

~ Commercial-in-Confidence ~

Hydrogeological Assessment

Wellard Darwin Integrated Live Export Facility

Report Number 23919.80231



Prepared for



Wellard

Wellard Rural Exports

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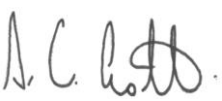
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Client

Wellard Rural Exports

1

Company

EnviroAg Australia

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Executive Summary

EnviroAg Australia Pty Ltd has been engaged by Wellard Rural to conduct a hydrogeological investigation for the proposed Livingstone Integrated Live Export Facility (ILEF), 2658 Stuart Highway, Livingstone NT. The proposed development is immediately adjacent to the “Santavan Pre-export Quarantine Yard” which is on the northern neighbouring property.

The objectives of this project were to;

- a) Define the hydrogeology of the site; and,
- b) Provide data critical to the design of the ILEF and allow the delivery of detailed design of the proposed key infrastructure.

The assessment has included;

- a) Desktop assessment;
- b) Drilling test bore holes to define the site hydrogeology;
- c) Excavation of fourteen (14) test pits; and,
- d) Compilation and assessment of the data obtained.

The site was divided into three zones in accordance with their proposed purposes;

- | | |
|---------|-----------------|
| Zone 1. | Export Facility |
| Zone 2. | Irrigable Area |
| Zone 3. | Waste Systems |

The bedrock geology consists of dolomite, carbonate rocks, sandstone, shale, siltstone, schist, granite and metamorphic rocks.

A hydrogeological assessment of the site identified that shallow ground waters associated with the swamp below the site and potential discharges to the headwaters of the Berry Springs Creek is replenished by the shallow aquifer (the first aquifer encountered during drilling).

The highest yielding bedrock aquifers are the dolomites and carbonate rocks. Lesser yielding aquifers are found in the fractured sandstones and siltstone. Schist, granite and metamorphic rocks are low yielding aquifers.

The installed bore draws water from the deeper dolomite aquifer therefore will not impact on the Berry Creek Spring resource.

Limitations Assessment

The hydrogeological modelling and recommendations presented within this report are based on a limited number of test pits and a test borehole with limited site coverage. It must be noted that variations in ground conditions occur over relatively short distances and with depth.

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1. Introduction

1.1 Hydrogeological Study

The purpose of the hydrogeological study is to investigate the subsurface hydrologic and geologic conditions of an area or site.

Data includes the thickness of the geologic materials, the soil properties, the occurrence and flow of groundwater, the quality of groundwater and the water levels at local groundwater wells.

1.2 Site Description

EnviroAg Australia Pty Ltd (EnviroAg) was engaged by Wellard Rural Pty Ltd (Wellard) to undertake a Hydrogeological Study at the proposed Livingstone Integrated Live Export Facility (ILEF) site in Darwin. The property is referred to as "Livingstone Valley" and is located on Lot 5544 Hundred of Strangways, 2658 Stuart Highway (Figure 1).

The site of the proposed ILEF is located adjacent to Stuart highway as shown in Figure 1 below. It is near the eastern boundary of the Berry Spring Creek catchment, a tributary of the Blackmore River which feeds into the Middle Arm of Darwin Harbour in the north-west (Figure 2). Berry Springs is fed from dolomite aquifers and is a major source of water for the rural community.

The site has been cleared, ploughed and sown to improved pasture. The land is currently used for grazing stock and pasture production. The site has an east to west slope of about 1.5% and a cross fall of about 0.5%.

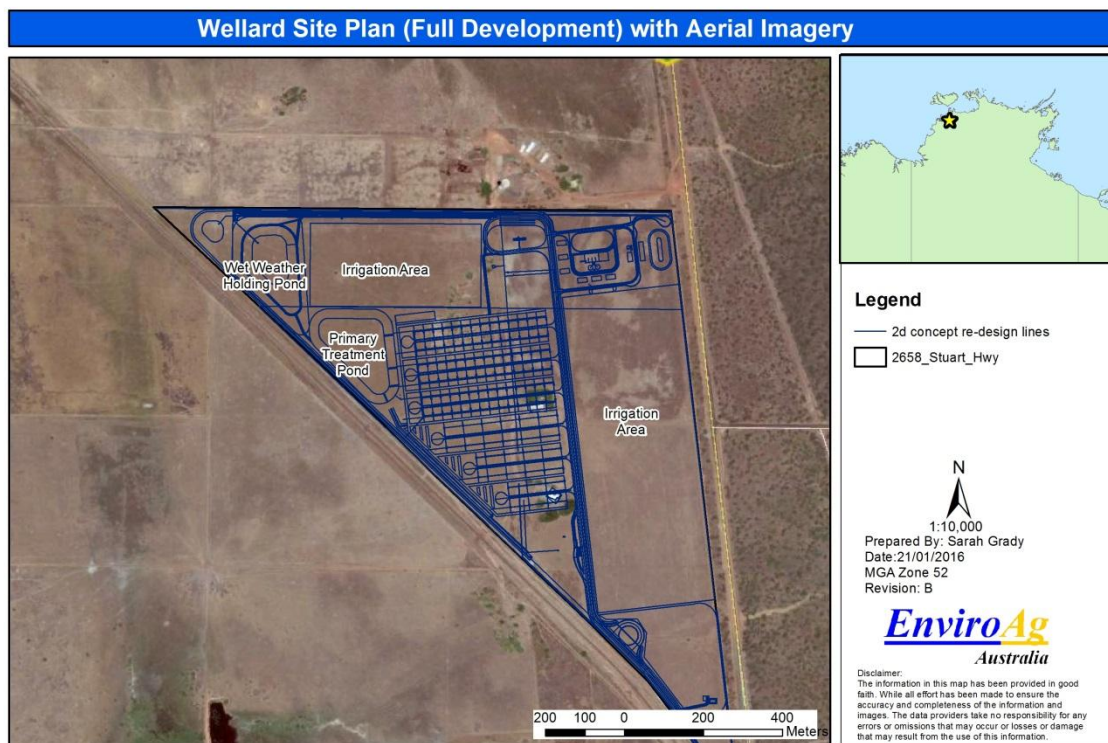


Figure 1 "Livingstone Valley" ILEF Site Satellite Image

A hydrogeological investigation assessment has been undertaken on the site. Key information and findings gathered through tests conducted are detailed within this report.

1.3 Site Details

Site details are presented in the Table 1 below.

Table 1 Wellard ILEF Site Details

Site Name	Wellard Darwin Integrated Live Export Facility
Site Address	Livingstone, NT 0822
Property Description	Lot 5544 Hundred of Strangways
County	Livingstone, Northern Territory
Current Land Use	Agriculture
Site Area	90.5 ha

2. Review of Site Geology

2.1 Regional Geology

The geology of the region has been described by the Department of Infrastructure, Planning and Environment in “*An understanding of the groundwater and surface water hydrology of the Darwin Harbour Plan of Management area*” (Haig & Townsend, 2003).

The elevation in the catchment ranges from 20 Australian Height Datum (AHD) to 60 AHD (Figure 6). It is positioned at the top of a foothill adjoining a plateau on which the Stuart Highway is positioned.

The majority of the Darwin Harbour region is covered by a 10m layer of Cainozoic aged laterite, below which there are 30-60 metres of Cretaceous aged sandstones and claystone. The regional unconfined aquifer system recharges during the wet season and is comprised of shallow sediments. Cretaceous sediments act as a source of recharge and storage to the deeper bedrock aquifers.

The following provides a summary of the regional geology as described by Haig and Townsend (2003):

- The bedrock geology consists of dolomite, carbonate rocks, sandstone, shale, siltstone, granite and metamorphic rocks. The highest yielding bedrock aquifers are the dolomites and carbonate rocks. Lesser yielding aquifers are found in the fractured sandstones and siltstone. Schist, granite and metamorphic rocks are low yielding aquifers.
- Most of the region is covered with 20 to 50 metres of more recent sandstone, siltstone and claystone. This stratum is capped in places by a 5 to 10 metre layer of laterite, i.e. a residual clayey layer consisting of mainly iron and aluminium hydroxides formed under tropical weathering of igneous rocks. Recharge to the regional aquifers is a result of direct infiltration of rain through the surface deposits. The average annual rainfall in the region is 1,700 mm, as much as 200 mm is recharged to some of the more transmissive areas in the catchment.
- Groundwater flows are determined by topography and the capacity of the aquifer to transmit water horizontally and vertically.
- Approximately 50% of the catchment area has moderately to severely water logged soils. Following the periods of high rainfall and runoff, the wetlands that form during the wet season will gradually dry up as shallow groundwater drains. Some wetlands which are “perched” above clay layers persist through the dry season.
- Perennially flowing springs, which are fed from deeper dolomite aquifers, are found at Howard Springs and Berry Springs.
- Compared to undeveloped areas, the groundwater levels at the end of the dry season in the developed rural area have lowered 6 to 10 metres over the last 20 years.
- The additional lowering of water levels at the end of the dry season is due to water extraction associated with rural development.
- Following the cycle of natural drainage and extraction of groundwater, the aquifer system is fully recharged each wet season.

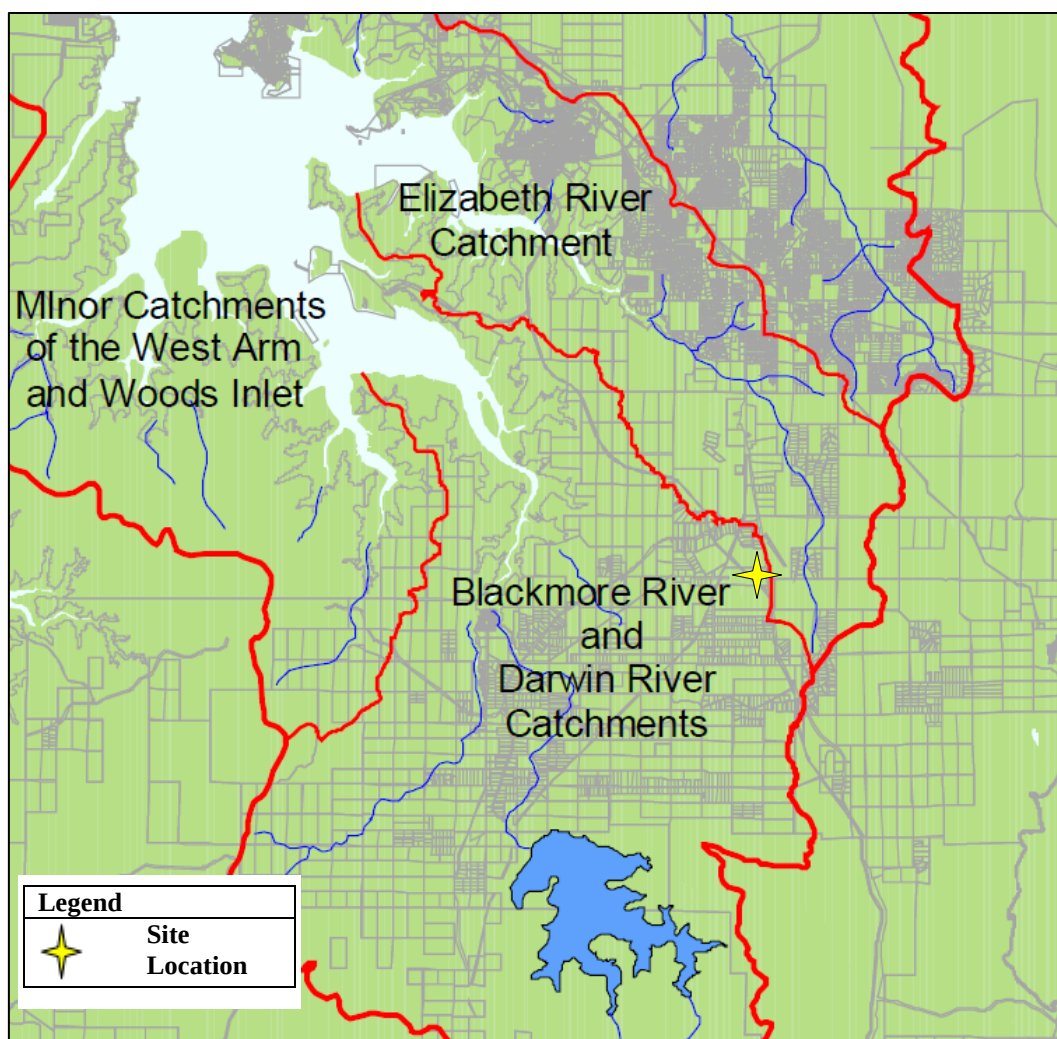


Figure 2 Catchments of the Darwin Harbour Region (Haig & Townsend, 2003)

2.2 Local Hydrogeology

2.2.1 Stratigraphy

A search of bores in the vicinity was undertaken. The location of the bores is shown in Figure 3 below. The bore cards for these bores are found in Appendix A.

The key attributes of the bores are summarised in Table 2 below. Bores 000079 and 000030 are found on “Livingstone Valley”.

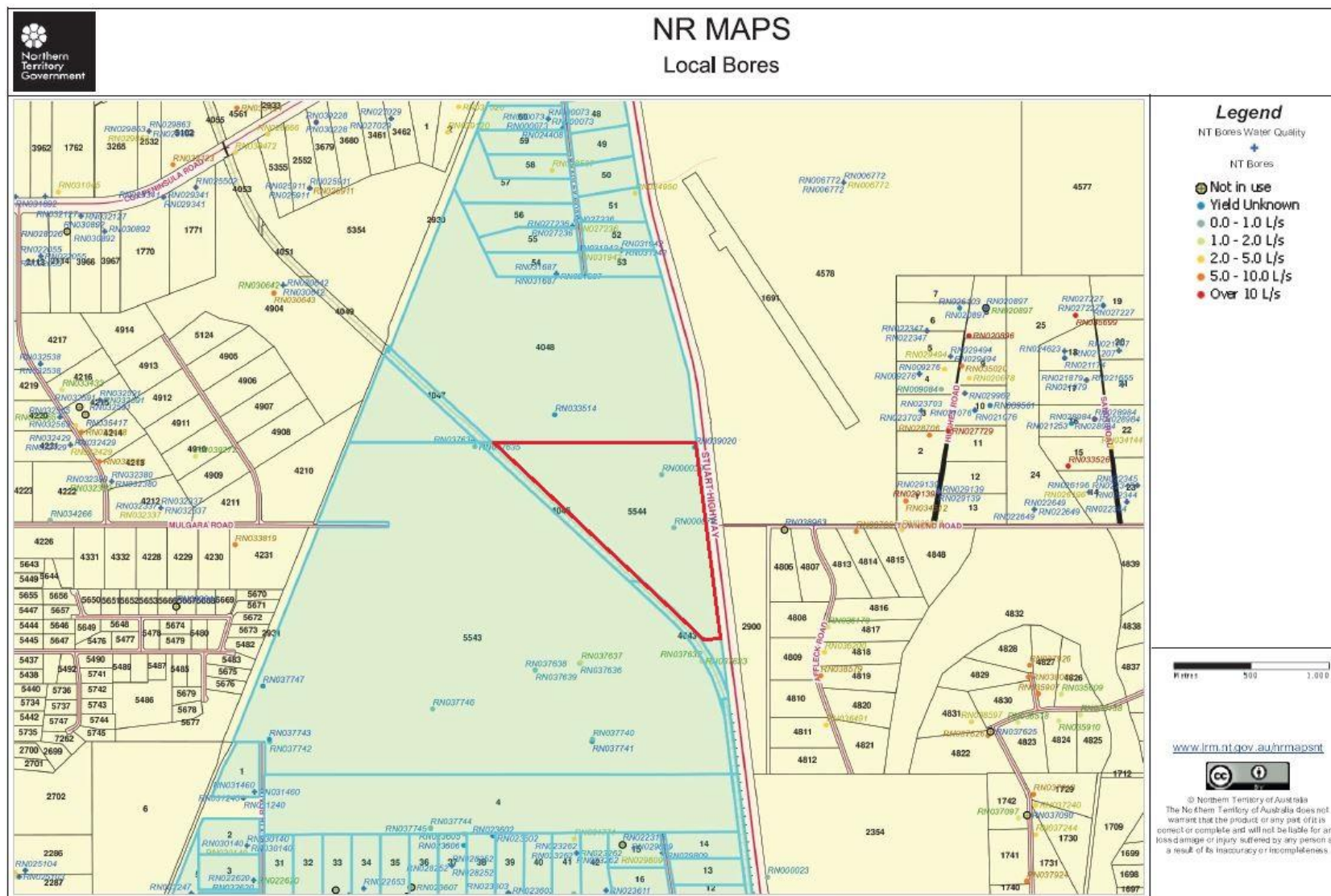


Figure 3 Rural Well Locations Surrounding the Property Lined in Red (DLRM, 2015)

Table 2 Summary of Bores Local to Site (DLRM, 2015)

Bore Reg number	Name	Date of Bore Completion	Depth (m) dbgl	Estimated Depth AHD (m)	SWL (m)	Water Bearing Zone screened (m)	Yield (L/s)	Quality	Use
037632	AA Co.	2012	40	11	5.8	5-10 16-24 28-32	2	EC 49.4, pH 8.51	Monitoring
037636	AA Co.	2012	40	0	2.4	5-8 28-40	0.2	EC 109.4, pH 8.45	Monitoring
037638	AA Co.	2012	40	-3	1.4	5-8 24-30	0.2	EC 87.2, pH 8.09	Monitoring
037634	AA Co.	2012	47	-9	2.2	0.5-10 20-40	0.75	EC 89.5, pH 8.43	Monitoring
033514	Santavan	1982 (registered 2002)	43	1	2	Unknown	Unknown	Unknown	Prod/ Domestic
030642	Santana	1996	40	-11		26-40	1.2	Good	Explorat ^N test
031687	McGuffog	1998	121	-70	18	104-121	1.5	EC 143, pH 8.2	Agri
031942	Chin	1992	133	-80	17	48-80 85-? 130-133	2.8	Unknown	Agri
037361	Malgorze-wicz	2011	53	-2	13	47.5-52	10	EC 338, pH 7.29	Domestic

The existing registered bores in the locality were drilled and constructed between 1996 and 2012 for monitoring, domestic and agricultural production purposes. Most bores were drilled to depths of approximately 40 metres with standing water levels of 1 – 6 metres below ground level.

Yields were mostly sufficient for domestic and production bores – less than 2 litres/second. The main water bearing zones are recorded as being from approximately 5 – 10 metres in depth in the near surface aquifers; and most generally at a depth of 20 – 40 metres, whilst the deepest aquifer is approximately 104–130m in depth.

Soil drill logs were recorded for the majority of these bores in the immediate vicinity of the proposed development.

The majority of borehole/drill logs exhibited the following information:

- Topsoil to 0.5 – 1.0 metre depth;
- Sandy surface soil is underlain by sandy clay and clay layers to ~20 – 30 metres in;
- The depth of clays provides a barrier to the groundwater aquifer;
- Deeper layers generally included grey clay, brown and grey “shale”; and,
- Siltstone with gravelly seams.

2.2.2 Ground Water Model

Haig and Townsend (2003) present a W-E cross section from Howard Springs to Black Jungle Lagoon. This cross section shows the Whites formation on the east and beds of sedimentary materials to the west as shown below in Figure 4.

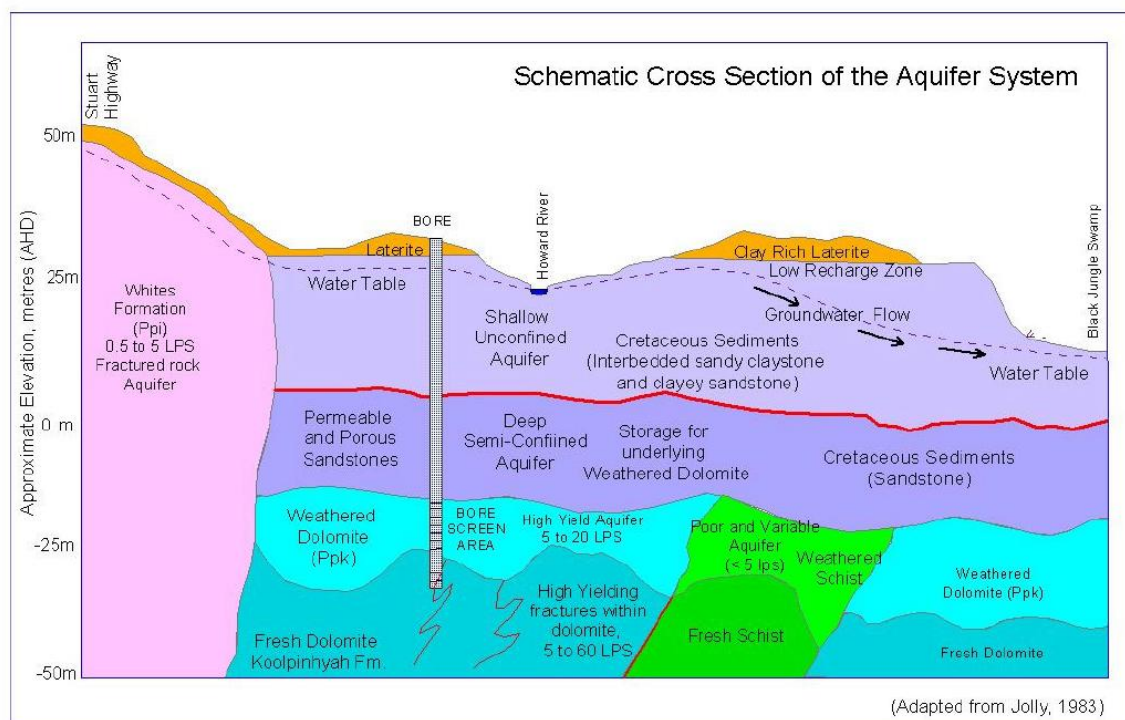


Figure 4 Schematic Cross Section of the Aquifer System (Haig and Townsend, 2003)

2.2.3 Site Drainage

Based on the available literature, shallow groundwater at the 'Livingstone Valley' site are likely to fluctuate with the season. Further low areas are likely to become inundated during the 'wet season' (Haig and Townsend, 2003).

The local rural community utilise water from Berry Creek and its springs. The sustainability of Berry Creek and its springs are relied upon as a source of water for the rural and recreation operations within the area. Groundwater discharge sourced predominantly from the lower dolomite aquifers and overland flows replenish Berry Spring Creek. The sustainability of the "base flow" into the creek can be directly linked to the rate extraction of the numerous stock and domestic bores in its catchment and the surrounding areas. These extract water from the sediments overlying the lower dolomite sediments. Excessive surface extraction reduces recharge rates to the deeper aquifers. Overland flow will only replenish Berry Spring Creek during the wet season.

Groundwater levels at the end of the dry season have been documented to have dropped six to ten metres over the last 20 years.

2.2.4 Water Quality

The water quality is determined by the time period in which it has spent in contact with the aquifer material, the type of aquifer, distance from the sea and the distance from the recharge source. Deeper dolomite aquifers tend to yield harder alkaline waters and the shallower cretaceous aged sandstone produces fresh non-carbonate water with more acidic properties.

3. Site Hydrogeological Assessment

A field study was undertaken in January and June 2015. In January 2015 the complete site was traversed and assessment of drainage was undertaken in parallel with a topographic site survey.

Advices were sought from the NT Government and local drilling companies that had drilled stock, domestic and production bores in the vicinity. Anecdotal advices were obtained that suggested the Whites Formation would be found on the eastern most area of the property and it would abut sedimentary formations.

In June 2015 a test bore was drilled and the location of existing bores was established and past bore holes were inspected (see Figure 5). The bore registration number is NR039020.

This test bore was drilled at the same time as the soil survey. The soil survey is reported by EnviroAg Australia in the Soil Survey report in Appendix L of the Environmental Assessment.



Figure 5 Test Bore Location in Relation to Existing Bores.

3.1 Surface Soils Characteristics

The soil characteristics of the site are described in the report (23870.150703 Soil Assessment and Land Capability) in Appendix L of the Environmental Impact Assessment.

The soils in the upper areas of the “Livingstone Valley” are a classic “Darwin Lateritic Red Kandosol”. Kandosols have gravelly sandy to loamy surface soil, gradually changing to sandy clay or clay subsoils with massive to poorly developed structure, low fertility and (generally) poor water holding capacity (Australian Soil Classification 2016). The weak structure and laterite can lead to seasonal waterlogging and this has been extensively observed on site.

3.2 Groundwater Characterisation

A test borehole (1) was drilled using the following drilling method:

- Open hole Rotary Air Blast (RAB) drilling with a 300mm drill to a depth of 5.1m to establish a surface case to hold loose surface material;
- Open hole drilling with a 200mm drill to a depth of 72m; and
- RAB drilling with a 150mm drill, through a 152mm ID casing, to 112m.

The soil strata was sampled and logged at 0.5m intervals. The assessment of consistency and density was based on soil textural characteristics, the relative difficulty of penetration by the drill rig. The drilling method employed clearly identified the horizon from which samples were taken. The bore logs for the installation of the bore are provided in Appendix B.

3.3 Bore Installation

Table 4 summarises the bore construction properties of the deep aquifer bore installed for the supply of the ILEF facility. As shown, the bore installed extracts water from the 4th (deep) aquifer, and will therefore not lower of the water levels within the near surface aquifer.

Drilling was conducted by Bores NT according to *Minimum Construction Requirements for Water Bores in Australia* (LWBC 2003). Soil sampling and logging was performed at strata changes and is detailed in Table 3.

Table 3 Summary of Drilling Observations

Type	Depth (m)	Description
Natural	0 - 0.5	Topsoil
Natural	0.5 - 5	Laterite; weathered laterite (ferricrete) based materials
	5 - 19	Clays, silts and decomposed siltstones / claystones
Natural	19 - 28	Weathered brown siltstone
Natural	28 - 40	Firm brown siltstone
Natural	40 - 90	Firm multi-coloured shades, good fracturing
Natural	90 - 98	Soft grey dolomite (mineralised; fine grained)
Natural	98 - 114	Soft grey dolomite (course crystals)

Table 4 Bore Construction Summary

Aquifer Depth	Aquifer 1 (Sandstone / Siltstone) – 25-36m (sealed off) Aquifer 2 (Sandstone / Siltstone) – 45-53m Aquifer 3 (Siltstone) – 62-73m Aquifer 4 (Dolomite; fine graduating to course grained) – 98-114m
Total Bore Depth	114m below ground level 115m below top of casing
Head Works	158mm casing 1m above ground level
Standing Water Level	13m below top of casing
Screen Construction	4.8m slotted casing (158mm Dia) 67-71.2 6m 115mm slotted casing 6m 115mm s/s wire wound screen: 107.2-113.2m

3.4 Ground Water Model

Based on the desktop assessment, bore logs and onsite drilling a ground water model was developed. Figure 6 depicts a cross section of the Livingstone site illustrating the movement of groundwater and the interaction of the newly implemented bore with the aquifer with the deepest aquifer.

It is noted that transient downslope flow occurs in the A2-B2 horizons. Where there is a reduction in slope the soil water is forced to the surface. It is at this change in slope that surface waters start to accumulate. These two processes lead the waterlogged areas shown in the maps presented by Haig and Townsend (2003).

Below the site these waters generate a swamp. A proportion of this accumulated water filters down through the ferricrete and travels into Berry Creek and its springs via the surface aquifers.

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Conceptual Cross Section of Darwin Wellard Rural Site - Project 23919

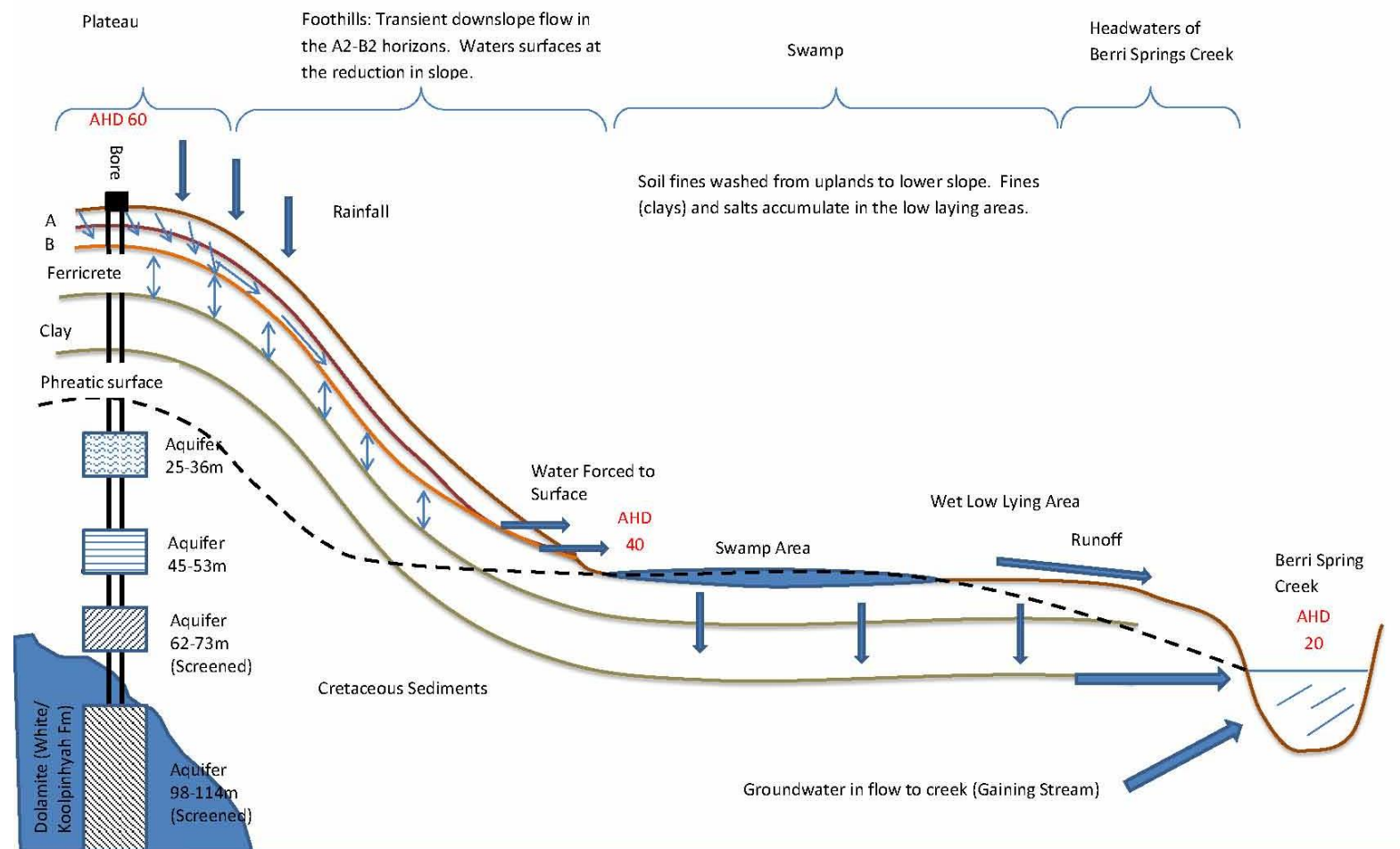


Figure 6 Conceptual Cross Section of the Hydrological Properties pertaining to the ILEF Darwin Site

4. Conclusions and Recommendations

The hydrogeological assessment of the site has confirmed that it has a stratigraphy aligned with the findings of Haig and Townsend (2003).

The site is underlain by a layer of ferricrete below which is found interbedded clay, silt and sandstones. The claystone is likely to be relatively impermeable and confine aquifers within this stratigraphic series. This aquifer is a relatively shallow aquifer and it is the source of much of the local stock and domestic supplies.

Below these materials more porous sandstones and dolomites are located.

The bore constructed on “Livingstone Valley” the Wellard ILEF site will extract water from the deeper sandstone and dolomite aquifers and as such will not impact on the near surface aquifers. It has been constructed so that the near surface aquifers are excluded from the screen zone and pump take.

The following recommendations apply:

- The holding and storage ponds will need to be lined to prevent groundwater inflows and/or be built above ground.
- The pond lining will need to be “reinforced” to ensure that the lining is not ‘pushed out’ by the subsurface flow. To reduce the risk of structural failure of pond walls and flooring a rock armouring will be implemented to improve stability during periods of heightened transient groundwater flow.
- Shallow near surface ground waters at the “toe” and bottom of the slope can adversely affect the construction of infrastructure in the wet season or immediately thereafter if not correctly managed. Controls must be implemented into the design at an early stage.
- A piezometer should be placed above and below the site to monitor shallow groundwater depth and quality.
- Monitoring of the water levels and extraction from the deep water should be undertaken.

5. References

Australian Soil Classification (2016), accessed 01/02/2016.

Australian Standard 1289 -1997 (Methods for testing soils for engineering purposes).

Australian Standard 1726 - 1993 (Geotechnical Site Investigations).

Casagrande, A. (1948). Classification and identification of soils. *Transactions of the American Society of Civil Engineers*, 113(1), 901-930.

Department of Land and Resource Management (DLRM) (2015). NT NR Maps. Northern Territory Government. Available from <http://www.lrm.nt.gov.au/spatial-lrm/nrmapsnt> (Accessed 10.08.2015).

Haig, T., & Townsend, S. (2003). An understanding of the groundwater and surface water hydrology of the Darwin Harbour Plan of Management area. *Proceedings: Darwin Harbour Region: current knowledge and future needs*, 122-149.

6. Appendices

Appendix A.	Records of Bores in the Vicinity of the Site	A-1
Appendix B.	Bore Completion Report	B-1

Appendix A. Records of Bores in the Vicinity of the Site

RECEIVED

06 AUG 2002

D.I.P.E. - N.R.D.

NORTHERN TERRITORY OF AUSTRALIA

Water Act

STATEMENT OF BORE

Pursuant to Section 53 of the Water Act

SANTAVAN FARMS PTY LTD

ENTER
5/9/02

14/D 0606

NAME OF OWNER : SANTAVAN

NAME OF BORE : ID S/WAYS

INTENDED USE :

LOCATION : SEC 4048 STUART H/WAY

REGISTRATION No : 33514

INDEX/MAP No : 80/7190

ADVICE No :

PERMIT No :

From	To	Particulars of strata	Name of Contractor : N/A							
		Info. Supplied from Taylor Lindschau (Adrail)	Name of Driller : N/A							
			Date Commenced : N/A							
			Date Completed : N/A							
			Depth Drilled : Approx 43m (m)							
			Completion Depth : (m)							
			METHOD OF DRILLING							
			☐ Rot. ☐ Rev. Circ. ☐ Cable ☐ Others							
			HOLE DIAMETER							
			DRILLING FLUID							
			Type							
PARTICULARS OF CASING			PARTICULARS OF PERFORATIONS OR SCREEN STRINGS							
From	To	Diam (ID)	Type	From	To	Diam (ID)	Aperture	Type		
N/A		6"	STEEL							
Casing Suspended ☐ Yes ☐ No				TOP OF PACKER SET AT : (m)						
Method :				LENGTH OF PACKER : (m)						
Height of Casing above G.L. : (m)				METHOD OF PACKER CONNECTION :						
CEMENTING/GRAVEL PACKING			WATER BEARING BEDS							
From	To	Type	Depth (m) From To	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.
STRATA AND WATER SAMPLES										
☐ Have been ☐ Will be Left at :			Completion Yield : (L/s) Method : Duration : (hr)							
			Completion SWL (G.L.) : 2 (m) Depth of Lift : (m)							

as @ 6/8/02

LOCATION SKETCH OF BORE		RN33514		LOCATION DESCRIPTION OF BORE	
52 L ~~0723204~~ UTM ~~8596539~~ GDA94 52 725463 E 8595641 W		m / km ☐ E ☐ S ☐ SE ☐ NE ☒ W ☐ N ☐ SW ☐ NW OF: 725334 8595530 600m Railway alignment Chainage Approx. 068.000			
FINAL CONSTRUCTION STATUS. ☒ Capped ☐ Casing pulled ☐ Left for Observation ☐ Abandoned ☐ Equipped ☐ Backfilled ☐ Others ()					
ADDITIONAL INFORMATION OF INTEREST ABOUT BORE SANTAVAN OWNER Apparently pumped (used) this bore 20 years ago. Info supplied from T. Lindschau Signature of Licenced Driller Date 6/8/02					
FOR OFFICIAL USE ONLY					
HOW LOCATED : ☒ GPS ☐ TST ☐ SURVEY ☐ HAND PLOTTED ☐ OTHER ()					
ELEVATION OF BORE AHD : (m) From ☐ G.L ☐ TOC					
DESCRIPTION OF PROPERTY ☒ Rural ☐ Reserve ☐ VCL ☐ SPL ☐ Min ☐ E.L ☐ Pastoral ☐ Other Lease No : Portion No : Lot No : Sect. No : 4048 Hundred of : STRANGWAYS Town of :					
CLASS OF BORE ☐ TOWN ☒ DOM ☐ INV. ☐ AGR. ☐ MIN. ☐ PAS. ☐ OTHER					
USE OF BORE ☒ PROD. ☐ INV. ☐ IRR. ☐ OBS. ☐ MON. ☐ ROAD					
GRID REFERENCE ☒ AMG ☐ CLARKE Zone : 52 Scale : 1:10000					
EASTING 725334 AGD 66 725463 GDA94 8595691 NORTHING : 8595530		LATITUDE : LONGITUDE :		MAP NAME : HUMPTY DOO MAP NUMBER : 0606	
AWRC STREAM BASIN No : 0815 Major Geological Units (Name) :					
GEOPHYSICAL LOG RUN YES / NO Date : / / Depth : (m) ☐ Gamma ☐ SP ☐ Point Res. ☐ Caliper ☐ Camera ☐ Density ☐ Other () TEST PUMP : YES / NO					
Date Registered : / / Plotted on the map : YES NO 20/8/02 M.CHIN					
Officer : Signature :					
Remarks :					



RECEIVED

06 AUG 2002

D.I.P.E. - N.R.D.

NORTHERN TERRITORY OF AUSTRALIA

Water Act

STATEMENT OF BORE

Pursuant to Section 53 of the Water Act

SANTAVAN FARMS PTY LTD

NAME OF OWNER : SANTAVAN

NAME OF BORE :

INTENDED USE :

LOCATION : Sec 4048 STUART H/WAY

REGISTRATION No : 33514

INDEX/MAP No : 80/7190

ADVICE No :

PERMIT No :

From

To

Particulars of strata

Info. Supplied from Taylor Lindschau (Adrail)

Name of Contractor : N/A

Name of Driller : N/A

Date Commenced : N/A

Date Completed : N/A

Depth Drilled : Approx 43m (m)

Completion Depth : (m)

METHOD OF DRILLING

Rot.

Rev. Circ.

Cable

Others

HOLE DIAMETER

DRILLING FLUID

From

To

Diameter

Type

From

To

Diam (ID)

Type

From

To

Diam (ID)

Aperture

Type

Casing Suspended Yes No

Method :

Height of Casing above G.L : (m)

TOP OF PACKER SET AT : (m)

LENGTH OF PACKER : (m)

METHOD OF PACKER CONNECTION :

CEMENTING/GRAVEL PACKING

WATER BEARING BEDS

From

To

Type

Depth (m) From To

Yield (L/s)

SWL (m)

Duration (hr)

Quality

EC

pH

Bottle No.

STRATA AND WATER SAMPLES

Completion Yield : (L/s) Method : Duration : (hr)

Completion SWL (G.L) : 2 (m) Depth of Lift : (m)

LOCATION SKETCH OF BORE		RN33514		LOCATION DESCRIPTION OF BORE	
52 L ~~0723204~~ UTM ~~8596539~~ GDA94 52 725463 E 8595641 W		m / km ☐ E ☐ S ☐ SE ☐ NE ☒ W ☐ N ☐ SW ☐ NW OF: 725334 8595530 600m Railway alignment Chainage Approx. 068.000			
FINAL CONSTRUCTION STATUS. ☒ Capped ☐ Casing pulled ☐ Left for Observation ☐ Abandoned ☐ Equipped ☐ Backfilled ☐ Others ()					
ADDITIONAL INFORMATION OF INTEREST ABOUT BORE SANTAVAN OWNER Apparentely pumped (used) this bore 20 years ago. Info supplied from T. Lindschau Signature of Licenced Driller Date 6/8/02					
FOR OFFICIAL USE ONLY					
HOW LOCATED : ☒ GPS ☐ TST ☐ SURVEY ☐ HAND PLOTTED ☐ OTHER ()					
ELEVATION OF BORE AHD : (m) From ☐ G.L ☐ TOC					
DESCRIPTION OF PROPERTY ☒ Rural ☐ VCL ☐ Min ☐ Pastoral ☐ Reserve ☐ SPL ☐ E.L ☐ Other Lease No : Lot No : Hundred of : STRANGWAYS Portion No : Sect. No : 4048 Town of :					
CLASS OF BORE ☐ TOWN ☒ DOM ☐ INV. ☐ AGR. ☐ MIN. ☐ PAS. ☐ OTHER					
USE OF BORE ☒ PROD. ☐ INV. ☐ IRR. ☐ OBS. ☐ MON. ☐ ROAD					
GRID REFERENCE ☒ AMG ☐ CLARKE Zone : 52 Scale : 1:10000					
EASTING 725334 AGD 66 725463 GDA94 8595691 NORTHING : 8595530		LATITUDE : LONGITUDE :		MAP NAME : HUMPTY DOO MAP NUMBER : 0606	
AWRC STREAM BASIN No : 0815 Major Geological Units (Name) :					
GEOPHYSICAL LOG RUN YES / NO Date : / / Depth : (m) ☐ Gamma ☐ SP ☐ Camera ☐ Density ☐ Point Res. ☐ Caliper ☐ Other () TEST PUMP : YES / NO					
Date Registered : / / Plotted on the map : YES NO 20/8/02 M. CHIN					
Officer : Signature : .					
Remarks :					



RECEIVED

NORTHERN TERRITORY OF AUSTRALIA

Water Act

05 NOV 1998

STATEMENT OF BORE**D.L.P.E - W.R.D.**Pursuant to Section 53 of the Water Act
D. C. MOORE + W. D. CHIN

23P1716

4/2 0607

NAME OF OWNER : <i>W.D. CHIN</i>		REGISTRATION No : <i>31942</i>	
NAME OF BORE : <i>Nº1</i>		INDEX/MAP No : <i>80/6317</i>	
INTENDED USE : <i>AGRICULTURE LOT 52 RD S/WAY</i>		ADVICE No :	
LOCATION : <i>BRADLEY RD NEWMAN</i>		PERMIT No : <i>9398</i>	

From	To	BRADLEY RD LOT 52 Particulars of strata	Name of Contractor : <i>BYNDS DRILLING</i>	
0	3	<i>BROWN SANDS</i>	Name of Driller : <i>B. LINGARD P. BOTTING M. NICHOLLS</i>	
3	6	<i>" " & clay</i>	Date Commenced : <i>14/9/98</i>	
6	42	<i>WEATHERED BROWN CHALK</i>	Date Completed : <i>15/9/98</i>	
42	17	<i>BROWN + RED SAND</i>	Depth Drilled : <i>133</i> (m)	
17	120	<i>SOFT GRAY SAND</i>	Completion Depth : <i>133</i> (m)	
120	133	<i>GRAY SAND</i>	METHOD OF DRILLING	
			☒ Rot. ☐ Rev. Circ. ☐ Cable ☐ Others	
			HOLE DIAMETER DRILLING FLUID	
From	To	Diameter	Type	
0	6	325 mm	Air	
6	86	200 mm	Air FOAM	
86	133	150 mm	Air	

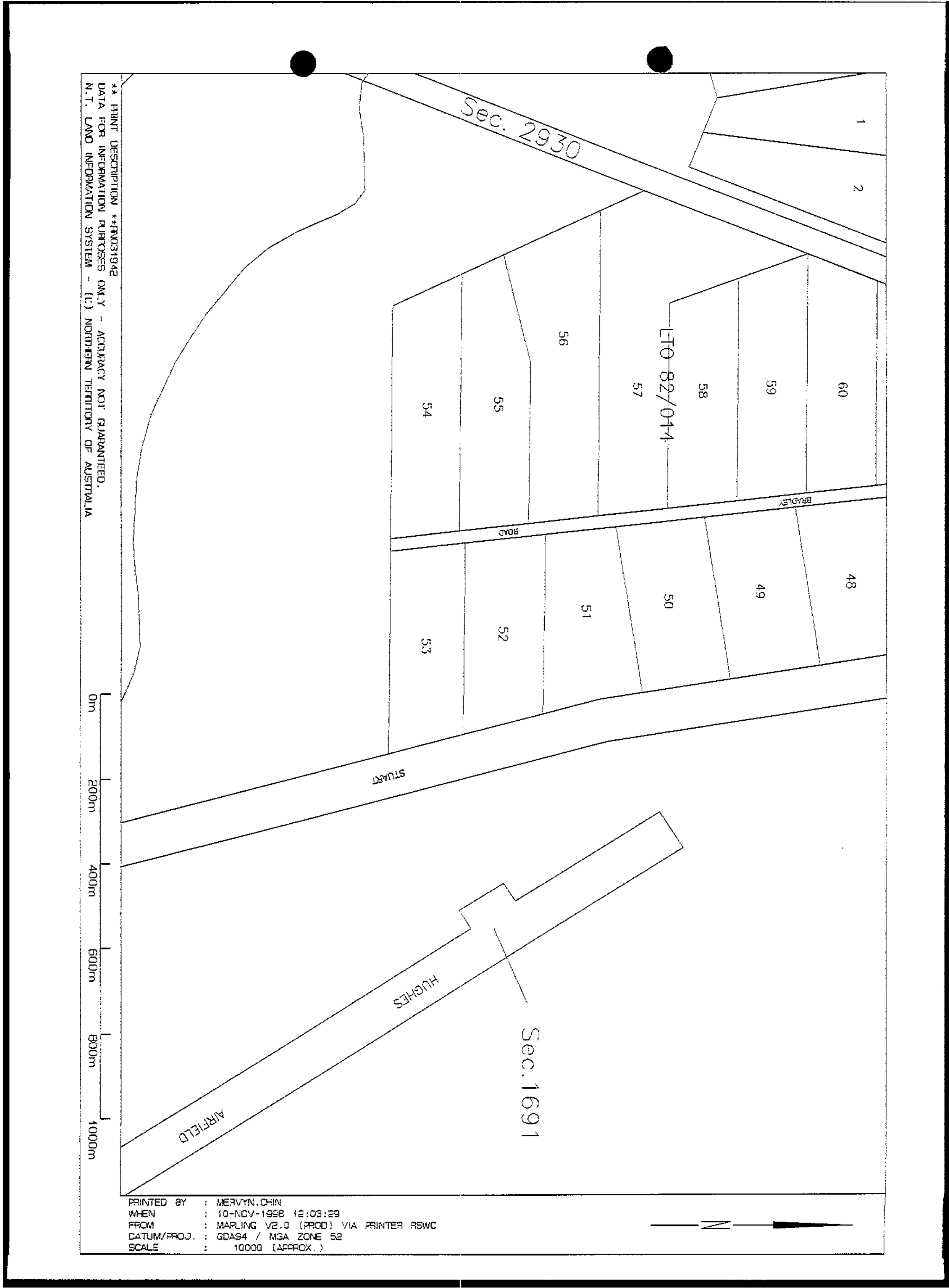
PARTICULARS OF CASING				PARTICULARS OF PERFORATIONS OR SCREEN STRINGS			
From	To	Diam (ID)	Type	From	To	Diam (ID)	Aperture Type
0	6	325 mm	PVC				
0	86	154 mm	STEEL	77.5	86	754 mm	0.75 slots

Casing Suspended ☐ Yes ☒ No		TOP OF PACKER SET AT : (m)	
Method :		LENGTH OF PACKER : (m)	
Height of Casing above G.L. : <i>0.7</i> (m)		METHOD OF PACKER CONNECTION :	

CEMENTING/GRAVEL PACKING			WATER BEARING BEDS							
From	To	Type	Depth (m) From To	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.
0	6	<i>CHALK</i>	48	20	<i>SUBSALD</i>					
		<i>SLURRY</i>	85	1.5						
50	86	<i>GRAVEL</i>	130	3.00						<i>WELL</i>

STRATA AND WATER SAMPLES		Completion Yield : <i>2.8</i> (L/s) Method : <i>Air</i> Duration : <i>1</i> (hr)	
☒ Have been ☐ Will be Left at <i>WR DETROT WINN</i>		Completion SWL (G.L.) : <i>17</i> (m) Depth of Lift : <i>70</i> (m)	

LOCATION SKETCH OF BORE		LOCATION DESCRIPTION OF BORE	
Sketch of bore location showing distance from road (e.g., 25m) and orientation.		m / km ☐ E ☐ S ☐ SE ☐ NE ☐ W ☐ N ☐ SW ☐ NW OF :	
FINAL CONSTRUCTION STATUS. ☒ Capped ☐ Casing pulled ☐ Left for Observation ☐ Abandoned ☐ Equipped ☐ Backfilled ☐ Others ()			
ADDITIONAL INFORMATION OF INTEREST ABOUT BORE			
Signature of Licenced Driller		Date	
FOR OFFICIAL USE ONLY			
HOW LOCATED : ☐ GPS ☐ TST ☐ SURVEY ☒ HAND PLOTTED ☐ OTHER ()			
ELEVATION OF BORE AHD : (m) From		☐ G.L ☐ TOC	
DESCRIPTION OF PROPERTY ☒ Rural ☐ VCL ☐ Min ☐ Pastoral ☐ Reserve ☐ SPL ☐ E.L ☐ Other Lease No : Lot No : 52 Hundred of : STRANGWAYS Portion No : Sect. No : 1697 Town of :			
CLASS OF BORE ☐ TOWN ☐ DOM ☐ INV. ☒ AGR. ☐ MIN. ☐ PAS. ☐ OTHER			
USE OF BORE ☒ PROD. ☐ INV. ☐ IRR. ☐ OBS. ☐ MON. ☐ ROAD			
GRID REFERENCE ☒ AMG ☐ CLARKE		Zone : 52 Scale : 1:10000	
EASTING : 725770	LATITUDE :	MAP NAME : HUMPTY DOO	
NORTHING : 8596600	LONGITUDE :	MAP NUMBER : 0607	
AWRC STREAM BASIN No : 0815		Major Geological Units (Name) :	
GEOPHYSICAL LOG RUN	YES / NO	Date : / /	Depth : (m)
☐ Gamma ☐ SP	☐ Camera	☐ Density	TEST PUMP : YES / NO
☐ Point Res. ☐ Caliper	☐ Other ()		
Date Registered : / /		Plotted on the map : (YES) NO 12/11/98 M.CHEN	
Officer :		Signature :	
Remarks :			



RECEIVED

NORTHERN TERRITORY OF AUSTRALIA

Water Act

05 NOV 1998

STATEMENT OF BORE**D.L.P.E - W.R.D.**Pursuant to Section 53 of the Water Act
D. C. MOORE + W. D. CHIN

ESP1716

4/2 0607

NAME OF OWNER :	WES CHIN	REGISTRATION No :	31942
NAME OF BORE :	Nº1	INDEX/MAP No :	89/6317
INTENDED USE :	AGRICULTURE LOT 52 RD S/WAY	ADVICE No :	
LOCATION :	BRADLEY RD NEOMAHAN	PERMIT No :	9398

From	To	BRADLEY RD LOT 52 RD S/WAY Particulars of strata	Name of Contractor :	BYNOS Drilling	
0	3	BROWN SEALS	Name of Driller	B. LINDSEY P. BOTTING M. NICHOLLS	
3	6	" " & clay	Date Commenced	: 14/9/98	
6	42	WEATHERED BROWN CHALK	Date Completed	: 15/9/98	
42	17	BROWN & RED SHALE	Depth Drilled	: 133 (m)	
17	120	SOFT GRAY SHALE	Completion Depth	: 133 (m)	
120	133	GRAY CHALK	METHOD OF DRILLING		
			☒ Rot. ☐ Rev. Circ. ☐ Cable ☐ Others		
			HOLE DIAMETER		DRILLING FLUID
From	To	Diameter	Type		
0	6	325 mm	Air		
6	86	200 mm	Air FOAM		
86	133	150 mm	Air		

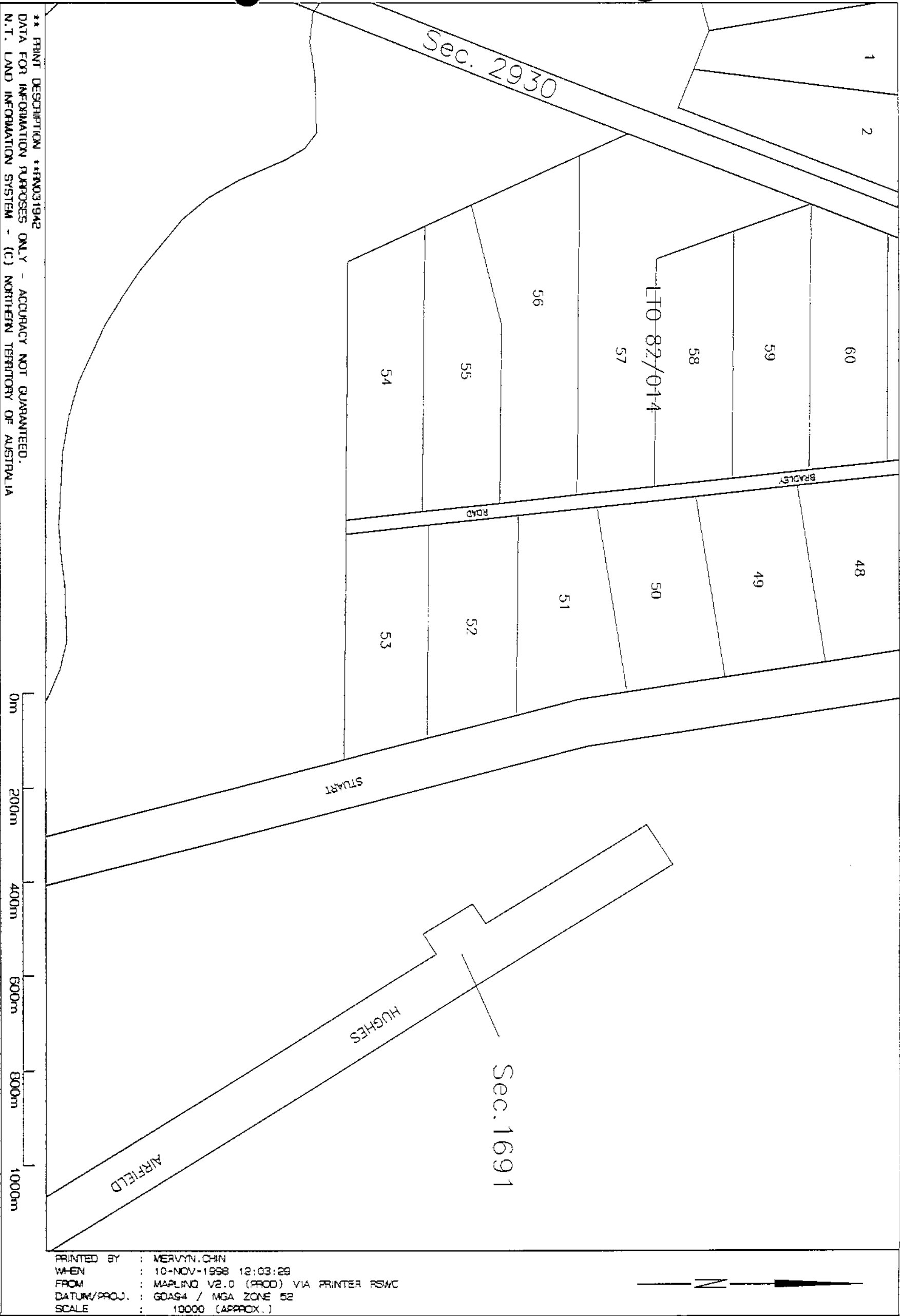
PARTICULARS OF CASING				PARTICULARS OF PERFORATIONS OR SCREEN STRINGS			
From	To	Diam (ID)	Type	From	To	Diam (ID)	Aperture
0	6	325 mm	PVC				
0	86	154 mm	STEEL	77.5	86	154 mm	0.75 slots

Casing Suspended	☐ Yes	☒ No	TOP OF PACKER SET AT :	(m)
Method :			LENGTH OF PACKER :	(m)
Height of Casing above G.L. :	0.7 (m)		METHOD OF PACKER CONNECTION :	

CEMENTING/GRAVEL PACKING			WATER BEARING BEDS								
From	To	Type	Depth (m) From	To	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.
0	6	CHALK	48	80	5.0						
		SLURRY	85		1.5						
50	86	GRAVEL	130		3.0						WCH

STRATA AND WATER SAMPLES											
☒ Have been	☐ Will be			Completion Yield : 2.8 (L/s)		Method : Air		Duration : 1 (hr)			
Left at : WR DOT WINN				Completion SWL (G.L.) : 17 (m)		Depth of Lift : 70				(m)	

24-207



McMINNS BORE SERVICES

BORE AND PUMP REPORT-

DATE- 30-8-05

RN- 31942

LOT 52 LTO 82014 1HD STRANGWAYS

OWNER/ADDRESS- S. DOLDISON

CASING SIZE/S- 6" to 86m

S.W.L - 7m

BORE DEPTH- 133m

TAPE READING- 100+

SCREEN/SLOTS AT- 73.5 to 86m

BORE CLEANED TO- -

AIRLIFTING FLOW RATE- 2.5 - 3 l/s APPROX

AIRLIFTING WATER QUALITY- GOOD

SAMPLES EXTRACTED- IRON, SCALE

BORE CONDITION COMMENTS-

BORE HAS MODERATE IRON FOULING, WATER
CLEANED UP QUICKLY.

PUMP MAKE/MODEL- CALPEDA 1450 8/19

MOTOR MAKE/KW- FRANKLIN 2.2kw
1Ø

SHUT HEAD PRESSURE- -

PUMP DEPTH SETTING- 72m

SCREEN CONDITION- (OLD PUMP 100% BLOCKED)

725899E

PUMP FLUSHING NEEDED- - (WORN SPLINE)

8596760W

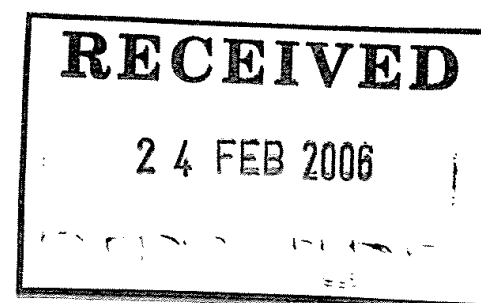
PUMPING RATE- 2 l/s OPEN

ZONE: 52

DRAWDOWN READING- -

PUMP/PUMPING RATE COMMENTS- OLD PUMP WAS COMPLETELY BLOCKED
WITH IRON, NEW WEEND INSTALLED, REGULAR PUMPING OVER
WET SEASON (WEEKLY) SHOULD REDUCE IRON FOULING.

McMINNS BORE SERVICES
P.O.BOX 3162 PALMERSTON NT 0831
Ph(08)89889748 fax (08)89889504
MOBILE-0427321417



NORTHERN TERRITORY OF AUSTRALIA										
Water Act										
STATEMENT OF BORE										
Pursuant to Section 53 of the Water Act										
NAME OF OWNER : <i>TIM Mc GURRUG</i>					REGISTRATION No : <i>31687</i>					
NAME OF BORE :					INDEX/MAP No :					
INTENDED USE : <i>AGRIC.</i>					ADVICE No : <i>29 AUG 1998</i>					
LOCATION : <i>BRADLEY RD NOONARAH</i>					PERMIT No : <i>9766</i>					
From	To	Particulars of strata			Name of Contractor : <i>BUNN DRILLING</i>					
104	121	GRY SHALE (Deepening of bore.)			Name of Driller : <i>E. WILSON P. RITCHIE</i>					
					Date Commenced : <i>13/7/98</i>					
					Date Completed : <i>14/7/98</i>					
					Depth Drilled : <i>121</i> (m)					
					Completion Depth : <i>121</i> (m)					
METHOD OF DRILLING										
☐ Rot. ☐ Rev. Circ. ☐ Cable ☐ Others										
HOLE DIAMETER					DRILLING FLUID					
From	To	Diameter			Type					
104	121	150 mm								
PARTICULARS OF CASING				PARTICULARS OF PERFORATIONS OR SCREEN STRINGS						
From	To	Diam (ID)	Type	From	To	Diam (ID)	Aperture	Type		
0	23.40		Good	N.I.	ADDS	6 m x 150 mm				
Casing Suspended ☐ Yes ☐ No				TOP OF PACKER SET AT : (m)						
Method :				LENGTH OF PACKER : (m)						
Height of Casing above G.L. : (m)				METHOD OF PACKER CONNECTION :						
CEMENTING/GRAVEL PACKING				WATER BEARING BEDS						
From	To	Type	Depth (m) From To	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.
N.I.			104	121						
STRATA AND WATER SAMPLES										
☒ Have been ☐ Will be				Completion Yield : <i>1.5</i> (L/s) Method : <i>AIN</i> Duration : <i>1/2</i> (hr)						
Set at : <i>W.R. DUTCH WILSON</i>				Completion SWL (G.L.) : <i>1/2</i> (m) Depth of Lift : <i>120</i> (m)						

 RESOURCE PROTECTION DIVISION WATER CHEMISTRY LABORATORY		G.P.O BOX 990 DARWIN N.T. 0801 HUDSON Fysh AVENUE DARWIN NT 0820 Telephone: (08) 8924 6413 Fax: (08) 8924 6410		Bottle No.: TMO2	Lab Register No.: 1021
		Date Received in Lab: 29.8.98	Time Sampled:	Date Sampled: 14.7.98	
R/N No.: 31687	Depth (m): 121	Q: 1.54/s	Map:	Sampler: G. UNSTED P. BOTTRELL M. NICHOLLS	
G.S. No.:	G.H. (m):	Q:	G.R.:		
Location: BRADLY RD NOONAMAH			Field Temp °C:	Field pH:	Field Cond µS/cm:
			RSP:	Project No.: TECHNICAL SERVICE	

ANALYSIS - PHYSICAL

☒ pH	[4500-H+B]	8-2	☐ Colour (Hazen units)	[2120B]	
☐ Electrical conductivity (microsiemens/cm at 25°C)	[2510B]	143	☐ Turbidity (NTU's)	[2130B]	
☐ Total dissolved solids (mg L ⁻¹ - dried at 180°C)	[2540C]	83	☐ Suspended solids (mg L ⁻¹)	[2540D]	

ANALYSIS - CHEMICAL (mg L⁻¹)

☐ Sodium, Na	[3111B]	12	☐ Chloride, Cl	[4500-Cl ⁻ B]	3
☐ Potassium, K	[3111B]	7	☐ Sulphate, SO ₄	[G]	1
☐ Calcium, Ca	[3111D]	9	☐ Nitrate, NO ₃	[4500-NO ₃ ⁻ B]	<1
☐ Magnesium, Mg	[3111B]	5	☐ Bicarbonate, HCO ₃	[2320B]	67
☒ Iron, (total) Fe	[3111B]	6.8	☐ Carbonate, CO ₃	[2320B]	15
☐ Total Hardness (as CaCO ₃) Calculation	[2340B]	43	☐ Hydroxide, OH	[2320B]	0
☐ Total Hardness (as CaCO ₃) Titration	[2340C]		☐ Fluoride, F	[4500-F ⁻ C]	0.1
☐ Total Alkalinity (as CaCO ₃)	[2320B]	80	☐ NaCl (calc. from chloride)		5
☐ Silica, SiO ₂	[4500-Si D]	30	☐ Dissolved Oxygen	[4500-O-C]	

ANALYSIS - ADDITIONAL (mg L⁻¹)

☐ Copper, Cu	[3111B]		☐ Manganese, Mn	[3111B]		☐ Zinc, Zn	[3111B]	
☐			☐			☐		

❖ U/S DENOTES UNSUITABLE FOR ANALYSIS

❖ I/S DENOTES INSUFFICIENT SAMPLE

❖ F DENOTES FILTRATE ANALYSIS

❖ T DENOTES TOTAL ANALYSIS

C1 46767 1020 8.9.98 | # 7

THIS REPORT HAS BEEN RE-ISSUED ON 28 SEPTEMBER 1998
 WITH AN AMENDED pH RESULT
 E. CZOBIK LABORATORY MANAGER

This report relates specifically to the "sample tested as received".

The test methods used (denoted within brackets) refer to the 1992 18th edition of "Standard Methods for the examination of Water and Wastewater", A.P.H.A. Except [G] which refers to the method of R. Goguel, Anal. Chem. 1969, 41, 1034.

DATE: 14 SEP 1998

CHECKED: 

SIGNATORY: 

Boxes marked thus indicate:

- ☐ Levels are within the limits as quoted in the "Guidelines for Drinking Water Quality in Australia", 1987 N.H. & M.R.C. and the A.W.R.C.
- ☒ Levels exceed non-health related limits.
- ☒ Levels exceed health related limits

RECEIVED

29 SEP 1998

DIPE.WRD

NORTHERN TERRITORY OF AUSTRALIA										
Water Act										
STATEMENT OF BORE					Pursuant to Section 53 of the Water Act					
NAME OF OWNER : <i>TIM Mc GUFFOG</i>					REGISTRATION No : <i>31687</i>					
NAME OF BORE :					INDEX/MAP No :					
ENDED USE : <i>AGRIC.</i>					ADVICE No : <i>29 AUG 1998</i>					
LOCATION : <i>BRADLEY RD NOONAMAH</i>					PERMIT No : <i>9700</i>					
From	To	Particulars of strata			Name of Contractor : <i>BYRON DRILLING</i>					
104	121	<i>GRY SHALE</i> <i>(deepening of bore)</i>			Name of Driller : <i>B. WATSON P. BOTTALL M. LICHFIELD</i>					
					Date Commenced : <i>13/7/91</i>					
					Date Completed : <i>14/7/91</i>					
					Depth Drilled : <i>121</i> (m)					
					Completion Depth : <i>121</i> (m)					
					METHOD OF DRILLING					
					☐ Rot. ☐ Rev. Circ. ☐ Cable ☐ Others					
					HOLE DIAMETER					DRILLING FLUID
From		To		Diameter		Type				
<i>104</i>		<i>121</i>		<i>150 mm</i>						
PARTICULARS OF CASING				PARTICULARS OF PERFORATIONS OR SCREEN STRINGS						
From	To	Diam (ID)	Type	From	To	Diam (ID)	Aperture	Type		
	<i>83.40</i>		<i>Good</i>				<i>1 1/2" - APPROX 6mm x 150mm</i>			
Casing Suspended ☐ Yes ☐ No				TOP OF PACKER SET AT : (m)						
Method :				LENGTH OF PACKER : (m)						
Height of Casing above G.L. : (m)				METHOD OF PACKER CONNECTION :						
CEMENTING/GRAVEL PACKING				WATER BEARING BEDS						
From	To	Type	Depth (m) From To	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.
<i>104</i>			<i>104</i>	<i>121</i>						<i>100</i>
STRATA AND WATER SAMPLES										
Have been ☐ Will be				Completion Yield : <i>1.5</i> (L/s) Method : <i>R/L</i> Duration : <i>1 1/2</i> (hr)						
at : <i>WR. OUTLET WIND</i>				Completion SWL (G.L.) : <i>12</i> (m) Depth of Lift : <i>10</i> (m)						

 RESOURCE PROTECTION DIVISION WATER CHEMISTRY LABORATORY		G.P.O BOX 990 DARWIN N.T. 0801 HUDSON Fysh AVENUE DARWIN NT 0820 Telephone: (08) 8924 6413 Fax: (08) 8924 6410		Bottle No. Tm02	Lab Register No.: 1021
		Date Received in Lab: 29.8.98	Time Sampled:	Date Sampled: 14.7.98	
R/N No.: 31687	Depth (m): 121	Q: 1.54/s	Map:	Sampler: G. UNSTED P. BOTTRELL M. NICHOLLS	
G.S. No.:	G.H. (m):	Q:	G.R.:		
Location: BRADLY RD NOONAMAH			Field Temp °C:	Field pH:	Field Cond µS/cm:
			RSP:	Project No.: TECHNICAL SERVICE	

ANALYSIS - PHYSICAL

☒ pH	[4500-H ⁺ B]	8.5	☐ Colour (Hazen units)	[2120B]	
☐ Electrical conductivity (microsiemens/cm at 25°C)	[2510B]	143	☐ Turbidity (NTU's)	[2130B]	
☐ Total dissolved solids (mg L ⁻¹ - dried at 180°C)	[2540C]	83	☐ Suspended solids (mg L ⁻¹)	[2540D]	

ANALYSIS - CHEMICAL (mg L⁻¹)

☐ Sodium, Na	[3111B]	12	☐ Chloride, Cl	[4500-Cl ⁻ B]	3
☐ Potassium, K	[3111B]	7	☐ Sulphate, SO ₄	[G]	1
☐ Calcium, Ca	[3111D]	9	☐ Nitrate, NO ₃	[4500-NO ₃ ⁻ B]	<1
☐ Magnesium, Mg	[3111B]	5	☐ Bicarbonate, HCO ₃	[2320B]	67
☒ Iron, (total) Fe	[3111B]	6.8	☐ Carbonate, CO ₃	[2320B]	15
☐ Total Hardness (as CaCO ₃) Calculation	[2340B]	43	☐ Hydroxide, OH	[2320B]	0
☐ Total Hardness (as CaCO ₃) Titration	[2340C]		☐ Fluoride, F	[4500-F ⁻ C]	0.1
☐ Total Alkalinity (as CaCO ₃)	[2320B]	80	☐ NaCl (calc. from chloride)		5
☐ Silica, SiO ₂	[4500-Si D]	30	☐ Dissolved Oxygen	[4500-O-C]	

ANALYSIS - ADDITIONAL (mg L⁻¹)

☐ Copper, Cu	[3111B]		☐ Manganese, Mn	[3111B]		☐ Zinc, Zn	[3111B]	
☐			☐			☐		

- ❖ U/S DENOTES UNSUITABLE FOR ANALYSIS
- ❖ I/S DENOTES INSUFFICIENT SAMPLE
- ❖ F DENOTES FILTRATE ANALYSIS
- ❖ T DENOTES TOTAL ANALYSIS
- Difficulty experienced with analysis.

This report relates specifically to the "sample tested as received".

The test methods used (denoted within brackets) refer to the 1992 18th edition of "Standard Methods for the examination of Water and Wastewater", A.P.H.A. Except [G] which refers to the method of R. Goguel, Anal. Chem. 1969, 41, 1034.

DATE: 14 SEP 1998

CHECKED: 

SIGNATORY: 

- Boxes marked thus indicate:
- ☐ Levels are within the limits as quoted in the "Guidelines for Drinking Water Quality in Australia", 1987 N.H. & M.R.C. and the A.W.R.C.
- ☒ Levels exceed non-health related limits.
- ☒ Levels exceed health related limits.

From		To	Particulars of strata	Name of Contractor						
0m		15m	BROWN FERRUGINOUS FINE GRAINED SILTY MUDSTONE, DRY & HIGHLY WEATHERED. GROUNDWATER INFLOW BETWEEN 12.3m - 15m. INTERVAL MADE UP OF WATER-WORN SILTSTONE PEBBLES IN VERY LOOSE FINE GRAINED BROWN SILTY SAND.	T. WYATT						
15m		20.4m	DARK BROWN SHALEY SILTSTONE, FINE GRAINED FERRUGINOUS MODERATELY WEATHERED. BECOMING HARDER FROM 15.1m.	SUPV. J. WHITE.						
20.4m		26.5m	BROWN SHALEY SILTSTONE, FINE GRAINED LESS FERRUGINOUS, SLIGHTLY WEATHERED HARDER ROCK.	Name of Driller : WHITE DRILLING PTY LTD DARWIN - NT.						
26.5m		34.8m	INTERMITTANT DARK BROWN - LIGHT GREY SHALEY SILTSTONE. VERY SILTY, DENSE.	Date Commenced : 29-7-96						
34.8m		40m	CARBONACEOUS DARK GREY - BLACK SHALE WITH OCCASIONAL THIN QUARTZ VEINING, LESS THAN 2mm THICK.	Date Completed : 31-7-96						
				Depth Drilled : 40 (m)						
				Completion Depth : 40 (m)						
METHOD OF DRILLING										
☒ Rot. ☐ Rev. Circ. ☐ Cable ☐ Others										
HOLE DIAMETER				DRILLING FLUID						
From	To	Diameter	Type							
0	5.5	250	AIR							
5.5	40	200	"							
PARTICULARS OF CASING										
From	To	Diam (ID)	Type							
0	5.5	204mm	P.V.C.							
5.5	40	156mm	STEEL							
PARTICULARS OF PERFORATIONS OR SCREEN STRINGS										
From	To	Diam (ID)	Aperture	Type						
26	40	156	1/8"	OXY						
Casing Suspended ☐ Yes ☒ No										
Method :										
Height of Casing above G.L. : 400 (m)										
TOP OF PACKER SET AT : N.A. (m)										
LENGTH OF PACKER : (m)										
METHOD OF PACKER CONNECTION :										
CEMENTING/GRAVEL PACKING			WATER BEARING BEDS							
From	To	Type	Depth (m) From To	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.
0	6	Cement	26	40	1.2	8	Good	-	-	
STRATA AND WATER SAMPLES										
☒ Have been ☒ Will be Left at :										
Completion Yield : 1.2 (L/s) Method : PUMP TEST Duration : 8 (hr) Completion SWL (G.L.) : (m) Depth of Lift : 35 (m)										

LOCATION SKETCH OF BORE S.01		LOCATION DESCRIPTION OF BORE	
Scale: 1:100,000		1:2 m/km ☐ E ☐ S ☐ SE ☐ NE ☐ W ☐ N ☐ SW ☒ NW OF: A WATER TANK LOCATED AT THE JUNCTION OF SANTAVAN STATION ACCESS LANEWAY AND THE N/S RAILWAY EASEMENT.	
FINAL CONSTRUCTION STATUS. ☒ Capped ☐ Casing pulled ☐ Left for Observation ☐ Abandoned ☐ Equipped ☐ Backfilled ☐ Others ()			
ADDITIONAL INFORMATION OF INTEREST ABOUT BORE			
Signature of Licenced Driller: <i>BA White</i>		Date: 8/8/96	
FOR OFFICIAL USE ONLY			
HOW LOCATED: ☒ GPS ☐ TST ☐ SURVEY ☒ HAND PLOTTED ☐ OTHER ()			
ELEVATION OF BORE AHD: (m) From ☐ GL ☐ TOC			
DESCRIPTION OF PROPERTY ☒ Rural ☐ VCL ☐ Min ☒ Pastoral ☐ Reserve ☐ SPL ☐ EL ☐ Other			
Lease No: Portion No:		Lot No: 46 Sect. No: Hundred of: STRANGWAYS Town of:	
CLASS OF BORE ☐ TOWN ☐ DOM ☒ INV. ☐ AGR. ☐ MIN. ☐ PAS. ☐ OTHER			
USE OF BORE ☐ PROD. ☒ INV. ☐ IRR. ☐ OBS. ☐ MON. ☐ ROAD			
GRID REFERENCE ☒ AMG ☐ CLARKE Zone: 52 Scale: 1:10000			
EASTING: ~~723600~~ <i>723600</i> (<i>+1-200m</i>)		LATITUDE: MAP NAME: <i>Middle Arm</i>	
NORTHING: ~~859639~~ <i>859639</i>		LONGITUDE: MAP NUMBER: 1007	
AWRC STREAM BASIN No: 815		Major Geological Units (Name): MUDSTONE SILTSTONE	
GEOPHYSICAL LOG RUN ☒ YES/NO Date: 7/7 Depth: (m)		TEST PUMP: YES/NO	
☐ Gamma ☐ SP ☐ Camera ☐ Density ☐ Point Res. ☐ Caliper ☐ Other ()		Plotted on the map: ☒ YES/NO 19/11/96	
Date Registered: / /		Signature: <i>DKB</i>	
Remarks:			

 POWER AND WATER AUTHORITY WATER RESOURCES WATER CHEMISTRY LABORATORY		G.P.O. BOX 1096, Darwin N.T. 0801 Telephone: (08) 8924 6413 Facsimile: (08) 8924 6410		Bottle No.: 30642	Lab Register No.: 2316
		Date Received in Lab: 26.11.96	Time Sampled:	Date Sampled: 31.7.96	
R/N No.: 30642	Depth (m): 40	Q:	Map:	Sampler: S. WHITE	
G.S. No.:	G.H. (m):	Q:	G.R.:		
Location: LOT 46 HUNDRED OF STRANGWAYS . BYNOE RD				Field Temp °C:	Field pH:
				RSP:	Project No.: 48102000006953

ANALYSIS - PHYSICAL

☐ pH [4500-H+B]	6.9	☐ Colour (Hazen units) [2120B]	
☐ Electrical conductivity (microsiemens/cm at 25°C) [2510B]	275	☐ Turbidity (NTU's) [2130B]	
☐ Total dissolved solids (mg L ⁻¹ - dried at 180° C) [2540C]	182	☐ Suspended solids (mg L ⁻¹) [2540D]	

ANALYSIS - CHEMICAL (mg L⁻¹)

☐ Sodium, Na [3111B]	4	☐ Chloride, Cl [4500-Cl ⁻ B]	4
☐ Potassium, K [3111B]	2	☐ Sulphate, SO ₄ [G]	4
☐ Calcium, Ca [3111D]	42	☐ Nitrate, NO ₃ [4500-NO ₃ ⁻ B]	<1
☐ Magnesium, Mg [3111B]	8	☐ Bicarbonate, HCO ₃ [2320B]	176
☒ Iron, (total) Fe [3111B]	0.7	☐ Carbonate, CO ₃ [2320B]	0
☐ Total Hardness (as CaCO ₃) Calculation [2340B]	138	☐ Hydroxide, OH [2320B]	0
☐ Total Hardness (as CaCO ₃) Titration [2340C]		☐ Fluoride, F [4500-F ⁻ C]	0.2
☐ Total Alkalinity (as CaCO ₃) [2320B]	144	☐ NaCl (calc. from chloride)	7
☐ Silica, SiO ₂ [4500-Si D]	14	☐ Dissolved Oxygen [4500-O-C]	

ANALYSIS - ADDITIONAL (mg L⁻¹)

☐ Copper, Cu [3111B]		☐ Manganese, Mn [3111B]		☐ Zinc, Zn [3111B]	
☐		☐		☐	

- ❖ U/S DENOTES UNSUITABLE FOR ANALYSIS C1 72821 1997-2309 # 8
 ❖ I/S DENOTES INSUFFICIENT SAMPLE
 ❖ F DENOTES FILTRATE ANALYSIS
 ❖ T DENOTES TOTAL ANALYSIS

This report relates specifically to the "sample tested as received".

The test methods used (denoted within brackets) refer to the 1992 18th edition of "Standard Methods for the examination of Water and Wastewater", A.P.H.A. Except [G] which refers to the method of R. Goguel, Anal. Chem. 1969, 41, 1034.

- Boxes marked thus indicate:
- ☐ Levels are within the limits as quoted in the "Guidelines for Drinking Water Quality in Australia". 1987 N.H. & M.R.C. and the A.W.R.C.
 - ☒ Levels exceed non-health related limits.
 - ☒ Levels exceed health related limits

DATE: **24 JAN 1997**

CHECKED: 

SIGNATORY: 

RECEIVED

17 FEB 1997

P.A.W.A. - W.R.D.

BORES NT

BORES NT PTY LTD

ABN: 75 109 951 117

THE NORTHERN TERRITORY OF AUSTRALIA

APPROVED FORM 21 (25/01/2011)

STATEMENT OF BORE

As per Water Regulations (2009)

PO BOX 1840 HUMPTY DOO NT 0836

Mobile 0411 63119 Fax (08) 8988 0038

...all: water

ENTER 29/8/12

Name of Owner: AACO				Registration No.: 37638			
Location/Address: 2660 Stuart Hwy				BC Permit No: BCPD 1490			
Intended Use: monitoring 5							
GPS Location:		Zone: 52L	GDA94 Other: ☒	Specify:	Easting: 725325	Northing: 8594028	

From	To	Particulars of Strata	Name of Drilling Company: Bored NT	
0	1	Sandy Topsoil	Name of Driller: B. Burrows	
1	3	Laterite	Name of supervising driller:	
3	30	Weathered siltstone with some Gravel	Date Commenced: 7-6-12	
30	36	Firm Grey sandstone	Date Completed: 7-6-12	
36	40	Firm Grey shale.	Depth Drilled: 40 (m)	
			Completion Depth: 40 (m)	

METHOD OF DRILLING				
Other ☐	Auger ☐	Rev. Circ. ☐	Rotary Air ☒	Rotary Mud ☐
Specify:				

HOLE DIAMETER			DRILLING FLUID	
From (m)	To (m)	Dia. (mm)	Type	
0	5.8	275	AIR	
5.8	40	200	AIR	

PARTICULARS OF CASING				PARTICULARS OF PERFORATIONS OR SCREEN STRINGS			
From	To	Dia (ID)	Type	From	To	Dia (ID)	Aperture
0.6	5.8	205	steel	16	40	157	2.5
0.6	40	157	steel				slotted steel

Casing Suspended: Yes ☐ No ☒	Top of Packer Set at: (m)
Method: seated	Length of Packer: (m)
Height of Casing above GL: 0.6 (m)	Method of Packer Connection:

CEMENTING/GRAVEL PACKING			WATER BEARING BEDS								
From	To	Type	Depth (m)	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.	
0	5.8	Cement	5	8	1				8.72	8.09	37638
15	40	Gravel	24	30	5						
14.5	15	Bentonite									
0	14.5	Natural									

STRATA / WATER SAMPLES		Completion Yield: 0.2 (L/s)	Method: Airlift	Duration: 1 (hr)
Have been ☐ Will be ☒	Completion SWL from GL: 1.4 (m)	Depth of Lift: 39.5 (m)		
Left at: W.R. Depot				

LOCATION SKETCH OF BORE RN: 0

LOCATION DESCRIPTION OF BORE

NW ☐	North ☐	NE ☐
West ☐		East ☐
SW ☐	South ☐	SE ☐

OF:

FINAL CONSTRUCTION STATUS

Capped ☒
 Casing Pulled ☐
 Left for Obs. ☐
 Abandoned ☐
 Equipped ☐
 Backfilled ☐
 Other ☐

ADDITIONAL INFORMATION ABOUT THE BORE: (Include any information which may assist for future reference)

Bore fitted with Lockable cover

Note: The holder of the NT licence shall submit the form to the Department within 28 days of completion of any works.

I certify that the information contained above is true and correct, and that I have complied with the bore licensing requirements and conditions of the Bore Construction Permit as issued if a Bore Construction Permit was required.

Bryce Burrows 104
Name and licence number of driller:

B. Burrows 104
Signature and licence number of licensed driller: Date: 7-6-12

FOR OFFICIAL USE ONLY

How Located: GPS ☒ TST ☐ Survey ☐ Hand Plotted ☐ Other ☐

DESCRIPTION OF PROPERTY:

Rural ☒ Mineral ☐ Pastoral ☐ Reserve ☐ VCL ☐ Other ☐

Lease No:

Portion No:

Lot No:

Section No: 5543

Hundred of: STRANGWAYS

Town of:

Class of Bore:

Town ☐Domestic ☐Investigation ☒Agriculture ☐Mineral ☐Pastoral ☐Other ☐

Use of Bore:

Production ☐Investigation ☐Irrigation ☐Observation ☐Monitoring ☒Roads ☐None ☐

Grid Reference:

AMG ☒Clark ☐

Zone: 52

Scale:

Easting: 725325

Northing: 8594028

Latitude:

Longitude:

Map Name:

Index Map Number: 80/9445

Date Registered:

Bore Plotted on the map?

Yes ☐No ☐

Dept Officer:

Signature:

Remarks:

NORTHERN AUSTRALIAN BEEF LTD

BORES NT

BORES NT PTY LTD ABN: 75 109 951 117

THE NORTHERN TERRITORY OF AUSTRALIA

APPROVED FORM 21 (25/01/2011)

PO BOX 1840 HUMPTY DOO NT 0836
Mobile 0411 631195 - Fax (08) 8988 8038

STATEMENT OF BORE

As per Water Regulations (2009)

ENTER 28/8/12

Name of Owner: <u>AACO.</u>				Registration No.: <u>37634</u>			
Location/Address: <u>2660 Stuart Hwy</u>				BC Permit No: <u>Bcp0 1490</u>			
Intended Use: <u>Monitoring</u>							
GPS Location: Zone: <u>SZL</u>		GDA94 Other: ☒		Specify: <u>724951</u>		Easting: <u>8595490</u>	
				Northing: <u>8595490</u>			

From	To	Particulars of Strata	Name of Drilling Company:
0	1	Sandy topsoil	<u>Bores NT</u>
1	3	Red clay	Name of Driller: <u>B. Burrows</u>
3	24	Weathered Brown Siltstone	Name of supervising driller:
24	37	Brown Siltstone	Date Commenced: <u>5-6-12</u>
37	40	Brown Shale.	Date Completed: <u>5-6-12</u>
40	47	Firm Grey shale.	Depth Drilled: <u>47</u> (m)
			Completion Depth: <u>47</u> (m)

METHOD OF DRILLING				
Other ☐	Auger ☐	Rev. Circ. ☐	Rotary Air ☒	Rotary Mud ☐
Specify:				

HOLE DIAMETER			DRILLING FLUID
From (m)	To (m)	Dia. (mm)	Type
0	5.8	275	<u>AIR</u>
5.8	47	200	<u>AIR.</u>

PARTICULARS OF CASING				PARTICULARS OF PERFORATIONS OR SCREEN STRINGS			
From	To	Dia (ID)	Type	From	To	Dia (ID)	Aperture
0.6	5.8	205	steel	23	47	157	2.5mm
0.6	47	157	steel				Slotted Steel

Casing Suspended: Yes ☐ No ☒	Top of Packer Set at: _____ (m)
Method: <u>Seated</u>	Length of Packer: _____ (m)
Height of Casing above GL: <u>0.6</u> (m)	Method of Packer Connection: _____

CEMENTING/GRAVEL PACKING			WATER BEARING BEDS							
From	To	Type	Depth (m)	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.
0	5.8	Cement	0.5	10	25			89.5	8.43	37634
22	47	Gravel	20	40	1					
21.5	22	Bentonite								
0	21.5	Natural Backfill								

STRATA / WATER SAMPLES		Completion Yield: <u>0.75</u> (L/s)	Method: <u>Air Lift</u>	Duration: <u>1</u> (hr)
Have been ☐ Will be ☒	Completion SWL from GL: <u>2.2</u> (m)			Depth of Lift: <u>46.5</u> (m)
Left at: <u>HR Depot DWN</u>				

LOCATION SKETCH OF BORE RN: 0	LOCATION DESCRIPTION OF BORE									
	m/km									
	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>NW ☐</td> <td>North ☐</td> <td>NE ☐</td> </tr> <tr> <td>West ☐</td> <td style="text-align: center;"></td> <td>East ☐</td> </tr> <tr> <td>SW ☐</td> <td>South ☐</td> <td>SE ☐</td> </tr> </table>	NW ☐	North ☐	NE ☐	West ☐		East ☐	SW ☐	South ☐	SE ☐
	NW ☐	North ☐	NE ☐							
	West ☐		East ☐							
	SW ☐	South ☐	SE ☐							
OF:										

FINAL CONSTRUCTION STATUS

Capped ☒
 Casing Pulled ☐
 Left for Obs. ☐
 Abandoned ☐
 Equipped ☐
 Backfilled ☐
 Other ☐

ADDITIONAL INFORMATION ABOUT THE BORE: (Include any information which may assist for future reference)

hole fitted with lockable cover.

Note: The holder of the NT licence shall submit the form to the Department within 28 days of completion of any works.

I certify that the information contained above is true and correct, and that I have complied with the bore licensing requirements and conditions of the Bore Construction Permit as issued if a Bore Construction Permit was required.

Bryce Burrows 104
Name and licence number of driller:

B. Burrows
Signature and licence number of licensed driller: Date: *5-6-12*

FOR OFFICIAL USE ONLY

How Located: GPS ☒ TST ☐ Survey ☐ Hand Plotted ☐ Other ☐

DESCRIPTION OF PROPERTY:

Rural ☒ Mineral ☐ Pastoral ☐ Reserve ☐ VCL ☐ Other ☐

Lease No: Lot No: Hundred of: *STRANGWAYS*
 Portion No: Section No: *5543* Town of:

Class of Bore: Town ☐ Domestic ☐ Investigation ☒ Agriculture ☐ Mineral ☐ Pastoral ☐ Other ☐
 Use of Bore: Production ☐ Investigation ☐ Irrigation ☐ Observation ☐ Monitoring ☒ Roads ☐ None ☐

Grid Reference: AMG ☒ Clark ☐ Zone: *52* Scale:
 Easting: *724951* Latitude: Map Name:
 Northing: *8595490* Longitude: Index Map Number: *80/9441*

Date Registered: Bore Plotted on the map? Yes ☐ No ☐

Dept Officer: Signature:

Remarks: *NORTHERN AUSTRALIAN BEEF LTD*

BORES NT PTY LTD

ABN: 75 109 951 117

THE NORTHERN TERRITORY OF AUSTRALIA

APPROVED FORM 21 (25/01/2011)

STATEMENT OF BORE

* As per Water Regulations (2009)

ENTER 29/8/12

FO BOX 1840 HUMPTY DOO NT 0836
Mobile 0411 631195 Fax (08) 8988 8038
...ail: westark

[illegible]

LOCATION SKETCH OF BORE RN: 0

LOCATION DESCRIPTION OF BORE

m/km		
NW ☐	North ☐	NE ☐
West ☐		East ☐
SW ☐	South ☐	SE ☐

OF:

FINAL CONSTRUCTION STATUS

Capped ☒
 Casing Pulled ☐
 Left for Obs. ☐
 Abandoned ☐
 Equipped ☐
 Backfilled ☐
 Other ☐

ADDITIONAL INFORMATION ABOUT THE BORE: (Include any information which may assist for future reference)

Bore fitted with lockable cover

Note: The holder of the NT licence shall submit the form to the Department within 28 days of completion of any works.

I certify that the information contained above is true and correct, and that I have complied with the bore licensing requirements and conditions of the Bore Construction Permit as issued if a Bore Construction Permit was required.

Bryce Burrows 104
Name and licence number of driller:

S. Burrows 104
Signature and licence number of licensed driller:

Date: 6-6-12

FOR OFFICIAL USE ONLY

How Located: GPS ☒ TST ☐ Survey ☐ Hand Plotted ☐ Other ☐

DESCRIPTION OF PROPERTY:

Rural ☒
 Mineral ☐
 Pastoral ☐
 Reserve ☐
 VCL ☐
 Other ☐

Lease No:

Lot No:

Hundred of: STRANGWAY

Portion No:

Section No: 5543

Town of:

Class of Bore:

Town ☐Domestic ☐Investigation ☒Agriculture ☐Mineral ☐Pastoral ☐Other ☐

Use of Bore:

Production ☐Investigation ☐Irrigation ☐Observation ☐Monitoring ☒Roads ☐None ☐

Grid Reference:

AMG ☒Clark ☐

Zone: 52

Scale:

Easting: 725612

Latitude:

Northing: 8594072

Longitude:

Index Map Number: 80/9443

Map Name:

Date Registered:

Dept Officer:

Bore Plotted on the map?

Yes ☐No ☐

Remarks:

NORTHERN AUSTRALIAN BEEF LTD

LOCATION SKETCH OF BORE RN: 0		LOCATION DESCRIPTION OF BORE				
m/km NW ☐ North ☐ NE ☐ West ☐ East ☐ SW ☐ South ☐ SE ☐ OF:						
FINAL CONSTRUCTION STATUS Capped ☒ Casing Pulled ☐ Left for Obs. ☐ Abandoned ☐ Equipped ☐ Backfilled ☐ Other ☐						
ADDITIONAL INFORMATION ABOUT THE BORE: <i>(Include any information which may assist for future reference)</i> Bore fitted with lockable cover.						
Note: The holder of the NT licence shall submit the form to the Department within 28 days of completion of any works. I certify that the information contained above is true and correct, and that I have complied with the bore licensing requirements and conditions of the Bore Construction Permit as issued if a Bore Construction Permit was required.						
Bryce Burrows 104 Name and licence number of driller:		B. Burrows 104 Signature and licence number of licensed driller: Date: 4-6-12				
FOR OFFICIAL USE ONLY						
How Located:		GPS ☒	TST ☐	Survey ☐	Hand Plotted ☐	Other ☐
DESCRIPTION OF PROPERTY: Rural ☒ Mineral ☐ Pastoral ☐ Reserve ☐ VCL ☐ Other ☐						
Lease No:		Lot No:		Hundred of: STRANGWAYS		
Portion No:		Section No: 5543		Town of:		
Class of Bore:		Town ☐	Domestic ☐	Investigation ☒	Agriculture ☐	Mineral ☐
Use of Bore:		Production ☐	Investigation ☐	Irrigation ☐	Observation ☐	Monitoring ☒
Grid Reference:		AMG ☒	Clark ☐	Zone: 52		Scale:
Easting: 726391		Latitude:		Map Name:		
Northing: 8594080		Longitude:		Index Map Number: 80/9439		
Date Registered:		Bore Plotted on the map?		Yes ☐ No ☐		
Dept Officer:		Signature:				
Remarks: NORTHERN AUSTRALIAN BEEF LTD						

BORES NT

BORES NT PTY LTD

ABN: 75 109 951 117

NORTHERN TERRITORY OF AUSTRALIA

Water Act

ENTER 12/10/11

PO BOX 1240 HUMPTY DOO NT 0836

Mobile 0411 631195 Fax (08) 8988 8038

E-mail: waterbores@bigpond.com.au

STATEMENT OF BORE

Pursuant to Section 53 of the Water Act

WILL ROB.

NAME OF OWNER : <u>LYRHEBB.</u> <u>ANNA MARGORZEWICZ</u>				REGISTRATION No : <u>37361</u>			
NAME OF BORE : <u>Nº1</u>				INDEX/MAP No : <u>80/9286</u>			
INTENDED USE : <u>DOMESTIC</u>				ADVICE No : <u></u>			
LOCATION <u>SEC 4814 TOWNEND RD. ACACIA HILLS</u>				PERMIT No <u>BCPD 1345</u>			

From	To	Particulars of strata	Name of Contractor : <u>BORES N.T.</u>			
<u>0</u>	<u>1</u>	<u>TOP SOIL</u>	Name of Driller : <u>D. CHARK.</u>			
<u>1</u>	<u>3</u>	<u>LATERITE</u>	Date Commenced : <u>11/07/11</u>			
<u>3</u>	<u>9</u>	<u>SANDY CHAYS.</u>	Date Completed : <u>12/07/11</u>			
<u>9</u>	<u>25</u>	<u>FIRM SANDSTONE</u>	Depth Drilled : <u>53</u> (m)			
<u>25</u>	<u>30</u>	<u>SHALE.</u>	Completion Depth : <u>53.</u> (m)			
<u>30</u>	<u>46</u>	<u>STICKY CHAYS.</u>	METHOD OF DRILLING ☒ Rot. ☐ Rev. Circ. ☐ Cable ☐ Others			
<u>46</u>	<u>47.5</u>	<u>SANDS.</u>				
<u>47.5</u>	<u>52</u>	<u>SANDS + GRAVELS IN CAVITY (LOSE CIRCULATION).</u>	HOLE DIAMETER		DRILLING FLUID	
<u>52</u>	<u>53.</u>	<u>HARD BAND.</u>	From	To	Diameter	Type
			<u>0</u>	<u>5.7</u>	<u>305mm</u>	<u>AIR.</u>
			<u>5.7</u>	<u>52</u>	<u>205mm</u>	<u>MUD.</u>
			<u>52</u>	<u>53</u>	<u>149.2</u>	<u>AIR.</u>

PARTICULARS OF CASING				PARTICULARS OF PERFORATIONS OR SCREEN STRINGS				
From	To	Diam (ID)	Type	From	To	Diam (ID)	Aperture	Type
<u>0.3</u>	<u>5.7</u>	<u>208.5</u>	<u>PVC</u>	<u>47</u>	<u>52</u>	<u>152.4</u>	<u>3mm</u>	<u>SLOTTED STEEL</u>
<u>0.7</u>	<u>52</u>	<u>152.4</u>	<u>STEEL</u>					
<u>52</u>	<u>53</u>	<u>149.2</u>	<u>OPEN.</u>					

Casing Suspended ☐ Yes ☒ No		TOP OF PACKER SET AT : (m)	
Method :		LENGTH OF PACKER : (m)	
Height of Casing above G.L. : <u>0.7</u> (m)		METHOD OF PACKER CONNECTION :	

CEMENTING/GRAVEL PACKING			WATER BEARING BEDS								
From	To	Type	Depth (m) From	To	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.
<u>0</u>	<u>5.7</u>	<u>CEMENT GROUT</u>	<u>47.5</u>	<u>52.</u>	<u>10</u>	<u>13</u>	<u>1</u>	<u>Good</u>	<u>333</u>	<u>7.29</u>	<u>37361</u>

STRATA AND WATER SAMPLES			Completion Yield : <u>10</u> (L/s) Method : <u>AIR</u> Duration : <u>2</u> (hr)		
☐ Have been ☒ Will be Left at : <u>DAN.</u>			Completion SWL (G.L.) : <u>13</u> (m) Depth of Lift : <u>46.</u> (m)		

LOCATION SKETCH OF BORE	LOCATION DESCRIPTION OF BORE
<u>TOWN END ROAD.</u> <u>GATE</u> *R.L. 37361 SEC. 4814	6 m / ~~100~~ ☐ E ☒ S ☐ SE ☐ NE ☐ W ☐ N ☐ SW ☐ NW OF: <u>NTH BOUNDARY.</u> <u>SOM WEST OF EAST</u> <u>BOUNDARY.</u> <u>526027386</u> <u>8594915</u>
FINAL CONSTRUCTION STATUS. ☒ Capped ☐ Casing pulled ☐ Left for Observation ☐ Abandoned ☐ Equipped ☐ Backfilled ☐ Others ()	
ADDITIONAL INFORMATION OF INTEREST ABOUT BORE Signature of Licenced Driller <u>[Signature]</u> Date <u>12 / 07 / 11</u>	
FOR OFFICIAL USE ONLY	
HOW LOCATED : ☒ GPS ☐ TST ☐ SURVEY ☐ HAND PLOTTED ☐ OTHER ()	
ELEVATION OF BORE AHD : (m) From ☐ G.L. ☐ TOC	
DESCRIPTION OF PROPERTY Lease No : Lot No : Hundred of : <u>STRANGWAYS</u> Portion No : Sect. No : <u>4814</u> Town of : ☒ Rural ☐ VCL ☐ Min ☐ Pastoral ☐ Reserve ☐ SPL ☐ E.L. ☐ Other	
CLASS OF BORE ☐ TOWN ☒ DOM ☐ INV. ☐ AGR. ☐ MIN. ☐ PAS. ☐ OTHER	
USE OF BORE ☒ PROD. ☐ INV. ☐ IRR. ☐ OBS. ☐ MON. ☐ ROAD	
GRID REFERENCE ☒ AMG ☐ CLARKE Zone : <u>52</u> Scale : 1:	
EASTING : <u>727386</u> NORTHING : <u>8594915</u>	LATITUDE : MAP NAME : LONGITUDE : MAP NUMBER :
AWRC STREAM BASIN No : <u>0815</u> Major Geological Units (Name) :	
GEOPHYSICAL LOG RUN YES / NO Date : / / Depth : (m) ☐ Gamma ☐ SP ☐ Camera ☐ Density ☐ Point Res. ☐ Caliper ☐ Other () TEST PUMP : YES / NO	
Date Registered : / / Plotted on the map : YES / NO	
Officer : Signature : .	
Remarks : <u>L.B. HEBB + A.E. MALGORZEWICZ</u>	

Appendix B. Bore Completion Report

~ Commercial-in-Confidence ~

Bore Completion Report

Wellard Rural Integrated Live Export Facility (ILEF)

Report Number 23870.79126



Prepared for



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Signatures					

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Client

Company

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Wellard Rural Exports

1

EnviroAg Australia

1

This document provides information to address the intent of Project Number 23870 as agreed to by Wellard Rural Exports.

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1. Introduction

EnviroAg Australia Pty Ltd (EnviroAg) was engaged by Wellard Rural Pty Ltd (Wellard) to undertake works at the proposed Livingstone Integrated Live Export Facility (ILEF) site in Darwin. The works included;

- a) Undertake the drilling of test bore hole to define the site hydrogeology; and,
- b) if possible, install a groundwater bore.

The purpose of this test bore was to;

- (a) define the geology at the site; and,
- (b) if possible, develop a water supply sufficient for the ILEF operations.

The focus of attention for the business was to for Wellard Rural to secure an environmentally and economically viable groundwater supply from a deeper aquifer other than the shallower unregulated sources used by neighbours.

1.1 Project Objectives

The objectives of this project were to:

- Find groundwater below the shallow aquifers; and,
- Install one bore from which water would be extracted for stock and domestic purposes.

1.2 Scope of Works

The project scope of works included the following

- Obtain quotes from local contractors;
- Select the most cost-effective quote and engage contractor;
- Select optimal location for pilot hole;
- Oversee/supervise drilling works;
- Define site hydro-geology;
- Measure flow rates of groundwater from appropriate aquifer(s);
- Provide detailed bore logs illustrating the aquifers available for groundwater extraction; and,
- Drill and construct a “production” bore if possible.

1.3 Timeframe

The key milestones during this assessment are summarised in Table 1.

Table 1 Project Milestones

Date	Activity / Milestone
April/May 2015	Supervision of drilling, logging bore, pump tests, logistics, travel, and cost control
May 2015	Deliver bore completion report

2. Site Description

2.1 Site details

Site details are presented in Table 2 below.

Table 2 Site details

Site Name	Wellard Rural Integrated Live Export Facility (ILEF)
Site Address	Livingstone, NT 0822
Property Description	Lot 5544 Hundred of Strangways
County	Livingstone, Northern Territory
Current Land Use	Agriculture
Site Area	90.5ha

2.2 Maps and Plans

A location map showing the site in regards to Darwin and surrounding areas is provided in Figure 1. Additionally, the site layout is presented in Figure 2.

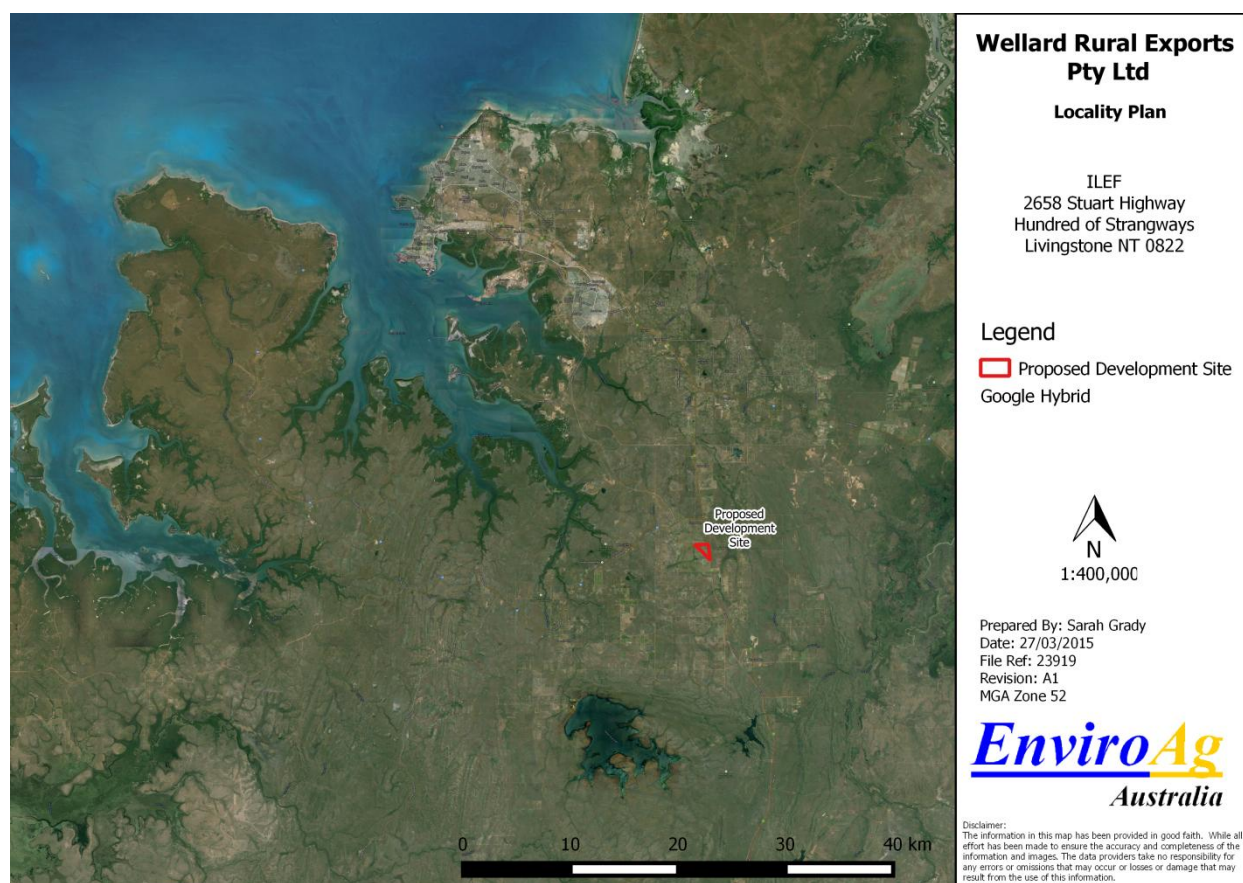


Figure 1 Location of Wellard Live Export Facility; Livingston Valley south-east of Darwin.

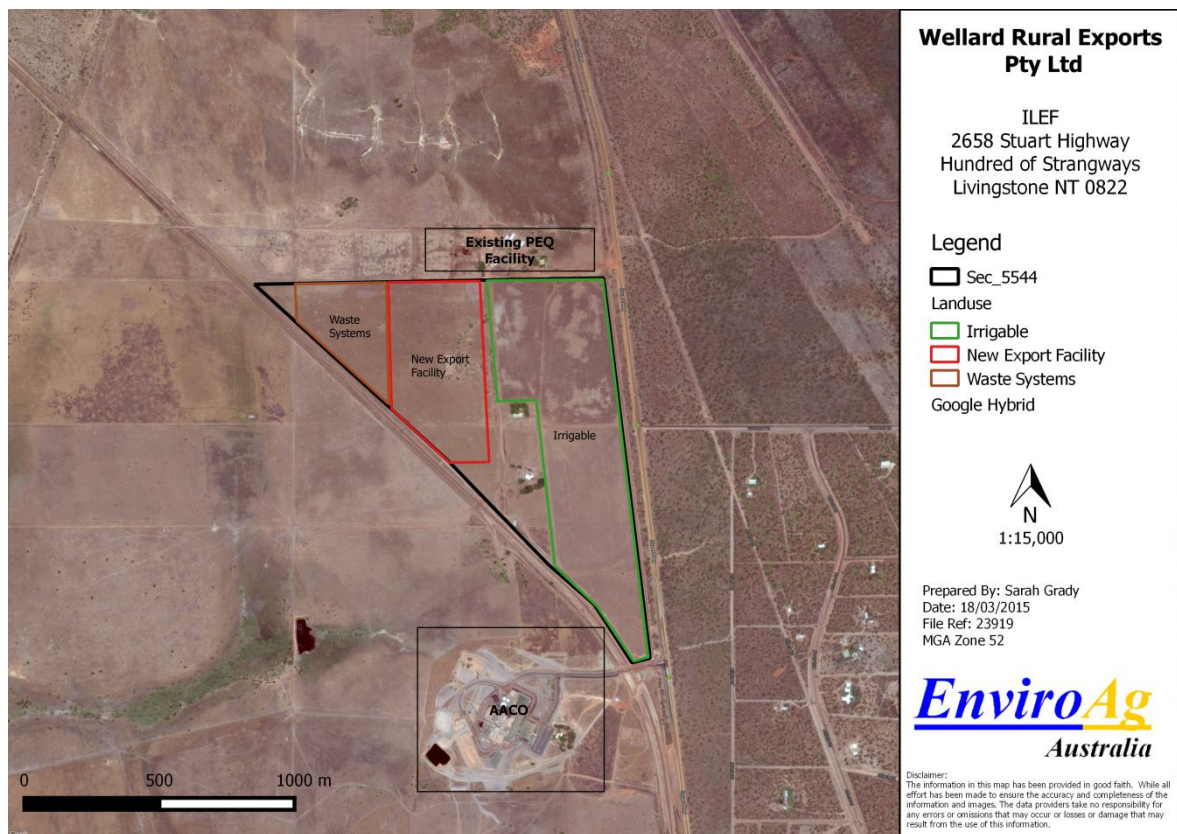


Figure 2 Site Layout Plan

3. Review of Site Geology

3.1 Overview of the Livingstone Valley ILEF Site

The site is relatively flat and has been completely cleared, ploughed and sown to improved pasture. The land is currently used for grazing stock. The site has a general East to West slope of about 2% and a cross fall of about 0.5%.

3.2 Site Geology

The geology of the region has been described by the Department of Infrastructure, Planning and Environment in “*An understanding of the groundwater and surface water hydrology of the Darwin Harbour Plan of Management area*” (Haig & Townsend, 2003).

The following provides a summary of the regional geology as described by Haig and Townsend (2003):

- The bedrock geology consists of dolomite, carbonate rocks, sandstone, shale, siltstone, schist, granite and metamorphic rocks. The highest yielding bedrock aquifers are the dolomites and carbonate rocks. Lesser yielding aquifers are found in the fractured sandstones and siltstone. Schist, granite and metamorphic rocks are low yielding aquifers.
- Most of the region is covered with 20 to 50 metres of more recent sandstone, siltstone and claystone. There is a 5 to 10 metre thick layer of laterite ie. a residual clayey layer mainly consisting of hydroxides of iron and aluminium formed under tropical climatic conditions by the weathering of igneous rocks, that forms a capping layer over most of the area.
- Recharge to the regional aquifers is a result of direct infiltration of rain through the surface deposits. The average annual rainfall in the region is 1,700 mm, as much as 200 mm is recharged to some of the more transmissive areas in the catchment.
- Approximately 50% of the catchment area has moderately to severely water logged soils. Following the periods of high rainfall and runoff, the wetlands that form during the wet season will gradually dry up as shallow groundwater drains. Some wetlands which are “perched” above clay layers persist through the dry season.
- Perennially flowing springs, which are fed from deeper dolomite aquifers, are found at Howard Springs and Berry Springs.
- Compared to undeveloped areas, the groundwater levels at the end of the dry season in the developed rural area have lowered 6 to 10 metres over the last 20 years.
- The additional lowering of water levels at the end of the dry season is due to water extraction associated with rural development.
- Following the cycle of natural drainage and extraction of groundwater, the aquifer system is fully recharged each wet season.

A review of local bore logs was undertaken. Two bores were located on the property. Both bores were drilled by the Australian Army. The bore logs for these bores are presented in Appendix B.

3.3 Groundwater

The majority of the existing registered bores in the locality were drilled and constructed between 1995 and 2009 for domestic and agricultural production purposes.

Soil drill logs were recorded for the majority of these bores in the immediate vicinity of the proposed development.

The majority of borehole/drill logs exhibited the following information:

- topsoil to 0.5 – 1.0 metre depth;
- sandy surface soil is underlain by sandy clay and clay layers to ~20 - 30 metres in;
- depth providing a barrier to the groundwater aquifer;
- deeper layers generally included yellow and grey clay, red and grey “shale”; and,
- siltstone with gravelly seams.

Most bores were drilled to depths ranging from 40 – 70 metres with standing water levels of 6 – 13 metres below ground level. Yields were mostly sufficient for domestic and production bores ranging between 0.5 – 5 litres/second. The main water bearing zones are recorded as being from approximately 27 – 95 metres in depth in the near surface aquifers; and most generally at a depth of 25 – 35m.

4. Drilling Methods

4.1 Drilling Approvals and Permits

Permits and approvals for the drilling works are provided in Appendix C.

The site was inspected by Mr Robin Lawrence of the Northern Territory Department of Land Resource Management on 6th May 2015 prior to the commencement of works.

4.2 Details

Drilling was conducted by Mr Bryce Burrows of Bores NT. Bryce is licensed to drill bores in the Northern Territory (Drillers License #104 expiry 08/11/2017)

Drilling was supervised by a Hydro-geologist and Licensed driller (National Class 2, NSW and SA Class Qld Class 1R) (Dr Simon Lott - License # 3365). Bore logs were recorded by Simon Lott and are attached in Appendix A.

Construction details of the bore are summarised in Table 3. A bore profile log, recorded at the time of drilling and installation, is provided in Appendix A. The location of the bore is detailed in Table 5.

Table 3 Groundwater monitoring well installation summary

Activity	Details
Drilling Contractor	Bores NT Pty Ltd
Drilling Contractor ABN	75 109 951 117
Drill Rig	Bourne Drill Rig with Kelly Drive
Bore Construction	Bore was installed in accordance with the <i>Minimum Construction Requirements for Waters Bores in Australia – 2nd Edition</i> (LWBC 2003);
Well Pack Type and Arrangement	Welded methodology. Top of packer is set at 67.8m. Cement and gravel packing 0-5.7m (cement grout).

4.3 Drilling Methods

The drilling method was:

- Open hole RAB drilling with 300mm drill to a depth of 5.1m to establish a surface case to hold loose surface materials.
- Open hole RAB drilling with a 200mm drill to a depth of 72m
- RAB drilling with a 150mm drill, through a 152mm ID casing, to 112m; and, subsequently

Mud drilling with a 150mm drill, through a 152mm ID casing, to 114m to clear the hole of collapsed materials and stabilise the hole

Pump testing was undertaken using the drill rig air lifting. Water flow rates were determined using a V-Notch weir.



Figure 3 Rotary Air Blast Drilling (Note 1m marks on drill stem for sampling)



Figure 4 RAB Drilling in operation with Water Strike

4.4 Stratigraphic Records

Soil sampling and logging was performed at strata change or 1 m intervals during the drilling process in surface materials to about 20m. Thereafter samples were collected at strata changes or 3m intervals in homogenous materials.



Figure 5 Chip sampling from drill stream



Figure 6 Strata laid out in a grid for assessment



Figure 7 Quality gravel was found at 98m extending to depth of 114m at end of hole

The stratigraphic logs are provided in Appendix B.

Based on the observations at the time of drilling, the geology and soil type at the site are summarised as described in Table 6 below. Appendix A contains the soil profile log recorded during well construction.

Table 4 Summary of Drilling Observations

Type	Depth (m)	Description
Natural	0 - 0.5	Topsoil
Natural	0.5 - 5	Laterite; weathered laterite based materials
	5-19	Clays, silts and decomposed siltstones
Natural	19 - 28	Weathered brown siltstone
Natural	28 - 40	Firm brown siltstone
Natural	40 - 90	Firm multi-coloured shades, good fracturing
Natural	90 - 98	Soft grey siltstone
Natural	98 - 114	Soft grey siltstone interbedded with quartz

4.5 Sampling and Analysis

No surface soil samples were sent for analysis as this did not form part of the project scope.

Dry samples were collected from cuttings when the open hole auguring was undertaken. The chip samples were then placed in piles on the ground to allow identification and description in the bore log records. No testing of the samples was undertaken.

No water samples were collected; therefore no samples were sent for analysis. Any water sample collection and testing did not form part of the project scope. The construction of the bore was in accordance with the Minimum Construction Requirements for Water Bores (3rd Edition) (2011).

A copy of the bore log can be found in Appendix A.

4.6 Bore Construction

A cement grout was placed around the surface casing to seal it off. The surface casing was 300mm IF PVC Class 9 pipe. See Figures 7 – 13 below.



Figure 8 Grout sealing of surface casing



Figure 9 Installation of 4.8m slotted casing (screen) placed to 71.2m



Figure 10 Welding 152mm ID Steel Casing String



Figure 11 Stainless Steel wire wound screen placed to 113m



Figure 12 Installation of Casing

Figure 12 shows a J Latch was installed on 4 1/2" Lower Casing to allow placement below 6" Casing. Top of casing slotted to ensure capture of water in aquifer at 72m and below



Figure 13 Water Flow Measurement



Figure 14 Concrete collar and slab with 152mm ID Casing extending above ground

4.7 Bore Completion Details

Details of the bore are described in Table 5 below:

Table 5 Bore Construction Summary

Name	Bore 1 (B1)
Placement	Easting: 726356.73 Northing: 8595471.26, Zone 52L
Aquifer Type	Multiple
Aquifer Depth	Aquifer 1 (Siltstone)– 25-36m (sealed off) Aquifer 2 (Siltstone) – 45-53m Aquifer 3 (Siltstone) – 62-73m Aquifer 4 (Quartz gravel) – 98-114m
Total Bore Depth	114m below ground level 115m below top of casing
Head Works	158mm casing 1m above ground level
Standing Water Level	13m below top of casing
Screen Construction	4.8m slotted casing (158mm Dia) 67-71.2 6m 115mm slotted casing 6m 115mm s/s wire wound screen: 107.2-113.2m

5. Conclusion

EnviroAg installed one (1) bore on the 6th – 9th May 2015 in order to identify groundwater resources below that of the shallow aquifers.

A bore (B1) was installed and yielded a maximum of 7L/s. Shallow groundwater was found at 25m below ground level (MBGL). The bore had a monument installed as was capped as per the construction details.

6. References

NUDLC (2012). *“Minimum Construction Requirements for Water Bores in Australia”*. Australian Government

T. Haig and S. Townsend (2003). *“An understanding of the groundwater and surface water hydrology of the Darwin Harbour Plan of Management area”*. Department of Infrastructure, Planning and Environment, PO Box 30, Palmerston NT 0831.

7. Appendices

Appendix A.	Bore Logs	A-1
Appendix B.	Historic Bore Logs	B-1
Appendix C.	Bore Construction Permit	C-1

Appendix A. Bore Logs

Form_06022_A										Bore Construction Log										EA Alliance									
Office Project No.: 23870										Borehole No: 1																			
Client: Wellard Rural										Sheet: 2 of 4																			
Project Manager: Simon Lott										Date started: 6/05/2015																			
Project: Wellard Rural Darwin Integrated Live Export Facility (ILEF)										Date completed: 6/05/2015																			
Bore Location: Livingstone Valley										Logged by: Simon Lott																			
										Checked by: Simon Lott / Nick Bainton																			
Easting: 131 degrees 05' 03"										R.L. at Surface:										Drilling Method: Rotary Air Blast / Mud									
Northing: 12 degrees, 41' 48"										Surface Drainage: 1° to West										Hole Size: 310mm surface / 200mm / 152mm									
Datum:										Current Land Use: Grazing / Hay Prodn																			
drilling information										material substance																			
method	penetration				support	water	notes, samples, tests, etc.	R.L.	depth (m)	graphic log	class. symbol	material - soil type: plasticity or particle characteristics, colour, secondary or minor components	moisture condition	consistency / density index	Plasticity	pocket penetrometer r (kPa)				Piezometer Construction									
	1	2	3	4												100	200	300	400	Annulus Pack		Casing		Water/development					
RAB								35			Siltstone - light brown - red																		
								36			Light tan, grey decomposed siltstone. V soft with some clay content																		
								37																					
								38																					
RAB								39			Red siltstone mix chips, steel grey inclusions																		
								40			Red & grey siltstone; "fresh"/ hard																		
								41																					
								42			Red - brown siltstone; grey - black inclusions																		
RAB								43																					
								44																					
								45			Tan siltstone, round pebble cobble quartz																		
								46																					
RAB								47																					
								48			Tan siltstone, grey inclusions																		
								49																					
								50																					
RAB								51			Red - tan variegated siltstone, green - grey inclusions																		
								52																					
								53																					
								54			White-grey siltstone with red and grey banding/inclusions																		
RAB								55																					
								56																					
								57			White-grey siltstone with red and grey banding/inclusions. Hard black rock in bands																		

[illegible]

Form_06022_A										Bore Construction Log										EA Alliance																			
Office Project No.: 23870										Borehole No: 1																													
Client: Wellard Rural										Sheet: 4 of 4																													
Project Manager: Simon Lott										Date started: 6/05/2015																													
Project: Wellard Rural Darwin Integrated Live Export Facility (ILEF)										Date completed: 6/05/2015																													
Bore Location: Livingstone Valley										Logged by: Simon Lott																													
										Checked by: Simon Lott / Nick Bainton																													
Easting: 131 degrees 05' 03"										R.L. at Surface:										Drilling Method: Rotary Air Blast / Mud																			
Northing: 12 degrees, 41' 48"										Surface Drainage: 1° to West										Hole Size: 310mm surface / 200mm / 152mm																			
Datum:										Current Land Use: Grazing / Hay Prodn																													
drilling information										material substance																													
method		penetration				support		water		notes, samples, tests, etc.		R.L.		depth (m)		graphic log		class. symbol		material - soil type: plasticity or particle characteristics, colour, secondary or minor components				moisture condition		consistency / density index		Plasticity		pocket penetrometer r (kPa)				Piezometer Construction					
		1 2 3 4																												Annulus Pack				Casing		Water/development			
RAB						M				S				105						Grey gravel 2-15mm angular																			
														106																									
														107																									
														108																									
														109																									
W						M				S				110																									
														111																									
														112																									
														113																									
														114																									
																				End of Hole																			

Appendix B. Historic Bore Logs



RN000030

N.T.A. WATER RESOURCES BRANCH

BORE DATA SHEET

NAME	Army Bore No. 71	INDEX No.	80/53
LOCALITY	Darwin Zone 4	REG. No.	30
DEPTH	260 feet 79.3m.	FILE No.	
CASINGS	49.1m 151m 76.2m 127m 161' of 6-inch, 250' of 5-inch	PERFORATIONS SCREENS	bottom 36' slotted (38.1 to 49.1m)
LOCATION	80 / 05 / 5.40 E4.15 N	SURFACE LEVEL R.L. 198.85	B.M. LEVEL R.L. DATUM
CONTRACTOR	2/1 ABS. RAE	DRILLER.	DATE STARTED 5/11/43 DATE FINISHED 10/11/43

WATER				STRATA SECTION			
AQUIFERS				DEPTH FEET	CASING	AQU.	SEC.
DEPTH STRUCK	29.3 96	33.5 110					
AQUIFER THICKNESS							
STANDING WATER LEVEL	21.3 70						
PUMP TEST G.P.H.	(1.4) 800	(1.14) 850					
DRAWDOWN LEVEL	36.6 120	10.1 35					
PUMP LEVEL							
DURATION HOURS OF TEST	24	8					
R.L. S.W.L.							
WATER TEMPERATURE °C							
TRANSMISSIBILITY							
STORAGE COEFF.							
ANALYSES							
BINOMIAL CLASSIFICATION							
T. D. S.							
CONDUCTIVITY							
TOTAL HARDNESS							
CHLORIDE							
BICARBONATE							
CARBONATE							
SULPHATE							
NITRATE							
FLUORIDE							
SODIUM							
POTASSIUM							
CALCIUM							
MAGNESIUM							
REG. ANAL. No.							
EQUIPMENT.	Pump Column in bore.						
REMARKS.	(See Bore No. 70 for Plan of site). This bore was deepened from 161' to 260' on 20/10/44.						

E N ZONE 52
726015-8595135 5B815
Humpty Dos 1:10000 Sheet 0506
OKR 24/2/94

BORE DATA SHEET

RESIDENT GEOLOGIST. N.T.

Darcina.....OFFICE.

4 MILE SHEET. Darcina..... 24

BORE No

D52/A-23
1 N° 53 R N° 30

BORE SITE

Name of Bore... Army 71

Class of Bore... Domestic..... Pastoral Lease.....

Sited by..... Date.....

Location : Run..... Photo..... Coords.....

Elevation: R.L.....

Situation..... Miles..... of 1 chain W. of main N.E. road.

.. at 3 1/2 m.p.

DRILLING RESULTS

Date drilled... 1953

Drilled by... ~~700'~~

Total Depth... 260' (79.26m)

Standing W. Level... 70' (21.34m)

Pump Level.....

WATER

Water struck at Supply (gph). Quality

1. (29.2-33.54m) 1. 800 (12/5) 1.

2. 177'-230' 2. 2. 2.

3. (60.06-70.12m) 3. 3. 3.

Present Supply.....gph. Date.....

Quality of Present Supply.....

GEOLOGY

DRILLERS LOG

Depth	Strata	Comments
0-28' 8.5	clay s. gravel	
28-95' 29.3	yellow clay	
95-110' 33.5	water bearing gravel	
110-149' 49.1	yellow clay	
149-260' 79.2	brown & yellow schist	
	with gl. s. frags.	

REMARKS



RN000079

N.T.A. WATER RESOURCES BRANCH

BORE DATA SHEET

NAME Army Bore No. 70		INDEX No. 80/61	
LOCALITY Darwin Zone 4		REG. No. 79	
DEPTH 210 m		FILE No.	
CASINGS 2 1/2" 209' 6"		PERFORATIONS Bottom slotted 36'	
LOCATION 80 / 05 / 5.40 E1.90 N		SURFACE R.L. 191.35	
CONTRACTOR 2/1 ABS RAE		DRILLER Sgt. Moskert	
DATE STARTED 18/10/43		DATE FINISHED 4/11/43	
WATER		STRATA SECTION	
AQUIFERS	DEPTH FEET	CASING	STRATA
DEPTH STRUCK 78	202		clay and gravel
AQUIFER THICKNESS			85.3
STANDING WATER LEVEL			
PUMP G.P.H. 720			yellow clay
DRAWDOWN LEVEL 190.9			23.8
PUMP LEVEL			kaolin with quartz
DURATION OF TEST HOURS 24			26.1
R.L. S.W.L.			yellow clay with quartz
WATER TEMPERATURE °C			32.3
TRANSMISSIBILITY			red slate
STORAGE COEFF			38.4
ANALYSES			slate and gravel seams
BINOMIAL CLASSIFICATION			40.2
T.D.S.			
CONDUCTIVITY			
TOTAL HARDNESS			
CHLORIDE			red slate
BICARBONATE			
CARBONATE			
SULPHATE			61.6
NITRATE			water bearing sand
FLUORIDE			64.0
SODIUM			
POTASSIUM			
CALCIUM			
MAGNESIUM			
REG. ANAL. No.			
EQUIPMENT.			
REMARKS.			

BORE DATA SHEET

RESIDENT GEOLOGIST. N.T.

Parua. OFFICE.

1 MILE SHEET Parua.

BORE No

D52/4-22
IN° 61 RN° 79

BORE SITE

Name of Bore... Army 70

Class of Bore... Domestic Pastoral Lease

Sited by... Date...

Location: Run... Photo... Coords...

Elevation: R.L.

Situation... Miles... of 2.0 yards West of main N.E.
road at 3 1/4 m.p.

DRILLING RESULTS

Date drilled... 1943

Drilled by...

Total Depth... 210' 54"

Standing W. Level... 60' 18.3"

Pump Level...

WATER

Water struck at Supply (gph) Quality

1... 78' 1... 72.0 (0.945)

2... 202' 2... 2...

3... 3... 3...

Present Supply... gph. Date...

Quality of Present Supply...

GEOLOGY

DRILLERS LOG

Depth	Strata	Comments
0-24'	clay f. gravel	
24'-78'	yellow clay	
78'-86'	redlin. w/ gtz. & ss	
86'-106'	yellow clay w/ gtz.	
106'-126'	red slate	
126'-132'	slate f. gravel & ss	
132'-202'	red slate	
202'-210'	water bearing sand	

REMARKS

Appendix C. Bore Construction Permit

DRILLER COPY

NORTHERN TERRITORY OF AUSTRALIA
APPROVED FORM 10(a) (13/7/12)
BORE CONSTRUCTION PERMIT
Pursuant to Section 57 of the Water Act
Permit No. BCPD01821

Water Sample required

No

Strata Samples required

No

Subject to full compliance with the terms and conditions set out below, permission is granted:

To: Suncode Pty Ltd – Atn Simon Lott
Of: PO Box 1061, Howard Springs, NT 0835
To undertake the following work: Drilling of up to Nine (9) attempts for the final construction of only Three (3) bores and any other work referred to in section 56(1) of the Water Act.

Located at:

Lot: N/A	Section No: 05544
Hundred of: Strangways	Portion No: N/A
Locality: Livingston	Road No: / Name: 2658 Stuart Highway

Such work must be completed within 12 months from the date of this Permit.

Terms and Conditions

1. All work will be undertaken in accordance with sound water bore drilling practices to the satisfaction of the Controller of Water Resources under "*Minimum Construction Requirements for Water Bores in Australia*" – Current Edition.
2. Work must be carried out by persons holding a recognised *Class 1 or above* NT Drilling Licence.
3. The following specific conditions will apply:
 - a) The permit holder must engage a driller licensed in accordance with Term 2 to undertake all work under this permit.
 - b) Notifications and queries should be directed to telephone number 89993647 during general business hours.
 - c) The completed bore must be at least 70m from any other completed bore in the vicinity and must also comply with the approved separation distance from the closest part of any onsite wastewater/effluent disposal area (100m for standard systems) required under the *Code of Practice for Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent*.
 - d) A surface hole must be drilled suitable for the installation of a surface collar to a minimum depth of 5m and with minimum annulus of 20mm and the surface collar must be cement grouted back to ground level.
 - e) If the hole is mud drilled or the standing groundwater level is less than 5m below ground level the cement grout must be tremmied down to prevent dilution.
 - f) The driller must give a minimum of 24 hours notification to telephone number 89993647 when ready for grouting.
 - g) The top of the bore casing must be at least 300mm above the top of the concrete block or the flood water level at the bore site - whichever is the higher. This distance may be reduced for pump installation if an effective waterproof seal is maintained at the top of the bore at all times to prevent contaminant entry.
 - h) A self-draining concrete block centred on the bore casing must be constructed at the surface with dimensions: 1m² area; 75mm above the final ground surface; and 25mm below final ground surface.
 - i) The completed bore must be sealed at top of casing by the driller to prevent contaminant entry at all times.
 - j) Each abandoned bore must be backfilled by the driller in accordance with "*Minimum Construction Requirements for Water Bores in Australia*" – Current Edition.
 - k) Each drilling attempt is to be identified by the driller with a unique Registration Number and described in a Statement of Bore and samples collected if required by this permit.
 - l) Before leaving the site the driller must ensure a unique Registration Number is clearly and permanently displayed on the completed bore.



Delegate of Controller of Water Resources

Date: 1 /05/ 2015

Note: Every application for a reissue of a Permit shall be made not later than one calendar month prior to the date of expiry of this Permit.

Drillers are reminded that within 28 days of completion or abandonment of work, all records and samples as set out in regulation 11 of the Water Regulations must be forwarded to the Controller and a copy of the records also provided to the owner of the land on which the work was conducted.