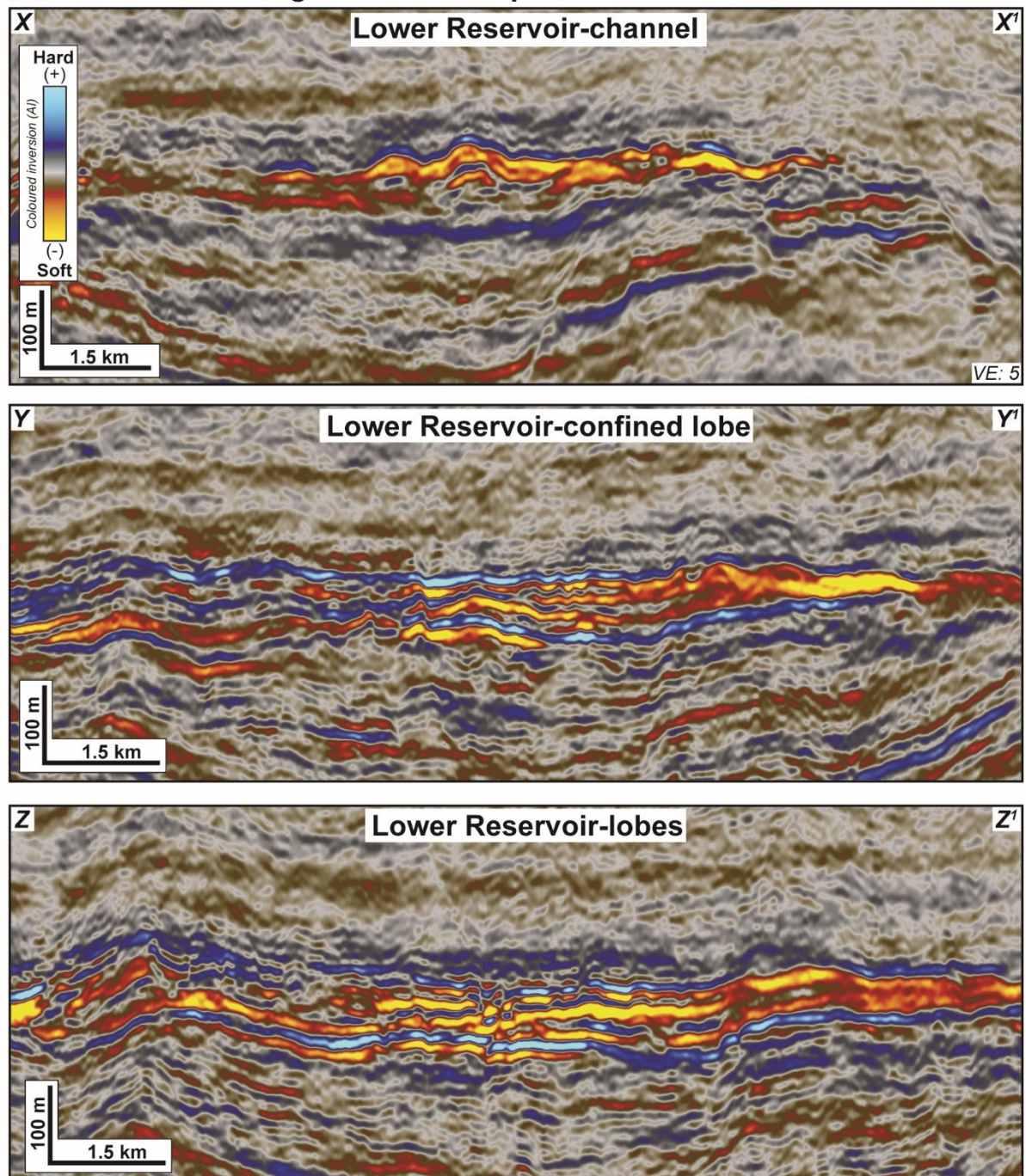


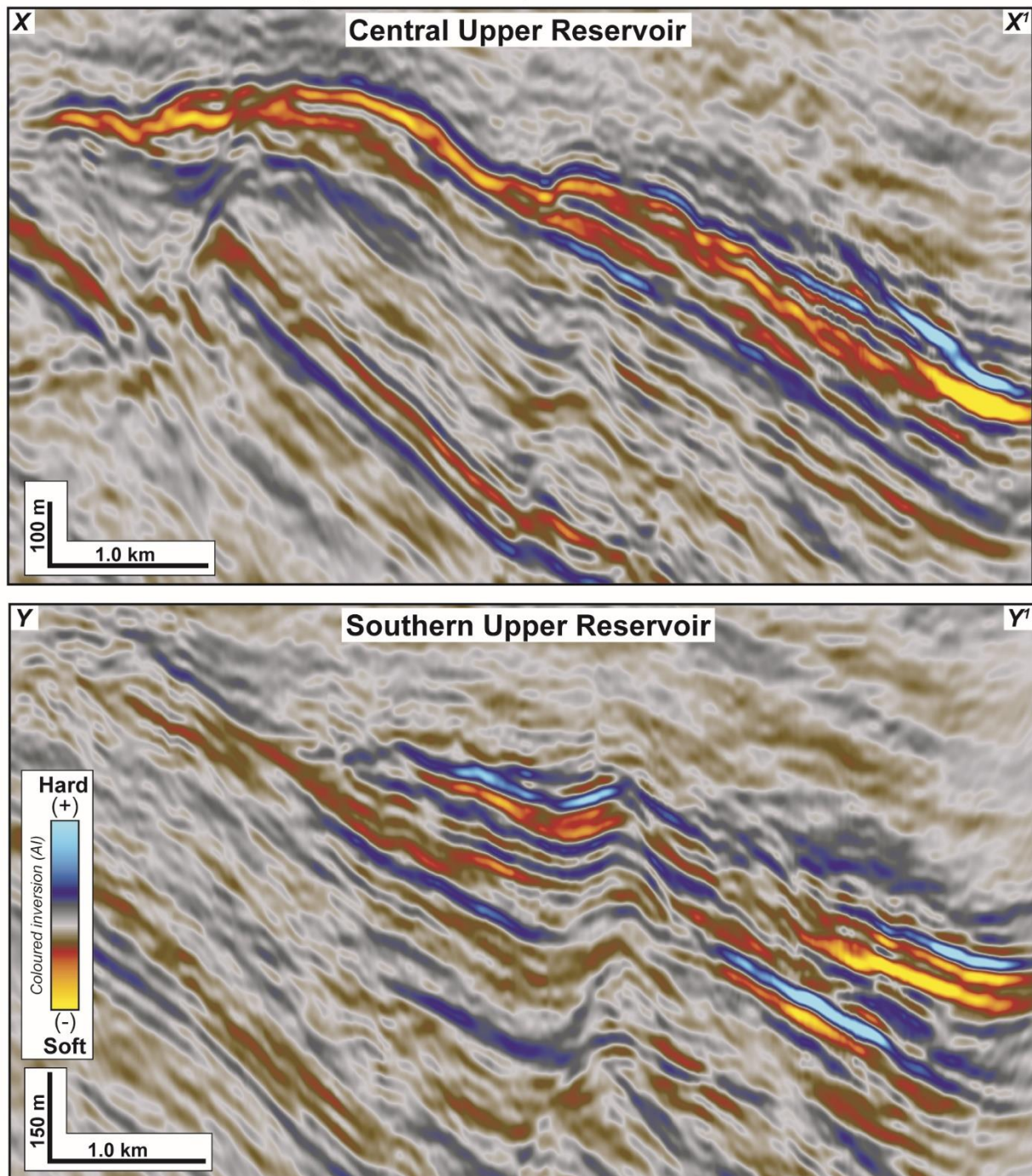
Supplementary material

UNINTERPRETED SEISMIC LINES

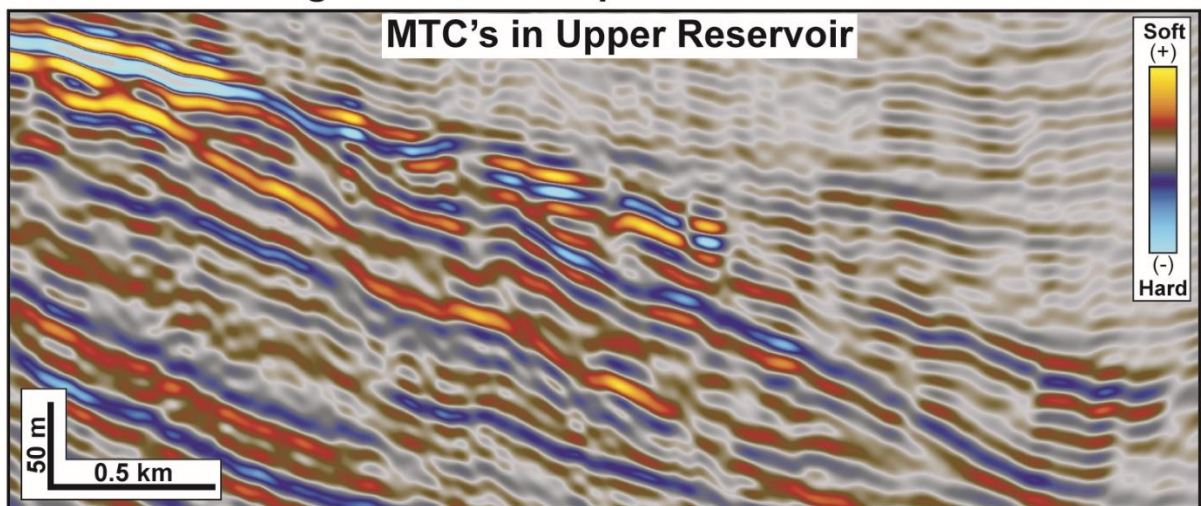
(a) Figure 15. Uninterpreted seismic lines



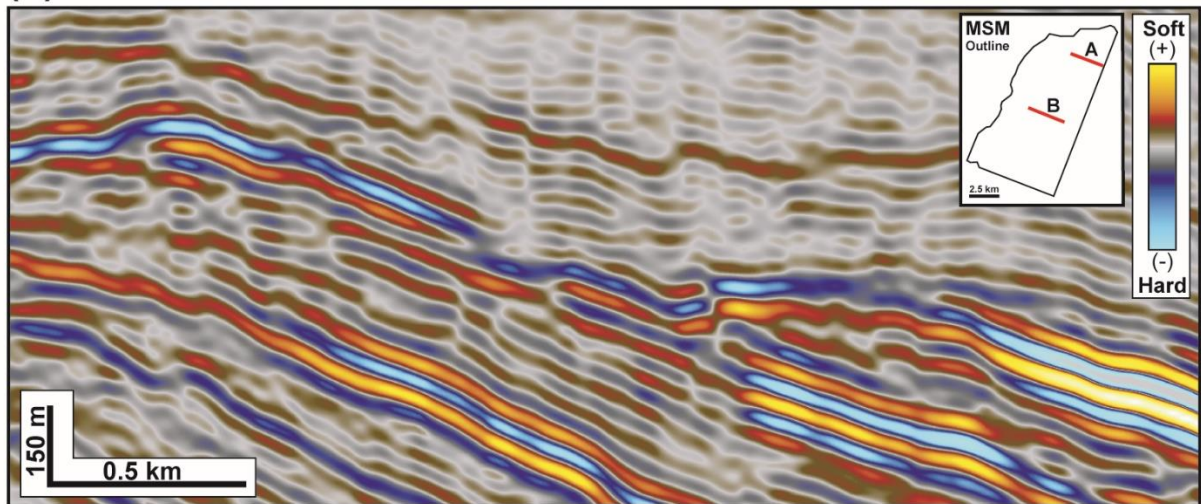
(a) Figure 16. Uninterpreted seismic lines



(a) **Figure 17. Uninterpreted seismic lines**



(b)



INDEX OF WELL DATASET

See associated data sheet which includes petrophysical logs, formation pressure, and biostratigraphic tops.

QEMSCAN RAW DATA

Table 0-4: QEMSCAN raw mineral percentages from well M16

	QM14	QM13	QM12	QM11	QM10	QM9	QM8	QM7	QM6	QM5	QM4	QM3	QM2	QM1
MD (m)	3266.65	3274.8	3275.9	3279.9	3295.81	3303.9	3309.5	3311.6	3313.82	3315.64	3317.68	3334.85	3338.97	3347.5
Quartz	21.28	47.47	37.54	55.56	3.74	13.27	23.66	33.56	59.56	15.66	38.54	46.94	51.96	47.90
Anorthoclase	0.05	0.02	0.03	0.01	0.02	0.11	0.07	0.12	0.01	0.04	0.02	0.02	0.01	0.02
KFeldspar_main	9.23	11.39	12.66	9.20	0.61	5.40	7.84	8.45	8.57	4.58	8.78	11.64	10.39	10.17
Albite	11.13	10.11	16.04	6.27	0.95	8.90	9.25	8.12	8.49	5.24	13.22	10.89	7.94	10.20
Oligoclase	0.31	0.14	0.32	0.04	0.03	0.24	0.34	0.29	0.14	0.26	0.25	0.12	0.07	0.12
Andesine	0.01	0.00	0.01	0.00	0.01	0.02	0.06	0.03	0.00	0.04	0.01	0.00	0.00	0.00
Labradorite	0.01	0.00	0.00	0.00	0.01	0.03	0.03	0.02	0.01	0.07	0.01	0.01	0.00	0.01
Bytownite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anorthite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phlogopite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biotite_main	1.71	0.36	0.59	0.07	0.01	2.72	1.89	0.35	0.13	0.56	0.45	0.12	0.10	0.09
Annite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Muscovite_main	3.52	0.69	1.25	0.16	0.78	2.33	2.04	1.28	0.19	6.29	1.07	0.41	0.20	0.23
FeMuscovite	0.45	0.10	0.15	0.01	0.08	0.37	0.32	0.18	0.03	1.36	0.13	0.07	0.06	0.05
Paragonite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glauconite	0.01	0.00	0.01	0.00	0.01	0.02	0.03	0.03	0.01	0.01	0.00	0.00	0.00	0.00
MuscoviteIllite	0.11	0.03	0.03	0.01	0.02	0.12	0.05	0.03	0.00	0.46	0.04	0.01	0.01	0.01
Illite_main	23.27	4.27	5.88	1.18	19.05	29.63	19.49	17.39	2.08	18.66	6.24	2.50	1.73	1.85
Clinochlore	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Chlorite_main	0.01	0.05	0.05	0.00	0.00	0.03	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00
Chamosite	0.01	0.02	0.02	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Kaolinite_Dickite	5.78	1.67	4.81	0.37	3.55	4.24	5.57	2.71	0.56	9.46	2.97	0.69	0.53	0.74
IlliteSmectite	6.53	0.77	1.32	0.07	3.26	7.23	5.04	4.80	0.21	8.73	1.08	0.22	0.08	0.12
Montmorillonite	0.07	0.02	0.01	0.01	0.18	0.19	0.30	0.25	0.03	0.14	0.02	0.01	0.01	0.02
Nontronite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Saponite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beidellite	0.30	0.08	0.17	0.03	0.68	0.36	0.51	0.53	0.04	0.99	0.20	0.04	0.04	0.04
Stevensite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Berthierine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vermiculite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corrensite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Palygorskite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sepiolite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OtherClaysBLS	2.11	0.42	0.42	0.17	5.78	3.56	1.86	2.75	0.25	10.60	0.62	0.27	0.20	0.26

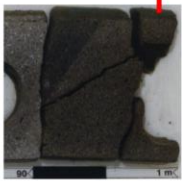
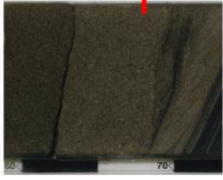
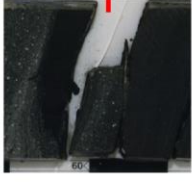
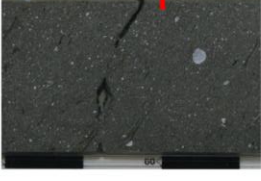
QuartzClayMix	6.61	1.17	2.01	0.26	24.15	8.06	10.74	9.29	0.84	5.73	1.50	0.73	0.39	0.41
Zircon	0.03	0.00	0.03	0.04	0.00	0.02	0.02	0.02	0.02	0.02	0.01	0.04	0.04	0.02
Rutile_Anatase	0.13	0.09	0.11	0.04	0.03	0.11	0.11	0.05	0.04	0.07	0.05	0.04	0.05	0.03
Apatite	0.12	0.05	0.07	0.03	0.10	0.12	0.11	0.05	0.07	0.05	0.07	0.04	0.01	0.03
Monazite_main	0.01	0.01	0.02	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Xenotime	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Florencite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcite_Aragonite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dolomite	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.17	0.00	0.08	0.26	0.00	0.15
FeDolomite	0.00	0.00	0.00	0.07	0.00	0.00	0.01	0.00	0.58	0.00	0.33	1.09	0.00	0.37
Ankerite_main	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.14	0.00	0.02
Kutnohorite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Marl	0.39	0.07	0.08	0.05	0.77	0.65	0.74	0.77	0.09	0.71	0.12	0.26	0.05	0.09
Siderite_main	0.03	0.09	0.06	0.23	0.00	0.00	0.13	0.01	0.07	0.00	0.08	0.20	0.13	0.10
SideriteMagnesite	0.00	0.00	0.00	0.03	0.00	0.01	0.11	0.01	0.05	0.00	0.06	0.07	0.01	0.07
Magnesite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rhodochrosite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FeOxides_main	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FeTiOxides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ilmenite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ulvospinel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goethite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyrite_Marcasite	1.54	0.45	0.60	0.28	8.84	2.15	1.79	4.41	0.24	4.47	0.37	0.15	0.28	0.17
Barite_main	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
BariteCelestine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Celestine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anhydrite_Gypsum	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Halite_main	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sylvite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dravite	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
DraviteSchorl	0.04	0.13	0.08	0.03	0.00	0.05	0.04	0.01	0.03	0.04	0.07	0.03	0.02	0.03
Schorl	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Elbaite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Almandine	0.02	0.12	0.12	0.12	0.00	0.04	0.04	0.05	0.16	0.03	0.02	0.00	0.06	0.01
Spessartine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pyrope	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grossular	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Andradite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uvarovite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Epidote_main	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zoisite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Piemontite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Allanite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Titanite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kyanite_Sillimanite_Andalusite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Staurolite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[illegible]

Schwertmannite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aluminium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OtherPhasesBL S	0.39	0.24	0.27	0.12	0.50	0.50	0.40	0.24	0.15	0.40	0.18	0.06	0.08	0.06
Steel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LowConfidence	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00
Unclassified_m ain	0.32	0.22	0.48	0.03	4.39	0.13	0.18	0.24	0.12	0.11	0.37	0.08	0.07	0.03
LowCR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Porosity_main	4.40	19.70	14.69	25.33	22.38	9.33	7.11	3.93	17.00	5.14	22.97	22.80	25.25	26.58

QEMSCAN sample index from well 211/12a-M16

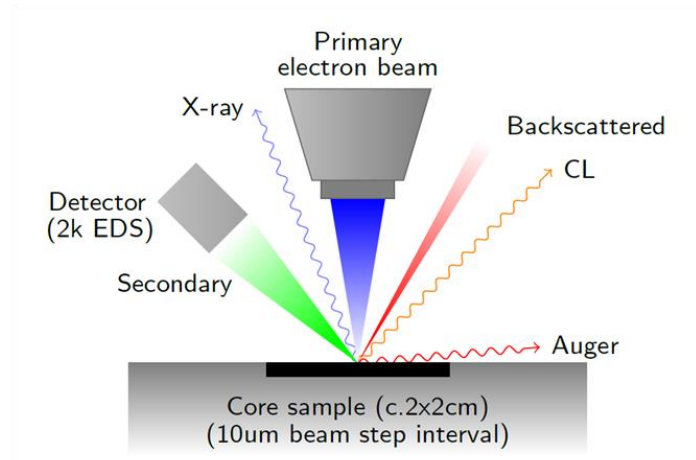
 = sample depth

QM1  3347.5 m Facies 1: HDT	QM2  3338.97 m Facies 1: HDT	QM3  3334.85 m Facies 1: HDT	QM4  3317.68 m Facies 1: HDT	QM5  3315.64 m Facies 6: MTD	QM6  3313.82 m Facies 1: HDT block within MTD	QM7  3311.6 m Facies 6: MTD	QM8  3309.5 m Banded beds	QM9  3303.9 m Facies 6: MTD	QM10  3295.81 m Facies 2: LDT	QM11  3279.9 m Facies 1: HDT	QM12  3275.9 m Facies 5: HEB (H1)	QM13  3274.8 m Facies 1: HDT	QM14  3266.5 m Facies 2: LDT
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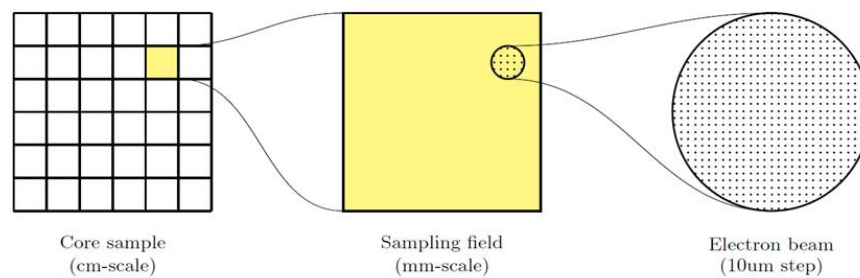
HDT = high-density turbidite, LDT = low-density turbidite, MTD = mass-transport deposit, HEB = hybrid-beds

QEMSCAN® (Quantitative Evaluation of Minerals by Scanning Electron Microscopy) SETUP

(a)



(b)



Supplementary 2: (a) QEMSCAN® (Quantitative Evaluation of Minerals by Scanning Electron Microscopy) is an automated image-analysis system that uses an electron beam to excite a core sample, acquiring Back-Scattered Electron (BSE) signals and Energy-Dispersive X-ray (EDX) spectra, (modified from Eric Jensen) (b) The Scanning Electron Microscope (SEM) divides the core sample (c. 2×2 cm) into a field grid, and then scans each field (c. 1.5×1.5 mm) collecting data points at a 10 µm steps (c. 1 nm³ excitation volume). The SEMs initial BSE image filters out low-density areas (e.g. pores/resin and carbon), and then rescans the high-density areas (i.e. minerals) with a greater accelerating voltage (15 kV), measuring x-ray emissions (2 k EDX count).

Supplementary 3: RockType QEMSCAN grouped vs detailed mineral list





VOLUME OF SHALE CALCULATION

$$VSH = \left(\frac{GR_{log} - GR_{clean}}{GR_{shale} - GR_{clean}} \right)$$

GR_{log} = log value

GR_{clean} = lowest consistent value for sandstone (i.e. “sand line”)

GR_{shale} = highest consistent value for shale (i.e. “shale line”)