AQUENAL PTY LTD

Investigations into *Gazameda gunnii* abundance in the vicinity of the outfall diffuser for Gunns Limited's proposed Pulp Mill

Prepared for

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1 INTRODUCTION

The purpose of this investigation is to review all benthic infauna samples collected in studies associated with the outfall of Gunns proposed pulp mill for the presence of *Gazameda gunnii*. This information is to be assessed to gain an understanding of the prevalence of *G. gunnii* in the vicinity of the outfall.

Aquenal Pty Ltd was commissioned by Gunns Limited to design and implement a pre-commissioning marine ecological monitoring program for the proposed effluent outfall in accordance with the recommendations of RPDC (2004). Pilot surveys were conducted in 2005 and 2006 followed by marine ecological monitoring surveys at the proposed Gunns Limited pulp mill outfall site at Five Mile Bluff in 2007. Included in these surveys was analysis of the abundance and diversity of benthic infauna in open, sandy habitat sampled using benthic grabs. Molluscs were identified to species level to detect several introduced marine pests such as *Maoricolpus roseus* and the threatened species *Gazameda gunnii*. Aquenal was commissioned in November 2006 to conduct a sampling survey to assess the abundance of *G. gunnii* in the interval to be excised from the original outfall route when the diffuser position was moved 250 m inshore.

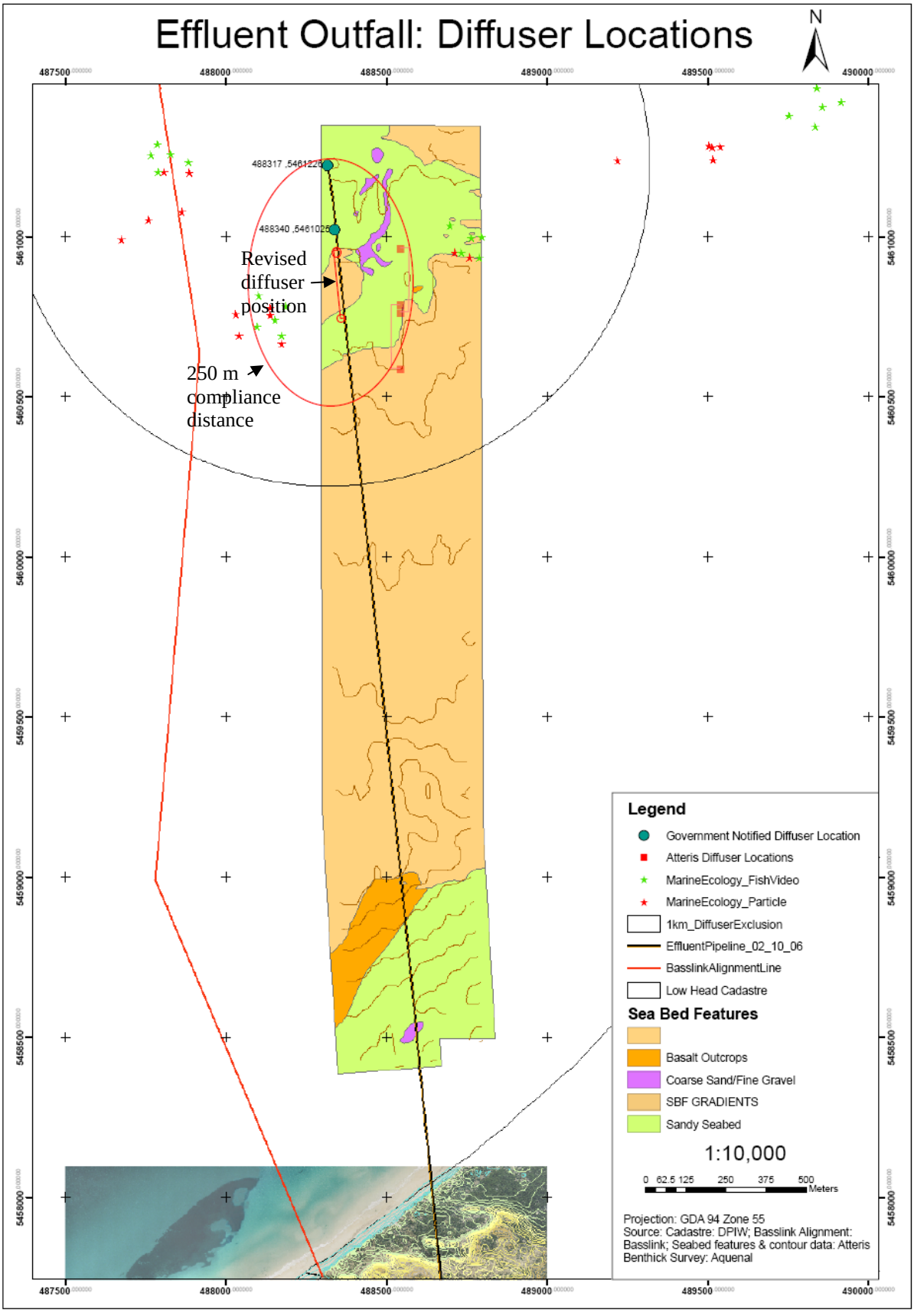

Figure 1 Map showing the outfall route, initial diffuser position, revised diffuser position and seabed geomorphology. (Courtesy of Gunns Limited)

2 METHODS

2.1 Benthic infauna surveys

As part of ongoing ecological monitoring surveys (Aquenal, 2005; Aquenal, 2006a; Aquenal, 2006b; Aquenal, 2007a; Aquenal, 2007b; Aquenal, 2008) benthic infauna samples have been collected in the vicinity of the proposed outfall, see Figure 2, Figure 3 and Figure 4. At each sampling location 5 benthic sample sites with two replicate Van Veen grab samples, of 0.07m^2 each, were collected. The grab samples were washed through an aluminium funnel into polypropylene bags with a mesh size of 0.8 mm. The bagged samples were labelled and placed into a 20 L drum of 10% buffered formalin for a minimum of 3 days. In the laboratory, collected material was washed through a 1 mm sieve and the retained material was sorted under a dissecting microscope to separate animals from other material. The animals (live at the time of sampling) were subsequently counted and identified to the taxonomic level of family, with the exception of any introduced marine pests or threatened species (such as *Gazameda gunnii*) and molluscs, which were identified to species level.

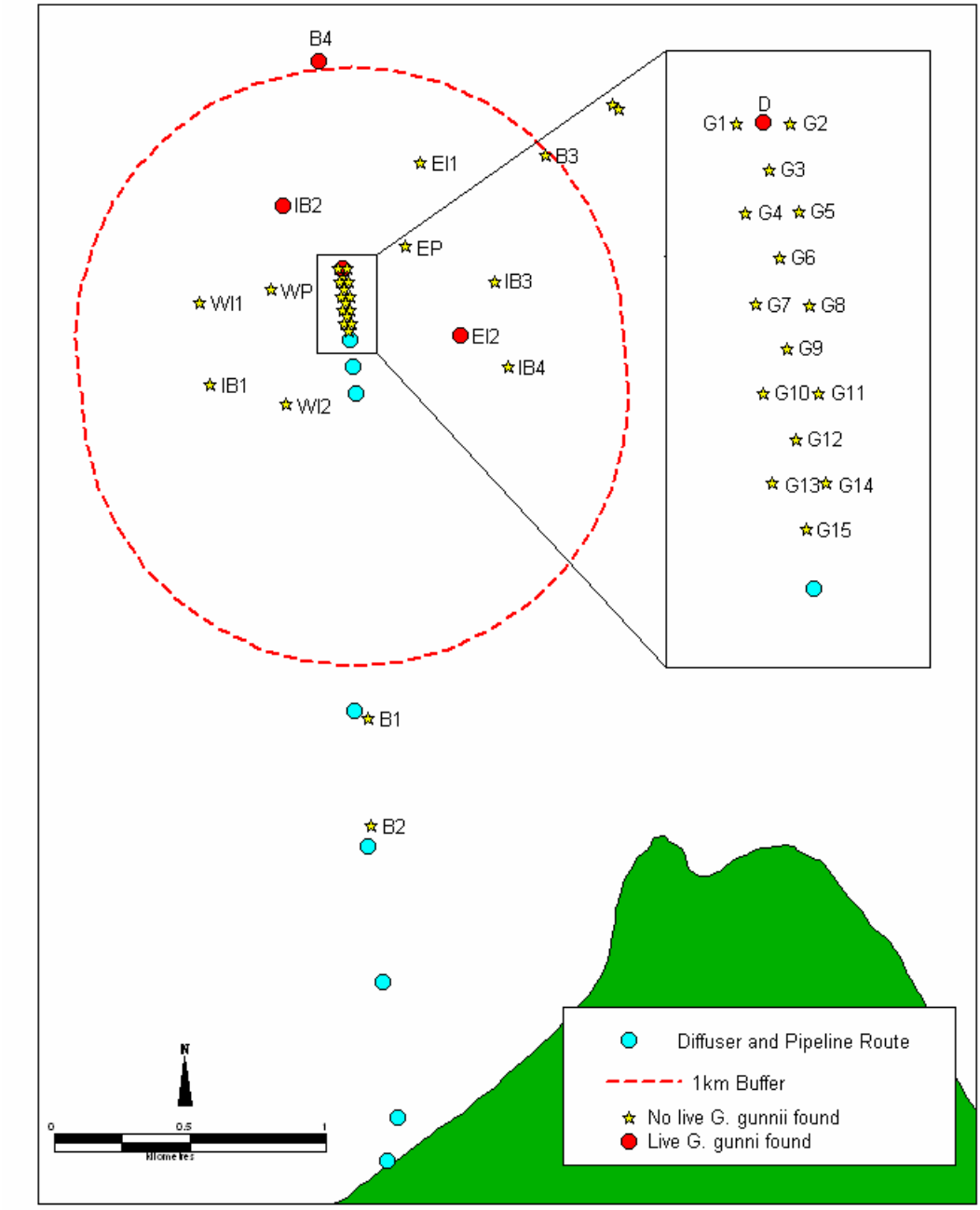

Figure 2 Samples of benthic infauna within 1 km radius of diffuser and along pipeline.

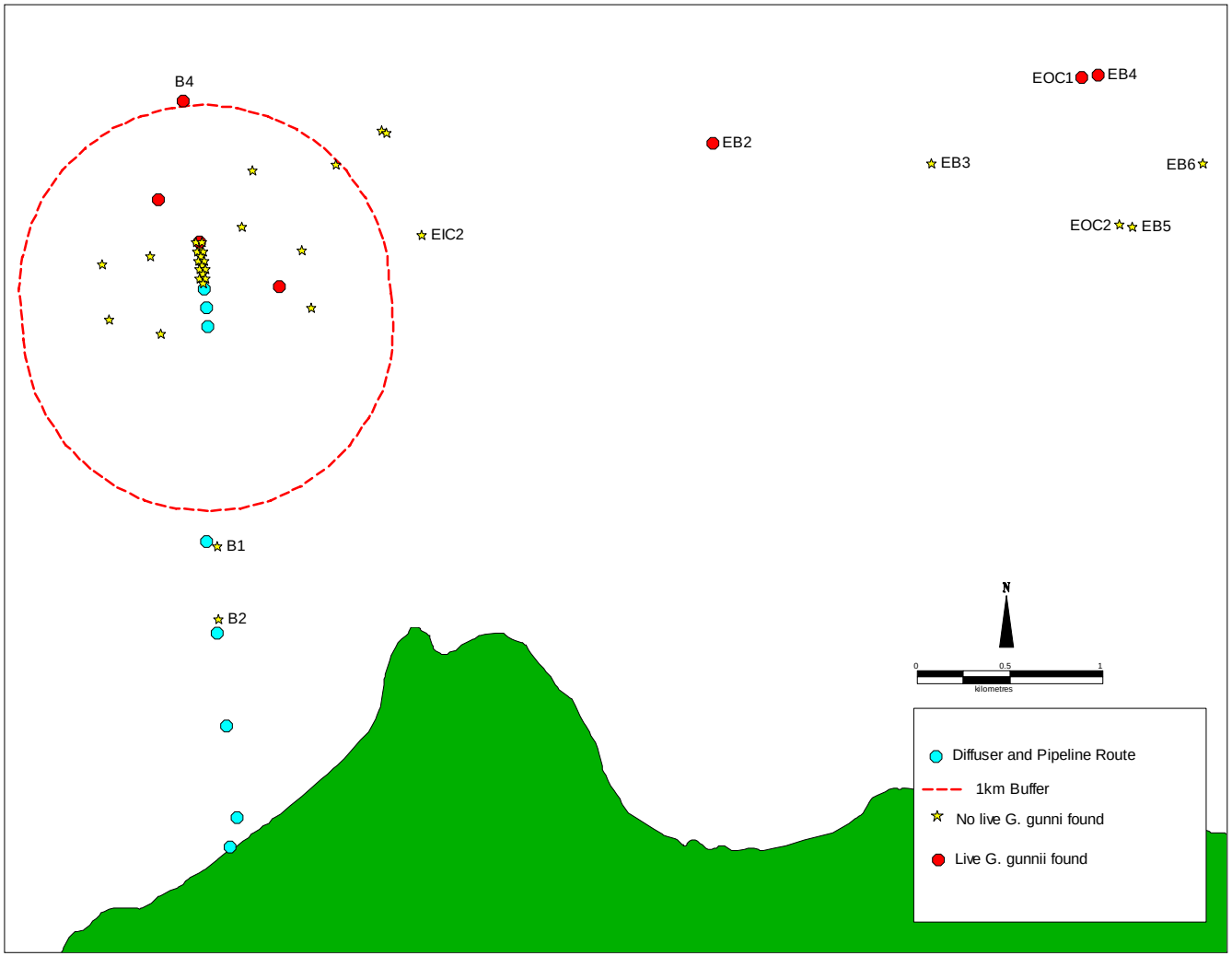

Figure 3 Samples of benthic infauna east of diffuser and pipeline.

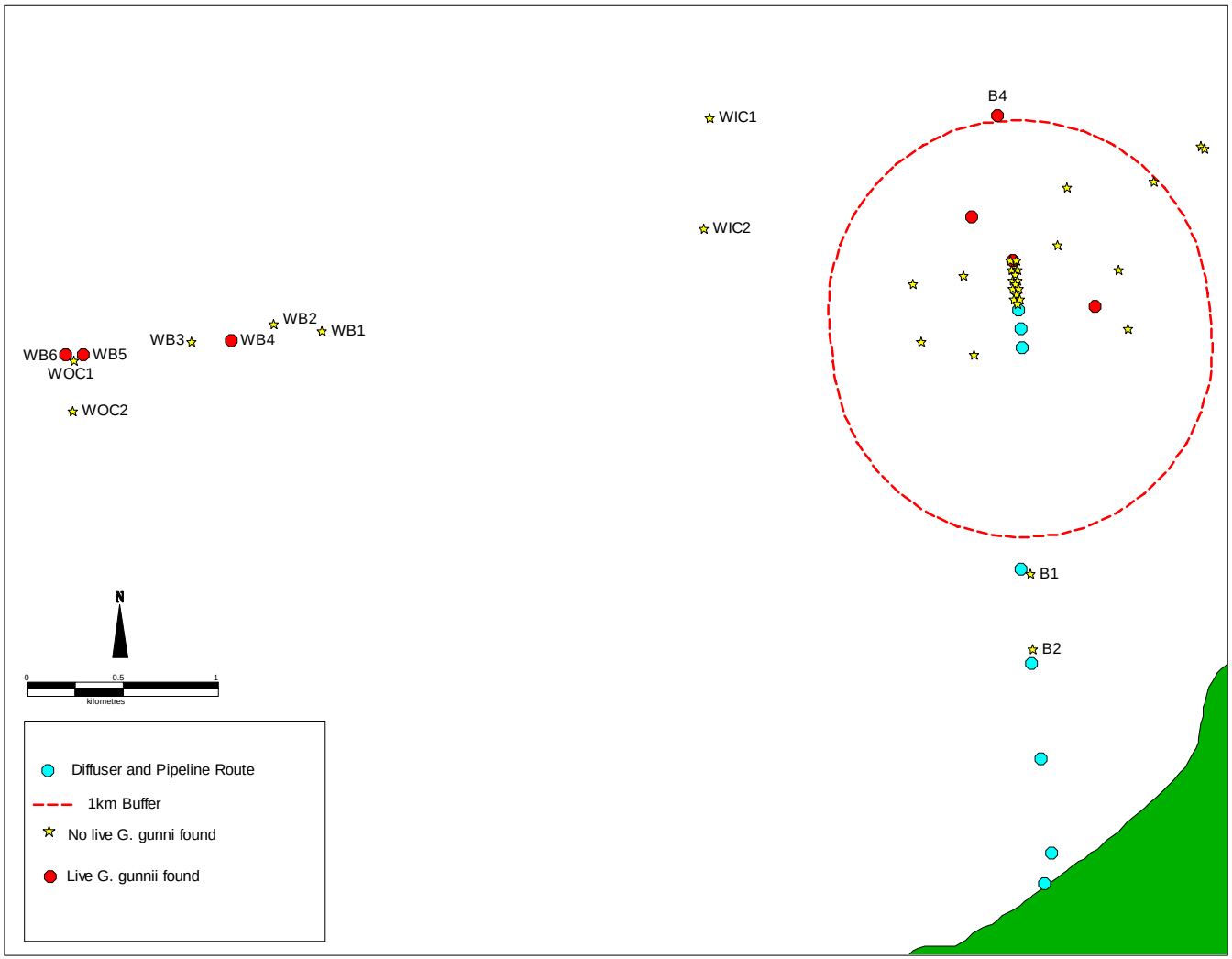

Figure 4 Samples of benthic infauna west of diffuser and pipeline.

2.2 *Gazameda gunnii* survey

In November 2006 a field survey investigating abundance of *Gazameda gunnii* was carried out in the area affected by repositioning the outfall diffuser for Gunns Limited's proposed Pulp Mill. A sampling grid was plotted over the area of sand to be saved from direct impact from the outfall construction (Figure 5). Van Veen grabs were used to collect 0.07m^2 seabed sediment samples from each selected site (G1– G15). Samples were washed over a 4 mm mesh sieve and any live or dead *G. gunnii* shells counted.

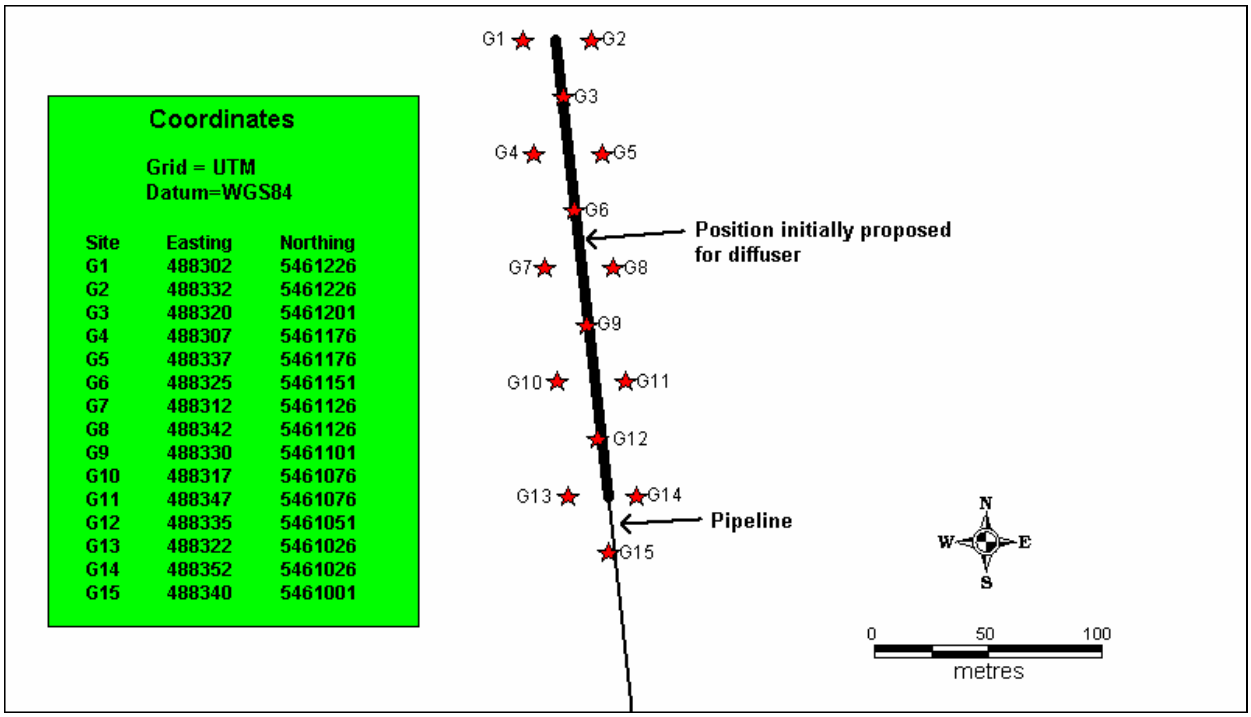

Figure 5 Sampling grid for *Gazameda gunnii* survey.

3 RESULTS

3.1 Benthic infauna surveys

A total of 14 live *Gazameda gunnii* were recorded in the six surveys during 2005, 2006 and 2007, see Table 1 below. 4 specimens were found in 2005 and the remaining in 2007. Of the 14 live *G. gunnii* found, 4 were found within 1 km of the diffuser (site D, EI2S2 and IB2 S1 (*2)) (Figure 2). In these surveys the number of dead shells was not recorded.

Table 1 Number of live *Gazameda gunnii* collected from monitoring surveys 2005 – 2007.

Survey	Site	Easting	Northing	Depth	Date	Number of live *G. gunnii*
Gunns Pulp Mill Basline Survey	B4	488232	5461983	32	29-Mar-05	1
Gunns Pulp Mill Basline Survey	D	488317	5461228	26	29-Mar-05	1
Gunns Pulp Mill Basline Survey	EI2S2	488733	5460953	23	29-Mar-05	1
Gunns Pulp Mill Monitoring Survey	EOC1S1	493114	5462087	29	24-Oct-05	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Autumn 2007)	EB2 S1	491107	5461756	27.5	03-Apr-07	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Autumn 2007)	EB2 S2	491078	5461762	27.5	03-Apr-07	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Autumn 2007)	EB2 S5	491104	5461781	27.5	03-Apr-07	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Autumn 2007)	EB4 S1	493173	5462127	28	03-Apr-07	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Autumn 2007)	IB2 S1	488123	5461464	29.7	03-Apr-07	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Autumn 2007)	WB4 S1	484223	5460816	29	03-Apr-07	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Autumn 2007)	WB4 S4	484178	5460793	29	03-Apr-07	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Autumn 2007)	WB5 S2	483437	5460738	29	03-Apr-07	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Spring 2007)	IB2 S1	488123	5461464	29.7	01-Oct-07	1
Gunns Pulp Mill Pre-Construction Monitoring Survey (Spring 2007)	WB6 S2	483322	5460710	29	01-Oct-07	1

3.2 2006 Gazameda gunnii survey

No live *Gazameda gunnii* were collected during this survey. Dead *G. gunnii* shells were collected from all but 2 sites. The number of dead shells at each site is given in Table 2.

Table 2 Number of dead *Gazameda gunnii* shells collected from in the interval to be excised from the original outfall route.

Site	Number of *G. gunnii* shells
G1	1
G2	0
G3	2
G4	2
G5	4
G6	2
G7	4
G8	3
G9	3
G10	0
G11	2
G12	3
G13	2
G14	2
G15	1

3.3 Pooled results

The total number of grabs (from section 3.1 and 3.2) collected throughout all monitoring surveys was 843. Of these, 271 grabs were taken within 1 km of the diffuser and 8 along the pipeline route. The area sampled within the 1 km radius totaled 18.97 m^2 out of the study area of 3340000 m^2, i.e. 0.00000568% of the area. This result is assuming that no grab landed in the same place as another, which is a fair assumption to make in waters of approximately 30m depth.

To more accurately assess a low density population of *G. gunnii*, a diver operated suction dredge sampler would be required.

4 CONCLUSIONS

The number of live *Gazameda gunnii* collected in the vicinity of the diffuser indicates their presence is in moderate to low density. The relatively high density of dead shells in the 2006 survey indicates either that there have been moderate to high densities in the survey area in the recent past or that the shells endure in the sediments for a long period and *G. gunnii* have been present in the vicinity for a long time.

5 REFERENCES

Aquenal (2005) Marine ecological monitoring program, Gunns Ltd pulp mill outfall. First pre-operational survey, April 2005. Report prepared for GHD Pty Ltd and Gunns Ltd.

Aquenal (2006a) Marine ecological monitoring program, Gunns Ltd pulp mill outfall. Second pre-operational survey, Spring 2005. Report prepared for GHD Pty Ltd and Gunns Ltd.

Aquenal (2006b) Marine ecological monitoring program, Gunns Ltd pulp mill outfall. Third pre-operational survey, Winter 2006. Report prepared for Gunns Ltd.

Aquenal (2007a) Marine ecological monitoring program, Gunns Ltd pulp mill outfall. Forth pre-operational survey, Spring 2006. Report prepared for Gunns Ltd.

Aquenal (2007b) GUNNS LTD PULP MILL OUTFALL MARINE ECOLOGICAL MONITORING PROGRAM, First Pre-commissioning Monitoring Survey, autumn 2007