Exercise objective:

To predict lithology logs using the ‘’*Lithology classification* tool’’, which is part of the machine learning plugin.

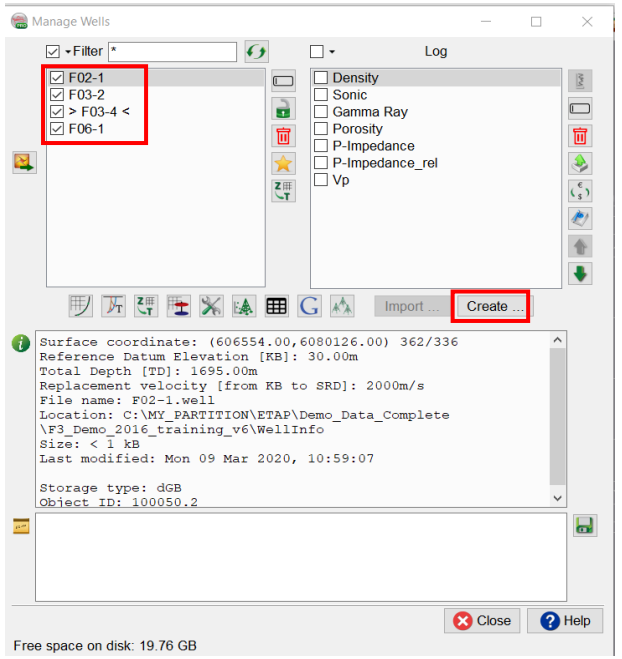
Well data Preparation
Well(s) need to be available in the survey. If not, **import** wells (track, logs, markers, optionally time-depth curve or checkshot).

Workflow:

For the purpose of this exercise, we will create a fake lithology log using Mathematics (as no lithology log exists in the survey)

1. **Open** the Well Manager  .

2. **Select** *All Wells in the* ‘’Well Manager’’*, and* **Hit** *Create.*



Workflow cont'd:

3. *In the "Calculate a New Well Log" window,* **Specify** the parameters as indicated *below to create a fake litho-log:*

   a. **Select**: MathFunctions.

   b. **Type** the Formula: *GR < 40 ? 1 : 2*

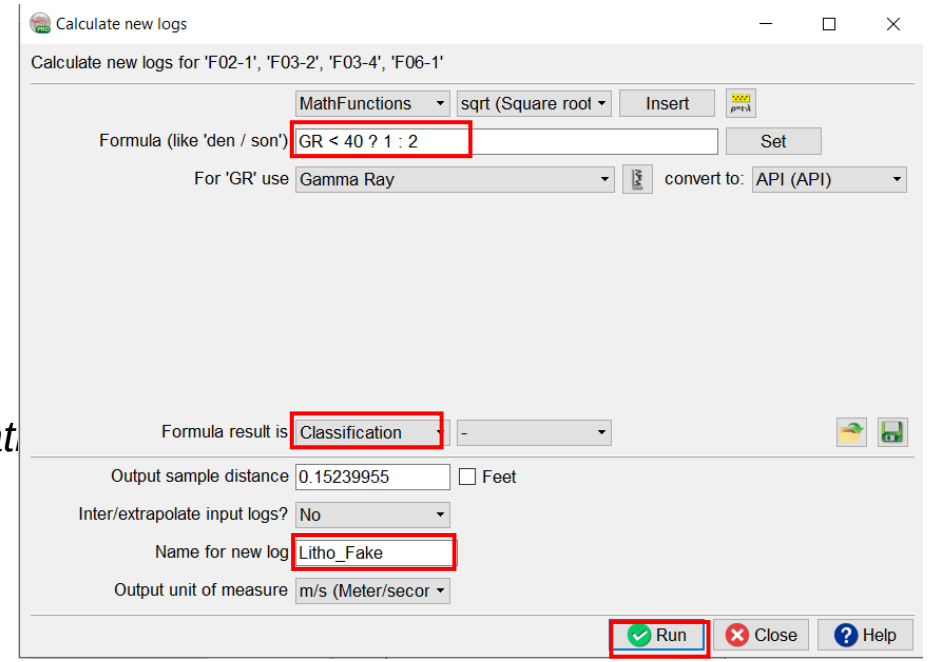
   c. **Hit** Set.

   d. **Select** Gamma Ray log.

   e. **Select** for the *Formula Results, Classificat*

   f. **Type** Name for new log: Litho_Fake.

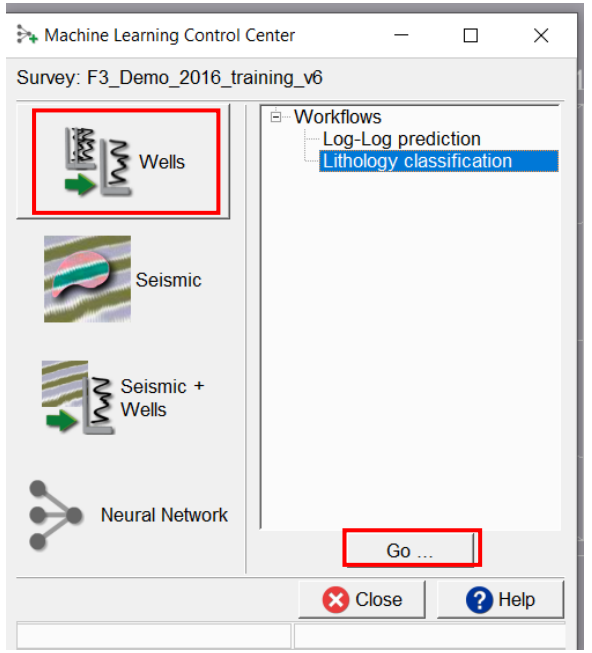
   g. **Select** Output Unit of Measures: None.



4. **Press** Run.

Workflow cont'd:

5. **Open** the Machine Learning Control Center with the  icon.
6. **Click** on Wells.
7. **Select** *Lithology classification.*
8. **Hit** Go.



Workflow cont'd:

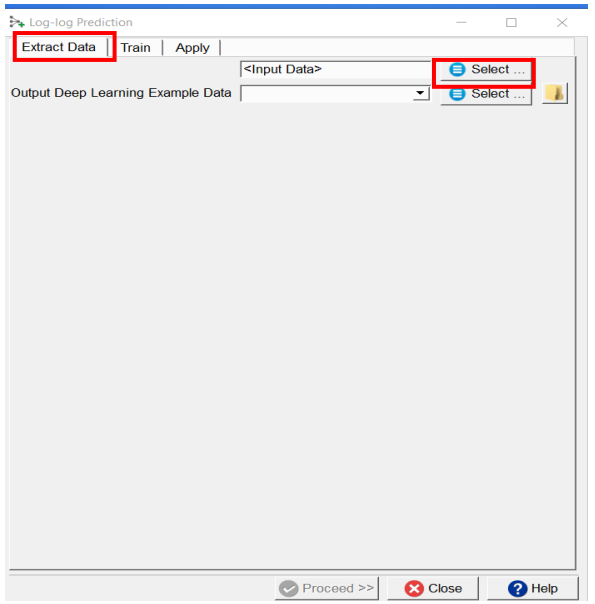
9. The Log-log prediction window pops up.

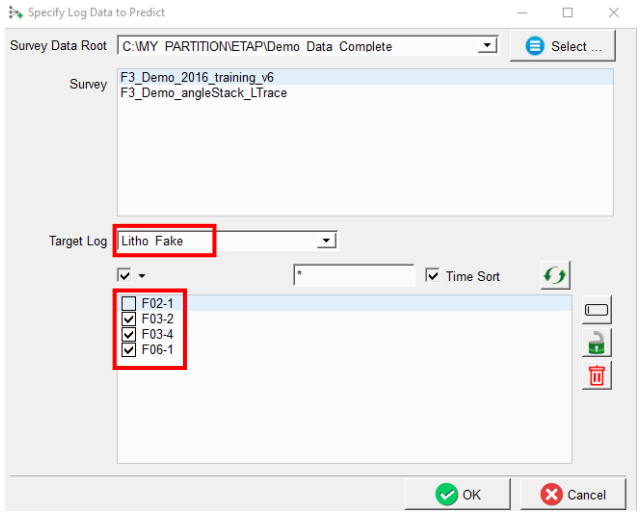
   Select *Input Data.*

10. ''*Specify Log Data to predict" window pops up.* **Select**: *Survey*, *Target Log,* and *Wells* as indicated in the window.

The well F02-1 is not selected, and will be used as a blind well.

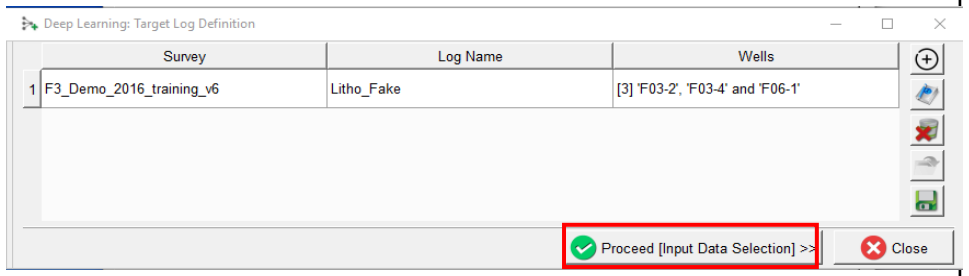
11. Press OK.





Workflow cont'd:

11. The "*Deep Learning: Target Log definition*" window pops up.

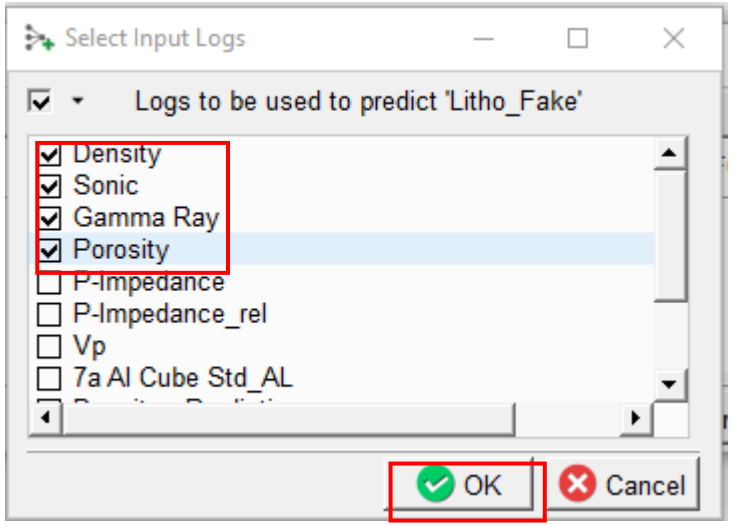


A new data selection from different survey definition can be added by clicking on ⊕ icon

12. **Press** Proceed [Input Data Selection].

13. In the *"Select Input Logs"* window, **Select** the Density, *Sonic* and *Gamma Ray l*ogs.

14. **Press** OK.



Workflow cont'd:

15. The *"Input Log Selection"* window pops up.

Input Logs can be modified here. Keep the default parameters as indicated in the window.

16. **Specify** a new name for the ''*Output Deep Learning Example Data" (e.g. DL_Example_Data_Lithology_st10).*

17. **Press** Proceed.

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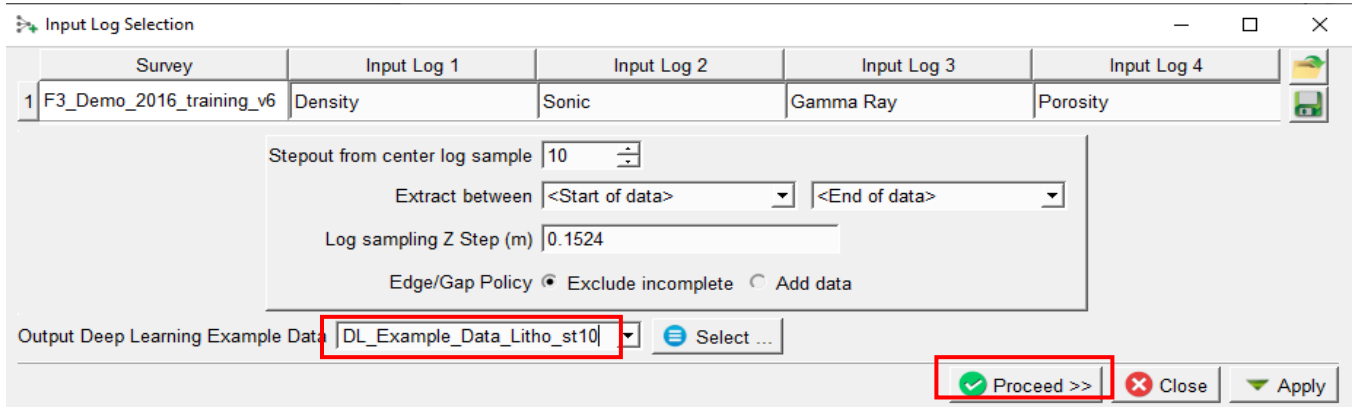


Workflow cont'd:

18. **Select** "New" at the Training Type checkbox.

19. The *"Train" tab* becomes active.

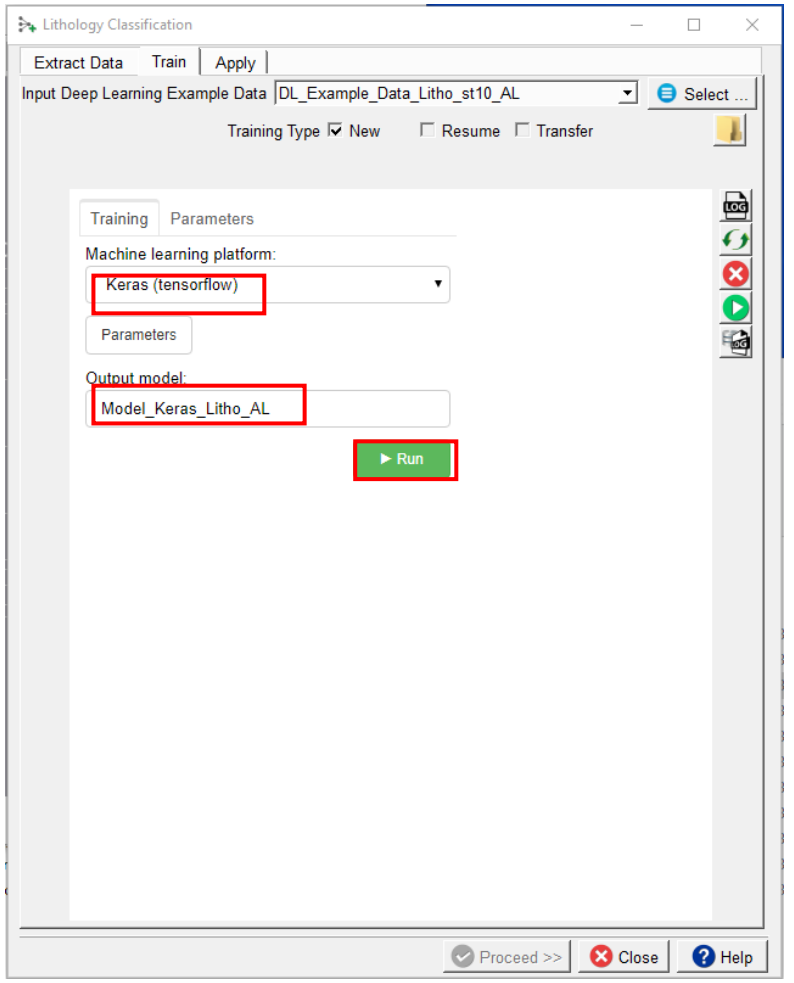
We train the extracted examples using the default learning algorithm (e.g. Keras (tensorflow).

> Different machine learning platforms and parameters can be tested.

20. Keep the defaults parameters.

Specify a new *Output mode*l name (e.g. Model_Keras_Litho_AL)

21. Press Run.

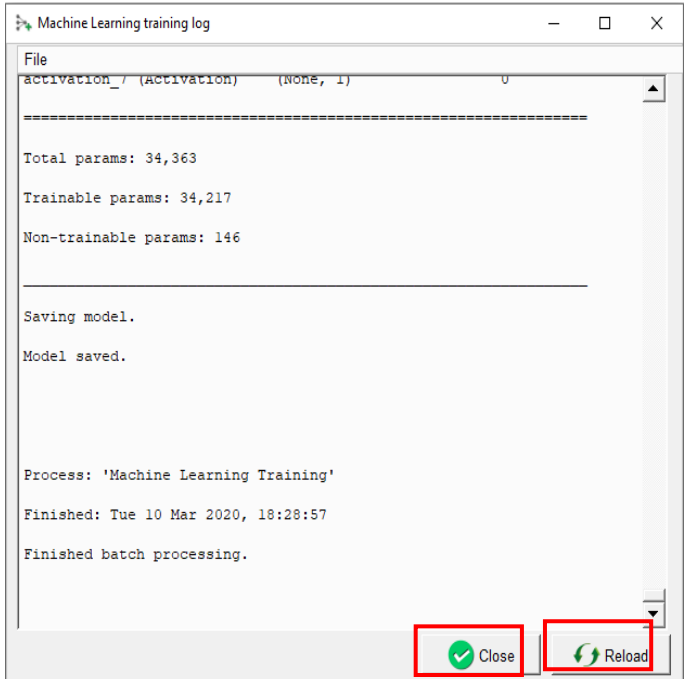


Workflow cont'd:

22. The Machine Learning training log file pops up. Otherwise **Click** on  icon.

23. Press Reload to refresh the window.

24. When the processing is done, **Close** the training log file.



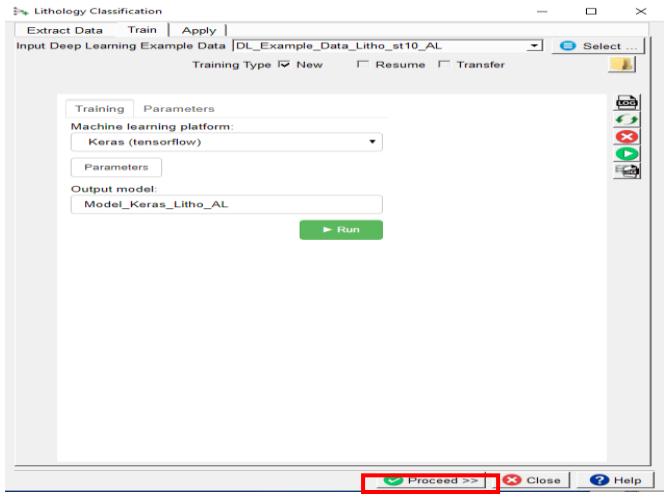
Workflow cont'd:

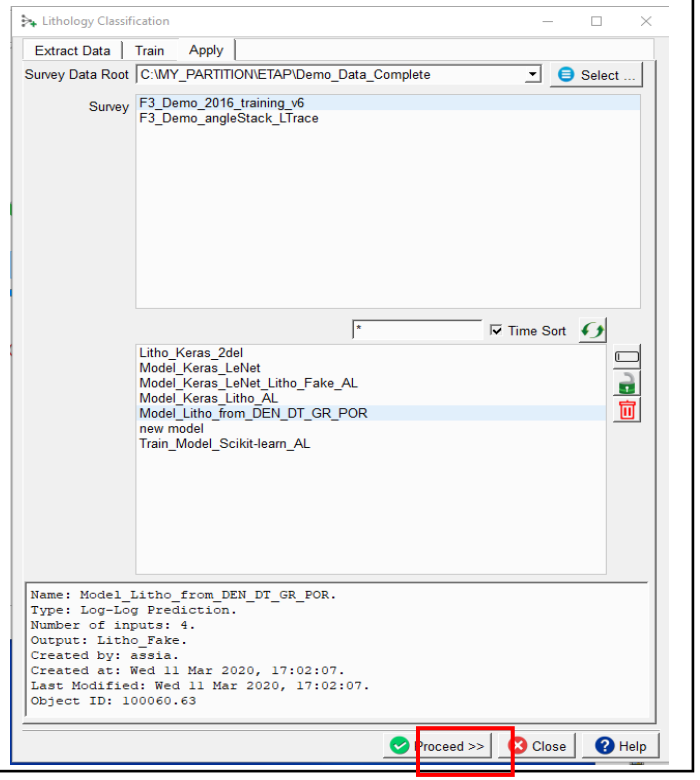
25. **Press** Proceed in the 'Lithology Classification-Train' Window.

26. ''Apply'' tab get activated, **Verify** the Survey and Model are correct. Otherwise, modify accordingly.

    The Survey, Training model can be modified here.

27. **Press** Proceed.





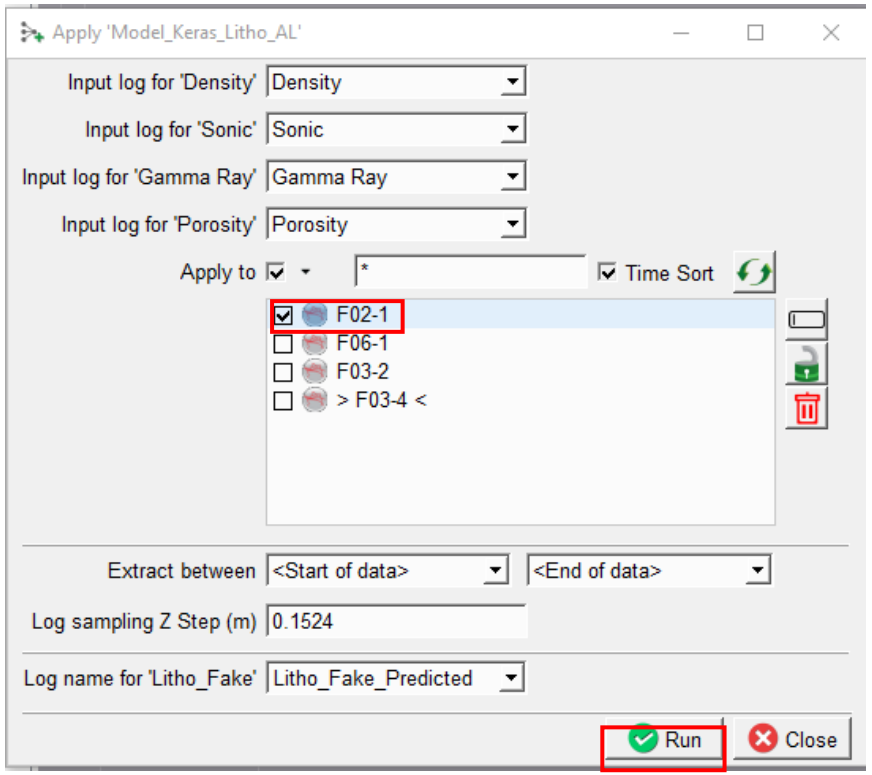
Workflow cont'd:

28. The ''*Apply* created training model'' window pops up.

29. **Apply** the trained model to a blind well (not used in the training process). **Select** F02-1.

30. **Keep** default parameters. **Type** a new
    Log name for the predicted lithology log ''Litho_Fake_Predicted''.

31. **Press Run** to continue.



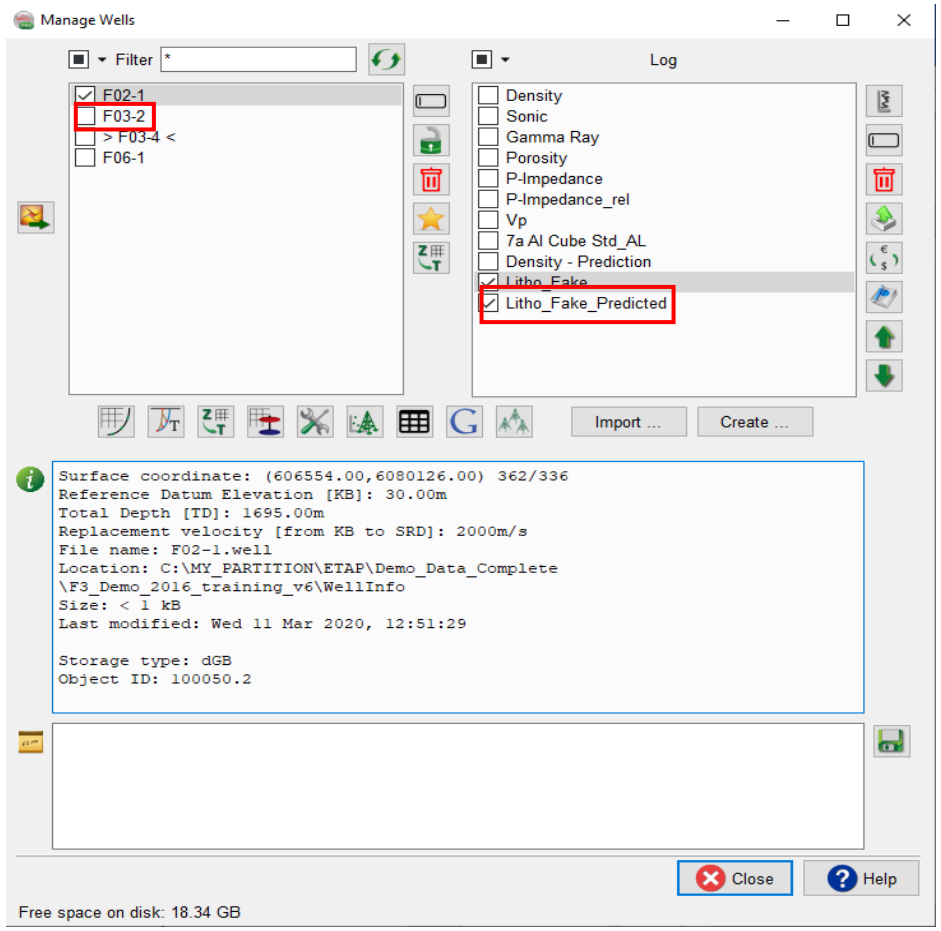
Workflow cont'd:

QC results by displaying the predicted log adjacent to the recorded log

32. **Click** on the Well Manager icon.

33. **Select** the blind well F02-1, Litho_Fake and Litho_Fake_Predicted logs.

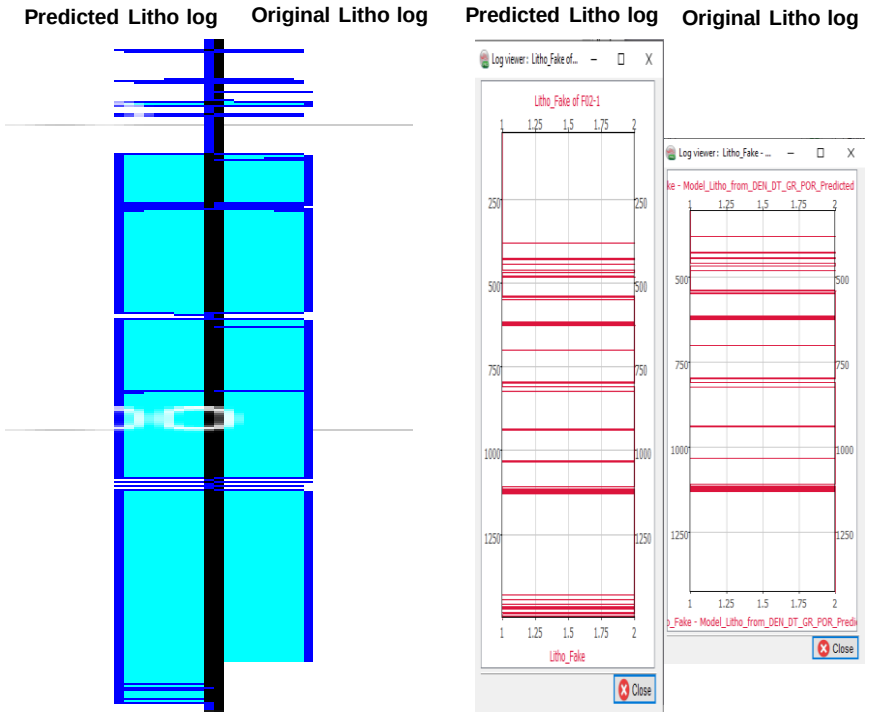
34. **Click** on view logs.



Workflow cont'd:

35. **Compare** the original vs predicted litho-log.

Note: The missing parts at the top and base of the predicted log are due to missing values in the input logs e.g. Porosity.



Workflow cont'd:

If the results are satisfactory, go back to the ''Apply training'' window, and apply the trained model to all the wells where you want to make predictions.

36. **Select** All Wells. Keep default parameters as indicated in the window.

37. **Press** Run to continue.