BMT WBM

Cairns Shipping Development Project EIS - Flood and Dredge Materials Mobilisation Technical Studies - Investigation for the Northern Sands Placement Site Alternative Option

Reference: R.B22074.014.00.Further Response to IR Final
Date: December 2017
Confidential

Cairns Shipping Development Project EIS - Flood and Dredge Materials Mobilisation Technical Studies - Investigation for the Northern Sands Placement Site Alternative Option

Prepared for:	Flanagan Consulting Group
Prepared by:	BMT WBM Pty Ltd (Member of the BMT group of companies)

Offices

Brisbane
Denver
London
Mackay
Melbourne
Newcastle
Perth
Sydney
Vancouver

Document Control Sheet

BMT WBM Pty Ltd Level 8, 200 Creek Street Brisbane Qld 4000 Australia PO Box 203, Spring Hill 4004 Tel: +61 7 3831 6744 Fax: + 61 7 3832 3627 ABN 54 010 830 421 www.bmtwbm.com.au	**Document:**	R.B22074.014.00.Further Response to IR Final
	Title:	Cairns Shipping Development Project EIS - Flood and Dredge Materials Mobilisation Technical Studies - Investigation for the Northern Sands Placement Site Alternative Option
	Project Manager:	Neil Collins
	Author:	Neil Collins
	Client:	Flanagan Consulting Group
	Client Contact:	Pat Flanagan
	Client Reference:	
Synopsis:		

REVISION/CHECKING HISTORY

Revision Number	Date	Checked by		Issued by	
0	14.12.17	Ian Clark	[signature]	Neil Collins	[signature]

DISTRIBUTION

Destination	Revision										
	0	1	2	3	4	5	6	7	8	9	10
Flanagan Consulting Group	✔										
BMT WBM File	✔										
BMT WBM Library	✔										

Contents

List of Figures

List of Tables

1 Purpose of the Report

This report has been prepared to address additional information requests by the Department of Environment and Heritage Protection (EHP) of 21 November 2017, and by Cairns Regional Council (CRC) of 23 November and 4 December 2017, in relation to flooding and the management of placed dredge material in the Northern Sands site to minimise remobilisation risk in respect of the Cairns Shipping Development Project CSDIP Environmental Impact Study process.

The report has been prepared by Neil Collins.

Neil Ian Collins – RPEQ No. 2699

2 EHP Supplementary advice on Outstanding Matters of 21 November 2017

Issues raised by EHP of relevance to flooding and dredge material remobilisation are as follows:

(a) Bund wall Consequence Category Assessment and impact of embankment collapse.

(b) Bund wall design and hydraulic performance of structure.

(c) River flooding and embankment protection measures, including spillways and erosion protection.

3 Cairns Regional Council Response Letter of 23 November 2017, and Outstanding Information Attachment of 4 December 2017

CRC's letter of 23 November 2017 raised the following broad information request areas:

(a) Flood model development and calibration / validation

(b) Potential impacts of a rare event.

(c) Consequences of structural failure of the bund.

(d) Clarity on bund height.

In CRC's email of 4 December 2017 to the Co-ordinator General's Department, specific information request areas are as follows:

(a) Flood model documentation.

(b) Flood impact assessment scenarios and flood cases to be assessed.

(c) Port-dredge material placement and final landform conditions.

(d) Sensitivity to high direct rainfall and contingency measures.

(e) Severe storm / loss of life consideration.

(f) Embankment failure and consequences.

(g) Proposed bund levels and freeboard details.

(h) Erosion / scour in overtopping events and management.

(i) Flood hazard assessment.

(j) Addition water level and velocity information.

(k) Risk of remobilisation.

As there is overlap between EHP's and CRC's requests, I have responded to these under broad headings on a chapter by chapter basis below, in Chapters 4 to 11.

4 Comparison of TUFLOW Flood Model to Connell Wagner's MIKE 21 Flood Model

CRC require full calibration and validation details for the TUFLOW flood model used. The TUFLOW model used was created for the development of the AQUIS project, and was calibrated against the 2007 MIKE 21 Council approved flood model previously developed by Connell Wagner (now Aurecon). It was developed quickly to allow more rapid development option testing over the Council model.

Topography and roughness maps used were generally that of the 2007 MIKE model. Boundary conditions for design flood events were identical to those of the MIKE model.

To demonstrate that the TUFLOW model is fit for purpose of Impact assessment as part of the EIS stage of this proposal, a comparison of peak flood levels between the TUFLOW and MIKE model across the delta and specifically in the vicinity of the site has been carried out.

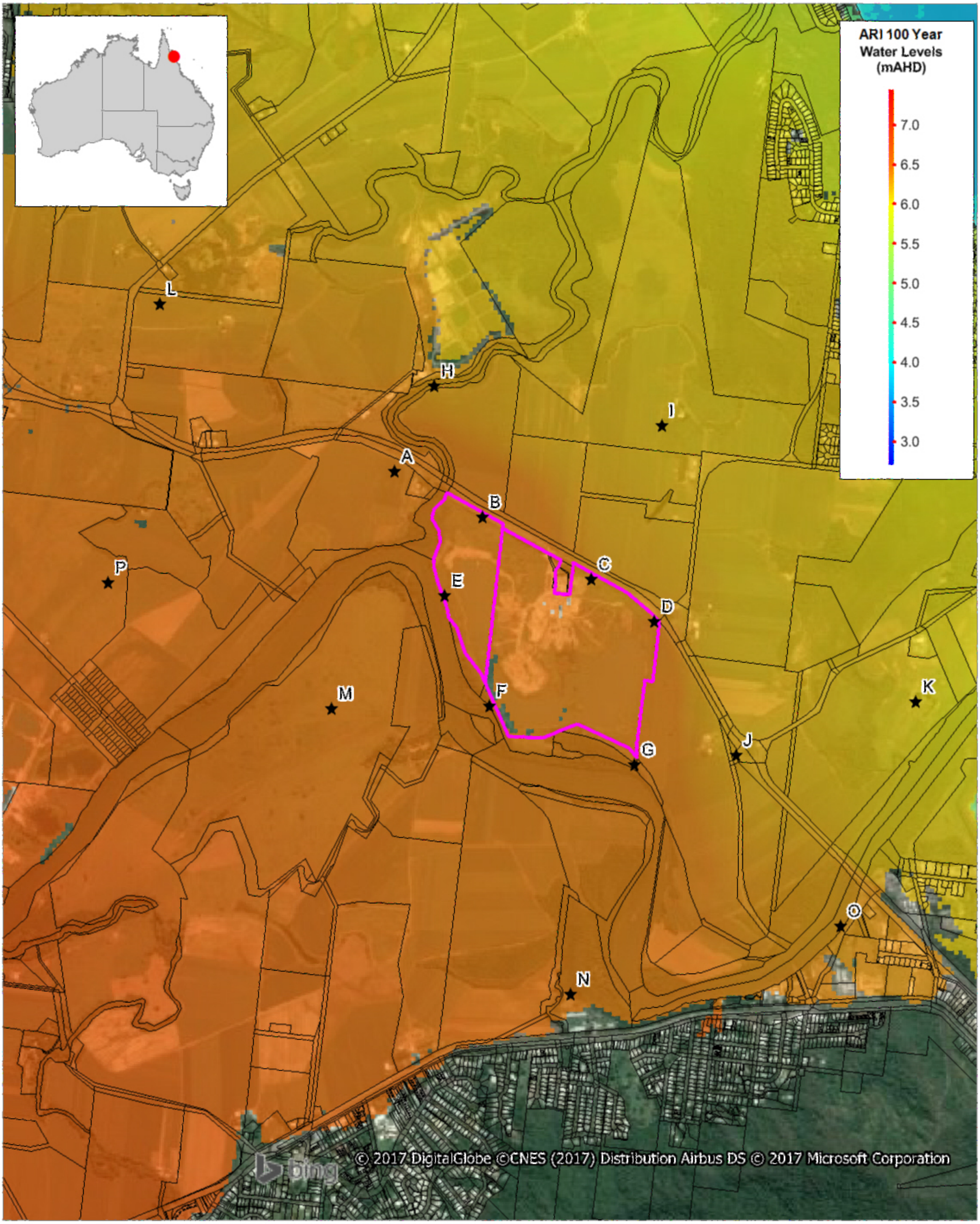
Figure 4-1 shows the locations of the comparison points and Table 4-1 provides results of comparisons.

Table 4-1 Comparison of TUFLOW v MIKE 21 Model Results

Reporting Point	100 Year ARI			20 Year ARI			5 Year ARI		
	TUFLOW (mAHD)	MikeFlood (mAHD)	Difference (mm)	TUFLOW (mAHD)	MikeFlood (mAHD)	Difference (mm)	TUFLOW (mAHD)	MikeFlood (mAHD)	Difference (mm)
A	5.806	5.803	3	5.035	5.060	-24	4.517	4.516	1
B	5.847	5.814	33	5.134	5.161	-27	4.715	4.649	65
C	5.366	5.362	4	4.589	4.571	18	4.026	4.042	-15
D	5.495	5.500	-6	5.067	5.012	55	4.539	4.485	54
E	6.239	6.182	57	5.441	5.448	-8	4.912	4.817	95
F	6.133	6.107	26	5.359	5.334	24	4.754	4.688	66
G	5.868	5.860	8	5.137	5.115	22	4.539	4.482	56
H	5.216	5.160	57	4.263	4.210	53	3.714	3.610	103
I	4.864	4.853	11	3.911	3.926	-14	3.148	3.146	2
J	5.044	5.043	0	4.140	4.160	-21	3.357	3.399	-42
K	4.593	4.603	-11	3.794	3.847	-53	3.169	3.223	-54
L	5.373	5.394	-21	4.203	4.264	-60	3.430	3.481	-51
M	6.501	6.522	-22	5.673	5.686	-13	4.948	4.923	25
N	5.841	5.847	-6	5.024	5.021	4	4.362	4.314	48
O	5.302	5.277	25	4.491	4.421	70	3.848	3.684	164
P	6.815	6.873	-57	5.944	6.004	-60	5.330	5.314	16

The comparison of results demonstrates that the TUFLOW model adequately matchesthe MIKE 21 flood model across a range of flow events. Comparisons across the entire delta can be provided if required. There is close agreement between the two models in the area of the delta that included the Aquis site as that was the purpose of its original development however there is close agreement generally across the delta. It is noted that Council accepted the outcomes of the Aquis assessment using the TUFLOW model.

It is noted that, prior to finalisation of the detailed design and prior to downstream operational works applications, the final adopted containment arrangement will be checked for hydraulic impacts in Council's MIKE 21 flood model.



Title:

Northern Sands Placement Site
Model Comparison Reporting Points

Figure: **4-1**

Rev: **A**

N

0 150 300
metres

BMT WBM
www.bmtwbm.com.au

Filepath: I:\B22074.I.Cairns EIS Update\DRG\Flood\REPORT\Oct2017\ESG_001_171212_ns_Dev_100y WSL_rep_points.WOR

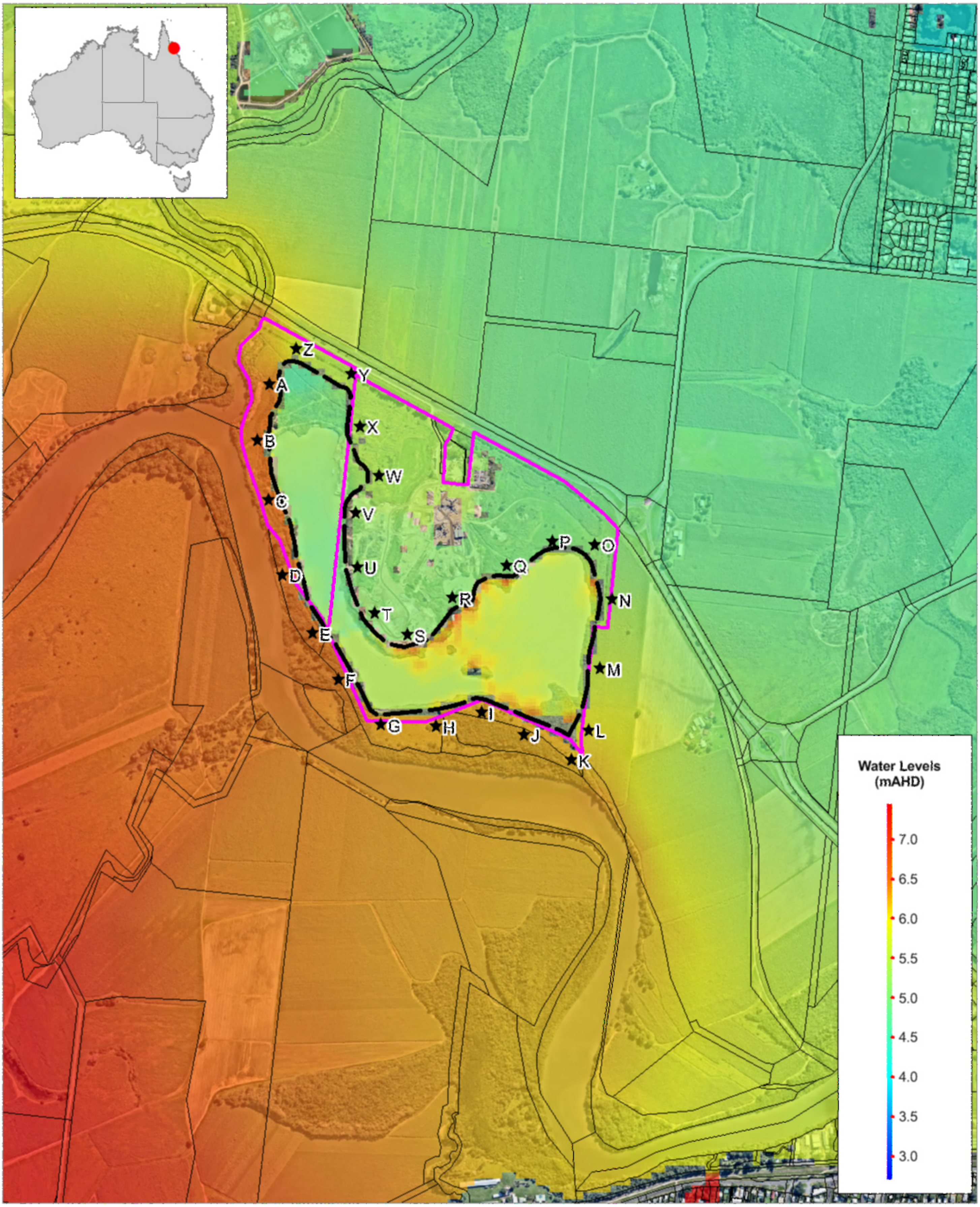
5 Additional Flood Level and Velocity Information for Northern Sands Site with Proposed Bunds in Place

Figure 5-1 shows the location of additional reporting points around the containment area. Table 5-1 below shows corresponding peak water levels across a range of ARI events.

Table 5-1 Peak Flood Levels around Containment Area

Reporting Point	ARI (Years) - Peak Water Level (mAHD)					
	100	50	20	10	5	2
A	6.44	6.01	5.55	5.18	4.76	4.11
B	6.65	6.24	5.81	5.47	5.03	-
C	6.63	6.21	5.79	5.47	5.04	-
D	6.61	6.18	5.74	5.40	4.98	4.16
E	6.54	6.11	5.66	5.32	4.90	4.07
F	6.47	6.02	5.56	5.22	4.81	4.00
G	6.26	5.80	5.33	4.99	4.61	3.84
H	6.20	5.75	5.28	4.94	4.56	3.79
I	6.19	5.74	5.27	4.94	4.56	3.79
J	6.18	5.74	5.27	4.94	4.56	3.79
K	6.11	5.69	5.25	4.93	4.56	3.79
L	5.89	5.51	5.13	4.85	4.54	3.79
M	5.55	5.25	4.95	4.75	4.50	3.79
N	5.25	5.03	4.83	4.68	4.48	3.79
O	5.04	4.88	4.75	4.64	4.48	3.79
P	4.97	4.79	4.70	4.61	4.47	3.79
Q	4.95	4.57	4.26	4.06	3.54	-
R	5.00	4.62	4.28	4.07	3.53	2.10
S	5.02	4.63	4.29	4.07	2.93	-
T	5.02	4.63	4.29	4.07	2.93	-
U	5.03	4.64	4.29	4.07	-	-
V	5.10	4.73	4.44	4.30	3.95	-
W	5.30	5.06	4.85	4.70	4.49	4.05
X	5.32	5.07	4.85	4.71	4.49	4.05
Y	5.37	5.10	4.87	4.71	4.49	4.05
Z	5.70	5.39	5.09	4.89	4.59	4.07

Top of bund levels will be set to provide immunity to the ARI 100 year(1% AEP) river flood event.



Title:

Northern Sands Placement Site
100 Year ARI Peak Water levels with Reporting Points

Figure: **5-1**

Rev: **A**

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

N

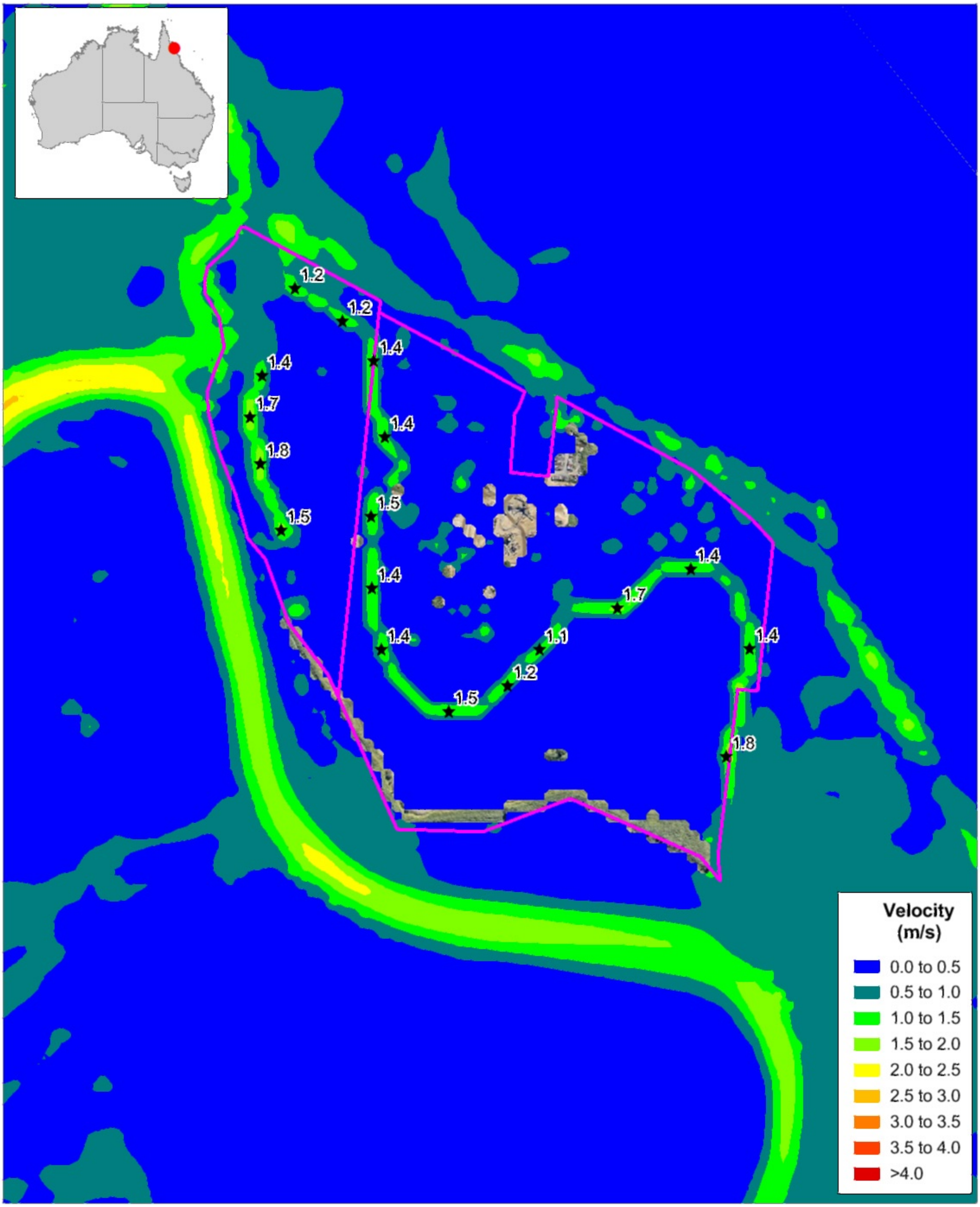
0 150 300
metres

BMT WBM
www.bmtwbm.com.au

Filepath: I:\B22074.I.Cairns EIS Update\DRG\Flood\REPORT\Oct2017\ESG_001_171212_ns_Dev_100y WSL_rep_points.WOR

In terms of velocities with the bund in place, Figure 5-2 shows velocities in an ARI 100 year event with ARI 100 year level levees in place. There is no overtopping in the southern section adjacent to the river, because of the existing topography there. Velocities are up to 1.8m/s but largely less than 1.5 m/s.

The velocities can be readily managed through design to ensure no significant scouring of the embankment will occur (e.g. grassing or rip-rap (100mm))



Title:
Northern Sands Placement Site
100 Year ARI Peak Velocities - Bund Overtopping

Figure: **5-2**

Rev: **A**

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

N

0 150 300
metres

BMT WBM
www.bmtwbm.com.au

Filepath: I:\B22074.I.Cairns EIS Update\DRG\Flood\REPORT\Dec2017\ESG_001_171213_ns_5p5_bund_100y Vel.WOR

6 Appropriate Flood Cases necessary for Assessment of the EIS

CRC in the request of 4 December 2017 on its outstanding information identified a significant number of cases, including historic Northern Sands conditions, current site, pre-quarry conditions, final landform, construction stage, first wet season, second wet season, post-dredge placement conditions / ongoing quarry usage, and revised final landform, conditions that may require flood impact assessment.

Upon review, my assessment is that only two cases ought to be considered to determine the impacts of the proposed dredge material placement at the Northern Sands Site are:

(a) Existing approved Northern Sands operations, as the appropriate base case; and

(b) the case with ARI 100 year (1% AEP) Barron River flood immune containment bunds in place.

Modelling to date for case a) has assumed existing earthworks, stockpiling and operations on site are lawful uses.

I understand that CRC is investigating whether certain aspects of existing earthworks, including a bund adjacent to the Barron River are lawful. Until this is clarified, I cannot assess any alternative for the base case.

Post dredge placement, the containment area will be returned to the pre-existing approved Northern Sands operations situation in terms of any impediment to flood flow.

The pre-quarry condition may be of historic interest, but is not relevant in predicting impacts due to the proposed dredge material placement strategy.

The first wet season condition will be case b) at worst, or with possibly reduced height bunds if settlement occurs at a more rapid rate than currently predicted as a worst-case scenario material. As actual settlement rates cannot be established until the material is placed, a conservative approach has been used of worst case scenario with bunds remaining at the nominal 100yr ARI (1% AEP) Flood level.

7 Consideration of Dam Failure

Natural ground levels around the containment area of the Northern Sands Site are generally around RL 3.5mAHD or higher. The adjacent highway levels are generally between RL 3.75m to RL 5.0 m AHD. At the two locations, where the containment bund is closest to the highway, the road levels are all above RL 4m AHD.

The current proposal, for containment, has bunds with crest levels at the 100yr ARI (1% AEP) flood level (nominally RL 5.5mAHD). Based on advice from Flanagan Consulting Group, at end of week 11 of the dredge material placement campaign, the placed dredge material and ponded water reach their highest levels of RL 3.51m and RL 4.51m respectively. There is 1m depth of water at this time.

Based on analysis of monthly flood records (as discussed in Chapter 8), there is a very low probability that a river flood will occur during the dredge material placement period. In terms of risk assessment considerations, a sunny day embankment collapse is the only possible risk during that period.

The containment bund is at its closest to the highway in the north-western corner, where it is approximately 100m from the highway in the north-eastern corner, the bund is approximately 150m from the highway.

Assuming an entire 200m length of the bund were to collapse in the north-west corner, the 1m depth of water will form a dam break wave, that will travel to the north-east. By the time this reaches the road, the wave will have spread to frontal width of approximately 400m with a depth of 0.5m.

Most of the dredge material will remain contained in the containment area because of the natural topography containing the material.

The highway is 0.5m to 1m higher than the adjacent site topographic levels. The water that has flowed through the embankment breach will pond behind the road embankment until the available storage is filled, then sheet flow overtopping of the highway will occur, at depths no greater than 300mm (based on my empirical calculations).

Hence, even under this worst-case scenario, there is no significant risk of loss of life to people driving on the highway. A possible additional mitigation strategy would be to construct a 1m high earth mound along the highway frontage to fully contain any water and spoil discharged under such on unlikely dam break situation.

In terms of workers on the site, procedures should be put in place to exclude any site buildings or activities in the areas between the bunds at their two closest points to the highway, and the highway, and within 150m of the bund elsewhere.

Figure 7-1 shows the levels along the highway adjacent to the site.

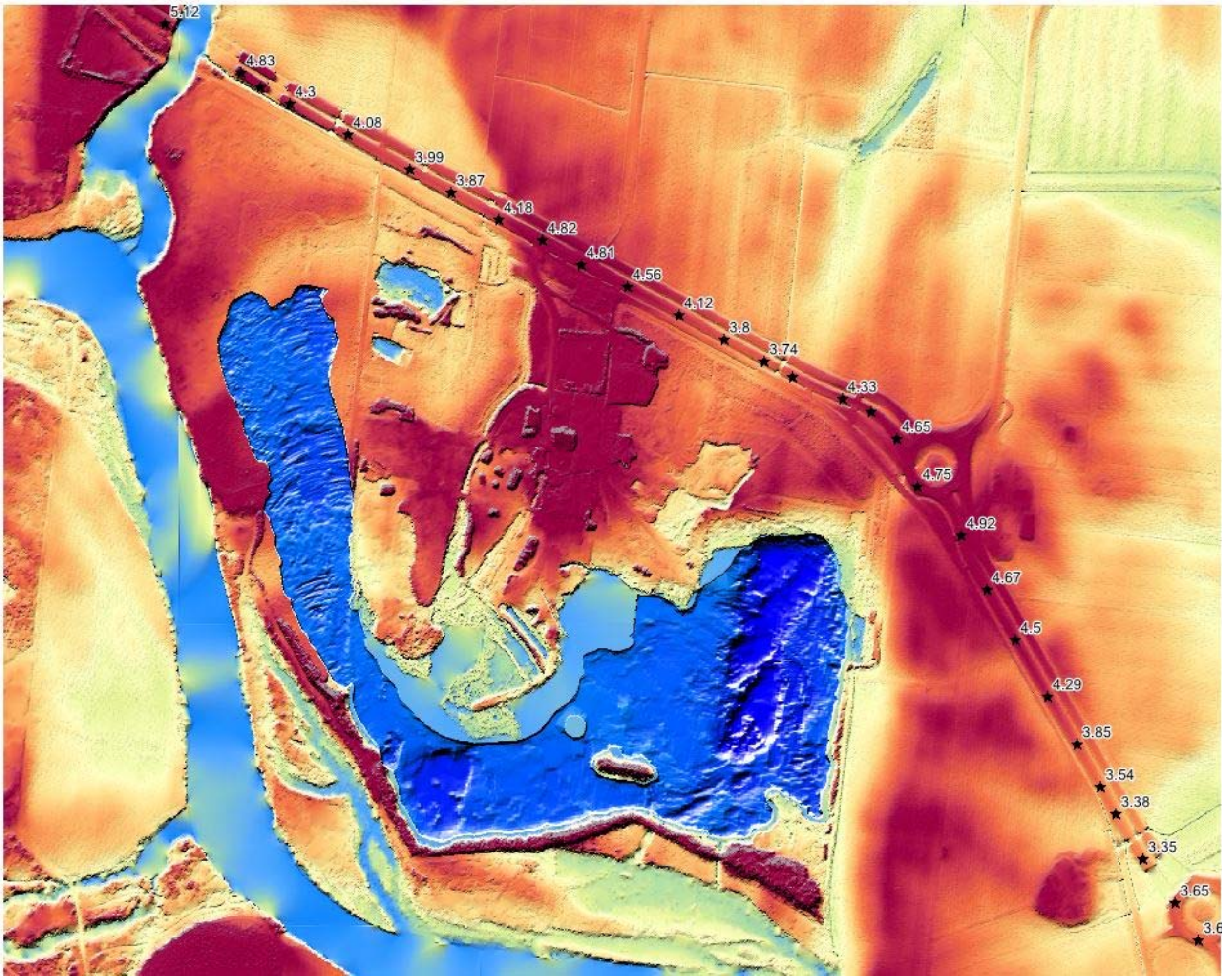


Figure 7-1 Highway Levels Adjacent to the Site

8 Month by Month Analysis of River Flooding

8.1 Overview

The Site is located on the lower Barron River and approximately 7.5km from the mouth. Two large dams regulate flows down the river system, being Tinaroo Dam on the Barron River on the Atherton Tablelands, and Copperlode Falls Dam, on Freshwater Creek.

The Barron River drops from the Atherton Tablelands through the Barron Gorge before reaching the Barron Delta, which has several bifurcations to the sea, including Thomatis-Richters Creek which is immediately to the north of the proposed dredge material placement site.

The period for the dredging campaign is proposed during May to September, during the dry period. The sections below, demonstrate the historical frequency of rainfall and flooding that occurs during the months of the proposed construction period.

8.2 Rainfall

The Site, located in Cairns is within the wet-tropics climate zone. Table 8-1 provides a summary of climate statistics from the Bureau of Meteorology (BOM) station Cairns Aero (031011) and Kuranda Railway (31036) whilst Figure 8-1 to Figure 8-4 provides graphical representations of this data.

The Cairns Aero rainfall station is located approximately 1.8km south of the Site and has records from 1942 to the present, whilst Kuranda Railway Station has records since 1898 and is located near Myola flow Gauging Station. These rainfall gauges have a large rainfall data set and are considered reliable and representative of the greater area.

As demonstrated from the presented data, the Cairns region experiences distinct wet summers and dryer winters. Average annual rainfall is approximately 2000mm to 2132 in the lower and upper catchment respectively.

The summer months (January to March) is the period when the majority of rainfall occurs and as such there are defined wet and dry seasons for the area. The majority of flood events typically to occur between the months of January to March and occasionally in April at the latest as detailed in Section 8.3.

The period between December and April is recognised as being Cyclone season however cyclones can form outside of this period (BOM, 2013).

Table 8-1 Summary of Climate Statistics from the Cairns AERO

Parameter	Month												Annual Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Cairns Aero (031011)													
Mean rainfall (mm)	395	451	424	195	91	45	29	27	34	47	94	179	2007
Highest rainfall (mm)	1417	1287	1128	635	322	144	145	140	103	394	372	919	3149
Highest daily rainfall (mm)	368	286	403	186	90	70	38	63	80	206	185	230	-
Kuranda Railway Station (31036)													
Mean rainfall (mm)	409	429	441	233	108	72	50	44	38	51	80	183	2132
Highest rainfall (mm)	2940	1531	1298	1841	408	267	213	232	152	366	382	768	4922
Highest daily rainfall (mm)	535	437	472	731	165	129	154	135	100	172	171	244	-

(Source BOM 2013)

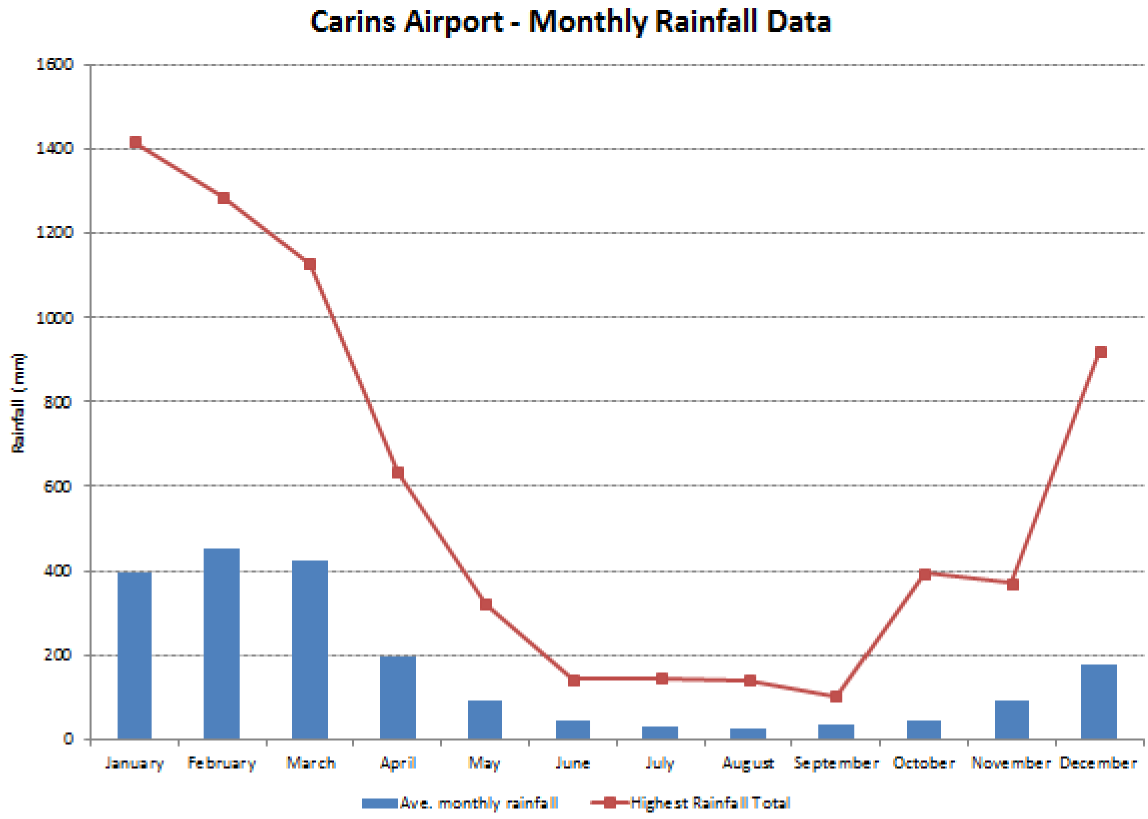


Figure 8-1 Monthly Rainfall

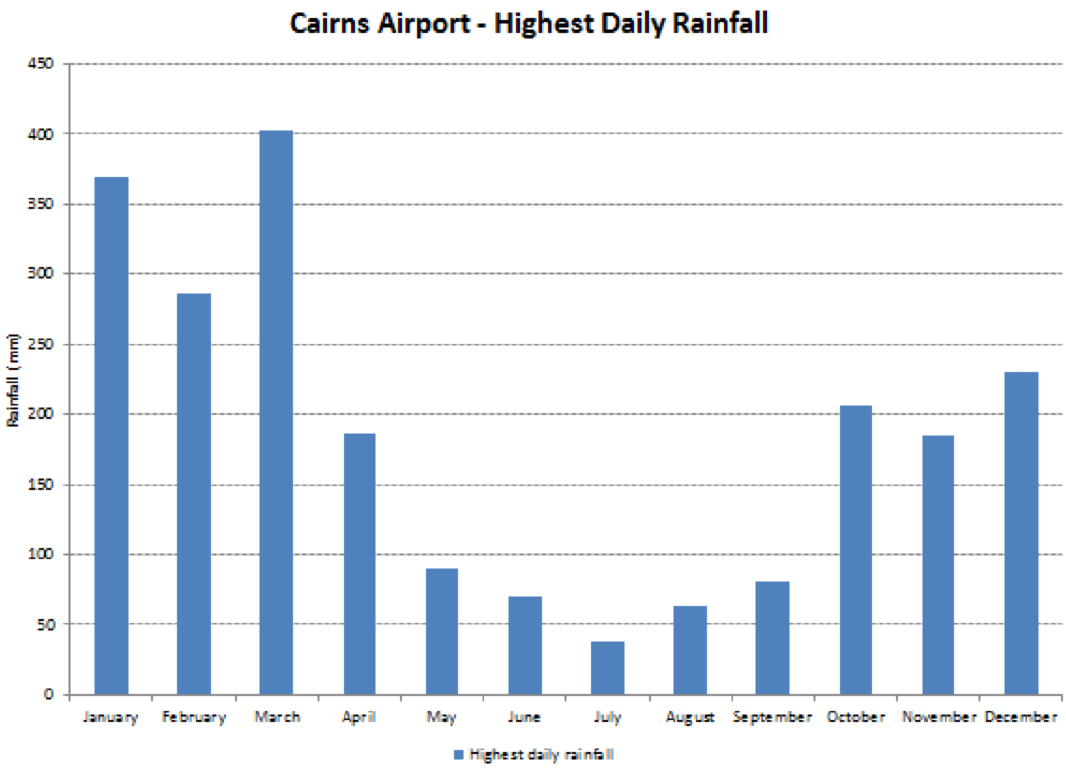


Figure 8-2 Highest Daily Rainfall

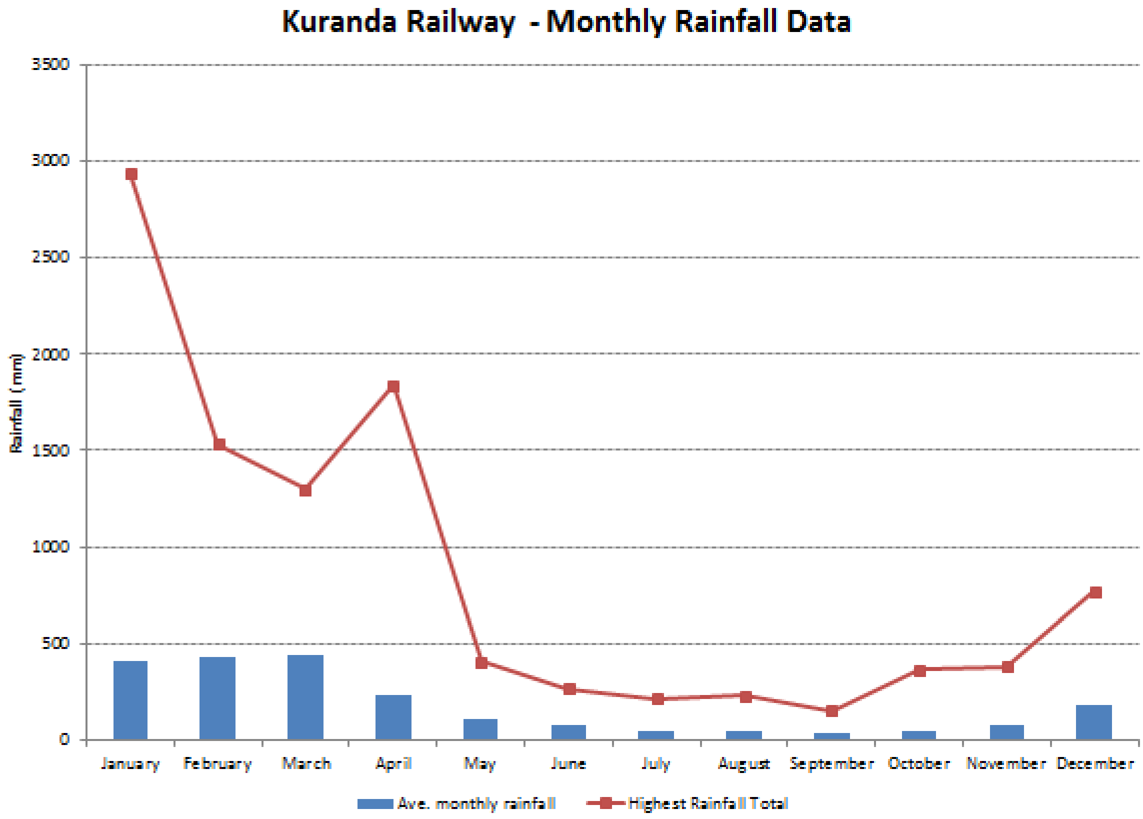


Figure 8-3 Monthly Rainfall

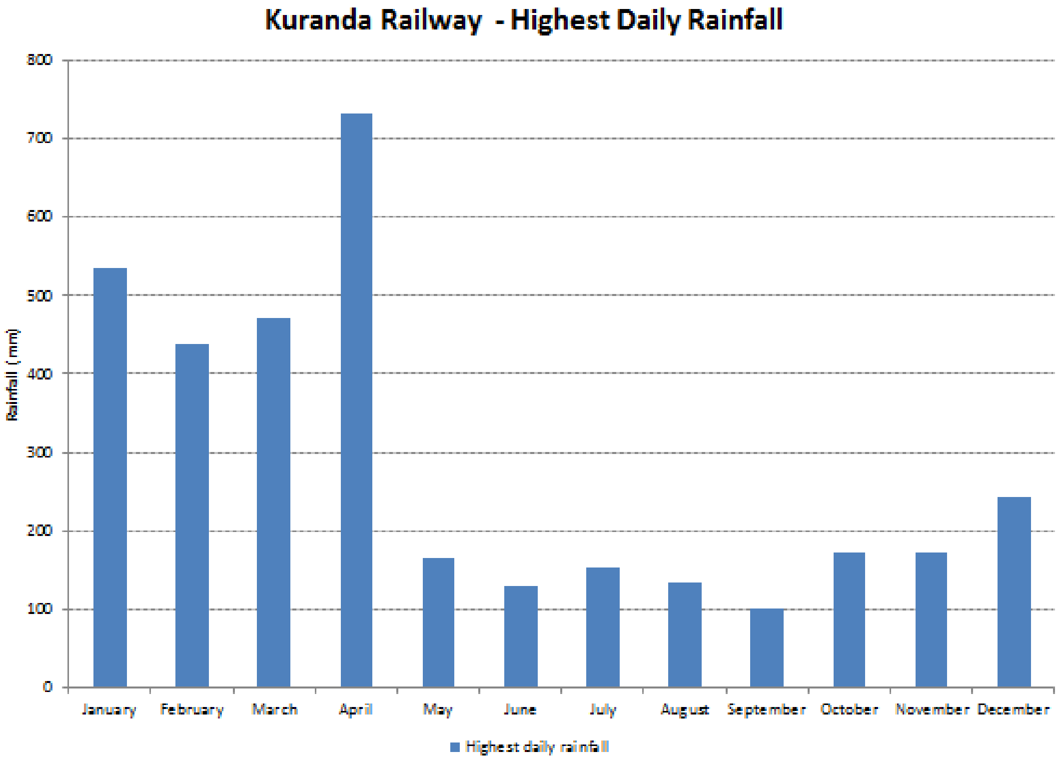


Figure 8-4 Highest Daily Rainfall

8.3 Peak Flood Flow

8.3.1 Myola Stream Gauge

Myola stream gauge has collected data since 1958 and is currently operational. Based on stream gauge records at Myola, and the latest estimates for Freshwater Creek, design peak flood flow estimates are as shown in Table 8-2.

Table 8-2 Design Peak Flood Flows in the Barron River

ARI (Years)	*AEP %	Barron River Peak Flow (Myola) (m^3/s)	Freshwater Creek Entering the Delta (m^3/s)
100	1	6392	820
50	2	4896	726
20	5	3430	607
10	10	2600	504
5	20	1820	426
Probable Maximum Flood (PMF)		25255	2124

(Source: Connell Wagner – Review of Barron river Delta Flood Model ((August 2007))

**Annual Exceedance Probability*

The dredge material placement site will not be impacted significantly during the construction period from peak flows below the 20% AEP (i.e. 5 yr ARI Flood). As a consequence, a review of the Myola gauge was undertaken to determine the flood flow characteristics at the Myola gauge.

The maximum daily peak flow is presented in Figure 8-5 based on the record from 1958 to 2017.

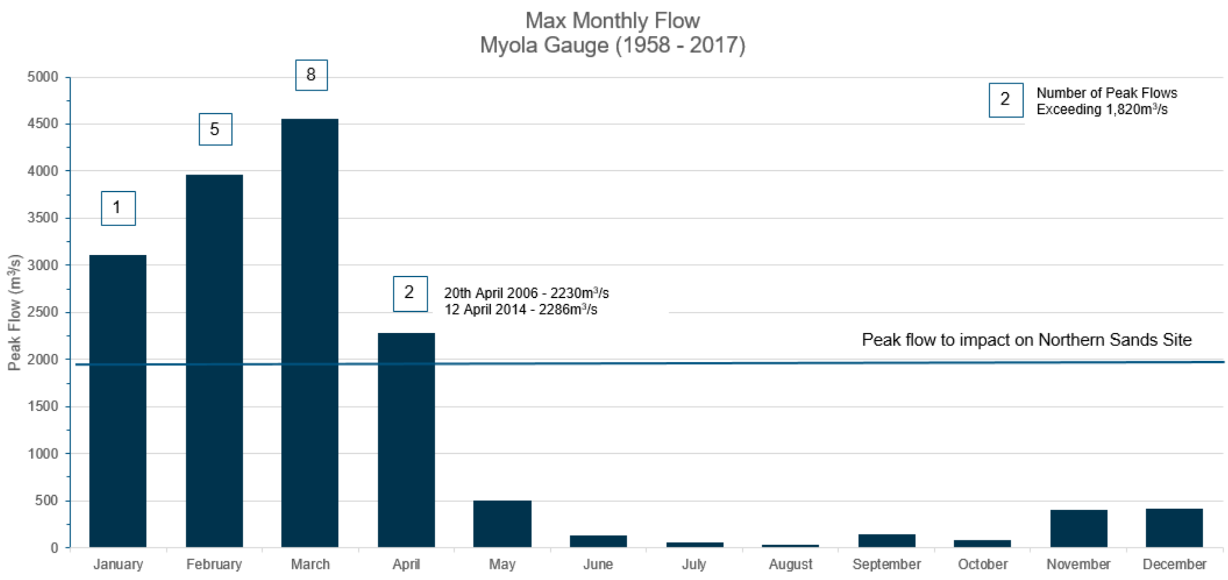


Figure 8-5 Max Monthly Flow at Myola Gauge (1958-2017)

From the graph presented above, it can be seen that there have not been any peak flood flows exceeding the 5 year ARI on the Barron River during the months of May to December since 1958. The peak flows during the months of May to December are typically below a 1 year ARI flood event (i.e. extrapolated from Table 8-2 and is equivalent to 500m^3/s at Myola).

During the months of January to March, fourteen (14) floods have exceeded the 5 year ARI flood event for the Barron River. Whilst April is outside the proposed construction period, only two flood have exceeded the 5yr ARI flood event and both of these were well less than a 10yr ARI Flood event (i.e. just exceeding the 5yr ARI).

8.3.2 Design Flood Events

Since 1981, there has been a number of flooding investigations in relation to the Barron Delta, with numerical modelling first applied in the mid-eighties. Currently there is a detailed full two-dimensional flood model that has been adopted by Cairns Regional Council that predicts the effects of design flood events across the delta (Connell Wagner, August 2007). Selected extracts of results of this latest modelling are provided below.

The ARI 5 year ARI flood extent is shown Figure 8-6 to represent the flooding characteristics at the proposed dredge material placement site.

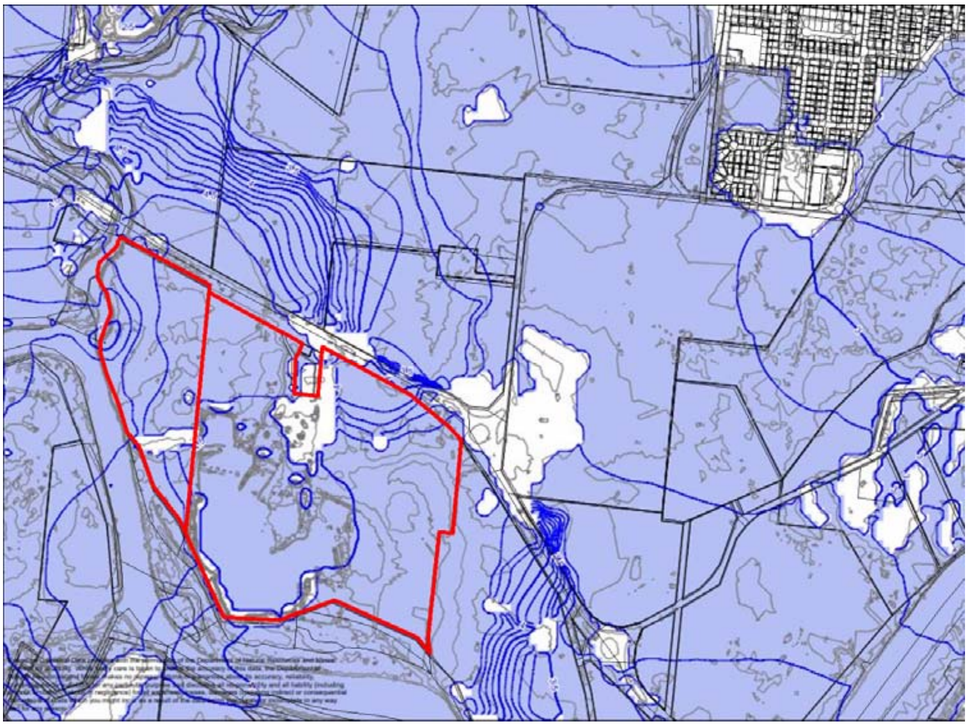


Figure 8-6 ARI 5 Year Flood Levels and Depths

9 Consideration of Extreme Local Rainfall Events and Spillway Requirements

In our November 2017 report, we provided an assessment of requirements for the bund arrangements and spillway requirements to safely manage the ARI 100 year local rainfall burst. In that report, it was proposed to provide an air buffer to contain the event, in addition to the provision of a spillway capable of carrying the peak flow. CRC has queried how more extreme events are to be managed, and this requirement is addressed in this report.

Based on Connell Wagner (August 2007), the 72 hour Probable Maximum Precipitation depths is approximately 1.9m. Assuming no freeboard, this would result in an outflow rate of 2.5m^3/s. Assuming all 1.9m rain fell in a 10 hour period, the out flow rate of 8.7m^3/s, which can be adequately managed with a 15m long by 0.5m deep emergency spillway.

Normal allowances for earthworks construction tolerances and wave action requires a minimum freeboard of around 300mm, which is sufficient to store extreme rainfall bursts of shorter duration. Clearly, a PMP local rainfall burst spillway can readily be designed to adequately manage associated outflow from the bunded area for this extreme event, and this will need to be further refined at the detailed design stage.

10 Details of Balancing Pipes

Balancing pipes are proposed to allow the containment area water levels to rise at a similar rate to external water levels in a Barron River flood event. These are pipes with flap valves to allow only one-way flow into the containment area.

Based on the March 1977 flood event, which was one of the fastest rate of rise floods on record, the average rate of flood level rise on the rising limb was 0.52 m/h. Hence, for the 34.6 ha containment area, this equates to $50m^3/s$ inflow required to ensure internal water levels are close to external levels.

The balancing pipes would be located on the western, upstream side of the bund for maximum driving head, at an invert level of around RL 4.0mAHD.

The actual sizing and location of balancing pipes is a matter for detailed design, however 32 1m diameter pipes would be capable of delivering the required inflow rate.

11 Re-evaluation of Placed Material Remobilisation

In our January 2017 Report, we considered the potential for dredge material resuspension, based on advice from BMT JFA that the material to be placed will consist of predominantly fine silt to coarse sand. We then conservatively assumed critical bed shear stress values for remobilisation of 0.04 to 0.15N/m^2, which equates to the fine silt to very fine sand based on the USGS report values included in that report.

More detailed information on the composition of the placed dredge material has been provided by Golder Associates, based on their December 2015 Report. Based on that report, Table 11-1 below has been prepared.

Table 11-1 Characteristics of Placed Dredge Material

Percent Clay (-0.002mm)	Percent Silt (0.06mm -0.002mm)	Percent Sand (2mm -0.06mm)
42	51	7

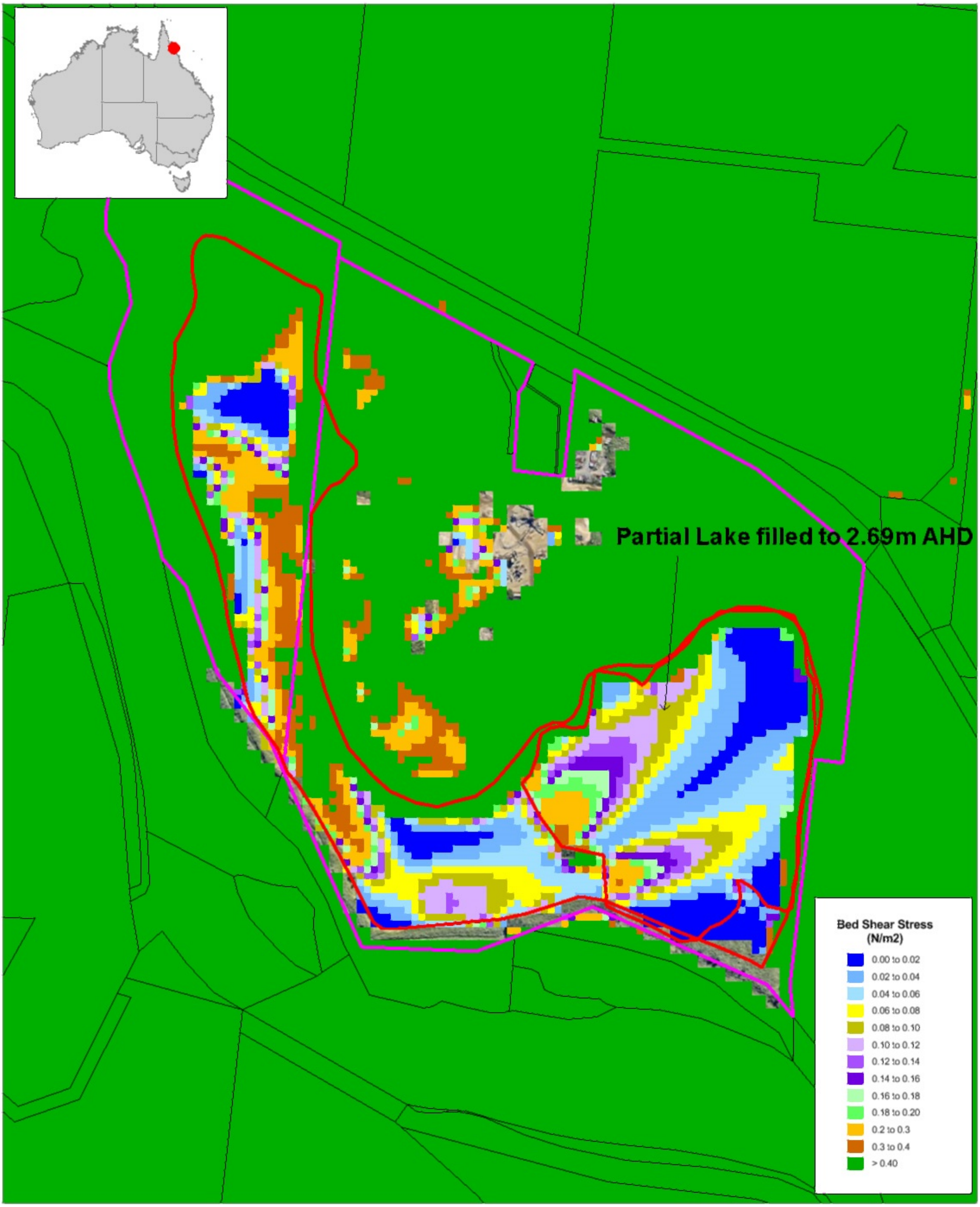
This dredged material is similar in property to that proposed to be dredged for the South of Embley Project, 40 km south of Weipa. In a report by Worley Parsons (WP) 'Marine Environmental Modelling of Dredging Methods for the Proposed Port' of 13 February 2013, the following table (reproduced of Table 11-2) was provided, based on Partheriades (1965) and Parchuve & Mehta (1985).

Table 11-2 Critical Shear Stress for Sedimentation Erosion

Mud Type	Density	Typical Critical Shear Stress (N/m^2)
Mobile Fluid Mud	180	0.05 -0.1
Partly consolidated mud	450	0.2-0.4
Hard mud	600+	0.6-2.0

WP adopted a critical shear stress of 0.3N/m^2 for the project, which was stated to be consistent with critical bed shear stress recommendations in other recent studies.

Figure 11-1 shows the results of bed shear stress analysis for an overtopping event with ARI 100 year bunds in place, with the containments area assumed to be filled with material to a level of RL 2.69m, over the south-eastern portion of the lake. It is important to note that with the balancing pipes in place, water levels within the containment area will generally match those of the adjacent floodwaters at the time when flood flow over the top of the containment area occurs. This will prevent scour of the inside face of the bunds, and will assist in ensuring sufficient water depth over the dredge material at all times to adequately manage the risk of remobilisation.



Title:

Northan Sands Disposal Site
RL 5.5m AHD Bund - ARI 100 Year Bed Shear Stress

Figure: **11-1**

Rev: **A**

N

0 100 200
metres

BMT WBM
www.bmtwbm.com.au

Filepath: I:\B22074.I.Cairns EIS Update\DRG\Flood\REPORT\Dec2017\ESG_001_171208_ns_5p5_bund_partial_lake_2p69_Q100_BSS.WOR

This shows that, assuming the WP critical bed shear stress valve, there is only very minor potential for resuspension under this scenario.

Additional testing of the dredge material may be considered as part of the design development to determine the actual critical bed shear stress for resuspension to allow finalisation of bund heights, velocity management and minimum water depth cover over the placed material.

BRW.
CLIENT
CHOICE
AWARDS
2013
australia's best professional service firms
WINNER

BMT WBM

BMT WBM Bangalow	6/20 Byron Street, Bangalow 2479 Tel +61 2 6687 0466 Fax +61 2 66870422 Email bmtwbm@bmtwbm.com.au Web www.bmtwbm.com.au
BMT WBM Brisbane	Level 8, 200 Creek Street, Brisbane 4000 PO Box 203, Spring Hill QLD 4004 Tel +61 7 3831 6744 Fax +61 7 3832 3627 Email bmtwbm@bmtwbm.com.au Web www.bmtwbm.com.au
BMT WBM Denver	8200 S. Akron Street, #B120 Centennial, Denver Colorado 80112 USA Tel +1 303 792 9814 Fax +1 303 792 9742 Email denver@bmtwbm.com Web www.bmtwbm.com
BMT WBM London	International House, 1st Floor St Katharine's Way, London E1W 1AY Email london@bmtwbm.co.uk Web www.bmtwbm.com
BMT WBM Mackay	PO Box 4447, Mackay QLD 4740 Tel +61 7 4953 5144 Fax +61 7 4953 5132 Email mackay@bmtwbm.com.au Web www.bmtwbm.com.au
BMT WBM Melbourne	Level 5, 99 King Street, Melbourne 3000 PO Box 604, Collins Street West VIC 8007 Tel +61 3 8620 6100 Fax +61 3 8620 6105 Email melbourne@bmtwbm.com.au Web www.bmtwbm.com.au
BMT WBM Newcastle	126 Belford Street, Broadmeadow 2292 PO Box 266, Broadmeadow NSW 2292 Tel +61 2 4940 8882 Fax +61 2 4940 8887 Email newcastle@bmtwbm.com.au Web www.bmtwbm.com.au
BMT WBM Perth	Level 3, 20 Parkland Road, Osborne, WA 6017 PO Box 1027, Innaloo WA 6918 Tel +61 8 9328 2029 Fax +61 8 9486 7588 Email perth@bmtwbm.com.au Web www.bmtwbm.com.au
BMT WBM Sydney	Level 1, 256-258 Norton Street, Leichhardt 2040 PO Box 194, Leichhardt NSW 2040 Tel +61 2 8987 2900 Fax +61 2 8987 2999 Email sydney@bmtwbm.com.au Web www.bmtwbm.com.au
BMT WBM Vancouver	Suite 401, 611 Alexander Street Vancouver British Columbia V6A 1E1 Canada Tel +1 604 683 5777 Fax +1 604 608 3232 Email vancouver@bmtwbm.com Web www.bmtwbm.com