E. REVIEW AND UPDATE OF HYDROGEOLOGICAL INFORMATION FOR THE MORGAN TO WELLINGTON MODEL AREA

Department of Water, Land and Biodiversity Conservation

REVIEW AND UPDATE OF HYDROGEOLOGICAL INFORMATION FOR THE MORGAN TO WELLINGTON MODEL AREA

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Australian WATER Environments

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INTRODUCTION

1.1. Purpose of the Review

The Department of Water, Land and Biodiversity Conservation (DWLBC) is seeking to update its existing Morgan to Wellington regional groundwater model. The work involves the collation and interpretation of existing hydrogeological information, including the most recent drillhole, potentiometric head, groundwater salinity and pumping test data. It also involves the refinement of the conceptual hydrogeological model based on this information.

Australian Water Environments (AWE) was engaged to undertake this review to incorporate up to date information. The methodology adopted for the review included five interpretive parts, as described below.

1. Hydrogeological Structure (top elevation data of: Murray Group Limestone aquifer (instructed that Ground Surface DEM data is adequate), Ettrick Formation aquitard and Renmark Group aquifer and the bottom elevation data of the Renmark Group aquifer)

2. Potentiometric Head (Murray Group and Renmark Group aquifers)

3. Groundwater Salinity (Murray Group and Renmark Group aquifers)

4. Aquifer Test Data (Murray Group Aquifer, Ettrick Formation aquitard and Renmark Group aquifer)

5. Conceptual Hydrogeological Model

1.2. History

The model region primarily consists of a section of the Murray River between Morgan and Wellington in South Australia. Model construction was undertaken several years ago with limited data and may have only included data until 1998. Consequently the majority of model design was based on Murray Basin Hydrogeological Map Sheets (Barnett, 1991) and available drillhole data. The current Morgan to Wellington model has previous versions as early as 2001, with additional data included since. The process of update requires model data review, inclusion of any new drillhole information and up to date groundwater level data.

SUMMARY OF HYDROGEOLOGY AND HYDROLOGY

1.3. Location

The Morgan to Wellington area is located in the Riverland region of South Australia on the western side of the Murray Basin near Mt Lofty Ranges. The model area occupies ~10,800 km^2 from the Morgan in the North, to Wellington in the south (Figure 1). The model area is bounded by the foothill edge of Mt Lofty Ranges to the west and extends ~40 km from the River Murray to the east. Figure 2 shows that topography in the model area is relatively steep along the foothill and river valley regions and flat in most high land regions east of the River Murray. The River Murray is the major surface water system from Morgan (at 321 river kilometre) to Wellington (at 80 river kilometre) in the model area. Lock 1 located next to Blanchetown with average pool level ~3.2 m AHD upstream and ~0.7 m AHD downstream. The River Murray is filled with a complex network of anabranches, lagoons, floodplain and floodplain irrigations.

1.4. Climate

The Riverland climate is typically characterised by hot dry summers and cool, wetter winters. The mean rainfall in Loxton since 1984 is approximately 263 mm per annum, with an annual mean evaporation rate of ~1900 mm on average (Bureau of Meteorology, 2008). Mean minimum and maximum temperature ranges from 3.8°C in July to 31°C in January.

The meteorology station at Murray Bridge shows that mean rainfall is 347 mm per annum since 1966. The mean minimum and maximum temperature range from 5.4°C in July to 29.2°C in February. No evaporation records were available for the Lower Murray region on the Bureau of Meterology website.

1.5. Regional Hydrogeology

The Murray Basin is a closed groundwater basin containing Cainozoic unconsolidated sediments and sedimentary rock up to 600 m in thickness, and contains a number of regional aquifer systems (Evans and Kellett, 1989).

Within the study area, there are three major aquifer systems of significance (see hydrogeological cross section in Figure 3). In the highland areas the water-table aquifer occurs in the Murray Group Limestone. This aquifer forms a regionally extensive unconfined to semi-confined aquifer into which the channel of the ancestral River Murray is incised. The Ettrick Formation aquitard separates the Murray Group aquifer from the underlying Renmark Group aquifer.

The semi-confined Monoman Formation (likely to have highly variable hydraulic conductivity) and Coonambidgal Formation has been deposited within the ancestral channel and it is within this sequence that the modern channel of the River Murray is incised. The Murray Group aquifer and the Monoman Formation aquifer are considered to be in direct hydraulic connection. Within the floodplains the groundwater table can occur within the overlying superficial sediments of the Coonambidgal Formation.

Within the model area, the groundwater flow direction in all aquifers of interest is generally towards the River Murray. The river and its anabranches behave as a sink for regional groundwater in the study area.

Saline groundwater enters the floodplain environment through one of three mechanisms:

- Lateral flow from the Murray Group Limestone aquifer.
- Slow upward leakage through the Ettrick Formation aquitard from the underlying regional confined Renmark Group aquifer.
- Seepage of perched groundwater may occur from cliff faces.

Discharge subsequently occurs either directly to the River Murray (or one of its backwaters or anabranches) through the Murray Group Limestone or Monoman Formation aquifer, or through evapotranspiration. Typical rates of evapotranspiration from the floodplain are 250 mm/yr (Holland 2001). With reference to upward leakage from the Renmark Group, upward gradients are interpreted to exist across the project area providing a potential for the upward movement of groundwater from the Remark Group (Figure 4). However, the rate of upward leakage is expected to be low (relative to other vertical fluxes) because of the presence of the thick Ettrick Formation confining layer.

As anecdotal evidence indicates that only minor seepage occurs from cliff faces in the model area, it is assumed that lateral flow from the Murray Group Limestone aquifer is the main mechanism for saline groundwater discharge to the River Murray. It should also be noted that within the study area, there is no evidence at this point that the River Murray is in direct contact with the Renmark Group.

The above two points conclude that the Murray Group and Monoman Formation aquifers contribute the majority of the salt load to the River Murray, and thus are the targets for salt accession investigation.

The schematic diagram of the Morgan to Wellington conceptual hydrogeological model is presented in Figure 5a (Yan 2006), Figure 5b and Figure 5c. The figures highlight the regional groundwater flow conditions, direction and leakage between the various hydrogeological units.

1.6. Project Region Hydrogeology

With the study area located along the western margin of the basin, where a highland ridge and pre-Tertiary basement forms the boundary, sediment thicknesses can vary significantly and in some cases not exist.

Surface Quaternary sediments exist within the study area, however are generally limited to several metres thickness and, for purposes of model construction, have not been considered as part of the project scope.

1.6.1. Woorinen Formation

The Woorinen Formation provides a thin capping of Quaternary sediments across the highlands of the project area. This layer is not defined and is incorporated into the uppermost layer of the numerical model.

1.6.2. Coonambidgal Formation

The Coonambidgal Formation clay layer occurs ubiquitously across the floodplain and comprises clay and silts deposited during periods of episodic flooding. The unit is commonly ~2 m in thickness. This layer is not defined and is incorporated into the uppermost layer of the numerical model.

1.6.3. Monoman Formation

Beneath the Coonambidgal clay lays the Monoman Formation. Typically, the Monoman Formation comprises a mixture of channel and sheet sand deposits with intervening

sequences of silty clay. This is likely to result in highly variable transmissivity throughout the floodplain similar to that encountered in previous investigation in Riverland areas.

There are not sufficient data to reliably construct groundwater elevation contours for the Monoman Formation aquifer for the entire length of the floodplain within the project area. However, there are observations regarding groundwater flow in the floodplain aquifers between Mannum to Wellington, which are likely to be relevant to the project area.

Due to its semi-unconfined nature and hydraulic connection, the potentiometric surface for the Monoman Formation has been merged with the Murray Group Limestone aquifer.

1.6.4. Murray Group Limestone

The Murray Group Limestone has been partially eroded (and fully eroded in a minor portion) across the floodplain but is present throughout the highland areas, and is often exposed in cliff faces within the project area.

For the purposes of the model area the upper layer of the model has been considered as the thickness from the ground surface to the base of the Murray Group Limestone (top of Ettrick Formation aquitard). Within the model area the top of the Murray Group Limestone sits at an elevation of more than 60 m AHD in the northeast portion of the project area and 5 m AHD in the southwest portion of the project area. Similarly, these sediments thin along a northeast/southwest axis. Thickness ranges from greater than 120 m in the northeast part of the project area to 50 m in the southwest portion of the project area (Figure 6).

A March 2008 potentiometric contour map has been produced by this work for the Murray Group Limestone aquifer and is presented in Figure 7 (some values have been inferred). The groundwater flow direction is predominantly to the River Murray from east and west. Contours on the floodplain may not be accurate due to lack of reliable data and numerous boundary conditions, which exist due to the extensive system of permanent anabranches and backwaters present.

1.6.5. Ettrick Formation

The Ettrick Formation, considered an aquitard, generally appears as a green/grey layer of glauconitic and fossiliferous marl, calcareous caly and mudstone, with silts and fine quartz sand indicative of a low energy marine environment (Drexel, 1995). It is recognised as discrete stratigraphic units, forming the major confining bed throughout the region separating the Murray Group Limestone and Renmark Group Aquifer. This confining bed primarily dips toward to the east. The top of the Ettrick Formation sediments reach an elevation of ~60 m AHD along the foot edge of Mt Lofty Range but dip to an elevation of ~-90 m AHD to the east (Figure 8). A maximum thickness of ~80 m is attained in this sequence of sediments, thinning to the north and west of the project area to less than 20 m and absent in a small section north of Mannum (Figure 9).

1.6.6. Renmark Group

Structure contours for the top of the Renmark Group litho facies found that the sediments are generally dipping along an approximate west/east axis. In the north west part of the study area the elevation of the top of the Remark Group is ~40 m AHD, dipping down to an elevation of ~-100 m AHD (Figure 10). Renmark Group sediment thickness increases from approximately 40 m in the west to 80 m in the south east and more than 100 m in the north east. Although a band of thin (approximately 20 m) Renmark Group sediments is reported in the central eastern region of the model area the thickness of the Renmark Group aquifer increases from west to east with the thickest portion in the noth east (Figure 11).

As mentioned in previous section the Renmark Group aquifer is unlikely to contribute a significant salt load to the River Murray in comparison with the Murray Group Limestone aquifer. This formation is considered as the base layer in the model to simulate upward leakage to the Murray Group aquifer.

Generally basement elevation structure contours reflect a similar pattern to the top of Renmark Group sediments, dipping from west to east, with the lowest elevations reported in the north east of the model area (Figure 12).

March 2008 contours of potentiometric groundwater elevation for the Renmark Group aquifer are presented in Figure 13. Regional groundwater flow (based on the 31 wells used to generate the contour plan) occurs from the east to west and east to southwest.

1.7. Aquifer Test Results and Yield

At the time of writing there were no recent aquifer tests analysed for wells completed in the region, however hydraulic conductivity in the Lower Mannum Formation has been reported from 1 m/d to 4 m/d in the Woolpunda - Cadell Reach Salt Interception Scheme (Rural Solutions, 2004) and from 5 m/d to 15 m/d in the Renmark Group between Lake Victoria and Morgan (Rammers et al, 2005).

Yields at the time of well production reported ranges from 0.1 L/s to more than 20 L/s in the Murray Group Limestone aquifer (Figure 14) and from 0.1 L/s to 8.0 L/s in the Renmark Group aquifer (Figure 15). Historical MDBC Basin in a Box data reports higher yields in both aquifers are generally east of the river channel with scattered patches of high yield in the western highlands and south of Mannum.

1.8. Groundwater Salinity

A salinity review of all Murray Group Limestone and Renmark Group wells was completed in the study area. This included 41 new Murray Group Limestone wells and one Remark Group well, which were drilled since January 2004. Historic data from microfiche was revisited and all wells were classified on the quality of data available.

There is a wide range in salinity from ~1,000 to greater than 50,000 mg/L TDS in the Murray Group Limestone aquifer. The highest salinity value (greater than 50,000 mg/L TDS) occurs north west of Blanchetown. Groundwater salinity in the model area generally tends to be slightly elevated from 1,500 to 10,000 mg/L TDS in the Murray Group Limestone aquifer (Figure 16).

The groundwater salinity values in the Renmark Group aquifer range from ~1,300 to greater than 20,000 mg/L TDS, with higher salinity groundwater reported in the northern region of the model. A band of higher salinity groundwater (>14,000 mg/L TDS) extends from the north east corner westerly and finishes north west of Blanchetown (Figure 17).

1.9. Regional Hydrology

The River Murray is the major surface water system from Morgan to Wellington in the model area and is filled with a complex network of anabranches, lagoons, floodplain and floodplain irrigations. It acts as a discharge point for both sides of the river and the river pool level plays a critical component in terms of how much groundwater will be discharged into the river. Average pool level upstream Lock 1 is ~3.2 m AHD and downstream is ~0.7 m AHD. However, current river pool level has dropped below sea level due to continuing nation wide drought conditions.

RECOMMENDATIONS

During the model review process the following observations were made that restricted the accuracy of the model:

Limited drillhole data across the majority of the model area, in particular close to the river channel (with the exception of the section of river from Waikerie to Morgan). This limited drillhole data not only limits model construction for stratigraphy thickness but also:

- Groundwater parameters and characteristics;
- Groundwater dynamics;
- Groundwater-surface water interaction; and
- Irrigation and/or pumping impacts.

No well aquifer test data is available. The only available data was the estimated yield which was recorded during well construction/development.

Additionally, it would be beneficial to gather groundwater analytical data to determine groundwater origins as reported high potentiometric surface levels of the Renmark Group aquifer has the potential for upward leakage where the overlying aquitard may be either thin, discontinuous or absent.

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Yan W., Howe B., Howles S., and Armstrong D. 2006. Numerical groundwater models for determining salt loads entering the River Murray in South Australia. Murray Darling Basin Commission Workshop 2006.

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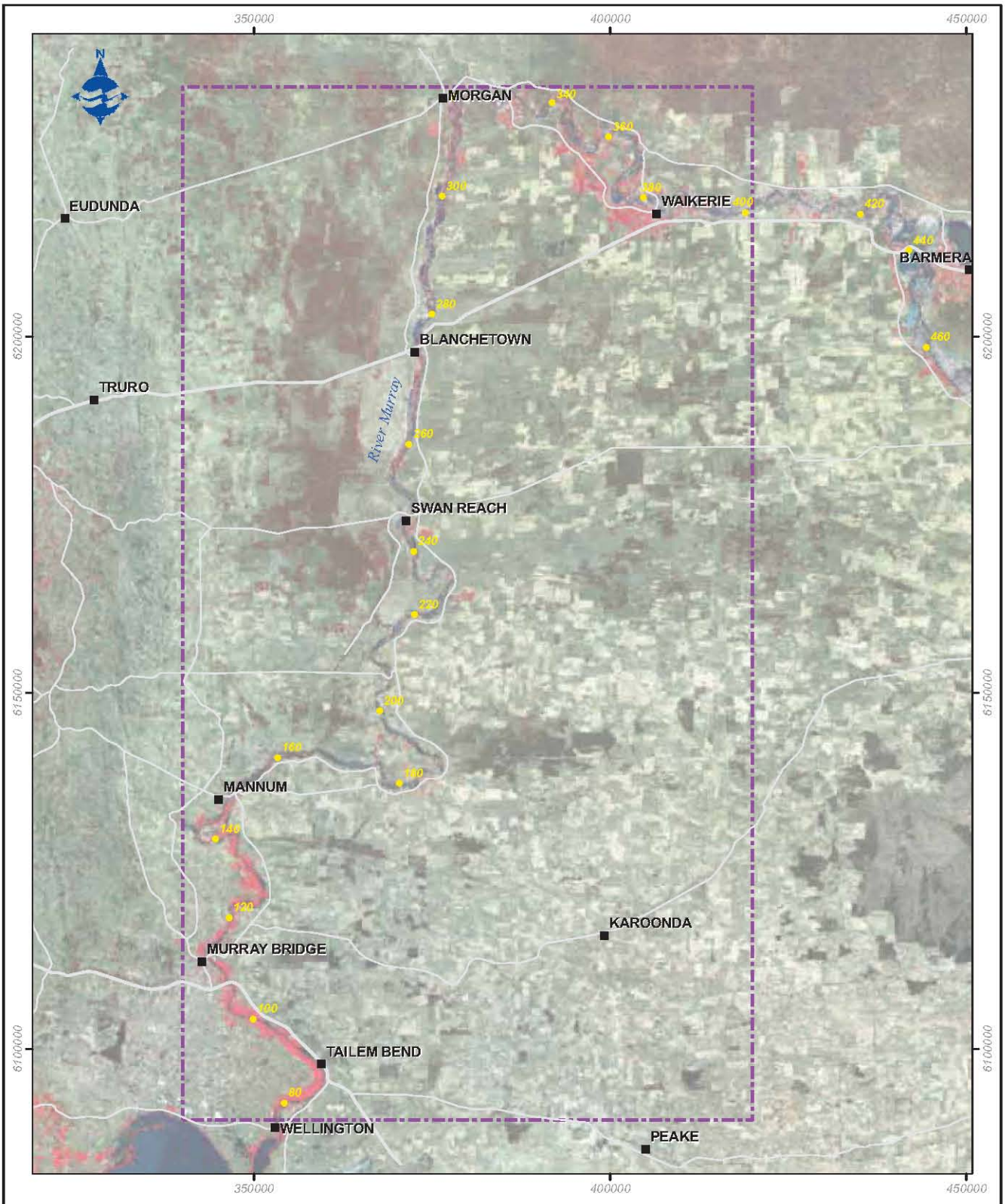
http://www.bom.gov.au

http://e-nrims.dwlbc.sa.gov.au/swa

https://info.pir.sa.gov.au/des/desHome.html

https://info.pir.sa.gov.au/obswell/new/obsWell/MainMenu/menu

FIGURES



0 10 20 30
Kilometres

LEGEND

- Township
- Model Extent
- 110 River Km Marker
- Major Road
- Minor Road

Data Source:
Model extent: AWE;
Landsat imagery: MDBC;
Townships, roads: Geoscience Australia.

Australian WATER Environments

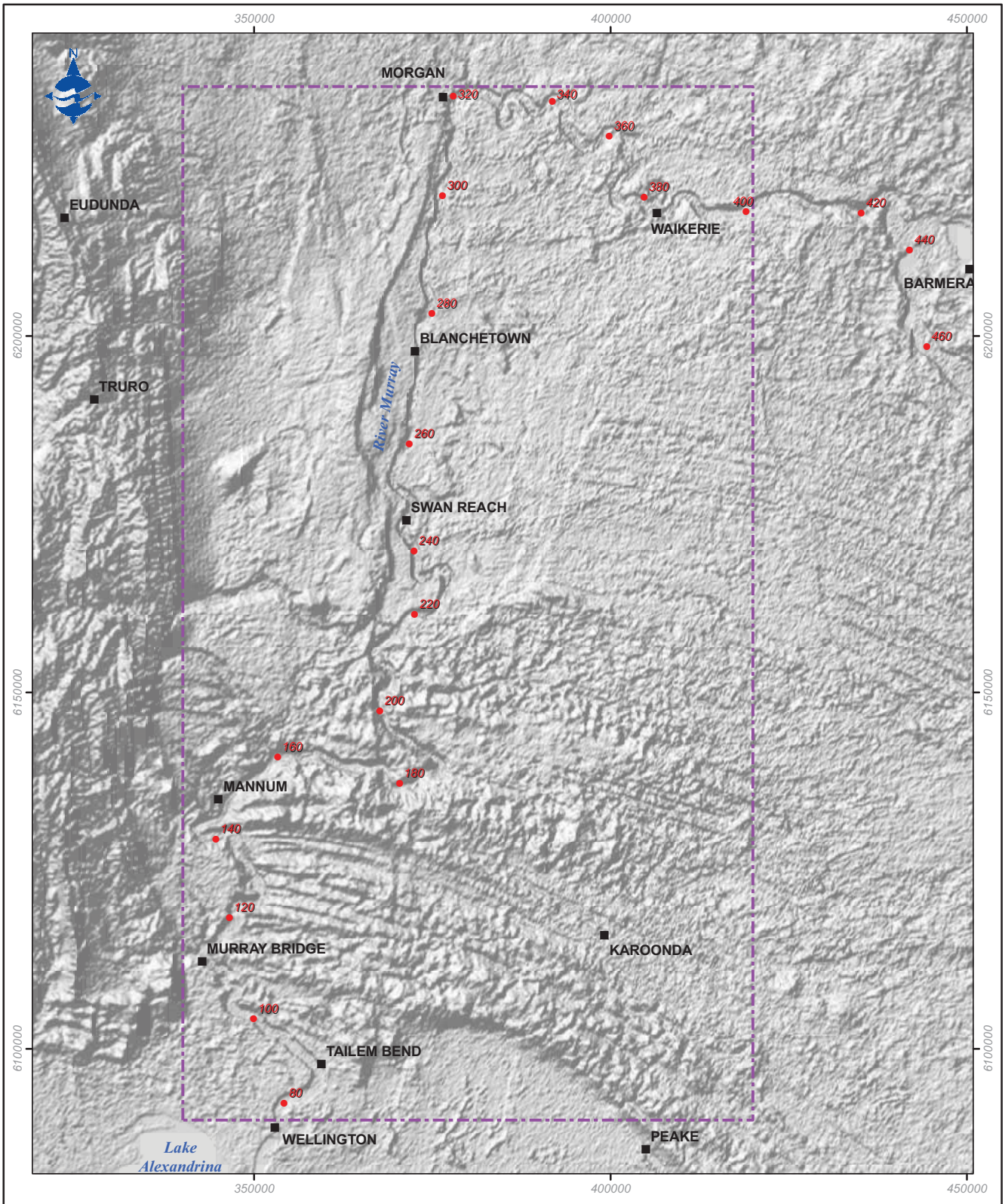
Murray Basin Hydrogeological Review

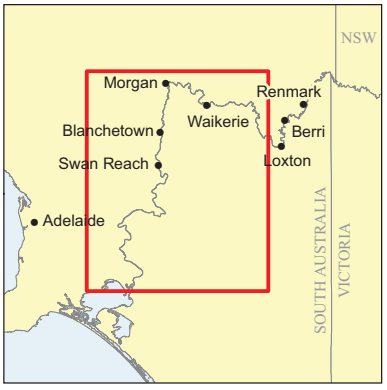
Morgan to Wellington

Location Plan

Job No. 09020 - 014
081209

Figure 1





0 10 20 30
Kilometres

LEGEND

- Locality
- Model Extent
- River Km Marker

Shuttle Radar Data, Elevations (mAHD)

110m
0m

Data Source:
Model extent: AWE;
River Kilometre Markers: Barry Porter & AWE;
Shuttle Radar elevations: USGS;
Localities: Geoscience Australia.

Australian WATER Environments

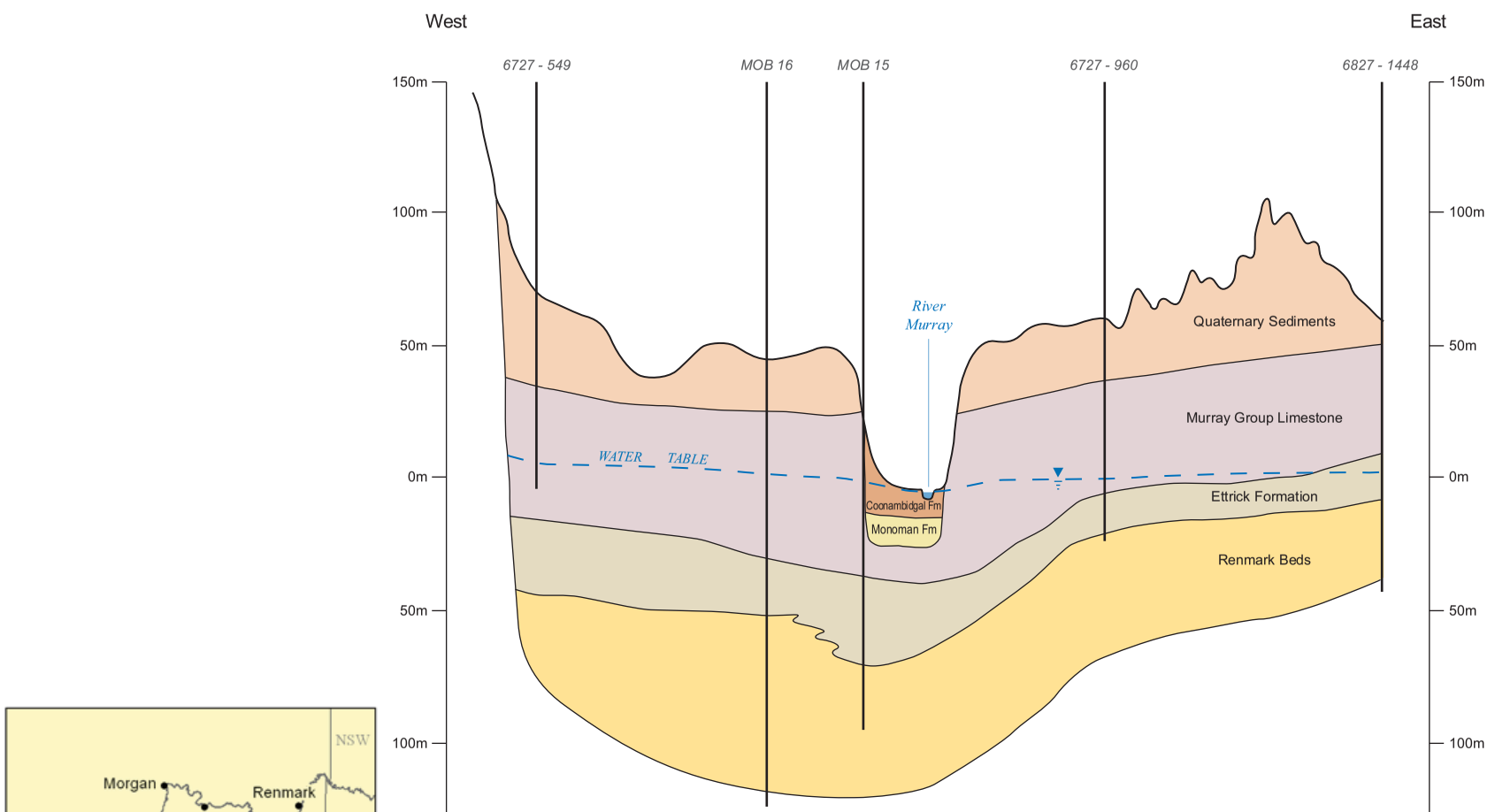
Murray Basin Hydrogeological Review

Morgan to Wellington

Shuttle Radar Topography

Job No. 09020 - 001
081210

Figure 2



Reference: Cross Section adapted from Barnett, 1994.

Australian WATER Environments

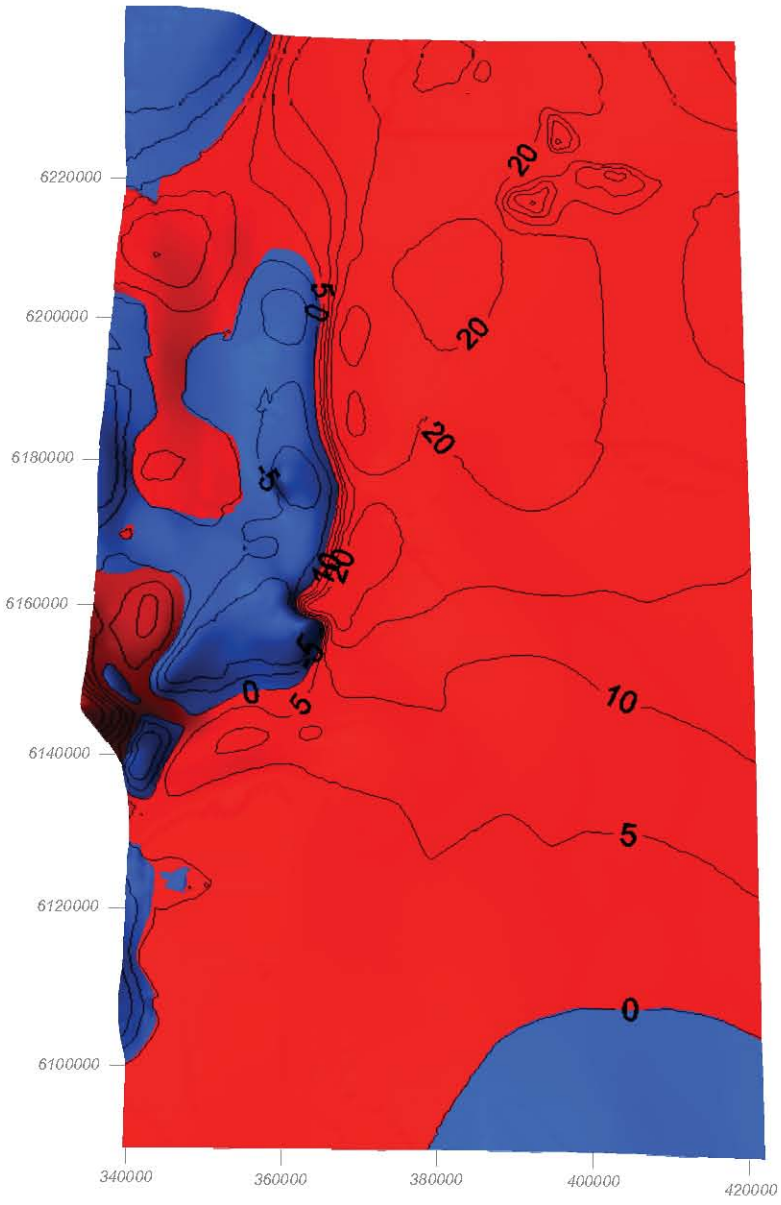
Murray Basin Hydrogeological Review

Morgan to Wellington

Hydrogeological Cross Section

Job No. 09020 - 028
081211

Figure 3



0 10 20 30
Kilometres

LEGEND

Head Difference (m)

Potential Upward Leakage

Potential Downward Leakage

Australian WATER Environments

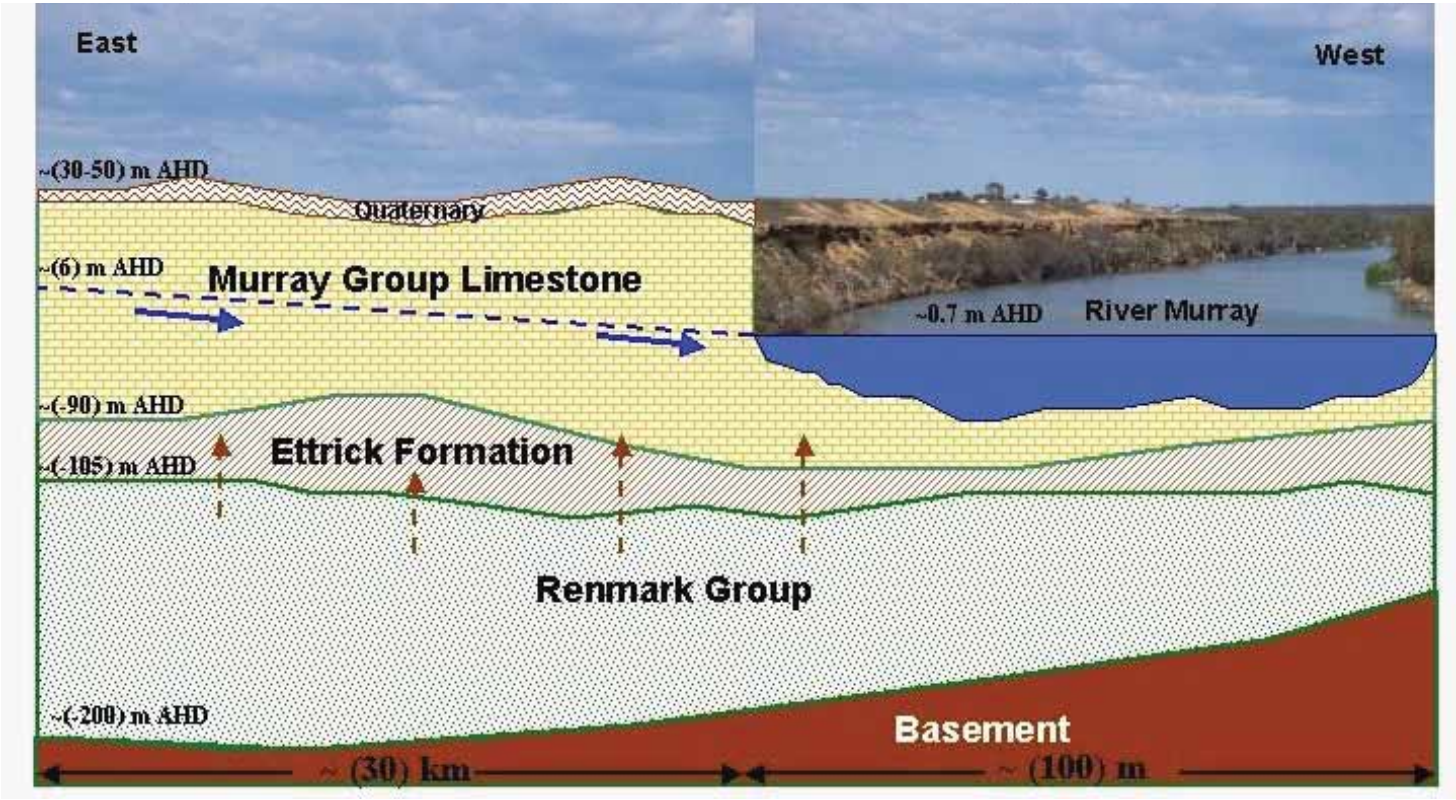
Murray Basin Hydrogeological Review

Morgan to Wellington

Aquifer Potentiometric Head Variation Murray and Renmark Groups

Job No. 09020 - 021
081210

Figure 4



Reference: Yan W., Howe B., Howles S., and Armstrong D. 2006. Numerical groundwater models for determining salt loads entering the River Murray in South Australia. Murray Darling Basin Commission Workshop 2006

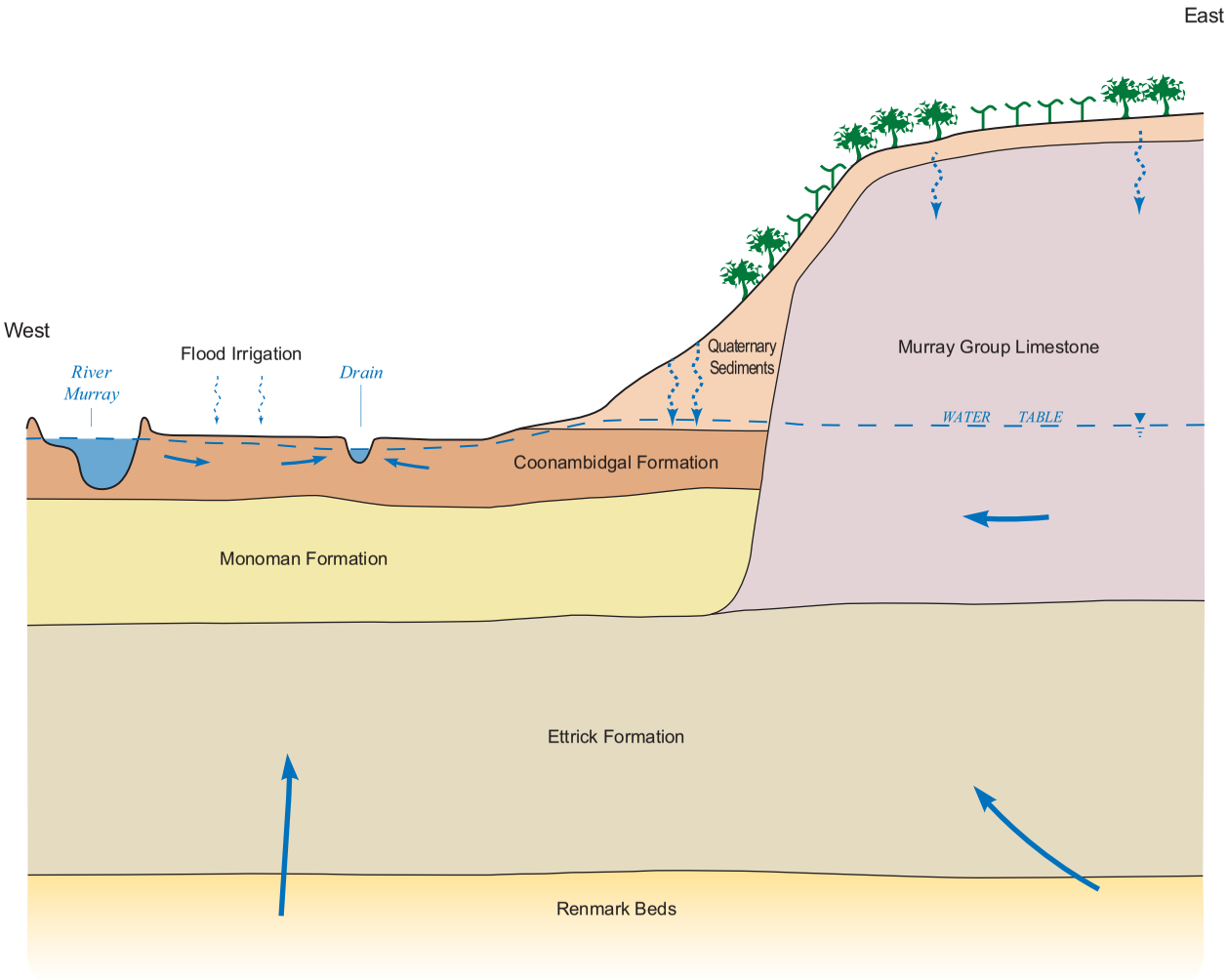
Murray Basin
Hydrogeological Review
Morgan to Wellington

Conceptual Hydrogeological Cross Section - Riverland District

Australian WATER Environments

Job No. 09020 - 027
081211

Figure 5a



Murray Basin
Hydrogeological Review
Morgan to Wellington

Hydrogeological Cross Section
Lower Murray District

Australian WATER Environments

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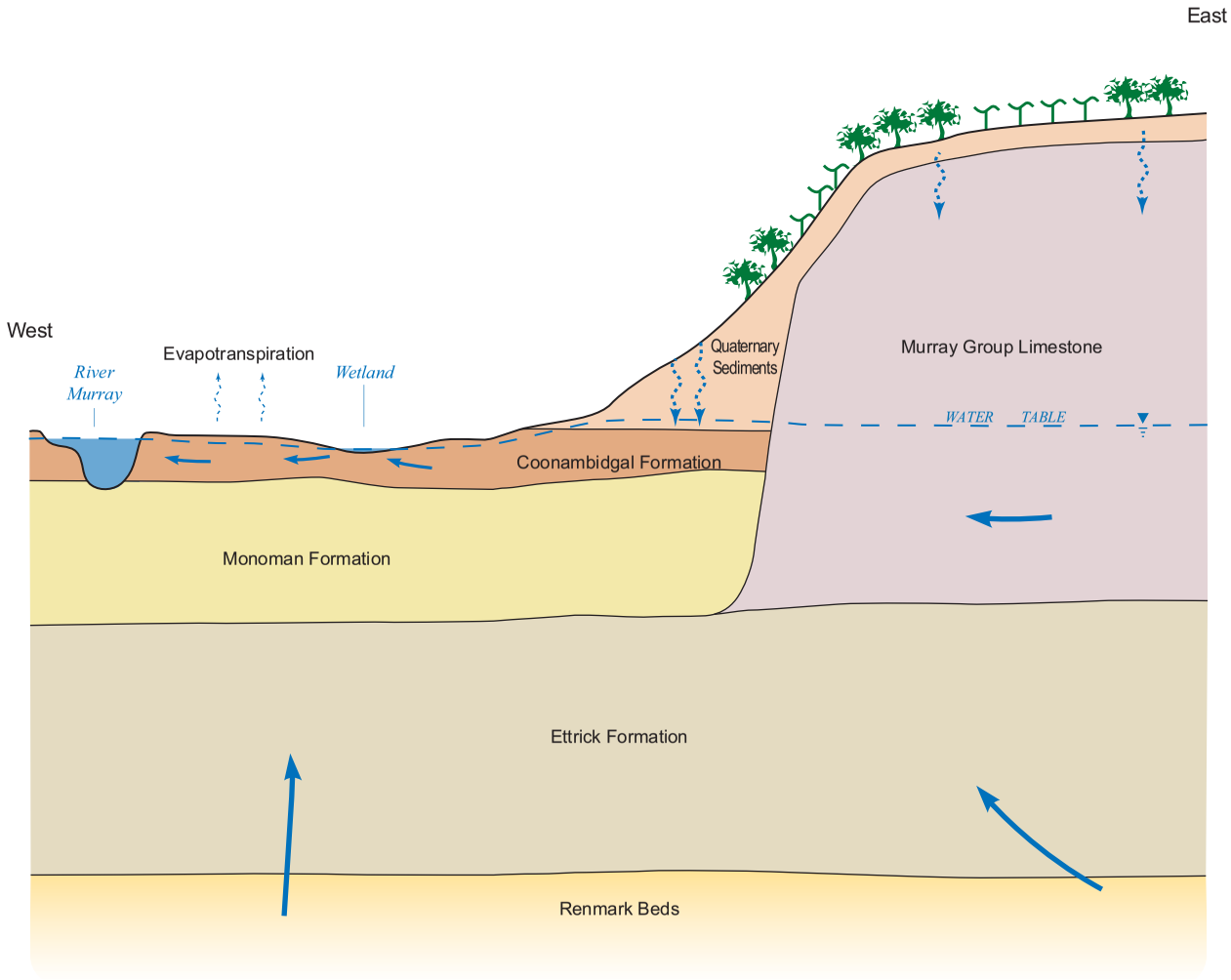
081211

Figure 5b



Murray Basin
Hydrogeological Review
Morgan to Wellington

Hydrogeological Cross Section
Morgan to Mannum Reach

Australian WATER Environments

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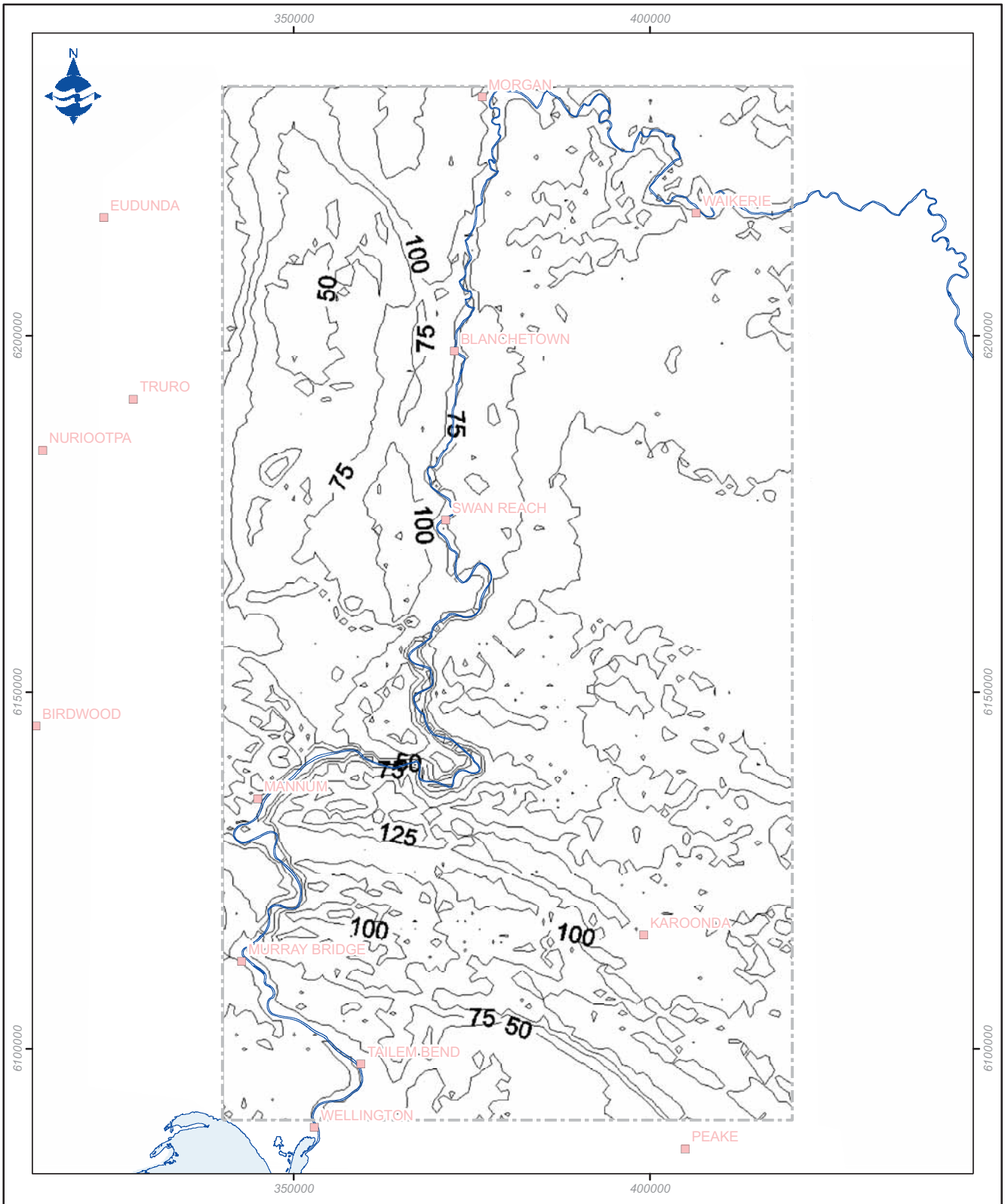
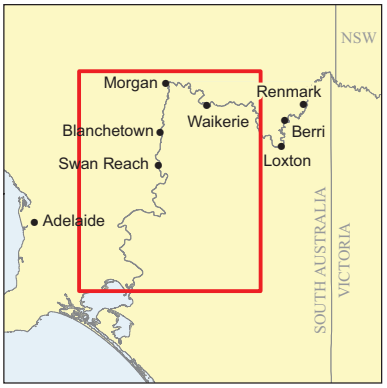
081222

Figure 5c





LEGEND

- Township
- Thickness Contours, mAHD
- Model Extent

0 10 20 30
Kilometres

Australian WATER Environments

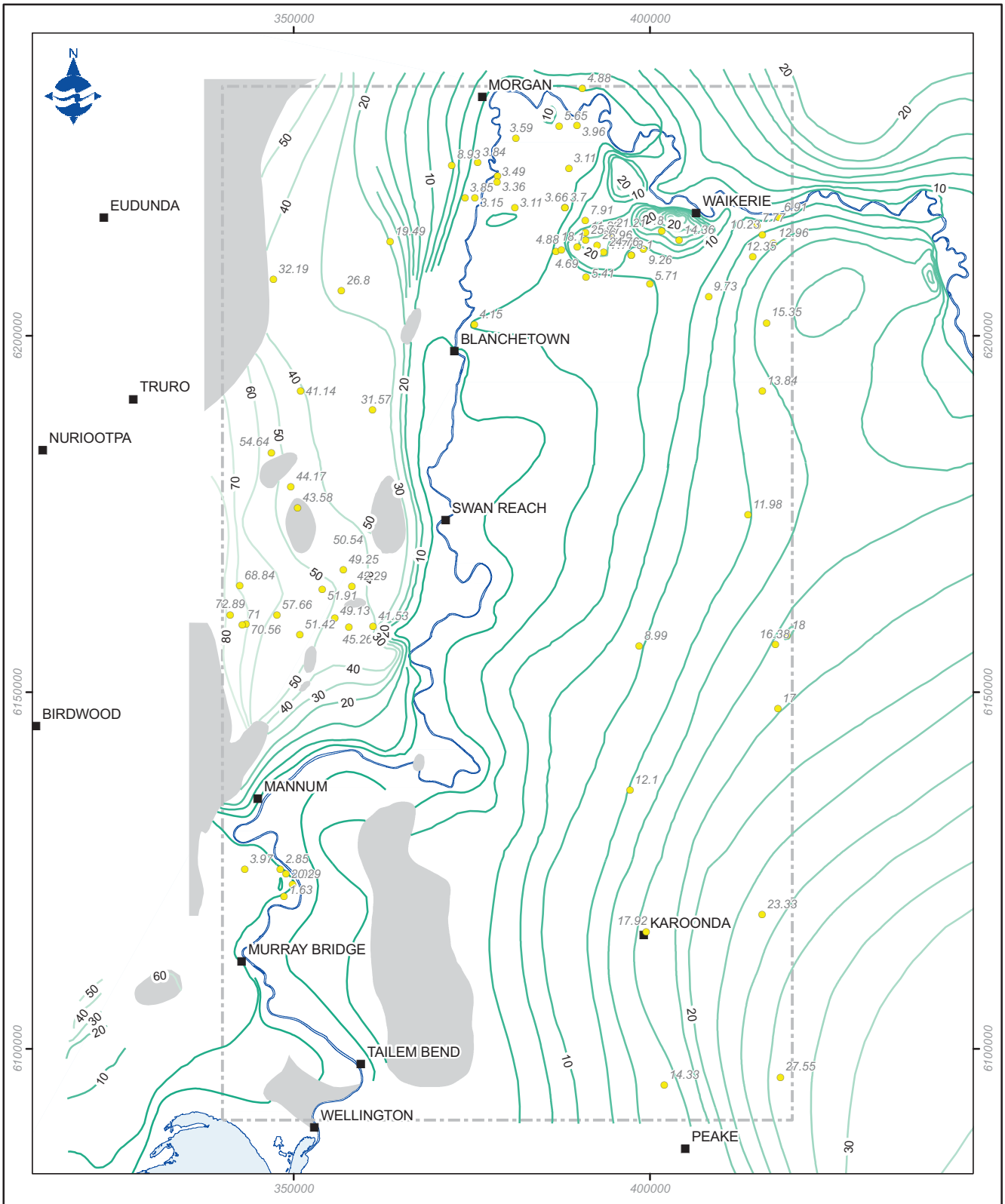
Murray Basin Hydrogeological Review

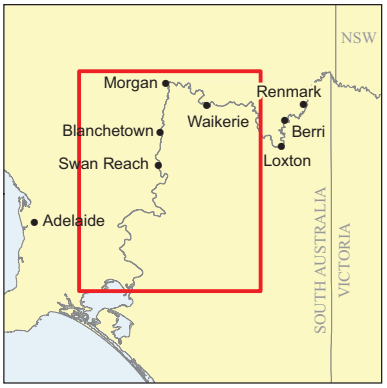
Morgan to Wellington

Murray Group Limestone Aquifer Thickness Contours (Surfer)

Job No. 09020 - 024
081222

Figure 6





0 10 20 30
Kilometres

LEGEND

- Township
- -38 Murray Group Wells, mAHD
- Murray Group Limestone Groundwater Contour
- Murray Group Limestone Groundwater Absent or Dry
- Coastline, watercourse
- Model Extent

Data Source:
Murray group wells, model extent: AWE;
Groundwater contours: AWE & MDBC;
Localities, state boundaries, watercourses: Geoscience Australia.

Australian WATER Environments

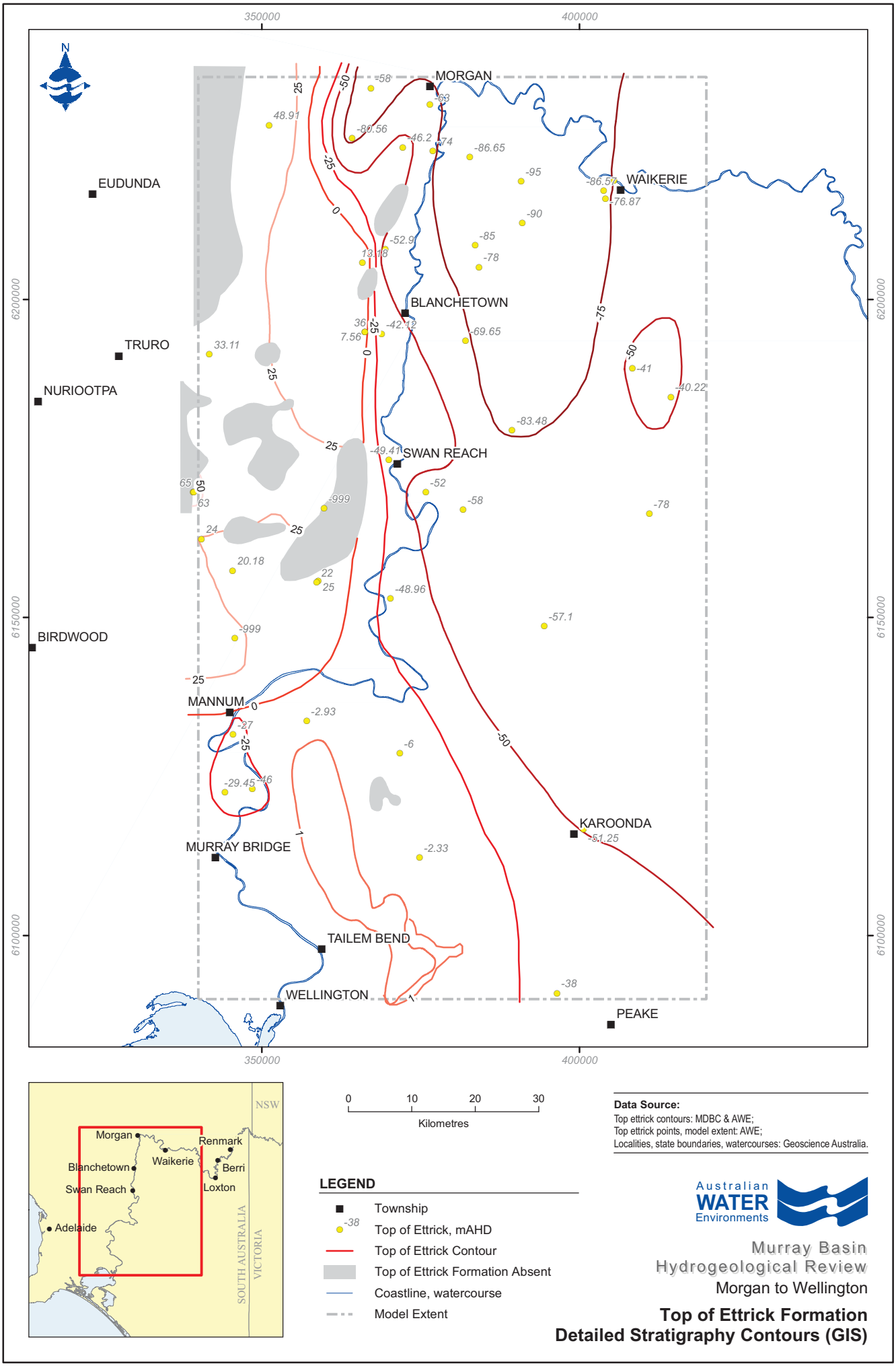
Murray Basin Hydrogeological Review

Morgan to Wellington

Murray Group Limestone Groundwater Contours March 2008 (GIS)

Job No. 09020 - 005
081211

Figure 7



Data Source:
Top ettrick contours: MDBC & AWE;
Top ettrick points, model extent: AWE;
Localities, state boundaries, watercourses: Geoscience Australia.

Australian WATER Environments

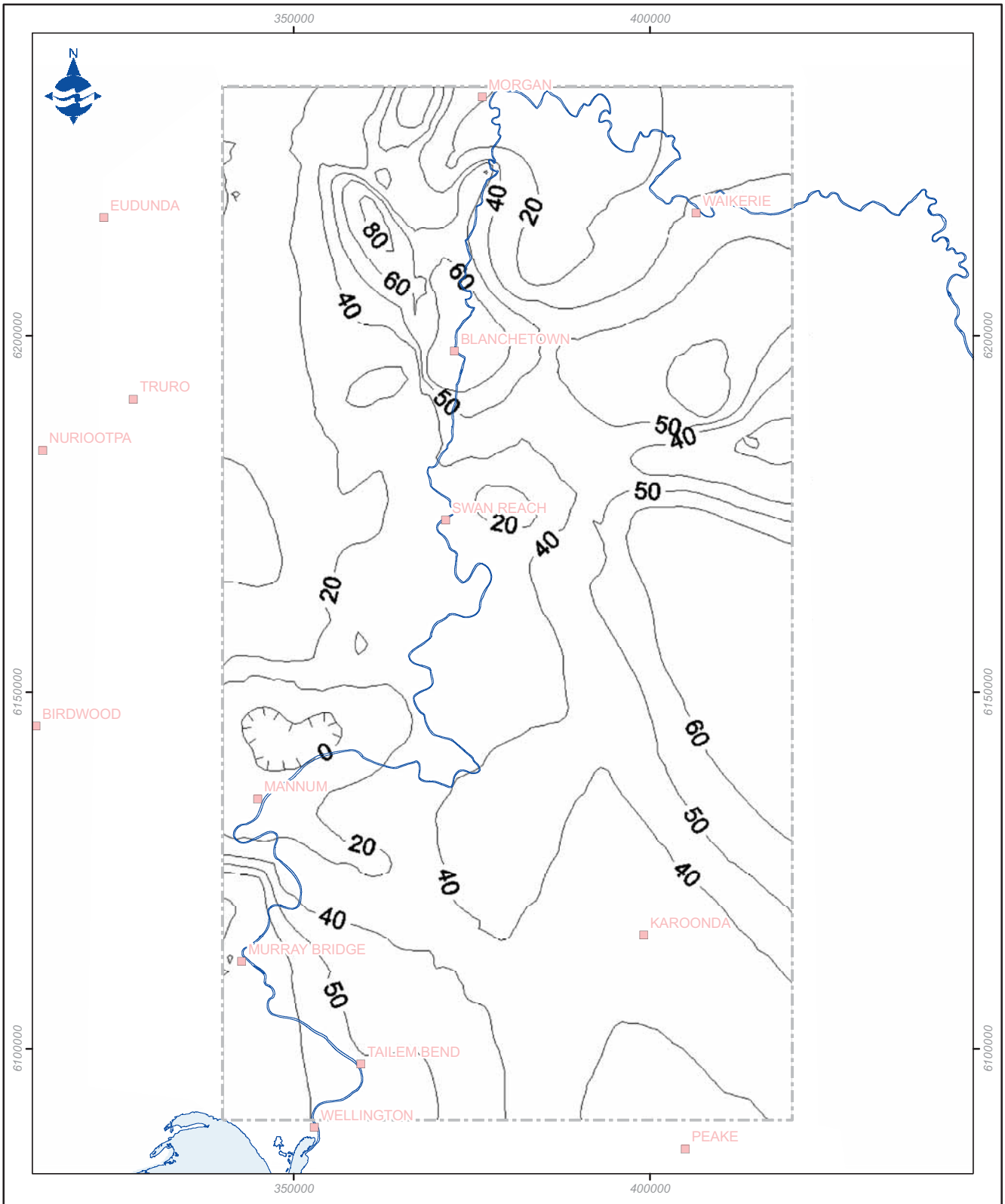
Murray Basin Hydrogeological Review

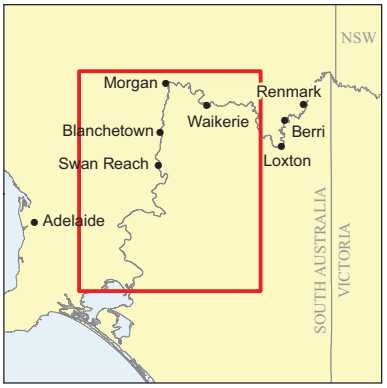
Morgan to Wellington

Top of Ettrick Formation
Detailed Stratigraphy Contours (GIS)

Job No. 09020 - 011
081126

Figure 8





LEGEND

- Township
- Thickness Contours, mAHD
- Model Extent

0 10 20 30
Kilometres

Australian WATER Environments

Murray Basin Hydrogeological Review

Morgan to Wellington

Ettrick Formation
Thickness Contours (Surfer)

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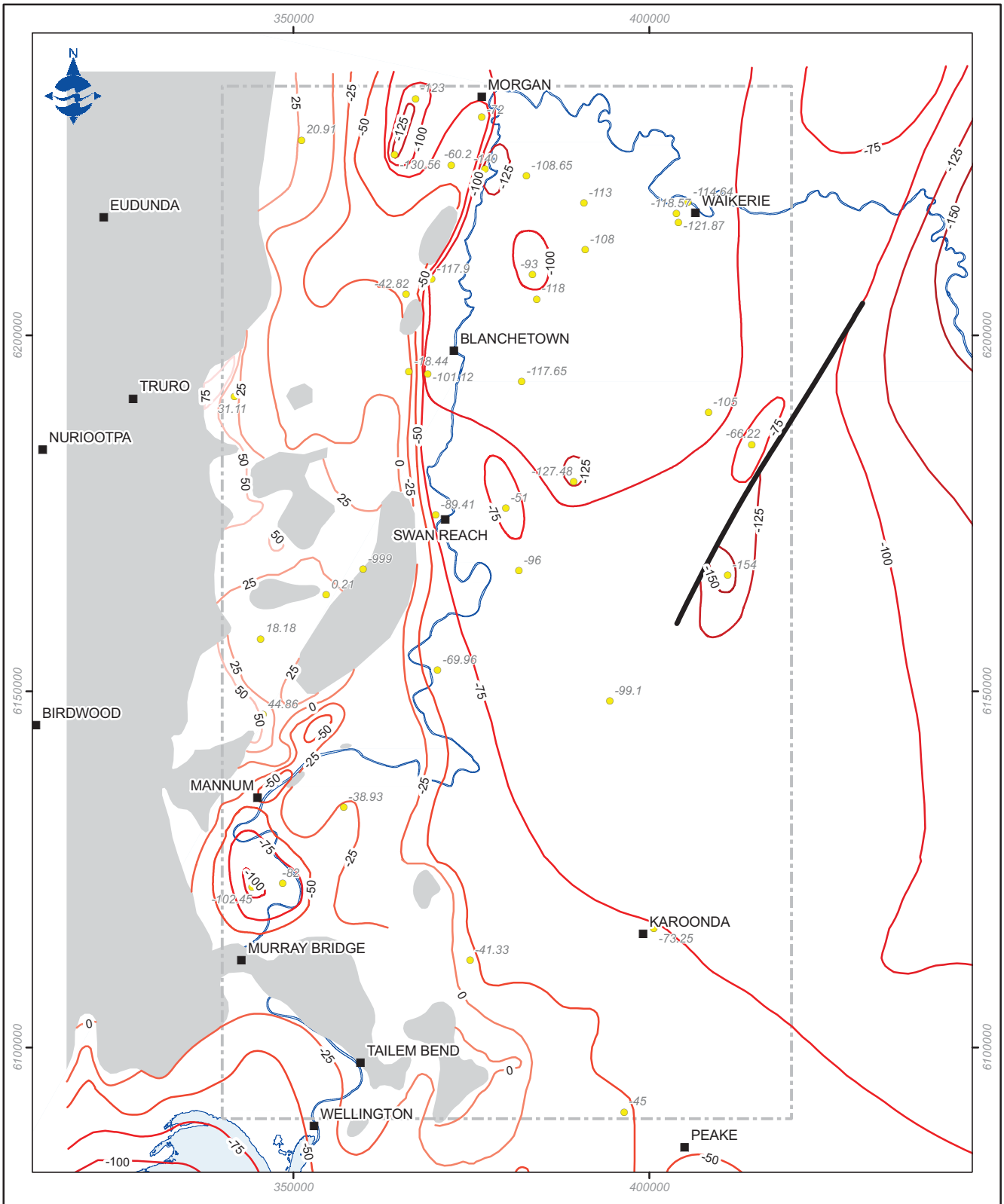
081222

Figure 9



LEGEND

- Township
- -38 Top of Renmark, mAHD
- Top of Renmark Contour
- Top of Renmark Group Absent
- Coastline, watercourse
- Model Extent
- Fault

Data Source:
Top renmark contours: MDBC & AWE;
Top renmark points, model extent: AWE;
Localities, state boundaries, watercourses: Geoscience Australia.

Australian WATER Environments

Murray Basin Hydrogeological Review

Morgan to Wellington

Top of Renmark Group Detailed Stratigraphy Contours (GIS)

Job No. 09020 - 012
081126

Figure 10

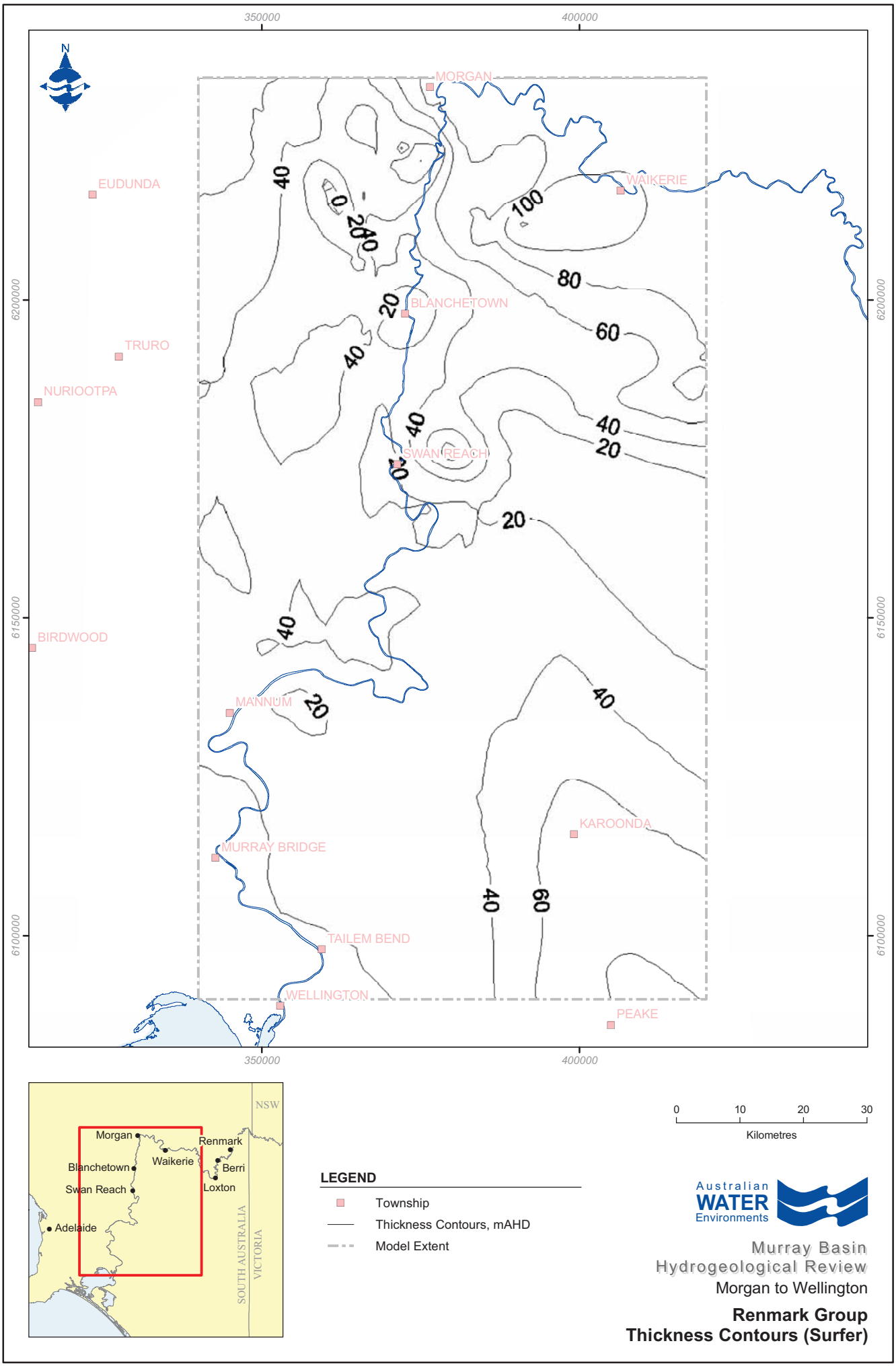


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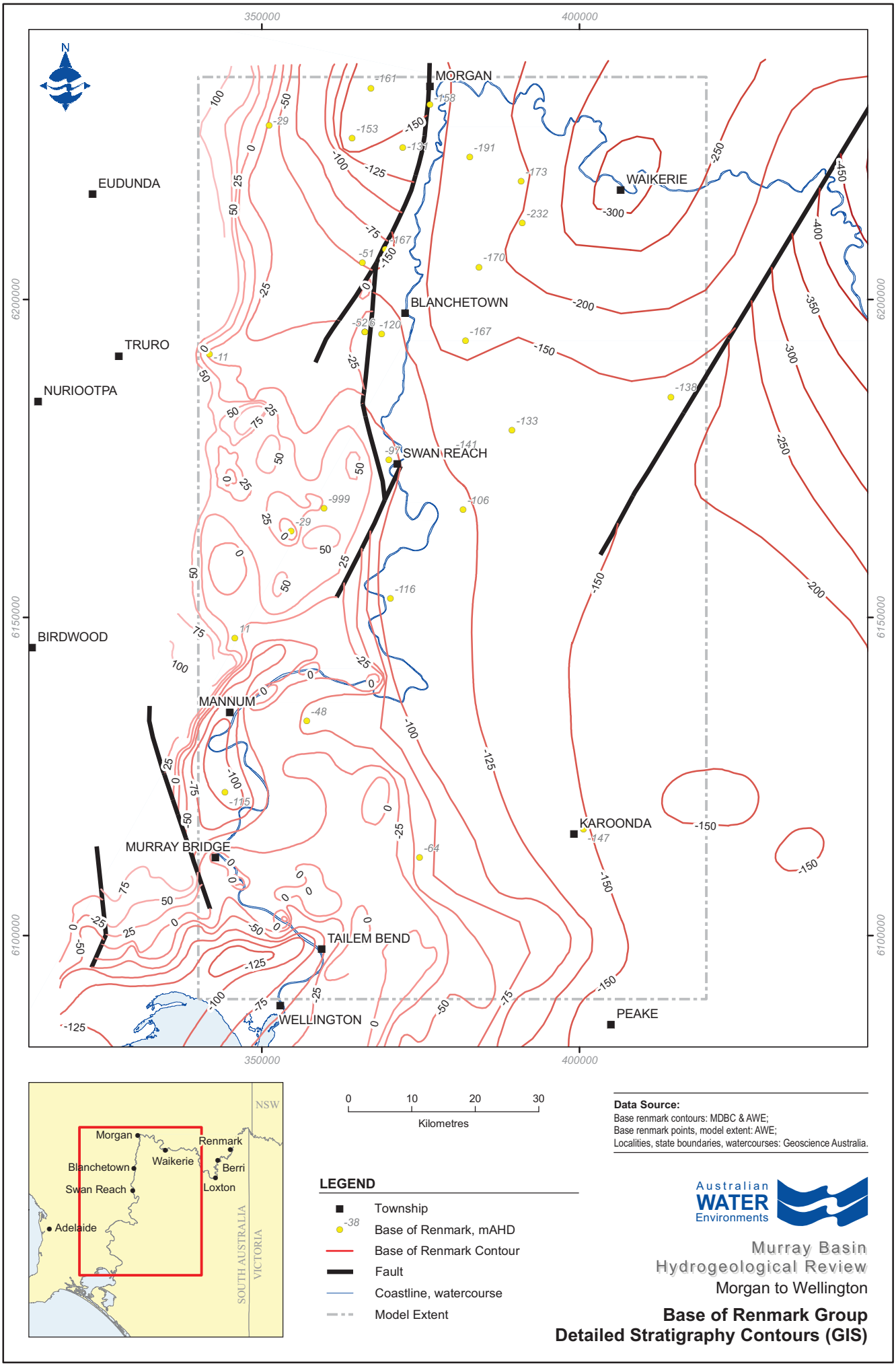
Figure 11



Data Source:
Base renmark contours: MDBC & AWE;
Base renmark points, model extent: AWE;
Localities, state boundaries, watercourses: Geoscience Australia.

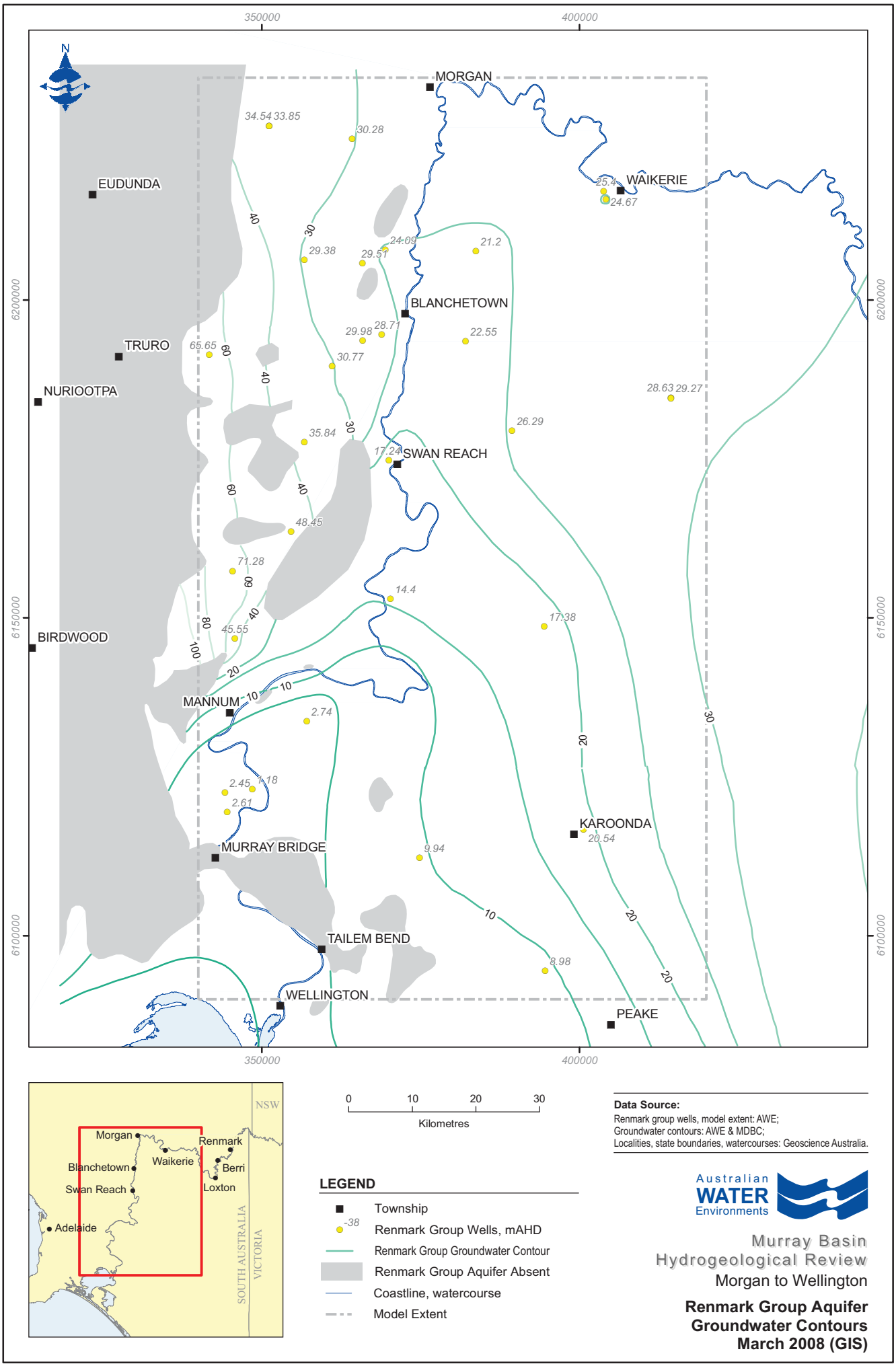
Australian WATER Environments

Murray Basin
Hydrogeological Review
Morgan to Wellington

Base of Renmark Group
Detailed Stratigraphy Contours (GIS)

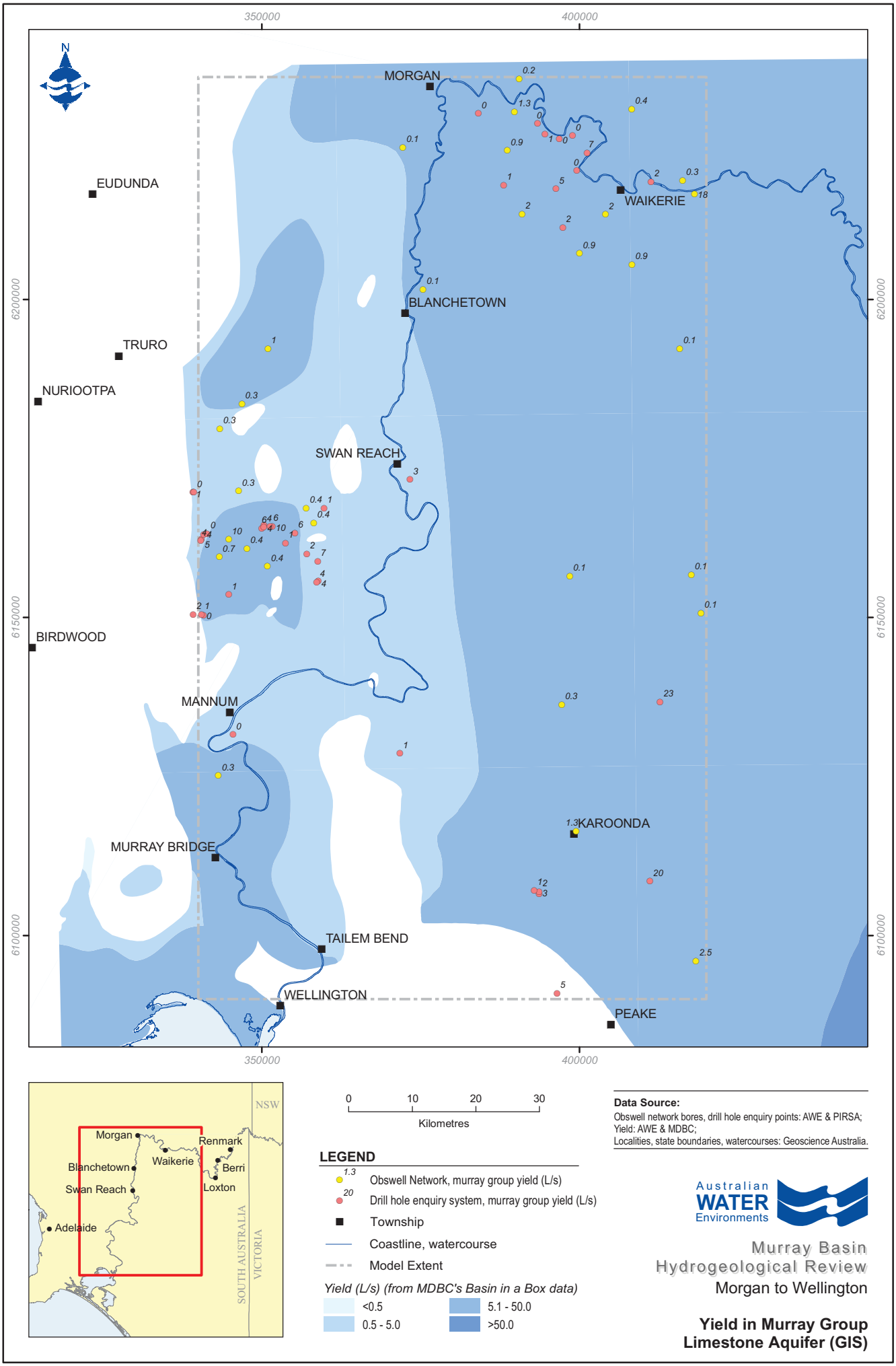
Job No. 09020 - 013
081126

Figure 12



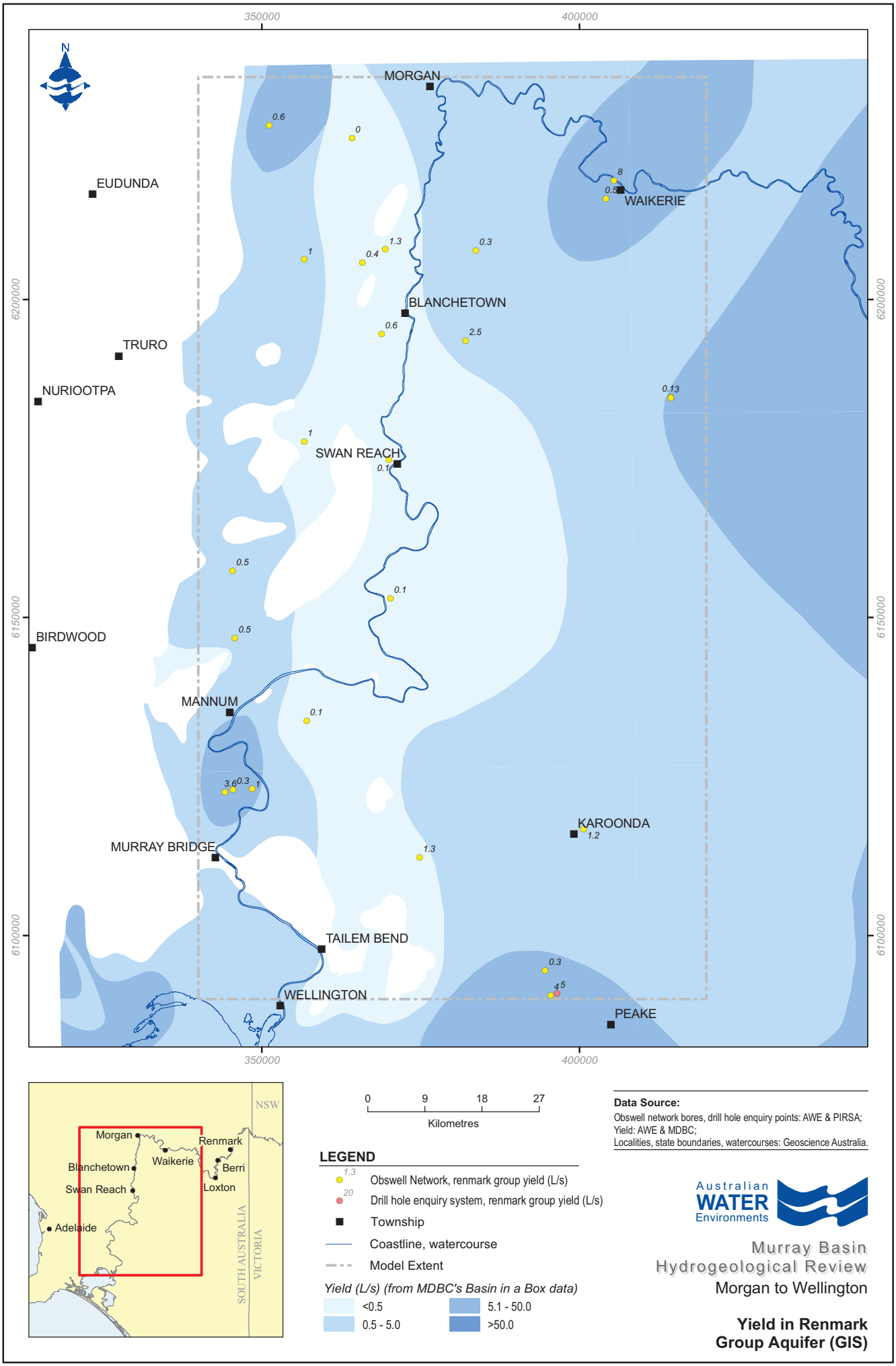
Job No. 09020 - 006
081126

Figure 13



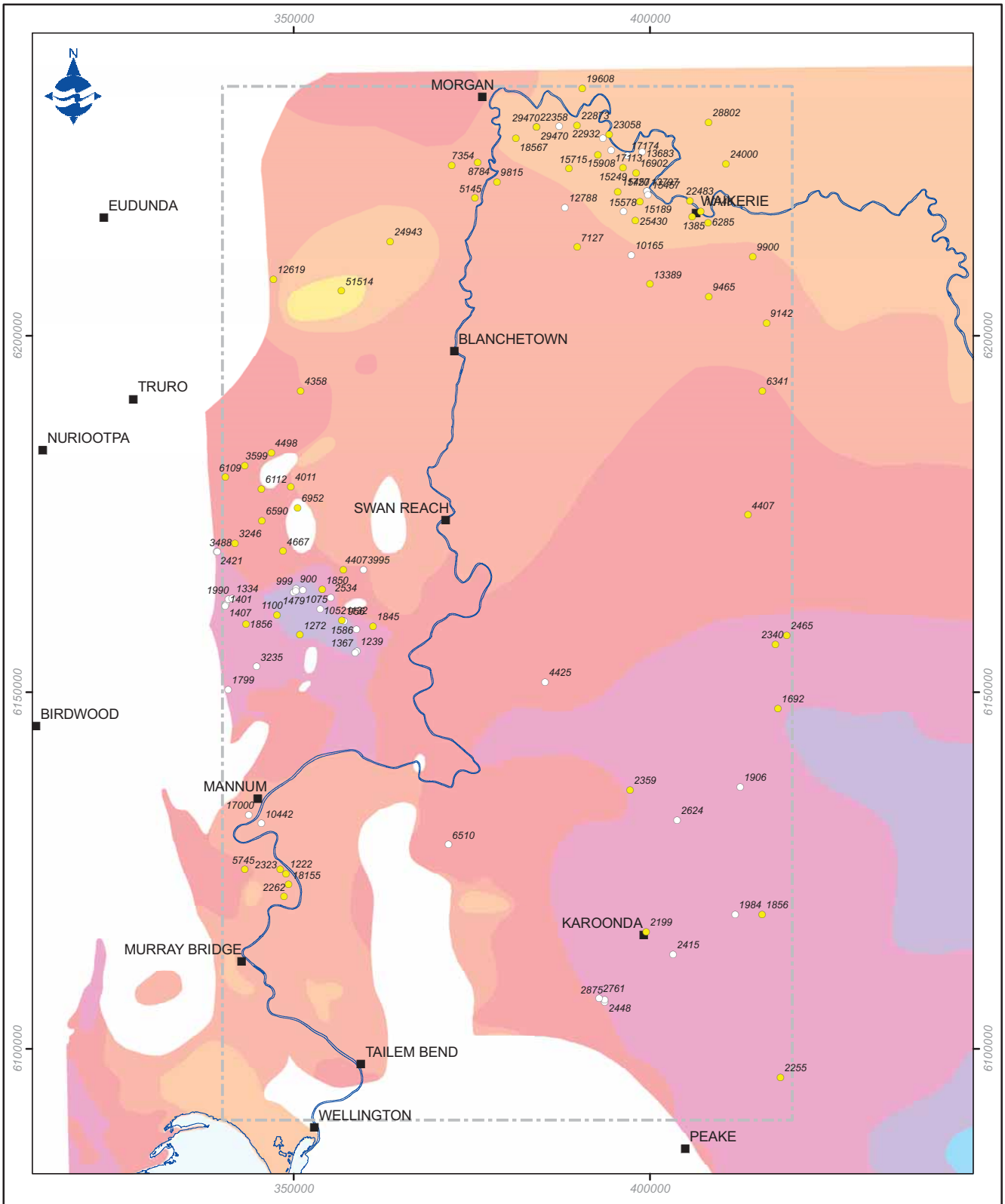
Job No. 09020 - 009
081126

Figure 14



Job No. 09020 - 010
081126

Figure 15



0 10 20 30
Kilometres

LEGEND

- 1856 / 2761 — Obswell Network, murray group salinity, TDS (mg/L); Drill hole enquiry system, murray group salinity, TDS (mg/L)
- Township
- Coastline, watercourse
- Model Extent

Salinity (mg/L)

- 500 - 1,000
- 1,001 - 1,500
- 1,501 - 3,000
- 3,001 - 7,000
- 7,001 - 14,000
- 14,001 - 35,000
- 35,001 - 100,000

Data Source:
obswell network bores, drill hole enquiry points: AWE & PIRSA;
Salinity: AWE & MDBC;
Localities, state boundaries, watercourses: Geoscience Australia.

Australian WATER Environments

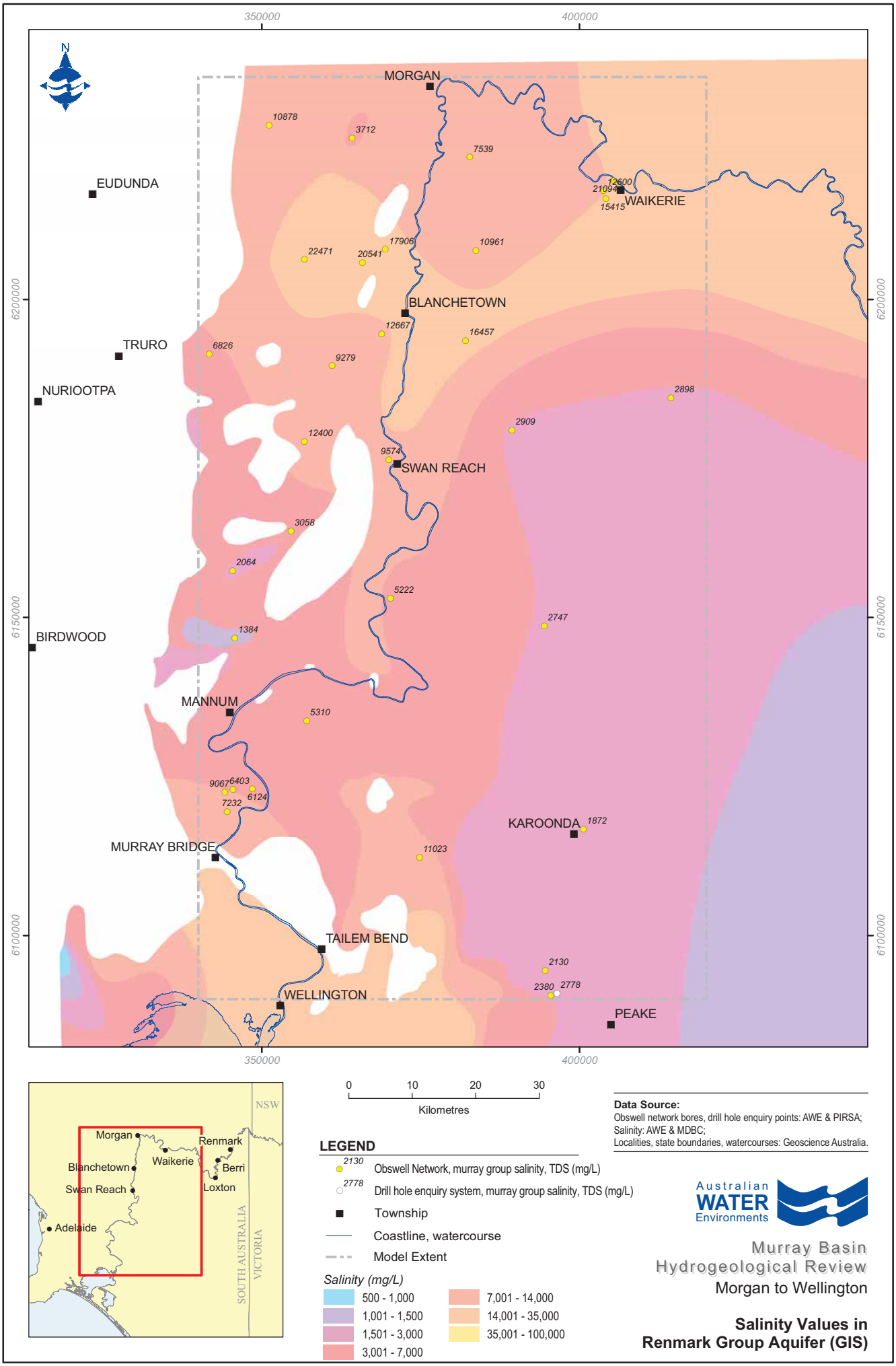
Murray Basin Hydrogeological Review

Morgan to Wellington

Salinity Values in Murray Group Limestone Aquifer (GIS)

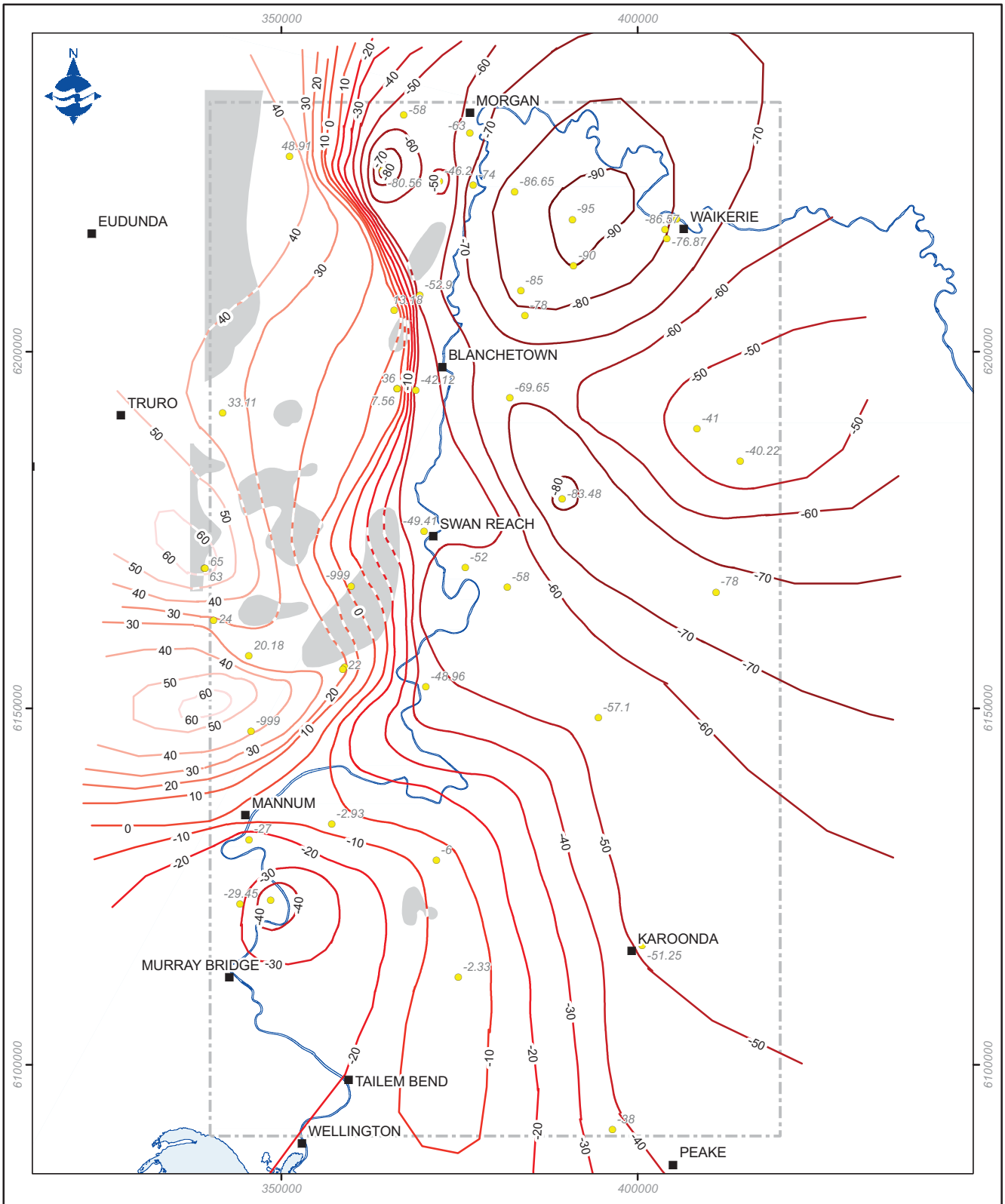
Job No. 09020 - 007
081126

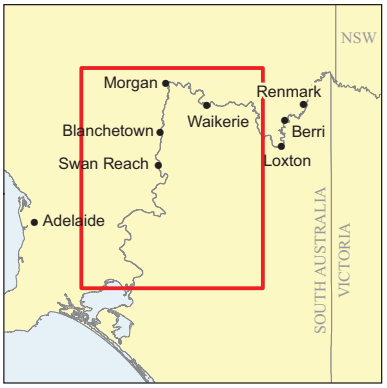
Figure 16



Job No. 09020 - 008
081126

Figure 17





0 10 20 30

Kilometres

LEGEND

- Township
- -38 Top of Ettrick, mAHD
- Top of Ettrick Contour
- Top of Ettrick Contour, interpreted
- Top of Ettrick Formation Absent
- Coastline, watercourse
- Model Extent

Data Source:

Top ettrick contours, top ettrick points, model extent: AWE;
Localities, state boundaries, watercourses: Geoscience Australia.

Australian WATER Environments

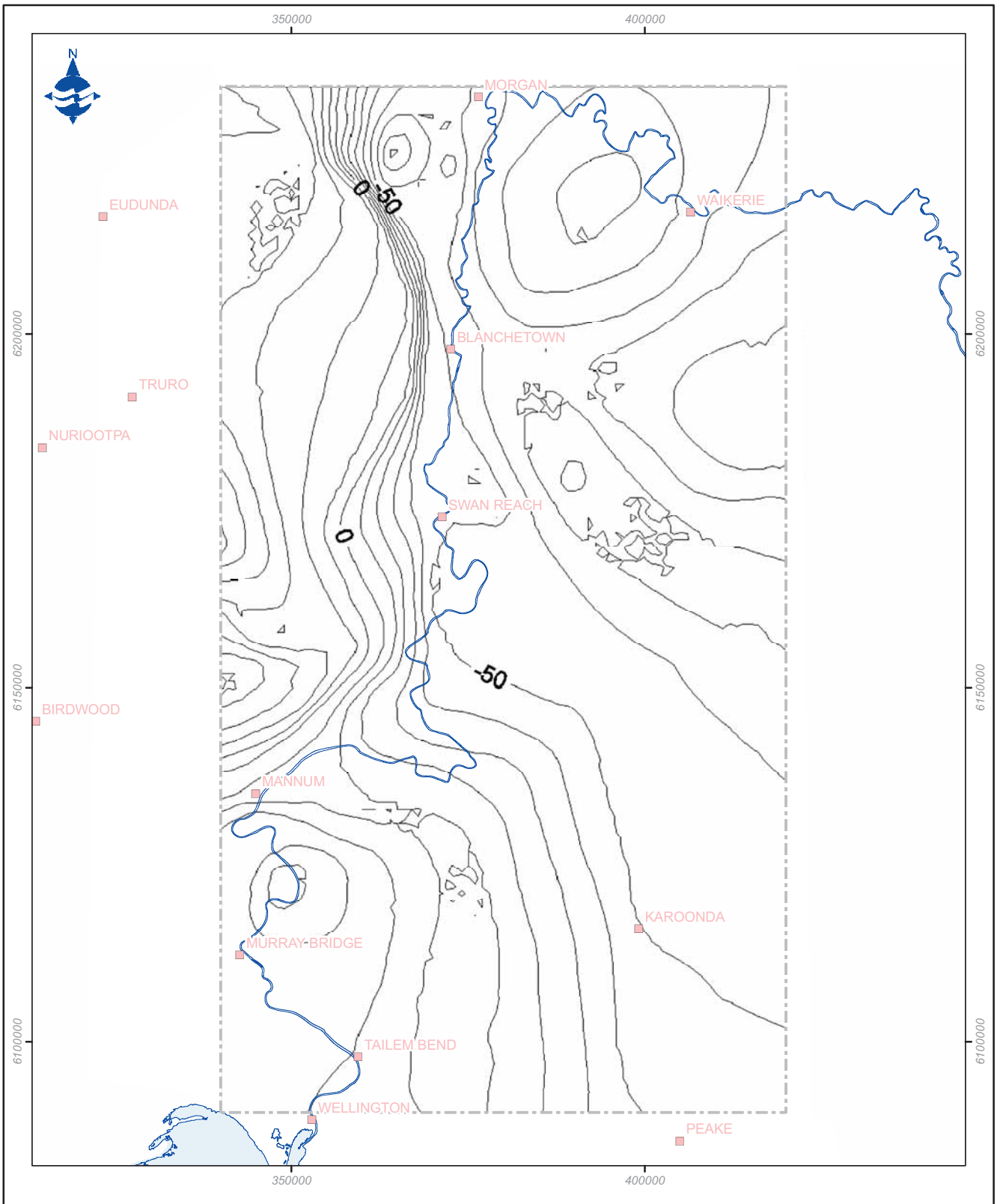
Murray Basin Hydrogeological Review

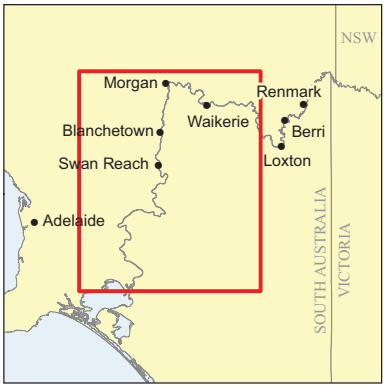
Morgan to Wellington

Top of Ettrick Formation Model Stratigraphy Contours (GIS)

Job No. 09020 - 002
081125

Figure 18a





LEGEND

- Township
- Stratigraphic Contours, mAHD
- Model Extent

0 10 20 30
Kilometres

Australian WATER Environments

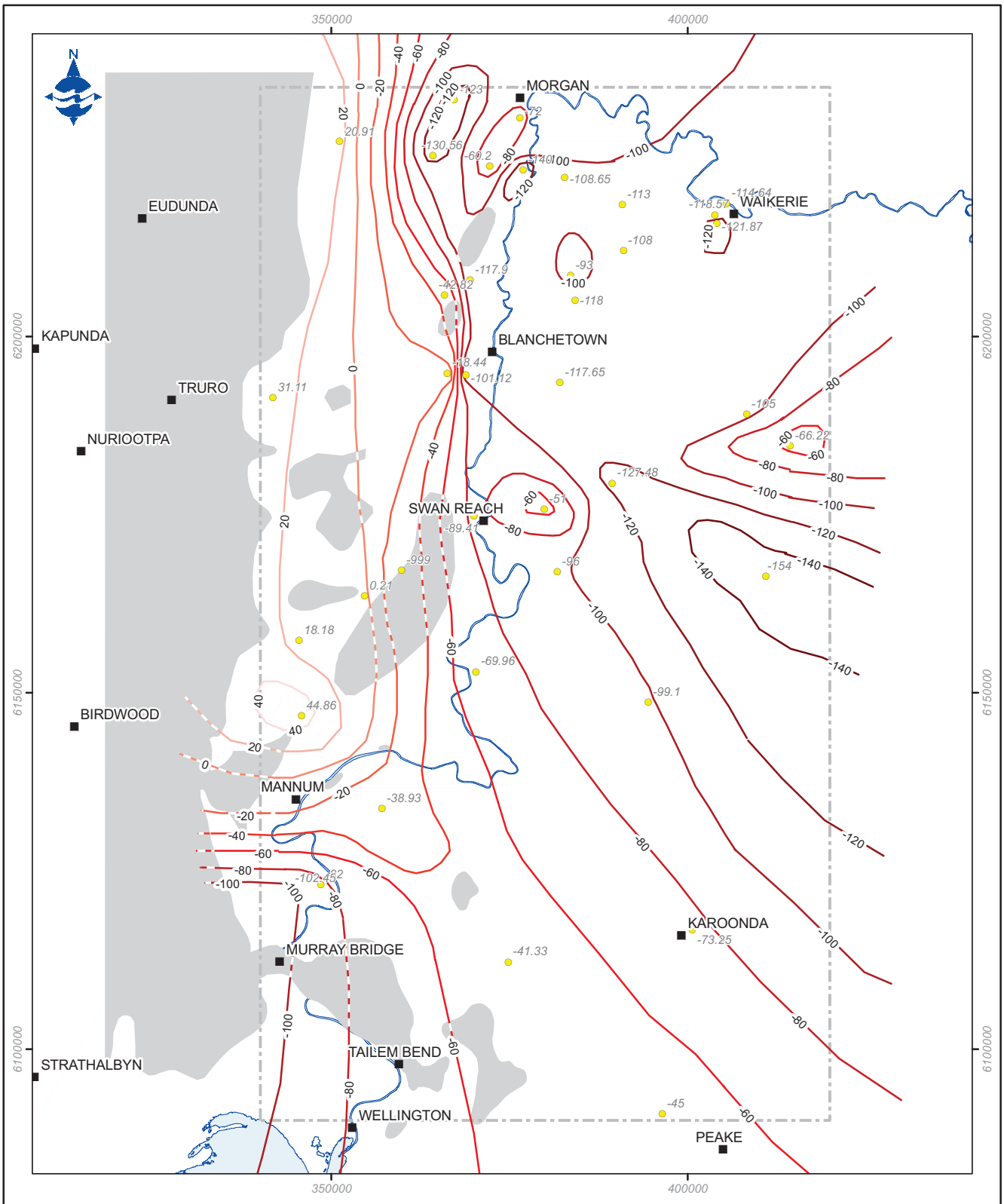
Murray Basin Hydrogeological Review

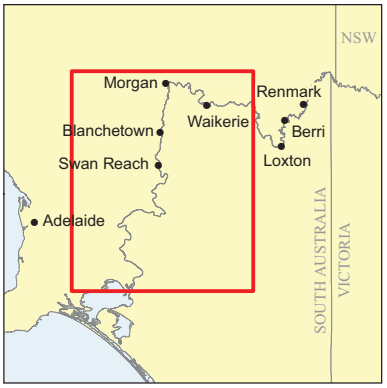
Morgan to Wellington

Top of Ettrick Formation
Model Stratigraphy Contours (Surfer)

Job No. 09020 - 018
081222

Figure 18b





0 10 20 30
Kilometres

LEGEND

- Township
- -38 Top of Renmark, mAHD
- Top of Renmark Contour
- Top of Renmark Contour, interpreted
- Top of Renmark Group Absent
- Coastline, watercourse
- Model Extent

Data Source:
Top renmark contours, top renmark points, model extent: AWE;
Localities, state boundaries, watercourses: Geoscience Australia.

Australian WATER Environments

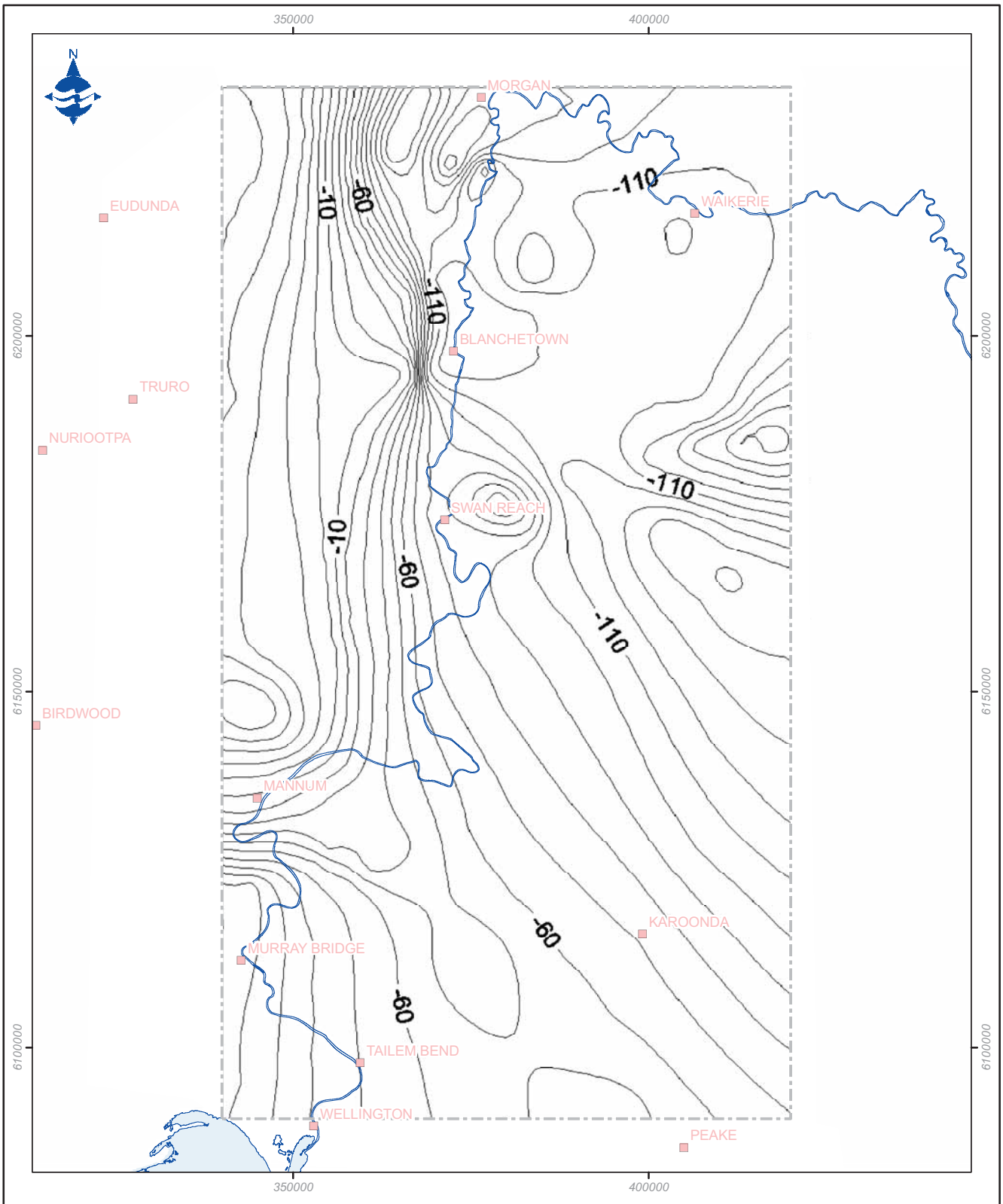
Murray Basin Hydrogeological Review

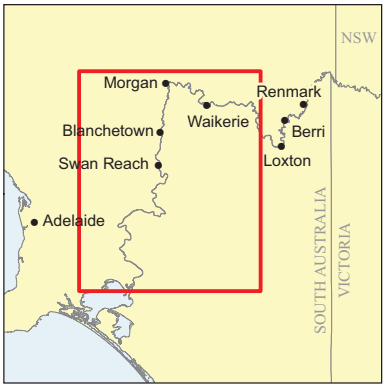
Morgan to Wellington

Top of Renmark Group Model Stratigraphy Contours (GIS)

Job No. 09020 - 003
081125

Figure 19a





LEGEND

- Township
- Stratigraphic Contours, mAHD
- Model Extent

0 10 20 30

Kilometres

Australian WATER Environments

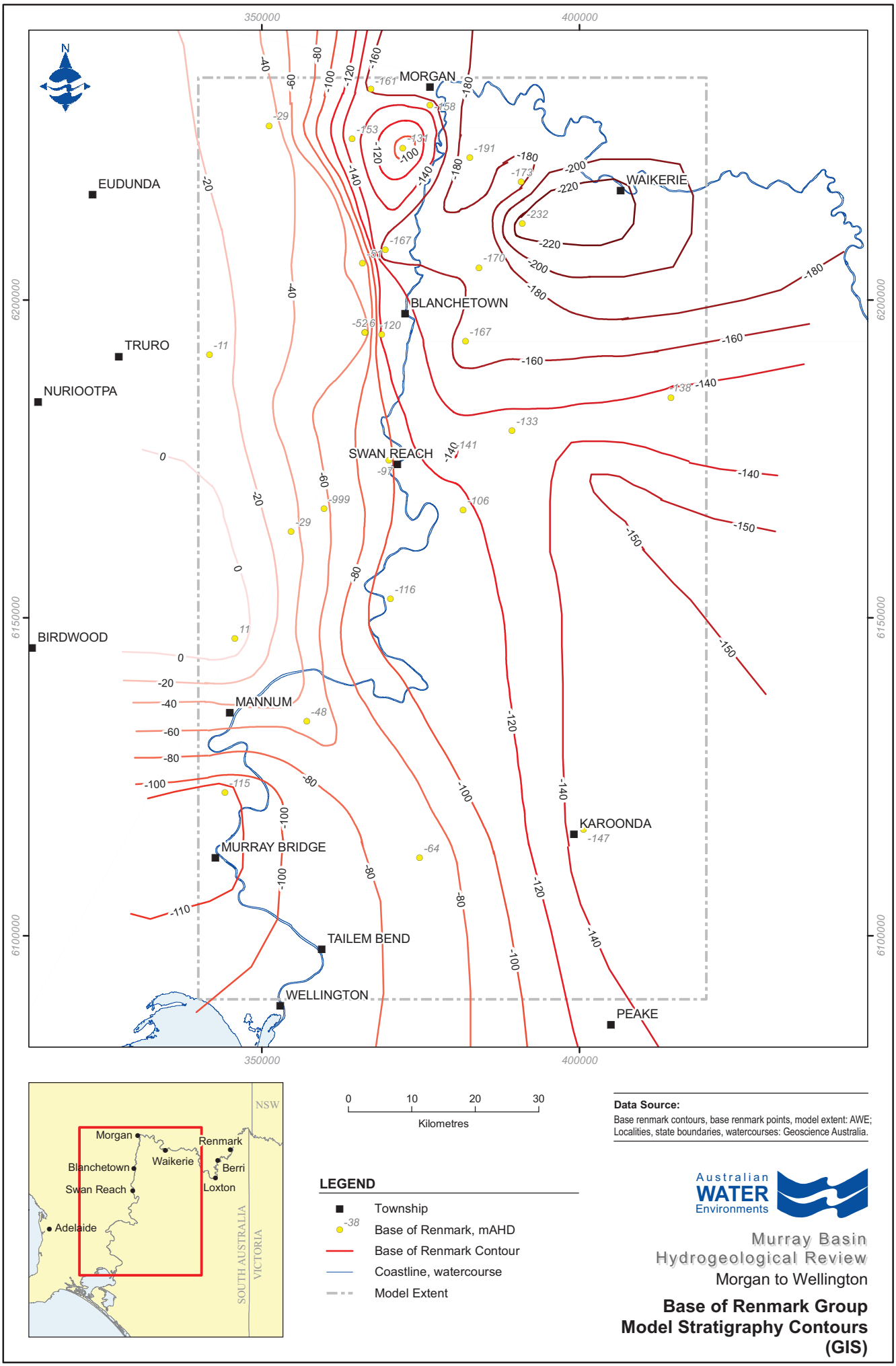
Murray Basin Hydrogeological Review

Morgan to Wellington

Top of Renmark Group
Model Stratigraphy Contours (Surfer)

Job No. 09020 - 019
081222

Figure 19b



LEGEND

- Township
- -38 Base of Renmark, mAHD
- Base of Renmark Contour
- Coastline, watercourse
- Model Extent

Data Source:

Base renmark contours, base renmark points, model extent: AWE; Localities, state boundaries, watercourses: Geoscience Australia.

Australian WATER Environments

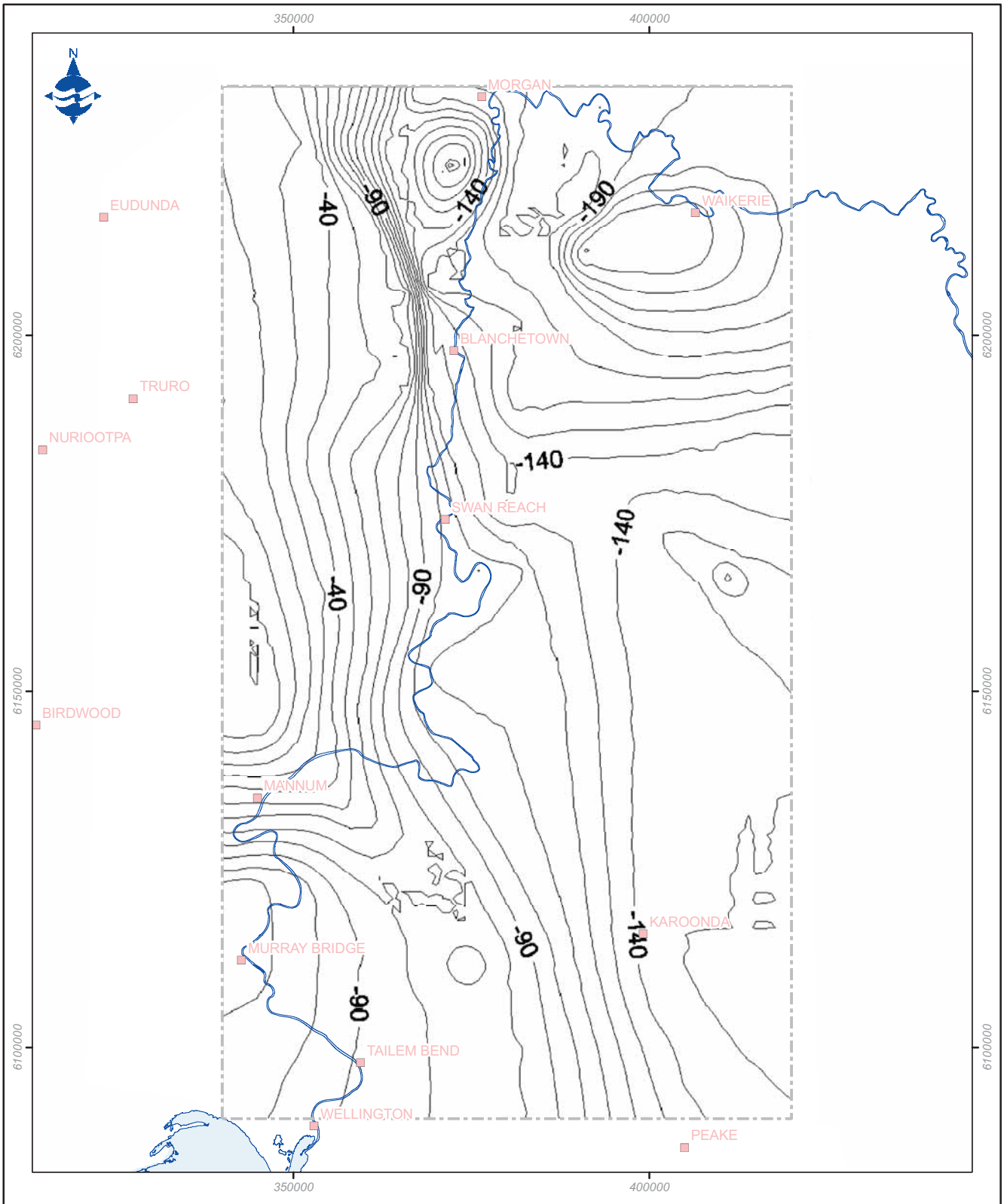
Murray Basin Hydrogeological Review

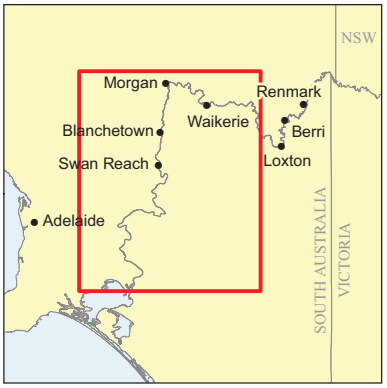
Morgan to Wellington

Base of Renmark Group Model Stratigraphy Contours (GIS)

Job No. 09020 - 004
081125

Figure 20a





LEGEND

- Township
- Stratigraphic Contours, mAHD
- Model Extent

0 10 20 30
Kilometres

Australian WATER Environments

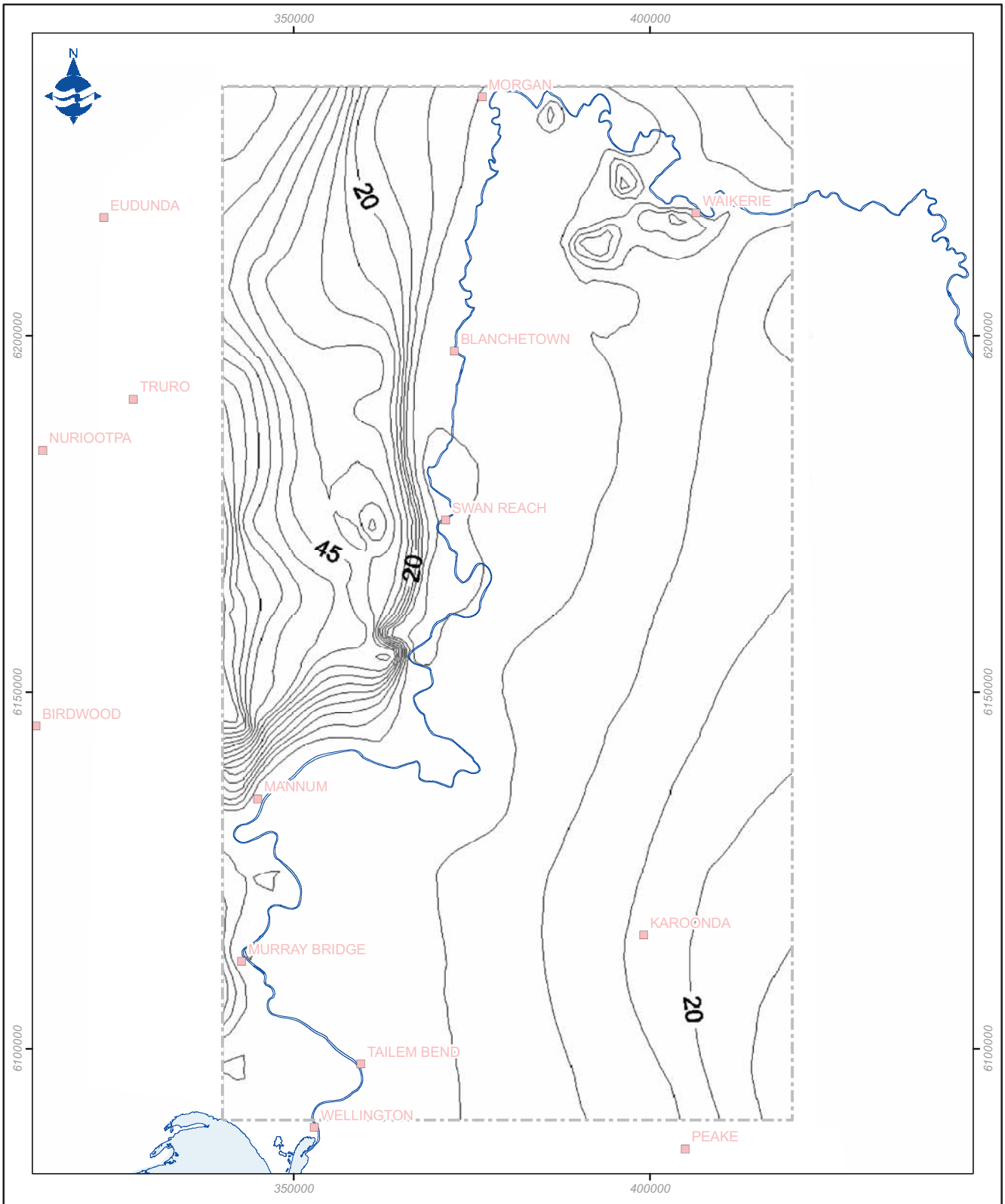
Murray Basin Hydrogeological Review

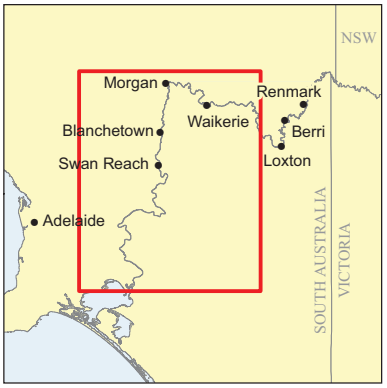
Morgan to Wellington

Base of Renmark Group Model Stratigraphy Contours (Surfer)

Job No. 09020 - 020
081222

Figure 20b





LEGEND

- Township
- Murray Group Limestone Aquifer Groundwater Contours, mAHD
- Model Extent

0 10 20 30
Kilometres

Australian WATER Environments

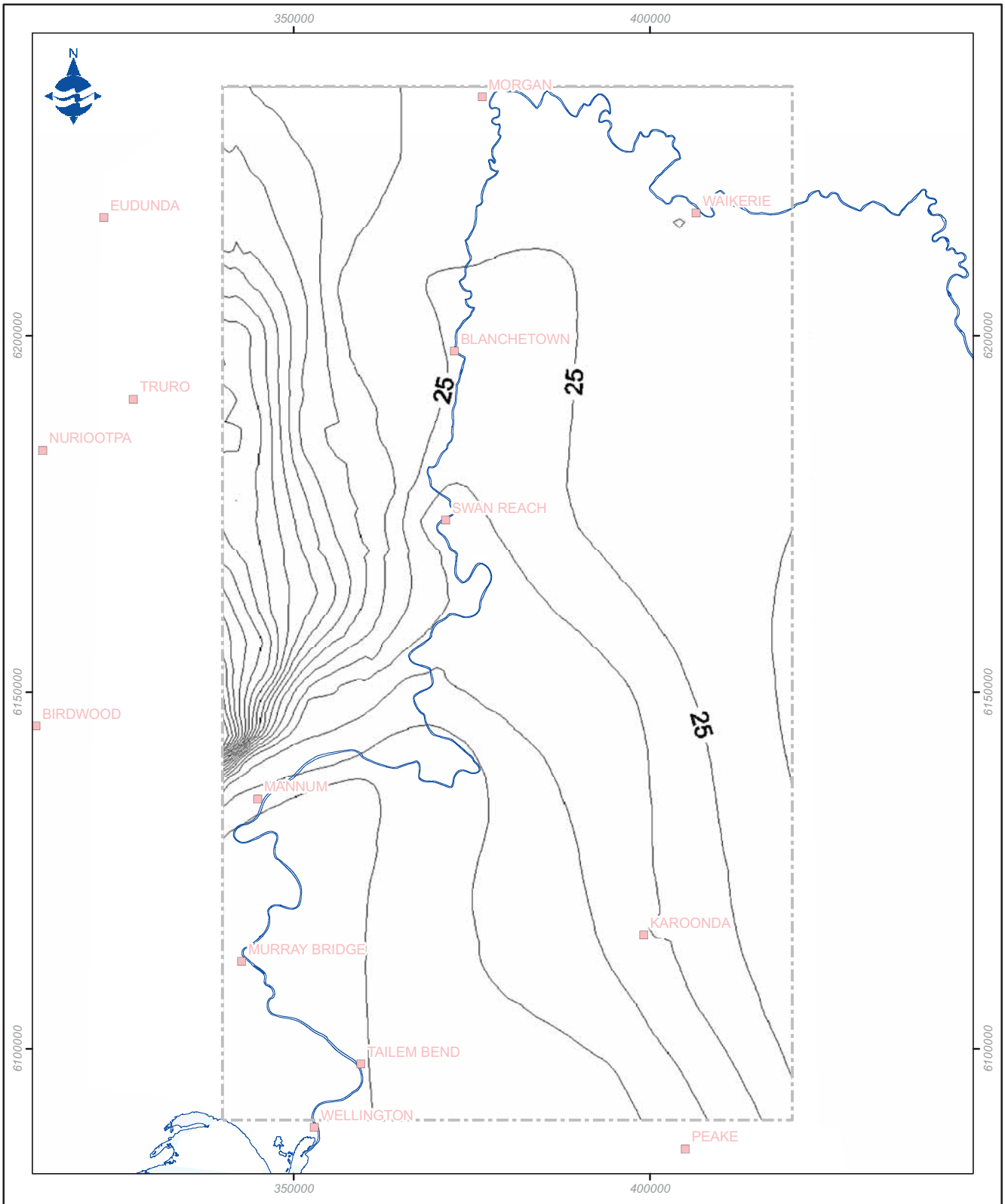
Murray Basin Hydrogeological Review

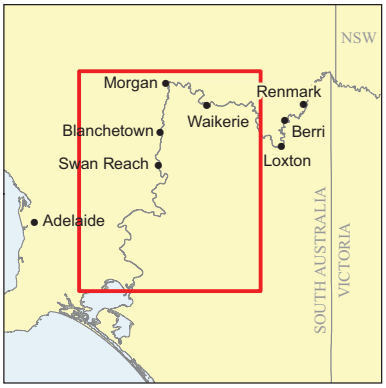
Morgan to Wellington

Murray Group Limestone Aquifer Groundwater Contours March 2008 (Surfer)

Job No. 09020 - 022
081222

Figure 21





LEGEND

- Township
- Renmark Group Aquifer Groundwater Contours, mAHD
- Model Extent

0 10 20 30
Kilometres

Australian WATER Environments

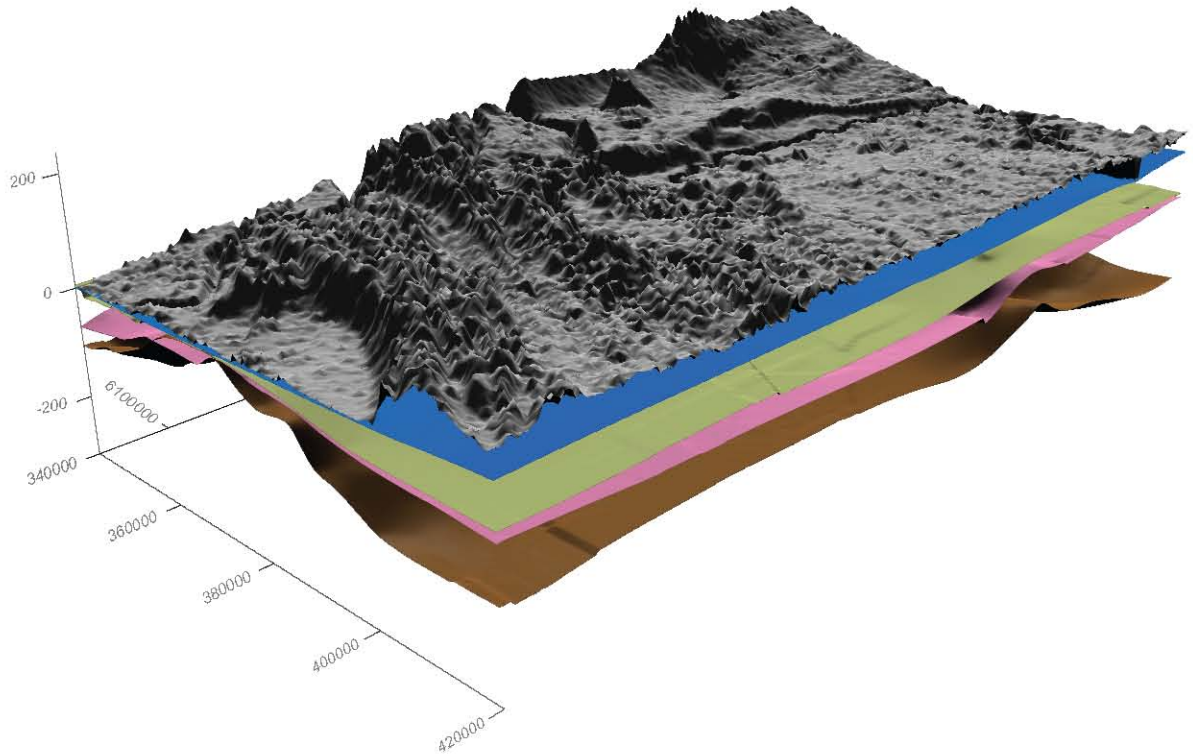
Murray Basin Hydrogeological Review

Morgan to Wellington

Renmark Group Aquifer Groundwater Contours March 2008 (Surfer)

Job No. 09020 - 023
081222

Figure 22



LEGEND

- Ground/surface
- Murray Group mAHD
- Top of EF
- Top of RGA
- Base of RGA

Murray Basin
Hydrogeological Review
Morgan to Wellington

Model Lithological Facies in 3D

Australian WATER Environments

Job No. 09020 - 029
081212

Figure 23

TABLE

Table 1: Reviewed DWLBC Drill Hole Stratigraphy
DWLBC-Structure information within Model Domain (DWLBC excel file: AllStratigraphy_Tash_2005)
AWE Comparison Data

Unit Number	Log Source	Name	Total Depth (m)	Easting	Northing	Grnd Elev	Top of MGA	**AWE Top MGA**	Top of EF	**AWE Top EF**	Top RGA	**AWE Top RGA**	Base of RGA	**AWE Base of RGA**
672702277	MF	M149	170.60	344218	6122529	46.55	18	18	76	76	149	149	163	162
672802449	MF	M141	147.00	357081	6133752	81.07	22	18	85	84	122	120	134	129
672802486	MF	M144	90.00	345781	6146785	94.86	13	14		none	49	50	82	84
672802487	DES	M145	120.00	345444	6157383	110.18	47	47		90	93	92		
672802489		M146	86.00	354655	6163582	57.21	10				57		86	
672901165	MF	M119	150.00	351146	6227434	114.91	12	16	70	66	96	94	140	144
672901170	MF	M124	116.00	341784	6191448	105.11	32	34	68	72	80	74	116	110
682701530	MF	M131	225.40	400654	6116736	62.75	31	30	112	114	142	136	221	200/221
682701562	MF	M148	170.00	374831	6112242	99.67	80?	74	102	102	141	141	164	164
682800730	DES	M125	135	370004	6174803	32.59	2	2	112	^82		122	130	
682800731	MF	M126	96.00	389412	6179431	52.52	10	8		136		180		186
682800732	MF	M127	174.00	370275	6152990	57.04	19	18	105	106	127	127	174	173
682800733	NL	81MBR16	204	381722	6167001	50	6		108		146		156	
682800736	MF	M128	201.10	394496	6148653	70.90	35	20/35	128	128	172	170		
682800776	NL	81MBR17	154.00	375822	6169756	40.00	2		92					
682800777	NL	81mbr18	182.00	379880	6175794	39.00	1		86		90		180	
682900264	MF	MORGAN COAL 1	196.29	376453	6230678	40	0	0	101	103	112		172	^198
682900269	MF	MORGAN COAL 3	175.41	376937	6223409	30	0		102	104	168	170		
682900578	MF	27W	329.49	404107	6215849	33.13	6.1	2	117.35	110	161.54	155		
682900802	MF	M101	234.00	364242	6225395	59.44	27	27	140	140	190	190	234	212/212
682900803	MF	M102	188	372199	6223956	49.8	0	2	94	96	110	110	142	182/180
682900804	MF & AWE	M103	224	382769	6222387	31.35	4	4	118	118	142	140	215	222
682900807	MF	M106	153.4	365861	6205806	77.18	0	2	67	64		120	128	128
682900809	MF	M142	229.50	369451	6207914	47.10	4.5	6	102	100	150	180/150	214	214
682900811	MF	M143	221	368859	6194624	45.88	6	6	90	88	133	147	162	166
682900966	NL, AWE	81MBR21	204	384222	6205128	30	2	*12	110	108	145	148	200	
682900968	NL, AWE	81MBR23	270	391022	6212078	30	42	**12	120	120	138	138	262	
682900969	NL, AWE	81MBR24	204	390872	6218578	31	16	*14	126	126	144	144	202	204
682900970	NL, AWE	81MBR28	174	383622	6208578	35	6	*10	120	120	148	128		
682900978	NL	82MP1	244	367189	6233254	70	32		128		193		231	
682900992	MF	RG 1 (FORMERLY	146.00	405471	6218688	10.36	22	22	83	82	130	125		
682900995	NL	82FS6RM	126	366242	6194878	76	6		40				70	
682900996	NL	82FS6P1	152	366242	6194878	77.56	8		70		96		130	
682901140	MF	RG 2	194.00	403846	6217103	42.43	15	15	129		164	161		
692800569	NL	81MBR31	246.00	411014	6166318	60.00	26		138		214			
692900423	MF	M129	230	414391	6184692	63.78	7	6	105	104	123	130	201	202
692900649	NL	81MBR30	222	408322	6189178	63	22		104		168			

Notes
AWE - Records from previous AWE investigation (Copy of log viewed)
MF - Log from MicroFiche
DES - Drillhole Enquiry System Log
NL - No Log on MicroFiche
20/35 - Data from Lithological Log/Driller Log
^ - Viewed only Lithological log on microFiche
* Bryant creek formation
**Glenforslan formation
Variation (+10m)

Table 2a: New and Reviewed Drill Hole Stratigraphy - Top of Murray Group to Base of Renmark Group
Morgan to Wellington Bore Log Stratigraphy

				Bore hole log data (mbgl)				
Unit No.	Easting	Northing	Reference (mAHD)	Top MGA	Top EF	Top RGA	Base RGA	Comments - New DES Bores
6727-2271	348514	6123064	6.00	36	52	88	NA	EOH in RGA (microfiche)
6727-2277	344218	6122529	46.55	18	76	149	162	
6727-3033*	343092	6112626	23	9	NA	NA	NA	EOH in MGA
6727-3037*	342940	6112852	9	3.25	NA	NA	NA	EOH in MGA
6728-2449	357081	6133752	81.07	18	84	120	129	
6728-2486	345781	6146785	94.86	14	none	50	84	
6728-2487	345444	6157383	110.18	47	90	92	NA	EOH in RGA
6728-2489	354655	6163582	57.21	10	NR	57	86	
6728-3533*	359830	6167169	86	7	none	none	none	Base of Murray Group at 98m, Over basement
6728-3540*	355225	6163271	59	6	NA	NA	NA	EOH in MGA
6728-3550*	344819	6153601	82	15	NA	NA	NA	EOH in MGA
6728-3553*	358799	6158816	57	5	NA	NA	NA	EOH in MGA
6728-3555*	340823	6150337	119	32	NA	NA	NA	Brown clay at base considered MGA
6728-3560*	340516	6162362	95	38	71	NA	NA	Grey clay considered as EF or like
6728-3561*	357089	6159970	60	0	NA	NA	NA	MGA from surface, EOH in MGA
6728-3562*	353719	6161647	92	29	NA	NA	NA	EOH in MGA, yellow clay considered MGA
6728-3575*	340420	6162064	102	34	NA	NA	NA	EOH in MGA
6728-3576*	350003	6164049	69	11	NA	NA	NA	EOH in MGA, coral content considered MGA
6728-3577*	339245	6150516	130	45	NA	NA	NA	EOH in MGA
6728-3578*	340532	6150506	118	40	NA	NA	NA	EOH in MGA
6728-3579*	340859	6163000	99	26	NA	NA	NA	EOH in MGA
6728-3600*	351663	6164320	68	14	NA	NA	NA	EOH in MGA
6728-3603*	339209	6169700	177	98	114	NA	NA	Grey clay considered as EF or like
6728-3604*	339323	6169686	177	86	112	NA	NA	Grey mudstone considered as EF or like
6728-3631*	358873	6155739	72	9	47	NA	NA	Grey clay considered as EF or like
6728-3632*	358653	6155519	73	10	51	NA	NA	Grey clay considered as EF or like
6728-3640*	345501	6131588	52	36	79	NA	NA	Grey clay considered as EF or like
6728-3669*	350372	6164577	67	0.5	NA	NA	NA	EOH in MGA
6728-3671*	351330	6164311	67	12	NA	NA	NA	EOH in MGA
6728-3673*	350297	6164228	72	1	NA	NA	NA	EOH in MGA
6728-3700	343749	6132808	14.98	0.5	NA	NA	NA	EOH in MGA
6728-3704*	341420	6163227	101	35	NA	NA	NA	EOH in MGA
6729-1165	351146	6227434	114.91	16	66	94	144	
6729-1170	341784	6191448	105.11	34	72	74	116	
6827-1530	400654	6116736	62.75	30	114	136	210	
6827-1562	374831	6112242	99.67	74	102	141	164	
6827-1892*	393681	6106584	75	7	NA	NA	NA	EOH in MGA
6827-1901*	396474	6090932	17	13	55	62	NA	EOH in RGA (Buccleuch)
6827-1902*	403260	6113274	66	31	NA	NA	NA	EOH in MGA
6827-1903*	393674	6106889	67	7	NA	NA	NA	EOH in MGA
6827-1911*	392874	6107103	68	4	NA	NA	NA	EOH in MGA
6828-730	370004	6174803	32.59	2	82	122	130	
6828-731	389412	6179431	52.52	8	136	180	186	
6828-732	370275	6152990	57.04	18	106	127	173	
6828-733	381722	6167001	50	6	108	146	156	
6828-736	394496	6148653	70.90	27.5	128	170	NA	
6828-776	375822	6169756	40.00	2	92	NA	NA	
6828-777	379880	6175794	39.00	1	86	90	180	
6828-901*	371734	6128649	92	14	98	NA	NA	Shales & clay considered EF or like
6828-917*	385309	6151453	48	8	NA	NA	NA	EOH in MGA
6828-920*	403830	6132100	61	29	NA	NA	NA	EOH in MGA
6828-922*	373305	6171699	38	0.5	NA	NA	NA	EOH in MGA
6829-264	376453	6230678	40	0	103	112	198	
6829-269	376937	6223409	30	0	104	170	NA	
6829-578	404107	6215849	33.13	2	110	155	NA	
6829-802	364242	6225395	59.44	27	140	190	212	
6829-803	372199	6223956	49.8	2	96	110	181	
6829-804	382769	6222387	31.35	4	118	140	222	
6829-805	382103	6193567	30.35	10	100	148	197	EOH in RGA (microfiche)
6829-807	365861	6205806	77.18	2	64	120	128	
6829-809	369451	6207914	47.10	6	100	165	214	
6829-811	368859	6194624	45.88	6	88	147	166	
6829-966	384222	6205128	30	12	108	148	200	EOH in RGA
6829-968	391022	6212078	30	12	120	138	262	EOH in RGA
6829-969	390872	6218578	31	14	126	144	204	
6829-970	383622	6208578	35	10	120	128	NA	EOH in RGA
6829-978	367189	6233254	70	32	128	193	231	
6829-992	405471	6218688	10.36	22	82	125	NA	
6829-995	366242	6194878	76	6	40	NR	70	
6829-996	366242	6194878	77.56	8	70	96	130	
6829-1140	403846	6217103	42.43	15	129	161	NA	
6829-1469	399596	6220247	42.69	42	NA	NA	NA	EOH in MGA
6829-1470	393429	6227675	35.9	40	NA	NA	NA	EOH in MGA
6829-1471	398910	6225788	37.73	30	NA	NA	NA	EOH in MGA
6829-1472	396838	6225312	32.99	26	NA	NA	NA	EOH in MGA
6829-1473	394591	6226031	33.64	40	NA	NA	NA	EOH in MGA
6829-1501	399592	6220248	41.99	41	NA	NA	NA	EOH in MGA
6829-1502	399743	6219828	48.41	30	NA	NA	NA	EOH in MGA
6829-1504*	401215	6223033	41	19	NA	NA	NA	EOH in MGA
6829-1533	384103	6229267	30.22	2	NA	NA	NA	EOH in MGA
6829-1534*	406460	6222945	37	2	NA	NA	NA	EOH in MGA
6829-1535	387302	6229383	32.24	6	NA	NA	NA	EOH in MGA
6829-1536	388122	6217963	31.08	5	NA	NA	NA	EOH in MGA, fossiliferous throughout
6829-1537	397397	6211337	50.8	38	NA	NA	NA	EOH in MGA
6829-1538	396307	6217413	34.13	14	NA	NA	NA	EOH in MGA
6927-946	411075	6108512	68	40	NA	NA	NA	EOH in MGA
6927-956*	411951	6118859	62	48	NA	NA	NA	EOH in MGA
6928-569	411014	6166318	60.00	26	138	214	234#	EOH in RGA
6928-704*	412687	6136736	66	49	NA	NA	NA	EOH in MGA
6929-423	414391	6184692	63.78	6	104	130	202	
6929-649	408322	6189178	63	22	104	168	NA	
6929-1000*	411270	6218533	43	14	NA	NA	NA	EOH in MGA

6727-2277 - Contained in DWLBC Model
* Elevation Data from DEM
# Control data point (Used for conversion to Surfer)
NR - Not recorded
NA - Not Applicable
27.5 Median between Lithological and Driller Log

Table 2b: New and Reviewed Drill Hole Stratigraphy - Top of Ettrick Formation
Morgan to Wellington Bore Log Stratigraphy

Unit No.	Easting	Northing	Reference (mAHD)	Elevation top EF (mbgl)	Elevation top EF (mAHD)
6727-2271	348514	6123064	6.00	52	-46.00
6727-2277	344218	6122529	46.55	76	-29.45
6727-3033*	343092	6112626	23	NA	NA
6727-3037*	342940	6112852	9	NA	NA
6728-2449	357081	6133752	81.07	84	-2.93
6728-2486	345781	6146785	94.86	none	none
6728-2487	345444	6157383	110.18	90	20.18
6728-2489	354655	6163582	57.21	NR	NA
6728-3533*	359830	6167169	86	none	none
6728-3540*	355225	6163271	59	NA	NA
6728-3550*	344819	6153601	82	NA	NA
6728-3553*	358799	6158816	57	NA	NA
6728-3555*	340823	6150337	119	NA	NA
6728-3560*	340516	6162362	95	71	24.00
6728-3561*	357089	6159970	60	NA	NA
6728-3562*	353719	6161647	92	NA	NA
6728-3575*	340420	6162064	102	NA	NA
6728-3576*	350003	6164049	69	NA	NA
6728-3577*	339245	6150516	130	NA	NA
6728-3578*	340532	6150506	118	NA	NA
6728-3579*	340859	6163000	99	NA	NA
6728-3600*	351663	6164320	68	NA	NA
6728-3603*	339209	6169700	177	114	63.00
6728-3604*	339323	6169686	177	112	65.00
6728-3631*	358873	6155739	72	47	25.00
6728-3632*	358653	6155519	73	51	22.00
6728-3640*	345501	6131588	52	79	-27.00
6728-3669*	350372	6164577	67	NA	NA
6728-3671*	351330	6164311	67	NA	NA
6728-3673*	350297	6164228	72	NA	NA
6728-3700	343749	6132808	14.98	NA	NA
6728-3704*	341420	6163227	101	NA	NA
6729-1165	351146	6227434	114.91	66	48.91
6729-1170	341784	6191448	105.11	72	33.11
6827-1530	400654	6116736	62.75	114	-51.25
6827-1562	374831	6112242	99.67	102	-2.33
6827-1892*	393681	6106584	75	NA	NA
6827-1901*	396474	6090932	17	55	-38.00
6827-1902*	403260	6113274	66	NA	NA
6827-1903*	393674	6106889	67	NA	NA
6827-1911*	392874	6107103	68	NA	NA
6828-730	370004	6174803	32.59	82	-49.41
6828-731	389412	6179431	52.52	136	-83.48
6828-732	370275	6152990	57.04	106	-48.96
6828-733	381722	6167001	50	108	-58.00
6828-736	394496	6148653	70.90	128	-57.10
6828-776	375822	6169756	40.00	92	-52.00
6828-777	379880	6175794	39.00	86	-47.00
6828-901*	371734	6128649	92	98	-6.00
6828-917*	385309	6151453	48	NA	NA
6828-920*	403830	6132100	61	NA	NA
6828-922*	373305	6171699	38	NA	NA
6829-264	376453	6230678	40	103	-63.00
6829-269	376937	6223409	30	104	-74.00
6829-578	404107	6215849	33.13	110	-76.87
6829-802	364242	6225395	59.44	140	-80.56
6829-803	372199	6223956	49.8	96	-46.20
6829-804	382769	6222387	31.35	118	-86.65
6829-805	382103	6193567	30.35	100	-69.65
6829-807	365861	6205806	77.18	64	13.18
6829-809	369451	6207914	47.10	100	-52.90
6829-811	368859	6194624	45.88	88	-42.12
6829-966	384222	6205128	30	108	-78.00
6829-968	391022	6212078	30	120	-90.00
6829-969	390872	6218578	31	126	-95.00
6829-970	383622	6208578	35	120	-85.00
6829-978	367189	6233254	70	128	-58.00
6829-992	405471	6218688	10.36	82	-71.64
6829-995	366242	6194878	76	40	36.00
6829-996	366242	6194878	77.56	70	7.56
6829-1140	403846	6217103	42.43	129	-86.57
6829-1469	399596	6220247	42.69	NA	NA
6829-1470	393429	6227675	35.9	NA	NA
6829-1471	398910	6225788	37.73	NA	NA
6829-1472	396838	6225312	32.99	NA	NA
6829-1473	394591	6226031	33.64	NA	NA
6829-1501	399592	6220248	41.99	NA	NA
6829-1502	399743	6219828	48.41	NA	NA
6829-1504*	401215	6223033	41	NA	NA
6829-1533	384103	6229267	30.22	NA	NA
6829-1534*	406460	6222945	37	NA	NA
6829-1535	387302	6229383	32.24	NA	NA
6829-1536	388122	6217963	31.08	NA	NA
6829-1537	397397	6211337	50.8	NA	NA
6829-1538	396307	6217413	34.13	NA	NA
6927-946	411075	6108512	68	NA	NA
6927-956*	411951	6118859	62	NA	NA
6928-569	411014	6166318	60.00	138	-78.00
6928-704*	412687	6136736	66	NA	NA
6929-423	414391	6184692	63.78	104	-40.22
6929-649	408322	6189178	63	104	-41.00
6929-1000*	411270	6218533	43	NA	NA

6727-2277 - Contained in DWLBC Model
* Elevation Data from DEM
NR - Not recorded
NA - Not Applicable
27.5

Table 2c: New and Reviewed Drill Hole Stratigraphy - Top of Renmark Group
Morgan to Wellington Bore Log Stratigraphy

Unit No.	Easting	Northing	Reference (mAHD)	Elevation top RGA (mbgl)	Elevation top RGA (mAHD)
6727-2271	348514	6123064	6.00	88	-82.00
6727-2277	344218	6122529	46.55	149	-102.45
6727-3033*	343092	6112626	23	NA	NA
6727-3037*	342940	6112852	9	NA	NA
6728-2449	357081	6133752	81.07	120	-38.93
6728-2486	345781	6146785	94.86	50	44.86
6728-2487	345444	6157383	110.18	92	18.18
6728-2489	354655	6163582	57.21	57	0.21
6728-3533*	359830	6167169	86	none	none
6728-3540*	355225	6163271	59	NA	NA
6728-3550*	344819	6153601	82	NA	NA
6728-3553*	358799	6158816	57	NA	NA
6728-3555*	340823	6150337	119	NA	NA
6728-3560*	340516	6162362	95	NA	NA
6728-3561*	357089	6159970	60	NA	NA
6728-3562*	353719	6161647	92	NA	NA
6728-3575*	340420	6162064	102	NA	NA
6728-3576*	350003	6164049	69	NA	NA
6728-3577*	339245	6150516	130	NA	NA
6728-3578*	340532	6150506	118	NA	NA
6728-3579*	340859	6163000	99	NA	NA
6728-3600*	351663	6164320	68	NA	NA
6728-3603*	339209	6169700	177	NA	NA
6728-3604*	339323	6169686	177	NA	NA
6728-3631*	358873	6155739	72	NA	NA
6728-3632*	358653	6155519	73	NA	NA
6728-3640*	345501	6131588	52	NA	NA
6728-3669*	350372	6164577	67	NA	NA
6728-3671*	351330	6164311	67	NA	NA
6728-3673*	350297	6164228	72	NA	NA
6728-3700	343749	6132808	14.98	NA	NA
6728-3704*	341420	6163227	101	NA	NA
6729-1165	351146	6227434	114.91	94	20.91
6729-1170	341784	6191448	105.11	74	31.11
6827-1530	400654	6116736	62.75	136	-73.25
6827-1562	374831	6112242	99.67	141	-41.33
6827-1892*	393681	6106584	75	NA	NA
6827-1901*	396474	6090932	17	62	-45.00
6827-1902*	403260	6113274	66	NA	NA
6827-1903*	393674	6106889	67	NA	NA
6827-1911*	392874	6107103	68	NA	NA
6828-730	370004	6174803	32.59	122	-89.41
6828-731	389412	6179431	52.52	180	-127.48
6828-732	370275	6152990	57.04	127	-69.96
6828-733	381722	6167001	50	146	-96.00
6828-736	394496	6148653	70.90	170	-99.10
6828-776	375822	6169756	40.00	NA	NA
6828-777	379880	6175794	39.00	90	-51.00
6828-901*	371734	6128649	92	NA	NA
6828-917*	385309	6151453	48	NA	NA
6828-920*	403830	6132100	61	NA	NA
6828-922*	373305	6171699	38	NA	NA
6829-264	376453	6230678	40	112	-72.00
6829-269	376937	6223409	30	170	-140.00
6829-578	404107	6215849	33.13	155	-121.87
6829-802	364242	6225395	59.44	190	-130.56
6829-803	372199	6223956	49.8	110	-60.20
6829-804	382769	6222387	31.35	140	-108.65
6829-805	382103	6193567	30.35	148	-117.65
6829-807	365861	6205806	77.18	120	-42.82
6829-809	369451	6207914	47.10	165	-117.90
6829-811	368859	6194624	45.88	147	-101.12
6829-966	384222	6205128	30	148	-118.00
6829-968	391022	6212078	30	138	-108.00
6829-969	390872	6218578	31	144	-113.00
6829-970	383622	6208578	35	128	-93.00
6829-978	367189	6233254	70	193	-123.00
6829-992	405471	6218688	10.36	125	-114.64
6829-995	366242	6194878	76	NR	NA
6829-996	366242	6194878	77.56	96	-18.44
6829-1140	403846	6217103	42.43	161	-118.57
6829-1469	399596	6220247	42.69	NA	NA
6829-1470	393429	6227675	35.9	NA	NA
6829-1471	398910	6225788	37.73	NA	NA
6829-1472	396838	6225312	32.99	NA	NA
6829-1473	394591	6226031	33.64	NA	NA
6829-1501	399592	6220248	41.99	NA	NA
6829-1502	399743	6219828	48.41	NA	NA
6829-1504*	401215	6223033	41	NA	NA
6829-1533	384103	6229267	30.22	NA	NA
6829-1534*	406460	6222945	37	NA	NA
6829-1535	387302	6229383	32.24	NA	NA
6829-1536	388122	6217963	31.08	NA	NA
6829-1537	397397	6211337	50.8	NA	NA
6829-1538	396307	6217413	34.13	NA	NA
6927-946	411075	6108512	68	NA	NA
6927-956*	411951	6118859	62	NA	NA
6928-569	411014	6166318	60.00	214	-154.00
6928-704*	412687	6136736	66	NA	NA
6929-423	414391	6184692	63.78	130	-66.22
6929-649	408322	6189178	63	168	-105.00
6929-1000*	411270	6218533	43	NA	NA

6727-2277 - Contained in DWLBC Model
* Elevation Data from DEM
NR - Not recorded
NA - Not Applicable
27.5

Table 2d: New and Reviewed Drill Hole Stratigraphy - Base of Renmark Group
Morgan to Wellington Bore Log Stratigraphy

Unit No.	Easting	Northing	Reference (mAHD)	Elevation base RGA (mbgl)	Elevation base RGA (mAHD)
6727-2271	348514	6123064	6.00	NA	NA
6727-2277	344218	6122529	46.55	162	-115.45
6727-3033*	343092	6112626	23	NA	NA
6727-3037*	342940	6112852	9	NA	NA
6728-2449	357081	6133752	81.07	129	-47.93
6728-2486	345781	6146785	94.86	84	10.86
6728-2487	345444	6157383	110.18	NA	NA
6728-2489	354655	6163582	57.21	86	-28.79
6728-3533*	359830	6167169	86	none	none
6728-3540*	355225	6163271	59	NA	NA
6728-3550*	344819	6153601	82	NA	NA
6728-3553*	358799	6158816	57	NA	NA
6728-3555*	340823	6150337	119	NA	NA
6728-3560*	340516	6162362	95	NA	NA
6728-3561*	357089	6159970	60	NA	NA
6728-3562*	353719	6161647	92	NA	NA
6728-3575*	340420	6162064	102	NA	NA
6728-3576*	350003	6164049	69	NA	NA
6728-3577*	339245	6150516	130	NA	NA
6728-3578*	340532	6150506	118	NA	NA
6728-3579*	340859	6163000	99	NA	NA
6728-3600*	351663	6164320	68	NA	NA
6728-3603*	339209	6169700	177	NA	NA
6728-3604*	339323	6169686	177	NA	NA
6728-3631*	358873	6155739	72	NA	NA
6728-3632*	358653	6155519	73	NA	NA
6728-3640*	345501	6131588	52	NA	NA
6728-3669*	350372	6164577	67	NA	NA
6728-3671*	351330	6164311	67	NA	NA
6728-3673*	350297	6164228	72	NA	NA
6728-3700	343749	6132808	14.98	NA	NA
6728-3704*	341420	6163227	101	NA	NA
6729-1165	351146	6227434	114.91	144	-29.09
6729-1170	341784	6191448	105.11	116	-10.89
6827-1530	400654	6116736	62.75	210	-147.25
6827-1562	374831	6112242	99.67	164	-64.33
6827-1892*	393681	6106584	75	NA	NA
6827-1901*	396474	6090932	17	NA	NA
6827-1902*	403260	6113274	66	NA	NA
6827-1903*	393674	6106889	67	NA	NA
6827-1911*	392874	6107103	68	NA	NA
6828-730	370004	6174803	32.59	130	-97.41
6828-731	389412	6179431	52.52	186	-133.48
6828-732	370275	6152990	57.04	173	-115.96
6828-733	381722	6167001	50	156	-106.00
6828-736	394496	6148653	70.90	NA	NA
6828-776	375822	6169756	40.00	NA	NA
6828-777	379880	6175794	39.00	180	-141.00
6828-901*	371734	6128649	92	NA	NA
6828-917*	385309	6151453	48	NA	NA
6828-920*	403830	6132100	61	NA	NA
6828-922*	373305	6171699	38	NA	NA
6829-264	376453	6230678	40	198	-158.00
6829-269	376937	6223409	30	NA	NA
6829-578	404107	6215849	33.13	NA	NA
6829-802	364242	6225395	59.44	212	-152.56
6829-803	372199	6223956	49.8	181	-131.20
6829-804	382769	6222387	31.35	222	-190.65
6829-805	382103	6193567	30.35	197	-166.65
6829-807	365861	6205806	77.18	128	-50.82
6829-809	369451	6207914	47.10	214	-166.90
6829-811	368859	6194624	45.88	166	-120.12
6829-966	384222	6205128	30	200	-170.00
6829-968	391022	6212078	30	262	-232.00
6829-969	390872	6218578	31	204	-173.00
6829-970	383622	6208578	35	NA	NA
6829-978	367189	6233254	70	231	-161.00
6829-992	405471	6218688	10.36	NA	NA
6829-995	366242	6194878	76	70	6.00
6829-996	366242	6194878	77.56	130	-52.44
6829-1140	403846	6217103	42.43	NA	NA
6829-1469	399596	6220247	42.69	NA	NA
6829-1470	393429	6227675	35.9	NA	NA
6829-1471	398910	6225788	37.73	NA	NA
6829-1472	396838	6225312	32.99	NA	NA
6829-1473	394591	6226031	33.64	NA	NA
6829-1501	399592	6220248	41.99	NA	NA
6829-1502	399743	6219828	48.41	NA	NA
6829-1504	401215	6223033	41	NA	NA
6829-1533	384103	6229267	30.22	NA	NA
6829-1534	406460	6222945	37	NA	NA
6829-1535	387302	6229383	32.24	NA	NA
6829-1536	388122	6217963	31.08	NA	NA
6829-1537	397397	6211337	50.8	NA	NA
6829-1538	396307	6217413	34.13	NA	NA
6927-946	411075	6108512	68	NA	NA
6927-956*	411951	6118859	62	NA	NA
6928-569	411014	6166318	60.00	234#	-174.00
6928-704*	412687	6136736	66	NA	NA
6929-423	414391	6184692	63.78	202	-138.22
6929-649	408322	6189178	63	NA	NA
6929-1000	411270	6218533	43	NA	NA

6727-2277 - Contained in DWLBC Model
* Elevation Data from DEM
# Control data point (Used for conversion to Surfer))
NR - Not recorded
NA - Not Applicable
27.5

Table 3: Groundwater Levels in Murray Group - Obswell Network Bores
Morgan to Wellington Model Review

Unit No.	Easting	Northing	RSWL (mAHD)
6727-2205	349874	6123070	0.29
6727-2794	348950	6124559	2.08
6727-2795	348130	6125178	2.85
6727-2796	348696	6121314	1.63
6727-800	343167	6125150	3.97
6728-027	350576	6175885	43.58
6728-108	355791	6160397	49.13
6728-122	361160	6159210	41.53
6728-2092	358188	6164880	42.29
6728-2093	356997	6167171	49.25
6728-2312	357750	6159115	45.26
6728-2346	349647	6178819	44.17
6728-2471	354031	6164390	51.91
6728-249	350900	6158040	51.42
6728-2639	360291	6173164	50.54
6729-010	346874	6183639	54.64
6729-1167	347185	6207961	32.19
6729-1169	356720	6206306	26.80
6729-1171	350999	6192286	41.14
6729-774	361098	6189564	31.57
6827-184	399497	6116444	17.92
6827-1891	402039	6094917	14.33
6828-106	398495	6156483	8.99
6828-229	397215	6136307	12.10
6829-1000	387606	6212099	4.88
6829-1001	394529	6214345	21.21
6829-1007	392623	6212697	26.96
6829-1014	393548	6211685	24.76
6829-1116	397396	6211334	7.77
6829-1117	399103	6212173	9.26
6829-1269	390980	6213465	25.77
6829-1535	387302	6229383	5.65
6829-1536	388122	6217963	3.66
6829-1537	397397	6211337	8.10
6829-174	375382	6201548	4.15
6829-238	375461	6219327	3.15
6829-245	381083	6218022	3.11
6829-268	375812	6224344	3.84
6829-271	374045	6219358	3.85
6829-276	381198	6227693	3.59
6829-281	378597	6222433	3.36
6829-285	378540	6221572	3.49
6829-300	386819	6211848	4.69
6829-301	389824	6212443	18.10
6829-681	388112	6217963	3.70
6829-682	388645	6223428	3.11
6829-683	389810	6229541	3.96
6829-684	390530	6234693	4.88
6829-685	400004	6207245	5.71
6829-716	401665	6214692	14.80
6829-803	372199	6223956	8.93
6829-812	363567	6213261	19.49
6829-902	404113	6213385	14.36
6829-952	390951	6216181	7.91
6829-954	391003	6214490	11.89
6829-999	391068	6208266	5.41
6927-554	418322	6096031	27.55
6927-563	415757	6118804	23.33
6928-501	417607	6156729	16.38
6928-523	417945	6147731	17.00
6928-528	413774	6174880	11.98
6928-539	419212	6157960	18.00
6929-311	414442	6211123	12.35
6929-314	417337	6213030	12.96
6929-315	415036	6215440	7.77
6929-316	415791	6214137	10.23
6929-354	408263	6205483	9.73
6929-355	416384	6201818	15.35
6929-358	415795	6192281	13.84
6929-688	418112	6216552	6.91
6728-231	347686	6160856	57.66
6728-156	342455	6164935	68.84
6728-2097	343331	6159524	70.56
6728-226	342820	6159470	71.00
6728-220	341140	6160887	72.89

Table 4: Groundwater Levels in Renmark Group - Obswell Network Bores
Morgan to Wellington Model Review

Unit No.	Easting	Northing	RSWL (mAHD)
6727-626	344583	6119447	2.61
6727-2271	348514	6123064	1.18
6727-2277	344219	6122529	2.45
6728-2449	357082	6133752	2.74
6728-2486	345782	6146785	45.55
6728-2487	345444	6157383	71.28
6728-2489	354655	6163582	48.45
6728-2490	356726	6177666	35.84
6729-597	361098	6189564	30.77
6729-1165	351147	6227434	34.54
6729-1166	351150	6227444	33.85
6729-1168	356720	6206306	29.38
6729-1170	341785	6191448	65.65
6827-353	394625	6094537	8.98
6827-1530	400655	6116736	20.54
6827-1562	374832	6112242	9.94
6828-730	370004	6174803	17.24
6828-731	389413	6179431	26.29
6828-732	370276	6152990	14.40
6828-736	394497	6148653	17.38
6829-578	404165	6215889	24.67
6829-802	364243	6225395	30.28
6829-805	382103	6193567	22.55
6829-806	383719	6207704	21.20
6829-807	365861	6205806	29.51
6829-809	369452	6207914	24.09
6829-810	365880	6193617	29.98
6829-811	368859	6194624	28.71
6829-1140	403829	6217126	25.40
6929-423	414391	6184692	28.63
6929-495	414409	6184605	29.27

Table 5: Murray Group Salinity
Morgan to Wellington Model Review

Unit No	Easting	Northing	TDS (mg/L)
Obswell Network Bores			
6727-800	343167	6125150	5,745
6727-2214	349305	6123011	18,155
6727-2794	348950	6124559	1,222
6727-2795	348130	6125178	2,323
6727-2796	348696	6121314	2,262
6728-001	340439	6180152	6,109
6728-027	350576	6175885	6,952
6728-057	341826	6170916	3,246
6728-122	361160	6159210	1,845
6728-231	347686	6160856	1,100
6728-249	350900	6158040	1,272
6728-2089	356788	6160106	1,132
6728-2093	356997	6167171	4,407
6728-2097	343331	6159524	1,856
6728-2346	349647	6178819	4,011
6728-2354	345490	6178550	6,112
6728-2359	348512	6169792	4,667
6728-2361	345575	6174108	6,590
6728-2471	354031	6164390	1,850
6729-008	343152	6181778	3,599
6729-10	346874	6183639	4,498
6729-1167	347185	6207961	12,619
6729-1169	356720	6206306	51,514
6729-1171	350999	6192286	4,358
6827-184	399497	6116444	2,199
6828-0229	397215	6136307	2,359
6829-238	375461	6219327	5,145
6829-268	375812	6224344	8,784
6829-276	381198	6227693	18,567
6829-285	378540	6221572	9,815
6829-301	389824	6212443	7,127
6829-508	405936	6216702	1,385
6829-682	388645	6223428	15,715
6829-683	389810	6229541	22,873
6829-684	390530	6234693	19,608
6829-685	400004	6207245	13,389
6829-717	397986	6216186	25,430
6829-803	372199	6223956	7,354
6829-812	363567	6213261	24,943
6829-989	405632	6218978	22,483
6829-1021	407162	6217478	10,148
6829-1353	398615	6218887	15,189
6829-1373	394299	6228207	23,058
6829-1466	395504	6220189	15,457
6829-1493	398057	6222886	16,902
6829-1495	396254	6223613	15,249
6829-1497	392733	6225411	15,908
6829-1533	384103	6229267	29,470
6927-554	418322	6096031	2,255
6927-563	415757	6118804	1,856
6928-501	417607	6156729	2,340
6928-523	417945	6147731	1,692
6928-528	413774	6174880	4,407
6928-539	419212	6157960	2,465
6929-206	410678	6224118	24,000
6929-311	414442	6211123	9,900
6929-353	408226	6229974	28,802
6929-354	408263	6205483	9,465
6929-355	416384	6201818	9,142
6929-358	415795	6192281	6,341
6929-635	408163	6215885	6,285

Unit No	Easting	Northing	TDS (mg/L)
New DES Bores			
6728-3533	359830	6167169	3,995
6728-3540	355225	6163271	2,534
6728-3550	344819	6153601	3,235
6728-3553	358799	6158816	1,586
6728-3555	340823	6150337	1,799
6728-3560	340516	6162362	1,401
6728-3561	357089	6159970	956
6728-3562	353719	6161647	1,052
6728-3575	340420	6162064	1,407
6728-3576	350003	6164049	1,479
6728-3579	340859	6163000	1,990
6728-3603	339209	6169700	2,421
6728-3604	339323	6169686	3,488
6728-3631	358873	6155739	1,239
6728-3632	358653	6155519	1,367
6728-3640	345501	6131588	10,442
6728-3669	350372	6164577	900
6728-3671	351330	6164311	1,075
6728-3673	350297	6164228	999
6728-3700	343749	6132808	17,000
6728-3704	341420	6163227	1,334
6827-1892	393681	6106584	2,448
6827-1902	403260	6113274	2,415
6827-1903	393674	6106889	2,875
6827-1911	392874	6107103	2,761
6828-901	371734	6128649	6,510
6828-917	385309	6151453	4,425
6828-920	403830	6132100	2,624
6829-1469	399596	6220247	13,797
6829-1470	393429	6227675	22,932
6829-1471	398910	6225788	13,683
6829-1472	396838	6225312	17,174
6829-1473	394591	6226031	17,113
6829-1501	399592	6220248	1,720
6829-1502	399743	6219828	15,457
6829-1533	384103	6229267	29,470
6829-1535	387302	6229383	22,358
6829-1536	388122	6217963	12,788
6829-1537	397397	6211337	10,165
6829-1538	396307	6217413	15,578
6927-956	411951	6118859	1,984
6928-704	412687	6136736	1,906

Table 6: Renmark Group Salinity
Morgan to Wellington Model Review

Unit No	Easting	Northing	TDS (mg/L)
Obswell Network Bores			
6727-2271	348514	6123064	6,124
6727-2277	344219	6122529	9,067
6727-626	344583	6119447	7,232
6727-797	345516	6122934	6,403
6728-2449	357082	6133752	5,310
6728-2486	345782	6146785	1,384
6728-2487	345444	6157383	2,064
6728-2489	354655	6163582	3,058
6728-2490	356726	6177666	12,400
6729-1166	351150	6227444	10,878
6729-1168	356720	6206306	22,471
6729-1170	341785	6191448	6,826
6729-597	361098	6189564	9,279
6827-1530	400655	6116736	1,872
6827-1562	374832	6112242	11,023
6827-1578	395495	6090603	2,380
6827-353	394625	6094537	2,130
6828-730	370004	6174803	9,574
6828-731	389413	6179431	2,909
6828-732	370276	6152990	5,222
6828-736	394497	6148653	2,747
6829-1140	403829	6217126	12,600
6829-578	404165	6215889	15,415
6829-802	364243	6225395	3,712
6829-804	382769	6222387	7,539
6829-805	382103	6193567	16,457
6829-806	383719	6207704	10,961
6829-807	365861	6205806	20,541
6829-809	369452	6207914	17,906
6829-811	368859	6194624	12,667
6829-992	405472	6218688	21,094
6929-495	414409	6184605	2,898

Unit No	Easting	Northing	TDS (mg/L)
New DES Bore			
6827-1901	396474	6090932	2,778

Table 7: Murray Group Yield
Morgan to Wellington Model Review

Unit No	Easting	Northing	Yield (L/s)
Obswell Network Bores			
6928-0297	419131	6150646	0.1
6727-800	343167	6125150	0.3
6728-011	343416	6179642	0.3
6728-076	346377	6169904	0.3
6728-2092	358188	6164880	0.4
6728-2093	356997	6167171	0.4
6728-231	347686	6160856	0.4
6728-249	350900	6158040	0.4
6728-3229	344816	6162282	10.0
6729-010	346874	6183639	0.3
6729-1171	350999	6192286	1.0
6827-184	399497	6116444	1.3
6828-106	398495	6156483	0.1
6828-229	397215	6136307	0.3
6829-1269	390980	6213465	2.0
6829-174	375382	6201548	0.1
6829-682	388645	6223428	0.9
6829-683	389810	6229541	1.3
6829-684	390530	6234693	0.2
6829-685	400004	6207245	0.9
6829-803	372199	6223956	0.1
6829-902	404113	6213385	2.0
6927-554	418322	6096031	2.5
6928-501	417607	6156729	0.1
6929-353	408226	6229974	0.4
6929-354	408263	6205483	0.9
6929-358	415795	6192281	0.1
6929-663	416237	6218770	0.3
6929-688	418112	6216552	18.0
6728-2097	343331	6159524	0.7

Unit No	Easting	Northing	Yield (L/s)
New DES Bores			
6728-3533	359830	6167169	1.0
6728-3540	355225	6163271	6.0
6728-3550	344819	6153601	1.0
6728-3553	358799	6158816	7.0
6728-3555	340823	6150337	0.0
6728-3560	340516	6162362	5.0
6728-3561	357089	6159970	2.0
6728-3562	353719	6161647	1.0
6728-3575	340420	6162064	4.0
6728-3576	350003	6164049	6.0
6728-3577	339245	6150516	2.0
6728-3578	340532	6150506	1.0
6728-3579	340859	6163000	4.0
6728-3600	351663	6164320	10.0
6728-3603	339209	6169700	1.0
6728-3604	339323	6169686	0.0
6728-3631	358873	6155739	4.0
6728-3632	358653	6155519	4.0
6728-3640	345501	6131588	0.0
6728-3669	350372	6164577	4.0
6728-3671	351330	6164311	6.0
6728-3673	350297	6164228	4.0
6728-3704	341420	6163227	0.0
6827-1892	393681	6106584	3.0
6827-1901	396474	6090932	5.0
6827-1903	393674	6106889	2.0
6827-1911	392874	6107103	1.0
6828-901	371734	6128649	1.0
6828-922	373305	6171699	3.0
6829-1469	399596	6220247	0.0
6829-1470	393429	6227675	0.0
6829-1471	398910	6225788	0.0
6829-1472	396838	6225312	0.0
6829-1473	394591	6226031	1.0
6829-1504	401215	6223033	7.0
6829-1533	384103	6229267	0.0
6829-1536	388122	6217963	1.0
6829-1537	397397	6211337	2.0
6829-1538	396307	6217413	5.0
6927-946	411075	6108512	20.0
6928-704	412687	6136736	23.0
6929-1000	411270	6218533	2.0

Table 8: Renmark Group Yield
Morgan to Wellington Model Review

Unit No	Easting	Northing	Yield (L/s)
Obswell Network Bores			
6827-1578	395495	6090603	4.0
6827-353	394625	6094537	0.3
6727-2277	344219	6122529	3.6
6728-2449	357082	6133752	0.1
6728-2486	345782	6146785	0.5
6728-2487	345444	6157383	0.5
6729-1165	351147	6227434	0.6
6827-1530	400655	6116736	1.2
6827-1562	374832	6112242	1.3
6828-732	370276	6152990	0.1
6829-578	404165	6215889	0.5
6829-802	364243	6225395	0.0
6829-809	369452	6207914	1.3
6829-992	405472	6218688	8.0
6929-423	414391	6184692	0.1
6929-495	414409	6184605	3.0
6727-2271	348514	6123064	1.0
6727-797	345516	6122934	0.3
6728-2490	356726	6177666	1.0
6729-1168	356720	6206306	1.0
6828-730	370004	6174803	0.1
6829-805	382103	6193567	2.5
6829-806	383719	6207704	0.3
6829-807	365861	6205806	0.4
6829-811	368859	6194624	0.6

Unit No	Easting	Northing	Yield (L/s)
New DES Bore			
6827-1901	396474	6090932	5

APPENDIX A (REVIEW PROCESS)

1.1 Part 1 Hydrogeological Structure

Hydrogeological Structure information is provided in Tables 1 and 2a and presented in Figures 18a, 19a and 20a. Drillhole lithological logs are contained in Appendix B.

Stratigraphy Data Review

Dillhole data used for model construction received from DWLBC included 37 wells within the model domain.

Initially data checking/verification was undertaken using the Drillhole Enquiry System website (DES). Limited drillhole logs (only 2 of 37 wells) were available on DES so well logs were referenced using the DWLBC microfiche collection.

All 37 well logs were referenced either on DES or microfiche with the exception of well 6728-2489, however 12 microfiche files had no well log record.

Where well logs were not recorded on microfiche or DES (wells 6829-966, 6829-968, 6829-969 and 6829-970) AWE was able to supply limited structure information from previous investigations (AWE, 2001).

Minor variations were noted following AWE drillhole data interpretation with variations greater than or equal to 10 m highlighted in Table 1.

Additional Drillhole Information

More recent information, sourced from DES, to enhance the accuracy within the model domain included drillhole information from wells drilled from January 2004 to September 2008. The new drillhole information was limited to include wells with either a lithological log and/or drillers log recorded on the database.

Following client consultation all wells less than 10 m total depth were not included with the exception of 6727-3037, which was drilled to 8 m below ground level (bgl) and reported the top of Murray Group at 3.25 m bgl.

Stratigraphic Contour Construction

Construction of contour maps for the top of Ettrick Formation, top of Renmark Group and base of Renmark Group were undertaken using well log information.

Hand drawn contours were constructed and then digitised using *ArcMap v9.3* for top of Ettrick Formation, top of Renmark Group and base of Renmark Group.

Additionally, for greater detail of facies, contours were reconstructed incorporating review data, MDBC Basin in a Box data and Murray Basin Hydrogeological 1:250,000 Map sheets.

Contours and well information was converted from *ArcMap* shape files to grid files for importation to *Surfer 8* and future model construction.

Following client consultation contours were extended beyond the model extent by the use of ‘control points’ to provide a coherent contoured surface to the limits of the model domain.

Contour construction for top of Murray Group Limestone aquifer was not undertaken as DWLBC advised that the ground surface was a suitable representation for the purposes of the model. The top of the Murray Group is represented by the shuttle radar ground surface elevations (Figure 2).

Top of Ettrick

Top of Ettrick Formation data is provided in Table 2b and presented in Figures 8, 18a and 18b. Comparison figures are presented in Appendix C (red contours of 2D comparison are AWE interpretations).

Detailed top of Ettrick Formation contours (Figure 8) represents review data, MDBC Basin in a Box and hydrogeological map sheet data. This detail for the top of Ettrick Formation was considered too complicated for model generation and therefore the hand drawn contours (Figure 18a) have been used for the model. *Surfer 8* generated contours (Figure 18b) show strong correlation for the conversion from *ArcMap* to *Surfer 8*.

Top of Ettrick Formation is reported near ground surface levels near Mannum with the zero mAHD contour passing beneath the river.

Comparison of contours and *Surfer 8* generated facies between DWLBC and AWE hand drawn contours for the top of Ettrick Formation (Appendix Figures C1 and C2) reported slight variations, however similar patterns were evident. The most significant variations are noted between Swan Reach and Murray Bridge with the majority of variation due to lower reported heights of Ettrick Formation in wells 6727-2271, 6727-2277 and 6728-3640.

Top of Renmark Group

Top of Renmark Group data is provided in Table 2c and presented in Figures 10, 19a and 19b. Comparison figures are presented in Appendix C (red contours of 2D comparison are AWE interpretation).

Detailed top of Renmark Group contours (Figure 10) represents review data and MDBC Basin in a Box contour reconstruction.

Again, the detailed top of Renmark Group was considered to complicated for model generation and therefore the hand draw contours (Figure 19a) have been used for the model. *Surfer 8* generated contours (Figure 19b) show strong correlation for the conversion from *ArcMap* to *Surfer 8*.

Comparison to Basin in a Box data (Appendix Figure C3) reported minor variations across the model domain, however data suggests that the Hamley Fault in the central eastern zone of the model may penetrate to the top of the Renmark Group with an approximate 90 m elevation variation between wells 6928-569 and 6929-423. Contour modification noted near the Marne River was due to well 6728-3560 reporting the top of Ettrick Formation lower than MDBC top of Renmark Group Basin in a Box contours. With a lower top of Ettrick Formation reported in this location the contours for top of Renmark Group in the region of well 6728-3560 were altered.

Comparison of contours and *Surfer 8* generated facies between DWLBC and AWE hand drawn contours for the top of Renmark Group (Appendix Figures C4 and C5) reported slight variations, however similar patterns were evident.

Base of Renmark Group

Base of Renmark Group data is provided in Table 2d and presented in Figures 12, 20a and 20b. Comparison figures are presented in Appendix C (red contours of 2D comparison are AWE interpretations).

No DWLBC hand drawn contours were available so the base of Renmark Group contours were reconstructed using review data and Basin in a Box top of basement (Figure 20a).

Similarly, the detailed base of Renmark Group was considered too complicated for model generation and therefore the hand draw contours (Figure 12) have been used for the model. *Surfer 8* generated contours (Figure 20b) shows strong correlation for the conversion of hand drawn.

Although variations may exist between the top of basement and base of Renmark Group (i.e. Renmark Group may be absent in some locations) the only significant variation reported between the Basin in a Box and reconstructed contours was south west of Morgan (Appendix Figure C6). At this location the basin in a box western Morgan Fault line does not appear to be evident with the data reporting a more gradual change in elevation.

1.2 Part 2 Potentiometric Head

Murray Group Limestone aquifer and Renmark Group aquifer groundwater results and contours are provided in Tables 3 and 4 and presented in Figures 7, 21, 13 and 22.

Groundwater contours in both the Murray Group Limestone aquifer and Renmark Group aquifer were reconstructed using the MDBC Basin in a Box data and drillhole data from the AWE data base (ObsWell network wells only), last updated in March 2008.

Some observation network wells water level data was ignored following data checking on the ObsWell website (e.g. well 6827-1578 levels varied due to down hole pump, well 6829-680 only had two water level records in 1980 and well 6829-804 had a 15 year gap between readings with the latest readings appearing anomalous).

Additionally, to reduce the numbers of data points in the Marne River and Waikerie regions where the number of wells is high, only several randomly selected wells were included.

No new DES wells water levels were used for the construction of the groundwater contours as the water level may have been recorded prior to an acceptable recovery period.

Only one well (6829-803) was represented from the DWLBC structure information in the construction of groundwater contours in the Murray Group Limestone aquifer. However, for the construction of the groundwater contours in the Renmark Group aquifer 20 wells contained within the DWLBC structure information were represented.

Murray Group Aquifer

Generally only minor variations were reported between the Basin in a Box and AWE interpretation of groundwater contours in the Murray Group Limestone aquifer with the exception of groundwater mounding identified in the Stockyard Plain region (Appendix Figure C7).

The reconstructed Murray Group Limestone aquifer groundwater contours (Figure 7) were considered suitable for the model and was converted to a grid file for importation into *Surfer 8*. *Surfer 8* generated contours (Figure 21) shows strong correlation for the conversion from *ArcMap* to *Surfer*.

Renmark Group Aquifer

Although the 25 mAHD contour through the centre of the model domain extended further north towards the Stockyard Plain region limited variation was identified (Appendix Figure C8).

The reconstructed Renmark Group aquifer groundwater contours (Figure 13) were also considered suitable for the model and was converted to a grid file for importation into *Surfer 8*. *Surfer 8* generated contours (Figure 22) shows strong correlation for the conversion from *ArcMap* to *Surfer 8*.

1.3 Part 3 Groundwater Salinity

Murray Group Limestone aquifer and Renmark Group aquifer groundwater salinity data is provided in Tables 5 and 6 and presented in Figures 16 and 17.

Groundwater salinity contours were constructed using information from the obswell network and DES wells together with the MBDC Basin in a Box data. The numbers of wells in the Marne River and Waikerie regions were also reduced by randomly selecting several wells.

Murray Group Aquifer

Salinity in the Murray Group Limestone aquifer shows low salinity water in the south east region of the model and in a small section on the western side of the river between Swan Reach and Mannum and (Figure 16).

Generally only minor variations were reported between the Basin in a Box and AWE interpretation of salinity contours in the Murray Group Limestone aquifer with the exception of more detail between Mannum and Murray Bridge where recorded salinities reported considerable variation (Appendix Figure C9).

Renmark Group Aquifer

Salinity in the Renmark Group aquifer reports a similar pattern to the Murray Group aquifer with low salinity water extending further north from the south east and in a small section on the western side of the river between Swan Reach and Mannum (Figure 17).

Generally only minor variations were reported between the MDBC Basin in a Box and AWE interpretation of salinity contours in the Renmark Group aquifer (Appendix Figure C10).

1.4 Part 4 Aquifer Yield

Murray Group and Renmark Group aquifer test data is provided in Tables 7 and 8 and presented in Figures 14 and 15.

Aquifer test data for the Murray Group Limestone aquifer and Renmark Group aquifer included both obswell network and new DES well data.

Comparison with MDBC Basin in a Box data was undertaken, however strong correlations were not identified and therefore data points are represented only as point data overlying the Basin in a Box data with no contour reconstruction.

1.5 Part 5 Conceptual Hydrogeological Model

Hydrogeological Cross Sections are presented in Figures 5a, 5b and 5c.

Following the completion of structure and groundwater facies all data was imported to *Surfer 8* to produce a stratigraphic layer sequence from base of Renmark Group to the ground/surface elevation. This format projected 3D images representing the interpreted layer sequence (Figure 23).

When importing grid files into *Surfer 8* the following was used for each layer:

- Grid geometry was limited to the model domain (E 340000, N 6090000 and E 420000, N 6235000) and a spacing of 500 m;
- Griding method via Kriging; and
- Absent data regions ignored.

Following comparison of the *Surfer 8* layers with the supplied DWLBC conceptual hydrogeological cross section (Figure 5a) and discussion with the client it was clear that the conceptual model presented was an acceptable representation of the modelled area using the limited available data. However, additional conceptual hydrogeological cross sections were constructed for the Morgan to Mannum Reach and Lower River Murray Region near Murray Bridge to indicate the slightly varied lithological sequences beneath the river channel in the model (Figures 5b and 5c).

APPENDIX B (DRILL HOLE LITHOLOGY)

Appendix B - Drill Hole Lithology

Unit_No	depth from	depth to	major lith code	minor lith code	Description
6727-3033	0	0.5	FILL	SAND	FILL GRAVELLY SAND brown, medium grained, roadbase gravels <20mm diameter, no odour/staining
6727-3033	0.5	2	FILL	SAND	FILL GRAVELLY SAND cream-orange, medium grained, roadbase and limestone gravels <20mm, no odour/staining
6727-3033	2	3	FILL	SAND	FILL SAND orange-cream, minor limestone gravels <10mm diameter, no odour/staining
6727-3033	3	4	SAND		SAND orange-brown, medium grained, abundant limestone gravels <10mm diameter, clay fines, no odour/staining
6727-3033	4	5.2	SAND	GRVL	GRAVELLY SAND orange-brown, fine to medium grained, limestone gravels <10mm diameter, clay fines, no odour/staining
6727-3033	5.2	7	SAND		SAND orange, fine to medium grained, clay fines, no odour/staining
6727-3033	7	8	LMST		LIMESTONE cream, clayey sand medium plus between limestone fragments, no odour/staining
6727-3033	8	9	SAND		SAND orange, fine to medium grained, abundant limestone gravels <4mm diameter, clay fines, no odour/staining
6727-3033	9	10	LMST		LIMESTONE cream-orange, fine to medium grained, weathered, no odour/staining
6727-3033	10	11	LMST		LIMESTONE cream-pink, fine to medium grained, hard no odour/staining
6727-3033	11	12	LMST		LIMESTONE whiter, very hard no odour/staining
6727-3033	12	13	LMST		LIMESTONE cream-light brown, weathered, soft, no odour/staining
6727-3033	13	14	SAND		SAND cream-light brown, fine to medium grained, minor limestone gravels <3mm, minor clays, no odour/staining
6727-3033	14	15	LMST		LIMESTONE white-cream, weathered, no odour/staining
6727-3033	15	19	LMST		LIMESTONE very hard, no odour/staining
6727-3033	19	25	SAND		CAVITY between 19 and 19.5 metres. SAND orange-light brown, medium to coarse grained, abundant gravels <3mm, clay fines, no odour/staining. End of hole at 25 metres
6727-3037	0	0.1	SAND	SILT	SILT SAND brown-grey, fine grained, some grasses/roots, no odour/staining
6727-3037	0.01	0.3	CLYU	SAND	SANDY CLAY grey, medium to high plasticity, no odours/staining
6727-3037	0.3	1.5	CLYU	SILT	SILTY CLAY dark brown, medium to high plasticity some white-cream gravels <4mm diameter
6727-3037	1.5	3.25	CLYU	SAND	SANDY CLAY dark grey-green, fine to medium grained, fragments of sandstone/limestone <40mm diameter and increasing with depth
6727-3037	3.25	6.4	LMST	SAND	SANDY LIMESTONE tan-green, fine to medium grained, larger fragments of limestone <30mm diameter
6727-3037	6.4	7.5	LMST	SAND	SANDY LIMESTONE tan-light yellow, fine to medium grained, larger fragments of limestone <40mm diameter
6727-3037	7.5	8	LMST		LIMESTONE tan, fine to medium grained, larger fragments of limestone <50mm diameter
6728-3533	0	7	TPSL		Sandy top soil, limestone broken rubbly, limestone, clay last 2 metres, limestone, clay bands
6728-3533	7	14	CLYU		Puggy clay, limestone, clay
6728-3533	14	49	LMST		Limestone, seams of clay
6728-3533	49	56	SDST		Soft, firm sandstone, limestone, some water
6728-3533	56	63	LMST		Limestone, granite, hard then broken, more water
6728-3533	63	70	LMST		Soft then hard break at 69 to 75 metres, little more water
6728-3533	70	77	LMST		Hard 70 to 77 metres, soft then hard again, soft coral
6728-3533	77	84	LMST		Sticky coral limestone
6728-3533	84	91	CORL		Soft coral to 86.75 metres, hard granite
6728-3533	91	98	CORL		Hard then break, soft to 93.75 metres, small break granite
6728-3533	98	112	GRNT		Hard granite, small break at 99 metres, soft clay, weathered granite
6728-3533	112	119	GRNT		Soft to 114 metres, hard weathered granite, softer 117 to 119 metres, fractured slightly
6728-3533	119	126	GRNT		Softer to 121 metres, weathered, hard, slightly fractured
6728-3540	0	2	TPSL		Red sandy soil
6728-3540	2	6	CLYU		Orange clay
6728-3540	6	10	LMST		Yellow clayish limestone
6728-3540	10	12	LMST		Softer sandy limestone
6728-3540	12	14	LMST		Harder limestone
6728-3540	14	30	LMST		Cavernouse limestone
6728-3540	30	32	LMST		Harder limestone
6728-3550	0	2	SAND		Red sandy soil
6728-3550	2	5	GRVL		River siltand gravel
6728-3550	5	6	SAND		Soft yellow sand
6728-3550	6	8	GRVL		Coarse gravel
6728-3550	8	9	CLYU		Yellow clay
6728-3550	9	15	CLYU		Grey and yellow layered clay
6728-3550	15	16	SDST		Soft white sandstone
6728-3550	16	19	SDST		Firm yellow sandstone
6728-3550	19	20	CLYU		Yellow clay
6728-3550	20	34	LMST		Hard yelllow limestone
6728-3550	34	40	LMST		Cavernouse limestone
6728-3550	40	43	LMST		Harder grey limestone
6728-3553	0	1.5	TPSL		Sandy soil
6728-3553	1.5	3	LMST		Crumbly limestone
6728-3553	3	5	CLYU		Yellow clay
6728-3553	5	8	LMST		Hard limestone
6728-3553	8	20	LMST		Soft broken and cavernous limestone
6728-3555	0	3	GRVL		Sandy gravel
6728-3555	3	5	SAND		Soft sand
6728-3555	5	15	CLYU		Firm grey-brown clay
6728-3555	15	28	CLYU		Yellow clay
6728-3555	28	32	CLYU		Soft sandy clay
6728-3555	32	35	LMST		Hard limestone
6728-3555	35	36	LMST		Hollow
6728-3555	36	42	LMST		Soft cavernous limestone
6728-3555	42	47	CLYU		Brown clay

Appendix B - DES Drill holes from Jan 2004 to Sept 2008 with Lithological and/or Drillers Log

Unit_No	depth from	depth to	major lith code	minor lith code	Description
6728-3560	0	1	TPSL		Sandy soil
6728-3560	1	2	SILT		River silt
6728-3560	2	7	SILT		Silt, gravel and boulders
6728-3560	7	9	CLYU		Sandy clay
6728-3560	9	13	LMST		Soft limestone
6728-3560	13	32	CLYU		Stiff yellow clay
6728-3560	32	35	SAND		Soft sand
6728-3560	35	38	CLYU		Clay
6728-3560	38	44	LMST		Soft orange limestone
6728-3560	44	55	LMST		Yellow limestone
6728-3560	55	71	LMST		Harder grey limestone with soft layers
6728-3560	71	72	CLYU		Grey clay
6728-3561	0	1.5	LMST		Crumbly limestone
6728-3561	1.5	4	LMST		Firm limestone
6728-3561	4	14	LMST		Hard white limestone
6728-3561	14	18	LMST		Yellow limestone, softer
6728-3561	18	22	LMST		Cavernous limestone
6728-3561	22	24	LMST		Clayish limestone
6728-3562	0	4	SAND		Soft sand
6728-3562	4	10	CLYU		Sandy red clay
6728-3562	10	18	CLYU		Firm yellow clay
6728-3562	18	26	CLYU		Sticky clay
6728-3562	26	29	CLYU		Sandy yellow clay
6728-3562	29	33	LMST		Soft yellow limestone
6728-3562	33	43	LMST		Harder limestone
6728-3562	43	63	LMST		Softer cavernous limestone
6728-3562	63	64	CLYU		Yellow clay
6728-3575	0	3	TPSL		Top soil
6728-3575	3	6	BLDR		River soil and boulders
6728-3575	6	20	CLYU		Soft clay, brown
6728-3575	20	30	CLYU		Yellow clay
6728-3575	30	34	ROCK		Brown sandy rock
6728-3575	34	36	LMST		Soft limestone, yellow
6728-3575	36	50	CORL		Soft grey coral
6728-3575	50	75	SHEL		Shells
6728-3576	0	1	TPSL		Top soil
6728-3576	1	11	CLYU		Clay
6728-3576	11	36	CORL		Yellow coral
6728-3577	0	1	TPSL		Top soil
6728-3577	1	40	CLYU		Red clay
6728-3577	40	45	CLYU		Yellow sandy clay
6728-3577	45	52	CORL		Yellow coral, hard and soft
6728-3577	52	55	CORL		Grey coral, black mud
6728-3578	0	1	TPSL		Top soil
6728-3578	1	30	CLYU		Clay, red
6728-3578	30	40	SAND		Yellow sandy
6728-3578	40	47	CORL		Yellow soft coral
6728-3578	47	48	CLYU		Black clay and lignite
6728-3579	0	4	CLYU		Clay
6728-3579	4	6	CLYU		Clay and boulders
6728-3579	6	9	ROCK		Seams of hard rock and clay
6728-3579	9	14	CLYU		Light coloured red clay
6728-3579	14	20	CLYU		Light grey clay
6728-3579	20	25	CLYU		Yellow clay
6728-3579	25	26	ROCK		Red soft rocks
6728-3579	26	29	LMST		Limestone, yellow
6728-3579	29	40	LMST		Limestone, hard and soft bars
6728-3579	40	44	LMST		Seams of limestone, gravel and clay
6728-3600	0	2	TPSL		Top soil
6728-3600	2	14	CLYU		Clay
6728-3600	14	25	CORL		Yellow coral, soft

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Unit_No	depth from	depth to	major lith code	minor lith code	Description
6728-3603	0	5	CLYU		Silty clay and gravel
6728-3603	5	12	CLYU		Firm gravelly clay
6728-3603	12	24	CLYU		Stiff brown clay
6728-3603	24	36	CLYU		Soft red clay
6728-3603	36	38	CLYU		Hard brown clay
6728-3603	38	53	CLYU		Brown clay
6728-3603	53	67	CLYU		Hard brown shale clay
6728-3603	67	95	SHLE		Firm brown shale
6728-3603	95	98	SHLE		Harder shale layers
6728-3603	98	111	LMST		Hard yellow limestone with soft sandy layers
6728-3603	111	114	LMST		Grey limestone
6728-3603	114	115	CLYU		Grey clay
6728-3604	0	4	CLYU		Silty clay
6728-3604	4	18	CLYU		Stiff red clay
6728-3604	18	23	GRVL		Gravel and silt layers
6728-3604	23	30	CLYU		Soft red clay
6728-3604	30	41	GRVL		Hard gravel layers
6728-3604	41	54	MDST		Soft mudstone
6728-3604	54	71	MDST		Light brown mudstone
6728-3604	71	86	MDST		Soft yellow mudstone
6728-3604	86	97	LMST		Yellow limestone with hard and soft layers
6728-3604	97	99	LMST		Very hard limestone
6728-3604	99	102	LMST		Soft grey limestone
6728-3604	102	103	LMST		Hard grey limestone
6728-3604	103	105	LMST		Softer grey limestone
6728-3604	105	112	LMST		Yellow limestone with soft sandy layer
6728-3604	112	120	MDST		Clayish grey mudstone
6728-3631	0	4	CLYU		Hard brown clay
6728-3631	4	6	CLYU		Sandy clay
6728-3631	6	9	SAND		Soft yellow sand
6728-3631	9	12	LMST		Soft sandy limestone
6728-3631	12	26	LMST		Firm yellow limestone
6728-3631	26	46	LMST		Firm yellow limestone with soft sandy layers
6728-3631	46	47	LMST		Grey clayish limestone
6728-3631	47	48	CLYU		Grey clay
6728-3632	0	1	TPSL		Clayish topsoil
6728-3632	1	4	CLYU		Stiff brown clay
6728-3632	4	10	SAND		Soft yellow sand
6728-3632	10	29	LMST		Soft yellow limestone
6728-3632	29	47	LMST		Harder limestone with soft sandy layers
6728-3632	47	49	LMST		Yellow clayish limestone
6728-3632	49	51	LMST		Grey limestone
6728-3632	51	52	CLYU		Grey clay
6728-3640	0	0.3	FILL		Fill
6728-3640	0.3	17	SAND		Yellow sand and sandstone
6728-3640	17	24	SAND		As above but micaceous
6728-3640	24	26	CLYU		Stiff, brown-grey sandy clay
6728-3640	26	27.5	SAND		Brown-grey clayey sand
6728-3640	27.5	31	CLYU		Stiff brown-grey sandy clay
6728-3640	31	33	SDST		Sandstone
6728-3640	33	35	SAND		Yellow micaceous sand
6728-3640	35	36	SAND		Sand
6728-3640	36	59	CLYU		Yellow sandy clay with limestone and sandstone layers
6728-3640	59	79	LMST		Yellow silty limestone
6728-3640	79	87	CLYU		Grey marly clay
6728-3669	0	0.5	TPSL		Top soil
6728-3669	0.5	2	LMST		White limestone
6728-3669	2	6	LMST		Yellow clayish limestone
6728-3669	6	15	LMST		Soft yellow limestone
6728-3669	15	28	LMST		Cavernous limestone
6728-3669	28	32	LMST		Harder white limestone

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Unit_No	depth from	depth to	major lith code	minor lith code	Description
6728-3671	0	1.5	SAND		Sandy top soil
6728-3671	1.5	8	SAND		Layers of sand and clay
6728-3671	8	12	CLYU		Yellow sandy clay
6728-3671	12	18	LMST		Soft yellow limestone
6728-3671	18	32	LMST		Yellow limestone with frequent ?
6728-3673	0	1	SAND		Sandy top soil
6728-3673	1	12	LMST		Hard white limestone
6728-3673	12	18	LMST		Softer yellow limestone
6728-3673	18	32	LMST		Very porous limestone
6728-3700	0	0.5	FILL	GRVL	FILL sandy GRAVEL pale grey-pale brown, fine to medium grained, fine to coarse grained sand
6728-3700	0.5	12	LMST		LIMESTONE pale grey-pale brown, high resistance
6728-3700	12	15	LMST		As above, yellow-brown
6728-3700	15	21	LMST		As above, pale brown. EOH at 21 metres
6728-3704	0	7.5	CLYU		CLAYS and stones
6728-3704	7.5	24	CLYU		Orange and red CLAYS
6728-3704	24	35	CLYU		White sandy CLAYS
6728-3704	35	37	LMST		White LIMESTONE
6728-3704	37	39	CLYU		Grey CLAY
6728-3704	39	57	LMST		Grey LIMESTONE corals
6729-1705	0	1	SAND		Sandy soil
6729-1705	1	9	CLYU		Sandy red clay
6729-1705	9	16	CLYU		Hard red clay
6729-1705	16	19	CLYU		Softer clay
6729-1705	19	22	CLYU		Clay with limestone bands
6729-1705	22	48	LMST		Yellow limestone, hard and soft bands
6729-1705	48	52	SAND		Coarse loose dry sand
6729-1705	52	58	CLYU		Dirty black sandy clay
6729-1705	58	65	LIGN		Soft black lignite or coal
6729-1705	65	70	CLYU		Soft brown clay
6827-1892	0	7	SAND		Sandy topsoil, limestone, clay
6827-1892	7	28	CLYU		Clay, sandy clay, sticky into sandy limestone,getting damp
6827-1892	28	35	LMST		Sandy limestone
6827-1892	35	42	LMST		Limestone same softer section,clay
6827-1892	42	56	CLYU		Clay, soft limestone, little water
6827-1892	56	63	LMST		Limestone, creme soft coral
6827-1892	63	70	LMST		Soft limestone coral
6827-1892	70	77	SDST		Sandstone, coral more water
6827-1892	77	84	LMST		Limestone, some shells
6827-1892	84	91	CORL		Coral,clay more water
6827-1901	0	1	CALC		Calcrete
6827-1901	1	5	LMST		Yellow sandy limestone
6827-1901	5	7	LMST		White limestone
6827-1901	7	9.5	CLYU		Grey sandy clay
6827-1901	9.5	13	SAND		Yellow sand with sandstone layers
6827-1901	13	24.5	LMST		White limestone and sandstone
6827-1901	24.5	34	LMST		Green grey marly limestone
6827-1901	34	38	LMST		Yellow sandy limestone with shell remains
6827-1901	38	55	LMST		Green-grey marly limestone with shell remains and grey sandstone layers
6827-1901	55	62	MARL		Grey silty marl
6827-1901	62	68	SAND		Yellow micaceous sands
6827-1901	68	90.5	CLYU		Brown silty clay and clay
6827-1901	90.5	96.5	LMST		Fossiliferous limestone
6827-1902	0	10	CLYU		red clay
6827-1902	10	25	CLYU		yellow clay
6827-1902	25	31	SDST		sandstone & clay
6827-1902	31	40	SDST		sandstone & shells
6827-1902	40	45	ROCK		cliffrock & shells
6827-1902	45	65	LMST		white lime coral & fossils

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Unit_No	depth from	depth to	major lith code	minor lith code	Description
6827-1903	0	7	TPSL		Top soil, clay, sandy
6827-1903	7	14	CLYU		Sandy clay, fractured limestone, fine sand
6827-1903	14	21	LMST		Limestone, cavernous
6827-1903	21	42	LMST		Limestone, firmer into traces of coral
6827-1903	42	49	LMST		Limestone, softer at 47 metres, coral
6827-1903	49	56	CORL		Soft coral, limestone shells, water
6827-1903	56	63	CORL		Soft coral
6827-1911	0	4	TPSL		Top soil, sandy clay
6827-1911	4	14	SAND		Sands and limestone
6827-1911	14	33	LMST		Firm cemented limestone
6827-1911	33	35	LMST		Limestone, some clay
6827-1911	35	58	LMST		Fractured white-yellow limestone
6827-1911	58	70	LMST		Clean limestone, coral
6828-901	0	7	LMST		Limestone
6828-901	7	14	CLYU		Soft sandy clay
6828-901	14	42	LMST		Soft limestone
6828-901	42	49	LMST		Limestone, coral
6828-901	49	56	LMST		Limestone, hard
6828-901	56	98	LMST		Soft, hard limestone
6828-901	98	112	CLYU		Some water, clay, coral, some shales
6828-917	0	6	CLYU		sandy clay
6828-917	6	8	SDST		sandstone
6828-917	8	30	ROCK		cliffrock, coral & fossils
6828-917	30	51	CORL		yellow lime coral & fossils
6828-920	0	17	CLYU		brown clay
6828-920	17	29	SDST		sandstone
6828-920	29	38	ROCK		cliffrock, shell, some clay
6828-920	38	60	LMST		creamy limestone, coral & fossils
6828-922	0	0.5	TPSL		Sandy soil
6828-922	0.5	1	LMST		Limestone cap rock
6828-922	1	36	LMST		Yellow limestone with soft sandy layers
6828-922	36	45	LMST		Damp yellow limestone
6828-922	45	52	LMST		Firmer white limestone
6828-922	52	56	LMST		Yellow limestone
6829-1469	0	1	SAND	CALC	Light red-brown fine quartz sand with calcrete chips. Sand is subangular and moderately well sorted
6829-1469	1	2	SAND	CALC	Red-brown fine quartz with calcrete chips. Sand is subangular and moderately well sorted
6829-1469	2	4	SAND	CLYU	Red-brown fine quartz sand with calcrete chips. Sand is subangular and moderately well sorted
6829-1469	4	5	SAND	CLYU	Light red-brown, trace clayey quartz sand and calcrete chips. Moderately well sorted, sub angular
6829-1469	5	6	SAND	CLYU	Light red-brown trace clayey quartz sand and calcrete chips. Moderately well sorted subangular
6829-1469	6	9	SAND	CLYU	Red to red-brown clayey sand. Very low plasticity, moderately well sorted, subangular
6829-1469	9	10	SAND	CLYU	Red to red-brown clayey sand. Very low plasticity, moderately well sorted 9.5 to 10 metres. Green-grey silty clay, medium to high plasticity
6829-1469	10	12	SAND		Orange grey fine to medium/coarse quartz sand. Subrounded, poorly sorted
6829-1469	12	14	SAND		Light brown-grey fine to medium quartz sand, subrounded, poorly sorted
6829-1469	14	23	SAND		No sample - lost circulation, hard band at 19.2 to 19.5 metres, 20 to 20.2 metres and 21 to 21.2 metres
6829-1469	23	25	CLYU	SAND	Contaminated sample - red-brown fine quartz sand, moderately well sorted
6829-1469	25	32	CLYU	SAND	No sample - lost circulation, hard band at 26 to 26.5 metres
6829-1469	32	34	CLYU	SAND	Contaminated sample - yellowy red-brown fine quartz and calcareous sand
6829-1469	34	36	CLYU	SILT	Fawn coloured very low plasticity silty clay. Few fossils, those observed include trace bryozoa. (sample feels very soft)
6829-1469	36	41	CLYU		Light yellow to fawn coloured very low plasticity, silty calcareous clay (sample feels very soft) increased sample volume
6829-1469	41	42	CLYU	LMST	Light yellow to fawn coloured very low plasticity silty, calcareous clay. (sample feels very soft) Increased sample volume 41.5 to 42 definite colour change to medium grey calcareous silty and sandy sample. Drilling becomes harder
6829-1469	42	45	LMST	SAND	Light grey silty and sandy fossiliferous limestone. Contains bryozoa, trace forams, worms tubes and echinoid spines
6829-1469	45	46	LMST	SAND	Small sample - light grey silty and sandy fossiliferous limestone. Contains bryozoa, trace forams, worm tubes and echinoid spines
6829-1469	46	48	LMST	SAND	Light grey silty and sandy fossiliferous limestone, contains bryozoa, trace forams, worm tubes and echinoid spines
6829-1469	48	50	LMST	SILT	Light medium grey silty fossiliferous limestone. Contains bryozoa, trace forams, worm tubes, echinoid spines and shell fragments
6829-1469	50	52	LMST	SAND	Medium grey moderately well cemented, silty and sandy limestone. Fossils are bryozoa and shell fragments
6829-1469	52	55	LMST	SAND	Medium grey moderately well cemented silty and sandy limestone. Fossils are bryozoa and shell fragments, shell fragments are becoming white (aragonitic)
6829-1469	55	56	LMST		Medium to dark grey fossiliferous limestone. Very silty trace clay, trace bryozoa and more abundant white (aragonitic) shell fragments
6829-1469	56	57	CLYU	SILT	Medium to dark grey silty clay with white (aragonitic) shell fragments and trace bryozoa

Appendix B - DES Drill holes from Jan 2004 to Sept 2008 with Lithological and/or Drillers Log

Unit_No	depth from	depth to	major lith code	minor lith code	Description
6829-1470	0	2	SAND		Fine well sorted red-brown subangular quartz sand
6829-1470	2	3	SAND		Lighter red-brown fine well sorted slightly clayey subangular quartz sand
6829-1470	3	6	SAND		Light red-brown slightly clayey subangular quartz sand, contains calcrete nodules and chips
6829-1470	6	7	CALC		Light brown to white calcrete chips with minor sand
6829-1470	7	8	CLYU	SILT	Green-grey medium plasticity, slightly silty clay
6829-1470	8	10	CLYU	SILT	Green medium plasticity, slightly silty clay
6829-1470	10	11	SAND		Yellow to yellow-orange fine to medium grained quartz sand, well sorted, subrounded
6829-1470	11	12	SAND		Yellow to yellow-orange fine to medium grained quartz sand. Well sorted, subrounded
6829-1470	12	14	SAND		Yellow to yellow-orange fine to medium grained quartz sand. Well sorted, subrounded. Contains minor light grey fine to medium grained sand lenses
6829-1470	14	16	SAND		Yellow orange-mustard fine grained moderately well sorted quartz sand
6829-1470	16	17	CLYU	LMST	Light yellow to fawn calcareous clay and limestone. No identifiable fossils
6829-1470	17	18	CLYU	LMST	Light yellow to fawn calcareous clay and limestone. No identifiable fossils. Contains hard and soft bands
6829-1470	18	19	CLYU	LMST	Light yellow to fawn calcareous clay and minor limestone. No identifiable fossils. Contains hard and soft bands
6829-1470	19	34	CLYU	SAND	No sample - circulation lost - stratigraphy inferred from adjacent QS7L
6829-1470	34	36	CLYU	SAND	Small sample, fawn coloured fine calcareous sand with trace clay. No identifiable fossils
6829-1470	36	37	CLYU		Softer drilling, fawn coloured sandy clay. No fossils, low plasticity
6829-1470	37	40	CLYU	SAND	Poor samples, softer drilling, fawn coloured sandy clay, no fossils, low plasticity, some bands between 38 and 40 metres
6829-1470	40	41	LMST		Light grey moderately well cemented limestone. Grey to orange-yellow, few fossils, well cemented (chips)
6829-1470	41	42	LMST		Yellow fine well sorted quartz sand and grey to light grey fossiliferous limestone
6829-1470	42	43	LMST		Grey to light grey fossiliferous limestone. Fossils include sponge worm tubes and minor bryozoa
6829-1470	43	44	LMST		Light to medium grey fossiliferous limestone. Contains abundant bryozoa, worm tubes, minor echinoid spines, trace forams. Also contains a fine grained calcareous sand fraction
6829-1470	44	48	LMST		Light to medium grey fossiliferous limestone. Contains abundant bryozoa, worm tubes, minor echinoid spines, trace forams. Also contains a fine grained calcareous sand fraction
6829-1470	48	51	LMST		Light to medium grey moderately well cemented (some sample in chips) fossiliferous limestone. Contains abundant bryozoa, worm tubes, minor echinoid spines, trace forams. Also contains a fine grained calcareous sand fraction
6829-1470	51	52	LMST	CAAR	Well cemented limestone calcarenite. Contains fossils and aragonitic shell fragments
6829-1470	52	53	SAND		Medium grey shelly calcareous sand. Shells are aragonitic, contains trace bryozoa
6829-1471	0	3	CALC	SAND	Pink to white nodular calcrete with minor fine subangular red-brown quartz sand
6829-1471	3	5	CLYU	SILT	Pink to white nodular calcrete with minor fine subangular red-brown quartz sand. 2.5 to 3 metres green to grey silty clay, medium to low plasticity
6829-1471	5	8	CLYU	SILT	Green to brown low plasticity, silty clay, minor to trace quartz grains
6829-1471	8	9	SAND		White to yellow quartz sand, fine to coarse, poorly sorted, subrounded with oyster shells
6829-1471	9	10	SAND		White to yellow quartz sand, fine to coarse poorly sorted, subrounded with increasing oyster shells
6829-1471	10	11	SAND		Lost circulation then regained, 0.5 metres later. Light grey to brown silty quartz sand, fine to medium grained, trace oysters
6829-1471	11	12	SAND		Light grey to brown silty quartz sand, fine to medium grained, trace oysters
6829-1471	12	13	SAND		Light grey brown fine to coarse quartz sand, subrounded, poorly sorted
6829-1471	13	14	SAND		Orange yellow fine to medium moderately well sorted quartz sand. Trace shells
6829-1471	14	16	SAND		Orange brown medium to coarse quartz sand. Poorly sorted, subrounded
6829-1471	16	18	CLYU	SAND	Fawn to light yellow-grey quartz, sandy clay. Low plasticity
6829-1471	18	19	CLYU		Light yellow, medium to low plasticity clay, minor to trace sand
6829-1471	19	20	CLYU		Light yellow to medium to light grey, medium to low plasticity clay. Minor to trace sand
6829-1471	20	23	CLYU	SILT	Light grey, medium plasticity, silty clay
6829-1471	23	26	CLYU	SILT	Light yellow-grey, medium to low plasticity, silty clay
6829-1471	26	30	CLYU	SILT	Very light grey to fawn-grey, very low plasticity clay. Silty or 'fluffy' feel. Hard, well cemented limestone band at 28 to 29 metres
6829-1471	30	31	LMST		Light grey, harder drilling, fossiliferous limestone. Trace silty and sandy
6829-1471	31	32	LMST		Light yellow grey-brown fossiliferous limestone. Contains various bryozoa species
6829-1471	32	35	LMST		Light yellow-grey-brown fossiliferous limestone. Containing echinoid, abundant bryosoa, trace forams, trace shells and trace worm tubes
6829-1471	35	36	LMST		Light yellow-grey-brown fossiliferous limestone. Less fossils and more cemented than above. Contains worm tubes and bryozoa
6829-1471	36	38	LMST		Light yellow-brown fossiliferous limestone. Well cemented, fewer fossils, minor shell fragments
6829-1471	38	39	LMST		Light yellow-brown fossiliferous limestone. Well cemented. fewer fossils, minor white aragonitic shell fragments
6829-1471	39	42	LMST		Medium grey well cemented limestone. Minor fossils are bryozoa, trace forams, trace shell fragments and white aragonitic fossils at 42 metres
6829-1471	42	43	LMST		Medium grey, well cemented limestone and minor silty clay. Minor fossils. Fossils are bryozoa, trace forams, trace shell fragments and white aragonitic fossils
6829-1471	43	44	CLYU	SILT	Medium grey silty clay. Medium plasticity, contains white aragonitic shell fragments
6829-1472	0	1	SAND		Red-brown fine quartz sand, subangular, well sorted
6829-1472	1	2	SAND		Red-brown fine quartz sand, subangular, well sorted
6829-1472	2	4	CALC		Pink to white angular calcrete chips (trace nodules and sand as above)
6829-1472	4	5	CALC	CLYU	Pink to white angular calcrete chips (trace nodules and sand as above) 4.5 to 5 metres dark green-grey silty clay, medium plasticity
6829-1472	5	6	CLYU	SILT	Brown grey silty clay with yellow oyster fragments
6829-1472	6	7	SAND	CLYU	White to yellow brown slightly clayey silt with oyster fragments
6829-1472	7	9	SAND		Yellow to gold, fine quartz sand. Poorly sorted, contains oyster fragments
6829-1472	9	10	SAND		Yellow to gold, fine to coarse quartz sand. Poorly sorted.
6829-1472	10	11	SAND		Yellow to gold, clayey and quartz sand, poorly cemented limestone with trace oyster fragments
6829-1472	11	12	CLYU	SILT	Yellow-gold trace sandy, silty clay, medium plasticity, contains gypsum and trace oyster fragments
6829-1472	12	13	CLYU	SILT	Yellow-gold trace sandy, silty clay, medium plasticity, contains gypsum
6829-1472	13	15	CLYU	SILT	Fawn to yellow, medium plasticity, silty clay with gypsum crystals
6829-1472	15	17	CLYU		Grey-yellow, high plasticity, clay with trace silt
6829-1472	17	20	CLYU	SILT	Yellow gold silty clay, contains worm tubes and trace bryozoa
6829-1472	20	21	SILT	CLYU	Light grey clayey silt, low plasticity, trace gypsum and worm tubes
6829-1472	21	23	SILT	CLYU	Light grey to white clayey silt, low plasticity, trace gypsum and worm tubes
6829-1472	23	26	SILT	CLYU	Light yellow grey fine slightly clayey silt, with trace shell fragments and increased bryozoa content
6829-1472	26	29	LMST		Yellow to light grey moderately cemented fossiliferous limestone, containing bryozoa and worm tubes (sample in chip tray also contains cemtent chips)
6829-1472	29	30	LMST		Yellow to light grey moderately well cemented limestone, moderately fossiliferous, containing bryozoa and worm tubes
6829-1472	30	31	LMST		Yellow to light grey moderately well cemented limestone, moderately fossiliferous, containing bryozoa and worm tubes
6829-1472	31	32	LMST		Golden yellow, moderately well cement limestone 50% of sample is chips. Less fossil content than above and containing white aragonitic shell fragments
6829-1472	32	35	LMST		Small sample - golden yellow moderately well cemented limestone 50% of sample is chips. Less fossil content than above and containing white aragonitic shells fragments
6829-1472	35	37	LMST		Golden yellow moderately well cemented limestone 50% of sample is chips. Less fossil content than above and containing white aragonitic shells fragments. Interbedded with grey well cemented limestone at 37 metres, the aragonitic shell content is increased from above
6829-1472	37	38	CLYU	SILT	Grey, well cemented limestone containing aragonitic shell fragments and minor bryozoa. Contains trace clay, medium grey sandy and silty clay. Low plasticity, contains white aragonitic shell fragments

Appendix B - DES Drill holes from Jan 2004 to Sept 2008 with Lithological and/or Drillers Log

Unit_No	depth from	depth to	major lith code	minor lith code	Description
6829-1473	0	1	SAND	CALC	Pink to red-brown calcrete chipsand moderately well sorted medium grained quartz san
6829-1473	1	2	SAND	CALC	Pink to red-brown calcrete chips and moderately well sorted medium grained quartz sand
6829-1473	2	3	SAND	CLYU	Pink to red-brown moderately well sorted medium grained quartz slightly clayey sand
6829-1473	3	6	SAND	CLYU	Red-brown moderately well sorted medium grained quartz clayey sand. Contains oyster shell fragments
6829-1473	6	7	SAND		Light grey coarse quartz sand, subrounded, moderately well sorted, containing oyster shell fragments
6829-1473	7	8	SAND		Light grey coarse quartz sand 7 to 7.5 metres, subrounded. Moderately well sorted, containing oyster shell fragments. Yellow to grey yellow fine quartz 7.5 to 8 metres sand and oyster shell fragments. Poorly sorted and trace clayey
6829-1473	8	9	SAND		Yellow to grey fine quartz sand and oyster shell fragments. Poorly sorted and trace clayey
6829-1473	9	10	SAND		Yellow to grey yellow fine quartz sand and oyster shell fragments, poorly sorted
6829-1473	10	12	SAND		Orange-yellow medium to coarse quartz sand, subrounded, moderately well sorted and containing shell fragments
6829-1473	12	13	SAND		Light grey very fine to fine well sorted quartz sand
6829-1473	13	20	SAND		Yellow-grey very fine to fine, well sorted quartz sand
6829-1473	20	22	SAND	CLYU	Orangey-yellow clayey sand with oyster shell fragments
6829-1473	22	23	CLYU	SAND	Light orange sandy clay and limestone, low plasticity, well cemented limestone, no fossils
6829-1473	23	24	CLYU	SAND	As above, grains
6829-1473	24	26	CLYU	SAND	Light grey, sandy clay and limestone. Low plasticity. well cemented limestone, contains shell fragments, echinoid spines and worm tubes
6829-1473	26	29	CLYU	SAND	Light grey slightly silty clay. Minor cemented limestone bands
6829-1473	29	30	CLYU	SAND	Orange-yellow sand and clay with minor limestone bands. Fossils include shell fragments and worm tubes
6829-1473	30	32	SAND	SILT	Orange-yellow sand and sitl with minor limestone bands. Fossils include shell fragments and worm tubes
6829-1473	32	34	SAND	SILT	Light yellow sand and silt with minor limestone bands. Fossils include shell fragments and worm tubes
6829-1473	34	36	SAND	SILT	Orange-yellow to dark orange sand and silt with minor limestone bands. Fossils include shell fragments and worm tubes
6829-1473	36	37	SAND	SILT	Darker orange sand and silt with minor limestone bands. Fossils include shell fragments and worm tubes. Dark to medium grey silty clay non plastic. Contains shell fragments, bryozoa, echinoid spines
6829-1473	37	40	CLYU	SILT	Dark to medium grey silty clay, non plastic. Contains shell fragments, bryozoa, echinoid spines
6829-1473	40	41	LMST	SAND	Medium grey, sandy limestone. Contains aragonitic shell fragments and bryozoa, forams, echinoid spines and worm tubes
6829-1473	41	42	LMST	SAND	Very contaminated sample but assumed to be the same as above. Medium grey sandy limestone. Contains aragonitic shell fragments and bryozoa forams, echinoid spines and worm tubes
6829-1473	42	44	LMST		Medium grey fossiliferous limestone. Sandy (calc sands) fossils include bryozoa, echinoid spines, worm tubes and shell fragments
6829-1473	44	45	LMST	SAND	Small sample, medium grey fossiliferous calcareous sand and limestone. Fossils include bryozoa, echinoid spines, worm tubes and shell fragments
6829-1473	45	46	LMST		Darker medium grey fossiliferous limestone. Some minor cemented bands. Fossils include echinoid spines, worm tubes, shell fragments and bryozoa (bryozoa fewer in number than above)
6829-1473	46	47	LMST		Medium grey fossliferous limestone. Some minor cemented bands. Fossils include echinoid spines, worm tubes, shell fragments and bryozoa (bryozoa fewer in number than above)
6829-1473	47	48	LMST	SAND	Dark medium grey sandy fossiliferous limestone. Contains echinoid spines, worm tubes, shell fragments and bryozoa. Shell fragments are white (aragonitic)
6829-1473	48	50	LMST	SAND	Medium grey sandy fossiliferous limestone. Contains echinoid spines, worm tubes, shell fragments and bryozoa. Shell fragments are white (aragonitic) contains cemented bands at 50 metres
6829-1473	50	52	LMST	SAND	Darker medium grey sandy fossiliferous limestone. Contains echinoid spines, worm tubes, shell fragments and bryozoa. Shell fragments are white (aragonitic), contains cemented bands
6829-1473	52	53	SAND		Dark to medium grey calcareous sand with aragonitic shell fragments and fewer fossils
6829-1501	0	1	SAND	CALC	SAND and CALCRETE light red-brown fine quartz sand with calcrete chips. Sand is subangular and moderately well sorted
6829-1501	1	3	SAND	CALC	SAND and CALCRETE red-brown, fine quartz sand with calcrete chips, sand is subangular and moderately well sorted
6829-1501	3	6	SAND	CALC	CLAYEY SAND and CALCRETE light red-brown, trace clayey quartz sand and calcrete chips, moderately well sorted, subangular
6829-1501	6	9	SAND	CLYU	CLAYEY SAND red to red-brown clayey sand, very low plasticity, moderately well sorted, subrounded
6829-1501	9	10	SAND	CLYU	CLAYEY SAND and SILTY CLAY 9.0 to 9.5 metres of red to red-brown clayey sand, very low plasticity, moderately well sorted, subrounded, 9.5 to 10 metres, greeny grey silty clay, medium to high plasticity
6829-1501	10	12	SAND		SAND orange-grey fine to medium coarse quarts sand, subrounded, poorly sorted
6829-1501	12	14	SAND		SAND light browny-grey fine to medium quartz sand, subrounded, poorly sorted
6829-1501	14	17	SAND		SAND light browny-grey medium to coarse subangular to subrounded quartz sand, poorly sorted
6829-1501	17	19	SAND		SAND no sample - lost circulation
6829-1501	19	20	SAND		SAND no sample - lost circulation 19.2 - 19.5 metres hard band
6829-1501	20	21	SAND		SAND no sample - lost circulation 20 - 20.2 metres hard band
6829-1501	21	22	SAND		SAND no sample - lost circulation 21 - 21.2 hard band
6829-1501	22	23	CLYU	SAND	SANDY CLAY no sample - lost circulation
6829-1501	23	25	CLYU	SAND	SANDY CLAY contaminated sample, red-brown, fine quartz sand, moderately well sorted
6829-1501	25	26	CLYU	SAND	SANDY CLAY some oyster shells - lost circulation
6829-1501	26	27	CLYU	SAND	SANDY CLAY no sample - lost circulation 26 - 26.5 metres, hard band
6829-1501	27	32	CLYU	SAND	SANDY CLAY no sample - lost circulation
6829-1501	32	34	CLYU	SAND	SANDY CLAY contaminated sample - yellowy red-brown fine quartz and calcareous sand
6829-1501	34	36	CLYU	SILT	SILTY CLAY fawn coloured very low plasticity, silty clay, few fossils, those observed include trace bryozoa, sample feels very soft
6829-1501	36	38	CLYU		CLAY light yellow to fawn coloured, very low plasticity, silty calcareous clay, sample feels very soft
6829-1501	38	41	CLYU		CLAY light yellow to fawn coloured, very low plasticity, silty calcareous clay, sample feels very soft, increased sample volume
6829-1501	41	42	LMST		LIMESTONE medium grey calcareous silty and sandy sample, drilling becoming harder
6829-1501	42	45	LMST	SAND	SANDY & SILTY LIMESTONE light grey, silty and sandy fossiliferous limestone, contains bryozoa, trace forams, worm tubes and echinoid spines
6829-1501	45	46	LMST	SAND	SANDY & SILTY LIMESTONE small sample - light grey silty and sandy fossiliferous limestone, contains bryozoa, trace forams, worm tubes and echinoid spines
6829-1501	46	48	LMST	SAND	SANDY & SILTY LIMESTONE light grey silty and sandy fossiliferous limestone, contains bryozoa, trace forams, worm tubes and echinoid spines
6829-1501	48	50	LMST	SILT	SILTY LIMESTONE light to medium grey silty fossiliferous limestone, contains bryozoa, trace forams, worm tubes, echinoid spines and shell fragments
6829-1501	50	52	LMST	SAND	SANDY & SILTY LIMESTONE medium grey moderately well cemented silty and sandy limestone, fossils are bryozoa and shell fragments
6829-1501	52	55	LMST	SAND	SANDY & SILTY LIMESTONE medium grey moderately well cemented silty and sandy limestone, fossils are bryozoa and shell fragments, shell fragments are becoming white (aragonitic)
6829-1501	55	56	LMST	SILT	SILTY LIMESTONE medium to dark grey fossiliferous limestone, very silty, trace clay, trace bryozoa and more abundant white (aragonitic) shell fragments
6829-1501	56	62	CLYU	SILT	SILTY CLAY medium to dark grey silty clay with white (aragonitic) shell fragments and trace bryozoa
6829-1501	62	68	CLYU	SILT	SILTY CLAY yellowish grey, rocky, shells, bryozoa
6829-1501	68	70	LMST		LIMESTONE grey, rock fragments, flat robust branching, delicate branching, fenestrate echinoids
6829-1501	70	72	LMST		LIMESTONE grey-yellowish colour, becoming sandier and increase in fossils
6829-1501	72	80	LMST		LIMESTONE light fawn, sandy, highly fossiliferous, shells, worms, forams, assorted bryozoa echinoids
6829-1501	80	90	LMST		LIMESTONE light fawn, sandy, echinoids, worms, shells, rock chips - all abundant

Appendix B - DES Drill holes from Jan 2004 to Sept 2008 with Lithological and/or Drillers Log

Unit_No	depth from	depth to	major lith code	minor lith code	Description
6829-1502	0	6	SAND		SAND red, fine quartz sand
6829-1502	6	17	CLYU		CLAY red to red-brown sand, very low plasticity, moderately well sorted, subrounded
6829-1502	17	21.5	CLYU		CLAY green clayey sand, very low plasticity, moderately well sorted, subrounded
6829-1502	21.5	26	SAND		SAND yellow-brown, quartz sand
6829-1502	26	28	SAND		SAND coarse quartz grains with poor sorting, subangular, subrounded, brown
6829-1502	28	30	SAND		SAND yellow, quartz rich, subrounded
6829-1502	30	40	LMST		LIMESTONE fawn, clayey, sandy, rock chips
6829-1502	40	45	CLYU		CLAY greenish grey plastic clay
6829-1502	45	47	LMST		LIMESTONE fawn, bryozoa, forams, echinoids, sandy, chippy
6829-1502	47	60	LMST		LIMESTONE grey, chippy limestone, some fossils, bryozoa, shells
6829-1502	60	64	CLYU		CLAY darker grey, silty, rock chips some bryozoa
6829-1502	64	70	LMST		LIMESTONE fawn, more bryozoa, more rock chips
6829-1502	70	72	LMST		LIMESTONE yellow, very rocky, sandy echinoid spines, forams, flat robust branching and delicate branching bryozoa
6829-1502	72	80	LMST		LIMESTONE yellow, sandier, finer, fossiliferous - mostly bryozoa and shells, forams
6829-1502	80	90	LMST		LIMESTONE yellow-grey, fossils, finer, sandy, echinoids, bryozoa, worms
6829-1504	0	6	SAND		Light red-brown fine quartz sand. Sand is subangular and moderately well sorted
6829-1504	6	10.5	CLYU		Plastic green-grey clay, fine
6829-1504	10.5	13	SAND		Coarse quartz sand, yellow, poor sorting
6829-1504	13	15	SAND		Clayey sand, coarse, quartz rich
6829-1504	15	19	SAND		Quartz sand, yellow, coarse becoming chippy, minor oysters
6829-1504	19	22	LMST		Yellow chippy limestone, sandy
6829-1504	22	30	LMST		Sandy clay, fine yellow
6829-1504	30	36	CLYU		Clayier, light yellow
6829-1504	36	40	LMST		Grey limestone, some bryozoa shells
6829-1504	40	44	LMST		Sandier, same as above
6829-1504	44	48	LMST		Coarser, grey limestone, more fossils
6829-1504	48	53	LMST		Siltier, limestone, grey, fossils
6829-1504	53	58	CLYU		Some aragonitic fossils, fine, silty, sandy clay
6829-1504	58	70	LMST		Medium grey to yellow-grey fossiliferous limestone. Some hard bands. Fossils identified include bryozoa (abundant) sponge, shell fragments, forams, echinoid spines and worm tubes
6829-1504	70	74	LMST		Light grey fine, sandy, limestone. Well cemented, samples as chips. Few fossils observed except shell fragments
6829-1504	74	78	LMST		Yellow-brown slightly sandy fossiliferous limestone. Contains bryozoa, echinoid spines, forams and worm tubes
6829-1504	78	82	LMST		Light yellow-grey fossiliferous limestone. Minor calcrete sand, contains hard, well cemented bands. Fossils observed include: shell fragments, bryozoa, worm tubes, echinoids spines and trace forams
6829-1504	82	84	LMST		Light yellow-grey, sandy fossiliferous limestone. Well cemented, contains mostly bryozoa and worm tubes
6829-1504	84	88	LMST		Light grey fossiliferous limestone. Moderately well cemented, slightly sandy. Contains bryozoa, worm tubes and minor shell fragments
6829-1504	88	92	LMST		Light yellow-grey calcareous sandy limestone. Fewer fossils than above. Fossils observed include shell fragments and worm tubes
6829-1504	92	94	LMST		Light grey moderately sandy limestone. Contains shell fragments and worm tubes with trace bryozoa. Has some well cemented bands (harder drilling)
6829-1504	94	96	LMST		Medium grey very sandy calcareous limestone. Very fine grained, few fossils, trace black flecks (unidentified). Fossils observed included shell fragments and trace bryozoa
6829-1533	0	2	CALC		Pale red to pale yellow surface sheet and nodular calcrete
6829-1533	2	29	LMST		Pale yellow to white limestone. Fine grained with alternating hard and soft layers. Unable to be logged pas 25 metres, due to unreliable cuttings. EOH at 29 metres
6829-1534	0	1	SAND		Dark red sand with calcrete. Medium grained
6829-1534	1	2	CALC		Calcrete rubble, white to pale yellow
6829-1534	2	5	LMST		Medium grained calcareous, light yellow to light red
6829-1534	5	8	LMST		Fine to medium grained calcareous limestone, pale brown
6829-1534	8	30	LMST		Fine to medium grained sandy limestone. Yellow, alternating hard and soft layers. Hole logged to 20 metres, reliable cuttings not available below this depth. EOH at 30 metres
6829-1535	0	2	CALC		Brownish pink, sandy calcrete, nodular and sheet type
6829-1535	2	6	CLYU		Brownish grey sandy clay
6829-1535	6	14	LMST		Orange-yellow sandy calcareous clay and consolidated limestone between 6 and 14 metres, lost circulation at 13 metres
6829-1535	14	29.5	LMST		Grey-white, fine to medium grained fossiliferous limestone. Reliable cuttings could not be retrieved beyond a depth of 21 metres. EOH at 29.5 metres
6829-1536	0	5	SAND		Red sand, calcrete, very hard
6829-1536	5	11	LMST		Oysters, yellow sand, hard
6829-1536	11	13	LMST		Fawny orange, gypsum clayey
6829-1536	13	15	LMST		Orange-yellow, gypsum, silty, clayey and some sand, minor bryozoa
6829-1536	15	17	LMST		Yellow-fawn, rock chips, gypsum, sandy, silty, some clay, minor bryozoa
6829-1536	17	18	LMST		Fawn clay, rock chips, plastic, sandy, lots of sample
6829-1536	18	20	LMST		Fawn clay, less rock chips, fine
6829-1536	20	25	CLYU		Light grey colour, clay, increase in cuttings, very few fossils (delicate branching bryozoa) no rock chips
6829-1536	25	27	CLYU		Fawn coloured, fluffy texture, not plastic, very large sample sizes, very fine, minor hard fragments, worms, bryozoa
6829-1536	27	30	CLYU		Yellow clay, fine, minor chips, flat robust branching bryozoa, shell fragments, plastic
6829-1536	30	32	CLYU		Yellow clay, fine, slightly sandy, minor fenestrate and delicate branching bryozoa
6829-1536	32	33	CLYU		Yellowish-green sandy clay, minor white fossils
6829-1536	33	34	CLYU		Yellowish-green sandy clay, minor white fossils, worm tubes, bryozoa
6829-1536	34	35.5	CLYU		Greenish-grey clay with minor white fossils
6829-1536	35.5	37	LMST		Greyish limestone, minor fossils - broyzoa, shell fragments
6829-1536	37	48	LMST		Greyish limestone, minor fossils - bryozoa, shells and forams

Appendix B - DES Drill holes from Jan 2004 to Sept 2008 with Lithological and/or Drillers Log

Unit_No	depth from	depth to	major lith code	minor lith code	Description
6829-1537	0	5	SAND		Red, fine to medium grained quartz sand, well sorted, sub to well rounded
6829-1537	5	6	SAND	CALC	As above but comprises approximately 50% calcrete and rock fragments
6829-1537	6	8	CLYU		White, moderately stiff clay
6829-1537	8	14	CLYU		Red-brown, stiff, moderately plastic clay
6829-1537	14	25	CLYU		Green-grey (mustard lenses) moderately stiff, moderate plasticity clay
6829-1537	25	34	SAND		Orange-yellow, dominantly fine with few coarse grains, clayey sand. Poorly sorted, subangular to subrounded, rock fragments between 30 and 33 metres
6829-1537	34	38	CLYU		Clay, grey, stiff, plastic
6829-1537	38	49	LMST		Yellow-cream, very fossiliferous from 46 to 49 metres
6829-1537	49	50	LMST		Silty grey limestone, rock chips
6829-1537	50	54	LMST		Bright grey, forams, delicate branching bryozoa, shell rich, fenestrate and celleporaria
6829-1537	54	57	LMST		Shells, forams, delicate branching, fawnish grey, sandy, fine, chippy
6829-1537	57	60	LMST		Increasing fossils, sandy, white - light grey, slight clayey feel, crab claw, shells, forams, turritella
6829-1537	60	66	LMST		Grey, lots of rock chips, shells, flat robust branching and delicate branching bryozoa, celleporaria
6829-1537	66	72	LMST		Yellow, sandier, increase in fossils, turritella, echinoid spines and plates, worms, delicate branching and flat robust branching bryozoa
6829-1537	72	75	LMST		Yellow, very sandy, highly fossiliferous, forams, flat robust branching, rods, shells, crab claws
6829-1537	75	77	LMST		Hard bands, grey, sandy, shells, bryozoa, forams
6829-1537	77	84	LMST		Yellow-mustard, fine to medium sand, fossiliferous - bryozoa, forams, echinoids, shells
6829-1538	0	6	SAND		Fine red quartz sand, no calcrete
6829-1538	6	10	CLYU		Greenish-yellow plastic clay, fine
6829-1538	10	14	CLYU		Brown plastic clay, fine
6829-1538	14	15	LMST		White yellow, chippy limestone, oysters (?)
6829-1538	15	19	LMST		Yellow, chippy limestone
6829-1538	19	20	LMST		Goldy-yellow, clayey sand
6829-1538	20	25	LMST		Yellow, sandy, minor bryozoa fossils
6829-1538	25	30	CLYU		Yellow plastic clay
6829-1538	30	33	CLYU		Grey plastic gypsum rich clay
6829-1538	33	40	LMST		Light grey limestone, sandy, minor fossils, chippy some clay
6829-1538	40	49	LMST		Light grey limestone, sandy, minor fossils, chippy
6829-1538	49	51	LMST		Light grey limestone, sandy, minor fossils, bryozoa
6829-1538	51	52	LMST		Light grey limestone, sandy, minor fossils, chippy, bryozoa
6829-1538	52	56	CLYU		Some white fossils, dirty fawn colour clay, silty, some sand
6829-1538	56	60	LMST		Dirty grey colour, sandier, chips, bryozoa, shell fragments
6829-1538	60	62	LMST		White with grey, chippy, sandy, some bryozoa, shells, forams and echinoids
6829-1538	62	66	LMST		Sandy, fossil rich, yellow, echinoids, bryozoa, shells, forams
6829-1538	66	84	LMST		Sandy, fine fossil rich, yellow, echinoids, bryozoa, shells, forams
6927-946	0	1	SAND		Sand
6927-946	1	18	SAND		Yellow clayey sand
6927-946	18	32	SAND		Yellow mica sand and gravel
6927-946	32	37	SAND		As above with sandstone layers
6927-946	37	40	CLYU		Yellow sandy clay
6927-946	40	81	LMST		Yellow limestone
6927-946	81	120	LMST		Grey limestone
6927-946	120	122	LMST		Grey limestone tending hard flint
6927-956	0	8	CLYU		yellow clay
6927-956	8	17	CLYU		sandy yellow clay
6927-956	17	18	SDST		hard sandstone
6927-956	18	40	CLYU		yellow clay & layers sandstone
6927-956	40	48	CLYU		yellow clay & shells
6927-956	48	68	LMST		creamy limestone, coral & fossils
6927-956	68	75	LMST		khaki limestone, coral & fossils
6927-956	75	120	LMST		grey limestone, coral & fossils
6928-704	0	6	CLYU		brown clay
6928-704	6	11	CLYU		red clay
6928-704	11	28	SDST		sandstone
6928-704	28	40	SDST		sandstone & clay
6928-704	40	49	ROCK		cliffrock & shells
6928-704	49	85	LMST		creamy limestone coral & fossils
6928-704	85	86	CLYU		green clay, coral & fossils
6928-704	86	110	LMST		grey limestone coral & fossils

Appendix B - DES Drill holes from Jan 2004 to Sept 2008 with Lithological and/or Drillers Log

Unit_No	depth from	depth to	major lith code	minor lith code	Description
6929-1000	0	6	SAND		SAND red, fine quartz sand
6929-1000	6	10.5	CLYU		CLAY green plastic clay
6929-1000	10.5	12.5	SAND		SAND white, some oysters
6929-1000	12.5	14	SAND		SAND medium coarse, yellow, quartz sand
6929-1000	14	21.5	LMST		LIMESTONE yellow, rock chips, sandy becoming clayey, sparse bryozoa
6929-1000	21.5	23	CLYU		CLAY plastic, fawn-green clay, fine
6929-1000	23	26	LMST		LIMESTONE sandier, yellow to fawn, fine, some rock chips, few fossils
6929-1000	26	40	LMST		LIMESTONE fawn, sandy, minor bryozoa, rods, delicate branching, forams, shells
6929-1000	40	42	LMST		LIMESTONE increasing fossils, fawn, bryozoa, fenestrate, flat robust branching delicate branching
6929-1000	42	45	CLYU		CLAY minor white shells, green clay, silty
6929-1000	45	50	LMST		LIMESTONE yellowish grey, rocky, shells, bryozoa
6929-1000	50	60	LMST		LIMESTONE grey, rock fragments, flat, robust branching, delicate branching, fenestrate, echinoids
6929-1000	60	62	LMST		LIMESTONE grey-yellowish colour, becoming sandier, increased fossils
6929-1000	62	66	LMST		LIMESTONE very sandy, yellow, rock chips, fossiliferous with shells, forams and bryozoa
6929-1000	66	84	LMST		LIMESTONE very sandy, yellow, rock chips, fossiliferous with shells, forams and bryozoa. EOH at 84 metres

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

BORE LOG

~~CONTINUATION SHEET~~

PROJECT MURRAY BASIN

Permit 94112

HOLE NO. M150

UNIT/STATE NO: 6727-2271

Depth (m) From	To	Geological Description of Sample	Unit	Age
0	1.4	SAND red brown, clayey	Monoman	Quaternary
1.4	5	CALCRETE pink & off-white, sandy.		
5	8	SAND pink - pale red. Cemented (calc), med gr. subangular		
8	17	CLAY red-brown, mottled grey - fawn, sandy 12-17 m mainly pale grey clay - sandy.		
17	36	SAND gravelly, poorly sorted fine to coarse & rounded pebbles < 1.5cm. Pale orange (Fe staining). Hard cemented ferrug cap.	Coonambidgal	
36	40	LIMESTONE fawn, well consolidated layers, sandy and fine grained. Marly layers	Murray Gp	Mioc
40	46	MARL dk grey, sl. fossiliferous & glauconitic. Mod. stiff		
46	52	LIGNITE soft, dk brown-black. Wood fragments present		
52	88	MARL grey-green, glauconitic. Sl sandy. Shelly 52-58 (turritella) 64-70m Occ bivalve fragments (large) - well cemented layers 70-75m marl stiffer, darker grey-green. 75-88m becoming more shelly with depth. Sandy	Ettrick Formation	Oligocene
88	93	CLAY dk brown - black carbonaceous. Mod. stiff.	Renmark Beds	Eocene
93	99	SAND silty, dk brown, fine-medium grained.		
99	102	CLAY as above		

END OF HOLE 102m

SHEET ..... OF .....

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

HOLE NO M149

Murray Basin
Unit 6059

BORE LOG

~~CONTINUATION LOGS~~

6727-2277

		GEOLOGICAL DESCRIPTION OF SAMPLE
0	13	CLAY dk red brown, mottled fawn & grey. Sandy Stiffer & depth.
19	76	LIMESTONE fawn cemented layers - fine med gr interbedded with soft fawn-grey marly Lst. 39-54 - mainly fossilif dk yellow-brown cemented layers 54-75 - uncemented Lst, occasional blebs of dk red brown non-calc clay. Sandy with depth.
76	96	MARL grey. stiff. glauconitic & fossilif. (20% fine gr)
96	111	SHELLY SAND subrounded - fine grained, 40% bryoz frags <2mm. Slightly marly - glauconitic
111	149	MARL as above, sandy Shelly (turretella) 126-149 - no shell frags. 141-149 - more carbonaceous grey brown colour
149	154	LIGNITE - CLAY dark brown - black carbonaceous
154	162	SAND silty, cl clayey. Dark brown, poorly sorted. Blk grains clear - subangular.
162	171	BASEMENT sandy white clay weathered. Pyritic aggregates.

END OF HOLE 171m

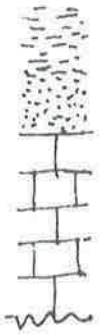
SHEET (OF)

MURRAY BASIN
Permit 93512

CORE DESCRIPTION

HOLE NO M141
6728 - 2449

EL81



0-12m SILT orange brown calc, 30% fine sand. Clayey.

12-18m SAND red-brown, silty • well sorted.

18-84m LIMESTONE fawn, silty and sandy. Soft generally with minor hard well cemented layers.

LOST CIRCULATION ZONE - NO SAMPLES

78-84m LIMESTONE yellow-brown, sl sandy • glauconitic, Marly.

84-120m MARL dk grey-green, fairly stiff. Finely glauconitic, with occ. fine pyrite, and shell fragments.

96-120m Black carbonaceous layers in marl.

117-120m vfine sand lenses.

120-129m CARBONACEOUS CLAY Lignitic, dk brown to black. Moderately stiff. Slightly sandy.

129-147m WEATHERED BASEMENT white • grey-green micaceous clay. Hard pyritic layer at 147m.

END OF HOLE 147m

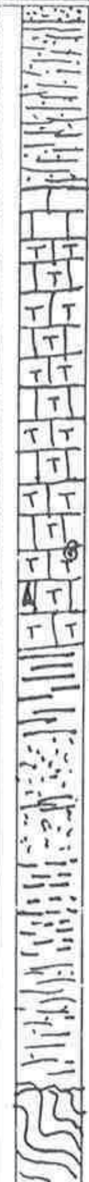
DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

BORE LOG

~~CONTINUATION SHEET~~

PROJECT: MURRAY BASIN
Permit 93979

HOLE NO. M144
UNIT/STATE NO: 6728-2486



Depth from (m)	Depth to (m)	Geological description of sample	Unit	Age
0	2	SAND silty, pale choc. brown, calcareous	BLANCHETOWN CL.	QUATERNARY
2	14	SANDY CLAY fawn mottled off-white-pink, non calc. 30% fine-med sand.		
14	50	LIMESTONE dk yellow marly, sl sandy. Hard off-white consolidated capping. From 28 m, consol layers, slightly glauconitic c̄ rare rounded ironstone grains. 44-50 m echinoid frags, blebs of red sandy clay and nodules of off-white non-calc claystone.	MURRAY GROUP	MIOCENE
50	84	CLAY/SAND interbedded dark grey-brown-black stiff clay, carbonaceous, finely micaceous. Lignitic intervals (see composite log).	RENMARK BEDS	EOCENE
84	90	BASEMENT grey green phyllitic clay - soft. Minor med gr. quartz.	KANMANTOO ?	

Casing: 76 mm

END OF HOLE 90 m

SHEET 1 OF 1

MURRAY BASIN
PERMIT 92:15

CORE DESCRIPTION

HOLE NO M119
6729-1165

EL = 114.9

0 – 4m SILT red-brown with 50% calcrete nodules, 5% coarse angular qtz

4 – 16m CLAY red-brown, mottled fawn & grey, v. stiff. Slightly sandy.

10–16m minor sand lenses, sandier with depth.

14–16m 30% medium sand, minor rounded gravel < 3mm

16 – 66m LIMESTONE yellow-brown, sandy (10%) minor cemented frags.

18–30m soft yellow, very marly limestone

30–38m as minor cemented fragments

38–66m yellow-grey v. marly limestone, minor v.fine glauconite

66 – 94m MARL grey, minor fine grained fossils, soft.

72–80m becoming stiffer

80–88m dark grey stiff marl, minor glauconite (vfine gr.)

88–90m v shelly, coarse frags 20–30%.

90–92m shelly 10%, 30–40% fine to med. gr subrounded sand, minor pyrite frags, 2% med gr. glauconite.

92 – 94m v. shelly, 50% turritella 1.5m, 10% sand.

94 – 96m SAND marly, dark grey, 10% shells (coarse) subrounded to rounded, med gr. w 0-3mm, mell sorted. Minor pyrite nodules

96 – 98m MARL as for 90–92m, slightly carbonaceous

98 – 102m CLAY dark brown-grey, carbonaceous and sandy. Subrounded coarse gr. qtz 5–10%. Stiff

102 – 114m CLAY pale grey-white, plastic. Slightly sandy (contaminant?)

SHEET 1 OF 2

PERMIT 92915

CORE DESCRIPTION

HOLE NO M119
STATE NO 6729-1165

GEOLOGICAL DESCRIPTION OF CORE

105

115

114 – 144m SAND medium grained, well sorted av 0·3–0·5 mm Minor carbonaceous fragg + minor pyrite. Subrounded to rounded. 30% dark grey ~~mark~~ clay

120

122 – 128m poorly sorted clean sand, mainly coarse gr av 1–2 mm

130

128 – 130m mod well sorted, med. grained, av 0·5–1·0 mm.
130 – 134m 20% grey silt, minor clay
134 – 138m GRAVEL? coarse sand, subang to sub.rounded av 2–3 mm with minor clay. poorly sorted. <5 mm.

140

138 – 142 – medium sand av 0·5 – 1·0 mm silty.
142 – 144 – poorly sorted aa. 20% clay. silt, 20% gravel.
144 – 150 BASEMENT pale orange, green-grey phyllitic clays, pale green fragments chlorite feldspar schist?

150

END OF HOLE 150m

SHEET 2 OF 2

M124

6727-117C

EL = 105 m.

CLAY red brown, [illegible] grey sandy occ calcrete nodules

GRAVELLY SILT [illegible] of basement (qtzite, slate etc) subrounded to sub-angular <2mm 30%. Silt as for 0-6m

14 GRAVEL as above with 20% silt [illegible].

14 CLAY stiff red brown, mottled grey-green. Sandy (10%) fine [illegible]. Plastic below 16m with the occasional pebble (contamn?)

30

34 - 64m LIMESTONE yellow brown, unfossiliferous fine grained & soft. [illegible] 34-40

40 BUM

46 - 62m minor cemented frags. Some shells.

50

60 62-64m yellow-grey limestone, clayey, 20% shell frags LM

64 - 72m COQUINA almost 100% shell fragments, black grey yellow & off-white. Occasional well rounded qtz <2mm. 2% v. fine sand. Pyrite.

70 NO CAMP?

72 - 82m SAND very dark grey, v. silty (72-74m) Minor shell frags (contamn?) subrounded <3mm, av 0.2mm fine sand.

NO CAMP?

74 - 76m poorly sorted med coarse, subrounded sand 0.1-3mm. av 1.0mm. Minor pyrite.

76 - 78m very silty silty sand 78-82 as with 10% carbonaceous clay.

80

82 - 110m ALTERNATING SILTY SANDS & SANDY CLAYS

OLNEY

clay soft brown mottled pale grey fine grained sand 5%.

90 92-96 stiff dk brown carbonaceous clay

96-98 v silty sand finely micaceous, poorly sorted 0.1-1.0mm

100 98-110. dk brown black v carbonaceous ~~[illegible]~~ clay as.

110 110-116m BASEMENT weathered, green-grey phyllite clay.

END OF HOLE 116m

72-74 [illegible]

STRIKE

KLR

ADCL-MT BAKER

INLINE C

X-SECT

F-G-H

SHEET 1 OF 1

MURRAY BASIN
PERMIT 1287P.

DEPARTMENT OF MINES — SOUTH AUSTRALIA
MINERALS DIVISION

CORE DESCRIPTION

HOLE NO M131
UNIT STATE NO
6827-1530

GEOLOGICAL DESCRIPTION OF CORE

RL = 62.75

0 – 4m SAND pale orange, silty, well sorted, subangular, fine gr (av 0.2mm)

4 – 8m SANDY CLAY sand 40% a.a. with pale orange clay.

8 – 24 – GRAVEL poorly sorted, rounded, <4mm, av 2mm. Clr smoky & milky, most Fe stained.

24 – 30m SAND poorly sorted, coarse grained av 1.0mm. 30% gravel aa.

30 – 114m LIMESTONE Hard consolidated, yellow brown, sandy. Fine gr.

36 – 60m pale yellow / off-white marly lst, soft & sticky with hard consolidated layers.

60 – 82m marly lst aa. no hard layers. Stiffer with depth.

82 – 104m grey-fawn, sl. fossiliferous, some cemented layers.

86 – 88m cemented layer, 10 – 20% fossils.

glauconitic below 92m.

104 – 106m hard grey layer, glauconitic, minor shells etc.

114 – 136m MARL dark grey, glauconitic, soft, 10% fossil frags, stiffer with depth.

136 – 220 – CLAY dk brown to black, mod stiff, minor fine sand.

174 – 178m v carbonaceous black clay, 10% fine sand, pyrite cemented sand.

220 – 225m BASEMENT white & grey phyllitic clay with 50% gravel comprising angular milky qz <1cm.

SHEET 1 OF 1

-7580

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

Official Well No. M13

1. PERMIT No. 12874

2. LOCATION OF WELL:
Hundred or Pastoral Lease No. MARYNIA DAM
Section 19 Lot No. ..... Site No. .....
Name of Property .....

As the person responsible for the work carried out on this well I advise that it has been completed as detailed below:

Name of Driller A. MCINTYRE Licence No. 2/119
Name of plant operator if under supervision .....

Permit holder or land occupier D. MYE
Postal Address P.O. BOX 151
EASTWOOD Postcode 5031

3. SUMMARY

Date work commenced 21.9.83. Date completed 28.9.83.
Work carried out: New well ✓, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)
Final Depth 225.4 m Final standing water level 42.25 m Final yield 1.2 l/sec.
Was well abandoned? NO If yes, state method .....

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	5.1	250	ROTARY	AIR
5.1	225.4	150	ROTARY	MUD

6.2 WATER CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
26.9.83	203	205	42.25	1.2	225.4	211.74	AIR LIFTED	GOOD

7. CASING LEFT IN WELL

7.1 DIMENSIONS

From (m)	To (m)	Internal Diam.
0	5.1	200
0	211.74	80

7.2 TYPE: Swell Joint, Welded Collar, Steel, Plastic, Etc.

From (m)	To (m)	Internal Diam.	Swell Joint, Welded Collar, Steel, Plastic, Etc.
0	5.1	200	CLASS 12 PVC
0	211.74	80	STEEL S+S

7.3 CASING SHOE

From (m)	To (m)	Internal Diam.	Swell Joint, Welded Collar, Steel, Plastic, Etc.	Shoe Yes	Shoe No	Diam. (mm)	Cemented Yes	Cemented No
0	5.1	200	CLASS 12 PVC	☐	☑		☐	☐
0	211.74	80	STEEL S+S	☐	☐		☐	☐
				☐	☐		☐	☐
				☐	☐		☐	☐

7.4 CASING PRESSURE CEMENTED

From (m)	To (m)	Internal Diam.	Swell Joint, Welded Collar, Steel, Plastic, Etc.	Cemented Yes	Cemented No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	5.1	200	CLASS 12 PVC	☑	☐	0	3.8	3	60	
0	211.74	80	STEEL S+S	☑	☐	0	196.12	65	1760	
				☐	☐					
				☐	☐					

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD
Open Hole
✓ Screened ☐ Slotted Casing

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
SCREEN	203	205.4	0.5	80	85	S. STEEL	SURESCREEN	CAPPED SUMP

Other, give details PERSPEX DISC + KINGFISHER SET AT 196.12m

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

19 OCT 1983
DEPT OF MINES
ENGINEERING
DIVISION

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken
AIRLIFTED FROM 120m FOR 3HRS

11. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	Interval Tested To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

12. SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—

Signature of Licensed Driller A. McIntyre Date 29/9/83

Driller to forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	4	RED SANDY CLAYS
4	10	RED SANDS - CLAYEY
10	20	COURSE GRAVELS
20	30	BROWN CLAYS SANDY MICATIOUS
	29m	IRONSTONE BAR 40cm
30	37	SANDSTONE - BROWN SANDY CLAY BANDS
37	80	LIMESTONE - THIN SANDSTONE BARS NEAR TOP OF LIMESTONE
80	103	GREEN LIMESTONE
103	123	GREY + GREEN LIMESTONE
123	134	GREY MARLS
134	142	SANDSTONE - FOSSILS
142	148	SANDSTONE - GREY
150	169	BROWN CLAYS - DARK
169	175	GREEN CLAYS - SANDS
175	180	CEMENTED SANDS
180	210	DARK BROWN CLAYS SANDS
210	221.6	LIGHT BROWN CLAYS
221.6	222	QUARTZ BAR
222	225.4	WHITE CLAYS

Form 1207

5-5.76 G5538 St. 21

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

BORE LOG

~~CONTINUATION SHEET~~

HOLE NO. M148

UNIT/STATE NO 6827-1562

PROJECT MURRAY BASIN

Permit 16059

EL = 99.67

DEPTH FROM	DEPTH TO	GEOLOGICAL DESCRIPTION OF SAMPLE
0	3	SAND fawn, calc + silty, poorly sorted
3	12	CLAY red-brown, mottled offwhite. Stiff + sandy 9-12m dk orange-red
12	74	SAND fine-medium gr, dk orange well sorted + sl micaceous. Clayey 12-18m. Occ well cemented layers Orange-yellow colours below 33m.
74	102	LIMESTONE pale yellow-fawn, soft fine-gr + marly 88-93 cemented layers
102	141	MARL dark grey, very glauconitic. Slightly fossilif. v fine shell frags.
141	148	CARBONACEOUS CLAY dark brown-black, silty and pyritic
148	157	LIGNITE dark-brown black, soft.
157	164	SAND clear fine-med gr, subrounded + poorly sorted Clayey in parts.
164	170	BASEMENT soft grey clay (weathered).

END OF HOLE 170m

Rotary - Reverse

NO SAMPLES 57-80m

DRILL HAS UNEST. @ 60m

UNIT	AGE
QUAT.	WOORINEN
PLIOCENE	PLIOCENE SANDS
MIOCENE	MURRAY GP
OLIGOCENE	ETTRICK FM
EOCENE	RENMARK BEDS
KANJANTEO?	

CASING 102 mm

WATERS CUT

WATER LEVEL

SHEET 1 OF 1

6827-1562

SCHEDULE EIGHT FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

Official Well No. 11/45

1. PERMIT No. 16651

2. LOCATION OF WELL:

Hundred or Pastoral Lease No. H. ORR
Section 21 Lot No. Site No. 1
Name of Property
Permit holder or land occupier D M+E
Postal Address
Postcode

As the person responsible for the work carried out on this well I advise that it has been completed as described below:

Name of Driller B. M. ... Licence No. 3119
Name of plant operator if under supervision

SUMMARY

Date work commenced 12 6 85 Date completed
Work carried out: New well ☑, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)
Final Depth 170 m Final standing water level 89.8 m Final yield 1.3 l/sec.
Was well abandoned? No If yes, state method

DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	55	350	ROTARY	AIR
	79	190	ROTARY	AIR
	170	145	ROTARY	MUD

6.2 WATERS CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
18.6.85	157	161	89.8	1.3	170	166.5	AIR	SALTY

7. CASING LEFT IN WELL

7.1 From (m)	To (m)	Internal Diam.	7.2 Type (Swell Joint, Welded Collar, Steel, Plastic, Etc.)	7.3 Casing Shoe Yes	No	Diam. (mm)	Cemented Yes	No	7.4 Casing Pressure Cemented Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	79	150	PVC	☐	☐		☐	☐	☐	☑	75	79	6	160	
			CLASS 6	☐	☐		☐	☐	☐	☐					
0	166	100	STS STEEL	☐	☐		☐	☐	☑	☐	0	154	30	553	

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD

Open Hole
☑ Screen(s) ☐ Slotted Casing
Other, give details

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
SCREEN	151	160	0.5	100	110	S/STEEL	SURE SCREEN	CAPPED.

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken

AIR LIFTED 5 HRS

11. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	4	SAND
4	7	SILCRETE
7	15	RED CLAYED SANDS.
15	60	SANDSTONE (LINE)
60	116	LIMESTONE
116	142	GREY MARL. (STICKY)
142	157	BLACK CLAYS (STICKY)
157	162	LIGNITES + SANDS
162	170	WHITE CLAYS
		WEATHERED GRANITE
		50 - 65m
		MICAVENOUS ZONE

12. SAMPLES

The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—

Signature of Licensed Driller [signature] Date 30/6/85

Driller to forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

1M675-5.76 G5538 St. 21

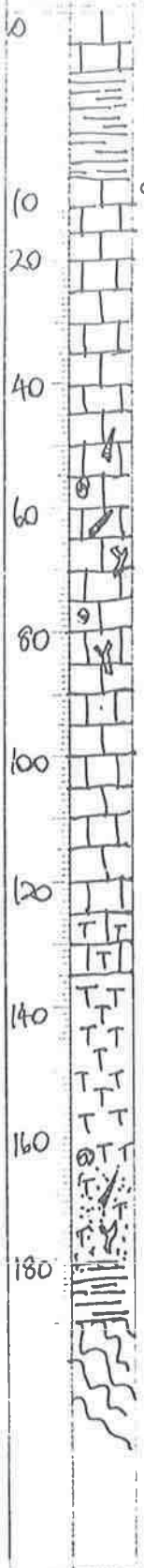
Form 1207

HOLE NO M126

MURRAY BASIN
PERMIT 92921B

CORE DESCRIPTION

6828-731



0 - 2m CALCRETE off white to pink, hard, layered.

2 - 8m CLAY 2-4m calcareous, off white & mottled pink, plastic
4-8 red-brown, mottled grey. Stiff & slightly sandy.

8 - 136m LIMESTONE Pale fawn, soft fine grained with occasional hard consolidated layers, yellow brown & sl. fossiliferous.

42-44m dark brown, fossilif. (20%) fine to med. grained. Sl sandy
44 - 50m yellow-brown, soft clayey lst.
50 - 86m fawn, 10-20% fossil frags, some well-cemented layers. Fine to med. grained.

86 - 110m fawn-grey in colour, slightly sandy.

100 - 120m finer grained lst, slightly marly & sticky
110 - 128m blebs of light grey fine gr. lst with streaks of bright green clay (glauconite?)
128 - 136m grey fine grained, very marly

136 - 180m MARL very dark grey and very stiff. Glauconitic.

160 - 180m soft marl, fossiliferous (bryozoa), 10-20% fine sand and occasional coarse gtz < 1 cm, interbedded with non-sandy marl.

180 - 186m CLAY blebs of stiff dk brown to black carbonaceous clay with marl (contam.)

186 - 188m BASEMENT weathered, white plastic clay.

END OF HOLE 188m

clay

REMARK MAP
RMK LAYOR THINNING
BETWEEN D-E
& UNKNOWN ABOVE E
↓
-731 BELOW D-E
PARALLEL TO SWAMP RD.

MURRAY BASIN
Permit 92922

CORE DESCRIPTION

HOLE NO M127

6828-732

0-2m CALCRETE off-white to pink, hard.

2-18m SAND orange-red, sl. micaceous, iron-stained. well sorted fg grains, subangular to sub-rounded, av 0.2-0.3mm. Non-calc.

6-18m clayey sand aa, 20-30% clay mottled red grey, off-white with coarser gr. (0.3-0.5mm) 6-8m.

18-106m LIMESTONE yellow-off-white, fine to med gr. consolidated limestone interbedded with soft yellow-brown lst. Slightly sandy. sl. fossiliferous.

32-36m soft, sl. marly yellow brown lst.

BMG.

70-80m more marly lst.

80-106m fawn-grey marly, glauconitic lst, fine gr, uncons'd. becoming greyer with depth.

106-127m MARL very stiff, glauconitic, dark grey. 2% finer gr. fossil frags.

TTT.

120-126m softer, sticky, 20-30% fine sand and fossil frags, pyrite. light grey. Hard cemented layer 123-124m.

126-127m 30-40% fine-med sand (av 0.3mm). fossil frags.

127-136m CARBONACEOUS CLAY dark brown, lignitic, sticky, slightly sandy (fine grained). ~~Stiff~~.

RM

134-136m stiffer sandy clay. 20% fine sand, calcareous fossil frags lignite.

SHEET 1 OF 2

MURRAY BASIN

CORE DESCRIPTION

HOLE NO M127

N.T.S. ATE NO 6828-733 732

140 136 - 140 SAND Fine grained milky qtz + calcareous grains with lignite frags

150 140 - 173 SANDY CLAY stiff dk brown lignite clay (dark also) with 30% white grains of ~~weathered~~ clay < 2mm. 20% interbedded light brown calcareous sand as (contamn?)

160

170 173 - 174 WEATHERED BASEMENT white weathered clay

END OF HOLE 174

180

SHEET 2 OF 2

732

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

1. PERMIT No. 92922 — Official Well No. [illegible]

2. LOCATION OF WELL:
Hundred or Pastoral Lease No. FORSTER
Section 163 Lot No. ...... Site No. ......
Name of Property ......

As the person responsible for the work carried out on this well I advise that it has been completed as described below.

Name of Driller F.B. SCHUMMER Licence No. 2-163
Name of plant operator if under supervision ......

Permit holder or land occupier Dept Mines & Energy
Postal Address PO Box 151
EASTWOOD Postcode 5063

5. SUMMARY
Date work commenced 27-9-83 Date completed 5-10-83
Work carried out: New well ☑, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)
Final Depth 174.0 m Final standing water level 133 m Final yield ...... l/sec. approx 100gph
[illegible]
[illegible] If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	30	200	Rotary	Air
30	174	140	Rotary	Mud

6.2 WATERS CUT (measurements from natural surface to nearest 0.1 m)

Date	Water Cut From (m)	To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
4/10	142	144		As Above	174	142	airlift	T.B.A.

7. CASING LEFT IN WELL

7.1 From (m)	To (m)	Internal Diam.	7.2 Type Swell Joint, Welded Collar, Steel, Plastic, Etc.	7.3 Casing Shoe Yes	No	Diam. (mm)	Cemented Yes	No	7.4 Casing Pressure Cemented Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	28	150	CL 12 PVC	☐	☐		☐	☐	☐	☐					
13	142	80	Steel	☐	☐		☐	☐	☑	☐	132				
144	150.5	80	Steel	☐	☐		☐	☐	☐	☐	0	132	35	875	—

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD
☐ Open Hole
☑ Screen(s) ☐ Slotted Casing
☐ Other, give details ......

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
Wirewound	142	144	.25	82	92	S/Steel	Sunscreen	Sump (80mm) Blanked

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken

Airlifting for 3hrs

11. PUMP TEST (measurements from natural surface to nearest 0.1 m)

Interval Tested From (m)	To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	.5	Sands over calcrete
.5	1.5	Calcrete nodules
1.5	15	Sands (red)
15	74	Limestone (marls)
74	94	Marls limestone (grey)
94	96	Dark Brown clays
96	98	Sands (carbonaceous)
98	108	Clays (carbonaceous)
108	113	Clays (dark grey)
113	123	Clays " " carbonaceous
123	123.5	Limestone (glauconitic V/hard)
123.5	126.5	Sands (shelly)
126.5	139	Lignitic clays silts-sands
139	172.5	Quartz sands white clays
172.5	174	Basement (Phylite)

12. SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—

Signature of Licensed Driller F.B. Schummer Date 13/10/83

Driller to forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

IMD.5 5.76 G5538 SI. 21

Form 1207

MURRAY BASIN
PERMIT 12877

CORE DESCRIPTION

HOLE NO M128
UNIT STATE NO
6828-736

EL. 70 m

0-20m SANDY CLAY mottled pink, orange, red & dk brown, sandy (30%, fine grained). Calcareous, minor calcrete nodules 8-20m Sandier with depth.

20-128m LIMESTONE fawn, hard & consolidated. Fine grained & sandy

38-40m minor recrystallizn

40-46m off-white, very fossiliferous, med-coarse Lst.

46-60m soft, unconsolidated pale orange fine to med gr.

60-70m consolidated fawn fine gr. lst, ≈50% fossil frags coarse grained.

70-80m as above, only 10% fossils, 10% marl.

80-128m fawn, soft marly limestone, fine grained.

108-114m pale grey well cemented limestone, 30-40% fossil frags, 20% marly Lst as.

SHEET 1 OF 2

6828 -136.

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

HOLE NO M128

DRILLER'S HOLE NO

CORE DESCRIPTION

PERMIT 12877

GEOLOGICAL DESCRIPTION OF CORE

128 - 170 m MARL soft, grey, glauconitic, fossiliferous (5%).

166-170m marl, 20% fine gr glauconite, 10-20% fine qz sand

170 - 192m SANDY CLAY dk. brown. black, stiff, up to 25% rounded qz, av 1-2mm.

188-192m carbonaceous clay, soft & sticky. 20% poorly sorted fine to coarse sand <2mm.

192 - 196m CARBONACEOUS SAND poorly sorted, med to coarse gr. sub ~~rounded~~ angular, av 2mm 10-20% lignite & clay.

230

BASEMENT — DRILLER LOG

CORE 201.

SHEET 2 OF 2

-786

COPE CLARE

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

Official Well No. H129

1. PERMIT No. 12772

2. LOCATION OF WELL

Hundred or Pastoral Lease No. BAROSSA

Section 47 Lot No. ..... Site No. .....

Name of Property .....

Permit holder or land occupier D. M+E

Postal Address P.O. BOX 151

EASTWOOD S.A. Postcode 5031

As the person responsible for the work carried out on this well I advise that it has been completed as detailed below:

Name of Driller A. McINTYRE Licence No. 2114

Name of plant operator if under supervision .....

3. SUMMARY

Date work commenced 20.10.83. Date completed 25.10.83

Work carried out: New well ✓, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)

Final Depth 201.1 m Final standing water level 52.75 m Final yield 0.25 l/sec.

Was well abandoned? NO If yes, state method .....

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	5.5	250	ROTARY	AIR
5.5	69.1	200	ROTARY	AIR
69.1	201.1	147	ROTARY	MUD

6.2 WATERS CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
25.10.83	168	170	52.75	0.25	201.1	176.12	AIR LIFTED	GOOD

7. CASING LEFT IN WELL

7.1 DIMENSIONS

From (m)	To (m)	Internal Diam.	7.2 TYPE: Swell Joint, Welded Collar, Steel, Plastic, Etc.	7.3 CASING SHOE: Yes	7.3 CASING SHOE: No	Diam. (mm)	Cemented Yes	Cemented No	7.4 CASING PRESSURE CEMENTED: Yes	7.4 CASING PRESSURE CEMENTED: No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	5.5	200	CLASS 6 PVC	✓	☐		✓	☐	☐	☐					
0	69.1	150	CLASS 6 PVC	✓	☐		✓	☐	☐	☐					
0	176.2	80	STEEL S/S	☐	☐		☐	☐	✓	☐	0	161.16	53	1453	
				☐	☐		☐	☐	☐	☐					

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD

Open Hole

✓ Screen(s) ☐ Slotted Casing

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
SCREEN	168	170	0.5	80	85	S. STEEL	SURESCREEN	CAPPED SUMP AT 176.12

Other, give details PEA GRAVEL PACK + BENTONITE SEAL AT 161.16.

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken

SCREEN WASHED THEN AIRLIFTED FROM 120m FOR 3 HRS

11. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	Interval Tested To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

12. SAMPLES

The provisions of the Water Resources Act and Regulations thereto require that drill and water samples must be obtained. If any samples have not been obtained state reasons

.....

.....

Signature of Licensed Driller ..... Date 28/10/83.

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	2	SILCRETE
2	22	RED + WHITE CLAYS
22	24	SANDSTONE
24	27.5	CLAYED RED SANDS
27.5	35	SANDSTONE
35	106	LIMESTONE
106	122	GREEN CLAYED LIMESTONE
122	126	GREY LIMESTONE
126	140	BROWN LIMESTONE
140	167	GREY MARLS
167	171	SANDS CLAY BANDS
171	187	SANDS - DARK CLAYS
187	187.6	HARD GREEN QUARTZ.
187.6	196	SANDS - LIGNITES
196	200	WHITE CLAYS
200	201.1	HARD GRANITE
		LOST CIRCULATION
		ZONES 40m + 42m

Driller to forward this Copy, within 14 days of completion to:

The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

Form 1207

1Mb78—5,76 G5538 SL 21

6829 -264

SOUTH AUSTRALIA
DEPARTMENT OF MINES
No 1 BORE MORGAN

Hundred of EBA Location See locality Plan

Angle of Bore. Vertical

DEPTH FROM SURFACE ft in	SECTION	THICKNESS ft in	DESCRIPTION of ROCK	REMARKS
2 - 0		2 - 0	Friable nodular limestone.	
		158-0	Polyzoal limestone.	
160-0				
		91 - 0	Greenish grey calcareous & argillaceous sandstone merging into shell-limestone.	
251-0				
		39-0	Bluish clay with shells.	
290-0		10-0	Stiff buff-coloured clay.	
300-0		27 0	Buff-coloured sandy clay.	
327-0		6-0	Fine grained sand.	
333-0		13-5	Dark clay with nodules of pyrites.	
346-5		0-5	Pyritic bar.	
346-10		21-5	Dark clay.	
368-3		0-3	Pyritic bar.	
368-6		15-0	Dark medium-grained sand.	
383-6		16-0	Dark sand & clay.	
399-6		0-3	Pyritic bar.	
399-9		15-3	Stiff dark clay.	
415-0		5-0	Brown sand.	
420-0		6-0	Buff-coloured sandy clay.	
426-0		0-6	Lignite.	
426-6		68 - 6	Carbonaceous shale with fine sandy partings.	
495-0		9 - 0	Lignitic clay shewing woody matter.	
504-0		14-0	Lignitic clay.	
518-0		12-0	Brown sand with a little clay.	
530-0		6-0	Buff-coloured sandy clay.	
536-0		5-6	Lignitic clay.	
541-6		1-6	Lignite.	
543-0		14-0	Lignitic clay.	
557-0		1-6	Lignite with clay.	
558-6		1-6	Lignite.	
560-0		4-0	Lignitic clay.	
564-0		56-0	White clay.	
620-0		20-0	Greenish blue slaty clay.	
640-0		4-0	Grey slate, bed rock.	
644-0				

C.F. Duffield
Engineer for Boring

R. Inkster Jack
Supervisor of Boring Operations

6F29 -269

EBA S. 34 BORE A

LOG OF BORE

Depth From	Depth To	Nature of Strata
0	2'	Friable nodular L.S.
2	35	Polyzoal L.S.
35	40	Yellow calcareous sand
40	63	Polyzoal L.S.
63	125	do. with layers of harder L.S.
125	145	Grey sandy clay
145	147	2' Hard grey L.S.
147	330	Grey calcareous and argillaceous sandstone with layers of hard L.S.
330	335	Grey sandy clay
335	336	Hard L.S.
336	455	Stiff dk. clay
455	489	Grey clay
489	490	Hard rock (no sample)
490	528	Grey sandy clay
528	550	Dark clay
550	555	White sand
555	560	Brown clay
560	570	White sand
570	574'0"	do. - fossiliferous. Hard rock (no sample)
574	574'6"	
		END OF BORE 575'6"

Micro Film No.

10m—8.58 9110

DEPARTMENT OF MINES.

RECORD OF BORING OPERATIONS.

NAME AND NUMBER OF BORE. No 3 Bore Morgan

Fortnightly Return—B.

Eastern corner Sec. 396, on road Hd. Eba

Depth from surface.	SECTION OF BORE. Each division equals one foot	Samples forwarded from depths indicated.	DESCRIPTION OF ROCK. To be filled in by Drill Engineer	To be filled in by Geologist.
8				
2'			Friable nodular limestone	
			Polyzoal limestone	
35'				
			Yellow limestone sand	
43'				
			Polyzoal limestone	
63'				
			Polyzoal limestone with layers of harder limestone	

Return for fortnight ending //.

Forwarded to the Supervisor of Boring Operations, Adelaide. //.

Received. //.

Engineer for Boring

H. E. POWELL, GOVERNMENT PHOTOLITHOGRAPHER, ADELAIDE.

DEPARTMENT OF MINES.

RECORD OF BORING OPERATIONS.

NAME AND NUMBER OF BORE. No 3 Bore Morgan

Fortnightly Return—B.

Depth from surface.	SECTION OF BORE. Each division equals one foot	Samples forwarded from depths indicated.	DESCRIPTION OF ROCK. To be filled in by Drill Engineer	To be filled in by Geologist.
63			As above	
126			Grey sandy clay	
147				
149			Hard grey limestone	

Return for fortnight ending / /.

Forwarded to the Supervisor of Boring Operations, Adelaide. / /.

Engineer for Boring

Received. / /.

H. E. POWELL, GOVERNMENT PHOTOLITHOGRAPHER, ADELAIDE.

DEPARTMENT OF MINES.

RECORD OF BORING OPERATIONS.

NAME AND NUMBER OF BORE. No 3 Bore Morgan

Fortnightly Return—B.

Depth from surface.	SECTION OF BORE. Each division equals one foot	Samples forwarded from depths indicated.	DESCRIPTION OF ROCK. To be filled in by Drill Engineer	To be filled in by Geologist.
149			Grey calcareous + argillaceous sandstone with layers of Hara limestone	
330'				
335'			Grey clay with sand Hara limestone	
337'				

Return for fortnight ending // .

Forwarded to the Supervisor of Boring Operations, Adelaide. // .

Engineer for Boring

Received. // .

H. E. POWELL, GOVERNMENT PHOTO-LITHOGRAPHER, ADELAIDE.

EYRE

5

Hd. Eba

Sec. 394 (Eastern cr. on road)

No 3. Morgan's Bore

DEPTH FROM SURFACE FEET	SECTION	DESCRIPTION OF STRATA	DEPTH AT WHICH WATER WAS STRUCK FT.	DEPTH AT WHICH WATER WAS STRUCK IN.	DEPTH BELOW SURFACE AT WHICH WATER STANDS FT.	DEPTH BELOW SURFACE AT WHICH WATER STANDS IN.	REMARKS
5		friable nodular L.S.					
10							
15							
20		Polyzoal L.S.					
30							
40		yellow calcareous sand					
50		Polyzoal L.S.					
60							
70							
80							
90		do with layers of harder L.S.					
100							
110							
120							
130		Grey sandy clay					
140		2' Hard grey L.S.					
150							
160							
170							
180							
190							
200							
210		Grey calcareous & argillaceous sandstone with layers of hard L.S					
220							
230							
240							
250							
260							
270							
280							
290							
300							
310							
320							
330		Grey sandy clay Hard L.S					
340							
350							
160							
170		Stiff dk clay					
180							
190							

6829-269

EYRE 3A

Hd. Eba

Sec 394

No 3 Morgan ↑ Bore (Continued)

DEPTH FROM SURFACE FEET	SECTION	DESCRIPTION OF STRATA	DEPTH AT WHICH WATER WAS STRUCK FT	DEPTH AT WHICH WATER WAS STRUCK IN	DEPTH BELOW SURFACE AT WHICH WATER STANDS FT	DEPTH BELOW SURFACE AT WHICH WATER STANDS IN	REMARKS
5 10 15 20 30 40 450 460 470 480 490 500 510 520 530 540 550 560 570 580 590 600 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390		Stiff dk. clay Grey clay Hard rock (no sample) Grey sandy clay Dark clay White sand Brown clay White sand 6" → do - fossiliferous Hard rock (no sample)					

Completed 30/5/25

6829-578

Fig 27M

X 0.31

LOG OF BORE

State No. ~~667055303~~ 667448009 Hundred WAIKERIE Section 553 Bore No. 03. ~~009~~ (27W)

Depth From	Depth To	Nature of Strata
0'	1'	Sand, very clayey, fine to coarse, dark red..
1'	7'	Sand, clayey fine to coarse, subrounded grains becoming marly below 4 ft..
7'	20'	Limestone, sandy, quartz grains fine to medium, some recemented pinkish brown. .
20'	35'	Sandstone, calcareous, subrounded quartz fine to medium, yellow brown.
35'	80'	Marl, silty, yellow-brown 35'-55' greyish 55'-65' yellow brown 65'-80'. Driller reports 'Limestone'.
24 80'	100'	Limestone, very slightly sandy, soft friable buff with some red-brown stains. Bryozoal. Driller reports 'collapsed'.
100'	123'	Limestone slightly marly. Limestone in hard bands. Very fossiliferous - bryozoal. Fawn and buff.
123'	190'	Limestone, slightly marly 5% sand, fine grain bryozoal and shelly. Some hard cemented bands. Grey and yellowish grey.
190'	270'	Limestone, slightly marly some cemented layers, fossiliferous. Finely sandy in places. Yellow brown to yellowish grey.
270'	300'	Limestone, small increase in marly content? Fossiliferous, grey.
300'	310'	Limestone, hard, cemented shelly, grey and grey-brown.
310'	330'	As for 270'-300'.
330'	355'	Limestone, marly, probably some hard bands fossiliferous, grey. Driller reports "Marl" from 350'.
ETTRK 110 355'	385' 119	Mainly marl, with some limestone, yellowish grey.
~~385~~	390'	grey sandy marl
390'	460'	Silt, calcareous, and marl, with 20% fine quartz sand. Microfossils. Buff and light grey.
460' 142m	470' 145.7	Clay and marl, glauconitic. Glauconite grains increasing downsection. Medium greenish grey.

Micro Film No.

10M-11.70 82118

Continued.

LOG OF BORE

667998 009

State No. ~~66705530~~3 Hundred WAIKERIA Section 553 Bore No. 03 (27W) 5009

Depth From	Depth To	CONTINUATION Nature of Strata
470'	485'	Mainly, Clay, calcareous with fine sand and plentiful glauconite grains. Also rare medium grain pink quartz.
485'	498' (154.4)	Clay, slightly calcareous. A few glauconite grains. Dark grey.
498'	499'	Sandstone, calcareous, very shelly strongly cemented. Grains quartz subrounded max. 1mm grey.
499'	505'	Sand, fine to coarse, max. 1.5.mms (rare).
505'	558'	Sand, samples taken for sieve analysis throughout. See results for details.
		Notes on tubes
		505'-506' Contains Sandstone nodules 5 cms. across strongly cemented, rounded fossiliferous.
		515'-516' Sand/clay mixture dark grey.
		527'-529' As above.
		~~529'-530' Sand, clayey.~~
		551'554' Sand, clayey.
		557'-558' Sand, clayey and with patches of clay and lignite.
558'	578'	Sand, clayey, fine to coarse grain, subrounded quartz, max. 1.0mm. Clay content decreasing down from very to slightly clayey. Medium grey.
578'	600'	Sand, slightly clayey throughout. Mainly fine to medium grain with scattered coarse grains to max. 1mm. Subangular to subrounded quartz light to medium grey.
600'	627'	Sand, mainly medium grain about 0.4mm. subrounded quartz, light grey.
		Clean sand 600'-605' 620'-625'
		Slightly clayey 605'-620' 625'-627'
627'	638'	Clay and S.lt, slightly sandy. 630'-635' dark grey.
638'	640'	Sand, very shelly, medium to coarse grain quartz, subrounded max. size 2.0mm. Grey. Driller reports 'BLEW'.

Micro Film No.....

SM-5.71 D 7349

Continued.

LOG OF BORE

667998 009 = 009

State No. ~~667055303~~ Hundred WAIKERIE Section 553, Bore No. 03 (27W).

Depth From	Depth To	CONTINUATION. Nature of Strata
640'	672'	Samples probably not reliable as for 638'-640' but samples very clayey. Washed sample 655'-665' and contained hard claystone pellets 2 cm. across and strongly cemented sandstone nodules rounded up to 2cm diameter. Driller reports 'layers of brown shale, sand, sandrock - 640'-672'.
672'	695'	Clay, shelly, silty and sandy. 685'-690' dark grey and greenish grey.
695'	715'	Clay, silty and sandy lignitic. Quartz grains rounded to maximum 1.5mm. Fossiliferous traces of pyrites. Med-dark grey.
715'	745'	Clay, lignitic, silty slightly fossiliferous minor quantities of subrounded quartz to max 1.5mm. Pyrites. Dark grey.
745'	755'	As for 695'-715'.
755'	765'	As for 715'-745'
765'	801'	Logged from cores at 768'-771', 780'-781', 790'-791', 800'-801'. Sand, fine grain, mainly 0.2mm., clayey and lignitic with thinly bedded Clay, lignitic, dark grey at intervals.
801'	830'	Clay, sandy and silty, lignitic sand mainly fine grain quartz max. 0.1mm. Sand content increasing to about 50% below 820', Dark grey.
830'	831'	Sand, clayey, fine to medium grain. Clay as thin beds and pockets. Lignitic. Dark grey.
831'	840'	Sludge sample - as for 830'-831' with high clay content.
840'	842'	Mainly clay, lignitic with thinly bedded fine to medium grain sand dark grey.
842'	860'	Sludge Samples. Clay, sandy. Probably as for 840'-842'.
860'	862'	Clay, lignitic. Thinly interbedded mainly dark grey with light grey.
862'	880'	Clay, dark grey becoming lighter down section. Slightly sandy at top.

Micro Film No.....

5M-5.73 D 7349

Continued.

LOG OF BORE

State No. ~~667055303~~ 667498009 Hundred WAIKERIE Section 553 Bore No. 03 (27W) = 009

Depth From	Depth To	CONTINUATION Nature of Strata
~~1045'~~	1047'	Sand, clayey and lignitic fine to coarse grain with scattered gravel. Quartz. Dark grey.
1047'	1050'	As for 1039'-1045' with gravel to 10.0mms.
1050'	1060'	Clay, sandy. Dark grey.
1060'	1070'	Clay, sandy. Medium grey.
1070'	1075'	As for 1047'-1050' Gravel - rare >10.0mm
1075'	1081'	Sand, clayey, Mainly fine to medium grain with some coarse grain. Quartz subrounded. Grey-brown.
		END OF BORE - LOGGED BY G.T. ROBERTS. 25.6.69

Micro Film No.....

5M-5.73 D 7349

LOG OF BORE

State No. ~~667055303~~ 667998009 Hundred WAIKERIE Section 553 Bore No. 03 (27W) =009

Depth From	Depth To	CONTINUATION. Nature of Strata
880'	915'	Clays, lignitic probably silty in part. Grey 885'-890' Dark grey to black. 890'-915'.
915'	928'	Clay, dark grey.
928'	932'	Sand, clayey and with discrete lumps of clay. Mainly coarse sand to fine gravel - max 5.0mm. subrounded quartz. Shell fragments. Clay increasing below 930'. Grey to dark grey.
932'	934'	Clay, dark grey.
934'	955'	Clay, light grey.
955'	966'	Sand, medium to coarse grain, max >2.0mm subangular and subrounded quartz. Slightly clayey 955'-960' clayey. 960'-966' Few shell fragments 955'-957' slightly micaceous. Light grey becoming darker down section.
966'	1000'	Clay, light grey and medium grey slightly sandy 995'-1000'.
1000'	1015'	Sand, clayey throughout very clayey 1002'-1003' medium to coarse grain with fine gravel to max 2.0mm subrounded to subangular quartz. Medium grey.
1015'	1025'	Mixture of clay, grey to dark grey and black with varying quantities of sand, thinly fine to medium but with some coarse grain.
1025'	1033'	Sand, clayey. Fine to coarse grain. Max. >2.0mm. Subangular to subrounded quartz medium - dark grey.
1033'	1039'	Sand, slightly clayey mainly fine to medium grain with some coarse and fine gravel to 1.5mm. Medium grey becoming dark grey 1037'-1039'.
1039'	1045'	Sand, mainly medium to coarse grain with gravel to 2.0mm plentiful and rare to 4.0mm. Becoming increasingly coarse down section and increasing quantities of gravel. Slightly clayey to 1041', with clay increasing down section. Quartz mainly subrounded to subangular. Medium grey.

Micro Film No.

5M-5.73 D 7349

Continued.

Not to be removed from Records Room

DEPARTMENT OF MINES

BORE RECORDS—WATER BORING

~~257~~ =009 D.M.—C 24 Card No. 1 GN

State No. ~~6667055303~~ 66-908009 Section ~~553~~ 382 Block Bore No. 03 (27W) R.L. 070071

Hundred WAIKERIE

Name of Owner RIVER MURRAY DRAINAGE ADELAIDE COMMITTEE, D.M. 1467/68. Folder No. 75/-.

Date Drilling commenced 14/5/68 Date Drilling completed 15/5/69. Driller E. JAMIESON. Micro Film No.

Depth 1080' Tested/Estimated Output How Tested

Drawdown Duration of Test Plant No. 19 & 32

ANALYSES OF WATERS CUT

Date	Water Cut	Static level ft.	Supply g.p.h.	Total Salts p.p.m.	Bi-Carbonates Ca.	Bi-Carbonates Mg.	Bi-Carbonates Na.	Sulphates Ca.	Sulphates Mg.	Sulphates Na.	Chlorides Ca.	Chlorides Mg.	Chlorides Na.	Nitrates K. Cl. No.	Hardness Temp.	Hardness Perm.	Anal. No.	pH.
1968	10'	4'		1200													200/2606.	✓7.5
1968	90'	7'		11185													200/2608.	✓7.5
1968	150'	50'		10700													200/2610.	✓8.0
1968	200'	50'6"		10785													200/2612.	✓8.0
1968	230'	50'		11430													200/2614.	✓8.0
1968	400'	59'6"		11985													209/5144.	✓7.4
1968	500'			14100													209/5146.	✓7.4
1968	500'	115'		14718	FULL ANALYSIS SEE FOLDER FOR DETAILS												209/5147.	✓7.4

CASING LEFT IN BORE

Diam., in.	From, ft.	To, ft.
10"	0	?
8"	0	498'7"
6"		928'6"
5"		1080'

Remarks BORE SERIAL NO. 420/68. DRAINAGE OBSERVATION BORE 27W.

Grain Size Analysis Sheets in folder. Cable Tool Drill, completed observation. In the construction of this bore a bank was graded up on side of sludge drain. Arrangements have been made with W. Marshall & Son, Earth Removers, Waikerie, to fill the hole and level of bank. This is to be done on 1.2.1971.

Checked

1a 1b 1c 1d 1e

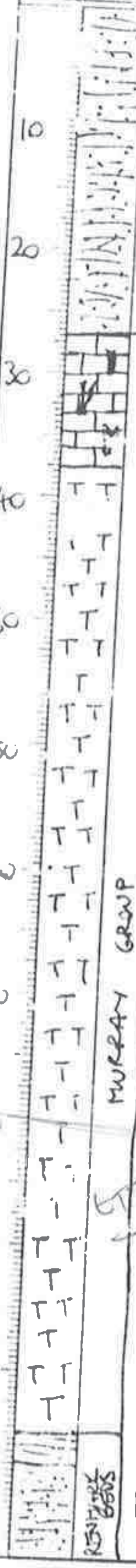
DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT MURRAY BASIN

CORE DESCRIPTION

HOLE NO M101
UNIT/STATE NO: 6829 - 802

GEOLOGICAL DESCRIPTION OF CORE



0 - 27m SANDY CLAY - alternate bands sandy clay & silt
Mottled red-brown, yellow & grey.

26-27m Bluish green clay

27 - 35m LIMESTONE yellow, moderately cemented, highly fossiliferous (bryozoal).

35 - 190m MARL grey to fawn, fossiliferous, some limestone frags

ETTRICK
Bore - 803 ≈ 96 m bgl → 110.

140-190m dark olive-green, grey marl, glauconite and fossiliferous

190 - 193m LIGNITIC CLAY stiff, pyrite

193 - 212m INTERBEDDED SANDY CLAY carbonaceous clay
minor pyrite. Fine to medium silty sand.

SHEET 1 OF 2

DEPARTMENT OF MINES -- SCUTH AUSTRALIA
ENGINEERING DIVISION

PROJECT MURRAY BASIN

CORE DESCRIPTION

HOLE NO M101
UNIT/STATE NO: 6829-802

CORE DIA	DEPTH	GRAPHIC LOG	GEOLOGICAL DESCRIPTION OF CORE
	210		
			212 – 228m WEATHERED BASEMENT blebs of white - green clay with fragments of dark grey siltstone (poor returns)
	220		
	230		END of HOLE 228m

SHEET 2 OF 2

PN 9879

DEPARTMENT OF MINES | DM—C12

~~PERCUSSION~~ Rotary. DRILLER'S WEEKLY REPORT AND TIMESHEET

Plant No. T40-01 | Week ending 21-2-82 | 1011/82

Dep. of Mines-Energy | Section No. | Hundred 623/79.

PO Box 151 Eastwood 5063. | or Pastoral Lease No.

Classification	Name	M.	T.	W.	Th.	F.	S.	Su.
DRILLER	F.M. STUMMER.	9½	10½	10	9	8	4½	
SAMPMAN.	I.R. ANDREW.	9½	10½	10	9	8	4½	
SAMPMAN.	R.A. BLIZZARD.	9½	10½	10	9	8	2	

MURRAY BASIN INVESTIGATION.

Hours worked certified correct

Hirer's Signature

Changes: ~~I.R. ANDREW to R.O. Morgan~~ I.R. ANDREW — Depot — others as per payment authorities.

STATE NATURE OF WORK AND TIME OCCUPIED FOR EACH DAY

Day	Work	Total
Mon. 15-2-82	Fuel rum (½hr) Mobilize to site (5hr) 7⅞" hole to 2m + set 2m 6" casing, including setting up (1½hrs) 5½" Rotary air to 18m (1hr) Set up for mud drilling + water carting (1hr) Mix mud (½hr) 5¼" Rotary to 60m (3hrs) Pullout (½hr) Rung depot + water run (1hr) 2hrs lost time due to rain.	9½
Tues 16-2-82	Run rods + ream to 60m (2hrs) 5¼" Rotary to 110m (4hrs) Dump mud (½hr) 5¼" Rotary to 132m (3hrs) Pullout (1hr)	10½
Wed 17-2-82	Run rods to 84m + ream to 132m - dump mud (3hrs) 5¼" Rotary to 160m (2½hrs) Pullout, change to roller Bit trip in (2½hrs) Rotary to 169m (1hr) Pullout (1hr)	10
Thursday 18-2-82	Trip in to 120 + ream to 169m (1½hrs) Roller rotary to 212m (5hrs) Replace U.J. Transfer case to 50 Box (1hr) Pullout (1½hr)	9
Friday 19-2-82	Rig Breakdown. Pull down U.J's + replace, Fitter replaced chain to leg from transfer case to Mud pump, traced noise to drawworks - Kelly clutch end, rang depot was decided to return rig to workshops	8hr
Saturday 20-2-82	Unload 4½" collars + drill pipe, pull off hole, secure site (1½hrs) Travel to Adelaide (3hrs)	4½hr

Day	Distance Drilled: Metres	From Metres	To Metres	Casing Depth Size
Monday	60	0	60	
Tuesday	72	60	132	
Wednesday	37	132	169	
Thursday	43	169	212	
Friday				
Saturday				
Sunday				

Depth at which Change occurs: From Metres	To Metres	Strata passed through
0	1.5	Sandy clays.
1.5	1.8	Calcrete
1.8	3.5	Red clays.
3.5	5.0	Yellow-Brown clays.
5.0	7.0	Red-Brown clays
7.0	24.0	Mottley clays.
24.	27.5	~~[illegible]~~ Grey clays
27.5	35.8	Limestone, fossils, oxidised.
35	60.0	Grey marls Limestone Bands
60	80 -	Limestone - Marl.
80	90	Limestone.
90	146	Marl - Limestone.
146	148	Brown clays
148	157	Marl Limestone
157	163	Fossil Limestone - pyritic Bands + grey hard
163	178	Marl
178	183	Carbonaceous sands
183	190	Marl + pyritic Bands hard drilling.

Water struck at

Water stands at from surface

Estimated quantity G.P.H.

Pumping or bailer test No. of hours

Water samples taken

Is water for domestic purposes, irrigation or stock?

Diameter of bore at completion Depth

Size

Bore started 15-Feb-82

Completed (Rig Breakdown.)

190-212 - clays - carbonaceous

Date 21-2-82

Signature of Driller F.M. Stummer.

Signature of C.D. and M. Engineer

DM—C12

DEPARTMENT OF MINES

PERCUSSION DRILLER'S WEEKLY REPORT AND TIMESHEET

1011/82.
625/79.

Bore No. ... Plant No. 720-01 Week ending 28.3.82

Name of Hirer Dept. Mines & Energy. Section No. ... Hundred ...

Address ... Eastwood 5063. or Pastoral Lease No.

Classification	Name	M.	T.	W.	Th.	F.	S.	Su.
SENIOR DRILLER	F.M. STUMMER	8	9½	9½	12	9	8	
OFFSIDER	I.R. ANDREW	8	9½	9½	12	9	8	
OFFSIDER	R.B. BLIZZARD	8	9½	9½	12	9	8	

Murray Basin Investigation.

Hours worked certified correct

Hirer's Signature

Cheques to I.R. ANDREW C/- P.O. Morgan 5320, others as per payment authorities.

STATE NATURE OF WORK AND TIME OCCUPIED FOR EACH DAY		Total
Monday 22-3-82	Travel from Adelaide to Morgan (3½hrs) Rain for remainder of day (4½hrs). R. Blizzard carted water, cleaned out sump whilst we were travelling to Morgan.	8hrs
Tuesday 23-3-82	Repaired + replaced hydraulic hose for mud (2hrs) set up over hole. Run rods to 78m + commence reaming to 212m (5½hrs) 5⅞" Rotary to 218m (½hr) Pullout (1½hrs)	9½hrs
Wednesday 24-3-82	Run rods to 150m - ream + stabilize 218m (3hrs) 5⅞" Rotary to 234m (2½hrs) Pullout for logging (2hrs). Unloaded 7" rods, tanks - pick up 25 Bags cement (2hrs)	9½hrs
Thursday 25-3-82	Run drill pipe to 134m + stabilize (3hrs) circulate (½hr) Pullout (2hrs) Run 80mm H/D casing to 205m + 2m 82mm S/Steel Screen + 6m 80mm sump blanked (4½hrs)	
[redacted]	Mix 20 Bags cement + stabilize water - pressure cement 192m back to 123m. Stripe cleanout mud pump (2hrs)	12hrs
Friday 26-3-82	[illegible] PVC casing at EWS yard (1hr) clean after pressure cementing + [illegible] (1hr) Run [illegible] + bit to 195m. Drilled cement + perspex disc - washed [illegible] (3½hrs)	
[redacted]	Pull back to 66m - commence airlifting (1hr) Chase rods down to 200m (2½hrs) [illegible] to 207m (½hr) Test blocked pullout + cleaned out [illegible] (1½hrs)	9hrs
Saturday 27-3-82	[illegible] + jet screen (3hrs) Pull back + [illegible] airlifting. Changing rods chase to 102m (2hrs)	8hrs
	Total	

	Distance Drilled Metres	From Metres	To Metres	Casing Depth Size	Depth at which Change occurs From Metres	To Metres	Strata passed through
Monday							Basement
Tuesday	6	212	218		212	234	White clays - siltstone -
Wednesday	16	218	234				
Thursday							
Friday							
Saturday							
Sunday							

Water struck at

Water stands at from surface To be advised

Estimated quantity ... G.P.H.

Pump or bailer test No. of hours

Water samples taken

Is water for domestic purposes, irrigation or stock?

Casing left in bore at completion - Depth

Size

Bore started 15-2-82 } rig returned

Completed 29-3-82 } to Adelaide for repairs

Depth

0 - 2m 145mm I.D. Class 9 PVC
0 - 205m 80mm H/D Steel pipe
205 - 207m 82mm 2D S/Steel Screen
207 - 213.5m 80mm H/D Steel pipe Blanked.
Cement plug at 192m.

Date 28-3-82

22/12/82
[illegible] 22-3-82

Signature of Driller F.M. Stummer

Signature of C.D. and M. Engineer

MURRAY BASIN INVESTIGATION

GOVERNMENT OF SOUTH AUSTRALIA

DRILLERS WELL CONSTRUCTION REPORT

1. PERMIT No. 9279

Official Well No. M/C1

2. LOCATION OF WELL

Hundred or Pastoral Lease No. ....

Section.......... Lot No.......... Site No..........

Name of Property ....

... the work carried out on this well I advise that it has been completed

Licence No. 2-1?3

Permit holder or land occupier Dept of Mines & Energy

Postal Address P.O. Box 151

Eastwood Postcode 5063

SUMMARY

Work commenced 15 Feb 82 Date completed 29-3-82

... New well, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)

... Final standing water level 103.45 m Final yield 352 ~~litres~~ galls / hour

... rate method ....

DRILLING DETAILS If a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

CONSTRUCTION DETAILS

From	To	Drilling Method	Fluid Used (Air, Water, Mud Type)
[illegible]	160	Rotary	Air
160	234	[illegible]	Mud

6.2 WATER CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield ~~l/sec.~~	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
	205	207	103.45	30gph.	234	202.5	airlift	1950

CASING LEFT IN WELL — [illegible] left in hole Steel pipe cemented in

From	To	Internal Diam.	7.2 Type (Swell Joint, Welded Collar, Steel, Plastic, Etc.)	7.3 Casing Shoe Yes	No	Diam. (mm)	Cemented Yes	No	7.4 Casing Pressure Cemented Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
[illegible]	[illegible]	[illegible]	Class 9 P.V.C	☐	☐		☐	☐	☑	☐	192	198	20	454	—
[illegible]	[illegible]	[illegible]	Steel	☐	☐		☐	☐	☑	☐					
[illegible]	[illegible]	[illegible]	Steel	☐	☐		☐	☐	☐	☐					

CONSTRUCTION AT PRODUCTION LEVEL

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Method	Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
Slotted Casing	Wirewound	205	207	.25	82	92	S/Steel	Summers	Blanked.

Other, give details: Formation seal set at 198m.

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

NON-DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

DEVELOPMENT State methods and time taken

Air lifting for 4hrs

PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/s	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	1.5	Sandy clays
1.5	1.8	calcrete
1.8	3.5	Red clays
3.5	5.0	Yellow & Brown Clays
5.0	7.0	Red-brown clays
7.0	24.0	Mottley clays
24.0	27.5	Grey clays
27.5	35.0	Limestone [illegible]
35.0	60.0	Grey marl, limestone bands
60.0	80.0	Limestone, marl bands
80.0	90.0	Limestone.
90.0	146.0	Marls & Limestone
146.0	148.0	Brown clays
148.0	157.0	Marl Limestone.
157.0	163.0	Limestone, pyrite Band & Marl
163.0	178	Marl
178	183	Carbonaceous sa[illegible]s
183	190	Marl, pyrite bands, hard drilling
190	212	Carbonaceous sands, clays
212	234	white clays, siltstone.

SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons: ...

Signature of Licensed Driller [illegible] Date 30/3/82

Driller to forward this Copy within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

Form 1207

PROJECT: UPPER MURRAY. GROUNDWATER INVESTIGATIONS

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: M 102.

UNIT / ENGINEERING NO: 6829-803

DM

LOCATION OR COORDS: 15 Km S.W. of Morgan.

SEC. HD. El Surface = El Ref. Point = Datum A.H.D.

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
	~40 m	40.40 14/4/82	78	90 slotted 80 mm pvc.			Air lifting.	2100 micromhos @ 27°C (field) (1100 mg/l)	W—

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia (mm)	CASING From (m)	CASING To (m)
0	2		Sand/Limestone	shelly, medium (average 0.3/0.5 mm), strongly cemented, subrounded, clean Light Brown.			80 pvc	0	78
2	8		LIMESTONE	strongly cemented in places, sandy. ferruginous, fossiliferous, yellow Brown	Murray Group (Miocene).				
8	12		MARL.	moderate plasticity ferruginous yellow Brown					
12	96		LIMESTONE	shelly (bleached) ferruginous, sandy yellow Brown. Fossiliferous, greyish from 16 m grey from 44 m. (Water Table) Unconformity from 46 m					

REMARKS: Permit 9880. Linatex seal at 77 m.
Site 12. Cement plug inside from 104 → 110 m.

* NOTE: kl / day = 1000 gals / hr.

DRILL TYPE: ROTARY — COMPLETED: 7/4/82

CIRCULATION: MUD — LOGGED BY: D. EDWARDS

SHEET 1 OF 4 — DATE: 2/4/82.

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

PROJECT:

LOCATION OR COORDS:

SEC. HD. EL Surface m EL Ref. Point m Datum

HOLE NO: M 102

UNIT / SHEET NO: 6829 - 803

DM

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	Analysis No:
									W—

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
10	96		LIMESTONE (contd)	Mostly from 88 m limonitic (nodular) + weathered forams etc from 84 m.	Murray Group (Miocene).				
96	110		MARL / ~~[illegible]~~	30% LIMESTONE as above 80% MARL grey high plasticity glauconitic	ETTRICK FORMATION (Oligocene).				
110	140		SANDS	medium (average 0.3 – 0.5 mm), well sorted, subrounded, mainly clear, pyritic, glauconitic (nodular). Grey Lignitic fines from 120 m. ~~[illegible] from 124 [illegible]~~ ~~[illegible]~~ More Argillaceous content increasing.	Buccleugh Beds (Eocene) ? Renmark Beds (Paleocene/Eocene) ? from 120 m.				

REMARKS:

* NOTE: 110 kl / day = 1000 gals / hr.

DRILL TYPE:

CIRCULATION:

SHEET 2 OF 4

COMPLETED:

LOGGED BY:

DATE:

PROJECT:

LOCATION OR COORDS:

SEC. HD.

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

El Surface m
El Ref. Point m Datum

HOLE NO: M 102

UNIT / GRID NO: 6829 – 803

DM

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
									W—

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(cm)	CASING From(m)	CASING To(m)
~~140~~	~~145~~								
140	145		SAND	very clayey (white non-calcareous fines), shelly, limonitic (nodular), pyritic glauconitic, grey.					
145	162		SAND,	angular, some vein quartz (milky) some iron cemented capping medium - coarse. Grey.					
162	164		CLAY	pyritic, minor lignite, [calcareous? Contamination? Glauconitic?] consolidation? sandy greenish grey.					

REMARKS:

* NOTE: 110 kl / day = 1000gals / hr.

DRILL TYPE:

CIRCULATION:

SHEET 3 OF 4

COMPLETED:

LOGGED BY:

DATE:

PROJECT:

LOCATION OR COORDS:

SEC. HD. El Surface m El Ref. Point m Datum

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: M 102

UNIT / BORE NO: 6829 - 803

DM

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
									W —

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
164	174		CLAY	shelly (bleached), glauconitic, high plasticity grey	Renmark Beds? Paleocene/Eocene?				
174	182		CLAYSTONE & clay.	weakly consolidated to well consolidated, fine, glauconitic, calcareous. Some bright limonitic material from 180 m ~~brown~~ grey.	Renmark Beds? — ? — ? —				
182	188		CLAY	High plasticity with red, yellow, and greenish white fines	Weathered Basement?				
				E. O. H. 188 m.					

Drilled to 180

REMARKS:

* NOTE: 190 kl / day = 1000gals / hr.

DRILL TYPE:

CIRCULATION:

SHEET 4 OF 4

COMPLETED:

LOGGED BY:

DATE:

MURRAY BASIN INVESTIGATION.

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

1. PERMIT No. 9880

Official Well No.
M102

2. LOCATION OF WELL:

Hundred or Pastoral Lease No: ....
Section.......... Lot No.......... Site No..........
Name of Property ....

As the person responsible for the work carried out on this well I advise that it has been completed as described below:

Name of Driller F.M. STUMMER Licence No. 2-103
Name of plant operator if under supervision..........

Permit holder or land occupier Dept of Mines & Energy
Postal Address P.O. BOX 151
Eastwood Postcode 5063

5. SUMMARY

Date work commenced 30-3-82 Date completed 6-4-82
Work carried out: New well ☑, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)
Final Depth 97.5 m Final standing water level 40.4 m Final yield 30 ~~l/sec.~~ gph. approx.
Was well abandoned? No If yes, state method ....

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	13	143	Rotary	Air
13	188	140	"	Mud.

6.2 WATERS CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield ~~l/sec.~~	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
			40.4	30 gph	97.5	78	air lift.	

7. CASING LEFT IN WELL

7.1 Dimensions From (m)	To (m)	Internal Diam.	7.2 Type Swell Joint, Welded Collar, Steel, Plastic, Etc.	7.3 Casing Shoe Yes	No	Diam. (mm)	Cemented Yes	Cemented No	7.4 Casing Pressure Cemented Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	12	143	Class 9 P.V.C.	☐	☐		☐	☐	☐	☐					
0	72	80	Class 12 P.V.C.	☐	☐		☐	☐	☐	☐					
90	97.5	80	" " "	☐	☐		☐	☐	☐	☐					
				☐	☐		☐	☐	☐	☐					

8. CONSTRUCTION AT PRODUCTION LEVEL Standpipe cemented over Bore (1 Bag cement)

8.1 METHOD

☐ Open Hole
☐ Screen(s) ☑ Slotted Casing
☐ Other, give details Cement plugged from 90m to 110m (10 Bags cement - 227 litres water)

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
class 12	78	90	1	80	92	P.V.C.	Hardituhe	7.5m 80mm Sump blanked.

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken
Airlifting for 4hours.

11. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	.5	sands - clay.
.5	20	clays - slost/siltstone bands
20	44	Marl - limestone (yellow)
44	64	Grey limestone & marl.
64	74	Limestone marl - glauconite.
74	88	Grey marl limestone.
88	104	Grey clay (micaceous)
104	109	Dark Brown - grey - clay.
109	145	Lignitic sands - sandstone.
145	160	white clays quartz Bands
160	180	Lignitic, pyritic - glauconitic clays.
180	188	yellow clays - weathered Basement.

12. SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—
....

Signature of Licensed Driller F.M. Stummer Date 12/4/82

-5 MAY 1982 DEPT OF MINES ENGINEERING

Driller to forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

1Mb25-5.76 G5538 St. 21

Form 1207

P/N 9880.

DEPARTMENT OF MINES

DM—C12

PERCUSSION DRILLER'S WEEKLY REPORT AND TIMESHEET

1015/82

Bore No. M 102 Plant No. T40-01 Week ending 4 April 1982

Name of Hirer Dept of Mines and Energy. Section No. ______ Hundred 625/79.

Address P.O. Box 151 Eastwood 5063. or Pastoral Lease No. ______

Classification	Name	M.	T.	W.	Th.	F.	S.	Su.
Senior Driller.	F.M. Stummer.	4½	4½	10	9½	9	8	
Snapman.	J.R. Andrew.	4½	4½	10	9½	9	8	
Snapman.	R.A. Blizzard.	4½	4½	10	9½	9	8	

Murray Basin Investigation.

Hours worked certified correct

Hirer's Signature

Cheques to ______

STATE NATURE OF WORK AND TIME OCCUPIED FOR EACH DAY		Total
Tuesday 30-3-82	Mobilize to M102 (1hr) Set up & drill in 3m 6" collar casing (1hr) Set up for mud drilling (½hr) 5⅞" Rotary to 10m Cost circulation (1hr) Pulled out & revert to air drilling (1hr)	4½hrs
Wednesday 31-3-82	7⅞" Rotary to 13m (2½hr) Run 6" casing to 13m (½hr) set up for mud drilling (½hr) Mix mud & circulate to 13m (½hr) 5⅞" Rotary to 90m (5½hr) Pull out (½hr)	10 hrs
Thursday 1-4-82	Grease rig (½hr) Trip in to 78m & ream & stabilize to 90m (1½hr) 5⅞" Rotary to 154m (6hr) Pull out (1½hrs)	9½hrs
Friday 2-4-82	Pick up tubes from Keas yard (3hr) 5⅞" Roller reaming to 154m (2½hr) 5⅞" Rotary to 188m (4¾hr) Pull out for logging (1½hr)	9hrs
Saturday 3-4-82	Ream & stabilize to 110m (1hr) Pull out, take off Bit & trip in to 110m (1hr) Repairs to mono-pump (1hr) Mix cement & pump down hole (10 Bags cement) (1½hr) Pull rods slowly out ensuring mud kept in rods and hole (1hr) Get water levels for M100 & M101 (1½hr) clean up site & replace gland packing in mud pump & secure site for week-end. (1hr)	8 hrs
	Total	

	Distance Drilled Metres	From Metres	To Metres	Casing Depth Size	Depth at which Change occurs From Metres	To Metres	Strata passed through
Monday					0	·5	Sand & clay.
Tuesday	10	0	10	13×6"	·5	2·0	Clay - shell limestone (fossils)
Wednesday	80	10	90	Collar	2·0	44·0	Marl & limestone (yellow)
Thursday	64	90	154		44·0	64·0	Grey limestone & marl
Friday	34	154	188		64·0	74·0	Limestone, marl - glauconitic.
Saturday					74·0	88·0	Grey marl Limestone.
Sunday					88·0	104·0	Grey clay (micaceous)
Water struck at					104·0	109·0	Dark Brown-grey clay
Water stands at from surface					109-	145·0	Lignitic sands - sandstone - clays
Estimated quantity G.P.H.					145	160·0	White clays quartz Bands
Pump or bailer test No. of hours					160	180·0	Lignitic - pyritic - glauconitic marl
Water samples taken					180	188·0	yellow clays weathered Basement

Stratigraphical only.

Is water for domestic purposes, irrigation or stock? ______

Casing left in bore at completion—Depth ______ Mixed 10 Bags cement plug from 90m to 110m

Size ______

Bore started 30-3-82

Completed ______

Depth 188m.

Signature of Driller F.M. Stummer.

Date 4 April 1982

Signature of C.D. and M. Engineer ______

200blks100-2,75 F4438 $1.55

P/N 9880

DEPARTMENT OF MINES DM—C12

PERCUSSION DRILLER'S WEEKLY REPORT AND TIMESHEET

Bore No. M102 Plant No. T40-01 Week ending 11- April 1982 105/82.

Name of Hirer Dept of Mines & Energy Section No. Hundred 625/79

Address P.O. Box 151 Eastwood 5063 or Pastoral Lease No.

Classification	Name	M.	T.	W.	Th.	F.	S.	Su.	Murray Basin Investigation. Hours worked certified correct
Senior Driller	F.M. Stummer	9	8	9½		Easter			
Snapman	I.R. Andrew	9	8	8	8	Week-			
Snapman	R.A. Blizzard	9	8	8	8	End			Hirer's Signature

Cheques to I.R. Andrew c/o P.O. Morgan - others as per payment authorities

STATE NATURE OF WORK AND TIME OCCUPIED FOR EACH DAY		Total
Monday 5-3-82	Repairs to Bedford clutch (1hr) pick up casing from E&WS yard (½hr) Trip in to 90m & locate cement plug (1hr) dump mud & drill to 97.5m & verify cement (1½hrs)	
	Pull out (1½hr) Run 78m x 90mm Class 12 PVC + 12m x 80mm slotted PVC + 7.5m x 90mm sump blanked (2hrs) Run 'A' rods to 76m & wash out mud (1hr)	
	Pull back to 66m & commence airlift very muddy - washout again (1½hrs)	9hrs.
Tues 6-3-82	Flushing & airlifting bore (5hrs) Bore developed up to approx 30gph. Rig down - wash rig - cement in standpipe (2hrs) Mobilize to Morgan	
	E&WS yard for Easter Break (1hr)	8hrs
Wed 7-3-82	Unload Bedford - reload trailer - clean down light weight vehicle (2hr) Travel from Morgan to Adelaide with Bedford (3hr)	
Thursday 8-3-82	offsiders travelled Morgan to Adelaide & return to Morgan with new truck (5hrs) reload truck (3hrs) myself Depot Duties.	8hrs
	Total	

	Distance Drilled			Casing Depth Size	Depth at which Change occurs		Strata passed through
	Metres	From Metres	To Metres		From Metres	To Metres	
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							
Sunday							

Water struck at 78 - 90m

Water stands at from surface 40.4m

Estimated quantity 30 G.P.H.

Pump or bailer test No. of hours Airlift (4hrs)

Water samples taken 2 Bottles

Is water for domestic purposes, irrigation or stock? NO

Casing left in bore at completion—Depth

Size

Bore started 30-3-82

Completed 6-4-82

Depth 97.5M

12m x 143mm ID class 9 PVC
78m x 80mm " class 12 PVC.
12m x 90mm " class 12 PVC slotted.
7.5m 80mm " class 12 PVC sump blanked
Lixitey seal set at 76m.
Standpipe cemented in over Bore

Signature of Driller F.M. Stummer

Signature of C.D. and M. Engineer

Date 11- April

200bks100—2.75 F4438 S1. 55

WATER WELL LOG

DEPARTMENT — SOUTH AUSTRALIA, ENGINEERING DIVISION

PROJECT: Upper Murray Groundwater Investigation

LOCATION OR COORDS: 5 Kms S of Mulko flat → Qualco Road

EL Surface: –

EL Ref Point: – AHD

SEC | HD

HOLE NO: M 103

UNIT / WELL NO: 6829-804

DM

AQUIFER SUMMARY:	Depth to water cut (m)	Depth to standing water (m)	Interval tested From	Interval tested To	Supply kilolitres/day*	Test length (hrs)	Method	Total dissolved solids mil (grammes/litre)	Analysis No
			148	150 80mm (0.25mm aperture) s/steel			Air lifting		W—

Depth From (m)	Depth To (m)	Graphic Log	Rock / Sediment Name	Geological Description	Formation / Age	Depth Core Sample	Casing (mm)	From	To
0	2		SAND / CALCRETE	nodular calcrete strongly cemented and sand (medium) Pale Red Brown.			80 steel	0	156.50 m.
2	4		Sand & Sandstone	medium – coarse (up to 3 mm), subrounded, very calcareous, some shells & casts. Pale Red Brown					
4	117		LIMESTONE	fine, marly, Yellow Brown (Marl 20%) 14–16m off white. From 16m fossiliferous, minor Marl. From 40m Grey, glauconitic fossiliferous shelly.	MURRAY GROUP (Miocene)				

REMARKS: Permit 9881
Seal set at 136m.
Cemented from 136 ↑ 120 m.

*NOTE: 1(kl) / day = 1000gals / hr

DRILL TYPE: ROTARY

CIRCULATION: Mud

SHEET 1 OF 5

COMPLETED: 20/4/82

LOGGED BY: D.R. EDWARDS

DATE: 16/4/82

6829-804

MURRAY BASIN INVESTIGATION

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

Official Well No. M103

1. PERMIT No. 4861

2. LOCATION OF WELL:
Hundred or Pastoral Lease No. .....
Section..... Lot No..... Site No.....
Name of Property .....

As the person responsible for the work carried out on this well I advise that it has been completed as described below.

Name of Driller J. P. Saunders Licence No. 2-103
Name of plant operator if under supervision .....

Permit holder or land occupier Dept of Mines - Energy
Postal Address P.O. Box 151
Eastwood Postcode 5063

3. SUMMARY
Date work commenced 13-4-82 Date completed 21-4-82
Work carried out: New well ☑, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)
Final Depth 224 m Final standing water level..... m Final yield..... l/sec.
Was well abandoned? NO If yes, state method .....

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	6	14"	Rotary	Air
6	224	14"	Rotary	mud

6.2 WATERS CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
	145	150					airlift	

7. CASING LEFT IN WELL

7.1 CASING

From (m)	To (m)	Internal Diam.	7.2 Type: Swell Joint, Welded Collar, Steel, Plastic, Etc.	7.3 Casing Shoe: Yes	No	Diam. (mm)	Cemented: Yes	No
0	148	20cm	Steel	☐	☐		☐	☐
0	156·5	20cm	Steel	☐	☐		☐	☐

7.4 CASING PRESSURE CEMENTED

Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
☐	☐	85	141			
☑	☐	135	~~135~~	20	454	
☐	☐	~~54~~				

8. CONSTRUCTION AT PRODUCTION LEVEL Standpipe cemented in over Bore 1 Basement

8.1 METHOD

Open Hole
☑ Screen(s) ☐ Slotted Casing
Other, give details Cementing water at 135m (Pressure cement back to ~~35m~~) 85m.

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
Wire wound	141	150	·25	82	92	S/Steel	Suniscreen	65mm 80mm steel Blanked.

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. OF A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken
Airlifting for 1 Hours
Rate Assisted early

11. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	Interval Tested To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

12. SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—
Water level too deep to collect sample
at this stage

Signature of Licensed Driller J. P. Saunders Date 26/4/82

Driller to forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	1	Calcrete.
1	4	Limestone - Fossil
4	8	Yellow sands - calcrete 4-5m
8	14	Yellow sandy clays
14	29	Limestone.
29	36	Bright yellow marl - limestone
36	128	Grey limestone - marl - Bands glauconite.
128	140	Dark grey-green Brown clays.
140	174	Sandstone - Sands
174	176	Sandstone - pyritic.
176	192	Marl/Sandstone Hard Bars
192	207	Dark Brown-grey carbonaceous clays
207	222	Sandstone pyritic.
222	224	Basalt Basement (Rig abandoned)

MAY 1982
DEPT OF MINES
EXPLORING DIVISION

Form 1207

IMb25—5.76 G5538 SL 21

MURRAY BASIN INVESTIGATION

[illegible] FORM FOUR
[illegible]RNMENT OF SOUTH AUSTRALIA
[illegible] Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

Official Well No. M163

1. PERMIT No. 9881

2. LOCATION OF WELL

Hundred or Pastoral Lease No. ....

Section .... Lot No. .... Site No. ....

Name of Property ....

[illegible] out on the well I advise that it has been completed

Permit holder or land occupier [illegible]

Postal Address P.O. Box 151

[illegible] Postcode 5063

[illegible] Licence No. 2 [illegible]

Date commenced [illegible] Date completed 21-4-82

[illegible]: New well ✓, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)

[illegible] Depth [illegible] m Final standing water level .... m Final yield .... l/sec.

[illegible] well abandoned? [illegible] If yes, state method ....

DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.2 WATER CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
	142	154						
							[illegible]	

Drilling details: [illegible] | Fluid Used (Air, Water, Mud Type): [illegible] mud

7.3 CASING SHOE / 7.4 CASING PRESSURE CEMENTED

Type (Steel, Wrought Iron, Plastic, Etc.)	Yes	No	Diam (mm)	Cemented Yes	Cemented No	Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
				☐	☐	☐	☐	25	141			
[illegible]				☐	☐	☑	☐	135	25	20	454	
[illegible]				☐	☐	☐	☐	69				

[illegible] PRODUCTION LEVEL [illegible]

8.2 [illegible] SLOTTED CASING (*If variable aperture screen used give limits)

	Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
Slotted Casing	[illegible]	142	154	.25	72	[illegible]	Steel	[illegible]	65 [illegible]

[illegible] 145m [illegible] (Back to [illegible]) 25m

9.1 GRAVEL PACK

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

10. [illegible] OF A DRILLED WELL (i.e. hand dug, etc)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

11. DEVELOPMENT State method and times used

[illegible]

12. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	To (m)	Water Level stabilised at End?	Test Method	Depth of Pump	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	1	Calcrete
1	4	Limestone [illegible]
4	8	[illegible]
8	14	yellow sandy clays
14	29	Limestone
29	36	[illegible]
36	[illegible]	[illegible] marl Bands [illegible]
[illegible]	[illegible]	[illegible]
[illegible]	74	[illegible]
74	76	[illegible] pyrite
76	[illegible]	[illegible]
[illegible]	[illegible]	[illegible] clays
[illegible]	[illegible]	[illegible] pyrite
[illegible]	264	[illegible] (Bery [illegible])

14. SAMPLES

[illegible] provisions of the Water Resources Act and Regulations thereto [illegible] that strata and water [illegible]. If any samples have not [illegible] state [illegible]

[illegible]

Licensed Driller [illegible] Date [illegible]

Please forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

[illegible] 65538 [illegible]

Form 1207

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: M 104

UNIT NO: 6829 - 805

DM

Datum AHD

... ACHILLEATER ... Nth. ... road from Renmark ...

AQUIFER SUMMARY: 146 m

Interval tested	Supply	Method	Total dissolved solids
4.35 (KP) 163 165 3.55 (E.L.) screen aperture 0.4 mm).		Air Lifting	W–

Depth	Rock sediment name	Geological description	Formation / age	Depth core sample	Casing
	CALCRETE & SANDSTONE	– calcrete is well cemented, sandstone medium. Pale Brown			80 0 163
4	SANDSTONE	gypsiferous, calcareous, ferruginous, medium average 0.3 to 0.5 mm), yellow Brown.	?Yamba Formation.		165 171.54 (SUMP). steel pipe
[illegible]	SAND	ferruginous, gypsiferous, medium (average 0.3 to 0.5 mm), calcareous Yellow Brown.			
[illegible]	LIMESTONE sandy	rubbly sandy, hard, yellow Brown, Minor sandstone.	Murray Group (Miocene).		
32 100	LIMESTONE (fine)	(26 – 28 grey lines) Well cemented some [struck out] flint present fossiliferous & bryozoal from 38 m			

REMARKS: PERMIT 9882. CEMENT [struck out] SEAL SET AT 156 m [struck out]. CEMENTED FROM 156 m back to 36 m (to m). SITE 22)

Drill type: Rotary

Circulation: AIR

Sheet 1 of 5

Completed: 20-7-72

Logged by: D. R. [illegible]

Date: 27-7-72

731 – 8 136 180 186

WATER WELL LOG

HOLE NO: M1104

6829 SOS

DM

TOTAL DISSOLVED SOLIDS

W —

FROM–TO	DESCRIPTION	FORMATION AGE
32–100	[illegible] from 70 m [illegible] from 70 m. [illegible]	ETTRICK FORMATION (OLIGOCENE).
100–146	glauconitic [illegible] plasticity from 112 m medium to high plasticity	
146–148	50% Marl (as above) 30% medium (average 0.5 – 1.0) [illegible] glauconitic pyrite [illegible]	

REMARKS

NOTE [illegible]

DRILL TYPE

CIRCULATION

SHEET

WATER WELL LOG

HOLE NO. M 104

6829 - 805

DM

SUPPLY

TOTAL DISSOLVED SOLIDS

W —

AQUIFER

SUMMARY

DEPTH		NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE
148	152	SAND	SAND, medium (Range 0.3 to 1.00 mm, average 0.5 mm), shelly, pyritic, poorly sorted, glauconitic Grey	Buccleuch Beds (Oligocene).
				— ? — ? —
[illegible]		MUDSTONE & MARL	[illegible], glauconitic, sandy, shelly, pyritic, chocolate brown fines. Grey Brown.	Renmark Beds Eocene/Oligocene
[illegible]		SAND	fine to medium 0.2 to 0.8 mm average grain size 0.2/0.3 mm, shelly, pyritic, fine, pyritic strongly cemented sandstone is common, clayey, subrounded to	

REMARKS:

NOTE

DRILL TYPE

CIRCULATION

SHEET 3 5

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: M104

UNIT / ~~STATE~~ NO: 6829 – 805

DM

AQUIFER

SUMMARY:

DEPTH m From	To	GRAPHIC LOG	ROCK SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE
154	173		SAND (CONtd)	subangular minor lignite, Brown. very ferruginous 170-172 m	Renmark Beds Eocene/Oligocene
173	184		SILT	sandy fine (average 0·1 mm), shelly? pyritic, glauconitic Brown.	
184	?		SAND	silty average grain size = 0·3 mm, some coarse, milky, rounded grains, up to 2 mm. Subrounded to subangular [shelly? fossiliferous? – contamination?] fine pyritic sandstone is common Brown.	

REMARKS:

* NOTE: 10 kl / day = 1000 gals / hr

DRILL TYPE

CIRCULATION

SHEET 4 OF 5

COMPLETED

LOGGED BY

DATE

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: M 104

UNIT / SHEET NO: 6829 — 805

DM

PROJECT

LOCATION OF SOURCE

El Surface m

Fl Ref Point m Datum

AQUIFER SUMMARY:	Depth to water cut m	Depth to standing water m	Interval tested From	To	Kilolitres/day*	Supply Test Length (hrs)	Method	Total Dissolved Solids milligrams/litre	Analysis No
									W—

Depth m From	To	Graphic Log	Rock / Sediment Name	Geological Description	Formation / Age	Depth Core Sample	Casing
197	212		CLAY	white & blue clay, some angular vein quartz chips with pyrite crystallization. Silver grey. E.O.H. 212 m	Basement (weathered slate or shale). ~~phyllite~~. Adelaidean ?		

REMARKS:

* NOTE 1 kl/day = 1000gals/hr

DRILL TYPE	COMPLETED
CIRCULATION	LOGGED BY
SHEET 5 OF 5	DATE

MURRAY BASIN
PERMIT 9884

CORE DESCRIPTION

HOLE NO M106
UNISTATE NO
6829-807
-807

GEOLOGICAL DESCRIPTION ZONE

0 - 2m CALCRETE offwhite, hard - nodular.

2 - 64m LIMESTONE fawn to offwhite, becoming yellow-brown with depth. Alternating well cemented & soft limestone. Sandy in parts. Fossiliferous (shells, bryozoa). Glauconite.

58 - 64m marly limestone, grey-green - glauconitic as.

64 - 120m MARL grey-green, minor shell fragments, glauconite. becoming stiffer & darker with depth.

88 - 120m very shelly bands (turretella & scallop?). Glauconitic

LIGNITE

100 - 120m becoming sandier with depth, <20%. Medium grained, poorly sorted. Very shelly.

TOP OF RMK.

120 - 128m MARLY SAND grey, poorly sorted, med.gr, subangular to subrounded < 3mm. Glauconite pellets <5%.

SHEET ... OF 2

(CONTAM?)

DEPARTMENT OF MINES - SOUTH AUSTRALIA
ENGINEERING DIVISION

MURRAY BASIN
PERMIT 9884

CORE DESCRIPTION

HOLE NO M106

UNIT/STATE NO 6829-807

GEOLOGICAL DESCRIPTION OF CORE

OK / WARINA

130 128 - 153m BASEMENT grey silty clay c coarse angular qtz. weathered.

NOT WARINA

140

MAY BASEMENT. 144 - 146m darker grey clay, fragments of black siltstone very hard, laminated

150

160

END OF HOLE 153.4m

SHEET 2 OF 2

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

BORE LOG

~~CONTINUATION SHEET~~

MURRAY BASIN
Permit 93510

HOLE NO. M142
UNIT/STATE NO. 6829-809

DEPTH (m) from	to	GEOLOGICAL DESCRIPTION OF SAMPLE
0	3	CALCRETE pink, offwhite, some calcisiltite
3	6	SANDY CLAY orange brown, stiff, 30% rounded qtz.
6	100	LIMESTONE interbedded hard well cemented sandy limestone and soft marly fine grained limestone. Below 24m, predom soft lst.
		72–75m hard well cemented layers. From 75m grey glauconitic fine grained limest becoming slightly fossilf, more glauconite below 96m, also marly.
100	180	MARL grey, glauconitic, stiff, slightly fossilf.
		150–162m sdfo, sandy, shelly.
		162–169m stiff grey marl with blebs of dark brown carbonaceous clay.
		169–180. grey-green marl with occ large shell frags. Very glauconitic, shelly 177–180.
180	214	CARBONACEOUS CLAY dark brown, very lignitic, black 195–208m. Stiff, pyritic.
214	229.5	BASEMENT weathered white, grey clays. Below 219m, hard dark basalt breccia.
		END OF HOLE 229.5m

UNIT	AGE	CASING	WATERS CUT	WATER LEVEL
MURRAY GROUP	MIOCENE			
ETTRICK FM	OLIGOCENE			
LEMARK BEDS	EOCENE			

SHEET ..... OF .....

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

1. PERMIT No. 23510 | Official Well No. 6829 - 809.

2. LOCATION OF WELL: M142

Hundred or Pastoral Lease No. FREELING
Section 148 Lot No. .... Site No. ....
Name of Property ....

As the person responsible for the work carried out on this well I advise that it has been completed as described below:

Name of Driller D. G. TESDIKE Licence No. 2-22
Name of plant operator if under supervision ....

Permit holder or land occupier DEPT MINES & ENERGY
Postal Address P.O. BOX 151 EASTWOOD
SA Postcode 5063.

5. SUMMARY

Date work commenced 16-5-84 Date completed 29-5-84
Work carried out: New well [✓], Existing well, deepen [ ], enlarge [ ], rehabilitate [ ], backfill [ ] (tick appropriate boxes)
Final Depth 229.5 m Final standing water level 26.78 m TOC 21/6/84 Final yield 1.000 l/sec +
Was well abandoned? NO If yes, state method ....

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	3	250mm	Rotary	Mud
3	229.5	180mm	Rotary	Mud

6.2 WATERS CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
23.5.84	210	213	at Completion				Airlift	SALTY

7. CASING LEFT IN WELL

7.1 Dimensions From (m)	To (m)	Internal Diam.	7.2 Type Swell Joint, Welded Collar, Steel, Plastic, Etc.	7.3 Casing Shoe Yes	No	Diam. (mm)	Cemented Yes	Cemented No	7.4 Casing Pressure Cemented Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	3	200	PVC	☐	☐		☐	☐	✓	☐	0	3	4	100l.	
+.7	216	75mm	HW STEEL STS	☐	☐		☐	☐	✓	☐			70	1890.	

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD
☐ Open Hole
☑ Screen(s) ☐ Slotted Casing
☐ Other, give details ....

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
SURESCREEN	211	213	0.5mm	75mm	85mm	Stainless Steel	SURESCREEN	3M Blanked Sump.

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken
Screen Jetted with Water 4 hrs
Air-lifted 3½ hrs.

11. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	10	SANDSTONE - WHITE - HARD
10	12	SANDSTONE + SEAMS ORANGE CLAY
12	13	SANDSTONE + SEAMS YELLOW CLAY
13	20	WHITE CLAY + LITTLE S/STONE
20		WHITE TO YELLOW CALCAREOUS CLAY
	50	WITH SOME HARD BANDS LIMESTONE
50	75	Yellow Marl
75	84	Grey Sandy Clay
84	120	Shells & Med Grey Siltstone & Clay
120	150	STICKY GREY CLAY
150	161	SANDS & PYRITES
161	173.5	Brown Clays & LIGNITES
173.5	178	Glauconitic Sands & Clays Shell
178	210	GREY CLAYS
210	213	White Sandy Clays
213.5	218	Blue Grey Shale
218	229.5	Basalt & Volcanic Rock

12. SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—
....

Signature of Licensed Driller .... Date 3/6/84

13 JUN 1984
ENGINEERING DIVISION

Driller to forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

1M625-6.76 G5538 S1. 21

Form 1307

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

BORE LOG

~~CONTINUATION SHEET~~

HOLE NO. M143
UNIT;STATE NO: 6829-811

PROJECT: MURRAY BASIN
Permit 93511

Ref 45:86

DEPTH (m) from	to	GEOLOGICAL DESCRIPTION OF SAMPLE
0	3	CALCRETE pink-offwhite, v hard.
3	6	CLAY mottled red brown & stiff sandy.
6	88	LIMESTONE soft, marly yellow-brown fine-grained sandy limestone. Some well cemented layers 15-18m light grey stiff clay. 51-66m pale fawn lst as. 66-78m pale fawn/grey lst as. 78-88m grey marly fine-grained lst, glauc oolitic.
88	135	MARL grey, glauconitic, stiff. Occ fine shell frags, from 102m grey-green, v stiff.
135	147	SANDY MARL 30% fine to coarse sand & shell frags. Marl less stiff.
147	166	CARBONACEOUS CLAY Dark brown/black. Moderately stiff.
166	221	BASEMENT weathered soft clay, white fawn pale orange.

END OF HOLE 221m

UNIT: MURRAY GROUP; AGE: MIOCENE; ETTRICK FM; OLIGOCENE; KENMARK BED; EOCENE; CASING; WATERS CUT; WATER LEVEL

SHEET.... OF ....

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

Official Well No. 6229-211

1. PERMIT No. 93511

2. LOCATION OF WELL: M143

Hundred or Pastoral Lease No. SKURRAY

Section 15 Lot No. .... Site No. ....

Name of Property ....

As the person responsible for the work carried out on this well I advise that it has been completed described below:

Name of Driller: [illegible] Licence No. 2/72

Name of plant operator if under supervision ....

Permit holder or land occupier DEPT MINES & ENERGY

Postal Address P.O. Box 151 EASTWOOD S.A. Postcode 5063

5. SUMMARY

Date work commenced 22-5-84 Date completed 2-6-84

Work carried out: New well ☑, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)

Final Depth 221 m Final standing water level 17.15 m TOC 20/6/84 Final yield 2000 l/hr

Was well abandoned? NO If yes, state method

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	3	250mm	Rotary	Mud
3	221	150mm	Rotary	Mud

6.2 WATERS CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
2-6-84	132	147	-	-	Completion		airlift	SALTY

7. CASING LEFT IN WELL

7.1 From (m)	To (m)	Internal Diam.	7.2 Type Swell Joint, Welded Collar, Steel, Plastic, Etc.	7.3 Casing Shoe Yes	No	Diam. (mm)	Cemented Yes	No	7.4 Casing Pressure Cemented Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	3	250	PVC	☐	☐		☐	☐	☐	☐	0	3	4	30	
0	136.5		Steel HW	☐	☐		☐	☐	☑	☐					
118	191		" "	☐	☐		☐	☐	☑	☐	0	129.5	45	1200	

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD

☐ Open Hole

☑ Screen(s) ☐ Slotted Casing

☐ Other, give details ....

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
WIREWOUND	136.5	138.5	0.5mm	75mm	35mm	STAINLESS STEEL	SCREENCO	3m Blank Pipe Sump Capped

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken

Jetted Screen 4½ hrs

Airlifted from 72m 3hrs

11. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	3	Calcrete
3	5	Clay Orange & White
5	13	Calcrete Lost Circulation
13	50	Orange Clays with Calcrete
50	89	Grey Silty Mud
89	132	Sticky Grey Clays.
132	147	Sands.
147	150	Brown Clays (Slightly lignitic)
150	165	Grey Marl Sticky
165	180	Sticky White Clays
180	185	Sands & Pyrite
185	191	Yellow Marl Slow Br.
191	221	Yellow Brown Grey Mud with Pyrite, Lignite.
	221	Total Depth

13 JUL 1984
MINES ... ENGINEERING DIVISION

12. SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—

....

Signature of Licensed Driller [signature] Date 11/6/84

Driller to forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

Form 1207

1Mb25—5.76 65538 SL 21

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

As the person responsible for the work carried out on this well I advise that it has been completed as described below.

Name of Driller: [illegible] Licence No. [illegible]

Name of plant operator if under supervision ....

1. PERMIT No. 9351 — Official Well No. 6727-211 M143

2. LOCATION OF WELL:

Hundred or Pastoral Lease No. SKEPTISY

Section 115 Lot No. .... Site No. ....

Name of Property ....

Permit holder or land occupier: DEPT MINES & ENERGY

Postal Address: P.O. BOX 151 EASTWOOD S.A. — Postcode 5063

5. SUMMARY

Date work commenced 22-5-84 — Date completed 2-6-84

Work carried out: New well ☑, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)

Final Depth 221 m — Final standing water level 17.15 m — Final yield 2000 l/sec

Was well abandoned? No — If yes, state method — TOC 30/6/84

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	3	250mm	Rotary	Mud
3	221	150mm	Rotary	Mud

6.2 WATERS CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
2-6-84	132	147	-	-	Completion		Airlift	Salty

7. CASING LEFT IN WELL

7.1 From (m)	To (m)	Internal Diam.	7.2 Type: Swell Joint, Welded Collar, Steel, Plastic, Etc.	7.3 Casing Shoe Yes	No	Diam. (mm)	Cemented Yes	Cemented No	7.4 Casing Pressure Cemented Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	3	200	PVC	☐	☐		☐	☐	☐	☐	0	3	4	30	
0	136.5		Steel HW	☐	☐		☐	☐	☑	☐					
125	141		" "	☐	☐		☐	☐	☑	☐	0	125.5	95	1200	

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD

☐ Open Hole
☑ Screen(s) ☐ Slotted Casing
☐ Other, give details ....

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
Wirewound	136.5	139.5	0.5mm	75mm	35mm	Stainless Steel	Sacrist	3m Plastic Pipe ... Capped

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)	Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken

Jetted Screen 4½ hrs
Airlifted from 72 — 3 hrs

11. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	3	Calcrete
3	5	Clay Orange & White
5	13	Calcrete Lost Circulation
13	50	Orange Clays with Calcrete
50	89	Grey Silty Mud
89	132	Sticky Grey Clays
132	147	Sands
147	150	Brown Clays (Slightly Lignitic)
150	165	Grey Mud Sticky
165	180	Sticky White Clay
180	185	Sands & Pyrite
185	191	Yellow Mud Slow Bo...
191	221	Yellow Brown Grey Mud with Pyrite & Lignite
	221	Total Depth

12. SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—

....

Signature of Licensed Driller .... [signature] Date 11/6/84

Driller to forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

* THIS IS 6829-966

MURRAY BASIN

BORELOGS

ORGN:BI
NAME:MHR
TYPE:
HOLE NUMBER:21
GRID TYPE:AMG
EASTING:3H4.100
NORTHING:6204.950
ACCURACY:APPROXIMATE
DATUM:AHD

COLLAR RL:30.000
SHEET REF:6829-3
INDEX:
TOTAL DEPTH:204.000
COMMENCED:10/03/81
COMPLETED:17/03/81
INCL:90
AZI:41

PARISH:MURRA
MURRAYED:1
SECTION:F
LOG ORGANISATION:CRA
LOGGER SYSTEM
DRILL CONTRACTOR:MOUNDSOIL
DRILL TYPE:MOUNTNE 1250
TECHNIQUE:MUD

CORE SIZE:
GEOPHYS CONTRACTOR:P.A. PTY LTD
WATER LEVEL:19.0
DATE MEASURED:17/03/81
PLUG DEPTHS:
CASED DEPTH:24.0
UNITS:

AVAILABLE DATA
NEUTRON
GAMMA
LONG SPACED DENSITY
MRD
C

MURRAY HASIN — BORELOGS

BORE: MAR 21

LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM #OHK SAMPLE NO SECT NUMBER
	.000		OPEN HOLE 0.0 TO 204.0M R.O.H. SAMPLES A91735 TO A91771 DESPATCHED ON D.P.O. NO. 18 0521.		
2.000	2.000	CALCRETE	PINK, LIGHT GREY, PEBBLY, NODULAR, MODERATELY STRONG ROCK.		
4.000	2.000	CALCRETE AND LIMESTONE	50:50, CALCRETE: PINK, LIGHT GREY, MODERATELY STRONG ROCK. LIMESTONE: YELLOW, SHELLY FOSSILS, COMMON, LARGE FRAGMENTS OF BIVALVES.		
12.000	8.000	LIMESTONE	YELLOW, SANDY, MARINE FOSSILS, COMMON, BIVALVES BRACHIOPODS GASTROPODS.		
18.000	6.000	SANDSTONE	YELLOW, LIGHT GREY, FINE GRAINED, CLAYEY, CALCAREOUS, SILTY, COMPACT SAND.		
22.000	4.000	CLAY	YELLOW, GREY, SANDY, CALCAREOUS, SILTY, COMPACT SAND, LOST CIRCULATION, SMALL SAMPLE SIZE.		
24.000	2.000	CLAY AND LIMESTONE	50:50, CLAY: YELLOW, SILTY, LIMESTONE: YELLOW, SANDY.		
26.000	2.000	CLAY AND LIMESTONE	50:50, CLAY: YELLOW, LIGHT GREY, LIMESTONE: GREY, SHELLY FOSSILS, COMMON.		
28.000	2.000	CLAY AND LIMESTONE	70:30, CLAY: YELLOW, SANDY, CALCAREOUS, LIMESTONE: YELLOW, SANDY.		
			-----TOP OF MURRAY GROUP LIMESTONE 28.000 M----		
30.000	2.000	LIMESTONE	YELLOW, SANDY, MARINE FOSSILS, COMMON, CORAL,	MURRAY GROUP LIMESTONE	
32.000	2.000	LIMESTONE	YELLOW, SHELLY FOSSILS, COMMON,	MURRAY GROUP LIMESTONE	
34.000	2.000	LIMESTONE	YELLOW, MARINE FOSSILS, COMMON, ECHINODERMS BRACHIOPODS BRYOZOA.	MURRAY GROUP LIMESTONE	
36.000	2.000	LIMESTONE	LIGHT GREY, YELLOW, MARINE FOSSILS, COMMON, BRYOZOA AND SHELLY FRAGMENTS.	MURRAY GROUP LIMESTONE	

MURRAY BASIN — BORELOGS

BORE: MAR 21

LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
38.000	2.000	LIMESTONE AND CLAY	60:40. LIMESTONE: GREY. MARINE FOSSILS. ABUNDANT. CLAY: GREY. SANDY. CALCAREOUS. GASTROPODS BRYOZOA CORALS AND SHELLY FRAGMENTS.	MURRAY GROUP LIMESTONE	
40.000	2.000	CLAY AND LIMESTONE	80:20. CLAY: GREY. SANDY. CALCAREOUS. LIMESTONE: GREY. MARINE FOSSILS. ABUNDANT.	MURRAY GROUP LIMESTONE	
42.000	2.000	CLAY AND LIMESTONE	50:50. CLAY: GREY. LIMESTONE: GREEN-GREY.	MURRAY GROUP LIMESTONE	
44.000	2.000	LIMESTONE AND CLAY	90:10. LIMESTONE: GREEN-GREY. MARINE FOSSILS. COMMON. CLAY: GREY. ECHINODERMS AND SHELLY FRAGMENTS.	MURRAY GROUP LIMESTONE	
48.000	4.000	LIMESTONE AND CLAY	90:10. LIMESTONE: GREEN-GREY. MARINE FOSSILS. COMMON. CLAY: GREY. ECHINODERMS GASTROPODS AND SHELL FRAGMENTS.	MURRAY GROUP LIMESTONE	
60.000	12.000	LIMESTONE	BUFF. MARINE FOSSILS. ABUNDANT. ECHINODERMS BRACHIOPODS FORAMS.	MURRAY GROUP LIMESTONE	
68.000	8.000	LIMESTONE	BUFF. MARINE FOSSILS. ABUNDANT. ECHINODERMS BRACHIOPODS FORAMS BRYOZOA AND CORALS.	MURRAY GROUP LIMESTONE	
76.000	8.000	LIMESTONE	GREY. BUFF. MARINE FOSSILS. ABUNDANT. CORALS SHELL FRAGMENTS AND ECHINODERMS.	MURRAY GROUP LIMESTONE	
88.000	12.000	LIMESTONE	GREY. BUFF. MARINE FOSSILS. ABUNDANT. GLAUCONITE. COMMON. DISSEMINATED. CORALS SHELL FRAGMENTS AND ECHINODERMS.	MURRAY GROUP LIMESTONE	
90.000	2.000	LIMESTONE AND CLAY	50:50. LIMESTONE: GREY. BUFF. MARINE FOSSILS. ABUNDANT. GLAUCONITE. COMMON. CLAY: GREY. SILTY. CALCAREOUS.	MURRAY GROUP LIMESTONE	
92.000	2.000	LIMESTONE	GREY. BUFF. MARINE FOSSILS. ABUNDANT. GLAUCONITE. COMMON.	MURRAY GROUP LIMESTONE	
96.000	4.000	LIMESTONE	GREY. MARINE FOSSILS. ABUNDANT. GLAUCONITE.	MURRAY GROUP LIMESTONE	

MURRAY BASIN — BORELOGS

BORE: MAR 21

LISTED ON 02/06/81

DEPTH TO BASE	ESTM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAN NAME	SN WORK SAMPLE NO SECT NUMBER
			COMMON. BRACHIOPODS CORAL AND ECHINODERMS.		
100.000	4.000	LIMESTONE AND CLAY	50:50. LIMESTONE: GREY. MARINE FOSSILS. ABUNDANT. MURRAY GROUP LIMESTONE GLAUCONITE. COMMON. CLAY: CALCAREOUS. SILTY.		
102.000	2.000	LIMESTONE AND CLAY	80:20. LIMESTONE: GREY. MARINE FOSSILS. ABUNDANT. MURRAY GROUP LIMESTONE GLAUCONITE. SPARSE. CLAY: GREY. SILTY. CALCAREOUS. GASTROPODS BRACHIOPODS ECHINODERMS CRINOIDS.		
108.000	6.000	LIMESTONE AND CLAY	70:30. LIMESTONE: GREY. MARINE FOSSILS. ABUNDANT. MURRAY GROUP LIMESTONE GLAUCONITE. COMMON. CLAY: GREY. SILTY. CALCAREOUS.		
			-----BASE OF MURRAY GROUP LIMESTONE 108.000 M-----		
			----------GEOLOGICAL THICKNESS 80.000 M----------		
			---TOP OF ETTRICK FORMATION LIMESTONE 108.000 M-		
112.000	4.000	CLAY	GREY. SILTY. CALCAREOUS.	ETTRICK FORMATION LIMESTONE	
114.000	2.000	CLAY	GREY. SILTY. CALCAREOUS. GLAUCONITE. COMMON.	ETTRICK FORMATION LIMESTONE	
116.000	2.000	CLAY AND LIMESTONE	80:20. CLAY: GREY. SILTY. CALCAREOUS. GLAUCONITE. COMMON. LIMESTONE: LIGHT GREY. SANDY. MARINE FOSSILS. COMMON. GLAUCONITE. COMMON. ECHINODERMS BRACHIOPODS.	ETTRICK FORMATION LIMESTONE	
118.000	2.000	LIMESTONE AND CLAY	70:30. LIMESTONE: LIGHT GREY. SANDY. MARINE FOSSILS. COMMON. GLAUCONITE. COMMON. CLAY: GREY. SILTY. CALCAREOUS. GLAUCONITE. COMMON.	ETTRICK FORMATION LIMESTONE	
124.000	6.000	CLAY	DARK GREY. SILTY. CALCAREOUS. FIRM CLAY.	ETTRICK FORMATION LIMESTONE	
130.000	6.000	CLAY	DARK GREY. SILTY. CALCAREOUS. FIRM CLAY. LESS CALCAREOUS THAN ABOVE.	ETTRICK FORMATION LIMESTONE	
132.000	2.000	CLAY	DARK GREY. SILTY. CARBONACEOUS. CUTTINGS.	ETTRICK FORMATION LIMESTONE	801735

MURRAY BASIN — BORELOGS

BORE: MAR 21

LISTED ON 02/08/81

DEPTH TO BASE	ESTM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
134.000	2.000	CLAY	DARK GREY, SILTY, CARBONACEOUS, CUTTINGS.	ETTRICK FORMATION LIMESTONE	891736
136.000	2.000	CLAY	DARK GREY, SILTY, CARBONACEOUS, CUTTINGS.	ETTRICK FORMATION LIMESTONE	891737
138.000	2.000	CLAY	DARK GREY, SILTY, CARBONACEOUS, CUTTINGS.	ETTRICK FORMATION LIMESTONE	891738
140.000	2.000	CLAY	DARK GREY, SILTY, CARBONACEOUS, CUTTINGS.	ETTRICK FORMATION LIMESTONE	891739
142.000	2.000	CLAY AND SANDSTONE	90:10, CLAY: DARK GREY, SILTY, CARBONACEOUS, CUTTINGS. SANDSTONE: LIGHT GREY, CALCAREOUS, FRAGMENTED SHELLS, ABUNDANT, GLAUCONITE, COMMON.	ETTRICK FORMATION LIMESTONE	891740
144.000	2.000	CLAY	DARK GREY, SILTY, CALCAREOUS, FRAGMENTED SHELLS, ABUNDANT, GLAUCONITE, COMMON, CUTTINGS.	ETTRICK FORMATION LIMESTONE	891741
146.000	2.000	CLAY	DARK GREY, SILTY, CALCAREOUS, FRAGMENTED SHELLS, ABUNDANT, GLAUCONITE, COMMON, CUTTINGS.	ETTRICK FORMATION LIMESTONE	891742
148.000	2.000	CLAY AND SANDSTONE	60:40, CLAY: DARK GREY, SILTY, CALCAREOUS, FRAGMENTED SHELLS, ABUNDANT, GLAUCONITE, COMMON, CUTTINGS. SANDSTONE: CALCAREOUS, ROUNDED GRAINS, POORLY SORTED, FRAGMENTED SHELLS, COMMON.	ETTRICK FORMATION LIMESTONE	891743
			---BASE OF ETTRICK FORMATION LIMESTONE 148.000 M-		
			----------GEOLOGICAL THICKNESS 40.000 M----------		
			------TOP OF COMPTON CONGLOMERATE 148.000 M------		
150.000	2.000	SANDSTONE AND CLAY	80:20, SANDSTONE: LIGHT GREY, CALCAREOUS, ROUNDED GRAINS, POORLY SORTED, FRAGMENTED SHELLS, COMMON, GLAUCONITE, SPARSE, CUTTINGS. CLAY: DARK GREY, SILTY, CALCAREOUS, FRAGMENTED SHELLS, COMMON, GLAUCONITE, COMMON, LIGNITE FRAGMENTS.	COMPTON CONGLOMERATE	891744
152.000	2.000	SANDSTONE	LIGHT GREY, CALCAREOUS, ROUNDED GRAINS, POORLY SORTED, FRAGMENTED SHELLS, COMMON, GLAUCONITE, SPARSE, CUTTINGS, LIGNITE FRAGMENTS.	COMPTON CONGLOMERATE	891745
154.000	2.000	SANDSTONE	LIGHT GREY, CALCAREOUS, ROUNDED GRAINS, POORLY	COMPTON CONGLOMERATE	891746

MURRAY BASIN BORELOGS

BORE: MBB 21 LISTED ON 85/06/01

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	STRAT NAME	SAMPLE NO
			SORTED. FRAGMENTED SHELLS. COMMON. GLAUCONITE. SPARSE. CUTTINGS. LIGNITE FRAGMENTS.		
190.000	2.000	SANDSTONE AND CLAY	90:10. SANDSTONE: LIGHT GREY. CALCAREOUS. ROUNDED GRAINS. POORLY SORTED. FRAGMENTED SHELLS. COMMON. GLAUCONITE. SPARSE. CUTTINGS. CLAY: GREY-BROWN.	COMPTON CONGLOMERATE	801747
188.000	2.000	SANDSTONE AND CLAY	80:20. SANDSTONE: LIGHT GREY. CALCAREOUS. ROUNDED GRAINS. POORLY SORTED. FRAGMENTED SHELLS. COMMON. GLAUCONITE. SPARSE. CUTTINGS. CLAY: GREY-BROWN.	COMPTON CONGLOMERATE	801748
			------BASE OF COMPTON CONGLOMERATE 150.000 M------		
			----------GEOLOGICAL THICKNESS 10.000 M----------		
			--------TOP OF UPPER RENMARK BEDS 150.000 M--------		
140.000	2.000	CLAY AND SANDSTONE	60:40. CLAY: GREY-BROWN. CARBONACEOUS. CUTTINGS. SANDSTONE: LIGHT GREY. CALCAREOUS. ROUNDED GRAINS. POORLY SORTED. FRAGMENTED SHELLS. COMMON. GLAUCONITE. SPARSE.	UPPER RENMARK BEDS	801749
182.000	2.000	LIMESTONE AND CLAY	80:20. LIMESTONE: GREY. MARINE FOSSILS. ABUNDANT. GLAUCONITE. COMMON. CUTTINGS. CLAY: GREY-BROWN. CARBONACEOUS. BRACHIOPODS ABUNDANT.	UPPER RENMARK BEDS	801750
186.000	2.000	LIMESTONE	GREEN-GREY. SANDY. FRAGMENTED SHELLS. ABUNDANT. CUTTINGS.	UPPER RENMARK BEDS	801751
188.000	2.000	LIMESTONE AND CLAY	80:20. LIMESTONE: GREEN-GREY. SANDY. FRAGMENTED SHELLS. ABUNDANT. CUTTINGS. CLAY: GREY-BROWN.	UPPER RENMARK BEDS	801752
190.000	2.000	LIMESTONE AND CLAY	80:20. LIMESTONE: GREEN-GREY. SANDY. FRAGMENTED SHELLS. ABUNDANT. CUTTINGS. CLAY: GREY-BROWN.	UPPER RENMARK BEDS	801753
170.000	2.000	LIMESTONE AND CLAY	80:20. LIMESTONE: GREEN-GREY. SANDY. FRAGMENTED SHELLS. ABUNDANT. CUTTINGS. CLAY: GREY-BROWN.	UPPER RENMARK BEDS	801754
172.000	2.000	CLAY AND LIMESTONE	80:20. CLAY: GREY-BROWN. SILTY. CALCAREOUS. FRAGMENTED SHELLS. ABUNDANT. CUTTINGS. LIMESTONE:	UPPER RENMARK BEDS	801755

MURRAY BASIN

BORELOGS

BORE: MAN 21

LISTED ON [illegible]

	DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK NO SECT	SAMPLE NUMBER
				GREEN-GREY. SANDY. FRAGMENTED SHELLS. ABUNDANT.			
	174.000	2.000	CLAY	GREY-BROWN. SILTY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS		891756
	176.000	2.000	CLAY	GREY-BROWN. SILTY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS		891757
176	178.000	2.000	CLAY	GREY-BROWN. SILTY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS		891758
180	180.000	2.000	LIMESTONE AND CLAY	90:10. LIMESTONE: LIGHT GREY. SANDY. FRAGMENTED SHELLS. ABUNDANT. CUTTINGS. CLAY: GREY-BROWN. SILTY. CARBONACEOUS. STIFF CLAY.	UPPER RENMARK BEDS		891759
182	182.000	2.000	LIMESTONE AND CLAY	70:30. LIMESTONE: LIGHT GREY. SANDY. FRAGMENTED SHELLS. ABUNDANT. CUTTINGS. CLAY: GREY-BROWN. DARK GREY. CARBONACEOUS.	UPPER RENMARK BEDS		891760
84	184.000	2.000	CLAY AND LIMESTONE	50:50. CLAY: GREY-BROWN. DARK GREY. CALCAREOUS. GLAUCONITE. COMMON. CUTTINGS. LIMESTONE: LIGHT GREY. SANDY. FRAGMENTED SHELLS. ABUNDANT.	UPPER RENMARK BEDS		891761
86	186.000	2.000	CLAY AND SAND	50:50. CLAY: GREY-BROWN. DARK GREY. CALCAREOUS. GLAUCONITE. COMMON. CUTTINGS. SAND: LIGHT GREY. MEDIUM AND COARSE GRAINED. ROUNDED GRAINS. MODERATELY SORTED. VERY LOOSE SAND.	UPPER RENMARK BEDS		891762
88	188.000	2.000	SAND AND CLAY	70:30. SAND: LIGHT GREY. MEDIUM AND COARSE GRAINED. ROUNDED GRAINS. MODERATELY SORTED. LOOSE SAND. FRAGMENTED SHELLS. SPARSE. CUTTINGS. CLAY: GREEN-GREY. SILTY. CALCAREOUS.	UPPER RENMARK BEDS		891763
190	190.000	2.000	SAND AND COALY CLAYSTONE	70:30. SAND: LIGHT GREY. MEDIUM AND COARSE GRAINED. ROUNDED GRAINS. MODERATELY SORTED. LOOSE SAND. FRAGMENTED SHELLS. SPARSE. CUTTINGS. COALY CLAYSTONE: GREY-BROWN. BROWN. LIGNITIC DARK BROWN CLAY.	UPPER RENMARK BEDS		891764

MURRAY BASIN — BORELOGS

BORE: MAR 21 — LISTED ON 02/06/81

DEPTH TO BASE	ESTM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
192.000	2.000	COALY CLAYSTONE AND SAND	60:40. COALY CLAYSTONE: GREY-BROWN, BROWN. CUTTINGS. SAND: LIGHT GREY, MEDIUM AND COARSE GRAINED, ROUNDED GRAINS, MODERATELY SORTED, LOOSE SAND, FRAGMENTED SHELLS, SPARSE.	UPPER RENMARK BEDS	891765
194.000	2.000	CLAY AND SAND	90:10. CLAY: GREY-BROWN, BROWN, CARBONACEOUS, SILTY, STIFF CLAY, CUTTINGS. SAND: LIGHT GREY, MEDIUM AND COARSE GRAINED, ROUNDED GRAINS, MODERATELY SORTED, LOOSE SAND, FRAGMENTED SHELLS, SPARSE.	UPPER RENMARK BEDS	891766
196.000	2.000	CLAY AND SAND	90:10. CLAY: GREY-BROWN, BROWN, CARBONACEOUS, SILTY, STIFF CLAY, CUTTINGS. SAND: LIGHT GREY, MEDIUM AND COARSE GRAINED, ROUNDED GRAINS, MODERATELY SORTED, LOOSE SAND, FRAGMENTED SHELLS, SPARSE.	UPPER RENMARK BEDS	891767
198.000	2.000	CLAY AND SAND	90:10. CLAY: GREY-BROWN, BROWN, CARBONACEOUS, SILTY, STIFF CLAY, CUTTINGS. SAND: LIGHT GREY, MEDIUM AND COARSE GRAINED, ROUNDED GRAINS, MODERATELY SORTED, LOOSE SAND, FRAGMENTED SHELLS, SPARSE.	UPPER RENMARK BEDS	891768
200.000	2.000	COALY CLAYSTONE AND QUARTZITE	60:40. COALY CLAYSTONE: GREY-BROWN, BROWN, STIFF CLAY, CUTTINGS. QUARTZITE: LIGHT GREY, MEDIUM AND COARSE GRAINED, QUARTZO-FELDSPATHIC, ANGULAR GRAINS, BASEMENT QUARTZO-FELDSPATHIC ROCK.	UPPER RENMARK BEDS	891769
202.000	2.000	COALY CLAYSTONE AND QUARTZITE	60:40. COALY CLAYSTONE: GREY-BROWN, BROWN, STIFF CLAY, CUTTINGS. QUARTZITE: LIGHT GREY, MEDIUM AND COARSE GRAINED, QUARTZO-FELDSPATHIC, ANGULAR GRAINS, BASEMENT QUARTZO-FELDSPATHIC ROCK.	UPPER RENMARK BEDS	891770
			-------BASE OF UPPER RENMARK BEDS 202.000 M-------		
			----------GEOLOGICAL THICKNESS 44.000 M----------		
204.000	2.000	COALY CLAYSTONE AND QUARTZITE	60:40. COALY CLAYSTONE: GREY-BROWN, BROWN, STIFF CLAY, CUTTINGS. QUARTZITE: LIGHT GREY, MEDIUM AND COARSE GRAINED, QUARTZO-FELDSPATHIC, ANGULAR GRAINS, BASEMENT QUARTZO-FELDSPATHIC ROCK.	**TOTAL DEPTH**	891771

END OF HOLE AT 204.000 M.

THIS IS 6829-968

MURRAY BASIN

BORELOGS

ORGN:81
NAME:MBR
TYPE:
HOLE NUMBER:23
GRID TYPE:
EASTING:390.900
NORTHING:6411.900
ACCURACY:APPROXIMATE
DATUM:AHD

COLLAR RL:30.000
SHEET REF:6829-1
INDEX:
TOTAL DEPTH:270.000
COMMENCED:19/03/81
COMPLETED:29/03/81
INCL:90
AZIM:

PARISH:WAIKE
HUNDRED:51
SECTION:RM
LOG ORGINSATION:CRA
LOGGED BY:TEM
DRLL CNTRCTR:THOMPSON
DRILL TYPE:BOURNE 1250
TECHNIQUE:MUD

CORE SIZE:
GEOPHYS CONTR:S.P.S. PTY LTD
WATER LEVEL:
DATE MEASURED:
PLUG DEPTHS:
CASED DEPTH:30.0
UNITS:

AVAILABLE DATA

NEUTRON
GAMMA
LONG SPACED DENSITY
GRD
SP
R
C

MURRAY BASIN — BORELOGS

BORE: MRR 23 — LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
.000			OPEN HOLE 0.0 TO 270.0M R.O.M. SAMPLES 891772 TO 891841 DESPATCHED ON S.P.O. NO. 08 0523.		
2.000	2.000	CALCRETE	LIGHT GREY, PINK, FINE AND MEDIUM GRAINED. MODERATELY STRONG ROCK.		
4.000	2.000	CALCRETE AND SANDSTONE	50:50. CALCRETE: LIGHT GREY, PINK, FINE AND MEDIUM GRAINED, MODERATELY STRONG ROCK. SANDSTONE: LIGHT GREY, YELLOW, MEDIUM AND COARSE GRAINED, CALCAREOUS, MODERATELY WEAK ROCK. SECONDARY GYPSUM, ABUNDANT.		
12.000	8.000	SANDSTONE	YELLOW, LIGHT GREY, MEDIUM AND COARSE GRAINED, CALCAREOUS, MODERATELY WEAK ROCK, SECONDARY GYPSUM, ABUNDANT. LOST CIRCULATION. SMALL SAMPLES ONLY FROM 6 TO 12 M..		
			-----TOP OF MURRAY GROUP LIMESTONE 12.000 M-----		
42.000	30.000	NO SAMPLE	LOST CIRCULATION.	MURRAY GROUP LIMESTONE	
46.000	4.000	LIMESTONE	LIGHT GREY, COARSE TO VERY COARSE GRAINED, SANDY, MURRAY GROUP LIMESTONE MODERATELY STRONG ROCK, MARINE FOSSILS, ABUNDANT. ECHINOIDS BRYOZOA BRACHIOPODS.		
52.000	6.000	LIMESTONE AND CLAY	70:30. LIMESTONE: LIGHT GREY, COARSE TO VERY COARSE GRAINED, SANDY, MODERATELY STRONG ROCK, MARINE FOSSILS, ABUNDANT. CLAY: LIGHT GREY, SOFT CLAY.	MURRAY GROUP LIMESTONE	
78.000	26.000	LIMESTONE	LIGHT GREY, BROWN, COARSE TO VERY COARSE GRAINED, SANDY, MODERATELY STRONG ROCK, MARINE FOSSILS, ABUNDANT. ECHINOIDS BRYOZOA BRACHIOPODS LARGE FORAMS BIVALVES AND CORALS.	MURRAY GROUP LIMESTONE	
86.000	8.000	LIMESTONE AND SANDSTONE	50:50. LIMESTONE: LIGHT GREY, BROWN, COARSE TO VERY COARSE GRAINED, SANDY, MODERATELY STRONG ROCK, MARINE FOSSILS, ABUNDANT. SANDSTONE: LIGHT GREY, MEDIUM AND COARSE GRAINED, CALCAREOUS,	MURRAY GROUP LIMESTONE	

MURRAY BASIN

HOLE: WHR 23 — BORELOGS

LISTED ON 02/06/81

DEPTH TO BASE	THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM #DHK SAMPLE NO SECT NUMBER
			MODERATELY STRONG ROCK. GLAUCONITE. COMMON.		
95.000	10.000	SANDSTONE AND LIMESTONE	40:20. SANDSTONE: LIGHT GREY. GREY. MEDIUM AND COARSE GRAINED. MODERATELY STRONG ROCK. GLAUCONITE. COMMON. LIMESTONE: LIGHT GREY. COARSE TO VERY COARSE GRAINED. SANDY. MODERATELY STRONG ROCK. MARINE FOSSILS. ABUNDANT.	MURRAY GROUP LIMESTONE	
102.000	8.000	LIMESTONE	LIGHT GREY. COARSE TO VERY COARSE GRAINED. SANDY. MURRAY GROUP LIMESTONE MODERATELY STRONG ROCK. MARINE FOSSILS. ABUNDANT.		
110.000	8.000	LIMESTONE AND MARL	50:50. LIMESTONE: LIGHT GREY. COARSE TO VERY COARSE GRAINED. SANDY. MODERATELY STRONG ROCK. MARINE FOSSILS. ABUNDANT. GLAUCONITE. COMMON. MARL: LIGHT GREY. SOFT CLAY.	MURRAY GROUP LIMESTONE	
120.000	12.000	SANDSTONE AND LIMESTONE	40:20. SANDSTONE: LIGHT GREY. MEDIUM AND COARSE GRAINED. MODERATELY WEAK ROCK. LIMESTONE: LIGHT GREY. COARSE TO VERY COARSE GRAINED. SANDY. MODERATELY STRONG ROCK. MARINE FOSSILS. ABUNDANT. GLAUCONITE. COMMON.	MURRAY GROUP LIMESTONE	
			------BASE OF MURRAY GROUP LIMESTONE 120.000 M------		
			----------GEOLOGICAL THICKNESS 10M.000 M----------		
			---TOP OF ETTRICK FORMATION LIMESTONE 120.000 M-		
130.000	8.000	LIMESTONE AND MARL	50:50. LIMESTONE: LIGHT GREY. COARSE TO VERY COARSE GRAINED. SANDY. MODERATELY STRONG ROCK. MARINE FOSSILS. ABUNDANT. GLAUCONITE. COMMON. MARL: LIGHT GREY. SOFT CLAY. GLAUCONITE. COMMON.	ETTRICK FORMATION LIMESTONE	
140.000	10.000	MARL AND LIMESTONE	40:20. MARL: LIGHT GREY. SOFT CLAY. GLAUCONITE. COMMON. LIMESTONE: LIGHT GREY. MEDIUM AND COARSE GRAINED. SANDY. MODERATELY STRONG ROCK. MARINE FOSSILS. ABUNDANT.	ETTRICK FORMATION LIMESTONE	
152.000	12.000	MARL	LIGHT GREY. SILTY. SOFT CLAY. GLAUCONITE. COMMON. ETTRICK FORMATION LIMESTONE		HB1772

MURRAY BASIN

BOREHOLES

BORE: MAR 23

LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM #ORK SAMPLE NO SECT NUMBER
			CUTTINGS.		
134.000	2.000	MARL	GREY, SILTY, SOFT CLAY, GLAUCONITE, COMMON, CUTTINGS.	ETTRICK FORMATION LIMESTONE	891773
136.000	2.000	MARL	GREY, SILTY, SOFT CLAY, GLAUCONITE, COMMON, CUTTINGS.	ETTRICK FORMATION LIMESTONE	891774
138.000	2.000	MARL	GREY, SILTY, SOFT CLAY, GLAUCONITE, COMMON, CUTTINGS.	ETTRICK FORMATION LIMESTONE	891775
			---BASE OF ETTRICK FORMATION LIMESTONE 138.000 M--		
			----------GEOLOGICAL THICKNESS 14.000 M----------		
			--------TOP OF UPPER RENMARK BEDS 138.000 M-------		
140.000	2.000	CLAY	GREY, SILTY, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891776
142.000	2.000	CLAY	GREY, SILTY, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891777
144.000	2.000	CLAY	GREY, SILTY, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891778
146.000	2.000	CLAY	GREY, SILTY, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891779
148.000	2.000	CLAY	GREY, SILTY, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891780
150.000	2.000	CLAY	GREY, BROWN, SILTY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891781
152.000	2.000	CLAY	GREY, SILTY, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891782
154.000	2.000	CLAY	GREY, SILTY, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891783
156.000	2.000	CLAY	BROWN, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891784
158.000	2.000	CLAY	BROWN, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891785
160.000	2.000	CLAY	BROWN, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891786

MURRAY BASIN — BORELOGS

BORE: MAR 23

LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
162.000	2.000	CLAY	BROWN, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891787
164.000	2.000	CLAY	BROWN, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891788
166.000	2.000	CLAY	BROWN, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891789
168.000	2.000	CLAY	BROWN, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891790
170.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891791
172.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891792
174.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891793
176.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891794
178.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891795
180.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891796
182.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891797
184.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891798
186.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891799
188.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, SECONDARY PYRITE, SPARSE, CUTTINGS.	UPPER RENMARK BEDS	891800
190.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, SECONDARY PYRITE, SPARSE, CUTTINGS.	UPPER RENMARK BEDS	891801
192.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, SECONDARY PYRITE, SPARSE, CUTTINGS.	UPPER RENMARK BEDS	891802
194.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, SECONDARY PYRITE, SPARSE, CUTTINGS.	UPPER RENMARK BEDS	891803
196.000	2.000	CLAY	BROWN, GREY, CARBONACEOUS, FIRM CLAY, SECONDARY	UPPER RENMARK BEDS	891804

MURRAY BASIN — BOREHOLES

BOREHOLE NUMBER 23 — LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SA WORK SAMPLE NO SECT NUMBER
			PYRITE, SPARSE, CUTTINGS.		
198.000	2.000	CLAY	BROWN, CARBONACEOUS, SILTY, FIRM CLAY, SECONDARY PYRITE, SPARSE, CUTTINGS.	UPPER RENMARK BEDS	891805
200.000	2.000	CLAY	BROWN, CARBONACEOUS, SILTY, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891806
202.000	2.000	CLAY	BROWN, CARBONACEOUS, SILTY, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891807
204.000	2.000	CLAY	BROWN, CARBONACEOUS, SILTY, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891808
206.000	2.000	CLAY	BROWN, CARBONACEOUS, SILTY, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891809
208.000	2.000	CLAY	BROWN, CARBONACEOUS, SILTY, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891810
210.000	2.000	CLAY	BROWN, CARBONACEOUS, SILTY, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891811
212.000	2.000	CLAY AND SANDSTONE	70:30, CLAY: BROWN, CARBONACEOUS, SILTY, FIRM CLAY, CUTTINGS, SANDSTONE: GREY, BROWN, COARSE TO VERY COARSE GRAINED, CALCAREOUS, MODERATELY STRONG ROCK, MARINE FOSSILS, COMMON, SECONDARY PYRITE, ABUNDANT, GASTROPODS COMMON, PYRITE AND MARCASITE ABUNDANT MINOR LIGNITE FRAGMENTS.	UPPER RENMARK BEDS	891812
214.000	2.000	CLAY AND SANDSTONE	70:30, CLAY: BROWN, CARBONACEOUS, SILTY, FIRM CLAY, CUTTINGS, SANDSTONE: GREY, BROWN, COARSE TO VERY COARSE GRAINED, CALCAREOUS, MODERATELY STRONG ROCK, MARINE FOSSILS, COMMON, SECONDARY PYRITE, ABUNDANT, GASTROPODS COMMON, PYRITE AND MARCASITE ABUNDANT MINOR LIGNITE FRAGMENTS.	UPPER RENMARK BEDS	891813
216.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891814
218.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891815
220.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	891816
222.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891817

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MURRAY BASIN — BORELOGS

BORE: MAR 23 — LISTED ON 02/06/81

DEPTH TO BASE	FSTHK THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
224.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891818
226.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891819
228.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891820
230.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891821
232.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891822
234.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891823
236.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891824
238.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891825
240.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891826
242.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891827
244.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891828
246.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891829
248.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891830

MURRAY BASIN BORELOGS

BORE: NRR 23 LISTED ON 02/06/81

DEPTH TO BASE	FSITH THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
250.000	2.000	CLAY	BROWN, CARBONACEOUS, FIRM CLAY, PLANT REMAINS, SPARSE, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891831
252.000	2.000	CLAY	BROWN, LIGHT GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891832
254.000	2.000	CLAY	BROWN, LIGHT GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891833
256.000	2.000	CLAY	BROWN, LIGHT GREY, CARBONACEOUS, FIRM CLAY, CUTTINGS, AROMATIC SMELL.	UPPER RENMARK BEDS	891834
258.000	2.000	CLAY	BROWN, LIGHT GREY, CARBONACEOUS, SOFT CLAY, SECONDARY PYRITE, SPARSE, CUTTINGS, MINOR PYRITE AND LIGNITE FRAGMENTS.	UPPER RENMARK BEDS	891835
260.000	2.000	CLAY	BROWN, LIGHT GREY, CARBONACEOUS, SOFT CLAY, SECONDARY PYRITE, SPARSE, CUTTINGS, MINOR PYRITE AND LIGNITE FRAGMENTS.	UPPER RENMARK BEDS	891836
262.000	2.000	CLAY AND QUARTZITE	80:20, CLAY: LIGHT GREY, BROWN, CARBONACEOUS, SOFT CLAY, SECONDARY PYRITE, COMMON, CUTTINGS, QUARTZITE: LIGHT GREY, MEDIUM AND COARSE GRAINED, QUARTZO-FELDSPATHIC, SUBANGULAR GRAINS, MODERATELY STRONG ROCK, SECONDARY PYRITE, COMMON, PYRITE FRAGMENTS COMMON, MINOR LIGNITE, BASEMENT.	UPPER RENMARK BEDS	891837
			-------BASE OF UPPER RENMARK BEDS 262.000 M-------		
			----------GEOLOGICAL THICKNESS 124.000 M----------		
264.000	2.000	QUARTZITE AND CLAY	80:20, QUARTZITE: LIGHT GREY, MEDIUM AND COARSE GRAINED, QUARTZO-FELDSPATHIC, SUBANGULAR GRAINS, MODERATELY STRONG ROCK, SECONDARY PYRITE, ABUNDANT, CUTTINGS, CLAY: LIGHT GREY, BROWN, CARBONACEOUS, FIRM CLAY, PYRITE ABUNDANT, LIGNITE FRAGMENTS COMMON.		891838

MURRAY BASIN BORELOGS

BORE: MAR 23 LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SE... NAT	...M WORK SAMPLE NO SECT. NUMBER
266.000	2.000	QUARTZITE AND CLAY	80:20. QUARTZITE: LIGHT GREY. MEDIUM AND COARSE GRAINED. QUARTZO-FELDSPATHIC. SUBANGULAR GRAINS. MODERATELY STRONG ROCK. SECONDARY PYRITE. ABUNDANT. CUTTINGS. CLAY: LIGHT GREY. BROWN. CARBONACEOUS. FIRM CLAY. PYRITE ABUNDANT. LIGNITE FRAGMENTS COMMON.		891839
268.000	2.000	QUARTZITE AND CLAY	80:20. QUARTZITE: LIGHT GREY. MEDIUM AND COARSE GRAINED. QUARTZO-FELDSPATHIC. SUBANGULAR GRAINS. MODERATELY STRONG ROCK. SECONDARY PYRITE. ABUNDANT. CUTTINGS. CLAY: LIGHT GREY. BROWN. CARBONACEOUS. FIRM CLAY. PYRITE ABUNDANT. LIGNITE FRAGMENTS COMMON.		891840
270.000	2.000	QUARTZITE AND CLAY	80:20. QUARTZITE: LIGHT GREY. MEDIUM AND COARSE GRAINED. QUARTZO-FELDSPATHIC. SUBANGULAR GRAINS. MODERATELY STRONG ROCK. SECONDARY PYRITE. ABUNDANT. CUTTINGS. CLAY: LIGHT GREY. BROWN. CARBONACEOUS. FIRM CLAY. PYRITE ABUNDANT. LIGNITE FRAGMENTS COMMON. **TOTAL DEPTH**		891841

END OF HOLE AT 270.000 M.

THIS IS 159 6829 - 969

EARTH SCIENCE COMPUTER SERVICES

PAGE 00

MURRAY BASIN — BORELOGS

BORE : MMB 24

LISTED ON 02/06/81

DEPTH TO BASE	DEPTH THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
	.000		OPEN HOLE 0.0 TO 204M B.O.H. SAMPLES 891442 TO 891871 DESPATCHED ON D.P.O. NO. RA 0524.		
4.000	4.000	SAND AND CALCRETE	40:60. SAND: RED. FINE GRAINED. LOOSE SAND. CALCRETE: CREAM. PINK. MODERATELY STRONG ROCK.		
8.000	4.000	LIMESTONE	YELLOW. SANDY. MODERATELY STRONG ROCK. FRAGMENTED SHELLS. ABUNDANT. SECONDARY GYPSUM. SPARSE. OYSTER SHELL FRAGMENTS ABUNDANT.		
12.000	4.000	LIMESTONE	YELLOW. SANDY. MODERATELY WEAK ROCK. FRAGMENTED SHELLS. COMMON. SECONDARY GYPSUM. ABUNDANT.		
14.000	2.000	SANDSTONE	YELLOW. CALCAREOUS. MODERATELY WEAK ROCK. FRAGMENTED SHELLS. COMMON. SECONDARY GYPSUM. COMMON.		
16.000	2.000	CLAY AND SANDSTONE	60:40. CLAY: LIGHT GREY. SOFT CLAY. SANDSTONE: YELLOW. CALCAREOUS. MODERATELY WEAK ROCK. FRAGMENTED SHELLS. COMMON. SECONDARY GYPSUM. SPARSE.		
28.000	12.000	MARL	LIGHT GREY. YELLOW. SANDY. LIMONITIC. GRITTY. SOFT CLAY.		
34.000	6.000	SANDSTONE	LIGHT GREY. YELLOW. MARLY. LIMONITIC. GRITTY. VERY WEAK ROCK.		
42.000	8.000	MARL	LIGHT GREY. SANDY.		
			-----TOP OF MURRAY GROUP LIMESTONE 42.000 M-----		
50.000	8.000	LIMESTONE	LIGHT GREY. SANDY. MODERATELY STRONG ROCK. MARINE FOSSILS. SPARSE. BRYOZOA AND ECHINOID SPINES.	MURRAY GROUP LIMESTONE	
68.000	18.000	LIMESTONE AND MARL	50:50. LIMESTONE: LIGHT GREY. SANDY. MODERATELY STRONG ROCK. MARINE FOSSILS. SPARSE. MARL: LIGHT GREY. SOFT CLAY.	MURRAY GROUP LIMESTONE	

MURRAY BASIN — BORELOGS

BORE: MHR 24 — LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
40.000	26.000	LIMESTONE	LIGHT GREY. SANDY. MODERATELY STRONG ROCK. MARINE FOSSILS. COMMON. BRYOZOA ECHINOIDS GASTROPODS BIVALVES.	MURRAY GROUP LIMESTONE	
100.000	14.000	NO SAMPLE	LOST CIRCULATION.	MURRAY GROUP LIMESTONE	
126.000	18.000	SANDSTONE AND CLAY	SAND: SANDSTONE: LIGHT GREY. YELLOW. FINE AND MEDIUM GRAINED. CALCAREOUS. VERY WEAK ROCK. MARINE FOSSILS. SPARSE. CLAY: LIGHT GREY. YELLOW. SILTY.	MURRAY GROUP LIMESTONE	
			-----BASE OF MURRAY GROUP LIMESTONE 126.000 M-----		
			----------GEOLOGICAL THICKNESS 44.000 M----------		
			---TOP OF ETTRICK FORMATION LIMESTONE 126.000 M-		
144.000	18.000	MARL	LIGHT GREY. SILTY. SOFT CLAY.	ETTRICK FORMATION LIMESTONE	
			---BASE OF ETTRICK FORMATION LIMESTONE 144.000 M-		
			----------GEOLOGICAL THICKNESS 18.000 M----------		
			-------TOP OF UPPER RENMARK BEDS 144.000 M-------		
146.000	2.000	CLAY	GREY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	891842
148.000	2.000	CLAY	GREY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	891843
150.000	2.000	CLAY	GREY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	891844
152.000	2.000	CLAY	GREY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	891845
154.000	2.000	CLAY	GREY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	891846
156.000	2.000	CLAY	GREY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	891847
158.000	2.000	CLAY	GREY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	891848
160.000	2.000	CLAY	GREY. CARBONACEOUS. STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	891849

MURRAY BASIN

BOREL0GS

BORE: MAR 24

LISTED ON 02/

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK S NO SECT N
162.000	2.000	CLAY	GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	8
164.000	2.000	CLAY	GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	8
166.000	2.000	CLAY	DARK GREY, BLUE, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	8
168.000	2.000	CLAY	DARK GREY, BLUE, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	8
170.000	2.000	CLAY	DARK GREY, BLUE, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	8
172.000	2.000	CLAY	DARK GREY, BLUE, CARBONACEOUS, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	8[illegible]
174.000	2.000	CLAY	DARK GREY, BROWN, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	8[illegible]
176.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	8[illegible]
178.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	89
180.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	89
182.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	89
184.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	89
186.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	89
188.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS.	UPPER RENMARK BEDS	89

MURRAY BASIN — BORELOGS

BORE: MMR 24

LISTED ON

DEPTH TO BASE	ESTI" THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SH #UM NO SEC
140.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	
142.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	
144.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY. CUTTINGS, SMALL SAMPLE, HEAVILY CONTAMINATED WITH SURFACE SAND.	UPPER RENMARK BEDS	
146.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY. CUTTINGS, SMALL SAMPLE, HEAVILY CONTAMINATED WITH SURFACE SAND.	UPPER RENMARK BEDS	
148.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	
200.000	2.000	CLAY	BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY. CUTTINGS.	UPPER RENMARK BEDS	
202.000	2.000	CLAY AND SAND	50:50, CLAY: BROWN, GREEN-GREY, CARBONACEOUS, STIFF CLAY, CUTTINGS. SAND: LIGHT GREY, CREAM, COARSE TO VERY COARSE GRAINED, CALCAREOUS, SURROUNDED GRAINS, LOOSE SAND, MARINE FOSSILS, ABUNDANT, SECONDARY PYRITE, SPARSE, FOSSILIFEROUS BEACH SANDS, GASTROPODS AND BIVALVE FRAGMENTS ABUNDANT.	UPPER RENMARK BEDS	
			----------BASE OF UPPER RENMARK BEDS 202.000 M----------		
			----------GEOLOGICAL THICKNESS 58.000 M----------		
			--------TOP OF LOWER RENMARK BEDS 202.000 M--------		
204.000	2.000	SAND AND SILTSTONE	50:50, SAND: LIGHT GREY, CREAM, COARSE TO VERY COARSE GRAINED, CALCAREOUS, SURROUNDED GRAINS, LOOSE SAND, MARINE FOSSILS, ABUNDANT, SECONDARY PYRITE, SPARSE, CUTTINGS, SILTSTONE: BROWN, DARK GREY, VERY STRONG ROCK, SILTSTONE BASEMENT.	LOWER RENMARK BEDS	

Base of lower Renmark beds 204 - m
Geological thickness 2m
end of hole 204 m.

THIS IS 6829-970

MURRAY BASIN

BORELOGS

ORGN:81
NAME:MMM
TYPE:
HOLE NUMBER:28 (28)
GRID TYPE:AMG
EASTING:383.500
NORTHING:6208.400
ACCURACY:APPROXIMATE
DATUM:AHD

COLLAR RL:35.000
SHEET REF:6829-3
INDEX:
TOTAL DEPTH:174.000
COMMENCED:31/03/81
COMPLETED:03/04/81
INCL:90
AZIM:

PARISH:MURRK
RUN NO:2
SECTION:RH
LOG ORGANISATION:CRA
LOGGED BY:DMM
DRILL CONTRCTR:THOMPSON
DRILL TYPE:HOOMNE 1250
TECHNIQUE:MUD

CORE SIZE:
GEOPHYS CONTR:S.P.D. PTY LTD
WATER LEVEL:190.0
DATE MEASURED:03/04/81
PLUG DEPTHS:
CASED DEPTH:30.0
UNITS:

AVAILABLE DATA

NEUTRON
GAMMA
LONG SPACED DENSITY
SP
R
C

EARTH SCIENCE COMPUTER SERVICES

MMM 2H

MURRAY BASIN — BOREHOLOGS

BORE: MAR 28

LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
	.000		OPEN HOLE 0.0 TO 174.0M B.O.H. SAMPLES 888700 & 891872 TO 891894 DESPATCHED ON D.P.O. NO. 8 0701.		
5.000	5.000	SAND	ORANGE BROWN. VERY FINE AND MEDIUM GRAINED. SUBROUNDED GRAINS. LOOSE SAND.		
10.000	4.000	LIMESTONE	YELLOW. VERY WEAK ROCK. MARINE FOSSILS. ABUNDANT. SECONDARY GYPSUM. COMMON. ABUNDANT FRAGMENTED OYSTER SHELLS.		
14.000	4.000	SANDSTONE	YELLOW. VERY FINE AND MEDIUM GRAINED. CALCAREOUS. MARLY. SUBROUNDED GRAINS. WEAK ROCK.		
22.000	8.000	MARL	YELLOW. SANDY. SOFT CLAY.		
			-----TOP OF MURRAY GROUP LIMESTONE 22.000 M----		
52.000	30.000	NO SAMPLE	HEAVILY CONTAMINATED DUE TO CIRCULATION PROBLEMS. MURRAY GROUP LIMESTONE		
78.000	26.000	LIMESTONE	GREY. YELLOW. SLIGHTLY. SANDY. MODERATELY WEAK ROCK. MARINE FOSSILS. COMMON. ECHINOID SPINES AND FORAMINIFERA.	MURRAY GROUP LIMESTONE	
102.000	24.000	LIMESTONE AND SANDSTONE	80:20. LIMESTONE: GREY. MODERATELY WEAK ROCK. MARINE FOSSILS. COMMON. SANDSTONE: GREY. FINE AND MEDIUM GRAINED. CALCAREOUS. SUBROUNDED GRAINS. WEAK ROCK. BIVALVE FRAGMENTS AND ECHINOID SPINES.	MURRAY GROUP LIMESTONE	
120.000	18.000	LIMESTONE AND SANDSTONE	50:50. LIMESTONE: GREY. MODERATELY WEAK ROCK. MARINE FOSSILS. SPARSE. SANDSTONE: GREY. FINE AND MEDIUM GRAINED. CALCAREOUS. SUBROUNDED GRAINS. WEAK ROCK. BIVALVE FRAGMENTS AND ECHINOID SPINES.	MURRAY GROUP LIMESTONE	

MURRAY BASIN — BORELOGS

BORE: MAR 28 — LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM FORM SAMPLE NO SECT NUMBER
			-----BASE OF MURRAY GROUP LIMESTONE 120.000 M----- ----------GEOLOGICAL THICKNESS 99.000 M----------		
			---TOP OF ETTRICK FORMATION LIMESTONE 120.000 M--		
126.000	6.000 (6)	MARL AND SANDSTONE (Marl + Sandstone)	MUDSTONE, MARL: GREENISH-GREY, SILTY, SOFT CLAY. SANDSTONE: GREY, FINE AND MEDIUM GRAINED, CALCAREOUS, SUBROUNDED GRAINS, WEAK ROCK.	ETTRICK FORMATION LIMESTONE	
			---BASE OF ETTRICK FORMATION LIMESTONE 126.000 M-- ----------GEOLOGICAL THICKNESS 6.000 M----------		
			-------TOP OF UPPER RENMARK BEDS 126.000 M------- Top of upper renmark beds 128		
128.000	2.000	CLAY	GREY, SANDY, FIRM CLAY, CUTTINGS. (firm?)	UPPER RENMARK BEDS	448700
130.000	2.000	CLAY	GREY, SANDY, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	441872
132.000	2.000	CLAY	GREY, SANDY, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	441873
134.000	2.000	CLAY	GREY, SANDY, FIRM CLAY, CUTTINGS.	UPPER RENMARK BEDS	441874
136.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	441875
138.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	441876
140.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	441877
142.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	441878
144.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	441879
146.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	441880

→ Slightly calcareous soft clay cuttings

MURRAY BASIN — BORELOGS

BORE: MAR 28

LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
148.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891881
150.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891882
152.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891883
154.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891884
156.000	2.000	CLAY	GREY, SLIGHTLY, CARBONACEOUS, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891885
158.000	2.000	SANDSTONE AND CLAY	80:20, SANDSTONE: BROWN, FINE AND MEDIUM GRAINED, CARBONACEOUS, SUBROUNDED GRAINS, MODERATELY WEAK ROCK, CUTTINGS, ADDITIONAL FEATURES INCLUDE:SLIGHTLY, LIGNITIC, CLAY: BLUE, GREY, SOFT CLAY.	UPPER RENMARK BEDS	891886
160.000	2.000	SANDSTONE AND CLAY	50:50, SANDSTONE: BROWN, FINE AND MEDIUM GRAINED, CARBONACEOUS, SUBROUNDED GRAINS, MODERATELY WEAK ROCK, CUTTINGS, ADDITIONAL FEATURES INCLUDE:SLIGHTLY, LIGNITIC, CLAY: GREY, SILTY, SOFT CLAY.	UPPER RENMARK BEDS	891887
162.000	2.000	SANDSTONE AND CLAY	60:40, SANDSTONE: BROWN, CARBONACEOUS, SUBROUNDED GRAINS, MODERATELY WEAK ROCK, CUTTINGS, ADDITIONAL FEATURES INCLUDE:SLIGHTLY, LIGNITIC, CLAY: BLUE, GREY, SOFT CLAY.	UPPER RENMARK BEDS	891888
164.000	2.000	CLAY AND SANDSTONE	60:40, CLAY: BLUE, GREY, SOFT CLAY, CUTTINGS. SANDSTONE: BROWN, FINE AND MEDIUM GRAINED, CARBONACEOUS, SUBROUNDED GRAINS, MODERATELY WEAK ROCK.	UPPER RENMARK BEDS	891889
166.000	2.000	CLAY AND SANDSTONE	60:40, CLAY: BLUE, GREY, SOFT CLAY, CUTTINGS.	UPPER RENMARK BEDS	891890

MURRAY BASIN — BORELOGS

BORE: MAR 28 — LISTED ON 02/06/81

DEPTH TO BASE	ESTIM THICK	ROCK TYPE	GEOLOGICAL DESCRIPTION OF DATA	SEAM NAME	SM WORK SAMPLE NO SECT NUMBER
			SANDSTONE: BROWN, FINE AND MEDIUM GRAINED, CARBONACEOUS, SURROUNDED GRAINS, MODERATELY WEAK ROCK.		
169.000	2.000	SANDSTONE AND CLAY	70:30, SANDSTONE: BROWN, FINE AND MEDIUM GRAINED, CARBONACEOUS, SURROUNDED GRAINS, MODERATELY WEAK ROCK, CUTTINGS, CLAY: BLUE, GREY, SOFT CLAY.	UPPER RENMARK BEDS	891891
170.000	2.000	SANDSTONE AND CLAY	50:50, SANDSTONE: BROWN, FINE AND MEDIUM GRAINED, CARBONACEOUS, SURROUNDED GRAINS, MODERATELY WEAK ROCK, CUTTINGS, CLAY: BLUE, GREY, SOFT CLAY.	UPPER RENMARK BEDS	891892
172.000	2.000	SANDSTONE AND CLAY	80:20, SANDSTONE: GREY, YELLOW, MEDIUM AND COARSE GRAINED, SURROUNDED TO WELL ROUNDED GRAINS, WEAK ROCK, MARINE FOSSILS, COMMON, CUTTINGS, CLAY: BLUE, GREY, SOFT CLAY, BROKEN BIVALVE SHELLS AND ECHINOID SPINES.	UPPER RENMARK BEDS	891893
			-------BASE OF UPPER RENMARK BEDS 172.000 M-------		
			----------GEOLOGICAL THICKNESS 46.000 M----------		
			-------TOP OF LOWER RENMARK BEDS 172.000 M-------		
174.000	2.000	SANDSTONE, CLAY	80:20, SANDSTONE: GREY, MEDIUM AND COARSE GRAINED, SURROUNDED TO WELL ROUNDED GRAINS, WEAK ROCK, MARINE FOSSILS, SPARSE, CUTTINGS, CLAY: BLUE, GREY, ADDITIONAL FEATURES INCLUDE:BROWN.	LOWER RENMARK BEDS	891894
			-------BASE OF LOWER RENMARK BEDS 174.000 M-------		
			----------GEOLOGICAL THICKNESS 2.000 M----------		

END OF BORE AT 174.000 M.

PROJECT: WAIKERIE S.I.S.

LOCATION: Hart Lagoon

SEC. 603 HD. Waikerie

ENGINEERING AND WATER SUPPLY DEPARTMENT SOUTH AUSTRALIA
WATER WELL LOG

HOLE No.: RG 1

PERMIT No.: 26509

EL SURFACE 10.64 m | T.D. 144 m | AQUIFER COMPLETED IN: Upper Renmark Beds | PURPOSE Observations | UNIT No.: 6829-392

AQUIFER SUMMARY	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED FROM	INTERVAL TESTED TO	SUPPLY L/SEC	SUPPLY TEST LENGTH (Hrs)	SUPPLY METHOD	TOTAL DISSOLVED SOLIDS mg/L	TDS DEPTH TAKEN	TDS DATE	TDS HOW TESTED

ELEV. AHD	DEPTH (m)	GRAPHIC LOG	FORMATION/AQUIFER NAME	GEOLOGICAL DESCRIPTION
0	0		Coonambidgal Fm.	CLAYEY SAND, light brown, fine to medium, cohesive. Grades with grey and orange-brown mottling.
	10		Moonan Sands	SAND, brown, coarse to very coarse subrounded quartz, poorly sorted, some gravel to 10mm.
	16			CLAYEY SAND, orange-brown, medium to coarse, cohesive.
	18			SAND, brown, as above, trace of silty fines.
	20			
-20	30		Murray Group	LIMESTONE, grey-brown, medium grained, friable, abundant coral reefs and shell fragments to 5mm.
				27m, Grades less shelly, some pockets of grey organic clay.
				33m, Grades very shelly, abundant coral reefs, shell fragments and sponge spicules.
	40			36 – 88m No Samples
-40	50			

TECHNICAL INFORMATION

Drilled 5 5/8" ϕ to 144m, rotary mud flush.

Existing casing

- 306mm steel pre-collar to 5m, grouted.
- 205mm class 9 PVC casing to 34.5m grouted annulus.

Piezometer completion

CORE | WATER CUT | S.W.L. | SAMPLES | HOLE COMPLETION DETAILS

REMARKS
- This piezometer installed in existing Murray Group production bore WPB3.
- 150mm class 9 PVC to 84.3m was extracted from the bore prior to deepening.

HOLE SPUDDED: COMPLETED:

LOGGED BY: Nick Watkins

DATE 23/11/91 SHEET 1 OF 3

890149C

LOCATION: Hart Lagoon

WATER WELL LOG — CONTINUATION SHEET

PERMIT No: 26509

ELEV. AHD.	DEPTH (m)	GRAPHIC LOG	FORMATION/AQUIFER NAME	GEOLOGICAL DESCRIPTION	TECHNICAL INFORMATION	CORE	WATER LEVEL	S.W.L.	SAMPLES	HOLE COMPLETION DETAILS
	50		Murray Group	No samples to 82m						
	60									
-60	70									
	80									
			Eltrick Formation	CLAY, grey, plastic?, fine sand ?						
-80	90			CALCARENITE, fine grained, khaki, clayey and silty, cohesive, bryozoal fragments to 5mm. (Possibly contaminated samples).						
	100			SANDY SILT, grey-green, glauconitic, fine, cohesive, some off-white calcareous clay pockets.						
				CLAYEY SILT, pale grey, firm, local glauconite concentrations, fine sand.						
-100	110			SILTY CLAY, dark grey with local glauconite concentrations, grades very silty with fine sand in places, firm to stiff, micaceous.						
	120			115m, less silty, no fine sand, high plasticity.						
				125m, fine black sand, bivalve fragments to 10mm.						

890150C

REMARKS

LOGGED BY: Nick Watkins | DATE 23/11/91 | SHEET 2 OF 3

PROJECT: WANKERIE S.I.S.

LOCATION: Hart Lagoon

ENGINEERING AND WATER SUPPLY DEPARTMENT SOUTH AUSTRALIA

WATER WELL LOG — CONTINUATION SHEET

HOLE No.: RG 1

PERMIT No.: 26509

ELEV. A.H.D.	DEPTH (m)	GRAPHIC LOG	FORMATION/AQUIFER NAME	GEOLOGICAL DESCRIPTION	TECHNICAL INFORMATION	CORE	WATER CUT	S.W.D.	SAMPLES	HOLE COMPLETION DETAILS
			Ettrick Fm.	SILTY CLAY, as above.						
-120	130		Remark Group	CLAYEY SAND / SAND, fine, base, glauconitic, some bivalve casts of very well cemented subrounded quartz grains.						
	140			140 - 144m, Cemented bands.						
-140	150									

REMARKS

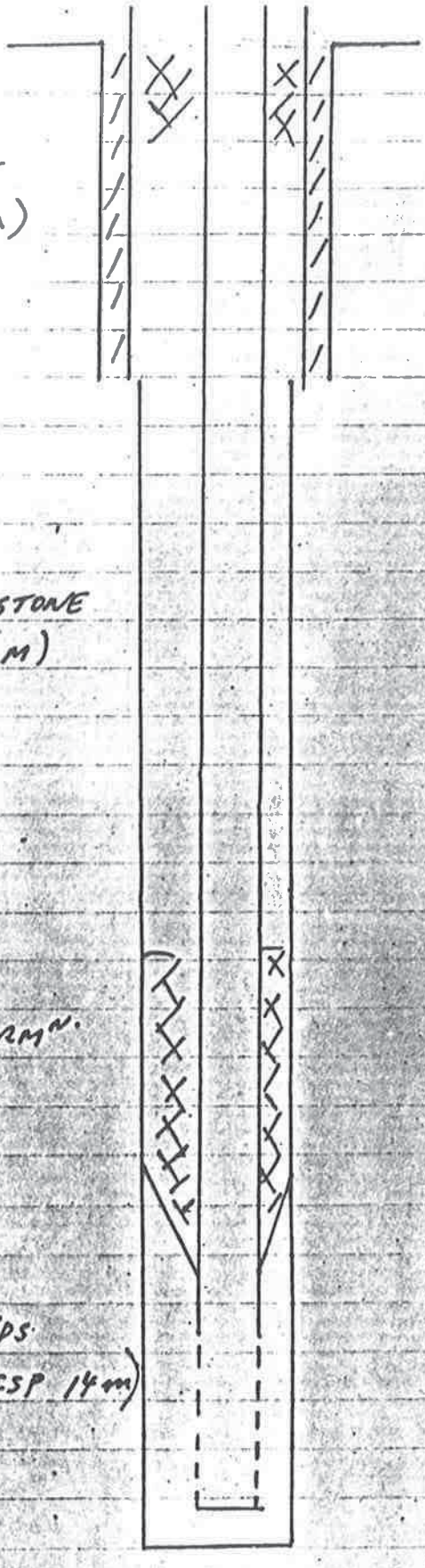
LOGGED BY: Nick Watkins

DATE 23/11/91

SHEET 3 OF 3

890150C

RG 1



187 mm HOLE

125 C9 PVC. CASING.

10% bentonite cement
(½ bag bent + 6 cement)

ALLUVIALS
(SWL 4m)

24 m

LMG LIMESTONE
(SWL 4 M)

50 MM C12 PVC.

82 m

NEAT CEMENT GROUT
(15 CEM, 90 GAL WATER)

ETTRICK FORMN.

CONE PACKER AT
BASE ETTRICK (114m)

114 m

RENMARK BEDS
(ARTESIAN, SISP 14m)

3M SCREEN

144 m

6829-992

(RG1) DMC-17

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

1. PERMIT No. 26509 — Official Well No.

2. LOCATION OF WELL:
Hundred or Pastoral Lease No. WAIKERIE
Section ..... Lot No. ..... Site No. .....
Name of Property .....

As the person responsible for the work carried out on this well I advised that it has been completed as described below:

Name of Driller D. JENNINGS Licence No. 2/167
Name of plant operator if under supervision .....

Permit holder or land occupier EWS
Postal Address GPO BOX 1751
ADELAIDE Postcode 5001.

5. SUMMARY
Date work commenced 23/11/91 Date completed 24/11/91
Work carried out: New well [✓], Existing well, deepen [ ], enlarge [ ], rehabilitate [ ], backfill [ ] (tick appropriate boxes)
Final Depth 144 m Final standing water level +10.6 m Final yield ..... l/sec.
Was well abandoned? NO If yes, state method ..... Artesian

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	146	143	ROTARY MUD	MUD WEIGHTED

6.2 WATERS CUT (measurements from natural surface to nearest 0.1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
			+10.6					

7. CASING LEFT IN WELL

7.1 DIMENSIONS / 7.2 TYPE / 7.3 CASING SHOE / 7.4 CASING PRESSURE CEMENTED

From (m)	To (m)	Internal Diam.	Swell Joint, Welded Collar, Steel, Plastic, Etc.	Shoe Yes	Shoe No	Diam. (mm)	Cemented Yes	Cemented No	Pressure Yes	Pressure No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	144	75	PVC C15	[ ]	[✓]		[ ]	[ ]	[✓]	[ ]	0	130	15	900	45 kgs AVI bentonite
				[ ]	[ ]		[ ]	[ ]	[ ]	[ ]					
				[ ]	[ ]		[ ]	[ ]	[ ]	[ ]					
				[ ]	[ ]		[ ]	[ ]	[ ]	[ ]					

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD
[ ] Open Hole
[✓] Screen(s) [ ] Slotted Casing
[ ] Other, give details .....

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
S/S INLINE	144	145		75	80	S/S	JOHNSON	CAPPED

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)

Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken
AIR LIFT 2 HOURS.

11. PUMP TEST (measurements from natural surface to nearest 0.1 m)

Interval Tested From (m)	Interval Tested To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

12. SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—
.....

Signature of Licensed Driller ..... for D. J. Date 29.11.94.

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	6	CLAYEY SAND
6	24	SANDS, SOME CLAY
24	36	LIMESTONE.
36	86	NO SAMPLE.
	130	ETTRECK FORM^N
130	140	RENMARK GROUP.
140	144	CEMENTED BANDS.

6829-992

Driller to forward this Copy, within 14 days of completion to:
The Director-General
Department of Mines and Energy
191 Greenhill Road
Parkside, S.A. 5063

Form 1207

STATE PRINT SA H6840

6829-1140

TRANSMISSION-REPORT

TEL NUMBER : +61-8-2741239
NAME : DME GROUNDWATER/ENG

NBR	DATE	TIME	DURATION	PGS	TO	DEPT NBR	MODE	STATUS
596	27/07	11:00	01/19	03	OLYMPIC BORING		G3	OK

22/11/91 26508

Elliick

153 - 158.1 m 33.07 metres

Dark green glauconitic marl.

Continued to 164 m

164 m green glauconitic sand with minor marl coarse shell fragments common. minor mica.

166 m very sandy - medium quartz with common coarse shell fragments Only occasional clasts of glauconitic marl ? contaminat → greenish because of drilling mud? Quite a clean sand

172 m A lot of marl clasts in sand & semi lithified sand/marl clasts.

184 m sand quite fine

194 Clasts of dk brown slightly sandy clay

EOH - ran out of pipe!

6829-1140

Christine 2033515

RG2

WOORINEN F.
10 M
N. W. BEND F.
15 M

MARL

30 M

LIMESTONE (UMG)
SWL 32 M.
CAVERNOUS.

40M APPROX

MURRAY LIMESTONE

129 M

ETTRICK

138 M

ETTRICK

161 M

REMMARK BEDS
(SWL 14 M)

172 M

280 MM HOLE
200 C9 PVC
10% BENTONITE CEMENT
(1 BENT & 12 CEM.)

187 MM HOLE
125 C12 PVC
10% BENT-CEMENT
(1½ BENT + 18 CEMENT

120 MM HOLE

6829-1140

Piezometer RG2

23/11/91
DCLS

Details from Jenno

8" ϕ to 34m
5" ϕ to 140m
3" ϕ 132 – 194m
T.D. 194m

Screen 168 – 170m.

SWL – 16.32m below g.l.
10:00 hrs, 24/11/91.

6829-1140

(RGZ) DMC-17

SCHEDULE EIGHT—FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

1. PERMIT No. 26508 — Official Well No.

As the person responsible for the work carried out on this well I advised that it has been completed as described below:

2. LOCATION OF WELL:
Hundred or Pastoral Lease No. ~~PUG~~ WAIKERIE
Section ..... Lot No. ..... Site No. .....
Name of Property .....

Name of Driller D. JENNINGS Licence No. 2/167
Name of plant operator if under supervision .....

Permit holder or land occupier EWS
Postal Address GPO BOX 1751
ADELAIDE Postcode 5001

5. SUMMARY
Date work commenced 19/11/91 Date completed 22/11/91
Work carried out: New well ☐, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)
Final Depth .....m Final standing water level .....m Final yield .....l/sec.
Was well abandoned? ..... If yes, state method .....

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	34	280	ROTARY	AIR/MUD
34	140	187	"	MUD
140	194	120	"	MUD

6.2 WATERS CUT (measurements from natural surface to nearest 0.1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
24/11			16.3					

7. CASING LEFT IN WELL

7.1 From (m)	7.1 To (m)	7.1 Internal Diam.	7.2 Type: Swell Joint, Welded Collar, Steel, Plastic, Etc.	7.3 Casing Shoe: Yes	7.3 Casing Shoe: No	7.3 Diam. (mm)	7.3 Cemented: Yes	7.3 Cemented: No	7.4 Casing Pressure Cemented: Yes	7.4 Casing Pressure Cemented: No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	34	205	C6 PVC	☐	✓		☐	☐	✓	☐	0	34	12	870	45 kgm bentonite
0	140	125	C12 "	☐	✓		☐	☐	✓	☐	0	140	18	1300	67 kgm bentonite
132	194	75	C15 "	☐	✓		☐	☐	☐	✓					
				☐	☐		☐	☐	☐	☐					

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD
☐ Open Hole
☐ Screen(s) ✓ Slotted Casing
☐ Other, give details .....

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
PVC	168	170	.75	75	80	PVC	VENEDEX	CAP
			*					

* Probable only

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)
Rubber	at 132m.	

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)

Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken
AIR LIFT 3 1/2 HRS.

11. PUMP TEST (measurements from natural surface to nearest 0.1 m)

Interval Tested From (m)	Interval Tested To (m)	Water Level Stabilised at End?	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

12. SAMPLES
The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons:—

13. FORMATION LOG

From (m)	To (m)	Description of Material
		Refer N. Watkins, M. Telfer, EWS
		Note hole cored from 155m to 158.1m for SADME.

Signature of Licensed Driller ..... Date 28/11/94

6829-1140

Driller to forward this Copy, within 14 days of completion to:
The Director-General
Department of Mines and Energy
191 Greenhill Road
Parkside, S.A. 5063

STATE PRINT SA H6669

Form 1207

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

CORE DESCRIPTION

PROJECT: MURRAY BASIN
PERMIT 12876

HOLE NO M129
UNIT/STATE NO 6929-423

CORE DIA	DEPTH m	GRAPHIC LOG	GEOLOGICAL DESCRIPTION OF CORE
	0		0-2m CALCRETE off-white/pink Hard.
			2-6m CLAYEY SAND dk orange, well sorted fine grained sand, 40-50% clay. Occasional fine mica.
	5		
			6-104m LIMESTONE Interbedded consolidated fine grained sandy limestone and soft offwhite marly Lst.
	10		
	20		
	40		40-50m yellow-orange well consol Lst, aa. 20% fossil frags
			50-62m fawn well cemented Lst aa.
	60		62-80m pale grey cemented fine Lst, 30-40% grey marl, 20% fossil frag. Occasional coarse gr. glauconite.
	80		80-94m soft marly Lst, fawn-grey, glauconitic, 20% fossils.
			94-104m as for 62-80m
	100		
			104-130m MARL soft, glauconitic dk grey/green, plastic. Stiffer with depth
	120		114-120m 30% fossil frags, coarse gr, dk grey.
			126-130m 30-40% fine gr. sand + shell frag.
	130		130-134m CLAY dk brown-black, stiff carbonaceous
			134-136m SAND poorly sorted, fine to coarse gr, pyrite cemented nodules, subrounded, clayey
	140		136-164m SANDY CLAY dk brown clay, 30% poorly sorted sand aa.
	160		
			164-168m CLAYEY SAND poorly sorted, fine to coarse gr. ≤4mm. 10% dk grey shell frags, 30-40% dk brown clay.
	170		168-198m SANDY CLAY as above, sl carbonaceous.
	180		

SHEET 1 OF 2

DEPARTMENT OF MINES — SOUTH AUSTRALIA
ENGINEERING DIVISION

CORE DESCRIPTION

HOLE NO H129
UNIT/STATE NO

PERMIT 12876

GEOLOGICAL DESCRIPTION OF CORE

180

200

198 - 202 GRAVEL rounded & sub-rounded, av 3 mm diam, < 1 cm.
Minor clay + pyrite.
200 - 202 soft clay.

220

202 - 228 WEATHERED BASEMENT + grey stiff clay, minor clear qtz grains.

228 - 230 RHYODACITE (see petrological report)

SHEET 2 OF 2

MAGELLA

SCHEDULE EIGHT – FORM FOUR
GOVERNMENT OF SOUTH AUSTRALIA
Water Resources Act, 1976

DRILLERS WELL CONSTRUCTION REPORT

Official Well No. M129

1. PERMIT No. 12876

2. LOCATION OF WELL:
Hundred or Pastoral Lease No. HOPER
Section 308 Lot No. ..... Site No. .....
Name of Property .....

As the person responsible for the work carried out on this well I advise that it has been completed as described below:

Name of Driller A. McINTYRE Licence No. 2/117
Name of plant operator if under supervision .....

Permit holder or land occupier O. M & E
Postal Address P.O. BOX 151
EASTWOOD S.A. Postcode 5031

5. SUMMARY

Date work commenced 10.10.83 Date completed 17.10.83

Work carried out: New well ☑, Existing well, deepen ☐, enlarge ☐, rehabilitate ☐, backfill ☐ (tick appropriate boxes)

Final Depth 230 m Final standing water level 35.5 m Final yield 06 l/sec.

Was well abandoned? NO If yes, state method .....

6. DRILLING DETAILS If not a drilled well please complete paragraphs 6.2, 9, 10, 11, 12 and 13 as necessary

6.1 CONSTRUCTION DETAILS

From (m)	To (m)	Diam. (mm)	Drilling Method Cable Tool, Rotary Auger, Etc.	Fluid Used (Air, Water, Mud Type)
0	2	250	ROTARY	AIR.
2	40	200	ROTARY	AIR
40	230	147	ROTARY	MUD

6.2 WATER CUT (measurements from natural surface to nearest 0·1 m)

Date	Water Cut From (m)	Water Cut To (m)	Standing Level (m)	Estimated Yield l/sec.	Hole Depth at Test (m)	Casing at Test (m)	Test Method	Salinity mg/l or Taste
15.10.83	148	200			230	213.51		

7. CASING LEFT IN WELL

7.1 Dimensions From (m)	To (m)	Internal Diam.	7.2 Type Swell Joint, Welded Collar, Steel, Plastic, Etc.	7.3 Casing Shoe Yes	No	Diam. (mm)	Cemented Yes	No	7.4 Casing Pressure Cemented Yes	No	From (m)	To (m)	Cement (bags)	Water (litres)	Other Additives
0	2	200	CLASS 6 PVC	☐	☐		☐	☐	☐	☐					
0	40	150	CLASS 6 PVC	☐	☐		☑	☐	☐	☐					
0	213.51	80	STEEL S+S	☐	☐		☐	☐	☑	☐	0	191.8	63	1774	
				☐	☐		☐	☐	☐	☐					

8. CONSTRUCTION AT PRODUCTION LEVEL

8.1 METHOD
☐ Open Hole
☑ Screen(s) ☐ Slotted Casing
☐ Other, give details PERSPEX DISC + LINATEX SEAL SET AT 197.8

8.2 SCREEN OR SLOTTED CASING (*If variable aperture screen used give limits)

Type	From (m)	To (m)	Aperture* (mm)	Inner Diam. (mm)	Outer Diam. (mm)	Material	Trade Name	Completion of Base
SCREEN	204·6	207	0·5	85	97	S. STEEL	SUREScREEN	CAPPED
CASING PERFORATED	148-200m		WITH 6mm HOLES					SEALED AT 213·5m

8.3 LINER SEAL (packer)

Material	Depth (m)	Diam. (mm)

8.4 GRAVEL PACKING

Method of Placement	Gravel Passing Mesh Size	From (m)	To (m)

9. IF NOT A DRILLED WELL (i.e. hand dug, etc.)

Method	Depth (m)	Length (m)	Width (m)	Diam. (m)

Lining Material	From (m)	To (m)

10. DEVELOPMENT State methods and times taken

AIR LIFTED FROM 120m FOR 2 HRS.

11. PUMP TEST (measurements from natural surface to nearest 0·1 m)

Interval Tested From (m)	To (m)	Water Level Stabilised at I and T	Test Method	Depth of Pump (m)	Discharge Rate l/sec.	Method of Measuring Discharge	No. of Hours Pumped	Draw Down (m)

12. SAMPLES

The provisions of the Water Resources Act and Regulations thereto require that strata and water samples must be obtained. If any samples have not been obtained state reasons .....

Signature of Licensed Driller A. McIntyre Date 20/10/83

13. FORMATION LOG

From (m)	To (m)	Description of Material
0	2	SURFACE
2	8	RED CLAYS
8	12	SANDSTONE
12	48	BROWN LIMESTONE
48	51	WHITE LIMESTONE
51	65	BROWN LIMESTONE
65	104	GREY LIMESTONE
104	114	GREY MARLS
114	122	SANDS + SHELLS
122	124	DARK CLAYS - CHARCOAL
124	132	GREEN + GREY SHALES
132	135	SLIGHT CLAYS
135	150	SANDS + CLAYS
150	163	BROWN CLAYS
163	203	SANDS + CLAYS
203	229	GREY MARLS
229	230	QUARTZ + DOLOMITE

Driller to forward this Copy, within 14 days of completion to:
The Director of Mines,
Department of Mines,
191 Greenhill Road,
Parkside, S.A. 5063

Form 1207

1MB75–8.76 G5538 SL 21

[Special Version - WARRINA Sheet Trial]

Unit Number	Map 6929 No 649
Classification	MW (WW = water, MW = mineral, PW = petroleum, SW = stratigraphic, etc).
Confidential	C or blank
Hole Name/Number	BLMBR 30
Depth Drilled	222.0 Date 06/04/81
Coordinates	E 408200.0 N 6189000.0 Zone 54
Elevation	63.0
Accuracy	P (Surv, Plot, Est)
Owner/Company	CRAE
Tenement	EL 667 (SML, EL, PEL, MC, EML)
Method Drilled	O (Open, Cored, Part cored, Spot cored)
Azimuth	— Dip 90
Purpose	E (Exploration, Development etc.).
Commodity	BM/CO (URanium, COal, etc. BM = base metals, GS = Gemstones, etc)
Status	— (BF=Backfilled, CE=cemented, WW=waterwell, CA=cased, UK=unknown)
Province/Basin	MURRAY BASIN
References	EN Env 1254 (RB, ENv, BUll, SAMFREF code)
Data	Geol Log (B,D/N) D Geophys Log (Y/N) Y Tests (Y/N)
Plan Number	(Drafting)
Comments	map sheet 6729 III

(Tests = GEOCHEMistry, PETROLogy, PALAEOntology, WATERanalyses etc)

Verified JJS Robert Date 9/1/90

Specialist Files Core Library ____ (Y/N) Others ____ (MINEX, PEPS, RS, etc)

[Special Version - WARRINA Sheet Trial]

Unit Number	Map 6829 No 966
Classification	MW (WW = water, MW = mineral, PW = petroleum, SW = stratigraphic, etc).
Confidential	__ C or blank
Hole Name/Number	81 MBR 21
Depth Drilled	204 O Date 17/03/81
Coordinates	E 384100.0 N 6204950.0 Zone 54
Elevation	30.0
Accuracy	P (Surv, Plot, Est)
Owner/Company	CRA EXPLORATION
Tenement	EL 667 (SML, EL, PEL, MC, EML)
Method Drilled	O (Open, Cored, Part cored, Spot cored)
Azimuth	___ Dip 90
Purpose	E (Exploration, Development etc.).
Commodity	BM CO (URanium, COal, etc. BM = base metals, GS = Gemstones, etc)
Status	___ (BF=Backfilled, CE=cemented, WW=waterwell, CA=cased, UK=unknown)
Province/Basin	MURRAY BASIN
References	EN ENV 4254 (RB, ENv, BUll, SAMFREF code)
Data	Geol Log (D,D/N) [D] Geophys Log (Y/N) [Y] Tests (Y/N) [ ]
Plan Number	___ (Drafting)
Comments	Map 6829-III.

(Tests = GEOCHEMistry, PETROLogy, PALAEOntology, WATERanalyses etc)

Verified [signature] Date 8/1/82

Specialist Files Core Library ___ (Y/N) Others ___ (MINEX, PEPS, RS, etc)

[Special Version - WARRINA Sheet Trial]

Unit Number — Map: 6829 — No: 968

Classification: MW (WW = water, MW = mineral, PW = petroleum, SW = stratigraphic, etc).

Confidential: __ C or blank

Hole Name/Number: BIMBR 23

Depth Drilled: 270.0 Date: 29/03/81

Coordinates: E 390900 N 6211900.0 Zone 54

Elevation: 30.0

Accuracy: P (Surv, Plot, Est)

Owner/Company: CRA EXPLORATION

Tenement: EL 667 (SML, EL, PEL, MC, EML)

Method Drilled: O (Open, Cored, Part cored, Spot cored)

Azimuth: ___ Dip: 90

Purpose: E (Exploration, Development etc.),

Commodity: BM CO (URanium, COal, etc. BM = base metals, GS = Gemstones, etc)

Status: ___ (BF=Backfilled, CE=cemented, WW=waterwell, CA=cased, UK=unknown)

Province/Basin: MURRAY BASIN

References: EN EDV4254 (RB, ENv, BUll, SAMFREF code)

Data: Geol Log (B,D/N) [D] Geophys Log (Y/N) [Y] Tests (Y/N) [ ]

Plan Number: _____ (Drafting)

Comments: map 6829 I

(Tests = GEOCHEMistry, PETROLogy, PALAEOntology, WATERanalyses etc)

Verified: [signature] Date: 9/1/82

Specialist Files Core Library ____ (Y/N) Others ____ (MINEX, PEPS, RS, etc)

[Special Version - WARRINA Sheet Trial]

Unit Number	Map 6829	No 969
Classification	MW (WW = water, MW = mineral, PW = petroleum, SW = stratigraphic, etc).	
Confidential	__ C or blank	
Hole Name/Number	81 MBR 24	
Depth Drilled	204.0	Date 30/03/81
Coordinates	E 390750.0	N 6218400.0 Zone 54
Elevation	31 0	
Accuracy	P (Surv, Plot, Est)	
Owner/Company	CRA EXPLORATION	
Tenement	EL 667 (SML, EL, PEL, MC, EML)	
Method Drilled	O (Open, Cored, Part cored, Spot cored)	
Azimuth	___	Dip 90
Purpose	E (Exploration, Development etc.).	
Commodity	BM/CO (URanium, COal, etc. BM = base metals, GS = Gemstones, etc)	
Status	___ (BF=Backfilled, CE=cemented, WW=waterwell, CA=cased, UK=unknown)	
Province/Basin	MURRAY BASIN	
References	EN Env 4254 / ___ (RB, ENv, BUll, SAMFREF code)	
Data	Gool Log (B,D/N) D	Geophys Log (Y/N) Y	Tests (Y/N)
Plan Number	___ (Drafting)	
Comments	map 6829 - I	

(Tests = GEOCHEMistry, PETROLogy, PALAEOntology, WATERanalyses etc)

Verified Jayne Roberts Date 9/1/90

Specialist Files Core Library ___ (Y/N) Others ___ (MINEX, PEPS, RS, etc)

[Special Version - WARRINA Sheet Trial]

	Map	No
Unit Number	6829	970

Classification: MW (WW = water, MW = mineral, PW = petroleum, SW = stratigraphic, etc).

Confidential: __ C or blank

Hole Name/Number: ELMBR 38

Depth Drilled: 174.0 Date: 03/04/81

Coordinates: E 383500.0 N 6208400.0 Zone 54

Elevation: 35.0

Accuracy: P (Surv, Plot, Est)

Owner/Company: CRAE

Tenement: EL 667 (SML, EL, PEL, MC, EML)

Method Drilled: O (Open, Cored, Part cored, Spot cored)

Azimuth: ___ Dip 90

Purpose: E (Exploration, Development etc.).

Commodity: BM CO (URanium, COal, etc. BM = base metals, GS = Gemstones, etc)

Status: ___ (BF=Backfilled, CE=cemented, WW=waterwell, CA=cased, UK=unknown)

Province/Basin: MURRAY BASIN

References: EN Env 1254 (RB, ENv, BUll, SAMFREF code)

Data: Geol Log (B,D/N) [D] Geophys Log (Y/N) [Y] Tests (Y/N) [ ]

Plan Number: _____ (Drafting)

Comments: mmp 6829 - III.

(Tests = GEOCHEMistry, PETROLogy, PALAEOntology, WATERanalyses etc)

Verified: [signature] Date: 9/1/90

Specialist Files Core Library _____ (Y/N) Others _____ (MINEX, PEPS, RS, etc)

(Special Version - WARRINA Sheet Trial)

Unit Number — Map 6829 | No 978

Classification — MW (WW = water, MW = mineral, PW = petroleum, SW = stratigraphic, etc).

Confidential — __ C or blank

Hole Name/Number — 82MP1

Depth Drilled — 244.0 Date 30/12/82

Coordinates — E 367067 N 6233076 Zone 54

Elevation — _____

Accuracy — __ (Surv, Plot, Est)

Owner/Company — CRA Exploration Pty Ltd

Tenement — (SML, EL, PEL, MC, EML)

Method Drilled — P (Open, Cored, Part cored, Spot cored)

Azimuth — ___ Dip 90

Purpose — E (Exploration, Development etc.).

Commodity — Bm (URanium, COal, etc. BM = base metals, GS = Gemstones, etc)

Status — ___ (BF=Backfilled, CE=cemented, WW=waterwell, CA=cased, UK=unknown)

Province/Basin — MURRAY BASIN

References — EN 3357 (RB, ENv, BUll, SAMFREF code)

Data — Geol Log (B,D/N) D | Geophys Log (Y/N) | Tests (Y/N) Y

Plan Number — 6829-TV (Drafting)

Comments — mafic intrusive basement (Gabbro)
Lat 24
Long 135

(Tests: GEOCHEMistry, PETROLogy, PALAEOntology, WATERanalyses, etc)

Verified — J Roberts Date 7/2/86

Specialist Files Core Library _____ (Y/N) Others _____ (MINEX, PEPS, RS, etc)

Version - WARRINA Sheet Trial)

Unit Number — Map 6828 | No 777

Classification ___ (WW - water, MW - mineral, PW - petroleum, SW - stratigraphic, etc).

Confidential ___ C or blank

Hole Name/Number _____

Depth Drilled _____ Date _____

Coordinates E _____ N _____ Zone _____

Elevation _____

Accuracy ___ (Surv, Plot, Est)

Owner/Company _____

Tenement _____ (SML, EL, PEL, MC, EML)

Method Drilled ___ (Open, Cored, Part cored, Spot cored)

Azimuth ____ Dip ___

Purpose ___ (Exploration, Development etc.).

Commodity ___ (URanium, COal, etc. BM = base metals, GS = Gemstones, etc)

Status ___ (BF=Backfilled, CE=cemented, WW=waterwell, CA=cased, UK=unknown)

Province/Basin _____

References ___ _____ (RB, ENv, BUll, SAMFREF code)

___ _____

Data — Geol Log (B,D/N) ☐ Geophys Log (Y/N) ☐ Tests (Y/N) ☐

Plan Number _____ (Drafting)

Comments _____ IV

(Tests = GEOCHEMistry, PETROLogy, PALAEOntology, WATERanalyses etc)

Verified _____ Date _____

Specialist Files Core Library _____ (Y/N) Others _____ (MINEX, PEPS, RS, etc)

[Special Version - WARRINA Sheet Trial]

Unit Number — Map: 6828 — No: 776

Classification ___ (WW = water, MW = mineral, PW = petroleum, SW = stratigraphic, etc).

Confidential ___ C or blank

Hole Name/Number _____

Depth Drilled _____ Date _____

Coordinates E _____ N _____ Zone 54

Elevation _____

Accuracy _____ (Surv, Plot, Est)

Owner/Company _____

Tenement _____ (SML, EL, PEL, MC, EML)

Method Drilled ___ (Open, Cored, Part cored, Spot cored)

Azimuth ____ Dip ___

Purpose ___ (Exploration, Development etc.).

Commodity ___ (URanium, COal, etc. BM = base metals, GS = Gemstones, etc)

Status ____ (BF=Backfilled, CE=cemented, WW=waterwell, CA=cased, UK=unknown)

Province/Basin _____

References ___ _____ (RB, ENv, BUll, SAMFREF code)
___ _____

Data — Geol Log (B,D/N) [D] — Geophys Log (Y/N) [Y] — Tests (Y/N) [ ]

Plan Number _____ (Drafting)

Comments _____ IV

(Tests = GEOCHEMistry, PETROLogy, PALAEOntology, WATERanalyses etc)

Verified _____ Date _____

Specialist Files Core Library _____ (Y/N) Others _____ (MINEX, PEPS, RS, etc)

[Special Version - WARKINA Sheet Trial]

Unit Number — Map: 6828 | No: 733

Classification ___ (WW = water, MW = mineral, PW = petroleum, SW = stratigraphic, etc).

Confidential ___ C or blank

Hole Name/Number _____

Depth Drilled _____ Date _____

Coordinates E _____ N _____ Zone _____

Elevation _____

Accuracy _____ (Surv, Plot, Est)

Owner/Company _____

Tenement _____ (SML, EL, PEL, MC, EML)

Method Drilled _____ (Open, Cored, Part cored, Spot cored)

Azimuth _____ Dip _____

Purpose _____ (Exploration, Development etc.).

Commodity _____ (URanium, COal, etc. BM = base metals, GS = Gemstones, etc)

Status ___ (BF=Backfilled, CE=cemented, WW=waterwell, CA=cased, UK=unknown)

Province/Basin _____

References _____ (RB, ENv, BUll, SAMFREF code)

Data — Geol Log (B,D/N) [ ] Geophys Log (Y/N) [ ] Tests (Y/N) [ ]

Plan Number _____ (Drafting)

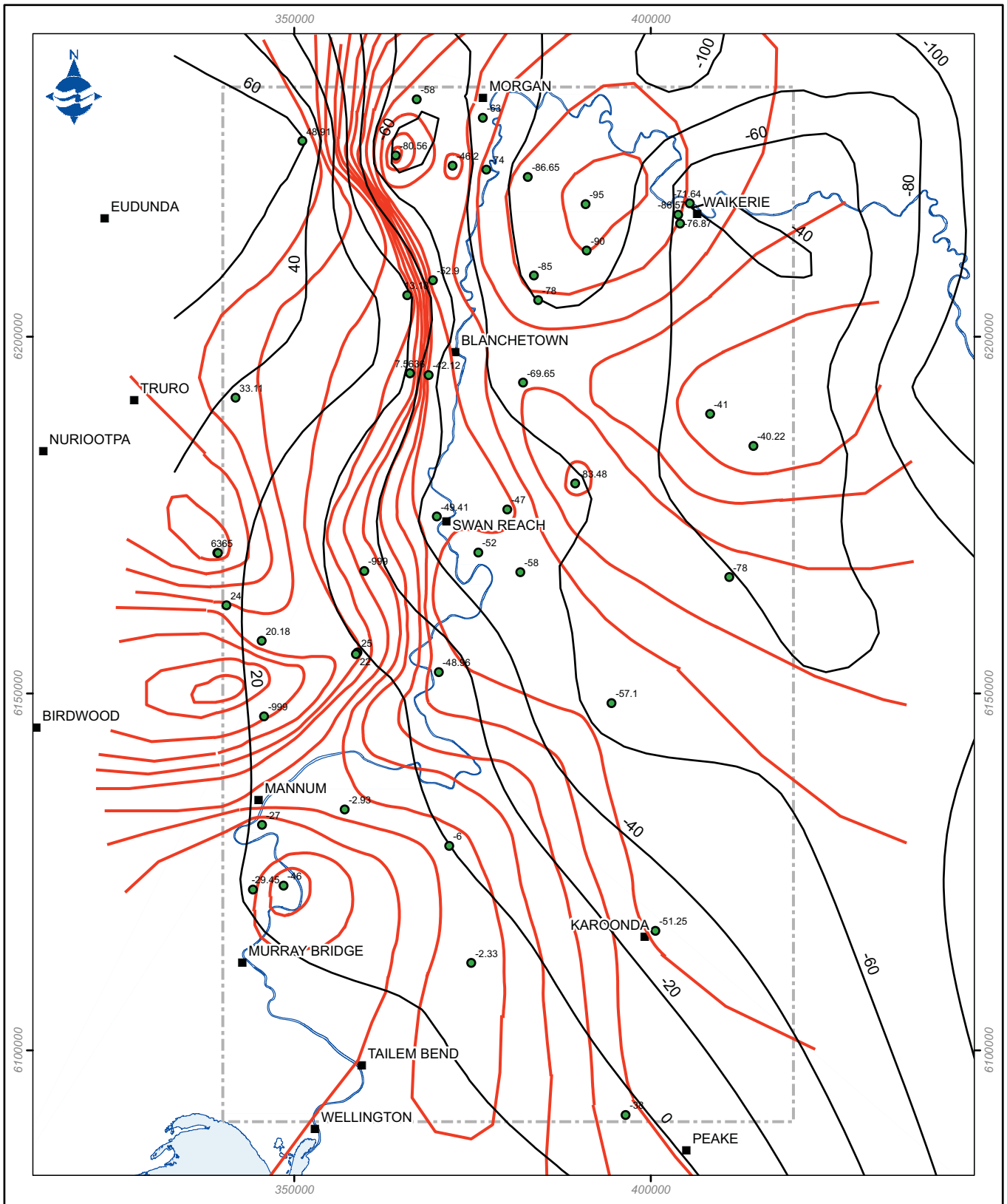
Comments _____

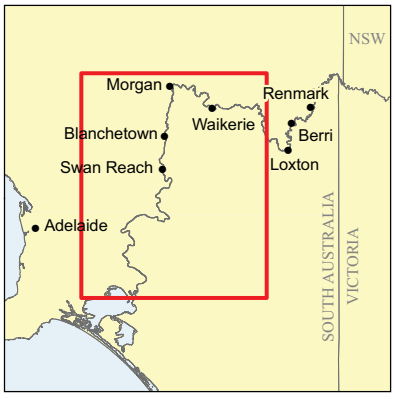
(Tests = GEOCHEMistry, PETROLogy, PALAEOntology, WATERanalyses etc)

Verified _____ Date _____

Specialist Files Core Library _____ (Y/N) Others _____ (MINEX, PEPS, RS, etc)

APPENDIX C (COMPARISON FIGURES)





0 10 20 30
Kilometres

LEGEND

- Township
- -38 Top of Ettrick, mAHD
- Contour, mAHD - AWE Interpretation
- Contour, mAHD - DWLBC Interpretation
- Coastline, watercourse
- Model Extent

Australian WATER Environments

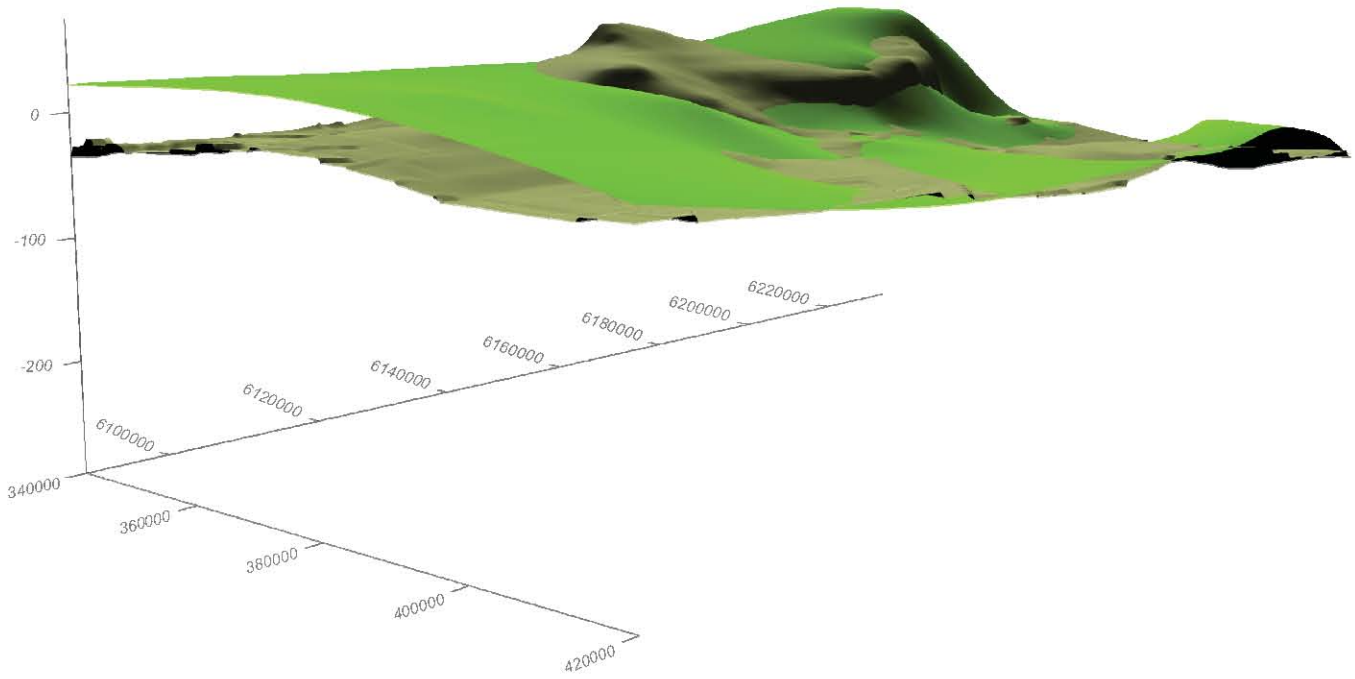
Murray Basin Hydrogeological Review

Morgan to Wellington

Top of Ettrick Formation
Hand Drawn Contour Comparison
DWLBC & AWE

Job No. 09020 - C1
090108

Figure C1



LEGEND

- AWE Hand Contours
- DWLBC Contours

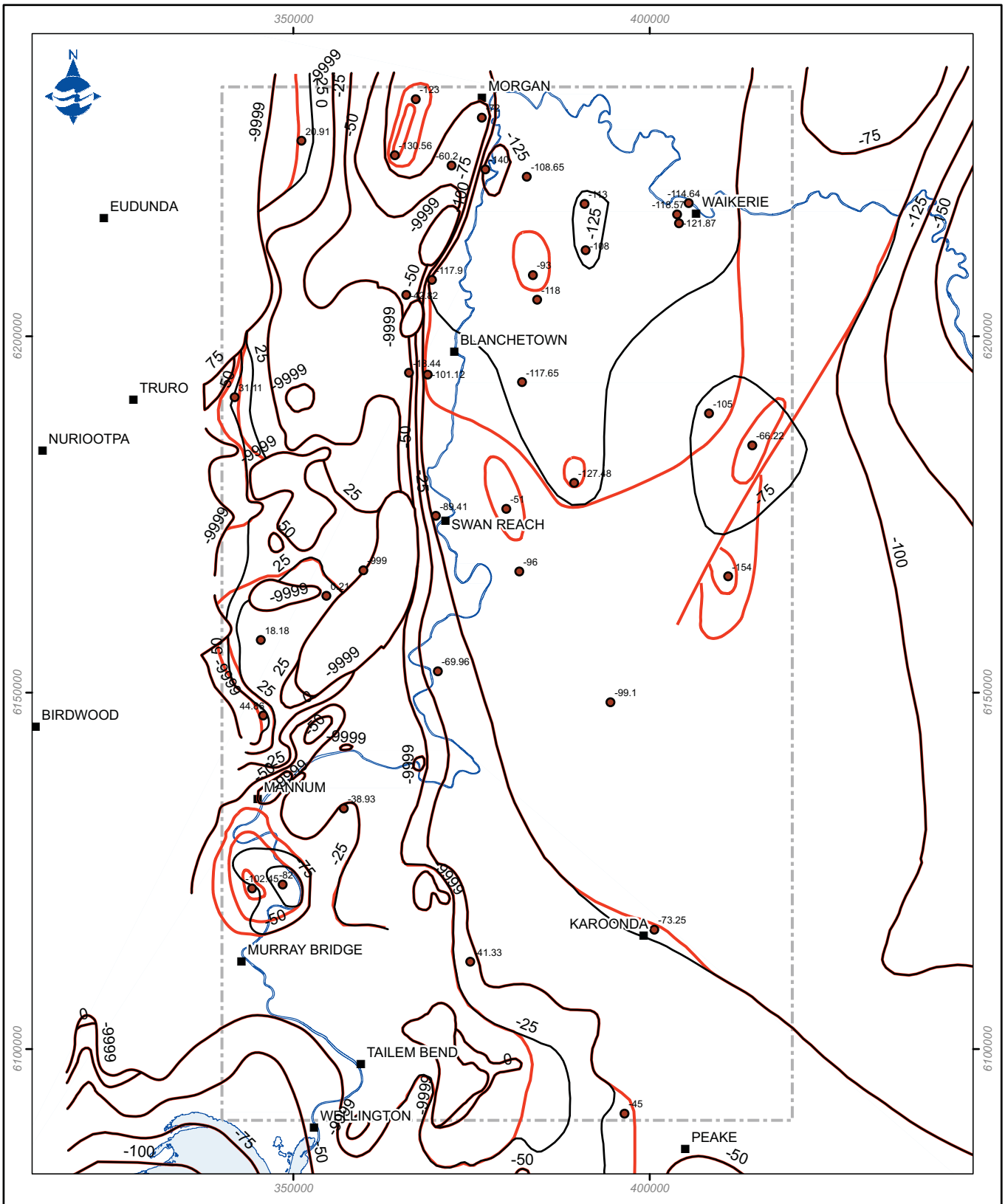
Murray Basin
Hydrogeological Review
Morgan to Wellington

DWLBC v's AWE Hand
Top of Ettrick Formation

Australian WATER Environments

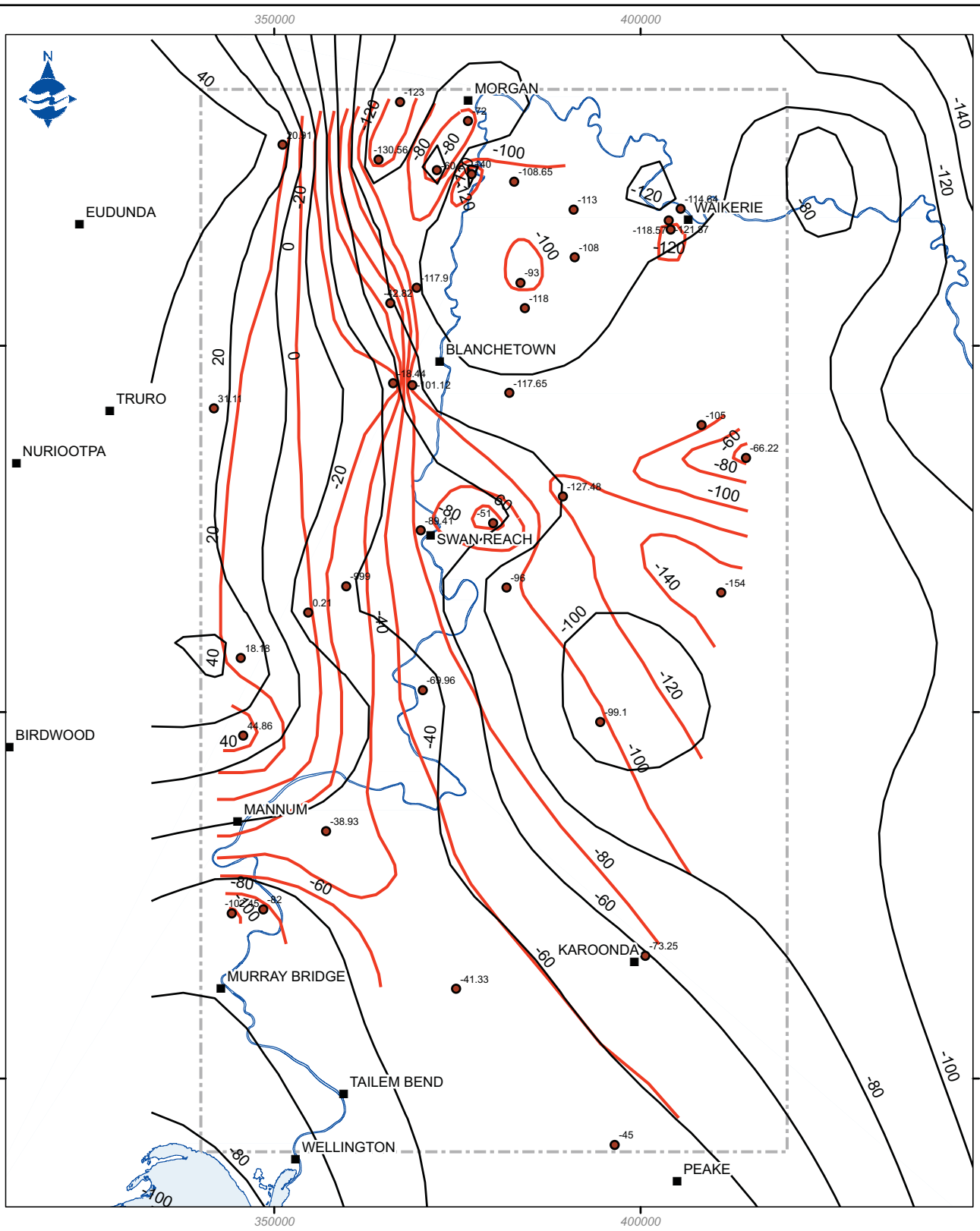
Job No. 09020 - 032
090109

Figure C2



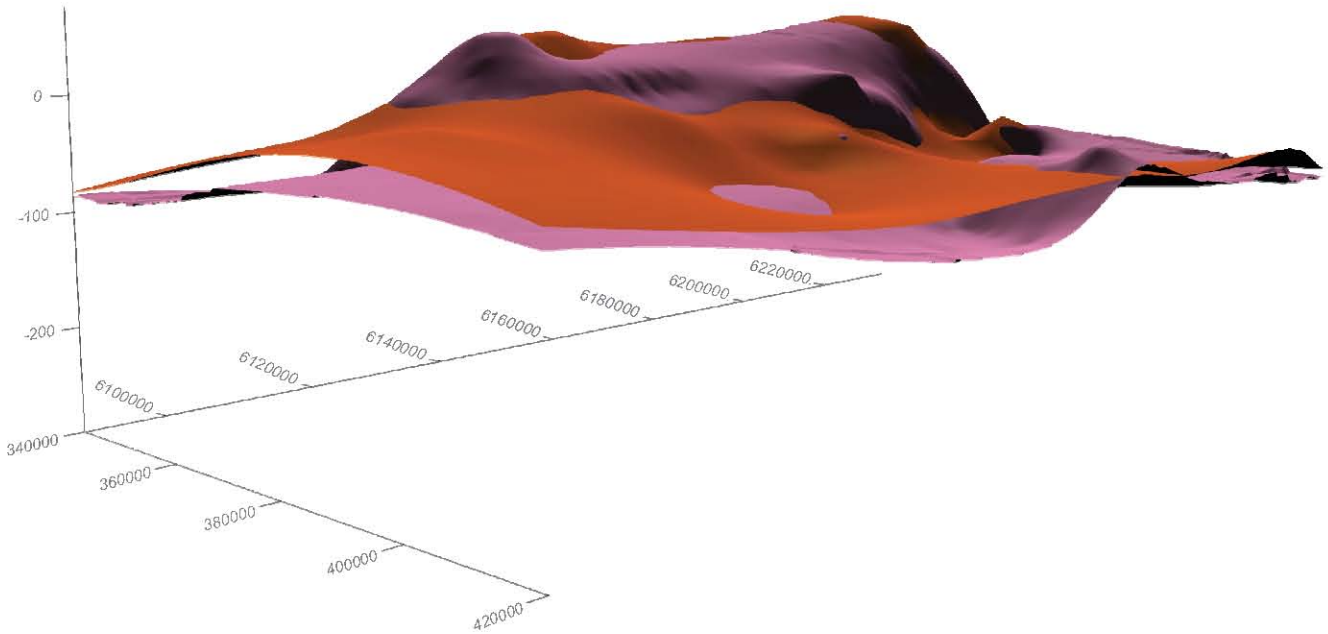
Job No. 09020 - C3
090108

Figure C3



Job No. 09020 - C4
090108

Figure C4



LEGEND

- AWE Hand Contours
- DWLBC Contours

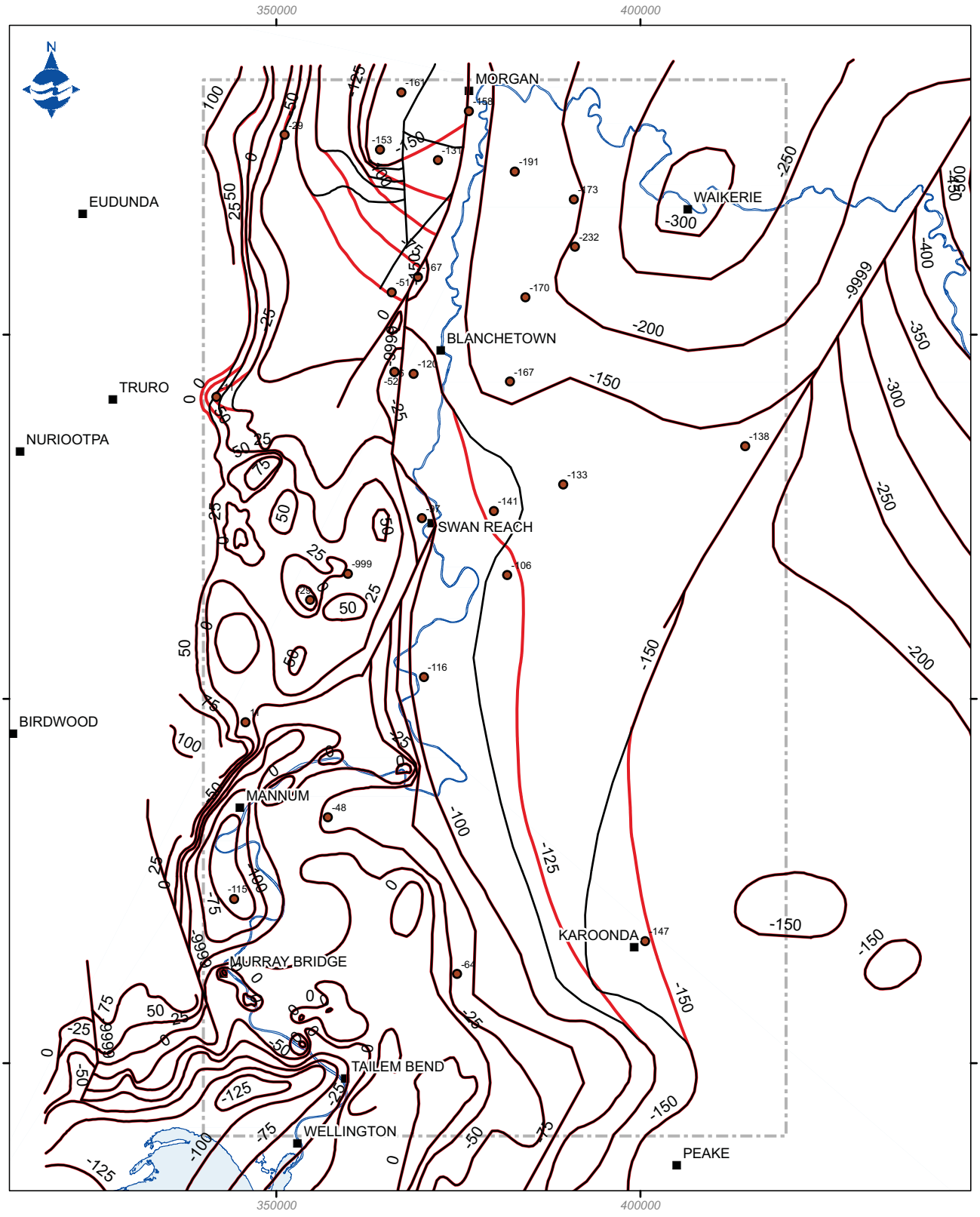
Murray Basin
Hydrogeological Review
Morgan to Wellington

DWLBC v's AWE Hand Top of RGA

Australian WATER Environments

Job No. 09020 - 033
090109

Figure C5



LEGEND

- Township
- -38 Base of Renmark, mAHD
- Contour mAHD - AWE Interpretation
- Contour mAHD - MDBC Interpretation
- Coastline, watercourse
- Model Extent

Australian WATER Environments

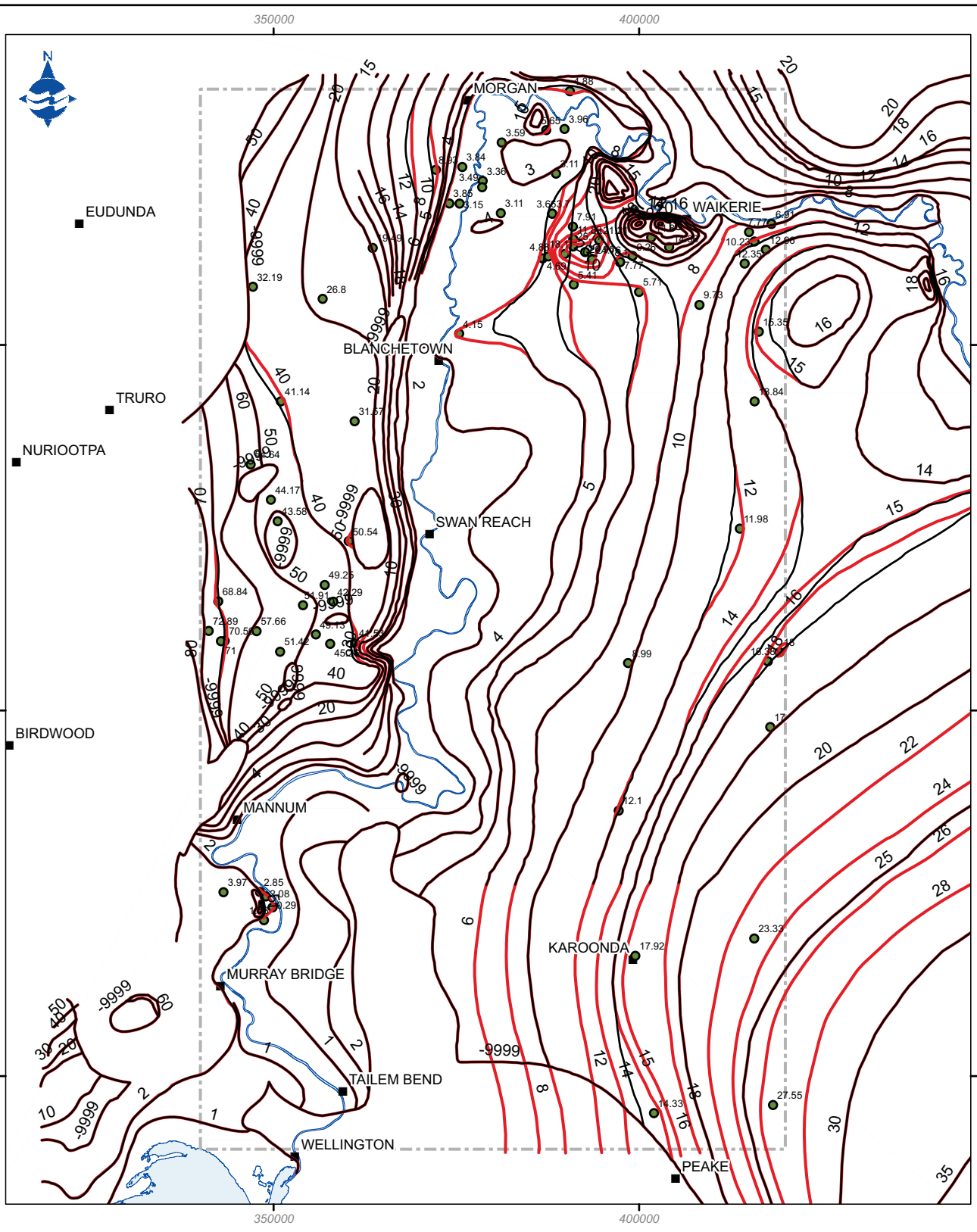
Murray Basin Hydrogeological Review

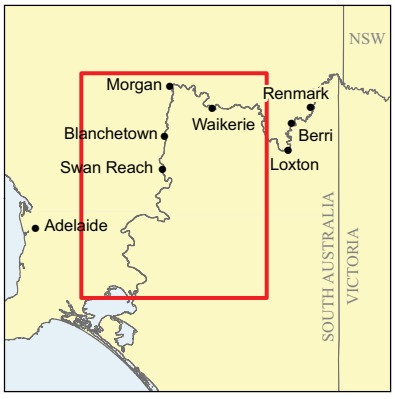
Morgan to Wellington

Base of Renmark Group Contour Comparison MDBC & AWE

Job No. 09020 - C6
090108

Figure C6





0 10 20 30
Kilometres

LEGEND

- Township
- 21.2 Water Level, mAHD
- Contour mAHD - AWE Interpretation
- Contour mAHD - MDBC Interpretation
- Coastline, watercourse
- Model Extent

Australian WATER Environments

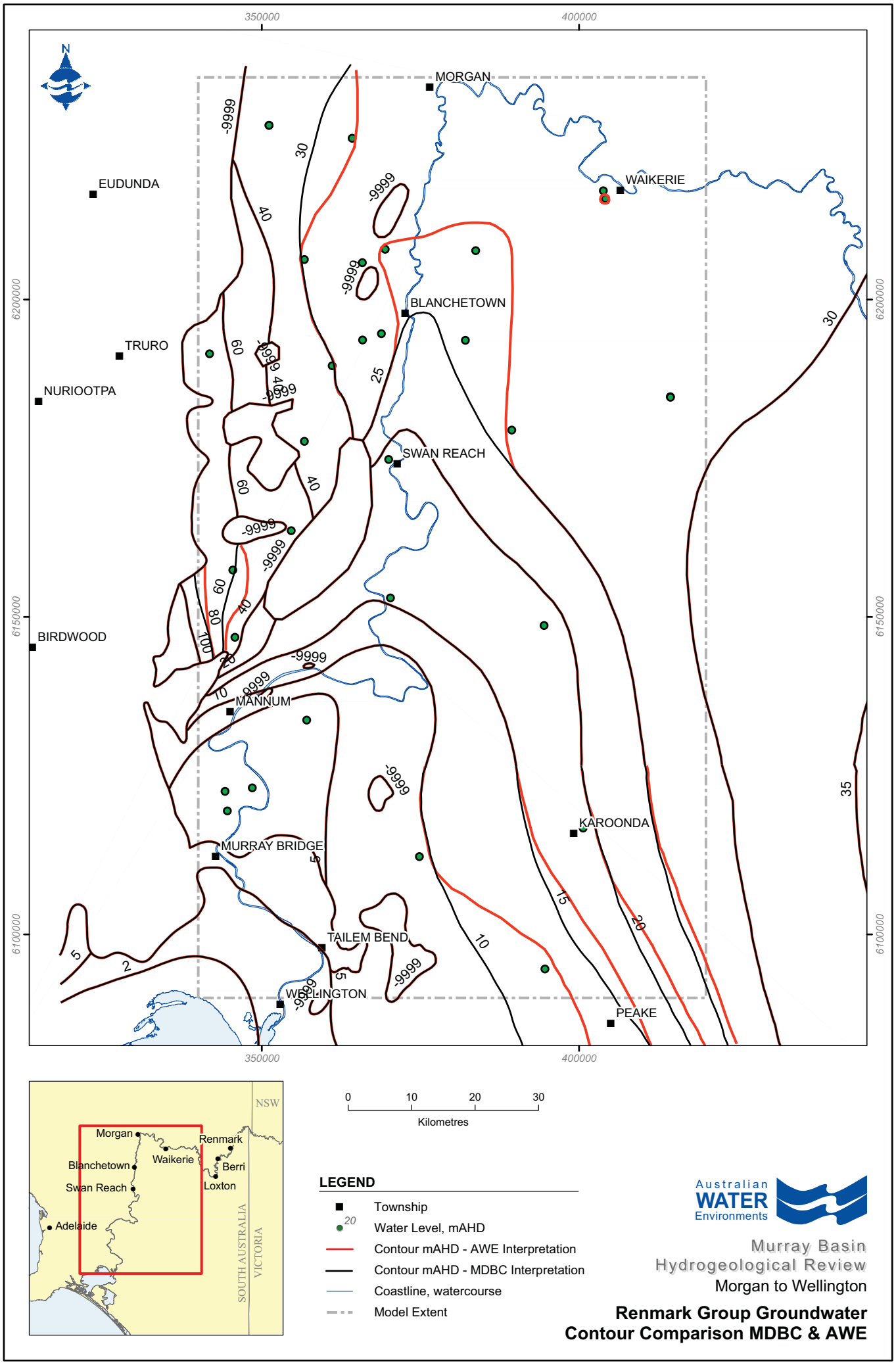
Murray Basin Hydrogeological Review

Morgan to Wellington

Murray Group Limestone Groundwater Contour Comparison MDBC & AWE

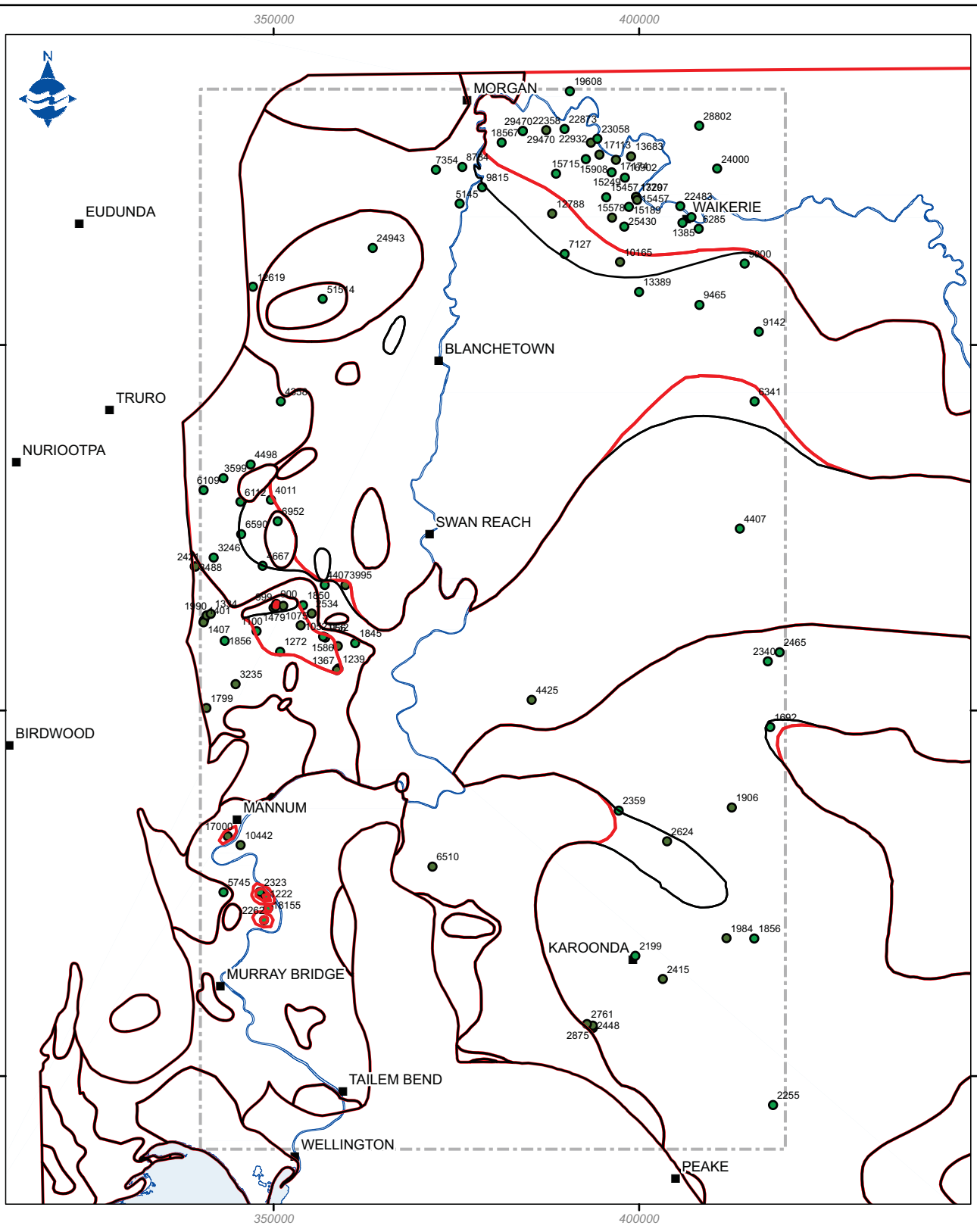
Job No. 09020 - C7
090108

Figure C7



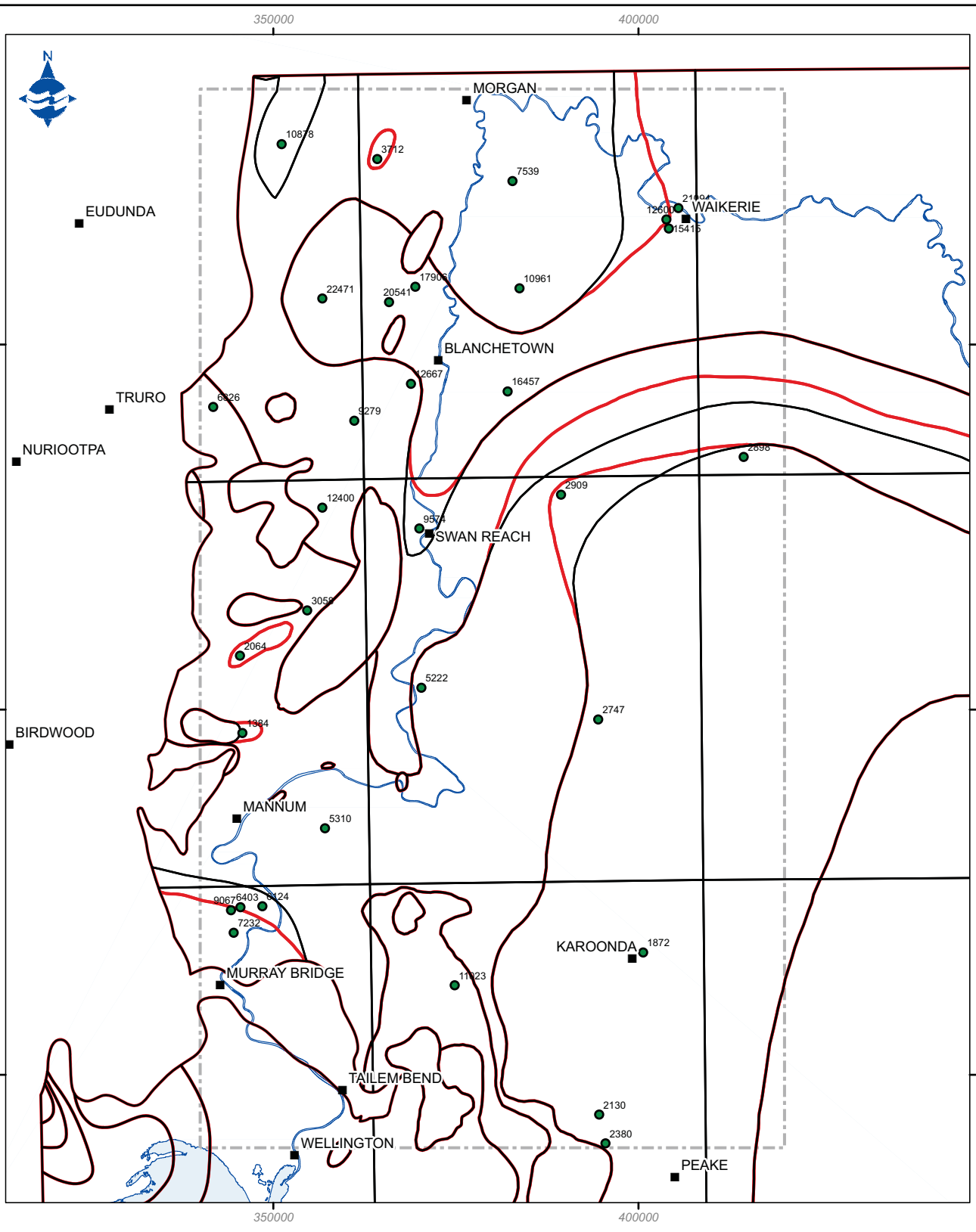
Job No. 09020 - C8
090108

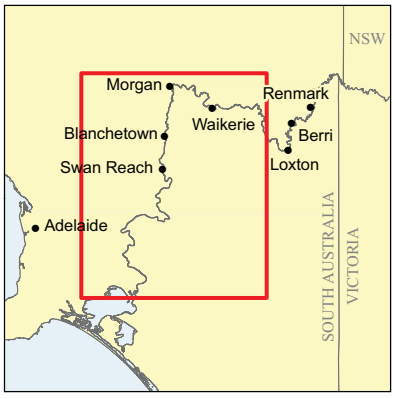
Figure C8



Job No. 09020 - C9
090108

Figure C9





0 10 20 30

Kilometres

LEGEND

- Township
- 2875 Salinity, mg/L
- Contour - AWE Interpretation
- Contour - MDBC Interpretation
- Coastline, watercourse
- Model Extent

Australian WATER Environments

Murray Basin Hydrogeological Review

Morgan to Wellington

Renmark Group Groundwater Salinity Contour Comparison MDBC & AWE

Job No. 09020 - C10
090108

Figure C10