Packing Plant, Shoalhaven Starches (Mod 21)

Geotechnical Assessment including creek bank stability – Abernethy's Creek

Manildra Group

27 May 2021

→ The Power of Commitment

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Printed date	27/05/2021 4:43:00 PM
Last saved date	27 May 2021
File name	https://projectsportal.ghd.com/sites/pp15_04/shoalhavenstarchesex/ProjectDocs/12548413-REP_Packing Plant, Creek Bank Stability_MOD21.docx
Author	Ryan Misola
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Client name	Manildra Group
Project name	Modification to Proposed Packing Plant
Document title	Packing Plant, Shoalhaven Starches (Mod 21) | Geotechnical Assessment including creek bank stability – Abernethy's Creek
Revision version	Rev [00]
Project number	12548413
Reference number	12548413-74442-9

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
	00	R. Misola	J. Thompson		J. Thompson		27/5/2021

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1. Introduction

1.1 General

Manildra Group Pty Ltd (Manildra) was previously granted Project Approval (MP06_0228, dated 28 January 2009) by the Minister of Planning for the proposed Shoalhaven Starches Expansion project, which encapsulated previous approvals for the general site.

Under Project Approval MP 06_0228, Shoalhaven Starches obtained approval to establish a new Packing Plant, container loading area and two rail spur lines on the northern side of Bolong Road. These works also required the provision of an overhead bridge structure to allow produce to be transferred and safe pedestrian movement across Bolong Road.

In 2019 the Independent Planning Commission approved Mod 16 which included the construction of a Specialty Product Facility and additional Gluten Dryer. The Specialty Products Building would enable the production of an increased range of specialised products as an extension to Shoalhaven Starches existing product line. The specialty products will comprise a range of modified gluten products for the food industry, and modified starches for both paper manufacturing as well as food production.

Shoalhaven Starches identified that as a result of the increase in range of different specialised products able to be produced as a result of Mod 16, amendments will be required to the approved Packing Plant on the northern side of Bolong Road. It is proposed to submit a Modification Application (MOD 21) to the NSW Department of Planning, Industry and Environment (DPIE) seeking approval for these proposed works.

In support of the Modification Application for the proposed works noted above (MOD 21) Manildra has requested a creek bank stability assessment to be undertaken in respect to the nearby Abernethy's Creek. This has been requested due to the following changes included in MOD 21:

– Proposed additional third rail siding to enable storage of additional rail wagons and enable wagons to be taken offline for maintenance purposes.
– Change of alignment of the pipe bridge
– Works associated with the provision of new pipe gantry over Abernethy's Creek

Cowman Stoddart Pty Ltd is acting on behalf of Manildra in submitting the Modification Application to the NSW DPIE and has engaged GHD Pty Ltd (GHD) to undertake this assessment of creek bank stability.

This assessment has been carried out in general accordance with GHD's proposal ref: 12548413-87561-4, dated 12 March 2021.

1.2 Purpose of this report

The purpose of this report is to document the findings of the assessment, which will support the Modification Application and address anticipated requirements from the NSW DPIE. The requirements anticipated for the Modification Application are listed in a letter from Cowman Stoddart Pty Ltd (letter reference: MP06_0228, dated 1 March 2021, pp. 12).

1.3 Objectives

The objective of the creek bank stability assessment is to provide geotechnical advice in relation to the proximity of the various structures proposed in the vicinity of Abernethy's creek and potential effects of the proposed modifications (Mod 21) on the stability of the creek bank.

In response to these objectives, a limited creek bank stability assessment was carried out by a GHD geotechnical engineer/technical director with local knowledge of the site. The assessment included a desktop review of subsurface conditions based on earlier geotechnical investigations, and observations of site surface conditions for the various structures proposed and condition of the western bank of the creek nearest the proposed Packing Plant. A slope stability analysis of the proposed Packing Plant and it effect on the stability of the nearest bank of

Abernethy's Creek was also carried out, based on available information from previous investigations and assessments at the site.

1.4 Scope of work

The scope of work undertaken by GHD included the following:

– Desktop study including a review of:
  - Existing subsurface information in the vicinity of the proposed Packing Plant structures.
  - A review of previous reporting/advice by SMEC (2020) on geotechnical parameters and creek bank stability within the vicinity of Abernethy's Creek.
  - Published information (e.g., topographic, geological, soil landscape).
– Site visit and observations by a GHD Geotechnical Director (Jon Thompson).
– Numerical modelling and assessment of the effects of the proposed modifications on the creek bank stability, taking into account the proximity of the existing structures, existing loads and additional loads applied by the proposed modification/s, based on existing subsurface information from previous investigations and previous modelling by SMEC.
– Report on desktop study and review, our site observations, stability modelling and analysis, and recommendations in accordance with the objectives as outlined above in section 1.3.

1.5 Limitations

This report: has been prepared by GHD for Manildra Group Pty Ltd and may only be used and relied on by Manildra Group Pty Ltd for the purpose agreed between GHD and Manildra Group Pty Ltd as set out in section 1 of this report. General notes presented in Appendix A should be read in conjunction with this report.

GHD otherwise disclaims responsibility to any person other than Manildra Group Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Manildra Group Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

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

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

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

This report is to be read in conjunction with document titled "General Notes" (Ref: DS5.5.1 Issue 0 Date: 05/10/2018), located in Appendix A of this report.

2. Project setting

2.1 Proposed development

The proposed changes under Modification Application (Modification 21) are indicated by red polygons and labels in Figure 2.1 below, (drawing supplied to GHD by Cowman Stoddart). Additional details in Figure 2.1, provided by GHD, are shown in green and orange. Two areas within the proposed Packing Plant development, labelled Area 1 and Area 2 in Figure 2.1 below, are relevant to this report.

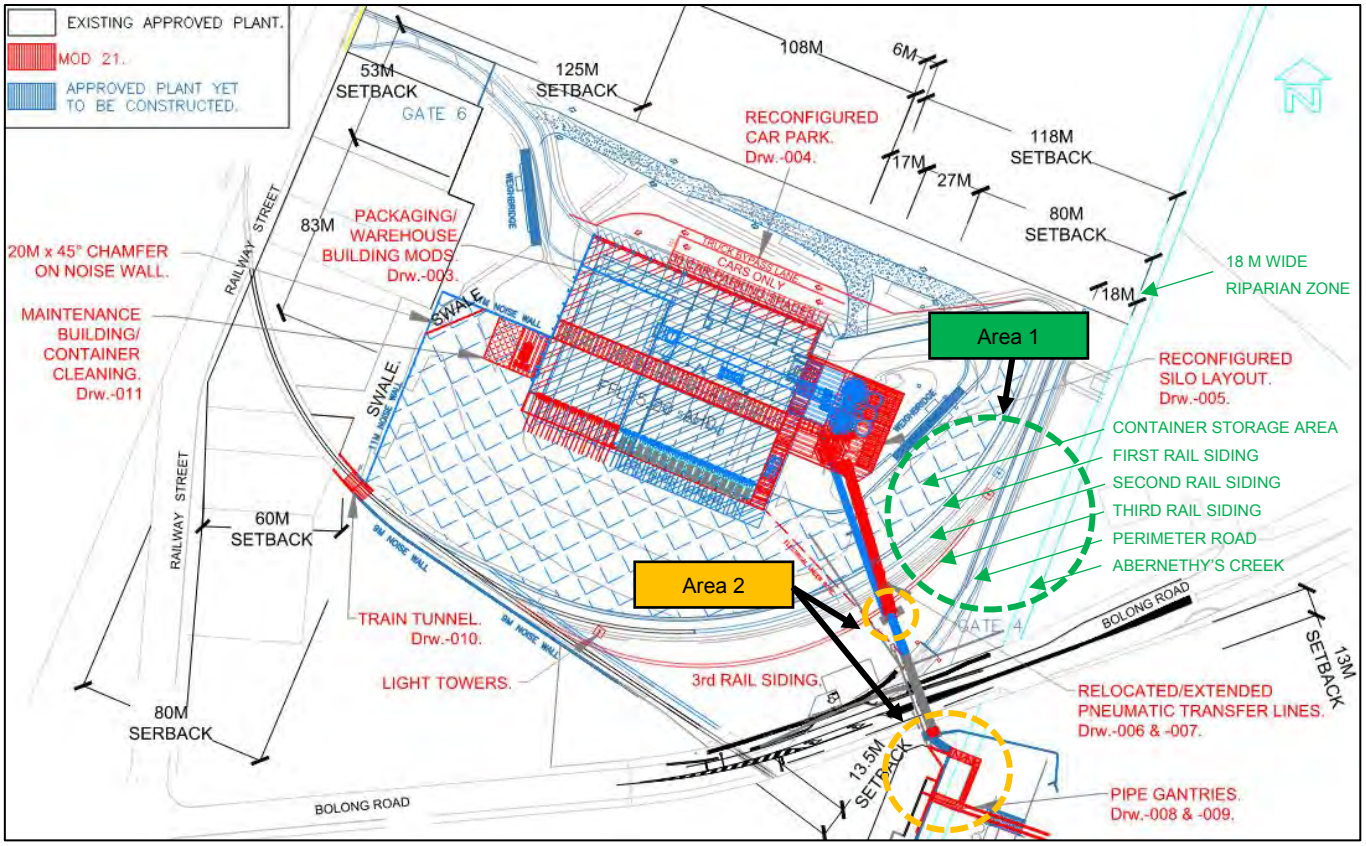

Figure 2.1 Shoalhaven Starches Overall Site Plan, Packing Plant Mod 21 Proposal (Manildra Group Ref: Project 7117WAE, DWG No. MN7323-002)

Area 1, encircled in green in Figure 2.1, refers to the portion of the development where a third rail siding is proposed. This area is also influenced by loading within the adjacent container storage area, two other rail sidings and associated embankments, and the internal perimeter road. Key considerations in relation to the combined load and potential effects on Abernethy's Creek bank stability are:

– There is an 18 m wide riparian zone between the nearest bank of Abernathy's Creek and the ring road.
– The first and second rail siding will be founded on structural fill embankments. It is assumed the third rail siding will be founded on an extension of the structural fill embankment supporting the first and second rail siding. Design drawings of the structural fill for the first and second rail siding are provided in the SMEC report.

Area 2, encircled in orange in Figure 2.1, refers to the portion of the development where proposed gantries may affect the stability of the eastern and western bank of Abernathy's Creek. It is expected that the pipe bridge and gantries will be supported on piles or connected to buildings supported by piles socketed into bedrock.

Several drawings showing more details on the proposed Packing Plant development works were provided by Manildra to GHD. These drawings are included in Appendix B of this report. A summary of these drawings is provided in Table 2.1.

Table 2.1 Summary of drawings provided to GHD by Manildra

Drawing Number	Description	Date provided to GHD by Manildra
MN7323-001, rev P14	Overall site plan showing position of the Packing Plant and MOD 21 works relative to other structures owned by Manildra along Bolong Road	4 May 2021
MN7323-002, rev P16	Detailed site plan of Packing Plant MOD 21 development	4 May 2021
None (labelled as North Packer MOD 21 Rail Siding #3)	Sketch section showing arrangement for the rail siding 2 embankment extension to accommodate rail siding 3	31 March 2021
MN7323-CONT, rev P02	Container layout site plan	5 May 2021
25003-200_S02, rev P3	Preliminary contour layout plan showing ground contours prior to earthworks. Reference for the Abernethy's Creek section. Drawing provided by Allen Price & Scarratts to Manildra.	5 May 2021

2.2 General site observations

The proposed Packing Plant development comprises Lot 16 in DP1121337, Bomaderry and has an approximate area of 6 hectares. It is bounded to the south by Bolong Road, to the west by light industrial complex, to the east by Abernethy's Creek, and to the north by Shoalhaven Water Sewerage Treatment Plant.

At the time of this assessment, structural fill placement, soft soil improvement earthworks including installation of prefabricated vertical drains (PVD's), drainage layer, and pre-loading surcharge were in progress (see Appendix E, photographs 6 to 10).

Based on the site preliminary contour layout plan supplied by Allen Price & Scarratts to Manildra in February 2016, the site elevation ranges from 5.2 m Australian Height Datum (AHD) on the southwestern corner of the site, to 1.5 m AHD on the north-eastern corner of the site, levelling out within the riparian corridor adjacent to Abernethy's Creek.

Some earthworks modifications to the north-eastern side of the site have occurred at an earlier stage, involving stripping of topsoil and stockpiling near the north-eastern boundary and formation of a sediment pond to collect site runoff from the stockpile area. A drain from the fill platform also discharges into the sediment pond. The closest waterbody to the Packing Plant development is Abernethy's Creek at the eastern boundary of the site (see Appendix E, photographs 1 to 5).

Abernethy's Creek follows a relatively straight channel where it passes the Packing Plant development, and the bed of the creek is generally about 3 m to 4 m below the crest of the banks. In normal flows the water level is generally less than 1 m above the bed level, however during flooding, water levels often overtop the banks and spread over the riparian zone as shown in the site photographs.

The current earthworks over the site involved filling to depths generally up to about 2 m depth. We understand the structural fill was placed and compacted under engineering control. A drainage layer comprising coarse rock up to about 100 mm maximum particle size, followed by structural woven geotextile and compacted sandy to gravelly clay fill have been placed over the natural ground. Wick drains were visible in a section of the exposed rock drainage layer in the lower south-eastern part of the site. Some erosion and local slumping of the incomplete fill batters has occurred during recent periods of heavy rain. At this early stage of the works, surface water drainage

has not been established, however it is anticipated that formal drainage will be included in the civil works, pavements, and rail/ road works.

Vegetation over the proposed Packing Plant development formerly comprised a thick grass cover which remains over the riparian corridor. Within the fill platforms and areas disturbed by earthworks, the vegetation has been removed. The banks of Abernethy's Creek are overgrown with thick vegetation comprising grasses, weeds, shrubs, and small trees. This vegetation covers most of the banks and hence it is difficult to see the extent of actual erosion, however no significant erosion or instability of the banks was evident at the time of our site observations. Local erosion and minor slumping of the western bank adjacent to the stormwater outlet to the creek near Bolong Road has occurred.

As part of the Packing Plant development at Area 2, a pipe gantry crossing is proposed over Abernethy's Creek to the south of Bolong Road. We understand this will involve new support footings on the eastern side of the creek and will be attached to the existing brick building on the western side of the creek. We understand that the pipe will be pile supported on the eastern side and the existing building on the western side is supported on piles. The banks of Abernethy's Creek at this location are well formed with no evidence of significant erosion or instability. Established trees line the banks and contribute to stability.

Photographs showing the general site conditions described above are presented in Appendix E. Note that some photographs show the site following a flood event in mid-March 2021, with water ponded on the lower parts of the site, and some show the site under 'normal' conditions. The flooding was associated with a heavy rainfall event where 250 mm of rain fell between 14 and 23 March 2021 (recorded at weather station: Nowra Boat Shed (Shoalhaven River), Station No. 68213, located approximately 1.7 km south-west of the site).

3. Desktop review

3.1 Soil landscape

Reference to the 1:100,000 Kiama Soil Landscape Series Sheet (9028, First Edition) (DECCW, 2010) indicates that the site is located on Shoalhaven Soils. These soils are described as moderately deep Prairie Soils on levees, Red Earths and Yellow and Red Podzolic Soils on terraces and Alluvial Soils and Gleyed Podzolic soils on the floodplains. The soil landscape map also indicates that this group is subject to flood hazard, seasonal water logging, permanently high water table, hardsetting, acid sulphate potential (subsoil), strongly acidic and moderate shrink-swell potential.

3.2 Previous geotechnical investigations

GHD identified two previous geotechnical investigation conducted within the vicinity of Area 1 and Area 2.

The first investigation was done by Coffey in 2007, which was commissioned by Manildra to provide preliminary environmental site assessment (ESA) and geotechnical assessment for the proposed ethanol plant expansion upgrade works at the Shoalhaven Starches Plant (Coffey, 2008). This investigation included test pits (CTP10, CPT11, CTP14, CTP16 and CTP30) located within Area 1 and Area 2 of the Packing Plant development.

The second investigation was done by SMEC in 2019, which was commissioned by Manildra to provide detailed design and issued for construction (IFC) drawings for the soft soil improvement within the Packing Plant development (SMEC, 2020). This investigation included boreholes and Cone Penetrometer Test (CPT) within Area 1 and Area 2 of the Packing Plant development. Relevant investigation points are listed below:

– Borehole : SBH01, SBH05, SBH07, SBH08
– CPT : SCPT01, SCPT04, SCPT06, SCPT07, SCPT08

Both Coffey and SMEC geotechnical investigations encountered similar subsurface geologic layers. However, as pointed out in section 12.1.4.2 of the Coffey (2008) report, the subsurface conditions in the Packing Plant vary considerably, particularly at the deep soft soil zones near Area 1.

Coffey (2008) report only included shallow test pits in Area 1 and Area 2. Thus, we only used SMEC (2020) report as reference for the subsurface condition due to availability of deeper boreholes and CPT's in this report.

A detailed discussion on the subsurface conditions within Area 1 and Area 2 is presented in section 3.3.2.

3.3 Geology

3.3.1 Regional

Reference to the 1:250,000 Wollongong Geological Series Sheet (S1 56-9, Second Edition) (NSW Department of Mines, 1966) indicates the site is likely to be underlain by Quaternary Alluvium, gravel, swamp deposits and sand dunes. West of site, the ground is underlain by rocks identified as part of the Shoalhaven Group, comprising Nowra Sandstone (Psn) and undifferentiated Berry Formation (Psb). The Nowra sandstone is described as quartz sandstone. The undifferentiated Berry Formation is described as siltstone, shale, and sandstone.

3.3.2 Subsurface conditions

Based on the SMEC (2020) report, the subsurface conditions in Area 1 and 2 are summarised as follows:

Table 3.1 Geotechnical units present in soft soil zone in eastern to southern part of Packing Plant development

Unit No.	Unit name	Description
Unit 1	Topsoil	Approximately 0.4 m to 0.5 m thick
Unit 2A/2B	Estuarine	CLAY, very soft to firm. Up to 9.1 m thick.
Unit 2C	Estuarine	Sandy CLAY to Clayey SAND, very loose to loose. Encountered at varying depths, up to 1.3 m thick.
Unit 3	Alluvial	CLAY, stiff to very stiff. Up to about 6.2 m thick.
Unit 4	Residual	CLAY, stiff to very hard. Top of layer encountered between 9.4 and 17.0 m bgl, overlying rock.
Unit 5a	Sandstone	Very low to low strength, top of layer encountered between 12.95 and 13.25 m bgl.
Unit 5b	Sandstone (medium strength or better)	Medium strength of better, top of layer encountered between 16.00 and 16.42 m bgl.

Excerpts from the SMEC (2020) report showing the borehole location plan and the location of section D is provided in Appendix C.

3.4 Groundwater

Groundwater information from different sources is provided below.

3.4.1 Water NSW

A search of the WaterNSW groundwater bore database indicates that there are 19 groundwater bores within 500 m of the site. Three of these bores (GW110107, GW110108, GW110109) are registered within the Shoalhaven Starches property located between 95 m and 265 m south of the site. The recorded standing water level at these bores ranged from 0.644 to 4.02 m bgl.

The remaining 16 bores were located between 180 m and 325 m west and north-west of the site. Of the 16 bores, three had recorded standing water level ranging from 2.5 to 4.5 m bgl.

Due to the topography on the vicinity of the site, these monitoring wells most likely do not represent the groundwater conditions on the site.

3.4.2 Previous geotechnical investigation

Groundwater information is available from the geotechnical investigation reports mentioned in section 3.2.

Based on SMEC (2020) report, groundwater inflow was observed in boreholes SBH01, SBH05, and SBH07 ranging from 0.6 to 0.9 m bgl. Groundwater inflow was observed in SBH08 at 6.8 m bgl. Groundwater level was encountered at CPT locations SCPT01, SCPT04, SCPT06, SCPT07, SCPT08 ranging from 1.1 to 2.1 m bgl.

Based on Coffey (2008) report, groundwater inflows were encountered at depths of 0.5-6 m, 2.1 m and 4 m bgl at borehole locations CBH109, CBH108 and CBH21, respectively. The groundwater inflow observed at CBH108 appeared to be associated with the sandy clay layer within alluvial soils. Groundwater inflows encountered at test pit locations CTP5 to CTP12, CTP14 were observed between 0.8 m and 1.9 m bgl. Standing water levels measured in test pits CTP 5 to CTP8, CTP 11, CTP12 and CTP14 were between 0.9 m and 2.0 m bgl. The standing water level at groundwater monitoring well MW1/CBH108 was measured 1.290 m bgl on 10/4/2008 (Coffey, 2008).

Based on topography, the groundwater is expected to flow in a north-westerly direction.

3.4.3 Abernethy's Creek survey

The water level at Abernethy's Creek is approximately at 0.78 m AHD under normal conditions, based on site preliminary contour layout plan supplied by Allen Price & Scarratts to Manildra in February 2016. Refer to Table 2.1 for more information on this drawing.

4. Slope stability analysis

4.1 Objective

A slope stability analysis was carried out to assess the potential influence of the proposed third rail siding and associated preloading works on the creek bank stability of the western bank of Abernethy's Creek at Area 1.

The centre of the third rail siding is located at a minimum distance of approximately 30 m from the western bank of Abernethy's Creek. The third rail siding will be founded on a structural fill embankment which will be subjected to preloading and will extend closer to the western bank of Abernethy's Creek. A perimeter road will also be constructed between the third rail siding embankment and Abernethy's Creek.

A designated 18 m wide riparian zone is located adjacent to the western bank of Abernathy's Creek, hence current Packing Plant development including earthworks, will be limited by this site constraint, that is, the fill platform and additional structures will be located at least 18 m from the western bank of Abernethy's Creek.

These stability analyses considered train loads, heavy vehicle loads, preloading surcharge loads, construction loads, and shipping container storage loads.

Structures relating to the proposed pipe bridge and gantry are assumed to be supported on piles, or supported by buildings founded on piles, with all building loads transferred to the underlying rock.

4.2 Methodology

This slope stability analysis has been conducted using Slope/W (GeoStudio 2019 R2, version 10.1.1.18) and adopting the Morgenstern – Price method of stability analysis. The analysis was carried out based on the following methodology:

– Develop the analysis geometry based on the following:
  - Natural site contours (including Abernethy's Creek bank and invert elevation) based on the preliminary site contour layout provided to Manildra by Allen Price and Scarratts Pty Ltd.
  - Structural fill and surcharge levels from the SMEC (2020) report.
– Develop the geological model and geotechnical parameters based on the Section D slope stability model in the SMEC (2020) report. This is the closest section to Area 1. A copy of the Section D slope stability model output provided by SMEC is provided in Appendix C.
– Develop the various load combinations based on client provided information, and consistent with the loading criterion adopted in the SMEC (2020) report.
– Perform analysis iterations and assess factor of safety (FoS) based on normal and flood conditions.

4.3 Assumptions

Assumptions made in undertaking the slope stability analyses are as follows:

– Subsurface conditions are based on Section D slope stability model in the SMEC (2020) report. Section D intersects the proposed location of the third rail siding and provides a representation of the subsurface condition.
– The third rail siding embankment will be at a similar design level as the embankment for the first and second rail siding. This is consistent with the sketch provided by Manildra, email dated 31 March 2021. A copy of this sketch is included in Appendix B and the key dimensions are as follows:
  - Centre to centre spacing between rail siding 2 and rail siding 3 = 10.5 m.
  - Distance from the centre of rail siding 3 to the toe of third rail siding embankment = 6 m.

– The third rail siding embankment will be constructed using similar materials as the first and second rail siding embankment. Essentially, the third rail siding embankment is an extension of the proposed embankment for the first and second rail siding. The embankment will comprise the following materials:
    - Structural fill
    - Drainage layer
    - One layer of 800 kN/m geotextile placed at 300 mm above the drainage layer, starting just behind the face of the permanent batter, placed perpendicular to the batter face.
– The design level of the preloading surcharge for the third rail siding embankment is similar to the SMEC design for the preloading surcharge over the first and second rail siding embankment.
– The third rail siding embankment, including the preloading surcharge, will have a slope ranging from 1V:2H to 1V:2.5H. We note that the sketch provided by Manildra indicates a batter slope for the third rail siding embankment of approximately 1V:1H. Note that the flatter batter slope adopted will result in the toe of the final batter encroaching to the western edge of the perimeter road.
– The perimeter road will be founded on a structural fill embankment. However, consistent with the SMEC (2020) design, it appears that this embankment will not be constructed with a drainage layer and will not be subjected to preloading. If this is the case the road may settle differentially relative to the rail sidings.
– The preloading surcharge will involve the placement of a significant volume of fill over the structural fill placed for the rail embankments and will extend over the perimeter road formation while in place. It is assumed that SMEC has considered the rate of placement of the surcharge and subsequent likely settlement of the perimeter road formation.
– We understand the loads implied by the container storage area and reach stackers on the upslope side of the rail sidings were not incorporated in the slope stability models presented in the SMEC (2020) report. However, these loads have been included in the GHD stability analyses.
– We assume the loads associated with the containers, rails and roads are as provided in the SMEC (2020) report, listed below:
    - Rail wagons (loaded) or locomotives – 45 kPa
    - Container storage zone – 45 kPa
    - Perimeter road and container handling zone – 20 kPa
    - Construction vehicle load – 20 kPa
– We have not conducted settlement/consolidation analysis for the third rail siding embankment.
– If the creek bank profile changes significantly (e.g., by collapse or undercutting of bank, formation of a steeper profile below water, or significant loss of vegetation over the banks), then the stability of the creek bank should be re-assessed.
– If the geometry of the embankment for the third rail siding changes significantly, then the stability of the embankment and the creek bank should be re-assessed.
– If the overall embankment formation between the Packing Plant and Abernethy's Creek (e.g., thickness of the structural fill material) changes from the current design, then the stability of the embankment and the creek bank should be re-assessed.
– The pipe gantry over Abernethy's Creek and the support for the pneumatic transfer lines will be through piles, or on buildings already supported on piles socketed into bedrock.

4.4 Results

The results of the stability analyses undertaken are summarised in Table 4.1 below, including resulting Factors of Safety (FoS) for the different construction stage and groundwater conditions, and the required minimum FoS. These required minimum FoS are reasonable values for the embankment life stage and groundwater conditions which are consistent with the SMEC (2020) report.

Slope /W analysis models and analysis outputs are included in Appendix D.

Table 4.1 Summary of slope stability analyses

Scenario No.	Embankment life stage	Groundwater condition	FoS	Required minimum FoS
1	Short term (with preloading surcharge)	Normal	1.56	1.30
2	Short term (with preloading surcharge)	Flood	1.28	1.20
3	Long term (no preloading surcharge)	Normal	1.73	1.50
4	Long term (no preloading surcharge)	Flood	1.61	1.20

4.5 Conclusion

The analyses show that the failure scenarios are driven by slope instability within the rail embankment and are limited to the perimeter road embankment. All scenarios considered have an FoS greater than the required minimum, indicating stable conditions based on the design levels of the proposed third rail siding embankment.

Hence, we conclude that the development of the proposed third rail siding embankment for the Packing Plant at Area 1, will not adversely affect the stability of the western bank of Abernethy's Creek.

The slope stability analyses are based on the assumptions outlined above. If any aspects of the assumptions made are incorrect or significant changes occur to the current site conditions or proposed development, then GHD should be notified, and the analyses should be re-assessed.

In regard to the proposed structures in Area 2, namely pipe bridge extending towards the creek from the proposed Packing Plant and the pipe gantry structure south of Bolong Road over Abernethy's Creek, these should not affect the stability of the creek banks, provided the structures are supported on piles extending to rock.

5. Recommendations

The objective of this geotechnical assessment was to advise on the effects of a proposed third rail siding and other structures associated with the Packing Plant development on the stability of the western bank of Abernethy's Creek. This assessment has shown that the factor of safety in respect to the stability of the creek bank following the rail siding construction is acceptable for the short and long term conditions.

Other geotechnical aspects relating to the third rail embankment design that should be considered in the design, construction and ongoing operation of the Packing Plant and associated infrastructure include:

– The stability of local batters within the third rail siding formation. Currently the fill batter for the third rail embankment is considered too steep.
– The extent of settlement over the rail siding and adjacent land, including long term settlement and differential settlement.
– The rate of placement of pre-load will need to be carefully controlled during construction to avoid rapid loading which can result in failure through the soft soil zone.
– Increased loading over the ground surface, ground disturbances or changes in the site surface profile between the Packing Plant and Abernethy's Creek may adversely influence settlement and local and /or stability.

6. References

Coffey. (2008). *Preliminary Environmental Site Assessment and Geotechnical Investigation, Proposed Ethanol Expansion, Shoalhaven Starches Plant, Bolong Road, Bomaderry, NSW. (Report reference: ENVIWOLL00111AA-R02, dated 25 June 2008).* Coffey Environments Pty Ltd.

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Appendices

Appendix A

General Notes

GENERAL NOTES

GHD
Specialist Services in Geotechnical Engineering, Geology, Field/Laboratory Testing and Hydrogeology
www.ghd.com/Geotechnical

The report contains the results of a geotechnical investigation or study conducted for a specific purpose and client. The results may not be used or relied on by other parties, or used for other purposes, as they may contain neither adequate nor appropriate information. In particular, the investigation does not cover contamination issues unless specifically required to do so by the client.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the report are excluded unless they are expressly stated to apply in the report.

TEST HOLE LOGGING

The information on the test hole logs (boreholes, test pits, exposures etc.) is based on a visual and tactile assessment, except at the discrete locations where test information is available (field and/or laboratory results). The test hole logs include both factual data and inferred information. Moreover, the location of test holes should be considered approximate, unless noted otherwise (refer report). Reference should also be made to the relevant standard sheets for the explanation of logging procedures (Soil and Rock Descriptions, Core Log Sheet Notes etc.).

GROUNDWATER

Unless otherwise indicated, the water depths presented on the test hole logs are the depths of free water or seepage in the test hole recorded at the given time of measuring. The actual groundwater depth may differ from this recorded depth depending on material permeabilities (i.e. depending on response time of the measuring instrument). Further, variations of this depth could occur with time due to such effects as seasonal, environmental and tidal fluctuations or construction activities such as a change is ground surface level. Confirmation of groundwater levels, phreatic surfaces or piezometric pressures can only be made by appropriate surveys, instrumentation techniques and monitoring programmes.

INTERPRETATION OF RESULTS

The discussion or recommendations contained within this report normally are based on a site evaluation from discrete test hole data, often with only approximate locations (e.g. GPS). Generalised, idealised or inferred subsurface conditions (including any geotechnical cross-sections) have been assumed or prepared by interpolation and/or extrapolation of these data. As such these conditions are an interpretation and must be considered as a guide only.

CHANGE IN CONDITIONS

Local variations or anomalies in ground conditions do occur in the natural environment, particularly between discrete test hole locations or available observation sites. Additionally, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site. Furthermore, conditions may change at the site from those encountered at the time of the geotechnical investigation through construction activities and constantly changing natural processes.

Any change in design, in construction methods, or in ground conditions as noted during construction, from those assumed or reported should be referred to GHD for appropriate assessment and comment.

GEOTECHNICAL VERIFICATION

Verification of the geotechnical assumptions and/or model is an integral part of the design process - investigation, construction verification, and performance monitoring. Variability is a feature of the natural environment and, in many instances, verification of soil or rock quality, or foundation levels, is required. There may be a requirement to extend foundation depths, to modify a foundation system and/or to conduct monitoring as a result of this natural variability. Allowance for verification by appropriate geotechnical personnel must be recognised and programmed for construction.

FOUNDATIONS

Where referred to in the report, the soil or rock quality, or the recommended depth of any foundation (piles, caissons, footings etc.) is an engineering estimate. The estimate is influenced, and perhaps limited, by the fieldwork method and testing carried out in connection with the site investigation, and other pertinent information as has been made available. The material quality and/or foundation depth remains, however, an estimate and therefore liable to variation. Foundation drawings, designs and specifications should provide for variations in the final depth, depending upon the ground conditions at each point of support, and allow for geotechnical verification.

REPRODUCTION OF REPORTS

Where it is desired to reproduce the information contained in our geotechnical report, or other technical information, for the inclusion in contract documents or engineering specification of the subject development, such reproductions must include at least all of the relevant test hole and test data, together with the appropriate Standard Description sheets and remarks made in the written report of a factual or descriptive nature.

Ref: DS5.5.1 Issue 0 Date: 05/10/2018

Appendix B

Drawings provided by Manildra to GHD

EXISTING APPROVED PLANT – BLACK.
PROPOSED MOD 21 – RED.
APPROVED PLANT YET TO BE CONSTRUCTED – BLUE.

PACKER ALTERATIONS.
MN7323–002.

NITROGEN GENERATOR AND PIPE GANTRY.
MN7323–012 & –013.

FERMENTERS #18 & #19.
MN7323–016 to –018.

CAR PARK RELOCATION
MN7323–019.

INDIRECT COOKING AND PIPE GANTRY.
MN7323–014 & –015.

PIPE GANTRY.
MN7323–008 & –009.

APPROVED EXIT.

GATE 6

GATE 4

GATE 1

APPROVED PACKAGING PLANT.

APPROVED CONTAINER STORAGE AREA.

SOUTH COAST RAILWAY

RAILWAY STREET

BOLONG ROAD

CLEARY BROS CONCRETE BATCHING PLANT
LOT 200 DP1062668

MANILDRA COMPLEX

FORMER DAIRY FARMERS FACTORY.

Shoalhaven River

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P14	D5	3rd rail shortened.	P.C.	04/5/21	B.H.	
P13	F4	Extra pipe gantry added.	P.C.	04/5/21	B.H.	
P12	E4	Sewer pump area boundary adjustment.	P.C.	04/5/21	B.H.	
P11	All	Was Mod 22.	P.C.	03/05/2	B.H.	
P10	C3	Noise wall relo amended.Maint. building relo.	P.C.	20/04/2	B.H.	
P09	C4	Packer ffl was 4.75.	P.C.	20/04/2	B.H.	
P08	E12	Car park recon.	P.C.	12/04/2	B.H.	

MANILDRA GROUP
100% AUSTRALIAN

DRAWN PC	DATE 10–02–21	SITE	MANILDRA–SHOALHAVEN STARCHES PTY LTD.
DESIGNED. PC	DATE	JOB TITLE	NOWRA PLANT.
CHKD BH	DATE	DWG TITLE	NORTH PACKER MODS.MOD 21 PROPOSALS. OVER ALL SITE PLAN.
APPD BH	DATE		
	SCALE 1:2500	PROJECT No. 7323	DWG No. MN7323-001

SHT SIZE A3 | SHEET | OF | REV. P14

EXISTING APPROVED PLANT.

MOD 21.

APPROVED PLANT YET TO BE CONSTRUCTED.

53M SETBACK

125M SETBACK

108M

6M

118M SETBACK

17M

27M

80M SETBACK

18M

GATE 6

RECONFIGURED CAR PARK. Drw.-004.

83M

PACKAGING/ WAREHOUSE BUILDING MODS. Drw.-003.

20M x 45° CHAMFER ON NOISE WALL.

MAINTENANCE BUILDING/ CONTAINER CLEANING. Drw.-011

RAILWAY STREET

SWALE.

11M NOISE WALL

WEIGHBRIDGE

TRUCK BYPASS LANE. CARS ONLY

30 CAR PARKING SPACES

FFL 5.20 AHD

RECONFIGURED SILO LAYOUT. Drw.-005.

60M SETBACK

9M NOISE WALL

TRAIN TUNNEL. Drw.-010.

LIGHT TOWERS.

3rd RAIL SIDING.

ELECTRICAL UNDER LINE

GATE 4

BOLONG ROAD

13M SETBACK

RELOCATED/EXTENDED PNEUMATIC TRANSFER LINES. Drw.-006 & -007.

80M SERBACK

13.5M SETBACK

PIPE GANTRIES. Drw.-008 & -009.

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P16	G8	3rd rail shortened.	P.C.	04/5/21	G.M.	
P15	J8	Extra pipe gantry added.	P.C.	04/5/21	B.H.	
P14	I7	Sewer pump area boundary adjustment.	P.C.	04/5/21	B.H.	
P13	ALL	Was Mod 22.	P.C.	03/5/21	B.H.	
P12	ALL	Proposed wall relo deleted,wall chamfer added.Maint. build relo.	P.C.	22/4/21	B.H.	
P11	ALL	Finished floor level was 4.75 AHD.	P.C.	20/4/21	B.H.	
P10	ALL	Car park reconfigured.Now Mod 22.	P.C.	17/3/21	B.H.	

Commitment to Excellence

GEM OF THE WEST

MANILDRA GROUP

100% AUSTRALIAN

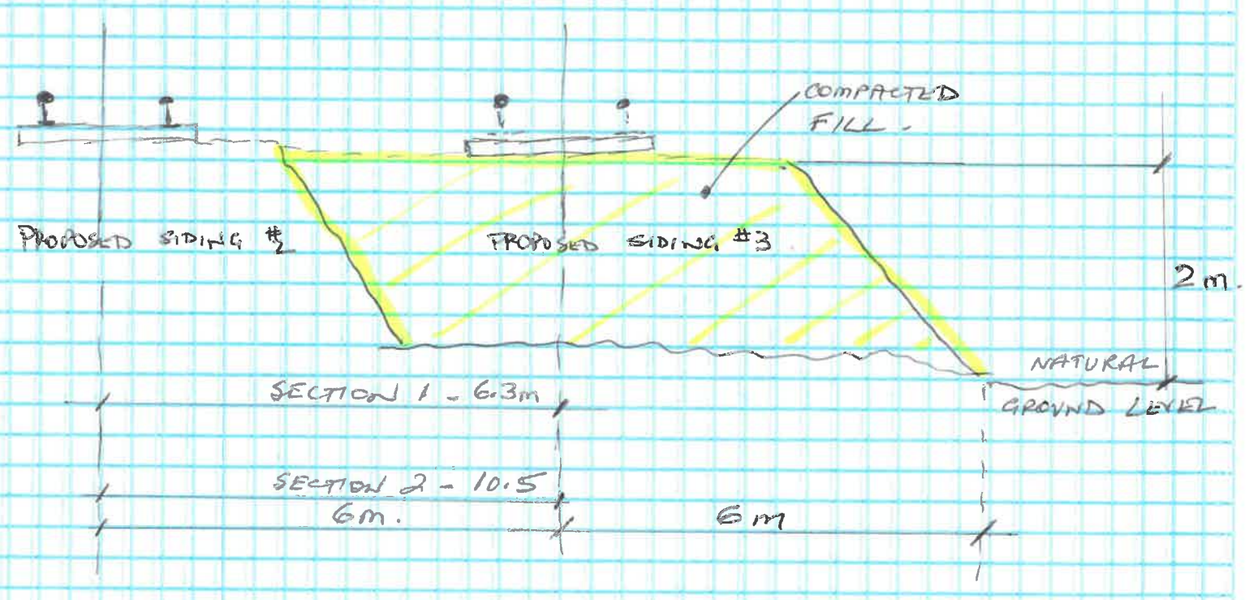
P.C.		SHOALHAVEN STARCHES.	SHT SIZE A3
CHKD GM	DATE 10/02/21	DWG TITLE NORTH PACKER MOD 21. SITE PLAN .	
APPD	DATE		REV. P16
	SCALE 1:1500	PROJECT No. 7117WAE	DWG No. MN7323-002

Project MOD number subsequently changed to MOD 21

MANILORA GROUP

NORTH PARKER MOD 22 RAIL SIDING #3

REFER MANILORA DRG MN7323-002. P10.



31/3/21.

GATE 6

TOTAL CONTAINERS
357 SPACES x 3 HIGH
= 1070 TOTAL.

RAILWAY STREET

WEIGHBRIDGE

TRUCK BYPASS LANE.
CARS ONLY
30 CAR PARKING SPACES.

100 x 3
= 300

SWALE

11M NOISE WALL

SWALE.

11M NOISE WALL

STAGE 4

STAGE 3.

FL 5.20 AHD

CONTAINER LOADING.

40 x 3
= 120

WEIGHBRIDGE

STAGE 2

STAGE 1.

15M

9M NOISE WALL

15M

NQJF x 15 WAGONS = 45 CONTAINERS.

217 x 3
= 650

9M NOISE WALL

GATE 4

NQJF x 14 WAGONS = 42 CONTAINERS.

29 NQJF WAGONS x 3 = 87 CONTAINERS TOTAL.
INSIDE LINE 15 WAGONS = 45 CONTAINERS.
OUTSIDE LINE 14 WAGONS = 42 CONTAINERS.

RAIL
MAINTENANCE
SIDING.

Project MOD number subsequently changed to MOD21

REV	ZONE	DETAILS	DRN	DATE	CHKD	APPD
P02	ALL	Maintenance building relo.	P.C.	28/4/21	N.S.	
P01	ALL	Reconfigured.	P.C.	28/4/21	N.S.	

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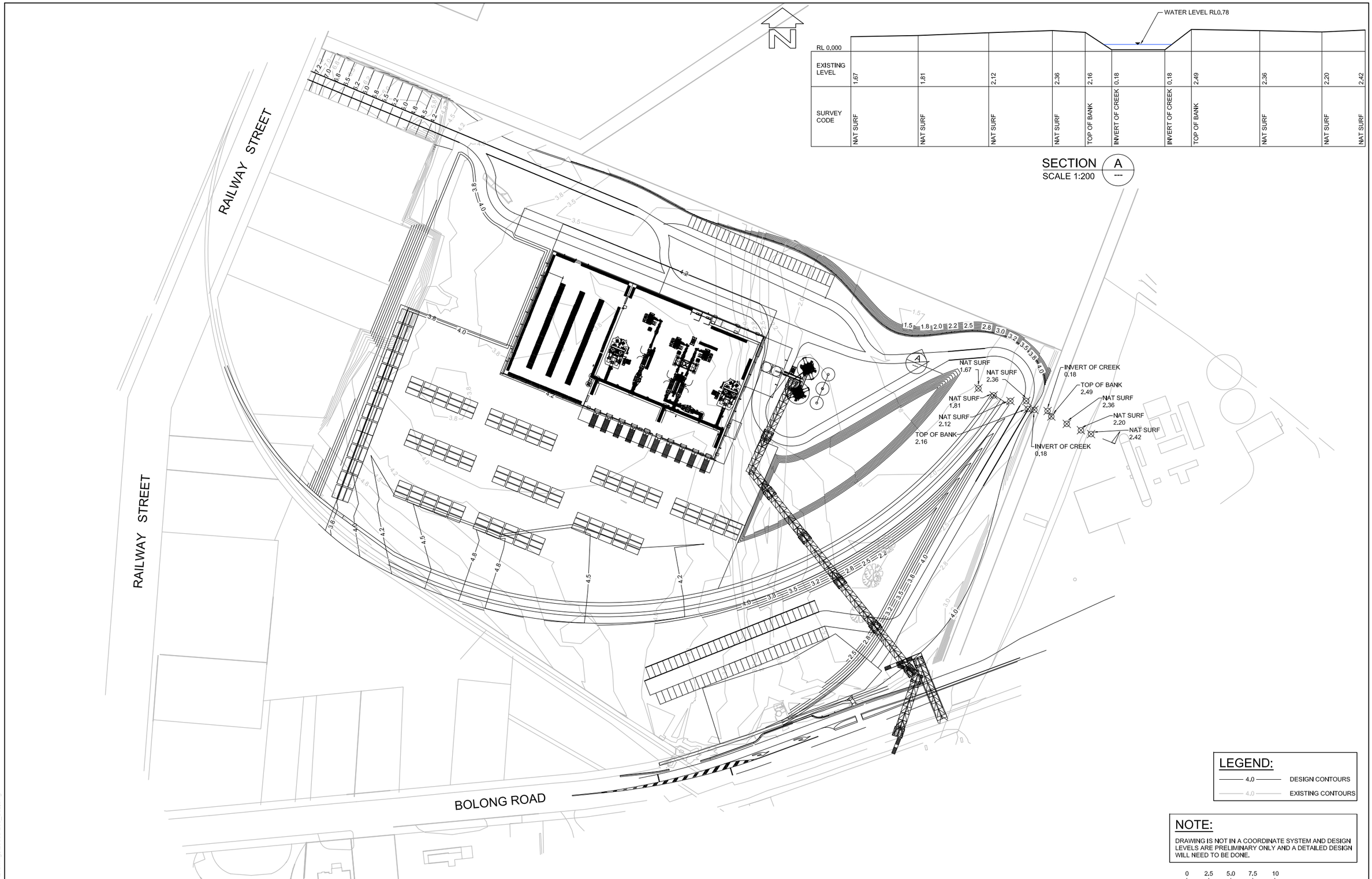
MANILDRA GROUP
100% AUSTRALIAN

P.C.
CHKD GM
DATE 10/03/21
APPD
DATE
SCALE 1:1000

SHOALHAVEN STARCHES.
TITLE
NORTH PACKER MOD 22.
CONTAINER LAYOUT SITE PLAN .

PROJECT No. 7117WAE
DWG No. MN7323-CONT

SHT SIZE A3
REV. P02



LAYOUT PLAN
SCALE 1:800

LEGEND:
- 4.0 DESIGN CONTOURS
- 4.0 EXISTING CONTOURS

NOTE:
DRAWING IS NOT IN A COORDINATE SYSTEM AND DESIGN LEVELS ARE PRELIMINARY ONLY AND A DETAILED DESIGN WILL NEED TO BE DONE.

0 2.5 5.0 7.5 10
SCALE:- 1:200

0 10 20 30 40 50
SCALE:- 1:800

LIABILITY LIMITED BY A SCHEME APPROVED UNDER PROFESSIONAL STANDARDS LEGISLATION.
COVER OF EXCELLENCE

BEWARE!
THE CONTRACTOR IS TO VERIFY THE LOCATION OF ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL BE RESPONSIBLE, AT THE CONTRACTOR'S EXPENSE, FOR ANY REPAIRS TO DAMAGE CAUSED DURING CONSTRUCTION.

DIAL BEFORE YOU DIG www.1100.com.au

RATIO:	DATUM:			REV	DESCRIPTION	BY	DATE
AS NOTED (AT A1 ORIGINAL)	AUSTRALIAN HEIGHT DATUM	SURVEY	APS	=			
	ORIGIN: SSM RL	DESIGN	CJG				
		DRAWN	CJG				
		CHECK'D	MP				
	DATE OF PLAN: FEBRUARY 2016						

allen price & scarratts
land and development consultants
Head Office: 75 Plunkett Street, Nowra NSW 2541
Kiama Branch: 5/125 Terralong Street, Kiama NSW 2533
phone:(02) 4421 6544 fax:(02) 4422 1821
consultants@allenprice.com.au www.allenprice.com.au

PROPOSED MODIFICATION APPLICATION FOR PACKING FACILITY, MANILDRA - SHOALHAVEN STARCHES PTY LTD

PRELIMINARY CONTOUR LAYOUT PLAN FOR THE MANILDRA GROUP

DRAWING STATUS: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWING NUMBER	SHEET	REVISION
25003-200_S02	1 OF 1	P3

M:\Projects\25000\25000s\25003\25003-200\Drawings\25003-200_S02.dwg

Appendix C

Excerpts from SMEC 2020 Report

Site Locality

LEGEND

- CPT Location
- Borehole Location

Design Contours

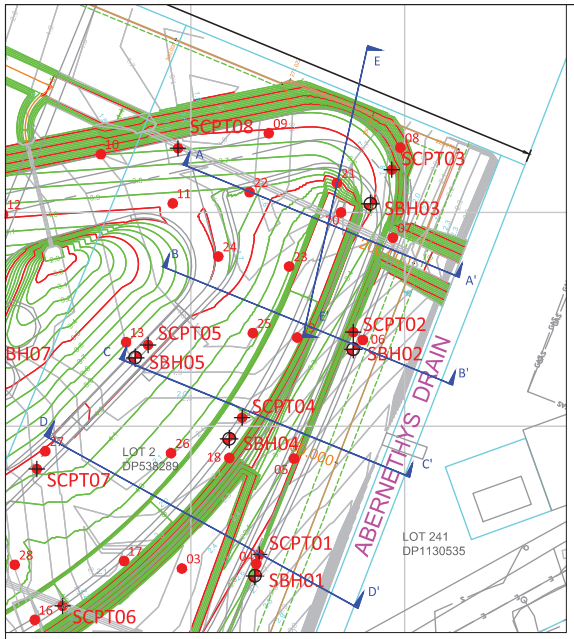
- 0.1 m Contours
- 0.5 m Contours

Existing Contours

- 0.1 m Contours

Based drawing from Allen Price & Scarratts Pty Ltd (Drawing No. 25003-300_600, updated on 18 May 2020)

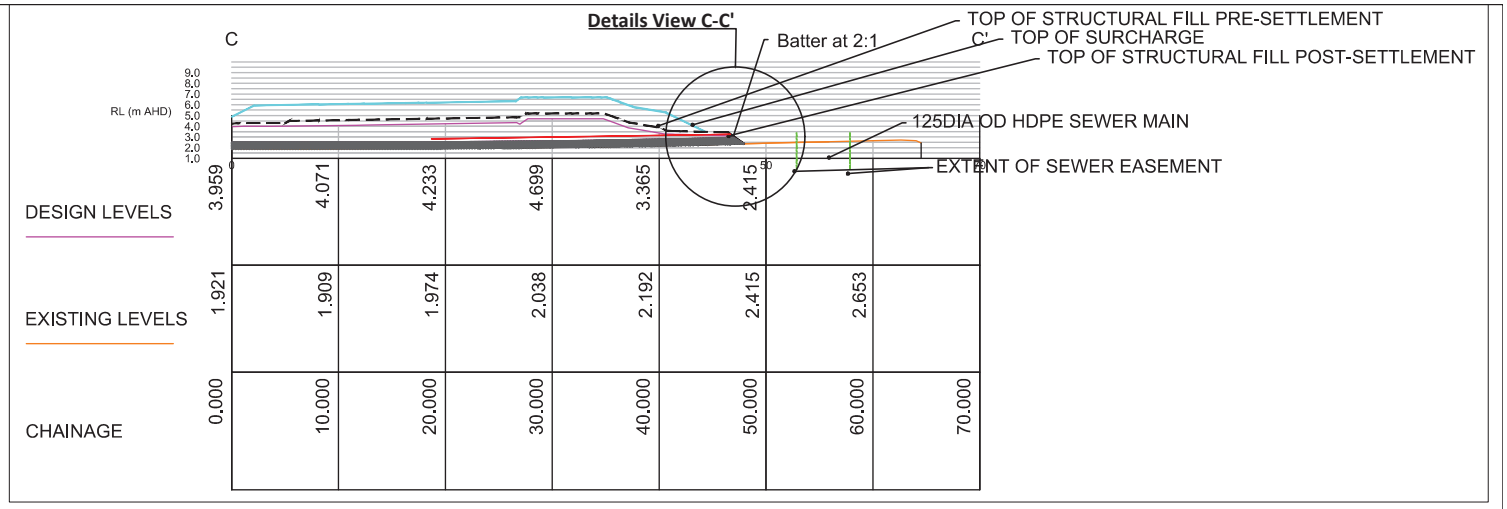
Title :	**GEOTECHNICAL SITE INVESTIGATION PLAN**	CLIENT: Manilda Group Pty Ltd	DATE: 3/06/2020	DRAWN BY: GRR	REVIEWED BY: KK	PROJECT No: 3001550	SMEC AUSTRALIA PTY LTD ABN 47 065 475 149 4/20 Beach St WOLLONGONG NSW 2500
Project :	**Shoalhaven Starch Plant**	0 5 10 20 30 40 50 75 100 125m				DRAWING No: 001	
Site Location	**Shoalhaven Starches, Bolong Road, Bomaderry**	1:1250 @ A3				REVISION: 02	



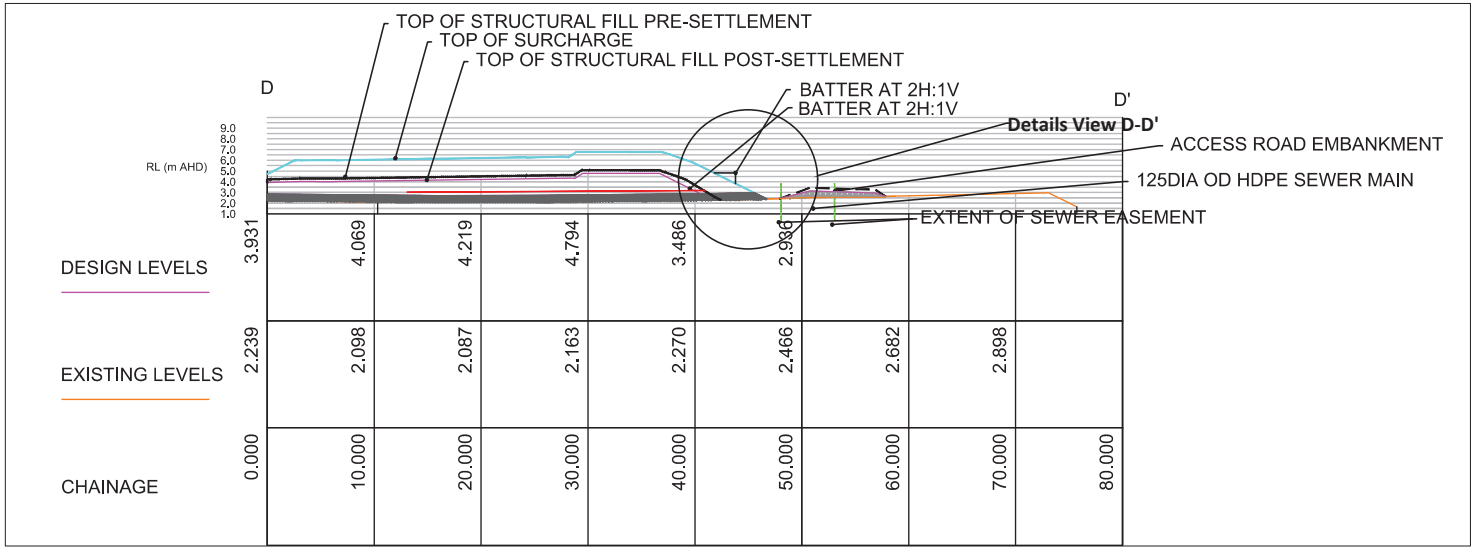
SECTION ARRANGEMENT
SCALE 1:1250

LEGEND

- CPT Location
- Borehole Location
- Design Points
- **Design Contours** 0.1 m Contours
- **Existing Contours** 0.1 m Contours
- Earthwork / Geotechnical Section



SECTION C-C'
SCALE 1:500



SECTION D-D'
SCALE 1:500

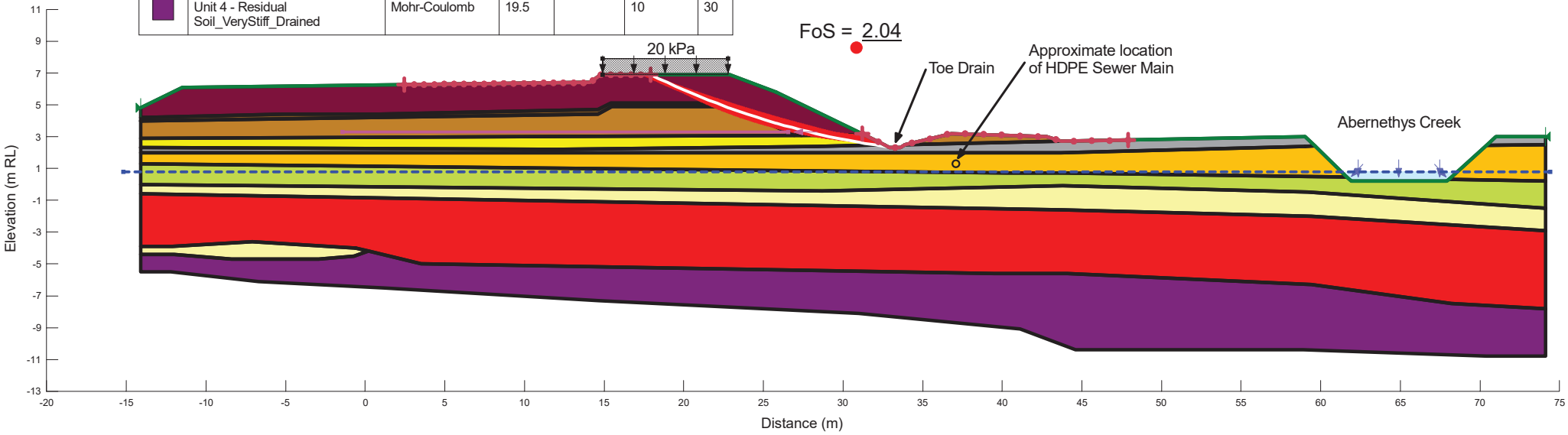
0 5 10 20 30 40 50 75 100 125m
1:1250 @ A3

0 5 10 15 20 30 40 50m
1:500 @ A3

Title :	**SECTIONS C-C' & D-D'**	CLIENT: Manildra Group Pty Ltd	DATE: 03/06/2020	DRAWN BY: GRR	REVIEWED BY: KK	PROJECT No: 3001550	SMEC AUSTRALIA PTY LTD ABN 47 065 475 149 4/20 Beach St WOLLONGONG NSW 2500
Project :	**Shoalhaven Starch Plant**					DRAWING No: 006.2	
Site Location	**Shoalhaven Starches, Bolong Road, Bomaderry**					REVISION: -	

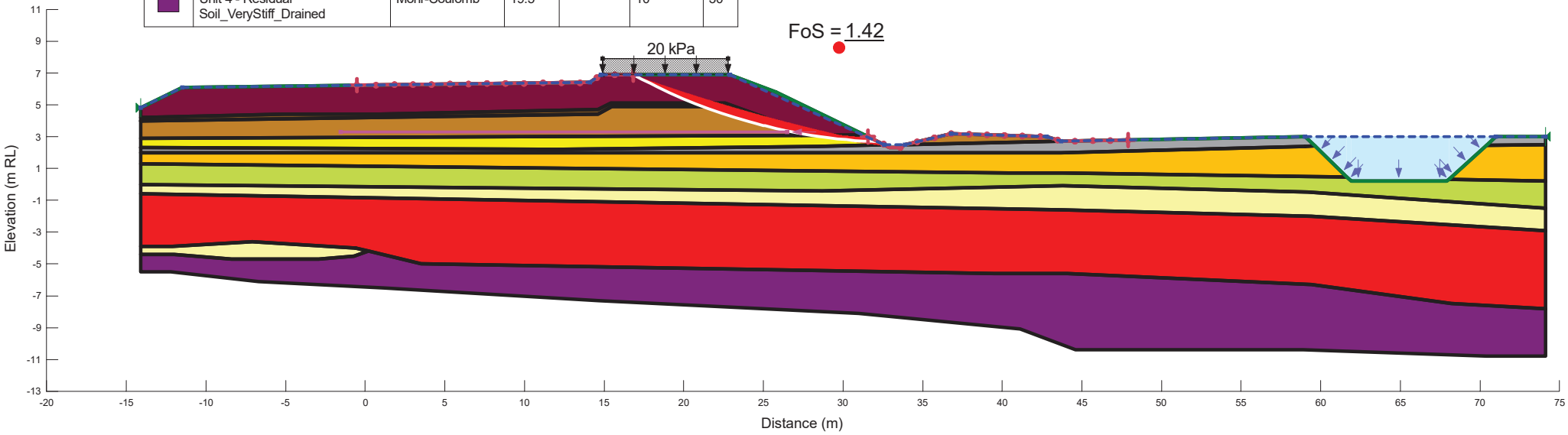
Section D - Case 1_Short-Term

Color	Name	Model	Unit Weight (kN/m³)	Cohesion (kPa)	Cohesion' (kPa)	Phi' (°)
	Drainage Layer_Fill	Mohr-Coulomb	20		0	35
	Structural Fill_Drained	Mohr-Coulomb	20		5	30
	Structural Fill_Drained (Additional)	Mohr-Coulomb	20		5	30
	Surcharge Fill_Drained	Mohr-Coulomb	20		2	30
	Topsoil	Mohr-Coulomb	18		4	27
	Unit 2A(1)-Estuatine_Very Soft to Soft_Undrained	Undrained (Phi=0)	14	10.8		
	Unit 2B(1)-Estuarine_Firm_Undrained	Undrained (Phi=0)	16.5	31.5		
	Unit 2C-Estuarine_Very Loose to Loose_Drained	Mohr-Coulomb	15		0	32
	Unit 3(1)-Alluvial_Stiff to Very Stiff_Undrained	Undrained (Phi=0)	16.5	58.5		
	Unit 4 - Residual Soil_VeryStiff_Drained	Mohr-Coulomb	19.5		10	30



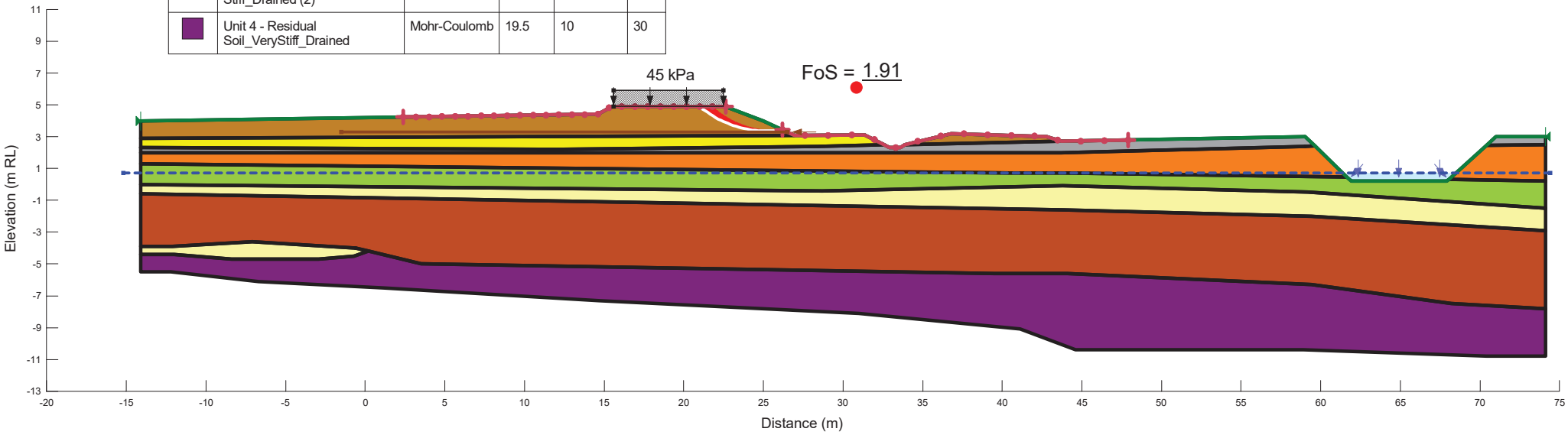
Section D - Case 2_Short-Term_Flooding

Color	Name	Model	Unit Weight (kN/m³)	Cohesion (kPa)	Cohesion' (kPa)	Phi' (°)
	Drainage Layer_Fill	Mohr-Coulomb	20		0	35
	Structural Fill_Drained	Mohr-Coulomb	20		5	30
	Structural Fill_Drained (Additional)	Mohr-Coulomb	20		5	30
	Surcharge Fill_Drained	Mohr-Coulomb	20		2	30
	Topsoil	Mohr-Coulomb	18		4	27
	Unit 2A(1)-Estuatine_Very Soft to Soft_Undrained	Undrained (Phi=0)	14	10.8		
	Unit 2B(1)-Estuarine_Firm_Undrained	Undrained (Phi=0)	16.5	31.5		
	Unit 2C-Estuarine_Very Loose to Loose_Drained	Mohr-Coulomb	15		0	32
	Unit 3(1)-Alluvial_Stiff to Very Stiff_Undrained	Undrained (Phi=0)	16.5	58.5		
	Unit 4 - Residual Soil_VeryStiff_Drained	Mohr-Coulomb	19.5		10	30



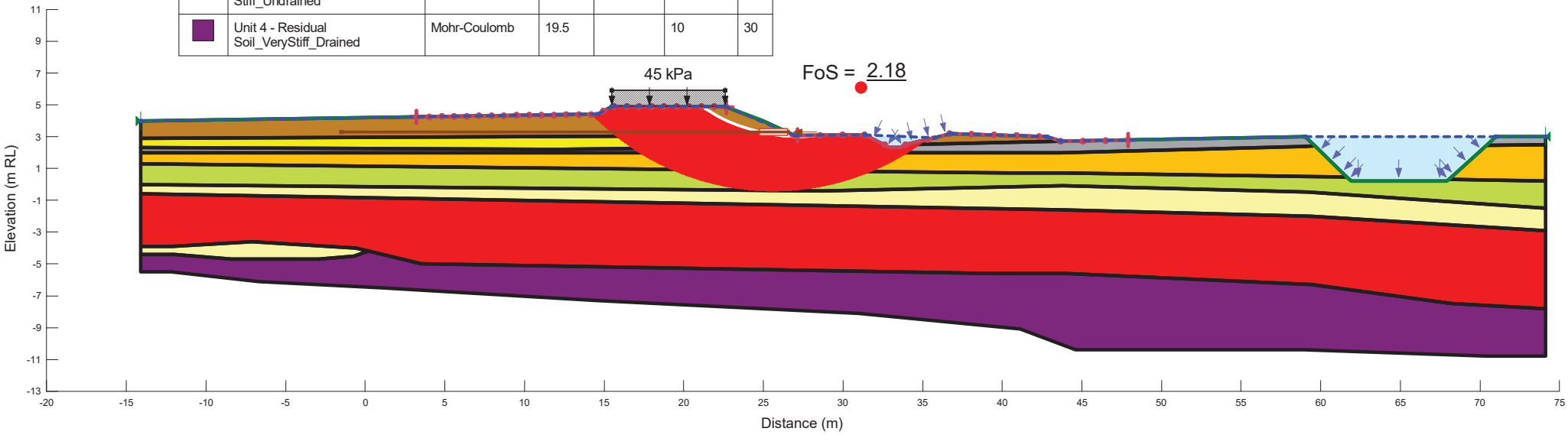
Section D - Case 3_Long-Term

Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)
	Drainage Layer_Fill	Mohr-Coulomb	20	0	35
	Structural Fill_Drained	Mohr-Coulomb	20	5	30
	Topsoil	Mohr-Coulomb	18	4	27
	Unit 2A(1)-Estuatine_Very Soft to Soft_Drained	Mohr-Coulomb	14	2	25
	Unit 2B(1)-Estuarine_Firm_Drained	Mohr-Coulomb	16.5	4	27
	Unit 2C-Estuarine_Very Loose to Loose_Drained	Mohr-Coulomb	15	0	32
	Unit 3(1)-Alluvial_Stiff to Very Stiff_Drained (2)	Mohr-Coulomb	19.5	5	28
	Unit 4 - Residual Soil_VeryStiff_Drained	Mohr-Coulomb	19.5	10	30



Section D - Case 4_Long-Term_Flooding

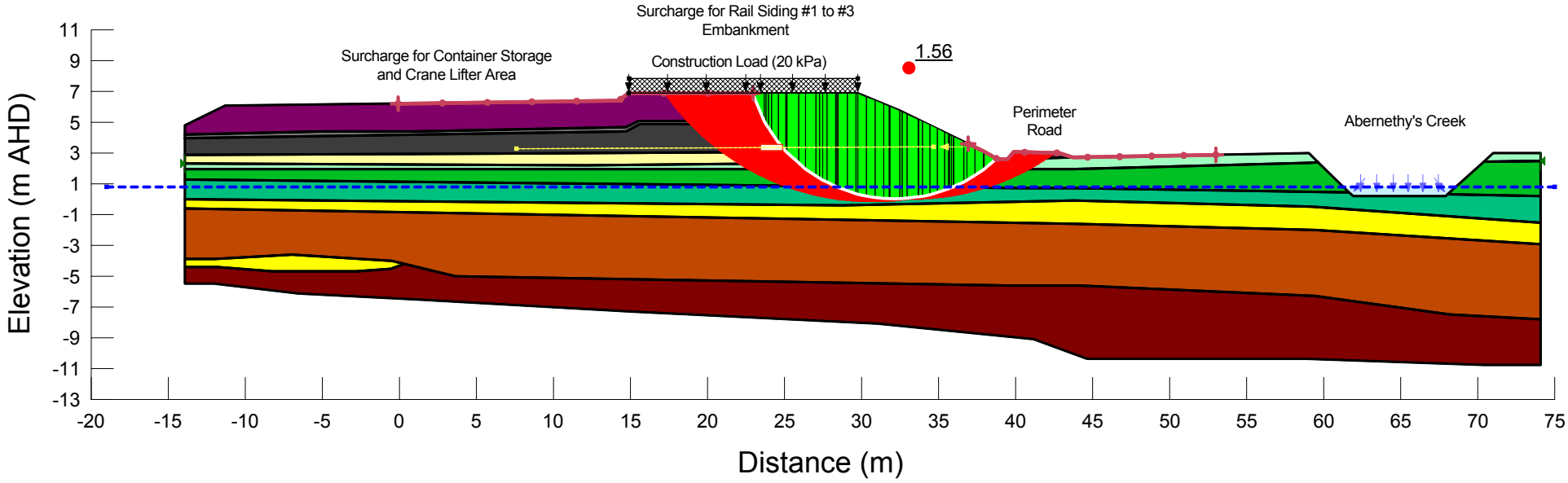
Color	Name	Model	Unit Weight (kN/m³)	Cohesion (kPa)	Cohesion' (kPa)	Phi' (°)
	Drainage Layer_Fill	Mohr-Coulomb	20		0	35
	Structural Fill_Drained	Mohr-Coulomb	20		5	30
	Topsoil	Mohr-Coulomb	18		4	27
	Unit 2A(1)-Estuatine_Very Soft to Soft_Undrained	Undrained (Phi=0)	14	10.8		
	Unit 2B(1)-Estuarine_Firm_Undrained	Undrained (Phi=0)	16.5	31.5		
	Unit 2C-Estuarine_Very Loose to Loose_Drained	Mohr-Coulomb	15		0	32
	Unit 3(1)-Alluvial_Stiff to Very Stiff_Undrained	Undrained (Phi=0)	16.5	58.5		
	Unit 4 - Residual Soil_VeryStiff_Drained	Mohr-Coulomb	19.5		10	30



Appendix D

Slope stability analysis results

Color	Name	Model	Unit Weight (kN/m³)	Cohesion (kPa)	Cohesion' (kPa)	Phi' (°)
	Fill_Drainage Layer	Mohr-Coulomb	20		0	35
	Fill_Structural	Mohr-Coulomb	20		5	30
	Fill_Structural (Additional)	Mohr-Coulomb	20		5	30
	Fill_Surcharge	Mohr-Coulomb	20		2	30
	Unit 1_Topsoil	Mohr-Coulomb	18		4	27
	Unit 2A(1)_Estuarine - VS to S_undrained	Undrained (Phi=0)	14	10.8		
	Unit 2B(1)_Estuarine - F_undrained	Undrained (Phi=0)	16.5	31.5		
	Unit 2C_Estuarine_VL to L	Mohr-Coulomb	15		0	32
	Unit 3_Alluvial - St to VSt_undrained	Undrained (Phi=0)	16.5	58.5		
	Unit 4_Residual - VSt_drained	Mohr-Coulomb	19.5		10	30

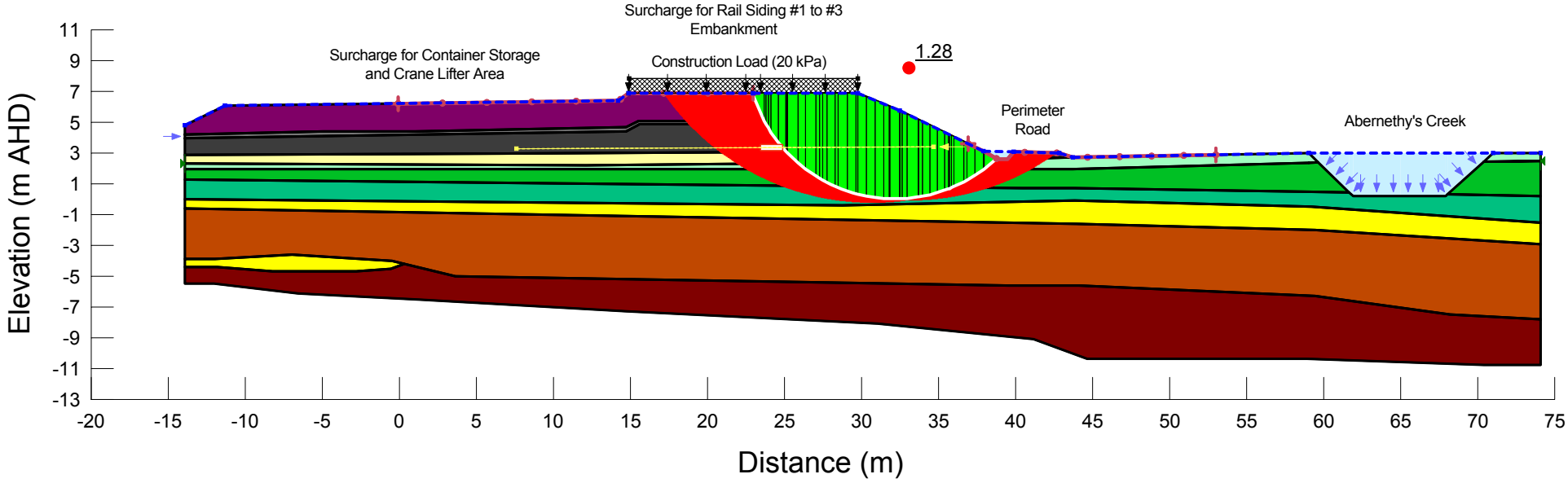


Short Term_Normal Condition

12548413_Packing Plant_MOD21 Slope Stability Models.gsz

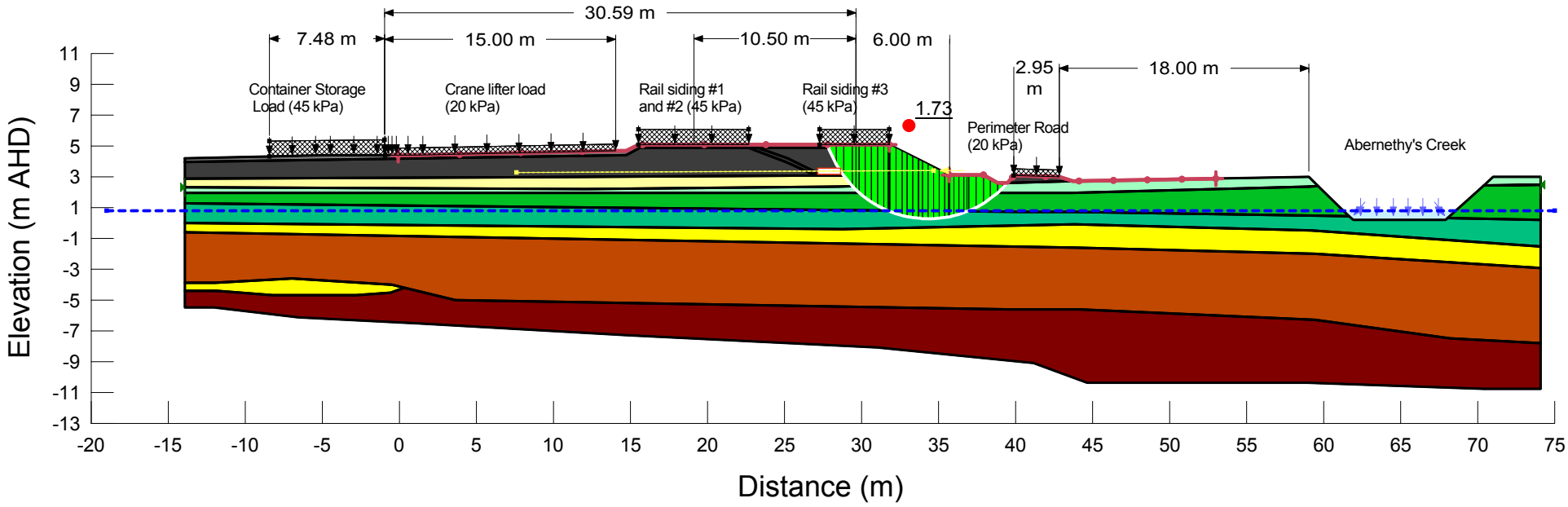
13/05/2021 1:400

Color	Name	Model	Unit Weight (kN/m³)	Cohesion (kPa)	Cohesion' (kPa)	Phi' (°)
	Fill_Drainage Layer	Mohr-Coulomb	20		0	35
	Fill_Structural	Mohr-Coulomb	20		5	30
	Fill_Structural (Additional)	Mohr-Coulomb	20		5	30
	Fill_Surcharge	Mohr-Coulomb	20		2	30
	Unit 1_Topsoil	Mohr-Coulomb	18		4	27
	Unit 2A(1)_Estuarine - VS to S_undrained	Undrained (Phi=0)	14	10.8		
	Unit 2B(1)_Estuarine - F_undrained	Undrained (Phi=0)	16.5	31.5		
	Unit 2C_Estuarine_VL to L	Mohr-Coulomb	15		0	32
	Unit 3_Alluvial - St to VSt_undrained	Undrained (Phi=0)	16.5	58.5		
	Unit 4_Residual - VSt_drained	Mohr-Coulomb	19.5		10	30



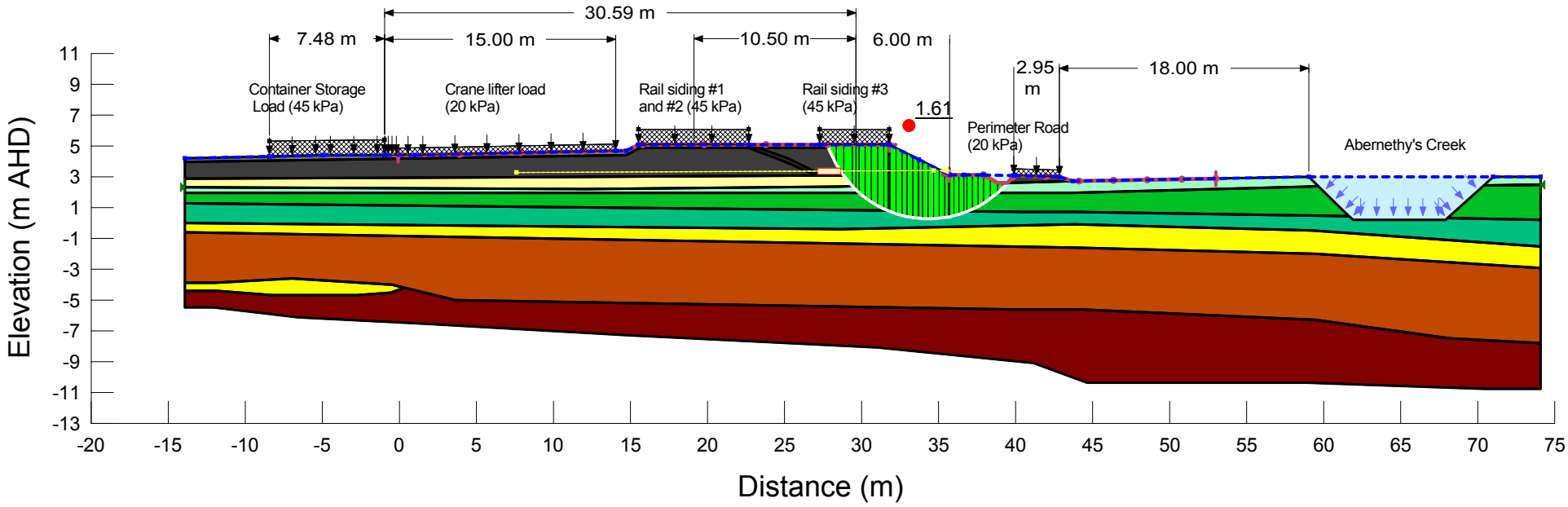
Short Term_Flood Condition	
12548413_Packing Plant_MOD21 Slope Stability Models.gsz	
13/05/2021	1:400

Color	Name	Model	Unit Weight (kN/m³)	Cohesion (kPa)	Cohesion' (kPa)	Phi' (°)
	Fill_Drainage Layer	Mohr-Coulomb	20		0	35
	Fill_Structural	Mohr-Coulomb	20		5	30
	Fill_Structural (Additional)	Mohr-Coulomb	20		5	30
	Unit 1_Topsoil	Mohr-Coulomb	18		4	27
	Unit 2A(1)_Estuarine - VS to S_undrained	Undrained (Phi=0)	14	10.8		
	Unit 2B(1)_Estuarine - F_undrained	Undrained (Phi=0)	16.5	31.5		
	Unit 2C_Estuarine_VL to L	Mohr-Coulomb	15		0	32
	Unit 3_Alluvial - St to VSt_undrained	Undrained (Phi=0)	16.5	58.5		
	Unit 4_Residual - VSt_drained	Mohr-Coulomb	19.5		10	30



Long Term_Normal Condition
12548413_Packing Plant_MOD21 Slope Stability Models.gsz
13/05/2021 1:400

Color	Name	Model	Unit Weight (kN/m³)	Cohesion (kPa)	Cohesion' (kPa)	Phi' (°)
	Fill_Drainage Layer	Mohr-Coulomb	20		0	35
	Fill_Structural	Mohr-Coulomb	20		5	30
	Fill_Structural (Additional)	Mohr-Coulomb	20		5	30
	Unit 1_Topsoil	Mohr-Coulomb	18		4	27
	Unit 2A(1)_Estuarine - VS to S_undrained	Undrained (Phi=0)	14	10.8		
	Unit 2B(1)_Estuarine - F_undrained	Undrained (Phi=0)	16.5	31.5		
	Unit 2C_Estuarine_VL to L	Mohr-Coulomb	15		0	32
	Unit 3_Alluvial - St to VSt_undrained	Undrained (Phi=0)	16.5	58.5		
	Unit 4_Residual - VSt_drained	Mohr-Coulomb	19.5		10	30



Long Term_Flood Condition
12548413_Packing Plant_MOD21 Slope Stability Models.gsz
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Appendix E

Site photographs

Photograph 1: (dated 24/3/2021). View of Abernethy's Creek, looking north from culvert entrance to watercourse, left of photo.

Photograph 2: (dated 24/3/2021). View of western bank of Abernethy's Creek near Packing Plant site. Note uniform surface over steep slope.

Photograph 3: View of normal flow in Abernethy's Creek looking downstream to south. Note thick vegetation over banks.

Photograph 4: (dated 24/3/2021). View across Abernethy's Creek near culvert outlet, looking north-west with Packing Plant site in background. Note high water level in creek following recent flooding.

Photograph 5: View of Abernethy's Creek looking north during flooding. View is from similar location to Photo 1. Note high water level in creek

Photograph 6: View looking south showing eastern edge of earthworks for Packing Plant development with riparian corridor and Abernethy's Creek to east (left of photo).

Photograph 7: View looking north showing eastern limit of earthworks for Packing Plant development. Note photo taken soon after period of heavy rain and flooding with water ponded over riparian corridor.

Photograph 8: View of site earthworks looking south, with structural geotextile exposed. Note settlement monitoring points and vibrating wire piezometer installations across the site. Note riparian corridor and Abernethy's Creek to east (left side of photo).

Photograph 9: Coarse gravel drainage layer in vicinity of perimeter road, with wick drains evident. Riparian corridor and Abernethy's Creek occur to east (left of photo). Note wick drains installed through drainage layer. The third rail siding will be positioned to west of the perimeter road (right side of photo).

Photograph 10: Fill platform over eastern part of site, with riparian corridor and Abernethy's Creek to east (left side of photo).

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