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Funafuti Detailed Design Report

Tuvalu Coastal Adaptation Project

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Table of Contents

List of Figures

List of Tables

1. INTRODUCTION

1.1 General

Consisting of nine islands and atolls spread over 72,000Nm^2, Tuvalu is the fourth smallest nation in the world in land area with a population of just over 10,000. It is one of the most vulnerable countries in the world to the impacts of climate change and particularly sea-level rise and the possibility of intensifying storm events. Recent cyclones have caused population displacement, significant loss and damage of infrastructure as well as destruction of agricultural resources, contamination of ground water and changes in shoreline systems. Such impacts negatively affect the wellbeing of communities and long-term sustainable development aspirations. In response to this increasing challenge, the Government of Tuvalu (GoT) and the Green Climate Fund (GCF) have jointly committed US$38 million for the Tuvalu Coastal Adaptation Project (TCAP).

The main island of Funafuti, as well as Nanumea and Nanumaga have been selected as target islands for the proposed GCF project. Funafuti was selected based on its concentration of economic, social, political and institutional assets. Previous feasibility studies including hydrodynamic and coastal processes, an ESIA, and financial and economic analysis highlighted the suitability of large-scale reclamation as the recommended coastal adaptation measure for Funafuti.

1.2 Project and report objectives

TCAP will build coastal resilience which is an urgent national priority. The project will address the financial and capacity constraints at all levels – from technical to community awareness. TCAP was approved in June 2016 and the project implementation commenced in September 2017. The project will run until September 2023. TCAP has 3 main outputs:

Output 1: Strengthening of institutions, human resources, awareness and knowledge for resilient coastal management.

Output 2: Vulnerability of key coastal infrastructure is reduced against wave induced damages in Funafuti, Nanumea and Nanumaga.

Output 3: A sustainable financing mechanism established for long-term adaptation efforts.

The following body of work progresses Output 2, which has two main task areas or Activities:

- Activity 2.1: Coastal protection design. Site-specific assessments and ESIA undertaken in all islands in a participatory manner.
- Activity 2.2: Coastal protection measures implemented.

The objective of this report is to provide detailed design parameters and present the finalised coastal protection measures on Funafuti ready for construction (implementation). This report is designed to be read in conjunction with the IFC drawings attached in Appendix A.

1.3 Report background

This report has brought together the findings of several investigations used to inform the design and implementation of the TCAP Funafuti Reclamation, these investigations include, but are not limited to:

- TCAP Concept Design Report (UNDP, 2020)
- Funafuti Environmental and Social Impact Assessment (SPC, 2020c)
- Geotechnical and UXO investigations of the lagoon and foreshore areas (SPC, 2020, 1995, 2016)
- Hydrodynamic and inundation investigations (SPC,2005, 2021)
- TCAP Funafuti Reclamation Drainage Investigation (Arcadis, 2020)

These investigations accompany extensive stakeholder consultation, site investigations and interviews with contractors working in the region to inform the detailed design presented herein.

1.4 Report outline

The structure of this report can be summarised as follows:

- Section 2 presents the design life, a brief description of the site as well as the basis of design
- Section 3 presents a description of the TCAP reclamation design and associated aspects, bund and breakwater, drainage and boat Harbour design.
- Section 4 presents an overview of the project's proposed implementation
- Section 5 provides a summary of the key findings of the Detailed Design and recommendations.
- Appendix A and B present the IFC drawings and Bill of Quantities
- Appendix C and D outlines the safety in design principles incorporated in the design and risk register

2. Basis of Design

2.1 Design Life

The Australian Standard Guidelines for the design of maritime structures (AS 4997-2005) specifically excludes the design of “coastal engineering structures such as rock armoured walls, groynes, etc.” As such, the design life of the different design elements of the Funafuti woks have been separated as follows:

2.1.1 Geosynthetic containers

The reclamation design presented in the Concept Design Report adopts geosynthetic sand container (GSC) armour units, which were originally expected to have a service life of at least 25 years in their earlier design iterations. Improvements in geosynthetics have been reported to have design lives exceeding 40 years (Bettington, 2018), this has been used as the design life of the bund structure. Geosynthetics have been selected for the bund material rather than rock or steel structures (which may have a longer design life) due to the GoT’s long-term strategy of further reclamation works (seaward of both the TCAP and QEII reclamation areas). Future burial of geotextile units will be more cost-efficient, then removing and replacing rock, concrete units or sheetpiles.

2.1.2 Reclamation

The reclamation has been designed to account for current worst case scenario Sea Level Rise predictions to 2100. As such, the design life of this structure is 80 years.

2.1.3 Rock breakwater

The rock breakwater protecting Catalina Boat Harbour has been designed to a 50-year design life

2.2 Design event

A 100-year Average Recurrence Interval (ARI) value has been adopted for the stability of any structures.

2.3 Site

Tuvalu is made up of a group of nine islands; three reef islands and six true atolls spread out between the latitude of 5° to 10° south and longitude of 176° to 180°, west of the International Date Line, see Figure 1. Funafuti Atoll, located in the extreme south-west of the island chain consists of at least 29 islets of which three are inhabited: Fongafale, Funafala in the south, and Amatuku in the north. The biggest is Fongafale, an L-shaped islet located on the eastern edge of the lagoon, it is also the most populated and serves as the administrative capital of Tuvalu. The coastal protection works proposed under TCAP are to be undertaken on the Vaiaku shoreline on the central arm of Fogafale, seen in Figure 1.

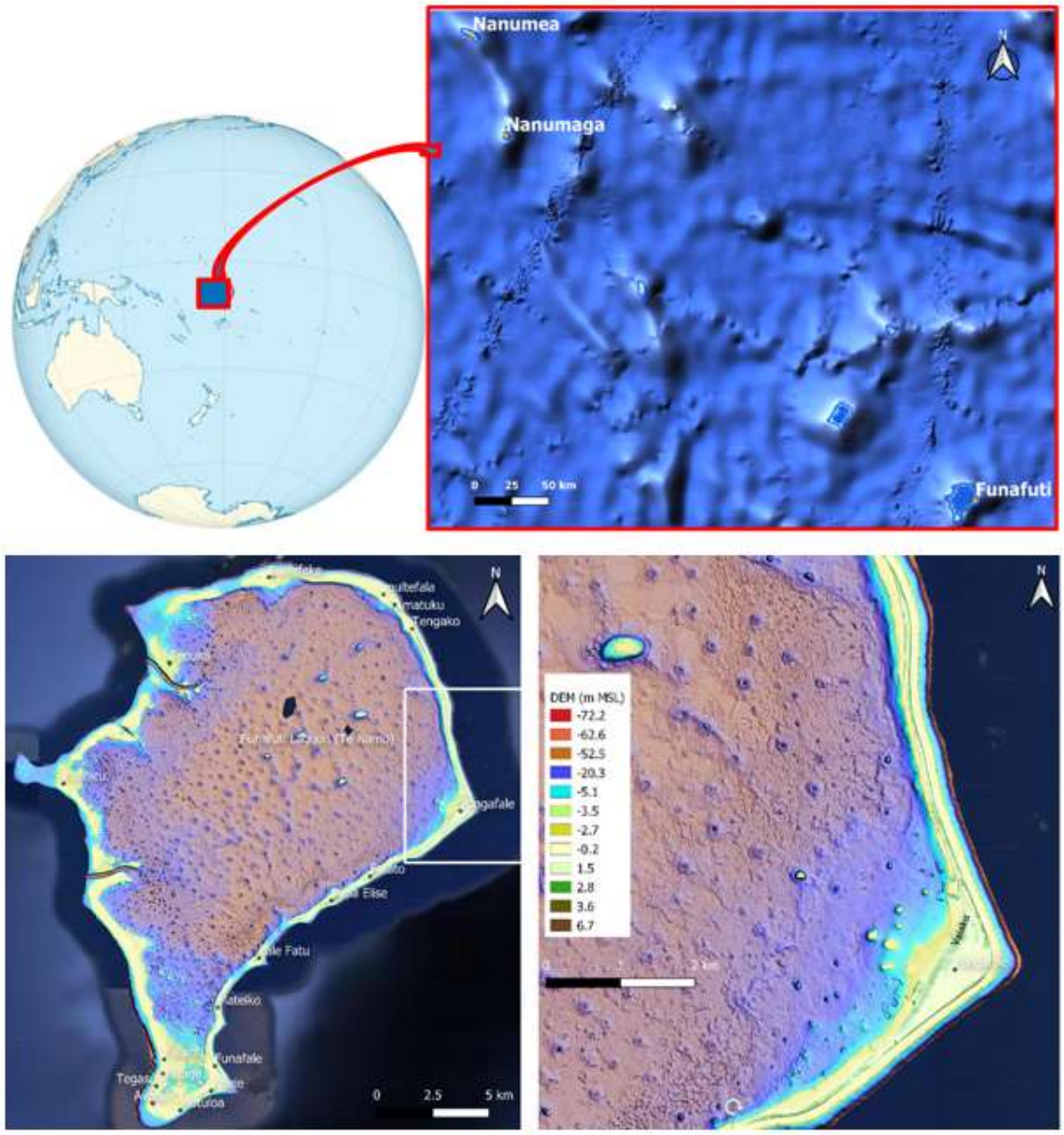


Figure 1: Site locality plan (top) and Funafuti digital elevation model (bottom). Right: close-up of Fongafale Islet. DEM heights have been corrected with respect to Mean Sea Level (MSL). (source: Fugro, 2019).

2.3.1 Bathymetry and topography

A marine Light Detection and Ranging (LiDAR) survey was undertaken of all Tuvalu's nine islands in August 2019 for TCAP by Fugro. The resultant dataset provided a high resolution topographic and bathymetric digital earth model (DEM) to a depth of approximately 40m (Figure 1), the bathymetry and topography at the project site on the Vaiaku Foreshore is provided in Figure 2.

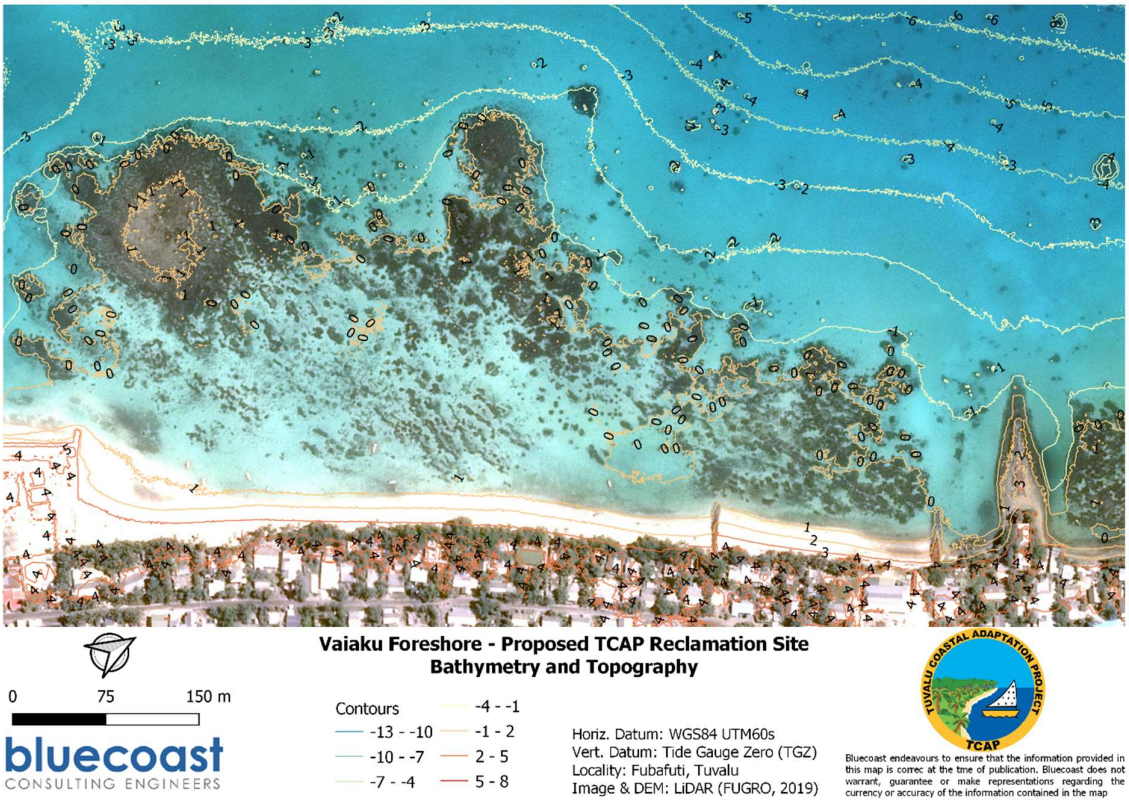


Figure 2: Topographic and bathymetric contour map of proposed TCAP reclamation site on Vaiaku Foreshore taken from FUGRO Marine LiDAR survey, August 2019.

2.3.2 Geomorphology

Funafuti is the largest and most populated islet of Fogafale atoll, which is located on Tuvalu Seamount Chain, a submarine chain of extinct volcanos on the Mid-Pacific plate, orientated roughly NW-SE between the Gilbert Ridge and the Samoan hotspot. The islands making up the atoll are low-lying accumulations of reef-derived sediment. Fongafale is a long narrow (reverse) L-shaped island divided into three geographical areas: the south arm, the central area and the north arm. The project site at Funafuti is at the intersection of the north and south arms on the Vaiaku shoreline. The island morphology controls the pattern of the longshore currents on the lagoon-side, which transport sand from both the northeast and southwest towards the central area, resulting in the formally well-established beaches in the central area (Vaiaku).

Profiles of three transects intersecting the north, central and south arms of the island can be seen in Figure 3, can described as follows:

- The offshore (outer) reef platform is generally narrow along both arms of the island (less than 100m) dropping very quickly to deep water (>50m) in less than 100m from the reef edge.
- A discontinuous cemented rubble bank is located on the inner reef flat believed to be the remains of a rubble rampart that was deposited 3 m from the reef edge during Tropical Cyclone Bebe in October 1972 (Maragos and Beveridge, 1973).

- A 5-10m wide conglomerate platform is located between the area of cemented rubble forming a steep beach face with a berm elevation of between 5-6m TGZ. The berm is formed by large, unconsolidated pieces of coral rubble and is seen to be the highest land formation of the island (Figure 3).

The lagoon shoreline has changed significantly since several boat channels, harbours and coastal structures have been built and subsequently built upon since 1945. The large Queen Elisabeth II reclamation was built in 2018 to the south side of the project site, covering the Vaiaku shoreline with a thin (1-2m) layer of beach sand (a remnant of the 2018 QEII reclamation) overlying beach rock providing an approximate 30m wide beach. The nearshore area is seen to be a thin layer (<1m) of beach sand interspersed over the underlying reef flat and scattered (domal coral) bombies which extends for approximately 800m offshore before the lagoon deepens to greater than -10m.

Further information on the geology and geomorphology of Fogafale and Tuvalu can be found in both the Funafuti Geotechnical and ESIA reports (SPC, 2020a & 2020b).

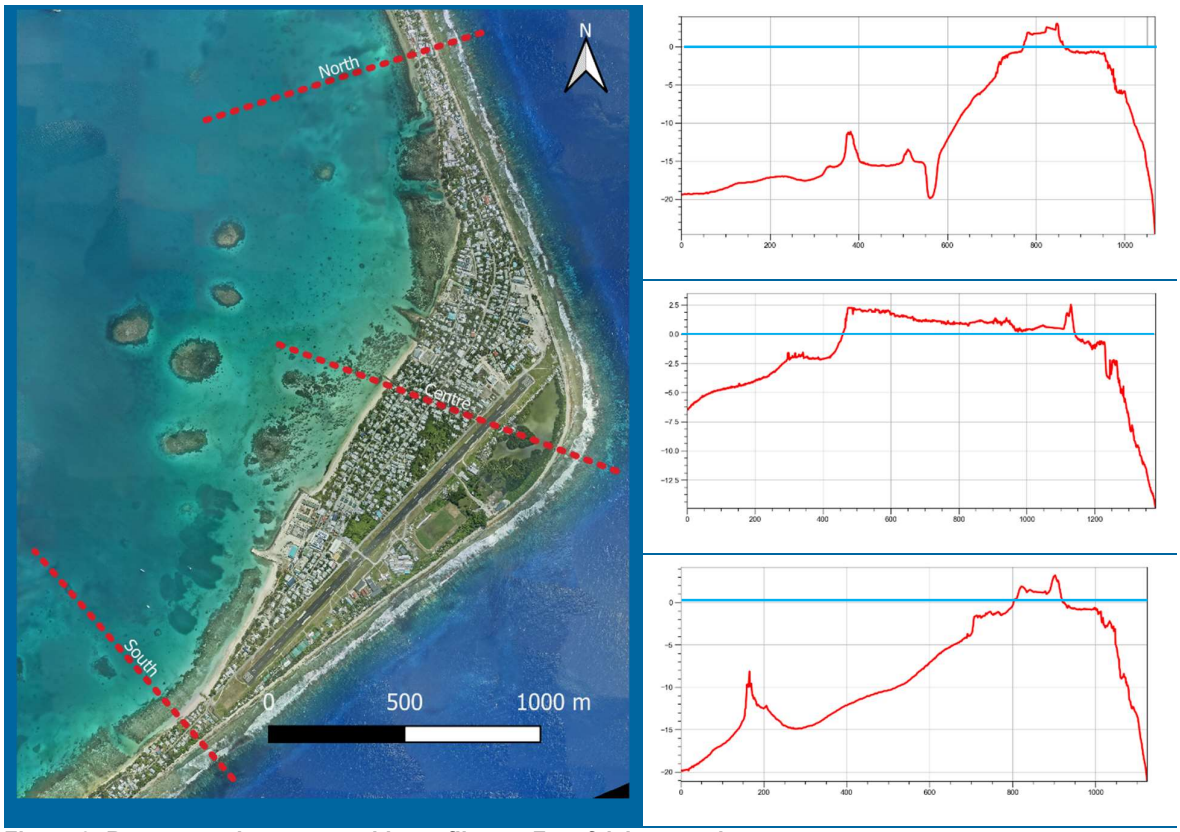


Figure 3: Representative topographic profiles on Fogafale's central arm.

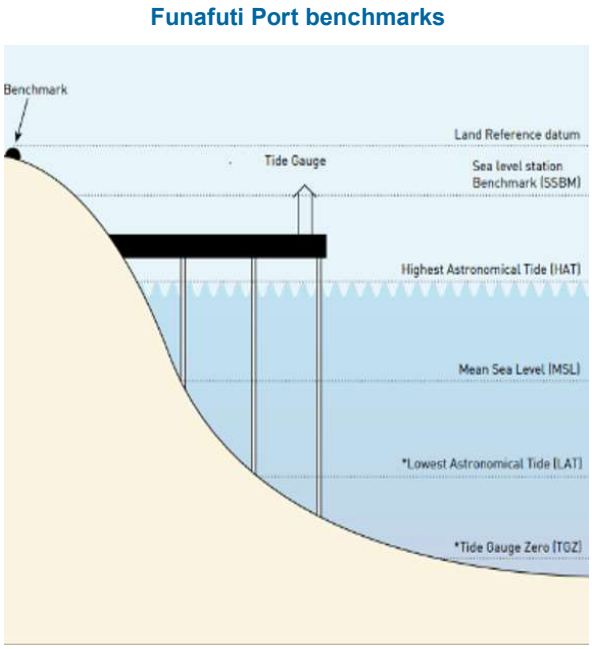
2.4 Design inputs

2.4.1 Water levels

Funafuti experiences a semidiurnal tidal regime. The mean tidal range is 0.7m during neap tides and 1.7m during spring tides, with a maximum range of 2.5m. Tidal planes for the project site were derived from a harmonic analysis of the 25-year dataset of hourly water levels recorded at the nearby Funafuti (Tuvalu Port) tide gauge, Figure 4. Design water levels for TCAP are

provided in Figure 4: Tidal plane at Funafuti Port with respect to Tide Gauge Zero (TGZ). (source: CoSPac, 2020)

Table 1, further information on the determination of these levels is provided in the Concept Design Report (UNDP, 2021a).



Tidal Plane	Recorded Height (m TGZ)
Benchmark 22 (BM22)	**4.01**
Highest Recorded Water Level	**3.44**
Highest Astronomical Tide (HAT)	**3.35**
Mean High Water Springs (MHWS)	**2.87**
Mean High Water Neap (MHWN)	**2.38**
Mean Sea Level (MSL)	**2.05**
Mean Low Water Neap (MLWN)	**1.72**
Mean Low Water Spring (MLWS)	**1.23**
Lowest Astronomical Tide (LAT)	**0.88**
Lowest Recorded Water Level	**0.56**
Tide Gauge Zero (TGZ)	**0.00**

Figure 4: Tidal plane at Funafuti Port with respect to Tide Gauge Zero (TGZ). (source: CoSPac, 2020)

Table 1: Calculated design water levels for TCAP

Design parameter	Water level
2100 Sea Level Rise[1]	0.75m
Wave setup[2]	0.21m
HAT Funafuti Port	3.35m TGZ
IBEmax[3]	0.28m
Design Water Level	**4.59m TGZ**

2.4.2 Waves

Fogafale is affected by two wave regimes, Ocean (deep water) waves hitting the outer eastern and southern atoll coasts and wind-generated waves generated within the lagoon. The deep-

[1] IPCC 2019 upper limit of RCP8.5 range
[2] Calculated as 10% of depth-limited wave heigh at project site (Section 2.4.3)
[3] maximum recorded value of Inverse Barometric Effect (IBE)

water wave climate off Fogafale' s east coast is seen to be dominated by swell waves (wave periods above 8 seconds), meaning wave energy is usually generated some distance from the atoll. Locally generated seas (wave periods below 8 seconds) only occur on average 3% of the time with a higher percentage seen in the dry season (5%). Average Significant Wave Height (Hs) is 1.8m with the largest waves occurring in the dry season attributed to Southern Ocean swells travelling from the south west. The dry season also sees a high frequency of waves generated along the east and south east trade fetch attributed to the strengthening and predominance of the trade winds during those months.

The wet season sees less frequent (and less intense) waves generated from the southerly sector, with a greater frequency in waves arriving from the north (NE to NW), these waves are most likely attributed to large events in the Northern Pacific. The largest waves can be seen to occur from the north and north west and are most likely attributed to the passage of tropical cyclones during the wet season.

The Pacific Community – Geoscience, Energy and Maritime Division has undertaken comprehensive wave inundation modelling (SPC, 2021) associated with the deep water, eastern shore of Fogafale Island. The wave inundation report shows that under SROCC (2019) RCP 8.5 projections out to 2050, direct landfall of the largest modelled cyclone event (ARI 250 year) would not impact the surface of the TCAP reclamation.

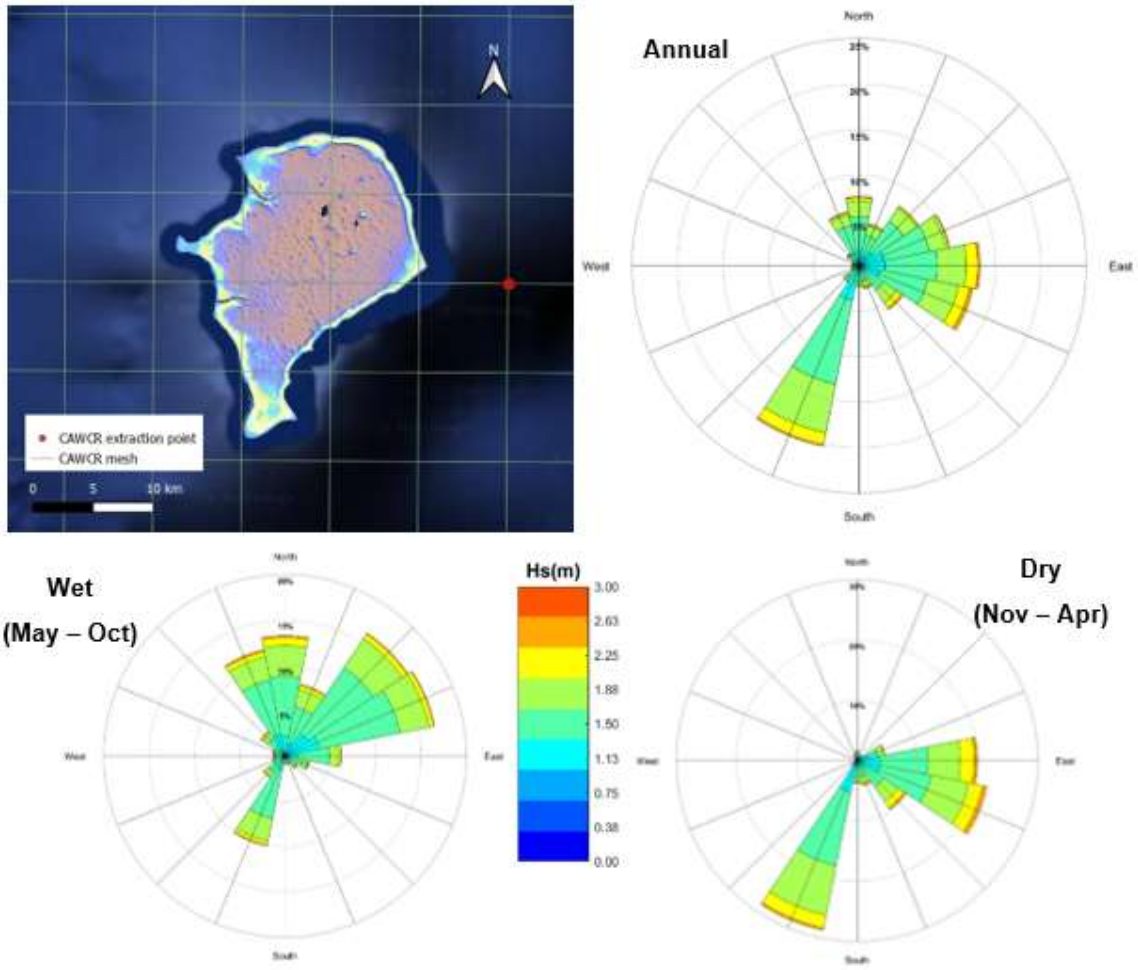
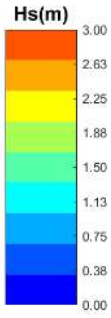


Figure 5: (clockwise from top left): CAWCR grid resolution around Funafuti and model extraction point, long-term and seasonal wave roses for the deep water CAWCR model extraction point (1979-2019).

Table 2: Long term statistics calculated for the CAWCR model extraction points in deep water offshore of Fongafale for the wave hindcast information 1979-2019

Parameter	Statistic	Long term average (40yrs)	Wet season (Nov- Apr)	Dry season (May – Oct)
Significant Wave Height Hs (m)	Average	1.8	1.7	1.8
	20%ile	1.5	1.5	1.5
	90%ile	2.2	2.1	2.3
	Max	5.4	5.4	3.6
Peak Wave Period Tp (s)	Average	11.8	12.1	11.4
	20%ile	9.1	9.8	8.8
	90%ile	15.9	15.9	15.9
	% of Time S (Tp<8s)	3%	1%	5%
	% of Time Swell (Tp>8s)	97%	99%	95%
Peak Wave Direction Dp (°N)	Weighted Average	119	16	151
	Standard Deviation	67	63	51



The largest waves within the lagoon are expected to occur during the passage of cyclones in the vicinity of the atoll and will be generated across the relatively small 20km north-south and 16km east-west fetches. Due to the relatively shallow lagoon areas fronting the reclamation, depth and fetch-limited wave heights have been calculated to determine conservative design wave heights at the toe of the reclamation as shown in Table 3.

Table 3: Calculated depth limited design wave heights within the Fogafale lagoon

Wave parameter	Design value
Design (depth-limited) wave height, Hs	**2.1m**[4]

[4] This value is considered conservative to the 1.7m design wave height calculated by AECOM (2015)

Wave parameter	Design value
Associated wave period[5], Tp	**5sec**

2.4.3 Currents

Current speeds in the vicinity of the reclamation are seen to be low at **less than 1m/s** in magnitude (Damlamian, 2005). The current regime can be described as generally low speed north to south directed flows for both ebb and flood tides during spring tides, with wind driven currents dominating during neap tides.

2.4.4 Wind regime

The wind climate at Funafuti was assessed using data extracted from a regional hindcast model from the Centre for Australian Weather and climate research (CAWCR). The wind roses in Figure 6 and wind climate statistics in Table 4

show prevailing winds are dominated by easterly trades of moderate strength. The range of wind directions is relatively larger during the wet season, with stronger wind speeds originating from the west.

Table 4: Wind climate statistics for Funafuti

Parameter	Statistic	Long term averages (41-years) - CAWCR		
		All seasons	Wet (Nov-Apr)	Dry (May-Oct)
Wind speed [m/s]	Mean	5.3	4.9	5.6
	20%ile	3.3	2.9	3.8
	50%ile	5.1	4.7	5.6
	75%ile	6.7	6.2	7.1
	90%ile	8.1	7.8	8.4
	99%ile	10.9	11.8	10.3
	99.5%ile	11.9	13.1	10.8
	Max	24.1	24.1	15.2
Wind direction	Weighted mean [°N]	100	130	85
	Standard deviation [°]	52	62	33

[5] This has been based on the wave period calculated by AECOM (2015)

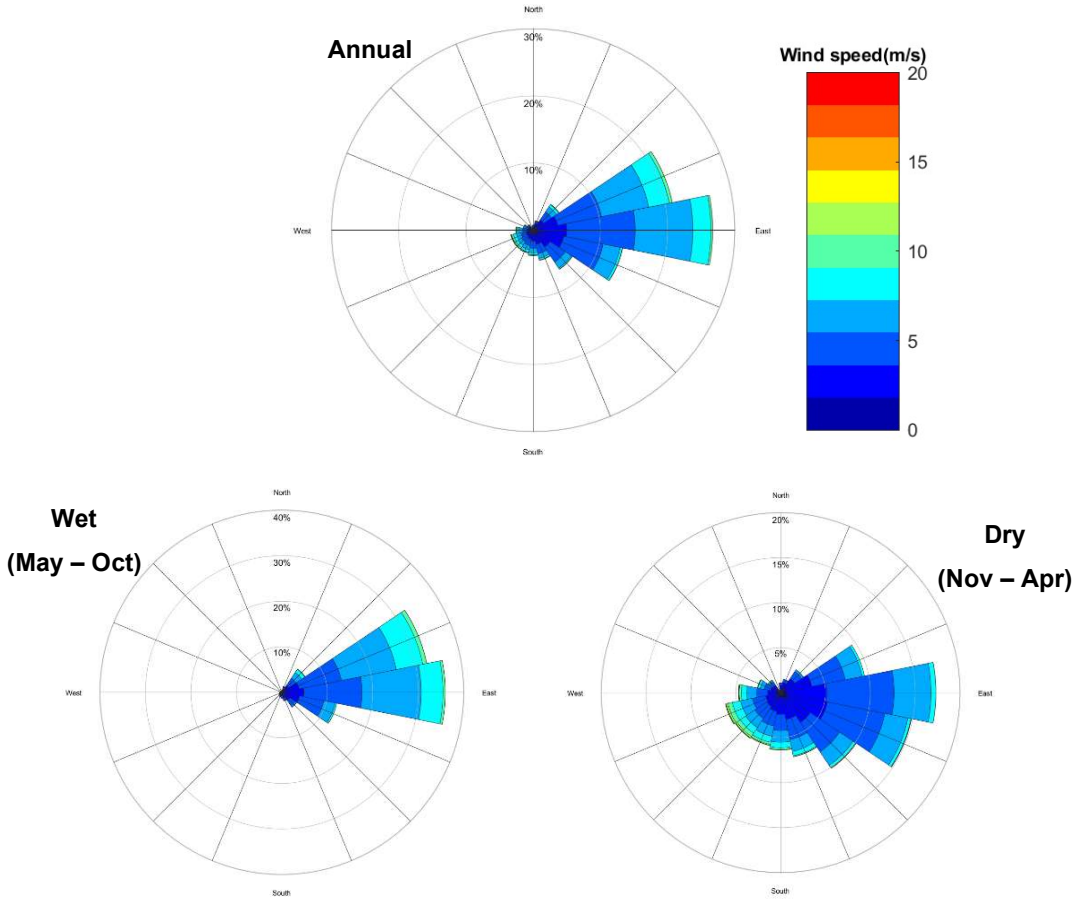


Figure 6: Annual, wet season and dry season wind roses for Funafuti.

3. Reclamation design

3.1 Overview

Full details on the design process and iterations of the Funafuti Reclamation can be found in the Concept Design Report (UNDP, 2021a) and is summarised in the following section. Appendix A: and **Error! Reference source not found.** provide the IFC detailed design drawings and bill of quantities of the reclamation design, Table 5 provides an overview of the key parameters.

Table 5: Overview of TCAP design parameters for Funafuti reclamation

Design parameter	Design value
Reclamation length	704m (excluding Catalina Harbour breakwater)
Reclamation height	5.8m TGZ at crest of reclamation
Reclamation width	100m (average over reclamation length)
Reclamation volume	269,400m^3
Bund design	Stacked geotextile mega containers fronted by a protective revetment consisting of stacked 2.5m^3 GSC units. Rock breakwater protecting the Catalina Boat Harbour
Drainage	Minimum 1% slope from crest. 30% of reclamation area draining seaward over bund, 70% draining to excavated channels surrounding reclamation

Figure 7: Site plan of the TCAP Funafuti Reclamation

3.2 Structure details

It has been determined that the most suitable material for the reclamation bund is a combination of stacked Geotextile Mega Containers (GMC) used as the core of the bund revetment with smaller 2.5m^3 Geotextile Synthetic Container (GSC) units used to protect the seaward face of the revetment, advantages and rationale of this design have been described in the Concept Design Report. A typical section of the reclamation bund is shown in Figure 8.

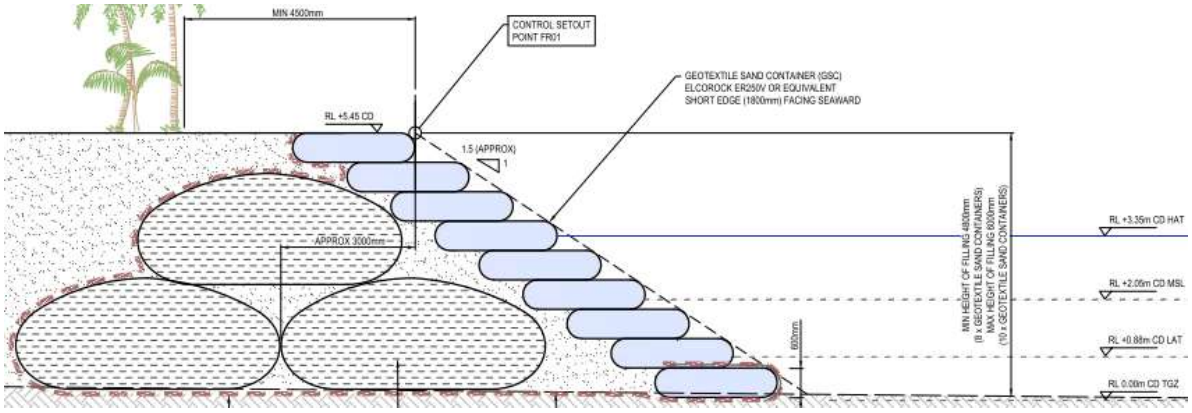


Figure 8: Typical section of reclamation seaward face

3.2.1 Geotextile unit sizing and stability

As shown in Figure 8, the stacked GMC units will offer the bunding for the reclamation volume. These units will be stacked 2 units high in a (2+1) pyramid formation. The GSC units will be stacked nine high on the seaward edge of the GMC bund to protect the GMCs from damage from vandalism or boat strikes. The slope of these units will be 1 vertical to 1.5 horizontal (1V:1.5H). These units will be stacked such that their short edge is facing seaward to increase inter-unit connectivity and stability. Recommended design dimensions for geosynthetic containers are provided in the IFC Drawings (Appendix A) and summarised for reference in Table 6.

Physical modelling of commercially available geosynthetic sand containers has been undertaken by the University of New South Wales' Water Research Laboratory (Coghlan, et al., 2009). Based on the published tables and graphs and following discussions with the Authors' it has been determined that the 2.5m^3 GSC unit armour layer is a suitable solution to withstand the wave climate at the project site, considering the GMC core utilised in the bund design.

Table 6: Geosynthetic container design sizes

Type	Height (mm)	Length (mm)	Width (mm)
2.5m^3 GSC unit	600 – 700	2,400 – 2,600	1,600 – 1,900
GMC	1,500 – 2,100	20,000	1,500 – 4,800

3.2.2 Toe and crest levels

The GSC and GMC units are to be founded on the lagoon reef flat to ensure there is no scour under the structure. The crest elevation of the GSC armour layer has been designed such that it

exceeds the design water level (4.59m TGZ, Sec. 2.4.1) by more than 1m and is approximately 2m higher than HAT. There is potential that the GSC armour layer may be overtopped during extreme wave and water level events in excess of the design event. It is recommended that the seawall be inspected after any significant overtopping event, and maintenance be undertaken to fill any areas where erosion has occurred. A construction setback limit of 25m is recommended inland of the GSC crest. This has been designed to limit damage to structures during overtopping events and to ensure piling or other excavation work does not have the potential to damage the underlying GMC units.

3.2.3 Durability and maintenance

The geotextile used for the construction of the units will be designed to be vandal and UV-resistant, TEXCEL 1200R or similar. Full geotextile specifications are provided in the IFC drawings (Appendix A). The vandal deterrent containers are designed to withstand exposure to wave action, sunlight, high volumes of pedestrian traffic and recreational fishing; however, there is potential for the bags to be damaged by impacts from debris and vessel strikes during large events. Should units become dislodged or damaged, the Government of Tuvalu Public Works department (PWD) will be trained in the repair of the units. The superstructure of the buried GMC units is such that any damage to the armour layer of GSC units, will have little impact to the containment and overall stability of the reclamation.

3.3 Drainage

A drainage investigation was undertaken on the proposed reclamation by Arcadis, provided in Appendix C. The investigation defined minimum surface slopes of 1%, catchment areas and drainage channels to capture the 1% Annual Exceedance Probability (AEP) design stormwater runoff, an example section can be seen in Figure 9. The drainage design allows for runoff generated across the reclamation and surrounding catchments (including the QEII Reclamation and Vaiaku Village). Whilst the drainage system has been designed to cater for flows up to the 1% AEP storm event, it is anticipated that higher flows and tidal surge maybe experienced during extreme storm events such as cyclones. To that end it is expected that the drains may run full/overtop or be inundated. Full drainage and channel design is illustrated in the IFC Drawings, Appendix A.

A site access road has been designed to follow the crest of the reclamation. The access road will consist of rolled subgrade or larger overburden extracted through the dredging process. The raised access road creates a minimum 25m setback from the reclamation bund, separates drainage catchments and restricts north-south access (Village to Reclamation) to one access road, this will assist increasing the life of the drainage channels.

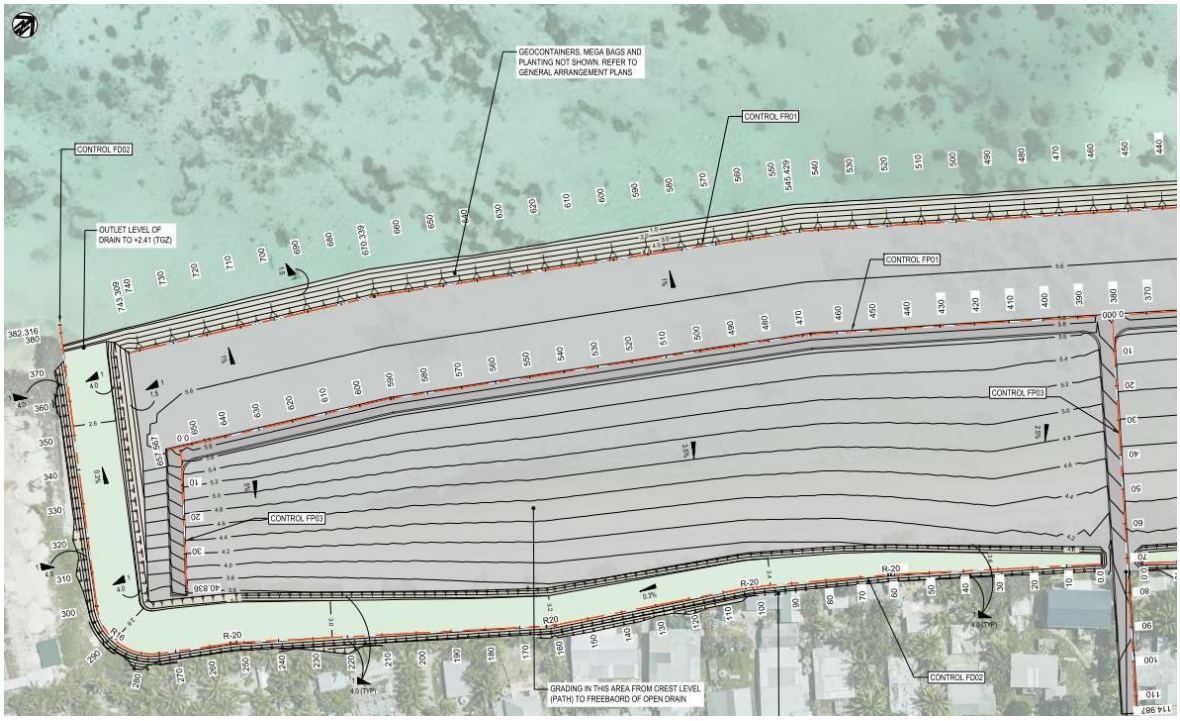


Figure 9: Plan view of western extent of Funafuti Reclamation showing grading of reclamation surface, access road, setback and drainage channels.

3.4 Borrow areas

Geotechnical investigations undertaken by SPC (Smith, 1995 & 2016) identified an area offshore of the project site with an estimated volume of up to 24Mm^3 of usable sediment which has been designated as the sand resource area (SRA). The yellow polygon in Figure 10 shows the location of the SRA and its proximity to the reclamation area. The final location within the boundary of the designated SRA will be determined by the successful contractor and is expected to be driven by the operational limits of the dredging vessel, pumping/haulage distances and quality of the sediments within the selected area. It should be noted that with the high possibility of future reclamation directly offshore of the project site, it is the preference of the GoT that sediment is sourced from deeper areas or those further afield from the project site within the designated SRA to reduce future infilling.

Smith (1995), Kaly and Peacock (2014), as well as recent dredging and sampling activities within the lagoon noted that there is a degree of variability in the quality of sediments across the SRA. Table 7 shows four samples taken on the south west corner of the SRA. The Required sediment characteristics for both the reclamation fill and the GSC and GMC units (as stated in the IFC drawings) have been split into two main categories based on the particle size distribution (PSD) of the sediment, these are provided in Table 8.

Recent dredging activities have revealed inconsistences in the penetration depths during original investigations stated in the SPC reports and that the presence of coral *bombies* are prevalent throughout the SRA. The presence of this harder material needs to be considered during the selection of an appropriate dredging, transport and sorting methodology.

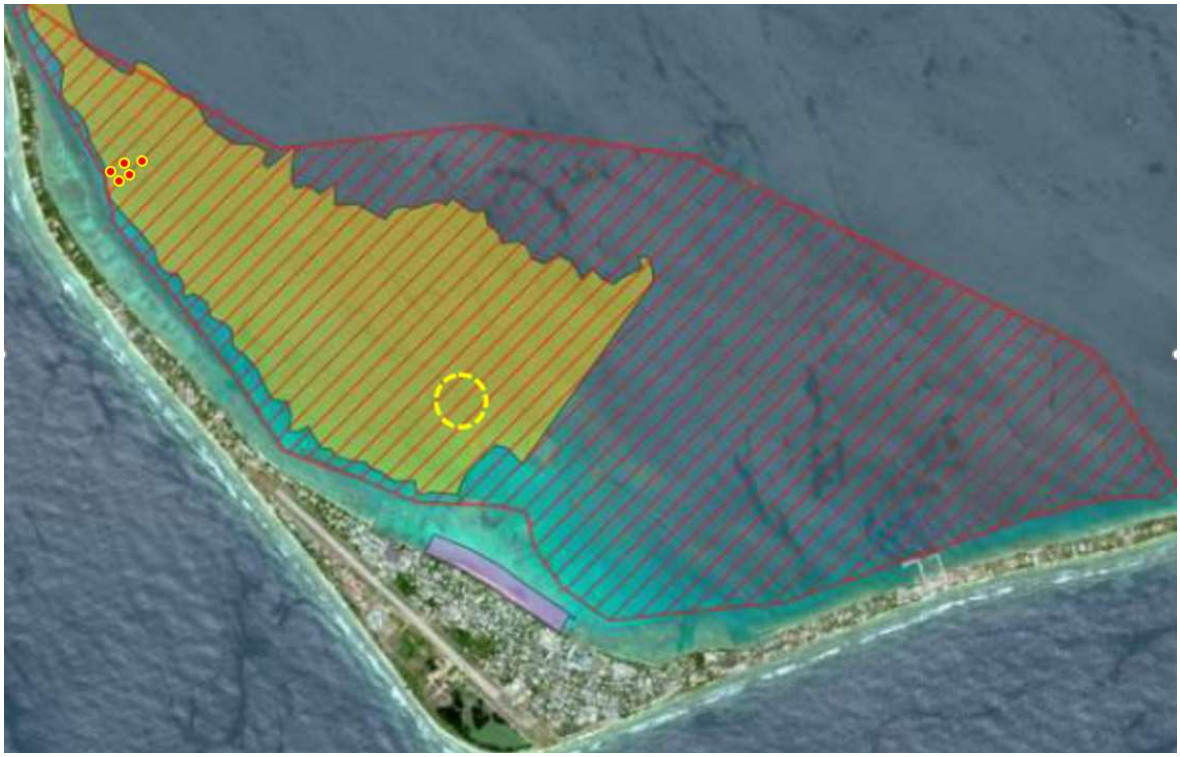


Figure 10: The olive-coloured zone is the established sediment resource area containing an estimated 24,000,000 m^3 of material which can be safely utilised (Smith, 1995). The larger red cross hatched zone is the area identified by Kaly and Peacock-Taylor (2014) as the "the zone of dead coral and eutrophication". The yellow circle approximates the area which would be dredged to a depth of 3.5m to supply 350,000m^3. The red/yellow dots are the (JP#) sample points detailed in Table 7 (Source: UNDP, 2019 and Hall, 2018).

Table 7: Sediment sampling undertaken within the resource area. (Source: Smith, 2015)

JP#	Easting m	Northing m	% Clay	% Silt (0.02-0.006 mm)	% Fine sand (0.06-0.2 mm)	%Medium Sand (0.2-0.6 mm)	% Coarse sand (0.6-2.0 mm	% Fine Gravel (2-6 mm)	%Coarse Gravel
12	739871.6	9055833	0	1.2	6	3.4	43.1	21	0
13	739843.3	9055793	0	1.2	28.7	37.1	29.2	3.4	0
14	739868	9055898	0	0.7	9.3	27.1	34.1	26.4	0
15	739913.7	9055866	0	2.2	13.7	26.4	31.4	21.8	0
16	739939.7	9055835	0	0.7	5	26.1	47.1	19.7	0

Table 8: Sediment size requirements for Funafuti reclamation.

Fill Type	Properties	Use
TYPE A	≥90% passing 75mm sieve 300mm maximum particle size	Reclamation fill material
TYPE B	100% passing 26.5mm sieve	GSC, GMC unit fill

3.4.1 Unexploded ordinance (UXO)

The presence of unexploded ordinance (UXO) has been found within the lagoon sediments as during WWII there were up to 174 vessels moored within the lagoon, with Funafuti being bombed on 9 separate occasions (JICA, 2011). Prior to the dredging work undertaken as part of the Borrow Pit and QEII Park reclamations, CSG Demining Consultants (CSG) conducted a Risk Assessment posed by Explosive Remnants of War (ERW). The key findings of the ERW risk assessment were that because there is minimal excavation required for the preparation and filling of the borrow pits, there is minimal potential for encountering ERW.

The report found potential to encounter ERW during dredging operations and made the following recommendations:

- A suitable ERW Awareness Brief be provided to all project staff and visitors.
- Ground-intrusive activities on land be avoided, or if essential, minimised. If significant ground-intrusive activities must be conducted, an ERW clearance of the location is to be conducted.
- The dredge system includes a screen on the dredge inlet, a bomb box with hydraulic door on the inlet pipeline and another bomb box on the outlet side of the dredge pipeline and deploy a UXO Technician for, at least, the first month of the dredging operation

Prior to dredging for the Borrow Pit and QEII reclamation, magnetometer surveys were undertaken of proposed dredge areas and sent to the Principal for approval. It is recommended that this survey be undertaken by the Contractor prior to any dredging works and the above recommendations are also to be undertaken for the TCAP reclamation works.

3.5 Catalina boat harbour

The eastern extremity of the reclamation terminates at the location of the Catalina Ramp[6]. A 30m long GMC core rock breakwater extends from the reclamation bund to create an all-tide access boat harbour for smaller local fishing vessels. The boat harbour provides vessel access to the shore and the reclamation area via a floating pontoon abutting the eastern reclamation bund. The detailed site plan of the boat harbour is shown in Figure 11. Key design elements of the boat harbour are as follows:

- A 60m long, 40m wide pontoon fronts the eastern extremity of the reclamation bund.
- The pontoon is made of modular floating dock system (CANDOCK or similar), with individual units added or removed to custom fit the required area. The modular system is anchored to the seabed.
- There are three ramps in the modular system that leave the reclamation and meet the long section of the pontoon. Each of these ramps can rise and fall with the tide and lay atop the geotextile units making up the reclamation bund. These ramp entrances have a gentler slope (1V:2H) than the adjacent 1V:1H eastern bun wall to ensure safe pedestrian access.

Full details and specifications of the boat harbour and docking system is provided in the IFC drawings.

[6] A remnant WWII dredged harbour and rock revetment where Catalina Seaplanes would berth

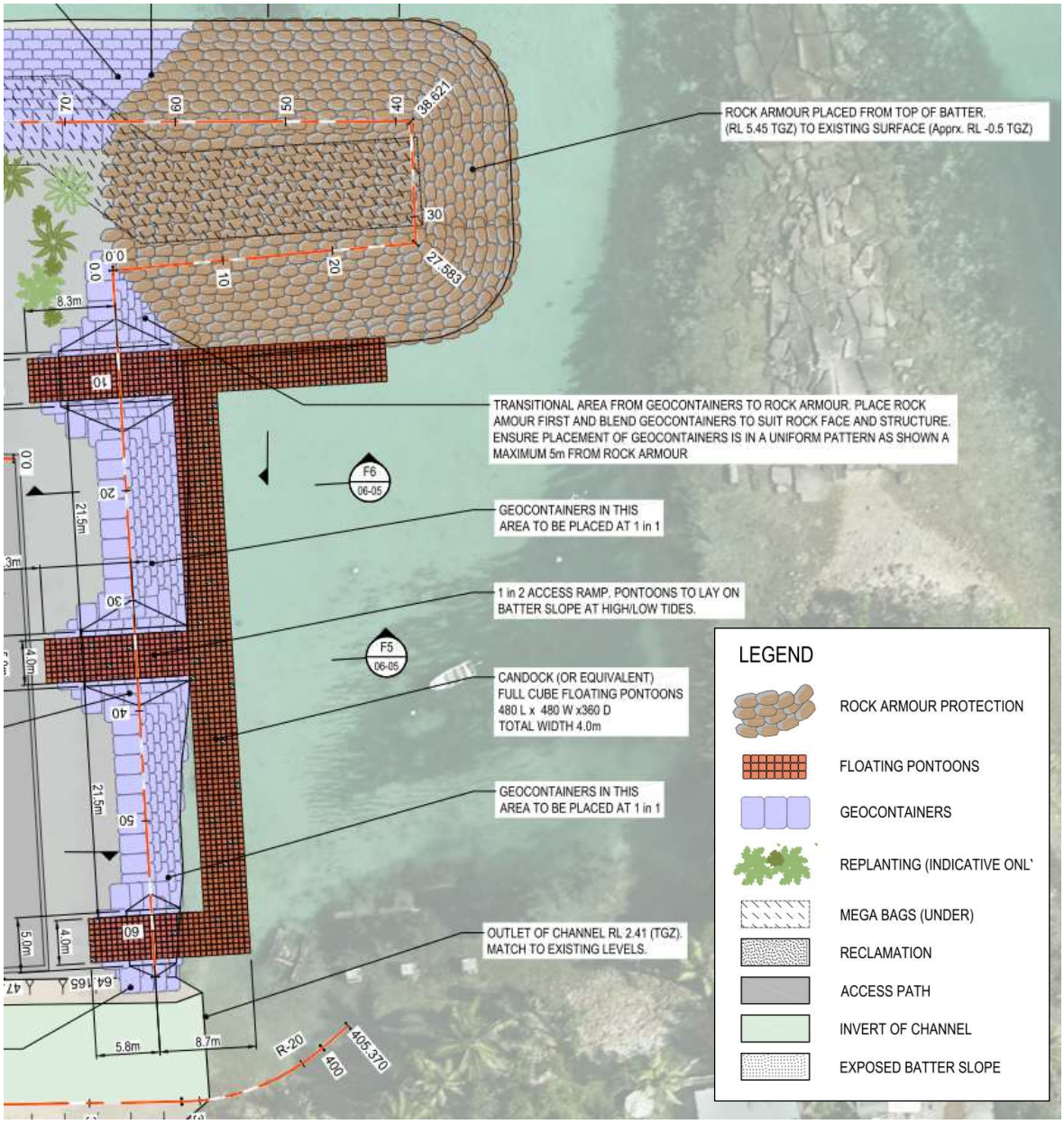


Figure 11: Catalina Boat Harbour detailed plan

3.5.1 Rock breakwater

The Catalina Boat Harbour breakwater will reuse the rock on the two groynes that lie within the reclamation footprint (on Tausoa Beach), seen in **Figure 12**. The rock appears to be igneous or metamorphic boulders (most probably granite) with a mean diameter (D_{50}) of around 1250mm, with boulders of up to 2500mm also found. The approximate dimensions and estimated available volume of rock of each of the structures is provided in the table below. The rock is considered to be high quality and from superficial inspection appears of suitable size (and density) for the expected wave climate within the lagoon to remain stable if used in a breakwater structure at this location.

As the proposed boat harbour is expected to be a long-term feature that is likely to remain undeveloped for a longer period in comparison to the reclamation bund, it is recommended that the armouring of the boat harbour breakwater be of this reused rock material. The core of the breakwater will consist of stacked GMC units as shown in **Figure 12**. Full details of the breakwater design are provided in the IFC drawings (Appendix A).

Structure	Length (m)	Width (m)	Mean height (m MSL)	Mean bed level (m MSL)
Vaiaku groyne	37	7	0.85	-0.5
Catalina groyne	43	9	0.9	-1.5

Figure 12: Rock sources for reuse in the Catalina Harbour Breakwater; Vaiaku and Catalina groynes

4. PROJECT IMPLEMENTATION

4.1 General

The United Nations Development Programme (UNDP), Pacific Office in Fiji act as the Project Management Unit (PMU) for TCAP, implementing the project in partnership with the GoT. Assistance throughout the implementation phase has also been provided by the Pacific Community (SPC) has also been engaged by UNDP to conduct the ESIA, coastal vulnerability and geotechnical components.

The following section describes non-design related aspects of the project implementation.

4.2 Project governance and oversight

TCAP has been led at the highest political level by a Technical Working Group (TWG) comprising key government departments and Non-governmental Organisation (NGO) associations representing vulnerable communities. The GCF financing, through TCAP, will enable the GoT to address the financial and capacity constraints at all levels – from technical to community awareness – that have so far prevented a sustainable coastal protection solution.

TCAP will strengthen institutional and community capacity for sustaining and replicating project results. It is envisaged that the project will help to strengthen governmental capacity for coastal management and its legacy will be a Coastal Management Strategy for Tuvalu with internal agency capacity for its implementation.

4.3 Procurement strategy

Due to the works complexities stemming from the remote location of the project sites, the unique atoll environments and the nature of the construction works in Tuvalu, UNDP have proposed a 3-stage *Interactive Dialogue* Procurement Strategy. The construction works will be tendered as a complete package of works encompassing Funafuti, Nanumea and Nanumaga. The procurement stages are briefly described below:

- Pre-qualification (PREQ): The PREQ procedure is aimed at identifying qualified applicants for the next stage of the procurement process based upon their expertise, financial and technical capacity, and experience in construction in remote undeveloped atoll islands.
- Request for Proposal (RFP): A formal RFP will be issued to pre-qualified tenderers to provide both a formal technical and financial response to the tender. A pre-bid conference will be undertaken prior to the submission of the tenderer's RFP response.
- Interactive Dialogue (ID):The interactive dialogue allows UNDP and tenderers to discuss the scope and complexities around the project and for tenderers to understand better the RFP requirements. ID offers significant and clear benefits; enabling risk and assumptions to be thoroughly tested, innovative solutions to evolve and the foundations established for ensuring a successful contractual outcome of the tender. After completion of the ID sessions, the offerors are expected to submit their proposals within the stipulated deadline. The evaluation of the proposals including the contract award will follow the standard UNDP RFP process.

4.4 Contract delivery

The works contract will be delivered through UNDP's standard construction contract. Terms of the contract and any proposed departures by the tenderers will be discussed during the ID phase of procurement in the presence of the UNDP Legal and Procurement Teams as well as the PMU. Contractual discussions and verifications through the ID phase will minimise the risk of contractual disputes during construction as the ID sessions provide an opportunity for both parties to explore contingencies and project risks prior to signing and commencement of works.

4.5 Construction Environmental and Social Management Plan (C-ESMP)

The planned works on Funafuti have the potential to create a variety of impacts through their implementation. These impacts can be either positive (e.g., improved coastal protection for community members) or negative (e.g., loss of trees, loss of beach access for recreation and fishing) depending on the activity and receptors involved. The impact of this project on the physical, biological, and social environment has been assessed and is described in detail in the Funafuti Environmental and Social impact Assessment undertaken by The Pacific Community – Geosciences, Energy and Maritime Division (SPC, 2020c). The key potential project impacts and risks have been identified as the following:

- Increased water turbidity from dredging works
- Changing access to, and use of, coastal marine environment
- Increased risk of traffic accidents
- Solid waste management
- Use of heavy machinery on the beach leading increased sedimentation
- Fuel or other hazardous spills
- Noise and dust disturbance

This ESIA contains the recommended mitigation measures for Funafuti for pre-construction, construction, and operational phases to avoid, reduce, or mitigate all identified impacts. The Contractor for the TCAP works will be required to produce a Contractor's Environmental and Social Management Plan (C-ESMP). The C-ESMP will be the Contractor's governing document for the implementation of this ESIA's recommendations during works. The C-ESMP will be reviewed and approved by the TCAP Project Management Unit and disclosed prior to commencement of civil works. A summary of the key protective mitigation measures is provided in the table below.

Table 9: Key protective environmental and social mitigation measures as part of the design, implementation and operation the TCAP Funafuti Reclamation (Source: SPC: 2020c)

Impact Area	Key Management Measures
Dredging and Fill Works	• Develop and implement of a site-specific Dredge and Fill Operations Plan to address water turbidity and water quality management. • Dredge method will be via a pipeline for conveying slurry to fill sites to minimise losses to lagoon waters. • Dredging will be limited to the sand excavation area identified in the ESIA • No ecologically significant areas are included in the design. Dredging concentrates on damaged parts of the lagoon. • Dredge plume to be monitored and dredge works halted if plume extends over a large area. • Dredge waters will be discharged within the revetment wall to allow filtering and control of dredge wastewater. • Strict control on de-watering release – by pumping to a contained area by using sediment curtains, and by route monitoring of turbidity – will be required in the C-ESMP. Care will be taken to ensure de-watering does not occur towards the island.
Retaining Structure	• The retaining geotextile structure will be designed to absorb and reduce wave energy, prevent overtopping, and minimise any wave reflection issues • Reclamation works will not extend to existing terrestrial vegetation line. • Reclaimed land will drain to stormwater drain. • Set back area will be defined 20m from seaward edge of reclamation. • Catalina Harbour will be designed with safe loading of passengers in mind. • Areas accidentally damaged during works will be restored by clean-up, re-contouring, and planting. • The removal and transfer to safer ground of epifaunal species such as sea cucumbers will be carried out by the Contractor to avoid burial. • Ensure that any erosion- and sediment-control devices are installed, inspected, and maintained as required. • No trees in the vegetation line will be removed or damaged during construction works.
Noise and Vibration	• Minimise nuisance from noise, especially closer to residential areas and sensitive receptors, through establishment and communication to affected parties of working hours, including night works. • Care will additionally be taken to avoid increase of noise and quantity of work equipment at outside of advertised hours. Advertise working hours at the site entrance. • Signage to outline complaints procedure and to provide contact details of recipient of complaints. • Contractor will develop a work schedule or operations with Kaupule to identify hours and days of no work due to religious and cultural activities.

Impact Area	Key Management Measures
Community Services and Infrastructure	• Through ongoing consultations, determine if the coastal reclamation could negatively impact fisherfolk, boat owners and users, and other potentially vulnerable groups in the community adjacent to the project site. • Explore additional and more culturally sensitive options for boat mooring for the adjacent community, other than the Catalina Harbour option. • Waste management practices will prioritise reduce, reuse, recycle • Preference shall be given to materials that can be used to construct the project that would reduce the direct and indirect waste generated. • All hazardous or contaminated waste will be exported from Tuvalu under the conditions of the Waigani Treaty and will be coordinated through the WMD • Disposal of waste shall be carried out in accordance with the Government of Tuvalu requirements. Waste that cannot be recycled, reused, composted, or otherwise disposed of in Tuvalu will be exported and disposed of in a licensed facility in another country. • Any dangerous goods (including batteries) stored on site shall be stored in accordance with Tuvalu regulations and international best practice. • The Contractor will be responsible for repairing any damage caused by construction works to the existing road network.
Hazardous Substance Management	• Prepare spill management plan addressing measures. • Store and handle all chemicals, fuels, oils, and potentially hazardous materials as specified in relevant standards and guidelines. • Hydrocarbon wastes shall be stored in colour-coded and labelled drums placed in secure storage areas on site. • Where possible, fuel and chemical storage and handling shall be undertaken at designated petrol stations on the island or at the project site on impermeable, bunded surfaces (preferably over drip trays). • Onsite storage of fuel and chemicals shall be kept to a minimum. • Emergency clean-up kits for oil and chemical spills will be available onsite and in all large vehicles.
UXO/ERW	• Contractor will undertake an updated magnetometry survey of the proposed dredge area • The dredge will be fitted with a suitable screen to exclude explosive remnants of war (ERW) at the cutter head and a beach-screening cage to capture ERW at the discharge end of the dredge pipe as was used in the Tuvalu Borrow Pit Project. • Contractor will undertake an updated magnetometry survey of the proposed dredge area. • The Contractor's C-ESMP will detail their protocols for safely handling and disposing of UXO.

Impact Area	Key Management Measures
Social Environment	• Ensure opportunities to incorporate men's and women's views and interests into project decisions and implementation are purposefully created and enabled in the stakeholder engagement processes throughout the project life. • Develop and implement a communication plan for the project and in particular the messaging that the Catalina Harbour is a public facility for all community members. • The communities, in coordination with their Kaupule, will provide the Contractor with a list of skilled and unskilled laborers. The Kaupule will also coordinate with the villages to ensure that job opportunities are distributed. Women will be encouraged to participate in the workforce and in uptake of job opportunities. Persons with disabilities will also be encouraged to participate in the workforce and with jobs that are appropriate and significant. • Communities on the island will have the opportunity to provide food, beverages, and housekeeping services for incoming workers to the island for 3-4 months. Provision of food services; provision of fresh water or coconuts; sale of food items such as local fruits, root crops, vegetables, etc.; sale of handicrafts; and laundry services are examples of income-generating activities.

5. SUMMARY AND RECOMMENDATIONS

5.1 Summary

This report is the culmination of the design process for the Funafuti Reclamation as part of the TCAP. It finalises the design narrative undertaken in the Concept Design Report (UNDP, 2020) and draws on extensive stakeholder consultation, site investigations and interviews with contractors working in the region. The basis of design, structure parameters and the project implementation framework is presented herein. A safety in design (SiD) investigation which presents a design and construction risk assessment is provided in appendix D for reference.

The Funafuti Reclamation can be summarised as follows:

- A bunded reclamation located on the Vaiaku Foreshore to the east of the QEII reclamation in Funafuti, consisting of approximately 270,000m^3 of sediment sourced from the Fogafale lagoon within 2Nm of the project site. Approximated dimensions of the reclamation are 700m x 100m raised at its highest point to 5.8m TGZ at crest of reclamation.
- The design of the reclamation bund design incorporates stacked geotextile mega containers fronted by a protective revetment consisting of stacked 2.5m^3 GSC units.
- Drainage slopes and channels are to be levelled into the reclamation surface to cater for flows from the reclamation itself, the adjacent village and QEII reclamation.
- A small boat harbour has been designed along the eastern extremity of the reclamation catering for small vessels. The harbour consists of a floating modular dock system abutting the GSC reclamation bund. A 30m long rock breakwater protects the harbour, the rock is to be sourced from the two rock groynes on Tausoa Beach.

5.2 Recommendations

The following recommendations are included as the TCAP moves through the implementation stage:

- Any uncertainties or omissions within this Detailed Design Report and associated IFC drawings should be conveyed by the tenderers to UNDP during the ID phase of the procurement strategy
- The submitted C-ESMP should address as a minimum the risks presented in Table 9.
- A post-construction monitoring and maintenance strategy should be established with clear tasks, roles, training and budget allocated to GoT.
- Wherever possible a UNDP representative engineer should be present during the construction phase to ensure the reclamation is constructed as to the specifications presented.

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Funafuti Environmental and Social impact Assessment undertaken by The Pacific Community – Geosciences, Energy and Maritime Division (SPC, 2020c

Appendix A: Funafuti Reclamation IFC Drawings

TUVALU COASTAL ADAPTATION PROJECT (TCAP)

FANUFUTI

FUNAFUTI DRAWING LIST

JOB No	PLAN No	Rev	DESCRIPTION
P19012			
P19012-FN-CV-	00-01	A	COVER SHEET AND DRAWING LIST
	01-01	A	SITE PLAN
	02-01	A	GENERAL NOTES SHEET 1
	02-02	A	GENERAL NOTES SHEET 2
	03-01	A	GENERAL ARRANGEMENT PLAN SHEET 1
	03-02	A	GENERAL ARRANGEMENT PLAN SHEET 2
	03-03	A	GENERAL ARRANGEMENT PLAN SHEET 3 - CATALINA BOAT HARBOUR
	04-01	A	SITE SETOUT AND GRADING PLAN SHEET 1
	04-02	A	SITE SETOUT AND GRADING PLAN SHEET 2
	04-03	A	SITE SETOUT TABLES
	05-01	A	EARTHWORK VOLUME MOVEMENT PLAN
	06-01	A	TYPICAL SECTION AND DETAILS SHEET 1
	06-02	A	TYPICAL SECTION AND DETAILS SHEET 2
	06-03	A	TYPICAL SECTION AND DETAILS SHEET 3
	06-04	A	TYPICAL SECTION AND DETAILS SHEET 4
	06-05	A	TYPICAL SECTION AND DETAILS SHEET 5
	06-06	A	TYPICAL SECTION AND DETAILS SHEET 6
	07-01	A	RECLAMATION LONGITUDINAL SECTION SHEET 1 CONTROL FR01
	07-02	A	RECLAMATION LONGITUDINAL SECTION SHEET 2 CONTROL FR02
	08-01	A	RECLAMATION SITE CROSS SECTIONS SHEET 1
	08-02	A	RECLAMATION SITE CROSS SECTIONS SHEET 2
	08-03	A	RECLAMATION SITE CROSS SECTIONS SHEET 3
	08-04	A	RECLAMATION SITE CROSS SECTIONS SHEET 4
	09-01	A	OPEN CHANNEL TYPICAL SECTIONS
	10-01	A	OPEN CHANNEL LONGITUDINAL SECTIONS
	11-01	A	OPEN CHANNEL SITE CROSS SECTIONS CONTROL FD01 SHEET 1
	11-02	A	OPEN CHANNEL SITE CROSS SECTIONS CONTROL FD01 SHEET 2
	11-03	A	OPEN CHANNEL SITE CROSS SECTIONS CONTROL FD02 SHEET 1
	11-04	A	OPEN CHANNEL SITE CROSS SECTIONS CONTROL FD02 SHEET 2

LOCALITY PLAN
SCALE 1: 25,000

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 250 500 750 1000 1250m
SCALE 1:25,000 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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CONSULTING ENGINEERS
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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
COVER SHEET AND DRAWING LIST

DRG NO.
P19012-FN-CV-00-01

REV.
A

SITE PLAN
SCALE 1: 1,000

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 10 20 30 40 50m
SCALE 1:1000 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
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PROJECT NUMBER
P19012

DRAWING TITLE
SITE PLAN

DRG NO.
P19012-FN-CV-01-01

REV.
A

TECHNICAL SPECIFICATION

GENERAL CONSTRUCTION NOTES

1. THE WORKS SALL BE PROTECTED AND/OR MANAGED TO ACCOUNT FOR HIGH WATER LEVES/ WAVE ACTION AND STORMWATER.
2. THE WORKS SHALL BE COMPLETED IN A MANNER WHICH LIMITS THE EXTENT OF THE WORKS EXPOSED TO POSSIBLE DAMAGE FROM HIGH WATER LEVELS, WAVE ACTION AND STORMWATER AND ENSURE THAT IT DOES NOT ADVERSEY AFFECT AREAS ADJACENT TO THE WORKS.
3. DEMOLITION AND EXCAVATION SHALL BE UNDERTAKEN IN A CAREFUL MANNER WITH A MINIMUM OF DISTURBANCE AND WITH EVERY POSSIBLE PRECAUTION TAKEN TO PREVENT DAMAGE TO PROPERTY AND INJURY TO PERSONNEL.
4. CARRY OUT ALL WORKS IN ACCORDANCE WITH THE APPROVED PROJECT DOCUMENTATION. RECORD AND HAVE AUTHORISED ANY CHANGES MADE TO THE WORKS UNDER THIS DOCUMENTATION IN ACCORDANCE WITH QUALITY PROCEDURES.
5. ALL DISCREPANCIES SHALL BE REFERRED TO THE UNDP ENGINEER FOR RESOLUTION BEFORE PROCEEDING.
6. DURING THE CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE WORKS INCLUDING ADJACENT STRUCTURES IN A STABLE CONDITION AND ENSURING NO PART IS OVERSTRESSED.
7. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS IN METRES RELATIVE TO CHART DATUM (CD).
8. ARRANGE SETOUT IN LIAISON WITH GOVERNMENT OF TUVALU LANDS AND SURVEY DEPARTMENT. NOTIFY SURVEY CO-ORDINATOR A MINIMUM OF 24 HOURS IN ADVANCE.
9. CATCHMENT BASED ON DIGITAL MODEL (DEM) PROVIDED BY FUGRO (2019).
10. ELEVATED PATHWAY TO BE HIGHEST POINT OF RECLAMATION TO ALLOW OVERLAND FLOWS FROM MAJOR STORM EVENTS TO BE CONVEYED OFF THE RECLAMATION. REFER DETAILED DESIGN REPORT FOR DETAILS.
11. ALL DIMENSIONS RELATING TO EXISTING WORK, GROUND AND SEABED LEVELS, OR ITEMS SUPPLIED BY OTHERS, SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF ANY FABRICATION AND ERECTION WORKS. THE CONTRACTOR HALL BE RESPONSIBLE FOR THEIR CORRECTNESS.
12. ALL PROPRIETARY ITEMS SHALL BE INSTALLED STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS/SUPPLIERS INSTRUCTIONS.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY SITE DRAINAGE AND GENERAL MAINTENANCE OF THE AREA DURING CONSTRUCTION.
14. THE CONTRACTOR SHALL RECORD PHOTOGRAPHIC EVIDENCE OF ALL EXCAVATIONS PRIOR TO ANY BACKFILING .

FILL MATERIAL

1. ALL FILL MATERIALSHALL BE NON-COHESIVE GRANULAR MATERIAL COMPRISING HARD, DENSE AND DURABLE PARTICLES WHICH SHALL BE FREE FORM ORGANIC AND CARBONACEOUS MATERIALS.

   GRADING OF FILL MATERIAL SHALL COMPLY WITH THE FOLLOWING PROPERTIES:

   TYPE A: 300mm MAXIMUM PARTICLE SIZE
   ≥90% PASSING 75mm SIEVE
   TYPE B: 100% PASSING 26.5mm SIEVE

EXCAVATION AND FILL WORKS

1. THE UNDP CONSTRUCTION SUPERVISOR SHALL BE ADVISED WHEN DEMOLITION, EXCAVATION AND FILL WORKS ARE TO COMMENCE
2. THE RECLAMATION BUND SHALL BE PREPARED ALONG THE ALIGNMENT AND IN ACCORDANCE WITH THE LEVELS AND SIDE SLOPES SHOWN ON THE DRAWINGS.
3. STOCKPILING OF ROCK FROM THE TAUSOA BEACH GROYNES SHALL NOT IMPEDED VEHICLE ACCESS ND WILL BE MADE IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE UNDP REPRESENTATIVE.
4. ROCK FROM THE TAUSOA BEACH GROYNES SHALL BE STOCKPILED INTO TWO DISTINCT SEPARATED PILES REPRESENTATIVE OF THE ARMOURSTONE AND UNDERLAYER ROCK MASS GRADINGS.
5. STOCKPILING OF SAND SHALL BE LIMITED TO THE MINIMUM EXTENT PRACTICAL FOR CONTINUITY OF THE WORKS.

GEOTEXTILE PLACEMENT

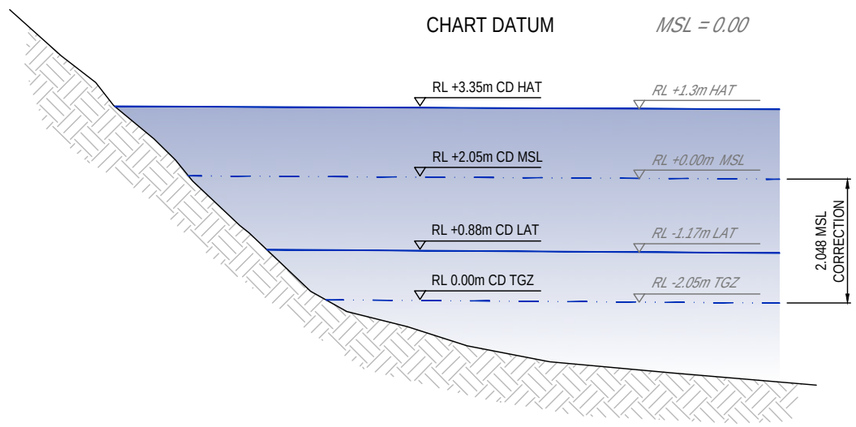
1. THE GEOTEXTILE SHALL BE TEXCEL 1200R OR APPROVED EQUIVALENT WHICH COMPLIES WITH THE FOLLOWING MINIMUM REQUIREMENTS:
   - UNIT WEIGHT TO AS3706.1
   - GRABTENSILE STRENGTH TO AS2001.2.3
   - TRAPEZOIDAL TEAR RESISTANCE ASTM D1117
   - WATER PERMEABILITY (10 CM HEAD)
   - 1000 g/m2
   - 1000N (MIN) IN ANY DIRECTION IN PLANE OF GEOTEXTILE
   - 600N (MIN) IN ANY DIRECTION
   - 30litres/m2/second (MIN)
2. THE PLACEMENT OF GEOTEXTILE FILTER SHALL SATISFY THE CRITERIA BELOW:
   - GROUND PREPARATION: SHARP-EDGED ROCKS, STUMPS AND THE LIKE ARE TO BE REMOVED PRIOR TO LAYING OF THE GEOTEXTILE
   - JOINING FABRIC ELEMENTS: FABRIC ELEMENTS MAY BE JOINED BY EITHER OVERLAPPING OR SEWING. OVERLAP WIDTHS SHALL BE NO LESS THAN 0.5M WITH THE DIRECTION OF OVERLAP TAKING INTO ACCOUNT THE OVERBURDEN MATERIAL SUPPLY DIRECTION. FOR SEWING ASSEMBLY 0.1m OVERLAP IS SUFFICIENT TO ENSURE CONTINUITY OR TO MANUFACTURERS INSTRUCTION.
   - LAYING IN WATER: RAPID IMMERSION REQUIRES BALLASTING OF FABRIC.
   - JOIN GEOTEXTILE AS TO RETAIN ADEQUATE FILTER FUNCTION.

GEOTEXTILE SAND CONTAINERS

1. PLACEMENT OF THE GEOSYNTHETIC SAND CONTAINERS SHALL ACHIEVE THE FOLLOWING TOLERANCES:
   - A TOLERANCE OF 5º FOR THE SLOPE ALONG THE RECLAMATION BUND OF INDIVIDUAL GEOSYNTHETIC SAND CONTAINERS
   - A TOLERANCE OF 10º FOR THE SLOPE UP THE FACE OF THE RECLAMATION BUND OF INDIVIDUAL GEOSYNTHETIC SAND CONTAINERS.
   - MAXIMUM 50mm HORIZONTAL OFFSET BETWEEN THE ENDS OF ADJACENT GEOSYNTHETIC SAND CONTAINERS.
   - MAXIMUM 50mm VERTICAL OFFSET BETWEEN THE ENDS OF ADJACENT GEOSYNTHETIC SAND CONTAINERS.
   - MAXIMUM 50mm HORIZONTAL SEPARATION BETWEEN ADJACENT GEOSYNTHETIC SAND CONTAINERS.
2. GEOSYNTHETIC SAND CONTAINERS SHALL BE FILLED USING TYPE B FILL MATERIAL.
3. GEOSYNTHETIC SAND CONTAINERS SHALL BE FILLED AND SEALED IN ACCORDANCE WITH PRESCRIBED BY THE MANUFACTURER AND IN ACCORDANCE WITH THE CONSTRUCTION PROCEDURE.
4. THE FILLING METHODS SHALL BE HYDRAULICALLY ASSISTED AND SHALL ACHIEVE SAND CONTAINER DIMENSIONS WITHIN THE RANGE SPECIFIED BELOW:

TYPE	HEIGHT (mm)	LENGTH (mm)	WIDTH (mm)
2.5m³ GSC	600-700	2400-2600	1600-1900
MEGACONTAINER	1500-2100	1500-4800	20000

5. THE GEOSYNTHETIC SAND CONTAINERS SHALL BE PLACED ON A GEOTEXTILE TO PREVENT THE LOSS OF FINES THROUGH THE STRUCTURE, IN ACCORDANCE WITH THE DRAWINGS AND THIS SPECIFICATION.
6. THE CONTAINERS SHOULD BE PLACED USING SPECIALISED FILLING/PLACEMENT EQUIPMENT, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
7. THE AMOUNT OF HANDLING SHALL BE MINIMISED TO ENSURE THE GEOSYNTHETIC SAND CONTAINER RETAINS ITS FORM AND SHAPE, AND TO REDUCE THE STRAINS PUT ON THE GEOTEXTILE AND SEAMS. THE GEOSYNTHETIC SAND CONTAINERS SHALL BE PLACED IN SUCH A WAY AS TO MINIMISE EXPOSURE OF THE ON-SITE CLOSURE SEAM.
8. THE GEOSYNTHETIC SAND CONTAINERS SHALL BE PLACED IN A STRETCHER BOND LAYOUT TO ENSURE EFFECTIVE INTERLOCK AND STABILITY.
9. IF VEHICULAR TRAFFICKING ATOP THE GEOSYNTHETIC SAND CONTAINERS IS REQUIRED DURING PLACEMENT, A MINIMUM SAND COVER OF 500mm IS REQUIRED OVER THE GEOSYNTHETIC SAND CONTAINERS.



Funafuti Tide Gauge Datum Relationships and MSL Correction" (source: Fugro, 2019). Source SPC, 2019

TIDE CHART - DATUMS

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

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GREEN CLIMATE FUND
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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL NOTES SHEET 1

DRG NO. P19012-FN-CV-02-01
REV. A

ROCK WORK (BREAKWATER)

1. BOULDERS SHALL BE SOUND IGNEOUS OR METAMORPHIC ROCKS CLEAN AND FREE OF TOPSOIL AND ORGANIC MATTER, SOURCED FROM THE TAUSOA BEACH GROYNES AS FOLLOWS:
   - SIZE 250 TO 3000KG
   - 50% OVER 1300KG
2. ROCK FILL SHALL BE SOUND IGNEOUS OR METAMORPHIC ROCKS CLEAN AND FREE OF TOPSOIL AND ORGANIC MATTER, SOURCED FROM THE TAUSOA BEACH GROYNES AS FOLLOWS:
   - SIZE 50 TO 800KG
   - 50% OVER 300KG
3. THE ROCK WORKS SHALL BE CONSTRUCTED IN THE LOCATION SHOWN AND TO THE LEVELS, WIDTHS AND SIDE SLOPES INDICATED ON THE DRAWINGS.
4. WHERE TRANSITIONS OR VARIATIONS IN SLOPE, LEVEL OR GEOMETRY ARE SHOWN IN THE DRAWINGS, THEY SHALL BE SMOOTH AND LINEAR OVER THE LENGTH OF THE TRANSITION WITH NO ABRUPT CHANGES IN THE OUTER SURFACE OF THE ROCK STRUCTURE.
5. STABLE ROCK PLACEMENT BATTERS WITH SLOPE NOT EXCEEDING 1:1.5 (VERTICAL TO HORIZONTAL) FOR ALL ROCK WORKS TO BE ACHIEVED.
6. ROCK WORKS SHALL BE PLACED TO SATISFY THE FOLLOWING:
   - ROCK SHALL BE PLACED TO MINIMISE ITS BREAKDOWN ON HANDLING, PRODUCTION OF FINES AND WATER CONTAMINATION
   - ROCK SHALL BE PLACED CAREFULLY TO AVOID DAMAGE TO THE GEOTEXTILE FILTER LAYER.
   - ROCK SHALL BE PLACED TO ACHIEVE AN EVEN DISTRIBUTION OF ROCK SIZES WITHOUT CONCENTRATIONS OF SMALLER ROCK.
   - THE FINISHED SLOPE SHALL BE NO STEEPER THAN THE SLOPE SPECIFIED ON THE DRAWINGS.
   - UNDERLAYER ROCK SHALL NOT BE COMPACTED.
   - UNDERLAYER ROCK SHALL BE PLACED TO ACHIEVE A PLACEMENT DENSITY EQUIVALENT TO RANDOM PLACEMENT.
   - STANDARD ARMOUR PLACEMENT SHALL BE ACHIEVED BY INDIVIDUALLY PLACING ROCK TO ACHIEVE A FULLY INTERLOCKED LAYER WITH EACH ROCK HAVING AT LEAST THREE POINTS OF CONTACT WITH OTHER ROCKS IN THE SAME LAYER. ROCKS SHALL BE WEDGED AND LOCKED TOGETHER SUCH THAT THEY CANNOT BE MOVED WITHOUT DISTURBING ADJACENT ROCKS,
   - VOIDS BELOW THE FINISHED PROFILE LEVEL SHALL NOT EXCEED 0.5 DN50 AND THE UNDERLAYER SHALL NOT BE VISIBLE AT ANY LOCATION.
   - PLACEMENT OF ROCK SHALL COMMENCE AT THE TOE AND PROCEED UPWARDS TOWARDS THE CREST.
   - THERE SHALL BE NO FREE ROCKS ON THE SURFACE OF THE ARMOUR LAYER. PIECES OF ARMOURSTONE BROKEN DURING HANDLING OR PLACING SHALL BE REMOVED IMMEDIATELY AT THE CONTRACTORS' EXPENSE.
   - SUBJECT TO THE APPROVAL OF THE UNDP REPRESENTATIVE, BROKEN PIECES OF ARMOURSTONE MAY BE INCLUDED IN SMALLER GRADINGS.
   - NO LAYER SHALL BE COVERED BY A SUBSEQUENT LAYER UNTIL THE PROFILE OF THE FORMER LAYER HAS BEEN APPROVED BY THE FORMER LAYER HAS BEEN APPROVED BY THE UNDP REPRESENTATIVE.
   - SURFACE OF THE ARMOURED SLOPE SHALL PRESENT AN ANGULAR UNEVEN FACE TO THE WATER. ARMOUR ROCK SMALLER THAN THE SPECIFIED MASS GRADING SHALL NOT BE USED TO FILL VOIDS OR TO PROP LARGER ARMOUR UNITS IN ORDER TO ACHIEVE THE REQUIRED PROFILE.

RECLAMATION BUND

1. THE AREA BEHIND THE LANDWARD EDGE OF THE RECLAMATION BUND IS SUBJECT TO WAVE OVERTOPPING.
2. ALL BUILDINGS AND OTHER STRUCTURES SHALL BE SET BACK 20m (MIN) FROM THE RECLAMATION BUND.
3. VEHICULAR ACCESS IS PROVIDED FOR CONSTRUCTION VEHICLES DURING EMERGENCIES.

FILL PLACEMENT

1. THE PLACEMENT OF DREDGED SEDIMENT SHALL BE CARRIED OUT IN THE AREAS AND TO THE LINES AND LEVELS SHOWN ON THE DRAWINGS. TO ACCOMMODATE UNFORESEEN SITUATIONS, UNDP RESERVES THE RIGHT TO AMEND THE LINES AND LEVELS OF PLACEMENT OF MATERIAL IN THESE GENERAL AREAS FROM THOSE SHOWN ON THE DRAWINGS.
2. THE SURFACE OF THE RECLAMATION SHALL BE KEPT MOIST BY SPRAYING WITH WATER TO SUPPRESS WIND-BLOWN SAND TRANSPORT (LOSSES) WHEN THE FORECAST OR RECORDED WIND SPEED, 10M ABOVE THE GROUND SURFACE, EXCEEDS 30km/hr.
3. DEVIATIONS FROM THE LINES, LEVELS, GRADES AND DIMENSIONS INDICATED ON THE DRAWINGS SHALL ONLY BE PERMITTED TO THE EXTENT THAT ANY DEVIATION COMPLIES WITH THE FOLLOWING CONSTRUCTION TOLERANCES:
   - A TOLERANCE OF 250mm FOR HORIZONTAL DEVIATIONS FROM THE LINES INDICATED ON THE DRAWINGS.
   - A TOLERANCE OF -100mm/+300mm FOR VERTICAL DEVIATIONS FROM THE LEVELS INDICATED ON THE DRAWINGS.
4. IN ADDITION TO MEETING THE CONSTRUCTION TOLERANCE REQUIREMENTS, THE SURFACE OF THE RECLAMATION SHALL BE SPREAD EVENLY OVER THE DESIGNATED AREA TO ACHIEVE A SMOOTH PROFILE AND AVOID AREAS OF PONDING OR ABRUPT CHANGES IN ELEVATION. ASSESSMENT AND ACCEPTANCE OF ANY SUCH AREAS SHALL BE AT THE DISCRETION OF THE UNDP REPRESENTATIVE.
5. WHERE DRAWINGS SPECIFY COMPACTED FILL, MATERIALS USING THE COMPACTED LAYER METHOD OR BY HYDRAULIC PLACEMENT TO ENSURE THAT THE FILL IS WELL COMPACTED AND FREE OF SIGNIFICANT POCKETS OR VOIDS.
6. FILL MATERIAL THAT WILL BE IN CONTACT WITH THE GEOTEXTILE SHALL NOT HAVE PROTRUSIONS THAT MAY DAMAGE THE GEOTEXTILE DURING INSTALLATION OR IN SERVICE.

REINSTATEMENT, SITE DISESTABLISHMENT AND CLEANUP

1. EXCEPT TO THE EXTENT THAT THE SITE HAS BEEN REPAIRED AND UPGRADED IN ACCORDANCE WITH THE WORKS, THE SITE SHALL BE REINSTATED TO ITS PRE-CONSTRUCTION CONDITION AND ANY STRUCTURES DAMAGED DURING THE COURSE OF THE WORKS.
2. UPON COMPLETION OF THE WORKS, THE SITE SHALL BE CLEARED F ALL SURPLUS MATERIALS, PLANT, FENCING, SITE SHED, NOTICE BOARDS AND THE LIKE, TO THE SATISFACTION OF THE UNDP REPRESENTATIVE.
3. UPON COMPLETION OF THE WORKS, REMOVAL AND LAWFUL DISPOSAL OFF SITE OF ALL SURPLUS SPOIL, RUBBISH OR EXCESS MATERIAL, AND FOR THE FINAL CLEANING UP OF ALL AREAS COVERED BY THE CONTRACT SHALL BE LEFT CLEAN AND TIDY UPON COMPLETION.

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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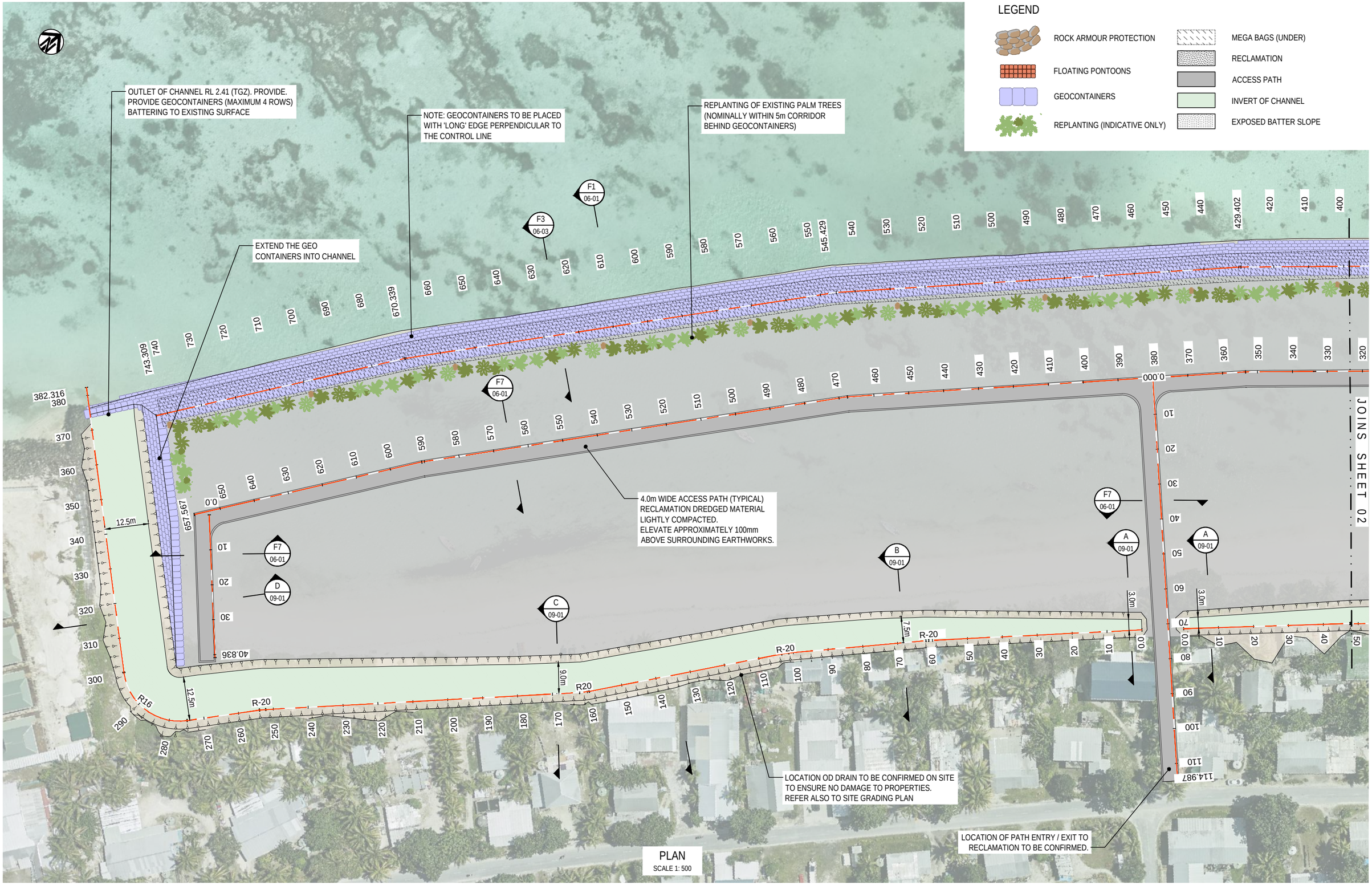
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL NOTES
SHEET 2

DRG NO. P19012-FN-CV-02-02
REV. A



PLAN
SCALE 1: 500

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 5 10 15 20 25m
SCALE 1:500 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
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TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
GENERAL ARRANGEMENT PLAN SHEET 1

DRG NO.
P19012-FN-CV-03-01

REV.
A

NOTE: GEOCONTAINERS TO BE PLACED WITH 'LONG' EDGE PERPENDICULAR TO THE CONTROL LINE

REPLANTING OF EXISTING PALM TREES (NOMINALLY WITHIN 5m CORRIDOR BEHIND GEOCONTAINERS)

4.0m WIDE ACCESS PATH (TYPICAL) RECLAMATION DREDGED MATERIAL LIGHTLY COMPACTED. ELEVATE APPROXIMATELY 100mm ABOVE SURROUNDING EARTHWORKS.

LOCATION OD DRAIN TO BE CONFIRMED ON SITE TO ENSURE NO DAMAGE TO PROPERTIES. REFER ALSO TO SITE GRADING PLAN

REFER TO GENERAL ARRANGEMENT SHEET 03-03 FOR CATALINA BOAT HARBOUR DETAIL PLAN

JOINS SHEET 01

F1 06-01 · F3 06-03 · F7 06-01 · B 09-01 · C 09-01

R20 · R5 · R-20 · R-20 · 7.5m · 9.0m · 9.0m · 38.621 · 27.583 · 64.165 · 47.037 · 405.370

LEGEND

- ROCK ARMOUR PROTECTION
- FLOATING PONTOONS
- GEOCONTAINERS
- REPLANTING (INDICATIVE ONLY)
- MEGA BAGS (UNDER)
- RECLAMATION
- ACCESS PATH
- INVERT OF CHANNEL
- EXPOSED BATTER SLOPE

PLAN
SCALE 1: 500

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 5 10 15 20 25m
SCALE 1:500 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
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PROJECT NUMBER
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DRAWING TITLE
GENERAL ARRANGEMENT PLAN SHEET 2

DRG NO.
P19012-FN-CV-03-02

REV.
A

ENSURE PLACEMENT OF GEOCONTAINERS IS IN A UNIFORM PATTERN AS SHOWN WITH MAXIMUM 5m FROM ROCK ARMOUR

TRANSITIONAL AREA FROM GEOCONTAINERS TO ROCK ARMOUR. PLACE ROCK AMOUR FIRST AND BLEND GEOCONTAINERS TO SUIT ROCK FACE AND STRUCTURE.

ROCK ARMOUR PLACED FROM TOP OF BATTER. (RL 5.45 TGZ) TO EXISTING SURFACE (Apprx. RL -0.5 TGZ)

MEGA BAGS PLACED ON RECLAMATION FACE AND BREAKWATER. (BENEATH GEOCONTAINERS AND ROCK ARMOUR

REPLANTING OF PALMS (INDICATIVE ONLY)

TRANSITIONAL AREA FROM GEOCONTAINERS TO ROCK ARMOUR. PLACE ROCK AMOUR FIRST AND BLEND GEOCONTAINERS TO SUIT ROCK FACE AND STRUCTURE. ENSURE PLACEMENT OF GEOCONTAINERS IS IN A UNIFORM PATTERN AS SHOWN A MAXIMUM 5m FROM ROCK ARMOUR

4.0m WIDE ACCESS PATH (TYPICAL) RECLAMATION DREDGED MATERIAL LIGHTLY COMPACTED. ELEVATE APPROXIMATELY 100mm ABOVE SURROUNDING EARTHWORKS.

GEOCONTAINERS IN THIS AREA TO BE PLACED AT 1 in 1

1 in 2 ACCESS RAMP. PONTOONS TO LAY ON BATTER SLOPE AT HIGH/LOW TIDES.

PROVIDE MIN 5.0m WIDE RAMP FOR 4.0m WIDE PONTOONS.

CANDOCK (OR EQUIVALENT) FULL CUBE FLOATING PONTOONS 480 L x 480 W x360 D TOTAL WIDTH 4.0m

PROVIDE 1 in 1 GEOCONTAINER BATTER SLOPE ON EDGES OF RAMP.

GEOCONTAINERS IN THIS AREA TO BE PLACED AT 1 in 1

OUTLET OF CHANNEL RL 2.41 (TGZ). MATCH TO EXISTING LEVELS.

LIMIT OF GEOCONTAINERS AT THE PROPOSED CHANNEL OUTLET

F2 06-02 · F3 06-03 · F4 06-04 · F5 06-05 · F6 06-05 · F7 06-01

LEGEND

- ROCK ARMOUR PROTECTION
- FLOATING PONTOONS
- GEOCONTAINERS
- REPLANTING (INDICATIVE ONLY)
- MEGA BAGS (UNDER)
- RECLAMATION
- ACCESS PATH
- INVERT OF CHANNEL
- EXPOSED BATTER SLOPE

CATALINA BOAT HARBOUR DETAIL PLAN

SCALE 1:250

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 2.5 5 7.5 10 12.5m

SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES

SURVEY PROVIDED BY

HORIZONTAL DATUM

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TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER

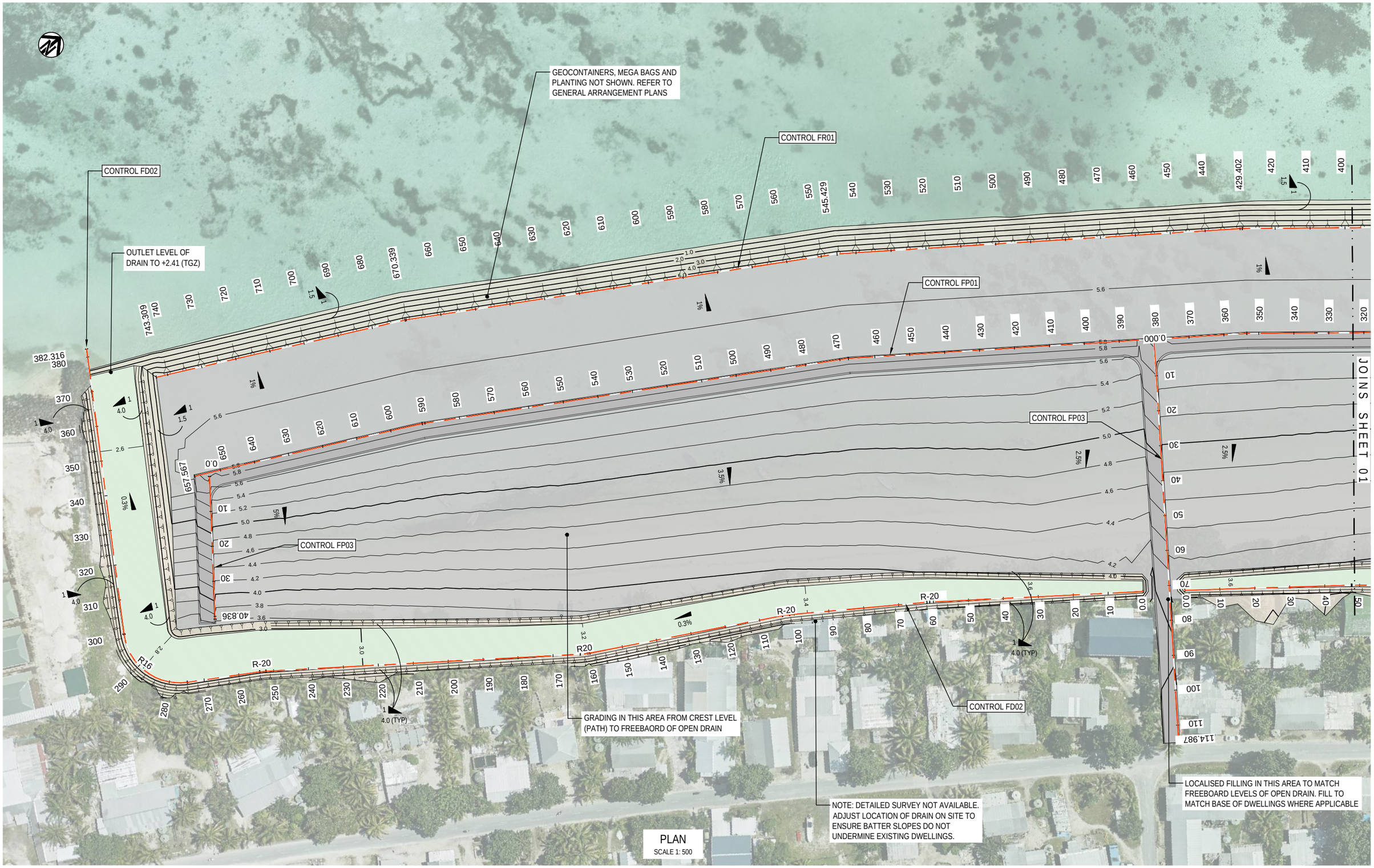
P19012

DRAWING TITLE

GENERALM ARRANGEMENT PLAN SHEET 3
CATALINA BOAT HARBOUR

DRG NO. P19012-FN-CV-03-01

REV. A



PLAN
SCALE 1: 500

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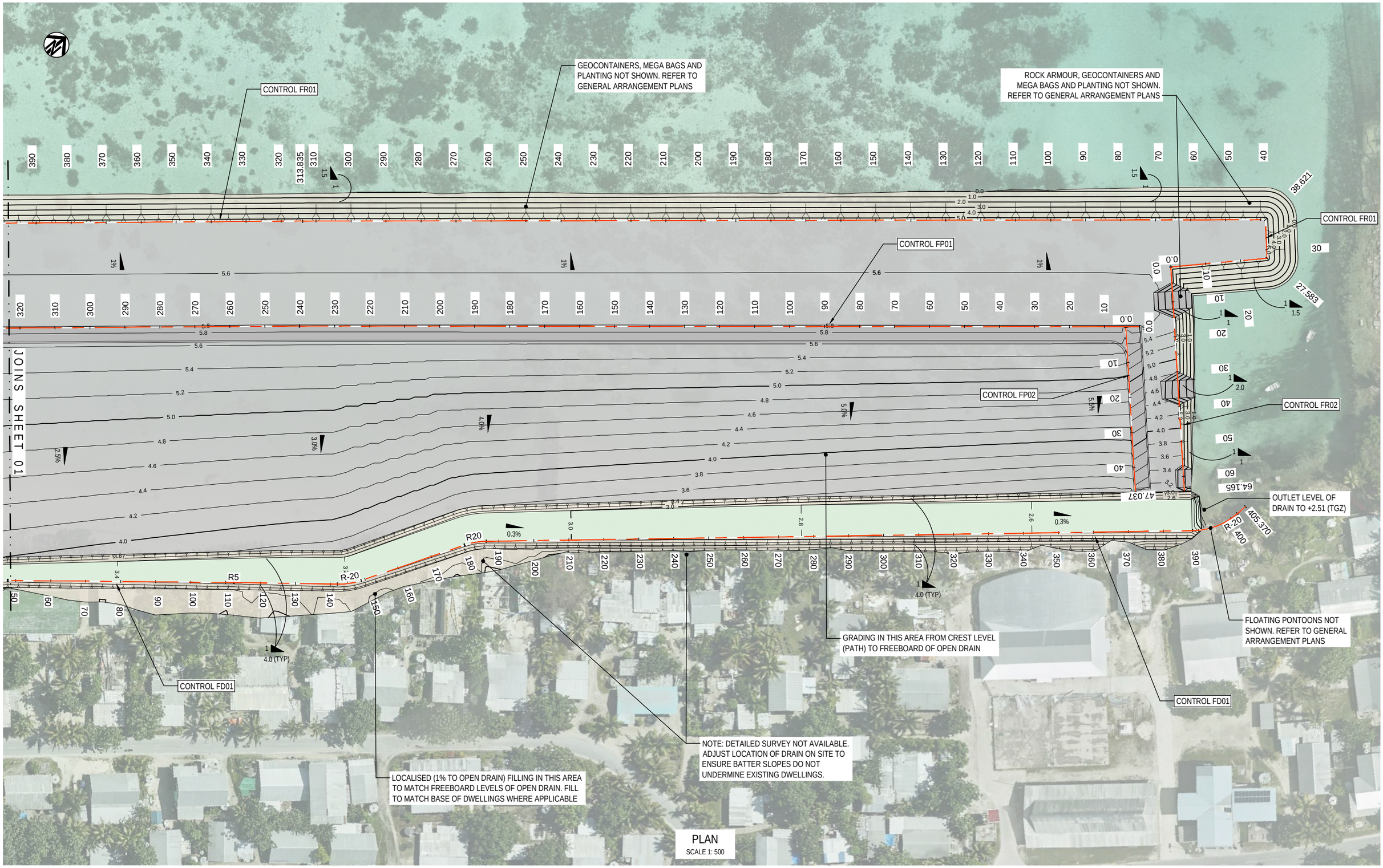
DRAWING TITLE
SITE SETOUT AND GRADING PLAN SHEET 1

DRG NO.
P19012-FN-CV-04-01

REV.
A



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SCALE 1: 500

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PROJECT NUMBER
P19012

DRAWING TITLE
SITE SETOUT AND GRADING PLAN SHEET 2

DRG NO.
P19012-FN-CV-04-02

REV.
A

CONTROL FR01

TYPE	CHAINAGE	EASTING	NORTHING	FSL	BEARING	LENGTH	RADIUS
IP	0	741868.012	9057824.135	5.45	29°47'47.59"		
	10	741872.981	9057832.813	5.45	29°47'47.59"		
	20	741877.951	9057841.491	5.45	29°47'47.59"		
IP	27.583	741881.719	9057848.072	5.45			
	30	741879.683	9057849.375	5.45	302°37'35.43"		
IP	38.621	741872.423	9057854.023	5.45			
	40	741871.635	9057852.891	5.45	214°51'11.31"		
	50	741865.92	9057844.685	5.45	214°51'11.31"		
	60	741860.205	9057836.479	5.45	214°51'11.31"		
	70	741854.49	9057828.272	5.45	214°51'11.31"		
	80	741848.776	9057820.066	5.45	214°51'11.31"		
	90	741843.061	9057811.86	5.45	214°51'11.31"		
	100	741837.346	9057803.654	5.45	214°51'11.31"		
	110	741831.631	9057795.448	5.45	214°51'11.31"		
	120	741825.917	9057787.241	5.45	214°51'11.31"		
	130	741820.202	9057779.035	5.45	214°51'11.31"		
	140	741814.487	9057770.829	5.45	214°51'11.31"		
	150	741808.772	9057762.623	5.45	214°51'11.31"		
	160	741803.058	9057754.417	5.45	214°51'11.31"		
	170	741797.343	9057746.21	5.45	214°51'11.31"		
	180	741791.628	9057738.004	5.45	214°51'11.31"		
	190	741785.913	9057729.798	5.45	214°51'11.31"		
	200	741780.199	9057721.592	5.45	214°51'11.31"		
	210	741774.484	9057713.386	5.45	214°51'11.31"		
	220	741768.769	9057705.179	5.45	214°51'11.31"		
	230	741763.054	9057696.973	5.45	214°51'11.31"		
	240	741757.34	9057688.767	5.45	214°51'11.31"		
	250	741751.625	9057680.561	5.45	214°51'11.31"		
	260	741745.91	9057672.355	5.45	214°51'11.31"		
	270	741740.195	9057664.148	5.45	214°51'11.31"		
	280	741734.481	9057655.942	5.45	214°51'11.31"		
	290	741728.766	9057647.736	5.45	214°51'11.31"		
	300	741723.051	9057639.53	5.45	214°51'11.31"		
	310	741717.336	9057631.324	5.45	214°51'11.31"		
IP	313.835	741715.145	9057628.177	5.45			
	320	741711.649	9057623.099	5.45	214°32'46.27"		
	330	741705.978	9057614.862	5.45	214°32'46.27"		
	340	741700.307	9057606.625	5.45	214°32'46.27"		
	350	741694.637	9057598.389	5.45	214°32'46.27"		
	360	741688.966	9057590.152	5.45	214°32'46.27"		
	370	741683.295	9057581.915	5.45	214°32'46.27"		
	380	741677.625	9057573.679	5.45	214°32'46.27"		
	390	741671.954	9057565.442	5.45	214°32'46.27"		
	400	741666.283	9057557.205	5.45	214°32'46.27"		
	410	741660.612	9057548.968	5.45	214°32'46.27"		
	420	741654.942	9057540.732	5.45	214°32'46.27"		
IP	429.402	741649.61	9057532.987	5.45			
	430	741649.299	9057532.477	5.45	211°20'44.00"		
	440	741644.097	9057523.936	5.45	211°20'44.00"		
	450	741638.895	9057515.396	5.45	211°20'44.00"		
	460	741633.693	9057506.856	5.45	211°20'44.00"		
	470	741628.491	9057498.315	5.45	211°20'44.00"		
	480	741623.289	9057489.775	5.45	211°20'44.00"		
	490	741618.087	9057481.234	5.45	211°20'44.00"		
	500	741612.885	9057472.694	5.45	211°20'44.00"		
	510	741607.683	9057464.153	5.45	211°20'44.00"		
	520	741602.481	9057455.613	5.45	211°20'44.00"		
	530	741597.279	9057447.072	5.45	211°20'44.00"		
	540	741592.077	9057438.532	5.45	211°20'44.00"		
IP	545.429	741589.253	9057433.895	5.45			
	550	741587.232	9057429.795	5.45	206°14'32.38"		
	560	741582.81	9057420.826	5.45	206°14'32.38"		
	570	741578.389	9057411.857	5.45	206°14'32.38"		
	580	741573.967	9057402.887	5.45	206°14'32.38"		
	590	741569.545	9057393.918	5.45	206°14'32.38"		
	600	741565.123	9057384.949	5.45	206°14'32.38"		
	610	741560.702	9057375.98	5.45	206°14'32.38"		
	620	741556.28	9057367.01	5.45	206°14'32.38"		
	630	741551.858	9057358.041	5.45	206°14'32.38"		
	640	741547.437	9057349.072	5.45	206°14'32.38"		
	650	741543.015	9057340.102	5.45	206°14'32.38"		
	660	741538.593	9057331.133	5.45	206°14'32.38"		
	670	741534.172	9057322.164	5.45	206°14'32.38"		
IP	670.339	741534.022	9057321.86	5.45			
	680	741530.403	9057312.902	5.45	201°59'42.49"		
	690	741526.658	9057303.63	5.45	201°59'42.49"		
	700	741522.913	9057294.357	5.45	201°59'42.49"		
	710	741519.168	9057285.085	5.45	201°59'42.49"		
	720	741515.422	9057275.813	5.45	201°59'42.49"		
	730	741511.677	9057266.541	5.45	201°59'42.49"		
	740	741507.932	9057257.269	5.45	201°59'42.49"		
IP	743.309	741506.692	9057254.2	5.45	201°59'42.49"		

CONTROL FD01

TYPE	CHAINAGE	EASTING	NORTHING	FSL	BEARING	LENGTH	RADIUS
IP	0	741724.958	9057460.351	3.64	33°11'54.83"		
	10	741730.433	9057468.719	3.61	33°11'54.83"		
	20	741735.908	9057477.087	3.579	33°11'54.83"		
	30	741741.384	9057485.455	3.549	33°11'54.83"		
	40	741746.859	9057493.822	3.519	33°11'54.83"		
TC	47.639	741751.042	9057500.215	3.495	33°11'54.83"		
IP	47.738	741751.096	9057500.297	3.495		0.197	5
CT	47.836	741751.153	9057500.377	3.495	35°27'12.75"		
	50	741752.408	9057502.14	3.488	35°27'12.75"		
	60	741758.209	9057510.286	3.458	35°27'12.75"		
	70	741764.009	9057518.432	3.427	35°27'12.75"		
	80	741769.809	9057526.578	3.397	35°27'12.75"		
	90	741775.61	9057534.723	3.367	35°27'12.75"		
	100	741781.41	9057542.869	3.336	35°27'12.75"		
	110	741787.211	9057551.015	3.306	35°27'12.75"		
TC	112.333	741788.564	9057552.916	3.299	35°27'12.75"		
IP	112.351	741788.574	9057552.93	3.299		0.035	5
CT	112.368	741788.584	9057552.944	3.299	35°51'03.94"		
	120	741793.054	9057559.13	3.276	35°51'03.94"		
	130	741798.911	9057567.235	3.245	35°51'03.94"		
	140	741804.768	9057575.341	3.215	35°51'03.94"		
TC	141.956	741805.914	9057576.926	3.209	35°51'03.94"		
IP	145.411	741807.957	9057579.755	3.198		6.909	-20
CT	148.865	741808.922	9057583.108	3.188	16°03'29.69"		
	150	741809.236	9057584.198	3.184	16°03'29.69"		
	160	741812.002	9057593.808	3.154	16°03'29.69"		
	170	741814.769	9057603.418	3.124	16°03'29.69"		
	180	741817.535	9057613.028	3.093	16°03'29.69"		
TC	180.125	741817.569	9057613.148	3.093	16°03'29.69"		
IP	183.269	741818.446	9057616.194	3.083		6.289	20
CT	186.414	741820.223	9057618.821	3.074	34°04'29.62"		
	190	741822.232	9057621.791	3.063	34°04'29.62"		
	200	741827.835	9057630.074	3.033	34°04'29.62"		
	210	741833.438	9057638.357	3.002	34°04'29.62"		
	220	741839.04	9057646.641	2.972	34°04'29.62"		
	230	741844.643	9057654.924	2.941	34°04'29.62"		
	240	741850.246	9057663.207	2.911	34°04'29.62"		
	250	741855.849	9057671.49	2.881	34°04'29.62"		
	260	741861.451	9057679.773	2.85	34°04'29.62"		
	270	741867.054	9057688.056	2.82	34°04'29.62"		
	280	741872.657	9057696.339	2.79	34°04'29.62"		
	290	741878.26	9057704.622	2.759	34°04'29.62"		
	300	741883.862	9057712.905	2.729	34°04'29.62"		
	310	741889.465	9057721.188	2.698	34°04'29.62"		
	320	741895.068	9057729.471	2.668	34°04'29.62"		
	330	741900.671	9057737.754	2.638	34°04'29.62"		
	340	741906.273	9057746.037	2.607	34°04'29.62"		
	350	741911.876	9057754.32	2.577	34°04'29.62"		
	360	741917.479	9057762.603	2.547	34°04'29.62"		
	370	741923.082	9057770.886	2.516	34°04'29.62"		
	380	741928.685	9057779.169	2.486	34°04'29.62"		
TC	388.357	741933.367	9057786.092	2.46	34°04'29.62"		
	390	741934.23	9057787.489		29°22'04.74"		
IP	395.331	741937.441	9057792.115			13.6	-20
	400	741936.799	9057797.046		0°43'12.34"		
CT	402.306	741936.695	9057799.348		354°06'50.18"		
IP	405.37	741936.381	9057802.396		354°06'50.18"		

CONTROL FD02

TYPE	CHAINAGE	EASTING	NORTHING	FSL	BEARING	LENGTH	RADIUS
IP	0	741718.427	9057450.371	3.7	212°05'20.27"		
	10	741713.115	9057441.899	3.669	212°05'20.27"		
	20	741707.802	9057433.426	3.638	212°05'20.27"		
	30	741702.49	9057424.954	3.606	212°05'20.27"		
	40	741697.178	9057416.482	3.575	212°05'20.27"		
	50	741691.865	9057408.01	3.544	212°05'20.27"		
	60	741686.553	9057399.537	3.513	212°05'20.27"		
TC	61.057	741685.992	9057398.642	3.51	212°05'20.27"		
IP	61.453	741685.781	9057398.307	3.508		0.793	-20
CT	61.849	741685.584	9057397.963	3.507	209°49'06.13"		
	70	741681.531	9057390.891	3.482	209°49'06.13"		
	80	741676.558	9057382.215	3.45	209°49'06.13"		
	90	741671.586	9057373.539	3.419	209°49'06.13"		
	100	741666.613	9057364.863	3.388	209°49'06.13"		
TC	101.264	741665.985	9057363.766	3.384	209°49'06.13"		
IP	102.29	741665.474	9057362.875	3.381		2.053	-20
CT	103.317	741665.057	9057361.936	3.378	203°56'15.47"		
	110	741662.346	9057355.827	3.357	203°56'15.47"		
	120	741658.288	9057346.688	3.326	203°56'15.47"		
	130	741654.231	9057337.548	3.295	203°56'15.47"		
	140	741650.173	9057328.408	3.263	203°56'15.47"		
	150	741646.116	9057319.268	3.232	203°56'15.47"		
TC	159.415	741642.296	9057310.662	3.203	203°56'15.47"		
	160	741642.051	9057310.132	3.201	205°36'44.04"		
IP	160.796	741641.735	9057309.398	3.199		2.761	20
CT	162.177	741641.005	9057308.224	3.194	211°50'55.08"		
	170	741636.877	9057301.578	3.17	211°50'55.08"		
	180	741631.6	9057293.084	3.139	211°50'55.08"		
	190	741626.323	9057284.589	3.107	211°50'55.08"		
	200	741621.046	9057276.095	3.076	211°50'55.08"		
	210	741615.77	9057267.601	3.045	211°50'55.08"		
	220	741610.493	9057259.106	3.014	211°50'55.08"		
	230	741605.216	9057250.612	2.983	211°50'55.08"		
	240	741599.939	9057242.117	2.951	211°50'55.08"		
	250	741594.663	9057233.623	2.92	211°50'55.08"		
TC	252.112	741593.548	9057231.829	2.914	211°50'55.08"		
IP	253.004	741593.077	9057231.071	2.911		1.784	-20
CT	253.895	741592.676	9057230.274	2.908	206°44'18.23"		
	260	741589.929	9057224.822	2.889	206°44'18.23"		
	270	741585.43	9057215.891	2.858	206°44'18.23"		
TC	274.807	741583.267	9057211.599	2.843	206°44'18.23"		
	280	741580.226	9057207.418	2.827	225°20'06.69"		
IP	287.473	741575.979	9057197.131	2.803		25.332	16
	290	741571.441	9057202.988	2.796	261°08'42.19"		
	300	741561.726	9057204.535	2.764	296°57'17.70"		
CT	300.138	741561.603	9057204.599	2.764	297°27'01.17"		
	310	741552.851	9057209.145	2.733	297°27'01.17"		
	320	741543.977	9057213.755	2.702	297°27'01.17"		
	330	741535.103	9057218.364	2.671	297°27'01.17"		
	340	741526.229	9057222.974	2.64	297°27'01.17"		
	350	741517.355	9057227.584	2.608	297°27'01.17"		
	360	741508.481	9057232.194	2.577	297°27'01.17"		
	370	741499.607	9057236.803	2.546	297°27'01.17"		
	380	741490.732	9057241.413		297°27'01.17"		
IP	382.316	741488.677	9057242.481		297°27'01.17"		

CONTROL FP01

TYPE	CHAINAGE	EASTING	NORTHING	FSL	BEARING	LENGTH	RADIUS
IP	0	741876.858	9057806.986	5.85	214°58'32.74"		
	10	741871.125	9057798.792	5.85	214°58'32.74"		
	20	741865.393	9057790.598	5.85	214°58'32.74"		
	30	741859.661	9057782.404	5.85	214°58'32.74"		
	40	741853.928	9057774.21	5.85	214°58'32.74"		
	50	741848.196	9057766.016	5.85	214°58'32.74"		
	60	741842.464	9057757.822	5.85	214°58'32.74"		
	70	741836.731	9057749.629	5.85	214°58'32.74"		
	80	741830.999	9057741.435	5.85	214°58'32.74"		
	90	741825.267	9057733.241	5.85	214°58'32.74"		
	100	741819.535	9057725.047	5.85	214°58'32.74"		
	110	741813.802	9057716.853	5.85	214°58'32.74"		
	120	741808.07	9057708.659	5.85	214°58'32.74"		
	130	741802.338	9057700.465	5.85	214°58'32.74"		
	140	741796.605	9057692.271	5.85	214°58'32.74"		
	150	741790.873	9057684.077	5.85	214°58'32.74"		
	160	741785.141	9057675.883	5.85	214°58'32.74"		
	170	741779.409	9057667.689	5.85	214°58'32.74"		
	180	741773.676	9057659.495	5.85	214°58'32.74"		
	190	741767.944	9057651.301	5.85	214°58'32.74"		
	200	741762.212	9057643.107	5.85	214°58'32.74"		
	210	741756.479	9057634.913	5.85	214°58'32.74"		
	220	741750.747	9057626.719	5.85	214°58'32.74"		
	230	741745.015	9057618.525	5.85	214°58'32.74"		
	240	741739.282	9057610.331	5.85	214°58'32.74"		
IP	240.12	741739.213	9057610.233	5.85			
	250	741733.61	9057602.096	5.85	214°33'14.12"		
	260	741727.938	9057593.86	5.85	214°33'14.12"		
	270	741722.266	9057585.624	5.85	214°33'14.12"		
	280	741716.594	9057577.388	5.85	214°33'14.12"		
	290	741710.923	9057569.152	5.85	214°33'14.12"		
	300	741705.251	9057560.916	5.85	214°33'14.12"		
	310	741699.579	9057552.68	5.85	214°33'14.12"		
	320	741693.907	9057544.445	5.85	214°33'14.12"		
	330	741688.235	9057536.209	5.85	214°33'14.12"		
	340	741682.564	9057527.973	5.85	214°33'14.12"		
	350	741676.892	9057519.737	5.85	214°33'14.12"		
IP	353.445	741674.938	9057516.9	5.85			
	360	741671.528	9057511.301	5.85	211°20'44.00"		
	370	741666.326	9057502.761	5.85	211°20'44.00"		
	380	741661.124	9057494.22	5.85	211°20'44.00"		
	390	741655.922	9057485.68	5.85	211°20'44.00"		
	400	741650.72	9057477.139	5.85	211°20'44.00"		
	410	741645.518	9057468.599	5.85	211°20'44.00"		
	420	741640.316	9057460.058	5.85	211°20'44.00"		
	430	741635.114	9057451.518	5.85	211°20'44.00"		
	440	741629.912	9057442.978	5.85	211°20'44.00"		
	450	741624.71	9057434.437	5.85	211°20'44.00"		
	460	741619.508	9057425.897	5.85	211°20'44.00"		
IP	467.571	741615.57	9057419.431	5.85			
	470	741614.496	9057417.252	5.85	206°14'32.38"		
	480	741610.074	9057408.283	5.85	206°14'32.38"		
	490	741605.652	9057399.313	5.85	206°14'32.38"		
	500	741601.231	9057390.344	5.85	206°14'32.38"		
	510	741596.809	9057381.375	5.85	206°14'32.38"		
	520	741592.387	9057372.405	5.85	206°14'32.38"		
	530	741587.966	9057363.436	5.85	206°14'32.38"		
	540	741583.544	9057354.467	5.85	206°14'32.38"		
	550	741579.122	9057345.497	5.85	206°14'32.38"		
	560	741574.7	9057336.528	5.85	206°14'32.38"		
	570	741570.279	9057327.559	5.85	206°14'32.38"		
	580	741565.857	9057318.589	5.85	206°14'32.38"		
	590	741561.435	9057309.62	5.85	206°14'32.38"		
IP	590.771	741561.095	9057308.929	5.85			
	600	741557.642	9057300.37	5.85	201°57'53.53"		
	610	741553.902	9057291.095	5.85	201°57'53.53"		
	620	741550.162	9057281.821	5.85	201°57'53.53"		
	630	741546.421	9057272.547	5.85	201°57'53.53"		
	640	741542.681	9057263.273	5.85	201°57'53.53"		
	650	741538.941	9057253.999	5.85	201°57'53.53"		
IP	657.567	741536.11	9057246.981	5.85	201°57'53.53"		

CONTROL FR02

TYPE	CHAINAGE	EASTING	NORTHING	FSL	BEARING	LENGTH	RADIUS
IP	0	741868.012	9057824.135	5.45	121°30'01.49"		
	10	741876.538	9057818.91	5.48	121°30'01.49"		
	20	741885.065	9057813.685	5.323	121°30'01.49"		
	30	741893.591	9057808.46	4.817	121°30'01.49"		
	40	741902.118	9057803.235	4.31	121°30'01.49"		
	50	741910.644	9057798.01	3.804	121°30'01.49"		
	60	741919.17	9057792.785	3.298	121°30'01.49"		
IP	64.165	741922.722	9057790.608	3.087	121°30'01.49"		

CONTROL FP02

TYPE	CHAINAGE	EASTING	NORTHING	FSL	BEARING	LENGTH	RADIUS
IP	0	741874.827	9057803.679	5.85	121°37'29.37"		
	10	741883.342	9057798.435	5.308	121°37'29.37"		
	20	741891.857	9057793.192	4.766	121°37'29.37"		
	30	741900.372	9057787.948	4.224	121°37'29.37"		
	40	741908.887	9057782.704	3.681	121°37'29.37"		
IP	47.037	741914.878	9057779.015		121°37'29.37"		

CONTROL FP03

TYPE	CHAINAGE	EASTING	NORTHING	FSL	BEARING	LENGTH	RADIUS
IP	0	741661.518	9057493.966	5.85	121°25'53.55"		
	10	741670.051	9057488.751	5.598	121°25'53.55"		
	20	741678.584	9057483.536	5.345	121°25'53.55"		
	30	741687.116	9057478.321	5.093	121°25'53.55"		
	40	741695.649	9057473.107	4.84	121°25'53.55"		
	50	741704.182	9057467.892	4.588	121°25'53.55"		
	60	741712.714	9057462.677	4.336	121°25'53.55"		
	70	741721.247	9057457.462	4.132	121°25'53.55"		
	80	741729.779	9057452.247	4.036	121°25'53.55"		
	90	741738.312	9057447.033	3.942	121°25'53.55"		
	100	741746.845	9057441.818	4.129	121°25'53.55"		
	110	741755.377	9057436.603	4.202	121°25'53.55"		
IP	114.987	741759.632	9057434.003		121°25'53.55"		

CONTROL FP04

TYPE	CHAINAGE	EASTING	NORTHING	FSL	BEARING	LENGTH	RADIUS
IP	0	741538.642	9057250.418	5.85	122°38'30.17"		
	10	741547.062	9057245.024	5.331	122°38'30.17"		
	20	741555.483	9057239.63	4.812	122°38'30.17"		
	30	741563.903	9057234.236	4.292	122°38'30.17"		
	40	741572.324	9057228.842	3.773	122°38'30.17"		
IP	40.836	741573.028	9057228.392	3.73	122°38'30.17"		

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
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VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
SITE SETOUT TABLES

DRG NO.
P19012-FN-CV-04-03

REV.
A

VOLUMES TABLE

DEPTH		VOLUME (m³)	
FROM	TO	CUT	FILL
-10.000	-5.000	0.000	0.000
-5.000	-4.000	0.000	0.000
-4.000	-3.000	0.000	0.000
-3.000	-2.000	0.000	0.000
-2.000	-1.000	-3.055	0.000
-1.000	0.000	-2292.834	0.000
0.000	1.000	0.000	66740.966
1.000	2.000	0.000	60092.425
2.000	3.000	0.000	53365.277
3.000	4.000	0.000	46141.337
4.000	5.000	0.000	35291.440
5.000	6.000	0.000	10043.825
6.000	10.000	0.000	5.003

NOTE: TOTALS ARE FOR THE ABOVE DEPTH RANGES ONLY

TOTAL CUT	-2295.889
TOTAL FILL	271680.273
TOTAL BALANCE	269384.384
IE EXCESS OF FILL OVER CUT	269384.384

FILL
MATERIAL PLACED FROM EXISTING SURFACE TO EARTHWORK LEVELS. INCLUSIVE OF ALL ROCK, GEOCONTAINERS AND MEGA BAGS

CUT
EXCAVATION TO EARTHWORK LEVELS.

SITE PLAN
SCALE 1: 1,000

CUT FILL CONTOUR LEGEND

- 0.5 — THICKNESS OF FILL REQUIRED (m)
- 0 — CUT FILL TRANSITION LINE
- -0.5 — DEPTH OF CUT REQUIRED (m)

CUT FILL DEPTH LEGEND

-10	to	-5	
-5	to	-4	
-4	to	-3	
-3	to	-2	
-2	to	-1	
-1	to	0	
0	to	1	
1	to	2	
2	to	3	
3	to	4	
4	to	5	
5	to	10	

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 10 20 30 40 50m
SCALE 1:1000 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
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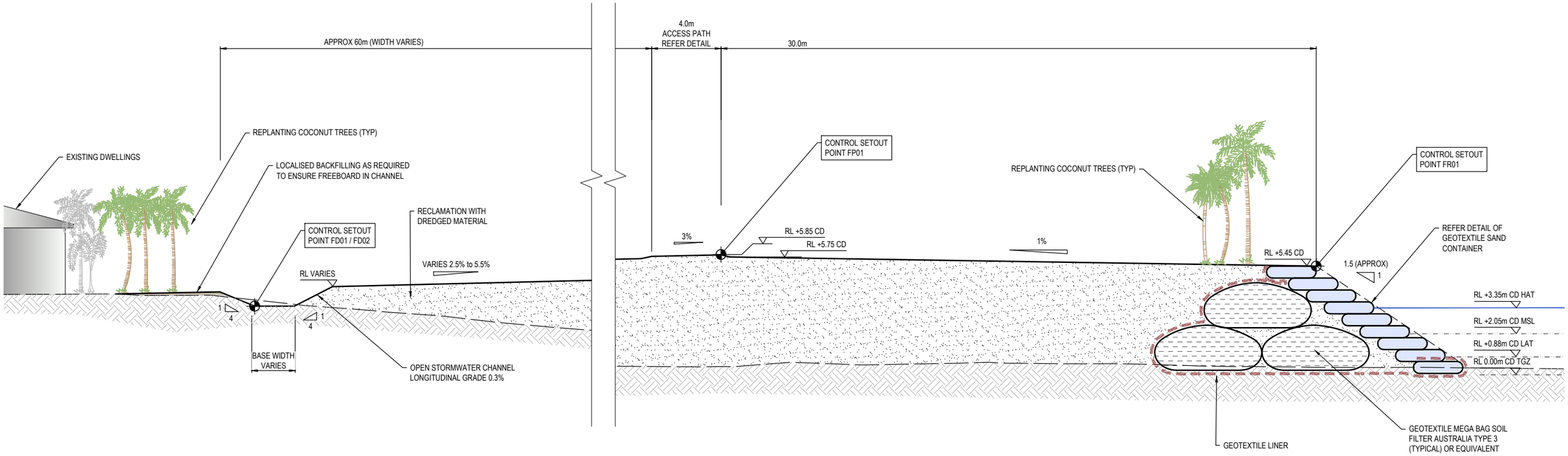
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
EARTHWORK VOLUME MOVEMENT PLAN

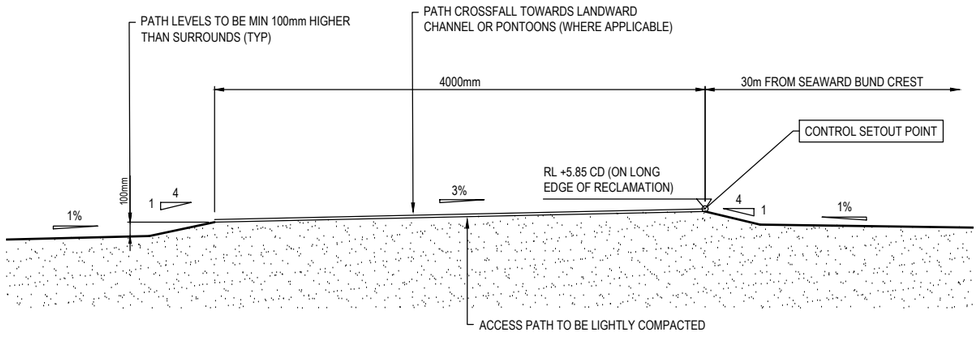
DRG NO. P19012-FN-CV-05-01
REV. A



TYPICAL SECTION - RECLAMATION

SCALE 1:100

F1
03-03, 03-04



TYPICAL SECTION - ACCESS PATH

SCALE 1:25

F7
03-01, 03-02

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

0 0.25 0.5 0.75 1.0 1.25m
SCALE 1:25 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

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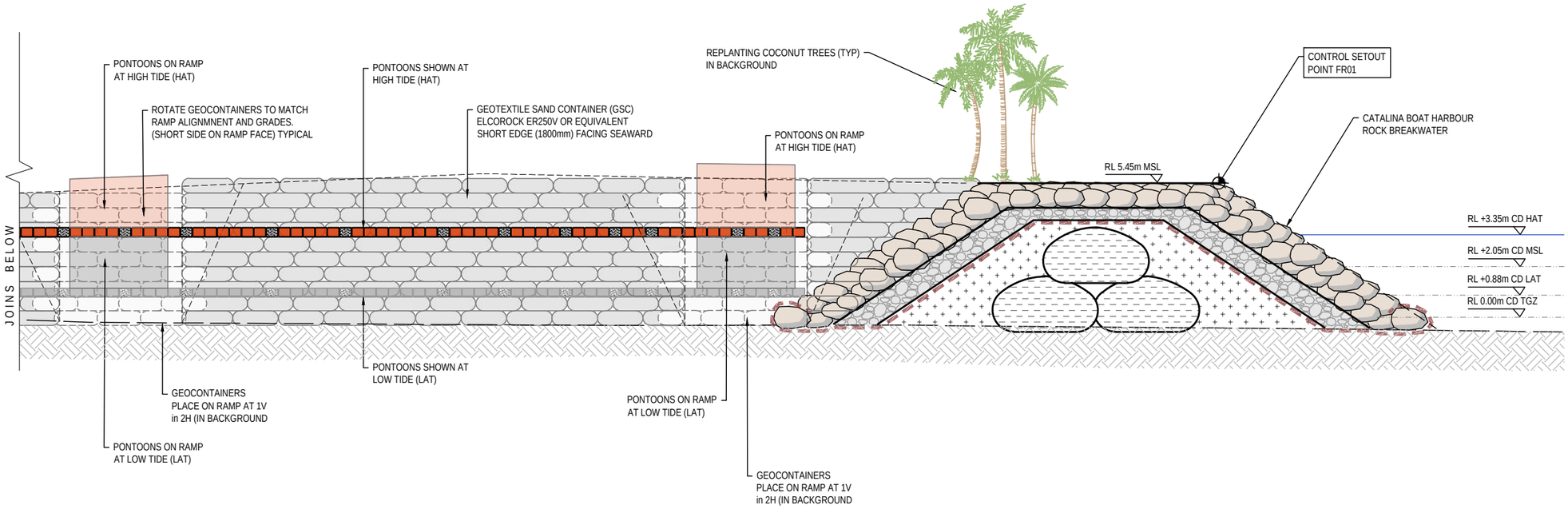
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

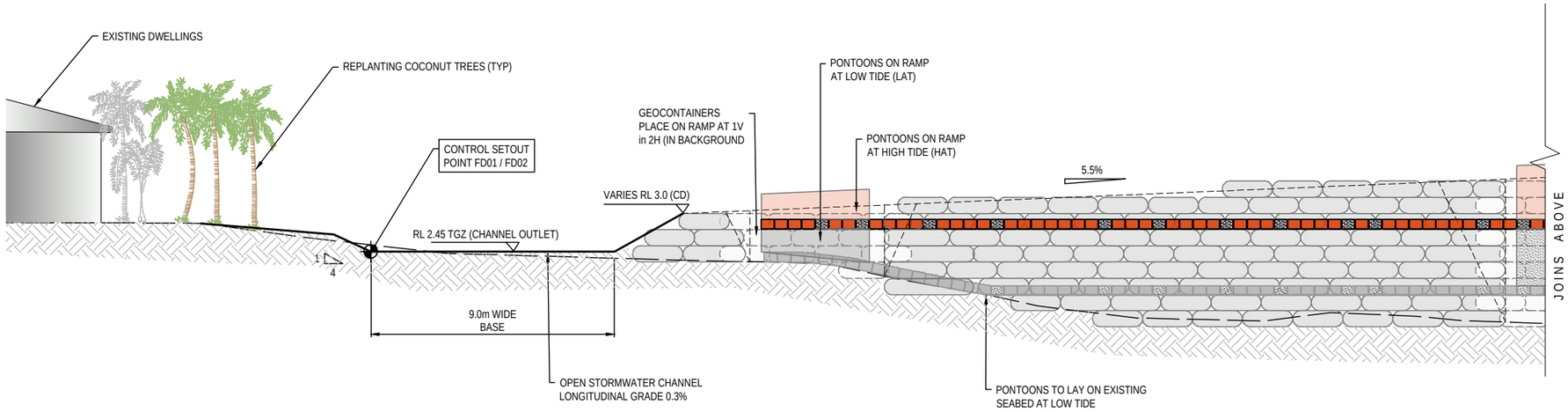
PROJECT NUMBER
P19012

DRAWING TITLE
TYPICAL SECTION AND DETAILS SHEET 1

DRG NO.
P19012-FN-CV-06-01

REV.
A





TYPICAL ELEVATION - CATALINA BOAT HARBOUR

F2
03-03

SCALE 1:100

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

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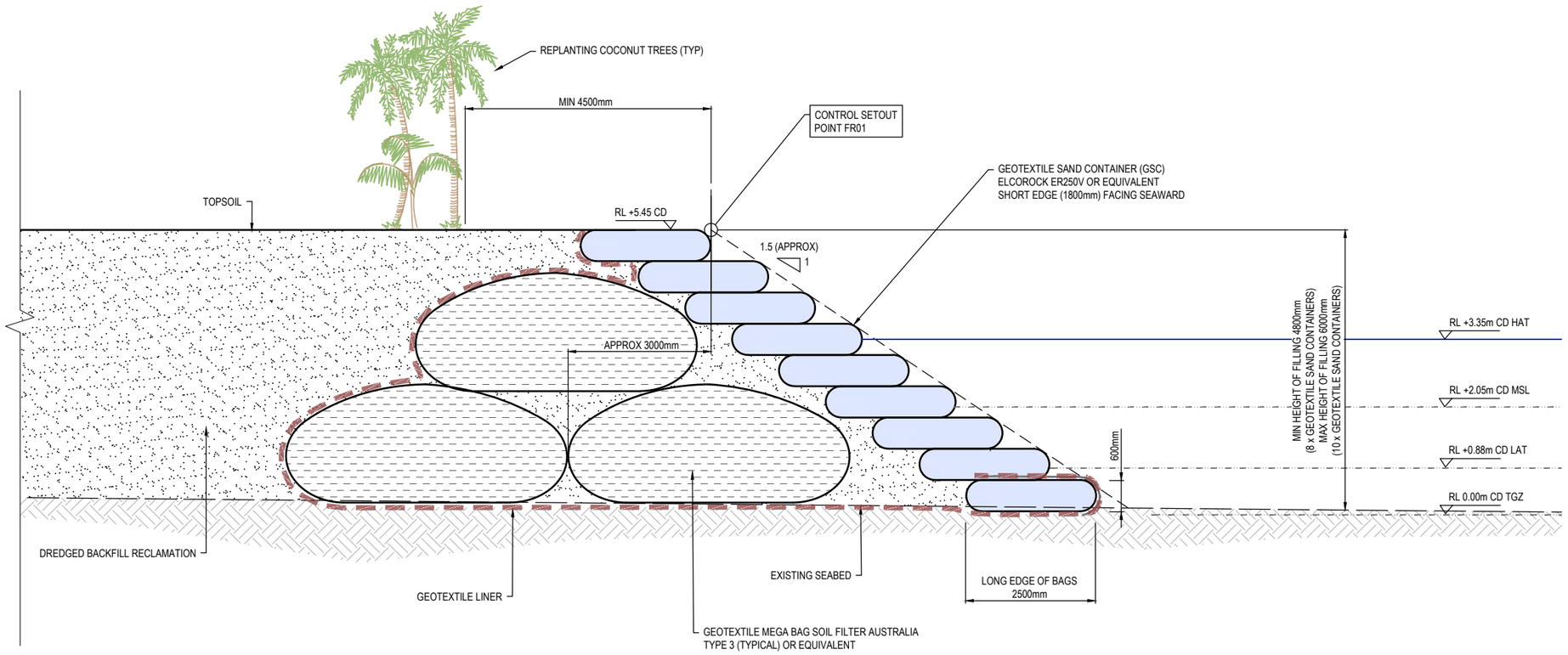
DRAWING TITLE
TYPICAL SECTION AND DETAILS SHEET 2

DRG NO.
P19012-FN-CV-06-02

REV.
A



TYPICAL SECTION - RECLAMATION SEWARD FACE

SCALE 1: 50

F3
03-01,03-04

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
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REFERENCES
SURVEY PROVIDED BY
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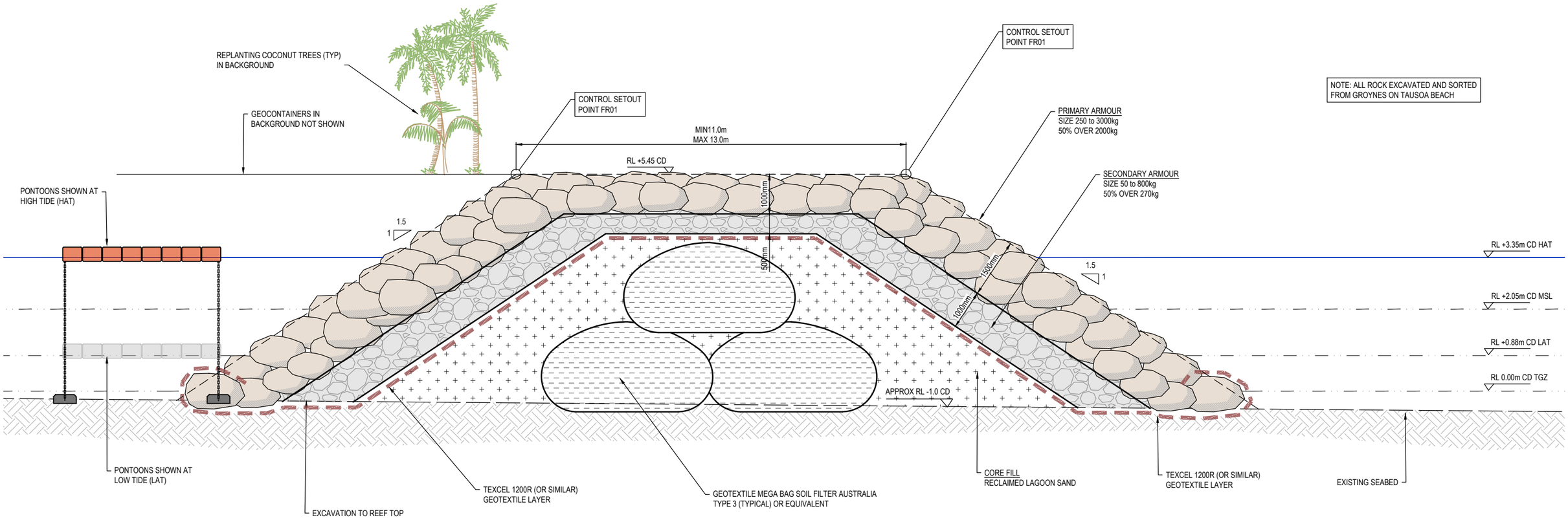
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
TYPICAL SECTION AND DETAILS SHEET 3

DRG NO.
P19012-FN-CV-06-03

REV.
A



TYPICAL SECTION - CATALINA BOAT HARBOUR BREAKWATER

SCALE 1:50

F4
03-03

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
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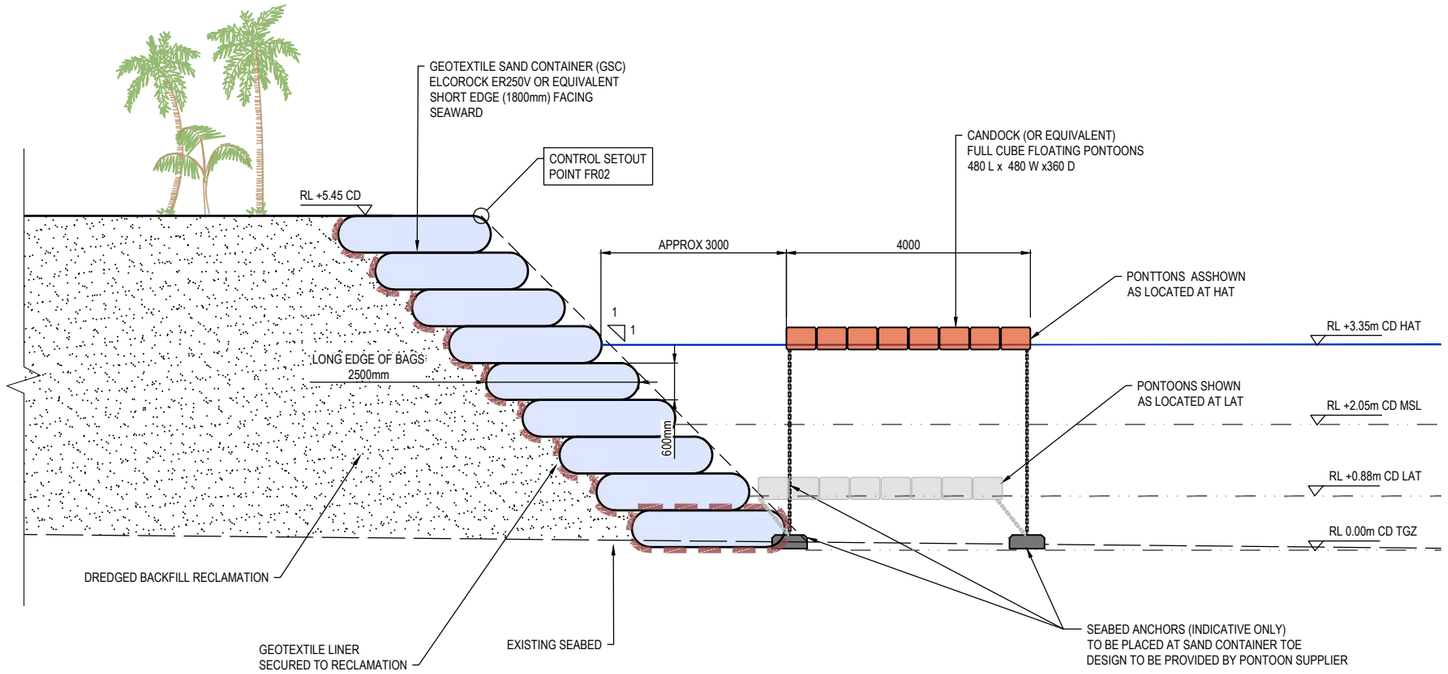
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
TYPICAL SECTION AND DETAILS SHEET 4

DRG NO.
P19012-FN-CV-06-04

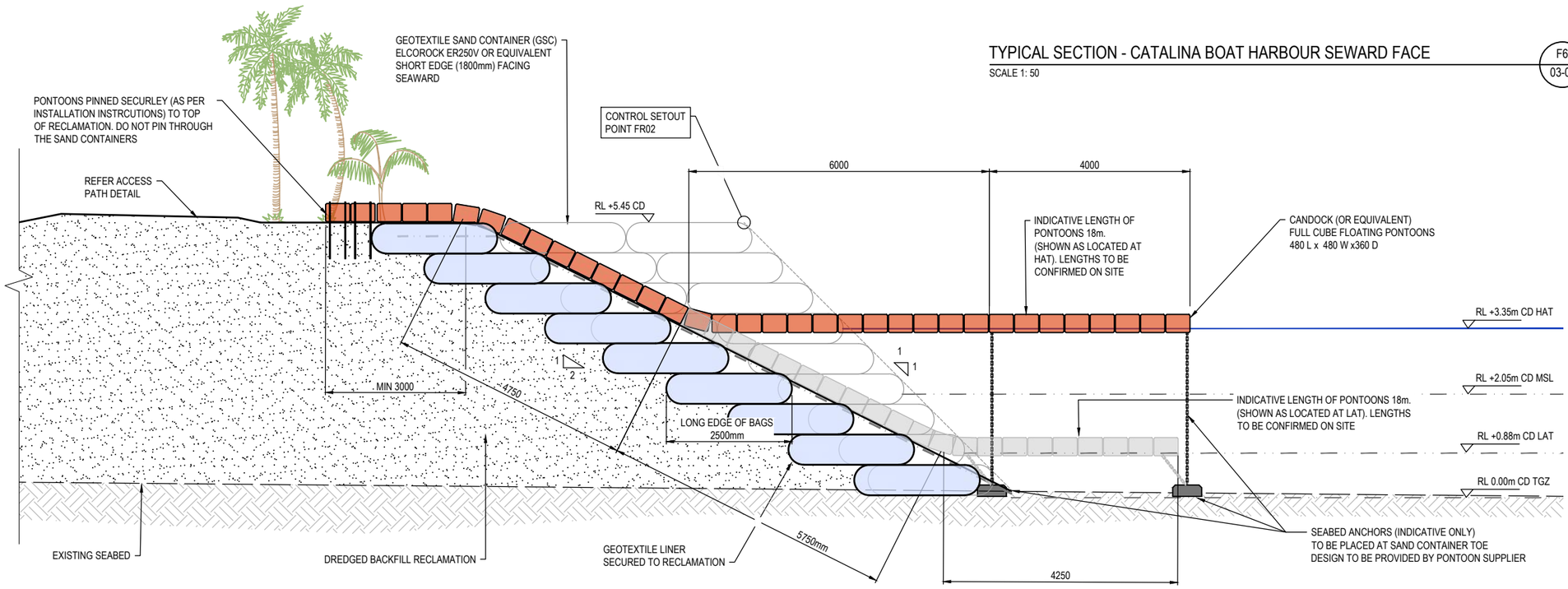
REV.
A



TYPICAL SECTION - CATALINA BOAT HARBOUR SEWARD FACE

SCALE 1: 50

F6
03-03



NOTE: DETAIL SIMILAR FOR NORTHERN AND SOUTHERN RAMPS

TYPICAL SECTION - CATALINA BOAT HARBOUR PONTOON (MID) RAMP

SCALE 1: 50

F5
03-03

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
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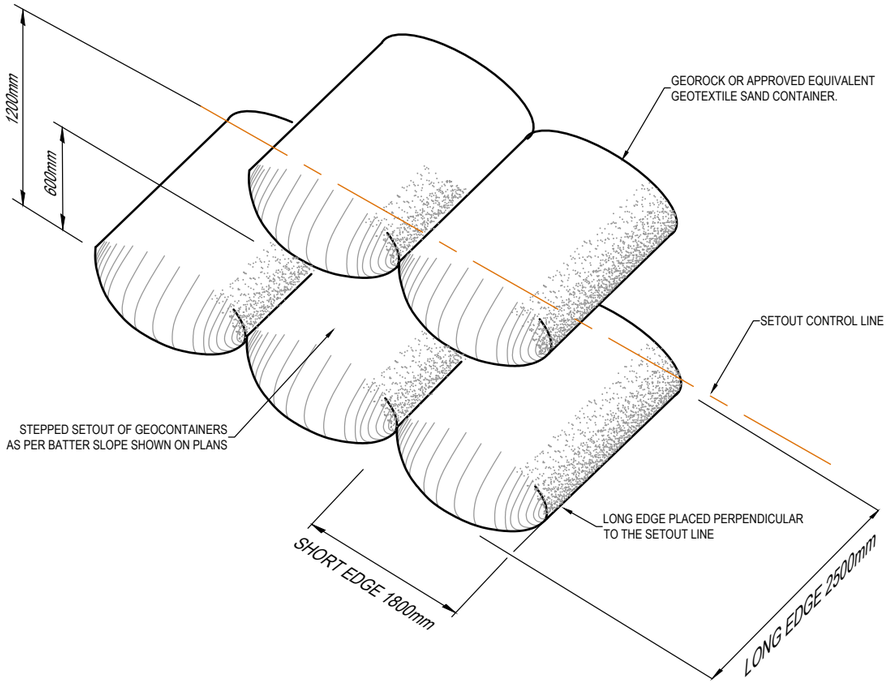
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
TYPICAL SECTION AND DETAILS SHEET 5

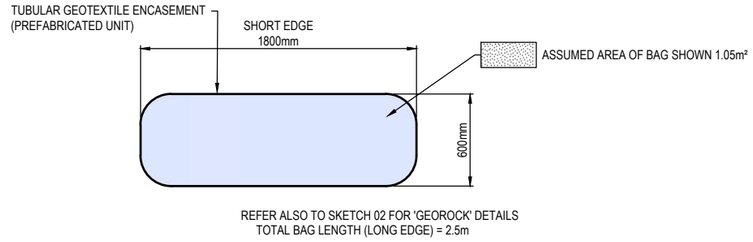
DRG NO.
P19012-FN-CV-06-05

REV.
A



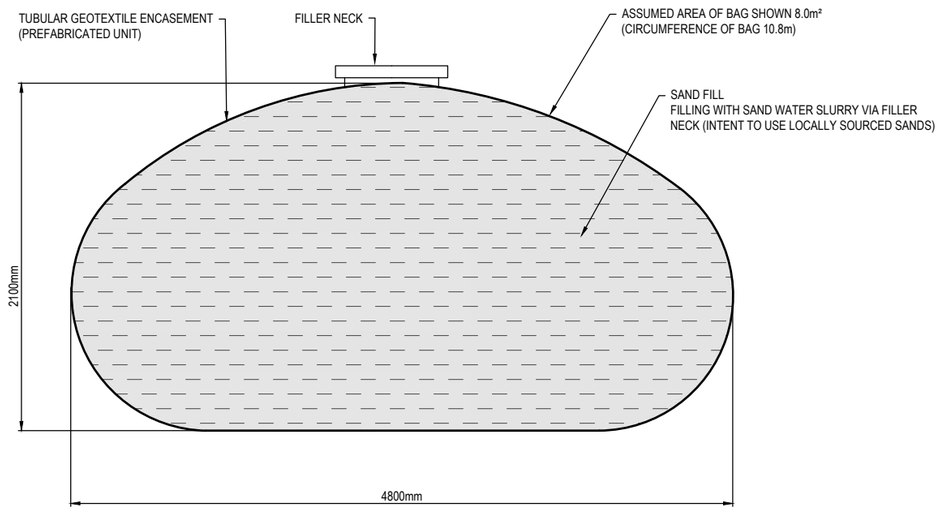
GEOTEXTILE SAND CONTAINER — G2

NOT TO SCALE



GEOTEXTILE SAND CONTAINER — G1

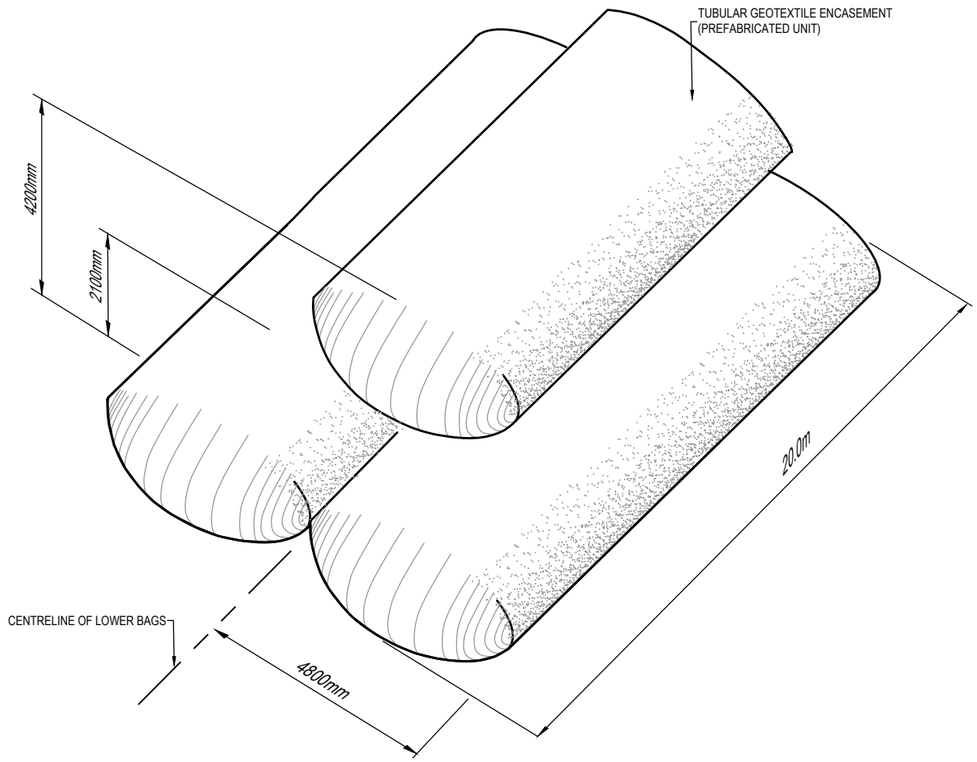
SCALE 1:20



NOTE: LENGTH OF MEGA BAG 20.0m

GEOTEXTILE MEGA CONTAINER (TYPE T3) — M1

SCALE 1:20



SAND (MEGA) CONTAINER (TYPE T3) — M2

NOT TO SCALE

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 0.2 0.4 0.6 0.8 1.0m

SCALE 1:20 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES

SURVEY PROVIDED BY

HORIZONTAL DATUM

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VERTICAL DATUM

CHART DATUM (CD) TGZ

PLANS PREPARED FOR:

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PROJECT

TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER

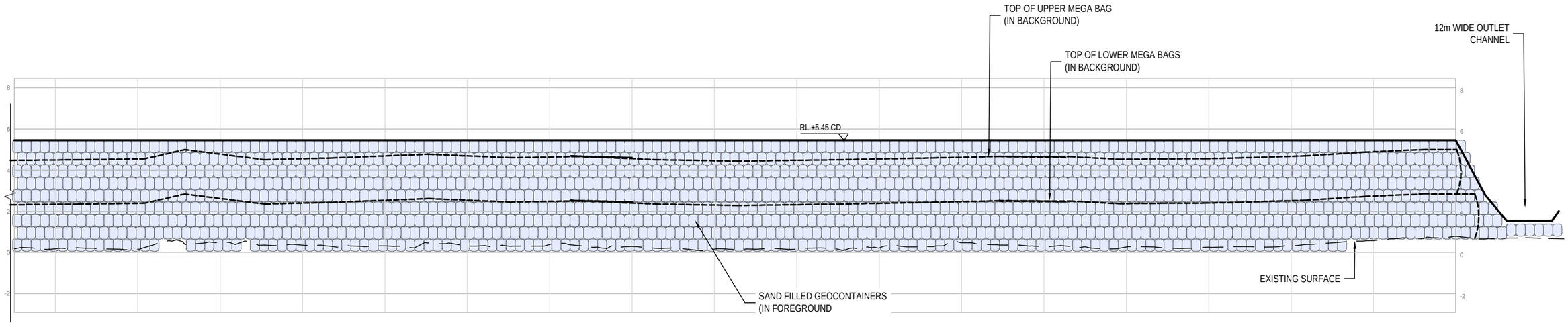
P19012

DRAWING TITLE

TYPICAL SECTION AND DETAILS SHEET 6

DRG NO. P19012-FN-CV-06-06

REV. A

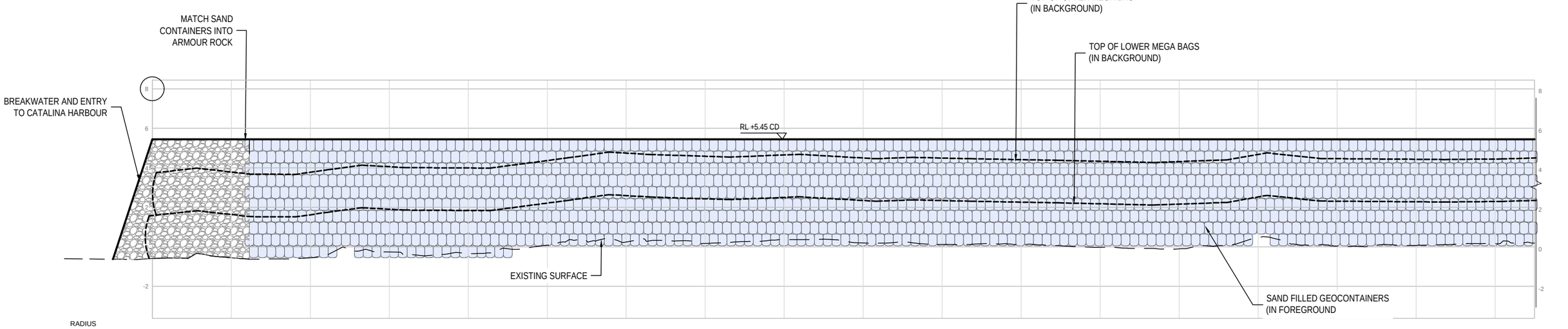


RADIUS

DATUM R.L. -4

CONTROL FR01	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45
EXISTING SURFACE	0.19	0.17	0.16	0.61	0.50	0.35	0.31	0.31	0.39	0.30	0.21	0.16	0.16	0.22	0.47	0.27	0.26	0.21	0.25	0.34	0.58	0.78	
CHAINAGE	390.00	400.00	420.00	429.40	440.00	460.00	480.00	500.00	520.00	540.00	545.43	560.00	580.00	600.00	620.00	640.00	660.00	670.34	680.00	700.00	720.00	740.00	

LONGITUDINAL SECTION FR01



RADIUS

DATUM R.L. -5

CONTROL FR01	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45
EXISTING SURFACE	-0.58	-0.57	-0.55	-0.26	-0.34	0.08	0.25	0.17	0.38	0.20	0.12	0.12	-0.02	-0.11	0.12	0.47	0.04	0.08	0.16	0.19			
CHAINAGE	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00	300.00	313.83	320.00	340.00	360.00	380.00	390.00			

LONGITUDINAL SECTION FR01

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 5 10 15 20 25m
SCALE 1:500 AT ORIGINAL SIZE

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
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UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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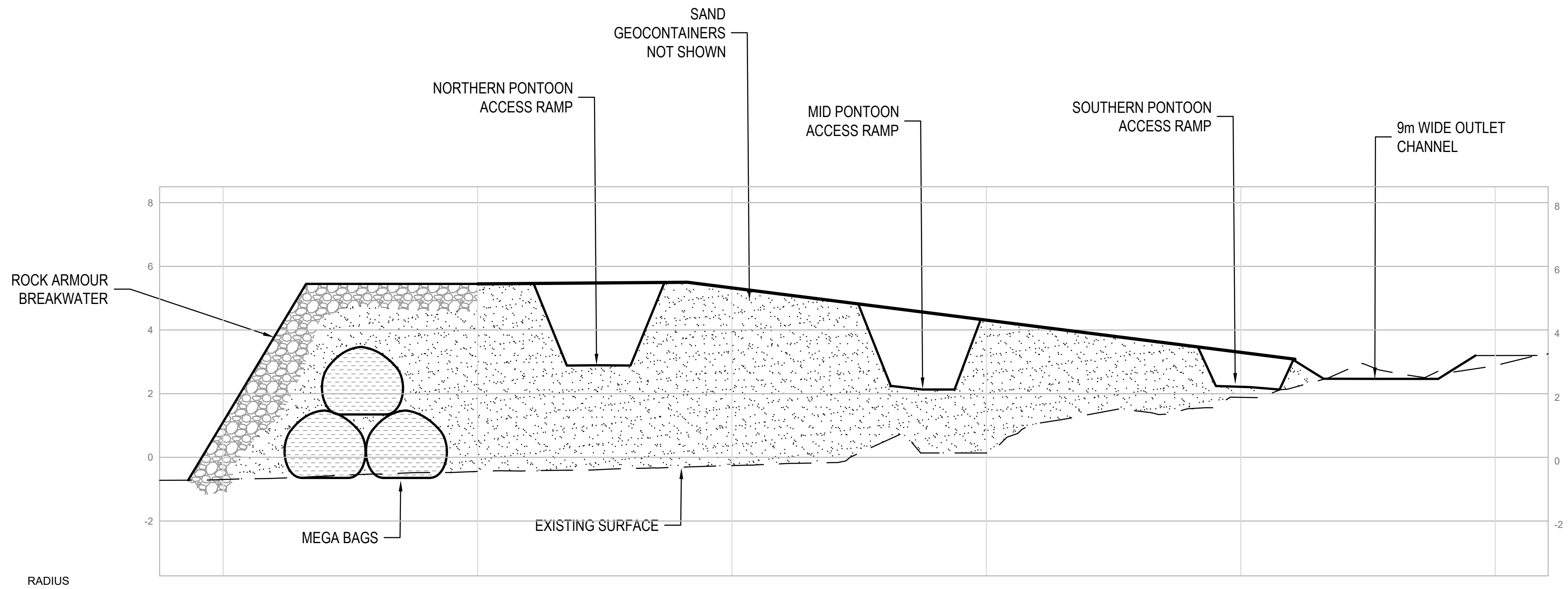
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
RECLAMATION LONGITUDINAL SECTION SHEET 1
CONTROL FR01

DRG NO. P19012-FN-CV-07-01

REV. A



RADIUS

DATUM R.L. -5

CONTROL FR02		5.45	5.47	5.48	5.50	5.50	5.32	5.07	4.82	4.56	4.31	4.06	3.80	3.55	3.30	3.09	
RECLAMATION SURFACE		5.45	4.88	2.89	5.49	5.50	5.32	5.07	4.74	2.13	4.31	4.06	3.80	3.55	2.22	3.09	
EXISTING SURFACE	-0.73	-0.45	-0.42	-0.38	-0.32	-0.30	-0.26	-0.19	0.13	0.14	0.13	1.13	1.49	1.44	1.88	2.19	3.25
CHAINAGE	-25.00	0.00	5.00	10.00	15.00	16.51	20.00	25.00	30.00	35.00	40.00	45.00	50.00	55.00	60.00	64.17	84.17

LONGITUDINAL SECTION FR02

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 2.5 5 7.5 10 12.5m SCALE 1:250 AT ORIGINAL SIZE

0 1 2 3 4 5m SCALE 1:100 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
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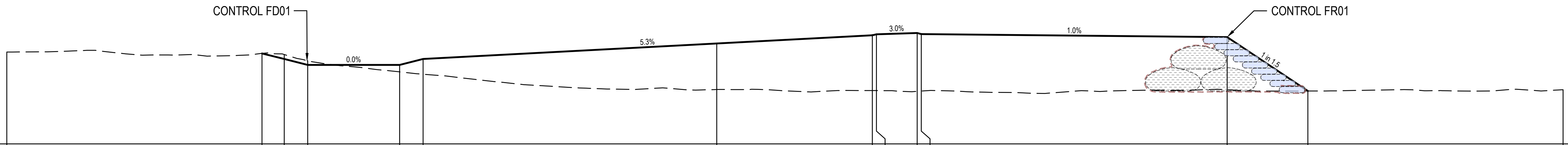
PROJECT NUMBER
P19012

DRAWING TITLE
RECLAMATION LONGITUDINAL SECTION SHEET 2 CONTROL FR02

DRG NO.
P19012-FN-CV-07-02

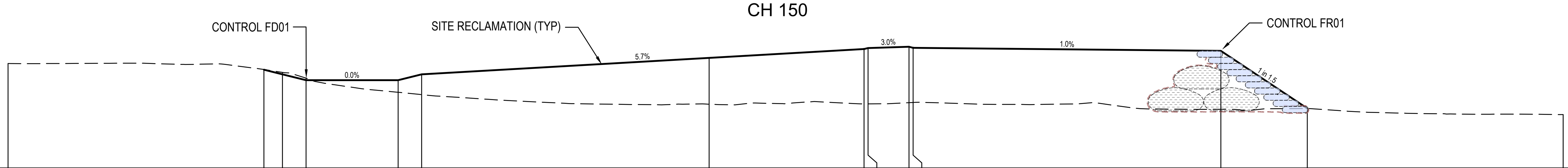
REV.
A



DATUM-5.0

RECLAMATION FSL (CONTROL FR01)		3.86	3.31	2.74	2.73	3.31	4.83	5.63	5.73	5.85	5.75	5.45	0.18	
EXISTING SURFACE	3.99	3.86	3.75	3.14	2.05	1.82	0.32	0.22	0.22	0.14	0.17	0.30	0.18	0.30
OFFSET (-LHS/+RHS)	-119.54	-94.54	-92.36	-90.06	-81.06	-78.76	-50.00	-34.76	-34.36	-30.36	-29.96	0.00	7.91	32.91

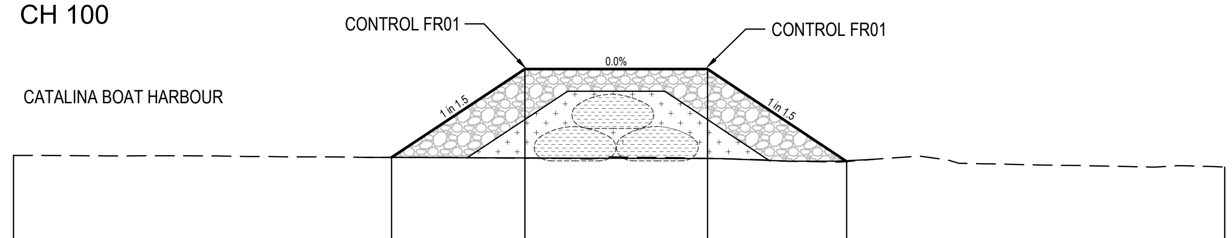
CH 150



DATUM-6.0

RECLAMATION FSL (CONTROL FR01)		3.61	3.16	2.58	2.58	3.16	4.76	5.63	5.73	5.85	5.75	5.45	-0.18	
EXISTING SURFACE	4.22	3.63	3.34	2.78	1.40	1.17	0.23	0.27	0.27	0.38	0.41	-0.26	-0.18	-0.78
OFFSET (-LHS/+RHS)	-118.49	-93.49	-91.68	-89.38	-80.38	-78.08	-50.00	-34.87	-34.47	-30.47	-30.07	0.00	8.45	33.45

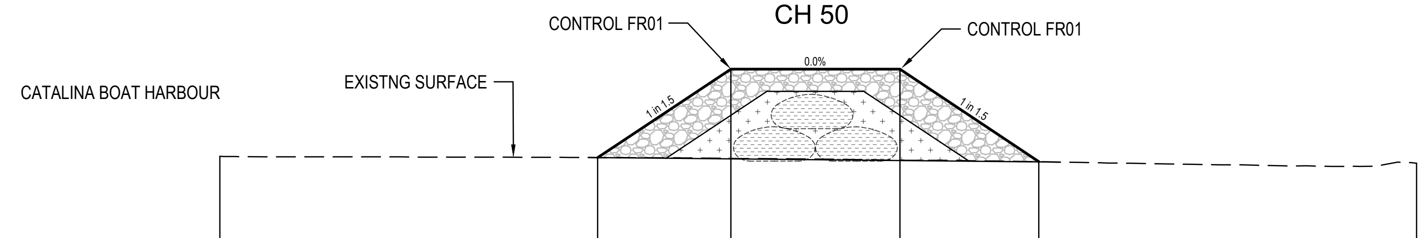
CH 100



DATUM-6.0

RECLAMATION FSL (CONTROL FR01)		-0.40	5.45	5.45	-0.68	
EXISTING SURFACE	-0.28	-0.40	-0.46	-0.47	-0.68	-1.05
OFFSET (-LHS/+RHS)	-45.89	-20.89	-12.07	0.00	9.20	34.20

CH 50



DATUM-6.0

RECLAMATION FSL (CONTROL FR01)		-0.40	5.45	5.45	-0.68	
EXISTING SURFACE	-0.33	-0.40	-0.46	-0.58	-0.68	-0.78
OFFSET (-LHS/+RHS)	-45.00	-20.00	-11.19	0.00	9.19	34.19

CH 40

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220, Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

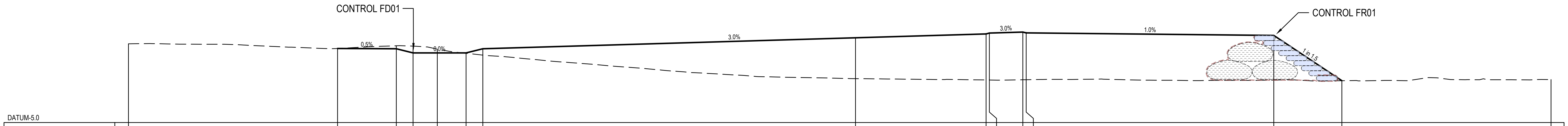
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
RECLAMATION
SITE CROSS SECTIONS
SHEET 1

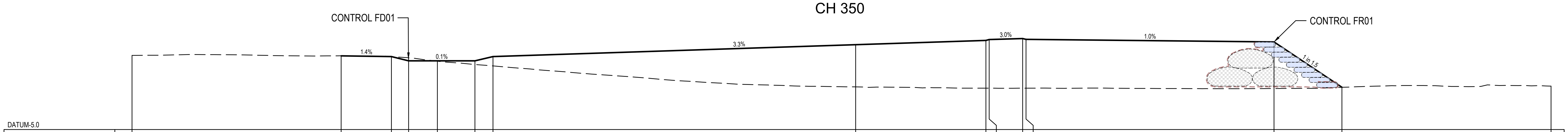
DRG NO.
P19012-FN-CV-08-01

REV.
A



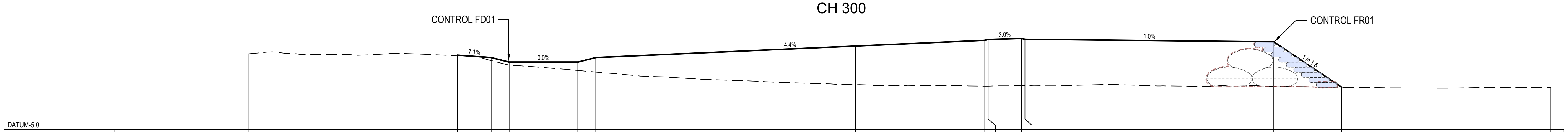
RECLAMATION FSL (CONTROL FR01)		3.88	3.85	3.35	3.35	3.35	3.85	5.17	5.63	5.73	5.85	5.75	5.45	0.02	
EXISTING SURFACE	4.45	3.88	4.21	4.16	3.80	3.30	3.09	0.27	0.10	0.10	0.13	0.14	0.10	0.02	0.16
OFFSET (-LHS/+RHS)	-136.93	-111.93	-104.90	-102.90	-100.00	-96.56	-94.56	-50.00	-34.40	-34.00	-30.00	-29.60	0.00	8.15	33.15

CH 350



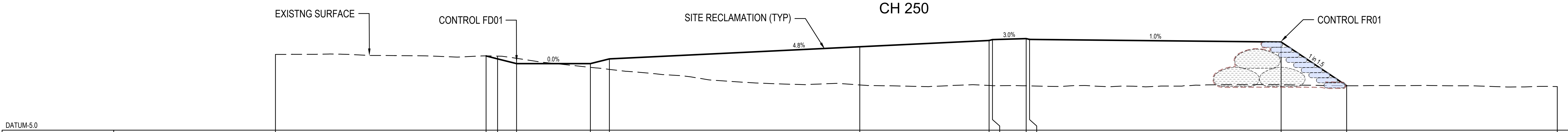
RECLAMATION FSL (CONTROL FR01)		3.79	3.71	3.20	3.19	3.19	3.70	5.12	5.63	5.73	5.85	5.75	5.45	0.03	
EXISTING SURFACE	3.84	3.79	3.69	3.56	3.15	2.76	2.59	0.09	-0.06	-0.07	-0.07	-0.07	-0.11	0.03	0.18
OFFSET (-LHS/+RHS)	-136.50	-111.50	-105.49	-103.44	-100.00	-95.52	-93.36	-50.00	-34.44	-34.04	-30.04	-29.64	0.00	8.12	33.12

CH 300



RECLAMATION FSL (CONTROL FR01)		3.86	3.58	3.04	3.04	3.57	4.95	5.63	5.73	5.85	5.75	5.45	0.03	
EXISTING SURFACE	4.01	3.78	3.21	2.68	2.03	1.84	0.32	0.17	0.16	0.23	0.24	0.16	0.03	-0.00
OFFSET (-LHS/+RHS)	-122.62	-97.62	-93.57	-91.42	-83.19	-81.04	-50.00	-34.54	-34.14	-30.14	-29.74	0.00	8.13	33.13

CH 250



RECLAMATION FSL (CONTROL FR01)		3.79	3.45	2.89	2.89	3.45	4.89	5.63	5.73	5.85	5.75	5.45	0.26	
EXISTING SURFACE	3.98	3.81	3.77	3.51	2.44	2.20	0.36	0.30	0.28	0.26	0.25	0.38	0.26	0.17
OFFSET (-LHS/+RHS)	-119.36	-94.36	-92.99	-90.74	-81.98	-79.72	-50.00	-34.65	-34.25	-30.25	-29.85	0.00	7.78	32.78

CH 200

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
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www.bluecoastconsulting.com.au

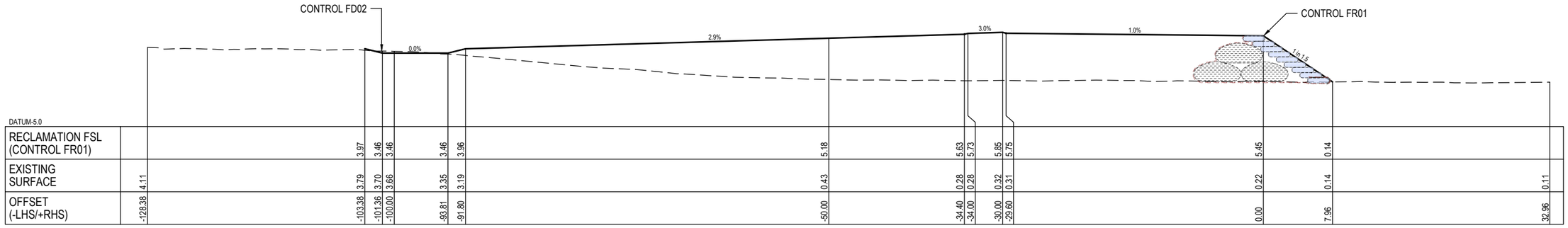
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

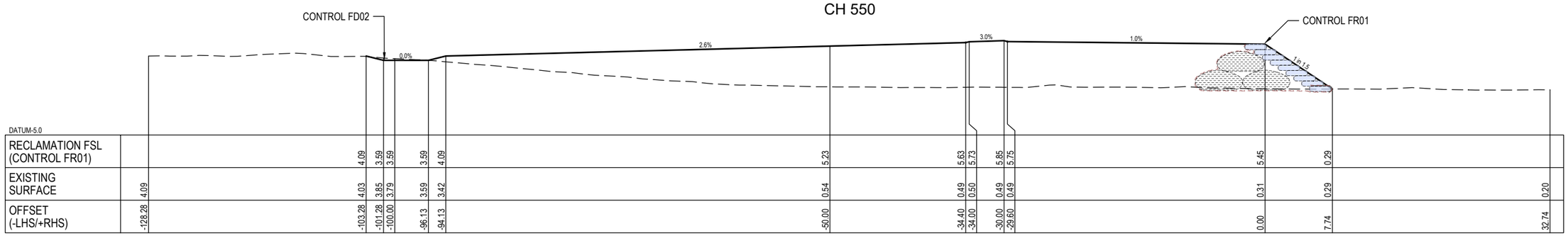
DRAWING TITLE
RECLAMATION SITE CROSS SECTIONS SHEET 2

DRG NO.
P19012-FN-CV-08-02

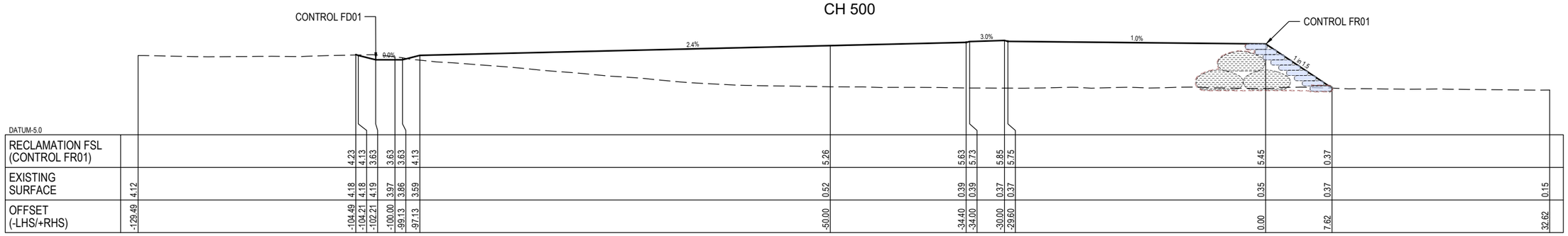
REV.
A



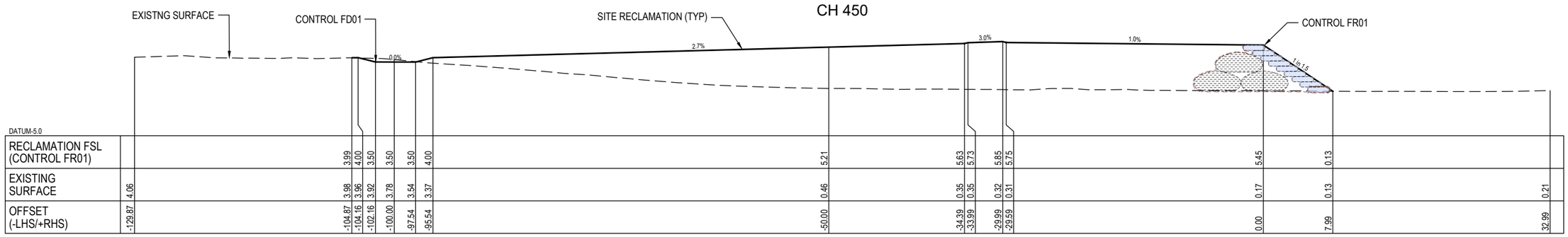
CH 550



CH 500



CH 450



CH 400

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
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CONSULTING ENGINEERS
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Burleigh Heads
QLD, 4220, Australia
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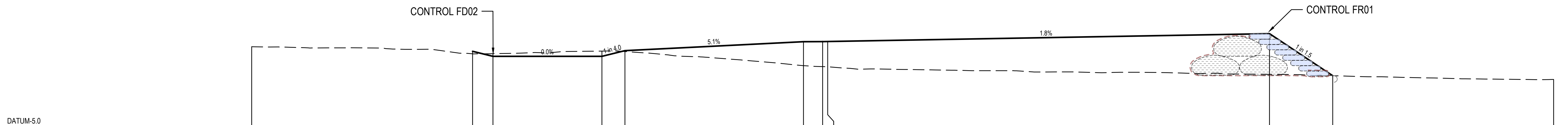
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

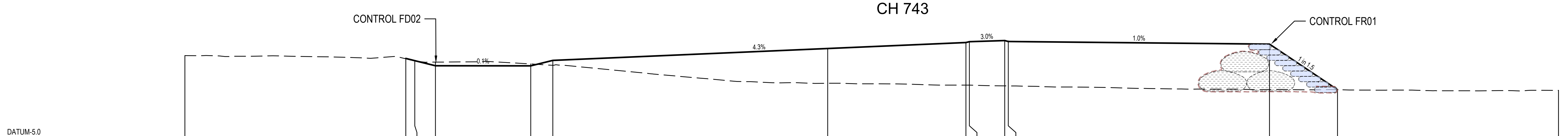
DRAWING TITLE
RECLAMATION
SITE CROSS SECTIONS
SHEET 3

DRG NO. P19012-FN-CV-08-03
REV. A



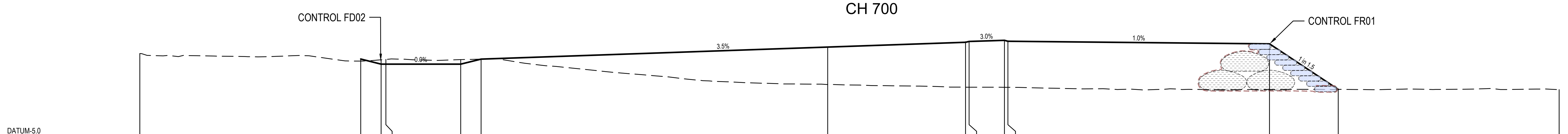
RECLAMATION FSL (CONTROL FR01)		3.45	2.88	2.87	3.52	4.54	4.56	4.57	5.45	0.68	
EXISTING SURFACE	3.97	3.17	3.18	3.48	3.42	1.82	1.71	1.69	0.84	0.68	0.25
OFFSET (-LHS/+RHS)	-115.19	-90.19	-87.88	-75.55	-72.95	-52.74	-50.57	-50.00	0.00	7.15	32.15

CH 743



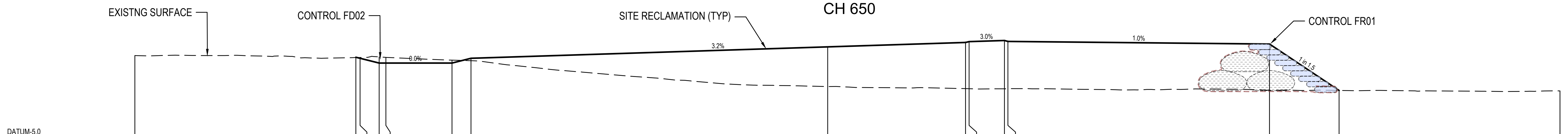
RECLAMATION FSL (CONTROL FR01)		3.84	3.59	3.01	3.01	3.62	4.96	5.63	5.73	5.85	5.75	5.45	0.32	
EXISTING SURFACE	4.16	3.80	3.56	3.43	3.23	3.07	1.05	0.84	0.83	0.75	0.75	0.34	0.32	0.24
OFFSET (-LHS/+RHS)	-122.74	-97.74	-96.72	-94.39	-83.60	-81.10	-50.00	-34.36	-33.96	-29.96	-29.56	0.00	7.70	32.70

CH 700



RECLAMATION FSL (CONTROL FR01)		3.72	3.15	3.15	3.15	3.72	5.09	5.63	5.73	5.85	5.75	5.45	0.27	
EXISTING SURFACE	4.35	3.50	3.64	3.68	3.66	3.72	0.83	0.52	0.52	0.51	0.51	0.27	0.27	0.24
OFFSET (-LHS/+RHS)	-127.84	-102.84	-100.54	-100.00	-91.53	-89.22	-50.00	-34.40	-34.00	-30.00	-29.60	0.00	7.77	32.77

CH 650



RECLAMATION FSL (CONTROL FR01)		3.96	3.84	3.30	3.30	3.31	3.84	5.13	5.63	5.73	5.85	5.75	5.45	0.20	
EXISTING SURFACE	4.15	3.92	3.93	4.00	3.95	3.63	3.57	0.65	0.41	0.40	0.39	0.40	0.22	0.20	0.15
OFFSET (-LHS/+RHS)	-128.40	-103.40	-102.91	-100.76	-100.00	-92.51	-90.37	-50.00	-34.40	-34.00	-30.00	-29.60	0.00	7.87	32.87

CH 600

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

PLANS PREPARED BY:
bluecoast
CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220, Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

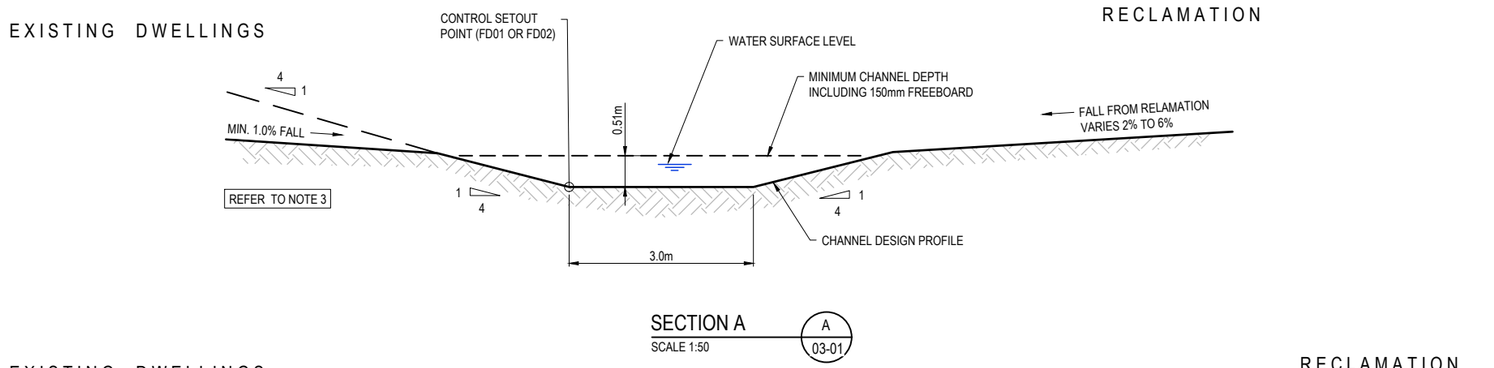
DRAWING TITLE
RECLAMATION
SITE CROSS SECTIONS
SHEET 4

DRG NO.
P19012-FN-CV-08-04

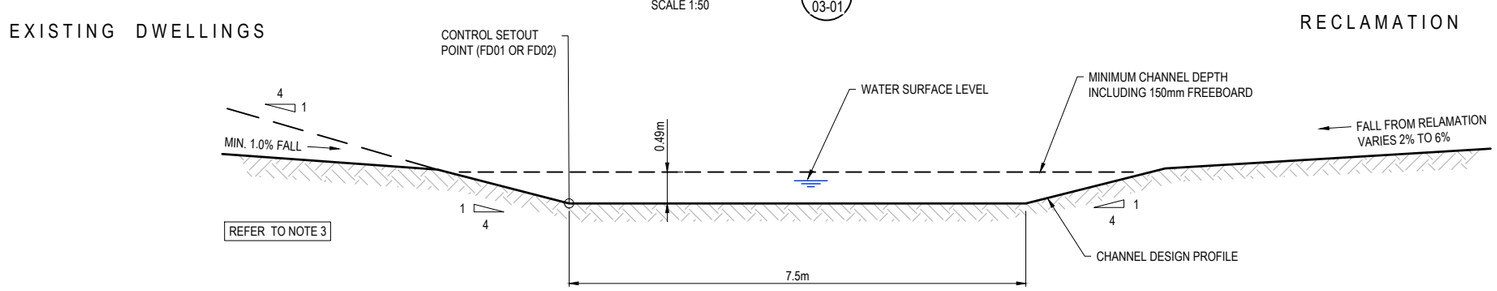
REV.
A

NOTES:

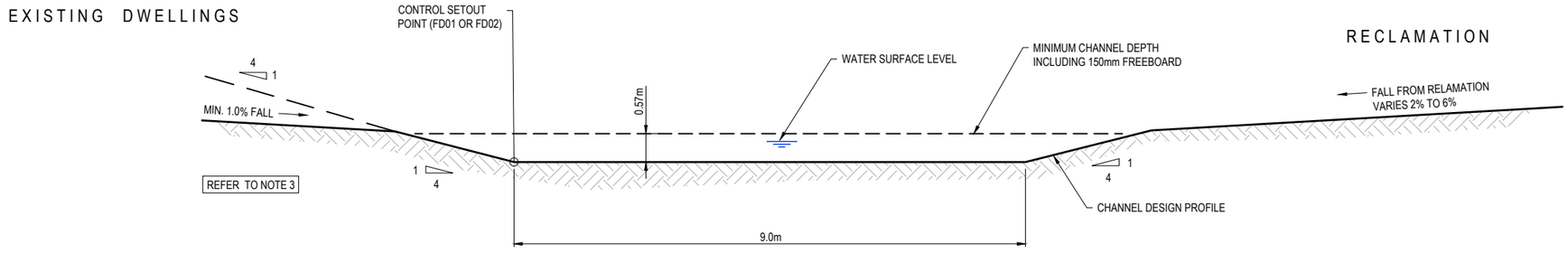
1. FOR FURTHER DRAINAGE INFORMATION (CATCHMENTS AND DATA) REFER TO ARCADIS REPORT 'FUNAFUTI RECLAMATION DRAINAGE INVESTIGATION., 15.07.2020 Ref 0001-30056428-MEMO-AAR-02.
2. OPEN CHANNEL SECTIONS REPRODUCED WITH PERMISSION FROM ARCADIS PLAN No SK-01-Rev 02 WITHIN REPORT NOTED ABOVE.
3. DETAILED SURVEY NOT AVAILABLE. ADJUST LOCATION OF DRAIN ON SITE TO MINIMISE UNNECESSARY EARTHWORKS AND ENSURE BATTER SLOPES DO NOT DAMAGE OR UNDERMINE EXISTING DWELLINGS.



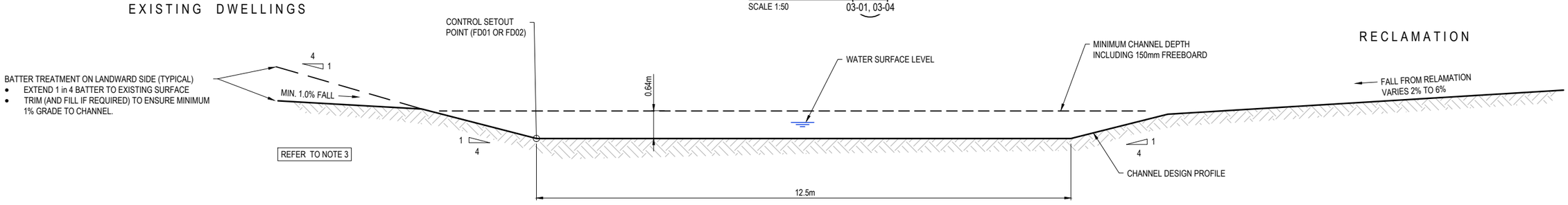
SECTION A (A, 03-01)
SCALE 1:50



SECTION B (B, 03-01, 03-04)
SCALE 1:50



SECTION C (C, 03-01, 03-04)
SCALE 1:50



SECTION D (D, 03-01, 03-04)
SCALE 1:50

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

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GREEN CLIMATE FUND
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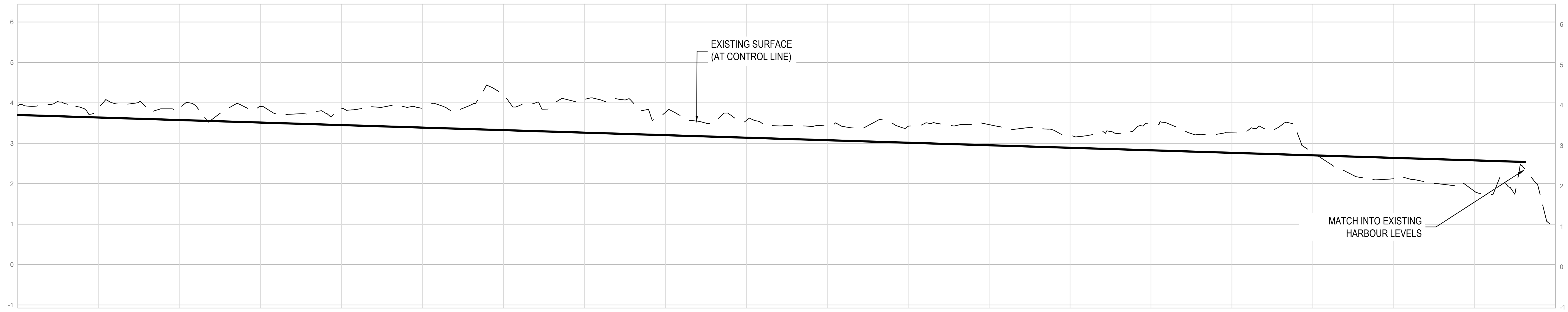
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
OPEN CHANNEL TYPICAL SECTIONS

DRG NO. P19012-FN-CV-09-01
REV. A

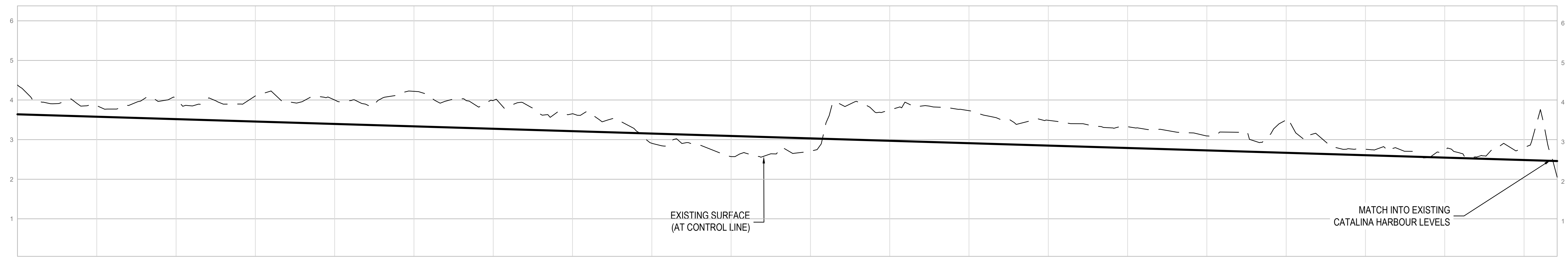


GRADE -0.3%

DATUM R.L. -2

CHAINAGE	CONTROL FD02 (INV.)	EXISTING SURFACE
0.00	3.70	3.94
10.00	3.67	4.03
20.00	3.64	3.88
30.00	3.61	4.03
40.00	3.58	3.87
50.00	3.54	3.74
60.00	3.51	3.91
61.06	3.51	3.88
61.85	3.51	3.83
70.00	3.48	3.73
80.00	3.45	3.85
90.00	3.42	3.89
100.00	3.39	3.88
101.26	3.38	3.94
103.32	3.38	3.98
110.00	3.36	3.87
120.00	3.33	4.21
130.00	3.29	3.85
140.00	3.26	4.09
150.00	3.23	4.07
159.42	3.20	3.71
160.00	3.20	3.76
162.18	3.19	3.77
170.00	3.17	3.50
180.00	3.14	3.56
190.00	3.11	3.44
200.00	3.08	3.44
210.00	3.05	3.43
220.00	3.01	3.42
230.00	2.98	3.45
240.00	2.95	3.46
250.00	2.92	3.39
252.11	2.91	3.37
253.90	2.91	3.36
260.00	2.89	3.18
270.00	2.86	3.29
274.81	2.84	3.29
280.00	2.83	3.48
290.00	2.80	3.24
300.00	2.76	3.26
300.14	2.76	3.26
310.00	2.73	3.31
320.00	2.70	2.77
330.00	2.67	2.21
340.00	2.64	2.12
350.00	2.61	2.01
360.00	2.58	1.81
370.00	2.55	1.78
380.00		0.92

LONGITUDINAL SECTION FD02 (DRAINAGE CHANNEL INVERT)



GRADE -0.3%

DATUM R.L. -1

CHAINAGE	CONTROL FD01 (INV.)	EXISTING SURFACE
0.00	3.64	4.38
10.00	3.61	3.91
20.00	3.58	3.86
30.00	3.55	3.94
40.00	3.52	4.04
47.64	3.50	4.01
47.84	3.49	4.03
50.00	3.49	3.98
60.00	3.46	4.10
70.00	3.43	3.93
80.00	3.40	4.00
90.00	3.37	3.89
100.00	3.34	4.22
110.00	3.31	4.02
112.33	3.30	4.03
112.37	3.30	4.03
120.00	3.28	3.99
130.00	3.25	3.79
140.00	3.21	3.65
141.96	3.21	3.61
148.87	3.19	3.50
150.00	3.18	3.53
160.00	3.15	2.91
170.00	3.12	2.89
180.00	3.09	2.57
180.12	3.09	2.57
186.41	3.07	2.58
190.00	3.06	2.64
200.00	3.03	2.71
210.00	3.00	3.90
220.00	2.97	3.75
230.00	2.94	3.85
240.00	2.91	3.73
250.00	2.88	3.50
260.00	2.85	3.49
270.00	2.82	3.37
280.00	2.79	3.33
290.00	2.76	3.23
300.00	2.73	3.09
310.00	2.70	3.18
320.00	2.67	3.51
330.00	2.64	2.94
340.00	2.61	2.76
350.00	2.58	2.71
360.00	2.55	2.70
370.00	2.52	2.59
380.00	2.49	2.80
388.35	2.46	2.05

LONGITUDINAL SECTION FD01 (DRAINAGE CHANNEL INVERT)

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 5 10 15 20 25m — SCALE 1:500 AT ORIGINAL SIZE

0 0.5 1.0 1.5 2.0 2.5m — SCALE 1:50 AT ORIGINAL SIZE

DESIGNED BY JL
DRAWN BY MLC
CHECKED BY JL
APPROVED AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP — Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT — TCAP

PLANS PREPARED BY:
bluecoast
CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220, Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

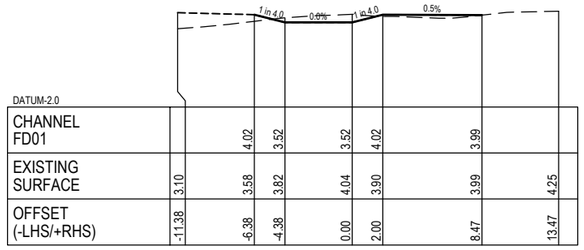
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

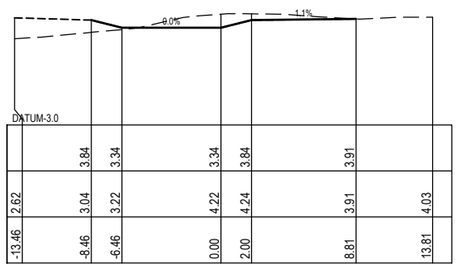
DRAWING TITLE
OPEN CHANNEL LONGITUDINAL SECTIONS

DRG NO.
P19012-FN-CV-10-01

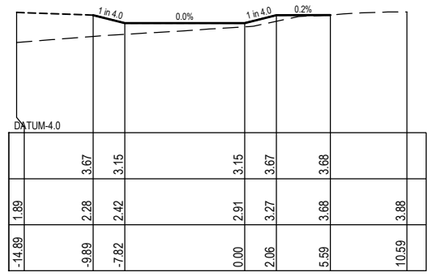
REV.
A



CH 40



CH 100



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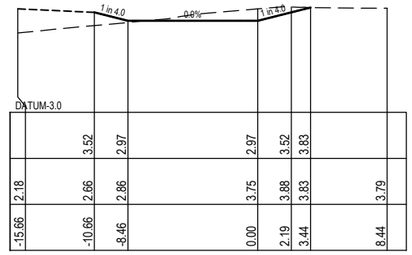

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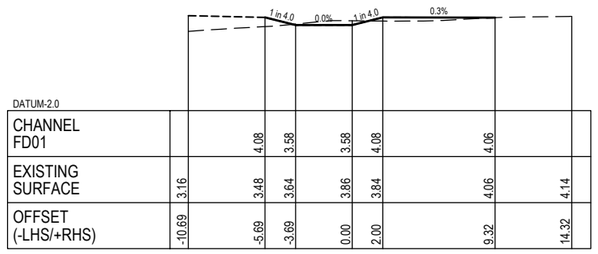
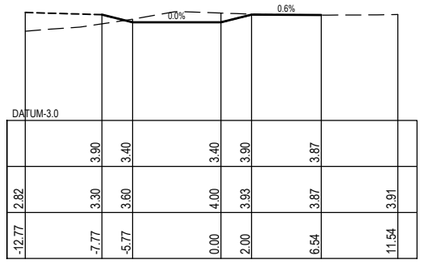
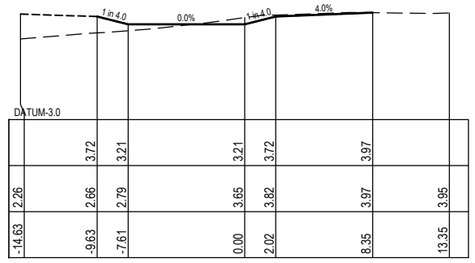


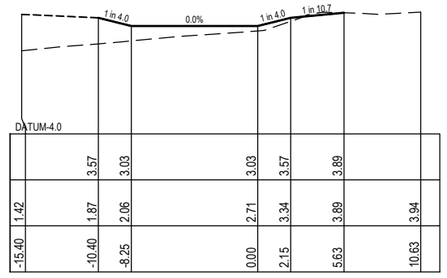
CH 20



CH 80



CH 140



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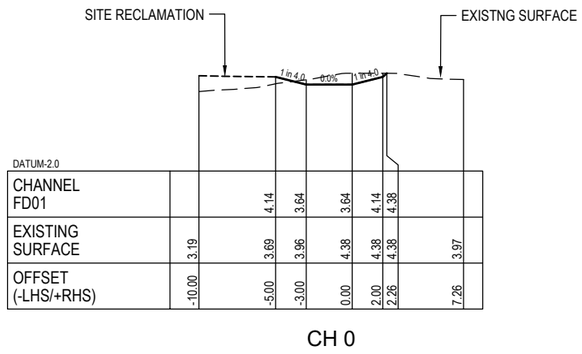
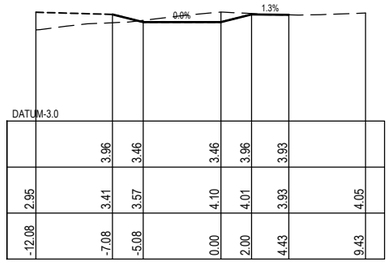
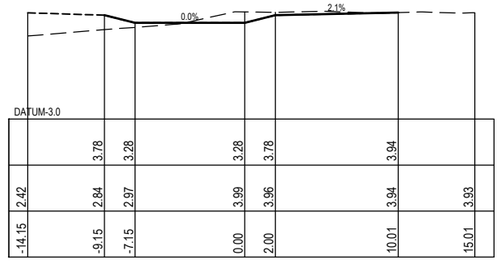


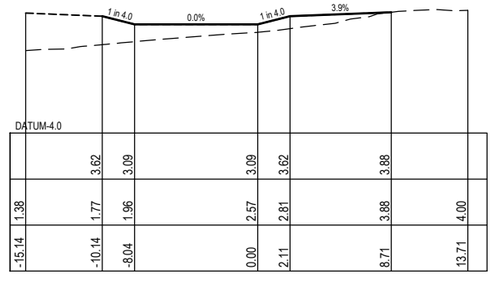
CH 0



CH 60



CH 120



CH 180

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 2 4 6 8 10m
SCALE 1:200 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
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CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

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1/1874 Gold Coast Highway
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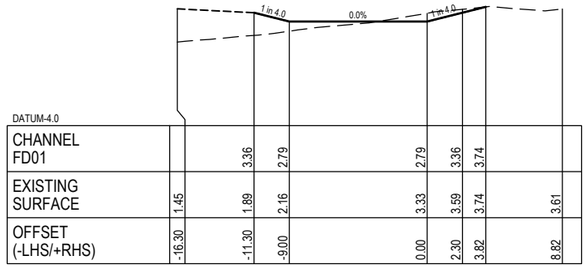
PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

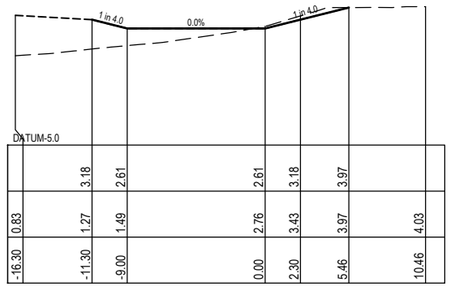
DRAWING TITLE
OPEN CHANNEL SITE CROSS SECTIONS CONTROL FD01 SHEET 1

DRG NO.
P19012-FN-CV-11-01

REV.
A



CH 280



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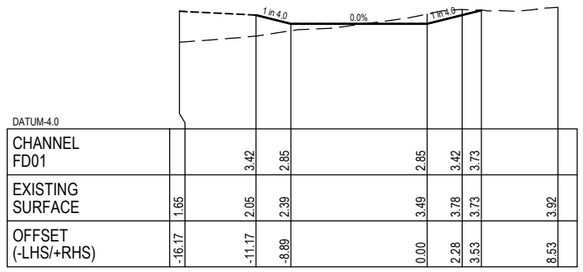
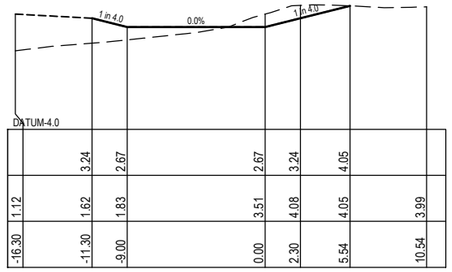
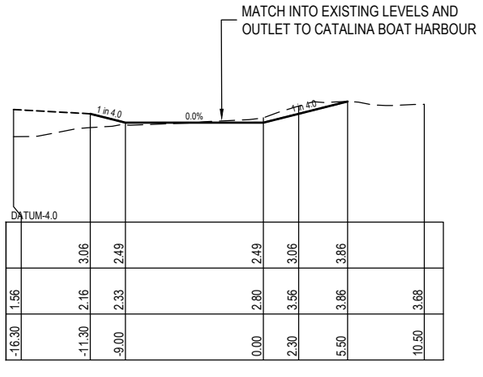


CH 260



CH 320



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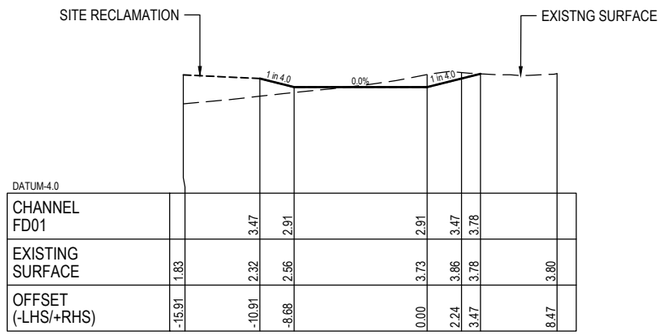

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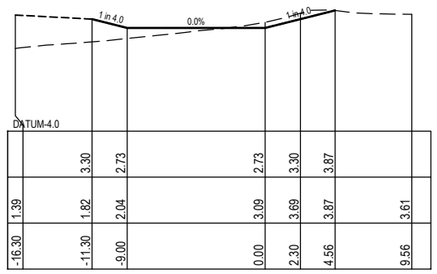
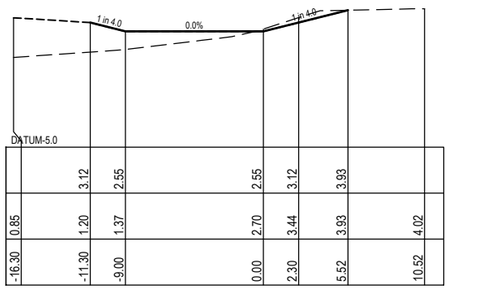


CH 300



CH 360

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 2 4 6 8 10m
SCALE 1:200 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
Empowered lives. Resilient nations.
GREEN CLIMATE FUND
TUVALU COASTAL ADAPTATION PROJECT TCAP

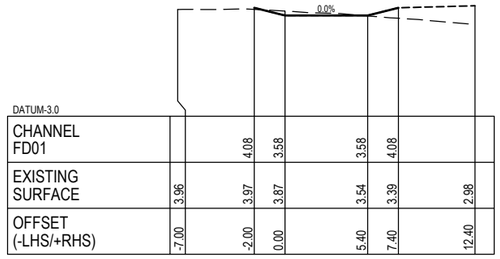
PLANS PREPARED BY:
bluecoast
CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220, Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

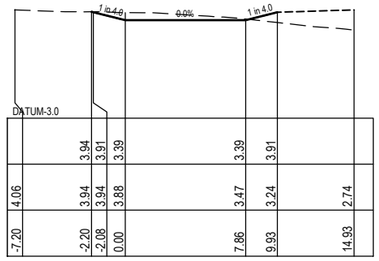
PROJECT NUMBER
P19012

DRAWING TITLE
OPEN CHANNEL
SITE CROSS SECTIONS
CONTROL FD01 SHEET 2

DRG NO. P19012-FN-CV-11-02
REV. A



CH 40



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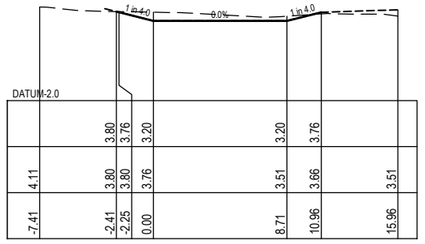

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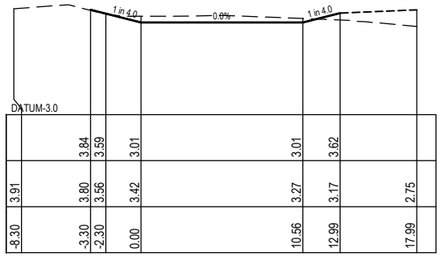
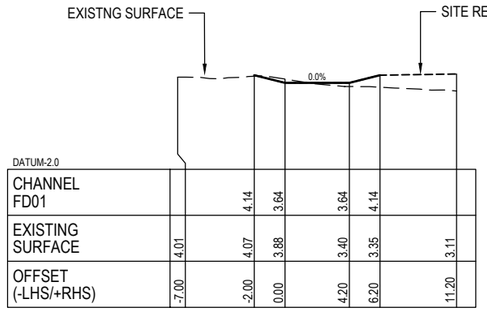


CH 220



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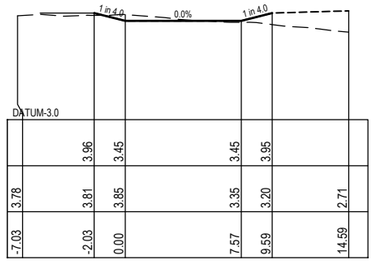
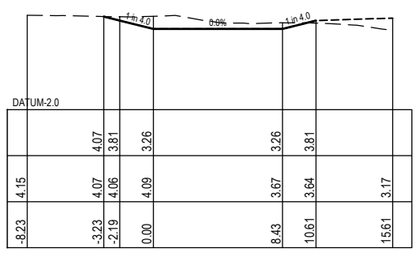
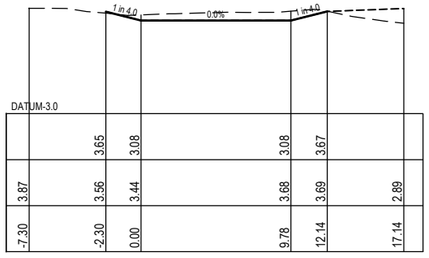


CH 80

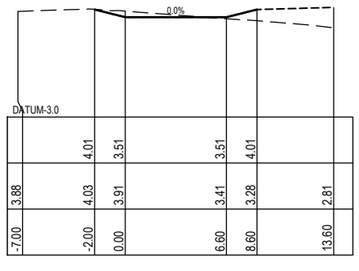


CH 140

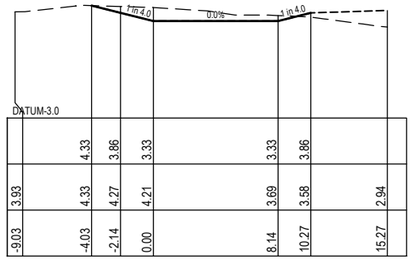


CH 200

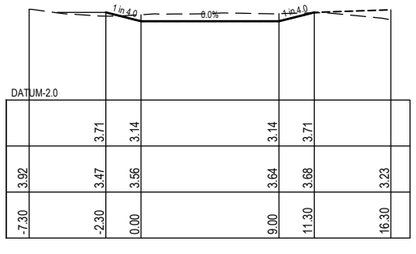
CH 0



CH 60



CH 120



CH 180

REV | DATE | DESCRIPTION | BY | APP'D | REVIEWED
A | XX | ISSUED FOR | MLC | AW | JL

UNFINISHED DRAWING

0 2 4 6 8 10m
SCALE 1:200 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
HORIZONTAL DATUM
UTM-WGS84 / UTSM60S EPSG32760
VERTICAL DATUM
CHART DATUM (CD) TGZ

PLANS PREPARED FOR:
UNDP Empowered lives. Resilient nations. | GREEN CLIMATE FUND | TUVALU COASTAL ADAPTATION PROJECT TCAP

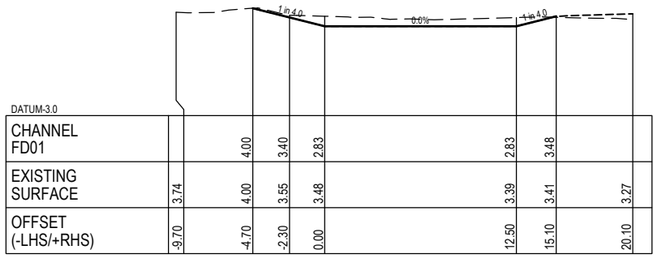
PLANS PREPARED BY:
bluecoast CONSULTING ENGINEERS
1/1874 Gold Coast Highway
Burleigh Heads
QLD, 4220, Australia
+61 (0) 412 393 703
www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

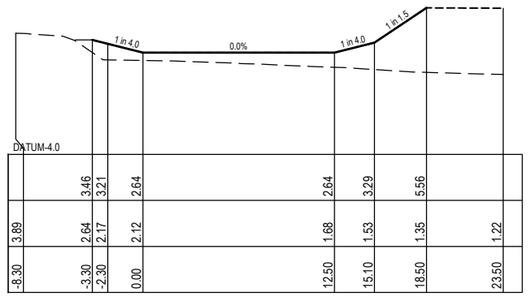
PROJECT NUMBER
P19012

DRAWING TITLE
OPEN CHANNEL SITE CROSS SECTIONS CONTROL FD02 SHEET 1

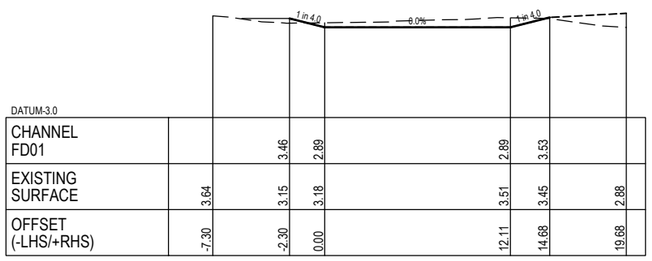
DRG NO. P19012-FN-CV-11-03
REV. A



CH 280



CH 340



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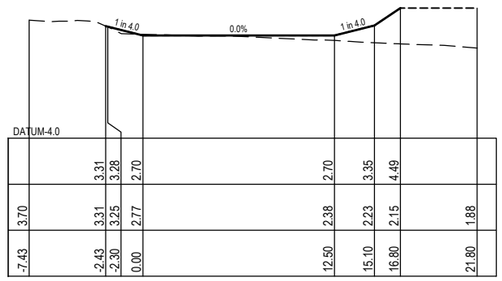

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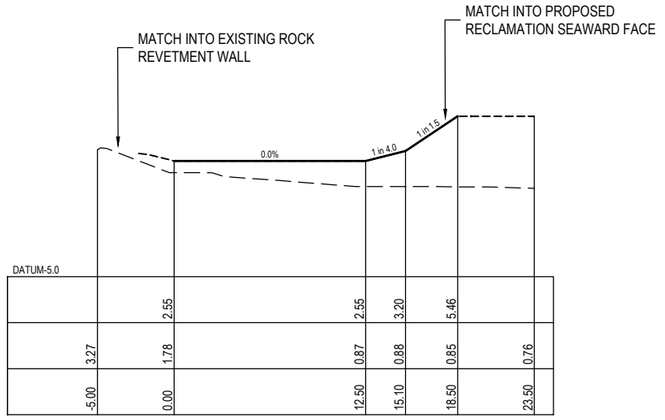
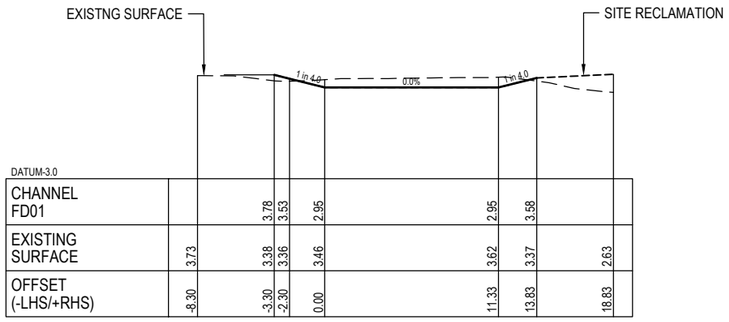
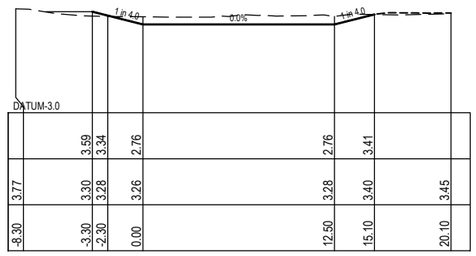


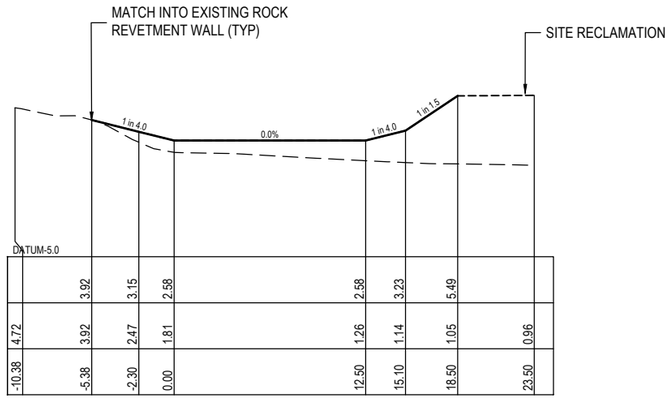
CH 370



CH 240



CH 300



CH 360

REV	DATE	DESCRIPTION	BY	APP'D	REVIEWED
A	XX	ISSUED FOR	MLC	AW	JL

UNFINISHED DRAWING

0 2 4 6 8 10m
SCALE 1:200 AT ORIGINAL SIZE

DESIGNED BY	JL
DRAWN BY	MLC
CHECKED BY	JL
APPROVED	AW

REFERENCES
SURVEY PROVIDED BY
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PLANS PREPARED FOR:
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GREEN CLIMATE FUND
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www.bluecoastconsulting.com.au

PROJECT
TUVALU COASTAL ADAPTATION PROJECT (TCAP), FUNAFUTI

PROJECT NUMBER
P19012

DRAWING TITLE
OPEN CHANNEL
SITE CROSS SECTIONS
CONTROL FD02 SHEET 2

DRG NO. P19012-FN-CV-11-04
REV. A