

QUICK TUTORIAL: OPERATOR EVALUATION USING LIQUIDS DATA – DUVERNAY FORMATION

Liquids Data and Decline Curves in Catalyst

The new Catalyst application incorporates the new Alberta NGL and Marketable Gas production volumes that became available in February 2024, complementing the data released in 2020 by the BC Energy Regulator. The liquids data are retroactive to 2014 and available for wells in Catalyst that are off-confidential, or generally over a year old. CDL updates the well production monthly, and reviews well decline curves approximately every 3 months. In this analysis, we are going to be evaluating the Veren wells that have liquids data available for the Duvernay, and divide the operator's wells up into areas of similar production characteristics. In order to do this, we will need to query Veren's wells using the search panel.

Search Panel

We will begin by querying the Veren wells in the Duvernay using the **Search Panel** on the upper left. In order to limit our analysis to newer horizontal wells, we are going to add two more parameters - horizontal wells, rig-released after 2018 – as shown in the image below.

Parameters				
Zone Of Interest	▼	In	▼	Duvernay x ▼
Type Curve Area	▼	In	▼	Select... ▼
Detailed Play	▼	In	▼	Select... ▼
Operator Current	▼	In	▼	Veren x ▼
Direction	▼	In	▼	Horizontal x ▼
Rig Release Date	▼	>	▼	2018-01-01 📅
Liquids Wells	▼	=	▼	True x ▼

Within this data set, there are going to be several wells that do not yet have liquids data or decline curves available. By setting the “Liquids Wells” parameter equal to “True”, we can determine which wells have liquids data available for analysis. Alternatively, by setting it to

“False” you can make a list of wells that may be coming off confidential shortly that you may want to keep track of.

Well Results Panel

The well listing resulting from the search will show up in the **Well Results Panel** on the upper right. At the top of the **Well Results Panel**, use the “Group By” drop-down and scroll to “Type Curve Area.” This will group the wells into different type curve areas in the results window, and different colour groupings on the **Map Panel**. (For more information about type curve areas, please consult the **Type Curve Area** section below.)

Note there is no oil production in these areas. Use the Column Chooser  on the top far right to add “Avg LGR (bbl/MMCF) | First Three Months” and “Avg LGR (bbl/MMCF) | First Twelve Months”, and remove any other default columns so the panel looks like the image below.

Click on the “Avg LGR (bbl/MMCF) | First Twelve Months” columns to sort the areas from highest to lowest liquids. Generally, we are expecting the Kaybob VO 500 to be the most liquids rich (averaging higher than 500 bbl/mmcF after 12 months) and the Kaybob DG-GC (dry gas – gas condensate) to be the most gas-rich area.

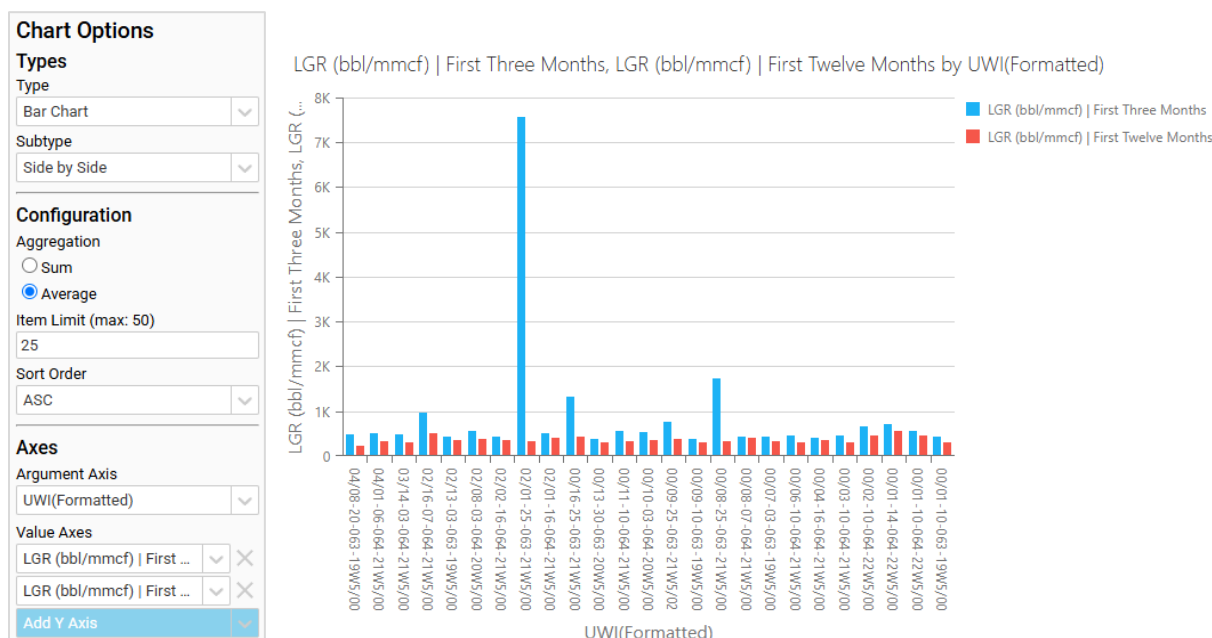
Colour	Type Curve Area	Well Count	Avg IP90 Gas (mcf/d)	Avg IP90 Oil (bopd)	Avg LGR (bbl/mmcF) First Three Months	↓ Avg LGR (bbl/mmcF) First Twelve Months
●	Duvernay Kaybob VO 500	78	1,514		765	564
●	Duvernay Kaybob VO 300	34	1,770		528	405
●	Duvernay Kaybob VRGC	25	2,320		889	368
●	Duvernay Kaybob RGC	18	3,643		247	181
●	Duvernay Kaybob DG-GC	1	4,225		121	102

In this data set, an anomaly within the Kaybob VRGC area is apparent. The average value for LGR at 3 months is anomalously high. Let’s examine this area in more detail, by adding this type curve area (“Type Curve Area” in “Duvernay Kaybob VRGC”) to our search parameters.

Chart Panel

The **Chart Panel** (lower right) provides many different graphing options in Catalyst, including bar, line, pie and scatter charts, which can be selected using the Type under Chart Options. In this example, we are going to use the default Bar Chart option and adjust the Configuration and Axes as shown below.



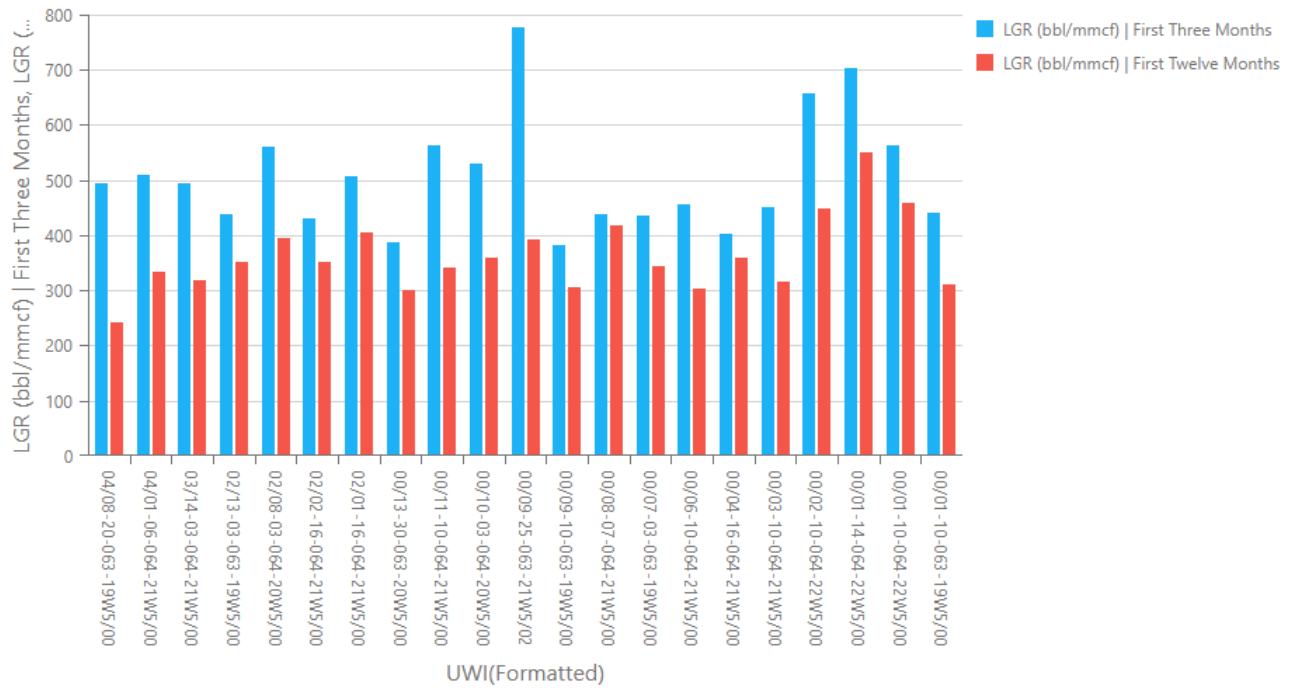


Adjust the bar chart parameters to include 25 items, add “*UWI (Formatted)*” as the argument axis and the 3-month and 12-month *LGR bbl/mmcf* as the value axes (typing LGR into the “Add Y Axis” box will help you find them). We can see right away that there are four wells that stand out as very different, the 02/01-25, 00/16-25, 00/08-25 and 00/16-07. We can remove the anomalous wells from this group and see if we can improve the group statistics. Right now, the best way to remove the wells is to add “Well Name” to the search parameters using the “Add Search Parameter” option, and then selecting the “Not In” dropdown option to remove the anomalous wells from the chart.

Parameters

Zone Of Interest	In	Duvernay	x	
Type Curve Area	In	Duvernay Kaybob VRGC	x	
Detailed Play	In	Select...		
Operator Current	In	Veren	x	
Direction	In	Horizontal	x	
Rig Release Date	>	2018-01-01		
Liquids Wells	=	True	x	
Well Name	Not In	CPEC TONY CKN 1-25-63-21 CPEC TONY CKN 8-25-63-21 CPEC TONY CKN 16-25-63-21 CPEC FC738E TONY CKN 16-7-64-21	x	

LGR (bbl/mmcf) | First Three Months, LGR (bbl/mmcf) | First Twelve Months by UWI(Formatted)



Now, remove “*Duvernay Kaybob VRGC*” from the “*Type Curve Area*” parameters to restore the full list of areas. You can see that the area parameters now make more sense. The liquids trends can be evaluated in a similar way for each of the areas.

Group By Type Curve Area ☒ AVG ☐ SUM Rows per page 50 1 - 5 of 5						
Colour	Type Curve Area	Well Count	Avg IP90 Gas (mcf/d)	Avg IP90 Oil (bopd)	Avg LGR (bbl/mmcf) First Three Months	Avg LGR (bbl/mmcf) First Twelve Months
	Duvernay Kaybob VO 500	78	1,514		765	564
	Duvernay Kaybob VO 300	34	1,770		528	405
	Duvernay Kaybob VRGC	21	2,300		505	362
	Duvernay Kaybob RGC	18	3,643		247	181
	Duvernay Kaybob DG-GC	1	4,225		121	102

In order to understand what the issue might be with these wells, we can change the *Well Name* search parameter from “*Not In*” to “*In*”, to bring up these wells and examine a well ticket. This way, we will be able to see whether there is an issue with the well production, or whether the well just needs to be included in another group.

Parameters				
Zone Of Interest	▼	In	▼	Duvernay x
Type Curve Area	▼	In	▼	Select...
Detailed Play	▼	In	▼	Select...
Operator Current	▼	In	▼	Veren x
Direction	▼	In	▼	Horizontal x
Rig Release Date	▼	>	▼	2018-01-01
Liquids Wells	▼	=	▼	True x
Well Name	▼	In	▼	CPEC TONY CKN 1-25-63-21 x CPEC TONY CKN 8-25-63-21 x CPEC TONY CKN 16-25-63-21 x CPEC FC738E TONY CKN 16-7-64-21 x

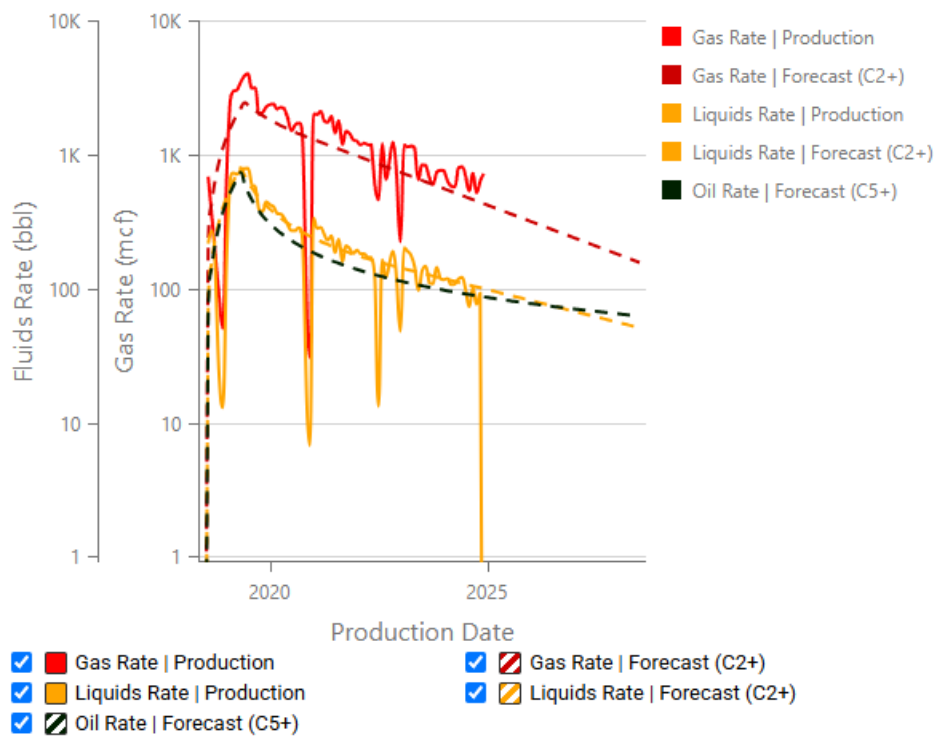
Well Ticket

In the **Well Results Panel**, change the “Group By” to “None” to return to the four wells above that were removed. Since the [02/01-25-063-21W5/00](#) had the most anomalous values of the group, let’s look at its ticket by clicking on a highlighted light blue UWI in the “UWI (Formatted)” column.

On the ticket, scroll down to the *Liquids Production* section, which will be populated with recently released *Alberta NGL* and *Marketable Gas* production volumes. For these wells, all production data and decline curves shown in the *Production Plot* at the bottom left are based on the *Liquids Production* data displayed. The solid lines are actual production, while the dotted lines are decline curves with forecasts. Production decline curves and forecasts have been performed on most wells with more than six months of production available using the Analytics for Energy Suite (A4E) from Blue River Analytics. There are three decline curves with forecasts in this liquids dataset – one each for marketable gas (dotted red) and ethane (C₂₊) plus (dotted orange), and one that provides an idea of the component of liquids that will be pentane or heavier (dotted black). The solid lines show total liquids (including oil) and marketable gas production. The black dotted line is intended only to indicate what proportion of the liquids will be higher value (C₅₊).

Use the cursor to hover over the production plot. By moving your cursor along the various curves, the production month and rate can be observed. There appears to be production issues on this plot in the early months, and the peak in production doesn’t come until late in the first year (9-11 months). As a result, early LGR values will not be very accurate.

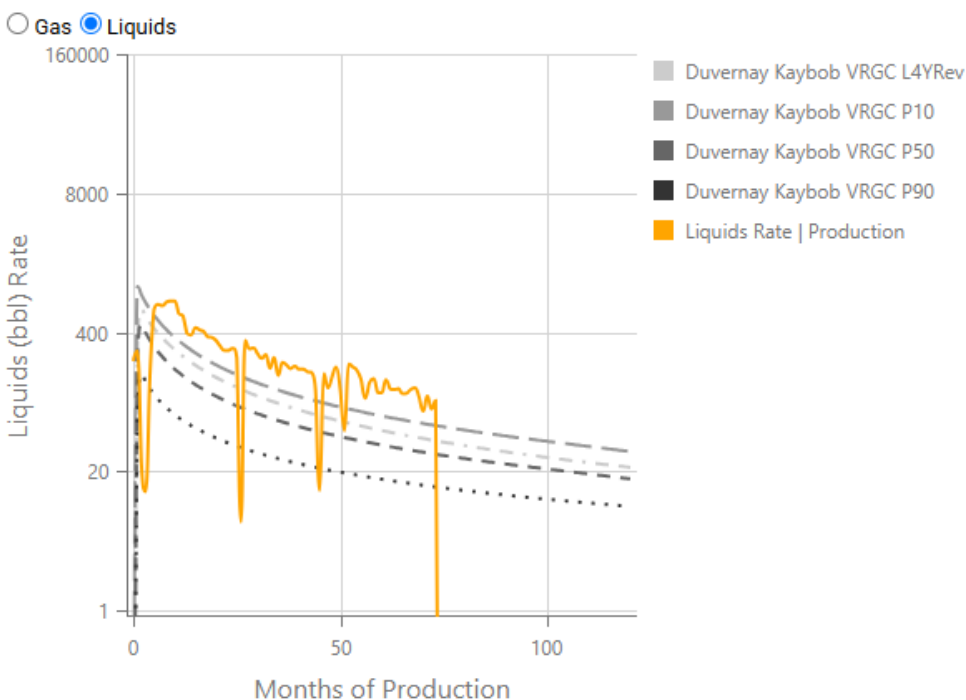
Production Plot



Type-Well Curve Areas

The plot on the lower right shows the actual well production with respect to the type-well curves. In CDL's Catalyst, each play has been evaluated to look for regions with similarities within the play based on our interpretations of the geology, known as a "*Detailed Play*". Many of these areas have a set of P90-P50-P10 type-well curves generated in the A4E Suite – comprising a "*Type Curve Area*" so the production of a given well can be compared to a larger regional well data set. In this case, the regional well data set contains over 300 wells. Also included is a P50 for wells drilled over the last four years (L4YRev). There is a toggle at the top of the chart that allows for the viewing of this well's gas and liquids production with respect to each set of type-well curves. In the chart below, we can observe that overall, this well sits above the P10 for this data set for both charts, however falls well below the type curve in early production.

Production Plot | Type Curve Area



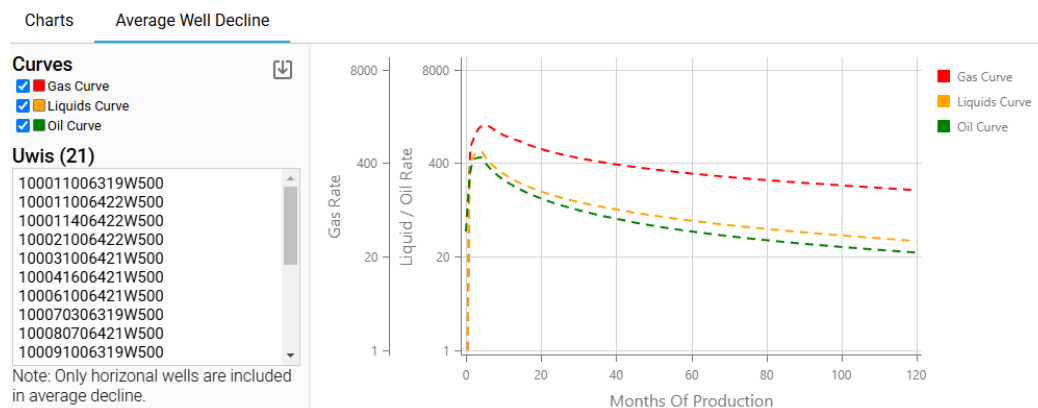
These regional type-well curves have been provided to create a general reference point to which given well results can be compared to a larger nearby area. However, in this case, the 300 well data set is too large and we'd like to create an average type-well curve that is more representative of Veren's performance in this area. To accommodate smaller well lists and more specific normalization, CDL has provided an option to create an average type-well curve using a custom group of wells.

Chart Panel: Average Well Decline (Average Type-Well Curve)

After looking at a few tickets, we feel justified in removing the four anomalous wells from our Veren Duvernay Kaybob VRGC grouping. We can take the remaining wells in the group (just over 20 wells at time of writing) and create an average of all the production declines and forecasts to create an average type-well curve. The search parameters should look like the image below.

Parameters				
Zone Of Interest	In		Duvernay x	X
Type Curve Area	In		Duvernay Kaybob VRGC x	X
Detailed Play	In		Select...	
Operator Current	In		Veren x	X
Direction	In		Horizontal x	X
Rig Release Date	>		2018-01-01	
Liquids Wells	=		True x	X
Well Name	Not In		CPEC TONY CKN 1-25-63-21 x CPEC TONY CKN 8-25-63-21 x CPEC TONY CKN 16-25-63-21 x CPEC FC738E TONY CKN 16-7-64-21 x	X

Navigate to the “**Charts**” panel and select “*Average Well Decline*”.



When using the *Average Well Decline*, a custom well list can be provided in several ways:

- by limiting the search to the desired wells (which was just done in this example);
- using the select tool on the map (shown by the dotted box with the “+”) to select a local set of wells;
- directly importing a well list using the import icon  in the Search Panel.

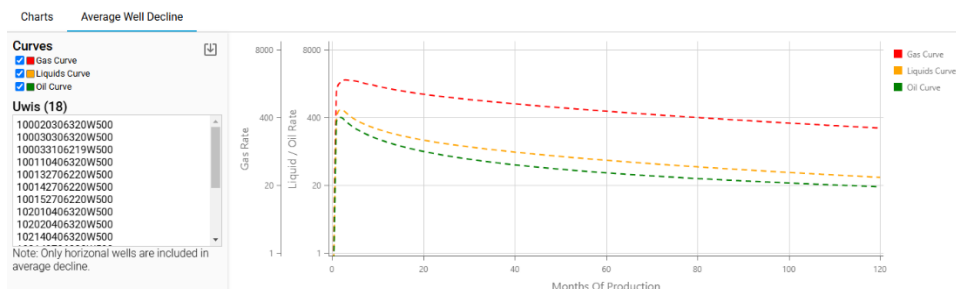
The chart shows an average of all the decline curves and forecasts in the selected UWI list, which is shown to the left of the chart.

This new type-well curve can be exported using the export icon that appears above the well list and below the words “*Average Well Decline.*” 

Now, return to the **Search Panel** and replace “Type Curve Area” with “Duvernay Kaybob RGC” in the parameters.

Parameters				
Zone Of Interest	▼	In	▼	Duvernay x
Type Curve Area	▼	In	▼	Duvernay Kaybob RGC x
Detailed Play	▼	In	▼	Select...
Operator Current	▼	In	▼	Veren x
Direction	▼	In	▼	Horizontal x
Rig Release Date	▼	>	▼	2018-01-01
Liquids Wells	▼	=	▼	True x
Well Name	▼	Not In	▼	CPEC TONY CKN 8-25-63-21 x CPEC TONY CKN 16-25-63-21 x CPEC TONY CKN 1-25-63-21 x CPEC FC738E TONY CKN 16-7-64-21 x

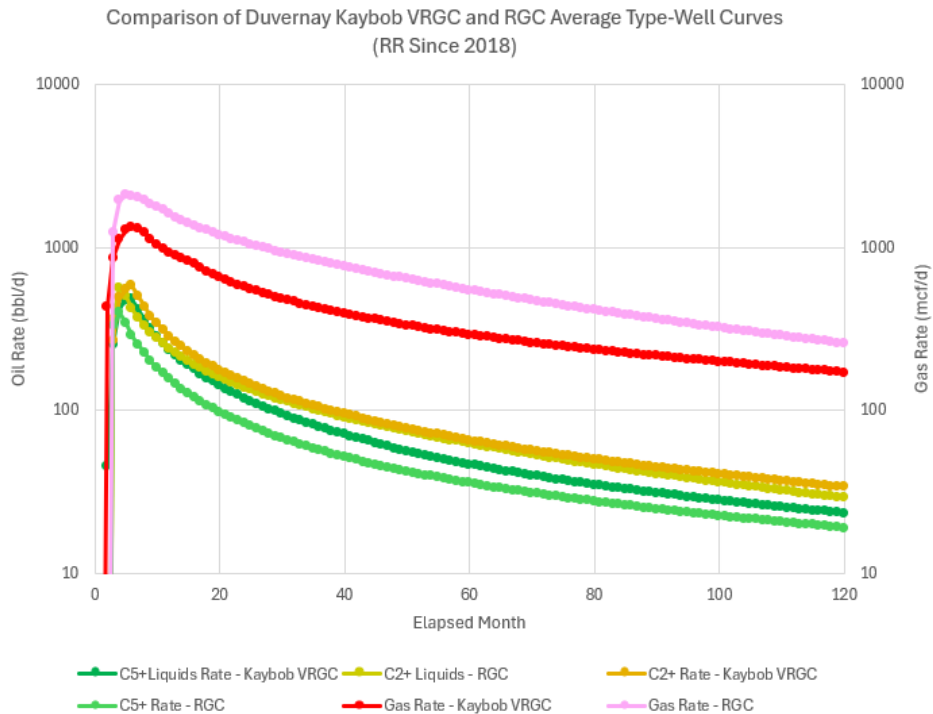
Export the resulting **Average Well Decline** type-well curves for these wells as well.



If using the map selection tool for future selections, remember to subsequently clear any map search boxes after the export (using the dotted box with the “x”) so the **Search Panel** won’t be limited to the map selection.

Using the Average Well Decline Export in Excel

The customized average type-well curves can be brought into Excel and compared. The file [Average Decline Curve Comparison Example Duvernay.xlsx](#) (shown below) accompanies this tutorial and includes a chart on the first worksheet with the three curves from each area displayed. The data for each set of curves can be found in the subsequent worksheets. The file is set up such that new curve exports can be cut and pasted into these worksheets and renamed to compare curves within different areas.



Templates

With all this work completed, a template can be saved at any stage, so work can be continued later, or search results can be shared. Templates can be saved using the template icon on the upper right , next to Account Settings .

Main Template

[Default] Well Template  

Component Templates

Chart:

[Default] Well Template (Chart)  

Results:

[Default] Well Template (Results)  

Search:

[Default] Well Template (Search)  

Templates can be saved for one panel (*Component Templates*), or a series of panels combined (*Main Template*). To save a template, use the disc icon next to the template you wish to save. To load a template, select it from the dropdown.

Main Template

(Modified) Default Hydro Template   

Component Templates

Chart:

[Default] Well Template (Chart)  

Results:

(Modified) Sample Hydro Template (Results)   

Search:

Default Hydro Template (Search)   

To delete an existing template, use the trash can icon, next to the disc icon. Note that after saving or deleting a template, you may need to temporarily switch to a default template and then back to your new template for the changes to take effect.

CDL Play Maps: Hydrodynamics Data

CDL Play Maps is a key component of CDL ONE that provides a unique view of production trends in active resource plays by examining the interrelationships between pressure, temperature, fluid chemistry and liquids distribution. The datasets included in Play Maps are also searchable and exportable through Catalyst.

Displaying Pressure Data

For this section, click the **Reset Search** button to clear previous searches. Then load the **Main Template** by clicking the template icon and selecting the “[Default] Hydro Template” in the dropdown. It will by default load the Montney pressure data from CDL Play Maps. The Duvernay data can be selected by going to the **Dataset** in the **Search Panel** and selecting “Duvernay - Hydrodynamics”.

A series of dropdown arrows now appear to the left of each well in the **Well Results Panel**. When clicked, these dropdown arrows reveal the pressure data associated with each well.

Using the column chooser on the upper right,  additional columns can be selected to view under “Hydrodynamics Tests.”

Add any additional columns desired, such as *Latitude* and *Longitude*, to the list of columns.

At this time, there is minimal charting capability for the CDL Play Maps data within Catalyst. As described above, columns can be added allowing a user to export the data for further analysis and charting out of Catalyst for a desired area. For example, the selected data are exportable to Excel to create plots such as pressure vs elevation plots.

Exporting Pressure Data

To export the data from Catalyst, use the export icon to export the pressure data for selected wells to Excel. 

Any columns previously selected in the column chooser will be automatically selected for the export. Well and production data can also be exported for these wells so correlations with production parameters can be created. For more information on how to create and interpret some useful graphs using Play Maps data, please consult CDL Play Maps, also available as part of the CDL ONE subscription.

At this time, there is minimal charting capability for the CDL Play Maps data within Catalyst. However, the selected data can be exported to create graphs such as C₂+ WGI vs IC₄/nC₄ ratio in Excel. For more information on how to create and use these graphs, please consult the CDL Play Maps Interactive PDF, also available as part of the CDL One subscription.

Conclusion

CDL hopes that this guide is a helpful introduction to some basic workflows and new features within CDL's new **Catalyst**. Please note that this guide focused on analysis in liquids-rich plays such as the Montney, Duvernay and Spirit River, and how to access **CDL Play Maps** data within Catalyst. It is recommended that you also consult the workflow in **Quick Tutorial – Production Data – Viking**, particularly if evaluating multiple operators and operations in multiple zones.

For more details on decline curves, forecasts and EURs within Catalyst, please consult Catalyst's **DCA and EUR Documentation**.

Changes from Previous Versions

Users who accessed CDL's previous online software (**Play Metrics**) may notice certain exclusions in the current version of the Catalyst software. Improved versions of some of these features are planned for future releases of Catalyst, while others are currently being evaluated for their feasibility. See below for more details or reach out to learn more.



Operator Summary

Previously, when clicking on the Operator hyperlink in the search results panel in Play Metrics, a summary plot would be generated for the operator with type curve areas on the y-axis and type curve tiers on the X-axis. CDL is currently working on a new, more accurate version of this plot using percentiles that will be available in the next release of Catalyst.

Detailed Play Tickets

When clicking on the Detailed Play hyperlink in Play Metrics, a summary of the detailed play could previously be accessed which included a map, schematic cross-section and write-up. CDL is currently updating these play summaries and improving the access mechanism for the play summaries in the new Catalyst; these summaries will be available in a future release.

Type Curve Tier Economic Parameters

Previously in Play Metrics, when selecting a Type Curve Tier Name, a set of economic parameters could be accessed. For these calculations to be accurate, the most recent price decks are needed, and certain proprietary cost parameters should be included in the calculations. CDL is currently exploring some additional avenues for providing access to comparative economics, including consulting services using in-house software. Should you need more economics support for your daily workflow using Catalyst, contact CDL to discuss options, so that CDL can provide solutions that have the most value for our clients.