



Provident Energy Ltd.

Application for a Change in Pool Designation

February 15, 2005

ALBERTA ENERGY AND UTILITIES BOARD

Decision 2005-009: Provident Energy Ltd.—Application for a Change in Pool Designation

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CONTENTS

1	Recommendation	3
2	Introduction.....	3
2.1	Application	3
2.2	Interventions	3
2.3	Hearing	3
3	Background.....	4
3.1	Appropriate Dispute Resolution	4
3.2	<i>Decision D 95-10</i>	4
3.3	Stratigraphic Terminology.....	5
4	Issues	5
5	Criteria for Distinguishing Jurassic from Mannville Strata.....	5
5.1	Views of the Applicant.....	5
5.2	Views of the Interveners.....	7
5.2.1	Views of Progress.....	7
5.2.2	Views of ARR	8
5.3	Views of the Examiners.....	8
6	Geological Age of the Disputed Zone in the 00/03-34-040-01W5/0 Well.....	9
6.1	Views of the Applicant.....	9
6.2	Views of the Interveners.....	10
6.2.1	Views of Progress.....	10
6.2.2	Views of ARR	11
6.3	Views of the Examiners.....	11
7	Other Matters	13
7.1	Coring.....	13
7.2	Appropriate Dispute Resolution	14
7.3	Balance of Evidence	14
	Appendix Hearing Participants.....	15
	Figure Area around the Gilby Basal Mannville A3A pool.....	16

ALBERTA ENERGY AND UTILITIES BOARD

Calgary Alberta

PROVIDENT ENERGY LTD.

APPLICATION FOR A CHANGE IN POOL DESIGNATION

GILBY FIELD

Decision 2005-009

Application No. 1322457

DECISION

The Alberta Energy and Utilities Board has considered the findings and recommendations set out in the following examiner report, adopts the recommendation, and directs that Application No. 1322457 be approved.

DATED at Calgary, Alberta, on February 14, 2005.

ALBERTA ENERGY AND UTILITIES BOARD

[Original signed by]

Neil McCrank, Q.C., P.Eng.
Chairman

**EXAMINER REPORT RESPECTING
PROVIDENT ENERGY LTD.
APPLICATION FOR A CHANGE IN POOL DESIGNATION
GILBY FIELD**

**Decision 2005-009
Application No. 1322457**

1 RECOMMENDATION

Having carefully considered all of the evidence, the examiner panel recommends that the Alberta Energy and Utilities Board (EUB/Board) approve Application No. 1322457.

2 INTRODUCTION

2.1 Application

Provident Energy Ltd. (Provident) applied, pursuant to Section 33 of the *Oil and Gas Conservation Act*, for a change in pool designation from Gilby Basal Mannville A3A to Jurassic (Application No. 1322457).

The attached figure shows the wells in the Gilby Basal Mannville A3A pool (A3A pool) and the location of other wells cited.

2.2 Interventions

Interventions were filed by Progress Energy Ltd. (Progress) and ARR Resources Ltd. (ARR). Progress earned Mannville rights as a farm-in on the drilling of the well in Legal Subdivision 11, Section 27, Township 40, Range 1, West of the 5th Meridian (LSD 00/11-27-040-01W5/0) (11-27 well). Reclassification of the A3A pool to Jurassic would substantially reduce the working interest for Progress in the 11-27 well. ARR holds a gross overriding royalty (GORR) on the Mannville in Section 34-040-01W5M (Section 34). The reclassification of the 00/3-34-040-01W5/0 (3-34) well would adversely affect ARR's rights because ARR's GORR in Section 34 would not apply to production from a Jurassic pool. The 11-27 and 3-34 wells are the only wells in the A3A pool.

ConocoPhillips Canada (ConocoPhillips) also filed a written intervention, but subsequently withdrew it prior to the hearing.

2.3 Hearing

The application was heard at a public hearing on November 29 and December 2 and 3, 2004, in Calgary, Alberta, before Board-appointed examiners C. D. Hill (Chair), R. J. Willard, P.Eng., and W. Elsner, P.Geol. Those who appeared at the hearing are listed in the appendix.

3 BACKGROUND

3.1 Appropriate Dispute Resolution

In conjunction with proceeding to a hearing date, the EUB encouraged the applicant to engage in Appropriate Dispute Resolution (ADR). Provident and ConocoPhillips met several times between September and November 2004 and came to an agreement prior to the start of the hearing, resulting in the withdrawal of ConocoPhillips's objection to Application No. 1322457. ADR was not conducted between the applicant and Progress and ARR. The hearing focused on the items outstanding between Progress, ARR, and the applicant.

3.2 *Decision D 95-10*¹

Although the examiners in these proceedings have been asked to make a decision on an application for a change in pool designation, it is the geological interpretation of the strata that determines the pool designation.

The parties made reference to the most recent EUB decision concerning designations of zones: *Decision D 95-10*, also known as the Hillcrest/Truax decision. This hearing was with regard to an application to determine the base of the Mannville within wells in Township 40, Range 5, West of the 5th Meridian. Although this area is four townships to the west of the area of these proceedings, the complexity of geology between Mannville and Jurassic strata is similar to the area in question. In *Decision D 95-10*, the Board stated: "The Board believes that in most cases the individual criteria were not shown to be diagnostic in distinguishing the Ellerslie from the Rock Creek. However, in determining the base of the Mannville, the Board is satisfied it must balance the evidence presented."² The criteria discussed in *Decision D 95-10* included mineralogy, presence of coal, sulphide mineralization, palynology, geophysical log signature, and trace fossils.

As part of that proceeding, EUB staff were asked to present a submission to ensure clarity regarding the use of deeper rights reversion zone designations (DRRZD) and EUB geologic data. This information is equally relevant to the current decision. The staff submission in the Hillcrest/Truax hearing noted that historically the name of the zone identified takes precedence over the depths identified when using a DRRZD on Crown leases. It is the operator's responsibility to exercise best judgement in areas of complex geology and to employ caution when drilling or operating wells in these areas. If a dispute does arise, the EUB has the legislative authority to make a decision to resolve the dispute. The current legislative authority for resolving disputes is found in Section 33(2) of the *Oil and Gas Conservation Act*.

The EUB geological staff assess pool delineation and assign pool names based on the information available at the time of assessment. Staff routinely revise pool names as additional and better information becomes available. It is this iterative process of data review that determines pool designations.

¹ *Decision D 95-10: Hillcrest Resources Limited —Application to Determine the Base of Mannville in Township 40, Range 5, West of the 5th Meridian*, issued August 30, 1995.

² *Decision D 95-10*, page 7.

3.3 Stratigraphic Terminology

For clarity, an attempt was made in this report to minimize usage of different geological stratigraphic names and where possible refer to the Mannville and Jurassic rather than their equivalents. However, equivalents may be used if specifically referred to in the participants' evidence or if reference to subdivisions finer than Mannville and Jurassic are required.

The Ellerslie Formation is a basal unit within the Cretaceous Mannville group. In some instances a Detrital zone may be identified at the base of the Mannville and is typically assigned to the Cretaceous. The Rock Creek Member is a sandstone within the Jurassic. The J3 sandstone is an informal unit of indeterminate age that may be associated with the pre-Cretaceous unconformity.

4 ISSUES

The examiner panel considers the issues respecting the application to be

- criteria for distinguishing Jurassic from Mannville strata,
- the geological age of the disputed zone in the 00/03-34-040-01W5/0 well, and
- other matters.

For the purposes of this report, the disputed zone in the 3-34 well refers to the interval 1934.5 metres measured from the kelly bushing (mKB) to 1948.0 mKB.

5 CRITERIA FOR DISTINGUISHING JURASSIC FROM MANNVILLE STRATA

5.1 Views of the Applicant

Provident stated that the Jurassic/Cretaceous boundary in the area around the A3A pool can be difficult to delineate because it separates similar lithologies of different ages. It identified a number of criteria that can be used in distinguishing the Jurassic and Mannville strata. It noted, however, that no single sedimentologic or petrologic criterion can by itself reliably differentiate Jurassic from Cretaceous strata. In this regard, it presented and discussed the following criteria:

Palynology: Provident submitted that palynological analysis is a method that can definitively locate the Jurassic/Cretaceous boundary and that the presence of adequate palynological material would provide conclusive evidence regarding the age determination of the strata.

In situ phosphate: Provident stated that in situ phosphate characterizes Jurassic but not Mannville or younger strata.

It stated that in thin section, phosphate occurs as medium- to dark-brown, high-relief grains that are isotropic under cross-polarized light. It submitted that in situ phosphate occurs as coated grains, oolites, soft mudclasts, pseudomatrix, peloids, and phosphate cement. Provident stated that typically phosphate is deposited in a colloidal or gel-like state as pellets or oolites. It said the pellets are believed to form authigenically at or below the water-sediment interface and that phosphate can also form from diagenetic replacement of other material. Provident submitted that phosphate-rich interstitial water is capable of phosphatizing clay, ooze, and other materials just below the sediment surface. It said that generally ovoid or rounded phosphate particles are naturally formed and are not a result of secondary abrasion in a high-energy environment.

Provident contended that the delicate texture of concentric in situ phosphate layers would not survive extensive reworking from older strata. Soft mudclasts and peloids show delicate grain shape and grain contacts well bounded with surrounding quartz grains, which would also not survive reworking. Provident believed that the only criteria that are important for determination whether phosphate is in situ or transported are the type and the form of phosphate that is present, not its abundance.

Provident stated that calcium aluminum (Ca-Al) phosphate is a normal composition for in situ phosphate in this area (Medicine River/Gilby Fields), and that the presence of Ca-Al phosphate in small but X-ray diffraction (XRD) detectable quantities in shales and shaly sandstones can be an indicator of Jurassic age. It stated that to identify phosphate in core using XRD analysis, samples must be collected from horizons that have clay laminations. Further, Provident stated that scanning electron microscopy (SEM) analysis of suspected phosphate grains can be used to confirm the presence of phosphorous.

Coal: Provident considered coal to be the most distinctive attribute of Ellerslie sandstones and mudstones. Carbonaceous material can be distributed in the form of carbonaceous roots, thin in situ coals, and plant fragments/coal clasts. It indicated that coaly, carbonaceous detritus/laminae and carbonaceous root structures are rare in Jurassic sandstones.

Clay minerals: Provident contended that in the area where the subject well is located, the presence or absence and abundance of illite and kaolinite vary within the Ellerslie and Jurassic Formations. Provident contended that the Ellerslie Formation is dominated by illite and kaolinite, while the J3 unit and its derivatives are dominated by kaolinite. This widespread formation of kaolinite can be used as an identifiable horizon or stratigraphic marker.

Open-hole geophysical logs (logs): Provident indicated that determination of stratigraphy using log correlation alone is a very crude first-order technique. It submitted that in contentious areas, lithostratigraphy or biostratigraphy have to be relied upon for stratigraphic age determination.

Other lithostratigraphic features: Provident contended that in stratigraphically complicated areas where log correlations and biostratigraphic correlations are not reliable, lithostratigraphic correlations can be used. It stated that lithostratigraphic correlations are based on lithic criteria, such as colour, lithology, component grains, mineralogical composition, chemical composition, and the presence or absence of distinctive accessory minerals. Provident indicated that the age of contentious strata can be inferred from lithostratigraphic correlation to reference studies and type wells.³ It added that lithostratigraphic pattern recognition requires that a large number of cores be examined to adequately compare and contrast various physical criteria.

³ In support of its submission, Provident referred to several published documents:
Glass, D. J., editor, 1990, *Lexicon of Canadian Stratigraphy*, Volume 4: *Western Canada, including eastern British Columbia, Alberta, Saskatchewan and southern Manitoba*.
Kramers, J. W., and Dolby, G., 1993, *Jurassic/Cretaceous Boundary Study, Central Alberta, TWP 33-55, Rg 1-15W5*, Alberta Research Council Open File Report ARC 1993-26.
Strobl, R. S., Kramers, J. W., and Dolby, G., 1993, *Jurassic Boundary Study, Medicine River/Sylvan Lake, TWP 37-40, Rg 3-5W5*, Alberta Research Council Open File Report ARC 1993-23.
The North American Commission on Stratigraphic Nomenclature, 1983, "North American Stratigraphic Code," *American Association of Petroleum Geologists Bulletin*, Vol. 67, No. 5.

Provident submitted that sedimentary structures and trace fossils can be used to indicate different depositional environments. However, these depositional environments are not necessarily diagnostic for age determination. It did not submit any specific examples of sedimentary structures or trace fossils that are diagnostic of Jurassic or Mannville strata in the subject area.

5.2 Views of the Interveners

5.2.1 Views of Progress

Progress did not present any definitive criteria to distinguish Mannville from Jurassic strata in this area. It commented, however, on various criteria presented by Provident and argued why those criteria cannot be used with any degree of certainty in establishing the age of the strata. Further, it indicated that the fulfillment of any single criterion may not be sufficient for age determination. With respect to the criteria posed by Provident, Progress provided its views as follows:

Palynology: In its submission, Progress indicated that palynological evidence, if available, can be conclusive for age determination.

In situ phosphate: Progress did not agree that the presence of phosphate would indicate deposition only within Jurassic strata. It suggested that in situ phosphate might form within a fluvial-dominated valley fill setting. However, it acknowledged that this would be a very rare situation. Progress submitted that such settings occurred during both Jurassic and Cretaceous time. Therefore, it maintained that the presence of in situ phosphates would provide no age discrimination between the two.

In support of its view that Cretaceous strata do contain phosphates in other areas, it submitted a photomicrograph of a sample from the upper Mannville-aged Bluesky Formation from northeastern British Columbia.

Progress contended that compaction and squeezing of softer phosphate grains after reworking might result in the generation of pseudomatrix and therefore that the phosphate identified was not necessarily the result of in situ formation. Further, Progress submitted that if the geochemical setting is appropriate for phosphate formation, it is normal to get an abundance of it in a marine deposit, suggesting that the abundance of phosphate is an important consideration.

Coal: Progress acknowledged that the presence of coal and carbonaceous debris are criteria that can be indicative of Cretaceous age.

Clay minerals: Progress observed that the illite-kaolinite signatures of some of the Eilerslie samples that were part of Provident's evidence are very similar to Jurassic samples. It contended that clay mineralogy evidence is not sufficiently strong to support any distinct age determination.

Open-hole geophysical logs: Progress commented that correlation using logs alone can result in many different interpretations. Nevertheless, Progress stated that certain log characteristics are very distinctive for the Detrital zone. It stated that its log correlations were tied to core.

Other lithostratigraphic features: Progress stated that the formal type wells describing the Eilerslie and Mannville serve as a reference to define these units. However, it said that the type

wells are old and do not adequately describe the variability seen in those formations and more recent regional work within the area of interest would be preferred. However, it did not provide any additional references in this regard.

Progress indicated that fluvial deposition can be interpreted from such features as root traces and high-angle cross-bedding. It stated that fluvial environments are more characteristic of the Cretaceous, but may also be present in the Jurassic. Therefore, it indicated that depositional environments are not reliable age indicators in this area.

5.2.2 Views of ARR

ARR did not comment directly on many of the criteria presented by Provident. It did, however, comment on the significance of coal and suggested that its absence would signify an environment that is probably aerated and in which it is difficult for peat and organic matter to accumulate as a deposit. As such, ARR noted that coal would not be found in a nearshore environment, a very subarid exposed environment, or a pedogenic environment, all of which are typical of the Jurassic period. ARR noted, however, that Jurassic and Cretaceous strata cannot be differentiated on the basis of coal alone, as there is coal present in the Jurassic Kootenay Formation to the south.

ARR submitted that in several other areas there is a Jurassic/Cretaceous unconformity that is a very pronounced weathered/erosive interval with the common presence of green clayey shales as matrix and thin beds. ARR also submitted that there is not one criterion that is diagnostic in sedimentary interpretation and that a number of criteria together should be used for a proper interpretation of the age of the strata.

ARR's primary evidence was based on the use of log correlations and flooding surfaces. It contended that log correlation was a valuable tool for differentiating between stratigraphic sequences. ARR used log correlations and interpreted flooding surfaces from wells that had established criteria for distinguishing Jurassic from Mannville strata.

5.3 Views of the Examiners

The examiners note that all hearing participants recognized the inherent difficulty in distinguishing Mannville from Jurassic strata within this area. From the evidence presented at the hearing, the examiners believe that various criteria can be used but some are more definitive. The examiners' views on the criteria presented are discussed below.

Palynology: The examiners accept Provident's and Progress's views that palynological information provides the most convincing evidence to differentiate Mannville from Jurassic strata. However, the examiners recognize that this type of evidence is commonly not present and may not include diagnostic specimens and that specimens may be unrecognizable within a disputed zone.

In situ phosphate: In *Decision D 95-10*, the Board accepted the presence of in situ phosphate as indicative of Middle Jurassic or older sediment. In its evidence, Provident supported this interpretation. Progress, however, argued that the decision referred to the Jurassic Rock Creek and that it therefore was not applicable in this case. Progress also made reference to the presence of phosphates in the Cretaceous Bluesky Formation and showed a slide in support of this but did not present any studies or further documentation. The examiners note that there was no evidence

presented that would suggest that in situ phosphates may be present in the Lower Mannville equivalent strata. The examiners further note that during cross-examination Progress indicated it was not aware of any literature that describes the presence of phosphates in the Ellerslie. This was consistent with comments made by Provident's expert witness that he was not aware of in situ phosphates in the Lower Mannville. Based on the evidence presented at the hearing, the examiners believe that there is nothing substantive to suggest that the conclusion respecting in situ phosphates reached in *Decision D 95-10* needs to be revised. The examiners therefore conclude that the presence of in situ phosphates is indicative of Middle Jurassic or older strata, not necessarily restricted to the Rock Creek.

Coal: The examiners conclude that within this area, the presence of coal is a reliable indicator of deposition within the Mannville. However, the absence of coal does not preclude the strata from being Mannville.

Clay minerals: The examiners acknowledge that the dominance of kaolinite, with a corresponding reduction of illite, within a specific interval may be a useful indicator of the pre-Cretaceous unconformity. However, the examiners believe that while this supports the existence of an unconformity, it does not necessarily imply that the strata below this interval are Jurassic.

Open-hole geophysical logs: The examiners believe geophysical log interpretation and correlations based on these logs can be a useful tool for geological interpretation. However, in this area, the complex nature of the erosional surface and the similar nature of the lithologies on either side of the unconformity make log correlation difficult. Accordingly, the examiners believe that geophysical logs are not definitive, on their own, in differentiating Mannville and Jurassic strata in complex areas.

Other lithostratigraphic features: The examiners agree that lithostratigraphic features can be useful to assist with differentiating stratigraphic sequences and depositional environments. However, individually many features are not unique to one depositional or stratigraphic setting. To be useful, clear descriptions and examples must illustrate diagnostic features that alone or collectively would suggest deposition in either Mannville or Jurassic.

The examiners believe that the usefulness of lithostratigraphic criteria requires that local and regional studies be cited to provide the proper context.

6 GEOLOGICAL AGE OF THE DISPUTED ZONE IN THE 00/03-34-040-01W5/0 WELL

6.1 Views of the Applicant

Provident contended that the disputed zone in the subject 3-34 well is of Jurassic age. It therefore concluded that the Gilby Basal Mannville A3A pool should be redesignated as Jurassic.

Provident provided evidence for the presence of in situ phosphate in support of its age determination of the disputed zone. It indicated that phosphate occurs in the 3-34 well as coated grains, nucleated pellets, encased pellets, oolites, soft mudclasts, moulded, ovoid, and rounded peloids, pseudomatrix, and cement.

Provident contended that the delicate texture of concentrically layered grains and the shape of soft mudclasts and peloids, as well as the grain contacts well bounded with surrounding quartz grains, would not survive extensive reworking from older strata. It identified nucleated pellets in which the quartz nuclei are very similar to the quartz grains in the surrounding matrix. For this reason Provident indicated that these pellets are not of detrital origin.

Provident confirmed the presence of suspected phosphate grains using SEM, which identified aluminum, phosphorous, and calcium. Provident also stated that XRD analysis of material from thin clay laminations within the subject zone demonstrated the presence of small quantities of Ca-Al phosphate.

Provident submitted that the distribution of clay minerals supported its interpretation. Provident discussed XRD charts from wells in the surrounding area, including 08-28-039-03W5M (8-28), 14-15-039-03W5M (14-15), and 12-22-039-03W5M (12-22), that showed variations in the illite and kaolinite content. It suggested that these variations could be used to identify the pre-Cretaceous unconformity at the top of the disputed zone in the 3-34 well.

Provident identified the Jurassic/Cretaceous boundary in 3-34 at 1934.8 mKB, based on its work on the subject core. It contended that on the basis of lithostratigraphic correlation, the section above this boundary is very similar to the Ellerslie and Mannville type wells. It interpreted the rock below the same boundary to be completely different in all its physical attributes and very similar to the Medicine River-Gilby reference wells that are described as Jurassic reservoirs in the Jurassic boundary study in western Alberta.

6.2 Views of the Interveners

6.2.1 Views of Progress

Progress contended that there was insufficient evidence to support a change in pool designation from Gilby Basal Mannville A3A to Jurassic.

Progress stated that in a regional context the strata in the 3-34 well were deposited as fluvial sands within a southwest-northeast valley system that is incised into Mississippian rocks. Progress recognized the validity and possibility of drawing the conclusions and making the correlations that Provident had done. However, it suggested that it is equally or even more probable to use the same information to interpret the valley system as containing Cretaceous strata in the 3-34 well. It considered that the balance of the regional evidence further suggests a Lower Cretaceous or Mannville age assignment.

Progress contended that the morphologies and textures of the phosphate grains in the disputed interval in the 3-34 well are inconclusive with respect to indicating in situ origin. Further, it indicated that the compaction and squeezing of softer reworked grains could result in the generation of pseudomatrix. Progress did not see any convincing evidence for in situ formation of the phosphate. It noted that there is only trace amount of phosphate in the 3-34 well and stated that if the geochemical setting is appropriate for phosphate formation, then phosphate should occur in larger quantities than appears to be the case in the 3-34 well. Progress contended that if there is actually in situ phosphate in the disputed interval, it would represent reworked phosphatic material within a fluvially dominated valley-fill setting, perhaps with estuarine

influences. It concluded that the phosphates in the 3-34 well were reworked from older sedimentary material redeposited in a fluvial environment.

It commented that the pre-Cretaceous unconformity logged by Provident at 1934.8 mKB in the 3-34 core exhibits no features, such as mineralization, mud chip lag, or pebble lag, that are indicative of the unconformity. Progress interpreted some interfingering of lithologies at the same depth. It further stated that interfingering, which it observed on a very fine scale, is not indicative of a major erosional surface, but rather a flooding surface.

Progress submitted that the only surface in the core of the 3-34 well that might be interpreted as exhibiting clear characteristics of an unconformity is the scour surface with a pebble lag at 1943.1 mKB. It stated that Provident logged this scour surface in exactly the same place as Progress. It further stated that this feature is not unique to any single environment but is strongly indicative of a fluvial environment. It stated that a fluvial setting is a more characteristic feature of the Cretaceous, but by no means excludes a Jurassic interpretation.

Progress noted the association of abundant kaolinite with the pre-Cretaceous unconformity, but suggested that it could represent reworking of J3 type sediments into the Ellerslie. Therefore it does not provide an age determination for the disputed interval in the 3-34 well.

Progress concluded that the reservoir sands in the disputed zone in the 3-34 well were deposited in a fluvial environment and are probably Cretaceous in age. Therefore it maintained that there was no justification for changing the designation of the pool.

6.2.2 Views of ARR

ARR interpreted the disputed zone as being Jurassic. It based its interpretation on the examination of the 3-34 core, which it interpreted as displaying nearshore marine affinities modified by subaerial/phreatic processes, such as dewatering and leaching.

Using a correlation of well logs from nearby wells, ARR extrapolated an interpreted flooding surface through the 3-34 well to the 11-27 well. On this basis, it considered the producing intervals within the 11-27 well to consist of both Mannville and Jurassic strata. It stated that since both strata contribute gas production to the designated pool, the appropriate pool designation should be split-rights Mannville/Jurassic.

ARR requested that if the Board decided to change the designation of the pool to Jurassic, the Board clarify whether ARR should receive its overriding royalties for the period of time the pool was designated as Mannville.

6.3 Views of the Examiners

In coming to a decision on a pool designation dispute, the examiners believe that all evidence presented must be weighed and the decision should be based on the balance of that evidence, even though there may ultimately be some remaining questions.

With respect to the 3-34 well, the examiners note that all parties at the hearing agreed that the strata immediately above the disputed zone is Ellerslie, based on palynology and the presence of coal. The examiners therefore reviewed the evidence presented by the participants to determine

the most plausible interpretation of the age of the disputed interval. Discussion of the criteria presented in Section 5 and their applicability to the interpretation of the disputed zone in the 3-34 well follows.

- There was a lack of palynological evidence, which could have provided an important diagnostic tool.
- Coal as a criterion only provides value in determining the age of the zone if it is present. Since it was absent in the disputed interval, no conclusions could be drawn.
- The examiners acknowledge the low illite signatures with corresponding high kaolinite signatures on the XRD charts of the J3 unit in the 8-28, 14-15, and 12-22 wells. Provident interpreted that a kaolinite marker derived from the J3 could be correlated to the 3-34 well. This would suggest to the examiners that a similar illite/kaolinite response should be observed in the 3-34 well. However, although there was a decrease in the illite signature, there was also an apparent decrease in the kaolinite signature in samples in the upper part of the disputed zone. The examiners believe that firm conclusions cannot be drawn from this and therefore did not rely heavily on this evidence.
- Provident indicated that the disputed interval in the 3-34 well exhibited physical lithological characteristics very similar to Jurassic core from wells in the Medicine River/Gilby area and dissimilar to the Eilerslie type well described in the Lexicon.⁴ However, Provident did not provide specific examples of core from the Medicine River/Gilby area to illustrate these differences. Although the parties presented considerable lithostratigraphic evidence, the examiners found that much of this was general in nature and did not provide specific detail that would allow definitive conclusions on the age of the disputed zone. Therefore, the examiners conclude that much of the lithostratigraphic evidence provided is of limited value in distinguishing Mannville from Jurassic in the 3-34 well.
- As stated earlier, the examiners accept that the presence of in situ phosphates is indicative of Middle Jurassic or older strata. The examiners note that there is no disagreement that phosphates are present within the disputed interval of the 3-34 well. Rather, the discord relates to whether they are in situ or detrital and the nature of the depositional environment in which they occur. The examiners accept Provident's view that the type or morphology of the phosphate is instructive as to the origin of the phosphatic material. Specifically, the examiners were influenced by the images from the petrographic study on the 3-34 well that showed examples of a quartz grain, similar to surrounding quartz grains, coated with phosphate, soft phosphate mudclasts, and phosphate pseudo-matrix. This morphology is suggestive of formation around and between existing grains rather than spherical grains having been abraded during transportation. The examiners accept Provident's view that grains of this type would be fragile and unlikely to survive transportation. The examiners also note the similarity of phosphate identified in these slides with examples provided from the Hillcrest/Truax hearing. The examiners are not satisfied that Progress's argument that sediment compaction of detrital materials is as plausible an explanation of the form and textures of the phosphate grains observed. Further, Progress did not provide any evidence of detrital phosphates within the Lower Mannville within this area.

⁴ Glass, D. J., editor, 1990, *Lexicon of Canadian Stratigraphy*, Volume 4: *Western Canada, including eastern British Columbia, Alberta, Saskatchewan and southern Manitoba*.

The examiners believe that even trace amounts of phosphate can provide useful information. Therefore, phosphate abundance is not necessarily a criterion that would assist in determining its origin.

On the basis of the evidence provided, the examiners accept that the phosphates identified in the 3-34 are of in situ origin.

Based on the information presented at the hearing, the examiners consider the phosphate evidence to be the most compelling and therefore gave it the most weight in coming to a conclusion on the age of the disputed zone. The remaining evidence presented for the age of the disputed zone did not materially assist the examiners in making a decision. Further, the examiners do not believe any evidence was presented that clearly supported a Mannville interpretation for the disputed zone in the 3-34 well.

Based on the balance of evidence presented at the hearing, the examiners conclude the disputed zone in the 3-34 well is Jurassic and therefore will recommend that the pool designation be changed from Gilby Basal Mannville A3A to Jurassic.

The examiners reiterate that while the purpose of the hearing was on the pool redesignation from Gilby Basal Mannville A3A to Jurassic, the focus of the evidence was on the disputed interval within the 3-34 well. As stated above, the examiners conclude that this interval is Jurassic. No conclusive evidence was presented to determine whether the producing interval in the 11-27 well is Jurassic or Mannville. However, there was no dispute among the parties that both wells were in the same producing pool.

With respect to the request by ARR on its GORR payment, the examiners conclude that this issue does not impact on a decision related to an application for a change in pool designation. Accordingly, the examiners have made no determination on this issue.

7 OTHER MATTERS

7.1 Coring

The parties acknowledged that the EUB's normal requirements do not compel operators to cut core, although core and core analysis must be submitted to the EUB if taken. It was also noted that the industry trend has been to cut less core even in areas with complex geology. However, the parties did not believe that direct intervention by the EUB was needed and thought that decisions on coring should be left up to industry. Nevertheless, there was concurrence that more core should be taken in geologically complex areas where mineral rights disputes are possible.

The examiners believe there is significant onus on operators to acquire the appropriate information to ensure the best geological interpretation possible in areas of complex geology where the potential for disputes exists. In this regard, the examiners support and reiterate the view expressed in *Decision D 95-10* that core is more valuable than geophysical logs or drill cuttings in interpreting complex stratigraphy. The examiners strongly encourage industry to obtain core in areas known to be stratigraphically complex and where mineral rights may be disputed.

7.2 Appropriate Dispute Resolution

The examiners also believe that mineral rights disputes are best resolved by the parties themselves and that the EUB hearing process should be considered an option only when it is clear that the dispute cannot be resolved. In this regard, the examiners acknowledge that ADR was successful in negotiating an agreement between Provident and ConocoPhillips. The examiners believe that more effort could have been made by all parties to address remaining issues. The examiners encourage operators involved in these types of disputes to share information either on their own or through a mediated ADR process.

7.3 Balance of Evidence

Operators must be aware that the EUB's initial zone determinations and, consequently, the corresponding pool designations are often based on limited available data. Progress commented on the need for regulator fairness, and in that respect the examiners believe the fairest approach is to make a determination based on a balance of the evidence presented to the Board, rather than the need for conclusive evidence before a change would be contemplated.

Dated in Calgary, Alberta, on February 15, 2005.

ALBERTA ENERGY AND UTILITIES BOARD

[Original signed by]

C. D. Hill
Presiding Member

[Original signed by]

R. J. Willard, P.Eng.
Examiner

[Original signed by]

W. Elsner, P.Geol.
Examiner

APPENDIX HEARING PARTICIPANTS

Principals and Representatives
(Abbreviations used in report)**Witnesses**

Provident Energy Ltd. (Provident)
L. Mooney

G. Buchanan, P.Geol.
R. Masuda, P.Geoph.
G. Dolby, Ph.D., P.Geol.
J. Stepic, P.Geol.
S. Butrenchuk, P.Geol.
J. Hopkins, Ph.D., P.Geol.
L. Rosenthal, Ph.D.

ARR Resources Ltd. (ARR)
A. Rallison

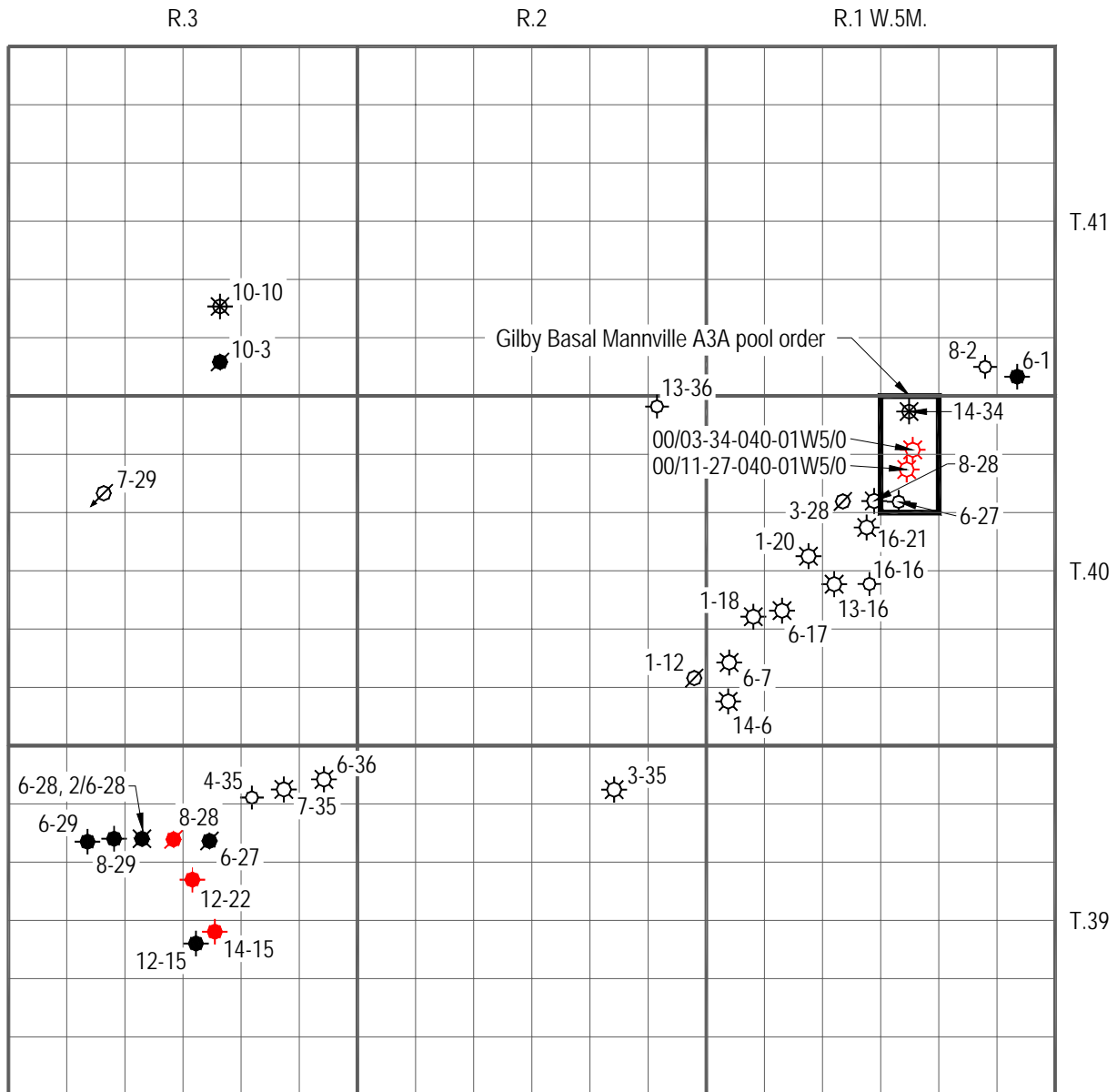
A. Rallison, P.Geol.
G. Reinson, P.Geol.

Progress Energy Ltd. (Progress)
J. Gruber

P. Saltman, P.Geol.
M. Lewis
B. Hayes, Ph.D., P.Geol.

Alberta Energy and Utilities Board staff

T. Bews, Board Counsel
A. Beken, P.Eng., P.Geol.
T. Poulton, Ph.D., Geological Survey of
Canada (assisting EUB staff)
T. Rempfer, P.Eng.



LEGEND

- | | | |
|-----------------|----------------------|--------------------------------|
| ⊘ Suspended | ⊘ Injection | ■ Wells in evidence |
| ☀ Gas | ● Oil | ■ Wells referenced in decision |
| ● Suspended oil | ⊘ Dry and abandoned | <u>Note:</u> |
| ★ Abandoned gas | ● Abandoned oil | All wells are not displayed |
| | ★ Abandoned serviced | |

Area around the Gilby Basal Mannville A3A pool