



Stable Isotope Geochemistry Laboratory
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ANALYSIS REPORT

Results of Analysis

The results of carbonate isotope and XRD analyses for well HUC-1 are detailed in the tables below.

Method of Analysis

Carbonate $\delta^{13}\text{C}_{\text{VPDB}}$ and $\delta^{18}\text{O}_{\text{VSMOW}}$:

All carbonate $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ isotopes were determined online, with an Isoprime Dual Inlet Stable Isotope Ratio Mass Spectrometer (DI-IRMS) coupled to a multiprep bench. Calibration was through use of international carbonate standards IAEA NBS-18 and NBS-19 and laboratory standard BCS with a precision better than $\pm 0.05\text{‰}$ at 1 σ for $\delta^{13}\text{C}$ and $\pm 0.1\text{‰}$ at 1 σ for $\delta^{18}\text{O}$. $\delta^{18}\text{O}$ values have been corrected for their acid fractionation factor depending on carbonate species determined via XRD for a subset of samples, in combination with well log reports.

Dual Inlet IRMS is the acknowledged industry gold standard for isotopic determination.

Carbonate XRD:

All XRDs were performed using a Bruker D8 Advance x-ray powder diffraction instrument and carbonate mineral species identification and semi-quantitative determination was completed using EVA software.

Tables:

Stable Isotope Data

Name	depth(m)	$\delta^{13}\text{C}_{\text{PDB}}\text{‰}$	$\delta^{18}\text{O}_{\text{SMOW}}\text{‰}$	$\delta^{18}\text{O}_{\text{PDB}}\text{‰}$	Species	XRD
HUC1-3	3	-1.3	20.9	-9.71	CAL	x
HUC1-85	8.5	-1.7	21.3	-9.32	CAL	
HUC1-137	13.7	-3.5	21.9	-8.74	C	
HUC1-19R	19	-0.7	22.0	-8.64	CAL	
HUC1-2402	24.02	-0.7	21.6	-9.03	CAL	
HUC1-29	39	-0.9	21.2	-9.42	C	x
HUC1-349	34.9	-0.9	20.5	-10.10	CAL	
HUC1-394	39.4	-1.7	19.0	-11.55	CAL	
HUC1-448	44.8	-0.7	22.2	-8.45	CAL	
HUC1-500	50.0	-1.5	22.9	-7.77	CAL	
HUC1-55	55	-3.1	21.7	-8.93	C	x
HUC1-60	60	-0.8	21.8	-8.84	CAL	
HUC1-65	65	-0.9	21.0	-9.61	CAL	
HUC1-70	70	-1.5	20.3	-10.29	CAL	
HUC1-75R	75	-0.5	21.1	-9.52	CAL	
HUC1-80	80	-1.5	20.8	-9.81	C	x
HUC1-85-0R	85	-0.8	20.8	-9.81	CAL	
HUC1-90	90	0.3	24.0	-6.70	CAL	
HUC1-95	95	-1.1	21.4	-9.22	CAL	
HUC1-1001	100.1	-0.9	19.3	-11.26	CAL	
HUC1-1055	105.5	-0.5	21.8	-8.84	C	x

HUC1-110-1R	110.1	0.3	19.4	-11.16	CAL	
HUC1-114-8R	114.8	0.0	23.1	-7.58	CAL	
HUC1-1200	120.0	0.1	20.6	-10.00	CAL	
HUC1-125R	125	1.1	19.8	-10.78	CAL(DOL)	
HUC1-130	130	0.2	20.2	-10.39	CAL(DOL)	x
HUC1-135	135	0.9	20.1	-10.49	CAL(DOL)	
HUC1-140	140	0.8	21.3	-9.32	CAL(DOL)	
HUC1-145	145	0.7	21.1	-9.52	CAL	
HUC1-150-05	150.05	0.6	23.1	-7.58	CAL	
HUC1-155	155	0.8	23.3	-7.38	C	x
HUC1-160	160	1.9	22.2	-8.45	CAL	
HUC1-160R	160	1.9	22.1	-8.55	CAL	
HUC1-165	165	1.5	23.3	-7.38	CAL	
HUC1-170	170	1.8	21.0	-9.61	CAL	
HUC1-175	175	2.1	21.2	-9.42	CAL	
HUC1-180	180	1.9	20.5	-10.10	C	x
HUC1-185	185	1.9	20.7	-9.90	CAL	
HUC1-190	190	1.1	19.7	-10.87	CAL	
HUC1-195-1	195.1	1.7	20.4	-10.19	CAL	
HUC1-200-7R	200.7	2.2	19.5	-11.07	CAL	
HUC1-205-2R	205.2	1.3	20.6	-10.00	C	x
HUC1-205-2R	205.2	1.4	20.7	-9.90	C	
HUC1-209-8	209.8	1.6	21.1	-9.52	CAL	
HUC1-215-5R	215.5	1.4	20.9	-9.71	CAL	
HUC1-215-5R	215.5	1.4	20.9	-9.71	CAL	
HUC1-220R	220	-0.4	19.5	-11.07	CAL(DOL)	
HUC1-225-3	225.3	-0.5	21.8	-8.84	CAL(DOL)	
HUC1-230	230	-1.1	21.6	-9.03	CAL(DOL)	x
HUC1-235	235	-2.1	23.0	-7.67	CAL(DOL)	
HUC1-240	240	-3.4	22.6	-8.06	CAL(DOL)	
HUC1-242-7	242.7	-4.5	16.6	-13.88	CAL(DOL)	
HUC1-243-4R	243.4	0.6	22.1	-8.55	CAL(DOL)	
HUC1-246-9R	246.9	-2.9	20.1	-10.49	CAL(DOL)	x
HUC1-251-4R	251.4	-0.1	20.9	-9.71	CAL(DOL)	
HUC1-256R	256	0.8	23.1	-7.58	CAL(DOL)	
HUC1-262R	262	-0.9	15.6	-14.85	CAL(DOL)	
HUC1-267R	267	-1.1	19.5	-11.07	CAL(DOL)	
HUC1-272R	272	-0.7	22.9	-7.77	CAL(DOL)	x
HUC1-277R	277	-0.8	22.1	-8.55	CAL(DOL)	
HUC1-282R	282	0.3	22.6	-8.06	CAL(DOL)	
HUC1-287-5R	287.5	-0.8	23.1	-7.58	CAL	
HUC1-292R	292	0.8	26.8	-3.99	CAL	
HUC1-297R	297	-1.4	21.9	-8.74	CAL	x
HUC1-302R	302	0.7	24.5	-6.22	CAL	
HUC1-307R	307	0.9	25.3	-5.44	CAL	
HUC1-312R	312	-1.7	24.0	-6.70	CAL	
HUC1-317	317	-2.5	22.7	-7.96	CAL	
HUC1-317R	317	-2.2	22.6	-8.06	CAL	
HUC1-321	321	-6.3	23.1	-7.58	C	x
HUC1-321R	321	-6.1	23.1	-7.58	CAL	
HUC1-332R	332	-4.5	22.7	-7.96	CAL	
HUC1-349-5R	349.5	0.7	25.3	-5.44	DOL	
HUC1-355R	355	0.5	23.2	-7.48	DOL	
HUC1-358-8R	358.8	0.5	22.0	-8.64	DOL	
HUC1-361R	361	0.6	24.6	-6.12	DOL	x

XRD Data

	Sample	depth(m)	Qtz	Cal	Dol	Ferroan Dol	Ank
	HUC1- 3	3	48	44	9		
	HUC1- 29	29	34	61			5
	HUC1- 55	55	14	86			
	HUC1- 80	80	49	44		6	
	HUC1- 105	105.5	27	73			
	HUC1- 130	130	60	28		12	
	HUC1- 155	155	72	21		7	
	HUC1- 180	180	52	37	11		
	HUC1- 205	205.2	41	45	11	7	
	HUC1- 230	230	55	24		11	11
	HUC1- 246	246.9		35	65		
	HUC1- 272	272	16	17	67		
	HUC1- 297	297	1	88	11		
	HUC1- 321	321	7	88	5		
	HUC1- 361	361	17		83		

NTGS Huc 1 [MD]

MD	Carbon Isotope		Oxygen Isotope	
1:1000	-5.00	5.00	-15.00	-5.00
	positive			
	negative			

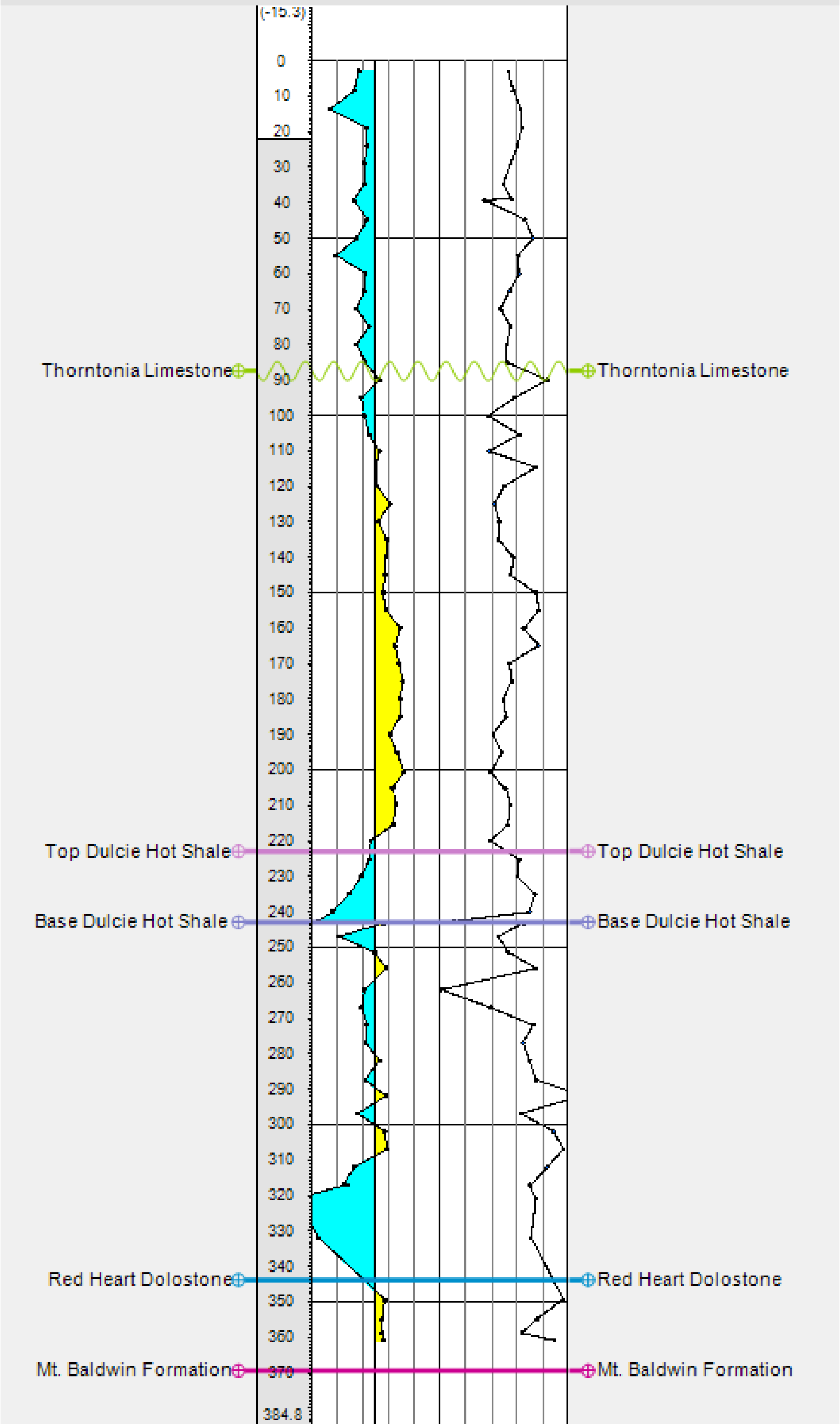


Figure 1: NTGS Huc 1 Carbon and Oxygen Isotope logs