



DWLBC REPORT

Northern Adelaide Plains Groundwater Monitoring Network Upgrade 2001/2002 Drilling Activity

2004/57



Government of South Australia
Department of Water, Land and
Biodiversity Conservation

Northern Adelaide Plains Groundwater Monitoring Network Upgrade

2001/02 Drilling Activity

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**Knowledge and Information Division
Department of Water, Land and Biodiversity Conservation**

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FOREWORD

South Australia's unique and precious natural resources are fundamental to the economic and social wellbeing of the State. It is critical that these resources are managed in a sustainable manner to safeguard them both for current users and for future generations.

The Department of Water, Land and Biodiversity Conservation (DWLBC) strives to ensure that our natural resources are managed so that they are available for all users, including the environment.

In order for us to best manage these natural resources it is imperative that we have a sound knowledge of their condition and how they are likely to respond to management changes. DWLBC scientific and technical staff continues to improve this knowledge through undertaking investigations, technical reviews and resource modelling.

Rob Freeman

CHIEF EXECUTIVE

DEPARTMENT OF WATER, LAND AND BIODIVERSITY CONSERVATION

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1. INTRODUCTION

Between September 2001 and February 2002 an upgrade of the Northern Adelaide Plains (NAP) monitoring network was undertaken. In total, eleven new wells were drilled in Angle Vale and Virginia areas. Two old government owned steel cased, non-pressure cemented monitoring wells (MPA 64 and MPA 75) were backfilled and replaced with new wells. All eleven monitoring wells were completed in the T2 Aquifer.

The review of the Northern Adelaide Plains (NAP) groundwater monitoring network conducted in 1999, recommended upgrading of the network. New and replacement wells were recommended to be drilled into the T1 and T2 confined aquifers, as well as to backfill and rehabilitate some old monitoring wells.

While the 2000/01 Drilling Program has prioritised and undertaken an upgrade of mainly the T1 Aquifer monitoring network in the Waterloo Corner area because of the lack of data and high consumption of groundwater from the T1 Aquifer in this area, the 2001/02 Drilling Program has undertaken upgrading of the T2 Aquifer monitoring network in the Angle Vale and Virginia areas.

Eleven wells were drilled and two wells were backfilled between September 2001 and February 2002. All monitoring wells were drilled and completed in the T2 confined aquifer. Two government non-pressure cemented monitoring wells (MPA 64 and MPA 75) were backfilled and replaced by new wells under the same program.

2. RESULTS OF DRILLING

The objective of the drilling of eleven monitoring wells (MPA 153 to MPA 159; PTA 115 and PTA 116; PTG 83 and PTG 84) and backfilling of two government non-pressure cemented monitoring wells MPA 64 and MPA 75 (Fig. 1) was to upgrade the monitoring of the T2 aquifer in the Angle Vale and Virginia areas. A summary of encountered lithology and well completion details are provided in Tables 1–4, with comprehensive description of lithology encountered over the well profiles included in Appendix A of this report.

A suite of geophysical logs was conducted over each hole prior to casing: gamma, neutron, point resistivity, caliper, spontaneous potential, density, medium inductivity and deep inductivity. Composite well logs identifying age, formation, completion and lithological profile data are included in Appendix B.

Following completion all wells were developed by airlifting, during which time water samples were collected for salinity analysis at Glenside laboratory. Salinity results are presented in Appendix C. All wells were completed for long term observation with a 0.5 m high lockable standpipe cemented over each well.

2.1 SITE NUMBER 1: PTA 115

The monitoring well PTA 115 (unit number 6628 – 20666) was drilled under P/N 56428.

The well was drilled adjacent to the section 171, hundred of Port Adelaide, on the western side of Buckland Road, 250 m north of Park Road. The well was drilled to a total depth of 87.5 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.3 m above ground level to 65 m, which was pressure cemented to the surface, with cement 2 m below the casing (67 m), whilst the remaining section of the well (67–87.5 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 50 m at a rate of 4–5 L/s for 2 hours, during which time two groundwater samples were obtained from the open hole section in the aquifer for salinity analysis. The electrical conductivity of 1230 uS/cm inferred a total dissolved solids (TDS) content of 677 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

2.2 SITE NUMBER 2: MPA 154

The monitoring well MPA 154 (unit number 6628 – 20729) was drilled under P/N 56853.

The well was drilled adjacent to the section 3879, hundred of Munno Para, approximately 20 m southwest of Angle Vale Road on the southeastern side of Frisby Road. The well was drilled to a total depth of 105.2 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

RESULTS OF DRILLING

Table 1. Summary of encountered lithology

	Site number 1 PTA 115		Site number 2 MPA 154		Site number 3 MPA 155		Site number 4 PTG 83		Site number 5 PTG 84		Site number 6 MPA 156	
	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)
Recent	0–1.5	1.5	0–3	3.0	0–3	3.0	0–3	3.0	0–3	3.0	0–3	3.0
Hindmarsh Clay	1.5–33	31.5	3–50.4	47.4	3–40.8	37.8	3–24.8	21.8	3–28	25.0	3–59.2	56.2
Carisbrooke Sand (Q4)	33–46	13	50.4–71	20.6	40.8–64	23.2	24.8–40.8	16	28–33.6	5.6	59.2–69.2	10.0
Hallett Cove Sandstone Dry Creek Sand (T1a)				64–70	6.0							
Upper Port Willunga Formation (T1b)	46–53	7.0	71–74.8	3.8	70–77	7.0	40.8–44.4	3.6			69.2–76	6.8
Munno Para Clay	53–60.8	7.8	74.8–80.8	6.0	77–82.6	5.6	44.4–52.4	8.0	33.6–35	1.4	76–78.4	2.4
Lower Port Willunga Formation (T2)	60.8–87.5+	26.7+	80.8–105.2+	24.4+	82.6–100+	17.4+	52.4–76+	23.6+	35–70+	35+	78.4–100+	21.6+

RESULTS OF DRILLING

Table 2. Summary of encountered lithology – continued

	Site number 7 MPA 157			Site number 8 MPA 158			Site number 9 PTA 116			Site number 10 MPA 153			Site number 11 MPA 159		
	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	Interval (m)	Thickness (m)	
Recent	0–4	4.0	0–3	3.0	0–2	2.0	0–1	1.0	0–3	3.0	0–3	3.0	0–3	3.0	
Hindmarsh Clay	4–53.2	49.2	3–38.5	35.5	2–38.8	36.8	1–38.5	37.5	3–48	45.0	3–48	45.0	3–48	45.0	
Carisbrooke Sand (Q4)	53.2–64	10.8	38.5–56	17.5	38.8–53.2	14.4	38.5–60.8	22.3	48–57.6	9.6	48–57.6	9.6	48–57.6	9.6	
Hallett Cove Sandstone Dry Creek Sand (T1a)	64–75	11.0	56–57	1.0	53.2–60	6.8					57.6–65.6	8.0			
Upper Port Willunga Formation (T1b)	75–83.2	8.2	57–60	3.0	60–66	6.0					65.6–71	5.4			
Munno Para Clay	83.2–91.2	8.0	60–60.4	4.4	66–74	8.0	60.8–68	7.2	71–79.6	8.6					
Lower Port Willunga Formation (T2)	91.2–120+	28.8+	64.4–86+	21.6+	74–96+	22.0+	68–94+	26.0+	79.6–100+	20.4+					

RESULTS OF DRILLING

Table 3. Well completion details

Observation well number	Site number 1 PTA 115	Site number 2 MPA 154	Site number 3 MPA 155	Site number 4 PTG 83	Site number 5 PTG 84	Site number 6 MPA 156
Well unit number	6628-20666	6628-20729	6628-20730	6628-20731	6628-20732	6628-20733
Well permit number	56428	56853	56851	56852	56847	56848
Easting (GDA 94)	273663	285823	281550	277800	279334	287948
Northing (GDA 94)	6161486	6164562	6160968	6165482	6168566	6164417
Reference Elevation	7.738	34.609	20.174	19.014	17.489	37.682
Total depth drilled (m)	87.5	105.2	100	76	70	100
Depth completed (m)	87.5	105.2	100	76	70	100
Casing (m)	-0.3*-67	-0.3*-84	-0.2*-86	-0.3*-56	-0.2*-50	-0.1*-84
Pressure cemented (m)	0-67	0-86†	0-86	0-56	0-50	0-84
Production zone (m)	67-87.5	86-105.2	86-100	56-76	50-70	84-100
Production zone type	Open hole	Open hole	Open hole	Open hole	Open hole	Open hole
Aquifer completed	T2	T2	T2	T2	T2	T2
Water level (m)	18	26.32	34.45	32.91	13.32	30.45
Salinity (mg/L)	677	655	1440	821	1010	556
Yield (L/s)‡	4-5	6	4-5	4	4-5	5

* 0.2 m above ground level

† Pressure cement below casing
‡ Yields determined from airlifting

RESULTS OF DRILLING

Table 4. Well completion details – continued

Observation well number	Site number 7 MPA 157	Site number 8 MPA 158	Site number 9 PTA 116	Site number 9 MPA 153	Site number 10 MPA 153	Site number 11 MPA 159
Well unit number	6628-20734	6628-20735	6628-20759	6628-20678	6628-20736	
Well permit number	57452	57535	57655	56430	56849	
Easting (GDA 94)	280472	279850	275824	282652	278472	
Northing (GDA 94)	6158816	6163287	6159322	6163250	6159988	
Reference Elevation	16.505	21.345	9.155	27.618	14.735	
Total depth drilled (m)	120	86	96	94	100	
Depth completed (m)	120	86	96	94	100	
Casing (m)	-0.3*-96	-0.3*-68	-0.3*-78	-0.2*-74	-0.2*-83	
Pressure cemented (m)	0-96	0-68	0-79†	0-74	0-83	
Production zone (m)	96-120	68-86	79-86	74-94	83-100	
Production zone type	Open hole					
Aquifer completed	T2	T2	T2	T2	T2	
Water level (m)	29.39	48.88	29.507	27.2	41.24	
Salinity (mg/L)	1726	567	761	1261	955	
Yield (L/s)‡	5	2-3	4	4	4	

* 0.2 m above ground level

† Pressure cement below casing
‡ Yields determined from airlifting

RESULTS OF DRILLING

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.3 m above ground level to 84 m, which was pressure cemented to the surface, with cement 2 m below the casing (86 m), whilst the remaining section of the well (86–105.2 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 60 m, at a rate of approximately 6 L/s for 4 hours during which time the well produced a significant amount of fine sand. During airlifting the sand content was decreasing and at the end of 4 hours of airlifting was around 5–10%. Further development was suggested.

The well was further developed on the 15th and 16th of May 2002 using a Legra pump set at 80 m.

Development began at a flowing rate of 2 L/s for a period of 90 minutes. The first few samples contained approximately 1/3–1/2 of a cup of fine sand per 1.25 litre of water sample, which slowly waned to about 1 teaspoon of sand per 1.25 litre water sample for the last 30 mins of the test (less than 1%). Then the flow rate was increased to 5 L/s, which brought about an increase in the sand content of approximately 1/4–1/3 of the cup of fine sand per 1.25 litre of water sample (~6%), which stayed constant for the duration of the development, being a total of 120 minutes. On 16/5/02; development continued at a flowing rate of 5 L/s for a total of 360 minutes with no sign of the sand content decreasing. No further development was conducted at this stage.

Three groundwater samples during initial development and another 34 during further development were collected for salinity analysis. The electrical conductivity of 1190 uS/cm inferred a total dissolved solids (TDS) content of 655 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

2.3 SITE NUMBER 3: MPA 155

The monitoring well MPA 155 (unit number 6628 – 20730) was drilled under P/N 56851.

The well was drilled adjacent to the section 3900, hundred of Munno Para, on the southeastern side of Short Road, 150 m southwest of Robert Road. The well was drilled to a total depth of 100 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.2 m above ground level to 86 m, which was pressure cemented to the surface, whilst the remaining section of the well (86–100 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 50 m, at a rate of 4–5 L/s for 3 hours during which time two groundwater samples were obtained from the open hole section in the aquifer for salinity analysis. The electrical conductivity of 2600 uS/cm inferred a total dissolved solids (TDS) content of 1440 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

2.4 SITE NUMBER 4: PTG 83

The monitoring well PTG 83 (unit number 6628 – 20731) was drilled under P/N 5682.

The well was drilled adjacent to the section 99, hundred of Port Gawler, on the northern side of Johns Rd, 350 m east of Baker Road. The well was drilled to a total depth of 76 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.3 m above ground level to 56 m, which was pressure cemented to the surface, whilst the remaining section of the well (56–76 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 50 m, at a rate of 4 L/s for 3 hours, during which time two groundwater samples were obtained from the open hole section in the aquifer for salinity analysis. The electrical conductivity of 1490 uS/cm inferred a total dissolved solids (TDS) content of 821 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

2.5 SITE NUMBER 5: PTG 84

The monitoring well PTG 84 (unit number 6628 – 20732), was drilled under P/N 56847.

The well was drilled adjacent to the section 174, hundred of Port Gawler, on the western side of Pederick Road, 30 m north of Hayman Road.

The well was drilled to a depth of 51 m and the total loss of circulation occurred between 45–51 m. The well was cased using 142 mm ID class 12 PVC casing from 0.2 m above ground level to 49.8 m and pressure cemented to the surface and than drilled to total depth of 70 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

The section of the well 49.8–70 m, encompassing the Lower Port Willunga Formation, was left as open hole completion.

The well was developed by airlifting from 37 m, at a rate of 4 L/s for 1.5 hours, during which time three groundwater samples were obtained from the open hole section in the aquifer for salinity analysis. The electrical conductivity of 1830 uS/cm inferred a total dissolved solids (TDS) content of 1010 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

2.6 SITE NUMBER 6: MPA 156

The monitoring well MPA 156 (unit number 6628 – 20733), was drilled under P/N 56848.

The well was drilled adjacent to the section 3296, hundred of Munno Para, approximately 250 m northwest of Stebonheath Road on the southwestern side of Dalkeith Road. The well was drilled to a total depth of 100 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

RESULTS OF DRILLING

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.1 m above ground level to 84 m, which was pressure cemented to the surface, whilst the remaining section of the well (84–100 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 60 m, at a rate of approximately 5 L/s for 2 hours, during which time the well produced significant amount of fine sand. During airlifting sand content was decreasing and at the end of 2 hours airlifting was around 5%.

The well was further developed on 21 of May 2002 using a Legra pump set at 80 m. Development began at a flow rate of 2 L/s for a period of 125 minutes with initial groundwater samples containing approximately 1/4 of a cup of sand per 1.25 litre of groundwater sample (~5%). Groundwater began to clear at about the 90 minutes mark, clearing up to 1 teaspoon per 1.25 litre of groundwater sample within the next 45 minutes. The increase of the flow rate up to 5 L/s brought on the sand at about the same ratio per sample as the first stage (~5%). At 240 minutes the sand content was decreasing and continued to do so up until the end of the stage, at 330 minutes, whereupon the sand content was down to about 1 teaspoon per 1.25 litre of groundwater sample. No further development was required at this stage.

Two groundwater samples during initial development, on the well completion, and another twenty one during further development were collected for salinity analysis. The electrical conductivity of 1010 uS/cm inferred a total dissolved solids (TDS) content of 556 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

2.7 SITE NUMBER 7: MPA 157

The monitoring well MPA 157 (unit number 6628 – 20734), was drilled under P/N 57452.

The well was drilled adjacent to the section 3055, hundred of Munno Para, approximately 250 m southwest of Penfield Road on the northwestern side of Short Road. The well was drilled to a total depth of 120 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.3 m above ground level to 96 m, which was pressure cemented to the surface, whilst the remaining section of the well (96–120 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 79 m, at a rate of 5 L/s for about 1 hour, during which time three groundwater samples were obtained from the open hole section in the aquifer for salinity analysis. The electrical conductivity of 3110 uS/cm inferred a total dissolved solids (TDS) content of 1726 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

2.8 SITE NUMBER 8: MPA 158

The monitoring well MPA 158 (unit number 6628 – 20735), was drilled under P/N 57535.

The well was drilled adjacent to the section 3027, hundred of Munno Para, approximately 150 m southeast of Angle Vale Road on the southwestern side of Davoren Road. The well

RESULTS OF DRILLING

was drilled to a total depth of 86 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.3 m above ground level to 68 m, which was pressure cemented to the surface, whilst the remaining section of the well (68–86 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 50 m, at a rate of 2–3 L/s for 2 hours, during which time two groundwater samples were obtained from the open hole section in the aquifer for salinity analysis. The electrical conductivity of 1030 uS/cm inferred a total dissolved solids (TDS) content of 567 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

2.9 SITE NUMBER 9: PTA 116

The monitoring well PTA 116 (unit number 6628 – 20759) was drilled under P/N 57655.

The well was drilled adjacent to the section 226 PT 95, hundred of Port Adelaide, approximately 50 m north of McEvoy Road on the eastern side of Supple Road. The well was drilled to a total depth of 96 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.3 m above ground level to 78 m, which was pressure cemented to the surface, with cement 1 m below the casing (79 m), whilst the remaining section of the well (79–96 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 54 m, at a rate of 4 L/s for 1.5 hours, during which time three groundwater samples were obtained from the open hole section in the aquifer for salinity analysis. The electrical conductivity of 1380 uS/cm inferred a total dissolved solids (TDS) content of 761 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

2.10 SITE NUMBER 10 – REPLACEMENT WELL: MPA 153

The monitoring well MPA 153 (unit number 6628 – 20678), was drilled under P/N 56430 to replace government non-pressure cemented monitoring well MPA 75, which was backfilled under P/N 56429.

This replacement monitoring well was drilled adjacent to the section 3889, hundred of Munno Para, approximately 20 m northeast of Curtis Road (3 m north of backfilled well MPA 75). The well was drilled to a total depth of 94 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.2 m above ground level to 74 m, which was pressure cemented to the surface, whilst the remaining section of the well (74–94 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 52 m, at a rate of 3–4 L/s for 3 hours, during which time three groundwater samples were collected for salinity analysis. The electrical conductivity of 2280 uS/cm inferred a total dissolved solids (TDS) content of 1261 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

RESULTS OF DRILLING

2.11 SITE NUMBER 11 – REPLACEMENT WELL: MPA 159

The monitoring well MPA 159 (unit number 6628 – 20736), was drilled under P/N 56849 to replace a government non-pressure cemented monitoring well MPA 64, which was backfilled under P/N 56850.

This replacement monitoring well was drilled adjacent to the section 3052, hundred of Munno Para, approximately 50 m southwest of Penfield Road on the southeastern side of King Road (~80 m south of backfilled well MPA 64). The well was drilled to a total depth of 100 m using rotary mud drilling. Sample cuttings were collected at three metre intervals over the entire penetrated depth.

Completion of the well was carried out using 142 mm ID class 12 PVC casing from 0.2 m above ground level to 83 m, which was pressure cemented to the surface, whilst the remaining section of the well (83–100 m encompassing the Lower Port Willunga Formation) was left as open hole completion.

The well was developed by airlifting from 60 m, at a rate of 4 L/s for 2 hours, during which time three groundwater samples were obtained from the open hole section in the aquifer for salinity analysis. The electrical conductivity of 1730 uS/cm inferred a total dissolved solids (TDS) content of 955 mg/L, the expected salinity of the T2 aquifer groundwater for this area.

3. RESULTS OF WELL BACKFILLING

Two backfilled wells had steel casing which was corroded (Fig. 1). They could not be rehabilitated and their backfilling was necessary because their condition deteriorated and they became a risk for the aquifers they were monitoring.

3.1 MONITORING WELL: MPA 75

The monitoring well MPA 75 (unit number 6628 – 2718) was backfilled under P/N 56429 with cement slurry from 112 m to the ground level.

3.2 MONITORING WELL: MPA 64

The monitoring well MPA 64 (unit number 6628 – 2470) was backfilled under P/N 56850 with cement slurry from 129 m to the ground level.

4. CONCLUSIONS

The Northern Adelaide Plains T2 Aquifer monitoring network was upgraded by eleven new monitoring wells, nine of which were constructed in new locations, whilst two were constructed on the existing monitoring sites, as replacement monitoring wells.

All wells were constructed according to specifications and following completion, nine wells were satisfactorily developed by airlifting. Only two wells (MPA 154 and MPA 156) required further developing for the reason that they were producing a significant amount of fine sand during initial airlifting. These wells were further developed to a satisfactory level (acceptable and practical limits) using the Legra pump.

During development the wells were sampled and groundwater salinity (TDS) of all the wells was in the expected range for each respective site.

Following completion all wells were surveyed (optically levelled to 3rd order standard with expected accuracy ± 0.005 m from true) and coordinates were derived from nearby coordinated cadastral marks by use of a Total Station Theodolite but are quoted to the nearest 0.1 m.

All monitoring wells data was updated in the SA-Geodata database and Asset Register.

APPENDICES

A. LITHOLOGICAL LOGS



The Department of
Water, Land and
Biodiversity
Conservation

GROUNDWATER PROGRAM
WATER WELL LOG

Coordinates: E 273662.6 N 6161485.9

El. Surface(m): 7.443

El. Ref. Point(m): 7.738

Datum: GDA 94

AQUIFER
SUMMARY

TOTAL DISSOLVED SOLIDS

Analysis No.

483039

GEOLOGICAL DESCRIPTION							FORMATION/AGE			CASING				
DEPTH (m)	GRAPHIC LOG		ROCK/SEDIMENT NAME	INTERVAL (m)	From	To	L/sec	Test length	Method	mg/L	Depth Core Sample	Dia (mm)	From (m)	To (m)
0	1.5		TOPSOIL	Light brown very sandy topsoil with calcareous grains throughout. Sand is fine to medium grained quartz sand. Abundant mica.					(Recent)		208	-0.2	2.8	
1.5	3		SANDY CLAY	Mottled grey, orange and brown very sandy micaceous clay. Calcrete grains up to 3 cm in diameter throughout.							142	-0.3	65	
3	5		CLAY	Overall grey somewhat mottled light brown clay. Soft when wet. Minor sandy, and minor calcrete grains throughout.										
5	10		SANDY CLAY / CLAYEY SAND	Interbedded mottled orange and light grey minor clayey fine grained micaceous sand and mottled light orange, light grey and whitish clay. Abundant calcrete grit throughout.										
10	12.5		CLAY	Grey mottled light brown and orange clay. Calcrete grains up to 15 - 20 mm in diameter throughout.										
12.5	16		SAND	Dark yellow and minor grey fine - medium grained quartz sand. Minor gravelly (fine gravel up to 6 mm - a few coarser grains > 6 mm). Minor clayey.										
REMARKS: CASING:				-0.2 to 2.8 m (PVC class 6, 208 mm ID - gravity cemented) -0.3 to 65 m (PVC class 12, 142 mm ID - pressure cemented - Cement 2m below casing)									DRILL TYPE: Auger, Rotary	COMPLETED: 87.5 m
OPEN HOLE:				67 to 87.5 m									DRILL FLUID: Mud	LOGGED BY: H. Zulfic
				DATE: 23/09/2001									SHEET 1 OF 3	



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

DEPTH (m)	GRAPHIC LOG		ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Depth Core Sample	CASING	
	From	To					Dia (mm)	From (m)
16	21		CLAY	Mottled grey and red stiff clay.				
21	24.5		CLAY	Overall dark red, somewhat grey sandy clay (from 23 m sandy).				
24.5	27		CLAY	Mottled grey and reddish clay.				
27	30		CLAY	Overall yellowish orange (when wet) clay.				
30	33		SANDY CLAY	Overall dark yellowish-orange sandy clay.	CARISBROOKE SAND (Quaternary)			
33	46		SAND	Multi coloured medium to fine grained soft, somewhat minor clayey quartz sand. From 39-42 m overall orange-dark yellow, minor off-white and light yellowish sand. From 42-45 m lighter than above - light yellowish sand. From 45 m darker.				
46	53		LIMESTONE	Overall yellow - dark yellow, getting darker with depth.	UPPER PORT WILLUNGA FORMATION (Tertiary)			
				From 46 - 49 m whitish fine to medium grained quartz sandstone/limestone and yellow fine to medium grained very hard limestone.. Calcareous. A few tiny shell fragments.				
				From 49 - 52 m yellow - dark yellow limestone, minor fossiliferous - a few very small bryozoa fragments.				
				From 52 - 53 m dark yellow limestone, fossiliferous (tiny bryozoa fragments), fairly dense, wells cemented . Fine - medium grained limestone.				
				Blue soft fossiliferous plastic clay interbedded with thin bars of grey limestone. Minor shell fragments.	MUNNO PARA CLAY (Tertiary)			
53	60.8		CLAY					



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GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

DEPTH (m)		GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Depth Core Sample	CASING
From	To					Dia (mm)	From (m) To (m)
60.8	64		LIMESTONE	Light grey very fossiliferous (bryozoal), well cemented, glauconitic limestone. Shell fragments up to 7 mm.	LOWER PORT WILLUNGA FORMATION (Tertiary)		
64	73		LIMESTONE	Overall very light grey. Light grey and whitish very fossiliferous (bryozoal) limestone. Sample silty sandy and clayey (Munno Para Clay).			
73	76		LIMESTONE	Overall greyish-yellowish. Grey - whitish limestone as above and yellowish bryozoal limestone. Small shell fragments.			
76	79		LIMESTONE	Overall light olive-yellowish. Light olive-yellowish, fine- medium grained well cemented fossiliferous (bryozoal) limestone. Minor shell fragments.			
79	87.5		LIMESTONE	Overall dark olive - greyish. Light olive - yellowish and grey fossiliferous very well cemented limestone.			



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GROUNDWATER PROGRAM
WATER WELL LOG

Coordinates: E 285822.5 N 6164562.2 El. Surface(m): 34.413 El. Ref. Point(m): 34.609 Datum: GDA 94

Hundred: Munno Para Adj. Sec: 3879

UNIT No. 6628 - 20729 (MPA 154)

PERMIT No. 56853

PROJECT: NAP-Observation Network												
AQUIFER												
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION						FORMATION/AGE	Depth Core Sample	CASING	
			From	To	INTERVAL (m)	From	To	L/sec	Test length	Method	mg/L	Analysis No.
0	3	TOPSOIL										
3	5.6	CLAY										
5.6	7	SAND										
7	11.2	CLAY										
11.2	12.5	CLAYEY SAND										
12.5	15	SANDY CLAY										
15	20	CLAYEY SAND / SANDY CLAY										
20	22.8	CLAYEY SAND										
REMARKS: CASING:			-0.2 to 3 m (PVC class 6, 208 mm ID - gravity cemented) -0.3 to 84 m (PVC class 12, 142 mm ID - pressure cemented - Cement 2m below casing)									
OPEN HOLE:			86 to 105.2 m									
NOTE: During 4 hours airlifting well was producing sandy water. Content of sand was decreasing during airlifting and at the end was around 3% solids in the water.												
DRILL TYPE: Auger, Rotary										COMPLETED: 105.2 m		
DRILL FLUID: Mud										LOGGED BY: H. Zulfic & M. Stadter		
DATE 10/01/2002										SHEET 1 OF 4		



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network									
PERMIT No. 56853									
UNIT No. 6628 - 20729 (MPA 154)									
Hundred: Munno Para Adj. Sec: 3879									
DEPTH (m)	GRAPHIC LOG		ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION			FORMATION/AGE	Depth Core Sample	CASING
From	To	From	To	From	To	From	From (mm)	Dia (mm)	To (m)
22.8	26.8			CLAYEY SAND		Mottled orange and grey very sandy, silty clay. Soft and sticky when wet. Micaceous.			
26.8	28.5			CLAY		Orange, somewhat mottled grey clayey and silty micaceous fine grained quartz sand.			
28.5	30.5			SANDY CLAY / CLAYEY SAND		Grey silty and sandy clay. Micaceous.			
30.5	36			CLAYEY SAND / SANDY CLAY		Interbedded light orange brown - reddish very sandy and silty clay and silty, clayey very fine soft sand. Micaceous.			
36	39			GRAVEL / SAND		Mottled orange and dark yellow somewhat grey fine silty and clayey soft quartz sand, interbedded with sandy silty grey and brown clay. Micaceous.			
39	41			CLAY		Dark yellow - orange. From 39 - 40 m fine to medium grained quartz gravel. Angular to sub-angular. From 40 - 41 m silty gravelly fine quartz sand.			
41	43			GRAVEL		Grey sandy plastic clay			
43	49			CLAY		Orange grey - grey sandy gravel somewhat clayey (46.6 - 47.4 m - grey clay). Gravel is fine - medium grained (mostly around 5 mm), sub-angular to sub-rounded.			
49	50.4			SAND		Light orange - light grey silty and sandy clay.			
50.4	54			SAND		Overall light grey (53 - 54 m minor dark yellow - orange). Silty minor clayey fine grained sand.			
54	60			SAND		Dark yellow - orange mottled grey fine to medium grained soft silty sand. From 59 - 60 m gravelly (fine grained quartz gravel).			



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network									
PERMIT No. 56853									
UNIT No. 6628 - 20729 (MPA 154)									
Hundred:	Munno Para	Adj. Sec:	3879						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION				FORMATION/AGE	Depth Core Sample	CASING
From	To							Dia (mm)	From To (m)
60	70	GRAVEL	Overall pale yellow somewhat light grey. Fine sandy quartz gravel. Grains are sub-rounded to sub-angular; clear, pale yellow and white. Sand is dark yellow coarse grained.						
70	71	CLAY	Grey clay (poor recovery)						
71	72.5	LIMESTONE	Overall dark yellow - orange - brown. Yellow - dark yellow very well cemented limestone, fossiliferous, very calcareous and a little bit glauconitic.				UPPER PORT WILLUNGA FORMATION (Tertiary)		
72.5	74.8	LIMESTONE	Overall grey, silty and sandy sample. Grey - dark grey fossiliferous limestone, poorly cemented. Minor black grains. Some loose shell fragments (up to 2 - 3 mm in diameter) and quartz sand fine to medium grained.						
74.8	80.8	CLAY	Overall grey. Blue soft plastic clay with some limestone. Fossiliferous.				MUNNO PARA CLAY (Tertiary)		
80.8	84	SANDY LIMESTONE	Overall grey (at the end of interval light yellowish to very light olive). Hard and soft layers of the sandy limestone.						
84	87	SANDY LIMESTONE	Overall light yellow - very light olive. Interbedded soft and hard bars of light yellow and off-white fossiliferous fairly well cemented minor glauconitic limestone and yellow very well cemented limestone. Sandy.				LOWER PORT WILLUNGA FORMATION (Tertiary)		
87	90	SANDY LIMESTONE	Overall pale yellow - very light olive-grey. Yellow and off-whitish fossiliferous, minor glauconitic fairly well cemented limestone and yellow better cemented limestone. Minor fragments of light grey - whitish very well cemented - very hard limestone. Minor loose fine - medium grained quartz sand and a few small shell fragments.						



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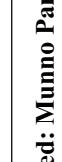
GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

PROJECT: NAP-Observation Network						
PERMIT No. 56853						
UNIT No. 6628 - 20729 (MPA 154)						
Hundred: Munno Para Adj. Sec: 3879						
DEPTH (m) Fro m	GRAPHIC LOG To	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION			
DEPTH (m) Fro m	GRAPHIC LOG To	ROCK/SEDIMENT NAME	FORMATION/AGE	DEPTH Core Sample From (m)	Dia (mm)	To (m)
90	96	SANDY LIMESTONE	Overall grey to dark grey. Sample is a little bit sandy and silty (grey sand and silt passes through 0.3 mm sieve. Grey to light brownish very well cemented limestone and grey to dark grey fossiliferous limestone. Loose silty sand and small shell fragments.			
96	99	SANDY LIMESTONE	Overall grey - little bit olive. Sample silty and sandy?. Grey and dark grey fossiliferous well cemented limestone. Light greyish - light olive fossiliferous well cemented limestone and some fragments of yellowish limestone. Some loose fine - medium grained sand (mainly finer than 0.3 mm) and small shell fragments.			
99	105.2	SANDY LIMESTONE	Overall grey. Sample sandy and silty. Light grey - yellowish fossiliferous well cemented limestone. Loose fine to medium grained quartz sand and shell fragments up to 10 mm (mostly around 5 mm) in diameter.			



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GROUNDWATER PROGRAM WATER WELL LOG

GROUNDWATER PROGRAM											
WATER WELL LOG											
 The Department of Water, Land and Biodiversity Conservation		Coordinates: E 281549.8 N 6160967.8		El. Surface(m): 19.985		El. Ref. Point(m): 20.174		Datum: GDA 94			
AQUIFER		DEPTH TO WATER CUT (m)		DEPTH TO STANDING WATER (m)		INTERVAL (m)		SUPPLY			
		N/A		34.45		From To		L/sec			
SUMMARY						86 100		≈ 4 - 5			
								Test length			
								3 hours			
								Method			
								Airlifting			
								1440 mg/L			
								495496 Analysis No.			
GEOLOGICAL DESCRIPTION											
DEPTH (m)		GRAPHIC LOG		ROCK/SEDIMENT NAME		FORMATION/AGE					
From	To					Recent		Depth Core Sample	CASING		
0	3			TOPSOIL				208 Dia (mm)	From (m) To (m)		
3	6			SANDY CLAY	Moderate brown clayey topsoil.			142	0 -0.2 2.8		
6	9			SANDY CLAY	Dark yellowish orange and somewhat mottled grey, gritty sandy clay. Sticky when wet.						
9	12			SANDY CLAY	Dark orange and mottled grey overall. Sandy clay. Rollable and micaceous.						
12	15.6			SAND / GRAVEL	Light brown to moderate brown overall. Clayey gravelly sand. Sand / Gravel is fine sand (0.06mm) to fine gravel (up to 5mm). Grains are sub-angular to very angular quartz grains. Grains are clear, milky, pale yellow and pale orange (Iron stained). Sample is micaceous.	HINDMARSH CLAY (Quaternary)					
15.6	16.5			SANDY CLAY	Greyish orange mottled sandy clay. Micaceous.						
16.5	18			SAND	Light brown slightly clayey sand. Micaceous. (Lost circulation within interval).						
REMARKS: CASING:										DRILL TYPE: Auger, Rotary	
OPEN HOLE: 0 to 2.8 m (PVC, 208 mm ID - gravity cemented) -0.2 to 86 m (PVC class 12, 142 mm ID - pressure cemented 0 – 86m) 86 to 100 m (Drilled with 200mm bit)										COMPLETED: 100	
										DRILL FLUID: Mud	LOGGED BY: M STADTER
										DATE: 24/01/02	SHEET 1 OF 5



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

DEPTH (m)	GEOLOGICAL DESCRIPTION			FORMATION/AGE	CASING
	From	To	GRAPHIC LOG	ROCK/SEDIMENT NAME	
18	20		CLAYEY SAND	Dark yellowish orange overall. Mottled clayey sand. Sample is micaceous.	
20	22		SANDY CLAY	Dark yellowish orange overall. Sandy clay. Sample is rollable and micaceous.	
22	27		GRAVEL / SAND	Light brown silty sandy clayey gravel. Sand / gravel is fine sand (0.06mm) to medium gravel (up to 10mm). Grains are clear, milky white, pale yellow and pale orange quartz grains. Grains are sub-rounded to angular (for all grain sizes). Approximately 70% fine to medium gravel and 20% fine to medium sand (only small percentage of coarse sand). Stiff grey clay from around 22m. Lost circulation at 26m.	
27	30		GRAVEL / SAND	Greyish orange silty clayey gravelly sand. Sample is micaceous. Sand and gravel as above.	
30	33		SAND / GRAVEL / CLAY	Moderate brown to moderate red overall. Interbedded clayey gravelly sand. Gravel and sand as above. Sample is sticky and slimy (perhaps due to drilling mud).	
33	36		CLAY / SAND	Moderate reddish greyish orange overall. Moderate red hard plastic clay interbedded with grey silty sand and sandy clay. Introduction of fine (0.06-0.2mm) yellowish orange sand. Only small percentage of gravel as above.	
36	39		CLAYEY SAND	Light brown silty clayey sand. Sand is fine (0.1 to 0.15mm approximately). Sample is soft, rollable and micaceous. Sample also contains a very small percentage of gravel.	
39	40.8		CLAYEY SAND	Dark yellowish orange silty clayey fine sand. Sample is micaceous but not rollable.	



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GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

				PROJECT: NAP-Observation Network			
				PERMIT No. 56851			
				UNIT No. 6628 – 20730 (MPA 155)			
Hundred: Munno Para				Adj. Sec: 3900			
DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Depth Core Sample	CASING
40.8	45		SAND	Dark yellowish orange to greyish orange overall. Fine (predominantly) to medium quartz sand. Grains are clear, pale yellow and pale orange in colour. Grains are sub-rounded to sub-angular in shape. Sample is micaceous and contains a small percentage of clay.			
45	48		SAND	Dark yellowish orange to greyish orange overall. Fine (predominantly) to medium quartz sand. Grains are clear, pale yellow and pale orange in colour. Grains are sub-rounded to sub-angular in shape. Sample is micaceous and contains a small percentage of clay.			
48	51		SAND	Same as above, without clay.	CARISBROOKE SAND (Quaternary)		
51	54		SAND	Dark yellowish orange overall. Fine sand (0.06mm) to medium gravel (up to 8mm). Predominantly (approximately 70%) medium sand (0.2 – 0.6mm), sub-rounded to sub-angular. Smaller percentage of fine to medium gravel. Grains of quartz in all sizes are clear, milky white, pale yellow and pale orange (iron stained) in colour.			
54	60		SAND / GRAVEL	Dark yellowish orange overall. Same as above, with slightly higher percentage of gravel.			
60	63		SAND / GRAVEL	Dark yellowish orange overall. Predominantly fine to medium quartz sand and fine gravel (up to 6mm). Grains are sub-rounded to sub-angular in shape and clear, milky white, pale yellow and pale orange (iron stained) in colour. Small amount of grey clay in sample. Sample is non calcareous.			
63	64		SAND / GRAVEL				SHEET 3 OF 5



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 56851						
UNIT No. 6628 – 20730 (MPA 155)						
Hundred: Munno Para Adj. Sec: 3900						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	DEPTH Core Sample	CASING
From	To				(mm)	Dia (mm) From To (m)
64	67	SAND / GRAVEL / LIMESTONE / SHELLS	Moderate brown overall. Fine sand and gravels as above with pale yellow and light grey weak (crumble under fingers) limestone / sandstone. Sample also contains loose shells (bryozoal up to 3mm). Sample is calcareous.	HALLETT COVE SANDSTONE / DRY CREEK SAND (Tertiary)		
67	68.5	LIMESTONE / SAND / GRAVEL / SHELLS	Same as above, including sand, gravels and shells. Higher percentage of limestone.			
68.5	70	LIMESTONE / GRAVEL / SHELLS	Pale yellowish poorly cemented weak limestone and light grey moderately cemented fossiliferous limestone (reasonably hard). Sample also containing fine quartz gravel (2-4mm). Gravel is sub-rounded to angular in shape and clear, milky, pale yellow and pale orange in colour. Sample also contains an abundance of shells, up to 5mm in size.			
70	73	SANDY LIMESTONE / SHELLS	Greyish orange overall. Light grey moderately cemented fossiliferous limestone. Limestone is moderately hard to break. Sample also contains fine to medium sand and fine gravel, which is believed to be the product of drilling weak poorly cemented sandy limestone and contamination from Hallett Cove Sandstone and Dry Creek Sand.	UPPER PORT WILLUNGA FORMATION (Tertiary)		
73	74.5	LIMESTONE	Moderate brown overall. Pale yellowish orange sandy limestone, reasonably soft. Light grey fossiliferous limestone, moderately hard. Sample contains an abundance of shells (up to 7mm) and fine quartz gravel (2-4mm) assumed to be contamination from above interval.			
74.5	76	LIMESTONE	Same as above with higher content of greyish limestone. Sample is also contaminated with loose shells from above.			
76	77	LIMESTONE	Dark yellowish brown overall. Sandy limestone. Same as above.			



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WATER WELL LOG
CONTINUATION SHEET

PROJECT: NAP-Observation Network								
PERMIT No. 56851								
UNIT No. 6628 – 20730 (MPA 155)								
Hundred: Munno Para Adj. Sec: 3900								
DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Depth Core Sample Dia (mm)	CASING Dia (mm)	From To (m) (m)
77	79		CLAY	Bluish grey sticky plastic fossiliferous clay.	MUNNO PARA CLAY (Tertiary)			
79	82.6		CLAY	Dusky bluish grey clay with small percentage of sand from above interval. Limestone bar approximately 80.6 ⇒ 81.4m inferred from geophysical log.				
82.6	100		LIMESTONE	Medium dark grey overall. Light grey and bone white, soft, moderate to well cemented fossiliferous glauconitic limestone. Sample also contains moderately hard pieces of limestone and miscellaneous shells. Bryozoal up to 5mm present.	LOWER PORT WILLUNGGA FORMATION (Tertiary)			



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GROUNDWATER PROGRAM WATER WELL LOG

GROUNDWATER PROGRAM													
WATER WELL LOG													
AQUIFER SUMMARY			Coordinates: E 277800.4 N 6165481.7 El. Surface(m): 18.749 El. Ref. Point(m): 19.014 Datum: GDA 94			INTERVAL (m) From To N/A 32.91			SUPPLY L/sec ≈ 4 56 76				
									GEOLOGICAL DESCRIPTION				
DEPTH (m)	GRAPHIC LOG		ROCK/SEDIMENT NAME								FORMATION/AGE		
From	To									Depth Core Sample	CASING		
0	3			TOPSOIL	Dark brown sandy topsoil. Micaceous.						208	From To (m) (m)	
3	4			SANDY LOAM	Moderate brown overall. Fine to medium sandy loam. Calcretey and Micaceous.						142	495493	
4	9			CLAY	Light brown gritty clay. Small percentage of fine sand. Very rollable. Somewhat calcretey.								
9	12			CLAY	Pale reddish brown overall. Reddish brown and grey clays. Slightly gritty and very sticky when wet. Nice and rollable, and also containing calcrite.								
12	15			CLAY / GRAVEL	Moderate red and light grey clays. Small percentage of fine quartz gravel (2-6mm). Grains are clear and milky in colour. Sample is rollable and forms thin sheets when dry.								
15	18			CLAY	Light red and light grey clays. Clays are only slightly gritty yet sticky when wet. Sample is rollable.								
18	21			CLAY	Moderate orange, light pinkish and light grey clays. Good clean sample of clay, no grit. Sample dried into thin sheets.								
REMARKS: CASING:			0 to 3 m (PVC, 208 mm ID - gravity cemented) -0.3 to 56 m (PVC class 12, 142 mm ID - pressure cemented 0 – 56m) OPEN HOLE: 56 to 76 m (Drilled with 198mm bit)						DRILL TYPE: Auger, Rotary			COMPLETED: 76	
									DRILL FLUID: Mud			LOGGED BY: M STADTER	
												DATE: 1/2/02	
												SHEET 1 OF 4	



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

DEPTH (m)	GEOLOGICAL DESCRIPTION			FORMATION/AGE	Depth Core Sample	CASING		
	From	To	GRAPHIC LOG			Dia (mm)	From (m)	To (m)
21	24.8		CLAY	Pale red and light grey clays. Same as above.				
24.8	27		CLAYEY SAND	Light greyish orange clayey sand. Fine to medium, sub-rounded to sub-angular quartz sand. Grains are clear and off-white when washed. Sample is micaceous.				
27	30		SAND	Greyish orange overall. Sand is fine to medium, sub-angular (predominantly) to sub-rounded quartz grained. Grains are clear, pale white and yellow in colour. Sample is micaceous.	CARISBROOKE SAND (Quaternary)			
30	33		SAND	Very pale orange overall. Sand is fine to medium (~0.2mm) sub-rounded to sub-angular quartz grained. Grains are clear, milky, yellow and orange in colour.				
33	36		SAND	Very pale orange and very light grey overall. Same as above.				
36	39		SAND	Greyish orange overall. Same as above. Higher percentage of bright orange sand.				
39	40.8		SAND	Dark yellowish orange. Predominantly yellow and orange sand as above. Non-calcareous.				
40.8	44.4		LIMESTONE / SAND	Dark yellowish orange overall. Sands to approximately 44m, and hard moderately well cemented yellow to off-white limestone (not very fossiliferous). Sample also contains fine quartz gravel (2-6mm). Calcareous.	UPPER PORT WILLUNGA FORMATION (Tertiary)			
44.4	48		CLAY	Bluish dark grey clay. Sticky and very plastic. Fossiliferous. Small amounts of yellow limestone.	MUNNO PARA CLAY (Tertiary)			
48	51		CLAY	Dark bluish grey and orange clay with limestone. Same as above. Limestone bars 48.4 ⇒ 49.6m and 50.2 ⇒ 51m inferred from geophysical log.				



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 56852						
UNIT No. 6628 – 20731 (PTG 83)						
Hundred: Port Gawler Adj. Sec: 99						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASING
From	To		From	To	Depth Core Sample (mm)	Dia (mm) From (m) To (m)
51	52.4	CLAY / LIMESTONE	Bluish grey clay with grey fossiliferous limestone. Limestone is poorly cemented. Sample also contained limey sand, which looked like the product of drilling. Bryozoal fragments present.			
52.4	57	LIMESTONE	Moderate grey overall. Light grey to bone coloured limestone when dry. Limestone is fossiliferous, well cemented and quite hard. Fossils include bryozoal as well as miscellaneous sea sponges.			
57	60	LIMESTONE	Light grey limestone, poorly cemented and easily broken. Sample contains numerous shells and an abundance of fine lime, which may be a product of drilling.			
60	63.5	LIMESTONE / SAND	Light grey to off-white overall. Soft and hard grey limestone. Introduction of medium to coarse (approximately 0.7mm) sub-rounded to sub-angular grained quartz sand.		LOWER PORT WILLUNGA FORMATION (Tertiary)	
63.5	67	LIMESTONE / SAND	Light olive grey overall. Well-cemented grey limestone with poorer cemented olive to pale yellow limestone (relatively easy to break). Very small amount of quartz sand. Sample is fossiliferous with an abundance of bryozoal.			
67	70	LIMESTONE / SAND	Medium dark grey overall. Moderate to well cemented grey and olive grey limestone. Soft and quite hard (angular from being cut) pieces. Very fossiliferous sample containing bryozoal, fan shaped shells and small dome like shells. Small amount of fine to medium, sub-rounded to sub-angular quartz sand.			
70	72.5	LIMESTONE / SAND	Medium grey fossiliferous limestone. Limestone is hard and well cemented. Small amount of fine to medium, sub-rounded to sub-angular quartz sand.			



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GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

PROJECT: NAP-Observation Network									
PERMIT No. 56852									
UNIT No. 6628 – 20731 (PTG 83)									
Hundred: Port Gawler		Adj. Sec: 99							
DEPTH (m)		GRAPHIC LOG		ROCK/SEDIMENT NAME		GEOLOGICAL DESCRIPTION		FORMATION/AGE	
From	To							Depth Core Sample	CASING
DEPTH (m)		GRAPHIC LOG		ROCK/SEDIMENT NAME		GEOLOGICAL DESCRIPTION		Depth Core Sample	CASING
From	To							Depth Core Sample	CASING
72.5	75	LIMESTONE / SAND		Medium grey / olive overall. Moderate grey and pale yellowish grey limestone. Limestone is fossiliferous and moderate to well cemented. Sample also contained loose bryozal and a small amount of fine to medium, sub-rounded to sub-angular quartz sand.				Depth Core Sample	CASING
75	76	LIMESTONE / SILT		Olive grey overall. Moderate grey well cemented limestone and olive to light grey marly silt. Sample also contained a small amount of fine to medium, sub-rounded to sub-angular quartz sand.				Depth Core Sample	CASING



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GROUNDWATER PROGRAM WATER WELL LOG

GROUNDWATER PROGRAM										
WATER WELL LOG										
 The Department of Water, Land and Biodiversity Conservation		PROJECT: NAP-Observation Network PERMIT No. 56847 UNIT No. 6628 – 20732 (PTG 84) Hundred: Port Gawler Adj. Sec: 174								
AQUIFER										
		DEPTH TO WATER CUT (m)	STANDING WATER (m)	INTERVAL (m)			SUPPLY		TOTAL DISSOLVED SOLIDS	
SUMMARY		N/A	13.32	From 50 To 70	To 70	L/sec ≈ 4 - 5	Test length 1 hour 25 mins	Method Airlifting	mg/L 1010	Analysis No. 495498
				GEOLOGICAL DESCRIPTION				FORMATION/AGE	CASING	
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME						Depth Core Sample	Depth Casing	
From	To							Core Sample (mm)	Casing Dia (mm)	
0	3	TOPSOIL	Moderate brown gritty clayey topsoil. Sample is micaceous and calcareous.	Recent	208	0	3			
3	6	SAND / CLAY / GRAVEL	Clayey gravelly sand to gravelly clayey sand. Moderate reddish orange and light grey overall. Sand is fine to medium grained (0.06 to 0.6mm) quartz, sub-rounded to sub-angular. Gravel is medium grained (8-15mm) sub-angular to angular quartz. Sample is soft and rollable (yet not sticky) and micaceous.		142	-0.2	50			
6	9	CLAY / SAND	Pale red and light grey overall. Pale red clay interbedded with light grey fine to medium quartz sand. Grains are sub-rounded predominantly to sub-angular. Grains are also generally clear. Sample isn't rollable and definitely not sticky. Sample is micaceous.	HINDMARSH CLAY (Quaternary)						
9	13	CLAYEY SAND	Moderate reddish orange, bright orange and light grey clayey sand. Sample is the same as above with higher percentage of light grey sand. Sample is also micaceous.							
13	15	SAND	Bright orange and bone white overall. Sand is fine to medium grained, sub-rounded to sub-angular quartz. Grains are clear, milky and pale orange predominantly.							
REMARKS: CASING:				0 to 3 m (PVC, 208 mm ID - gravity cemented) -0.2 to 50 m (PVC class 12, 142 mm ID - pressure cemented 0 – 50m) 50 to 70 m (Drilled with 140mm roller bit)	DRILL TYPE: Auger, Rotary	COMPLETED: 70				
OPEN HOLE:				DRILL FLUID: Mud	LOGGED BY: M STADTER					
REMARKS: DRILLING:				0 - 3 m drilled with 225mm bit. 0 – 51 m drilled with 200 mm bit. Total loss of circulation by 51 m. Decided to case to 50m, and drill on production interval. 50 – 70 was drilled with 140mm roller bit (through cement plug).	DATE: 6/2/02					
				SHEET 1 OF 4						



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network										
PERMIT No. 56847										
UNIT No. 6628 – 20732 (PTG 84)										
Hundred: Port Gawler Adj. Sec: 174										
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION			FORMATION/AGE	Depth Core Sample	Dia (mm)	CASING	
From	To		From	To			(mm)	(m)	(m)	
15	21	SAND	Dark yellowish orange overall. Fine (0.06-0.2mm) predominantly to medium quartz sand. Grains are sub-rounded to sub-angular and clear, milky, pale orange and orange in colour. Sample also contains a very small percentage of clay and is micaceous. Sample is not rollable.							
21	24	SAND / CLAY / GRAVEL	Clayey gravelly sand. Greyish orange overall. Sand as above with light grey clay and gravel. Sample is micaceous and only just rollable. Gravel is fine to medium (5-8mm) grained, sub-angular quartz. Gravel is generally clear and milky in colour. Presumably interbedded.							
24	28	CLAYEY SAND	Pale yellowish orange overall. Fine (0.06-0.2mm) predominantly to medium grained sub-rounded to sub-angular quartz sand. Grains are clear, milky, pale yellow and orange in colour. Small percentage of light grey clay. Sample is micaceous and is only just rollable.							
28	33.6	SAND	Pale yellowish orange overall. Bright yellow and light grey sands. Sand is fine to medium grained sub-rounded to sub-angular quartz. Grains are clear, milky and pale yellow in colour. Hard bar from 33.2 ⇒ 33.6m inferred from geophysical log. Non calcareous.			CARISBROOKE SAND (Quaternary)				
33.6	35	CLAY	Clay is quite hard, darkish grey clay and dried into clumps. It is believed to be the thinning of the formation, near the Munno Para Clay limit. Calcareous.			MUNNO PARA CLAY (Tertiary)				
35	36	LIME / SILT / SHELLS / CLAY	Pale olive and pale yellow overall. Sample is a mixture of intervals including clay, silt, lime and a small amount of sand from above. Lime is off-white to bone in colour and is very friable or crumbly. Sample also contains corals (sponges) and bryozoal (up to 4mm).			LOWER PORT WILLUNGA FORMATION (Tertiary)				



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network							
PERMIT No. 56847							
UNIT No. 6628 – 20732 (PTG 84)							
Hundred: Port Gawler Adj. Sec: 174							
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASTING	
			From	To		Core Sample	Dia (mm)
36	39	SANDY LIMESTONE	Pale yellow sandy limestone. Very weak. Crushable with fingers under hardly any pressure. Sand is fine (generally less than 0.2mm).				
39	42	LIMESTONE	Dark yellowish orange overall. Very weak sandy limestone. Quartz grains are fine to medium in size (less than 0.5mm) Quite breakable. Bryozoa up to 3mm present.				
42	45	LIMESTONE	Moderate yellow overall. Dark yellowish orange sandy limestone, easily breakable as above. Also pale yellow to off white glauconitic limestone. Moderately cemented. Breakable (reasonably). Bryozoa up to 5mm present.				
45	51	N/A	NO RETURN – TOTAL LOSS OF CIRCULATION.				
51	54	LIMESTONE	Yellowish grey overall. Poorly cemented olive and yellow fossiliferous limestone as well as moderately cemented grey fossiliferous limestone. Both are generally breakable.				
54	57	LIMESTONE	Medium light grey overall. Mixture of poorly cemented yellowish grey limestone as above and harder, well-cemented bluish grey fossiliferous limestone.				
57	60	LIMESTONE	Medium grey overall. Moderate to well cemented limestone. Generally breakable.				
60	63	LIMESTONE	Light olive grey overall. Moderate to well cemented grey limestone. Soft to hard pieces present in sample. Very small percentage of shell fragments (bryozoa) in sample.				
63	66	LIMESTONE	Greenish grey overall. Grey and some bluue grey, moderately well cemented limestone. Quite breakable, not very fossiliferous.				



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WATER WELL LOG
CONTINUATION SHEET

PROJECT: NAP-Observation Network		PERMIT No. 56847		UNIT No. 6628 – 20732 (PTG 84)		Hundred: Port Gawler Adj. Sec: 174	
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	Depth Core Sample	CASING
From	To					Dia (mm)	From (m) To (m)
66	69	LIMESTONE	Dark greenish grey overall. Olive green and pale olive yellow poorly cemented fossiliferous limestone. Limestone is quite weak and easily broken.				
69	70	SANDY LIMESTONE	Light olive grey overall. Light olive / pale grey and dark marly olive fossiliferous limestone. Limestone is poorly cemented, quite soft and easily broken. Sample also contained olive marly sand, may be product of drilling.				



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GROUNDWATER PROGRAM
WATER WELL LOG

UNIT No. 6628 – 20733 (MPA 156)

Hundred: Munno Para Adj. Sec: 3296

PROJECT: NAP-Observation Network															
PERMIT No. 56848															
TOTAL DISSOLVED SOLIDS															
Analysis No.															
AQUIFER	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL (m)	SUPPLY											
From	To	From	To	L/sec	Test length	Method									
SUMMARY	N/A	30.45	84	100	≈ 5	2 hours									
						Airlifting									
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION			FORMATION/AGE									
From	To					Recent									
0	3	TOPSOIL	Dark reddish brown sandy clayey topsoil.												
3	6	CLAY	Moderate brown sandy clay. Rollable and sticky when wet. Sample is micaceous.												
6	9	CLAY	Moderate reddish brown overall. Very sticky and only slightly gritty clay. Sample is rollable and micaceous.												
9	12	CLAY	Moderate reddish orange sticky clay. Sample is very rollable.												
12	15	SANDY CLAY	Moderate reddish orange overall. Silty gritty clay with small amount of coarse sand (0.6 – 2mm in diameter). Sample is micaceous but not overly rollable.												
15	18	CLAY	Moderate reddish orange gritty sandy clay. Sample is rollable and micaceous. Sand is medium to coarse (0.2 to 2mm), sub-rounded to sub-angular quartz grained.												
REMARKS: CASING:															
0 to 1.8 m (PVC, 208 mm ID – gravity cemented) - 0.1 to 84 m (PVC class 12, 142 mm ID - pressure cemented 0 – 84m)															
OPEN HOLE:	84 to 100 m (Drilled with 200mm bit)														
REMARKS: AIRLIFTING :	Airlifting produced approximately 50mm of sand in 20L container, further development required.														
GEOPHYSICS :	Gamma / Neutron log was adjusted by Don Freebairn as these were non coherent with Induction log.														
DRILL TYPE: Auger, Rotary															
COMPLETED: 100															
DRILL FLUID: Mud	LOGGED BY: M STADTER														
DATE: 8/2/02	SHEET 1 OF 5														



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 56848						
UNIT No. 6628 – 20733 (MPA 156)						
Hundred: Munno Para Adj. Sec: 3296						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASING
From	To		From	To	Core Sample (mm)	Depth (m)
18	21	SAND / GRAVEL / CLAY	Moderate reddish orange overall. Grey clay interbedded with coarse sand to fine gravel (0.6-2mm). Grains are sub-rounded to sub-angular and clear to pale yellow (with minor mafic) in colour. Sample is micaceous.			
21	24	CLAY	Pale yellowish brown overall. Silty gritty brown and grey clay. Sample is somewhat sticky but not rollable. Sample contains coarse sand as above.			
24	27	CLAY	Moderate yellowish brown overall. Same as above without grit or sand. Sample is only just rollable.			
27	28.8	GRAVEL / SAND	Light brown overall. Coarse sand to predominantly gravel. Gravel is fine to medium (2mm up to 10mm in diameter) in size and sub-rounded to angular in shape. Grains are clear, white, pale yellow, orange and mafic in colour. Sample is micaceous.			
28.8	34.4	GRAVEL	Moderate yellowish brown sandy gravel. Coarse sand and fine to medium gravel as above. Gravel consists of quartz and sandstone.			
34.4	38	GRAVELLY CLAY	Dark yellowish orange overall. Gravelly sandy clay. Gravel is medium to coarse (6-20mm) in size and consists of angular pieces of quartz. Sand is fine to medium in size. Sample is rollable and micaceous. Clay layer 34.4 ⇒ 36.0 m inferred from geophysical log.			
38	40.8	SANDY CLAY	Dark yellowish orange sandy clay. Sample consists of yellowish orange and grey mottled clays. Clays are micaceous and very rollable. Sand is fine to medium grained.			
40.8	45	CLAYEY SAND	Pale yellowish orange clayey sand. White, off-white and yellow quartz sands. Grains are fine to medium in size and sub-rounded to sub-angular in shape.			



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PROJECT: NAP-Observation Network						
PERMIT No. 56848						
UNIT No. 6628 – 20733 (MPA 156)						
Hundred: Munno Para Adj. Sec: 3296						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASING
From	To		From	To	Depth Core Sample (mm)	Dia (mm) From To (m) (m)
45	48	SAND / GRAVEL	Dark yellowish orange overall. White, off-white and yellow quartz sands. Grains are fine to coarse in size and sub-rounded to sub-angular in shape. Sample also contains fine quartz gravel (2-6mm), which is also sub-rounded to sub-angular.			
48	50	SAND	Bright yellow, orange and white quartz sands. Sand is fine to medium in size (approximately 0.2mm predominantly) and sub-rounded to sub-angular in shape. Grains are clear, milky and pale yellow in colour. Sample is micaceous.			
50	52	SANDY CLAY	Bright yellow and orange sands as above, interbedded with light olive and medium grey clays. Sample is rollable but not overly sticky.			
52	54	SAND / CLAY	Bright yellow, orange and white sands as above (fine to medium and sub-rounded to sub-angular) and medium grey clay. Clay is rollable and very plastic. Presumably interbedded.			
54	57	CLAY / SAND	Yellowish grey overall. Same as above, with higher percentage of grey plastic clay. Sands are fine to medium and sub-rounded to sub-angular. Sample is very rollable. Presumably interbedded.			
57	59.2	CLAY / SAND	Yellowish grey overall. Hard plastic and rollable grey clay and fine to medium yellow and white quartz sands. Sample is micaceous. Presumably interbedded.			
59.2	64	SANDY GRAVEL	Yellowish grey overall. Fine to medium yellow and white sands and fine to medium quartz and sandstone gravel. Small percentage of coarse gravel up to 30mm.			
64	67.4	SAND	Yellowish grey clayey sand. Bone white and pale yellow fine to medium quartz sands. Grains are sub-rounded to sub-angular. Sample is micaceous and non calcareous.			



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WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 56848						
UNIT No. 6628 – 20733 (MPA 156)						
Hundred: Munno Para Adj. Sec: 3296						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	DEPTH Core Sample	CASING
From	To				Dia (mm)	Front To (m)
67.4	69.2	CLAY	Stiff grey clay, non-sticky, almost brittle when dry. Non calcareous.	UPPER PORT WILLUNGA FORMATION (Tertiary)		
69.2	72	SAND / SHELLS / LIMESTONE	Moderate yellowish brown overall. Fine quartz sand less than 0.2mm in diameter. Miscellaneous shell fragments (bryozoal) and moderately cemented greyish orange limestone. Sample is calcareous.			
72	74	LIMESTONE / SHELLS	Light grey and greyish orange overall. Moderately cemented greyish orange fossiliferous limestone. Limestone is breakable. Sample contains miscellaneous shells (bryozoal).	MUNNO PARA CLAY (Tertiary)		
74	76	LIMESTONE	Light grey and orange overall. Silty limestone. Pale yellowish orange sandy fossiliferous limestone. Limestone is moderately to mostly well cemented, containing minor mafic grains. Pieces up to 15mm present. Sample also contains light grey moderate to well cemented limestone with minor glauconite.			
76	78.4	CLAY	Medium grey overall. Dark bluish grey sticky plastic clay. Small amounts of grey limestone with minor glauconite.	LOWER PORT WILLUNGA FORMATION (Tertiary)		
78.4	85	LIMESTONE	Light olive grey silty marly limestone. Pale yellow and grey moderately well cemented limestone. Sample contains miscellaneous shells and is a little sticky when wet.			
85	88	LIMESTONE SHELLS	Medium light grey overall. Silty marly limestone. Pale olive and light grey moderate to well cemented glauconitic limestone. Sample a little sticky.			
88	91		Medium light grey overall. Silty sandy limestone. Pale olive yellow sandy limestone. Limestone is moderate to well cemented (only just breakable under fingers). Sample contains loose shells (predominantly sponges) up to 5mm and loose quartz grains up to 1mm.			



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CONTINUATION SHEET

PROJECT: NAP-Observation Network			
PERMIT No. 56848			
UNIT No. 6628 - 20733 (MPA 156)			
Hundred: Munno Para Adj. Sec: 3296			
DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK/SEDIMENT NAME
91	94		LIMESTONE / SHELLS
94	97		LIMESTONE / SHELLS / SAND
97	100		LIMESTONE / SHELLS
GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASING
From	To	Depth Core Sample Dia (mm)	From To (m) (m)

Dark grey overall. Same as above with introduction of greenish black well cemented glauconitic limestone.

Medium dark grey overall. Light greyish olive moderate to well cemented limestone. Limestone is quite hard. Sample contains an abundance of broken shell fragments (bryozoal up to 8mm) and small percentage of clear quartz grains up to 2mm.

Medium grey overall. Marly limestone. Light greyish olive moderate to well cemented limestone. Limestone is quite hard. Sample contains an abundance of broken shell fragments (bryozoal up to 8mm).



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GROUNDWATER PROGRAM WATER WELL LOG

PROJECT: NAP-Observation Network																
PERMIT No. 57452																
UNIT No. 6628 – 20734 (MPA 157)																
Hundred: Munno Para Adj. Sec: 3055																
GROUNDWATER PROGRAM																
WATER WELL LOG																
The Department of Water, Land and Biodiversity Conservation		Coordinates: E 280471.9 N 6158815.8		El. Surface(m): 16.248		El. Ref. Point(m): 16.505		Datum: GDA 94								
AQUIFER	DEPTH TO WATER CUT (m)		DEPTH TO STANDING WATER (m)		INTERVAL (m)		SUPPLY		TOTAL DISSOLVED SOLIDS							
	From	To	From	To	1/sec	5	Test length	Method	mg/L	Analysis No.						
SUMMARY	N/A		29.39		96 120		1hour 10mins		1726							
										496264						
DEPTH (m)	GRAPHIC LOG		ROCK/SEDIMENT NAME		GEOLOGICAL DESCRIPTION				FORMATION/AGE		Depth Core Sample	CASING				
From	To									Recent		Dia (mm)	Front (m)	To (m)		
0	4			TOPSOIL		Moderate brown clayey, sandy topsoil. Micaceous. A little sticky when wet and also contains calcrete.						208	0	2		
4	6			SANDY CLAY		Reddish brown sandy clay. Reasonably rollable and micaceous. Sample is sticky when wet and also contains calcrete.						142	-0.3	96		
6	9			CLAY		Mottled greyish red silty gritty clay. Sample is only just rollable and sticky when wet. Contains calcrete as above.										
9	15			CLAYEY SAND		Moderate yellowish brown clayey sand. Fine to medium sand, predominantly sub-rounded to sub-angular. Micaceous. Greyish clay only just rollable. Sample is non calcareous.				HINDMARSH CLAY (Quaternary)						
15	18			SAND		Moderate yellowish brown overall. Fine to medium sand, predominantly sub-rounded to sub-angular. Very micaceous. Grains consist of clear to pale yellow quartz. Sample isn't rollable.										
REMARKS: CASING:										0 to 2.0 m (PVC, 208 mm ID - gravity cemented) -0.3 to 96 m (PVC class 12, 142 mm ID - pressure cemented 0 – 96m) 96 to 120 m (Drilled with 200mm bit)				DRILL TYPE: Auger, Rotary	COMPLETED: 120	
OPEN HOLE:										DRILL FLUID: Mud				LOGGED BY: M STADTER		
REMARKS: DRILLING :										Well was apparently drilled to 118m, geophysical log shows 120m as total depth. This could be due to a miscalculation with drilling (eg Kelly bit). Subsequent geophysical log (21/4/02 TD 115.15m) matches original log (see file).				DATE: 12/02/2002		
														SHEET 1 OF 5		



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CONTINUATION SHEET**

PROJECT: NAP-Observation Network

PERMIT No. 57452

UNIT No. 6628 = 20734 (MPA 157)

Hundred: Munno Para Adj Sec: 3055

GEOLOGICAL DESCRIPTION				FORMATION/AGE	DEPTH Core Sample	Dia (mm)	From (m)	To (m)	CASING
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME							
From	To								
18	20.4	SAND / GRAVEL	Moderate yellowish brown overall. Fine to medium quartz sand, predominantly sub-rounded to sub-angular. Small percentage of coarse sand to fine gravel and even smaller percentage of medium gravel (up to 10mm). Quartz and sandstone gravel.						
20.4	24	CLAYEY SAND	Moderate yellowish brown clayey sand. Fine to medium quartz sand, predominantly sub-rounded to sub-angular as above. Micaceous. Rollable.						
24	27	CLAY	Pale reddish brown overall. Pale red and light grey mottled clays. Very sticky when wet and rollable. Sample not very gritty and dried into thin sheets.						
27	29.2	CLAY	Moderate reddish brown overall. Same as above, with higher concentration of red clay.						
29.2	33	CLAYEY SAND	Moderate yellowish brown clayey sand. Pale red clay from above interbedded with grey fine to medium quartz grained sand. Predominantly sub-rounded to sub-angular. Micaceous.						
33	35.2	SAND / GRAVEL / CLAY	Greyish orange overall. Interbedded clayey gravelly sand and sandy gravelly clay. Mottled pale red and grey clays. Sand is fine to medium grey and orange sands. Small percentage of fine (predominantly) to medium quartz gravel (up to 15mm).						
35.2	39.6	CLAY	Moderate yellowish brown silty sandy clays. Rollable and sticky when wet. Micaceous.						
39.6	41.2	CLAYEY SAND	Dark yellowish orange clayey sand. Fine to medium, sub-rounded to sub-angular quartz grained sand and orange and grey mottled clays (micaceous).						
41.2	46	CLAY	Very pale orange gritty clay. Very rollable (almost plastic). Micaceous.						



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CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 57452						
UNIT No. 6628 – 20734 (MPA 157)						
Hundred: Munno Para Adj. Sec: 3055						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASING
From	To		From	To	Core Sample (mm)	Depth (m)
46	48	CLAYEY SAND	Pale yellowish orange clayey sand. Off white to grey, fine to medium grained sand. Grains are predominantly sub-rounded to sub-angular quartz grains. Small amount of grey clay as above.			
48	52	SAND / GRAVEL	Dark yellowish orange overall. Light grey and bright yellow quartz sands. Fine to medium, sub-rounded to sub-angular. Clear, milky and pale yellow coloured quartz grains. Sample also containing fine to medium, sub-rounded to sub-angular quartz gravel (up to 10mm). Gravel is clear, milky, pale yellow and pale orange in colour.			
52	53.2	CLAY	Reasonably hard grey clay. Depth inferred from geophysical log.			
53.2	60	SAND	Dark yellowish orange overall. Fine to medium quartz sand predominantly sub-rounded to sub-angular. Grains are clear and pale yellow in colour. Micaceous.			
60	64	SAND / GRAVEL	Dark yellowish orange overall. Fine to medium quartz sand predominantly sub-rounded to sub-angular. Grains are clear and pale yellow in colour. Small percentage of coarse sand to fine gravel. Gravel is also sub-rounded to sub-angular quartz, containing mafic coloured grains in addition to clear and pale yellow grains. Micaceous. Non calcareous.			
64	67	SHELLS / LIMESTONE	Medium grey overall. Moderately cemented grey to off white fossiliferous limestone. Sample containing an abundance of shells. Obviously calcareous.			
67	73	SHELLS / LIMESTONE	Medium grey overall. As above, with a higher percentage of shells.			
73	75	LIMESTONE / SHELLS	Light olive grey overall. Moderate to well cemented light grey fossiliferous limestone and loose shells. Sample also contains orange to brown clay.			



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WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 57452						
UNIT No. 6628 – 20734 (MPA 157)						
Hundred: Munno Para Adj. Sec: 3055						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASING
From	To		From	To	Depth Core Sample (mm)	Dia (mm) From (m) To (m)
75	79	LIMESTONE	Medium grey overall. Poor to moderately cemented fossiliferous limestone and loose shells (bryozoal up to 5mm). Sample also containing clay as above unit.		UPPER PORT WILLUNGA FORMATION (Tertiary)	
79	83.2	LIMESTONE	Medium grey to light olive overall. Moderately cemented grey fossiliferous limestone. Soft and harder pieces present. Fewer shells than above.			
83.2	91.2	CLAY	Medium grey overall. Bluish grey sticky plastic clay and moderate to well cemented light grey to light olive fossiliferous limestone with loose shells. Limestone bar 88.4 ⇒ 89.2m inferred from geophysical log.		MUNNO PARA CLAY (Tertiary)	
91.2	97	LIMESTONE	Medium light grey overall. Moderately cemented grey and off white glauconitic limestone. Sample also containing bryozoal and miscellaneous corals.			
97	103	LIMESTONE	Light grey overall. Moderately cemented grey limestone and moderate to well cemented off white limestone. Quite hard and glauconitic. Sea sponges, shells (bryozoal) and miscellaneous corals.		LOWER PORT WILLUNGA FORMATION (Tertiary)	
103	106	LIMESTONE	Light olive grey overall. Grey and light grey fossiliferous limestone. Moderate to well cemented medium to hard limestone. Sample containing spiral shaped shells (and clays from above intervals).			
106	109	LIMESTONE	Medium grey overall. Light grey limestone when dry. Well cemented and quite hard limestone with a decrease in fossil abundance. Only a small percentage of sea sponges evident. Sample is also clayey, as above, possibly due to contamination from other intervals.			
109	112	LIMESTONE	Medium grey / olive grey overall. Light grey to off white (bone) fossiliferous limestone, moderate to well cemented. Small percentage of quartz sand in sample.			



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network

PERMIT No. 57452

UNIT № 6628 - 20734 (MPA 157)

Hundred: Munne Para Δ di Ses: 3055

GEOLOGICAL DESCRIPTION				FORMATION/AGE			CASING		
DEPTH (m)		ROCK/SEDIMENT NAME		Depth Core Sample	Dia (mm)	From (m)	To (m)		
From	To	GRAPHIC LOG							
112	115	LIMESTONE	Medium olive grey overall. Light grey moderate to well cemented fossiliferous limestone. Small percentage of quartz sand and shells up to 12mm.						
115	120	LIMESTONE	Medium olive grey overall. Moderate to well cemented soft and hard fossiliferous limestone and softer sandy light grey limestone (micaceous).						



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GROUNDWATER PROGRAM
WATER WELL LOG

Coordinates: E 279850.4 N 6163286.8
El. Surface(m): 21.067

El. Ref. Point(m): 21.345
Datum: GDA 94

UNIT No. 6628 – 20735 (MPA 158)

Hundred: Munno Para Adj. Sec: 3027

PROJECT: NAP-Observation Network						
PERMIT No. 57535						
TOTAL DISSOLVED SOLIDS						
AQUIFER	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL (m)	SUPPLY		
SUMMARY	From To	From To	From To	Test length	Method	mg/L
	N/A	48.88	68 86	≈ 2 – 3	2 hours	Airlifting 567
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION			FORMATION/AGE
0	3	TOP SOIL	Dark reddish brown sandy clayey topsoil. Sample contains calcrite and is micaceous.			Recent
3	6	CLAY	Moderate reddish brown sandy clay and topsoil. Sample contains calcrite and is also micaceous. Sample is rollable and a little sticky when wet.			HINDMARSH CLAY (Quaternary)
6	9	CLAY	Moderate yellowish brown gritty calcrety clay. Sample is micaceous and sticky when wet. It is also nice and rollable and dried into sheets.			
9	12	CLAY	Moderate yellowish brown silty clay. Smooth and a little sticky when wet. Rollable but with low plasticity. Small percentage of calcrite present.			
12	15	CLAY	Pale reddish brown overall. Red and grey layered clays. Very sticky when wet, although not very rollable or plastic.			
15	18	CLAY	Moderate reddish brown overall. Same as above.			
REMARKS: CASING:			0 to 2 m (PVC, 208 mm ID - gravity cemented) -0.3 to 68 m (PVC class 12, 142 mm ID - pressure cemented 0 – 68m) 68 to 86 m (Assumed to be drilled with 200mm bit)			
OPEN HOLE:			I suspect the hole was only cleaned to casing depth prior to geophysical logging. This prevented geophysical logging to total depth. Drilling bit sizes (absent from schedule 8) should replicate MPA 157.			
REMARKS: DRILLING:			DATE: 14/2/02			
DRILL TYPE: Auger, Rotary			SHEET 1 OF 5			
DRILL FLUID: Mud			LOGGED BY: M STADTER			



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GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

DEPTH (m)		GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	CASING		
From	To					Depth Core Sample	Dia (mm)	From (m) To (m)
18	21		CLAYEY SAND	Pale red and light grey overall. Light grey fine to coarse grained (0.15 to 0.2mm) quartz sand. Grains are sub-rounded to sub-angular. Sample is interbedded with pale red clays and is micaceous.				
21	24		SAND / CLAY / GRAVEL	Greyish orange pink sandy gravelly clay to clayey gravelly sand. Sand from above interval interbedded with orange, brown and grey clays. Gravel is fine (up to 5mm) and consists of clear, milky, pale yellow and pale orange quartz. Sample is micaceous.				
24	27		CLAYEY SAND / GRAVEL	Greyish orange and pink clayey sand. Predominantly fine (0.1mm) to medium (0.6mm) sand interbedded with small amount of fine gravel, up to 6mm. Sand is predominantly sub-rounded. Gravel is sub-rounded to sub-angular. Quartz grains are clear, milky white, pale yellow and pale orange in colour. Sample is sticky and rollable.				
27	30		CLAYEY SAND / GRAVEL	Very pale orange and light grey clayey sand. Fine (0.1mm) to predominantly medium (0.6mm) sand interbedded with small amount of fine gravel, up to 6mm. Sand is predominantly sub-rounded. Gravel is sub-rounded to sub-angular. Quartz grains are clear, milky white, pale yellow and pale orange in colour. Sample is micaceous, only just rollable and not sticky.				
30	34		CLAY / SAND / GRAVEL	Light grey and greyish orange overall. Clayey sand to sandy clay. Fine (0.1mm) to predominantly medium (0.6mm) sand interbedded with small amount of fine gravel, up to 6mm. Sand is predominantly sub-rounded. Gravel is sub-rounded to sub-angular. Quartz grains are clear, milky white, pale yellow and pale orange in colour. Sample is rollable and micaceous but not overly sticky.				



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network								
PERMIT No. 57535								
UNIT No. 6628 – 20735 (MPA 158)								
Hundred: Munno Para Adj. Sec: 3027								
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	Depth Core Sample	CASING	
From	To		From	To	(mm)	(mm)	(m)	
34	38.5	CLAYEY SAND / GRAVEL	Greyish orange overall. Clayey sand. Grey plastic clay interbedded with fine to coarse sand and fine to medium gravel. Sand is sub-rounded to sub-angular and consists of clear, milky white, pale yellow and pale orange quartz grains. Gravel is sub-rounded to angular and consists of quartz and sandstone pieces up to 15mm. Sample is micaceous.		CARISBROOKE SAND (Quaternary)			
38.5	43	CLAYEY SAND / GRAVEL	Dark yellowish orange. As above. Higher percentage of sand than gravel. Clay assumed to be from 30-34m.					
43	46	SAND / GRAVEL	Dark yellowish orange overall. Fine to medium sub-rounded to sub-angular quartz sand. Clear, milky white, pale yellow and pale orange coloured grains. Small percentage of coarse sand to fine gravel (up to 4mm). Gravel consists of sub-rounded to angular quartz and sandstone. Very small percentage of clay (contamination from above). Sample is micaceous.		CARISBROOKE SAND (Quaternary)			
46	49	SAND / GRAVEL	Dark yellowish orange. Predominantly fine to medium sand, sub-rounded to sub-angular. Minor percentage of coarse sand up to 1mm. Very small percent of fine to medium gravel. Gravel consists of sub-rounded to angular quartz and greyish brown sandstone.					
49	55.4	SAND / GRAVEL	Pale yellowish orange overall. As above. Poor returns.		HALLETT COVE SANDSTONE / DRY CREEK SAND (Tertiary)			
55.4	56	CLAY	Light grey sandy clay and moderate red thick plastic clay (came up in large clumps). Non calcareous.					
56	57	SANDSTONE / SHELLS / SAND	Moderate brown reasonably consolidated non-calcareous sandstone. Sandstone is quite hard, but breakable. Sandstone consists of fine quartz grains (<0.2mm). Miscellaneous shell fragments, up to 3mm. Fine to medium sand as above.					



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 57535						
UNIT No. 6628 – 20735 (MPA 158)						
Hundred: Munno Para Adj. Sec: 3027						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASING
From	To		From	To	Depth Core Sample (mm)	Dia (mm) From (m) To (m)
57	59	LIMESTONE / SHELLS	Pale yellowish orange overall. Greyish orange weak poorly cemented sandy limestone. Miscellaneous shell fragments, up to 3mm.			
59	60	LIMESTONE / SHELLS	Dark yellowish orange overall. Greyish orange moderately cemented sandy limestone. Limestone is breakable (only just breakable under fingers). Very small percentage of shell fragments. Limey sand medium, product of drilling.	UPPER PORT WILLUNGA FORMATION (Tertiary)		
60	62	CLAY / LIMESTONE	Pale yellowish orange overall. Light grey plastic clay and greyish orange moderately cemented sandy limestone as above.	MUNNO PARA CLAY (Tertiary)		
62	64.4	CLAY / LIMESTONE	Medium bluish grey sticky clay. Olive grey moderate to well cemented glauconitic limestone. Miscellaneous shell fragments (bryozoal) up to 4mm. Limestone bar 62.2 ⇒ 63.2m inferred from geophysical log.			
64.4	67	LIMESTONE / SHELLS	Medium grey overall. Olive grey moderate to well cemented glauconitic limestone. Miscellaneous shell fragments (bryozoal) up to 4mm.			
67	70	LIMESTONE / SHELLS	Light olive well cemented fossiliferous and glauconitic limestone (quite hard to break). Light olive moderately cemented sandy limestone (reasonably breakable). Broken shell fragments up to 4mm.	LOWER PORT WILLUNGA FORMATION (Tertiary)		
70	73	LIMESTONE / SHELLS	Medium grey overall. Light olive grey well cemented fossiliferous glauconitic limestone (quite hard, not very breakable). Olive grey moderately cemented sandy limestone (quite breakable). Small percentage of shell fragments (bryozoal) up to 2mm.			
73	76	LIMESTONE / SHELLS	Medium light grey overall. Light olive grey moderately cemented glauconitic fossiliferous limestone (reasonably hard). Dark yellowish orange sandy moderate to well cemented limestone (quite hard to break). Miscellaneous shell fragments (sponges and bryozoal) up to 5mm.			



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GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

DEPTH (m)		GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Depth Core Sample	CASING
From	To					Dia (mm)	From (m) To (m)
76	79		LIMESTONE / SHELLS	Medium light grey overall. . Light olive grey moderately cemented glauconitic fossiliferous limestone (reasonably hard). Olive grey sandy limestone, moderately cemented containing mafic grains (quite breakable). Small percentage of clear quartz grains up to 2mm (may be product of drilling). Miscellaneous shell fragments (sponges and bryozoal) up to 5mm.			
79	82		LIMESTONE / SHELLS	Light olive grey overall. Dark yellowish orange sandy moderate to well cemented limestone (quite hard to break). Light olive grey fossiliferous glauconitic limestone, Moderate to well cemented (quite hard). Small percentage of shell fragments up to 2mm. Sample is slightly marly and sticky when wet.			
82	86		LIMESTONE / SHELLS	Medium grey overall. Light olive well cemented limestone containing mafic grains (very hard). Clear and iron stained grains of fine quartz gravel (up to 6mm). Minor shells (bryozoal). Sample is slightly marly and sticky when wet.			



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GROUNDWATER PROGRAM
WATER WELL LOG

Coordinates: E 275824.3 N 6159321.7 El. Surface(m): 8.85

El. Ref. Point(m): 9.155 Datum: GDA 94

AQUIFER		DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION				FORMATION/AGE	DEPTH Core Sample	CASING
From	To	DEPTH TO WATER CUT (m)	STANDING WATER (m)	INTERVAL (m)	From	To	L/sec	Test length	Method	mg/l	Analysis No.
0	2	N/A	29.507	78	96	4		1hour 30mins	Airlifting	761	496604
SUMMARY											
0	2		TOPSOIL	Moderate brown overall. Sandy clayey topsoil. Micaceous and calcrety.	Recent					208	0 1.9
2	6		CLAY	Greyish orange overall. Gritty light brown clay. Nice and rollable and sticky when wet. Micaceous and calcrety.						142	-0.3 78
6	9		CLAY	Yellowish brown overall. Mottled reddish brown, light orange and light grey clays. Reasonably rollable and sticky when wet. Small percentage of calcrite.							
9	10		SANDY CLAY	Greyish orange sandy clay. Sand consists of fine to medium, sub-rounded to sub-angular quartz grains. Not very sticky when wet and only just rollable. Very micaceous. Non calcareous. Presumably interbedded.							
10	12.6		SAND	Light grey medium to coarse sand. Grains are sub-rounded to sub-angular. Smaller percentage of fine sand. Grains are clear, pale white, pale yellow and pale orange in colour. Micaceous.							
12.6	14.4		SAND / GRAVEL	Yellowish grey overall. Medium to coarse sand as above interbedded with fine quartz gravel (up to 3mm). All grains predominantly sub-rounded to sub-angular. Clear, milky, pale yellow and pale orange grains. Micaceous.							
REMARKS: CASING:		0 to 1.9 m (PVC, 208 mm ID - gravity cemented) -0.3 to 78 m (PVC class 12, 142 mm ID - pressure cemented 0 - 79m) 79 to 96 m (Pressure cement approximately 1m below casing shoe from 78 - 79m)				DRILL TYPE: Auger, Rotary				COMPLETED: 96	
OPEN HOLE:		79 to 96 m (Pressure cement approximately 1m below casing shoe from 78 - 79m)				DRILL FLUID: Mud				LOGGED BY: M STADTER	
REMARKS: DRILLING:		0 to 94 m drilled with 200mm bit. 94 to 96 drilled with 140mm after casing.				DATE: 27/02/2002				SHEET 1 OF 4	



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GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

DEPTH (m)		GRAPHIC LOG		ROCK/SEDIMENT NAME		GEOLOGICAL DESCRIPTION		FORMATION/AGE		CASING	
From	To	From	To	From	To	From	To	Core Sample	Depth From (mm)	Dia (mm)	To (m)
14.4	28			CLAY		Moderate reddish brown and grey mottled clays. Reasonably rollable yet not overly sticky. Dried into thinly layered sheets. Micaceous. Calcrete evident from 15 – 18m.					
28	30			SAND		Light brown silty sand. Sand is fine to medium, sub-rounded to sub-angular quartz grained sand. Grains are clear, milky, pale yellow and pale orange. Micaceous. Non calcareous.					
30	31.6			SAND / GRAVEL		Greyish orange overall. Fine to medium sand from above with introduction of fine to medium gravel (up to approximately 10mm). Gravel consists of sub-rounded to angular, clear, milky and pale yellow quartz grains.					
31.6	38.8			CLAY		Light grey clay. Smooth (not much grit), but very hard clay. Not very sticky yet very rollable and moderate plasticity. Very small percentage of fine to medium sand. Possibly inter bedded.					
38.8	42			SAND		Greyish orange silty sand. Fine to medium grained (~ 0.2mm) quartz sand. Sub-rounded to sub-angular. Micaceous.					
42	45			SAND		Light greyish orange sand. Fine to medium grained, sub-rounded to sub-angular quartz sand. Clear, milky and pale yellow grains. Micaceous.					
45	48			SAND / GRAVEL		Light greyish orange sand as above with approximately 50% coarse sand to fine quartz gravel (up to 4mm). Gravel is predominantly sub-rounded to sub-angular.					
48	51			SAND		Greyish orange overall. Bright orange and grey fine to medium sands. Sub-rounded to sub-angular quartz grains. Clear, milky, pale yellow and pale orange grains. Micaceous.					
											SHEET 2 OF 4

PROJECT: NAP-Observation Network

PERMIT No. 57655

UNIT No. 6628 – 20759 (PTA 116)

Hundred: Port Adelaide Sec: ADJ 226
PT 95



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	CASTING		
					From	To	Depth Core Sample
51	53.2	SAND / GRAVEL	Dark yellowish orange and moderate greenish yellow sand. Fine to medium grained, sub-rounded to sub-angular quartz sand. Clear, milky, yellow, orange, olive and greenish grains. Sample also contained fine to medium quartz gravel (up to 10mm). Non calcareous.				
53.2	57	SANDSTONE / SHELLS / LIMESTONE	Light olive yellow overall. Fine sand (less than 0.2mm) predominantly sub-angular to sub-rounded. Clear and milky quartz grains. Micaceous. Pale yellow glauconitic sandstone. High percentage of shells (sea sponges and various corals up to 20mm). Introduction of light greyish poorly to medium cemented fossiliferous, glauconitic limestone. Quite breakable, obviously calcareous.	HALLETT COVE SANDSTONE / DRY CREEK SAND (Tertiary)			
57	60	SAND / GRAVEL	Light greyish orange to light brown overall. Approximately 50% fine to medium grained sub-rounded to sub-angular sand, interbedded with 50% coarse sand to fine quartz gravel (up to 4mm). Clear, milky, pale yellow, pale orange, light greyish and small amount of mafic grains. Shells (bryozoal) up to 5mm.				
60	64	LIMESTONE / SAND	Medium light grey overall. Fine to coarse grained sub-rounded to sub-angular sand. Clear, milky, pale yellow, pale orange, light greyish and small amount of mafic grains. Medium grey to light grey poor to medium cemented fossiliferous limestone. Abundance of shells (bryozoal) present. Sand may be product of drilling.	UPPER PORT WILLUNGA FORMATION (Tertiary)			
64	66	SANDY LIMESTONE	Light grey sandy limestone. Sand is fine to medium (up to 0.5mm) quartz sand, sub-rounded to angular. Limestone is light to medium grey, predominantly moderate to well cemented fossiliferous limestone. Bryozoal present.				
66	74	CLAY	Light olive grey overall. Bluish grey plastic fossiliferous clay with bars of poor to medium cemented light to medium grey fossiliferous glauconitic limestone. Shells up to 10mm present. Limestone bars 68.2 \Rightarrow 70m and 71.2 \Rightarrow 72.8m inferred from geophysical log.	MUNNO PARA CLAY (Tertiary)			



GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

DEPTH (m)		GRAPHIC LOG		ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Depth Core Sample	CASING	
From	To	From	To			Dia (mm)	From (m)	To (m)	
74	81			LIMESTONE	POOR RETURNS. Medium light grey overall. Light grey and light olive grey poorly cemented limestone (fossiliferous and easily broken) and grey to medium grey moderate to well cemented limestone (also fossiliferous, but much harder). Bryozoal, sea sponges and other shells up to 8mm present.				
81	84			LIMESTONE	Medium light grey overall. Light grey to bone, poor to moderately cemented (small percentage well cemented) fossiliferous and glauconitic limestone. Grey to medium grey moderate to well cemented harder limestone (also fossiliferous). Bryozoal, sea sponges and other shells up to 5mm present.				
84	87			LIMESTONE	Medium light grey overall. Light grey to very light grey fossiliferous and glauconitic limestone. Moderate to well cemented. Quite hard to break. Bryozoal, sea sponges and other shells up to 3mm present.				
87	90			LIMESTONE	Light olive grey overall. Medium grey to very light grey fossiliferous and glauconitic limestone. Moderate to well cemented. Quite hard to break. Bryozoal, sea sponges and other shells up to 3mm present.				
90	94			LIMESTONE	Light olive grey to greenish grey overall. Silty sandy limestone. Light olive green silt to very fine sand. Pale yellow / light olive poor to moderately cemented fossiliferous limestone (quite soft). Light olive to light grey moderate to well cemented fossiliferous limestone (moderately hard). Grey to medium grey moderate to well cemented fossiliferous limestone (quite hard). Bryozoal, sea sponges and other shells up to 10mm present.				
94	96			LIMESTONE	Light olive to pale yellowish grey well cemented limestone. Fossiliferous and glauconitic.				
									SHEET 4 OF 4



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GROUNDWATER PROGRAM
WATER WELL LOG

PROJECT: NAP-Observation Network

PERMIT No. 56430

UNIT No. 6628 - 20678 (MPA 153)

Hundred: Munno Para Adj. Sec: 3889

Coordinates: E 282651.7 N 6163249.5 El. Surface(m): 27.409 El. Ref. Point(m): 27.618 Datum: GDA 94

AQUIFER
SUMMARY

DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION						FORMATION/AGE	Depth Core Sample	CASING
			From	To	INTERVAL (m)	Supply	Test length	Method			
0	1	TOPSOIL	Overall brown. Micaceous silty and a little bit clayey fine sand						(Recent)		
1	4	SAND / GRAVEL	Coarse quartz sand to fine gravel. Clear and yellowish coloured angular to sub-rounded quartz grains.								
4	6.8	CLAY	Dark brown plastic, soft clay when wet. Minor mica throughout.								
6.8	8	SAND	Overall dark yellowish orang. Fine - medium grained sub-angular, soft sand. Very micaceous.								
8	11.2	GRAVEL	Overall dark yellowish-orange. Fine - medium grained sandy gravel. Grains are clear, milky, yellow and black in colour. Mainly fine grained gravel (grains around 6 mm in diameter), some grains up to 20 mm in size, angular to sub-rounded.								
11.2	15.2	CLAY	Overall dark reddish - orange. Mottled dark red, orange and grey clay. Soft and sticky when wet.								

REMARKS: CASING:	0 to 2.5 m (PVC class 6, 208 mm ID - gravity cemented) -0.2 to 74 m (PVC class 12, 142 mm ID - pressure cemented)	DRILL TYPE: Auger, Rotary	COMPLETED: 94
OPEN HOLE:	74 to 94 m	DRILL FLUID: Mud	LOGGED BY: H. Zulfic
This observation well, MPA 153 is replacing observation well MPA 75		DATE: 28/09/2001	SHEET 1 OF 4



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

DEPTH (m)	GRAPHIC LOG		ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	CASING		
	From	To				Depth Core Sample	Dia (mm)	From (m)
15.2	21	SANDY CLAY	Overall light reddish brown - light brown. Interbedded mottled brown and grey sandy clay and clayey fine - medium grained sand. Micaceous. Non calcareous.					
21	27	SAND	Overall dark yellow orange. Mottled brown and grey fine - medium grained micaceous, soft quartz sand. Somewhat clayey.					
27	30	GRAVELLY SAND	Dark yellowish fine - medium grained gravelly sand. Gravel is fine grained quartz.					
30	32	GRAVELLY SAND	Overall dark yellowish - orange. Fine - coarse grained angular to sub-angular gravelly sand. Gravel is mainly fine grained. Minor medium grained gravel (grains 6 - 15 mm in size). Content of gravel increases with depth.					
32	34	GRAVEL	Dark yellow sandy mainly fine gravel (minor medium size grains), angular to sub-angular - sub-rounded.					
34	36.5	CLAY	Light grey fairly hard clay. Plastic when wet. From 35.5 - 36.5 mottled reddish.					
36.5	38.5	SANDY CLAY / CLAYEY SAND	Overall light brown. Mottled grey, light brown and somewhat reddish. Interbedded sandy clay and fine sand					
38.5	45	SAND	Overall light yellowish - orange to light brown. Fine - medium grained sub-angular multi coloured (grey, yellow, reddish and orange) soft and micaceous quartz sand.					
45	46	SANDY GRAVEL	Overall dark yellow. Fine grained (grain size mainly around 4 mm) sandy gravel, angular to sub-angular clear and milky coloured quartz grains. Sand dark yellow - orange, medium grained.	CARISBROOKE SAND (Quaternary)				



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 56430						
UNIT No. 6628 - 20678 (MPA 153)						
Hundred: Munno Para Adj. Sec: 3889						
DEPTH (m) From To	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION			CASING
46 49		GRAVEL	Overall dark yellow. Medium - fine grained angular to sub-angular quartz gravel. Grains are mainly around 10 mm in diameter. Less sandy than interval (45 - 46 m).			
49 57		SAND	Dark yellow medium - fine grained (mainly medium grained - 0.3 mm grains) soft quartz sand. Mainly sub-angular.			
57 60.8		GRAVELLY SAND / SANDY GRAVEL	Overall dark yellow - dark yellowish orange. Gravelly sand to sandy gravel. Sand as above. Gravel fine grained (minor medium grains), sub-angular.			
60.8 68		CLAY	Bluish - grey soft and plastic fossiliferous clay, sand and silt. Bars of light grey shelly fossiliferous limestone from 62.2 - 65.2 m (shell fragment 2 - 4 mm and bryozoa fragments).			MUNNO PARA CLAY (Tertiary)
68 72		LIMESTONE	Overall grey. Sample clayey, sandy and silty. Fragments of grey soft limestone. Shell and bryozoa fragments throughout the sample.			
72 75		LIMESTONE	Overall grey. Grey fossiliferous (bryozoal) and shelly well cemented limestone. Sample sandy and minor clayey.			LOWER PORT WILLUNGA FORMATION (Tertiary)
75 78		LIMESTONE	Overall light grey. Very light grey medium grained fossiliferous (bryozoal) limestone. Shell fragments throughout sample. Minor green glauconitic grains in limestone. Minor sand and lumps of off-white lime. Sample a little bit sandy and clayey.			
78 81		LIMESTONE	Overall very light grey - off-white. Off-white fossiliferous (bryozoal) limestone. Sample very sandy (sand could be product of drilling - grinding).			
81 82		LIMESTONE	Overall grey. Grey fossiliferous limestone, well cemented. Minor glauconitic.			
						SHEET 3 OF 4



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GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

DEPTH (m)		GRAPHIC LOG		ROCK/SEDIMENT NAME		GEOLOGICAL DESCRIPTION		FORMATION/AGE		DEPTH CORE SAMPLE		CASING		
From	To									Core Sample	Depth (mm)	Dia (mm)	From (m)	To (m)
82	87			LIMESTONE		Overall grey - very light grey when wet. Greyish - light brownish very hard fossiliferous (bryozoal) limestone. Minor light brownish - yellowish well cemented limestone. Fragments of grey very glauconitic limestone. Shell and bryozoa fragments. (Sample very contaminated with Munno Para Clay and Carisbrooke Sand). Sample very sandy??								
87	90			LIMESTONE		Overall dark grey. Grey fossiliferous (bryozoal) and shelly well cemented glauconitic limestone and light grey, somewhat off-whitish limestone, minor glauconitic. Lose sand, small shell and bryozoa fragments.								
90	94			LIMESTONE		Overall dark grey with dark olive in colour when wet. Light and dark grey glauconitic limestone. Dark grey limestone with dark olive in colour - very glauconitic, well cemented. Lose sand, shell and bryozoa fragments.								



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GROUNDWATER PROGRAM WATER WELL LOG

PROJECT: NAP-Observation Network											
PERMIT No. 56849											
UNIT No. 6628 – 20736 (MPA 159)											
Hundred: Munno Para Adj. Sec: 3052											
GROUNDWATER PROGRAM WATER WELL LOG											
The Department of Water, Land and Biodiversity Conservation		Coordinates: E 278472.2 N 6159987.9		El. Surface(m): 14.584		El. Ref. Point(m): 14.735		Datum: GDA 94			
AQUIFER	DEPTH TO STANDING WATER (m)			INTERVAL (m)			SUPPLY				
	From	To		From	To	L/sec	Test length	Method	mg/L	Analysis No.	
SUMMARY	N/A	41.24		83	100	≈ 4	2 hours	Airlifting	955	495494	
				GEOLOGICAL DESCRIPTION				FORMATION/AGE	CASING		
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME						Depth Core Sample	Depth Core Sample	From (m)	To (m)
0	3	TOPSOIL / CLAY					Recent	208	0	3	
3	5	CLAY / SAND						142	-0.2	83	
5	8	SAND									
8	12	SANDY CLAY									
12	15	CLAY / SAND									
15	18	CLAYEY SAND									
REMARKS: CASING:				0 to 3 m (PVC, 208 mm ID - gravity cemented) -0.2 to 83 m (PVC class 12, 142 mm ID - pressure cemented 0 – 83m) OPEN HOLE: 83 to 100 m (Drilled with 187mm bit)				DRILL TYPE: Auger, Rotary	COMPLETED: 100		
REMARKS: DRILLING:				Throughout drilling, the cuttings looked like they had been reworked and seemed to have a large lag time before reaching the surface (driller was required to surge the bit). At completion the mud pump was identified to be malfunctioning.				DRILL FLUID: Mud	LOGGED BY: M STADTER		
								DATE: 29/01/02	SHEET 1 OF 5		



The Department of
Water, Land and
Biodiversity
Conservation

**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 56849						
UNIT No. 6628 – 20736 (MPA 159)						
Hundred: Munno Para Adj. Sec: 3052						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASING
From	To				Depth Core Sample	Dia (mm) From (m) To (m)
18	21	CLAY	Moderate reddish brown and light grey mottled clay. Very small percentage of sand or grit. Sample dried into thin sheets of grey clay and reddish orange clumps of clay. Sample is sticky when wet.			
21	24	CLAY	Moderate reddish orange and light grey gritty clay. Sample is lighter in colour and higher in sand content than previous sample. Sample is very sticky when wet.			
24	27	CLAY	Very pale orange in colour. Very hard clay. Sample dried into large clumps. Drillers complained of mud-rings forming.			
27	30	CLAY	Very pale greyish orange overall. Silty clay with only a very small amount of grit. Very sticky when wet.			
30	32	CLAY	Very pale greyish orange overall. Silty gritty clay. Sticky when wet yet not rollable. Contains amounts of grey clay, which is harder and more plastic than rest of sample.			
32	36	CLAYEY SAND	Greyish orange to light grey clayey sand. Sand is fine to medium grained (average size approximately 0.2mm) sub-angular to predominantly sub-rounded. Sample is micaceous.			
36	39	SAND / CLAY	Greyish orange clayey sand to sandy clay. Sand is fine to medium grained, sub-angular to predominantly sub-rounded quartz rich sand. Sample is rollable and micaceous.			
39	42	CLAY	Greyish orange overall. Silty greyish orange and grey mottled clays. Slightly gritty, not overly rollable and sticky when wet.			
42	45	CLAY	Greyish orange overall. Same as above.			



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**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network							
PERMIT No. 56849							
UNIT No. 6628 – 20736 (MPA 159)							
Hundred: Munno Para Adj. Sec: 3052							
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	Depth Core Sample (mm)	CASING Dia (mm) From (m) To (m)
From	To						
45	48	SANDY CLAY	Greyish orange fine to medium grained sandy clay. Reddish orange and grey mottled clays. Sample is rollable.				
48	51	CLAYEY SAND	Dark yellowish orange clayey sand. Sand is fine to medium in size and sub-rounded to sub-angular grained. Sample is micaceous.				
51	54	GRAVEL / SAND SILT	Dark yellowish orange overall. Silty sandy gravel. Grain sizes range from 0.06mm (fine sand) to 6mm (fine gravel). Grains consist of quartz, and are sub-rounded to sub-angular. Grains are clear (up to 80%), pale yellow and pale orange in colour.		CARISBROOKE SAND (Quaternary)		
54	57.6	GRAVEL / SAND / SILT	Dark yellowish orange. As above. Non Calcareous.				
57.6	60	SANDSTONE / SHELLS / GRAVEL	Pale olive and dusky yellow overall. Moderately hard sandstone. Abundance of shells (up to 10mm), and gravel (up to 4mm). Sample is also lignitic and contains sand from above interval. Sample obviously calcareous.				
60	61.5	SANDSTONE / SHELLS / GRAVEL	Greyish orange and olive overall. As above.		HALLETT COVE SANDSTONE / DRY CREEK SAND (Tertiary)		
61.5	65.6	SANDSTONE / SHELLS / GRAVEL	Greyish orange overall. Pale yellow and boney white fossiliferous sandstone. Soft and harder pieces present. Sample containing an abundance of shells up to 8mm. Fine to medium quartz gravel (up to 8mm) consisting of clear, milky white and pale yellow grains.				
65.6	69	LIMESTONE / SHELLS	Medium grey overall. Clayey sandy soft grey fossiliferous limestone. Sample is very shelly and contains shells up to 10mm. Sample also contains fine to medium gravel (up to 10mm). Poor recovery. Shells and gravel are thought to be contamination from above interval.		UPPER PORT WILLUNGA FORMATION (Tertiary)		



The Department of
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Conservation

**GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET**

PROJECT: NAP-Observation Network						
PERMIT No. 56849						
UNIT No. 6628 – 20736 (MPA 159)						
Hundred: Munno Para Adj. Sec: 3052						
DEPTH (m)	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION		FORMATION/AGE	CASING
From	To		From	To	Depth Core Sample (mm)	Dia (mm) From To (m) (m)
69	71	LIMESTONE / SHELLS	Medium grey and light olive overall. Sandy fossiliferous grey limestone. Moderately cemented. Sample contains miscellaneous shells up to 5mm in size (contamination from above?)			
71	75	CLAY / LIMESTONE	Medium grey and light olive overall. Dark bluish grey plastic fossiliferous clay. Sample also contains soft, moderately cemented grey limestone.			
75	78	CLAY	Dark bluish grey plastic fossiliferous clay. Poor recovery.			
78	79.6	CLAY / LIMESTONE	Medium grey overall. Sandy fossiliferous limestone with bluish clay as above. Poor returns. Drilling was very slow and lead to a change in bit. Limestone bars 74.8 ⇒ 75.8m and 76.8 ⇒ 77.8m inferred from geophysical log.			
79.6	84	LIMESTONE / CLAY	Contaminated sample due to change of drilling bit. Sample is light grey overall. Sample contains mixture of bluish grey clay, soft and hard grey fossiliferous limestone, fine to medium quartz sand and loose shells (bryozoal).			
84	86	LIMESTONE	Light olive grey and yellowish grey moderately cemented fossiliferous and glauconitic limestone. Sample contains miscellaneous shell fragments up to 12mm and bryozoal up to 3mm. Sample also contains a very small percentage of clear and milky white fine quartz gravel (up to 4mm).			
86	88	LIMESTONE	Medium light grey overall. Yellowish grey well cemented fossiliferous and glauconitic limestone. Sample contains miscellaneous shells up to 3mm (including bryozoal). Includes small percentage of gravel as above.			
88	91	LIMESTONE	Medium light grey. Sample as above.			
91	97	LIMESTONE	Light grey overall. Yellowish grey well cemented fossiliferous and glauconitic limestone. Sample contains miscellaneous shells up to 3mm (including bryozoal).			

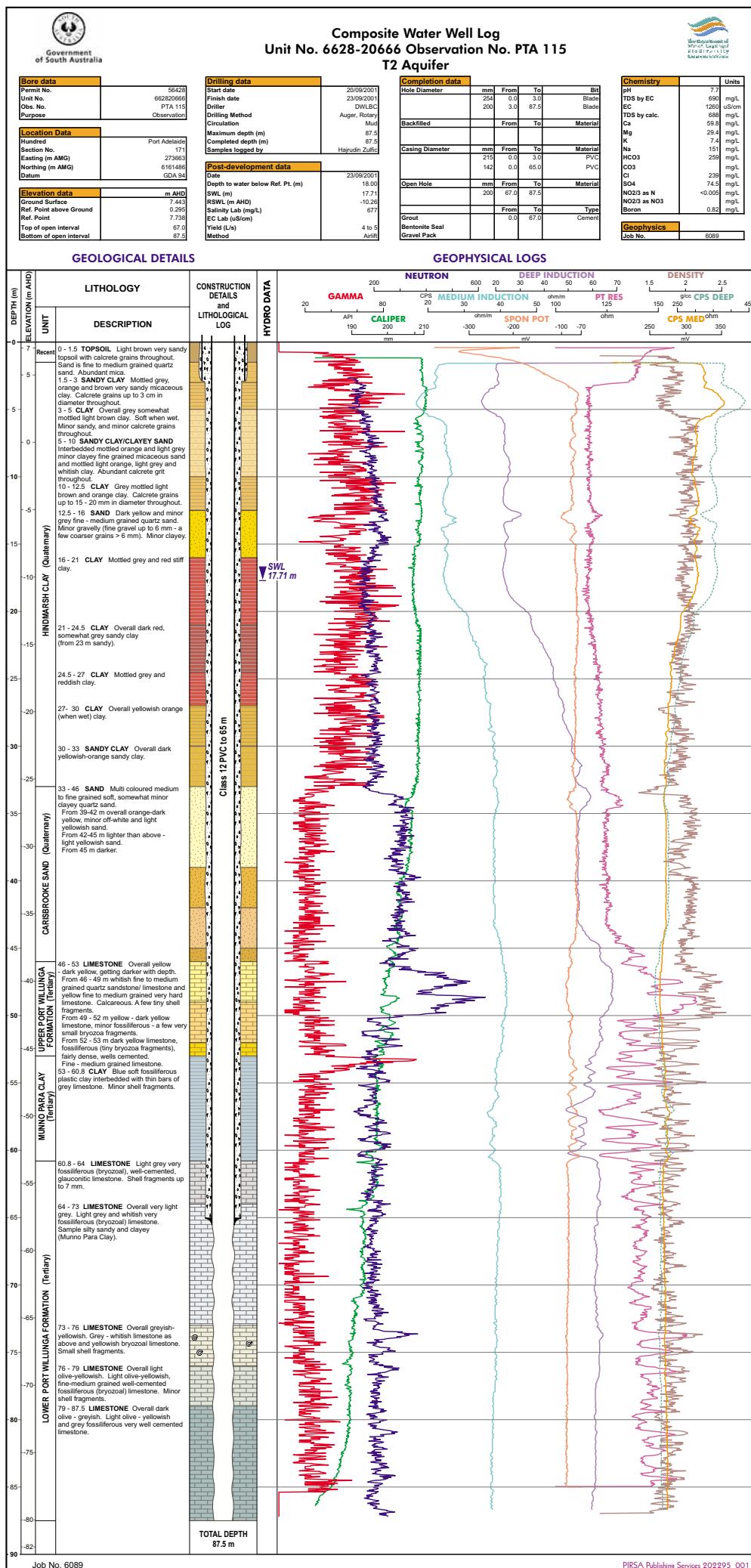


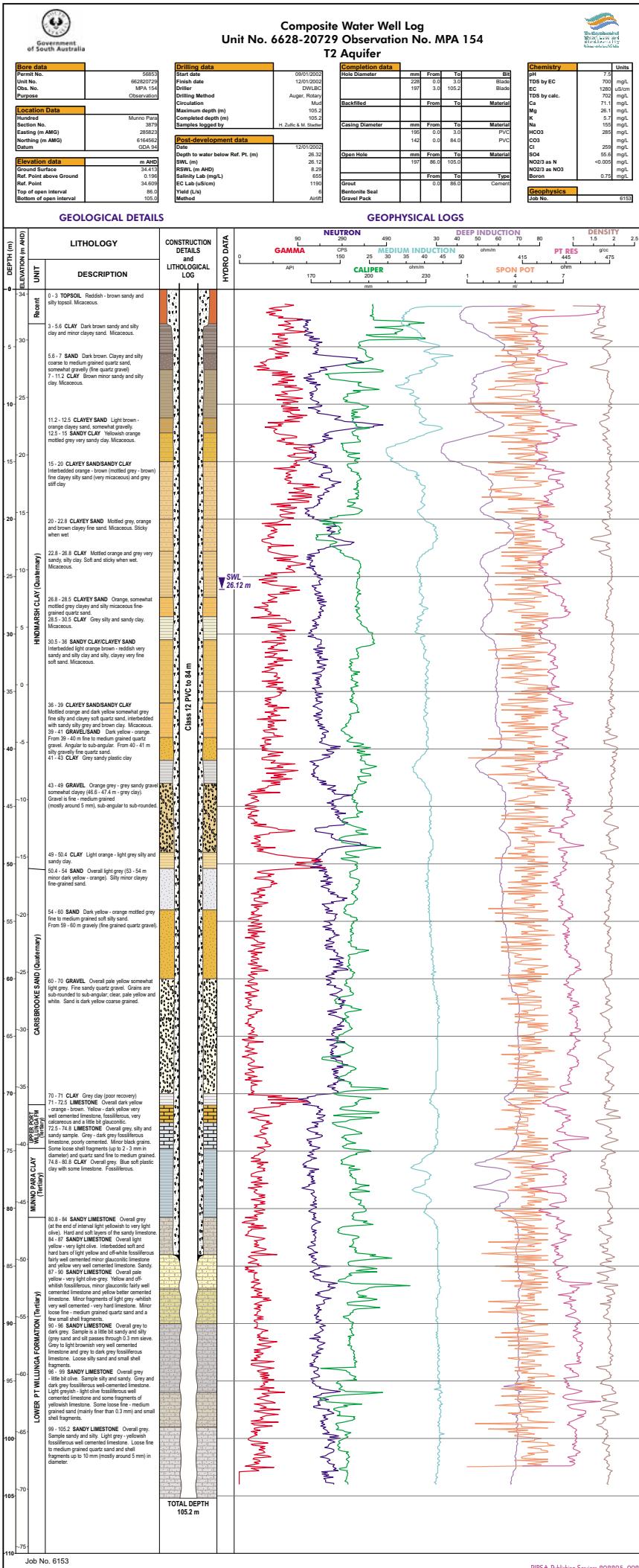
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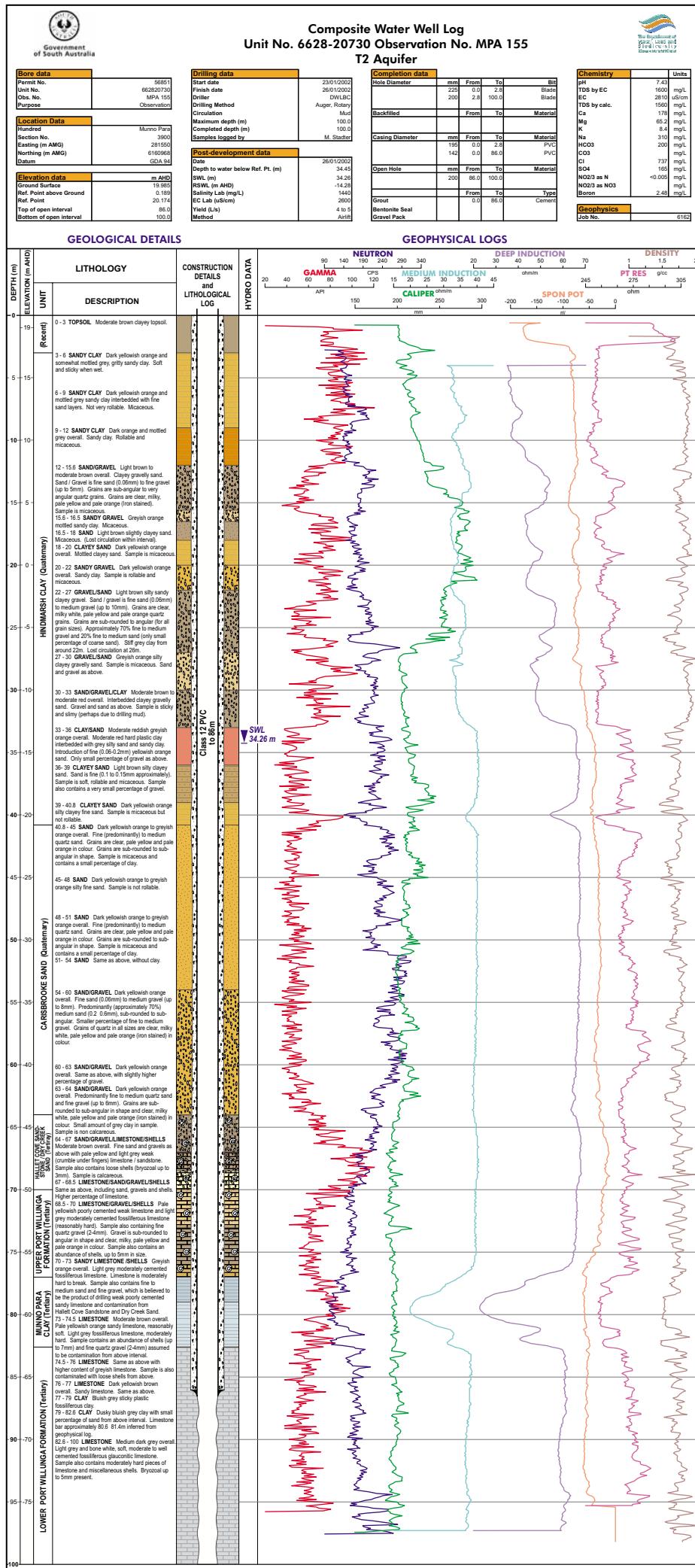
GROUNDWATER PROGRAM
WATER WELL LOG
CONTINUATION SHEET

PROJECT: NAP-Observation Network								
PERMIT No. 56849								
UNIT No. 6628 – 20736 (MPA 159)								
Hundred: Munno Para Adj. Sec: 3052								
DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK/SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION/AGE	Depth Core Sample Dia (mm)	CASING Dia (mm)	From To (m) (m)
97	99		LIMESTONE	Light grey overall. Yellowish grey well cemented fossiliferous and glauconitic limestone. Limestone is hard to break with fingers. Sample contains miscellaneous shells up to 3 mm (including bryozoal).				
99	100		LIMESTONE	Light grey and pale yellow overall. Same as above, with light olive grey moderate to well cemented sandy and fossiliferous limestone.				

B. COMPOSITE WELL LOGS







TOTAL DEPTH 100 m

Job No. 6162

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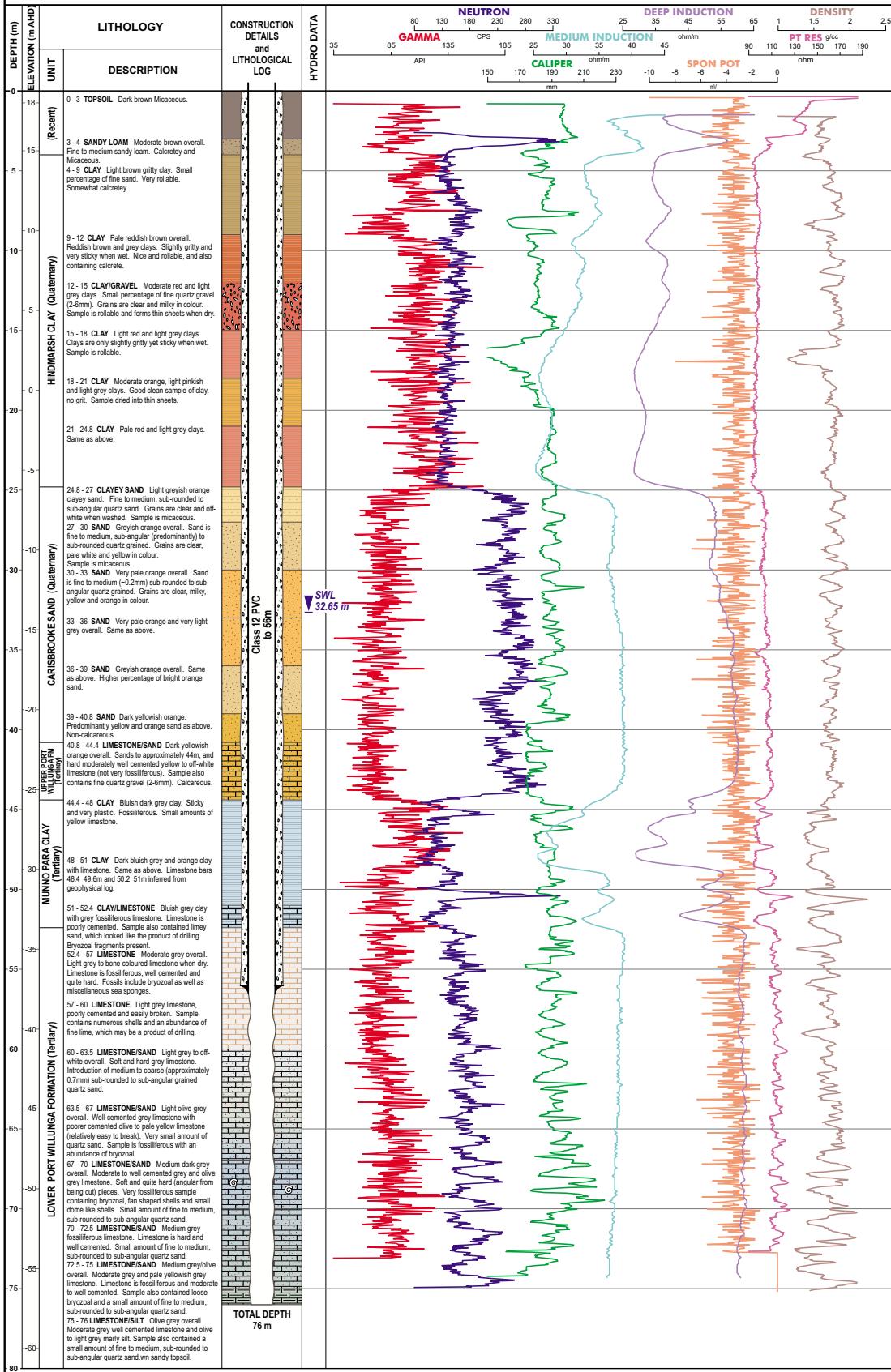
Government
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Composite Water Well Log
Unit No. 6628-20731 Observation No. PTG 83

The Environment
Water, Land and
Biodiversity
Conservation Act 2017

Bore data		Drilling data		Completion data		Chemistry	
Permit No.	56852	Start date	31/01/2002	Hole Diameter	mm	From	To
Unit No.	662820731	Finish date	02/02/2002	225	0.0	3.0	Bit
Obs. No.	PTG 83	Driller	DWLBC	198	3.0	76.0	Blade
Purpose	Observation	Drilling Method	Auger, Rotary				Blade
Location Data		Circulation	Mud				
Region	Port Gawler	Maximum depth (m)	76.0				
Section No.	99	Completed depth (m)	76.0				
Eastings (m AMG)	277800	Samples logged by	M. Städter				
Northings (m AMG)	6165480						
Datum	GDA 94						
Elevation data		Post-development data		Completion data		Chemistry	
m AHD		Date	02/02/2002	Hole Diameter	mm	From	To
Ground Surface	18.749	SWL (m)	32.91	225	0.0	3.0	pH
Ref. Point above Ground	0.265	RSWL (m AHD)	32.65	198	3.0	76.0	TDS by EC
Ref. Point	19.014	Salinity Lab (mg/L)	-13.90				EC
Top of open interval	56.0	EC Lab (µS/cm)	821				TDS by calc.
Bottom of open interval	76.0	Vield (L/s)	1490				Ca
		Method	4				Mg
			Airlift				K
							Na
							HCO ₃
							CO ₃
							Cl
							SO ₄
							NO ₂ /N as N
							NO ₂ /N as NO ₃
							Boron

GEOLOGICAL DETAILS





Government of South Australia

Composite Water Well Log Unit No. 6628-20732 Observation No. PTG 84 T2 Aquifer



Bore data	
Permit No.	56847
Unit No.	662820732
Obs. No.	PTG 84
Purpose	Observation

Location Data	
Hundred	Port Gawler
Section No.	174
Easting (m AMG)	279334
Northing (m AMG)	6168566
Datum	GDA 94

Elevation data	
Ground Surface	17.292
Ref. Point above Ground	0.197
Ref. Point	17.489
Top of open interval	51.0
Bottom of open interval	70.0

Drilling data

Start date	02/02/2002
Finish date	06/02/2002
Driller	DWLBC
Drilling Method	Auger, Rotary
Coring System	Mud
Maximum depth (m)	70.0
Completed depth (m)	70.0
Samples logged by	M. Stadler

Post-development data

Date	06/02/2002
Depth to water below Ref. Pt. (m)	13.32
SWL (m)	13.12
RSWL (m AHD)	4.17
Salinity Lab (mg/L)	1010
EC Lab (µS/cm)	1830
Yield (L/s)	4 to 5
Method	Airlift

Completion data

Hole Diameter	mm	From	To	Bit
225	0.0	3.0		Blade
200	3.0	51.0		Blade
140	50.0	70.0		Roller bit
Backfilled		From	To	Material

Casing Diameter	mm	From	To	Material
208	0.0	3.0		PVC
142	0.0	50.0		PVC

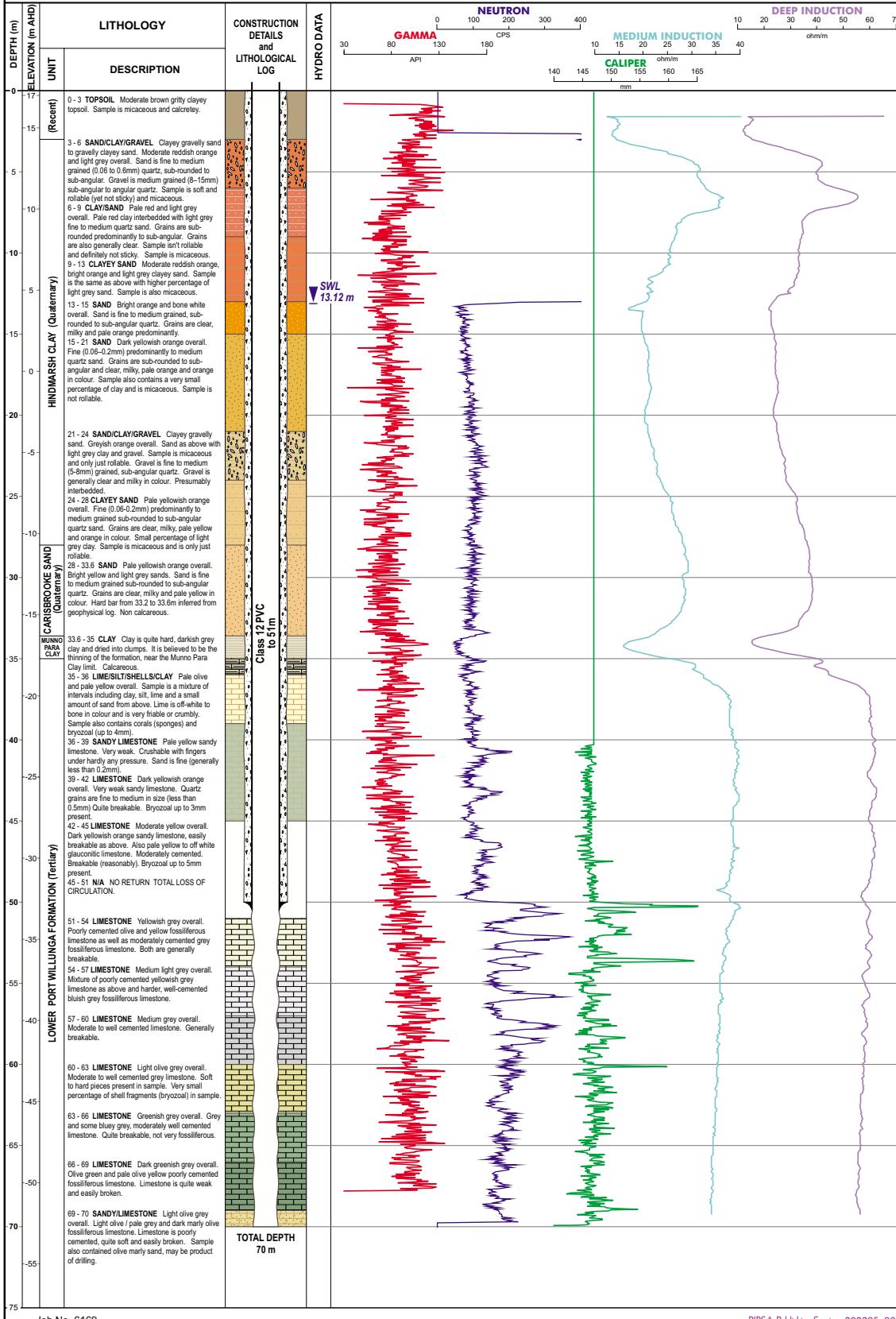
Open Hole	mm	From	To	Material
		From	To	Type

Grout		0.0	50.0	Cement
Bentonite Seal				
Gravel Pack				

Chemistry	Units
pH	7.6
TDS by EC	1000 mg/L
EC	1860 µS/cm
TDS by calc.	1010 mg/L
Ca	63.7 mg/L
Mg	38.2 mg/L
K	8.5 mg/L
Na	25.3 mg/L
HCO ₃	308 mg/L
CO ₃	403 mg/L
Cl	95.4 mg/L
SO ₄	<0.005 mg/L
NO ₂ /N as N	mg/L
NO ₂ /N as NO ₃	mg/L
Boron	1.36 mg/L

Geophysics	
Job No.	6169

GEOLOGICAL DETAILS





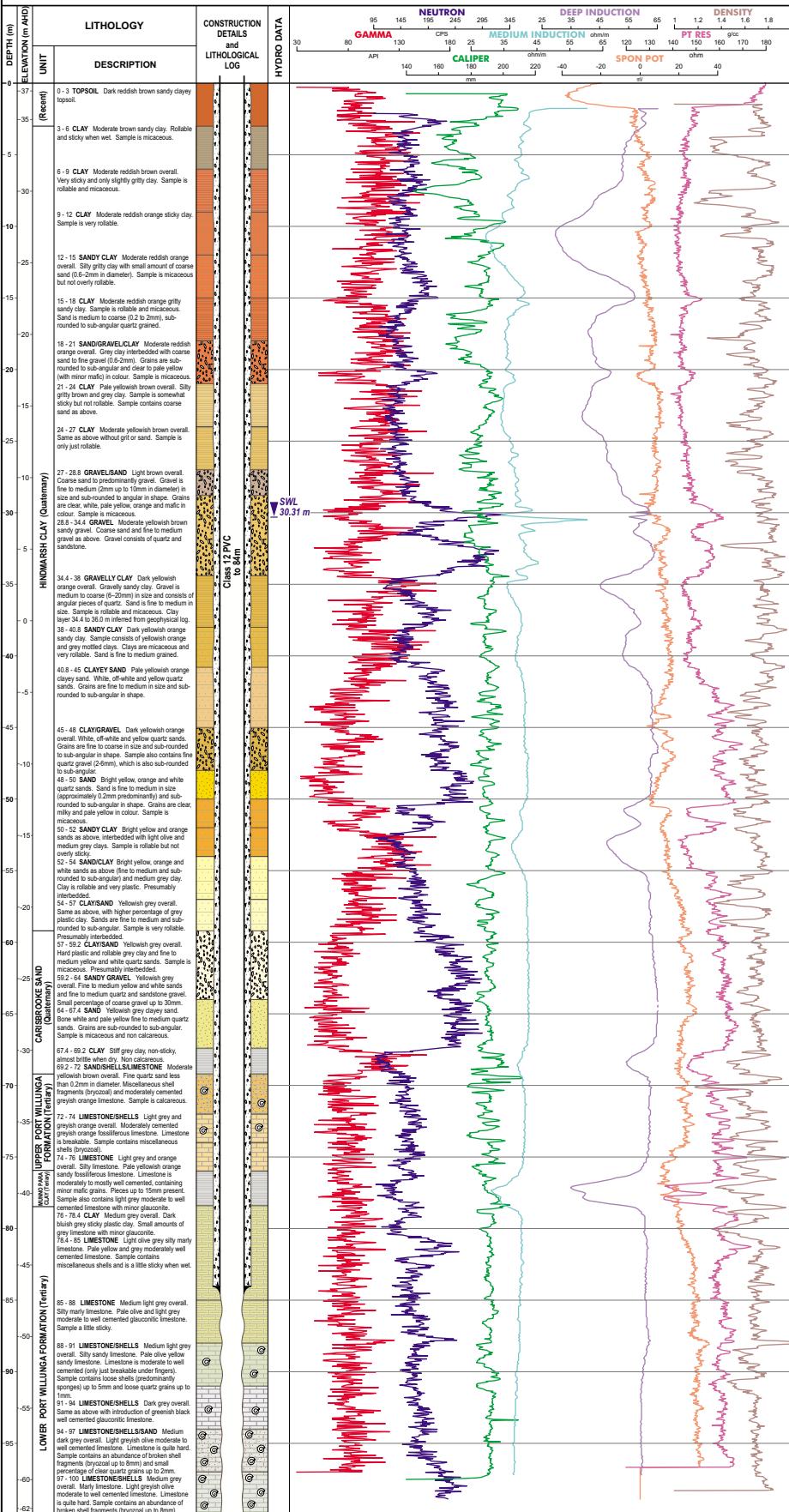
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of South Australia

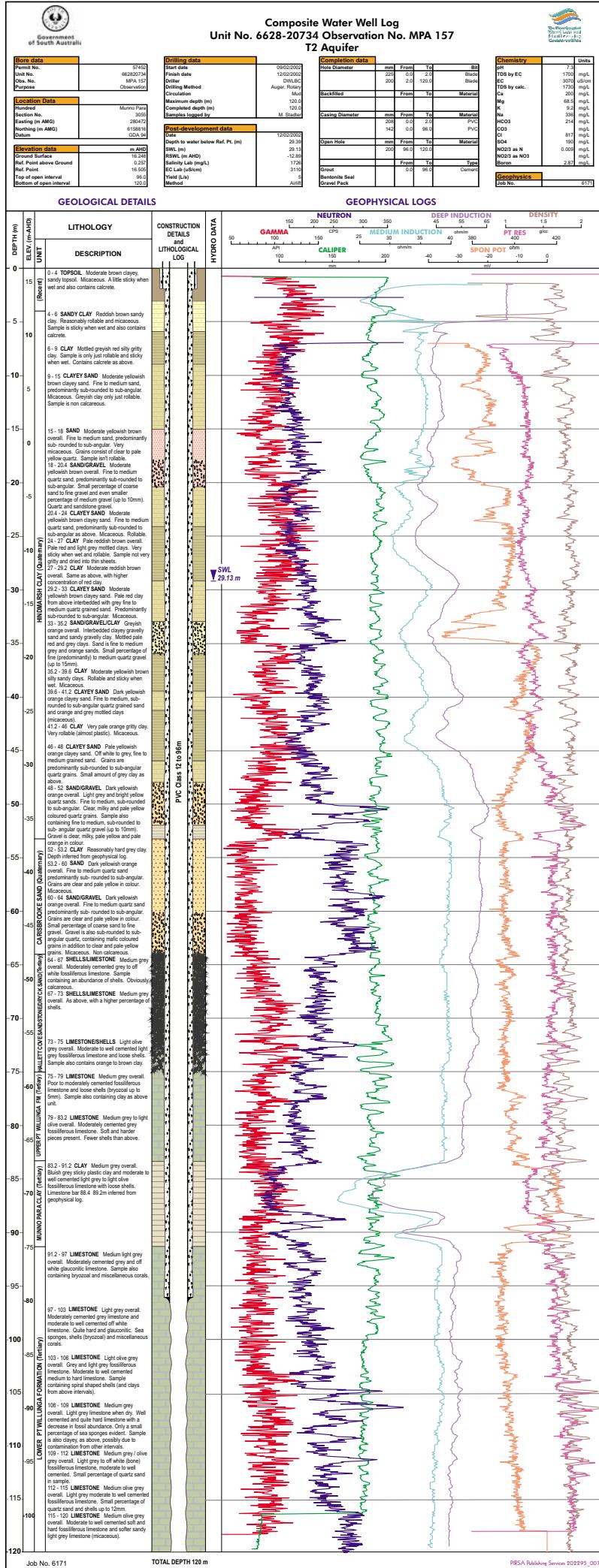
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Unit No. 6628-20733 Observation No. MPA 156
T2 Aquifer

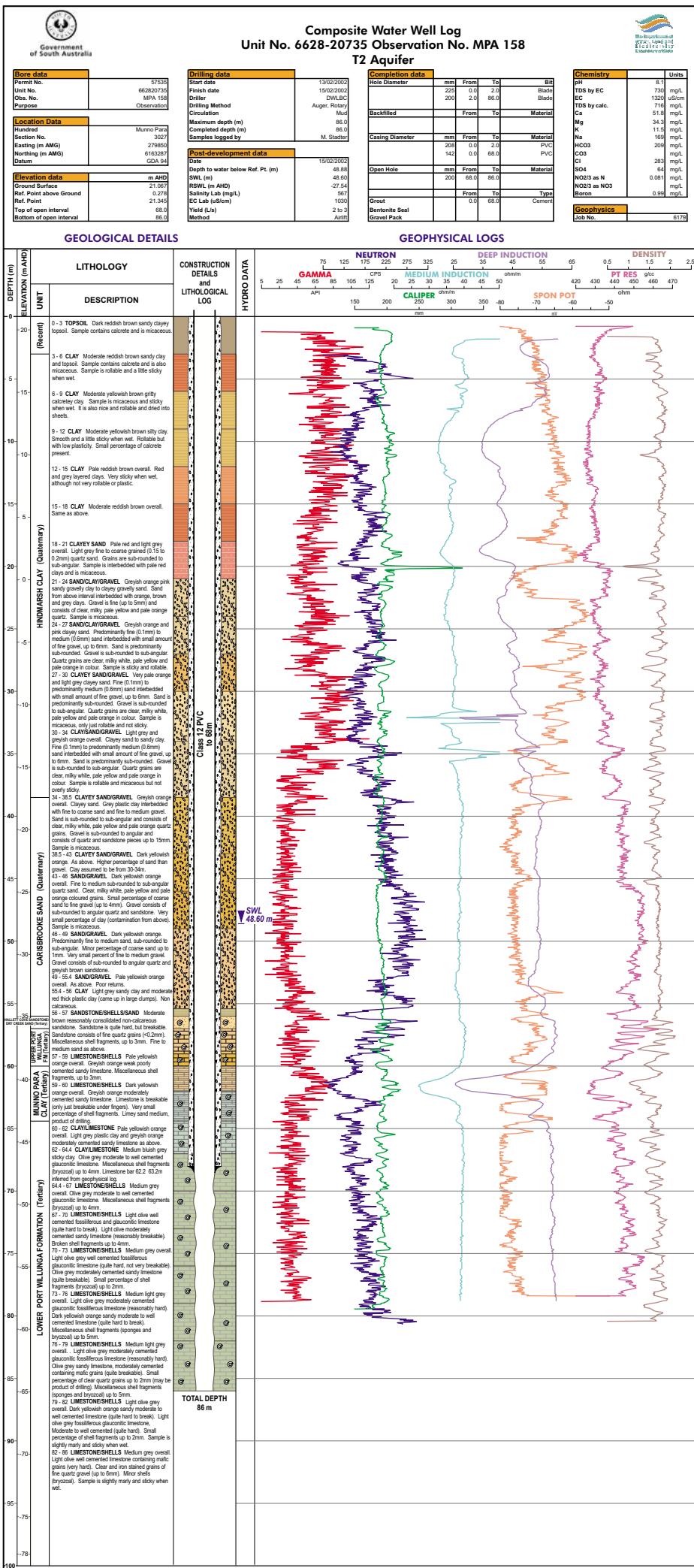


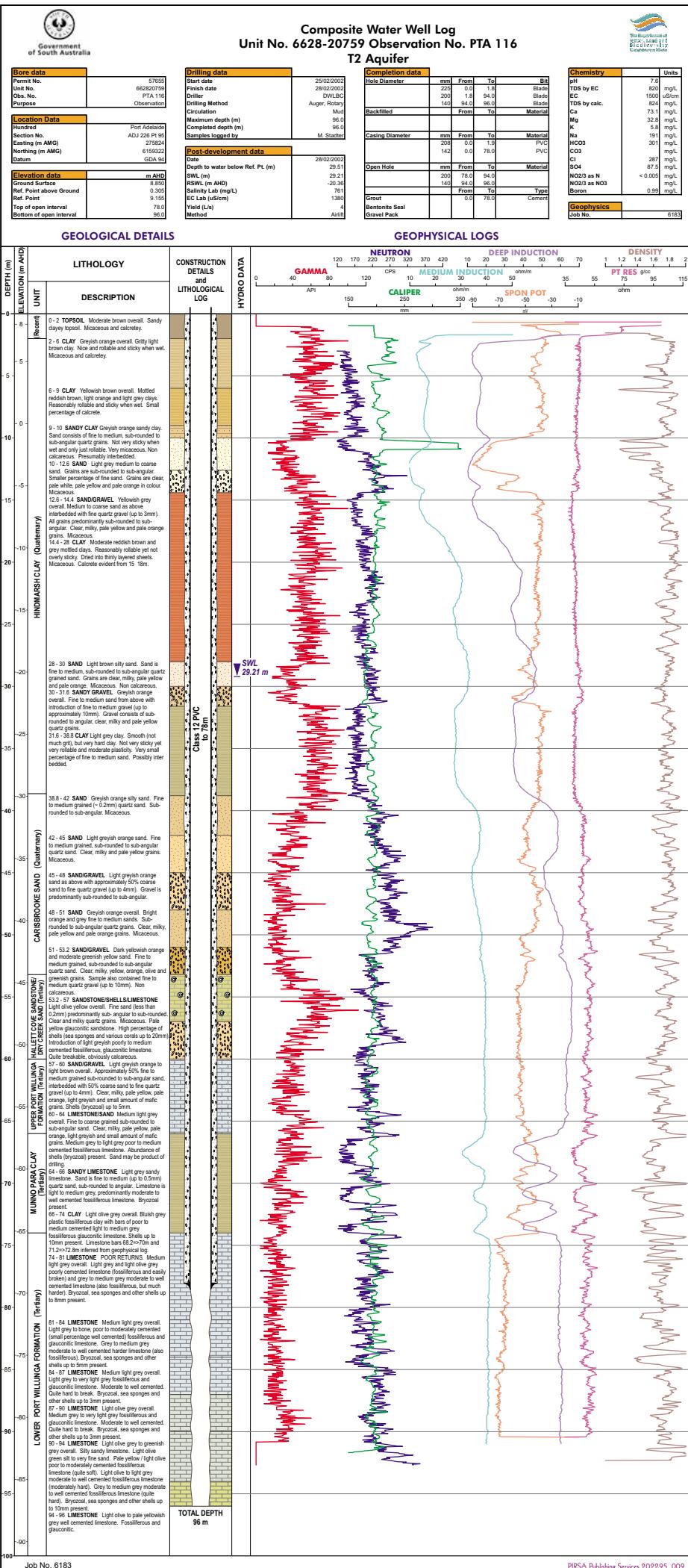
Bore data		Drilling data		Completion data				Chemistry	
Perm No.	56848	Start date	07/02/2002	Hole Diameter	mm	From	To	pH	Units
Unit No.	66280733	Finish date	09/02/2002	225	0.0	1.8		7.7	
Obs. No.	MPA 156	Driller	DWBLC	200	1.8	100.0		560	mgl
Purpose	Observation	Drilling Method	Auger, Rotary					1020	µS/cm
Location Data		Circulation	Water					TDS by EC	
Hundred	Munro Park	Maximum depth (m)	100.0					EC	
Section No.	3298	Completed depth (m)	100.0					TDS by calc.	
Easting (in AMG)	287849	Samples logged by	M. Stadler					557	mgl
Northing (in AMG)	6164417							584	mg/L
Datum	GDA 94							Ca	mg/L
Post-development data		Date	09/02/2002					Mg	mg/L
Elevation data		Depth to water below Ref. Pt. (m)	30.45					K	mg/L
Ground Surface	m AHD	SWL (m)	30.31					Na	mg/L
Ref. Point above Ground		RSWL (m AHD)	7.23					HCO3	mg/L
Ref. Point		Salinity Lab (mg/L)	0.137					CO3	mg/L
Top of open interval	84.0	EC Lab (dbcm)	564					Cl	mg/L
Bottom of open interval	100.0	Yield (L/s)	5					SO4	mg/L
		Method	Airift					NO23 as N	<0.005
								NO23 as NO3	mg/L
								Boron	0.52
Geophysics		Job No.	6170						

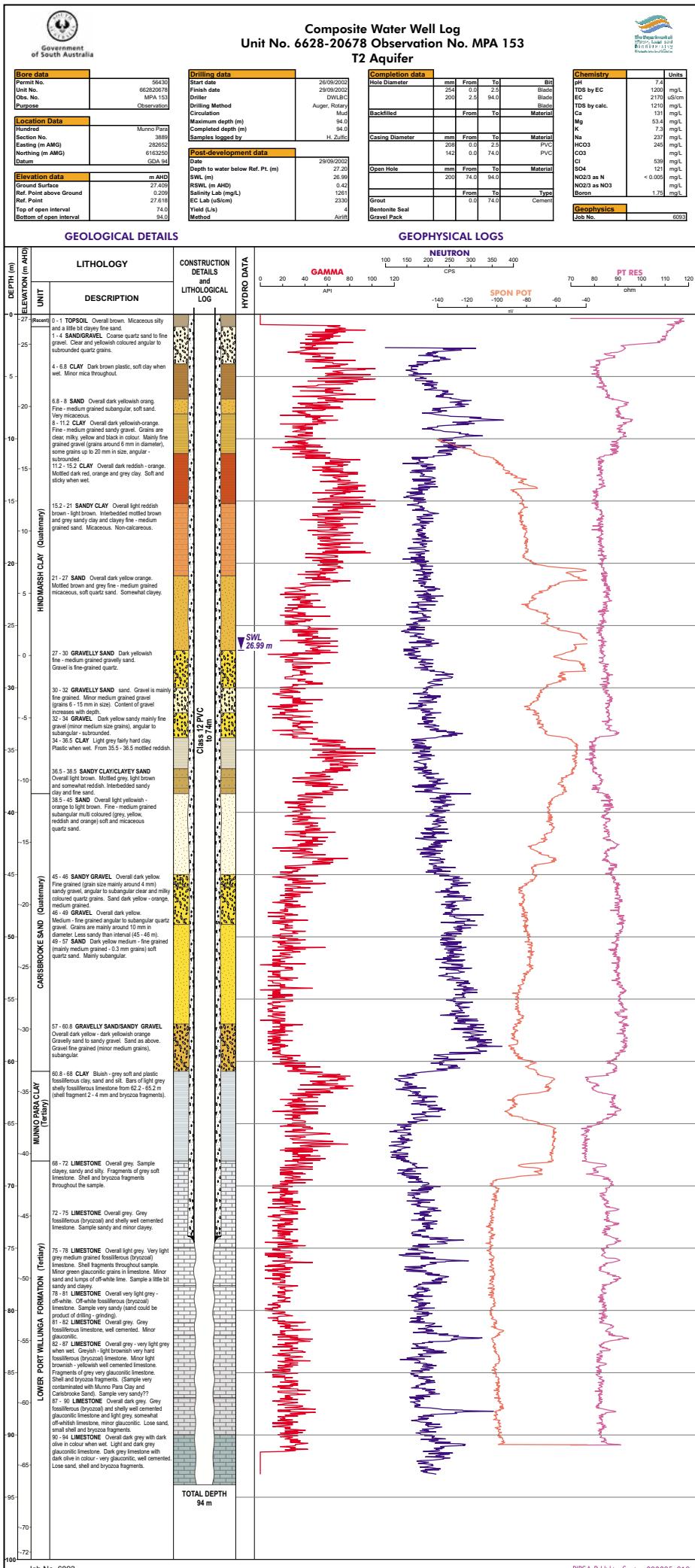
GEOLOGICAL DETAILS

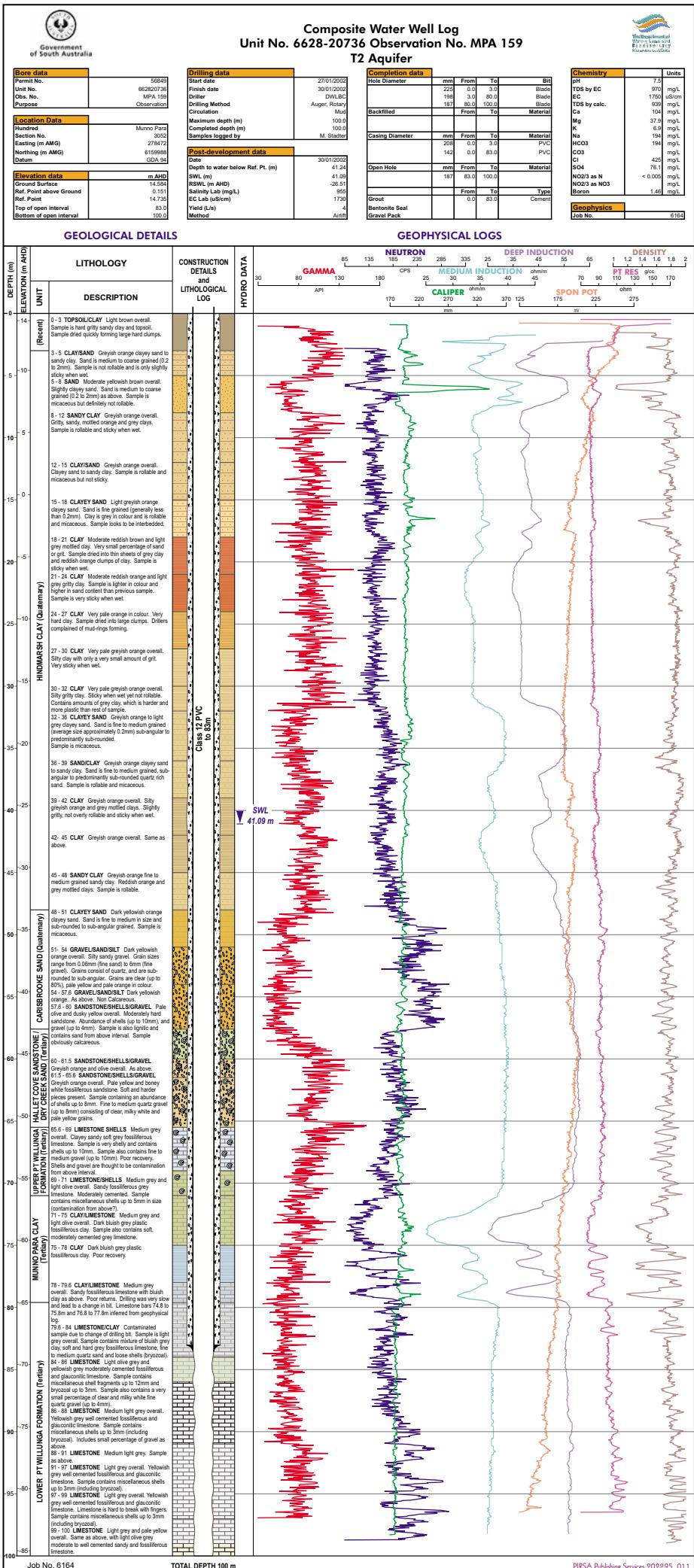












C. GROUNDWATER SAMPLE SALINITY RESULTS

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA			
Groundwater Sample			
Sample No: 483038	Unit No: 6628 20666	Obs No: PTA 115	Permit No: 56428
Permit Holder: DWR - ZULFIC H		Date: 23/09/2001	Time: 12:30
Address: 101 GRENFELL ST ADELAIDE 5000		Hundred: PORT ADELAIDE	
Results To: - Zulfic H Dwr		Section: PT 171	Lot No:
Address: 101 Grenfell St Adelaide 5000			
Collected By: S BODEY DEPOT DRILLING		Sample Depth From: 87.00	To: M
Remarks: SAMPLE N/O=1			
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1190	
Method: Airlift / Bail / Flow / Pump		TDS: 655	
Source: Tank / Well / Dam / River / Spring		pH:	

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA			
Groundwater Sample			
Sample No: 483039	Unit No: 6628 20666	Obs No: PTA 115	Permit No: 56428
Permit Holder: DWR - ZULFIC H		Date: 23/09/2001	Time: 14:00
Address: 101 GRENFELL ST ADELAIDE 5000		Hundred: PORT ADELAIDE	
Results To: - Zulfic H Dwr		Section: PT 171	Lot No:
Address: 101 Grenfell St Adelaide 5000			
Collected By: S BODEY DEPOT DRILLING		Sample Depth From: 87.00	To: M
Remarks: SAMPLE N/O=2 AIRLIFTING 2=hrs			
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1230	
Method: Airlift / Bail / Flow / Pump		TDS: 677	
Source: Tank / Well / Dam / River / Spring		pH:	

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA			
Groundwater Sample			
Sample No: 493225	Unit No: 6628 20729	Obs No: MPA 154	Permit No: 56853
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 12/01/2002	Time: 10:00
Address: PO BOX 2834 ADELAIDE 5001		Hundred: MUNNO PARA	
Results To: For Water Resources Department		Section: 3879	Lot No:
Address: Po Box 2834 Adelaide 5001			
Collected By: H ZULFIC		Sample Depth From: 86.00 To: 105.00 M	
Remarks:			
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1190	
Method: Airlift / Bail / Flow / Pump		TDS: 655	
Source: Tank / Well / Dam / River / Spring		pH:	

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA			
Groundwater Sample			
Sample No: 495499	Unit No: 6628 20729	Obs No: MPA 154	Permit No: 56853
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 12/01/2002	Time: 16:00
Address: PO BOX 2834 ADELAIDE 5001		Hundred: MUNNO PARA	
Results To: H ZULFIC		Section: 3879	Lot No:
Address: Po Box 2834 Adelaide 5001			
Collected By: H ZULFIC		Sample Depth From: 86.00 To: 105.00 M	
Remarks:			
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1170	
Method: Airlift / Bail / Flow / Pump		TDS: 644	
Source: Tank / Well / Dam / River / Spring		pH:	

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No:	496247	Unit No:	6628 20729	Obs No:	MPA 154
Permit Holder:	DEPARTMENT FOR WATER RESOURCES			Permit No:	56853
Address:	PO BOX 2834 ADELAIDE 5001			Date:	12/01/2002
Results To:	HAJRUDIN ZULFIC			Time:	Hundred: MUNNO PARA
Address:	Po Box 2834 Adelaide 5001			Section:	3879
Collected By:	M FREESTONE			Lot No:	
Remarks:					
Collected:	Drilling / Final Sample / Monitoring / Pump Test			EC:	1190
Method:	Airlift / Bail / Flow / Pump			TDS:	655
Source:	Tank / Well / Dam / River / Spring			pH:	
Sample Depth From: 86.00 To: 105.00 M					

Date 18/11/2004 10:57 AM
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The Department will not assume responsibility
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Page 2 of 2

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA				
Groundwater Sample				
Sample No: 495496	Unit No: 6628 20730	Obs No: MPA 155	Permit No: 56851	
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 26/01/2002	Time: 12:00	
Address: PO BOX 2834 ADELAIDE 5001		Hundred: MUNNO PARA		
Results To: MICK STADTER		Section: 3900	Lot No:	
Address: Po Box 2834 Adelaide 5001				
Collected By: MICK FREESTONE		Sample Depth From: 86.00	To: 100.00 M	
Remarks:				
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 2600		
Method: Airlift / Bail / Flow / Pump		TDS: 1440		
Source: Tank / Well / Dam / River / Spring		pH:		

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA				
Groundwater Sample				
Sample No: 496259	Unit No: 6628 20730	Obs No: MPA 155	Permit No: 56851	
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 26/01/2002	Time:	
Address: PO BOX 2834 ADELAIDE 5001		Hundred: MUNNO PARA		
Results To: HAJRUDIN ZULFIC		Section: 3900	Lot No:	
Address: Po Box 2834 Adelaide 5001				
Collected By: M FREESTONE DEPOT DRILLING		Sample Depth From: To: M		
Remarks:				
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 2600		
Method: Airlift / Bail / Flow / Pump		TDS: 1440		
Source: Tank / Well / Dam / River / Spring		pH:		

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 495493	Unit No: 6628 20731	Obs No: PTG 83	Permit No: 56852		
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 02/02/2002	Time: 12:00		
Address: PO BOX 2834 ADELAIDE 5001		Hundred: PORT GAWLER			
Results To: MICK STADTER		Section: 99	Lot No:		
Address: Po Box 2834 Adelaide 5001					
Collected By: MICK FREESTONE		Sample Depth From: 56.00	To: 76.00 M		
Remarks:					
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1490			
Method: Airlift / Bail / Flow / Pump		TDS: 821			
Source: Tank / Well / Dam / River / Spring		pH:			

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 496261	Unit No: 6628 20731	Obs No: PTG 83	Permit No: 56852		
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 02/02/2002	Time:		
Address: PO BOX 2834 ADELAIDE 5001		Hundred: PORT GAWLER			
Results To: HAJRUDIN ZULFIC		Section: 99	Lot No:		
Address: Po Box 2834 Adelaide 5001					
Collected By: M FREESTONE DEPOT DRILLING		Sample Depth From: To: M			
Remarks:					
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1490			
Method: Airlift / Bail / Flow / Pump		TDS: 821			
Source: Tank / Well / Dam / River / Spring		pH:			

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 495497	Unit No: 6628 20732	Obs No: PTG 84	Permit No: 56847		
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 06/02/2002	Time: 11:15		
Address: PO BOX 2834 ADELAIDE 5001		Hundred: PORT GAWLER			
Results To: MICK STADTER		Section: 174	Lot No:		
Address: Po Box 2834 Adelaide 5001					
Collected By: MICK FREESTONE		Sample Depth From: 50.00	To: 70.00 M		
Remarks: SAMPLR N/O=1					
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1520			
Method: Airlift / Bail / Flow / Pump		TDS: 838			
Source: Tank / Well / Dam / River / Spring		pH:			

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 495498	Unit No: 6628 20732	Obs No: PTG 84	Permit No: 56847		
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 06/02/2002	Time: 12:20		
Address: PO BOX 2834 ADELAIDE 5001		Hundred: PORT GAWLER			
Results To: MICK STADTER		Section: 174	Lot No:		
Address: Po Box 2834 Adelaide 5001					
Collected By: MICK FREESTONE		Sample Depth From: 50.00	To: 70.00 M		
Remarks: FINAL SAMPLE N/O=2					
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1830			
Method: Airlift / Bail / Flow / Pump		TDS: 1010			
Source: Tank / Well / Dam / River / Spring		pH:			

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 496262	Unit No: 6628 20732	Obs No: PTG 84	Permit No: 56847		
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 06/02/2002	Time:		
Address: PO BOX 2834 ADELAIDE 5001		Hundred: PORT GAWLER			
Results To: HAJRUDIN ZULFIC		Section: 174	Lot No:		
Address: Po Box 2834 Adelaide 5001					
Collected By: M FREESTONE DEPOT DRILLING		Sample Depth From: 50.00	To: 70.00 M		
Remarks:					
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1830			
Method: Airlift / Bail / Flow / Pump		TDS: 1010			
Source: Tank / Well / Dam / River / Spring		pH:			

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APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 496093	Unit No: 6628 20733	Obs No: MPA 156	Permit No: 56848		
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 09/02/2002	Time: 11:00		
Address: PO BOX 2834 ADELAIDE 5001		Hundred: MUNNO PARA			
Results To: For Water Resources Department		Section: 3296	Lot No:		
Address: Po Box 2834 Adelaide 5001					
Collected By: MICK STADTER		Sample Depth From: 84.00	To: 100.00 M		
Remarks:					
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1000			
Method: Airlift / Bail / Flow / Pump		TDS: 550			
Source: Tank / Well / Dam / River / Spring		pH:			

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 496263	Unit No: 6628 20733	Obs No: MPA 156	Permit No: 56848		
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 09/02/2002	Time:		
Address: PO BOX 2834 ADELAIDE 5001		Hundred: MUNNO PARA			
Results To: HAJRUDIN ZULFIC		Section: 3296	Lot No:		
Address: Po Box 2834 Adelaide 5001					
Collected By: M FREESTONE DEPOT DRILLING		Sample Depth From: To: M			
Remarks:					
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1010			
Method: Airlift / Bail / Flow / Pump		TDS: 556			
Source: Tank / Well / Dam / River / Spring		pH:			

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DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA				
Groundwater Sample				
Sample No: 496088	Unit No: 6628 20734	Obs No: MPA 157	Permit No: 57452	
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 12/02/2002	Time: 11:00	
Address: 25 GRENFELL STREET ADELAIDE 5001		Hundred: MUNNO PARA		
Results To: MICK STADTER		Section: PT 3055	Lot No: 4	
Address: 25 Grenfell Street Adelaide 5001				
Collected By: MICK STADTER		Sample Depth From: 96.00 To: 118.00 M		
Remarks: START OF LIFTING SAMPLE N/O=1				
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 2720		
Method: Airlift / Bail / Flow / Pump		TDS: 1508		
Source: Tank / Well / Dam / River / Spring		pH:		

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA				
Groundwater Sample				
Sample No: 496089	Unit No: 6628 20734	Obs No: MPA 157	Permit No: 57452	
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 12/02/2002	Time: 12:00	
Address: 25 GRENFELL STREET ADELAIDE 5001		Hundred: MUNNO PARA		
Results To: MICK STADTER		Section: PT 3055	Lot No: 4	
Address: 25 Grenfell Street Adelaide 5001				
Collected By: MICK STADTER		Sample Depth From: 96.00 To: 118.00 M		
Remarks: LAST SAMPLE N/O=2				
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 3070		
Method: Airlift / Bail / Flow / Pump		TDS: 1703		
Source: Tank / Well / Dam / River / Spring		pH:		

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA			
Groundwater Sample			
Sample No: 496264	Unit No: 6628 20734	Obs No: MPA 157	Permit No: 57452
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 12/02/2002	Time:
Address: 25 GRENFELL STREET ADELAIDE 5001		Hundred: MUNNO PARA	
Results To: HAJRUDIN ZULFIC		Section: PT 3055	Lot No: 4
Address: 25 Grenfell Street Adelaide 5001			
Collected By: M FREESTONE DEPOT DRILLING		Sample Depth From: M	To: M
Remarks:			
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 3110	
Method: Airlift / Bail / Flow / Pump		TDS: 1726	
Source: Tank / Well / Dam / River / Spring		pH:	

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DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 496090	Unit No: 6628 20735	Obs No: MPA 158	Permit No: 57535		
Permit Holder: DEPT FOR WATER RESOURCES			Date: 15/02/2002	Time: 10:00	
Address: 25 GRENFELL ST ADELAIDE 5001			Hundred: MUNNO PARA		
Results To: MICK STADTER			Section: 3027	Lot No:	
Address: 25 Grenfell St Adelaide 5001					
Collected By: MICK STADTER			Sample Depth From: 68.00	To: 86.00 M	
Remarks:					
Collected: Drilling / Final Sample / Monitoring / Pump Test			EC: 990		
Method: Airlift / Bail / Flow / Pump			TDS: 545		
Source: Tank / Well / Dam / River / Spring			pH:		

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 496265	Unit No: 6628 20735	Obs No: MPA 158	Permit No: 57535		
Permit Holder: DEPT FOR WATER RESOURCES			Date: 15/02/2002	Time:	
Address: 25 GRENFELL ST ADELAIDE 5001			Hundred: MUNNO PARA		
Results To: HAJRUDIN ZULFIC			Section: 3027	Lot No:	
Address: 25 Grenfell St Adelaide 5001					
Collected By: M FREESTONE DEPOT DRILLING			Sample Depth From: To: M		
Remarks:					
Collected: Drilling / Final Sample / Monitoring / Pump Test			EC: 1030		
Method: Airlift / Bail / Flow / Pump			TDS: 567		
Source: Tank / Well / Dam / River / Spring			pH:		

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DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No:	496602	Unit No:	6628 20759	Obs No:	PTA 116
Permit Holder:	DEPARTMENT FOR WATER RESOURCES			Permit No:	57655
Address:	25 GRENFELL ST ADELAIDE 5001			Date:	01/03/2002
Results To:	MICK STADTER			Time:	10:16
Address:	25 Grenfell St Adelaide 5001			Hundred:	PORT ADELAIDE
Collected By:	MICK FREESTONE DEPOT DRILLING			Section:	PT 95
Remarks:	FIRST SAMPLE DURING AIRLIFTING			Lot No:	SAMPLE N/O=1
Collected:	Drilling / Final Sample / Monitoring / Pump Test			EC:	1360
Method:	Airlift / Bail / Flow / Pump			TDS:	750
Source:	Tank / Well / Dam / River / Spring			pH:	
Sample Depth From: To: M					

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No:	496603	Unit No:	6628 20759	Obs No:	PTA 116
Permit Holder:	DEPARTMENT FOR WATER RESOURCES			Permit No:	57655
Address:	25 GRENFELL ST ADELAIDE 5001			Date:	01/03/2002
Results To:	MICK STADTER			Time:	10:34
Address:	25 Grenfell St Adelaide 5001			Hundred:	PORT ADELAIDE
Collected By:	MICK FREESTONE DEPOT DRILLING			Section:	PT 95
Remarks:	SECOND SAMPLE DURING AIRLIFTING			Lot No:	SAMPLE N/O=2
Collected:	Drilling / Final Sample / Monitoring / Pump Test			EC:	1360
Method:	Airlift / Bail / Flow / Pump			TDS:	750
Source:	Tank / Well / Dam / River / Spring			pH:	
Sample Depth From: 78.00 To: 96.00 M					

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No: 496604	Unit No: 6628 20759	Obs No: PTA 116	Permit No: 57655		
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 01/03/2002	Time: 11:09		
Address: 25 GRENFELL ST ADELAIDE 5001		Hundred: PORT ADELAIDE			
Results To: MICK STADTER		Section: PT 95	Lot No:		
Address: 25 Grenfell St Adelaide 5001					
Collected By: MICK FREESTONE DEPOT DRILLING		Sample Depth From: 78.00	To: 96.00 M		
Remarks: FINAL SAMPLE					
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1380			
Method: Airlift / Bail / Flow / Pump		TDS: 761			
Source: Tank / Well / Dam / River / Spring		pH:			

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DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No:	483180	Unit No:	6628 20678	Obs No:	MPA 153
Permit Holder:	DWR - ZULFIC H			Permit No:	56430
Address:	101 GRENFELL ST ADELAIDE 5000			Date:	29/09/2001
Results To:	- Zulfic H Dwr			Time:	13:00
Address:	101 Grenfell St Adelaide 5000			Hundred:	MUNNO PARA
Collected By:	S BODEY DEPOT DRILLING			Section:	PT 3889
Remarks:	HALF-HOUR AIRLIFTING AT=52m sample n/o=1			Lot No:	
Collected:	Drilling / Final Sample / Monitoring / Pump Test			EC:	2280
Method:	Airlift / Bail / Flow / Pump			TDS:	1261
Source:	Tank / Well / Dam / River / Spring			pH:	
Sample Depth From: 74.00 To: 94.00 M					

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No:	483181	Unit No:	6628 20678	Obs No:	MPA 153
Permit Holder:	DWR - ZULFIC H			Permit No:	56430
Address:	101 GRENFELL ST ADELAIDE 5000			Date:	29/09/2001
Results To:	- Zulfic H Dwr			Time:	13:30
Address:	101 Grenfell St Adelaide 5000			Hundred:	MUNNO PARA
Collected By:	S BODEY DEPOT DRILLING			Section:	PT 3889
Remarks:	ONE HOUR AIRLIFTING AT=52m SAMPLE N/O=2			Lot No:	
Collected:	Drilling / Final Sample / Monitoring / Pump Test			EC:	2280
Method:	Airlift / Bail / Flow / Pump			TDS:	1261
Source:	Tank / Well / Dam / River / Spring			pH:	
Sample Depth From: 74.00 To: 94.00 M					

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No:	483182	Unit No:	6628 20678	Obs No:	MPA 153
Permit Holder:	DWR - ZULFIC H			Permit No:	56430
Address:	101 GRENFELL ST ADELAIDE 5000			Date:	29/09/2001
Results To:	- Zulfic H Dwr			Time:	Hundred: MUNNO PARA
Address:	101 Grenfell St Adelaide 5000			Section:	PT 3889
Collected By:	S BODEY DEPOT DRILLING			Lot No:	
Remarks:	LAST SAMPLE N/O=3				
Collected:	Drilling / Final Sample / Monitoring / Pump Test			EC:	2280
Method:	Airlift / Bail / Flow / Pump			TDS:	1261
Source:	Tank / Well / Dam / River / Spring			pH:	
Sample Depth From: 74.00 To: 94.00 M					

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DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA				
Groundwater Sample				
Sample No: 495494	Unit No: 6628 20736	Obs No: MPA 159	Permit No: 56849	
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 30/01/2002	Time: 15:15	
Address: PO BOX 2834 ADELAIDE 5001		Hundred: MUNNO PARA		
Results To: MICK STADTER		Section: 3052	Lot No:	
Address: Po Box 2834 Adelaide 5001				
Collected By: MICK STADTER		Sample Depth From: 83.00	To: 100.00 M	
Remarks:				
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1730		
Method: Airlift / Bail / Flow / Pump		TDS: 955		
Source: Tank / Well / Dam / River / Spring		pH:		

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA				
Groundwater Sample				
Sample No: 495495	Unit No: 6628 20736	Obs No: MPA 159	Permit No: 56849	
Permit Holder: DEPARTMENT FOR WATER RESOURCES		Date: 30/01/2002	Time: 15:00	
Address: PO BOX 2834 ADELAIDE 5001		Hundred: MUNNO PARA		
Results To: MICK STADTER		Section: 3052	Lot No:	
Address: Po Box 2834 Adelaide 5001				
Collected By: MICK STADTER		Sample Depth From: 83.00	To: 100.00 M	
Remarks: SAMPLE N/O=1				
Collected: Drilling / Final Sample / Monitoring / Pump Test		EC: 1730		
Method: Airlift / Bail / Flow / Pump		TDS: 955		
Source: Tank / Well / Dam / River / Spring		pH:		

APPENDICES

DWLBC, GROUNDWATER ASSESSMENT - SOUTH AUSTRALIA					
Groundwater Sample					
Sample No:	496260	Unit No:	6628 20736	Obs No:	MPA 159
Permit Holder:	DEPARTMENT FOR WATER RESOURCES			Permit No:	56849
Address:	PO BOX 2834 ADELAIDE 5001			Date:	30/01/2002
Results To:	HAJRUDIN ZULFIC			Time:	Hundred: MUNNO PARA
Address:	Po Box 2834 Adleaide 5001			Section:	3052
Collected By:	M FREESTONE DEPOT DRILLING			Lot No:	
Remarks:				Sample Depth From:	To: M
Collected:	Drilling / Final Sample / Monitoring / Pump Test			EC:	1730
Method:	Airlift / Bail / Flow / Pump			TDS:	955
Source:	Tank / Well / Dam / River / Spring			pH:	

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UNITS OF MEASUREMENT

Units of measurement commonly used (SI and non-SI Australian legal)

Name of unit	Symbol	Definition in terms of other metric units	Quantity
day	d	24 h	time interval
gigalitre	GL	10^6 m^3	volume
gram	g	10^{-3} kg	mass
hectare	ha	10^4 m^2	area
hour	h	60 min	time interval
kilogram	kg	base unit	mass
kilolitre	kL	1 m^3	volume
kilometre	km	10^3 m	length
litre	L	10^{-3} m^3	volume
megalitre	ML	10^3 m^3	volume
metre	m	base unit	length
microgram	μg	10^{-6} g	mass
microlitre	μL	10^{-9} m^3	volume
milligram	mg	10^{-3} g	mass
millilitre	mL	10^{-6} m^3	volume
millimetre	mm	10^{-3} m	length
minute	min	60 s	time interval
second	s	base unit	time interval
tonne	t	1000 kg	mass
year	y	356 or 366 days	time interval

δD	hydrogen isotope composition
$\delta^{18}\text{O}$	oxygen isotope composition
^{14}C	carbon-14 isotope (percent modern carbon)
CFC	chlorofluorocarbon (parts per trillion volume)
EC	electrical conductivity ($\mu\text{S}/\text{cm}$)
pH	acidity
ppm	parts per million
ppb	parts per billion
TDS	total dissolved solids (mg/L)

GLOSSARY

Act (the). In this document, refers to The *Natural Resources Management Act (South Australia) 2004*.

Adaptive management. A management approach, often used in natural resource management, where there is little information and/or a lot of complexity and there is a need to implement some management changes sooner rather than later. The approach is to use the best available information for the first actions, implement the changes, monitor the outcomes, investigate the assumptions and regularly evaluate and review the actions required. Consideration must be given to the temporal and spatial scale of monitoring and the evaluation processes appropriate to the ecosystem being managed.

Algal bloom. A rapid accumulation of algal biomass (living organic matter) which can result in deterioration in water quality when the algae die and break down consuming the dissolved oxygen and releasing toxins.

Ambient. The background level of an environmental parameter (e.g. a background water quality like salinity).

Anabanch. A branch of a river that leaves the main stream.

Annual adjusted catchment yield. Annual catchment yield with the impact of dams removed.

Aquifer. An underground layer of rock or sediment which holds water and allows water to percolate through.

Aquifer, confined. Aquifer in which the upper surface is impervious and the water is held at greater than atmospheric pressure. Water in a penetrating well will rise above the surface of the aquifer.

Aquifer, storage and recovery (ASR). The process of recharging water into an aquifer for the purpose of storage and subsequent withdrawal.

Aquifer test. A hydrological test performed on a well, aimed to increase the understanding of the aquifer properties, including any interference between wells, and to more accurately estimate the sustainable use of the water resource available for development from the well.

Aquifer, unconfined. Aquifer in which the upper surface has free connection to the ground surface and the water surface is at atmospheric pressure.

Aquitard. A layer in the geological profile that separates two aquifers and restricts the flow between them.

Arid lands. In South Australia arid lands are usually considered to be areas with an average rainfall of less than 250 mm and support pastoral activities instead of broad acre cropping.

Artesian. Under pressure such that when wells penetrate the aquifer water will rise to the ground surface without the need for pumping.

Artificial recharge. The process of artificially diverting water from the surface to an aquifer. Artificial recharge can reduce evaporation losses and increase aquifer yield. (See *recharge, natural recharge, aquifer*.)

Barrage. Specifically any of the five low weirs at the mouth of the River Murray constructed to exclude seawater from the Lower Lakes.

Baseflow. The water in a stream that results from groundwater discharge to the stream. (This discharge often maintains flows during seasonal dry periods and has important ecological functions.)

Basin. The area drained by a major river and its tributaries.

Benchmark condition. Points of reference from which change can be measured.

Biological diversity (biodiversity). The variety of life forms: the different life forms including plants, animals and micro-organisms, the genes they contain and the *ecosystems* (see below) they form. It is usually considered at three levels — genetic diversity, species diversity and ecosystem diversity.

GLOSSARY

Biota. All of the organisms at a particular locality.

Bore. See *well*.

Buffer zone. A neutral area that separates and minimises interactions between zones whose management objectives are significantly different or in conflict (e.g. a vegetated riparian zone can act as a buffer to protect the water quality and streams from adjacent land uses).

Catchment. A catchment is that area of land determined by topographic features within which rainfall will contribute to runoff at a particular point.

Catchment water management board. A statutory body established under Part 6, Division 3, s. 53 of the Act whose prime function under Division 2, s. 61 is to implement a catchment water management plan for its area.

Catchment water management plan. The plan prepared by a CWMB and adopted by the Minister in accordance with Part 7, Division 2 of the Water Resources Act 1997.

Codes of practice. Standards of management developed by industry and government, promoting techniques or methods of environmental management by which environmental objectives may be achieved.

Cone of depression. An inverted cone-shaped space within an aquifer caused by a rate of groundwater extraction which exceeds the rate of recharge. Continuing extraction of water can extend the area and may affect the viability of adjacent wells, due to declining water levels or water quality.

Conjunctive use. The utilisation of more than one source of water to satisfy a single demand.

Council of Australian Governments (COAG). A council of the Prime Minister, State Premiers, Territory Chief Ministers and the President of the Australian Local Government Association which exists to set national policy directions for Australia.

CWMB. Catchment Water Management Board.

Dams, off-stream dam. A dam, wall or other structure that is not constructed across a watercourse or drainage path and is designed to hold water diverted, or pumped, from a watercourse, a drainage path, an aquifer or from another source. Off-stream dams may capture a limited volume of surface water from the catchment above the dam.

Dams, on-stream dam. A dam, wall or other structure placed or constructed on, in or across a watercourse or drainage path for the purpose of holding and storing the natural flow of that watercourse or the surface water.

Dams, turkey nest dam. An off-stream dam that does not capture any surface water from the catchment above the dam.

Diffuse source pollution. Pollution from sources such as an eroding paddock, urban or suburban lands and forests; spread out, and often not easily identified or managed.

District Plan. (District Soil Conservation Plan) An approved soil conservation plan under the repealed *Soil Conservation Act 1989*. These plans are taken to form part of the relevant regional NRM plans under the transitional provisions of the *Natural Resources Management Act 2004* (Schedule 4 – subclause 53[4] until regional NRM plans are prepared under Chapter 4, Part 2 of the Act).

Domestic purpose. The taking of water for ordinary household purposes and includes the watering of land in conjunction with a dwelling not exceeding 0.4 hectares.

Domestic wastewater. Water used in the disposal of human waste, for personal washing, washing clothes or dishes, and swimming pools.

DSS (decision support system). A system of logic or a set of rules derived from experts, to assist decision making. Typically they are constructed as computer programs.

DSS. Dissolved suspended solids.

DWLBC. Department of Water, Land and Biodiversity Conservation. Government of South Australia.

EC. Abbreviation for electrical conductivity. 1 EC unit = 1 micro-Siemen per centimetre ($\mu\text{S}/\text{cm}$) measured at 25 degrees Celsius. Commonly used to indicate the salinity of water.

GLOSSARY

Ecological processes. All biological, physical or chemical processes that maintain an ecosystem.

Ecological values. The habitats, the natural ecological processes and the biodiversity of ecosystems.

Ecologically sustainable development (ESD). Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

Ecology. The study of the relationships between living organisms and their environment.

Ecosystem. Any system in which there is an interdependence upon and interaction between living organisms and their immediate physical, chemical and biological environment.

Ecosystem Services. All biological, physical or chemical processes that maintain ecosystems and biodiversity and provide inputs and waste treatment services that support human activities.

Effluent. Domestic wastewater and industrial wastewater.

EIP. Environment improvement program.

EMLR. Eastern Mount Lofty Ranges.

Entitlement flows. Minimum monthly River Murray flows to South Australia agreed in the Murray-Darling Basin Agreement 1992.

Environmental values. The uses of the environment that are recognised as of value to the community. This concept is used in setting water quality objectives under the Environment Protection (Water Quality) Policy, which recognises five environmental values — protection of aquatic ecosystems, recreational water use and aesthetics, potable (drinking water) use, agricultural and aquaculture use, and industrial use. It is not the same as ecological values, which are about the elements and functions of ecosystems.

Environmental water provisions. Those parts of environmental water requirements that can be met, at any given time. This is what can be provided at that time with consideration of existing users' rights, social and economic impacts.

Environmental water requirements. The water regimes needed to sustain the ecological values of aquatic ecosystems, including their processes and biological diversity, at a low level of risk.

EP. Eyre Peninsula.

EPA. Environment Protection Agency.

Ephemeral streams / wetlands. Those streams or wetlands that usually contain water only on an occasional basis after rainfall events. Many arid zone streams and wetlands are ephemeral.

Erosion. Natural breakdown and movement of soil and rock by water, wind or ice. The process may be accelerated by human activities.

ESD. Ecologically sustainable development (see above for definition).

Estuaries. Semi-enclosed waterbodies at the lower end of a freshwater stream that are subject to marine, freshwater and terrestrial influences and experience periodic fluctuations and gradients in salinity.

Eutrophication. Degradation of water quality due to enrichment by nutrients (primarily nitrogen and phosphorus), causing excessive plant growth and decay. (See *algal bloom*).

Evapotranspiration. The total loss of water as a result of transpiration from plants and evaporation from land, and surface waterbodies.

Fishway. A generic term describing all mechanisms that allow the passage of fish along a waterway. Specific structures include fish ladders (gentle sloping channels with baffles that reduce the velocity of water and provide resting places for fish as they 'climb' over a weir) and fishlifts (chambers, rather like lift-wells, that are flooded and emptied to enable fish to move across a barrier).

Floodplain. Of a watercourse means: (a) the floodplain (if any) of the watercourse identified in a catchment water management plan or a local water management plan; adopted under Part 7 of the Water Resources Act 1997; or (b) where paragraph (a) does not apply — the floodplain (if any) of the watercourse identified in a development plan under the Development Act 1993, or (c) where neither

GLOSSARY

paragraph (a) nor paragraph (b) applies — the land adjoining the watercourse that is periodically subject to flooding from the watercourse.

Flow bands. Flows of different frequency, volume and duration.

GAB. Great Artesian Basin.

Gigalitre (GL). One thousand million litres (1 000 000 000).

GIS (geographic information system). Computer software allows for the linking of geographic data (for example land parcels) to textual data (soil type, land value, ownership). It allows for a range of features, from simple map production to complex data analysis.

GL. See *gigalitre*.

Greenhouse effect. The balance of incoming and outgoing solar radiation which regulates our climate. Changes to the composition of the atmosphere such as the addition of carbon dioxide through human activities, have the potential to alter the radiation balance and to effect changes to the climate. Scientists suggest that changes would include global warming, a rise in sea level and shifts in rainfall patterns.

Geological features. Include geological monuments, landscape amenity and the substrate of land systems and ecosystems.

Greywater. Household wastewater excluding sewage effluent. Wastewater from kitchen, laundry and bathroom.

Groundwater. See *underground water*.

Habitat. The natural place or type of site in which an animal or plant, or communities of plants and animals, lives.

Heavy metal. Any metal with a high atomic weight (usually, although not exclusively, greater than 100), for example mercury, lead and chromium. Heavy metals have a widespread industrial use, and many are released into the biosphere via air, water and solids pollution. Usually these metals are toxic at low concentrations to most plant and animal life.

Hydrogeology. The study of groundwater, which includes its occurrence, recharge and discharge processes and the properties of aquifers. (See *hydrology*.)

Hydrography. The discipline related to the measurement and recording of parameters associated with the hydrological cycle, both historic and real time.

Hydrology. The study of the characteristics, occurrence, movement and utilisation of water on and below the earth's surface and within its atmosphere. (See *hydrogeology*.)

Hyporheic zone. The wetted zone among sediments below and alongside rivers. It is a refuge for some aquatic fauna.

Indigenous species. A species that occurs naturally in a region.

Industrial wastewater. Water (not being domestic wastewater) that has been used in the course of carrying on a business (including water used in the watering of irrigation of plants) that has been allowed to run to waste or has been disposed of or has been collected for disposal.

Infrastructure. Artificial lakes; or dams or reservoirs; or embankments, walls, channels or other works; or buildings or structures; or pipes, machinery or other equipment.

Integrated catchment management. Natural resources management that considers in an integrated manner the total long-term effect of land and water management practices on a catchment basis, from production and environmental viewpoints.

Intensive farming. A method of keeping animals in the course of carrying on the business of primary production in which the animals are confined to a small space or area and are usually fed by hand or by mechanical means.

Irrigation. Watering land by any means for the purpose of growing plants.

Irrigation season. The period in which major irrigation diversions occur, usually starting in August–September and ending in April–May.

GLOSSARY

Lake. A natural lake, pond, lagoon, wetland or spring (whether modified or not) and includes: part of a lake; and a body of water declared by regulation to be a lake; a reference to a lake is a reference to either the bed, banks and shores of the lake or the water for the time being held by the bed, banks and shores of the lake, or both, depending on the context.

Land. Whether under water or not and includes an interest in land and any building or structure fixed to the land.

Land capability. The ability of the land to accept a type and intensity of use without sustaining long-term damage.

Leaching. Removal of material in solution such as minerals, nutrients and salts through soil.

Licence. A licence to take water in accordance with the Water Resources Act 1997. (See *water licence*.)

Licensee. A person who holds a water licence.

Local water management plan. A plan prepared by a council and adopted by the Minister in accordance with Part 7, Division 4 of the Act.

Macro-invertebrates. Animals without backbones that are typically of a size that is visible to the naked eye. They are a major component of aquatic ecosystem biodiversity and fundamental in food webs.

MDBC. Murray-Darling Basin Commission.

Megalitre (ML). One million litres (1 000 000).

ML. See *megalitre*.

MLR. Mount Lofty Ranges.

Model. A conceptual or mathematical means of understanding elements of the real world which allows for predictions of outcomes given certain conditions. Examples include estimating storm runoff, assessing the impacts of dams or predicting ecological response to environmental change.

Mount Lofty Ranges Watershed. The area prescribed by Schedule 1 of the regulations.

Natural recharge. The infiltration of water into an aquifer from the surface (rainfall, streamflow, irrigation etc.) (See *recharge area, artificial recharge*.)

NHMRC. National Health and Medical Research Council.

NHT. Natural Heritage Trust.

Natural Resources. Soil; water resources; geological features and landscapes; native vegetation, native animals and other native organisms; ecosystems.

Natural Resources Management (NRM). All activities that involve the use or development of natural resources and/or that impact on the state and condition of natural resources, whether positively or negatively.

Occupier of land. A person who has, or is entitled to, possession or control of the land.

Owner of land. In relation to land alienated from the Crown by grant in fee simple — the holder of the fee simple; in relation to dedicated land within the meaning of the *Crown Lands Act 1929* that has not been granted in fee simple but which is under the care, control and management of a Minister, body or other person — the Minister, body or other person; in relation to land held under Crown lease or licence — the lessee or licensee; in relation to land held under an agreement to purchase from the Crown — the person entitled to the benefit of the agreement; in relation to any other land — the Minister who is responsible for the care, control and management of the land or, if no Minister is responsible for the land, the Minister for Environment and Heritage.

Palaeochannels. Ancient buried river channels in arid areas of the state. Aquifers in palaeochannels can yield useful quantities of groundwater or be suitable for ASR.

Pasture. Grassland used for the production of grazing animals such as sheep and cattle.

GLOSSARY

Percentile. A way of describing sets of data by ranking the data set and establishing the value for each percentage of the total number of data records. The 90th percentile of the distribution is the value such that 90% of the observations fall at or below it.

Permeability. A measure of the ease with which water flows through an aquifer or aquitard.

Personal property. All forms of property other than real property. For example, shares or a water licence.

Phreaphytic vegetation. Vegetation that exists in a climate more arid than its normal range by virtue of its access to groundwater.

Phytoplankton. The plant constituent of organisms inhabiting the surface layer of a lake; mainly single-cell algae.

PIRSA. (Department of) Primary Industries and Resources South Australia.

Pollution, diffuse source. Pollution from sources that are spread out and not easily identified or managed (e.g. an eroding paddock, urban or suburban lands and forests).

Pollution, point source. A localised source of pollution.

Potable water. Water suitable for human consumption.

Potentiometric head. The potentiometric head or surface is the level to which water rises in a well due to water pressure in the aquifer.

Precautionary principle. Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Prescribed area, surface water. Part of the State declared to be a surface water prescribed area under the Water Resources Act 1997.

Prescribed lake. A lake declared to be a prescribed lake under the Water Resources Act 1997.

Prescribed water resource. A water resource declared by the Governor to be prescribed under the Act, and includes underground water to which access is obtained by prescribed wells. Prescription of a water resource requires that future management of the resource be regulated via a licensing system.

Prescribed watercourse. A watercourse declared to be a prescribed watercourse under the Water Resources Act 1997.

Prescribed well. A well declared to be a prescribed well under the Water Resources Act 1997.

Property right. A right of ownership or some other right to property, whether real property or personal property.

Proponent. The person or persons (who may be a body corporate) seeking approval to take water from prescribed water.

PWA. Prescribed Wells Area.

PWCA. Prescribed Watercourse Area.

PWRA. Prescribed Water Resources Area.

Ramsar Convention. This is an international treaty on wetlands titled The Convention on Wetlands of International Importance Especially as Waterfowl Habitat. It is administered by the International Union for Conservation of Nature and Natural Resources. It was signed in the town of Ramsar, Iran in 1971, hence its common name. The Convention includes a list of wetlands of international importance and protocols regarding the management of these wetlands. Australia became a signatory in 1974.

Recharge area. The area of land from which water from the surface (rainfall, streamflow, irrigation, etc.) infiltrates into an aquifer. (See *artificial recharge*, *natural recharge*.)

Reclaimed water. Treated effluent of a quality suitable for the designated purpose.

Rehabilitation (of waterbodies). Actions that improve the ecological health of a waterbody by reinstating important elements of the environment that existed prior to European settlement.

GLOSSARY

Remediation (of waterbodies). Actions that improve the ecological condition of a waterbody without necessarily reinstating elements of the environment that existed prior to European settlement.

Restoration (of waterbodies). Actions that reinstate the pre-European condition of a waterbody.

Reticulated water. Water supplied through a piped distribution system.

Riffles. Shallow stream section with fast and turbulent flow.

Riparian landholder. A person whose property abuts a watercourse or through whose property a watercourse runs.

Riparian rights. These were old common law rights of access to, and use of water. These common law rights were abolished with the enactment of the Water Resources Act 1997, which now includes similar rights under s. 7. Riparian rights are therefore now statutory rights under the Act. Where the resource is not prescribed (Water Resources Act 1997, s. 8) or subject to restrictions (Water Resources Act 1997, s. 16), riparian landholders may take any amount of water from watercourses, lakes or wells without consideration to downstream landholders, if it is to be used for stock or domestic purposes. If the capture of water from watercourses and groundwater is to be used for any other purpose then the right of downstream landholders must be protected. Landholders may take any amount of surface water for any purpose without regard to other landholders, unless the surface water is prescribed or subject to restrictions.

Riparian zone. That part of the landscape adjacent to a water body, that influences and is influenced by watercourse processes. This can include landform, hydrological or vegetation definitions. It is commonly used to include the in-stream habitats, bed, banks and sometimes floodplains of watercourses.

Seasonal watercourses or wetlands. Those watercourses and wetlands that contain water on a seasonal basis, usually over the winter/spring period, although there may be some flow or standing water at other times.

State water plan. The plan prepared by the Minister under Part 7, Division 1, s. 90 of the Act.

Stock Use. The taking of water to provide drinking water for stock other than stock subject to intensive farming (as defined by the Act).

Stormwater. Runoff in an urban area.

Surface water. (a) water flowing over land (except in a watercourse), (i) after having fallen as rain or hail or having precipitated in any another manner, (ii) or after rising to the surface naturally from underground; (b) water of the kind referred to in paragraph (a) that has been collected in a dam or reservoir.

Taxa. General term for a group identified by taxonomy — which is the science of describing, naming and classifying organisms.

To take water. From a water resource includes (a) to take water by pumping or syphoning the water; (b) to stop, impede or divert the flow of water over land (whether in a watercourse or not) for the purpose of collecting the water; (c) to divert the flow of water in a watercourse from the watercourse; (d) to release water from a lake; (e) to permit water to flow under natural pressure from a well; (f) to permit stock to drink from a watercourse, a natural or artificial lake, a dam or reservoir.

Total kjeldhal nitrogen (TKN). The sum of aqueous ammonia and organic nitrogen. Used as a measure of probable sewage pollution.

Transfer. A transfer of a licence (including its water allocation) to another person, or the whole or part of the water allocation of a licence to another licensee or the Minister under Part 5, Division 3, s. 38 of the Act. The transfer may be absolute or for a limited period.

Underground water (groundwater). Water occurring naturally below ground level or water pumped, diverted or released into a well for storage underground.

Volumetric allocation. An allocation of water expressed on a water licence as a volume (e.g. kilolitres) to be used over a specified period of time, usually per water use year (as distinct from any other sort of allocation).

Wastewater. See *domestic wastewater, industrial wastewater*.

GLOSSARY

Water affecting activities. Activities referred to in Part 4, Division 1, s. 9 of the Act.

Water allocation. (a) in respect of a water licence means the quantity of water that the licensee is entitled to take and use pursuant to the licence; (b) in respect of water taken pursuant to an authorisation under s. 11 means the maximum quantity of water that can be taken and used pursuant to the authorisation.

Water allocation, area based. An allocation of water that entitles the licensee to irrigate a specified area of land for a specified period of time usually per water use year.

Water allocation plan (WAP). A plan prepared by a CWMB or water resources planning committee and adopted by the Minister in accordance with Division 3 of Part 7 of the Act.

Water licence. A licence granted under the Act entitling the holder to take water from a prescribed watercourse, lake or well or to take surface water from a surface water prescribed area. This grants the licensee a right to take an allocation of water specified on the licence, which may also include conditions on the taking and use of that water. A water licence confers a property right on the holder of the licence and this right is separate from land title.

Water plans. The State Water Plan, catchment water management plans, water allocation plans and local water management plans prepared under Part 7 of the Act.

Water service provider. A person or corporate body that supplies water for domestic, industrial or irrigation purposes or manages wastewater.

Waterbody. Waterbodies include watercourses, riparian zones, floodplains, wetlands, estuaries, lakes and groundwater aquifers.

Watercourse. A river, creek or other natural watercourse (whether modified or not) and includes: a dam or reservoir that collects water flowing in a watercourse; and a lake through which water flows; and a channel (but not a channel declared by regulation to be excluded from the this definition) into which the water of a watercourse has been diverted; and part of a watercourse.

Water-dependent ecosystems. Those parts of the environment, the species composition and natural ecological processes, which are determined by the permanent or temporary presence of flowing or standing water, above or below ground. The in-stream areas of rivers, riparian vegetation, springs, wetlands, floodplains, estuaries and lakes are all water-dependent ecosystems.

Water-use year. The period between 1 July in any given calendar year and 30 June the following calendar year. This is also called a licensing year.

Well. (a) an opening in the ground excavated for the purpose of obtaining access to underground water; (b) an opening in the ground excavated for some other purpose but that gives access to underground water; (c) a natural opening in the ground that gives access to underground water.

Wetlands. Defined by the Act as a swamp or marsh and includes any land that is seasonally inundated with water. This definition encompasses a number of concepts that are more specifically described in the definition used in the Ramsar Convention on Wetlands of International Importance. This describes wetlands as areas of permanent or periodic/intermittent inundation, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tides does not exceed six metres.