13/01/2011 12:44:58 PM





**WELL TICKET**

|             |                          |               |            |
|-------------|--------------------------|---------------|------------|
| WELL ID:    | 4041                     | SPUD DATE:    | 1984-02-04 |
| WELL NAME:  | ROWE RAM 4 DOVER 6-6-IVE | COMPLETED:    | 1984-02-09 |
| SHORT NAME: | RR4                      | SURFACE ELEV: | 176.05 m   |
| COUNTY:     | KENT                     | KB ELEV:      | 177.90 m   |
| TOWNSHIP:   | DOVER                    | TD:           | 1076.40 m  |
| TRACT:      | 6                        | WELL STATUS:  | OPGP       |
| LOT:        | 6                        |               |            |
| CONC:       | IVE                      |               |            |
| OPERATOR:   | LIBERTY OIL & GAS        | LATITUDE:     | 42.37321   |
| PERMIT:     | T006437                  | LONGITUDE:    | -82.34032  |

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TVD (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 1.85             | 1.85           | 176.05         | GEOBASE       |
| DUNDEE           | 93.00            | 93.00          | 84.90          | GEOBASE       |
| LUCAS            | 120.00           | 120.00         | 57.90          | GEOBASE       |
| AMHERBRG         | 176.80           | 176.80         | 1.10           | GEOBASE       |
| BOISBLAC         | 205.60           | 205.60         | -27.70         | GEOBASE       |
| BASSISLD         | 263.30           | 263.30         | -85.40         | GEOBASE       |
| GSHALE           | 305.20           | 305.20         | -127.30        | GEOBASE       |
| FSHALE           | 311.80           | 311.80         | -133.90        | GEOBASE       |
| ECARB            | 343.80           | 343.80         | -165.90        | GEOBASE       |
| CSHALE           | 385.80           | 385.80         | -207.90        | GEOBASE       |
| BMARKER          | 402.00           | 402.00         | -224.10        | GEOBASE       |
| BSALT            | 414.00           | 414.00         | -236.10        | GEOBASE       |
| BANHY            | 463.70           | 463.70         | -285.80        | GEOBASE       |
| A2CARB           | 465.50           | 465.50         | -287.60        | GEOBASE       |
| A2ANHY           | 492.80           | 492.80         | -314.90        | GEOBASE       |
| A1CARB           | 495.60           | 495.60         | -317.70        | GEOBASE       |
| GUELPH           | 506.20           | 506.20         | -328.30        | GEOBASE       |
| GOATISL          | 567.00           | 567.00         | -389.10        | GEOBASE       |
| GASPORT          | 581.20           | 581.20         | -403.30        | GEOBASE       |
| ROCHESTR         | 591.30           | 591.30         | -413.40        | GEOBASE       |
| REYNALES         | 599.00           | 599.00         | -421.10        | GEOBASE       |
| CABTHEAD         | 600.70           | 600.70         | -422.80        | GEOBASE       |
| MANITOUL         | 640.20           | 640.20         | -462.30        | GEOBASE       |
| QUEENSTN         | 650.30           | 650.30         | -472.40        | GEOBASE       |
| BLUEMTN          | 742.80           | 742.80         | -564.90        | GEOBASE       |
| COBOURG          | 873.30           | 873.30         | -695.40        | GEOBASE       |
| SHERMANFALL      | 912.60           | 912.60         | -734.70        | GEOBASE       |
| KIRKFLD          | 954.20           | 954.20         | -776.30        | GEOBASE       |
| COBOCONK         | 998.20           | 998.20         | -820.30        | GEOBASE       |
| GULLRIVR         | 1,031.00         | 1,031.00       | -853.10        | GEOBASE       |
| FTD              | 1,076.40         | 1,076.40       | -898.50        | GEOBASE       |

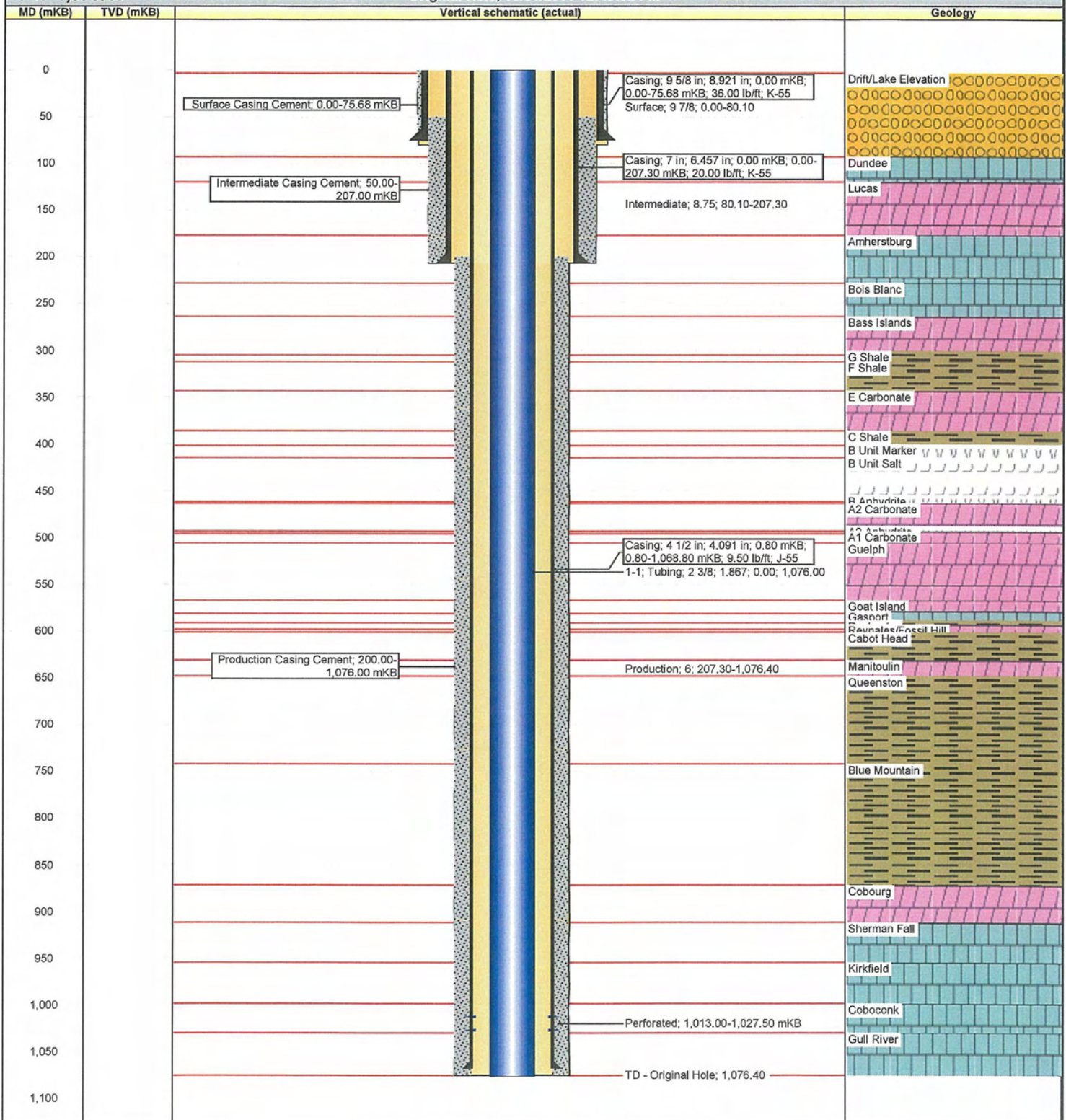
END OF WELL TICKET

Well Name: Rowe Ram 4 Dover 6-6-IVE

|                          |                                         |                        |                               |                             |
|--------------------------|-----------------------------------------|------------------------|-------------------------------|-----------------------------|
| UWI<br>4041              | Surface Legal Location<br>Dover 6-6-IVE | License #<br>T006437   | Pool<br>Dover                 | State/Province              |
| Well Configuration Type  | KB Elevation (m)                        | KB-Ground Distance (m) | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>   |                                         |                        |                               |                             |
| Job Category<br>Drilling | Primary Job Type<br>Drilling - original | Secondary Job Type     | Start Date<br>04/02/1984      | End Date<br>09/02/1984      |

TD: 1,076.40

Original Hole, 13/01/2011 12:45:32 PM





**WELL TICKET**

WELL ID: 10271  
 WELL NAME: CANENERCO /CNR 23  
 SHORT NAME: C23  
 COUNTY: KENT  
 TOWNSHIP: DOVER  
 TRACT: 4  
 LOT: 5  
 CONC: IVE  
 OPERATOR: LIBERTY OIL & GAS  
 PERMIT: T009591

SPUD DATE: 2000-09-01  
 COMPLETED: 2000-09-09  
 SURFACE ELEV: 175.66 m  
 KB ELEV: 179.31 m  
 TD: 1158.00 m  
 WELL STATUS: OBS  
 LATITUDE: 42.37301  
 LONGITUDE: -82.34678

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TVD (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 3.64             | 3.64           | 175.67         | GEOBASE       |
| KETTLEPT         | 24.20            | 24.20          | 155.11         | GEOBASE       |
| DUNDEE           | 87.40            | 87.40          | 91.91          | GEOBASE       |
| LUCAS            | 120.00           | 120.00         | 59.31          | GEOBASE       |
| AMHERBRG         | 180.40           | 180.40         | -1.09          | GEOBASE       |
| BOISBLAC         | 226.30           | 226.30         | -46.99         | GEOBASE       |
| BASSISLD         | 261.10           | 261.10         | -81.79         | GEOBASE       |
| GSHALE           | 310.00           | 310.00         | -130.69        | GEOBASE       |
| FSHALE           | 315.80           | 315.80         | -136.49        | GEOBASE       |
| ECARB            | 344.00           | 344.00         | -164.69        | GEOBASE       |
| CSHALE           | 390.50           | 390.50         | -211.19        | GEOBASE       |
| BMARKER          | 406.00           | 406.00         | -226.69        | GEOBASE       |
| BSALT            | 420.00           | 420.00         | -240.69        | GEOBASE       |
| A2CARB           | 461.00           | 461.00         | -281.69        | GEOBASE       |
| A2SHALE          | 483.90           | 483.90         | -304.59        | GEOBASE       |
| A1CARB           | 492.00           | 492.00         | -312.69        | GEOBASE       |
| GUELPH           | 507.60           | 507.60         | -328.29        | GEOBASE       |
| GOATISL          | 547.00           | 547.00         | -367.69        | GEOBASE       |
| GASPORT          | 574.20           | 574.20         | -394.89        | GEOBASE       |
| ROCHESTR         | 588.80           | 588.80         | -409.49        | GEOBASE       |
| REYNALES         | 596.30           | 596.30         | -416.99        | GEOBASE       |
| CABTHEAD         | 598.40           | 598.40         | -419.09        | GEOBASE       |
| MANITOUL         | 633.50           | 633.50         | -454.19        | GEOBASE       |
| QUEENSTN         | 647.70           | 647.70         | -468.39        | GEOBASE       |
| BLUEMTN          | 742.80           | 742.80         | -563.49        | GEOBASE       |
| COBOURG          | 873.20           | 873.20         | -693.89        | GEOBASE       |
| SHERMANFALL      | 912.00           | 912.00         | -732.69        | GEOBASE       |
| KIRKFLD          | 953.10           | 953.10         | -773.79        | GEOBASE       |
| COBOCONK         | 997.20           | 997.20         | -817.89        | GEOBASE       |
| GULLRIVR         | 1,030.00         | 1,030.00       | -850.69        | GEOBASE       |
| SHADLAKE         | 1,132.00         | 1,132.00       | -952.69        | GEOBASE       |
| CAMBRIAN         | 1,135.00         | 1,135.00       | -955.69        | GEOBASE       |
| PRECAMB          | 1,137.50         | 1,137.50       | -958.19        | GEOBASE       |
| FTD              | 1,158.00         | 1,158.00       | -978.69        | GEOBASE       |

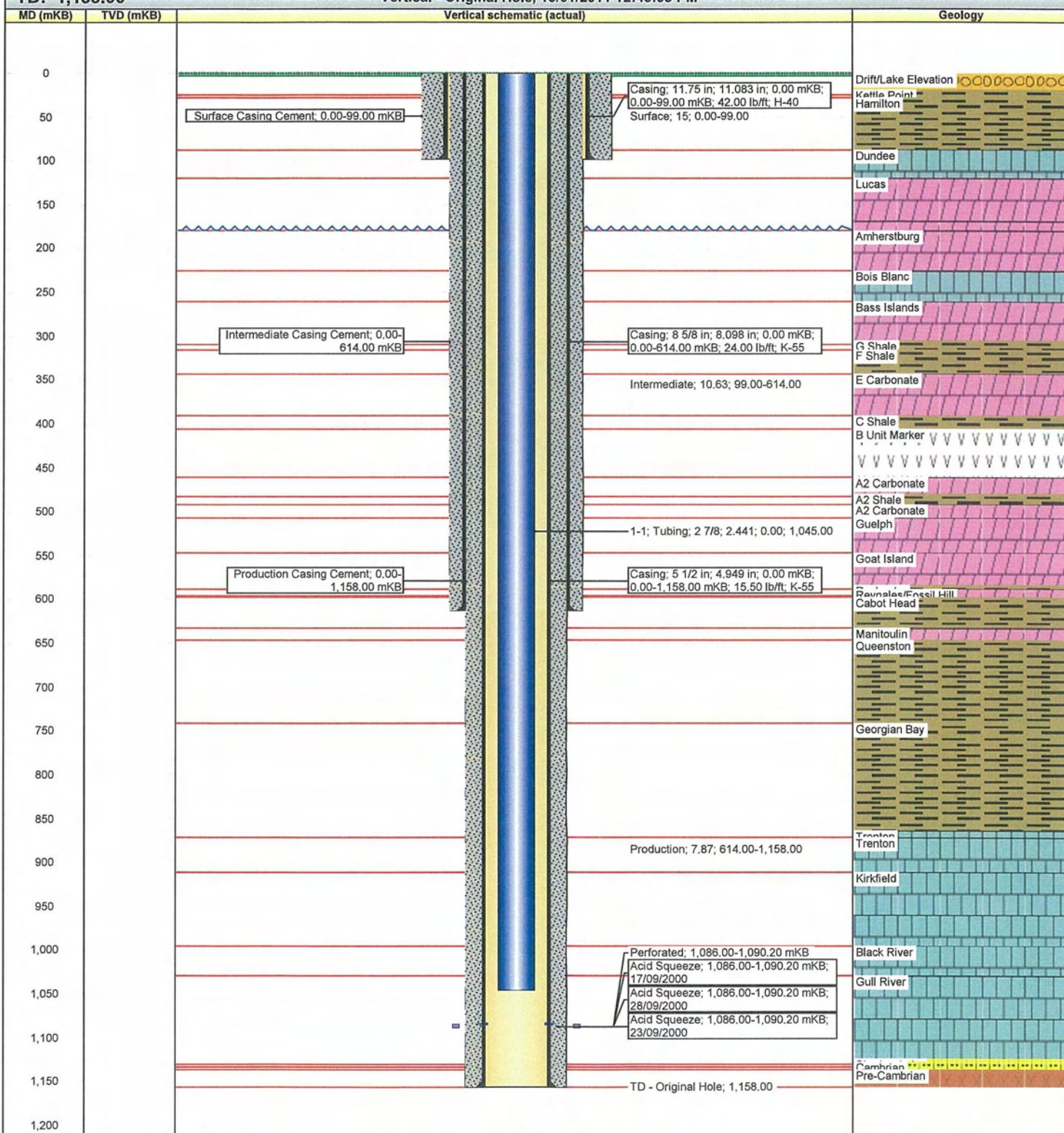
END OF WELL TICKET

Well Name: CanEnerco/CNR #23

|                                     |                                         |                                |                               |                             |
|-------------------------------------|-----------------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>10271                        | Surface Legal Location<br>Dover 4-5-IV  | License #<br>T009591           | Pool<br>Dover                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Vertical | KB Elevation (m)<br>179.31              | KB-Ground Distance (m)<br>3.65 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>              |                                         |                                |                               |                             |
| Job Category<br>Drilling            | Primary Job Type<br>Drilling - original | Secondary Job Type             | Start Date<br>01/09/2000      | End Date<br>09/09/2000      |

TD: 1,158.00

Vertical - Original Hole, 13/01/2011 12:46:05 PM









JACOB POOL  
SEISMIC COVERAGE  
MAP

LEGEND



JACOB POOL BOUNDARY

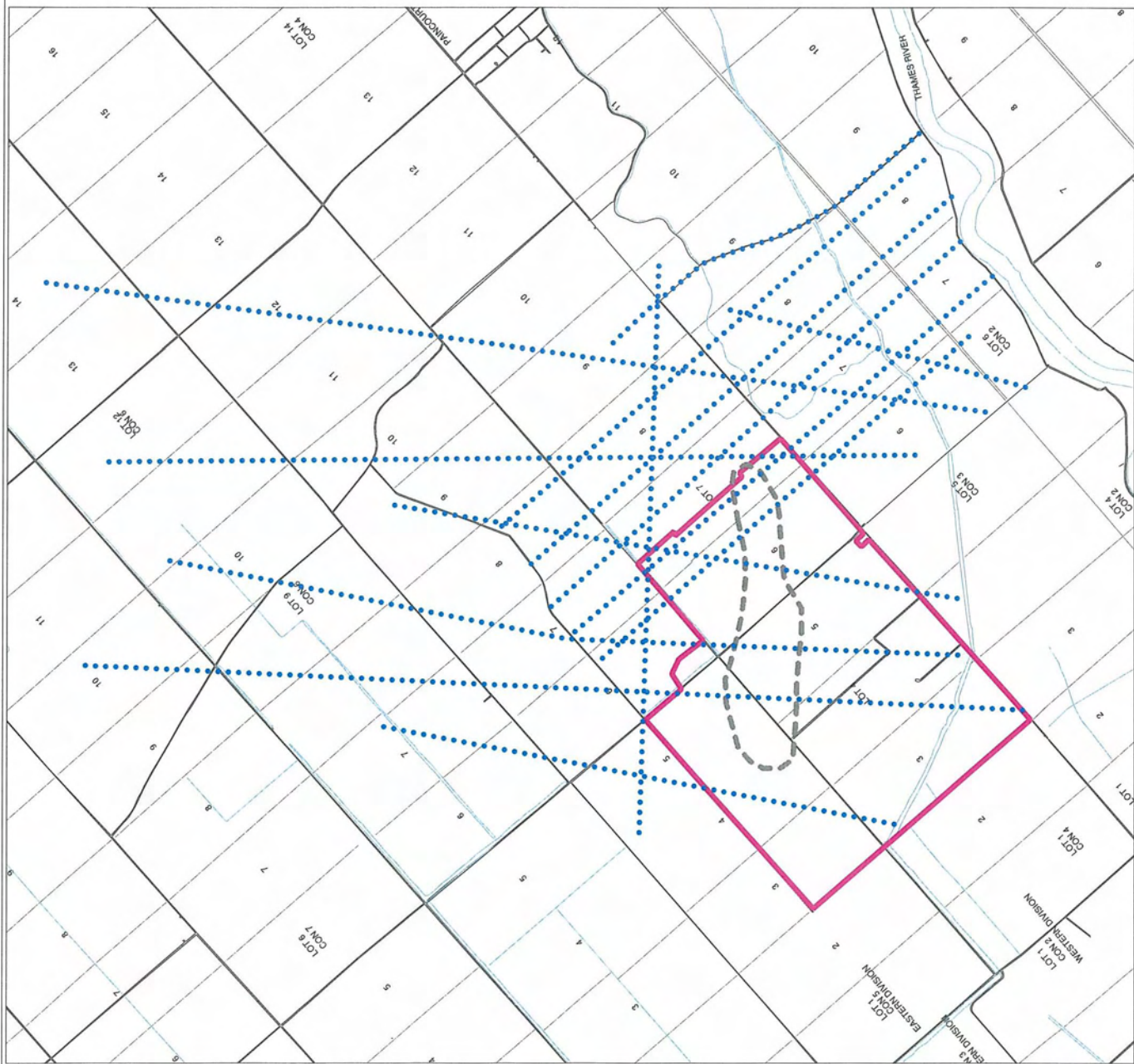


REPROCESSED 2D SEISMIC LINE



3D SEISMIC OUTLINE

SCALE







## Section 3 - Schedule 8

**WELL TICKET**

WELL ID: 11927  
 WELL NAME: PAIN COURT 1 HORIZONTAL 1  
 SHORT NAME: PC1  
 COUNTY: KENT  
 TOWNSHIP: DOVER  
 TRACT: 3  
 LOT: 6  
 CONC: IVE  
 OPERATOR: UNION GAS LIMITED  
 PERMIT: T012049

SPUD DATE: 2010-07-21  
 COMPLETED: 2010-08-31  
 SURFACE ELEV: 175.40 m  
 KB ELEV: 180.00 m  
 TD: 1903.00 m  
 WELL STATUS: STRAT

LATITUDE: 42.37500  
 LONGITUDE: -82.34089

| <u>FORMATION</u> | <u>DEPTH (m)</u> | <u>TVD (m)</u> | <u>TVE (m)</u> | <u>SOURCE</u> |
|------------------|------------------|----------------|----------------|---------------|
| DRFTLKL          | 4.60             | 4.60           | 175.40         | UNION GAS     |
| KETTLEPT         | 24.50            | 24.50          | 155.50         | UNION GAS     |
| HAMILTON         | 28.50            | 28.50          | 151.50         | UNION GAS     |
| DUNDEE           | 92.00            | 92.00          | 88.00          | UNION GAS     |
| LUCAS            | 127.00           | 127.00         | 53.00          | UNION GAS     |
| BOISBLAC         | 201.00           | 201.00         | -21.00         | UNION GAS     |
| BASSISLD         | 243.00           | 243.00         | -63.00         | UNION GAS     |
| GSHALE           | 307.00           | 307.00         | -127.00        | UNION GAS     |
| FSHALE           | 314.00           | 314.00         | -134.00        | UNION GAS     |
| ECARB            | 346.50           | 346.50         | -166.50        | UNION GAS     |
| DSALT            | 377.00           | 377.00         | -197.00        | UNION GAS     |
| CSHALE           | 388.50           | 388.50         | -208.50        | UNION GAS     |
| BMARKER          | 405.50           | 405.50         | -225.50        | UNION GAS     |
| BSALT            | 417.00           | 417.00         | -237.00        | UNION GAS     |
| A2CARB           | 462.00           | 462.00         | -282.00        | UNION GAS     |
| A2ANHY           | 497.50           | 497.50         | -317.50        | UNION GAS     |
| A1CARB           | 498.50           | 498.50         | -318.50        | UNION GAS     |
| A1ANHY           | 525.00           | 525.00         | -345.00        | UNION GAS     |
| GUELPH           | 528.00           | 528.00         | -348.00        | UNION GAS     |
| GOATISL          | 535.50           | 535.50         | -355.50        | UNION GAS     |
| GASPORT          | 581.00           | 581.00         | -401.00        | UNION GAS     |
| ROCHESTR         | 594.00           | 594.00         | -414.00        | UNION GAS     |
| REYNALES         | 602.00           | 602.00         | -422.00        | UNION GAS     |
| CABTHEAD         | 603.50           | 603.50         | -423.50        | UNION GAS     |
| MANITOU          | 643.50           | 643.49         | -463.49        | UNION GAS     |
| QUEENSTN         | 653.50           | 653.47         | -473.47        | UNION GAS     |
| BLUEMTN          | 744.50           | 741.72         | -561.72        | UNION GAS     |
| COBOURG          | 922.00           | 878.34         | -698.34        | UNION GAS     |
| SHERMANFALL      | 1,020.00         | 915.74         | -735.74        | UNION GAS     |
| FTD              | 1,903.00         | 922.65         | -742.65        | UNION GAS     |

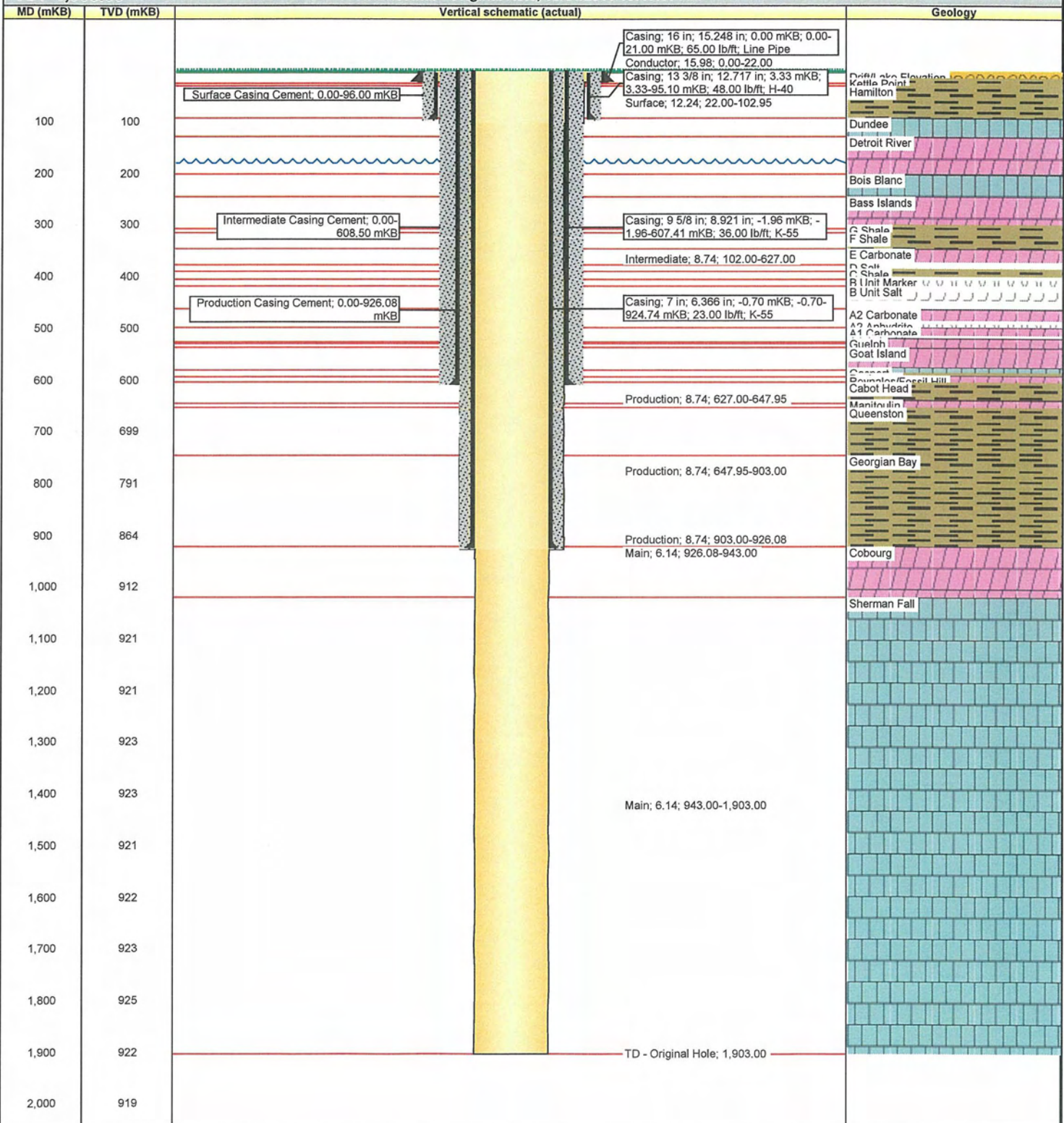
END OF WELL TICKET

**Well Name: Pain Court 1 (Horiz. #1), Dover 3 - 6 - IVE**

|                                       |                                         |                                |                               |                             |
|---------------------------------------|-----------------------------------------|--------------------------------|-------------------------------|-----------------------------|
| UWI<br>11927                          | Surface Legal Location<br>Dover 3-6-4   | License #<br>12049             | Pool<br>Jacob                 | State/Province<br>Ontario   |
| Well Configuration Type<br>Horizontal | KB Elevation (m)<br>180.00              | KB-Ground Distance (m)<br>4.60 | KB-Casing Flange Distance (m) | KB-Tubing Head Distance (m) |
| <b>Most Recent Job</b>                |                                         |                                |                               |                             |
| Job Category<br>Drilling              | Primary Job Type<br>Drilling - original | Secondary Job Type             | Start Date<br>05/07/2010      | End Date<br>03/09/2010      |

TD: 1,903.00

Horizontal - Original Hole, 13/01/2011 10:49:35 AM







***Threshold Pressure Determination  
By  
Mercury Injection Report***

**PAIN COURT 1 (HORIZ #1)  
DOVER 3-6-4**



Prepared for:

**UNION GAS LTD.**

P.O Box 2001  
Chatham, Ontario, Canada  
N7M 5M1

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Prepared by:  
**AGAT Laboratories Ltd.**

3700 – 21<sup>st</sup> Street NE  
Calgary, Alberta T2E 6V6  
Phone: 403.299.2000  
Fax: 403.299.2184

**W/O: 10RE2695  
OCTOBER 2010**

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## EXECUTIVE SUMMARY

Mercury injection capillary pressure tests were carried out on three (3) end piece samples from the PAIN COURT 1 (HORIZ #1) DOVER 3-6-4 well.

The mercury porosity results of the tested samples were measured from 3.03% to 3.29%. The three (3) samples had grain densities ranging from 2672 kg/m<sup>3</sup> and 2697 kg/m<sup>3</sup>.

The threshold pressure, the pressure at which mercury forms a connected pathway across the sample, ranged from 439.47 kPa to 1542.76 kPa.

Mercury injection capillary pressure test results indicate that all the samples from the selected interval of the formations in the reservoir displayed a unimodal pore throat distribution with majority content of microporosity.

The majority of pore throat sizes were of micropores for the three (3) samples tested. Microporosity ranged from 60.18% to 70.08%, mezoporosity ranged from 11.09% to 23.65%, and macroporosity ranged from 14.81% to 18.84% for all three (3) samples.

Porosity values of the cores from the specified depth interval of the well indicated that the formation seems to have a limited storage capacity with restricted transport properties.

By reviewing the laboratory outcome integrated with seismic to micro structural data, it will further provide a robust basis for interpretation of the reservoir potential, sealing capacity, and stability/strength of individual strata.

## STUDY OBJECTIVE

Mercury Injection Porosimetry is an experimental technique, which is used to estimate porosity, threshold pressure, pore size distributions and capillary pressures in porous materials. The method consists of injecting mercury at increasing pressure into a sample, which has been previously evacuated; this process is known as primary drainage (the "wetting" phase is the vacuum). Recording mercury pressures and saturations allows generation of a capillary pressure-saturation curve. By next lowering the pressure in stages, an imbibition process can be simulated and the equivalent capillary pressure can be generated. A second series of pressure increases will simulate a secondary or re-drainage process; again a capillary pressure curve can be plotted. The end saturation for the primary drainage process gives an estimation of the primary drainage and the imbibition processes gives an indication of the recovery efficiency for the hydrocarbon in a reservoir (again assuming the reservoir to be water wet).

Mercury Injection Porosimetry data are used to determine pore size distributions of core samples. By using suitable scaling parameters, oil/brine capillary pressure curves may also be deducted from mercury injection capillary pressure curves. AGAT can measure mercury injection capillary pressure curves and infer pore size distribution data.

The objective of the project is to study the formation characteristics of core samples collected from the well.

## **SCOPE OF WORK**

For the purpose of evaluation of the formation, the following job was included in this project.

- Mercury injection porosity tests on end piece samples from the well to evaluate the threshold pressure, pore geometry, and capillary pressure.



## EXPERIMENTAL PROCEDURE

### Mercury Injection Capillary Pressure Test

End piece core samples from the well are selected for mercury injection capillary pressure testing. The clean end piece samples are individually placed in a penetrometer assembly and weighed together. The penetrometer containing the sample is loaded into the low-pressure chamber of Micromeritics Autopore porosimeter. The penetrometer is evacuated to a pressure of less than 50 micron of mercury and then filled with mercury at a pressure of 10 kPa gauge (1.5 psi gauge). Using nitrogen gas as the displacing medium, mercury is injected into the sample at incremental pressures from 10 kPa gauge (1.5 psi gauge) to 207 kPa gauge (30 psi gauge). At each pressure increment, mercury intrusion is monitored while the pressure is held constant. The pressure and the total volume for each point are recorded. Upon completion of the 30 psi gauge injection increment, the low-pressure stage is completed and the injection pressure is reduced to atmospheric. The penetrometer is removed and weighed with the sample and mercury in place (the assembly weight).

The sample is loaded into the high-pressure chamber of Autopore system and the system pressure is increased to 207 kPa gauge. Mercury is then injected into the sample at incremental pressures from 207 kPa gauge to 414 MPa gauge using hydraulic oil as the displacing medium. At each pressure increment, mercury intrusion is monitored while the pressure is held constant. The pressure and the total volume of for each point are recorded. At 414 MPa gauge the mercury is assumed to have invaded 100% of the pore space; therefore, the maximum intrusion volume at this pressure is assumed to be equal to the pore volume of the sample.

The porosity is the ratio of mercury pore volume to bulk volume and is calculated based on injected intrusion volume and sample bulk volume. The mercury pore volume is reported as a cumulative volume of mercury injected into the sample void space at the maximum injection pressure. During the mercury intrusion procedure the volume of the whole sample is determined (bulk volume). The bulk density is calculated from the sample weight and volume of the bulk. A correction to the bulk volume is required in terms of the conformance volume of the sample. The volume of mercury recorded at the selected entry pressure is the conformance volume.

$$d_b = \frac{W_{spl}}{V_{pen} - \frac{W_{as} - W_{pen} - W_{spl}}{D_{hg}} + C_{vol}}$$

Where,

|           |                          |
|-----------|--------------------------|
| $d_b$     | Bulk density (g/cc)      |
| $W_{spl}$ | Sample weight (g)        |
| $W_{as}$  | Assembly weight (g)      |
| $W_{pen}$ | Penetrometer weight (g)  |
| $V_{pen}$ | Penetrometer volume (cc) |
| $D_{hg}$  | Mercury density (g/cc)   |
| $C_{vol}$ | Conformance volume (cc)  |

Porosity (%) = { Mercury Pore Volume (cc) / Bulk Volume (g/cc) } \* 100

The non-wetting phase saturation ( $H_g$ ) corresponding to each pressure step is defined as the volume of the non-wetting phase (mercury) divided by the total pore volume:

$$S_v = \frac{V_{Hg}}{PV}$$

Where,

|          |                                 |
|----------|---------------------------------|
| $S_v$    | Mercury saturation (%)          |
| $V_{Hg}$ | Volume of mercury injected (cc) |
| $PV$     | Total pore volume (cc)          |

The pressure steps are then plotted versus their corresponding saturation to achieve the drainage capillary pressure curve.

For each capillary pressure increment, the corresponding pore throat entry radius can be calculated via the following equation:

$$r = \frac{2\sigma \cos \theta}{P_c}$$

Where,

|          |                                                                |
|----------|----------------------------------------------------------------|
| $\sigma$ | Interfacial tension (480 dynes/cm for a mercury/vacuum system) |
| $\theta$ | The contact angle (140° for a mercury/vacuum system)           |
| $P_c$    | Capillary pressure (kPa gauge)                                 |

From the corresponding wetting phase saturation, the percentage of the pore space controlled by a given pore throat radius can be determined. This data is presented as the Cumulative Intrusion Volume.

The "Normalized Incremental Intrusion Volume" is calculated by dividing the mercury volume injected at each pressure increment by the maximum incremental intrusion volume.

The mercury capillary pressure curve may be converted to an air-water capillary pressure curve by the application of the pore throat radii equation. That is, with  $r$  constant at a given saturation, the ratio of the capillary pressures for the different fluids would yield:

$$\frac{(P_c)_1}{(P_c)_2} = \frac{\sigma_1 \cos \theta_1}{\sigma_2 \cos \theta_2}$$

Where, the subscripts denote type of fluids.

Assuming a mercury-vacuum system (where  $\sigma_1 = 480$  dynes/cm and  $\theta_1 = 140^\circ$ ) and an air-water system (where  $\sigma_2 = 72$  dynes/cm and  $\theta_2 = 0^\circ$ ), the above relation yields a ratio of (-5.1) {this is an industry standard based on the contact angle and interfacial tension for mercury and brine}. It is recommended that this ratio be used with caution since it has been shown (by Brown<sup>1</sup>) that the ratio varies from formation to formation and even from sample to sample. The air-brine equivalent capillary pressure curve was generated by dividing the mercury pressure by this ratio (-5.1) and by plotting against the wetting phase saturation.

The air-brine capillary pressure in height above free water is determined using the following formula:

$$h = \frac{P_c}{(\rho_w - \rho_g)g}$$

Where,

|          |                                                     |
|----------|-----------------------------------------------------|
| $h$      | Height above free water level (m)                   |
| $P_c$    | Capillary pressure (Pa)                             |
| $\rho_w$ | Formation water density (kg/m <sup>3</sup> )        |
| $\rho_g$ | Gas density (N <sub>2</sub> ) (kg/m <sup>3</sup> )  |
| $g$      | Gravitational acceleration (9.81 m/s <sup>2</sup> ) |

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1. Brown, H. W., "*Capillary Pressure Investigations*", AIME Petroleum Transactions, Vol. 192, pp. 67-74, 1951.

The threshold pressure of each sample is determined based on the correlation formula by Thomas et al. 1968.

$$P_{thres} = 50.814 \left( \frac{1}{WinlandPerm} \right)^{0.43}$$

Where,

|                    |                           |
|--------------------|---------------------------|
| P <sub>thres</sub> | Threshold Pressure (kPa)  |
| Winland Perm       | Winland Permeability (mD) |

An estimate of the gas permeability of the samples is derived from the pore throat size distribution data through the use of the "**Winland R<sub>35</sub>**" formula. This proprietary equation is based on the pore throat radius associated with the 35% intrusion volume (R<sub>35</sub>) and the porosity derived from the mercury injection tests.

$$\text{Log } R_{35} = 0.732 + 0.588 \text{ Log } K_{air} - 0.864 \text{ Log } \phi_{core}$$

Where,

|                  |   |                                                                                                                           |
|------------------|---|---------------------------------------------------------------------------------------------------------------------------|
| R <sub>35</sub>  | = | pore aperture radius corresponding to the 35 <sup>th</sup> percentile of mercury saturation in a mercury porosimetry test |
| K <sub>air</sub> | = | uncorrected air permeability (mD)                                                                                         |
| φ                | = | Porosity (%)                                                                                                              |



## RESULTS

Mercury injection tests on three (3) samples from the PAIN COURT 1 (HORIZ #1) DOVER 3-6-4 well determined pore throat size distribution, mercury porosity, grain density, threshold pressure, and peak and median pore radii.

Mercury porosity had a range of 3.03% to 3.29% for the three (3) samples. Grain densities ranged from 2672 Kg/cm<sup>3</sup> to 2697 Kg/cm<sup>3</sup> for the samples.

The threshold pressure, the pressure at which mercury forms a connected pathway across the sample for the specific depth interval, ranged from 439.47 kPa to 1542.76 kPa for all three (3) samples.

The majority of pore throat sizes were of micropores for the three (3) samples tested. Microporosity ranged from 60.18% to 70.08%, mezoporosity ranged from 11.09% to 23.65%, and macroporosity ranged from 14.81% to 18.84% for all three (3) samples.

Peak pore throat radius was found to range from 0.0015 µm to 0.0025 µm. Median pore throat radius was found to range from 0.0055 µm to 0.0088 µm.

*Table A* shows the summary of mercury injection results. Laboratory data and graphs for individual samples are found in *Tables and Figures*.

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Table A: Summary of Mercury Injection Results

| Sample ID | LSD:        | Measured Depth (m) | True Vertical Depth (m) | Grain Density ( $K_g/cm^3$ ) | Hg Porosity (%) | Winland Permeability (mD) | Threshold Pressure (kPa) | Peak Radius ( $\mu m$ ) | Median Radius ( $\mu m$ ) | Micropores (<1 $\mu m$ ) (%) | Macropores (>3 $\mu m$ ) (%) | Mezopores (1-3 $\mu m$ ) (%) |
|-----------|-------------|--------------------|-------------------------|------------------------------|-----------------|---------------------------|--------------------------|-------------------------|---------------------------|------------------------------|------------------------------|------------------------------|
| SP-1      | DOVER 3-6-4 | 903.64             | 865.29                  | 2689                         | 3.03            | 0.0004                    | 1542.76                  | 0.0015                  | 0.0055                    | 69.83                        | 14.81                        | 15.36                        |
| SP-2      | DOVER 3-6-4 | 906.41             | 867.31                  | 2672                         | 3.29            | 0.0066                    | 439.47                   | 0.0025                  | 0.0088                    | 70.08                        | 18.84                        | 11.09                        |
| SP-3      | DOVER 3-6-4 | 910.20             | 870.09                  | 2697                         | 3.28            | 0.0013                    | 872.76                   | 0.0015                  | 0.0062                    | 60.18                        | 16.16                        | 23.65                        |

|         |  |      |      |        |         |        |        |       |       |       |
|---------|--|------|------|--------|---------|--------|--------|-------|-------|-------|
| Minimum |  | 2672 | 3.03 | 0.0004 | 439.47  | 0.0015 | 0.0055 | 60.18 | 14.81 | 11.09 |
| Average |  | 2686 | 3.20 | 0.0028 | 951.66  | 0.0018 | 0.0068 | 66.70 | 16.60 | 16.70 |
| Maximum |  | 2697 | 3.29 | 0.0066 | 1542.76 | 0.0025 | 0.0088 | 70.08 | 18.84 | 23.65 |

## CONCLUSIONS

Mercury injection capillary pressure test results indicate that all the samples from the selected interval of the formations in the reservoir displayed a unimodal pore throat distribution with higher content of microporosity.

Porosity values of the cores from the specified depth interval of the well indicated that the formation seems to have a limited storage capacity with restricted transport properties.

The threshold pressure is a key parameter to design geological storage and avoid an upward migration of the injected fluid into the overlaying formations. The requirement for hydrocarbon seal rocks is that minimum displacement pressure of the lithologic unit comprising the sealing surface be greater than the buoyancy pressure of the hydrocarbon column in the accumulation. The pore aperture size is influenced by sample size and surface irregularities of the rock relative to pore geometry, which create a boundary condition. The pore circumference is not proportional to the pore radius. In a sense, further cut-off determination (Net pay permeability cut-off and porosity cut-off) is subjected to consider with specific rock type correlations.

Another type of method such as image analysis method, small angle X-ray scattering method or SEM method may be useful to identify the characteristics of pore structure.

The outcome of mercury injection test provides non-wetting phase directional injection, pore network characterization, free water level determination, calculation of reservoir efficiency, calculation of hydrocarbon column heights and the integration with scanning electron microscope sample analysis.

Comments and conclusions made herewith are based on the micro scale lab tests on the selected core plug samples from the specific depth interval of pertinent well and one should be aware that several well performance, well logging data, and further observation on vital characteristics such as reservoir heterogeneity, lithology differences, ejection efficiencies, and the existence of variations in the pore system shall be convinced to have a better conclusion of the reservoir and recovery technique. As a result, macro scale field scenario may override the micro scale results.

## TABLES AND FIGURES



**Table 1: Mercury Injection Capillary Pressure Data - SP-1**

Sample: SP-1

Hg Porosity: 3.03%

Depth: 865.29 (m)

Winland Permeability 0.0004mD

| Air/Hg<br>Capillary<br>Pressure<br>(kPa) | Pore<br>Radius<br>(µm) | Cumulative<br>Hg Intrusion<br>Volume<br>(ml/g) | Incremental<br>Intrusion<br>Volume<br>(ml/g) | Normalised<br>Intrusion<br>Volume | Mercury<br>Saturation<br>(%) | Equivalent<br>A/B<br>Pressure<br>(kPa) | Wetting<br>Phase<br>Saturation<br>(%) | Height<br>Above<br>Free Water<br>(m) | Incremental<br>Mercury<br>Saturation |
|------------------------------------------|------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------|------------------------------|----------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| 10.4                                     | 59.812                 | 0.000                                          | 0.0000                                       | 0.00                              | 0.01                         | 2.0                                    | 100.0                                 | 2.3                                  | 0.014                                |
| 12.5                                     | 49.960                 | 0.000                                          | 0.0001                                       | 0.05                              | 0.56                         | 2.4                                    | 99.4                                  | 2.8                                  | 0.544                                |
| 14.8                                     | 42.184                 | 0.000                                          | 0.0001                                       | 0.04                              | 0.99                         | 2.9                                    | 99.0                                  | 3.3                                  | 0.435                                |
| 17.4                                     | 35.748                 | 0.000                                          | 0.0001                                       | 0.05                              | 1.54                         | 3.4                                    | 98.5                                  | 3.9                                  | 0.544                                |
| 20.5                                     | 30.364                 | 0.000                                          | 0.0001                                       | 0.06                              | 2.17                         | 4.0                                    | 97.8                                  | 4.5                                  | 0.631                                |
| 24.2                                     | 25.717                 | 0.000                                          | 0.0001                                       | 0.11                              | 3.36                         | 4.8                                    | 96.6                                  | 5.4                                  | 1.197                                |
| 28.5                                     | 21.906                 | 0.000                                          | 0.0001                                       | 0.05                              | 3.86                         | 5.6                                    | 96.1                                  | 6.3                                  | 0.500                                |
| 33.6                                     | 18.577                 | 0.001                                          | 0.0001                                       | 0.06                              | 4.52                         | 6.6                                    | 95.5                                  | 7.4                                  | 0.653                                |
| 39.8                                     | 15.654                 | 0.001                                          | 0.0001                                       | 0.08                              | 5.37                         | 7.8                                    | 94.6                                  | 8.8                                  | 0.848                                |
| 46.8                                     | 13.313                 | 0.001                                          | 0.0001                                       | 0.08                              | 6.26                         | 9.2                                    | 93.7                                  | 10.4                                 | 0.892                                |
| 55.4                                     | 11.264                 | 0.001                                          | 0.0001                                       | 0.07                              | 7.06                         | 10.9                                   | 92.9                                  | 12.3                                 | 0.805                                |
| 65.3                                     | 9.543                  | 0.001                                          | 0.0001                                       | 0.07                              | 7.87                         | 12.8                                   | 92.1                                  | 14.5                                 | 0.805                                |
| 77.2                                     | 8.075                  | 0.001                                          | 0.0001                                       | 0.09                              | 8.80                         | 15.1                                   | 91.2                                  | 17.1                                 | 0.935                                |
| 91.4                                     | 6.825                  | 0.001                                          | 0.0001                                       | 0.10                              | 9.85                         | 17.9                                   | 90.2                                  | 20.2                                 | 1.044                                |
| 107.9                                    | 5.778                  | 0.001                                          | 0.0001                                       | 0.09                              | 10.80                        | 21.2                                   | 89.2                                  | 23.9                                 | 0.957                                |
| 128.6                                    | 4.848                  | 0.001                                          | 0.0001                                       | 0.11                              | 11.96                        | 25.2                                   | 88.0                                  | 28.5                                 | 1.153                                |
| 152.1                                    | 4.100                  | 0.002                                          | 0.0001                                       | 0.11                              | 13.13                        | 29.8                                   | 86.9                                  | 33.7                                 | 1.175                                |
| 179.8                                    | 3.467                  | 0.002                                          | 0.0002                                       | 0.14                              | 14.68                        | 35.3                                   | 85.3                                  | 39.8                                 | 1.545                                |
| 189.9                                    | 3.284                  | 0.002                                          | 0.0000                                       | 0.01                              | 14.81                        | 37.2                                   | 85.2                                  | 42.0                                 | 0.130                                |
| 230.8                                    | 2.702                  | 0.002                                          | 0.0000                                       | 0.02                              | 15.04                        | 45.3                                   | 85.0                                  | 51.1                                 | 0.237                                |
| 278.6                                    | 2.238                  | 0.002                                          | 0.0001                                       | 0.04                              | 15.50                        | 54.6                                   | 84.5                                  | 61.7                                 | 0.455                                |
| 332.7                                    | 1.874                  | 0.002                                          | 0.0001                                       | 0.08                              | 16.36                        | 65.2                                   | 83.6                                  | 73.7                                 | 0.863                                |
| 396.6                                    | 1.572                  | 0.002                                          | 0.0001                                       | 0.08                              | 17.25                        | 77.8                                   | 82.8                                  | 87.8                                 | 0.887                                |
| 467.5                                    | 1.334                  | 0.002                                          | 0.0001                                       | 0.09                              | 18.27                        | 91.7                                   | 81.7                                  | 103.5                                | 1.021                                |
| 561.2                                    | 1.111                  | 0.002                                          | 0.0001                                       | 0.09                              | 19.23                        | 110.0                                  | 80.8                                  | 124.3                                | 0.963                                |
| 673.4                                    | 0.926                  | 0.002                                          | 0.0001                                       | 0.08                              | 20.08                        | 132.0                                  | 79.9                                  | 149.1                                | 0.851                                |
| 794.3                                    | 0.785                  | 0.002                                          | 0.0001                                       | 0.07                              | 20.89                        | 155.7                                  | 79.1                                  | 175.9                                | 0.808                                |
| 949.4                                    | 0.657                  | 0.003                                          | 0.0001                                       | 0.08                              | 21.73                        | 186.2                                  | 78.3                                  | 210.2                                | 0.838                                |
| 1123.4                                   | 0.555                  | 0.003                                          | 0.0001                                       | 0.06                              | 22.41                        | 220.3                                  | 77.6                                  | 248.8                                | 0.678                                |
| 1345.3                                   | 0.463                  | 0.003                                          | 0.0001                                       | 0.06                              | 23.11                        | 263.8                                  | 76.9                                  | 297.9                                | 0.702                                |
| 1585.6                                   | 0.393                  | 0.003                                          | 0.0001                                       | 0.05                              | 23.66                        | 310.9                                  | 76.3                                  | 351.1                                | 0.553                                |
| 1894.3                                   | 0.329                  | 0.003                                          | 0.0001                                       | 0.06                              | 24.36                        | 371.4                                  | 75.6                                  | 419.5                                | 0.698                                |
| 2267.6                                   | 0.275                  | 0.003                                          | 0.0001                                       | 0.06                              | 24.99                        | 444.6                                  | 75.0                                  | 502.1                                | 0.626                                |
| 2626.2                                   | 0.237                  | 0.003                                          | 0.0001                                       | 0.05                              | 25.52                        | 514.9                                  | 74.5                                  | 581.5                                | 0.539                                |
| 3137.8                                   | 0.199                  | 0.003                                          | 0.0001                                       | 0.05                              | 26.06                        | 615.3                                  | 73.9                                  | 694.8                                | 0.534                                |
| 3683.2                                   | 0.169                  | 0.003                                          | 0.0001                                       | 0.05                              | 26.65                        | 722.2                                  | 73.4                                  | 815.6                                | 0.589                                |
| 4487.4                                   | 0.139                  | 0.003                                          | 0.0001                                       | 0.06                              | 27.28                        | 879.9                                  | 72.7                                  | 993.7                                | 0.633                                |
| 5200.9                                   | 0.120                  | 0.003                                          | 0.0000                                       | 0.04                              | 27.71                        | 1019.8                                 | 72.3                                  | 1151.7                               | 0.427                                |
| 6097.1                                   | 0.102                  | 0.003                                          | 0.0001                                       | 0.05                              | 28.22                        | 1195.5                                 | 71.8                                  | 1350.1                               | 0.516                                |

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 W/O: 10RE2695  
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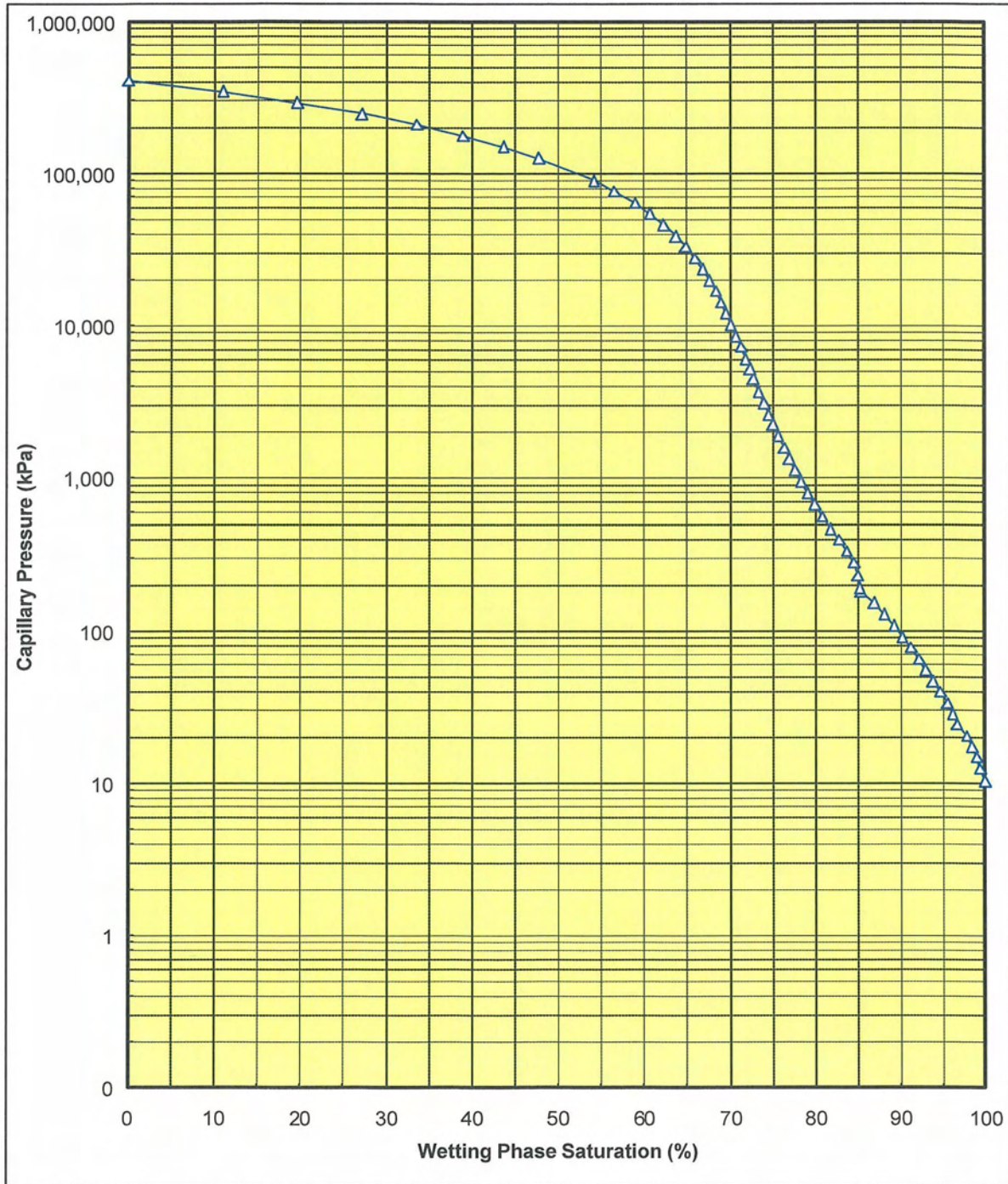
| Air/Hg<br>Capillary<br>Pressure<br>(kPa) | Pore<br>Radius<br>(µm) | Cumulative<br>Hg Intrusion<br>Volume<br>(ml/g) | Incremental<br>Intrusion<br>Volume<br>(ml/g) | Normalised<br>Intrusion<br>Volume | Mercury<br>Saturation<br>(%) | Equivalent<br>A/B<br>Pressure<br>(kPa) | Wetting<br>Phase<br>Saturation<br>(%) | Height<br>Above<br>Free Water<br>(m) | Incremental<br>Mercury<br>Saturation |
|------------------------------------------|------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------|------------------------------|----------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| 7303.5                                   | 0.085                  | 0.003                                          | 0.0001                                       | 0.05                              | 28.73                        | 1432.1                                 | 71.3                                  | 1617.3                               | 0.509                                |
| 8634.8                                   | 0.072                  | 0.003                                          | 0.0001                                       | 0.05                              | 29.31                        | 1693.1                                 | 70.7                                  | 1912.1                               | 0.577                                |
| 10180.5                                  | 0.061                  | 0.003                                          | 0.0001                                       | 0.05                              | 29.88                        | 1996.2                                 | 70.1                                  | 2254.3                               | 0.573                                |
| 12036.5                                  | 0.052                  | 0.004                                          | 0.0001                                       | 0.05                              | 30.47                        | 2360.1                                 | 69.5                                  | 2665.3                               | 0.590                                |
| 14149.0                                  | 0.044                  | 0.004                                          | 0.0001                                       | 0.05                              | 31.05                        | 2774.3                                 | 69.0                                  | 3133.1                               | 0.573                                |
| 16819.6                                  | 0.037                  | 0.004                                          | 0.0001                                       | 0.05                              | 31.63                        | 3298.0                                 | 68.4                                  | 3724.5                               | 0.586                                |
| 19816.8                                  | 0.031                  | 0.004                                          | 0.0001                                       | 0.07                              | 32.40                        | 3885.7                                 | 67.6                                  | 4388.2                               | 0.770                                |
| 23473.8                                  | 0.027                  | 0.004                                          | 0.0001                                       | 0.07                              | 33.22                        | 4602.7                                 | 66.8                                  | 5198.0                               | 0.817                                |
| 27758.5                                  | 0.022                  | 0.004                                          | 0.0001                                       | 0.08                              | 34.06                        | 5442.8                                 | 65.9                                  | 6146.7                               | 0.837                                |
| 32883.0                                  | 0.019                  | 0.004                                          | 0.0001                                       | 0.10                              | 35.15                        | 6447.7                                 | 64.8                                  | 7281.5                               | 1.096                                |
| 38746.4                                  | 0.016                  | 0.004                                          | 0.0001                                       | 0.11                              | 36.32                        | 7597.3                                 | 63.7                                  | 8579.9                               | 1.169                                |
| 45986.7                                  | 0.014                  | 0.004                                          | 0.0002                                       | 0.13                              | 37.69                        | 9017.0                                 | 62.3                                  | 10183.1                              | 1.372                                |
| 54247.3                                  | 0.011                  | 0.005                                          | 0.0002                                       | 0.15                              | 39.30                        | 10636.7                                | 60.7                                  | 12012.3                              | 1.610                                |
| 64135.3                                  | 0.010                  | 0.005                                          | 0.0002                                       | 0.15                              | 40.99                        | 12575.5                                | 59.0                                  | 14201.9                              | 1.691                                |
| 75918.0                                  | 0.008                  | 0.005                                          | 0.0003                                       | 0.22                              | 43.43                        | 14885.9                                | 56.6                                  | 16811.0                              | 2.436                                |
| 89903.9                                  | 0.007                  | 0.005                                          | 0.0003                                       | 0.22                              | 45.80                        | 17628.2                                | 54.2                                  | 19908.0                              | 2.367                                |
| 125879.0                                 | 0.005                  | 0.006                                          | 0.0007                                       | 0.59                              | 52.23                        | 24682.1                                | 47.8                                  | 27874.2                              | 6.437                                |
| 149346.1                                 | 0.004                  | 0.007                                          | 0.0005                                       | 0.38                              | 56.35                        | 29283.6                                | 43.7                                  | 33070.7                              | 4.112                                |
| 176441.7                                 | 0.004                  | 0.007                                          | 0.0005                                       | 0.43                              | 61.04                        | 34596.4                                | 39.0                                  | 39070.6                              | 4.693                                |
| 208999.9                                 | 0.003                  | 0.008                                          | 0.0006                                       | 0.49                              | 66.41                        | 40980.4                                | 33.6                                  | 46280.2                              | 5.373                                |
| 247073.8                                 | 0.003                  | 0.008                                          | 0.0007                                       | 0.59                              | 72.85                        | 48445.8                                | 27.1                                  | 54711.1                              | 6.441                                |
| 292273.7                                 | 0.002                  | 0.009                                          | 0.0009                                       | 0.69                              | 80.38                        | 57308.6                                | 19.6                                  | 64720.0                              | 7.525                                |
| 345439.6                                 | 0.002                  | 0.010                                          | 0.0010                                       | 0.79                              | 89.07                        | 67733.3                                | 10.9                                  | 76492.9                              | 8.688                                |
| 408570.2                                 | 0.002                  | 0.012                                          | 0.0013                                       | 1.00                              | 100.00                       | 80111.8                                | 0.0                                   | 90472.3                              | 10.935                               |



**Figure 1A: Hg/Air Capillary Pressure vs. Wetting Phase Saturation – SP-1**

Sample: SP-1  
Depth: 865.29 (m)

Hg Porosity: 3.03 %  
Winland Permeability: 0.0004 mD





**Figure 1B: Derived Air/Water Capillary Pressure vs. Wetting Phase Saturation – SP-1**

Sample: SP-1 Hg Porosity: 3.03 %  
Depth: 865.29 (m) Winland Permeability 0.0004 mD

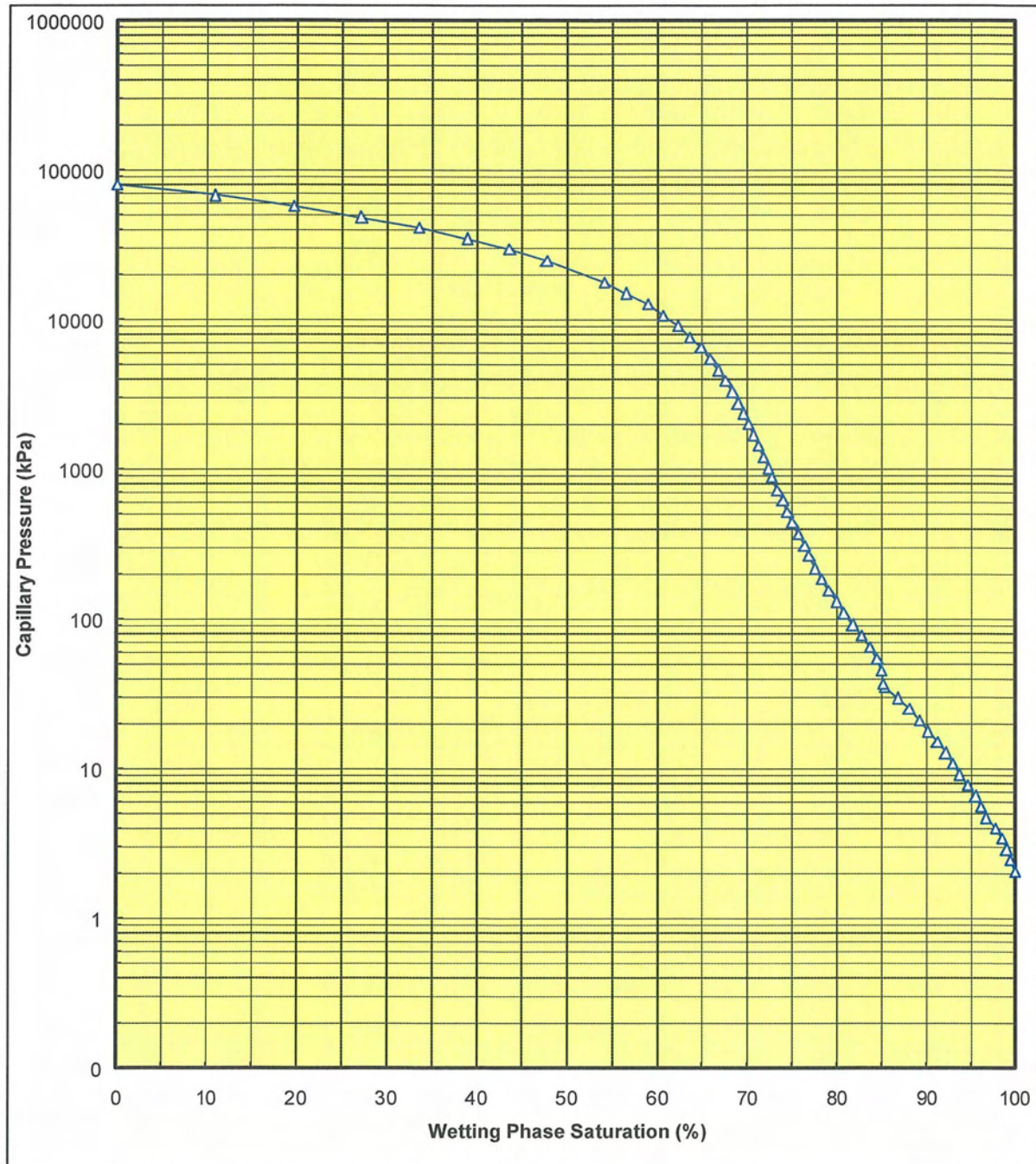
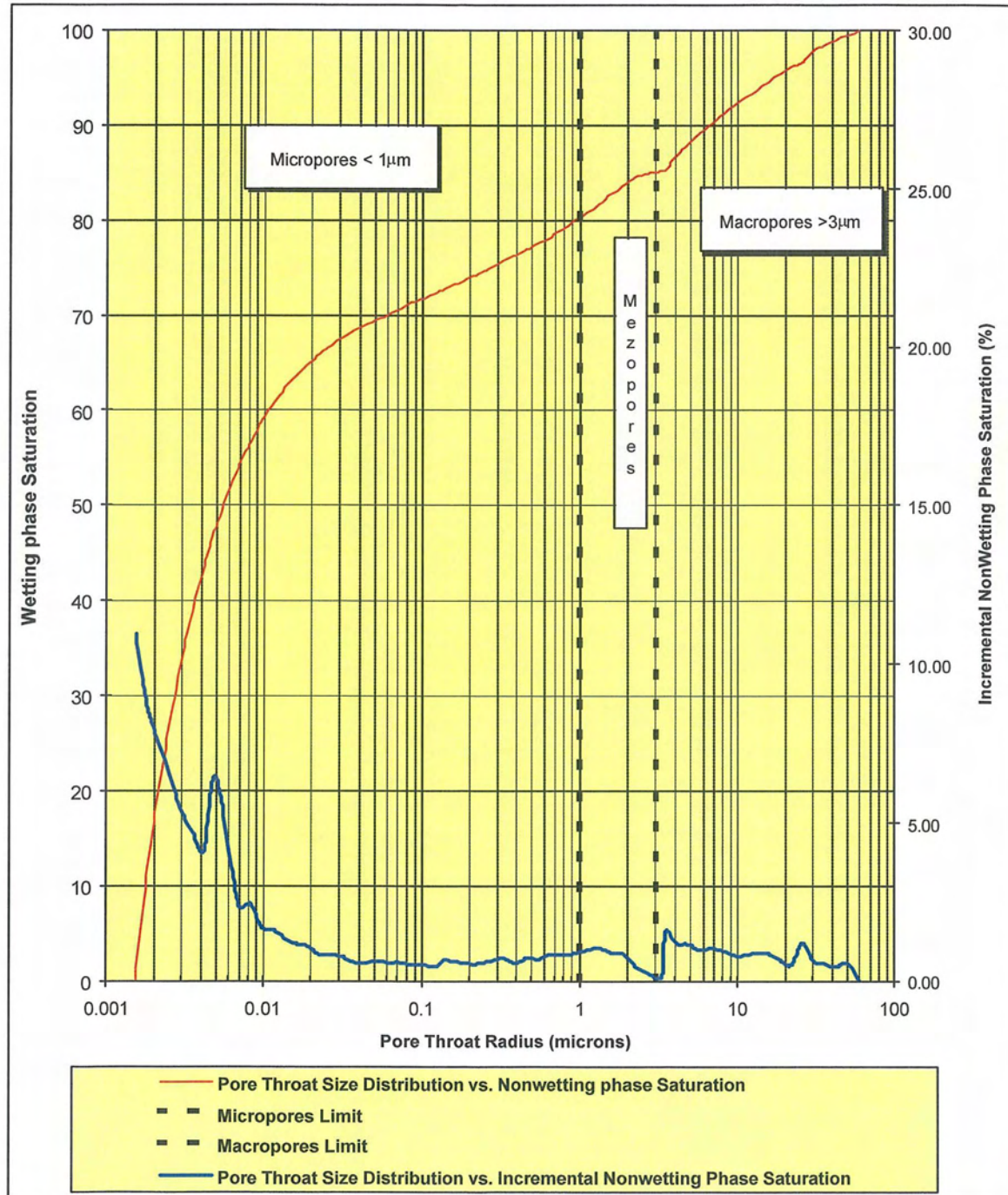




Figure 1C: Pore Distribution – SP-1

Sample: SP-1  
 Depth: 865.29 (m)

Hg Porosity: 3.03 %  
 Winland Perme: 0.0004 mD





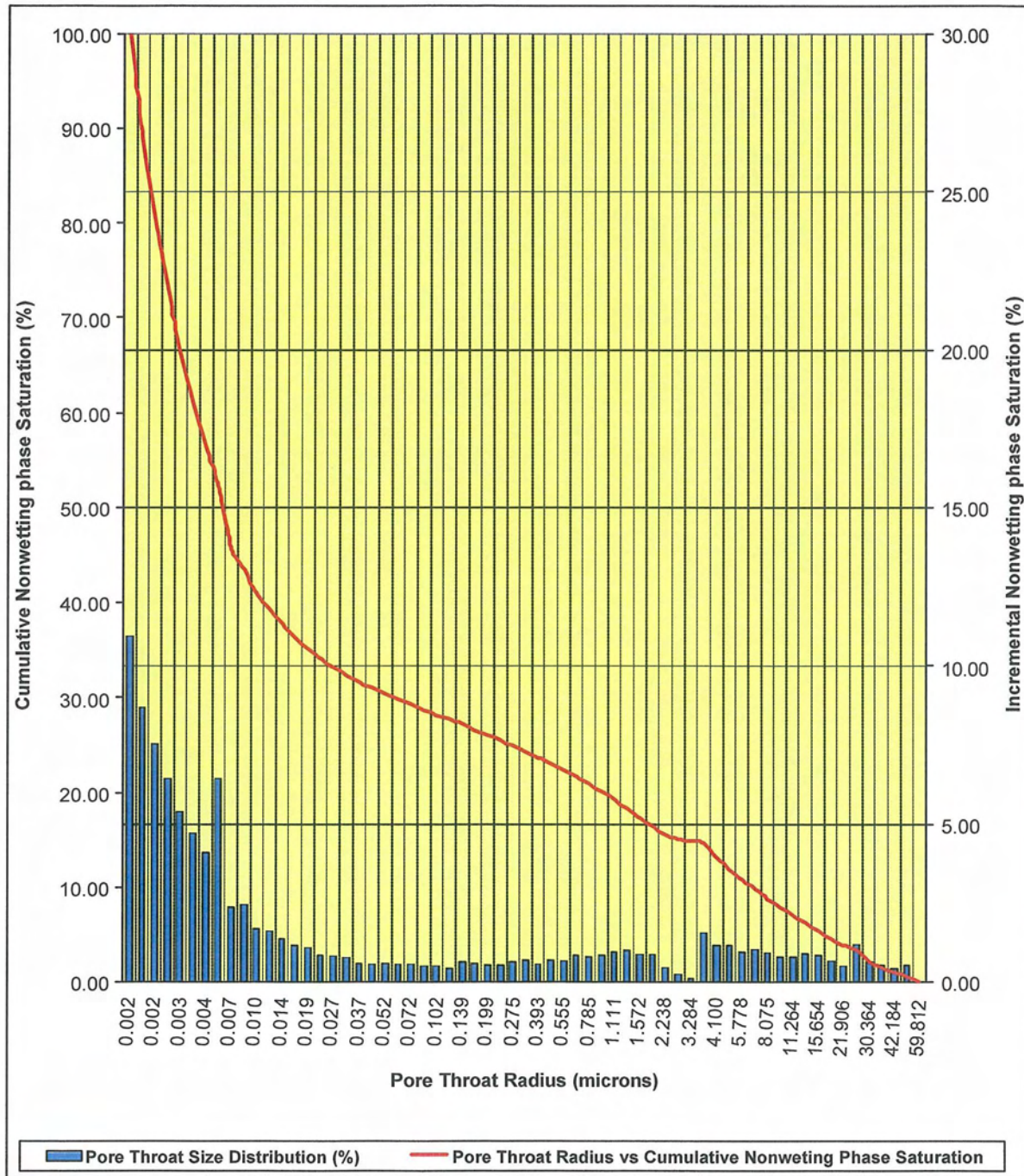
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**Figure 1D: Pore Distribution Histogram – SP-1**

Sample: SP-1  
 Depth: 865.29 (m)

Hg Porosity: 3.03 %  
 Winland Permeability 0.0004 mD



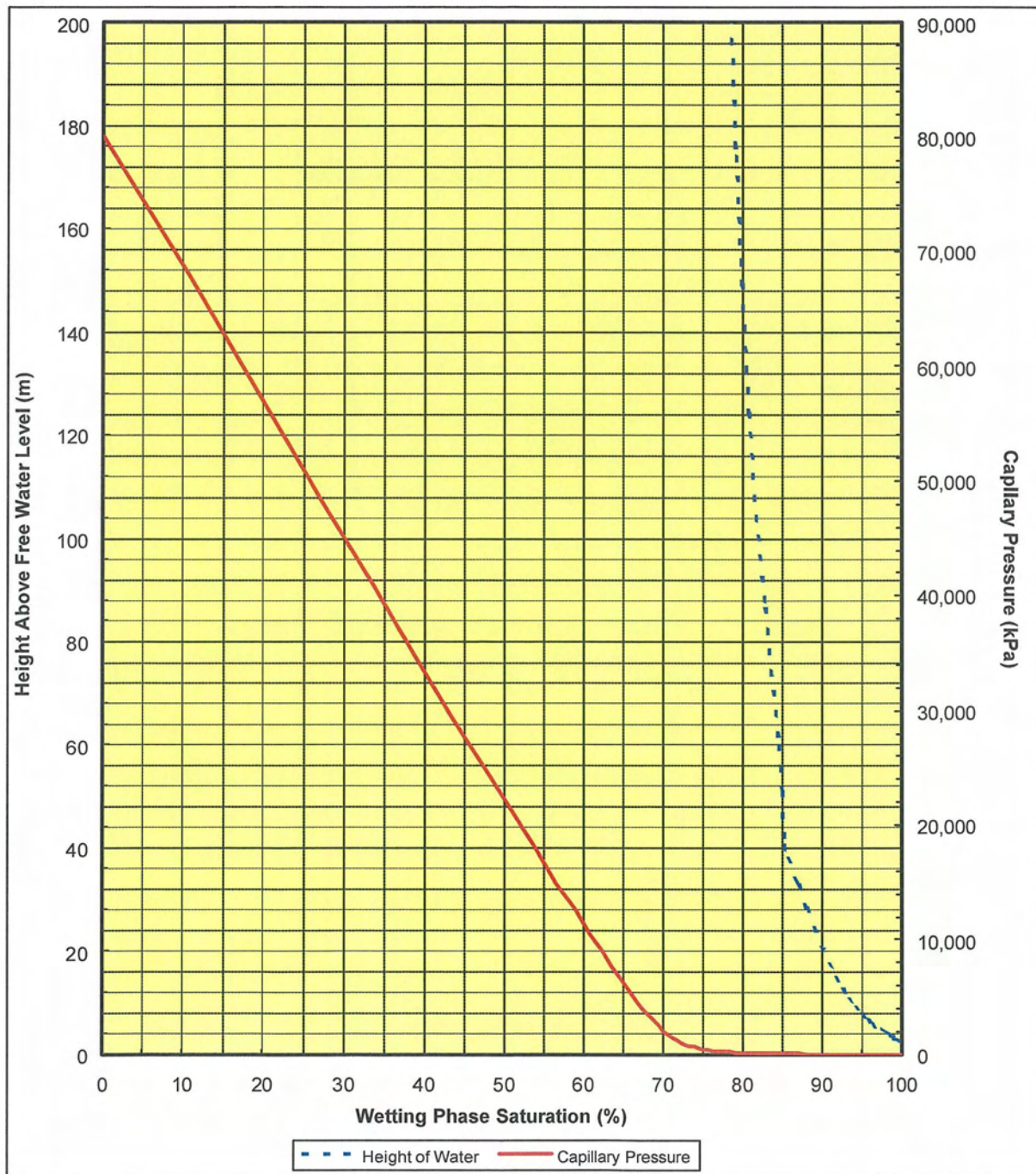


**Figure 1E: Height Above Free Water - Equivalent Gas/Brine System – SP-1**

Sample: SP-1  
Depth: 865.29 (m)

Hg Porosity:  
Winland Permeability

3.03 %  
0.0004 mD



**Table 2: Mercury Injection Capillary Pressure Data - SP-2**

Sample: SP-2

Hg Porosity: 3.29%

Depth: 867.31 (m)

Winland Permeability 0.0066mD

| Air/Hg<br>Capillary<br>Pressure<br>(kPa) | Pore<br>Radius<br>(µm) | Cumulative<br>Hg Intrusion<br>Volume<br>(ml/g) | Incremental<br>Intrusion<br>Volume<br>(ml/g) | Normalised<br>Intrusion<br>Volume | Mercury<br>Saturation<br>(%) | Equivalent<br>A/B<br>Pressure<br>(kPa) | Wetting<br>Phase<br>Saturation<br>(%) | Height<br>Above<br>Free Water<br>(m) | Incremental<br>Mercury<br>Saturation |
|------------------------------------------|------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------|------------------------------|----------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| 10.4                                     | 59.863                 | 0.000                                          | 0.0000                                       | 0.00                              | 0.01                         | 2.0                                    | 100.0                                 | 2.3                                  | 0.013                                |
| 12.4                                     | 50.095                 | 0.000                                          | 0.0001                                       | 0.06                              | 0.61                         | 2.4                                    | 99.4                                  | 2.8                                  | 0.598                                |
| 14.8                                     | 42.250                 | 0.000                                          | 0.0001                                       | 0.05                              | 1.17                         | 2.9                                    | 98.8                                  | 3.3                                  | 0.559                                |
| 17.4                                     | 35.791                 | 0.000                                          | 0.0002                                       | 0.12                              | 2.46                         | 3.4                                    | 97.5                                  | 3.9                                  | 1.292                                |
| 20.5                                     | 30.387                 | 0.000                                          | 0.0001                                       | 0.08                              | 3.27                         | 4.0                                    | 96.7                                  | 4.5                                  | 0.810                                |
| 24.3                                     | 25.697                 | 0.001                                          | 0.0001                                       | 0.07                              | 4.00                         | 4.8                                    | 96.0                                  | 5.4                                  | 0.733                                |
| 28.5                                     | 21.914                 | 0.001                                          | 0.0001                                       | 0.08                              | 4.89                         | 5.6                                    | 95.1                                  | 6.3                                  | 0.887                                |
| 33.6                                     | 18.572                 | 0.001                                          | 0.0002                                       | 0.12                              | 6.16                         | 6.6                                    | 93.8                                  | 7.4                                  | 1.273                                |
| 39.8                                     | 15.667                 | 0.001                                          | 0.0002                                       | 0.13                              | 7.53                         | 7.8                                    | 92.5                                  | 8.8                                  | 1.369                                |
| 46.8                                     | 13.313                 | 0.001                                          | 0.0001                                       | 0.10                              | 8.65                         | 9.2                                    | 91.3                                  | 10.4                                 | 1.118                                |
| 55.3                                     | 11.267                 | 0.001                                          | 0.0001                                       | 0.09                              | 9.58                         | 10.9                                   | 90.4                                  | 12.3                                 | 0.926                                |
| 65.3                                     | 9.545                  | 0.001                                          | 0.0001                                       | 0.08                              | 10.39                        | 12.8                                   | 89.6                                  | 14.5                                 | 0.810                                |
| 77.2                                     | 8.076                  | 0.001                                          | 0.0001                                       | 0.09                              | 11.33                        | 15.1                                   | 88.7                                  | 17.1                                 | 0.945                                |
| 91.4                                     | 6.825                  | 0.002                                          | 0.0001                                       | 0.10                              | 12.41                        | 17.9                                   | 87.6                                  | 20.2                                 | 1.080                                |
| 107.9                                    | 5.781                  | 0.002                                          | 0.0001                                       | 0.11                              | 13.57                        | 21.1                                   | 86.4                                  | 23.9                                 | 1.157                                |
| 128.9                                    | 4.836                  | 0.002                                          | 0.0002                                       | 0.15                              | 15.13                        | 25.3                                   | 84.9                                  | 28.5                                 | 1.562                                |
| 152.1                                    | 4.100                  | 0.002                                          | 0.0002                                       | 0.16                              | 16.87                        | 29.8                                   | 83.1                                  | 33.7                                 | 1.736                                |
| 179.8                                    | 3.467                  | 0.002                                          | 0.0002                                       | 0.17                              | 18.66                        | 35.3                                   | 81.3                                  | 39.8                                 | 1.793                                |
| 190.5                                    | 3.273                  | 0.002                                          | 0.0000                                       | 0.02                              | 18.84                        | 37.4                                   | 81.2                                  | 42.2                                 | 0.175                                |
| 228.3                                    | 2.731                  | 0.002                                          | 0.0000                                       | 0.02                              | 19.08                        | 44.8                                   | 80.9                                  | 50.6                                 | 0.241                                |
| 275.3                                    | 2.265                  | 0.002                                          | 0.0001                                       | 0.05                              | 19.56                        | 54.0                                   | 80.4                                  | 61.0                                 | 0.485                                |
| 339.3                                    | 1.838                  | 0.003                                          | 0.0001                                       | 0.10                              | 20.66                        | 66.5                                   | 79.3                                  | 75.1                                 | 1.101                                |
| 395.3                                    | 1.577                  | 0.003                                          | 0.0001                                       | 0.10                              | 21.69                        | 77.5                                   | 78.3                                  | 87.5                                 | 1.029                                |
| 475.4                                    | 1.312                  | 0.003                                          | 0.0001                                       | 0.11                              | 22.83                        | 93.2                                   | 77.2                                  | 105.3                                | 1.135                                |
| 559.8                                    | 1.114                  | 0.003                                          | 0.0001                                       | 0.10                              | 23.89                        | 109.8                                  | 76.1                                  | 124.0                                | 1.063                                |
| 673.4                                    | 0.926                  | 0.003                                          | 0.0001                                       | 0.10                              | 24.95                        | 132.0                                  | 75.1                                  | 149.1                                | 1.058                                |
| 793.3                                    | 0.786                  | 0.003                                          | 0.0001                                       | 0.08                              | 25.81                        | 155.5                                  | 74.2                                  | 175.7                                | 0.866                                |
| 944.8                                    | 0.660                  | 0.003                                          | 0.0001                                       | 0.10                              | 26.87                        | 185.3                                  | 73.1                                  | 209.2                                | 1.061                                |
| 1131.8                                   | 0.551                  | 0.004                                          | 0.0001                                       | 0.09                              | 27.85                        | 221.9                                  | 72.2                                  | 250.6                                | 0.971                                |
| 1335.0                                   | 0.467                  | 0.004                                          | 0.0001                                       | 0.07                              | 28.62                        | 261.8                                  | 71.4                                  | 295.6                                | 0.772                                |
| 1585.2                                   | 0.393                  | 0.004                                          | 0.0001                                       | 0.07                              | 29.35                        | 310.8                                  | 70.7                                  | 351.0                                | 0.732                                |
| 1895.3                                   | 0.329                  | 0.004                                          | 0.0001                                       | 0.08                              | 30.19                        | 371.6                                  | 69.8                                  | 419.7                                | 0.840                                |
| 2263.0                                   | 0.276                  | 0.004                                          | 0.0001                                       | 0.08                              | 31.01                        | 443.7                                  | 69.0                                  | 501.1                                | 0.823                                |
| 2623.1                                   | 0.238                  | 0.004                                          | 0.0001                                       | 0.05                              | 31.51                        | 514.3                                  | 68.5                                  | 580.9                                | 0.499                                |
| 3134.6                                   | 0.199                  | 0.004                                          | 0.0001                                       | 0.07                              | 32.25                        | 614.6                                  | 67.7                                  | 694.1                                | 0.742                                |
| 3686.3                                   | 0.169                  | 0.004                                          | 0.0001                                       | 0.07                              | 32.95                        | 722.8                                  | 67.1                                  | 816.3                                | 0.697                                |
| 4491.3                                   | 0.139                  | 0.004                                          | 0.0001                                       | 0.07                              | 33.74                        | 880.6                                  | 66.3                                  | 994.5                                | 0.790                                |
| 5186.6                                   | 0.120                  | 0.004                                          | 0.0001                                       | 0.05                              | 34.29                        | 1017.0                                 | 65.7                                  | 1148.5                               | 0.548                                |
| 6101.7                                   | 0.102                  | 0.004                                          | 0.0001                                       | 0.06                              | 34.94                        | 1196.4                                 | 65.1                                  | 1351.1                               | 0.657                                |



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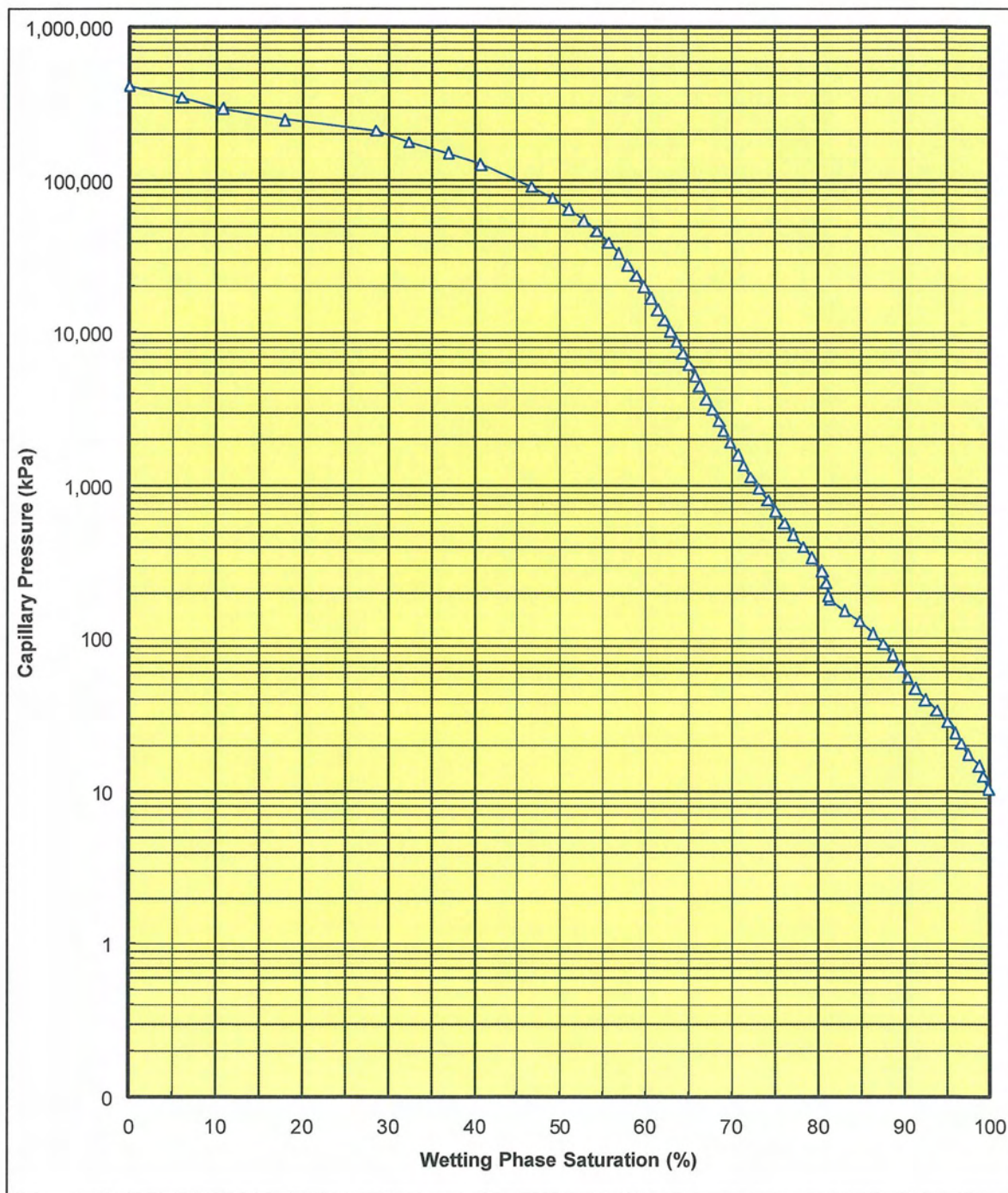
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| Air/Hg<br>Capillary<br>Pressure<br>(kPa) | Pore<br>Radius<br>(µm) | Cumulative<br>Hg Intrusion<br>Volume<br>(ml/g) | Incremental<br>Intrusion<br>Volume<br>(ml/g) | Normalised<br>Intrusion<br>Volume | Mercury<br>Saturation<br>(%) | Equivalent<br>A/B<br>Pressure<br>(kPa) | Wetting<br>Phase<br>Saturation<br>(%) | Height<br>Above<br>Free Water<br>(m) | Incremental<br>Mercury<br>Saturation |
|------------------------------------------|------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------|------------------------------|----------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| 7300.5                                   | 0.085                  | 0.005                                          | 0.0001                                       | 0.07                              | 35.68                        | 1431.5                                 | 64.3                                  | 1616.6                               | 0.732                                |
| 8639.8                                   | 0.072                  | 0.005                                          | 0.0001                                       | 0.07                              | 36.37                        | 1694.1                                 | 63.6                                  | 1913.2                               | 0.699                                |
| 10181.8                                  | 0.061                  | 0.005                                          | 0.0001                                       | 0.07                              | 37.09                        | 1996.4                                 | 62.9                                  | 2254.6                               | 0.718                                |
| 12044.5                                  | 0.052                  | 0.005                                          | 0.0001                                       | 0.06                              | 37.78                        | 2361.7                                 | 62.2                                  | 2667.1                               | 0.688                                |
| 14149.3                                  | 0.044                  | 0.005                                          | 0.0001                                       | 0.08                              | 38.59                        | 2774.4                                 | 61.4                                  | 3133.2                               | 0.807                                |
| 16824.1                                  | 0.037                  | 0.005                                          | 0.0001                                       | 0.07                              | 39.32                        | 3298.8                                 | 60.7                                  | 3725.5                               | 0.735                                |
| 19813.4                                  | 0.031                  | 0.005                                          | 0.0001                                       | 0.08                              | 40.17                        | 3885.0                                 | 59.8                                  | 4387.4                               | 0.842                                |
| 23469.9                                  | 0.027                  | 0.005                                          | 0.0001                                       | 0.09                              | 41.10                        | 4601.9                                 | 58.9                                  | 5197.1                               | 0.930                                |
| 27761.7                                  | 0.022                  | 0.005                                          | 0.0001                                       | 0.09                              | 42.10                        | 5443.5                                 | 57.9                                  | 6147.5                               | 1.002                                |
| 32875.6                                  | 0.019                  | 0.005                                          | 0.0001                                       | 0.10                              | 43.12                        | 6446.2                                 | 56.9                                  | 7279.9                               | 1.024                                |
| 38742.5                                  | 0.016                  | 0.006                                          | 0.0002                                       | 0.12                              | 44.37                        | 7596.6                                 | 55.6                                  | 8579.0                               | 1.246                                |
| 46000.6                                  | 0.014                  | 0.006                                          | 0.0002                                       | 0.13                              | 45.73                        | 9019.7                                 | 54.3                                  | 10186.2                              | 1.362                                |
| 54249.4                                  | 0.011                  | 0.006                                          | 0.0002                                       | 0.14                              | 47.24                        | 10637.1                                | 52.8                                  | 12012.8                              | 1.510                                |
| 64139.2                                  | 0.010                  | 0.006                                          | 0.0002                                       | 0.16                              | 48.95                        | 12576.3                                | 51.0                                  | 14202.7                              | 1.715                                |
| 75921.9                                  | 0.008                  | 0.006                                          | 0.0002                                       | 0.17                              | 50.82                        | 14886.7                                | 49.2                                  | 16811.9                              | 1.868                                |
| 89919.2                                  | 0.007                  | 0.007                                          | 0.0003                                       | 0.23                              | 53.27                        | 17631.2                                | 46.7                                  | 19911.4                              | 2.450                                |
| 125876.1                                 | 0.005                  | 0.008                                          | 0.0008                                       | 0.56                              | 59.22                        | 24681.6                                | 40.8                                  | 27873.6                              | 5.952                                |
| 149353.7                                 | 0.004                  | 0.008                                          | 0.0005                                       | 0.35                              | 63.02                        | 29285.0                                | 37.0                                  | 33072.4                              | 3.798                                |
| 176443.3                                 | 0.004                  | 0.009                                          | 0.0006                                       | 0.43                              | 67.65                        | 34596.7                                | 32.4                                  | 39071.0                              | 4.623                                |
| 208982.8                                 | 0.003                  | 0.009                                          | 0.0005                                       | 0.35                              | 71.42                        | 40977.0                                | 28.6                                  | 46276.4                              | 3.770                                |
| 247067.1                                 | 0.003                  | 0.010                                          | 0.0014                                       | 1.00                              | 82.13                        | 48444.5                                | 17.9                                  | 54709.7                              | 10.710                               |
| 292260.3                                 | 0.002                  | 0.011                                          | 0.0009                                       | 0.67                              | 89.28                        | 57305.9                                | 10.7                                  | 64717.1                              | 7.149                                |
| 345500.6                                 | 0.002                  | 0.012                                          | 0.0006                                       | 0.44                              | 93.96                        | 67745.2                                | 6.0                                   | 76506.4                              | 4.689                                |
| 408592.1                                 | 0.002                  | 0.013                                          | 0.0008                                       | 0.56                              | 100.00                       | 80116.1                                | 0.0                                   | 90477.2                              | 6.035                                |

**Figure 2A: Hg/Air Capillary Pressure vs. Wetting Phase Saturation – SP-2**

Sample: SP-2  
Depth: 867.31 (m)

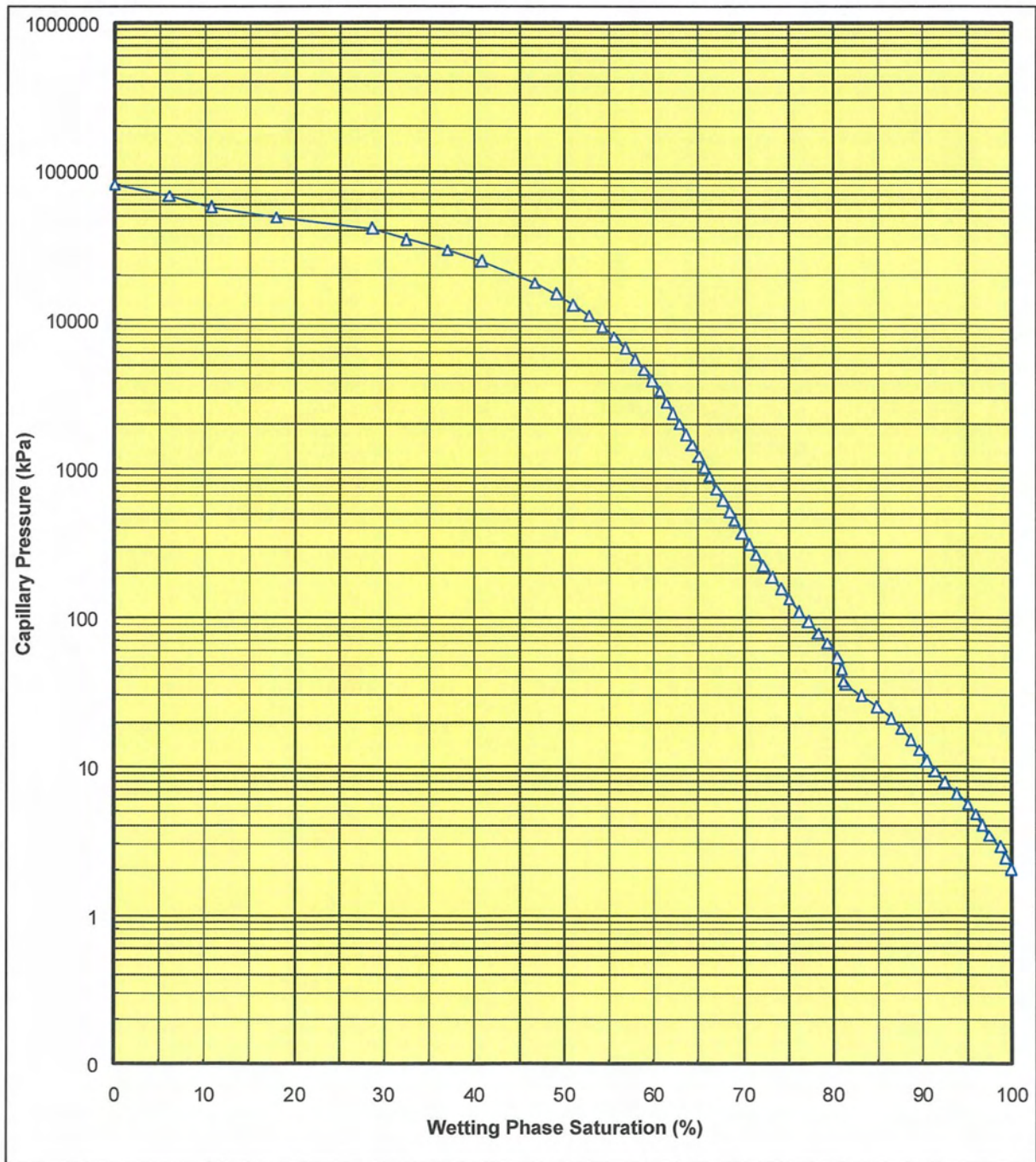
Hg Porosity: 3.29 %  
Winland Permeability: 0.0066 mD





**Figure 2B: Derived Air/Water Capillary Pressure vs. Wetting Phase Saturation – SP-2**

|         |            |                      |           |
|---------|------------|----------------------|-----------|
| Sample: | SP-2       | Hg Porosity:         | 3.29 %    |
| Depth:  | 867.31 (m) | Winland Permeability | 0.0066 mD |





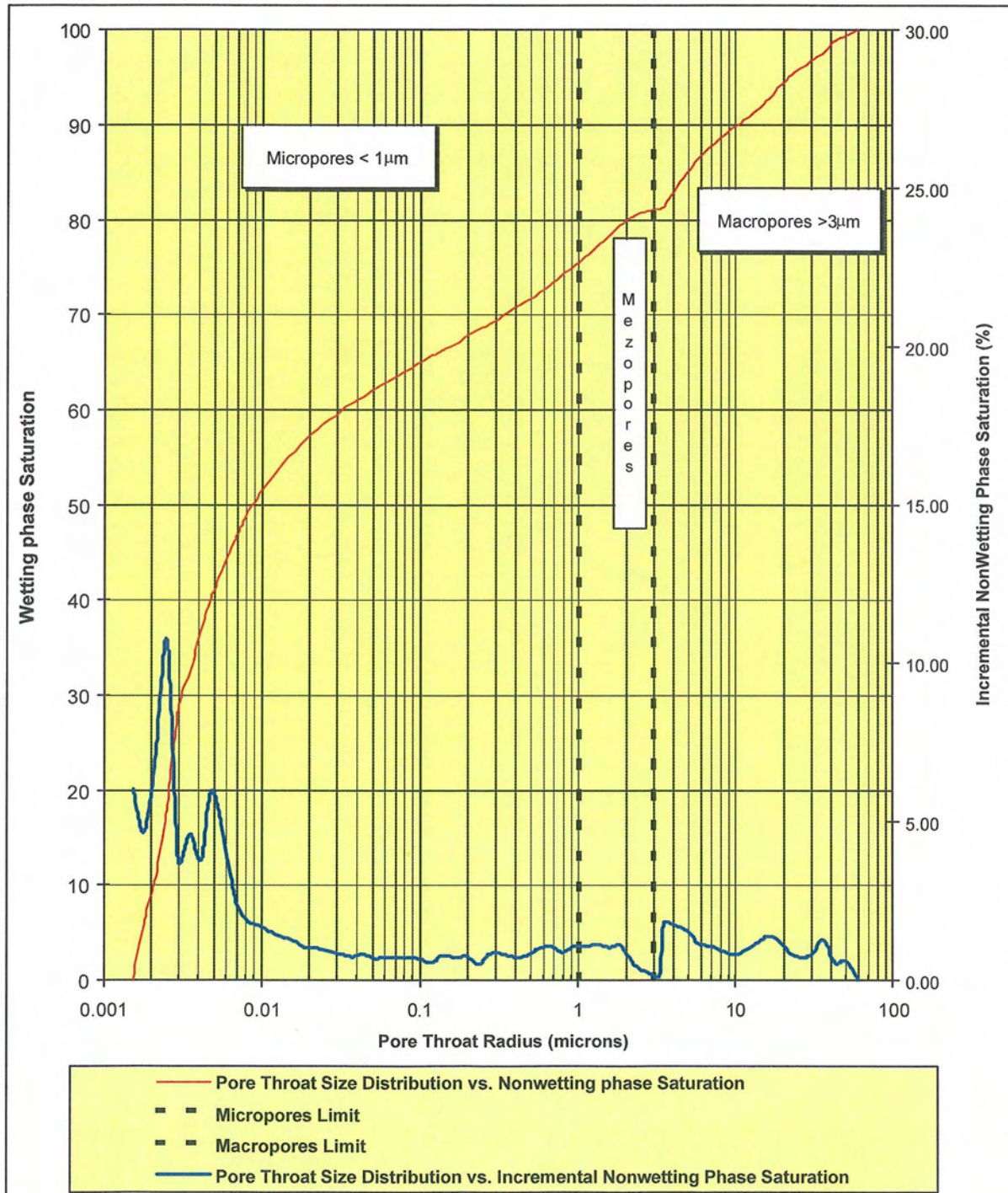
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**Figure 2C: Pore Distribution – SP-2**

Sample: SP-2  
 Depth: 867.31 (m)

Hg Porosity: 3.29 %  
 Winland Permeability: 0.0066 mD

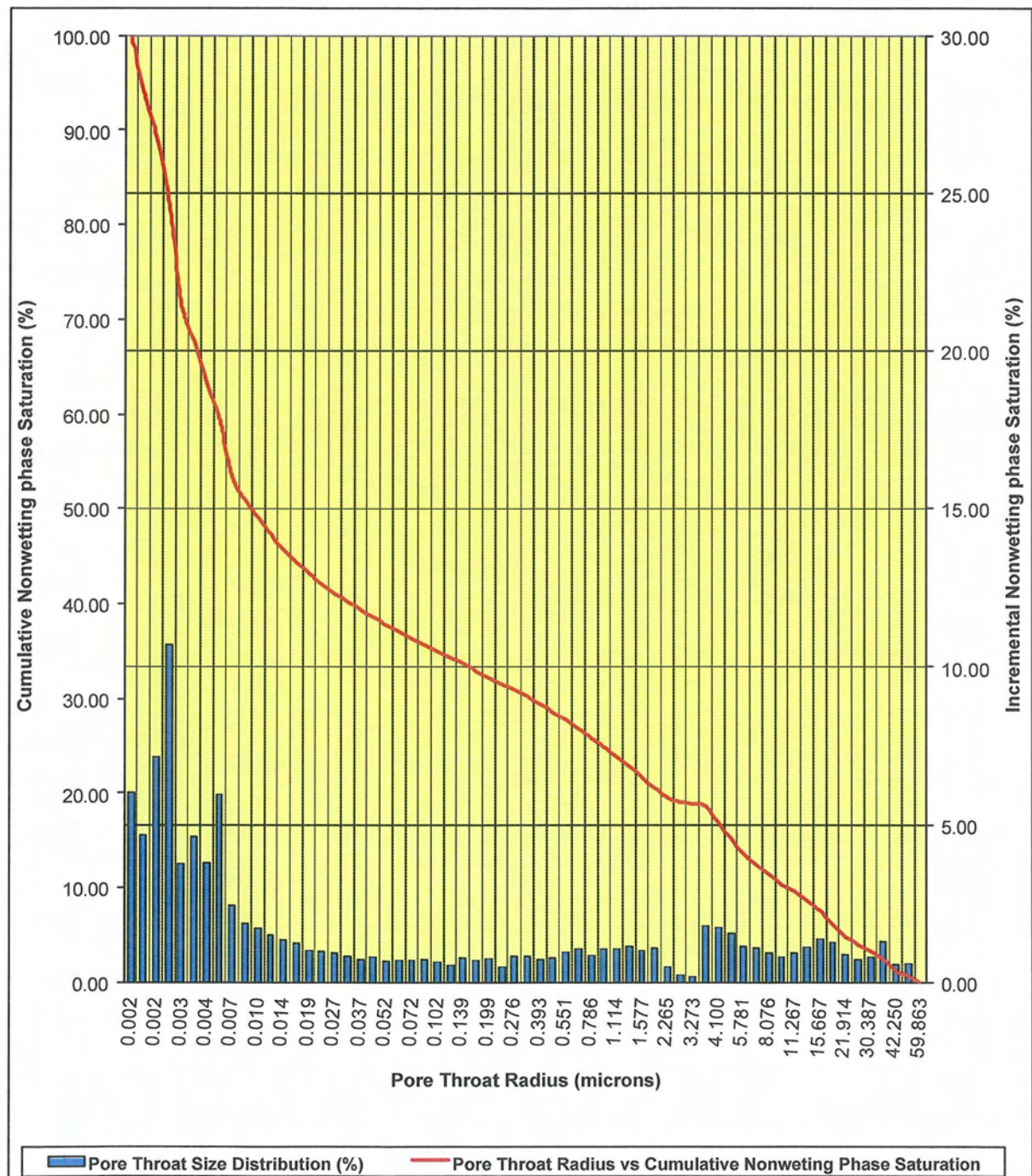




**Figure 2D: Pore Distribution Histogram – SP-2**

Sample: SP-2  
 Depth: 867.31 (m)

Hg Porosity: 3.29 %  
 Winland Permeability: 0.0066 mD



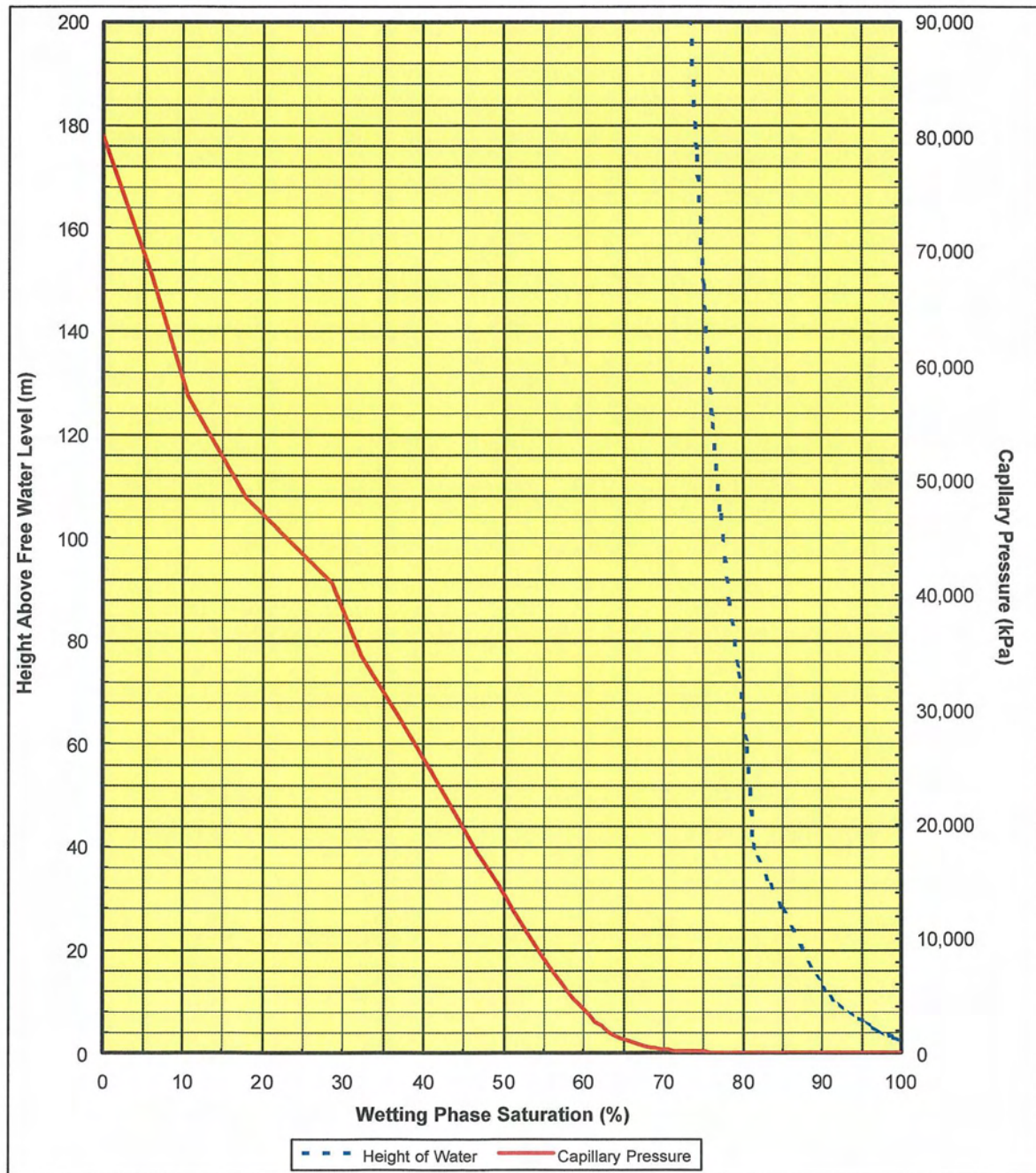


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**Figure 2E: Height Above Free Water - Equivalent Gas/Brine System – SP-2**

|         |            |                      |           |
|---------|------------|----------------------|-----------|
| Sample: | SP-2       | Hg Porosity:         | 3.29 %    |
| Depth:  | 867.31 (m) | Winland Permeability | 0.0066 mD |



**Table 3: Mercury Injection Capillary Pressure Data - SP-3**

Sample: SP-3

Hg Porosity: 3.28%

Depth: 870.09 (m)

Winland Permeability 0.0013mD

| Air/Hg<br>Capillary<br>Pressure<br>(kPa) | Pore<br>Radius<br>(µm) | Cumulative<br>Hg Intrusion<br>Volume<br>(ml/g) | Incremental<br>Intrusion<br>Volume<br>(ml/g) | Normalised<br>Intrusion<br>Volume | Mercury<br>Saturation<br>(%) | Equivalent<br>A/B<br>Pressure<br>(kPa) | Wetting<br>Phase<br>Saturation<br>(%) | Height<br>Above<br>Free Water<br>(m) | Incremental<br>Mercury<br>Saturation |
|------------------------------------------|------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------|------------------------------|----------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| 10.4                                     | 59.980                 | 0.000                                          | 0.0000                                       | 0.00                              | 0.01                         | 2.0                                    | 100.0                                 | 2.3                                  | 0.008                                |
| 10.4                                     | 60.122                 | 0.000                                          | 0.0000                                       | 0.01                              | 0.13                         | 2.0                                    | 99.9                                  | 2.3                                  | 0.125                                |
| 12.5                                     | 50.064                 | 0.000                                          | 0.0001                                       | 0.05                              | 0.66                         | 2.4                                    | 99.3                                  | 2.8                                  | 0.531                                |
| 14.7                                     | 42.352                 | 0.000                                          | 0.0001                                       | 0.07                              | 1.38                         | 2.9                                    | 98.6                                  | 3.3                                  | 0.718                                |
| 17.4                                     | 35.809                 | 0.000                                          | 0.0002                                       | 0.15                              | 2.94                         | 3.4                                    | 97.1                                  | 3.9                                  | 1.560                                |
| 20.5                                     | 30.406                 | 0.000                                          | 0.0001                                       | 0.10                              | 3.94                         | 4.0                                    | 96.1                                  | 4.5                                  | 0.999                                |
| 24.2                                     | 25.751                 | 0.001                                          | 0.0001                                       | 0.07                              | 4.66                         | 4.7                                    | 95.3                                  | 5.4                                  | 0.718                                |
| 28.4                                     | 21.933                 | 0.001                                          | 0.0001                                       | 0.06                              | 5.31                         | 5.6                                    | 94.7                                  | 6.3                                  | 0.655                                |
| 33.5                                     | 18.591                 | 0.001                                          | 0.0001                                       | 0.06                              | 5.94                         | 6.6                                    | 94.1                                  | 7.4                                  | 0.624                                |
| 39.8                                     | 15.680                 | 0.001                                          | 0.0001                                       | 0.08                              | 6.72                         | 7.8                                    | 93.3                                  | 8.8                                  | 0.780                                |
| 46.8                                     | 13.318                 | 0.001                                          | 0.0001                                       | 0.10                              | 7.72                         | 9.2                                    | 92.3                                  | 10.4                                 | 0.999                                |
| 55.3                                     | 11.272                 | 0.001                                          | 0.0001                                       | 0.07                              | 8.47                         | 10.8                                   | 91.5                                  | 12.2                                 | 0.749                                |
| 65.3                                     | 9.546                  | 0.001                                          | 0.0001                                       | 0.08                              | 9.25                         | 12.8                                   | 90.8                                  | 14.5                                 | 0.780                                |
| 77.2                                     | 8.078                  | 0.001                                          | 0.0001                                       | 0.10                              | 10.21                        | 15.1                                   | 89.8                                  | 17.1                                 | 0.967                                |
| 91.3                                     | 6.829                  | 0.001                                          | 0.0001                                       | 0.09                              | 11.15                        | 17.9                                   | 88.9                                  | 20.2                                 | 0.936                                |
| 107.9                                    | 5.781                  | 0.002                                          | 0.0001                                       | 0.11                              | 12.30                        | 21.1                                   | 87.7                                  | 23.9                                 | 1.155                                |
| 128.9                                    | 4.836                  | 0.002                                          | 0.0001                                       | 0.10                              | 13.37                        | 25.3                                   | 86.6                                  | 28.6                                 | 1.061                                |
| 152.0                                    | 4.101                  | 0.002                                          | 0.0002                                       | 0.12                              | 14.58                        | 29.8                                   | 85.4                                  | 33.7                                 | 1.217                                |
| 179.8                                    | 3.467                  | 0.002                                          | 0.0002                                       | 0.12                              | 15.83                        | 35.3                                   | 84.2                                  | 39.8                                 | 1.248                                |
| 189.1                                    | 3.298                  | 0.002                                          | 0.0000                                       | 0.03                              | 16.16                        | 37.1                                   | 83.8                                  | 41.9                                 | 0.333                                |
| 228.4                                    | 2.730                  | 0.002                                          | 0.0000                                       | 0.03                              | 16.44                        | 44.8                                   | 83.6                                  | 50.6                                 | 0.277                                |
| 276.3                                    | 2.257                  | 0.002                                          | 0.0001                                       | 0.06                              | 17.06                        | 54.2                                   | 82.9                                  | 61.2                                 | 0.616                                |
| 334.1                                    | 1.866                  | 0.002                                          | 0.0001                                       | 0.07                              | 17.73                        | 65.5                                   | 82.3                                  | 74.0                                 | 0.672                                |
| 398.0                                    | 1.566                  | 0.002                                          | 0.0001                                       | 0.09                              | 18.62                        | 78.0                                   | 81.4                                  | 88.1                                 | 0.888                                |
| 469.5                                    | 1.328                  | 0.002                                          | 0.0002                                       | 0.12                              | 19.81                        | 92.1                                   | 80.2                                  | 104.0                                | 1.194                                |
| 565.5                                    | 1.103                  | 0.003                                          | 0.0001                                       | 0.10                              | 20.83                        | 110.9                                  | 79.2                                  | 125.2                                | 1.024                                |
| 671.5                                    | 0.929                  | 0.003                                          | 0.0001                                       | 0.09                              | 21.72                        | 131.7                                  | 78.3                                  | 148.7                                | 0.888                                |
| 794.3                                    | 0.785                  | 0.003                                          | 0.0001                                       | 0.09                              | 22.64                        | 155.7                                  | 77.4                                  | 175.9                                | 0.914                                |
| 946.9                                    | 0.658                  | 0.003                                          | 0.0001                                       | 0.08                              | 23.49                        | 185.7                                  | 76.5                                  | 209.7                                | 0.855                                |
| 1121.2                                   | 0.556                  | 0.003                                          | 0.0001                                       | 0.09                              | 24.40                        | 219.8                                  | 75.6                                  | 248.3                                | 0.905                                |
| 1335.6                                   | 0.467                  | 0.003                                          | 0.0001                                       | 0.08                              | 25.21                        | 261.9                                  | 74.8                                  | 295.7                                | 0.815                                |
| 1587.1                                   | 0.393                  | 0.003                                          | 0.0001                                       | 0.08                              | 26.02                        | 311.2                                  | 74.0                                  | 351.4                                | 0.809                                |
| 1895.3                                   | 0.329                  | 0.003                                          | 0.0001                                       | 0.08                              | 26.81                        | 371.6                                  | 73.2                                  | 419.7                                | 0.793                                |
| 2271.2                                   | 0.275                  | 0.003                                          | 0.0001                                       | 0.08                              | 27.61                        | 445.3                                  | 72.4                                  | 502.9                                | 0.797                                |
| 2631.6                                   | 0.237                  | 0.004                                          | 0.0001                                       | 0.06                              | 28.18                        | 516.0                                  | 71.8                                  | 582.7                                | 0.568                                |
| 3139.9                                   | 0.199                  | 0.004                                          | 0.0001                                       | 0.06                              | 28.82                        | 615.7                                  | 71.2                                  | 695.3                                | 0.639                                |
| 3688.5                                   | 0.169                  | 0.004                                          | 0.0001                                       | 0.07                              | 29.48                        | 723.2                                  | 70.5                                  | 816.8                                | 0.664                                |
| 4493.7                                   | 0.139                  | 0.004                                          | 0.0001                                       | 0.08                              | 30.24                        | 881.1                                  | 69.8                                  | 995.1                                | 0.759                                |
| 5189.0                                   | 0.120                  | 0.004                                          | 0.0001                                       | 0.05                              | 30.78                        | 1017.5                                 | 69.2                                  | 1149.0                               | 0.539                                |



Union Gas Ltd.

PAIN COURT 1 (HORIZ #1), DOVER 3-6-4

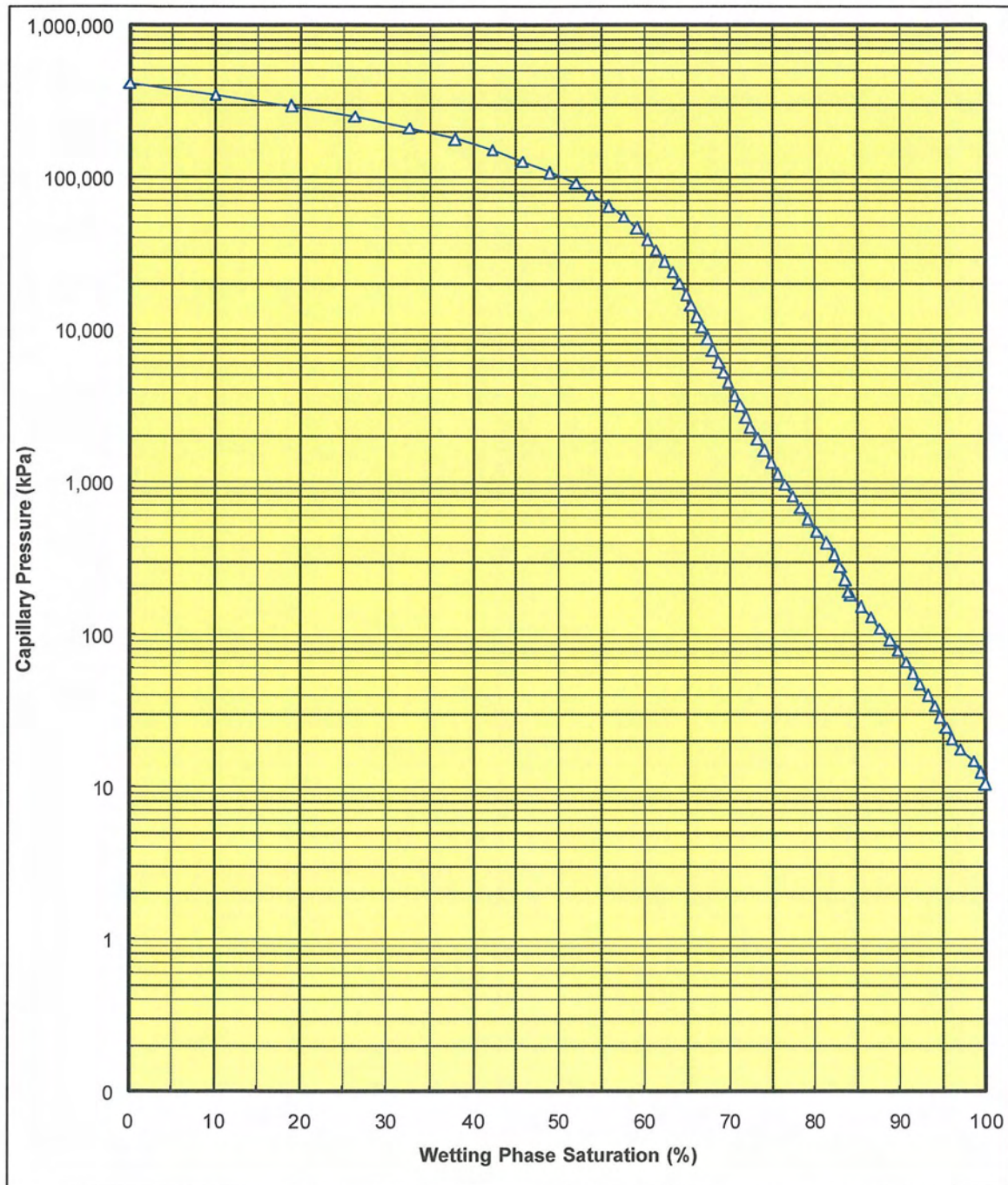
Threshold Pressure by Mercury Injection Report

| Air/Hg<br>Capillary<br>Pressure<br>(kPa) | Pore<br>Radius<br>(µm) | Cumulative<br>Hg Intrusion<br>Volume<br>(ml/g) | Incremental<br>Intrusion<br>Volume<br>(ml/g) | Normalised<br>Intrusion<br>Volume | Mercury<br>Saturation<br>(%) | Equivalent<br>A/B<br>Pressure<br>(kPa) | Wetting<br>Phase<br>Saturation<br>(%) | Height<br>Above<br>Free Water<br>(m) | Incremental<br>Mercury<br>Saturation |
|------------------------------------------|------------------------|------------------------------------------------|----------------------------------------------|-----------------------------------|------------------------------|----------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|
| 6097.9                                   | 0.102                  | 0.004                                          | 0.0001                                       | 0.06                              | 31.36                        | 1195.7                                 | 68.6                                  | 1350.3                               | 0.579                                |
| 7296.5                                   | 0.085                  | 0.004                                          | 0.0001                                       | 0.08                              | 32.12                        | 1430.7                                 | 67.9                                  | 1615.7                               | 0.759                                |
| 8645.7                                   | 0.072                  | 0.004                                          | 0.0001                                       | 0.06                              | 32.69                        | 1695.2                                 | 67.3                                  | 1914.5                               | 0.575                                |
| 10181.4                                  | 0.061                  | 0.004                                          | 0.0001                                       | 0.06                              | 33.32                        | 1996.4                                 | 66.7                                  | 2254.5                               | 0.631                                |
| 12045.4                                  | 0.052                  | 0.004                                          | 0.0001                                       | 0.06                              | 33.92                        | 2361.9                                 | 66.1                                  | 2667.3                               | 0.597                                |
| 14150.6                                  | 0.044                  | 0.004                                          | 0.0001                                       | 0.07                              | 34.65                        | 2774.6                                 | 65.3                                  | 3133.5                               | 0.734                                |
| 16816.3                                  | 0.037                  | 0.004                                          | 0.0001                                       | 0.05                              | 35.21                        | 3297.3                                 | 64.8                                  | 3723.7                               | 0.554                                |
| 19800.6                                  | 0.031                  | 0.005                                          | 0.0001                                       | 0.08                              | 36.03                        | 3882.5                                 | 64.0                                  | 4384.6                               | 0.825                                |
| 23468.7                                  | 0.027                  | 0.005                                          | 0.0001                                       | 0.07                              | 36.75                        | 4601.7                                 | 63.2                                  | 5196.8                               | 0.719                                |
| 27761.4                                  | 0.022                  | 0.005                                          | 0.0001                                       | 0.09                              | 37.70                        | 5443.4                                 | 62.3                                  | 6147.4                               | 0.944                                |
| 32881.0                                  | 0.019                  | 0.005                                          | 0.0001                                       | 0.10                              | 38.72                        | 6447.3                                 | 61.3                                  | 7281.1                               | 1.024                                |
| 38737.2                                  | 0.016                  | 0.005                                          | 0.0001                                       | 0.10                              | 39.74                        | 7595.5                                 | 60.3                                  | 8577.8                               | 1.019                                |
| 45997.6                                  | 0.014                  | 0.005                                          | 0.0002                                       | 0.12                              | 40.95                        | 9019.1                                 | 59.1                                  | 10185.5                              | 1.210                                |
| 54233.6                                  | 0.011                  | 0.005                                          | 0.0002                                       | 0.14                              | 42.41                        | 10634.0                                | 57.6                                  | 12009.3                              | 1.459                                |
| 64132.9                                  | 0.010                  | 0.006                                          | 0.0002                                       | 0.17                              | 44.15                        | 12575.1                                | 55.9                                  | 14201.4                              | 1.740                                |
| 75938.1                                  | 0.008                  | 0.006                                          | 0.0002                                       | 0.19                              | 46.12                        | 14889.8                                | 53.9                                  | 16815.5                              | 1.967                                |
| 89891.7                                  | 0.007                  | 0.006                                          | 0.0002                                       | 0.19                              | 48.00                        | 17625.8                                | 52.0                                  | 19905.3                              | 1.888                                |
| 106331.0                                 | 0.006                  | 0.006                                          | 0.0004                                       | 0.31                              | 51.10                        | 20849.2                                | 48.9                                  | 23545.6                              | 3.091                                |
| 125883.7                                 | 0.005                  | 0.007                                          | 0.0004                                       | 0.31                              | 54.27                        | 24683.1                                | 45.7                                  | 27875.2                              | 3.174                                |
| 149354.0                                 | 0.004                  | 0.007                                          | 0.0004                                       | 0.35                              | 57.78                        | 29285.1                                | 42.2                                  | 33072.4                              | 3.507                                |
| 176452.6                                 | 0.004                  | 0.008                                          | 0.0005                                       | 0.43                              | 62.14                        | 34598.5                                | 37.9                                  | 39073.0                              | 4.359                                |
| 208993.6                                 | 0.003                  | 0.008                                          | 0.0007                                       | 0.52                              | 67.43                        | 40979.1                                | 32.6                                  | 46278.8                              | 5.298                                |
| 247066.2                                 | 0.003                  | 0.009                                          | 0.0008                                       | 0.62                              | 73.70                        | 48444.3                                | 26.3                                  | 54709.5                              | 6.266                                |
| 292267.1                                 | 0.002                  | 0.010                                          | 0.0009                                       | 0.72                              | 81.02                        | 57307.3                                | 19.0                                  | 64718.6                              | 7.318                                |
| 345240.6                                 | 0.002                  | 0.011                                          | 0.0011                                       | 0.88                              | 89.89                        | 67694.2                                | 10.1                                  | 76448.9                              | 8.867                                |
| 408583.2                                 | 0.002                  | 0.013                                          | 0.0013                                       | 1.00                              | 100.00                       | 80114.4                                | 0.0                                   | 90475.2                              | 10.114                               |

**Figure 3A: Hg/Air Capillary Pressure vs. Wetting Phase Saturation – SP-3**

Sample: SP-3  
Depth: 870.09 (m)

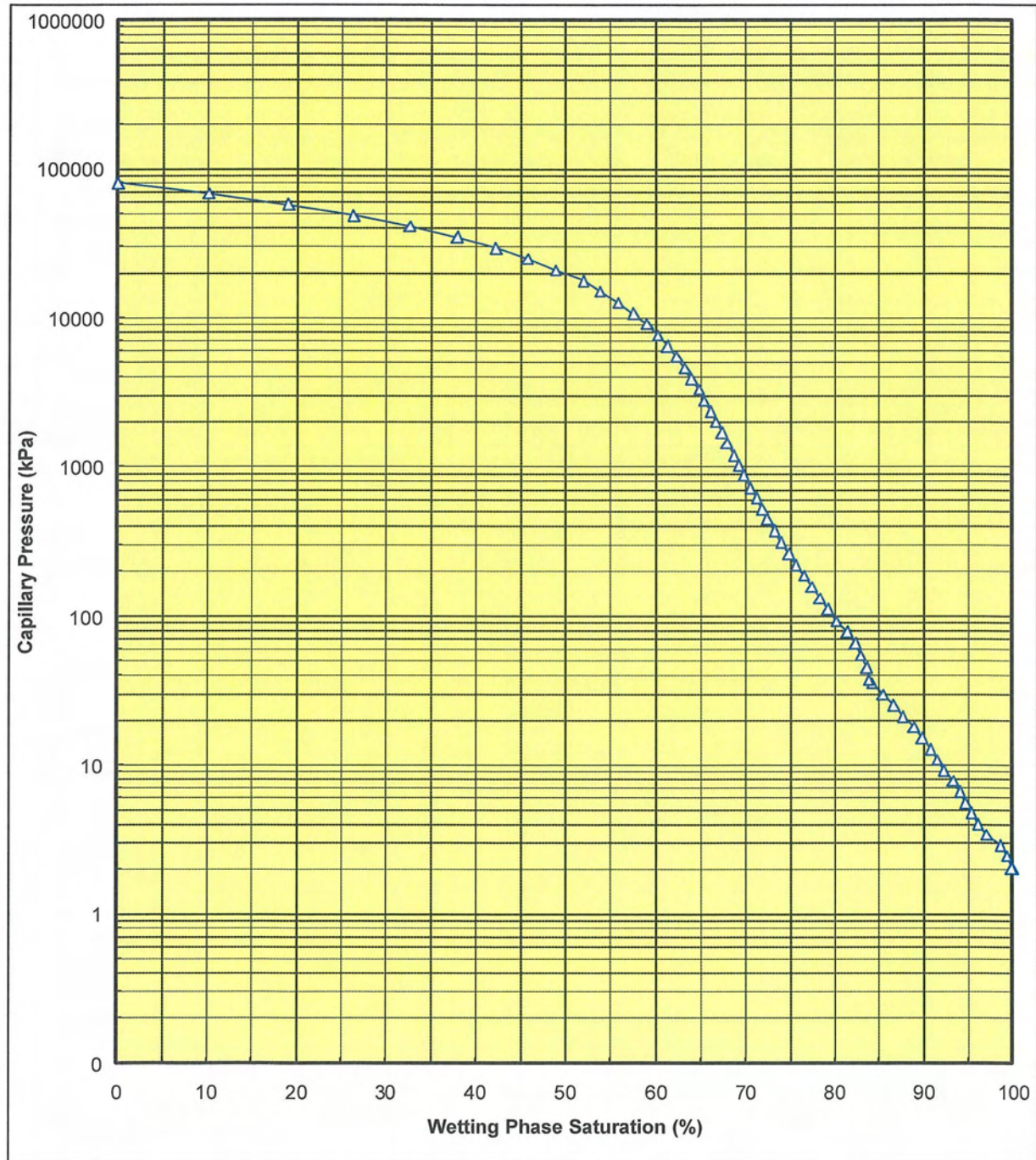
Hg Porosity: 3.28 %  
Winland Permeability 0.0013 mD





**Figure 3B: Derived Air/Water Capillary Pressure vs. Wetting Phase Saturation – SP-3**

|         |            |                      |           |
|---------|------------|----------------------|-----------|
| Sample: | SP-3       | Hg Porosity:         | 3.28 %    |
| Depth:  | 870.09 (m) | Winland Permeability | 0.0013 mD |



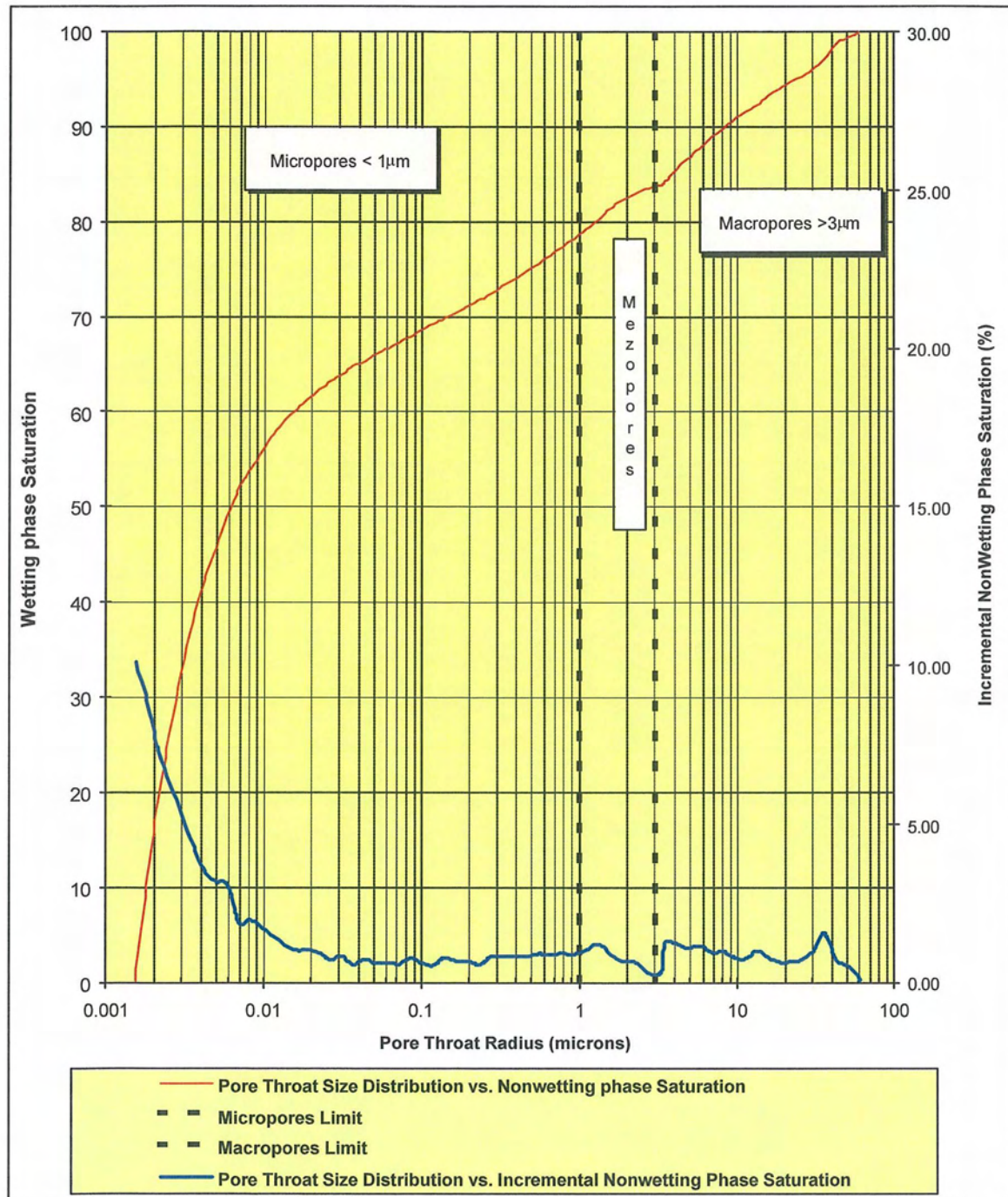


Union Gas Ltd.  
 PAIN COURT 1 (HORIZ #1), DOVER 3-6-4  
 Threshold Pressure by Mercury Injection Report

**Figure 3C: Pore Distribution – SP-3**

Sample: SP-3  
 Depth: 870.09 (m)

Hg Porosity: 3.28 %  
 Winland Perme: 0.0013 mD

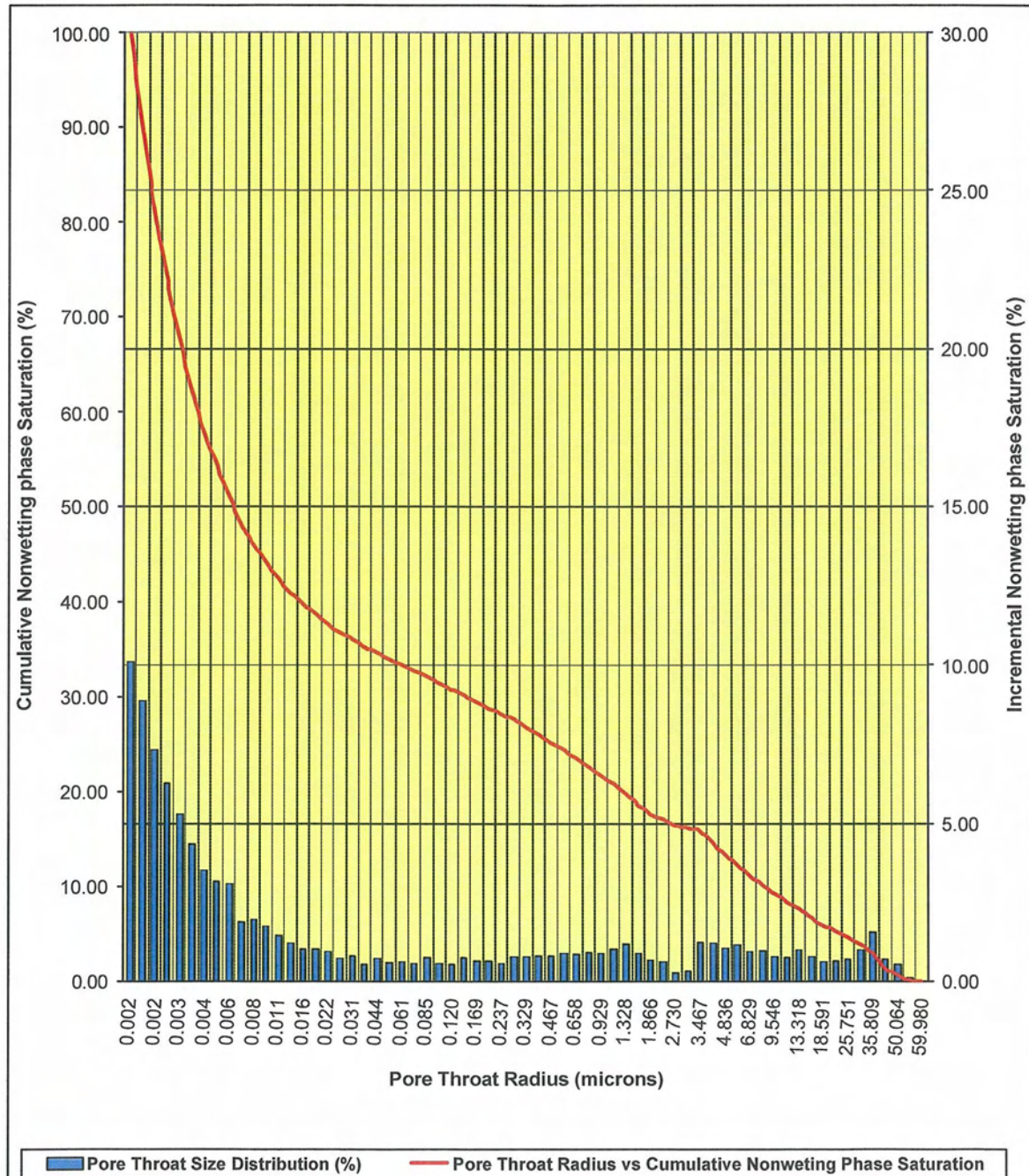




**Figure 3D: Pore Distribution Histogram – SP-3**

Sample: SP-3  
 Depth: 870.09 (m)

Hg Porosity: 3.28 %  
 Winland Permeability 0.0013 mD



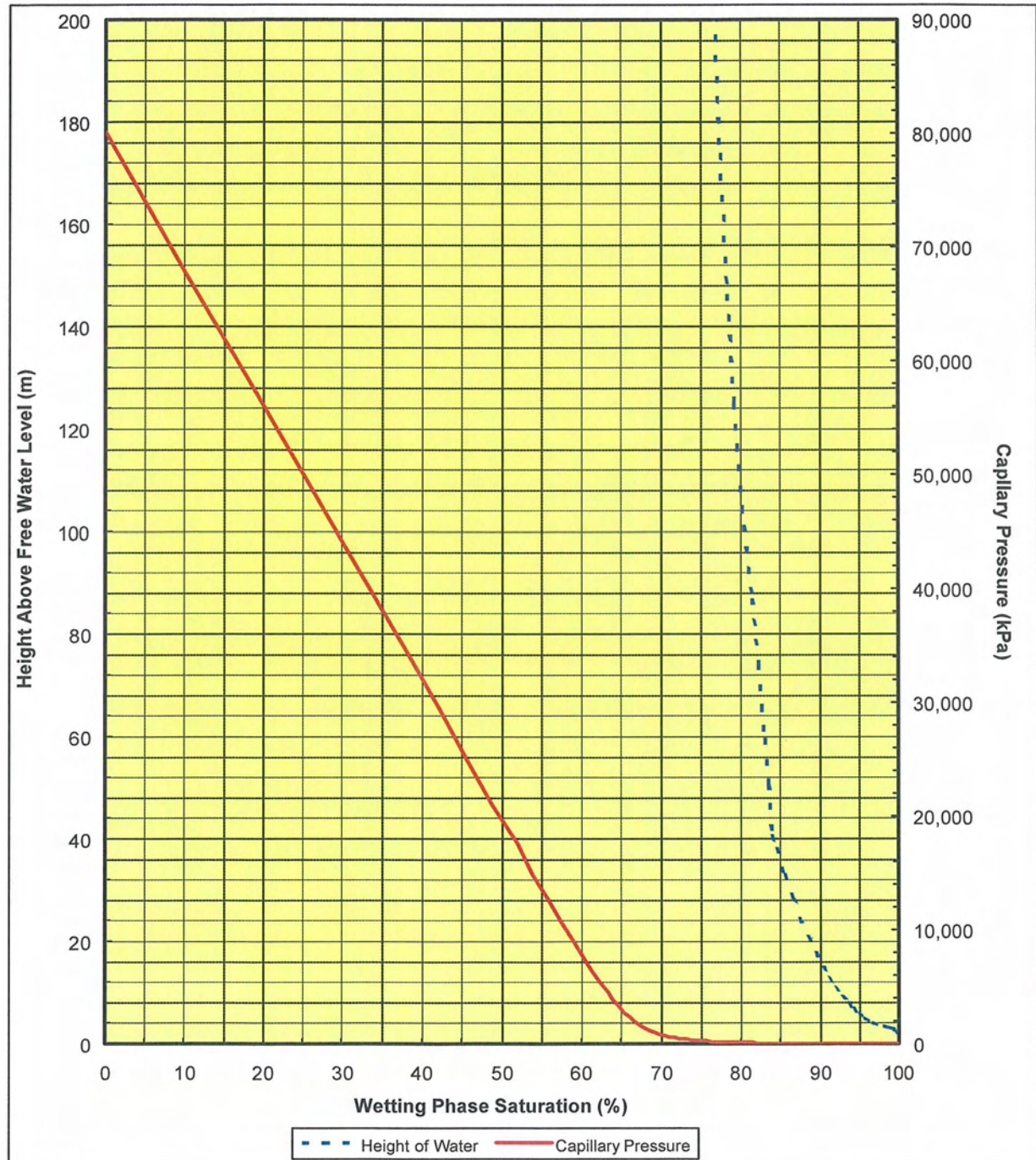


**Figure 3E: Height Above Free Water - Equivalent Gas/Brine System – SP-3**

Sample: SP-3  
Depth: 870.09 (m)

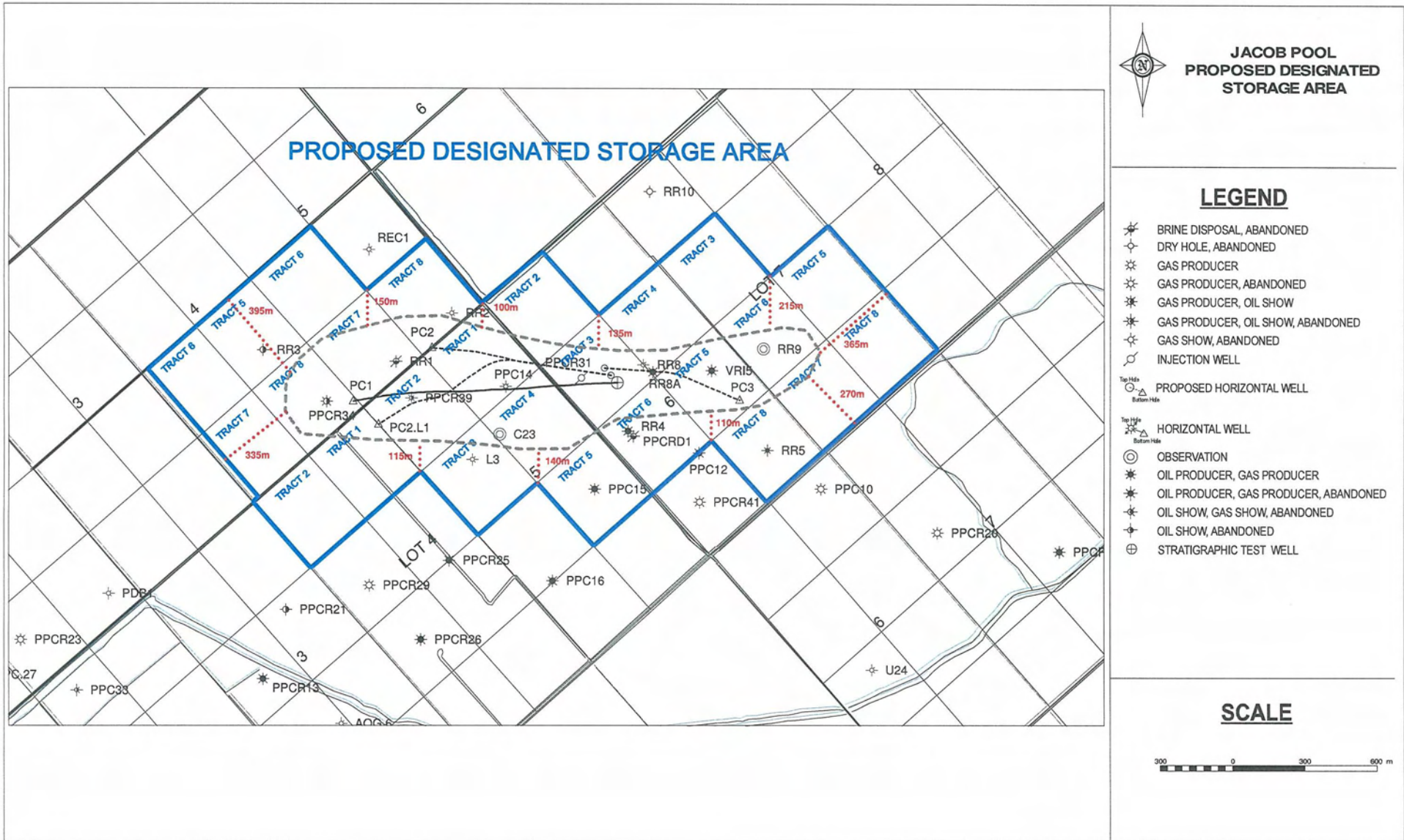
Hg Porosity:  
Winland Permeability

3.28 %  
0.0013 mD



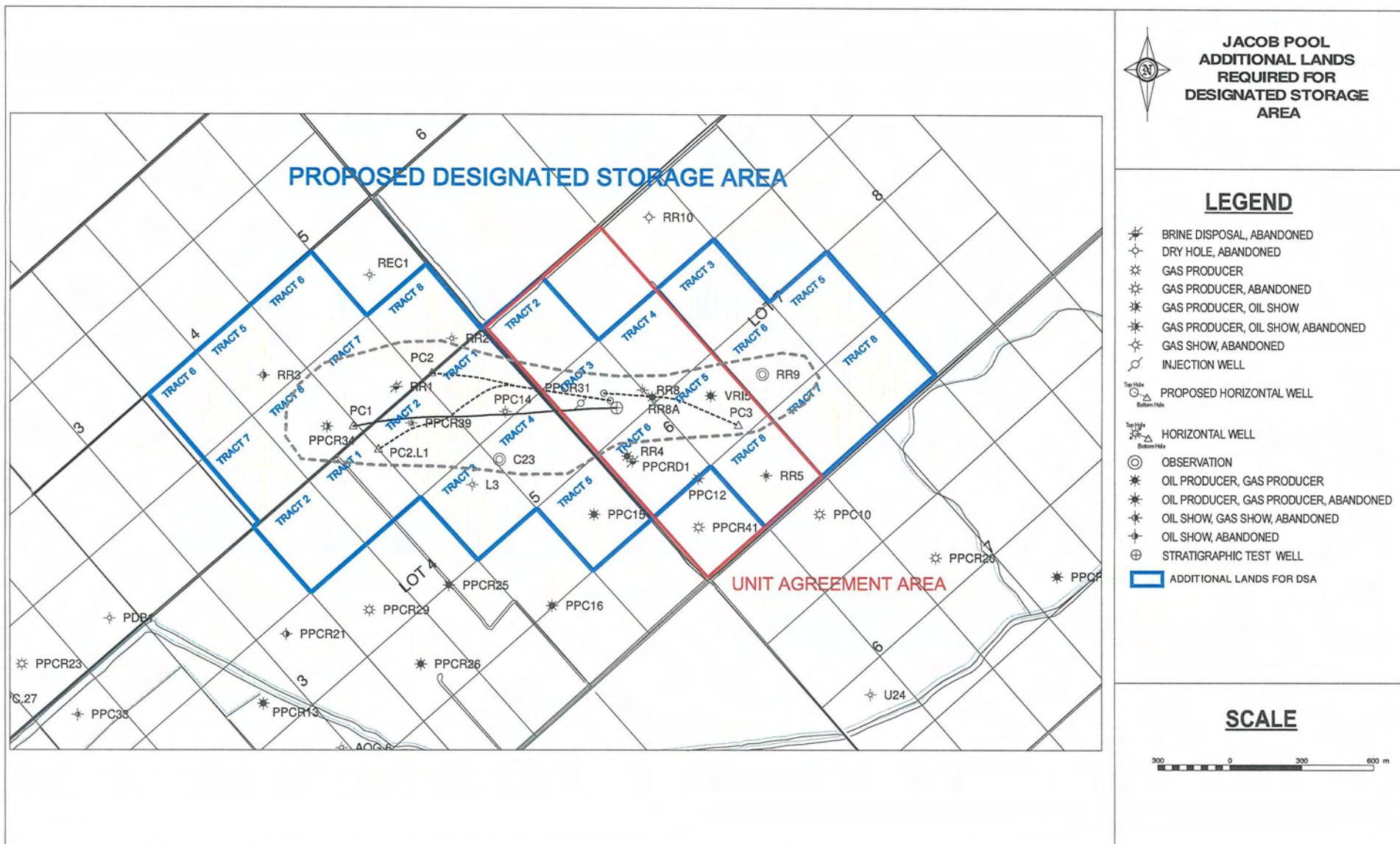
















**RECORD OF TECHNICAL DATA REVIEWED FOR A  
PROPOSED DESIGNATED GAS STORAGE AREA**

|                        |             |                |                 |          |
|------------------------|-------------|----------------|-----------------|----------|
| Date: December 8, 2010 |             |                |                 |          |
| Proponent: Steve Pardy |             | Union Gas      |                 |          |
| (Name)                 |             | (Representing) |                 |          |
| DSA Name: Jacob Pool   |             |                |                 |          |
| Zone(s): Trenton       |             |                |                 |          |
| Area:                  | Tracts      | Lots           | Concs.          | Township |
|                        | 5,6,7,8     | 4              | 5 East Division | Dover    |
|                        | 6,7,8       | 5              | 5 East Division | Dover    |
|                        | 1,2         | 4              | 4 East Division | Dover    |
|                        | 1,2,3,4,5   | 5              | 4 East Division | Dover    |
|                        | 2,3,4,5,6,8 | 6              | 4 East Division | Dover    |
|                        | 3,5,6,7,8   | 7              | 4 East Division | Dover    |
|                        |             |                |                 |          |
|                        |             |                |                 |          |

**DATA SUBMITTED:**

| Well Data         | Geo-physical/chemical Data         |                                     |
|-------------------|------------------------------------|-------------------------------------|
| Completion record | Seismic profile                    |                                     |
| DST               | Seismic, Geological interpretation | <input checked="" type="checkbox"/> |
| Draw down test    | Gravity                            |                                     |
| Build-up test     | Magnetic                           |                                     |
| Pressure survey   | Geochemical:                       |                                     |
| Other:            | Other:                             |                                     |

Data Retained: ☐ Yes ☒ No

**COMMENTS:**

|  |
|--|
|  |
|  |

Ministry staff are in agreement with the proposed area and boundaries?

☒ Yes ☐ No

*R. M. Ryland*

Signature – Petroleum Resources Staff

Proposed DSA has been approved by the OEB?

☐ Yes

If yes, return signed copy of this form to Petroleum Resources Centre.

|      |           |      |
|------|-----------|------|
|      |           |      |
| Name | Signature | Date |

**MNR Use Only**

| Checklist            | <input checked="" type="checkbox"/> | Initial | Date | Comments |
|----------------------|-------------------------------------|---------|------|----------|
| DSA Boundary Plotted |                                     |         |      |          |
| DSA File Created     |                                     |         |      |          |





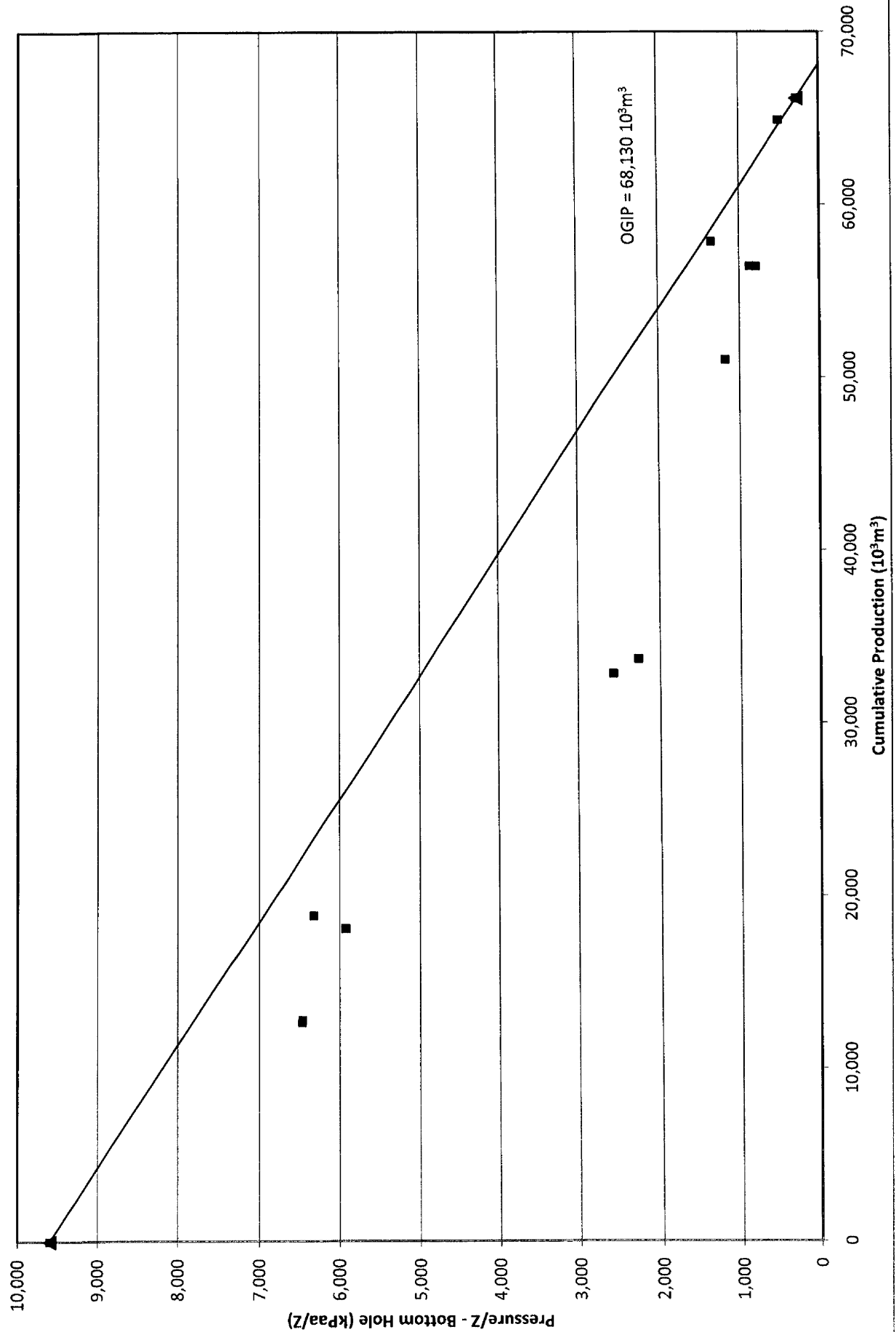
**Jacob Pool Production History**

| Date       | Cumulative Production<br>(10 <sup>3</sup> m <sup>3</sup> ) | Bottom Hole Pressure |        | P <sub>e</sub> /Z<br>(kPaa/Z) | Well   |
|------------|------------------------------------------------------------|----------------------|--------|-------------------------------|--------|
|            |                                                            | (kPag)               | (kPaa) |                               |        |
| 15-Jan-88  | 0.0                                                        | 7927                 | 8026.3 | 9601.0                        | PPC 14 |
| 20-Jun-90  | 12790.7                                                    | 5582                 | 5681.3 | 6456.1                        | PPC 14 |
| 07-Jun-90  | 12653.9                                                    | 5588                 | 5687.3 | 6463.8                        | RR 9   |
| 19-Jun-91  | 18108.9                                                    | 5167                 | 5266.3 | 5928.0                        | PPC 31 |
| 10-Aug-91  | 18839.2                                                    | 5472                 | 5571.3 | 6315.2                        | PPC 34 |
| 30-Jun-92  | 32842.6                                                    | 2331                 | 2430.3 | 2562.1                        | PPC 39 |
| 27-Jul-92  | 33695.6                                                    | 2057                 | 2156.3 | 2259.0                        | PPC 39 |
| 19-Jan-96  | 51022.4                                                    | 1053                 | 1152.3 | 1179.8                        | PPC 34 |
| 20-Jul-98  | 56424.3                                                    | 758                  | 857.3  | 871.9                         | PPC 34 |
| July, 1998 | 56409.3                                                    | 682                  | 781.3  | 793.3                         | PPC 14 |
| 27-May-99  | 57851.8                                                    | 1215                 | 1314.3 | 1350.6                        | PPC 39 |
| 14-Sep-06  | 64883.6                                                    | 395                  | 494.3  | 498.7                         | PPC 34 |
| 23-Nov-09  | 66134.2                                                    | 181.1                | 280.4  | 281.5                         | PPC 34 |





Jacob Pool - Production Decline Plot





## SECTION 4

### PROPOSED FACILITIES

#### Description of Proposed Facilities

1. A total of four I/W wells (includes one multilateral) and two observation wells are planned to operate the Jacob Pool.
2. A NPS 8 pipeline will be constructed from Union's existing Dover Transmission Station to the Jacob Pool Compressor Station
3. Approximately 1,829 metres of gathering lines is required to connect the wells to the compression station. A compressor station will be required to operate the Jacob Pool. A valve site to be located within the existing Dover Transmission Station is also required at the connection from the transmission line to the Panhandle system at the Dover Transmission Station
4. A drawing of the proposed facilities can be found at Section 4–Schedule 1.
5. Union proposes to construct the facilities in accordance with its standard construction procedures and the environmental mitigation measures outlined in the ER.

#### Wells

6. The development of the Jacob Pool will include four I/W wells in order to allow complete cycling of the entire working inventory on an annual basis. Pain Court 2 (Horiz. #1), Dover 3-6-IVE ("PC2") and Pain Court 3 (Horiz. #1), Dover 3-6-IVE ("PC3") are proposed I/W wells to be drilled at new surface locations. Pain Court 2 (Horiz. #1, Lat. #1), Dover 3-6-IVE ("PC2.L1") is proposed as a horizontal lateral to be drilled from the PC2 wellbore. PC1 was drilled as a stratigraphic test well and will be used as an I/W well. The existing PPCR34 well will be converted to an I/W well.
7. The Jacob Pool development will also include two observation wells. Existing wells RR9 and CanEnerco/CNR #23 ("C23") will be converted to observation wells. RR9 will be



completed to monitor pressure in the Trenton Group while C23 will monitor the pressure in both the Trenton Group and Black River Group. Well information and schematics for these wells is shown in Section 3 – Schedule 6.

8. The surface and downhole locations of these wells are illustrated on Section 3 - Schedule 5. A copy of the MNR Applications for Well License (Form 1) and survey maps are included in Section 4 - Schedule 2. Well locations were selected based on information from all wells within the DSA and the seismic interpretation.
9. The I/W wells will be drilled using a combination of rotary and cable tool drilling methods. Section 4 – Schedule 3 describes the drilling procedure that Union will employ for the drilling. Section 4 – Schedule 4 outlines the casing specifications for the proposed storage wells. All wells will be drilled and completed in accordance with CSA Z341-10 and the *Oil, Gas and Salt Resources Act (“OGSRA”), Provincial Operating Standards (Version 2.0)*.
10. Access to the proposed wells will be provided by permanent all-weather access roads as shown on the drawing attached to the landowner Acknowledgements found in Section 7-Schedule 9.
11. In order to begin well drilling in January 2012, materials will be ordered in November 2011.
12. No well abandonments are planned as part of this project.

### **Station Facilities**

13. An additional compressor station and piping will be installed at the corner of Maple Line and Jacob Road. The compressor station will consist of all the necessary piping and valves to direct gas flow, a 740 Hp reciprocating compressor package complete with jackshaft driver gas cooler, a natural gas dehydration package, ultrasonic flow measurement and pressure regulation and flow control.

14. The valve site at the Dover Transmission Station will consist of provisions for a future pig launcher and receiver, and the necessary valving to tie into the existing NPS 16 and NPS 20 Panhandle lines.

### **Pipeline Facilities**

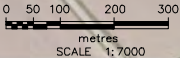
15. A NPS 8 pipeline will be constructed from the Dover Transmission Station to the Jacob Pool Compressor Station (Section 4-Schedule 1). The pipeline will be approximately 4,712 metres in length.
16. The Jacob Pool will require 1,829 metres of NPS 8 and 6 gathering lines (Section 4-Schedule 1). The proposed pipelines are designed to transport the expected flows to and from the new wells. These pipelines will be constructed between April 27, 2012 and June 21, 2012 using the existing access road network.
17. Design and pipe specifications for the proposed storage gathering pipelines are outlined in Section 4-Schedule 5. All the design specifications are in accordance with the *Ontario Regulation 210/01 for Oil and Gas Pipeline Systems*.
18. The Maximum Operating Pressure ("MOP") for the proposed gathering pipelines is 9930 kPa. The MOP for the proposed transmission pipeline is 6040 kPa.
19. The proposed pipelines are located primarily within a Class 1 location. For a pipeline within a Class 1 location, Union uses location factors of 0.9 for general locations, 0.75 for road crossings, 0.625 for pipe within a station and a design factor of 0.8. For a pipeline within a Class 2 location, Union uses location factors of 0.9 for general locations, 0.625 for road crossings, 0.625 for pipe within a station and a design factor of 0.8.
20. Union proposes to design the pipeline to meet or exceed Class 2 location requirements. The pipeline design and pipe specifications can be found in Section 4-Schedule 4.
21. Section 4-Schedule 6 describes the techniques and methods of construction that Union will employ for the construction of the proposed pipelines.

22. The pipelines will be installed in accordance with all applicable codes and Union's standard pipeline construction procedures.
23. In order for construction of the proposed NPS 8 transmission pipeline to commence in April, 2012 pipe, valves and all other materials will be ordered by February 17, 2012. The proposed construction schedule is found in Section 4-Schedule 7.









**uniongas**  
A Spectra Energy Company

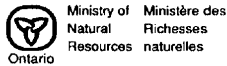
JACOB STORAGE POOL PROJECT  
-PLAN-  
GENERAL LOCATION

|             |               |       |            |             |                |
|-------------|---------------|-------|------------|-------------|----------------|
| DRAWN BY    | G.T. HANUSZAK | DATE  | 2011-01-06 | PLOT SPEC   | 1/7000         |
| CHECKED BY  |               | DATE  |            | CAD CODE    | M291-01.dwg    |
| APPROVED BY |               | DATE  |            | JOB NUMBER  | 60-10-501-4001 |
| SIZE        |               | SHEET |            | DRAWING No. | M291-01        |









Oil, Gas and Salt Resources Act  
**Application for a Well Licence**

Form 1 To the Minister of Natural Resources v.1999-01-07  
The undersigned operator applies for a well licence under the Oil, Gas and Salt Resources Act and the Regulations thereunder and submits the following information, together with the application fee of \$100 + 13% HST.

1. WELL NAME Pain Court 2 (Horiz. #1), Dover 3 - 6 - 4 Target Formation Sherman Fall

Purpose of Proposed Well (Well Type) Natural Gas Storage

2. NAME OF OPERATOR Union Gas Limited Tel # 519 436-4568

Address 50 Keil Drive North, Chatham, Ontario, N7M 5M1 Fax # 519 436-4560

3. LOCATION County Kent Township Dover

Tract 3 Lot 6 Concession 4 Lake Erie: Block Tract

Lake Erie licence or lease number

Bottom-hole location Bottom-hole Latitude 42°22'33.844" N Bottom-hole Longitude 82°21'01.044" W

Surface location metres from Lot Boundaries 565.95 m North ☐ South ☒ Latitude 42°22'30.954" N

184.75 m East ☒ West ☐ Longitude 82°20'28.389" W

Within 1.6 km of Designated Storage Area? Yes ☐ No ☒ Off-target? Yes ☐ No ☒

4. WELL PARTICULARS Vertical ☐ Horizontal ☒ Directional ☐ Deepening ☐ Re-entry ☐

Rig Type: Rotary ☒ Cable ☒ Well to be cored? Yes ☐ No ☒ Formation at TD Sherman Falls

Ground Elevation 175.4 Proposed Depth TMD 1539.0 Proposed Depth TVD 930.0 Proposed Start Date Sep. 2011

5. LANDOWNER

Address

Spacing unit shown on attached survey plan is pooled (see O.Reg.245/97 definitions: "pooled spacing unit") Yes ☐ No ☒

6. DRILLING CONTRACTOR (if known)

Address

7. PROPOSED CASING AND CEMENTING PROGRAM

| Hole Size (mm) | Casing O.D. (mm) | Weight (kg/m) | Grade     | New, Used or in-hole | Setting Depth TVD | Setting Formation | CASING SETTING INFORMATION |              |                    |
|----------------|------------------|---------------|-----------|----------------------|-------------------|-------------------|----------------------------|--------------|--------------------|
|                |                  |               |           |                      |                   |                   | How Set                    | Cement Type  | Cement Top KB / RF |
| 406.0          | 406.00           | 76.49         | Line pipe | New                  | 22.0              | Kettle Point      | Driven                     | N/A          | N/A                |
| 387.3          | 339.70           | 71.43         | H-40      | New                  | 95.5              | Dundee            | Cemented                   | 0:1:0        | 1.9                |
| 311.0          | 244.50           | 53.57         | K-55      | New                  | 616.5             | Cabot Head        | Cemented                   | 0:8:0; 0:1:0 | 4.6                |
| 222.0          | 177.80           | 34.23         | K-55      | New                  | 880.0             | Cobourg           | Cemented                   | 0:1:0        | 4.6                |

8. BLOW-OUT PREVENTION EQUIPMENT

Rotating Head, Annular Preventer, Blind Rams, Pipe Rams, Lubricator, 7" Valve

9. WELL SECURITY

Name of Trustee 1236596 Ontario Limited Address Pensa & Associates, 130 Dufferin Ave., London, ON, N6A 5R3

Tel # 519 667-4018 Fax # 519 434-9656 Total # unplugged wells 212 Current Balance \$ 70,000

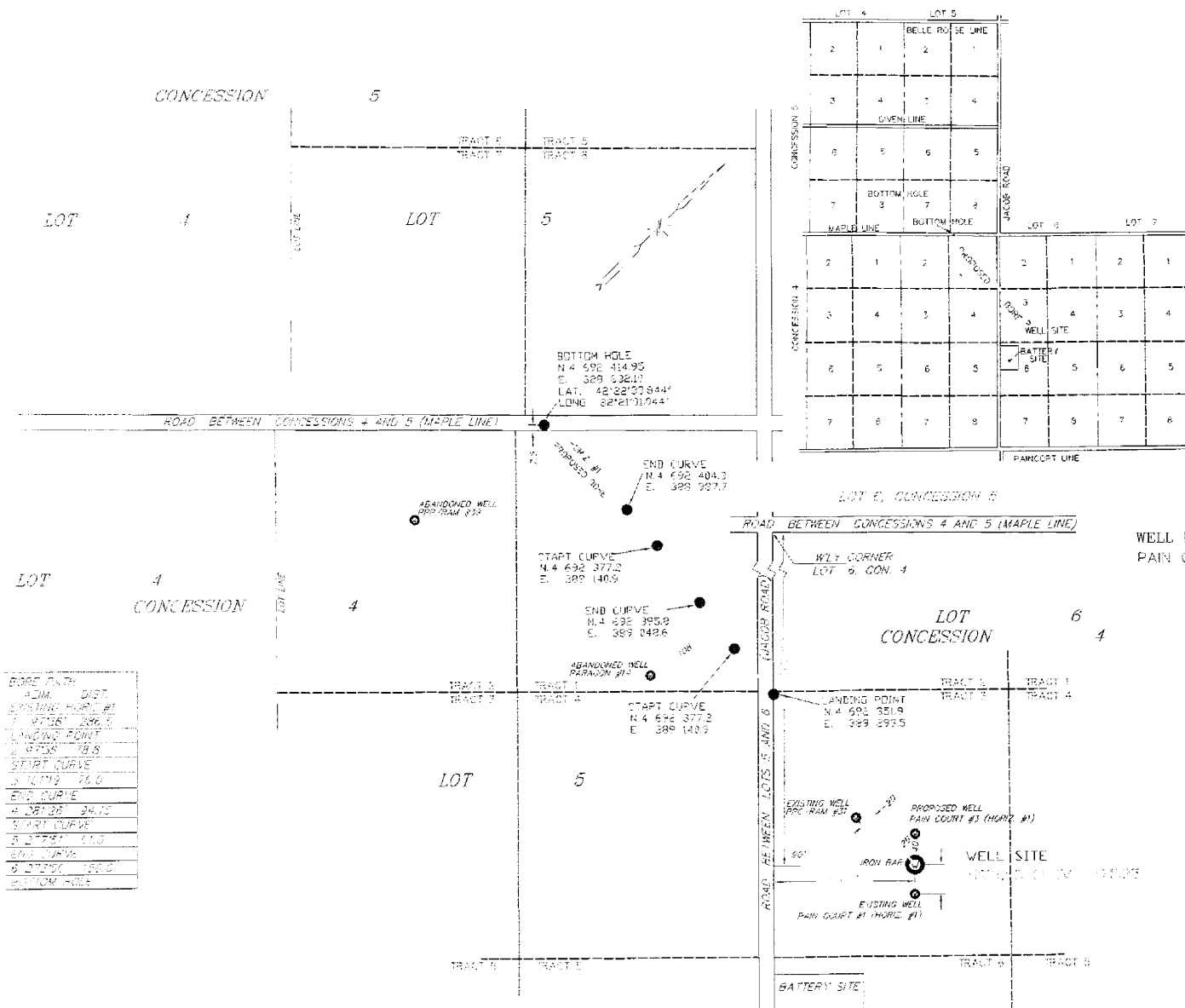
10. REMARKS

11. ENCLOSURES: Fee ☒ Location Plan ☒ (Land wells only) Drilling Program ☒

12. AUTHORITY: The undersigned certifies that the information provided herein is complete and accurate, the operator has the right to drill or operate a well in the above location, and he/she has authority to bind the operator.

Date 11-Jan-11 Name Steven Pardy, P.Eng. Signature

Date of Birth April 24, 1970 Title Manager, Reservoir Engineering and Drilling



LOT 1  
CONCESSION 4  
GEOGRAPHIC TOWNSHIP OF DOVER  
MUNICIPALITY OF DOVER  
COUNTY OF DOVER

SCALE 1:5000

NOTE METRIC  
DISTANCES SHOWN ON THIS PLAN ARE IN METERS AND  
CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

NOTE BENCH MARK  
ELEVATIONS ARE REFERRED TO GEODETIC DATUM AND  
REFERENCE BENCH MARK BEING  
MONUMENT NO. 720007  
ELEVATION = 176.742

NOTE GEODETIC HORIZONTAL CONTROL  
U.T.M. CO-ORDINATES ARE GEODETIC DATUM NAD 83  
AND REFERRED TO MONUMENTS  
693385 AND 693399

NOTE (WELL SITE) CO-ORDINATES  
LATITUDE N. 42° 22' 50.954" LONGITUDE W. 80° 20' 29.329"  
U.T.M. N. 4 692 314.0 E. 389 577.5

WELL NAME  
PAIN COURT #2 (HORIZ. #1) - DOVER - 3 - 6 - 4

PREPARED BY  
STANLEY AND SONS INC.  
1425331 ONTARIO LIMITED  
SERVING THE PETROLEUM INDUSTRY  
THROUGHOUT ONTARIO  
WELL CONSTRUCTION AND TECHNICAL SURVEYING  
DIGITAL MAPPING  
LAND AND LEASE SURVEYS  
OFFICE (519) 451-5072  
CELL (519) 401-2075  
FAX (519) 451-2113  
PO BOX 327 - N7M-5K4  
CHATHAM, ONTARIO

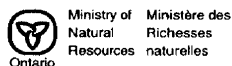
PREPARED FOR

FILE NO. 10-4951 PLAN NO. JMI6429.DWG

JANUARY 10, 2011

TIMOTHY J. O'ROURKE C.S.T. A.C.E.T.

AUTHORIZED BY THE MINISTER OF NATURAL RESOURCES  
UNDER THE PETROLEUM RESOURCES ACT OF ONTARIO



Oil, Gas and Salt Resources Act  
**Application for a Well Licence**

Form 1

To the Minister of Natural Resources

v.1999-01-07

The undersigned operator applies for a well licence under the Oil, Gas and Salt Resources Act and the Regulations thereunder and submits the following information, together with the application fee of \$100 + 13% HST.

1. **WELL NAME** Pain Court 2 (Horiz. #1, Lat. #1), Dover 3 - 6 - 4 Target Formation Sherman Fall

Purpose of Proposed Well (Well Type) Natural Gas Storage

2. **NAME OF OPERATOR** Union Gas Limited Tel # 519 436-4568

Address 50 Keil Drive North, Chatham, Ontario, N7M 5M1 Fax # 519 436-4560

3. **LOCATION** County Kent Township Dover

Tract 3 Lot 6 Concession 4 Lake Erie: Block Tract

Lake Erie licence or lease number

Bottom-hole location Bottom-hole Latitude 42°22'23.404" N Bottom-hole Longitude 82°21'10.276" W

Surface location metres from Lot Boundaries 565.95 m North ☐ South ☒ Latitude 42°22'30.954" N

184.75 m East ☒ West ☐ Longitude 82°20'28.389" W

Within 1.6 km of Designated Storage Area? Yes ☐ No ☒ Off-target? Yes ☐ No ☒

4. **WELL PARTICULARS** Vertical ☐ Horizontal ☒ Directional ☐ Deepening ☐ Re-entry ☐

Rig Type: Rotary ☒ Cable ☒ Well to be cored? Yes ☐ No ☒ Formation at TD Sherman Falls

Ground Elevation 175.4 Proposed Depth TMD 1827.0 Proposed Depth TVD 930.0 Proposed Start Date Sep., 2011

5. **LANDOWNER** Tel #

Address

Spacing unit shown on attached survey plan is pooled (see O.Reg.245/97 definitions: "pooled spacing unit") Yes ☐ No ☒

6. **DRILLING CONTRACTOR (if known)**

Address

**7. PROPOSED CASING AND CEMENTING PROGRAM**

| Hole Size (mm) | Casing O.D. (mm) | Weight (kg/m) | Grade | New, Used or in-hole | Setting Depth TVD | Setting Formation | CASING SETTING INFORMATION |             |                    |
|----------------|------------------|---------------|-------|----------------------|-------------------|-------------------|----------------------------|-------------|--------------------|
|                |                  |               |       |                      |                   |                   | How Set                    | Cement Type | Cement Top KB / RF |
|                |                  |               |       |                      |                   |                   |                            |             |                    |
|                |                  |               |       |                      |                   |                   |                            |             |                    |
|                |                  |               |       |                      |                   |                   |                            |             |                    |
|                |                  |               |       |                      |                   |                   |                            |             |                    |

**8. BLOW-OUT PREVENTION EQUIPMENT**

Rotating Head, Annular Preventer, Blind Rams, Pipe Rams, Lubricator, 7" Valve

**9. WELL SECURITY**

Name of Trustee 1236596 Ontario Limited Address Pensa & Associates, 130 Dufferin Ave., London, ON, N6A 5R3

Tel # 519 667-4018 Fax # 519 434-9656 Total # unplugged wells 212 Current Balance \$ 70,000

**10. REMARKS**

Lateral drilled from Pain Court 2 (Horiz#1) wellbore

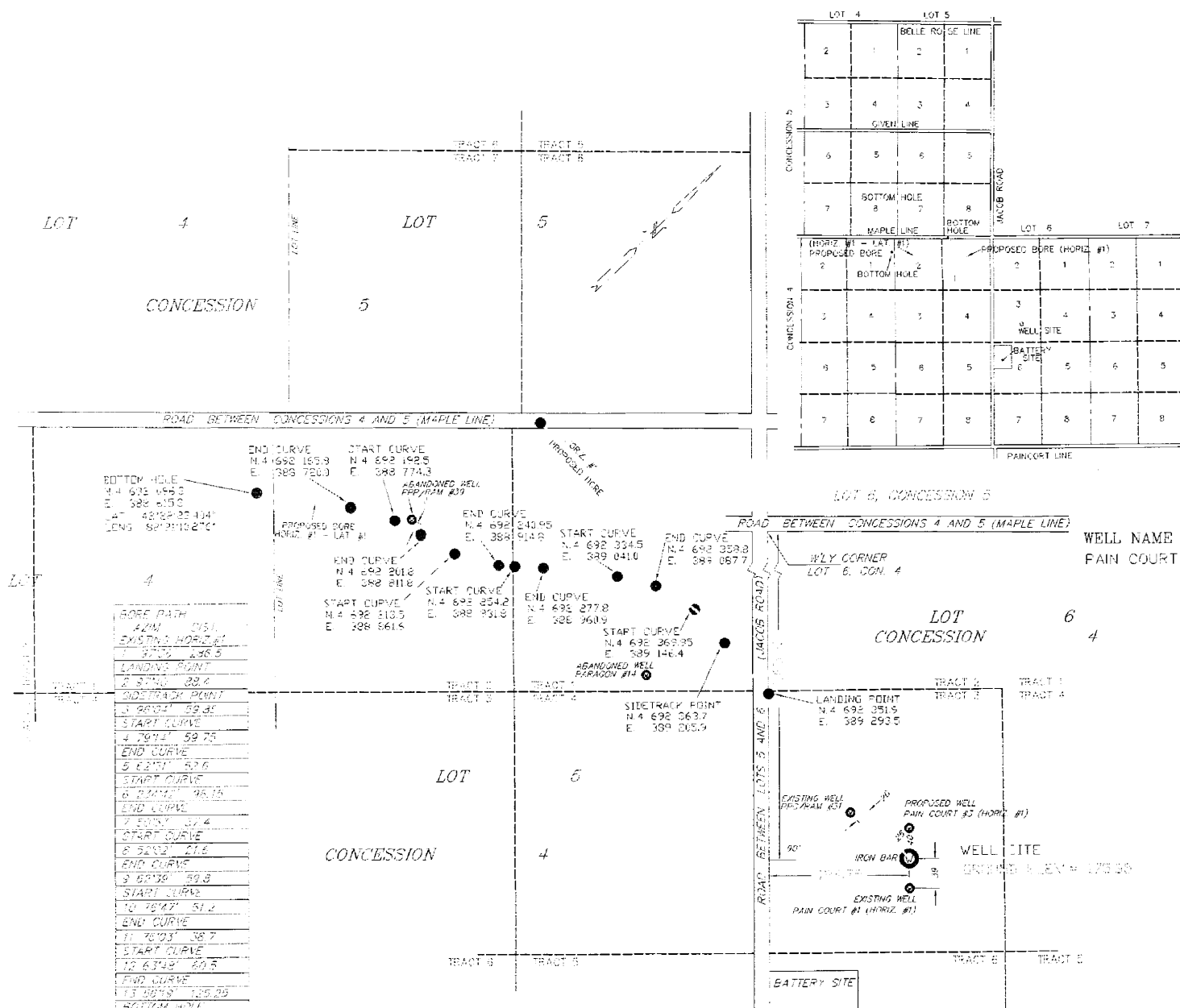
11. **ENCLOSURES:** Fee ☒ Location Plan ☒ (Land wells only) Drilling Program ☒

12. **AUTHORITY:** The undersigned certifies that the information provided herein is complete and accurate, the operator has the right to drill or operate a well in the above location, and he/she has authority to bind the operator.

Date 11-Jan-11 Name Steven Pardy, P.Eng. Signature

Date of Birth April 24, 1970 Title Manager, Reservoir Engineering and Drilling





LOT 4  
CONCESSION 4  
GEOGRAPHIC TOWNSHIP OF DOVER  
ADMINISTRATIVE  
CHATHAM - KENT

SCALE 1:5000

NOTE METRIC  
DISTANCES SHOWN ON THIS PLAN ARE IN METERS AND  
CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

NOTE BENCH MARK  
ELEVATIONS ARE REFERRED TO GEODETIC DATUM AND  
REFERENCE BENCH MARK BEING  
MONUMENT NO. 72/107  
ELEVATION = 176.762

NOTE GEODETIC HORIZONTAL CONTROL  
UTM CO-ORDINATES ARE GEODETIC DATUM NAD 83  
AND REFERRED TO MONUMENTS  
692385 AND 692399

NOTE (WELL SITE) CO-ORDINATES  
LATITUDE N 42° 22' 30.954" LONGITUDE W 82° 20' 28.389"  
UTM N 4 692 314.0 E 389 577.5

PREPARED BY  
SHISCO AND O'ROURKE  
1425301 ONTARIO LIMITED  
SERVING THE PETROLEUM INDUSTRY  
THROUGHOUT ONTARIO  
WELLS CONSTRUCTION AND TECHNICAL SURVEYING  
DIGITAL MAPPING  
LAND AND LEASE SURVEYS  
OFFICE (519) 351-5073  
CELL (519) 401-5073  
FAX (519) 351-3113  
PO BOX 327 - N7M-SK4  
CHATHAM, ONTARIO

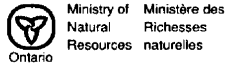
PREPARED FOR

FILE NO. 10-4951 PLAN NO. UNI6430.DWG

JANUARY 10, 2011

TIMOTHY J. O'ROURKE C.S.T. A.C.E.T.

AUTHORIZED BY THE MINISTER OF NATURAL RESOURCES  
UNDER THE PETROLEUM RECOVERY ACT OF ONTARIO



Oil, Gas and Salt Resources Act  
**Application for a Well Licence**

Form 1 To the Minister of Natural Resources v.1999-01-07  
The undersigned operator applies for a well licence under the Oil, Gas and Salt Resources Act and the Regulations thereunder and submits the following information, together with the application fee of \$100 + 13% HST.

1. WELL NAME Pain Court 3 (Horiz. #1), Dover 3 - 6 - 4 Target Formation Sherman Fall

Purpose of Proposed Well (Well Type) Natural Gas Storage

2. NAME OF OPERATOR Union Gas Limited Tel # 519 436-4568

Address 50 Keil Drive North, Chatham, Ontario, N7M 5M1 Fax # 519 436-4560

3. LOCATION County Kent Township Dover

Tract 3 Lot 6 Concession 4 Lake Erie: Block Tract

Lake Erie licence or lease number

Bottom-hole location Bottom-hole Latitude 42°22'28.19" N Bottom-hole Longitude 82°20'04.91" W

Surface location metres from Lot Boundaries 849.60 m North ☒ South ☐ Latitude 42°22'31.913" N

184.70 m East ☒ West ☐ Longitude 82°20'29.568" W

Within 1.6 km of Designated Storage Area? Yes ☐ No ☒ Off-target? Yes ☐ No ☒

4. WELL PARTICULARS Vertical ☐ Horizontal ☒ Directional ☐ Deepening ☐ Re-entry ☐

Rig Type: Rotary ☒ Cable ☒ Well to be cored? Yes ☒ No ☐ Formation at TD Sherman Falls

Ground Elevation 175.4 Proposed Depth TMD 1450.0 Proposed Depth TVD 990.0 Proposed Start Date November, 2011

5. LANDOWNER Tel

Address

Spacing unit shown on attached survey plan is pooled (see O.Reg.245/97 definitions: "pooled spacing unit") Yes ☐ No ☒

6. DRILLING CONTRACTOR (if known)

Address

7. PROPOSED CASING AND CEMENTING PROGRAM

| Hole Size (mm) | Casing O.D. (mm) | Weight (kg/m) | Grade     | New, Used or in-hole | Setting Depth TVD | Setting Formation | CASING SETTING INFORMATION |              |                    |
|----------------|------------------|---------------|-----------|----------------------|-------------------|-------------------|----------------------------|--------------|--------------------|
|                |                  |               |           |                      |                   |                   | How Set                    | Cement Type  | Cement Top KB / RF |
| 406.0          | 406.00           | 76.49         | Line pipe | New                  | 22.0              | Kettle Point      | Driven                     | N/A          | N/A                |
| 387.3          | 339.70           | 71.43         | H-40      | New                  | 95.5              | Dundee            | Cemented                   | 0:1:0        | 1.9                |
| 311.0          | 244.50           | 53.57         | K-55      | New                  | 616.5             | Cabot Head        | Cemented                   | 0:8:0; 0:1:0 | 4.6                |
| 222.0          | 177.80           | 34.23         | K-55      | New                  | 880.0             | Cobourg           | Cemented                   | 0:1:0        | 4.6                |

8. BLOW-OUT PREVENTION EQUIPMENT

Rotating Head, Annular Preventer, Blind Rams, Pipe Rams, Lubricator, 7" Valve

9. WELL SECURITY

Name of Trustee 1236596 Ontario Limited Address Pensa & Associates, 130 Dufferin Ave., London, ON, N6A 5R3

Tel # 519 667-4018 Fax # 519 434-9656 Total # unplugged wells 212 Current Balance \$ 70,000

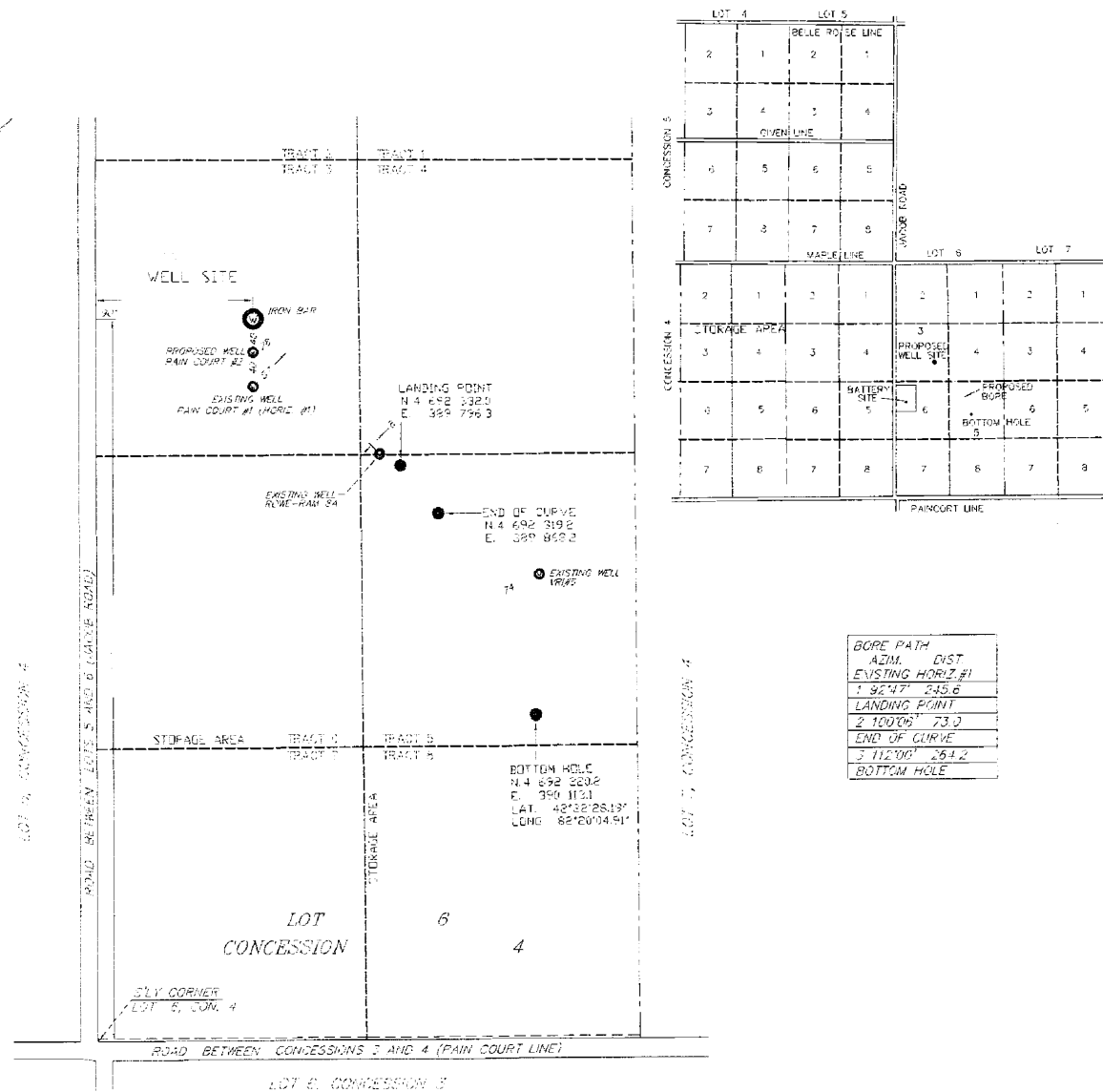
10. REMARKS

11. ENCLOSURES: Fee ☒ Location Plan ☒ (Land wells only) Drilling Program ☒

12. AUTHORITY: The undersigned certifies that the information provided herein is complete and accurate, the operator has the right to drill or operate a well in the above location, and he/she has authority to bind the operator.

Date 11-Jan-11 Name Steven Pardy, P.Eng. Signature

Date of Birth April 24, 1970 Title Manager, Reservoir Engineering and Drilling



LOT 13  
CONCESSION 4  
GEOGRAPHIC TOWNSHIP OF DOVER  
MUNICIPALITY OF  
CHATHAM KENT

SCALE 1:5000

WELL NAME  
PAIN COURT #3 (HORIZ.#1) - DOVER - 3 - 6 - 4

NOTE (WELL SITE) CO-ORDINATES  
LATITUDE N.42°22'31.910" LONGITUDE W.82°20'29.568"  
U.T.M. N.4 692 344.0 E.389 551.0

NOTE METRIC  
DISTANCES SHOWN ON THIS PLAN ARE IN METERS AND  
CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

NOTE BENCH MARK  
ELEVATIONS ARE REFERRED TO GEODETIC DATUM AND  
REFERENCE BENCH MARK BEING  
MONUMENT NO. 720007  
ELEVATION = 176.762

NOTE GEODETIC HORIZONTAL CONTROL  
U.T.M. CO-ORDINATES ARE GEODETIC DATUM NAD 83  
AND REFERRED TO MONUMENTS  
693385 AND 693399

PREPARED BY  
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 OFFICE (519) 251-5073  
 CELL (519) 401-5073  
 FAX (519) 251-3112  
 P.O. BOX 327 • N7M-5L4  
 CHATHAM, ONTARIO

FREPARED FOR

FILE NO. 10-4251

PLAN NO. JN16428.DWG

JANUARY 10, 2011

TIMOTHY J. O'ROURKE C.S.T. A.C.E.T.

AUTHORIZED BY THE MINISTER OF NATURAL RESOURCES  
UNDER THE PETROLEUM RESOURCES ACT OF ONTARIO





## **DRILLING PROCEDURE**

### **Pain Court 2 (Horiz. #1), Dover 3 - 6 - 4**

#### **CONDUCTOR HOLE**

1. Underground Storage to notify M.N.R. 48 hours prior to spud.
2. Move in and rig up cable tool drilling rig.

**Note: All depths referenced to 4.6 mKB**

3. Drill and drive 406 mm conductor pipe 1 m into Kettle Point (22 mKB) with a 406 mm bit. Ensure that fresh water is shut off before proceeding.

**Note: Record fresh water interval**

4. Record conductor casing OD, weight, grade and set depth.

#### **SURFACE HOLE**

5. Drill 5 m into Dundee (96 mKB) with a 387.3 mm bit.

**Note: One sample shall be collected every 3 m once Kettle Point is reached.**

6. Run 339.7 mm surface casing to bottom (96 mKB) with centralizers 2m above shoe and at joints 2 and 4. Tack weld guide shoe on bottom. The optimum makeup torque is 4170 N-m (3070 ft-lb) and the maximum makeup torque is 5210 N-m (3840 ft-lb).
7. Record surface casing OD, weight, grade, placement of cementing hardware and set depth.
8. Raise surface casing 0.5 m off bottom and set in slips. Cement 339.7 mm surface casing to surface as per cementing program.
9. Wait on cement (W.O.C.) for 24 hours.
10. Record cement top in casing.
11. Rig out cable tool rig.

#### **INTERMEDIATE HOLE**

12. Rig in rotary drilling rig (**KB = 4.6 m**).
  13. Pressure Test entire BOP system to 1900 kPag for 10 minutes and record results in log according to OGSRA Operating Standards v 2.0 sec.4.5.21
  14. Drill out cement and shoe with 311 mm bit.
  15. Drill a maximum of 0.5 m of new formation
  16. Using a low volume, high pressure pump, pressure test the formation at a pressure equivalent to a gradient of 18 kPa/m for 10 minutes using an incompressible fluid.
  17. Drill until top of Cabot Head formation (603 mKB) with 311 mm, surveying every 30m.
- Note: Geologist must be on site to verify top of Cabot Head.**
18. Drill into the Cabot Head formation (603 mKB) with 311 mm bit until directed by company personnel
  19. Run 244.5 mm intermediate casing to bottom with float collar at top of bottom joint. Centralizers should be placed 2 m above shoe, at joints 2, 4 and 5 and every 5th joint to surface.  
Cement basket should be placed above Detroit River formation. Threadlock guide shoe on bottom. The optimum makeup torque is 7690 N-m (5660 ft-lb) and the maximum makeup torque is 8300 N-m (6110 ft-lb). Land casing at proper elevation for thread-on type casing bowl.
  20. Install circulating head, circulate minimum 1 hole volume, Observe returns over shaker, ensure clean returns prior to cementing.
  21. Record intermediate casing OD, weight, grade, placement of cementing hardware and set depth.
  22. Prepare to cement 244.5 mm intermediate casing to surface.
  23. Hold safety meeting with all on-site personal.
  24. Pressure test surface equipment to 15 MPag for 1 minute. Ensure no leaks.
  25. Pump citric acid followed by fresh water pre-flush. Cement to surface as per cementing program. Ensure cement returns to surface. Take a minimum of four cement samples. Record all circulating pressures and volumes.
  26. W.O.C. for 48 hours.
  27. Cased Hole Logging. See *LOGGING PROGRAM, Log Run 1*.

**DRILLING PROCEDURE****Pain Court 2 (Horiz. #1), Dover 3 - 6 - 4****Production Hole**

28. Pressure Test Pipe Rams to 1400 kPag for ten minutes. Pressure Test entire BOP system to 7000 kPag for 10 minutes and record results in log according to OGSRA Operating Standards v 2.0 sec. 4.5 (This pressure test also tests the casing and casing bowl requirement of 5,500 kPag.)
29. Drill out cement and shoe with 222 mm bit.
30. Drill a maximum of 0.5 m of new formation with 222 mm bit.
31. Prepare for Pressure Integrity Test (P.I.T.). Using a low volume, high pressure pump, pressure test the formation at a pressure equivalent to a gradient of 18 kPa/m for 10 minutes using an incompressible fluid.
32. Rig in directional drilling contractor.
33. Hold safety meeting with all on-site personnel.
34. Continue drilling 222 mm hole to KOP 19 m into Cabot Head formation (603 mKB) to 622 mKB using brine as a drilling fluid. Clean hole.
35. Kick off and build angle as per directional drilling contractor until 2 m into Cobourg (943 mKB MD, 880 mKB TVD) or directed by company personnel.

**Note: Geologist will be onsite to verify top of Collingwood formation.**

41. Run 177.8 mm production casing to 942mKB with insert float at top of bottom joint. Centralizers should be placed on every joint until above the curve and every 5th joint to surface. Tack weld guide shoe on bottom. The optimum makeup torque is 4630 N-m (4260 ft-lb) and the maximum makeup torque is 4630 N-m (3410 ft-lb).
42. Record production casing OD, weight, grade, placement of cementing hardware and set depth.
43. Ensure that a collar is not positioned where the wellhead seals need to be installed.
44. Prepare to cement 177.8 mm production casing to surface.
45. Hold safety meeting with all on-site personal.
46. Pressure test surface equipment to 15 MPag for 1 minute. Ensure no leaks.
47. Pump citric acid followed by fresh water pre-flush. Cement to surface as per cementing program. Displace cement with fresh water. Ensure cement returns to surface or arrange for remedial cementing from surface. Take a minimum of four cement samples to verify setup time and density. Record all circulating pressures and volumes.
48. Set Casing Slips
49. W.O.C. for 48 hours.
50. Cased Hole Logging. See *LOGGING PROGRAM, Log Run 2*.
51. Pressure test wellhead and production casing to 15,500 kPag for four (4) hours.

**MAIN HOLE - HORIZONTAL**

52. Drill out cement, shoe and 0.5 m of new formation with 158.8 mm bit.
54. Prepare for Pressure Integrity Test (P.I.T.). Using a low volume, high pressure pump, pressure test the formation at a pressure equivalent to a gradient of 18 kPa/m for a duration of ten (10) minutes using an incompressible fluid.
55. P.O.O.H. and rig in directional drilling contractor.
56. Rig in separator, flare stack. Pressure/function test equipment. Record results.
57. Continue drilling horizontal section to 1539 mKB MD as per directional drilling contractor.
58. **One sample shall be collected every 6 m from the production casing to TD.**
59. Prepare to drill Lateral 1 well bore. See Pain Court #2 (Horiz#1, Lat#1) Drilling Program
66. Underground Storage to notify M.N.R. within 48 hours after TD is reached.

|                           |
|---------------------------|
| <b>DRILLING PROCEDURE</b> |
|---------------------------|

**Pain Court 2 (Horiz. #1, Lat. #1), Dover 3 - 6 - 4**

**MAIN HOLE - HORIZONTAL**

1. Underground Storage to notify M.N.R. 48 hours prior to spud.
2. R.I.H to KOP(1160mKb)
3. Continue drilling horizontal section to 1827 mKB MD as per directional drilling contractor.
4. **One sample shall be collected every 6 m from the production casing to TD.**
5. P.O.O.H. Rig out directional driller, seperator, flare stack.
6. Rig in loggers.
7. Set wireline retrievable release plug in vertical section (~400 mKB MD). Check for gas.
8. Rig out loggers.
9. Rig out rotary drilling rig.
10. Install Master Valve and Blind Flange.
11. Pressure test wellhead and production casing to 15,500 kPag for four (4) hours.
12. Underground Storage to notify M.N.R. within 48 hours after TD is reached.



**DRILLING PROCEDURE****Pain Court 3 (Horiz. #1), Dover 3 - 6 - 4****CONDUCTOR HOLE**

1. Underground Storage to notify M.N.R. 48 hours prior to spud.
2. Move in and rig up cable tool drilling rig.

**Note: All depths referenced to 4.6 mKB**

3. Drill and drive 406 mm conductor pipe 1 m into Kettle Point (22 mKB) with a 406 mm bit. Ensure that fresh water is shut off before proceeding.

**Note: Record fresh water interval**

4. Record conductor casing OD, weight, grade and set depth.

**SURFACE HOLE**

5. Drill 5 m into Dundee (96 mKB) with a 387.3 mm bit.

**Note: One sample shall be collected every 3 m once Kettle Point is reached.**

6. Run 339.7 mm surface casing to bottom (96 mKB) with centralizers 2m above shoe and at joints 2 and 4. Tack weld guide shoe on bottom. The optimum makeup torque is 4170 N-m (3070 ft-lb) and the maximum makeup torque is 5210 N-m (3840 ft-lb).
7. Record surface casing OD, weight, grade, placement of cementing hardware and set depth.
8. Raise surface casing 0.5 m off bottom and set in slips. Cement 339.7 mm surface casing to surface as per cementing program.
9. Wait on cement (W.O.C.) for 24 hours.
10. Record cement top in casing.
11. Rig out cable tool rig.

**INTERMEDIATE HOLE**

12. Rig in rotary drilling rig (KB = 4.6 m).
13. Pressure Test entire BOP system to 1900 kPag for 10 minutes and record results in log according to OGSRA Operating Standards v 2.0 sec.4.5.21
14. Drill out cement and shoe with 311 mm bit.
15. Drill a maximum of 0.5 m of new formation
16. Using a low volume, high pressure pump, pressure test the formation at a pressure equivalent to a gradient of 18 kPa/m for 10 minutes using an incompressible fluid.
17. Drill until top of Cabot Head formation (603 mKB) with 311 mm, surveying every 30m.

**Note: Geologist must be on site to verify top of Cabot Head.**

18. Drill into the Cabot Head formation (603 mKB) with 311 mm bit until directed by company personnel
19. Run 244.5 mm intermediate casing to bottom with float collar at top of bottom joint. Centralizers should be placed 2 m above shoe, at joints 2, 4 and 5 and every 5th joint to surface.  
Cement basket should be placed above Detroit River formation. Threadlock guide shoe on bottom. The optimum makeup torque is 7690 N-m (5660 ft-lb) and the maximum makeup torque is 8300 N-m (6110 ft-lb). Land casing at proper elevation for thread-on type casing bowl.
20. Install circulating head, circulate minimum 1 hole volume, Observe returns over shaker, ensure clean returns prior to cementing.
21. Record intermediate casing OD, weight, grade, placement of cementing hardware and set depth.
22. Prepare to cement 244.5 mm intermediate casing to surface.
23. Hold safety meeting with all on-site personal.
24. Pressure test surface equipment to 15 MPag for 1 minute. Ensure no leaks.
25. Pump citric acid followed by fresh water pre-flush. Cement to surface as per cementing program. Ensure cement returns to surface. Take a minimum of four cement samples. Record all circulating pressures and volumes.
26. W.O.C. for 48 hours.

**DRILLING PROCEDURE****Pain Court 3 (Horiz. #1), Dover 3 - 6 - 4**

27. Cased Hole Logging. See LOGGING PROGRAM, Log Run 1.

**Production Hole**

28. Pressure Test Pipe Rams to 1400 kPag for ten minutes. Pressure Test entire BOP system to 7000 kPag for 10 minutes and record results in log according to OGSRA Operating Standards v 2.0 sec. 4.5 (This pressure test also tests the casing and casing bowl requirement of 5,500 kPag.)
29. Drill out cement and shoe with 222 mm bit.
30. Drill a maximum of 0.5 m of new formation with 222 mm bit.
31. Prepare for Pressure Integrity Test (P.I.T.). Using a low volume, high pressure pump, pressure test the formation at a pressure equivalent to a gradient of 18 kPa/m for 10 minutes using an incompressible fluid.
32. Drill to 1 m into Georgian Bay/Blue Mountain formation

**Note: Geologist will be onsite to verify top of Blue Mountain formation.**

33. POOH
34. Hold safety meeting with all on-site personnel.
35. Rig in Coring Contractor, Core 18m as per coring program, POOH
36. Complete Microfrac as per micro frac program.
37. Rig in Directional Contractor
38. Ream hole to bottom
39. Continue drilling 222 mm hole to KOP 20 m into Georgian Bay/Blue Mountain formation (740 mKB) to 760 mKB using brine as a drilling fluid. Clean hole.
40. Hold safety meeting with all on-site personnel.
41. Kick off and build angle as per directional drilling contractor until 2 m into Cobourg (887.5 mKB MD, 880 mKB TVD).

**Note: Geologist will be onsite to verify top of Cobourg formation.**

42. Run 177.8 mm production casing to 886.5mKB with insert float at top of bottom joint. Centralizers should be placed on every joint until above the curve and every 5th joint to surface. Tack weld guide shoe on bottom. The optimum makeup torque is 4630 N-m (4260 ft-lb) and the maximum makeup torque is 4630 N-m (3410 ft-lb).
43. Record production casing OD, weight, grade, placement of cementing hardware and set depth.
44. Ensure that a collar is not positioned where the wellhead seals need to be installed.
45. Prepare to cement 177.8 mm production casing to surface.
46. Hold safety meeting with all on-site personal.
47. Pressure test surface equipment to 15 MPag for 1 minute. Ensure no leaks.
48. Pump citric acid followed by fresh water pre-flush. Cement to surface as per cementing program. Displace cement with fresh water. Ensure cement returns to surface or arrange for remedial cementing from surface. Take a minimum of four cement samples to verify setup time and density. Record all circulating pressures and volumes.
49. Set Casing Slips
50. W.O.C. for 48 hours.
51. Cased Hole Logging. See LOGGING PROGRAM, Log Run 2.
52. Install Wellhead and Master Valve
53. Pressure test wellhead and production casing to 15,500 kPag for four (4) hours.

**MAIN HOLE - HORIZONTAL**

54. Drill out cement, shoe and 0.5 m of new formation with 158.8 mm bit.
55. Prepare for Pressure Integrity Test (P.I.T.). Using a low volume, high pressure pump, pressure test the formation at a pressure equivalent to a gradient of 18 kPa/m for a duration of ten (10) minutes using an incompressible fluid.

|                           |
|---------------------------|
| <b>DRILLING PROCEDURE</b> |
|---------------------------|

**Pain Court 3 (Horiz. #1), Dover 3 - 6 - 4**

56. P.O.O.H. and rig in directional drilling contractor.
57. Rig in separator, flare stack. Pressure/function test equipment. Record results.
58. Continue drilling horizontal section to 1450 mKB MD as per directional drilling contractor.
59. **One sample shall be collected every 6 m from the production casing to TD.**
60. P.O.O.H. Rig out directional driller, separator, flare stack.
61. Rig in loggers.
62. Set wireline retrievable release plug in vertical section (~400 mKB MD). Check for gas.
63. Rig out loggers.
64. Rig out rotary drilling rig.
65. Install Master Valve and Blind Flange.
66. Pressure test wellhead and production casing to 15,500 kPag for four (4) hours.
67. Underground Storage to notify M.N.R. within 48 hours after TD is reached.





|                       |
|-----------------------|
| <b>CASING PROGRAM</b> |
|-----------------------|

|                                                  |
|--------------------------------------------------|
| <i>Pain Court 2 (Horiz. #1), Dover 3 - 6 - 4</i> |
|--------------------------------------------------|

**CONDUCTOR CASING SUMMARY (Referenced to 4.6 m KB-GL)**

| Description              | Metric                                         |      | Imperial      |
|--------------------------|------------------------------------------------|------|---------------|
|                          | Value                                          | Unit | Value         |
| Top                      | 0.0                                            | mKB  | 0.0           |
| Bottom                   | 22.0                                           | mKB  | 72.2          |
| Outside Diameter         | 406.00                                         | mm   | 15.984        |
| Weight                   | 76.49                                          | kg/m | 51.4          |
| Drift Diameter           | 390.60                                         | mm   | 15.378        |
| Inside Diameter          | 390.60                                         | mm   | 15.378 inches |
| Grade                    | Line pipe                                      |      | Line pipe     |
| Thread                   | N/A                                            |      | N/A           |
| Coupling                 | Welded                                         |      | Welded        |
| Burst                    | N/A                                            | kPa  | N/A psi       |
| Collapse                 | N/A                                            | kPa  | N/A psi       |
| Pipe Body Yield Strength | N/A                                            | daN  | N/A lb-f      |
| Joint Strength           | N/A                                            | daN  | N/A lb-f      |
| Torque - Optimum         | N/A                                            | N-m  | N/A ft-lb     |
| Torque - Maximum         | N/A                                            | N-m  | N/A ft-lb     |
| Condition                | New                                            |      |               |
| Float Equipment          | None                                           |      |               |
| Shoe                     | Drive                                          |      |               |
| Threadlock               | Tack weld drive shoe on bottom joint of casing |      |               |

**SURFACE CASING SUMMARY (Referenced to 4.6 m KB-GL)**

| Description              | Metric                                          |      | Imperial |        |
|--------------------------|-------------------------------------------------|------|----------|--------|
|                          | Value                                           | Unit | Value    | Unit   |
| Top                      | 0.0                                             | mKB  | 0.0      | ftKB   |
| Bottom                   | 95.5                                            | mKB  | 313.3    | ftKB   |
| Outside Diameter         | 339.70                                          | mm   | 13.374   | inches |
| Weight                   | 71.43                                           | kg/m | 48.0     | lb/ft  |
| Drift Diameter           | 319.00                                          | mm   | 12.559   | inches |
| Inside Diameter          | 322.96                                          | mm   | 12.715   | inches |
| Grade                    | H-40                                            |      | H-40     |        |
| Thread                   | 8 Rd.                                           |      | 8 Rd.    |        |
| Coupling                 | ST & C                                          |      | ST & C   |        |
| Burst                    | 11,930                                          | kPa  | 1,730    | psi    |
| Collapse                 | 5,100                                           | kPa  | 740      | psi    |
| Pipe Body Yield Strength | 240,600                                         | daN  | 541,000  | lb-f   |
| Joint Strength           | 143,200                                         | daN  | 322,000  | lb-f   |
| Torque - Optimum         | 4,170                                           | N-m  | 3,070    | ft-lb  |
| Torque - Maximum         | 5,210                                           | N-m  | 3,840    | ft-lb  |
| Condition                | New                                             |      |          |        |
| Float Equipment          | None                                            |      |          |        |
| Centralizers             | Joints 2,4 and 6                                |      |          |        |
| Shoe                     | Guide                                           |      |          |        |
| Threadlock               | Threadlock guide shoe on bottom joint of casing |      |          |        |

## CASING PROGRAM

Pain Court 2 (Horiz. #1), Dover 3 - 6 - 4

### INTERMEDIATE CASING SUMMARY (Rotary: 4.6 m KB-GL)

| Description              | Metric                                                          |      | Imperial |        |
|--------------------------|-----------------------------------------------------------------|------|----------|--------|
|                          | Value                                                           | Unit | Value    | Unit   |
| Top                      | 0.0                                                             | mKB  | 0.0      | ftKB   |
| Bottom                   | 616.5                                                           | mKB  | 2022.6   | ftKB   |
| Outside Diameter         | 244.50                                                          | mm   | 9.626    | inches |
| Weight                   | 53.57                                                           | kg/m | 36.0     | lb/ft  |
| Drift Diameter           | 222.63                                                          | mm   | 8.765    | inches |
| Inside Diameter          | 226.59                                                          | mm   | 8.921    | inches |
| Grade                    | K-55                                                            |      | K-55     |        |
| Thread                   | 8 Rd.                                                           |      | 8 Rd.    |        |
| Coupling                 | LT & C                                                          |      | LT & C   |        |
| Burst                    | 24,270                                                          | kPa  | 3,520    | psi    |
| Collapse                 | 13,930                                                          | kPa  | 2,020    | psi    |
| Pipe Body Yield Strength | 250,900                                                         | daN  | 564,000  | lb-f   |
| Joint Strength           | 217,500                                                         | daN  | 489,000  | lb-f   |
| Torque - Optimum         | 7,690                                                           | N-m  | 5,660    | ft-lb  |
| Torque - Maximum         | 8,300                                                           | N-m  | 6,110    | ft-lb  |
| Condition                | New                                                             |      |          |        |
| Float Equipment          | Float Collar (Top of 1 <sup>st</sup> joint)                     |      |          |        |
| Centralizers             | Joints 2,4 & 5; every 5 <sup>th</sup> joint & 10 m from surface |      |          |        |
| Cement Basket            | Run above Detroit River formation                               |      |          |        |
| Shoe                     | Guide                                                           |      |          |        |
| Threadlock               | Threadlock guide shoe on bottom joint of casing                 |      |          |        |

### PRODUCTION CASING SUMMARY (Rotary: 4.6 m KB-GL)

| Description              | Metric                                                                                                |      | Imperial |        |
|--------------------------|-------------------------------------------------------------------------------------------------------|------|----------|--------|
|                          | Value                                                                                                 | Unit | Value    | Unit   |
| Top                      | 0.0                                                                                                   | mKB  | 0.0      | ftKB   |
| Bottom                   | 942.0                                                                                                 | mKB  | 3090.6   | ftKB   |
| Outside Diameter         | 177.80                                                                                                | mm   | 7.000    | inches |
| Weight                   | 34.23                                                                                                 | kg/m | 23.0     | lb/ft  |
| Drift Diameter           | 156.24                                                                                                | mm   | 6.151    | inches |
| Inside Diameter          | 161.70                                                                                                | mm   | 6.366    | inches |
| Grade                    | K-55                                                                                                  |      | K-55     |        |
| Thread                   | 8 Rd.                                                                                                 |      | 8 Rd.    |        |
| Coupling                 | LT & C                                                                                                |      | LT & C   |        |
| Burst                    | 30,060                                                                                                | kPa  | 4,360    | psi    |
| Collapse                 | 22,550                                                                                                | kPa  | 3,270    | psi    |
| Pipe Body Yield Strength | 162,800                                                                                               | daN  | 366,000  | lb-f   |
| Joint Strength           | 137,400                                                                                               | daN  | 309,000  | lb-f   |
| Torque - Optimum         | 5,790                                                                                                 | N-m  | 4,260    | ft-lb  |
| Torque - Maximum         | 4,630                                                                                                 | N-m  | 3,410    | ft-lb  |
| Condition                | New                                                                                                   |      |          |        |
| Float Equipment          | Float Collar (Top of 1 <sup>st</sup> joint)                                                           |      |          |        |
| Centralizers             | Every Joint from bottom to top of curve and every 5 <sup>th</sup> joint to surface; 10 m from surface |      |          |        |
| Shoe                     | Guide                                                                                                 |      |          |        |
| Threadlock               | Threadlock guide shoe on bottom joint of casing                                                       |      |          |        |

|                       |
|-----------------------|
| <b>CASING PROGRAM</b> |
|-----------------------|

|                                                  |
|--------------------------------------------------|
| <i>Pain Court 3 (Horiz. #1), Dover 3 - 6 - 4</i> |
|--------------------------------------------------|

**CONDUCTOR CASING SUMMARY (Referenced to 4.6 m KB-GL)**

| Description              | Metric                                         |      | Imperial      |
|--------------------------|------------------------------------------------|------|---------------|
|                          | Value                                          | Unit | Value         |
| Top                      | 0.0                                            | mKB  | 0.0           |
| Bottom                   | 22.0                                           | mKB  | 72.2          |
| Outside Diameter         | 406.00                                         | mm   | 15.984        |
| Weight                   | 76.49                                          | kg/m | 51.4          |
| Drift Diameter           | 390.60                                         | mm   | 15.378        |
| Inside Diameter          | 390.60                                         | mm   | 15.378 inches |
| Grade                    | Line pipe                                      |      | Line pipe     |
| Thread                   | N/A                                            |      | N/A           |
| Coupling                 | Welded                                         |      | Welded        |
| Burst                    | N/A                                            | kPa  | N/A psi       |
| Collapse                 | N/A                                            | kPa  | N/A psi       |
| Pipe Body Yield Strength | N/A                                            | daN  | N/A lb-f      |
| Joint Strength           | N/A                                            | daN  | N/A lb-f      |
| Torque - Optimum         | N/A                                            | N-m  | N/A ft-lb     |
| Torque - Maximum         | N/A                                            | N-m  | N/A ft-lb     |
| Condition                | New                                            |      |               |
| Float Equipment          | None                                           |      |               |
| Shoe                     | Drive                                          |      |               |
| Threadlock               | Tack weld drive shoe on bottom joint of casing |      |               |

**SURFACE CASING SUMMARY (Referenced to 4.6 m KB-GL)**

| Description              | Metric                                          |      | Imperial |        |
|--------------------------|-------------------------------------------------|------|----------|--------|
|                          | Value                                           | Unit | Value    | Unit   |
| Top                      | 0.0                                             | mKB  | 0.0      | ftKB   |
| Bottom                   | 95.5                                            | mKB  | 313.3    | ftKB   |
| Outside Diameter         | 339.70                                          | mm   | 13.374   | inches |
| Weight                   | 71.43                                           | kg/m | 48.0     | lb/ft  |
| Drift Diameter           | 319.00                                          | mm   | 12.559   | inches |
| Inside Diameter          | 322.96                                          | mm   | 12.715   | inches |
| Grade                    | H-40                                            |      | H-40     |        |
| Thread                   | 8 Rd.                                           |      | 8 Rd.    |        |
| Coupling                 | ST & C                                          |      | ST & C   |        |
| Burst                    | 11,930                                          | kPa  | 1,730    | psi    |
| Collapse                 | 5,100                                           | kPa  | 740      | psi    |
| Pipe Body Yield Strength | 240,600                                         | daN  | 541,000  | lb-f   |
| Joint Strength           | 143,200                                         | daN  | 322,000  | lb-f   |
| Torque - Optimum         | 4,170                                           | N-m  | 3,070    | ft-lb  |
| Torque - Maximum         | 5,210                                           | N-m  | 3,840    | ft-lb  |
| Condition                | New                                             |      |          |        |
| Float Equipment          | None                                            |      |          |        |
| Centralizers             | Joints 2, 4 and 6                               |      |          |        |
| Shoe                     | Guide                                           |      |          |        |
| Threadlock               | Threadlock guide shoe on bottom joint of casing |      |          |        |

### CASING PROGRAM

Pain Court 3 (Horiz. #1), Dover 3 - 6 - 4

#### **INTERMEDIATE CASING SUMMARY (Rotary: 4.6 m KB-GL)**

| Description              | Metric                                                          |      | Imperial |        |
|--------------------------|-----------------------------------------------------------------|------|----------|--------|
|                          | Value                                                           | Unit | Value    | Unit   |
| Top                      | 0.0                                                             | mKB  | 0.0      | ftKB   |
| Bottom                   | 616.5                                                           | mKB  | 2022.6   | ftKB   |
| Outside Diameter         | 244.50                                                          | mm   | 9.626    | inches |
| Weight                   | 53.57                                                           | kg/m | 36.0     | lb/ft  |
| Drift Diameter           | 222.63                                                          | mm   | 8.765    | inches |
| Inside Diameter          | 226.59                                                          | mm   | 8.921    | inches |
| Grade                    | K-55                                                            |      | K-55     |        |
| Thread                   | 8 Rd.                                                           |      | 8 Rd.    |        |
| Coupling                 | LT & C                                                          |      | LT & C   |        |
| Burst                    | 24,270                                                          | kPa  | 3,520    | psi    |
| Collapse                 | 13,930                                                          | kPa  | 2,020    | psi    |
| Pipe Body Yield Strength | 250,900                                                         | daN  | 564,000  | lb-f   |
| Joint Strength           | 217,500                                                         | daN  | 489,000  | lb-f   |
| Torque - Optimum         | 7,690                                                           | N-m  | 5,660    | ft-lb  |
| Torque - Maximum         | 8,300                                                           | N-m  | 6,110    | ft-lb  |
| Condition                | New                                                             |      |          |        |
| Float Equipment          | Float Collar (Top of 1 <sup>st</sup> joint)                     |      |          |        |
| Centralizers             | Joints 2,4 & 5; every 5 <sup>th</sup> joint & 10 m from surface |      |          |        |
| Cement Basket            | Run above Detroit River formation                               |      |          |        |
| Shoe                     | Guide                                                           |      |          |        |
| Threadlock               | Threadlock guide shoe on bottom joint of casing                 |      |          |        |

#### **PRODUCTION CASING SUMMARY (Rotary: 4.6 m KB-GL)**

| Description              | Metric                                                                                                |      | Imperial |        |
|--------------------------|-------------------------------------------------------------------------------------------------------|------|----------|--------|
|                          | Value                                                                                                 | Unit | Value    | Unit   |
| Top                      | 0.0                                                                                                   | mKB  | 0.0      | ftKB   |
| Bottom                   | 886.5                                                                                                 | mKB  | 2908.5   | ftKB   |
| Outside Diameter         | 177.80                                                                                                | mm   | 7.000    | inches |
| Weight                   | 34.23                                                                                                 | kg/m | 23.0     | lb/ft  |
| Drift Diameter           | 156.24                                                                                                | mm   | 6.151    | inches |
| Inside Diameter          | 161.70                                                                                                | mm   | 6.366    | inches |
| Grade                    | K-55                                                                                                  |      | K-55     |        |
| Thread                   | 8 Rd.                                                                                                 |      | 8 Rd.    |        |
| Coupling                 | LT & C                                                                                                |      | LT & C   |        |
| Burst                    | 30,060                                                                                                | kPa  | 4,360    | psi    |
| Collapse                 | 22,550                                                                                                | kPa  | 3,270    | psi    |
| Pipe Body Yield Strength | 162,800                                                                                               | daN  | 366,000  | lb-f   |
| Joint Strength           | 137,400                                                                                               | daN  | 309,000  | lb-f   |
| Torque - Optimum         | 5,790                                                                                                 | N-m  | 4,260    | ft-lb  |
| Torque - Maximum         | 4,630                                                                                                 | N-m  | 3,410    | ft-lb  |
| Condition                | New                                                                                                   |      |          |        |
| Float Equipment          | Float Collar (Top of 1 <sup>st</sup> joint)                                                           |      |          |        |
| Centralizers             | Every Joint from bottom to top of curve and every 5 <sup>th</sup> joint to surface; 10 m from surface |      |          |        |
| Shoe                     | Guide                                                                                                 |      |          |        |
| Threadlock               | Threadlock guide shoe on bottom joint of casing                                                       |      |          |        |





## Design and Pipe Specifications

### Jacob Storage Pool

#### Design Specifications

##### Mainline

|                            |   |          |
|----------------------------|---|----------|
| Class Location             | - | Class 2  |
| Design Factor              | - | 0.800    |
| Location Factor (General)  | - | 0.900    |
| Location Factor (Roads)    | - | 0.625    |
| Maximum Operating Pressure | - | 6040 kPa |
| Test Medium                | - | Water    |
| Test Pressure              | - | 8456 kPa |
| Valves / Fittings          | - | PN 100   |
| Minimum Depth of Cover     | - | 1.0 m    |

##### Gathering Line

|                            |   |           |
|----------------------------|---|-----------|
| Class Location             | - | Class 2   |
| Design Factor              | - | 0.800     |
| Location Factor (General)  | - | 0.900     |
| Location Factor (Roads)    | - | 0.625     |
| Maximum Operating Pressure | - | 9930 kPa  |
| Test Medium                | - | Water     |
| Test Pressure              | - | 13902 kPa |
| Valves / Fittings          | - | PN 100    |
| Minimum Depth of Cover     | - | 1.0 m     |

#### Pipe Specifications

##### Mainline

|                |   |                          |
|----------------|---|--------------------------|
| Size           | - | NPS 8                    |
| Wall Thickness | - | 4.8 mm                   |
| Type           | - | Electric Resistance Weld |
| Description    | - | CSA Z245.1               |
| Grade          | - | 290                      |
| Category       | - | I                        |
| Coating        | - | Yellow Jacket            |

Gathering Line

|                |   |                          |
|----------------|---|--------------------------|
| Size           | - | NPS 6                    |
| Wall Thickness | - | 4.8 mm & 5.8 mm          |
| Type           | - | Electric Resistance Weld |
| Description    | - | CSA Z245.1               |
| Grade          | - | 290                      |
| Category       | - | I                        |
| Coating        | - | Yellow Jacket            |

|                |   |                          |
|----------------|---|--------------------------|
| Size           | - | NPS 8                    |
| Wall Thickness | - | 5.3 mm & 7.5 mm          |
| Type           | - | Electric Resistance Weld |
| Description    | - | CSA Z245.1               |
| Grade          | - | 290                      |
| Category       | - | I                        |
| Coating        | - | Yellow Jacket            |





## **GENERAL TECHNIQUES AND METHODS OF CONSTRUCTION**

---

1. Union Gas Limited ("Union") will provide its own inspection staff to enforce Union's construction specifications and *Ontario Regulation 210/01 under the Technical Standards and Safety Act 2000, Oil and Gas Pipeline Systems*.
2. Minimal crews are expected to perform the construction of this pipeline given the scope of the pipeline facilities.
3. Union's contract specifications require the contractor to adhere to the requirements of the Occupational Health and Safety Act including the use of safety barricades, fences, signs or flashers, or to use flag persons as may be appropriate, around any excavation across or along a road.
4. It is Union's policy to restore the areas affected by the construction of the pipeline to "as close to original condition" as possible. As a guide to show the "original condition" of the area, photos and/or a video will be taken before any work commences. When the clean up is completed, the approval of the landowner or appropriate government authority is obtained.
5. Construction of the pipeline includes the following activities.

### **Locating Running Line**

6. Union establishes the location where the pipeline is to be installed ("the running line"). For pipelines within road allowances, the adjacent property lines are identified and the running line is set at a specified distance from the property line. For pipelines located on private easement, the easement is surveyed and the running line is set at the specified distance from the edge of the easement. The distance from the start of the pipeline (or other suitable point) is marked on the pipeline stakes and the drawings.

### **Clearing and Grading**

7. The right-of-way is prepared for the construction of the pipeline. When required, bushes, trees and crops are removed and the ground leveled. When required, the topsoil is stripped and stored, and/or sod is lifted.

**Stringing**

8. The pipe is strung adjacent to the running line. The joints of pipe are laid end-to-end on supports that keep the pipe off the ground to prevent damage to the pipe coating.

**Welding**

9. The pipe is welded into manageable lengths. The welds are then radiographically inspected and coated.

**Trenching/Backfilling**

10. Pipe may be buried using either the trench method or the trenchless method. All utilities that will be crossed or paralleled by the pipeline are located by the appropriate utility/operating company prior to installing the pipeline. Prior to trenching, all such utilities will be hand-located or by hydro-vacuuming

**Trench Method:** Trenching is done by using a trenching machine or hoe excavator depending upon the ground conditions. For gathering line construction, trenching activities are typically completed from an adjacent permanent gravel roadway or wellpad when applicable. Provisions are made to allow residents access to their property, as required. All drainage tiles that are cut during the trench excavation are flagged to signify that a repair is required. All cut tiles are surveyed for their location, measured and recorded as to size, depth, type and quality. This information is kept on file with Union and provided to the drainage consultant for the post-construction tile design. If a repair is necessary in the future, Union will have an accurate method of locating the tile. Next, the pipe is lowered into the trench. The pipe coating is tested using a high voltage electrical tester as the pipe is lowered into the trench. All defects in the coating are repaired before the pipe is lowered in. Next, if the soil that was excavated from the trench is suitable for backfill, it is backfilled. If the soil is not suitable for backfill (such as rock), it is hauled away and the trench is backfilled with suitable material such as sand. After the trench is backfilled, drainage tile is repaired. Tile repairs are made by excavating back into the bank along the tile run and placing clear stone as a foundation for a perforated drainage pipe. A new drainage tile is cut to the appropriate length and installed between the two exposed tile ends. Prior to the actual setting of the perforated drainage tile, the existing tile run is checked to ensure that it is clear and undamaged within the limits of the work area. If it is not, further tile is excavated and the damaged tile is replaced to the edge of the work area. A company inspector,

and as required the lands relations agent, inspects each tile repair and acts as a liaison between the contractor, the landowner and/or municipality. If required, the landowner or municipal representative is requested to inspect tile repairs prior to backfill completion. Union undertakes that it is responsible for the tile repair and will be accountable for the tile repairs at any future date after construction of the pipeline.

**Trenchless Method:** Trenchless methods are alternate methods used to install pipelines under railways, roads, water courses, sidewalks, trees and lawns. There are a variety of trenchless methods that are used, depending on the soil conditions, and the length and size of the installation. These methods are boring and horizontal directional drilling (HDD).

### **Tie-Ins**

11. The sections of pipelines that have been buried using either the trench or trenchless method are joined together (tied-in).

### **Cleaning and Testing**

12. To complete the construction, the pipeline is cleaned, tested in accordance with Union's specifications using water and then dried.

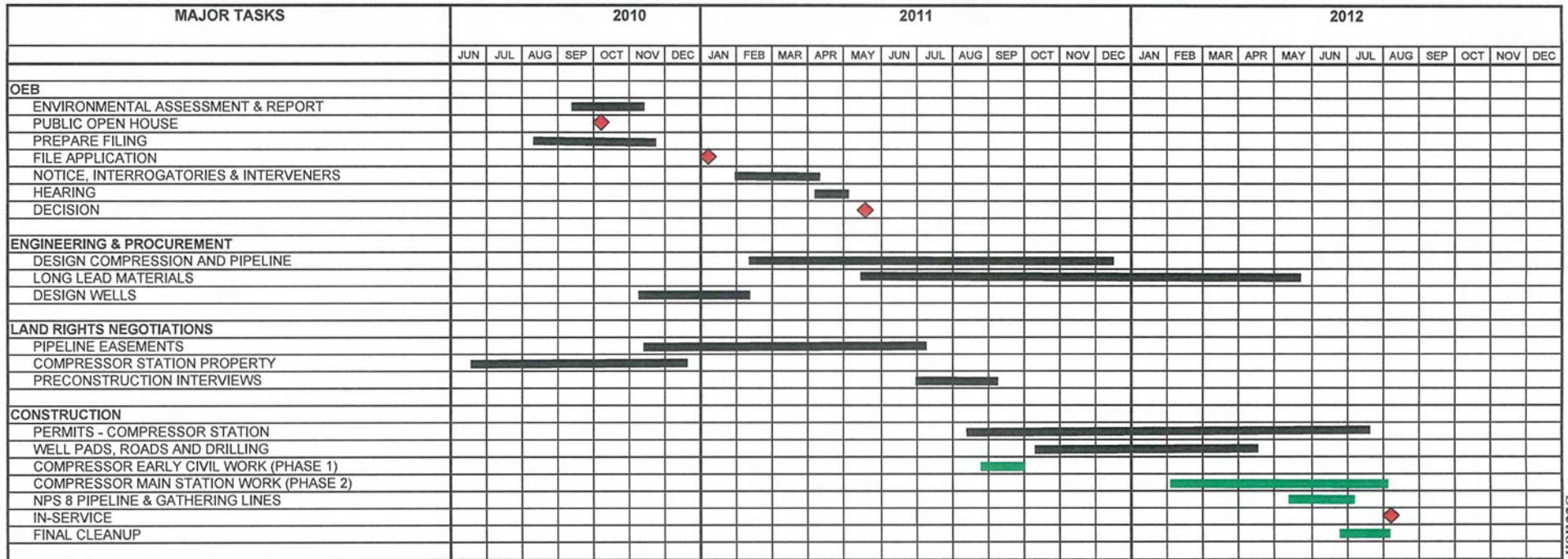
### **Restoration**

13. The final activity is the restoration. Topsoil is replaced, the work area is leveled, and sod is replaced in lawn areas and other grassed areas are re-seeded. Where required, concrete, asphalt and gravel are replaced. All work areas will be returned to as close to the original conditions as possible and to the satisfaction of the landowner or municipality.



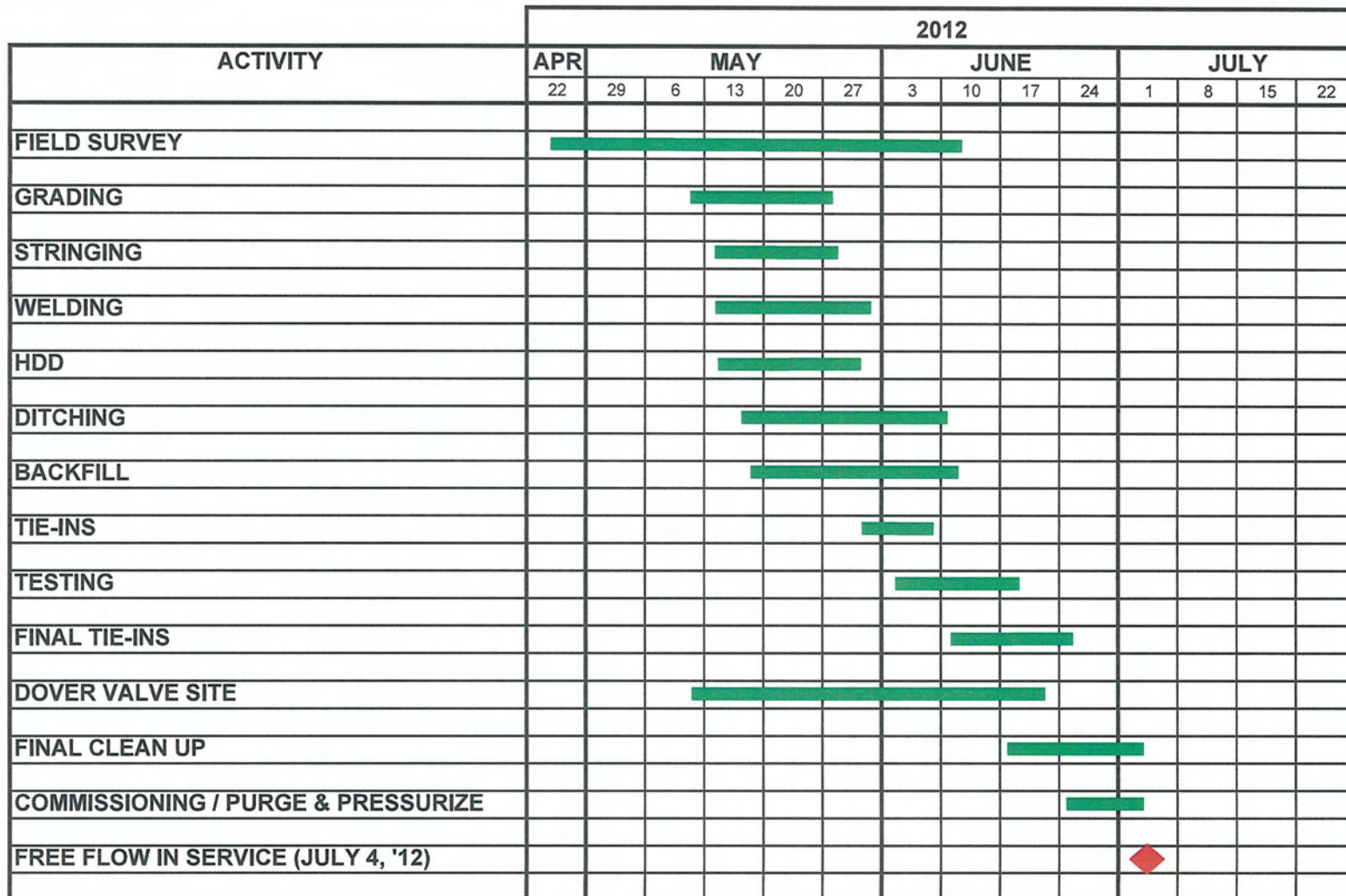


### Jacob Storage Pool Proposed Project Schedule



## Jacob Storage Pool Proposed Project Schedule

Transmission and Gathering Pipeline Construction Schedule (Includes Dover Valve Site)





## SECTION 5

### Proposed Storage Operation

1. Storage operations are planned to commence at the Jacob Pool as early as May 2011. Initially the pool will be delta-pressured to a pressure gradient of 10.55 kPa/m (0.467 psi/ft). The performance of the reservoir will be monitored on a regular basis during injection and withdrawal cycles. The proposed monitoring program is provided in Section 5 – Schedule 1. By placing the facilities in-service no later than July 1, 2011 and delta-pressuring the pool to 9,150 kPaa bottom hole, the necessary cushion gas can be injected and the entire working capacity of the reservoir can be utilized in 2011.
2. The Jacob Pool will be operated at a cushion pressure of 2,170 kPaa corresponding to an inventory of 17,200  $10^3\text{m}^3$ . The inventory of the Jacob Pool at a maximum operating pressure of 10,280 kPaa bottom hole (represents pressure gradient of 11.85 kPa/m or 0.524 psi/ft) will be approximately 86,600  $10^3\text{m}^3$ , resulting in a working inventory of approximately 69,400  $10^3\text{m}^3$ .
3. During injection and withdrawal, gas will be controlled, measured, compressed and filtered at the Jacob Pool compressor station located at the intersection of Maple Line and Jacob Road. The Jacob Pool will be connected to Union's integrated storage system by way of 4,700 metres of NPS 8 pipeline and a tie-in at Union Gas's Dover Transmission Station.
4. Union will own and operate the Jacob Pool facilities as defined under the *Oil, Gas and Salt Resources Act*. As operator, Union is accountable for the safe operation and maintenance of its facilities and will manage operations and maintenance of the Jacob Pool facilities. Union will utilize its Operations and Maintenance Procedures and Emergency Response Plans in operating and maintaining the pool.





**Proposed Reservoir Monitoring Program**  
**Jacob Pool**

The following are the key operational items in the monitoring program for the Jacob Pool's storage operation.

***Observation Wells***

- RR9 will be completed as an Observation well to monitor pressure in the Trenton formation.
- C23 will be completed as an Observation well to monitor pressure in both the Trenton and Black River formations.

***Active Production Wells***

- Producer will supply pressures for the following active production wells on a monthly basis.

| <b><u>Well</u></b> | <b><u>Formation</u></b> | <b><u>Status</u></b>      |
|--------------------|-------------------------|---------------------------|
| VR15               | Black River             | Gas Producer              |
| RR4                | Black River             | Oil Producer/Gas Producer |
| PPC10              | Trenton                 | Gas Producer              |
| PPCR41             | Trenton                 | Gas Producer              |
| PPCR29             | Trenton                 | Gas Producer              |

***Prior to Injection***

- Obtain and analyze gas samples
- Recalculate OGIP & RGIP estimates
- Collect and record pressures on Observation Wells and

***During Injection Season***

- Monitor and record pressure in observation wells (RR9 and C23) on an hourly basis from wellhead telemetry.
- Manually collect and record pressure in observation wells on a monthly basis.
- Meter and record all volumes injected into storage
- Prepare P/z vs measured volume and update and review on a monthly basis
- Identify and investigate deviations from the theoretical curve

***During Stabilization Period (Following Injections & Withdrawals)***

- Continue to monitor and record pressure in observation wells on a hourly basis
- Manually collect and record pressure in observation wells on a weekly basis.
- The pool will be shut in until pressure stabilization is reached or until the stabilized pool pressure can be reasonably extrapolated
- Maintain separate P/z vs measured inventory plot for stabilized pool pressures (final stabilization point)

***During Withdrawal Season***

The monitoring procedures during the withdrawal season would remain the same as the injection season with the following exceptions:

- Measure and record all produced fluids





## **SECTION 6**

### **Environmental Matters**

#### **Pipelines**

1. The Environmental Report (“ER”) for this project is found in Section 6-Schedule 1. The ER was prepared in December 2010 by Azimuth Environmental Consulting Inc. A copy of the ER has been sent to the OPCC, local municipalities, the St. Clair Region Conservation Authority, local First Nations and Métis. Directly affected landowners have received a copy of the Executive Summary and will be provided a copy of the ER upon request. A summary of comments received and Union’s response to concerns from government agencies and landowners will be filed as part of Section 6-Schedule 2.
2. A Public Information Centre was held on October 7, 2010. Landowners, agencies, First Nations and Métis were invited to attend the session by letter of invitation. A newspaper notice was also published in two local newspapers, the Wallaceburg Courier Press on Thursday September 23, 2010 and in the Chatham Daily News on Saturday, September 25, 2010,
3. Communications with First Nations and Métis to date has included:

All phone calls made by Manager Government and Aboriginal Affairs, Union Gas

- Walpole Island First Nation: Sept. 27, 2010: called and left a message for the Assistant Consultation Manager, Jared Macbeth. Called Jared Macbeth again Friday Oct. 15, 2010 to discuss the project. Resent copies electronically of the two information letters to Jared Macbeth who could not find the letters’;
- Kettle and Stoney Point First Nation: Sept. 27<sup>th</sup>, 2010: spoke to Lands Manager Anna Batten who will follow up with Chief, no response back to date;
- Caldwell First Nation: Sept. 27<sup>th</sup>, 2010 - left a phone message with the Band Manager Melody Watson. No response to date;

- Moravian of the Thames First Nation: Sept. 27<sup>th</sup>, 2010 - spoke to Lands Manager Ena Jacob who will follow-up with the Chief. No response to date;
- Aamjiwnaang First Nation: Sept. 27<sup>th</sup>, 2010 - left a phone message with the Land Manager Carolyn Nahmanbin. No response to date;
- Métis Nation of Ontario: Sept. 27<sup>th</sup>, 2010 - emailed and spoke to Consultation Manager Brian Tucker who will follow up with local Community councils. No response to date.

Union will continue to communicate with First Nations and the Métis Nation throughout the project.

4. Union has discussed the location of all gathering lines with the directly affected landowners and reached an agreement for the location of the pipelines.
5. A directly affected landowner is a landowner whose authority is required to use land for construction of the pipelines.
6. Mitigation measures were developed between the landowners and Union to protect site-specific features on a landowner's property where gathering lines are to be constructed.
7. There is one watercourse crossing associated with the Project which will be installed using Horizontal Directional Drill (HDD).
8. Union will comply with all the mitigation measures proposed in the ER.
9. All pipelines will be constructed in the manner recommended and described in the Board document "Environmental Guidelines for Locating, Constructing and Operating Hydrocarbon Pipelines in Ontario (2003)".

### **Well Drilling**

10. Well drilling issues are discussed in Section 9 of the ER.
11. Union will follow the mitigation measures proposed in the ER during well drilling operations.

**Compressor Station**

12. Union has discussed the location of the compressor station with the directly affected landowner and has reached an agreement for the location of this facility.
13. All aspects of the compressor station design will be in accordance with Ontario Regulation 210/01 for Oil and Gas Pipeline Systems the Ontario Electrical Safety Code, and the applicable Ontario Ministry of Environment's standards for air emissions and noise emissions. This facility will be incorporated into Union's existing Ministry of Environment Comprehensive Certificate of Approval.

**Summary**

14. Union will implement its standard water well monitoring program for this project which involves retaining a qualified hydrogeologist to develop and implement a program for monitoring all wells that could be affected by construction. The hydrogeologist will be on retainer throughout the project to address any concerns or complaints should they occur.
15. The most current construction specifications, at the time of construction, will be followed.
16. The total estimated environmental mitigation costs associated with the construction of the Proposed Facilities are identified in Section 6 - Schedule 3. These costs are identified as pre-construction related, construction-related and post-construction related. The estimated total environmental costs are \$ 208,000.00.
17. Union will apply for all permits that are required. Union will comply with the intent of all relevant local by-laws.
18. Union will implement a program for environmental inspection. This will ensure that the recommendations in the ER, any commitments made during the hearing or any conditions of approval, are implemented. An environmental inspector will monitor construction activities and ensure that all activities comply with all conditions of approval.

19. There will also be a post-construction review. A report will be completed within 15 months after construction that will report on the effectiveness of the mitigation measures implemented during construction. A log of any landowner complaints will be attached to the monitoring report.
20. The conclusions of the ER indicate that the environmental and socio-economic effects associated with construction of the Project are generally short-term in nature and minimal. There are no significant cumulative effects as a result of the construction of the project.







**Summary of Comments**

**TO BE FILED WHEN RECEIVED**





**TOTAL ESTIMATED ENVIRONMENTAL COSTS**

**JACOB STORAGE POOL PROJECT**

**Pre-Construction**

|                                          |    |               |
|------------------------------------------|----|---------------|
| Environmental Report                     | \$ | 35,000        |
| Archaeology                              |    | 15,000        |
| Soil Sampling                            |    | 2,500         |
| Hearing Costs (Environmental Consultant) |    | 5,000         |
| Surveys (fish, wildlife, plants)         |    | 7,500         |
| Permits                                  |    | <u>15,000</u> |

**Total Pre-Construction** \$ **80,000**

**Construction**

|                                   |    |               |
|-----------------------------------|----|---------------|
| Environmental Inspection/Planning | \$ | 10,000        |
| Stream Crossings                  |    | 3,000         |
| Site Restoration                  |    | 68,000        |
| Water Well Sampling               |    | <u>25,000</u> |

**Total Construction** \$ **106,000**

**Post Construction**

|                  |    |              |
|------------------|----|--------------|
| Site Restoration | \$ | 17,000       |
| Tree Replacement |    | <u>5,000</u> |

**Total Post Construction** \$ **22,000**

**Total Estimated Environmental Costs** \$ **208,000**



**SECTION 7**  
**LAND MATTERS**

**Storage Land Matters**

1. Union holds all of the Petroleum and Natural Gas ("P&NG") rights and Gas Storage rights in the Jacob Pool proposed designated storage area ("DSA"). The landowners with leases have received, and are continuing to receive, all payments required under these agreements.
2. After the Jacob Pool has been developed for gas storage, Union will administer and maintain the annual rental payments to all affected landowners.
3. Negotiations with landowners for a determination of the payment for P&NG and Gas Storage Agreement rentals, including an additional acreage rental, well and roadway payments, and the remaining residual gas are at varying stages of completion as noted in the adjoining pool summaries. If negotiations are not concluded prior to injection, an offer will be made in accordance with the terms of the Gas Storage Agreements prior to the date of injection.
4. The offer of purchase for residual gas will be extended to the landowners within the proposed DSA with a participating interest in residual gas as established in the Unit Operation Agreements or the Unit Operation Amending Agreement as applicable.
5. Union proposes to offer a compensation package to the landowners that are consistent with Union's existing Gas Storage Landowner Compensation Program. The combined P&NG and Gas Storage Lease rentals for inside acres will be \$115.68 per acre. The specific components of the offer are as follows:

|                           |                    |
|---------------------------|--------------------|
| P&NG Lease Rental:        | \$ 25.15 per acre  |
| Gas Storage Lease Rental: | \$ 90.53 per acre  |
| Combined Rental:          | \$ 115.68 per acre |

6. The offer for well and outside acreage rental payments are as follows:

|                           |    |                      |
|---------------------------|----|----------------------|
| Gas Storage Well Payment: | \$ | 1,313.37 per well    |
| P&NG Lease Rental:        | \$ | 25.15 per acre       |
| Gas Storage Lease Rental: | \$ | <u>9.58 per acre</u> |
| Combined Storage:         | \$ | 34.73 per acre       |

**Note:** These payments are currently adjusted annually by the Consumer Price Index for the preceding July 1 to June 30 period.

7. Outside acres result when the acreage held by a single deed or lease are severed by the DSA boundary resulting in some acres being inside the DSA and some acres being outside the DSA boundary.

**Jacob Pool**

8. The metes and bounds description of the proposed Jacob Pool DSA is described in Section 7-Schedule 1.
9. Section 7-Schedule 2 identifies the property owners and the holder of the P&NG agreements for each property within the proposed Jacob Pool DSA. Section 7-Schedule 3 identifies the property owners and the holder of the Gas Storage Agreements for each property within the proposed DSA. Section 7-Schedule 4 lists all of the landowners for each property within the proposed Jacob Pool DSA. The Property Agreement Summary, copies of the P&NG Lease Agreements and copies of the Gas Storage Leases as applicable for each property within the proposed DSA are filed as Tabs 1 to 22 inclusive.
10. Union holds all of the P&NG rights.
11. Union holds all of the Gas Storage Lease rights.
12. There are no recoverable reserves.
13. The Jacob Pool landowners with acreage inside the existing Unit Area currently receive annual P&NG rentals. After project approval, but before injection, Union proposes to negotiate and execute Amending Agreements - Schedule of Payments with all landowners to alter the payment structure of the existing agreements to match the compensation package



paid to landowners within Union's existing storage pools as referred to in paragraphs 5 and 6 of this section.

**NPS 8 Transmission Pipeline**

14. The proposed NPS 8 transmission pipeline connects the Jacob Pool to the Panhandle system.
15. Union requires approximately 1.474 hectares of permanent transmission easement for the proposed pipeline. Section 7-Schedule 5 lists the names and addresses of all affected landowners and the dimensions of the permanent transmission easements required. As of the date of filing, Options for 2 of the 3 permanent transmission easements have been obtained.
16. Union's Grant of Easement form is attached as Section 7-Schedule 6.
17. Union will require approximately 0.868 hectares of temporary land use for the proposed construction. The affected landowners and dimensions of temporary land use are also outlined in Section 7-Schedule 5. These agreements are for a period of two years. This period allows Union an opportunity to return following construction to perform further clean-up work as required.
18. At the conclusion of construction, Union will seek a Full and Final Release from each of the directly affected landowners. This Release covers any compensation for actual damages resulting from the pipeline construction.

**Well Drilling, Roads and Gathering Lines**

19. Union requires approximately 0.524 hectares of easements for the gathering pipeline and approximately 2.367 hectares of temporary land use for construction of the gathering pipeline. Section 7-Schedule 7 lists the names and addresses of all of the affected landowners and the dimensions required for roadways, well pads and gathering easements as well as the area required for temporary land use.

20. Drilling of wells, construction of roadways, and construction of gathering pipelines within the proposed DSA will be undertaken pursuant to existing Storage Lease Agreements with the landowners in conjunction with the signed Letters of Acknowledgement.
21. In the Jacob Pool, wells will be drilled on the four properties. The location of wells can be found in Section 4-Schedule 1.
22. Permanent all-weather roadways are required to accommodate vehicular traffic to the existing and proposed well locations and will be used on an ongoing basis during and following construction. These access roads will be used where possible for construction and maintenance of the gathering pipelines in order to minimize environmental disturbance. The location of the access roads is shown in Section 7-Schedule 8.
23. Letters of Acknowledgement stating that there is no objection to the commencement of drilling of the wells and construction of the permanent all-weather access roads in the locations proposed have been presented to each landowner. Signed Letters of Acknowledgment have been received and are included as Section 7-Schedule 9. Union expects to have signed Letters of Acknowledgement from all parties prior to construction.
24. Although Union has the authority it requires to install the gathering lines pursuant to the existing Storage Lease Agreements, Union will secure easements for the gathering lines in order to clearly define their location and register them on title. Union's Grant of Easement form is attached as Section 7-Schedule 6. Union will obtain these easements after construction.
25. Compensation for all crop damage and other surface impacts from the construction of wells, pipeline, and roadways will be paid to the landowner or tenant farmer where applicable. At the conclusion of construction, Union will seek a Full and Final Release from each of the directly affected landowners or tenant farmers.

**Landowner Contacts**

26. Union has implemented a comprehensive program to provide landowners, tenants, and other interested persons with information regarding the proposed development. Project information was distributed through correspondence and individual meetings.

**Construction Monitoring and Follow-Up**

27. During the construction phase, Union will arrange for a Landowner Relations Agent to be available to ensure that commitments made to the landowners are fulfilled and to address questions or concerns of the landowners. In addition, any complaint received by Union related to the construction will be recorded and monitored to ensure follow-up. This process assists in resolving complaints and fulfilling commitments.
28. After construction, negotiations with landowners continue where necessary to settle any damages that were not foreseen or compensated for prior to construction.





ALL AND SINGULAR that certain parcel or tract of land in the Geographical Township of Dover, now in the Municipality of Chatham-Kent and being composed of part of Lots 4 and 5, Concession 5 and part of Lots 4, 5, 6 and 7, Concession 4, part of the road allowance between Lots 5 and 6, Concession 4 and part of the road allowance between Concession 4 and 5 all in the Geographical Township of Dover, now in the Municipality of Chatham-Kent, which said parcel may be more particularly described as follows...

COMMENCING at the north-westerly corner of Lot 4, Concession 4. Thence south-easterly along the line between Lots 3 and 4, on a bearing of south 41 degrees 20 minutes and 10 seconds east, a distance of 345.50 metres to the line between the north and south half of the north half of Lot 4, Concession 4;

THENCE north-easterly along the line between the north and south half of the north half of Lot 4 Concession 4, on a bearing of north 48 degrees 56 minutes and 30 second east, a distance of 618.92 metres to the line between Lots 4 and 5, Concession 4;

THENCE south-easterly along the line between Lots 4 and 5, Concession 4 on a bearing of south 41 degrees 41 minutes 40 seconds east, a distance of 346.83 metres to the line between the north and south half of Lot 5, Concession 4;

THENCE north-easterly along the line between the north and south half of Lot 5, Concession 4, on a bearing of north 48 degrees 18 minutes and 0 seconds east, a distance of 313.35 metres to the line between the east and west half of Lot 5, Concession 4;

THENCE south-easterly along the line between the east and west half of Lot 5, Concession 4 on a bearing of south 41 degrees 26 minutes 20 seconds east, a distance of 345.22 metres to the line between the north and south half of the south half of Lot 5, Concession 4;

THENCE north-easterly along the line between the north and south half of the south half of Lot 5, Concession 4, continuing across the road allowance between Lots 5 and 6, Concession 4, and continuing on the line between the north and south half of the south half of Lot 6, Concession 4, on a bearing of north 48 degrees 5 minutes and 50 seconds east, a distance of 646.84 metres to the line between the east and west half of Lot 6, Concession 4;

THENCE south-easterly along the line between the east and west half of Lot 6, Concession 4, on a bearing of south 41 degrees 59 minutes 30 seconds east, a distance of 345.42 metres to a point in the northerly limit of the road allowance between Concessions 3 and 4 being Pain Court Line;

THENCE north-easterly along the northerly limit of the road allowance between Concessions 3 and 4 being Pain Court Line on a bearing of north 48 degrees 17 minutes 40 seconds east, a distance of 952.84 metres to the south easterly corner of Lot 7, Concession 4;

THENCE north-westerly along the line between Lots 7 and 8, Concession 4, on a bearing of north 41 degrees 31 minutes and 30 seconds west, a distance of 677.36 metres to the line between the north and south half of Lot 7, Concession 4;

THENCE south-westerly along the line between the north and south half of Lot 7, Concession 4, on a bearing of south 48 degrees 50 minutes 10 seconds west, a distance of 315.83 metres to the line between the east and west half of Lot 7, Concession 4;

THENCE north-westerly along the line between the east and west half of Lot 7, Concession 4, on a bearing of north 41 degrees 31 minutes 30 seconds west, a distance of 342.04 metres to the line between the north and south half of the north half of Lot 7, Concession 4;

THENCE south-westerly along the line between the north and south half of the north half of Lot 7, Concession 4 and continuing on along the line between the north and south half of the north half of Lot 6, Concession 4, on a bearing of south 48 degrees 50 minutes 10 seconds west, a distance of 641.42 metres to the line between the east and west half of Lot 6, Concession 4;

THENCE north-westerly along the line between the east and west half of Lot 6, Concession 4, on a bearing of north 41 degrees 29 minutes 10 seconds west, a distance of 342.04 metres to the southerly limit of the road allowance between Concessions 4 and 5, being Maple Line.

THENCE south-westerly along the southerly limit of the road allowance between Concessions 4 and 5, being Maple Line, on a bearing of south 48 degrees 53 minutes 40 seconds west, a distance of 340.25 metres to a point in the southerly limit of said road allowance in the northerly limit of Lot 5, Concession 4;

THENCE north-westerly crossing the road allowance between Concessions 4 and 5, being Maple Line and continuing along the widened limit of the road allowance between Lots 5 and 6, Concession 5, on a bearing of north 40 degrees 17 minutes and 20 seconds west, a distance of 369.05 metres to a point in that widened limit to the line between the north and south half of the south half of Lot 5, Concession 5;

THENCE south-westerly along the line between the north and south half of the south half of Lot 5, Concession 5, on a bearing of south 48 degrees 59 minutes 50 seconds west, a distance of 298.41 metres to a point in the east and west half of Lot 5, Concession 5;

THENCE north-westerly along the line between the east and west half of Lot 5, Concession 5, on a bearing of north 41 degrees 1 minute 40 seconds west, a distance of 344.56 metres to a point in the southerly limit of Given Line;

THENCE south-westerly along the southerly limit of Given Line, on a bearing of south 48 degrees 59 minutes 50 seconds west, a distance of 921.90 metres to the line between Lots 3 and 4, Concession 5;

THENCE south-westerly along the line between Lots 3 and 4, Concession 5, on a bearing of south 41 degrees 10 minutes 10 seconds east, a distance of 694.92 metres to the south-west corner of Lot 4, Concession 5;

THENCE southerly crossing the road allowance between Concessions 4 and 5, being Maple Line, on a bearing of south 7 degrees 54 minutes 0 seconds west, a distance of 30.64 metres to the point of commencement.





|                 |
|-----------------|
| Lands File No.: |
| Cheque No.:     |
| Project:        |
| Acct No.:       |

## PIPELINE EASEMENT

(the "Easement")

Between

(herein called the "Transferor")

and

**UNION GAS LIMITED**

(herein called the "Transferee")

This Easement is an easement in Gross

WHEREAS the Transferor is the owner in fee simple of those lands and premises more particularly described as:  
PIN:            Insert Legal            (hereinafter called the "Transferor's Lands").

The Transferor does hereby GRANT, CONVEY, TRANSFER AND CONFIRM unto the Transferee, its successors and assigns, to be used and enjoyed as appurtenant to all or any part of the lands of the Transferee's lands the right, liberty, privilege and easement on, over, in, under and/or through a strip of the Transferor's Lands more particularly described as being PIN:            Insert Legal            Being Part of the PIN (hereinafter referred to as the "Lands") to survey, lay, construct, maintain, inspect, patrol, alter, remove, replace, reconstruct, repair, move, keep, use and/or operate one Pipe line for the transmission of pipeline quality natural gas as defined in The Ontario Energy Board Act S.O. 1998 (hereinafter referred to as the "Pipeline") including therewith all such buried attachments, equipment and appliances for cathodic protection which the Transferee may deem necessary or convenient thereto, together with the right of ingress and egress at any and all times over and upon the Lands for its servants, agents, employees, those engaged in its business, contractors and subcontractors on foot and/or with vehicles, supplies, machinery and equipment for all purposes necessary or incidental to the exercise and enjoyment of the rights, liberty, privileges and easement hereby granted. The Parties hereto mutually covenant and agree each with the other as follows:

1. In consideration of the sum of            DOLLARS (\$) of lawful money of Canada (hereinafter called the "Consideration"), which sum is payment in full for the rights and interest hereby granted and for the rights and interest, if any, acquired by the Transferee by expropriation, including in either or both cases payment in full for all such matters as injurious affection to remaining lands and the effect, if any, of registration on title of this document and where applicable, of the expropriation documents, subject to Clause 12 hereof to be paid by the Transferee to the Transferor within 90 days from the date of these presents or prior to the exercise by the Transferee of any of its rights hereunder other than the right to survey (whichever may be the earlier date), the rights, privileges and easement hereby granted shall continue in perpetuity or until the Transferee, with the express written consent of the Transferor, shall execute and deliver a surrender thereof. Prior to such surrender Transferee shall remove all debris as may have resulted from the Transferee's use of the Lands from the Lands and in all respects restore the Lands to its previous productivity and fertility so far as is reasonably possible, save and except for items in respect of which compensation is due under Clause 2. hereof. Transferor and Transferee hereby agree that nothing herein shall oblige Transferee to remove the Pipeline from the Lands as part of Transferee's obligation to restore the Lands.

2. The Transferee shall make to the Transferor (or the person or persons entitled thereto) due compensation for any damages to the Lands resulting from the exercise of any of the rights herein granted, and if the compensation is not agreed upon by the Transferee and the Transferor, it shall be determined by arbitration in the manner prescribed by the Expropriations Act, R.S.O. 1990, Chapter E-26 or any Act passed in amendment thereof or substitution therefore. Any gates, fences and tile drains curbs, gutters, asphalt paving, lockstone, patio tiles interfered with by the Transferee shall be restored by the Transferee at its expense as closely as reasonably possible to the condition and function in which they existed immediately prior to such interference by the Transferee and in the case of tile drains, such restoration shall be performed in accordance with good drainage practice and applicable government regulations.

3. The Pipeline (including attachments, equipment and appliances for cathodic protection but excluding valves, take-offs and fencing installed under Clause 9 hereof) shall be laid to such a depth that upon completion of installation it will not obstruct the natural surface run-off from the Lands nor ordinary cultivation of the Lands nor



any tile drainage system existing in the Lands at the time of installation of the Pipeline nor any planned tile drainage system to be laid in the Lands in accordance with standard drainage practice, if the Transferee is given at least thirty (30) days notice of such planned system prior to the installation of the pipeline; provided that the Transferee may leave the Pipeline exposed in crossing a ditch, stream, gorge or similar object where approval has been obtained from the Ontario Energy Board or other Provincial Board or authority having jurisdiction in the premises. The Transferee agrees to make reasonable efforts to accommodate the planning and installation of future tile drainage systems following installation of the pipeline so as not to obstruct or interfere with such tile installation.

4. As soon as reasonably possible after the construction of the Pipeline, the Transferee shall level the Lands and unless otherwise agreed to by the Transferor, shall remove all debris as may have resulted from the Transferee's use of the Lands therefrom and in all respects restore the Lands to its previous productivity and fertility so far as is reasonably possible, save and except for items in respect of which compensation is due under Clause 2 hereof.

5. The Transferee shall indemnify the Transferor for any and all liabilities, damages, costs, claims, suits and actions which are directly attributable to the exercise of the rights hereby granted, except to the extent of those resulting from the gross negligence or wilful misconduct of the Transferor.

6. In the event that the Transferee fails to comply with any of the requirements set out in Clause 2, 3, or 4 hereof within a reasonable time of the receipt of notice in writing from the Transferor setting forth the failure complained of, the Transferee shall compensate the Transferor (or the person or persons entitled thereto) for any damage, if any, necessarily resulting from such failure and the reasonable costs if any, incurred in the recovery of those damages.

7. Except in case of emergency, the Transferee shall not enter upon any of the Transferor's Lands, other than the Lands, without the consent of the Transferor. In case of emergency the right of entry upon the Transferor's Lands for ingress and egress to and from the Lands is hereby granted. The determination of what circumstances constitute an emergency, for purposes of this paragraph is within the absolute discretion of the Transferee, but is a situation in which the Transferee has a need to access the pipeline in the public interest without notice to the Transferor, subject to the provisions of paragraph 2 herein. The Transferee will, within 72 hours of entry upon such lands, advise the Transferor of the said emergency circumstances and thereafter provide a written report to the Transferor with respect to the resolution of the emergency situation. The Transferee shall restore the lands of the Transferor at its expense as closely as reasonably practicable to the condition in which they existed immediately prior to such interference by the Transferee and in the case of tile drains, such restoration shall be performed in accordance with good drainage practice.

8. The Transferor shall have the right to fully use and enjoy the Lands except for planting trees over the lesser of the Lands or a six (6) metre strip centered over the Pipeline, and except as may be necessary for any of the purposes hereby granted to the Transferee, provided that without the prior written consent of the Transferee, the Transferor shall not excavate, drill, install, erect or permit to be excavated, drilled, installed or erected in, on, over or through the Lands any pit, well, foundation, pavement, building, mobile homes or other structure or installation. Notwithstanding the foregoing the Transferee upon request shall consent to the Transferor erecting or repairing fences, hedges, pavement, lockstone constructing or repairing tile drains and domestic sewer pipes, water pipes, and utility pipes and constructing or repairing lanes, roads, driveways, pathways, and walks across, on and in the Lands or any portion or portions thereof, provided that before commencing any of the work referred to in this sentence the Transferor shall (a) give the Transferee at least (30) clear days notice in writing describing the work desired so as to enable the Transferee to evaluate and comment on the work proposed and to have a representative inspect the site and/or be present at any time or times during the performance of the work, (b) shall follow the instructions of such representative as to the performance of such work without damage to the Pipeline, (c) shall exercise a high degree of care in carrying out any such work and, (d) shall perform any such work in such a manner as not to endanger or damage the Pipeline as may be required by the Transferee.

9. The rights, privileges and easement herein granted shall include the right to install, keep, use, operate, service, maintain, repair, remove and/or replace in, on and above the Lands any valves and/or take-offs subject to additional agreements and to fence in such valves and/or take-offs and to keep same fenced in, but for this right the Transferee shall pay to the Transferor (or the person or persons entitled thereto) such additional compensation as may be agreed upon and in default of agreement as may be settled by arbitration under the provisions of The Ontario Energy Board Act, S.O. 1998, or any Act passed in amendment thereof or substitution thereof. The Transferee shall keep down weeds on any lands removed from cultivation by reason of locating any valves and/or take-offs in the Lands.

10. Notwithstanding any rule of law or equity and even though the Pipeline and its appurtenances may become annexed or affixed to the realty, title thereto shall nevertheless remain in the Transferee.

11. Neither this Agreement nor anything herein contained nor anything done hereunder shall affect or prejudice the Transferee's rights to acquire the Lands or any other portion or portions of the Transferor's lands under the provisions of The Ontario Energy Board Act, S.O. 1998, or any other laws, which rights the Transferee may exercise at its discretion in the event of the Transferor being unable or unwilling for any reason to perform this Agreement or give to the Transferee a clear and unencumbered title to the easement herein granted.

12. The Transferor covenants that he has the right to convey this easement notwithstanding any act on his part, that he will execute such further assurances of this easement as may be requisite and which the Transferee may at its expense prepare and that the Transferee, performing and observing the covenants and conditions on its part

to be performed, shall have quiet possession and enjoyment of the rights, privileges and easement hereby granted. If it shall appear that at the date hereof the Transferor is not the sole owner of the Lands, this Indenture shall nevertheless bind the Transferor to the full extent of his interest therein and shall also extend to any after-acquired interest, but all moneys payable hereunder shall be paid to the Transferor only in the proportion that his interest in the Lands bears to the entire interest therein.

13. In the event that the Transferee fails to pay the consideration as hereinbefore provided, the Transferor shall have the right to declare this easement cancelled after the expiration of 15 days from personal service upon the Secretary, Assistant Secretary or Manager, Lands Department of the Transferee at its Executive Head Office in Chatham, Ontario, (or at such other point in Ontario as the Transferee may from time to time specify by notice in writing to the Transferor) of notice in writing of such default, unless during such 15 day period the Transferee shall pay the said consideration; upon failing to pay as aforesaid, the Transferee shall forthwith after the expiration of 15 days from the service of such notice execute and deliver to the Transferor at the expense of the Transferee, a valid and registerable release and discharge of this easement.

14. All payments under these presents may be made either in cash or by cheque of the Transferee and may be made to the Transferor (or person or persons entitled thereto) either personally or by mail. All notices and mail sent pursuant to these presents shall be addressed to the Transferor at \_\_\_\_\_ and to the Transferee at Union Gas Limited, P.O.Box 2001, 50 Keil Drive North, Chatham, Ontario N7M 5M1. Attention: Manager, Lands or to such other address in either case as the Transferor or the Transferee respectively may from time to time appoint in writing.

15. The rights, privileges and easement hereby granted are and shall be of the same force and effect as a covenant running with the land and this Indenture, including all the covenants and conditions herein contained, shall extend to, be binding upon and enure to the benefit of the heirs, executors, administrators, successors and assigns of the Parties hereto respectively; and, wherever the singular or masculine is used it shall, where necessary, be construed as if the plural, or feminine or neuter had been used, as the case may be.

16. The Transferor hereby acknowledges that this transfer will be registered electronically and the Transferor hereby authorizes the Transferee to complete the registration of this transfer.

DATED this \_\_\_\_\_ day of January 2010

\_\_\_\_\_  
**Name & Title:**

I have authority to bind the corporation

\_\_\_\_\_  
**Name & Title:**

I have authority to bind the corporation

Address:

**UNION GAS LIMITED**

\_\_\_\_\_  
**Name: Mervyn R. Weishar**  
**Senior Lands Agent**

I have authority to bind the Corporation

Additional Information: (if applicable)

Solicitor:

Telephone:

Municipality of Chatham-Kent

Province of Ontario

DECLARATION REQUIRED UNDER  
SECTION 50 OF THE PLANNING  
ACT, R.S.O. 1990, as amended

I, Mervyn R. Weishar, of the City of Municipality of Chatham-Kent , in the Province of Ontario.

DO SOLEMNLY DECLARE THAT

1. I am, Senior Lands Agent                      Lands Department of Union Gas Limited, the Transferee in the attached Grant of Easement and as such have knowledge of the matters herein deposed to.

2. The use of or right in the land described in the said Grant of Easement is being acquired by Union Gas Limited for the purpose of a hydrocarbon transmission line within the meaning of part VI of the Ontario Energy Board Act , 1998.

AND I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath, and by virtue of The Canada Evidence Act.

DECLARED before me at the  
Municipality of Chatham-Kent,  
in the Province of Ontario

this                      day of January ,2010

A Commissioner, etc.