WARRIEWOOD VALLEY LAND RELEASE
NARRABEEN CREEK BELOW BRANDS LANE

PRE-CONSTRUCTION WATER QUALITY MONITORING DATA FOR 53B WARRIEWOOD ROAD FOR THE PERIOD NOVEMBER 2017 TO JUNE 2019

Figure 1 Looking upstream at site NC4 during wet weather sampling, falling limb on 5 June 19.

Report Prepared for Craig & Rhodes

Marine Pollution Research Pty Ltd

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1 INTRODUCTION

There are several urban construction projects underway or in the planning stage for lands alongside the lower section of Narrabeen Creek between Brands Lane and McPherson Street Warriewood, and Marine Pollution Research Pty Ltd (MPR) was originally commissioned to undertake a combined water quality, annual sediment and RBA monitoring program for several of these developments (**See Figure 1**), as per the Pittwater Council Water Management Specification (WMS) prepared by Lawson & Treloar (2001). Following an agreement with Pittwater (now Northern Beaches) Council, the combined project used three Narrabeen in-stream sites (see MPR 2016c). **Table 1** shows the annual WMS sampling schedule.

Mr Jayson Blaine of Craig & Rhodes has requested MPR to provide a report on the MPR WMS sampling results for Narrabeen Creek upstream, adjacent to, and downstream of a new development currently being proposed at No 53B Warriewood Road Warriewood (LegendWay project see **Appendix C**) to meet the conditions of a Northern Beaches Council Request for Information Letter that states *inter alia* at Condition 4(d) *A water quality monitoring report is required, which includes data and analysis of current (pre-development) samples*. It is accepted that the RFI Condition 4d refers to water quality monitoring to meet the WMS requirements set out in Section 4.2 of the WMS.

Table 1 Lower Narrabeen Creek Annual WMS Sampling Schedule

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Water Samples												
Creek Dry WQ												
NC3		D			D			D+			D	
NC4		D			D			D+			D	
NC5		D			D			D+			D	
Creek Wet WQ												
NC3		2W+			2W+			2W+				
NC4		2W+			2W+			2W+				
NC5		2W+			2W+			2W+				
RBA & Sediment Chemicals (R+S)												
NC3								R+S				
NC4								R+S				
NC5								R+S				

Notes:

Dry = Routine Creek Water Samples over all Construction Phases

Dry+ = Annual Creek Dry Water Samples - Pre-Construction & Construction Phases

Dry++ = Annual Creek Dry Water Samples Post-Construction Phase Only

Wet+ = SQID & Routine Wet Weather samples (with F coliforms)

Wet - = ESC Wet Weather samples (- F coliforms)

R = Annual Rapid Biological Assessment + algae counts & S = Annual Sediments

Figure 1 Location of Narrabeen Creek Designated Water Quality, Sediment Quality and Rapid Biological Assessment sampling sites for projects in the lower creek.

The 53B Warriewood Road Project site is located downstream of Creek sites NC3 and upstream of creek site NC4 with current runoff via site S5ESC.

2 WATER QUALITY RESULTS – NOV 2017 TO JUN 2019

2.1 Sampling Weather Conditions

Tables 2 and 3 provide daily rainfall data measured at Long Reef Golf Club for the period July 2017 to June 2019 with sampling dates highlighted in yellow:

- The period July to October 2017 was notable for an almost complete lack of rainfall in September and very low rainfall for the rest of the period (**Table 2**) and no WMS sampling was undertaken.
- The short rain events in late October 2017 restored some flow and depth to the creek and the scheduled November dry weather sample was obtained on 3 November 2017.
- Whilst there were daily high rainfall volumes recorded at Long Reef on 5 and 6 November this did not penetrate to Warriewood where that gauge indicated only 16mm between midnight and 10am on the 5th, and 16.5mm between 4 am and 6 am on the 6th. Notwithstanding, there was sufficient rain predicted to attempt a wet weather raising limb sample on the 6th November, but with no actual follow-up rain, the sample became a minor falling limb sample for the previous rainfall. There was insufficient rainfall to trigger a runoff event from the property through 53B-ESC, which remained dry.
- Whilst the next two months had closer to normal rainfall distribution, the monthly volumes were still reduced. Notwithstanding, there was more or less continuous flow through Narrabeen Creek over Christmas 2017 and the scheduled February 2018 Dry Weather sampling run including annual aquatic ecology and sediment sampling was undertaken on 6 February 2018.
- Even though there was considerable rainfall over the period March to June 2018 the majority of storm events were short thunderstorms in late afternoon/evening or they had raising limbs over weekends (when sampling is not permitted by Council).
- Further, rainfall that reached Long Reef does not necessarily continue to Warriewood. From hourly rainfall records at Warriewood for March 2018, it is clear that the 67 mm rain indicated for the 13th and 14th March was actually confined to midnight to 07:00 on the 13th - see **Figure 2**.
- July to September 2018 were very dry with little opportunity for wet weather sampling. An opportunity was seized when a small rain event was forecast for the 20th and 21st of September 18. Whilst there was 10mm at Long Reef, Warriewood ended up receiving only 5.5mm over 3hrs on the 20th September 2018.

Table 2 Daily Rainfall June 2017 to June 2018 (Long Reef Golf Club Station BoM 66126)

(Note that daily rainfall is for the 24 hours up to 9AM on the date indicated)

Day	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1st	0	0	4.8	1.2	0	0	0	0	0.4	0	0	0	0
2nd	0	0	0	0	0	0	0	0	13.4	0	0	0	0
3rd	0	0	0	0	0	0	11.8	1	10.6	0	2.2	0	1.2
4th	1.2	1	10.4	0	0	4	0	0	0.8	0	0	0	0.4
5th	0	0	0	0	0	24	6.2	0	0	0	0	0	17.2
6th	0	0	0	0	0	22.8	0	0	0	8.4	0	0	34.6
7th	42.4	0	0	0	0	5.4	14.6	0	0	3.6	0	0	17.4
8th	64.8	0	0	0	0	0	0	0	0	0	0	0	1.2
9th	8.8	0	0	0	0.2	0	0	38.8	0	0	0	0	3.2
10th	9.2	0	0	0	0	0	0	0.6	2	0	0	0	3.6
11th	5.8	0	0	0	1.6	0	0	0	3.2	0	0	0	7.2
12th	0	10.6	0	0	1.2	0	0	0	0	0	0	4.2	0
13th	0	10.2	0	0	0	0	0	0	0	50.8	0	0.4	0
14th	5.2	0	0	0	1	0	0	5.5	0	17.8	0	10.8	0
15th	0	0	0	0	0.4	0	0	2.5	0	0	0	0	0
16th	0	0	0.6	0	0	0	0	0	0	0	0	0.4	0
17th	2.6	0	0	0	0	0	0	0	0	0	0	0	0
18th	0.2	0	0	0	0	0.4	0	0	0	0	0	0	0
19th	11	0	0	0	0	0.2	2.4	0	0	0	0	0	20.2
20th	2.6	0	0	0	6	4.2	0	0	0	0	0	0	43.2
21st	0	0	0	0	7.4	0	7.6	0	0	1.2	0	0	4.2
22nd	0	0	0	0	0	0	0	0	0	0.8	0	0	0
23rd	0	0	0	0	4.4	0	0	0	0	0.8	0	0	0
24th	0	0	0	0	0	0	0	0	0	0	0	0	0
25th	0	0	2	0	0	0	0	0	0	1.0	0	0	0
26th	0	0	0	0	0	0	2.6	0	46.2	15.4	0	0	0
27th	0	0	0	0	7.4	0	3.4	0	3.6	0	2.6	0	2.4
28th	0	0	1	0	0	0	0	0	0	0	1.6	0	27.2
29th	3	0	0	0	0	3	0	0		0	8.2	0	7.6
30th	0	0	0	0	0	7.4	5	0		0	31.6	4.2	0
31st	-	0	0	0	0	-	0.6	2.2		0		2.8	
Total	156.8	21.8	18.8	1.2	29.6	71.4	54.2	50.6	80.2	99.8	46.2	22.8	190.8

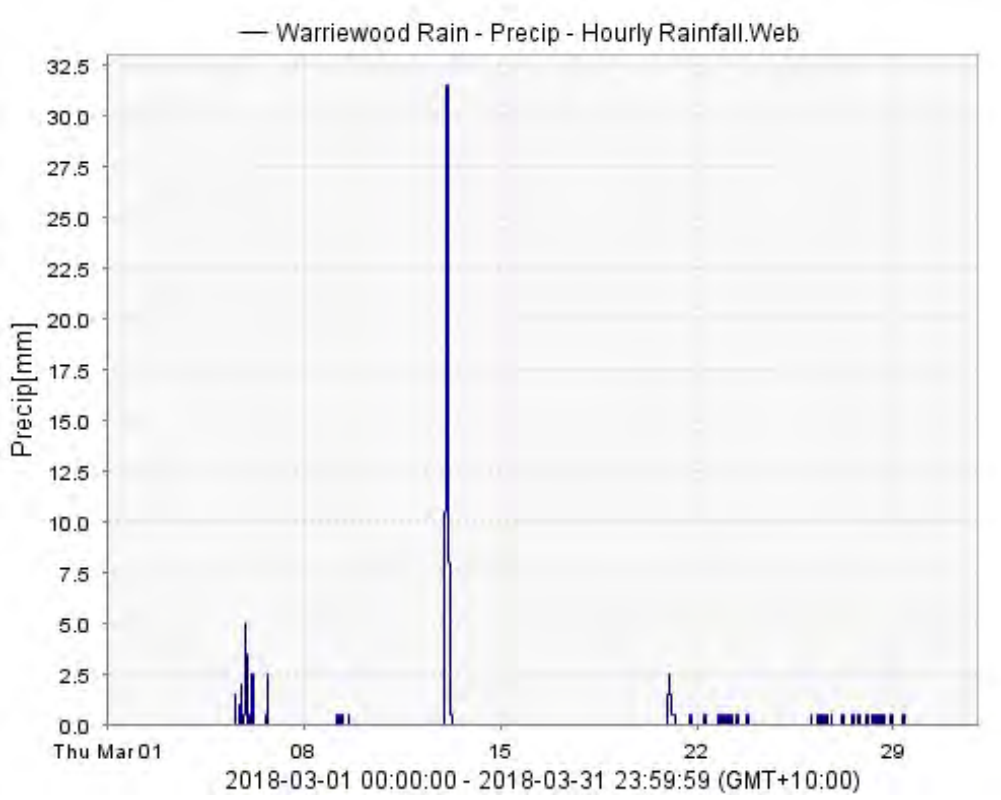

Figure 2 Hourly Rainfall for Warriewood for March 2018.

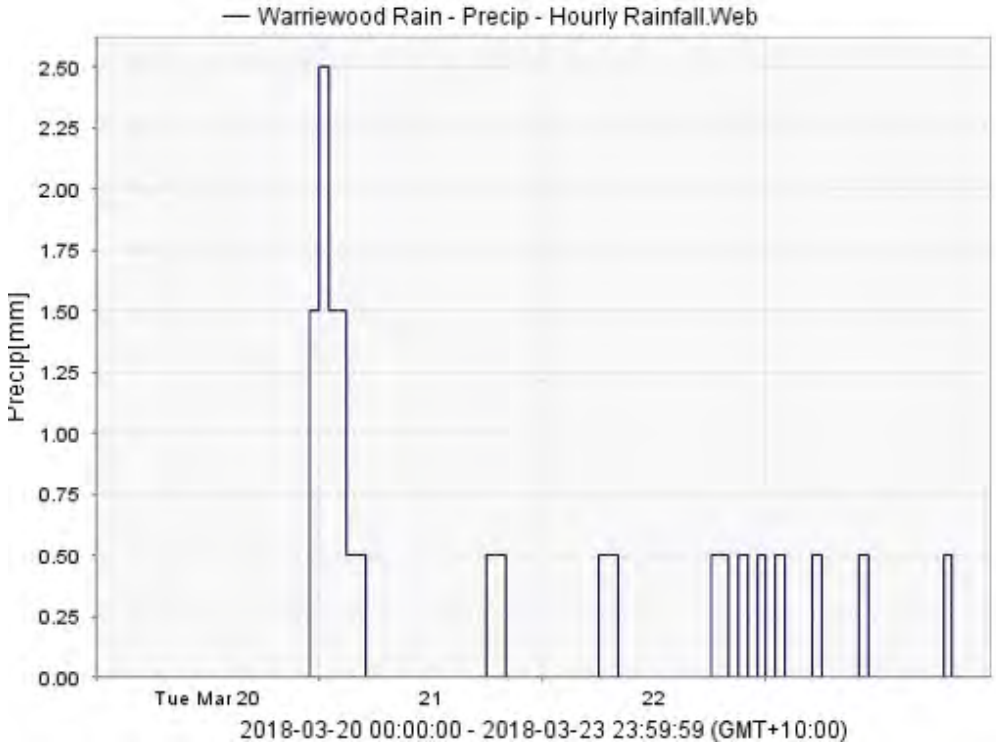

Figure 3 Hourly Rainfall at Warriewood 20 to 24 March 2018

Table 3 Daily Rainfall June 2018 to June 2019 (Long Reef Golf Club Station BoM 66126).
(Note that daily rainfall is for the 24 hours up to 9AM on the date indicated)

Day	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1st	0	0	0	1	0	0	0	2	0	0	0	0	0
2nd	0	1.2	0	0	0	0	0	0	4	3.8	7.2	0	0
3rd	1.2	1	0	3.6	0	2.4	0	0	0	2	1	0	0
4th	0.4	0	0	4.2	2.2	0	0	0	0	0	0	19.4	14.8
5th	17.2	0	0	0	23.4	0	0	0	0	0	9.8	0	25.4
6th	34.6	0	0	1.8	13.4	0	0	9.8	0.8	0	0	7	9.2
7th	17.4	0	0	3.8	1.6	0	0	0	0	2.8	0	0	1.4
8th	1.2	0	0	1.6	15.6	14.4	0	2.6	0	0	0	0	6
9th	3.2	0	0	1.2	2	0	0	4.4	16	0	0	0	0
10th	3.6	0	0	0	0	0	0	0	0	0.8	0.4	0	0
11th	7.2	0	0	0	10.2	0	0	0	0	0	0	0	0
12th	0	0	0	0	7	0	0	1.8	0	0	0	0	0
13th	0	0	0	0	1.8	0	0	0	0	0	0	0	0
14th	0	0	0	0	25.4	0	2	0	0	13.2	0	0	0
15th	0	0	0	0	7.2	0	10	0	0	61.2	0	0	0
16th	0	0	0	0	8.4	3.4	12.2	0	0	5.4	0	0	14.8
17th	0	0	0	0	0	0	0	0	0	15.2	0	0	6.4
18th	0	0	0	0	1.8	7.6	0	0	0	65.8	0	0	26.6
19th	20.2	0	0	0	0	0	0	0	0	2.2	0	0	
20th	43.2	0	0	9	0	0	12	0	9.6	5.2	0	0	
21st	4.2	0	0	2.4	3.2	0	18.8	2.2	3.4	1.4	0	0	
22nd	0	0	0	0	0	0	1	0	3.4	1.2	0	0	
23rd	0	0	0	0	0	0	6.4	0	9.6	0	0	0	
24th	0	0	7.2	1.2	0	0	0	0	5.2	2.8	0	0	
25th	0	0	3	4.8	0.4	0	0	0	0	2.6	0	0	
26h	0	0	0	4.6	0	1.2	0	0	0	0	0	0	
27th	2.4	0	2.8	11.6	0	0	0	0	0	0	0	0	
28th	27.2	0	0	0	2.8	27.2	0	8.4	4.8	0	0	0	
29th	7.6	0.4	0	0	0	26.4	0	0		0	0	0	
30th	0	0	0	0	0		0	0		24.4	0	0	
31st		0	0		0		0	0		1.2		0	
Total	190.8	2.6	13	50.8	126.4	82.6	62.4	31.2	56.8	211.2	18.4	26.4	104.6

- Owing to the defaulting on payments for water quality sampling by the proponents for both No 53+53AB, and No 53C, water quality sampling for laboratory analysis at site NC3 was discontinued in November 2018 with full sampling at sites NC4, NC4.5 and NC5 sampling continued for the lower creek project at Nos 23-27 Warriewood Road.
- Observational data from site NC3 through to NC4 was still collected and added to field notes over this latter period.

2.2 Event Sampling Results

The following sub-sections provide the field notes and metered water quality results for each survey plus the results of annual RBAs where applicable. Site photographs for each of the surveys are provided in **Appendix A** and each sub-section references the relevant ALS laboratory reports, with the full laboratory reports attached at **Appendix B**.

2.2.1 November 2017 Dry Weather Sampling

Dry weather sampling was undertaken on the 3rd of November 2017. **Table 4** below provides field notes recorded during the dry sampling, and **Table 5** provides the metered water quality results for the dry sampling event. The chemical analysis results (**ALS Report ES1727600**) for collected water samples (TDS, TSS, nutrients, and faecal coliform counts) are attached in **Appendix B** to this report.

Table 4 Field Comments – November 2017 Dry Weather

Site	Comments
NC3	Water was relatively clear with a very low flow throughout site length. Bank vegetation was still mostly cleared. Macrophytes observed included: *Percicaria deipiens* (Slender Knot Weed), *Ludwigia periviana* (Peruvian Primrose), *Nastertiom officinalle* (Watercress) and *Ludwigia peploides* (Floating Water Primrose). No filamentous green alga was observed.
NC4	Water was fairly clear with a low flow throughout site. Vegetation was cleared on both banks as in former survey. Macrophytes observed: River Clubrush, Slender Knot Weed, Watercress and *Myriophyllum sp* and *Ludwigia peploides* (Floating Water Primrose). Filamentous green alga was not observed.
NC5	Water was slightly turbid with no observable surface flow through the site. No macrophytes were observed. Site consisted of muddy channel with leafy debris scattered throughout. Filamentous green alga not observed.

Table 5 Lower Narrabeen Creek Dry Weather Sample 3rd November 18 - Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC3	14:23	0.1	26.51	489	135.5	6.83	7.1	20	250	0.14	
NC4	14:12	0.1	20.14	480	18.7	6.22	4.7	40	100	0.14	
NC5	13:14	0.3	18.79	392	1.7	6.2	2.6	0.9	250	0.00	

2.2.2 November 2017 Wet Weather Sampling

Wet weather sampling was undertaken on the 6th of November 2017. Whilst this sample was to be a Raising Limb there was no follow-up rainfall so the sample became a Falling Limb sample for the rainfall flows from the previous two days, as per the WMS. As noted above, there was no flow from ESC-53B.

Table 6 below provides field notes recorded during the wet weather sampling. In addition to the sampling site notes provided below it was also noted that construction works were underway along the riparian bank for the development downstream at Nos 29 to 31 Warriewood Road.

Table 6 Field Comments – November 2017 Wet Weather

Site	Comments
NC3-U	Water was clear with a low flow through site. Vegetation still fairly clear along the banks. Macrophytes observed included: *Percicaria deipiens* (Slender Knot Weed), *Ludwigia periviana* (Peruvian Primrose), *Carex, Nastertiom officinalle* (Watercress) and *Ludwigia peploides* (Floating Water Primrose). No filamentous green alga was observed.
NC4-U	Water was relatively clear, however dark in colour. Site had a low flow throughout. Vegetation was cleared on both banks. Macrophytes observed: River Clubrush, *Ludwigia peploides* (Floating Water Primrose), Slender Knot Weed, Watercress and *Myriophyllum sp*. Filamentous green alga was not observed.
NC5-U	Water was dark in colour no observable surface flow. Site conditions similar to previous surveys. Filamentous green alga not observed.
53B-ESC	No flow entering Narrabeen creek via 53B. No observable surface flow in Narrabeen Creek.

Table 7 provides the metered water quality results for the falling wet weather sampling event. The chemical analysis results (**ALS Report ES1727794**) for collected water samples (TDS, TSS, nutrients, and faecal coliform counts) are attached in **Appendix B** to this report.

Table 7 Creek Wet Weather Samples 6th November 2017 - Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	
Falling Limb 19th May		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC3	13:18	0.1	20.88	266	100.7	6.57	16.5	40	240	0.1	
NC4	13:30	0.1	19.94	220	65.9	6.42	16.7	50	100	0.5	
53C-ESC	14:17	0.1	20.62	259	73.2	6.61	32.1				0
NC5	13:49	0.1	19.56	198	55.1	6.25	32	80	300	0.00	

2.2.3 February 2018 Annual Dry Weather Sampling

Table 8 provides field notes recorded during the annual dry weather sampling on 6th of February 2018 and **Table 9** provides the metered water quality results. **Table 10** provides the results of the annual Rapid Biological Assessment (RBA) sampling. The chemical analysis results (ALS Report **ES1804021**) for collected water and sediment samples and for algae speciation plus counts are attached in **Appendix B** to this report.

Table 8 Field Comments – February 2018 Dry Weather Sampling

Site	Comments
NC3	Water was clear with a low flow throughout site length. Large proliferation of Watercress along the bank. Macrophytes observed included: *Nastertiom officinalle* (Watercress), *Percicaria deipiens* (Slender Knot Weed), *Ludwigia periviana* (Peruvian Primrose) and *Ludwigia peploides* (Floating Water Primrose). Filamentous green alga was abundant.
NC4	Water was relatively clear with no observable surface flow throughout. Increased masses of macrophytes, choking sections of the site, particularly downstream. Macrophytes included: Peruvian Primrose, *Carex*, River Clubrush, Slender Knot Weed, Watercress and *Myriophyllum sp*. Filamentous green alga was abundant.
NC5	Similar site conditions to previous survey. Water was fairly clear with with no observable surface flow. Still plenty of canopy cover. Lots of *Lemna* (Duck Weed) covering the surface of the water. Filamentous green alga was present in small amounts.

Table 9 Lower Narrabeen Creek Dry Weather Sample 06 February 18 - Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC3	13:53	0.1	28.6	412	153.8	7.43	3.9	0.1	70	0.08	
NC4	15:24	0.1	23	289	29.4	6.53	5	20	80	0.00	
NC5	15:29	0.1	23.36	549	4.7	7.26	18.1	0.6	250	0.00	

Table 10 Aquatic Macroinvertebrate Sampling Results Narrabeen Creek 6 February 2018

Phylum	Class				Common	19/2/18	19/2/18	19/2/18		
		Family	Sub-Family	Species	Name	NC3	NC4	NC5	Occur	SIG-2
Arthropoda	Insecta	Dytiscidae			Diving Beetles		1	1	2	2
Arthropoda	Insecta	Ceratopogonidae			Biting Midges				0	4
Arthropoda	Insecta	Chironomidae	Chironominae		Bloodworms			1	1	3
Arthropoda	Insecta	Gelastocoridae			Toad Bugs		1		1	5
Arthropoda	Insecta	Gerridae			Pond Skaters	1		1	2	4
Arthropoda	Insecta	Veliidae			Small Water Treaders	1	1	1	3	3
Arthropoda	Insecta	Aeshnidae			Dragonflies	1			1	4
Arthropoda	Insecta	Hemicorduliidae			Dragonflies		1		1	5
Arthropoda	Insecta	Coenagrionidae			Damselflies		1		1	2
Arthropoda	Insecta	Megapodagrionidae			Damselflies				0	5
Arthropoda	Insecta	Sciritidae			Marsh beetles			1	1	6
Arthropoda	Insecta	Sciritidae			Crane flies			1	1	5
Arthropoda	Arachnida				Freshwater Mites	1	1	1	3	6
Arthropoda	Crustacea	Cyclopidae			Copepods	1	1		2	*
Arthropoda	Ostracoda				Seed Shrimps			1	1	*
Annelida	Oligochaeta				Freshwater Worms	1	1	1	3	2
Annelida	Hirudinea	Glossiphoniidae			Leeches				0	1
Mollusca		Hydrobiidae			Freshwater Snails	1			1	4
Mollusca		Physidae			Freshwater Snails	1			1	1
Mollusca		Lymnaeidae			Freshwater Snails	1		1	2	2
Mollusca	Bivalva	Sphaeriidae			Freshwater Bivalve				0	5
Platyhelminthes		Dugesiidae			Flatworms	1			1	2
Chordata	Osteichtyes	Poeciliidae	*Gambusia holbrooki*		Plague Minnow	1	1	1	2	*
				Total number of invertebrate taxa:		10	8	10	18	16
				Site SIGNAL scores:		3.11	3.57	3.67		3.50

2.2.4 March 2018 Wet Weather Sampling

Wet weather sampling was undertaken on the 21st of March 2018 (rising limb) and on the 23rd of March 2018 (falling limb). **Table 11** provides field notes recorded during the wet sampling and site photographs for both the rising and falling limb surveys are attached in **Appendix A**. There was no overland flow from the No 563B property and no flow from the ESC-53B location. Whilst there were construction works underway at the adjoining ARH site at Number 53C Warriewood Road, no discharge flow from ESC-53C was observed during the rising or falling limb surveys. In addition to the sampling site notes provided below it was also noted that construction works were underway along the riparian bank for the development at Nos 29 to 31 Warriewood Road. These works were noted to have contributed turbid waters to the creek downstream.

Table 12 provides the metered water quality results for the wet sampling event. The chemical analysis results (ALS Reports **ES1808499 & ES1808753**) for collected water samples (TDS, TSS, nutrients, and faecal coliform counts) are attached in **Appendix B** to this report.

Table 11 Field Comments – March 2018 Wet Weather Rising

Site	Comments
NC3-U	Water was clear with a low flow through site. Vegetation had been cleared like previous survey. Soft sands in the upstream sections of site. Orange staining found in upstream sections. Macrophytes observed included: *Percicaria deipiens* (Slender Knot Weed), *Ludwigia periviana* (Peruvian Primrose), *Nastertiom officinalle* (Watercress) and *Ludwigia peploides* (Floating Water Primrose). Moderate Filamentous green alga observed.
NC4-U	Water fairly clear and dark in colour. Vegetation was cleared on both banks as in former surveys. Macrophytes observed: River Clubrush, Slender Knot Weed, Watercress and *Myriophyllum sp*. Filamentous green alga was not observed.
NC5-U	Water was dark in colour. Very low surface flow. Traces of Duck weed, *Lemna*. Filamentous green algae not observed.
NC3-D	Conditions like the rising limb sample. Water clear, with a greater flow throughout site. Filamentous green alga not observed.
NC4-D	Water fairly clear. Slightly greater flow through site. Filamentous green alga not observed.
NC5-D	Water dark in colour. Similar conditions with an increased flow. Filamentous green alga not observed.

Table 12 Lower Narrabeen Creek Wet Weather Samples 21st and 23rd March 18 - Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
Raising Sample		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC3-U	12:38	0.1	20.98	325	84	7.01	4.5	30	70	0.14	
NC4-U	12:56	0.02	21.09	308	27.8	6.74	8	25	70	0.16	
NC5-U	13:12	0.11	20.91	362	22.4	6.46	7.8	0.9	250	0.00	
ESC-53C										No flow	
Falling Sample 23rd March 2018											
NC3-D	10:33	0.12	20.48	338	95.8	7.05	4.1	30	180	0.2	
NC4-D	10:49	0.05	20.1	281	35.7	6.5	6.6	40	120	0.2	
NC5-D	11:36	0.09	20.04	308	24.1	6.47	6.9	80	300	0.14	
ESC-53C										No flow	

2.2.5 May 2018 Dry Weather Sampling

Table 13 provides field notes recorded during the final annual dry weather sampling on 11th of May 2018 and site photographs for survey are attached in **Appendix A**. **Table 14** provides the metered water quality results. The chemical analysis results (ALS Report **ES1813538**) for collected water samples are attached in **Appendix B** to this report.

Table 13 Field Comments – May 2018 Dry Weather Sampling

Site	Comments
NC3	Water was clear with a low flow and brown silt covering most of the rocky sediment. An established sandbar was present just downstream of the sediment curtain that is in place. In the deeper sections of the creek the water was turbid and a yellowish-grey in colour. Macrophytes observed included: *Nastertiom officinalle* (Watercress), *Percicaria deipiens* (Slender Knot Weed), *Ludwigia periviana* (Peruvian Primrose), *Ludwigia peploides* (Floating Water Primrose), *Typha* sp. (Cumbunji) and River Clubrush. No filamentous green algae observed.

NC4	Very low flow with the downstream section chocked by *Myriophyllum* sp. The water was turbid with a thin layer of scum on the surface. Water levels were lower than previous surveys. Macrophytes included: Floating Water Primrose, River Clubrush, Slender Knot Weed, Watercress, *Juncas acutus* sp and *Myriophyllum sp*. Downstream sections choked with Watercress and *Myriophyllum sp*. Filamentous green alga was not observed.
NC5	Substrate covered in a brown silt. Filamentous green alga was present in moderate amounts. There was a small amount of water entering the site from a storm water pipe. Macrophytes started to grow in-between rocks. Water levels were low with a small amount of water trickling through the rock riffle. Water was clear and not turbid. Macrophytes observed included: Slender Knot Weed, Carex, Peruvian Primrose and Cyprus

Table 14 Lower Narrabeen Creek Dry Weather Sample 11th May 18 - Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC3	12:46	0.1	12.2	514	105.6	7.47	4.3	15	1.5	0.1	
NC4	13:00	0.1	14.82	495	27.9	7.19	9.2			-	
NC5	13:18	0.1	13.34	564	34.1	7.34	7.6			-	

2.2.6 August 2018 Dry Weather Sampling

Table 15 provides field notes recorded during the dry weather sampling on 14th of August 2018 and site photographs for survey are attached in **Appendix A**. **Table 16** provides the metered water quality results. The chemical analysis results (ALS Report **ES1823842**) for collected water samples are attached in **Appendix B** to this report.

Table 15 Field Comments – August 2018 Dry Weather Sampling

Site	Comments
NC3	Water fairly clear with a low flow throughout the site length. Macrophytes observed included: *Nastertiom officinalle* (Watercress), *Percicaria deipiens* (Slender Knot Weed), *Ludwigia periviana* (Peruvian Primrose), *Ludwigia peploides* (Floating Water Primrose), *Typha* sp. (Cumbungi) and River Clubrush. Filamentous green alga was present in small amounts

NC4	Water fairly clear with no observable surface flow. Creek choked with macrophytes: Floating Water Primrose, River Clubrush, Slender Knot Weed, Watercress, Pennywort and *Myriophyllum sp*. Downstream sections choked with Watercress and *Myriophyllum sp*. Filamentous green alga was present in small amounts.
NC4.5	Water very turbid, with no observable surface flow. Upstream sections choked with macrophytes. Small traces of ferny Azolla.
NC5	Water slightly turbid with a very low flow. alga was present in moderate amounts. Increase in macrophytes. Macrophytes observed included: Slender Knot Weed, Carex, Peruvian Primrose and Cyprus. Substrate covered in a brown silt. Filamentous green alga present in small amounts.

Table 16 Lower Narrabeen Creek Dry Weather Sample 14th August 18 - Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC3	15:57	0.1	11.76	554	71.6	6.28	12.2	10	1.1		
NC4	11.92	0.1	11.92	520	50.8	6.3	6.5	10	60		
NC4.5	15:08	0.1	15.76	545	74.9	5.92	100	50	600		
NC5	15:23	0.1	12.27	576	49.5	6.19	53.3	60	300	0.045	

2.2.7 September 2018 Wet Weather Sample

Wet sampling was undertaken on the 20th of September 2018 (rising limb) and on the 20th of September 2018 (falling limb). **Table 17** below provides field notes recorded during the wet sampling and site photographs for both the rising and falling limb surveys are attached in **Appendix A**. In addition to the sampling site notes provided below it was also noted that construction works were underway along the riparian bank for the development at Nos 29 to 31 Warriewood Road. Whilst there were construction works underway at Number 53C Warriewood Road there was no flow from ESC-53C observed during the rising or falling limb surveys.

Table 18 provides the metered water quality results for the wet sampling event. The chemical analysis results (ALS Report **ES1827935 & ES1828050**) for collected water samples (TDS, TSS, nutrients, and faecal coliform counts) are attached in **Appendix B** to this report.

Table 17 Field Comments – September 2018 Wet Weather Rising	
Site	Comments
NC3-U	Water was slightly turbid with a low flow through site. Vegetation had been cleared like previous survey. Orange staining found in upstream sections. Macrophytes observed included: *Percicaria decipiens* (Slender Knot Weed), *Schoenoplectus Validus* (River Club Rush), *Ludwigia periviana* (Peruvian Primrose), *Nastertiom officinalle* (Watercress), *Ludwigia peploides* (Floating Water Primrose) and *Typha .Sp* (Cumbungi). Substrates covered in brown silt. Small amounts of Filamentous green alga observed.
NC4-U	Water fairly clear with good flow. Vegetation was cleared on both banks as in former surveys. Macrophytes observed: River Clubrush, Floating Water Primrose, *Hydrocotyle bonariensis* (Pennywort), Watercress and *Myriophyllum sp*. Filamentous green alga was not observed.
NC4.5-D	Low flow with water slightly turbid. Upstream sections with less canopy cover have an increase in macrophytes: Watercress, Slender Knot Weed and Cumbungi.
NC5-U	Water is slightly turbid, with the increased flow stirring the silt/algal matrix that situs upon the rock substrates upstream. Sand coming from the stormwater pipe under the road bridge. Increase of instream macrophytes: Slender Knot Weed, Peruvian Primrose, Water cress, Cumbungi and *Carex .Sp*.
NC3-D	Conditions like the rising limb sample. Water clear, with no flow throughout site. Filamentous green alga present in small amounts.
NC4-D	Water fairly clear. No flow through site. Filamentous green alga not observed.
NC4.5-D	Water fairly clear. No flow through site. Filamentous green alga not observed.
NC5-D	Similar conditions with clear water and a slightly lesser flow. Filamentous green alga not observed

Table 18 Lower Narrabeen Creek Wet Weather Rising Sample 20th and 21st September 18 - Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC3-U	15:21	0.1	15.96	314	87.3	7.39	9.9	15	200	0.06	
NC4-U	13:49	0.1	14.79	476	37.7	7.28	10.2	12	80	0.14	
NC4.5-U	13:15	0.1	14.27	448	34.9	7.27	12.6	70	600	0.03	
NC5-U	14:23	0.1	15.10	518	41.7	7.41	9.1	20	400	0.09	

Falling Sample 21st September 2018										
NC3-D	11:42	0.1	13.03	405	73.0	7.23	6.4	10	190	
NC4-D	12:16	0.1	15.43	387	46.9	7.22	8.3	12	60	
NC4.5-D	12:07	0.1	13.04	449	33.8	7.32	6.2	60	600	
NC5-D	12.31	0.1	14.71	494	40.5	7.36	6.7	80	300	0.03

2.2.8 November 2018 Dry Weather Sampling

Table 19 provides field notes recorded during the dry weather sampling on 26th of November 2018 and site photographs for survey are attached in **Appendix A**. **Table 20** provides the metered water quality results. The chemical analysis results (ALS Report **ES1835246**) for collected water samples are attached in **Appendix B** to this report.

Table 19 Field Comments – November 2018 Dry Weather Sampling

Site	Comments
NC3	Water fairly clear with a low flow throughout the site length. Orange Precipitate found throughout channel sections. Macrophytes observed included: *Nastertiom officinalle* (Watercress), *Percicaria deipiens* (Slender Knot Weed), *Ludwigia periviana* (Peruvian Primrose), *Ludwigia peploides* (Floating Water Primrose), *Typha* sp. (Cumbungi) and River Clubrush. Filamentous green alga was present in moderate amounts
NC4	Water slightly turbid with an unmeasurable flow. Downstream sections had a slight scum or sheen on the surface. Iron precipitate coming from the inner channel. Contractors pulling out trees on the northern bank. Creek choked with macrophytes: Floating Water Primrose, River Clubrush, Slender Knot Weed, Watercress, Pennywort and *Myriophyllum sp*. Downstream sections choked with Watercress and *Myriophyllum sp*. Filamentous green alga was abundant.
NC4.5	No observable surface flows. Water was slightly turbid with surface sheen/scum on the bank edges. Macrophytes upstream of the site, chocking channel sections. Filamentous green alga was abundant.
NC5	Water slightly turbid with a very low flow. Iron precipitate and staining throughout the site. Surface/sheen on the surface of most waters. Macrophytes observed included: *Percicaria deipiens* (Slender Knot Weed), *Ludwigia periviana* (Peruvian Primrose), *Ludwigia peploides* (Floating Water Primrose), *Typha* sp. (Cumbungi) and River Clubrush. Large proliferation of Peruvian Primrose in the upstream sections. Filamentous green alga was abundant.

Table 20 Lower Narrabeen Creek Dry Weather Sample 26th November 18 - Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC4	12:03	0.1	18.79	488	25.3	6.77	10	0.2	0.3	N/A	
NC4.5	12:26	0.1	18.09	545	8.5	6.81	12.5	0.5	3.0	N/A	
NC5	13:01	0.1	23.69	533	67.5	6.8	12.6	0.5	2.5	N/A	

2.2.9 November 2018 Wet Weather Sampling

Wet sampling was undertaken on the 28th of November 2018 (rising limb) and on the 29th of November 2018 (falling limb). **Figure 5** shows hourly rainfall for Warriewood in November, and **Table 21** provides field notes recorded during the wet sampling rising and falling. Site photographs for both wet rising and falling limb surveys are attached in **Appendix A**. **Table 22** provides the metered water quality results for the wet sampling event (rising and falling). The chemical analysis results (ALS Report **ES1835494 & ES1835745**) for collected water samples (TDS, TSS, nutrients, and faecal coliform counts) are attached in **Appendix B** to this report.

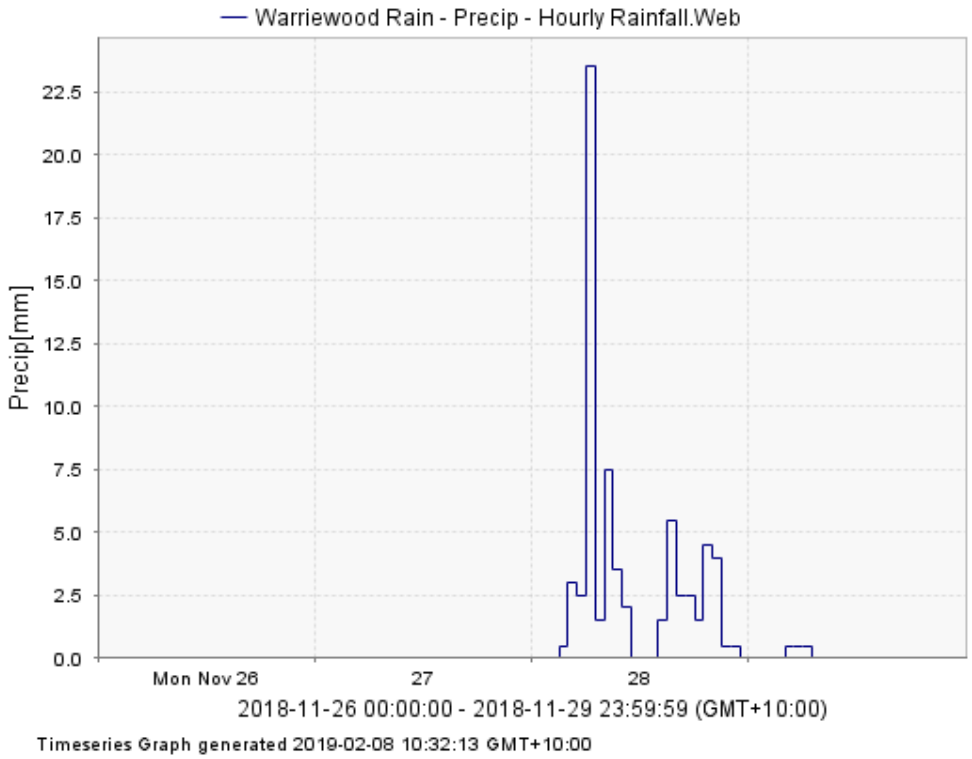

Figure 5 Hourly Rainfall at Warriewood 26 to 29 November 2018

Table 21 Field Comments – November 2018 Wet Weather Rising	
Site	Comments
NC4-U	Water fairly clear with low - moderate flow. Vegetation was cleared on both banks as in former surveys. Macrophytes observed: River Clubrush, Floating Water Primrose, *Hydrocotyle bonariensis* (Pennywort), Watercress and *Myriophyllum sp*. Filamentous green alga was not observed.
NC4.5-D	Unmeasurable flow with water slightly turbid. Upstream sections with less canopy cover have slight increase in macrophytes: Watercress, Slender Knot Weed and Cumbungi.
NC5-U	Water is slightly turbid, with a low to moderate flow, most of the flow from the ESC. Sand coming from the stormwater pipe under the road bridge with flow. Increase of instream macrophytes: Slender Knot Weed, Peruvian Primrose, Water cress, Cumbungi and *Carex .Sp*. Filamentous green alga present in small amounts. Algae being stirred up and taken downstream.
NC3-D	Conditions like the rising limb sample, with elevated water levels. Evidence of water levels 20-30cm greater than current. Water slightly turbid. Filamentous green alga present in small amounts.
NC4-D	Water slightly turbid covering entire site width. Slightly greater flow. Filamentous green alga not observed.
NC4.5-D	Water turbid with no measurable flow. Filamentous green alga not observed.
NC5-D	Similar conditions with fairly clear water. Sand sediments have benn pushed futher downstream. Water covering full riffle sections under the bridge. Storm water pipe flowing. Filamentous green alga present in small amounts.

Table 22 Lower Narrabeen Creek Wet Weather Rising Sample 28th November 18- Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC4-U	6:33	0.1	19.14	489	9.2	6.68	10.2	0.2	1.2	N/A	
NC4.5-U	6:18	0.1	19.44	553	6.2	6.77	11.6	0.5	3.0	N/A	
NC5-U	5:57	0.1	20.16	434	39.6	6.92	98.5	0.37	1	0.11	
Falling Sample 29th November 2018											
NC4-D	14:32	0.1	18.94	292	38.9	6.83	11	0.5	0.8	0.25	
NC4.5-D	14:11	0.1	18.51	288	37.5	6.92	12.2	0.5	3.0	0.13	
NC5-D	14:50	0.1	18.7	298	41	6.9	18.6	2.5	0.3	0.13	

2.2.10 February 2019 Dry Weather Sampling

Table 23 provides field notes recorded during the annual dry weather sampling on 4th of February 2019 and site photographs for survey are attached in **Appendix A**. **Table 24** provides the metered water quality results. **Table 25** provides the results of the annual Rapid Biological Assessment (RBA) sampling. The chemical analysis results (ALS Report **ES1903393**) for collected water and sediment samples and for algae speciation plus counts are attached in **Appendix B** to this report.

Table 23 Field Comments – February 2019 Dry Weather

Site	Comments
NC4	Water fairly clear with no observed surface flow. Small surface sheen throughout. Water levels lower compared to former surveys. Increased amounts of macrophytes throughout especially *Myriophyllum sp* and *Persicaria decipiens*. Vegetation was cleared on northern banks as in former surveys. Macrophytes observed: River Clubrush, Floating Water Primrose, *Hydrocotyle bonariensis* (Pennywort), Watercress and *Myriophyllum sp*. Filamentous green alga was moderate to abundant (greater in areas of sunlight).
NC4.5	No observable with water slightly turbid. Upstream sections with less canopy cover have an increase in macrophytes: Watercress, Slender Knot Weed and Cumbungi.
NC5	Water was clear with a small trickle flow. Large increase in macrophytes especially *Myriophyllum sp*. downstream and 100% cover of Peruvian Primrose upstream. Increase of instream macrophytes: Slender Knot Weed, Peruvian Primrose, Water cress, Cumbungi and *Carex .Sp*. Greater amounts of silt and algae throughout. Filamentous green alga was abundant.

Table 24 Lower Narrabeen Creek Dry Weather Sample 4th February 19- Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC4-U	11:07	0	24.17	349	11.5	6.81	8.4	0.2	1.2	N/A	
NC4.5-U	14:09	0	23.77	379	7.3	6.94	13.4	0.5	3.0	N/A	
NC5-U	12:39	0	24.44	380	26.9	7.02	9.7	0.3	1.0	N/A	

Table 25 Macroinvertebrate and Fish Sampling Results Narrabeen Creek 19 February 2018									
Phylum	Class				Common	4/2/19	4/2/19	Total	
		Family	Sub-Family	Species	Name	NC4	NC5	Occur	SIG-2
Arthropoda	Insecta	Dytiscidae			Diving Beetles	1		1	2
Arthropoda	Insecta	Ceratopogonidae			Biting Midges	1	1	2	4
Arthropoda	Insecta	Chironomidae	Chironominae		Bloodworms	1	1	2	3
Arthropoda	Insecta	Chironomidae	Orthocladiinae		Bloodworms	1		1	4
Arthropoda	Insecta	Culicidae			Mosquitoes	1		1	3
Arthropoda	Insecta	Belostomatidae			Giant Water Bugs		1	1	1
Arthropoda	Insecta	Veliidae			Small Water Treaders	1	1	2	3
Arthropoda	Insecta	Libellulidae			Dragonflies	1	1	2	4
Arthropoda	Insecta	Coenagrionidae			Damselflies	1	1	2	2
Arthropoda	Insecta	Sciomyzidae			Marsh Flies	1		1	2
Arthropoda	Arachnida				Freshwater Mites	1	1	2	6
Arthropoda	Crustacea	Cyclopidae			Copepods	1		1	*
Annelida	Oligochaeta				Freshwater Worms	1	1	2	2
Annelida	Hirudinea	Glossiphoniidae			Leeches	1		1	1
Mollusca		Lymnaeidae			Freshwater Snails	1	1	2	2
Platyhelminthes		Dugesiidae			Flatworms	1		1	2
Chordata	Osteichtyes	Poeciliidae	*Gambusia holbrooki*		Plague Minnow	1	1	2	*
Chordata	Osteichtyes	Gobiidae	*Hypseleotris compressa*		Empirefish	1		1	
Chordata	Osteichtyes	Gobiidae	*Gobiomorphus australis*		Striped Gudgeon	1		1	
				Total number of invertebrate taxa:		15	9	16	
					Site SIGNAL scores:	2.86	3.00	2.73	

2.2.11 May 2019 Dry Weather Sampling

Table 26 provides field notes recorded during the dry weather sampling on 1st of May 2019 and site photographs for survey are attached in **Appendix A**. **Table 27** provides the metered water quality results. The chemical analysis results (ALS Report **ES1913104**) for collected water samples are attached in **Appendix B** to this report.

Table 26 Field Comments – May 2019 Dry Weather Sampling

Site	Comments
NC4	Water fairly clean, however a thin layer of scum was present on the surface of the site. There was no observable flow and water levels were significantly lower than previous surveys. The banks were fairly eroded. Fish species Gambusia was also observed. Filamentous green algae was present in moderate amounts, downstream was chocked with Macrophytes. Macrophytes that were observed include: *Nastertiom officinalle* (Watercress), *Percicaria deipiens* (Slender Knot Weed), *Ludwigia peruviana* (Peruvian Primrose), *Ludwigia peploides* (Floating Water Primrose), *Myriophyllum (*Milfoil), *Schoenoplectus Validus* (River Clubrush) and *Hydrocotyle bonariensis* (Kurnell Curse).
NC4.5	There was no observable surface flow and water was fairly turbid. Appears as though works had been initiated, with banks being widened and 21tabilization works had been put in place. The clearing of shrubs and plants on the construction side of the bank paired with the widening of the bank will increase the sunlight that the river has previously had, likely to produce a greater growth in macrophytes. Filamentous green algae on the Northern bank was abundant, due to high exposure to sunlight and high disturbance from construction works. Water levels were significantly low. On the south bank there were small amounts of Persicaria decipiens (slender knot weed) and Carex. There were also traces of *Lemna* (Duck weed) throughout the site.
NC5	Water was heavily choked by mcrophytes downstream, flow was low. Water was slightly turbid with a layer on scum on the surface. The water escape had no flow coming from it. Substrates were covered in brown silt, filamentous green algae was present in small amounts. The macrophytes observed at this site include: *Ludwigia peruviana* (Peruvian Primrose), *Myriophyllum, Carex* and *Cumbunji*. There were small amounts of *Lemna* (Duck weed) gathered in eddy's downstream. Gambusia fish were also observed in small amounts in shallow areas. Macrophytes on the South bank upstream have all grown significantly, possibly due to the clearing on the North side and widening, increasing the sunlight exposure.

Table 27 Lower Narrabeen Creek Dry Weather Sample 1st May 19 – Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (cm)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC4	16:02	0.14	17.36	517	12.9	7.12	8.3	0.2	0.3	N/A	
NC4.5	16:16	0.1	18.64	582	12	7.08	31.8	0.5	3.0	N/A	
NC5	16:36	0.25	19.95	594	69.9	7.33	32.6	0.5	3	0.8	

2.2.12 June 2019 Wet Weather Sampling

Wet sampling was undertaken on the 4th of June 2019 (rising limb) and on the 5th of June 2019 (falling limb). **Figures 6** and **7** shows hourly rainfall for Warriewood in from May through to June, and **Table 28** provides field notes recorded during the wet sampling rising and falling. Site photographs for both wet rising and falling limb surveys are attached in **Appendix A**. **Table 29** provides the metered water quality results for the wet sampling event (rising and falling). The chemical analysis results (ALS Reports **ES1917059 & ES1917222**) for collected water samples (TDS, TSS, nutrients, and faecal coliform counts) are attached in **Appendix B** to this report.

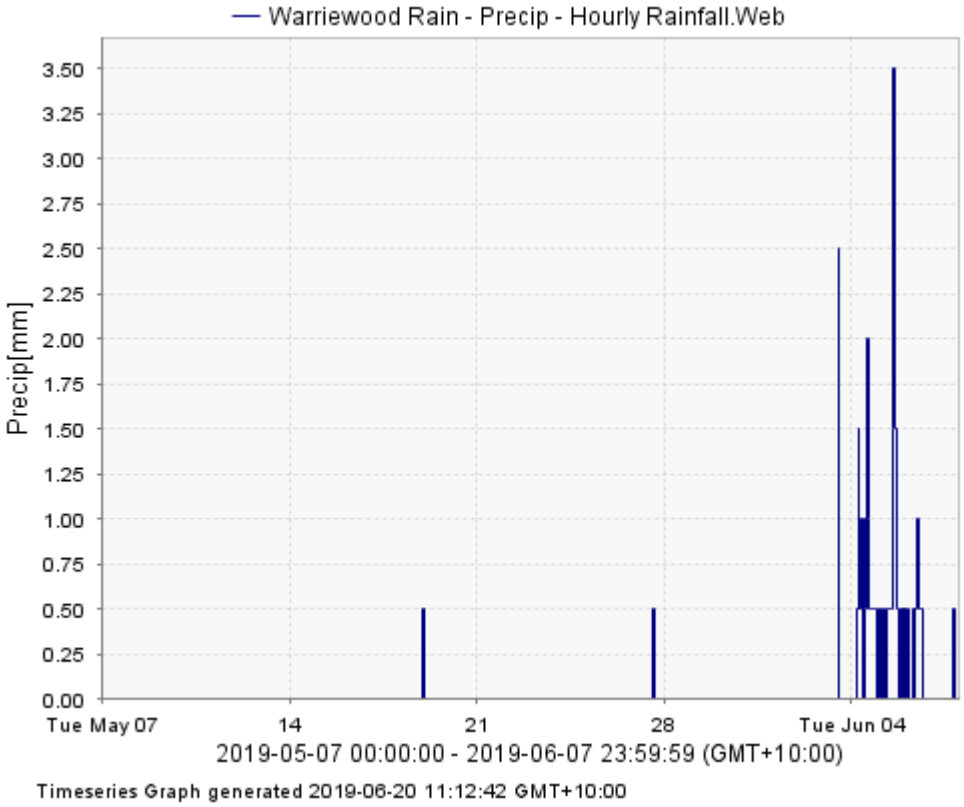

Figure 6 Hourly Rainfall for Warriewood for 7 May 19 – 7 June 19

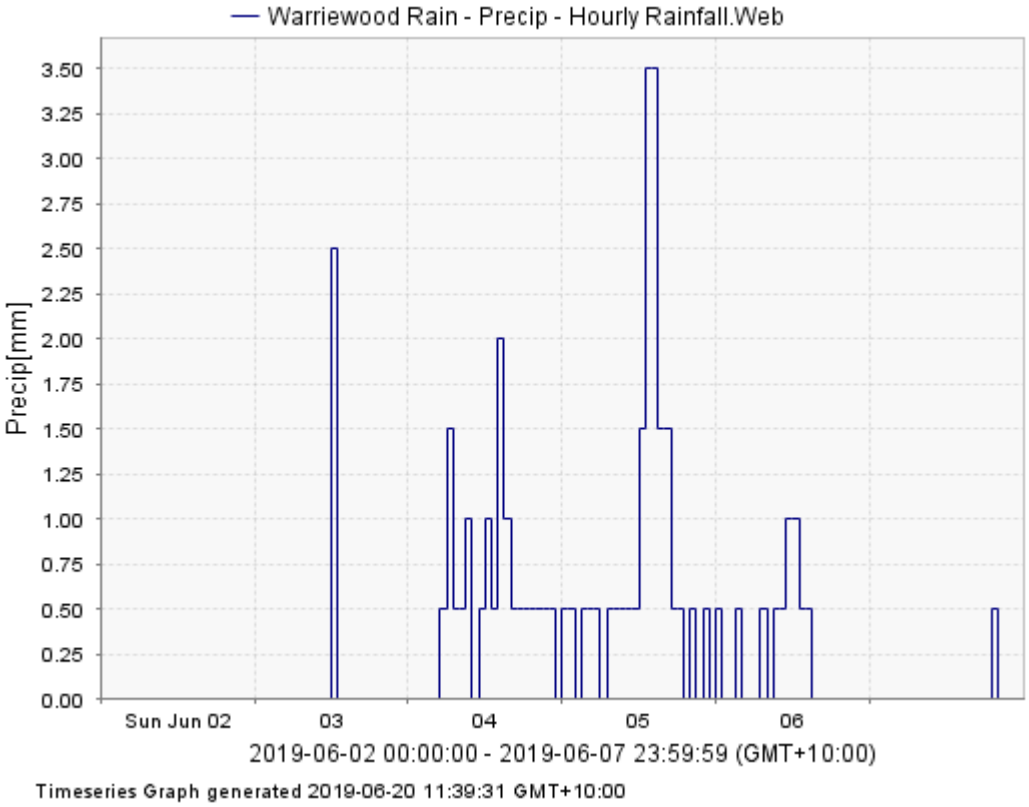

Figure 7 Hourly Rainfall at Warriewood 2 to 7 June 2019

Table 28 Field Comments – June 2019 Wet Weather Rising & Falling Limbs

Site	Comments
NC4-U	Water fairly clear with a moderate - high flow. Water was spilling over and flowing through the inner channel. Vegetation was cleared on both banks as in former surveys. Macrophytes observed: River Clubrush, Slender Knot Weed, Floating Water Primrose, *Hydrocotyle bonariensis* (Pennywort), Watercress and *Myriophyllum sp*.
NC4.5-U	Low flow with water slightly turbid. Upstream sections with less canopy cover have slight increase in macrophytes: Watercress, Slender Knot Weed and Cumbungi. The creek section is wider with the bank work complete on the eastern side. Filamentous green alga was not observed.
NC5-U	Water was slightly turbid, with a moderate flow. The escape pipe (NC5-ESC) has turbid water entering NC5. Sand coming from the stormwater pipe under the road bridge with flow. Increase of instream macrophytes: Slender Knot Weed, Peruvian Primrose, Water cress, Cumbungi and *Carex .Sp*. Filamentous green alga present in small amounts.
NC4-D	Water slightly turbid covering entire site width. High flow throughout. Water spilling over the bank and into the cleared dirt patch on the northern bank. Filamentous green alga not observed.

NC4.5-D	Water slightly turbid with a low flow. Very similar to the rising limb conditions. Filamentous green alga not observed.
NC5-D	Water turbid with a high flow throughout. Water covering full riffle sections under the bridge. Storm water pipe flowing with extremely turbid waters. The Mericon site to the west did not seem to have efficient runoff measures. Numerous points were observed where water flowing over dirt was entering Narrabeen creek from the Mericon site. Creek waters did start to clear up within the short time present while sampling.

Table 29
Lower Narrabeen Creek Wet Weather Rising Sample 4th June 2019 - Physical Water Quality

Site	Time	Depth	Temp	Cond	DO	pH	Turb	Channel (m)		Flow	Flow
		(m)	°C	µS/cm	%Sat	Units	NTU	Depth	Width	m/sec	L/sec
NC4-U	12:50	0.18	11.28	129	81.5	6.41	17.9	0.6	1.3	0.5	
NC4.5-U	13:15	0.2	11.30	177	67.0	6.40	17.5	0.5	12	0.07	
NC5-U	13:35	0.16	11.39	175	77.2	6.52	63.4	0.37	2	0.5	
NC5-ESC-U	13:38	0.24	13.00	380	96.4	8.98	49.4	0.4	0.8	0.1	
Falling Limb Sample 5th June 2019											
NC4-D	12:03	0.43	11.74	162	89	6.42	15.8	0.6	2.0	0.5	
NC4.5-D	12:44	0.39	12.07	220	74.4	6.48	11.5	0.5	12	0.08	
NC5-D	12:23	0.34	11.87	208	82.1	6.56	161.8	0.4	4.0	0.67	
NC5-ESC-U	12:27	0.43	12.34	200	98.6	8.9	577.3	0.8	0.8	0.2	

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MPR (2016b)

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MPR (2016c)

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MPR (2017a)

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MPR (2017b)

Warriewood Land Release Narrabeen Ck Below Brands Lane, Pre-construction Water Quality Monitoring, January 2017 To March 2017. Report No 03; prepared for Arcare (Knowles Group) by Marine Pollution Research Pty Ltd, April 2017.

MPR (2017c)

Warriewood Land Release Narrabeen Ck Below Brands Lane, Pre-construction Water Quality Monitoring, April 2017 To June 2017. Report No 04; prepared for Arcare (Knowles Group) by Marine Pollution Research Pty Ltd, July 2017.

MPR (2018a)

Warriewood Land Release Narrabeen Ck Below Brands Lane, Pre-construction Water Quality Monitoring, July 2017 To February 2018. Report No 05&06; prepared for Arcare (Knowles Group) by Marine Pollution Research Pty Ltd, June 2018.

MPR (2018b)

Warriewood Land Release Narrabeen Ck Below Brands Lane, Pre-construction Water Quality Monitoring, March 2018 To June 2018. Report No 07; prepared for Arcare (Knowles Group) by Marine Pollution Research Pty Ltd, May 2018.

MPR (2018c)

Warriewood Land Release Narrabeen Ck Below Brands Lane, Pre-construction Water Quality Monitoring, July 2018 To Oct 2018. Report No 08; prepared for Arcare (Knowles Group) by Marine Pollution Research Pty Ltd, Oct 2018.

MPR (2019a)

Warriewood Land Release Narrabeen Ck Below Brands Lane, Pre-construction Water Quality Monitoring, Nov 2018 To Feb 2019. Report No 09; prepared for Arcare (Knowles Group) by Marine Pollution Research Pty Ltd, Feb 2019.

APPENDIX A

WARRIEWOOD VALLEY
LOWER NARRABEEN CREEK MONITORING

SITE PHOTOGRAPHS FOR THE PERIOD
OCT 16 TO JAN 18

Dry Weather November 2017
Wet Weather Falling Limb November 2017
Annual Dry Weather February 2018
Wet Weather Rising Limb March 2018
Wet Weather Falling Limb March 2018
Dry Weather May 2018
Dry Weather August 2018
Wet Weather Rising Limb September 2018
Wet Weather Falling Limb September 2018
Dry Weather November 2018
Wet Weather Rising Limb November 2018
Wet Weather Falling Limb November 2018
Annual Dry Weather February 2019
Dry Weather May 2019
Wet Weather Rising Limb June 2019
Wet Weather Falling Limb June 2019

SITE PHOTOGRAPHS - DRY WEATHER SAMPLING NOVEMBER 2017

Plate 1: Looking upstream at site NC3 during dry sample on 03/11/17

Plate 2: Looking downstream at site NC3 during dry weather sampling 03/11/17.

Plate 3: Looking across NC4 during the dry sample on 03/11/17.

Plate 4: Looking upstream NC4 during the dry sample on 03/11/17.

Plate 5: Dry weather sample, looking downstream at NC5 on the 03/11/17.

Plate 6: Site 53C-ESC during dry sample 03/11/17

SITE PHOTOGRAPHS – WET WEATHER SAMPLING NOVEMBER 2017

Plate 7: Looking upstream at site NC3 during wet weather sampling, falling limb on 06/11/17.

Plate 8: Looking downstream at site NC3 during wet weather sampling, falling limb on 06/11/17.

Plate 9: Looking upstream at site NC4 during the wet weather sample, falling limb on 06/11/17.

Plate 10: Looking across NC4 during the wet weather sample, falling limb on 06/11/17.

Plate 11: Wet weather sample during falling limb, looking downstream at NC5 on the 06/11/17.

Plate 12: Upstream at Site 53B-ESC during the wet weather falling limb 06/11/17.

SITE PHOTOGRAPHS – ANNUAL DRY WEATHER SAMPLING FEBRUARY 2018

Plate 13: Looking upstream at site NC3 during dry weather sampling, 6/02/17.

Plate 14: Looking downstream at site NC3 during dry weather sampling, 6/02/17.

Plate 15: Looking downstream at site NC4 during dry weather sampling, 6/02/17.

Plate 16: Looking upstream at site NC4 during dry weather sampling, 6/02/17.

Plate 17: Looking downstream at site NC5 during dry weather sampling, 6/02/17.

SITE PHOTOGRAPHS - WET WEATHER RISING SAMPLES 21st MARCH 2018

Plate 1: Looking upstream at site NC3 during rising wet sample on 21/03/18

Plate 2: Looking downstream at site NC3 during rising wet sample on 21/03/18

Plate 3: Looking across NC4 during rising wet sample on 21/03/18

Plate 4: Looking upstream NC4 during rising wet sample on 21/03/18

Plate 5: Dry weather sample, looking downstream during rising wet sample on 21/03/18

SITE PHOTOGRAPHS – WET WEATHER SAMPLING MARCH 2018

Plate 6: Looking upstream at site NC3 during wet weather sampling, falling limb on 23/03/18.

Plate 7: Looking downstream at site NC3 during wet weather sampling, falling limb on 23/03/18.

Plate 8: Looking upstream at site NC4 during the wet weather sample, falling limb on 23/03/18.

Plate 9: Looking downstream at site NC4 during the wet weather sample, falling limb on 23/03/18.

Plate 10: Wet weather sample during falling limb, looking downstream at NC5 on the 23/03/18.

Plate 11: Site 53B (looking upstream) during the wet weather falling limb 23/03/18.

Plate 12: Site 53C-ESC during the wet weather falling limb 23/03/18.

SITE PHOTOGRAPHS –DRY WEATHER SAMPLING MAY 2018

Plate 13: Looking upstream at site NC3 during dry weather sampling 11/05/18.

Plate 14: Looking downstream at site NC3 during dry weather sampling, 11/05/18.

Plate 15: Looking downstream at site NC4 during dry weather sampling, 11/05/18.

Plate 16: Looking upstream at site NC4 during dry weather sampling, 11/05/18.

Plate 17: Looking downstream at site NC5 during dry weather sampling, 11/05/18.

SITE PHOTOGRAPHS –DRY WEATHER SAMPLING AUGUST 2018

Plate 1: Looking upstream at site NC3 during dry weather sampling 14/08/18.

Plate 2: Looking downstream at site NC3 during dry weather sampling, 14/08/18.

Plate 3: Looking downstream at site NC4 during dry weather sampling, 14/08/18.

Plate 4: Looking upstream at site NC4 during dry weather sampling, 14/08/18.

Plate 5: Looking downstream at site NC4.5 during dry weather sampling, 14/08/18.

Plate 6: Looking upstream at site NC4.5 during dry weather sampling, 14/08/18.

Plate 7: Looking downstream at site NC5 during dry weather sampling, 14/08/18.

Plate 8: Looking across site NC5 during dry weather sampling, 14/08/18.

SITE PHOTOGRAPHS - WET WEATHER RISING SAMPLES 20th SEP 2018

Plate 9: Looking upstream at site NC3 during rising wet sample on 20/09/18

Plate 10: Looking downstream at site NC3 during rising wet sample on 20/09/18

Plate 11: Looking across NC4 during rising wet sample on 20/09/18

Plate 12: Looking upstream NC4 during rising wet sample on 20/09/18

Plate 13: Looking across site NC4.5 during rising wet sample on 20/09/18

Plate 14: Looking downstream at site NC4.5 during rising wet sample on 20/09/18

Plate 15: Stormwater outlet at site NC5 during rising wet sample on 20/09/18

Plate 16: Looking downstream at site NC5 during rising wet sample on 20/09/18

Plate 17: Looking downstream at site 53C-ESC during rising wet sample on 20/09/18

Plate 18: Looking upstream at site NC3 during wet weather sampling, falling limb on 21/09/18.

Plate 19: Looking downstream at site NC3 during wet weather sampling, falling limb on 21/09/18.

Plate 20: Looking upstream at site NC4 during the wet weather sample, falling limb on 21/09/18.

Plate 21: Looking downstream at site NC4 during the wet weather sample, falling limb on 21/09/18.

Plate 22: Wet weather sample during falling limb, looking across NC4.5 on the 21/09/18.

Plate 23: Looking upstream at NC5 during the wet weather falling limb 21/09/18.

Plate 24: Site NC5 during the wet weather falling limb 21/09/18.

Plate 25: 53C-ESC during the wet weather falling limb 21/09/18.

DRY WEATHER SAMPLING NOVEMBER 2018

Plate 1: Looking downstream at site NC4 during dry weather sampling, 26/11/18.

Plate 2: Looking upstream at site NC4 during dry weather sampling, 26/11/18.

Plate 3: Looking downstream at site NC4.5 during dry weather sampling, 26/11/18.

Plate 4: Looking upstream at site NC4.5 during dry weather sampling, 26/11/18.

Plate 5: Looking downstream at site NC5 during dry weather sampling, 26/11/18.

Plate 6: Looking upstream at site NC5 during dry weather sampling, 26/11/18.

WET WEATHER RISING SAMPLES 28th NOVEMBER 2018

Plate 7: Looking across NC4 during rising wet sample on 28/11/18.

Plate 8: Looking upstream NC4 during rising wet sample on 28/11/18.

Plate 9: Looking across site NC4.5 during rising wet sample on 28/11/18.

Plate 10: Looking downstream at site NC4.5 during rising wet sample on 28/11/18.

Plate 11: Stormwater outlet at site NC5 during rising wet sample on 28/11/18.

Plate 12: Looking downstream at site NC5 during rising wet sample on 28/11/18.

WET WEATHER FALLING LIMB 29th Nov 2018

Plate 13: Looking upstream at site NC4 during the wet weather sample, falling limb on 29/11/18.

Plate 14: Looking downstream at site NC4 during the wet weather sample, falling limb on 29/11/18.

Plate 15: Wet weather sample during falling limb, looking across NC4.5 on the 29/11/18.

Plate 16: Wet weather sample during falling limb, looking downstream at NC4.5 on the 29/11/18.

Plate 17: Looking upstream at NC5 during the wet weather falling limb 29/11/18.

Plate 18: Site NC5 during the wet weather falling limb 29/11/18.

DRY WEATHER SAMPLING 4th FEBRUARY 2019

Plate 19: Looking downstream at site NC4 during dry weather sampling, 04/02/19

Plate 20: Looking upstream at site NC4 during dry weather sampling, 04/02/19

Plate 21: Looking downstream at site NC4.5 during dry weather sampling, 04/02/19

Plate 22: Looking across site NC4.5 during dry weather sampling, 04/02/19

Plate 23: Looking downstream at site NC5 during dry weather sampling, 04/02/19

Plate 24: Looking upstream at site NC5 during dry weather sampling, 04/02/19

SITE PHOTOGRAPHS –DRY WEATHER SAMPLING MAY 2019

Plate 1: Looking downstream at site NC4 during dry weather sampling, 01/05/19.

Plate 2: Looking upstream at site NC4 during dry weather sampling, 01/05/19.

Plate 3: Looking downstream at site NC4.5 during dry weather sampling, 01/05/19.

Plate 4: Looking upstream at site NC4.5 during dry weather sampling, 01/05/19.

Plate 5: Looking downstream at site NC5 during dry weather sampling, 01/05/19.

Plate 6: Looking upstream at site NC5 during dry weather sampling, 01/05/19.

WET WEATHER RISING SAMPLES 4th JUNE 2019

Plate 7: Looking across NC4 during rising wet sample on 04/06/19.

Plate 8: Looking upstream NC4 during rising wet sample on 04/06/19.

Plate 9: Looking across site NC4.5 during rising wet sample on 04/06/19.

Plate 10: Looking downstream at site NC4.5 during rising wet sample on 04/06/19

Plate 11: Stormwater outlet at site NC5 during rising wet sample on 04/06/19.

Plate 12: Looking downstream at site NC5 during rising wet sample on 04/06/19.

WET WEATHER FALLING LIMB 5th JUNE 2019

Plate 13: Looking upstream at site NC4 during the wet weather sample, falling limb on 05/06/19.

Plate 14: Looking downstream at site NC4 during the wet weather sample, falling limb on 05/06/19.

Plate 15: Wet weather sample during falling limb, looking across NC4.5 on the 05/06/19.

Plate 16: Wet weather sample during falling limb, looking downstream at NC4.5 on the 05/06/19.

Plate 17: Looking upstream at NC5 during the wet weather falling limb 05/06/19.

Plate 18: Site NC5 during the wet weather falling limb 05/06/19.

Plate 19: Site NC5 during the wet weather falling limb 05/06/19.

APPENDIX B

WARRIEWOOD VALLEY
LOWER NARRABEEN CREEK MONITORING

LABORATORY CHEMICAL ANALYSIS REPORTS

FOR THE PERIOD OCT 17 TO JUN 19:

ES1727600 Dry Weather November 2017
ES1727794 Wet Weather Falling Limb November 2017
ES1804021 Annual Dry Weather February 2018
ES1808499 Wet Weather Rising Limb March 2018
ES1808753 Wet Weather Falling Limb March 2018
ES1813538 Dry Weather May 2018
ES1823842 Dry Weather August 2018
ES1827935 Wet Weather Rising Limb September 2018
ES1828050 Wet Weather Falling Limb September 2018
ES1835246 Dry Weather November 2018
ES1835494 Wet Weather Rising Limb November 2018
ES1835745 Wet Weather Falling Limb November 2018
ES1903393 Annual Dry Weather February 2019
ES1913104 Dry Weather May 2019
ES1917059 Wet Weather Rising Limb June 2019
ES1917222 Wet Weather Falling Limb June 2019

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1727600**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK (imetro)	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 03-Nov-2017 16:15
Order number	: ----	Date Analysis Commenced	: 03-Nov-2017
C-O-C number	: ----	Issue Date	: 13-Nov-2017 10:24
Sampler	: Jacob Broom		
Site	: ----		
Quote number	: SYBQ/360/17		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW

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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC3	NC4	NC5	----	----
			Client sampling date / time	03-Nov-2017 00:00	03-Nov-2017 00:00	03-Nov-2017 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1727600-001	ES1727600-002	ES1727600-003	--------	--------
				Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**254**	**239**	**206**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	**9**	**----**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.03**	**0.10**	**0.19**	**----**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	**----**	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.06**	<0.01	<0.01	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.06**	<0.01	<0.01	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.4**	**0.5**	**1.0**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.5**	**0.5**	**1.0**	**----**	**----**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	**0.02**	**0.03**	**0.10**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.02**	**0.04**	**0.14**	**----**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.01**	<0.01	**0.02**	**----**	**----**
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	**160**	**82**	**72**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1727794**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK (imetro)	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 06-Nov-2017 16:15
Order number	: ----	Date Analysis Commenced	: 07-Nov-2017
C-O-C number	: ----	Issue Date	: 24-Nov-2017 14:09
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: SYBQ/360/17		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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- Analytical Results

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Signatories

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

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC3-U	NC4-U	NC5-U	53C-ESC-U	----
			Client sampling date / time	06-Nov-2017 00:00	06-Nov-2017 00:00	06-Nov-2017 00:00	06-Nov-2017 00:00	----
Compound	CAS Number	LOR	Unit	ES1727794-001	ES1727794-002	ES1727794-003	ES1727794-004	--------
				Result	Result	Result	Result	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	187	153	124	178	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	7	7	11	14	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.15	0.06	0.04	0.05	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.02	0.02	0.02	0.04	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.60	0.50	0.39	0.60	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.62	0.52	0.41	0.64	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.4	0.4	0.4	0.5	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	1.0	0.9	0.8	1.1	----
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	0.03	0.06	0.08	0.06	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.07	0.10	0.11	0.09	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	~14000	4500	1600	7600	----

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

CERTIFICATE OF ANALYSIS

BATCH NUMBER: ES1727794
CLIENT: MARINE POLLUTION RESEARCH PTY LTD

ADDRESS: PO BOX 279 CHURCH POINT:
SYDNEY NSW 2105
CONTACT: MR PAUL ANINK (imetro)

ANALYSIS:	Non Filterable Phosphorus

Sub-Matrix			WATER	WATER	WATER	WATER
Sample Name			NC3-U	NC4-U	NC5-U	53C-ESC-U
Depth Type						
Depth in metres						
Analyte			6/11/2017 0:00	6/11/2017 0:00	6/11/2017 0:00	6/11/2017 0:00
	Units	Rep. LOR	ES1727794-001	ES1727794-002	ES1727794-003	ES1727794-004
Non Filterable Phosphorus (mg/L)	mg/L	0.01	0.04	0.04	0.03	0.03

Wisam Marassa (22-11-2017)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1804021**	Page	: 1 of 11
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 06-Feb-2018 16:45
Order number	: ----	Date Analysis Commenced	: 07-Feb-2018
C-O-C number	: ----	Issue Date	: 12-Feb-2018 17:12
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 6		
No. of samples analysed	: 6		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sunitha Kannampilli	Phycologist	Sydney Phycology, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

General Comments

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Results apply to sample(s) as submitted.
- MF = membrane filtration
- CFU = colony forming unit
- It has been noted that filtered TP is greater than Reactive P for sample 1, however this difference is within the limits of experimental variation.
- KEY: PTP=Potential Toxin Producers
; ND=Not Detected; NS=Not Specified
; cf. = comparable from
- Samples were preserved with Lugols Iodine solution.
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- Membrane filtration results for MW006 for No. 3 are reported as an estimate (~) due to the presence of many non-target organism colonies that may have inhibited the growth of the target organisms on the filter membrane. It may be informative to record this fact.
- Note: Recent reports from Australia have included Geitlerinema spp. as a Potential Toxin Producer (PTP); however, the toxins produced by this spp. is currently unknown
- Under microscopic observation, debris present is sample#01, #02 and #03
- MW006 is ALS's internal code and is equivalent to AS4276.7.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Client sample ID	NC3	NC4	NC5	----	----
			Client sampling date / time	06-Feb-2018 00:00	06-Feb-2018 00:00	06-Feb-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1804021-004	ES1804021-005	ES1804021-006	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**22.1**	**28.8**	**43.4**	**----**	**----**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	**----**	**----**
Chromium	7440-47-3	2	mg/kg	<2	<2	**8**	**----**	**----**
Copper	7440-50-8	5	mg/kg	<5	<5	**25**	**----**	**----**
Lead	7439-92-1	5	mg/kg	<5	<5	**19**	**----**	**----**
Zinc	7440-66-6	5	mg/kg	**14**	**24**	**255**	**----**	**----**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	**----**	**----**
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	**----**	**----**
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	**----**	**----**
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	**----**	**----**

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Client sample ID	NC3	NC4	NC5	----	----
				Client sampling date / time	06-Feb-2018 00:00	06-Feb-2018 00:00	06-Feb-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1804021-004	ES1804021-005	ES1804021-006	--------	--------
					Result	Result	Result	----	----
EP068A: Organochlorine Pesticides (OC) - Continued									
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**115**	**130**	**103**	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**92.1**	**110**	**108**	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**73.3**	**86.1**	**87.9**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC3	NC4	NC5	----	----
				Client sampling date / time	06-Feb-2018 00:00	06-Feb-2018 00:00	06-Feb-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1804021-001	ES1804021-002	ES1804021-003	--------	--------
					Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		189	192	171	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	<5	6	----	----
ED093F: SAR and Hardness Calculations									
Total Hardness as CaCO3	----	1	mg/L		100	69	61	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	1	µg/L		1	<1	5	----	----
Chromium	7440-47-3	1	µg/L		<1	<1	<1	----	----
Copper	7440-50-8	1	µg/L		2	<1	<1	----	----
Lead	7439-92-1	1	µg/L		<1	<1	<1	----	----
Zinc	7440-66-6	5	µg/L		7	<5	9	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	µg/L		<0.1	<0.1	<0.1	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	0.03	0.02	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.01	<0.01	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.01	<0.01	<0.01	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.4	0.6	0.5	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.4	0.6	0.5	----	----
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser									
Filtered Total Phosphorus as P	----	10	µg/L		<10	50	100	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		20	80	120	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		0.01	0.02	0.03	----	----
EP008: Chlorophyll a & Pheophytin a									
Chlorophyll a	----	0.001	mg/L		0.009	0.003	0.006	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC3	NC4	NC5	----	----
				Client sampling date / time	06-Feb-2018 00:00	06-Feb-2018 00:00	06-Feb-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1804021-001	ES1804021-002	ES1804021-003	--------	--------
					Result	Result	Result	----	----
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L		<5	<5	<5	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	1	µg/L		<1	<1	<1	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L		<0.5	<0.5	<0.5	----	----
beta-BHC	319-85-7	0.5	µg/L		<0.5	<0.5	<0.5	----	----
gamma-BHC	58-89-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
delta-BHC	319-86-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Heptachlor	76-44-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Aldrin	309-00-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L		<0.5	<0.5	<0.5	----	----
trans-Chlordane	5103-74-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
cis-Chlordane	5103-71-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Dieldrin	60-57-1	0.5	µg/L		<0.5	<0.5	<0.5	----	----
4.4`-DDE	72-55-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Endrin	72-20-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
4.4`-DDD	72-54-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
4.4`-DDT	50-29-3	2.0	µg/L		<2.0	<2.0	<2.0	----	----
Endrin ketone	53494-70-5	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Methoxychlor	72-43-5	2.0	µg/L		<2.0	<2.0	<2.0	----	----
^ Total Chlordane (sum)	----	0.5	µg/L		<0.5	<0.5	<0.5	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L		<0.5	<0.5	<0.5	----	----
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Monocrotophos	6923-22-4	2.0	µg/L		<2.0	<2.0	<2.0	----	----
Dimethoate	60-51-5	0.5	µg/L		<0.5	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC3	NC4	NC5	----	----
				Client sampling date / time	06-Feb-2018 00:00	06-Feb-2018 00:00	06-Feb-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1804021-001	ES1804021-002	ES1804021-003	--------	--------
					Result	Result	Result	----	----
EP068B: Organophosphorus Pesticides (OP) - Continued									
Diazinon	333-41-5	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Parathion-methyl	298-00-0	2.0	µg/L		<2.0	<2.0	<2.0	----	----
Malathion	121-75-5	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Fenthion	55-38-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Parathion	56-38-2	2.0	µg/L		<2.0	<2.0	<2.0	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Fenamiphos	22224-92-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Prothiofos	34643-46-4	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Ethion	563-12-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Carbophenothion	786-19-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Azinphos Methyl	86-50-0	0.5	µg/L		<0.5	<0.5	<0.5	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2-Chlorophenol	95-57-8	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<1.0	<1.0	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L		<2.0	<2.0	<2.0	----	----
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L		<1.0	<1.0	<1.0	----	----
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	<2.0	<2.0	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC3	NC4	NC5	----	----
				Client sampling date / time	06-Feb-2018 00:00	06-Feb-2018 00:00	06-Feb-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1804021-001	ES1804021-002	ES1804021-003	--------	--------
					Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	<0.5	<0.5	----	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		~18000	420	~230	----	----
MW024: Bacillariophytes (Diatoms) - Centrales									
Cyclotella spp.	----	5	cells/ml		25	75	50	----	----
Melosira spp.	----	5	cells/ml		150	----	----	----	----
MW024: Bacillariophytes (Diatoms) - Pennales									
Amphora spp.	----	5	cells/ml		50	----	----	----	----
Cylindrotheca closterium	----	5	cells/ml		125	25	----	----	----
Fragilaria spp.	----	5	cells/ml		225	----	----	----	----
Navicula spp.	----	5	cells/ml		25	----	50	----	----
Nitzschia spp.	----	5	cells/ml		350	25	15	----	----
MW024: Bacillariophytes (Diatoms) - TOTAL BACILLARIOPHYTES									
Total Bacillariophytes	----	5	cells/ml		950	125	115	----	----
MW024: Chlorophytes (Green Algae) - Chlorococcales									
Ankistrodesmus spp.	----	5	cells/ml		100	----	----	----	----
Coelastrum spp.	----	5	cells/ml		175	----	----	----	----
Dictyosphaerium spp.	----	5	cells/ml		450	----	400	----	----
Kirchneriella spp.	----	5	cells/ml		75	----	----	----	----
Monoraphidium spp.	----	5	cells/ml		75	25	----	----	----
Oocystis spp.	----	5	cells/ml		75	50	25	----	----
Scenedesmus spp.	----	5	cells/ml		700	575	175	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC3	NC4	NC5	----	----
				Client sampling date / time	06-Feb-2018 00:00	06-Feb-2018 00:00	06-Feb-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1804021-001	ES1804021-002	ES1804021-003	--------	--------
					Result	Result	Result	----	----
MW024: Chlorophytes (Green Algae) - Chlorococcales - Continued									
Sphaerocystis spp.	----	5	cells/ml		25	25	----	----	----
Tetraedron spp.	----	5	cells/ml		25	----	----	----	----
MW024: Chlorophytes (Green Algae) - TOTAL CHLOROPHYTES									
Total Chlorophytes	----	5	cells/ml		1880	705	600	----	----
MW024: Chlorophytes (Green Algae) - Volvocales									
Chlamydomonas spp.	----	5	cells/ml		175	25	----	----	----
MW024: Chlorophytes (Green Algae) - Zygnematales									
Closterium spp.	----	5	cells/ml		10	5	----	----	----
MW024: Cyanophytes (Blue Green Algae) - Chroococcales									
Chroococcus spp.	----	5	cells/ml		100	----	----	----	----
Merismopedia spp.	----	5	cells/ml		100	----	----	----	----
Microcystis spp.	----	5	cells/ml		600	----	----	----	----
Radiocystis spp.	----	5	cells/ml		----	----	750	----	----
Total Chroococcales	----	5	cells/ml		800	----	1600	----	----
Aphanocapsa spp. > 2µm	----	5	cells/ml		----	----	850	----	----
MW024: Cyanophytes (Blue Green Algae) - Nostocales									
Unidentified Nostocales	----	5	cells/ml		----	90	----	----	----
Total Nostocales	----	5	cells/ml		----	90	----	----	----
MW024: Cyanophytes (Blue Green Algae) - Oscillatoriales									
Geitlerinema spp.	----	5	cells/ml		----	480	----	----	----
Pseudanabaena spp.	----	5	cells/ml		1100	825	450	----	----
Total Oscillatoriales	----	5	cells/ml		1100	1300	450	----	----
MW024: Cyanophytes (Blue Green Algae) - TOTAL CYANOPHYTES									
Total Cyanophytes	----	5	cells/ml		1900	1400	2050	----	----
MW024: Cyanophytes (Blue Green Algae) - TOTAL POTENTIALLY TOXIC CYANOPHYTES									
Total Potentially Toxic Cyanophytes	----	5	cells/ml		<5	480	<5	----	----
MW024: Flagellates - Cryptophytes									
Chroomonas spp.	----	5	cells/ml		----	----	25	----	----
Cryptomonas spp.	----	5	cells/ml		50	100	75	----	----
MW024: Flagellates - Euglenophytes									
Euglena spp.	----	5	cells/ml		25	50	175	----	----
Phacus spp.	----	5	cells/ml		----	----	25	----	----
Trachelomonas spp.	----	5	cells/ml		25	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC3	NC4	NC5	----	----
				Client sampling date / time	06-Feb-2018 00:00	06-Feb-2018 00:00	06-Feb-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1804021-001	ES1804021-002	ES1804021-003	--------	--------
					Result	Result	Result	----	----
MW024: Flagellates - TOTAL FLAGELLATES									
Total Flagellates	----	5	cells/ml		100	150	300	----	----
MW024T: TOTAL ALGAE									
Total Algae Count	----	5	cells/ml		4840	2380	3060	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	1	%		127	118	104	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.5	%		105	104	91.0	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.5	%		106	97.9	83.7	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		22.0	18.5	19.6	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%		49.8	46.2	50.6	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%		48.8	44.1	43.6	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		71.3	61.2	71.2	----	----
Anthracene-d10	1719-06-8	1.0	%		96.2	91.8	67.6	----	----
4-Terphenyl-d14	1718-51-0	1.0	%		96.8	92.5	85.6	----	----

Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	29	129
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	67	111
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	67	111
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1808499**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 21-Mar-2018 15:00
Order number	:	Date Analysis Commenced	: 22-Mar-2018
C-O-C number	: ----	Issue Date	: 28-Mar-2018 19:03
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

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.

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^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC3-U	NC4-U	NC5-U	----	----
			Client sampling date / time	21-Mar-2018 00:00	21-Mar-2018 00:00	21-Mar-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1808499-001	ES1808499-002	ES1808499-003	--------	--------
				Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**202**	**204**	**221**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	**----**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.02**	**0.02**	<0.01	**----**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	**----**	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.11**	**0.18**	**0.14**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.11**	**0.18**	**0.14**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.3**	**0.4**	**0.4**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.4**	**0.6**	**0.5**	**----**	**----**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	**0.01**	**0.03**	**0.03**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.02**	**0.04**	**0.04**	**----**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.01**	**0.02**	**0.02**	**----**	**----**
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	**1400**	**2800**	**2000**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1808753**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK (imetro)	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 23-Mar-2018 13:09
Order number	:	Date Analysis Commenced	: 23-Mar-2018
C-O-C number	: ----	Issue Date	: 29-Mar-2018 18:05
Sampler	: JACOB BROOM (hotmail)		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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- Analytical Results

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Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW

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.

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC3-D	NC4-D	NC5-D	----	----
			Client sampling date / time	23-Mar-2018 00:00	23-Mar-2018 00:00	23-Mar-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1808753-001	ES1808753-002	ES1808753-003	--------	--------
				Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**224**	**206**	**202**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	**----**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.05**	**0.12**	**0.06**	**----**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	**0.02**	<0.01	**----**	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.06**	**0.05**	**0.05**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.06**	**0.07**	**0.05**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.2**	**0.3**	**0.1**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.3**	**0.4**	**0.2**	**----**	**----**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	**0.01**	**0.02**	**0.04**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.02**	**0.03**	**0.05**	**----**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	**----**	**----**
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	**330**	**710**	**270**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1813538**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK (imetro)	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 11-May-2018 13:20
Order number	:	Date Analysis Commenced	: 12-May-2018
C-O-C number	: ----	Issue Date	: 17-May-2018 15:18
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
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Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

General Comments

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~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC3	NC4	NC5	----	----
			Client sampling date / time	11-May-2018 00:00	11-May-2018 00:00	11-May-2018 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1813538-001	ES1813538-002	ES1813538-003	--------	--------
				Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**294**	**278**	**324**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	**----**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.04**	**0.39**	**0.09**	**----**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	**----**	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	**0.07**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	**0.07**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.3**	**0.6**	**0.3**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.3**	**0.6**	**0.4**	**----**	**----**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.03**	**0.01**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.02**	**0.06**	**0.02**	**----**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.01**	**0.01**	<0.01	**----**	**----**
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	**65**	**~16000**	**42**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1823842**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 14-Aug-2018 16:15
Order number	:	Date Analysis Commenced	: 15-Aug-2018
C-O-C number	: ----	Issue Date	: 17-Aug-2018 20:25
Sampler	: Jacob Broom		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
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ISO/IEC 17025 - Testing

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- Analytical Results

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Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

General Comments

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC3	NC4	NC4.5	NC5	----
				Client sampling date / time	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	14-Aug-2018 00:00	----
Compound	CAS Number	LOR	Unit		ES1823842-001	ES1823842-002	ES1823842-003	ES1823842-004	--------
					Result	Result	Result	Result	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**336**	**310**	**361**	**364**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	<5	**52**	**12**	**----**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.31**	**0.01**	**0.06**	**0.05**	**----**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**----**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.11**	**0.01**	**0.03**	**0.10**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.11**	**0.01**	**0.03**	**0.10**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.4**	**0.1**	**1.8**	**0.6**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.5**	**0.1**	**1.8**	**0.7**	**----**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser									
Filtered Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.02**	**0.06**	**0.03**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.02**	**0.23**	**0.07**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**----**
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		**~8**	<1	**100**	**50**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1827935**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 20-Sep-2018 15:34
Order number	:	Date Analysis Commenced	: 21-Sep-2018
C-O-C number	: ----	Issue Date	: 26-Sep-2018 18:45
Sampler	: JACOB BROOM		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 4		
No. of samples analysed	: 4		

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- General Comments
- Analytical Results

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Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC3	NC4	NC4.5	NC5	----
			Client sampling date / time	20-Sep-2018 00:00	20-Sep-2018 00:00	20-Sep-2018 00:00	20-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit	ES1827935-001	ES1827935-002	ES1827935-003	ES1827935-004	--------
				Result	Result	Result	Result	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**198**	**289**	**269**	**314**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	**18**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.04**	**0.02**	**0.03**	**0.04**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.05**	**0.06**	**0.09**	**0.04**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.05**	**0.06**	**0.09**	**0.04**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.2**	**0.3**	**0.3**	**0.3**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.2**	**0.4**	**0.4**	**0.3**	**----**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	**0.03**	**0.04**	**0.03**	**0.03**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.04**	**0.05**	**0.04**	**0.05**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	**0.02**	**0.01**	<0.01	**----**
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	**1800**	**~1100**	**540**	**210**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1828050**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JACOB BROOM (gmail)	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 21-Sep-2018 12:50
Order number	:	Date Analysis Commenced	: 21-Sep-2018
C-O-C number	: ----	Issue Date	: 27-Sep-2018 16:05
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 4		
No. of samples analysed	: 4		

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Signatories

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Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

General Comments

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

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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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC3-D	NC4-D	NC4.5-D	NC5-D	----
			Client sampling date / time	21-Sep-2018 00:00	21-Sep-2018 00:00	21-Sep-2018 00:00	21-Sep-2018 00:00	----
Compound	CAS Number	LOR	Unit	ES1828050-001	ES1828050-002	ES1828050-003	ES1828050-004	--------
				Result	Result	Result	Result	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**215**	**240**	**274**	**290**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	**9**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.09**	<0.01	**0.03**	**0.04**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.04**	**0.01**	<0.01	**0.05**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.04**	**0.01**	<0.01	**0.05**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.2**	**0.3**	**0.3**	**0.3**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.2**	**0.3**	**0.3**	**0.4**	**----**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.01**	**0.01**	**0.01**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.01**	**0.02**	**0.01**	**0.02**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	**----**
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	**250**	**430**	**170**	**40**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1835246**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 26-Nov-2018 19:20
Order number	:	Date Analysis Commenced	: 27-Nov-2018
C-O-C number	: ----	Issue Date	: 03-Dec-2018 13:02
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 3		
No. of samples analysed	: 3		

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Signatories

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Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Sarah Griffiths	Microbiologist	Sydney Microbiology, Smithfield, NSW

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.

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Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- EK067G/EK067FG: It is recognised that Total Phosphorus is less than Filtered Total Phosphorus for samples 1 & 2. However, the difference is within experimental variation of the methods.
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC 4	NC 4.5	NC 5	----	----
				Client sampling date / time	26-Nov-2018 00:00	26-Nov-2018 00:00	26-Nov-2018 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1835246-001	ES1835246-002	ES1835246-003	--------	--------
					Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		298	335	366	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	8	6	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.02	0.06	0.06	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.3	0.3	0.5	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.3	0.3	0.5	----	----
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser									
Filtered Total Phosphorus as P	----	0.01	mg/L		0.04	0.11	0.06	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.04	0.11	0.08	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	0.01	0.02	----	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		110	140	210	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1835494**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JACOB BROOM (gmail)	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 28-Nov-2018 11:00
Order number	:	Date Analysis Commenced	: 28-Nov-2018
C-O-C number	: ----	Issue Date	: 04-Dec-2018 17:32
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 4		
No. of samples analysed	: 4		

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Accredited for compliance with
ISO/IEC 17025 - Testing

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- Analytical Results

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Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Sarah Griffiths	Microbiologist	Sydney Microbiology, Smithfield, NSW

General Comments

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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.

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Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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.
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^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC4_M	NC45_M	NC5_M	NC5_ESC_M	----
			Client sampling date / time	28-Nov-2018 00:00	28-Nov-2018 00:00	28-Nov-2018 00:00	28-Nov-2018 00:00	----
Compound	CAS Number	LOR	Unit	ES1835494-001	ES1835494-002	ES1835494-003	ES1835494-004	--------
				Result	Result	Result	Result	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	302	330	324	310	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	17	71	143	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.11	0.06	0.05	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.01	0.03	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	0.02	0.57	1.20	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.02	0.58	1.23	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.4	0.5	1.0	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.3	0.4	1.1	2.2	----
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	0.03	0.16	0.27	0.24	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.04	0.20	0.39	0.25	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.03	0.15	0.22	----
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	380	320	4800	8400	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1835745**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 29-Nov-2018 16:15
Order number	:	Date Analysis Commenced	: 30-Nov-2018
C-O-C number	: ----	Issue Date	: 05-Dec-2018 16:10
Sampler	: JACOB BROOM		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 4		
No. of samples analysed	: 4		

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Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW

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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- Membrane filtration results for MW006 are reported as an estimate (~) due to the growth of bacteria on the filter membrane being counted <10cfu and/or >100cfu and due to the presence of many non-target organism colonies that may have inhibited the growth of the target organisms on the filter membrane. It may be informative to record this fact.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC4-D	NC4-5-D	NC5-ESC-D	NC5-D	----
				Client sampling date / time	29-Nov-2018 00:00	29-Nov-2018 00:00	29-Nov-2018 00:00	29-Nov-2018 00:00	----
Compound	CAS Number	LOR	Unit		ES1835745-001	ES1835745-002	ES1835745-003	ES1835745-004	--------
					Result	Result	Result	Result	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		201	194	472	109	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	<5	<5	<5	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.01	0.02	0.10	0.04	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	0.23	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.18	0.16	3.33	0.23	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.18	0.16	3.56	0.23	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.5	0.5	1.2	0.5	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.7	0.7	4.8	0.7	----
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser									
Filtered Total Phosphorus as P	----	0.01	mg/L		0.04	0.04	0.10	0.04	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.05	0.05	0.12	0.06	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		0.03	0.03	0.10	0.03	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		~400	~480	~360	~100	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1903393**	Page	: 1 of 11
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 04-Feb-2019 16:06
Order number	:	Date Analysis Commenced	: 05-Feb-2019
C-O-C number	: ----	Issue Date	: 13-Feb-2019 14:53
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 6		
No. of samples analysed	: 6		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Sunitha Kannampilli	Phycologist	Sydney Phycology, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Results apply to sample(s) as submitted.
- MF = membrane filtration
- CFU = colony forming unit
- EP068: LOR for sample raised due to the high amount of moisture present.
- EK067FG: It has been noted that Filtered Total P is greater than Total P on sample No 2, however this difference is within the limits of experimental variation.
- KEY: PTP=Potential Toxin Producers
; ND=Not Detected; NS=Not Specified
; cf. = comparable from
- Samples were preserved with Lugols Iodine solution.
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- Under microscopic observation, debris present in sample #01, #02 and #03
- MW006 is ALS's internal code and is equivalent to AS4276.7.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	NC4	NC4-5	NC5	----	----
				Client sampling date / time	04-Feb-2019 00:00	04-Feb-2019 00:00	04-Feb-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1903393-004	ES1903393-005	ES1903393-006	--------	--------
					Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**35.7**	**25.8**	**79.2**	----	----
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	**42**	----	----
Chromium	7440-47-3	2	mg/kg		**4**	**7**	**30**	----	----
Copper	7440-50-8	5	mg/kg		**7**	<5	**92**	----	----
Lead	7439-92-1	5	mg/kg		**6**	**8**	**104**	----	----
Zinc	7440-66-6	5	mg/kg		**86**	**21**	**868**	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	**0.1**	----	----
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg		<0.1	<0.1	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
beta-BHC	319-85-7	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
gamma-BHC	58-89-9	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
delta-BHC	319-86-8	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
Heptachlor	76-44-8	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
Aldrin	309-00-2	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
^ Total Chlordane (sum)	----	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
alpha-Endosulfan	959-98-8	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
Dieldrin	60-57-1	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
4.4`-DDE	72-55-9	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
Endrin	72-20-8	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
^ Endosulfan (sum)	115-29-7	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
4.4`-DDD	72-54-8	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg		<0.05	<0.05	<0.06	----	----
4.4`-DDT	50-29-3	0.2	mg/kg		<0.2	<0.2	<0.3	----	----
Endrin ketone	53494-70-5	0.05	mg/kg		<0.05	<0.05	<0.06	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	NC4	NC4-5	NC5	----	----
				Client sampling date / time	04-Feb-2019 00:00	04-Feb-2019 00:00	04-Feb-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1903393-004	ES1903393-005	ES1903393-006	--------	--------
					Result	Result	Result	----	----
EP068A: Organochlorine Pesticides (OC) - Continued									
Methoxychlor	72-43-5	0.2	mg/kg		<0.2	<0.2	<0.3	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg		<0.05	<0.05	<0.05	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**81.0**	**72.9**	**72.9**	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**114**	**126**	**116**	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**80.9**	**72.6**	**76.8**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC4	NC4-5	NC5	----	----
			Client sampling date / time	04-Feb-2019 00:00	04-Feb-2019 00:00	04-Feb-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1903393-001	ES1903393-002	ES1903393-003	--------	--------
				Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**164**	**194**	**188**	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	----	----
ED093F: SAR and Hardness Calculations								
Total Hardness as CaCO3	----	1	mg/L	**78**	**80**	**80**	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.001**	<0.001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.006**	<0.005	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.06**	**0.08**	**0.07**	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.4**	**0.4**	**0.4**	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.4**	**0.4**	**0.4**	----	----
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	**0.09**	**0.17**	**0.20**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.10**	**0.16**	**0.20**	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.02**	**0.05**	**0.13**	----	----
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m³	**5**	**3**	**2**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC4	NC4-5	NC5	----	----
				Client sampling date / time	04-Feb-2019 00:00	04-Feb-2019 00:00	04-Feb-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1903393-001	ES1903393-002	ES1903393-003	--------	--------
					Result	Result	Result	----	----
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L		**5**	<5	<5	----	----
EP066: Polychlorinated Biphenyls (PCB)									
^ **Total Polychlorinated biphenyls**	----	1	µg/L		<1	<1	<1	----	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L		<0.5	<0.5	<0.5	----	----
beta-BHC	319-85-7	0.5	µg/L		<0.5	<0.5	<0.5	----	----
gamma-BHC	58-89-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
delta-BHC	319-86-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Heptachlor	76-44-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Aldrin	309-00-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L		<0.5	<0.5	<0.5	----	----
trans-Chlordane	5103-74-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
cis-Chlordane	5103-71-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Dieldrin	60-57-1	0.5	µg/L		<0.5	<0.5	<0.5	----	----
4.4`-DDE	72-55-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Endrin	72-20-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
4.4`-DDD	72-54-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
4.4`-DDT	50-29-3	2.0	µg/L		<2.0	<2.0	<2.0	----	----
Endrin ketone	53494-70-5	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Methoxychlor	72-43-5	2.0	µg/L		<2.0	<2.0	<2.0	----	----
^ **Total Chlordane (sum)**	----	0.5	µg/L		<0.5	<0.5	<0.5	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.5	µg/L		<0.5	<0.5	<0.5	----	----
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Monocrotophos	6923-22-4	2.0	µg/L		<2.0	<2.0	<2.0	----	----
Dimethoate	60-51-5	0.5	µg/L		<0.5	<0.5	<0.5	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC4	NC4-5	NC5	----	----
				Client sampling date / time	04-Feb-2019 00:00	04-Feb-2019 00:00	04-Feb-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1903393-001	ES1903393-002	ES1903393-003	--------	--------
					Result	Result	Result	----	----
EP068B: Organophosphorus Pesticides (OP) - Continued									
Diazinon	333-41-5	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Parathion-methyl	298-00-0	2.0	µg/L		<2.0	<2.0	<2.0	----	----
Malathion	121-75-5	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Fenthion	55-38-9	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Parathion	56-38-2	2.0	µg/L		<2.0	<2.0	<2.0	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Fenamiphos	22224-92-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Prothiofos	34643-46-4	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Ethion	563-12-2	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Carbophenothion	786-19-6	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Azinphos Methyl	86-50-0	0.5	µg/L		<0.5	<0.5	<0.5	----	----
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2-Chlorophenol	95-57-8	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2-Methylphenol	95-48-7	1.0	µg/L		<1.0	<1.0	<1.0	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L		<2.0	<2.0	<2.0	----	----
2-Nitrophenol	88-75-5	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L		<1.0	<1.0	<1.0	----	----
4-Chloro-3-methylphenol	59-50-7	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L		<1.0	<1.0	<1.0	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Pentachlorophenol	87-86-5	2.0	µg/L		<2.0	<2.0	<2.0	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Phenanthrene	85-01-8	1.0	µg/L		<1.0	<1.0	<1.0	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC4	NC4-5	NC5	----	----
				Client sampling date / time	04-Feb-2019 00:00	04-Feb-2019 00:00	04-Feb-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1903393-001	ES1903393-002	ES1903393-003	--------	--------
					Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Anthracene	120-12-7	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Fluoranthene	206-44-0	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Pyrene	129-00-0	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L		<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L		<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L		<1.0	<1.0	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L		<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	<0.5	<0.5	----	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		280	720	770	----	----
MW024: Bacillariophytes (Diatoms) - Pennales									
Navicula spp.	----	5	cells/ml		----	25	25	----	----
Pinnularia spp.	----	5	cells/ml		----	----	50	----	----
MW024: Bacillariophytes (Diatoms) - TOTAL BACILLARIOPHYTES									
Total Bacillariophytes	----	5	cells/ml		----	25	75	----	----
MW024: Chlorophytes (Green Algae)									
Chlamydomonas spp.	----	5	cells/ml		75	25	25	----	----
Kirchneriella spp.	----	5	cells/ml		----	----	25	----	----
Oocystis spp.	----	5	cells/ml		75	----	----	----	----
Scenedesmus spp.	----	5	cells/ml		450	225	----	----	----
MW024: Chlorophytes (Green Algae) - TOTAL CHLOROPHYTES									
Total Chlorophytes	----	5	cells/ml		600	250	50	----	----
MW024: Cyanophytes (Blue Green Algae)									
Anabaena spp. (straight)	----	5	cells/ml		600	----	----	----	----
Cyanogranis libera	----	5	cells/ml		----	----	375	----	----
Planktolyngbya minor	----	5	cells/ml		----	----	250	----	----
Pseudanabaena spp.	----	5	cells/ml		1550	1080	1250	----	----
Merismopedia spp.	----	5	cells/ml		----	----	200	----	----
Romeria spp.	----	5	cells/ml		----	----	100	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC4	NC4-5	NC5	----	----
				Client sampling date / time	04-Feb-2019 00:00	04-Feb-2019 00:00	04-Feb-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1903393-001	ES1903393-002	ES1903393-003	--------	--------
					Result	Result	Result	----	----
MW024: Cyanophytes (Blue Green Algae) - Continued									
Microcystis spp.	----	5	cells/ml		----	----	175	----	----
Rhabdoderma spp.	----	5	cells/ml		----	----	300	----	----
Synechococcus spp.	----	5	cells/ml		----	250	----	----	----
Geitlerinema spp. (possible PTP)	----	5	cells/ml		225	----	----	----	----
MW024: Cyanophytes (Blue Green Algae) - TOTAL CYANOPHYTES									
Total Cyanophytes	----	5	cells/ml		2380	1330	2650	----	----
MW024: Cyanophytes (Blue Green Algae) - TOTAL POTENTIALLY TOXIC CYANOPHYTES									
Total Potentially Toxic Cyanophytes	----	5	cells/ml		225	<5	<5	----	----
MW024: Flagellates - Cryptophytes									
Chroomonas spp.	----	5	cells/ml		25	----	----	----	----
Cryptomonas spp.	----	5	cells/ml		175	50	25	----	----
MW024: Flagellates - Euglenophytes									
Euglena spp.	----	5	cells/ml		50	25	75	----	----
Strombomonas spp.	----	5	cells/ml		50	----	----	----	----
Trachelomonas spp.	----	5	cells/ml		75	75	----	----	----
MW024: Flagellates - Pyrrophytes									
Peridinium spp.	----	5	cells/ml		5	----	----	----	----
MW024: Flagellates - TOTAL FLAGELLATES									
Total Flagellates	----	5	cells/ml		380	150	100	----	----
MW024T: TOTAL ALGAE									
Total Algae Count	----	5	cells/ml		3360	1760	2880	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	1	%		93.8	81.9	112	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.5	%		70.4	78.8	77.1	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.5	%		100	83.8	106	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		19.6	20.3	25.5	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%		43.3	48.4	60.1	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%		41.7	44.1	64.6	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		65.4	72.6	86.7	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC4	NC4-5	NC5	----	----
				Client sampling date / time	04-Feb-2019 00:00	04-Feb-2019 00:00	04-Feb-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		ES1903393-001	ES1903393-002	ES1903393-003	--------	--------
					Result	Result	Result	----	----
EP075(SIM)T: PAH Surrogates - Continued									
Anthracene-d10	1719-06-8	1.0	%		**91.1**	**95.4**	**88.0**	**----**	**----**
4-Terphenyl-d14	1718-51-0	1.0	%		**74.8**	**76.8**	**85.9**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	29	129
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	67	111
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	67	111
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1913104**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR JACOB BROOM (gmail)	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 01-May-2019 16:50
Order number	:	Date Analysis Commenced	: 02-May-2019
C-O-C number	: ----	Issue Date	: 07-May-2019 21:16
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- EK067FG: It has been noted that Filtered Total P is greater than Total P on sample No 1, however this difference is within the limits of experimental variation.
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC 4	NC 4.5	NC 5	----	----
			Client sampling date / time	01-May-2019 00:00	01-May-2019 00:00	01-May-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	ES1913104-001	ES1913104-002	ES1913104-003	--------	--------
				Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**264**	**299**	**310**	**----**	**----**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	**16**	**7**	**----**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.08**	**0.06**	**0.02**	**----**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	**----**	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.08**	**0.01**	**0.06**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.08**	**0.01**	**0.06**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.4**	**0.6**	**0.5**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.5**	**0.6**	**0.6**	**----**	**----**
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	**0.06**	**0.05**	**0.05**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.04**	**0.08**	**0.09**	**----**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	**----**	**----**
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	**200**	**210**	**190**	**----**	**----**

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1917059**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: Warriwood	Date Samples Received	: 04-Jun-2019 13:55
Order number	: ----	Date Analysis Commenced	: 05-Jun-2019
C-O-C number	: ----	Issue Date	: 11-Jun-2019 17:35
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 4		
No. of samples analysed	: 4		

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Accreditation No. 825
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- Analytical Results

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Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Vyoma Tailor	Microbiologist	Sydney Microbiology, Smithfield, NSW

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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	NC4-u	NC45-u	NC5-ESS-u	NC5-u	----
				Client sampling date / time	04-Jun-2019 00:00	04-Jun-2019 00:00	04-Jun-2019 00:00	04-Jun-2019 00:00	----
Compound	CAS Number	LOR	Unit		ES1917059-001	ES1917059-002	ES1917059-003	ES1917059-004	--------
					Result	Result	Result	Result	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		116	168	262	133	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		10	14	20	22	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.09	0.13	0.13	0.22	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	0.02	0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.30	0.35	0.35	0.36	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.30	0.35	0.37	0.37	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.4	0.5	0.7	0.5	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.7	0.8	1.1	0.9	----
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser									
Filtered Total Phosphorus as P	----	0.01	mg/L		0.06	0.08	0.15	0.12	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.07	0.09	0.16	0.15	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		0.06	0.08	0.14	0.08	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		4500	6400	280	4800	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1917222**	Page	: 1 of 3
Client	: **MARINE POLLUTION RESEARCH PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR PAUL ANINK	Contact	: Customer Services ES
Address	: PO BOX 279 CHURCH POINT SYDNEY NSW 2105	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 9997 6541	Telephone	: +61-2-8784 8555
Project	: Warriewood	Date Samples Received	: 05-Jun-2019 13:15
Order number	:	Date Analysis Commenced	: 06-Jun-2019
C-O-C number	: ----	Issue Date	: 12-Jun-2019 19:27
Sampler	: JACOB BROOM (gmail)		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Tony DeSouza	Senior Microbiologist	Sydney Microbiology, Smithfield, NSW

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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- EK067FG/EK071G: It has been noted that Reactive Phosphorus is greater than Filtered Total Phosphorus on samples 1 & 2, however this difference is within the limits of experimental variation.
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- Membrane filtration results for MW006 No. 4 are reported as an estimate (~) due to the presence of many non-target organism colonies that may have inhibited the growth of the target organisms on the filter membrane. It may be informative to record this fact.
- MW006 is ALS's internal code and is equivalent to AS4276.7.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NC4-D	NC45-D	NC5-ESC-D	NC5-D	----
			Client sampling date / time	05-Jun-2019 00:00	05-Jun-2019 00:00	05-Jun-2019 00:00	05-Jun-2019 00:00	----
Compound	CAS Number	LOR	Unit	ES1917222-001	ES1917222-002	ES1917222-003	ES1917222-004	--------
				Result	Result	Result	Result	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	109	136	196	162	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	10	7	115	55	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.09	0.04	0.06	0.02	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.32	0.22	0.54	0.26	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.32	0.22	0.55	0.26	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.1	0.3	1.0	0.5	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	0.4	0.5	1.6	0.8	----
EK067FG: Filtered Total Phosphorus as P by Discrete Analyser								
Filtered Total Phosphorus as P	----	0.01	mg/L	0.08	0.04	0.15	0.10	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.25	0.08	0.28	0.18	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.09	0.06	0.10	0.07	----
MW006: Faecal Coliforms & E.coli by MF								
Faecal Coliforms	----	1	CFU/100mL	6600	2000	2700	~4600	----

APPENDIX C

PROPOSED DEVELOPMENT

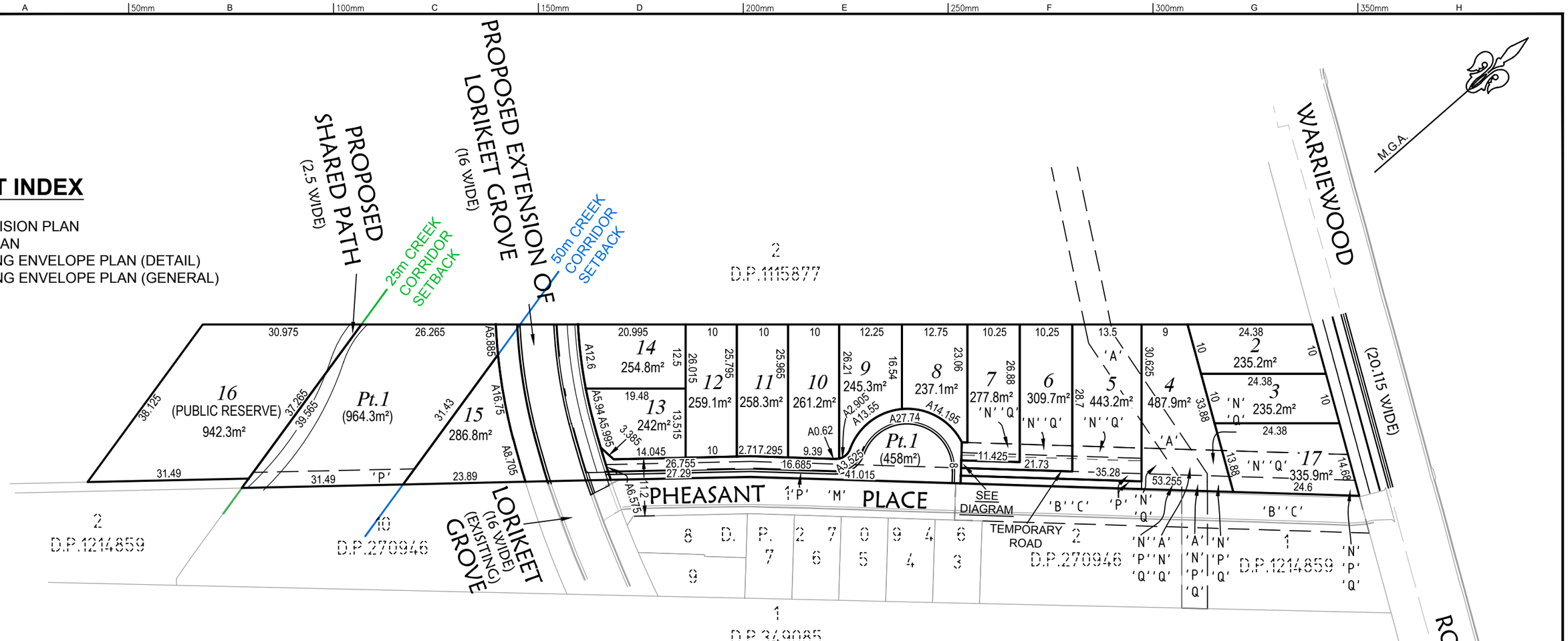
AT

53B WARRIEWOOD ROAD

WARRIEWOOD VALLEY

A3

SHEET INDEX



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'R' - PROPOSED RIGHT OF ACCESS 6.5 WIDE

NOTE:

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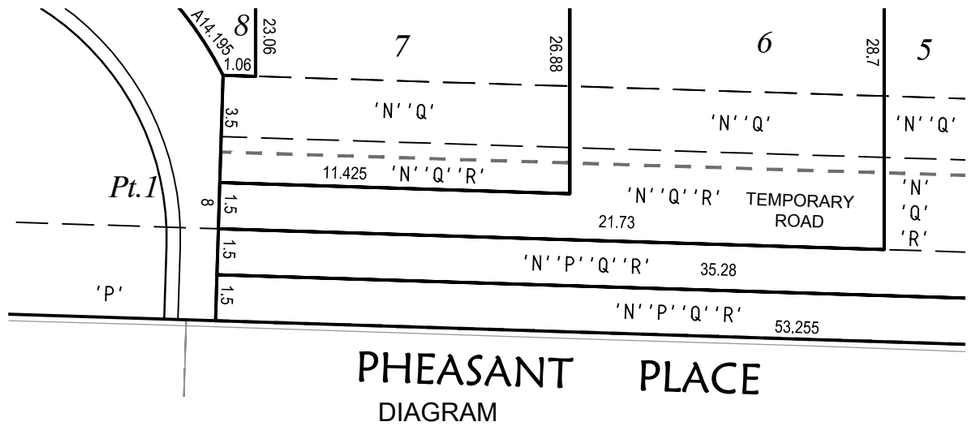

DIAGRAM
SCALE 1:200

30 20 10 0 25 50
1:800 @ A3

PLAN AFTER ACQUISITION OF LOT 3 D.P.942319

ISSUE FOR DA

AMEND. No.:	DATE:	DETAILS:
09	24/06/2019	LOT LAYOUT AND BEP UPDATED (LOTS 2, 3 & 17)

DIAL 1100 BEFORE YOU DIG

APPROVED COMPANY AS/NZS 4801 OH&S Management System QMS
APPROVED COMPANY ISO 14001 Environmental Management System QMS
APPROVED COMPANY ISO 9001 Quality Management Systems QMS

Project:
PLAN OF SUBDIVISION
OVER PART LOT 3 D.P.942319 & LOT 3 D.P.1115877
53A & 53B WARRIEWOOD ROAD, WARRIEWOOD

Principal: LEGENDWAY PTY LTD

Scale	Date	Council Ref.
1:800	15/01/2019	
	Datum A.H.D.	L.G.A. NORTHERN BEACHES
Calc's N.G.	Drawn. S.E.	Proj.Man. J.B.	Client Ref:

CRAIG & RHODES TAKE THE LEAD
ABN 77 050 209 991 ACN 050 209 991
Suite 701, Level 7, 3 Rider Boulevard,
Rhodes, NSW, 2138
PO Box 3220, Rhodes NSW 2138
Tel. 9869-1855
reception@crhodes.com.au
www.craigandrhodes.com.au

Our Ref. 076-18

Dwg File Ref. [Rev] - Sheet Ref.
076-18P DA01 [09]
- 01 Subdivision Plan

CAD REF.: Z:\076-18\PLANNING\DA\SUBDIVISION PLAN\076-18P DA01[09].DWG - 01 Subdivision Plan - N.G. - S.E. - J.B. - DATE PRINTED: 24/06/2019 3:10:51 PM

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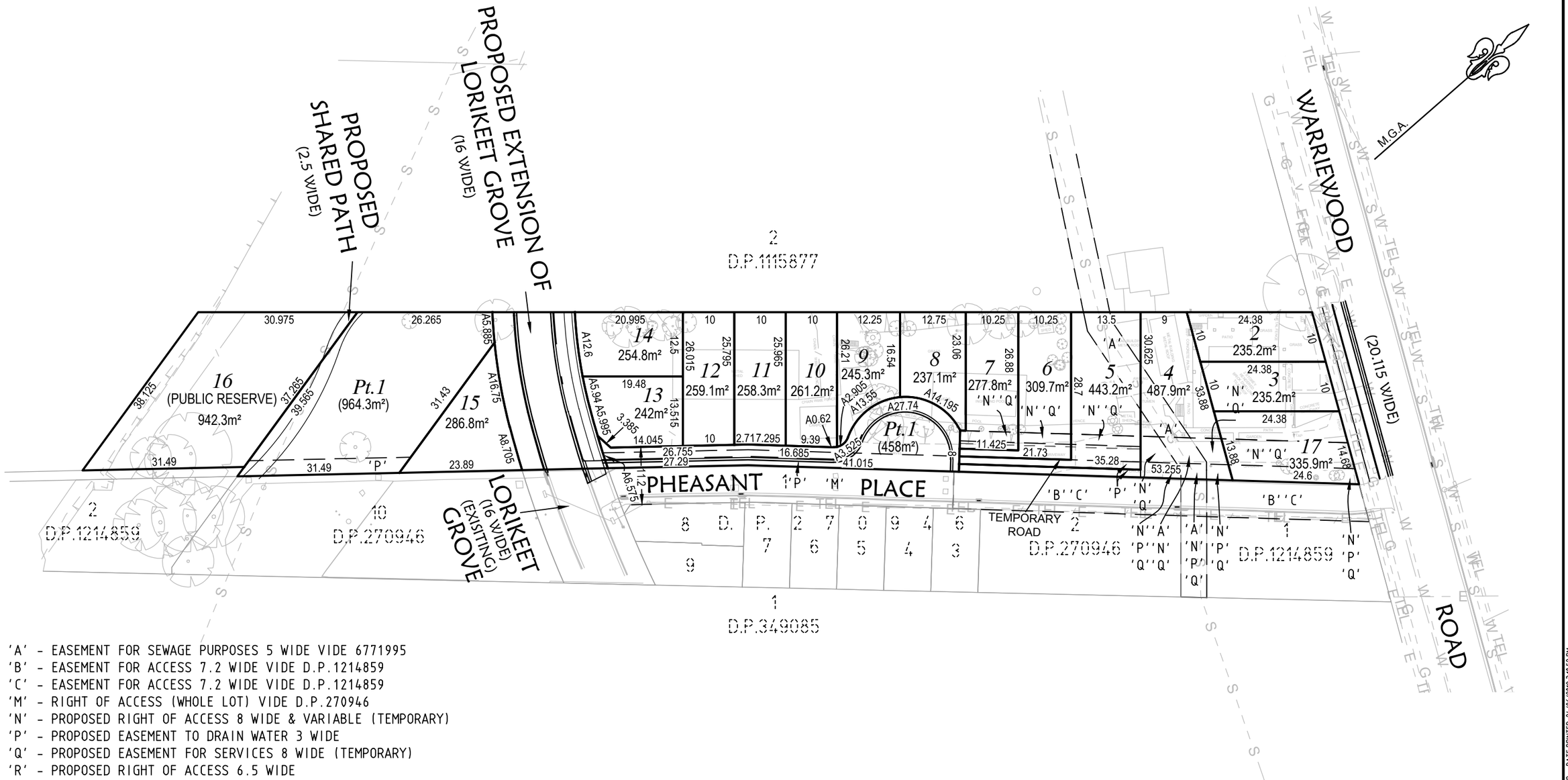

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NOTE:

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30 20 10 0 25 50
1:800 @ A3

ISSUE FOR DA

AMEND. No.: 09 DATE: 24/06/2019 DETAILS: LOT LAYOUT AND BEP UPDATED (LOTS 2, 3 & 17)

DIAL 1100 BEFORE YOU DIG

APPROVED COMPANY AS/NZS 4801 OH&S Management System QMS

APPROVED COMPANY ISO 14001 Environmental Management System QMS

APPROVED COMPANY ISO 9001 Quality Management Systems QMS

Project:
SITE PLAN
OVER PART LOT 3 D.P.942319 & LOT 3 D.P.1115877
53A & 53B WARRIEWOOD ROAD, WARRIEWOOD

Principal: LEGENDWAY PTY LTD

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1:800	15/01/2019	
	Datum A.H.D.	L.G.A. NORTHERN BEACHES

Calc's	Drawn.	Proj.Man.	Client Ref:
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Dwg File Ref. [Rev] - Sheet Ref.
076-18P DA01 [09]
- 02 Site Plan

CAD REF.: Z:\076-18P\PLANNING\DA\SUBDIVISON PLAN\076-18P DA01 [09].DWG - 02 Site Plan - N.G. - S.E. - J.B. - DATE PRINTED: 24/06/2019 3:10:52 PM

A3

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M.G.A.

2
D.P.1115877

WARRIEWOOD ROAD (20.115 WIDE)

PHEASANT 1 'M' PLACE

PROPOSED EXTENSION OF LORIKEET ROAD (16 WIDE)

Pt.1 (964.3m²)

15 286.8m²

10
D.P.270946

Pt.1 458m²

14 254.8m² | 13 242m² | 12 259.1m² | 11 258.3m² | 10 261.2m² | 9 245.3m² | 8 237.1m² | 7 277.8m² | 6 309.7m² | 5 443.2m² | 4 487.9m² | 3 235.2m² | 2 235.2m² | 17 335.9m²

LEGEND

- PRINCIPAL PRIVATE OPEN SPACE
- ARTICULATION ZONE
- PRIVATE OPEN SPACE
- PREFERRED GARAGE LOCATION
- SINGLE STOREY BUILDING
- 2 STOREY BUILDING
- DRIVEWAY

10 8 6 4 2 0 10 20
1:400 @ A3

ISSUE FOR DA

AMEND. No.: 09 DATE: 24/06/2019 DETAILS: LOT LAYOUT AND BEP UPDATED (LOTS 2, 3 & 17)

DIAL 1100 BEFORE YOU DIG

APPROVED COMPANY AS/NZS 4801 OH&S Management System QMS
APPROVED COMPANY ISO 14001 Environmental Management System QMS
APPROVED COMPANY ISO 9001 Quality Management Systems QMS

Project:
BUILDING ENVELOPE PLAN DETAIL
OVER LOT 3 D.P.1115877 & PART LOT 3 D.P.942319
53A & 53B WARRIEWOOD ROAD, WARRIEWOOD

Principal: LEGENDWAY PTY LTD

Scale	Date	Council Ref.
1:400	15/01/2019	
	Datum A.H.D.	L.G.A. NORTHERN BEACHES

Calc's	Drawn.	Proj.Man.	Client Ref:
N.G.	S.E.	J.B.	

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076-18P DA01 [09]
- 03 BEP

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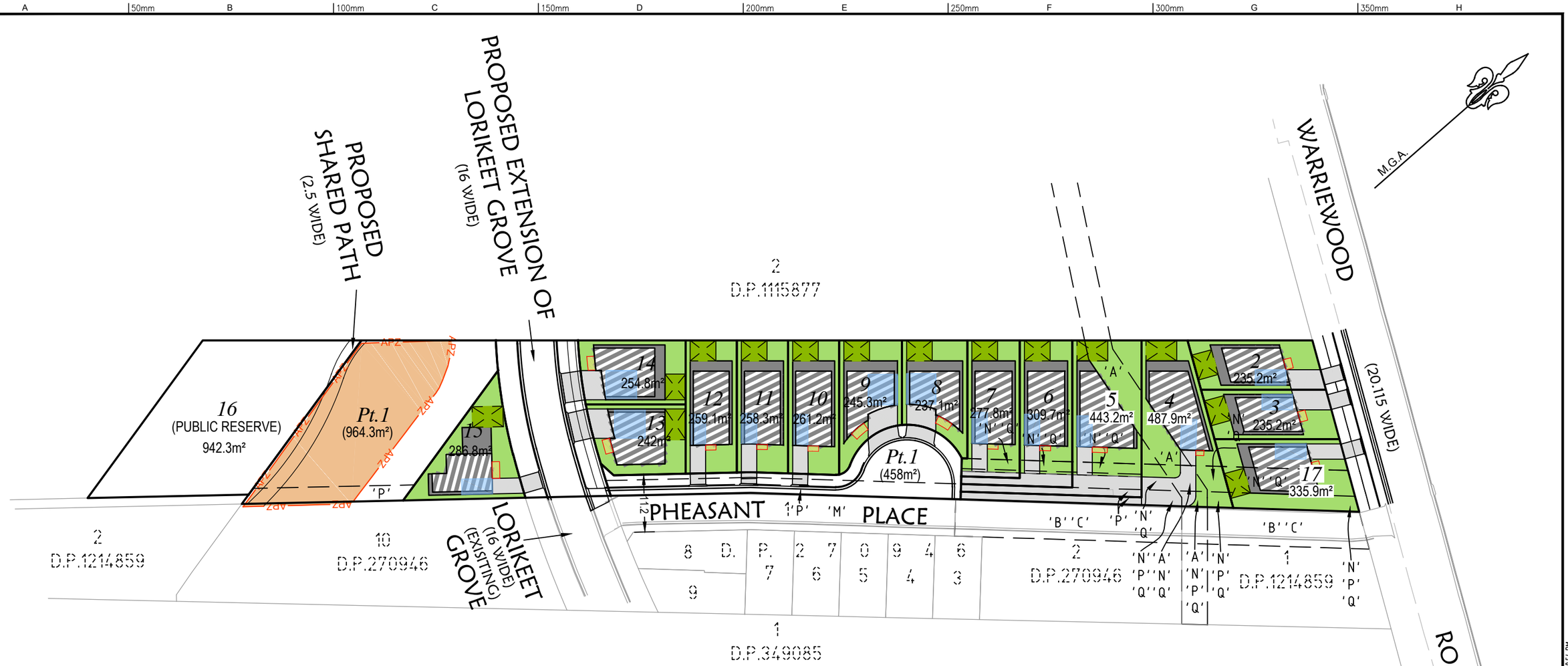

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LEGEND

- PRINCIPAL PRIVATE OPEN SPACE
- ARTICULATION ZONE
- PRIVATE OPEN SPACE
- PREFERRED GARAGE LOCATION
- SINGLE STOREY BUILDING
- 2 STOREY BUILDING
- DRIVEWAY
- ASSET PROTECTION ZONE (DETERMINED BY BUSHFIRE PROTECTION ASSESSMENT PREPARED BY ECOLOGICAL AUSTRALIA, DATED 06/03/2019)

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30 20 10 0 25 50

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