Nexxtep Resources Ltd.

Pool Delineation Application: Redesignation of the Lower Mannville C Pool to Rock Creek

Wilson Creek Field

August 7, 2009

Energy Resources Conservation Board

ENERGY RESOURCES CONSERVATION BOARD
Decision 2009-050: Nexxtep Resources Ltd., Pool Delineation Application, Redesignation of the Lower Mannville C Pool to Rock Creek

August 7, 2009

Published by

Energy Resources Conservation Board
640 – 5 Avenue SW
Calgary, Alberta
T2P 3G4

Telephone: 403-297-8311
Fax: 403-297-7040
E-mail: Hinfoservices@ercb.caH
Web site: www.ercb.ca

CONTENTS

ENERGY RESOURCES CONSERVATION BOARD
Calgary, Alberta

NEXXTEP RESOURCES LTD.
POOL DELINEATION APPLICATION **Decision 2009-050**
WILSON CREEK FIELD **Application No. 1523329**

1 DECISION

Having carefully considered all of the evidence, the Majority of the Energy Resources Conservation Board (ERCB/Board) hereby finds that the disputed interval is Jurassic in age. The Minority of the Board finds that there is insufficient evidence to support the application. As a result of new evidence that was submitted in the proceeding, the Board will make changes to the pooling designations. The Board suspends Talisman Energy Inc.'s (Talisman's) Well Licence No. 0084269 pending the Alberta Court of Queen's Bench ruling on the ownership of the 00/02-16 well.

This decision report reflects the unanimous views of the Board panel with the exception of the specific views of the Majority and the specific views of the Minority as noted.

2 INTRODUCTION

2.1 Application

Nexxtep Resources Ltd. (Nexxtep) applied to the ERCB, pursuant to Section 33, Subsection 1(d), of the *Oil and Gas Conservation Act* (*OGCA*), to redesignate the Wilson Creek Lower Mannville C Pool (973310003) (C Pool) in Sections 16 and 21 of Township 43, Range 4, West of the 5th Meridian (Sections 16 and 21), to the Jurassic Rock Creek Formation (Rock Creek) and to implement consequential measures, in accordance with Sections 16 and 25 of the *OGCA*, for immediate cancellation or suspension of the licence for the 100/2-16-043-04W5/02 (00/2-16) well and such other alternative relief as the ERCB may deem appropriate.

2.2 Interventions

Talisman submitted a letter on August 1, 2007, objecting to the application submitted by Nexxtep to redesignate the zone from which the 00/2-16 well was producing. Talisman believed that the producing horizon of the C Pool was Cretaceous Ellerslie (Ellerslie) and therefore should not be redesignated. Talisman indicated that it would be the party of record for OMERS Energy Inc. (OMERS), which had previously submitted a letter on July 25, 2007, stating its objection to the application. For the purpose of this decision, Talisman/OMERS are referred to as Talisman.

Bonavista Petroleum Ltd. (Bonavista) submitted a letter on October 17, 2008, agreeing that the current designation of pools in Section 21 was correct and that status quo should be upheld. Bonavista holds the mineral rights in Section 21 from below base Mannville to base Rock Creek. Bonavista is currently producing from wells at 02/14-21-43-4 W5 (02/14-21 well) and 00/16-21-43-4 W5 (00/16-21 well). The 00/16-21 well has been assigned to the Wilson Creek Rock Creek Q Pool (Q Pool) in Section 21.

The following companies submitted objection letters, but did not appear at the hearing: Primewest Energy Inc., ARC Resources Ltd., Provident Energy Inc., Signalta Resources Ltd., Lotus Resources Ltd., CPBC 80 Oil & Gas Ltd., Shapco Resources Ltd., and 96690 Limited Partnership 1980 No. 2.

2.3 Hearing

The Board held a public hearing in Calgary, Alberta, which commenced on December 1, 2008, and concluded on December 9, 2008, before Board Members M. J. Bruni, Q.C. (Presiding Member), and G. Eynon, P.Geol., and Acting Board Member C. A. Langlo, P.Geol.

On March 3, 2009, the Board requested that the parties submit certain additional information no later than March 20, 2009. The Board subsequently received parties' responses to this request. On April 3, 2009, the Board issued a notice that it was reopening the hearing for the limited purpose of providing the parties with the opportunity to provide oral evidence and argument with respect to the additional submissions that were filed. The public hearing was reopened on April 14, 2009, and continued on May 8 and 9, 2009. The hearing closed on May 9, 2009. Those who appeared at the hearing are listed in Appendix 1.

3 BACKGROUND

In these proceedings the Board has been asked to make a decision on an application for a change in pool designation. It is the geological interpretation of the strata and reservoir engineering data that determines the pool designation. There are currently two wells producing from the C Pool, the 00/2-16 well and the 00/6-21-43-4W5 well (00/6-21 well). The disputed interval in the 00/02-16 well is 2066.8-2074.0 metres (m) true vertical depth (TVD)[1] (A1 interval, Figure 2a). A second, horizontal well in Section 16 was drilled from a surface location at 00/16-16-43-4W5 to a bottomhole location at 02/2-16-43-4W5 (the 02/2-16 well). This wellbore penetrated the disputed interval (B1 interval, Figure 2a) about 800 m northeast of its location in the 00/02-16 wellbore.[2]

The C Pool was originally discovered by the 00/02-16 well drilled in 1980 and a second well, the 00/6-21 well, was drilled into the pool in 1985. The interval identified by the producing perforations 2068.5–2074.0 in the 00/02-16 well was defined as Leedale Lower Mannville C effective February 1, 1988. When Leedale Field was rescinded and the area added to Wilson Creek Field, this pool was rescinded and redefined as Wilson Creek Lower Mannville C effective September 1, 1989. The C Pool has been on continuous production since May 1994. The Board recognizes that the Alberta government made the rights below the base of the Mannville in Section 21 available for purchase, and in 2003 those rights were acquired and the 00/16-21 well was drilled into the Q Pool.

Nexxtep and Talisman are currently engaged in litigation over a purchase and sales agreement in which Nexxtep purchased from Talisman all rights, title, estate, and interest in and to certain assets. The Alberta Court of Queen's Bench has already determined that Nexxtep purchased an interest in the Crown Petroleum and Natural Gas (PNG) lease from the base of the Mannville to

[1] The disputed interval in the 00/02-16 well is depicted in Figure 2a as A1.
[2] The disputed interval is depicted in Figure 2a as B1.

the base of the Pekisko Formation (Pekisko), which included both the Rock Creek and the Pekisko. The court also determined that included in the purchase was an interest Talisman had in the 02/2-16 well (the horizontal well) producing from the Pekisko. The court found that Nexxtep did not purchase the 00/02-16 well that is operated by Talisman or the production from the well.

On September 24, 2007, Talisman filed a preliminary motion requesting that the Board summarily dismiss Nexxtep's application on the basis that Nexxtep did not have standing because it was not a licensee of a well in the potentially affected pools. Alternatively, Talisman requested that the Board stay or adjourn the processing of Nexxtep's application pending the final determination or resolution of the court action between the parties. On July 4, 2008, the Board dismissed Talisman's motion, as it was of the view that Sections 33(2) and 94 of the *OGCA* provided it with the authority to consider Nexxtep's application.

4 ISSUES

The Board considers the issues respecting the application to be

- the criteria for distinguishing some specific Ellerslie deposits from the Rock Creek;
- the evidentiary test that the Board must apply, and whether the evidence provided meets the appropriate test; and
- determination of the geological age of the reservoir rocks in the C Pool.

In reaching the determinations in this decision, the Board has considered all relevant materials constituting the record of this proceeding, including the evidence and argument provided by each party. Accordingly, references in this decision to specific parts of the record are intended to assist the reader in understanding the Board's reasoning relating to a particular matter and should not be taken as an indication that the Board did not consider all relevant portions of the record with respect to that matter.

5 CRITERIA FOR DISTINGUISHING BETWEEN ELLERSLIE AND ROCK CREEK

The Board believes that assessment of the following engineering and geoscience criteria might allow it to make a decision as to the age of the specific reservoir rocks of the producing interval in question, and therefore the appropriate zone/pool designation:

- stratigraphy and depositional environments
- palynology
- well log analyses and correlations
- petrography, mineralogy, and lithology
- occurrence of coal
- occurrence of phosphates
- X-ray diffraction analysis
- reservoir pressures and production histories

6 EVIDENTIARY TEST

6.1 Views of Nexxtep

Nexxtep argued that the evidentiary test to be applied in the hearing of Nexxtep's application for a change in pool delineation was the same as in a civil law action, namely, the balance of probabilities. Nexxtep relied on a number of authorities to support its proposition, including administrative law texts and court decisions. Specifically, Nexxtep relied on the Alberta Court of Appeal's comments in *Gannon Bros. Energy Ltd. v. Alberta (Energy and Utilities Board)*[3] on the standard of proof required in an application before the Alberta Energy and Utilities Board (now the ERCB). The Court of Appeal concluded that the standard of proof was to persuade the Board "not beyond a reasonable doubt, but simply to persuade them…."

Nexxtep also provided the Board with past ERCB decisions regarding the burden of proof in pool delineation hearings. Nexxtep submitted that in *Decision 2005-009*[4] and *Decision 95-10*[5] the ERCB made it clear that the standard of proof in such applications was on a balance of probabilities. Particularly in *Decision 2005-09,* the examiners wrote at page 11:

> 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.

Furthermore, Nexxtep argued that the evidentiary test was clearly on the balance of probabilities, which it stated was not a standard by which Nexxtep had to overcome every conceivable doubt on the matter. It submitted that there just had to be a preponderance of evidence that persuaded the Board that what Nexxtep was postulating was more likely than the converse. Nexxtep further submitted that the circumstances before the Board did not give rise to any particular policy consideration that would justify departing from that standard.

6.2 Views of Talisman

Talisman argued that a party seeking to overturn a long-standing pool designation carried a high burden of proof to justify redesignation. Talisman submitted that when the Board was assessing this application and determining the standard of proof that Nexxtep must meet, it should have regard to several important factors.

First, Talisman stated that Section 33 of the *OGCA*[6] was discretionary, not mandatory. In exercising its discretion, the Board must consider all relevant factors as they related to the specific application, both to the technical issues and to the overall mandate of the ERCB.

Second, Talisman argued that the Board's discretion under Section 33 to change its designation orders was akin to the Alberta Court of Appeal's ability to reconsider its previous decisions on

[3] (1996), 178 A.R. 302 (C.A.).
[4] *Decision 2005-009: Provident Energy Ltd., Application for a Change in Pool Designation.*
[5] *Decision 95-10: Hillcrest Resources Limited, Application to Determine the Base of the Mannville in Township 40, Range 5, West of the 5th Meridian.*
[6] Section 33 (1) (b) states: "The Board may, by order, designate a pool describing the surface area vertically above the pool and by naming the geological formation, member or zone in which the pool occurs or by some other method of identification that the Board in any case considers suitable…"

the ground that previous decisions do not bind it. Talisman maintained that as the Court of Appeal was not bound by previous decisions, nor was the Board.

Third, Talisman was of the view that Board orders should not be changed lightly because they were relied upon by the oil and gas industry and the Crown in governing their affairs. Talisman stated that it was a settled expectation of the oil and gas industry that the Board's designation orders could be relied upon. Changing such orders without substantial evidence would reduce the certainty of the Board's orders, with the potential to undermine the utility of the Board's designation system. Talisman further noted that regulatory certainty was an important principle, which had been recognized by the Board on many occasions.

Talisman viewed the concept of a high onus being reflected in the general rules relating to challenging existing Board orders and the changing of the Board's designation of the pool as broadly analogous to a court's power of rectification. It argued that a court would be hesitant to rectify any instrument where third-party rights had intervened and that the evidence showed that this had happened, as Bonavista's third-party rights would be altered based on a new Board's redesignation order for the pool.

Talisman further argued that the high onus that must be applied on Nexxtep's application was contemplated by *Directive 065: Resources Applications for Conventional Oil and Gas Reservoirs* by analogy. Talisman stated that the directive encouraged well licensees to apply for redesignation if additional information became available that could substantially change current decisions.

Talisman took the position that since redesignation of the pool would most likely result in prolonged shutdown of production while interests were worked out, redesignation was inconsistent with the Board's mandate to oversee the orderly, economic, and efficient maximization of Alberta's oil and gas resources. As a result, Talisman was of the view that Nexxtep's evidence must be substantial and there must be technical certainty in order to trigger redesignation.

Talisman argued that the burden of proof exceeded the balance of probabilities and that Nexxtep had a high onus in these circumstances.

6.3 Views of Bonavista

Bonavista acknowledged that it had not found any clear authority for the proposition that the standard of proof was anything other than the balance of probability standard typically applied in civil matters. However, Bonavista submitted that the standard of proof had to be distinguished from a degree of proof. Specifically, the degree of proof required to establish a fact by balance of probabilities would depend on the circumstances, including the nature of the facts to be provided and the consequences that would flow from that finding.

Bonavista argued that while the overall standard of proof may be balance of probabilities, the Board should be applying a very rigorous degree of proof in terms of the evidence it needed to see before changing a pool designation. Furthermore, the degree of proof that the Board needed to apply should be high, given the complexity of the materials and the possible consequences.

6.4 Findings of the Board

The Board acknowledges that the burden of proof in an administrative hearing is on the balance of probabilities. This requires that the Board weigh all the evidence that it hears and its decision must be based on the balance of the evidence. Specifically, there has to be a preponderance of evidence to show that the conclusion the applicant seeks to establish is substantially the most probable of the possible views of the facts presented to the Board.[7] In this case, the Board is not satisfied that a pool designation application requires any higher onus be imposed as argued by Talisman and Bonavista. Furthermore, conclusive evidence is not necessary in order to make a determination on this application.

7 GEOLOGICAL AGE OF THE RESERVOIR ROCKS IN THE C POOL

7.1 Views of Nexxtep

Nexxtep interpreted the C Pool to be producing from the Rock Creek rather than the Ellerslie, and it submitted geological and engineering analyses in support of its application for redesignation.

Nexxtep noted that two previous Board decisions (*Decision 95-10* and *Decision 2005-009*), summarized criteria used to distinguish between particular Lower Mannville and Jurassic strata. Accordingly, Nexxtep used these decisions to guide it when compiling the information it believed was required.

Nexxtep acknowledged that there was no core available from the producing horizons of the C Pool wells and that there were no drill cuttings available over the disputed interval in the 00/2-16 well. Nexxtep noted, however, that there were drill cuttings available from the 02/2-16 and 00/6-21 wells that could assist in identifying the disputed interval, which was the producing interval in the 00/2-16 well.

Nexxtep noted that in *Decision 95-10* the Board believed that in the absence of core or sample data, it was reasonable to use well log analyses and correlations to determine the base of the Mannville Group. Nexxtep submitted four different types of analyses on the available cores and cutting samples from adjacent wells: a petrographic thin section examination, X-ray diffraction (XRD) analyses, a palynological analysis, and an ichnological examination.

Nexxtep believed that its integrated multidisciplinary approach, which included analyses of lithology, petrography, palynology, sedimentology, ichnology, digital geophysical well log, and reservoir engineering, presented by its independent expert consultants overwhelmingly supported its determination of the age of the producing interval in the 00/02-16 well.

Nexxtep believed that the combination of all the lines of evidence presented met the evidentiary test that there simply had to be a preponderance of evidence to persuade the Board that what Nexxtep was postulating was more probable than the alternative. Nexxtep argued that on the balance of probabilities, which was not a standard by which Nexxtep had to overcome every

[7] As per the Supreme Court of Canada's description of the balance of probabilities in Clark v. R., [1921] 59 D.L.R. 121 (S.C.C.) at 5.

conceivable doubt on the matter, its multidisciplinary approach with various lines of inquiry provided sufficient evidence for the Board to decide in its favour.

Nexxtep stated that the Board should not give weight to all the objections filed by the various working interest participants in the 00/2-16 and the 00/16-21 wells, as these only took the form of brief statements of objection, without reasons. Nexxtep believed that there was an onus on the current operators of pools to understand the geology correctly, particularly in areas of complex geology.

7.1.1 Stratigraphy and Depositional Environments

Poker Chip

Nexxtep interpreted the Rock Creek to be situated disconformably above the Poker Chip shale (Poker Chip) and unconformably below the Ellerslie. Nexxtep observed that toward and beyond the edge of the paleotopographic high, the Poker Chip became much thinner and in some cases, as in the 00/8-21 well, was completely eroded. Nexxtep believed that the Poker Chip would have a constant thickness when overlain by the Rock Creek, but that when thinning was evident it was an indication of downcutting and erosion through the Rock Creek into the Poker Chip by Mannville sediments.

Rock Creek

Nexxtep interpreted the Rock Creek to have been deposited within a shallow marine shelf environment during a period of slow subsidence, which resulted in deposition of thin, areally extensive sheet-like sandstones. Nexxtep submitted a study of the ichnology (i.e., the study of animal sediment interactions) of selected Wilson Creek area cores to determine the fauna/sediment interaction and the biogenic sedimentary structures present.

Nexxtep reviewed the cores from the 00/01-07-043-04W5 (00/01-07) well, 00/10-15-43-4W5 (00/10-15) well, 00/16-17-43-4W5 (00/16-17) well, and 02/01-36-42-5W5 (02/01-36) well, all of which it interpreted to be Rock Creek, based on a combination of petrographic, palynological, and ichnological evidence of active shoreface deposition. Nexxtep submitted that these cores over the Rock Creek represented a depositional system that was dominated by a marine shoreface and tidal inlet environment where deposition was in an open marine bay-type system. Furthermore, Nexxtep interpreted that the lowermost deposits were a fining-upward tidal inlet succession characterized by abundant shell debris and whole shells, which had been overlain by upward coarsening marine shoreface deposits. Nexxtep observed that the presence of deposit-feeding structures and the presence of abundant shelly material indicated well-oxygenated bottom waters. It suggested the modern-day Chesapeake Bay as a depositional analog for the Rock Creek in the Wilson Creek area.

Nexxtep also submitted that the Rock Creek seemed to end where marine deposition terminated, generally at a distinctive mineralized surface that it characterized as a *Glossifungites* assemblage. It stated that Mannville age deposits were overlying this mineralized surface.

Ellerslie

Nexxtep's depositional model for the Ellerslie in the Wilson Creek area envisioned a pre-Cretaceous paleotopographic high that was essentially a flat-topped mesa-like feature. Nexxtep submitted that Ellerslie deposition took place subsequent to Jurassic time, removing material from the crest and sides of the high and redepositing it in the adjacent low areas.

Nexxtep believed that the paleotopographic high had not been completely cross-cut by Ellerslie channelling, interpreting the thickest Ellerslie and Ostracod sands to have been deposited in the erosional lows off the flanks of the paleotopographic high, and that thin non-reservoir shales were deposited over the crest.

Nexxtep stated that Ellerslie deposition occurred in a non-marine coastal plain or fluvial environment.

Nexxtep stated that its review of the core from the wells in 00/09-08-43-4W5 (00/09-08 well) and 00/06-22-43-4W5 (00/06-22 well) indicated the sediments to be Ellerslie age, based on the presence of rooted structures, a brackish water trace fossil assemblage, and coal. Nexxtep also stated that the presence of coal was a reliable indicator of Ellerslie age deposition and that coal seams were deposited in the lows adjacent to the paleotopographic high.

7.1.2 Palynology

Nexxtep presented palynological analyses of 27 core and cuttings samples from seven wells. Nexxtep also presented palynological analysis of 11 cuttings samples from the 02/2-16 and 00/15-9- wells.[8] These analyses included the number of specimen found and the degree of confidence Nexxtep had in the age assignments derived from the occurrences of diagnostic taxa. The samples taken from the cores and cuttings yielded three palynomorph assemblages:

- a rich and varied early Cretaceous Aptian-Albian assemblage, equivalent to the Ellerslie and Ostracod Member (Ostracod);
- a Middle Jurassic Bajocian assemblage of low diversity and abundance and characteristic of the Rock Creek; and
- an Early Jurassic Toarcian assemblage of greater diversity and abundance, characteristic of the Poker Chip.

Nexxtep noted that it had observed no recycled palynomorphs in the Early Cretaceous samples.

Nexxtep saw no significant difference in either preservation or thermal maturity of the spores and pollen between those from the Rock Creek and the Ellerslie, and it considered the assemblages reported by Talisman to complement its own analyses.

Nexxtep stated that while the Rock Creek dinoflagellate assemblages were poorly developed, which decreased the likelihood of finding age-diagnostic taxa, samples taken from drill cuttings from the sandstone intervals in the 02/2-16 well at and below 2085 m measured depth (MD) in

[8] See Exhibit B-11 Palynological Analysis of Twenty-Seven Core Samples from Seven Wells, Wilson Creek Area, Alberta, by B. G. T. van Helden, October 2008; and B-17 Palynological Analysis of 11 Cutting Samples 02/2-16-43-2W5M 15-9-43-2W5M Wilson Creek Area, Alberta, B. G. T. van Helden, November 2008.

fact yielded several rare Jurassic dinoflagellates. Nexxtep noted that these occurred with abundant up-hole contamination of Albian and Aptian age. The Jurassic dinoflagellates identified were considered to be in situ, and possibly indicative of Middle Jurassic Rock Creek age sediments.

In the 02/2-16 well at 2085 m, 2090 m, and 2095m MD, the following select dinocysts were also found by Nexxtep:

- *Stephanelytron recliffense*—late Middle to early Late Jurassic; (Oxfordian to early Kimmeridgian)
- *Gonyaulacysta*—Middle Jurassic through Tertiary;
- *Endoscrinium luridum*—Bathonian to Oxfordian, Middle to Late Jurassic; and
- *Scriniodinium crystallinum*—Callovian-Oxfordian, Middle to Late Jurassic.

Nexxtep stated that if this assemblage came from a single outcrop section, it would determine an age of Late Middle Jurassic (Callovian) to early Late Jurassic (Oxfordian) age. However, Nexxtep pointed out that given the nature of drill cuttings, there was always the possibility of uphole contamination during the collection process. Since its analysis was based on drill cuttings, the position of the fossils could be the result of uphole contamination or caving. Nexxtep held that the recovery of the dinocysts assemblage in the 02/2-16 well from samples at 2085 m, 2090 m, and 2095 m supported a Jurassic age for the rocks at these drill depths. It also noted that the assignment of uppermost stage of the Middle Jurassic (Callovian) or younger age to the assemblage of dinocysts identified in the 02/2-16 well at 2085-2095 m MD would be appropriate if the fossils were in situ.

Nexxtep stated that the absence of definitive recycled Jurassic palynomorphs in the 2075 m and 2080 m MD samples from the 02/2-16 well, which it considered to be Ellerslie, supported its observation that recycling of Jurassic fossils into the Ellerslie sediment was not observed in the area. Nexxtep concluded that there was no evidence to suggest that Jurassic fossils might have survived reworking and have been redeposited in the Ellerslie.

7.1.3 Well Log Analyses and Correlations

Nexxtep submitted that the logs over the cored sections in the following wells were good analogs for the disputed interval in the 00/2-16 well: 00/1-7, 02/1-36, 00/6-22, 00/9-8, 03/16-05, 00/10-15, and 00/16-17.

Nexxtep stated that the cylindrical or “blocky” gamma ray log shape, having sharp contacts with shale at the top and base of the zone, could be used to identify the marine Rock Creek deposition. However, Nexxtep agreed that the cylindrical gamma ray shape could occur in deposits other than the Rock Creek. Nexxtep indicated that a fining-upward gamma ray profile was common in fluvial Ellerslie sands, but that the wells it interpreted to be Ellerslie exhibited a gamma ray curve that had an erratic shape. Nexxtep also noted that the Rock Creek tidal inlet channel recognized in the core of the 00/1-7 well also exhibited an upward-fining log character.

Nexxtep correlated the intervals in the 00/2-16 well (A1 and A2 in Figure 2a) with the interval labelled B1, B2, and B3 in Figure 2a in the 02/2-16 well and stated that the entire interval was

Rock Creek based on various criteria, including similarity of log character. Nexxtep did not correlate the individual sands and shales within the Rock Creek interval. Nexxtep stated that because it was satisfied that the two wells could be correlated, the drill cuttings of the 02/2-16 well could be used to determine the lithology of the disputed interval in the 00/2-16 well.

Nexxtep found that both the log porosities and lithologies calculated from its log analysis package showed a strong correlation to those from core, but that there was variation of the porous layers from well to well. Nexxtep noted that the 00/02-16 well exhibited poorer quality rock in the top layer of the disputed interval, while generally the other wells indicated higher porosity rock near the top.

Mineralized Zones

Nexxtep stated that mineralization commonly occurred immediately at or below the pre-Cretaceous unconformity, but argued that this was not represented solely by the extensive mineralization associated with the thick coquina development seen in several wells. Nexxtep presented evidence from detailed digital geophysical log analysis identifying other mineralized zones, different from the lower, mineralized coquina, that it also believed to be of Jurassic age.

Nexxtep stated that mineralized surfaces probably formed due to an extensive period of exposure such as had occurred during later Jurassic to early Cretaceous time, and that such mineralization zones formed through a number of different processes. Nexxtep believed that such mineralization would result in a surface that would be difficult to erode. Nexxtep agreed that the presence of a high concentration of pyrite mineralization, exhibiting a low resistivity response and a high density log response, with a separation on the neutron density curves, would be a dependable criterion for identifying an erosional surface and Rock Creek deposition.

It stated that these would only be the obvious cases of a Rock Creek mineralized zone at the top of the Rock Creek, but that the thickness, degree of mineralization, and mineral composition (pyrite, siderite, ankerite, or any iron-rich minerals) all would affect the magnitude of this anomaly on the logs. Nexxtep also submitted that detecting a mineralized zone was not a necessary condition for identifying Rock Creek, because the log signature associated with a mineralized zone could be missing due to non-deposition, erosion, thin bed effects, or gas effect in porous sand.

With respect to the subject wells, namely the 00/2-16 and 00/6-21 wells, Nexxtep identified a mineralized surface from a spike on the density log at the top of the disputed interval, which it interpreted to represent the Jurassic/Cretaceous unconformity surface. Nexxtep stated that since the density spike anomaly was weak in the 00/6-21 well, other geologists may not recognize or agree with this interpretation. It also stated that part of the mineralization zone might have been eroded at some other time.

Nexxtep further stated that one curve by itself was not truly diagnostic, adding that it would prefer to see analysis of a full suite of logs on a well and to be able to use that one in conjunction with the rest of the disciplines to get a true picture.

Nexxtep noted that the base of the disputed interval in both subject wells exhibited a high degree of mineralization. Nexxtep stated that the zone below the disputed interval in the 00/6-21 well exhibited a high photo-electric (PE) log value reflecting pyrite and other heavy minerals and that

the neutron/density logs of both the 00/6-21 and 00/2-16 wells exhibited a density anomaly that went beyond the scale of the logs. Nexxtep noted that the logs of both subject wells exhibited more pronounced mineralization in the zone at the base of the disputed interval than was evident at the top.

Nexxtep argued that it had found no evidence of a zone of mineralization associated with the top of the Ellerslie, with the exception of a density anomaly caused by pyrite mineralization in what it interpreted to be the top of the Ellerslie in the 00/1-7 well. Nexxtep also noted the presence of density log anomalies at the top of the Ellerslie in the 00/16-17 well (which it described as tight sand or silt) and the 03/16-5 well (which it described as a mudstone).

Nexxtep submitted petrophysical results and raw data plots used to estimate the heavy mineral fraction. Nexxtep identified heavy minerals zones at the top of the Ellerslie in the 00/5-15, 00/6-21, 00/10-15, 00/16-17, 02/1-36, 00/8-21, and 00/16-21 wells.

7.1.4 Petrography, Mineralogy, and Lithology

Cuttings

Nexxtep stated that the cutting samples represented 5 m intervals; however, when picking the cuttings samples for analysis, it had a high degree of confidence that the samples selected represented the proper sand intervals. It stated that its confidence was based on a visual inspection of the actual rock material and comparison with the geophysical gamma ray log. Nexxtep also stated that because of the nature of the drill cuttings procedure the contamination from above could be expected but that contamination from below was highly unlikely.

Rock Creek

Nexxtep stated that the main indicators differentiating Rock Creek from Ellerslie sandstones were the presence of very fine- to fine-grained, well-sorted quartzarenite and/or coquina rock type with various forms of in situ phosphate, as well as Jurassic fossils.

Nexxtep stated that the quartzarenite classification reflected a detrital framework composition of quartz greater than 95 per cent and rock fragments, including chert, of less than 5 per cent.

Nexxtep's petrographic study described the Rock Creek as having two main lithologies. The first was an upper very fine- to upper fine-grained, well-sorted, quartz-cemented or argillaceous quartzarenite with up to 3 per cent rock fragments including chert and various forms of in situ phosphates; the second was a coquina rock type, containing abundant bivalves and crinoids and with varying content of quartz grains.

Nexxtep stated that in most of the Rock Creek samples, the volume of chert and rock fragments was minor, 1 to 2 per cent, indicating a quartzarenite rock type, and that this was consistent in both core and drill cuttings in the study area. Nexxtep stated that the quartzarenite rock type in both core and cutting samples was consistently fine grained and well sorted, with subangular to subrounded grain. Nexxtep stated that this was indicative of the quartzarenites having both a similar provenance and depositional environment. Nexxtep also noted that quartz and localized calcite, siderite, and pyrite cements were more common in the Rock Creek than in the Ellerslie.

Nexxtep determined that the particular quartzarenite lithology indicative of Rock Creek occurred in the 00/6-21 well in samples from 2095 m to 2105 m (C1 interval, Figure 2a) and from 2105 m to 2110 m (C2 interval, Figure 2a) and in the 02/2-16 well at 2090 m and 2115 m sample depths. Nexxtep further stated that these intervals in the two wells were definitively Rock Creek. Nexxtep noted that while no samples were available from the 00/2-16 well, the disputed interval correlated well with the 02/2-16 well and was therefore also Rock Creek.

Ellerslie

Nexxtep described the Ellerslie as primarily of litharenite to sublitharenite composition, usually described as having a "salt and pepper appearance." Nexxtep submitted that the Ellerslie was a more chert-rich sand than the Rock Creek and typically was classified as a sublitharenite. Nexxtep recognized that the Ellerslie could also be a quartzarenite, but noted that the Ellerslie quartzarenite typically had a higher percentage of rock fragments including chert, in the order of 3 to 5 per cent, an amount two or three times greater than found in the Rock Creek.

Nexxtep submitted that the grain size of the Ellerslie was typically coarser than that of the Rock Creek, the sorting typically not as good, and the cements, while similar mineralogically, not as common as in the Rock Creek.

Nexxtep described the petrographic samples in the disputed interval in the 00/6-21 well as a fine-grained well-sorted quartzarenite with some clay-rich sedimentary grains, some local siderite cement, and 1 per cent chert. Nexxtep concluded that the disputed interval in 00/6-21 well was therefore Rock Creek, not Ellerslie.

7.1.5 Occurrence of Coal

Nexxtep reviewed two cored wells, the 00/09-8-43-4W5 (00/9-8) well and the 00/6-22 well, which it interpreted to be Ellerslie based on brackish water trace fossil assemblage, a primarily litharenite mineralogy, and the presence of coal.

Nexxtep stated that coal was a reliable indicator of Mannville deposition in this area. It further stated that coal was indicated on logs by a dramatic increase in the density and neutron porosity and that the logs of the 00/2-16 well showed no evidence of coal in the disputed interval. Nexxtep considered the minor coal noted in the sample description of the disputed interval in the 00/2-16 well to be uphole contamination and stated that such uphole Mannville coal as cavings material was a common occurrence. Nexxtep further stated that the mere presence of minor coal in the samples of the 00/2-16 well did not support the interval being Ellerslie.

Nexxtep further argued that the sample description for the 00/2-16 well submitted by Talisman in the well site geologist report should not be given significant weight by the Board, as its content could not be tested in cross-examination.

7.1.6 Occurrence of Phosphates

Nexxtep submitted that the following specific types of in situ phosphate formed during the Middle Jurassic (Rock Creek) time:

- soft phosphate mudclasts
- phosphate matrix

- phosphate coated grains
- phosphate intraclasts
- phosphate fossils
- soft phosphate peloids

Nexxtep stated that in situ phosphate formed at the sediment water interface syndepositionally along the stratigraphic layers at the time of deposition. Nexxtep also included in its definition of "in situ" the local, contemporaneous reworking of this material in a lateral direction within that depositional environment in the same stratigraphic layer.

Nexxtep stated that the specific types of phosphates, such as the soft phosphate peloid found in the 02/02-16 sample and formed at the time of deposition, were soft and delicate and would not survive reworking and redeposition into younger sediments.

Nexxtep further stated that, in contrast, hard phosphate peloids, such as that found in the 00/06-22 well, could be resistant to erosion and could possibly be eroded and reworked into younger formation. Nexxtep stated that the in situ phosphates exhibited no, or only minor, chemical alteration and were almost inclusion free, while detrital phosphate grains showed a high degree of chemical alteration and significant inclusions of impurities.

Nexxtep noted that with the exception of the sample at 2090 m MD in the 02/2-16 well, all the occurrences of soft phosphate were from undisputed Rock Creek or Poker Chip age samples that had been dated based on palynological or trace fossil assemblage analysis.

With respect to the environment required for phosphate precipitation, Nexxtep stated that phosphate crusts were frequently found in carbonate-rich environments and were traditionally explained as a post-lithification replacement of carbonate material by permeating phosphate-rich solution. Nexxtep postulated that the carbonate in the Rock Creek could have come from the shelly material seen in the core. Nexxtep referred to a study by Marshall-Neill and Ruffell (2004) of the phosphate nodules and pellets found in a transgressive horizon (Coniacian/Santonian) at the base of the Cretaceous succession in Northern Ireland. Nexxtep stated that this study showed that the phosphate pellets and nodules contained an admixture of carbonate fluorapatite, calcite, glauconite, pyrite, and quartz and that the phosphate nodules probably replaced calcite nodule precursors in suboxic conditions.

Nexxtep stated that in order for phosphate to form in situ, the following geological conditions must be present: a fully marine environment, the appropriate temperature conditions, and the requisite fauna. Nexxtep stated that that the tectonic and sedimentary conditions that prevailed during Jurassic time in the Alberta region of the Western Canada Sedimentary Basin were in marked contrast to those in Cretaceous time. During the Jurassic, there were relatively stable continent margin marine conditions, with occasional phosphate deposition indicating access to oceanic nutrient-rich water.

Nexxtep stated that during early Middle Jurassic (Rock Creek) time, the sedimentary conditions in the Western Canada Sedimentary Basin were favourable for in situ phosphate deposition. It stated that was in contrast to Early Cretaceous time, which was characterized by brackish and

non-marine conditions, and it further stated that there was no modern-day analog for non-marine phosphate deposition.

Nexxtep stated that the absence of phosphate in drill cuttings over the disputed interval in the 00/6-21 well was the norm, given the limited size of cuttings samples available for analysis, and therefore not particularly significant. Nexxtep believed that the 02/2-16 and 00/2-16 wells were correlatable, based on logs, and that the presence of phosphate in the 02/2-16 well was supportive of the producing interval in the 00/2-16 vertical well being Jurassic.

7.1.7 X-Ray Diffraction Analysis

Nexxtep stated that in response to the Board's request for parties to identify specific minerals present in the mineralized zones, it used X-ray diffraction (XRD) due to its capability of positively identifying crystalline materials. Nexxtep stated that the XRD analysis identified crystalline material only, and the results were semi-quantitative. Nexxtep stated that the scope of the sampling for the XRD was specifically for mineralized zones. When selecting core samples and drill cuttings, it specifically looked for sandstone rock type that had mineralization between the sand grains or the metallic luster that was visible in hand samples; therefore, the XRD samples represented the mineralized zone, while the cuttings for the thin section represented actual clean, porous sandstone. Nexxtep stated that the purpose was to find out the presence of the minerals, not to find out how much of each mineral was present in each sample.

The XRD analysis of the mineralized zones in the tested wells had identified quartz, pyrite, apatite, and phosphate as the most common minerals, with lesser amounts of ankerite, marcasite, local calcite, and siderite. Nexxtep identified two varieties of apatite from XRD analysis—hydroxyl apatite and fluor-apatite.

Nexxtep stated that finding apatite group minerals at the top of the mineralized zone was significant, because a phosphate source was required for apatite to precipitate, Nexxtep stated that the phosphate source was probably the Rock Creek.

Nexxtep disagreed with Talisman's reinterpretation of the XRD results for the 02/02-16 well and other wells with respect to the 25.9 peak, which was identified by Nexxtep as Hydroxylapatite and redesignated by Talisman as K-feldspar. As evidence, Nexxtep noted the complete absence of any primary feldspar peaks.

7.1.8 Reservoir Pressures and Production Histories

Nexxtep submitted pressure and production data from the wells in Sections 16 and 21 and from nearby wells in support of its pool interpretation. Nexxtep considered the pressure data in the 00/02-16 and 00/06-21 wells obtained from 1985 to 1999 and from the other wells in Section 21 to be of sufficient quality and quantity for evaluation, although it agreed that more recent additional data, particularly from the 00/02-16 well, would have been useful.

Nexxtep concluded that the 00/02-16 (Figure 2a, A1), 00/06-21 (Figure 2a, C1), and 02/14-21 (Figure 2b, D1) wells were in the same pressure regime, but separate from the 00/16-21-43-4W5 (00/16-21) well (Figure 2b, E1), based on the pressure vs. time plot. It submitted that pressure depletion at the 02/14-21 well was due to communication with the C Pool. Nexxtep posited that

the lack of tracking of the 00/02-16 and 00/06-21 well production data is a function of reservoir transmissibility and possibly other wells providing pressure support, not of separate pools.

Nexxtep was of the view that the connection with other Rock Creek pools in the vicinity might explain the apparent recharging in the 00/02-16 well when it was shut in, the somewhat depleted initial pressure at 00/16-21, the slowly declining later time production profiles of 00/02-16 and 00/06-21, and the poor fit of the line to the data on the P/Z[9] material balance plot.

Nexxtep assigned pay in the 02/14-21 well based on its interpretation of a lower and upper Rock Creek reservoir separated by a 1.5 m thick shaly-sand section, which Nexxtep did not believe was a competent pressure barrier. The lower Rock Creek sand (D2 interval, Figure 2b) was perforated and fracture stimulated in November 2007 by the original operator, Chamaelo Energy Inc. Nexxtep believed that both sands were at the same pressure before and after the fracture stimulation. Nexxtep reported that the pressure transient analysis (PTA) after the fracture stimulation showed no indication of differential pressure when compared to the expected PTA characteristics of a dual layer model with sands at significantly different pressure. Nexxtep also believed that the PTA indicated very good permeability at 02/14-21, and that the poor performance of the D2 interval in Figure 2b prior to fracture stimulation was typical of Rock Creek prefracture performance in the area and of pressure depleted or damaged Rock Creek wells.

Nexxtep mapped a single Rock Creek pool containing the three wells, 00/02-16, 00/06-21, and 02/14-21, as having an original-gas-in-place (OGIP) of 16.4 billion cubic feet (Bcf) based on volumetrics. However, Nexxtep noted that the P/Z plot indicated 12.7 Bcf OGIP, while the cumulative production from the C Pool was 11.1 Bcf.

Nexxtep noted that Talisman's net pay map was based on a single Ellerslie pool containing the same three wells, but that the productive zone at 02/14-21 was not included in the map. It also noted that the Ellerslie pay zone in the 02/14-21 well was in the upper sand, even though the completed interval was in the lower sand. Nexxtep's volumetric calculation of OGIP using Talisman's net pay map was 5 Bcf, which it believed was inconsistent with the actual volumes produced to date and significantly less than the results from the other methods.

Nexxtep also noted that reservoirs designated as Ellerslie were anomalous in the Wilson Creek area, a small island in an ocean of Rock Creek wells.

In summary, Nexxtep considered the 00/02-16, 00/06-21, and 02/14-21 wells to be in the same pressure regime, whether completed in the lower or upper sand, and noted that all parties agreed on this point. Nexxtep also believed that when producing intervals in wells were in the same pressure regime, the normal result was acknowledgement that the wells were in the same pool. Nexxtep believed that the 02/14-21 well was completed in the lower of the two sands, Rock Creek, and that the 00/02-16 and 00/06-21 wells were completed in the upper of the two sands. Based on these relationships and the reservoir engineering data, Nexxtep concluded that the three wells were most probably in the same pressure regime because the two sands in each well were part of the same pool.

[9] P/Z is pressure divided by the gas compressibility factor versus cumulative gas production.

7.2 Views of Talisman

Talisman submitted that its geological and engineering evidence confirmed that the C Pool was properly designated as Lower Mannville.

Talisman suggested that much of Nexxtep's evidence was either noncontentious or irrelevant and stressed that the quality of evidence related to the criteria must be carefully considered by the Board.

Talisman observed that in prior decisions, where the quality of the evidence related to each of the criteria was not high, the Board generally held that the particular criteria were not helpful. As examples Talisman cited *Decision 2005-009*, where there was core for the well at issue, and *Decision 95-10*, where all but one of the wells had either core or drill cutting samples available.

Talisman noted that in *Decision 95-10* for the one well with neither core nor drill cuttings, log correlation to a well only 70 m away was deemed appropriate by the Board. Talisman argued that in this case—where there was no core from the disputed interval from any of the wells in the pool, there were no drill cuttings for the 00/2-16 well and the nearest well with drill cutting samples was 800 m away at the 02/2-16 horizontal well—the Board should determine that the evidence presented was not helpful. Talisman further noted that the geology in the Wilson Creek area was complex and could change over short distances, as evidenced by the complete erosion of the Rock Creek between the Rock Creek producing well in 00/16-21 and the 00/08-21 well, a distance of about 650 m.

Talisman did not dispute Nexxtep's conclusions from its petrographic and palynological analysis of core, but since all of these analyses were from wells outside the C Pool, Talisman suggested they should be given little weight.

Talisman noted that all of Nexxtep's working interest owners in the 02/2-16 well had also objected to this application.

7.2.1 Stratigraphy and Depositional Environments

Talisman stated that it agreed with Nexxtep's geological interpretation that the Rock Creek was deposited within a near-shore marine or well-oxygenated tidal environment.

With respect to the use of the thickness of the Poker Chip as an indicator of Rock Creek deposition, Talisman submitted that the Poker Chip thickened and thinned throughout the area irrespective of whether it was overlain by Ellerslie or Rock Creek, and that the thickness of the Poker Chip was therefore not useful as an indicator of the age of the overlying sediment.

Talisman noted that the paleotopography of the Western Canada Sedimentary Basin at the onset of Cretaceous time was characterized by several regional highland features bifurcated and dissected by extensive valley systems. Talisman submitted that this was consistent with its Ellerslie depositional model for the Wilson Creek area, which it interpreted to be a pre-Cretaceous paleo-highland dissected by secondary and successively smaller tributary channel systems draining into larger tributaries. Talisman stated that the earliest Cretaceous sedimentation was in a coastal plain setting with fluvial sands deposited in channels and with coals, brackish muds, and overbank sediment deposited in the interfluve and intertidal areas.

Talisman believed that as the Boreal Sea continued to inundate the basin, the uppermost parts of the Lower Manville became increasingly marine and highlands would be affected by marine estuarine conditions as the ancestral landmass was submerged. Talisman interpreted multiple erosional and subsequent depositional events that contributed sediment into the system and resulted in the younger deposits as being derived from the erosion of older sediments.

Talisman concluded that its regional review of the Wilson Creek area, which included structural mapping on the pre-Cretaceous unconformity surface covering nine townships, clearly demonstrated down-cutting incisions into the Jurassic sediments, with significant channelling throughout the area to the east, west, north, and south of the lands and wells in question. Talisman interpreted the C Pool to be within a channel trend that was continuous from the northeast to the southwest through Sections 16 and 21 and included the cored intervals in the 00/9-8 and 00/6-22 wells. Both Talisman and Nexxtep interpreted the cored intervals in the wells to be Ellerslie, with possibly a thin remnant of the Rock Creek at the base in the 00/9-8 well.

In Talisman's opinion, the mesa-like topographical high model advanced by Nexxtep did not recognize the erosion and subsequent channel fill that had occurred throughout the area and resulted in the complex interplay of Cretaceous and Jurassic sediments. Talisman believed its geological model explained the presence of multiple Rock Creek reservoirs in the Wilson Creek area.

7.2.2 Palynology

Talisman presented palynological analyses of five cutting samples from 2075 m to 2095 m from the 02/2-16 well. Talisman noted that these yielded assemblages of species that were mixed in environmental preference, colour, and age. It stated that there was no compelling evidence to definitively identify the age of the intervals in question, but concluded that an Early Cretaceous (Barremian to Aptian) age might be postulated for the interval from 2075 m to 2090 m MD (B1 interval and the underlying shale in Figure 2a). Talisman submitted that the complete mixture of Lower Cretaceous assemblages and possible Jurassic palynomorphs provided little confidence that any of the fossils might be in situ. It considered the confidence level for determining the precise age of this 20 m interval solely based on samples from drill cuttings to be low.

Talisman submitted that the Jurassic fossils it identified in the drill cutting samples of the 02/2-16 well, using the principles of overlapping species ranges, could be interpreted to indicate either that the sands could not be Rock Creek and must be a younger deposit, or that the fossils were derived from younger Jurassic rocks (Callovian or Oxfordian age), which were redeposited in the sands of the Lower Cretaceous.

With regard to the first option, Talisman noted that Nexxtep agreed to the assignment of a Callovian to Late Jurassic age to the assemblage of dinocysts identified in the 02/2-16 well at 2085 - 2095 m MD (B1 interval and the underlying shale in Figure 2a), if the fossils were in situ. However, Talisman noted that the Rock Creek was of Bajocian age and that there was a depositional hiatus in this area through the younger Callovian period.

Talisman considered the combined assemblage of Jurassic forms identified by Nexxtep as age equivalent to the Green Beds, Transition Beds, and Passage Beds, which are all younger Jurassic deposits than the Rock Creek. Talisman contended that the Callovian and younger Jurassic

fossils were most likely derived by erosion from rocks laterally adjacent to the Wilson Creek area.

Talisman concluded that the fossils were likely redeposited in Cretaceous sediments and argued that the palynology showed Nexxtep's stratigraphic argument to be seriously flawed. Talisman also suggested that the sole use of samples taken from drill cuttings for age determination over such a thin interval was exceptionally precarious and therefore suggested that the Board should give no weight to the palynological evidence in determining the age of the sands in question.

7.2.3 Well Log Analyses and Correlations

Talisman argued that the Board must rely on petrophysical log characteristics and correlations, as this was the only evidence before it that was specific to the C Pool. Talisman also argued that the difficulty of well log correlations in the Wilson Creek area illustrated the complexity of the depositional environments present.

Talisman believed that, in general, the fining-upward gamma ray and porosity log signatures indicated Ellerslie age deposition within fluvial and/or estuarine channels, and it interpreted the disputed interval in the 00/2-16 well to clearly exhibit just such a fining-upward profile.

Talisman believed there was a good log correlation between its interpreted Ellerslie and Rock Creek intervals in the 00/2-16 and 00/6-21 wells when using the Medicine River coal as the datum. However, Talisman found that it was challenging to correlate the disputed intervals of the horizontal 02/2-16 well with that of the vertical 00/2-16 well. Talisman stated that the 2-3 m shale unit present below the interval it interpreted to be Ellerslie sand in the 02/2-16 well did not correlate to an equivalent shale in the 00/2-16 vertical well (Figure 2a). Furthermore, it noted that there were two Rock Creek sands in the 02/2-16 well (B2 and B3), but only one Rock Creek sand in the 00/2-16 well (A2). Talisman believed that the area of interest was characterized by significant changes in lithology over short distances.

Mineralized Zones

Talisman stated that pyrite was the most common of the heavy minerals associated with sedimentary rocks and that it was found in rocks of all ages. Talisman stated that concentrated mineralization, often with centimetre-thick pyrite laminations, was greatest at erosional unconformities. It also noted that pyrite mineralization would manifest itself on logs as having both a sharp low-resistivity response and a corresponding high-density response.

Talisman did not believe that a high-density spike by itself indicated an erosional surface. It noted that the thinner zones of pyrite would not be recognizable on logs due to the resolution ability of the logging tools and that if a mineralized zone were recognizable on logs, it could be concluded that mineralization was present in that interval.

Talisman stated that the specific log characteristics it used for identifying an erosional surface were not evident on the logs at the top of the disputed interval of either the 00/2-16 or the 00/6-21 well. Talisman noted that the high-density log response in the Ostracod beds overlying the disputed interval in the 00/2-16 and 00/6-21 wells was caused by the presence of limestone or shell beds, rather than pyrite as suggested by Nexxtep. Furthermore Talisman did not agree with Nexxtep that the neutron log response was much affected by pyrite. It stated that the presence of

clay would have more affect on the neutron response, causing a pronounced increase in the neutron porosity. Talisman argued that the presence of clay was the cause of the increase in the neutron log response at the top of the disputed interval (Figure 2 A1 in 02/02-16), rather than the pyrite mineralization interpreted by Nexxtep.

Talisman agreed with Nexxtep that a zone of strong mineralization was present below the disputed interval in both the 00/2-16 and 06-21 wells. However, it was Talisman's interpretation that this mineralization was evidence of a hard ground or a bounding surface at the top of the Rock Creek and represented the Jurassic/Cretaceous unconformity surface. Talisman interpreted that the producing sands in the C Pool were deposited above the mineralized zone at the top of the Rock Creek and were properly designated as Lower Mannville sands.

7.2.4 Petrography, Mineralogy, and Lithology

Cuttings

Talisman took issue with the ability of Nexxtep to accurately pinpoint from drill cutting samples the exact horizon that was the source of the single grain of phosphate found in the 02/2-16 well. Talisman suggested that although the drill cutting samples were assumed to represent the lithology present in the wellbore over a 5 m interval, there were often inaccuracies in the collection of the samples at the drilling rig and that the collection of samples was not an exact science. As an example of this, Talisman noted that samples may or may not lag and that human error could result in the potential for mistakes in depth calculations. Talisman further questioned the dependability of determining an age for the producing horizon in the 00/2-16 well based on drill cutting samples from a horizon encountered in a well about 800 m distant from the producing horizon, particularly within an area of complex geology.

Rock Creek

Talisman described the Rock Creek as a fine-grained quartzarenite with less than 1.5 per cent rock fragments and with porosity occluded by quartz overgrowths except where grains had a coating of illite.

Talisman stated that coquinoid sandstone was often present at the base of Rock Creek and that in situ phosphatic and pyritic nodules were disseminated in uppermost Rock Creek beds.

Ellerslie

Talisman described the Ellerslie as a coarse- to medium-grained, grading upwards to fine-grained quartzarenite to sub-litharenite and litharenites with associated thin coal, siltstones, and shale interbeds.

Talisman suggested that sedimentary rock fragments form 3.5 to 10 per cent of rock framework grains and that porosity would be occluded by quartz overgrowth and minor calcareous cement.

Talisman believed that the occurrence of quartzarenite did not define Jurassic sandstones exclusively. Talisman submitted that the earliest Ellerslie deposits were located in the deeper channels or lows off the Jurassic paleotopographic high and were coarse- to medium-grained litharenites often associated with thin-bedded coal seams. Talisman noted that in its review of

some of the published literature, it found reference to Ellerslie deposits overlying Jurassic units exposed on paleotopographic highs that had been described as clean quartzose sands and had been ascribed to fluvial coastal plain depositional environments. Talisman, in its review of the drill cuttings of the 00/08-21-043-04W5 (00/8-21) well, described a quartzarenite sand overlying an Ellerslie coalbed to indicate that quartzarenite sands did occur in the Ellerslie. Furthermore, Talisman believed that this Ellerslie quartzarenite correlated with the disputed interval in the 6-21 and 00/2-16 wells and supported its contention that the subject pool was Ellerslie in age.

7.2.5 Occurrence of Coal

Talisman noted that all parties agreed that the presence of coal was a reliable indicator of deposition within the Mannville in the Wilson Creek area. Talisman submitted that the well site geologist whose report Talisman had placed into evidence recognized minor coal in the drill cuttings from the disputed interval of the 00/2-16 well. Talisman stated that this geological report was an independent and unbiased description of the drill cuttings and should be given weight by the Board when making its decision.

Talisman believed the presence of coal in the sample descriptions was further evidence that the productive zone in the 00/2-16 well was Ellerslie. Talisman explained that well site geologists were trained not to include descriptions of cavings in the well site reports and furthermore that the first reference to coal came after 15 m of new hole had been drilled in which no coal was reported.

With respect to the lack of evidence of coal from logs, Talisman stated that very thin coal layers could not be resolved by logging tools and that the coal in the zone described was likely either from a thin coalbed or a coal clast within the sand bed.

7.2.6 Occurrence of Phosphates

Talisman stated that none of the forms or types of phosphates mentioned at the hearing was exclusively indicative of formation in place. Talisman defined in situ phosphate as having been formed by chemical precipitation from the water column immediately below the sediment water interface, and it stated that precipitation occurred in anoxic or reducing environments with a low sedimentation rate. Talisman further observed that the Rock Creek in the Wilson Creek area was interpreted by Nexxtep to be deposition within a well-oxygenated tidal environment, which Talisman concluded would not be an environment conducive to precipitation of in situ phosphate. Therefore, Talisman believed that any phosphate present in the quartzarenite sand of the Rock Creek of the Wilson Creek area would be detrital phosphate.

Talisman defined detrital phosphate as having been reworked from its original setting and transported to another location. It disagreed with Nexxtep's contention that soft phosphate grains could not be reworked, since, in Talisman's experience, pristine phosphate grains could survive multiple erosion and redeposition events. Talisman stated that it viewed this as a diagenetic alteration process that could occur in either the Cretaceous or Jurassic, and therefore was not an age indicator.

Talisman noted that only one grain of phosphate in the form of a phosphatic mudclast was found in the drill cuttings of the 02/2-16 horizontal well and no grains of phosphate were found in the sample analysis of the 06-21 well. Talisman stated that the deposit that had been host to the

phosphate grain found in the 02/2-16 well was described by Nexxtep as a sub-angular to sub-rounded quartzarenite. Talisman concluded that such a deposit would have accumulated in a highly turbulent bed load flow regime characteristic of fluvial or estuarine channels, with significant sediment influx and where authigenic phosphate precipitation would be contrary to all definitions expected for phosphate precipitation.

Talisman did not believe that the presence or absence of phosphate was a reliable indicator of the age of sediments, and it believed that no one mineral species could be used as an age indicator if there was a possibility that the mineral could be reworked from the antecedent deposits, especially with limited distance of transport. Talisman stated that phosphate, whether in the form of a mudclast or a peloid, could exist in Cretaceous age deposits that had been eroded from Jurassic age rocks. Talisman noted that in *Decision 95-10* the Board stated that it considered the association of quartzarenite with in situ forms of phosphate throughout a vertical succession as significant in distinguishing the Jurassic from the Cretaceous. Talisman stressed that in this case, in situ forms of phosphate had not been found throughout a vertical succession in any well within the subject pool.

7.2.7 XRD Analysis

Talisman did not submit any XRD analysis but did review and comment on the work done by Nexxtep. Talisman agreed that the XRD analysis identified crystalline material only, that the results were semi-quantitative, and that for more accurate identification the XRD results should be incorporated with other analyses. Talisman stated that it would prefer to perform the XRD interpretation with the digital data over the graph, because the X-ray diffraction was precise and the exact position of the peaks could change one's interpretation.

Talisman believed that XRD was capable of positively identifying crystalline materials, but that experience and judgement were important components of the interpretation. Talisman noted that XRD was a semi-quantitative analysis and expressed concern about the analytical precision in terms of identifying the minerals and the proportions present. Talisman stated that the precision of analysis was a function of the signal to the noise on the diffractogram, so if 10 per cent of a certain mineral was present in analyzed sample, there was relatively low signal to noise, resulting in high uncertainty, whereas at 50 per cent there was a high signal compared to the noise.

Talisman agreed with the interpretation of the presence of phosphates (fluorapatite) in the 16-17 sample only but could not confirm the presence of any phosphate minerals based on the XRD patterns submitted by Nexxtep for the samples from the 02/2-16, 00/6-21, or 02/1-36 wells. Talisman argued that the lack of primary peaks in the analysis resulted in the inability to accurately identify minerals.

7.2.8 Reservoir Pressures and Production Histories

Talisman submitted that the pressure data had limited value for pooling designation, for determining communication between wells in Section 21, and for material balance OGIP calculations, since it was predominantly early time data.

Talisman concluded, however, that the 00/02-16 and 00/06-21 wells were in the same pool based on the available data. It considered any difference in production and pressure trends and declines

in the 00/02-16 and 00/06-21 wells to be due to differing reservoir characteristics and not due to separate pools.

Talisman also concluded that the 00/02-16 and 00/06-21 wells were in a separate pool from the 00/16-21 well based on less pressure depletion at 00/16-21, no production response in the wells when the prolific 00/16-21 well was placed on production, and material balance and decline curve analysis of the 00/16-21 well.

Talisman acknowledged that the depleted pressure at 02/14-21 well may be due to fracture-induced connection within the 02/14-21 wellbore to the depleted Lower Mannville C Pool. Within the wellbore, Talisman mapped 1.5 m of Lower Mannville C sand above 4 m of Rock Creek sand separated by a 1 m shale in the 02/14-21 well (Figure 2b, interval D1). However, Talisman also acknowledged that production from the 00/16-21 well, which it interpreted as Rock Creek, could be the cause of pressure depletion in the 02/14-21 well, since it had been on production for some time, with an estimated current pressure of 6000 KPa.

Talisman did not believe that the recent pressure difference between the 02/14-21 and 00/16-21 wells was sufficient to conclude that pressure depletion at 02/14-21 was not at least in part due to production from the 00/16-21 well, based on modelling it conducted in house but did not submit in evidence. The model involved the expected Lower Mannville C pressures in the upper sand at 02/14-21 and the most recent pressure in the 00/16-21 well in the lower sand. Since the PTA model closely matched the actual pressure buildup data at 02/14-21, Talisman concluded there was more than one hypothesis and suggested that natural communication between overlying Cretaceous sediments could be the cause of pressure depletion at 02/14-21.

It was Talisman's view, based on its in-house modelling mentioned above and on its ability to create a PTA model that closely fit the actual pressure data at 02/14-21, that the pressures in the two sands were different prior to fracture-induced communication. Talisman also believed that Nexxtep's single-layer, single-pressure PTA results were predetermined by the model and inputs used.

Talisman noted that the poor inflow and pressure response upon perforation of the lower sand at 02/14-21 prior to fracture stimulation was not typical of Rock Creek performance in the area and indicated low permeability and/or a depleted reservoir. Talisman also noted that both sands were likely contributing to production at the 02/14-21 well.

Talisman concluded that regardless of whether communication between two formations was completion induced or natural, the resulting pool designation should be based on the zone perforated. In this case it argued that the 02/14-21 well should be designated Rock Creek.

Talisman noted that all Rock Creek pools in the Gilby, Minnehik-Buck Lake, Willesden Green, and Wilson Creek areas were relatively small, with OGIP averaging less than 3 Bcf. It argued that if the C Pool were redesignated as Rock Creek, it would be the largest Rock Creek pool by a factor of at least two.

Talisman believed there was no evidence before the Board that would allow it to make a definitive decision on communication between the wells in Section 21.

7.3 Views of Bonavista

Bonavista expressed a concern that if the Board designated all the productive sands in Section 21 as Mannville, Bonavista would potentially lose its rights to the zone in dispute, but it stated that it was not certain of the consequences of such a redesignation. Bonavista submitted that the producing horizon in the C Pool should not be redesignated as Rock Creek.

Bonavista stated that the deeper rights (i.e., below the base of the Mannville in Section 21) were posted for sale by the Crown because there had been no action taken to preserve those rights. This resulted in the subsequent purchase of the deeper rights and the drilling of the 00/6-21 Rock Creek well. Bonavista subsequently purchased its interest in Section 21. Bonavista stated that prior to the purchase, it had reviewed the available data and had no concerns about the existing designation of the pool.

Bonavista submitted that while the geological evidence in this proceeding was extensive, none had led it to change its geological interpretation. In support of this position it submitted its own interpretation of the pool and jointly sponsored Talisman's palynological evidence.

Bonavista did not dispute the core work done by Nexxtep or Talisman. However, it believed that examination of data not directly related to the wells in question was of limited value, although it used core from the surrounding sections to help determine the position of the Rock Creek subcrop edge.

7.3.1 Stratigraphy and Depositional Environments

Bonavista agreed that the Rock Creek had been deposited within a tidally influenced, extensive open-marine shelf and that within the Wilson Creek area the Rock Creek was a complex set of channellized estuarine deposits.

Bonavista found the Rock Creek to be discontinuous and composed of various sedimentary facies and therefore found it difficult to correlate and map individual sand units within the Rock Creek. Given this geological complexity, Bonavista argued that data distant from the subject wells were not helpful in interpreting the age of the zones in question.

Furthermore, Bonavista stated that in its experience, Rock Creek pools were of small size and did not extend for 2.5 km, as was the case with the C Pool.

Bonavista determined the erosional edge of the Rock Creek to be gradational through the Wilson Creek area, and argued that Nexxtep's interpretation of the producing horizon in the 00/6-21 well as being Rock Creek was not consistent with the erosional pattern it had observed. Bonavista stated that, if the disputed interval in the 00/6-21 well was Rock Creek, there would have to be an extremely deep erosional cut into both the Rock Creek and Poker Chip between the 00/6-21 well and the 00/08-21-043-04W5 well. Therefore Bonavista believed that the general erosional trends it had observed further substantiated its interpretation that the 00/6-21 producing horizon was Ellerslie.

7.3.2 Well Log Analyses and Correlations

In Bonavista's view, the most reliable evidence before the Board for identifying the Rock Creek in this area was from the interpretation of well logs. Bonavista submitted that an upward-fining character on the gamma ray log was indicative of an Ellerslie fluvial channel and that this characteristic was observed in the A1 interval in the 00/2-16 well (Figure 2a). Bonavista therefore interpreted production from this interval in the 00/2-16 well to be Ellerslie.

Bonavista found that in its experience there was neither a consistent rock succession nor a consistent log signature for the Rock Creek that was recognizable over a wide area. It submitted that this was due to repeated channelling within both the Rock Creek and the Ellerslie and the complex geology as seen by multiple sedimentary facies encountered in the 02/14-21 horizontal well (Figure 2b, D1 and D2) it had drilled through the formation.

Bonavista maintained that as pyrite or mineralization could occur in settings other than a major unconformity, it therefore was not completely reliable as an indicator of a major unconformity surface. Bonavista preferred to use similar log characteristics to correlate an unconformity surface and stated that it recognized a pronounced lithologic change, interpreted from the gamma ray and neutron density logs, to indicate the Jurassic/Cretaceous boundary. Bonavista submitted that it recognized and correlated this boundary to be below the C1 interval in the 00/6-21 well, below the D1 interval in the 02/14-21 well, and above the E1 interval in the 00/16-21 well.

7.3.3 Reservoir Pressures and Production Histories

Bonavista submitted limited reservoir engineering data. Bonavista reviewed the data submitted by Nexxtep and made conclusions regarding their significance to the pool delineation application. Bonavista believed the available pressure data to be of adequate quality for P/Z analysis and made conclusions based on its analyses of the data.

Bonavista suggested that the 00/02-16 well, the 00/06-21 C Pool wells, and the 02/14-21 Rock Creek Undefined well appeared to be in communication.

Using the P/Z analysis, Bonavista considered the 00/02-16 and 00/06-21 wells to be in the same pool, although not in the classic sense of communication within a good-permeability reservoir. Bonavista considered the change in slope of the P/Z line to be indicative of a tighter reservoir in contact with more permeable rock near the wellbore, providing more pressure support later in the production history.

Bonavista argued that the 02/14-21 well was not part of the current application and that if interested parties decided at a future point that there was an issue about where the gas was coming from in that well, they could address it at that time.

Nevertheless, Bonavista provided the following regarding the 02/14-21 well. It stated that reservoir communication between the 02/14-21 well and the C Pool was due either to the fracture stimulation within the 02/14-21 wellbore creating a direct connection between the Rock Creek and Ellerslie reservoirs or to natural vertical permeability between the two units. Bonavista initially suggested that this communication might also be a possible cause of the partial initial pressure depletion in the 00/16-21 Rock Creek Q well. However, with the March 27, 2009, submission of new pressure data from the 00/16-21 well, Bonavista concluded that production

from the 00/16-21 well was not being influenced by surrounding production, which it maintained supported its view that the well was in its own pool.

Bonavista interpreted the Lower Mannville C Pool and the 02/14-21 Rock Creek Undefined pool as two separate reservoirs, but believed them to be in some form of communication. Bonavista believed the fracture stimulation likely resulted in reservoir communication between the upper and lower sand.

Bonavista concluded that the Board should determine whether the zones in question were the same zone and the same reservoir, or a dual reservoir in communication forming a single pool. Bonavista submitted that there were other instances of pools being designated as Ellerslie Rock Creek (for example, the Ellerslie B and the Rock Creek C Pools). In the case of the 02/14-21 well, Bonavista believed that the upper sand, the Ellerslie, contributed the majority, and possibly all, of the production from the well. Nevertheless, Bonavista believed pool designations should be defined by the perforations, which in the case of the 02/14-21 well would be Rock Creek.

Bonavista argued that Rock Creek wells declined more rapidly than Ellerslie wells and that production declines in the 00/02-16 and 00/06-21 wells were not typical of Rock Creek wells in the vicinity. It asserted that this characteristic supported the current C Pool designation as Ellerslie, which was interpreted as a channel with better permeability over a longer distance.

Bonavista submitted that the pressure data in its entirety should be given little weight by the Board in its consideration to redesignate the Lower Mannville C Pool as Rock Creek.

7.4 Majority Findings of the Board

The views expressed below are those of Board Members M. J. Bruni, Q.C., and G. Eynon, P.Geol. (the Majority).

7.4.1 Evidentiary Test

The Board is cognizant of the nature of the evidentiary test in this hearing and that the burden of proof in this case is on the balance of probabilities. The Board notes that this burden does not point to the need for conclusive evidence before a change would be contemplated. On this basis, the Board has weighed all the evidence that was presented and makes its decision based on the balance of that evidence. The coordinated, systematic, and multidisciplinary approach provided by the applicant in the presentation of its evidence and the combined utilization put forth by Nexxtep in evidence also assisted in meeting this burden of proof. As a result, the Board finds that the evidence supports the applicant’s case for change for the reasons set out hereafter.

7.4.2 Cores and Drill Cuttings

The Board notes that no cores were cut over the intervals of interest in the wells drilled in Sections 16 and 21. As has been noted in previous decisions, the Board continues to strongly encourage industry to obtain core in areas such as this where stratigraphy is complex and disputes over mineral rights are possible. The Board also believes that there is significant onus on operators to acquire information needed to ensure the best geological interpretation possible.

While the Board believes that core would likely be invaluable to differentiate the Jurassic Rock Creek from the Cretaceous Basal Ellerslie, the absence of core is not an impediment to the Board's assessment of the evidence as presented in this instance.

In the absence of core from the wells in Sections 16 and 21, the Board was presented with evidence based on drill cuttings. While these are less desirable than cores for most analyses, there can be a high degree of confidence that the cuttings represent the proper intervals when correlated to the well logs suites. As a result, the Board considers the various lines of evidence presented using the cuttings to be adequate to reach a decision in this case.

7.4.3 Summary

This summary section is an overview of the Majority findings, which outlines the various evidence the majority of the Board panel used and weighed in its decision. It is followed by a more detailed discussion of those findings.

The Board reviewed the pre-Cretaceous surface structure maps provided by the parties and finds that the paleotopographical high is not likely to have been dissected by Cretaceous channelling on its summit. While there are channels on the flanks of the paleotopographic high that extends towards the summit, the Board does not believe there is sufficient evidence to extrapolate the erosion of the channels up to and atop the high. The maps themselves indicate separate channels draining eastward from both the 08-21 and 09-08 wells, not connecting the two wells from northeast to southwest as suggested by the interveners. The Board finds it more likely for the fluvial sediments of the Ellerslie to have been deposited in the lows adjacent to the paleotopographical high, and the high to have been subsequently overtopped by thin non-reservoir Ellerslie shales and siltstones at the final stages of Ellerslie deposition.

The Board notes the disagreement of the parties as to the age of the intervals of interest in the 00/02-16 well with respect to the palynological evidence and also notes the low degree of confidence that both parties placed on their identification. The Board notes the identification of fossil assemblages of Callovian-Oxfordian age in the well, which are younger than Rock Creek (Bajocian-Bathonian) but considerably older than Lower Cretaceous. The Board finds it likely—given added cumulative evidence with respect to lithology, petrography, mineralogy, and mineralization—that these rocks are of Callovian to Oxfordian age and were deposited in the immediate area considerably earlier than the Ellerslie sediments above the pre-Cretaceous surface, that is, sometime during the 40 to 50 million-year hiatus previously noted.

With respect to the usefulness of well logs in correlation of rock sequences, the Board finds the application of general rules of thumb to be simplistic; visual similarities or dissimilarities with respect to the logs are not sufficient to establish age equivalencies or differences between the sequences of the actual rocks they represent. The Board finds this particularly to be the case with respect to log character and implied environments of deposition assumed from simple log shape rules of thumb, given the varied subenvironments encompassed by terms such as fluvial or tidal plain.

The Board notes that there is a significant pre-Cretaceous unconformity surface, representing a hiatus of some 40-50 million years in duration, with which extensive mineralization is associated. Both parties recognized various mineralization zones, using several lines of evidence. The Board notes that Talisman relied heavily on a high response on the density curve, a definite

low response on the resistivity curve, and a high response on the PE curve, or a combination of these, as evidence for such a mineralization zone. The Board further notes that Talisman identified only a single mineralization zone as being representative of the pre-Cretaceous surface, that being the several-metre-thick zone associated with a coquina within the Rock Creek.

Nexxtep presented evidence from detailed digital geophysical log analysis identifying other mineralized zones, different from the mineralized coquina, but also believed to be of Jurassic age. Nexxtep also identified these mineralized zones through XRD analysis. The Board notes that Nexxtep believes the combined use of XRD and detailed geophysical log analysis reinforces its view of the age of the intervals of interest. The Board places greater weight on the evidence from the detailed log analysis approach, confirmed by XRD and thin section results, employed by Nexxtep, than on the log analysis rules of thumb used by the interveners. Given the presence of mineralized zones at the tops of the intervals of interest confirmed by logs and XRD, the lithological differences identified, and the presence of phosphates confirmed by thin section analysis, the Board finds it more probable that the disputed sands are Jurassic than Cretaceous.

The Board notes that Nexxtep identified features of the lithologies of the Rock Creek and Ellerslie that provide the ability to differentiate the two. Nexxtep described the Rock Creek sandstones as being quartzarenites, while the Ellerslie sandstones are predominantly sublitharenites to litharenites, with readily identifiable differences between the two. The Board notes that Nexxtep identified the Rock Creek sandstones as very fine- to fine-grained, well-sorted, sub-angular to sub-rounded, quartz-cemented or argillaceous quartzarenite, with up to 2 per cent chert and various forms of in situ phosphates. Talisman argued that the lithologies were so similar as to be virtually indistinguishable, given that it considered the Ellerslie sands to have been derived from the underlying Rock Creek by erosion and redeposition. The Board finds that while there are similarities of rock type and it might not be definitive as a sole line of evidence with respect to geological age, the visible differences in framework composition noted above provide a basis to differentiate the Rock Creek and Ellerslie on the basis of lithology.

The Board notes that Nexxtep described a number of types of phosphate occurrence: soft phosphate mudclasts, phosphate matrix, phosphate-coated grains, phosphate intra-clasts, phosphate fossils, and phosphate peloids. The Board further notes the discussion and statements with respect to the definitions of the terms “in situ” and “detrital,” but gives little weight to the semantics. The Board finds that in situ as used in this case refers to the phosphate being precipitated locally and contemporaneously within the overall depositional environment, even though it might have been moved locally—and almost simultaneously in geological terms—from its absolute point of origin to an adjacent locus. The Board recognizes that areas of localized anoxic and reducing conditions would have coexisted with well-oxygenated areas in the tidal environment, which could have been the local sources of phosphatic sediments.

The Board finds the combination of the evidence with respect to the various types and occurrence of phosphates to be helpful; the presence of phosphate as an in situ mineral is indicative of marine deposition and therefore more likely to be deposited in Jurassic age strata, rather than reworked into much later Cretaceous deposits.

The Board agrees with the parties that XRD analysis identifies crystalline material only, the results are semi-quantitative, and XRD identifies the presence or absence of the crystalline

fabric/material but does not define the origin (detrital vs. authigenic/in situ). As noted above in the comments regarding mineralization, the Board finds the presence of fluorapatite to be a significant piece of evidence reinforcing the likelihood of the rocks being of marine origin and therefore of Jurassic age. The Board notes that apatite group minerals require a phosphate precursor or source and the fact that the Jurassic age rocks contain such a source in situ is yet another corroborative piece of evidence.

The reservoir pressures and production history are useful in answering a number of questions, though they do not bear on the age of the reservoir rocks and alone are not definitive for unique formation redesignation of the currently designated C Pool. The Board finds the data are, however, of sufficient quality and quantity to evaluate a number of issues, particularly with respect to pressure communication between these wells and nearby wells and to which wells may or may not be in the same pool.

A more complete analysis of the Majority findings now follows.

7.4.4 Stratigraphy and Depositional Environments

The Board understands that one of the key geological elements with respect to the stratigraphy, both regionally and locally, is the pre-Cretaceous unconformity. The parties' regional mapping of the pre-Cretaceous surface illustrates the extent of erosion of Jurassic and Mississippian units, indicating areas to the north, east, and south of the local Wilson Creek area where the Jurassic and Mississippian units have been eroded.

The parties identified and agreed that in the Wilson Creek area several formations are exposed at the pre-Cretaceous unconformity. Locally the paleo-highs are topped with the Jurassic Rock Creek, and the erosional surface progressively exposes Jurassic Poker Chip and Nordegg Formations and the Mississippian Pekisko and Banff Formations (Pekisko and Banff respectively). The Banff forms the floor of the valleys adjacent to the Wilson Creek high on the pre-Cretaceous unconformity. Basal Cretaceous rocks, locally represented by the terrestrial deposits of the Ellerslie, infill the local topography.

Poker Chip

The Board notes that the parties disagreed over the use of the thickness of the Poker Chip with respect to determining the nature of the overlying rocks.

The Board notes that Poker Chip varies in thickness below the Rock Creek and thins to zero below the pre-Cretaceous surface. The Board finds that the Poker Chip sits disconformably above the Nordegg and disconformably below the Rock Creek in stratigraphic sequence. As noted above, the Poker Chip subcrops at the pre-Cretaceous surface, where it is overlain locally by the Ellerslie in the Wilson Creek area.

The Board does not consider the thickness of the Poker Chip to be an indicator of the age of the overlying deposit.

Rock Creek

The Rock Creek sits disconformably above the Poker Chip and unconformably below Cretaceous rocks, which include the Ellerslie.

The only description of the depositional environment of the Rock Creek was that submitted by Nexxtep, which described it as marine deposits in a tidal setting. Nexxtep identified a number of depositional subenvironments in the Rock Creek. Where Nexxtep characterized the reservoirs as a series of predominantly tidal channel sand deposits, it made reference to areas such as Chesapeake Bay as likely modern-day analogs. As in such tidal areas, Nexxtep described the overall tidal environment as including associated deposits of non-reservoir-quality rocks, some of which would have been ponded marshes and backwaters with anoxic and reducing conditions. Given the inherently better preservation potential of the tidal channel sands, much of the associated facies would have been eroded and some of the sediments incorporated into the predominantly sandy tidal facies.

The interveners did not dispute this model, and the Board accepts this as a reasonable interpretation of the depositional setting for the Rock Creek in the Wilson Creek area.

Ellerslie

With respect to the depositional setting of the Ellerslie, the Board notes that both Nexxtep and Talisman envisioned the Ellerslie to be deposited unconformably on a pre-Cretaceous surface, which itself represents a 40 to 50 million-year hiatus (that is, a break in the continuity of the geological record, creating an absence of rocks in a stratigraphic sequence that were either not deposited or were eroded before the deposition of the overlying rocks).

Locally in the Wilson Creek area, the pre-Cretaceous surface forms a paleotopographic high capped predominantly by resistive Rock Creek. The parties similarly agree that a paleo-valley system was developed adjacent to the paleotopographic high, with channelling extending into it. The Board observes that the relative elevation from valley floor (where the Mississippian Banff subcrops) to the top of the paleotopographic high (where the Rock Creek is predominant) is some 80 m at its greatest locally.

Both parties envision the topography as being infilled with early Cretaceous fluvial/estuarine sediments. The parties disagree as to whether Ellerslie sediments were deposited over the top of the high in the area in dispute.

Nexxtep interprets the top of the high to be capped by resistive Rock Creek reservoir. Nexxtep further argues that channelling with Cretaceous fluvial depositional fill does not extend fully to the crest and that only thin non-reservoir Ellerslie shales and siltstones were deposited as the final stage of infill locally. The thicker Basal Ellerslie sediments were deposited in the valleys adjacent to the main paleotopographic high.

Talisman, on the other hand, envisioned a system of Ellerslie erosion and channelling that dissected the paleotopographic high right up to and over its crest, with early Cretaceous fluvial/estuarine sediments deposited within those channels.

The Board reviewed the pre-Cretaceous structure maps submitted by the parties and finds that the paleotopographical high is not likely to have been dissected by Cretaceous channelling over its summit. While there is channelling filled with Ellerslie deposits that extends towards the paleotopographic high, the Board does not believe there is sufficient evidence to extrapolate the erosion of the channels up to and over the top of the high. The sub-Cretaceous unconformity structure maps provided by the parties indicate separate channels draining due eastward from both the 08-21 and 09-08 wells, not connecting the two from northeast to southwest as suggested by the interveners and not penetrating the topographic high.

The Board finds it much more likely for the fluvial sediments of the Ellerslie to have been deposited in the lows adjacent to the paleotopographical high and for the high to have been subsequently overtopped by thin non-reservoir Ellerslie shales and siltstones at the last stages of Ellerslie deposition.

7.4.5 Palynology

The Board notes that palynology could provide valuable diagnostic, perhaps even definitive, information as to the age of reservoir rocks in dispute by the parties. The best situation would be to have palynological information from samples obtained from cores cut from the disputed strata in the wells under dispute.

The assemblages reported by Nexxtep and Talisman from core samples elsewhere—outside Sections 16 and 21—demonstrate that Jurassic and Cretaceous strata can be differentiated on the basis of the palynomorphs present given core availability.

That definitive age dating from the palynology might be possible is evident from the facts that both Nexxtep and Talisman agree substantially on presence and identification of Cretaceous and Jurassic palynomorphs and that the assemblages reported by both palynologists are complementary, rather than contradictory.

However, with no cores in any of the wells in either Section 16 or 21, the palynology information from the 02/2-16 well is the most germane to the age of the pool in dispute. However, the parties disagree as to the ages of the rocks based on palynology. Talisman identified assemblages from samples at 2075 m to 2090 m MD as Cretaceous, but with a low confidence level, and the sample at 2095 m MD as containing both Cretaceous and Jurassic forms, again with low confidence. Talisman identified a possible early Jurassic form at 2095 m MD and acknowledged samples below 2090 m MD as potentially Jurassic, and on this basis it agreed that the B2 and B3 intervals (Figure 2a) in the 02/2-16 well were Jurassic.

Nexxtep, on the other hand, identified Jurassic palynomorphs in samples from the 02/02-16 well at 2085 m, 2090 m, and 2095 m MD, but also with low confidence. Using the depth-of-last-appearance principle as a reliable method of inference in using cuttings samples, Nexxtep concluded that the evidence supports a Jurassic age for the specific sand (B1) occurring at 2083 m to 2089.5 m MD. Nexxtep correlates this portion of the 02/02-16 well with the disputed horizon in the 00/02-16 well, specifically the sand (A1) at 2066 m to 2073 m TVD, and therefore believes the disputed zone to be of Jurassic age.

Talisman disagreed with Nexxtep’s correlation on the basis of log character or log curve shape; specifically the lack of similarity of shapes of the logs over the two sets of sands in question.

While the Board agrees that the log character of the two wells is quite dissimilar, it also finds that reliance on the similarity or otherwise of log character or curve shape is an inadequate technique for stratigraphic correlation without other more scientific lines of evidence. Further discussion of this finding occurs in the next section.

The Board notes that Talisman and Nexxtep agree that the age of the Rock Creek is Bajocian. The Board notes that dinoflagellates the parties identified as Jurassic (or possibly Jurassic, in the case of Talisman) at and below 2085 m MD in the 02/2-16 well are representative of Callovian to Oxfordian assemblages and are therefore younger than Bajocian.

Talisman interprets these to be fossil assemblages that have been reworked locally into basal Ellerslie deposits during early Cretaceous times from Jurassic rocks that are no longer present in the Wilson Creek area.

The Board notes that while no evidence was presented by either party with respect to the specific local presence of late Middle to Late Jurassic strata, the Callovian to Oxfordian age determination from the palynology is, in and of itself, evidence of such deposition.

The Board finds it likely, given additional lines of evidence with respect to lithology, petrography, mineralogy, and mineralization, that these specific rocks are of Callovian to Oxfordian age and were deposited in the immediate area prior to Ellerslie deposition on the pre-Cretaceous surface, that is, during the 40 to 50 million-year hiatus previously noted.

7.4.6 Geophysical Log Character and Mineralized Zones

The Board notes that simple petrophysical log curve shape or character and more detailed digital geophysical log data analysis were presented in evidence by the parties. The Board notes that log shape or character has been used both as evidence of depositional environment and as a well-to-well correlation tool. The Board further notes that both visual inspection of the log displays and digital analysis of the raw data have been used to identify mineralized zones.

Log Shape or Character

The Board notes that both the applicant and the interveners placed considerable reliance on geophysical log shape and character to correlate from well to well and to identify depositional environments of the sands in the various stratigraphic units under dispute.

For example, it was suggested that, locally at least, a fining-upward log character on the gamma ray log is indicative of deposition in a fluvial environment and is therefore evidence of Mannville age, and similarly that coarsening-upward indicates a marine environment and Jurassic age.

The Board acknowledges that well log interpretation, used to a significant degree in areas where logs are routinely available and where other more definitive options are not available, often forms the basis for correlation of litho-stratigraphic zones. However, the Board does not consider such correlations to be definitive for chrono-stratigraphic purposes, especially in the absence of actual rock data.

While noting, for example, that a fining-upward sequence identified on logs can be indicative of a type of channel-fill process if corroborated by core examination, the Board finds that log curve shape or character is not a definitive means of determining the specific depositional environment of rock sequences. The Board further notes that channel fills occur in a wide variety of depositional settings: fluvial, estuarine, tidal, and marine. The Board also notes that not all channel fills are fining upwards. Furthermore, the Board does not accept that log character or shape can be used definitively to establish geological age simply through similarity of shape from one well to another, particularly in areas of complex geology.

The Board agrees with Nexxtep that in shallow coastal systems many environments will result in fining-upward sequences. Nexxtep noted that tidal flats are one of the most common, where the sequence moves from sand flats to mixed sand and mud to mud flats. It also noted the presence of point bars in lateral accretion deposits in estuaries and bay-head delta areas. The Board also agrees with Nexxtep that the term “turbidite” (a deposit laid down by a turbidity current) is not restricted to deep marine environments and is also associated with shallow water deltaic deposits.

The Board finds that many environments form fining-upward sequences and, therefore, does not place much weight on such evidence, especially when the trends on the gamma ray logs are subtle at best.

The Board notes the stated differences between the sand sequences under dispute in the 00/02-16 and 02/02-16 wells, particularly with respect to the number of sands present and their varying shapes or characters.

The Board finds, however, that simple visual dissimilarities with respect to the logs are not sufficient to establish age differences between the sequences of actual rocks they represent.

Log Analysis and Mineralization

The Board notes that both Talisman and Nexxtep agree that mineralization is often present at various surfaces that represent unconformities, disconformities, and depositional hiatuses. The Board further notes that such mineralization was formed during extensive exposure of the surfaces. The Board also notes that mineralization zones can be of varying thickness (from millimetres to metres) and of different mineralogy.

The Board notes that throughout most of Alberta, there is a significant pre-Cretaceous unconformity surface with which extensive mineralization is associated. As noted previously, this particular hiatus was of 40 to 50 million years in duration. The Board also notes that with most depositional sequences, less obvious mineralization occurs within the stratigraphic sequences both above and below this major unconformity surface. The Board notes too that the parties agreed that smaller, shorter duration, local hiatuses are common in most depositional environments and that the Wilson Creek area is no exception.

Both Nexxtep and Talisman recognize various mineralization zones, using several lines of evidence. The Board notes that Talisman relied primarily on the presence of at least two of the following as indicators of a high concentration of mineralization: a high response on the density curve, a definite low response on the resistivity curve, and a high response on the PE curve.

Both Nexxtep and Talisman recognize a zone of mineralization to be present below the disputed interval from the log responses in both the 00/2-16 and 00/6-21 wells. The Board notes that this zone of mineralization is 3 m to 4 m thick in both wells and agrees that it represents a hardground formed during an extensive period of exposure. Both parties agree that the primary rock constituent of this zone appears to be a coquina.

The Board notes that Talisman believes this zone of mineralization, located at the base of the disputed interval in the 00/2-16 and 00/6-21 wells, represents the Jurassic/Cretaceous unconformity surface and that since the producing horizons in the C Pool are above this surface, they must be of Lower Cretaceous Ellerslie age.

The Board notes that Nexxtep also identifies mineralization immediately at or below the pre-Cretaceous unconformity, but that it does not believe it to be represented solely by the thick coquina with extensive mineralization noted above.

Nexxtep presented evidence from detailed digital geophysical log analysis identifying other mineralized zones that are different from the lower mineralized coquina, but are also believed to be of Jurassic age. Nexxtep also identified these mineralized zones through XRD analysis (discussed below). The Board notes that Nexxtep believes the combined use of XRD and detailed geophysical log analysis reinforces its view of the age of the intervals of interest.

With respect to the detailed digital geophysical log analysis, Nexxtep argued that the log response to mineralization could not be properly identified purely through visual analysis and rules of thumb. Nexxtep further argued that the log response from mineralized zones is influenced by both the degree or amount of mineralization, the composition of the minerals present, and the thickness of the mineralized zone. Nexxtep identified mineralized zones in cores ranging in thickness from less than 30 cm to more than 3 m, and it stated that mineralized zones at the lower end of this range, with a less obvious geophysical log response, are nevertheless readily identifiable.

Nexxtep provided XRD analysis of the mineralized zones and identified the specific minerals present as mainly pyrite, with local ankerite (Ferroan-dolomite) and marcasite (an unstable form of pyrite), local calcite, siderite, apatite, and fluorapatite. Nexxtep considered the presence of apatite group minerals, observed to be concentrated in the mineralized zones, as highly significant, as the apatite group minerals require a source of phosphate in order to be formed, and Nexxtep considered the phosphates present in the marine Jurassic rocks to be the likely source.

The Board places greater weight on the evidence from the detailed log analysis approach, confirmed by XRD and thin section results employed by Nexxtep, than on the rules of thumb used by the interveners.

Given the presence of mineralized zones at the tops of the intervals of interest confirmed by logs and XRD, the quartzarenite lithology discussed below, and the presence of phosphates confirmed by thin section analysis also discussed below, the Board finds it more probable that the disputed sands are Jurassic rather than Cretaceous.

7.4.7 Lithology, Petrography, and Mineralogy

The Board finds that the combination of lithologic, petrographic, and mineralogical analyses presented is sufficient to differentiate between the Jurassic and Cretaceous sandstones in question.

Quartzarenite vs. Litharenite

The parties agreed that the predominant lithology of the Rock Creek is quartzarenite, with 2 per cent rock fragments including chert (although as much as 3 per cent in a few samples). They also agree that the Ellerslie is predominantly sub-litharenite to litharenite, with up to 10 per cent rock fragments. Both parties agree that the Ellerslie can also be a quartzarenite, but with as much as five times more rock fragments including chert.

Talisman argued that the lithologies were so similar as to be virtually indistinguishable, given that it considered the Ellerslie to have been derived from the underlying Rock Creek by erosion and redeposition.

The Board notes, however, that Nexxtep identified other features of its lithologies that provide the ability to differentiate the two. Nexxtep described the Rock Creek as being quartzarenites, while the Ellerslie is predominantly litharenites, with readily identifiable differences between the two.

The Board notes that Nexxtep identified the Rock Creek as very fine- to fine-grained, well-sorted, sub-angular to sub-rounded, quartz-cemented or argillaceous quartzarenite, with up to 2 per cent chert and various forms of in situ phosphates.

Nexxtep described the Ellerslie as primarily of sub-litharenite to litharenite composition, usually as having a "salt and pepper appearance." It noted that that the Ellerslie was more chert-rich than the Rock Creek, but acknowledged that it could also be a quartzarenite, although it typically had a higher percentage of rock fragments (1 to 3 per cent greater) than the Rock Creek. Nexxtep also noted that the grain size of the Ellerslie was typically coarser than the Rock Creek, the sorting typically not as good, and the cements, while similar mineralogically, not as common as in the Rock Creek.

The Board finds that while there are similarities of rock type and it might not be definitive as a sole line of evidence with respect to geological age, the visible differences in framework composition noted above provide a basis to differentiate the Rock Creek and Ellerslie on the basis of lithology.

Other aspects of the mineralogy of the rocks, particularly the issue of specific precursor minerals to phosphates, are discussed below.

7.4.8 Occurrence of Coal

The parties agree that the presence of coal can be a useful feature to distinguish Ellerslie units from Rock Creek on the basis of the rock alone.

The Board notes that the sample description of the 00/2-16 well (written in 1980 when the well was being drilled) indicates the presence of minor coal within the disputed interval. However, the Board is mindful of the fact that the report is some 28 years old and that the well site geologist was not present at the hearing to speak to his geological report.

Talisman believes this description of minor coal to be definitive evidence of Cretaceous age. Nexxtep identified the possibility of the occurrence coal, as described in the report, to be from caving of uphole material and stressed the fact that no physical samples are available.

The Board also notes this occurrence of coal to be a singular piece of evidence and, in the absence of either visual corroboration or direct evidence from the well site geologist, gives this line of evidence little weight.

7.4.9 Occurrence of Phosphates

The presence or absence of phosphate in the sandstones is a challenging issue, more especially with respect to the semantics of definition and use of the term in situ.

Presence of Phosphates

The Board notes that both parties defined "in situ phosphate" as formed by chemical precipitation from the water column at or immediately below the sediment water interface. The Board also notes that phosphate precipitation occurred in anoxic or reducing environments with low sedimentation rates, but that this is not wholly inconsistent with an overall tidal depositional environment. As previously noted, the Board recognizes that the tidal environment as envisaged—the Chesapeake Bay analogy—includes tidal marshes and backwaters with just such anoxic or reducing conditions.

As previously discussed, the Board notes that Nexxtep provided XRD analysis of the mineralized zones, identifying the specific minerals present with particular reference to apatite group minerals. The Board notes that in doing so it considered the presence of apatite, which it observed to be concentrated in the mineralized zones, as highly significant, since it requires a source of phosphate for it to be formed, and that Nexxtep believes the presence of phosphate and/or phosphate-precursor minerals to therefore be indicative of Jurassic age, since these rocks are predominantly of marine depositional origin.

The Board notes Talisman's view that the phosphate in the sandstones could be the product of erosion of the Jurassic and redeposition in the Ellerslie.

Types of Phosphates

The Board notes that Nexxtep described a number of types of phosphate occurrence: soft phosphate mudclasts, phosphate matrix, phosphate-coated grains, phosphate intra-clasts, phosphate fossils, and phosphate peloids.

The Board notes the parties' discussion and statements with respect to the definitions of the terms "in situ" and "detrital," but gives little weight to the semantics. The Board finds that the term "in situ" as used in this case refers to the phosphate being precipitated locally and contemporaneously within the overall depositional environment, even though it might have been

moved locally, and almost simultaneously in geological terms, from its absolute point of origin to an adjacent locus.

The Board notes, as previously discussed, that it recognizes that areas of localized anoxic and reducing conditions would have coexisted with well-oxygenated areas in the tidal environment, which could have been the local sources of phosphatic sediments.

The Board further notes Nexxtep's argument with respect to the mechanical and chemical stability and the preservation potential of the types of phosphate it described that it is highly unlikely for such types of phosphate to survive successive cycles of deposition, erosion, and redeposition.

The Board notes Nexxtep's argument with respect to the optical properties of in situ phosphates as being soft and inclusion free, in contrast to the detrital phosphate being inclusion rich and having abraded grain margins. The Board notes that the phosphate found in the 02/02-16 well appears to be slightly compacted between more resistant quartz grains, indicating the soft, clean, and inclusion free nature suggestive of an in situ origin.

The Board finds the combination of the evidence with respect to the various types and occurrence of phosphates to be phosphate as an in situ mineral is indicative of marine deposition and therefore more likely to be deposited in Jurassic age strata, rather than reworked into much later Cretaceous deposits.

7.4.10 XRD Analysis

The Board agrees with Nexxtep and Talisman that XRD analysis identifies crystalline material only, the results are semi-quantitative, and XRD identifies the presence or absence of the crystalline fabric/material but does not define the origin (detrital vs. authigenic/in situ). The Board finds that the interpretation can be very accurate with respect to the presence or absence of certain mineral, but not its amounts within the sample. The Boards agrees that in order to correctly identify the presence of certain minerals, the diffractogram has to show the presence of primary and secondary picks, with adequate picks placement and intensity, which are characteristic and unique for each mineral. However, the Board recognizes that the secondary or even primary peak picks may not be clearly identified when the mineral is present in small amounts, is poorly crystalline, or has some substitutions or when another mineral with a partially similar pattern is present in the analyzed sample. In these cases, an additional analysis is required to confirm the minerals present.

The Board agrees with Nexxtep's interpretation for the presence of fluorapatite in the 00/16-17 well. The Board acknowledges the disagreement between the parties with respect to the XRD interpretation for the 25.9 peak in the 02/02-16 well and other wells, identified as an apatite-group mineral by Nexxtep and as a K-feldspar group mineral by Talisman. The Board disagrees with Talisman's interpretation, given the absence of primary K-feldspar peaks on the diffractograms. The Board agrees that the interpretation of the XRD data would be more precise if the digital data were available.

As noted above in the sections on mineralization, the Board finds the presence of fluorapatite to be a significant piece of evidence reinforcing the likelihood of the rocks being of Jurassic age. The Board notes that apatite group minerals require a phosphate precursor or source and that the

fact that the Jurassic age rocks contain such a source in situ is yet another corroborative piece of evidence.

The Board Majority has weighed all the evidence presented and makes its decision based on the balance of that evidence. The coordinated, systematic, and multidisciplinary approach provided by the applicant in the presentation of its evidence assisted in meeting this burden of proof. As a result, the Board finds that the evidence supports the applicant's case for change for the reasons set out above.

7.5 Minority Findings of the Board

The views expressed below are those of Acting Board Member C. A. Langlo, P.Geol. (the Minority).

7.5.1 Evidentiary Test

The Minority of the Board (Minority) recognizes that its decision is based on the balance of probabilities and agrees that all the evidence must be carefully considered and a decision made based on the balance of that evidence. The Minority notes that mineral rights for the Lower Mannville and Jurassic intervals have changed ownership over time and also notes that the C Pool has been on continuous production since 1994. The Minority believes that redesignating the C Pool will have significant consequences for the parties involved. The Minority also recognizes that the elements of this decision will influence future zone and pool designations in this area.

7.5.2 Minority Decision

The Minority finds that the applicant and the interveners submitted thoroughly researched technical evidence that indicates commitment and superior knowledge of the subject matter presented to the panel during the hearing. The submissions reinforce how difficult it is and has been historically to differentiate the Rock Creek from the Ellerslie. In this case, the Minority finds that the evidence presented does not support the redesignation of the Wilson Creek Lower Mannville for the C Pool.

In summary, for the following reasons, discussed in more detail in the sections that follow, the Minority finds that the evidence presented does not support the application to redesignate the disputed interval in the wells in Sections 16 and 21-43-4W5:

- the palynological data available from the 02/02-16 well, which supports an Ellerslie age for the disputed interval (see Palynology);
- the evidence of Cretaceous channelling into the Rock Creek paleotopographic high, which supports the view that Ellerslie sediments are present across the high (see Ellerslie);
- the log character of the 00/2-16 well, which is indicative of channel deposition within the Ellerslie (see Stratigraphy and Depositional Environments);
- the presence and location of confirmed mineralized zones at the base of the intervals in question and interpreted to represent the pre-Cretaceous unconformity in the wells in question (see Geophysical Log Character and Mineralized Zones);
- the lack of well log correlation between the 02/2-16 and the 00/2-16 wells (see Log Shape or Character); and

- the uncertainty regarding the source of the samples used in the petrographic analysis for the 02/02-16 and 00/06/21 wells and their use to determine age of the sediments in question (see Petrography, Mineralogy, and Lithology),

7.5.3 Cores and Drill Cuttings

The Minority agrees with the Majority regarding the need to strongly encourage industry to obtain core in areas such as this where the stratigraphy is complex and disputes over mineral rights are possible. While the Majority is of the view that the absence of core is not an impediment to the Board's assessment of the evidence, the Minority believes that in this instance core over the intervals in dispute would be invaluable to differentiate the Rock Creek from the Ellerslie.

The Minority also agrees that evidence from drill cuttings can be useful in the absence of core, but finds in this case that the absence of drill cuttings specific to the wells and zones in dispute limits use of that evidence.

The Minority believes, in accordance with Board findings in *Decision 95-10*, that well log signature can be useful and, in the absence of other information, can be used to define zones on the basis of correlation. This is discussed in more detail under Geophysical Log Character and Mineralized Zones.

7.5.4 Stratigraphy and Depositional Environments

The Minority accepts the description of stratigraphy as noted by the Majority findings with the following qualification.

The Minority is satisfied that the evidence shows that there are areas of erosion that cut across the paleotopographic high in and adjacent to the area of interest. Specifically, the Minority notes that the wells located at 00/09-08, 00/08-21, 00/6-22, and 02/01-06-43-04W5, most of which are cored, show significant Ellerslie erosion and channelling into the Rock Creek and Poker Chip.

Poker Chip

The Minority concurs with the Majority that the thickness of the Poker Chip cannot be used as a reliable indicator of the age of the overlying deposits. The Minority observes that because the Rock Creek sits disconformably on the Poker Chip, erosion of the Poker Chip would be expected. The Minority also notes this view is supported by the evidence of Talisman.

Rock Creek

The Minority agrees with the Majority on the depositional model for the Rock Creek as presented by Nexxtep.

The Minority notes that the Rock Creek in the Wilson Creek area is compartmentalized into multiple separate reservoirs and that Nexxtep interpreted this to be due to estuarine Rock Creek sands being cut by estuarine channels and feeder channels. However, Nexxtep believed that the estuarine channels did not form a complete reservoir barrier. The Minority notes that Talisman believed that the Rock Creek was also compartmentalized into multiple pools by channel erosion

and subsequent deposition of separate Ellerslie sands within the channels. The Minority further notes that the Q Pool (00/16-21 well) is a separate reservoir from the C Pool as a result of Ellerslie channelling into the Rock Creek.

Ellerslie

The Minority accepts the description of the depositional setting for the Ellerslie as presented in the Majority findings and agrees that the debate centres on the extent of pre-Cretaceous erosion of the Rock Creek topographic high.

The Minority notes that Talisman envisioned a system of Ellerslie erosion and channelling that extended across the paleotopographic high, with early Cretaceous fluvial/estuarine sediments deposited within the resulting channels, and that this model was based on the paleotopography of the Western Canadian Sedimentary Basin at the onset of Cretaceous time. The Minority further notes that the abundance of coal in the Ellerslie sediments off the paleotopographic high indicates that a warm and moist environment existed that was likely characterized by abundant rainfall, which would support fluvial erosion of the highland areas.

The Minority observes that Talisman's map of the structure on the pre-Cretaceous unconformity (exhibit C-23, tab C) acknowledges the thinning and channelling of the Rock Creek. This channelling trends from Section 9-43-4W5 through the subject wells in Sections 16 and 21 to the 00/8-21 well, where it interprets the Rock Creek as completely eroded. The Minority notes that Talisman's mapping illustrates the presence of a system of channels within Sections 16 and 21.

The Minority does not agree with the Majority that it is necessary for Lower Cretaceous channelling to have completely cross-cut and eroded channels over top of the paleotopographic high. Based on the pre-Cretaceous structure maps and Rock Creek net sand maps, the Minority notes that Nexxtep maps a thinning trend in the Rock Creek, to as little as 1.5 m in the 00/9-8 well, within what appears to be a channel-shaped feature that is about one section wide and extends from the zero edge of the Rock Creek well into the paleotopographic high (Exhibit B-6, tabs 4 and 6). The Minority notes that Nexxtep's thinning trend is in the same locality as the channel mapped by Talisman. The Minority believes that the most reasonable explanation for the thinning of the Rock Creek into the centre of the paleotopographic high is Cretaceous channel erosion.

The Minority compared Nexxtep's interpreted Rock Creek thickness (Exhibit B-6, tab 4) with the well logs of two adjacent wells, the 00/01-8-43-4W5 (00/1-8) well and the 02/01-8-43-4W5 (02/1-8) well (see Figure 1) and notes that the Rock Creek in the 00/1-8 well is almost 10 m thicker than in the 02/1-8 well, and conversely that the Ellerslie in the 02/1-8 well is 10 m thicker in the 00/1-8 well. The Minority believes that this is further evidence of channelling through the Rock Creek and deposition of Ellerslie within the channel.

7.5.5 Palynology

The Minority agrees with the Majority view that palynology could provide valuable diagnostic, perhaps even definitive, information as to the age of reservoir rocks in dispute and that the best situation would be to have palynological information from samples obtained from cores cut over those intervals.

The Minority also agrees that the assemblages reported by Nexxtep and Talisman from core samples in wells adjacent to the wells in dispute demonstrate that Jurassic and Cretaceous strata can be differentiated on the basis of the palynomorphs present.

The Minority notes Nexxtep's argument that its palynological information from the drill cutting samples of the 02/2-16 well is the most direct evidence of the age of the C Pool.

The Minority reviewed Nexxtep's palynological analysis of 02/02-16 well (exhibit B-17) and notes that within a host of abundant Cretaceous palynomorphs, only a small and questionable assemblage of Jurassic age diagnostic fossils were identified, with a low degree of confidence. The specimens identified from 2085 m to 2095 m MD (B1 interval, Figure 2a) include

- 2085 m MD, *Scriniocassis dictyotus*, one specimen;
- 2090 m MD, *Mendicodinium* cf. *groenlandicum*, single specimen; *Stephanelytron redcliffensis*, single specimen; and *Endoscrinium luridum*, questionable specimen; and
- 2095 m MD, *Scriniodinium crystallinum*, questionable specimen.

The Minority notes that Nexxtep identified these palynomorphs as being of Jurassic, but not Rock Creek, age using the depth-of-last appearance principle as a reliable method of inference in using cuttings samples.

The Minority further notes that Talisman and Nexxtep both agreed that if this assemblage were in situ, the age of the deposit from 2085 m to 2095 m MD (B1 interval in Figure 2a) would be Callovian to Oxfordian, which is younger than Bajocian age Rock Creek (Figure 3). The Minority also notes that although Nexxtep originally submitted that this fossil assemblage was in situ, it later suggested that the fossils were likely to be uphole cavings and therefore out of place. The Minority observes that there are no Callovian-Oxfordian beds interpreted by any of the participants to be overlying the disputed interval (B1 interval, Figure 2a) in the 02/02-16 well and concludes that there is therefore no opportunity for these fossils to be uphole cavings from younger Jurassic rocks.

The Minority finds it very important that the geological community recognizes a major erosional hiatus to have occurred in the Western Canadian Sedimentary Basin during Callovian-Oxfordian time, meaning that deposits of this age have been eroded and are not expected to be present in the Wilson Creek area. It also notes that the existence of Callovian-Oxfordian deposits was not proposed to be present in the Wilson Creek area by any of the participants. The Minority also notes that no evidence was presented to support the presence of marine Callovian to Oxfordian age deposits in any of the surrounding cored or uncored wellbores and finds it therefore unreasonable to conclude that a remnant of a marine deposit of this age would be preserved only in the B1 interval in the 02/02-16 well. The Minority concludes, as argued by Talisman, that the Jurassic palynomorphs interpreted to be present in the drill cuttings in the B1 interval of the 02/02-16 well represent fossils that were eroded and redeposited in sands of Lower Cretaceous age. In support of its view that recycling of older sediments does occur, the Minority notes that a single Triassic fossil was found within a sample from the Poker Chip at 2120 m MD 10 m below the base of the B3 interval (Figure 2a).

The Minority notes that Nexxtep correlates the B1 interval of the 02/02-16 well with the disputed horizon (A1 interval) in the 00/02-16 well and therefore believes the disputed zone in 00/02-16 to be of Jurassic age.

The Minority is not satisfied that the log data available support correlation of the A1 and B1 intervals between the two wells. Given the predominance of Cretaceous age palynomorphs in the B1 interval samples, the Minority does not find that the palynological evidence of the 02/2-16 well supports the interpretation of the age of the A1 interval in the 00/2-16 well as Jurassic.

7.5.6 Geophysical Log Character and Mineralized Zones

The Board notes that petrophysical log curve shape or character and more detailed digital geophysical log data analysis were presented in evidence by the parties. Log shape or character was used both as evidence of depositional environment and as a well-to-well correlation tool. The Minority further notes that both visual inspection of the log displays and digital analysis of the raw data have been used to identify mineralized zones.

Log Shape or Character

The Minority notes that log signature has been accepted in prior decisions as useful in the absence of other information and believes that it is useful in this instance. The Minority accepts that while digital analysis of log data can provide more detail regarding the assessments being done, it is also possible to obtain reasonable estimates of both reservoir parameters and lithology, including the identification of mineralized zones, using log curve readings and manual analysis. While digital analysis provides more data and in a more detailed form, the Minority is satisfied that the same log analysis models and reservoir parameter equations can be applied to the evaluation of well log data from hardcopy well logs. Further, while encouraging the best possible evaluations, the Minority is hesitant to recommend one form of log analysis over another.

The Minority finds that as there are no samples from the 00/02-16 well for analysis, well log interpretation is the only data available to use to interpret the depositional environment of the disputed zone. The Minority acknowledges that both the applicant and the interveners placed considerable reliance on geophysical log shape and character both to correlate from well to well and to identify depositional environments of the sands in the various stratigraphic units under dispute. The Minority accepts this as a reasonable approach.

The Minority notes that Nexxtep, Talisman, and Bonavista all agree that fining-upward log character on the gamma ray log was generally indicative of Mannville fluvial deposition and that Nexxtep and Talisman believe that upward-coarsening sequence indicates a marine environment, while Nexxtep believes a blocky gamma ray log shape is also indicative of marine deposition. The Minority notes that both Bonavista and Talisman interpret the A1 interval (Figure 2a) in the 00/2-16 well to have an upward-fining character on the gamma ray log over the disputed interval and interpret that this indicates fluvial deposition and Mannville age. The Minority notes that Nexxtep believes that the log character of the disputed interval has a blocky shape, which it believed to be indicative of a marine deposit. However, Nexxtep acknowledged that the digital log analysis of the 00/2-16 well indicated that the poorer quality rock occurred in the top layer of the disputed interval, while generally the other wells indicated a higher porosity rock in the top layer of the Rock Creek.

The Minority does not believe that blocky gamma ray log signature is exclusively indicative of a marine deposit, but does believe that both blocky and upward fining gamma ray log character can also be reflected in fluvial deposition. The Minority agrees with Talisman and Bonavista that the gamma ray log of the disputed interval (A1, Figure 2a) of the 00/2-16 well exhibits an upward-fining character and that there is also an upward decrease of porosity, as noted by Nexxtep.

The Minority notes that the log characters of the 00/02-16 and 02/02-16 wells are very different. The Minority is aware that fluvial geomorphology is very complex and sediments can change from well to well within the same depositional environment. The Minority observes that the there is a 3 m shale unit below the B1 interval that is not present in the 00/02-16 well and that the log character of the A1 interval (Figure 2a) of the 00/02-16 well is different from that of the B1 interval of the 02/02-16 well. The Minority does not find that the A1 interval of the 00/02-16 well correlates with the B1 interval and underlying shale of the 02/02-16 well. As noted in the discussion of palynology, the Minority finds that the B1 interval is Cretaceous and interprets that both the A1 and B1 intervals are sediments of Cretaceous age deposited within a fluvial channel environment.

The Minority finds that the geophysical log character of the A1 interval in the 00/2-16 well is indicative of fluvial Mannville deposition and that this is in agreement with the interpreted fluvial channelling seen in the structure map on the pre-Cretaceous unconformity surface provided by Talisman.

7.5.7 Log Analysis and Mineralization

The Minority notes that both Talisman and Nexxtep agree that a mineralized surface is often present at unconformity surfaces and that the mineralization was formed during an extensive period of exposure and erosion such as had occurred during the erosional and depositional hiatus that followed the Jurassic Period, e.g., the Jurassic/Cretaceous unconformity. The Minority also notes that both parties agree that the presence of a high concentration of pyrite mineralization would be reflected on the well logs as a low-resistivity response, a high-density log response, and a separation of the neutron density curves. The Minority agrees that this log response would be a dependable criterion, and in fact a best-case scenario, for identifying an erosional or unconformity surface. The Minority accepts that such log characteristics representing a mineralized zone at an unconformity surface were confirmed in a number of wells with core data, such as the 02/01-36 well. The Minority notes that parties agreed that this interval represented the Jurassic/Cretaceous unconformity surface.

The Minority notes that both Nexxtep and Talisman recognize the presence of a significant zone of mineralization below the disputed interval in both the 00/2-16 and 00/06-21 wells. Nexxtep argued that this mineralization did not represent the Jurassic/Cretaceous unconformity surface, but rather mineralization of a coquina-rich interval. Nexxtep also interpreted a mineralized zone at the top of the disputed interval in the subject wells as the Jurassic/Cretaceous unconformity surface. The Minority notes, however, that Nexxtep acknowledged that the identifying log response at the top of the disputed interval was very weak in the 00/6-21 well and that other geologists may not recognize or agree with its interpretation.

The Minority finds that mineralization, as argued by Nexxtep to be present at the top of the disputed interval in the 00/6-21 and 00/2-16 wells, can be characterized as a weak reflection

based on well logs. The Minority does not have confidence that this type of log response can be used to identify the Jurassic/Cretaceous unconformity surface. The Minority finds that the log response evident below the disputed interval in both the 00/02-16 well exhibit (A1 interval, Figure 2a) and the 00/06-21 well (C1 interval) does represent the Jurassic/Cretaceous unconformity surface. The Minority notes that this type of log response represents a best-case scenario log response for identification of an erosional surface. The Minority finds that the disputed interval in both the 00/02-16 and 00/06-21 wells overlies this mineralized surface and provides further evidence that the disputed interval in both wells is of Cretaceous age.

7.5.8 Petrography, Mineralogy, and Lithology

The Minority is concerned that the petrographic descriptions of the drill cuttings submitted by Nexxtep (Exhibits B-10 and B-16) may not provide sufficient evidence on which to confirm the B1 unit as Jurassic. The Minority also notes its findings based on palynology, which support a Cretaceous age for the B1 interval.

The Minority notes that Nexxtep's petrographic analysis describes seven drill cutting samples from the B1, B2, and B3 intervals in Figure 2a as a very consistent quartzarenite lithology composed of 83 to 91 per cent monocrystalline quartz framework grains and that all but one sample contained only 1 per cent chert. Nexxtep submitted that on this basis, the entire interval (from B1 to B3) is Rock Creek. The Minority accepts that both Talisman and Nexxtep agree that the intervals from 2095 m to 2110 m MD (B2 and B3 intervals) in the 02/2-16 well are Rock Creek.

The Minority does not question the accuracy of the petrographic descriptions of the samples from the 02/02-16 well, but is concerned that the descriptions from drill cuttings may not accurately describe the lithology of the intervals in question based on log character of the intervals and the lithologies described from what appear to be equivalent beds from nearby cored wells.

The drill cutting samples of the B3 interval in the 02/02-16 well describe a quartzarenite with 89 to 91 per cent quartz framework grains, with little or no calcite and no fossils. The descriptions for the lowermost Rock Creek deposits for the cored wells 00/01-7, 02/01-36, 03/16-05, 00/10-15, and 00/07-29 describe the stratigraphically equivalent interval as a shell debris or a coquina, with abundant dolomitic lithoclasts, fossils, and calcite cement. The Minority also notes that the samples of the A2 interval in the 00/02-16 well (Exhibit C10, tab E), interpreted to be the Rock Creek by all parties, is described as a chalky, slightly argillaceous limestone with minor crinoids. While the Minority accepts that it may be possible for a different lithology to be present in the Rock Creek in the 02/02-16 well, it is not satisfied that there is evidence to support that conclusion and is concerned that the drill cutting samples of the B3 interval do not appear to describe the lithology that is confirmed to be present in that interval from core and sample descriptions of surrounding wells.

As a second example, the Minority reviewed the sample description at 2115 m MD (which represents the drilled interval from 2110 m to 2115 m MD and the beds below the B3 interval). This interval, when correlated to the well logs, should be described as a part of the Poker Chip shale. However, the Minority notes that the interval is described by Nexxtep as a quartzarenite with 1 per cent chert, 7 per cent quartz overgrowths, trace pore lining clay, and no detrital clay

matrix. The Minority finds that the drill cutting sample at 2115 m MD is not representative of the lithology of the rock present in the wellbore from 2110 m to 2115 m MD in the 02/2-16 well.

The Minority also reviewed the petrographic analysis of two drill cutting samples of the C2 interval (2105 m to 2110 m TVD) from the 00/06-21 well (exhibits B-10 and B-16). The Minority notes that this interval is within the highly mineralized zone recognized by all parties and would therefore expect a greater heavy mineral content to be present in the samples. The Minority also believes the samples should reflect the sandy coquina lithology that is interpreted to characterize the base of the Rock Creek (C2 interval) if the samples accurately represent the interval. The Minority notes that Nexxtep's petrographic analysis of the C2 interval again describes a quartzarenite with 1 per cent chert, no calcite, and only 1 per cent pyrite in only one sample. The Minority finds the use of specific grains to describe intervals of 5 to 15 m in thickness may not be representative of the zones in question.

The Minority does not have confidence to conclude that the samples selected for petrographic analysis correctly represent the intervals Nexxtep interpreted to represent in either the 02/02-16 or the 00/06-21 well.

Based on the evidence before it, the Minority finds that it cannot conclude the exact source point of the drill cutting samples. Given this uncertainty, the Minority finds that it cannot use the petrographic analysis of the samples from intervals of the 02/2-16 well to make a conclusion as to the lithology of the disputed interval of the 00/02-16 well. The Minority also notes that the samples collected from the 02/02-16 wellbore are 800 m away from the A1 and A2 intervals in the 00/02-16 vertical well. As discussed under Log Shape or Character, the Minority finds that there is significant difference in the log character of the disputed intervals in the two wells.

With regard to the differentiation between the Rock Creek and Ellerslie based on lithology, the Minority finds that both Nexxtep and Talisman agree that the Ellerslie can have quartzarenite mineralogy similar to that of the Rock Creek, though with generally 1 to 3 per cent more rock fragments. Talisman stressed that if the sandstone within the Ellerslie channels was the product of erosion of the Rock Creek quartzarenites, the two would have similar petrographic characteristics and that the occurrence of quartzarenite was therefore not clear evidence of Jurassic sandstones. The Minority is not confident that it can rely on the differentiation of sediments based on lithology from select samples and on a small difference in the percentage of chert content within the sample.

The Minority concludes that the presence of quartzarenite sand is not adequate evidence to redefine the producing interval in the C Pool as Rock Creek, since the 00/2-16 well has no samples available for analysis, there is evidence from the literature submitted in the hearing and from the 00/8-21 sample analysis that the Ellerslie can be a quartzarenite, and there is potential for sediments in the subject wells to be the erosional product of the Rock Creek.

7.5.9 Occurrence of Coal

The Minority agrees with the views of the Majority with respect to coal.

7.5.10 Occurrence of Phosphates

The Minority notes that both Talisman and Nexxtep defined in situ phosphate as having been formed by chemical precipitation from the water column at or immediately below the sediment water interface. The Minority notes that Talisman further submitted that phosphate precipitation occurred in anoxic or reducing environments with low sedimentation rates. Nexxtep referred to work by various authors that described the phosphate precipitated within an overall environment where there was oceanic upwelling, episodic oxidizing, and reducing seafloor conditions. The Minority notes that Nexxtep's depositional analog of the Rock Creek in the Wilson Creek area is that of a tidal inlet model characterized by well-oxygenated bottom waters. This appears to be inconsistent with anoxic or reducing environments that appear necessary for phosphate precipitation.

The Minority notes that the phosphate mudclast found at 2090 m MD in the 02/2-16 well was within a host sediment described as a sub-angular to sub-rounded quartzarenite, and it agrees with Talisman that such a deposit would have accumulated in a turbulent bed load flow regime, with significant sediment influx, where authigenic phosphate precipitation would not likely occur. The Minority agrees with Talisman that the phosphate grain found in the 02/2-16 well is more likely a detrital phosphate than a phosphate precipitate and that detrital phosphate is not useful as an age determinate mineral.

The Minority further notes that there were no phosphates found in the analyzed sample of the 00/6-21 well and that there were no samples available for analysis of the 00/2-16 well. It therefore concludes that there is no direct evidence presented to indicate the presence of in situ phosphates in the disputed interval in the C Pool. The Minority is not prepared to make a finding with respect to the presence or absence of in situ phosphates as an indicator of Rock Creek age.

7.5.11 XRD Analysis

The Minority recognizes that the main purpose of the XRD analysis was to identify the type of minerals present in a mineralized zone, and not their amounts. The Minority agrees with Nexxtep's interpretation of the presence of fluoroapatite in the 00/16-17 well.

The Minority notes that the presence of fluorapatite in the XRD is evidence that a phosphate source is necessary, but finds that there is phosphate in the Ellerslie in the 00/6-22-43-4W5 well in the form of detrital phosphate. Since there is phosphate present in both the Ellerslie and the Rock Creek that could be the source of phosphate for fluorapatite, the Minority finds that the presence of fluorapatite in the XRD is not a useful criterion to differentiate between Ellerslie and Rock Creek.

7.6 Joint Findings of the Board

7.6.1 Reservoir Engineering and Pooling

Reservoir engineering data are useful for attempting to answer a number of questions, although they do not bear on the age of the reservoir rocks. It is equally clear that reservoir engineering data alone are not definitive for unique formation redesignation of the currently designated C Pool.

The Board finds that the data submitted in this proceeding are, however, of sufficient quality and quantity to evaluate a number of issues, particularly with respect to pressure communication between the 00/02-16 and 00/06-21 wells and nearby wells and which wells may or may not be in the same pool.

The Board further notes that Nexxtep, Talisman, and Bonavista all believe the 00/02-16 and 00/06-21 producing gas wells to be producing from the same pool, based on reservoir pressure and production history data. Nexxtep believes the reservoirs to be Rock Creek, while Talisman and Bonavista believe them to be Ellerslie.

The Board has listened to the evidence presented and examined the reservoir engineering data and finds that the 00/02-16 and 00/06-21 producing gas wells are not, in fact, in the same pool. Communication between the 00/02-16 and 00/06-21 wells is not indicated from the currently available pressure and production data. Specifically, the recharging in the 00/02-16 well when it was shut in, the poor tracking of the later time production profiles, and the P/Z analysis all indicate that the 00/06-21 well is not connected to the 00/02-16 well.

However, by itself this does not constitute evidence for unique formation designation of either. Even if the reservoir engineering data indicate that the two wells are in different pools, the formation designation issue remains unresolved.

The fact that the C Pool, as currently designated, is two to three times larger than any pool in the vicinity further validates that the 00/02-16 and 00/06-21 wells are separate.

It is the Board's opinion that the recently drilled and producing 02/14-21 well provides reservoir engineering and geology evidence directly applicable to formation designation and pooling. In the Board's view, Bonavista's conclusion that the 02/14-21 well is not part of this application would only apply if the 02/14-21 well was clearly not in the C Pool. Otherwise it is standard ERCB practice to review the significance and impact on all wells in a pool or potentially in the pool for which redesignation is requested.

All parties participating in the hearing agree that the 02/14-21 well contains a productive Rock Creek reservoir. Two of the three parties, Nexxtep and Bonavista, believe that the depleted pressure in this well is due to pressure communication with the C Pool as currently designated.

In the Board's view, it is unlikely that the 00/16-21 well is the cause of the pressure depletion at 02/14-21. This conclusion is based on the data submitted, including the December 12, 2008, to January 21, 2009, buildup data on the 00/16-21 well. The average reservoir pressure at 00/16-21 extrapolates to 6147 kilopascals absolute (kPaa), which is almost twice the initial pressure of 3028 kPaa taken at 02/14-21 a year earlier, in December 2007.

All parties are in agreement that stratigraphic correlations between the 00/02-16, 00/06-21, and 02/14-21 wells show that there are two sands in the stratigraphic section immediately above the Poker Chip. In addition, all parties agree that the completed sand in the 02/14-21 well is the lower sand, which is Rock Creek, and that the completed sands in the 00/02-16 and 00/06-21 wells are the upper sand, which is either Ellerslie or Rock Creek, depending on the geological interpretation. All parties also agree that a 26 tonne fracture stimulation of the lower sand in the 02/14-21 well likely extended the completion interval in this well to include both sands.

However, Nexxtep does not agree that there was an effective pressure barrier between the two sands prior to the fracture stimulation.

Irrespective of which sand or formation is producing and/or perforated in the three wells, the Board finds that the most reasonable conclusion from the evidence, including the PTA evidence from 02/14-21, is that the 00/06-21 and 02/14-21 wells are in pressure communication, following the same depletion trend.

With regard to pressure communication between the 02/14-21 and 00/06-21 wells, Bonavista makes an excellent point when it states that there can be communication between two separate reservoirs, making pooling more complicated. The Board agrees that in certain situations where there is communication between formations, individual pool designations can include more than one formation. In reference to the currently designated C Pool and the 02/14-21 Rock Creek Undefined pool, Bonavista noted that in its view there were two separate reservoirs, the Ellerslie and the Rock Creek, that were in communication. What needs to be determined for this pool delineation application is whether it is designated as the same zone and the same reservoir or as a dual reservoir in communication forming one pool. The Board believes a dual reservoir forming one pool is the most reasonable conclusion based on the reservoir engineering and geological evidence.

The Board finds that the 00/06-21 well should be redesignated with a stratigraphic designation as determined by the Majority view, and the 02/14-21 well should be included in the new pool.

Similarly, the Board finds that the 00/02-16 well should be removed from the C Pool, placed in a separate single-well pool, and be redesignated as determined by the Majority view.

The Board is of the opinion that the review of Application No. 1523329 would have benefited greatly from additional pressure readings in the key wells, 00/02-16 and 00/06-21, and a more rigorous and committed review of the existing pressure data by all parties.

Additional pressure data from the 00/02-16 and 00/06-21 wells might have helped in determining whether these wells are in the same or separate pools. Although both wells are expected to have similar depleted pressures due to the produced volumes, new pressure data would allow a better material balance review.

However, the Board has made its decision based on the data presented at the hearing. If additional reservoir engineering data were to be available to indicate that this redesignation should be revisited, upon application the ERCB may review these data, which could result in further revisions to the pooling.

7.6.2 Consequential Measures

Nexxtep requested that the Board implement consequential measures in the event its application was granted: suspend the well licence and shut in the 0/02-16 well or cancel the well licence. Nexxtep argued that if the Board were to redesignate the Wilson Creek Lower Manville C Pool as Rock Creek, Talisman could no longer prove its entitlement to operate the well, particularly given that Talisman sold the Rock Creek to Nexxtep. Nexxtep recognized that the court, not the Board, would make a final determination of ownership of the 00/02-16 well.

Talisman agreed that the court would make the final determination of ownership, whether Talisman did or did not sell either the 00/02-16 well or the rights to its production to Nexxtep. Talisman emphasized that the Board could ignore the court and effectively make a determination of ownership by cancelling the well licence. Talisman requested that the well not be suspended or shut in pending the court's decision.

The Board agrees that the ownership of the well and the producing zone will be determined by the court following its consideration of evidence of the intention of the parties to the purchase and sale agreement. The Board has determined that Talisman has an interest in the well pending the outcome of the court action and that cancellation of the well licence is not appropriate at this time. However, in light of the redesignation of the C Pool, the Board suspends Talisman's well licence pending the court's ruling on the ownership of the 00/02-16 well.

Dated in Calgary, Alberta, on August 7, 2009.

ENERGY RESOURCES CONSERVATION BOARD

M. J. Bruni, Q.C.
Presiding Member

G. Eynon, P.Geol.
Board Member

C. A. Langlo, P.Geol.
Acting Board Member

APPENDIX 1 HEARING PARTICIPANTS

Principals and Representatives (Abbreviations used in report)	Witnesses
Nexxtep Resources Ltd. (Nexxtep) L. H. Olthafer	D. Krayzel, President S. Prenioslo, P.Geol., of REM Resources Ltd. L. Burke, P.Eng., of RPS Energy R. Crain, P.Eng., of Spectrum 2000 Mindware Ltd. G. Pemberton, Ph.D., F.R.S.C., P.Geol., Consultant J. Stepic, P.Geol., of JMS Geological Consultants Ltd. R. Strom, of Calgary Rock and Materials Services Inc. B. Van Helden, M.Sc., of Biostratigraphic Services
Talisman Energy Trust and OMERS Energy (Talisman) R. W. Block, Q.C. M.A. Marion	D. Luft, P.Eng. E. Davies, Ph.D., P.Geol., of Branta Biostratigraphic Services Ltd. L. Kis, P.Eng., of AJM Petroleum Consultants Ltd. R. Mann, M.Sc., P.Geol., of AJM Petroleum Consultants Ltd. G. Reinson, Ph.D., P.Geol., Consultant R. Spencer, Ph.D., Consultant H. Visscher, P.Geol., of Tretio Exploration Ltd.
Bonavista Energy Trust (Bonavista) R. B. Brander	B. Jensen, P.Eng. C. Lee
Energy Resources Conservation Board staff B. Kapel Holden, Board Counsel G. Perkins, Board Counsel B. Prenevost, Board Counsel K. Bieber, P.Geol. B. Keeler, P.Eng., P.Geol. N. Sitek, M.Sc., P.Geol. J. White, Ph.D., Geological Survey of Canada (Consultant to the ERCB)	

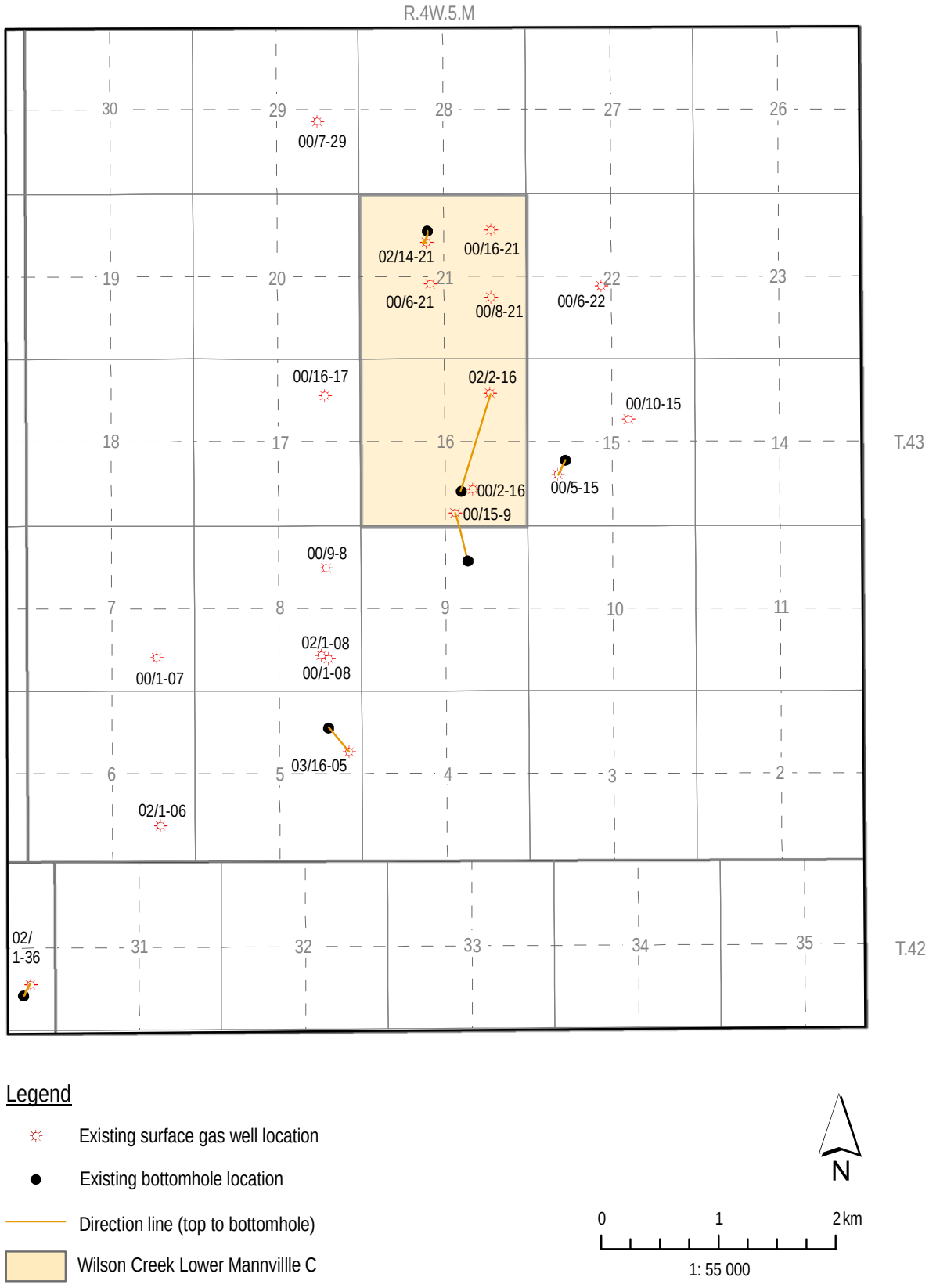

Figure 1. Well locations

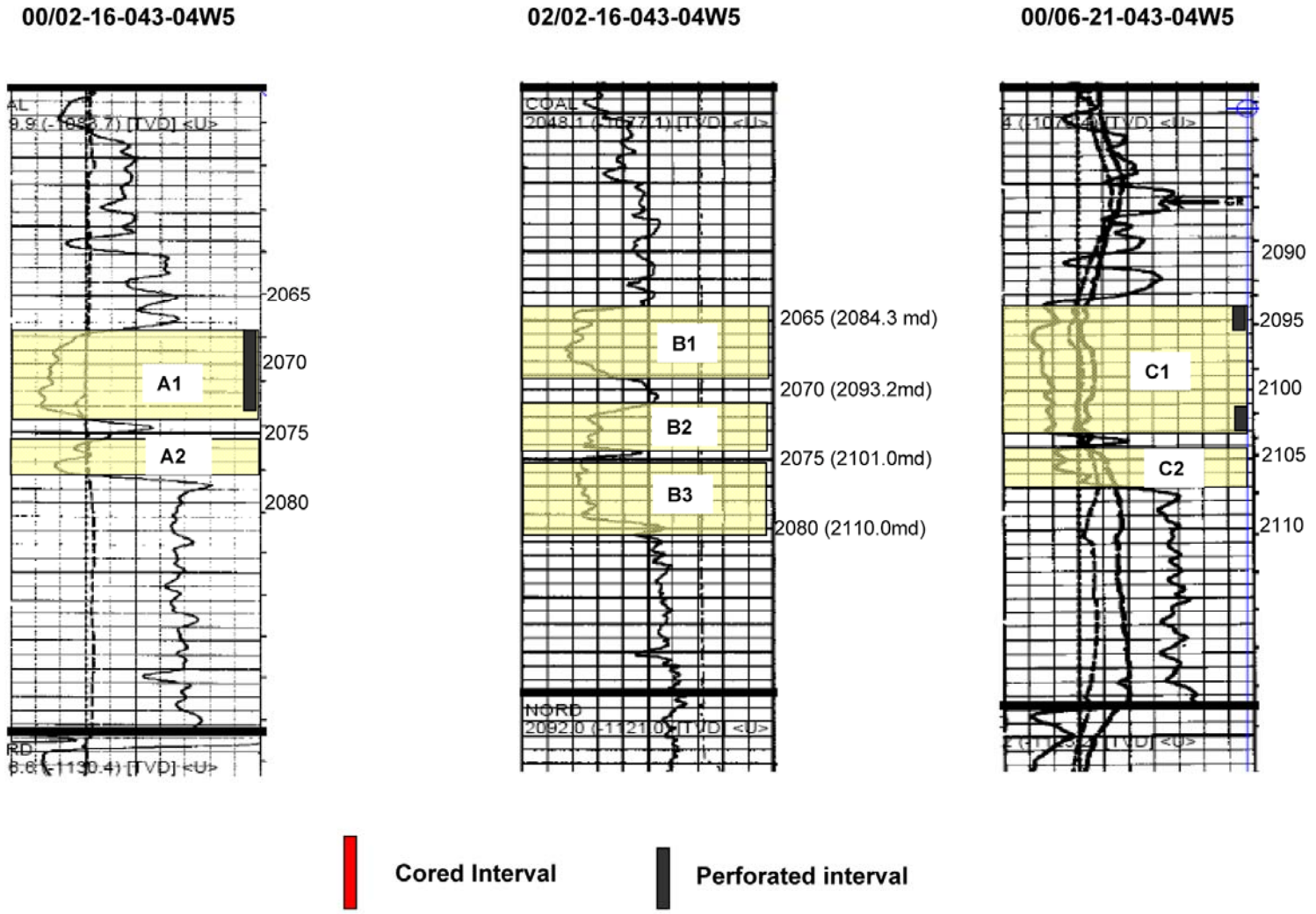

Figure 2a. Stratigraphic cross-section

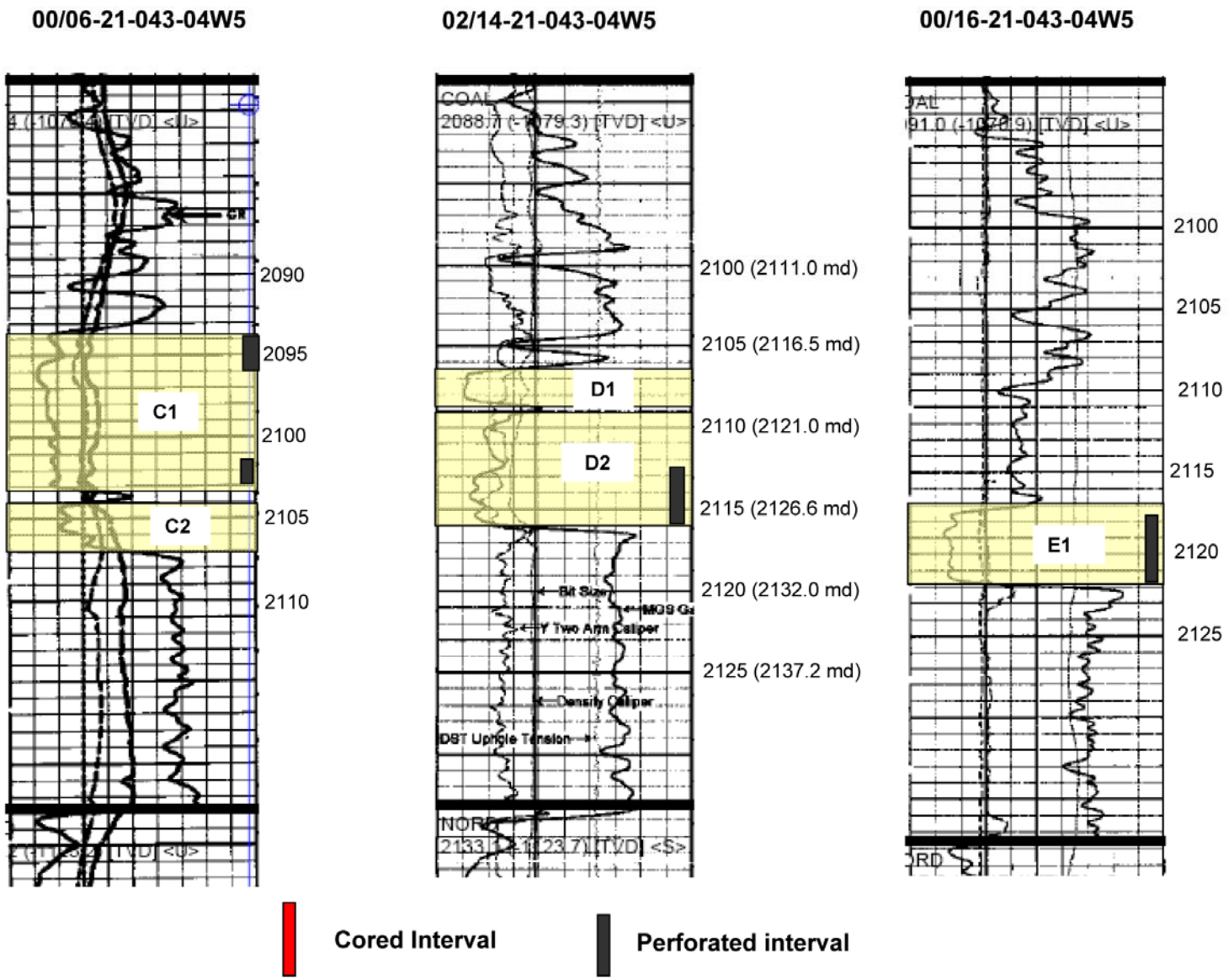

Figure 2b. Stratigraphic cross-section

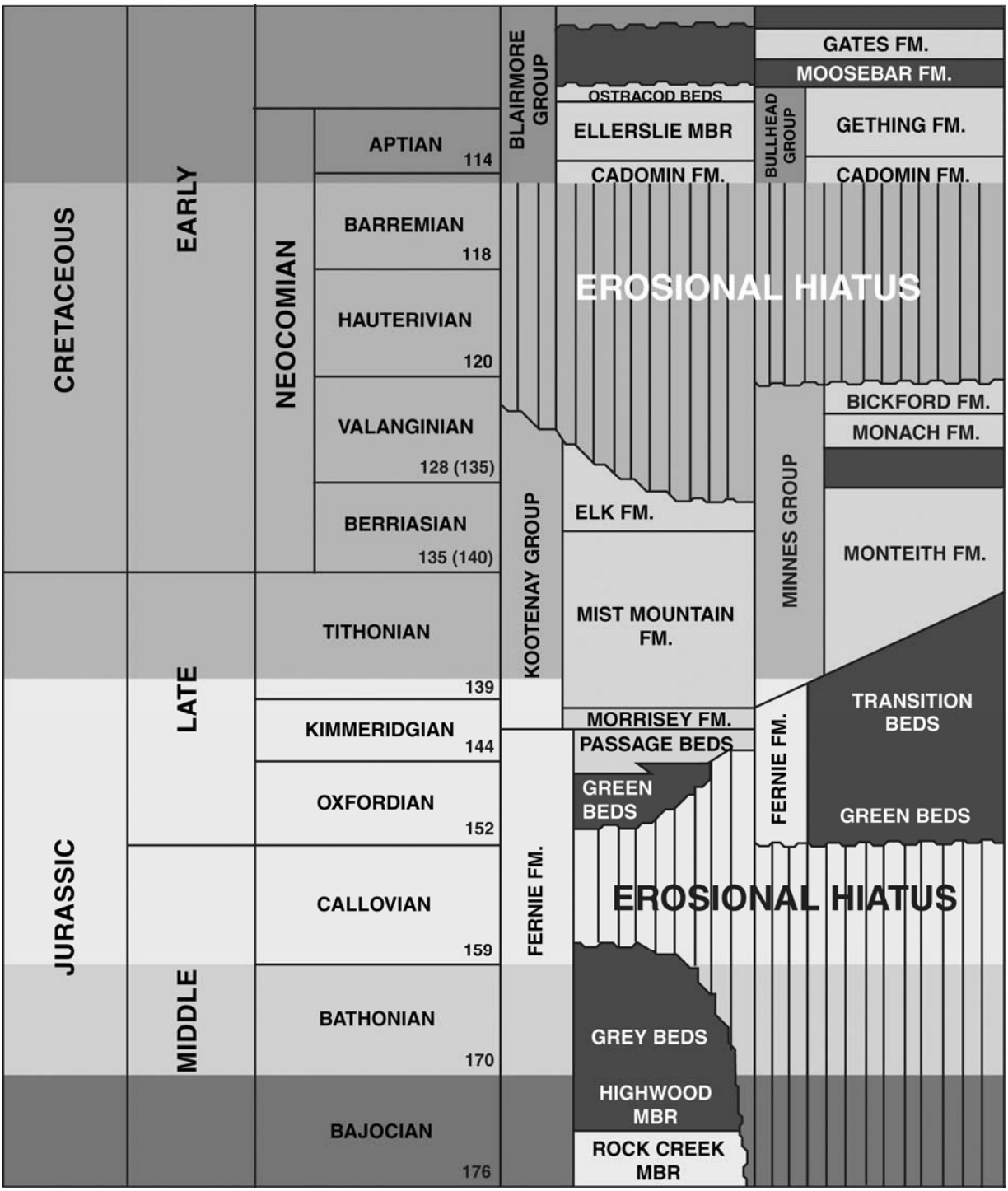

Figure 3. Geological time scale adapted from Exhibit C-19