



HITCHCOCK ROAD SAND EXTRACTION AND REHABILITATION PROJECT MAROOTA

ANNUAL ENVIRONMENTAL MANAGEMENT REPORT 2008 - 2009



PF Formation

HITCHCOCK ROAD
Sand Extraction and Rehabilitation Project Maroota

**ANNUAL ENVIRONMENTAL MANAGEMENT
REPORT 2008-2009**

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Hitchcock Road sand extraction and rehabilitation project

Annual Environmental Management Report 2008-2009

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Terms and abbreviations

Term:	Definition
AEMR	Annual Environmental Management Report
AHD	Australian Height Datum. The standard reference level used to express the relative elevation of various features. A height given in metres AHD is essentially the height above sea level.
Airshed	Lower atmosphere within a defined geographic area.
Ambient	The background level at a specific location, being a composite of all sources.
Annual Average Daily Traffic	Annual average daily traffic volume representing the total traffic in both directions at a specified location calculated from mechanically obtained axle counts.
Annual Exceedance Probability (AEP)	The probability of a flood event exceeding a nominated level in a year. A one percent AEP is the probability of an event exceeding a nominated level in 100 years.
Aquifer	Geologic formation, group of formations, or part of a formation capable of transmitting and yielding economic quantities of water.
Archaeology	The scientific study of human history, particularly the relics and cultural remains of the distant past.
ARI	Average Recurrence Interval-average or expected period between exceedance of a flood.
Background Noise Level	The ambient sound pressure noise level in the absence of the sound under investigation exceeded for 90 percent of the measurement period. Normally equated to the average minimum A-weighted sound pressure level.
Batter	The side slope of walls, embankments and cuttings or the degree of such slope, usually expressed as a ratio of horizontal distance to one vertical height.
Bore	A cylindrical drill hole sunk into the ground from which water is pumped for use or monitoring.
Buffer	A physical barrier, structure or width of land which encloses, partially encloses or defines a particular environment. It serves to minimise the impacts of non-desirable external influences on the adjoining environment.
Bund Wall	A wall erected to prevent the escape of various emissions into the environment (liquids, noise or views).
Catchment	The area drained by a stream or body of water or the area of land from which water is collected.
Clay	Very fine grained sediment, often defined as having a particle size less than 2 microns (0.002mm) in diameter.
Compaction	The process of compressing individual grains in a soil or sediment in response to pressure.

Term:	Definition
Conservation	The management of resources in a way that will benefit both present and future generations.
Contaminant	Any physical, chemical, biological or radiological substance or matter in water or soil that is not of natural origin.
Contamination	The degradation of the natural environment as a result of human activities.
Council	The Hills Shire Council.
Day	The period from 7.00am to 6.00pm on Monday to Saturday and 8.00am to 6.00pm on Sunday and public holidays.
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DECC	NSW Department of Environment and Climate Change.
Decibel	A scale unit used in the comparison of powers and levels of sound energy. The number of decibels is ten times the logarithm to the base of ten of the ratio of the powers.
Department	NSW Department of Planning.
Director-General	Director-General of the Department of Planning or delegate.
DPI	NSW Department of Primary Industries
DWE	NSW Department of Water and Energy
EA	Environmental Assessment of the project entitled <i>Hitchcock Road Sand Extraction and Rehabilitation Project Environmental Assessment and Appendices</i> (3 volumes) dated November 2007, prepared by DFA Consultants, including the response to submissions and Preferred Project Report.
Ecology	The relationship between living things and their environment.
Ecologically Sustainable Development	Using, conserving and enhancing the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
Ecosystem	A functional unit of energy transfer and nutrient cycling in a given place. It includes all relationships within the biotic community and between the biotic components of the system.
Emission	Discharge of a substance to the environment.
Environment	A term for all the conditions (physical, chemical, biological and social) in which an organism or group of organisms, including humans, exists.
Environmental Assessment (EA)	A formal description of a project and an assessment of its likely impact on the physical, social and economic environment. It includes an evaluation of alternatives and an overall justification of the project. The EA is used as a vehicle to facilitate public comment and as the basis for analysing the project with respect to granting approval under relevant legislation.

Term:	Definition
Environment Protection Licence	A licence that allows pollution of the environment under controlled conditions regulated by the Department of Environment and Climate Change.
EMP	Environmental Management Plan
EP&A Act	<i>Environmental Planning and Assessment Act 1979.</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000.</i>
EPL	Environmental Protection Licence issued under the <i>Protection of the Environment Operations Act 1997.</i>
Equivalent Continuous Sound Level (LAeq)	The constant sound level which when operating over the same time interval as a fluctuating sound over an extended time, is equivalent to the same sound energy.
Erosion	The wearing away of the land surface by the action of water, wind and ice.
Evening	The period from 6.00pm to 10.00pm.
Excavate	Dig into natural material and remove using specialist machinery.
Extraction	A term referring to the removal of material from the earth synonymous with quarrying.
Extraction area	The land described as the extraction area in Appendix 1 of the Project Approval.
Evapotranspiration	Loss of water from a land mass through transpiration from plants and evaporation from the soil.
Fauna	All animals including birds, reptiles, marsupials and fish.
Flora	All plants
Frequency	Similar to the pitch of a musical note in sound pressure fluctuations of cycles per second (Hertz). Most sounds comprise a composite of frequencies of varying sound pressure levels in the range of 20 Hertz to 20,000 Hertz.
Friable	Easily crumbled.
Front-end loader	Machine used to lift and place soil, earth, rocks and other materials within an extraction site or to load products into trucks.
Gradient	Rate of change of a given variable with distance, such as temperature or elevation.
g/m ² /month	grams per square metre per month
Greenhouse effect	Changes in climate that could occur due to increases in atmospheric concentrations of certain gases.
Groundwater	Subsurface water contained within the saturated zone.
Hawkesbury Sandstone	Prominent cliff-forming sandstone occurring across the Sydney basin.

Term:	Definition
Head (hydraulic head)	Energy contained in a water mass produced by elevation, pressure or velocity.
Heritage	Things of value which are inherited from the past.
Hydrocarbon	Any organic compound, gaseous, liquid or solid, consisting only of carbon and hydrogen.
Hydrogeology	The study of subsurface water in its geological context.
Impact	The effect of human-induced action on the environment.
Infiltration	The process of surface water soaking into the soil.
Infrastructure	Supporting installations and services supplying the needs of a project.
Introduced species	Plants and animals not native to Australia and known or thought to have been brought here by humans.
Land	Land means the whole of a lot or contiguous lots owned by the same landowner in a current plan registered at the Land Titles Office at the date of the approval.
Landform	A specific feature of the landscape or the general shape of the land.
$\mu\text{g}/\text{m}^3$	micrograms per cubic metre
$\mu\text{S}/\text{cm}$	microsiemens per centimetre
micron	Unit of measure-one millionth of a metre.
mg/L	milligrams per litre
Mitigation measures	Measures put in place to reduce an impact.
Modelling	Use of mathematical equations to simulate and predict real events and processes.
Monitoring	Regular measurement of components of the environment to understand their condition and establish if necessary standards are being met.
Minister	NSW Minister for Planning or delegate.
Night	The period from 10.00pm to 7.00am on Monday to Saturday and 10.00pm to 8.00am on Sunday and public holidays/
Observation well	A well constructed or utilised for the purpose of observing groundwater parameters such as water levels, pressure changes and water quality.
Palaeochannel	An ancient river bed, often filled with more recent sediments.
Perched water	Unconfined groundwater separated from an underlying body of groundwater by an unsaturated zone.
pH	A measure of acidity or alkalinity of a solution, numerically equal to 7 for neutral solution, increasing with increasing alkalinity and decreasing with increasing acidity. Originally stood for the words potential of hydrogen.

Term:	Definition
Piezometer	A pipe in which the elevation of the water level or potentiometric surface can be determined.
Privately owned land	Land not owned by a public agency or the proponent or its related companies.
Preferred Project Report	The proponent's Preferred Project Report dated September 2008 prepared by DFA Consultants as modified in the Proponent's email to the Department of Planning on 18 November 2008.
Process plant	Equipment used to clean and separate sand into various sizes.
Project	The development as described in the EA.
Proponent	PF Formation or its successors in title.
Recharge	Addition of water to the zone of saturation; also the amount of water added.
Recovery	The difference between the observed water level during the recovery period after cessation of pumping and the water level measured immediately before pumping stopped.
Receptor	An environmental modelling term used to describe a map reference point where the impact is predicted. A sensitive receptor is a home, work place, school or other place where people spend some time. An elevated receptor is a point above ground level.
Rehabilitation	Preparation of a final landform following extraction and its stabilisation with vegetation.
Remnant vegetation	Native vegetation remaining after widespread clearing has taken place.
Resource	Potentially usable material in a defined area that can be economically extracted.
Response to Submissions	The proponent's response to issues raised in submissions dated March 2008 prepared by DFA Consultants and subsequent submissions to the Department of Planning dated 27 August 2008.
RL	Reduced level, usually in metres to an arbitrary datum.
RTA	NSW Roads and Traffic Authority
Run-off	The proportion of precipitation discharged through surface water systems.
Sand	Sediment comprising particles ranging between 0.063mm and 2mm.
Sandstone	A fine grained rock of sedimentary origin composed primarily of sand-sized particles (0.06 to 2 mm).
Sedimentation basin	An area where runoff is ponded to allow sediment to be deposited. The longer the period that the runoff is held, the smaller the size of the sediment deposited. Such basins have to be regularly cleaned.

Term:	Definition
SHTW	Sydney Hinterland Transition Woodland
Silt	Sediment comprising most particles between 0.004mm and 0.063mm.
Species	Taxonomic grouping of organisms that are able to interbreed with each other but not with other species.
Stakeholder	An individual or group with an interest in the proposal.
Statement of Commitments	The proponent's commitments in Appendix 3 of the Project Approval.
Stockpile	Mound used to store material.
Stormwater	Rainwater which runs off catchments following rain events. The untreated water is carried into creeks, rivers and lakes.
Strategy A, Strategy B	The alternative rehabilitation proposals described in the Preferred Project Report.
Terrestrial	Relating to the land as distinct from air or water.
Tertiary	Geologic time at the beginning of the Cainozoic era, 65 to 2 million years ago, after the Cretaceous and before the Quaternary.
Topography	The physical relief and contours of the area.
Topsoil	The surface layer of a soil profile containing most of the organic material and viable life forms and seeds.
Total Dissolved Solids (TDS)	The dissolved mineral content of groundwater, commonly expressed in milligrams/Litre.
Total Suspended Solids	A measure of suspended solids concentrations in a water body and expressed in terms of mass per unit of volume.
Triassic	The earliest of the three periods that constitute the Mesozoic Era. Approximately between 230 and 180 million years before present.
TSC Act	NSW Threatened Species Conservation Act.
Turbidity	A measure of light penetration through a water column containing particles of matter in suspension.
Underflow	The volume of groundwater that flows through a cross sectional area of an aquifer. It depends on permeability and the prevailing gradient.
Unsaturated zone	That part of an aquifer between the land surface and water table.
Vegetation Offset	The conservation and enhancement program described in the Preferred Project Report to occur on the land shown on the plan in Appendix 5 of the Project Approval.
VENM	Virgin Excavated Natural Material as defined in the <i>Protection of the Environment Operations Act 1997</i> .

Term:	Definition
Wash plant	Equipment designed to wash unwanted sized materials from the product.
Water quality	Degree or lack of contamination.
Water table	The surface of saturation in an unconfined aquifer at which the pressure of the water is equal to that of the atmosphere.
Well	A hole sunk into the ground and completed for the abstraction or injection of water or for water observation purposes. Generally synonymous with bore.
1 in 100 Year Flood Level	The flood which occurs on average once every 100 years. Also known as the 100 year Average Recurrence Interval of a flood.

*Chapter One***INTRODUCTION**

Development of the Hitchcock Road site for sand extraction and associated rehabilitation has been undertaken in compliance with orders of the NSW Land and Environment Court (10064 of 1998) since 1999. These required that the proponent (PF Formation) submits an Environmental Management Plan (EMP) every twelve months from the endorsed date of consent in order to satisfy Council (Baulkham Hills Shire Council now the Hills Shire Council) concerning the overall performance and management of site operations. Audits responding to the requirements of the relevant Court orders have been prepared and submitted in August each year covering the following issues:

- dust generation;
- noise compliance;
- ground and surface water management;
- erosion and sediment controls;
- flora and fauna management;
- rehabilitation;
- social impact management; and
- compliance with the requirements of Council DCP 16-Extractive Industries.

There is therefore a ten year data set (sometimes longer in the case of earlier approvals) relating to these issues.

Following a further DA and associated EA under Part 3A of the Environmental Planning and Assessment Act, the present development was approved by the Minister for Planning on 3 February 2009. The conditions attached to the approval required, among other things, the preparation of five management plans/monitoring programs:

- Environmental Strategy;
- Noise Management Plan;
- Air Quality Monitoring Program;
- Water Management Plan;
- Landscape Management Plan.

The first four were to be prepared in association with the Department of Environment and Climate Change (DECC) and submitted to the Department of Planning (DoP) three months from the date of approval. These were approved by the Director-General of the Department of Planning on 8 July 2009. The Landscape Management Plan was required to be prepared by persons approved by the Director-General, in consultation with DECC, and submitted within six months of the date of Project Approval. This has been prepared and awaits approval.

Each of these documents sets out the various monitoring programs required to comply with the requirements of the approval conditions. The monitoring results are to be summarised in an annual report known as the Annual Environmental Management Report (AEMP). This is to be submitted 12 months from the date of approval and every year thereafter to the Director-General, relevant agencies and the Community Consultative Committee (CCC), the new name for the existing Liaison and Review Committee. The report will:

- identify the standards and performance measures that apply to the project;
- describe the works that will be carried out in the next 12 months;
- include a summary of the complaints received during the past year and compare this to complaints received in previous years;
- include a summary of the monitoring results for the project during the past year;
- include an analysis of these results against the relevant:
 - impact assessment criteria/limits;
 - monitoring results from previous years; and
 - predictions in the EA;
- identify any trends in the monitoring results over the life of the project;
- identify any non-compliance during the previous year; and
- describe what actions were, or are being, taken to ensure compliance.

The report will be audited by an independent specialist within 12 months of the date of approval and every three years thereafter. The audit will:

- be conducted by a suitably qualified, experienced and independent person(s) whose appointment has been approved by the Director-General;
- include consultation with the relevant agencies;
- assess the environmental performance of the project and its effects on the surrounding environment;
- assess whether the project is complying with the relevant standards, performance measures and statutory requirements; and
- review the adequacy of any strategy/program required under this approval and, if necessary, recommend measures or actions to improve the environmental performance of the project and/or any strategy/plan/program required under this approval.

The approval requires the completion and submittal of the AEMP 12 months from the date of approval (3 February 2009). This would result in the first AEMP reporting monitoring undertaken over a period of 18 months since the last report, under the previous consent, was issued in August 2008. It was decided therefore to submit the first AEMP in August/September 2009 including 12 months of monitoring and allowing a consistent transition between the two reporting regimes to be achieved. This will allow for easier comparison with the previous ten years of data.

Monitoring continued on the basis of the previous Court consent until the approval of the relevant management plans/monitoring programs on 8 July 2009. Most of the data summarised in the AEMP is therefore based on the requirements of the previous consent. The AEMP to be submitted in August 2010 will therefore provide 12 months of data in compliance with the requirements of the management plans/monitoring programs under the new approval.

The **development sites** referred to in this document relate to all those properties from which sand and other materials are extracted as part of the Hitchcock Road project. They include all those properties subject to the approval conditions applying to the project and those parts of Lot 198 DP752025 where processing of the sand product prior to transport to market takes place.

Sand may also be extracted from Lot 2 DP555184 and Lot 1 DP34599 under the Court consent with the product trucked to the existing slurry plant on Lot 1 DP57096 for transport by pipeline to the process plant on Lot 198 following written agreement between the land owners and PF Formation. Extraction from these lots is not included in the present project approval but the total mass of sand extracted under both consents combined must not exceed the total (400,000 processed tonnes) listed in both approvals.

This report is the first Annual Environmental Management Report under the new approval and contains chapters on the following:

- Project status.
- Air quality.
- Noise management.
- Ground and surface water management.
- Rehabilitation

Discussion of erosion and sediment controls is included in the chapter on ground and surface water management and **Appendix A** provides a table indicating compliance with the requirements of Council DCP 16-Extractive Industries.

The following sections respond to the relevant parts of the approval conditions and the requirements set out in the approved management plans/monitoring programs. Where appropriate, the individual chapters have been amended to include a number of new requirements set out in these documents. The relevant attachments are included at the end of each chapter as appropriate.

A copy of the report has been sent to the Department of Environment and Climate Change and the Hills Shire Council.

*Chapter Two***STATUS OF THE PROJECT**

The court orders imposed a number of requirements on the Hitchcock Road development, which had timing implications. These included the necessity to submit additional data and other material to Council prior to the commencement of activities on the site and the requirement to cease the transportation of material by truck from the site to the central processing plant within a fixed period from the start of operations. A number of dates are therefore of significance.

- The endorsed date of the court orders is 14 July 1998. Submittal of the EMP to Council was therefore no later than 13 July 1999 and every 12 months thereafter.
- The commercial operations at the site started on 20 October 1998.
- Transportation by truck was limited to 18 months from the commencement of commercial operations. The sand slurry transport plant therefore needed to be in operation by the 19 April 2000.

The sand slurry transport plant came into full operation at the beginning of May 2000 following an extended period of testing.

The Minister for Planning approved the current project on 3 February 2009. The Project Approval contains the following administrative conditions:

- Extraction and processing operations may take place until 30 November 2028. PF Formation is required to rehabilitate the site and provide offsets to the satisfaction of the Director-General. The approval will therefore continue to apply in all other respects other than the right to conduct extraction and processing operations until the site has been rehabilitated and the offset provided to a satisfactory standard.
- The quantity of processed material produced at the site, together with material produced at Lot 2 DP555184 and Lot 1 DP34599 (not included in the present development) in accordance with the development consent issued by the Land and Environment Court on 14 July 1998, shall not exceed 400,000 tonnes a year.
- PF Formation may accept material extracted from Lot 2 DP555184 and Lot 1 DP34599 in accordance with the development consent of 14 July 1998 to be transported across the site and to the slurry plant on Lot 1 DP570966 via the slurry pipeline and processed on Lot 198 DP752025. Prior to the start of any processing of extractive material from these activities, PF Formation must demonstrate to the satisfaction of the Director-General that an agreement has been reached with the owners of these lots regarding the proportion of the extraction limit applying to each lot.
- PF Formation must restrict total laden truck movements associated with the project to:
 - 200 per day for combined operations at Maroota;
 - 20 per day for trucks importing VENM to the site; and
 - 10 per day for trucks entering/exiting the site between 06.00 and 07.00 hours.

The site survey plan attached as **Attachment 2A** shows the current status of the development. This is based on photography flown on 15 April 2009. The location of the various lots that make up the site is shown on Figure 2 at **Attachment 2B**.

A total of 238,080 tonnes of processed material was derived from the Hitchcock Road site over the 12 months to June 2009. This is within the limit of 400,000 tonnes of processed material allowed under **Condition No 3.9** of Court Approval No 10064 of 1998 and **Condition 7** of **Schedule 2** for the Hitchcock Road Project Approval.

Changes on the Hitchcock Road site since August 2008

The following major changes have taken place on site since the previous Audit Report:

- Extraction has continued in a northerly direction into Lot 1 DP1091018 on the northern side of Tailings Pond 7. However, following the new approval, extraction in this area has ceased in preference to extraction in Lot 214 DP752039. The crest of the extraction has been graded to control surface runoff and direct it around the area to prevent flow over the top of the excavation wall.
- Backfilling has continued in the north-western corner of Tailings Pond 10 on the northern side of Tailings Pond 7.
- Minor extraction has been undertaken on the south-western side of the slurry plant on Lot 1 DP57096 to create an additional space suitable for stockpiles.
- Extraction has started on Lot 214 DP752039 on the southern side of the main clean water dam.
- Visual bunds have been constructed on the southern side of the new extraction area.
- Topsoil has been stripped and stockpiled on the southern side of the supplementary (unused) clean water dam and towards the bund along the southern boundary.
- The tailings stream currently incorporates Tailings Ponds 5 and 7; Tailings Ponds 9 and 10 are not presently in use.
- Previously capped Tailings Ponds 2 and 8 continued to be used as overburden stockpile areas.
- The supplementary water storage dam on the western side of the main clean water supply dam has not yet been brought into use.

Recent changes to the surface water management system are described in **Chapter 5**.

Activities to be undertaken on site over the following 12 months

Site activities during the next phase of development will focus on the following:

- Continuation of extraction on Lot 214 DP752039 and along the western side of Lot 167 DP752039.
- Extraction in a southerly direction within Lots 1 and 2 DP57096.
- Progressive capping and consolidation of Tailings Ponds 5 and 7.

- Construction of two new tailings ponds in Lot 1 DP1091018, 10A adjacent to the boundary along Old Northern Road and 11 in the centre of the lot adjacent to its boundary with Lot 2 DP233818.
- Continuation of revegetation in the completed areas of Lot 2 DP233818.

These activities will be initiated or continued over the next 12 months and be progressively completed over three years.

There have been no complaints recorded over the past 12 months. This is consistent with previous experience with only one minor complaint being received over the ten year life of operations on the site.

Attachment 2A

SITE SURVEY PLAN

Attachment 2B

LOTS INCLUDED IN THE DEVELOPMENT



Figure 2
LOTS INCLUDED IN THE DEVELOPMENT

— Boundary of the proposed extraction area

Chapter Three

AIR QUALITY

3.1 Introduction

The Project Approval (**Schedule 3 Condition 12**) for the Hitchcock Road development requires the preparation and implementation of an Air Quality Monitoring Program in order to demonstrate that compliance with the relevant air quality criteria listed in the approval has been achieved

The objectives of the tenth annual audit report and first Annual Environmental Management Report on air quality issues are therefore;

- identify the dust deposition criteria nominated in the relevant approval documents and listed in the Noise Management Plan;
- document the results of dust deposition monitoring conducted in the 12 months ending June 2009;
- assess the measured dust deposition levels against the relevant amenity criteria; and
- nominate existing dust deposition monitoring methodology and establish routine measurement procedures.

3.2 Dust impact assessment criteria

The proponent will ensure that dust generated by the project does not cause exceedances of the criteria listed in **Tables 3.1** and **3.2** at any residence or on more than 25 per cent of any privately owned land.

Table 3.1 Impact assessment criteria for particulate matter

Pollutant	Averaging period	Criterion
Total suspended particulate (TSP) matter	Annual	90µg/m ³
Particulate matter < 10µm (PM ₁₀)	Annual	30µg/m ³
	24 hour	50µg/m ³

Table 3.2 Impact assessment criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2g/m ² /month	4g/m ² /month

Notes

Deposited dust is assessed as insoluble solids as defined by Standards Australia 1991 AS 3580.10.1-1991: Methods for Sampling and Analysis of Ambient Air – Determination of Particulates – Deposited Matter – Gravimetric Method

3.3 Dust monitoring

During the reporting period to the end of June 2009, PF Formation maintained a program of continuous monthly dust deposition monitoring. This will remain in compliance with the requirements of the Air Quality Monitoring Program approved by the Director-General of the Department of Planning on 8 July 2009. The locations of the monitoring stations established prior to the present program are shown on **Figure 3.1**. The results from Maroota Public School, Location 2 (Vucko residence) and Location 3 (Jurd residence) are presented in this report. Location 2 has now been amended to include a site adjacent to a house on the western side of Wisemans Ferry Road close to its intersection with Hitchcock Road.

Analysis of the dust composition measurements was carried out independently by Boral Materials Testing and Environmental Services. The analysis procedure was in accordance with AS3580.10.1-1991 *Methods for Sampling and Analysis of Ambient Air Method 10.1: Determination of Particulate Deposited Matter – Gravimetric Method*.

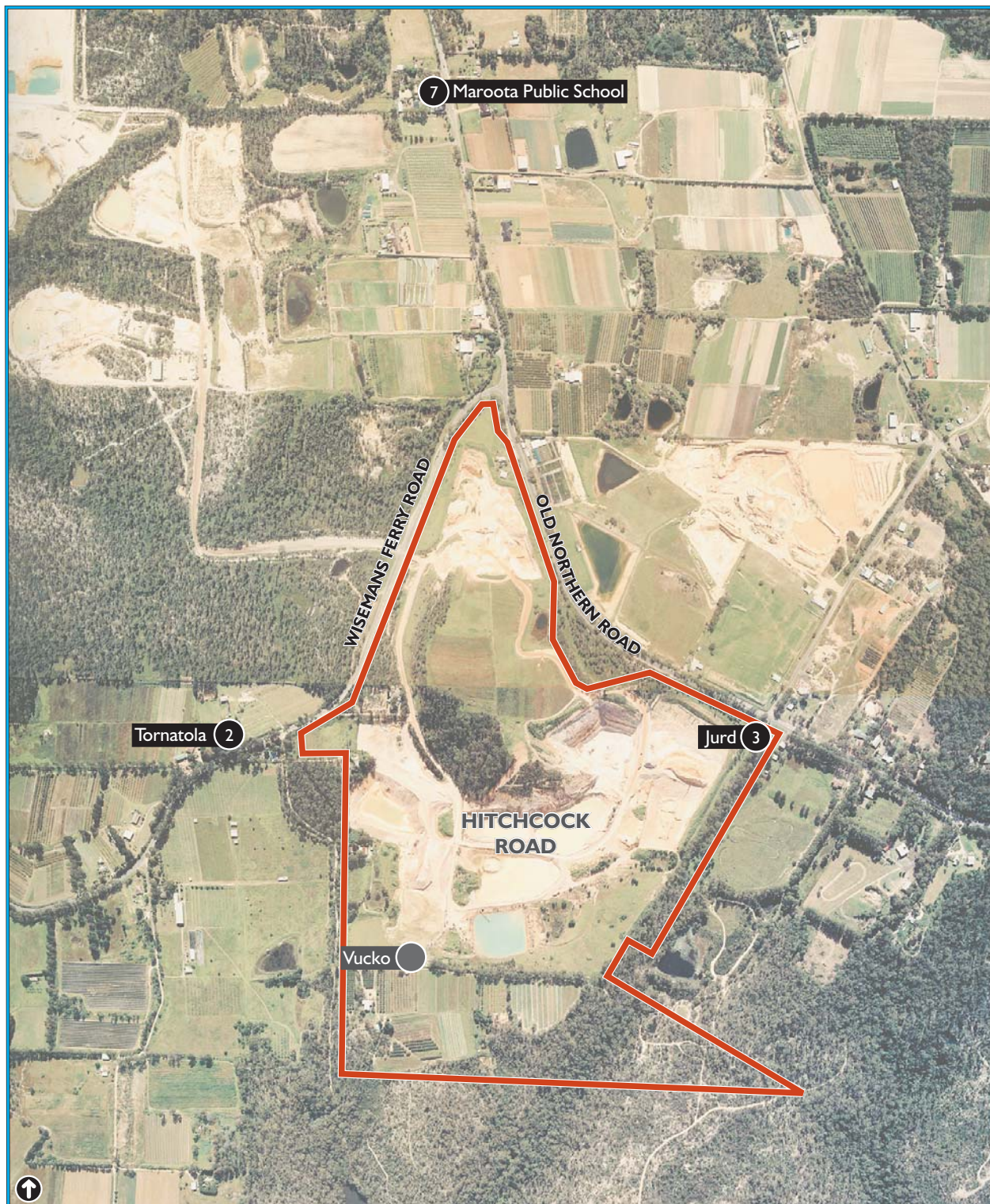
3.4 Monitoring results

A more detailed summary of the monthly dust deposition monitoring results is provided at **Attachment 3A**. The measurement and analysis results are summarised in **Table 3.3**. Location 4 in the Test Reports is not relevant to the Hitchcock Road site.

In general, dust monitoring procedures were guided by the requirements of AS2724.1-1984 *Ambient Air Particulate Matter, Part 1 – Determination of Deposited Matter Expressed as Insoluble Solids, Ash, Combustible Matter, Soluble Solids and Total Solids*.

The following information can be derived from these results in relation to the dust nuisance criterion.

- The insoluble solids portion of deposited dust is expected to be mineral matter with the ash content indicating the level of solid dust particles of inorganic origin likely to be derived from the sand extraction and processing operations.
- The monitoring results are characterised by generally low average levels over extended periods with an occasional spike when high levels are experienced. Exceedances of the nuisance level appear to be more frequent at Location 1 (Maroota Public School). This is at some distance from the Hitchcock Road development and is potentially subject to the influence of other sand extraction operations and occasional horticultural activities. The level and source of the air pollutants at this location are available to the DECC via the monitoring available from the TEOM located adjacent to the school. These should be available to PF Formation sometime in 2009.
- The annual average ambient dust deposition rate (insoluble solids) at Maroota Public School was 4.05 g/m²/month which is marginally above the dust nuisance criterion of 4 g/m²/month. This is higher than last year which was considerably lower than in previous years when higher rates appear to have resulted from activities on other extraction sites and possibly, horticultural operations taking place in the proximity of the school. Apart from two high monthly levels (September and December 2008), deposition rates have been below the criterion for extended periods.



Scale
 0 500 Metres

- Site boundary
- 1 Monitoring locations
- V Monitoring location used until June 2009

Figure 3.1
 AIR QUALITY MONITORING LOCATIONS

Table 3.2 Summary of dust deposition monitoring results (g/m²/month)

Month	Location 1 (Maroota Public School) ¹			Location 2 (Vucko residence)			Location 3 (Jurd residence)		
	Ash	Insoluble solids	Total solids	Ash	Insoluble solids	Total solids	Ash	Insoluble solids	Total solids
2008 June	4.69	5.17	5.75	1.27	1.88	11.50	1.36	2.30	2.39
July	1.05	1.85	2.53	20.19	21.97	23.49	2.06	2.62	3.09
August	1.06	2.02	2.86	1.49	2.27	2.43	1.32	2.57	2.75
September	9.73	10.66	12.50	10.14	12.60	17.14	4.34	5.87	8.89
October	2.15	3.57	6.60	3.15	4.13	6.96	2.27	3.88	7.38
November	1.45	2.10	2.66	1.64	3.06	4.38	1.71	3.62	5.36
December	2.70	6.31	9.81	4.11	5.62	8.00	2.09	3.88	5.96
2009 January	2.34	3.18	6.55	2.91	4.27	6.40	2.37	3.09	5.75
February	2.56	3.77	8.09	5.09	5.32	8.24	2.77	3.10	6.79
March	2.08	3.53	7.40	3.34	5.59	9.28	2.34	3.44	6.06
April	1.86	4.03	7.42	2.43	3.28	4.92	1.38	2.42	3.89
May	1.48	2.39	5.96	1.91	2.50	4.78	0.74	0.89	4.65
Annual Average	2.76	4.05	6.49	4.81	6.04	9.00	2.06	3.14	5.25

Note 1: Continuous recording of deposition rates of air pollutants is also undertaken via TEOM at this location. The results from 01.02.08 to 31.03.09 show that the highest result occurred on 29.09.08 when the rolling 24-hour average PM₁₀ reading reached 35. This high wind day was probably the cause of the high results recorded at all deposit gauges in September 2008.

- The annual average ambient dust deposition rate (insoluble solids) at Location 2 (Vucko's House), which is located adjacent to the southern boundary of the Hitchcock Road operations, was 6.04 g/m²/month which is above the dust nuisance criterion of 4 g/m²/month. This is substantially higher than the average results for the previous 12 months. This residence is located within the extraction area and is close to site operations. The annual average is heavily influenced by two very high monthly results (July and September 2008), when backburning was taking place in an adjacent property, and a number of elevated results in other months.
- The annual average ambient dust deposition rate (insoluble solids) at Location 3 (Jurd residence) was 3.14 g/m²/month which is below the dust nuisance criterion defined by the DECC. This residence is also located close to, but within the boundary, of the extraction site.
- The upper limit of the contribution of the Hitchcock Road site to the annual average deposition rate (insoluble solids) can be estimated from the ash content which ranges between 65 and 79 percent of the portion of insoluble solids at these monitoring sites. (Other sources will be contributing to the total load).
- Dust emissions from operations undertaken on the Hitchcock Road site remain variable with substantial differences between two locations very close to the boundary of the extraction area where one (Vucko residence) was affected by backburning taking place on an adjacent property. Overall, deposition rates have increased over the previous year following a slow decline in previous years. The monitoring location most representative of air quality impacts beyond the site boundary (Jurd residence) shows consistently low rates of deposition with one exception (September 2008).
- PF Formation and Dixon Sand (a neighbouring operator) have an agreement whereby if the rolling 24-hour PM₁₀ average recorded by the TEOM reaches 42.5 µg/m³, PF Formation would be notified. The wind direction would then be assessed and measures to reduce any dust impacts affecting the TEOM readings would be implemented. At no time in the last 12 months have the results derived from the TEOM reached the designated trigger.
- There have been no complaints concerning dust generation over the past year.

3.1 Conclusions

In accordance with the requirements of the Project Approval, PF Formation has implemented a program of dust deposition monitoring. The results of the regular monthly dust deposition monitoring conducted over the past year and analysed externally by Boral Materials Testing and Environmental Services show that deposition rates have risen in comparison with the previous monitoring period. However, these appear to have been influenced by a small number of very high monthly values which are probably the result of specific incidents rather than a consistent increase in dust impacts.

Results at Maroota Public School also show an increase in annual rates over previous years but monthly rates remain variable. Results from the TEOM monitoring station at the school should assist in determining the source(s) of this variability. These are reported to the Department of Environment and Climate Change.

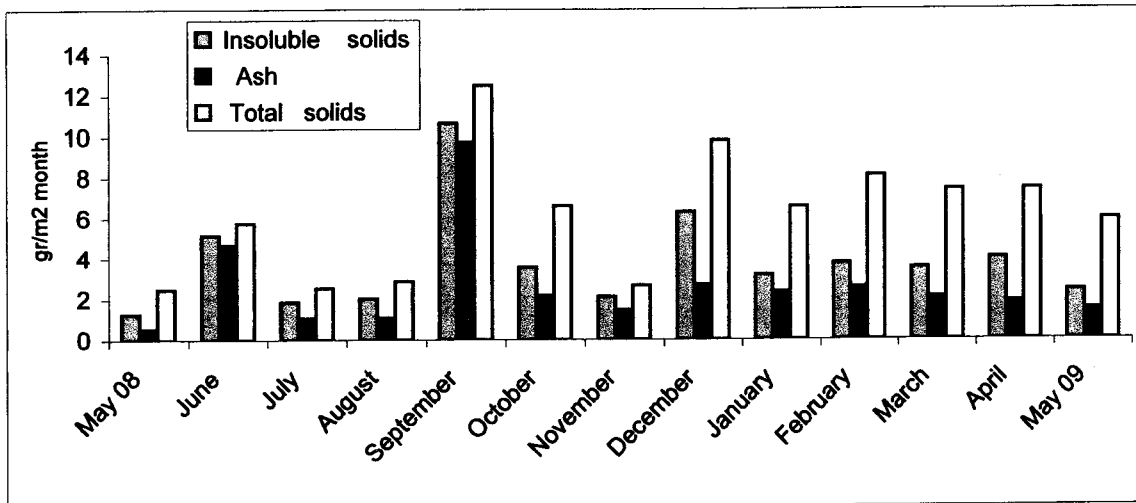
The dust monitoring gauge previously located adjacent to Vucko's house has been moved to one closer to potentially affected local residents. These locations are shown on **Figure 3.1**.

Attachment 3A

**MONTHLY DUST DEPOSITION
MONITORING RESULTS**

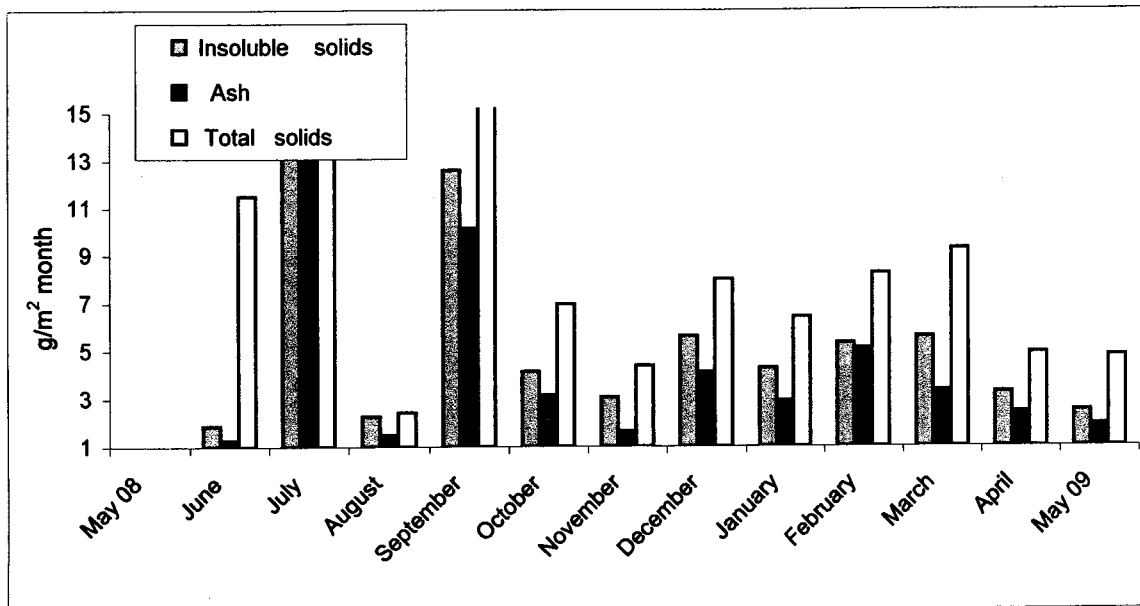
Dust Monitoring
Maroota Site 1
Maroota Public School

	Insoluble solids	Ash	Total solids
May 08	1.25	0.53	2.47
June	5.17	4.69	5.75
July	1.85	1.05	2.53
August	2.02	1.06	2.86
September	10.66	9.73	12.50
October	3.57	2.15	6.60
November	2.10	1.45	2.66
December	6.31	2.70	9.81
January	3.18	2.34	6.55
February	3.77	2.56	8.09
March	3.53	2.08	7.40
April	4.03	1.86	7.42
May 09	2.39	1.48	5.96



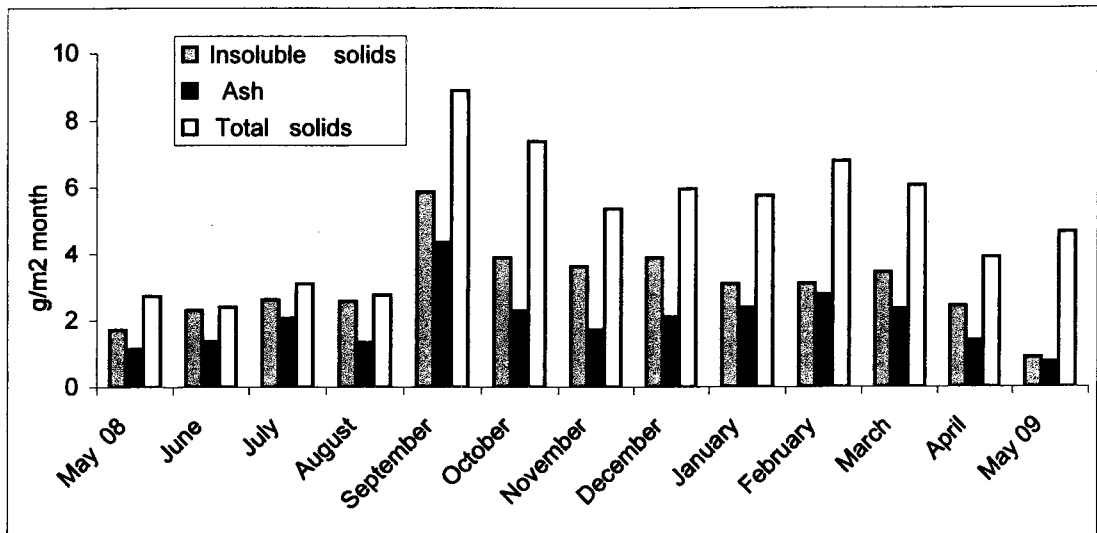
Dust Monitoring
Maroota Site 2
Vucko's House

	Insoluble solids	Ash	Total solids
May 08	0.00	0.00	0.00
June	1.88	1.27	11.50
July	21.97	20.19	23.94
August	2.27	1.49	2.43
September	12.60	10.14	17.14
October	4.13	3.15	6.96
November	3.06	1.64	4.38
December	5.62	4.11	8.00
January	4.27	2.91	6.40
February	5.32	5.09	8.24
March	5.59	3.34	9.28
April	3.28	2.43	4.92
May 09	2.50	1.91	4.78



Dust Monitoring
Maroota Site 3
Jurd's Property

	Insoluble solids	Ash	Total solids
May 08	1.72	1.13	2.72
June	2.30	1.36	2.39
July	2.62	2.06	3.09
August	2.57	1.32	2.75
September	5.87	4.34	8.89
October	3.88	2.27	7.38
November	3.62	1.71	5.36
December	3.88	2.09	5.96
January	3.09	2.37	5.75
February	3.10	2.77	6.79
March	3.44	2.34	6.06
April	2.42	1.38	3.89
May 09	0.89	0.74	4.65



TEST REPORT

CLIENT : P.F.FORMATION

File No:250/08

PROJECT: Gravimetrical Dust Monitoring at Maroota (P.F.Formation) for the month of June 2008

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	83239	83240	83241	83242
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	2.06.08		to	1.07.08

Results :

Insoluble solids g/m ² month :	5.17	1.88	2.30	2.03
Ash g/m ² month :	4.69	1.27	1.36	1.33
Combustible matter g/m ² month :	0.49	0.61	0.94	0.71
Soluble matter g/m ² month :	0.58	9.62	0.10	0.67
Total Solids g/m ² month :	5.75	11.50	2.39	2.71
Volume of liquid in the gauge,mL :	1500	3300	2100	2000

Refer to attached graph.

JOSHUA GRAHAM
File

F.Grima



Approved Signatory F. Grima
Date 31-7-08 Serial No. 70787

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TEST REPORT

CLIENT : P.F.FORMATION

File No:250/08

PROJECT: Gravimetrical Dust Monitoring at Maroota (P.F.Formation) for the month of July 2008

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	84130	84131	84132	84133
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	1.07.08		to	1.08.08

Results :

Insoluble solids g/m ² month :	1.85	21.97	2.62	1.38
Ash g/m ² month :	1.05	20.19	2.06	1.07
Combustible matter g/m ² month :	0.80	1.78	0.56	0.32
Soluble matter g/m ² month :	0.68	1.97	0.47	0.35
Total Solids g/m ² month :	2.53	23.94	3.09	1.73
Volume of liquid in the gauge, mL :	600	1000	700	700

Refer to attached graph.

JOSHUA GRAHAM
File

F.Grima



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Approved Signatory

Date 18-8-08

Serial No. 71150

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TEST REPORT

File No:250/08

CLIENT : P.F.FORMATION

PROJECT: Gravimetric Dust Monitoring at Maroota (P.F.Formation) for the month of August 2008

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

	1	2	3	4
Field No :				
Lab.Sample No :	85105	85106	85107	85108
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	1.08.08		to	1.09.08
Results :				
Insoluble solids g/m ² month :	2.02	2.27	2.57	1.83
Ash g/m ² month :	1.06	1.49	1.32	0.95
Combustible matter g/m ² month :	0.96	0.78	1.25	0.88
Soluble matter g/m ² month :	0.84	0.16	0.18	0.31
Total Solids g/m ² month :	2.86	2.43	2.75	2.14
Volume of liquid in the gauge,mL :	950	1000	900	950

Refer to attached graph.

JOSHUA GRAHAM
File

F.Grima



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Approved Signatory

F. Grima

Date 19-9-08

Serial No. 71996

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Number: 9968

TEST REPORT

CLIENT : P.F.FORMATION

File No:250/08

PROJECT: Gravimetric Dust Monitoring at Maroota (P.F.Formation) for the month of September 2008

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	86211	86212	86213	86214
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	1.09.08	to		1.10.08
Results :				
Insoluble solids g/m ² month :	10.66	12.60	5.87	3.25
Ash g/m ² month :	9.73	10.14	4.34	2.25
Combustible matter g/m ² month :	0.93	2.46	1.53	0.99
Soluble matter g/m ² month :	1.84	4.53	3.02	1.90
Total Solids g/m ² month :	12.50	17.14	8.89	5.15
Volume of liquid in the gauge,mL :	1900	1900	2000	1700

Refer to attached graph.

JOSHUA GRAHAM
File

F.Grima



Approved Signatory F. Grima
Date 22-10-08 Serial No. 72774

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Number: 9968**

TEST REPORT

CLIENT : P.F.FORMATION

File No:250/08

PROJECT: Gravimetrical Dust Monitoring at Maroota (P.F.Formation) for the month of October 2008

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	87186	87187	87188	87189
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	1.10.08		to	3.11.08

Results :

Insoluble solids g/m ² month :	3.57	4.13	3.88	4.84
Ash g/m ² month :	2.15	3.15	2.27	3.79
Combustible matter g/m ² month :	1.42	0.98	1.62	1.06
Soluble matter g/m ² month :	3.02	2.83	3.50	4.08
Total Solids g/m ² month :	6.60	6.96	7.38	8.92
Volume of liquid in the gauge,mL :	1600	1750	1800	1800

Refer to attached graph.

JOSHUA GRAHAM
File

F.Grima

TEST REPORT

CLIENT : P.F.FORMATION

File No:250/08

PROJECT: Gravimetrical Dust Monitoring at Maroota (P.F.Formation) for the month of November 2008

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

	1	2	3	4
Field No :				
Lab.Sample No :	87981	87982	87983	87984
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	3.11.08		to	1.12.08

Results :

Insoluble solids g/m ² month :	2.10	3.06	3.62	3.79
Ash g/m ² month :	1.45	1.64	1.71	2.06
Combustible matter g/m ² month :	0.65	1.43	1.91	1.73
Soluble matter g/m ² month :	0.56	1.31	1.74	1.09
Total Solids g/m ² month :	2.66	4.38	5.36	4.89
Volume of liquid in the gauge,mL :	1450	1450	1400	1600

Refer to attached graph.

JOSHUA GRAHAM
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TEST REPORT

CLIENT : P.F.FORMATION

File No:250/08

PROJECT: Gravimetric Dust Monitoring at Maroota (P.F.Formation) for the month of December 2008

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
 Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	88337	88338	88339	88340
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	1.12.08		to	2.01.09

Results :

Insoluble solids g/m ² month :	6.31	5.62	3.88	2.69
Ash g/m ² month :	2.70	4.11	2.09	1.55
Combustible matter g/m ² month :	3.61	1.50	1.79	1.14
Soluble matter g/m ² month :	3.51	2.38	2.08	1.85
Total Solids g/m ² month :	9.81	8.00	5.96	4.55
Volume of liquid in the gauge,mL :	1800	1900	1900	1780

Refer to attached graph.

JOSHUA GRAHAM
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S.Krishnamoorthy



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 Date 23.1.09 Serial No. 74755

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TEST REPORT

CLIENT : P.F.FORMATION

File No:250/09

PROJECT: Gravimetric Dust Monitoring at Maroota (P.F.Formation) for the month of January 2009

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	89454	89455	89456	89457
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	2.01.09	to		2.02.09
Results :				
Insoluble solids g/m ² month :	3.18	4.27	3.09	2.91
Ash g/m ² month :	2.34	2.91	2.37	2.23
Combustible matter g/m ² month :	0.84	1.36	0.72	0.68
Soluble matter g/m ² month :	3.37	2.13	2.67	3.89
Total Solids g/m ² month :	6.55	6.40	5.75	6.79
Volume of liquid in the gauge,mL :	1250	800	1100	1400

Refer to attached graph.

JOSHUA GRAHAM
File

M.ABDULNEBE

TEST REPORT

CLIENT : P.F.FORMATION

File No:250/09

PROJECT: Gravimetric Dust Monitoring at Maroota (P.F.Formation) for the month of February 2009

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	89931	89932	89933	89934
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	2.02.09		to	2.03.09

Results :

Insoluble solids g/m ² month :	3.77	5.32	3.10	1.68
Ash g/m ² month :	2.56	5.09	2.77	1.17
Combustible matter g/m ² month :	1.21	0.23	0.32	0.51
Soluble matter g/m ² month :	4.32	2.92	3.70	2.57
Total Solids g/m ² month :	8.09	8.24	6.79	4.25
Volume of liquid in the gauge,mL :	3450	3700	3400	3500

Refer to attached graph.

JOSHUA GRAHAM
File


M.ABDULNEBE

Approved Signatory _____

Date 10-03-09 Serial No. 75949

TEST REPORT

CLIENT : P.F.FORMATION

File No:250/09

PROJECT: Gravimetric Dust Monitoring at Maroota (P.F.Formation) for the month of March 2009

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	91400	91401	91402	91403
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	2.03.09		to	1.04.09
Results :				
Insoluble solids g/m ² month :	3.53	5.59	3.44	4.52
Ash g/m ² month :	2.08	3.34	2.34	2.46
Combustible matter g/m ² month :	1.45	2.25	1.10	2.06
Soluble matter g/m ² month :	3.87	3.69	2.62	3.38
Total Solids g/m ² month :	7.40	9.28	6.06	7.91
Volume of liquid in the gauge,mL :	1600	1800	1900	2100

Refer to attached graph.

JOSHUA GRAHAM
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Number: **9968**

TEST REPORT

CLIENT : P.F.FORMATION

File No:250/09

PROJECT: Gravimetric Dust Monitoring at Maroota (P.F.Formation) for the month of April 2009

SAMPLE : Dust

TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	92199	92200	92201	92202
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	1.04.09	to		1.05.09

Results :

Insoluble solids g/m ² month :	4.03	3.28	2.42	2.07
Ash g/m ² month :	1.86	2.43	1.38	1.23
Combustible matter g/m ² month :	2.17	0.85	1.04	0.84
Soluble matter g/m ² month :	3.40	1.65	1.47	0.79
Total Solids g/m ² month :	7.42	4.92	3.89	2.86
Volume of liquid in the gauge,mL :	1900	1700	1500	2100

Refer to attached graph.

JOSHUA GRAHAM
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TEST REPORT

CLIENT : P.F.FORMATION

File No:250/09

PROJECT: Gravimetrical Dust Monitoring at Maroota (P.F.Formation) for the month of May 2009

SAMPLE : Dust


TEST PROCEDURE : AS3580.10.1 - 2003 - Methods for sampling and analysis of ambient air.
Method 10.1 : Determination of particulate Deposited Matter - Gravimetric Method.

Field No :	1	2	3	4
Lab.Sample No :	93009	93010	93011	93012
Location :	Site 1	Site 2	Site 3	Site 4
Date sampled from:	1.05.09	to		1.06.09
Results :				
Insoluble solids g/m ² month :	2.39	2.50	0.89	0.76
Ash g/m ² month :	1.48	1.91	0.74	0.70
Combustible matter g/m ² month :	0.91	0.59	0.15	0.06
Soluble matter g/m ² month :	3.57	2.28	3.76	0.39
Total Solids g/m ² month :	5.96	4.78	4.65	1.15
Volume of liquid in the gauge,mL :	2900	3100	2950	3000

Refer to attached graph.

JOSHUA GRAHAM
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M.ABDULNEBE

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Date 12.06.09 Serial No. 78232

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Page 1 of 1

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Number: 9968

Attachment 3B

SUMMARY OF WEATHER CONDITIONS

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/06/2008	SUNDAY					16.5MM	
2/06/2008	13	16	0-	SE	1026.8	9.5MM	OVERCAST
3/06/2008	13	15	0-5	SSE	1026.2	38MM	SLIGHT-RAIN
4/06/2008	14	15	6-15	S/ESE	1022.4	57MM	RAIN
5/06/2008	13	15	7-30	WSW/SSE	1019.2	6MM	SLIGHT-RAIN
6/06/2008	13	16	0-20	SSW/SSE	1021.2	NIL	OVERCAST
7/06/2008	10	17	0-22	SSW	1023.2	NIL	CLOUDY
8/06/2008	SUNDAY						
9/06/2008	P/H					5MM	SLIGHT-RAIN
10/06/2008	11	18	0-15	SSE/NNW	1026.2	2MM	OVERCAST
11/06/2008	12	21	6-10	N	1022.3	4.5MM	OVERCAST
12/06/2008	11	20	0-15	S/NNE	1020.8	NIL	OVERCAST
13/06/2008	13	17	0-55	NNW/WSW	1014.9	NIL	CLOUDY
14/06/2008	8	17	5-45	SW/WSW	1021.2	NIL	OVERCAST
15/06/2008	SUNDAY					5MM	OVERCAST
16/06/2008	12	16	5-20	SW/ESE	1023.8	3MM	OVERCAST
17/06/2008	13	17	0-10	SW	1024	NIL	OVERCAST
18/06/2008	12	19	0-10	SW	1024.6	NIL	OVERCAST
19/06/2008	12	18	0-5	NE/S	1019.8	7MM	OVERCAST
20/06/2008	13	15	0-5	SE/W	1017.6	NIL	OVERCAST
21/06/2008	9	19	0-10	NNW/W	1018.9	NIL	FINE
22/06/2008	SUNDAY						
23/06/2008	6	17	0-5	E/WSW	1023.4	NIL	FINE
24/06/2008	5	18	0-15	ENE/NNE	1026.7	NIL	FINE
25/06/2008	7	19	0-9	NNE/NNW	1024.3	NIL	FINE
26/06/2008	10	19	5-15	NNW/S	1017.5	NIL	FINE
27/06/2008	4	19	0-5	NW/N	1025.8	NIL	FINE
28/06/2008	4	18	0-5	SE/W	1027.3	NIL	FINE
29/06/2008	SUNDAY						
30/06/2008	11	20	5-45	NW/	1016.2	NIL	FINE

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/07/2008	11	20	0-35	NNW-WNW	1012.1	NIL	FINE
2/07/2008	9	18	0-35	NNW	1014.9	NIL	FINE
3/07/2008	5	20	0-15	WSW-SE	1023.1	NIL	FINE
4/07/2008	4	14	0-20	ESE	1029.2	4MM	OVERCAST
5/07/2008	6	19	0-10	SW	1031	NIL	FINE
6/07/2008	SUNDAY						
7/07/2008	8	18	0-15	NW-NNW	1023.7	3.7MM	CLOUDY
8/07/2008	8	17	0-15	W-SW	1019.3	NIL	CLOUDY
9/07/2008	4	15	0-15	WNW-S	1018	2.5MM	FINE
10/07/2008	6	14	10-35	NW-NNW	1014.6	NIL	FINE
11/07/2008	8	16	20-30	NW-W	1016.5	NIL	FINE
12/07/2008	2	15	0-10	WNW-N	1027.7	NIL	FINE
13/07/2008	SUNDAY						
14/07/2008	9	20	0-15	NNE-NNW	1023.1	NIL	FINE
15/07/2008	7	21	0-15	WNW-NNW	1019.1	NIL	FINE
16/07/2008	6	19	0-15	NNW-SSE	1022.4	NIL	FINE
17/07/2008	6	17	0-10	E-NNW	1019.4	NIL	FINE
18/07/2008	7	19	0-30	NW/W	1009	NIL	FINE
19/07/2008	5	18	0-15	WNW-W	1017.5	NIL	FINE
20/07/2008	SUNDAY						
21/07/2008	10	16	10-40	NW-WNW	1007.6	NIL	FINE
22/07/2008	4	16	0-25	WSW-SSE	1023.6	NIL	FINE
23/07/2008	4	14	0-10	ESE	1031.6	NIL	CLOUDY
24/07/2008	8	12	0-15	SE-E	1031.6	4MM	OVERCAST
25/07/2008	8	14	0-5	SSW-SSE	1022.3	NIL	FINE
26/07/2008	4	14	0-5	SE	1018.7	NIL	FINE
27/07/2008	SUNDAY						
28/07/2008	5	10	0-40	SE-SW	1010.1	9MM	OVERCAST
29/07/2008	6	14	5-20	SSW-SE	1017.2	NIL	OVERCAST
30/07/2008	3	17	0-5	SE-SW	1017.8	NIL	FINE
31/07/2008	4	17	0-10	NNW	1016	NIL	FINE

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/08/2008	14	18	5-35	N-WSW	1005.8	NIL	OVERCAST
2/08/2008	9	18	20-30	NW	1012.4	NIL	FINE
3/08/2008	SUNDAY						
4/08/2008	4	17	0-5	SW-NNW	1020.7	NIL	OVERCAST
5/08/2008	3	16	0-18	WNW	1018.7	NIL	OVERCAST
6/08/2008	7	16	0-10	N-SW	1013.5	3MM	OVERCAST
7/08/2008	6	15	0-10	SW-NNW	1019.9	NIL	OVERCAST
8/08/2008	6	17	0-20	WNW	1017.8	NIL	FINE
9/08/2008	3		0	S	1023.8	NIL	
10/08/2008	SUNDAY					NIL	
11/08/2008	4	16	0-25	NW	1015.8	NIL	FINE
12/08/2008	2	16	0-10	WSW	1021.8	NIL	FINE
13/08/2008	4	19	0-10	NW-WSW	1022.6	NIL	FINE
14/08/2008	2	20	0-25	WNW-NW	1020.2	NIL	FINE
15/08/2008	4	20	0-25	W-NW	1013.2	NIL	FINE
16/08/2008	7	20	0-15	WNW	1111.1	NIL	FINE
17/08/2008	SUNDAY						
18/08/2008	3	16	0-15	ENE-NW	1025.1	NIL	FINE
19/08/2008	3	18	0-15	NW	1025.2	NIL	FINE
20/08/2008	6	19	0-15	NNW	1024.9	NIL	FINE
21/08/2008	8	16	0-15	WNW-SW	1023.4	4MM	FINE
22/08/2008	9	11	0-15	ESE-SSE	1115.4	10MM	SHOWERS
23/08/2008	7	16		W	1020.8	NIL	FINE
24/08/2008	SUNDAY						
25/08/2008	6	16	0-10	ESE-SSE	1030.1	NIL	FINE
26/08/2008	7	23	0-10	N-ESE	1023	NIL	FINE
27/08/2008	7	16	0-5	ESE-SW	1024.3	NIL	FINE
28/08/2008	6	18	0-10	WSW-SW	1024.1	NIL	FINE
29/08/2008	6	19	0-15	WNW-SW	1024.6	NIL	FINE
30/08/2008	6	16	0-20	ENE	1022.7	NIL	FINE
31/08/2008	SUNDAY						

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/09/2008	8	21	0-20	SW-NNW	1023	24MM	FINE
2/09/2008	6	20	0-10	NW-E	1027	NIL	FINE
3/09/2008	7	14	0-10	SE-SW	1028.4	7MM	FINE
4/09/2008	10	14	0-15	E-SE	1033.2	15.5MM	RAIN
5/09/2008	10	14	0-15	SE	1023.6	38MM	RAIN
6/09/2008	9	12	10-25	S-SW	1014.7	24MM	RAIN
7/09/2008	SUNDAY						
8/09/2008	7	18	0-10	E-ENE	1018.7	NIL	FINE
9/09/2008	7	19	0-15	SE	1026.2	NIL	FINE
10/09/2008	5	19	0-15	ENE	1023.5	NIL	FINE
11/09/2008	5	21	0-12	ENE-N	1018.6	NIL	FINE
12/09/2008	8	23	0-20	NNW	1012.6	NIL	FINE
13/09/2008	17		10	NW-E	1014.6	NIL	
14/09/2008	SUNDAY					4.5MM	
15/09/2008	16	27	0-50	NNW	1011.3	NIL	FINE
16/09/2008	11	22	25	WNW	1017.9	NIL	FINE
17/09/2008	8	16	0-5	SSE-NE	1025.9	NIL	FINE
18/09/2008	9	17	0-10	ENE	1021.4	NIL	FINE
19/09/2008	14	28	10-20	ENE	1015.7	NIL	FINE
20/09/2008	18	32	7-35	N-NNW	1010.5	NIL	FINE
21/09/2008	SUNDAY					NIL	
22/09/2008	12	28	5-50	NNW-NW	1011.9	3.5MM	FINE
23/09/2008	17	16	5-20	WSW	1016.7	NIL	FINE
24/09/2008	7	22	0-10	ESE-NE	1029.7	NIL	FINE
25/09/2008	7	21	0-10	ENE-SSE	1031.9	NIL	FINE
26/09/2008	9	25	0-15	N	1025.2	NIL	FINE
27/09/2008	14	30	0-5	NNE-N	1021.6	NIL	FINE
28/09/2008	SUNDAY						
29/09/2008	12	19	0-10	E-SSW	1013.7	NIL	FINE
30/09/2008	10	22	0-12	WE-NWN	1020.9	NIL	FINE

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/10/2008	11	25	0-15	NW	1018.5	NIL	FINE
2/10/2008	18	32	0-15	N-NNW	1017.6	NIL	FINE
3/10/2008	22	32	10-50	NW	1014.9	7.5MM	FINE
4/10/2008	18	22	0-10	WSW	1014.5	NIL	FINE
5/10/2008	SUNDAY					14MM	
6/10/2008	P/H						
7/10/2008	7	23	0-5	SW-W	1015.7	NIL	FINE
8/10/2008	8	22	0-10	WNW	1017.7	NIL	FINE
9/10/2008	7	22	0-12	W-SSW	1027.1	NIL	FINE
10/10/2008	11	24	0-5	NNE-E	1028.4	NIL	FINE
11/10/2008	15	24	0-5	WSW-E	1026	NIL	FINE
12/10/2008	SUNDAY						
13/10/2008	14	28	0-15	NE-NNW	1022.6	NIL	FINE
14/10/2008	17	26	10-10	NW-SW	1019.8	30MM	RAIN
15/10/2008	13	17	0-5	S-ENE	1020.9	NIL	OVERCAST
16/10/2008	10	21	0-10	ESE-E	1025.6	NIL	FINE
17/10/2008	11	26	0-10	ENE-NE	1025	NIL	FINE
18/10/2008	10	27	0-10	NE-NW	1024.7	NIL	FINE
19/10/2008	SUNDAY						
20/10/2008	17	25	0-10	E-SE	1021.8	6MM	OVERCAST
21/10/2008	14	19	0-15	SSE-SW	1020.9	8.5MM	OVERCAST
22/10/2008	10	15	10-55	SW	1020.7	6.5MM	RAIN
23/10/2008	7	16	10-45	S	1025.1	NIL	FINE
24/10/2008	7	21	5-15	S	1020.5	NIL	FINE
25/10/2008	10	26	0-10	NE	1017.3	NIL	FINE
26/10/2008	SUNDAY						
27/10/2008	20	32	5-30	N-NNE	1014.4	NIL	FINE
28/10/2008	18	23	0-15	ESE-NNE	1018.5	3.5MM	FINE
29/10/2008	17	18	0-5	SE	1024	4MM	OVERCAST
30/10/2008	15	26	0-10	SE	1023.9	0.25MM	FINE
31/10/2008	21	35	0-45	NNE-WSW	1011.3	NIL	FINE

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/11/2008	18	26	0-	ESE-	1019.2	NIL	FINE
2/11/2008	SUNDAY						
3/11/2008	17	28	10-25	NW-SW	1011.3	4-5MM	FINE
4/11/2008	16	18	0-15	E-SW	1013.2	NIL	FINE
5/11/2008	14	22	0-15	SE-NNW	1016.6	NIL	OVERCAST
6/11/2008	14	31	6-10	NW	1009.3	NIL	FINE
7/11/2008	14	25	0-5	SE	1015	NIL	FINE
8/11/2008	15	26	0-10	SE-SW	1018.4	NIL	FINE
9/11/2008	SUNDAY						
10/11/2008	16	26	0-10	N-NE	1024.1	NIL	FINE
11/11/2008	13	26	0-5	NE-	1023.5	NIL	FINE
12/11/2008	16	29	0-15	NNW-SSE	1020.5	NIL	FINE
13/11/2008	14	29	0-10	ENE-SSE	1019.6	NIL	FINE
14/11/2008	18	34	0-35	NNE-SW	1013.4	9NN	FINE
15/11/2008	20	26	0-10	NNW	1012.2	NIL	FINE
16/11/2008	SUNDAY						
17/11/2008	14	18	0-5	W-NE	1020.7	NIL	FINE
18/11/2008	14	21	0-15	ENE	1017.5	9MM	OVERCAST
19/11/2008	16	26	0-10	ESE-	1011.3	16MM	OVERCAST
20/11/2008	18	25	10-20	NNE-WSW	1001.6	1.5	OVERCAST
21/11/2008	16	29	0-35	W-SW	1001.3	NIL	OVERCAST
22/11/2008	16	22	10-35	WSW	990.5	6.5MM	OVERCAST
23/11/2008	SUNDAY						
24/11/2008	11	24	0-25	S-ENE	1002	NIL	OVERCAST
25/11/2008	15	26	0-10	SE-NE	1013.9	NIL	OVERCAST
26/11/2008	15	18	0-10	ESE-	1017.1	NIL	FINE
27/11/2008	14	29	0-10	NE-SSW	1012.6	2MM	FINE
28/11/2008	19	21	0-55	N-NE	1004.9	21MM	O/N STORM
29/11/2008	18	23	0-15	WSW-SW	1001.4	10MM	OVERCAST
30/11/2008	SUNDAY						

PF FORMATION WEATHER CHART

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PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
5/01/2009	18	37	0-20	W-SW	1013.6	NIL	FINE
6/01/2009	19	38	0-	ENE-NW	1008.8	NIL	FINE
7/01/2009	21	38	0-15	ESE-N	1007.2	NIL	FINE
8/01/2009	21	23	0-10	SSE	1011.5	3.5MM	OVERCAST
9/01/2009	14	23	0-10	ESE-N	1020.4	NIL	FINE
10/01/2009	15	22	0-5	NW-ENE	1016.6	NIL	FINE
11/01/2009	SUNDAY					6MM	FINE
12/01/2009	18	28	0-10	SSW	1014.1	NIL	FINE
13/01/2009	20	29	0-5	SE	1019	NIL	FINE
14/01/2009	20	38	0-15	NEW	1014	NIL	FINE
15/01/2009	26	40	0-15	NNW-ENE	1007.8	4MM	FINE
16/01/2009	19	32	0-20	SSW-NE	1011.4	NIL	FINE
17/01/2009	18	28	6-	SSE	1018.2		
18/01/2009	SUNDAY						
19/01/2009	15	30	0-15	NNE	1019.6	NIL	FINE
20/01/2009	19	38	0-5	NW-ENE	1013.9	2MM	FINE
21/01/2009	22	38	0-15	SE-SW	1011.1	25.5MM	STORM
22/01/2009	23	36	0-10	NNW-ENE	1008.8	NIL	FINE
23/01/2009	24	34	0-15	NW-ENE	1006.9	NIL	FINE
24/01/2009	24	36	May-35	NW-NNW	1004.1		
25/01/2009	SUNDAY						
26/01/2009	P/H						
27/01/2009	20	36	0-10	SSE-SW	1010.1	NIL	FINE
28/01/2009	20	35	0-5	NNE	1014.3	NIL	FINE
29/01/2009	20	36	0-5	N-NW	1018.7	NIL	FINE
30/01/2009	19	34	0-15	ENE-NE	1017.8	NIL	FINE
31/01/2009	20	32	0-10	NNE	1017.1	NIL	FINE

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
2/02/2009	20	33	0-20	ENE	1017.0	NIL	FINE
3/02/2009	21	33	0-20	NE-SSE	1008.4	NIL	FINE
4/02/2009	21	32	0-25	SE-S	1009.9	NIL	FINE
5/02/2009	21	38	0-25	NNW-NNE	1006.9	NIL	FINE
6/02/2009	23	39	0-25	NNE-NE	1006.3	NIL	FINE
7/02/2009	23	40	0-20	NNE	1013.1	NIL	FINE
8/02/2009	23	42	0-10	NNE	1011.2	NIL	FINE
9/02/2009	22	24	0-20	SSW-SSE	1010.8	8.5 MM	FINE
10/02/2009	18	19	0-5	SSE-S	1011.2	13 MM	SHOWERS
11/02/2009	15	20	0-10	SSE-S	1010.4	1.5 MM	OVERCAST
12/02/2009	15	20	0-5	SSW	1017.2	8.5 MM	OVERCAST
13/02/2009	15	20	0-15	SE	1024.1	30 MM	SHOWERS
14/02/2009	20	20	0-5	S	1022.0		SHOWERS
15/02/2009	SUNDAY					63 MM	SHOWERS
16/02/2009	17	23	May-25	SSE-SE	101.2	9.5 MM	SHOWERS
17/02/2009	17	20	0-15	S-ESE	1016.5	14.5 MM	SHOWERS
18/02/2009	17	26	May-20	SW-WSW	1009.5	2 MM	FINE
19/02/2009	19	30	0-15	ENE-N	1007.1	4 MM	FINE
20/02/2009	20	25	0-10	NNE	1013.2	NIL	FINE
21/02/2009	20	26	0-10	ENE	1014.4	9 MM	OVRNGHT RAIN
22/02/2009	SUNDAY						
23/02/2009	19	31	0-20	E-NE	1016.3	25 MM	OVRNGHT RAIN
24/02/2009	20	30	0-15	NNW	1012.9	1 MM	FINE
25/02/2009	21	28	0-15	SSE-SE	1014.4	NIL	FINE
26/02/2009	19	30	0-20	SE-SSE	1019.2	NIL	FINE
27/02/2009	17	28	0-15	SE-SSE	1015.2	NIL	FINE
28/02/2009	16	28	0-10	N-NE	1009.0	NIL	FINE

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
2/03/2009	16	27	0-10	E-ENE	1016.6	NIL	FINE
3/03/2009	16	27	0-10	NE-NNE	1015.7	NIL	FINE
4/03/2009	21	27	0-25	NNW	1008.1	NIL	FINE
5/03/2009	13	26	0-10	WSW-NNE	1008.7	NIL	FINE
6/03/2009	13	26	0-10	S-NE	1012.4	NIL	FINE
7/03/2009	16	29	0-15	N-NE	1012.9	NIL	FINE
8/03/2009	SUNDAY					13 MM	
9/03/2009	17	23	0-10	WSW-S	1021.5	NIL	FINE
10/03/2009	17	26	0-10	NE-SE	1020.4	NIL	FINE
11/03/2009	16	26	0-10	NE-SE	1021.2	4.5 MM	OVRNGHT / FINE
12/03/2009	16	25	0-5	ESE-NNE	1022.4	NIL	FINE
13/03/2009	17	26	0-5	SW-W	1017.4	NIL	FINE
14/03/2009	18	26	0-15	ENE-WNW	1010.0	5.5 MM	LITTLE STORM
15/03/2009	SUNDAY						
16/03/2009	16	28	0-20	SSE-SW	1011.5	NIL	FINE
17/03/2009	13	27	0-15	SSW	1012.4	NIL	FINE
18/03/2009	15	26	0-10	ESE-NNW	1017.8	NIL	FINE
19/03/2009	14	31	0-15	NNE-NE	1016.6	NIL	FINE
20/03/2009	17	31	0-15	ENE-S	1015.5	NIL	FINE
21/03/2009	17	29	0-15	ENE-ESE	1018.4	NIL	FINE
22/03/2009	SUNDAY					4.5	FINE
23/03/2009	18	30	0-5	NE-ENE	1015.1	NIL	FINE
24/03/2009	19	31	0-10	NE-SE	1016.3	NIL	FINE
25/03/2009	19	34	0-15	SSE-NNE	1017.3	2.5 MM	FINE
26/03/2009	19	31	0-0	N-NNW	1018.8	2 MM	FINE
27/03/2009	20	24	Oct-20	SSW-ESE	1021.9	NIL	FINE
28/03/2009	15	27	0-10	SE-NE	1024.7	NIL	FINE
29/03/2009	SUNDAY						
30/03/2009	15	25	0-20	NE-SSE	1024.2	15 MM	OVRNGHT RAIN
31/03/2009	18	25	0-15	S-NE	1019.9	33 MM	RAIN

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/04/2009	19	24	0-15	S-NE	1019.5	55 MM	RAIN
2/04/2009	18	25	0-10	E-ENE	1022.4	3.5 MM	OVERCAST
3/04/2009	18	25	0-15	NE	1021.4	NIL	
4/04/2009	18	24	0-5	E	1013.8	NIL	FINE
5/04/2009	SUNDAY						
6/04/2009	13	20	0-15	S-SE	1013.4	2 MM	FINE
7/04/2009	15	21	0-5	SSE-ESE	1019.7	NIL	FINE
8/04/2009	11	23	0-10	S-N	1021.6	NIL	FINE
9/04/2009	EASTER					14.5 MM	
10/04/2009	EASTER						
11/04/2009	EASTER						
12/04/2009	EASTER						
13/04/2009	EASTER						
14/04/2009	17	27	0-5	W-SSE	1010.2	NIL	FINE
15/04/2009	15	29	0-20	S-W	1006.1	NIL	FINE
16/04/2009	12	26	0-5	SE-NNE	1009.8	NIL	FINE
17/04/2009	11	25	0-20	ENE-E	1009.7	NIL	FINE
18/04/2009	12	23	0-10	E-SW	1014.6		
19/04/2009	SUNDAY					9 MM	
20/04/2009	12	17	0-5	SSE-S	1014.4	4.5 MM	OVERCAST
21/04/2009	13	20	0-15	SSE-S	1017.8	4.5 MM	OVERCAST
22/04/2009	13	20	0-15	S-SSW	1018.6	7 MM	OVERCAST
23/04/2009	13	20	0-10	SE-N	1016.2	NIL	OVERCAST
24/04/2009	11	21	0-10	N-ENE	1007.6		
25/04/2009	ANZAC DAY						
26/04/2009	SUNDAY					NIL	
27/04/2009	10	20	0-30	WNW-W	1007.2	NIL	FINE
28/04/2009	11	21	0-25	WNW	1009.4	NIL	FINE
29/04/2009	6	15	0-15	SE-SSE	1016.3	NIL	FINE
30/04/2009	10	17	0-20	WSW-E	1014.3	NIL	FINE

PF FORMATION WEATHER CHART

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/05/2009	8	21	0-15	ESE-E	1018.7	NIL	FINE
2/05/2009	8	21	0-20	N-S	1018.4	NIL	FINE
3/05/2009	SUNDAY						
4/05/2009	10	21	0-10	NNE-NE	1022.6	NIL	FINE
5/05/2009	13	20	0-15	ENE-E	1023.6	NIL	FINE
6/05/2009	11	21	0-20	SE-NW	1022.2	NIL	FINE
7/05/2009	9	24	0-10	NE-SSW	1017.9	NIL	FINE
8/05/2009	11	20	0-10	SE-SSE	1020.9	NIL	FINE
9/05/2009	8	21	0-5	SSE-S	1018.9	NIL	FINE
10/05/2009	SUNDAY						
11/05/2009	9	20	0-10	SSE-E	1020.4	NIL	FINE
12/05/2009	6	20	0-10	ENE-SE	1016.2	NIL	FINE
13/05/2009	8	21	0-15	SE-WSW	1010.7	NIL	FINE
14/05/2009	8	21	0-42	WSW-WNW	1006.8	NIL	FINE
15/05/2009	8	21	0-35	W-WNW	1007.5	NIL	FINE
16/05/2009	16	22	8-45	WNW-SW	1003.5	NIL	FINE
17/05/2009	SUNDAY						
18/05/2009	8	20	0-15	ENE-ESE	1012.4	NIL	FINE
19/05/2009	11	20	0-5	ESE-N	1018.9	6.5 MM	FINE
20/05/2009	14	20	0-10	ENE-SSE	1015.6	19.5 MM	SHOWERS
21/05/2009	13	19	5-15	NNE	1016.6	62 MM	RAIN
22/05/2009	13	17	5-20	S-NE	1016.8	52 MM	RAIN
23/05/2009	13	19	0-15	ENE	1016.3	4 MM	OVERCAST
24/05/2009	SUNDAY						
25/05/2009	12	18	0-5	SSW-NE	1020.2	NIL	OVERCAST
26/05/2009	11	22	0-15	ENE-NW	1016.4	NIL	FINE
27/05/2009	12	16	0-10	WNW-W	1013.9	3 MM	OVERCAST
28/05/2009	13	18	0-10	SSE	1014.5	NIL	OVERCAST
29/05/2009	10	16	0-10	SW-S	1018.3	NIL	FINE
30/05/2009	10	16	0-15	SSW-S	1022.5	NIL	OVERCAST
31/05/2009	SUNDAY					13 MM	SHOWERS

Chapter Four

NOISE MANAGEMENT

4.1 Introduction

The Project Approval (**Schedule 3 Condition 8**) for the Hitchcock Road development requires the preparation and implementation of a Noise Management Plan in order to demonstrate that compliance with the relevant noise impact assessment listed in the approval has been achieved

The objectives of the tenth annual audit report and first Annual Environmental Management Report on noise issues are therefore;

- identify the environmental noise emission criteria nominated in the relevant approval documents;
- document the results of environmental noise monitoring conducted in the 12 months ending June 2008;
- assess the measured noise emissions levels against the relevant criteria; and
- nominate existing noise emission monitoring methodology and establish routine measurement procedures.

Noise monitoring up to the end of June 2009 has been undertaken on the basis of locations and assessment criteria in the relevant Court orders applying to the previous consent. The new Noise Management Plan was approved on 8 July 2009. This provides the basis for the monitoring to be reported in the next AEMP for submittal in August 2010.

4.2 Noise emission criteria

The court orders (**Number 4.5**) nominated noise emission criteria as follows:

The proponent shall ensure that construction and operational noise on the development site does not exceed the background noise level when measured at the receivers boundary, by no more than 5dBA or otherwise to the notified requirements of the Environment Protection Authority and the Council's Director-Planning Services Group.

The orders also nominated hours of operation in Part 3: Operational (**Number 3.12**). These are:

Extraction, processing, maintenance and on-site transportation	Monday to Saturday 0700 to 1800 hours
Off-site transportation	Monday to Saturday 0600 to 1800 hours
No Operations	Sundays and Public Holidays

The EPA (now DECC) Environment Protection Licence 3407, nominates noise emission criteria as follows (**Section L6.1**):

The sound pressure level LA10T of noise emanating from the operation of plant or process in or on the premises must not exceed the sound pressure level of 45dB(A), (LA10T is to be measured for any time period between ten and fifteen minutes) at any point within one metre of any residential boundary or other noise sensitive areas such as hospitals in the vicinity of the premises; 5dBA must be added to the measured level if the noise is substantially tonal or impulsive in character.

The court orders (**Number 4.5**) made reference to the DECC requirements which nominated an LA10(15minute) noise emission limit of 45 dBA.

Based on unattended noise logging conducted in August 1995 and January 1999, **Table 4.1** provides the mean LA90(15minute) ambient noise levels together with the LA10(15minute) noise emission criteria based on the mean ambient LA90(15minute) level plus 5 dBA in accordance with the EPA Licence.

**Table 4.1 Ambient unattended noise levels and emission criteria
(dBA re 20 µPa)**

Location	19 to 29 January 1999 Monday to Saturday (0700 to 1800 hours)				17 to 24 August 1995 Monday to Sunday (0700 to 2200 hours)		Mean ambient	Noise criteria
	LA1	LA10	LAeq	LA90	LA90(15minute)		LA90(15minute)	LA90(15minute)
3	65	52	59	35.0	30.5		33	45
5	60	60	57	37.7	32.5		35	45
6	66	58	57	36.5	32.5		35	45
7	67	58	61	36.7	32.5		35	45

Note: Locations are:

- 3 Jurd residence, Old Northern Road
- 5 Pignataro residence, Corner of Old Northern and Wisemans Ferry Roads
- 6 Young residence, Corner of Hitchcock and Wisemans Ferry Roads
- 7 Black residence, Lot 214, Hitchcock Road

The following information can be derived from these results in relation to the noise emission criteria.

- The reported 1999 LA90(15minute) ambient noise levels are generally 4 dBA higher than those determined in 1995. This discrepancy arises from the difference in the analysis time interval period. It should be noted that the 1999 data analysis was carried out for the approved hours of operation only, as appropriate.
- It is therefore considered reasonable (in the absence of a revised analysis of the 1995 data set) to adopt the mean LA90(15minute) ambient noise level as the basis for determining the applicable mean ambient levels.
- In accordance with the previous DEC noise emission requirements, the LA10(15minute) noise emission criteria would be 45 dBA at all locations.

The new Noise Management Plan requires the noise criteria set out in **Table 4.2** to be applied to the impact assessment.

Table 4.2 Noise impact assessment monitoring locations

Noise assessment location	Day	Night ¹	
	L _{Aeq} (15 minute)	L _{Aeq} (15 minute)	L _{A1} (1 minute)
R2 - Tornatola	39	35	45
R3 - Jurd	39	35	45
R5 - Pignataro	42	35	45
R7 – Maroota public school	36 _{(L_{Aeq}(1 hour))}	N/A	N/A

Note 1: Night time is defined as the period between 10.00pm and 7.00am. Activities on the site start at 6.00am and are completed by 6.00pm. There is no activity on the site during the evening period.

The following noise parameters will be measured at the nominated monitoring locations.

- L_{Aeq}(15 minute) noise level measured at an appropriate free-field location close to the façade of the relevant residence or other building during day time and evening hours.
- L_{Aeq}(1 minute) noise level measured at an appropriate free-field location close to the façade of the relevant residence during night time hours.

The results of the noise monitoring undertaken over the next 12 months will be reported in the AEMP to be submitted in August 2010.

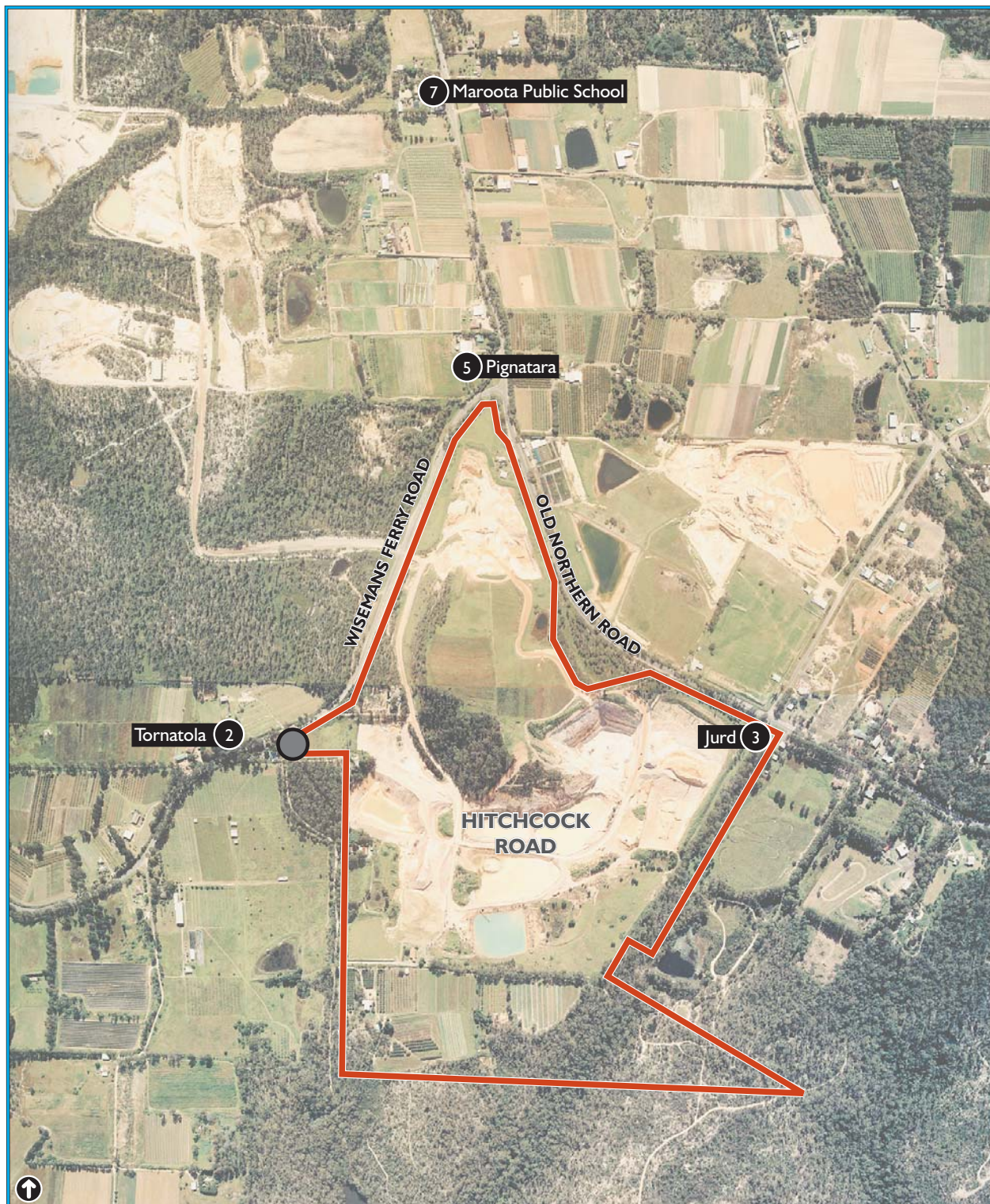
4.3 Noise monitoring

During the reporting period to the end of June 2009, PF Formation maintained a program of regular monthly noise monitoring. The locations of the monitoring stations are shown on **Figure 4.1**. In compliance with the requirements of the Noise Management Plan approved by the Director-General on 8 July 2009, monitoring frequency will be amended from monthly to quarterly and there will be a minor change to the monitoring locations with Maroota Public School substituted for the Black Residence.

In general, noise measurement procedures were guided by the requirements of AS1055-1989, *Acoustics - Description and Measurement of Environmental Noise* and the Department of Environment and Conservation *Industrial Noise Policy* (INP) (2000).

All acoustic instrumentation employed throughout the monitoring programme was designed to comply with the requirements of AS 1259.2-1990, *Sound Level Meters* and carries current NATA or manufacturer calibration certificates.

The statistical noise exceedance levels (LAN) are the levels exceeded for N% of the 15 minute interval. The LA90 represents the level exceeded for 90 percent of the interval period and is referred to as the average minimum or background noise level. The LA10 is the level exceeded for 10 percent of the time and is usually referred to as the average maximum noise level. The LAeq is the equivalent continuous sound pressure level and represents the steady sound level which is equal in energy to the fluctuating level over the interval period. The L_{Amax} is the maximum noise level recorded over the interval.



Scale
 0 500 Metres

- Site boundary
- 9 Monitoring locations
- Monitoring location used until June 2009

Figure 4.1

NOISE IMPACT ASSESSMENT MONITORING LOCATIONS

Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding $\pm 0.5\text{dBA}$.

Unattended noise logging

Four unattended continuous noise loggers were positioned at the nominated locations for a period of ten days commencing 19 January 1999 to quantify the overall ambient noise levels and to assist in the assessment of noise amenity levels in the vicinity of the Hitchcock Road site. Additional unattended noise logging has not been required over the past four years as it was considered that the ambient noise environment has not changed significantly over that time.

Operator-attended noise surveys

Daytime operator-attended noise measurements were conducted on Tuesday 20 July 2004 to quantify the overall ambient noise levels and the contributed levels of noise emissions from current extractive and processing operations. Operations at the site involve the use of both mobile equipment and fixed plant as set out in **Table 4.5**. All items of equipment were operating normally during the noise surveys.

Table 4.3 lists the test locations. These were selected as representative of the noise environment experienced at residences in the potentially affected area to provide the basis for the evaluation and assessment of noise emissions resulting from site operations.

Table 4.3 Noise test locations and measurement instrumentation

Location	Resident	Description	Operator-Attended Monitoring
			20.07.2004
3	Jurd	Old Northern Road, Maroota	
5	Pignatara	Corner of Old Northern and Wisemans Ferry Roads, Maroota	Bruel & Kjaer 2231 Sound Level Meter Bruel & Kjaer 4230 Acoustic Calibrator
6	Young	Lot 10, Corner of Hitchcock and Wisemans Ferry Roads, Maroota	
7	Black	Lot 214 Hitchcock Road, Maroota	

Plant and equipment noise emission measurements

Nearfield sound pressure level measurements were carried out on major items of equipment on Tuesday 20 July 2004.

Noise measurement procedures were guided by the requirements of AS2012-1990, *Acoustics – Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors – stationary test condition*.

4.4 Operator-attended noise survey results

Operator attended daytime noise surveys were conducted at each of the four residential test locations. These were of 15 minutes duration using a precision integrating sound level meter. During attended noise surveys, the operator identified the character and duration of acoustically significant ambient noise sources. Wherever possible the operator quantified

local traffic flow and provided a qualitative assessment of the prevailing weather conditions. These are summarised in Table 4.4.

Table 4.4 Daytime operator-attended noise survey (20 July 2004)

Location start time	Primary noise descriptor (dBA re μ Pa)					Description of noise emission typical maximum (LA _{max})
	LA1	LA10	LA _{eq}	LA50	LA90	
3 (Jurd) ¹ 10.57 hours W Wind-1-2 m/s	59	51	49	47	43	Local traffic (cars)-52-56dBA Local traffic (truck)-58-67dBA Site extraction works audible Reversing alarms-52dBA
	Site contribution LA10 46 dBA (estimated)					
5 (Pignataro) 11.41 hours W Wind-1m/s	67	59	57	48	40	Local traffic (cars)-45-63dBA Local traffic (trucks)-81dBA Birds-40-48dBA Site extraction works audible
	Site contribution LA10 45 dBA (estimated)					
6 (Davies) 12.28 hours W Wind-1m/s	60	53	50	45	37	Local traffic (car)-46-56dBA Local traffic (truck)-46-64dBA Site works just audible during wind lulls-34dBA Excavator-33-35dBA Wind in trees-42-46dBA
	Site contribution LA10 34 dBA (estimated)					
7 (Black) 13.18 hours Wind-calm	41	39	36	35	32	Distant traffic (car)-39-41dBA Distant traffic (trucks)-39-42dBA Wind in trees-32-38dBA Wood saw-33-35dBA Site extraction works audible Excavator-33-40dBA
	Site contribution LA10 39dBA (estimated)					

Note 1: The Jurd property is included in the area subject to the present approval.

The following information can be derived from these results in relation to the noise emission criteria.

- Hitchcock Road site extraction works were audible at Locations 7 (Black), 3 (Jurd) and 5 (Pignataro) are only just audible (during traffic lulls) at Location 6 (Davies).
- The highest LA10(15minute) noise level was 46 dBA recorded at Location 3 (Jurd) due to the relative proximity of the extraction operations.
- The LA10(15minute) noise emission levels at all assessment locations were below the 45 dBA noise emission criteria based on site contribution except for a marginal (1 dBA) exceedance at Location 3 (Jurd). It is expected that noise emission levels at this location will decrease as the depth of extraction increases.

It was therefore concluded that noise emission impacts were acceptable.

4.5 Nearfield plant and equipment measurement results

The nearfield and equipment measurement results were subsequently processed to derive the 1/1 octave band and overall maximum Sound Power Level (SWL) for each item which are summarised in Table 4.5.

Table 4.5 L_{Amax} plant and equipment sound power levels
(dBA 10^{-12} Watts)

Description	1/1 octave band centre frequency (Hz)										Overall SWL
	31	63	125	250	500	1k	2k	4k	8k	16k	
CAT D9L Dozer	109	111	120	119	120	114	114	119	106	104	120
CAT 730 Dump Truck	104	124	125	119	117	112	108	104	106	104	117
CAT 330CL Excavator	102	119	120	108	111	102	102	100	100	92	110
CAT 633D Scraper	123	118	123	122	119	116	116	111	112	103	121
CAT D6D Dozer	110	123	114	109	110	111	108	116	107	99	118
Cat 966F Loader	105	113	116	108	110	109	108	100	94	90	113
Slurry Plant	117	113	109	105	106	106	103	102	97	91	110

The following information can be derived from these results:

- The measured sound power levels of all items of plant indicate that the equipment is well maintained with relatively low noise emissions and no apparent defects warranting further investigation.

4.6 Monthly noise monitoring results

PF Formation has conducted operator-attended noise measurements on a monthly basis since April 1996. Noise monitoring instrumentation comprises a Bruel & Kjaer Type 2226 (S/N 1014703) sound level meter and acoustic calibrator Type 4230 (S/N 1059668). The sound level meter records the overall ambient equivalent continuous noise level (LAeq) from all noise sources including sand mining operations. In the event that sand extraction noise emissions dominate the ambient noise environment then the measured LAeq value can be used to estimate the corresponding LA10(15minute) and LA90(15minute) statistical noise exceedance levels.

Where items of mobile equipment are the major source of noise emission from sand mining operations, noise levels are constantly fluctuating. An examination of noise logging results for many of these types of operations indicates that the LA10(15minutes), LA90(15minutes) and LAeq(15minutes) are generally related by the following factors:

Estimated LA10(15minutes) = LAeq(15minutes) plus 3 dBA

Estimated LA90(15minutes) = LAeq(15minutes) minus 7 dBA

A complete copy of the monthly noise monitoring records from Location 1 (Maroota Public School), Location 3 (Jurd house), Location 5 (Pignataro house) and Location 6 (Davies house) is included as **Attachment 4B**. The Jurd property is included in the site of the present approval for sand extraction. While it remains a noise monitoring location, it cannot be considered to be a sensitive receiver. Three of the monitoring sites are located close to the roads surrounding the site and the acoustic records indicate that the noise environment is substantially influenced by traffic.

The following information can be derived from the results summarised in **Table 4.6** and the noise emission criteria for the Hitchcock Road development:

- There were two minor exceedances of the noise emission criterion of 45dBA at Maroota Public School (2dBA recorded in July 2008 and 1dBA in September 2008). This location is some 1,500 metres to the north of current site operations at Hitchcock Road and is unlikely to be influenced by noise emissions from there. Similar sand extraction activities are undertaken by other operators much closer to the school site.
- Exceedances (up to 5dBA) were also recorded at the monitoring site at the Jurd house (Location 3). This house is occupied by tenants of PF Formation and is included within the operational area. The monthly noise monitoring records suggest that extraction activity does not contribute significantly to the noise environment here which is dominated by traffic noise, some of which is contributed by truck movements generated by sand extraction.
- Extraction works were recorded as inaudible at Location 5 (Pignataro house) and Location 6 (Davies house) for all the monitoring period and for nine out of eleven months at Location 1 (Maroota Public School), the noise environment dominated by traffic on Wisemans Ferry Road and Old Northern Road respectively.

The results of the monitoring suggest that noise emission impacts relating to sand extraction activities were generally acceptable at the assessment locations.

4.7 Conclusions

In accordance with the requirements of the court orders for the previous Hitchcock Road development and the current relevant approval conditions, PF Formation has implemented a program of environmental noise monitoring.

The results of the regular monthly noise monitoring indicate that environmental noise emission levels at the nearest potentially affected receivers to both sites were generally acceptable throughout the year. There would appear to have been minor changes to the acoustic environment from the previous year resulting in a slight increase in noise impacts generated by site related activities while traffic related noise would appear to be increasing. The latter would be expected as a result of increasing activity in the area.

Table 4.6 Summary of daytime noise monitoring results (Contribution of extraction operations)

Date	Location 1 (Maroota Public School)			Location 3 (Jurd house) ¹			Location 5 (Pignatara house)			Location 6 (Davies house)		
	Audibility of operations	Estimated		Audibility of operations	Estimated		Audibility of operations	Estimated		Audibility of operations	Estimated	
		LA90 (15 min)	LA10 (15 min)		LA90 (15 min)	LA10 (15 min)		LA90 (15 min)	LA10 (15 min)		LA90 (15 min)	LA10 (15 min)
15.07.08	Audible	37	47	Audible	40	50	Inaudible	<20	<30	Inaudible	<20	<30
11.08.09	Inaudible	<20	<30	Audible	40	50	Inaudible	<20	<30	Inaudible	<20	<30
19.09.08	Audible	36	46	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30
24.10.08	Inaudible	<20	<30	Audible	39	49	Inaudible	<20	<30	Inaudible	<20	<30
21.11.08	Inaudible	<20	<30	Audible	39	49	Inaudible	<20	<30	Inaudible	<20	<30
19.12.08	Audible	33	43	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30
29.01.09	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30
19.02.09	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30
30.03.09	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30
27.04.09	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30	Inaudible	<20	<30
28.05.09	Inaudible	<20	<30	Audible	38	48	Inaudible	<20	<30	Inaudible	<20	<30
17.06.09	Inaudible	<20	<30	Audible	34	44	Inaudible	<20	<30	Inaudible	<20	<30

Note 1: This house is no longer occupied and the lot is included in the development area.

At this stage, field noise measurement procedures and instrumentation requirements are considered to be satisfactory. Nearfield plant and equipment noise measurements will also continue to be checked as necessary to identify any potential deterioration in acoustic performance and ensure that existing noise emission levels are maintained.

Noise impacts at the monitoring locations appear to be dominated by traffic using Old Northern and Wisemans Ferry Roads. Modelled noise generated by site operations however, provided the basis for the development of the assessment criteria included in the new Noise Management Plan. This may result in difficulties for future compliance and may require a further review of noise monitoring procedures once the results for the next 12 months are analysed. These will be undertaken in compliance with the requirements of the approved management plan.

Attachment 4A

MONTHLY NOISE MONITORING RESULTS

OB No: 1507081 DATE: 15th July 2008

LOCATION DESCRIPTION: Maroota Public School (back of Oval)

TIME MEASUREMENTS COMMENCED: 8:20am

WEATHER CONDITIONS: Fine conditions, cool and crisp.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 42.5 TO 45.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	43	1.125	Birds Chirping
	2	43.5	1.25	✓ ✓
	3	42.5		Quarry Noise
	4	42		Road Traffic
	5	43.5	1.25	✓ ✓
	6	44	1.425	✓ ✓
	7	40		Quarry Noise
	8	42.5	1.0	Road Traffic
	9	44.5	1.6	Birds Chirping
	10	43	1.125	Road Traffic
	11	43	1.125	Quarry Noise
	12	42.5		Road Traffic
	13	47.5		Birds Chirping
	14	45.5		✓ ✓
	15	48		✓ ✓
	16	46		✓ ✓
	17	45.5	2.0	✓ ✓
	18	46.5		✓ ✓
	19	42.5	1.0	✓ ✓
	20	41.5		✓ ✓
Sum of Indices			12.9	

Sum of Indices = $\frac{12.9}{10}$ = 1.29 Compost Index

= 43.6 dB(A)

No: 1108085DATE: 11th August 2008.LOCATION DESCRIPTION: Maroota Public School (back of Oval)MEASUREMENTS COMMENCED: 10:30amWEATHER CONDITIONS: Fine sunny conditions, cool and crisp.INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)MEASURING RANGE: 41.5 TO 43 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	42.5	1.25	Road Traffic
	2	40.5		Natural Sounds
	3	41		✓ ✓
	4	43	1.425	Road Traffic
	5	41.5	1.0	✓ ✓
	6	46		✓ ✓
	7	44.5		✓ ✓
	8	41		Natural Sounds
	9	42	1.125	✓ ✓
	10	40.5		✓ ✓
	11	43.5		Road Traffic
	12	42	1.125	✓ ✓
	13	41.5	1.0	Natural Sounds
	14	42	1.125	Road Traffic
	15	42	1.125	✓ ✓
	16	42.5	1.25	✓ ✓
	17	44		✓ ✓
	18	43.5		✓ ✓
	19	42.5	1.25	✓ ✓
	20	40		Natural Sounds
Sum of Indices			11.675	

Sum of Indices
Total Duration (min)

=

11.675
10

=

1.168

Compost Index

=

42.2

dB(A)

OB No: 1909084 DATE: 19th September 2008

LOCATION DESCRIPTION: Maroota Public School (back of Oval)

TIME MEASUREMENTS COMMENCED: 1:45 pm

WEATHER CONDITIONS: Fine, sunny conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 37 TO 45 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	45	6.3	Road Traffic
	2	40.5	2.25	Natural Sounds
	3	45		Road Traffic
	4	49		Birds Chirping
	5	42	3.15	Quarry Noise
	6	43.5	4.5	Natural Sounds
	7	43.5	4.5	✓ ✓
	8	36		✓ ✓
	9	52.5		Birds Chirping
	10	44.5	5.65	Road Traffic
	11	43	4.0	✓ ✓
	12	51		Birds Chirping
	13	42.5	3.57	Road Traffic
	14	45	6.3	✓ ✓
	15	36.5		Natural Sounds
	16	36		✓ ✓
	17	33.5		✓ ✓
	18	36.5		✓ ✓
	19	37	1.0	✓ ✓
	20	45		Road Traffic
Sum of Indices			40.22	

Sum of Indices = 40.22 = 4.022 Compost Index
 Total Duration (min) 10

= 43 dB(A)

B No: 2410084DATE: 24th October 2008LOCATION DESCRIPTION: Maroota Public School (back of Oval)MEASUREMENTS COMMENCED: 10:35amWEATHER CONDITIONS: Fine conditions, cool and crisp, cloudyINSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)MEASURING RANGE: 45 TO 46 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	47.5		Birds Chirping
	2	45		✓ ✓
	3	45.5	1.125	✓ ✓
	4	45		✓ ✓
	5	47		✓ ✓
	6	46		✓ ✓
	7	46		✓ ✓
	8	46	1.25	✓ ✓
	9	48		✓ ✓
	10	46	1.25	✓ ✓
	11	45.5	1.125	Natural Sounds.
	12	44.5		✓ ✓
	13	44.5		✓ ✓
	14	44.5		✓ ✓
	15	45.5	1.125	Road Traffic
	16	46	1.25	✓ ✓
	17	45	1.0	Natural Sounds
	18	45	1.0	✓ ✓
	19	45	1.0	✓ ✓
	20	45	1.0	✓ ✓
Sum of Indices			11.125	

Sum of Indices
Total Duration (min)

=

11.125
10

=

1.113

Compost Index

=

45.5

dB(A)

OB No: 2111084 DATE: 21st November 2008

LOCATION DESCRIPTION: Maroota Public School (back of Oval)

TIME MEASUREMENTS COMMENCED: 1:30 pm

WEATHER CONDITIONS: Overcast, hot and humid conditions.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 40.5 TO 44 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	44.5		Road Traffic
	2	44		✓ ✓
	3	40		Natural Sounds
	4	39.5		✓ ✓
	5	42	1.425	✓ ✓
	6	41	1.125	✓ ✓
	7	42.5	1.6	✓ ✓
	8	45		Road Traffic
	9	46.5		✓ ✓
	10	43	1.8	Natural Sounds
	11	42	1.425	✓ ✓
	12	44	2.25	Road Traffic
	13	43.5	2.0	✓ ✓
	14	40.5		Natural Sounds
	15	41	1.125	✓ ✓
	16	40.5	1.0	✓ ✓
	17	45		Road Traffic
	18	39		Natural Sounds
	19	40		✓ ✓
	20	42.5	1.6	✓ ✓
Sum of Indices			15.35	

Sum of Indices = $\frac{15.35}{10}$ = 1.535 Compost Index

= 42.3 dB(A)

DB No: 1912084 DATE: 19th December 2008

LOCATION DESCRIPTION: Maroota Public School (back of Oval)

TIME MEASUREMENTS COMMENCED: 1:00pm

WEATHER CONDITIONS: Fine, sunny conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 40 TO 41 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	40		Natural Sounds
	2	39.5		✓ ✓
	3	40.5	1.13	✓ ✓
	4	41		Road Traffic
	5	41		✓ ✓
	6	42		✓ ✓
	7	40.5	1.13	Natural Sounds
	8	39.5		Quarry Noise.
	9	41	1.25	Road Traffic
	10	40	1.0	✓ ✓
	11	39.5		Natural Sounds
	12	40	1.0	✓ ✓
	13	41	1.25	✓ ✓
	14	39.5		✓ ✓
	15	40	1.0	✓ ✓
	16	41		✓ ✓
	17	40.5	1.13	✓ ✓
	18	40	1.0	✓ ✓
	19	41		✓ ✓
	20	40	1.0	✓ ✓
Sum of Indices			10.89	

Sum of Indices = 10.89 = 1.08 Compost Index
 Total Duration (min) 10

= 40.3 dB(A)

Job No: 2901091 DATE: 29th January 2009

LOCATION DESCRIPTION: Maroota Public School (back of Oval)

TIME MEASUREMENTS COMMENCED: 7:10 am

WEATHER CONDITIONS: Cool, foggy conditions.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 38 TO 42 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	45.5		Birds Chirping
	2	41.5	2.25	✓ ✓
	3	42		✓ ✓
	4	49.5		Helicopter
	5	41.5	2.25	Natural Sounds
	6	39.5	1.425	✓ ✓
	7	39	1.25	✓ ✓
	8	38	1.0	✓ ✓
	9	38.5	1.125	✓ ✓
	10	36.5		✓ ✓
	11	38	1.0	✓ ✓
	12	37		✓ ✓
	13	34.5		✓ ✓
	14	38.5	1.125	Road Traffic
	15	42	2.5	✓ ✓
	16	38.5	1.125	✓ ✓
	17	35.5		Natural Sounds.
	18	42.5		Road Traffic
	19	45.5		✓ ✓
	20	34		Natural Sounds.
Sum of Indices			15.05	

Sum of Indices = 15.05 = 1.505 Compost Index
 Total Duration (min) 10

= 39.8 dB(A)

JOB No: 1902095 DATE: 19th February 2009.

LOCATION DESCRIPTION: Maroota Public School (back of Oval)

TIME MEASUREMENTS COMMENCED: 1:45 pm

WEATHER CONDITIONS: Fine, sunny conditions.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 39 TO 42 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	37		Natural Sounds.
	2	38.5		✓ ✓
	3	38		✓ ✓
	4	40	1.25	✓ ✓
	5	43		Road Traffic
	6	41.5	1.8	✓ ✓
	7	42		✓ ✓
	8	41.5	1.8	✓ ✓
	9	44		Birds Chirping.
	10	37.5		Natural Sounds.
	11	37		✓ ✓
	12	39	1.0	✓ ✓
	13	40.5	1.425	✓ ✓
	14	41	1.6	Road Traffic
	15	42	2.0	✓ ✓
	16	41.5	1.8	✓ ✓
	17	40.5	1.425	✓ ✓
	18	43		✓ ✓
	19	42	2.0	✓ ✓
	20	43.5		✓ ✓
Sum of Indices			16.1	

Sum of Indices = 16.1 = 1.61 Compost Index
 Total Duration (min) 10

= 41 dB(A)

OB No: 3003094DATE: 30th March 2009LOCATION DESCRIPTION: Maroota Public School (back of Oval)TIME MEASUREMENTS COMMENCED: 1:35pmWEATHER CONDITIONS: Fine, sunny conditionsINSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)MEASURING RANGE: 39 TO 43.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	35.5		Natural Sounds
	2	36		✓
	3	42.5	2.25	Road Traffic ✓
	4	44		✓
	5	43	2.5	✓
	6	40	1.25	Natural Sounds ✓
	7	40.5	1.425	✓
	8	39.5	1.125	✓
	9	40	1.25	✓
	10	39	1.0	✓
	11	37		✓
	12	45.5		Road Traffic ✓
	13	40	1.25	Natural Sounds ✓
	14	36		✓
	15	36.5		✓
	16	43	2.5	Road Traffic ✓
	17	43.5	2.825	✓
	18	44		✓
	19	46		✓
	20	45		✓
Sum of Indices			17.375	

Sum of Indices
Total Duration (min)

=

17.375
10

=

1.738

Compost Index

= 41.3 dB(A)

JOB No: 2704093 DATE: 27th April 2009

LOCATION DESCRIPTION: Maroota Public School (back of Oval)

TIME MEASUREMENTS COMMENCED: 9:45am

WEATHER CONDITIONS: Fine conditions, cool and crisp

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 37 TO 42 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	37		Natural Sounds
	2	36.5		✓ ✓
	3	37	1.0	✓ ✓
	4	35		✓ ✓
	5	36		✓ ✓
	6	43.5		Road Traffic
	7	44.5		✓ ✓
	8	44		✓ ✓
	9	42	3.15	✓ ✓
	10	43		✓ ✓
	11	39	1.6	Natural Sounds
	12	40.5	2.25	✓ ✓
	13	40.5	2.25	✓ ✓
	14	39	1.6	✓ ✓
	15	43		Road Traffic
	16	38.5	1.425	Natural Sounds
	17	36.5		✓ ✓
	18	37	1.0	✓ ✓
	19	40	2.0	✓ ✓
	20	39	1.6	✓ ✓
Sum of Indices			17.875	

Sum of Indices = 17.875 = 1.788 Compost Index
Total Duration (min) 10

= 39.5 dB(A)

JOB No: 2805093 DATE: 28th May 2009

LOCATION DESCRIPTION: Maroota Public School (back of Oval)

TIME MEASUREMENTS COMMENCED: 1:00pm

WEATHER CONDITIONS: Overcast conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 42 TO 44.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	42	1.0	Natural Sounds
	2	46.5		Road Traffic
	3	40.5		Natural Sounds
	4	39		✓ ✓
	5	41		✓ ✓
	6	45.5		Road Traffic
	7	43	1.25	School Noise
	8	45.5		Road Traffic
	9	44.5	1.8	✓ ✓
	10	43	1.25	School Noise
	11	42	1.0	✓ ✓
	12	41.5		Road Traffic
	13	41.5		✓ ✓
	14	44.5	1.8	School Noise
	15	44	1.6	✓ ✓
	16	45		✓ ✓
	17	44.5	1.8	✓ ✓
	18	42	1.0	✓ ✓
	19	47.5		Road Traffic
	20	43.5	1.425	School Noise.
Sum of Indices			13.925	

Sum of Indices = 13.925 = 1.393 Compost Index
 Total Duration (min) 10

= 43.4 dB(A)

PF Formation – Attended Noise Monitoring – DAY LAeq (15 minute)

JOB No: 1906091

DATE: 19th June 2009

LOCATION DESCRIPTION: Maroota Public School (back of Oval)

TIME MEASUREMENTS COMMENCED: 10:10am

WEATHER CONDITIONS: Foggy conditions, cool and crisp.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)

Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 40 TO 43.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	39.5		Natural Sounds
	2	43.5	2.25	Road Traffic
	3	47		Birds Chirping
	4	41	1.25	✓ ✓
	5	38.5		✓ ✓
	6	40	1.0	✓ ✓
	7	39.5		✓ ✓
	8	44.5		✓ ✓
	9	41.5	1.425	✓ ✓
	10	39		✓ ✓
	11	43.5	2.25	✓ ✓
	12	42	1.6	✓ ✓
	13	39.5		✓ ✓
	14	41	1.25	✓ ✓
	15	42.5	1.8	✓ ✓
	16	40.5	1.125	✓ ✓
	17	46.5		Road Traffic
	18	42.5	1.8	Birds Chirping
	19	48.5		Road Traffic
	20	42	1.6	Birds Chirping
	21	43	2.0	✓ ✓
	22	43	2.0	Road Traffic
	23	42	1.6	Birds Chirping
	24	45		✓ ✓
	25	40.5	1.125	✓ ✓
Sum of Indices			<u>24.075</u>	

Sum of Indices = 24.075 = 1.605 Compost Index
 Total Duration (min) 15

Operator: Joshua Graham
 Signature: [Signature]

= 42 dB(A)

JOB No: 1507083 DATE: 15th July 2008

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 10:15am

WEATHER CONDITIONS: Fine conditions, cool and crisp

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 43 TO 46.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	46.5		Road Traffic
	2	47		✓ ✓
	3	45.5	1.8	✓ ✓
	4	46	2.0	✓ ✓
	5	40		Natural Sounds.
	6	43	1.0	Birds Chirping
	7	43.5	1.125	✓ ✓
	8	48.5		Road Traffic
	9	45	1.6	✓ ✓
	10	40.5		Natural Sounds
	11	46.5		Road Traffic
	12	47		Quarry Noise
	13	40.5		Natural Sounds
	14	44.5	1.425	Birds Chirping
	15	45.5	1.8	Road Traffic
	16	46	2.0	✓ ✓
	17	48		✓ ✓
	18	46.5	2.25	✓ ✓
	19	44	1.25	✓ ✓
	20	39.5		Natural Sounds
Sum of Indices			16.25	

Sum of Indices = 16.25 = 1.625 Compost Index
 Total Duration (min) 10

= 45.1 dB(A)

OB No: 1108082 DATE: 11th August 2008

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 7:35am

WEATHER CONDITIONS: Fine conditions, cool and crisp.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 46 TO 48.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	48.5		Road Traffic
	2	48.5	1.8	✓ ✓
	3	46		✓ ✓
	4	49		✓ ✓
	5	47.5	1.425	✓ ✓
	6	44		✓ ✓
	7	48	1.6	Birds Chirping
	8	45.5		Road Traffic
	9	46.5	1.125	✓ ✓
	10	39		Natural Sounds
	11	40.5		Quarry Noise
	12	47	1.25	Road Traffic
	13	47.5	1.425	✓ ✓
	14	47	1.25	✓ ✓
	15	50		✓ ✓
	16	49		✓ ✓
	17	48.5	1.8	✓ ✓
	18	45.5		✓ ✓
	19	46	1.0	✓ ✓
	20	46.5	1.125	✓ ✓
Sum of Indices			<u>13.8</u>	

Sum of Indices = 13.8 = 1.38 Compost Index
 Total Duration (min) 10

= 47.4 dB(A)

OB No: 1909081 DATE: 19th September 2008

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 10:15am

WEATHER CONDITIONS: Fine, sunny conditions.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 44.5 TO 49 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	49	2.825	Birds Chirping
	2	46.5	1.6	Road Traffic
	3	44		✓ ✓
	4	47	1.8	✓ ✓
	5	45.5	1.25	✓ ✓
	6	50.5		✓ ✓
	7	46	1.425	✓ ✓
	8	40		Natural Sounds
	9	41.5		✓ ✓
	10	44		Road Traffic
	11	44.5	1.0	✓ ✓
	12	46	1.425	✓ ✓
	13	49	2.825	✓ ✓
	14	44.5		Birds Chirping
	15	44		Road Traffic
	16	45.5	1.25	✓ ✓
	17	50		✓ ✓
	18	48	2.25	Birds Chirping
	19	50.5		✓ ✓
	20	44.5		✓ ✓
Sum of Indices			17.65	

Sum of Indices = 17.65 = 1.765 Compost Index
 Total Duration (min) 10

= 46.9 dB(A)

JOB No: 2410082 DATE: 24th October 2008

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 8:30am

WEATHER CONDITIONS: Fine, conditions, cool and crisp.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 44.5 TO 47.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	50.5		Birds Chirping
	2	49		✓ ✓
	3	44.5	1.0	Road Traffic
	4	46	1.425	✓ ✓
	5	48.5		✓ ✓
	6	41.5		Quarry Noise
	7	43.5		Birds Chirping
	8	40.5		✓ ✓
	9	47	1.8	✓ ✓
	10	45	1.125	✓ ✓
	11	42		Road Traffic
	12	45.5	1.25	Birds Chirping
	13	48.5		✓ ✓
	14	47	1.8	✓ ✓
	15	51.5		✓ ✓
	16	46	1.425	Road Traffic
	17	47.5	2.0	Birds Chirping
	18	43.5		✓ ✓
	19	46	1.425	✓ ✓
	20	45.5	1.25	✓ ✓
Sum of Indices			14.5	

Sum of Indices = 14.5 = 1.45 Compost Index
Total Duration (min) 10

= 46.1 dB(A)

JOB No: 2111082 DATE: 21st November 2008

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 11:20am

WEATHER CONDITIONS: Overcast, humid conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 42 TO 49 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	46.5	2.825	Road Traffic
	2	47.5	3.575	✓ ✓
	3	50		✓ ✓
	4	49.5		✓ ✓
	5	40		Natural Sounds
	6	42		✓ ✓
	7	42.5	1.125	✓ ✓
	8	41		✓ ✓
	9	40.5		✓ ✓
	10	54		Birds Chirping
	11	48	4.0	✓ ✓
	12	46	2.5	Road Traffic
	13	49	5.0	✓ ✓
	14	50.5		✓ ✓
	15	51		✓ ✓
	16	42.5	1.125	Natural Sounds
	17	41.5		Quarry Noise
	18	42	1.0	✓ ✓
	19	45.5	2.25	Road Traffic
	20	46	2.5	✓ ✓
Sum of Indices			25.9	

Sum of Indices = 25.9 = 2.59 Compost Index
 Total Duration (min) 10

= 46 dB(A)

OB No: 1912081 DATE: 19th December 2008

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 9:55am

WEATHER CONDITIONS: Fine, sunny conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 41 TO 46.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	45	2.5	Road Traffic
	2	51		✓ ✓
	3	46.5	3.57	✓ ✓
	4	37		Natural Sounds
	5	51		Road Traffic
	6	46.5	3.57	✓ ✓
	7	44	2.0	✓ ✓
	8	51.5		✓ ✓
	9	37		Natural Sounds
	10	44	2.0	Road Traffic
	11	41	1.0	✓ ✓
	12	50		✓ ✓
	13	41		✓ ✓
	14	45.5	2.82	✓ ✓
	15	38.5		Natural Sounds
	16	40		Road Traffic
	17	46	3.15	✓ ✓
	18	42.5	1.42	✓ ✓
	19	44	2.0	✓ ✓
	20	54.5		✓ ✓
Sum of Indices			<u>24.03</u>	

Sum of Indices = 24.03 = 2.40 Compost Index
 Total Duration (min) 10

= 44.8 dB(A)

OB No: 2901094 DATE: 29th January 2009

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 9:35 am

WEATHER CONDITIONS: Foggy, moist and humid.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 45 TO 46 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	49.5		Road Traffic
	2	44.5		Farm Equipment
	3	48		Road Traffic
	4	45	1.0	✓ ✓
	5	44.5		✓ ✓
	6	46	1.25	Farm Equipment
	7	46	1.25	✓ ✓
	8	45	1.0	✓ ✓
	9	46	1.25	✓ ✓
	10	46	1.25	✓ ✓
	11	44		✓ ✓
	12	45.5	1.125	✓ ✓
	13	49		Road Traffic
	14	44		Birds Chirping
	15	49		✓ ✓
	16	47		✓ ✓
	17	45	1.0	✓ ✓
	18	46	1.25	Farm Equipment
	19	44.5		Natural Sounds
	20	45.5	1.125	✓ ✓
Sum of Indices			11.5	

Sum of Indices = 11.5 = 1.15 Compost Index
 Total Duration (min) 10

= 45.6 dB(A)

JOB No: 1902093 DATE: 19th February 2009

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 11:00am

WEATHER CONDITIONS: Fine, sunny conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 40.5 TO 46 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	45	2.825	Road Traffic
	2	40.5	1.0	✓ ✓
	3	43	1.8	✓ ✓
	4	39.5		Natural Sounds
	5	35.5		✓ ✓
	6	39		✓ ✓
	7	40.5	1.0	✓ ✓
	8	44.5	2.5	Road Traffic
	9	47.5		✓ ✓
	10	41.5	1.25	✓ ✓
	11	47.5		✓ ✓
	12	46		✓ ✓
	13	44	2.25	✓ ✓
	14	36.5		Natural Sounds
	15	46	3.575	Road Traffic
	16	48.5		✓ ✓
	17	41	1.125	Natural Sounds
	18	47.5		Road Traffic
	19	45	2.825	✓ ✓
	20	39.5		Natural Sounds
Sum of Indices			20.15	

Sum of Indices = 20.15 = 2.015 Compost Index
Total Duration (min) 10

= 43.5 dB(A)

JOB No: 3003092 DATE: 30th March 2009

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 11:15am

WEATHER CONDITIONS: Fine, sunny conditions.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 40 TO 47 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	46.5	4.5	Road Traffic
	2	47	5.0	✓ ✓
	3	46	4.0	✓ ✓
	4	47.5		✓ ✓
	5	45	3.15	✓ ✓
	6	48		✓ ✓
	7	37		Natural Sounds
	8	37.5		✓ ✓
	9	43.5	2.25	Road Traffic
	10	40		Natural Sounds
	11	39.5		✓ ✓
	12	39		✓ ✓
	13	42.5	1.8	Road Traffic
	14	44	2.5	✓ ✓
	15	47.5		✓ ✓
	16	48.5		✓ ✓
	17	46	4.0	✓ ✓
	18	40	1.0	Natural Sounds
	19	40.5	1.125	✓ ✓
	20	47.5		Road Traffic
Sum of Indices			29.325	

Sum of Indices = $\frac{29.325}{10}$ = 2.933 Compost Index

= 44.7 dB(A)

JOB No: 2704092DATE: 27th April 2009LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)TIME MEASUREMENTS COMMENCED: 8:10 amWEATHER CONDITIONS: Fine conditions, cool and crisp.INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)MEASURING RANGE: 44.5 TO 47 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	43.5		Natural Sounds
	2	42		✓ ✓
	3	43		✓ ✓
	4	47		Road Traffic
	5	48.5		✓ ✓
	6	46.5	1.6	✓ ✓
	7	46	1.425	✓ ✓
	8	47.5		✓ ✓
	9	41.5		Natural Sounds
	10	44.5	1.0	Road Traffic
	11	45	1.125	✓ ✓
	12	46	1.425	✓ ✓
	13	45.5	1.25	✓ ✓
	14	43		Natural Sounds
	15	49.5		Birds Chirping
	16	47	1.8	Road Traffic
	17	45.5	1.25	✓ ✓
	18	46	1.425	✓ ✓
	19	46	1.425	✓ ✓
	20	47.5		✓ ✓
Sum of Indices			13.725	

Sum of Indices = 13.725 = 1.373 Compost Index
Total Duration (min) 10

= 45.9 dB(A)

JOB No: 2805092DATE: 28th May 2009LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)TIME MEASUREMENTS COMMENCED: 11:00amWEATHER CONDITIONS: Overcast, cool and breezyINSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)MEASURING RANGE: 43.5 TO 46.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	45	1.425	Quarry Noise (D6)
	2	46.5		✓ ✓
	3	46	1.8	✓ ✓
	4	46	1.8	✓ ✓
	5	46.5	2.0	✓ ✓
	6	45.5	1.6	✓ ✓
	7	44.5	1.25	Road Traffic
	8	46.5	2.0	✓ ✓
	9	43.5		Birds Chirping
	10	43		✓ ✓
	11	41		✓ ✓
	12	41.5		✓ ✓
	13	45.5	1.6	Road Traffic
	14	51		✓ ✓
	15	51		✓ ✓
	16	48		✓ ✓
	17	47.5		✓ ✓
	18	43.5	1.0	✓ ✓
	19	44	1.125	✓ ✓
	20	42.5		✓ ✓
Sum of Indices			15.60	

Sum of Indices
Total Duration (min)

=

15.60
10

=

1.56

Compost Index

=

45.4

dB(A)

PF Formation - Attended Noise Monitoring - DAY LAeq (15 minute)

JOB No: 1706092 DATE: 17th June 2009

LOCATION DESCRIPTION: Fenceline Boundary, Jurds Property (cnr of chicken pen)

TIME MEASUREMENTS COMMENCED: 10:45am

WEATHER CONDITIONS: Overcast conditions, cool and crisp

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 39 TO 45 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	39.5	1.125	Natural Sounds
	2	48.5		Road Traffic
	3	45	4.0	✓ ✓
	4	46		✓ ✓
	5	39.5	1.125	Natural Sounds
	6	41	1.6	Road Traffic
	7	40	1.25	Natural Sounds
	8	37		✓ ✓
	9	45.5		Road Traffic
	10	37		Natural Sounds
	11	37		✓ ✓
	12	41	1.6	Road Traffic
	13	40.5	1.425	✓ ✓
	14	45.5		✓ ✓
	15	40.5	1.425	✓ ✓
	16	36.5		Natural Sounds
	17	39	1.0	Road Traffic
	18	44.5	3.575	✓ ✓
	19	47		✓ ✓
	20	35		Natural Sounds
	21	42	2.0	Quarry Noise
	22	41.5	1.8	Birds Chirping
	23	41	1.6	✓ ✓
	24	42	2.0	Road Traffic
	25	40	1.25	Quarry Noise
Sum of Indices			26.775	

Sum of Indices = 26.775 = 1.785 Compost Index
 Total Duration (min) 15

Operator: Joshua Graham
 Signature: [Signature]

= 41.5 dB(A)

JOB No: 1507084 DATE: 15th July 2008

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 10:50am

WEATHER CONDITIONS: Fine conditions, cool and crisp

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 54 TO 57.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	54		Road Traffic
	2	56.5	1.8	✓ ✓
	3	57	2.0	✓ ✓
	4	55	1.25	✓ ✓
	5	60		✓ ✓
	6	50.5		✓ ✓
	7	49.5		✓ ✓
	8	57	2.0	✓ ✓
	9	54		✓ ✓
	10	53.5		✓ ✓
	11	56	1.6	✓ ✓
	12	58.5		✓ ✓
	13	57.5	2.25	✓ ✓
	14	60		✓ ✓
	15	55.5	1.425	✓ ✓
	16	56	1.6	✓ ✓
	17	54	1.0	✓ ✓
	18	56	1.6	✓ ✓
	19	59.5		✓ ✓
	20	58		✓ ✓
Sum of Indices			16.525	

Sum of Indices = 16.525 = 1.653 Compost Index
 Total Duration (min) 10

= 56.1 dB(A)

JOB No: 1103083 DATE: 11th August 2008

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 8:10am

WEATHER CONDITIONS: Fine conditions, cool and crisp.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 52 TO 56.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	52.5	1.125	Road Traffic
	2	51		✓ ✓
	3	53	1.25	✓ ✓
	4	52	1.0	✓ ✓
	5	54.5	1.8	✓ ✓
	6	59		✓ ✓
	7	55.5	2.25	✓ ✓
	8	55	2.0	✓ ✓
	9	56.5	2.825	✓ ✓
	10	41.5		Natural Sounds.
	11	49		Road Traffic
	12	50.5		✓ ✓
	13	41		Natural Sounds
	14	56	2.5	Road Traffic
	15	57.5		✓ ✓
	16	55	2.0	✓ ✓
	17	56.5	2.825	✓ ✓
	18	60		✓ ✓
	19	59.5		✓ ✓
	20	60		✓ ✓
Sum of Indices			19.575	

Sum of Indices = 19.575 = 1.958 Compost Index
 Total Duration (min) 10

= 54.9 dB(A)

JOB No: 1909083 DATE: 19th September 2008

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 12:55pm

WEATHER CONDITIONS: Fine, sunny conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 56 TO 58.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments	
	1	56.5	1.125	Road Traffic	
	2	55		✓	✓
	3	57	1.25	✓	✓
	4	53		✓	✓
	5	55.5		✓	✓
	6	58	1.6	✓	✓
	7	58.5		✓	✓
	8	57	1.25	✓	✓
	9	58.5		✓	✓
	10	60		✓	✓
	11	60		✓	✓
	12	59.5		✓	✓
	13	54		✓	✓
	14	53.5		✓	✓
	15	57.5	1.425	✓	✓
	16	56	1.0	✓	✓
	17	57	1.25	✓	✓
	18	58.5	1.8	✓	✓
	19	57	1.25	✓	✓
	20	56.5	1.125	✓	✓
Sum of Indices			13.075		

Sum of Indices = 13.075 = 1.308 Compost Index
 Total Duration /min 10

= 57.2 dB(A)

JOB No: 2410083 DATE: 24th October 2008

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 10:00am

WEATHER CONDITIONS: Fine sunny conditions, cloudy.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 50 TO 55 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments	
	1	51.5	1.425	Road Traffic	
	2	50.5	1.125	✓	✓
	3	53	2.0	✓	✓
	4	47		✓	✓
	5	56		✓	✓
	6	40		✓	✓
	7	50	1.0	✓	✓
	8	55	3.15	✓	✓
	9	57		✓	✓
	10	56		✓	✓
	11	53.5	2.25	✓	✓
	12	46.5		✓	✓
	13	60		✓	✓
	14	51	1.25	✓	✓
	15	37.5		Natural Sounds.	
	16	40.5		Road Traffic	
	17	51.5	1.425	✓	✓
	18	60		✓	✓
	19	54.5	2.825	✓	✓
	20	53.5	2.25	✓	✓
Sum of Indices			18.7		

Sum of Indices = 18.7 = 1.87 Compost Index
 Total Duration (min) 10

= 52.7 dB(A)

JOB No: 2111083 DATE: 21st November 2008

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 12:55pm

WEATHER CONDITIONS: Overcast, hot and humid conditions.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 51 TO 56 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	53	1.6	Road Traffic
	2	49.5		✓ ✓
	3	51		✓ ✓
	4	56		✓ ✓
	5	54.5	2.25	✓ ✓
	6	56.5		✓ ✓
	7	55	2.5	✓ ✓
	8	50		✓ ✓
	9	41.5		Natural Sounds
	10	51	1.0	Road Traffic
	11	54	2.0	✓ ✓
	12	60		✓ ✓
	13	58		✓ ✓
	14	48.5		✓ ✓
	15	53	1.6	✓ ✓
	16	54.5	2.25	✓ ✓
	17	56	3.15	✓ ✓
	18	60		✓ ✓
	19	53	1.6	✓ ✓
	20	52	1.25	✓ ✓
Sum of Indices			19.2	

Sum of Indices = 19.2 = 1.92 Compost Index
 Total Duration / min 10

= 53.8 dB(A)

JOB No: 1912082 DATE: 19th December 2008

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 10:30am

WEATHER CONDITIONS: Fine, sunny conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 50 TO 54 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	59.5		Road Traffic
	2	52.5	1.8	✓ ✓
	3	47.5		✓ ✓
	4	49.5		✓ ✓
	5	59.5		✓ ✓
	6	52.5	1.8	✓ ✓
	7	50	1.0	✓ ✓
	8	49.5		✓ ✓
	9	51	1.25	✓ ✓
	10	54	2.5	✓ ✓
	11	55		✓ ✓
	12	51.5	1.42	✓ ✓
	13	53.5	2.25	✓ ✓
	14	52.5	1.8	✓ ✓
	15	48.5		✓ ✓
	16	54	2.5	✓ ✓
	17	60		✓ ✓
	18	52	1.6	✓ ✓
	19	58		✓ ✓
	20	47		✓ ✓
Sum of Indices			17.92	

Sum of Indices = 17.92 = 1.79 Compost Index
 Total Duration / min 10

= 52.5 dB(A)

IOB No: 2901093DATE: 29th January 2009LOCATION DESCRIPTION: Pignataro Residence (at driveway)TIME MEASUREMENTS COMMENCED: 8:30 amWEATHER CONDITIONS: Foggy, moist conditions, slightly humid.INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)Calibrated @ 94db(A) with model type 4230 (serial number 1059668)MEASURING RANGE: 51 TO 57.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	54.5	2.25	Road Traffic
	2	54.5	2.25	✓ ✓
	3	59.5		✓ ✓
	4	59		✓ ✓
	5	48.5		✓ ✓
	6	53	1.6	✓ ✓
	7	60		✓ ✓
	8	57	4.0	✓ ✓
	9	57.5	4.5	✓ ✓
	10	58		✓ ✓
	11	55.5	2.825	✓ ✓
	12	45.5		✓ ✓
	13	56.5	3.575	✓ ✓
	14	56.5	3.575	✓ ✓
	15	35		Natural Sounds
	16	60		Road Traffic
	17	51	1.0	✓ ✓
	18	48		✓ ✓
	19	50		✓ ✓
	20	57.5	4.5	✓ ✓
Sum of Indices			30.075	

Sum of Indices
Total Duration /min

=

30.075
10

=

3.008

Compost Index

55.8 dB(A)

JOB No: 1902092 DATE: 19th February 2009

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 10:35am

WEATHER CONDITIONS: Fine, sunny conditions, slight breeze

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 50.5 TO 57.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	52	1.425	Road Traffic
	2	51	1.125	✓ ✓
	3	60		✓ ✓
	4	49.5		✓ ✓
	5	52.5	1.6	✓ ✓
	6	59.5		✓ ✓
	7	58		✓ ✓
	8	47		✓ ✓
	9	60		✓ ✓
	10	60		✓ ✓
	11	50.5	1.0	✓ ✓
	12	55.5	3.15	✓ ✓
	13	41.5		Natural Sounds
	14	50		Road Traffic
	15	54	2.25	✓ ✓
	16	52	1.425	✓ ✓
	17	42.5		Natural Sounds
	18	55	2.825	Road Traffic
	19	53	1.8	✓ ✓
	20	57.5	5.0	✓ ✓
Sum of Indices			21.6	

Sum of Indices = $\frac{21.6}{10}$ = 2.16 Compost Index

= 53.8 dB(A)

JOB No: 3003093 DATE: 30th March 2009

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 1:00 pm

WEATHER CONDITIONS: Fine, sunny conditions.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 51 TO 54.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments	
	1	53	1.6	Road Traffic	
	2	54.5	2.25	✓	✓
	3	50		✓	✓
	4	52.5	1.425	✓	✓
	5	53	1.6	✓	✓
	6	52.5	1.425	✓	✓
	7	60		✓	✓
	8	49.5		✓	✓
	9	60		✓	✓
	10	56.5		✓	✓
	11	54.5	2.25	✓	✓
	12	53	1.6	✓	✓
	13	51	1.0	✓	✓
	14	54	2.0	✓	✓
	15	55.5		✓	✓
	16	56		✓	✓
	17	52	1.25	✓	✓
	18	50.5		✓	✓
	19	49		✓	✓
	20	50.5		✓	✓
Sum of Indices			16.4		

Sum of Indices = 16.4 = 1.64 Compost Index
Total Duration (min) 10

= 53 dB(A)

JOB No: 2704095 DATE: 27th April 2009

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 11:10am

WEATHER CONDITIONS: Fine, sunny conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 53 TO 56 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments	
	1	55.5	1.8	Road Traffic	
	2	55	1.6	✓	✓
	3	56		✓	✓
	4	53		✓	✓
	5	54.5	1.425	✓	✓
	6	53	1.0	✓	✓
	7	54	1.25	✓	✓
	8	56.5		✓	✓
	9	55.5	1.8	✓	✓
	10	56	2.0	✓	✓
	11	60		✓	✓
	12	52		✓	✓
	13	60		✓	✓
	14	56	2.0	✓	✓
	15	51.5		✓	✓
	16	53	1.0	✓	✓
	17	52		✓	✓
	18	52.5		✓	✓
	19	53	1.0	✓	✓
	20	60		✓	✓
Sum of Indices			14.875		

Sum of Indices = 14.875 = 1.488 Compost Index
Total Duration (min) 10

= 54.7 dB(A)

JOB No: 2805095DATE: 28th May 2009LOCATION DESCRIPTION: Pignataro Residence (at driveway)TIME MEASUREMENTS COMMENCED: 2:30pmWEATHER CONDITIONS: Overcast conditionsINSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)MEASURING RANGE: 47.5 TO 53.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	48.5	1.25	Road Traffic
	2	53.5		✓ ✓
	3	54.5		✓ ✓
	4	43.5		✓ ✓
	5	53.5	4.0	✓ ✓
	6	53.5	4.0	✓ ✓
	7	47.5	1.0	✓ ✓
	8	53.5	4.0	✓ ✓
	9	52	2.825	✓ ✓
	10	53.5	4.0	✓ ✓
	11	48	1.125	✓ ✓
	12	47		✓ ✓
	13	59.5		✓ ✓
	14	58		✓ ✓
	15	49.5	1.6	✓ ✓
	16	52	2.825	✓ ✓
	17	60		✓ ✓
	18	46.5		✓ ✓
	19	45		✓ ✓
	20	41		✓ ✓
Sum of Indices			26.625	

Sum of Indices
Total Duration (min)

=

26.625
10

=

2.663

Compost Index

=

51.7 dB(A)

PF Formation – Attended Noise Monitoring – DAY LAeq (15 minute)

JOB No: 1706093

DATE: 17th June 2009

LOCATION DESCRIPTION: Pignataro Residence (at driveway)

TIME MEASUREMENTS COMMENCED: 12:55pm

WEATHER CONDITIONS: Overcast conditions, cool and crisp

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)

Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 51.5 TO 59.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	53.5	1.6	Road Traffic
	2	56.5	3.15	✓ ✓
	3	60		✓ ✓
	4	55	2.25	✓ ✓
	5	44.5		✓ ✓
	6	53.5	1.6	✓ ✓
	7	59.5	6.3	✓ ✓
	8	60		✓ ✓
	9	56.5	3.15	✓ ✓
	10	60		✓ ✓
	11	53.5	1.6	✓ ✓
	12	56.5	3.15	✓ ✓
	13	58	4.5	✓ ✓
	14	60		✓ ✓
	15	54	1.8	✓ ✓
	16	60		✓ ✓
	17	55	2.25	✓ ✓
	18	54	1.8	✓ ✓
	19	46		✓ ✓
	20	43.5		✓ ✓
	21	51		✓ ✓
	22	47		Farm Equipment
	23	54.5	2.0	Road Traffic
	24	51.5	1.0	✓ ✓
	25	53	1.425	✓ ✓
Sum of Indices			37.575	

Sum of Indices = 37.575 = 2.505 Compost Index
 Total Duration (min) 15

Operator: Joshua Graham
 Signature: *Adam*

= 55.5 dB(A)

JOB No: 1507082 DATE: 15th July 2008

LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 9:45am

WEATHER CONDITIONS: Fine conditions, cool and crisp.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 43 TO 47 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	42.5		Natural Sounds
	2	43		✓ ✓
	3	41.5		✓ ✓
	4	47	2.5	Road Traffic
	5	48.5		✓ ✓
	6	44	1.25	✓ ✓
	7	48		✓ ✓
	8	43.5	1.125	Birds Chirping
	9	42.5		Natural Sounds
	10	50		Road Traffic
	11	47	2.5	✓ ✓
	12	46.5	2.25	✓ ✓
	13	41.5		Natural Sounds
	14	45	1.6	Road Traffic
	15	54		Bird Chirping
	16	50.5		Road Traffic
	17	46	2.0	✓ ✓
	18	43	1.0	Natural Sounds
	19	43.5	1.125	✓ ✓
	20	44	1.25	✓ ✓
Sum of Indices			16.6	

Sum of Indices = 16.6 = 1.66 Compost Index
 Total Duration (min) 10

= 45.2 dB(A)

JOB No: 1108081DATE: 11th August 2008LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)TIME MEASUREMENTS COMMENCED: 7:00amWEATHER CONDITIONS: Fine conditions, cool and crisp.INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)Calibrated @ 94db(A) with model type 4230 (serial number 1059668)MEASURING RANGE: 45 TO 48 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	50.5		Road Traffic
	2	46	1.25	✓ ✓
	3	48	2.0	✓ ✓
	4	40.5		Natural Sounds
	5	46.5	1.425	Road Traffic
	6	47	1.6	✓ ✓
	7	45	1.0	✓ ✓
	8	45.5	1.125	✓ ✓
	9	50		✓ ✓
	10	39.5		Natural Sounds
	11	47	1.6	Bird Chirping
	12	46	1.25	✓ ✓
	13	40		Natural Sounds
	14	40.5		✓ ✓
	15	44.5		Road Traffic
	16	48.5		✓ ✓
	17	48	2.0	✓ ✓
	18	50		✓ ✓
	19	50.5		✓ ✓
	20	48	2.0	✓ ✓
Sum of Indices			15.25	

Sum of Indices
Total Duration (min)

=

15.25
10

=

1.525

Compost Index

=

46.8

dB(A)

OB No: 1909082 DATE: 19th September 2008

LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 11:10 am

WEATHER CONDITIONS: Fine, sunny conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 39 TO 46 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	38.5		Natural Sounds
	2	40	1.25	✓ ✓
	3	39		✓ ✓
	4	45	4.0	Road Traffic
	5	39.5	1.125	Natural Sounds
	6	46.5		Road Traffic
	7	46	5.0	✓ ✓
	8	47		✓ ✓
	9	48.5		✓ ✓
	10	37.5		Natural Sounds
	11	39	1.0	Birds Chirping
	12	38.5		✓ ✓
	13	42.5	2.25	✓ ✓
	14	43	2.5	Road Traffic
	15	40	1.25	Natural Sounds
	16	40.5	1.425	✓ ✓
	17	48		Road Traffic
	18	46	5.0	✓ ✓
	19	47.5		✓ ✓
	20	37.5		Natural Sounds
Sum of Indices			<u>24.8</u>	

Sum of Indices = 24.8 = 2.48 Compost Index
 Total Duration (min) 10

= 43 dB(A)

JOB No: 2410081 DATE: 24th October 2008

LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 7:50am

WEATHER CONDITIONS: Fine conditions, cool and crisp.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 48.5 TO 52 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	45		Road Traffic
	2	51.5	2.0	✓ ✓
	3	48.5		✓ ✓
	4	48.5	1.0	✓ ✓
	5	44.5		Birds Chirping
	6	52.5		Road Traffic
	7	53.5		✓ ✓
	8	50	1.425	Birds Chirping
	9	53.5		Road Traffic
	10	50.5	1.6	✓ ✓
	11	52		✓ ✓
	12	45.5		Birds Chirping
	13	47.5		Road Traffic
	14	52	2.25	✓ ✓
	15	50.5	1.6	Birds Chirping
	16	49	1.125	✓ ✓
	17	54.5		✓ ✓
	18	52	2.25	✓ ✓
	19	50	1.425	✓ ✓
	20	51	1.8	Road Traffic.
Sum of Indices			16.475	

Sum of Indices = 16.475 = 1.648 Compost Index
 Total Duration (min) 10

= 50.6 dB(A)

OB No: 2111081 DATE: 21st November 2008

LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 10:45 am

WEATHER CONDITIONS: Overcast, humid conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 45 TO 49 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	40.5		Natural Sounds
	2	42		✓ ✓
	3	41.5		✓ ✓
	4	49	2.5	Road Traffic
	5	45	1.0	✓ ✓
	6	46.5	1.425	✓ ✓
	7	52		Birds Chirping
	8	45.5	1.125	Road Traffic
	9	50.5		Birds Chirping
	10	50		✓ ✓
	11	46.5	1.425	Road Traffic
	12	48.5	2.25	✓ ✓
	13	51		✓ ✓
	14	50.5		✓ ✓
	15	47.5	1.8	✓ ✓
	16	40		Natural Sounds
	17	39		✓ ✓
	18	47	1.6	Road Traffic
	19	47.5	1.8	✓ ✓
	20	46	1.25	✓ ✓
Sum of Indices			16.175	

Sum of Indices = 16.175 = 1.618 Compost Index
 Total Duration (min) 10

= 47 dB(A)

OB No: 1912083 DATE: 19th December 2008

LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 11:15 am

WEATHER CONDITIONS: Fine, sunny conditions.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 41.5 TO 49 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	47	3.57	Road Traffic
	2	39.5		Natural Sounds
	3	42.5	1.25	✓ ✓
	4	41		✓ ✓
	5	52		Road Traffic
	6	41		✓ ✓
	7	49	5.65	✓ ✓
	8	45.5	2.5	✓ ✓
	9	59		✓ ✓
	10	45.5	2.5	✓ ✓
	11	35		Natural Sounds
	12	42.5	1.25	Road Traffic
	13	52		✓ ✓
	14	49	5.65	✓ ✓
	15	41.5	1.0	✓ ✓
	16	41.5	1.0	✓ ✓
	17	37.5		Natural Sounds
	18	42.5	1.25	Road Traffic
	19	51.5		✓ ✓
	20	50.5		✓ ✓
Sum of Indices			<u>25.62</u>	

Sum of Indices = 25.62 = 2.56 Compost Index
 Total Duration (min) 10

= 45.6 dB(A)

JOB No: 2901095 DATE: 29th January 2009

LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 1:20 pm

WEATHER CONDITIONS: Hot, sunny conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 42 TO 45 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	44.5	1.8	Road Traffic
	2	42	1.0	Natural Sounds
	3	45	2.0	Road Traffic
	4	42	1.0	Natural Sounds
	5	48		Road Traffic
	6	40		Natural Sounds
	7	45	2.0	Road Traffic
	8	46.5		✓ ✓
	9	40.5		✓ ✓
	10	43.5	1.425	Natural Sounds
	11	40		✓ ✓
	12	41.5		✓ ✓
	13	47.5		Road Traffic
	14	49.5		✓ ✓
	15	44.5	1.8	✓ ✓
	16	47		✓ ✓
	17	43.5	1.425	✓ ✓
	18	45	2.0	✓ ✓
	19	42.5	1.125	✓ ✓
	20	40		Natural Sounds.
Sum of Indices			15.575	

Sum of Indices = $\frac{15.575}{10}$ = 1.558 Compost Index

= 43.9 dB(A)

JOB No: 1902091 DATE: 19th February 2009

LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 10:05am

WEATHER CONDITIONS: Fine, sunny conditions.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 44 TO 48.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	52		Road Traffic
	2	44	1.0	✓ ✓
	3	47	2.0	Plane Overhead
	4	42		Natural Sounds
	5	44	1.0	Road Traffic
	6	53		✓ ✓
	7	43.5		✓ ✓
	8	51		✓ ✓
	9	53.5		✓ ✓
	10	48.5		✓ ✓
	11	39.5		Natural Sounds
	12	43.5		Road Traffic
	13	44.5	1.125	✓ ✓
	14	48.5	2.825	✓ ✓
	15	48	2.5	✓ ✓
	16	48	2.5	✓ ✓
	17	41		✓ ✓
	18	44	1.0	✓ ✓
	19	44.5	1.125	✓ ✓
	20	44.5	1.125	✓ ✓
Sum of Indices			16.2	

Sum of Indices = 16.2 = 1.62 Compost Index
Total Duration (min) 10

= 46 dB(A)

JOB No: 3003091 DATE: 30th March 2009

LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 8:15am

WEATHER CONDITIONS: Cool, foggy conditions

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 45 TO 47.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments	
	1	46.5	1.425	Road Traffic	
	2	48		✓	✓
	3	47.5	1.8	✓	✓
	4	45.5	1.125	✓	✓
	5	48		✓	✓
	6	44.5		✓	✓
	7	46	1.25	✓	✓
	8	45	1.0	✓	✓
	9	50.5		✓	✓
	10	40		Natural Sounds	
	11	47	1.6	Road Traffic	
	12	48		✓	✓
	13	46	1.25	✓	✓
	14	39.5		Natural Sounds	
	15	39		✓	✓
	16	40		✓	✓
	17	54		Birds Chirping	
	18	46.5	1.425	Road Traffic	
	19	45.5	1.125	✓	✓
	20	47	1.60	✓	✓
Sum of Indices			13.6		

Sum of Indices = 13.6 = 1.36 Compost Index
Total Duration (min) 10

= 46.3 dB(A)

JOB No: 2704091 DATE: 27th April 2009

LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 7:35am

WEATHER CONDITIONS: Fine conditions, cool and crisp.

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 40.5 TO 45.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	45	2.825	Road Traffic
	2	46		✓ ✓
	3	45.5	3.15	✓ ✓
	4	39.5		Natural Sounds
	5	39		✓ ✓
	6	47		Road Traffic
	7	45.5	3.15	✓ ✓
	8	44	2.25	✓ ✓
	9	45	2.825	✓ ✓
	10	47		✓ ✓
	11	46.5		✓ ✓
	12	43.5	2.0	Birds Chirping
	13	43	1.8	✓ ✓
	14	44	2.25	✓ ✓
	15	46.5		Road Traffic
	16	38		Natural Sounds
	17	39		✓ ✓
	18	38.5		✓ ✓
	19	41	1.125	✓ ✓
	20	40.5	1.0	✓ ✓
Sum of Indices			22.375	

Sum of Indices = 22.375 = 2.238 Compost Index
 Total Duration (min) 10

= 44 dB(A)

JOB No: 2805091DATE: 28th May 2009LOCATION DESCRIPTION: Cnr Wisemans Ferry Rd & Hitchcock Road (at driveway)TIME MEASUREMENTS COMMENCED: 10:10 amWEATHER CONDITIONS: Overcast, cool and breezy.INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)
Calibrated @ 94db(A) with model type 4230 (serial number 1059668)MEASURING RANGE: 42 TO 46.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	49.5		Road Traffic
	2	42	1.0	✓ ✓
	3	36.5		Dog Barking
	4	51.5		Road Traffic
	5	39.5		Natural Sounds.
	6	46.5	2.825	Road Traffic
	7	47.5		✓ ✓
	8	47.5		✓ ✓
	9	44.5	1.8	✓ ✓
	10	35.5		Natural Sounds.
	11	44.5	1.8	Road Traffic
	12	45.5	2.25	✓ ✓
	13	43.5	1.425	✓ ✓
	14	42.5	1.125	✓ ✓
	15	46	2.5	✓ ✓
	16	32.5		Natural Sounds
	17	41.5		Road Traffic
	18	43	1.25	✓ ✓
	19	43.5	1.425	✓ ✓
	20	51.5		✓ ✓
Sum of Indices			17.40	

Sum of Indices
Total Duration (min)17.40
101.74

Compost Index

44.3 dB(A)

PF Formation – Attended Noise Monitoring – DAY LAeq (15 minute)

JOB No: 1706091

DATE: 17th June 2009

LOCATION DESCRIPTION: Cnr Wisemans Ferry Road & Hitchcock Road (at driveway)

TIME MEASUREMENTS COMMENCED: 9:55am

WEATHER CONDITIONS: Overcast conditions, cool and crisp

INSTRUMENTATION: Bruel and kjaer S.L.M Type 226 (serial number 1014703)

Calibrated @ 94db(A) with model type 4230 (serial number 1059668)

MEASURING RANGE: 42 TO 50.5 dB(A)

Measurement Location	Min	60s Leq	Conv. Index	Comments
	1	39		Natural Sounds
	2	51.5		Road Traffic
	3	41		Natural Sounds
	4	41.5		✓
	5	45	2.0	Road Traffic ✓
	6	50.5	7.15	✓ ✓
	7	51		✓ ✓
	8	50	6.3	✓ ✓
	9	48	4.0	✓ ✓
	10	44	1.6	✓ ✓
	11	55.5		✓ ✓
	12	46	2.5	✓ ✓
	13	42.5	1.125	Natural Sounds
	14	41.5		✓ ✓
	15	46	2.5	Road Traffic
	16	42	1.0	Natural Sounds
	17	43.5	1.425	Road Traffic
	18	50.5		✓ ✓
	19	47	3.15	✓ ✓
	20	45	2.0	✓ ✓
	21	40.5		Natural Sounds
	22	51		Road Traffic
	23	50.5	7.15	✓ ✓
	24	47.5	3.575	✓ ✓
	25	42	1.0	Natural Sounds
Sum of Indices			46.475	

Sum of Indices = 46.475 = 3.1 Compost Index
 Total Duration (min) 15

Operator: Joshua Graham

Signature: [Signature]

= 46.9 dB(A)

*Chapter Five***GROUND AND SURFACE WATER MANAGEMENT****5.1 Introduction**

The court orders (**Number 6.3**) for the Hitchcock Road development and the conditions of consent (**Number 42**) for Lot 198 required the preparation of a report in the form of a Water Management Plan in order to demonstrate that adequate means of transferring and/or discharging the build-up of ground and surface waters is continually maintained and monitored in relation to the following:

- certified and suitable arrangements for dewatering water pits including contingency arrangements;
- means of treating polluted (including sediment laden) waters;
- means of maintaining/monitoring current surface and sub surface water quality;
- identification and adequacy of existing destination points for waters collected within the extraction area;
- on-site reuse of collected water and other potential uses;
- maximum and average water levels experienced and the capacity of the existing water sump to sustain major storm events;
- state of significant site features, groundwater recharge areas and natural springs; and
- achievement of qualitative and quantitative criteria of the approved Water Management Strategy including any improvements and/or adjustments now needed.

The groundwater monitoring program included in the new Water Management Plan approved by the Director-General of the Department of Planning on 8 July 2009 includes:

- provision of additional monitoring bores around the periphery of the site;
- detailed baseline data on groundwater levels, flows and quality in the region and particularly any groundwater bores, springs and seeps (including spring and seep fed dams) that may be affected by operations on site;
- groundwater assessment criteria including trigger levels for investigating any potentially adverse groundwater impacts;
- a program to monitor:
 - groundwater levels and quality in new and existing monitoring bores;
 - impacts of the project on any groundwater bores, springs and seeps (including spring and seep fed farm dams) on privately-owned land and any groundwater dependent ecosystems; and

- a protocol for further groundwater modelling to confirm the limits to excavation depth across the site permitted in accordance with **Condition 9** of **Schedule 2**.

This chapter addresses the surface and groundwater aspects of the sand extraction operations at the site. It is divided into two parts for this purpose.

The first deals with the groundwater component and has been prepared by URS Australia (formerly AGC Woodward-Clyde Pty Ltd); the second concerns surface water management prepared by Douglas Partners.

5.2 Groundwater

5.2.1 Groundwater monitoring

Groundwater is monitored at five locations on the Hitchcock Road site. These are:

- monitoring bore PF167MW1, located in Lot 167 DP752039;
- monitoring bore PF166MW1, located in Lot 2 DP57096;
- supply dam PF167DAM located in Lot 167 DP752039;
- monitoring bore PFL2HitchMW1, located in Lot 2 DP1063296; and
- monitoring bore PFP21MW1, located in Lot 214 DP752039

Bores PFLHitchMMW1 and PFP214MW1 were installed following the Project Approval in February 2009. The location of these bores is shown on **Figure 5.1**.

In addition, groundwater pumpage and chemical records are collected for the two water supply bores in Lot 198. These are:

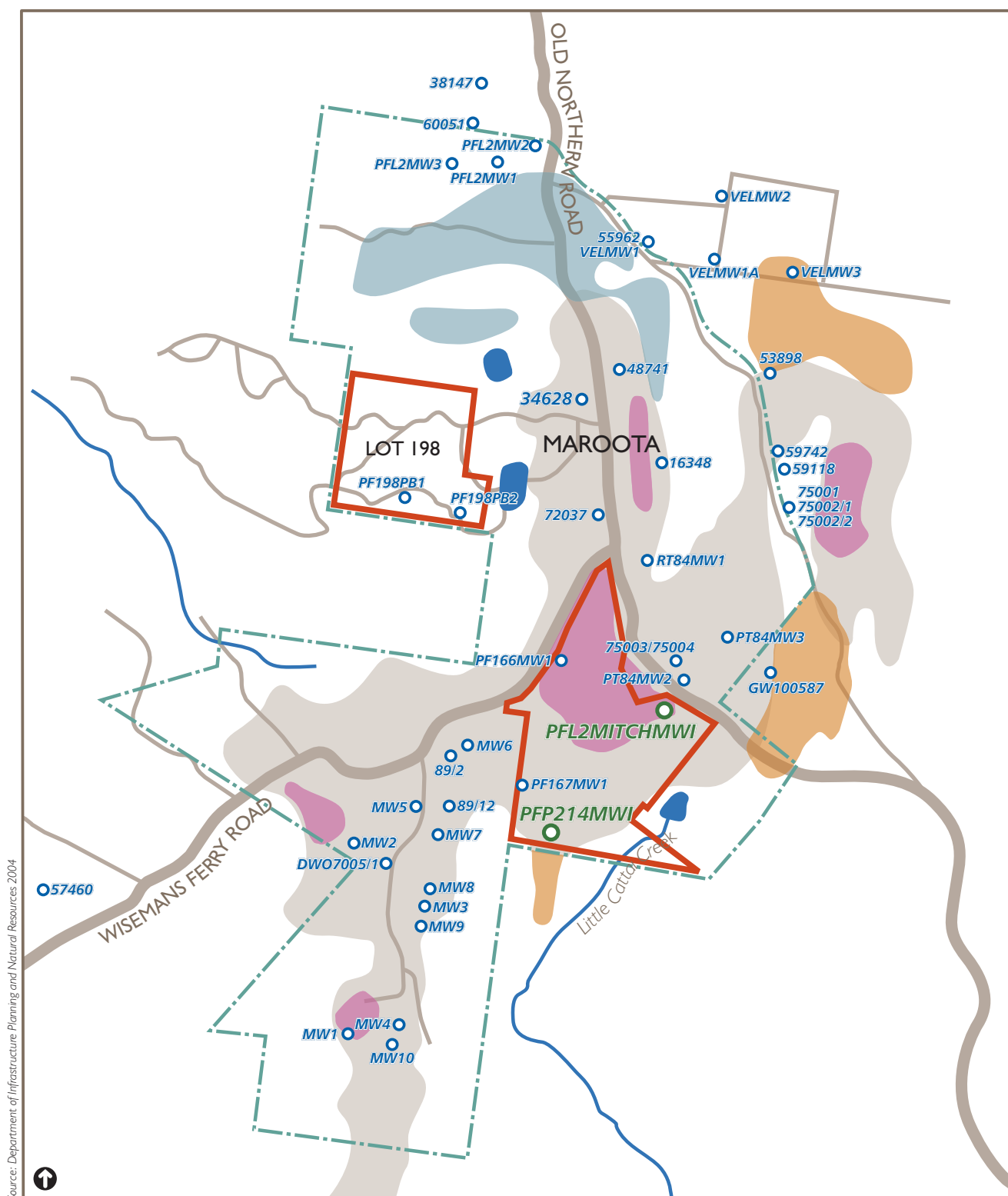
- Water supply bore PF198PB1, located at the wash plant; and
- Water supply bore PF198PB2, located at the rear of the workshop.

Groundwater samples for chemical analysis have been collected from these bores since they were drilled in 1998.

Groundwater monitoring has been carried out at these sites since 1996. Initially, water levels in bores PF166MW1 and PF167MW1 were measured manually at weekly intervals together with chemical field parameters such as pH and Electrical Conductivity (EC). The manual measurements continued until December 1998. In January 1999, the two bores were equipped with Dataflow Systems automatic data loggers.

Data loggers have been downloaded quarterly between January 1999 and June 2000. Since June 2000, the data loggers have been downloaded biannually. The old style data loggers were replaced in January 2006 with Solinst Levellogger units with a battery life of approximately 10 years capable of storing 40,000 readings in memory. These will allow annual data downloading a monitoring interval started in July 2006.

Groundwater samples for chemical analysis have been collected at the same time for the monitoring and pumping bores and the analytical results plotted on individual graphs to assess possible trends with time.



Source: Department of Infrastructure Planning and Natural Resources 2004

Scale
0 2.0 Kilometres

- Hitchcock Road site
- Sydney Regional Environmental Plan 9 area boundary
- Maroota Sand
- Clay occurrence
- Ferruginised sand
- Hawkesbury sandstone
- 57460 Licensed bore
- New bore

Figure 5.1
LOCATION OF LICENSED BORES

Water samples were collected and submitted for chemical analysis under Chain of Custody procedures to Australian Laboratory Services Pty Ltd. The laboratory reports are presented in **Attachment 5A**. The analytical list, which was discussed and agreed with the former Department of Land and Water Conservation (now the Department of Water and Energy), includes the following:

- pH, Electrical Conductivity and Total Dissolved Solids
- Calcium, Magnesium, Sodium and Potassium
- Chloride, Sulphate and Bicarbonate
- Oil and Grease.

Following a request by the Department of Water and Energy that groundwater should be monitored for additional analytes at a location within the Hitchcock Road site, a sample will be collected from July 2009 and analysed for the following in addition to the existing list:

- Heavy metals;
- Nutrients(Ammonia, Nitrate, Total Nitrogen and Total Phosphorus); and
- Benzene

This suite of analytes is that required under the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000* 95% freshwater protection levels (slightly to moderately disturbed systems).

Monitoring Bore PF167MW1

Groundwater monitoring at bore PF167MW1 started in March 1996. The data between March 1996 and December 1998 (manual collection) have been plotted in the graph in **Figure 2** at **Attachment 5B**, together with EC and rainfall records collected by PF Formation.

The plot of bore PF167MW1 provides a combined record of Dataflow and Solinst data and is presented in **Figure 3** at **Attachment 5B**. Some minor data gaps exist and a slight difference between the manual data and the start of the automatic recording is evident in the graph. This is due to the time interval between the end of the manual and start of the automatic recording methods.

Monitoring Bore PF166MW1

Groundwater monitoring at bore PF166MW1 started in March 1998 in the same manner as bore PF167MW1. The data between March 1998 and December 1998 (manual collection) have been plotted in the graph of **Figure 4** at **Attachment 5C**, together with EC and rainfall records collected by PF Formation.

The plot of bore PF167MW records collected after the installation of the Dataflow data logger is presented in **Figure 5** also at **Attachment 5C**.

Monitoring Bore PFP214MW1

Bore PFP214MW1 was installed in March 2009 as part of the extended groundwater monitoring program following the Project Approval for the extension of sand extraction into Lot 214 DP752039.

A data logger was installed in the bore in April 2009 (Solinst Levellogger Gold 3001, serial number 51040540) and downloaded for the first time in July 2009. **Figure 6** at **Attachment 5D** shows the hydrograph for the bore.

Monitoring Bore PFL2HitchMW1

Bore PFL2HitchMW1 was also installed in March 2009. This bore is located midway along the eastern boundary of the Hitchcock Road site and monitors the full sequence of the Maroota sand.

A data logger was installed in the bore in April 2009 (Solinst Levellogger Gold 3001, serial number 510405840) and downloaded for the first time in July 2009. **Figure 7** at **Attachment 5E** shows the hydrograph for the bore.

Dam in Lot 167

During an early stage of the site development, an excavation was carried out to the top of the Hawkesbury Sandstone to an approximate level of 178m AHD. The excavation collected groundwater and surface water and was eventually licensed by the former Department of Land and Water Conservation (No 10BL157308) as part of the water supply system.

Water levels measured against survey pegs have been collected at the dam since September 1996 and pumpage records kept since January 1997.

Plots of the water level in the dam together with the rainfall for the corresponding period are presented in **Figure 8** at **Attachment 5F**.

No water quality monitoring is carried out at the dam as, in addition to groundwater, it collects direct rainfall and runoff from the surrounding area and, therefore, the quality of the water in the dam would vary according to the different proportions of the inputs at the time of measurement.

Water supply bores

The two water supply bores in Lot 198 have been monitored manually since their installation in March 1998. Groundwater samples have been collected quarterly for the last four quarters to March 2000, biannually to July 2006 and annually since then. Pumpage records are kept and totalled every two weeks. Water levels are not monitored in these bores due to the influence of the pumps.

Water quality data have been plotted for selected parameters. The laboratory reports are included in **Attachment 5A** with the quality plots for Bores PF198PB1 and PF198PB2 presented in **Attachment 5H** and **Attachment 5I** respectively.

5.2.2 Data assessment

Groundwater levels

Groundwater levels in the Maroota Sand measured in the monitoring bores indicate that the aquifer is variable and contains numerous perched water tables. The plots of bore PF167MW1, which taps the full saturated thickness of the Maroota Sand and bore PF166MW1, which taps an unconfined aquifer perched at a higher elevation, indicate a rapid response to periods of sustained rainfall. Records of the two new monitoring bores are not sufficiently long to assess their response to rainfall.

The average yearly rainfall for July 2008 to June 2009 was 1,294 mm, substantially above the long term average of 884.8 mm and similar to the previous year. Rainfall data are reported from the PF Formation recording system as the Bureau of Meteorology data have not been updated since January 2008.

Monitoring Bore PF167MW1

Following a significant rainfall event in June 2007, the water level rose by 4.5m to a level similar to the highest recorded value in mid 2000. The unexpected rise in water level in this bore exceeded the 10m pressure sensor range and, as a result data were not recorded for the last six months. The suspension cable of the data logger was subsequently shortened and the logger reset. However, the plot shows the July manual water level measurement at 182.44m AHD confirming the rising water level trend at the site. The water level in this bore fell between October 2008 and March 2009 by approximately one metre to begin rising again during the three months to July 2009.

Monitoring Bore PF166MW1

Following a period of significant and sustained rainfall, the water level in this bore has risen by 1.5m since July 2007, less than a metre from the highest level recorded in the first half of 2002.

PF167Dam

Water levels in the PF167DAM, which was originally excavated to the base of the Maroota Sand within the deep palaeochannel, have been kept above 180 m AHD over the year to June 2009 by regulating pumping so that this level is not exceeded. Due to the above average rainfall of the last two years there have been long periods when water was not extracted from this source.

The rainfall recorded for the year to the end of June 2009 was 1,294 mm, which is above the yearly average of 884.8 mm. Following heavy rainfall during June 2007 (384.5 mm) and the following above-average year to November 2008, the water level in the dam has risen to just over 183 m AHD, the highest level recorded at this location since monitoring started in September 1996. Sporadic pumping since November 2009 is reflected in fluctuating water levels in the hydrograph. The high levels is considered to be the result of the combined effects of the high rainfall, reduced need for pumping from this source since November 2006 and general aquifer recovery and recharge.

Although water is pumped from the dam for a variety of purposes, such as dust suppression and irrigation of rehabilitated areas and more recently for sand slurring, records show that water levels return rapidly to the average values indicated above even after higher levels are experienced following heavy rainfall and consequent runoff.

Figure 6 in **Attachment 5F** shows the combined effects of rainfall and runoff on the water level in the dam. These suggest that the Maroota sand aquifer at the site is capable of sustaining the required pumpage even under low rainfall recharge conditions and the additional demand placed upon it in the wider Maroota area by the many groundwater users.

Groundwater quality

Water quality in bores PF167MW1 and PF166MW1 has been monitored for pH and EC since monitoring started. Since June 1999 groundwater quality has been analysed quarterly for a range of analytical parameters to obtain background data.

From July 2009, groundwater quality data will be available from the two recently installed monitoring bores. In addition, in response to a condition of the Project Approval, a sample from Bore PF167MW1 has been analysed for a wider range of analytes in accordance with the *Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000*, Guideline 2, 95% freshwater protection level. The results are shown in **Table 5.1**.

These indicate that groundwater quality complies with guideline levels with the exception of Aluminium and Nitrate. Aluminium is commonly at high levels in Australian groundwater and should not be of concern. Nitrate is above the guideline. However, as fertiliser and other chemicals are not used at the site, it is likely that the marginally high concentration is of natural origin.

Table 5.1 Bore PF167MW1 Chemical analyses

Analyte	Unit	BorePF167MW1	Guideline value ¹
pH		4.00	NG
Electrical Conductivity, EC	µS/cm	177	NG
Total Dissolved Solids, TDS	mg/L	104	NG
Calcium, Ca	mg/L	5	NG
Magnesium, Mg	mg/L	4	NG
Sodium, Na	mg/L	14	NG
Potassium, K	mg/L	4	NG
Bicarbonate, HCO ₃	mg/L	<1	NG
Sulphate, SO ₄	mg/L	22.6	NG
Chloride, Cl	mg/L	34.8	NG
Hardness	mg/L	27	NG
Ammonia	mg/L	0.06	0.9
Nitrate	mg/L	2.36	0.7
Total N	mg/L	3.2	NG
Total P	mg/L	0.01	NG
Aluminium, Al	mg/L	0.77	0.055
Arsenic, As	mg/L	<0.001	0.024
Barium, Ba	mg/L	0.024	NG
Boron, B	mg/L	<0.05	0.37
Cadmium, Cd	mg/L	<0.0001	0.001
Chromium Cr(VI)	mg/L	<0.010	0.0014
Copper, Cu	mg/L	<0.001	NG
Iron, Fe	mg/L	<0.05	0.0034
Lead, Pb	mg/L	<0.001	NG
Lithium, Li	mg/L	0.001	NG
Manganese, Mn	mg/L	0.022	1.9
Mercury, Hg	mg/L	0.0002	0.0006
Nickel, Ni	mg/L	<0.001	0.011
Selenium, Se	mg/L	<0.01	0.011
Silver, Ag	mg/L	<0.001	0.00005
Zinc, Zn	mg/L	<0.005	0.008
Benzene	µg/L	<1	950

Note 1: Australian and New Zealand Guidelines for Fresh and marine Water Quality 2000, 95% freshwater protection levels.

Historical and recent analytical results for the other samples from the monitoring sites are summarised in **Tables 5.2 to 5.6** and have been plotted in the graphs presented in **Attachments 5G to 5L**. The laboratory reports are presented in **Attachment 5A**. Bore PF166MW1 could not be sampled during the previous monitoring round due to the low level of water in the bore.

Table 5.2 Summary of chemical analysis at Bore PF167MW1

Analyte	Unit	Date					
		22.06.05	19.01.06	06.07.06	05.07.07	03.07.08	03.07.09
pH		5.42	4.32	4.27	4.88	5.29	4.00
Electrical Conductivity EC	µS/cm	215	205	199	188	161	177
Total Dissolved Solids TDS	mg/L	137	141	119	76	100	104
Calcium Ca	mg/L	5	4	4	2	6	5
Magnesium Mg	mg/L	4	4	4	3	5	4
Sodium Na	mg/L	28	25	23	16	13	14
Potassium K	mg/L	3	3	3	2	4	4
Chloride Cl	mg/L	57	57	53	36	26	35
Sulphate SO ₄	mg/L	13	10	6	10	30	23
Bicarbonate HCO ₃	mg/L	2	2	>1	<1	<1	<1
Oil and Grease	mg/L	<5	<5	<5	<5	<5	<5

The plots in **Attachment 5C** show electrical conductivity (EC) together with water levels and rainfall for the initial monitoring period, before the installation of the data loggers. The EC plots show a sympathetic variation with rainfall, indicating the effects of dilution generated by recharge (decrease in EC) and by a lower water table. In the latter case, the improved EC is interpreted as the effect of aquifer recharge by fresher water.

The plots confirm the dependence of the aquifer on rainfall to maintain storage and supply. No analysis has been carried out of the water from the dam because extraneous influences, such as direct rainfall and run-off, make that water unrepresentative of the groundwater at the site.

The waters in the two Maroota Sand aquifer monitoring bores are similar and have a characteristic meteoric composition, with low pH, low TDS and a Sodium-Chloride type. The samples were also analysed for Oil and Grease to monitor the possible effect of the sand extraction operations. Oil and grease was detected in the groundwater in Bore PF198PB1 in January 2006 (6 mg/L), in Bore PF198PB2 in December 2001 (11 mg/L) and in Bore PF166MW1 (6mg/L). As no oil and grease was detected in all other sampling occasions, it is considered that such occurrences do not represent a cause for concern.

Table 5.3 Summary of chemical analysis at Bore PF166MW1

Analyte	Unit	Date					
		22.06.05	19.01.06	06.07.06	05.07.07	03.07.08	03.07.09
pH		Dry	Dry	Dry	4.76	No sample	3.58
Electrical Conductivity EC	µS/cm				163		240
Total Dissolved Solids TDS	mg/L				98		140
Calcium Ca	mg/L						<1
Magnesium Mg	mg/L						4
Sodium Na	mg/L						256
Potassium K	mg/L						2
Chloride Cl	mg/L						49
Sulphate SO ₄	mg/L						2.2
Bicarbonate HCO ₃	mg/L						<1
Oil and Grease	mg/L						<5

Table 5.4 Summary of chemical analysis at Bores PFL2HitchMW1 and PFP214MW1

Analyte	Unit	Bore	
		PFL2HitchMW1	PFP214MW1
pH		3.96	4.19
Electrical Conductivity EC	µS/cm	183	168
Total Dissolved Solids TDS	mg/L	84	100
Calcium Ca	mg/L	1	<1
Magnesium Mg	mg/L	2	6
Sodium Na	mg/L	19	18
Potassium K	mg/L	2	1
Chloride Cl	mg/L	40	24
Sulphate SO ₄	mg/L	8	2
Bicarbonate HCO ₃	mg/L	<1	<1
Oil and Grease	mg/L	<5	<5

Groundwater quality has also been monitored at bores PF198PB1 and PF198PB2, the two process plant water supply bores. The water in these bores is derived from the Hawkesbury Sandstone aquifer. Quality records are summarised in **Tables 5.4** and **5.5** and the data plotted in the graphs included in **Attachments 5K** and **5L**.

The deep pumping bores groundwater displays a slightly different character to that in the shallow Maroota Sand aquifer in the Hitchcock Road area and from shallow Hawkesbury Sandstone aquifer in other areas of Maroota. The deeper groundwater has a slightly higher TDS pH (PFPB1) and bicarbonate content (PF198PB2) than the shallower Maroota Sand groundwater. However, its overall low salinity content and a sodium-chloride meteoric composition indicate a dynamic groundwater regime with regular and rapid rainfall recharge.

Overall, all the bores in both the Hawkesbury Sandstone and the Maroota Tertiary Sand show a marginal decrease in Total Dissolved Solids over time, the deeper bores showing a more consistent character.

Table 5.5 Summary of chemical analysis at Bore PF198PB1

Analyte	Unit	Date					
		22.06.05	19.01.06	06.07.06	05.07.07	03.07.08	03.07.09
pH		5.22	5.74	5.16	No sample	4.59	3.94
Electrical Conductivity EC	µS/cm	157	158	155		144	174
Total Dissolved Solids TDS	mg/L	105	115	98		85	83
Calcium Ca	mg/L	1	2	1		<1	1
Magnesium Mg	mg/L	2	4	3		2	2
Sodium Na	mg/L	23	21	20		18	19
Potassium K	mg/L	2	2	2		1	2
Chloride Cl	mg/L	47	43	44		31	39
Sulphate SO ₄	mg/L	8	6	2		10	9
Bicarbonate HCO ₃	mg/L	1	12	5		<1	<1
Oil and Grease	mg/L	<5	5	<5		<5	<5

Table 5.6 Summary of chemical analysis at Bore PF198PB2

Analyte	Unit	Date					
		22.06.05	19.01.06	06.07.06	05.07.07	03.07.08	03.07.09
pH		6.43	5.30	5.46	4.37	5.25	4.50
Electrical Conductivity EC	µS/cm	133	126	122	195	135	130
Total Dissolved Solids TDS	mg/L	87	104	79	88	79	79
Calcium Ca	mg/L	<1	<1	1	<1	1	<1
Magnesium Mg	mg/L	4	3	4	3	5	3
Sodium Na	mg/L	17	19	16	21	16	16
Potassium K	mg/L	2	1	2	1	2	2
Chloride Cl	mg/L	35	39	30	45	32	32
Sulphate SO ₄	mg/L	4	1	1	4	2	3
Bicarbonate HCO ₃	mg/L	14	7	24	<1	24	9
Oil and Grease	mg/L	<5	<5	<5	<5	<5	<5

Pumpage records

Records of pump operations have been kept for PF167DAM since January 1997. Annual pumpage for the current year (42.2 ML) has been below the licensed limit (50 ML/year) mainly due to improved management of the central process plant.

Pumping records for the two water supply bores in Portion 198 have been kept since July 1999. The total pumpage for the year July 2008 to June 2009 of 41.6 ML was below the combined annual allocation of 60 ML.

Due to modifications carried out at the wash plant on Lot 198, these bores are no longer required for continuous supply.

5.3 Surface water management**5.3.1 Current site conditions**

This section of the report has been prepared on the basis of observations made during the course of visits to the site to carry out inspections of various geotechnical and other related issues together with discussions with operational and site personnel. It relates specifically to the extraction works being carried out at the Hitchcock Road site under the previous consent. Consideration is also given to surface water management issues on Lot 198.

Previous extraction operations on the site have resulted in the pre-1998 construction of the following features:

- vegetated bunds along most of the Old Northern Road boundary;

- an existing pit towards the southern boundary, with a grassed rehabilitated batter;
- haul road from the Wisemans Ferry Road entrance to the existing pit;
- construction/access road from the Wisemans Ferry Road entrance to the location of the slurry plant and along the eastern side of the site to the present extraction areas; and
- vegetated bund on the northern side of the Wisemans Ferry Road entrance. This has since been extended.

Work at the site under the previous consent started following receipt of approval under **Parts 1 and 2**, and **Condition 3.6** of the Land and Environmental Court orders on 20 October 1998. The works consisted of the preparation of tailings ponds, a clean water supply dam, installation of the slurry/tailings and water supply pipelines as well as associated bunds and a spillage containment basin, together with preparation for construction of the sand slurry plant.

Extraction commenced in Lot 167 DP752039 to allow construction of tailings ponds to be undertaken. Since June 1999, extraction has been completed in the south-western corner of this phase and extended first to the north and subsequently to the east.

The location of the current extraction areas, tailings ponds and sediment basins is shown on the figure at **Attachment 2A**.

The following changes have been implemented during the year from August 2008.

- Extraction has continued in a northerly direction into Lot 1 DP1091018 on the northern side of Tailings Pond 7. However, following the new approval, extraction in this area has ceased in preference to extraction in Lot 214 DP752039. The crest of the extraction has been graded to control surface runoff and direct it around the area to prevent flow over the crest of the excavation wall.
- Backfilling has continued in the north-western corner of Tailings Pond 10 on the northern side of Tailings Pond 7.
- Minor extraction has been undertaken on the south-western side of the slurry plant on Lot 1 DP57096 to create an additional space suitable for stockpiles.
- Extraction has started on Lot 214 DP752039 on the southern side of the main clean water dam.
- Visual bunds have been constructed on the southern side of the new extraction area.
- Topsoil has been stripped and stockpiled on the southern side of the supplementary (unused) clean water dam and towards the bund along the southern boundary.
- The tailings stream currently incorporates Tailings Ponds 5 and 7; Tailings Ponds 9 and 10 are not presently in use.
- Previously capped Tailings Ponds 2 and 8 continued to be used as overburden stockpile areas.
- The supplementary water storage dam on the western side of the main clean water supply dam has not yet been brought into use.

5.3.2 Comments and discussion

The following points respond, where appropriate, to the specific surface water issues listed at the beginning of the chapter.

Dewatering of water pits

A total of ten tailings ponds has now been constructed and eight commissioned for the dewatering of the tailings in the main extraction area. Tailings Pond 10 has been completed but not yet included in the tailings cycle as extraction has only recently ceased on the northern side. The ponds have been inspected and are considered to have generally been constructed in accordance with design information provided by Douglas Partners. Of the commissioned ponds, Numbers 5 and 9 are currently in the tailings stream cycle with Number 7 currently drying prior to capping.

Tailings Ponds 1, 2, 3, 4 and 6 on the western side of the southern haul road and Tailings Pond 8 on the eastern side have been fully capped.

Decant water from the tailings ponds flows to the clean water supply dam, thence to the slurry plant and the processing/wash plant on Lot 198.

The tailings ponds on Lot 198 (Wisemans Ferry Road) are currently not used for tailings disposal. Only one uncapped tailings pond remains in Area B and those in Area C are fully capped with topsoil spread as part of the rehabilitation process.

Treatment of sediment-laden water

Sediment-laden water is treated by the use of a series of tailings ponds which enable the sediment to progressively settle out of suspension with the resulting clean water returned to the processing cycle.

Stormwater runoff from disturbed areas flows to these ponds and other sediment basins across the site to maximise reuse of all water. Prior to overflow and discharge from the spillways and the site, the stormwater runoff will be treated where necessary.

The clean water supply dam, located close to the southern boundary of the southern catchment, comprises the final sediment basin before any discharge of stormwater from the Hitchcock Road site. It is included in the process water cycle and, at the time of the inspection, was estimated to be using about 60 percent of its calculated capacity of 25,000 cubic metres.

Past extraction in the northern extraction area has created a temporary excavation, the capacity of which significantly exceeds that required as a sediment basin for the northern catchment section of the site. A minimum capacity of 7,800 cubic metres will be maintained following final trimming of this basin. Inspection indicates a current freeboard to the spillway of about 3.5 metres with no indication of any discharge from the site during the year.

Maintaining/monitoring current surface water quality

The site does not have any permanently flowing surface waters. Existing surface water is limited to a supply sump in an area of previous extraction and a number of small farm dams. The existing tailings ponds and sediment basins will maintain the quality of the intermittent surface water flows experienced on the site.

Monitoring of surface water quality will be achieved by the visual inspection of waters within the sediment basins allowing treatment to take place if necessary prior to overflow and discharge from the site.

Destination points for waters collected within the extraction areas

In the southern catchment, the collected waters flow to the tailings ponds and the clean water dam (southern sediment basin) and thence to the slurry plant and the main process plant on Lot 198. In the northern part of the Hitchcock Road site they flow to the northern sediment basin and thence (if not recovered and reused) via the overflow spillway, and two further minor sediment traps to the Wisemans Ferry Road surface drains. There are no indications that any surface water has been discharged from the Hitchcock Road site and all available water is used in the processing cycle.

On-site reuse of collected waters

All collected waters are reused in the processing cycle during the operational stage of the extraction works.

Water levels within the existing water sump

Water levels and volumes within the sump are detailed in **Section 5.2**. The sump (dam) is located at the lowest point- in the south-eastern corner of the existing pit on Portion 167 on the eastern side of the clean water dam. The capacity of this area is essentially the full extent of the existing pit and would greatly exceed that calculated in the Rehabilitation Plan as necessary for the total capture of runoff from the 100 year time of concentration storm event (19,400 m³).

Significant site features, recharge areas and natural areas

The main extraction area has now moved from Lot 168 to continue within Lot 214 and along the western edge of Lot 167. Extraction in the northern part of the site will continue southwards over the next three years. Groundwater recharge areas, outside the current extraction areas remain essentially unaltered and the groundwater management plan has concluded that there has been no apparent impact on the sustainability of the groundwater. (see **Section 5.2**)

5.3.3 Other issues

Minor works are required to improve operating conditions in the extraction areas on the Hitchcock Road site. These include the repair and reinstatement of the batters at the water discharge point of the pipes between Tailings Ponds 5 and 7 and between Pond 5 and the clean water supply dam where erosion has taken place. The discharge points at the ends of the pipes will be extended to beyond the toe of the pond embankments.

Access to the area above the former extraction area on the northern side of Tailings Pond 7 is now restricted and the southern side of the track in this area has been graded to control surface water runoff. This exclusion zone will be widened by at least 10 metres at the crest of the pit and a star picket fence or similar will be erected.

5.4 Conclusions

The data collected from the monitoring stations in the Hitchcock Road area, some of which represent the oldest data available to the groundwater study in the area, imply that:

- water levels in the Maroota Sand aquifer respond rapidly to the rainfall pattern;
- the water table in bore PF167MW1 has fallen steadily since April 2002 in response to lower rainfall, but rose rapidly after the rain event in June 2007;
- water quality in the Maroota Sand aquifer varies with rainfall;

- the water level in the Lot 167 dam has averaged 182.21 mAHD, a value higher than the long term average (180.67 mAHD) since 1996. This high level is thought to be due to the higher than average rainfall over the last two years and consequent runoff to the dam;
- records indicate that the water level in the dam recovers rapidly on cessation of pumping;
- groundwater pumpage from the two deep water supply bores in Portion 198 (41.6 ML) has been below the licence limit of 60 ML for the year;
- the quality of the groundwater in the deep aquifer of the Hawkesbury Sandstone (water supply bores in Lot 198) has an overall character that indicates that recharge occurs readily;
- groundwater quality at the site is below the ANZECC Guidelines for Fresh and Marine Water Quality 2000 95% groundwater protection level (slightly to moderately disturbed systems) with the exception of modest exceedances for Aluminium and Nitrate which are considered to be of natural origin; and
- current sand extraction operations in the Hitchcock Road area operate in a manner that does not appear to have a significant impact on groundwater sustainability and is in accordance with the relevant Court orders and Approval Conditions.

The collected data have been made freely available to the Department of Water and Energy for its continuing groundwater study of the Maroota area.

Monitoring of water levels and quality as described in this AEMP will continue for inclusion in the next report.

Attachment 5A

**CHEMICAL ANALYSIS
OF GROUNDWATER**

CHAIN OF CUSTODY FORM

Sheet of

THIS COLUMN FOR LAB USE ONLY Job Code: Due Date:	FROM: URS ACN 000 691 690 116 Miller Street North Sydney NSW 2060 Ph: 8925 5500		DATE: <div style="font-size: 2em; font-family: cursive;">3/7/09</div>		TO: ALS 277-289 Woodpark Road Smithfield NSW 2164		Container Size, Type, Preservative and Analysis Container Identification							
							Size	1 L	500mL	125 mL	60 mL	40 mL		
							Type*	P	G	P	P	G		
							Label colour	green	purple	purple	red	Maroon		
							Preservative Code							
							Number of containers	pH, EC, TDS, Ca, Mg, Na, K, Cl, HCO ₃ , SO ₄ , Hardness	oil and grease	Ammonia, Nitrate, Total N, Total P	Heavy Metals: Al, As, As(III), As(V), Ba, B, Cd, Cr(VI), Cu, Fe, Pb, Li, Mn, Hg, Ni, Se, Ag, Zn	BT/EX		
	Project No: 43167726 Project Manager: Fabio Carosone Agreement No:		Sampler(s): Signature(s): <div style="font-family: cursive; font-size: 1.5em;">Fabio Carosone</div> Checked:		Received for Laboratory by: <div style="font-family: cursive;">Soy Steps</div> Date: 03/7/19 Time: 16:05									
Custody seal intact? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Sample cold? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Released for URS by: Fabio Carosone Date: 3/7/07 Time: 16:05												

Lab identification	Date	Time	Matrix	Sample Number	Comments	Total no	Tick required analytes							
1			Water	PF167MW1 ✓		7	✓	✓	✓	✓	✓			
2				PF166MW1 ✓		3	✓	✓						
3				PFP214MW1 ✓		3	✓	✓						
				PFL2MW1		3	✓	✓						
4				PFL3MW1 ✓		3	✓	✓						
5				PF198PB1 ✓ <i>VEL MW 2</i>		3	✓	✓						
6				PF198PB2 ✓		3	✓	✓						
							7	14	1	1	2			
TOTAL						25								

Remarks:

 Courier Job No:

* Con VC =
 Spec

**Environmental Division
Sydney**
Work Order

ES0909760

Telephone : + 61-2-8784 8555

Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinsed Jar; S = Solvent Washed Acid Rinsed Glass Bottle; Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle

NOTE: SAMPLES MAY CONTAIN DANGEROUS AND HAZARDOUS SUBSTANCES



Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES0909760	Page	: 1 of 7
Client	: URS AUSTRALIA (NSW) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR FABIO CAROSONE	Contact	: Charlie Pierce
Address	: LEVEL 3, 116 MILLER STREET NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: fabio_carosone@urscorp.com	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 89255500	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 89255555	Facsimile	: +61-2-8784 8500
Project	: 43167726	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 03-JUL-2009
C-O-C number	: ----	Issue Date	: 13-JUL-2009
Sampler	: FC	No. of samples received	: 6
Site	: ----	No. of samples analysed	: 6
Quote number	: EN/001/08 V4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits



NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Celine Conceicao	Spectroscopist	Inorganics
Edwandy Fadjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **ED093F: LCS recovery Magnesium elements falls outside ALS Dynamic Control Limit. However, they are within the acceptance criteria based on ALS DQO. No further action is required.**
- **EG035T: Positive mercury results have been confirmed by re-analysis**
- **EN055- Ionic Balance out of acceptable limits for various samples due to analytes not quantified in this report.**
- **EP080: Level of Reporting raised for toluene due to ambient background levels in the laboratory.**



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				PF167MW1	PF166MW1	PFP214MW1	PFL3MW1	VELMW2
				[03-JUL-2009]	[03-JUL-2009]	[03-JUL-2009]	[03-JUL-2009]	[03-JUL-2009]
Compound	CAS Number	LOR	Unit	ES0909760-001	ES0909760-002	ES0909760-003	ES0909760-004	ES0909760-005
EA005: pH								
pH Value	----	0.01	pH Unit	4.00	3.58	4.19	4.07	4.18
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	177	240	168	189	325
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	104	140	100	114	210
EA065: Total Hardness as CaCO3								
^ Total Hardness as CaCO3	----	1	mg/L	27	18	24	14	15
ED009: Anions								
Chloride	16887-00-6	0.20	mg/L	34.8	49.1	24.3	53.8	88.0
Sulfate	14808-79-8	0.20	mg/L	22.6	2.21	1.90	5.57	17.2
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	<1	<1	2
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	<1	<1	2
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	5	1	<1	<1	<1
Magnesium	7439-95-4	1	mg/L	4	4	6	3	4
Sodium	7440-23-5	1	mg/L	14	26	18	24	47
Potassium	7440-09-7	1	mg/L	4	2	1	1	<1
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.77	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Barium	7440-39-3	0.001	mg/L	0.024	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Lithium	7439-93-2	0.001	mg/L	0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	0.022	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	0.0002	----	----	----	----



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				PF167MW1	PF166MW1	PFP214MW1	PFL3MW1	VELMW2
				[03-JUL-2009]	[03-JUL-2009]	[03-JUL-2009]	[03-JUL-2009]	[03-JUL-2009]
Compound	CAS Number	LOR	Unit	ES0909760-001	ES0909760-002	ES0909760-003	ES0909760-004	ES0909760-005
EG050F: Hexavalent Chromium - Filtered								
Hexavalent Chromium	18540-29-9	0.010	mg/L	<0.010	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.06	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
^ Nitrate as N	14797-55-8	0.01	mg/L	2.36	----	----	----	----
EK059G: NOX as N by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	2.36	----	----	----	----
EK061: Total Kjeldahl Nitrogen (TKN)								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.8	----	----	----	----
EK062: Total Nitrogen as N								
^ Total Nitrogen as N	----	0.1	mg/L	3.2	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.01	----	----	----	----
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	1.45	1.43	0.72	1.63	----
Total Anions	----	0.01	meq/L	----	----	----	----	2.17
^ Total Cations	----	0.01	meq/L	1.23	1.54	1.27	1.35	2.32
^ Ionic Balance	----	0.01	%	----	----	27.3	----	----
EP020: Oil and Grease (O&G)								
^ Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5
EP080: BTEX								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<5	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	5	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	2	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	0.1	%	84.6	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	94.1	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	96.2	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**

Client sample ID

PF198PB2

Client sampling date / time

[03-JUL-2009]

Compound	CAS Number	LOR	Unit	ES0909760-006				
EA005: pH								
pH Value	----	0.01	pH Unit	4.50	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	130	----	----	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	79	----	----	----	----
EA065: Total Hardness as CaCO3								
^ Total Hardness as CaCO3	----	1	mg/L	13	----	----	----	----
ED009: Anions								
Chloride	16887-00-6	0.20	mg/L	32.2	----	----	----	----
Sulfate	14808-79-8	0.20	mg/L	2.78	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	8	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	8	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
Magnesium	7439-95-4	1	mg/L	3	----	----	----	----
Sodium	7440-23-5	1	mg/L	16	----	----	----	----
Potassium	7440-09-7	1	mg/L	2	----	----	----	----
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	1.12	----	----	----	----
^ Total Cations	----	0.01	meq/L	1.01	----	----	----	----
EP020: Oil and Grease (O&G)								
^ Oil & Grease	----	5	mg/L	<5	----	----	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115



Environmental Division

QUALITY CONTROL REPORT

Work Order	: ES0909760	Page	: 1 of 8
Client	: URS AUSTRALIA (NSW) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR FABIO CAROSONE	Contact	: Charlie Pierce
Address	: LEVEL 3, 116 MILLER STREET NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: fabio_carosone@urscorp.com	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 89255500	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 89255555	Facsimile	: +61-2-8784 8500
Project	: 43167726	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 03-JUL-2009
C-O-C number	: ----	Issue Date	: 13-JUL-2009
Sampler	: FC		
Order number	: ----		
Quote number	: EN/001/08 V4	No. of samples received	: 6
		No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits



NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Celine Conceicao	Spectroscopist	Inorganics
Edwandy Fadjjar	Senior Organic Chemist	Organics
Hoa Nguyen	Inorganic Chemist	Inorganics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC



Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005: pH (QC Lot: 1029714)									
ES0909740-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	Anonymous	Anonymous	Anonymous	Anonymous
ES0909764-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	Anonymous	Anonymous	Anonymous	Anonymous
EA010P: Conductivity by PC Titrator (QC Lot: 1033092)									
ES0909733-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	Anonymous	Anonymous	Anonymous	Anonymous
ES0909760-001	PF167MW1	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	177	179	1.1	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1031719)									
ES0909743-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909747-002	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ED009: Anions (QC Lot: 1034341)									
ES0909729-017	Anonymous	ED009: Chloride	16887-00-6	0.20	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED009: Sulfate	14808-79-8	0.20	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909760-002	PF166MW1	ED009: Chloride	16887-00-6	0.20	mg/L	49.1	50.0	1.8	0% - 20%
		ED009: Sulfate	14808-79-8	0.20	mg/L	2.21	2.16	2.2	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 1033093)									
ES0909760-001	PF167MW1	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ES0909831-010	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ED093F: Dissolved Major Cations (QC Lot: 1029727)									
ES0909760-001	PF167MW1	ED093F: Calcium	7440-70-2	1	mg/L	5	5	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	4	4	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	14	13	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.0	No Limit
ED093F: Dissolved Major Cations (QC Lot: 1029944)									
ES0909678-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED093F: Magnesium	7439-95-4	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED093F: Sodium	7440-23-5	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED093F: Potassium	7440-09-7	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909760-002	PF166MW1	ED093F: Calcium	7440-70-2	1	mg/L	1	1	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	4	4	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	26	26	0.0	0% - 20%

Page : 4 of 8
 Work Order : ES0909760
 Client : URS AUSTRALIA (NSW) PTY LTD
 Project : 43167726



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 1029944) - continued									
ES0909760-002	PF166MW1	ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 1031421)									
ES0909686-006	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Barium	7440-39-3	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Copper	7440-50-8	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Lead	7439-92-1	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Lithium	7439-93-2	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Boron	7440-42-8	0.05	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
EG020A-T: Iron	7439-89-6	0.05	mg/L	Anonymous	Anonymous	Anonymous	Anonymous		
ES0909743-008	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Barium	7440-39-3	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Copper	7440-50-8	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Lead	7439-92-1	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Lithium	7439-93-2	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Boron	7440-42-8	0.05	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
EG020A-T: Iron	7439-89-6	0.05	mg/L	Anonymous	Anonymous	Anonymous	Anonymous		
EG020T: Total Metals by ICP-MS (QC Lot: 1031422)									
ES0909686-006	Anonymous	EG020B-T: Silver	7440-22-4	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909743-008	Anonymous	EG020B-T: Silver	7440-22-4	0.001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1031806)									
ES0909782-008	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909754-003	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
EG050F: Hexavalent Chromium - Filtered (QC Lot: 1029713)									
ES0909760-001	PF167MW1	EG050G-F: Hexavalent Chromium	18540-29-9	0.010	mg/L	<0.010	<0.010	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1029957)									
ES0909743-003	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909747-003	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1029724)									

Page : 5 of 8
 Work Order : ES0909760
 Client : URS AUSTRALIA (NSW) PTY LTD
 Project : 43167726



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1029724) - continued									
ES0909740-003	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909757-001	Anonymous	EK057G: Nitrite as N	----	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
EK059G: NOX as N by Discrete Analyser (QC Lot: 1029958)									
ES0909743-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909754-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
EK061: Total Kjeldahl Nitrogen (TKN) (QC Lot: 1031887)									
ES0909754-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909765-008	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1031888)									
ES0909754-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909765-008	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
EP080: BTEX (QC Lot: 1030028)									
ES0909670-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: Toluene	108-88-3	2	µg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: Ethylbenzene	100-41-4	2	µg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	Anonymous	Anonymous	Anonymous	Anonymous
			106-42-3						
ES0909727-001	Anonymous	EP080: ortho-Xylene	95-47-6	2	µg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: Benzene	71-43-2	1	µg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: Toluene	108-88-3	2	µg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: Ethylbenzene	100-41-4	2	µg/L	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	Anonymous	Anonymous	Anonymous	Anonymous
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	Anonymous	Anonymous	Anonymous	Anonymous



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA010P: Conductivity by PC Titrator (QCLot: 1033092)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	100	86.3	112
EA015: Total Dissolved Solids (QCLot: 1031719)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	293 mg/L	99.6	77.9	122
ED009: Anions (QCLot: 1034341)								
ED009: Chloride	16887-00-6	0.2	mg/L	<0.25	4 mg/L	91.0	80	120
ED009: Sulfate	14808-79-8	0.2	mg/L	<0.25	4 mg/L	106	80	120
ED037P: Alkalinity by PC Titrator (QCLot: 1033093)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	91.5	80.2	108
ED093F: Dissolved Major Cations (QCLot: 1029727)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	94.0	88	110
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	95.0	90	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	91.6	81	107
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.8	89	109
ED093F: Dissolved Major Cations (QCLot: 1029944)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.5	88	110
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	# 87.2	90	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	81	107
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	98.9	89	109
EG020T: Total Metals by ICP-MS (QCLot: 1031421)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	98.6	89	117
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	85	111
EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	98.6	89	113
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.1	88	108
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	96.6	89	115
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	98.2	91	113
EG020A-T: Lithium	7439-93-2	0.001	mg/L	<0.001	0.1 mg/L	108	80	118
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	99.6	89	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	97.6	91	113
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	97.0	77	113
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.6	78	116
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.1 mg/L	89.9	73	127
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	109	84	118
EG020T: Total Metals by ICP-MS (QCLot: 1031422)								



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EG020T: Total Metals by ICP-MS (QCLot: 1031422) - continued								
EG020B-T: Silver	7440-22-4	0.001	mg/L	<0.001	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1031806)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	92.4	81	119
EG050F: Hexavalent Chromium - Filtered (QCLot: 1029713)								
EG050G-F: Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.010	0.50 mg/L	100	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1029957)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1.00 mg/L	107	79.6	122
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1029724)								
EK057G: Nitrite as N	----	0.01	mg/L	<0.01	0.96 mg/L	89.2	65.1	129
EK059G: NOX as N by Discrete Analyser (QCLot: 1029958)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.96 mg/L	110	76.9	122
EK061: Total Kjeldahl Nitrogen (TKN) (QCLot: 1031887)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	88.2	62.4	140
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1031888)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	79.8	64.3	120
EP020: Oil and Grease (O&G) (QCLot: 1031196)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	83.6	81.6	107
EP080: BTEX (QCLot: 1030028)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	115	76.2	124
EP080: Toluene	108-88-3	2	µg/L	----	10 µg/L	123	74.4	124
		5	µg/L	<5	----	----	----	----
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	110	76.1	122
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	112	75.7	123
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	117	77.9	121



Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%) MS	Recovery Limits (%) LowHigh	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number				
EG020T: Total Metals by ICP-MS (QCLot: 1031421)							
ES0909686-009	Anonymous	EG020A-T: Arsenic	7440-38-2	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Barium	7440-39-3	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Cadmium	7440-43-9	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Copper	7440-50-8	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Lead	7439-92-1	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Manganese	7439-96-5	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Nickel	7440-02-0	Anonymous	Anonymous	Anonymous	Anonymous
		EG020A-T: Zinc	7440-66-6	Anonymous	Anonymous	Anonymous	Anonymous
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1031806)							
ES0909782-008	Anonymous	EG035T: Mercury	7439-97-6	Anonymous	Anonymous	Anonymous	Anonymous
EG050F: Hexavalent Chromium - Filtered (QCLot: 1029713)							
ES0909760-001	PF167MW1	EG050G-F: Hexavalent Chromium	18540-29-9	0.50 mg/L	88.7	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 1029957)							
ES0909743-003	Anonymous	EK055G: Ammonia as N	7664-41-7	Anonymous	Anonymous	Anonymous	Anonymous
EK057G: Nitrite as N by Discrete Analyser (QCLot: 1029724)							
ES0909740-003	Anonymous	EK057G: Nitrite as N	----	Anonymous	Anonymous	Anonymous	Anonymous
EK059G: NOX as N by Discrete Analyser (QCLot: 1029958)							
ES0909743-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	Anonymous	Anonymous	Anonymous	Anonymous
EK061: Total Kjeldahl Nitrogen (TKN) (QCLot: 1031887)							
ES0909754-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	Anonymous	Anonymous	Anonymous	Anonymous
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1031888)							
ES0909754-001	Anonymous	EK067G: Total Phosphorus as P	----	Anonymous	Anonymous	Anonymous	Anonymous
EP080: BTEX (QCLot: 1030028)							
ES0909670-001	Anonymous	EP080: Benzene	71-43-2	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: Toluene	108-88-3	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: Ethylbenzene	100-41-4	Anonymous	Anonymous	Anonymous	Anonymous
		EP080: meta- & para-Xylene	108-38-3	Anonymous	Anonymous	Anonymous	Anonymous
			106-42-3				
		EP080: ortho-Xylene	95-47-6	Anonymous	Anonymous	Anonymous	Anonymous



Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES0909760	Page	: 1 of 8
Client	: URS AUSTRALIA (NSW) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR FABIO CAROSONE	Contact	: Charlie Pierce
Address	: LEVEL 3, 116 MILLER STREET NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: fabio_carosone@urscorp.com	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 89255500	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 89255555	Facsimile	: +61-2-8784 8500
Project	: 43167726	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 03-JUL-2009
Sampler	: FC	Issue Date	: 13-JUL-2009
Order number	: ----		
Quote number	: EN/001/08 V4	No. of samples received	: 6
		No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

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Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005: pH								
Clear Plastic Bottle - Natural PF167MW1, PF166MW1, PFP214MW1, PFL3MW1, VELMW2, PF198PB2	03-JUL-2009	---	---	---	03-JUL-2009	03-JUL-2009	✓	
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural PF167MW1, PF166MW1, PFP214MW1, PFL3MW1, VELMW2, PF198PB2	03-JUL-2009	---	---	---	08-JUL-2009	31-JUL-2009	✓	
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural PF167MW1, PF166MW1, PFP214MW1, PFL3MW1, VELMW2, PF198PB2	03-JUL-2009	---	---	---	07-JUL-2009	10-JUL-2009	✓	
ED009: Anions								
Clear Plastic Bottle - Natural PF167MW1, PF166MW1, PFP214MW1, PFL3MW1, VELMW2, PF198PB2	03-JUL-2009	---	---	---	09-JUL-2009	31-JUL-2009	✓	
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural PF167MW1, PF166MW1, PFP214MW1, PFL3MW1, VELMW2, PF198PB2	03-JUL-2009	---	---	---	08-JUL-2009	17-JUL-2009	✓	
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural PF167MW1, PF166MW1, PFP214MW1, PFL3MW1, VELMW2, PF198PB2	03-JUL-2009	---	---	---	06-JUL-2009	31-JUL-2009	✓	



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unspecified PF167MW1	03-JUL-2009	07-JUL-2009	30-DEC-2009	✓	08-JUL-2009	30-DEC-2009	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unspecified PF167MW1	03-JUL-2009	----	----	----	09-JUL-2009	31-JUL-2009	✓
EG050F: Hexavalent Chromium - Filtered							
Clear Plastic Bottle - Natural PF167MW1	03-JUL-2009	----	----	----	03-JUL-2009	04-JUL-2009	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid PF167MW1	03-JUL-2009	---	---	----	06-JUL-2009	31-JUL-2009	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural PF167MW1	03-JUL-2009	---	---	----	06-JUL-2009	05-JUL-2009	✗
EK059G: NOX as N by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid PF167MW1	03-JUL-2009	---	---	----	06-JUL-2009	31-JUL-2009	✓
EK061: Total Kjeldahl Nitrogen (TKN)							
Clear Plastic Bottle - Sulphuric Acid PF167MW1	03-JUL-2009	07-JUL-2009	31-JUL-2009	✓	07-JUL-2009	31-JUL-2009	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulphuric Acid PF167MW1	03-JUL-2009	07-JUL-2009	31-JUL-2009	✓	07-JUL-2009	31-JUL-2009	✓
EP020: Oil and Grease (O&G)							
Amber Glass Bottle - Sulphuric Acid PF167MW1, PF166MW1, PFP214MW1, PFL3MW1, VELMW2, PF198PB2	03-JUL-2009	----	----	----	07-JUL-2009	31-JUL-2009	✓
EP080: BTEX							
Amber VOC Vial - HCl or NaHSO4 PF167MW1	03-JUL-2009	---	---	----	06-JUL-2009	17-JUL-2009	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER** Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	16	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	19	10.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Filtered	EG050G-F	1	1	100.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	3	19	15.8	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	11	18.2	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	14	14.3	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	13	15.4	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Standard Anions	ED009	2	16	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	15	13.3	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	2	19	10.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	2	19	10.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	2	19	10.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	2	11	18.2	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	16	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Filtered	EG050G-F	1	1	100.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	2	19	10.5	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	14	7.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Oil and Grease	EP020	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Standard Anions	ED009	1	16	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	15	6.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	11	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement



Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Method Blanks (MB) - Continued							
Conductivity by PC Titrator	EA010-P	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Filtered	EG050G-F	1	1	100.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	2	19	10.5	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	14	7.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Oil and Grease	EP020	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Standard Anions	ED009	1	16	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	15	6.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Metals by ICP-MS - Suite B	EG020B-T	1	19	5.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	11	9.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	19	5.3	5.0	✓	ALS QCS3 requirement
Hexavalent Chromium by Discrete Analyser - Filtered	EG050G-F	1	1	100.0	5.0	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	9.1	5.0	✓	ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	14	7.1	5.0	✓	ALS QCS3 requirement
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	15	6.7	5.0	✓	ALS QCS3 requirement
Total Mercury by FIMS	EG035T	1	19	5.3	5.0	✓	ALS QCS3 requirement
Total Metals by ICP-MS - Suite A	EG020A-T	1	19	5.3	5.0	✓	ALS QCS3 requirement
Total Phosphorus as P By Discrete Analyser	EK067G	1	11	9.1	5.0	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	20	5.0	5.0	✓	ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures 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 in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Hardness as CaCO3	EA065	WATER	APHA 21st ed., 2340 B. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Standard Anions	* ED009	WATER	APHA 21st ed., 4110. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Major Cations - Filtered	ED093F	WATER	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite B	EG020B-T	WATER	(APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Hexavalent Chromium by Discrete Analyser - Filtered	EG050G-F	WATER	APHA 21st ed., 3500 Cr-A & B. Hexavalent chromium is determined directly on water sample by Seal Discrete Analyser as received by pH adjustment and colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N by Discrete analyser	EK055G	WATER	APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N by Discrete Analyser	EK057G	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Analytical Methods	Method	Matrix	Method Descriptions
Nitrate as N by Discrete Analyser	EK058G	WATER	APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by Discrete Analyser. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	APHA 21st ed., 4500-Norg D. 25mL water samples are digested using a traditional Kjeldahl digestion followed by determination by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	APHA 21st ed., 4500-Norg / 4500-NO3-. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	APHA 21st ed., 4500-P B&F This procedure involves sulphuric acid digestion of a 100mL sample to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by IC PCT and ICPAES	EN055 - IC ED009	WATER	APHA 21st Ed. 1030F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Oil and Grease	EP020	WATER	APHA 21st ed., 5520 B Oil & grease is a gravimetric procedure to determine the amount of oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	APHA 21st ed., 4500 Norg - D; APHA 21st ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
ED093F: Dissolved Major Cations	1182497-030	----	Magnesium	7439-95-4	87.2 %	90-110%	Recovery less than lower control limit

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EK057G: Nitrite as N by Discrete Analyser						
Clear Plastic Bottle - Natural PF167MW1	----	----	----	06-JUL-2009	05-JUL-2009	1

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.

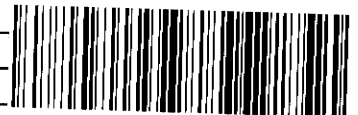
CHAIN OF CUSTODY FORM

Sheet of

THIS COLUMN FOR LAB USE ONLY		FROM: URS ACN 000 691 690 116 Miller Street North Sydney NSW 2060 Ph: 8925 5500				DATE: 6/07/2009		TO: ALS 277-289 Woodpark Road Smithfield NSW 2164 Fax: 8925 5555		Container Size, Type, Preservative and Analysis							
Job Code:		Due Date:		Project No: 43167726 Project Manager: Fabio Carosone Agreement No:		Sampler(s): Signature(s): Fabio Carosone Checked:		Received for Laboratory by: Date: 07/11/09 Time: 17:10		Container Identification							
										Size	1 L	500mL	125 mL	60 mL	40 mL		
										Type*	P	G	P	P	G		
										Label colour Preservative Code	green	purple	purple	red	Maroon		
										Number of containers	pH, EC, TDS, Ca, Mg, Na, K, Cl, HCO3, SO4, Hardness	oil and grease	Ammonia, Nitrate, Total N, Total P	Heavy Metals: Al, As, As(III), As(V), Ba, B, Cd, Cr(VI), Cu, Fe, Pb, Li, Mn, Hg, Ni, Se, Ag, Zn	BTEX		
Custody seal intact?		YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>		Sample cold?		YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>											
Lab identification		Date	Time	Matrix	Sample Number	Comments		Total no	Tick required analytes								
1		6/07/2009		Water	VELMW1A			3	✓ ✓								
2		6/07/2009		Water	VELMMW3			1	✓								
3		6/07/2009		Water	PFL2HitchMW1			3	✓ ✓								
4		6/07/2009		Water	PF198PB1	SO4 PRESERVATIVE		3	✓ ✓								
						RINSED OUT BY MISTAKE											
Remarks:								TOTAL	10								
Courier Job No:		Specify Turnaround Time:						NOTE: SAMPLES MAY CONTAIN DANGEROUS AND HAZARDOUS SUBSTANCES									

Environmental Division
Sydney
Work Order

ES0909908



Telephone : +61-2-8784 8555



Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES0909908	Page	: 1 of 3
Client	: URS AUSTRALIA (NSW) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR FABIO CAROSONE	Contact	: Charlie Pierce
Address	: LEVEL 3, 116 MILLER STREET NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: fabio_carosone@urscorp.com	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 89255500	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 89255555	Facsimile	: +61-2-8784 8500
Project	: 43167726	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 07-JUL-2009
C-O-C number	: ----	Issue Date	: 14-JUL-2009
Sampler	: FC	No. of samples received	: 4
Site	: ----	No. of samples analysed	: 4
Quote number	: EN/001/08 V4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

Environmental Division Sydney

Part of the **ALS Laboratory Group**

277-289 Woodpark Road Smithfield NSW Australia 2164

Tel. +61-2-8784 8555 Fax. +61-2-8784 8500 www.alsglobal.com

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General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA015 TDS result has been confirmed for sample ID"VELMMW3" by reanalysis.**



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				VELMW1A	VELMMW3	PFL2HITCHMW1	PF198PB1	
				06-JUL-2009 15:00	06-JUL-2009 15:00	06-JUL-2009 15:00	06-JUL-2009 15:00	----
Compound	CAS Number	LOR	Unit	ES0909908-001	ES0909908-002	ES0909908-003	ES0909908-004	----
EA005: pH								
pH Value	----	0.01	pH Unit	4.12	4.01	3.96	3.94	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	162	157	182	172	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	87	----	84	83	----
Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	----	50	----	----	----
EA065: Total Hardness as CaCO3								
^ Total Hardness as CaCO3	----	1	mg/L	9	9	8	12	----
ED009: Anions								
Chloride	16887-00-6	0.20	mg/L	39.4	38.7	40.3	38.8	----
Sulfate	14808-79-8	0.20	mg/L	2.14	2.00	7.88	9.31	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	<1	<1	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	<1	<1	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	<1	1	----
Magnesium	7439-95-4	1	mg/L	2	2	2	2	----
Sodium	7440-23-5	1	mg/L	18	16	21	19	----
Potassium	7440-09-7	1	mg/L	<1	<1	<1	2	----
EN055: Ionic Balance								
^ Total Anions	----	0.01	meq/L	1.16	1.13	1.30	1.29	----
^ Total Cations	----	0.01	meq/L	0.98	0.88	1.07	1.10	----
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	----	<5	<5	----



Environmental Division

QUALITY CONTROL REPORT

Work Order	: ES0909908	Page	: 1 of 5
Client	: URS AUSTRALIA (NSW) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR FABIO CAROSONE	Contact	: Charlie Pierce
Address	: LEVEL 3, 116 MILLER STREET NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: fabio_carosone@urscorp.com	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 89255500	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 89255555	Facsimile	: +61-2-8784 8500
Project	: 43167726	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----	Date Samples Received	: 07-JUL-2009
C-O-C number	: ----	Issue Date	: 14-JUL-2009
Sampler	: FC	No. of samples received	: 4
Order number	: ----	No. of samples analysed	: 4
Quote number	: EN/001/08 V4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits



NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

Environmental Division Sydney

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General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC



Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005: pH (QC Lot: 1032561)									
ES0909906-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	Anonymous	Anonymous	Anonymous	Anonymous
EA010P: Conductivity by PC Titrator (QC Lot: 1034280)									
ES0909878-003	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	Anonymous	Anonymous	Anonymous	Anonymous
ES0909908-004	PF198PB1	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	172	169	1.8	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1033012)									
ES0909876-003	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909892-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ED009: Anions (QC Lot: 1035587)									
ES0909882-003	Anonymous	ED009: Chloride	16887-00-6	0.20	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED009: Sulfate	14808-79-8	0.20	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909911-002	Anonymous	ED009: Chloride	16887-00-6	0.20	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED009: Sulfate	14808-79-8	0.20	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ED037P: Alkalinity by PC Titrator (QC Lot: 1034281)									
ES0909878-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909908-004	PF198PB1	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ED093F: Dissolved Major Cations (QC Lot: 1032595)									
ES0909882-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED093F: Magnesium	7439-95-4	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED093F: Sodium	7440-23-5	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED093F: Potassium	7440-09-7	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
ES0909897-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED093F: Magnesium	7439-95-4	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED093F: Sodium	7440-23-5	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous
		ED093F: Potassium	7440-09-7	1	mg/L	Anonymous	Anonymous	Anonymous	Anonymous



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) LowHigh	
Method: Compound	CAS Number	LOR	Unit	Result				
EA010P: Conductivity by PC Titrator (QCLot: 1034280)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	100	86.3	112
EA015: Total Dissolved Solids (QCLot: 1033012)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	293 mg/L	101	77.9	122
ED009: Anions (QCLot: 1035587)								
ED009: Chloride	16887-00-6	0.2	mg/L	<0.25	4 mg/L	93.2	80	120
ED009: Sulfate	14808-79-8	0.2	mg/L	<0.25	4 mg/L	89.7	80	120
ED037P: Alkalinity by PC Titrator (QCLot: 1034281)								
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	----	200 mg/L	100	80.2	108
ED093F: Dissolved Major Cations (QCLot: 1032595)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	94.9	88	110
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	94.3	90	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	92.0	81	107
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.5	89	109
EP020: Oil and Grease (O&G) (QCLot: 1034081)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	96.4	81.6	107



Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) Results are required to be reported.**



Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES0909908	Page	: 1 of 5
Client	: URS AUSTRALIA (NSW) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR FABIO CAROSONE	Contact	: Charlie Pierce
Address	: LEVEL 3, 116 MILLER STREET NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: fabio_carosone@urscorp.com	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 89255500	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 89255555	Facsimile	: +61-2-8784 8500
Project	: 43167726	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 07-JUL-2009
Sampler	: FC	Issue Date	: 14-JUL-2009
Order number	: ----		
Quote number	: EN/001/08 V4	No. of samples received	: 4
		No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Environmental Division Sydney

Part of the **ALS Laboratory Group**

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Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005: pH								
Clear Plastic Bottle - Natural VELMW1A, PFL2HITCHMW1,	VELMMW3, PFL198PB1	06-JUL-2009	----	----	----	07-JUL-2009	06-JUL-2009	✖
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural VELMW1A, PFL2HITCHMW1,	VELMMW3, PFL198PB1	06-JUL-2009	---	---	----	09-JUL-2009	03-AUG-2009	✔
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural VELMW1A, PFL2HITCHMW1,	VELMMW3, PFL198PB1	06-JUL-2009	----	----	----	08-JUL-2009	13-JUL-2009	✔
ED009: Anions								
Clear Plastic Bottle - Natural VELMW1A, PFL2HITCHMW1,	VELMMW3, PFL198PB1	06-JUL-2009	----	----	----	10-JUL-2009	03-AUG-2009	✔
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural VELMW1A, PFL2HITCHMW1,	VELMMW3, PFL198PB1	06-JUL-2009	---	---	----	09-JUL-2009	20-JUL-2009	✔
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural VELMW1A, PFL2HITCHMW1,	VELMMW3, PFL198PB1	06-JUL-2009	---	---	----	08-JUL-2009	03-AUG-2009	✔
EP020: Oil and Grease (O&G)								
Amber Glass Bottle - Sulphuric Acid VELMW1A, PFL198PB1	PFL2HITCHMW1,	06-JUL-2009	----	----	----	09-JUL-2009	03-AUG-2009	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.0	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	20	10.0	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	2	20	10.0	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	1	5	20.0	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Standard Anions	ED009	2	20	10.0	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	16	12.5	10.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Oil and Grease	EP020	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Standard Anions	ED009	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	16	6.3	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Conductivity by PC Titrator	EA010-P	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Major Cations - Filtered	ED093F	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Oil and Grease	EP020	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Standard Anions	ED009	1	20	5.0	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	16	6.3	5.0	✔	NEPM 1999 Schedule B(3) and ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures 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 in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Hardness as CaCO3	EA065	WATER	APHA 21st ed., 2340 B. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Standard Anions	* ED009	WATER	APHA 21st ed., 4110. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Major Cations - Filtered	ED093F	WATER	APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ionic Balance by IC PCT and ICPAES	EN055 - IC ED009	WATER	APHA 21st Ed. 1030F. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Oil and Grease	EP020	WATER	APHA 21st ed., 5520 B Oil & grease is a gravimetric procedure to determine the amount of oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005: pH						
Clear Plastic Bottle - Natural VELMW1A, VELMMW3, PFL2HITCHMW1, PFL198PB1	----	----	----	07-JUL-2009	06-JUL-2009	1

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.

Attachment 5B

**WATER LEVEL PLOTS FOR
BORE PF167MW1**

P.F.FORMATION
Bore PF167MW1 Groundwater Monitoring Data

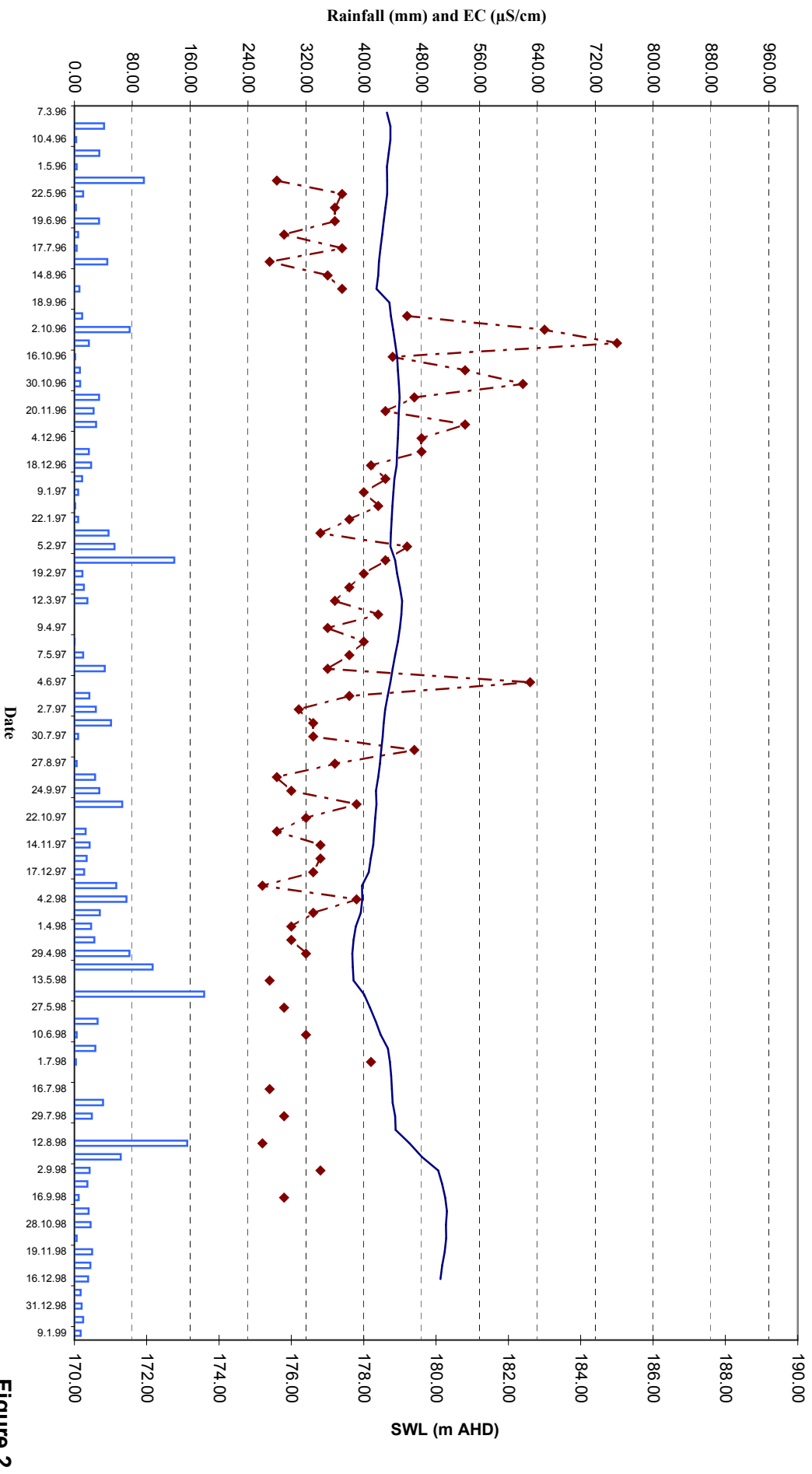


Figure 2

PF FORMATION **Bore PF167MW1 Groundwater Monitoring Data**

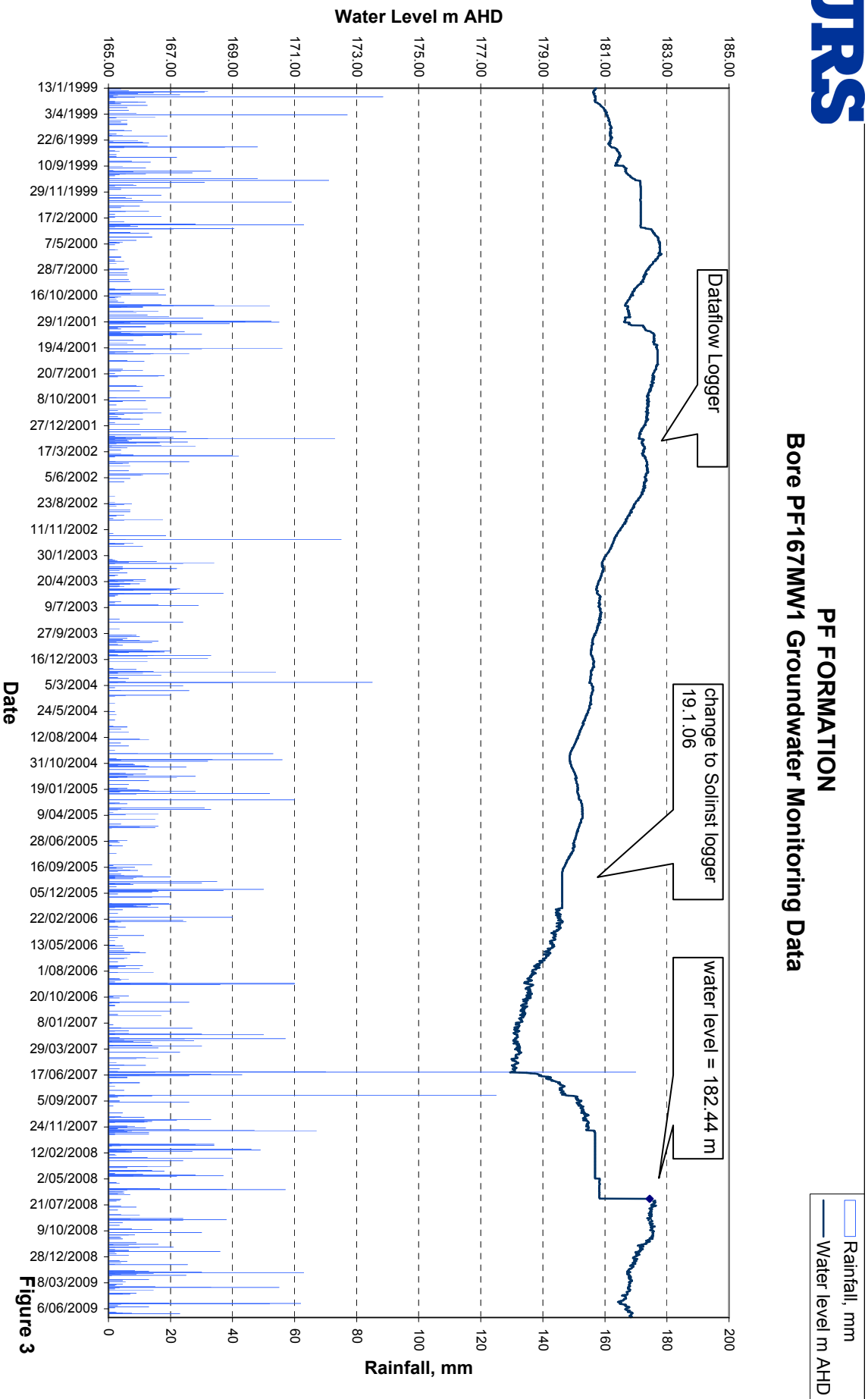


Figure 3

Attachment 5C

**WATER LEVEL PLOTS FOR
BORE PF166MW1**

PF FORMATION PF166MW1 Groundwater Monitoring Data

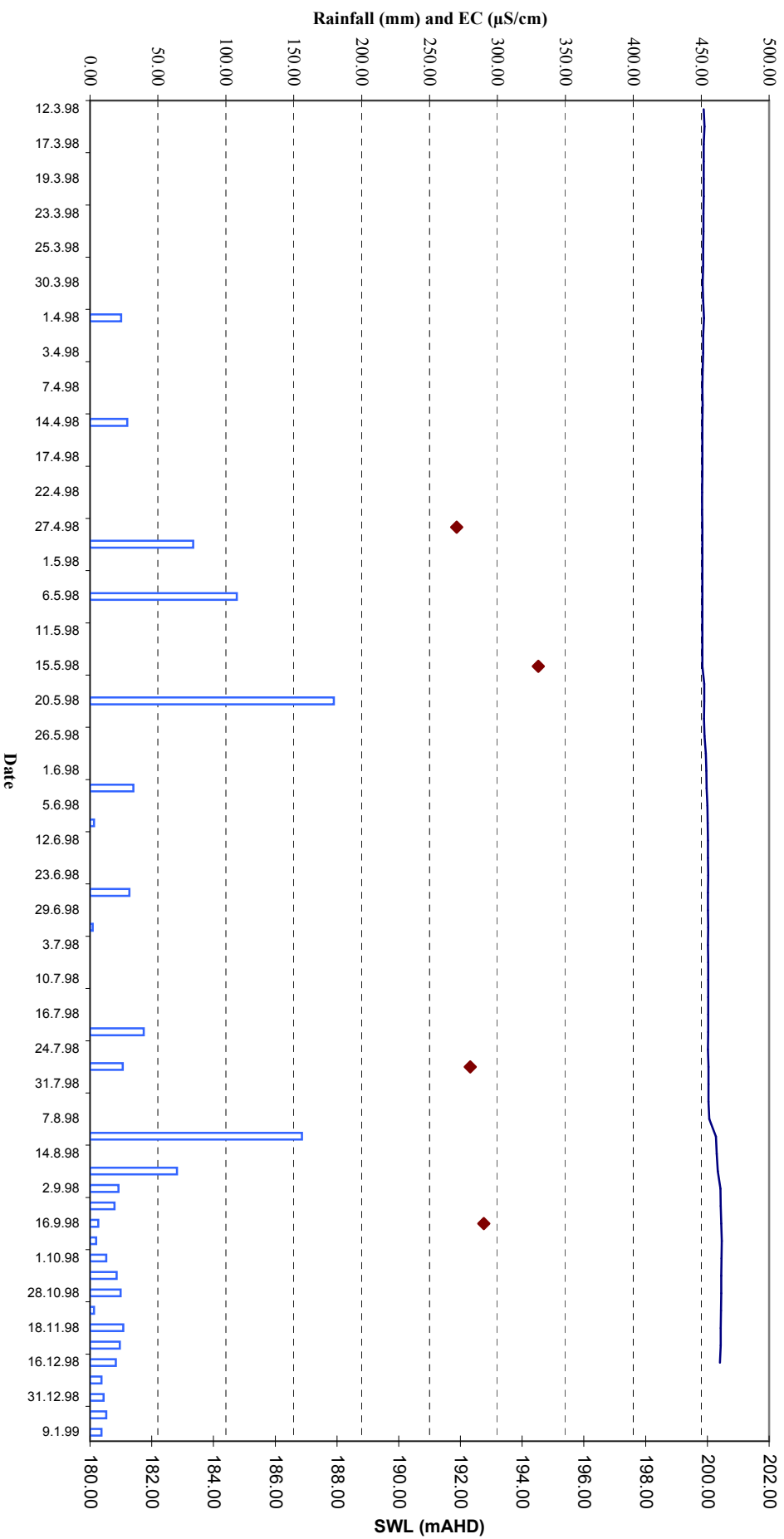


Figure 4

PF FORMATION Bore PF166MW1 Groundwater Monitoring Data

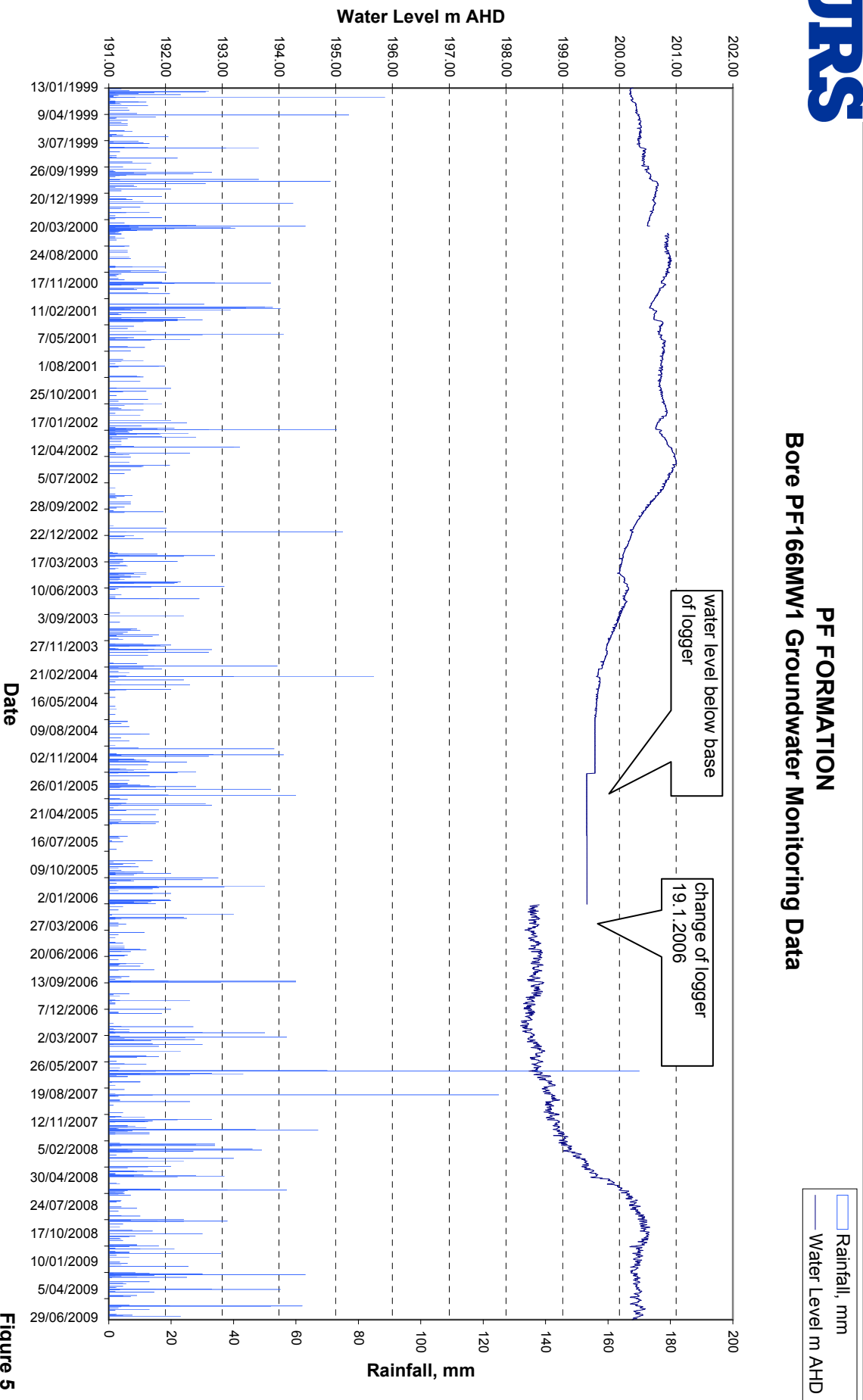


Figure 5

Attachment 5D

**WATER LEVEL PLOTS FOR
BORE PFP214MW1**

PF FORMATION **Bore PFP214MW1 Groundwater Monitoring Data**

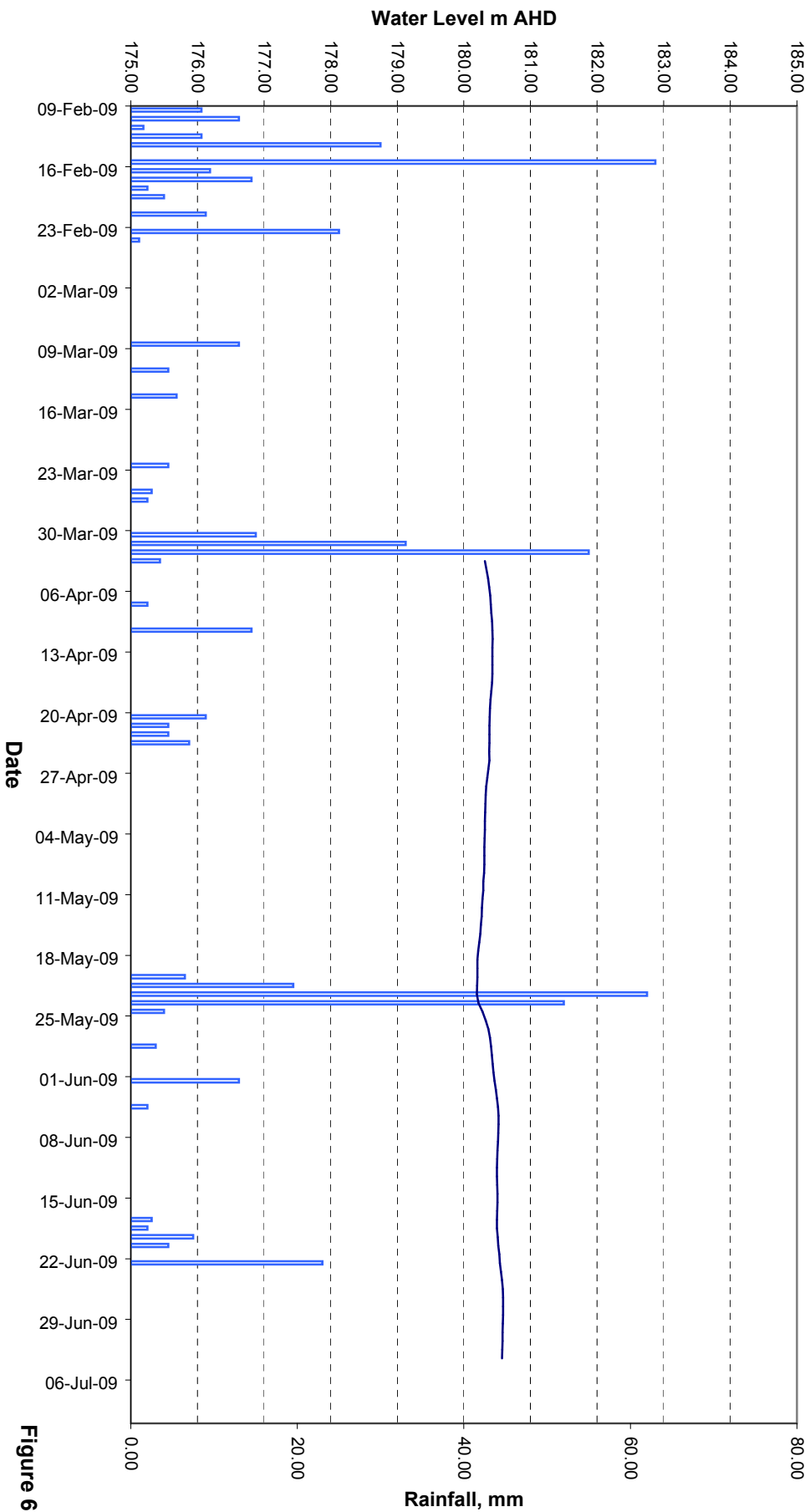


Figure 6

Attachment 5E

**WATER LEVEL PLOTS FOR
BORE PFLHitchMW1**

PF FORMATION **Bore PFL2HitchMW1 Groundwater Monitoring Data**

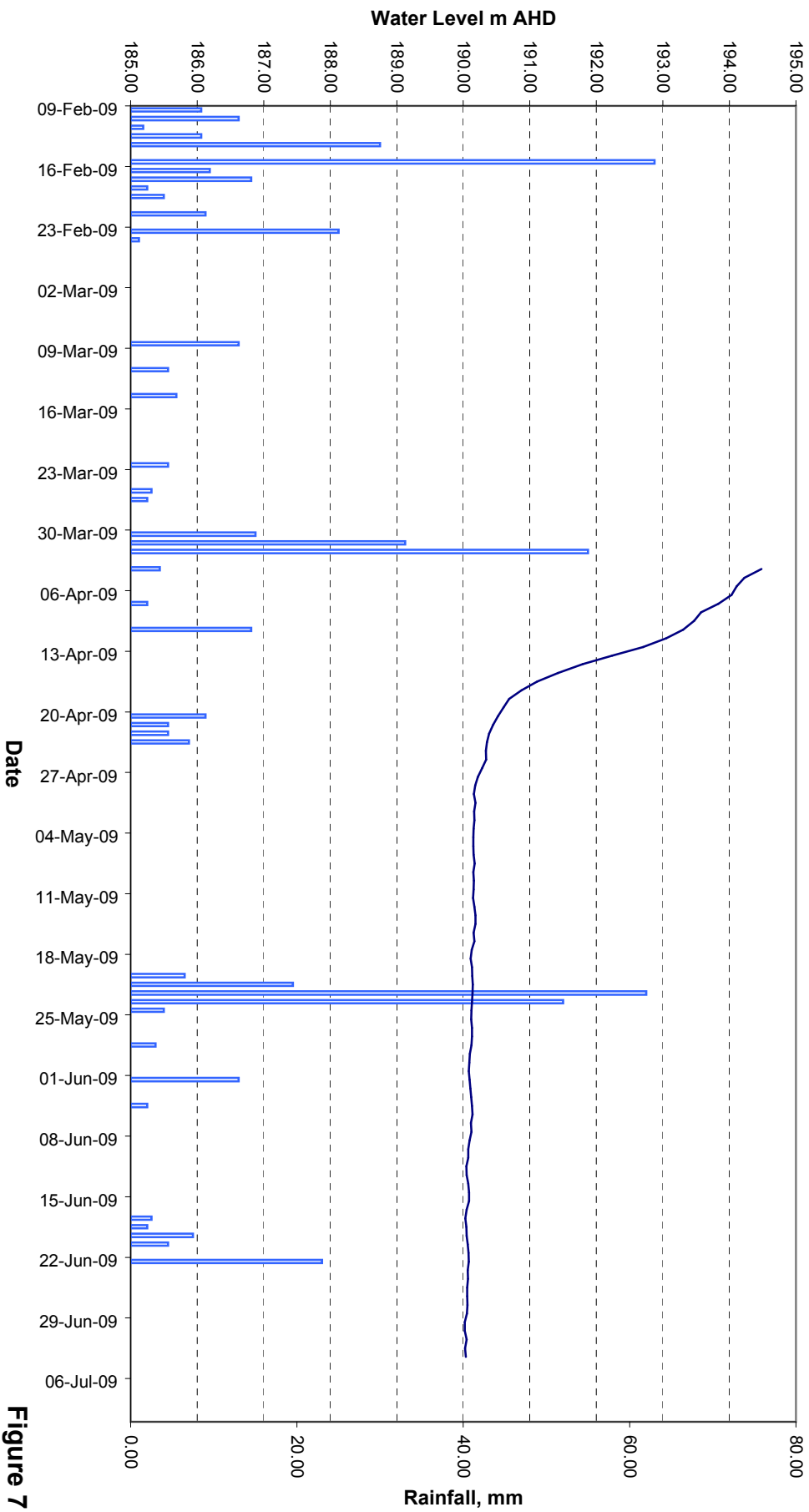


Figure 7

Attachment 5F

WATER LEVEL PLOTS FOR DAM PF167

PF FORMATION
PF167DAM, Licence No. 10BL157308, Groundwater Monitoring Data

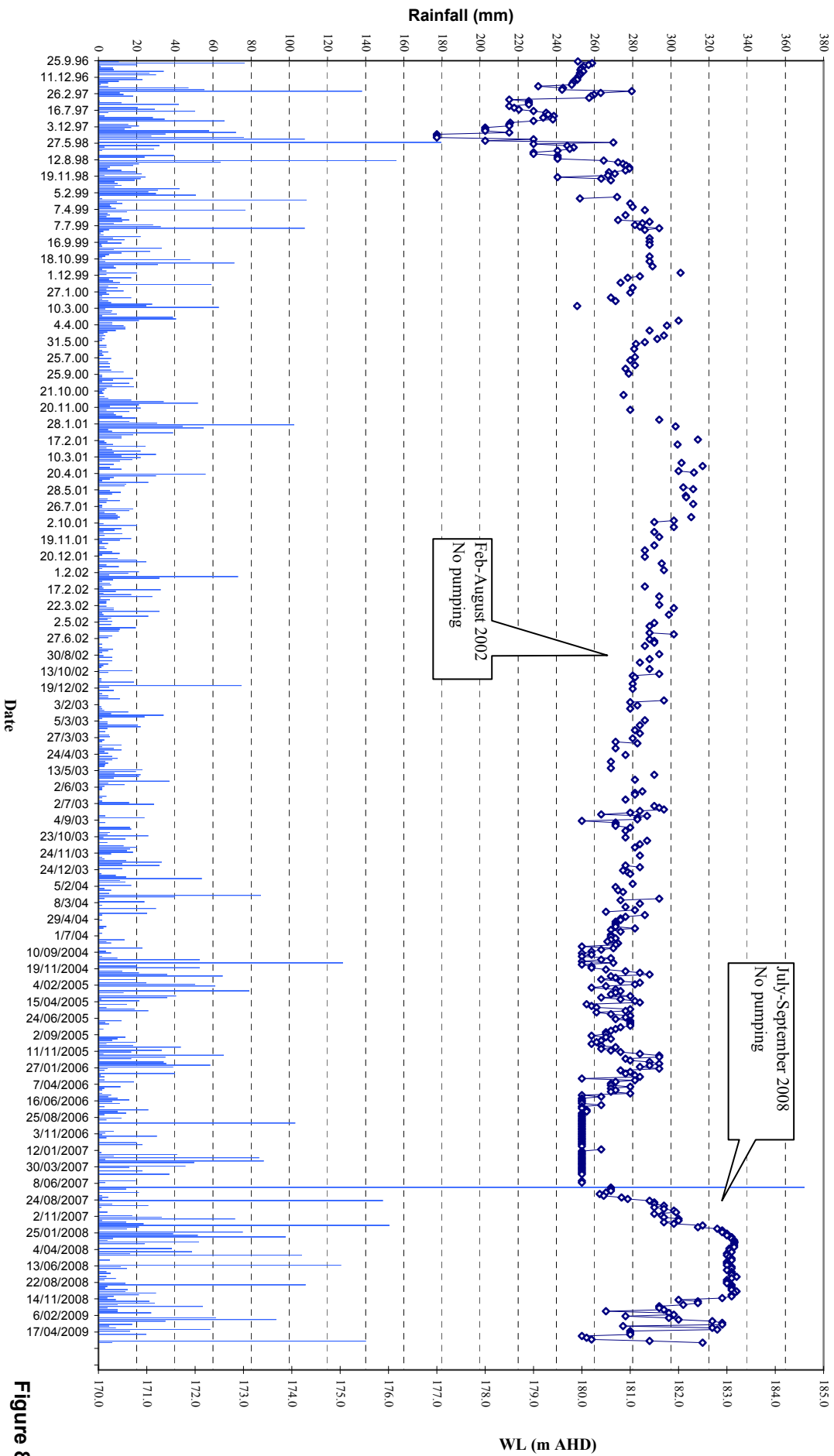


Figure 8

Attachment 5G

**GROUNDWATER QUALITY PLOTS FOR BORE
PF167MW1**

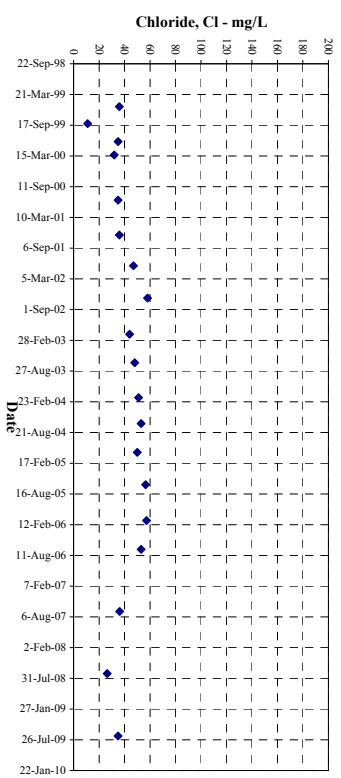
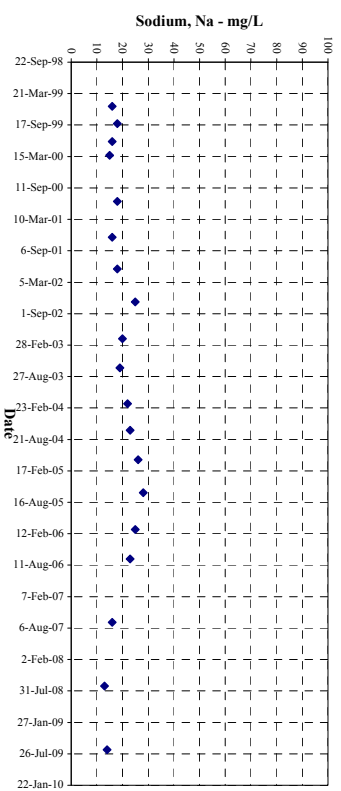
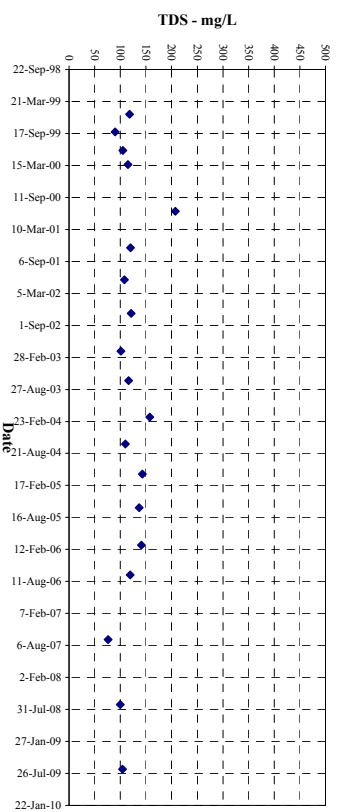
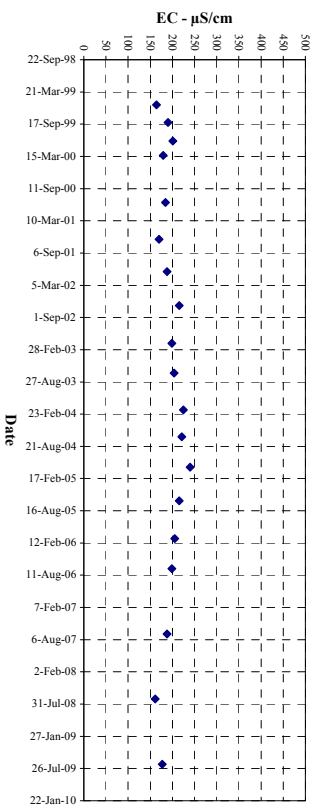
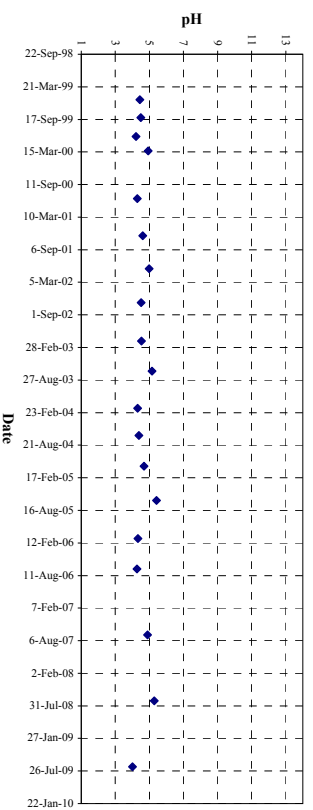
PF FORMATION - MAROOTA
BORE PF167MW1 GROUNDWATER ANALYTICAL SUMMARY

Analysis	Units	LOR	1-Jun-99	8-Sep-99	21-Dec-99	9-Mar-00	28-Nov-00	21-Jun-01	19-Dec-01	26-Jun-02	23-Jan-03	9-Jul-03	30-Jan-04	29-Jun-04	15-Dec-04	22-Jun-05	19/01/06	6/07/06	5/07/07	3/07/08	3/07/09
pH		0.01	4.43	4.49	4.21	4.93	4.28	4.61	4.98	4.52	4.54	5.15	4.31	4.38	4.68	5.42	4.32	4.27	4.88	5.29	4
Electrical Conductivity	µS/cm	1	164	190	201	179	184	170	188	215	199	204	225	221	240	215	205	199	188	161	177
Total Dissolved Solids	mg/L	1	118	90	105	115	207	120	108	121	101	116	157	110	143	137	141	119	76	100	104
Calcium	mg/L	1	3	3	5	6	3	6	6	5	3	4	4	5	5	5	4	4	2	6	5
Magnesium	mg/L	1	5	4	4	4	4	4	5	4	4	3	4	4	4	4	4	4	3	5	4
Sodium	mg/L	1	16	18	16	15	18	16	18	25	20	19	22	23	26	28	25	23	16	13	14
Potassium	mg/L	1	2	2	3	3	3	5	4	5	2	2	2	3	3	3	3	3	2	4	4
Bicarbonate	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	2	1	<1	<1	<1	<1
Sulphate	mg/L	1	9	<1	13	17	16	15	15	14	9	13	12	10	13	13	10	6	10	30	22.6
Chloride	mg/L	1	36	11	35	32	35	36	47	58	44	48	51	53	50	56.6	57.4	53.1	36.1	26.4	34.8
Oil and Grease	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

LOR = Limit of Reporting

Average EC = 196 µS/cm
Average TDS = 120 mg/L
Average pH = 5

N.B. = TDS value in November 2000 is unusually high because of the presence of particulate matter in the sample.



Attachment 5H

**GROUNDWATER QUALITY PLOTS
FOR BORE PF166MW1**

PF FORMATION - MAROOTA
BORE PF166MW1 GROUNDWATER ANALYTICAL SUMMARY

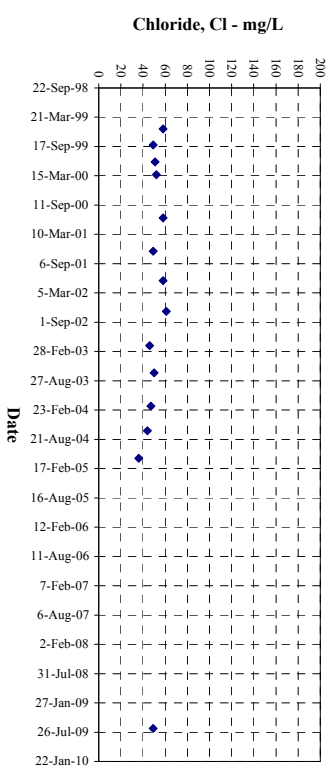
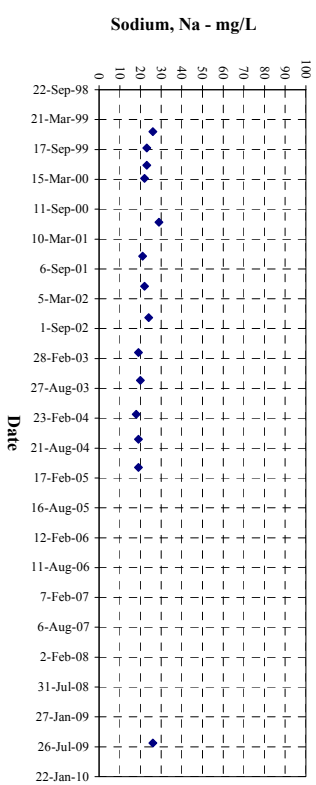
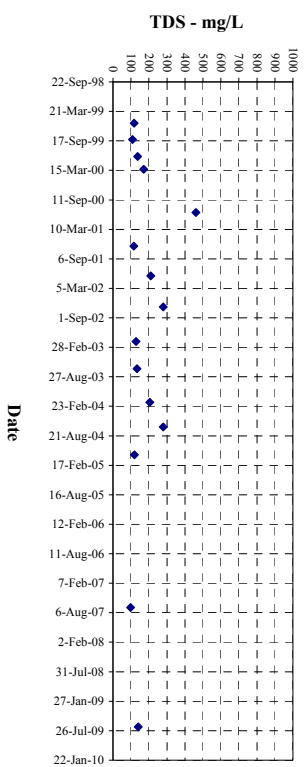
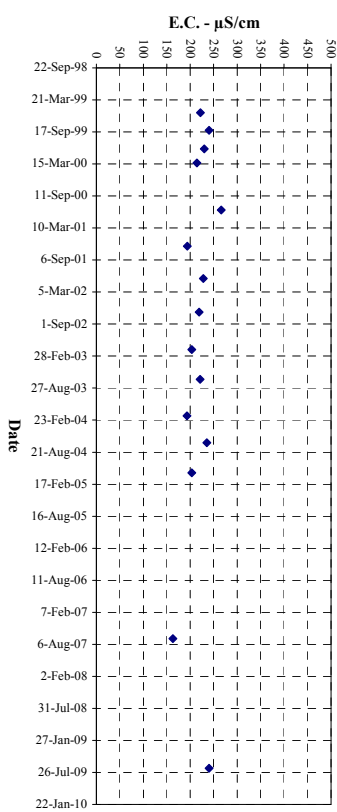
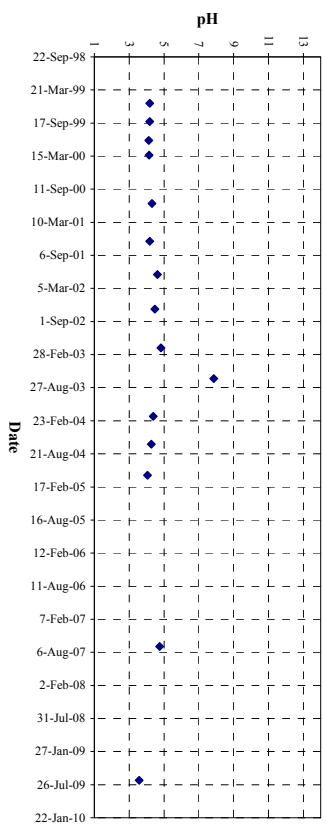
Analysis	Units	LOR	1-Jun-99	8-Sep-99	21-Dec-99	9-Mar-00	28-Nov-00	21-Jun-01	19-Dec-01	26-Jun-02	23-Jan-03	9-Jul-03	30-Jan-04	29-Jun-04	15-Dec-04	22-Jun-05	19/01/06	6/07/06	5/07/07	3/07/08	3/07/09
pH		0.01	4.18	4.19	4.13	4.14	4.31	4.19	4.63	4.48	4.82	7.86	4.39	4.27	4.06	DRY	DRY	DRY	4.76	DRY	3.58
Electrical Conductivity	µS/cm	1	222	240	230	214	266	194	228	219	203	221	193	235	203				163		240
Total Dissolved Solids	mg/L	1	118	108	137	170	460	115	210	280	128	134	204	280	120				98		140
Calcium	mg/L	1	1	1	1	1	1	1	1	2	1	1	<1	1	1						1
Magnesium	mg/L	1	6	6	6	5	6	5	6	6	5	4	5	5	4						4
Sodium	mg/L	1	26	23	23	22	29	21	22	24	19	20	18	19	19						26
Potassium	mg/L	1	<1	<1	1	1	1	1	2	1	<1	<1	<1	1	1						2
Bicarbonate	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1						<1
Sulphate	mg/L	1	1	7	1	1	16	2	1	2	<1	<1	2	<1	2						2.21
Chloride	mg/L	1	58	49	51	52	58	49	58	61	46	50	47	44	36						49.1
Oil and Grease	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	6	<5	<5	5	<5						<5

LOR = Limit of Reporting

* field measurements

Average EC = 218 µS/cm
Average TDS = 180 mg/L
Average pH = 5

N.B. = TDS value in November 2000 is unusually high because of the presence of particulate matter in the sample.
NA = Not enough water for sample



Attachment 5I

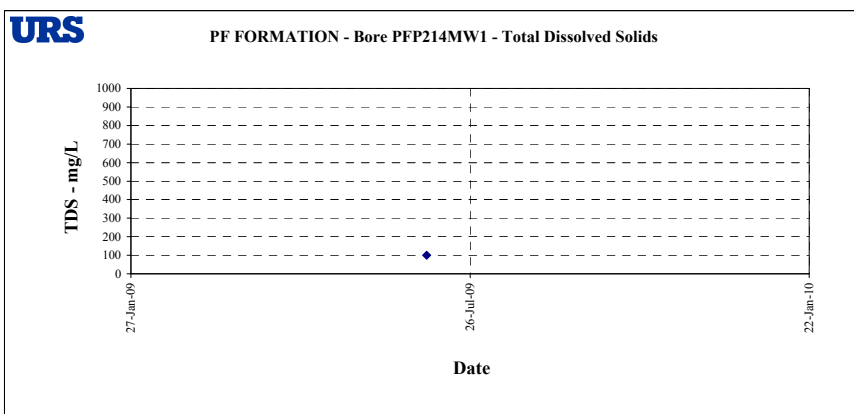
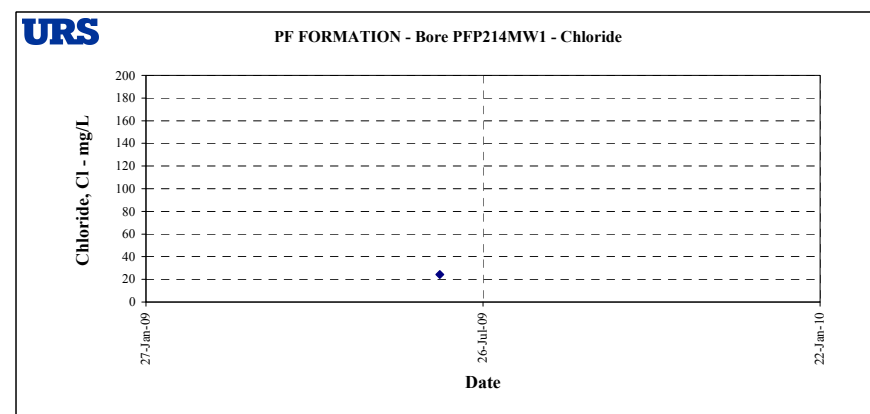
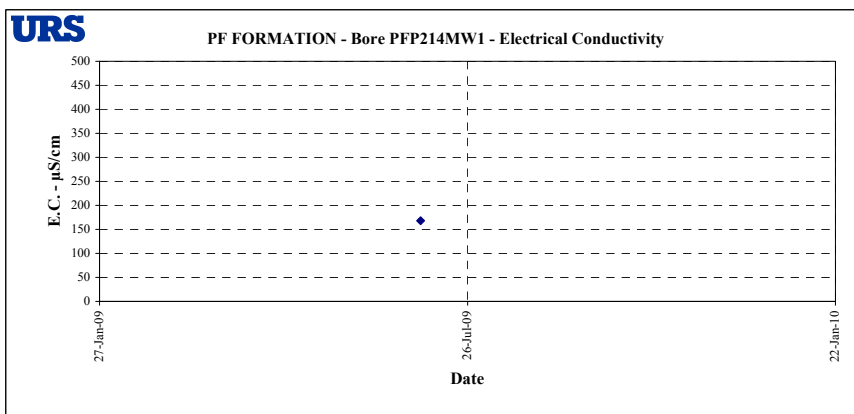
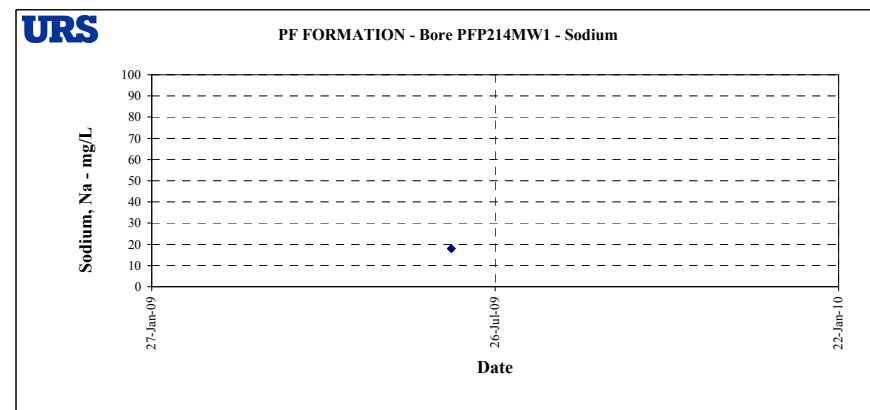
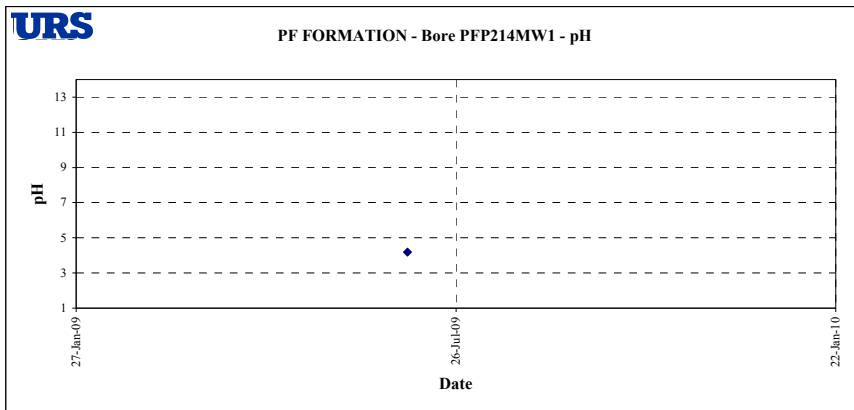
**GROUNDWATER QUALITY PLOTS
FOR BORE PFP214MW1**

PF FORMATION - MAROOTA
BORE PFP214MW1 GROUNDWATER ANALYTICAL SUMMARY

Analysis	Units	LOR	3-Jul-09
pH		0.01	4.19
Electrical Conductivity	µS/cm	1	168
Total Dissolved Solids	mg/L	1	100
Calcium	mg/L	1	<1
Magnesium	mg/L	1	6
Sodium	mg/L	1	18
Potassium	mg/L	1	1
Bicarbonate	mg/L	1	<1
Sulphate	mg/L	1	1.9
Chloride	mg/L	1	24.3
Oil and Grease	mg/L	5	<5

LOR = Limit of Reporting

Average EC = 168 µS/cm
Average TDS = 100 mg/L
Average pH = 4



Attachment 5J

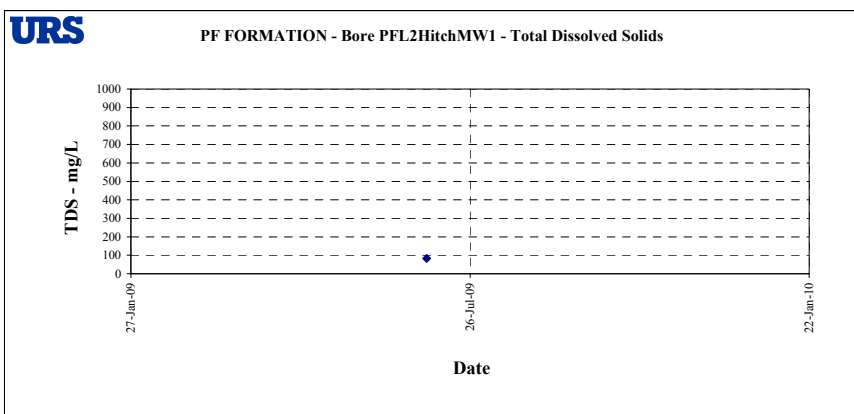
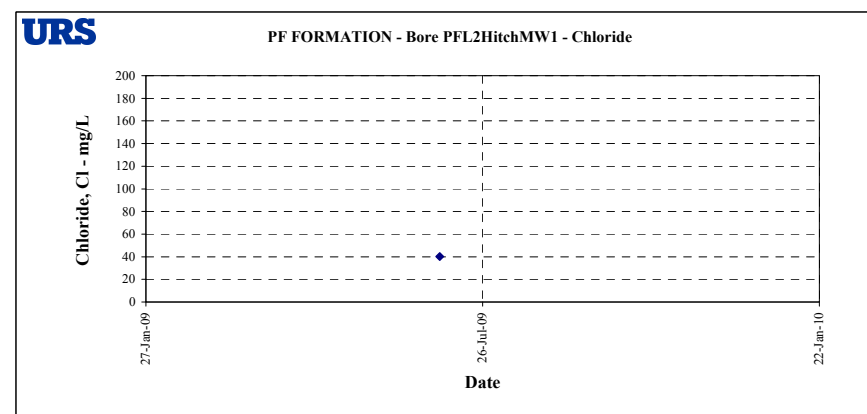
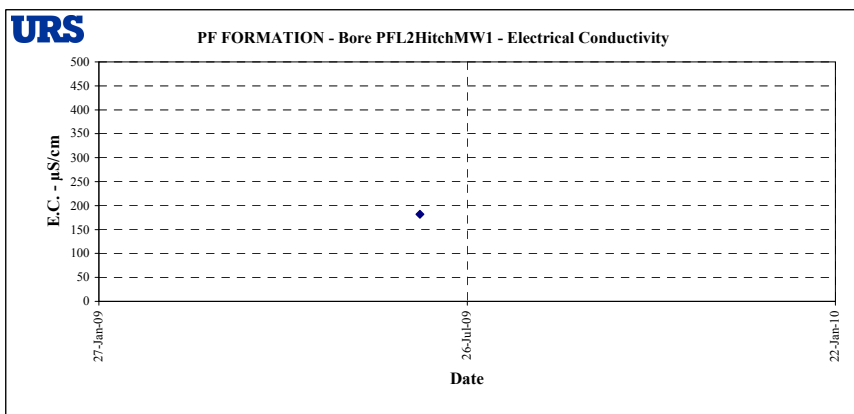
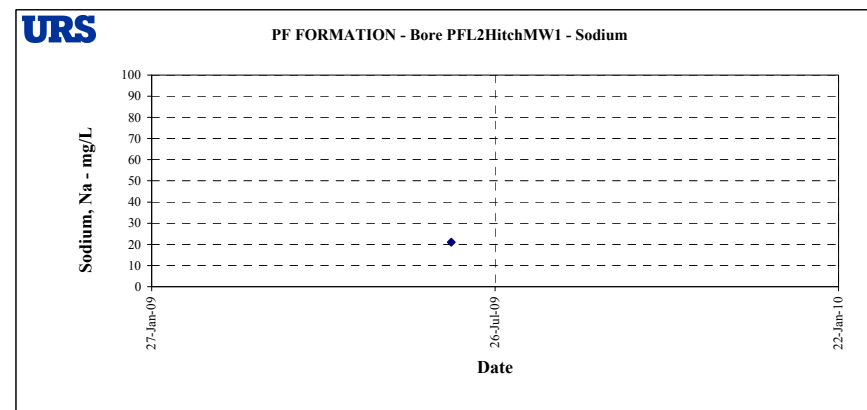
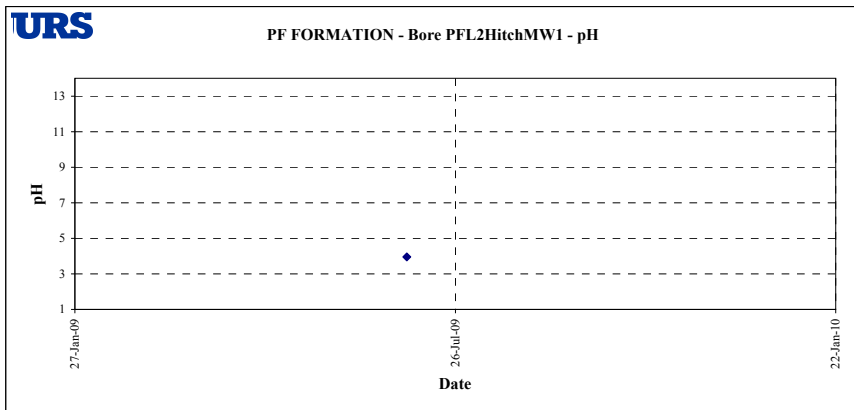
**GROUNDWATER QUALITY PLOTS
FOR BORE PFL2HitchMW1**

PF FORMATION - MAROOTA
BORE PFL2HitchMW1 GROUNDWATER ANALYTICAL SUMMARY

Analysis	Units	LOR	3-Jul-09
pH		0.01	3.96
Electrical Conductivity	µS/cm	1	182
Total Dissolved Solids	mg/L	1	84
Calcium	mg/L	1	<1
Magnesium	mg/L	1	2
Sodium	mg/L	1	21
Potassium	mg/L	1	<1
Bicarbonate	mg/L	1	<1
Sulphate	mg/L	1	7.88
Chloride	mg/L	1	40.3
Oil and Grease	mg/L	5	<5

LOR = Limit of Reporting

Average EC = 182 µS/cm
Average TDS = 84 mg/L
Average pH = 4



Attachment 5K

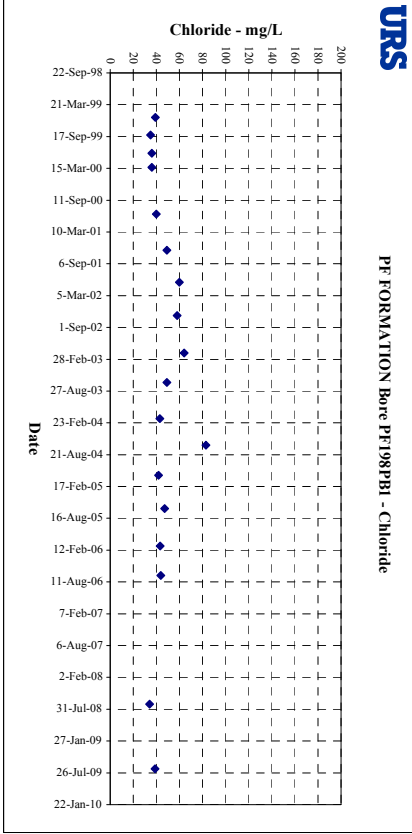
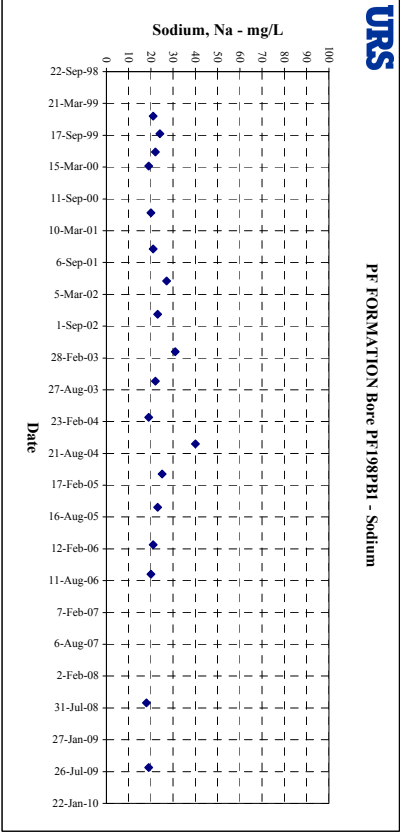
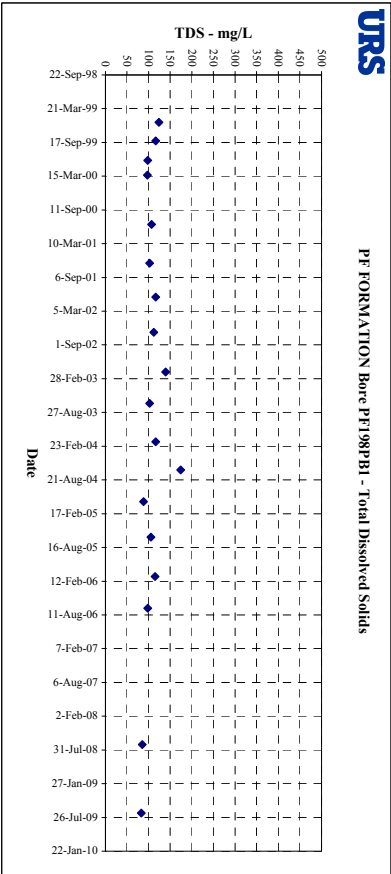
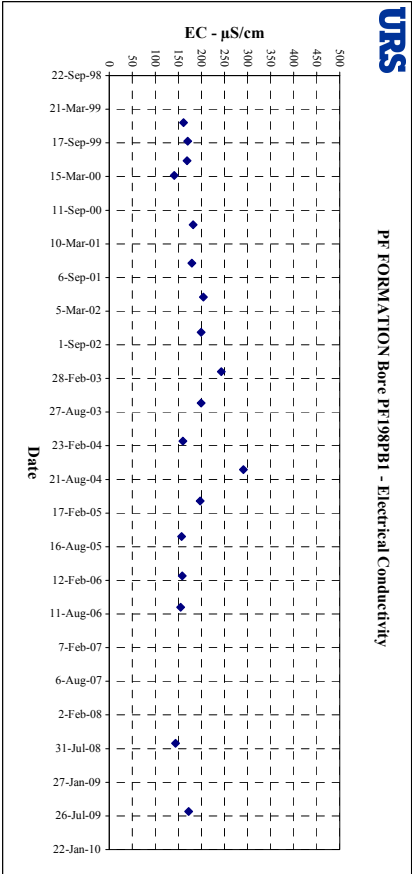
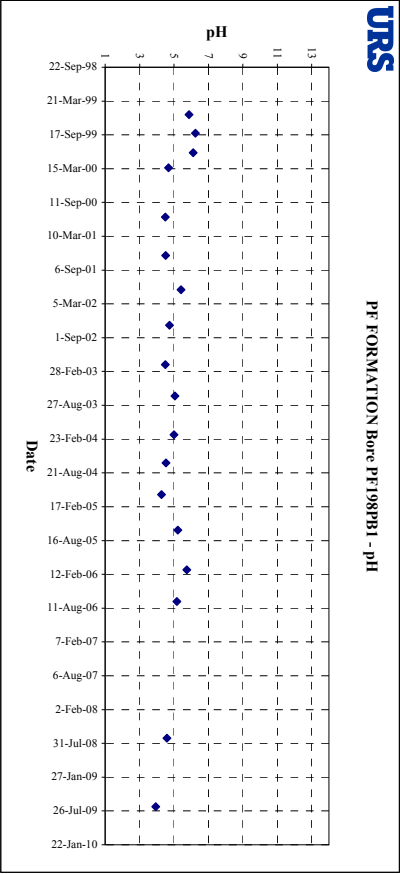
**GROUNDWATER QUALITY PLOTS
FOR BORE PF198PB1**

PF FORMATION - MAROOTA
BORE PF198PB1 GROUNDWATER ANALYTICAL SUMMARY

Analysis	Units	LOR	1-Jun-99	8-Sep-99	21-Dec-99	10-Mar-00	28-Nov-00	21-Jun-01	20-Dec-01	26-Jun-02	23-Jan-03	9-Jul-03	30-Jan-04	29-Jun-04	15-Dec-04	22-Jun-05	19-Jan-06	6-Jul-06	5-Jul-07	3-Jul-08	3-Jul-09
pH		0.01	5.87	6.24	6.11	4.69	4.49	4.51	5.41	4.73	4.49	5.06	5	4.53	4.28	5.22	5.74	5.16	NA	4.59	3.94
Electrical Conductivity	µS/cm	1	161	170	169	141	182	179	204	199	243	199	160	291	197	157	158	155		144	172
Total Dissolved Solids	mg/L	1	124	116	98	97	107	102	116	112	139	102	116	174	88	105	115	98		85	83
Calcium	mg/L	1	1	<1	1	1	3	2	2	4	3	2	2	4	1	1	2	1		<1	1
Magnesium	mg/L	1	4	6	5	3	3	4	4	4	4	3	2	5	2	2	4	3		2	2
Sodium	mg/L	1	21	24	22	19	20	21	27	23	31	22	19	40	25	23	21	20		18	19
Potassium	mg/L	1	1	<1	1	1	2	5	5	3	3	2	2	3	2	2	2	2		1	2
Bicarbonate	mg/L	1	13	29	22	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	12	5		<1	<1
Sulphate	mg/L	1	4	4	4	2	8	8	3	7	4	8	6	9	8	8	6	2		10	9.31
Chloride	mg/L	1	39	35	36	36	40	49	60	58	64	49	43	83	42	47.1	43.4	43.8		34.1	38.8
Oil and Grease	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	6	<5	<5	<5	<5	<5	5	<5		<5	<5

LOR = Limit of Reporting

Average EC = 182 µS/cm
Average TDS = 110 mg/L
Average pH = 5



Attachment 5L

**GROUNDWATER QUALITY PLOTS
FOR BORE PF198PB2**

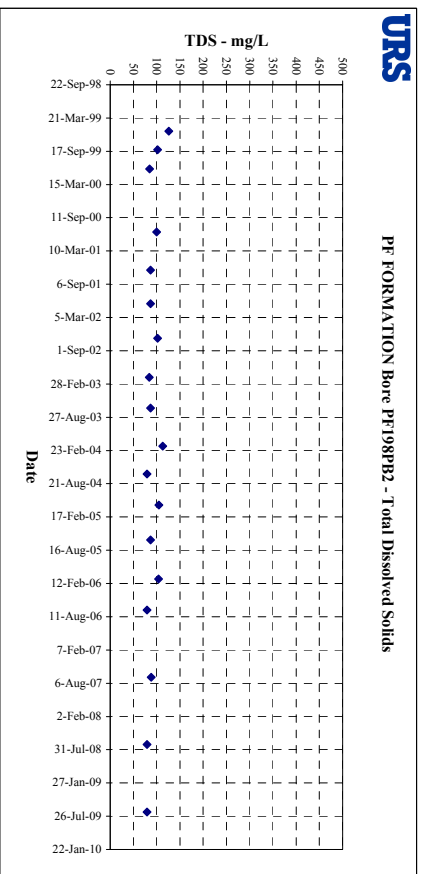
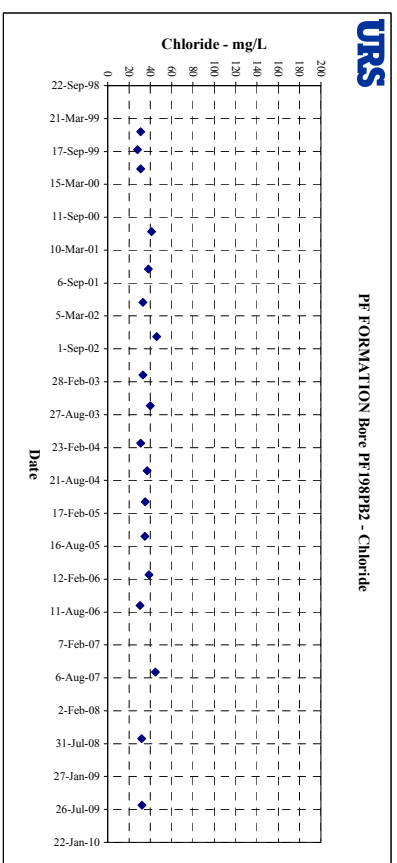
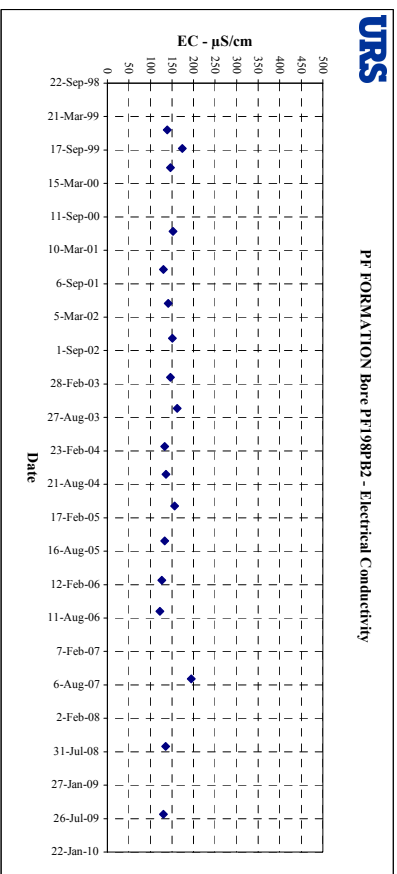
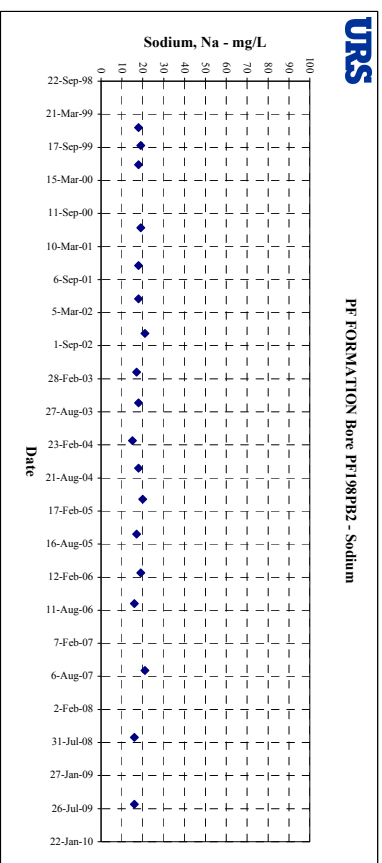
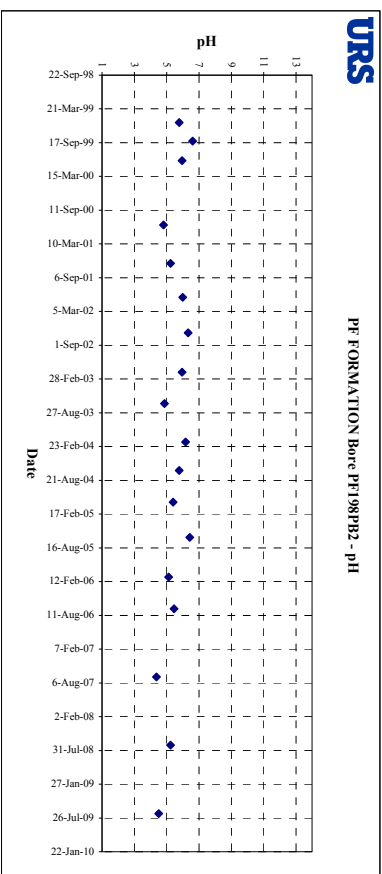
PF FORMATION - MAROOTA
BORE PF198PB2 GROUNDWATER ANALYTICAL SUMMARY

Analysis	Units	LOR	1-Jun-99	8-Sep-99	21-Dec-99	28-Nov-00	21-Jun-01	20-Dec-01	26-Jun-02	23-Jan-03	9-Jul-03	30-Jan-04	29-Jun-04	15-Dec-04	22-Jun-05	19-Jan-06	6-Jul-06	5-Jul-07	3-Jul-08	3-Jul-09
pH		0.01	5.78	6.61	5.96	4.8	5.24	5.99	6.33	5.96	4.87	6.18	5.78	5.39	6.43	5.13	5.46	4.37	5.25	4.5
Electrical Conductivity	µS/cm	1	139	174	146	152	130	141	151	146	162	133	136	156	133	126	122	195	135	130
Total Dissolved Solids	mg/L	1	126	102	85	100	87	87	102	84	87	113	79	105	87	104	79	88	79	79
Calcium	mg/L	1	1	2	2	<1	<1	<1	1	<1	<1	<1	1	1	<1	<1	1	0.01	1	<1
Magnesium	mg/L	1	5	5	5	4	3	4	4	4	2	4	4	2	4	3	4	3	5	3
Sodium	mg/L	1	18	19	18	19	18	18	21	17	18	15	18	20	17	19	16	21	16	16
Potassium	mg/L	1	2	2	2	1	1	2	2	1	<1	1	1	2	2	1	2	1	2	2
Bicarbonate	mg/L	1	23	33	19	4	3	13	8	16	<1	16	9	2	14	7	24	<1	24.4	9.6
Sulphate	mg/L	1	3	3	2	1	1	3	2	<1	4	2	1	4	4	1	1	4	2	2.78
Chloride	mg/L	1	31	28	31	41	38	33	46	33	40	31	37	35	34.9	38.8	30.2	44.8	31.8	32.2
Oil and Grease	mg/L	5	<5	<5	<5	<5	<5	11	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

LOR = Limit of Reporting

Average EC = 145 µS/cm
Average TDS = 93 mg/L
Average pH = 6

Note: PF198PB2 could not be sampled in March 2000



Chapter Six

REHABILITATION

6.1 Introduction

The court orders (**Number 6.4**) require the preparation of a review in which compliance with the following is to be demonstrated:

- the rate of rehabilitation should relate to the staging programme referred to in **Condition 3.4** of the Court consent;
- vegetated conservation zones and rehabilitated areas are maintained;
- vegetation within buffer zones is successfully retained and protected;
- progressive rehabilitation integrates with the surrounding terrain as illustrated in the Rehabilitation Plan dated 25 June 1998, subject to the requirements of **Condition 2.1**;
- vegetative covers are established at the earliest possible opportunity;
- assessment/comment on the progress of rehabilitation carried out under the direction of the nominated supervisor;
- on-going monitoring programme for all flora and fauna species and communities within the development site, particularly those scheduled under the *Threatened Species Conservation Act, 1995*;
- conservation of threatened species, populations and ecological communities including buffer zones and conservation zones containing the Shale Sandstone Transition Forest as identified in the Rehabilitation Plan dated 25 June 1998 at all times;
- the construction of acoustic and visual bunding surrounding and containing all mechanical equipment is progressing in accordance with the Rehabilitation Plan dated 25 June 1998 and **Condition 2.1**; and
- method and progress of the rehabilitation of extracted areas and tailings dams are in accordance with current environmental laws, standards and practices including guidelines published by the Australian- Federal Environment Department and the Department of Land and Water Conservation.

A Landscape Management Plan has been prepared in compliance with the requirements of the current Project Approval but is awaiting approval by the Department of Planning. The following section therefore describes the current phase of site rehabilitation followed by responses to the issues raised in the court orders where appropriate. Reference is also made to the biodiversity offset strategy which is described in more detail in the Landscape management Plan.

6.2 Earth bunding and rehabilitation

This section of the report submitted to Council for the year 1998-1999 addressed the boundary treatment and rehabilitation of the Hitchcock Road site focussing on the areas around the periphery which constitute the first phase of rehabilitation. This will not be repeated here.

Staging of construction

Bund construction and planting work has been completed in most areas, mainly sections of the northern and southern boundaries of the triangular shaped, northern portion of the site bounded by Old Northern Road and Wisemans Ferry Road.

Sections along Old Northern Road have been completed and recently extended (refer to Staging Plans at **Appendix 6A** in the Audit Report for 1998-1999).

Visual assessment

The proposed works will, in time, provide a thick elevated visual screen of indigenous trees and shrubs to a minimum width of 30 metres and an eventual height between 10 and 20 metres. This will provide an acceptable screen to ameliorate the visual impacts of the sand extraction operations. However, most parts of the extraction area are not visible from the external roads although material stockpiled adjacent to the slurry plant at the northern extremity of the site can be seen by drivers travelling south along Old Northern Road.

Conclusions

The works as proposed ensure that satisfactory screening and rehabilitation of the boundary areas of the Hitchcock Road site is achieved. The proposed method of earth bunding and planting will, in time, ameliorate the visual impacts of the site operations. In conjunction with further rehabilitation work, the site can be returned to a natural state on the completion of sand extraction.

6.3 Response to rehabilitation issues

The following section provides responses, where relevant to the specific requirements of Court Order **Number 6.4** listed in the Introduction.

Rate of rehabilitation

Rehabilitation of the site is taking place generally in phase with the overall staging program. The removal of material from the first phases has been completed and extraction has continued as shown on the Site Survey Plan at **Attachment 2A**. Rehabilitation of the project is dependent on two main factors:

- Material for backfilling does not become available until topsoil and overburden are removed from later phases as similar material from the first phase area is used to form peripheral mounds and the earthworks required for the tailings dams.
- Substantial parts of the operational area are occupied by a series of basins required for surface water treatment. These require capping prior to any major rehabilitation-taking place in the area. This cannot be undertaken until new basins are developed as part of the next phase development which in turn serve the whole project. In addition, capping cannot take place until the ponds are sufficiently dry to accommodate heavy vehicles with safety. This can take up to three years.

The timing of the rehabilitation of the initial phases is therefore dependent on a substantial start being made on the next phase. Activity to date has focussed on the provision of the peripheral mounds which are required for acoustic and visual reasons. These have been constructed, so far, in those areas particularly sensitive to these impacts. This work has now been completed.

A number of the early tailings dams have been capped and the area is in the process of rehabilitation. This is particularly the case in the western part of the site immediately to the south of the former Crown Road where several silt ponds have been capped and the ground contours reconfigured. The final pond in this area is currently in the process of capping and the northern part has been seeded under the supervision of Greening Australia.

Maintenance of vegetated conservation zones and rehabilitated areas

Conservation zones identified in the draft Landscape Management Plan are regularly inspected as required in the Environmental Strategy (**Strategy 7.1**). These will be marked and the areas suitably protected. All existing vegetation around the periphery of the site will be protected within setbacks and buffer zones.

The peripheral bunds constructed to date have been planted. These are regularly inspected and the area maintained.

Retention and protection of vegetation within buffer zones

All existing vegetation within the defined buffer zones will be retained and protected. A setback with a minimum depth of 30 metres is being maintained along Hitchcock Road and all existing vegetation within this area will be retained.

Integration of the site rehabilitation with the surrounding terrain

Operations have been undertaken on the Hitchcock Road site under the previous consent since November 1998. These have inevitably concentrated on the site works required for the development including retention basins and the construction of the peripheral bunds. It is too early in the life of the development, with more than 20 years of life remaining, to consider the establishment of the final landform in any detail. The area to the south of the former Crown Road has been reformed with final batter slopes which give an indication of the way in which the final landform will integrate with the surrounding area.

The final landform of the Hitchcock Road site will be influenced by the depth of extraction, the location of commercially available resource and the volume of overburden, mainly clay, available for re-contouring the extracted areas. Sand has been extracted from part of the site to the depth allowed in the previous consent and part of this area has been rehabilitated.

Setbacks around the periphery of the site, at the boundaries of properties not undertaking sand extraction and from buildings such as houses and other facilities not located on properties associated with sand extraction are defined in Baulkham Hills Shire Council Development Control Plan 16 – Extractive Industries. The setbacks shown on the Site Survey Plan at **Attachment 2A** generally comply with the requirements of DCP 16.

The existing topography is also shown on the Site Survey Plan. Two final landforms have been developed in response to the requirements of the proposed biodiversity offset strategy.

- Strategy A is similar to that shown in the EA (**Figure 2.7**). This comprises a large gently sloping basin with steeper side slopes along the boundary to Old Northern Road. Some of the levels have been amended to reflect changes in the extraction areas to minimise vegetation removal.
- Strategy B accommodates the retention of the woodland on the highest slopes of the site. As the high point is retained, the landform would comprise steeper slopes from those in Strategy A with substantial inward facing slopes in the northern section of the site with a large more gently sloping area in the centre. The area to the south (Lot 214 DP752039) would be the same in both strategies. This strategy is constrained by the volume of overburden available for the reshaping of the site profile so that steep slopes are unavoidable.

A decision on which strategy is to be implemented will be dependent on the success achieved in creating a revegetated area containing a community with the characteristics of that to be removed from the area adjacent to the former trig reserve, namely *Sydney Hinterland Transition Woodland*. This process is described in more detail in the Landscape Management Plan.

Early establishment of vegetative cover

Grass cover has been established on those peripheral mounds already in place and tree and shrub planting has been undertaken. The main works within the peripheral areas of the site have been completed with some further additions undertaken in 2008-2009.

A revised planting program is currently being prepared in collaboration with Greening Australia. Implementation of the program was delayed by the exceptionally dry conditions prevailing prior to the rains in July/August 2007 but the first phases have now been completed. Further consideration of the planting program is currently being undertaken as part of the implementation of the biodiversity offset strategy being developed in collaboration with the Department of Planning and the Department of Environment and Climate Change.

Assessment of the progress of rehabilitation

Initial works relating to rehabilitation such as the peripheral mounds are complete. All the tailings dams in the early extraction stages have been decommissioned, and all have been capped. This area has now been regraded to its finished level.

An area of approximately one hectare was prepared initially as a test site for the broadcasting of seed previously collected and stored by Greening Australia. The top soil stripped from an adjacent site is expected to contain a substantial supply of native seed and this was reinforced by the broadcasting of further seed in 2005 and 2006. This area is developing successfully and the approach used will be extended to include other areas within the conservation areas included in the biodiversity offset strategy.

Additional seed has been collected. This includes *Alocasuarina littoris*, *Banksia Ericifolia*, *Syncarpia glomulifera* and *Pittosporum undulatum*. Consideration will be given over the next 12 months to the establishment of orchards of shrub layer and understorey species, from which it is difficult to derive seed stock, on parts of the site which are not expected to be disturbed for many years. The planting of large numbers (approximately 10,000) of seedlings is planned for future planting seasons.

Flora and fauna monitoring programme

Regular monitoring of flora and fauna is a requirement of the Environmental Strategy. Surveys are undertaken over an appropriate period in the warmer weather, later in the year. Results to date are encouraging.

Conservation of threatened species, populations and ecological communities

It is a requirement of the Environmental Strategy that all those areas to be retained and defined as needing protection will be clearly identified. This will be undertaken at a suitable time as part of the biodiversity offset Strategy.

Construction of acoustic and visual bunding

Construction of the peripheral bunds has already been noted. These have now been completed including those screening the sand slurry plant.

Compliance with current environmental laws, standards and practices

All the necessary management controls and related actions are in conformity with all relevant current laws, standards and practices as indicated in the document.

*Chapter Seven***SOCIAL IMPACT MANAGEMENT**

The court orders (**Number 6.5**) required the preparation of a report confirming that the extraction operations effectively manage and monitor social impacts on the local community including:

- impact management planning which clearly identifies adjusted operating objectives and procedures undertaken to minimise social impact;
- monitoring and mitigating procedures involving the collection of information about actual impacts which is then applied to specific operating procedures to mitigate and manage social effects; and
- evaluation involving the retrospective review of the overall performance of extraction and assessment of the effectiveness of the management process itself with the view of rectifying any deficiencies.

There are a significant number of difficulties associated with compliance with this consent order. Some of these are:

- difficulty in defining and measuring social impacts as distinct from the environmental issues described elsewhere in this document. The latter include noise, air quality and visual effects which could all be classified as having social effects as they impact directly on the local community. These are measured separately and their impacts reported. Other, more ill-defined impacts relate to economic and general amenity effects. These include such factors as community perceptions of the benefits or costs of sand mining in the area. None of these can be directly measured even if the effect could be adequately conceptualised by the affected individuals;
- impossibility of identifying the social impacts of one operation in the context of a much larger and more widespread industry in the area; and
- great difficulty in linking specific operating procedures on a single site to somewhat generalised social effects and measuring effectiveness in their mitigation.

There is no doubt that large-scale sand mining has some social effects, however defined, but it would take a very extensive investigation to identify those issues in such a way as to understand the relationship between the on-site operation and community perceptions of its impacts. Any attempt to measure change would also be fraught with difficulties. Such a requirement goes well beyond what can be reasonably expected in the context of a development approval.

However, the EMP included a series of actions related to social issues (**Item 5.9**) aimed at attempting to determine the views and perceptions of local residents and community groups in relation to site activities. The outcomes of this consultation will be taken into consideration in the regular reviews of operations undertaken at the site.

Overall the effectiveness of the site operations can best be judged by the level of compliance achieved with relevant factors which are subject to measurement plus the number and nature of any complaints received from members of the local community. In essence, the decision to safeguard the Maroota sand resource by the State government can be seen to be based on its conclusion that the community as a whole would benefit. It is not unreasonable to suggest that it is the responsibility of the Department of Planning to determine whether this is so in practice.

Community-based activities during 2008-2009

Community representatives participate in the Liaison and Review Committee (now renamed the Community Consultative Committee) which has met twice since July 2008. Minutes of these meetings are included as **Attachment 7A**. Most of the concerns expressed by community members related to issues which go well beyond those that can be considered within the context of a single, albeit, large-scale development. These continue to include the cumulative impacts of sand mining on the Maroota area and social impacts on the community relating to those who are seen to gain significantly while others experience undesirable impacts. This has been interpreted as reflecting a potential split in the community. Concerns are also expressed about the nature and extent of the environmental impacts reported in the EMP. Concerns have been raised relating to the cessation of the activities of the Maroota Quarry Cumulative Committee whose apparent demise is seen as premature.

Other concerns relate to the direct benefits - or lack of them - accruing to the local community as a result of Sc 94 contributions stemming from the development. Again this is an issue which relates to all sand mining operations in the area and cannot reasonably be considered in the light of a single development approval.

These issues are regularly raised at the formal meetings as noted in the minutes and during conversations with individual community members.

Meetings of the Maroota Quarry Cumulative Committee convened by the previous Department of Infrastructure, Planning and Natural Resources have ceased and no meetings have taken place during this reporting year.

Conclusions

The issues summarised above go well beyond the measurable effects of one development. It is unrealistic to expect to be able to determine a verifiable relationship between activities on one site plus the specific methods employed there and the community's concerns about the future of their area when it is not possible to establish even a theoretically acceptable connection between the two. It might be possible to demonstrate such a relationship following a long-term study of the community but this remains way beyond a reasonable requirement on the site operator.

No complaints have been received from the local community concerning the operations of PF Formation at Maroota over the last 12 months.

Attachment 7A

**MINUTES OF COMMUNITY CONSULTATIVE
COMMITTEE MEETINGS**

**Liaison and Review Committee Meeting
Re PF Formation Hitchcock Road and Lot 198
Sand Extraction and Rehabilitation Projects**

**Minutes
10 November 2008**

Attendance

Kristine McKenzie – Baulkham Hills Shire Council (BHSC) - Chairperson
Robert Buckham – Baulkham Hills Shire Council (BHSC)
Daniel Giffney – Baulkham Hills Shire Council (BHSC)
Peter Ridgeway – Baulkham Hills Shire Council (BHSC)
Steve Durrington – Department of Environment and Conservation (DECC)
Marianne Sheumack – Resident
Shaunagh Hitchcock – Resident
John Graham – PF Formation
Peter Cummins – PF Formation
Luke Graham – PF Formation

Apology

Liz McAuley – Resident
David Fingland – DFA Consultants
Joshua Graham – PF Formation

Minutes of Previous Meeting

- Accepted

Report on Current Status of Operations by John Graham

- No complaints received in the period
- Business has been solid notwithstanding the depressed Sydney building industry for the last 2 years since the M7 motorway was finished. This local demand emphasizes the importance of the Maroota resources even in depressed economic times. Penrith Lakes are closing their fine sand production at December whilst the remaining sand and gravel will be extracted over the next five years. The slowdown over the last few years has extended the life of the Penrith Lakes Development area.
- We recently had a Mine Engineer conduct a safety audit as part of the Department of Mineral Resources mine safety monitoring. The recommendations were implemented and reviewed at a follow up visit..
- Quarterly staff safety meetings have been expanded to incorporate environment concerns to ensure all staff realize their environmental responsibilities.

- The new Hitchcock Road Development is still with the Department of Planning awaiting approval. Draft conditions of consent have been received and further requests for additional information were provided to the Department the previous Friday. PF Formation is hopeful of receiving approval before Christmas and will commence extraction immediately from the 'Breen' property. Current production is very inefficient working in a very limited area up against the for Crown Road area due to the much longer than anticipated approval process.
- It was noted that removal of vegetation in the new development was one of the ongoing issues. It is now confirmed that the existing vegetation is classified as Sydney Hinterland Transition Woodland which is not an endangered ecological community.

Other Matters

- PF Formation have lodged a development application with Baulkham Hills Shire Council over Lot 1 Old Northern Road (Accurso property). Extraction has previously occurred on this property and the proposed development is to finish off the extraction on the property and better shape the final landform. The DA is for a maximum of 30,000 cubic metres and the extraction will be completed within 2 years. No additional trucks will use the roads as the material will be transferred off-road to Lot 198. The majority of Lot 1 is approved for agriculture but as part of this approval an area will be returned to bushland.
- The Environmental Management Plan Annual Audit for 2007-2008 was distributed to Marianne Sheumack to have at the resource centre. It was noted that the rainfall for the year was 1,292 mm, 50% higher than the long-term average. This has resulted in an increase in the groundwater levels. No contaminants were found in the testing of the ground water. Noise was within the usual limits and dust results from the dust deposit gauges were generally good with the one or two abnormal results that has not derived from quarry generated dust. PF Formation has an agreement to be notified by Dixon Sands if the 24-hour average PM10 dust levels next to the school monitoring site exceed 45. No exceedances have occurred in the last six months.
- The RTA responded to the PF Formation letter dated 5 June requesting that flashing lights be installed in the Maroota Public School traffic zone. The RTA letter stated that 400 sets of lights will be installed over the next four years at schools in NSW based on risk factors. Maroota school will be assessed based these on risk factors.
- Steve Durrington was introduced as the new DEC officer.
- Peter Ridgeway was introduced as BHSC flora and fauna officer.

Resident Matters

- Council views and actions on weed control were discussed.
- No news on possible development of the adjoining Arkzeal property.

Site Visit

- A full site inspection was conducted.

Next Meeting

- Monday 10.00 AM Monday 11 May 2009 (subject to aligning the meeting with Dixon Sands meeting on the same day).

**Community Consultative Committee
Hitchcock Road and Lot 198 Maroota
Sand Extraction and Rehabilitation Projects**

**Minutes
12 May 2009**

Attendance

Kristine McKenzie – Baulkham Hills Shire Council (BHSC) - Chairperson
Robert Buckham – Baulkham Hills Shire Council (BHSC)
Daniel Giffney – Baulkham Hills Shire Council (BHSC)
Kieran Horkan - Department of Environment and Climate Change (DECC)
Mark Hanemann – Department of Environment and Climate Change (DECC)
Marianne Sheumack – Resident
Shaunagh Hitchcock – Resident
David Fingland – DFA Consultants
John Graham – PF Formation
Peter Cummins – PF Formation
Joshua Graham – PF Formation

Apology

Liz McAuley – Resident
Kane Winwood – Planning NSW

Minutes of Previous Meeting

- Accepted

Meeting Chairperson

- On behalf of the Hills Shire Council Kristine McKenzie agreed to continue as Chairperson of the Community Consultative Committee (CCC).

New Approval

- Signed by Minister for Planning on 3 February 2009. A summary of the new approval taken from the 'News' section of the website www.pfformation.com.au was handed out and discussed.
- A copy of the conditions attached to the Project Approval and the assessment documentation can be accessed from the website.
- The Noise Management Plan, Air Quality Monitoring Program, Water Management Plan and Environmental Strategy incorporating the above have been reviewed by DECC and are with the Department of Planning awaiting approval.
- A Maximum Extraction Depth Map and survey plan of the extraction and ancillary work areas will be sent to the Department of Planning in the next few days
- A Landscape Management Plan including a Rehabilitation and Offset Management Plan and Quarry Closure Plan will be submitted in the next 3 months.
- An Annual Environment Management Report based on the year ending 30 June 2009 will be submitted to Planning NSW in the second half of the year.

- An Independent Environment Audit will be undertaken during the first year and every three years after that.
- Approved management plans/monitoring programs and other information will be maintained on the website.

Report on Current Status of Operations by John Graham

- No complaints received in the previous six months
- Operations have continued in a stable manner
- The main extraction area has moved to the eastern side of the site. The rehabilitation of the previous extraction area has commenced.
- The main slurry pipeline will be replaced by a rubber-lined steel pipeline to minimize breakdowns and the resultant potential environmental impact.

New DEC Officer

- Kieran Horkan introduced Mark Hanemann as the DECC Officer responsible for this area replacing Steve Durrington who has been rotated to other industries.

Other Matters

- Two new groundwater monitoring bores have been installed. One each on the eastern and northern perimeters.
- How the Arkzeal and Camilleri properties included in the 1998 Court Approval can be extracted in conjunction with this new approval was discussed.
- Property setbacks were discussed. Generally 30 metres from roads and properties not connected with extractive industry and 40 metres from former Crown land to east of Project.
- Deposited dust gauge results over last year were reviewed
- The plan for revegetation and the future removal of vegetation was discussed

Site Visit

- A full site inspection was conducted.

Next Meeting

- Friday 10.00 AM Monday 6 November 2009 (subject to aligning the meeting with Dixon Sands meeting on the same day).

Chapter Eight

CONCLUSIONS

The Environmental Management Plan (EMP) prepared for the Hitchcock Road Sand Extraction and Rehabilitation Project was previously in two parts. The Management Plan itself formed Part One, provided the basis for the environmental management system to be employed at the site. It conformed to ISO 14001-14004 and went substantially further than required by the court orders. It set in place a series of management controls which, when implemented, ensured that the development not merely complied with the conditions imposed by the Court but with all other current relevant legislation and guidelines. It provided the basis for the operation of the site within the context of all these requirements. It was reviewed in 2005 and updated to reflect experience gained and changes that have taken place over the previous five years.

The requirements of the EMP, which were expressed as a series of management controls and associated actions, were gradually put in place. The reporting procedures included within the EMP more than satisfy those set out in the court orders.

The monitoring undertaken complied with the requirements of these orders and the results clearly indicated that the site has been operated in compliance with the orders and all other prevailing legislation and guidelines.

This report has provided a summary and assessment of monitoring undertaken over the past 12 months. This has mainly focussed on the requirements of the previous Court orders as the relevant management plans and monitoring programs were not approved by the Department of Planning until early July 2009 with approval of the Landscape Management Plan still outstanding. The report to be submitted next year will respond to the requirements of the new plans and report the results of the new monitoring programs.

APPENDIX A

**COMPLIANCE WITH THE REQUIREMENTS OF
DEVELOPMENT CONTROL PLAN 16-EXTRACTIVE INDUSTRIES**

*Appendix A***COMPLIANCE WITH THE REQUIREMENTS OF DEVELOPMENT
CONTROL PLAN 16-EXTRACTIVE INDUSTRIES**

Development Control Plan 16 – Extractive Industries has been designed to assist applicants in the preparation, assessment and determination of extractive industry proposals.

The objectives of the Development Control Plan are to:

- consider the social, economic and environmental issues in the assessment and management of extractive industries;
- implement the objectives of international and nationally recognized environmental standards;
- encourage community participation in all phases of extractive industry development;
- provide sound technical parameters to facilitate the orderly development of extractive resources within environmentally sensitive regions;
- conserve the biological and cultural diversity and quality of Baulkham Hills Shire; and
- implement the requirements of the *Environmental Planning and Assessment Act 1979* and other relevant environmental statutes.

The Development Control Plan also provides objectives, performance criteria and prescriptive measures for various environmental issues. Performance criteria and/or prescriptive measures relevant to the project are listed in **Table A1** together with comments regarding compliance with these measures.

Table A1 Relevant Performance Criteria and Other Requirements of Development Control Plan 16 - Extractive Industries

Element	Performance Criterion or Prescriptive Measure	Comments
Community Participation	Community consultation should be undertaken in the preparation, assessment and management of extractive industries.	Two meetings are held each year with the Liaison and Review Committee (now the Community Consultative Committee) relating to extraction operations at Maroota. The committee is made up of community members, Council, Environment Protection Authority and Department of Land and Water Conservation representatives and any others considered to be appropriate by Council. These meetings, which focus on activities on both the Hitchcock Road and Lot 198 sites also address issues raised in relation to current operations and those needing to be addressed as part of future development proposals.
	Proponents are encouraged to promote a better understanding of the links with local cultural history and diversity; natural features and biodiversity; local economies and local views, values and aspirations.	Articles on the company website include the reporting of monitoring results and a discussion of sand mining issues.
Setbacks	<p>Extraction should be set back no less than:</p> <ul style="list-style-type: none"> • 10 metres from adjoining property boundaries; • 30 metres from a public road; • 40 metres from the top bank of a watercourse or otherwise to the requirements of the Department of Natural Resources; • 100 metres from a public or community facility; and • 100 metres from a residence not associated with extraction 	The proposed development complies with these setback provisions with the exception of the setback from the Rural Fire Brigade facility on Lot 3 DP542117 which although a community facility is not considered to be sensitive to any impacts from sand extraction..

**Table A1 Relevant Performance Criteria and Other Requirements of Development Control Plan 16 – Extractive Industries
(continued)**

Element	Performance Criterion or Prescriptive Measure	Comments
Transport	<p>Internal access roads should be:</p> <ul style="list-style-type: none"> • no less than 20 metres wide; • have a setback of at least 10 metres from adjoining property boundaries; • have a setback of at least 50 metres from environmentally sensitive areas, including habitats of threatened species; and • have a setback of 100 metres from residences not associated with extraction. 	The project relies on the existing haul roads which comply with these requirements.
Water Resources	<p>A water management strategy should be prepared and submitted.</p> <p>Extraction should not occur within 2 metres of the wet weather high groundwater level or otherwise to the requirements of the Department of Natural Resources.</p>	<p>The surface water management strategy is contained in Section A6 of the Environmental Strategy and the Water Management Plan.</p> <p>Extraction will not occur within two metres of the wet weather high groundwater level. Groundwater levels and quality are reported in Chapter 5.</p>
Visual Amenity and Scenic Quality	<p>A landscape site analysis must be submitted that identifies and assesses the scenic qualities, landscape constraints and options for landscape protection of the extraction site.</p> <p>Visual pollution should be minimised through appropriate setbacks, perimeter screen planting and other measures.</p> <p>Extraction sites should be rehabilitated to a final landform compatible with the shape, grade, level, form, land use, landscape quality and biodiversity of the surrounding terrain.</p>	<p>Actions relating to the maintenance of visual amenity of the site are contained in Section A10 of the Environmental Strategy.</p> <p>The site is not visible from any location accessible to the public and specific measures to minimise the visual impact of the proposal are not required.</p> <p>A rehabilitation and revegetation strategy is in the process of implementation for the existing development and the principles of this strategy will be applied to the proposed development amended as appropriate.</p>

Table A1 Relevant Performance Criteria and Other Requirements of Development Control Plan 16 – Extractive Industries (continued)

Element	Performance Criterion or Prescriptive Measure	Comments
Flora and Fauna	<p>A flora and fauna assessment should be undertaken including eight part tests and a Species Impact Statement where required.</p> <p>Extraction operations should provide a buffer zone of at least 50 metres from the critical habitat of threatened species, populations and ecological communities.</p>	Measures to protect native vegetation, including threatened species are contained in Section A7 of the Environmental Strategy and the Landscape Management Strategy.
Heritage and Archaeological Resources	<p>An archaeological study should be submitted which includes an assessment of the scientific, educational, landscape and cultural values of all Aboriginal and non-Aboriginal sites.</p> <p>Extraction should not occur within 40 metres of rock engravings, axe grinding grooves, open scatters of artefacts, stone arrangements, waterhole/well and/or scarred trees, archaeological sites protected under the <i>National Parks and Wildlife Act 1974</i> and listed in the Aboriginal Sites Register and any other requirements of the National Parks and Wildlife Service.</p>	<p>Measures to protect items of heritage value during site operations are contained in Section A9 of the Environmental Strategy.</p> <p>No Aboriginal archaeological sites or areas of potential archaeological deposit were identified.</p>
Soil Conservation	A sediment and erosion control plan should be submitted.	Measures to minimise opportunities for soil erosion and sedimentation are contained in the Water Management Plan.
Acoustic Management	An acoustic impact assessment report must be submitted which identifies and assesses the range of noise levels within the locality and the impacts likely to be generated by the proposal.	<p>Measures to minimise the impacts of noise and vibration during operations are contained in Section 5.3 of the EMP Volume One.</p> <p>The results of noise monitoring are reported in Chapter 4.</p>

**Table A1 Relevant Performance Criteria and Other Requirements of Development Control Plan 16 – Extractive Industries
(continued)**

Element	Performance Criterion or Prescriptive Measure	Comments
Air Quality Management	An air quality assessment report should be submitted.	Measures to minimise the impacts of air emissions are contained in Section A3 of the Environmental Strategy and the Air Quality Monitoring Program. The results of air quality monitoring are reported in Chapter 3 .
Extraction Program	An extraction program should be submitted.	The proposed extraction plan is located in Section 2.4 of the relevant EIS and Chapter 3 of the Preferred Project Report..
Rehabilitation	A rehabilitation strategy should be submitted.	The rehabilitation and revegetation strategy is contained in the Landscape Management Plan.
Social and Economic Assessment	An economic appraisal report and social impact assessment should be submitted.	A socio-economic profile of the area is provided in Section 4.15 of the relevant EIS together with a discussion of the costs and benefits of the proposal.
Ecologically Sustainable Development	An ecologically sustainable development summary report should be submitted.	The manner in which the proposal would comply with the principles of ecologically sustainable development is described in Section 4.16 of the relevant EIS.
Post-Extraction Land Use	The extraction site should be rehabilitated to a useable and stable final landform that can support a variety of agricultural or other permissible land uses. A farm management plan should be submitted for agricultural post-extraction land uses.	The rehabilitation and revegetation strategy for the site of the proposal and details of final land uses are provided in the Landscape Management Plan.

**Table A1 Relevant Performance Criteria and Other Requirements of Development Control Plan 16 – Extractive Industries
(continued)**

Element	Performance Criterion or Prescriptive Measure	Comments
Maroota	<p>Extractive industry set backs specific to the Maroota area are:</p> <ul style="list-style-type: none"> • 40 metres from Maroota State Forest; • 50 metres from known critical habitats of the Yellow Bellied Glider, <i>Kunzea rupestris</i> and <i>Tetratheca glandulosa</i>, other threatened species, populations and ecological communities; and • 250 metres from Maroota Public School. 	The project complies with these setback requirements.
Section 94 Contributions	Section 94 contributions may be required.	Section 94 contributions will be made as required.
Environmental Management Systems	An annual environmental management plan should be submitted to indicate the overall performance and management of the operation, to include an acoustic management plan, a rehabilitation management plan, a water management plan and a social impact management plan.	An environmental management system is in place for the existing development on the site. This requires annual reporting of the overall performance and management of the operation. This will be continued following review and updating to take account of any changes.