Description of Macauley & Associates Viewer for BCER Data

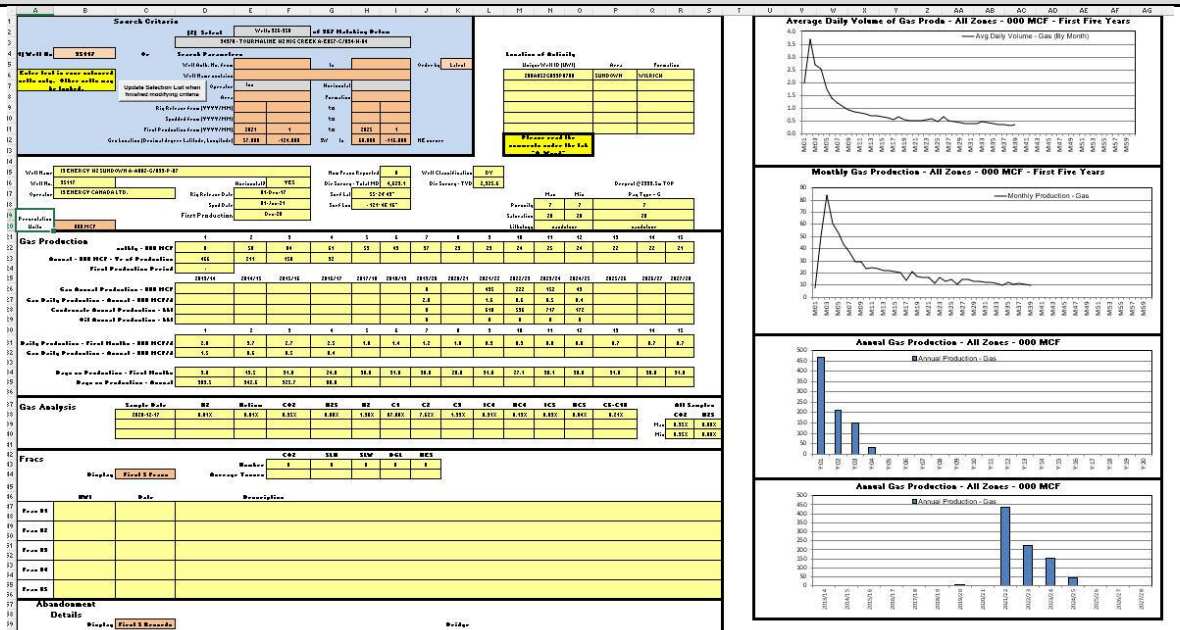
A. Introduction

The BC Energy Regulator (BCER) publishes extensive information on its website (BC-ER.ca) about the drilling of and production from natural gas wells in British Columbia. This information is refreshed on a monthly basis. We have processed a portion of the data, stored the processed data in an MS Access database and developed a Viewer in MS Excel to display this information for individual wells[1].

Figure 1 presents a view of the Summary sheet in the Viewer workbook that displays the component for selecting individual wells (in blue) and presenting information for the selected well in tabular (in yellow) and graphical formats.

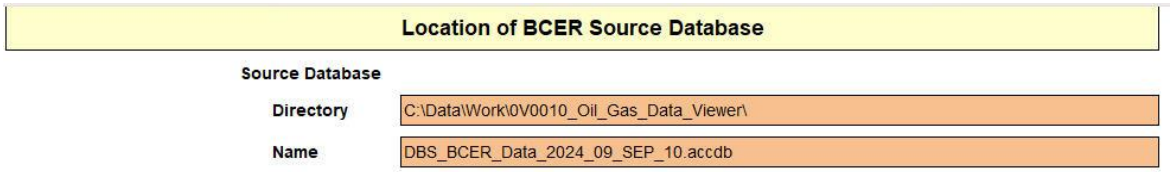
The Viewer links to an MS Access database whose location is specified on the DBS_Location worksheet in the Viewer workbook.

Figure 1 - Overview of BCER Data Viewing Tool



[1] While the Viewer presents data on a single well basis, the data could be easily aggregated based on criteria including those discussed in this paper and made available for further analysis. Additional criteria could also include factors such as natural gas liquid (NGL) content (dry, wet, rich) and productivity (modest, average, prolific) and assist in analysis of type curves and other features.

Figure 2 – Location of Access Database in Sheet DBS_Location Worksheet



The key benefits of storing the BCER data in a separate database are:

(1) The power and flexibility of structured query language (SQL) supported by MS Access allow for selection of individual wells based on criteria identified by the user. The initial selection criteria are described in Section B of this paper but can be extended through modifications to the MS Access database and Viewer workbook.

(2) Any customization that the user makes to the Viewer workbook will be maintained and will not be lost or require repeated modifications to the workbook to accommodate additional data as was the case in a previous version of the Viewer that retained all data within the Viewer workbook.

(3) The size of the Viewer workbook will be largely unchanged and will not expand significantly (or at all) as more data is added to the database with the passage of time.

(4) It is relatively easy to obtain a refreshed version of the database and merely update the reference to the location of the database as shown in Figure 2.

B. Selection of Individual Wells

The MS Access database contains a table named WELL_SEARCH_INDEX which contains a link between the well authorization (WA) number and (i) well name, (ii) well operator (number and text) , (iii) area (number and text) , (iv) formation (number and text) , (v) rig release month, (vi) spud month, (vii) initial production month, (viii) horizontal or vertical status, and (ix) geographic location (decimal degree latitude and longitude).

Figure 3 – Well Selection

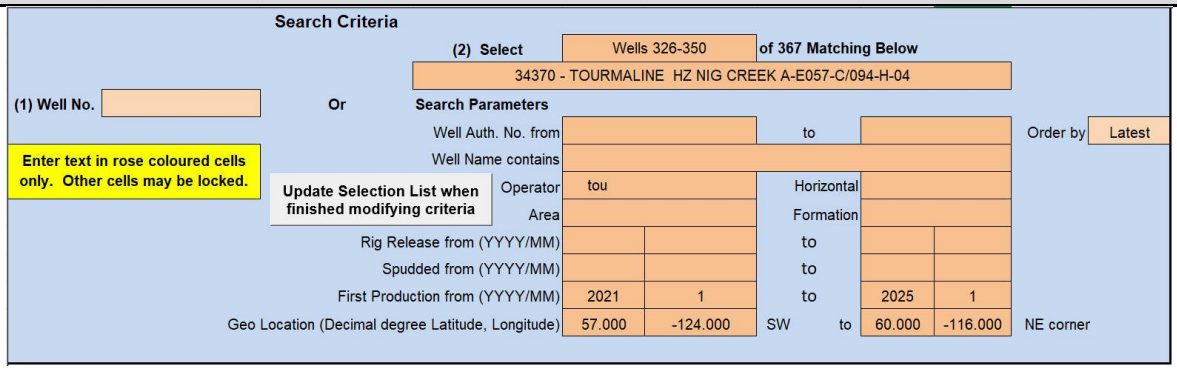


Figure 3 presents the initial selection criteria used by the Viewer. The information in the Search Parameters in rose-coloured cells in Figure 3 are used by the Viewer to match values in WELL_SEARCH_INDEX in the database to return WA numbers and well names that match those criteria.

Range of WA Numbers – the user can identify a range of WA numbers to which the selection is to be restricted. For example, if only wells with WA numbers of 30,000 or higher are desired, the range of 30000 [to] 99999 could be entered.

Well Names Containing Specific Text – a portion of the text from the well name could be entered to restrict selected values to wells containing that text in the well name. Wildcards (%) can be used such that entering “NIG%CREEK” would return wells with combinations of well names containing either “NIG CREEK” and “NIGCREEK”, for example.

Well Operator – the user could enter either a well operator number or a portion of the operator’s name, again with the ability to use wildcards.

Horizontal/Vertical Well Specification – the dropdown menu allows the user to identify whether horizontal, vertical or all wells are to be selected.

Area – the user may enter either a code for the area (presented in the CODES worksheet) or a portion of the name of the area. For example, to select only wells from the Northern Montney area, the user could specify “NORTHERN MONTNEY”, “NOR%MONTNEY” or 9022.

Formation – the user may enter either a code for the formation (presented in the CODES worksheet) or a portion of the name of the formation. For example, to select only wells from the Montney formation, the user could specify “MONTNEY” or 5000.

Rig Release Date Range – the user may enter a range of rig release dates for wells to be included in the selection. The year (YYYY) and month (MM) are entered into separate cells for both the “from” and “to” portions of the date. Specifying this date range will omit both wells outside the date range and wells that have no recorded rig release date.

Spud Date Range – the user may enter a range of spud dates for wells to be included in the selection. The year (YYYY) and month (MM) are entered into separate cells for both the “from” and “to” portions of the date. Specifying this date range will omit both wells outside the date range and wells that have no recorded spud date.

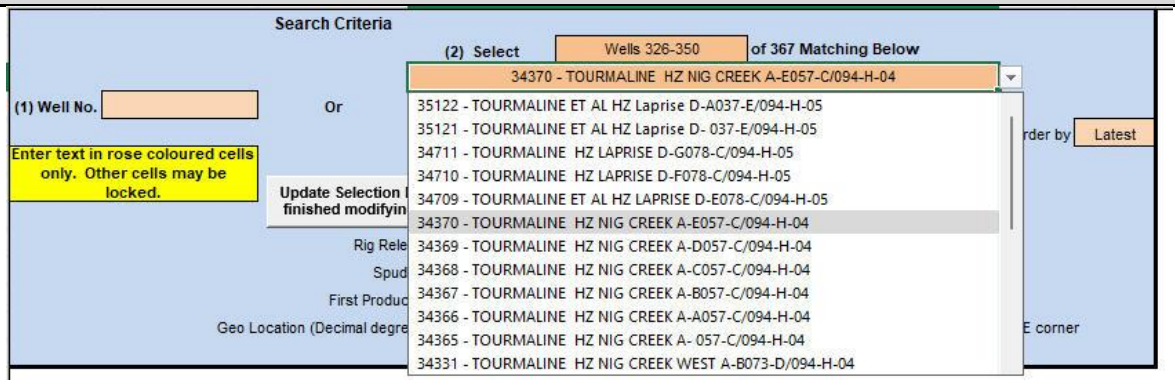
First Production Month Range – the user may enter a range of initial production dates for wells to be included in the selection. The year (YYYY) and month (MM) are entered into separate cells for both the “from” and “to” portions of the date. Specifying this date range will omit both wells outside the date range and wells that have no recorded production.

Geographic (Latitude/Longitude) Range – the user may enter decimal degree locations (latitude and longitude) for the southwest (SW) and northeast (NE) corners of an approximately rectangular (depending on the curvature of the Earth) quadrant and wells will be selected that fall within that quadrant. This may be useful where specified areas do not provide as fine or extensive a geographic basis as required.

If the user enters a specific WA number in the top left corner of the blue selection section ((1) Well No.), the data will be returned for that WA number.

If the WA number cell is blank, the selection mechanism will be implemented. When the user has specified all the selection criteria that they want to use to restrict the retrieval, the user presses the button (Update Selection List when finished modifying criteria) to the left of the selection criteria and the selected data will be refreshed. As displayed in Figure 4, the number of wells matching the criteria will be identified (367 in the example). The dropdown menu at the top will identify the range of wells selected (in 25-well blocks) and the user identifies the range of wells. The second dropdown menu will identify the wells by WA number and name from the selected block of wells. When a specific well is selected (for example, the well with WA number 34370) the data on the page will be refreshed and present information for that well.

Figure 4 – Identification of Specific Wells from those Retrieved



C. Presentation of Data for Selected Well

Figure 5 presents the “high-level” information about the selected well including well name, operator, area, formation, dates (rig release, spud, initial production), well depths and geographic location.

Figure 5 – Well Selection and High-Level Results

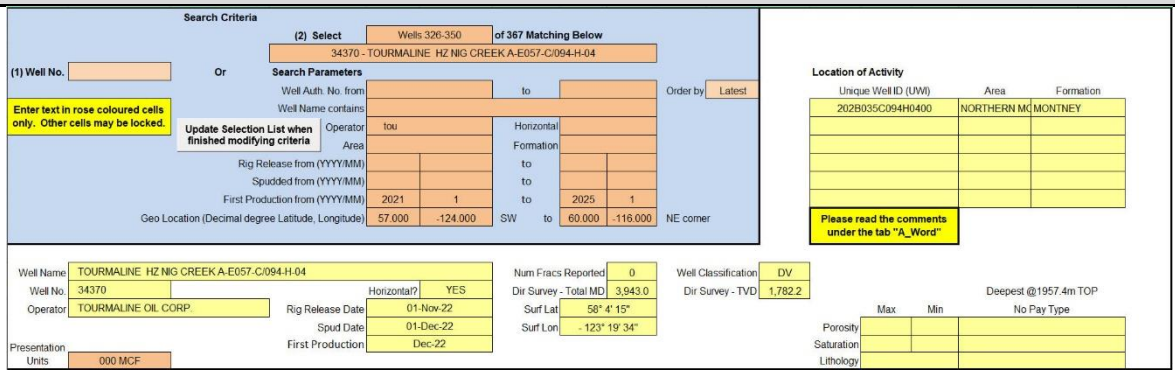


Figure 6 – Summary of Gas/Oil/Condensate Production and Gas Analysis

Gas Production

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Monthly - 000 MCF	159	215	185	192	174	169	160	96	156	145	140	131	129	125	112
Annual - 000 MCF - Yr of Production	1,922	888													
First Production Period	-														

	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Gas Annual Production - 000 MCF										751	1,653	405			
Gas Daily Production - Annual - 000 MCF/d										7.0	4.7	3.5			
Condensate Annual Production - bbl										0	0	0			
Oil Annual Production - bbl										0	0	0			

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Gas Daily Production - First Months - 000 MCF/d	9.3	7.0	6.6	6.2	5.8	5.5	5.4	5.1	5.1	4.8	4.6	4.4	4.2	4.1	4.0
Gas Daily Production - Annual - 000 MCF/d	5.7	3.8													
Days on Production - First Months	17.0	31.0	28.0	31.0	30.0	30.9	29.8	18.8	30.9	30.0	30.6	29.8	30.6	30.6	28.3
Days on Production - Annual	337.8	234.7													

Gas Analysis

Sample Date	H2	Helium	CO2	H2S	N2	C1	C2	C3	IC4	NC4	IC5	NC5	C6-C10
2022-12-30	0.01%	0.00%	0.16%	0.12%	0.46%	83.65%	9.48%	3.70%	0.68%	0.96%	0.25%	0.25%	0.28%
2022-12-16	0.00%	0.01%	0.16%	0.09%	0.13%	83.97%	9.49%	3.56%	0.66%	0.97%	0.29%	0.29%	0.38%

All Samples	CO2	H2S
Max	0.16%	0.12%
Min	0.16%	0.09%

Figure 6 presents a summary of natural gas, oil and condensate production in the units specified in the lower left corner of Figure 5 (mcf, 000 mcf or 000 m3 for natural gas and m3 or barrels (bbls) for oil and condensates based on the mcf or m3 identified for natural gas). Figure 6 also shows an overview of the (up to) 3 most recent gas analyses recorded for the well.

Figure 7 presents a summary of hydraulic fracturing (fracking), abandonment and casing activities recorded for the selected wells. Where there are more than 5 records for a well, the

Figure 7 – Summary of Fracking, Abandonment and Casing

Fracs

Display: First 5 Fracs

	CO2	SLH	SLW	DGL	NES
Number	0	0	0	0	3
Average Tonnes					0

	UWI	Date	Description
Frac #1	100103108117W600	September 20, 2014	DFIT: pumped starting at 0.4 m3/min, and descrease in stages to a final pump rate of 0.11m3/min.
Frac #2	100103108117W600	October 4, 2014	Injection test: established feed rate of 110 L/min at 17.0 MPa. Final injection rate of 70 L/min at 17 MPa. ISIP = vacuum. No max pressure recorded.
Frac #3	100103108117W600	December 5, 2014	Injection test: establish feed rate of 23 L/min at 30.6 MPa. Shut down pump and then pump in stages.
Frac #4			
Frac #5			

Abandonment Details

Display: First 5 Records

	UWI	Date	Event Seq	Plug Number	Plug Type	Top Depth	Base Depth	Cement Volume	Cement Grade	Bridge Plug Set Depth	Remarks
Rec #1											
Rec #2											
Rec #3											
Rec #4											
Rec #5											

Casing Details

Display: First 5 Segments

	UWI	Date	Event Seq	Casing Shoe Depth	Casing Size	Casing Type	Casing Grade Code	Casing Joint Quantity	Cement Volume	Casing Weight	Comments
Seg #1	100103108117W600		0	219	244.5	SURF	J55	17	12	53.57	cmt SurfCem1700, 2.5m3 cmt rtns
Seg #2	100103108117W600		0	1,379	177.8	PROD	J55	104	23	34.23	cmt SpectraCem G 1500, 2.5m3 cmt rtns
Seg #3											
Seg #4											
Seg #5											

user may select up to a total of 20 records to be displayed for each section by specifying a block (First 5, 6-10, etc.) from the corresponding dropdown menu.

Figure 8 presents the average daily volume (ADV) and monthly production of natural gas for up to the first 60 months of well operation.

Figure 8 – Graph of ADV and Monthly Production of Natural Gas

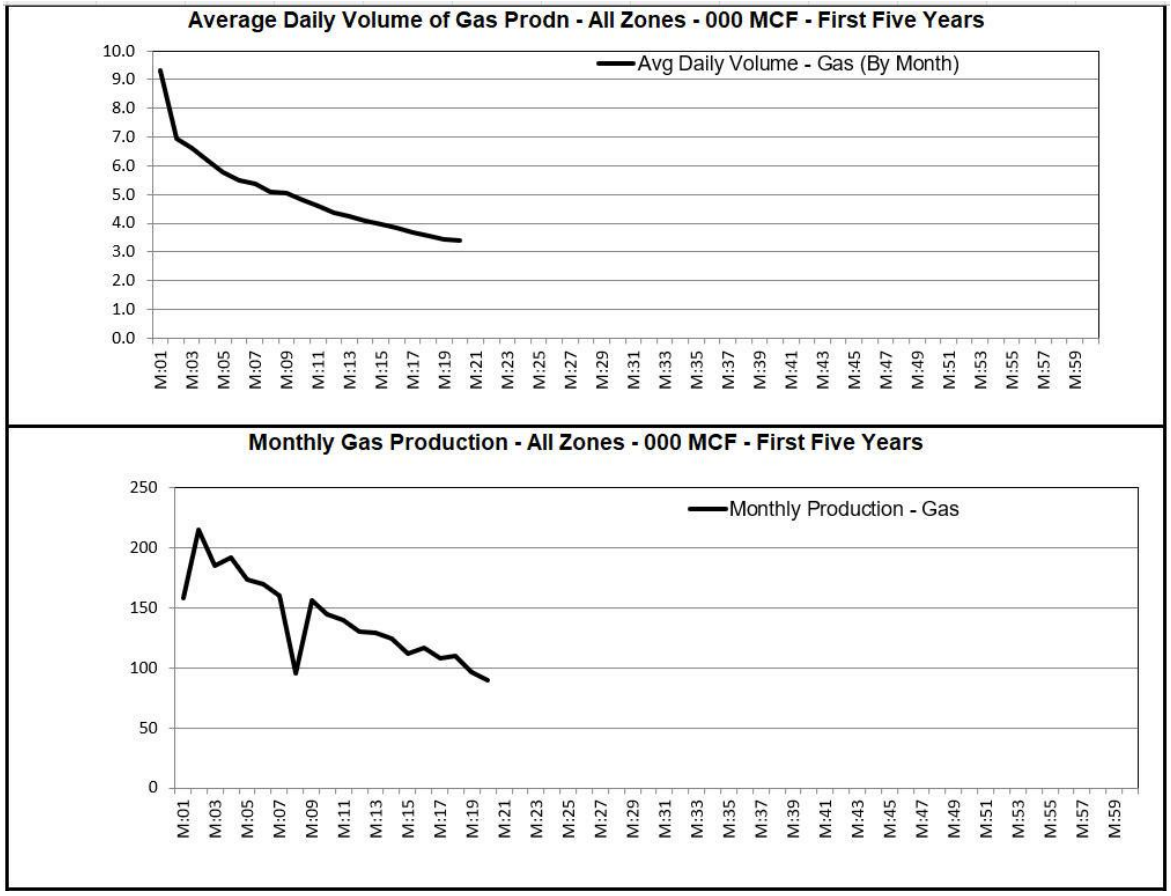


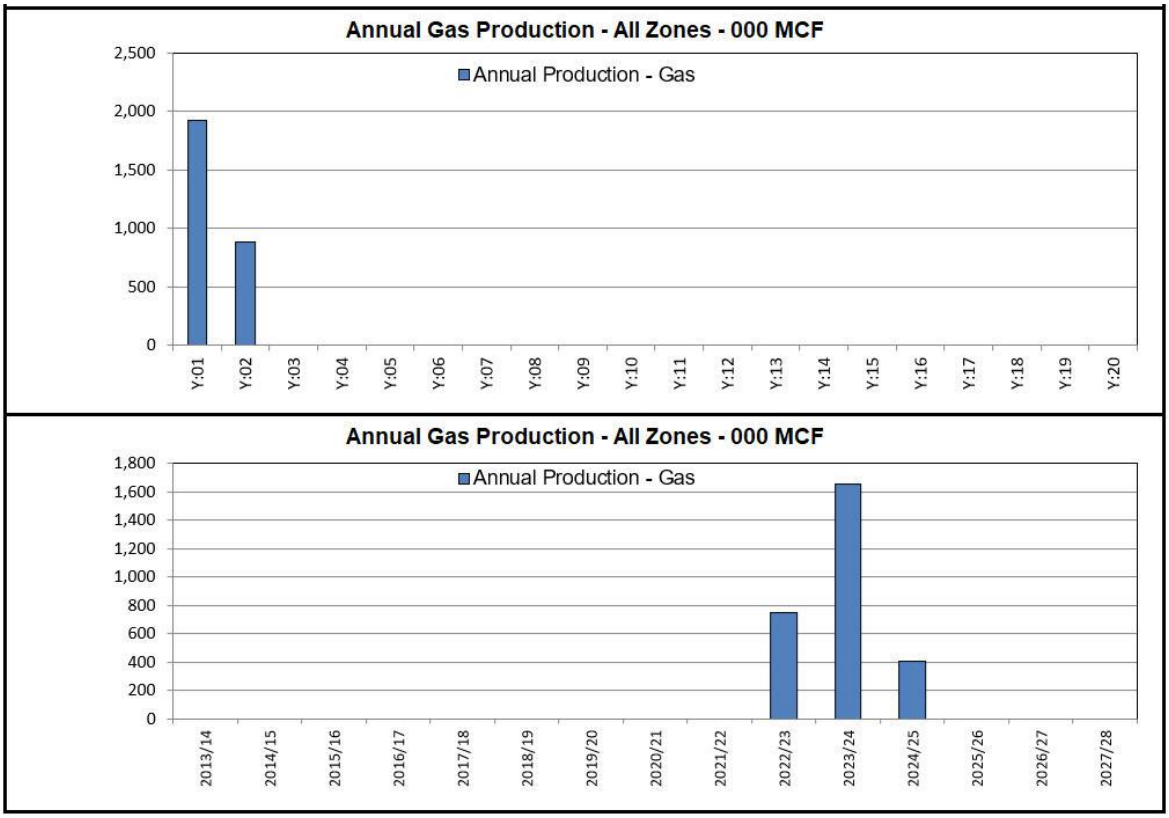
Figure 9 presents the calendar year (up to the first 20 years of operation) and fiscal year (for specified fiscal years) production of natural gas for the selected well.

Figures A-1 to A-3 in Appendix A present the results for a selected well (WA Number 30256) that has been operating for a longer time period and has a more extensive time profile. Note that the results may include only a partial year for the last calendar year and fiscal year results.

Appendix B contains a few words about the use of the BCER Data Viewer and associated databases.

George Macauley
September 19, 2024

Figure 9 – Graph of Calendar Year and Fiscal Year Production of Natural Gas



Appendix A – Results for WA Number 30256

Figure A-1 – Alternative Production Summary

Well Name	OVV CRP HZ SWAN C02-03-077-14			Num Fracs Reported	0	Well Classification	DV									
Well No.	30256	Horizontal?	YES	Dir Survey - Total MD	5,376.0	Dir Survey - TVD	2,512.1									
Operator	OVINTIV CANADA ULC	Rig Release Date	01-Aug-14	Surf Lat	56° 0' 1"											
		Spud Date	01-Nov-14	Surf Lon	- 121° 5' 24"											
Presentation Units	000 MCF	First Production	Nov-14													

	Max	Min	Deepest @2601m TOP
Porosity			No Pay Type
Saturation			
Lithology	UM		UM

Gas Production	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Monthly - 000 MCF	10	109	201	226	216	194	226	252	200	163	115	163	111	104	109
Annual - 000 MCF - Yr of Production	2,076	1,204	949	728	602	570	513	492	436	246					
First Production Period	-														

	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
Gas Annual Production - 000 MCF		321	2,076	1,134	902	707	985	137	492	488	437	133			
Gas Daily Production - Annual - 000 MCF/d		6.7	5.9	3.2	2.7	2.2	1.6	1.6	1.5	1.3	1.2	1.2			
Condensate Annual Production - bbl		4,404	17,048	1,718	5,099	7,250	7,647	459	1,017	659	583	160			
Oil Annual Production - bbl		0	0	0	0	0	0	0	0	0	0	0			

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Gas Daily Production - First Months - 000 MCF/d	3.7	7.8	6.5	7.6	7.4	6.5	7.3	8.2	7.0	5.4	4.9	5.4	3.6	3.6	3.5
Gas Daily Production - Annual - 000 MCF/d	6.7	3.3	2.7	2.3	1.7	1.6	1.6	1.4	1.2	1.2					
Days on Production - First Months	2.7	14.0	31.0	29.8	29.1	29.7	31.0	30.5	28.6	30.5	23.2	30.5	30.5	29.0	31.0
Days on Production - Annual	310.6	360.7	347.1	315.2	357.1	364.4	318.6	362.9	363.3	206.5					

Figure A-2 – Alternative Graph of ADV and Monthly Production of Natural Gas

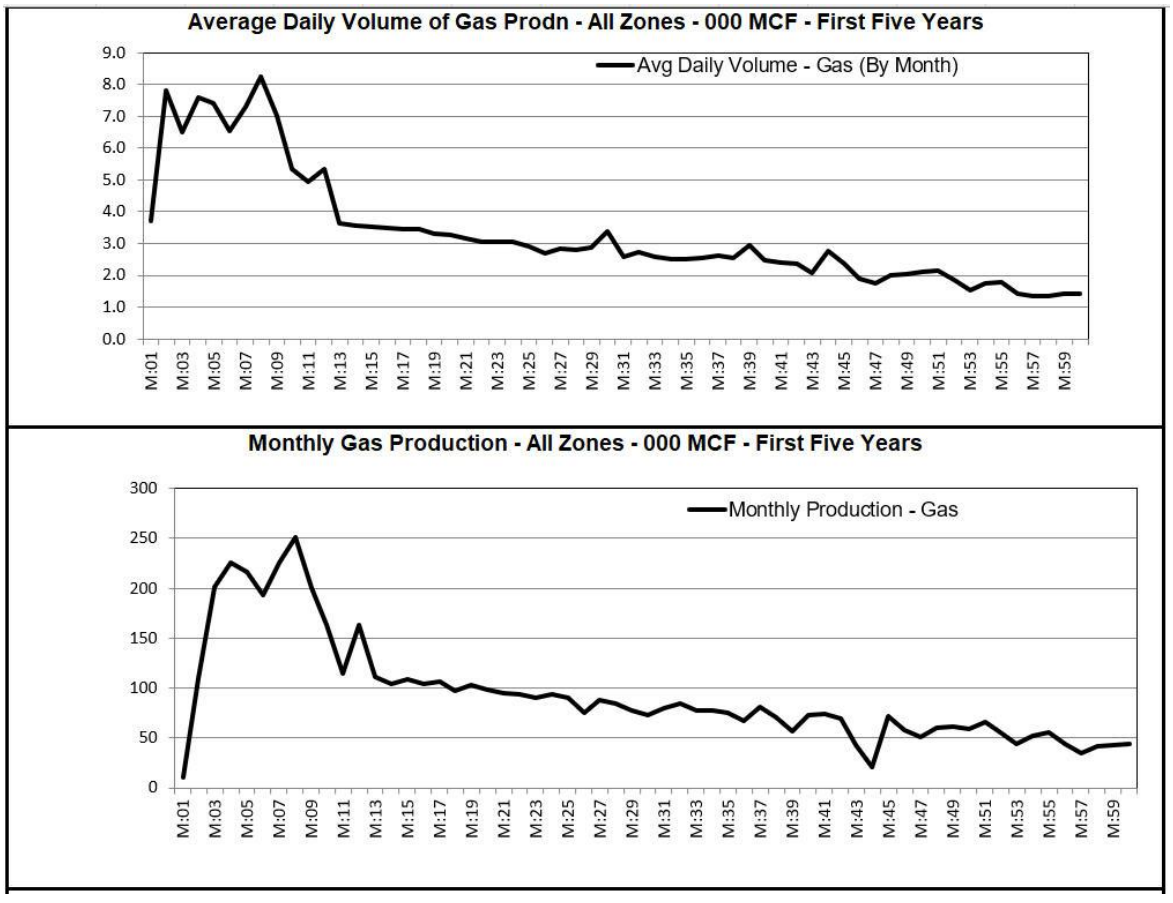
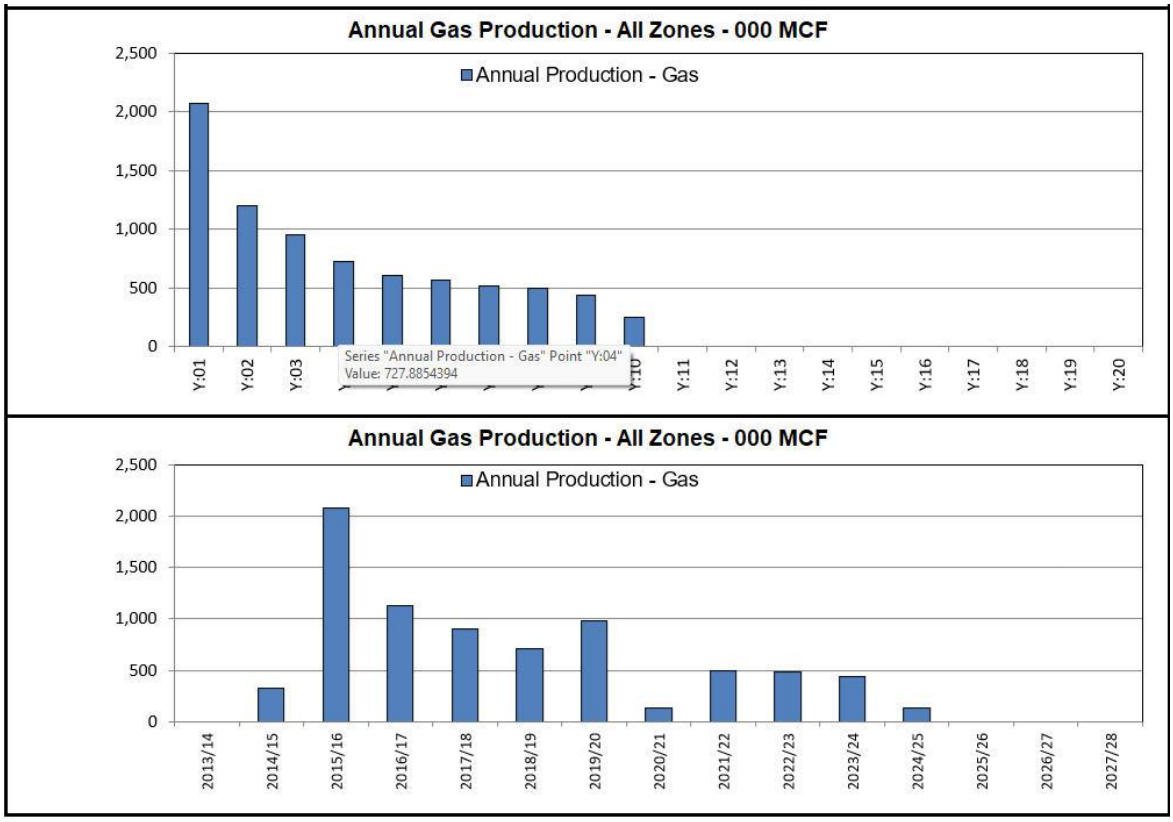


Figure A-3 – Alternative Graph of Calendar Year and Fiscal Year Production of Natural Gas



Appendix B – A Few Words About the Use of the BCER Data Viewer and Database

The data presented in BCER Data Viewer by Macauley & Associates Consulting Inc. is publicly available from the British Columbia Energy Regulator (BCER) website (www.bc-er.ca). The BCER provides this data to industry and members of the public. We are not aware of any restrictions that the BCER has placed upon the use of its data, but the BCER should be appropriately credited when information from its website (or summarized in this workbook and accompanying MS Access database) is cited.

We have accessed, assembled and (in some cases) processed the BCER data to present it in a readily accessible format. The BCER Data Viewer workbook and associated MS Access database is provided without any representation or warranty that the information contained therein is complete, correct, or current. We accept no legal liability for any actions taken or harm suffered in reliance upon the contents of the workbook or associated MS Access database. We advise you to access data directly from the BCER website if you intend to use the data for commercial purposes.

The data is current to the date specified in the name of the MS Access database. For example, the database name DBS_BCER_Data_2024_09_SEP_10.accdb indicates that the data was accessed from the BCER website on or about and is current to September 10, 2024. We understand that the data does not include any information that the BCER treats as confidential (in particular for experimental wells) until the confidentiality period has passed. We only present information provided on the BCER website and make no representation or warranty as to its completeness, correctness, currency, or fitness for any particular purpose.