

DECISION 2006.01
RESPECTING THE AMENDMENT TO THE
HIBERNIA DEVELOPMENT PLAN
January 2006

Disponible en français

ISBN 1-897101-12-0

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1.0 THE APPLICATION:

On June 24, 2005, the Hibernia Management and Development Company (the Proponent) submitted an application for amendment to the Hibernia Development Plan concerning the development of the Ben Nevis-Avalon reservoir. The application document, *Hibernia Development Plan Update Ben Nevis – Avalon*, compiles and summarizes the more recent studies on the Ben Nevis–Avalon reservoir, and outlines the way forward for development of this complex, but significant reservoir. On September 29, 2005, the Proponent submitted additional information requested by the Board in a document titled *Hibernia Development Plan Update Ben Nevis-Avalon Supplementary Information Submission #3*. On November 21, 2005, the Proponent submitted the required assessment addressing Condition 97.01.5 of Decision 97.01 in a document entitled: *Hibernia Development Plan Update Ben Nevis-Avalon Supplementary Information Submission #4*.

Two main reservoirs exist within the Hibernia field, the Hibernia reservoir and the Ben Nevis-Avalon reservoir. The Hibernia Development Plan submitted in 1985 proposed only a limited area of development for the Ben Nevis-Avalon reservoir. The Board rejected the development plan for the Ben Nevis-Avalon reservoir at that time, asking the Hibernia owners to explore ways to exploit the reservoir earlier than proposed. In July 1996, the Proponent submitted a Development Plan Amendment for the Hibernia field, which included a proposed appraisal program for the Ben Nevis-Avalon reservoir. The Proponent's strategy included an appraisal stage designed to resolve reservoir uncertainties and acquire new information that could lead to the preparation of an appropriate development plan for the Ben Nevis-Avalon reservoir.

In *The Amendment to the Hibernia Development Plan, Decision 97.01*, the Board approved the Proponent's plan to conduct an appraisal program for the Ben Nevis-Avalon reservoir. In the Amendment, the Proponent committed to submitting a report detailing the results of the Ben Nevis-Avalon appraisal program, and an update to the Hibernia Development Plan five years after first oil production (by December 2002). This report was also to provide a comprehensive development plan for the Ben Nevis-Avalon reservoir.

On December 13, 2002, the Proponent submitted the document *Ben Nevis-Avalon Appraisal Program Update*, and requested an extension of the Ben Nevis-Avalon appraisal period from December 31, 2002 to December 31, 2005. The Proponent noted that while considerable effort had been made to appraise the Ben Nevis-Avalon reservoir, experience to date indicated the reservoir was significantly more complex than originally anticipated. The Proponent stated that many of the essential elements necessary for preparation of a comprehensive development plan still remained unknown. The Board conditionally approved an extension to the appraisal period up to June 30, 2005.

The material covered by Submission #4 was the Proponent's evaluation of the potential to exploit areas of the Ben Nevis-Avalon reservoir penetrated by Hibernia reservoir development wells and not proposed for development, by re-completing selected wells. Condition 97.01.5 specified that the results of the evaluation were to be presented in the Development Plan Update to be submitted to the Board following the Ben Nevis-Avalon appraisal period.

2.0 THE CONTEXT

Two main reservoirs exist within the Hibernia field, the Hibernia reservoir and the Ben Nevis-Avalon reservoir. The Ben Nevis-Avalon reservoir is the shallower reservoir, occurring at depths of 2,100 to 3,000 metres subsea. The Hibernia reservoir is the deeper of the two reservoirs, occurring at depths between 3,300 and 4,030 metres subsea.

The Hibernia Development Plan submitted in 1985 proposed a limited area of development for the Ben Nevis-Avalon reservoir, to maintain the plateau oil production rate for the Hibernia platform. Production from the Ben Nevis-Avalon reservoir was to begin eight years after the initiation of production from the Hibernia reservoir. The Board rejected the development plan proposed for the Ben Nevis-Avalon reservoir at that time, stating that it expected the Proponent to continue to evaluate the potential of the Ben Nevis-Avalon reservoir and to consider ways to exploit the reservoir earlier than proposed in the development plan.

Since the 1985 Development Plan submission, the Hibernia partners have represented to the Board that commercial quantities of oil exist in the Ben Nevis-Avalon reservoir in the southwest portion of the Hibernia field. Based on the evidence presented, the Board included this area in the commercial discovery declaration for the Hibernia field.

On July 10, 1996, the Proponent submitted a Development Plan Amendment for the Hibernia field, which included, among other items, a proposed appraisal program for the Ben Nevis-Avalon reservoir. The Proponent's strategy for the Ben Nevis-Avalon reservoir development included an appraisal stage designed to resolve uncertainties and acquire the information necessary to devise a comprehensive development plan for the Ben Nevis-Avalon reservoir. The strategy proposed earlier development and a larger development area than proposed in the 1985 Development Plan. The Ben Nevis-Avalon reservoir well locations that were tentatively scheduled for the appraisal program period, as per Decision 97.01, are shown in Figure 1. In the Development Plan Amendment submitted in 1996, the Proponent committed to submitting a Development Plan for the Ben Nevis-Avalon reservoir five years after first oil from the Hibernia field (by December, 2002). In its Decision 97.01 approving the Hibernia Development Plan Amendment, the Board noted that there were two major areas of uncertainty which needed to be addressed in order to prepare a comprehensive development plan for the Ben Nevis-Avalon reservoir. These were the production performance of the reservoir under water flood conditions, and delineation of the reservoir in the southwest and northwest areas of the Hibernia structure to establish more precisely the extent of the hydrocarbon accumulation and determine reservoir characteristics.

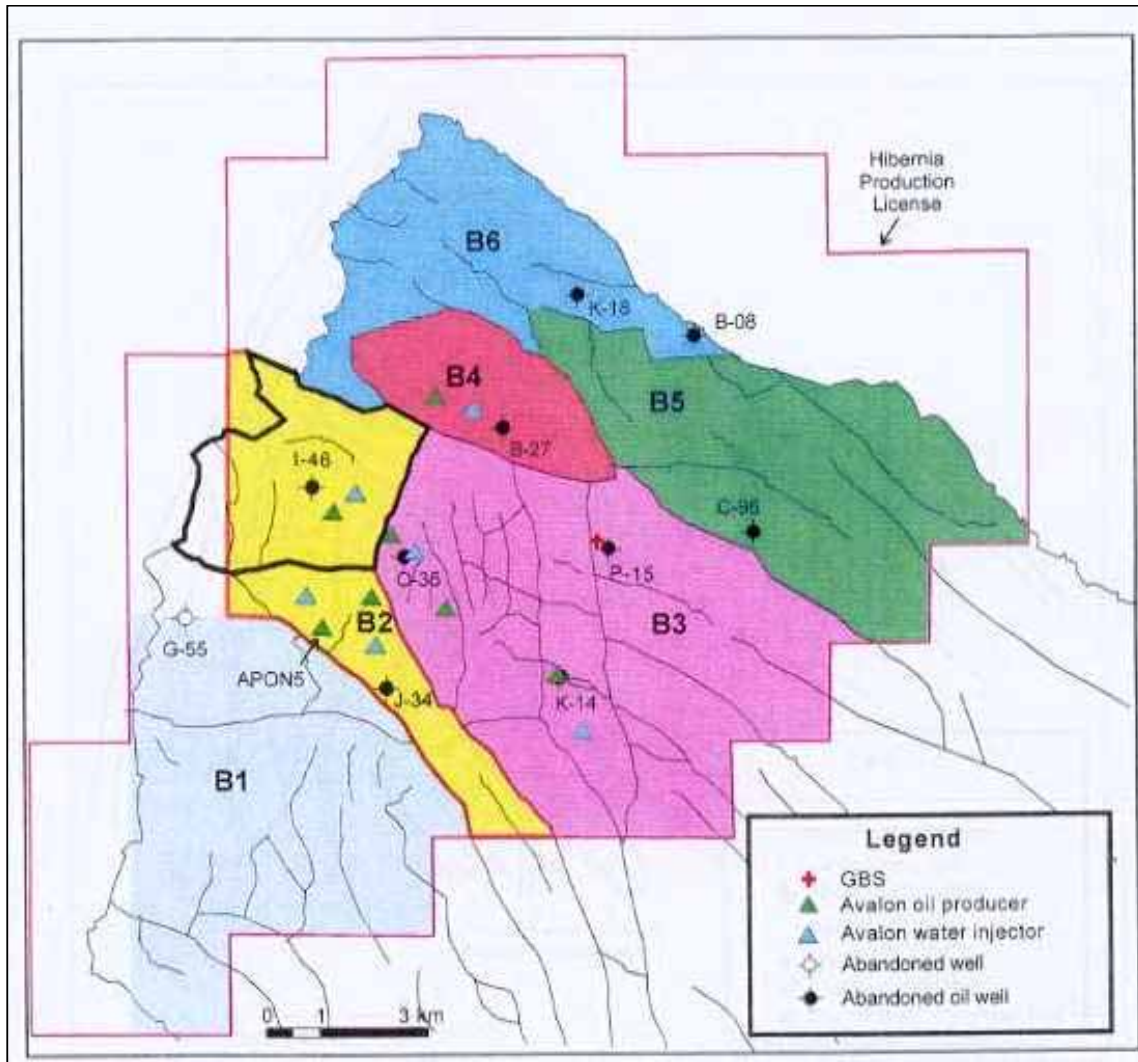


Figure 1: Ben Nevis-Avalon Reservoir proposed appraisal period wells (Source: After HMDC 1996)

Further, the Board noted in its decision that while the Proponent proposed to drill a well (AOPN5) to probe the southwest area, this well alone would not adequately appraise the southwest area of the Ben Nevis-Avalon reservoir, and further drilling in the area beyond the present range of extended reach drilling, would be needed. The Board also noted that it believed delineation drilling would be necessary before a comprehensive development plan for the Ben Nevis-Avalon reservoir could be developed. The Board accepted the strategy for the Ben Nevis-Avalon development to be followed during the appraisal period, but noted that the development plan update to be submitted following the appraisal period must include a firm plan to delineate the northwest and southwest areas of the Ben Nevis-Avalon reservoir. The Board conditionally accepted the Proponent's strategy for Ben Nevis-Avalon development during the appraisal period. In October of 2002 the Proponent drilled a delineation well, HMDC Hibernia B-44, in the southwest

area of the Ben Nevis-Avalon reservoir. The well confirmed the existence of good quality, oil-bearing Ben Nevis-Avalon reservoir. Also, an oil water contact of approximately 2862 metres subsea was encountered, which is deeper than the 2602 metres subsea used as a base in the original development plan.

On December 13, 2002, the Proponent submitted the document *Ben Nevis-Avalon Appraisal Program Update*. The Proponent noted that while considerable effort had been made to appraise the Ben Nevis-Avalon reservoir, experience to date indicated that the reservoir was significantly more complex than originally anticipated, and many of the essential elements necessary for preparation of a comprehensive development plan still remain unknown. The Proponent, therefore, requested that the current Ben Nevis-Avalon appraisal period be extended to December 31, 2005. The Proponent also requested that while the application was being considered, it be permitted to continue with production from the Ben Nevis-Avalon reservoir. The Board approved an extension of the appraisal period to either September 30, 2004, in the event that no well had been drilled in the 'O' and 'N' Ben Nevis-Avalon reservoir fault blocks, and, in the opinion of the Chief Conservation Officer, drilling activity was not being diligently pursued or, June 30, 2005 in the event that a well had been drilled or was being diligently pursued in the Ben Nevis-Avalon reservoir 'O' and 'N' fault blocks prior to September 30, 2004.

Details of this are found in Decision 2003.02. This decision was also contingent upon submission of a North West (NW) drilling plan in 2004 that was acceptable to the Board, and quarterly updates of the Proponent's progress on their appraisal program.

The Proponent submitted the NW drilling plan on June 30, 2004. The Board rejected the plan and issued an order to the Proponent to submit a revised plan acceptable to the Board. The Proponent responded on February 04, 2005 with a document entitled *Addendum to the Ben Nevis – Avalon NW Wedge Submission*, which outlined the Proponent's plans to delineate the northwest area of the Ben Nevis–Avalon reservoir.

The addendum outlined conditions whereby a delineation well targeting the NW area could be planned for as early as Q1/Q2 2007, and as late as Q2/Q3 2008. The Proponent expects that the NW area, if developed, will likely be done in a phased manner from the platform with a focus on reducing the risk of several of the play elements. Subject to satisfactory reservoir modelling and simulation, the area might be evaluated by successively stepping out from the platform with an initial well pair into the B block. A step out well into the saddle area beyond the B-27 delineation well would help to evaluate the presence of sand and hydrocarbons beyond the spill point into the NW Wedge prospect, and could lead to additional development in this area.

Since the year 2000, eight development wells have been drilled and completed in the Ben Nevis-Avalon reservoir, consistent with C-NLOPB approvals (Figure 2). One well, B-16 20X, has been re-drilled with the objective of improving injectivity into blocks where

water injection performance had been problematic. Also, several development wells targeting the Hibernia reservoir which penetrated the Ben Nevis–Avalon reservoir have evaluated the Ben Nevis-Avalon reservoir by logging and coring. This drilling has provided further insights to the complexity of the Ben Nevis-Avalon reservoir.

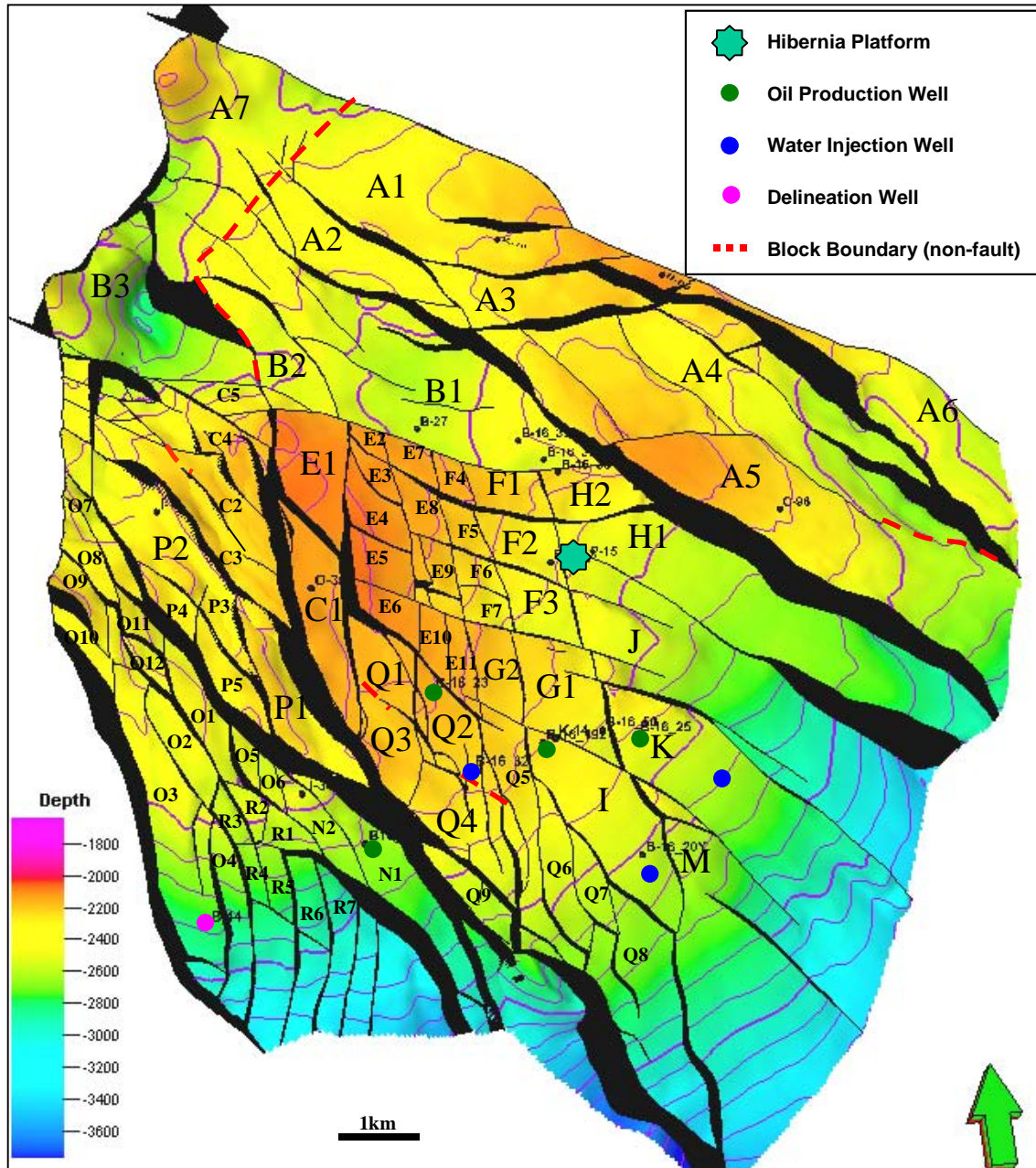


Figure 2: Ben Nevis-Avalon Current Well Locations (Source: HMDC)

With high reservoir complexity, the Proponent advocates a phased development strategy, with all opportunities evaluated on a well-by-well basis. Much of this phased

development can be implemented from the existing infrastructure, utilizing, in some cases, extended reach drilling.

3.0 THE C-NLOPB DECISION

Board Staff have reviewed all technical information submitted, as well as the evolution of the Ben Nevis-Avalon project to date.

Both the Board and the Proponent acknowledge that the Ben Nevis-Avalon reservoir is highly complex and contains upwards of 2 billion unrisks barrels of Stock Tank Original Oil in Place (STOOIP). However, because of the complexity of this reservoir, much of this STOOIP may be unrecoverable, with expected recovery efficiency estimates ranging from 2.5 to 9 percent. The Board acknowledges this complexity and the related uncertainty with predictions of production and injection performance. Having regard for these factors, the Board concurs with the Proponent's proposed phased approach to the Ben Nevis-Avalon reservoir development.

The Board emphasises that the Proponent should continue to explore ways to exploit the oil resources in the Ben Nevis-Avalon, and also explore the application of new technologies and approaches to recovering these resources.

The Board approves the Proponent's Application for development of the Ben Nevis-Avalon Reservoir. This approval is subject to conditions 2006.01.01 and 2006.01.02 set out below, and the outstanding conditions contained in Decision Reports 86.01, 90.01, 97.01, 2000.01, 2003.01, and 2003.02. The outstanding conditions are summarised in Appendix A.

Condition 2006.01.01

It is a condition of the Board's approval that:

The Proponent submit, within 9 months of drilling of the delineation well in the NW wedge, a report describing the learnings from that well in the context of the overall Ben Nevis-Avalon development.

Condition 2006.01.02

It is a condition of the Board's approval that:

The Proponent submit, in its Annual Production Report submitted to the Chief Conservation Officer, details of activities undertaken to increase oil recovery from the Ben Nevis-Avalon Reservoir.

4.0 SUPPORTING ANALYSIS

4.1 Geological Model Review

Technical staff of the C-NLOPB have reviewed the geological models described in the document Hibernia Development Plan Update Ben Nevis-Avalon, dated June 2005, and have compared them to the Petrel models provided to the Board by the Proponent. Board staff appreciate the complexity of the geological model, and the corresponding complexity of the Petrel mapping models.

The stratigraphy of the Ben Nevis-Avalon has evolved significantly since the submission of the original development plan. The most recent description of the stratigraphy is detailed in the Proponent's application and its associated references. This new stratigraphic interpretation takes into account recently acquired data and is considered reasonable.

The Proponent has presented three levels of mapping detail for the Ben Nevis-Avalon reservoir. The most mature area, the IQK blocks, has the greatest number of well penetrations, and is supported by production data. In this case, the Proponent has mapped and modeled in detail only one horizon (LBN1). This model has been up-scaled into the Proponent's simulation software. Although limited to only one horizon, Board staff view the model provided as reasonable, recognising that it is subject to change as understanding of the Ben Nevis-Avalon reservoir evolves.

The Proponent's understanding of the South West (SW) area of the Hibernia field is at a less mature state than the IQK blocks, and describes the LBN2, LBN3 and UBN1 horizons. The Proponent has described three alternate frameworks for the geology of this area, and has constructed a reservoir simulation model for the above four horizons. The model described is considered reasonable, given the complexity of the geology and the current number of well penetrations in the area. The Board recognises that this understanding is subject to change, as further information from drilling and production is obtained.

The least detailed area of mapping is the NW wedge area. A significant amount of work has been done on this area, but many unknowns continue to exist. Mapping suggests a significant thickening in the sediments along the Murre fault in the NW wedge, but with no delineation wells in the area, it is unknown whether the Ben Nevis-Avalon Formation possesses reservoir characteristics. In February 2005, the Board approved Proponent's delineation plan for the NW area and required a well to be drilled to evaluate this area by 2007, unless otherwise approved by the Board.

Overall, the Proponent's latest geological interpretation appears to be reasonable. However, there may be other possible interpretations, and further drilling, production and study are critical to confirm and develop this significant resource.

4.2 Reservoir Simulation Model Review

The Board's technical staff have reviewed the Proponent's reservoir simulation efforts to date. The Proponent has shown, through the analysis of pressure data and water contacts, that there is an uncertainty in the data used to develop a simulation model. Oil-water contacts are interpretative, and variations in absolute pressure in the oil legs of different Ben Nevis-Avalon blocks, may represent differences in the oil-water contact (OWC). They may also represent reservoir compartmentalization. This shows that the Ben Nevis-Avalon is a complex reservoir that may have stratigraphic and structural barriers that can lead to different interpretations.

The Proponent suggests that only through careful phased development of these regions of the Ben Nevis-Avalon can a better understanding of the reservoir be obtained. The Board's technical staff believe this is correct and that more data about the reservoir, including both well and production data, is required. This would help address reservoir modelling and compartmentalization issues.

The Proponent has constructed simulation models for two areas of the field at this time, the IQK region and the SW region of the Ben Nevis-Avalon reservoir. The remainder of the field is not included in the simulation work. Additional field data would allow the Proponent to construct a more complete model.

The IQK and SW area models are stand-alone simulation models. The IQK model was history-matched with production data. The SW model adopted similar parameters from the IQK model.

The key modelling issues addressed in the models included:

- 1) Faulting – The Ben Nevis-Avalon is highly faulted and thus the impact of flow across the faults is addressed.
- 2) Calcite cement – Modelling of the calcite cement was considered in the model. These nodules were modelled using an EPSIM proprietary simulator.
- 3) Injectivity – The model was matched against the injectivity of the well data present.
- 4) Effective Reservoir – The Proponent let the model determine what parts of the reservoir were effective.

The Proponent has demonstrated an understanding of the issues involved with construction of the simulation model, based on available data.

The technical staff of the Board acknowledges the challenges for the Proponent to achieve a history match. Several parameters required significant adjustment. This demonstrates the level of complexity of the Ben Nevis-Avalon reservoir and indicates the need for more manageable sector simulation models. This would allow for better understanding over the large areal extent of the Ben Nevis-Avalon reservoir, and could be incorporated into the full Hibernia simulation model under development. In order for more sector models to be built, more field data would be required to populate the models. The view of the Board's technical staff is that the reservoir simulation models are at an early stage of development and are not highly reliable. However, the Proponent understands this and is addressing the issues.

4.3 Delineation/Development Strategy

The Proponent's plan of progressively stepping out from IQK areas into adjoining areas has been detailed in Appendix B of this report. These plans appear to be carefully considered, balancing drilling slot availability/use, and usefulness of the data recovered from the wells, with the 'competing' opportunities available from the Hibernia Formation reservoirs. While the Ben Nevis-Avalon reservoir is not being developed quickly by some standards, The Proponent, to date, has committed significant resources to its evaluation, and is continuing into the future.

The Board notes the requirement for the NW delineation well, as per Condition 2003.02.01 Part (b), approved on February 28, 2005, to be drilled in 2007, and not to extend beyond 2007, unless otherwise approved. The Proponent will be required to submit a development plan amendment for the Board's approval prior to proceeding with development of the NW Wedge area.

4.4 Protection of the Environment, Industrial Benefits, Operations and Safety

The Board has reviewed the Proponent's Application to determine whether the proposed development plan raises any new environmental, benefits, operational or safety issues. The Application involves only the required definition of the development and depletion strategy for the Ben Nevis-Avalon reservoir resources, and does not involve any major modification to, or operation of, the production facilities. The Board has determined that the proposed Ben Nevis-Avalon development plan does not introduce any safety, environmental or benefits issues that are not already addressed by current approvals issued by the Board.

4.5 Discussion

Both the Board and the Proponent acknowledge that the Ben Nevis-Avalon reservoir is highly complex and contains upwards of 2 billion un-risked barrels of oil in place. However, because of the complexity discussed above, much of this STOOIP may be unrecoverable, with expected recovery efficiency estimates ranging from 2.5 to 9 percent. Although not based on the Proponent's model, the current C-NLOPB estimate of the recoverable reserves for the Ben Nevis-Avalon reservoir at Hibernia is 182 million barrels, which is probably a realistic view of the magnitude of the resource from a holistic perspective. The Board acknowledges the complexity of the Ben Nevis-Avalon reservoir, and the uncertainty with predictions of production and injection performance. Having regard for these factors, the Board concurs with the Proponent's proposed phased approach to the Ben Nevis-Avalon reservoir development.

The Board emphasises that the Proponent needs to continue to explore ways to exploit the oil resources in the Ben Nevis-Avalon reservoir, and explore the application of new technologies and approaches to recovering these resources. These activities will be reported annually in the Annual Production Report. The Board will continue to closely monitor development activities for this reservoir, and may require special reporting. If there are significant changes to the underlying understanding from a geologic, reservoir performance and/or technology perspective, the Board may require a Development Plan Amendment.

Appendix A: Outstanding Conditions

Outstanding Conditions From Decisions 2003.02, 2003.01, 2000.01, 97.01, 90.01 and 86.01

A1

Extension of the Ben Nevis/Avalon Appraisal Period Decision 2003.02

Condition 2003.02.01

It is a condition of the Board's approval that:

The Proponent submit, by June 30, 2004, the following:

- a) a report detailing the results of relevant analyses of the northwest area of the Ben Nevis/Avalon reservoir including analysis of the seismic data to assess the Murre Fault seal and direct hydrocarbon indicators at the northwest wedge location; and,
- b) a plan acceptable to the Board for delineation of the northwest area of the Ben Nevis/Avalon reservoir.

Status:

Condition 2003.02.01: Satisfied/Ongoing

Condition 2003.02.02

The Proponent submit, quarterly, a report to the satisfaction of the Chief Conservation Officer, summarizing the results achieved over the previous three months. The first report should cover the period January 1, 2003 to the effective date of this decision report and be submitted 30 days following the effective date of this decision report.

Status:

Condition 2003.02.02: Satisfied

A2

Hibernia Development Plan Amendment Decision 2003.01

The Board has reviewed the status of its conditions attached to its Decision 2003.01 approval of the Hibernia Development Plan Amendment.

Condition 2003.01.01

It is a condition of the Board's approval that:

The Board's Chief Conservation Officer may at any time reduce the production rate if reservoir performance differs significantly from that predicted in the document entitled "*Technical Support For Hibernia Field Rate Increase Revision 1*", and the

Chief Conservation Officer has reason to believe that production at the approved rate may cause waste.

Status:

Condition 2003.01.01: Ongoing

Condition 2003.01.02

It is a condition of the Board's approval that:

- (i) The Proponent undertake and submit to the Chief Conservation Officer no later than March 31, 2004 an analysis of the feasibility of produced water re-injection; and,
- (ii) The Proponent proceed with produced water re-injection if, in the opinion of the Chief Conservation Officer, it is technically feasible and economically reasonable to do so.

Status:

Condition 2003.01.02: Ongoing

Condition 2003.01.03

It is a condition of the Board's approval that:

No later than 6 months prior to seeking approval for anticipated marine discharge of produced water at a daily rate in excess of 24 000 m³, the Proponent shall:

- (i) Submit, in a form suitable for public release and acceptable to the Board's Chief Conservation Officer, an assessment of the environmental effects of produced water discharge at the maximum daily discharge rate for which it anticipates seeking approval, including but not limited to:
 - A description of results from modelling of the physical fate of discharged produced water at rates up to the maximum daily rate proposed;
 - An assessment of the potential environmental effects of the aforementioned produced water; and
 - An assessment of any resultant changes to the conclusions of the *Hibernia Environmental Impact Statement*; and
- (ii) Submit for the approval of the Chief Conservation Officer revisions to the Environmental Protection Plan components of the *Hibernia Operational Plan* that are necessary in consideration of the assessment described in Condition 2003.01.03(i).

Status:

Condition 2003.01.03i: **Ongoing**

A study has been submitted in March 2005 and is currently under public review.

Condition 2003.01.03ii: **Ongoing.**

EPP/Operations Plan amended to reflect higher produced water discharge rates. The revised Operations Plan was submitted in September 2005 for Board review and approval.

A3
Hibernia Development Plan Amendment
Decision 2000.01

The Board has reviewed the status of its condition attached to its 2000 approval of the Hibernia Development Plan Amendment. This condition requires a continuing response.

Condition 2000.01.1

It is a condition of the Board's approval that:

This approval may be suspended or revoked if the Board's Chief Conservation Officer determines that the Proponent's operations depart significantly from those projected in the Application or if reservoir performance differs significantly from that predicted in its document entitled "*Technical Support for Hibernia Field Rate Increase*".

Status:

Condition 2000.01.1: **Superceded**, see Hibernia Decision 2003.01, Condition 2003.01.01.

A4
Hibernia Development Plan Amendment
Decision 97.01

The Board has reviewed the status of the five conditions attached to its 1997 approval of the Hibernia Development Plan Amendment. One of these conditions has been fully satisfied. The remaining four conditions, some of which require a continuing response and some of which relate to activities that have yet to occur, have not yet been fully satisfied.

Condition 97.01.1

It is a condition of approval of the Amendment that:

- (i) Prior to initiating of production from the Hibernia 'A' pools, the Proponent submit its depletion plan therefore for the approval of the Board.
- (ii) The Development Plan update to be submitted following the appraisal period must provide a firm plan for delineation of the northwest and southwest areas of the Avalon reservoir.

Status:

Condition 97.01.1(i): Continued.

Condition 97.01.1(ii): Satisfied/Ongoing.

The Proponent drilled a delineation well (B-44) in the southwest of the Avalon reservoir during 2002. In December, 2002 the Proponent submitted an application for extension of the Avalon appraisal period to December 31, 2005. This request is the subject of Decision 2003.02. The proposed update was later submitted in June, 2005, with further clarification/information requested by the Board..

Condition 97.01.2

It is a condition of approval of the Amendment that:

- (i) Prior to proceeding with the water flood in the Hibernia reservoir 'B5' pool 'H' and 'I' fault blocks, the Proponent reassess the depletion schemes for these blocks and obtain the approval of the Chief Conservation Officer for the scheme to be implemented.
- (ii) The oil production rate in the Hibernia reservoir 'G' gas flood block is restricted to a maximum rate of 1190 STm³/d per well, until such time it can be demonstrated to the Chief Conservation Officer that a higher production rate will not be detrimental to oil recovery.
- (iii) The reservoir pressure in those fault blocks containing a gas cap shall be maintained at least 1000 kPa above the dew point pressure. In other fault blocks, the reservoir pressure shall be maintained at least 500 kPa above the bubble point pressure.

Status:

Condition 97.01.2(i): Satisfied.

Condition 97.01.2(ii): Satisfied.

Condition 97.01.2(iii): Ongoing.

Condition 97.01.5

It is a condition of approval of the Hibernia Development Plan Amendment that the Proponent evaluate the potential to exploit areas of the Avalon reservoir penetrated by Hibernia reservoir development wells and not proposed for development by re-completing selected wells. The results of the evaluation are to be presented in the Development Plan Update to be submitted to the Board following the Avalon reservoir appraisal period.

Status:

Condition 97.01.5(i): Ongoing.

In December, 2002 the Proponent submitted an application for extension of the Avalon appraisal period to December 31, 2005. This request is the subject of [Decision 2003.02]. In June 2005, HMDC submitted an update to the Development Plan for the BNA which addresses this condition (This decision report).

A5

**Hibernia Development Plan Update
Decision 90.01**

The Board attached four Conditions to its 1990 approval of the Hibernia Development Plan Update. These have all been satisfied.

A6

**Hibernia Benefits Plan
Decision 86.01 Status**

The Board attached five conditions to its 1986 approval of the Hibernia Benefits Plan. The following conditions have not been satisfied:

Condition #4

That as the project evolves, the Proponent provide to the Board comprehensive listings of all major contracts and purchase orders anticipated. The Board, in consultation with the Proponent, will determine which of these major contracts and purchase orders will be subject to Board review.

Status:

Satisfied/Ongoing.

The Proponent provides this information to the Board in accordance with the C-NOPB's *Procurement Reporting Guidelines*: Hibernia Development Project.

Condition #5

That the Proponent provide advance notice of, and information on, major contracts and purchase orders to enable the Board to conduct its review. The review time required will be determined by the Board, in full consultation with the Proponent.

Status:

Satisfied/Ongoing.

The Proponent provides this information to the Board, in accordance with the

C-NOPB Procurement Reporting Guidelines: Hibernia Development Project.

A7

**Hibernia Development Plan
Decision 86.01 Status**

The Board attached seventeen conditions to its 1986 approval of the Hibernia Development Plan. The following conditions have not been satisfied:

Condition #1

- (i) That the Proponent at a very early stage in the development program, drill a well in the area of the B-08 gas cap, to obtain samples for laboratory analyses and define a gas-condensate-oil regime; and,
- (ii) that the Proponent undertake studies, concurrent with initial development drilling, to establish the feasibility of a miscible flood for the Hibernia reservoir.

Status:

The Proponent has undertaken to drill a well in the area of the B-08 gas cap early in the development and complete a miscible flood feasibility study.

Condition 1(i): Satisfied.

Condition 1(ii): Continued.

Condition #2

- (i) That prior to any development of the Avalon Reservoir, the Proponent submit a revised plan for the Board's approval;
- (ii) that during development of the Hibernia Reservoir, the Proponent evaluate the Avalon Reservoir by coring, logging and testing all prospective zones penetrated by wells drilled to the Hibernia Reservoir; and,
- (iii) that during the design of topside facilities, the Proponent give due consideration to sizing equipment and allocating space for production facilities and utilities, sufficient to accommodate additional production from the Avalon Reservoir concurrently with Hibernia production, should there be a requirement to produce the Avalon Reservoir prior to the time contemplated in the Development Plan, and that the Proponent report to the Board on its actions in this regard before the topside facilities design is finalized.

Status:

Condition 2(i): Satisfied.

The submission of the 1996 Hibernia Development Plan Amendment constitutes a revised plan for development of the Avalon reservoir.

Condition 2(ii): Continued.

Condition 2(iii): Satisfied.

In August 1991, the Board accepted the Proponent's plans for satisfying this condition.

Condition #3

- (i) That the Proponent file for approval by the Board, prior to commencement of development drilling, a specific drilling schedule designed to reduce gas flaring to limits acceptable to the Board;
- (ii) that in the unlikely event that reservoir conditions prevent gas-reinjection, the Proponent present to the Board for approval a plan for gas disposal; and,
- (iii) that the Proponent obtain the Board's approval to flare those small volumes of gas needed for normal operations.

Status:

Conditions 3(i) and 3(iii): Satisfied.

In August 1996, the Board conditionally approved the Proponent's drilling schedule and volumes of gas to be flared during start-up and transition to steady state operations.

Condition 3(ii): Continued.

The Proponent has informed the Board that it has evaluated the feasibility of gas re-injection, and considers it to be highly feasible. A plan for gas disposal will be necessary only if gas re-injection proves to be detrimental to the resource recovery.

Condition #5

- (i) That the Proponent design the export lines and loading platforms so that they can be flushed of hydrocarbons if there is risk of damage to those facilities; and,
- (ii) that the design iceberg scour depth be determined by the Proponent and approved by the Board prior to the design of subsea well installations.

Status:

Condition 5(i): Satisfied.

The Proponent designed its facilities so that export lines will be capable of being flushed, and, in a May 1997 submission to the Board, described its proposed procedures for flushing the risers in the offshore loading system. The Board approved the proposed procedures in May 1997.

Condition 5(ii): Continued.

No subsea well installations have yet been proposed.

Condition #9

That the Proponent obtain specific approval from the Board for its plans for subsea installations prior to proceeding with the detailed design of these facilities.

Status:

Continued.

Condition #15

That the Proponent provide periodically to the Board, during the execution of the project, in a form to be prescribed, estimates of the expected capital cost for the project as a whole and for those major components which the Board shall request.

Status:

Satisfied/Ongoing.

On a semi-annual basis, the Proponent's Canada-Newfoundland Benefits Department provides capital cost expenditure forecasts and associated estimates of Canada-Newfoundland content levels which are expected to be achieved.

Appendix B: Proponent's Application

Appendix B: Proponent's Application

B.1 Reservoir Performance

Since start-up of production in 2000, the total volumes of oil production and water injection into the Ben Nevis-Avalon reservoir are 2.1 and 2.6 million cubic metres, respectively. These volumes are broken down by well in Table B1 below, and are plotted as Figure B1.

Well	Oil Production (million Sm ³)	Water Injection (million Sm ³)
B-16 19Z	1.001	
B-16 23	0.649	
B-16 25	0.466	
B-16 48	0.010	
B-16 20X	0.000	0.042
B-16 20Y	0.003	1.309
B-16 32	0.004	0.434
B-16 37	0.000	0.858
Total	2.133	2.643

Table B1: Ben Nevis-Avalon Production & Injection Volumes Up to October 31, 2005 (Source C-NLOPB)

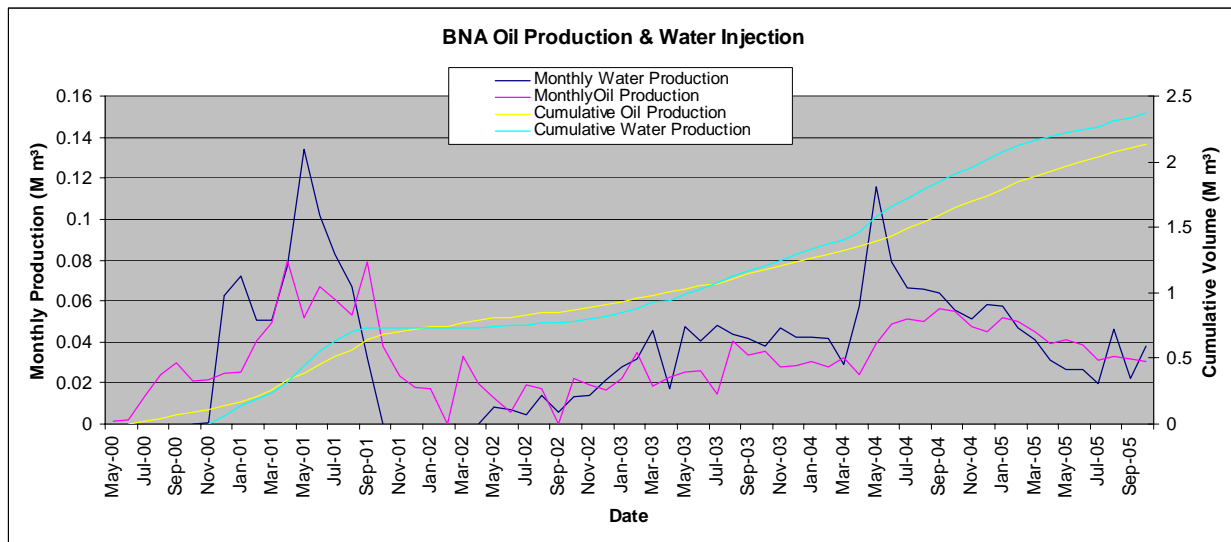


Figure B1: Ben Nevis-Avalon Total Production and Injection History (Source C-NLOPB)

B.2 Proponent's Geologic Model

On July 3, 2003, the Proponent presented to the Board's technical staff, details of its new sequence stratigraphic-based interpretation. The Proponent emphasized that understanding of the Ben Nevis-Avalon reservoir is still evolving.

Reservoir distribution of the Ben Nevis-Avalon interval has changed significantly since the last development plan. More recent data have shown that the previous sequence stratigraphic framework did not match with the biostratigraphic age zonations seen in the latest wells. These new data were incorporated into the mapping of the surfaces, which have significantly changed the understanding of the age relationships of the sands. A conversion chart, detailing the old and new stratigraphic frameworks is seen in Figure B2.

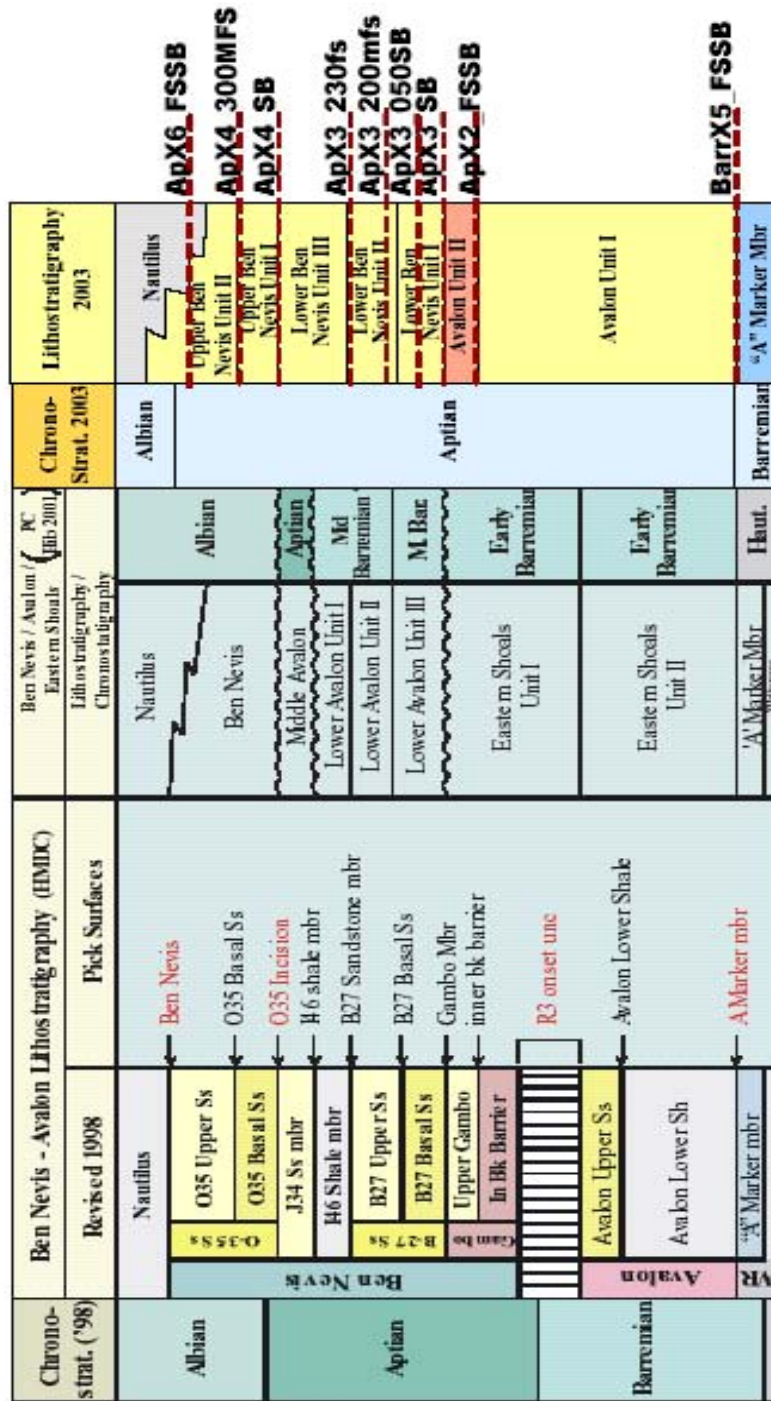


Figure B2: Conversion Chart Comparing 1998 and 2003 Stratigraphic Frameworks (Source HMDC)

It is important to note that the new stratigraphic framework was developed using well data from the three South West (SW) wells where the Ben Nevis-Avalon section is

believed to be partially removed through faulting. Different interpretations of the extent and exact position of fault removal can result in very different versions of how the reservoir units are distributed in the SW. An alternate sequence stratigraphic framework has been generated for the SW, where there are fewer faults, and the ApX4 sequence boundary is seen to be strongly erosional, which would remove the LBN3 sands in the northern part of the SW area near the I-46 delineation well, rather than removal of these sands through faulting. The Proponent is considering both of these frameworks, as both have strengths and weaknesses.

Details of the new stratigraphic interpretation and its reservoir units can be found in the Proponent's Application, and C-NOPB Decision 2003.02. With the inherent uncertainty in the understanding of the Ben Nevis-Avalon, further study and delineation are critical to a better understanding of these reservoir units.

B.3 Petrophysics

The petrophysical data available in the Ben Nevis-Avalon at Hibernia has been acquired in four distinct phases:

1. The Ben Nevis-Avalon was penetrated and evaluated by the original exploration and delineation wells drilled in the 1980's. Conventional logs and significant cores were obtained, but hole and log quality were affected by hole washouts. Detailed analysis of these wells were completed by Clow (1993). Even with significant new learnings, the Proponent states in its application that Clow's work continues to be valid a decade after it was completed;
2. The IQK Blocks have been the main target for the appraisal program to date, and have been penetrated by producer/injector pairs, for a total of six platform wells. The wells drilled in these blocks have used oil based mud, which has significantly enhanced the quality of the log and core data recovered;
3. All Hibernia Formation drilling has penetrated the Ben Nevis-Avalon in the 311 mm hole. Although much of this data clusters around the platform area, the Ben Nevis-Avalon has been evaluated in several wells, such as the B-16 33, B-16 39, B-16 46 and B-16 47; and
4. The B-44 delineation well in the SW area encountered a complete unfaulted reservoir section, adding significant understanding to the geological interpretation in this area.

The logs, core and Special Core Analyses (SCAL) acquired through the above-noted phases have driven several petrophysical learnings:

- Capillary pressure data (centrifuge and porous plate) appears to validate older SCAL measurements. Collectively, the older and newer data provided key input into permeability - Swirr relationships that shapes the current view of water saturation in the Ben Nevis sands (Ben Nevis-Avalon Appraisal Extension, 2Q, 2004).
- Petrographic studies confirm facies distinctions between the LBN1 sands and SW area sands of B-44 well.
- Relative permeability measurements used directly in reservoir simulation models and incorporate mixed wettability learnings.
- Overburden porosity-permeability relationships from previous studies were confirmed.

The understanding of the distribution of localized carbonate cements in the Ben Nevis-Avalon Formation has been problematic for all of the Ben Nevis-Avalon reservoirs in the Jeanne d'Arc basin. In the Hibernia field, these cements occur as a) stratiform bodies often filled with fossil debris, generally found in shoreface sediments; and b) discrete nodular bodies, generally found in estuarine sediments. While these cements and nodules are readily identifiable on logs, they add major complexity to the reservoir characterization, volumetric and flow models. No geological trends have been identified for the cement abundance and geographic distribution, leading to large uncertainty in their mapping. These bodies have very little porosity and act as baffles and barriers to flow, and thus are likely to impact rock producibility. Since their distribution is uncertain, it makes it difficult to predict production rates from simulation studies alone.

The Ben Nevis-Avalon at Hibernia has a large core and log database, and significant well test data. Despite this, the petrophysical characterization of the sands and shaly sands carries significant uncertainty. Some of this is related to assessing the reservoir properties in the wellbores from the available data. However, a greater amount is associated with distributing those properties away from the well-bore within the geologic model.

Because of the extreme stratigraphic and structural complexity of the reservoir, and to overcome limitations of the modelling software, the Proponent has constructed three geological models in Petrel to enable simulation, well planning and resource estimation work. With some overlap, these models, seen in Figure B3, cover the following areas and horizons:

1. The IQK area model (LBN1 only);
2. The SW wedge model (all units except LBN1);
3. Volumetric Estimation map-based model, designed to address other intervals not included in the above noted models (LBN1 in SW Wedge, LBN2,3/UBN1 in IQK, and all units in NW area)

The Proponent states that ongoing field development will be managed through these and future Petrel models, that will continually evolve as data is acquired in the field.

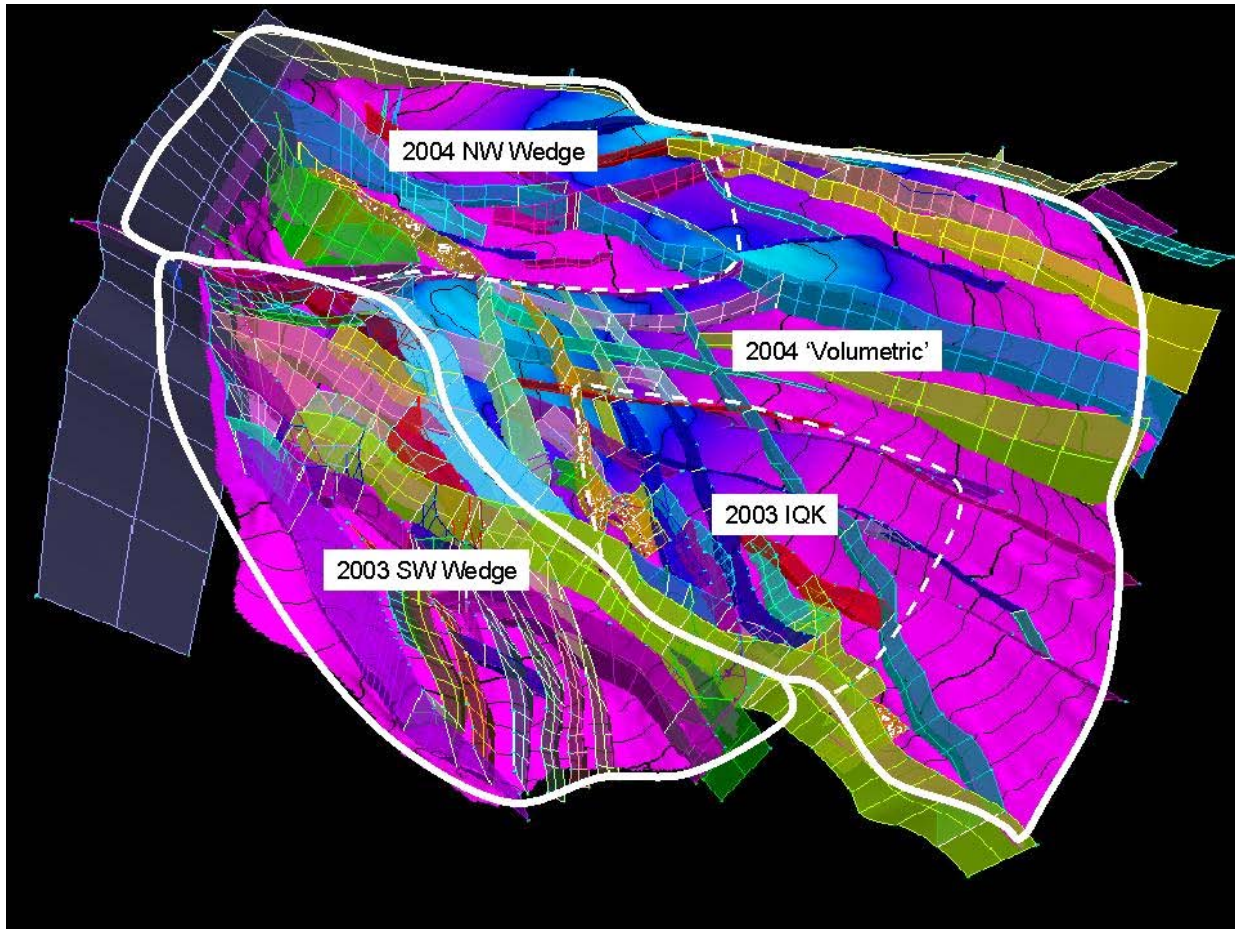


Figure B3: Areas Covered by HMDC Petrel Models (Source HMDC)

B.4 Volumetrics

It has long been realized that there is considerable potential oil-in-place in the Ben Nevis-Avalon; however, the reservoir quality and flow characteristics make recovery of much of it difficult.

Using the Petrel modelling software, the extraction of raw volumes is a straightforward process once the geological model have been established within the software. The Proponent has completed a thorough appraisal of each fault block, and has selectively filtered the raw volumes to best reflect the differing levels of confidence in the STOOIP estimates throughout the field.

For both the SW area, and the Central and North areas of the Proponent's study, firstly, a vertical filter was applied, which eliminated non-target sands, with the intent to high-

grade developable sands; and secondly, an areal filter was applied to address STOOIP uncertainty to the west and eastern edges of the accumulation. Finally, a 20 millidarcy permeability cut-off was applied to the pore volume, to eliminate STOOIP that wouldn't be expected to flow significant quantities of oil. This is illustrated in Table B2/Figure B4 and Figure B5 below.

	STOOIP (MBO)
SW area	
Deterministic STOOIP	531
LBN1 nonprospective	107
3-20 mD unlikely to flow (20% SW Model)	85
Remaining SW STOOIP	339
Central and North	
Deterministic STOOIP	1210
Thin (<10 m) North sands nonprospective	104
Eastern section high risk: OWC & N/G	32
Non-target reservoir units (LBN2,3,UBN1)	315
3-20 mD unlikely flow (14% IQK Model)	169
Remaining Central and North STOOIP	590
TOTAL FILTERED STOOIP	929

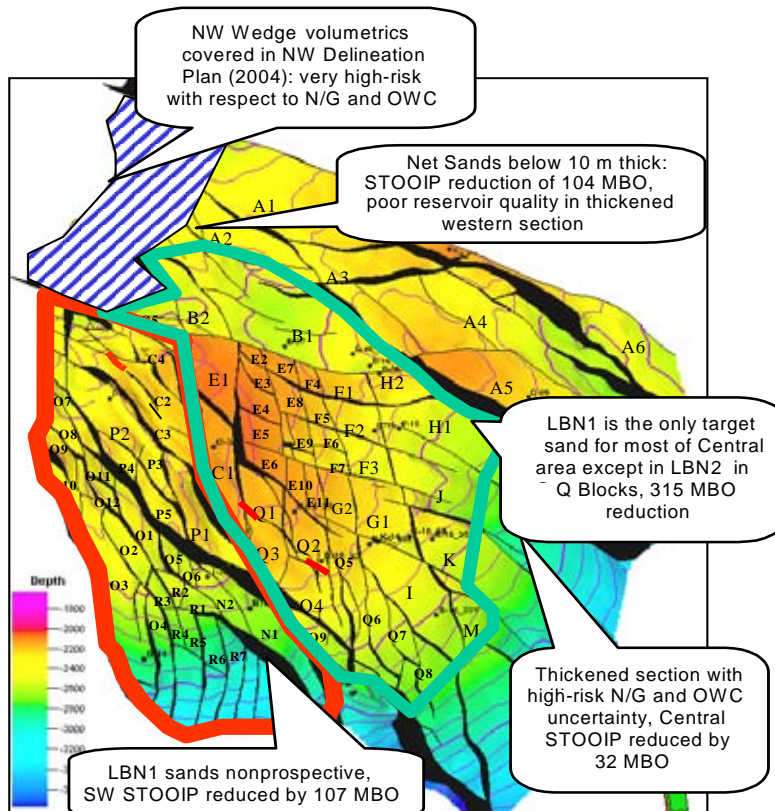


Table B2: Resource Assessments/Model Areas (Source HMDC)

Figure B4: Resource Assessments/Model Areas (Source HMDC)

The Proponent's best estimates of volumetric STOOIP are detailed in Tables B3 and B4. STOOIP values for the SW and Central and North areas are taken from the above-noted analysis, detailed in the Proponents June 2005 submission. The STOOIP for the NW wedge, is taken from the Proponent's NW Wedge Submission, dated June 30, 2004.

Area	STOOIP Mm3	STOOIP MBO
SW Area	84.4	531
Central and North	192.3	1210
NW Wedge*	62	390
Total Unfiltered STOOIP	338.7	2131

Table B3: Unfiltered STOOIP, Hibernia Ben Nevis-Avalon

Area	STOOIP Mm3	STOOIP MBO
SW Area	53.9	339
Central and North	93.8	590
NW Wedge*	62	390
Total Filtered STOOIP	209.7	1319

Table B4: Filtered STOOIP, Hibernia Ben Nevis-Avalon

***Note:** STOOIP in NW Wedge was not separated into Filtered and Unfiltered by the Proponent, so the same value is used in each table.

Both the filtered and unfiltered STOOIPs are presented, which helps emphasize that significant quantities of STOOIP are distributed either amongst some very small fault blocks, or other areas and/or horizons deemed unlikely to produce. Recovery of these resources will be problematic. (Figure B5)

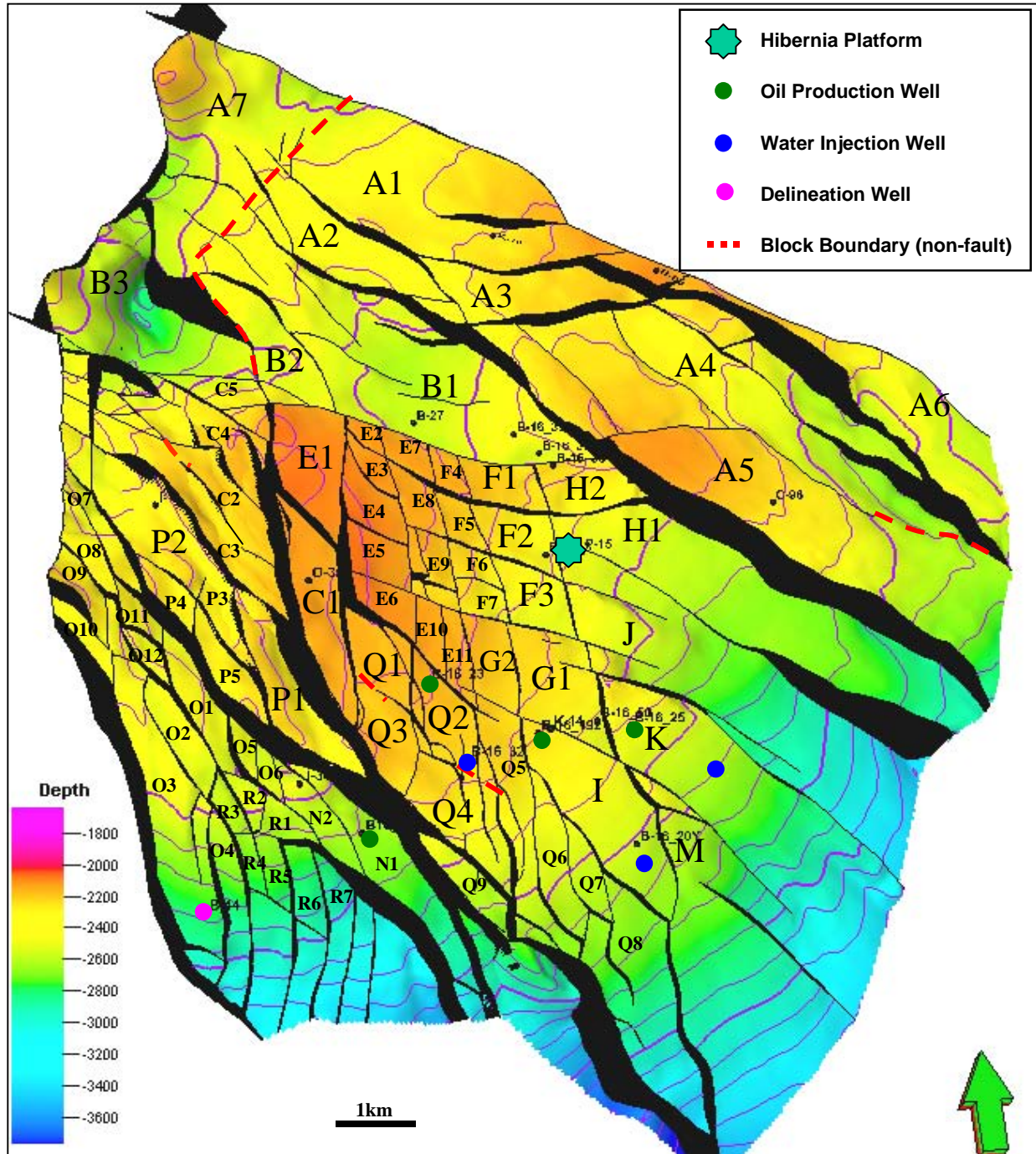


Figure B5: ApX4 Structure Map With Block Names (Source HMDC) showing complexity of faulting in the Ben Nevis-Avalon. The recovery of STOOIP distributed in the smaller fault blocks will be problematic.

B.5 Reservoir Engineering Analysis

The Proponent has conducted a thorough reservoir engineering analysis, which is closely tied to the latest geological interpretations of the reservoir.

B.5.1 DST Results

Drill stem tests were run in the Ben Nevis-Avalon in the exploration wells, and the data is summarized by well and formation name in the Proponent’s documentation. The Proponent notes that there are 20 tests that flowed appreciable oil to surface from the primary reservoir formations. The Proponent also notes that detailed interpretation of the DST data is difficult and problematic due to the limited test durations, and the variable accuracy of the data obtained, mainly due to the use of mechanical pressure gauges.

B.5.2 Reservoir Pressure and Temperature

Wireline data has been collected throughout the drilling history of the Ben Nevis-Avalon. The pressure data has been a significant input to the development of the understanding of reservoir compartmentalization and fluid contacts. This data is summarized in the Ben Nevis-Avalon Pressure-Depth (PD) plot, Figure B6.

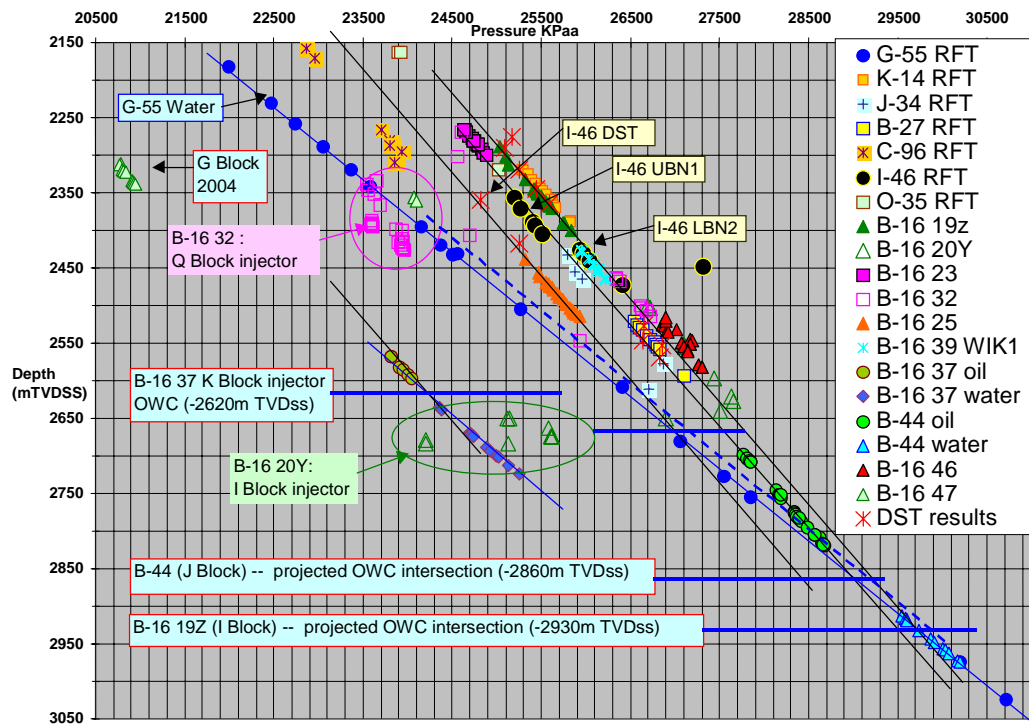


Figure B6: Wireline Pressure Test Data in the Ben Nevis-Avalon (Source HMDC)

The delineation wells B-44 and G-55 are key wells for the interpretation of the pressure systems seen in the Ben Nevis-Avalon reservoir. With pressure data from these wells, it is interpreted that the G-55 well data is the baseline gradient for the determination of oil-water contacts in the Ben Nevis-Avalon Formation at Hibernia. While there is still uncertainty in the analysis, the Proponent has determined the following best estimates for the oil-water contacts for the Ben Nevis-Avalon:

Ben Nevis-Avalon Central Region (Blocks E-F-G-H-I-J-K-M-Q) (some uncertainty)	2930	m	TVDss
Ben Nevis-Avalon SW Area (Blocks C-N-O-P-R-S) (variable uncertainty)	2860	m	TVDss
Ben Nevis-Avalon K Block (Block K) (little uncertainty)	2620	m	TVDss
Northern Region (Ben Nevis-Avalon A-B Blocks) (much uncertainty)	2930	m	TVDss

To summarize, it is seen that the overall reservoir system is large and the uncertainty in stratigraphic and structural reservoir barriers complicates the interpretations from pressure data that is spaced kilometres apart.

B.5.2 Fluid Properties

The Proponent has performed fluid modelling on samples recovered from four of the development wells, and one delineation well. All samples are subsurface formation oil samples, obtained during wireline (MDT) operations.

Table B5 details a field summary of the most representative Pressure-Volume-Temperature (PVT) data available for modelling of the Ben Nevis Avalon.

	I Block B-16 19z	Q Block B-16 23	K Block B-16 25	SW B-44	North B-16 39
Sample Date	20/04/00	07/02/01	07/04/01	16/11/02	24/01/03
Sample #	965	1202	1206	1360	1202
Reservoir Name	LBN1	LBN1	LBN1	LBN3	UBN1
Depth (m RT MD)	4142.2	4257.8	4373.4	2985.8	3425.7
Bubble Point, kPag	18,099	20,326	9,404	13,259	21,015
Gas-Oil-Ratio, m ³ /m ³	95.4	114.6	44.8	60.0	112.6
FVF, rm ³ /sm ³	1.309	1.357	1.185	1.206	1.345
Viscosity@Pb, mPa.s	1.265	0.842	2.050	2.020	0.605
ST Oil Gravity, API	30.4	31.6	30.0	27.4	32.7
C1 (mole%)	40.05	42.72	24.24	33.06	43.74
Reservoir Press, kPaa	25,578	24,781	25,890	28,387	25,959
Reservoir Temp, °C	69.0	67.8	72.5	72.1	78.2

Table B5: Ben Nevis-Avalon Reservoir Fluid Properties (Source HMDC)

B.5.3. Reservoir Modelling

The Proponent states that the understanding of the Ben Nevis-Avalon at Hibernia is evolving; therefore, reservoir modelling for different areas of the reservoir are at different levels of maturity. The IQK blocks have the most production, injection, pressure and geological data, so the simulation model is very detailed with complete history matches to the production data. Learnings from these blocks have been extended to the south west, where a separate simulation study exists. The least mature area, from an understanding point of view is the north and northwest wedge area. Details of this area are included in the Proponent's NW wedge study.

The Proponent lists and details key issues considered in the modelling process of the Ben Nevis-Avalon at Hibernia. These include:

- Faulting – which faults are significant and should be included in the model?;
- Calcite Cement – how are the calcite nodules and laminae modelled?;
- Injectivity – recognized as a key uncertainty in the Ben Nevis-Avalon. The impact of injecting colder fluids into the reservoir has not been addressed explicitly; and,
- Effective Reservoir – which reservoir is considered effective? The Proponent has taken the strategy to include all reservoir, and let the models determine which is effective.

B.5.4 Development Strategy

The Proponent details a three-stage development strategy for the development of the Ben Nevis-Avalon at Hibernia, with the first two stages being progressed concurrently.

Stage 1 details continued development and analysis of the Central (IQK) Region. This stage has a two-tier approach that reflects the maturity of the opportunities. The Tier 2 opportunities have specific reservoir issues that need to be addressed through a combination of monitoring adjacent block performance, well cost reductions, and further reservoir modelling, before the opportunity can advance for investment consideration.

The Supplementary Information Submission #4 document, presented by the Proponent, details how Hibernia-targeted wells can be used to support the Ben Nevis-Avalon Development Plan, as required by Condition 97.01.5. This document highlights locations where up-hole re-completions of existing wells offer the potential to expand the Ben Nevis-Avalon development to include J and H blocks, when existing wells become available for re-completion. As well, the Proponent notes in this document their progressive philosophy of building their wells to the Hibernia and Ben Nevis-Avalon horizons with multiple targets in mind. Figure B7 illustrates what the Proponent sees as

potential Ben Nevis-Avalon block development utilizing up-hole re-completions of Hibernia targeted wells.

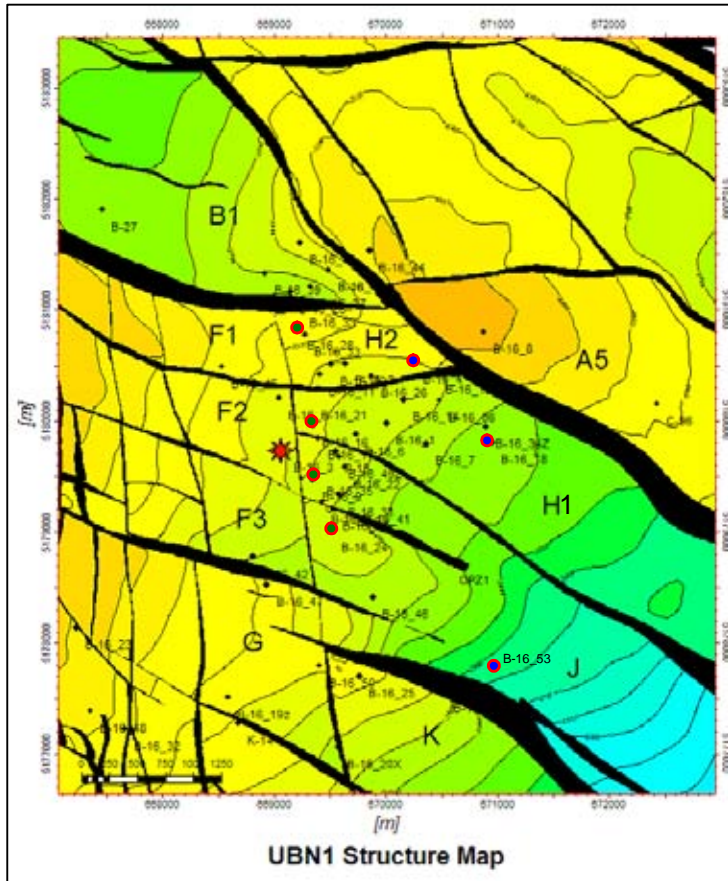


Figure B7: Potential BNA Block Development With Up-hole Re-completions (Source HMDC)

Figure B8 details the progression by fault block of the Stage 1 opportunities.

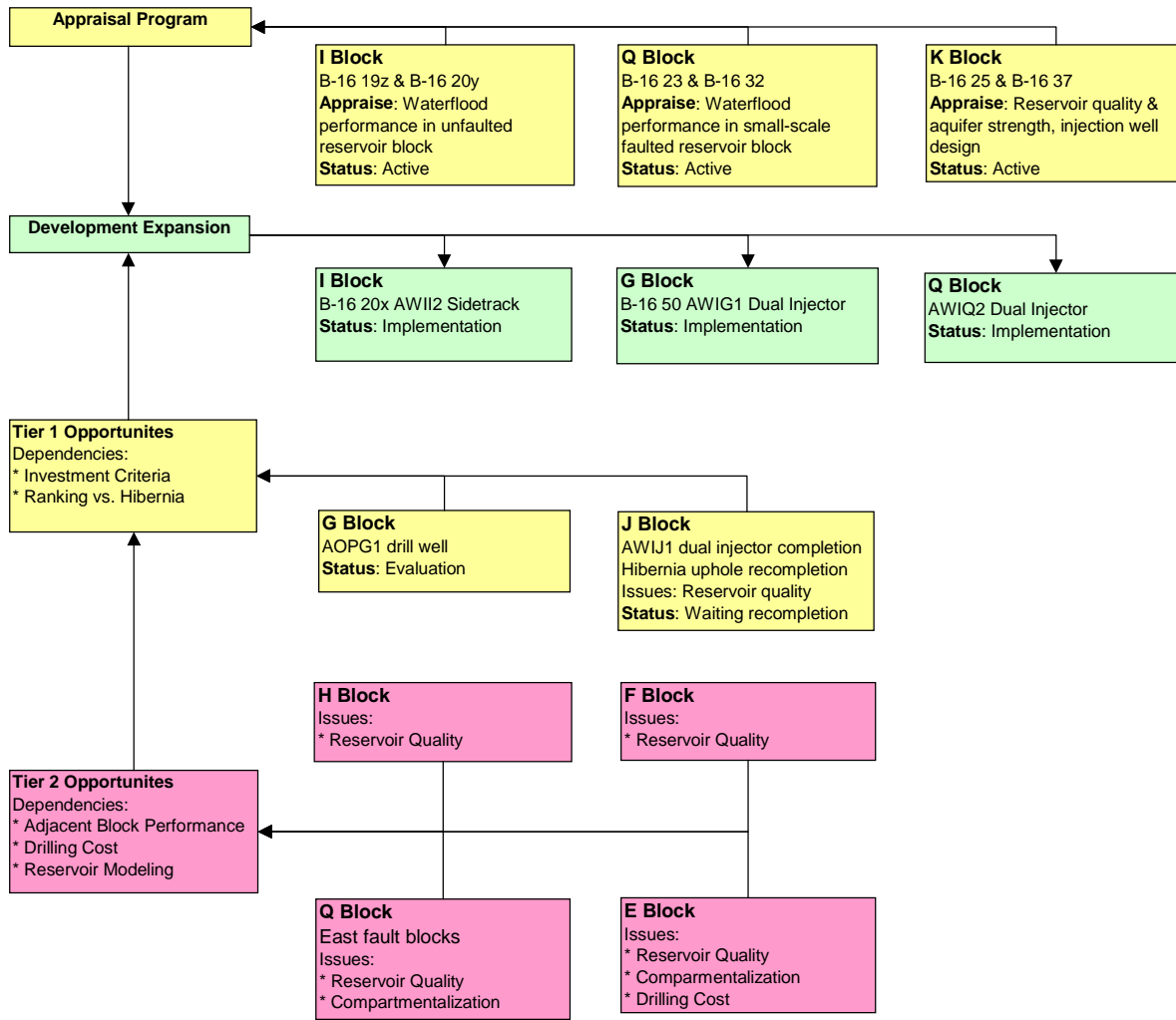


Figure B8: Stage 1 Progression by Fault Block (Source HMDc)

The Stage 2 opportunities build on the learnings of the Stage 1 evaluation, and are expected to be evaluated and drilled concurrently with the Stage 1 opportunities. These opportunities lie in the South West (SW) Region, and include the N, O, and P blocks. The first production well drilled in the SW region is the B-16 48 well, drilled into the N block. This well was completed in January 2005.

The Proponent notes that the selection criteria for the N block was important as it:

- was the most manageable long-reach drilling opportunity from the platform for the Ben Nevis-Avalon in the SW;
- provided east-west geological control combined with well B-44 located in O block; and,

- was the lowest investment risk in the SW region.

A follow-up water injection well for the N block is planned for 2005, and will be the first waterflood of the LBN3 and UBN1 reservoir units. The performance of this well pair will assist in derisking the SW expansion opportunities, as further development will require progressively more complex and challenging extended-reach wells.

Following the successful performance of the N block wells, the initial O block development would potentially target the most prospective fault block north of the delineation well B-44. Wells in this block are expected to penetrate oil-bearing sands in the UBN1, LBN3, LBN2 and LBN1 reservoir units. Because of the geometry of the faulting in the SW, multiple penetrations of the Ben Nevis-Avalon fault blocks may be possible for wells being drilled to the O Block. Specifically, multi-target wells may be able to target the smaller fault compartments present in the center of the O block. The Proponent states that “any multi-target well design may prohibitively increase the drilling complexity, but represents an opportunity to reduce slot utilization, while enhancing potential recovery from the numerous relatively small compartments in the SW region”.

Following the O block wells, the Proponent has identified a pair of targets in the P block. Drilling to this location is slightly farther than the N block, but less complex than the O Block. Reservoir quality is a significant uncertainty in the P Block, given the poor quality sand penetrated by I-46.

Because of the extensive faulting present in the SW, there are significant in-place volumes contained in relatively small compartments. Data from the N, O and P blocks will reduce reservoir uncertainty and facilitate advancing well proposals of multi-target applications.

Figure B9 details the progression by fault block of the Stage 2 opportunities.

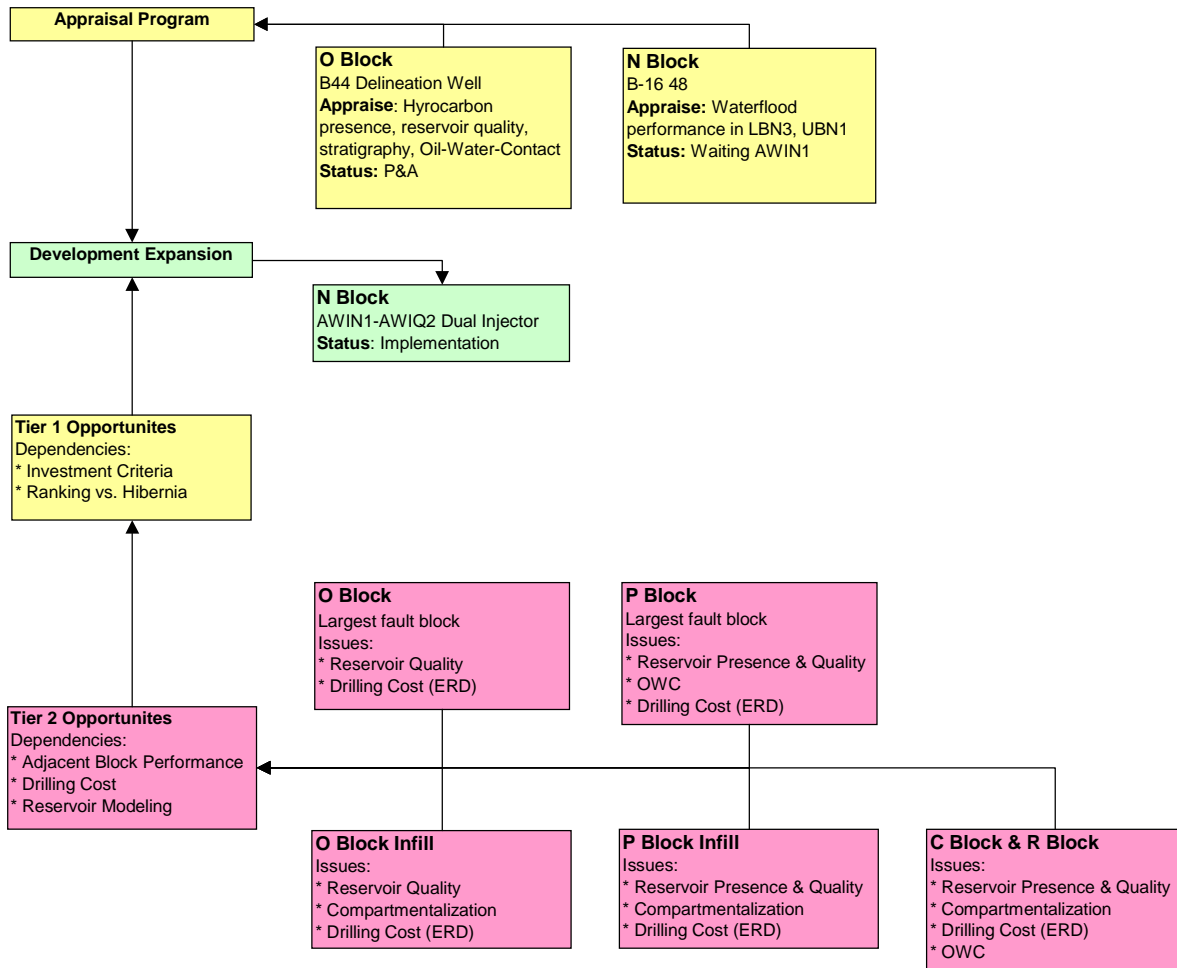


Figure B9: Stage 2 Progression by Fault Block (Source HMDC)

The Stage 3 opportunities comprise the area commonly known as the North West Wedge, and is shown in Figure B10. The Proponent has previously submitted a detailed analysis of this area in compliance with Condition 2003.02.01 of the appraisal period extension approval.

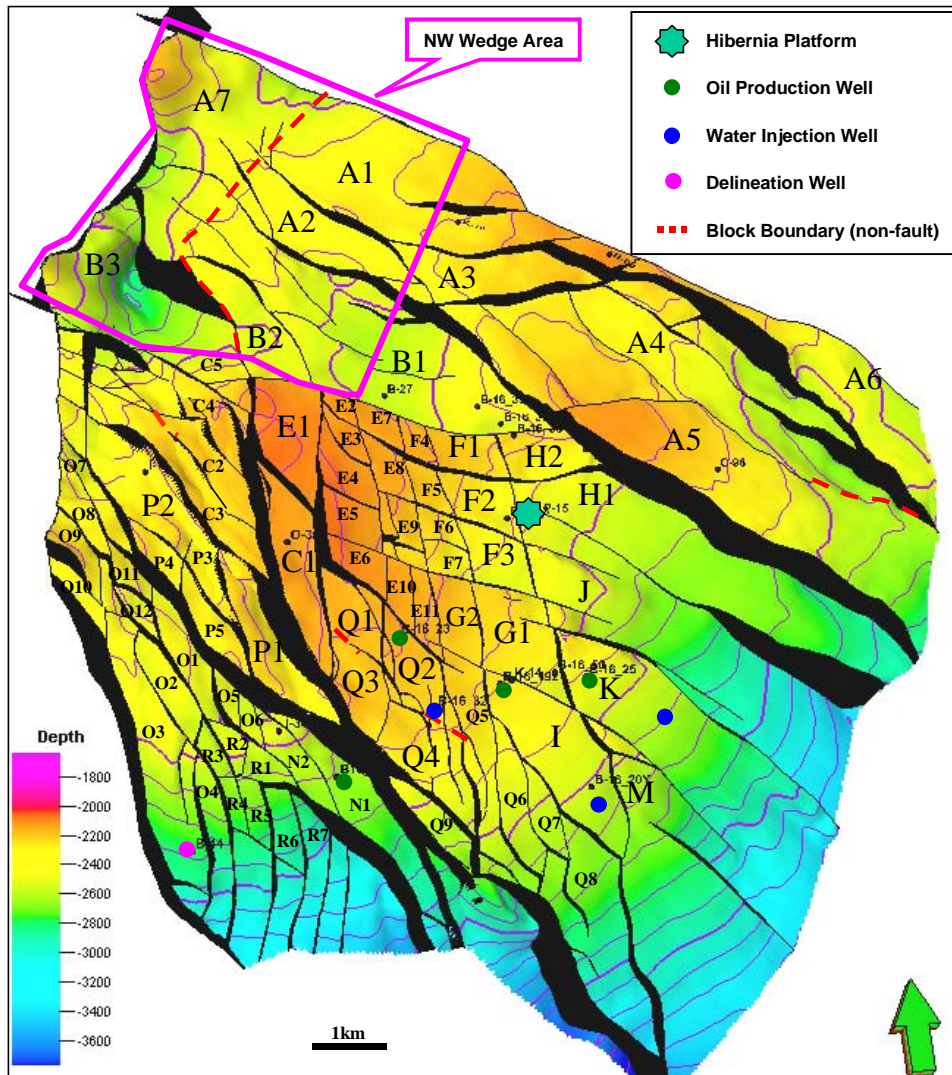


Figure B10: NW Wedge Area (Source HMDC)

The Proponent describes the prospectivity of this area as having considerable development risk, in both reservoir presence, quality and fault seal. As well, wells drilled from the platform for this area would be far more challenging and costly than any other wells drilled to date.

The Proponent expects that data acquired from the first two phases of development of the Ben Nevis-Avalon may increase the viability of drillable targets in the NW wedge. Specifically, a possible drill well targeting the P block would provide a regional indication of sand quality and thickness, and hydrocarbon charge in the area.

Well data to date suggests that within the fault blocks north of the IQK region, the reservoir sands thin over this northern area, with the exception of the wedge lying against

the Murre fault. Seismic data suggest the reservoir units thicken here, but there are no wells penetrating these units to evaluate the reservoir quality, thickness and charge.

The Stage 3 progression of block development is outlined in Figure B11.

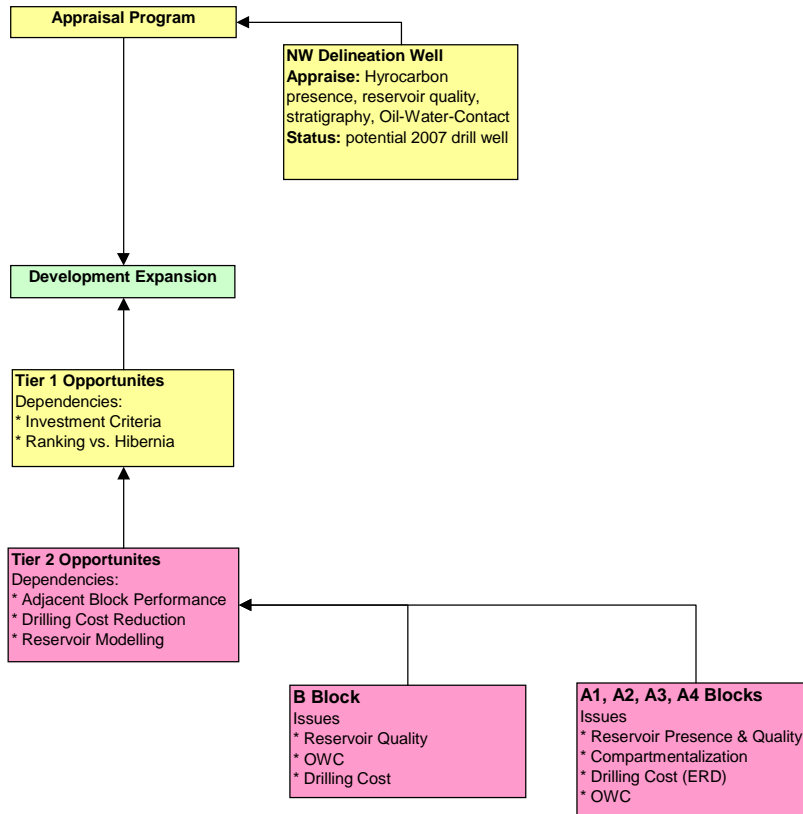


Figure B11: Stage 3 Progression by Fault Block (Source HMDC)

B.5.6 Drilling Schedule

The Proponent outlines the current Ben Nevis-Avalon drilling schedule. Since the Ben Nevis-Avalon development is only one part of the overall development, the relative timing depends on the overall reservoir management strategy and drilling results. The most recent Ben Nevis-Avalon drilling schedule presented by the Proponent is presented in Figure B12. As was noted above, ongoing development and operational issues arising, may affect actual well selection and timing.

Rig	Block	2005				2006				2007				2008			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
West	N			AWIN1													
West	Q _{east}			AWIQ2													
West	G																AOPG1
West	SW1							AOPSW1									
East	SW1												AWISW1				
Scenario 1	NW												NW DW				
Scenario 2	NW																NW DW

Figure B12: Platform Ben Nevis-Avalon Drilling Preliminary Schedule (Source HMDC)

The Proponent notes that the next well to evaluate the Ben Nevis-Avalon will be in the SW region and is currently under study (AOPSW1). It is expected to be a dual producing well, penetrating both the O and P blocks with a single well bore, and will be spudded from the west rig sometime in the third quarter of 2006. However, the Proponent also notes that the integration of the Hibernia South opportunities may impact the timing of this and following wells. The companion water injection well, AWISW1 is expected to follow this well from the east rig in the fourth quarter of 2007. Following this well, a dual Hibernia Ben Nevis-Avalon producer is being investigated for Ben Nevis-Avalon G block with a target in the Hibernia Formation. This well is expected to be started in the fourth quarter of 2008.

The timing of the NW delineation well was discussed in the Addendum to the Ben Nevis-Avalon NW Wedge Submission, and is also reflected in Figure A12. Two scenarios are outlined, based on the outcomes of development drilling. The earliest timing of a delineation well would be mid-to-late 2007. If the results of AOPSW1 (specifically P block) show poor reservoir quality, the well may be delayed to the summer of 2008, or later. No other details on rig or well slot have been brought forward for this well to date. It is significant to note, however, that the timing for the two NW delineation well scenarios presented by the Proponent have slipped approximately 3 months from that presented in the NW Wedge Submission.

B.5.7 Production Forecast

The Proponent notes that the updated Ben Nevis-Avalon simulation models have not been incorporated into the Hibernia multi-field simulation model to date. Therefore, the forecasts presented do not account for any platform processing constraints. The Stage 1 forecast was generated using the history-matched IQK model, and includes the G block currently under development. It does not address blocks F, H and E, as no simulation model has been constructed for these blocks to date. The Stage 2 forecast is comprised of the N Block prediction from a sector study to justify AWIN1 (B-16_52Z). Further models have not been constructed to date.

The Ben Nevis-Avalon Stages 1 and 2 forecast presented by the Proponent is shown in Figure B13.

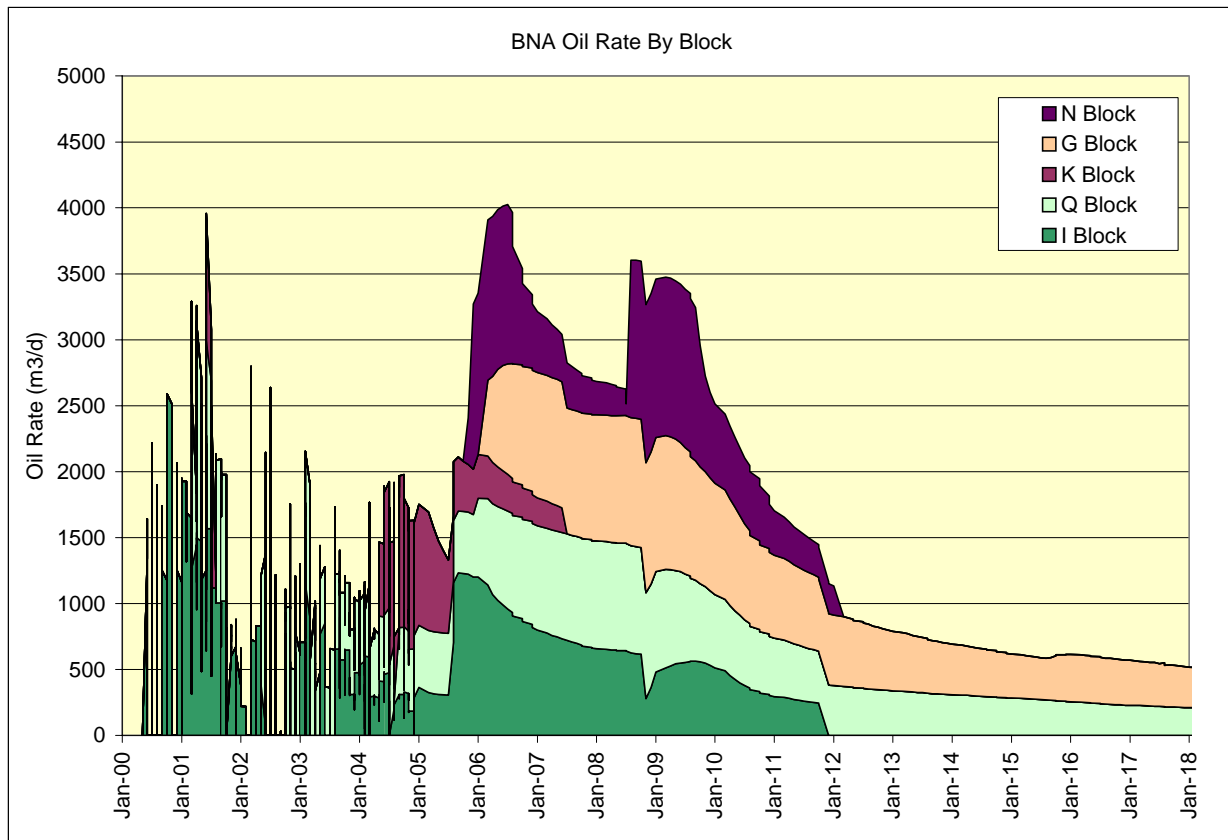


Figure B13: Ben Nevis-Avalon Stages 1 & 2 Forecast (Appraisal & Tier 1) (Source HMDC)

The simulation recovery predictions for the profiles are shown in Table B6. Note that all recovery estimates are **unrisked** results from simulation models constructed to date. For comparison to Ben Nevis-Avalon analogue fields, the Proponent notes the expected recovery efficiencies for the secondary reservoirs ranged from 26% to 32%.

Stage	Block	Initial Oil, MBO	Simulation Recovery		Analogue Lowside	
			Np, MBO	RF%	Np, MBO	RF%
1	I	45.0	15.1	34%	11.7	26%
1	Q	57.7	17.5	30%	15.0	26%
1	K	14.3	3.8	26%	3.8	26%
1	G	49.8	17.3	35%	12.9	26%
2	N	22.0	9.1	41%	5.7	26%
Total Developed		188.8	62.8	33%	49.2	26%

Table B6: Ben Nevis-Avalon Simulation Recovery (Source HMDC)

Glossary

Aquifer

A porous rock that is water bearing.

bbls (Barrels)

1 bbl = 0.15898 m³

Board, the

In this report, the Canada-Newfoundland and Labrador Offshore Petroleum Board.

Bubble point pressure

The reservoir pressure below which dissolved gas begins to bubble out of the host oil at the prevailing temperature conditions.

C-NOPB

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Certifying Authorities

Bodies licensed by the Board to conduct examination of designs, plans and facilities and to issue Certificates of Fitness.

Completion

The activities necessary to prepare a well for the production of oil and gas or injection of a fluid.

Delineation well

Well drilled to determine the extent of a reservoir.

Development well

Well drilled for the purpose of production or observation or for the injection or disposal of fluid into or from a petroleum accumulation.

Fault

In the geological sense, a break in the continuity of rock types.

Flooding

The injection of water or gas into or adjacent to, a productive formation or reservoir to increase oil recovery.

Injection

The process of pumping gas or water into an oil-producing reservoir to provide a driving mechanism for increased oil production.

Logging

A systematic recording of data from the driller's log, mud log, electrical well log, or radioactivity log.

m³

1 m³ = 6.2898 bbls

OOIP

Original oil in place.

Petrel

Trademark of Schlumberger product group geologic modelling software.

Petrophysics

Study of reservoir properties from various logging methods.

Pool

Is a natural underground reservoir containing or appearing to contain an accumulation of petroleum that is separated or appears to be separated from any such other accumulation

Produced water

Water associated with oil and gas reservoirs that is produced along with the oil and gas.

Production platform

An offshore structure equipped to produce and process oil and gas.

Production well

A well drilled and completed for the purpose of producing crude oil or natural gas.

Recoverable reserves

That part of the hydrocarbon volumes in a reservoir that can be economically produced.

Reservoir

A porous, permeable rock formation in which hydrocarbons have accumulated.

Reservoir pressure

The pressure of fluids in a reservoir.

Sandstone

A compacted sedimentary rock composed of detrital grains of sand size.

Seismic

Pertaining to or characteristic of earth vibration. Also, process whereby information regarding subsurface geological structures may be deduced from sound signals transmitted through the earth.

STOOIP

Stock tank original oil in place.