Summary of Carnarvon GG (as of Dec 5 2022)

DJGeoscience

1. The forgotten art of interpreting geothermal gradients (GG)
2. Some 500 GG were calculated from BHT measured in wells (see excel spreadsheet attached). Scope of the study is shown below and GG lising shown on website under well tops tab
3. GG is mostly not a reflection of depth to basement in areas with thick sediment cover.
4. Gas and HCs elevate GG
5. Observations in Carnarvon Basin:

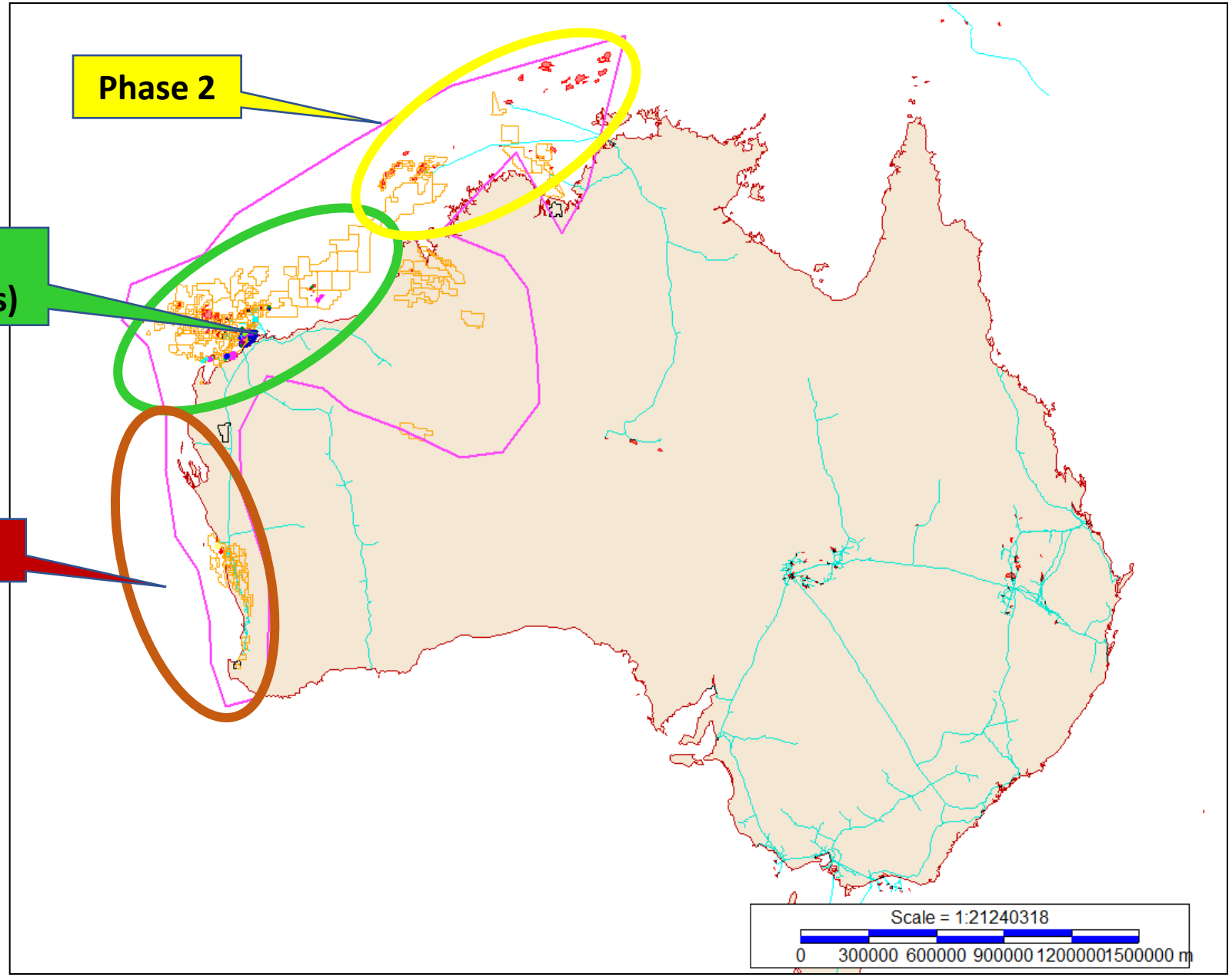
    a) Nearshore and onshore GG are the highest, but this is a reflection of shallow basement and shallow GG measurements
    b) Difference between the Alpha Arch and NW Rankin Trend suggesting HC compositional differences been areas (dry gas vs more condensate rich areas)
    c) Explains why parts of Rankin Trend (Malus-1, Bluebell-1 and other parts) didn't work
    d) Provides insights into the HC potential of the Victoria Syncline and the Brigadier Trend
    e) Provides insights into deep water HC prospectivity and why there is so much variability
    f) Shows low geothermal gradient in some HC bearing areas providing an "alternate explanation" for their existence
    g) Provides insights into Exmouth and Barrow-Dampier sub-basins
    h) Provides insights into eastern flank (upthrown and downthrown) of the Barrow-Dampier Sub-basin
    i) Important GG variations pointing to patchy success along the Legendre Trend.
    j) Provides insights into the Beagle Sub-basin and why this basin has been so far unsuccessful despite significant SRs and depth of burial
    k) If GG is below critical value then SR is likely to have never been ignited (there are some notable exceptions)
    l) If GG above critical value and structure with res/seal pair is valid then migration efficiency (including no SR) is likely explanation for well failure
    m) Short distance migration is the norm with notable exceptions

6. "Senses" nearby HC pools, if burial of sediments is not significant)
7. "Senses" nearby intrusive rocks
8. Shows areas of current active tectonism (onshore and offshore compression associated with Australia and SE Asia collision)
9. Thick Tertiary acts as a thermal blanket
10. This doesn't predict CO_2 content as a different mechanism is postulated
11. Other WA basins will be analyzed in the near future illustrating important difference been southern and northern Perth Basin.

12. Useful in establishment of HC cells and identification of "death lines"
13. GG grid with source data with excel spreadsheets can be provided and upon requests individual areas can be interpreted and summarized in ppt
14. Input into temperature mapping (VR proxy) to be provided soon

Geothermal Gradient Scope

DJGeoscience



Typical Geothermal Gradient Calculation

DJGeoscience

Well Data

Well:		De Grey-1	Sea Bed Temp:	23
Date:			Water Depth:	94
Suite #:			RT Elevation:	29
Run #:			Log Depth:	2005

Horner Data

(TVD) RTft	(TVD) RTm	Deg F	Deg C	t	tx	t/(tx+t)	Ln
6578	2004.97	171	77.22	5	1	0.83333	-0.1823
6540	1993.39	172	77.78	7	1	0.875	-0.1335

Av. Gradient	3.49	
Extrap BHT ° C	79.3	Deg C
Horner Modified	86.4	Deg C

(Northwest Shelf correction factor is Extrap. BHT * 1.09)

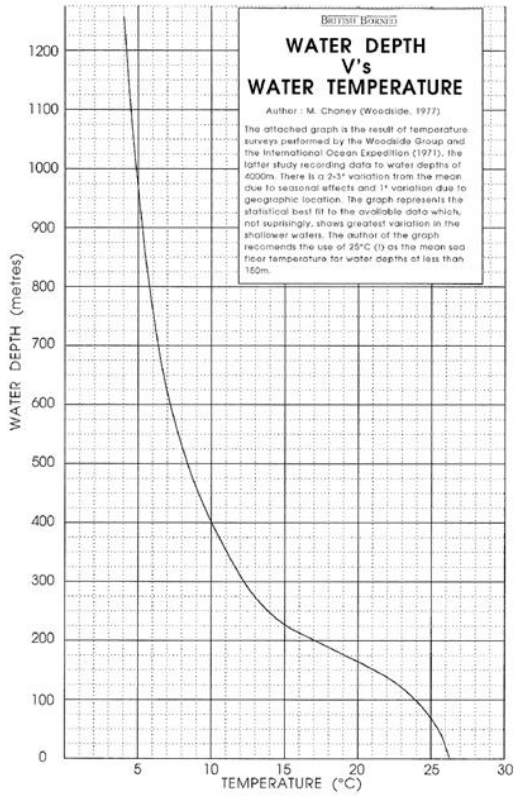
tx assume 1hr

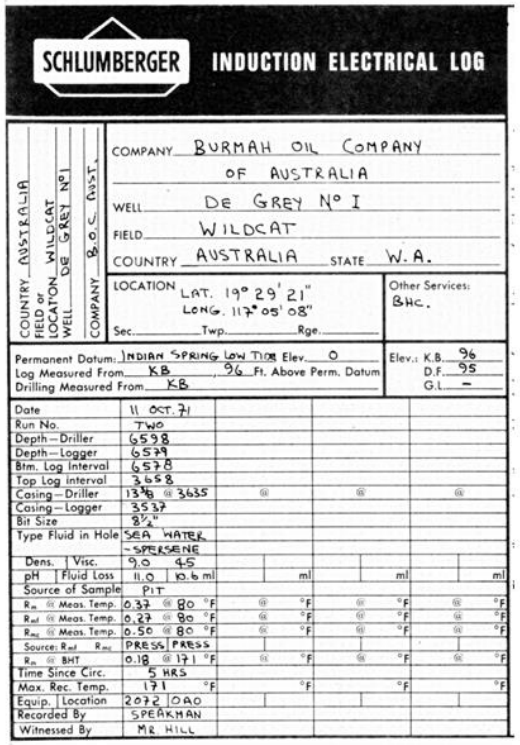
Geothermal Gradient Data

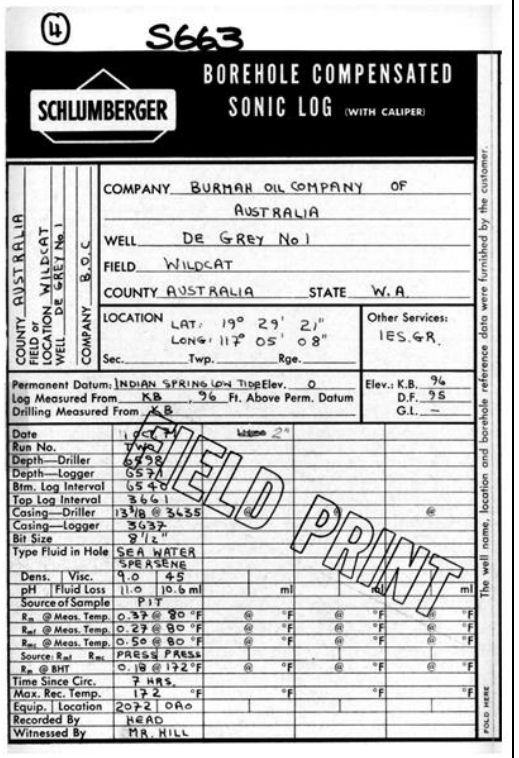
Horner Data		Horner Modified		Shell Method	
Depth	Temp	Depth	Temp	Depth	Temp
94	23.0	94	23	94	23.0
1976	79.3	1976.0	86.4	1976.0	100.4
Gradient		*Gradient*		*Gradient*	
2.99		*3.37*		*4.11*	

Shell Method

Rock Column (m):	1882
First Log Temp:	77.22222
Shell Corrected Temp:	100.4
Thermal Gradient:	4.11







$(32°F - 32) \times 5/9 = 0°C$