



**Cardno
Forbes Rigby**

Shaping the Future



Vincentia Coastal Village and District Centre
First Bi-Annual Construction Phase
Water Quality Monitoring Report

May 2008

Stockland Development Pty Ltd

Cardno Forbes Rigby Reference 104016-10 Report 001 Rev 0



CARDNO FORBES RIGBY PTY LTD

**First Bi-Annual Construction Phase
Water Quality Monitoring Report**

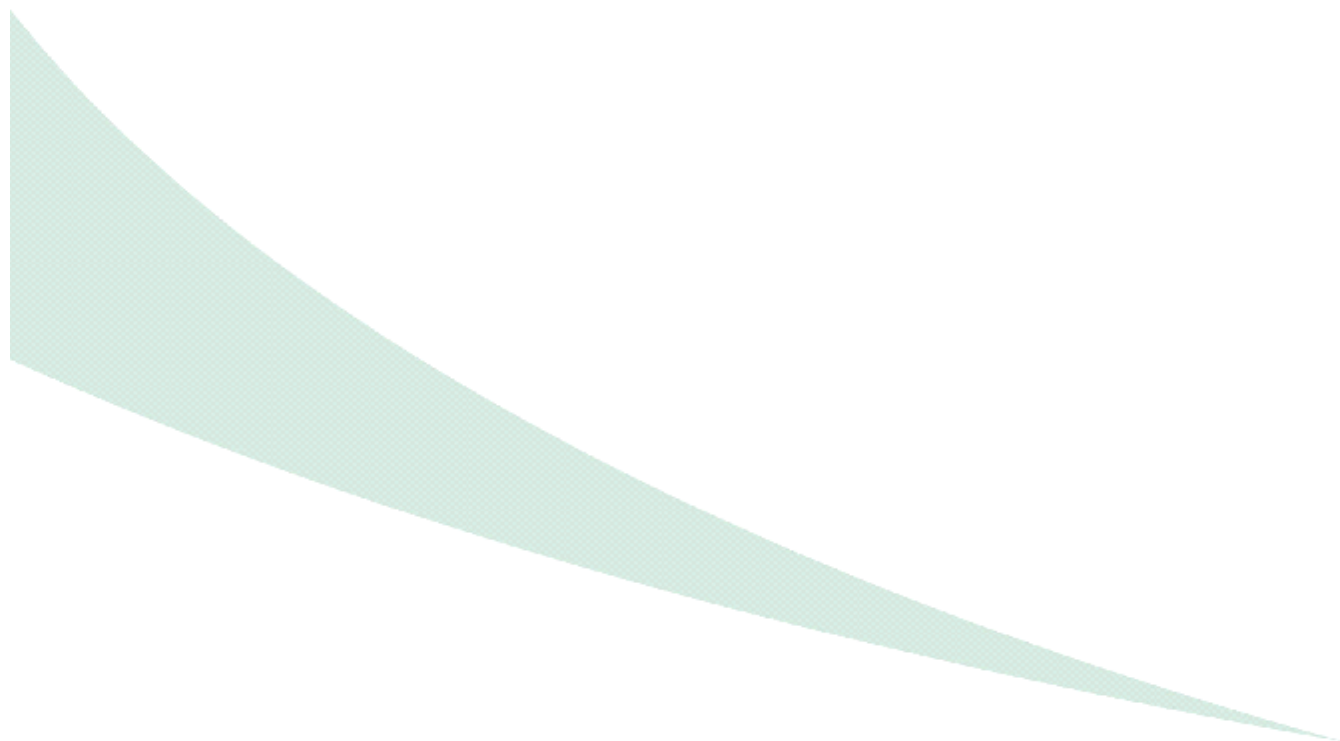
Report 001 Rev 0

First Biannual Report
May 2008



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1. INTRODUCTION

1.1. BACKGROUND

Commitment number 73 in Department of Planning's statement of commitments, relating to the development of the site, calls for an environmental monitoring program to be put in place prior to the commencement of development and to be continued for three years during the commissioning phase. The commitment states:

Stockland will undertake a water quality monitoring program in accord with the Water Quality Monitoring Plan to measure performance of WSUD measures against ANZECC Guidelines throughout the development and for a period of three years following the registration of the final subdivision plan for the final stage that drains into the monitoring location.

CFR has already developed the Water Quality Monitoring Plan, and as of January 2008 have commenced on the implementation of the biannual monitoring and reporting of results and observations. The implementation of the Plan involves sample collection, chemical analysis of collected samples and interpretation of data, and preparation of a report on the findings. CFR will also be responsible for the issue of the report to all stakeholders of the project.

The program is structured as follows:

1. Baseline monitoring of water quality prior to development of the site
2. Monitoring of water quality during the development phase
3. Post-development monitoring.

This report is the first biannual reports for sample for sampling conducted in accord with the Water Quality Monitoring Plan called for Commitment number 73 (CFR 2007).

1.2. SAMPLING CAMPAIGNS CONDUCTED

Two sampling campaigns are covered by this report:

- A scheduled (dry weather) surface water monitoring campaign conducted on 8 November 2007. This campaign is referred to as Campaign number 9.
- An unscheduled (wet weather) surface water monitoring campaign conducted on 5 February 2008. This campaign is referred to as Campaign number 10.

Note Campaign numbers 1 – 8 were the baseline monitoring conducted over the period October 2004 to July 2006.

1.3. MONITORING PARAMETERS

The Water Quality Monitoring Plan recommends that the following parameters be measured for each biannual campaign:

- pH
- Electrical conductivity (EC)
- Total suspended solids (TSS)
- Ammonia nitrogen (NH₃-N)
- Total oxidized nitrogen comprising nitrate and nitrite forms (NO_x-N)
- Total Kjeldahl nitrogen (TKN) comprising organic nitrogen (Org-N) and ammonia nitrogen (NH₃-N) forms
- Total phosphorus (TP)
- Reactive phosphorus (RP)
- Oil and grease (O & G)
- Faecal coliforms.

The rationale for this parameter selection has been outlined in the accompanying water quality monitoring plan. Briefly, the nitrogen (organic, ammonia and nitrite / nitrate forms) and phosphorus concentrations are used as indicators of pollutants arising from human activities and their sources can be both animal and plant forms. The extent of pollution by human activities is gauged by comparisons with ANZECC/ARMCANZ (2000)¹ trigger values for national water quality management strategy. Oil and grease pollutants also arise from human activities predominantly from road-runoffs, and they provide a good indicator for pollution caused by vehicular use, construction plant and equipment on and near the Vincentia site.

1.4. SAMPLING LOCATIONS

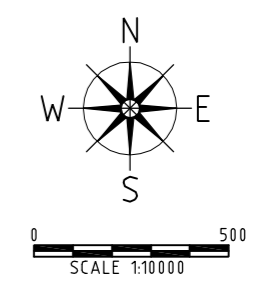
For Campaign 9 sampling was conducted at six of the (ultimate) ten sites identified in the Water Quality Management Plan in line with the extent of construction works underway at the time the sampling was carried out. The ten sites are marked in Figure 1, and the overall Village Central Catchment is shown in **Appendix A**. The six sites sampled were SW2, SW2A, SW4, SW5, MW1 and MW3. A subset of these sites (SW2, SW2A, SW5) were also sampled following heavy rainfall in February (Campaign number 10,) While to date only a maximum of six sites have been sampled in any one campaign, all 10 sites shown in Figure 1 (and listed below) will be sampled in future campaigns.

Note the sites include both up-stream and down-stream sites. The rationale for the site selection is provided in the Plan.



SURFACE WATER QUALITY SAMPLING LOCATIONS

VINCENTIA COASTAL VILLAGE and DISTRICT CENTRE



LEGEND

- EXISTING SURFACE WATER QUALITY MONITORING SAMPLE POINTS TO BE RETAINED
- PREVIOUS SURFACE WATER QUALITY MONITORING SAMPLE POINTS (TO BE NO LONGER SAMPLED)
- NEW SURFACE WATER QUALITY MONITORING SAMPLE POINTS (APPROX. LOC'N)
- CURRENT BOREHOLES FOR GROUNDWATER MONITORING

FIGURE 1.2



Map Produced by Cardno Forbes Rigby
 Date: 09 November 2007
 Coordinate System: MGA/GDA 94
 PLAN MAP REFERENCE:
 104016-10 SK01 Water Quality Monitoring Locations.dwg

2. MONITORING RESULTS

Section 2.1 provides a brief description of conditions prevailing at the Vincentia site during the campaigns, while **Section 2.2** provides the chemical analysis results of the samples collected from SW2, SW2A, SW4, SW5, MW1 and MW3 sites (campaign 9) and from SW2, SW2A, and SW5 sites.

2.1. SITE CONDITIONS DURING SAMPLING CAMPAIGN

Table 1 provides rainfall data during sampling campaigns 9 and 10. Rainfall measured in the period 24 hours prior to the sampling as well as 7 days leading up to the sampling campaign are included in Table 1.

Table 1 – Surface Water Monitoring Campaigns Conducted by CFR

Campaign No.	Date	Wet or Dry campaign	Flow	Antecedent Rainfall (mm) [*] (24 hrs)	Antecedent Rainfall (mm) [*] (7 Days)
9	8 November 2007	Dry	Yes	6.8	73
10	05 February 2008	Wet	Yes	82.8	150.0

*Jervis Bay Weather Station (Pt Perpendicular Lighthouse)

2.2. CHEMICAL ANALYSIS OF SURFACE WATER SAMPLES

Table 2 summarises the chemical analysis data of samples collected for campaigns 9 and 10.

Table 2 – Summary of Laboratory Results Water Quality Monitoring^[d]

pH								
Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3
9	8-Nov-07	0.01	6.61	5.90	5.33	5.68	6.18	5.82
10	05-Feb-08	0.01	6.22	5.96	-	5.55	-	-

Electrical Conductivity (mS/cm)

Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3
9	8-Nov-07	1	429	480	226	303	79	19400
10	05-Feb-08	1	140	170	-	80	-	-

Total Suspended Solids (mg/L)

NSW EPA Trigger Value = 50 mg/L

Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3
9	8-Nov-07	1	115 ^[d]	176 ^[d]	32	29	8	17
10	05-Feb-08	1	20	22	_ ^[c]	19	_ ^[c]	_ ^[c]

N as Ammonia (mg/L)

ANZECC Trigger Value^[a] = 0.02 mg/L

Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3
9	8-Nov-07	0.01	0.03 ^[d]	0.04 ^[d]	0.01	0.03 ^[d]	0.01	0.02
10	05-Feb-08	0.01	0.02	0.03 ^[d]	_ ^[c]	0.02	_ ^[c]	_ ^[c]

N as Nitrate & Nitrite (mg/L)

ANZECC Trigger Value^[a] = 0.04 mg/L

Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3
9	8-Nov-07	0.010	1.190 ^[d]	0.151 ^[d]	0.019	0.044 ^[d]	0.118 ^[d]	0.011
10	05-Feb-08	0.010	0.010	0.010	_ ^[c]	0.010	_ ^[c]	_ ^[c]

N as TKN (mg/L)

ANZECC Trigger Value^[a] = 0.5 mg/L

Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3
9	8-Nov-07	0.10	1.00	0.80	0.60	2.30	0.40	0.50
10	05-Feb-08	0.10	1.30	1.70	_ ^[c]	0.05	_ ^[c]	_ ^[c]

N as Org N (mg/L)

Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3
9	8-Nov-07	0.01	0.97	0.76	0.59	2.27	0.39	0.48
10	05-Feb-08	0.01	1.28	1.67	-	0.03	-	-

P as Total Phosphorus (mg/L)

ANZECC Trigger Value^[a] = 0.05 mg/L

Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3
9	8-Nov-07	0.010	0.010	0.040	0.010	0.090 ^[d]	0.040	0.010
10	05-Feb-08	0.010	0.010	0.020	_ ^[c]	0.010	_ ^[c]	_ ^[c]

P as Reactive Phosphorus (mg/L)									ANZECC Trigger Value ^[a] = 0.02 mg/L
Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3	
9	8-Nov-07	0.010	0.010	0.029	0.010	0.026^[d]	0.010	0.010	
10	05-Feb-08	0.010	0.010	0.010	_ ^[c]	0.010	_ ^[c]	_ ^[c]	

Oil & Grease (mg/L)								
Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3
9	8-Nov-07	5.0	2.5	2.5	2.5	6.0	2.5	2.5
10	05-Feb-08	5.0	15.0	2.5	_ ^[c]	2.5	_ ^[c]	_ ^[c]

Faecal Coliforms (CFU/100mL)									ANZECC Trigger Value ^[b] = 1000 CFU/100mL
Campaign #	Date	LOR	SW2	SW2A	SW4	SW5	MCW1	MCW3	
9	8-Nov-07	1	2700^[d]	1500^[d]	1900^[d]	340	7000^[d]	150	
10	05-Feb-08	1	3000^[d]	2500^[d]	_ ^[c]	1400^[d]	_ ^[c]	_ ^[c]	

^[a] Trigger Values for physical and chemical stressors SE Australia in lowland rivers.

^[b] Trigger Value for secondary contact in recreational waters.

^[c] Not monitored

^[d] Bold values exceed Trigger Values for physical and chemical stressors SE Australia in lowland rivers.

3. DISCUSSIONS

Campaign 9 was essentially a 'dry weather' campaign, with approximately 7 mm of rain having fallen in the 24 hrs prior to sampling, and 73 mm in the 7 days leading to the campaign. There were generally no measurable flows observed in the watercourses, and as such samples were taken from pools fed by trickle flows. Campaign 10 was a 'wet weather' campaign and was conducted following ~83 mm of rainfall over a 24 hour period, and there was a total of 150 mm of rainfall in the 7 days preceding the sampling campaign.

3.1. pH AND SALINITY

The pH values for the sites range from 5.3 (SW4) to 6.6 (SW2) and with the exception of site SW2 the values fall in the slightly acidic range. Measured electrical conductivity values are low for majority of sites (<500 $\mu\text{S}/\text{cm}$) but site MCW3 site exhibited an anomalously high value at 19400 $\mu\text{S}/\text{cm}$, suggesting a high concentration of dissolved ions at this site.

3.2. TOTAL SUSPENDED SOLIDS

The total suspended solids for sites SW4, SW5, MCW1 and MCW3 were well below the ANZECC trigger value of 50 mg/L for both campaigns 9 and 10. However, the SW2 and SW2A sites recorded values higher than the trigger value in campaign 9. This was an unexpected finding as the rainfall preceding the sampling campaign was quite low. The values for the wet campaign 10 three months later showed the values had decreased by factors of 5-8, and well below the trigger value. From this, we conclude that the campaign 9 results for SW2 and SW2A sites were anomalous and specific to that campaign only. We believe the high levels observed may be due to surface run-off from the adjacent road.

The low concentration at MCW1 site (<10 mg/L) reflects the generally lower pollutant loadings of this parameter resulting from sealed or well vegetated surfaces from the nearby established residential catchment, which comprises relatively new residential development.

The observed values are consistent with mean values for these sites obtained over 8 campaigns conducted between October 2004 and July 2006. (see Appendix B).

3.3. AMMONIA NITROGEN

Ammonia nitrogen concentrations in some cases have exceeded the ANZECC trigger value of 0.02 mg/L in both campaigns 9 and 10, by a factor of 2 in the case of SW2A in Campaign 9. However, in the case of SW2 and SW5 sites in Campaign 9, and SW2A in Campaign 10 the value of 0.03 mg/L is acceptable, if we take into account that the uncertainty associated with the experimental results correspond to the systematic error in the measurements which in this case is the ± 0.01 mg/L (=LOR). Hence, we conclude that the observed values comply with the ANZECC trigger value for this parameter.

It should be noted that the very low values observed for MCW1 and MCW3 reflects the effectiveness of the Eastern Moona Moona Creek Wetland in nutrient stripping, as these sites being adjacent to well-established residential developments are otherwise expected to have higher ammonia concentrations.

It should also be noted that the ammonia concentration values in these two campaigns remain unchanged from baseline campaigns 1 to 8 (see Appendix B).

3.4. OXIDIZED NITROGEN SPECIES

For sites SW4, SW5 and MCW3 sites the NO_x-N concentrations at, respectively, 0.019, 0.044 and 0.011 mg/L are at or below the ANZECC trigger value set at 0.04 mg/L. At other sites the trigger value is exceeded by factors ranging from ~3-4 (SW2A and MCW1) to as high as ~30 measured at the SW2 site.

The high concentration measured at SW2 site is a matter of concern. Note however the 10-fold reduction in the NO_x-N concentration in going from the upstream SW2 site to the downstream SW2A site, confirms the effectiveness of the constructed wetland between the two sites in removing the nitrogen containing species. Note also that the wet campaign results for SW2, SW2A and SW5 sites are all well below the ANZECC trigger value for this parameter.

We note that, like the ammonia nitrogen concentrations, the NO_x-N concentration range reported here for these sites are consistent with values previously obtained in the baseline monitoring campaign noted above, and data for which are reproduced in Appendix B.

3.5. TOTAL PHOSPHORUS AND REACTIVE PHOSPHORUS

The total phosphorus concentration is a sum of all forms of phosphorus present in the aqueous media being monitored including PO₄³⁻ (aq), H₂PO₄⁻ (aq) HPO₄²⁻ (aq), organically- and inorganically-bound PO₄³⁻ species etc). Dissolved reactive phosphorus (PO₄³⁻ (aq)) is that portion of total phosphorus that is readily available for algal and other plant growth and can make up typically about 10-30% of total phosphorus concentration.

From Table 2, we see that except for the SW5 site, where the total phosphorus concentration was measured to be 0.09 mg/L, this parameter at all other sites were recorded to be below the ANZECC trigger value set at 0.05 mg/L. Accordingly, a high value was recorded for the reactive phosphorus at this site, being 0.026 mg/L slightly higher than the ANZECC trigger value set for reactive phosphorus at 0.02 mg/L. Surprisingly the highest value for reactive phosphorus was recorded for the SW2A site which at 0.029 mg/L constituted >70% of the total phosphorus measured at that site at 0.04 mg/L.

Compared to the mean total and reactive phosphorus concentrations observed in the baseline monitoring campaigns the values obtained in campaigns are not too different, suggesting that the concentrations of these species have remained reasonably constant over a number of years.

3.6. OIL AND GREASE

Most sites recorded oil and grease concentrations below the limit of reading for both Campaigns 9 and 10, which is surprising given the urban nature of the development.

Only site SW5 recorded a concentration typical for urban areas (8 mg/L) in Campaign 9. Site SW2 in Campaign 10 recorded a significantly higher value at 15 mg/L, even higher than the

SW5 site, probably due the road runoff from the adjacent road especially after the heavy rainfall experienced in the area prior to this campaign.

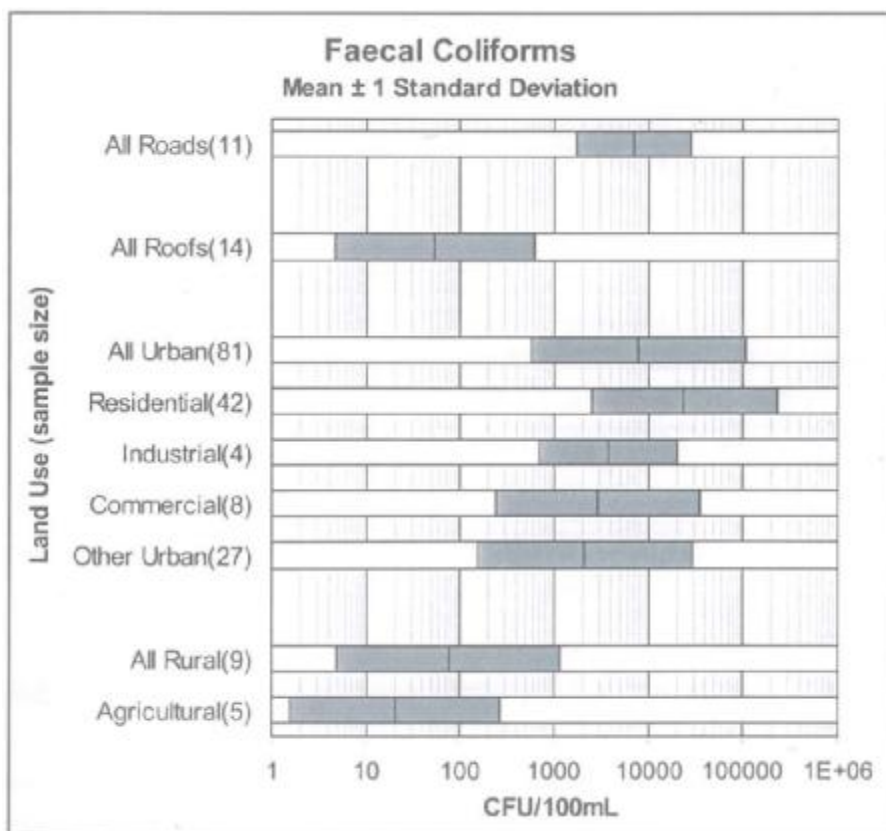
Similar to the results presented in this report, mean oil and grease concentrations for these sites in campaigns 1-8 of the baseline monitoring program also fell in ranges that did not exhibit any particular trends, and we postulate that the varied concentrations observed are a consequence of a balance between the amount of oil and grease introduced into the surface site from road run-off at any one time and the amount removed from the water by wetlands.

3.7. FAECAL COLIFORMS

Except for SW5 and MCW3 sites, faecal coliform monitored at all other sites in Campaign 9 recorded concentrations well above the ANZECC trigger value set at 1000 CFU/100 mL, ranging from a value of 1500 CFU/100 mL at site SW2A to 7000 CFU/100 mL at MCW1 site. During the wet weather Campaign 10 all sites monitored recorded faecal coliform concentrations higher than 1000 CFU/100 mL. These values are similar to the wide-ranging values obtained in Campaigns 5 – 8 conducted in the period November 2005 to July 2006 (see Appendix B).

It should be noted that the high concentrations recorded for the majority of the sites are comparable to the mean concentrations determined in stormwater from similar land uses, as shown below in Figure 2

Figure 2 – Faecal Coliform Concentration versus Land Use



Source: Australian Runoff Quality, Engineers Australia (2005)

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. CONCLUSIONS

Conclusions drawn from the results presented in Table 2 and comparisons made against the ANZECC trigger values and mean values from previous 1- 8 baseline monitoring campaigns conducted at the site are as follows:

- Total suspended solids are generally low and for majority of the sites are well below the ANZECC trigger value
- Ammonia nitrogen values do not exceed the trigger values for physical and chemical stressors in SE Australia in lowland rivers, which is different from results obtained in baseline monitoring Campaigns 1-8 where the trigger value was exceeded in almost all cases
- The NO_x-N concentrations in the dry campaign 9 exceed the ANZECC trigger values at the majority of the sites, and these values were observed to be greatly reduced at sites monitored during the wet Campaign 10, which it is assumed is the direct result of movement of surface water and its dissolved nutrients in the general downstream direction
- The total and reactive phosphorus values for the majority of cases are below the ANZECC trigger value and consistent with the almost constant values obtained for each site over the last 10 campaigns conducted to date at the Vincentia site
- Concentrations of oil and grease are generally low and only in one case does it exceed the trigger value due to the heavy rainfall and accompanying road run-off
- Faecal coliform trigger value is exceeded in majority of the sites similar to the observations made in the baseline monitoring campaigns and these high values are consistent with those observed in stormwater from comparable land use practices.

The overall water quality results from Campaigns 9 and 10 are analogous to mildly polluted stormwater runoff when compared to published event mean concentrations for mixed rural and urban catchments. However, no general trends or evidence of continual pollution can be deduced from these results and / or results from the baseline monitoring campaigns. Furthermore, the sampling campaigns have not yielded any evidence that the activities of the development are contributing to the mildly polluted nature of the water. The slight pollution observed is a result of the activities of the Vincentia area in general and the surrounding areas.

4.2. RECOMMENDATIONS

It is recommended that:

- Water quality monitoring be continued biannually at the Vincentia site in accord with the Water Quality Monitoring Plan
- The ground water sites be sampled as outlined in Section 2.6 of the Plan
- The next campaign be conducted in June 2008 and this campaign to include the ground water sampling noted above
- The parameters monitored for this report continue to be monitored for future campaigns so that any trends in concentration changes can be deduced, and in the case of a rapid concentration increase of any one parameter mitigation and management measures be deployed to control the increase so that ANZECC trigger values are not exceeded.

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REFERENCES

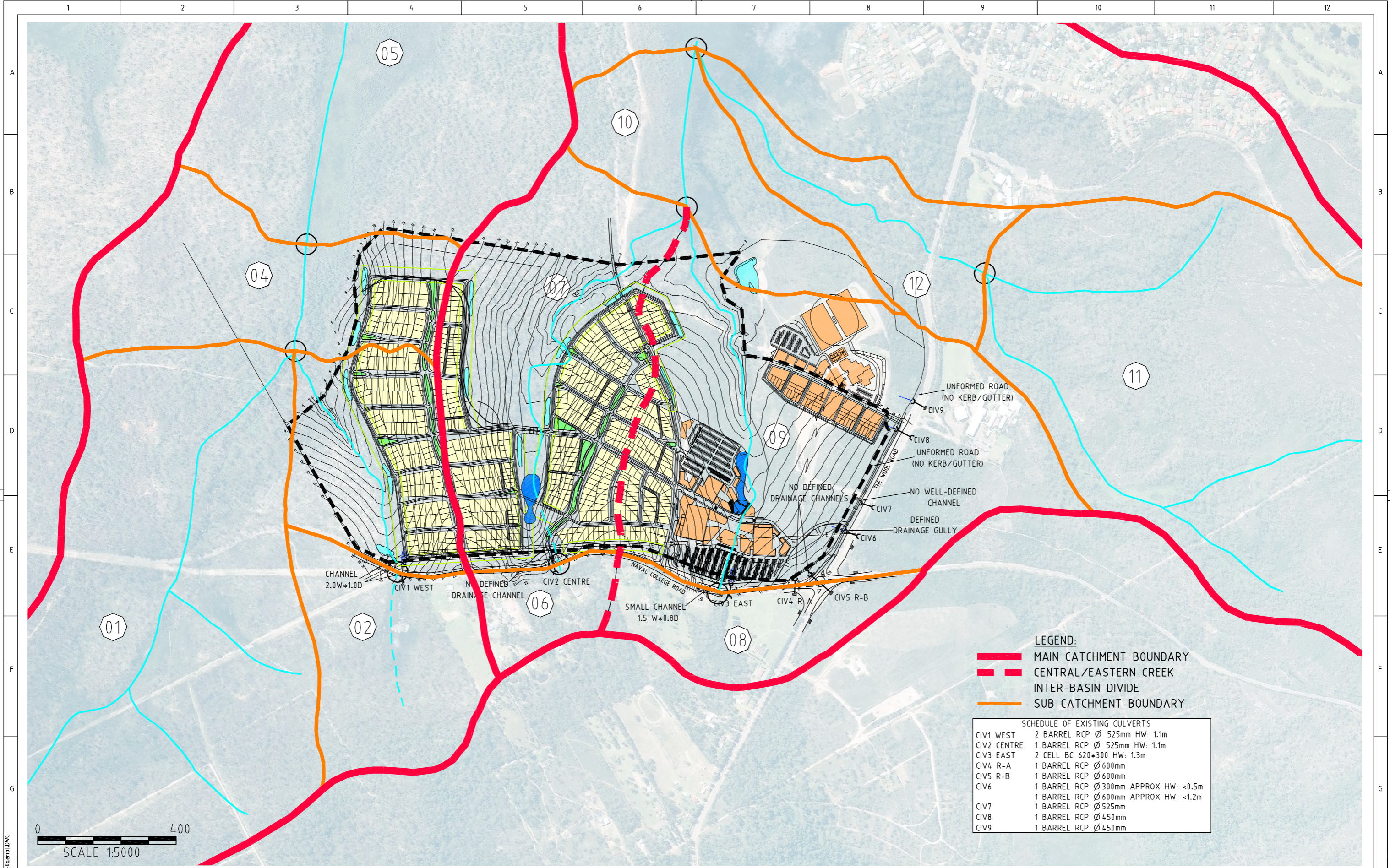
- ¹ ANZECC/ARMCANZ (2000) National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volume 1. The Guidelines (Chapters 1-8). Australia and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

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**VINCENTIA
CATCHMENT PLAN**

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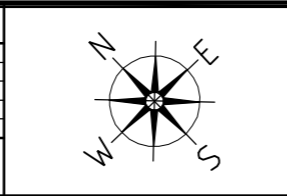
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PROJECT TITLE
 VINCENTIA COASTAL VILLAGE
 & DISTRICT CENTRE
 for
 STOCKLAND DEVELOPMENTS PTY LT

DRAWING TITLE			
HYDROLOGIC CATCHMENT PLAN			
Project No.	Com No.	Drawing No.	REV
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B

**WATER QUALITY DATA
BASELINE CAMPAIGNS
1-8**

The following table has been reproduced from Report 004 (Baseline Surface Water Quality Monitoring Program 2003 - 2006, Vincentia Coastal Village and District Centre) prepared for Stockland Development Pty Ltd in October 2006 by Cardno Rigby Forbes (CFR Ref 104016-03 Report 004 Rev 1).

TSS (mg/L)		NSW EPA Trigger Value = 50 mg/L								
Campaign #	Date	LOR	SW1	SW2	SW3	SW4	SW5	MCW1	MCW2	MCW3
1	18-Oct-04	1	55	108	15	16	13			
2	21-Oct-04	1	12	52	14	16	18			
3	14-Dec-04	1	7	6	19	2	8			
4	21-Jan-05	1	6	22	16	31	250			
5	28-Nov-05	1	9	11	23	62	28	2	10	11
6	16-Mar-06	1	200					6	58	32
7	31-May-06	1	14	90	6	37	124	6	10	36
8	27-Jul-06	1	2	22	3	1	3	6	1	2
Mean			38	44	14	24	63	5	20	20

Ammonia as N (mg/L)		ANZECC Trigger Value ^[a] = 0.02								
Campaign #	Date	LOR	SW1	SW2	SW3	SW4	SW5	MCW1	MCW2	MCW3
1	18-Oct-04	0.01	0.51	0.09	0.13	0.10	0.41			
2	21-Oct-04	0.01	0.03	0.05	0.07	0.08	0.04			
3	14-Dec-04	0.01	0.06	0.05	0.05	0.04	0.05			
4 ^[c]	21-Jan-05	0.01								
5	28-Nov-05	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01
6	16-Mar-06	0.01	0.28					0.04	0.07	0.04
7	31-May-06	0.01	0.02	0.01	0.01	0.01	0.01	0.08	0.01	0.02
8	27-Jul-06	0.01	0.01	0.01	0.01	0.01	0.99	0.41	0.05	0.01
Mean			0.13	0.03	0.04	0.03	0.22	0.13	0.03	0.02

Nitrate & Nitrite as N (mg/L)		ANZECC Trigger Value ^[a] = 0.04								
Campaign #	Date	LOR	SW1	SW2	SW3	SW4	SW5	MCW1	MCW2	MCW3
1	18-Oct-04	0.01	0.26	0.09	0.32	0.06	0.03			
2	21-Oct-04	0.01	0.01	0.01	0.01	0.03	0.04			
3	14-Dec-04	0.01	0.01	0.01	0.06	0.01	0.02			
4	21-Jan-05	0.01	0.01	0.01	0.01	0.02	0.01			
5	28-Nov-05	0.01	0.01	0.01	0.02	0.01	0.01	0.12	0.06	0.01
6	16-Mar-06	0.01	0.01					0.61	0.01	0.03
7	31-May-06	0.01	0.04	0.04	0.04	0.01	0.03	1.39	0.81	0.02
8	27-Jul-06	0.01	0.01	0.06	0.12	0.01	0.02	0.21	0.09	0.01
Mean			0.04	0.03	0.08	0.02	0.02	0.58	0.24	0.01

TKN as N (mg/L)										
Campaign #	Date	LOR	SW1	SW2	SW3	SW4	SW5	MCW1	MCW2	MCW3
1	18-Oct-04	0.1	1.5	0.8	0.9	1.7	1.7			
2	21-Oct-04	0.1	0.7	1.2	1.1	0.7	0.8			
3	14-Dec-04	0.1	0.9	0.7	1.1	0.5	1.3			
4	21-Jan-05	0.1	1.3	1.6	1.4	1.2	0.7			
5	28-Nov-05	0.1	1.1	1.1	0.9	0.9	1.8	0.8	1.1	0.4
6	16-Mar-06	0.1	2.4					1.0	1.3	0.2
7	31-May-06	0.1	0.7	0.3	0.6	0.6	0.9	0.9	0.9	0.5
8	27-Jul-06	0.1	0.6	0.6	0.8	0.5	1.0	0.5	0.7	0.5
Mean			1.15	0.9	0.97	0.87	1.17	0.8	1.0	0.4

TP as P (mg/L)										
ANZECC Trigger Value ^[a] = 0.05										
Campaign #	Date	LOR	SW1	SW2	SW3	SW4	SW5	MCW1	MCW2	MCW3
1	18-Oct-04	0.01	0.10	0.11	0.09	0.32	0.06			
2	21-Oct-04	0.01	0.05	0.08	0.38	0.02	0.02			
3	14-Dec-04	0.01	0.03	0.01	0.04	0.02	0.02			
4	21-Jan-05	0.01	0.06	0.04	0.10	0.03	0.04			
5	28-Nov-05	0.01	0.02	0.06	0.04	0.02	0.14	0.06	0.62	0.01
6	16-Mar-06	0.01	0.34					0.17	0.17	0.01
7	31-May-06	0.01	0.17	0.07	0.01	0.02	0.06	0.07	0.12	0.01
8	27-Jul-06	0.01	0.03	0.05	0.10	0.04	0.02	0.04	0.04	0.01
Mean			0.10	0.06	0.11	0.07	0.05	0.09	0.24	0.01

RP as P (mg/L)										
ANZECC Trigger Value ^[a] = 0.02										
Campaign #	Date	LOR	SW1	SW2	SW3	SW4	SW5	MCW1	MCW2	MCW3
1	18-Oct-04	0.01	0.01	0.01	0.01	0.01	0.01			
2	21-Oct-04	0.01	0.02	0.01	0.25	0.01	0.01			
3	14-Dec-04	0.01	0.02	0.01	0.02	0.01	0.01			
4	21-Jan-05	0.01	0.01	0.01	0.04	0.01	0.01			
5	28-Nov-05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
6	16-Mar-06	0.01	0.01					0.01	0.04	0.01
7	31-May-06	0.01	0.02	0.01	0.01	0.01	0.01	0.09	0.07	0.01
8	27-Jul-06	0.01	0.02	0.01	0.05	0.01	0.01	0.01	0.02	0.01
Mean			0.01	0.01	0.05	0.01	0.01	0.03	0.03	0.01

O & G (mg/L)										
Campaign #	Date	LOR	SW1	SW2	SW3	SW4	SW5	MCW1	MCW2	MCW3
1	18-Oct-04	5	2.5	2.5	2.5	2.5	2.5			
2	21-Oct-04	5	22	2.5	58	9	2.5			
3	14-Dec-04	5	6	10	2.5	12	2.5			
4	21-Jan-05	5	10	14	14	13	15			
5	28-Nov-05	5	10	5	5	7	2.5	2.5	2.5	2.5
6	16-Mar-06	5	2.5					2.5		2.5
7	31-May-06	5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
8	27-Jul-06	5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Mean			7.25	5.57	12.43	6.93	4.29	2.5	2.5	2.5

Faecal Coliforms (CFU/100ml)										ANZECC Trigger Value ^[b] = 1000
Campaign #	Date	LOR	SW1	SW2	SW3	SW4	SW5	MCW1	MCW2	MCW3
5	28-Nov-05	1.00	106	90	190	50	78	113	68	11
6	16-Mar-06	1.00	1600					1600	2	130
7	31-May-06	1.00	1700	16000	1300	5400	2400	16000	9200	420
8	27-Jul-06	1.00	23	350	350	79	80	700	920	23
Mean			686	5480	613	1843	853	604	2548	117
Median			853	350	350	79	80	1150	494	77

^[a] Trigger Values for physical and chemical stressors SE Australia in lowland rivers.

^[b] Trigger Value for secondary contact in recreational waters.

^[c] Lab Results for Ammonia were not provided for Campaign 4.

^[d] Bold values exceed Trigger Values for physical and chemical stressors SE Australia in lowland rivers.