

## Chapter Five AIR QUALITY

### Introduction

The Project Approval (**Schedule 3 Condition 12**) for the Hitchcock Road development required the preparation and implementation of an Air Quality Monitoring Program. The objectives of the 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 Air Quality Monitoring Program;
- document the results of dust deposition monitoring conducted in the 12 months ended June;
- assess the measured dust deposition levels against the relevant amenity criteria; and
- nominate existing dust deposition monitoring methodology and establish routine measurement procedures.

### Dust impact assessment criteria

The proponent will ensure that dust generated by the project does not cause exceedances of the criteria listed in **Tables 5.1** and **5.2** at any residence or on more than 25 per cent of any privately owned land.

<b>Table 5.1 Impact Assessment Criteria for Particulate Matter</b>		
<b>Pollutant</b>	<b>Averaging period</b>	<b>Criterion</b>
Total suspended particulate (TSP) matter	Annual	90µg/m <sup>3</sup>
Particulate matter < 10µm (PM <sub>10</sub> )	Annual	30µg/m <sup>3</sup>
	24 hour	50µg/m <sup>3</sup>

<b>Table 5.2 Impact Assessment Criteria for deposited dust</b>			
<b>Pollutant</b>	<b>Averaging period</b>	<b>Maximum increase in deposited dust level</b>	<b>Maximum total deposited dust level</b>
Deposited dust	Annual	2g/m <sup>2</sup> /month	4g/m <sup>2</sup> /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*

## Dust monitoring

PF Formation maintained a program of continuous monthly dust deposition monitoring. This is in compliance with the requirements of the Air Quality Monitoring Program. The locations of the monitoring stations are shown on **Attachment 5A**.

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*.

## Monitoring results

A summary of the monthly dust deposition monitoring results is provided at **Attachment 5B**. The detailed measurement and analysis results by month as prepared by Boral Materials Testing and Environmental Services are summarised in **Attachment 5C**. 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*.

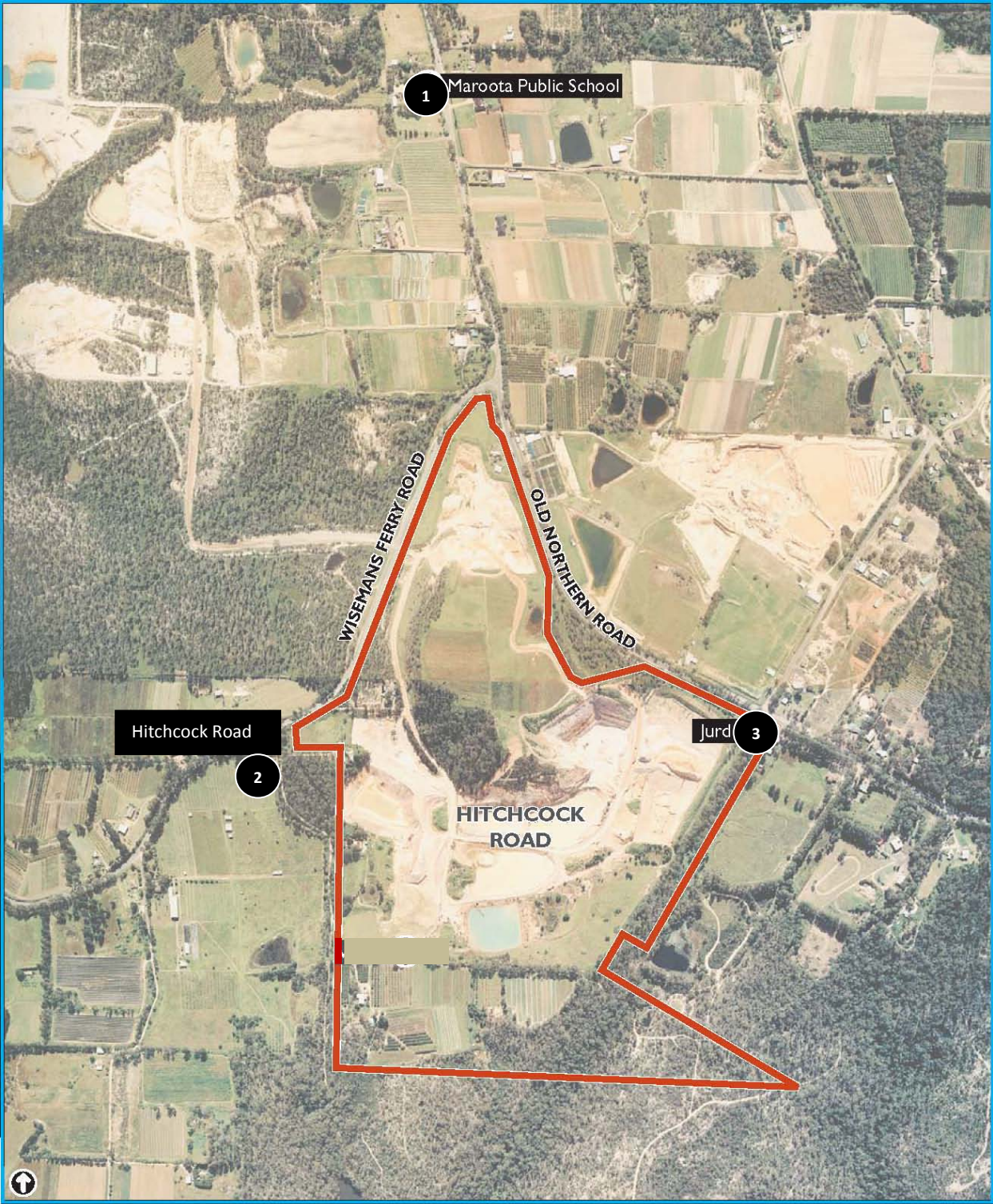
The following information can be derived from these results in relation to the dust nuisance criterion.

- 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 such as soil/dust that could be derived from a source such as 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. As the operations from the site are very consistent the dust generated from the site is consistent subject to weather impacts. Spikes are usually caused by factors unrelated to the quarry such as mowing or horticultural activities near the monitoring station or regional issues such as bush fires.
- The annual average ambient dust deposition rate (insoluble solids) considered a nuisance criterion is 4 g/m<sup>2</sup>/month. All sites monitored had annual averages below this level.
- The annual average ambient dust deposit rate (insoluble solids) at Location 1 – Maroota School was 2.26 g/m<sup>2</sup>/month (3.35 in 2013). This is less than the dust nuisance criterion of 4 g/m<sup>2</sup>/month. This site often gets impacted by external factors such as horticultural activities adjoining the school. This did not occur in 2014 and the results were very low.
- The results of the dust deposit gauges were very good for the year being below the nuisance criterion. Because of the distances from the quarry operations and the significant other factors impacting the dust deposit gauge results high recordings are not necessarily a result of quarry operations. It is reassuring when all locations have relatively low results in the last few years.

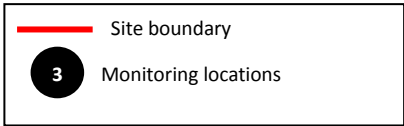
- PF Formation and Dixon Sand (a neighbouring operator) have an agreement whereby if the rolling 24-hour PM<sub>10</sub> average recorded by the TEOM reaches 42.5 µg/m<sup>3</sup>, PF Formation would be notified. The wind direction would then be assessed and measures to reduce any dust impacts affecting 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. A copy of the action plan if this occurs is attached in **Attachment 5D**.
- There have been no complaints concerning dust generation over the past year.
- A summary of the weather conditions recorded on-site are in **Attachment 5E**.

## 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 from all sources are well below the maximum levels criteria.



AIR QUALITY MONITORING LOCATIONS



		Summary of Dust Deposition Monitoring Results (g/m2/month)		
		Location 1	Location 2	Location 3
		Maroota School	Hitchcock Road	Jurd residence
Month/Year		Insoluble Solids	Insoluble Solids	Insoluble Solids
2013	July	0.99	1.28	1.11
	August	1.5	1.85	2.27
	September	2.34	2.46	4.43
	October	3.17	4.67	4.87
	November	2.79	2.77	3.57
	December	3.01	2.73	3.53
2014	January	2.5	2.27	1.72
	February	2.65	3.36	3.19
	March	2.92	4.65	2.42
	April	1.34	1.82	1.55
	May	2.16	2.56	3.47
	June	1.7	2.11	2.27
Monthly Average		2.26	2.71	2.87
	2013	3.35	2.74	2.95
	2012	1.90	1.66	2.43
	2011	3.22	2.38	2.56
	2010	2.27	2.18	2.55




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### TEST REPORT

CLIENT: P.F. FORMATION

FILE No: 250 / 14

1774 Wisemans Ferry Road Maroota NSW 2756

PROJECT: Gravimetric Dust monitoring at Maroota for June 2014

REQUEST No: 58182

**TEST PROCEDURE:** AS 3580.10.1 – 2003 – Methods for Sampling and Analysis of Ambient Air  
Method 10.1 – Determination of Particulate Matter - Deposited Matter – Gravimetric Method

Lab Sample Number:	155730	155731	155732	155733
Field Number:	1	2	3	4
Sample Description:	Dust			
Sampling Period:	From 2.06.14 to 1.07.14			

### TEST RESULTS

Insoluble Solids (g/m <sup>2</sup> month)	1.70	2.11	2.27	8.62
Ash (g/m <sup>2</sup> month)	1.03	1.36	1.52	7.13
Combustible Matter (g/m <sup>2</sup> month)	0.67	0.75	0.75	1.49
Soluble Matter (g/m <sup>2</sup> month)	0.54	0.85	1.16	1.07
Total Solids (g/m <sup>2</sup> month)	2.24	2.96	3.43	9.69
Volume of Liquid in the Gauge (ml)	500	600	600	600

Refer to attached graphs.

Samples submitted by the Client.

J.Graham, Mat.File, File.

S.Krishnamoorthy

Approved Signatory *[Signature]*

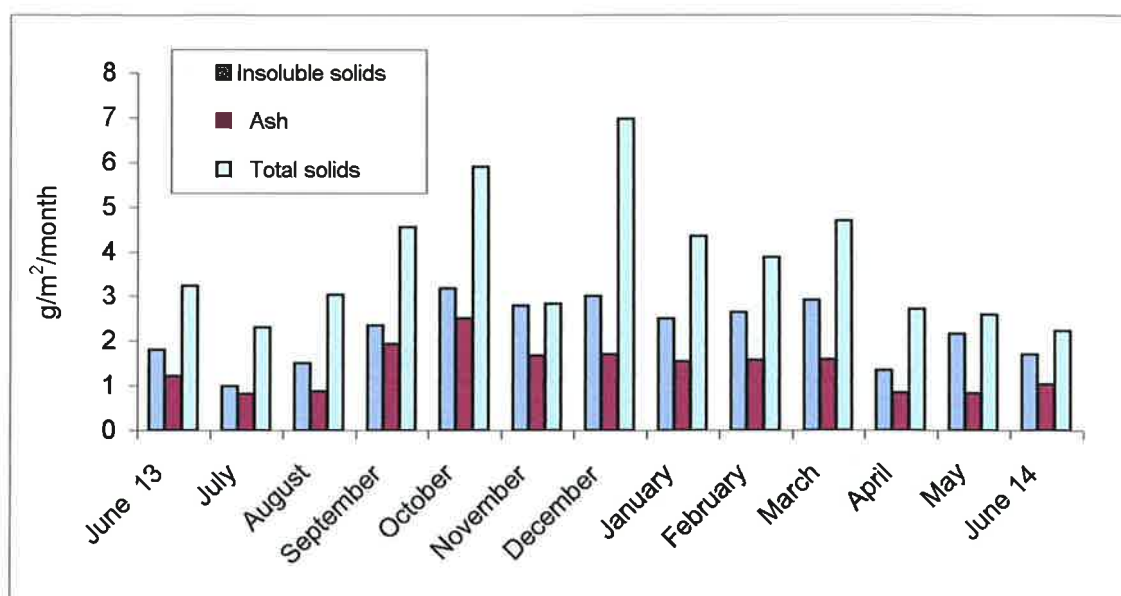
Date 11.7.14 Serial No. 127197

NATA Accredited Laboratory

Number: 9968

**Dust Monitoring**  
**MARROOTA Site 1**  
**Maroota Public School**

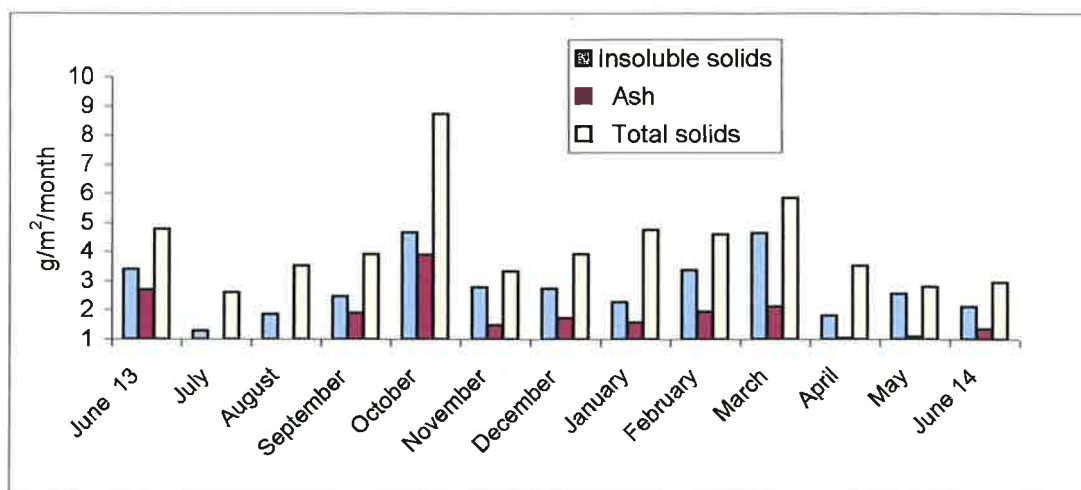
	Insoluble solids	Ash	Total solids
June 13	1.80	1.22	3.23
July	0.99	0.81	2.30
August	1.50	0.87	3.04
September	2.34	1.93	4.55
October	3.17	2.51	5.90
November	2.79	1.68	2.84
December	3.01	1.70	6.97
January	2.50	1.55	4.35
February	2.65	1.57	3.88
March	2.92	1.59	4.70
April	1.34	0.85	2.72
May	2.16	0.83	2.59
June 14	1.70	1.03	2.24



\* NSW-EPA - Approved Methods and Guidance- For the Modelling and Assessment of Air Pollutants in New South Wales - AUGUST 2001(pg 11)

**Dust Monitoring**  
**MARROTA Site 2**  
**Hitchcock Road**

	Insoluble solids	Ash	Total solids
June 13	3.39	2.68	4.78
July	1.28	0.95	2.60
August	1.85	0.96	3.53
September	2.46	1.89	3.93
October	4.67	3.9	8.72
November	2.77	1.48	3.33
December	2.73	1.73	3.93
January	2.27	1.58	4.76
February	3.36	1.95	4.61
March	4.65	2.12	5.85
April	1.82	1.05	3.53
May	2.56	1.08	2.81
June 14	2.11	1.36	2.96

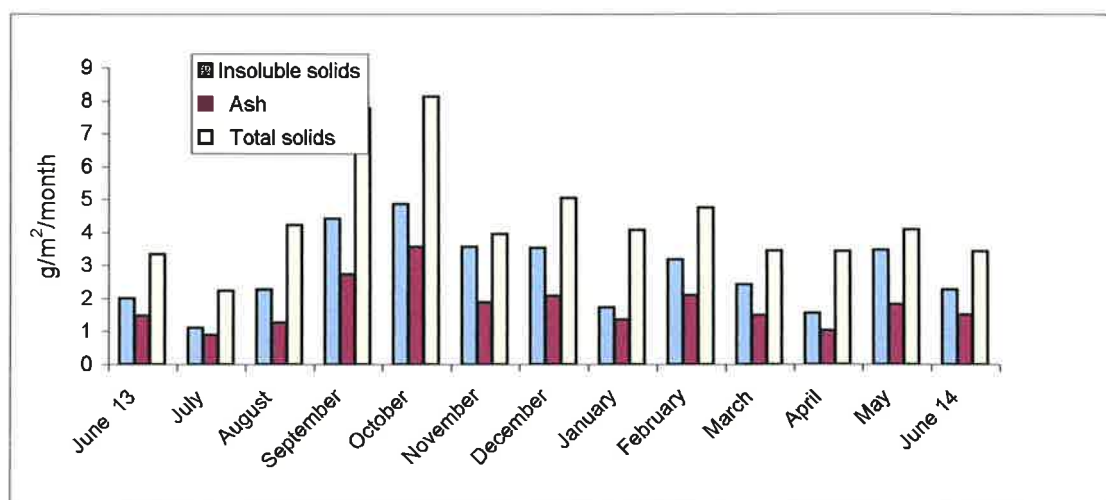


\* NSW-EPA - Approved Methods and Guidance- For the Modelling and Assessment of Air Pollutants in New South Wales - AUGUST 2001(pg 11)



**Dust Monitoring**  
**MARROOTA Site 3**  
**Jurd's House**

	Insoluble solids	Ash	Total solids
June 13	1.99	1.47	3.33
July	1.11	0.89	2.24
August	2.27	1.26	4.22
September	4.43	2.73	7.78
October	4.87	3.56	8.13
November	3.57	1.88	3.95
December	3.53	2.07	5.05
January	1.72	1.36	4.07
February	3.19	2.09	4.75
March	2.42	1.49	3.45
April	1.55	1.03	3.43
May	3.47	1.83	4.10
June 14	2.27	1.52	3.43



\* NSW-EPA - Approved Methods and Guidance- For the Modelling and Assessment of Air Pollutants in New South Wales - AUGUST 2001(pg 11)

## **PM10 Dust Action Plan**

### **Background**

As Dixon Sands have a PM10 monitoring location at Maroota on the property adjoining the Maroota Public School they have agreed to contact us in the event the rolling 24-hour average PM10 result nears or exceeds 42 ug/m<sup>3</sup> in working hours. (This is after Dixon's themselves are notified by their consultants.) We have agreed to the following Plan in the event we become aware of high PM10 dust recordings in the Maroota area. The aim is to determine whether PF Formation operations could be a source or contributor to the high results and if this is the case and if there could be a potential impact on the school to take measures to reduce this potential impact.

### **Plan**

In the event PF Formation are contacted by Dixon Sands advising that the PM10 result is near or exceeds the trigger then:

1. John Graham, Peter Watt, Joshua Graham, Luke Graham and Peter Cummins (management team) are all to be advised by telephone/two-way immediately
2. The current wind direction is to be assessed by them at the weather monitoring station.
3. If the wind direction is from our operations to the Dixon monitoring location then action must be taken to reduce PF Formation's PM10 emissions.
4. The management team are to advise all staff to assess all dust generating activities for all areas that could impact the Maroota Public School except for activities solely undertaken to reduce dust impacts
5. The management team is to evaluate the conditions, liaise with Dixon Sands regarding the status of the rolling 24-hour PM10 average and undertake necessary dust suppression activities such as watering roads, exposed areas and stockpiles.
6. If the dust levels have not reduced to allowable levels within 1 hour of ceasing dust generating activities and it is within school hours plus 30 minutes then all dust generating activities within the relevant area must stop.

## PF FORMATION WEATHER CHART

JUL 13

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/07/2013	8	17	0-0	SW-S	1025.4	50	FOG/FINE
2/07/2013	6	19	0-0	S-N	1026	NIL	FOG/FINE
3/07/2013	6	18	0-0	N-NW	1025.7	NIL	LOVELY
4/07/2013	6	20	Dec-24	N-W	1018.9	NIL	FINE/WINDY
5/07/2013	12	20	15-May	WNW-WNW	1011.3	NIL	FINE/WINDY
SATURDAY							
SUNDAY							
8/07/2013	4	19	0-0	S-ESE	1032.9	NIL	FINE
9/07/2013	6	14	0-0	S-ESE	1036.3	NIL	CLOUDY
10/07/2013	8	14	0-0	ESE-ESE	1034.5	NIL	CLOUDY
11/07/2013	7	17	0-0	ESE-WNW	1035.5	NIL	FOG/CLOUDY
12/07/2013	5	15	0-0	WNW-WNW	1032.4	NIL	FOG CLOUDY
SATURDAY							
SUNDAY							
15/07/2013	12	16	0-5	N-NW	1026.2	5	RAIN
16/07/2013	12	17	0-0	N-WNW	1025.1	5	RAIN/CLOUDY
17/07/2013	13	20	3-Aug	NNW-NW	1024.7	NIL	
18/07/2013	11	21	0-0	N-NW	1023.8	NIL	CLOUDY
19/07/2003	15	14	8-Oct	WNW-WNW	1017	NIL	CLOUDY/RAIN
SATURDAY							
SUNDAY							
22/07/2013	5	16	0-16	WNW-NW	1020.6	NIL	CLOUDY
23/07/2013	5	16	0-0	W-ESE	1021.6	NIL	FINE/CLOUDY
24/07/2013	8	16	0-29	SSE-S	1028.1	NIL	
25/07/2013	4	19	0-7	ESE-WNW	1031.6	NIL	FINE
26/07/2013	6	17	0-0	N-NNE	1027.6	NIL	FINE
27/07/2013	4	19	0-0	NNE-NNE	1031.4	NIL	
SUNDAY							
29/07/2013	8	20	0-5	NNE	1027.1	NIL	CLOUDY
30/07/2013	10	18	0-0	NNE-NNE	1020.7	NIL	CLOUDY
31/07/2013	11	15	0-3	S-SSE	1024.6	NIL	CLOUDY

## PF FORMATION WEATHER CHART

AUG 13

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/08/2013	6	18	0-0	ESE-WNW	1025	NIL	FINE/CLOUDY
2/08/2013	7	19	0-8	WNW-WNW	1020	NIL	CLOUDY
3/08/2013	9	20	0-0	WNW-WNW	1016.9	NIL	FINE
SUNDAY							
5/08/2013	6	20	0-7	WNW-WNW	1019.6	NIL	FINE
6/08/2013	11	24	8-May	WNW-WNW	1014.9	NIL	FINE/CLOUDY
7/08/2013	9	20	0-3	NW-ESE	1014.2	NIL	FINE
8/08/2013	9	8	0-14	SSW-S	1009.1	9	RAIN/CLOUDY
9/08/2013	5	15	0-0	SSW-WNW	1020.2	3	FINE/CLOUDY
10/08/2013	10	22	0-0	NNW>NNW	1017	NIL	
SUNDAY							
12/08/2013	13		Jun-45	WNW-	1009.4	NIL	CLOUDY
13/08/2013	8	22	0-5	N-W	1014.8	NIL	FINE
14/08/2013	12	21	0-8	NW>NNW	1015.5	NIL	FINE
15/08/2013	9	18	0-14	SSW-ESE	1018.4	NIL	FINE
16/08/2013	5	20	0-0	SSW-WNW	1024.9	NIL	FINE
SATURDAY							
SUNDAY							
19/08/2013	12	19	Jul-20	WNW-WNW	1011.4	NIL	FINE
20/08/2013	4	14	3-Aug	SW-NW	1014.2	NIL	
21/08/2013	3	18	0-0	W-S	1018	NIL	FINE/CLOUDY
22/08/2013	6	16	0-10	SW-SW	1016.3	NIL	CLOUDY
23/08/2013	11	16	5-Jun	NW-NW	1012.5	NIL	CLOUDY
24/08/2013	8	23	0-8	N-WSW	1018.2	NIL	FINE
SUNDAY							
26/08/2013	7	21	0-0	ESE-WNW	1025.9	NIL	FINE/CLOUDY
27/08/2013	9	25	0-0	ESE-SSW	1023.7	NIL	CLOUDY
28/08/2013	9	22	0-0	NNE-NNE	1021.9	NIL	FINE/CLOUDY
29/08/2013	9	22	0-0	NNE-NNE	1025.4	NIL	CLOUDY
30/08/2013	16	20	Oct-13	N-WNW	1017	NIL	FINE
31/08/2013	13	24	0-0	ESE-WSW	1020.7	NIL	FINE/CLOUDY

## PF FORMATION WEATHER CHART

SEP 13

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
2/09/2013	10	25	0-0	NNE-NNE	1031.5	NIL	FINE
3/09/2013	10	24	0-0	NNE-NNE	1032.1	NIL	FINE
4/09/2013	10	24	0-4	NW-N	1034.1	NIL	FINE
5/09/2013	12	28	0-0	WNW-S	1029.3	NIL	FINE
6/09/2013	14	28	0-0	ESE-NNE	1026.8	NIL	FINE/CLOUDY
7/09/2013	16	28	0-0	N-WNW	1023.1	NIL	FINE/CLOUDY
SUNDAY							
9/09/2013	15	23	0-11	NNE-NNE	1023.2	NIL	CLOUDY
10/09/2013	19	31	0-45	N-SSW	1008.2	NIL	CLOUDY/WINDY
11/09/2013	9	23	0-25	SSW-SW	1012.3	NIL	FINE/WINDY
12/09/2013	9	23	0-9	SSW-W	1016.9	NIL	FINE/CLOUDY
13/09/2013	9	18	0-0	SSW-NNE	1022.3	NIL	CLOUDY
14/09/2013	12	22	0-0	W-WNW	1014.4	NIL	FINE/CLOUDY
SUNDAY							
16/09/2013	13	16	0-0	E-NNW	1017.8	NIL	CLOUDY/RAIN
17/09/2013	12	19	7-Dec	WNW-WNW	1002.2	20	CLOUDY
18/09/2013	15	23	May-15	NW-W	1003.8	NIL	FINE
19/09/2013	13	23	0-0	SSW-SW	1006.3	NIL	FINE
20/09/2013	10	19	0-9	WNW-SSW	1010.5	NIL	FINE/CLOUDY
21/09/2013	7	22	0-12	W-S	1015.7	NIL	FINE/WINDY
SUNDAY							
23/09/2013	10	32	0-0	NNE-SSW	1013.9	NIL	FINE
24/09/2013	19	32	0-0	N-S	1006.9	NIL	CLOUDY
25/09/2013	14	32	0-0	N-WNW	1010.6	NIL	FINE
26/09/2013	16	23	0-28	N-SSW	1006.3	NIL	FINE
27/09/2013	6	24	0-0	WNW-N	1021.1	NIL	FINE
28/09/2013	11	29	0-7	N-W	1013.8	NIL	FINE/WINDY
SUNDAY							
30/09/2013	10	29	0-10	NNE-	1018.4	NIL	FINE

## PF FORMATION WEATHER CHART

OCT 13

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/10/2013	20	21	10-21	N-W	1007.7	NIL	CLOUDY/WINDY
2/10/2013	9	23	5-30	NW-N	1017.6	NIL	WINDY
3/10/2013	13	13	9-0	WNW-ESE	1010.5	NIL	CLOUDY
4/10/2013	7	21	0-0	SW-S	1023.5	NIL	FINE
5/10/2013	9	26	0-0	WNW-NNE	1018.7	NIL	FINE
SUNDAY							
LABOUR DAY							
8/10/2013	11	23	0-10	ESE-ESE	1014.8	NIL	CLOUDY
9/10/2013	11	28	0-5	NNW-	1020.9	NIL	FINE
10/10/2013	19	33	0-24	WNW-WNW	1012.8	NIL	FINE/WINDY
11/10/2013	17	25	0-9	N-E	1009.6	NIL	CLOUDY
12/10/2013	11	26	0-10	NNE-WNW	1016.2	NILE	FINE
SUNDAY							
14/10/2013	12	20	0-6	SW-ESE	1012.8	NIL	CLOUDY
15/10/2013	6	23	0-6	SW-SW	1023.4	NIL	FINE
16/10/2013	11	28	0-6	E-	1020.8	NIL	
17/10/2013	21	31	11-26	N-WNW	1008.5	NIL	FINE/CLOUDY
18/10/2013	11	20	0-2	ESE-S	1024.7	NIL	CLOUDY
19/10/2013	9	21	0-5	NNE-NNE	1028.4	NIL	FINE
SUNDAY							
21/10/2013	15		0-	NNE-	1016.9	NIL	FINE
22/10/2013	19	26	0-	ESE-NNE	1015.3	NIL	CLOUDY
23/10/2013	21	31	0-20	NNW-	1006.6	4.5	FINE/WINDY
24/10/2013	16	21	3-16	WNW-SW	1012.6	NIL	CLOUDY
25/10/2013	7	22	0-0	SW-ESE	1023.9	NIL	FINE
26/10/2013	10	20	0-5	NE-SW	1021.2	NIL	FINE/CLOUDY
SUNDAY							
28/10/2013	14	25	0-5	SE-NW	1021	NIL	CLOUDY
29/10/2013	13	15	0-8	SW-ESE	1007.4	13	CLOUDY/RAIN
30/10/.13	13	20	0-5	S-	1021.4	NIL	
31/10/2013	11	25	0-0	NNE-SE	1022.7	NIL	FINE/CLOUDY



## PF FORMATION WEATHER CHART

NOV 13

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/11/2013	15	24	0-3	ESE-SW	1024.4	NIL	CLOUDY
2/11/2013	14	26	0-0	NE-NW	1019	NIL	SMOKEY-FIRE
SUNDAY							
4/11/2013	13	20	0-15	ESW-NNE	1021.5	NIL	CLOUDY
5/11/2013	12	18	0-5	ESE-SW	1028.7	NIL	CLOUDY
6/11/2013	9	24	0-10	NE-NE	1025.5	NIL	FINE
7/11/2013	12	32	0-0	NE-NW	1018.9	NIL	FINE
8/11/2013	18	35	0-6	NE-WNW	1011.9	NIL	CLOUDY
9/11/2013	23	32	0-13	N-NW	1006.4	NIL	FINE-WINDY
SUNDAY							
11/11/2013	13		0-	SW-	1018.9	15	RAIN
12/11/2013	15	18	0-0	S-SE	1014.2	30	RAIN
13/11/2013	12	26	0-18	SW-NW	1015.3	NIL	
14/11/2013	12	28	0-11	SW-SW	1015.3	NIL	FINE-CLOUDY
15/11/2013	14	22	0-5	ESE-NE	1016.5	NIL	CLOUDY
16/11/2013	14	19	0-0	S-SE	1016.4	NIL	CLOUDY-RAIN
SUNDAY							
18/11/2013	13	15	0-10	SW-NW	1015.4	80	CLOUDY-RAIN
19/11/2013	15	23	0-0	S-NNE	1013.2	50	CLOUDY-RAIN
20/11/2013	14	27	0-5	SEE-NE	1011.9		
21/11/2013	16	26	0-8	NE-NE	1012.8	NIL	CLOUDY
22/11/2013	18	21	0-5	SE-NE	1010.8		RAIN
23/11/2013	17	21	0-0	NE-NNE	1006.3		CLOUDY-RAIN
SUNDAY							
25/11/2013	14	20	0-16	ESE-SSE	1008.9	35	CLOUDY
26/11/2013	12	21	0-13	SW-SW	1017.1	NIL	FINE-CLOUDY
27/11/2013	11	26	0-	SSE-	1018.9		
28/11/2013	15	34	0-4	NE-NW	1013.3	NIL	CLOUDY
29/11/2013	19	15	0-0	ESE-SW	1005.3	NIL	RAIN
30/11/2013	13	19	0-2	SE-SE	1017.8	NIL	CLOUDY

## PF FORMATION WEATHER CHART

DEC 13

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
SUNDAY							
2/12/2013	13	25	0-0	NNE-W	10254	NIL	CLOUDY
3/12/2013	12	29	0-3	NNE-E	1019.1	NIL	FINE
4/12/2013	15	33	0-6	NNE-	1008.3	10	FINE
5/12/2013	19	18	0-40	NNE-WNW	996.5	NIL	RAIN/CLOUDY
6/12/2013	11	23	0-6	SW-S	1011.3	NIL	FINE
7/12/2013	10	21	0-0	NNE-NW	1021.1	NIL	FINE
SUNDAY							
9/12/2013	18	34	0-	NNE-N	1009.9	NIL	CLOUDY
10/12/2013	18		0-11	NNE-SW	1003	NIL	CLOUDY
11/12/2013	15	29	0-9	SSE-NWW	1010.6	NIL	FINE
12/12/2013	15	26	0-2	SW-E	1011.7	NIL	CLOUDY
13/12/2013	16	29	0-11	NNE-NNE	1012.8	NIL	FINE/CLOUDY
SATURDAY							
SUNDAY							
16/12/2013	17		0-	N-	1020.3	NIL	CLOUDY
17/12/2013	15	26	0-0	NNE-NW	1021.9	NIL	CLOUDY
18/12/2013	16	27	0-5	NNE-	1023	NIL	
19/12/2013	16	31	0-0	NNE-NNE	1023.7	NIL	FINE
20/12/2013	19	39	0-2	NNE-NW	1017.2	NIL	FINE
21/12/2013	22	28	0-0	SE-S	1015	NIL	FINE
SUNDAY							
23/12/2013	27	33	0-8	NW-NW	1006.5	NIL	CLOUDY
24/12/2013	18	19	5-May	SW-S	1016.3	NIL	CLOUDY
25/12/2013	CHRISTMAS	DAY					
26/12/2013	BOXING	DAY					
27/12/2013	CLOSED						
28/12/2013	CLOSED						
SUNDAY							
30/12/2013	CLOSED						
31/12/2013	CLOSED						

[illegible]

## PF FORMATION WEATHER CHART

FEB 14

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/02/2014	21	26	0-8	S-SW	1014.9	NIL	FINE
SUNDAY							
3/02/2014	19	31	0-0	NE-ESE	1015.8	NIL	CLOUDY/FINE
4/02/2014	18	21	0-2	SW-S	1014.1	NIL	CLOUDY/RAIN
5/02/2014	16	2	0-5	NNE	1022.5	NIL	CLOUDY
6/02/2014	15	22	0-3	SE-SE	1021	NIL	CLOUDY
7/02/2014	12	29	0-0	NE-SW	1018.7	NIL	FINE
8/02/2014	21	28	0-0	NE-SW	1017.8	NIL	FINE
SUNDAY							
10/02/2014	20	28	0-3	S-S	1018	NIL	CLOUDY
11/02/2014	18	26	0-8	ESE-NW	1018.2	NIL	RAIN
12/02/2014	21	28	0-5	S-SE	1015.9	NIL	CLOUDY
13/02/2014	19	30	0-6	N-ESE	1015.5	NIL	CLOUDY
14/02/2014	19	25	0-0	NE-NE	1009	NIL	CLOUDY
15/02/2014	20	24	0-2	N-N	1004.4	NIL	RAIN
SUNDAY							
17/02/2014	17		0-	S-	1013.4	45	RAIN
18/02/2014	17	23	0-0	ESE-NE	1013.8	4	CLOUDY
19/02/2014	20	24	0-5	NE-S	1006	NIL	RAIN
20/02/2014	19	28	0-18	SW-WNW	1006.3	15	CLOUDY
21/02/2014	16	26	3-0	ESE-ESE	1014.9	NIL	CLOUDY
22/02/2014	16	25	0-0	SE-NW	1019.7	NIL	FINE/CLOUDY
SUNDAY							
24/02/2014	17	26	0-4	N-NNW	1021.5	NIL	RAIN/FINE
25/02/2014	16	29	0-0	NE-ESE	1018.5	NIL	FOG/CLOUDY
26/02/2014	18	32	0-6	NE-NW	1011.7	NIL	CLEAR
27/02/2014	18	20	0-0	NW-SE	1016.2	8	CLOUDY/RAIN
28/02/2014	16	17	0-8	S-S	102.4	10	RAIN

## PF FORMATION WEATHER CHART

MAR 14

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/03/2014	16	20	5-	SW-S	1021.5	NIL	CLOUDY/RAIN
SUNDAY							
3/03/2014	16	23	0-	S-	1025	35	CLOUDY
4/03/2014	18	24	0-0	NE-NE	1027.3	4	CLOUDY
5/03/2014	18	24	0-10	NW-NE	1019.4	NIL	
6/03/2014	19	23	0-0	NW-S	1018.4	NIL	CLOUDY
7/03/2014	18	27	0-0	NE-NE	1019.9	NIL	CLOUDY
8/03/2014	18	26	0-6	NE-N	1021.5	NIL	CLOUDY/FINE
SUNDAY							
10/03/2014	16		0-	N-	1022.9	NIL	FINE
11/03/2014	17	27	0-8	NE-N	1023.7	NIL	FINE/CLOUDY
12/03/2014	17	28	0-2	NE-SW	1018.2	NIL	FINE
13/03/2014	17	24	0-0	ESE-WNW	1020.4	25	RAIN/CLOUDY
14/03/2014	17	28	0-0	NE-NE	1018.6	NIL	CLOUDY
15/03/2014	17	25	2-0	NE-NW	1013.6	NIL	CLOUDY
SUNDAY							
17/03/2014	13	25	0-5	SW-S	1016.5	6	FINE
18/03/2014	13	28	0-0	NNE-N	1021.5	NIL	FINE/CLOUDY
19/03/2014	16	26	0-5	SSE-S	1022.9	NIL	FINE
20/03/2014	19	26	0-3	SE-ESE	1027.2	NIL	FOG/CLOUDY
21/03/2014	18	27	0-3	NE-NW	1023.2	NIL	CLOUDY
22/03/2014	16	25	0-5	NE-NW	1018.2	NIL	FINE
SUNDAY							
24/03/2014	18	16	0-6	ESE-ESE	1016.6	NIL	CLOUDY/RAIN
25/03/2014	15	24	0-0	SE-NW	1019.3	8	FOG
26/03/2014	19	33	0-0	E-SSE	1022.8	NIL	CLOUDY
27/03/2014	19	19	0-0	N-NE	1021.8	15	RAIN
28/03/2014	16	22	0-5	NE-SSW	1017.7	15	CLOUDY
29/03/2014	16	23	0-3	SW-SW	1017.6	NIL	CLOUDY
SUNDAY							
31/03/2014	17	24	0-0	SW-SW	1022.8	50	FOG/CLOUDY

## PF FORMATION WEATHER CHART

APR 14

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/04/2014	16	26	0-0	E-NNE	1020.2	NIL	FOG/CLOUDY
2/04/2014	16	27	0-5	NE-	1018	NIL	FOG/SUNNY
3/04/2014	17	29	0-0	NE-NW	1017.1	NIL	FOG/CLOUDY
4/04/2014	19	22	0-	SW-ESE	1018.2	2	RAIN
5/04/2014	18	21	0-0	SW-S	1018.1	NIL	CLOUDY
SUNDAY							
7/04/2014	14	19	0-0	S-NE	1025.6	25	RAIN
8/04/2014	15	22	0-	ESE-	1024	NIL	CLOUDY
9/04/2014	14	24	0-5	NNE-	1021.8	NIL	FINE
10/04/2014	16	21	0-0	E-NE	1018.2	NIL	CLOUDY
11/04/2014	18	25	0-0	NE-SW	1007.5	5	RAIN/CLOUDY
12/04/2014	16	20	0-11	SW-SW	1010.5	NIL	CLOUDY
SUNDAY							
14/04/2014	12	17	0-0	S-E	1020.8	NIL	FINE
15/04/2014	13	21	0-3	SE-SSW	1021.8	NIL	FINE
16/04/2014	13	21	0-4	SSE-SSE	1020.5	NIL	FINE
17/04/2014	11	22	0-0	SE-SE	1020.4	NIL	CLOUDY
18/04/2014	GOOD	FRIDAY					
19/04/2014	EASTER	SATURDAY					
20/04/2014	EASTER	SUNDAY					
21/04/2014	EASTER	MONDAY					
22/04/2014	11	23	0-2	NW-NW	1020.8	NIL	CLOUDY
23/04/2014	10	24	0-0	NW-NW	1018.9	NIL	CLOUDY
24/04/2014	16	27	0-0	N-NW	1014.6	NIL	CLOUDY
25/04/2014	ANZAC	DAY					
26/04/2014	13	18	0-5	NW-NW	1016.9	NIL	CLOUDY
SUNDAY							
28/04/2014	13	19	0-3	S-NW	1027.3	NIL	CLOUDY
29/04/2014	13	24	0-14	NNE-NE	1020.3	NIL	CLOUDY
30/04/2014	18	22	6-	NNW-S	1012.4	NIL	CLOUDY



## PF FORMATION WEATHER CHART

MAY 14

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
1/05/2014	8	19	0-5	S-NW	1019.1	5	FINE
2/05/2014	5	19	3-Jun	NW-WNW	1009.7	NIL	CLOUDY
3/05/2014	12	12	0-13	NW-NW	998.5	NIL	CLOUDY
SUNDAY							
5/05/2014	5	18	0-0	NW-SW	1018.4	NIL	FINE
6/05/2014	7	18	0-4	SW-S	1023	NIL	CLOUDY
7/05/2014	10	18	0-9	SW-S	1024.6	NIL	FINE
8/05/2014	10	18	2-0	SW-S	1027.9	NIL	CLOUDY
9/05/2014	11	19	0-0	ESE-NE	1028.2	NIL	RAIN
10/05/2014	10	18	0-2	NE-NW	1025.3	NIL	CLOUDY
SUNDAY							
12/05/2014	12	19	0-0	ESE-SE	1030.5	4	CLOUDY
13/05/2014	13	20	0-3	SW-SSW	1031.5	NIL	RAIN
14/05/2014	12	21	0-	NW-	1030.1	NIL	FINE
15/05/2014	8	21	0-0	SE-NE	1030	NIL	FOG/FINE
16/05/2014	9	22	0-0	NE-NE	1030.1	NIL	FINE
17/05/2014	11	21	0-3	NE-NW	1030.5	NIL	FINE
SUNDAY							
19/05/2014	13	21	2-0	NW-NW	1027.7	NIL	CLOUDY
20/05/2014	14	21	0-0	NW-NW	1024.3	NIL	FINE
21/05/2014	13	22	0-0	NW-NW	1025.3	NIL	CLOUDY
22/05/2014	10	23	0-5	NE-N	1024.9	NIL	FOG/FINE
23/05/2014	15	24	0-0	NW-WNW	1019.7	NIL	CLOUDY
24/05/2014	15	23	0-0	NW-NW	1015.2	NIL	FINE
SUNDAY							
26/05/2014	12	25	0-0	NE/NE	1024.5	NIL	CLOUDY
27/05/2014	16	22	0-8	WNW-NW	1019.9	NIL	CLOUDY
28/05/2014	16	22	5-Jun	WNW-SW	1013.8	NIL	FINE
29/05/2014	9	19	0-0	W-ESE	1023.3	NIL	CLOUDY
30/05/2014	14	18	0-0	S-SW	1027.5	NIL	CLOUDY
31/05/2014	12	18	0-0	SW-NE	1026.8	NIL	CLOUDY

## PF FORMATION WEATHER CHART

JUN 14

DATE	TEMP-MIN	TEMP-MAX	WIND-SPD	WIND-DIR	BAR	RAIN	CONDITION
2/06/2014	10	19	3-May	WNW-WNW	1019.2	5	FOG/FINE
3/06/2014	9	18	0-2	NW-WNW	1019.5	NIL	FINE
4/06/2014	8	19	0-0	SW-S	1024.7	NIL	FINE
5/06/2014	13	15	0-0	S-S	1026.6	NIL	FOG/RAIN
6/06/2014	13	15	2-Aug	SE-S	1027.5	NIL	CLOUDY
7/06/2014	10	15	0-11	SE-S	1028.1	NIL	FINE
SUNDAY							
QUEENS	BIRTHDAY						
10/06/2014	10	14	5-0	SE-ESE	1032.2	5	RAIN
11/06/2014	9	16	0-0	SW-SE	1027.8	NIL	CLOUDY
12/06/2014	9	18	0-0	NE-NW	1023.6	NIL	CLOUDY
13/06/2014	8	16	0-0	NE-N	1020.4	NIL	FOG/CLOUDY
14/06/2014	13	14	0-0	NW-NW	1013.4	NIL	CLOUDY/RAIN
SUNDAY							
16/06/2014	8	17	0-3	W-NW	1021.4	NIL	FINE
17/06/2014	8	17	0-8	SW-SW	1024.8	NIL	FINE/CLOUDY
18/06/2014	10	18	0-0	S-NE	1031.5	NIL	CLOUDY
19/06/2014	10	18	0-6	NE-NNW	1030.1	NIL	CLOUDY
20/06/2014	12	18	0-0	N-N	1021.5	NIL	CLOUDY
21/06/2014	10	17	0-0	S-SW	1021.2	NIL	FINE
SUNDAY							
23/06/2014	9	14	3-Oct	N-WNW	1018.1	NIL	CLOUDY
24/06/2014	10	14	5-Nov	NW-NW	1009.6	NIL	FINE/CLOUDY
25/06/2014	12	16	8-May	WNW-SW	1012.5	NIL	FINE/CLOUDY
26/06/2014	9	18	0-5	ESE-ESE	1020.2	NIL	FINE/CLOUDY
27/06/2014	10	18	0-5	NW-NW	1022.2	NIL	CLOUDY /FINE
28/06/2014	12	18	Feb-13	NE-NW	1009.8	NIL	CLOUDY/WINDY
SUNDAY							
30/06/2014	8	13	0-3	WNW-SW	1016	NIL	CLOUDY/FINE

## *Chapter Six*

# GROUND & SURFACE WATER MANAGEMENT

## Introduction

The groundwater monitoring program included in the Water Management Plan approved by the Director-General of the Department of Planning and Environment 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.

## Groundwater management

The groundwater component of the report has been prepared by Earth2Water and their full report follows in **Attachment 6A**. The previous water hydrologist consultant from URS Australia retired during the year but assisted in the 2014 data recording and downloading process.

URS Australia had previously prepared the map of the wet weather groundwater level for the site based on all available site specific groundwater monitoring data they have reviewed over the years. This map is in **Attachment 6B**.

From the wet weather groundwater levels URS Australia has prepared the Maximum Extraction Depth Map for the project and this is **Attachment 6C**.

## Surface water management

### *Current site conditions*

The location of the current extraction areas, tailings ponds and sediment basins is shown on the figure at **Attachment 2A**. No significant changes have occurred in these areas in the last year as discussed in Chapter 2.

The following points respond, where appropriate, to the specific surface water issues listed in the Water Management Plan.

### ***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 is 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 67 percent of its calculated capacity of 25,000 cubic metres.

The clean water supply dam is connected by pipe to the clean water dam on Lot 198 DP 752025 below the central processing plant (sand washplant). A sediment trap system has now been built in front of the dam to pump the washplant sediment back into the washplant. The system is working well and minimal operational sediment now enters the clean water dam. The capacity is 50,000 cubic metres and was estimated to be using 30% at the time of inspection. Water can be balanced between the two sites as necessary. **(Attachment 2C – Photos 9 & 14)**

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 4 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.

No discharges from the site occurred but quarterly samples were taken from an existing monitoring site on the creek below Lot 198 DP 752025. The results from these samples are in **Attachment 6D**. The PH, electrical conductivity and oil and grease results were all within the expected ranges.

### ***Dewatering of water pits***

Of the commissioned ponds, Numbers 9 and 10 are currently in the tailings stream cycle with Number 5 partially capped (as it is still used as a drain to the clean water dam). A new pond on Lot 214 DP 752039 will be commissioned in the 2015 year to June. Ponds 9 and 10 will be discontinued over the next year.

All other tailings ponds have been fully capped.

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

### ***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 **Attachment 6A**. 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 m<sup>3</sup>).

### ***Significant site features, recharge areas and natural areas***

The main extraction area changes within the site but only impacts internal water flows. 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 **Attachment 6A**)

## **Conclusion**

Groundwater and surface water levels have been monitored and water samples tested with no abnormalities noted.

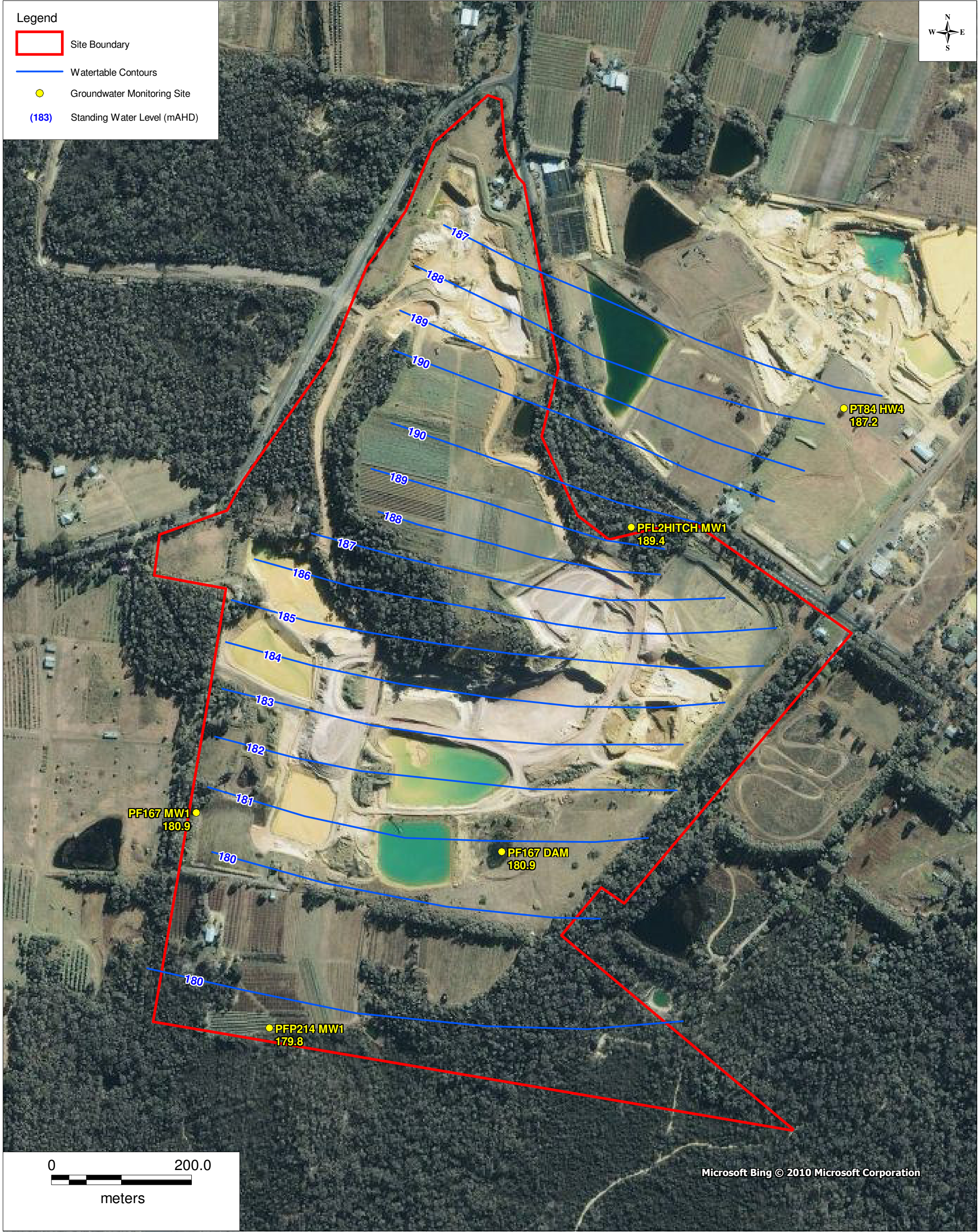
# **Attachment 6A**

## Groundwater Report

*(Please refer to attached PDF File)*



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PF FORMATION

HITCHCOCK ROAD, SAND EXTRACTION  
AND REHABILITATION PROJECT

HITCHCOCK ROAD SITE  
WATERTABLE CONTOURS @ 22/06/2011

URS

File No: 43167726.001.wor

Drawn: SB

Approved: FB

Date: 21/07/2011

Figure: 001

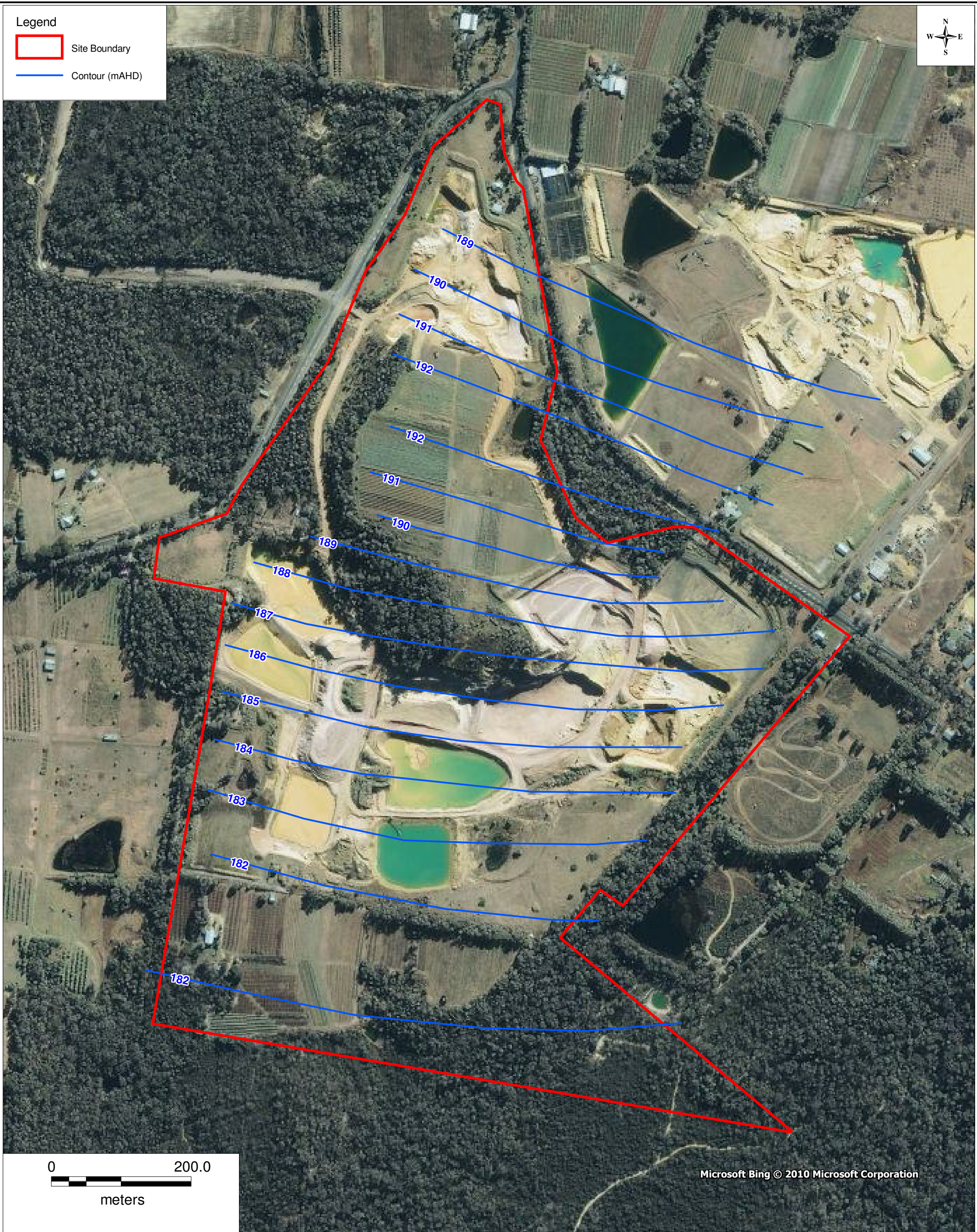
Rev. A

A3





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PF FORMATION

HITCHCOCK ROAD, SAND EXTRACTION  
AND REHABILITATION PROJECT

HITCHCOCK ROAD SITE  
DEPTH OF MINING CONTOURS  
@ 22/06/2011

URS

File No: 43167726.002.wor

Drawn: SB

Approved: FB

Date: 21/07/2011

Figure: 002

Rev. A

A3





MATERIALS TECHNICAL SERVICES  
BORAL RESOURCES (NSW) PTY LTD  
ABN 51 000 756 507

Unit 4, 3-5 Gibbon Road  
Baulkham Hills NSW 2153 Australia  
PO Box 400, Winston Hills NSW 2153  
Telephone 61 2 9624 9900  
Facsimile 61 2 9624 9999

### Test Report

CLIENT: P.F.FORMATION

FILE No.: 250/13

ADDRESS: 1774 WISEMANN'S FERRY ROAD, MAROOTA, NSW 2756

PROJECT: Testing of Water Samples from P.F. Formation

REQUEST No.: 54271

**TEST PROCEDURE:** APHA 4500 H<sup>+</sup> B - pH Value - Electrometric Method  
 APHA 2130 B - Turbidity - Nephelometric Method  
 APHA 5520 C - Oil & Grease - Partition-Infrared Method  
 APHA 2540 D - Total Suspended Solids Dried at 103-105 °C  
 APHA 2510 B - Conductivity - Laboratory Method

Laboratory Sample No.:	146094	146095
Date Sampled:	10/09/2013	10/09/2013
Date Received:	10/09/2013	10/09/2013
Sample Description:	Water - Downstream Lot 198 - 11:00am	Water - Pit 4 Causeway Crossing - 11:40am
Field No.:	1	2

### TEST RESULTS

pH	5.2	6.9
Turbidity (NTU)	7.2	21
Oil & Grease (mg/L)*	< 1.0	< 1.0
Total Suspended Solid (mg/L)	3.2	8.4
Conductivity (µS/cm)	176	294

Samples submitted by the Client.

\* Solvent used in the determination of Solvent Extractable Matter for Oil & Grease analysis:  
 Polychlorotrifluoroethylene (S316)

J. Graham, Q.C. File, File.



Approved Signatory

Date 17-10-13

*Nallos*

Nanthini Selvadurai

Serial No.

120159





MATERIALS TECHNICAL SERVICES  
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### Test Report

CLIENT: P.F.FORMATION

FILE No.: 250/13

ADDRESS: 1774 WISEMANNS FERRY ROAD, MAROOTA, NSW 2756

PROJECT: Testing of Water Samples from P.F. Formation

REQUEST No.: 55506

**TEST PROCEDURE:** APHA 4500 H<sup>+</sup> B - pH Value - Electrometric Method  
 APHA 2130 B - Turbidity - Nephelometric Method  
 APHA 5520 C - Oil & Grease - Partition-Infrared Method  
 APHA 2540 D - Total Suspended Solids Dried at 103-105 °C  
 APHA 2510 B - Conductivity - Laboratory Method

Laboratory Sample No.:	148986	148987
Date Sampled:	09/12/2013	09/12/2013
Date Received:	09/12/2013	09/12/2013
Sample Description:	Water - Downstream Lot 198 - 8:30am	Water - Pit 4 Causeway Crossing - 9:15am
Field No.:	1	2

### TEST RESULTS

pH	7.4	7.0
Turbidity (NTU)	7.1	28
Oil & Grease (mg/L) *	1.7	1.8
Total Suspended Solid (mg/L)	6.0	13
Conductivity (μS/cm)	185	191

**NOTE:**

\* Solvent used in the determination of Solvent Extractable Matter for Oil & Grease analysis: Polychlorotrifluoroethylene S316.

Samples submitted by the Client.

J. Graham, Q.C. File, File.

Nanthini Selvadurai

Approved Signatory

Date 17-12-13

Serial No.

122028



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TECHNICAL  
COMPETENCE

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NATA Accredited Laboratory  
Number: 9968


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### Test Report

CLIENT: P.F. Formation

FILE No.: 250/14

PROJECT: Testing of Water from P.F. Formation.

REQUEST No.: 56260

**TEST PROCEDURE:** APHA 4500 H<sup>+</sup> B - pH Value - Electrometric Method  
 APHA 2130 B - Turbidity - Nephelometric Method  
 APHA 5520 C - Oil & Grease - Partition-Infrared Method  
 APHA 2540 D - Total Suspended Solids Dried at 103-105 °C  
 APHA 2510 B - Conductivity - Laboratory Method

Laboratory Sample No.:	150831	150832
Date Sampled:	14/02/2014	14/02/2014
Date Received:	14/02/2014	14/02/2014
Sample Description:	Water - Downstream - Lot 198 - 12:30pm	Water - Pit 4 Causeway Crossing - 1:00pm
Field No.:	1	2

### TEST RESULTS

pH*1	5.7	6.5
Turbidity (NTU)	8	20
Oil & Grease (mg/L) *2	< 0.1	< 0.1
Total Suspended Solid (mg/L)	4.0	5.3
Conductivity (µS/cm)	175	238

Samples submitted by the Client.

**NOTE:**

\*1 Test has not met the sample specified holding time.

\*2 Solvent used in the determination of Solvent Extractable Matter for Oil & Grease analysis: Polychlorotrifluoroethylene S316.

J. Graham, Q.C. File, File.

*N. Selvadurai*


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### Test Report

CLIENT: P.F.FORMATION

FILE No.: 250/14

ADDRESS: 1774 WISEMANNS FERRY ROAD, MAROOTA, NSW 2756

PROJECT: Testing of Water Samples from P.F. Formation

REQUEST No.: 57669

**TEST PROCEDURE:** APHA 4500 H<sup>+</sup> B - pH Value - Electrometric Method  
 APHA 2130 B - Turbidity - Nephelometric Method  
 APHA 5520 C - Oil & Grease - Partition-Infrared Method  
 APHA 2540 D - Total Suspended Solids Dried at 103-105 °C  
 APHA 2510 B - Conductivity - Laboratory Method

Laboratory Sample No.:	154373	154374
Date Sampled:	2/06/2014	2/06/2014
Date Received:	2/06/2014	2/06/2014
Sample Description:	Water - Downstream - Lot 198 - 11:00am	Water - Pit 4 Causeway Crossing - 10:00am
Field No.:	1	2

### TEST RESULTS

pH	5.7	7.1
Turbidity (NTU)	5.0	10
Oil & Grease (mg/L) *	1.5	1.4
Total Suspended Solid (mg/L)	3.2	6.0
Conductivity (μS/cm)	157	199

**NOTE:**

\* Solvent used in the determination of Solvent Extractable Matter for Oil & Grease analysis: Polychlorotrifluoroethylene S316.

Samples submitted by the Client.

J. Graham, Q.C. File, Mat. File, File.

Nanthini Selvadurai



Approved Signatory

*N. Selvadurai*

Date 25-06-14 Serial No. 126712

NATA Accredited Laboratory

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Number: 9968



## *Chapter Seven*

# **REHABILITATION**

### **Introduction**

A Landscape Management Plan has been prepared in compliance with the requirements of the current Project Approval and was approved by the Department of Planning. The following section therefore describes the current phase of site rehabilitation. Reference is also made to the biodiversity offset strategy which is described in more detail in the Landscape Management Plan.

### **Earth bunding and rehabilitation**

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 Hitchcock Road were referred to in the Independent Environmental Audit as an area where improvement is required. The screen planting and bunding could be improved in this area notwithstanding it adjoins another quarry. Further planting in this section will occur over the next year.

### **Visual assessment**

Because extraction has occurred and will continue to occur in the high areas of the site it has become more visible from surrounding areas. Boundary planting has occurred but the visual restriction impact is limited as these areas are substantially lower than the extraction area. The area along Old Northern Road will continue to be the main area of focus for rehabilitation.

### **Conclusion**

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 but there is increasing visual accessibility of the quarry from a distance because of the extraction of the higher levels in the middle of the site. In conjunction with further rehabilitation work, the site can be returned to a natural state on the completion of sand extraction.

## Rehabilitation Issues

### *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 Plan at **Attachment 2A**.

Rehabilitation of the project is dependent on three 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. 4 hectares of the eastern part has been seeded under the guidance of Greening Australia and Parsons Brinckerhoff.

### *Final Landform (Strategy A)*

Two options for the final landform were incorporated in the planning documents. Strategy B was based on final landforms if PF Formation was unable to get approval from the Director General to disturb the Sydney Hinterland Transition Woodland (SHTW) in the middle of the site. On 15 March 2013 the NSW Department of Planning and Infrastructure gave approval to proceed with the clearing of the SHTW. Therefore the final landform will be based on Strategy A from the planning documents.

### *Maintenance of vegetated conservation zones and rehabilitated areas*

Conservation zones identified in the Landscape Management Plan are regularly inspected as required in the Environmental Strategy (**Strategy 7.1**). These areas are signposted 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 10 years of life remaining, to consider the establishment of the final landform in any detail. The area in the south 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.

The existing topography and setbacks is also shown on the Site Survey Plan. The final landform has been developed in response to the requirements of the proposed biodiversity offset strategy.

The final landform (Strategy A) 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.

### ***Vegetative cover***

In 2010 Greening Australia were commissioned to prepare a plan of management for the rehabilitation area of 2.4 hectares previously planted and for the additional area of 1.6 hectares to be rehabilitated. Based on that plan of management the additional area was planted in Spring 2011 to give an area subject to SHTW rehabilitation exceeding 4 hectares.

### ***Flora and fauna monitoring program***

Regular monitoring of flora and fauna is a requirement of the Environmental Strategy. Results to date are encouraging. A report prepared by Parson Brinkerhoff was completed in December 2013 and is appended as **Attachment 7A**. The report states that 'the rehabilitation of the area is progressing well and is generally meeting or exceeding the targets set'. Parson Brinkerhoff will conduct their next further site inspection to be included in the 2015 AEMR.

### ***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. Signs have been placed at intervals around the areas needing protection.

### ***Construction of acoustic and visual bunding***

Construction of the peripheral bunds has already been noted. Improvements are required along Old Northern Road to better screen 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.

## **Conclusion**

The site rehabilitation is necessarily more in focus in the latter stages of the development. 4.2 hectares of Sydney Hinterland Transition Woodland has been planted on site. Parsons Brinckerhoff last monitored this area in December 2013 by reviewing plant species within six fixed (20 x 20 metre) quadrants and their report is in **Attachment 7A**. In general the revegetation areas appear to be progressing well and is meeting or exceeding the targets set.

## **Attachment 7A**

### Monitoring of Revegetation

*(Please refer to attached PDF File)*

*Chapter Eight*

## **SOCIAL IMPACT MANAGEMENT**

Community representatives participate in the Community Consultative Committee which has met twice during the year. Minutes of these meetings are included as **Attachment 8A**.

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

**Minutes  
12 November 2013**

**Attendance**

Kristine McKenzie – Hills Shire Council (HSC) - Chairperson  
Robert Buckham – Hills Shire Council (HSC)  
Daniel Giffney – Hills Shire Council (HSC)  
Marianne Sheumack – Resident  
Shaunagh Hitchcock – Resident  
John Graham – PF Formation  
Peter Cummins – PF Formation  
Joshua Graham – PF Formation

Absent: Kane Winwood – NSW Department of Planning  
Peter Harkins – Resident

**Minutes of Previous Meeting**

- Accepted

**Report on Current Status of Operations by John Graham (PF)**

- There have been no complaints in the last 6 months
- Operations have been relatively stable
- Rehabilitation has continued to progress but the dry weather has been challenging. Additional planting has occurred on the corner of Wisemans Ferry and Old Northern Roads in spring. Autumn planting is much more successful and in the future PF will not plant in summer or spring.
- The tailings pond on the southern side has been capped and further significant overburden has been stockpiled there.
- The property at the southern side of the Development is largely extracted with only friable sandstone to be extracted.
- The Surveyor General and the Department of Planning have given approval for the removal of Sydney Hinterland Transitional Forrest (SHTF) area. The removal may occur in 2014 depending on the sand demand. There has been a greater demand for colour controlled material lately. Any SHTF will be moved directly to a rehabilitation area of the same size.
- Operationally the business has picked up in the last couple of months and PF are confident that the business will return to previous levels next year.
- Truck movements are down and have reduced over the years due to the increased average truck loads.
- Lot 1 (Accurso's) is due to be finished next March. Rehabilitation has been slow but PF is aware of the deadline. Seed stock has been sourced for the rehabilitation area.

**Reporting**

- The Annual Environment Management Report (AEMR) for 2013 is on the website. No matters of significance arose in the Report. The independent audit will be done next year.

**Environmental Matters**

- The monthly dust deposit results were reviewed and discussed.
- The results were low for the 6 months
- The quadrant testing of the rehabilitation area by Parsons Brinckerhoff will occur in the next month.

**Other Matters Discussed**

- The draft Hills Shire Works Program for the Section 94 roadworks as prepared by RMS was tabled and discussed
- Peter Cummins to contact the RMS representative, David Blackmore, to invite him to our next meeting

**Site Visit**

- A site inspection was not conducted due to the wet weather.

**Next Meeting**

- 10.00 am Tuesday 6 May 2014

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

**Minutes  
6 May 2014**

**Attendance**

Kristine McKenzie – Hills Shire Council (HSC) - Chairperson  
Daniel Giffney – Hills Shire Council (HSC)  
Marianne Sheumack – Resident  
John Graham – PF Formation  
Peter Cummins – PF Formation  
Joshua Graham – PF Formation  
Steven Flint – Downer Mitchell

Apologies: Kane Winwood – NSW Department of Planning  
Peter Harkins – Resident  
Shaunagh Hitchcock – Resident  
Robert Buckham – Hills Shire Council (HSC)

**Minutes of Previous Meeting**

- Accepted

**Matters Arising from Minutes**

- David Blackmore from the Roads & Maritime Services (RMS) was invited to the meeting but he had moved on to a different job as RMS had subcontracted the work to Downer Mouchel. Steve Flint from Downer Mouchel attended the meeting and explained:
- The RMS split the Sydney region in 3 and tendered the road maintenance and projects contract for the West Sydney area from 1 July 2013. Downer Mouchel were the successful tenderers for the West Sydney area which encompasses the Maroota region.
- There is a 24 hour contact number for any road repairs which is 1800 332 660
- Steve had a list of 4 projects being conducted in region in the next year but he wasn't aware of how the section 94 monies received by Council were spent or the future planning of projects in the region.
- Kristine McKenzie agreed to contact the Council Traffic Manager to investigate this matter further (*refer note 1 below*)

**Report on Current Status of Operations by John Graham (PF)**

- There have been no complaints in the last 6 months
- Operations have been relatively routine
- An effort has been made to tidy up the site with signs being replaced and upgraded
- The trees planted recently on the corner of Old Northern Road and Wisemans Ferry Road have progressed well. The majority if trees are now growing quickly having survived the hot, dry summer period.



- The removal of the Sydney Hinterland Transitional Forest (SHTF) has commenced recently.
- Operationally business has picked up this year after a very quiet 2013.
- Lot 1 (Accurso's) has been completed, seed spread in the rehabilitation area and this area has been identified with starposts. Council have undertaken a number of inspections and will undertake further inspections with PF to ensure planting is satisfactory.

### **Reporting**

- The independent audit required to be conducted every three years has recently been completed. The Audit Recommendations summarized in the report were discussed by item. The full report will be put on the website in the next few days. PF Formation is required to respond to the audit recommendations within 6 weeks. Within 3 months of this response PF Formation is required to update each of the monitoring strategies/plans/programs as well as review the vegetation offset bond.

### **Environmental Matters**

- The monthly dust deposit results were reviewed and discussed.
- The results were low for the 6 months
- Parsons Brinckerhoff completed quadrant testing and a review of the main rehabilitation area. The report confirmed that progress was ahead of schedule. The report will put on the website and will be incorporated in the 2014 AEMR. The next review by Parsons Brinckerhoff will be completed in 2015.

### **Other Matters Discussed**

- Truck volumes were discussed and in particular Steven Flint was made aware of the combined truck numbers from the quarry industry at Maroota.

### **Site Visit**

- A site inspection was conducted.

### **Next Meeting**

- 10.00 am Tuesday 11 November 2014

*Note 1: Following the meeting Kristine McKenzie forwarded a copy of the adopted 5 year works program from the Section 94 Contribution Plan. This identified the works to be undertaken which included an overtaking lane on Old Northern Road which was discussed at the meeting as being of benefit to residents. A copy was forwarded to Maianne Sheumack.*

*Chapter Nine*

**INDEPENDENT AUDIT REPORTS**

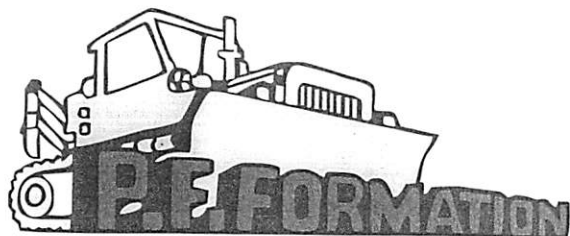
**Attachment 9A** – Independent Environmental Audit Report

**Attachment 9B** – Response to Audit Recommendations

## **Attachment 9A**

### **Independent Environmental Audit Report**

*(Please refer to attached PDF File)*



Etra Pty Ltd as Trustee for PF Formation Trust  
ABN 62 113 814 256

Director-General  
NSW Government Department of Planning  
GPO Box 39  
Sydney  
NSW 2001

## SAND & CONCRETE

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12 June 2014

Dear Sir/Madam

### **Hitchcock Road Sand Project (06\_0104) Comments on Independent Environmental Audit**

Under Clause 6 of Schedule 5 of the Notice of Project Approval dated 3 February 2010 we are required to commission an Independent Environmental Audit every three years. The first audit was completed in April 2011 and a copy of the most recent audit completed in April 2014 is enclosed. Our response to the audit recommendations outlined on page 46 of the report are detailed below:

1. *The Environmental Strategy needs to be updated including the date of publication, new names of NSW government departments, new legislation, updated emergency response management, revised Australian Standards and references. The revised documents should then be made available on the PF Formation website.*

Agreed. Within 3 months of this response being issued ie by 12 September 2014, any updated environmental management and monitoring strategies/plans/programs are to be forwarded to the Director- General for approval. After this approval is received the updated Environmental Strategy will be made available on the PF Formation website.

2. *All AEMPs need to include the EPA annual returns.*

Agreed. The 2010 and 2011 EPA annual returns were inadvertently excluded from the 2011 and 2012 AEMP. The 2012 EPA annual return was included in the 2013 AEMP.

3. *Annual reports on the effectiveness of the retention basins need to be produced and included in the AEMRs.*

In the Water Management Statement of Commitments it says 'All retention basins will be regularly inspected and an annual report prepared on their effectiveness'. This commitment was incorporated into Strategy 5.1 of the Environmental Operation Procedures and is reviewed as part of the monthly checklist. These reports are signed off, dated and copies included in the AEMR (Chapter 3). Whilst there is no separate report it is reported in the AEMR in a satisfactory manner. Specific reference to the effectiveness of the retention basins will be incorporated in the AEMR in the future.

4. *The monthly operational checklists in the AEMPs need more complete heading descriptions for the first three columns.*

The monthly operational checklist is a monthly summary of the Environmental Operating Procedures. The headings will be improved to better reference back to the Environmental Operating Procedures.

5. *Modified copies of the annual production data produced for the Department of Primary Industries using the standard form for that purpose need to be included in the AEMRs. With the consent of the Department of Planning and Environment and to avoid disclosure of commercially sensitive information to the public and competitors, production data should be provided in 100,000 tonne bands in the AEMRs. Alternatively a Section 96 modification could be made to amend this consent condition.*

The AEMR is available on our website for public viewing and therefore we are reluctant to include the detail of our sales as disclosed in the annual production data provided to the Department of Primary Industries. This is particularly the case when the information provided to the Department of Primary Industries is a total of all our sales not just those from this Approval. In the second paragraph of Chapter 2 of the AEMR we confirm that our annual volume was within the limit of 400,000 tonnes. We will show the data relating to this development within bands as suggested.

6. *The Complaints Register needs to be recorded in full in response to any complaints on the project and any corrective actions undertaken.*

Agreed. The one complaint in the period should have had a better documented response.

7. *With the consent of the Department of Planning and Environment only the three closest noise assessment locations to the project being R3 Jurd, R5 Pignataro, R10 Tornatola plus R7 Maroota Public School need to be monitored in the future. Alternatively a Section 96 modification could be made to amend this consent condition.*

Whilst the Approval refers to several residences in the area the noise assessment locations are those closest to the quarry covering all directions and all residences mentioned. We could apply to remove some of the locations that are duplicated but as our testing covers all the locations and meets the Approval requirements we will not apply to change the Approval wording unless it is in conjunction with other Section 96 modifications.

8. *The EPA approved pollution incident response management plan needs updating (on page 11) to include telephone contacts for all authorities and inclusion of Attachment A Hazardous Substances Register, Attachment B Emergency Procedure and Attachment C Site Plans/Map. PF Formation should consider including landslip or land stability as an additional hazard to be considered in the plan. The revised plan then needs to be made available on the PF Formation website.*

Agreed.

9. *Procedures must be improved so that the site operations including truck movements and use of the weighbridge do not commence before 6 am and that no more than 10 laden trucks enter and leave the site between 6 am and 7 am.*

No trucks left the site before 6am. Trucks were going on the weighbridge and getting their paperwork (the earliest was at 5.56am) before moving forward 40 metres to a separate area to cover their load. We have advised the weighbridge staff that no trucks are to leave the weighbridge until 6am not just the site which was their understanding.

With regard to limiting truck numbers within defined hours it is very difficult to implement unless it is an average figure. Because trucks arrive from various locations every day you do not know there is a problem until they arrive. For a period we did have a truck operator that was sending their fleet of vehicles to Maroota at one time. We subsequently spoke with the operator and got them to limit the number of trucks sent to Maroota between 6am to 7am.

PF Formation also has Hills Shire Consent 2592/2005/HE which uses the same truck entry and has no numerical limit on the number of trucks between 6 am and 7 am. Therefore having more than 10 trucks before 7am does not necessarily mean the consent condition is not being adhered to.

*10. The Hazardous Substance Register needs revision to include only hazardous substances.*

All items with Material Safety Data Sheets are kept in one folder at our weighbridge for easy access. We will now separate them into two folders, one for hazardous substances and one for non-hazardous substances.

*11. At the site entrance on Wisemans Ferry Road a 20km/hour speed limit sign needs to be installed.*

There are several speed limit signs in our main quarry on the northern side of Wisemans Ferry Road. We will place a speed limit sign on the southern side of Wisemans Ferry Road.

*12. A 3m high peripheral bund planted with screening vegetation needs to be fully established all along and 30m away from the Hitchcock Road boundary to improve visual amenity.*

As there are no residents in the area, only another approved quarry on the other side of the Hitchcock Road, we had considered our bunding sufficient. We will improve the peripheral bund wall.

Yours faithfully



Peter Cummins  
General Manager