



Water Corporation

Binningup Water Quality Monitoring

Revision History

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				Copies	Date
155-AB	0	D. Procter	M. Jukic		July 2006

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Executive Summary

360 Environmental was commissioned by the Water Corporation to conduct a single round of seawater quality sampling at a site approximately one kilometre north west of Binningup, Western Australia. The work was undertaken to provide information regarding the quality of seawater at the monitoring site.

The scope of work undertaken included:

- The collection of four water samples and in-situ monitoring at a single specified offshore location at Binningup.
- Laboratory testing of the samples collected for a range of analytes nominated by the client.
- The preparation of a brief report detailing the findings of the sampling and analysis program.

Sampling was undertaken by 360 Environmental Scientists on the 25th of May 2006.

Overall seawater quality at the Binningup sampling location was found to be characteristic of typical seawater and generally very similar to that measured at Cockburn Sound for the range of parameters nominated. Higher than anticipated silt density indexes (SDI) were an exception. It is recommended that additional sampling and analysis be undertaken to verify the SDI results.



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1. Introduction

1.1. Background

360 Environmental was commissioned by the Water Corporation to conduct seawater quality sampling at a site approximately one kilometre north west Binningup, Western Australia (Figure 1). This report presents the results of the investigation.

1.2. Objectives

The objective of the investigation was to provide information regarding the quality of seawater at the specified site close to Binningup.

1.3. Scope of Work

The following scope of work undertaken for this investigation was generally in accordance with 360 Environmental's proposal 155 AA dated the 22nd of May 2006 and included the following:

- The collection and in-situ monitoring of four water samples from a single offshore location at Binningup.
- Laboratory testing of the samples collected for a range of analytes nominated by the client.
- The preparation of a brief report detailing the findings of the sampling and analysis program.

1.4. Report Format

The remainder of this report is comprised of the following components:

- Section 2 - Guidelines and Assessment Criteria
- Section 3 - Methodology
- Section 4 - Results and Discussion
- Section 5 - Conclusions

2. Guidelines and Assessment Criteria

Where applicable the seawater analysis results from this investigation were compared against the guidelines for marine waters as presented in the Department of Environment's (DOE) (2003) *Assessment Levels for Soil, Sediment and Water*. The recommended criteria have been developed based on the risk-based approach in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ 2000).

Results were also compared against typical seawater values (Kennish, 2001) and background water quality obtained from previous investigations in Cockburn Sound, Western Australia (Water Corporation, 2005). Although it is recognised that seawater quality levels may vary between the Binningup site located in open coastal waters and Cockburn Sound which occurs in a sheltered embayment, seawater quality data from Cockburn Sound investigations was nonetheless considered appropriate for comparisons purposes due to the comparable range of parameters analysed in these investigations and the relatively close proximity of Cockburn Sound to the study site.

3. Methodology

3.1. Field Sampling

The field investigation was undertaken on the 25th of May 2006 and included the collection of water samples from a site nominated by the Water Corporation, located approximately one kilometre offshore of Binningup. The GPS co-ordinates of the sample location were:
E: 376683.93 N: 6333795.48 (Figure 1).

The sampling program and site selection were at the direction of the Water Corporation. The fieldwork was supervised by a 360 Environmental Scientist, who was responsible for coordinated the environmental sampling and ensuring QA/QC procedures.

Water samples were collected using a 12V Waterra submersible pump with Waterra standard flow, low density, polyethylene tubing. Samples BY01 and BY03 were collected at the surface and at a depth of five meters respectively, along with a duplicate sample (BY02 and BY04) at each location.

Water samples were collected directly into laboratory-supplied containers for the required analytes and kept chilled on ice for storage and transport to the analytical laboratory. These were then dispatched to the nominated analytical laboratories and to the Water Corporation's Kwinana Water Reclamation Plant.

New, clean gloves were worn for the collection of each sample to reduce the risk of cross contamination. All pieces of equipment re-used between sample locations were rinsed with a phosphate-free decontaminant solution (Extran) and deionised water prior to sampling and at each location.

Field water quality parameters including, pH, temperature, turbidity, and electrical conductivity were recorded and are contained in Appendix A.

3.2. Laboratory Analysis

All water samples were analysed by NATA-accredited laboratories for a range of parameters specified by the Water Corporation. These include the following:

- Total Dissolved Solids (TDS)
- Total Suspended Solids (TSS)
- Silicate
- Fluoride
- Sulphate
- Chloride
- Magnesium
- Calcium
- Strontium
- Boron
- Barium
- Bromide
- Potassium
- Sodium
- Carbonate
- Bicarbonate
- Ammonia
- Total Nitrogen
- Total Phosphorus
- Aluminium
- Heterotrophic Plate Count (48 hours at 37°C)
- Heterotrophic Plate Count (72 hours at 20°C)
- Oil and Grease

Analysis of the majority of the parameters was undertaken by the Marine and Freshwater Research Laboratory (MAFRL) whilst heterotrophic plate counts, carbonate and bicarbonate were analysed by Microserve Laboratory and fluoride, bromide and Oil and Grease by Australian Laboratory Services (ALS). In addition samples were analysed for SDI at the Kwinana Water Reclamation Plant, using the Water Corporations SDI measuring device.

3.3. Quality Assurance and Quality Control

Quality assurance/quality control (QA/QC) measures as recommended in Australian Standard AS4482.1 and the *Australian Guidelines for Water Quality Monitoring and Reporting* (ANZECC / ARMCANZ) (2000) were adopted during sampling.

Work was carried out by experienced environmental scientists in accordance with accepted industry standards and protocols for environmental sampling as detailed in the DOE (2001 - 2005) *Contaminated Sites Management Series*. Prior to commencement of field investigations, all sampling equipment was cleaned with water and phosphate-free detergent and rinsed with deionised water. Field quality control samples included at least 10% duplicates, rinsates samples and



trip blanks. All samples were kept chilled on ice and transported to the appropriate laboratories within twenty-four hours of sampling.

As noted in Section 3.2, laboratory analysis for water testing was undertaken by NATA-registered laboratories. All samples were transported under 360 Environmental chain-of-custody procedures. Chain-of-custody documentation and laboratory sample receipt advice reports for all sampling are presented in Appendix B.

3.4. Data Usability

An assessment of the usability of the laboratory data has been made by considering field and laboratory procedures and comparing against pre-determined qualitative criteria. Appendix C - Quality Assurance/Quality Control Data Assessment Report presents the results of the assessment and the implications of the findings on the final data usability. On the basis of this assessment, it is considered that the laboratory tests reasonably represent the conditions at the sampling points at the time of sampling.

4. Results and Discussion

Tables 1 and 2 present the results of the water sampling and compare the results with previous studies and applicable guidelines as outlined in section 2. The laboratory analytical reports are presented in Appendix D. The findings of the seawater quality analysis are discussed in the following sections.

4.1. Major Constituents

Concentrations of the major constituents of seawater in both samples were generally at levels expected for seawater (Kennish, 2001) and within the range of concentrations measured in Cockburn Sound (WC, 2005). Carbonate concentrations in both samples were notably lower however than levels measured in seawater at Cockburn Sound (12 to 14 mg/L). The higher concentrations in Cockburn Sound are attributed to the naturally occurring carbonate sediments underlying the area (DALSE, 2002).

4.2. Minor Constituents

Trace elements were measured at concentrations typical of seawater (Kennish, 2001), with the exception of silicate. Silicate concentrations ranged from 25 - 27 $\mu\text{g Si/L}$ compared to levels of around 13, 700 $\mu\text{g Si/L}$ found in typical seawater (Horne, 1969). Very low concentrations of silicate in Perth coastal waters have been attributed to a high proportion of diatoms in the phytoplankton which extract silicate from the water column (DALSE, 2002). Concentrations of silicate in Cockburn Sound have been recorded at 50 $\mu\text{g Si/L}$ (DALSE 2002).

Concentrations of aluminium and boron were below respective recommended guideline values of 0.055 mg/L and 370 mg/L (DoE, 2003). No Guideline levels were available for the remaining analytes.

4.3. Nutrients

Total nitrogen and total phosphorous concentrations ranged from 100 to 110 $\mu\text{g N/L}$ and 15 to 18 $\mu\text{g P/L}$ respectively. Concentrations of both were significantly lower than levels of 150 to 210 $\mu\text{g N/L}$ and 36 to 39 $\mu\text{g P/L}$ previously recorded in Cockburn Sound (WC, 2005). This is likely a reflection of naturally higher levels of nutrients found in a sheltered

embayment such as Cockburn Sound compared to open coastal waters such as the sample location.

Ammonia concentrations were within the range previously recorded in seawater at Cockburn Sound (WC, 2005) of 4 - 10 µg/L .

4.4. Pollutants

Concentration of oil and grease were below laboratory detection levels for all samples analysed.

4.5. Bacteria (Heterotrophic Plate Counts)

The heterotrophic plate count (HPC) measures the total bacteria load of a sample of water and expresses the results in colony forming units per millilitre of water (CFU/mL). The HPCs in the samples analysed ranged from 6 to 60 CFU/mL when cultured at 21^oC for 72 hours and from 18 to 56 CFU/mL when cultured at 37^oC for 48 hours. All samples analysed were generally within the range previously recorded in Cockburn Sound with the exception of one surface sample which recorded 56 CFU/ml at 37^oC for 48 hours. HPCs cultured at 37^oC include faecal bacteria whilst those cultured at 21^oC do not. All counts were considered to be relatively low however further analysis, particularly for faecal bacteria may be considered.

4.6. Physical Characteristics

Physical characteristics (pH, temp, salinity, turbidity) monitored in situ during sampling and TDS and TSS were all within the range previously recorded in Cockburn Sound.

Levels of TSS (2 mg/L) and turbidity (0 NTU) were low for all samples indicating the water column at the site was relatively free of sediment at the time of sampling.

4.7. Silt Density Index

The silt density index (SDI) is a measure of the tendency of a solution to plug a 45µm filter over a period of time, generally 5, 10 or 15 minutes. SDI levels of 32.9 and 32.7 for the surface sample (BY01) and the five meter sample (BY03) respectively were both higher than anticipated given the



relatively low TSS, TDS and turbidity readings measured. Further sampling is recommended to verify these above results.



5. Conclusions

Overall seawater quality was found to characteristic of typical seawater and generally very similar to that measured at Cockburn Sound for the range of parameters nominated. Elevated SDI levels were an exception however and for this reason it is recommended that further sampling and analysis is undertaken to verify these results.



6. References

ANZECC / ARMCANZ, 2000. *Australian Guidelines for Water Quality Monitoring and Reporting, National Water Quality Management Strategy No. 7.*

Department of Environment, 2001-2005. *Contaminated Sites Management Series.* Department of Environmental and Conservation, Perth.

DALSE, 2002. *Perth Seawater Desalination Plant. Seawater Quality Assessment.* DAL Science and Engineering for Water Corporation.

Horne, R.A. 1969. *Marine Chemistry - The Structure of Water and the Chemistry of the Hydrosphere.* Wiley Interscience, SBN 451 40942 1 USA

Kennish, Micheal, J., 2001. *Practical Handbook of Marine Science, 3rd Edition.* CRC Press.

Water Corporation, 2005. *Perth Seawater Desalination Plant, Draft Basis for Design and Construction.*



TABLES

Table 1

**Binningup Water Quality
Chemical Composition of Major and Minor Constituents**



Element	Depth	BY01/ BY03	BY02/ BY04	Average Seawater (Kennish 2001)	Cockburn Sound (Water Corporation 2005)	DoE (2003) Marine Water
Major Constituents						
Chloride (mg/L)	0m	20000	20000	19353	19000 - 21000	NG
	5m	21000	21000			
Calcium (mg/L)	0m	420	420	411.9	410 - 490	NG
	5m	400	400			
Magnesium (mg/L)	0m	1300	1200	1297	1300 - 1500	NG
	5m	1200	1200			
Potassium (mg/L)	0m	450	430	399	410 - 470	NG
	5m	420	450			
Sodium (mg/L)	0m	11000	10000	10760	9800 - 12000	NG
	5m	10000	10000			
Sulphate as SO ₄ (mg/L)	0m	2800	2800	2712	2760 - 2880	NG
	5m	2800	2800			
Carbonate (CO ₃ mg/L)	0m	<1	<1	-	12 - 14	NG
	5m	<1	<1			
Bicarbonate (HCO ₃ mg/L)	0m	150	150	145	121 - 130	NG
	5m	150	150			
Minor Constituents						
Aluminium (mg/L)	0m	<0.01	0.03	0.002	0.02 - 0.06	55 #
	5m	0.03	0.01			
Barium (mg/L)	0m	0.0033	0.0034	0.02	0.0037 - 0.004	NG
	5m	0.0033	0.0027			
Boron (mg/L)	0m	4.2	4.2	4.6	4.4 - 5.0	370 #
	5m	3.9	4			
Strontium (mg/L)	0m	7.4	6.9	7.6	7.2 - 8.5	NG
	5m	6.8	6.7			
Bromide (mg/L)	0m	83.6	79.7	67.3	69 - 74	NG
	5m	82.4	80.8			
Fluride (mg/L)	0m	0.9	0.9	1.3	0.2 - 1.1	NG
	5m	1.7	0.9			
Silicate (µg.Si/L)	0m	27	25	13700 ²	50 ¹	NG
	5m	27	26			

Notes¹ Default to DALSE (2002)² Default to Horne (1969)

- No value recorded

NG = No Guideline

default to fresh water guideline

Table 2

**Binningup Water Quality
Nutrient, Pollution, Bacterial and Physical Characteristics.**



Parameter	Depth	BY01/ BY03	BY02/ BY04	Cockburn Sound (Water Corporation 2005)	DoE (2003) Marine Water
Nutrients					
Total Nitrogen (ug.N/L)	0m	100	100	150 - 210	NG
	5m	110	100		
Ammonia (ug.N/L)	0m	8	8	4 - 10	NG
	5m	8	8		
Total Phosphorus (ug.P/L)	0m	15	15	36 - 39	NG
	5m	17	18		
Pollutants					
Oil and Grease (mg/L)	0m	<5	<5	<5 - 7	NG
	5m	<5	<5		
Bacteria					
Heterotrophic Plate Count CFU/ml 72 hrs at 21 °C	0m	60	12 ¹	10 - 150	NG
	5m	8 ¹	6 ¹		
Heterotrophic Plate Count CFU/ml 48 hrs at 37 °C	0m	56	18 ¹	20 - 40	NG
	5m	30	26		
Physical					
TSS (mg/L)	0m	2	2	1 - 9	NG
	5m	2	2		
TDS (g/L)	0m	36	36	35.6 - 38.6	NG
	5m	36	35		
pH	0m	8.32	8.21	8.1 - 8.3	NG
	5m	8.32	8.21		
Temp (°C)	0m	18.09	18.16	14 - 26	NG
	5m	18.12	18.15		
Salinity (ppt)	0m	37.52	37.65	-	NG
	5m	37.59	37.64		
Turbidity (NTU)	0m	0	0	0.6 - 8	NG
	5m	0	0		
Silt Density Index					
SDI (15 mins)	0m	32.9 ²		4.5 - 5.8	NG
	5m	32.7 ²			

Notes

- No value recorded

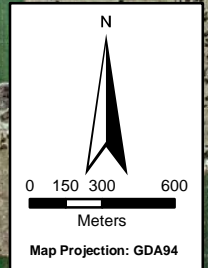
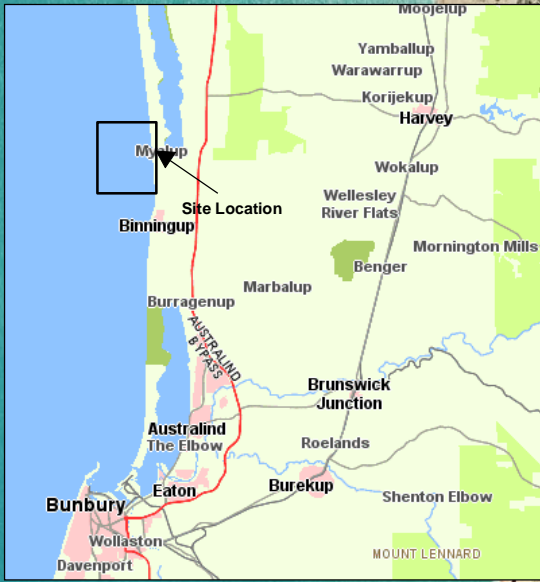
NG = No Guideline

1. This count is outside the standard measurement of certainty

2. Both tests plugged before completion with a plugging factor estimated at 75% for both.



FIGURES



Water Corporation
 BINNINGUP WATER QUALITY MONITORING

Sampling Location

Figure 1



APPENDICES



APPENDIX A

Field Measurement Results



APPENDIX B

360 Chain of Custody Documentation

Chain of Custody Record

Send samples to:
 Laboratory name: Microserve
 Laboratory address: 181 Claisebrook Rd Perth
 Laboratory contact number: 9227 6499
 Sample delivery method: Courier
 Laboratory evaluation reference: 096-220506

Chain of custody numt 155-250506-1
Samples from:
 360 Environmental
 1 Altona Street West Perth WA 6005
 PO Box 14 Wes ph: (08) 9321 0420 fax (08) 9226 0739

Send electronic results to:
 labresults@360environmental.com.au
 davidprocter@360environmental.com.au
Name of samplers:
 1 adam harris
 2 Joe Toon
Address correspondence to:
 David Procter
Sample details verified by (sign):
 1

Project reference details:
 Project name: Nicholson Road Monitoring
 Project number: 155

Sample analysis									
Depth (m)	Carbonate	Bicarbonate	Heterotrophic Plate Count (72 hours at 20oC)	Heterotrophic Plate Count (48 hours at 37oC)					
5	x	x	x	x					
5	x	x	x	x					
0	x	x	x	x					
0	x	x	x	x					

*IR spoke to David Procter
 Base water which end use most likely drinking
 The client wants a general look at water quality*

Laboratory sample reference	Sample Number	Matrix				Collection Method	Time	Date	Comments
		Water	Soil	Sediment	Other				
	BY01 ✓	X					25/05/2006		
	BY02 ✓	X					25/05/2006		
	BY03 ✓	X					25/05/2006		
	BY04 ✓	X					25/05/2006		

Relinquished by (print name): David Procter Signature: *[Signature]* Date: 26/5/06 Time: 8:00
 Relinquished by (print name): Peter CTI Signature: *[Signature]* Date: 26-05-06 Time: 8:55

Received by (print name): Peter CTI 14 Signature: *[Signature]* Date: 26-05-06 Time: 8:20
 Received by (print name): Ken Frankish Signature: *[Signature]* Date: 26 05 06 Time: 8:55

P.01/01
 TO 92260739
 FROM Microserve Laboratory
 08 9227 6455
 29-MAY-2006 08:54

TOTAL P.01





APPENDIX C

360 Environmental Quality Assurance and Quality Control Report



Client: Water Corporation
 Project Name: Binninup Water Quality
 Project Number: 155
 Project Manager: David Procter
 Date Project Commencement: May-06

1 INTRODUCTION

The following provides an account of quality assurance (QA) and quality control (QC) procedures applied by 360 Environmental during environmental field investigations for the above project. The information is provided to ensure data used in the assessment of projects is valid and acceptable in terms of accuracy and precision. Information is

- Fieldwork planning
- Sample collection
- Decontamination procedures
- Sample handling and transit
- Field QA/QC samples
- Laboratory QA/QC
- Data Usability

2 FIELDWORK PLANNING

Prior to commencement of field investigations, the following documentation was prepared:

- Sampling and analysis plan (SAP)
- Health, safety and environment plan (HSEP)
- Fieldwork Briefing and QA/QC Plan

3 SAMPLE COLLECTION

All samples were collected by suitably qualified and trained environmental practitioners following pre-set procedures as detailed in the sampling and analysis plan. All safety inductions as required for the site were undertaken by samplers and sub-contractors. Laboratory supplied sample jars and bottles were labeled with the 360 Environmental job number, the sample collection date, a unique sample reference, and the company name with a permanent marker. The sample identifier was made marked on both the body and the lid of the sample jar. Chain of custody documentation was used for all sampling events with copies retained by 360 Environmental. Other data, such as field conditions, sampling notes, occupational health, safety and environment details, etc were recorded in the field. All analytical equipment used in the field was supplied by a reputable supplier, calibrated prior to use and used according to manufacturer specifications.

Device for soil sample collection:	
Hand auger	NA
Soil stem auger	NA
Hollow flight auger	NA
Push core	NA
Back hoe	NA
Other (please specify)	NA

Number of days sampling:	
Soil	NA
Water	1

Quality Assurance / Quality Control (QA/QC) Data Assessment Report



4 DECONTAMINATION PROCEDURES

Prior to sampling and between sample collections, all equipment used for sampling was decontaminated using the following industry accepted protocols:

- Wash and scrub as necessary in tap water.
- Rinse and scrub in phosphate-free detergent (decon 90, Extran or similar).
- Rinse with distilled water.
- Repeat if necessary.

Where possible, dedicated equipment was used to prevent cross-contamination.

5 SAMPLE HANDLING AND TRANSIT

Were the samples kept chilled at all times following sample collection?	YES
Were samples appropriately handled between the field and the laboratory?	YES
Were the samples in appropriate custody between the field and the laboratory?	YES
Were the samples received in good condition at the laboratory?	YES

6 FIELD QA/QC SAMPLES

Number of samples collected:	Soil: 0
	Water: 4

Number of sampled analysed:	Soil: 0
	Water: 4

Field QA/QC samples:	No.	Percentage of primary samples / comments
Intra-laboratory soil duplicates analysed:	NA	-
Intra-laboratory water duplicates analysed:	2	100%
Rinsate / wash blanks analysed:	1	1 per sampling event
Trip blanks analysed:	1	0%
Field blanks analysed	0	0 per groundwater sampling event
Trip spikes analysed:	0	0 per groundwater sampling event

- | | |
|--|------------------------|
| • Were laboratory prepared sample jars used for sample collection? | YES |
| • Were the Relative Percent Differences (RDPs) for field sample duplicates within acceptable control limits? (see tables A1, A2) | NO ¹
YES |
| • Were the trip and field blanks free of contamination? (see table B) | YES |
| • Were the rinsates free of contamination? (see table C) | YES ² |
| • Were trip spike percentage within acceptable between 70 - 130%? (see table D) | NA |



Comments:

	Range	Acceptable Range
Intra-laboratory duplicate	0% - 100%	Metals

1. An intra-laboratory duplicate pair analysed had an RDP in excess of 50%. The variation in concentrations between the primary and secondary sample are attributed to the the low concentrations of metals detected that were close to the detection limits of the laboratory.
2. Small amounts of copper were detected in rinsate samples. Not assessed to have been likely to significantly alter reported levels from cross contamination.

7 LABORATORY QA/QC

The laboratory's internal QA/QC measures included laboratory / reagent blanks, laboratory control samples, matrix spikes, matrix spike duplicates, laboratory duplicates and surrogate spikes.

- Was a NATA registered laboratory used to perform the analysis?
- Were NATA accredited tests used to perform the tests?
- Were the laboratory reports signed by an appropriate person?
- Were appropriate limits of reading reported?
- Was the NATA Seal on the reports?

Yes	No	Comment
√		
√		
√		
√		
√		

- Were the matrix spike recoveries within control limits?
 - Organics (60% to 120%)
 - Inorganics (various, see laboratory quality control reports)
- Were the RDPs for the laboratory spike duplicates within acceptable limits?
- Were the RDPs for laboratory duplicates within acceptable limits?
- Were the surrogate recoveries within control limits?
- Were the laboratory / reagent blanks free of contamination?

Yes	No	Comment
NA		
√		
NA		
√		
√		
√		

8 DATA USABILITY

The data collected for this investigation is considered usable. Overall the QA/QC procedures adopted in the field and by the laboratory are considered to indicate the results of the chemical analysis reported by the laboratory reasonably represent the concentrations of substances within the stated matrix on the site for comparison with the site criteria.

TABLE A1
DUPLICATE RELATIVE PERCENT DIFFERENCES (RPDs) - METALS



Sample Description			Analysis Results						
Sample ID	Date Field Sampling	Metals (mg/kg)							
		Aluminium	Barium	Boron	Magnesium	Potassium	Sodium	Strontium	
Primary Sample	BY1	25/05/2006	0.03	0.0033	3.9	1200	420	10000	6.8
Duplicate Sample	BY2	25/05/2006	0.01	0.0027	4	1200	450	10000	6.7
<i>RDP</i>			<i>100.0%</i>	<i>20.0%</i>	<i>-2.5%</i>	<i>0.0%</i>	<i>-6.9%</i>	<i>0.0%</i>	<i>1.5%</i>
Primary Sample	BY3	25/05/2006	0.01	0.0033	4.2	1300	450	11000	7.4
Duplicate Sample	BY4	25/05/2006	0.03	0.0034	4.2	1200	430	10000	6.9
<i>RDP</i>			<i>-100.0%</i>	<i>-3.0%</i>	<i>0.0%</i>	<i>8.0%</i>	<i>4.5%</i>	<i>0.0%</i>	<i>7.0%</i>
NOTES: RDP = Relative Percent Difference Where less than values are reported (<) half of the reported value has been assumed									

TABLE A2
DUPLICATE RELATIVE PERCENT DIFFERENCES (RPDs) - TPH/BTEX



Sample Description			Analysis Results													
Sample ID	Date Field Sampling		TSS (mg/L)	TDS (g/L)	Carbonate (CO ₃)(mg/L)	Bicarbonate (HCO ₃)(mg/L)	Bromide (mg/L)	Fluoride (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Total Nitrogen (ug.N/L)	Ammonia (ug.N/L)	Total Phosphorus (ug.P/L)	Silicate (ug.Si/L)	Sulphate (as SO ₄ 2-)(mg/L)	Oil and Grease (mg/L)
Primary Sample	BY1	25/06/2006	2	36	<1	150	82.4	1.7	400	21000	110	8	17	27	2800	<5
Duplicate Sample	BY2	25/06/2006	2	35	<1	150	80.8	0.9	400	21000	100	8	18	26	2800	<5
<i>RDP</i>			0.0%	2.8%	-	0.0%	2.0%	61.5%	0.0%	0.0%	9.5%	0.0%	-5.7%	3.8%	0.0%	-
Primary Sample	BY3	25/06/2006	2	36	<1	150	83.6	0.9	420	20000	100	8	15	27	2800	<5
Duplicate Sample	BY4	25/06/2006	2	36	<1	150	79.7	0.9	420	20000	100	8	15	25	2800	<5
<i>RDP</i>			0.0%	0.0%	-	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	-
<p>NOTES: RDP = Relative Percent Difference Where less than values are reported (<) half of the reported value has been assumed</p>																

TABLE C
RINSATE ANALYSIS RESULTS



Sample Description	Sample ID	Rinsate
	Date Field Sampling	2/03/2006
	Lab Batch Reference	EP0600496-039
Metals		
Arsenic	ug/L	<1
Cadmium		<0.1
Chromium		<1
Copper		0.009
Lead		<1
Nickel		<1
Zinc		<5
Mercury		<0.1



APPENDIX D

Laboratory Analysis Results

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MICROSERVE LABORATORY PTY LTD
ABN 44 066 016 199
NATA Accreditation No. 10642

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Perth WA 6000

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WATER REPORT

360 Environmental
1 Altona Street
West Perth WA 6005

Date Collected 25/5/06
Date Received 26/5/06
Date Tested 26/5/06

David Proctor

Project Reference Nicholson Road
Monitoring
Project Number 155

Cooling Tower ()	Recreational ()	Effluent ()
Drinking Supply ()	Swimming Pool ()	Other (x)
Chlorinated ()	Non-chlorinated ()	

Lab No.	0616071W	0616072W	0616073W	0616074W	
Sample Details					
-Source	BY01	BY02	BY03	BY04	
-Site					
Appearance	Clear; colourless; sediment	Clear; colourless; sediment	Clear; colourless; sediment	Clear; colourless; sediment	
TEST	RESULT	RESULT	RESULT	RESULT	METHOD
Heterotrophic Plate Count					
at 21°C CFU per mL	8*	6*	60	12*	MMM 4.2.4.1W
at 37°C CFU per mL	30	26	56	18*	MMM 4.2.4.1W
Carbonate, CO ₃ mg/L	< 1	< 1	< 1	< 1	MCM 6.1.4.22
Bicarbonate, HCO ₃ mg/L	150	150	150	150	MCM 6.1.4.22

Laboratory Comments:

The test results relate specifically to the samples as received in the laboratory.

< denotes less than > denotes greater than

*This count is outside the standard measurement of certainty.

Ian Ross B.Sc.
Laboratory Manager, Microbiology
30/5/06

Peter Bamford B.Sc.
Laboratory Manager, Chemistry
30/5/06





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Client: 360 Environmental, David Procter
Address: First Floor, 1 Altona St, West Perth, WA 6005

Date of Issue: 30/6/2006
Reference: MIS 06-14

WATER QUALITY DATA

METHOD SAMPLE CODE	APHA 2540D TSS * mg/L	APHA 2540C TDS g/L	ICP001 Al mg/L	ICP001 B mg/L	ICP001 Ba mg/L	ICP001 Ca mg/L	ICP001 K mg/L	ICP001 Mg mg/L	ICP001 Na mg/L	ICP001 Sr mg/L	5030 CHLORIDE mg/L	5050 SO4 mg/L	2300 SILICATE µg-Si/L	2000 AMMONIA µg-N/L	4700 TOTAL-P µg-P/L	2700 TOTAL-N µg-N/L	
Reporting Limit	<1	<0.05	<0.01	<0.003	<0.0004	<0.001	<0.05	<0.005	<0.05	<0.001	<1	<1	<2	<3	<5	<50	
File	060526	060530	06060103		06060103		06060103		06060103		06060603	06060603	06060602	06062302		06062902	
BY01	25/5/06	2	36	0.03	3.9	0.0033	400	420	1200	10000	6.8	21000	2800	27	8	17	110
BY02	25/5/06	2	35	0.01	4.0	0.0027	400	450	1200	10000	6.7	21000	2800	26	8	18	100
BY03	25/5/06	2	36	<0.01	4.2	0.0033	420	450	1300	11000	7.4	20000	2800	27	6	15	100
BY04	25/5/06	2	36	0.03	4.2	0.0034	420	430	1200	10000	6.9	20000	2800	25	6	15	100

Note: *This testing is outside the terms of NATA accreditation

Signatory: *J. Ward*
Date: 30/6/06



CERTIFICATE OF ANALYSIS

<i>Client</i>	: 360 ENVIRONMENTAL PTY LTD	<i>Laboratory</i>	: ALS Environmental Perth	<i>Page</i>	: 1 of 5
<i>Contact</i>	: MR DAVID PROCTER	<i>Contact</i>	: Shaun Crabb	<i>Work Order</i>	: EP0601257
<i>Address</i>	: P O BOX 14 WEST PERTH WA AUSTRALIA 6872	<i>Address</i>	: 10 Hod Way Malaga WA Australia 6090		
<i>E-mail</i>	: davidprocter@360environmental.com.au	<i>E-mail</i>	: Shaun.Crabb@alsenviro.com		
<i>Telephone</i>	: 08 9321 0420	<i>Telephone</i>	: 61-8-9209-7655		
<i>Facsimile</i>	: 08 9226 0739	<i>Facsimile</i>	: 61-8-9209-7600		
<i>Project</i>	: 155	<i>Quote number</i>	: PE-070-05 BQ	<i>Date received</i>	: 29 May 2006
<i>Order number</i>	: - Not provided -			<i>Date issued</i>	: 6 Jun 2006
<i>C-O-C number</i>	: 155-250506-1			<i>No. of samples</i>	- Received : 6
<i>Site</i>	: Nicholson Road				Analysed : 6

ALSE - Excellence in Analytical Testing



NATA Accredited Laboratory
825

This document is issued in
accordance with NATA's
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatory</i>	<i>Position</i>	<i>Department</i>
Celine Conceicao	Spectroscopist	Inorganics - NATA 825 (10911 - Sydney)
Sarah Millington	Senior Inorganic Chemist	Inorganics - NATA 825 (10911 - Sydney)
Shaun Crabb	Laboratory Manager	Perth Inorganics - NATA 825 (15847 - Perth)
Steven McGrath	Senior Chemist	Perth Organics - NATA 825 (15847 - Perth)

Comments

This report for the ALSE reference EP0601257 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

1 Analytical results for samples submitted

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insufficient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

1 Surrogate control limits

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Specific comments for Work Order **EP0601257**

Positive Copper results for "Rinsate" sample confirmed by redigestion and reanalysis.

Page Number : 3 of 5
 Client : 360 ENVIRONMENTAL PTY LTD
 Work Order : EP0601257



Analytical Results

				Client Sample ID :	BY01	BY02	BY03	BY04	Rinsate
				Sample Matrix Type / Description :	WATER	WATER	WATER	WATER	WATER
				Sample Date / Time :	25 May 2006 15:00	25 May 2006 15:00	25 May 2006 15:00	25 May 2006 15:00	25 May 2006 15:00
				Laboratory Sample ID :	EP0601257-001	EP0601257-002	EP0601257-003	EP0601257-004	EP0601257-005
Analyte	CAS number	LOR	Units						
EG020F: Dissolved Metals by ICP-MS									
Bromine	7726-95-6	0.1	mg/L	82.4	80.8	83.6	79.7	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L	----	----	----	----	----	<0.001
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	----	----	<0.0001
Chromium	7440-47-3	0.001	mg/L	----	----	----	----	----	<0.001
Copper	7440-50-8	0.001	mg/L	----	----	----	----	----	0.009
Lead	7439-92-1	0.001	mg/L	----	----	----	----	----	<0.001
Nickel	7440-02-0	0.001	mg/L	----	----	----	----	----	<0.001
Zinc	7440-66-6	0.005	mg/L	----	----	----	----	----	<0.005
EG035T: Total Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	----	----	----	----	----	<0.0001
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	1.7	0.9	0.9	0.9	----	----
EP020: Oil and Grease (O&G)									
Oil & Grease		5	mg/L	<5	<5	<5	<5	----	----

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 Client : 360 ENVIRONMENTAL PTY LTD
 Work Order : EP0601257



Analytical Results

Client Sample ID : **Tripblank**
 Sample Matrix Type / Description : WATER
 Sample Date / Time : 25 May 2006 15:00
 Laboratory Sample ID : EP0601257-006

Analyte	CAS number	LOR	Units	EP0601257-006				
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction		20	µg/L	<20				
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	92.5				
Toluene-D8	2037-26-5	0.1	%	89.1				
4-Bromofluorobenzene	460-00-4	0.1	%	80.8				

Page Number : 5 of 5
Client : 360 ENVIRONMENTAL PTY LTD
Work Order : EP0601257



Surrogate Control Limits

Matrix Type: WATER - Surrogate Control Limits

Surrogate Control Limits

Method name	Analyte name	Lower Limit	Upper Limit
EP080: TPH Volatiles/BTEX			
EP080S: TPH(V)/BTEX Surrogates	1,2-Dichloroethane-D4	70.0	126
	Toluene-D8	71.2	128
	4-Bromofluorobenzene	70.4	130