CANADA-NEWFOUNDLAND and LABRADOR OFFSHORE PETROLEUM BOARD

STAFF ANALYSIS
OF THE
NORTH AMETHYST DEVELOPMENT PLAN
AMENDMENT APPLICATION

NORTH AMETHYST HIBERNIA FORMATION

2013-09-23

ISBN# 978-1-927098-33-2

Table of Contents

Page

1.0 PURPOSE 1

2.0 EXECUTIVE SUMMARY 2

3.0 BACKGROUND 5

3.1 THE APPLICATION 5
3.2 HISTORY/CONTEXT 6

4.0 RESOURCE MANAGEMENT 12

4.1 RESOURCE MANAGEMENT REVIEW 12
4.2 GEOLOGICAL/GEOPHYSICAL/PETROPHYSICAL MODEL REVIEW 12
4.2.1 Regional Geology 12
4.2.2 Geology of Hibernia Formation 12
4.2.3 Geophysics 14
4.2.4 Petrophysics 15
4.2.5 Geological Reservoir Model 15
4.3 OIL AND GAS IN-PLACE 18
4.4 RESERVOIR ENGINEERING 20
4.4.1 Reservoir Pressure and Temperature 20
4.4.2 Fluid Data 23
4.4.3 Special Core Analysis (SCAL) 23
4.5 DEVELOPMENT STRATEGY 24
4.5.1 Displacement Strategy 24
4.5.2 Development Scenario 24
4.5.3 G-25 4 Water Injector 27
4.5.4 Full Field Performance 27
4.5.5 Gas Storage 28
4.6 RESERVOIR SIMULATION 28
4.6.1 Oil Production Results and Forecasts 29
4.6.2 Gas Production Results and Forecasts 31
4.6.3 Water Production Results and Forecasts 34
4.6.4 Water Injection Results and Forecasts 35
4.6.5 Reservoir Pressure Results and Forecast 36
4.6.6 Reservoir Simulation Summary 37
4.7 RESERVE ESTIMATES 38
4.8 CONCLUSIONS AND RECOMMENDATION 38

5.0 OPERATIONS 40

5.1 DRILLING AND COMPLETIONS 40
5.2 SUBSEA EQUIPMENT INSTALLATION, COMMISSIONING AND OPERATION 40
5.3 MODIFICATIONS TO FPSO 41
5.4 SAFETY ANALYSIS 41
5.5 CONCLUSIONS AND RECOMMENDATIONS 42

6.0 SAFETY 43

7.0 PROTECTION OF THE ENVIRONMENT 44

List of Tables

Table 4.1: Comparison of Proponent and C-NLOPB probabilistic resources in place for North Amethyst Hibernia E-17 block.
Table 4.2: Comparison of Proponent and C-NLOPB probabilistic prospective resources in-place for North Amethyst Hibernia Northern and G-25 1 blocks.
Table 4.3: North Amethyst Hibernia fluid gradients (Source: Husky Energy).
Table 4.4: North Amethyst Hibernia fluid contacts (Source Husky Energy).
Table 4.5: North Amethyst E-17 Vertical Interference Test Results (Source: Husky Energy).
Table 4.6: Comparison of Proponent and C-NLOPB probabilistic reserve estimates, North Amethyst Hibernia E-17 block.

List of Figures

Figure 3.1: Stratigraphic chart of the White Rose Field (Source: Husky Energy)
Figure 3.2: Map of the White Rose Development area, identifying well locations, drill centres, pool boundaries and North Amethyst Field.
Figure 3.3: Map of the White Rose Significant Discovery Area, identifying exploration licences, significant discovery licences and production licences.
Figure 3.4: North Amethyst Hibernia fault blocks and well locations (E-17, G-25 1 and G-25 4) (Source: Husky Energy).
Figure 4.1: Stratigraphic cross-section through North Amethyst Hibernia region (Source: Husky Energy).
Figure 4.2: North Amethyst Middle and Basal Hibernia Top with block names, well penetrations, and oil-water contact.
Figure 4.3: Stratigraphic well-section through the Hibernia Formation at North Amethyst.
Figure 4.4: Comparison of log and upscaled porosity and water saturation data.
Figure 4.5: Proponent's North Amethyst Hibernia pressure-versus-depth plot.
Figure 4.6: North Amethyst Hibernia Geothermal Gradient Estimate (Source: Husky Energy).
Figure 4.7: Hydrocarbon contacts for the North Amethyst Hibernia Formation in relation to the fault blocks and delineation well locations.
Figure 4.8: North Amethyst Basal Hibernia oil production rate and cumulative – base case.
Figure 4.9: North Amethyst Middle Hibernia oil production cases.
Figure 4.10: North Amethyst Basal Hibernia gas production rate and cumulative – base case.
Figure 4.11: North Amethyst Basal Hibernia GOR – base case.
Figure 4.12: North Amethyst Basal Hibernia water production rate and cumulative – base case.
Figure 4.13: North Amethyst Basal Hibernia water cut – base case.
Figure 4.14: North Amethyst Basal Hibernia water injection rate and cumulative – base case.
Figure 4.15: North Amethyst Basal Hibernia pressure – base case.

1.0 PURPOSE

The purpose of this staff analysis is to provide the Board with an assessment of Husky Oil Operations Limited (Proponent) North Amethyst Development Plan Amendment (DPA) for the North Amethyst Hibernia Formation. This analysis considered safety, environment, resource management and industrial benefits aspects of the Application.

2.0 EXECUTIVE SUMMARY

On December 20, 2011, the Proponent submitted to the Canada-Newfoundland and Labrador Offshore Petroleum Board (Board) on behalf of its partners Suncor Energy and Nalcor Energy-Oil and Gas the following document – "North Amethyst Development Plan Amendment – North Amethyst Hibernia Formation (December 2011)".

The proposed development is an amendment to the existing North Amethyst Development Plan (Decision 2008.03). The objective of the amendment is to produce hydrocarbons within the Basal Hibernia of the E-17 Block at North Amethyst. It is anticipated that the North Amethyst Hibernia development will consist of one production well and one water injection well. The G-25 4 water injection well within the Hibernia Formation was drilled and completed in 2010.

The North Amethyst Hibernia Formation lies within PL's 1006, 1007, and 1008, and according to the Proponent has an estimated mean OOIP of 4.52 MMm^3 (28.4 MMbbls) in the E-17 Block Basal Hibernia Formation. The estimated reserves for the North Amethyst Hibernia E-17 block are 1.32 MMm^3 (8.33 MMbbls).

Staff reviewed the document for completeness and on February 17, 2012 and December 6, 2012 requested additional information from the Proponent. The Proponent's application was not deemed to be complete until June 25, 2013. This delay was primarily due to the Proponent's delay in responding to our letters and to software compatibility issues between the geological and reservoir models.

The Development Plan Amendment document as well as the supplementary information received constitute the "Application" and is the focus of this review.

With respect to industrial benefits, staff assessed the Application and determined that the Hibernia Formation development would not require an amendment to the existing North Amethyst Benefits Plan (Decision 2008.03).

With respect to the public review process, the Board decided that a public review was not necessary for this Application.

Staff reviewed the Application from a resource management, safety, operations, and environment perspective. The following is a summary of this review.

Resource Management

In assessing the Resource Management aspects of the Application, staff reviewed the Proponent's seismic interpretations, geological model and reservoir simulation model. Staff also conducted a review of reservoir and geological data acquired and used this data to construct a geological model for the North Amethyst Hibernia Formation.

The original proposed amendment involved drilling an oil producer and water injector from an existing template in the North Amethyst excavated drill center. Currently, the Proponent is proposing to drill a delineation pilot/development producer from the Central drill center in the White Rose field. This approach may allow for a better understanding of the North Amethyst Hibernia Formation.

The Proponent previously completed a water injection well, North Amethyst G-25 4, in 2010 under an exemption granted by both Ministers to enable the Board to issue an approval to drill a well prior to the approval of a development plan amendment.

Staff are in agreement with the Proponent that the lower reservoir quality and heterogeneity of the Middle Hibernia makes development of the interval technically unfeasible at this time. Staff also concur with the Proponent that development of the G-25 1 block is not feasible at this time. Development potential does exist for the Northern block; however significant uncertainty exists for this area at this time. This uncertainty should be reduced after the Proponent penetrates the block with the delineation pilot leg prior to drilling the E-17 block producer. The Proponent will be expected to update the Board with in-place resource estimates and potential timing of development for the Northern block in the Resource Management Plan of the North Amethyst Annual Production Report.

Under the proposed scheme, the Proponent's P50 recoverable oil estimate for the North Amethyst Hibernia E-17 block is 1.32 MMm^3 (8.33 MMbbls) while staff's estimate is 1.07 MMm^3 (6.73 MMbbls).

Staff found the Proponent's geological and reservoir simulation modeling to be reasonable and appropriate. The reservoir simulation indicates that the SeaRose FPSO facilities can adequately handle additional production from the proposed North Amethyst Hibernia exploitation scheme.

As the proposed project progresses, staff would expect the Proponent to address potential reserves and anticipated timing for development in the Resource Management Plan of the North Amethyst Annual Production Report should the results from delineation of the Northern block prove positive.

Based on its assessment, staff concur with the proposed Application from a resource management perspective, and recommend approval.

Safety

No safety concerns were identified which would preclude staff from recommending approval of the Application. Activities in connection with this Application can be managed in accordance with established safety processes and procedures.

Operations

No operational concerns were identified which would preclude staff from recommending approval of the Application. Activities in connection with this Application can be managed in accordance with established processes and procedures.

Protection of the Environment

There is an existing environmental assessment in place that covers the activity proposed in this Application, therefore staff concluded that the Application does not require additional environmental assessment pursuant to the Canadian Environmental Assessment Act and recommends approval of the Application. Furthermore, the activity proposed in the Application is covered by the Proponent's existing environmental protection plan.

3.0 BACKGROUND

3.1 The Application

On December 20, 2011, Husky Oil Operations Limited (Proponent) submitted to the Canada-Newfoundland and Labrador Offshore Petroleum Board (Board) on behalf of its co-venturers Suncor Energy and Nalcor Energy - Oil and Gas the following document:

- North Amethyst Development Plan Amendment - North Amethyst Hibernia Formation (December 2011)

The proposed development requires an amendment of the approved North Amethyst Development Plan (Decision 2008.03) as the Proponent did not contemplate development of the Hibernia Formation at that time.

Staff reviewed the document for completeness and in a letter dated February 17, 2012 staff requested additional information from the Proponent. On October 3, 2012 the Proponent submitted a reservoir simulation model and a letter addressing the issues raised in our letter. Following review of the Proponent's response and reservoir simulation model, staff requested further information and the submission of a geological model and revised reservoir simulation model in a letter dated December 6, 2012. On February 15, 2013 the Proponent submitted the geological model with a revised reservoir simulation model and additional information regarding the issues noted in the December 6, 2012 letter. Staff reviewed the information along with the geological and reservoir simulation model submitted with the February 15 letter and requested the submission of another version of the simulation model due to software compatibility issues. The Proponent submitted the final reservoir simulation model on March 21, 2013. Following email correspondence and discussions with the Proponent concerning the various cases used in the most recent reservoir simulation model submission, the Board received a letter on May 22, 2013 clarifying staff's questions. Staff used this information to assess the final simulation model and, in a letter dated June 25, 2013, informed the Proponent that the application was complete.

The Development Plan Amendment document as well as the supplementary information received constitute the "Application" and is the focus of this review.

3.2 History/Context

The White Rose Field and North Amethyst Field is located approximately 350 km east of St. John's, Newfoundland and Labrador on the eastern edge of the Jeanne d'Arc Basin, in water depths ranging from 115 to 130 metres.

The White Rose Significant Discovery Area encompasses the White Rose Field, which was discovered in 1984 by the drilling and testing of the Husky et al. White Rose N-22 exploratory well, and the adjacent North Amethyst Field, which was discovered in 2006 by the drilling of the Husky Oil et al. North Amethyst K-15 well. The White Rose Field includes the South Avalon Pool, the North Avalon Pool, the South White Rose Pool and the West White Rose Pool.

The producing oil formation at White Rose and North Amethyst is the Ben Nevis/Avalon (BNA) Formation sandstone. Production has been ongoing since 2005 at the White Rose South Avalon Pool and since 2010 at the North Amethyst BNA Pool.

The Hibernia Formation at White Rose and North Amethyst underlies the BNA Formation as shown in Figure 3.1.

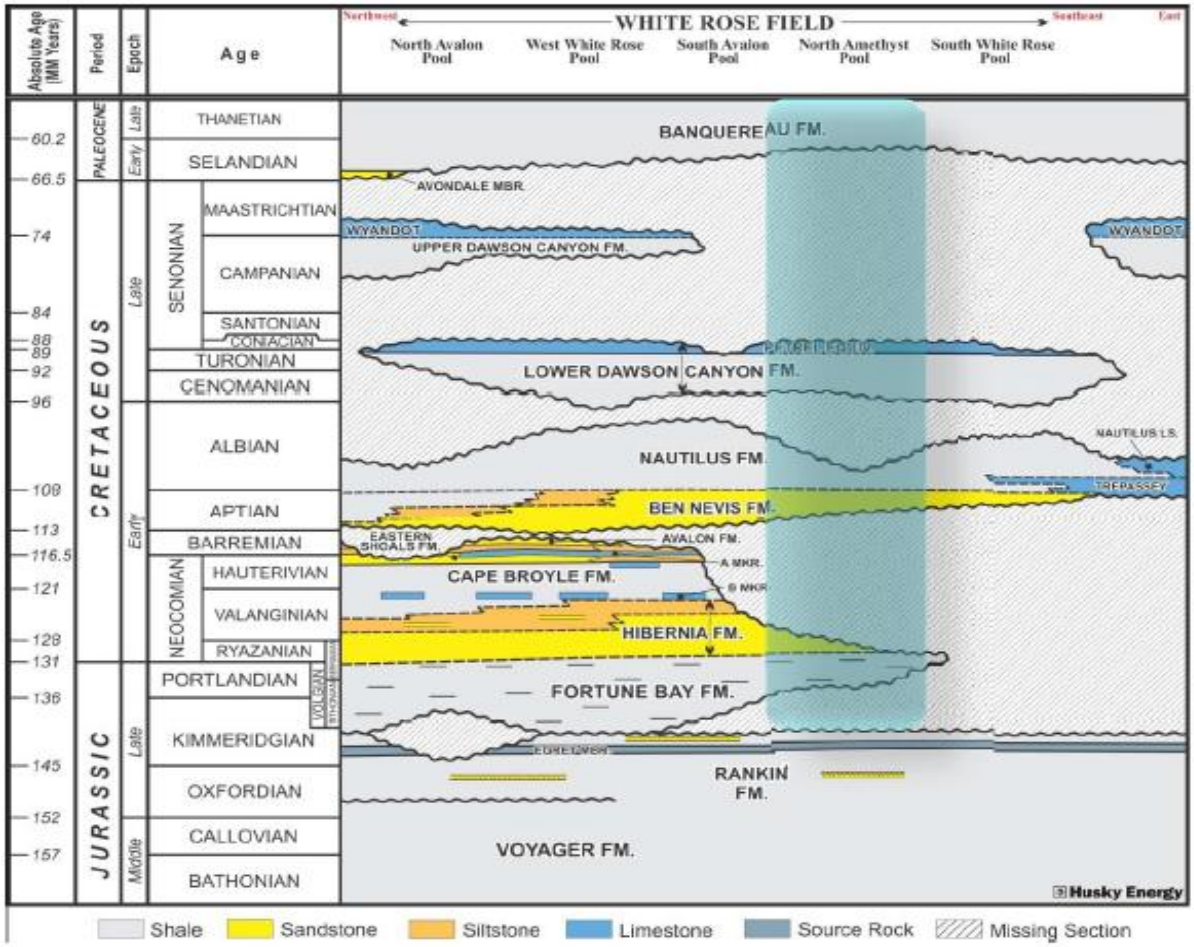

Figure 3.1: Stratigraphic chart of the White Rose Field (Source: Husky Energy)

The location of the North Amethyst Hibernia Pool in relation to the White Rose BNA pools and fields is illustrated in Figure 3.2.

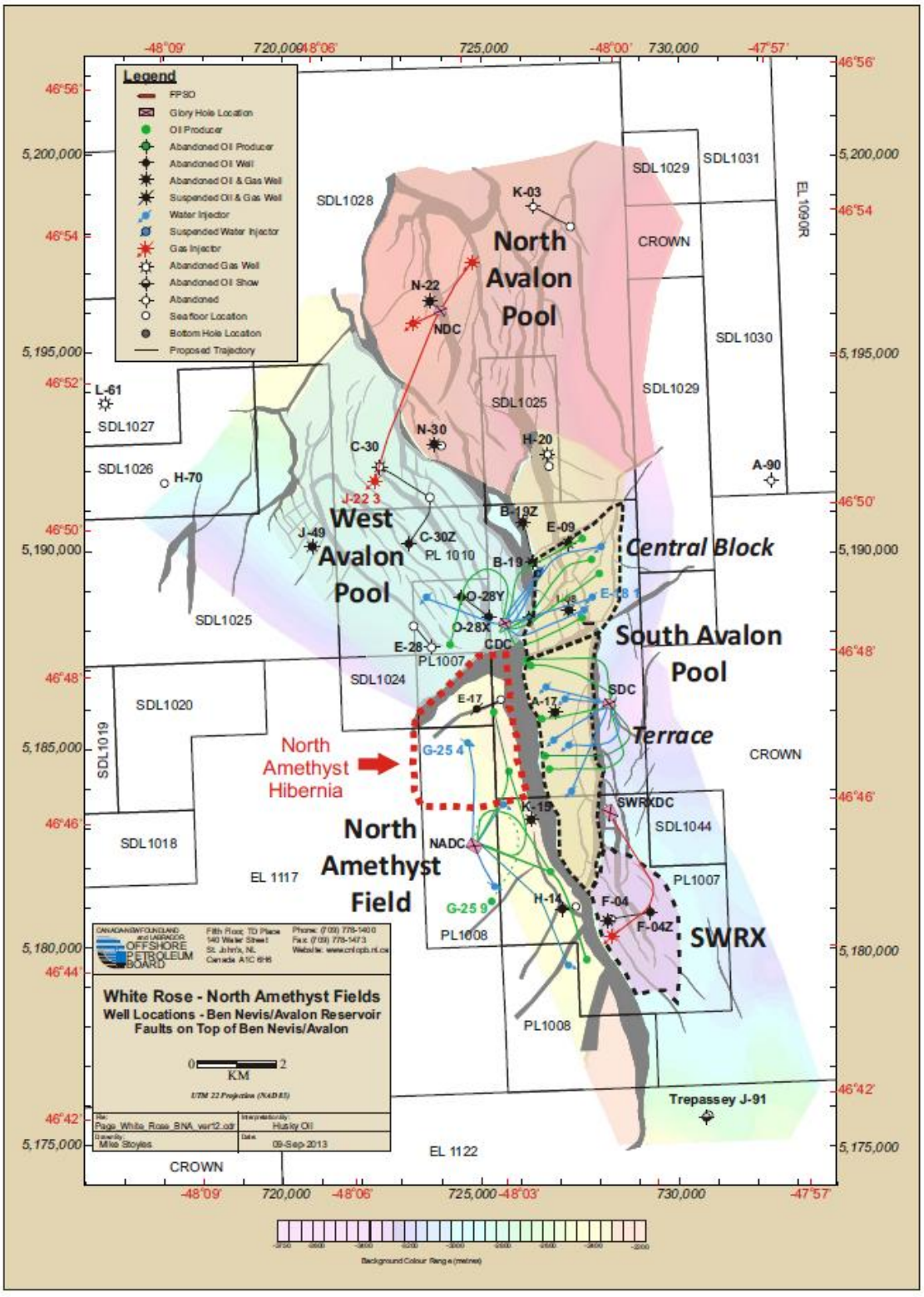

Figure 3.2: Map of the White Rose Development area, identifying well locations, drill centres, pool boundaries and North Amethyst Field.

At present, the White Rose Significant Discovery Area incorporates fourteen Significant Discovery Licences (SDLs). As well, there are five Production Licences (PLs) located in the White Rose Significant Discovery Area as indicated in Figure 3.3. PLs 1006 and 1007 are located in the White Rose Field. PLs 1009 and 1010 contain the West Avalon Pool while PL 1008 contains in the North Amethyst Field (Figure 3.3).

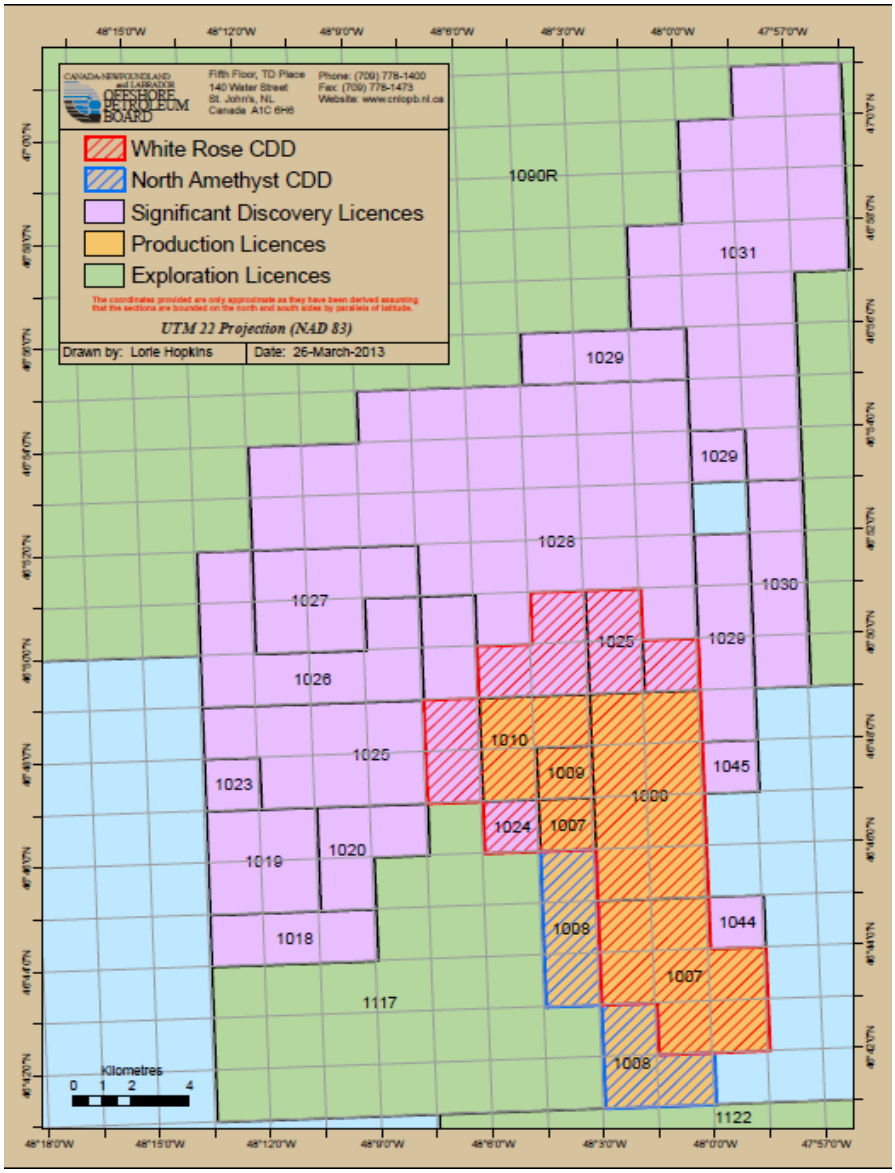

Figure 3.3: Map of the White Rose Significant Discovery Area, identifying exploration licences, significant discovery licences and production licences.

During the Proponent's delineation program for the North Amethyst BNA in 2008, an exploration component was added to the North Amethyst E-17 delineation well by deepening the well to evaluate older stratigraphy. The well encountered oil in the Basal and Middle members of the Hibernia Formation in the central E-17 block.

The Hibernia Formation also consists of the Northern fault block and the G-25 1 fault block to the south. The G-25 1 well is a North Amethyst BNA water injection well that was deepened to further delineate the North Amethyst Hibernia Formation in 2009. The well encountered water but there is a possibility of a hydrocarbon accumulation occurring further up the structure. The Northern fault block has not been penetrated by a well at this time. The three fault blocks comprising the North Amethyst Hibernia Pool are illustrated in Figure 3.4.

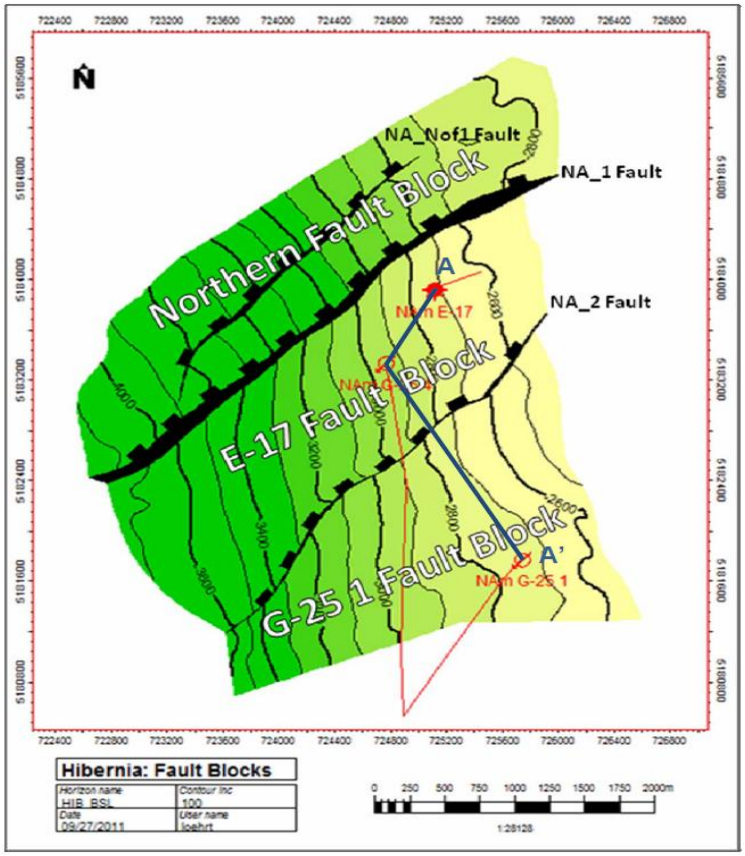

Figure 3.4: North Amethyst Hibernia fault blocks and well locations (E-17, G-25 1 and G-25 4) (Source: Husky Energy).

In 2010, the Proponent received approval from the Federal and Provincial Ministers of Natural Resources to utilize a two zone intelligent completion when drilling and completing the North Amethyst G-25 4 water injection well. This completion provided the Proponent with the capability to inject water into both the Hibernia and BNA Formations. The upper completion zone of the G-25 4 well currently supports the G-25 3 BNA production well. The lower completion zone will be utilized to support a future Hibernia Formation production well should this Application be approved.

The Proponent submitted the Application for approval on December 20, 2011.

4.0 RESOURCE MANAGEMENT

4.1 Resource Management Review

Staff reviewed the Application, which included the Proponent's seismic interpretations, geological model and reservoir simulation model. Staff also conducted a review of reservoir and geological data acquired and used this data to construct a geological model for the North Amethyst Hibernia Formation.

4.2 Geological/Geophysical/Petrophysical Model Review

4.2.1 Regional Geology

In Decision 2001.01, the Proponent extensively detailed the regional geologic history of the Jeanne d'Arc Basin. As this discussion adequately describes the tectonic evolution of the White Rose region, a similar discussion is not required for this Application.

4.2.2 Geology of Hibernia Formation

In the North Amethyst Field, the Hibernia Formation consists of four members: the Basal Hibernia Member, the Lower Hibernia Member, the Middle Hibernia Member and the Upper Hibernia Member (Figure 4.1). These members are interpreted to represent several cycles of sea-level rise and fall within a fluvio-deltaic setting.

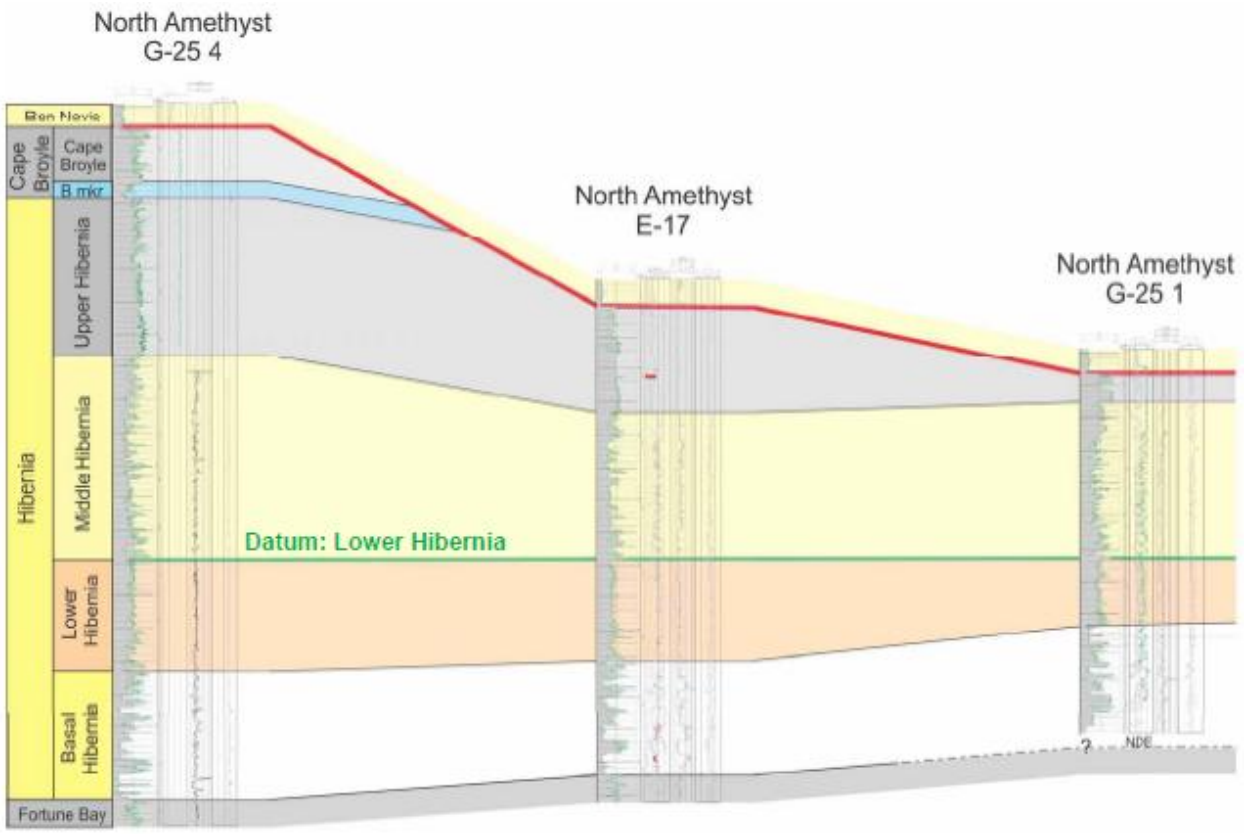

Figure 4.1: Stratigraphic cross-section through North Amethyst Hibernia region (Source: Husky Energy).

The Basal Hibernia Member at North Amethyst Field consists of several fining-upward successions of sandstone that were deposited in a lowstand fluvial dominated delta setting with significant marine influence. The Basal Hibernia includes fine to coarse-grained, good reservoir quality sandstones that contain oil in the E-17 well.

The Lower Hibernia Member consists of poor reservoir quality sandstones and shales interpreted as part of a shoreface depositional succession. It has not been found to contain hydrocarbons, and acts as an effective barrier to vertical communication between the two reservoir units.

The Middle Hibernia Member is comprised of multiple small coarsening-upward cycles of shale and sandstone interpreted as transgressive to highstand deposits of a delta. Reservoir quality sands containing hydrocarbons were encountered while drilling the North Amethyst E-17 well.

The Upper Hibernia Member consists of shales and poor quality sandstones in a series of coarsening-upward cycles. It is not considered to be a reservoir interval at North Amethyst.

Three fault blocks of the North Amethyst Field are considered structural possibilities for hydrocarbon accumulation in the Hibernia Formation (Figure 4.2). The proven oil accumulation is in the E-17 Block, where the E-17 well encountered oil in the Basal and Middle Hibernia members. To the south, the G-25 1 well encountered only water, but there is potential for attic oil accumulation in the eastern up-dip portion of the G-25 1 block. The Northern Fault Block has not yet been drilled, and as such, the fluid contacts are unknown.

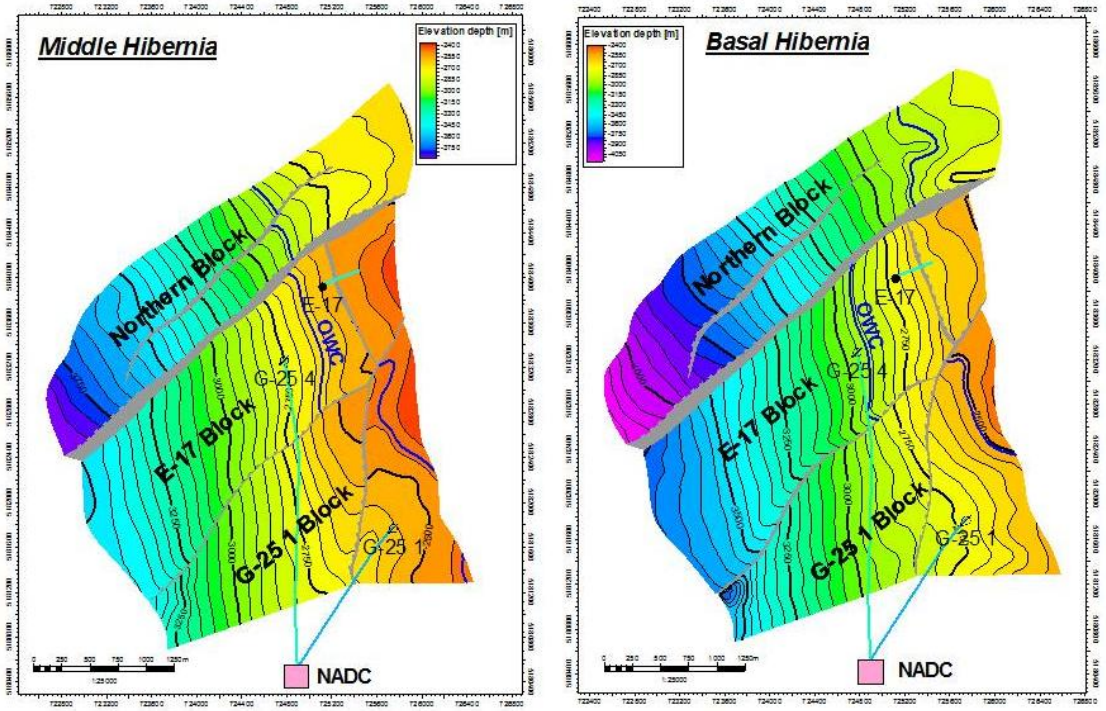

Figure 4.2: North Amethyst Middle and Basal Hibernia Top with block names, well penetrations, and oil-water contact.

Staff concur with the Proponent's description of the Hibernia geology at North Amethyst.

4.2.3 Geophysics

Seismic data quality in the White Rose asset area is fair to good. In 2008, the Proponent acquired a high-resolution 3-D seismic survey over the White Rose and North Amethyst fields. This

survey helped to improve fault resolution and resolve some of the structural and stratigraphic uncertainty within the White Rose asset area.

In the North Amethyst region, the ties between the synthetic seismograms, vertical seismic profiles (VSP's), and marine seismic data are generally good. The main wells used by the Proponent to correlate the Hibernia seismic markers within the North Amethyst Field were White Rose A-17, North Amethyst E-17, North Amethyst G-25 1 and North Amethyst G-25 4.

The Proponent mapped five seismic markers over the area of interest, including the mid-Aptian Unconformity (top Hibernia), the Middle Hibernia, the Lower Hibernia, the Basal Hibernia, and the top Fortune Bay. The Proponent supplied geophysically controlled horizon and fault interpretations for the North Amethyst Field, and these interpretations were audited and verified by Board staff and determined to be appropriate.

4.2.4 Petrophysics

The Proponent has conducted a comprehensive logging and coring program while drilling the three wells that have been drilled into the North Amethyst Hibernia Formation. In the Application, the Proponent summarized their petrophysical interpretation of the Middle, Lower and Basal Hibernia reservoir intervals for the North Amethyst E-17, G-25 1 and G-25 4 wells. The Proponent supplied supplemental information on the methodology, assumptions and criteria used in their petrophysical analysis.

Staff reviewed the petrophysical data and determined that the Proponent's petrophysical interpretation is similar to staff's assessment with slight differences attributed to different methodology, assumptions and criteria used in interpreting the data. Based on its analyses, staff believes the interpretation presented by the Proponent in support of this Application is reasonable and appropriate to evaluate this Application.

4.2.5 Geological Reservoir Model

Staff constructed a detailed 3D geological model for the Hibernia Formation at North Amethyst to estimate the in-place hydrocarbon resources. This model incorporated available geophysical, petrophysical, geological and reservoir engineering data.

The structural framework for the model is based on the fault and surface interpretation supplied by the Proponent. The model is limited vertically by the Upper Hibernia member and the Fortune Bay Formation and is subdivided by stratigraphic surfaces interpreted from seismic and well log data (Figure 4.3). Each stratigraphic zone was further subdivided by proportionally layering each interval. Overall, the average grid cell size for the model is 46 x 48 x 1.3 m.

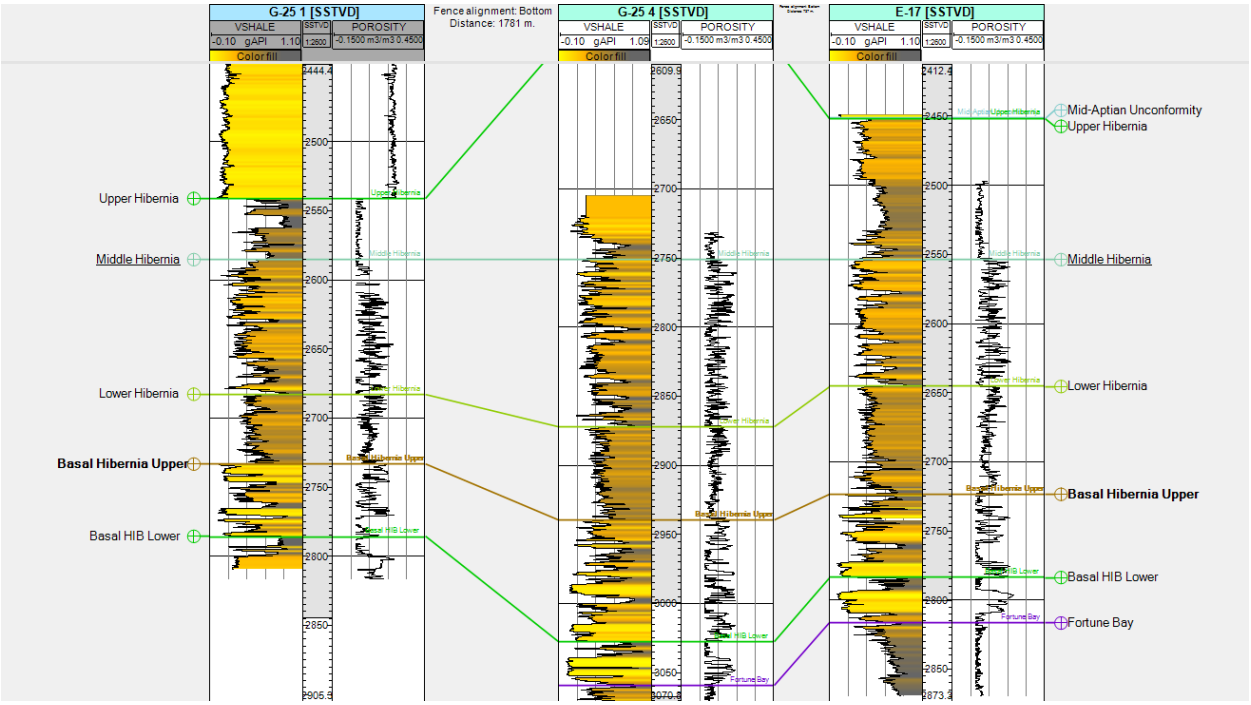

Figure 4.3: Stratigraphic well-section through the Hibernia Formation at North Amethyst.

A hierarchical modeling approach was used for the Hibernia Formation whereby the depositional environment and facies interpretations guide the statistical populations of the petrophysical data. Data from core analysis, well log interpretation and available literature were used to interpret environment of deposition (EOD) and lithofacies for the Hibernia Formation in the North Amethyst Field area. EOD and lithofacies interpretations were calibrated to the well log data within the cored interval and then extrapolated through the reservoir interval at each well location. The interpretations were then upscaled to the 3D grid. The EOD model was populated using a truncated Gaussian simulation with trends algorithm for the upper zones (Upper, Middle, and Lower Hibernia) and an object based modeling algorithm for the lower zones (Basal Hibernia) to account for the variability of fluvial channel distribution within the model. The

lithofacies were then populated using sequential indicator simulation conditioned to the EOD model. The statistical population was guided by variograms based on the interpreted shoreline and fluvial channel trends and subjective interpretation of facies sizes.

Porosity and water saturation were modeled for the Hibernia Formation at North Amethyst. The property modeling process included upscaling the logs into the 3D grid (Figure 4.4), and analysing the data by both zones and facies. The upscaled porosity data were conditioned to the facies model and populated through the grid using a sequential Gausian simulation algorithm. Distribution curves obtained from histograms of the porosity data, filtered by facies and zone, were used to ensure that the input statistics were honoured in the distribution. The modeling parameters were set on a zone-by-zone basis.

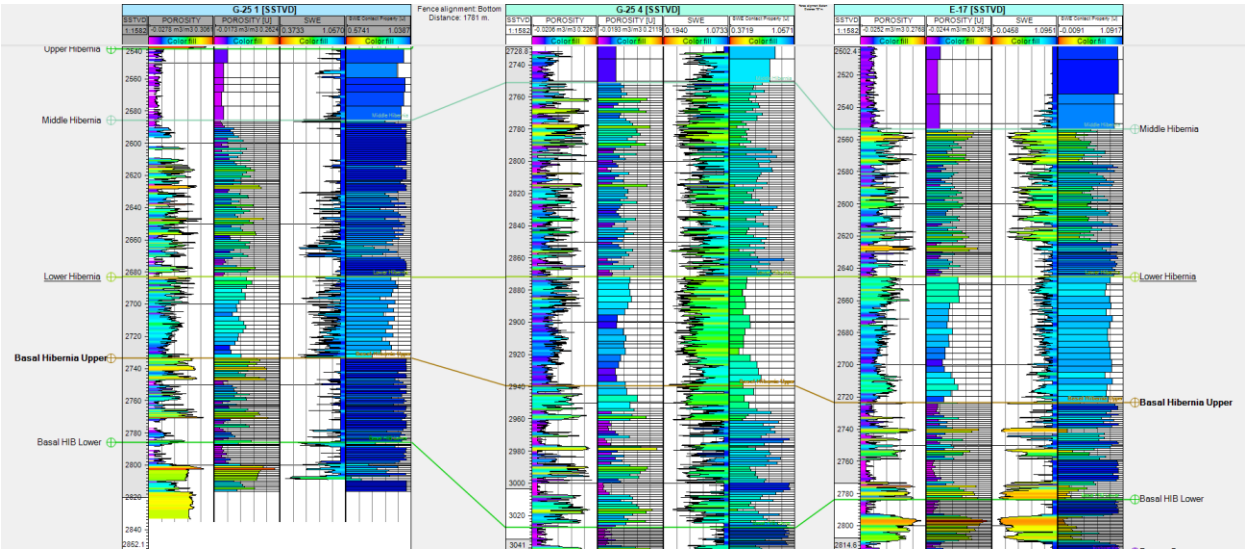

Figure 4.4: Comparison of log and upscaled porosity and water saturation data.

The water saturation data was upscaled to the 3D grid, populated using a Gausian random function simulation algorithim, and co-kriged to the porosity model. The statistical population was also conditioned to the hydrocarbon contacts. A distribution curve obtained from a histogram of the water saturation values, filtered to the hydrocarbon zone, was used to ensure the input statistical trends were honoured.

4.3 Oil and Gas In-Place

Staff conducted an assessment of the in-place hydrocarbon resources in the North Amethyst Hibernia Pool. The resulting deterministic hierarchical geological model was used as a basis for the stochastic assessment. Multiple parameters were varied in the assessment, including facies, porosity, water saturation, hydrocarbon contacts and shrinkage.

The primary focus of the North Amethyst Hibernia development, as outlined in the Application, is the hydrocarbon column within the Basal Hibernia of the E-17 block. A comparison of the Proponent's and the Board's volumetric oil-in-place (OOIP) estimates for North Amethyst Hibernia E-17 block, are shown in Table 4.1. These are probabilistic in-place resource estimates: P90 (downside case), P50 (most likely case) and P10 (upside case).

	Formation	Units	P90		P50		P10	
			Husky	C-NLOPB	Husky	C-NLOPB	Husky	C-NLOPB
E-17 Block OOIP	**Basal Hibernia**	MMbbls	**19.2**	**17.17**	**28.4**	**21.7**	**40.6**	**30.38**
		MMm^3	**3.05**	**2.73**	**4.52**	**3.45**	**6.46**	**4.83**
	Middle Hibernia	MMbbls	**5.85**	**7.93**	**10**	**9.74**	**14.9**	**12.39**
		MMm^3	**0.93**	**1.26**	**1.59**	**1.55**	**2.37**	**1.97**

Table 4.1: Comparison of Proponent and C-NLOPB probabilistic resources in place for North Amethyst Hibernia E-17 block.

Overall, there are differences between the Proponent and staff's volumetric OOIP assessment for the E- 17 block. These differences can be attributed to the geological modeling and statistical population methodologies, the petrophysical analysis, and the parameters varied in the uncertainty analysis. Considering the above statement, and the limited reservoir data, staff find the Proponent's OOIP estimates for the E-17 block to be acceptable.

The Application also indicates there is potential for hydrocarbon accumulations in the Northern and G-25 1 blocks but this has not been confirmed by well penetrations. The G-25 1 block was penetrated by a well but was found to be wet. There is a possibility of hydrocarbon accumulation occurring above this well penetration; however the Proponent believes this to be

unlikely. Staff are of a similar view that any oil accumulation in the G-25 1 block would be minimal.

As a well penetration has not confirmed hydrocarbons in the Northern or G-25 1 block, the Application presented the Proponent's probabilistic distributions for prospective resource in-place as unrisked distributions. A comparison of the Proponent's and staff's prospective volumetric resource in-place estimates for North Amethyst Hibernia Northern and G-25 1 blocks, are shown in Table 4.2. These are probabilistic in-place resource estimates: P90 (downside case), P50 (most likely case) and P10 (upside case).

	Formation	Units	P90		P50		P10	
			Husky	C-NLOPB	Husky	C-NLOPB	Husky	C-NLOPB
North Block OOIP	**Basal Hibernia**	MMbbls	**10.3**	**4.84**	**16.7**	**7.48**	**26.92**	**24.15**
		MMm^3	**1.64**	**0.77**	**2.66**	**1.19**	**4.28**	**3.84**
	Middle Hibernia	MMbbls	**10.2**	**15.78**	**17.74**	**20.57**	**27.49**	**32.58**
		MMm^3	**1.62**	**2.51**	**2.82**	**3.27**	**4.37**	**5.18**
G-25 1 Block OOIP	**Basal Hibernia**	MMbbls	**4.84**	**1.88**	**10**	**5.53**	**20.06**	**25.73**
		MMm^3	**0.77**	**0.3**	**1.59**	**0.88**	**3.19**	**4.09**
	Middle Hibernia	MMbbls	**2.42**	**0.94**	**4.96**	**3.21**	**9.18**	**11.01**
		MMm^3	**0.385**	**0.15**	**0.789**	**0.51**	**1.46**	**1.75**

Table 4.2: Comparison of Proponent and C-NLOPB probabilistic prospective resources in-place for North Amethyst Hibernia Northern and G-25 1 blocks.

Differences exist between the Proponent's and staff's volumetric assessment for the Northern and G-25 1 blocks. These can be attributed to differences in the geological modeling and statistical population methodologies, the petrophysical analyses and the parameters varied in the uncertainty analysis. Staff find the Proponent's prospective resources in-place for the Northern and G-25 1 block to be acceptable.

The uncertainty of the resource in-place estimates for the Northern block will be resolved after the Proponent penetrates the block by drilling a delineation pilot leg into it prior to drilling of the E-17 block producer. Further details on the Proponent's plans to delineate the Northern block can be found in Section 4.5.2.

4.4 Reservoir Engineering

Analysis of the reservoir engineering component of the Application included a review of the following items:

- Reservoir Pressure and Temperature
- Fluid Data
- Special Core Analysis

4.4.1 Reservoir Pressure and Temperature

The North Amethyst Hibernia Pool has been delineated by the G-25 1, G-25 4 and E-17 wells to date. Reservoir pressures were obtained from these wells using Schlumberger's modular dynamic formation tester tool (MDT). A pressure-versus-depth plot for the North Amethyst Hibernia Pool is illustrated in Figure 4.5.

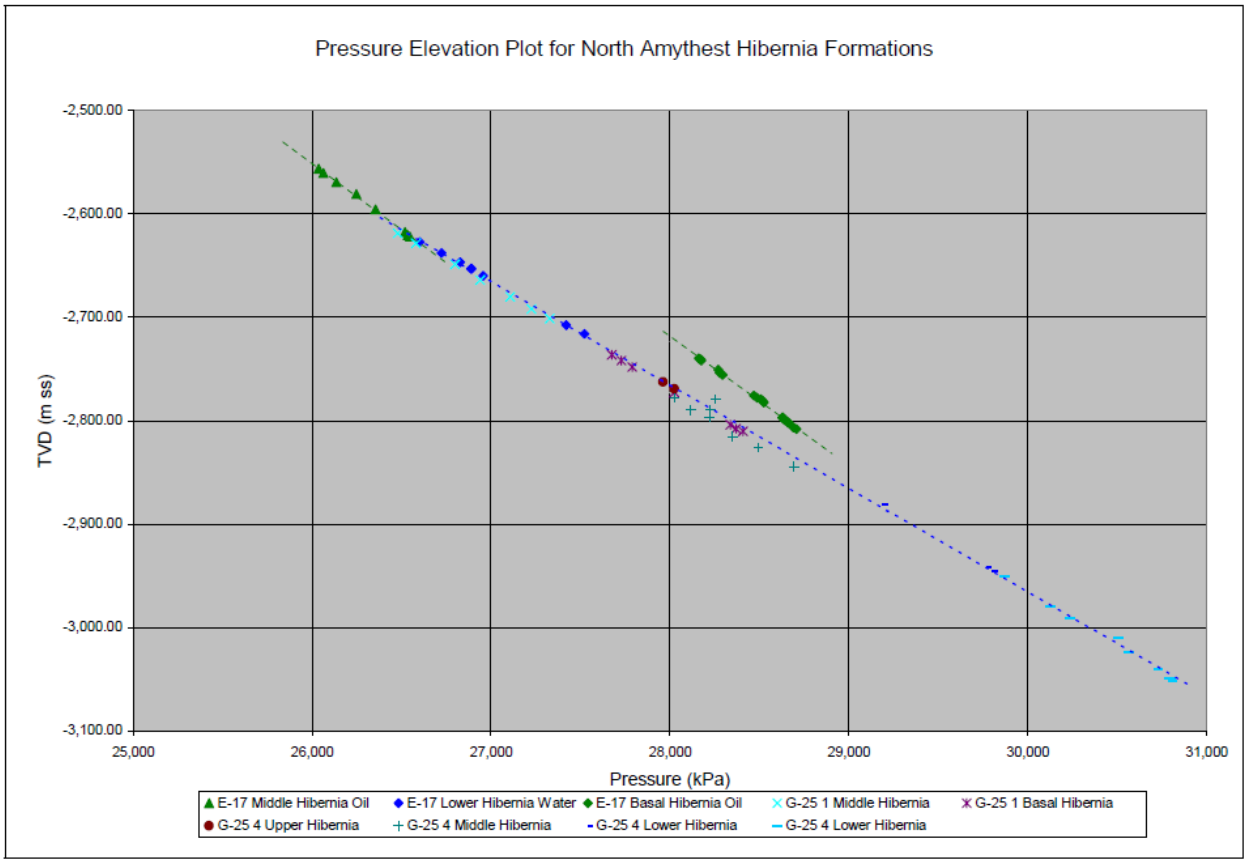

Figure 4.5: Proponent's North Amethyst Hibernia pressure-versus-depth plot.

The North Amethyst Hibernia Pool is defined by the fluid gradients encountered in the G-25 1, G-25 4 and E-17 wells as shown in Table 4.3. There was no gas encountered in the three wells and thus no reservoir gas gradient was calculated.

Well	Reservoir Gas Gradient (kPa/m)	Reservoir Oil Gradient (kPa/m)	Reservoir Water Gradient (kPa/m)
G-25 1	N/A	N/A	10.01
G-25 4	N/A	N/A	9.86
E-17 Middle	N/A	7.83	10.13
E-17 Basal	N/A	7.43	N/A

Table 4.3: North Amethyst Hibernia fluid gradients (Source: Husky Energy).

The estimated fluid contacts from the North Amethyst Hibernian E-17 MDT results are shown in Table 4.4. There is good agreement between the Proponent's and the staff's oil-water contacts.

Well	Formation	Contact	Subsea Depth (m TVD SS)
E-17	Middle Hibernia	Oil-Water	-2620
E-17	Basal Hibernia	Oil-Water	-2905

Table 4.4: North Amethyst Hibernia fluid contacts (Source Husky Energy).

The Proponent also utilized the MDT tool to perform vertical interference testing in the Hibernia formation of the E-17 well to assess the flow capabilities of the Hibernia Formation. This testing provided the Proponent with vertical communication, permeability and skin data. The results of the testing are shown in Table 4.5 and indicate adequate reservoir quality.

Test Formation	Test Depth (m)	Top (m)	Bottom (m)	Formation Pressure (kPa)	Kh (md)	Kv (md)	Kh/Kv	Skin
Middle Hibernia	2654.5	2653.6	2655.0	26056.0	56	6.5	8.62	0.9
Basal Hibernia	2875.0	2871.0	2879.0	28508.7	214	20	10.70	1.0
Basal Hibernia	2894.0	2888.0	2898.0	28648.2	330	31	10.65	2.5

Table 4.5: North Amethyst E-17 Vertical Interference Test Results (Source: Husky Energy).

Due to the number of wells drilled in the North Amethyst BNA Formation, the temperature gradient is well understood. The Proponent expects that the gradient will extend into the deeper Hibernia Formation. Reservoir temperature in North Amethyst Hibernia was measured in the G-25 1, G-25 4 and E-17 wells. The maximum temperature found was 105 deg C during logging of the G-25 4 well. The Proponent estimates the reservoir temperature to be 109 deg C to 119 deg C (at 3,100 m TVDss). This estimate takes into account the expected reduction in reservoir temperature during logging due to drilling mud circulation. The temperatures recorded during the MDT testing of the G-25 1, G-25 4 and E-17 wells are illustrated in Figure 4.6.

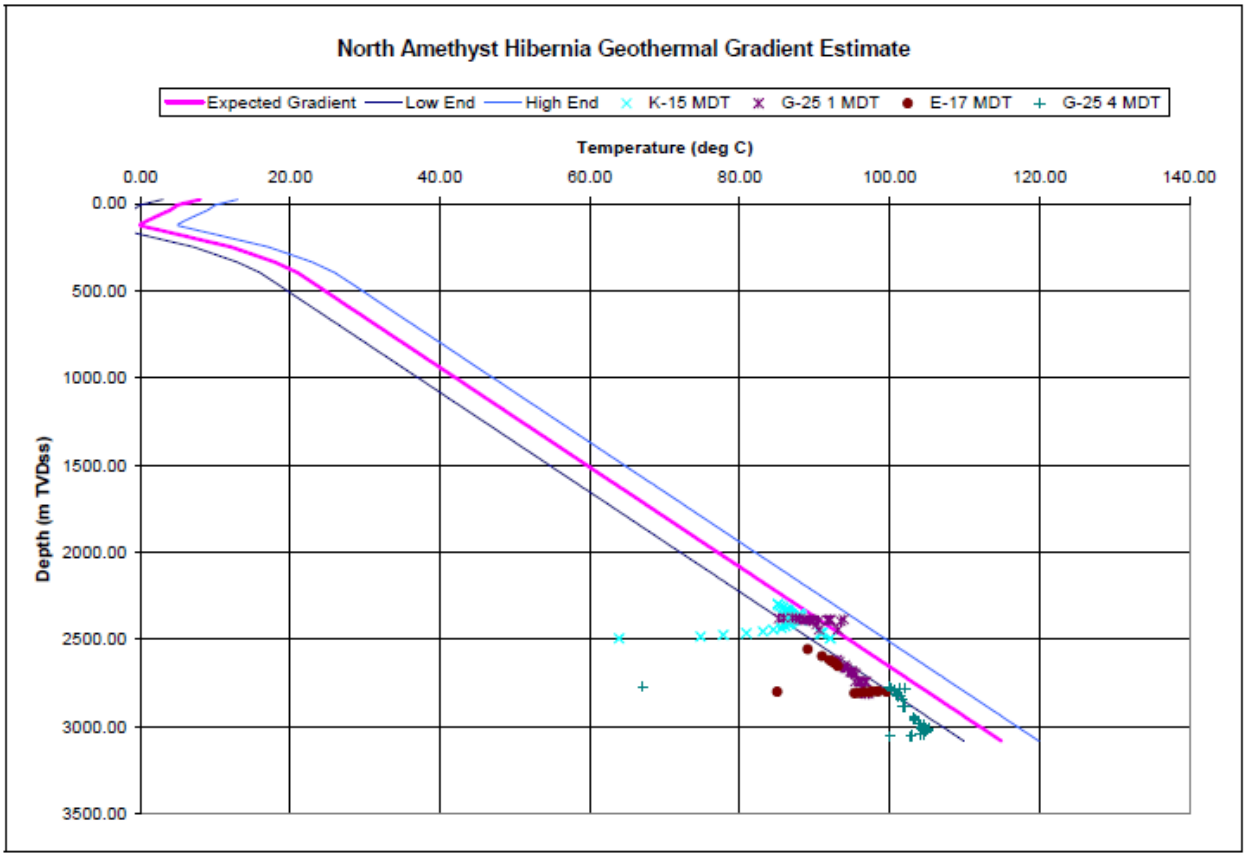

Figure 4.6: North Amethyst Hibernia Geothermal Gradient Estimate (Source: Husky Energy).

Staff considers the Proponent's analysis and use of the pressure and temperature data to be reasonable and appropriate for the North Amethyst Hibernia Pool.

4.4.2 Fluid Data

The Proponent collected 14 oil samples and four water samples from the Hibernia Formation in the E-17 well. The Application indicates a separator flash test and a differential liberation test were conducted on oil sample 1200. The fluid analysis testing on this oil sample found a gas-oil-ratio (GOR) of 104 sm^3/sm^3, a formation volume factor of 1.29 m^3/sm^3, and a bubble point pressure of 24,700 kPa for the North Amethyst Hibernia Formation.

The E-17 well did not encounter any free gas or gas cap in the Hibernia Formation. The Proponent does not expect a gas cap in the Basal Hibernia Pool as the initial reservoir pressure of 28,630 kPa was found to be higher than the estimated bubble point pressure from the fluid analysis.

The Proponent also performed water compositional analysis on two of the water samples taken from the Lower Hibernia Formation in the E-17 well.

Staff considers the Proponent's oil, gas and water characterizations to be reasonable and appropriate.

4.4.3 Special Core Analysis (SCAL)

The normalized relative permeability curves for the North Amethyst BNA/Avalon Pool were used by the Proponent in the North Amethyst Hibernia reservoir simulation model. The endpoints of the laminated sandstone normalized relative permeability curves were adjusted to match the early results found in some of the E-17 special core analysis testing. The Proponent did not adjust the endpoints for the shale and bioturbated rock types. This approach was used as the special core analysis study for North Amethyst Hibernia was ongoing at the time the reservoir simulation model was being built by the Proponent. The Proponent will be expected to provide updates on the North Amethyst Hibernia SCAL work in the Resource Management Plan of the North Amethyst Annual Production Report.

Staff found the Proponent's approach to special core analysis and overall reservoir engineering data to be reasonable and acceptable.

4.5 Development Strategy

The Application indicates the Proponent's reservoir management plan for the North Amethyst Hibernia will be in accordance with the existing criteria currently being employed to produce the South Avalon and North Amethyst pools.

4.5.1 Displacement Strategy

The Application proposes development of the North Amethyst Hibernia Pool through secondary recovery by waterflood. This displacement strategy is the same that is currently employed for North Amethyst BNA Pool.

As the G-25 4 water injector is currently in place, the Proponent could commence water injection and voidage replacement when production from the North Amethyst Hibernia Pool begins. The Proponent will optimize the voidage replacement ratio throughout the life of field in order to maximize oil recovery. The water used for injection will be seawater, sourced and treated in the same manner as the water currently being injected into the South Avalon and North Amethyst BNA pools from the SeaRose FPSO.

Staff find the Proponent's plans for the displacement strategy of the North Amethyst Hibernia to be reasonable and acceptable.

4.5.2 Development Scenario

The potential hydrocarbon bearing region of the North Amethyst Hibernia is comprised of three main fault blocks. These fault blocks are the Northern fault block, the E-17 fault block and the G-25 1 fault block and are illustrated in Figure 4.7.

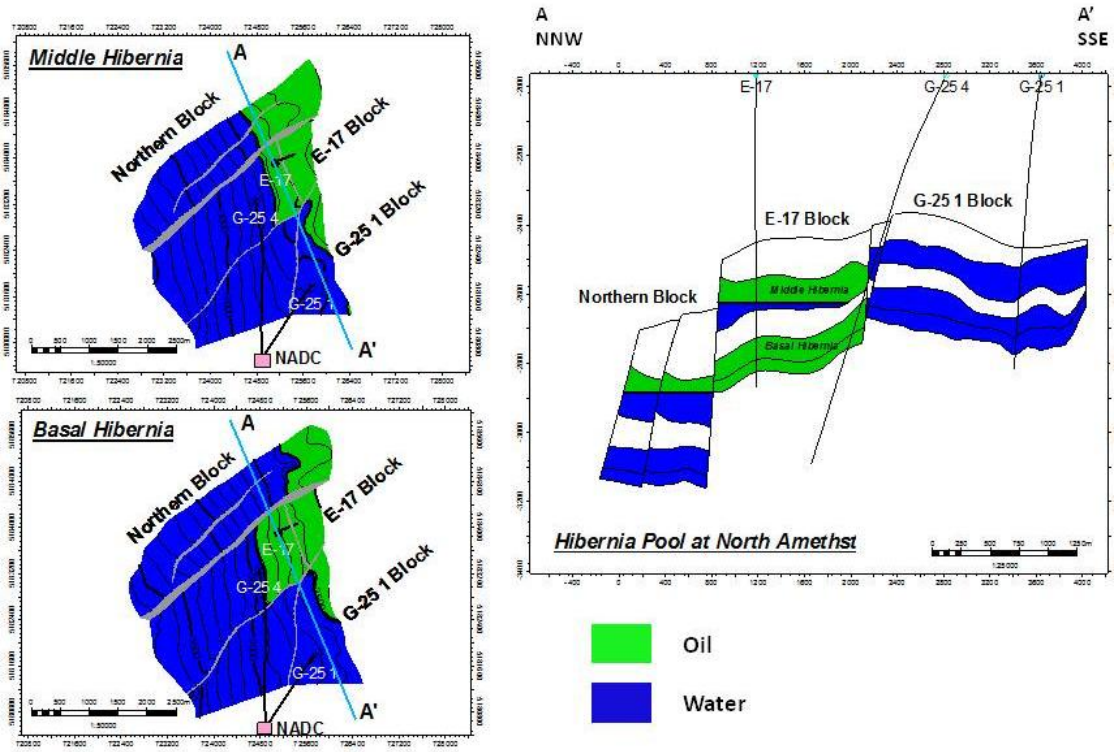

Figure 4.7: Hydrocarbon contacts for the North Amethyst Hibernia Formation in relation to the fault blocks and delineation well locations.

The Application indicates the primary focus of the North Amethyst Hibernia development is the hydrocarbon column in the Basal Hibernia Formation of the E-17 block. The Proponent anticipates the development of the E-17 block will consist of one production well and the lower interval of the existing G-25 4 water injection well as the aerial extent of the Basal Hibernia Pool is thought to be limited at this time. The producer is expected to be equipped with gas lift capability.

The Application states that consideration will be given to additional wells in the North Amethyst Hibernia should the information obtained from the proposed producer prove there is further potential. The G-25 1 delineation well, drilled to the south of the E-17 fault block, encountered water and as a result the Proponent believes the block to be wet and does not currently anticipate development of this fault block. The Northern fault block has not been penetrated by a well but has the potential to be hydrocarbon bearing.

While the Application does not address development of the Northern fault block, the Proponent expressed a desire to delineate this area. The Proponent has evaluated several different methods of delineating this block, such as drilling a dedicated delineation pilot leg in the Northern block in conjunction with the drilling of the E-17 block producer. With positive results the Northern block could potentially be developed in the future.

The Proponent does not consider development of the Middle Hibernia interval to be technically feasible at this time due to the interbedded nature and lower reservoir quality of the sands. The heterogeneity of the Middle Hibernia will reduce the effectiveness of water flooding and result in poor sweep efficiency and thus ultimate recovery. Based on the review of the Proponent's Middle Hibernia reservoir simulation cases, and the staff's geological modeling work, staff are in agreement with the Proponent's assessment. Further discussion on the Middle Hibernia reservoir simulation cases can be found in Section 4.6.1.

Upon initial submission of the Application, drilling of the North Amethyst Hibernia E-17 block producer was proposed through a spare drill slot in the North Amethyst Drill Centre (NADC). Since that time, the Proponent has altered the development scenario for the North Amethyst Hibernia producer. Drilling design work performed by the Proponent found that due to the extended reach design of drilling the producer from the NADC, the complexity of the well and the resulting drilling cost, could be reduced by drilling the producer from a spare drilling slot in the Central Drill Centre (CDC). With this change in well design the measured depth of the well will be significantly less than the initial NADC design. The spare drilling slot in the CDC was not previously assigned to any development well.

The Proponent does not anticipate any significant modifications or additions to the existing subsea infrastructure or the SeaRose FPSO for this proposed development.

Staff find the Proponent's development strategy to be reasonable and are encouraged by the Proponent's plans to delineate the Northern fault block of the North Amethyst Hibernia. Should the results from delineation of the Northern block prove positive the Proponent will be expected to address potential reserves and anticipated timing for development in the Resource Management Plan of the North Amethyst Annual Production Report.

4.5.3 G-25 4 Water Injector

While developing the depletion scheme for the North Amethyst Hibernia Formation, the Proponent recognized the planned location for the second North Amethyst BNA water injector (G-25 4) was in an optimal location for water injection into the Basal Hibernia Formation and as a result provided the opportunity for a single water injector to support production wells in both pools.

The G-25 4 water injector was drilled in 2010 and was equipped with a two zone intelligent completion allowing for water injection into both the BNA and Hibernia formations. The upper completion zone of this well currently provides pressure support for the G-25 3 North Amethyst BNA producer. This zone is classified as development while the lower interval in the Hibernia Formation is classified as delineation. As development of the North Amethyst Hibernia had not been approved by the Board at the time, the Proponent had to seek ministerial approval prior to completing the G-25 4 dual water injector. Ministerial approval to drill the well was given to the Proponent on August 12, 2010. The delineation classification for the Hibernia interval of the dual water injection well will be reclassified as development should the Application be approved by the Board.

4.5.4 Full Field Performance

As the South Avalon and North Amethyst pools have come off peak production the Proponent indicates there is spare capacity within the current SeaRose FPSO production facilities to accommodate the increased production volumes from the proposed North Amethyst Hibernia development. As the development only proposes one producer and water injector pair the additional production and injection volumes are not anticipated to be significant.

Staff took the SeaRose FPSO production facility capacities into account when reviewing the Proponent's reservoir simulation model to ensure there were no significant issues. The SeaRose FPSO production and injection constraints used for this assessment are as follows:

- Total Liquids – 33,000 m^3/day (208,000 bbls/day)
- Total Water Injection – 44,000 m^3/day (277,000 bbls/day)
- Water Injection per excavated drill centre – 30,000 m^3/day (189,000 bbls/day)
- Produced Water – 28,000 m^3/day (176,000 bbls/day)

- Gas Compression – 4.2 MMm^3/day (148 MMscf/day)
- Lift Gas – 1.6 MMm^3/day (56 MMscf/day)
- Lift Gas per excavated drill centre – 1.19 MMm^3/day (42 MMscf/day)

Staff did not find any cause for concern from the predicted produced or injected volumes that would result from this proposed amendment. Further details on staff's analysis of the Proponent's reservoir simulation model can be found in Section 4.6.

4.5.5 Gas Storage

Produced gas from the North Amethyst Hibernia will be re-injected through the gas storage infrastructure and stored in the same manner that produced gas from the White Rose Development Area is currently being handled. The Proponent will either re-inject the gas in the Northern Drill Centre (NDC) for storage in the North Avalon or West White Rose pools, or alternatively re-inject the gas in the recently approved (Decision 2013.04) South White Rose Drill Centre (SWRXDC) for gas flooding of the South Avalon or SWRX pools. As the remaining gas storage capacity in the NDC is minimal, it is anticipated the majority of produced gas from North Amethyst Hibernia will be used for gas flooding through the SWRXDC.

4.6 Reservoir Simulation

To support this Application, the Proponent submitted several reservoir simulation models for the North Amethyst Hibernia E-17 block. The most recent simulation model was submitted to the Board on March 21, 2013 and was based on a single realization of the associated statistically populated Petrel geological model. A total of five simulation cases were included for the E-17 block with this most recent submission. Two of the simulation cases were for the Basal Hibernia sands, which had minimal difference in the cumulative oil production, while the remaining three were cases run to evaluate production potential from the Middle Hibernia sands.

All the simulation cases provided by the Proponent assumed production from North Amethyst Hibernia commenced at the start of the year 2012 and produced until the end of 2024. As the assumed start date has now passed, Staff adjusted the simulation forecasts to commence production on January 1, 2014 and cease producing at the end of 2026. The later production start date is more reflective of the timing indicated on the Proponent's most recent drill well schedule.

Overall, the Proponent's reservoir simulation model and the assumptions used are reasonable and are consistent with modeling constraints used by the Proponent in the past.

4.6.1 Oil Production Results and Forecasts

Production from the North Amethyst Basal Hibernia producer has an initial production rate of approximately 1,480 m^3/d (8,805 bbls/d) when the well first comes online. The model indicates a very steep decline rate over the first three months of production when the rate has dropped to approximately 800 m^3/d (5,032 bbls/d). The oil production rate then stabilizes and averages approximately 750 m^3/d (4,717 bbls/d) for a two year period before beginning to steeply decline again. This steep decline continues for a period of approximately three years before the decline rate begins to decrease for the remainder of field life.

Using the Proponent's exploitation scheme of one producer and water injector pair, the reservoir simulation model suggests that ultimate recovery from the North Amethyst Basal Hibernia will be 1.83 MMm^3 (11.5 MMbbls). This equates to a predicted recovery factor of 33 percent as the original oil in place of the model is 5.54 MMm^3 (34.86 MMbbls). Figure 4.8 illustrates the predicted Basal Hibernia oil production rate and cumulative production from the North Amethyst Hibernia reservoir simulation model.

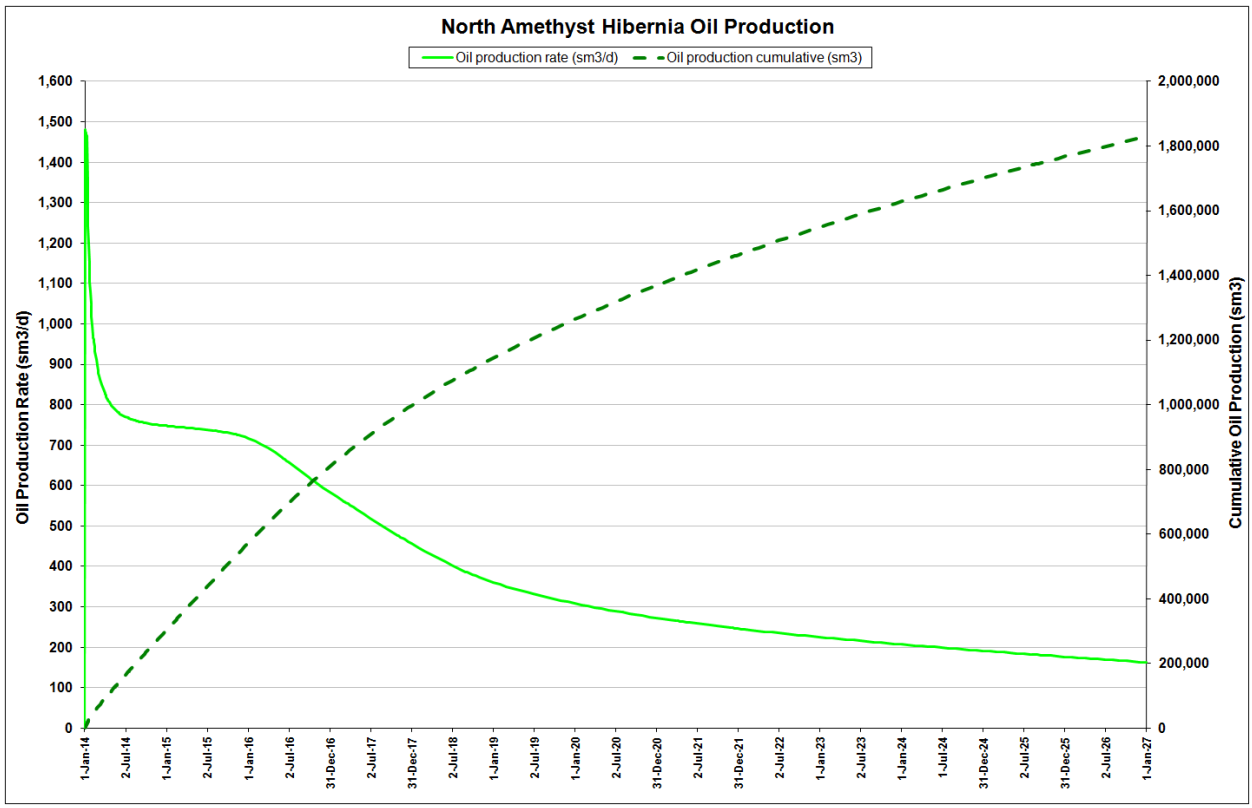

Figure 4.8: North Amethyst Basal Hibernia oil production rate and cumulative – base case.

The Proponent provided three Middle Hibernia simulation cases in which a producer and a water injector were placed in various locations in the formation. Two of these cases resulted in approximately the same cumulative oil production of 0.11 MMm^3 (0.69 MMbbls) at the end of field life where the wells, in both cases, were producing below 200 m^3/day approximately one month after commencing production. The third case achieved the highest ultimate recovery but was only slightly higher with a cumulative oil production of 0.12 MMm^3 (0.75 MMbbls). Similar to the other Middle Hibernia cases, the oil production rate in this case decreased below 200 m^3/day within one month of production start up. The simulated recovery factor for this highest recoverable Middle Hibernia case was 9.4 percent which is considerably lower than the recovery factor (33 percent) of the Basal Hibernia cases. The poor results from these Middle Hibernia simulation cases, depicted in Figure 4.9, have contributed to the Proponent's view that developing the Middle Hibernia Interval is currently not feasible.

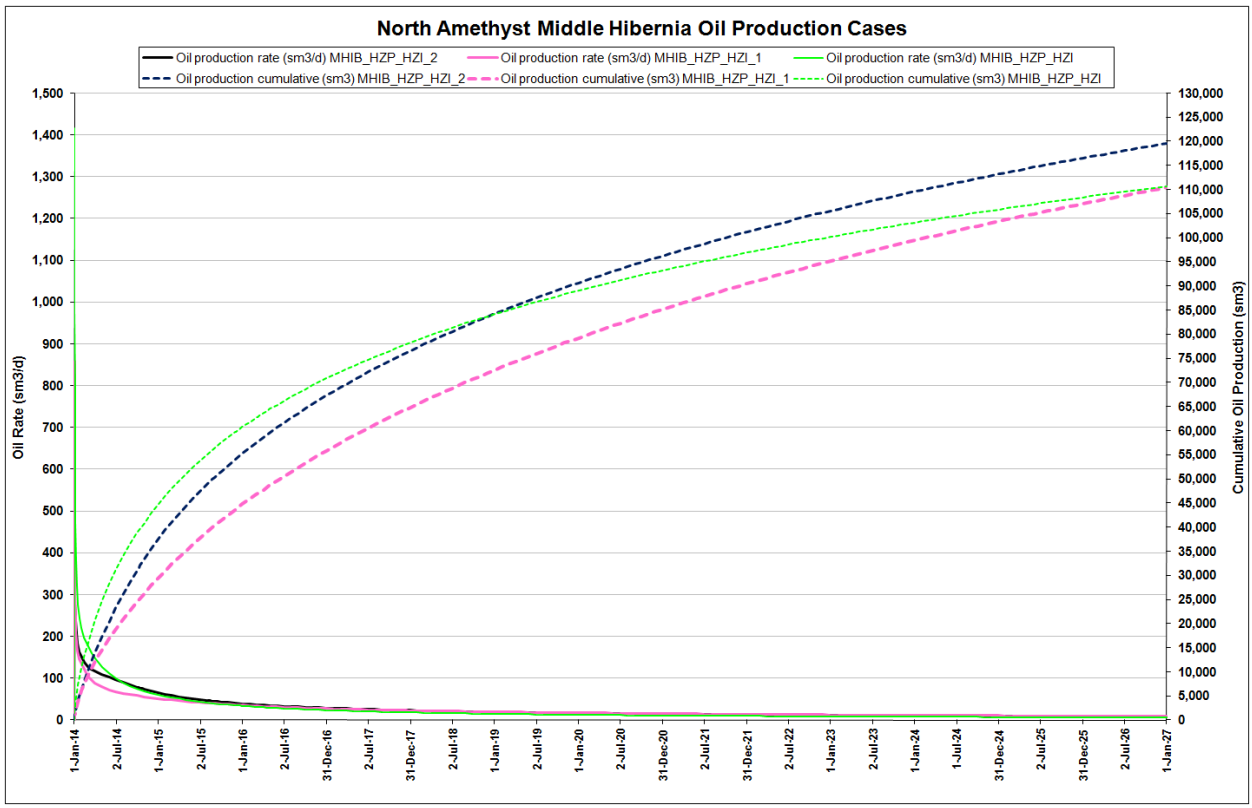

Figure 4.9: North Amethyst Middle Hibernia oil production cases.

Based on the geological modeling work by staff in conjunction with the results of the reservoir simulation cases for the Middle Hibernia Formation, staff concur with the Proponent and do not believe development of the Middle Hibernia to be feasible at this time. For this reason, the remaining reservoir simulation sections below will only detail simulation results of the Basal Hibernia.

Staff finds the Proponent's approach to reservoir simulation for the Basal and Middle Hibernia and the resulting oil production forecasts to be reasonable and acceptable.

4.6.2 Gas Production Results and Forecasts

The gas production profile for the North Amethyst Basal Hibernia producer is depicted in Figure 4.10. The predicted produced gas volume at the end of field life is 189 MMm^3 (6.7 Gcf).

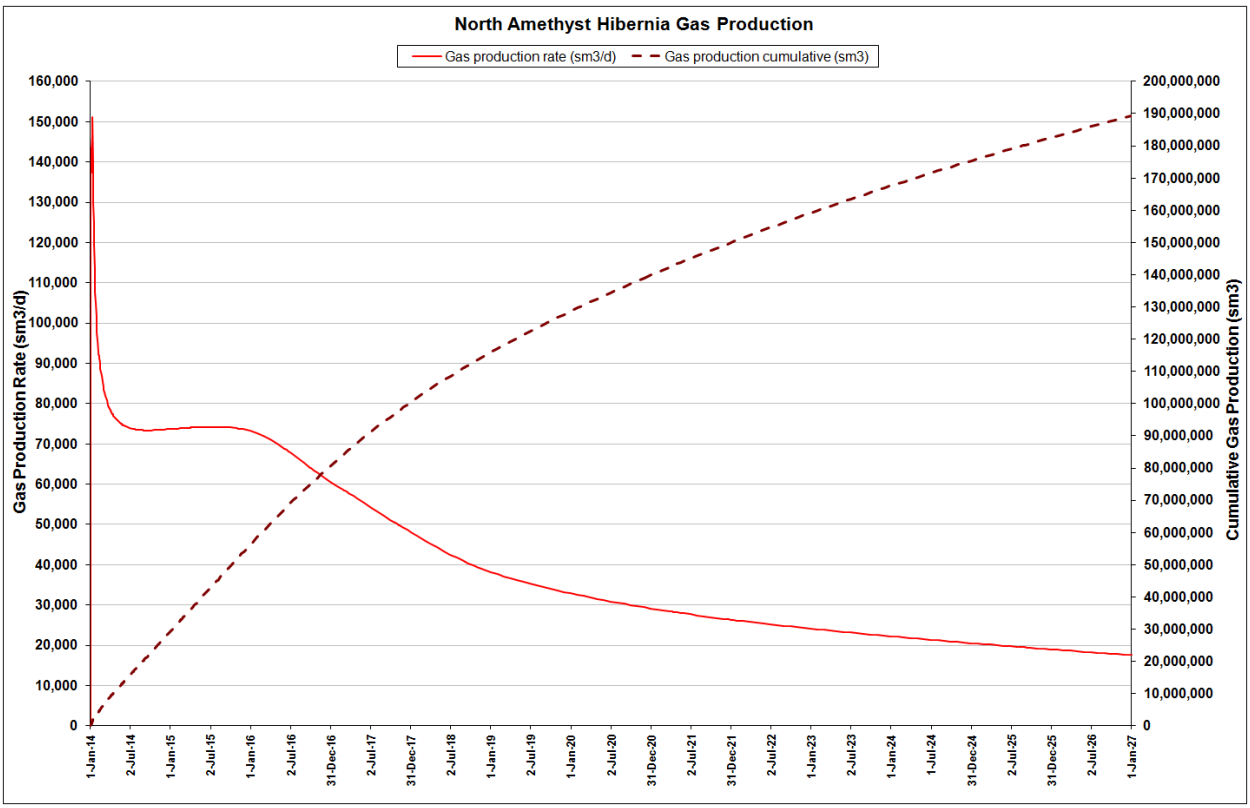

Figure 4.10: North Amethyst Basal Hibernia gas production rate and cumulative – base case.

Figure 4.11 illustrates the predicted GOR for the North Amethyst Basal Hibernia producer over the life of field. The GOR remains relatively stable which is expected as the North Amethyst Hibernia Pool is not believed to have a gas cap.

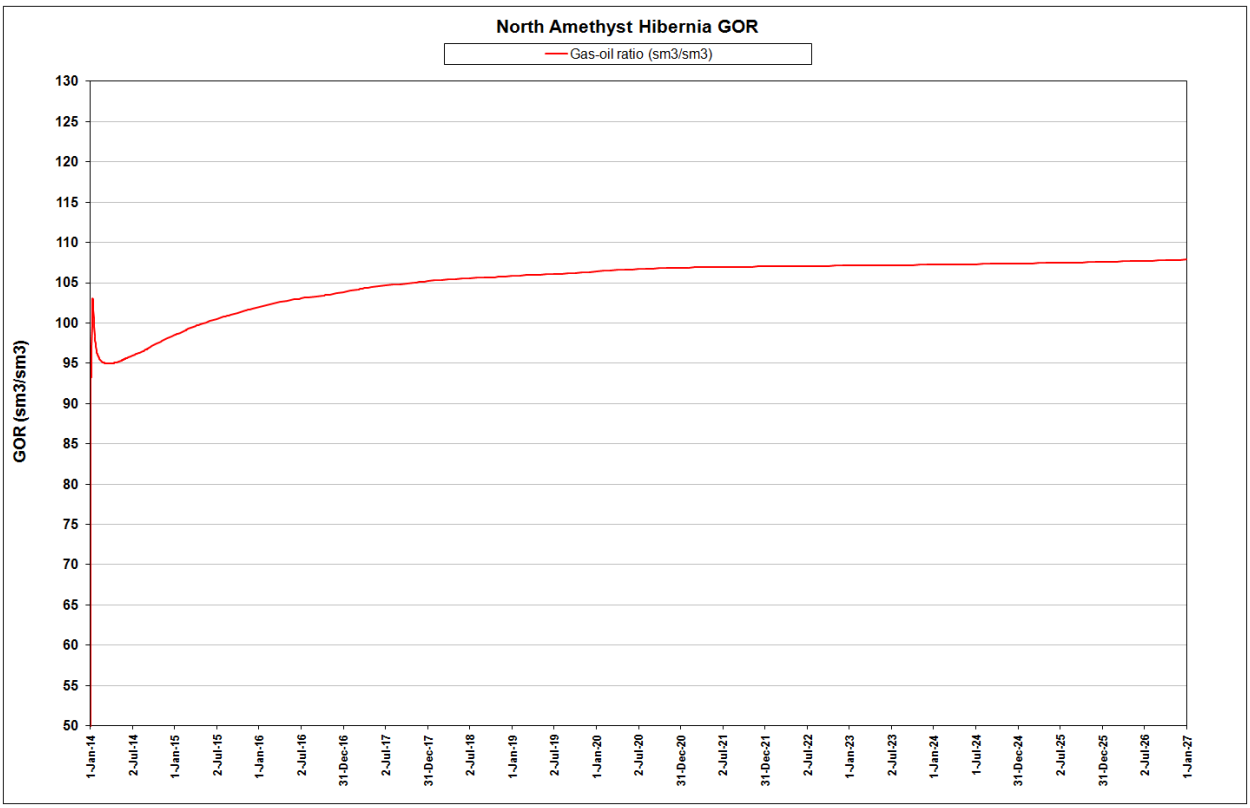

Figure 4.11: North Amethyst Basal Hibernia GOR – base case.

The highest daily volume of gas produced from the North Amethyst Basal Hibernia producer is approximately 150,000 m^3/d which is quite small when compared to the SeaRose FPSO gas handling capacity of 4.2 MMm^3/d. This peak gas production rate represents 3.6 percent of the SeaRose FPSO gas handling capacity and as a result is not considered to be significant. In addition, the 150,000 m^3/d peak rate is maintained for a brief period of time before quickly decreasing to a more sustained rate of 74,000 m^3/d which represents only 1.8 percent of the SeaRose FPSO gas handling capacity.

The predicted gas production volumes from the simulation indicate the gas handling capacity of the SeaRose FPSO is more than adequate to handle produced gas from the North Amethyst Basal Hibernia.

4.6.3 Water Production Results and Forecasts

Figure 4.12 shows the simulated water production profile for the North Amethyst Basal Hibernia producer. The well initially begins to produce a small constant amount of water for approximately two and a half years before the rate begins to drastically increase. The total cumulative volume of water produced from the well is predicted to be 1.8 MMm^3 (11.3 MMbbls).

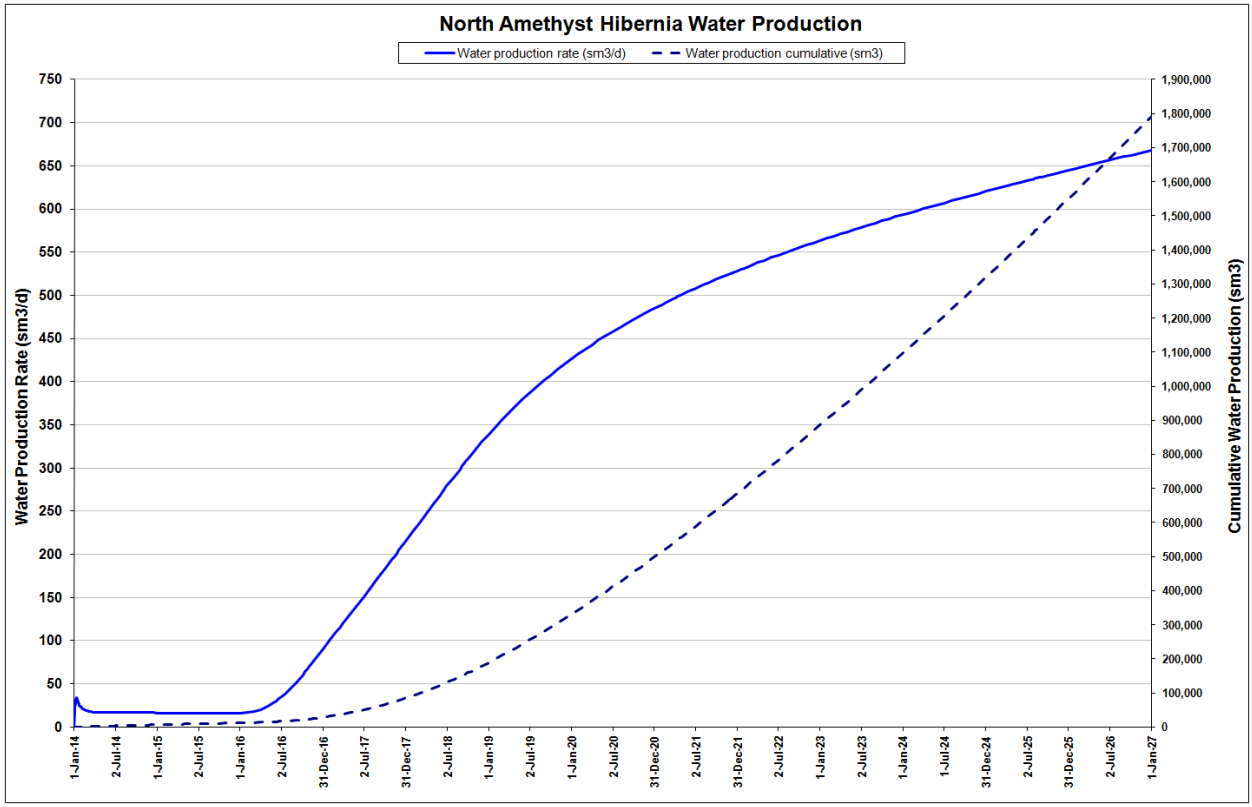

Figure 4.12: North Amethyst Basal Hibernia water production rate and cumulative – base case.

Figure 4.13 shows the simulated water cut profile for the North Amethyst Basal Hibernia producer. The water cut is very similar to the water production profile and begins to drastically increase approximately two and half years after production commences before beginning to slightly level off late in field life.

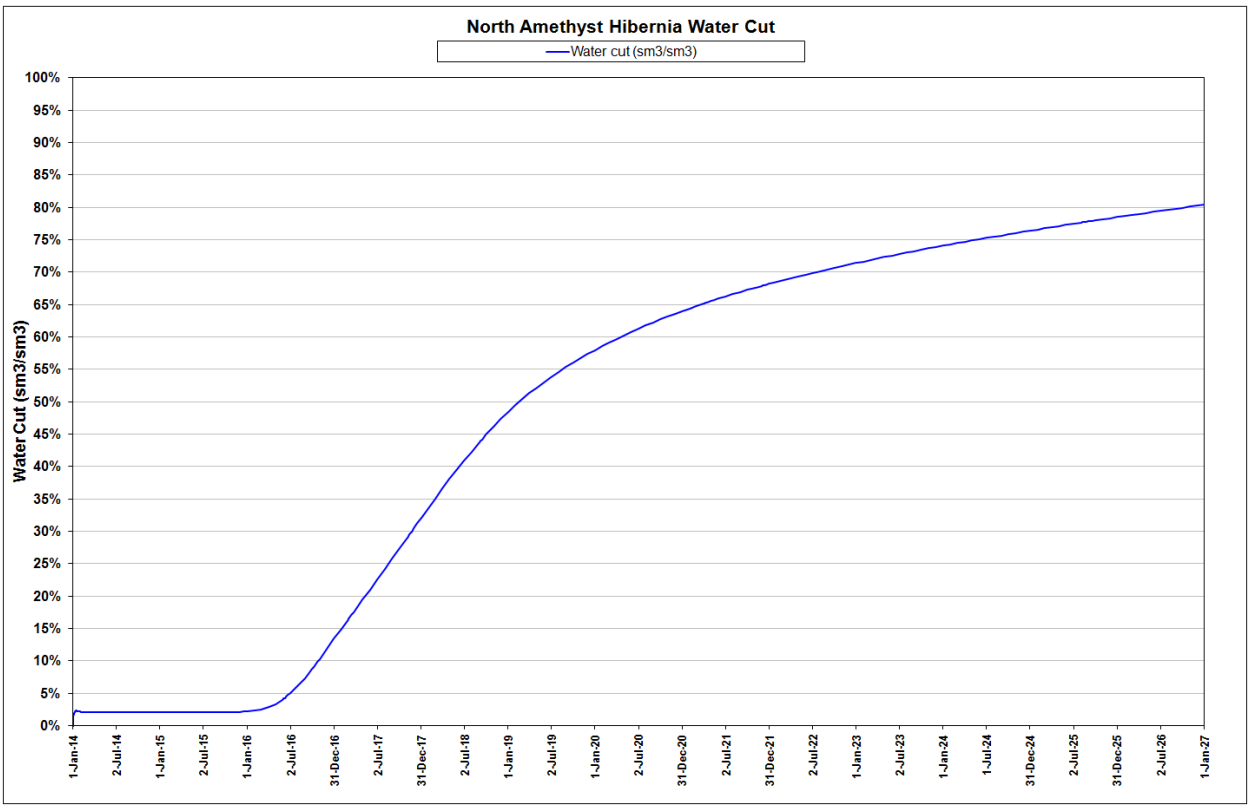

Figure 4.13: North Amethyst Basal Hibernia water cut – base case.

The highest daily volume of water produced from the North Amethyst Basal Hibernia producer is approximately 650 m^3/d which is quite small when compared to the SeaRose FPSO water handling capacity of 28,000 m^3/d. This water production rate represents 2.3 percent of the SeaRose FPSO water handling capacity and as such is not considered to be significant.

4.6.4 Water Injection Results and Forecasts

Figure 4.14 illustrates the simulated water injection profile for the North Amethyst Basal Hibernia G-25 4 water injection well. The total cumulative volume of water injected into the well is predicted to be 5.01 MMm^3 (31.52 MMbbls).

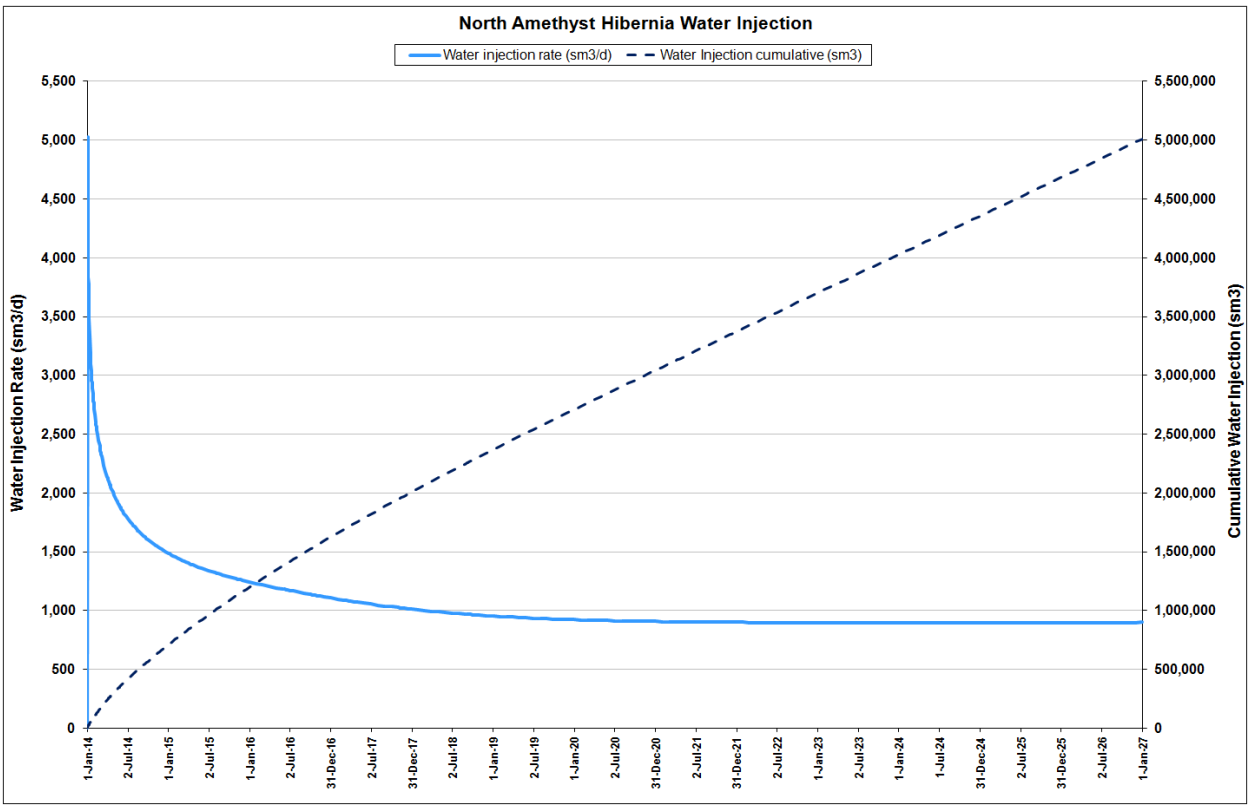

Figure 4.14: North Amethyst Basal Hibernia water injection rate and cumulative – base case.

The initial daily injected volumes of water for the G-25 4 injector are predicted to reach 5000 m^3/d but begin to decrease very quickly. The daily injected rate is forecast to drop to 2000 m^3/d within four months which represents approximately 4.5 percent of the SeaRose FPSO water injection capacity of 44,000 m^3/day and as such is not considered to be significant.

4.6.5 Reservoir Pressure Results and Forecast

When plotting reservoir pressure from the North Amethyst Hibernia simulation model, reservoir pressure begins to increase immediately after production commences. This is expected as the G-25 4 water injector is currently in place and will allow the Proponent to commence water flooding upon start up of the North Amethyst Basal Hibernia producer. Reservoir pressure continues to increase at a consistent rate throughout most of the life of field before beginning to level off late in field life.

Based on the Proponent's reservoir simulation model, there are no concerns with the maintenance of reservoir pressure or voidage replacement using the proposed development scheme. Figure 4.15 displays the North Amethyst Basal Hibernia reservoir pressure for the life of the field.

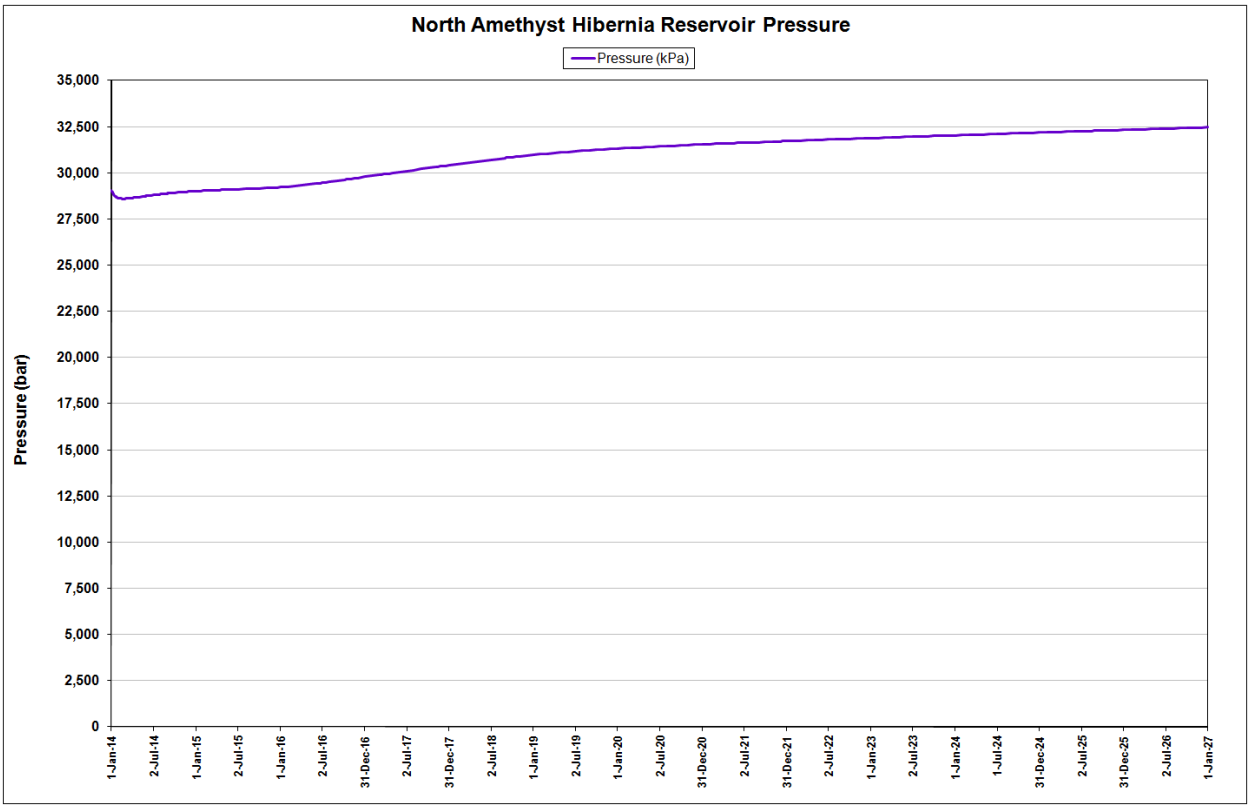

Figure 4.15: North Amethyst Basal Hibernia pressure – base case.

4.6.6 Reservoir Simulation Summary

The Proponent used the available geological and reservoir engineering information to develop a reasonable reservoir simulation model for the North Amethyst Hibernia. The model and cases submitted provide an adequate overview of the development area. Staff's analysis indicates that the reservoir simulation model is sufficient in the context of this Application.

4.7 Reserve Estimates

Probabilistic recoverable reserve estimates for the Basal Hibernia, of the E-17 fault block, were presented in the Application. Table 4.6 summarizes the Proponent's and staff's low, expected and high case recoverable estimates for the Basal Hibernia.

		P90		P50		P10	
		Husky	C-NLOPB	Husky	C-NLOPB	Husky	C-NLOPB
E-17 Block Basal Hibernia	MMbbls	4.29	**3.61**	8.33	**6.73**	14.0	**10.94**
	MMm^3	0.68	**0.57**	1.32	**1.07**	2.22	**1.74**

Table 4.6: Comparison of Proponent and C-NLOPB probabilistic reserve estimates, North Amethyst Hibernia E-17 block.

Staff did not construct an independent reservoir simulation model for the North Amethyst Hibernia Pool. Rather, staff's recoverable oil estimates were calculated by using low, medium and high case recovery factors in conjunction with staff's OOIP estimates. The recovery factors chosen were based on the Proponent's probabilistic reserve estimates and reservoir simulation results in addition to staff's geologic and engineering assessments.

4.8 Conclusions and Recommendation

The Proponent has outlined a plan that calls for the drilling of one production well in the Basal Hibernia of the E-17 block. Pressure support for the block will be achieved by water injection into the lower interval of the previously drilled G-25 4 water injector.

Staff are in agreement with the Proponent that the lower reservoir quality and heterogeneity of the Middle Hibernia makes development of the interval technically unfeasible at this time. Staff also concur with the Proponent that development of the G-25 1 block is not feasible at this time. Development potential does exist for the Northern block; however significant uncertainty exists for this area at this time. This uncertainty should be reduced after the Proponent penetrates the block with a delineation pilot leg prior to drilling the E-17 block producer. The Proponent will be expected to update the Board with in-place resource estimates and potential timing of development for the Northern block in the Resource Management Plan of the North Amethyst Annual Production Report.

Under the proposed scheme, the Proponent's P50 recoverable oil estimate for the North Amethyst Hibernia E-17 block is 1.32 MMm^3 (8.33 MMbbls) while the Board's estimate is 1.07 MMm^3 (6.73 MMbbls).

Staff found the Proponent's geological and reservoir simulation modeling to be reasonable and appropriate. The reservoir simulation indicates that the SeaRose FPSO facilities can adequately handle additional production from the proposed North Amethyst Hibernia exploitation scheme.

The following list summarizes staff's expectations and requirements as the proposed project progresses:

- The Proponent will be expected to address potential reserves and anticipated timing for development in the Resource Management Plan of the North Amethyst Annual Production Report should the results from delineation of the Northern block prove positive.

Staff concur with the proposed Application from a resource management perspective, and recommend approval.

5.0 OPERATIONS

The operations review of the Application focused on an assessment of the Proponent's plans to drill a producing well and use the lower interval of the existing water injection well, G-25 4, to produce hydrocarbons from the Hibernia Formation of the North Amethyst Field.

The original plan was to develop this area by using the North Amethyst Drill Centre (NADC), tying in the production and water injection manifolds via subsea flowlines and drilling the production well utilizing a semi-submersible drilling installation. Currently, the Proponent is proposing to drill a delineation pilot/development producer from the Central Drill Center (CDC) in the White Rose field.

The Proponent is planning to use the excavated drill centers as the means of protecting the subsea templates, wellheads, production trees and manifolds against scouring icebergs. This is an acceptable methodology for subsea developments as approved in the White Rose and North Amethyst Development Plans.

5.1 Drilling and Completions

The drilling and completions activities will be carried out using the Proponent's existing White Rose and North Amethyst processes and systems. Drilling hazards and mitigative measures are covered by the Proponent's existing Quantitative Risk Analysis (QRA) and Safety Plan. The water injection well for North Amethyst Hibernia Formation will utilize smart well technology. The final design of the drilling program of the development wells will be reviewed during the Approval to Drill a Well (ADW) process.

The drilling and completions activity do not raise any new concerns as the Proponent has existing plans to cover such activities and has demonstrated it can execute such programs safely.

5.2 Subsea Equipment Installation, Commissioning and Operation

The North Amethyst Hibernia Formation development will utilize well templates and wellhead systems that are the same as those used for the other wells in the field. The water injection well for this project has already been completed. The second North Amethyst BNA water injector (G-25 4) was determined to be an optimal location for water injection within the Basal Hibernia

Formation, thereby providing the potential for a single water injector to support producers in both reservoirs. The North Amethyst G-25 4 water injection well was installed as a two zone intelligent completion and was initially given a dual classification. The upper internal (BNA) is classified as development and the lower interval (Hibernia) is classified as delineation.

The installation activities associated with the North Amethyst Hibernia Formation do not raise any new operational safety concerns from the staff's perspective as the Proponent has demonstrated the ability to execute such programs successfully in the past.

5.3 Modifications to FPSO

As the project moves into the detailed engineering phase, modifications will be made to the various control systems on board the *SeaRose FPSO*, including minor modifications to the Integrated Control and Safety System (ICSS) and Master Control Station (MCS) software. The Proponent will use the existing management of change process for the modifications on the *SeaRose*. Any modifications will require the involvement of the Certifying Authority in particular during the various design, installation and commissioning activities.

The oil produced from the North Amethyst Hibernia Formation wells will be transferred through flowlines back to the *SeaRose FPSO* for processing and storage.

5.4 Safety Analysis

The Proponent will utilize existing systems and processes for assessing any identified risks related to activities associated with the development of the North Amethyst Hibernia Formation. These processes include the Proponent's procedure for management of change and east coast risk management process.

The Proponent's existing systems and processes for assessing risks of planned operations, modifications or changes will be used in relation to the implementation of the North Amethyst Hibernia Formation. The Proponent's existing operations and maintenance policies and procedures, ice management plan, contingency plans, logistical support, communications, vessel surveillance and production safety protocols will also apply to the implementation of the North Amethyst Hibernia Formation. These documents were effective for the development and operation of the previous White Rose and North Amethyst fields.

5.5 Conclusions and Recommendations

No operational concerns were identified which would preclude staff from recommending approval of the Application. Activities in connection with this Application can be managed in accordance with established processes and procedures.

6.0 SAFETY

As noted, the proposed amendment involved drilling a subsea oil producer from the existing template in the Central Drill Center (CDC) and the associated water injector pair from the existing template in the North Amethyst excavated drill center. This activity is authorized under the Operations Authorization covering Production and Drilling operations in the White Rose field. Subsea facilities and technology already approved in the original White Rose and North Amethyst Development Plans will be used for the completion of these wells and for production operations from the SeaRose FPSO. The drilling and completions programs will be subject to Board review and approval through the Approval to Drill a Well (ADW) process.

The production of this resource will not necessitate any significant changes to the FPSO or other infrastructure, with the exception of minor control system software upgrades associated with the smart completion technology for the water injection well. Also, this program will not alter drilling or production operational activities, which are conducted in compliance with the White Rose Safety Plan and conditions of the Operations Authorization. Activities in connection with this Application can be managed in accordance with established safety oversight processes and procedures.

No safety concerns were identified which would preclude staff from recommending approval of the Application.

7.0 PROTECTION OF THE ENVIRONMENT

Staff reviewed the Proponent's Application to determine whether the North Amethyst Development Plan Amendment – North Amethyst Hibernia Formation raises any new environmental issues.

The additional development activities described in the Application were within the scope of project assessed in the "*Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment"* and the "*Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment Addendum"*, and will not require modification of the existing Compliance Monitoring Plans (EPCMPS's) and Environmental Protection Plans (EPPs) for Production and Drilling Operations at the White Rose project.

Staff also note that the Proponent should review its decommissioning and abandonment plan to ensure that the plan addresses all aspects of the proposed development plan amendment, that all developments operated by the Proponent in association with White Rose and North Amethyst are described by the plan, and that the plan is acceptable in respect of any related application for an Operations Authorization.

No environmental concerns were identified that would preclude staff from recommending approval of the Application.