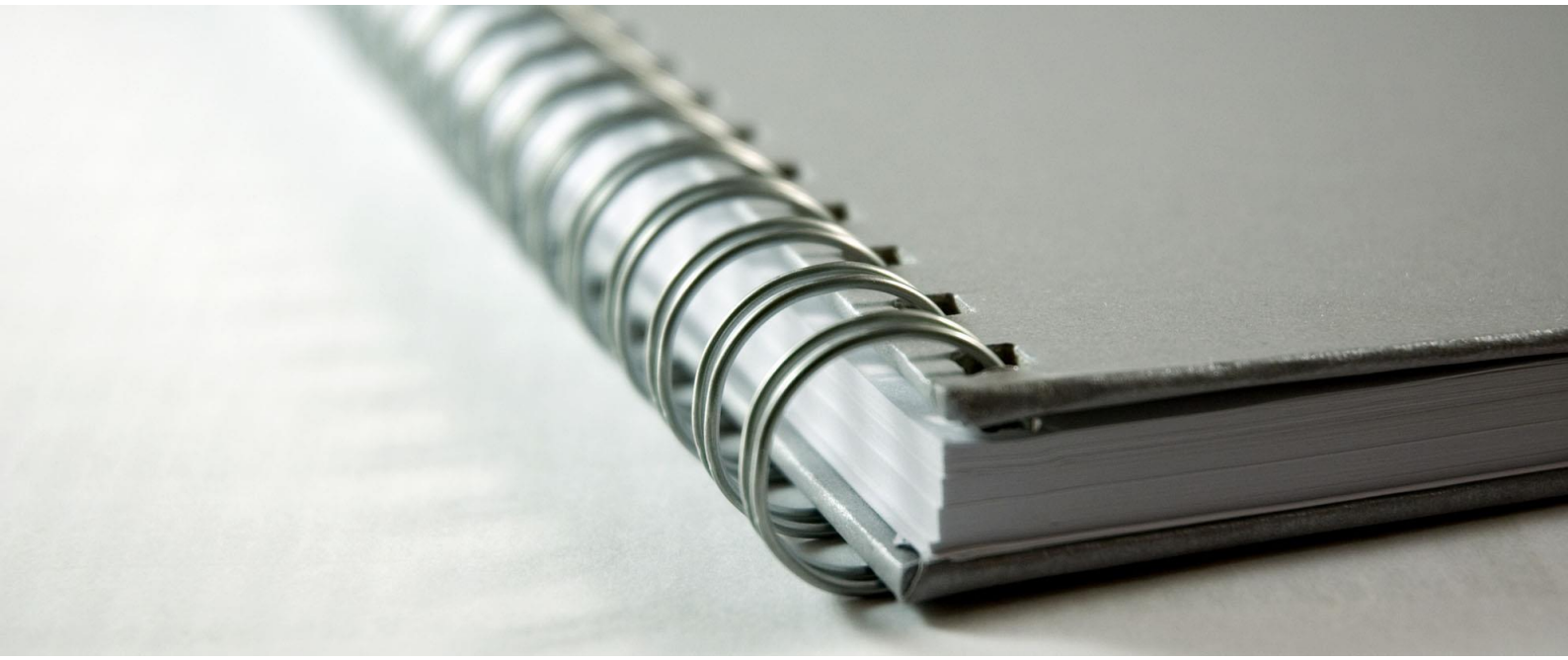

Cook Shire Council

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□a□□□□ a□d Mar□□a □□□□□□□ □□□

May 2016

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Table index

Appendices

1. Introduction

1.1 General

[illegible] Marina [illegible]

[illegible] Marina and [illegible]

- [illegible]
- [illegible]
- [illegible] Marina
- [illegible] and [illegible]

1.2 Scope of work

1.2.1 Water Quality Testing

[illegible]

- [illegible]
  - [illegible]
  - [illegible]
  - [illegible]

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
- [illegible] 12 [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1.3 Sheet Pile Wall to Lagoon and Marina

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

1.4 Water ingress into and out of the Lagoon

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

2. Site Investigation Comments

2.1 Saltwater Tidal Lagoon

[illegible]

[illegible]

2.1.1 General Lagoon Area

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

2.1.2 Lagoon Sheet Piles

- [illegible]
- [illegible]
- [illegible]

[illegible]

- [illegible]

- [illegible]

- [illegible]

2.1.3 300 Series Blockwork Retaining Wall

- [illegible]

- [illegible]

- [illegible]

- [illegible] d [illegible] a [illegible] r [illegible] a [illegible] d [illegible] 6 [illegible] – [illegible] r [illegible] r [illegible] d [illegible] a r [illegible] 60 [illegible] 0 y [illegible] a [illegible] d [illegible] a [illegible] d [illegible] a [illegible] d [illegible] a [illegible] d ra [illegible] y [illegible] a [illegible] a [illegible] r [illegible] ar [illegible] y [illegible] r [illegible] r [illegible] d [illegible] r [illegible] r [illegible]
- A check of the 3m high blockwork wall against “standard designs” indicate that the wall, [illegible] y a 2 [illegible] d [illegible] da [illegible] d [illegible] ay [illegible] a [illegible] y a [illegible] d [illegible] r [illegible] a [illegible] ra [illegible] d [illegible] r [illegible] d [illegible] a [illegible] d [illegible] r [illegible] r [illegible] d [illegible] ad [illegible] a [illegible] 6 [illegible] – [illegible] r [illegible] r [illegible] d [illegible] a [illegible] a [illegible] r [illegible] ad [illegible] a [illegible] a [illegible] d [illegible] a [illegible] a [illegible] y [illegible] a [illegible]
- [illegible] r [illegible] r [illegible] r a [illegible] y dra [illegible] a [illegible] ay [illegible] r [illegible] d [illegible] r [illegible] r [illegible] d [illegible] ay [illegible] r [illegible] r [illegible] d [illegible] a [illegible] d [illegible]
- [illegible] r [illegible] a [illegible] r [illegible] d ra [illegible] y a [illegible] d [illegible] a [illegible] r [illegible] r [illegible] d [illegible] a [illegible] r [illegible] add [illegible] dra [illegible] d [illegible] r [illegible] a [illegible] d [illegible] r [illegible] r [illegible] a [illegible] y [illegible] a [illegible] dard [illegible] r [illegible] a [illegible] d [illegible] r [illegible] a [illegible] a [illegible] d [illegible]

2.1.4 Lagoon Seating Wall

– [illegible] da [illegible] a [illegible] r [illegible] a [illegible] a [illegible] a [illegible] d [illegible] r [illegible] d [illegible] a [illegible] r [illegible] r [illegible] ar [illegible] a [illegible] ra [illegible] a [illegible] ad [illegible] d [illegible] y [illegible] a [illegible] a [illegible] r [illegible] d d [illegible] a [illegible] d [illegible] a [illegible] d [illegible] a [illegible] r [illegible] d [illegible] a [illegible] da [illegible] a [illegible] r [illegible] ar [illegible] a [illegible] ra [illegible] r [illegible] r [illegible] a [illegible] ar [illegible] d [illegible] a [illegible] r [illegible] a [illegible] d [illegible] ra [illegible] y [illegible] r [illegible] a [illegible] d [illegible] r [illegible] d [illegible]

2.1.5 Access Ramp

- [illegible] a [illegible] ra [illegible] a [illegible] d [illegible] r [illegible] d [illegible] r [illegible] r [illegible] r [illegible] y [illegible] d [illegible] a [illegible] d [illegible] ad a [illegible] ar [illegible] d [illegible] d [illegible] r [illegible] a [illegible] ra [illegible] a [illegible] ra [illegible] a [illegible] d [illegible] da [illegible] r [illegible] a [illegible] d [illegible] da [illegible] a [illegible] r [illegible] r [illegible] a [illegible] d [illegible] a [illegible] d [illegible]
- [illegible] a [illegible] ra [illegible] r [illegible] a [illegible] a [illegible] a [illegible] ry [illegible] a [illegible] a [illegible] a [illegible] a [illegible] a [illegible] d [illegible] y a [illegible] d [illegible] r [illegible] a [illegible] ar [illegible] y 1 2 [illegible] a [illegible] a [illegible] r [illegible] a [illegible] y [illegible] 1 [illegible] a [illegible] d [illegible] d [illegible] dra [illegible] da [illegible] ar [illegible] y [illegible] ar [illegible] d [illegible] a [illegible] d [illegible] d [illegible] r [illegible] a [illegible] ar [illegible] d [illegible] a [illegible] d [illegible] a [illegible] d [illegible] da [illegible] a [illegible] d [illegible] r [illegible] r [illegible] a [illegible] d [illegible] a [illegible] ar [illegible] a [illegible] r [illegible] d [illegible] ar [illegible] a [illegible] a [illegible] r [illegible] a [illegible] a [illegible] ary [illegible] d [illegible] Ma [illegible] r [illegible] a [illegible] d [illegible] ar [illegible] a [illegible] d [illegible] r [illegible] a [illegible] d [illegible] r [illegible] y ad [illegible] ar [illegible] a [illegible] r [illegible] ar [illegible] d [illegible] r [illegible] d [illegible] a [illegible] a [illegible] r [illegible] ar [illegible] a [illegible]

2.1.6 Marina

- [illegible] ar [illegible] a [illegible] ary [illegible] r [illegible] r [illegible] d [illegible] a [illegible] a [illegible] a [illegible] d [illegible] a [illegible] r [illegible]
- [illegible] a [illegible] r [illegible] r [illegible] r [illegible] a [illegible] a [illegible] r [illegible] a [illegible] d [illegible] Ma [illegible] d [illegible] r [illegible] r [illegible] a [illegible] a [illegible] r [illegible] r [illegible] a [illegible] d [illegible] r [illegible] r [illegible] ar [illegible] a [illegible] d [illegible] y r [illegible] d [illegible] a [illegible]

- [illegible]
- [illegible]
- [illegible] ‘Piling Contractor’ [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

2.1.7 Rock Wall General Comments

- [illegible]
- [illegible]

3. Sheet Piling Design and Information Gathering

[illegible] ‘Piling Contractor’ [illegible]

The available information indicates that only a “Preliminary or Concept” Design was ever completed for the design of the sheet piles. Why this “Preliminary Design” was not progressed [illegible] this “Concept Design” was used as the “For Construction” drawings [illegible] documents were issued “For Construction” [illegible]

- [illegible]
- [illegible] ‘Piling Contractor’ [illegible]

[illegible] ‘Steel Supplier’ [illegible] 11 [illegible] 022 [illegible] 001 [illegible] 201 [illegible] drawing that it is a “Preliminary Design – For Discussion”. In addition to this drawing there is [illegible] ‘Steel Supplier’ [illegible] ‘Piling Contractor’ [illegible] “design”.

The following correspondence was located in relation to discussions on the “Concept Designs and Calculations” [illegible]

- [illegible] ‘Steel Supplier’ [illegible] ‘Piling Contractor’ [illegible] 11 [illegible] 201 [illegible] ‘Piling Contractor’ [illegible]
  - “[illegible]”
- [illegible] ‘Steel Supplier’ [illegible] ‘Piling Contractor’ [illegible] 1 [illegible] 201 [illegible] ‘Piling Contractor’ [illegible]
  - “Please see details on Steel sheet pile for berthing pen below and attached. Do you [illegible] ‘Steel Supplier’ [illegible]

add [illegible] FRP Box Section for the swimming enclosure."

- 'Steel Supplier' [illegible] 26 [illegible] 1 [illegible] 201[illegible] [illegible] 11[illegible]022 [illegible]001

[illegible] 'Piling Contractor' [illegible]

- "[illegible]"

- "[illegible]"

- "[illegible]"

- "[illegible]"

- "[illegible]"

3.1 Fact Finding

[illegible] 2[illegible] [illegible]2016 [illegible] May 2016[illegible]

- "There was no formal design around the piling. 'Steel Supplier' [illegible] 'Steel Supplier''s response was that the initial 'design' provided in no way constituted, or was intended to be, a legitimate or certified design." [illegible] 'Steel Supplier'[illegible]

- "There was no formal contract with 'Piling Contractors' [illegible] the piles as being driven into rock or refusal."

[illegible]

3.1.1 Questions Posed and Responses from 'Steel Supplier'

[illegible] 'Steel Supplier' [illegible] 26 [illegible]2016 [illegible] 'Steel Supplier' [illegible] 2[illegible] [illegible]2016 [illegible]"'Steel Supplier' did [illegible] with 'for construction' drawings and RPEQ for this project. [illegible] 'for discussion'" [illegible]

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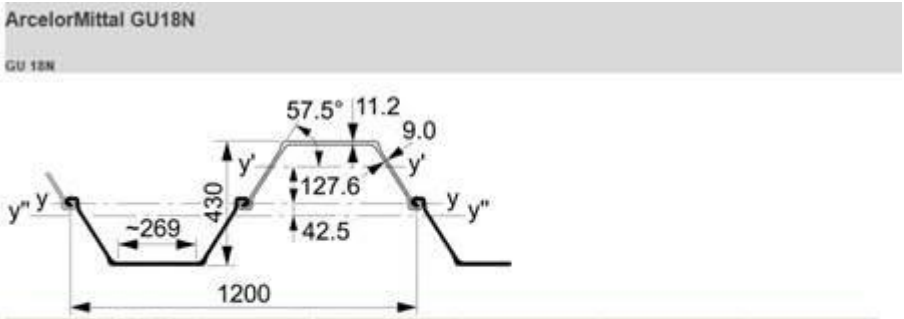
- A “□r□□□□rM□□a□□ □1□□ □ □□0□ □□□□”□□□□ □□□□□ □□□□r□ □□□□□ □ □□□ □r□□□□ □□□□□□ □□□□□ □□□□□



	Sectional area	Mass per m	Moment of inertia	Section modulus	Radius of gyration	Coating area*
	cm²	kg/m	cm⁴	cm³	cm	m²/m
Per S	98,0	76,9	7 220	484	8,58	0,87
Per D	196,0	153,8	46 360	2 160	15,38	1,72
Per T	294,0	230,7	64 240	2 495	14,78	2,58
Per m of wall	163,3	128,2	38 650	1 800	15,38	1,43

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- A “‘Steel Supplier’ did not issue a certified design with ‘for construction’ drawings”

□ □□□d ‘Steel Supplier’ □a□□ □□□ □□□□□□□□r□□□r□□

- A. “Don’t believe so” □□ □□□□□ □□□□r□ a□□□□ □□□□□□y ‘Steel Supplier’ □□d□a□□□a □□□□□□□□ □□□□r□ a□□□□ □a□ □ ad□ a□a□a□□□ □□ ‘Steel Supplier’□

□ □□□d y□□ □□□□ a□□□□□□□□ □□□□ □□□□□r□□□□

- A. “Don’t believe so as per above” □□ □□□□□ □□□□r□ a□□□□ □□□□□y ‘Steel Supplier’ □□d□a□□□a □□□□□□□□□□□□r□ a□□□□ □a□ □ ad□ a□a□a□□□ □□ ‘Steel Supplier’□

□ □□□d ‘Steel Supplier’ □□□□□ □□□□r □□□□□□□□□□□□ □□□□d □□□□□□ra□□ □□□□ □□□r□□□ a□d □ □a□□□□□□ □ara□ □□□r□d□d □□□y □□□ □□r □□□□r □r□□□□ □□ary d□□□□□□

- A “Depends on type of rock”

□ □□□ a□a□y □a□□r d□□□r□□□a□□□□□□r □d□ □□□□□ □a□a□□□□□ □d□

- A. “No□a□ □□□y □□□□□□□”

□ □□□ □y d□d y□□ □r□□d□ □□a□□□ □□ □□□□ □d□ □□□y a□d □□a□□□ □□□ □a□□□□ □y□□ a□d □□□□□□□□□□□

  - A. “□□r□a□y □□□□d □a□□ □□a□□□□□□□□d□□□□□d□ □□ □□a□□□r□□□□r□d□□ □□□□□r□ □□a□□a□ d□□□”

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  - A. “□ □□□□□r□ □□a□□□ □□□□d□□□□ □□□□□□ □□ □□□y a □□□□□□□□”

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[illegible]

[illegible]There is a suggestion of an anchor at RL 3.5 (0.5m below top of wall) but I can't see how this [illegible]

[illegible] 'Steel Supplier' [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

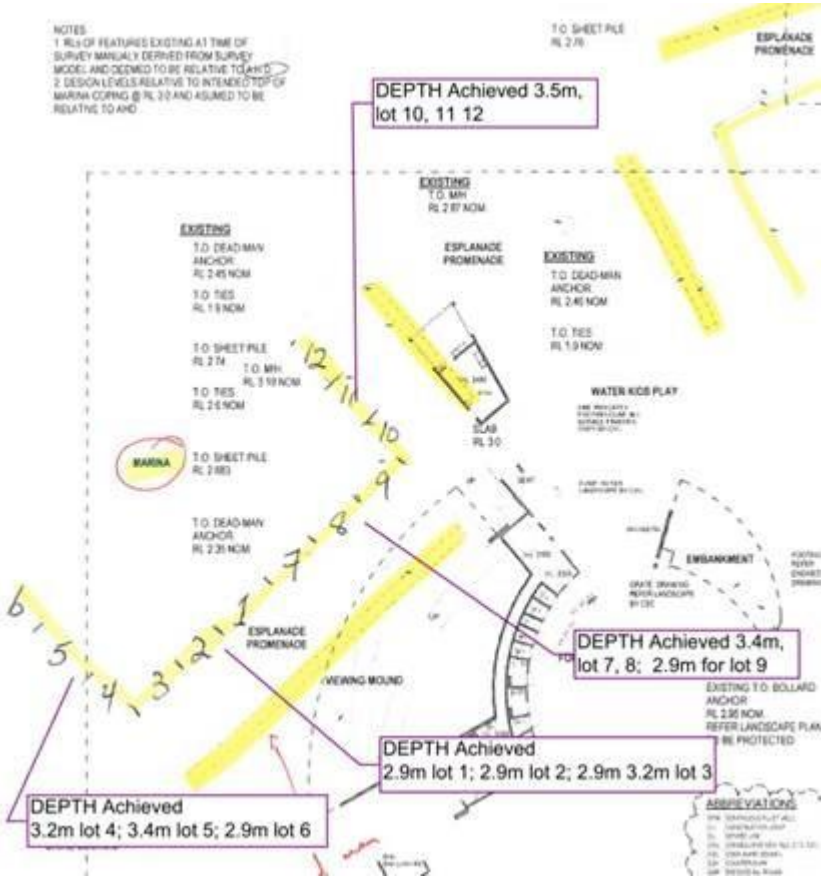
[illegible]

- A. "[illegible]
  - 1[illegible]
  - 2[illegible]
  - [illegible]
- A. "'Steel Supplier' [illegible] 'Steel Supplier' [illegible] May 2[illegible] [illegible] M[illegible]day [illegible]0 May"

[illegible] 20 May 2016 [illegible] 'Steel Supplier' [illegible]

3.1.2 Questions Posed and Responses from 'Piling Contractor'

[illegible] 'Piling Contractor' [illegible] 2[illegible]2016 [illegible]



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- A. "□□□ □□a□□□ □a□a□□□□d □□ □□□ r□□□□a□□ □□y□□□□a□ □□□□r□□□□ □□□ a□□00 □ □□r□□□ □□ □□□ □ □ □r□□ □□□□□□□□□ □□□a□a□□□□d □y 'Steel Supplier' □a□□□□a□□r□"
- A. "□□□r□ □a□a□□□ a□a□□d□ □y□□ □ □ □y□□□□ □□□ra□□□□ 6□□□□002 □□□ □□□□□□a□□□d □□ □r□□□□□□□□ □□□□r□ □□r□□□□r□ □ □□□ □□□□□a□□□□□d□ra□□□ □□ □□□ □a□□ □a□□□□ □□□□a□d□□□□□□d a□d □□□□□□d □y □□rr□□□□ □□□□□a□□□□□□□a□□ a□a□□□d □□□ □ d□a□□ □□□□"
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□ □□ □a□□ □r□ □□□□ □□□□□□ □□ □□□□□□ dr□□□□□ □□□□ □□□ r□□□□

- A "The bore logs were not deep enough to encounter the hard rock. □□□r□ □a□a □□a□ ra□ □ □□□□□ □□□□□r□□□□d □□r □M□ □□□□□□□□□r□a□ a□d □□□ □□r□ □□□□ □□r □□a□□□□ □□□□□d □ard r□□□a□□□a□□□□ d□□□□□ □□□ □ard r□□□□ □ □r□ □□□ary □□□□□□□ □□ar □□□ □ □r□□□□□ a□d a□ □□□□□□□d □□□a□□□□ □□ar□y□ □□□y ar□ □a□□□d a□d □□□□□□ □ □□□□ □□ □□y □□□□□ra□□□□ d□□□□□ □ary□ □ □dr□□□ □□□ □□□□ □□r□□□□ □□□ □□□□□y a□d □ □d□ra□□y □□a□□□r□d r□□□ □□□□□ □ □ □□ r□□□□a□□□ □□□ □ard r□□□□ □ □ □□r□ □□r□r□□d □y □□□ □ □□□ □□□□□ra□□□ □□a□□□□□d □□□ □□□ □ard r□□□ □□□□□□d□d □□ □□□□ dr□□□□□ □□r□□□a□d□□ □□ □□□ r□□□ □□r□□□□□ □□□ □□□□□□□□□□

in the hammer or at the base. Attached details of our BSP SL30da hammer” [illegible]

[illegible] y[illegible] [illegible]a[illegible] a[illegible]y dr[illegible] r[illegible]rd[illegible]

- A. “[illegible] r[illegible]r[illegible] (it was noted that the inspection report provided by CSC isn’t the [illegible]a[illegible]r[illegible] [illegible] [illegible]a[illegible]r[illegible] [illegible]r [illegible]ar[illegible]Mar[illegible]a [illegible]y[illegible] r[illegible]rd [illegible]r [illegible]a[illegible] [illegible]r[illegible]a[illegible] [illegible]a[illegible] a[illegible]a[illegible]d a [illegible] [illegible] [illegible] [illegible]r [illegible] [illegible]Mar[illegible]a [illegible]r[illegible]r[illegible]a[illegible] [illegible]a[illegible] [illegible] [illegible]d a[illegible]y [illegible] [illegible]r[illegible]a[illegible] [illegible] [illegible] [illegible]a[illegible] [illegible]” [illegible]r [illegible] [illegible]d[illegible] [illegible]r [illegible]da[illegible]d [illegible]r[illegible]a[illegible] [illegible]r[illegible]d[illegible]d [illegible]y ‘Piling Contractor’ a[illegible]d [illegible] [illegible]r[illegible]a[illegible]r[illegible]rd[illegible]r[illegible]d[illegible]d [illegible]y [illegible]
- A. “[illegible] [illegible] [illegible] [illegible]r[illegible]a[illegible]d [illegible] [illegible]ar[illegible]d [illegible] [illegible]ay[illegible]r[illegible]d[illegible]d y[illegible]rday [illegible]r[illegible] [illegible]rr[illegible] [illegible] [illegible] [illegible]d a[illegible] [illegible] [illegible] [illegible] [illegible] [illegible]a[illegible]a[illegible] [illegible]r[illegible] [illegible]r[illegible]r[illegible] a[illegible]d [illegible]ar[illegible]d [illegible] [illegible] [illegible] [illegible] [illegible] 12[illegible] a[illegible]d 1[illegible] [illegible] [illegible] [illegible] [illegible]r 201[illegible]”
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- A. “[illegible] [illegible] [illegible]r[illegible]y[illegible] [illegible]r[illegible]d[illegible]d y[illegible]rday da[illegible]d [illegible] 10[illegible]12[illegible]1[illegible] [illegible]d [illegible]r[illegible]a[illegible]d [illegible] [illegible] [illegible]a[illegible] [illegible]r[illegible]r[illegible]d[illegible]d da[illegible]d [illegible] 10[illegible]12[illegible]1[illegible] [illegible]a[illegible] [illegible] [illegible]r [illegible] [illegible] [illegible] [illegible]r[illegible]r[illegible]10[illegible]11 a[illegible]d 12[illegible] [illegible] [illegible]r [illegible] [illegible]a[illegible] [illegible] [illegible] a[illegible]” [illegible]r [illegible]d[illegible] [illegible]
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3.2 Construction Procedure

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- [illegible]
- [illegible]
- [illegible]
- [illegible]

3.3 “‘Steel Supplier’ Preliminary Design”

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

4. Sheet Pile Design Review

[illegible] r [illegible] a [illegible] a [illegible] d [illegible] y 'Piling Contractor' a d a [illegible] ar [illegible] r [illegible] a [illegible] y [illegible] a [illegible] a [illegible] r [illegible] a [illegible] r [illegible] d [illegible] y [illegible] a d [illegible] a [illegible] ad [illegible]

4.1 Summary of available information for Marina Area

- [illegible] r [illegible] a [illegible] a [illegible] d [illegible] Mar [illegible] a ar [illegible] a [illegible] a [illegible] r [illegible] a [illegible] y [illegible] 1 [illegible] 1 [illegible] 0 [illegible] a r [illegible] r d [illegible] d [illegible] Mar [illegible] a [illegible] r [illegible] r [illegible] a [illegible] a [illegible] 2 [illegible] a [illegible] r d [illegible] a [illegible]
- [illegible] a [illegible] a ad [illegible] d a [illegible] 2 [illegible] 2 [illegible] a [illegible] ar [illegible] d [illegible] dra [illegible] d [illegible] a [illegible] d [illegible] 200 [illegible] a [illegible] a [illegible] r a [illegible] r a [illegible] y [illegible] 2 [illegible] 2 [illegible] 6 [illegible] a [illegible] a [illegible] r [illegible] r [illegible] ra [illegible] 0 [illegible] 001 [illegible] r [illegible] d [illegible] a [illegible] a [illegible] ar [illegible] 0 [illegible]
- [illegible] a [illegible] r [illegible] rd [illegible] d a [illegible] 2 [illegible]

[illegible] r a [illegible] a [illegible] a [illegible] a [illegible] ad [illegible]

- [illegible] r a [illegible] d a [illegible] d r [illegible] d [illegible] r [illegible] a [illegible] d [illegible] y 0 21 [illegible] a [illegible] a r [illegible] a [illegible] d [illegible] r [illegible] d [illegible] ar y 6 [illegible] a [illegible] a [illegible] y [illegible] 2 [illegible] r [illegible] d [illegible] a [illegible] d [illegible] a [illegible] d [illegible] a [illegible]
- [illegible] a [illegible] ra [illegible] r [illegible] a [illegible] r [illegible] d [illegible] r [illegible] ar [illegible] a [illegible] 2 [illegible] 1 [illegible] a [illegible] dard [illegible] a [illegible] 0 [illegible] 2 [illegible] ar [illegible] d [illegible] 1 [illegible] dard [illegible] a [illegible] M [illegible] a [illegible] a [illegible] ra [illegible] d [illegible] d [illegible] r [illegible] a [illegible] d [illegible] a [illegible] a [illegible] 0 [illegible] 1 [illegible] d [illegible] d [illegible] a [illegible] d [illegible]
- [illegible] a [illegible] ra [illegible] r [illegible] a [illegible] r [illegible] d [illegible] ar [illegible] a [illegible] 1 [illegible] 2 [illegible] a [illegible] dard [illegible] a [illegible] 0 [illegible] ar [illegible] d [illegible] 1 [illegible] dard [illegible] a [illegible] M [illegible] a [illegible] a [illegible] ra [illegible] d [illegible] d [illegible] r [illegible] a [illegible] d [illegible] a [illegible] a [illegible] 1 [illegible] 1 [illegible] d [illegible] d [illegible] a [illegible] d [illegible]

4.2 Summary of available information for Lagoon Area

- [illegible] r [illegible] a [illegible] a [illegible] d [illegible] a [illegible] a [illegible] a [illegible] r [illegible] a [illegible] y [illegible] 1 [illegible]
- [illegible] a [illegible] a [illegible] a [illegible] ar [illegible] 0 [illegible] a d [illegible] d a [illegible] 2 [illegible] 6 [illegible] a [illegible] r [illegible] r [illegible] ra [illegible]
- [illegible] a [illegible] d [illegible] a [illegible] r [illegible] a [illegible] y [illegible] 2 0 [illegible] a [illegible] d [illegible] ar a [illegible]
- Embedment into rock achieved is unknown but the "concept design" appears to show that 2 [illegible] r [illegible] r [illegible] d [illegible]

[illegible] r [illegible] a [illegible] a [illegible] a [illegible] a [illegible] ad [illegible]

- [illegible] r [illegible] d r [illegible] d height is 5m compared to the "concept design" of 4.5m maximum.
- [illegible] 2 [illegible] r [illegible] r [illegible] r [illegible] ad [illegible] y [illegible] d [illegible] r [illegible] d [illegible] a [illegible] a [illegible] 1 [illegible] 1 [illegible] r [illegible]

- [illegible] deeper than those noted above for the Marina and ranging from embedment's of 2m up [illegible]

4.3 GHD Review

4.3.1 Critical Parameters

[illegible] the "concept design" is extremely sensitive to toe stability as the forces that need to be [illegible]

[illegible]

- [illegible]
- [illegible] 'Geotechnical Consultant' [illegible]
- [illegible]
- [illegible] 600 [illegible]
- [illegible] the photos seem to confirm this. The "concept drawing" requests gravel back [illegible] "concept drawing" requests for gravel backfill at the locations tested. [illegible]

4.3.2 GHD Model Findings

[illegible]

- [illegible]

- [illegible] unless embedment's [illegible]

- [illegible] original “concept drawings’.

- [illegible]

- [illegible] no differential pore pressure allowed for in the “concept design” so if [illegible]

[illegible]

5. Inflow/Outflow Analysis - Lagoon

5.1 Lagoon Volume Calculations

[illegible]

- [illegible]
- [illegible]
- [illegible]

[illegible]

5.2 Estimated Flow Rates if 900 dia pipe was open

[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

5.3 Estimate of Measured Inflow and Outflow with Inlet Pile Closed

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
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6. Marina Functionality

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- The D fenders are most likely undersized for safe mooring, particularly for ‘bow in’ [illegible]r[illegible] [illegible]a[illegible]d [illegible]a[illegible] [illegible]d[illegible]r[illegible]d[illegible] [illegible] [illegible]a[illegible] [illegible] [illegible]d[illegible]ra[illegible] d[illegible] [illegible]r[illegible] [illegible]r[illegible] [illegible]ra[illegible] [illegible] [illegible]y[illegible]a[illegible]d[illegible] [illegible]ar[illegible] [illegible] [illegible]d[illegible]r [illegible]a[illegible]d [illegible]a[illegible] [illegible] [illegible]a[illegible] [illegible] [illegible]d[illegible]r[illegible]r[illegible]d[illegible]
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- [illegible]r[illegible] [illegible]a[illegible]a[illegible]d[illegible] [illegible]a[illegible] [illegible]ad[illegible]a[illegible]a[illegible]a[illegible] [illegible]d a[illegible]
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- [illegible]

- [illegible]

- [illegible] 62 [illegible]

7. Water Quality Testing

[illegible] 1 May 2016 [illegible] 200 [illegible]

Monitoring Design and Purpose

[illegible]

Sampling Parameters

[illegible] 10 [illegible]

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Initial Results

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Table 1 Water Quality Analyses

Parameter	NHMRC	QWQG	Neap	High Tide	Low Tide
Biological			16□0□□16	1□□0□□16	21□0□□16
E. coli M□□□100 □ □	□□a□□□□□ *Enterococci*	□a□□□ □□1□□ □□ □ □	□2□1□	□2□1□	161
□□□r□ □□□□□ra□□□□□□□r□ □ □a□□a□□□□□r□ □□ □□□□100 □ □	□□a□□□□□ *Enterococci*	□a□□□ □□1□□ □□ □ □	□2□1□	□2□1□	1□0
Enterococci M□□□100 □ □	□□□□r □a□□□ 1	□□□□r □a□□□ 1	□1	□10	**19,863**
□ya□□□a□□□r□a □□□□□□□□ □ □ □ □□□	□10 □□□□□□□□ □ *Karenia brevis* a□d□ □r □a□□ *Lyngbya majuscula* a□d□r *Pfiesteria* □r□□□□□□□ □□□□ □□□ □□r□□	□□ □□r a□□r□ ≥0□□ □□ □10	**1.9135** *Lyngbya majuscula* □r□□□□□	**2.7236**	□
□□y□□□a□□□□□ □d□a□□□ □□ □□a□□□□□□□ □	□ □□□□□□□□ □□ □□□r□□□□ □□d□□a□□r	□ □□□□□□□□ □□ □□□r□□□□ □□d□□a□□r	10□120	12□□2□	□00
Physico-chemical					
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□□□ □□ra□□r□ □□□			□1□□	□2□□	□0□1
□□□□□□□□□d □□y□□□ □□□□□ □	□□0□	□0	**5.88 (73%)**	**5.33 (72%)**	6□□□ □□□□ □
□ □□d□□□□□□y □□ □□□□ □	□□a	□□a	□6□□	□6□□	□□□□
□□r□□d□□y □□ □□ □	a□□□□□□□□□ □□a	a□□□□□□□□□ □□a	□□2	6□6	□□□

[illegible]

Table 2 Derivation of Values for Microbial Water Quality Assessment Categories

Category	95th percentile for enterococci/100ml	Basis of Derivation	Estimation of Probability
[illegible]	≤ [illegible]0	[illegible] the 'No Observed Adverse Effect Level' [illegible]	[illegible] 1[illegible]
[illegible]	[illegible]1 [illegible]200	[illegible]	[illegible] 1[illegible] [illegible] 200[illegible]100 [illegible] 20 [illegible]
[illegible]	201 [illegible]00	[illegible]	[illegible] 10[illegible]
[illegible]	≥ [illegible]01	[illegible]	[illegible] 10[illegible]

[illegible] Ma[illegible] 200[illegible]

General Discussion

[illegible] 100[illegible] [illegible] day[illegible] [illegible] 16[illegible] Mar[illegible] [illegible] 1[illegible] [illegible] 1[illegible] [illegible]

[illegible] *E.coli* [illegible] day[illegible] [illegible] 1[illegible] *E coli* [illegible]

[illegible]

[illegible] *E. coli* [illegible] 200[illegible] [illegible] *Enterococci* [illegible] *Enterococci* [illegible] 2 [illegible]

[illegible] 21 [illegible] *Enterococci* [illegible] day [illegible]

[illegible] the water volume in the lagoon is tidally mixed and 'turned over' within a two day (four tide [illegible] 1[illegible] Mar [illegible] 16[illegible] [illegible] complete 'turn over' [illegible] *Lyngbya majuscula* [illegible] ath ('fireweed') and was present on the [illegible] Mar [illegible] 1 [illegible] amber alert ≥0.4 to <10 ra[illegible] *Lyngbya majuscula* [illegible]

[illegible] *insitu* [illegible] dard [illegible]

Summary

- [illegible]
- [illegible] sewered residential areas and while not considered to be within a 'high risk' healt[illegible]

[illegible] within an ‘amber warning’ level of notification.

- [illegible]

- [illegible]

- [illegible]

[illegible]

- [illegible]

- [illegible]

- [illegible]

- [illegible]

[illegible]

- [illegible]

- [illegible]

- [illegible]

[illegible]

8. Upgrading Options

[illegible]

[illegible]

8.1 Lagoon Area

1 [illegible]

2 Investigations into the sheet pile embedment's achieved would need [illegible]

[illegible]

[illegible]

[illegible]

6 [illegible]

[illegible]

[illegible]

8.2 Marina Area

1 [illegible]

[illegible]

9. Conclusions

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

- It appears that a “Concept Design”, with a number of qualifications from the supplier ‘Steel Supplier’ has been used “For Construction” [illegible] addition to this, the “Concept Design” has been modified to such an extent that the [illegible]
- [illegible] ‘Steel Supplier’ [illegible] ‘Piling Contractor’ [illegible]
- [illegible] ‘Steel Supplier’ [illegible] ‘Steel Supplier’ [illegible] ‘Steel Supplier’’s response was that the initial ‘design’ provided in no way constituted, or was intended to [illegible]
- [illegible] ‘Piling Contractor’ [illegible]
- [illegible]
- [illegible] is significantly higher than the “concept design” of 4.5m.
- [illegible] higher than the “concept design” of 4.5m.

- [illegible]
- [illegible] and Maria [illegible]

[illegible] We can also say that we believe the “Concept Design” had [illegible]

[illegible] Maria [illegible]

[illegible] and Maria [illegible]

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Where estimates of potential costs are provided with an indicated level of confidence, notwithstanding the conservatism of the level of confidence selected as the planning level, there remains a chance that the cost will be greater than the planning estimate, and any funding would not be adequate. The confidence level considered to be most appropriate for planning purposes will vary depending on the conservatism of the user and the nature of the project. The user should therefore select appropriate confidence levels to suit their particular risk profile.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

Appendices

Appendix A – Photos Prestart

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Photo 1 – Marina sheet piles and rust staining and damage to fenders

Photo 2 – Cracking to Capping Beam

Photo 3 – Marina Fender Piles

Photo 4 – Lagoon sheet pile corrosion on extended piles

Photo 5 – Lagoon undermining of ramp and seating beam

Photo 6 – Lagoon interface between 300 Series Blockwork Wall and Sheetpiling

Photo 7 – Erosion and undermining of the ramp due to inflow/outflow from Lagoon

Photo 8 – Lagoon inflow and outflow erosion around eastern end of sheetpile wall

Photo 9 – Lagoon ramp cracking and undermining in surrounding areas

Appendix B – Provided Consultant Drawings

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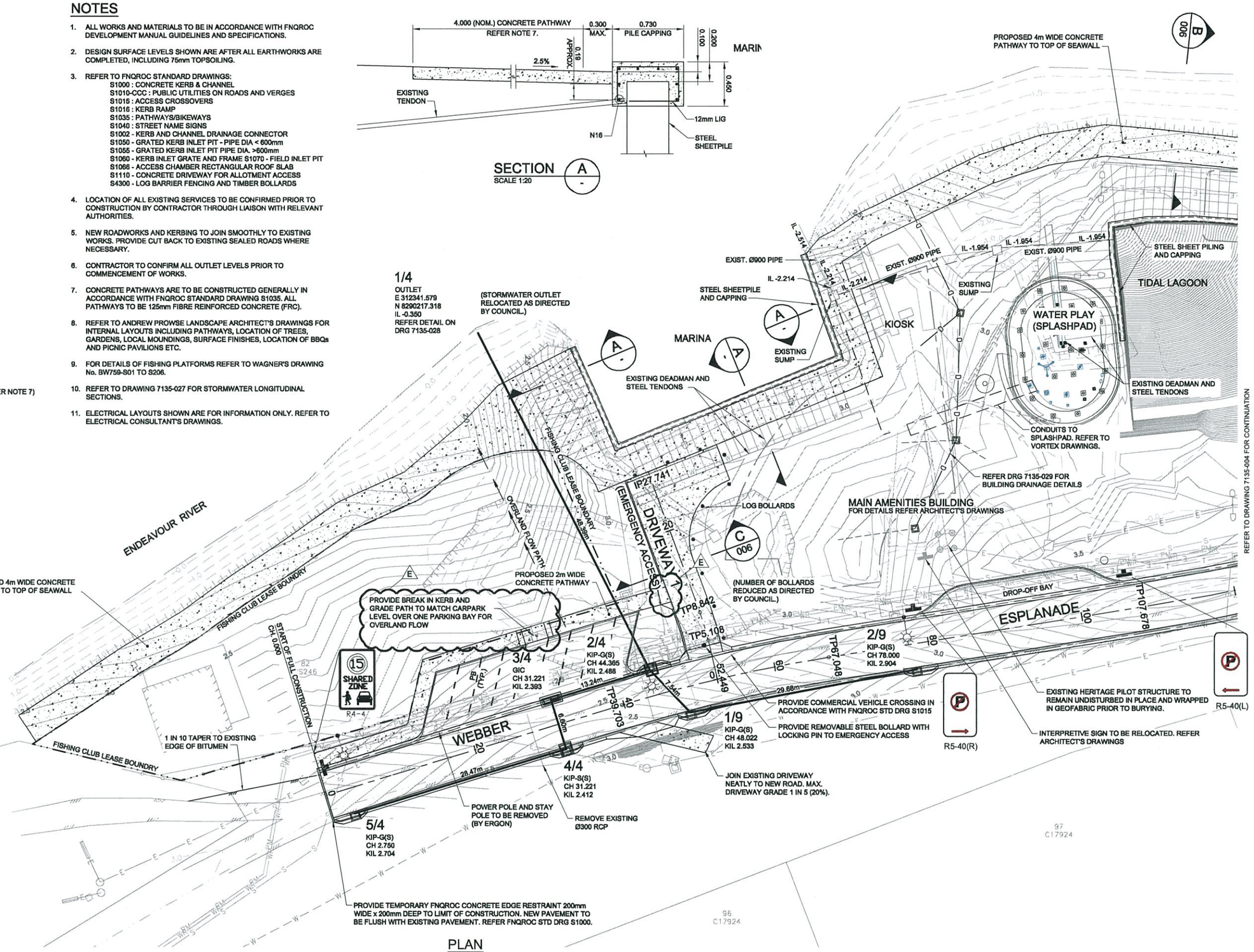
LEGEND

- LAYBACK KERB AND CHANNEL
- BARRIER KERB
- CONCRETE INVERT (TYPE 2)
- STORMWATER LINE AND KERB INLET PIT
- STORMWATER LINE AND HEADWALL
- 22.35m — PIPE LENGTH
- 2/6 — LINE No. / STRUCTURE No.
- KIP-G(S) — KERB INLET PIT ON GRADE (WITH SMALL EXTENSIONS ON ONE SIDE)
- KIP-S(M) — KERB INLET PIT ON SAG (WITH MEDIUM EXTENSION ON BOTH SIDES)
- GIC — GRATED INLET CHAMBER (REFER DETAIL ON 7135-028)
- CH — ROAD CHAINAGE
- KIL — KERB INVERT LEVEL
- SW/S — INDICATES STORMWATER (SW) CROSSING OTHER SERVICES eg. (S) SEWER
- S — PROPOSED SEWER
- PM — PROPOSED SEWER PRESSURE MAIN
- WR — PROPOSED WATER REUSE MAIN
- W — PROPOSED WATER RETICULATION
- SW — EXISTING STORMWATER PIPE
- 4.0 — DESIGN SURFACE CONTOUR (0.05m INTERVAL)
- 4.0 — EXISTING SURFACE CONTOUR (0.5m INTERVAL)
- CONCRETE PATHWAY (WIDTHS AS SHOWN - REFER NOTE 7)
- KERB RAMP
- ACCESS CROSSOVER
- BATTER TOE/TOP
- EXISTING EDGE OF PAVEMENT
- ET — Ø80mm ELECTRICTY / Ø50mm TELSTRA CONDUITS (BY CONTRACTOR)
- E — ELECTRICITY, PILLAR BOX
- LIGHTS (REFER TO ELECTRICAL CONSULTANT'S DRAWINGS FOR LIGHT TYPES
- LOG BOLLARDS (OR APPROVED EQUIVALENT)

NOTES

1. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
2. DESIGN SURFACE LEVELS SHOWN ARE AFTER ALL EARTHWORKS ARE COMPLETED, INCLUDING 75mm TOPSOILING.
3. REFER TO FNQROC STANDARD DRAWINGS:
   - S1000 : CONCRETE KERB & CHANNEL
   - S1010-CCC : PUBLIC UTILITIES ON ROADS AND VERGES
   - S1015 : ACCESS CROSSOVERS
   - S1016 : KERB RAMP
   - S1035 : PATHWAYS/BIKEWAYS
   - S1040 : STREET NAME SIGNS
   - S1002 - KERB AND CHANNEL DRAINAGE CONNECTOR
   - S1050 - GRATED KERB INLET PIT - PIPE DIA < 600mm
   - S1055 - GRATED KERB INLET PIT PIPE DIA. >600mm
   - S1060 - KERB INLET GRATE AND FRAME S1070 - FIELD INLET PIT
   - S1066 - ACCESS CHAMBER RECTANGULAR ROOF SLAB
   - S1110 - CONCRETE DRIVEWAY FOR ALLOTMENT ACCESS
   - S4300 - LOG BARRIER FENCING AND TIMBER BOLLARDS
4. LOCATION OF ALL EXISTING SERVICES TO BE CONFIRMED PRIOR TO CONSTRUCTION BY CONTRACTOR THROUGH LIAISON WITH RELEVANT AUTHORITIES.
5. NEW ROADWORKS AND KERBING TO JOIN SMOOTHLY TO EXISTING WORKS. PROVIDE CUT BACK TO EXISTING SEALED ROADS WHERE NECESSARY.
6. CONTRACTOR TO CONFIRM ALL OUTLET LEVELS PRIOR TO COMMENCEMENT OF WORKS.
7. CONCRETE PATHWAYS ARE TO BE CONSTRUCTED GENERALLY IN ACCORDANCE WITH FNQROC STANDARD DRAWING S1035. ALL PATHWAYS TO BE 125mm FIBRE REINFORCED CONCRETE (FRC).
8. REFER TO ANDREW PROWSE LANDSCAPE ARCHITECT'S DRAWINGS FOR INTERNAL LAYOUTS INCLUDING PATHWAYS, LOCATION OF TREES, GARDENS, LOCAL MOUNDINGS, SURFACE FINISHES, LOCATION OF BBQs AND PICNIC PAVILIONS ETC.
9. FOR DETAILS OF FISHING PLATFORMS REFER TO WAGNER'S DRAWING No. BW759-S01 TO S206.
10. REFER TO DRAWING 7135-027 FOR STORMWATER LONGITUDINAL SECTIONS.
11. ELECTRICAL LAYOUTS SHOWN ARE FOR INFORMATION ONLY. REFER TO ELECTRICAL CONSULTANT'S DRAWINGS.

SECTION A
SCALE 1:20



PLAN
SCALE 1:250

0 2.5 5 7.5 10 12.5m
SCALE 1:250 (A1 SIZE)

Revisions No.	Description	Reviewed	Approved	Date
E	MINOR REVISIONS TO PATH NOTES AT APPROX. CH 30	–	–	04/12/15
D	ESPLANADE ROAD WIDENED; STORMWATER ADJUSTED TO SUIT			20/11/15
C	CONSTRUCTION ISSUE			20/01/15
B	ORIGINAL ISSUE	ARH	GDB	07/10/14
A	PRELIMINARY ISSUE	–	–	5/09/14

Cook Shire COUNCIL

Black & More
ABN 24 845 447 493
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

Client: COOK SHIRE COUNCIL
Project: COOKTOWN WATERFRONT ACTIVITY PRECINCT

Drawn	GAS	Drawing Check	ARH	Approved	Date
Designed	GAS	Design Check	ARH		RPEQ

Drawing is not to be used for construction unless approved

Drawing Title: ROADWORKS & DRAINAGE PLAN SHEET 1 OF 3

Drawing Size	Scale (A1 size)	Drg No	Revision
A1	1:250	7135-003	E

External References: B&M-TITLE-A1_e.dwg ; 7135-X-LOGO.dwg ; 7135-X-SURVEY.dwg ; 7135-X-DESIGN.dwg ; 7135-X-CONT-SURVEY.dwg ; 7135-X-CONT-DESIGN.dwg ; 7135-X-ELEC_20150116.dwg

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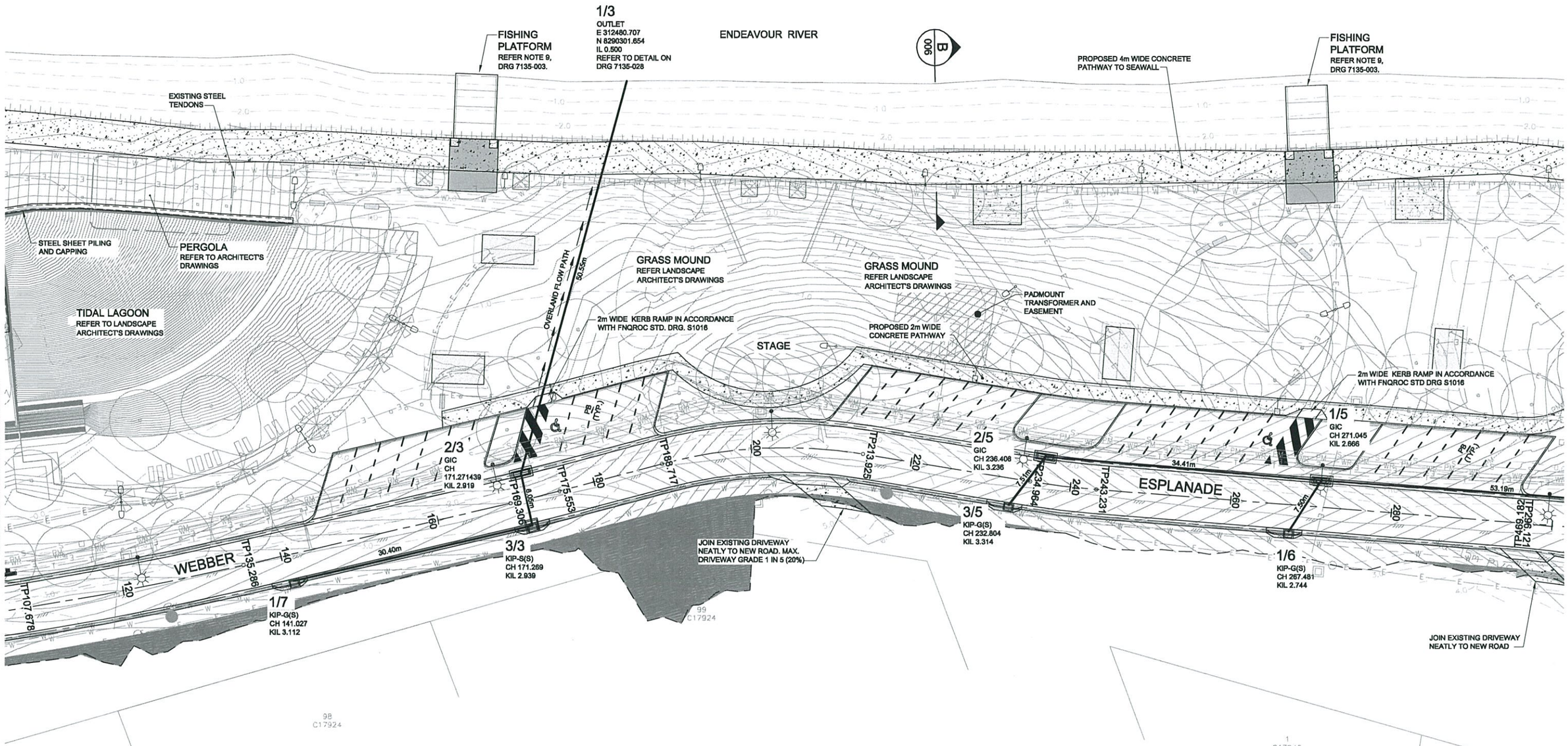

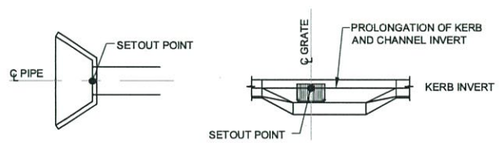

HEADWALL

KERB INLET PIT

DRAINAGE STRUCTURE SETOUT POINTS

NOT TO SCALE

NOTES

1. REFER TO DRAWING 7135-003 FOR NOTES AND LEGEND.
2. REFER TO DRAWING 7135-030 FOR TYPICAL JOINT USE SERVICES TRENCH DETAIL.

0 2.5 5 7.5 10 12.5m

SCALE 1:250 (A1 SIZE)

PLAN

SCALE 1:250

Revisions				
D	ESPLANADE ROAD WIDENED; STORMWATER ADJUSTED TO SUIT		20/11/15	
C	CONSTRUCTION ISSUE			20/01/15
B	ORIGINAL ISSUE	ARH	GOB	07/10/14
A	PRELIMINARY ISSUE	-	-	5/09/14
No.	Description	Reviewed	Approved	Date

Cook Shire COUNCIL

Black & More
ABN 24 845 447 493
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

Client: COOK SHIRE COUNCIL

Project: COOKTOWN WATERFRONT ACTIVITY PRECINCT

Drawn	GAS	Drawing Check	ARH	Approved	Date
Designed	GAS	Design Check	ARH	RPEQ	

Drawing is not to be used for construction unless approved

Drawing Title: ROADWORKS & DRAINAGE PLAN SHEET 2 OF 3

Drawing Size	Scale (A1 size)	Drg No	Revision
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External References: B&M-TITLE-A1_e.dwg ; 7135-X-LOGO.dwg ; 7135-X-SURVEY.dwg ; 7135-X-DESIGN.dwg ; 7135-X-CONT-SURVEY.dwg ; 7135-X-CONT-DESIGN.dwg ; 7135-X-ELEC_20150116.dwg ; 7135-X-1150 - LP-P1.0_150129.dwg ; 150223_Csc-03_A105_Main Amenities Viewing Mound Works By Csc (B)_150224JT.dwg ; Cooktown Park SP, AU_P&E_22386_ANCHORE POSITIONING PLAN_150218.dwg ; 150223_Csc-03_A101_Main Amenities Ground Floor & Roof-Deck Plans (D)_150224JT.dwg

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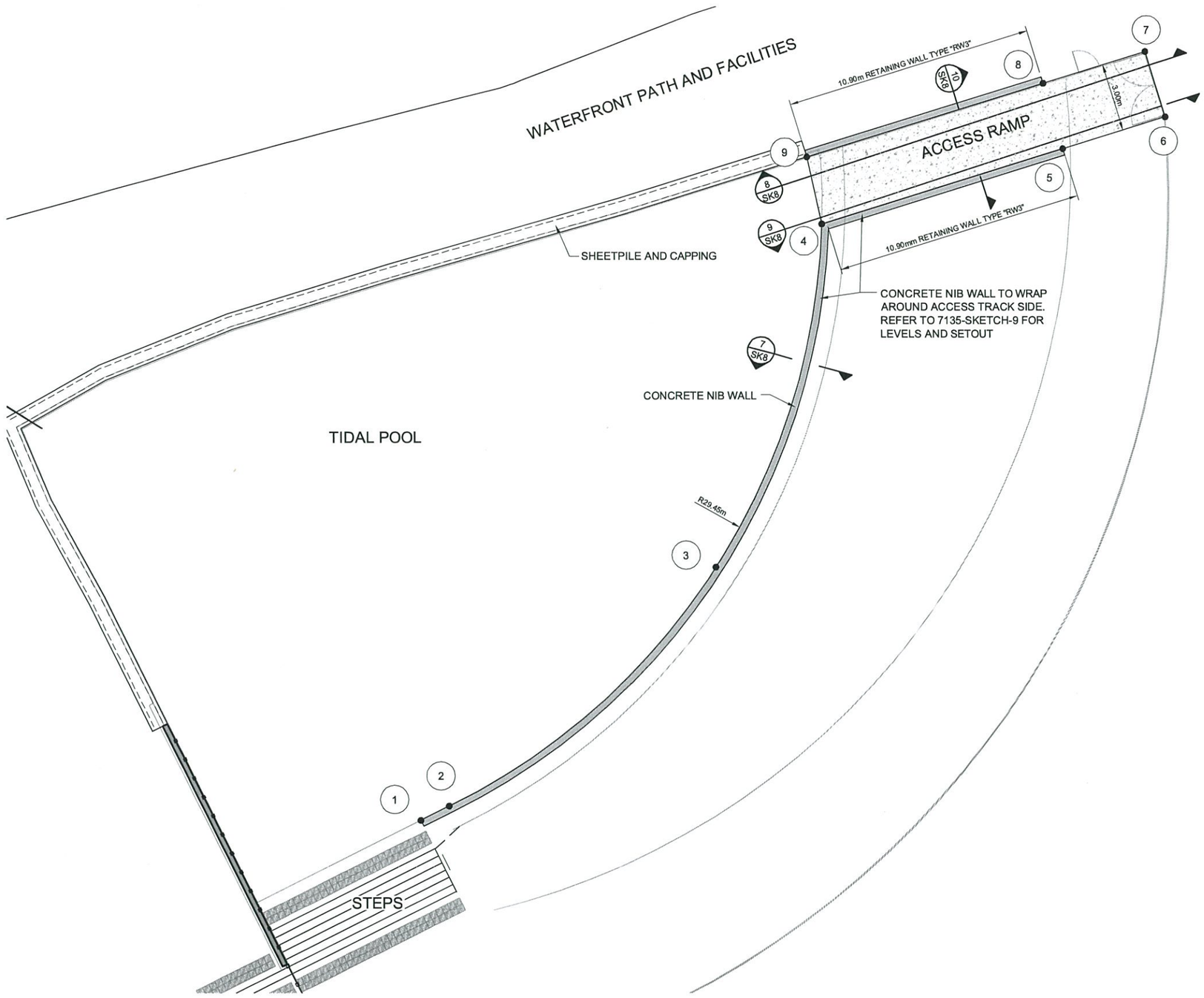

N

NIB WALL, RW3 AND ACCESS RAMP SETOUT

POINT	EASTING	NORTHING	TOP WALL LEVEL	TOE WALL LEVEL	ACCESS RAMP LEVEL
1	312430.974	8290241.448	2.350	1.850	-
2	312432.232	8290242.076	2.350	1.850	-
3	312444.013	8290252.555	2.350	1.850	-
4	312448.699	8290267.609	2.350	1.850	1.850
5	312459.314	8290270.901	2.950	2.950	2.950
6	312463.830	8290272.302	-	-	3.021
7	312462.941	8290275.167	-	-	3.021
8	312458.447	8290273.773	2.950	2.950	2.950
9	312448.036	8290270.544	2.950	1.850	1.850

FOR CONSTRUCTION

0 1 2 3 4 5m
SCALE 1:100 (A1 SIZE)

Cook Shire COUNCIL

Black & More
ABN 24 845 447 493
93 Digger St Cairns North QLD 4870
PO Box 999N Cairns North QLD 4870
Telephone (07) 4031 9944
Fax (07) 4031 9914
Email black.more@blackm.com
Internet www.blackm.com

COOK SHIRE COUNCIL
COOKTOWN WATERFRONT ACTIVITY PRECINCT

CONCRETE ACCESS RAMP AND NIB WALL SETOUT DETAILS

SKETCH-7135-9

Date	Project Number	
MAY 2015	7135	
Drawing Size	Scale (A1 size)	Revision
A1	1:100	A

File: D:\B&M Files\Projects\7135\Drawings\ 7135-SKETCH-009(A).dwg
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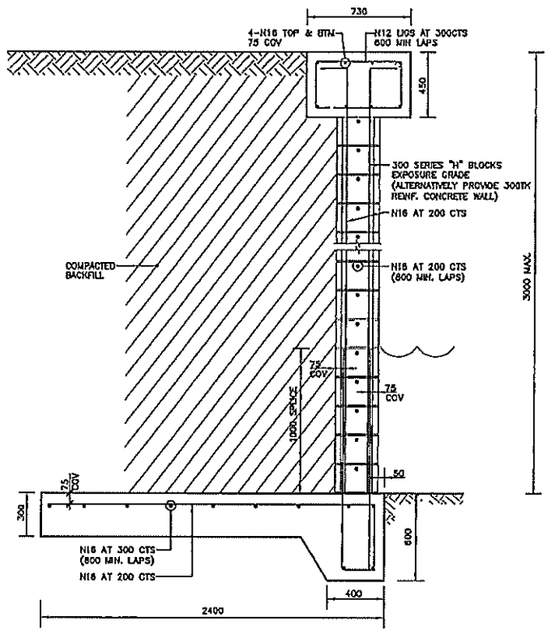


SECTION A 01 SCALE 1:20 DETAIL RW1 01 SCALE 1:20

WATERFRONT RETAINING WALL
SCALE 1:20

REFER LANDSCAPE ARCHITECTS AND CIVIL CONSULTANTS DRAWINGS FOR EXTENT/LOCATION OF WALLS & SEATING. ALL DIMENSIONS, STEPS, FALLS & LEVELS.

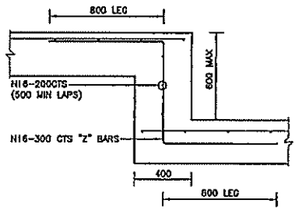
NOTE:

- BLOCKWORK TO BE 300 SERIES "H" BLOCKS EXPOSURE GRADE (ALTERNATIVELY PROVIDE 300TK REINF. CONCRETE WALL)
- ALL MORTAR JOINTS TO BE IRONED JOINTS
- ALL REINFORCEMENT TO BE HOT DIPPED GALVANISED
- CONCRETE GRADE TO BE N50
- COREFILL TO BE GRADE S50 CONCRETE

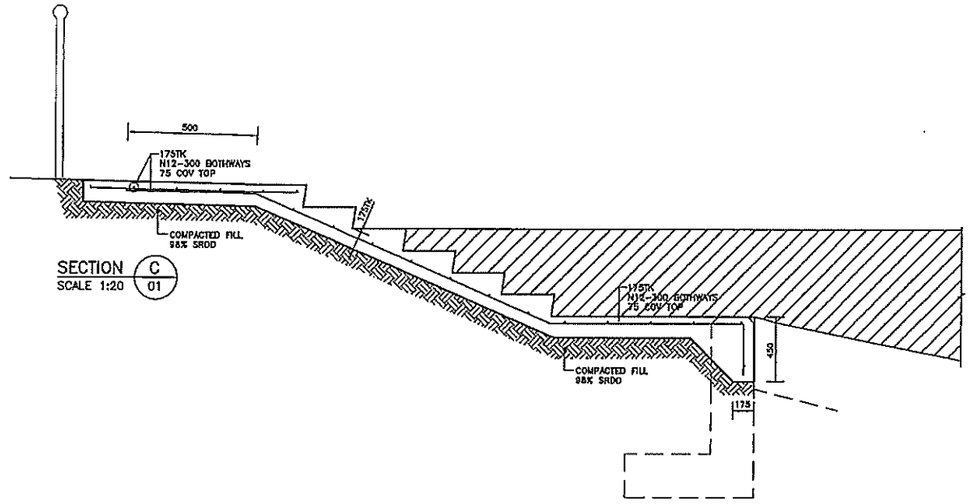
NOTE:

NEW AND EXISTING CONCRETE CAPPING TO BE JOINED WITH 4-20ϕx400 LONG STAINLESS STEEL DOWELS TOP AND BOTTOM

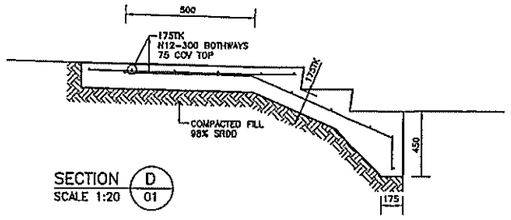
NOTE:
STEP IN FOOTING TO BE VERIFIED ON-SITE PRIOR TO CONSTRUCTION



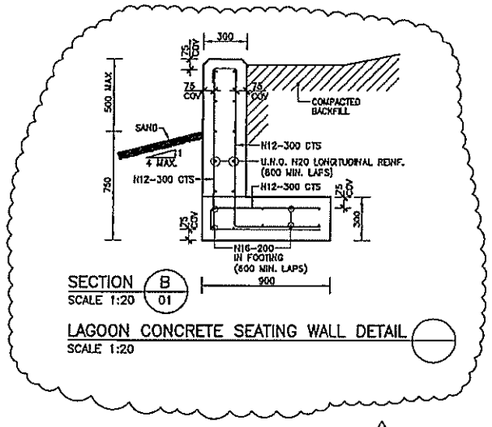
TYPICAL STEP FOOTING DETAIL
SCALE 1:20



SECTION C 01 SCALE 1:20



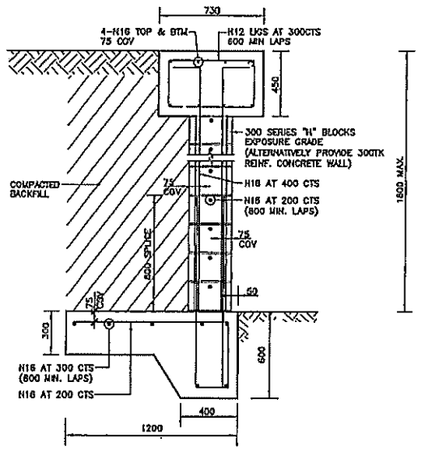
SECTION D 01 SCALE 1:20



SECTION B 01 SCALE 1:20

LAGOON CONCRETE SEATING WALL DETAIL
SCALE 1:20

B



DETAIL RW2 01 SCALE 1:20

WATERFRONT RETAINING WALL
SCALE 1:20

REFER LANDSCAPE ARCHITECTS AND CIVIL CONSULTANTS DRAWINGS FOR EXTENT/LOCATION OF WALLS & SEATING. ALL DIMENSIONS, STEPS, FALLS & LEVELS.

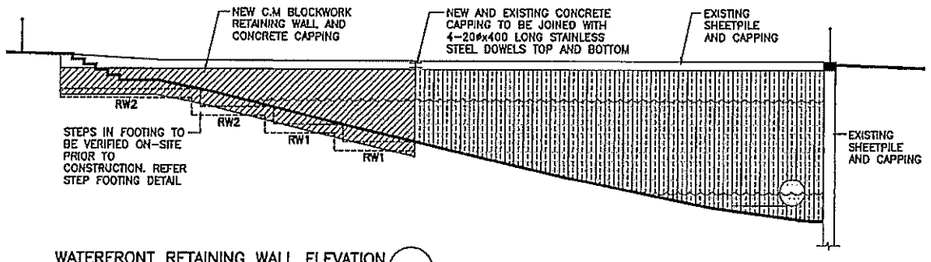
NOTE:

-PROVIDE CONTROL JOINTS AT 12m CTS

-JOINTS TO BE DOWELED WITH 4-20ϕx400 LONG STAINLESS STEEL DOWELS TOP AND BOTTOM

-CONCRETE GRADE TO BE N50

NOTE:
REFER LANDSCAPING DRAWINGS FOR EXTENT AND LOCATION



WATERFRONT RETAINING WALL ELEVATION
SCALE 1:100

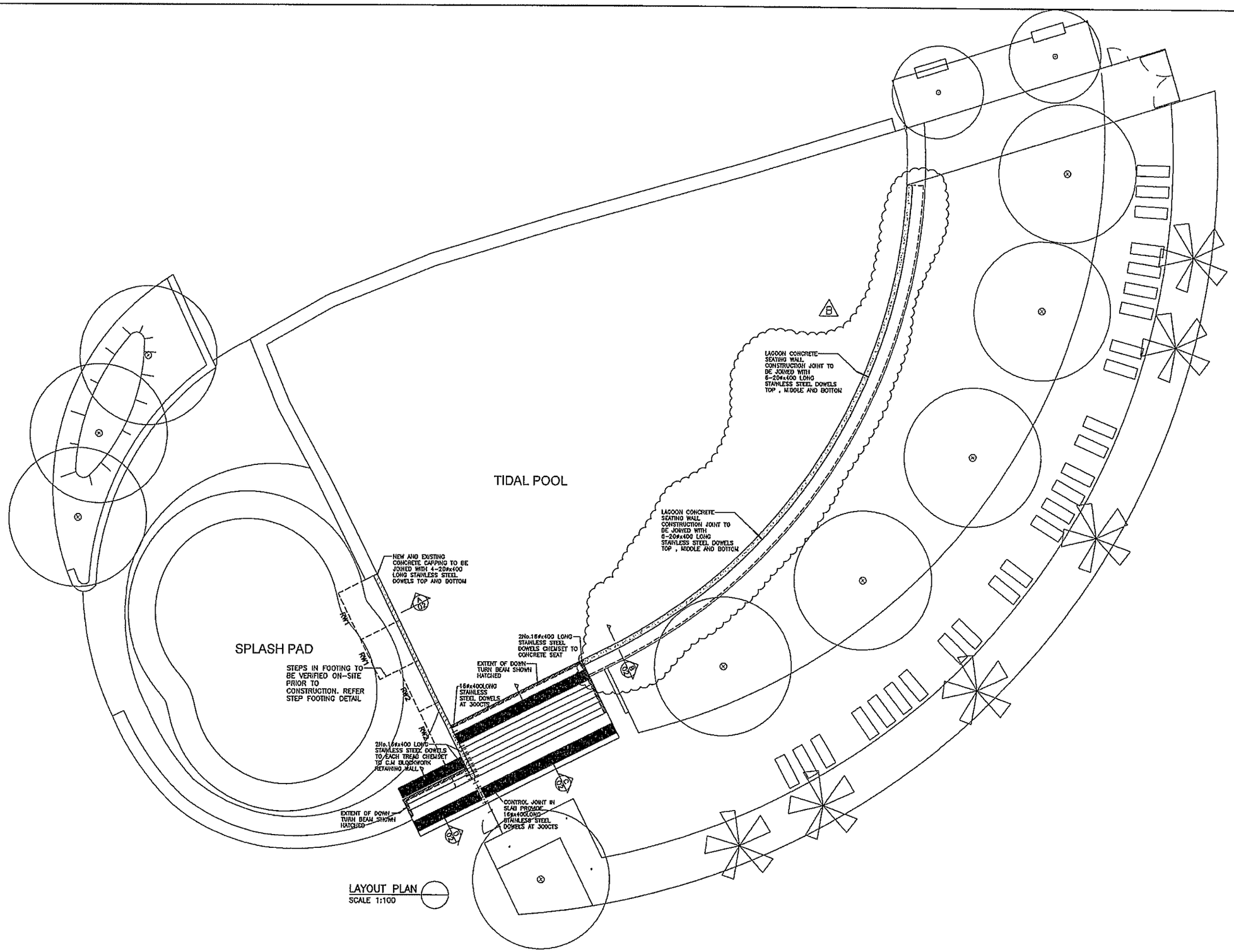
issue			amendments	associated consultants
A	CONSTRUCTION ISSUE	13.02.15		
B	CONCRETE SEATING WALL DETAIL AMENDED	08.04.15		

C.M.G. CONSULTING ENGINEERS PTY. LTD.
ACN. 011 065 375 STRUCTURAL AND CIVIL
208 Buchan Street CAIRNS, 4870. Phone: (07) 4031 2775
P.O. Box 5901 Cairns Mail Centre Fax: (07) 4051 9013

COOK SHIRE COUNCIL
PROPOSED COOKTOWN FORESHORE ACTIVITIES PRECINCT AT COOKTOWN

TITLE: LAGOON RETAINING WALLS

SCALE	AS SHOWN	DRAWN	AGM
		DESIGNED	C.M.G.
DATE	FEB 15	CHECKED	C.M.G.
APPROVED			
DWG NUMBER	1428 -S02	AMDT	B



LAYOUT PLAN
SCALE 1:100

issue		
A	CONSTRUCTION ISSUE	13.02.15
B	CONCRETE SEATING WALL DETAIL AMENDED	08.04.15

amendments

associated consultants

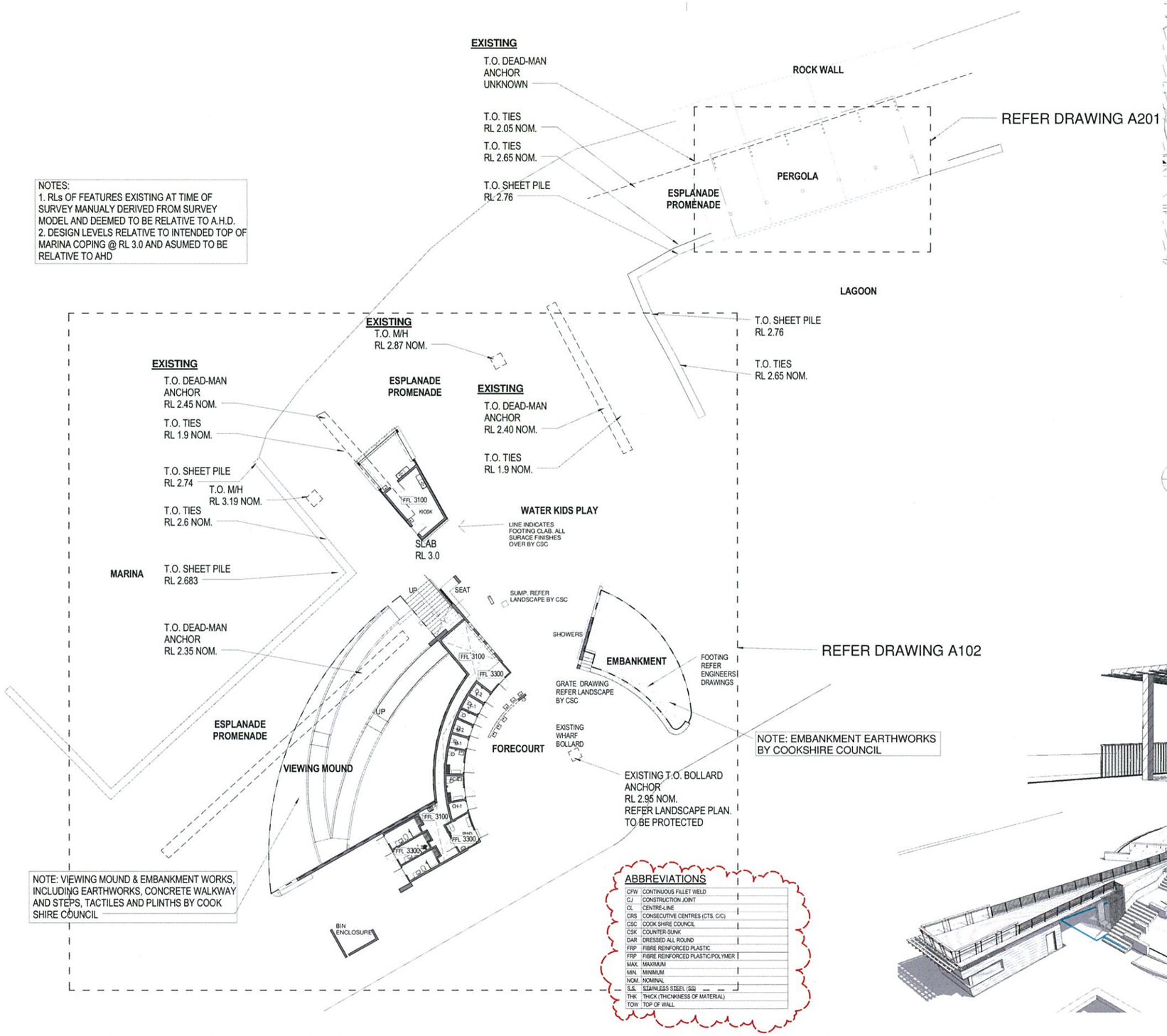
C.M.G. CONSULTING ENGINEERS PTY. LTD.
A.C.N. 011 065 375 STRUCTURAL AND CIVIL
208 Buchan Street CAIRNS, 4870. Phone: (07) 4031 2775
P.O. Box 5901 Cairns Mail Centre Fax: (07) 4051 9013

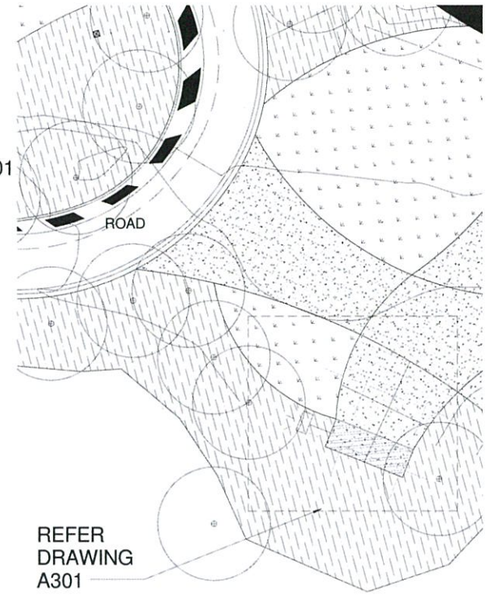
COOK SHIRE COUNCIL
PROPOSED COOKTOWN FORESHORE ACTIVITIES PRECINCT AT COOKTOWN

TITLE: LAGOON RETAINING WALLS

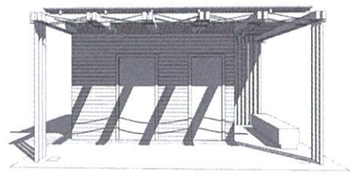
SCALE	AS SHOWN	DRAWN	AGM
		DESIGNED	C.M.G.
DATE	FEB 15	CHECKED	C.M.G.
APPROVED			
DWG NUMBER	64428 -S01	AMDT	B

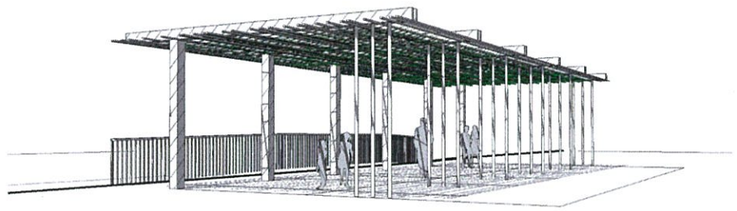
NOTES:
1. RLs OF FEATURES EXISTING AT TIME OF SURVEY MANUALY DERIVED FROM SURVEY MODEL AND DEEMED TO BE RELATIVE TO A.H.D.
2. DESIGN LEVELS RELATIVE TO INTENDED TOP OF MARINA COPING @ RL 3.0 AND ASUMED TO BE RELATIVE TO AHD

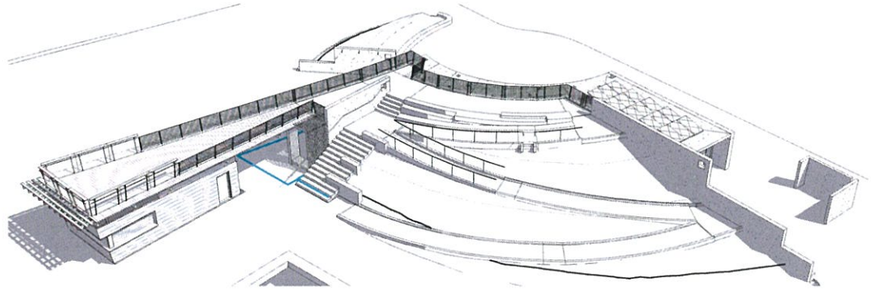




2 A102 NORTHERN AMENITIES PLAN
1 : 200







ABBREVIATIONS

CFW	CONTINUOUS FILLET WELD
CJ	CONSTRUCTION JOINT
CL	CENTRE-LINE
CRS	CONSECUTIVE CENTRES (CTS. C/C)
CSC	COOK SHIRE COUNCIL
CSK	COUNTER-SUNK
DAR	DRESSED ALL ROUND
FRP	FIBRE REINFORCED PLASTIC
FRP	FIBRE REINFORCED PLASTIC/POLYMER
MAX.	MAXIMUM
MIN.	MINIMUM
NOM.	NOMINAL
S.S.	STAINLESS STEEL (SS)
THK	THICK (THICNKNESS OF MATERIAL)
TOW	TOP OF WALL

REV	DATE	NOTE
1	08-09-14	TENDER
Ø 2	09-09-14	TENDER
Ø 3	17-10-14	CLIENT REVIEW
Ø 4	01-12-14	TENDER
A	05-12-14	CONSTRUCTION

No.	Drawing Name
A001	SITE PLAN
A101	MAIN AMENITES GROUND FLOOR & ROOF/DECK PLANS
A102	MAIN AMENITIES ELEVATIONS & DOOR SCHEDULE
A103	MAIN AMENITIES SECTIONS & DETAILS
A104	MAIN AMENITIES DETAIL PLANS & INTERIOR ELEVATIONS
A201	PERGOLA
A301	NORTHERN AMENITIES BLOCK

Cook Shire COUNCIL

GENERAL NOTES

THE BUILDING CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THAT ALL THE PROPOSED BUILDING WORK SHOWN ON THIS DRAWING IS TO COMPLY WITH ALL ASPECTS OF THE STANDARD & SPECIAL CONDITIONS OF THE **BUILDING CODE OF AUSTRALIA**, AUSTRALIAN STANDARDS & CODES | LOCAL GOVERNMENT AUTHORITIES, ANY OTHER BODIES HAVING JURISDICTION OVER THE WORKS.
COMPLY WITH MANUFACTURERS WRITTEN SPECIFICATIONS FOR THE CONSTRUCTION, APPLICATION, INSTALLATION, ETC. FOR PRODUCTS AND MATERIALS SPECIFIED.
THE BUILDING CONTRACTORS TO BRING TO THE NOTICE OF THE ARCHITECT ANY DISCREPANCIES WHICH ARE FOUND CONTAINED IN THIS DRAWING PRIOR TO COMMENCEMENT OF WORKS.
REFER TO STRUCTURAL ENGINEERS DRAWING FOR ALL STRUCTURAL CONCRETE, MASONRY AND STEEL WORK.
REFER TO HYDRAULIC CONSULTANTS DRAWING FOR ALL STORMWATER, SILAGE AND SEWERAGE DRAINAGE, HOT AND COLD WATER LAYOUT.
COMPLY WITH THE QUEENSLAND DEVELOPMENT CODE REQUIREMENTS OF SUSTAINABLE BUILDINGS FOR ENERGY EFFICIENT LIGHTING.
HOT WATER SUPPLY: EITHER A HEAT PUMP OR A SOLAR HOT WATER OR A GAS HOT WATER SYSTEM WITH A FIVE STAR ENERGY RATING OR AS SPECIFICATIONS.
WATER CONSERVATION: BY USE OF WATER SAVING SHOWER ROSES, LIMITING WATER PRESSURES WITH PRESSURE LIMITING DEVICE TO MAX 550KPA, LIMITING TOILET CISTERNS TO 3/7.5 & 6/7.5 HALF AND FULL FLUSHES.

N

Total Project Group Architects
124 Collins Avenue Edge Hill, QLD 4870 t +617 4032 1944 f +617 4032 0677
e cairns@totalprojectgroup.com.au www.totalprojectgroup.com.au

PROJECT PHASE:	TENDER
DATE:	JUNE 2014
DRAWN:	AB
CHECKED:	RM
ORIGINAL SCALE @ PAPER SIZE:	1 : 200 @ A1
SCALE 1:100 @ A1 / SCALE 1:200 @ A3	0 1 2 3 4 5M

PROJECT: COOKTOWN WATERFRONT ACTIVITY PRECINCT
SHEET TITLE: SITE PLAN

PROJECT NO:	DRAWING NO:	REVISION:
CSC-03	A001	A

5/12/2014 6:21:54 PM

Appendix C – ‘Steel Supplier’ Preliminary Design

□□ a□□r□□ ‘Steel Supplier’ □□ □ □□□ □□r□ □ □□□□□□da□□d □ □□□r□ary 2016

□□ a□□r□□ ‘Piling Contractor’ □r□□□ □□□ a□a□□□ □□□□ da□□d 12 □□□□ 2016

□□ a□□r□□ ‘Piling Contractor’ □r□□□ da□□d 1□ □□□□ 2016

‘Steel Supplier’ □□□□□□ □□ □□001 □y□□a□□a□ □rra□□□□ □□□□ □□□□□□

DATA

GENERAL SETTINGS:

Units system: kN, kN/m², m
Water weight: 10.000 kN/m3
Number of iterations per phase: 50
Calculation step: 0.500

Accounting for 2nd order moments: no
Definition of the project in: elevation

CHARACTERISTICS OF SOIL LAYERS:

Layer	z [m]	zw [m]	γ [kN/m3]	γd [kN/m3]	φ [°]	c [kN/m²]	dc [kN/m²]	k0	kaγ	kpγ	kd	kr	kac	kpc	kh [kN/m3]	dkh [kN/m3]
GRAVEL_FILL	4.000	0.000	17.200	10.300	40.00	0.000	0.000	0.357	0.217	10.749	0.357	0.357	0.960	10.160	60000	0
SILTY_CLAY	-0.520	0.000	20.000	10.000	15.00	2.000	0.000	0.741	0.529	1.873	0.741	0.741	1.740	3.240	10761	0
ARGILLITE	-1.520	0.000	20.000	17.000	40.00	20.000	0.000	0.357	0.217	10.749	0.357	0.357	0.960	10.160	71031	0

WALL PROPERTIES:

Section	z0 [m]	EI [kNm²]	L [m]	B_D
1. AU 14	4.000	60228	1.000	1.00

zf = -4.000 m

OPTIONS:

Caquot surcharge on the ground surface: 10.00 kN/m².

DATA

ANCHOR	Phase	za [m]	K [kN/m]	P [kN]	α [°]	Lu [m]
1	1	3.500	40.00	0.00	15.00	10

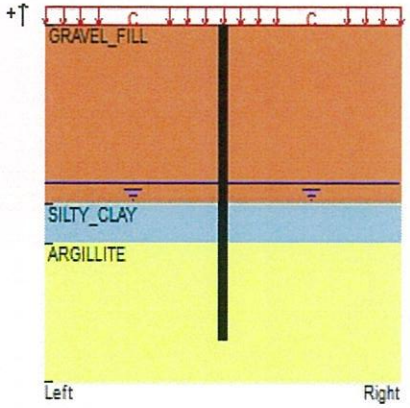
AM RETAIN v.1.2.2

PROJECT COOKTOWN_SEAWALL_

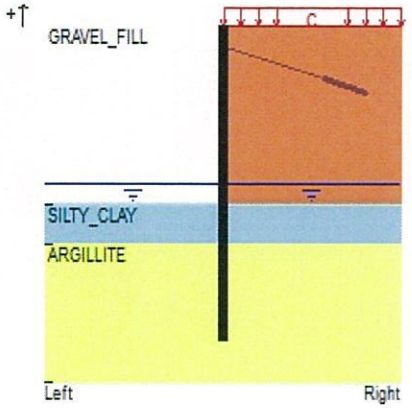
CONCEPT DESIGN ONLY

STAGED CONSTRUCTION SYNTHESIS

INITIAL PHASE



PHASE 1



- Caquot surcharge: q [kN/m²] = 10.00

- excavation (left): zh [m] = -0.520
  zw [m] = 0.000
- installation of anchor: n°1
  za [m] = 3.500
  K [kN/m] = 40
  P [kN] = 0
  α [°] = 15.00
  Lu [m] = 10

ArcelorMittal

Calculated by:

TERRASOL

RESULTS

PHASE 1

- excavation (left): zh [m] = -0.520 zw [m] = 0.000
- installation of anchor : n°1 za[m] = 3.500 K [kN/m] = 40 P [kN] = 0 α [°] = 15.00 Lu [m] = 10

Calculation converged after 4 iterations.

Level	Rotation	Displ.	Moment		Shear force		Soil status		Earth pressure		Water pressure		Vertical pressure		Limiting active pressure		limiting passive		Diff. pressures	
			M.k	M.d	V.k	V.d	left	right	left	right	left	right	left	right	left	right	left	right	P.k	P.d
[m]	[rad]	[mm]	[kNm]	[kNm]	[kN]	[kN]			[kN/m²]	[kN/m²]	[kN/m²]	[kN/m²]	[kN/m²]	[kN/m²]	[kN/m²]	[kN/m²]	[kN/m²]	[kN/m²]	[kN/m²]	[kN/m²]
4.00	0.00808	-44.75	0.00	-	0.00	-	excavation	active press.	0.00	2.17	0.00	0.00	0.00	10.00	0.00	2.17	0.00	107.49	2.17	-
3.50	0.00808	-40.71	-0.35	-	-1.55	-	excavation	active press.	0.00	4.04	0.00	0.00	0.00	18.60	0.00	4.04	0.00	199.93	4.04	-
3.50	0.00808	-40.71	-0.35	-	-1.55	-	excavation	active press.	0.00	4.04	0.00	0.00	0.00	18.60	0.00	4.04	0.00	199.93	4.04	-
3.00	0.00807	-36.66	-1.72	-	-4.05	-	excavation	active press.	0.00	5.91	0.00	0.00	0.00	27.24	0.00	5.91	0.00	292.84	5.91	-
2.50	0.00804	-32.61	-4.58	-	-7.49	-	excavation	active press.	0.00	7.79	0.00	0.00	0.00	35.89	0.00	7.79	0.00	385.74	7.79	-
1.99	0.00798	-28.58	-9.41	-	-11.88	-	excavation	active press.	0.00	9.66	0.00	0.00	0.00	44.53	0.00	9.66	0.00	478.64	9.66	-
1.49	0.00787	-24.59	-16.67	-	-17.20	-	excavation	active press.	0.00	11.54	0.00	0.00	0.00	53.17	0.00	11.54	0.00	571.55	11.54	-
0.99	0.00769	-20.68	-26.85	-	-23.47	-	excavation	active press.	0.00	13.41	0.00	0.00	0.00	61.82	0.00	13.41	0.00	664.45	13.41	-
0.49	0.00741	-16.88	-40.42	-	-30.68	-	excavation	active press.	0.00	15.29	0.00	0.00	0.00	70.46	0.00	15.29	0.00	757.35	15.29	-
-0.02	0.00700	-13.25	-57.85	-	-38.83	-	excavation	active press.	0.00	17.14	0.18	0.18	0.00	78.98	0.00	17.14	0.00	848.96	17.14	-
-0.52	0.00643	-9.87	-79.57	-	-47.73	-	excavation	active press.	0.00	18.26	5.20	5.20	0.00	84.16	0.00	18.26	0.00	904.59	18.26	-
-0.52	0.00643	-9.87	-79.57	-	-47.73	-	passive press.	active press.	6.48	41.04	5.20	5.20	0.00	84.16	0.00	41.04	6.48	164.10	34.56	-
-1.02	0.00565	-6.84	-107.48	-	-63.33	-	passive press.	active press.	15.85	43.68	10.20	10.20	5.00	89.16	0.00	43.68	15.85	173.47	27.84	-
-1.52	0.00461	-4.26	-142.34	-	-75.57	-	passive press.	active press.	25.21	46.33	15.20	15.20	10.00	94.16	1.81	46.33	25.21	182.83	21.12	-
-1.52	0.00461	-4.26	-142.34	-	-75.57	-	elastic	active press.	306.44	1.23	15.20	15.20	10.00	94.16	0.00	1.23	310.69	1215.28	-305.20	-
-2.02	0.00342	-2.27	-148.04	-	40.98	-	elastic	active press.	167.79	3.06	20.16	20.16	18.43	102.59	0.00	3.06	401.33	1305.92	-164.73	-
-2.51	0.00235	-0.85	-111.53	-	97.99	-	elastic	active press.	70.05	4.89	25.12	25.12	26.86	111.02	0.00	4.89	491.96	1396.55	-65.16	-
-3.01	0.00165	0.12	-59.53	-	102.39	-	elastic	elastic	3.92	51.32	30.08	30.08	35.30	119.45	0.00	6.72	582.60	1487.19	47.40	-
-3.50	0.00133	0.85	-16.96	-	64.42	-	not linked	elastic	0.00	105.74	35.04	35.04	43.73	127.88	0.00	8.55	673.23	1577.83	105.74	-
-4.00	0.00126	1.48	0.00	-	0.00	-	not linked	elastic	0.00	154.00	40.00	40.00	52.16	136.32	0.00	10.38	763.87	1668.46	154.00	-

Anchor n° 1 elevation 3.5 axial force 0.0 0 kN

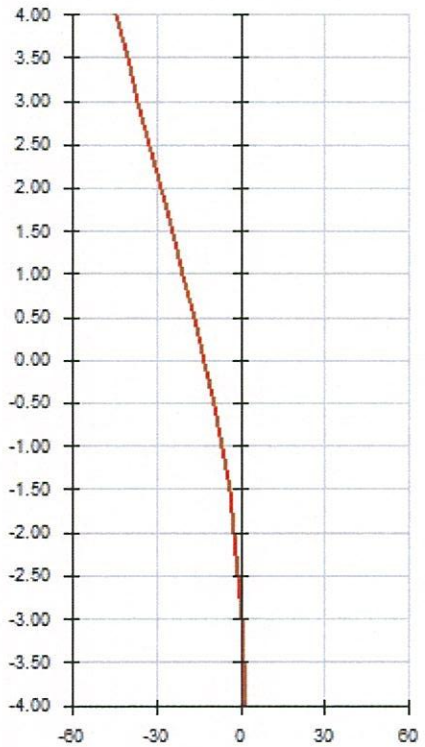
limiting earth resistance [kN] = 1348 **mobilised earth resistance [kN] =** 212 **ratio (1) =** 6.367

AM RETAIN v.1.2.2

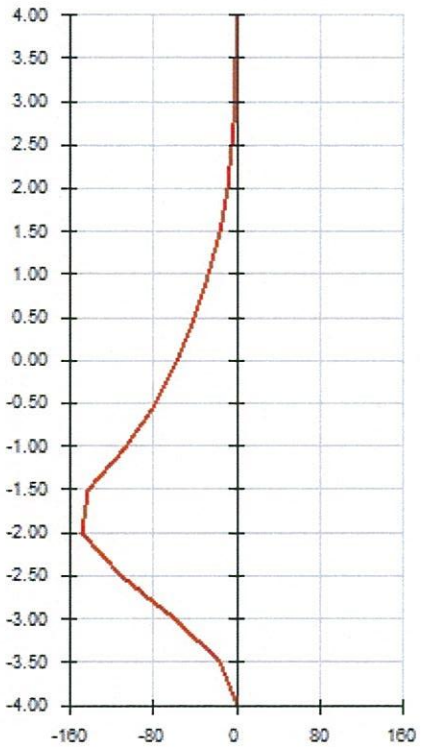
PROJECT COOKTOWN_SEAWALL_

CONCEPT DESIGN ONLY

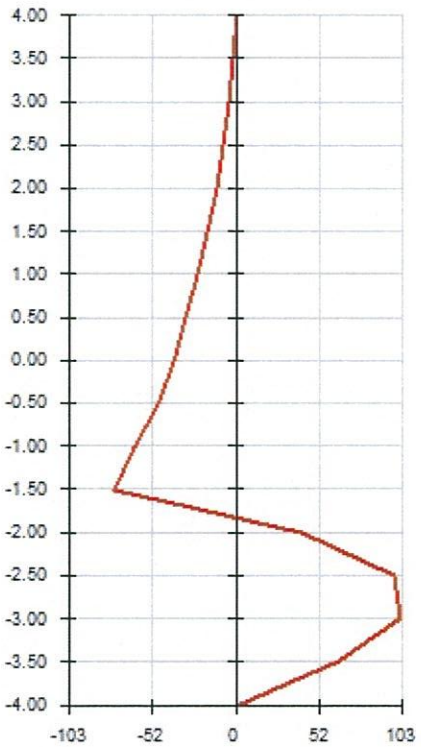
RESULTS (Phase 1)



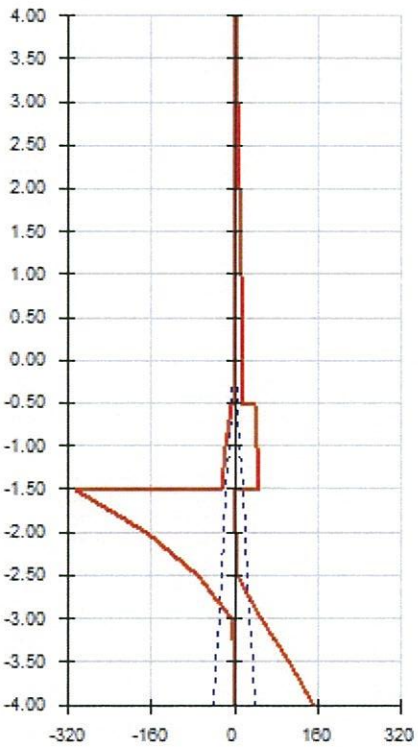
Dmax = 1.483
Dmin = -44.751



M.k max = 0.000
M.k min = -148.037



V.k max = 102.394
V.k min = -75.565



P max = 153.999
P min = -306.436
Pw max = 40.000
Pw min = -40.000

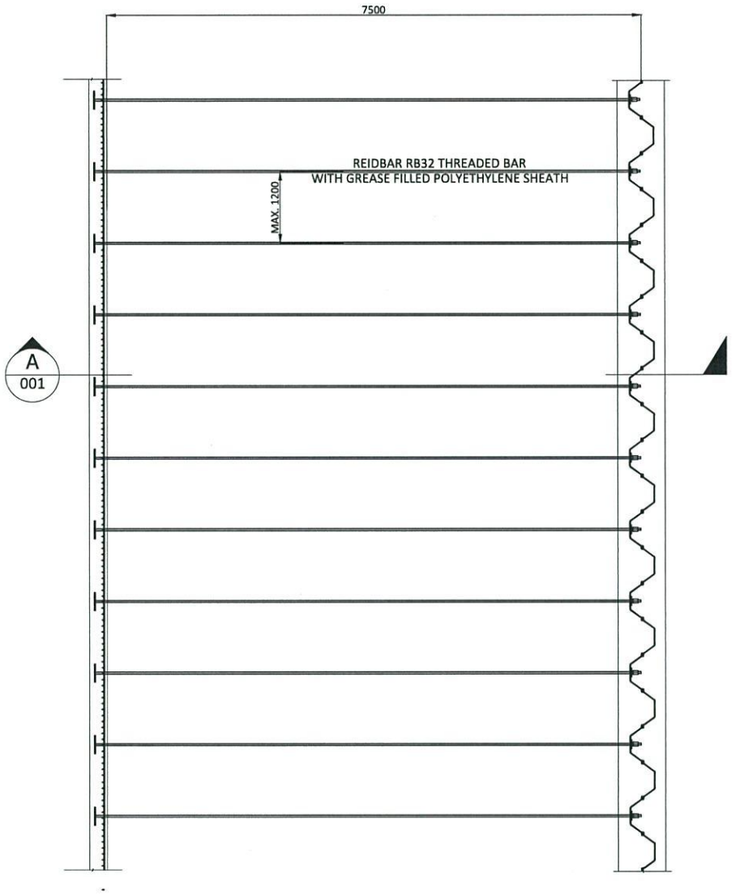
ArcelorMittal

Calculated by:

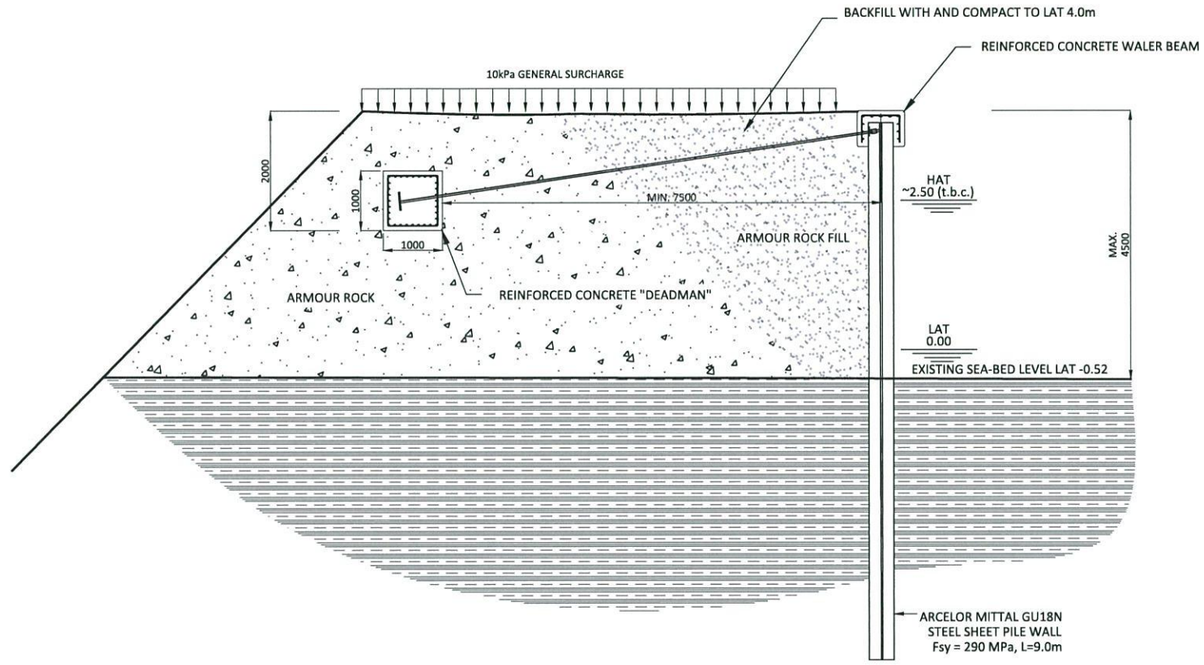
TERRASOL

RESULTS (Synthesis)

Phase N°	Displac. Head mm	Displac. max mm	Moment max kNm	Shear force max kN	Ratio Earth resist.	Anchor 1 kN
1	-44.75	-44.75	-148.04	102.39	6.367	0.000
Extrema	-44.75	-44.75	-148.04	102.39	6.367	



TYPICAL PART PLAN VIEW
1:50



TYPICAL SECTION A 001
1:50

REV	DATE	AMENDMENT / REVISION DESCRIPTION	DESIGNED	APPROVAL
P1	26/08/13	CONCEPT - FOR DISCUSSION	SA	
P2	02/10/13	REVISED CONCEPT FOR DISCUSSION	SA	
P3	31/10/13	REVISED CONCEPT FOR DISCUSSION	SA	

NOTES:

PRELIMINARY CONCEPT - FOR DISCUSSION

DESIGN LIFE: 25 YEARS
CORROSION ALLOWANCE: 0.1mm YEAR
(TO BE CONFIRMED IN DETAILED CORROSION ASSESSMENT)

CONSTRUCTION SEQUENCE:

1) INSTALL SHEET PILES
2) BACKFILL TO LAT 2.0m.
3) INSTALL REINFORCED CONCRETE "DEADMAN" & TIE RODS.
4) BACKFILL TO UNDERSIDE OF CAPPING BEAM.
5) INSTALL REINFORCED CONCRETE WALER BEAM.
6) BACKFILL TO LAT 4.0m.

CLIENT:

PROJECT:
COOKTOWN BERTHING PEN
& SWIMMING ENCLOSURE

PROJECT No
114-022

DRAWING
TYPICAL PLAN ARRANGEMENT & SECTION

DRAWING No
SK001

REVISION
P3

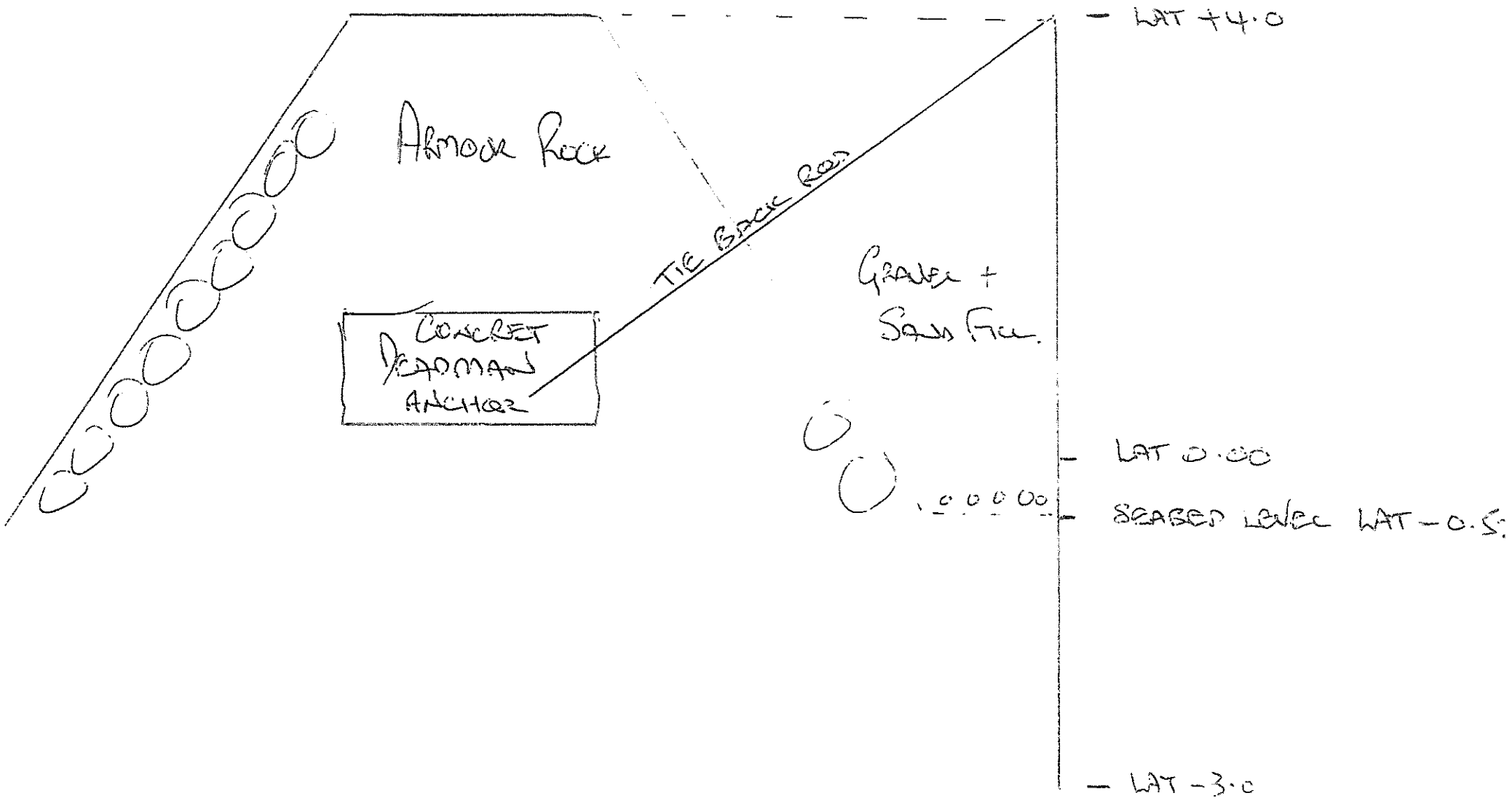
SCALE
1:50 @ A1

Appendix D – ‘Piling Contractor’

[illegible]

[illegible]r [illegible] [illegible]r [illegible]

[illegible]a[illegible]a[illegible]a


LAT +4.0
Armour Rock
TIE BACK ROD
GRAVEL +
SAND FILL
CONCRETE
DEADMAN
ANCHOR
LAT 0.00
SEABED LEVEL LAT -0.5
LAT -3.0

Form 4

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.
If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 1	LOT No: 2	LOT No: 3
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	✓
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	YES	YES	YES
- Use of Dawson Clamp (all)	✓	✓	✓
- Metrage marks (all)	NA	NA	NA
3. DRIVING			
- Wale Beam – Position & check level	✓	✓	✓
- First Pile - Position & check vertical	✓	✓	✓
(1-2m) - Position & check vertical	✓	✓	✓
- Second Pile - Vertical	✓	✓	✓
(1-2m) - Vertical	✓	✓	✓
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING	✓	✓	✓
4. RL (Depth) achieved – Average for each lot	2.9	2.9	3.2
If any RL depths out of average:	-4	-4.2	-3.9
state which sheet pile and depth achieved	~~HIT~~		
~~HIT~~ HIT ROCK			
H/P + DROVE	9	8	9
5. **HOLD POINT** ..... checked by	✓	✓	✓
6. One set of sheet piles in Wale Beam COMPLETED	✓	✓	✓

Quality Officer:.. ..... **Date:**.....26-11-13.....

START IN CENTER OF BACK WALL
AND WORKED WEST END

Form 4

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.
If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 1	LOT No: 2	LOT No: 3
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	✓
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	YES	YES	YES
- Use of Dawson Clamp (all)	✓	✓	✓
- Metrage marks (all)	NA	NA	NA
3. DRIVING			
- Wale Beam – Position & check level	✓	✓	✓
- First Pile - Position & check vertical	✓	✓	✓
(1-2m) - Position & check vertical	✓	✓	✓
- Second Pile - Vertical	✓	✓	✓
(1-2m) - Vertical	✓	✓	✓
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING	✓	N	✓
4. RL (Depth) achieved – Average for each lot	2.9	2.9	3.2
If any RL depths out of average: state which sheet pile and depth achieved	~~NO~~		
~~HIT~~ HIT ROCK			
5. **HOLD POINT** ..... checked by			
6. One set of sheet piles in Wale Beam COMPLETED	✓	✓	✓

Quality Officer:..... ..... **Date:**24-11-13

Form 4

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.

If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 4	LOT No: 5	LOT No: 6
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	✓
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	YES	YES	YES
- Use of Dawson Clamp (all)	✓	✓	✓
- Metrage marks (all)	✓	✓	✓
3. DRIVING			
- Wale Beam – Position & check level	✓	✓	✓
- First Pile - Position & check vertical	✓	✓	✓
(1-2m) - Position & check vertical	✓	✓	✓
- Second Pile - Vertical	✓		
(1-2m) - Vertical	✓		✓
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING	✓	✓	✓
4. RL (Depth) achieved – Average for each lot	3.2	3.4	2.9
If any RL depths out of average: state which sheet pile and depth achieved	NO	NO	NO
	-4	-4	-4
HIT ROCK			
H/P + DROVE	8	8	7
5. **HOLD POINT** ..... checked by			
6. One set of sheet piles in Wale Beam COMPLETED	✓	✓	✓

Quality Officer:.... ..... **Date:**.....28-11-13

WORK ON ~~EAST~~ WEST WING WALL

Form 4

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.
If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 4	LOT No: 5	LOT No: 6
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	✓
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	YES	YES	YES
- Use of Dawson Clamp (all)	✓	✓	✓
- Metrage marks (all)	✓	✓	✓
3. DRIVING			
- Wale Beam – Position & check level	✓	✓	✓
- First Pile - Position & check vertical	✓	✓	✓
(1-2m) - Position & check vertical	✓	✓	✓
- Second Pile - Vertical	✓		
(1-2m) - Vertical	✓	✓	✓
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING	✓	✓	✓
4. RL (Depth) achieved – Average for each lot	3.2	3.4	2.9
If any RL depths out of average: state which sheet pile and depth achieved	NO	NO	NO
HIT ROCK			
5. **HOLD POINT** ..... checked by			
6. One set of sheet piles in Wale Beam COMPLETED	.....	.....	.....

Quality Officer:... ..... **Date:**.....28-11-13

Form 4

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.

If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 7	LOT No: 8	LOT No: 9
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	✓
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	✓	✓	✓
- Use of Dawson Clamp (all)	✓	✓	✓
- Metrage marks (all)	NA	NA	NA
3. DRIVING			
- Wale Beam – Position & check level	✓		
- First Pile - Position & check vertical	✓		
(1-2m) - Position & check vertical	✓		
- Second Pile - Vertical	✓		
(1-2m) - Vertical	✓		
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING			
4. RL (Depth) achieved – Average for each lot	3.4	3.4	2.9
If any RL depths out of average: state which sheet pile and depth achieved	NO	NO	NO
	-4.4	-4.4	-4
~~HIT~~ HIT ROCK			
H/P + DROVE	10	9	6
5. **HOLD POINT** ..... checked by	✓	✓	✓
6. One set of sheet piles in Wale Beam COMPLETED	✓	✓	✓

Quality Officer:..... ..... **Date:**....30 - 11 - 13

START BACK WALL ~~FRT~~ FROM CENTRE TO THE EAST END

Form 4

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.

If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 7	LOT No: 8	LOT No: 9
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	✓
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	✓	✓	✓
- Use of Dawson Clamp (all)	✓	✓	✓
- Metrage marks (all)	NA	NA	NA
3. DRIVING			
- Wale Beam – Position & check level	✓		
- First Pile - Position & check vertical	✓		
(1-2m) - Position & check vertical	✓		
- Second Pile - Vertical	✓		
(1-2m) - Vertical	✓		
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING			
4. RL (Depth) achieved – Average for each lot	3.4	3.4	2.9
If any RL depths out of average: state which sheet pile and depth achieved	NO	NO	NO
~~HIT~~ HIT ROCK			
5. **HOLD POINT** ..... checked by	✓	✓	✓
6. One set of sheet piles in Wale Beam COMPLETED	✓	✓	✓

Quality Officer:..... ..... **Date:**....30 - 11 - 13

Form 4

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.

If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 10	LOT No:	LOT No:
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	✓
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	✓	✓	✓
- Use of Dawson Clamp (all)	✓	✓	✓
- Metrage marks (all)	NA	NA	NA
3. DRIVING			
- Wale Beam – Position & check level	✓	✓	✓
- First Pile - Position & check vertical	✓	✓	✓
(1-2m) - Position & check vertical	✓	✓	✓
- Second Pile - Vertical	✓	✓	✓
(1-2m) - Vertical	✓	✓	✓
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING	✓	✓	✓
4. RL (Depth) achieved – ~~2.4m~~ Average for each lot	~~3.5~~ ~~2.2~~ m	3.5 ~~2.4~~	3.5 ~~3.0~~
If any RL depths out of average: state which sheet pile and depth achieved	✓ ✓	✓ ✓	✓ ✓
H/P + DROVE	10	6	7
5. **HOLD POINT** ..... checked by			
6. One set of sheet piles in Wale Beam COMPLETED	10 ✓	6 ✓	✓

Quality Officer:..... ..... **Date:**...10-12-13

EAST WING WALL

Form 4

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.

If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 10	LOT No:	LOT No:
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	✓	✓	
- Use of Dawson Clamp (all)	✓	✓	
- Metrage marks (all)	NA	NA	
3. DRIVING			
- Wale Beam – Position & check level	✓	✓	
- First Pile - Position & check vertical	✓	✓	
(1-2m) - Position & check vertical	✓	✓	
- Second Pile - Vertical	✓	✓	
(1-2m) - Vertical	✓	✓	
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING	✓	✓	
4. RL (Depth) achieved – ~~2m~~ Average for each lot	2.2m	2.1	
If any RL depths out of average: state which sheet pile and depth achieved	✓	✓	
	✓	✓	
5. **HOLD POINT** ..... checked by			
6. One set of sheet piles in Wale Beam COMPLETED	11	6	

Quality Officer:..... ..... **Date:**.....

Form 4 WEST WING WALL

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.

If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 1 10 Pile	LOT No: 2 6 Piles	LOT No: 3 6 Piles
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	✓
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	✓	✓	
- Use of Dawson Clamp (all)	✓	✓	✓
- Metrage marks (all)	NA	N.A	NA
3. DRIVING		✓	
- Wale Beam – Position & check level	✓	✓	✓
- First Pile - Position & check vertical	✓	✓	✓
(1-2m) - Position & check vertical	✓	✓	✓
- Second Pile - Vertical	✓	✓	✓
(1-2m) - Vertical	✓	✓	✓
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING	✓	✓	✓
4. RL (Depth) achieved – Average for each lot	2.5	2.5	2.5
If any RL depths out of average: state which sheet pile and depth achieved	NO	NO	NO
	✓	✓	✓
5. **HOLD POINT** ..... checked by	✓	✓	✓
6. One set of sheet piles in Wale Beam COMPLETED	.....	.....	.....

Quality Officer:..... ..... **Date:** 6 - 12 13

Form 4

INSPECTION REPORT - SHEET PILE DRIVING

Job No:.....C341... **Client:**.....COOK SHIRE COUNCIL.....

If test results are applicable, the result(s) are to be reported.

If visual only, indicate conformance with ✓. If no test applicable, indicate with -

Note: " LOT" means one (1) set of sheet piles in Wale Beam only

PROPERTY	LOT No: 1	LOT No: 2	LOT No: 3
1. CONSTRUCTION METHOD ESTABLISHED	✓	✓	✓
2. PREPARATION:			
- Piles in acceptable condition with holes in one end of piles (all)	✓	✓	✓
- Use of Dawson Clamp (all)	✓	✓	✓
- Metrage marks (all)	N.A	N.A	N.A
3. DRIVING			
- Wale Beam – Position & check level	✓	✓	✓
- First Pile - Position & check vertical	✓	✓	✓
(1-2m) - Position & check vertical	✓	✓	✓
- Second Pile - Vertical	✓	✓	✓
(1-2m) - Vertical	✓	✓	✓
MONITOR VERTICALITY OF EACH SHEET PILE AT ALL TIMES WHILE DRIVING	✓	✓	✓
4. RL (Depth) achieved –			
Average for each lot	✓	✓	✓
If any RL depths out of average: state which sheet pile and depth achieved	3.5m	3.5m	3.5m
EAST WING WALL			
5. **HOLD POINT** ..... checked by	✓		
6. One set of sheet piles in Wale Beam COMPLETED	.....	.....	.....

Quality Officer:..... ..... **Date:**10-12-13

Northern Baths wall
62 sheets
~~39~~.6m
37.2M.

West Baths Wall
17 Sheets
10.2m

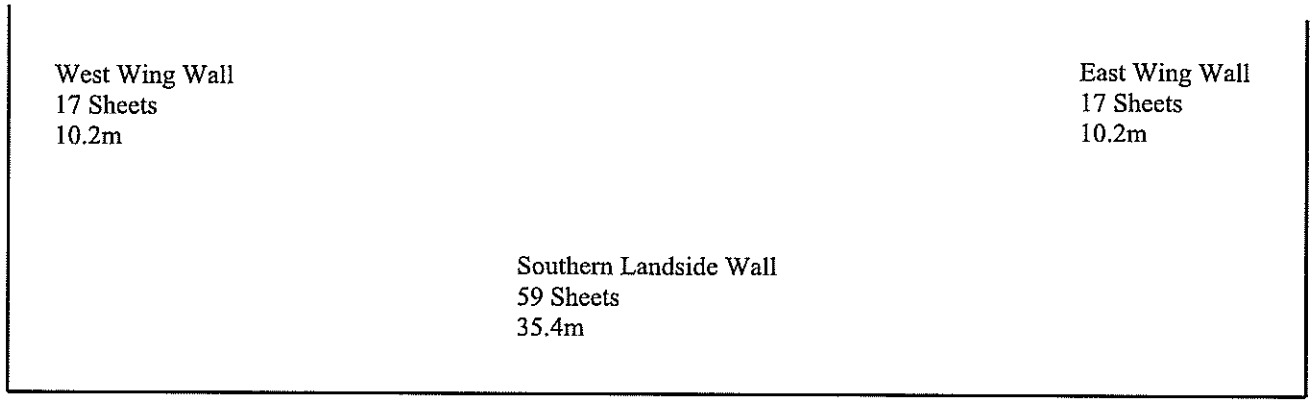
West wing
wall

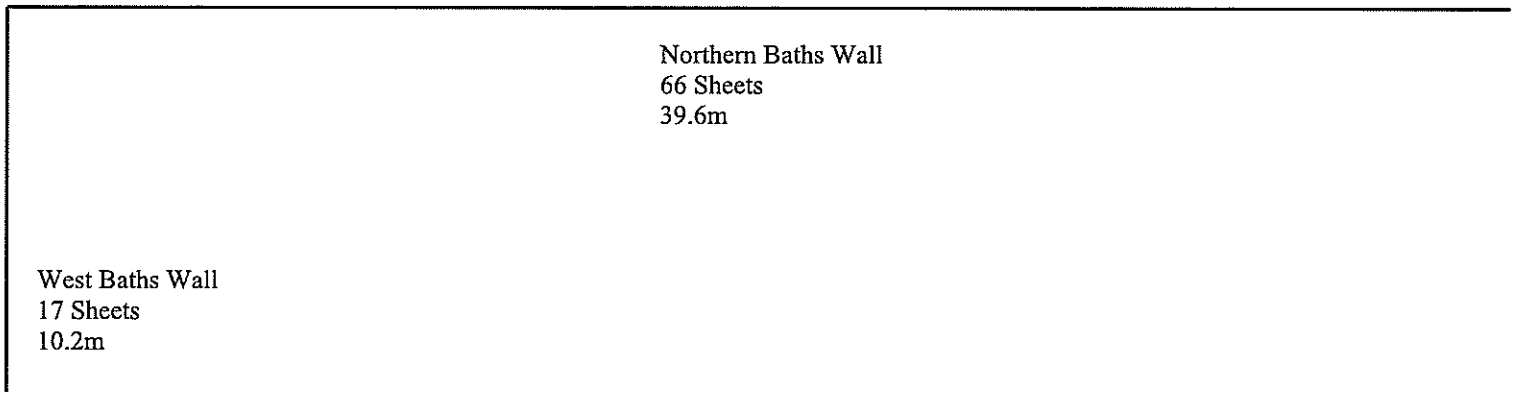
23 Sheets
13.8m

East wing
wall

23 Sheets
13.8m

Southern Landside wall
51
30.6m


West Wing Wall
17 Sheets
10.2m
East Wing Wall
17 Sheets
10.2m
Southern Landside Wall
59 Sheets
35.4m


Northern Baths Wall
66 Sheets
39.6m
West Baths Wall
17 Sheets
10.2m

COOK SHIRE COUNCIL - SHEET PILE WALL				
Sheet Pile cut off measurements above RL 4.00				
Short Wall Town End (from ocean in)		West Wing Wall Long Wall from Town End		
Pile No.	Off Cut	Pile No.	Off Cut	
1	1780	1	2310	
2	1780	2	2785	
3	1780	3	2105	
4	1780	4	1180	
5	1780	5	860	
6	1950	6	700	
7	1480	7	700	
8	2060	8	700	
9	2110	9	700	
10	1660	10	700	
11	2280	11	700	
12	1670	12	700	
13	2200	13	1100	
14	2450	14	600	
15	2000	15	600	
16	1890	16	600	
17	1340	17	600	
18	1410	18	600	
19	1850	19	600	
20	1680	20	600	
21	2110	21	600	
22	1370	22	600	
23	2530	23	1400	
		24	1650	
		25	1750	
		26	2200	
		27	760	
		28	1820	
		29	1300	
		30	1350	
		31	1300	
		32	1300	
		33	1400	
		34	1400	
		35	1650	
		36	1550	
		37	1500	
		38	1050	
		39	1100	
		40	1300	
		41	1610	
		42	1270	
		43	1770	
		44	1770	
		45	1800	
		46	1100	
		47	1100	
		48	1100	
		49	1100	

SL TECHNICAL DATA

THE POWER TO PERFORM

Above: Various SL30 Hammers fitted with legs and inserts for diving sheet piles. All are shown in crane suspended operation and powered by BSP Power Packs.

The SL range of piling hammers are designed for driving sheet piles and small bearing piles of concrete, steel or timber. The SL range is available with legs and inserts for use freely suspended or with backguides for operating from a piling mast. The hammers have the following important features:

- ☐ Total control of hammer stroke and blow rate.
- ☐ Allows precise matching of energy to suit pile driving requirements.
- ☐ Optional digital readout of hammer performance in choice of units - (Stroke or Energy).
- ☐ Double acting cylinder produces high impact energy from a short stroke to give a high blow rate
- ☐ Slim design allows hammer to pass between upstanding piles including PZ 27 sections .
- ☐ Economical - Low Hydraulic power requirement.
- ☐ Available with BSP Hydropacks which conform to latest EC environmental regulations.
- ☐ Hammer can be operated directly from Hydraulic crane or excavator bases.
- ☐ Can drive piles with ultimate load bearing up to 1800 kN

Specifications	Ram Mass	Max. Imapct Energy	Blow Rate @ rated energy	Operating Pressure	Hyraulic Flow Required	Hammer Length (with legs)	Hammer Width	Hammer Weight (with legs)
MODEL	kg	kNm	bpm	bar	L/min	mm	mm	kg
SL20da	1,500	20	84	160	130	4970	784	4700
SL30da	2,500	30	84	180	170	5970	784	5750

Performance related to use with BSP Hydropacks.

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PO Box 840 North Sydney
NSW 2059 Australia
T: + 61 2 9954 9166
Sales + 61 2 4966 0688
F: + 61 2 9955 4298
enquiries@steelcom.com.au
www.steelcom.com.au

PO Box 51254 Pakuranga
Auckland 2140 New Zealand
T: + 64 9 576 3977
F: + 64 9 576 3978
afenn@steelcomnz.co.nz
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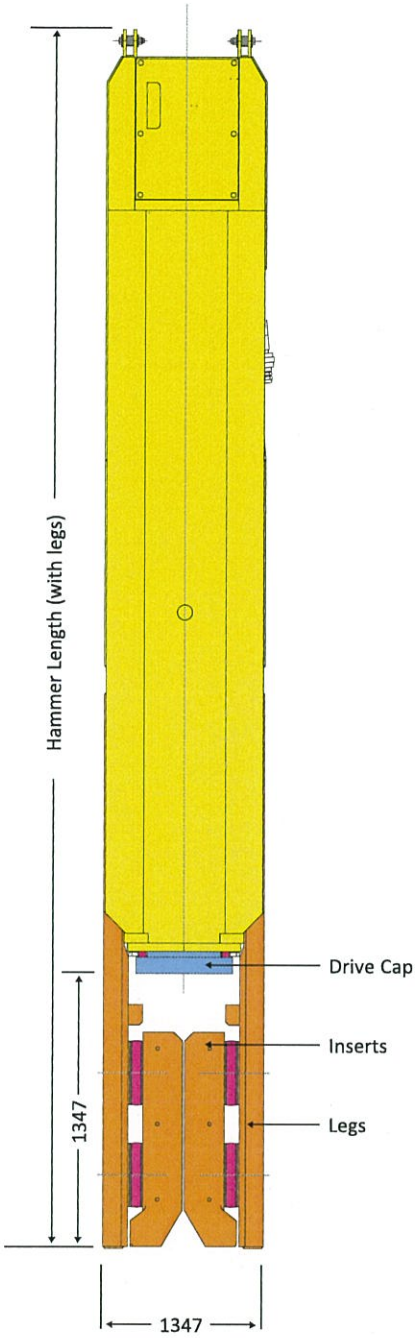
ThyssenKrupp

Q05585

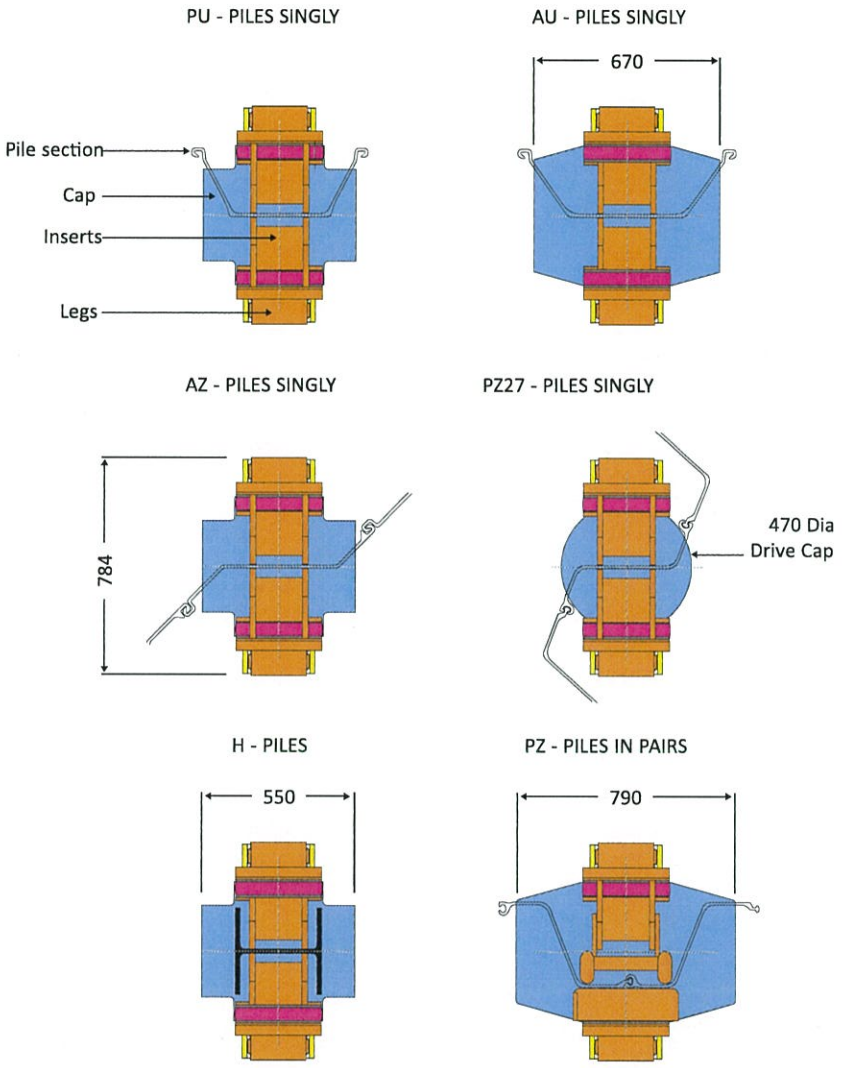
BSP : SL Hydraulic Hammer Range (MK III)

SL TECHNICAL DATA

THE POWER TO PERFORM



Drive cap and insert arrangements for various sheet piles and 'H' sections are shown below. Inserts for tube and square section piles up to 406mm are also available. (Dimensions are mm)



Above: Standard SL30 Hammer for sheet piles and 'H' bearing piles. Inserts can be changed to drive tubes and square section piles.

SL hammers can be used freely suspended from a crane or be fitted with back guides to allow mounting to leaders or piling rigs.

PILE TYPES
Typical piles driven singly or in pairs (if ground conditions allow):

Arcelor AZ12 to AZ50, Arcelor AU14 to AU26
Also, LX / PU / W Ranges, USA PZ range (PZ27 singly)
Hoesch H1200 to H3600, 'H' Piles,
HP260 to HP400, USA HP10" to HP16"
Tubes up to 406mm Dia (16") Plus many others...

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F: + 61 2 9955 4298
enquiries@steelcom.com.au
www.steelcom.com.au

PO Box 51254 Pakuranga
Auckland 2140 New Zealand
T: + 64 9 576 3977
F: + 64 9 576 3978
afenn@steelcomnz.co.nz
www.steelcomnz.co.nz

Q05585

BSP : SL Hydraulic Hammer R ange (MK III)

Appendix E – ‘Geotechnical Consultant’

□r□□□a□□ □□□□□□□□□a□□□□□□□□a□□□ □ □□□r□da□□d 16 □□□□□ □□r 200□

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REPORT
on
GEOTECHNICAL INVESTIGATION

PROPOSED FORESHORE REVETMENT AND RECLAMATION WEBBER ESPLANADE, COOKTOWN

prepared for
GHD PTY LTD

Project 38744
16 September 2005

Douglas Partners

Geotechnics • Environment • Groundwater

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Douglas Partners Pty Ltd
ABN 75 053 980 117

13 Industrial Avenue
STRATFORD QLD 4870
Phone (07) 4055 1550
Fax (07) 4055 1774
cairns@douglaspartners.com.au

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DJM:KAB:ag
Project 38744
16 September 2005

REPORT ON GEOTECHNICAL INVESTIGATION PROPOSED FORESHORE REVETMENT AND RECLAMATION WEBBER ESPLANADE, COOKTOWN

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation performed for a proposed area of foreshore revetment and reclamation, to be located along Webber Esplanade at Cooktown. The work was carried out for GHD Pty Ltd, on behalf of Cook Shire Council.

The scope of work comprised a series of test bores drilled from a barge-mounted drilling rig, followed by engineering evaluation, analysis and reporting.

The purpose of the investigation was to provide information on site soil and groundwater conditions, followed by geotechnical engineering comment on slope stability of the revetment works, plus comment on suitable materials to be placed as bulk filling.

A plan showing the layout of the proposed foreshore revetment and reclamation, as well as a partial detailed survey plan of the site, was provided by the client to assist the investigation.

2.0 SITE DESCRIPTION

The site is located just outside the mouth of the Endeavour River on a north facing shoreline (refer attached Drawing 1) adjacent to Webber Esplanade, approximately between Short Street and Clerk Street at Cooktown.

The site is located at the toe of Grassy Hill, which rises up steeply from Webber Esplanade near the site, to an elevation of several hundred metres. The sealed roadway along Webber Esplanade is built on a narrow filled bench, which is approximately 1m to 1.5m high on the downhill side. The foreshore beach is located below and adjacent to this narrow filled bench, and mostly comprises exposed bedrock, with some loose boulders, cobbles and some areas of sand.

3.0 GEOLOGY

Reference to the 1:250 000 Queensland Bureau of Mineral Resources, Geology and Geophysics Geological series Cooktown sheet, and accompanying explanatory notes, indicates the site is located nearby to the boundary between an area underlain by Finlayson Granite (Grassy Hill),

indicated to comprise *"medium grained porphyritic adamellite"*, and an area underlain by Hodgkinson Formation deposits, indicated to comprise *"greywacke, slate, minor volcanics and limestone"*.

The bedrock encountered during drilling of the test bores is considered consistent with Hodgkinson Formation deposits.

4.0 FIELD WORK METHODS

The field work was undertaken in the period 12 to 16 April 2005 and comprised the drilling of four test bores (Bores 1 to 4) to depths of between 1.0m and 3.85m below seabed level, using a drilling rig mounted on a flat topped barge. In general, bore depth was limited by the prevailing windy weather at the time of the investigation. This generated large waves which resulted in unsafe movement of the barge so that drilling had to be prematurely terminated in many instances.

Standard penetration tests (SPTs) were performed in the bores at regular depth intervals. Due to weather restrictions, as described above, NMLC rock coring could only be undertaken in Bore 1. The approximate locations of the test bores are indicated on Drawing 1.

An experienced geotechnical engineer took samples at selected depths for classification purposes and logged the bores.

The reduced levels shown on the attached test bore report sheets were determined by Douglas Partners (DP) in conjunction with surveyors from Cook Shire Council. At each bore location, a survey prism was set up on the barge. The depth from the prism to seabed was then measured by DP on the barge at the same time as the elevation of the prism was recorded by the surveyor from an instrument set up on-shore.

5.0 FIELD WORK RESULTS

Details of the subsurface conditions encountered in the test bores are presented on the attached test bore report sheets. These should be read in conjunction with the general notes preceding them, which explain the descriptive terms and classification methods used.

In summary, the subsurface conditions encountered at the test locations were relatively uniform. These generally comprised shallow **alluvial soils** to 0.2m to 1.3m depth, over hard **residual soils** and/or **extremely weathered rock** (argillite) to final depths of between 1.0m and 3.85m.

The shallow **alluvial soils** comprised very soft silty clay in Bore 1 to 1.0m depth, very loose to loose sand and clayey sand in Bores 2 and 3 to 1.3m and 0.2m depth respectively, and sandy gravel in Bore 4 to 0.7m depth.

The **residual soils** were encountered in Bores 2 to 4 underlying the above described alluvial soils, and generally comprised very stiff or hard sandy clay, which in some bores graded to extremely low to very low strength argillite. Drilling was discontinued in this material in these bores. Extremely low

strength argillite was encountered directly beneath the soft alluvial silty clay in Bore 1, from 1m depth to final depth.

Sea water depths at the time of the investigation varied due to tide levels, but were typically in the range of approximately 1m to 2m.

6.0 PROPOSED DEVELOPMENT

It is understood that the proposed development will comprise the reclamation of a foreshore area at Cooktown, located to the east of the public jetty, near the toe of Grassy Hill and the mouth of the Endeavour River. It is understood that the area of reclamation will be approximately 500m long and 20m wide. A rock armour wall is proposed along the seaward perimeter.

7.0 COMMENTS

7.1 Slope Stability Model

The subsurface conditions modelled for slope stability analysis have been based on the results of the four test bores undertaken at the site.

A summary of the effective stress parameters adopted in the analysis is presented in Table 1 below. The strength parameters were derived from published and in-house correlations with the test bore and SPT results.

Two options were modelled for the core material rubble as follows:

Option 1 – in which it is assumed that the core is a cohesive material;
Option 2 – in which it is assumed that the core is a non-cohesive (sand) material.

In addition, two scenarios were modelled for the reclamation fill – one representing cohesive material and the other representing granular material.

Table 1 – Summary of Effective Stress Parameters Used for Stability Analysis

Layer Description		Cohesion c′ (kPa)	Friction Angle Φ′ (degrees)	Bulk Density (kN/m^3)
Armour Rock		15	40	20
Filter Rock		5	30	20
Core Fill	Cohesive	5	20	20
	Granular	2	35	20
Reclamation Fill	Cohesive	5	20	20
	Granular	2	35	20
Very Soft Silty Clay		2	15	20
Very Stiff Clay		5	20	20
Argillite		20	40	20

The groundwater surface adopted for the analysis was modelled as indicated on attached Drawings 2 and 3. Within the reclamation fill, which is assumed to have reduced permeability due to some clay content, groundwater was modelled to be at mean sea level. The lowest sea level (ie. water level on the outer slope) represents the least stable condition. This was taken as Mean Low Water Springs. A linear distribution was assumed between the inner and outer sides of the sea wall, due to assumed relatively good drainage conditions in the sea wall armour and filter layers.

Two sections through the fill platform were modelled (refer Drawings 2 and 3). These were based on the subsurface conditions encountered in Bores 1 and 3, which appear to represent the two 'worst' sea bed profiles.

7.2 Slope Stability Analysis

Slope stability analysis was conducted using the *GALENA* computer program applied to the model described above in Section 7.1. A pseudo-static earthquake load analysis was included using an earthquake coefficient of 0.06 (with reference to AS 1170.4-1993[1]).

The results of the analysis are summarised in Table 2 below for Sections 1 (Bore 3) and 2 (Bore 1).

Table 2 – Results of Slope Stability Analysis

Section	Earthquake Load (0.06g)	Reclamation and Core Fill Type	Factor of Safety (1)	
			Calculated	Minimum Required
1 (Bore 3)	No	Cohesive	1.5	1.5
		Granular	1.5	1.5
	Yes	Cohesive	1.3	1.2
		Granular	1.3	1.2
2 (Bore 1)	No	Cohesive	1.8	1.5
		Granular	1.7	1.5

Notes: (1) Computed factor of safety against slip failure.

The minimum required factors of safety against slope stability were derived from common industry practice of 1.5 for normal loading conditions, and 1.2 to 1.3 for extreme conditions, such as earthquake loading.

7.3 Discussion

The results of the slope stability analysis indicate that, for either cohesive or granular core and reclamation fill, the estimated factor of safety against failure is acceptable in all cases (ie. greater than 1.5 for static loading conditions and 1.2 for earthquake loading conditions).

It should be recognised that the sea wall will be subject to wave attack. In this case, the coarse rock armour and rock filter material should be checked to ensure it is suitable to resist wave attack. If the

[1] *Australian Standard AS 1170.4 – 1993 "Minimum Design Loads on Structures, Part 4: Earthquake Loads", Standards Association of Australia.*

rock armour is insufficiently coarse to resist the 'design wave', or contains excessive fine material between boulders, then fines will be sucked out from the face under severe storm wave attack, resulting in batter face instability and movement.

The sizing of rock armour and rock filter should follow published filter guidelines such as that by Sherard et al[2] below:

D^F_{85}	>50mm
D^R_{15} / D^F_{85}	<10
D^F_{15} / D^E_{85}	<5

where: D_{85} is rock/particle size below which 85% is smaller
R – rip rap, F – filter, E – embankment bulk fill

This may require more than one layer of filter rock to be included in order to prevent embankment soils being sucked out, and will depend on actual particle sizes of rock armour and bulk core filling. Alternatively, a layer of robust, non-woven geofabric may be placed to reduce the number of filter rock layers.

In regard to the core fill material quality, it is suggested that this material should comprise a predominantly sand and gravel sized material with a minor amount of clay binder (typically with a maximum particle size of approximately 50mm and a range of 5% to 20% fines passing the 75μm sieve). A quarry overburden type material, with a soaked California bearing ratio of at least 15%, may be acceptable, but subject also to filter criteria being satisfied.

[2] *Sherard, JL et al "Earth and Earth-Rock Dams", Wiley & Sons, New York, 1963.*

ATTACHMENTS

Notes Relating to This Report
Test Bore Report Sheets (Nos 1 to 4)
Drawing 1 – Test Location Plan
Drawings 2 and 3 – Cross Section of Revetment

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NOTES RELATING TO THIS REPORT

Introduction

These notes have been provided to amplify the geotechnical report in regard to classification methods, specialist field procedures and certain matters relating to the Discussion and Comments section. Not all, of course, are necessarily relevant to all reports.

Geotechnical reports are based on information gained from limited subsurface test boring and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, Geotechnical Site Investigations Code. In general, descriptions cover the following properties - strength or density, colour, structure, soil or rock type and inclusions.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (eg. sandy clay) on the following bases:

Soil Classification	Particle Size
Clay	less than 0.002 mm
Silt	0.002 to 0.06 mm
Sand	0.06 to 2.00 mm
Gravel	2.00 to 60.00 mm

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Undrained Shear Strength kPa
Very soft	less than 12
Soft	12—25
Firm	25—50
Stiff	50—100
Very stiff	100—200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT) as below:

Relative Density	SPT "N" Value (blows/300 mm)	CPT Cone Value (q_c — MPa)
Very loose	less than 5	less than 2
Loose	5—10	2—5
Medium dense	10—30	5—15
Dense	30—50	15—25
Very dense	greater than 50	greater than 25

Rock types are classified by their geological names. Where relevant, further information regarding rock classification is given on the following sheet.

Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing with a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

Drilling Methods.

The following is a brief summary of drilling methods currently adopted by the Company and some comments on their use and application.

Test Pits — these are excavated with a backhoe or a tracked excavator, allowing close examination of the in-situ soils if it is safe to descent into the pit. The depth of penetration is limited to about 3 m for a backhoe and up to 6 m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Large Diameter Auger (eg. Pengo) — the hole is advanced by a rotating plate or short spiral auger, generally 300 mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube sampling.

Continuous Sample Drilling — the hole is advanced by pushing a 100 mm diameter socket into the ground and withdrawing it at intervals to extrude the sample. This is the most reliable method of drilling in soils, since moisture content is unchanged and soil structure, strength, etc. is only marginally affected.

Continuous Spiral Flight Augers — the hole is advanced using 90—115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical

means of drilling in clays and in sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be contaminated. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability, due to remoulding, contamination or softening of samples by ground water.

Non-core Rotary Drilling — the hole is advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from 'feel' and rate of penetration.

Rotary Mud Drilling — similar to rotary drilling, but using drilling mud as a circulating fluid. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg. from SPT).

Continuous Core Drilling — a continuous core sample is obtained using a diamond-tipped core barrel, usually 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation.

Standard Penetration Tests

Standard penetration tests (abbreviated as SPT) are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" — Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of say 4, 6 and 7

  as 4, 6, 7
  N = 13

- In the case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm

  as 15, 30/40 mm.

The results of the tests can be related empirically to the engineering properties of the soil.

Occasionally, the test method is used to obtain samples in 50 mm diameter thin walled sample tubes in clays. In such circumstances, the test results are shown on the borelogs in brackets.

Cone Penetrometer Testing and Interpretation

Cone penetrometer testing (sometimes referred to as Dutch cone — abbreviated as CPT) described in this report has been carried out using an electrical friction cone penetrometer. The test is described in Australian Standard 1289, Test 6.4.1.

In the tests, a 35 mm diameter rod with a cone-tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130 mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20 mm per second) the information is plotted on a computer screen and at the end of the test is stored on the computer for later plotting of the results.

The information provided on the plotted results comprises: —

- Cone resistance — the actual end bearing force divided by the cross sectional area of the cone — expressed in MPa.
- Sleeve friction — the frictional force on the sleeve divided by the surface area — expressed in kPa.
- Friction ratio — the ratio of sleeve friction to cone resistance, expressed in percent.

There are two scales available for measurement of cone resistance. The lower scale (0—5 MPa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main scale (0—50 MPa) is less sensitive and is shown as a full line.

The ratios of the sleeve friction to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1%—2% are commonly encountered in sands and very soft clays rising to 4%—10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:—

$$q_c \text{ (MPa)} = (0.4 \text{ to } 0.6)\ N \text{ (blows per 300 mm)}$$

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:—

$$q_c = (12 \text{ to } 18)\ c_u$$

Interpretation of CPT values can also be made to allow estimation of modulus or compressibility values to allow calculation of foundation settlements.

Inferred stratification as shown on the attached reports is assessed from the cone and friction traces and from experience and information from nearby boreholes, etc. This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties, and where precise information on

soil classification is required, direct drilling and sampling may be preferable.

Hand Penetrometers

Hand penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150 mm increments of penetration. Normally, there is a depth limitation of 1.2 m but this may be extended in certain conditions by the use of extension rods.

Two relatively similar tests are used.

- Perth sand penetrometer — a 16 mm diameter flat-ended rod is driven with a 9 kg hammer, dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.
- Cone penetrometer (sometimes known as the Scala Penetrometer) — a 16 mm rod with a 20 mm diameter cone end is driven with a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). The test was developed initially for pavement subgrade investigations, and published correlations of the test results with California bearing ratio have been published by various Road Authorities.

Laboratory Testing

Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms.

Bore Logs

The bore logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable, or possible to justify on economic grounds. In any case, the boreholes represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes, the frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Ground Water

Where ground water levels are measured in boreholes, there are several potential problems;

- In low permeability soils, ground water although present, may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report.
- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Engineering Reports

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building), the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface condition, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- unexpected variations in ground conditions — the potential for this will depend partly on bore spacing and sampling frequency
- changes in policy or interpretation of policy by statutory authorities
- the actions of contractors responding to commercial pressures.

If these occur, the Company will be pleased to assist with investigation or advice to resolve the matter.

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is

recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

DESCRIPTION AND CLASSIFICATION OF ROCKS FOR ENGINEERING PURPOSES

DEGREE OF WEATHERING

Term	Symbol	Definition
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties – ie. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered	MW	Rock substance affected by weathering to the extent that staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is no longer recognisable.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable.
Fresh	Fs	Rock substance unaffected by weathering; limonite staining along joints.
Fresh	Fr	Rock substance unaffected by weathering.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index [$I_{S(50)}$] and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described in Australian Standard AS4133.4.1–1993.

Term	Symbol	Field Guide*	Point Load Index [$I_{S(50)}$] MPa	Approx Unconfined Compressive Strength (q_u) MPa**
Extremely Low	EL	Easily remoulded by hand to a material with soil properties.	<0.03	<0.6
Very Low	VL	Material crumbles under firm blows with sharp end of geological pick; can be peeled with a knife; too hard to cut a triaxial sample by hand. SPT will refuse. Pieces up to 30mm thick can be broken by finger pressure.	0.03 – 0.1	0.6 – 2
Low	L	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the geological pick point; has dull sound under hammer. A piece of core 150mm long by 40mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.	0.1 – 0.3	2 – 6
Medium	M	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.	0.3 – 1	6 – 20
High	H	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken with geological pick with a single firm blow; rock rings under hammer.	1 – 3	20 – 60
Very High	VH	Hand specimen breaks with geological pick after more than one blow; rock rings under hammer.	3 – 10	60 – 200
Extremely High	EH	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.	>10	>200

Note that these terms refer to strength of rock and not to the strength of the rock mass, which may be considerably weaker due to rock defects.

* The field guide visual assessment of rock strength may be used for preliminary assessment or when point load testing is not able to be done.

** The approximate unconfined compressive strength (q_u) shown in the table is based on an assumed ratio to the point load index of 20:1. This ratio may vary widely.

DESCRIPTION AND CLASSIFICATION OF ROCKS FOR ENGINEERING PURPOSES

STRATIFICATION SPACING

Term	Separation of Stratification Planes
Thinly laminated	<6mm
Laminated	6mm to 20mm
Very thinly bedded	20mm to 60mm
Thinly bedded	60mm to 0.2m
Medium bedded	0.2m to 0.6m
Thickly bedded	0.6m to 2m
Very thickly bedded	>2m

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks. The orientation of rock defects is measured as an angle relative to a plan perpendicular to the core axis.

Note the recording of actual spacing and range of spacing is preferred in place of the terms below.

Term	Description
Fragmented	The core is comprised primarily of fragments of length less than 20mm, and mostly of width less than the core diameter.
Highly fractured	Core lengths are generally less than 20mm to 40mm with occasional fragments.
Fractured	Core lengths are mainly 30mm to 100mm with occasional shorter and longer sections.
Slightly fractured	Core lengths are generally 300mm to 1000mm with occasional longer sections and occasional sections of 100mm to 300mm.
Unbroken	The core does not contain any fracture.

ROCK QUALITY DESIGNATION (RQD)

This is defined as the ratio of sound (ie. low strength or better) core in lengths of greater than 100mm to the total length of the core, expressed in percent. If the core is broken by handling or by the drilling process (ie. the fracture surfaces are fresh, irregular breaks rather than joint surfaces), the fresh broken pieces are fitted together and counted as one piece.

REFERENCE

International Society of Rock Mechanics, Suggested Method for Determining the Point Load Strength, 1985.

TEST BORE REPORT

BORE No: 1

CLIENT: GHD PTY LTD | **PROJECT No:** 38744 | **DATE:** 12/04/05

PROJECT: FORESHORE RECLAMATION | **SURFACE LEVEL:** -2.0 AHD | **SHEET** 1 OF 1

LOCATION: WEBBER ESPLANADE, COOKTOWN | **DIP OF HOLE:** 90° | **AZIMUTH:** --

Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results & Comments	Core Rec. %
	SILTY CLAY - very soft, grey silty clay with some fine sand and a trace of organic fibres.		0.5		
		S		0,0,1 N = 1	
1 1.0	- some cobbles at 0.95m depth.		0.95		
	ARGILLITE - extremely low strength to very low strength, extremely weathered, yellow brown and light grey argillite with some medium to coarse sand.				
		S	1.6 1.69	30/90	
2			1.95		
	- becoming low strength, highly weathered, fractured orange brown and light grey argilite bedding at 60° to 70°. - fragmented zone with clay infilling at 2.11m to 2.18m depth. - fragmented zone with clay infilling at 2.21m to 2.24m depth. - drill break. - becoming extremely low strength, extremely weathered, fragmented with clay infilling, light grey with some orange brown argillite. - becoming very low strength to low strength, highly weathered, fractured, brown with light grey and orange brown argillite bedding at 70° to 80°.	C			
3	- becoming extremely low strength to very low strength, extremely weathered, fragmented with clay infilling, light grey and orange brown argillte. - becoming very low strength to low strength, extremely weathered, fractured, orange brown with some light grey argillite bedding at 60°. - becoming extremely low strength to very low strength, extremely weathered, fragmented with clay infill, light grey with a trace to some orange brown argillite.	C	3.05		
3.85	TEST BORE DISCONTINUED AT 3.85m DEPTH.		3.85		

RIG: GEMCO 210B **DRILLER:** BACONBIRD **LOGGED:** SAR **CASING:** HW to 1.6m, NW to 1.9m

TYPE OF BORING: Washboring with TC blade bit to 1.90m, NMLC coring to 3.85m.

WATER OBSERVATIONS: NA

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	PL	Point load strength Is(50) MPa
B	Bulk sample	S	Standard penetration test
C	Core drilling	U_x	Tube sample (x mm dia.)
pp	Pocket penetrometer (kPa)	V	Shear vane (kPa)

CHECKED
Initials:
Date:

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TEST BORE REPORT

BORE No: 2

CLIENT: GHD PTY LTD
PROJECT No: 38744
DATE: 15/04/05

PROJECT: FORESHORE RECLAMATION
SURFACE LEVEL: -1.5 AHD
SHEET 1 OF 1

LOCATION: WEBBER ESPLANADE, COOKTOWN
DIP OF HOLE: 90°
AZIMUTH: --

Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results & Comments	Core Rec. %
	SAND - very loose grey and brown fine to medium sand with some fine gravel.		0.0		
		S		0,0,0 N = 0	
			0.45 0.5		
		S		1/700mm	
1					
			1.2		
1.3	SANDY CLAY - hard grey and yellow brown with some red brown bands of medium sandy clay, with some gravel (residual).	S		7, 24, 30/100mm	
			1.6		
2					
3			3.0		
		S		30/140mm	
3.14	TEST BORE DISCONTINUED AT 3.14m DEPTH.		3.14		

RIG: GEMCO 210B **DRILLER:** BACONBIRD **LOGGED:** DJM **CASING:**

TYPE OF BORING: Washboring with TC blade bit.

WATER OBSERVATIONS: NA

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	PL	Point load strength Is(50) MPa
B	Bulk sample	S	Standard penetration test
C	Core drilling	U_x	Tube sample (x mm dia.)
pp	Pocket penetrometer (kPa)	V	Shear vane (kPa)

CHECKED
Initials:
Date:

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TEST BORE REPORT

BORE No: 3

CLIENT: GHD PTY LTD | **PROJECT No:** 38744 | **DATE:** 16/04/05

PROJECT: FORESHORE RECLAMATION | **SURFACE LEVEL:** -1.7 AHD | **SHEET** 1 OF 1

LOCATION: WEBBER ESPLANADE, COOKTOWN | **DIP OF HOLE:** 90° | **AZIMUTH:** --

Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results & Comments	Core Rec. %
	CLAYEY SAND - loose orange brown and grey clayey sand.		0.0		
0.2	SANDY CLAY - very stiff orange brown and grey mottled medium to coarse sandy clay (residual), with some zones of clayey sand.	S		0,2,6 N = 8	
			0.45		
			0.6		
	- grading extremely low strength argillite below approx. 0.9m depth	S		14, 23, 25/90mm	
1 1.0	TEST BORE DISCONTINUED AT 1.0m DEPTH DUE TO EXCESSIVE SWELL AND WIND.		0.99		
2					
3					

RIG: GEMCO 210B **DRILLER:** BACONBIRD **LOGGED:** DJM **CASING:** NW to 0.5m

TYPE OF BORING: Washboring with TC blade bit.

WATER OBSERVATIONS: NA

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	PL	Point load strength Is(50) MPa
B	Bulk sample	S	Standard penetration test
C	Core drilling	U_x	Tube sample (x mm dia.)
pp	Pocket penetrometer (kPa)	V	Shear vane (kPa)

CHECKED

Initials:

Date:

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TEST BORE REPORT

BORE No: 4

CLIENT: GHD PTY LTD
PROJECT No: 38744
DATE: 16/04/05

PROJECT: FORESHORE RECLAMATION
SURFACE LEVEL: -1.3 AHD
SHEET 1 OF 1

LOCATION: WEBBER ESPLANADE, COOKTOWN
DIP OF HOLE: 90°
AZIMUTH: --

Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results & Comments	Core Rec. %
	SANDY GRAVEL - grey medium to coarse sandy gravel, fine to coarse rounded gravel, with some rounded cobbles and small boulders to approximately 400mm diameter (on surface).	S	0.0	10,7,7 N = 14	
			0.45		
			0.6		
0.7	SANDY CLAY - hard orange brown mottled medium to coarse sandy clay, trace fine gravel (residual).	S		7,24,30/100mm	
1	- grading to extremely low strength rock, orange red brown and grey mottled (argillite) from approximately 1.0m depth.		1.0		
			1.3		
		S		7,16,25 N = 41	
1.75	TEST BORE DISCONTINUED AT 1.75m DEPTH DUE TO EXCESSIVE WAVES.		1.75		
2					
3					

RIG: GEMCO 210B **DRILLER:** BACONBIRD **LOGGED:** DJM **CASING:** NW to 1.0m

TYPE OF BORING: Washboring with TC blade bit.

WATER OBSERVATIONS: NA

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	PL	Point load strength Is(50) MPa
B	Bulk sample	S	Standard penetration test
C	Core drilling	U_x	Tube sample (x mm dia.)
pp	Pocket penetrometer (kPa)	V	Shear vane (kPa)

CHECKED
Initials:
Date:

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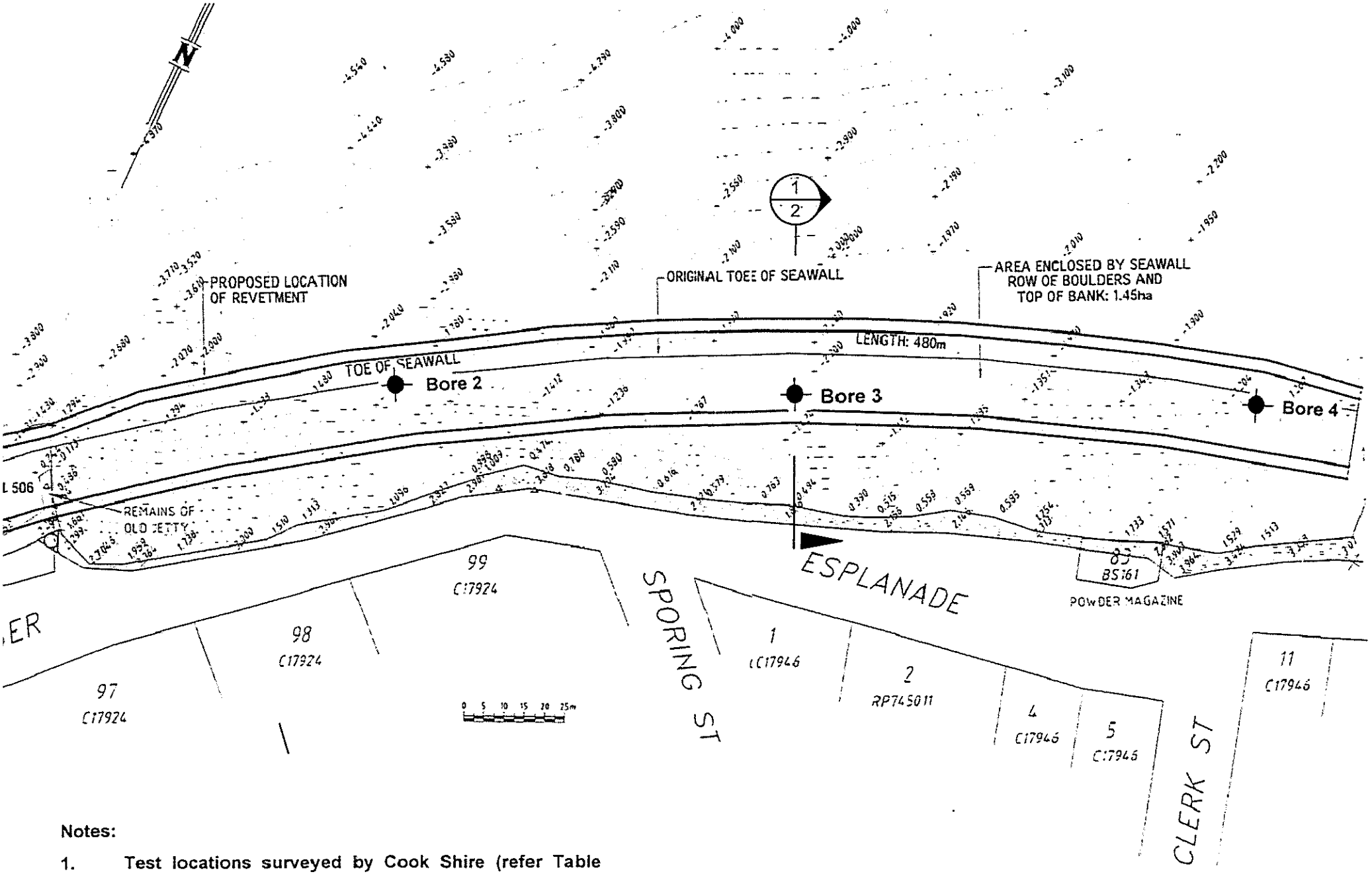
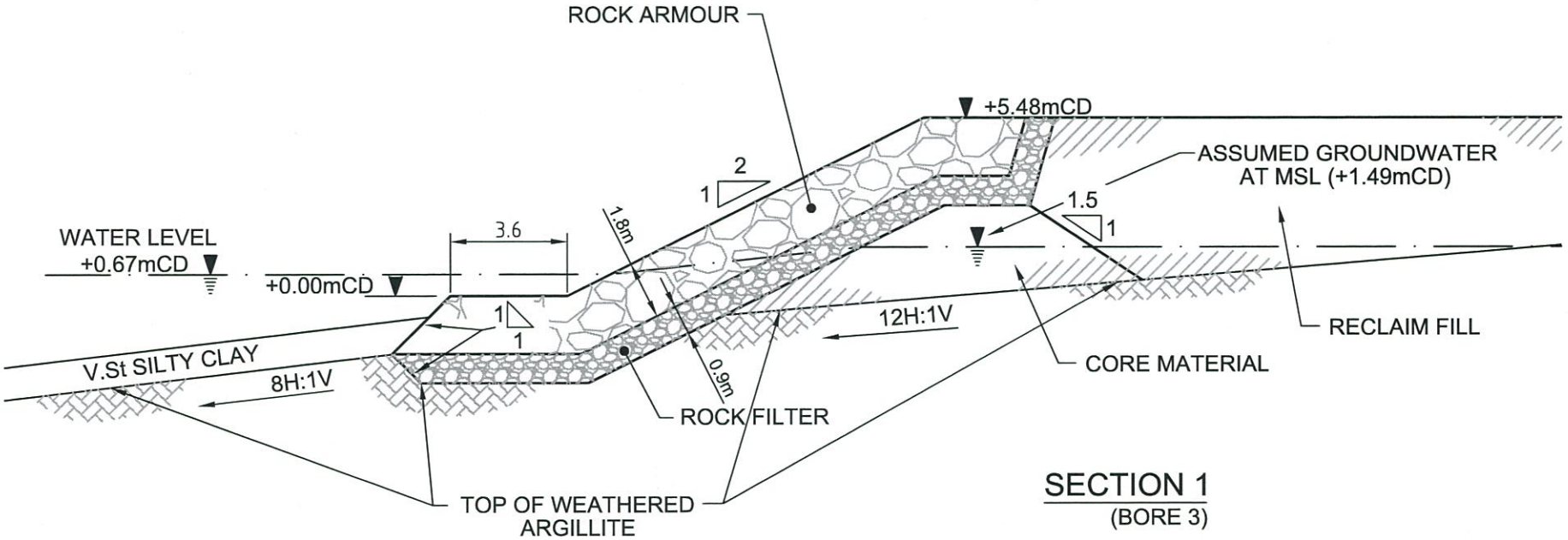


Notes:

1. **Test locations surveyed by Cook Shire (refer Table below for Co-ordinates).**
2. **Drawing based on preliminary survey plan provided by GHD Pty Ltd (refer GHD Drawing No. 42-12740-C001).**

	Easting *	Northing *	Seabed RL (AHD)



SECTION 1
(BORE 3)

0 5 10

SCALE 1:200 (A4)

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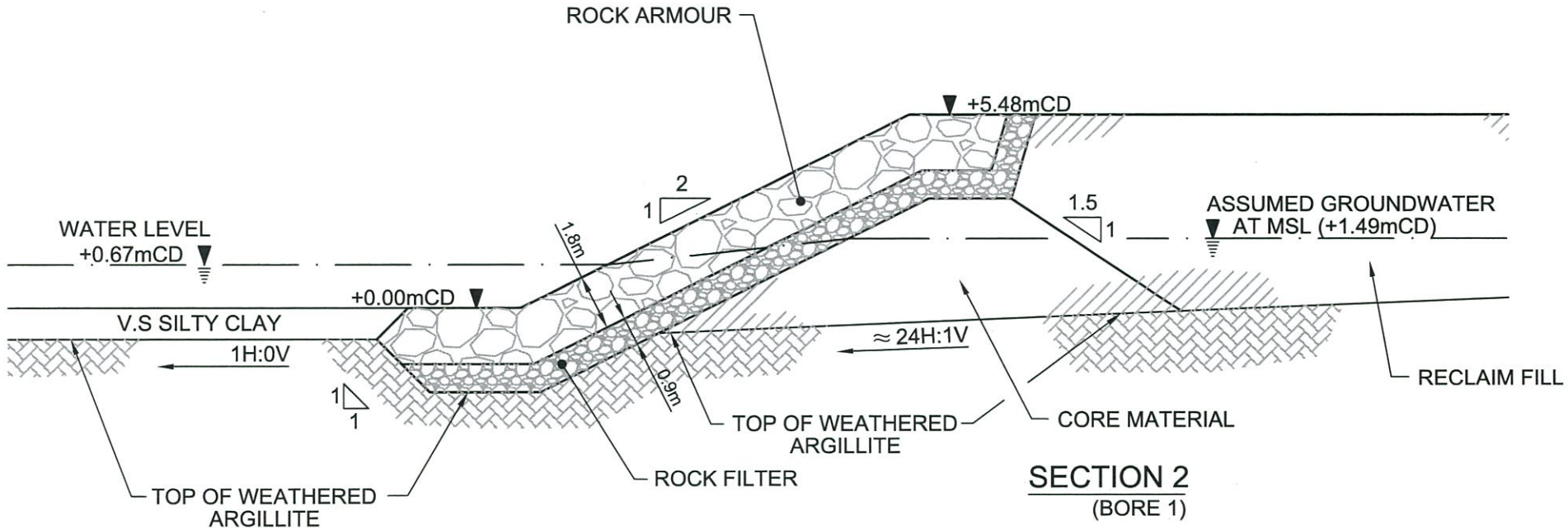
Sydney, Newcastle, Brisbane, Melbourne, Perth, Darwin

Campbelltown, Townsville, Cairns, Wollongong, Wyong

TITLE: **CROSS SECTION OF REVETMENT - SHEET 1 OF 2**
PROPOSED FORESHORE REVETMENT AND RECLAMATION
WEBBER ESPLANADE, COOKTOWN

CLIENT: GHD PTY LTD			OFFICE: BRISBANE
DRAWN BY: SAR	SCALE: 1:200 (A4)	PROJECT No: 38744	DRAWING No: 2
APPROVED BY:		DATE: AUGUST 2005	



SECTION 2
(BORE 1)

0 5 10

SCALE 1:200 (A4)

Douglas Partners
Geotechnics . Environment Groundwater

Sydney, Newcastle, Brisbane, Melbourne, Perth, Darwin

Campbelltown, Townsville, Cairns, Wollongong, Wyong

TITLE: **CROSS SECTION OF REVETMENT - SHEET 2 OF 2**
PROPOSED FORESHORE REVETMENT AND RECLAMATION
WEBBER ESPLANADE, COOKTOWN

CLIENT: GHD PTY LTD			OFFICE: BRISBANE
DRAWN BY: SAR	SCALE: 1:200 (A4)	PROJECT No: 38744	DRAWING No: 3
APPROVED BY:		DATE: AUGUST 2005	

Appendix F – Cook Shire Council Supplied Information

□□□□□ 1	Mar□□a □□r□□y
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□□□□□ 6	Mar□□a □a□□□□ a□□
□□□□□ □	□a□□□□□ □□a□ard □ a□□
□□□□□ □	□a□□□□□□d □a□d □a□□□□□□1
□□□□□ □	□□□r□□□ □ □□□r□a□ □□ad□ a□ □a□□□□□ 1
□□□□□ 10	□□□□□r □ar□ □□□□ □□□□□□ □a□□□□□ 1
□□□□□ 11	□□□□□r □ar□ □□□□ □□□□□□ □a□□□□□ 2
□□□□□ 12	□□□□□r □ar□ □□□□ □□□□□□ Mar□□a □□□ 1

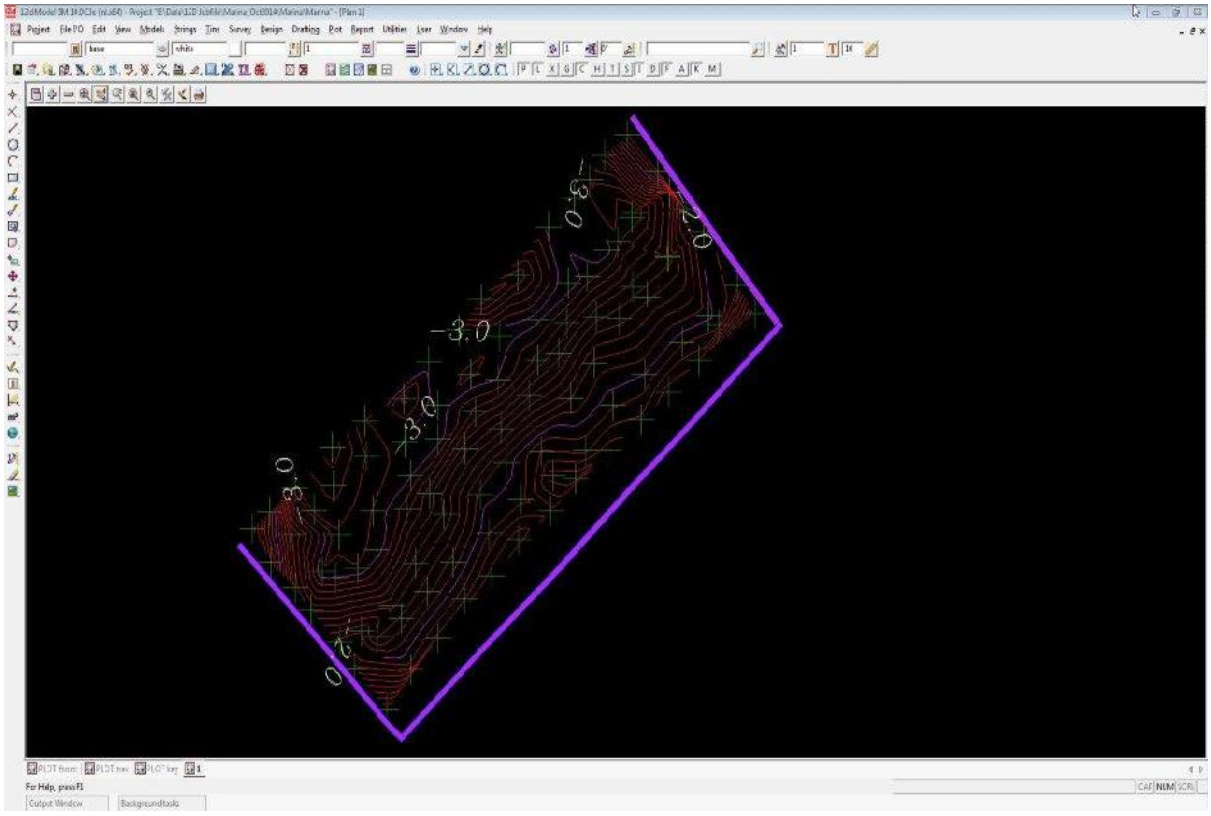


Photo 1 – Marina Survey

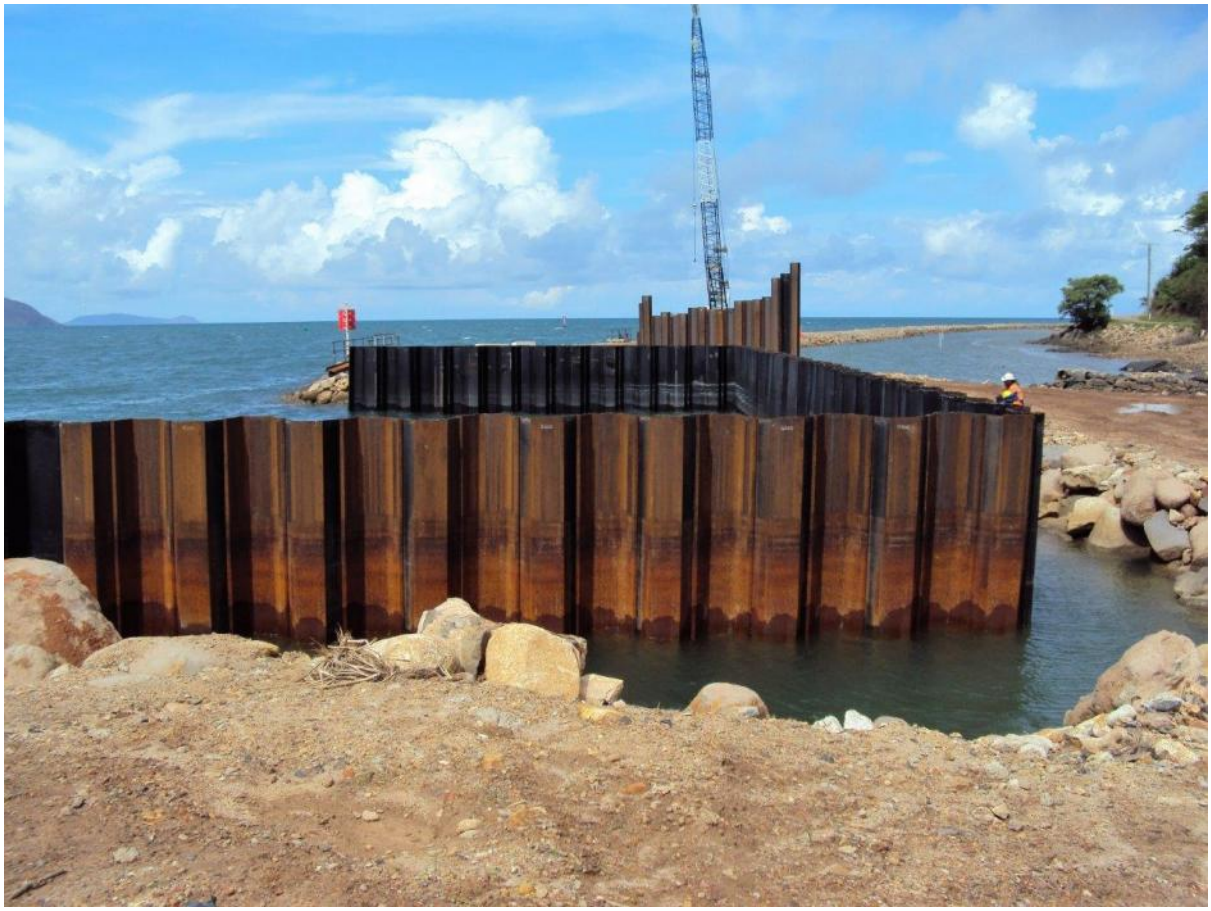


Photo 2 – Marina piles cut with Lagoon piles behind

Photo 3 – Lagoon Piles

Photo 4 – Marina piles from land

Photo 5 – Marina South Wall

Photo 6 – Marina East Wall

Photo 7 – Lagoon Seaward Wall

Photo 8 – Stabilised Sand Backfill

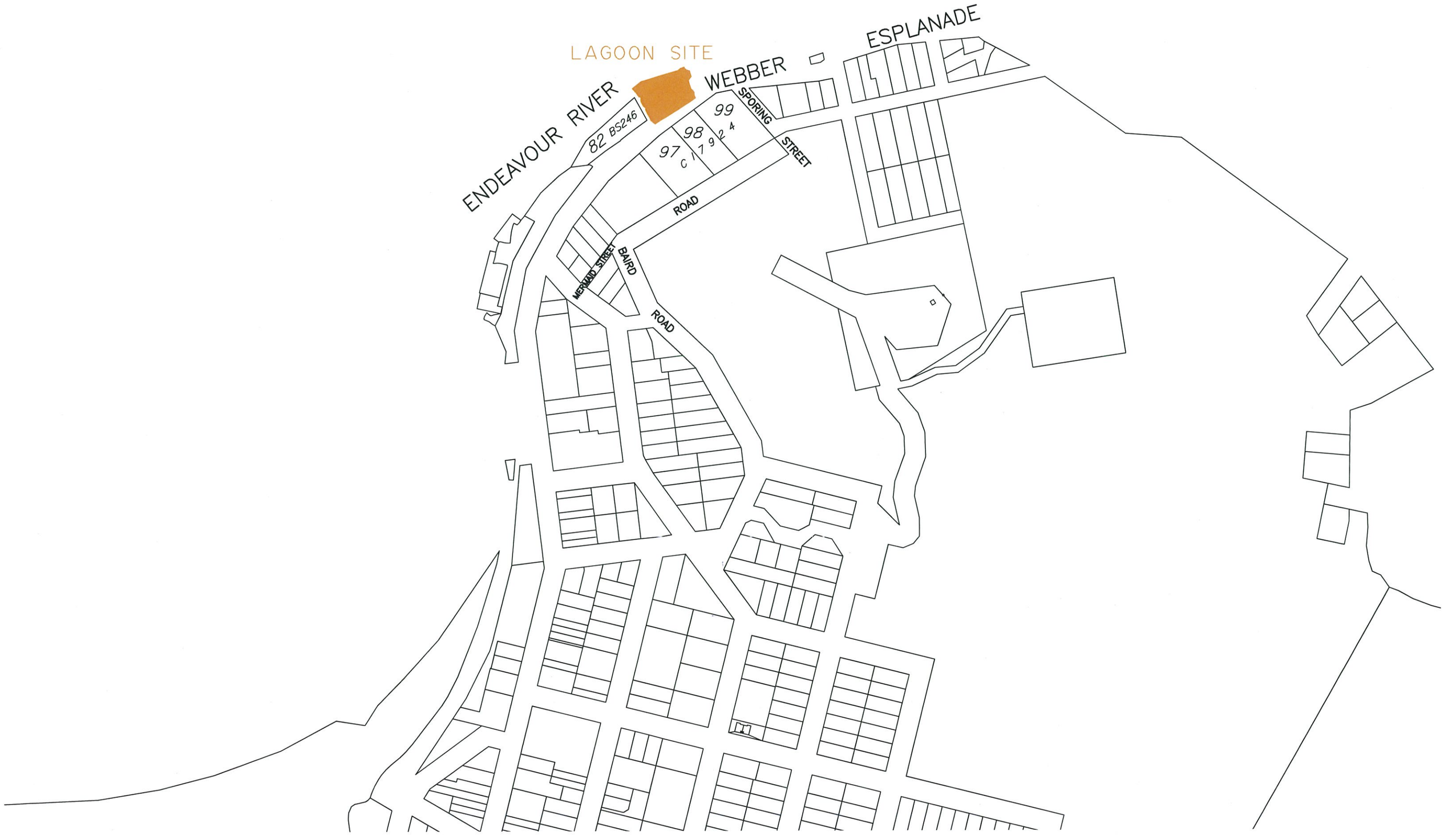
Photo 9 – Pouring upstream Deadman lagoon

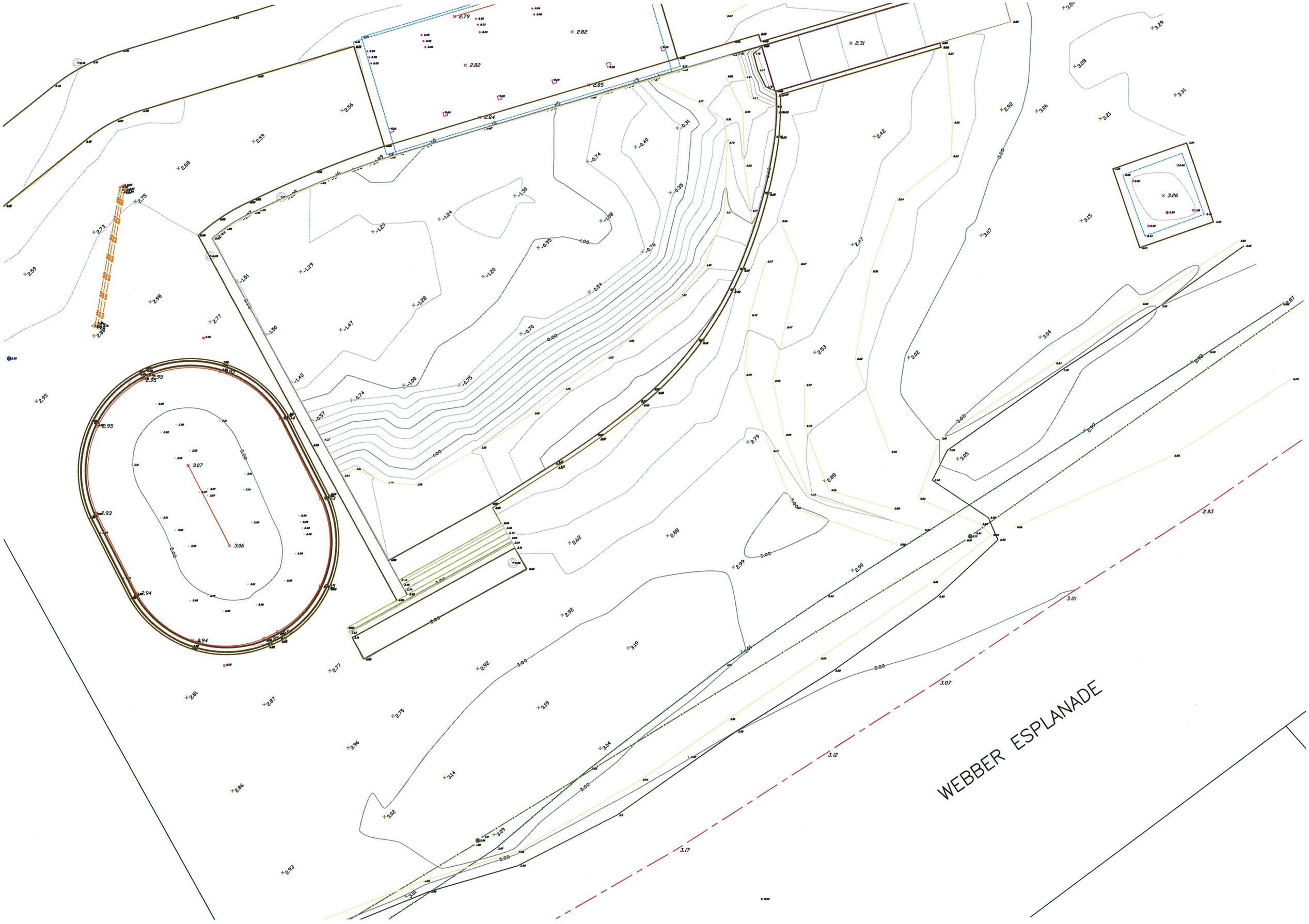
Photo 10 – Anchor Bars complete Lagoon

Photo 11 – Anchor Bars complete Lagoon

Photo 12 –Anchor Bars complete Marina

Appendix G – Survey


LAGOON SITE
ESPLANADE
WEBBER
ENDEAVOUR RIVER
82 BS246
97
98
99
C 1792 4
SPORING
STREET
ROAD
MERMAID STREET
BAIRD
ROAD

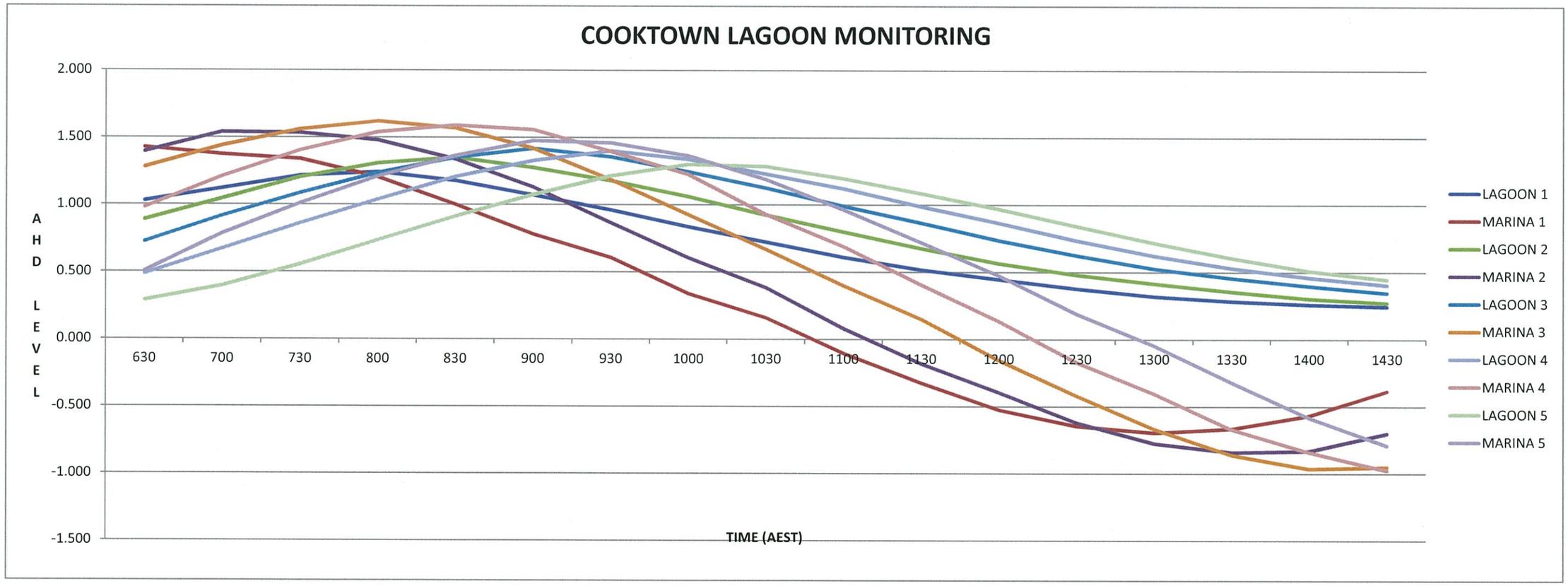

WEBBER ESPLANADE

Appendix H – Cooktown Monitoring

COOKTOWN LAGOON AND MARINA - WATER LEVEL OBSERVATIONS - APRIL 2016

LEVELS ARE AHD VIA ORIGIN - OPSM145410 RL = 2.759

4th April			5th April			6th April			7th April			8th April		
Lagoon	Marina	Time	Lagoon	Marina	Time	Lagoon	Marina	Time	Lagoon	Marina	Time	Lagoon	Marina	Time
1.030	1.427	630	0.888	1.395	630	0.724	1.280	630	0.485	0.980	630	0.288	0.505	630
1.121	1.374	700	1.045	1.540	700	0.916	1.440	700	0.671	1.210	700	0.396	0.785	700
1.216	1.340	730	1.204	1.534	730	1.086	1.560	730	0.861	1.405	730	0.556	1.010	730
1.243	1.205	800	1.308	1.480	800	1.237	1.620	800	1.039	1.540	800	0.737	1.212	800
1.179	1.000	830	1.351	1.338	830	1.351	1.570	830	1.207	1.590	830	0.913	1.365	830
1.072	0.780	900	1.276	1.130	900	1.418	1.420	900	1.328	1.557	900	1.075	1.476	900
0.961	0.605	930	1.178	0.865	930	1.357	1.185	930	1.401	1.395	930	1.216	1.460	930
0.837	0.338	1000	1.061	0.605	1000	1.246	0.925	1000	1.338	1.225	1000	1.301	1.364	1000
0.724	0.160	1030	0.926	0.385	1030	1.126	0.670	1030	1.231	0.930	1030	1.286	1.190	1030
0.611	-0.105	1100	0.800	0.080	1100	0.991	0.398	1100	1.121	0.690	1100	1.197	0.964	1100
0.518	-0.325	1130	0.676	-0.182	1130	0.866	0.150	1130	0.989	0.405	1130	1.085	0.720	1130
0.447	-0.525	1200	0.566	-0.395	1200	0.736	-0.155	1200	0.866	0.134	1200	0.971	0.475	1200
0.378	-0.645	1230	0.481	-0.620	1230	0.626	-0.420	1230	0.736	-0.170	1230	0.843	0.190	1230
0.321	-0.695	1300	0.416	-0.774	1300	0.527	-0.667	1300	0.623	-0.405	1300	0.719	-0.046	1300
0.285	-0.665	1330	0.356	-0.840	1330	0.458	-0.860	1330	0.531	-0.670	1330	0.606	-0.320	1330
0.261	-0.567	1400	0.304	-0.830	1400	0.398	-0.963	1400	0.461	-0.840	1400	0.511	-0.583	1400
0.245	-0.385	1430	0.273	-0.700	1430	0.347	-0.950	1430	0.405	-0.975	1430	0.446	-0.790	1430



Appendix I – Dynamic Cone Penetrometer

GHD GEOTECHNICS

DYNAMIC CONE PENETROMETER

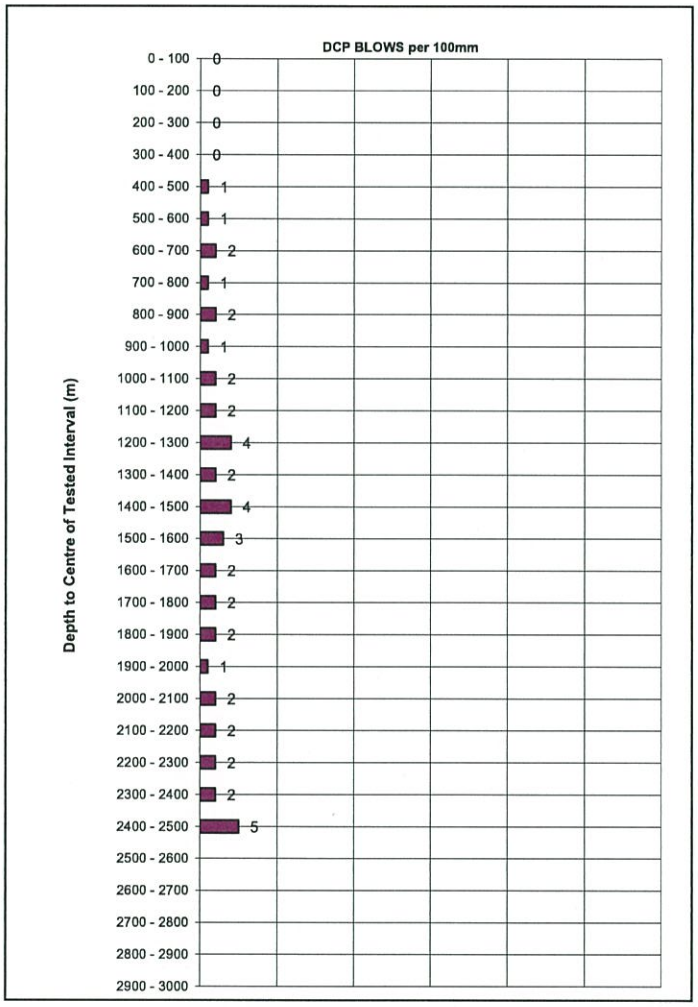
LOCATION
SHEET 1 of 4

CLIENT:	Cook Shire Council	**DATE OF TEST:**	15/04/2016
PROJECT:	Webber Esplanade Structural Assessment	**OPERATED BY:**	
LOCATION:	Webber Esplanade Cook Town	**CHECKED BY:**	
JOB No:	4219491		

WEIGHT (kg):	**9**	**DROP (mm):**	**510**	**R.L. SURFACE (m):**	
TIP (cone or blunt):	**Cone**	**EASTING:**		**NORTHING:**	**DATUM:**

TEST RESULTS **DCP1**

DEPTH (mm)	BLOWS (Ns) per 100mm
0 - 100	0
100 - 200	0
200 - 300	0
300 - 400	0
400 - 500	1
500 - 600	1
600 - 700	2
700 - 800	1
800 - 900	2
900 - 1000	1
1000 - 1100	2
1100 - 1200	2
1200 - 1300	4
1300 - 1400	2
1400 - 1500	4
1500 - 1600	3
1600 - 1700	2
1700 - 1800	2
1800 - 1900	2
1900 - 2000	1
2000 - 2100	2
2100 - 2200	2
2200 - 2300	2
2300 - 2400	2
2400 - 2500	5
2500 - 2600	
2600 - 2700	
2700 - 2800	
2800 - 2900	
2900 - 3000	



Notes:

Was able to push the DCP 200mm into the soil with hand.

First blow penetrated the soil 350mm.

Loaction of DCP - Refer DCP layout plan.

GHD GEOTECHNICS

DYNAMIC CONE PENETROMETER

LOCATION

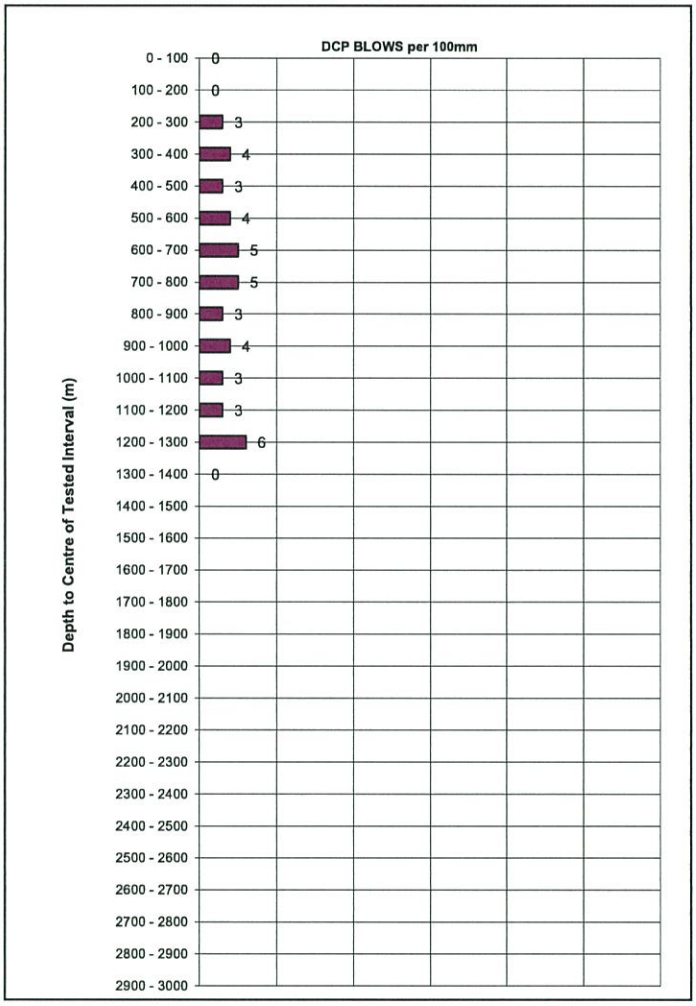
SHEET 2 of 4

CLIENT:	Cook Shire Council	**DATE OF TEST:**	15/04/2016
PROJECT:	Webber Esplanade Structural Assessment	**OPERATED BY:**	
LOCATION:	Webber Esplanade Cook Town	**CHECKED BY:**	
JOB No:	4219491		

WEIGHT (kg):	**9**	**DROP (mm):**	**510**	**R.L. SURFACE (m):**	
TIP (cone or blunt):	**Cone**	**EASTING:**	**NORTHING:**	**DATUM:**	

TEST RESULTS **DCP2**

DEPTH (mm)	BLOWS (Ns) per 100mm
0 - 100	0
100 - 200	0
200 - 300	3
300 - 400	4
400 - 500	3
500 - 600	4
600 - 700	5
700 - 800	5
800 - 900	3
900 - 1000	4
1000 - 1100	3
1100 - 1200	3
1200 - 1300	6
1300 - 1400	R
1400 - 1500	
1500 - 1600	
1600 - 1700	
1700 - 1800	
1800 - 1900	
1900 - 2000	
2000 - 2100	
2100 - 2200	
2200 - 2300	
2300 - 2400	
2400 - 2500	
2500 - 2600	
2600 - 2700	
2700 - 2800	
2800 - 2900	
2900 - 3000	



Notes:

Was able to push the DCP 200mm into the soil with hand.

Hit refusal at 1400mm - Most likely tie-back beam

Loaction of DCP - Refer DCP layout plan.

GHD GEOTECHNICS

DYNAMIC CONE PENETROMETER

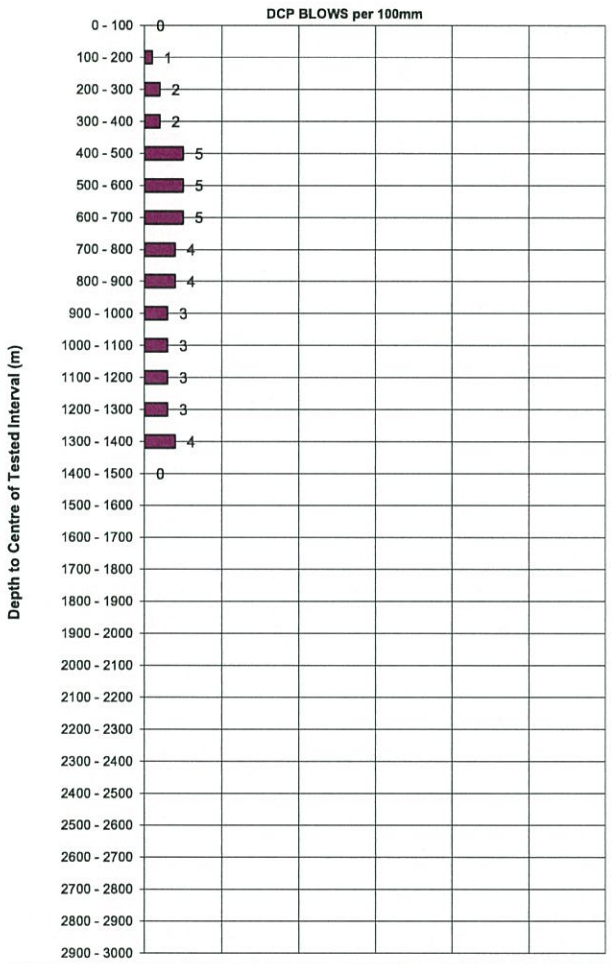
LOCATION
SHEET 3 of 4

CLIENT:	Cook Shire Council	**DATE OF TEST:**	15/04/2016
PROJECT:	Webber Esplanade Structural Assessment	**OPERATED BY:**	
LOCATION:	Webber Esplanade Cook Town	**CHECKED BY:**	
JOB No:	4219491		

WEIGHT (kg):	**9**	**DROP (mm):**	**510**	**R.L. SURFACE (m):**	
TIP (cone or blunt):	**Cone**	**EASTING:**		**NORTHING:**	**DATUM:**

TEST RESULTS **DCP3**

DEPTH (mm)	BLOWS (Ns) per 100mm
0 - 100	0
100 - 200	1
200 - 300	2
300 - 400	2
400 - 500	5
500 - 600	5
600 - 700	5
700 - 800	4
800 - 900	4
900 - 1000	3
1000 - 1100	3
1100 - 1200	3
1200 - 1300	3
1300 - 1400	4
1400 - 1500	R
1500 - 1600	
1600 - 1700	
1700 - 1800	
1800 - 1900	
1900 - 2000	
2000 - 2100	
2100 - 2200	
2200 - 2300	
2300 - 2400	
2400 - 2500	
2500 - 2600	
2600 - 2700	
2700 - 2800	
2800 - 2900	
2900 - 3000	



Notes:

Was able to push the DCP 100mm into the soil with hand.

Hit refusal at 1500mm - Most likely tie-back beam

Loaction of DCP - Refer DCP layout plan.

GHD GEOTECHNICS

DYNAMIC CONE PENETROMETER

LOCATION

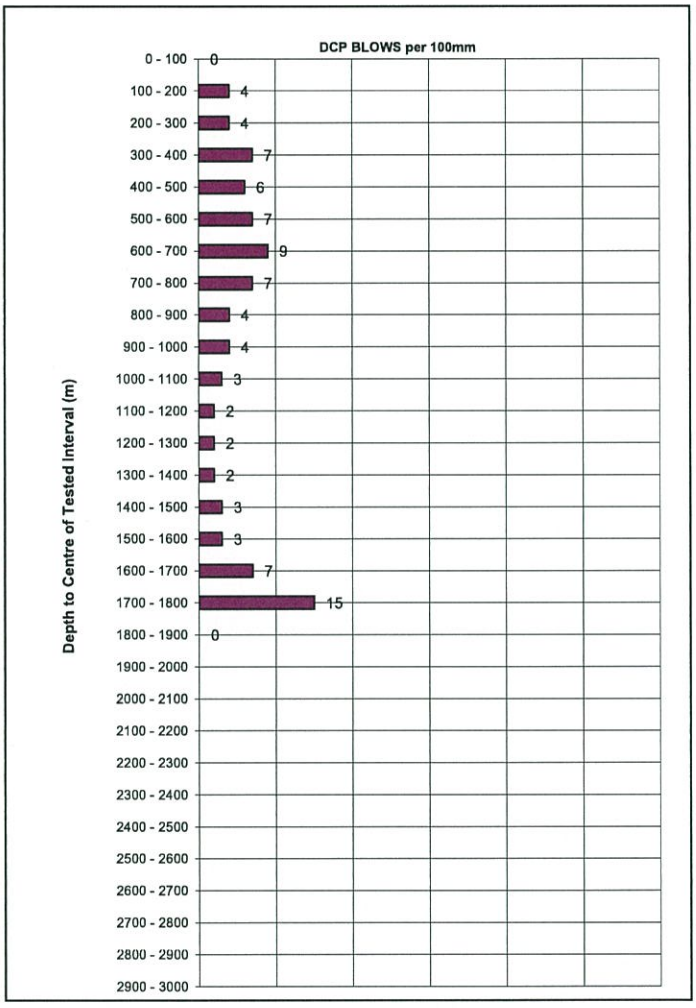
SHEET 4 of 4

CLIENT:	Cook Shire Council	**DATE OF TEST:**	15/04/2016
PROJECT:	Webber Esplanade Structural Assessment	**OPERATED BY:**	
LOCATION:	Webber Esplanade Cook Town	**CHECKED BY:**	
JOB No:	4219491		

WEIGHT (kg):	**9**	**DROP (mm):**	**510**	**R.L. SURFACE (m):**	
TIP (cone or blunt):	**Cone**	**EASTING:**	**NORTHING:**	**DATUM:**	

TEST RESULTS **DCP4**

DEPTH (mm)	BLOWS (Ns) per 100mm
0 - 100	0
100 - 200	4
200 - 300	4
300 - 400	7
400 - 500	6
500 - 600	7
600 - 700	9
700 - 800	7
800 - 900	4
900 - 1000	4
1000 - 1100	3
1100 - 1200	2
1200 - 1300	2
1300 - 1400	2
1400 - 1500	3
1500 - 1600	3
1600 - 1700	7
1700 - 1800	15
1800 - 1900	R
1900 - 2000	
2000 - 2100	
2100 - 2200	
2200 - 2300	
2300 - 2400	
2400 - 2500	
2500 - 2600	
2600 - 2700	
2700 - 2800	
2800 - 2900	
2900 - 3000	



Notes:

Was able to push the DCP 100mm into the soil with hand.

Hit refusal at 1900mm - Probably due to well compacted soil

Loaction of DCP - Refer DCP layout plan.

DYNAMIC CONE PENETROMETER TEST – REPORT A.S. 1289 6.3.2

CLIENT: Cook Shire Council	**REPORT NUMBER:** 42-19491
	REPORT DATE: July 2015
JOB NO: 42-19491	**TEST DATE:** 15/04/2016
PROJECT: Webber Esplanade	**TECHNICIAN:**
SAMPLE LOCATION: Refer 15475-SK02	**CLIENT ORDER NO.:** N/A
SAMPLE DESCRIPTION:	**CLIENT JOB NO.:** N/A

DEPTH (Meters)	*TEST COMMENCED AT 0.03 m BELOW SURFACE LEVEL									
	DCP 1		DCP 2		DCP 3		DCP 4		DCP 5	
	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np	No. Blows	Np
0.0 -- -- 0.1	0		0		0		0			
0.1 -- -- 0.2	0		0		1		4			
0.2 -- --0.3	0	0	3	3	2	3	4	8		
0.3 -- --0.4	0	0	4	7	2	5	7	15		
0.4 -- --0.5	1	1	3	10	5	9	6	17		
0.5 -- --0.6	1	2	4	11	5	12	7	20		
0.6 -- --0.7	2	4	5	12	5	15	9	22		
0.7 -- -- 0.8	1	4	5	14	4	14	7	23		
0.8 -- --0.9	2	5	3	13	4	13	4	20		
0.9 -- -- 1.0	1	4	4	12	3	11	4	15		
1.0 -- --1.1	2	5	3	10	3	10	3	11		
1.1 -- --1.2	2	5	3	10	3	9	2	9		
1.2 -- --1.3	4	8	6	12	3	9	2	7		
1.3 -- -- 1.4	2	8	>20R	29	4	10	2	6		
1.4 -- --1.5	4	10			>20R	27	3	7		
1.5 -- --1.6	3	9					3	8		
1.6 -- --1.7	2	9					7	13		
1.7 -- -- 1.8	2	7					15	25		
1.8 -- --1.9	2	6					>20R	42		
1.9 -- --2.0	1	5								
2.0 -- --2.1	2	5								
2.1 -- --2.2	2	5								
2.2 -- --2.3	2	6								
2.3 -- --2.4	2	6								
2.4 -- --2.5	5	9								
WATER INFLOW:	Refer to Test Pit logs									

(Np) : Penetration Resistance
= blows per 300mm

Note: DCP 1 is on the natural ground approximately 0.8-1.0m below the slab (i.e. not on fill pad).

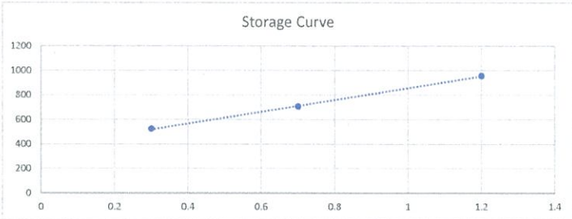
SIGNATURE:

SIGNED BY:
POSITION:
DATE:

Note: R denotes REFUSAL

Appendix J – Lagoon Flow Rate Assessment

Water Level Lagoon (AHD RL)	Volume (m3)
0.3	524
0.7	706
1.2	957



Date	Max OUTFLOW from Lagoon (L/s)	Max INFLOW to Lagoon(L/s)
4/04/2016	-34.582	26.494
5/04/2016	-37.650	44.343
6/04/2016	-37.650	53.547
7/04/2016	-36.813	52.232
8/04/2016	-35.698	49.084

4th April

Lagoon	Marina	Volume (m3)	Volume (L)	Time	time scale (min)	m3/sec	L/sec	
1.030	1.427	872	871660	630	0			-0.397
1.121	1.374	917	917342	700	30	0.025	25.379	-0.253
1.216	1.340	965	965032	730	60	0.026	26.494	-0.124
1.243	1.205	979	978586	800	90	0.008	7.530	0.038
1.179	1.000	946	946458	830	120	-0.018	-17.849	0.179
1.072	0.780	893	892744	900	150	-0.030	-29.841	0.292
0.961	0.605	837	837022	930	180	-0.031	-30.957	0.356
0.837	0.338	775	774774	1000	210	-0.035	-34.582	0.499
0.724	0.160	718	718048	1030	240	-0.032	-31.514	0.564
0.611	-0.105	666	665505	1100	270	-0.029	-29.191	0.716
0.518	-0.325	623	623190	1130	300	-0.024	-23.508	0.843
0.447	-0.525	591	590885	1200	330	-0.018	-17.947	0.972
0.378	-0.645	559	559490	1230	360	-0.017	-17.442	1.023
0.321	-0.695	534	533555	1300	390	-0.014	-14.408	1.016
0.285	-0.665	517	517175	1330	420	-0.009	-9.100	0.950
0.261	-0.567	506	506255	1400	450	-0.006	-6.067	0.828
0.245	-0.385	499	498975	1430	480	-0.004	-4.044	0.630

Min	*-34.582*	*L/s*
Max	*26.494*	*L/s*
Average	*-12.940*	*L/s*

5th April

Lagoon	Marina	Volume (m3)	Volume (L)	Time	time scale (min)	m3/sec	L/sec	
0.888	1.395	800	800376	630	0			-0.507
1.045	1.540	879	879190	700	30	0.044	43.786	-0.495
1.204	1.534	959	959008	730	60	0.044	44.343	-0.330
1.308	1.480	1011	1011216	800	90	0.029	29.004	-0.172
1.351	1.338	1033	1032802	830	120	0.012	11.992	0.013
1.276	1.130	995	995152	900	150	-0.021	-20.917	0.146
1.178	0.865	946	945956	930	180	-0.027	-27.331	0.313
1.061	0.605	887	887222	1000	210	-0.033	-32.630	0.456
0.926	0.385	819	819452	1030	240	-0.038	-37.650	0.541
0.800	0.080	756	756200	1100	270	-0.035	-35.140	0.720
0.676	-0.182	695	695080	1130	300	-0.034	-33.956	0.858
0.566	-0.395	645	645030	1200	330	-0.028	-27.806	0.961
0.481	-0.620	606	606355	1230	360	-0.021	-21.486	1.101
0.416	-0.774	577	576780	1300	390	-0.016	-16.431	1.190
0.356	-0.840	549	549480	1330	420	-0.015	-15.167	1.196
0.304	-0.830	526	525820	1400	450	-0.013	-13.144	1.134
0.273	-0.700	512	511715	1430	480	-0.008	-7.836	0.973

Min	*-37.650*	*L/s*
Max	*44.343*	*L/s*
Average	*-10.023*	*L/s*

6th April

Lagoon	Marina	Volume (m3)	Volume (L)	Time	time scale (min)	m3/sec	L/sec	
0.724	1.280	718	718048	630	0			-0.556
0.916	1.440	814	814432	700	30	0.054	53.547	-0.524
1.086	1.560	900	899772	730	60	0.047	47.411	-0.474
1.237	1.620	976	975574	800	90	0.042	42.112	-0.383
1.351	1.570	1033	1032802	830	120	0.032	31.793	-0.219
1.418	1.420	1066	1066436	900	150	0.019	18.686	-0.002
1.357	1.185	1036	1035814	930	180	-0.017	-17.012	0.172
1.246	0.925	980	980092	1000	210	-0.031	-30.957	0.321
1.126	0.670	920	919852	1030	240	-0.033	-33.467	0.456
0.991	0.398	852	852082	1100	270	-0.038	-37.650	0.593
0.866	0.150	789	789332	1130	300	-0.035	-34.861	0.716
0.736	-0.155	724	724072	1200	330	-0.036	-36.256	0.891
0.626	-0.420	672	672330	1230	360	-0.029	-28.746	1.046
0.527	-0.667	627	627285	1300	390	-0.025	-25.025	1.194
0.458	-0.860	596	595890	1330	420	-0.017	-17.442	1.318
0.398	-0.963	569	568590	1400	450	-0.015	-15.167	1.361
0.347	-0.950	545	545385	1430	480	-0.013	-12.892	1.297

Min	*-37.650*	*L/s*
Max	*53.547*	*L/s*
Average	*-5.995*	*L/s*

7th April

Lagoon	Marina	Volume (m3)	Volume (L)	Time	time scale (min)	m3/sec	L/sec	
0.485	0.980	608	608175	630	0			-0.495
0.671	1.210	693	692805	700	30	0.047	47.017	-0.539
0.861	1.405	787	786822	730	60	0.052	52.232	-0.544
1.039	1.540	876	876178	800	90	0.050	49.642	-0.501
1.207	1.590	961	960514	830	120	0.047	46.853	-0.383
1.328	1.557	1021	1021256	900	150	0.034	33.746	-0.229
1.401	1.395	1058	1057902	930	180	0.020	20.359	0.006
1.338	1.225	1026	1026276	1000	210	-0.018	-17.570	0.113
1.231	0.930	973	972562	1030	240	-0.030	-29.841	0.301
1.121	0.690	917	917342	1100	270	-0.031	-30.678	0.431
0.989	0.405	851	851078	1130	300	-0.037	-36.813	0.584
0.866	0.134	789	789332	1200	330	-0.034	-34.303	0.732
0.736	-0.170	724	724072	1230	360	-0.036	-36.256	0.906
0.623	-0.405	671	670965	1300	390	-0.030	-29.504	1.028
0.531	-0.670	629	629105	1330	420	-0.023	-23.256	1.201
0.461	-0.840	597	597255	1400	450	-0.018	-17.694	1.301
0.405	-0.975	572	571775	1430	480	-0.014	-14.156	1.380

Min	*-36.813*	*L/s*
Max	*52.232*	*L/s*
Average	*-1.264*	*L/s*

8th April

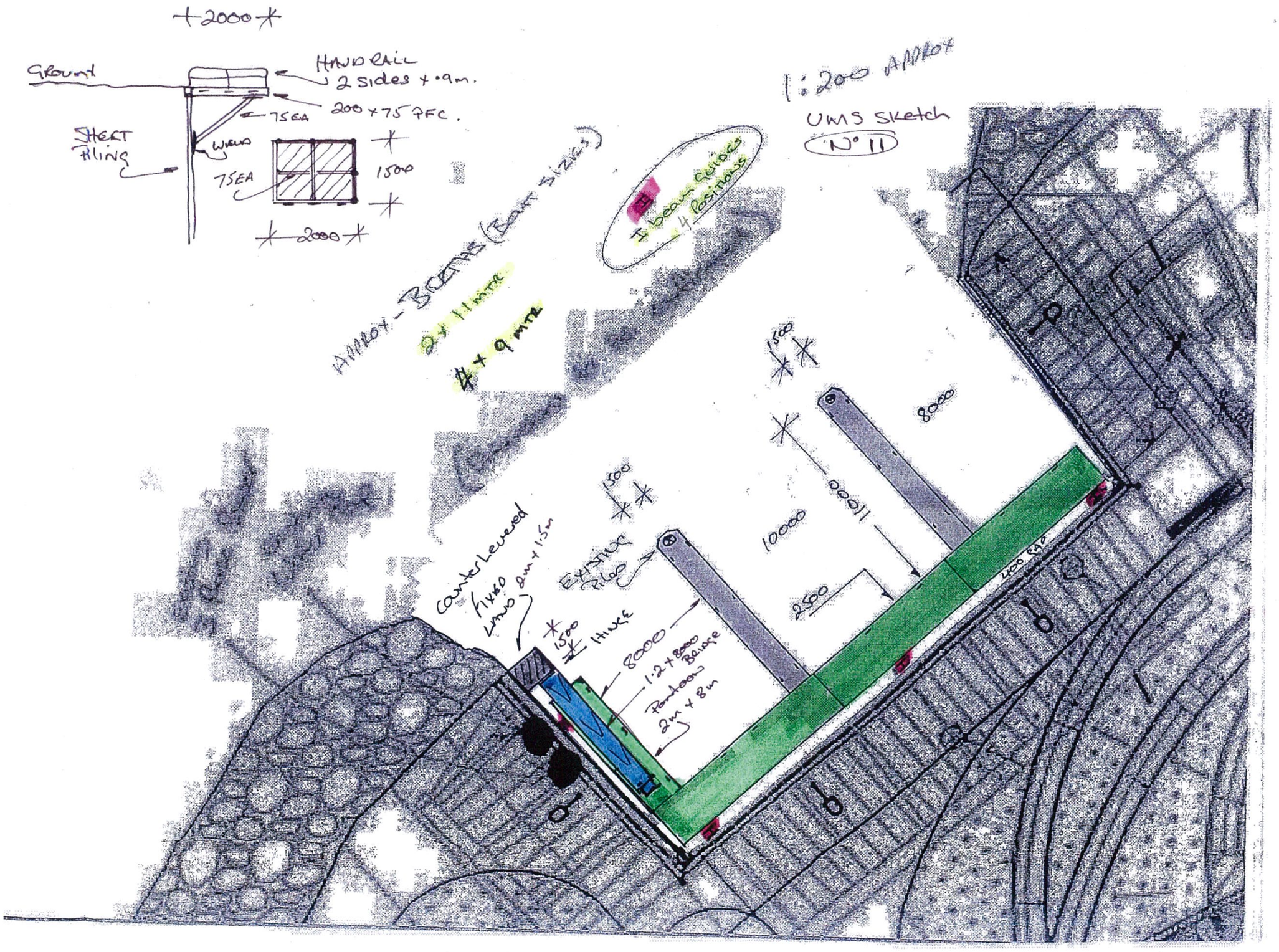
Lagoon	Marina	Volume (m3)	Volume (L)	Time		m3/sec	L/sec	
0.288	0.505	519	518540	630				-0.217
0.396	0.785	568	567680	700		0.012	11.700	-0.389
0.556	1.010	640	640480	730		0.040	40.444	-0.454
0.737	1.212	725	724574	800		0.020	20.022	-0.475
0.913	1.365	813	812926	830		0.049	49.084	-0.452
1.075	1.476	894	894250	900		0.019	19.363	-0.401
1.216	1.460	965	965032	930		0.039	39.323	-0.244
1.301	1.364	1008	1007702	1000		0.010	10.160	-0.063
1.286	1.190	1000	1000172	1030		-0.004	-4.183	0.096
1.197	0.964	955	955494	1100		-0.011	-10.638	0.233
1.085	0.720	899	899270	1130		-0.031	-31.236	0.365
0.971	0.475	842	842042	1200		-0.014	-13.626	0.496
0.843	0.190	778	777786	1230		-0.036	-35.698	0.653
0.719	-0.046	716	715538	1300		-0.015	-14.821	0.765
0.606	-0.320	663	663230	1330		-0.029	-29.060	0.926
0.511	-0.583	620	620005	1400		-0.010	-10.292	1.094
0.446	-0.790	590	590430	1430		-0.016	-16.431	1.236

Min	*-35.698*	*L/s*
Max	*49.084*	*L/s*
Average	*1.507*	*L/s*

Age of Water in Lagoon
Hydraulic Grade - piping failure likely to occur?
velocity of failure?

k value using formula from jons email check discharge amount

Appendix K – Marina Berthing Plan


2000
Ground
HANDRAIL
2 sides x .9m.
200 x 75 PFC.
75EA
SHEET PILING
WELD
75EA
1500
2000
1:200 APPROX
UMS Sketch
N° 11
4 beam Supports
4 Positions
APPROX - BEAMS (Beam sizes)
2x 11mtr
4x 9mtr
1500
8000
1500
10000
11000
Existing Pilon
2500
400 Gap
Counterbalanced Fixed UMS 2m x 1.5m
1500
HINGE
8000
1:2 x 8000 Bauce Pontoon 2m x 8m

Appendix L – Water Quality Testing Results

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Client
Address

Telephone
Facsimile
Email

Project	**WE Lagoon**
Order Number	(Not specified)
Samples	2

LABORATORY DETAILS

Manager
Laboratory
Address

Telephone
Facsimile
Email

SGS Reference	**CE120166 R0**
Date Received	17 Mar 2016
Date Reported	24 Mar 2016

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

Please see attached algae analysis subcontracted to Ecoscope Environmental Laboratory, 79 Elphinstone st, BESERKER QLD 4701, NATA Accreditation Number 14956, SGS-C160316.

SIGNATORIES

Parameter	Units	LOR	CE120166.001	CE120166.002
		Sample Number	CE120166.001	CE120166.002
		Sample Matrix	Water	Water
		Sample Date	16 Mar 2016	16 Mar 2016
		Sample Name	4219491 WE Lagoon	4219491 WE Lagoon BS
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248 Tested: 22/3/2016				
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	**0.013**	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281 Tested: 23/3/2016				
Total Kjeldahl Nitrogen	mg/L	0.05	**0.44**	-
Total Nitrogen (calc)	mg/L	0.05	**0.46**	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293 Tested: 23/3/2016				
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	<0.02	-
Sample Subcontracted Method: Tested: 24/3/2016				
Sample Subcontracted*	No unit	-	see attached	see attached

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: ME-(AU)-[ENV]AN248

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB034952	mg/L	0.005	<0.005	0%	96%

TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Kjeldahl Nitrogen	LB034962	mg/L	0.05	<0.05	1 - 2%	96 - 98%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB034962	mg/L	0.02	<0.02	1 - 5%	96 - 97%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN248	Nitrate / Nitrite by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulfuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
		-	The sample was not analysed for this analyte
		NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

PHYTOPLANKTON REPORT.

Ecoscope Environmental Laboratory

79 Elphinstone Street
PO Box 3338
Red Hill Rockhampton, QLD, 4701
Telephone: (07) 4926 0630 Fax: (07) 4926 0367
Email: ECOSCOPE@bigpond.net.au
Website: www.ecoscopeenvironmental.com.au

CLIENT: SGS Australia Pty Ltd
CLIENT ORDER NO:
CLIENT REF NO: CE120166

RESULTS TO:
SGS Environmental
Shey Goddard
Unit 2, 58 Comport St
Portsmith, Qld, 4870

ECOSCOPE REF NO: SGS-C160316AR **SAMPLES RECEIVED:** 18/03/16 8.50am **REPORT DATE:** 18/03/16

SAMPLE ID & DATE
*Results reported relate only to samples analysed as supplied to laboratory

CE120166.001 WE Lagoon 16/03/16

CYANOBACTERIA	Unit: cells/ml	DIATOMS	Unit: cells/ml	FLAGELLATES	Unit: cells/ml	GREEN ALGAE	Unit: cells/ml
Taxa Identification		Taxa Identification		Taxa Identification		Taxa Identification	
nil detected		*Chaetoceros* sp	3 640	nil detected		nil detected	
		Navicula sp	6 480				
Total cells/ml	nil	Total cells/ml	10 120	Total cells/ml	nil	Total cells/ml	nil

Method QP25-1

NDA - no date advised
EST – estimated
< less than, > greater than

Results Approved By: Howard Howell
B.App.Sc (Biol)
Principal Biologist

NATA Accredited
Laboratory No. 14956

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

This is the final report which supersedes any reports previously issued relating to the sample(s)

PHYTOPLANKTON REPORT.

79 Elphinstone Street
PO Box 3338
Red Hill Rockhampton, QLD, 4701
Telephone: (07) 4926 0630 Fax: (07) 4926 0367
Email: ECOSCOPE@bigpond.net.au
Website: www.ecoscopeenvironmental.com.au

ECOSCOPE REF NO: SGS-C160316AR	SAMPLES RECEIVED: 18/03/16 8.50am	REPORT DATE: 18/03/16

SAMPLE ID & DATE
*Results reported relate only to samples analysed as supplied to laboratory

CE120166.002 WE Lagoon BS 16/03/16

CYANOBACTERIA	Unit: cells/ml	DIATOMS	Unit: cells/ml	FLAGELLATES	Unit: cells/ml	GREEN ALGAE	Unit: cells/ml
Taxa Identification		Taxa Identification		Taxa Identification		Taxa Identification	
Lyngbya majuscula	26 400	*Navicula* sp	98 800	nil detected		nil detected	
Spirulina subsalsa	6 040	*Nitzschia* sp	38 000				
Phormidium sp	10 520	*Pleurosigma* sp	16 200				
		Chaetoceros sp	45 600				
		Entomoneis sp	2 240				
Total cells/ml	42 960	Total cells/ml	200 840	Total cells/ml	nil	Total cells/ml	nil

Method QP25-1

NDA - no date advised
EST – estimated
< less than, > greater than

Results Approved By:

Principal Biologist

NATA Accredited
Laboratory No. 14956

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

REPLACEMENT COVERING REPORT.

(Replacement for Report No SGS-C160316CAR, issued on 18/03/16)

RESULTS TO: **S**

79 Elphinstone Street
PO Box 3338, Red Hill
North Rockhampton, QLD, 4701
Telephone: (07) 4926 0630 Fax: (07) 4926 0367
Email: ECOSCOPE@bigpond.net.au
Website: ecoscopeenvironmental.com.au

ECOSCOPE REF NO: SGS-C160316CAR.a **SAMPLES RECEIVED: 18/03/16 8.50am** **REPORT DATE: 18/03/16**

POTENTIALLY TOXIC SPECIES (known in Australia and overseas to be potentially toxic)	NON TOXIC SPECIES (not known to be potentially toxic)
Lyngbya majuscula	*Spirulina subsalsa*
	Phormidium sp

SAMPLE ID & DATE		TOTAL CYANOBACTERIA BIOVOLUME mm^3/L
CE120166.001 WE Lagoon	16/03/16	N/A
CE120166.002 WE Lagoon BS	16/03/16	1.9135 mm^3/L

POTABLE	Continue with monitoring	NON POTABLE	Ensure jar tests are completed for floc formation. Review backwashing schedule. Ensure activated carbon is being used.
FILTER CLOGGING POTENTIAL	☐ High ☐ Medium ☐ Low ■ Not Applicable		

General Comment: All cyanobacteria contain a lipopolysaccharide endotoxin in the cell walls, which makes them mildly toxic. Certain species also produce a secondary metabolite toxin, which can be excreted when alive or released on the death of the cell. These toxins are very dangerous and species producing them are known as potentially toxic species. If you have any further enquires please do not hesitate to phone me on 4926 0630.

NDA – no date advised,
N/A - not applicable
EST – estimated
<less than, > greater than

Results Approved By:

Moestrup, Q. et al. (2004) IOC Taxonomic Reference List of Toxic Algae, Intergovernmental Oceanographic Commission of Unesco, http://www.ioc.unesco.org/hab/data.htm

MICROBIOLOGY REPORT.

RESULTS TO:

79 Elphinstone Street
PO Box 3338
Red Hill Rockhampton, QLD, 4701
Telephone: (07) 4926 0630 Fax: (07) 4926 0367
Email: ECOSCOPE@bigpond.net.au
Website: www.ecoscopeenvironmental.com.au

ECOSCOPE REF NO: SGS-C160316MR **SAMPLES RECEIVED: 18/03/16 11.05am** **REPORT DATE: 20/03/16**

ANALYSIS RESULTS	SAMPLE TYPE	METHOD	TESTING COMMENCED (DATE / TIME)	SAMPLE ID & DATE *Results reported relate only to samples analysed as supplied to laboratory
				#WE Lagoon 4219491 16/03/16 12.00pm
E. coli MPN/100ml	Water	QP25-3	18/03/16 11.15am	>2 419
Thermotolerant Coliforms (Faecal Coliforms) CFU/100ml	Water	QP25-5	18/03/16 11.15am	>2 419
#Enterococci MPN/100ml	Water	QP25-21	18/03/16 11.15am	31

<1 = nil detected

#Samples received out of 24 hour holding period are not covered by NATA accreditation.

NDA - no date advised
NTR - no time recorded
EST – estimated
< less than, > greater than

Results Approved By:

Principal Biologist

NATA Accredited
Laboratory No. 14956

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

***This is the final report which supersedes any reports previously issued relating to the sample(s)**

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Client	
Address	
Telephone	
Facsimile	
Email	
Project	**Webber Esplanade**
Order Number	(Not specified)
Samples	4

LABORATORY DETAILS

Manager	
Laboratory	
Address	
Telephone	
Facsimile	
Email	
SGS Reference	**CE120630 R0**
Date Received	18 Apr 2016
Date Reported	27 Apr 2016

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

Please see attached algae analysis subcontracted to Ecoscope Environmental Laboratory, 79 Elphinstone st, BESERKER QLD 4701, NATA Accreditation Number 14956, SGS-C150416.

SIGNATORIES

Parameter	Units	LOR	CE120630.001	CE120630.002	CE120630.003	CE120630.004
		Sample Number	CE120630.001	CE120630.002	CE120630.003	CE120630.004
		Sample Matrix	Water	Water	Water	Water
		Sample Date	15 Apr 2016	15 Apr 2016	15 Apr 2016	15 Apr 2016
		Sample Name	WE-N	WE-M	WE-AS	WE-A
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248 Tested: 22/4/2016						
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005	<0.005	-	-	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281 Tested: 21/4/2016						
Total Kjeldahl Nitrogen	mg/L	0.05	<0.05	-	-	-
Total Nitrogen (calc)	mg/L	0.05	<0.05	-	-	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293 Tested: 26/4/2016						
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02	<0.02	-	-	-
Sample Subcontracted Method: Tested: 27/4/2016						
Sample Subcontracted*	No unit	-	-	see attached	see attached	see attached

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage.* Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: ME-(AU)-[ENV]AN248

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB035725	mg/L	0.005	<0.005	0%	93 - 104%

TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Kjeldahl Nitrogen	LB035756	mg/L	0.05	<0.05	0 - 2%	91 - 94%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB035756	mg/L	0.02	<0.02	1%	109 - 110%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN248	Nitrate / Nitrite by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulfuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
		-	The sample was not analysed for this analyte
		NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

SGS Cairns Environmental

CE120630 COC
Received: 18 – Apr – 2016

STODY & ANALYSIS REQUEST

Job Number: CE120630
(Lab use only)

Laboratory ID	SAMPLE ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER	Matrix: BENTHIC	Preservation Method: NONE	Preservation Method: ICE	Preservation Method: ACID	Preservation Method: OTHER		Analysis Required: NUTRIENT AN8	Analysis Required: MICROBIOLOGY	Analysis Required: ALGAL SCRAPE	Analysis Required: ALGAE								Comments:
	WE-N	15/4/16		✓								✓											
	WE-M	"											✓										
	WE-AS	"				✓								✓									
	WE-A	"													✓								

Company Name:
Address:
Contact Name:
Email address:
Telephone: Facsimile:

Client Order Number:
Project Name: Nebber esplanade
Project Number:
Results Required By: std

Bottles Received - Lab use only:
NOx, TKN, TP
2xAlgae 1x250NP 1xMicro

(Please specify if AW is Field Filtered or Total)

Relinquished by: Date: 18/4/16 Time: 0900 Received by: Date: 18/4/16 Time: 9:15am

Relinquished by: Date: Time: Received by: Date: Time:

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

SAMPLE RECEIPT ADVICE

CE120630

CLIENT DETAILS

Contact
Client

Telephone
Facsimile

Project	**Webber Esplanade**
Order Number	(Not specified)
Samples	4

LABORATORY DETAILS

Manager
Laboratory
Address

Telephone
Facsimile

Samples Received	Mon 18/4/2016
Report Due	Thu 28/4/2016
SGS Reference	**CE120630**

SUBMISSION DETAILS

This is to confirm that 4 samples were received on Monday 18/4/2016. Results are expected to be ready by Thursday 28/4/2016. Please quote SGS reference CE120630 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	4 Waters	Type of documentation received	COC
Date documentation received	18/4/2016	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Ambient
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Na	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	1

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

Sending samples to Ecoscope for Algae - Ecoscope to report and invoiec direct to client

SAMPLE RECEIPT ADVICE

CE120630

CLIENT DETAILS

Client GHD Pty Ltd

Project Webber Esplanade

SUMMARY OF ANALYSIS

No.	Sample ID	Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto	Sample Subcontracted	TKN Kjeldahl Digestion by Discrete Analyser	Total Phosphorus by Kjeldahl Digestion DA in
001	WE-N	1	1	2	1
002	WE-M	-	1	-	-
003	WE-AS	-	1	-	-
004	WE-A	-	1	-	-

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

PHYTOPLANKTON REPORT.

79 Elphinstone Street
PO Box 3338
Red Hill Rockhampton, QLD, 4701
Telephone: (07) 4926 0630 Fax: (07) 4926 0367
Email: ECOSCOPE@bigpond.net.au
Website: www.ecoscopeenvironmental.com.au

ECOSCOPE REF NO: SGS-C150416AR	SAMPLES RECEIVED: 19/04/16 10.25am	REPORT DATE: 19/04/16

SAMPLE ID & DATE
*Results reported relate only to samples analysed as supplied to laboratory

CE120630.004 WE-A 15/04/16

CYANOBACTERIA	Unit: cells/ml	DIATOMS	Unit: cells/ml	FLAGELLATES	Unit: cells/ml	GREEN ALGAE	Unit: cells/ml
Taxa Identification		Taxa Identification		Taxa Identification		Taxa Identification	
nil detected		*Navicula* spp	12 400	nil detected		nil detected	
		Chaetoceros spp	580				
Total cells/ml	nil	Total cells/ml	12 980	Total cells/ml	nil	Total cells/ml	nil

Method QP25-1

NDA - no date advised
EST – estimated
< less than, > greater than

Principal Biologist

NATA Accredited
Laboratory No. 14956

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

PHYTOPLANKTON REPORT.

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ECOSCOPE REF NO: SGS-C150416AR	SAMPLES RECEIVED: 19/04/16 10.25am	REPORT DATE: 19/04/16

SAMPLE ID & DATE
*Results reported relate only to samples analysed as supplied to laboratory

CE120630.003 WE -AS 15/04/16

CYANOBACTERIA	Unit: cells/ml	DIATOMS	Unit: cells/ml	FLAGELLATES	Unit: cells/ml	GREEN ALGAE	Unit: cells/ml
Taxa Identification		Taxa Identification		Taxa Identification		Taxa Identification	
Phormidium sp	18 100	*Navicula* spp	49 200	nil detected		nil detected	
Spirulina subsalsa	2 780	*Nitzschia* sp	30 400				
		Pleurosigma sp	13 700				
		Chaetoceros spp	51 200				
		Entomoneis sp	1 460				
		Rhizosolenia sp	1 720				
		Amphora sp	280				
Total cells/ml	20 880	Total cells/ml	147 960	Total cells/ml	nil	Total cells/ml	nil

Method QP25-1

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EST – estimated
< less than, > greater than

Principal Biologist

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COVERING REPORT

79 Elphinstone Street
PO Box 3338, Red Hill
North Rockhampton, QLD, 4701
Telephone: (07) 4926 0630 Fax: (07) 4926 0367
Email: ECOSCOPE@bigpond.net.au
Website: ecoscopeenvironmental.com.au

ECOSCOPE REF NO: SGS-C150416CAR **SAMPLES RECEIVED: 19/04/16 10.25am** **REPORT DATE: 19/04/16**

POTENTIALLY TOXIC SPECIES (known in Australia and overseas to be potentially toxic)	NON TOXIC SPECIES (not known to be potentially toxic)	SAMPLE ID & DATE		TOTAL CYANOBACTERIA BIOVOLUME mm^3/L
nil detected	*Phormidium* sp	CE120630.004 WE-A	15/04/16	N/A
	Spirulina subsalsa	CE120630.003 WE AS	15/04/16	2.7236 mm^3/L

POTABLE	Continue with monitoring	NON POTABLE	Ensure jar tests are completed for floc formation. Review backwashing schedule. Ensure activated carbon is being used.
FILTER CLOGGING POTENTIAL	☐ High ☐ Medium ☐ Low ■ Not Applicable		

General Comment: All cyanobacteria contain a lipopolysaccharide endotoxin in the cell walls, which makes them mildly toxic. Certain species also produce a secondary metabolite toxin, which can be excreted when alive or released on the death of the cell. These toxins are very dangerous and species producing them are known as potentially toxic species. If you have any further enquires please do not hesitate to phone me on 4926 0630.

NDA – no date advised,
N/A - not applicable
EST – estimated
<less than, > greater than

Moestrup, Q. et al. (2004) IOC Taxonomic Reference List of Toxic Algae, Intergovernmental Oceanographic Commission of Unesco, http://www.ioc.unesco.org/hab/data.htm

MICROBIOLOGY REPORT.

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Website: www.ecoscopeenvironmental.com.au

ECOSCOPE REF NO: SGS-C150416MR **SAMPLES RECEIVED: 19/04/16 10.25am** **REPORT DATE: 21/04/16**

ANALYSIS RESULTS	SAMPLE TYPE	METHOD	TESTING COMMENCED (DATE / TIME)	SAMPLE ID & DATE *Results reported relate only to samples analysed as supplied to laboratory
				#CE120630.002 **WE-M** **15/04/16** **NTR**
E. coli MPN/100ml	Water	QP25-3	19/04/16 10.35am	>2 419
Thermotolerant Coliforms (Faecal Coliforms) CFU/100ml	Water	QP25-5	19/04/16 10.35am	>2 419
**Enterococci* MPN/100ml	Water	QP25-21	19/04/16 10.35am	<10

<1 = nil detected

#Samples received out of 24 hour holding period are not covered by NATA accreditation.
* Analysis not covered by NATA Accreditation

NDA - no date advised
NTR - no time recorded
EST – estimated
< less than, > greater than

Principal Biologist

NATA Accredited
Laboratory No. 14956

Accredited for compliance with ISO/IEC 17025.
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***This is the final report which supersedes any reports previously issued relating to the sample(s)**

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Client
Address

Telephone
Facsimile
Email

Project	**Webber Esplanade**
Order Number	(Not specified)
Samples	4

LABORATORY DETAILS

Manager
Laboratory
Address

Telephone
Facsimile
Email

SGS Reference	**CE120788 R0**
Date Received	22 Apr 2016
Date Reported	06 May 2016

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

Please see attached algae analysis subcontracted to Ecoscope Environmental Laboratory, 79 Elphinstone st, BESERKER QLD 4701, NATA Accreditation Number 14956, SGS-C210416.

SIGNATORIES

Parameter	Units	LOR	Sample Number Sample Matrix Sample Date Sample Name	CE120788.001 Water 21 Apr 2016 WE-M	CE120788.002 Water 21 Apr 2016 WE-N	CE120788.003 Water 21 Apr 2016 WE-AS	CE120788.004 Water 21 Apr 2016 WE-A
Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: AN248 Tested: 6/5/2016							
Nitrate/Nitrite Nitrogen, NOx as N	mg/L	0.005		-	**0.037**	-	-
TKN Kjeldahl Digestion by Discrete Analyser Method: AN281 Tested: 4/5/2016							
Total Kjeldahl Nitrogen	mg/L	0.05		-	**0.12**	-	-
Total Nitrogen (calc)	mg/L	0.05		-	**0.16**	-	-
Total Phosphorus by Kjeldahl Digestion DA in Water Method: AN279/AN293 Tested: 4/5/2016							
Total Phosphorus (Kjeldahl Digestion)	mg/L	0.02		-	<0.02	-	-
Sample Subcontracted Method: Tested: 27/4/2016							
Sample Subcontracted*	No unit	-		See attached	-	See attached	See attached

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto Analyser Method: ME-(AU)-[ENV]AN248

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Nitrate/Nitrite Nitrogen, NOx as N	LB036091	mg/L	0.005	<0.005	0 - 8%	106 - 109%

TKN Kjeldahl Digestion by Discrete Analyser Method: ME-(AU)-[ENV]AN281

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Kjeldahl Nitrogen	LB035940	mg/L	0.05	<0.05	3 - 10%	88 - 101%

Total Phosphorus by Kjeldahl Digestion DA in Water Method: ME-(AU)-[ENV]AN279/AN293

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Phosphorus (Kjeldahl Digestion)	LB035940	mg/L	0.02	<0.02	0 - 7%	90 - 98%

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN248	Nitrate / Nitrite by Auto Analyser: In an acidic medium, nitrate is reduced quantitatively to nitrite by cadmium metal. This nitrite plus any original nitrite is determined as an intense red-pink azo dye at 540 nm following diazotisation with sulphanilamide and subsequent coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. Reference APHA 4500-NO3- F.
AN279/AN293	The sample is digested with Sulphuric acid, K2SO4 and CuSO4. All forms of phosphorus are converted into orthophosphate. The digest is cooled and placed on the discrete analyser for colorimetric analysis.
AN281	An unfiltered water or soil sample is first digested in a block digestor with sulfuric acid, K2SO4 and CuSO4. The ammonia produced following digestion is then measured colourimetrically using the Aquakem 250 Discrete Analyser. A portion of the digested sample is buffered to an alkaline pH, and interfering cations are complexed. The ammonia then reacts with salicylate and hypochlorite to give a blue colour whose absorbance is measured at 660nm and compared with calibration standards. This is proportional to the concentration of Total Kjeldahl Nitrogen in the original sample.

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	NATA accreditation does not cover the performance of this service.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
		-	The sample was not analysed for this analyte
		NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calcuated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

SGS Cairns Environmental

CE120788 COC
Received: 22 – Apr – 2016

CUSTODY & ANALYSIS REQUEST

Job Number: CE120788
(Lab use only)

Page ..... of .....

	SAMPLE ID	Sample Date	Matrix: SOIL	Matrix: WATER	Matrix: OTHER		Preservation Method: NONE	ICE	ACID	OTHER		Analysis Required: ANS	Micro	Algae scan	Algae								Comments:
	WE-M	21-4-16											✓										
	WE-N	21-4-16										✓											
	WE-AS	21-4-16												✓									
	WE-A	21-4-16													✓								

Company Name .....
Address: .....
.....
Contact Name: .....
Email address: .....
Telephone: .....

Client Order Number: .....
Project Name: .....
Project Number: .....
Results Required By: .....

Bottles Received - Lab use only:
Webber Esplanade
1x Micro 1x250NP 2x Algae
(Please specify if AW is Field Filtered or Total)

Relinquished by: Date: 22-4-16 Time: 9-10 Received by: te: 22/4/16 Time: 9:10am

Relinquished by: ..... Date: ..... Time: ..... Received by: ..... Date: ..... Time: .....

* Circle whichever is applicable

Sample Cooler Sealed: YES/NO*	Samples Intact: YES/NO*	Correct Sample Bottles Used: YES/NO*	Temperature: AMBIENT/CHILLED*

Comments including subcontracting details:

Please provide client with details ☐
Consent given for subcontracting ☐

SAMPLE RECEIPT ADVICE

CE120788

CLIENT DETAILS

Contact	
Client	
Address	
Telephone	(Not specified)
Facsimile	(Not specified)
Email	
Project	**Webber Esplanade**
Order Number	(Not specified)
Samples	4

LABORATORY DETAILS

Manager	
Laboratory	
Address	
Telephone	
Facsimile	
Samples Received	Fri 22/4/2016
Report Due	Thu 5/5/2016
SGS Reference	**CE120788**

SUBMISSION DETAILS

This is to confirm that 4 samples were received on Friday 22/4/2016. Results are expected to be ready by Thursday 5/5/2016. Please quote SGS reference CE120788 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	4 Waters	Type of documentation received	COC
Date documentation received	22/4/2016	Samples received in good order	Yes
Samples received without headspace	Yes	Sample temperature upon receipt	Chilled
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice	Samples clearly labelled	Yes
Complete documentation received	Yes	Number of eskies/boxes received	1

Samples will be held for one month for water samples and two months for soil samples from date of report, unless otherwise instructed.

COMMENTS

Sending samples to Ecoscope for Algae - Ecoscope to report and invoiec direct to client

SAMPLE RECEIPT ADVICE

CE120788

CLIENT DETAILS

Client GHD Pty Ltd

Project Webber Esplanade

SUMMARY OF ANALYSIS

No.	Sample ID	Nitrate Nitrogen and Nitrite Nitrogen (NOx) by Auto	Sample Subcontracted	TKN Kjeldahl Digestion by Discrete Analyser	Total Phosphorus by Kjeldahl Digestion DA in
002	WE-N	1	1	2	1

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

PHYTOPLANKTON REPORT.

Ecoscope Environmental Laboratory

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PO Box 3338
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Telephone: (07) 4926 0630 Fax: (07) 4926 0367
Email: ECOSCOPE@bigpond.net.au
Website: www.ecoscopeenvironmental.com.au

CLIENT: SGS Australia Pty Ltd
CLIENT ORDER NO:
CLIENT REF NO: CE120788

RESULTS TO:
SGS Environmental
Shey Goddard
Unit 2, 58 Comport St
Portsmith, Qld, 4870

ECOSCOPE REF NO: SGS-C210416AR **SAMPLES RECEIVED:** 26/04/16 10.45am **REPORT DATE:** 26/04/16

SAMPLE ID & DATE
*Results reported relate only to samples analysed as supplied to laboratory

CE120788.004 WE-A 21/04/16

CYANOBACTERIA	Unit: cells/ml	DIATOMS	Unit: cells/ml	FLAGELLATES	Unit: cells/ml	GREEN ALGAE	Unit: cells/ml
Taxa Identification		Taxa Identification		Taxa Identification		Taxa Identification	
nil detected		*Navicula* spp	60	nil detected		nil detected	
Total cells/ml	nil	Total cells/ml	60	Total cells/ml	nil	Total cells/ml	nil

Method QP25-1

NDA - no date advised
EST – estimated
< less than, > greater than

Principal Biologist

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Laboratory No. 14956

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ECOSCOPE REF NO: SGS-C210416AR	SAMPLES RECEIVED: 26/04/16 10.45am	REPORT DATE: 26/04/16

SAMPLE ID & DATE
*Results reported relate only to samples analysed as supplied to laboratory

CE120788.003 WE-AS	21/04/16

CYANOBACTERIA	Unit: cells/ml	DIATOMS	Unit: cells/ml	FLAGELLATES	Unit: cells/ml	GREEN ALGAE	Unit: cells/ml
Taxa Identification		Taxa Identification		Taxa Identification		Taxa Identification	
nil detected		*Navicula* spp	540	nil detected		nil detected	
		Nitzschia sp	140				
		Chaetoceros sp	220				
Total cells/ml	nil	Total cells/ml	900	Total cells/ml	nil	Total cells/ml	nil

Method QP25-1

NDA - no date advised
EST – estimated
< less than, > greater than

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COVERING REPORT

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Email: ECOSCOPE@bigpond.net.au
Website: ecoscopeenvironmental.com.au

ECOSCOPE REF NO: SGS-C210416CAR **SAMPLES RECEIVED: 26/04/16 10.45am** **REPORT DATE: 26/04/16**

POTENTIALLY TOXIC SPECIES (known in Australia and overseas to be potentially toxic)	NON TOXIC SPECIES (not known to be potentially toxic)
nil detected	nil detected

SAMPLE ID & DATE		TOTAL CYANOBACTERIA BIOVOLUME mm^3/L
CE120788.004 WE-A	21/04/16	N/A
CE120788.003 WE AS	21/04/16	N/A

POTABLE	Continue with monitoring	NON POTABLE	Ensure jar tests are completed for floc formation. Review backwashing schedule. Ensure activated carbon is being used.
FILTER CLOGGING POTENTIAL	☐ High ☐ Medium ☐ Low ■ Not Applicable		

General Comment: All cyanobacteria contain a lipopolysaccharide endotoxin in the cell walls, which makes them mildly toxic. Certain species also produce a secondary metabolite toxin, which can be excreted when alive or released on the death of the cell. These toxins are very dangerous and species producing them are known as potentially toxic species. If you have any further enquires please do not hesitate to phone me on 4926 0630.

NDA – no date advised,
N/A - not applicable
EST – estimated
<less than, > greater than

Moestrup, Q. et al. (2004) IOC Taxonomic Reference List of Toxic Algae, Intergovernmental Oceanographic Commission of Unesco, http://www.ioc.unesco.org/hab/data.htm

MICROBIOLOGY REPORT.

CLIENT:
CLIENT ORDER NO:
CLIENT REF NO:

ECOSCOPE REF NO: SGS-C210416MR	**SAMPLES RECEIVED: 26/04/16 10.45am**	**REPORT DATE: 28/04/16**

ANALYSIS RESULTS	**SAMPLE TYPE**	**METHOD**	**TESTING COMMENCED (DATE / TIME)**	**SAMPLE ID & DATE** *Results reported relate only to samples analysed as supplied to laboratory
				#CE120788.001 WE-M 21/04/16 NTR
E. coli MPN/100ml	Water	QP25-3	26/04/16 11.00am	161
Thermotolerant Coliforms (Faecal Coliforms) CFU/100ml	Water	QP25-5	26/04/16 11.00am	170
**Enterococci* MPN/100ml	Water	QP25-21	26/04/16 11.00am	19 863

<1 = nil detected

#Samples received out of 24 hour holding period are not covered by NATA accreditation.
* Analysis not covered by NATA Accreditation

NDA - no date advised
NTR - no time recorded
EST – estimated
< less than, > greater than

Principal Biologist

NATA Accredited
Laboratory No. 14956

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This document may not be reproduced except in full

***This is the final report which supersedes any reports previously issued relating to the sample(s)**

□□□□□d□□□□