

3.0 GEOLOGY

The study area is situated within the Lachlan Fold Belt in south eastern New South Wales. Review of the areas geological setting was conducted with reference to the Department of Natural Resources Gunning 1:100,000 series sheet as is shown in **Figure 2**.

The investigation area is dominated by the Ordovician Adaminaby Group which comprises inter-bedded sandstone, phyllite and siltstone sequences that have been tightly folded and faulted. The Adaminaby Group adjoins Silurian aged granites to the east and south. The region is influenced by numerous major north-south fault structures with localised east-west lineaments.

4.0 HYDROGEOLOGY

4.1 SETTING

Viable groundwater resources in the area are associated primarily with fractured rock aquifers controlled by geological faults, fractures, and joints from both regional and district faulting. Enhanced hydraulic conductivity is largely dependent on the scale and density of primary (void space between grains) and secondary (fractures) porosity.

Groundwater gradients and flow regimes are expected to imitate catchment topography with flows towards the Lachlan River under subtle gradients.

The subject bores have been sited in proximity of geological lineaments mapped from aerial photography and geological maps to meet operational requirements. The bore locations are shown in **Figure 1**.

4.1.1 DEPTH

The subject bores were drilled to 114m (Bore 1) and 120m (Bore 2) whilst registered bores in the area are installed to depths between 18 metres and 61 metres below ground level (mbgl). During the investigation the static water level (SWL) in the subject bores was 26.84m (Bore 1) and 13.88m (Bore 2) during round 1 pump testing.

4.1.2 YIELD

Average yields for registered bores in the vicinity of the site are between 0.1L/s and 1.89L/s. The cumulative yield in the subject bores was reported as approximately 4L/s (Bore 1) and 0.6L/s (Bore 2) during airlifting by the driller.

4.1.3 GRADIENT AND FLOW

Determination of groundwater gradients and flow parameters requires field monitoring and surveying of boreheads to relative levels. The gathering of this necessary detail was beyond

the scope of work for this assessment. Local groundwater flows are expected to mimic topographic trends with subtle gradients towards the Lachlan River to the north.

4.1.4 RECHARGE AND DISCHARGE

The deep fractured rock aquifers intersected by the subject bores are considered regional scale systems with recharge from an extensive catchment area. During the scope of work no signs of groundwater discharge (seeps or springs) were identified at the site.

4.2 LICENSED WORKS

A review of *NOW* registered bore records was conducted to develop a conceptual understanding of regional groundwater conditions, including aquifer depths, yields, and water quality. The search did not identify any registered bores within a one (1) kilometre radius of the subject bores as depicted in **Figure 3**. The search was extended to the surrounding area. A summary of selected registered bore details is outlined in **Table 2** and bore reports are provided in **Appendix E**.

The existing registered bores in proximity to the area are drilled to various depths from 18-61m with ‘good’ to ‘brackish’ water quality and low yields up to 1.9L/s. In general the existing bores are considered insufficient in depth to facilitate assessment of the deeper aquifers (~50-120m) which have been intersected by the subject bores. Previous drilling investigations by *Hydroilex* in the region at Narrawa and Windermere Reserve intersected yields between 1.25 and 2.2L/s at depths from 23-48m.

It is noted that one (1) existing farm bore inspected during this assessment did not appear on the *NOW* groundwater database. *Hydroilex* understand the Stock and Domestic bore situated in Lot345 DP754111 (GDA 55E699430 N615483) may not be licensed. It is recommended that the owner be notified and the necessary documentation lodged with *NOW*.

Table 2 Summary of Nearby Registered Bores

Bore ID	East/North GDA 55	Depth m	Purpose	Yield L/s	Salinity	Aquifer	Geology	Distance from B1
GW703450	699345 6158566	18.6	Stock & domestic	0.5	N.D.	N.D.	N.D.	2.4km
GW060994	-	48.1	Stock & domestic	0.13 0.33	Good Good	39-39.3 45.1-45.4	Shale Shale	-
GW054033	699368 6157565	54	Stock & domestic	0.3 0.15 0.16 0.69	Fair Fair Fair Fair	20-22 22-30 30-38 38-54	Slate Slate Slate Slate	3km
GW047202	700206 6155550	61.5	TWS Bore 2	0.1 1.89	N.D.	33-34 58-61	Siltstone Shale	4.4km
GW070051	-	42	Stock & domestic	0.8	Good Good	18-19 30-31	Slate Slate	-
GW700858	-	30	Stock & domestic	0.25 0.31	N.D.	15-16 22-24	Shale Shale	-
GW600151	-	50	Monitoring Bore	0.05	8808 uS/cm	34-40	Sand	-
GW702612	699595 6161312	21	Stock & domestic	0.67	Brackish	10-20	N.D.	2.2km
GW702614	-	50	Stock & domestic	N.D.	N.D.	N.D.	N.D.	-

Table 2 Summary of Nearby Registered Bores

Bore ID	East/North GDA 55	Depth m	Purpose	Yield L/s	Salinity	Aquifer	Geology	Distance from B1
GW015985	?	23.5	TWS	1.26	N.D.	21-21	Shale	-
GW047175	-	50	Public municipal	0.1		29-36	Shale siltstone	-
GW047174	700126 6155721	40	TWS (Bore 1)	1.5	salty	20-30	shale	4.3km
No record	699430 6154835	n/a	n/a	n/a	n/a	n/a	n/a	5.3km

5.0 BORE CONSTRUCTION

The subject bores were drilled and constructed by *Bungendore Water Bores* in December 2011 and January 2012. *Hydroilex* understand the bores were constructed in accordance with the guidelines set out by the Land and Water Biodiversity Committee in the *Minimum Construction Requirements for Water Bores in Australia - 2nd Edition* (2003). Detailed bore construction records are documented in the 'Form A' reports contained in **Appendix A**. A summary of the construction data and aquifer intercepts is provided in **Table 3**.

Table 3 Bore Construction

Bore ID	Dalton Power Station - Bore 1	Dalton Power Station - Bore 2
Completion Date	22 / 12 / 2011	5/1/2012
Test Bore License	70BL233651	70BL233652
Lot/DP	306 / DP754111	307 / DP754111
Easting MGA 55	701426	701574
Northing MGA	6159761	6159409
Depth Drilled (m)	114	120
Casing	0 - 6m (200 mm steel) 0 – 114m (150mm PVC casing)	0-120 class 9 PVC
Water Entry (m)	54-114m (150mm slotted PVC casing)	18-90m (150mm slotted PVC casing)
Gravel Pack	0-114m 3.5 tonne (~1.4m ³) 6-7mm graded	0-90m 4 tonne (~1.5m ³) 6-7mm graded
Static Water Level (mbgl)	26.84	13.88
Aquifers m-m~L/s (driller)	40-42 seepage 49-51 ~0.3L/s 64-66 ~0.3L/s 89-91 ~0.5L/s 103-105 ~2L/s	15m ~seepage 22-24 ~0.2 39-41 ~0.3 65-66 ~possible aquifer 76-78 ~0.1 87-90 ~0.1
Yield (drillers airlift after construction)	4L/s	0.7L/s
Geology	0-17 Clay and wthrd shale, orange/brown 17-19 Shale, wthrd, clayey, light grey 19-48 Shale, light grey 48-72 Shale, medium grey	0-1 Clay, yellow/brown 1-6 Shale, slatey, weathered, yellow/brown 6-12 a/a, light brown

Bore ID	Dalton Power Station - Bore 1	Dalton Power Station - Bore 2
	72-114 Shale, slatey, dark grey, carbonaceous, occasional silty interbeds	12-25 slate, light grey 25-120 slate, medium grey, occasional quartz veining, highly carbonaceous below 72m

6.0 AQUIFER TESTING

6.1 PUMP TEST METHODOLOGY

The bores were subjected to two (2) rounds of 24 hour drawdown and recovery pump testing conducted between in December 2011 and February 2012. Pumping test design and methodology was developed and conducted in accordance with the Australian Standard for Test Pumping of Water Wells (AS 2368-1990). The pumping rate, duration and depth setting was selected following detailed review of the hydrogeological conditions including depth of target aquifers, aquifer type, available drawdown, and bore construction. Testing was conducted using a submersible *Grundfos* pump. Water level data was collected both manually and automatically with a submersible *minitroll* water level data logger programmed to record water levels at 10 minute intervals.

6.2 PUMP TEST RESULTS

A summary of the drawdown and recovery test results is provided in **Appendix B** (Round 1) and **Appendix C** (Round 2). Drawdown and recovery data was tabulated and plotted to produce aquifer response curves. The drawdown and recovery curves demonstrate high quality aquifer response data to support graphical analysis of aquifer properties.

Table 4 Summary of Drawdown and Recovery Test Results

Bore ID	Bore 1 Test 1	Bore 1 Test 2	Bore 2 Test 2	Bore 2 Test 2
Test Date Start	22/12/2011	16/2/2012	10/1/2012	14 2/2012
Drawdown Test Duration (hrs)	1 Day (24 Hours)	1 Day (24 Hours)	1 Day (24 Hours)	1 Day (24 Hours)
Recovery Test Duration (hrs)	>1 Day	>1 Day	>1 Day	>1 Day
Flow Rate (Litres per second)	3 L/s	3 L/s	0.6L/s	0.6L/s
Static Water Level (SWL mbgl)	26.84	26.71	13.88	13.88
Available Drawdown (ADD)	76mbSWL (103mbgl) to primary aquifer.		76mbSWL to base of aquifers observed during drilling & pump testing at 90mbgl)	
Final Drawdown during testing (m below SWL)	72.9mbgl after 24hrs	66.24mbgl after 24hrs	90.35mbgl after 24 hours	81.82mbgl after 24 hours
Transmissivity (m²/day)	8.6		0.5	
Storativity	0.008		0.4	

Bore ID	Bore 1 Test 1	Bore 1 Test 2	Bore 2 Test 2	Bore 2 Test 2
Recommended discharge rate (L/s)	Up to 3.0L/s		Up to 0.5L/s	
Recommended pump setting (mbgl)	103m		90m	
Capable Annual Yield (ML) pumping at 50% duty (12hrs/day 365 days / year)	50ML		10ML	

6.3 AQUIFER PARAMETERS

Water level observation data from the pumping tests was analysed with Aqtesolv Prov 4.0 software to estimate aquifer properties. Pump test analysis is generally more rigorous supported by water level drawdown data in monitoring bores. Monitoring was conducted in both production bores and six (6) existing bores. The production bores are approximately 383m apart. However, no significant drawdown was observed in any monitoring bores during pumping. Hence the aquifer test analysis was conducted using only the observation data from within the pumping bores. Straight line methods for confined aquifers were applied including Cooper Jacob (1946), and Theis (1935). Results are summarised in **Table 5**. It is recommended that any further application of aquifer test results incorporate sensitivity analysis using the range of values presented in this assessment.

Transmissivity

Transmissivity is a measure of how easily an aquifer layer transmits water or the hydraulic conductivity (K) over the thickness of a given layer. **Bore 1** reports T values between 6.35m²/day and 10.35m²/day. It is recommended the late time recovery data be applied with a T value of **8.6m²/day**. T values in Bore 1 are greater than Bore 2 which has a range between 0.316m²/day and 3.99m²/day. The yield in **Bore 2** is significantly less than Bore 1 hence a lower T value of **0.5m²/day** should be adopted.

Storativity

Storativity (S) is a dimensionless parameter that integrates storage over the height of the aquifer (volume/area/length). S is defined as the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head. It is equal to the product of specific storage and aquifer thickness (Fetter 2001).

S values derived from pump testing presents a range of values, it is recommended that a value of **0.008** be adopted in **Bore 1**. Results in **Bore 2** indicate an S value of **0.4** may be suitable based on late drawdown data. Aquifer test results for Storativity in Bore 2 report a large range in values as low as 2.8E-31. More detailed analysis of S values in Bore 2 would require an additional monitoring bore which is beyond the scope of work for this assessment and is not considered necessary given the relatively low required yield at the Site.

Table 5 Transmissivity and Storativity Values

			Cooper Jacob Drawdown	Cooper Jacob Recovery	Theis Drawdown	Theis Recovery
Bore 1	Test 1	T m ² /day	8.096	8.682	8.147	8.621
		S	1.748E-5	8.099E-6	1.404E-5	-
	Test 2	T m ² /day	6.35	10.35	10.04	9.358
		S	0.008247	1.404E-5	1.404E-5	-
Bore 2	Test 1	T m ² /day	0.5088	3.828	0.508	-
		S	0.4414	2.8E-31	0.4408	-
	Test 2	T m ² /day	0.357	3.67	0.316	0.9007
		S	0.2782	1.821E-24	0.441	-

6.4 CAPABLE YIELD

Initial water level recovery at completion of pumping is noted to be rapid becoming gradual. Groundwater yields are supported by the intersection of multiple fractured rock aquifers and an extensive recharge zone. The aquifer test results indicate Bore 1 is capable of sustaining discharge rates up to 4L/s with suitable recovery between pumping cycles to ensure the long term sustainability of the bore structure and groundwater resources. In general it is recommended to operate the bore at 50 percent duty pumping at 3L/s this is equivalent to an annual yield of approximately 50ML per year.

- **Bore 1 - 3.0L/s; 12hr Pumping; 12hrs Recovery; 50ML per year at 50% duty.**

Whilst the yield in Bore 2 is less, consistent pumping at a low rate may be conducted to maintain storage at the site. In general it is recommended to operate the bore at 50 percent duty pumping at 0.5L/s this is equivalent to an annual yield of approximately 10ML per year.

- **Bore 2 - 0.5L/s; 12hr Pumping; 12hrs Recovery; 10ML per year at 50% duty.**

The combined capable yield of the bores is approximately 60ML per year. This is noted to be greater than the proposed site requirements. The pumping regime recommendations are based on a 24 hour pumping cycle. Further drawdown modelling may be required to predict water levels under long term pumping. It should be noted that extrapolation beyond one (1) week is not reliable given the relatively short duration of the pump tests and no supporting records from monitoring bores. Should more accuracy be required for long term predictions a minimum 7 day pump test should be considered, and supported by water level measurements from one or more monitoring bores.

It should be noted that the indicated groundwater extraction regime is based on the aquifer response during a limited period of testing and simulation stress. Groundwater extraction should be supported by appropriate groundwater management practices including regular water level monitoring. Bore performance may alter as a result of structural and chemical changes within the bore or due to variations in aquifer recharge, namely as rainfall.

7.0 WATER QUALITY

Water samples were collected at the end of test pumping and submitted for formal analysis at a NATA accredited laboratory. A summary of the chemical analysis results is outlined in **Table 6** with the relevant water quality guidelines. Laboratory certificates of analysis are provided in **Appendix D**. Based on the laboratory results the water quality is considered appropriate for construction purposes including dust suppression. It is recommended that the laboratory results be compared against specific project requirements to determine

Table 6 Groundwater Quality Results

7.1 Summary of Water Quality Guidelines						
Analytes	Units	ANZECC 2000 Trigger values for Freshwater Level of protection (95% species)	ADWG 1996		B1	B2
			Health	Aesthetic		
Diss Calcium	mg/L	ID	ID	ID	170	210
Diss Potassium	mg/L	ID	ID	ID	3.8	3.8
T. Sodium	mg/L	ID	ID	180	240	360
Diss Magnesium	mg/L	ID	ID	ID	140	270
Carbonate	mg/L	ID	ID	ID	<0.1	<0.1
Bicarbonate	mg/L	ID	ID	ID	587	544
Sulphate	mg/L	ID	500	250	270	110
Chloride	mg/L	ID	ID	250	460	1200
Nitrate (as N)	mg/L N	700	50	50	<0.05	0.17
Nitrite (as N)	mg/L	ID	3	3	<0.01	<0.01
T.Iron	mg/L	ID	ID	0.3	3.4	3.2
pH	pH units	ID	ID	6.5-8.5	7.1	7.0
Electrical Conductivity	uS/cm	ID	ID	ID	2700	4600
T.Hardness	mg/L	ID	ID	200	1000	1600
T Diss Solids (c) - TDS	mg/L	ID	ID	500	1800	3000
Copper-Dissolved	mg/L	0.0014	2	1	0.0014	0.0028
Barium-Dissolved	mg/L	ID	0.7	ID	0.051	0.110
Cadmium-Dissolved	mg/L	0.0002	0.002	ID	<0.0005	0.0005
Chromium-Dissolved	mg/L	0.001	0.05	ID	<0.002	<0.002
Manganese-Dissolved	mg/L	1.9	0.5	0.1	0.23	0.34
Zinc-Dissolved	mg/L	0.008	ID	3	0.016	0.036
Lead-Dissolved	mg/L	0.0034	0.01	ID	<0.00005	<0.00005
Antimony-Dissolved	mg/L	ID	0.003	ID	<0.003	<0.003
Arsenic-Dissolved	mg/L	0.024	0.007	ID	0.001	0.003
Mercury-Dissolved	mg/L	0.0006	0.001	ID	<0.001	0.001
Selenium-Dissolved	mg/L	0.011	0.01	ID	<0.003	<0.002
Silver-Dissolved	mg/L	0.00005	0.1	ID	<0.001	<0.001

1: Australian and New Zealand Water Quality (ANZECC) Guidelines for fresh and marine waters, 2000

2: Australian Drinking Water Guidelines (ADWG) 1996

8.0 IMPACT ASSESSMENT

8.1 DISTANCE DRAWDOWN

The nearest registered bore (**GW702612**) is situated approximately 2.2km to the northwest and is not expected to be in strong hydraulic connection with the subject bores. The production bores (Bore 1 and Bore 2) were monitored during pumping to assess potential drawdown. The bores are positioned approximately 385m apart. It should be noted that no drawdown during pumping was recorded in Bore 2 whilst pumping Bore 1 and similarly no drawdown was recorded in Bore 1 whilst pumping Bore 2. Water level loggers were installed in six (6) existing bores during the second round of pump testing, hydrographs are reported in **Appendix C**. The hydrographs show ***no drawdown was recorded in monitoring bores associated with pump testing*** in the production bores. Distinct drawdown responses are noted in several bores associated with pump operation in those bores during the test period. Hydroilex understand two (2) landowners have expressed concern regarding potential impacts from pumping. The monitoring data clearly demonstrates no drawdown impacts beyond ~380m from the production bores. The production bores have intersected deep fractured rock aquifers associated with large scale aquifers. Hence, given the distance of existing bores and no record of drawdown during pumping in monitoring bores the proposed pumping schedule is not expected to impact on existing users.

8.2 GROUNDWATER DEPENDENT ECOSYSTEMS

Review of the property and surrounding land uses indicates that the site does not contain or form part of any critical habitats. Site inspections did not identify any significant areas of groundwater discharge or Groundwater Dependent Ecosystems (GDE's) in vicinity of the site. GDE's were considered to comprise hanging swamps or vegetation communities dependent on groundwater discharge. No shallow aquifers were identified during drilling, hence the constructed bores are not assessed to be in strong hydraulic connection with any GDE's or existing nearby bores. In summary the aquifer testing and hydrogeological assessment demonstrates that under the recommended extraction regime the subject bores are unlikely to result in any significant measurable impact on environmental conditions.

9.0 GROUNDWATER MANAGEMENT

9.1 TRIGGER LEVELS

The practical purpose for creating trigger levels for groundwater abstraction thresholds is in consequence of the following:

- The need to manage the resource in a sustainable manner;
- To provide protection for other users in the region, where increased drawdown due to pumping may cause other users to be disadvantaged;

- To reduce any impact of severe drawdown on the environment – e.g. baseflow declines, depletion of groundwater storage, impacts on distal GDE's; and
- To provide a level of confidence and protection to the designated authority (*NOW*) for the issue of the appropriate license.

Groundwater management requirements on the site will be outlined in the licence provided by *NOW*. The importance of limiting drawdown by excessive pumping will be important to maintain water quality consistency and pumping efficiency. A number of factors that have been considered important in the development of trigger levels are:

- Consideration of the aquifer boundaries, aquifer heterogeneity, and shape of the drawdown cone. A high level of confidence has however been gained by the regional knowledge, stratigraphic control, test data, and drawdown levels recorded during testing operations;
- Climatic changes which may impact on groundwater levels and recharge rates;
- 'Low risk' that stakeholders will be impacted;
- Impacts from any abstraction from future new bores on adjoining properties, especially if not controlled by an allocation or metered discharge rates (e.g. excessive abstraction from 'stock & domestic' licensed bores);
- The need to establish levels which certify the preservation of the environment, which are acceptable to the community. Recognition of groundwater abstraction attitudes, and perceptions of abstraction abuse which may or may not be tangible;
- The likely need to review trigger levels upon license renewal, or as required, in the event that conditions change;
- The setting of sensible trigger levels which are equitable for both the viability of the operation, other users and the environment;
- The need to review trigger levels in the event that new bores are constructed in the immediate area; and
- Recognition that the aquifer is relatively 'deep'.

It is proposed that three (3) trigger levels, or 'alarms' be created, having different levels of reporting requirements. The Trigger Levels and actions to be taken if threshold levels are reached or exceeded, including reporting to regulatory authority, cease-to-pump conditions are detailed in **Table 7**.

Table 7 Pumping Trigger Levels

Level	Bore 1 - Trigger	Bore 2 - Trigger	Recommended Action
1	Monitored water level in the production bore during <i>any</i> production pumping period falls to a level of 80m below ground level	Monitored water level in the production bore during <i>any</i> production pumping period falls to a level of 80m below ground level	Record date of impact in water level database. Notify the hydrogeological consultant by email or phone within 7 days. This trigger level (if reached) should not constitute a formal notification. Provide relevant data to the hydrogeological consultant for assessment.
2	Monitored water level in the production bore during <i>any</i> production pumping period falls to a level of 90m below ground level	Monitored water level in the production bore during <i>any</i> production pumping period falls to a level of 85m below ground level	Record date of impact in water level database. Notify the <i>Senior Hydrogeologist, NOW</i> and the hydrogeological consultant by email or letter within 7 days. Provide <i>all</i> relevant data to the hydrogeological consultant for assessment. Consider adjusting the extraction rate of the production bore to a flow where the trigger water level is not exceeded, OR Consider adjusting the pumping period where the trigger water level is not exceeded, OR Consider adjusting both the extraction rate <u>and</u> the pumping period where the trigger water level is not exceeded.
3	Monitored water level in the production bore during <i>any</i> production pumping period falls to a level of 100m below ground level	Monitored water level in the production bore during <i>any</i> production pumping period falls to a level of 90m below ground level	STOP PUMPING Record date of impact in water level database. Notify the <i>Senior Hydrogeologist, NOW</i> and the hydrogeological consultant by email or letter within 5 days. Assess all monitoring and production data. Make conclusions and provide recommendations. Meet with the <i>Senior Hydrogeologist, NOW</i> to discuss results, cause/s of the declining water level and a contingency plan to go forward.

9.2 MONITORING

A long-term program of water level monitoring in the production bore should be implemented. Water level monitoring will provide important baseline water level data and facilitate the long-term sustainable management of the groundwater resource. Monitoring at the site should include the following:

- Measure and record water levels in the production bore by either manual water level readings, or installation of an automated water level data logger;

- Record the water level weekly if manual or daily if logger is installed;
- The water level logger should be maintained and downloaded regularly by a qualified groundwater consultant, or the site manager should be fully trained in the operation of the water level data logger; and
- Install a suitable on-line flow meter on the discharge of the production bore. Record discharge volumes on a regular basis for the production bore.

9.3 REPORTING

A proposed protocol for reporting is described as follows:

- All water level data and any water quality monitoring results should be reported in-house on an annual basis and reviewed by the consulting hydrogeologist. The aim is to assess any medium to long-term changes in water levels and identify reasons for the changes if they occur. The monitoring schedule should be reviewed at least annually and changed if deemed appropriate by the consultant.
- A complete set of results of the production and monitoring program should be formally reported to the *Senior Hydrogeologist, NOW* on an annual basis.
- The annual report should provide the extraction records, pumping times and water level measurements from monitoring in the production bore. The report should include raw water level logger data, a figure showing the locations of the production bore and a set of hydrographs for the monitoring data.
- A copy of the annual report should be sent in hard copy to the *Senior Hydrogeologist, NOW*. The raw water level data can be appended to the report in electronic form. The complete report should also be submitted in electronic format to *NOW* and to the Owner.

9.4 CONSTRAINTS

Based on the information reviewed during this assessment no constraints have been identified that may impact the groundwater licence application and proposed use of groundwater. Potential constraints are considered to include any consent conditions imposed by council or other regulatory authority that would prevent the requested entitlement being realised in full for the purpose for which the licence is being sought.

It is noted that the area is subject to a Water Sharing Plan. Final licensing of the bores for production will require purchasing an existing allocation from a licence holder within the same groundwater source.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 CONCLUSIONS

Based on the findings obtained during the scope of work the following conclusions may be made:

- The proposal is to license Bore 1 and Bore 2 for irrigation, commercial and industrial purposes to support the construction and long-term operation of the Dalton power station;
- The site is situated on the southern side of the Lachlan River approximately five (5) kilometres north of Dalton in an area underlain by the Ordovician Adaminaby Group which comprises inter-bedded sandstone, phyllite and siltstone sequences;
- Bore 1 was drilled in December 2011 to 114m and constructed with 150mm Class 9 PVC slotted from 54-114m. The drillers airlift reported a cumulative yield of 4.0L/s;
- Bore 2 was drilled in January 2012 to 120m and constructed with 150mm Class 9 PVC slotted from 18-90m. The drillers airlift reported a cumulative yield of 0.7L/s;
- The bores were subjected to two (2) rounds of 24 hour drawdown and recovery pumping tests conducted between December 2011 and February 2012. The aquifer test results indicate the bores are capable of sustaining the following long term pumping regime:
 - Bore 1 - 3.0L/s; 12hr Pumping; 12hrs Recovery; 50ML per year at 50% duty;
 - Bore 2 - 0.5L/s; 12hr Pumping; 12hrs Recovery; 10ML per year at 50% duty.
- Water level loggers were installed in six (6) existing bores during the second round of pump testing. The hydrographs show no drawdown was recorded in monitoring bores associated with pump testing in the production bores;
- Review of registered bores and pumping test results indicates that under the proposed extraction regime the subject bores are not expected to result in any significant measurable impact on the environment and adjoining groundwater users; and
- This hydrogeological assessment incorporating two (2) rounds of 24 hour pump testing concludes the bores are capable of sustaining a combined annual groundwater allocation of 60ML, supported by a significant level of available drawdown, and multiple aquifers with an extensive recharge zone.

10.2 RECOMMENDATIONS

Based on the findings and conclusions outlined in this report the following recommendations are provided:

- A long-term program of water level monitoring in the production bores should be considered. Water level monitoring will provide important baseline water level data and facilitate the long-term sustainable management of the groundwater resource;

- Install a suitable on-line flow meter on the discharge of the proposed production bore. Record discharge volumes on a regular basis for the production bore. The *NSW Office of Water (NOW)* may require this as a condition of the bore licensing;
- Measure and record water levels in the production weekly if manual or daily with automated logger. The *NOW* may require this schedule as a condition of the bore licensing. *Hydroilex* can advise on the method and can review the water level data on an annual basis;
- Consider collecting groundwater discharge samples on a regular basis (summer and winter) and submit to a NATA registered laboratory for water quality testing; and
- Proceed with the licensing of the production bores for the intended purpose of Irrigation, commercial and industrial, and apply to transfer an annual allocation of:
 - Bore 1 - 50ML supported by 24 hour pumping test; and
 - Bore 2 - 10ML.

11.0 REFERENCES

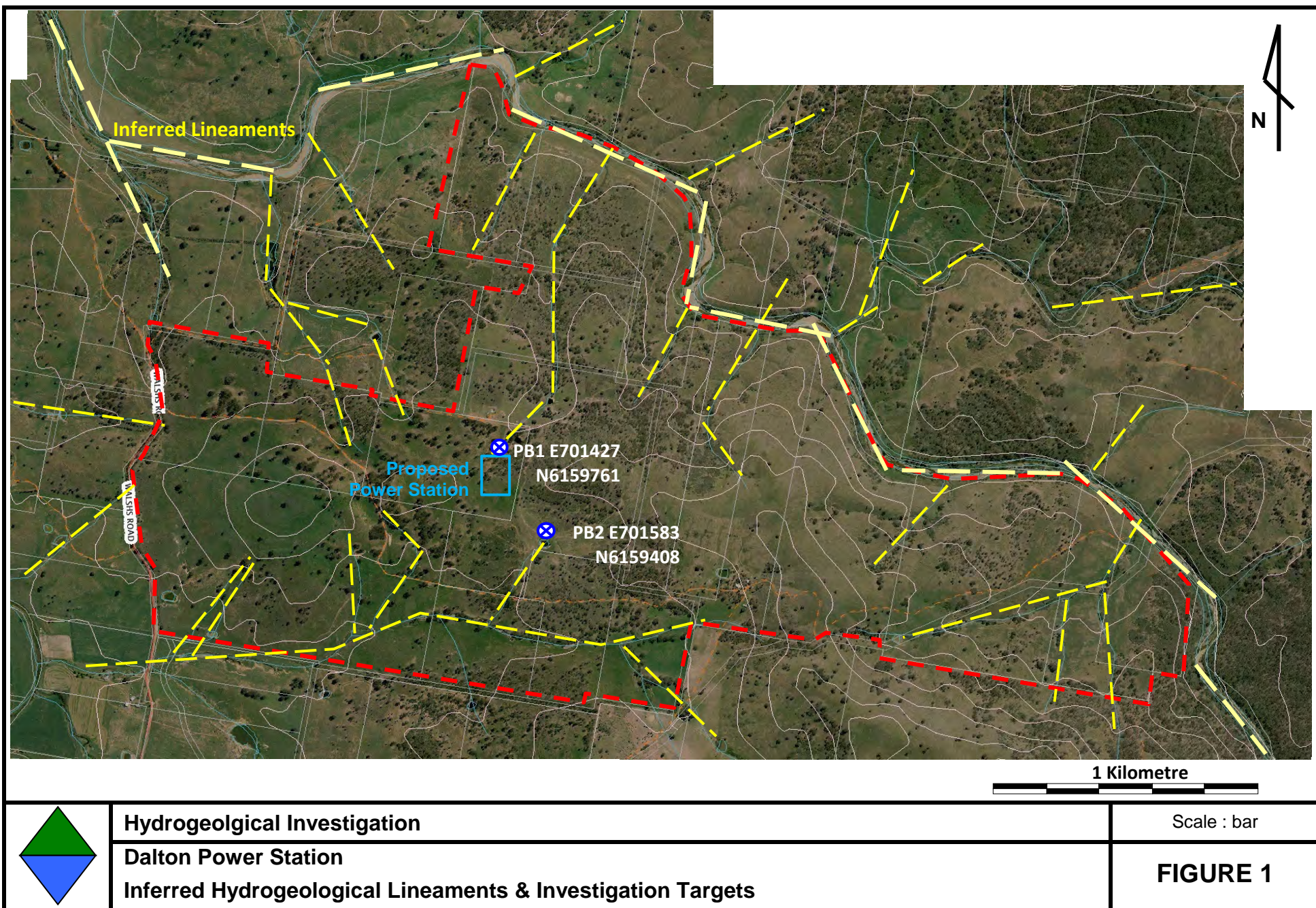
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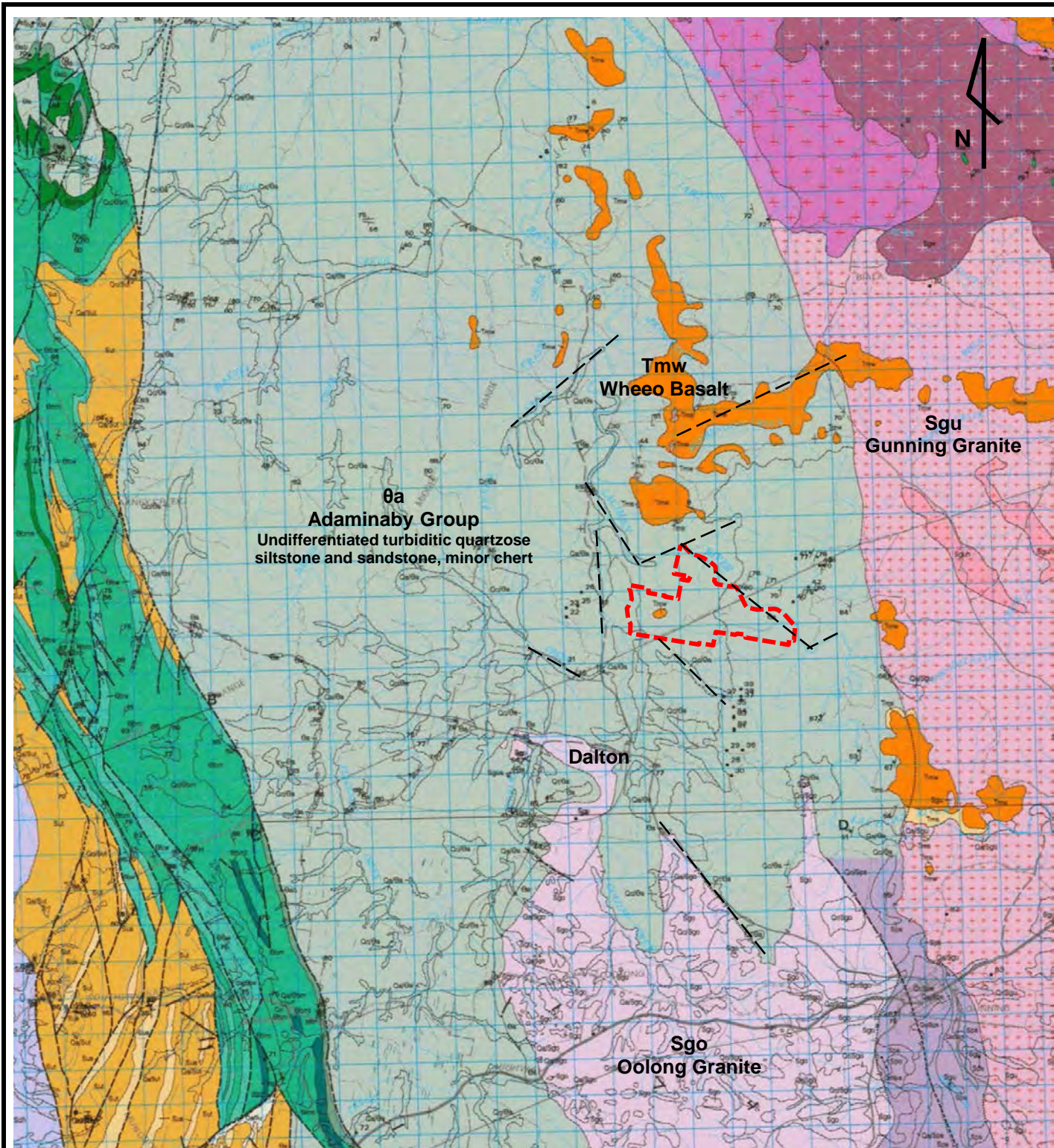
FIGURES

Figure 1 Location Map

Figure 2 Regional Geology

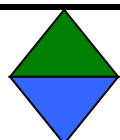
Figure 3 Registered Groundwater Bores





5 Kilometres

Gunning 1:100,000



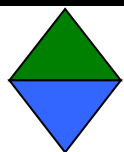
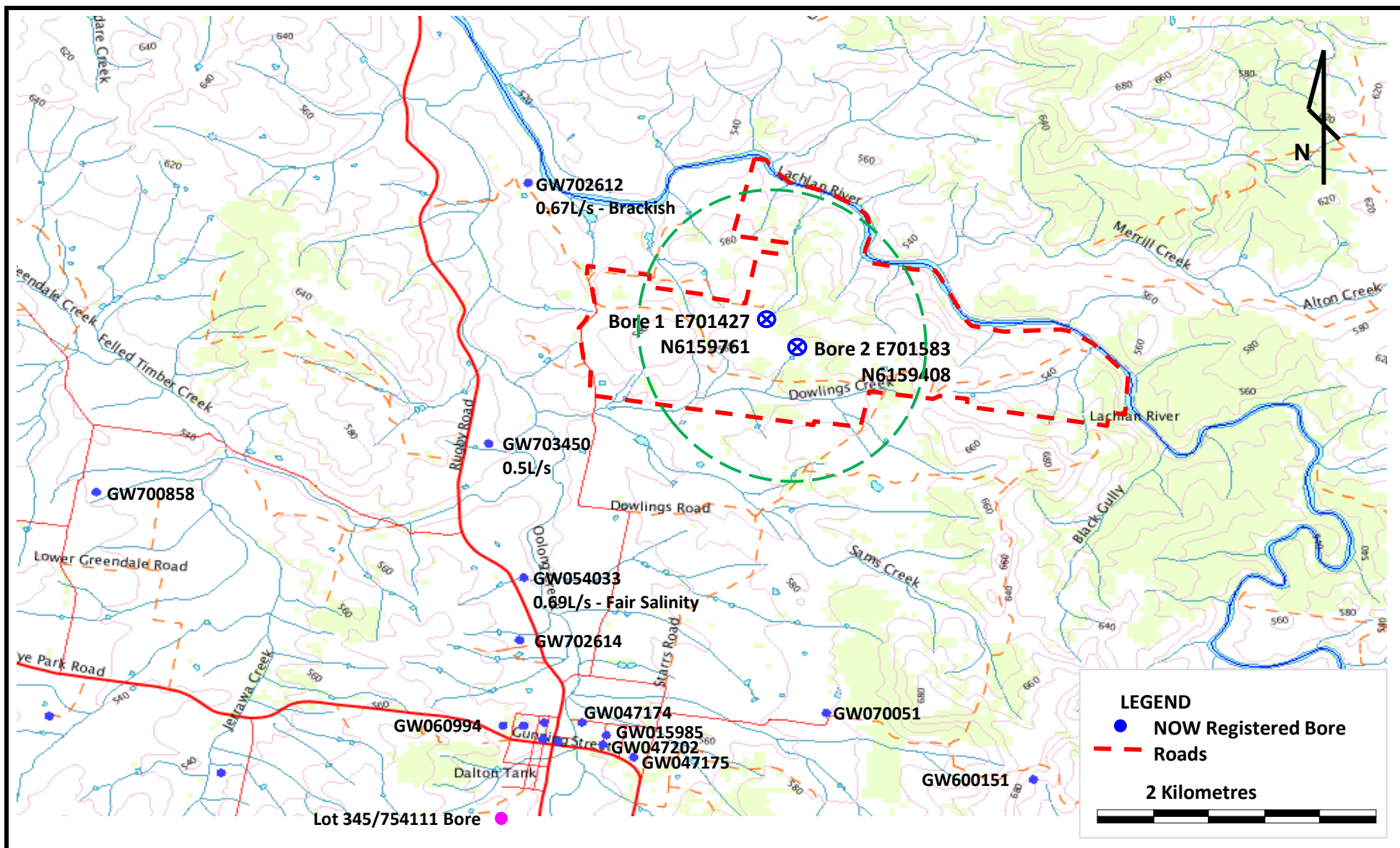
Hydrogeological Investigation

Dalton Power Station

Regional Geology

Scale - see bar

FIGURE 2



Hydrogeological Investigation

Dalton Power Station

NOW Registered Groundwater Bores

Scale : bar

FIGURE 3

Appendix A

Form A Bore Construction Report

NSW DEPARTMENT OF WATER & ENERGY

Natural Resource Products

FORM A
PARTICULARS OF COMPLETED WORKDriller's Licence No: **1623** **1**Class of Licence: **4**Driller's Name: **Danny Hill**Assistant Driller: **-**Contractor: **Bungendore Water Bores**New bore ☒ Replacement bore ☐Deepened ☐ Enlarged ☐Reconditioned ☐ Other (specify) Final Depth **120.0 m**Work Licence No: **70 B L 233652** **2**Name of Licensee: **AGL Power Generation Pty Ltd**Intended Use: **Irrigation, Commercial & Industrial**Completion Date: **22/12/2011**DRILLING DETAILS **3**

From (m)	To (m)	Hole Diameter (mm)	Drilling Method Code
0	114	200	9
114	120	150	9

WATER BEARING ZONES **4**

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s)		Test method Code	D D L at end of test (m)	Duration		Salinity (Conductivity or TDS)	
				Individual Aquifer	Cumulative			Hrs	min	Cond. (µS/cm)	TDS (mg/L)
15	15	0	26.84	seepage		1					
22	24	2		0.2		1					
39	41	2		0.3		1					
65	66	1		minor		1					
76	78	2		0.1		1					
87	90	3		0.1	0.7	1				4600	3000

CASING / LINER DETAILS **5**

Material Code	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code	Casing support method Code	2
5	150		0	90		Type of casing bottom Code	2
						Centralisers installed	No <input type="checkbox"/> Yes <input checked="" type="checkbox"/> (indicate on sketch)
						Sump installed	No <input checked="" type="checkbox"/> Yes <input type="checkbox"/> From m To m
						Pressure cemented	No <input checked="" type="checkbox"/> Yes <input type="checkbox"/> From m To m
						Casing Protector cemented in place	No <input type="checkbox"/> Yes <input checked="" type="checkbox"/>

WATER ENTRY DESIGN **6**

General							Screen	Slot Details		
Material Code	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type Code	Fixing Code	Aperture (mm)	Length (mm)	Width (mm)	Alignment Code
5	150		18	90			2			

GRAVEL PACK **7**

Type	Grade	Grain size (mm)		Depth (m)		Quantity	
		From	To	From	To	Litres	or m ³
Rounded <input checked="" type="checkbox"/>	Graded <input checked="" type="checkbox"/>	6	7	0	90		1.5
Crushed <input type="checkbox"/>	Ungraded <input type="checkbox"/>						
Bentonite/Grout seal	No <input type="checkbox"/> Yes <input checked="" type="checkbox"/>						
Method of placement of Gravel Pack	Code	1					

For D W E use only:

G W

FORM A
PARTICULARS OF COMPLETED WORK

Natural Resource Products

Work Licence No: **10** B L 233652**BORE DEVELOPMENT****8**

Chemical used for breaking down drilling mud No ☒ Yes ☐ Name: _____

Method	Bailing/Surging <input type="checkbox"/>	Jetting	Airlifting <input checked="" type="checkbox"/>	Backwashing <input type="checkbox"/>	Pumping <input checked="" type="checkbox"/>	Other:
Duration	hrs	hrs	~2 hrs	hrs	2 4 hrs	hrs

DISINFECTION ON COMPLETION**9**

Chemical/s used	Quantity applied (litres)	Method of application

PUMPING TESTS ON COMPLETION**10**

Test type	Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery	
							Water level (m)	Time taken (hrs) (mins)
Multi stage (stepped drawdown)	Stage 1							
	Stage 2							
	Stage 3	Refer to Hydroilex Report						
	Stage 4							
Single stage (constant rate)								

Height of measuring point above ground level _____ m Test Method **Code** See Code Table 4

WORK PARTLY BACKFILLED OR ABANDONED**11**

Original depth of work: _____ metres Is work partly backfilled: No ☐ Yes ☐

Is work abandoned: No ☐ Yes ☐ Method of abandonment: Backfilled ☐ Plugged ☐ Capped ☐

Has any casing been left in the work No ☐ Yes ☐ From _____ m To _____ m

Sealing / fill type Code	From depth (m)	To depth (m)	Sealing / fill type Code	From depth (m)	To depth (m)

Site chosen by: Hydrogeologist ☒ Geologist ☐ Driller ☐ Diviner ☐ Client ☐ Other _____ **12**

Lot No **307** DP No **754111** **13**

Work Location Co ordinates Easting **701574** Northing **61 59409** Zone **55**

GPS: No ☐ Yes ☒ >> AMG/AGD ☐ or MGA/GDA ☒ (See explanation)

Please mark the work site with "X" on the DWE CLID map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:Driller:  (on behalf of driller)Licensee:  (on behalf of applicant)Date: **20/1/2012**Date: **20/1/2011**

**FORM A
PARTICULARS OF COMPLETED WORK**

Work Licence No: 10 B L 233652

[illegible]

WORK NOT CONSTRUCTED BY DRILLING RIG

Method of excavation: Hand dug <input type="checkbox"/> Back hoe <input type="checkbox"/> Dragline <input type="checkbox"/> Dozer <input type="checkbox"/> Other _____							
Depth (m)	Length (m)	Width (m)	Diameter (m)	Lining material	Dimensions of liner (m)	From Depth (m)	To Depth (m)

Please attach copies of the following if available

Geologist log No ☐ Yes ☒ Laboratory analysis of water Sample No ☐ Yes ☒ Pumping test(s) No ☐ Yes ☒

Geophysical log No ☒ Yes ☐ Sieve analysis of aquifer material No ☒ Yes ☐ Installed Pump details No ☒ Yes ☐

NSW DEPARTMENT OF WATER & ENERGY

Natural Resource Products

FORM A
PARTICULARS OF COMPLETED WORK
Driller's Licence No: **1623** **1**Class of Licence: **4**Driller's Name: **Danny Hill**Assistant Driller: **-**Contractor: **Bungendore Water Bores**New bore ☒ Replacement bore ☐Deepened ☐ Enlarged ☐Reconditioned ☐ Other (specify) Final Depth **114.0 m**Work Licence No: **70 B L 233651** **2**Name of Licensee: **AGL Power Generation Pty Ltd**Intended Use: **Irrigation, Commercial & Industrial**Completion Date: **22/12/2011****DRILLING DETAILS** **3**

From (m)	To (m)	Hole Diameter (mm)	Drilling Method Code
0	114	200	9

WATER BEARING ZONES **4**

From (m)	To (m)	Thickness (m)	S W L (m)	Estimated Yield (L/s)		Test method Code	D D L at end of test (m)	Duration		Salinity (Conductivity or TDS)	
				Individual Aquifer	Cumulative			Hrs	min	Cond. (µS/cm)	TDS (mg/L)
40	42	2	26.84	seepage		1					
49	51	2		0.3		1					
64	66	2		0.3		1					
89	91	2		0.5		1					
103	105	2		2	4	1				2700	1800

CASING / LINER DETAILS **5**

Material Code	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Method Fixing Code	Casing support method Code 2	Type of casing bottom Code 2
9	200		0	6		Centralisers installed No <input type="checkbox"/> Yes <input checked="" type="checkbox"/> (indicate on sketch)	
5	150		0	114		Sump installed No <input checked="" type="checkbox"/> Yes <input type="checkbox"/> From m To m	
						Pressure cemented No <input checked="" type="checkbox"/> Yes <input type="checkbox"/> From m To m	
						Casing Protector cemented in place No <input type="checkbox"/> Yes <input checked="" type="checkbox"/>	

WATER ENTRY DESIGN **6**

General							Screen	Slot Details		
Material Code	OD (mm)	Wall Thickness (mm)	From (m)	To (m)	Opening type Code	Fixing Code	Aperture (mm)	Length (mm)	Width (mm)	Alignment Code
5	150		54	114			2			

GRAVEL PACK **7**

Type		Grade		Grain size (mm)		Depth (m)		Quantity	
				From	To	From	To	Litres or m ³	
Rounded	<input checked="" type="checkbox"/>	Graded	<input checked="" type="checkbox"/>	6	7	0	114		1.4
Crushed	<input type="checkbox"/>	Ungraded	<input type="checkbox"/>						
Bentonite/Grout seal		No	<input type="checkbox"/>	Yes	<input checked="" type="checkbox"/>				
Method of placement of Gravel Pack					Code	1			

For D W E use only:

G W

FORM A
PARTICULARS OF COMPLETED WORK

Natural Resource Products

Work Licence No: **10** B L 233651**BORE DEVELOPMENT****8**

Chemical used for breaking down drilling mud No ☒ Yes ☐ Name: _____

Method	Bailing/Surging <input type="checkbox"/>	Jetting	Airlifting <input checked="" type="checkbox"/>	Backwashing <input type="checkbox"/>	Pumping <input checked="" type="checkbox"/>	Other:
Duration	hrs	hrs	~2 hrs	hrs	2 4 hrs	hrs

DISINFECTION ON COMPLETION**9**

Chemical/s used	Quantity applied (litres)	Method of application

PUMPING TESTS ON COMPLETION**10**

Test type	Date	Pump intake depth (m)	Initial Water Level (SWL) (m)	Pumping rate (L/s)	Water Level at end of pumping (DDL) (m)	Duration of Test (hrs)	Recovery	
							Water level (m)	Time taken (hrs) (mins)
Multi stage (stepped drawdown)	Stage 1							
	Stage 2							
	Stage 3	<i>Refer to Hydroilex Report</i>						
	Stage 4							
Single stage (constant rate)								

Height of measuring point above ground level _____ m Test Method **Code** See Code Table 4

WORK PARTLY BACKFILLED OR ABANDONED**11**

Original depth of work: _____ metres Is work partly backfilled: No ☐ Yes ☐

Is work abandoned: No ☐ Yes ☐ Method of abandonment: Backfilled ☐ Plugged ☐ Capped ☐

Has any casing been left in the work No ☐ Yes ☐ From _____ m To _____ m

Sealing / fill type Code	From depth (m)	To depth (m)	Sealing / fill type Code	From depth (m)	To depth (m)

Site chosen by: Hydrogeologist ☒ Geologist ☐ Driller ☐ Diviner ☐ Client ☐ Other _____ **12**

Lot No **306** DP No **754111** **13**

Work Location Co ordinates Easting **701426** Northing **61 59761** Zone **55**

GPS: No ☐ Yes ☒ >> AMG/AGD ☐ or MGA/GDA ☒ (See explanation)

Please mark the work site with "X" on the DWE CLID map.

Indicate also the distances in metres from two (2) adjacent boundaries, and attach the map to this Form A package.

Signatures:

Driller:  (on behalf of driller)

Licensee:  (on behalf of applicant)

Date: **20/1/2012**

Date: **20/1/2011**

Appendix B

Pumping Test Results (Round 1)

TABLE 1

DRAWDOWN ANALYSIS DATA**SINGLE RATE PUMP TEST**

Test date : 22/12/2011
Start time : 3:15 PM
Pump Off: 23/12/2011 3:15 PM
Casing I.D.: -
Pump type/mod: -
Pump O.D.: -
Pump Intake m: -

HYDROILEX

PROJECT : Dalton AGL

CLIENT : Aurecon

BORE No # Bore 1

Tested by: J.Lee

Av.Pump Rate (L/sec): 2.94

SWL (mbtoc): 27.84

Ref. Point (m): 1.00

<i>Real time</i>	<i>Hours</i>	<i>Time minutes T</i>	<i>Drawdown metres S1</i>	<i>Depth to water metres below ground level mbgl</i>	<i>Discharge Rate L/sec Q</i>	<i>Time to fill 200L Secs</i>	<i>Comments / Observations</i>
3:15 PM		0	0.00	26.84	2.94	-	= SWL
		10	36.81	63.65	-	-	
		20	36.51	63.35	-	-	Note: Data recorded at 10 minute intervals on Minitrol
		30	37.86	64.70	-	-	
		40	38.61	65.45	-	-	
		50	39.07	65.91	-	-	
4:15 PM	1	60	39.38	66.22	-	-	
		70	39.55	66.39	-	-	
		80	39.87	66.71	-	-	
		90	40.06	66.90	-	-	
5:15 PM	2	120	40.63	67.47	-	-	
		150	40.97	67.81	-	-	
6:15 PM	3	180	41.33	68.17	-	-	
		210	41.65	68.49	-	-	
7:15 PM	4	240	41.93	68.77	-	-	
		270	42.12	68.96	-	-	
8:15 PM	5	300	42.36	69.20	-	-	
		330	42.46	69.30	-	-	
9:15 PM	6	360	42.67	69.51	-	-	
	7	420	42.94	69.78	-	-	
	8	480	43.35	70.19	-	-	
12:15 AM	9	540	43.66	70.50	-	-	
	10	600	43.91	70.75	-	-	
	11	660	44.10	70.94	-	-	
	11	670	44.12	70.96	-	-	
3:15 AM	12	720	44.34	71.18	-	-	
	14	840	44.78	71.62	-	-	
	16	960	45.17	72.01	-	-	
	18	1080	45.48	72.32	-	-	
	20	1200	45.57	72.41	-	-	
3:15 PM	24	1440	46.06	72.90	2.94	-	

TABLE 2

RECOVERY ANALYSIS DATA

SINGLE RATE PUMP TEST

Test date : 22/12/2011
Start time : 3:15 PM
Pump Off: 23/12/2011 3:15 PM
Casing I.D.: -
Pump type/mod: -
Pump O.D.: -
Pump Intake m: -

HYDROILEX

PROJECT : Dalton AGL
CLIENT : Aurecon
BORE No # Bore 1
Tested by: J.Lee
Av.Pump Rate (L/sec): 2.94
SWL (mbtoc): 27.84
Ref. Point (m): 1.00

Real time	Minutes since pump Started t	Time since pump stopped Hrs	Minutes t'	Depth to water metres below ground level mbgl	Ratio t/t'	Residual Drawdown metres S'	Comments / Observations
3:15 PM	1440		0.1	73.90	14401	46.06	= depth to water at
	1450		10	40.39	145	12.55	instant pump stopped
	1460		20	37.57	73	9.73	
	1470		30	36.68	49.0	8.84	
	1480		40	35.01	37.0	7.16	
	1490		50	35.68	29.8	7.83	
4:15 PM	1500	1	60	35.43	25.0	7.59	
	1510		70	35.20	21.6	7.36	
	1520		80	35.00	19.0	7.16	
	1530		90	34.83	17.0	6.99	
5:15 PM	1560	2	120	34.39	13.0	6.55	
	1590		150	34.04	10.6	6.20	
6:15 PM	1620	3	180	33.85	9.0	6.01	
	1650		210	33.53	7.9	5.69	
7:15 PM	1680	4	240	33.34	7.0	5.50	
	1710		270	33.15	6.3	5.31	
8:15 PM	1740	5	300	32.99	5.8	5.15	
	1770		330	32.84	5.4	5.00	
9:15 PM	1800	6	360	32.70	5.0	4.86	
	1860	7	420	32.44	4.4	4.60	
11:15 PM	1920	8	480	32.23	4.0	4.39	
	1980	9	540	32.04	3.7	4.20	
1:15 AM	2040	10	600	31.86	3.4	4.02	
	2100	11	660	31.70	3.2	3.86	
3:15 AM	2160	12	720	31.56	3.0	3.72	
	2280	14	840	31.33	2.7	3.49	
	2400	16	960	-	-	-	
	2520	18	1080	-	-	-	
	2640	20	1200	-	-	-	
3:15 PM	2880	24	1440	-	-	-	

Chart 1: Drawdown & Recovery Curves - 'Dalton-AGL' Bore 1 Pumping at 2.94 L/sec for 24 Hours

SWL 26.84mbgl

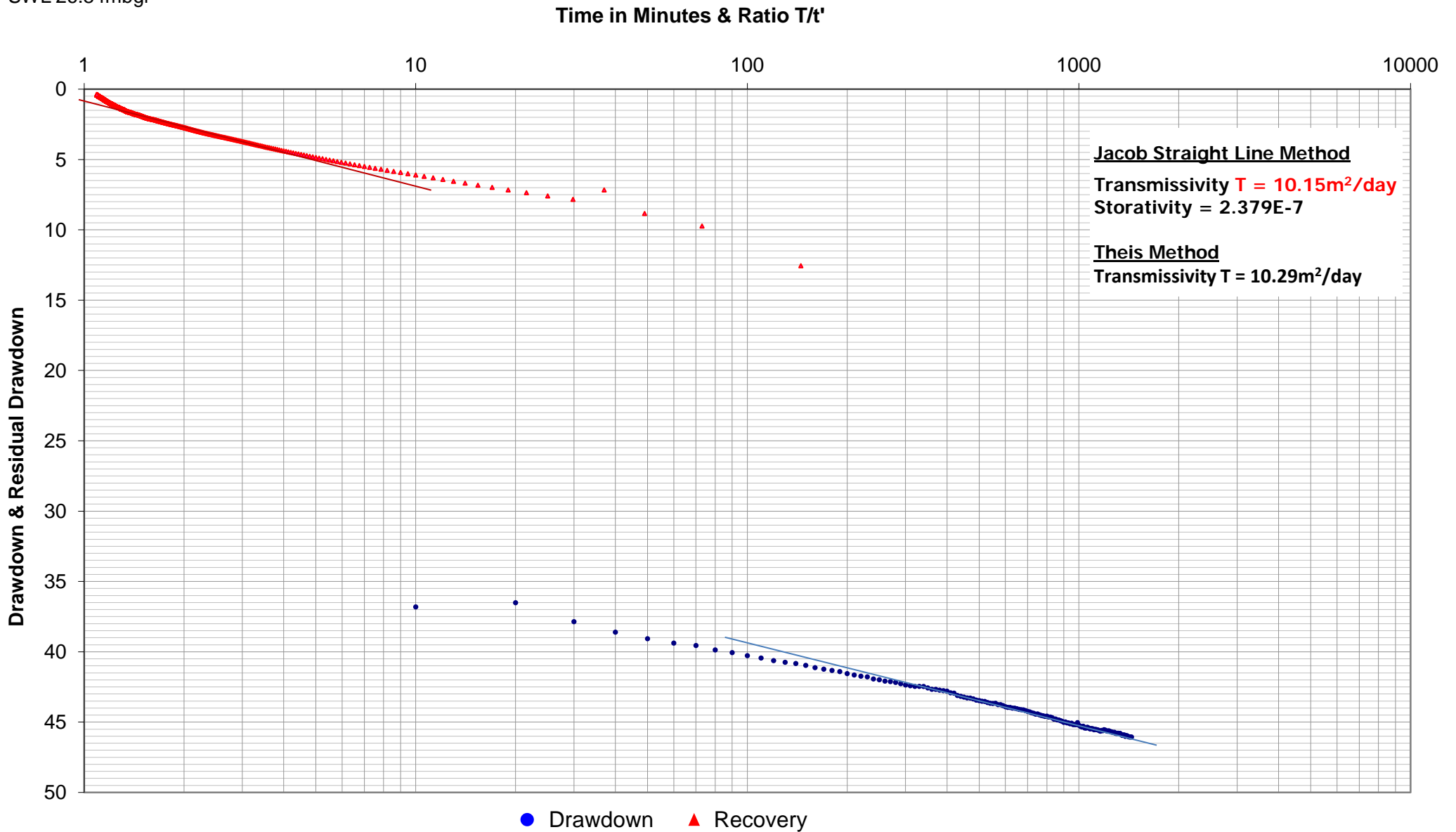


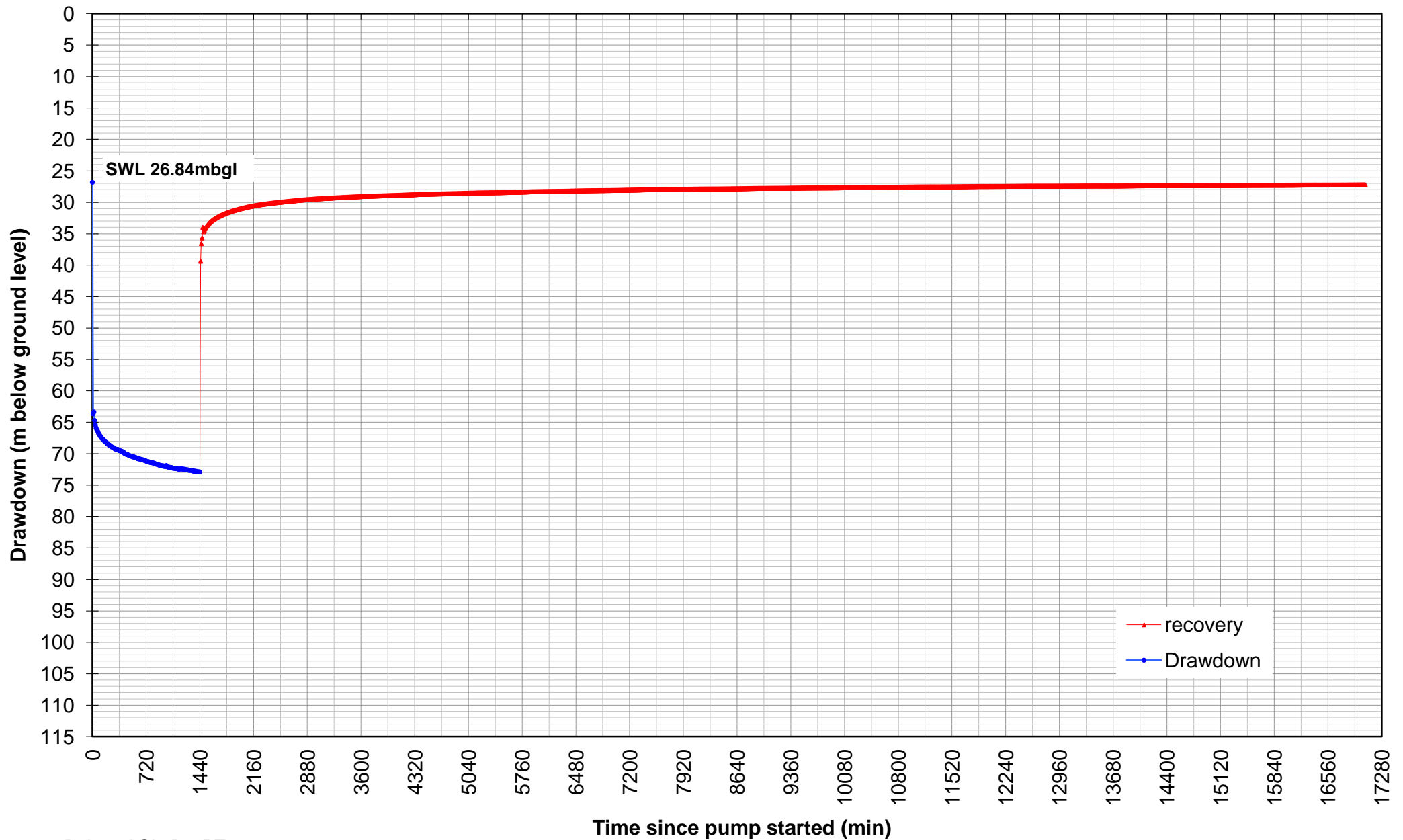
Chart 2: Time-Drawdown & Recovery - 'Dalton - AGL' Bore 1 Pumping at 2.94 L/sec for 24 Hours

TABLE 1

DRAWDOWN ANALYSIS DATA

SINGLE RATE PUMP TEST

Test date : 10/01/2012
Start time : 3:30 PM
Pump Off: 11/01/2012 4:00 PM
Casing I.D.: -
Pump type/mod: -
Pump O.D.: -
Pump Intake m: -

HYDROILEX

PROJECT : Dalton AGL
CLIENT : Aurecon
BORE No # Bore 2
Tested by: J.Lee & D Schmich
Av.Pump Rate (L/sec): 0.55
SWL (mbtoc): 14.88
Ref. Point (m): 1.00

<i>Real time</i>	<i>Hours</i>	<i>Time minutes T</i>	<i>Drawdown metres S1</i>	<i>Depth to water metres below ground level mbgl</i>	<i>Discharge Rate L/sec Q</i>	<i>Time to fill 200L Secs</i>	<i>Comments / Observations</i>
3:30 PM		0	0.00	13.88	0.60	-	= SWL
		10	6.16	20.04	-	-	
		20	8.74	22.62	-	-	Note: Data recorded at
		30	11.50	25.38	-	-	10 minute intervals
		40	14.75	28.63	-	-	on Minitrol
		50	17.14	31.02	-	-	
4:30 PM	1	60	18.81	32.69	-	-	
		70	20.22	34.10	-	-	
		80	21.42	35.30	-	-	
		90	22.49	36.37	-	-	
5:30 PM	2	120	24.91	38.79	-	-	
		150	26.69	40.57	-	-	
6:30 PM	3	180	28.44	42.32	-	-	
		210	29.89	43.77	-	-	
7:30 PM	4	240	31.00	44.88	-	-	
		270	32.06	45.94	-	-	
8:30 PM	5	300	32.93	46.81	-	-	
		330	33.65	47.53	-	-	
9:30 PM	6	360	34.36	48.24	-	-	
	7	420	35.51	49.39	-	-	
	8	480	36.38	50.26	-	-	
12:30 AM	9	540	37.18	51.06	-	-	
	10	600	37.91	51.79	-	-	
	11	660	38.69	52.57	-	-	
	11	670	38.80	52.68	-	-	
3:30 AM	12	720	39.31	53.19	-	-	
	14	840	40.62	54.50	-	-	
	16	960	41.86	55.74	0.60	-	
	16	1030	42.53	56.41	0.55	-	
	18	1080	41.29	55.17	-	-	
	20	1200	43.14	57.02	-	-	
3:30 PM	24	1440	76.47	90.35	0.55	-	
	24	1440	76.44	90.32	-	-	

TABLE 2

RECOVERY ANALYSIS DATA

SINGLE RATE PUMP TEST

Test date : 10/01/2012
Start time : 3:30 PM
Pump Off: 11/01/2012 4:00 PM
Casing I.D.: -
Pump type/mod: -
Pump O.D.: -
Pump Intake m: -

HYDROILEX

PROJECT : Dalton AGL
CLIENT : Aurecon
BORE No # Bore 2
Tested by: J.Lee & D Schmich
Av.Pump Rate (L/sec): 0.55
SWL (mbtoc): 14.88
Ref. Point (m): 1.00

Real time	Minutes since pump Started t	Time since pump stopped Hrs	Minutes t'	Depth to water metres below ground level mbgl	Ratio t/t'	Residual Drawdown metres S'	Comments / Observations
4:00 PM	1470		0.1	91.32	14701	76.44	= depth to water at
	1480		10	78.07	148	63.19	instant pump stopped
	1490		20	54.95	75	40.07	
	1500		30	38.71	50.0	23.83	
	1510		40	27.60	37.8	12.72	
	1520		50	23.15	30.4	8.27	
5:00 PM	1530	1	60	21.26	25.5	6.38	
	1540		70	19.59	22.0	4.71	
	1550		80	18.80	19.4	3.92	
	1560		90	18.40	17.3	3.52	
6:00 PM	1590	2	120	17.63	13.3	2.75	
	1620		150	17.35	10.8	2.47	
7:00 PM	1650	3	180	17.25	9.2	2.37	
	1680		210	17.03	8.0	2.15	
8:00 PM	1710	4	240	16.90	7.1	2.02	
	1740		270	16.82	6.4	1.94	
9:00 PM	1770	5	300	16.74	5.9	1.86	
	1800		330	16.68	5.5	1.80	
10:00 PM	1830	6	360	16.62	5.1	1.74	
	1890	7	420	16.52	4.5	1.64	
12:00 AM	1950	8	480	16.43	4.1	1.55	
	2010	9	540	16.36	3.7	1.48	
2:00 AM	2070	10	600	16.30	3.5	1.42	
	2130	11	660	16.24	3.2	1.36	
4:00 AM	2190	12	720	16.18	3.0	1.30	
	2310	14	840	16.09	2.8	1.21	
	2430	16	960	-	-	-	
	2550	18	1080	-	-	-	
	2670	20	1200	-	-	-	
4:00 PM	2910	24	1440	-	-	-	

Chart 1: Drawdown & Recovery Curves - 'Dalton-AGL' Bore 2 Pumping at 0.55 L/sec for 24 Hours

SWL 13.88mbgl

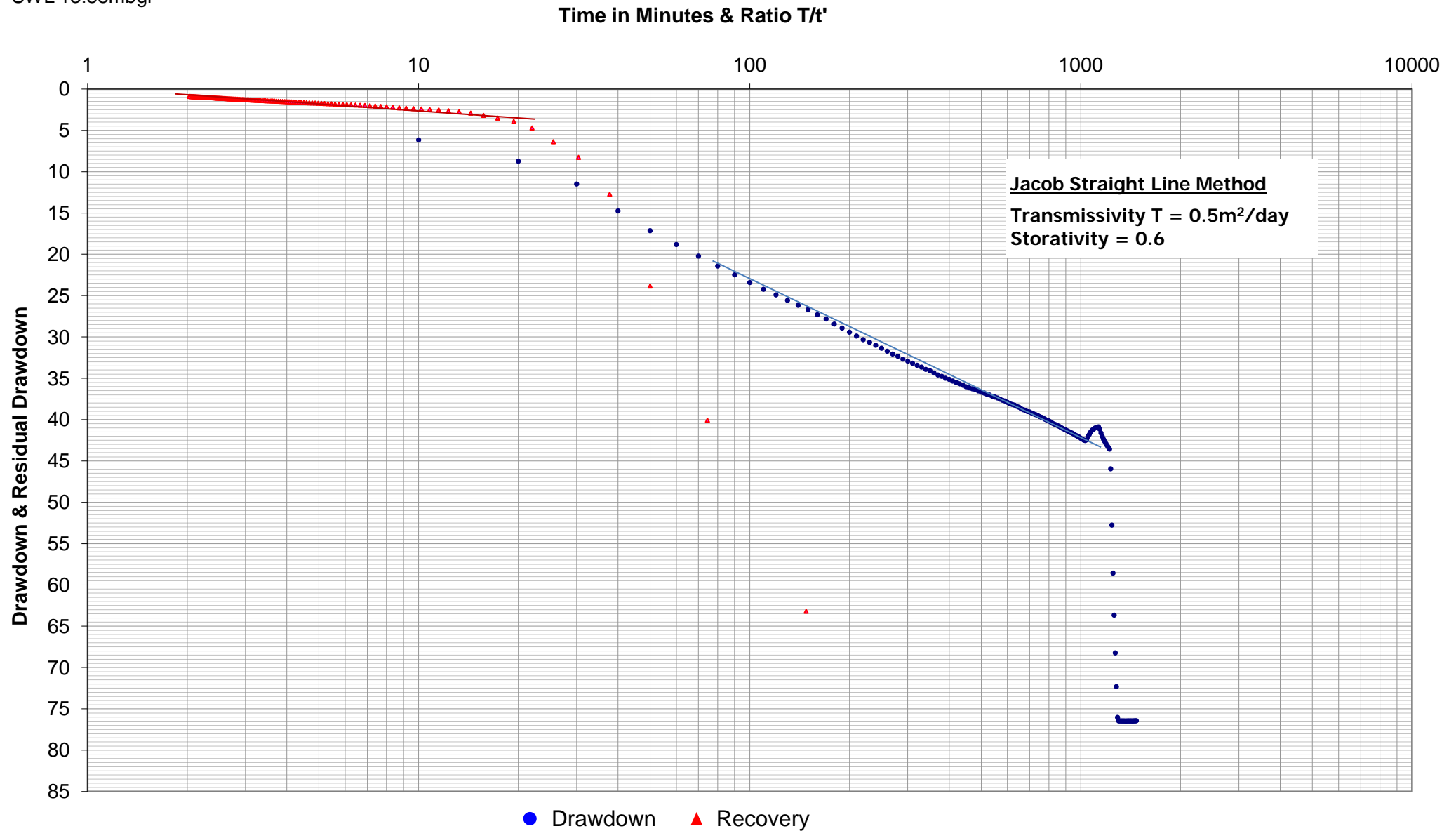
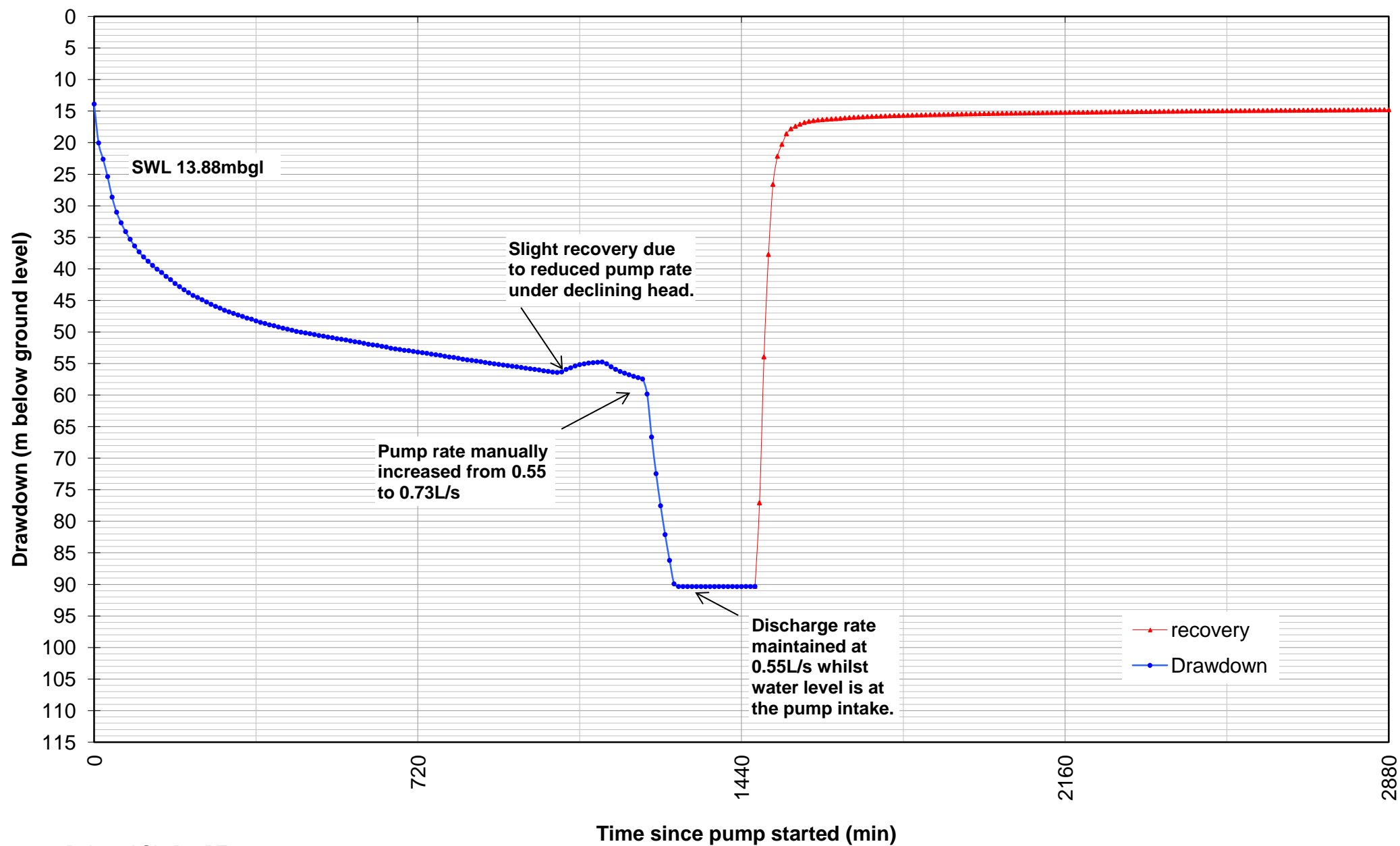


Chart 2: Time-Drawdown & Recovery - 'Dalton - AGL' Bore 2 Pumping at 0.55 L/sec for 24 Hours

Appendix C

Pumping Test Results (Round 2)

TABLE 1

DRAWDOWN ANALYSIS DATA**SINGLE RATE PUMP TEST**

Test date : 16/02/2012
Start time : 8:00 AM
Pump Off: 17/02/2012 8:00 AM
Casing I.D.: -
Pump type/mod: -
Pump O.D.: -
Pump Intake m: 80

HYDROILEX

PROJECT : Dalton AGL

CLIENT : Aurecon

BORE No # Bore 1

Tested by: J.Lee

Av.Pump Rate (L/sec): 2.94

SWL (mbtoc): 27.41

Ref. Point (m): 0.70

<i>Real time</i>	<i>Hours</i>	<i>Time minutes T</i>	<i>Drawdown metres S1</i>	<i>Depth to water metres below ground level mbgl</i>	<i>Discharge Rate L/sec Q</i>	<i>Time to fill 200L Secs</i>	<i>Comments / Observations</i>
8:00 AM		0	0.00	26.71	3.00	66.0	= SWL
		10	22.88	49.59	-	-	
		20	29.42	56.13	-	-	Note: Data recorded at 10 minute intervals on Minitrol
		30	30.92	57.63	-	-	
		40	31.65	58.36	-	-	
		50	32.10	58.81	-	-	
9:00 AM	1	60	32.45	59.16	-	-	
		70	32.69	59.40	-	-	
		80	32.92	59.63	-	-	
		90	33.05	59.76	-	-	
10:00 AM	2	120	33.43	60.14	-	-	
		150	33.73	60.44	-	-	
11:00 AM	3	180	34.03	60.74	-	-	
		210	34.29	61.00	-	-	
12:00 PM	4	240	34.43	61.14	-	-	
		270	34.58	61.29	-	-	
1:00 PM	5	300	34.71	61.42	-	-	
		330	34.86	61.57	-	-	
2:00 PM	6	360	35.04	61.75	-	-	
	7	420	35.37	62.08	-	-	
	8	480	35.68	62.39	-	-	
5:00 PM	9	540	35.98	62.69	-	-	
	10	600	36.24	62.95	-	-	
	11	660	36.51	63.22	-	-	
	11	670	36.62	63.33	-	-	
8:00 PM	12	720	36.84	63.55	-	-	
	14	840	37.41	64.12	-	-	
	16	960	37.96	64.67	-	-	
	18	1080	38.52	65.23	-	-	
	20	1200	39.03	65.74	-	-	
8:00 AM	24	1440	39.53	66.24	2.80	72.0	

TABLE 2

RECOVERY ANALYSIS DATA

SINGLE RATE PUMP TEST

Test date : 16/02/2012
Start time : 8:00 AM
Pump Off: 17/02/2012 8:00 AM
Casing I.D.: -
Pump type/mod: -
Pump O.D.: -
Pump Intake m: 80

HYDROILEX

PROJECT : Dalton AGL
CLIENT : Aurecon
BORE No # Bore 1
Tested by: J.Lee
Av.Pump Rate (L/sec): 2.94
SWL (mbtoc): 27.41
Ref. Point (m): 0.70

Real time	Minutes since pump Started t	Time since pump stopped Hrs	Minutes t'	Depth to water metres below ground level mbgl	Ratio t/t'	Residual Drawdown metres S'	Comments / Observations
8:00 AM	1440		0.1	66.94	14401	39.53	= depth to water at
	1450		10	44.38	145	16.97	instant pump stopped
	1460		20	37.67	73	10.26	
	1470		30	36.61	49.0	9.20	
	1480		40	36.05	37.0	8.64	
	1490		50	35.66	29.8	8.25	
9:00 AM	1500	1	60	35.35	25.0	7.94	80% recovery
	1510		70	35.11	21.6	7.70	
	1520		80	34.89	19.0	7.48	
	1530		90	34.72	17.0	7.31	
10:00 AM	1560	2	120	34.28	13.0	6.87	
	1590		150	33.94	10.6	6.53	
11:00 AM	1620	3	180	33.74	9.0	6.33	
	1650		210	33.31	7.9	5.90	
12:00 PM	1680	4	240	33.12	7.0	5.71	
	1710		270	32.94	6.3	5.53	
1:00 PM	1740	5	300	32.78	5.8	5.37	
	1770		330	32.63	5.4	5.22	
2:00 PM	1800	6	360	32.49	5.0	5.08	
	1860	7	420	32.24	4.4	4.83	
4:00 PM	1920	8	480	32.03	4.0	4.62	
	1980	9	540	31.86	3.7	4.45	
6:00 PM	2040	10	600	31.70	3.4	4.29	
	2100	11	660	31.55	3.2	4.14	90% recovery
8:00 PM	2160	12	720	31.40	3.0	3.99	
	2280	14	840	31.19	2.7	3.78	
	2400	16	960	31.00	2.5	3.59	
	2520	18	1080	30.83	2.3	3.42	
	2640	20	1200	30.70	2.2	3.29	
8:00 AM	2880	24	1440	30.49	2.0	3.08	

Chart 1: Drawdown & Recovery Curves - 'Dalton-AGL' Bore 1 Pumping at 3.0 L/sec for 24 Hours (TEST 2)

SWL 26.71mbgl

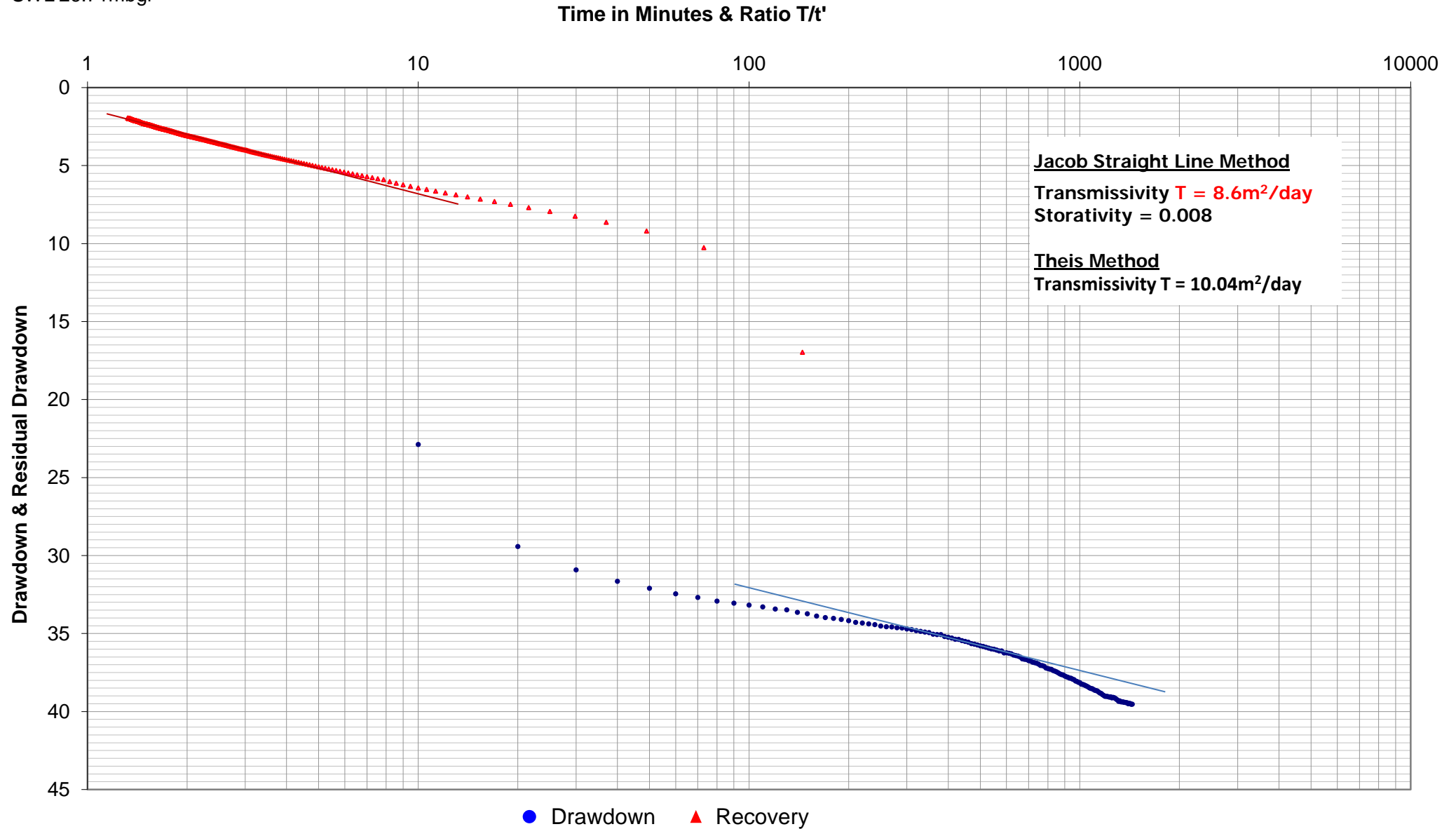


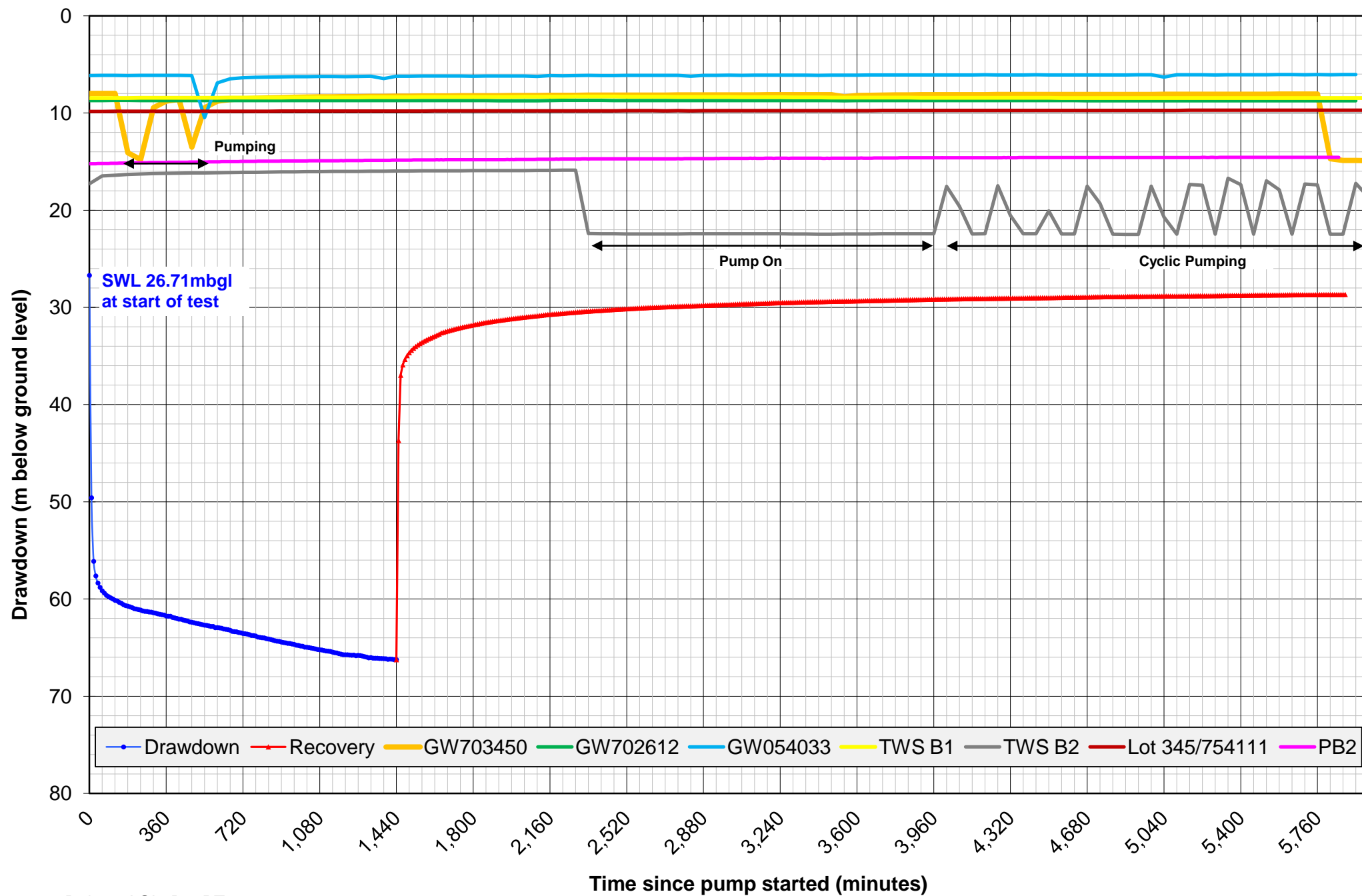
Chart 2: Time-Drawdown & Recovery - 'Dalton - AGL' Bore 1 Pumping at 3 L/sec for 24 Hours (TEST 2)

TABLE 1

DRAWDOWN ANALYSIS DATA**SINGLE RATE PUMP TEST**

Test date : 14/02/2012
Start time : 9:45 AM
Pump Off: 15/02/2012 9:45 AM
Casing I.D.: -
Pump type/mod: -
Pump O.D.: -
Pump Intake m: 85

HYDROILEX**PROJECT :**

Dalton AGL

CLIENT :

Aurecon

BORE No #

Bore 2

Tested by:

J.Lee & D Schmich

Av.Pump Rate (L/sec):

0.60

SWL (mbtoc):

16.30

Ref. Point (m):

1.00

<i>Real time</i>	<i>Hours</i>	<i>Time minutes T</i>	<i>Drawdown metres S1</i>	<i>Depth to water metres below ground level mbgl</i>	<i>Discharge Rate L/sec Q</i>	<i>Time to fill 100L Secs</i>	<i>Comments / Observations</i>
9:45 AM		0	0.00	15.30	0.67	150.0	= SWL
		10	4.09	19.39	-	-	
		20	11.08	26.38	-	-	Note: Data recorded at
		30	15.54	30.84	-	-	10 minute intervals
		40	19.07	34.37	-	-	on Minitrol
		50	22.01	37.31	-	-	
10:45 AM	1	60	24.38	39.68	-	-	
		70	26.65	41.95	-	-	
		80	28.91	44.21	-	-	
		90	30.91	46.21	-	-	
11:45 AM	2	120	35.75	51.05	-	-	
		150	39.18	54.48	-	-	
12:45 PM	3	180	41.59	56.89	-	-	
		210	43.65	58.95	-	-	
1:45 PM	4	240	45.30	60.60	-	-	
		270	46.70	62.00	-	-	
2:45 PM	5	300	47.83	63.13	-	-	
		330	48.84	64.14	-	-	
3:45 PM	6	360	49.54	64.84	-	-	
	7	420	50.87	66.17	-	-	
	8	480	52.10	67.40	0.63	158.0	
6:45 PM	9	540	53.29	68.59	-	-	
	10	600	54.30	69.60	-	-	
	11	660	55.33	70.63	-	-	
	11	670	55.58	70.88	-	-	
9:45 PM	12	720	56.55	71.85	-	-	
	14	840	58.26	73.56	-	-	
	16	960	59.71	75.01	-	-	
	18	1080	61.17	76.47	-	-	
	20	1200	63.20	78.50	-	-	
9:45 AM	24	1440	66.52	81.82	0.58	171.0	

TABLE 2

RECOVERY ANALYSIS DATA

SINGLE RATE PUMP TEST

Test date : 14/02/2012
Start time : 9:45 AM
Pump Off: 15/02/2012 9:45 AM
Casing I.D.: -
Pump type/mod: -
Pump O.D.: -
Pump Intake m: 85

HYDROILEX

PROJECT : Dalton AGL
CLIENT : Aurecon
BORE No # Bore 2
Tested by: J.Lee & D Schmich
Av.Pump Rate (L/sec): 0.60
SWL (mbtoc): 16.3
Ref. Point (m): 1.00

Real time	Minutes since pump Started t	Time since pump stopped Hrs	Minutes t'	Depth to water metres below ground level mbgl	Ratio t/t'	Residual Drawdown metres S'	Comments / Observations
9:45 AM	1440		0.1	82.82	14401	66.52	= depth to water at
	1450		10	79.93	145	63.63	instant pump stopped
	1460		20	53.14	73	36.84	
	1470		30	36.35	49.0	20.05	
	1480		40	26.19	37.0	9.89	
	1490		50	22.55	29.8	6.25	
10:45 AM	1500	1	60	20.95	25.0	4.65	
	1510		70	19.41	21.6	3.11	
	1520		80	18.70	19.0	2.40	
	1530		90	18.28	17.0	1.97	
11:45 AM	1560	2	120	17.37	13.0	1.07	
	1590		150	17.04	10.6	0.74	
12:45 PM	1620	3	180	16.92	9.0	0.62	
	1650		210	16.76	7.9	0.46	
1:45 PM	1680	4	240	16.49	7.0	0.19	
	1710		270	16.16	6.3	-0.14	
2:45 PM	1740	5	300	15.82	5.8	-0.48	
	1770		330	15.72	5.4	-0.58	
3:45 PM	1800	6	360	15.63	5.0	-0.67	
	1860	7	420	15.47	4.4	-0.83	
5:45 PM	1920	8	480	15.36	4.0	-0.94	
	1980	9	540	15.28	3.7	-1.02	
7:45 PM	2040	10	600	15.20	3.4	-1.10	
	2100	11	660	15.12	3.2	-1.18	
9:45 PM	2160	12	720	15.06	3.0	-1.24	
	2280	14	840	14.96	2.7	-1.34	
	2400	16	960	-	-	-	
	2520	18	1080	-	-	-	
	2640	20	1200	-	-	-	
9:45 AM	2880	24	1440	-	-	-	

Chart 1: Drawdown & Recovery Curves - 'Dalton-AGL' Bore 2 Pumping at 0.6 L/sec for 24 Hours (TEST 2)

SWL 15.3mbgl

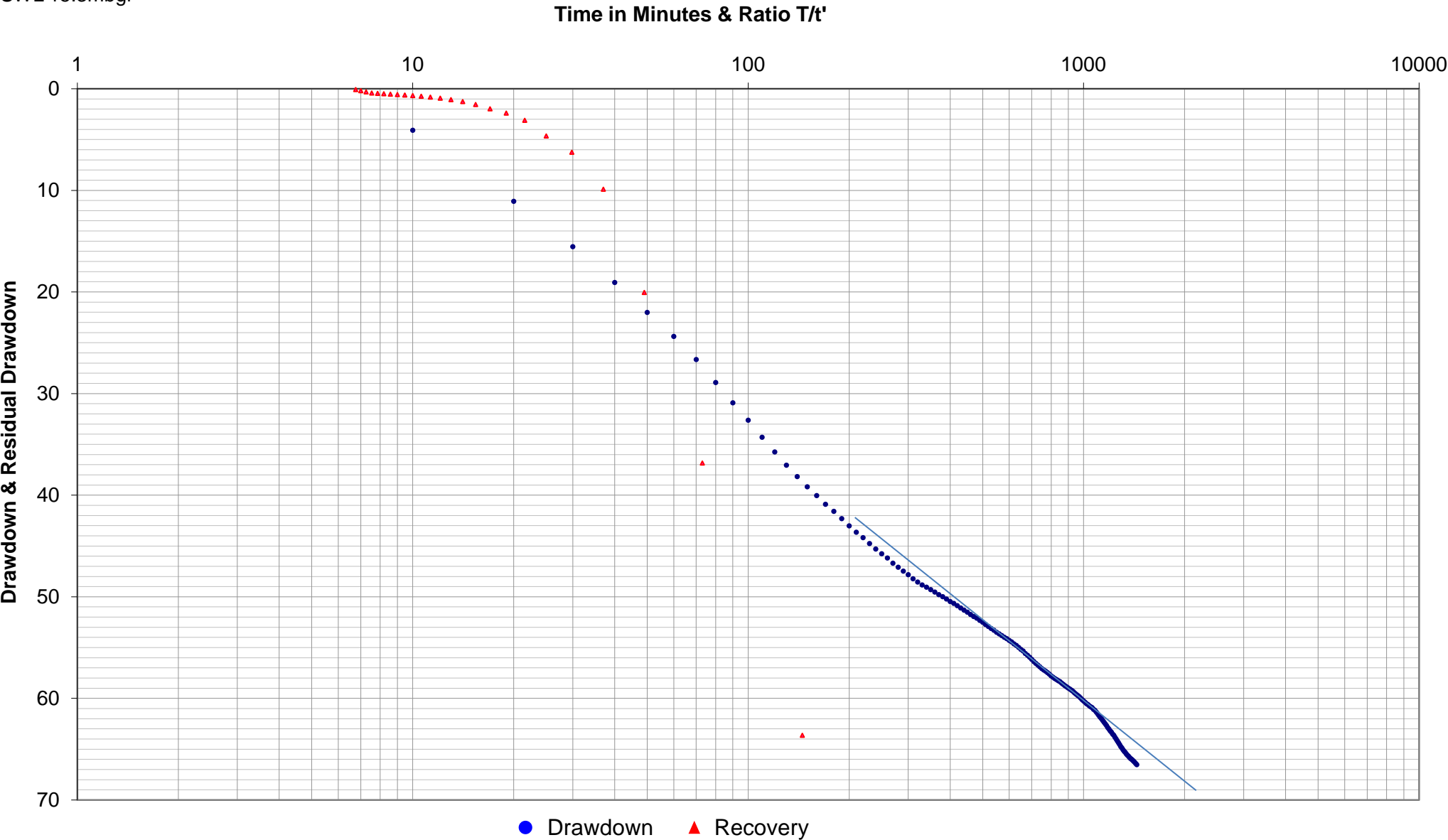
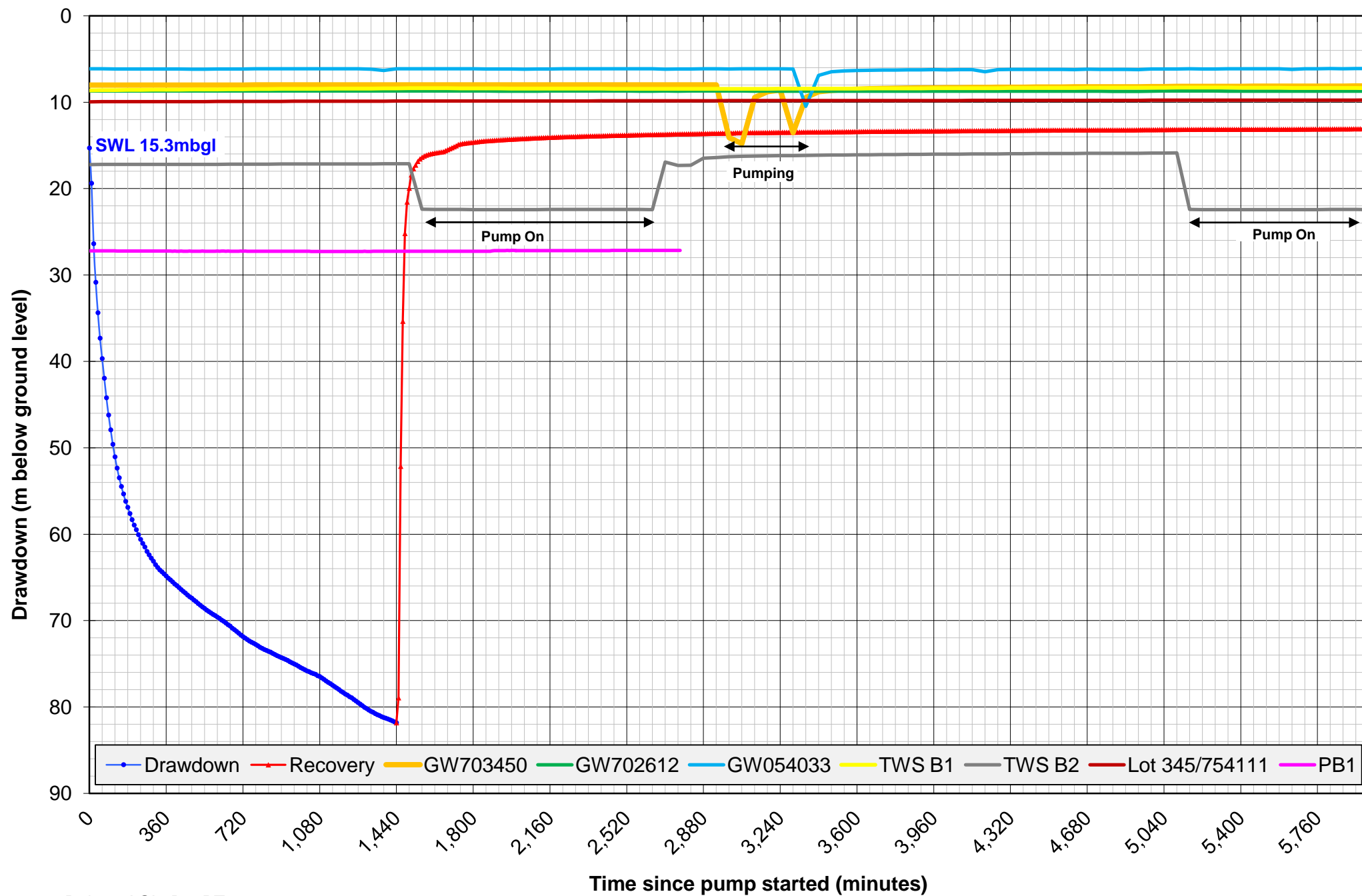


Chart 2: Time-Drawdown & Recovery - 'Dalton - AGL' Bore 2 Pumping at 0.6 L/sec for 24 Hours (TEST 2)

Appendix D

Laboratory Certificates of Analysis



Environmental Division (Water Resources Group)

Certificate of Analysis

Batch No: XHYDROILEX_21584

Final Report: XHYDROILEX_21584_LALK6

Client: Hydroilex

Contact: Rohan Last

Address: 38 Gibbs Street
Miranda NSW 2228

Client Ref: Dalton PS Bore 1

Client PO: Dalton Power Stn

Page

Laboratory

Address

Phone

Fax

Contact:

Page 1 of 3

Canberra Laboratory

PO Box 1834, Fyshwick, Canberra. ACT 2609.

02 6202 5401

02 6202 5452

Shane Reynolds

Supervisor Chemistry

shane.reynolds@alsglobal.com

Date Sampled:

04-Jan-2012

Date Samples Received:

04-Jan-2012

Date Issued:

12-Jan-2012

Date Testing Commenced:

04-Jan-2012

The sample(s) referred to in this report were analysed by the following method(s):

- NATA accreditation does not cover the performance of this service

Analysis	Method	Laboratory	NATA No.	Analysis	Method	Laboratory	NATA No.	Analysis	Method	Laboratory	NATA No.
Chloride	35	CANBERRA	992	Sulphate	35	CANBERRA	992	Alkal.(CaCO3)	10	CANBERRA	992
Conductivity	65	CANBERRA	992	Sulphide	273	CANBERRA	992	T.Diss Solids	260	CANBERRA	992
pH	210	CANBERRA	992	Diss. Calcium	120	CANBERRA	992	Diss. Magnesium	120	CANBERRA	992
Diss. Mercury	122	CANBERRA	992	Diss. Metals	121	CANBERRA	992	Total Calcium	120	CANBERRA	992
Total Hardness	105	CANBERRA	992	Total Iron	120	CANBERRA	992	Total Magnesium	120	CANBERRA	992
Total Potassium	120	CANBERRA	992	Total Sodium	120	CANBERRA	992	Nitrate (asN)	150 152	CANBERRA	992
Nitrite (asN)	150	CANBERRA	992	T.Oxid Nit(asN)	150	CANBERRA	992				

Temperature on receipt at Lab: 14.7



**NATA Accredited
Laboratory No. 992**

**Accredited for
compliance with
ISO/IEC 17025**

Signatories

These results have been electronically signed by the authorised signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11

Name	Title	Name	Title
Geetha Ramasundera	Chemistry	Shane Reynolds	Supervisor Chemistry
Terry Obrien	Supervisor Nutrients	Titus Vimalasiri	Supervisor Metals

Page: Page 2 of 3
 Batch No: XHYDROILEX_21584
 Report Number: XHYDROILEX_21584_LALK6
 Client: Hydroilex
 Client Ref: Dalton PS Bore 1



Sample No. 869180
 Client Sample ID. Dalton PS Bore 1
 Sample Point. GRNDWATER
 Sample Date. 04-Jan-2012 10:30:00AM

Analysis	Analyte	LOR	Units	
Alkal.(CaCO3)	Bicarb	<2	mg/L	587
	Carb	<0.1	mg/L	<0.1
	Hydrox	<0.1	mg/L	<0.1
	Total	<2	mg/L	587
Chloride	Chloride	<0.1	mg/L	460
Conductivity	SpC	<2	uS/cm	2700
Diss. Calcium	Diss_Ca	<0.05	mg/L	170
Diss. Magnesium	Diss_Mg	<0.05	mg/L	140
Diss. Mercury	Diss_Hg	<0.1	ug/L	<0.1
Diss. Metals	Silver	<1	ug/L	<1
	Aluminium	N/A	ug/L	<5
	Arsenic	N/A	ug/L	1
	Barium	N/A	ug/L	51
	Beryllium	<0.1	ug/L	<0.1
	Cadmium	N/A	ug/L	<0.05
	Cobalt	N/A	ug/L	0.8
	Chromium	N/A	ug/L	<2
	Copper	N/A	ug/L	1.4
	Manganese	N/A	ug/L	230
	Molybdenum	N/A	ug/L	<0.5
	Nickel	N/A	ug/L	7
	Lead	N/A	ug/L	<0.05
	Antimony	<3	ug/L	<3
	Selenium	N/A	ug/L	<2
	Zinc	N/A	ug/L	16
Nitrate (asN)	Nitrate	<0.01	mg/L N	<0.05
Nitrite (asN)	Nitrite	<0.01	mg/L N	<0.01
pH	pH	<0.1	pH units	7.1
Sulphate	Sulphate	<0.4	mg/L SO4	270
Sulphide	Sulphide	<0.02	mg/L S	<0.02
T.Diss Solids	TDS	<20	mg/L	1800
T.Oxid Nit(asN)	Oxidised_N	<0.05	mg/L N	<0.05
Total Calcium	Total_Ca	<0.1	mg/L	170

Page: Page 3 of 3
 Batch No: XHYDROILEX_21584
 Report Number: XHYDROILEX_21584_LALK6
 Client: Hydroilex
 Client Ref: Dalton PS Bore 1



				869180
				Dalton PS Bore 1
				GRNDWATER
				04-Jan-2012 10:30:00AM
Total Hardness	Total	<0.1	mg/L	1000
Total Iron	Total_Fe	<0.02	mg/L	3.4
Total Magnesium	Total_Mg	<0.05	mg/L	140
Total Potassium	Total_K	<0.1	mg/L	3.8
Total Sodium	Total_Na	<0.1	mg/L	240

These samples were analysed as received into the Laboratory.

Tests marked # are not NATA accredited.

A blank space indicates no test performed. A 'P' indicates results are pending authorisation

Soil results expressed in mg/kg dry weight unless specified otherwise

LOR = Limit of reporting. When a reported LOR is higher than the standard LOR, this may due to high moisture content, insufficient sample or matrix interference.

The analytical procedures in this report (including house methods) are developed from internationally recognised procedures such as those published by USEPA, APHA and NEPM

Results listed as Total Metals are actually Total Recoverable Metals



Environmental Division (Water Resources Group)

Certificate of Analysis

Batch No: XHYDROILEX_21630

Final Report: XHYDROILEX_21630_LASK5

Client: Hydroilex

Contact: Rohan Last

Address: 38 Gibbs Street
Miranda NSW 2228

Client Ref: Dalton PS Bore 2

Client PO: Dalton Power Stn

Page

Laboratory

Address

Phone

Fax

Contact:

Page 1 of 3

Canberra Laboratory

PO Box 1834, Fyshwick, Canberra. ACT 2609.

02 6202 5401

02 6202 5452

Shane Reynolds

Supervisor Chemistry

shane.reynolds@alsglobal.com

Date Sampled:

11-Jan-2012

Date Samples Received:

11-Jan-2012

Date Issued:

19-Jan-2012

Date Testing Commenced:

11-Jan-2012

The sample(s) referred to in this report were analysed by the following method(s):

- NATA accreditation does not cover the performance of this service

Analysis	Method	Laboratory	NATA No.	Analysis	Method	Laboratory	NATA No.	Analysis	Method	Laboratory	NATA No.
Chloride	35	CANBERRA	992	Sulphate	35	CANBERRA	992	Alkal.(CaCO3)	10	CANBERRA	992
Conductivity	65	CANBERRA	992	Sulphide	273	CANBERRA	992	T.Diss Solids	260	CANBERRA	992
pH	210	CANBERRA	992	Diss. Calcium	120	CANBERRA	992	Diss. Magnesium	120	CANBERRA	992
Diss. Mercury	122	CANBERRA	992	Diss. Metals	121	CANBERRA	992	Total Calcium	120	CANBERRA	992
Total Hardness	105	CANBERRA	992	Total Iron	120	CANBERRA	992	Total Magnesium	120	CANBERRA	992
Total Potassium	120	CANBERRA	992	Total Sodium	120	CANBERRA	992	Nitrate (asN)	150 152	CANBERRA	992
Nitrite (asN)	150	CANBERRA	992	T.Oxid Nit(asN)	150	CANBERRA	992				

Temperature on receipt at Lab: 21.4



NATA Accredited
Laboratory No. 992

Accredited for
compliance with
ISO/IEC 17025

Signatories

These results have been electronically signed by the authorised signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11

Name	Title	Name	Title
Geetha Ramasundera	Chemistry	Shane Reynolds	Supervisor Chemistry
Terry Obrien	Supervisor Nutrients	Titus Vimalasiri	Supervisor Metals

Page: Page 2 of 3
 Batch No: XHYDROILEX_21630
 Report Number: XHYDROILEX_21630_LASK5
 Client: Hydroilex
 Client Ref: Dalton PS Bore 2



Sample No. 870318
 Client Sample ID. Dalton PS Bore 2
 Sample Point. GRNDWATER
 Sample Date. 11-Jan-2012 12:50:00PM

Analysis	Analyte	LOR	Units	
Alkal.(CaCO3)	Bicarb	<2	mg/L	544
	Carb	<0.1	mg/L	<0.1
	Hydrox	<0.1	mg/L	<0.1
	Total	<2	mg/L	544
Chloride	Chloride	<0.1	mg/L	1200
Conductivity	SpC	<2	uS/cm	4600
Diss. Calcium	Diss_Ca	<0.05	mg/L	210
Diss. Magnesium	Diss_Mg	<0.05	mg/L	270
Diss. Mercury	Diss_Hg	<0.1	ug/L	0.1
Diss. Metals	Silver	<1	ug/L	<1
	Aluminium	N/A	ug/L	<5
	Arsenic	N/A	ug/L	3
	Barium	N/A	ug/L	110
	Beryllium	<0.1	ug/L	<0.1
	Cadmium	N/A	ug/L	0.05
	Cobalt	N/A	ug/L	2.7
	Chromium	N/A	ug/L	<2
	Copper	N/A	ug/L	2.8
	Manganese	N/A	ug/L	340
	Molybdenum	N/A	ug/L	<0.5
	Nickel	N/A	ug/L	10
	Lead	N/A	ug/L	<0.05
	Antimony	<3	ug/L	<3
	Selenium	N/A	ug/L	<2
	Zinc	N/A	ug/L	36
Nitrate (asN)	Nitrate	<0.01	mg/L N	0.17
Nitrite (asN)	Nitrite	<0.01	mg/L N	<0.01
pH	pH	<0.1	pH units	7.0
Sulphate	Sulphate	<0.4	mg/L SO4	110
Sulphide	Sulphide	<0.02	mg/L S	<0.02
T.Diss Solids	TDS	<20	mg/L	3000
T.Oxid Nit(asN)	Oxidised_N	<0.05	mg/L N	0.17
Total Calcium	Total_Ca	<0.1	mg/L	220

Page: **Page 3 of 3**
 Batch No: **XHYDROILEX_21630**
 Report Number: **XHYDROILEX_21630_LASK5**
 Client: **Hydroilex**
 Client Ref: **Dalton PS Bore 2**



				870318
				Dalton PS Bore 2
				GRNDWATER
				11-Jan-2012 12:50:00PM
Total Hardness	Total	<0.1	mg/L	1600
Total Iron	Total_Fe	<0.02	mg/L	3.2
Total Magnesium	Total_Mg	<0.05	mg/L	290
Total Potassium	Total_K	<0.1	mg/L	3.8
Total Sodium	Total_Na	<0.1	mg/L	360

These samples were analysed as received into the Laboratory.

Tests marked # are not NATA accredited.

A blank space indicates no test performed. A 'P' indicates results are pending authorisation

Soil results expressed in mg/kg dry weight unless specified otherwise

LOR = Limit of reporting. When a reported LOR is higher than the standard LOR, this may due to high moisture content, insufficient sample or matrix interference.

The analytical procedures in this report (including house methods) are developed from internationally recognised procedures such as those published by USEPA, APHA and NEPM

Results listed as Total Metals are actually Total Recoverable Metals

Appendix E

Registered Bore Records

Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)

Document Generated on Thursday, July 1, 2010

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A](#) [Licensed](#) [Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW703450

Works Details [\(top\)](#)

GROUNDWATER NUMBER	GW703450
LIC-NUM	70BL228934
AUTHORISED-PURPOSES	DOMESTIC STOCK
INTENDED-PURPOSES	DOMESTIC STOCK
WORK-TYPE	Bore
WORK-STATUS	Supply Obtained
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2003-01-20
FINAL-DEPTH (metres)	18.60
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	DAWNDEN
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	4.20
SALINITY	
YIELD	0.50

Site Details [\(top\)](#)

REGION	70 - LACHLAN
RIVER-BASIN	
AREA-DISTRICT	
CMA-MAP	
GRID-ZONE	
SCALE	
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6158595.00
EASTING	699301.00
LATITUDE	34 41' 43"
LONGITUDE	149 10' 33"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	
REMARK	

Form-A [\(top\)](#)

COUNTY KING
PARISH BUNTON
PORTION-LOT-DP 50//754106

Licensed [\(top\)](#)

COUNTY KING
PARISH BUNTON
PORTION-LOT-DP 50 754106

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	P.V.C.	0.00	0.00	100			

Water Bearing Zones [\(top\)](#)

no details

Drillers Log [\(top\)](#)

no details

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Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)

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Work Requested -- GW702614

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW702614
LIC-NUM 70BL228930
AUTHORISED-PURPOSES DOMESTIC STOCK
INTENDED-PURPOSES DOMESTIC STOCK
WORK-TYPE Bore
WORK-STATUS Supply Obtained
CONSTRUCTION-METHOD (Unknown)
OWNER-TYPE Private
COMMENCE-DATE
COMPLETION-DATE 2003-03-31
FINAL-DEPTH (metres) 50.00
DRILLED-DEPTH (metres)
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY ESHCOL
GWMA -
GW-ZONE -
STANDING-WATER-LEVEL 18.00
SALINITY
YIELD

Site Details [\(top\)](#)

REGION 70 - LACHLAN
RIVER-BASIN 412 - LACHLAN RIVER
AREA-DISTRICT
CMA-MAP 8728-4S
GRID-ZONE 55/3
SCALE 1:25,000
ELEVATION
ELEVATION-SOURCE
NORTHING 6156670.00
EASTING 699488.00
LATITUDE 34 42' 45"
LONGITUDE 149 10' 42"
GS-MAP
AMG-ZONE 55
COORD-SOURCE GIS - Geographic Information System
REMARK

Form-A [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 149//754111

Licensed [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 149 754111

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	50.00	150			(Unknown)
1	1	Casing	P.V.C.	0.00	50.00	150			(Unknown); (Unknown); (Unknown)

Water Bearing Zones [\(top\)](#)

no details

Drillers Log [\(top\)](#)

no details

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Groundwater Works Summary

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Work Requested -- GW702612

Works Details [\(top\)](#)

GROUNDWATER NUMBER	GW702612
LIC-NUM	70BL228833
AUTHORISED-PURPOSES	DOMESTIC STOCK
INTENDED-PURPOSES	DOMESTIC STOCK
WORK-TYPE	Bore
WORK-STATUS	Supply Obtained
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2003-02-28
FINAL-DEPTH (metres)	21.00
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	MT PLEASANT
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	9.50
SALINITY	
YIELD	0.67

Site Details [\(top\)](#)

REGION	70 - LACHLAN
RIVER-BASIN	412 - LACHLAN RIVER
AREA-DISTRICT	
CMA-MAP	8728-4S
GRID-ZONE	55/3
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6161135.00
EASTING	699648.00
LATITUDE	34 40' 20"
LONGITUDE	149 10' 45"
GS-MAP	
AMG-ZONE	55
COORD-SOURCE	GIS - Geographic Information System
REMARK	

Form-A [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 6//754111

Licensed [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 6 754111

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	21.00	150			(Unknown)
1	1	Casing	P.V.C.	0.00	20.00	150			(Unknown); (Unknown); (Unknown)
1	1	Opening	Slots	10.00	20.00	150			PVC; (Unknown); (Unknown)

Water Bearing Zones [\(top\)](#)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
10.00	20.00	10.00		9.50		0.67			S.Brackish

Drillers Log [\(top\)](#)

no details

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Groundwater Works Summary

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Work Requested -- GW700858

Works Details [\(top\)](#)

GROUNDWATER NUMBER	GW700858
LIC-NUM	70BL227308
AUTHORISED-PURPOSES	DOMESTIC STOCK
INTENDED-PURPOSES	DOMESTIC STOCK
WORK-TYPE	Bore
WORK-STATUS	Supply Obtained
CONSTRUCTION-METHOD	Down Hole Hammer
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	1999-01-09
FINAL-DEPTH (metres)	30.00
DRILLED-DEPTH (metres)	30.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	KOOKABURRA RISE
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	9.00
SALINITY	
YIELD	0.56

Site Details [\(top\)](#)

REGION	70 - LACHLAN
RIVER-BASIN	412 - LACHLAN RIVER
AREA-DISTRICT	
CMA-MAP	8728-N
GRID-ZONE	55/3
SCALE	1:50,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6158184.00
EASTING	696388.00
LATITUDE	34 41' 58"
LONGITUDE	149 8' 39"
GS-MAP	74ab3
AMG-ZONE	55
COORD-SOURCE	Map Interpretation
REMARK	

Form-A [\(top\)](#)

COUNTY KING
PARISH BUNTON
PORTION-LOT-DP LOT 1 DP 854987

Licensed [\(top\)](#)

COUNTY KING
PARISH BUNTON
PORTION-LOT-DP 1 854987

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	30.00	203			Down Hole Hammer
1	1	Casing	P.V.C.	-0.40	30.00	165	157		Screwed and Glued; Seated on Bottom PVC Class 9; Sawn; SL: 150mm; A: 2mm
1	1	Opening	Slots - Vertical	12.00	24.00	165			

Water Bearing Zones [\(top\)](#)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
15.00	16.00	1.00		9.00		0.25	17.00	0.50	
22.00	24.00	2.00		9.00		0.31	30.00	1.50	

Drillers Log [\(top\)](#)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	6.00	6.00	Shale, fractured, yellow		
6.00	18.00	12.00	Shale, soft, brown		
18.00	30.00	12.00	Shale, grey-black		

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Groundwater Works Summary

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Work Requested -- GW600151

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW600151
LIC-NUM
AUTHORISED-PURPOSES
INTENDED-PURPOSES MONITORING BORE
WORK-TYPE Bore
WORK-STATUS Supply Obtained
CONSTRUCTION-METHOD Auger - Solid Flight
OWNER-TYPE Private
COMMENCE-DATE
COMPLETION-DATE 2008-07-21
FINAL-DEPTH (metres) 50.00
DRILLED-DEPTH (metres) 52.30
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY
GWMA
GW-ZONE
STANDING-WATER-LEVEL 7.00
SALINITY 14680.00
YIELD 0.05

Site Details [\(top\)](#)

REGION 60 - LOWER MURRAY / DARLING
RIVER-BASIN
AREA-DISTRICT
CMA-MAP
GRID-ZONE
SCALE
ELEVATION
ELEVATION-SOURCE
NORTHING 6155225.00
EASTING 703260.00
LATITUDE 34 43' 29"
LONGITUDE 149 13' 12"
GS-MAP
AMG-ZONE 55
COORD-SOURCE
REMARK

Form-A [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 308//754111

Licensed [\(top\)](#)

no details

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	2.20	150			Auger - Solid Flight
1		Hole	Hole	2.20	52.30	122			Rotary - Coring
1	1	Casing	PVC Class 12	1.00	37.00	60.35	50.35		Glued; Cap PVC Class 12;
1	1	Opening	Slots - Horizontal	36.00	38.00	60.35			Mechanically Slotted; Glued
1		Annulus	Waterworn/Rounded	34.00	40.00	122	60.35		Graded; GS: 8-16mm

Water Bearing Zones [\(top\)](#)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
34.00	40.00	6.00		7.00		0.05		1.50	8808.00

Drillers Log [\(top\)](#)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	4.80	4.80	Grey Grey Brown Clay		
4.80	6.80	2.00	Silty Sand		
6.80	10.30	3.50	Green Grey heavy Clay		
10.30	52.30	42.00	Sand		

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Groundwater Works Summary

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Work Requested -- GW070051

Works Details [\(top\)](#)

GROUNDWATER NUMBER	GW070051
LIC-NUM	70BL150254
AUTHORISED-PURPOSES	DOMESTIC STOCK
INTENDED-PURPOSES	DOMESTIC STOCK
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	Rotary Air
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	1992-06-01
FINAL-DEPTH (metres)	42.00
DRILLED-DEPTH (metres)	42.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N/A
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	0.80

Site Details [\(top\)](#)

REGION	70 - LACHLAN
RIVER-BASIN	412 - LACHLAN RIVER
AREA-DISTRICT	
CMA-MAP	8728-4S
GRID-ZONE	55/3
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6155909.00
EASTING	701743.00
LATITUDE	34 43' 8"
LONGITUDE	149 12' 11"
GS-MAP	0074A4
AMG-ZONE	55
COORD-SOURCE	
REMARK	

Form-A [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 239

Licensed [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 235

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	P.V.C.	0.00	19.00	150			Driven into Hole
1	1	Opening	Slots - Horizontal	17.00	19.00	150		1	PVC; SL: 0mm; A: 3mm

Water Bearing Zones [\(top\)](#)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
18.00	19.00	1.00	Unconsolidated	16.00		0.80			Good
30.00	31.00	1.00	Fractured						Good

Drillers Log [\(top\)](#)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	19.00	19.00	Topsoil and clay		
19.00	42.00	23.00	Slate		

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Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
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Work Requested -- GW060994

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW060994
LIC-NUM 70BL132634
AUTHORISED-PURPOSES DOMESTIC STOCK
INTENDED-PURPOSES DOMESTIC STOCK
WORK-TYPE Bore open thru rock
WORK-STATUS (Unknown)
CONSTRUCTION-METHOD Rotary Air
OWNER-TYPE Private
COMMENCE-DATE
COMPLETION-DATE 1985-05-01
FINAL-DEPTH (metres) 48.10
DRILLED-DEPTH (metres) 48.10
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY N/A
GWMA -
GW-ZONE -
STANDING-WATER-LEVEL
SALINITY
YIELD

Site Details [\(top\)](#)

REGION 70 - LACHLAN
RIVER-BASIN 412 - LACHLAN RIVER
AREA-DISTRICT
CMA-MAP 8728-4S
GRID-ZONE 55/3
SCALE 1:25,000
ELEVATION
ELEVATION-SOURCE (Unknown)
NORTHING 6155838.00
EASTING 699349.00
LATITUDE 34 43' 12"
LONGITUDE 149 10' 37"
GS-MAP 0074A3
AMG-ZONE 55
COORD-SOURCE GD.,ACC.MAP
REMARK

Form-A [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 348

Licensed [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 348

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	Welded Steel	-0.30	6.70	165			Driven into Hole

Water Bearing Zones [\(top\)](#)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
39.00	39.30	0.30	Fractured			0.13			Good
45.10	45.40	0.30	Fractured			0.33			Good

Drillers Log [\(top\)](#)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.30	0.30	Topsoil		
0.30	6.70	6.40	Shale Broken		
6.70	48.10	41.40	Shale Water Supply		

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Groundwater Works Summary

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Work Requested -- GW054033

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW054033
LIC-NUM 70BL111689
AUTHORISED-PURPOSES DOMESTIC STOCK
INTENDED-PURPOSES DOMESTIC STOCK
WORK-TYPE Bore open thru rock
WORK-STATUS (Unknown)
CONSTRUCTION-METHOD Rotary Air
OWNER-TYPE Private
COMMENCE-DATE
COMPLETION-DATE 1982-02-01
FINAL-DEPTH (metres) 54.00
DRILLED-DEPTH (metres) 54.00
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY KANIMBLA
GWMA -
GW-ZONE -
STANDING-WATER-LEVEL
SALINITY
YIELD

Site Details [\(top\)](#)

REGION 70 - LACHLAN
RIVER-BASIN 412 - LACHLAN RIVER
AREA-DISTRICT
CMA-MAP 8728-4S
GRID-ZONE 55/3
SCALE 1:25,000
ELEVATION
ELEVATION-SOURCE (Unknown)
NORTHING 6157282.00
EASTING 699533.00
LATITUDE 34 42' 25"
LONGITUDE 149 10' 43"
GS-MAP 0074A3
AMG-ZONE 55
COORD-SOURCE GD.,ACC.MAP
REMARK

Form-A [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 29

Licensed [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 29

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	P.V.C.	0.00	12.00	150			Driven into Hole

Water Bearing Zones [\(top\)](#)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
20.00	22.00	2.00	Fractured			0.30			Fair
22.00	30.00	8.00	Fractured			0.15			Fair
30.00	38.00	8.00	Fractured			0.16			Fair
38.00	54.00	16.00	Fractured			0.69			Fair

Drillers Log [\(top\)](#)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.60	0.60	Soil		
0.60	5.00	4.40	Clay		
5.00	9.00	4.00	Mudstone		
9.00	12.00	3.00	Mudstone Consolidated		
12.00	54.00	42.00	Slate Fine Water Supply		

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Groundwater Works Summary

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Work Requested -- GW047202

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW047202
LIC-NUM 70BL108944
AUTHORISED-PURPOSES TOWN WATER SUPPLY
INTENDED-PURPOSES G/WATER XPLORE
WORK-TYPE Bore
WORK-STATUS (Unknown)
CONSTRUCTION-METHOD Cable Tool
OWNER-TYPE Local Govt
COMMENCE-DATE
COMPLETION-DATE 1978-08-01
FINAL-DEPTH (metres) 61.50
DRILLED-DEPTH (metres) 61.50
CONTRACTOR-NAME
DRILLER-NAME
PROPERTY VILLAGE OF DALTON
GWMA -
GW-ZONE -
STANDING-WATER-LEVEL
SALINITY
YIELD

Site Details [\(top\)](#)

REGION 70 - LACHLAN
RIVER-BASIN 412 - LACHLAN RIVER
AREA-DISTRICT
CMA-MAP 8728-4S
GRID-ZONE 55/3
SCALE 1:25,000
ELEVATION
ELEVATION-SOURCE (Unknown)
NORTHING 6155637.00
EASTING 700082.00
LATITUDE 34 43' 18"
LONGITUDE 149 11' 6"
GS-MAP 0074A3
AMG-ZONE 55
COORD-SOURCE GD.,ACC.MAP
REMARK

Form-A [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP SEC 11

Licensed [\(top\)](#)

COUNTY KING
PARISH DALTON
PORTION-LOT-DP 182 754111

Construction [\(top\)](#)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	Threaded Steel	0.00	40.60	152			Suspended in Clamps
1	1	Casing	Threaded Steel	0.00	61.50	127			Seated on Bottom
1	1	Opening	Slots	13.90	40.60	152		1	Oxy-Acetylene Slotted; SL: 0mm; A: 0mm
1	1	Opening	Slots - Vertical	61.00	72.70	127		2	Oxy-Acetylene Slotted; SL: 0mm; A: 6mm

Water Bearing Zones [\(top\)](#)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
33.00	34.00	1.00	(Unknown)	23.00		0.10			(Unknown)
58.00	61.00	3.00	(Unknown)	14.50		1.89			(Unknown)

Drillers Log [\(top\)](#)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	0.10	0.10	Topsoil		
0.10	16.00	15.90	Clay Yellow Grey Streaks		
16.00	28.00	12.00	Clay Grey Some Shale		
28.00	34.00	6.00	Siltstone Grey Green Clay		
34.00	35.00	1.00	Shale Grey Hard		
35.00	44.00	9.00	Shale Slightly Hard		
44.00	61.45	17.45	Shale Grey		
61.45	61.50	0.05	Shale Grey Hard		

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.



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