00232 Lithmetrics Results

Introduction

- This report covers all aspects of Lithmetrics carried out on the 00232 dataset.
- This project provides an update on tests that showed promise on previous projects and is followed by some new tests that have been applied to this dataset.
- The aims were to see if Lithmetrics could be used to identify changes in lithology and then apply positive findings to the blind sites.
- Because much of the shallower units aren’t seen due to the beam saturation, the main focus was firstly on identifying dolomites and breccias but secondly the base of the Waulsortian Limestone.

Methodology

Overall methodology steps for this project

For all data

Normalise processed data and creation of common depth points & creation of Lith_1 to Lith_7 lithmetrics using LithMetrics_v100 script.

Calculate the median and subtract the median for each parameter.

E-logs, WMF, Correlation Data

Visual check each dataset against training data

Creation & testing of Dolomite Lithmetric.

Defining negative and positive thresholds values for E-log,Weighted Mean Frequency & Correlation data. Test against training logs.

Complete weight of evidence for peaks and troughs for E-log and Weighted Mean Frequency. Test against training logs.

Harmonics

Complete weight of evidence for peaks (E-ADR, E-Mean, E-SD, F-Mean, F-SD and troughs (F-Gamma, E-ADR). Test different variations if initial results are poor.

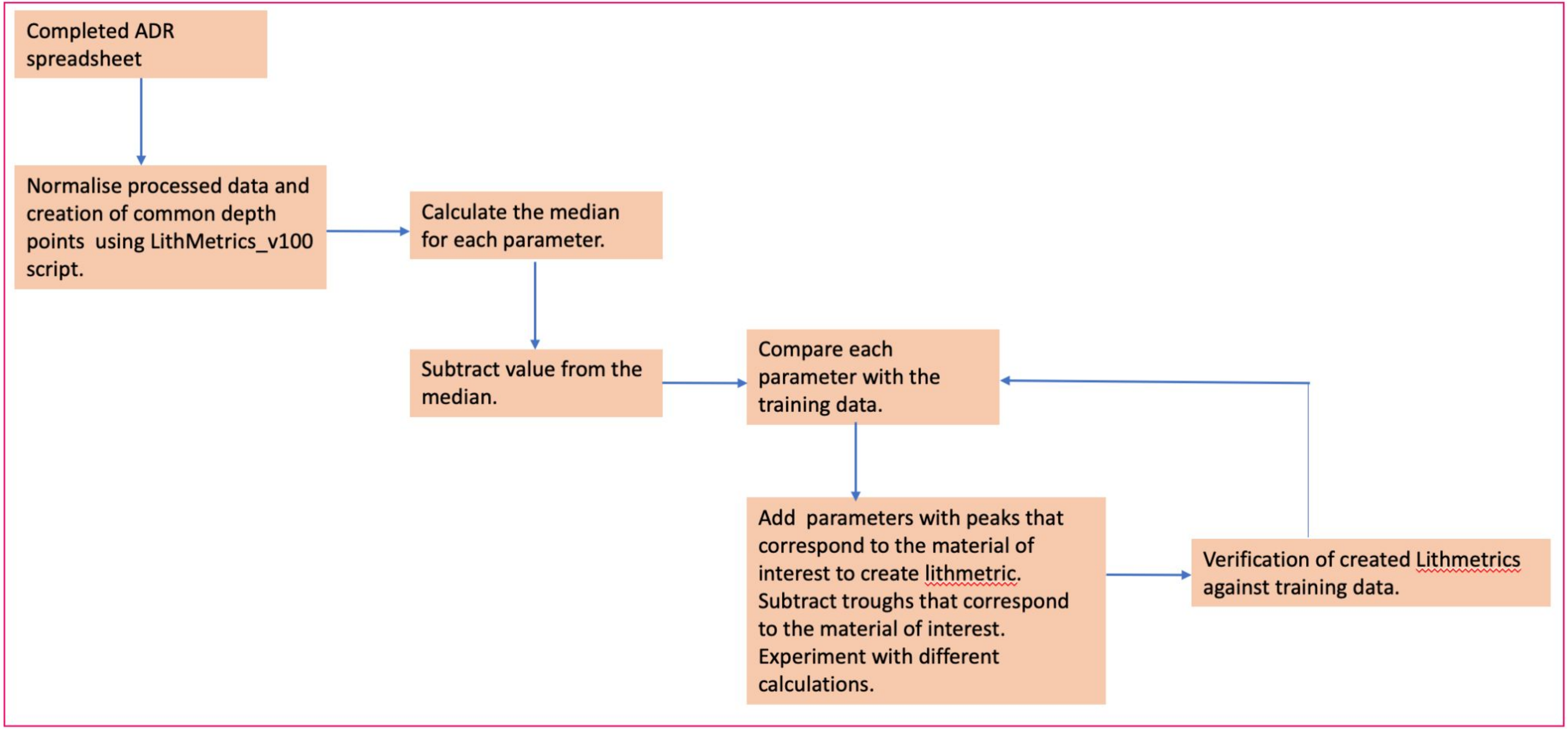
Compare each parameter with the training data quantitatively. Set threshold value.

Lith_1 to Lith_7

Visual check of all seven Lithmetrics against training data.

Defining and setting threshold values

Flow diagram Difference from the Median Method



Difference from the median method

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Depth (m)	Depth (ft)	E-Log MA3	Median	Difference to Median
150	492.126	0	0.3493	-0.349298
151	495.407	0.666667	0.3493	0.317369
152	498.688	0.8	0.3493	0.450702
153	501.969	0.842498	0.3493	0.4932
154	505.249	0.951795	0.3493	0.602497

Parameter (normalised to 0-1)

Median for full each parameter dataset

Median subtracted from parameter

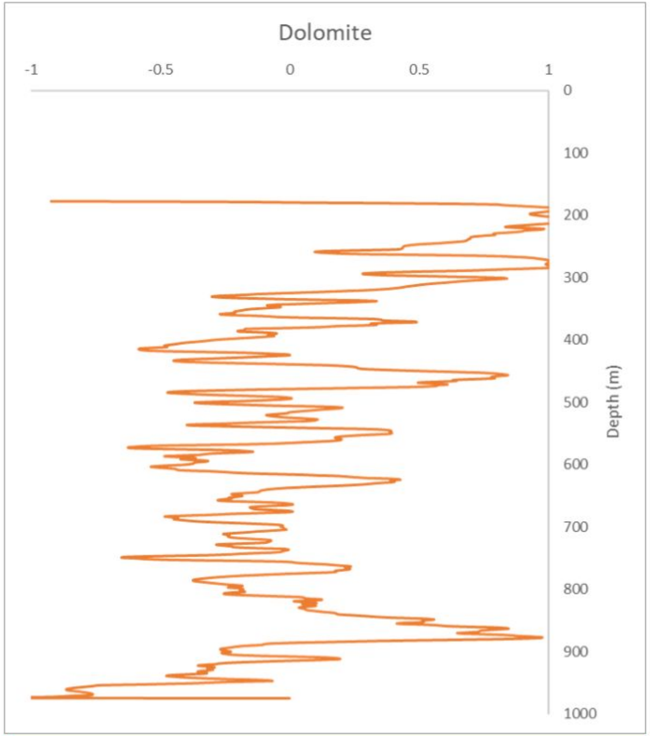
- Top XXm cropped from the dataset because of beam saturation. This was different for each V-bore.
- Medians were calculated for each dataset.
- The differences from the median are then calculated.
- Lithmetrics were then created by adding peaks in parameters at identical depth and subtracting troughs in parameters at identical depths.
- Data range for parameters limited to -0.5 to + 0.5 to identify peaks in parameters with a smaller range.

Dolomite (Difference from the Median)

- After comparing the difference from the median method graph for each parameter visually against the training logs a calculation was devised that could be tested against all the training sites.

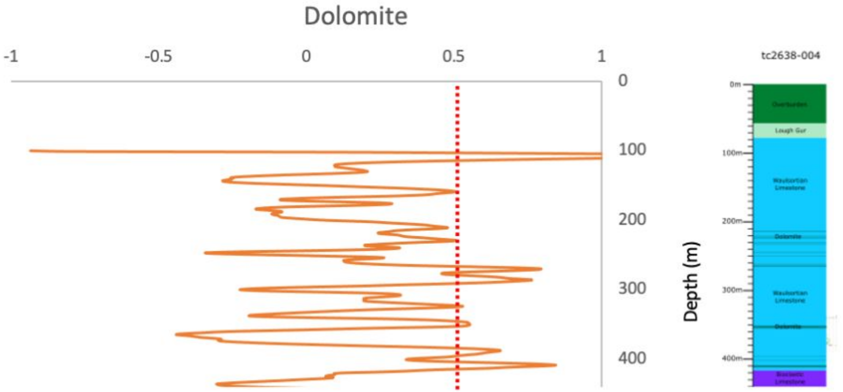
- The WMF and the Correlation criteria were used for trying to identify dolomites.

- These parameters were tested and combined into a single metric because the harmonics have previously been used successfully for establishing relationships with sulphides.



Equation used.
Corr 5-10MHz + Corr 1-5MHz + WMF

TC2638-04



- Multiple thinner dolomites also present.
- Values above 0.5 show some good matches for dolomites in the larger sections shown in the figure, although some of the smaller examples above 150m are not seen.

TC2638-09

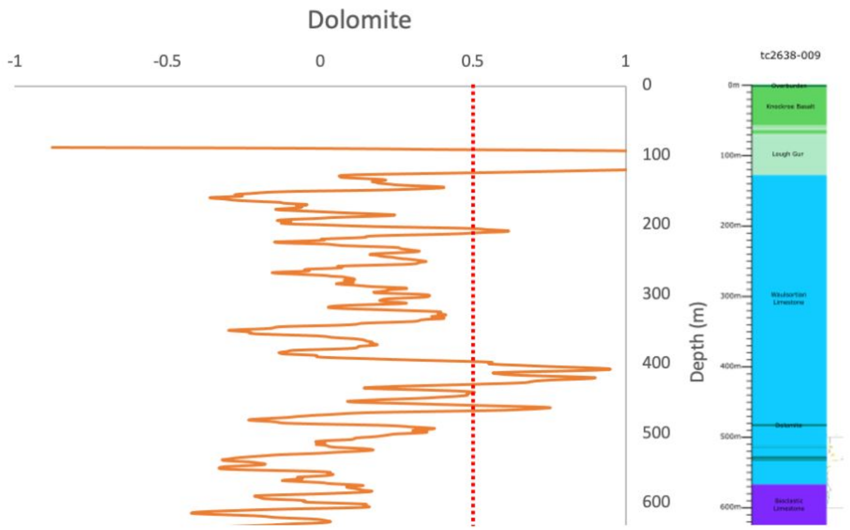
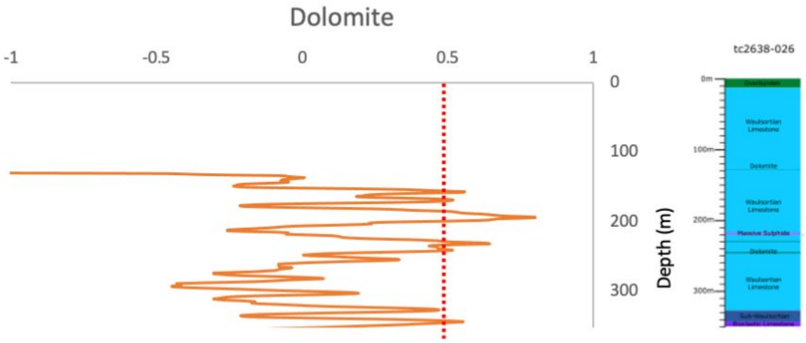


Chart Area

- Multiple thinner dolomites also present. However even the thinner examples within the Waulsortian are not identified by the Lithmetric.

- Values above 0.5 show some good matches for dolomites.

TC2638-26



- Multiple thinner dolomites also present. However even the thinner examples within the Waulsortian are not identified by the lithmetric at 120-140m.

- Values above 0.5 show some good matches for dolomites at 250m and there seems to be an inverse relationship between the dolomite lithmetric and the massive sulphide.

TC2638-30

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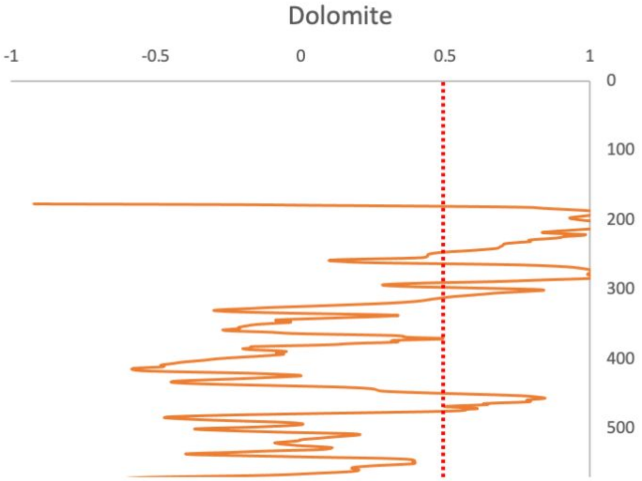
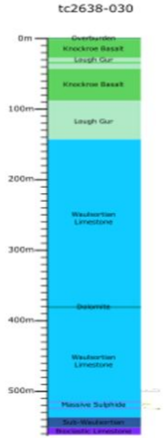
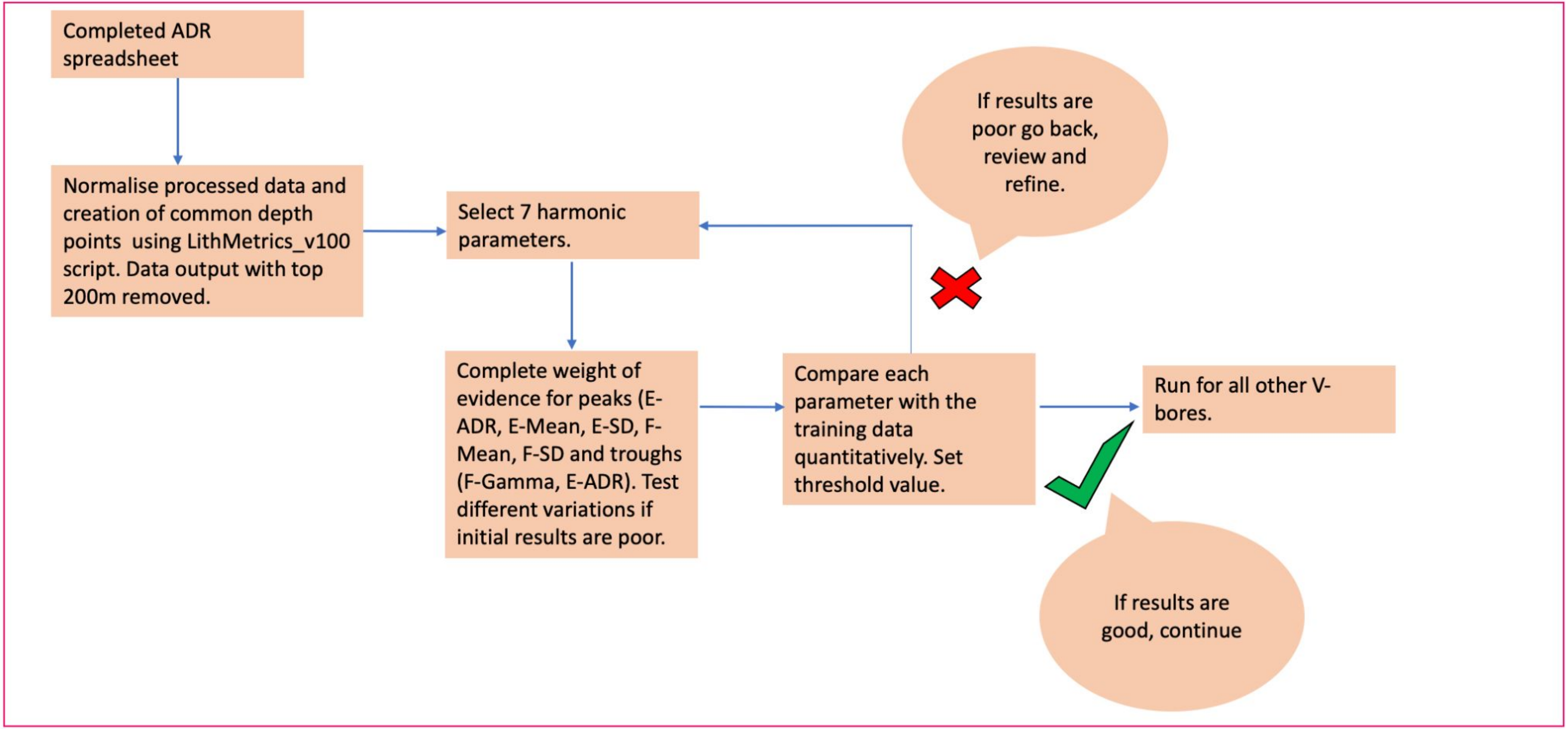




- No obvious relationship between the dolomite lithmetric and the dolomite present in the drill log.

- Because the results are inconsistent in the four training sites, this method will not be used for the blind holes.

Flow diagram Weight of Evidence



Weight of Evidence Method

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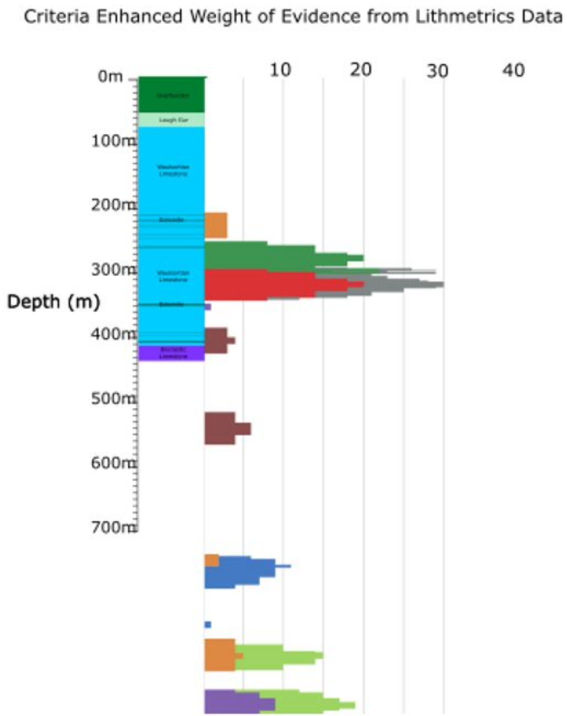
4 = place values 25m above and below = buffer of 25m either side of the peak in the value.
3 = 20 cells above and below (20m buffer on either side)
2 = 10 cells above and below (10m buffer on either side)
1 = 5 cells above and below (5m buffer on either side)

- This uses the same normalised data used for the difference from the median method.
- The parameters used are Low F-Gamma, High F-ADR, High F-Mean, High F-SD, High E-Mean, High E-SD and High or Low values for E-ADR (see *).
- *The top 4 peaks or troughs for each of the parameters above was weighted from 4 to 1 with the exception of E-ADR where the top two peaks were weighted 3 and 4 and the top two troughs were also given a weighted value of 3 and 4.
- All the values were then added together, to produce the final value at each depth interval.
- Values of 15 or greater are considered mineral zones.
- This gives a value more similar to the estimated percentage of sulphides from the training data and only adds 1-1.5 hours to the analytical process.

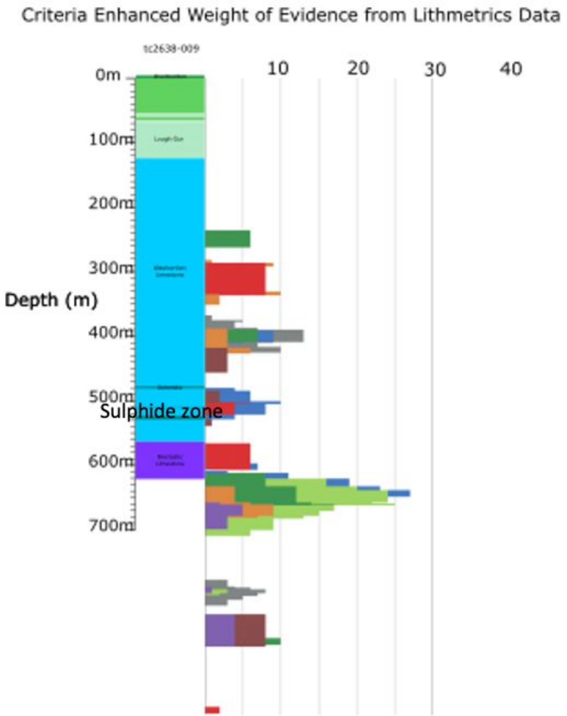
TC2638-04 Lithmetrics Weight of Evidence



- Metallic area is between 350-380m The weight of evidence method suggests the mineral zone is shallower between 280-380m. When the full training data is examined much of this area 280-350m is associated with breccia rather than Zn and Pb.

- There may also be further mineralisation below 500m with regular peaks as high as 19.

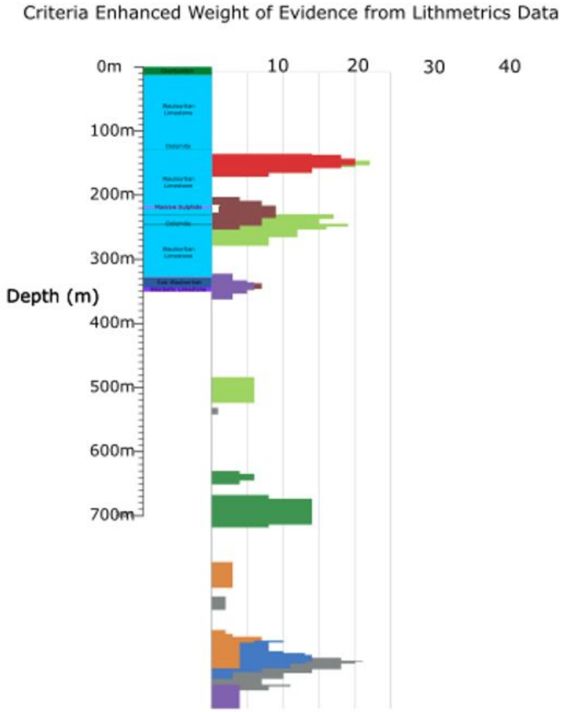
TC2638-09 Lithmetrics Weight of Evidence



- Metallic area is between 500-595m. This is identified using the weight of evidence method. However, there also appears to be multiple false positives at both 300m and 600m. When the full training data is examined, many of these are associated with breccias.

- There may also be further mineralisation below 600m with regular peaks as high as 28.

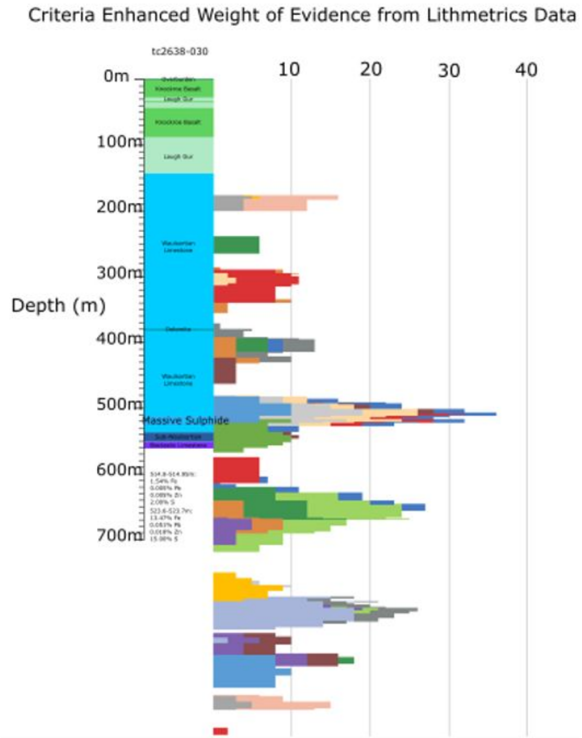
TC2638-026 Lithmetrics Weight of Evidence



- Metallic area is between 214-225m. This is identified using the weight of evidence method. However, there are also false positives at 130-150m and 320-340m. The latter marks the change of formation from the Waulsortian in the sub-Waulsortian and the bioclastic Limestone. When the full training data is examined, many of these false positives are associated with breccias.

- There may also be further mineralisation below 500m with regular peaks as high as 20.

TC2638-30 Lithmetrics Weight of Evidence



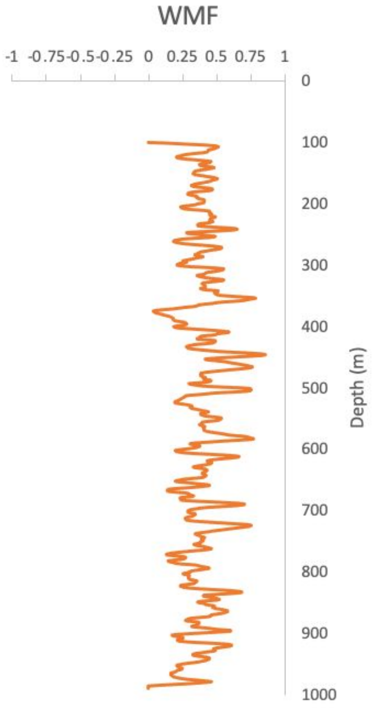
- Metallic area is between 516-527m. This is identified using the weight of evidence method. However, there are also false positives between 190-480m. The latter marks the change of formation from the Waulsortian in the sub-Waulsortian and the bioclastic Limestone. When the full training data is examined, many of these are associated with breccias

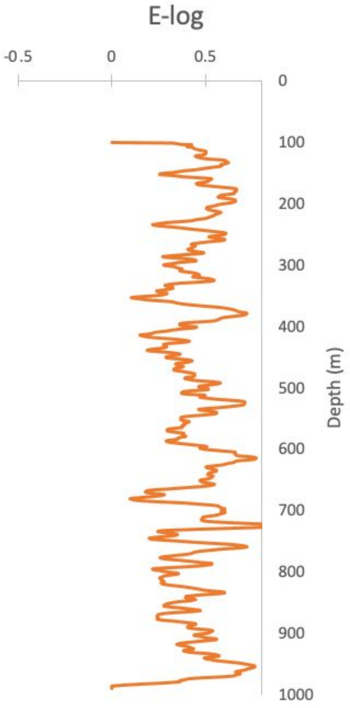
- There may also be further mineralisation below 500m with regular peaks as high as 30.

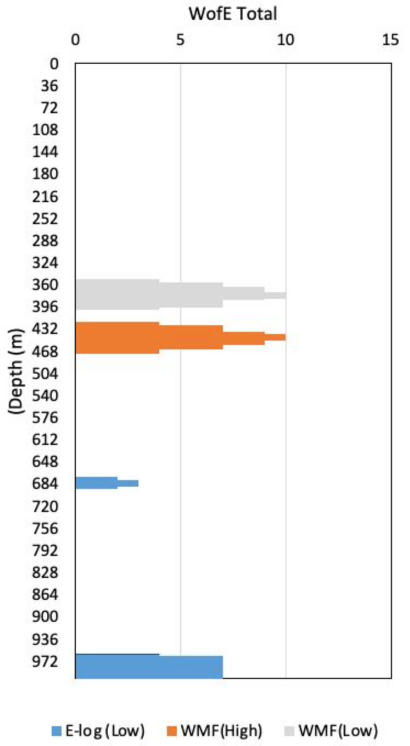
- This method does offer promise as a tool for sulphides but there are multiple false promises many of which correspond with the breccias.

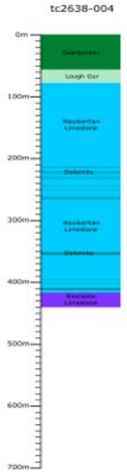
Weight of evidence using WMF and E-log

TC2638-04



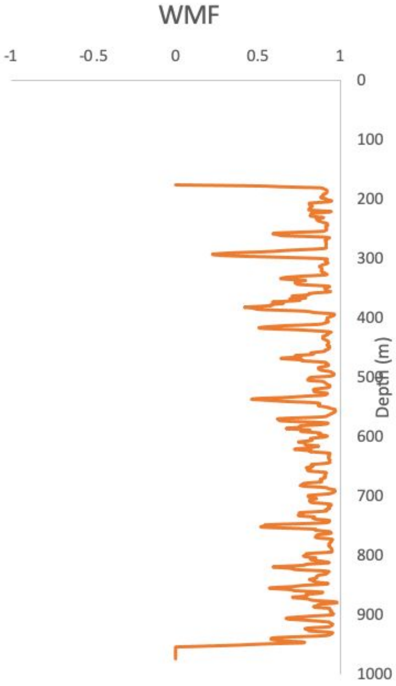


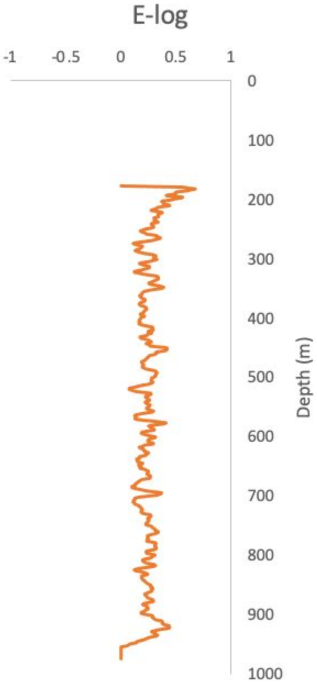


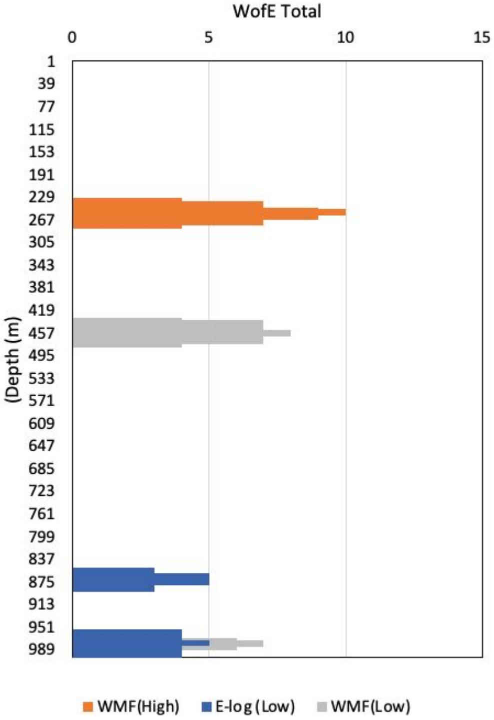


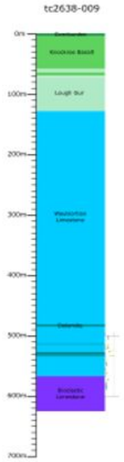
- No E-log lows correlate with the training data.
- Low WMF picks out the second deepest dolomite but no correlations with dolomite are seen.
- The High WMF identifies the Bioclastic Limestone.

TC2638-09



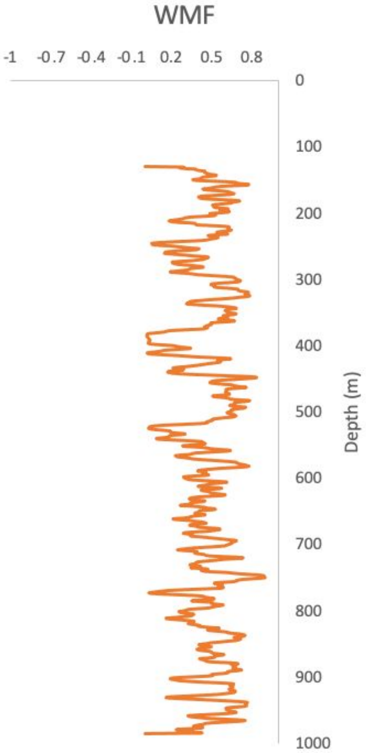


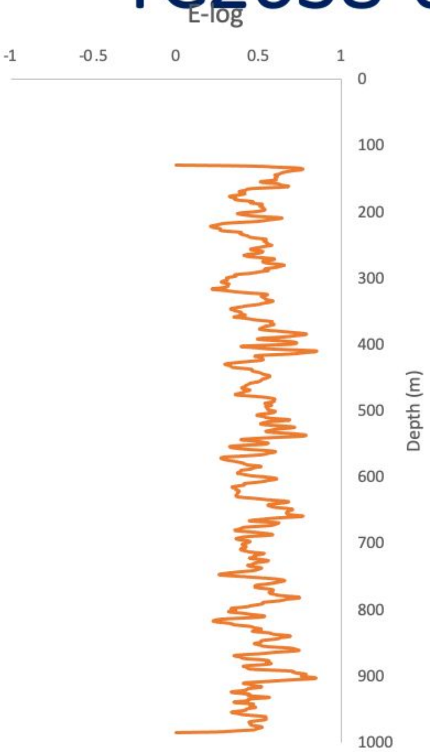


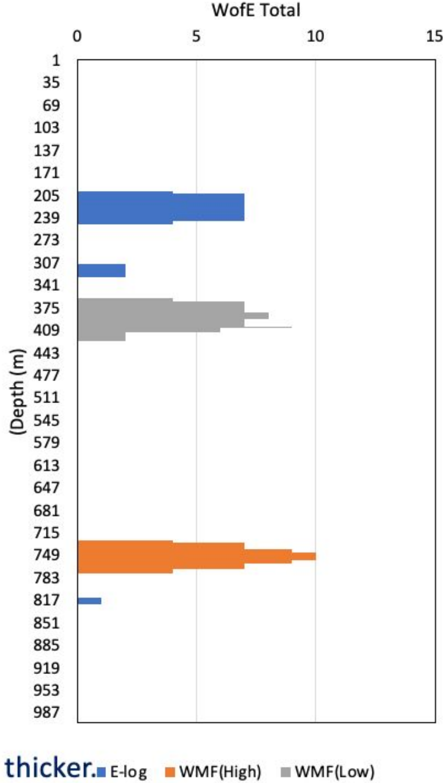


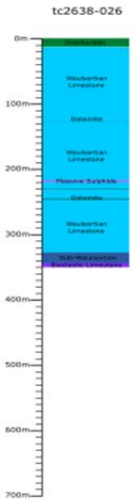
- The E-logs do not correspond to any known training data.
- The low WMF picks out the one of the dolomites but not the thicker section below 530m.
- The high WMF does not pick out any obvious change in lithology although there are highs in WMF corresponding to the Bioclastic Limestone.

TC2638-026



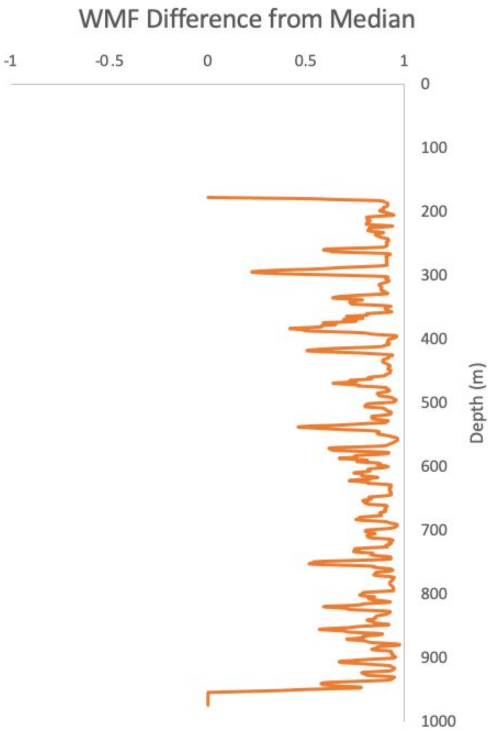


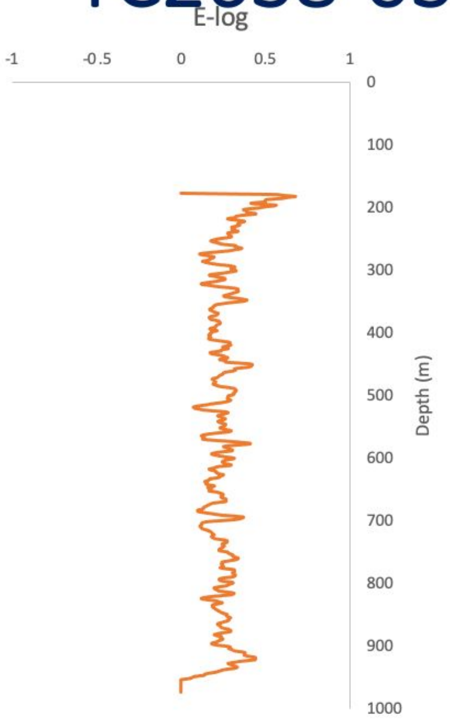


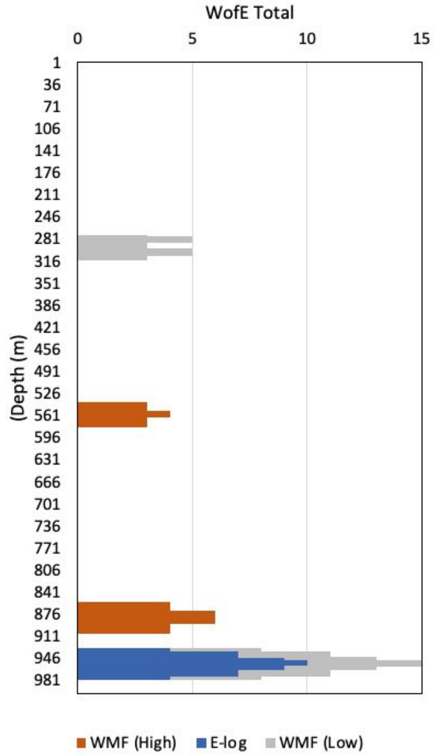


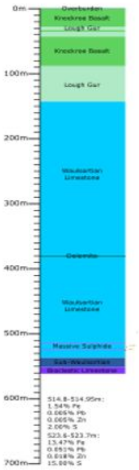
- E-log lows are corresponding to the massive sulphides but the WSCC values are much thicker.
- The low WMF does not pick out any known lithological change.
- The highest WMF does not pick out of any known lithological change. However, peaks in WMF are seen corresponding the Sub-Waulsortian and Bioclastic Limestone.

TC2638-030









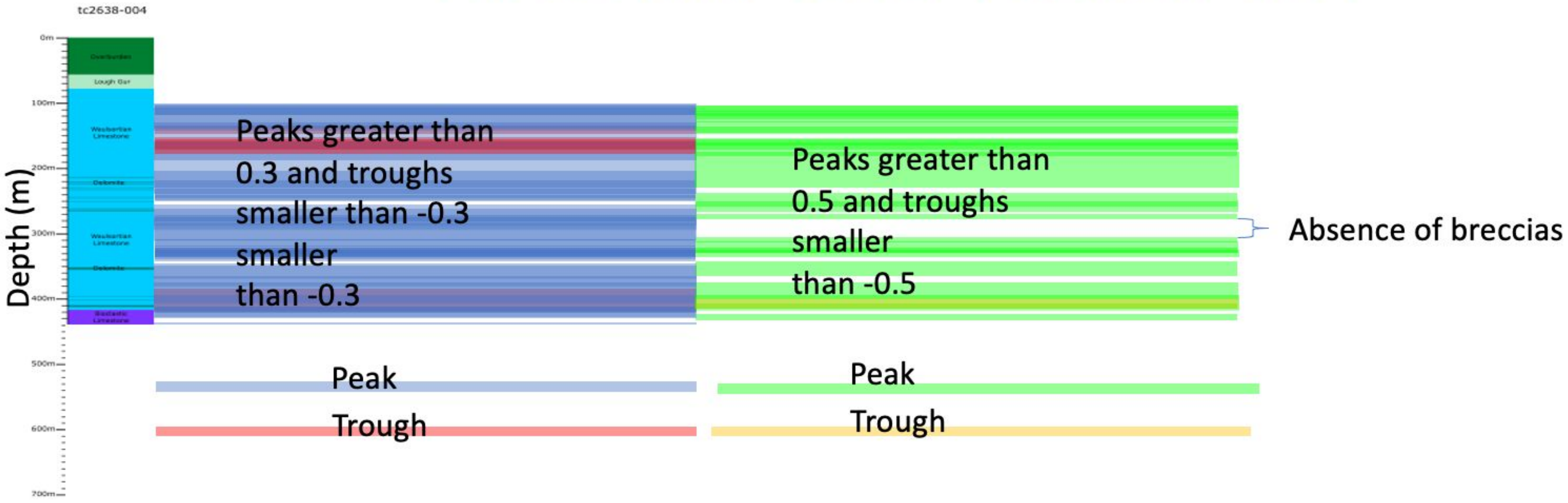
- E-log lows do correspond to the massive sulphides but the lowest values do not .
- Low WMF do not pick out any known lithological change, though the dolomite is picked out by a low value in WMF.
- Peaks in WMF are seen corresponding to boundary between Waulsortian and the Sub-Waulsortian.

Thresholds for Correlation, E-log, WMF

- A threshold value of +0.5 and -0.5 is applied to the difference from the median data for the following six parameters, E-log, WMF, Corr 1-5, SD 1-5, Corr 5-10 and SD 5-10.

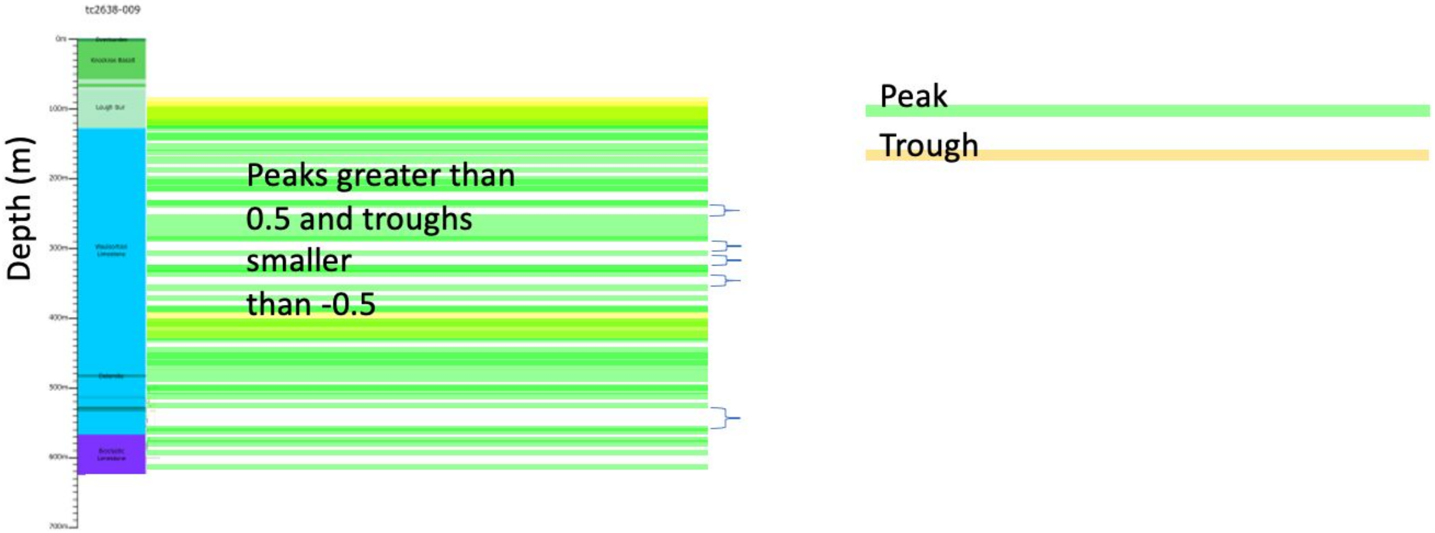
- Initially threshold values of -0.3 and +0.3 will also applied. However, these were seen too regularly throughout the test site, so after TC2638-04, only a threshold of +0.5 and -0.5 was used.

Threshold Tests TC2638-004



- Troughs are only seen at 150m and 400m with a threshold of -0.5.
- Peaks are seen regularly once the beam saturation is taken into account.
- Large gaps are seen at 300m which might correspond to an absence in breccias but the remaining smaller gaps do not.

Threshold Tests TC2638-009



- Troughs are only seen at 100m and 400m and do not appear to correspond to any lithological change.
- Peaks are seen regularly once the beam saturation is taken into account though there are fewer close to dolomites.
- There is no association with gaps and lithology change.

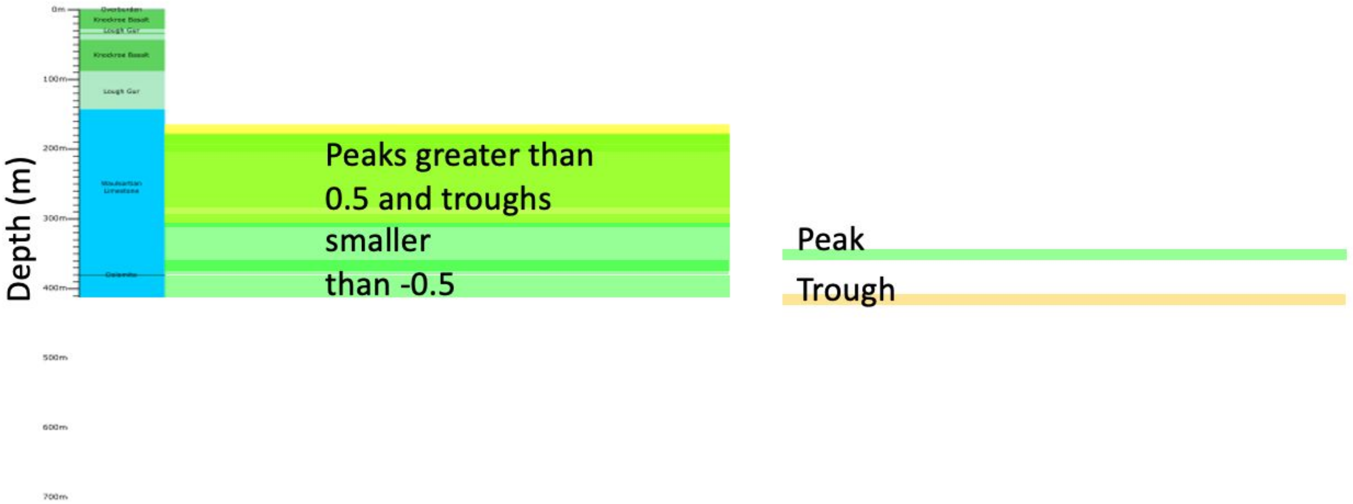
Threshold Tests TC2638-026

- Troughs are only seen at 100m and 400m and do not appear to correspond to any lithological change.

- Peaks are seen regularly once the beam saturation is taken into account some of these are associated with dolomites such as at 250m but others are not.

- There is no association with gaps and lithology change.

Threshold Tests TC2638-030



- Troughs are seen throughout the V-bore.
- Peaks are seen regularly once the beam saturation is taken into account some of these are associated with dolomites.
- There is no association with gaps and lithology change.
- There is no consistent relationship between lithology and the threshold data. This will be discontinued for the blind sites.