

DEPARTMENT OF **LAND RESOURCE MANAGEMENT**

Important Information about bores

(that you may not know to ask about)

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Senior Manager Water Assessment
Water Resources Division

www.lrm.nt.gov.au



The Rules of Play

- Licenced driller for all water bores in the NT
- Comply with ***Minimum Construction Guidelines-
for Water Bores in Australia***
- 3 licence classes – drilling knowledge to cope with specific conditions
- Required to lodge a **Final Statement of Bore**
 - ✓ Hydrogeologic knowledge built on bore information
 - ✓ Sharing of knowledge of bore construction, likelihood of success, water quality, yield and drilling conditions

Available On-line Information

edition
3

**MINIMUM CONSTRUCTION REQUIREMENTS
FOR WATER BORES IN AUSTRALIA**

February 2012

Northern Territory Government
DEPARTMENT OF
LAND RESOURCE MANAGEMENT

**WATER
RESOURCES
NORTHERN TERRITORY**

**Water Bore
Drilling Licences**
A how to for new, renewals and upgrades

Why Licence Water Bore Drillers?
Drillers play a vital role in the development, use and protection of the groundwater resource. They provide a service to clients and therefore have a responsibility to ensure that this role is fulfilled through high standards of work and use of materials. The NT applies licensing standards, that are consistent with other jurisdictions throughout Australia. This is the most appropriate way to determine the skills and knowledge required by drillers and to protect the resource.

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LAND RESOURCE MANAGEMENT

**WATER
RESOURCES
NORTHERN TERRITORY**

**Water Bore Drillers
Requirements & Responsibilities**

Requirements
All drilling activities shall be conducted in accordance with the Water Act and its Regulations. Drillers are required to:

1. Obtain a Registered Number (RN) from the Department. RN is a unique identification number and must be clearly and permanently displayed on the bore and included on the Statement of Bore form;
2. Sight the valid Bore Construction Permit if conducting any drilling work within a Water Control District;
3. Read, understand and implement all the conditions on the Bore Construction Permit;
4. Complete and submit the Statement of Bore to the department for every bore within 28 days of completion;
5. Submit required strata and water samples to the department for every bore drilled within 28 days of completion. Strata samples are to be approximately 250g secured in sealed bags of each change in strata observed in the bore. Representative water samples of 1 litre are to be taken from each water bearing bed found in the bore (unless an exemption is provided on the Bore Construction Permit).

Responsibilities
The Department encourages good industry practice relating to water bore drilling as stated in the *Minimum Construction Requirements for Water Bores in Australia*. The publication can be found at: www.aids.gov.au

Drillers have the following responsibilities:

- Adhere to all relevant Territory legislative requirements;
- Bore design shall: suit the hydrogeological conditions, be appropriate to protect the aquifer, be suitable for the intended purpose of the bore and meet the client's requirements;
- The bore shall be constructed by a suitably qualified driller who possesses the appropriate experience and the relevant class of licence and endorsement;
- A bore is sited to meet separation requirements and provide a reliable and useful water supply;
- Information should be sought about the hydrogeological conditions in the area before drilling;
- Water bores must be constructed a suitable distance from known possible sources of contamination, or designed and constructed to eliminate all sources of contamination;
- The driller shall ensure the location complies with any conditions specified in the bore permit;
- Formation samples shall be taken to determine the nature and type of strata, and to confirm any changes in the formation. Water samples should be taken to provide a guide to water quality encountered during drilling operations;

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**WATER
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**Bore Construction Permits
Frequently Asked Questions**

Is a Bore Construction Permit?
A Bore Construction Permit provides permission to drill, construct, alter, plug or decommission a bore, remove, replace or repair the casing lining or screen of a bore, deepen a bore,

How long does it take to process a permit application?
Approximately 2 weeks.

How much water will I need?
Careful planning is essential before embarking on costly construction and other commitments related to drilling a bore. Here are three preliminary planning steps for you to consider:

1. Determine the specific water use for your property - for example, water use may include a mix of domestic, home, garden, stock, crop irrigation etc.
2. Estimate the amount of water needed for each proposed use and when you need it most - for example, how much water will I need for the house? When will my crop require the most water?
3. Determine what options are available to provide the required supplies at the level and timing wanted, such as rainwater tanks, water storage tanks and pumping options.

As a general guide, household water use in the NT is 500 litres per person per day. The amount of water required for a garden will be unique to your property as garden designs and plant type vary. Your local irrigation specialist or pump supplier will be able to provide specific advice on your water requirements and the most efficient irrigation systems.

Do I need a Bore Construction Permit?
If you are located within a Water Control District, you will apply for a Bore Construction Permit. Water Control have been declared for the Alice Springs, Daly Roper, Rural, Cove Peninsula, Great Artesian Basin, Tennant Creek and Western Davenport regions. A map of the Water Control Districts can be found on the back page of this publication.

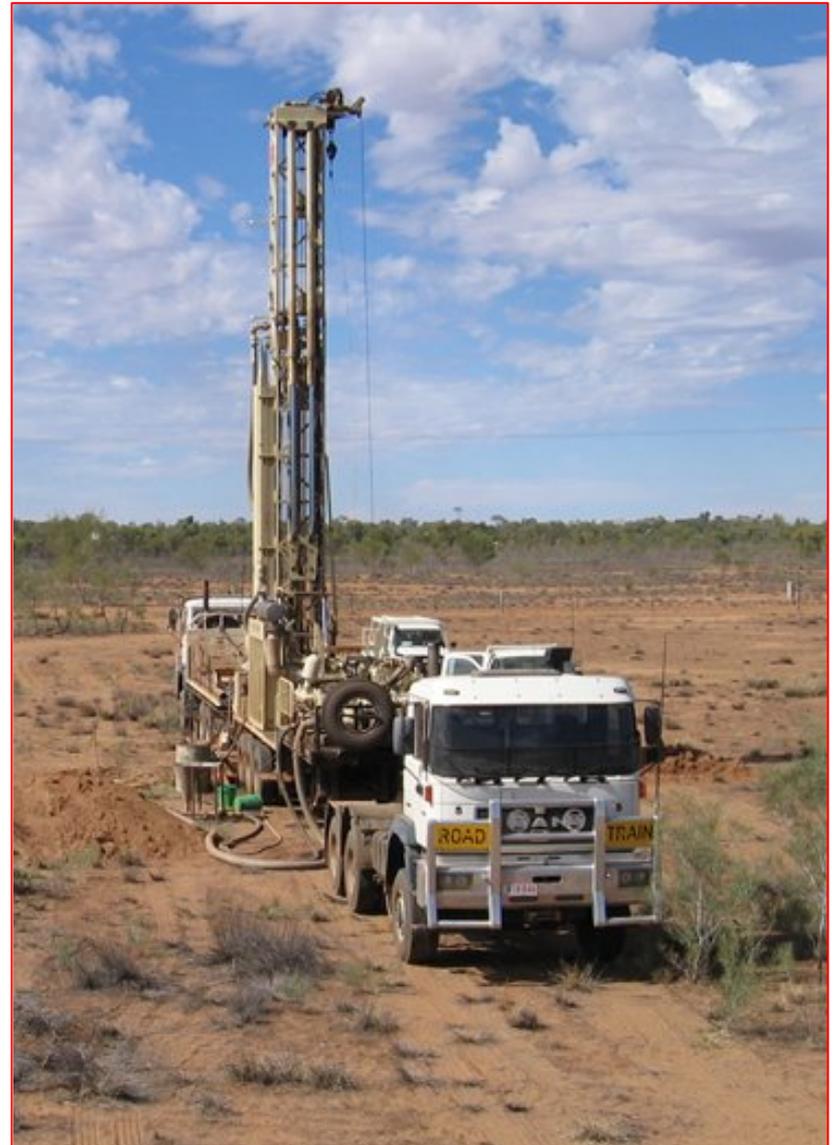
Do I need a Bore Construction Permit?
If you are the owner or legal occupier of the land on which a bore is to be constructed, you are responsible for obtaining a permit. Permit application forms are available on our website or at any of our offices.

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Some Drilling Terminology

- Drilling Fluid
- Airlift Yield
- Lost Circulation
- Screens and Slots
- Conductivity (of water)



DRILLING FLUID

















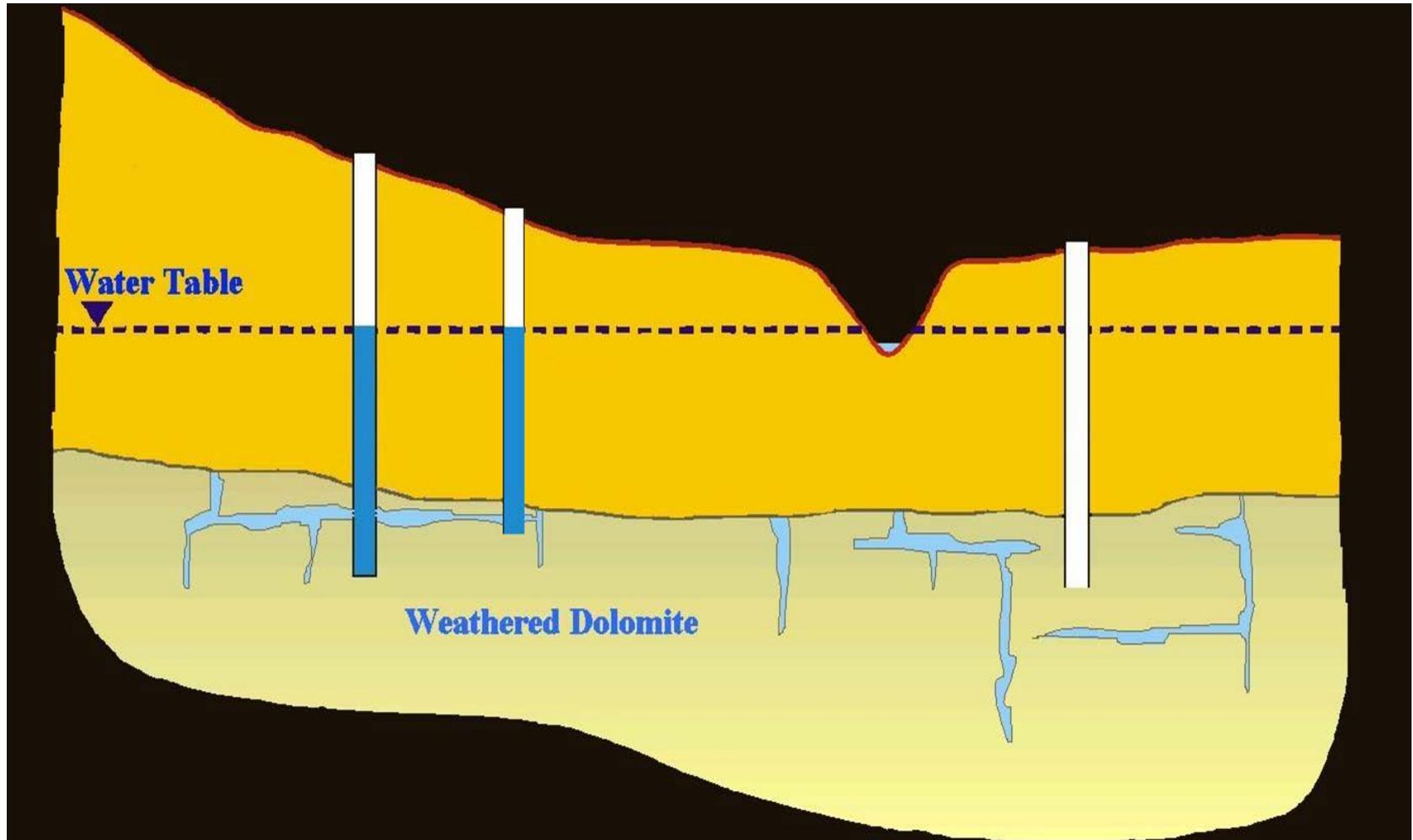
AIRLIFT YIELD







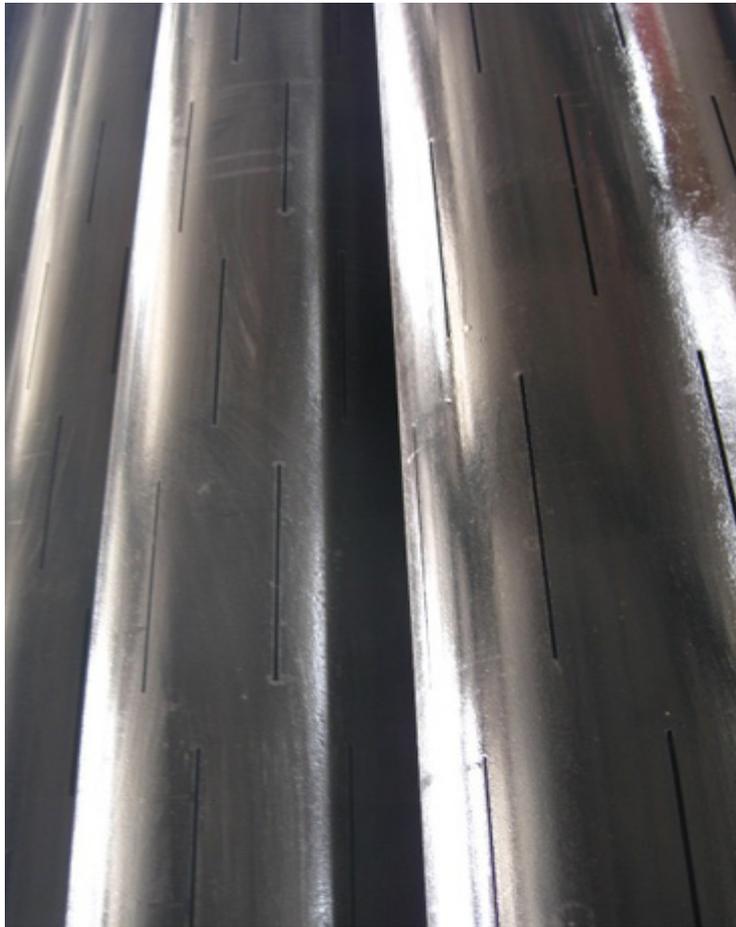
LOST CIRCULATION



SCREENS



and SLOTS



The Final Statement of Bore

- Facts

STATEMENT OF BORE

As per Water Regulations (2009)

Name of Owner: NT Government		Registration No.: 38195								
Location/Address: Section 6648 of Bagot		BC Permit No.: BCPD 1758								
Intended Use: Monitoring										
GPS Location: Zone: GDA94 Other: Specify: 52L <input type="checkbox"/> <input checked="" type="checkbox"/> WGS 84		Easting: 726447 Northing: 8615695								
From To Particulars of Strata		Name of Drilling Company: Water Resources								
0 0.5 Sandy top soil		Name of Driller: Jeff Stam								
0.5 5.4 Red sandy clay with some laterite		Name of supervising driller Dennis Low								
5.4 14 Multi colour sandy clay		Date Commenced: 31/03/2014								
14 22 White sandy clay		Date Completed: 7/04/2014								
22 25.5 sandstone		Depth Drilled: 63.50 (m)								
25.5 37 Quartz with some sandstone		Completion Depth: 63.0 (m)								
37 51.5 Broken quartz		METHOD OF DRILLING Other <input type="checkbox"/> Auger <input type="checkbox"/> Rev. Circ. <input type="checkbox"/> Rotary Air <input checked="" type="checkbox"/> Rotary Mud <input type="checkbox"/> Specify:								
51.5 56.5 Cavity										
56.5 63.5 Grey dolomite										
		HOLE DIAMETER From (m) To (m) Dia. (mm) Type								
		0 5.4 254 Air								
		5.4 48.3 200 Air/Foam								
		48.3 63.5 149 Air/Foam								
PARTICULARS OF CASING				PARTICULARS OF PERFORATIONS OR SCREEN STRINGS						
From	To	Dia (ID)	Type	From	To	Dia (ID)	Aperture	Type		
0	5.4 m	200 mm	Steel							
† 0.6	57 m	100 mm	PVC	57	63	100 mm	3 mm Slots	PVC		
Casing Suspended: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				Top of Packer Set at: N/A						
Method: Height of Casing above GL: 0.2 m x 200 mm steel casing				Length of Packer: N/A						
0.7 m x 156 mm steel casing (PVC CASING PROTECTOR)				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	5.4 m	Cement	4.5	22	Moisture					
50	63 m	Gravel	22	25.5	2	(Drilling)				
			37	63.5	10	(Drilling)				
						1	Good	190	7.2	RN38195
STRATA / WATER SAMPLES			Completion Yield: 5 (L/s)		Method: 7.04 (m)		Duration: 1 (hr)			
Have been <input checked="" type="checkbox"/> Will be <input type="checkbox"/>			Completion SWL from GL:		36 (m)		Depth of Lift:			
Tannadice Street Depot										

The Final Statement of Bore

- Facts
- Observations

THE NORTHERN TERRITORY OF AUSTRALIA
APPROVED FORM 21 (25/01/2011)
STATEMENT OF BORE
As per Water Regulations (2009)

REC 2/A/15
ENTER 4/9/15

Name of Owner: NT Government				Registration No.: 38819							
Location/Address: Barkly Stockroute				BC Permit No:							
Intended Use: Investigation											
GPS Location:		Zone: GDA94	Other: <input type="checkbox"/>	Specify: WGS84	Easting: 413408	Northing: 8004408					
From	To				Name of Drilling Company: Water Resources						
0	2.5	Grey soil clay			Name of Driller: S. Ellis - Under supervision						
2.5	5	White sandy clay			Name of supervising driller P. Pardon						
5	7	Hard limestone			Date Commenced: 8/07/2015						
7	36m	Soft lt brown&white sandstone			Date Completed: 22/07/2015						
36	42	Bands of lt brown sandstone&grey limestone			Depth Drilled: 200.67						
42	69.5	Brown&grey sandy mudstone			Completion Depth: 200.67m						
69.5	75	Lt brown&grey limestone			METHOD OF DRILLING						
75	78	Grey siltstone			Other <input type="checkbox"/>	Auger <input type="checkbox"/>	Rev. Circ. <input type="checkbox"/>				
78	156	Bands of brown&grey limestone&mudstone			Rotary Air <input checked="" type="checkbox"/>	Rotary Mud <input type="checkbox"/>					
156	163	Lt brown limestone			Specify: AIR FOAM						
163	194	Bands of lt brown limestone&Multi coloured mudstn			HOLE DIAMETER		DRILLING FLUID				
194	200.55	No returns			From (m)	To (m)	Dia. (mm)				
					0	5.7	254				
					5.7	200.67	203				
							Type				
							Air				
							Air/foam				
PARTICULARS OF CASING				PARTICULARS OF PERFORATIONS OR SCREEN STRINGS							
From	To	Dia (ID)	Type	From	To	Dia (ID)	Aperture				
0	5.7 m	208 mm	Steel								
0	120 m	156 mm	Steel								
Casing Suspended: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				Top of Packer Set at:							
Method: Cement plug&annulus ring				Length of Packer:							
Height of Casing above GL: 0.5 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	5.7 m	Cement	73	97	0.5		Fair	1369	7.5	1	
0	120 m	Cement	97	128	3		Fair	1386	8.91	2	
			128	139	7		Salty	2202	8.89	3	
			139	200.5	12		Salty	2236	8.81	4	
STRATA / WATER SAMPLES			Completion Yield: 15 (L/s)		Method: Air		Duration: 15min				
Have been <input checked="" type="checkbox"/> Will be <input type="checkbox"/>			Completion SWL from GL:		58.35		Depth of Lift: 200m				
Taken to Darwin Depot											

NOTE: No company advertising is to be imprinted on this certificate apart from where requested.

The Final Statement of Bore

- Facts
- Observations

Regulation 8 THE NORTHERN TERRITORY OF AUSTRALIA
Control of Waters Act

RN 13409 WR4/3
IN/16/1909

FINAL STATEMENT OF BORE

From	To	Description of Strata (including colour and hardness)	Name of Bore —
0	7m	RED SOIL CLAY & SAND	RN 13409 P22
7m	62m	YELLOW PINK SANDSTONE AND RED SILTSTONE	Name of Property — MEREENIE BORE FIELDS
62	148m	PINK WHITE SANDSTONE PINK & WHITE CLAY	Description of Property —
148	164m	PINK & BROWN SANDSTONE	Name of Owner — CROWN LAND
164	184m	BROWN & GREY SANDSTONE	Name of Contractor —
184	211m	GREY SANDSTONE	WATER INVESTIGATIONS UNIT
211	231m	GREY SANDSTONE - RED SILTSTONE	Name of Driller —
231	254	DARK GREY SANDSTONE GREY SILTSTONE	MARKS - DARBY - STALL
254	279	BROWN GREY SANDSTONE	Date of Commencement — 29-5-82
Location of Bore (or supply sketch on the back hereof) — 40 METRES			Date of Completion — 1-7-82
(a) S SE of (b) NORTH OF			Total Depth — 279.50 m 297.50 m
E NW BORE RN 11858			Particulars of Casing — 0 To 7.63m = 24" O.D. 2 0 To 168.97m = 14" O.D. LINE PIPE
W SW			Particulars of Perforations or Screens — SCREENS AND CASING AS PER ATTACHED PAPER
(a) Circle appropriate direction.			Water
(b) Use known point such as existing bore, homestead, outstation, etc.			1st Supply only
Additional information of interest about bore.			2nd Supply only
Grid Reference E381641 N7367234.9PS			3rd Supply only
Map Number SF 53-14			Struck at
Samples of Strata and Water Supplies have been* will be			171m 193m 211m
left at the following place — WATER INVESTIGATIONS UNIT SHEEPS SPRINGS			Standing Water Level
Signature corrected GPS to correct lat/long 23° 48.102' = 23° 48.191' 133° 50.289' = 133° 50.211' = E381508 N 7367071			SEE AT WATER LEVEL 59.6m
*Delete non applicable			Pumping Supply Litres/sec
For Office use only — BORE DRILLED WITH RIG 6. MUD DRILLED TO 164m THEN AIR DRILLED TO T.D. HOLE BACK FILLED WITH GRAVEL TO 227m. SCREENS AND CASING SAT ON TOP OF GRAVEL.			106/5 502/5
			Duration of Pump Test
			Water Level During Test
			Quality: Good, Fair or Bad
			GOOD.

22463.812 A. B. CAUGGILL, Government Printer of the Northern Territory

The Final Statement of Bore

- Facts
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- Interpretations

Regulation 8 THE NORTHERN TERRITORY OF AUSTRALIA
Control of Waters Act

WR4/3
I.N. 53/117
R.N. 25,853

From To Description of Strata (including colour and hardness) 0 - 3 GRAVEL & BLACKSOIL 3 - 65 LIMESTONE 65 - 116.5 LOST CIRCULATION	Name of Bore — R.N. 25853																														
	Name of Property — TABLELANDS HIGHWAY <i>V.C.L.</i>																														
	Description of Property — ROAD BORE <i>P.L. 861</i>																														
	Name of Owner — TENNANT CREEK TRANSPORT & WORKS																														
	Name of Contractor — GOREY & COLE DRILLERS																														
Name of Driller — S. RICHARDS																															
Location of Bore (or supply sketch on the back hereof) — km (a) S SE of (b) BOSTOK CREEK E NW W SW			Date of Commencement — 21.7.88																												
(a) Circle appropriate direction. (b) Use known point such as existing bore, homestead, outstation, etc.			Date of Completion — 25.7.88																												
Additional information of interest about bore. Grid Reference 571400-8097300 Map Number 1:100,000 SHEET 6063 'KILGOUR' Samples of Strata and Water Supplies have been* will be* at the following place — P.O. A. DARWIN N.T. <i>[Signature]</i> Signature Delete non applicable			Total Depth — 116.5 METRES																												
Particulars of interest about bore. <i>ZONE 53 S/B 907</i> Grid Reference 571400-8097300 Map Number 1:100,000 SHEET 6063 'KILGOUR' Samples of Strata and Water Supplies have been* will be* at the following place — P.O. A. DARWIN N.T. <i>[Signature]</i> Signature Delete non applicable			Particulars of Casing — 6.5 METRES OF 8" STEEL CASING 117 METRES OF 6" STEEL CASING																												
Particulars of Perforations or Screens — PERFS. BETWEEN 61m - 67m & 98m - 110m			<table border="1"> <thead> <tr> <th>Water</th> <th>1st Supply only</th> <th>2nd Supply only</th> <th>3rd Supply only</th> </tr> </thead> <tbody> <tr> <td>Struck at</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Standing Water Level</td> <td>55m</td> <td></td> <td></td> </tr> <tr> <td>Pumping Supply Litres/sec</td> <td>.5 L/S</td> <td>LOST CIRCULATION</td> <td></td> </tr> <tr> <td>Duration of Pump Test</td> <td>1 HOUR</td> <td></td> <td></td> </tr> <tr> <td>Water Level During Test</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Quality: Good, Fair or Bad</td> <td>GOOD</td> <td></td> <td></td> </tr> </tbody> </table>	Water	1st Supply only	2nd Supply only	3rd Supply only	Struck at				Standing Water Level	55m			Pumping Supply Litres/sec	.5 L/S	LOST CIRCULATION		Duration of Pump Test	1 HOUR			Water Level During Test				Quality: Good, Fair or Bad	GOOD		
Water	1st Supply only	2nd Supply only	3rd Supply only																												
Struck at																															
Standing Water Level	55m																														
Pumping Supply Litres/sec	.5 L/S	LOST CIRCULATION																													
Duration of Pump Test	1 HOUR																														
Water Level During Test																															
Quality: Good, Fair or Bad	GOOD																														
For Office use only — AFTER CASING - PUMPING 4.2 L/S AT 85 METRES. CONTINUOUS FOR 10 HOURS <i>Phattal s/11/88</i>			Pumping Supply Litres/sec .5 L/S Duration of Pump Test 1 HOUR Water Level During Test Quality: Good, Fair or Bad GOOD																												

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Bore Construction Principles

- Screen adjacent to the aquifer
 - Poor hydraulic performance (inefficient)
 - May affect water quality (turbidity)
- Use appropriate aperture size
 - Poor hydraulic performance
 - Affects pump sizing
 - Affects yield
- Seal off all except target aquifer
 - Changes hydraulic performance
 - May affect water quality
 - May affect pump installation

Screens

- Screen placement
- Aperture size



THE NORTHERN TERRITORY OF AUSTRALIA

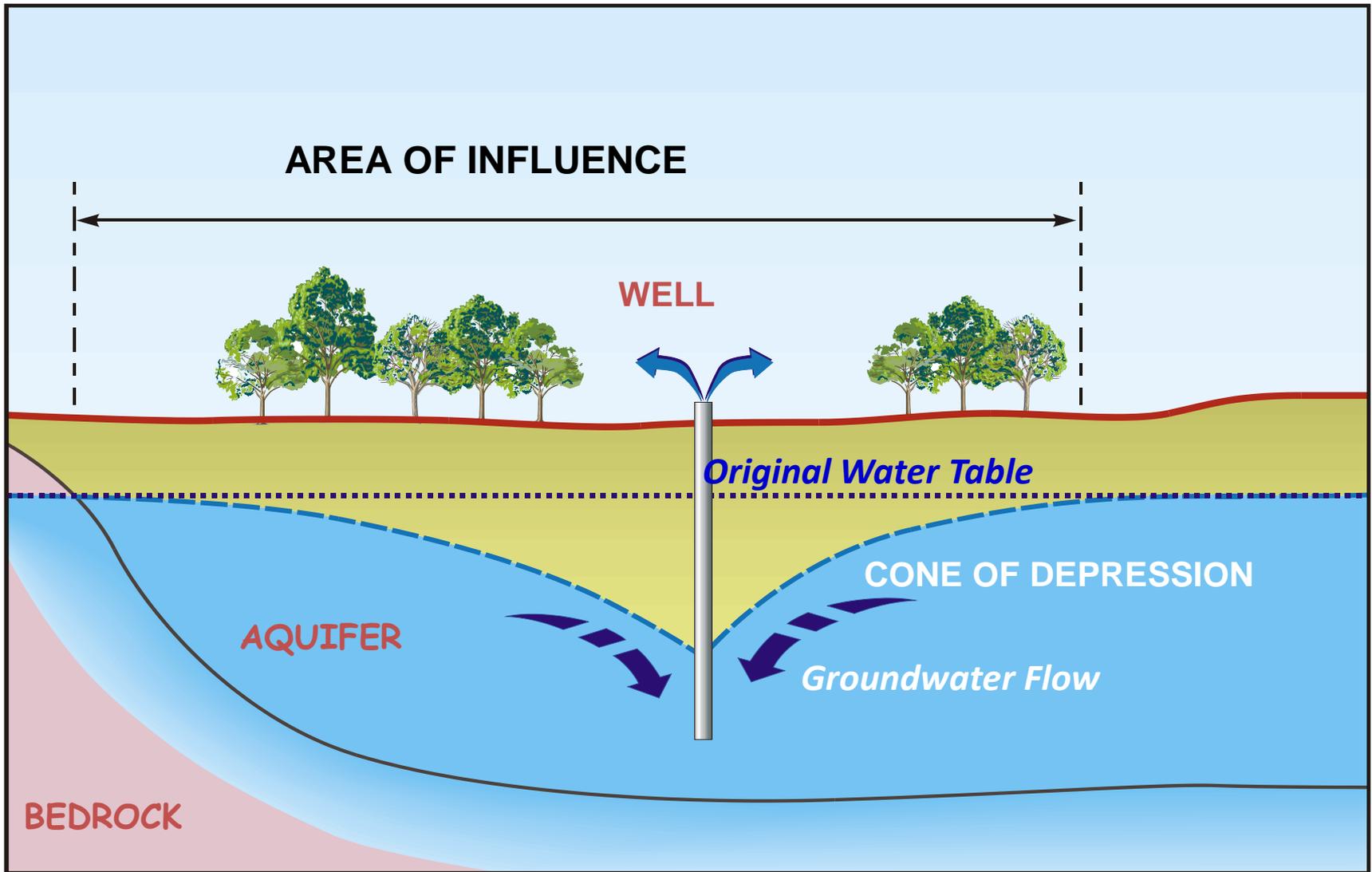
APPROVED FORM 21 (25/01/2011)

STATEMENT OF BORE

As per Water Regulations (2009)

Name of Owner: Pemco Mining Company		Registration No.: 29291								
Location/Address: North-west Peninsular		BC Permit No: BCPX818								
Intended Use: Town Supply & Processing Plant										
GPS Location: Zone: 52	GDA94 Other: <input checked="" type="checkbox"/>	Specify: <input type="checkbox"/>	Eastings: 546962							
		Northing: 8424303								
From	To	Name of Drilling Company: Ti-Tree Drilling Contractors								
0	8	Name of Driller: T. Pot								
8	28	Name of supervising driller								
28	48	Date Commenced: 15/10/2014								
48	65	Date Completed: 23/10/2014								
65	67	Depth Drilled: 99.0 m								
67	85	Completion Depth: 87.7 m								
85	99	METHOD OF DRILLING								
		Other <input type="checkbox"/>	Auger <input type="checkbox"/>							
		Rev. Circ. <input type="checkbox"/>	Rotary Air <input checked="" type="checkbox"/>							
			Rotary Mud <input checked="" type="checkbox"/>							
Specify:										
HOLE DIAMETER		DRILLING FLUID								
From (m)	To (m)	Dia. (mm)	Type							
0	7	407	Air & Foam							
7	67	311	Mud							
67	99	230	Mud							
PARTICULARS OF CASING		PARTICULARS OF PERFORATIONS OR SCREEN STRINGS								
From	To	Dia (ID)	Type	From	To	Dia (ID)	Aperture	Type		
+0.3	7 m	335 mm	Steel	66.24	66.5 m	205 mm	Packer	Stainless Steel		
+0.5	67 m	236 mm	ABS	66.5	68.9 m	205 mm	Blank	Stainless Steel		
				68.9	85.3 m	205 mm	1.5 mm	Stainless Steel		
				85.3	87.7 m	205 mm	Sump	Stainless Steel		
Casing Suspended: Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Top of Packer Set at: 66.24 m								
Method:		Length of Packer: 0.26 m								
Height of Casing above GL: 0.5 m		Method of Packer Connection: Welded								
CEMENTING/GRAVEL PACKING		WATER BEARING BEDS								
From	To	Type	Depth (m)	Yield (L/s)	SWL (m)	Duration (hr)	Quality	EC	pH	Bottle No.
0	6 m	Grouted								
6	61 m	Sand	67	85	35		Good	202	6.8	PCO1
61	67 m	Cement								
87.7	99 m	Gravel								
Temperature = 32 degree										

Bore Performance



Bore Performance

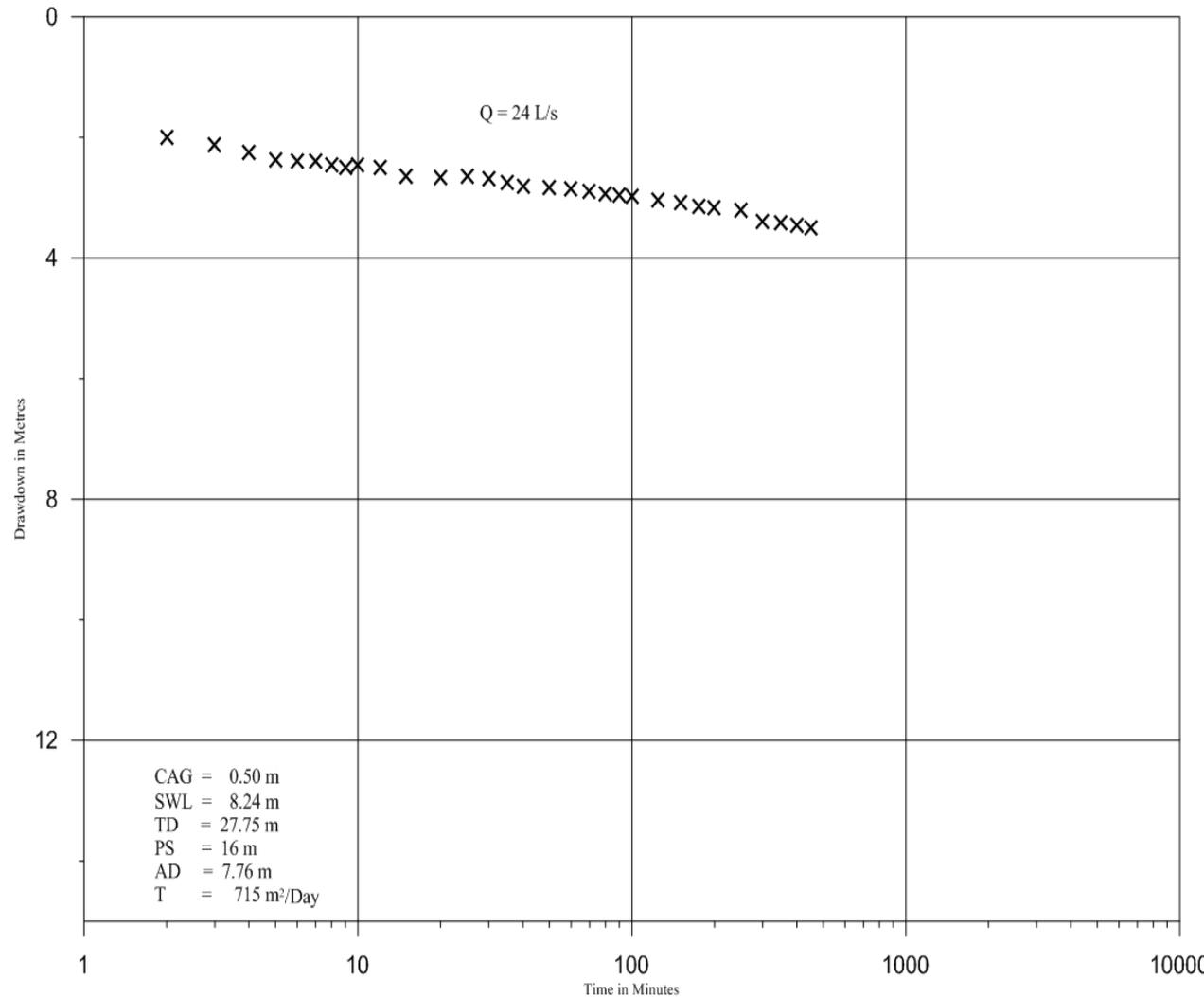
Drawdown:

➤ Aquifer Loss

Depends on hydraulic properties of aquifer

➤ Well Loss

Depends on hydraulic properties of bore



CONSTANT DISCHARGE TEST
22.7.74

Elsley 74/2
RN 008362

Factors Affecting Bore Performance

- Screen Placement
- Aperture size
- Length of flow
- Diameter of casing

RN013407 (P21)

- RN013407 (aka P21)
Alice Springs
- Original hole tested at 85 L/s with 6 m drawdown
- 16 inch casing to 178 m
- 8 inch screens and blank casing set between 178 and 268m
- With screens and casing removed, drawdown now 1.8m at 63 L/s



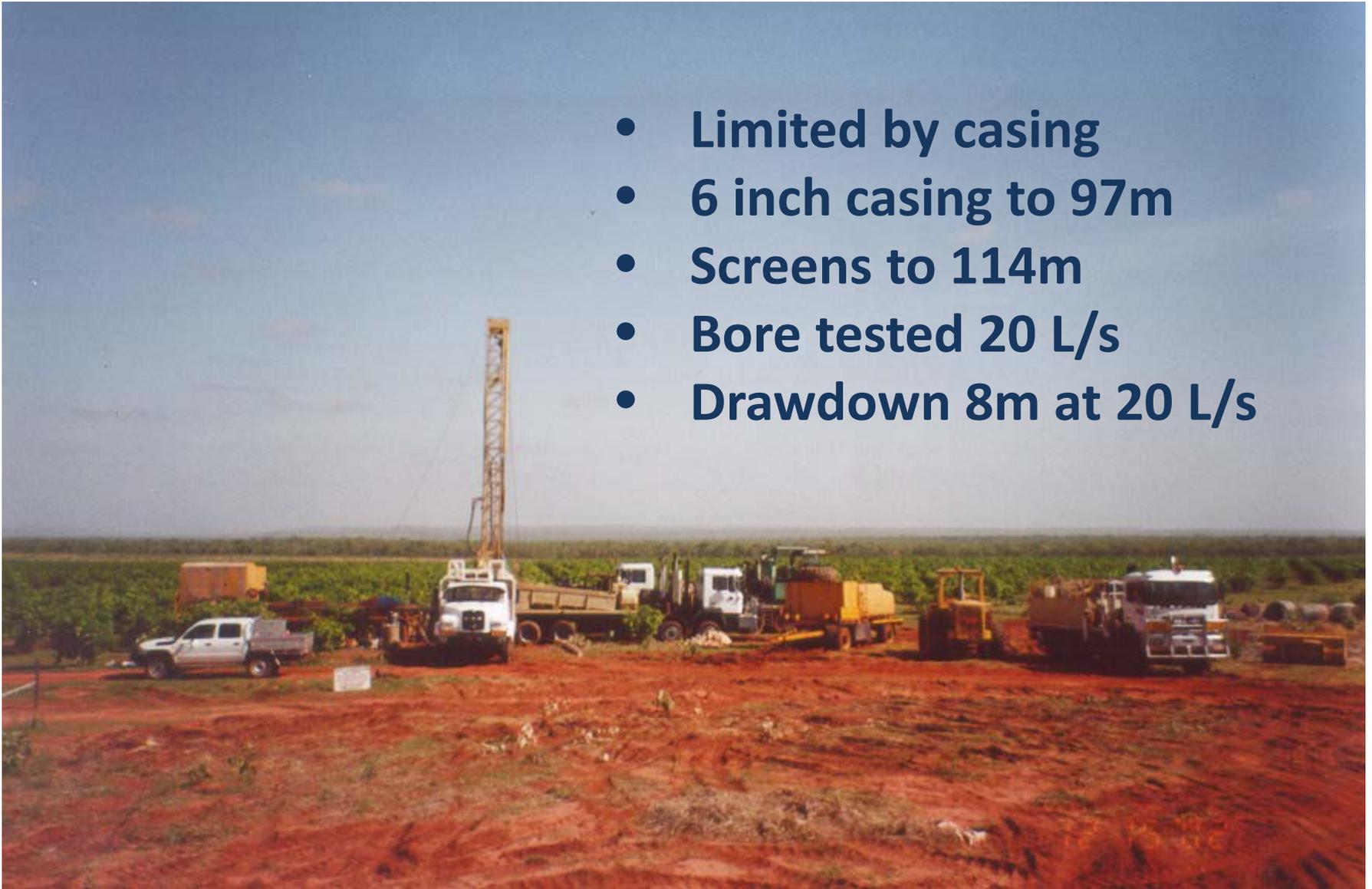






RN029736 / RN037490

- Limited by casing
- 6 inch casing to 97m
- Screens to 114m
- Bore tested 20 L/s
- Drawdown 8m at 20 L/s



RN029736 / RN037490

- 10" casing to 75m
- 8" screens to 83m
- Yield 80 L/s
- Drawdown 2.7m

