PLATIPUS
EARTH ANCHORING SYSTEMS

Conceptual Proposal

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Platipus Anchors are the global market leaders in the design, manufacture, and supply of Percussion Driven Earth Anchors (PDEA®). Founded in 1982, we are renowned for providing some of the most innovative and cost-effective anchoring solutions for the Civil Engineering and Construction industries.

We trust the information provided meets with your present requirements. Should you have queries please do not hesitate to contact us.

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APPENDICES

1.0 INTRODUCTION

1.1 General

Platipus Anchors Ltd (Platipus) were requested by PDP Green Consulting Engineers Ltd to produce a Conceptual Proposal in relation to Ponsharden Cemeteries, Falmouth.

1.2 The Site

The site is located in “Falmouth, Cornwall and is centred approximately on Ordnance Survey Grid Reference SW 794 388.

The site is a sensitive monument site containing multiple cemeteries, that previously was open to the public for viewing. The site comprised of an irregular shape containing the multiple cemeteries with many headstones and grave mounds. Access gates to the north-eastern and north-western boundaries are observed, with tracks to walk around the site. A retaining wall on the northern boundary is seen showing weathered rock, and tree stumps. A small rectangle concrete building is seen to the south-western edge of site.

Geomorphologically the site was fairly level however there were steep manmade slopes to the north and west and it was clear that the site had been artificially cut into the rock, with the south east part of the site apparently having been raised. The natural ground level sloped steeply to the west.”

1.3 Objective

It is understood that the objective of this conceptual anchoring proposal is to provide a slope reinforcement & soil retention / erosion control solution in relation to the northern boundary of the site where a steep sloping earth face falls from the cemetery grounds down to Falmouth road.

1.4 Design Life

The anchors are to be installed as part of a permanent works stabilisation solution. As such, a design life of 120 years has been requested in accordance with Manual of Contract Documents for Highway Works Volume 1 Specification for Highway Works - Series 600 – Clause 622 Earthworks for Reinforced Soil and Anchor Earth Structures.

1.5 Geotechnical Category

The scheme has been classified as Category 2 as described within EC7. Category 2 includes conventional geotechnical structures; shallow and piled foundations, retaining walls and earthworks constructed without exceptional geotechnical risks, loading or difficult ground conditions. Designs for Category 2 should normally include quantitative geotechnical data and analysis to ensure the fundamental requirements are satisfied.

1.6 Standards

Where practicable, the proposal was undertaken in accordance with the following standards and guidance:

- BS EN 1997-1:2004+A1:2013 Eurocode 7: Geotechnical Design, Part 1: General Rules.
- BS EN 1997-2:2007 Eurocode 7: Geotechnical Design, Part 2: Ground Investigation and Testing.
- NA+A1:2014 to BS EN 1997-1:2004+A1:2013 UK National Annex to Eurocode 7: Geotechnical Design, Part 1: General Rules.
- BS 6031:2009 Code of Practice for Earthworks.
- BS 8004:2015 Code of Practice for Foundations.
- BS 8006-1:2010+A1;2016 Code of Practice for Strengthened/Reinforced Soils and Other Fills.
- BS 8006-2:2011+A1;2017 Code of Practice for Strengthened/Reinforced Soils.

Other technical sources may have been cited in respect of specific aspects of the proposal, as referenced throughout the text. The Standards listed above may refer to alternative methods of providing anchorages (generally using cementitious grout) and full compliance with these Standards is not required.

2.0 GEOTECHNICAL INFORMATION

2.1 Previous Ground Investigation

The comments and recommendations within this report are based on a review of primary information obtained during the ground investigation works and associated laboratory testing (undertaken by others), as well as available published secondary information relevant to the Site.

The following relied upon information has been provided to Platipus Anchors Ltd for use in the preparation of this proposal:

TITLE:	Geotechnical Report
SITE:	Ponsharden Cemeteries Falmouth Road, Falmouth, Cornwall
COMPANY:	AGS Ground Solutions Ltd
DATE:	March 2021
REF:	A2292-1

Site works were carried out on the 2nd and 3rd March 2021 and comprised the following:

- "Excavation of 6 no. Window Sample Holes (WS1-6) to depths of 5.45 m. Window sample holes WS1 to WS6 were excavated on the site using an hand portable cut down windowless sample rig.
- Standard Penetration Tests (SPTs) were performed every 1.0 m intervals in all of the window sample holes.
- Hand shear vanes were used to gather information on mass shear strength within the window sample arisings.
- Samples were recovered for laboratory analysis"

It is strongly recommended that the reader review the above-mentioned report to which this proposal relates and referrers to throughout.

2.2 Geological Setting

The following section provides a summary of the general ground conditions recorded across the Site during the ground investigation works, for guidance purposes only.

"During the site investigation, three main soil / rock layers were identified on the site. An upper layer of Made Ground (MGR) was encountered which was found to overlay Weathered Mylor Slate Formation (MRSL) and The Mylor Slate Formation (MRSL).

Made Ground (MGR)
Made Ground (MGR) was the uppermost layer encountered on the site. The layer comprised a layer of concrete over sandy gravelly clay.

The Made Ground (MGR) was encountered in all excavations and was found to be between 0.30 m deep in Window Sample Hole WS1, WS2, WS3, WS5, and WS6, and 0.75 m in window sample hole WS4.

Weathered Mylor Slate Formation (MRSL)
The Weathered Mylor Slate Formation (MRSL) was situated immediately beneath the Made Ground (MGR).

The layer comprised a stiff brown grey gravelly clay, transitioning to a moderately weak to moderately strong grey brown metamudstone. Very thin laminae (1 – 4 mm) and rare quartz gravelly observed. Arising as clayey gravel at depth.

The Weathered Mylor Slate Formation was encountered in all locations and varied in thickness from 1.70 m in window sample hole WS2 to 3.70 m in window sample hole WS1.

Mylor Slate Formation (MRSL)

The Mylor Slate Formation (MRSL) was the layer on which all of the window sample holes refused. Although not observed, observations during drilling suggest that the material is intact rock."

It should however be noted that an area of moderately weak METAMUDSTONE, was encountered in all window at the top of the Mylor Slate Formation, to depths ranging from 2.33m to 4.44mbgl. Samples taken from this area were recovered as a clayey, silty sandy GRAVEL with SPT N values ranging from 21 to 37 before refusing at greater depths where window sample holes refused and were halted. As such the area of moderately weak METAMUDSTONE has been modelled as a soil strata as it is believed mechanical anchors could be driven within this material.

2.3 Soil Strength

This section includes a review of the available data and selection of suitable characteristic parameters for the principal material types that will be encountered during anchoring works.

Please note that a number of the correlations are derived for a certain type of soil, and may not be appropriate for all the soil types encountered on this project.

Table 1.0: Geotechnical Parameters

Stratum	Material Properties	Characteristic Value	Reference
Weathered Mylor Slate Formation (MRSL)	Unit Weight (kN/m3)	19	BS 8004:2015 Figure 1
	Drained Angle of shearing Resistance (°)	30	BS 8004:2015 Eq. 8
	Effective cohesion (kPa)	0	
Moderately Week Mylor Slate Formation (MRSL)	Unit Weight (kN/m3)	20	BS 8004:2015 Figure 1
	Drained Angle of shearing Resistance (°)	37	BS 8004:2015 Eq. 4
	Effective cohesion (kPa)	0	

2.4 Hydrogeology

Groundwater was not encountered during excavation of any of the investigative positions.

Groundwater levels may vary from those at the time of the investigation. Groundwater levels may fluctuate seasonally and with variations in rainfall. Water may also become perched upon cohesive strata or around features such as foundations, and may also occur from leaking drains and water mains; etc.

3.0 STABILITY ASSESSMENT

3.1 General

This Conceptual Proposal presents an assessment of the available sources of geological, geotechnical and geo-environmental information and provides initial comments on a remedial anchoring scheme. The findings detailed in this proposal are based upon an engineering review of the available information, and professional judgement in its interpretation.

Three cross sections (Sections 3, 4 and 5) have been provided to Platipus Anchors Ltd (drawing: Road Bank Sections, ref: 2503, RIBA Chartered Practice), which illustrate the existing/proposed ground profile.

3.2 Ground Water

The groundwater table was not encountered during the site investigation. Groundwater is not anticipated to impact the site. However, if groundwater is encountered or is known to influence the site, Platipus should be notified immediately.

The groundwater conditions are based on observations made at the time of the fieldwork. It should be noted that groundwater levels may vary due to seasonal and other effects.

If groundwater or surface water flows are greater than anticipated, then the scheme presented within this Conceptual Proposal will require reviewing to suit changes encountered within the water regime. Unforeseen circumstances, such as changes in ground or hydraulic conditions, shall be reported immediately to Platipus.

3.3 Trees and Vegetation

The existing slope is covered in vegetation that includes grasses, shrubs, and trees. It is very likely that the presence of the vegetation is aiding in stabilizing the slope.

De-vegetation of the slope will be required for the re-grading operation. To reduce the risk of triggering a slope failure due to the removal of the vegetation, we recommend using a progressive plan of clearing and grubbing that would remove the vegetation only in small areas at a time.

Site clearance should be undertaken before the specialist works commence. An ecologist and tree consultant should be consulted before any vegetation on site is disturbed/removed to ensure compliance with the scheme's planning consent. The specification of site clearance and compliance with ecological constraints falls outside of the scope of this Conceptual Proposal.

A detailed arboricultural survey was outside the scope of this report. A survey may be required for tree root protection purposes or for assessing anchor usage in the vicinity of trees.

It should be noted that stability analyses may underestimate the factors of safety due to the absence of the positive effect's vegetation.

3.4 Anchor Suitability Tests

While the provided ground investigation report allows an estimation of soil parameters it is insufficient to determine reliable anchor holding capacities. For this reason, anchor suitability testing must be completed to confirm the correct choice in anchor size.

At the time of writing this Conceptual Proposal NO anchor suitability tests have been completed onsite. A small number of trial ground anchors should be installed and tested prior to live installation, to confirm that the required pull-out capacities can be achieved, support technical assumptions and to identify any potential issues with driving the anchors.

3.5 Geotechnical Parameters

In accordance to BS EN 1997-1:2004+A1:2013, the stability analysis has been conducted with partial factors applied to characteristic loads and soil strength parameters. Design Approach 1 was utilised to ensure a level of safe working practice was met. The verification analysis is performed for two sets of coefficients, Combination 1 (DA1-1) and Combination 2 (DA1-2). Partial factors are applied to actions in DA1-1 and to unfavourable variable actions and material properties in DA1-2.

Partial factors in line with Design Approach 1, Combination 1 and Combination 2 as set out in BS EN 1997-1:2004+A1:2013, Section 2.4.7 and in the UK National Annex are presented in Table 2.0.

Table 2.0: Eurocode 7 Partial Factors

Item			Design Approach 1	
			Combination 1	Combination2
Actions	Permanent	Favourable	1.00	1.00
		Unfavourable	1.35	1.00
	Variable	Favourable	0.00	0.00
		Unfavourable	1.50	1.30
Material Properties	Coefficient of shearing resistance		1.00	1.25
	Effective Cohesion		1.00	1.25
	Undrained Strength		1.00	1.40
	Unconfined Compressive Strength		1.00	1.40
	Weight Density		1.00	1.00

The slope stability analyses were undertaken using the effective stress conditions, representing the long-term situation for the overall stability, for each design combination, interpreted from AGS Ground Solutions Ltd as well as those derived within Section 2.3, Table 1 with partial factors applied in line with BS EN 1997 1:2004+A1:2013.

Table 3.0: Adopted Soil Parameters for Preliminary Slope Stability Assessment

Stratum	Characteristic Values				Design Approach 1 - Combination 1		Design Approach 1 - Combination 2	
	Unit Weight (kN/m3)		Angle of Shearing Resistance (°)	Effective Cohesion (kPa)	Angle of Shearing Resistance (°)	Effective Cohesion (kPa)	Angle of Shearing Resistance (°)	Effective Cohesion (kPa)
	γ_{dry}	γ_{sat}	ϕ	c'	ϕ	c'	ϕ	c′
Made Ground	15	n/a	15	0	15	0	12.09	0
Weathered Mylor Slate Formation (MRSL)	19	n/a	30	0	30	0	24.79	0
Moderately Week Mylor Slate Formation (MRSL)	20	n/a	37	0	37	0	31.08	0
Mylor Slate Formation (MRSL)	20	n/a	Infinite	Infinite	Infinite	Infinite	Infinite	Infinite

In most cases, characteristic soil properties and profiles have been assessed on a conservative best estimate of the available data set. The selection process considers the variability of the data and the careful consideration of extreme or unrepresentative data values, possibly leading to their omission where appropriate. Values derived from regression analysis were also considered. Following this process, where applicable a further review has been undertaken using comparisons with published data, correlations and other parameters and engineering judgement to arrive at a final characteristic value. Global, site-wide characteristic parameters have been adopted.

Given the strength and composition of made ground deposits which exhibit significant lateral and vertical variation, it is extremely difficult to provide characteristic design parameters for this material, as such conservative strength parameters were adopted for this soil horizon within the stability assessment.

The Mylor Slate Formation (MRSL) deposits show a range of geotechnical properties as they transition from moderately weak to intact metamudstone rock. Geotechnical parameters have been assigned to the moderately weak metamudstone deposits based on where they meet the criteria for a granular soil once it is deemed they are performing more as a rock the stability analysis has assumed infinite strength parameters as it is not deemed the slope will fail through this stratigraphy. A rock mass assessment of the intact metamudstone rock is outside the requirement of this Conceptual Proposal and is the responsibility of the client to undertake.

It is considered the strength parameters adopted are potentially conservative. Further investigation would allow for a more detailed analysis, including the potential use of less conservative values of c' and ϕ '. This increase would show an associated increase in the factor of safety or a reduction within the anchoring requirements.

3.6 Stability Analysis

Slope stability analyses was conducted using the Rocscience, Slide software (version 7.030). The scheme was derived using best practice design techniques outlined within BS EN 1997-2:2004+A1:2013 where appropriate. Design Approach 1 was utilised to ensure a level of safe working practice was met using the following limit state equilibrium methods:

- Spencer;
- Modified Bishop; and
- GLE/Morganstern-Price.

The above slope stability methods were used for computing the factor of safety against slope failure, with: between 50 and 75 slices calculated; a factor-of-safety tolerance of 0.005; and a minimum slip surface thickness of 0.50m. Both circular and translational failure mechanisms were considered, however; only the most critical failure mechanism is provided in the attached exhibits.

3.7 Stability Assessment

Slope stability analyses have been carried out to help assess the stability the following conditions:

1- Proposed Condition (Un-Supported)
2- Remediated Condition (Supported)

Table 4.0 compiles the results of the analysis showing the minimum factor of safety for each of the conditions, for each of the Sections (3, 4 and 5). The analyses outputs can be provided upon request. Appendices A and B presents the most critical section for each scenario.

Table 4.0: Preliminary Slope Stability Assessment

Section	Design Approach	Factor of Safety					
		Proposed Condition (Un-Supported)			Remediated Condition (Supported)		
		Spencer	Modified Bishop	Morgenstern - Price	Spencer	Modified Bishop	Morgenstern - Price
Section 3	DA1-1	0.387	0.348	0.369	1.104	1.091	1.119
	DA1-2	0.337	0.282	0.290	1.049	1.010	1.054
Section 4	DA1-1	0.367	0.372	0.367	1.681	1.659	1.681
	DA1-2	0.301	0.304	0.307	1.620	1.619	1.622
Section 5	DA1-1	0.371	0.304	0.323	1.275	1.257	1.277
	DA1-2	0.222	0.225	0.222	1.278	1.254	1.275

Traditionally a single, lumped factor of safety accounts for all design uncertainties, which is interpreted as an over-design factor. BS EN 1997-2:2004+A1:2013, applies partial factors to different components throughout the analysis. Therefore, by considering this approach, the calculated factor of safety must need only equate to 1.00 or greater.

The above analysis has been conducted to determine Ultimate Limit State (ULS) criteria, A check against Serviceability Limit State (SLS) is deemed outside the specification of this anchoring proposal.

The conceptual model created, used the best approximation of geological conditions for the site. However, soil properties adopted in the model may be conservative or even optimistic. Without further geotechnical investigation and/or soil laboratory testing, it is difficult to refine the values adopted in the analysis with confidence. However, the models do provide an indication of the relative slope stability before and after anchor installation.

3.8 Anchor Recommendations

Anchor performance was varied to achieve an acceptable factor of safety within the analysis. The following recommendations have been made with respect to a possible mechanical anchoring scheme.

Table 5.0: Conceptual Anchoring Proposal		
Anchor Type	N/A	S8
Working Load	kN	15
Proof Load	kN	19
Ultimate Load	kN	23
Horizontal Spacing (Out of plane spacing)	m	1.20
Vertical Spacing Along Slope Face	m	1.20
Anchor Driven Depth	m	4.00
No. rows	N/A	TPC onsite

ANCHORS TO BE INSTALLED IN A STAGGERED PATTEREN PERPENDICULAR TO THE SLOPE FACE.

Alternating anchor rows should be offset by 0.6m from the anchors above and below to form a diamond pattern.

The recommended anchoring layout is presented in Appendix B.

3.9 Installation

The strength of the Mylor Slate Formation (MRSL) at relatively shallow depth may make driving mechanical anchors difficult.

It is considered anchor installation to the specified depths is **NOT** likely to be possible using traditional hand-held techniques (i.e. hand-held hydraulic hammer / breaker). It is therefore recommended that an excavator/machine with a mounted hydraulic hammer/breaker be utilized for anchor installation.

Access to the embankment may not be possible without the use of Traffic Management (TM) or an Impact Protection Vehicle (IPV) due to the location of the site.

The Client shall inform Platipus Anchors Ltd if there are any special circumstances at the site that are likely to restrict the use or selection of plant or equipment by the contractor in the performance of their services. The client could be liable for any reasonable additional costs where such restrictions are not advised in good time if anchoring works are to proceed.

It is strongly recommended a specialist Approved Installer, experienced with ground anchor installation, be instructed to undertake site works or at minimum their advice sought to provide initial onsite training to aid the installation process.

Where anchor positions clash with individual trees or tree stumps that are to remain, these may be varied by +/- 500mm in the horizontal and vertical planes along the line of the slope face.

3.10 Slope Excavation

It is of paramount importance that the cut face to be stabilised is smooth and even to allow a tight profiling of the geotextile.

Due to the presence of isolated sandy soils open excavations are largely anticipated to be unstable on site.

To provide a safe working platform during anchor installation and to prevent cut face collapse, staged excavation will be required. Each horizontal level of anchoring must be completed and locked off before further excavation take place. All excavated slopes should be supported at the end of each shift.

All benches of excavated ground are not to exceed 1 no. rows of anchors in height, unless otherwise agreed. The next bench should not be excavated until the current row of anchors and geotextile have been installed over the full cutting extent.

The period between trimming of the face of the slope and the anchor installation should be minimised to prevent risk of face collapse. Where possible, faces should not be exposed during periods of bad weather. In accordance with good earthworks practice and if necessary to maintain temporary stability; when forming benches and successive stepped cuts, the initial cut face may be formed proud of that proposed, at a slacker angle and then trimmed back to the final finished profile.

At each level of excavation, the soil type and level of any groundwater encountered should be observed and compared with those anticipated from the ground investigation and that of the model created within this Conceptual Proposal. Where differences are observed, these shall be reported to Platipus immediately and any necessary actions to be taken.

Where there is uncertainty about the stability of the ground at the proposed face angle, then face stability assessment tests should be undertaken. It is important to note that face stability assessment tests are not precise and are only intended to give an indication of face stability. The test involves the excavation of a trial pit to a batter and depth equal to the slope angle and bench height used in the proposal. The width of excavation should not be less than twice the bench height and the period of observation should be representative of the anticipated time between the installations of rows of anchors. Where possible, these tests should be undertaken before execution of the works. Where anchor execution involves excavation to significant depths and in varying strata, then consideration should be given to carrying out additional tests as execution proceeds or as changing ground conditions are encountered.

Any cut slope should be regularly inspected for signs of potential instability, and sufficient working space should be allowed at the base.

3.11 Slope Facing

All effort should be made to securely anchor a geotextile finish as close as possible to the face of the slope to help mitigate against water ingress and thus wash out of material from the slope. It may be appropriate to install additional non-structural anchors to aid in the profiling of the chosen surface finish.

To protect against shallow mantle failure in the cut between mechanical anchors, a MacMAt R Steel system manufactured by Maccaferri (or equivalent) should be installed prior to mechanical anchoring works. The MacMAt R Steel should be underlain by coir matting to reduce the risk of soil erosion while vegetation can establish.

The geotextile shall be placed according to the manufacturer's system requirements.

The geotextile should be draped over the slope face terminated, along the upper and lower edge, in an anchor trench to prevent storm runoff getting beneath as to the manufacture's recommendations. A min. 300mm deep anchor trench is considered appropriate unless contradicted by advice given by the geotextile supplier.

If an anchor trench is not possible thought should be given to securely anchoring the geotextiles at the crest of the slope as site restrictions prevent the use of a traditional toe in trench. It is important that the upper edge of the geotextiles is held securely. A single row of Platipus S2 anchors could be installed along the upper edge with horizontal centres no greater than 0.50m. Platipus S2 anchors to have a nominal load applied (pulled by hand) to fix the geotextiles along at the crest the slope.

The lower edge of the geotextiles should extend below the rock head by approximately 0.5m to enable it to be fixed to the rock using S02 ARGS Anchors at 0.5m centres holding the geotextile in place with 0.4m x 0.1m stainless steel walers. **This detail is important as there is a chance that the rock head will create a spring line along the cut face which must be drained whilst preventing large scale loss of fines.**

Seeded topsoil should be packed behind the proposed geotextile and kept moist during the first few months until the vegetation can establish. The client must accept responsibility to ensure successful vegetation is achieved by careful construction, inclusion of suitable topsoil on face and appropriate planting and irrigation if this becomes necessary. Should, three months after completing construction, no significant vegetation be visible we recommend that the face of the reinforced slope is hydro-seeded. Additional seeded topsoil may also be required over the geotextile as to the manufacture's recommendation. Vegetation plays an important role in reducing erosion, the roots provide a reinforcing action and their need for water will reduce the in-situ moisture content of the soil.

However, careful consideration of the long-term effects of vegetation, in particular trees and large shrubs, should be undertaken. Care should be given to avoid planting large trees near the crest of clay slopes. Large trees have adverse loading effects and tend to dry the soil. Trees placed at the base of slopes can, however, have beneficial effects. When considering any planting scheme.

Vegetation should be kept short to ensure it forms dense grass sods. These create a consistent root network, making the banks more resilient to erosion from waves, over topping and heavy rain. Keeping the grass short also allows continued monitoring and early detection of small instabilities if they were to occur which often allows for an early warning sign of something more significant. Shorter vegetation also discourages vermin from digging into the bank, embankments with animal warrens can cause instabilities through their potential collapse when water runs through them

3.12 Limitations

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from intrusive site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Subsoils are inherently variable and by their very nature are hidden from view such that no investigation can be exhaustive to the extent that all soil conditions are revealed. Conditions may therefore be present beneath the site that were not apparent from the data available for review. Similarly, this assessment has been based in part on third party data. Third party data has been taken at face value and has not been subjected to any external validation. Consideration may be given to enlisting the services of a suitably qualified person (Geotechnical Engineer), to provide observations and testing services during pertinent construction phases. If variations are observed on-site, Platipus should be immediately notified. If variations appear, Platipus can provide further evaluation and supplemental recommendations.

CONDITIONS OF USE

You agree use of this Conceptual Proposal and the recommendations, suggestions, and information herein is at your own risk, and you assume all liabilities for outcomes based thereon. Such recommendations, suggestions, and information are technical guidance only. You should commission an independent engineer to verify and validate such recommendations, suggestions, and information.

BY ACCEPTING DELIVERY OF THIS CONCEPTUAL PROPOSAL AND/OR USING THE RECOMMENDATIONS, SUGGESTIONS, AND INFORMATION HEREIN, YOU ACKNOWLEDGE AND AGREE PLATIPUS ANCHORS LTD IS NOT LIABLE TO YOU OR ANY THIRD PARTY FOR THE RECOMMENDATIONS, SUGGESTIONS, AND INFORMATION IN THE CONCEPTUAL PROPOSAL, AND YOU AGREE TO HOLD HARMLESS AND TO INDEMNIFY PLATIPUS ANCHORS LTD FROM ALL LIABILITIES AND LOSSES ARISING FROM YOUR USE THEREOF.

CLIENT OBLIGATIONS

The Client acknowledges that in agreeing to provide this Conceptual Proposal, Platipus Anchors Ltd has relied upon the Client to make full disclosure of all relevant information. The Client shall provide promptly to Platipus Anchors Ltd any new relevant information, which becomes available or any other information, which may materially affect the Conceptual Proposal.

Where the Client is not the Site owner, the Client shall be responsible for ensuring that all regulatory permits and permissions from any relevant third party are in place to enable the undertaking of anchoring as set out within this Conceptual Proposal.

No aspect of this report should be taken as a guarantee whatsoever. The client should take all responsibility in assuring that the information provided satisfies the specific on-site requirement.

ACCOMPANYING NOTES

1) **This report considers the subject site at the time of issue of the report. Should the site change significantly, then the implications regarding the geotechnical aspects will need to be reviewed. No geoenvironmental assessment has been undertaken.**
2) **Information provided by third parties has been used in good faith and is taken at face value; however, Platipus Anchors Ltd cannot guarantee its authenticity, accuracy or completeness. The client should satisfy that this anchoring proposal is accurate/representative of the onsite conditions and fulfils the onsite requirements.**
3) **No geoenvironmental assessment was undertaken under the remit of this conceptual proposal in regards to end user or groundworker protection, risk to Controlled Waters or waste disposal.**
4) **Should the design plan change, Platipus Anchors Ltd should be given the opportunity to review and update the recommendations given within this conceptual proposal where necessary.**
5) **The recommendations presented in this conceptual proposal have been made based on the foregoing information. If the concept of the project is changed or differs from that assumed, recommendations contained within this conceptual proposal may need to be revised as necessary. The recommendations provided in this report have been made under the assumption that construction will be performed in accordance with the relevant construction standards and specifications.**
6) **No warranties, either expressed or implied, are made concerning the professional advice included in this report.**
7) **This report makes no representation on other matters such as ecology, structural condition, building materials, boundaries and planning etc.**
8) **The client or their appointed representatives shall field verify all dimensions, conditions and quantities affecting the anchoring works. Any conflicts shall be brought to the attention of the engineer before proceeding.**
9) **Groundwater findings described are only representative of the dates on which they were made and levels may vary. The worst anticipated ground water level during the lifespan of the project should be confirmed prior to the adoption of the below anchoring recommendations.**
10) **Interpretation of ground conditions inherently depends on conditions revealed by a limited data set. We take no responsibility for any conditions not directly revealed by the investigation or of the information provided to us.**
11) **If soil parameters are known to differ from those listed, the above anchoring scheme will be invalidated.**
12) **If unforeseen ground conditions or obstructions are encountered that have not been previously identified, this anchoring scheme will be invalidated. Platipus Anchors Ltd will not be held liable for any costs associated with these changes.**
13) **In the interests of safety, it is important that a thorough survey is made for buried services. In particular gas, electricity, water and telecommunications should be positively identified, located and marked prior to commencement of anchor installation. We do not accept any responsibility whatsoever for any damage caused by the installation of our anchors. THE LOCATION AND PROTECTION OF ALL UTILITIES IS THE RESPONSIBILITY OF THE CLIENT OR THEIR APPOINTED REPRESENTATIVES.**
14) **The Contractor shall satisfy that the area is free from existing services and plant that could be damaged by installation of the ground anchors or present a hazard to personnel involved in the installation works or members of the public.**
15) **Platipus Anchors Ltd takes NO responsibility to the recommendations given to anchor drivability, the above should be taken as an indication only.**
16) **It has been assumed there are NO significant spatial constraints on site, that are likely to restrict anchor installation.**
17) **There should be no further cuts on the hillslope other than those shown on the provided grading plans unless reviewed by a qualified geotechnical engineer;**
18) **No channelized water flows should be directed over the top-of-slope.**
19) **The slope should maintain a well vegetated slope at all times.**
20) **The enclosed information within this conceptual proposal is provided only for general guidance. Under no circumstances should the information provided be interpreted to mean that anyone other than the construction contractor assumes responsibility for construction site safety.**
21) **The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom.**
22) **The Contractor is required to comply with all relevant Health & Safety legislation and with any special requirements of the Client.**
23) **It is the responsibility of the Contractor/Client to acquire any necessary permits / permissions from relevant authorities to carry out the works.**
24) **The client understands that this report does not purport to be a "Geotechnical Design Report" as defined in Clause 2.8 of Eurocode 7 (Geotechnical Design BS EN 1997-1:2004).**

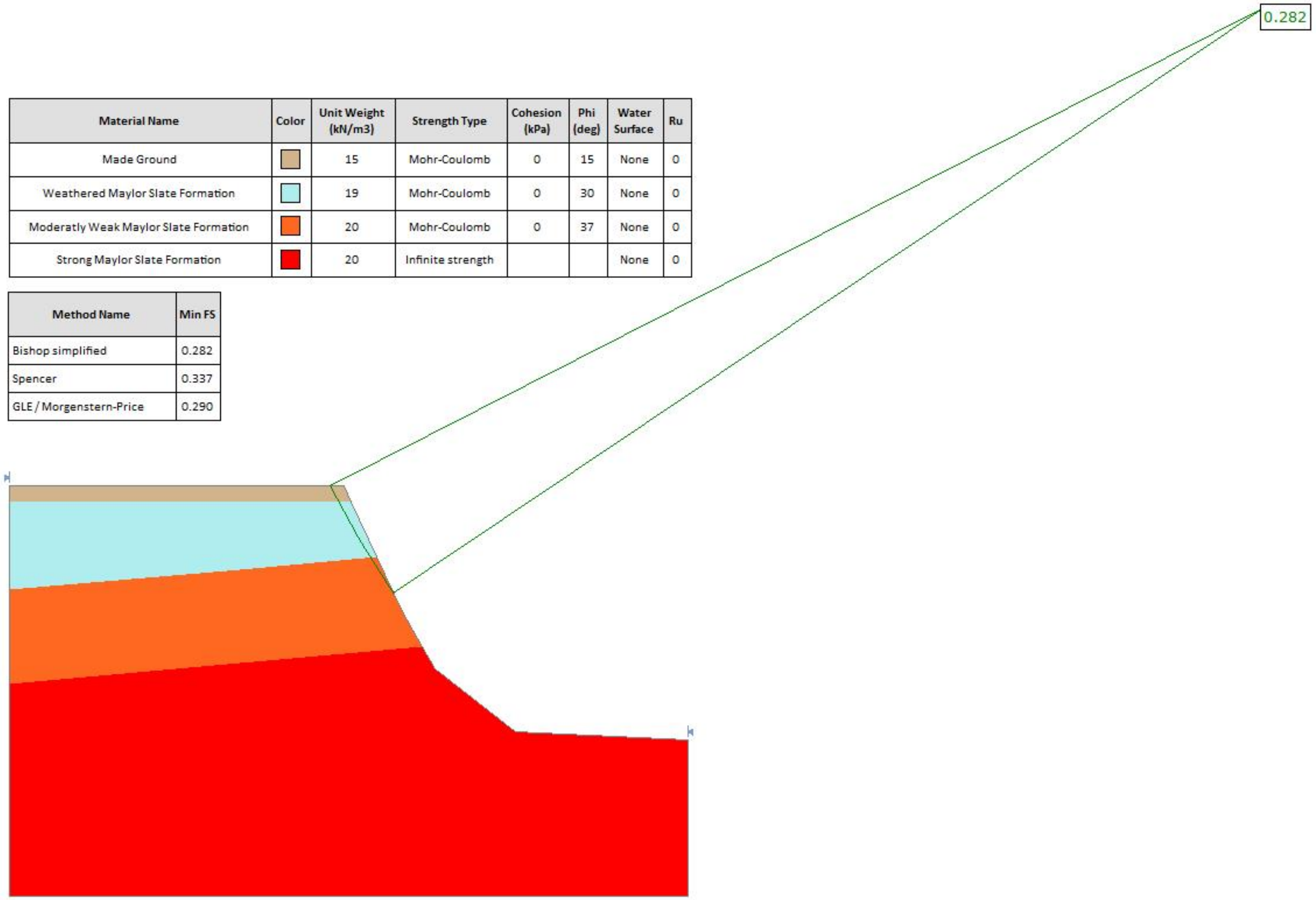
APPENDIX A:

Stability Assessment Proposed Condition
(Un-Supported)

DO NOT SCALE FROM THIS DRAWING

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Made Ground		15	Mohr-Coulomb	0	15	None	0
Weathered Maylor Slate Formation		19	Mohr-Coulomb	0	30	None	0
Moderatly Weak Maylor Slate Formation		20	Mohr-Coulomb	0	37	None	0
Strong Maylor Slate Formation		20	Infinite strength			None	0

Method Name	Min FS
Bishop simplified	0.282
Spencer	0.337
GLE / Morgenstern-Price	0.290



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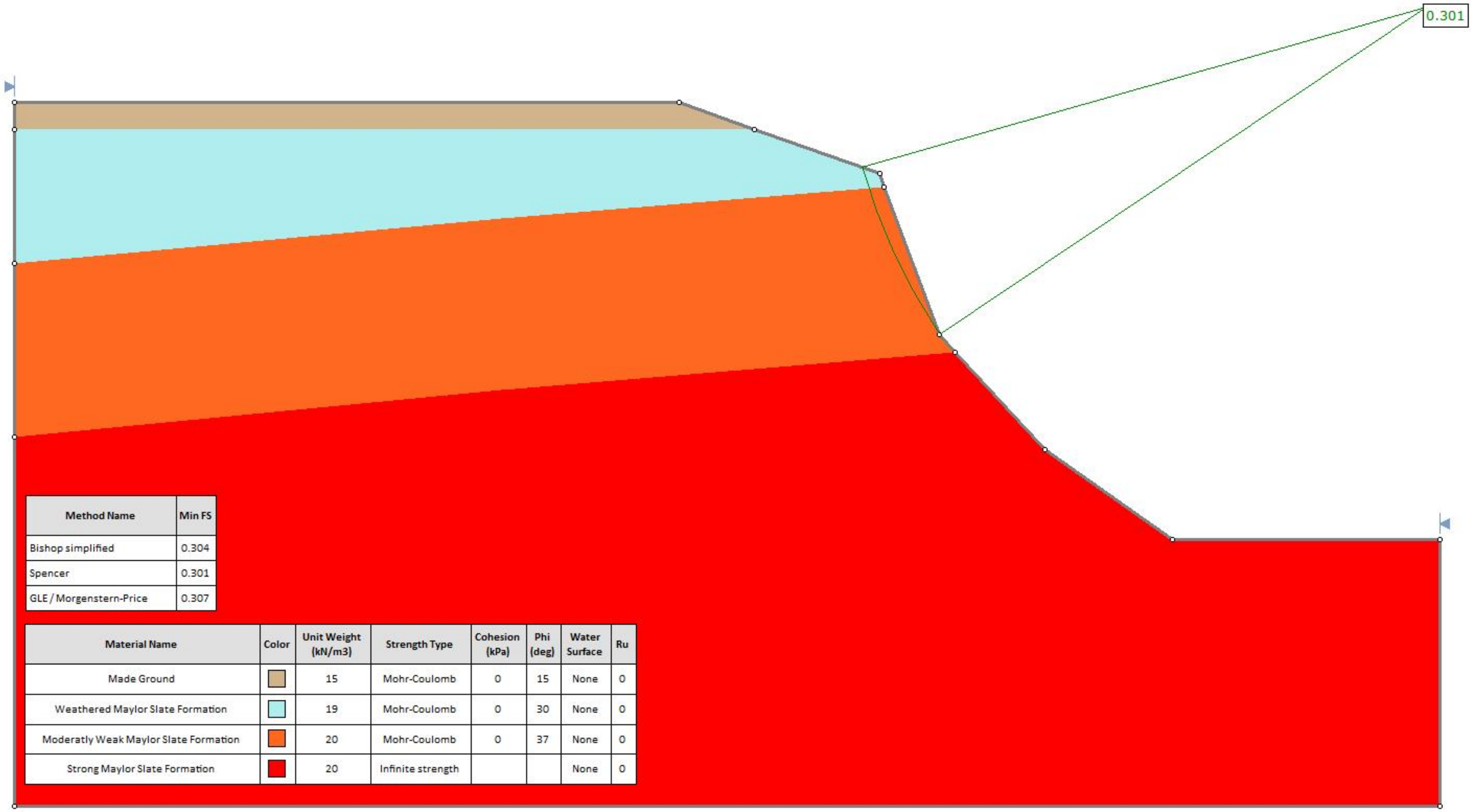
DO NOT SCALE FROM THIS DRAWING



Method Name	Min FS
Bishop simplified	0.304
Spencer	0.301
GLE / Morgenstern-Price	0.307

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Made Ground		15	Mohr-Coulomb	0	15	None	0
Weathered Maylor Slate Formation		19	Mohr-Coulomb	0	30	None	0
Moderatly Weak Maylor Slate Formation		20	Mohr-Coulomb	0	37	None	0
Strong Maylor Slate Formation		20	Infinite strength			None	0

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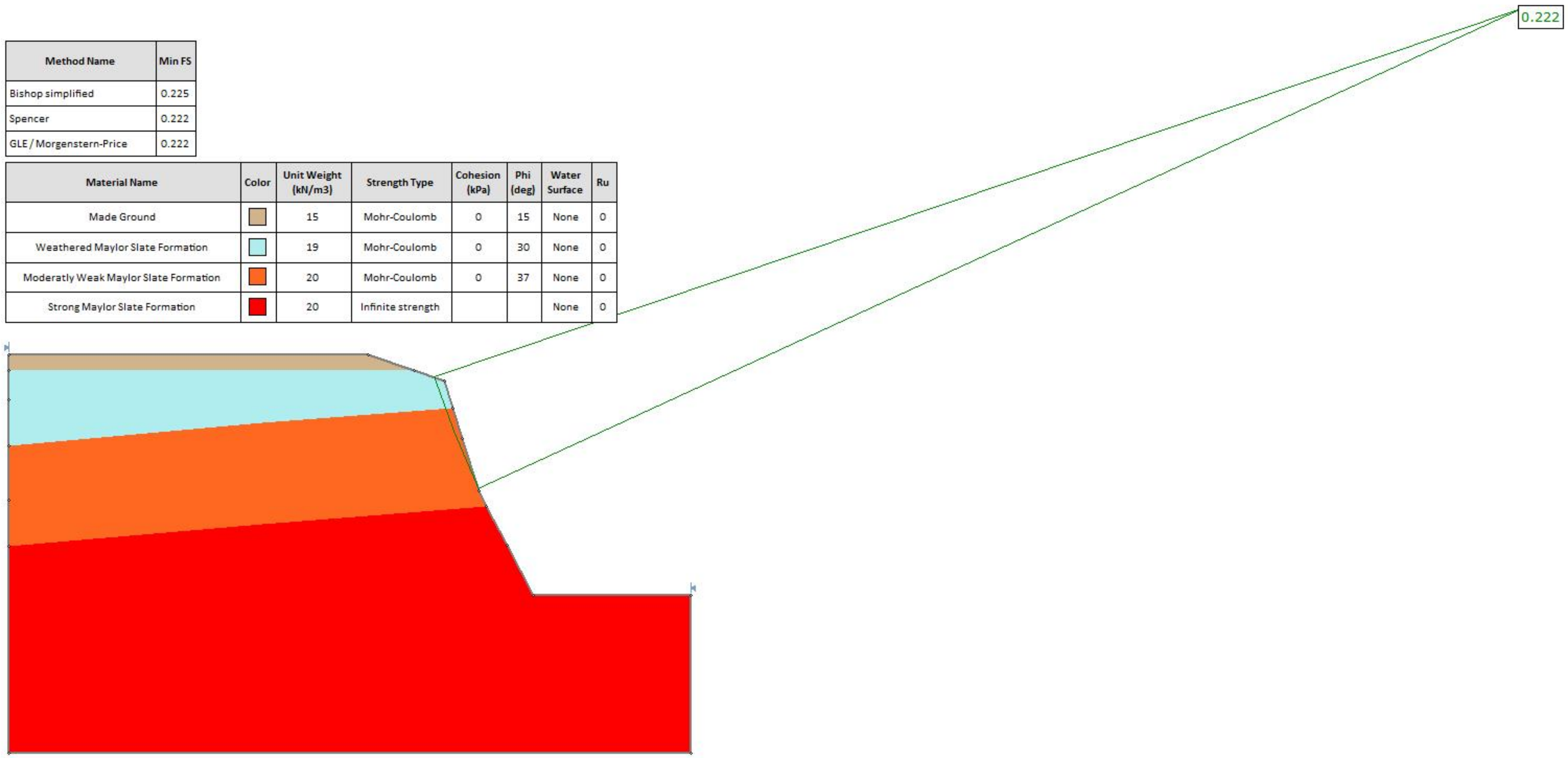
Method Name	Min FS
Bishop simplified	0.225
Spencer	0.222
GLE / Morgenstern-Price	0.222

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Made Ground		15	Mohr-Coulomb	0	15	None	0
Weathered Maylor Slate Formation		19	Mohr-Coulomb	0	30	None	0
Moderatly Weak Maylor Slate Formation		20	Mohr-Coulomb	0	37	None	0
Strong Maylor Slate Formation		20	Infinite strength			None	0



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PROJECT NAME
Ponsharden Cemeteries

DRAWING TITLE
Section 5

PROJECT NO.
15320

DATE
09/ 04 / 2021

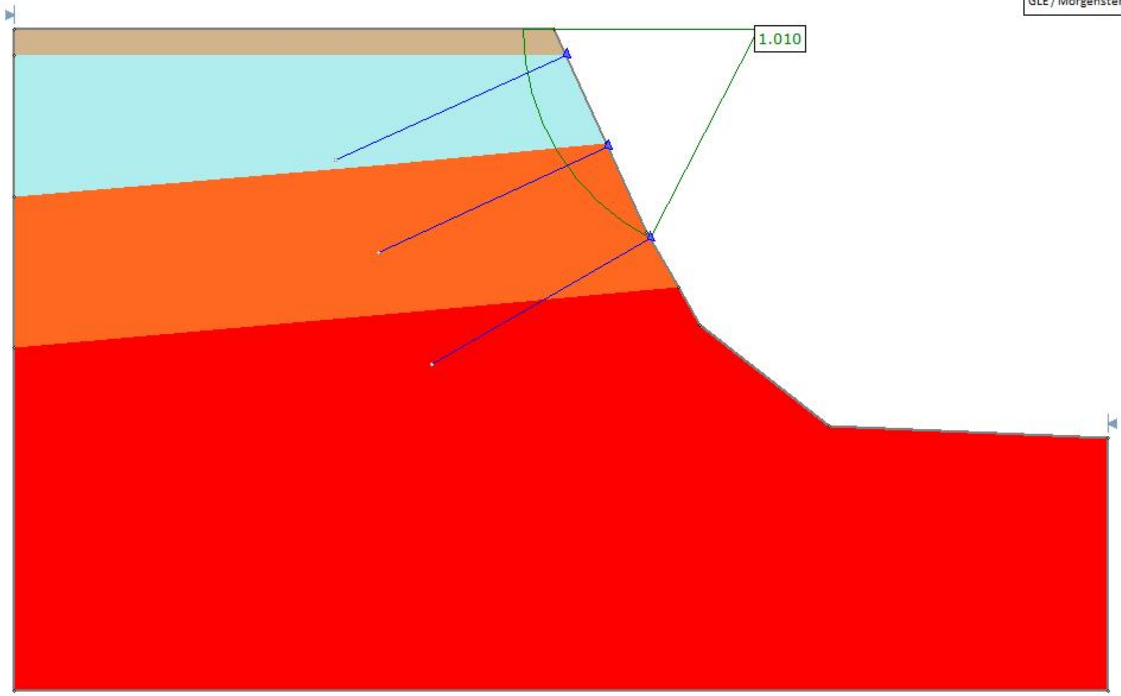
APPENDIX B:

Stability Assessment Remediated Condition (Supported)

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Made Ground		15	Mohr-Coulomb	0	15	None	0
Weathered Maylor Slate Formation		19	Mohr-Coulomb	0	30	None	0
Moderatly Weak Maylor Slate Formation		20	Mohr-Coulomb	0	37	None	0
Strong Maylor Slate Formation		20	Infinite strength			None	0

Support Name	Color	Type	Force Application	Anchor Capacity (kN)	Out-Of-Plane Spacing (m)
Support 1		End Anchored	Active (Method A)	15	1.2

Method Name	Min FS
Bishop simplified	1.010
Spencer	1.049
GLE / Morgenstern-Price	1.054



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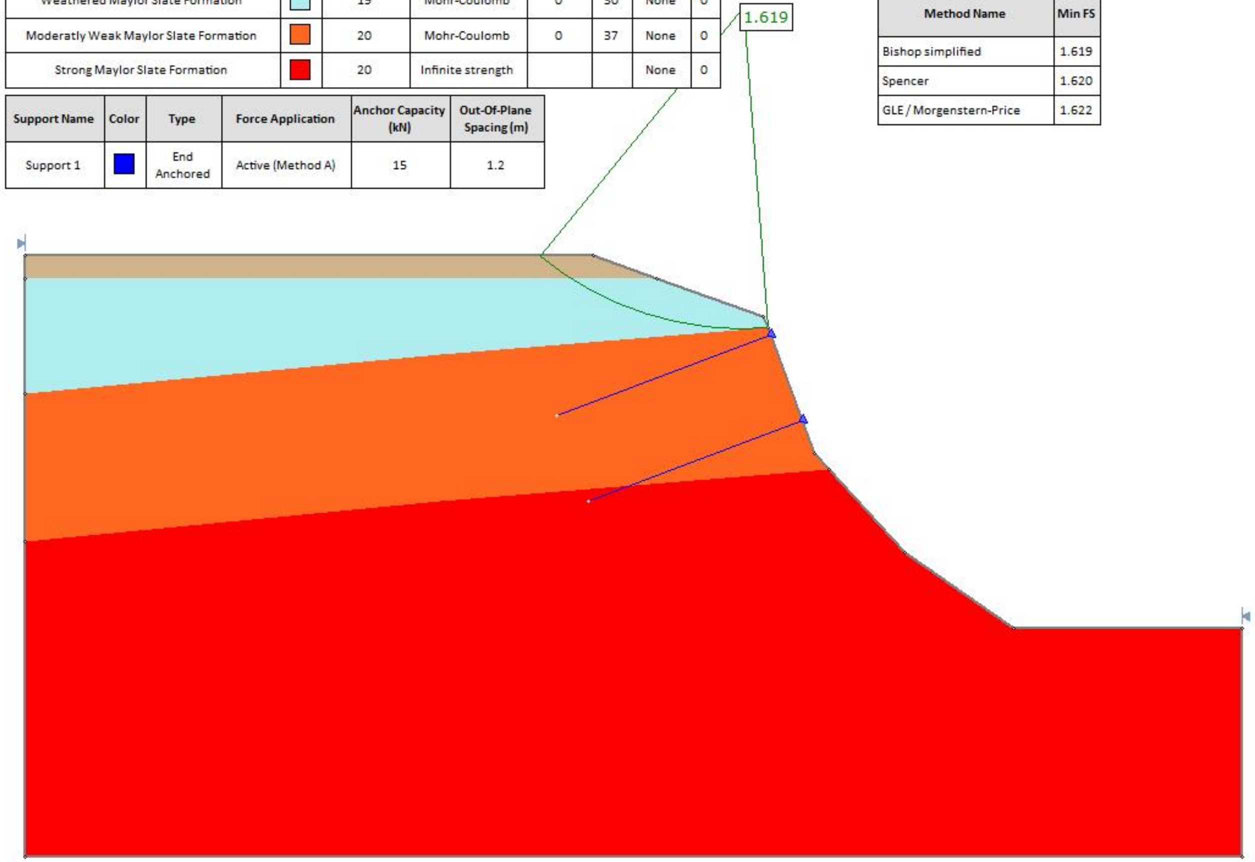
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Made Ground		15	Mohr-Coulomb	0	15	None	0
Weathered Maylor Slate Formation		19	Mohr-Coulomb	0	30	None	0
Moderatly Weak Maylor Slate Formation		20	Mohr-Coulomb	0	37	None	0
Strong Maylor Slate Formation		20	Infinite strength			None	0

Support Name	Color	Type	Force Application	Anchor Capacity (kN)	Out-Of-Plane Spacing (m)
Support 1		End Anchored	Active (Method A)	15	1.2

Method Name	Min FS
Bishop simplified	1.619
Spencer	1.620
GLE / Morgenstern-Price	1.622



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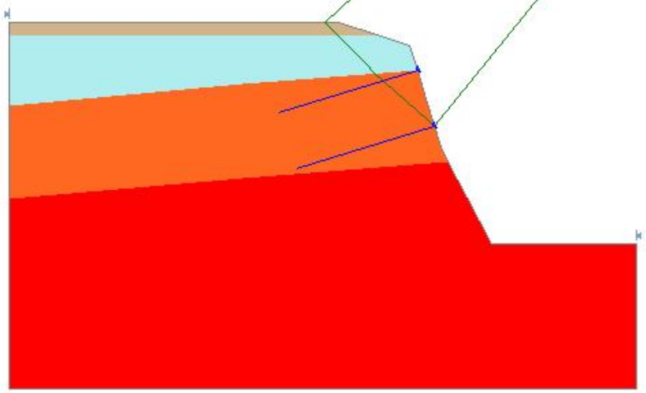
PROJECT NO. 15320	**DATE** 09/ 04 / 2021

1.254

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Ru
Made Ground		15	Mohr-Coulomb	0	15	None	0
Weathered Maylor Slate Formation		19	Mohr-Coulomb	0	30	None	0
Moderatly Weak Maylor Slate Formation		20	Mohr-Coulomb	0	37	None	0
Strong Maylor Slate Formation		20	Infinite strength			None	0

Support Name	Color	Type	Force Application	Anchor Capacity (kN)	Out-Of-Plane Spacing (m)
Support 1		End Anchored	Active (Method A)	15	1.2

Method Name	Min FS
Bishop simplified	1.254
Spencer	1.278
GLE / Morgenstern-Price	1.275



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PROJECT NO.	**DATE**
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