Hydrogeology Report 139

LAKE TOOLIBIN DRILLING PROGRAM- BORE COMPLETION REPORT AND PUMPING TEST DATA

by
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INTRODUCTION

Lake Toolibin is one of the important freshwater lakes in the wheatbelt region of southwest Australia. The lake and its surrounding reserve provide an important habitat for a wide variety of native waterbirds. Its unique wildlife ecosystem is internationally recognised and listed under the Ramsar Convention as a wetland of international importance. However the health of the vegetation cover of the lake and surrounding reserve is threatened by the increase of the salinity level of the lake water (Halse, 1987).

The rise of saline groundwater and increased saline water inflows from the Toolibin catchment have resulted in the degradation of the vegetation "Casuarina and Paperbark" particularly in the western shoreline of the lake.

Investigation into the salinisation of Lake Toolibin began by the Northern Arthur River Wetlands Committee in 1977. A hydrogeological investigation was carried out to understand groundwater dynamics and the inflow of saline water from the surrounding catchment to the Lake Toolibin (Martin, 1982, 1987 a, b, 1990). The scope of these studies was to highlight the adverse impact of the increasing salinity on the ecosystem of the lake.

Martin (1987 a,b) concluded that the capillary rise of saline groundwater is one of the processes that has an important role in the degradation of the vegetation cover of the lake. Therefore, he recommended the construction of production bores to pump the groundwater in order to maintain groundwater level and minimise the saline groundwater rise to the lakebed. However the impact of pumping from a production bore on the western shoreline of the lake was minimal to the overall health of the lake system.

Therefore, a more comprehensive recovery plan was developed by CALM (Conservation and Land Management) and AGWEST (Agriculture Western Australia) to reclaim the degraded areas within the lake and the surrounding reserve, and to protect the existing vegetation cover from the continuation of the increase in salinity. One of the key components of the lake protection was the management of surface and groundwater salinities within the lake. The recovery plan recommended a more comprehensive dewatering scheme, and that a bore field be established to maintain the water level beneath the lake. Based on the previous investigations, 9 sites were selected for the construction of the production bores within the lake (George, and Bennett 1995).

In order to investigate the impact of the existing groundwater pumping scheme on the vegetation of Lake Toolibin a further study was commissioned by CALM (Sinclair Knight Merz, 1998). The focus of this study was to develop a groundwater model to investigate the impact of dewatering under different scenarios (i.e. whether the existing pumping scheme is adequate to maintain the water level beneath the lake). Based on this

model and information obtained from an Airborne Geophysical Survey, five more sites were selected for the construction of production bores.

This report is a summary of the results of the drilling program of the five bores commissioned by CALM, giving details of bore construction, lithology, hydrogeology groundwater salinity and the results of the pumping tests. The assessment and synthesis of the outcomes of this investigation will be presented in a separate report.

REFERENCES

Halse, S. A., 1987, Probable effect of increased salinity on the water birds of Lake Toolibin: Dept of Conservation and Land Management, Technical Report No. 15.

Martin, M. W., 1987 a, Hydrogeology of Lake Toolibin, Western Australia Geological Survey, Hydrogeology Report 2797.

Martin, M. W., 1987 b, Lake Toolibin Dewatering Investigation, Western Australia Geological Survey, Record 1986/13.

Martin, M. W., 1990, Salinity Control by Groundwater Pumping at Lake Toolibin, Western Australia, Western Australia Geological Survey, Hydrogeology Report No. 1990/30.

George, G. and Bennett, D., 1995, Toolibin Groundwater Management Program, Drilling Results, Explanatory notes and drill logs, Catchment Hydrology Group, South-Western Rivers Region.

Sinclair Knight Merz Pty. Ltd 1998, Groundwater Model of the Effects of Groundwater Pumping on Lake Toolibin, Conservation and Land Management, Western Australia, March 1999.

LAKE TOOLIBIN BORE P14

LOCATION AND IDENTIFICATION

OWNER	:	Conservation and Land Management
BORE ID	:	P 14
LOCATION	:	Lake Toolibin Flora and Fauna reserve, South western side of Lake Toolibin
AQWABase Ref	:	2432-111-sw-0098
MAP SHEET	:	1: 250 000 CORRIGIN SI 50-3 1: 100 000 YEALERING SI 50-3/2432 1: 50 000 TOOLIBIN SI 50-3/2432 - III
AMG REF	:	555909.79mE 6356684.59mN
SWRIS NO	:	
PURPOSE	:	Production Bore

CONSTRUCTION

Sp. BUNBURY

DRILLED BY	:	Banbury Drilling Company
RIG	:	Gardener Denver 15W
METHOD	:	Mud Rotary Drilling
DRILLED	:	31.3.99
ELEVATION	:	Natural Surface-
DIAMETER	:	240 mm
DEPTH	:	49.6 m

CASING

Interval (m)	Type	Id (mm)	Comments
-0.5-31.6	Class 12 Plain pvc	150	
31.6-49.6	Class 12 Slotted pvc	150	End cap installed

GRAVEL PACK AND SEAL

Interval (m)	Item	Type	Description
0.0-14.6	Seal	Concrete	Cement and gravel 8/16 grade
14.6-49.6	Gravel Pack	Sand	8/16 grade

HEADWORK DETAILS

Item	Type	Description
Extension of casing	Class 12 pvc	0.5 m above nbs
Cap	150 mm pvc protective cap	
Surface protection pad	Concrete	600x600x300 mm

GEOLOGICAL DATA

SAMPLES : Cuttings logged at 1.0m intervals, bagged and retained for each bore hole.

SUMMARY LOG

Depth (m)	Age	Stratigraphic Unit	Lithology
0.0-5.5	Quaternary	Surficial	Clay
5.5-49.6	Archaean	Weathered Granite	Sand, clay

HYDROGEOLOGICAL DATA

AQUIFER : Weathered granite

WATER LEVELS: 0.76 m (below ground level)

YIELD : 0.5 litre/sec

SALINITY : 7550 mS/m obtained at the end of drilling

LOG OF SAMPLES

Depth (m bns)	Lithology	Description
0.0-1.0	Clay	grey, brown, fine to medium sun-angular sandy (quartz) clay, minor feldspar grains
1.0-2.0	Clay	grey, yellow sandy clay, fine to medium subangular to angular sand, relatively high feldspar content
2.0-3.0	Clay	brown grey sandy clay, semi-indurated plastic clay interbedded with thin layers of fine to medium quartz sandy clay
3.0-5.5	Clay	grey clay, heavy plastic, fine sand
5.5-9	Clay	white clay fine subangular quartz sand
9.0-10.0	Clay	brown, reddish ferruginised clay, angular sand occasional thin band of white clay
10-13	Clay	multicoloured clay

13-16	Clay	white, pink clay, fine to medium angular sand
16-37 (Aquifer)	Sand/Clay	white to pink medium to coarse quartz sand occasional medium feldspar grains
37-38	Clay	white, yellow fine quartz sand
38-45(Aquifer)	Sand/Clay	yellow white clay, angular quartz grains up to 7 mm embedded in clay matrix
45-49.6	Sandy/Clay	yellow white sandy clay, granite grains up to 5mm in grey yellow clay matrix

STEP TEST DATA
(PUMPING RATE 20L/MIN)

DATE: 13/04/99
DATUM FOR MEASURMENT: minus 0.9 m
DEPTH OF PUMP BELOW DATUM: 42 m
STATIC WATER LEVEL: 0.76 m
LOCATION: Toolibin
WELL NAME: P14

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
7.00 pm	0		1.66			20L/min	
	0.5		2.63				
			3.13				
	1.5		3.72				
	2		4.24				
	2.5		4.73				
	3		5.19				
	3.5		5.73				
	4		6.22				
	4.5		6.6				
	5	30	7.16				5.30min
	6		7.88				
	7		8.68				
	8		9.32				
	9		9.97				
	10		10.57				
	15		13.45				
	20		15.68				
	25		17.72				
	30		19.02				

(PUMPING RATE 30L/MIN)

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	0		19.02			30L/min	
	0.5						
	1.5		19.38				
	2						
	2.5						
	3		19.91				
	3.5						
	4						
	4.5						
	5		20.37				
	6		21.45				
	7		22.66				
	8						
	9		25.82				
	10		26.96				
	15		28.82				
	20		29.43				
	25		30.63				
	30		31.81				

(PUMPING RATE 40L/MIN)

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	0		31.81			40L/min	
	0.5						
	1.5		32.71				
	2						
	2.5		33.13				
	3						
	3.5		33.93				
	4						
	4.5		34.77				
	5		35.69				
Time	Elapsed		Water	Draw	Recovery	Pumping Rate	Remarks

	Time		Level (m)	Down (m)	(m)	(L/min)	
	Minutes	Hours					
	6						
	7		36.89				
	8						
	9		38.23				
	10		38.77				
	15		39.22				Water level close to the pump

RECOVERY TEST DATA

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
12.20 pm	0					40L/min	
	0.5						
	1.5						
	2						
	2.5						
	3						
	3.5			33.51			
	4			31.71			
	4.5						
	5			30.03			
	6						
	7			28.18			
	8			27.48			
	9			26.47			
	10.30			24.23			
	15			22.4			
	20			19.51			
	25			17.09			
	30			15.34			
	35			13.25			
	40			12.08			
	45			10.94			
	50			9.91			
	55			9.13			
	60	1		8.36			
	75			6.66			
	90	1.5		5.65			
	105			4.98			
	120	2		4.45			
	150	2.5		3.85			

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	180	3		3.41			
	210	3.5		3.115			

PUMP TEST DATA

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (m)	Remarks
	Minutes	Hours					
	0		3.11			17.4L/min	
			5.68				
	0.5		6.32				
			7.2				
	1.5		7.72				
	2						
	2.5		8.36				
	3		8.79				
	3.5		9.23				
	4		9.82				
	4.5						
	5		10.39				
	6		11.16				
	7		11.68				
	8		12.33				
	9		12.73				
	10		13.37				
	15		15.48				
	20		17.16				
	25		18.38				
	30		19.44				
	35		20.27				
	40		21.04				
	45		21.81				
	50		22.21				
	55		22.68				
	60	1	23.05				
	75		23.95				
	90	1.5	24.61				
	105		25.08				
	120	2	25.48				
	150	2.5	26.02				
	180	3	27.43				
	210	3.5	27.89				
	240	4	28.00				
	270	4.5	28.04				
	300	5	28.21				
	330	5.5	28.32				

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (m)	Remarks
	Minutes	Hours					
	360	6	28.44				
	390		28.56				
	420	7	28.60				
	450						
	480	8	28.78				
	510						
	540	9	28.84				
	570						
	600	10	28.93				
	630						
	660	11	29.05				
	690						
	720	12	29.13				
	750						
	780	13	29.2				
	810						
	840	14	29.26				
	870						
	900	15	29.29				
	930						
	960	16	29.34				
	990						
	1020	17	29.39				
	1050						
	1080	18	29.46				
	1110						
	1140	19	29.42				
	1170						
	1200	20	29.47				
	1230						
	1260	21	29.47				

LAKE TOOLIBIN BORE P13

LOCATION AND IDENTIFICATION

OWNER	:	Conservation and Land Management
BORE ID	:	P13
LOCATION	:	Lake Toolibin Flora and Fauna reserve, South Central part of Lake Toolibin
AQWABase Ref	:	2432-111-sw-0099
MAP SHEET	:	1: 250 000 CORRIGIN SI 50-3 1: 100 000 YEALERING SI 50-3/2432 1: 50 000 TOOLIBIN SI 50-3/2432 - III
AMG REF	:	556713.35mE 6356424.86mN
SWRIS NO	:	
PURPOSE	:	Production Bore

CONSTRUCTION

DRILLED BY	:	Bunbury Drilling Company
RIG	:	Gardener Denver 15W
METHOD	:	Mud Rotary Drilling
DRILLED	:	27.3.99
ELEVATION	:	Natural Surface-
DIAMETER	:	240 mm
DEPTH	:	39 m

CASING

Interval (m)	Type	Id (mm)	Comments
-0.5-21	Class 12 Plain pvc	150	
21-39	Class 12 Slotted pvc	150	End cap installed

GRAVEL PACK AND SEAL

Interval (m)	Item	Type	Description
0.0-16	Seal	Concrete	Cement and gravel 8/16 grade
16-39	Gravel Pack	Sand	8/16 grade

HEADWORK DETAILS

Item	Type	Description
Extension of casing	Class 12 pvc	0.5 m above nbs
Cap	150 mm pvc protective cap	
Surface protection pad	Concrete	600x600x300 mm

GEOLOGICAL DATA

SAMPLES : Cuttings logged at 1.0m intervals, bagged and retained for each bore hole.

SUMMARY LOG:

Depth (m)	Age	Stratigraphic Unit	Lithology
0.0-9.0	Quaternary	Surficial	Clay
9.0-39.0	Tertiary	Palaeochannel	Sand, clay
39.0-	Archaean	Yilgarn Craton	Saprolite, granitic gneiss

HYDROGEOLOGICAL DATA

AQUIFER : Tertiary

WATER LEVELS: 0.76 m (below ground level)

YIELD : 3 litre/sec

SALINITY : 6670 mS/m obtained at the end of drilling

LOG OF SAMPLES

Depth (m bns)	Lithology	Description
0.0-1.0	Clay	grey clay, minor fine to medium sand (quartz), patches of ferruginised reddish clay
1.0-2.0	Clay/Sand	grey, medium subangular sandy clay, poorly sorted, yellow patches of clay (lemonite)
2.0-9.0	Clay	grey heavy plastic yellow, no quartz sand present
9.0-10.5	Clay	grey yellow clay plastic, no sand present
10.5-11	Clay	reddish brown, ferruginised clay, indurated, fine subangular sand
11-13	Clay/Sand	grey brown ferruginised clay, angular fine to medium sand
13-14	Clay	grey yellow fine sandy clay
14-15	Clay/Sand	grey reddish ferruginised clay, angular fine to medium sand

15-16	Sand/Clay	silicified clay, relatively higher content of fine to medium quartz sand
16-17	Sand/Clay	silicified clay, fine to medium quartz sand, poorly sorted, ferruginised reddish clay, sub angular sand
17-18	Sand	grey fine to medium sand, sub angular quartz sand
18-19	Sand	grey clayey fine to medium quartz sand
19-20	Clay	grey, yellow clay, fine sand
20-21	Sand/Clay	grey clay, fine sand
21-22	Sand	silicified quartz sand, chips up to 1 cm, subangular coarse sand
22-23	Clay/ Sand	grey, clay fine to medium subangular sand
23-24	Sand	grey medium sub angular sand
24-34	Sand	grey medium to coarse subangular quartz sand
34-35	Sand	grey to black (organic matter) coarse sand up to 8mm in diameter
35-36	Sand	grey to black clayey sand, the % of sand decrease
36-39	Sand/Clay	grey to black fine sand (organic matter)
39-	Granite	Granitic gneiss chips

STEP TEST DATA
(PUMPING RATE 52.6L/MIN)

DATE: 13/04/99
DATUM FOR MEASURMENT: minus 0.9 m
DEPTH OF PUMP BELOW DATUM: 32 m
STATIC WATER LEVEL: 0.76 m
LOCATION: Toolibin
WELL NAME: P13

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (m)	Remarks
	Minutes	Hours					
10.38 pm	0		1.66			52.6L/min	
	0.5						
			3.33				
	1.5		3.86				
	2		4.2				
	2.5		4.26				
	3		4.84				
	3.5		4.41				
	4		4.49				
	4.5		4.54				
	5		4.60				
	6		4.67				
	7		4.74				
	8		4.81				
	9		4.86				
	10		4.9				

Time	Elapsed Time (min)		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate	Remarks
	Minutes	Hours					
	15		5.07				
	20		5.19				
	25		5.28				
	30		5.35				

(PUMPING RATE 84.5L/MIN)

Time	Elapsed Time		Water Level (m)	Draw Down	Recovery	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	0					84.5L/min	
	0.5		6.51				
			6.79				
	1.5		7.03				
	2		7.18				
	2.5		7.35				
	3		7.4				
	3.5		7.47				
	4		7.54				
	4.5		7.58				
	5		7.63				
	6		7.7				
	7		7.75				
	8		7.8				
	9		7.85				
	10		7.89				
	15		8.06				
	20		8.17				
	25		8.26				
	30		8.35				

STEP TEST (PUMPING RATE 94.7L/MIN) AND RECOVERY TEST DATA

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	0				9.49	94.7L/min	
	0.5				6.11		
			8.70		6.4		
	1.5		8.77		5.39		
	2		8.86				

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (m)	Remarks
	Minutes	Hours					
	2.5		8.93		4.14		
	3		8.95		3.85		
	3.5		8.99		3.63		
	4		9.02		3.52		
	4.5		9.05		3.4		
	5		9.07		3.1		
	6		9.10		3.14		
	7		9.13		3.03		
	8		9.16		2.93		
	9		9.18		2.85		
	10		9.20		2.77		
	15		9.29		2.52		
	20		9.37		2.36		
	25		9.43		2.24		
	30		9.49		2.15		

PUMPING TEST DATA

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	0		2.12			94.7L/min	
	0.5		4.69				
			5.72				
	1.5		6.54				
	2		6.97				
	2.5		7.35				
	3		7.62				
	3.5		7.82				
	4		7.98				
	4.5		8.09				
	5		8.21				
	6		8.37				
	7		8.51				
	8		8.60				
	9		8.69				
	10		8.75				
	15		9.01				
	20		9.16				
	25		9.30				
	30		9.39				
	35		9.47				
	40		9.54				

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	45		9.58				
	50		9.65				
	55		9.7				
	60	1	9.74				
	75		9.88				
	90	1.5	9.97				
	105		10.04				
	120	2	10.09				
	150	2.5	10.20				
	180	3	10.28				
	210	3.5	10.36				
	240	4	10.41				
	270	4.5	10.45				
	300	5	10.48				
	330	5.5	10.52				
	360	6	10.58				
	390						
	420	7	10.61				
	450						
	480	8	10.65				
	510						
	540	9	10.68				
	570						
	600	10	10.73				
	630						
	660	11	10.78				
	690						
	720	12	10.79				
	750						
	780	13	10.80				
	810						
	840	14	10.81				
	870						
	900	15	10.83				
	930						
	960	16	10.84				
	990						
	1020	17	10.85				
	1050						
	1080	18	10.86				

LAKE TOOLIBIN BORE P11

LOCATION AND IDENTIFICATION

OWNER : Conservation and Land Management

BORE ID : P 11

LOCATION : Lake Toolibin Flora and Fauna reserve, closer to the eastern side of Lake Toolibin

AQWABase Ref : 2432-111-sw-0100

MAP SHEET : 1: 250 000 CORRIGIN SI 50-3
1: 100 000 YEALERING SI 50-3/2432
1: 50 000 TOOLIBIN SI 50-3/2432 - III

AMG REF : 557156.50mE
6357687.10mN

SWRIS NO :

PURPOSE : Production Bore

CONSTRUCTION

DRILLED BY : Bunbury Drilling Company

RIG : Gardener Denver 15W

METHOD : Mud Rotary Drilling

DRILLED : 15.3.99

ELEVATION : Natural Surface-

DIAMETER : 240 mm

DEPTH : 40 m

CASING

Interval (m)	Type	Id (mm)	Comments
-0.5-19	Class 12 Plain pvc	150	
19-37	Class 12 Slotted pvc	150	End cap installed

GRAVEL PACK AND SEAL

Interval (m)	Item	Type	Description
0.0-10.0	Seal	Concrete	Cement and gravel 8/16 grade
10.0-37.0	Gravel Pack	Sand	8/16 grade

HEADWORK DETAILS

Item	Type	Description
Extension of casing	Class 12 pvc	0.5 m above nbs
Cap	150 mm pvc protective cap	
Surface protection pad	Concrete	600x600x300 mm

GEOLOGICAL DATA

SAMPLES : Cuttings logged at 1.0m intervals, bagged and retained for each bore hole.

SUMMARY LOG:

Depth (m)	Age	Stratigraphic Unit	Lithology
0.0-8.0	Quaternary	Surficial	Clay
8.0-37.0	Tertiary	Palaeochannel	Sand, clay
37.0-40.0	Archaean	Yilgarn Craton	Saprolite, granitic gneiss

HYDROGEOLOGICAL DATA

AQUIFER : Tertiary sediments

WATER LEVELS: 0.35 m (below ground level)

YIELD : 3 litre/sec

SALINITY : 6860 mS/m obtained at the end of drilling

LOG OF SAMPLES

Depth (m bns)	Lithology	Description
0.0-1.0	Clay	grey, heavy, plastic clay, fine to medium sabangular sand, poorly sorted
1.0-7.0	Clay	grey, plastic yellow clay, no sand or quartz grains
7.0-10.0	Clay/Sand	red to grey clay, ferruginised matter, fine to medium angular sand
10.0-11.0	Sand	grey red clay, fine to medium sub angular sand
11.0-12.0	Clay	grey red ferruginised clay, fine to medium angular to sub-angular quartz sand
12.0-13.0	Clay/Sand	ferruginised clay, patches of grey fine to medium sand
13.0-14.0	Sand/Clay	brown to grey clay fine to medium sand, sabangular, patches of

		ferruginised clay
14.0-16.0	Sand	grey to brown sandy clay, fine to medium sand, angular subangular, occasional pink feldspar
16.0-18.0	Sand	grey clay, angular fine to medium quartz sand
18.0-19.0	Clay/Sand	grey clay, fine quartz sand
19.0-20.0	Clay	grey to brown yellow clay, low fine to medium quartz sand
20.0-21.0	Clay/Sand	grey yellow clay, fine to medium quartz sand
21.0-22.0	Sand/Clay	grey medium quartz sand
22.0-23.0	Sand	grey fine to medium sand, angular to subangular, relatively low clay content
23.0-35.0	Sand	grey medium sand very low clay content
35.0-38.0	Clay/Sand	grey clay, fine to medium subangular quartz sand, green patches of green clay
38.0-40.0	Sand/Clay	white to light grey sand with rock fragments from granite bedrock

PUMP TEST AND RECOVERY TEST DATA

DATE: 15/04/99
DATUM FOR MEASURMENT: minus 0.9 m
DEPTH OF PUMP BELOW DATUM: 32 m
STATIC WATER LEVEL: 0.35 m
LOCATION: Toolibin
WELL NAME: P11

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
2.30 pm	0		1.25		9.06	94.7L/min	
	0.5		3.59		6.90		
			4.60		5.47		
	1.5		5.27		5.00		
	2		5.71		4.60		
	2.5		6.02		4.27		
	3		6.26		4.02		
	3.5		6.45		3.85		
	4		6.59		3.70		
	4.5		6.72		3.57		
	5		6.83		3.47		5.30min
	6		6.98		3.29		
	7		7.12		3.16		
	8		7.24		3.05		
	9		7.32		2.96		
	9		7.32		2.96		
	10		7.40		2.89		

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	15		7.64		2.65		
	20		7.79		2.26		
	25		7.88		2.04		
	30		7.96		1.94		
	35		8.04		1.86		
	40		8.10		1.81		
	45		8.15		1.76		
	50		8.18				
	55		8.22				
	60	1	8.24				
	75		8.30				
	90	1.5	8.37				
	105		8.42				
	120	2	8.47				
	150	2.5	8.53				
	180	3	8.59				
	210	3.5	8.65				
	240	4	8.68				
	270	4.5	8.72				
	300	5	8.74				
	330	5.5	8.80				
	360	6	8.83				
	390						
	420	7	8.84				
	450						
	480	8	8.90				
	510						
	540	9	8.94				
	570						
	600	10	9.06				

LAKE TOOLIBIN BORE P15

LOCATION AND IDENTIFICATION

OWNER : Conservation and Land Management

BORE ID : P15

LOCATION of Lake : Lake Toolibin Flora and Fauna reserve, closer to the south eastern side Toolibin

AQWABase Ref : 2432-111-sw-0101

MAP SHEET : 1: 250 000 CORRIGIN SI 50-3
1: 100 000 YEALERING SI 50-3/2432
1: 50 000 TOOLIBIN SI 50-3/2432 - III

AMG REF : 557204.57mE
6356747.21mN

SWRIS NO :

PURPOSE : Production Bore

CONSTRUCTION

DRILLED BY : Bunbury Drilling Company

RIG : Gardener Denver 15W

METHOD : Mud Rotary Drilling

DRILLED : 8.4.99

ELEVATION : Natural Surface-

DIAMETER : 240mm

DEPTH : 31.6 m

CASING

Interval (m)	Type	Id (mm)	Comments
-0.5-13.6	Class 12 Plain pvc	150	
13.6-31.6	Class 12 Slotted pvc	150	End cap installed

GRAVEL PACK AND SEAL

Interval (m)	Item	Type	Description
0.0-9.0	Seal	Concrete	Cement and gravel 8/16 grade
9.0-31.6	Gravel Pack	Sand	8/16 grade

HEADWORK DETAILS

Item	Type	Description
Extension of casing	Class 12 pvc	0.5 m above nbs
Cap	150 mm pvc protective cap	
Surface protection pad	Concrete	600x600x300 mm

GEOLOGICAL DATA

SAMPLES : Cuttings logged at 1.0m intervals, bagged and retained for each bore hole.

SUMMARY LOG

Depth (m)	Age	Stratigraphic Unit	Lithology
0.0-8.0	Quaternary	Surficial	Clay
8.0-31.6	Archaean	Yilgarn Craton	Saprolite, granitic gneiss

HYDROGEOLOGICAL DATA

AQUIFER : Weathered Granite

WATER LEVELS: 0.32 m (below ground level)

YIELD : 3 litre/sec

SALINITY : 6480 mS/m obtained at the end of drilling

LOG OF SAMPLES

Depth (m bns)	Lithology	Description
0.0-1.0	Clay/Sand	grey, brown, fine to medium subangular sand, poorly sorted
1.0-2.0	Sand	grey, sandy quartz, semi indurated medium grains of pink feldspar
3.0-8.0	Clay	grey sandy plastic clay, fine quartz sand
8.0-9.5	Sand/Clay	brown ferruginised sandy clay, medium to coarse quartz sand
9.5-10.0	Clay	grey brown sandy clay, fine quartz sand
10.0-11.5	Sand/Clay	grey brown ferruginised matter, fine to medium quartz sand
11.5-12.5	Clay	white, fine sandy clay occasional pink grains of feldspar
12.5-14.0	Sand/Clay	red ferruginised sandy clay, fine to medium sabangular quartz sand
14.0-16.0	Clay	white clay, fine to medium sand

16.0-18.0	Clay	multicolour (grey, white, red and pink) clay, fine to medium quartz sand
18.0-29.0	Sand	brown red medium to coarse sandy clay, quartz grains up to 3mm
29.0-31.6	Clay/Sand	grey brown clay, granite fragments from fresh bedrock

PUMP TEST AND RECOVERY TEST DATA

DATE: 16/04/99
DATUM FOR MEASURMENT: minus 0.9 m
DEPTH OF PUMP BELOW DATUM 28 m
STATIC WATER LEVEL: 0.32 m
LOCATION: Toolibin
WELL NAME: P15

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
6.25 Am	0		1.22		5.85	48L/min	
	0.5		2.54		5.14		
			3.26				
	1.5		3.82		4.70		
	2		4.19		4.39		
	2.5		4.50		4.20		
	3		4.72		4.10		
	3.5		4.92		4.00		
	4		5.07		3.84		
	4.5		5.20		3.77		
	5		5.31		3.70		
	6		5.50		3.59		
	7		5.65		3.49		
	8		5.77		3.40		
	9		5.88		3.32		
	10		5.96		3.24		
	15		6.28		3.00		
	20		6.51		2.79		
	25		6.71		2.57		
	30		6.85		2.26		
	35		7.02		2.15		
	40		7.18		2.04		
	45		7.30		1.90		
	50		7.40				
	55		7.51				
	60	1	7.57				
	75		7.72				
	90	1.5	7.79				
	105		7.91				

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	120	2	8.00				
	150	2.5	8.11				
	180	3	8.17				
	210	3.5	8.25				
	240	4	8.29				
	270	4.5	8.33				
	300	5	8.39				
	330	5.5	8.42				
	360	6	8.42				
	390						
	420	7	8.46				
	450						
	480	8	8.49				
	510						
	540	9	8.50				
	570						
	600	10	8.53				
	630						
	660	11	8.55				

LAKE TOOLIBIN BORE P12

LOCATION AND IDENTIFICATION

OWNER : Conservation and Land Management

BORE ID : P 12

LOCATION : Lake Toolibin Flora and Fauna reserve, closer to the eastern side of Lake Toolibin

AQWABase Ref : 2432-111-sw-0102

MAP SHEET : 1: 250 000 CORRIGIN SI 50-3
1: 100 000 YEALERING SI 50-3/2432
1: 50 000 TOOLIBIN SI 50-3/2432 - III

AMG REF : 556767.84mE
6356980.29mN

SWRIS NO :

PURPOSE : Production Bore

CONSTRUCTION

DRILLED BY : Bunbury Drilling Company

RIG : Gardener Denver 15W

METHOD : Mud Rotary Drilling

DRILLED : 9.4.99

ELEVATION : 280AHD

DIAMETER : 240mm

DEPTH : 32.5 m

CASING

Interval (m)	Type	Id (mm)	Comments
-0.5-14.5	Class 12 Plain pvc	150	
14.5-32.5	Class 12 Slotted pvc	150	End cap installed

GRAVEL PACK AND SEAL

Interval (m)	Item	Type	Description
0.0-9.0	Seal	Concrete	Cement and gravel 6/18 grade
9.0-32.5	Gravel Pack	Sand	8/16 grade

HEADWORK DETAILS

Item	Type	Description
Extension of casing	Class 12 pvc	0.5 m above nbs
Cap	150 mm pvc protective cap	
Surface protection pad	Concrete	600x600x300 mm

GEOLOGICAL DATA

SAMPLES : Cuttings logged at 1.0m intervals, bagged and retained for each bore hole.

SUMMARY LOG

Depth (m)	Age	Stratigraphic Unit	Lithology
0.0-7.0	Quaternary	Surficial	Clay
7.0-32.5	Archaean	Yilgarn Craton	Saprolite, granitic gneiss

HYDROGEOLOGICAL DATA

AQUIFER : Weathered Granite

WATER LEVELS: 0.17 m (below ground level)

YIELD : 0.3 litre/sec

SALINITY : 6860 mS/m obtained at the end of drilling

LOG OF SAMPLES

Depth (m bns)	Lithology	Description
0.0-1.0	Clay	grey, heavy, plastic clay, no sand
1.0-2.0	Clay	grey, green plastic yellow clay, no sand or quartz grains
2.0-3.0	Clay	green clay minor fine sand
3.0-4.0	Clay	green clay, yellow clay patches with minor fine sand
4.0-7.0	Clay	yellow, grey green fine quartz sand
7.0-8.0	Clay/Sand	red grey ferruginised sandy clay
8.0-9.0	Sand/Clay	brown to grey ferruginised clay, ferruginised clay fragments up to 7 mm present
9.0-10.0	Clay	grey to brown clay, minor fine to medium quartz sand
10.0-15.0	Sand/Clay	grey, red indurated fine to medium sandy clay

15.0-16.0	Sand	grey sandy clay, medium quartz sand angular to sub angular
16.0-17.0	Sand	grey red medium sandy clay
17.0-18.0	Sand	brown dark coarse sandy clay, angular quartz grains up to 2mm
18.0-24.0	Sand	pink grey yellow fine to medium angular sand
24.0-25.0	Sand/Clay	green, white yellow sandy clay, fine to coarse sand,
25.0-26.0	Clay/Sand	whit fine sandy clay
26.0-31.0	Clay/Sand	grey fine to medium sand very low sand content
31.0-32.5	Sand	light green sand with rock fragments from fresh granite bedrock

PUMP TEST AND RECOVERY TEST DATA

DATE: 16/04/99
DATUM FOR MEASURMENT: minus 0.9m
DEPTH OF PUMP BELOW DATUM: 32m
STATIC WATER LEVEL: 0.17m
LOCATION: Toolibin
WELL NAME: P12

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
6.28 Am	0		1.07		5.85	18.5	
	0.5		1.92		5.14		
			2.42				
	1.5		2.98		4.70		
	2		3.43		4.39		
	2.5		3.76		4.20		
	3		4.02		4.10		
	3.5		4.29		4.00		
	4		4.68		3.84		
	4.5		4.89		3.77		
	5		5.08		3.70		
	6		5.52		3.59		
	7		5.97		3.49		
	8		6.16		3.40		
	9		6.42		3.32		
	10		6.61		3.24		
	15		7.12		3.00		
	20		7.62		2.79		
	25		7.80		2.57		
	30		7.90		2.26		
	35		7.99		2.15		
	40		8.03		2.04		
	45		8.10		1.90		
	50		8.12				
	55		8.15				
	60	1	8.18				

Time	Elapsed Time		Water Level (m)	Draw Down (m)	Recovery (m)	Pumping Rate (L/min)	Remarks
	Minutes	Hours					
	75						
	90	1.5	8.25				
	105						
	120	2	8.29				
	150	2.5					
	180	3	8.34				
	210	3.5					
	240	4	8.37				
	270	4.5					
	300	5	8.42				
	330	5.5					
	360	6	8.43				
	390						
	420	7	8.44				
	450						
	480	8	8.45				
	510						
	540	9	8.32				Adjust the valve 21 l/min
	570						
	600	10	9.29				
	630						
	660	11	9.26				
	690						
	720	12	9.32				
	750						
	780	13	9.36				
	810						
	840	14	9.39				
	870						
	900	15	9.38				
	930						
	960	16	9.39				
	990						
	1020	17	9.40				
	1050						
	1080	18	9.40				