



FORAMINIFERAL ANALYSIS, WRASSE-1,
GIPPSLAND BASIN

by

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INTRODUCTION

Sixty five sidewall core samples and five samples of core (four from core 1 and one from core 2) were examined for their foraminiferal content in Wrasse-1 from 1930.0m to 2822.0m (deviated KB depths). A summary of the biostratigraphic breakdown of the stratigraphic units in the well is given in Table 1. Tables 2 and 3 provide a summary (Basic and Interpretative) of the palaeontological analysis in Wrasse-1. All depths quoted are deviated KB depths.

TABLE 1: BIOSTRATIGRAPHIC SUMMARY, WRASSE-1

AGE	UNIT	ZONE	DEPTH (mKB dev.)
Mid Miocene	Lakes	D2/D1	1930.0 - 2120.5
Early Miocene	Entrance	E2	2157.0
Early Miocene	Formation	F	2170.0 - 2203.0
Early Miocene		F/G	2236.0 - 2272.0
-----log break at 2299m (mid Miocene Marker)-----			
	Lakes		
Early Miocene	Entrance	F/G	2332.0-2440.0
Early Miocene	Formation	G	2455.0-2537.0
-----log break at 2540m (mid Early Miocene disconformity)-----			
Early Miocene	Lakes Entrance Formation (recrystallized limestone)	G	2548.0 - 2680.0
-----log break at 2680.5m (basal Early Miocene or mid Oligocene disconformity)-----			
Early Oligocene	Lakes Entrance	?I2	2690.0 - 2699.0
Early Oligocene	Formation	J2	2703.0 - 2711.0
-----log break at 2713.0m-----			
Late Eocene	Un-named marl	K	2715.0 - 2729.0
-----lithological break at 2730m-----			
* Late Eocene	"Gurnard Greensand"	Lower <u>N. asperus</u>	2733.0 - 2742.85
-----log break at 2742.5m-----			
* Late Eocene	Turrum Formation (Unit A)	Lower <u>N. asperus</u>	2743.9 - 2822.0
-----log break at 2824m-----			
*Late Eocene	Turrum Formation (Unit B)	Lower <u>N. asperus</u>	2826.0 - 2848.0
-----log break at 2859m-----			
*Late Eocene	Turrum Formation (Unit C)	Lower <u>N. asperus</u>	2865.0
-----log break at 2868.5m (basal Late Eocene disconformity)-----			
#	Latrobe Group (coarse clastics)		

*Age based on palynological analysis
of Hannah et al. (1984)
Not studied

GEOLOGICAL COMMENTS

The Turrum Formation (2730 - 2668.5m) can be sub-divided into the following four distinct units in Wrasse-1: "Gurnard Greensand" (2730-2742.5m), Unit A (2742.5 - 2824m), Unit B (2824 - 2859m) and Unit C (2859 - 2868.5m). Unit C consists of a dark carbonaceous shale which is Lower N. asperus in age (Hannah et al., 1984). Unit B consists of interbeds of shale, siltstone and sandstone. Palynological evidence indicates that the unit is Lower N. asperus in age (Hannah et al., 1984). Neither Units C or B were examined for foraminifera. Unit A comprises a shale with quartz and glauconite floaters. This lithology was noted in all sidewall cores and core samples processed for foraminiferal analysis between 2742.85m and 2808.0m. With the exception of the core sample at 2742.85m, all these samples were barren of foraminifera. The core sample at 2742.85m contains rare specimens of Globigerina angiporoides. Unit A has been age-dated as Lower N. asperus by Hannah et al. (1984). Most of Unit A appears to have been deposited very rapidly. The unit appears to represent a debris flow with quartz and glauconite floaters in a shale groundmass. It is quite possible that the glauconite has been derived from greensand facies being deposited contemporaneously or previously on the margin or near the source of the channel. If the glauconite has been sourced from shelfal greensands then Unit A would be expected to have accumulated in a submarine channel (? canyon head) of greater than 200 metres bathymetry.

Unit A is conformably or disconformably overlain by greensand of Late Eocene age ("Gurnard Greensand"). The unit contains very rare planktonic foraminifera which are Zone K or older in age, and has been age-dated as Lower N. asperus by Hannah et al., 1984. The "Gurnard Greensand" in Wrasse-1 contains common glauconite and anomalously high amounts of fish teeth remains. The unit represents a condensed sequence deposited in relatively deepwater.

The "Gurnard Greensand" is disconformably overlain by an un-named glauconitic marl of Late Eocene/Early Oligocene (Zone K) age. A log break separating the two units has been put at 2730m. The unit contains a few to 20% pelletal glauconite and fish teeth remains were noted in all samples examined. Deep water benthonic foraminifera (of bathyal aspect) were noted in the sidewall core sample at 2723.0m. Benthonic foraminiferal evidence indicates that deposition of the marl probably occurred in an upper bathyal environment.

The un-named marl is conformably or disconformably overlain by Early Oligocene calcareous shales of the Lakes Entrance Formation. The units are separated by a gamma log break at 2713m. The un-named marl and "Gurnard Greensand" sequence in Wrasse-1 have a distinctively higher relative gamma log expression than units above and below it. This is attributed to the glauconite content in this sequence. The Lakes Entrance Formation in Wrasse-1 lacks glauconite.

There is a disconformity within the Lakes Entrance Formation at 2680.5m. This disconformity represents either the basal Early Miocene or mid Oligocene event documented by Vail et al. (1977). Undifferentiated Early Oligocene calcareous shales of the Lakes Entrance Formation are disconformably overlain by an Early Miocene recrystallized unit of the Lakes Entrance Formation. The hiatus between the units spans Zones H1-H1. The recrystallized limestone unit persists up to 2540m and has a higher sonic and bulk density log signature than the units above and below it. Planktonic foraminiferal assemblages in the interval are very poorly preserved.

There is another probable disconformity within the Lakes Entrance Formation at 2540m. The log break at 2540m marks the top of the recrystallized limestone unit of the Lakes Entrance Formation. The disconformity occurs within Zone G. This disconformity represents a well defined seismic horizon in Wrasse-1. This seismic horizon probably equates with the mid Early Miocene disconformity documented by Vail et al. (1977).

The Mid Miocene Seismic Marker probably equates with the sonic log break at 2299m. The log break occurs within Zones F or G. Evidence from elsewhere in the Gippsland Basin (Rexilius, 1983) supports a Zone F (latest Early Miocene) assignment for the Mid Miocene Marker. The entry of the Zone F defining species Globigerinoides sicanus in the Gippsland Basin appears to be patchy (Rexilius, 1983). In Wrasse-1, for example, specimens of primitive Globigerinoides sicanus (= G. trilobus/G. sicanus transition) occur earlier (at 2440.0m) than more abundant advanced specimens at 2203.0m (see section dealing with Discussion of Zones).

DISCUSSION OF ZONES

The Tertiary biostratigraphy in Wrasse-1 is based on the Gippsland Basin planktonic foraminiferal zonal scheme of Taylor (in prep.).

Indeterminate Interval: 2754.0-2822.0m

The interval is barren of foraminifera but has been assigned to the Middle N. asperus palynological Zone by Hannah et al. (1984).

Zone K: 2715.0-2729.0m

The interval contains a typical Zone K planktonic foraminiferal assemblage comprising Globigerina angiporoides, G. linaperta, G. brevis and Globorotalia gemma.

Zone J2: 2703.0-2711.0m

The association of Globigerina angiporoides, G. brevis and Globorotalia gemma without Globigerina linaperta in the interval is indicative of a Zone J2 assemblage. Preservation of the Zone J2 assemblages in Wrasse-1 is very poor.

?Zone I2: 2690.0 - 2699.0m

The interval contains Globorotalia opima associated with indeterminate globigerinids. Preservation of the planktonic foraminiferal assemblages in the interval is very poor. A Zone I2 assignment for the interval is based on the presence of Globorotalia opima without Globigerina angiporoides (which ranges no higher than Zone J2) or Globoquadrina dehiscens s.l. (which makes its first appearance at the base of Zone I1). The absence of Globigerina angiporoides and Globoquadrina dehiscens s.l. is considered significant because both species are resistant to dissolution and are usually detectable in very poorly preserved material. Despite this however, a Zone I2 assignment for the interval must be considered speculative. The use of absence of taxa in poorly preserved material for age determination must be treated with a low degree of confidence.

Zone G: 2445.0-2680.0m

The uphole entry of Globigerinoides trilobus at 2680.0m defines the base of the zone. The interval contains very poorly preserved, recrystallized planktonic foraminiferal assemblages.

Zones F or G: 2236.0-2440.0m

Transitional specimens between Globigerinoides trilobus and G. sicanus make their first uphole entry at 2440.0m, and were also noted at 2344.0m. Other samples in the interval (2236.0, 2258.0, 2272.0, 2332.0, 2351.0, 2367.9 and 2425.0m) contain no evidence of Globigerinoides sicanus. The tight sampling of the Early Miocene section in Wrasse-1 may have exposed problems with the use of Globigerinoides sicanus as a defining event. The species represents an excellent defining event elsewhere (e.g. tropics and New Zealand) but appears to make a patchy first appearance in the Gippsland Basin (Rexilius, 1983). The Mid Miocene Seismic Marker has been shown to occur within Zone F in the

Gippsland Basin (Rexilius, 1983). Since the Mid Miocene Marker event appears to be represented by a major sonic break at 2299m, it is likely that most, if not all of the interval 2236.0-2440.0m is 'Zone F equivalent' even though the zone defining species is absent or very rare.

Zone F: 2170.0-2203.0m

The first common uphole appearance of advanced Globigerinoides sicanus occurs at 2203.0m.

Zone E2: 2139.0-2157.0m

The uphole entry of Praeorbulina glomerosa at 2157.0m defines the base of Zone E2 in the well.

Zones D2/D1: 1930.0-2120.5m

The association of Orbulina universa with Globorotalia miozea miozea and G. praescitula in the interval is indicative of a Zone D2/D1 assignment. The absence of Globorotalia peripheroacuta precluded a more refined sub-division.

REFERENCES

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VAIL, P.R., MITCHUM, R.M. & THOMPSON, S., 1977. Global cycles of relative changes of sea level. In: PAYTON, C.E. (Editor), Seismic Stratigraphy - Application to Hydrocarbon Exploration. Am. Assoc. Pet. Geol., Mem., 26: 83-97.

MICROPALAEONTOLOGICAL DATA SHEET

BASIN: Gippsland
 WELL NAME: Wrasse-1

ELEVATION: KB: +21.0m GL: -65.0m
 TOTAL DEPTH: 2984.0m KB deviated

AGE	FORAM. ZONULES	HIGHEST DATA					LOWEST DATA				
		Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
PLEIS- TOCENE	A ₁										
	A ₂										
PLIO- CENE	A ₃										
	A ₄										
MIOCENE	LATE	B ₁									
		B ₂									
		C									
	MIDDLE	D ₁	1930.0	1							
		D ₂						2120.5	1		
		E ₁									
		E ₂	2157.0	0				2157.0	0		
	EARLY	F	2170.0	0				2203.0	1		
		G	2455.0	1				2680.0	1		
		H ₁									
OLIGOCENE	LATE	H ₂									
		I ₁									
	I ₂	2690.0	2				2699.0	2			
	EARLY	J ₁									
		J ₂	2703.0	1				2711.0	1		
EOC- ENE	K	2715.0	1				2729.0	1			
	Pre-K										

COMMENTS: The absence of Zone E1 is probably the result of gap in sampling.
 Samples 2236.0 - 2440.0m inclusive are assignable to either Zone G
 or F.
 Samples 2733.0 - 2742.85 inclusive are Zone K or older.

- CONFIDENCE RATING:
- 0: SWC or Core - Complete assemblage (very high confidence).
 - 1: SWC or Core - Almost complete assemblage (high confidence).
 - 2: SWC or Core - Close to zonule change but able to interpret (low confidence).
 - 3: Cuttings - Complete assemblage (low confidence).
 - 4: Cuttings - Incomplete assemblage, next to uninterpretable or SWC with depth suspicion (very low confidence).

NOTE: If an entry is given a 3 or 4 confidence rating, an alternative depth with a better confidence rating should be entered, if possible. If a sample cannot be assigned to one particular zone, then no entry should be made, unless a range of zones is given where the highest possible limit will appear in one zone and the lowest possible limit in another.

DATA RECORDED BY: J.P. Rexilius DATE: 10.2.84
 DATA REVISED BY: J.P. Rexilius DATE: 5.3.85

TABLE 2
SUMMARY OF PALAEOONTOLOGICAL ANALYSIS, WRASSE-1, GIPPSLAND BASIN
INTERPRETATIVE DATA

NATURE OF SAMPLE	DEPTH (mKB)	PLANKTONIC FORAMINIFERAL YIELD	PRESERVATION	PLANKTONIC FORAMINIFERAL DIVERSITY	ZONE	AGE	COMMENTS
SWC 44	2822.0	Barren	-	-	-	-	
SWC 45	2817.0	Barren	-	-	-	-	
SWC 47	2808.0	Barren	-	-	-	-	
SWC 48	2802.0	Barren	-	-	-	-	
SWC 49	2798.0	Barren	-	-	-	-	
SWC 50	2794.0	Barren	-	-	-	-	
SWC 51	2790.0	Barren	-	-	-	-	
SWC 52	2784.0	Barren	-	-	-	-	Fish teeth
SWC 53	2778.0	Barren	-	-	-	-	
SWC 54	2773.0	Barren	-	-	-	-	
SWC 55	2769.0	Barren	-	-	-	-	
SWC 56	2764.0	Barren	-	-	-	-	
SWC 57	2759.0	Barren	-	-	-	-	
SWC 58	2754.0	Barren	-	-	-	-	
Core 2	2742.85	Very low	Poor	Very low	K or older	-	
SWC 59	2737.0	Low	Very poor	Very low	K or older	-	Fish teeth
SWC 60	2733.0	Very low	Very poor	Very low	K or older	-	
SWC 61	2729.0	Moderate	Very poor	Low	K	latest Late Eocene	Fish teeth
SWC 62	2723.0	Low/Moderate	Poor	Low	K	latest Late Eocene	Fish teeth, deep-water benthonic forams
SWC 63	2719.0	Low/Moderate	Poor	Low	K	latest Late Eocene	Fish teeth

TABLE 2 continued

NATURE OF SAMPLE	DEPTH (mKB)	PLANKTONIC FORAMINIFERAL YIELD	PRESERVATION	PLANKTONIC FORAMINIFERAL DIVERSITY	ZONE	AGE	COMMENTS
SWC 64	2715.0	Moderate	Very poor	Moderate/Low	K	latest Late Eocene	Fish teeth
SWC 65	2711.0	Low	Very poor	Very low	J2	Early Oligocene	Echinoid spines
SWC 66	2707.0	Moderate	Poor	Very low	J2	Early Oligocene	
SWC 67	2703.0	Very low	Very poor	Very low	J2	Early Oligocene	Echinoid spines
SWC 68	2699.0	Moderate	Very poor	Very low	?I2	latest Early Oligocene	Fish teeth
SWC 69	2690.0	Low	Very poor	Very low	?I2	latest Early Oligocene	
SWC 70	2680.0	High	Moderate	Moderate/Low	G	Early Miocene	<u>Fish teeth</u>
SWC 71	2662.0	Moderate	Very poor	Very low	G	Early Miocene	
SWC 72	2644.0	Moderately low	Very poor	Very low	G	Early Miocene	
SWC 73	2626.0	High	Very poor	Very low	Indeterminate	-	
SWC 74	2608.0	Moderate	Very poor	Very low	G	Early Miocene	Interval consists of
Core 1	2594.2	Moderate	Very poor	Very low	Indeterminate	-	recrystallized
Core 1	2593.25	High	Very poor	Low	G	Early Miocene	limestone.
Core 1	2592.75	Low	Very poor	Very Low	Indeterminate	-	Planktonic foram
Core 1	2589.9	Moderately low	Very poor	Very low	G	Early Miocene	assemblages
SWC 75	2584.0	Moderate	Very poor	Very low	Indeterminate	-	very poorly preserved.
SWC 76	2566.0	Moderate	Very poor	Low	G	Early Miocene	
SWC 77	2548.0	High	Very poor	Moderate	G	Early Miocene	
SWC 78	2537.0	Very low	Very poor	Very low	G	Early Miocene	

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TABLE 2 continued

NATURE OF SAMPLE	DEPTH (mKB)	PLANKTONIC FORAMINIFERAL YIELD	PRESERVATION	PLANKTONIC FORAMINIFERAL DIVERSITY	ZONE	AGE	COMMENTS
SWC 79	2522.0	Moderate	Poor	Moderate	G	Early Miocene	Fish teeth
SWC 80	2508.0	Low	Poor	Low	G	Early Miocene	
SWC 81	2492.0	Moderate	Very poor	Moderate	G	Early Miocene	
SWC 1	2465.0	High	Moderate	Moderate	G	Early Miocene	
SWC 2	2455.0	Moderate	Moderate	Moderate/high	G	Early Miocene	
SWC 3	2440.0	Moderate	Moderate	Moderate	F/G	Early Miocene	
SWC 4	2425.0	Low	Poor	Moderate/Low	F/G	Early Miocene	
SWC 6	2367.9	Moderate/Low	Moderate	Moderate	F/G	Early Miocene	
SWC 7	2351.0	Moderate	Moderate	Moderate	F/G	Early Miocene	
SWC 8	2344.0	Low	Moderate	Moderate	F/G	Early Miocene	
SWC 9	2332.0	Moderate	Moderate/Poor	Moderate	F/G	Early Miocene	
SWC 10	2272.0	Moderate/High	Moderate	Moderate	F/G	Early Miocene	
SWC 11	2258.0	Moderate	Moderate/Poor	Low	F/G	Early Miocene	
SWC 13	2236.0	Moderate	Moderate/Poor	Moderate	F/G	Early Miocene	
SWC 14	2203.0	Low	Moderate	Low	F	Early Miocene	
SWC 15	2180.0	Low	Moderate	Moderate	F	Early Miocene	
SWC 16	2170.0	Moderate/High	Moderate	Moderate/High	F	Early Miocene	
SWC 17	2157.0	Moderate	Moderate	Moderate	E2	Middle Miocene	
SWC 18	2139.0	Moderate/Low	Poor	Moderate	E2	Middle Miocene	
SWC 19	2120.5	Moderate/Low	Moderate	Moderate	D	Middle Miocene	
SWC 20	2100.0	High	Good	Moderate	D2/D1	Middle Miocene	
SWC 21	2085.0	Moderate/High	Moderate	Moderate	D2/D1	Middle Miocene	
SWC 22	2065.0	High	Moderate	Moderate/Low	D2/D1	Middle Miocene	

TABLE 2 continued

NATURE OF SAMPLE	DEPTH (mKB)	PLANKTONIC FORAMINIFERAL YIELD	PRESERVATION	PLANKTONIC FORAMINIFERAL DIVERSITY	ZONE	AGE	COMMENTS
SWC 23	2045.0	High	Moderate	Moderate	D2/D1	Middle Miocene	Rare sponge spicules
SWC 24	2020.0	Moderate	Moderate	Moderate/High	D2/D1	Middle Miocene	
SWC 25	2010.0	Low	Poor	Moderate/Low	D2/D1	Middle Miocene	Echinoid spines
SWC 26	2000.0	Low	Poor	Moderate/Low	D2/D1	Middle Miocene	
SWC 27	1990.0	Moderate/Low	Moderate/Poor	Moderate/Low	D2/D1	Middle Miocene	
SWC 28	1980.0	Moderate/High	Moderate/Poor	Moderate/High	D2/D1	Middle Miocene	Echinoid spines
SWC 29	1950.0	High	Moderate	Moderate	D2/D1	Middle Miocene	Sponge spicules, echinoid spines
SWC 30	1930.0	Low	Poor	Moderate	D2/D1	Middle Miocene	

BASIC DATA

TABLE 3: FORAMINIFERAL DATA, WRASSE-1

RANGE CHART: TERTIARY PLANKTONIC FORAMINIFERA

TABLE 3
SUMMARY OF PALAEOONTOLOGICAL ANALYSIS, WRASSE-1, GIPPSLAND BASIN
INTERPRETATIVE DATA

NATURE OF SAMPLE	DEPTH (mKB)	PLANKTONIC FORAMINIFERAL YIELD	PRESERVATION	PLANKTONIC FORAMINIFERAL DIVERSITY
SWC 44	2822.0	Barren	-	-
SWC 45	2817.0	Barren	-	-
SWC 47	2808.0	Barren	-	-
SWC 48	2802.0	Barren	-	-
SWC 49	2798.0	Barren	-	-
SWC 50	2794.0	Barren	-	-
SWC 51	2790.0	Barren	-	-
SWC 52	2784.0	Barren	-	-
SWC 53	2778.0	Barren	-	-
SWC 54	2773.0	Barren	-	-
SWC 55	2769.0	Barren	-	-
SWC 56	2764.0	Barren	-	-
SWC 57	2759.0	Barren	-	-
SWC 58	2754.0	Barren	-	-
Core 2	2742.85	Very low	Poor	Very low
SWC 59	2737.0	Low	Very poor	Very low
SWC 60	2733.0	Very low	Very poor	Very low
SWC 61	2729.0	Moderate	Very poor	Low
SWC 62	2723.0	Low/Moderate	Poor	Low
SWC 63	2719.0	Low/Moderate	Poor	Low
SWC 64	2715.0	Moderate	Very poor	Moderate/Low
SWC 65	2711.0	Low	Very poor	Very low
SWC 66	2707.0	Moderate	Poor	Very low
SWC 67	2703.0	Very low	Very poor	Very low
SWC 68	2699.0	Moderate	Very poor	Very low
SWC 69	2690.0	Low	Very poor	Very low
SWC 70	2680.0	High	Moderate	Moderate/Low
SWC 71	2662.0	Moderate	Very poor	Very low
SWC 72	2644.0	Moderately low	Very poor	Very low
SWC 73	2626.0	High	Very poor	Very low
SWC 74	2608.0	Moderate	Very poor	Very low
Core 1	2594.2	Moderate	Very poor	Very low
Core 1	2593.25	High	Very poor	Low
Core 1	2592.75	Low	Very poor	Very Low
Core 1	2589.9	Moderately low	Very poor	Very low

TABLE 3 continued

NATURE OF SAMPLE	DEPTH (mKB)	PLANKTONIC FORAMINIFERAL YIELD	PRESERVATION	PLANKTONIC FORAMINIFERAL DIVERSITY
SWC 75	2584.0	Moderate	Very poor	Very low
SWC 76	2566.0	Moderate	Very poor	Low
SWC 77	2548.0	High	Very poor	Moderate
SWC 78	2537.0	Very low	Very poor	Very low
SWC 79	2522.0	Moderate	Poor	Moderate
SWC 80	2508.0	Low	Poor	Low
SWC 81	2492.0	Moderate	Very poor	Moderate
SWC 1	2465.0	High	Moderate	Moderate
SWC 2	2455.0	Moderate	Moderate	Moderate/high
SWC 3	2440.0	Moderate	Moderate	Moderate
SWC 4	2425.0	Low	Poor	Moderate/Low
SWC 6	2367.9	Moderate/Low	Moderate	Moderate
SWC 7	2351.0	Moderate	Moderate	Moderate
SWC 8	2344.0	Low	Moderate	Moderate
SWC 9	2332.0	Moderate	Moderate/Poor	Moderate
SWC 10	2272.0	Moderate/High	Moderate	Moderate
SWC 11	2258.0	Moderate	Moderate/Poor	Low
SWC 13	2236.0	Moderate	Moderate/Poor	Moderate
SWC 14	2203.0	Low	Moderate	Low
SWC 15	2180.0	Low	Moderate	Moderate
SWC 16	2170.0	Moderate/High	Moderate	Moderate/High
SWC 17	2157.0	Moderate	Moderate	Moderate
SWC 18	2139.0	Moderate/Low	Poor	Moderate
SWC 19	2120.5	Moderate/Low	Moderate	Moderate
SWC 20	2100.0	High	Good	Moderate
SWC 21	2085.0	Moderate/High	Moderate	Moderate
SWC 22	2065.0	High	Moderate	Moderate/Low
SWC 23	2045.0	High	Moderate	Moderate
SWC 24	2020.0	Moderate	Moderate	Moderate/High
SWC 25	2010.0	Low	Poor	Moderate/Low
SWC 26	2000.0	Low	Poor	Moderate/Low
SWC 27	1990.0	Moderate/Low	Moderate/Poor	Moderate/Low
SWC 28	1980.0	Moderate/High	Moderate/Poor	Moderate/High
SWC 29	1950.0	High	Moderate	Moderate
SWC 30	1930.0	Low	Poor	Moderate