

<p>ORDINARY MEETING</p> <p>22 NOVEMBER 2023</p>	<p>12</p>
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PROJECT LAUNCH APPROVAL (PLA) – PG22031-01 – BREAKWATERS – HOLLOWAYS BEACH EROSION MANAGEMENT

50/5/32 | #7282948

RECOMMENDATION:

That Council:

1. Approves the Project Launch Approval for project PG22031-01 for construction of Breakwaters for Holloways Beach Erosion Management with a Project Launch Budget (PLB) of \$2,402,745 and an Approved End Date (AED) of 30 July 2024.
2. Delegates authority to the Chief Executive Officer in accordance with the *Local Government Act 2009* to enter into contracts, finalise and negotiate any and all matters relating to this project subject to normal procurement practices and policies.

INTERESTED PARTIES:

N/A

EXECUTIVE SUMMARY:

This report seeks endorsement for the Project Launch Approval for the construction of three breakwaters for Holloways Beach erosion management with an overall Project Launch Budget (PLB) of \$2,402,745 excluding GST and an approved end date (AED) of 30 July 2024.

The construction of the breakwaters will provide longer term protection of the foreshore whilst reducing ongoing costs of regular sand nourishment programs.

The project has a total budget allocation of \$2,500,000 in 23/24 and 24/25 in Council's Capital Works program. The State government has committed \$750,000 of funding to this project under the Preparing Our Communities Program (POCP).

The construction works will be undertaken by Council's Works construction staff and subcontractors on Council's Register of Providers. Sand nourishment is to occur on the beach following construction of the breakwaters.

BACKGROUND:

Continued erosion of Holloways Beach has resulted in the need for erosion protection structures to be considered. Sand nourishment campaigns have recently been completed in 2021 and 2023 to address significant erosion occurring to the grassed foreshore and to address the risk to nearby public infrastructure. These campaigns are undertaken at

substantial cost with limited success as the sand continues to be washed away by wave action as part of the natural coastal processes. The most recent campaign was in 2023 when approximately 35,000m³ of sand was pumped onto the beach at a cost of \$1,250,000. It is desirable to reduce the frequency and improve the effectiveness of sand nourishment by implementing a more permanent engineered solution to retaining the sand.

Council recently constructed two rock structures to the Holloways Beach foreshore which protect the southern 650m of beachfront. These are proving to be successful in retaining sand on the beach front. The consultancy 'International Coastal Management' were engaged and have provided an engineered solution to the remaining 650m of grassed foreshore containing public infrastructure. The design proposes three breakwaters to be installed to the nominated area.

COMMENT:

The primary objective of the project is to trap sand being transported north along Holloway's beach and reduce the risk of long-term erosion on the beach. The trapped sand can then be recycled back to the south when needed. Trapping sand will improve the resilience of the beach and improve the functionality, be more attractive and more useable for the community.

A sand nourishment program is anticipated to occur following construction of the breakwater structures and will be completed as a separate project.

OPTIONS:

That Council:

1. Approves the Project Launch Approval for project PG22031-01 for construction of Breakwaters for Holloways Beach Erosion Management with a Project Launch Budget (PLB) of \$2,402,745 and an Approved End Date (AED) of 30 July 2024.
2. Delegates authority to the Chief Executive Officer in accordance with the *Local Government Act 2009* to enter into contracts, finalise and negotiate any and all matters relating to this project subject to normal procurement practices and policies.

Or

1. That Council does not approve the Project Launch Approval (PLA) for project PG22031-01 Breakwaters for Holloways Beach Erosion Management and adopts an alternate course of action.

CONSIDERATIONS:

Risk Management:

RISK	RISK LEVEL	MITIGATION/MANAGEMENT STRATEGY	RESPONSIBLE BRANCH
Permit Approvals not obtained	MED	Early engagement with regulators proceeded however still awaiting final approvals.	Project Management Office (PMO)
Rock material availability	MED	Early engagement with suppliers to confirm ability to supply.	Works Construction Services
Poor sand retention	MED	Design against sand erosion is not an exact science and there is a possibility that the proposed breakwaters will not fully address the ongoing erosion. Consultant has provided a design report supporting the justification of the design for the three breakwaters.	Project Management Office (PMO)

Council Finance and the Local Economy:

The estimated cost to construct the three breakwaters inclusive of construction and costs to date is included in the recommended Project Launch Budget (PLB) of \$2,300,000 which is within the combined 2023/24 & 2024/25 budget allocations of \$1,250,000 and \$1,250,000 respectively. Note that subject to the timely receipt of the required permits, the intent is to complete all works prior to 30 June 2024, with the requirement to bring forward some monies from the 2024/25 budget allocation.

PG22031-01	Previous Years	2022/23	2023/24	2024/25	TOTAL
Allocated Budget	\$32,550	\$76,933	\$1,250,000	\$1,250,000	\$2,609,483
PLB	\$32,550	\$70,195	\$2,100,000	\$200,000	\$2,402,745
Variance	\$0	\$6,728	-\$850,000	\$1,050,000	\$206,728

Following the installation of the breakwaters, sand nourishment will be required to rectify existing erosion of the beach. This work will be completed as a separate project.

It is proposed that construction of the breakwaters will be undertaken by Council's Works Construction Services team using Council's existing register of prequalified suppliers. Project management will continue to be undertaken by Council's Project Management Office branch.

Community and Cultural Heritage:

The proposed breakwaters will improve the amenity of the beach and provide longer term protection to the foreshore.

Natural Environment:

All necessary notifications and approvals to undertake the proposed works have been made and /or obtained.

Corporate and Operational Plans:

The proposal aligns with Council's corporate plan Focus #2 for Natural Assets – Protecting and enhancing our iconic natural environment.

Statutory:

A Development Permit for Operational Works required under the *Planning Act 2016* has been received (DM#7300312). A Marine Parks Permit Application to be received late November. The works will proceed as soon as all of permits are received.

CONSULTATION:

Community consultation occurred in early 2019 concerning erosion management options at Holloways Beach and was reported in the Holloways Seawall Condition Assessment and Proposed New Groynes - Report to the Ordinary Meeting 25 September 2019.

Council undertook further consultation regarding the construction of two rock groynes. The consultation period extended from 18 November 2019 to 20 December 2019. Council received 31 submissions and the majority of respondents were from Holloways Beach (24). From these submissions, it can be determined that the majority of respondents (22) supported the construction two rock groynes.

Further consultation will follow the Community Engagement and Communication Plan to ensure the community is fully aware of the proposed imminent works.

ATTACHMENTS:

- Attachment 1 -#6831453 Project Approval Form – Breakwaters – Holloways Beach Erosion Management PG22031-01
- Attachment 2 - #7243861 Plans showing location and design of the breakwaters



Ray Plasto
Executive Manager – Project Management Office




Sarah Stephen
Associate Director Engineering Services



Mark Wuth
Director Cairns Infrastructure & Assets

ATTACHMENT 1 - #6831453 Project Approval Form – Breakwaters - Holloways Beach Erosion Management PG22031-01

PROJECT MANAGEMENT FRAMEWORK		
PROJECT APPROVAL DOCUMENT		SECTION E
PROJECT LAUNCH APPROVAL		

1	PROGRAM NAME	Shoreline Erosion Management 2021/22	DM#	6831453
	PROJECT NAME	Holloways Beach Erosion Management		
	PROJECT NUMBER	PG22031-01		
	INTERNAL/EXTERNAL	PARTNERSHIP	COUNCIL DIVISION	Division 8 - Rhonda Coghlan
	CLIENT INTERNAL			
	DEPARTMENT	CIA	BRANCH	SAMP
	UNIT	SAMP Drainage	NEW/RENEWAL/UPGRADE	New
	CLIENT EXTERNAL (Full Name)	0		
	ASSET CLASS	Other Structures	ASSET NUMBER	0

2	RECOMMENDATION			
	It is recommended that _____ CEO _____ approves the Project Launch Approval (PLA) for project PG22031-01 Holloways Beach Erosion Management			
	Comment			
	Project Launch Budget (PLB) - refer to Section 10	\$	2,402,745.00	
	Approved End Date (AED) - refer to Section 4	30/07/2024		

3	PROJECT DESCRIPTION			
	Design, approvals and construction of three rock breakwater erosion protection structures along Holloways Beach. Major sand nourishment will follow as a separate project. Additional information is available in the design brief #6697600			
	Project Drivers / Objectives			
	Continual erosion of Holloways Beach has resulted in the need for erosion protection structures to be constructed.			

4	Proposed PLA date	PCA	01/08/2022	PPA	30/11/2023	PDA	30/11/2023	PLA	22/11/2023
	Milestone (Outline major milestone activities and their forecast completion)								
	Milestone 1	Complete Concept Design						Date	1/06/2022
	Milestone 2	Complete Detailed Design						Date	1/02/2023
	Milestone 3	Receive Permit Approvals						Date	22/11/2023
	Milestone 4	Construction practical completion						Date	30/06/2024
	Milestone 5							Date	
	Proposed end Date (PF)	PCA	30/06/2023	PPA	30/06/2024	PDA	30/06/2024	PLA	30/07/2024

FINANCIAL INFORMATION									
5	PROJECT FUNDING SOURCES								
	Source	PCA		PPA		PDA		PLA	
	Revenue	\$ 2,000,000.00		\$ 1,550,000.00		\$ 1,550,000.00		\$ 1,652,745.00	
	Developer Contributions	\$ -		\$ -		\$ -			
	Other (please specify)	\$ -		\$ -		\$ -			
	Operations	\$ -		\$ -		\$ -			
	Grants	\$ -		\$ 750,000.00		\$ 750,000.00		\$ 750,000.00	
	Total	\$ 2,000,000.00		\$ 2,300,000.00		\$ 2,300,000.00		\$ 2,402,745.00	
	GRANT ID	TBA		Grant Funding Agreement DM#			7238402		
	Comment: (include any budget transfer required)	State government program Preparing our Communities Program (POCP) has committed \$750K to project. Grant funding agreement being drafted for CRC review and acceptance.							

6	RISKS- Describe any additional risks identified after the PDA			
(Outline the major risks associated with the project which may impact on delivery of the scoped project on time and on budget)				
	Description of Risk	Impact of Risk	Proposed Solution	Cost to Mitigate
	Project doesn't get permit approval in timely manner	High	Early engagement with regulator	\$ -
	Issues with supply of rock materials	High	Early engagement with suppliers to ensure availability of supply.	\$ -
	Ineffective sand retention by breakwaters	Medium	Closely monitor effectiveness of works following future sand nourishment and review design if required.	\$ -

7	RESPONSIBLE OFFICERS	
	Client Representative	Tyron Curcuruto
	Deliverer Representative	Leigh Gniel
	Project Manager	Leigh Gniel
	Other	

8	MINIMUM ENERGY PERFORMANCE STANDARDS FOR CAPITAL WORKS PROJECTS		
	Does the design and construction comply with Council's Minimum Energy Performance Standards?	Y	Supporting Document Number DM# -
	COUNCIL GENERATED WASTE		
	Will this project produce Council generated waste? (i.e. excavation, demolition)	N	

9	PROCUREMENT ARRANGEMENTS
Outline the procurement arrangements to be followed or those that have been followed for the project. This relates only to the substantive components of the project.	
ROPS 2828 for quarry products.	




10	REVISED PROJECT BUDGET ESTIMATE (Outline the details for each main project phase) at Launch Approval									
	Initial Budget Estimate	Submission	\$ 2,000,000.00	PCA	\$ 2,000,000.00	PPA	\$ 2,300,000.00	PDA	\$ 2,300,000.00	
	REVISED PROJECT BUDGET ESTIMATE (Outline the details for each main project phase) at Launch Approval									
	Project Phase	Status	Estimate / Cost		P (Accuracy)		Total			
			Phase	Contingency (incl. in Total)						
	INITIATE	Complete			P	100	\$ -			
	PLAN	Complete	\$ 32,550.00		P	100	\$ 32,550.00			
	DESIGN	Complete	\$ 70,195.00		P	100	\$ 70,195.00			
	DELIVERY		\$ 2,300,000.00	\$ 250,000.00	P	100	\$ 2,300,000.00			
	FINALISE				P	100	\$ -			
	TOTAL		\$ 2,402,745.00	\$ 250,000.00			\$ 2,402,745.00			
	PROJECT LAUNCH BUDGET (PLB) REQUIRED							\$ 2,402,745.00		

11	VARIATIONS IN THE ORIGINAL BUDGET VS PLB								
		Year 1	Year 2	Year 3	Years 4-5	Years 6-10	TOTAL		
	Estimate at PCA (or previous year budget allocations)	\$ 50,000.00	\$ 1,950,000.00	\$ -	\$ -	\$ -	\$ 2,000,000.00		
	Estimate at PPA	\$ 90,000.00	\$ 2,210,000.00	\$ -	\$ -	\$ -	\$ 2,300,000.00		
	Estimate at PDA	\$ 130,000.00	\$ 2,170,000.00	\$ -	\$ -	\$ -	\$ 2,300,000.00		
	Estimate at PLA	\$ 102,745.00	\$ 2,100,000.00	\$ 200,000.00			\$ 2,402,745.00		
		Previous Years	2023/24	2024/25	2025/26	TOTAL			
	Adopted Budget	\$ 109,483.00	\$ 1,250,000.00	\$ 1,250,000.00		\$ 2,609,483.00			
	PLB	\$ 102,745.00	\$ 2,100,000.00	\$ 200,000.00		\$ 2,402,745.00			
	VARIATIONS IN THE ORIGINAL BUDGET VS PLB	\$ 6,738.00	\$ (850,000.00)	\$ 1,050,000.00	\$ -	\$ 206,738.00			
	Comment:	It is proposed to bring forward funding from 24/25 to allow these works to proceed as soon as possible with practical completion targeted for June 2024							
	OPERATIONAL VARIANCE								
	Is there going to be significant variance in operating costs?	N	If yes, annual estimate			\$ -			

12 ATTACHMENTS	
DM# 6697600	Holloways and Clifton Beach Erosion Management - Scope of works
DM# 7242861	For Construction Civil design drawings - Holloways Beach Breakwaters
DM# 7238274	PMO Cost Management Plan PG22031-01
DM#	Cultural Heritage Reports
DM#	Marine Park Permits
DM#	Development Approval
DM#	Executed grant funding agreement

13 APPROVAL	
All necessary planning and other statutory approvals have been identified and/or responsibility for obtaining such approvals has been allocated.	

14 LEGAL REVIEW OF UNDERLYING CONTRACTS	
Have the major underlying contracts been reviewed by Council's legal advisors?	
(If no, outline below how contracts have been drafted)	
Council's Works section are to undertake the construction	

Submitted for Approval by Project Manager:			
Name:	LEIGH GNIEL		
Position:	Senior Project Engineer		
Signature:		Date:	02/11/2023
Endorsed by Executive Manager:			
Name:			
Signature:		Date:	09/11/2023
Endorsed / Approved by CRB (Capital Review Board)		(as per Capital Expenditure Delegations)	
Date:	09-Nov-23		
Link to minutes	LIVE-#6999948-Capital Review Board (CRB) Agenda and Minutes (re-versioned each week)	Date:	09/11/2023
Approved by Council:		(as per Capital Expenditure Delegations)	
Submitted to:			
Date:			

Attachment 2 - #7243861 Plans showing location and design of the breakwaters



Holloways & Clifton Beach Erosion Protection
Holloways Beach - Design Drawings

Prepared for Cairns Regional Council

SCHEDULE OF DRAWINGS			
DRAWING NUMBER	DRAWING TITLE	DATE	REVISION NO.
HCBEF-200	Cover	24/08/2023	C
HCBEF-201	Scheme of Works	27/07/2023	A
HCBEF-202	HB1 Construction Plan	24/08/2023	C
HCBEF-203	HB2 Construction Plan	14/08/2023	B
HCBEF-204	HB3 Construction Plan	14/08/2023	B
HCBEF-205	Typical Detailed Plan	10/11/2022	-
HCBEF-206	Typical Detailed Sections	10/11/2022	-
HCBEF-207	Indicative Construction Access	10/11/2022	-



LOCALITY PLAN

NOTES

LEGEND

AERIAL DETAILS:
 SURVEY DETAILS: -
 VERTICAL DATUM: -
 HORIZONTAL DATUM: -

REVISION REGISTER

REV	DATE	DESCRIPTION	BY	ENG	APP
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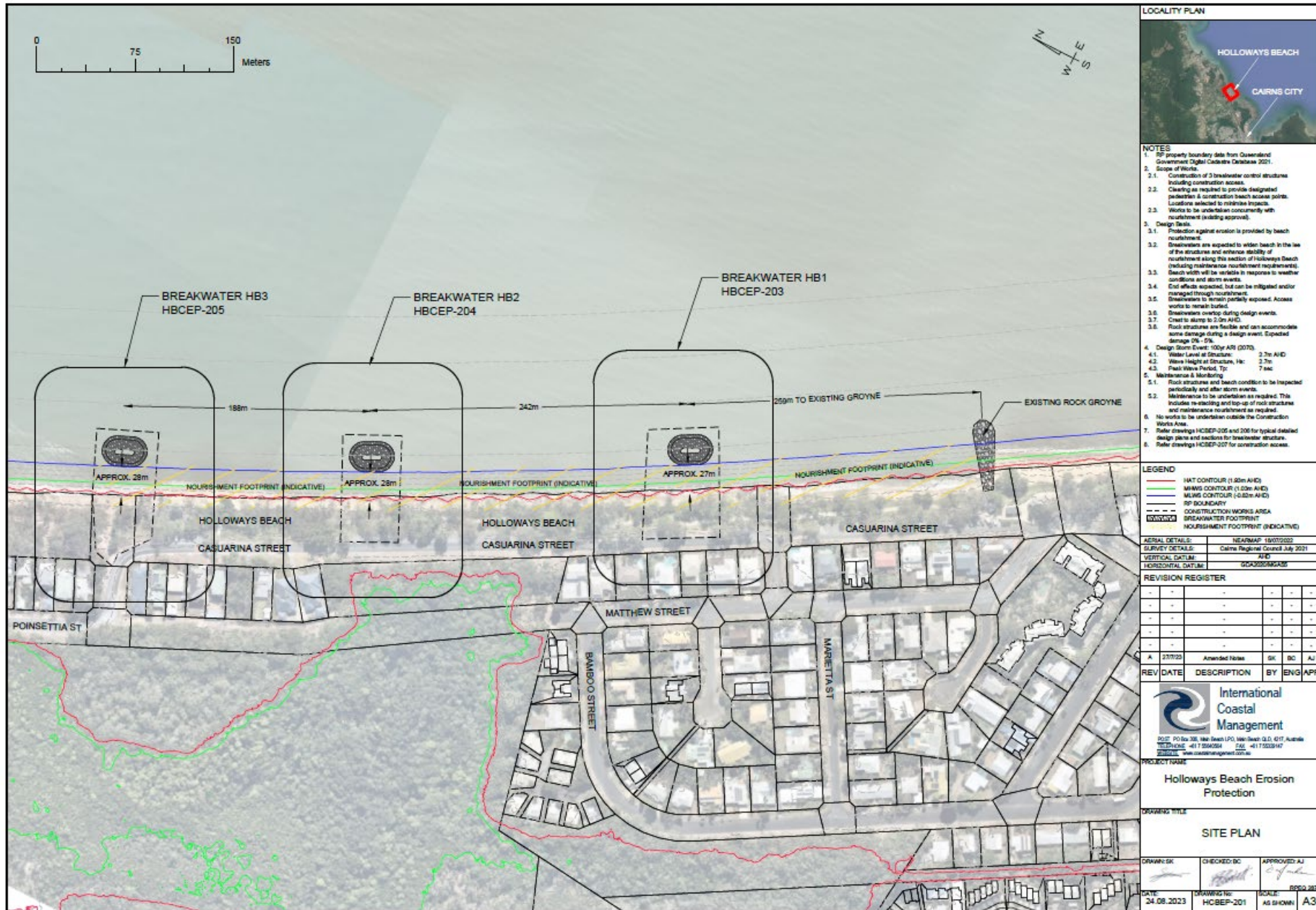
International Coastal Management
20/17, 20/18, 20/19, 20/20, 20/21, 20/22, 20/23, 20/24, 20/25, 20/26, 20/27, 20/28, 20/29, 20/30, 20/31, 20/32, 20/33, 20/34, 20/35, 20/36, 20/37, 20/38, 20/39, 20/40, 20/41, 20/42, 20/43, 20/44, 20/45, 20/46, 20/47, 20/48, 20/49, 20/50, 20/51, 20/52, 20/53, 20/54, 20/55, 20/56, 20/57, 20/58, 20/59, 20/60, 20/61, 20/62, 20/63, 20/64, 20/65, 20/66, 20/67, 20/68, 20/69, 20/70, 20/71, 20/72, 20/73, 20/74, 20/75, 20/76, 20/77, 20/78, 20/79, 20/80, 20/81, 20/82, 20/83, 20/84, 20/85, 20/86, 20/87, 20/88, 20/89, 20/90, 20/91, 20/92, 20/93, 20/94, 20/95, 20/96, 20/97, 20/98, 20/99, 20/100
 PHONE: 417 5542261 FAX: 417 5532147
 WEBSITE: www.internationalcoastal.com.au

PROJECT NAME
 Holloways Beach Erosion Protection

DRAWING TITLE
 COVER

DRAWN BY: [Signature] CHECKED BY: [Signature] APPROVED BY: [Signature]

DATE: 24.08.2023 DRAWING NO: HCBEF-200 SCALE: - REVISION: A3



LOCALITY PLAN

HOLLOWAYS BEACH
CAIRNS CITY

NOTES

- RP property boundary data from Queensland Government Digital Cadastre Database 2021.
- Scope of Works:
 - Construction of 3 breakwater control structures including construction access.
 - Clearing as required to provide designated pedestrian & construction beach access points. Locations selected to minimise impacts.
 - Works to be undertaken concurrently with nourishment (pending approval).
- Design Details:
 - Protection against erosion is provided by beach nourishment.
 - Breakwaters are expected to widen beach in the lee of the structures and enhance stability of nourishment along this section of Holloways Beach (including maintenance nourishment requirements). Beach width will be variable in response to weather conditions and storm events.
 - Crud effects expected, but can be mitigated and/or managed through nourishment.
 - Breakwaters to remain partially exposed. Access points to remain buried.
 - Breakwaters overlap during design events.
 - Chests to slump to 2.0m AHD.
 - Rock structures are flexible and can accommodate some damage during a design event. Expected damage 0% - 15%.
- Design Storm Event: 100yr ARI (2070)
 - Water Level at Structure: 3.2m AHD
 - Wave Height at Structure, Hw: 2.7m
 - Peak Wave Period, Tp: 7 sec
- Maintenance & Monitoring:
 - Rock structures and beach condition to be inspected periodically and after storm events.
 - Maintenance to be undertaken as required. This includes re-stacking and top-up of rock structures and maintenance nourishment as required.
- No works to be undertaken outside the Construction Works Area.
- Refer drawings HCSEP-205 and 206 for typical detailed design plans and sections for breakwater structures.
- Refer drawings HCSEP-207 for construction access.

LEGEND

- HWT CONTOUR (1.80m AHD)
- MHW CONTOUR (1.00m AHD)
- MWS CONTOUR (-0.80m AHD)
- RP BOUNDARY
- CONSTRUCTION WORKS AREA
- LOWWATER
- BREAKWATER FOOTPRINT
- NOURISHMENT FOOTPRINT (INDICATIVE)

AERIAL DETAILS: NEARMAP 18/07/2022
SURVEY DETAILS: Cairns Regional Council July 2021
VERTICAL DATUM: MSL
HORIZONTAL DATUM: GDA2020/MGRS48

REV	DATE	DESCRIPTION	BY	ENGR	APP
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A	27/07/23	Amended Notes	OK	BC	AJ

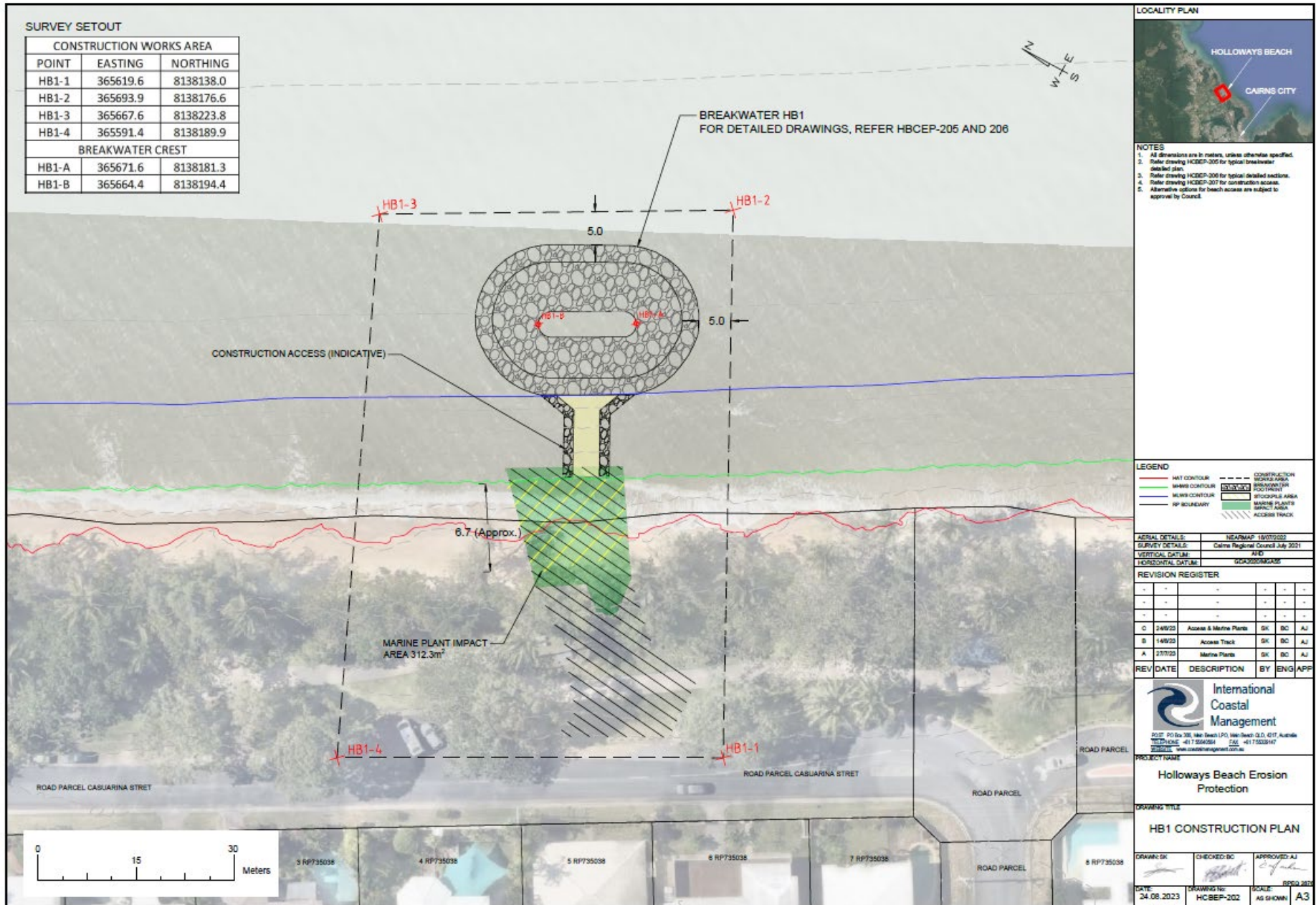
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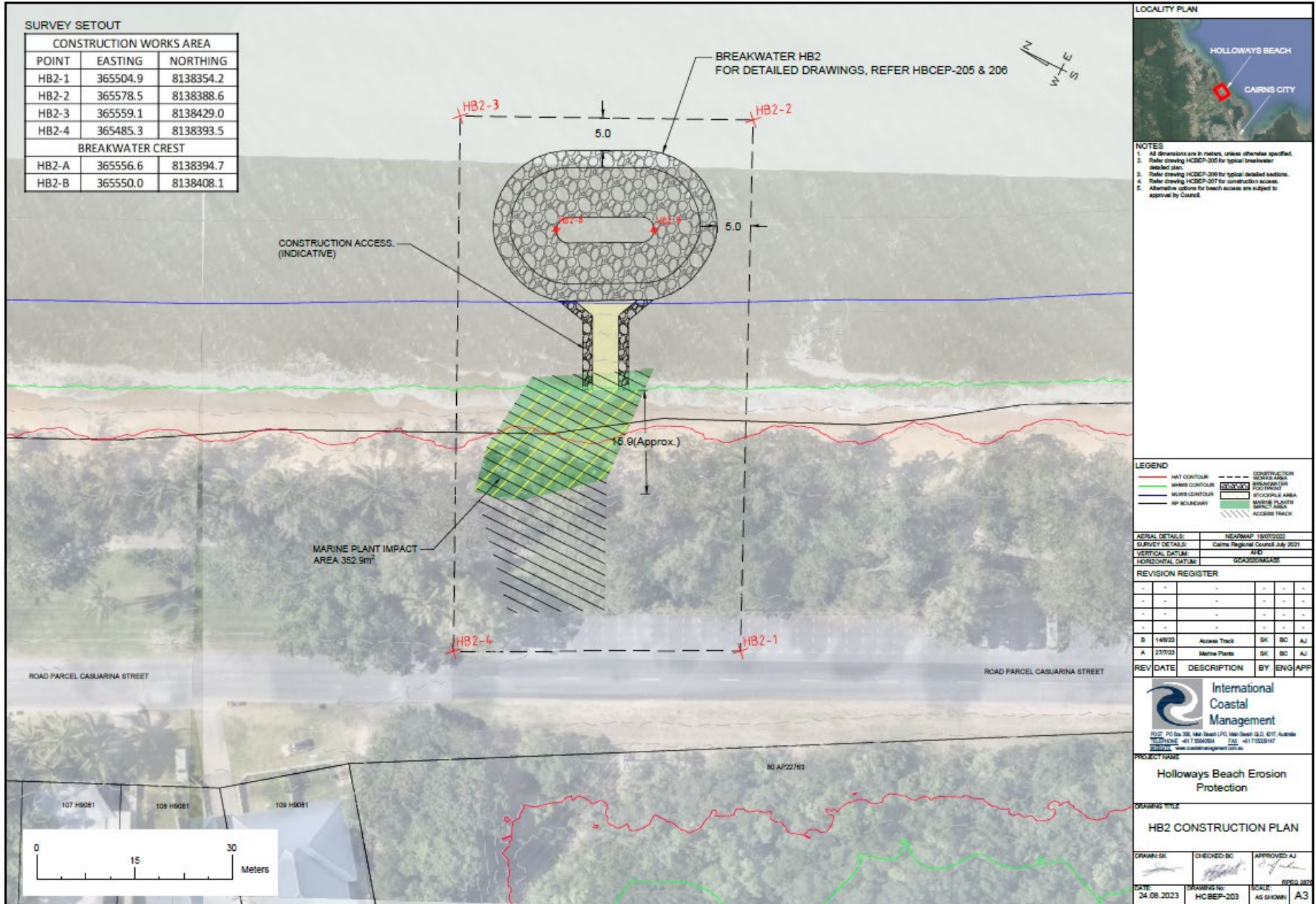
International Coastal Management
 PO Box 308, Hill Beach QLD 4871, Australia
 TELEPHONE +61 7 5940254 FAX +61 7 5533147
 WEBSITE www.internationalcm.com.au

PROJECT NAME: Holloways Beach Erosion Protection

DRAWING TITLE: SITE PLAN

DRAWN: BK	CHECKED: BC	APPROVED: AJ
DATE: 24.08.2023	DRAWING No: HCSEP-201	SCALE: AS SHOWN
		PROJECT No: BPSG 2023
		SCALE: A3





SURVEY SETOUT

CONSTRUCTION WORKS AREA		
POINT	EASTING	NORTHING
HB2-1	365504.9	8138354.2
HB2-2	365578.5	8138388.6
HB2-3	365559.1	8138429.0
HB2-4	365485.3	8138393.5
BREAKWATER CREST		
HB2-A	365556.6	8138394.7
HB2-B	365550.0	8138408.1



- NOTES**
- All dimensions are in meters, unless otherwise specified.
 - Refer drawing HCCEP-205 for typical breakwater detailed plan.
 - Refer drawing HCCEP-206 for typical detailed sections.
 - Refer drawing HCCEP-207 for construction access.
 - Alternative options for beach access are subject to approval by Council.

LEGEND

MFL CONTOUR	CONSTRUCTION WORKS AREA
MHW CONTOUR	ROADWAY/DRIVE FOOTPRINT
MWS CONTOUR	STOCKPILE AREA
RP BOUNDARY	MARINE PLANTS IMPACT AREA
	ACCESS TRACK

AERIAL DETAILS: NEARMAP 18/07/2022
SURVEY DETAILS: Cairns Regional Council July 2021
VERTICAL DATUM: AHD
HORIZONTAL DATUM: GDA2020/94MAG36

REVISION REGISTER

NO.	DATE	DESCRIPTION	BY	ENG	APP
1	14/09/23	Access Track	SK	BC	AJ
2	23/07/23	Marine Plants	SK	BC	AJ

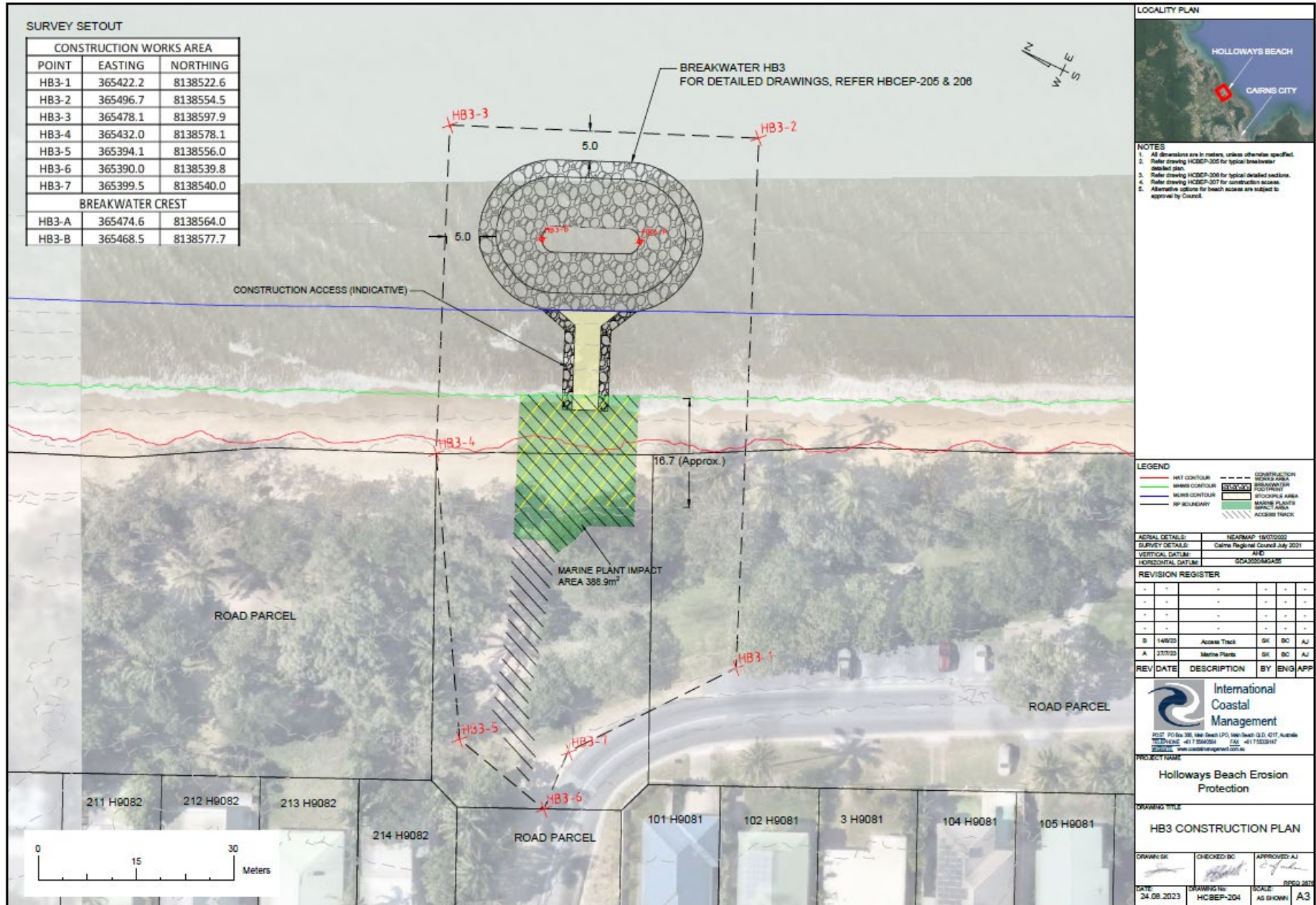
REV	DATE	DESCRIPTION	BY	ENG	APP
1	14/09/23	Access Track	SK	BC	AJ
2	23/07/23	Marine Plants	SK	BC	AJ

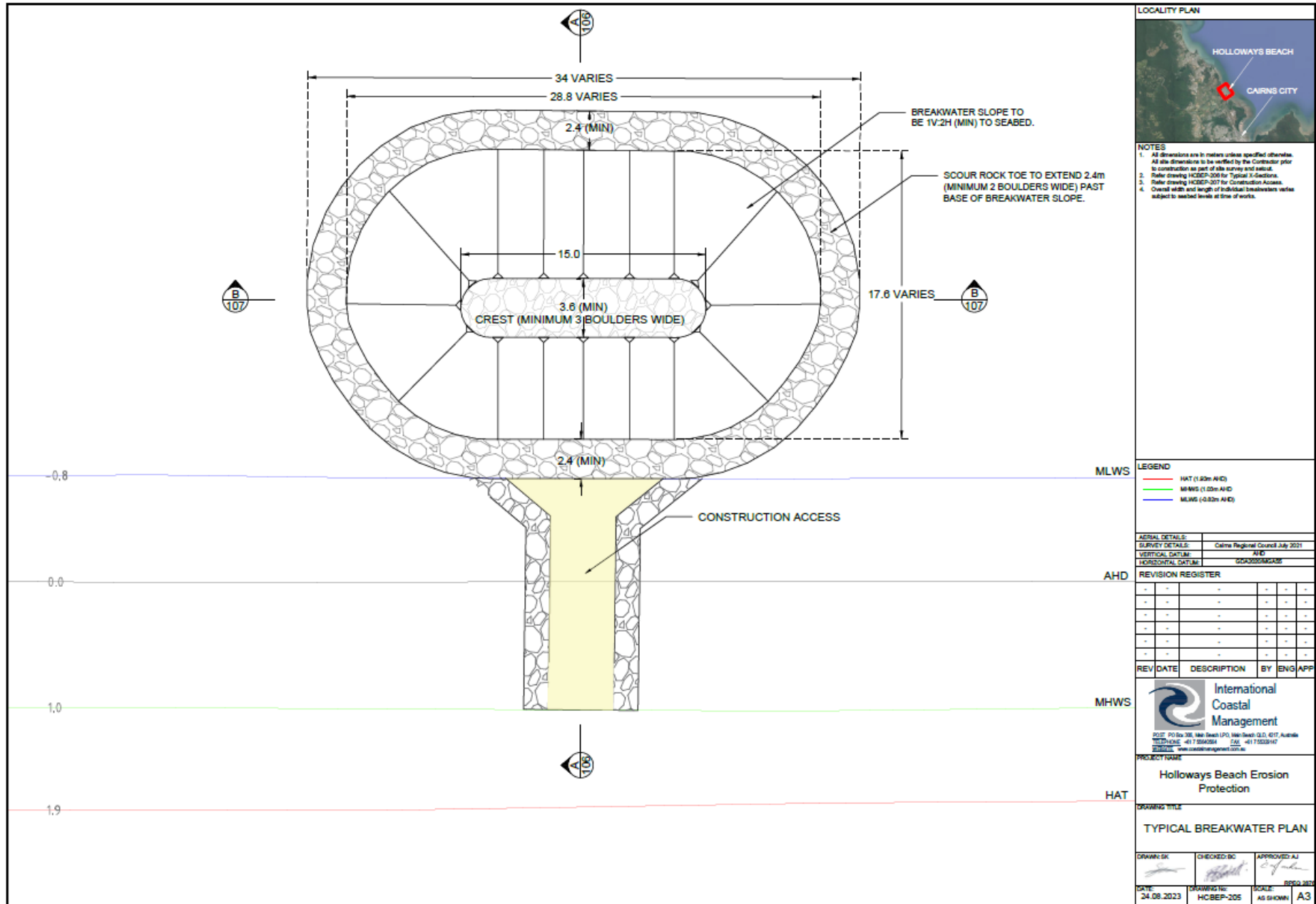
International Coastal Management
 20/21 PO Box 308, Mike Beach PO, Mike Beach QLD 4817, Australia
 TELEPHONE: +61 7 55642561 FAX: +61 7 55331417
 EMAIL: info@icmg.com.au

PROJECT NAME:
 Holloways Beach Erosion Protection

DRAWING TITLE:
 HB2 CONSTRUCTION PLAN

DRAWN: SK	CHECKED: BC	APPROVED: AJ
DATE: 24.08.2023	DRAWING NO: HC-BEP-203	SCALE: AS SHOWN





- NOTES**
- All dimensions are in meters unless specified otherwise.
 - All site dimensions to be verified by the Contractor prior to construction as part of site survey and set-out.
 - Refer drawing HCSEP-205 for Typical X-Sections.
 - Refer drawing HCSEP-207 for Construction Access.
 - Overall width and length of individual breakwaters varies subject to seabed levels at time of works.

LEGEND

—	HAT (+1.9m AHD)
—	MHWS (+1.0m AHD)
—	MLWS (-0.8m AHD)

AERIAL DETAILS

SURVEY DETAILS:	Cairns Regional Council July 2021
VERTICAL DATUM:	AHD
HORIZONTAL DATUM:	GDA2020MGA55

REVISION REGISTER

REV	DATE	DESCRIPTION	BY	ENG	APP
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International Coastal Management

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 EMAIL: www.internationalcoastal.com.au

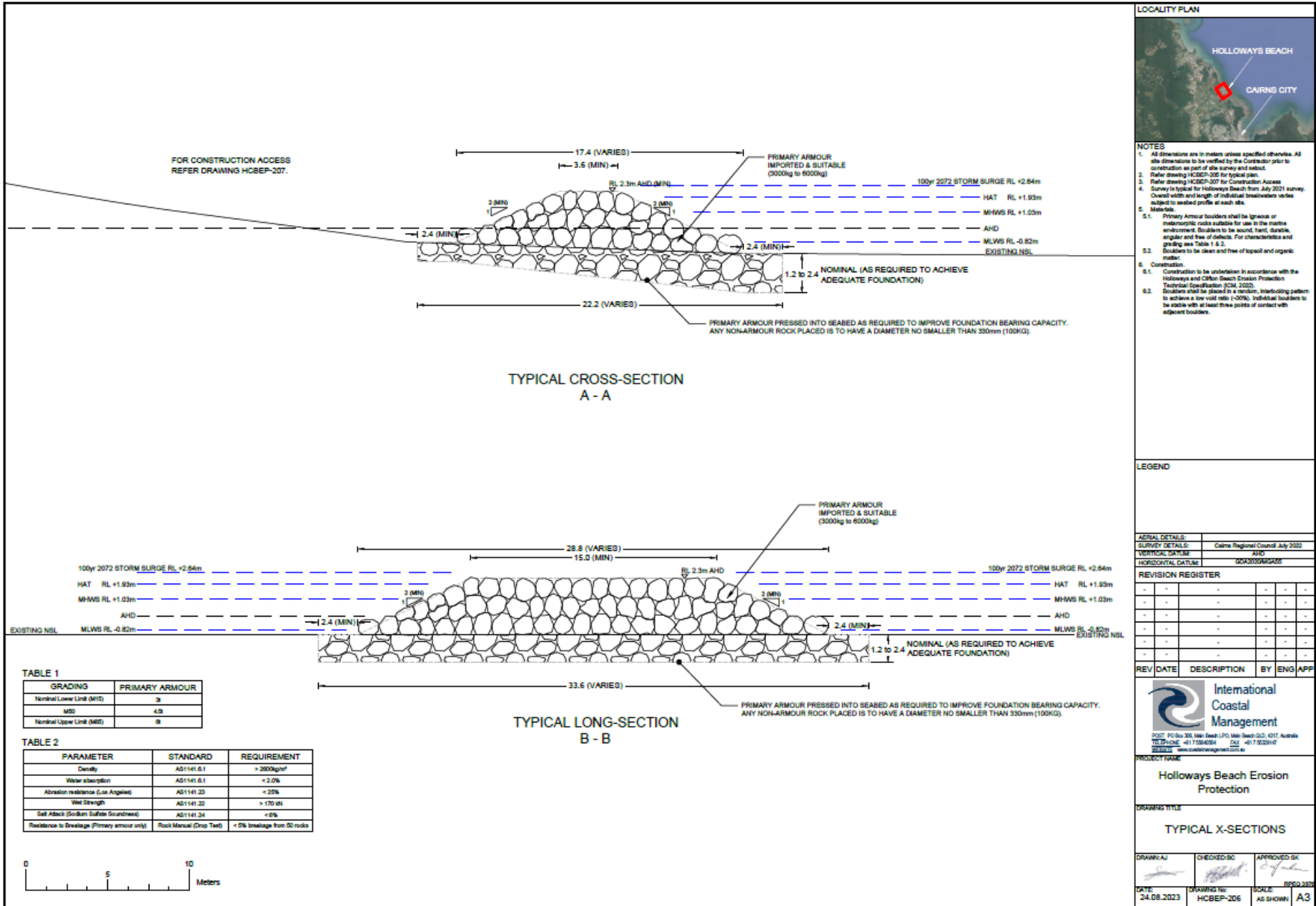
PROJECT NAME

Holloways Beach Erosion Protection

DRAWING TITLE

TYPICAL BREAKWATER PLAN

DRAWN BY:	CHECKED BY:	APPROVED BY:
DATE:	DRAWING NO.:	SCALE:
24.08.2023	HCSEP-205	A3 SHOW A3



- NOTES**
- All dimensions are in meters unless specified otherwise. All site dimensions to be verified by the Contractor prior to construction as part of the survey and set-out.
 - Refer drawing HCSEP-206 for typical plan.
 - Refer drawing HCSEP-207 for Construction Access.
 - Survey is typical for Holloways Beach from July 2021 survey. Overall width and length of individual breakwaters varies subject to seabed profile at each site.
 - Materials:
 - Primary Armour boulders shall be igneous or metamorphic rocks suitable for use in the marine environment. Boulders to be sound, hard, durable, angular and free of defects. For characteristics and grading see Table 1 & 2.
 - Boulders to be clean and free of topsoil and organic matter.
 - Construction:
 - Construction to be undertaken in accordance with the Holloways and Clifton Beach Erosion Protection Technical Specification (2014, 2022).
 - Boulders shall be placed in a random, interlocking pattern to achieve a low void ratio (~50%). Individual boulders to be stable with at least three points of contact with adjacent boulders.

LEGEND

AERIAL DETAILS:	Cairns Regional Council July 2022				
SURVEY DETAILS:	AHD				
VERTICAL DATUM:	MSL				
HORIZONTAL DATUM:	GDA2020/AGD85				
REVISION REGISTER					
REV	DATE	DESCRIPTION	BY	ENG	APP
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International Coastal Management

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 WWW: www.internationalcoastal.com.au

PROJECT TITLE
 Holloways Beach Erosion Protection

DRAWING TITLE
 TYPICAL X-SECTIONS

DRAWN BY: [Signature]	CHECKED BY: [Signature]	APPROVED BY: [Signature]
DATE: 24.08.2023	DRAWING NO.: HCSEP-206	SCALE: AS SHOWN A3

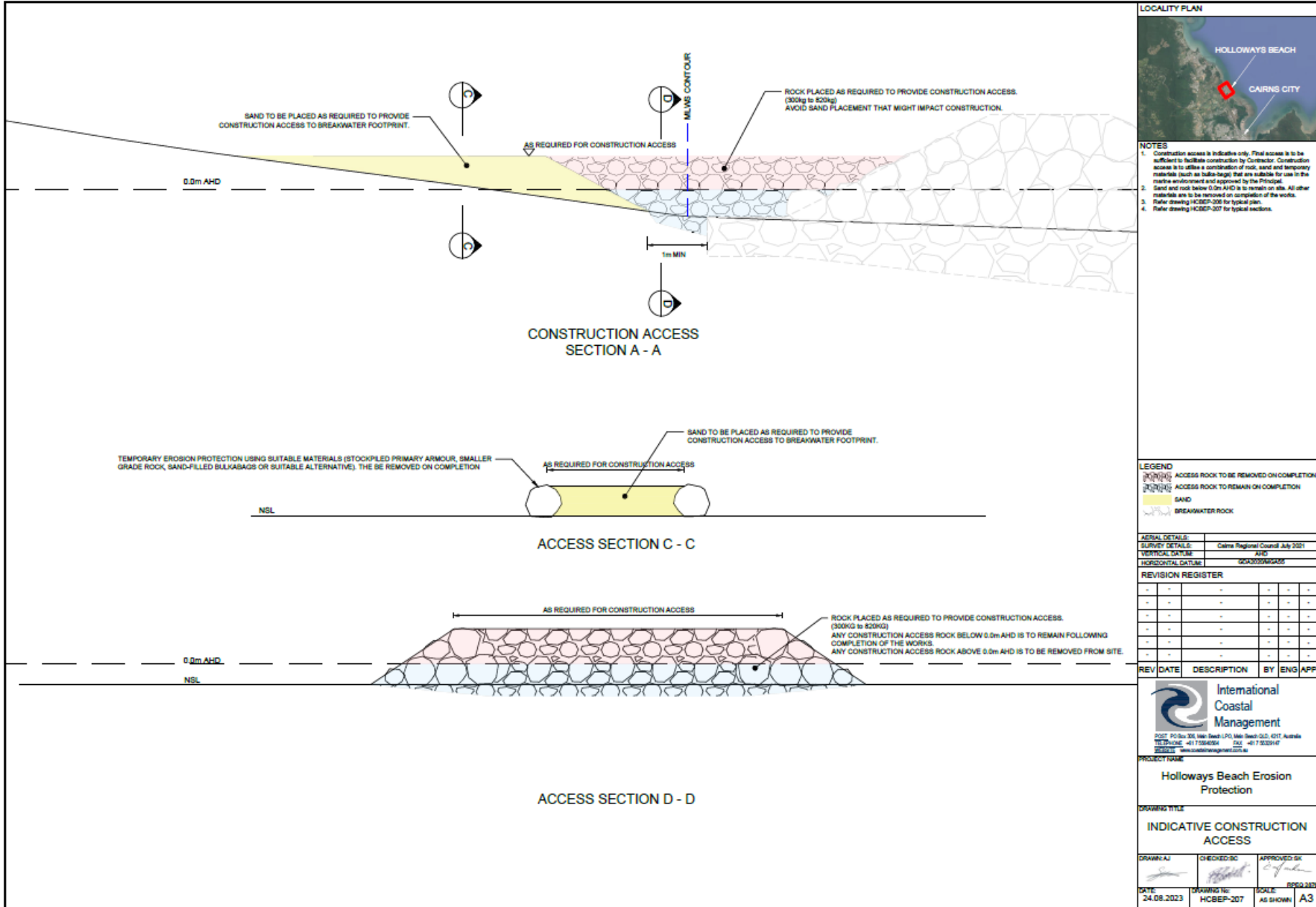
TABLE 1

GRADING	PRIMARY ARMOUR
Nominal Lower Limit (M15)	3
M50	4.5
Nominal Upper Limit (M65)	6

TABLE 2

PARAMETER	STANDARD	REQUIREMENT
Density	AS 1141.6.1	> 2600kg/m ³
Water absorption	AS 1141.6.1	< 2.0%
Abrasion resistance (Los Angeles)	AS 1141.23	< 25%
Wear Strength	AS 1141.22	> 170 MI
Salt Attack (Sodium Sulphate Soundness)	AS 1141.24	< 6%
Resistance to Breakage (Primary armour only)	Rock Manual (Drop Test)	< 5% breakage from 50 rocks





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