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28th May 2026

Our Ref: C10128A/AL/11206

Dear Kenny,

Re: C10128A, Woolley Colliery Road, Darton - Supplementary Ground Investigation Letter Report - Southern Site Area

Further to the issue of our Geoenvironmental Appraisal (GA) Report for the above site (Sirius Report Ref. C10128, dated July 2024), we present the findings of our recently undertaken supplementary ground investigation, along with revised assessments and recommendations, where appropriate.

Whilst this letter discusses pertinent findings of the GA report, it must be read in conjunction with that report.

INTRODUCTION

It is understood that consideration is being given to the development of the above site for a low-rise residential end use, comprising the construction of 42 No. houses (some with detached garages) with private gardens, as well as new access roads and an attenuation basin.

The development boundary is shown on Sirius Drawing No. C10128A/S/02 in Appendix A.

Cut and fill earthwork proposals have been provided by the client (HBL Drawing No. 10701-HBL-XX-XX-DR-C-5205, rev. P01, included in Appendix A). This shows that in order to reach an assumed formation level of 600mm below finished ground level (FGL), levels are to be raised from existing in the majority of the site, typically by up to c. 2 m, but locally by up to c. 3m, along part of the western site boundary. Levels are to be locally cut from existing, including by up to c. 3m in the south-west of the site, and by up to c. 4m in the northern end of the site, to form the attenuation basin. The drawing shows that the cut and fill earthworks will result in a surplus of material.

LIMITATIONS

If the proposed site layout and . or cut and fill earthworks change significantly from those shown on the above-referenced drawings, then the conclusions and recommendations made in this report should be reassessed, and amendments may be required.

The comments and opinions presented in this report are based on ground conditions encountered during intrusive investigation works performed by Sirius. There may be other conditions prevailing on the site which have not been revealed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of strata, contamination or other spatially variable features between or beyond investigation positions is conjectural and given for guidance only. Confirmation of ground conditions between exploratory holes should be undertaken if deemed necessary. Evaluation of groundwater is based on observations made at the time of the investigation and monitoring visits. It should be noted that groundwater levels and quality may vary due to seasonal and other effects.

All marked site features shown on the appended drawings are given for indicative purposes only. Enclosed drawings should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the text enclosed within this report for commentary on the potential location of these features including coordinates if available and any further works required to locate features.

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PREVIOUS INVESTIGATION

Sirius Geoenvironmental Appraisal, 2024

Salient findings from the previous investigation included:

- Historically, the site remained undeveloped until c. 1930, when buildings appeared in the east. Spoil heaps also appeared along the southwestern boundary around this time. The spoil heaps / stockpiles increased in area over time until c. the 1950s. Latterly, further stockpiles were emplaced, and by c. 2010, covered most of the site, with the buildings no longer shown from the 1980s onwards.
- The intrusive site investigation identified that no natural topsoil is present. Locally, a thin layer of made ground topsoil was present at surface, comprising friable clay with gravel of sandstone, mudstone, brick, etc. Asphalt surfacing is present in the east of the site, to depths of 0.05m to 0.1m below ground level (bgl). A drawing is included within Appendix A to this report (C10128A/S/06), showing the approximate extents of the asphalt surfacing.
- One sample of asphalt surfacing (TP301S at 0.05m bgl) was tested for speciated PAHs, to ascertain whether it is a coal tar or bitumen-based product. The results of that testing returned a total PAH concentration of 320mg/kg, suggesting that the binding agent may be coal tar based, rather than bitumen based.

- Made ground is generally relatively thin across the east (up to c. 1m thick), increasing to c. 3m thick towards the west, with a maximum proven thickness of c. 6m, adjacent to the south-western boundary. Much of the made ground is granular in nature, comprising gravel of mudstone, sandstone, coal, ash, slag, brick, etc. In the eastern end of the site, red coloured gravel of mudstone was present. Where cohesive made ground was present, this generally comprised slightly sandy slightly gravelly clay, with gravel of sandstone, mudstone, coal, brick, etc.

- Natural residual soils present beneath the made ground, and overlying competent bedrock, mostly comprised firm to stiff, medium to high strength slightly sandy gravelly clay, with gravel predominantly comprising sandstone, mudstone and coal. Competent bedrock mostly comprised sandstone (Woolley Edge Rock) and was encountered from depths ranging between ground level and c. 2.2m bgl within the eastern and northern parts, becoming deeper towards the west, where the competent bedrock was encountered between 2.7m and 5.0m bgl.

- A coal mine adit is recorded within the site by the Mining Remediation Authority (MRA). The portal was historically blocked up, but the roadway leading to off-site workings, as well as broken ground proven by previous site investigation in proximity to the roadway (which may represent shallow unrecorded mine workings within the Top Haigh Moor Coal seam), requires drill and grout treatment to mitigate stability risks following development. No recorded shallow mine workings are present beneath the site, and other than the broken ground identified in proximity to the adit noted above, no shallow mine workings have been identified by intrusive site investigations. However, proof drilling has been recommended to verify that unrecorded shallow mine workings are not present.

- The recorded concentrations of arsenic, lead, genotoxic polycyclic aromatic hydrocarbons (PAH) and naphthalene within the various types of made ground present at the site (including thin, localised topsoil) have been determined to present an unacceptable chronic risk to human health via dermal, ingestion and dust inhalation pathways where present within garden and soft landscaped areas following development. Furthermore, the recorded concentrations of naphthalene within made ground were considered to present an unacceptable risk to human health via potential vapour inhalation pathways.

- Groundwater seepages were recorded in a minority of exploratory holes, at depths ranging between 1.0m and 4.9m bgl. Subsequent groundwater monitoring determined that the majority of monitoring wells were dry during the monitoring period; however, groundwater was recorded standing at c. 2.3-2.8m bgl in the vicinity of the proposed attenuation basin.

- A preliminary quantitative slope stability assessment was undertaken on the southwestern slope. This determined, based on limited data, that parts of the slope may not be stable following development of the site, and further surveys were recommended in order to assess slope stability, once final development layout and levels were confirmed.

- A settlement assessment has shown the potential for excessive settlement of made ground soils from self-weight (creep) and consolidation due to loading from

placement of fill to raise ground levels. Excavation and re-engineering of made ground is likely to be required to mitigate settlement and to remove existing obstructions.

- Further ground investigation / survey was recommended, to allow a more detailed quantitative slope stability assessment for the slope in the southwest of the site, where development is proposed adjacent to this slope, including an assessment of confirmed site levels.

Supplementary Investigation (2026)

A scope of works for a supplementary ground investigation was compiled, based on the above recommendations, and to investigate specific additional issues, which included the following:

- Further ground investigation / survey to allow a more detailed quantitative slope stability assessment for the slope in the southwest of the southern site area, where development is proposed adjacent to this slope.
- Drilling of boreholes to confirm ground conditions within the footprint of the proposed attenuation pond (located in an area which was previously outside of the investigation boundary) and to allow installation of groundwater monitoring wells, followed by a period of groundwater level monitoring.

These works have now been undertaken, and are reported within this letter report.

SCOPE OF SUPPLEMENTARY INVESTIGATION

The information contained in this report is limited to areas of land accessible during the investigation within the site boundary. A site location plan is included as Drawing No. C10128/01 in Appendix A. An exploratory hole location plan showing the recent fieldworks is presented as Drawing No. C10128A/S/02, with a plan showing all works from the 2024 and 2026 investigations included as Drawing No. C10128A/S/03.

The supplementary ground investigation, which was supervised by Sirius Geoenvironmental Engineers, took place from 9th to 10th March 2026 and comprised drilling of 9 No. window sample boreholes (WS401S to WS409S) to a maximum depth of 5.0m bgl, with 6 of those boreholes extended by dynamic probing techniques, to a maximum depth of 9.7m bgl.

The window sampler boreholes were either drilled to a depth at which further progress was not possible due to the strength of strata encountered, or at the maximum practicable depth of drilling using this method within the ground conditions encountered. Dynamic probing was continued until hard strata (defined as requiring 50 blows to penetrate 100mm) was encountered.

Groundwater monitoring wells were installed in WS401S to WS403S (in the vicinity of the proposed attenuation basin) and within WS404S to WS406S (along the crest of the southwestern slope), comprising 50mm diameter standpipes with slotted response zones within a combination of made ground and bedrock. A programme of groundwater level monitoring has been carried out and is reported below.

EXPLORATORY HOLE LOCATIONS

The exploratory hole locations were selected in order to achieve general site coverage, target specific areas of interest and resolve key uncertainties, as summarised in Table 1, below.

Table 1 – Exploratory Hole Position Rationale

Exploratory Hole	Rationale
WS401S - WS403S	To investigate ground conditions within the vicinity of a proposed attenuation basin, and to install groundwater monitoring wells.
WS404S - WS409S	To provide further geotechnical / ground condition data along the crest of the southwestern slope and to install groundwater monitoring wells.

Exploratory hole logs are included within Appendix B to this report.

GROUND CONDITIONS ENCOUNTERED

The ground conditions encountered during the supplementary investigation were broadly in line with those encountered during the previous phase of ground investigation at the site, as described below.

Attenuation Basin Area

Made ground was encountered in each borehole in this area, to depths of between 1.6m and 2.3m bgl, being deeper in the south. From surface the made ground in WS401S and WS402S comprised firm friable gravelly clay to depths of 0.8m and 0.4m bgl respectively, being underlain by made ground of medium dense clayey sandy gravel of sandstone, mudstone and coal. In WS403S, similar granular made ground was present from surface to 0.6m bgl, being underlain by granular made ground with a higher proportion of red mudstone.

Sandstone bedrock was present directly below the made ground in each borehole, with the shallower weathered rock recovered as fine to coarse gravel, to depths of between 2.8m and 3.0m bgl, at which depth borehole refusal occurred in competent sandstone.

These ground conditions are generally similar to those found previously in this area of the site.

Southwestern Slope Area

Previously, made ground was encountered along the whole length of the slope crest, to depths of 3.0m and 4.7m bgl, with the made ground being predominantly granular.

Made ground encountered during this investigation was similar to previous in the far north, centre and south of the slope (i.e. in WS404S, WS406S, WS407S and WS408S), being encountered to depths of between 3.85m and 4.6m bgl and comprising predominantly granular material (slightly clayey, sandy gravel of sandstone, mudstone and occasional coal). Below the made ground, a thin layer of soft to stiff natural clay was generally encountered, with drilling refusals and/or the presence of sandstone indicating that bedrock was present at depths of between c. 4m and 4.7m bgl.

However, towards the north of the slope, in WS405S and WS409S, deeper made ground was encountered, of a more cohesive nature. Soft cohesive made ground was present to 0.8m and 2.0m bgl respectively, underlain by granular made ground to 1.9m and 3.0m bgl. Below those depths, soft to firm cohesive made ground was encountered to the base of each borehole at

5m and 4m bgl, respectively. Dynamic probing was carried out beyond the base of each borehole, which showed the presence of similar presumed low strength material to a depth of c. 7.4m bgl in WS405S and c. 6.6m bgl in WS409S. Below those depths, the dynamic probing indicated stronger material to be present, which has been tentatively interpreted as representing granular material resulting from weathering of the sandstone bedrock. This material was present to 9.9m bgl in WS405S and 9.8m bgl in WS409S, at which point refusal of the dynamic probe is interpreted as representing competent sandstone bedrock.

In summary, an area of deeper made ground was encountered in WS405S and WS409S, which was predominantly of low strength cohesive material, rather than the shallow generally granular made ground present to the north and south of these.

GROUNDWATER

Tables 2 and 3 summarise groundwater observations made during the investigation and in the three subsequent monitoring visits, respectively.

Table 2 - Summary of Groundwater Observations Encountered During Site Investigation

Exploratory Hole	Depth Encountered (m bgl)	Description	Stratum
North of Site (Attenuation Basin Area)			
WS402S	1.0	Tube liner wet.	Made ground
West of Site (Southwestern Slope Area)			
WS405S	4.9	Tube liner damp.	Made ground

Table 3 - Summary of Groundwater Levels During Monitoring

Exploratory Hole	Type	Depth Encountered (m bgl)	Depth Encountered (m AOD)	Response Zone (m bgl)	Stratum
North of Site (Attenuation Basin Area)					
WS401S	Standpipe	2.86 - DRY	75.90 - DRY	1 - 3	MG / SST
WS402S	Standpipe	2.38 - 2.58	75.78 - 75.58	1 - 2.8	MG / SST
WS403S	Standpipe	DRY	DRY	1 - 3	MG / SST
West of Site (Southwestern Slope Area)					
WS404S	Standpipe	DRY	DRY	1 - 4	MG
WS405S	Standpipe	4.05 - 4.43	74.44 - 74.06	1 - 5	MG
WS406S	Standpipe	DRY	DRY	1 - 5	MG / Clay / SST

Based on the above data, it is considered that in the vicinity of the attenuation basin, groundwater is standing at a depth of c. 2m below existing ground level.

In the vicinity of the southwestern slope, groundwater appears to be standing at a depth of greater than c. 7m within granular made ground / weathered rock, although some perched

groundwater appears to be locally present at a depth of c. 4m bgl within the cohesive made ground, as encountered within WS405S. The presence of potential perched groundwater has been taken into consideration during our slope stability assessment, see below.

CONCLUSIONS AND RECOMMENDATIONS

Attenuation Basin Area

Ground conditions within the area of the proposed attenuation basin (as shown on HBL Drawing No. 10701-HBL-XX-XX-DR-C-5522, Rev. P03) have been shown to comprise made ground to below the maximum depth of the proposed attenuation basin in all three boreholes drilled in this area.

The made ground in this area generally comprises firm cohesive and medium dense granular soil types.

The recorded groundwater levels in WS401S and WS402S were approximately 1m below the base of the proposed basin, with WS403S remaining dry during the monitoring period. However, during drilling, wet arisings were encountered at a level above the proposed invert level of the basin. Furthermore, groundwater levels could potentially be higher at wetter times of the year. Given this, an impermeable membrane should be incorporated into the basin construction to prevent groundwater ingress (as shown to be present on the HBL drawing), however a high permeability drainage layer will also be needed below the liner to dissipate any build-up of hydrostatic pressure during periods of high groundwater levels.

The basin has been designed with sides at a gradient of c. 1 in 3, and as noted above most of the slopes will be constructed within made ground. It should therefore be ensured that the slope stability of the basin sides is assessed prior to construction, to confirm the global stability of the basin.

Settlement Assessment

From examination of the above-referenced HBL cut and fill drawing, it is noted that the greatest proposed raising of ground levels is coincident with the area of greatest depth of existing made ground, adjacent to the site's western boundary (e.g., vicinity of plots 93-96), with up to c. 3m of ground raising and up to c. 7.5m depth of made ground in that area. Further east, adjacent to Plots 88 and 89, ground raising of c. 2.5m is also proposed. These worst-case areas have therefore been subject to settlement assessments.

The settlement calculations have taken into account the proven ground conditions and proposed changes to site levels. For granular materials, i.e. the majority of the made ground strata, consolidation settlement is predicted to predominantly take place during surcharge loading associated with the ground raising. For cohesive made ground, consolidation settlement will predominantly occur following the surcharge loading.

As well as the consolidation settlement, ongoing creep settlement of the made ground has also been taken into consideration. This assessment, using historical mapping, has assumed that the majority of the made ground was placed prior to 1960, with the remaining c. 1.5m being placed by 2008.

As described within the previous Sirius GA report, it is considered that there is a low risk of inundation settlement affecting made ground at the site.

Calculations utilising the proposed levels and made ground depths summarised above, has shown that combined creep and consolidation settlements of up to c. 70-190mm could be expected to occur in the vicinity of the southwestern slope, within the curtilages of Plots 92-96, and therefore this area of the site will be at risk of unacceptable total and differential settlements associated with the presence of made ground strata, necessitating geotechnical remedial works. These works will need to be combined with works required to enhance slope stability, and are therefore discussed further within the Slope Stability section, below.

The area of site which is considered to require an enhanced level of geotechnical remediation is illustrated on Drawing No. C10128A/S/07, in Appendix A. This area has been defined based on the amount of proposed up-filling, and depth and nature of made ground.

This area is also subject to influence of the adjacent southwestern slope, and a retaining wall of up to 2.65m in height is proposed for this area; the stability of both of these features will have to be considered along with the calculated excessive settlements in this area. Further discussion on these is given below.

It should be noted that the presence of the slope may mean that the amount of total settlement at the crest of the slope is greater than calculated and stated above, as the settlement assessment uses a one-dimensional approach, which cannot take into account the absence of soils to the west of the slope, and corresponding absence of lateral support.

Calculated settlements for the vicinity of Plots 88 to 89 were <50mm, and therefore no enhanced geotechnical remedial works are considered necessary within this area, as it is currently understood that new buildings are most likely to either be founded on piles, or on reinforced strip foundations bearing onto improved ground (e.g. by vibro stone columns).

It is also understood that proposed site enabling works will include a site turnover of c. 1m, in order to reduce post-construction settlements in external areas to tolerable limits (i.e. ≤50mm). From the settlement assessment undertaken, it is considered that the proposed depths of turnover would be sufficient to reduce total long-term settlement in external works to ≤50mm across the site, except for within the vicinity of Plots 92-96, where an enhanced level of geotechnical remediation will be required, as discussed further below.

This document should be forwarded to scheme's warranty provider to ensure that the proposed design settlement amount of ≤50mm in external works is acceptable to them.

Updated Outline Slope Stability Assessment

Introduction:

An outline slope stability assessment was carried out within the previous Sirius GA Report, relating to the c. 12m high, heavily vegetated steep slope that is present immediately adjacent to the southwestern boundary of the site. At that time, due to site constraints, including dense vegetation on the slope and the presence of inaccessible railway land, only a limited visual inspection could be carried out. Limited topographical levels were obtained, from the crest of the slope and from land adjacent to the slope, on the far side of the railway.

Currently, no further topographic data has been made available; however, the proposed site layout, including proposed ground levels, have been updated. Furthermore, as part of the recent fieldworks, additional ground investigation was undertaken in the vicinity of the slope, including from areas which were previously inaccessible due to the presence of dense

vegetation, which encountered worse ground conditions than were encountered previously. An updated outline slope stability assessment has therefore been undertaken, and is discussed below.

As per the original assessment, the most accurate data has been used where available. However, where accurate data was not available / able to be obtained, conservative assumptions have been used. It should also be noted that the modelling method used cannot take into consideration the effect of vegetation on the slope, which generally increases the stability of such slopes.

Ground Model:

Previously, two slope cross sections were modelled, at the northern and southern ends of the slope. The locations were chosen to cover the area of proven deepest made ground at that time (Section A-A') and an area where a proposed plot was nearest the slope (Section B-B'), which also included an area of exposed rock face.

Previously, the ground model indicated that the slope is underlain by mostly granular made ground of up to c. 6m in thickness, overlying sandstone, with a coal seam (Top Haigh Moor) present at the toe of the slope. The rock below the coal seam was anticipated to be mudstone. However, the recent supplementary fieldworks identified that deeper made ground was present towards the far north of the slope, of up to c. 7.5m depth, which was predominantly composed of low strength cohesive material, rather than the predominantly granular made ground encountered elsewhere on the site.

The previous slope stability assessment was undertaken on the understanding that ground levels along the length of the slope would remain much as present, with the exception of minor ground raising to provide gardens / parking areas. Furthermore, it was assumed that all proposed plots would be founded on piles.

Since the previous assessment, updated proposed site levels have been received which indicate that towards the south of the slope ground levels will remain much as present, or be reduced slightly (i.e. Plots 100-104, assessed by previous Slope Sections A-A' and B-B'). However, towards the north, ground levels are due to be raised by up to c. 1.5m, with even greater increase in levels at the crest of the slope, of c. 2.5-3m, where a retaining wall is proposed of up to 2.65m in height (see Retaining Wall Section, below).

Therefore, due to the changed circumstances of greater ground raising, and identified poorer ground conditions in the vicinity of the slope, this assessment has been undertaken on the area of identified deep low strength made ground, which is also coincident with the area of proposed greatest ground raising. Two updated cross-sections were therefore produced (Sections AA-AA' and BB-BB'), for the section of slope opposite Plots 93 and 94 respectively (see Drawing No. C10128A/S/04 for an illustration of the sections, including their locations).

Cross-sections at these locations were compiled for both the existing and the proposed scenarios (i.e. including proposed ground raising). As per the previous assessment, it has been assumed that the proposed buildings will be supported on piled foundations, and loads imposed by the buildings will not be transferred onto / into the slope. It should however be noted that the addition of a retaining wall into the proposed scheme will have significant implications, which are discussed further below.

Initial modelling showed that slope stability at Section AA-AA' was slightly worse than at BB-BB', and therefore a full set of models was only produced for Section AA-AA', as a conservative approach.

Example slope stability assessment cross sections for the existing and proposed scenarios for Section AA-AA' are included in Appendix C, along with output from the slope stability assessment for both scenarios (Drawing Nos. C10128A/S/SA01-04).

Material Properties:

The material properties adopted within this assessment are summarised in Table I1 in Appendix C. These are based on the ground investigation data, and taking into account the uncertainly of reliable soil/rock properties, geotechnical properties for the various strata anticipated to be present within / below the slope have been collated. For sandstone and mudstone, both Mohr-Columb and Hoek-Brown models are adopted, representing properties of soil and rock, respectively.

Also as previous, a design groundwater level has been used, based on recorded groundwater levels obtained during previous and current investigations. Also as previous, an alternative model using a design pore water pressure (PWP) of Ru=0.1 was also assessed, as a conservative model for perched groundwater within the made ground.

Loading:

Loading has been modelled by creating an updated model for each scenario, with ground levels raised to the approximate elevation proposed for that area, plus the addition of a standard 10 kN/m^2 surcharge (variable loading), to allow for loading of external areas (e.g. gardens / driveways at the slope crest) as a general practice in accordance with BS 8002:2015 and CIRIA C760.

No loading due to foundations has been allowed for at the slope crest, with the assumption being that loads will be transferred through the made ground into underlying competent strata, and will ensure that loads are not transferred into the slope (see assumptions included in Appendix C).

Assumptions and Limitations

This assessment is limited to the slope stability of soils / rock within the slope only, and it is understood both internal and external stability of the slope will be designed and constructed by others. Therefore, the proposed upfill, including a retaining wall structure at the crest, was assumed as a surcharge over the existing ground level. Accordingly, the slope stability of the retaining wall itself is not included within this assessment.

A slope stability analysis of the attenuation pond has not been undertaken.

Assessment Methodology:

The slope stability assessment was undertaken using 2D commercial software Geo5 Slope Stability version 2026.36 by Fine Software, using the Morgenstern-Price method. Previous modelling for this site was undertaken using adopted Eurocode 7 (EC7) Design Approach 1, Combinations 1 and 2. For the current assessment, the Geo5 software used compares EC7 Combinations 1 and 2, and only reports the least favourable (most conservative) of these. As

a comparison, each model scenario was also assessed using a standard factors of safety (FOS) approach. Output from the modelling is included within Appendix C.

Using the above models, various iterations were assessed, with models using different soil/rock models as well as different groundwater conditions, to allow for variations / uncertainties relating to these. Full results from the various models are shown in Table I2, in Appendix C. Utilisation values greater than 100% within the model results indicate that the slope may be unstable for that combination of rock model / design approach / groundwater condition.

Results and Discussion:

This assessment shows some utilisation values at the critical failure plane being greater than 100%, indicating the slope stability does not satisfy the requirements of Eurocode (see Drawing Nos. C10128/S/SA/03 and 04 in Appendix C).

In comparison to the modelling carried out previously, for Sections A-A' and B-B', the section of slope modelled in the current assessment indicates a greater potential for instability. The highest risk of instability in the previous models was generally within the granular made ground close to the slope crest. However, the current models indicate potential instability within that material, plus within the low strength cohesive made ground present beneath the northern end of the slope, for both the existing and proposed scenarios.

Notwithstanding the above, the results suggest that the rock within / beneath the slope is anticipated to have sufficient sliding resistance, subject to the assumption that the in-situ rock is generally intact (i.e. not highly weathered). From the slope modelling results (see Appendix C) it can be seen that the potential slip planes which intersect bedrock all have utilisation values of >100%.

Geotechnical Considerations Associated with Slope Stability:

Based on the above, outline slope stability assessment, the existing slope profile for the proposed development, in particular the made ground close to the slope crest and / or at the steeper slope section, will not be sufficient to meet the design requirements of Eurocode 7, and instability of the slope is a possibility, which could potentially affect gardens adjacent to the crest of the slope.

It should be noted that the aim of this preliminary assessment is not to determine if the existing slope will fail, but to determine whether, given the parameters available, there is the potential for the slope to fail.

Previous assessment of the slope stability, as reported in the Sirius GA Report, determined that some instability could be possible at shallow depth on the slope, presuming that no ground raising was proposed within influencing distance of the slope. Therefore, it was suggested that further ground investigation data, and/or more detailed, topographic data relating to the slope could be used to further assess the slope stability. However, to date no further topographic data has been supplied, and therefore this assessment is solely based on the additional ground investigation data.

Furthermore, the current proposed development scheme has been amended from previous to include significant ground raising along the crest of the slope, towards the northern end (i.e. vicinity of Plots 92-99), of up to c. 3m above existing, which will have a significant

influence on slope stability in this area. Currently, no slope raising is proposed along the southern end of the slope (i.e. vicinity of Plots 100-104) and therefore our conclusions relating to slope stability remain as previous in this area (i.e., there is the possibility for minor shallow instability).

Given the above, the assessment carried out as part of the current works was targeted at the northern end of the slope, where low strength clay made ground is present within the slope, and significant amounts of ground raising are proposed.

The assessment has shown that for the existing and proposed scenarios, the made ground within the slope will not be sufficient to meet the design requirements of EC7, and therefore it is anticipated that slope stability improvement will be required.

As noted above, it is understood that the current requirements for up-filling will require the provision of a retaining wall near to the crest of the slope. Therefore, any slope improvement works will need to take into account the requirement to improve slope stability, the influence of the proposed retaining wall, and the additional loading due to the placing of up-fill materials to the rear of the retaining wall.

Current proposals include for a turnover of 1m of made ground, to reduce the risk from settlement of made ground. However, given the proposed additional ground raising in the vicinity of Plots 92-99, and the greater potential slope stability issues in that area, additional geotechnical remedial works may be required in that area.

Possible options for slope stability improvement could include, but not be limited to, a combination of the following:

- Redesign of gardens / reassess site levels near the slope, i.e., limiting the amount of ground raising to avoid surcharging the slope;
- Enhanced turnover in this area, to include deeper excavation and with soils placed back as part of the turnover used as fill within a reinforced earth structure, rather than simply being replaced and compacted in a controlled manner, to further increase the stability of the made ground. This may need to be undertaken in conjunction with the provision of a retaining wall;
- Ground improvement to improve the strength and stiffness of made ground within garden areas, which may include vibro techniques;
- Geotechnical stabilisation using techniques such as soil nailing.

Consideration should be given to the ability of the slope stability improvement method being able to reduce the groundwater pressure behind the slope, to allow perched water within the made ground to discharge at surface.

The proposed foundation solution should take into account building near to the slope. Piled foundations would transfer the loading into competent bedrock, meaning no load imposed below the pile tip would affect the slope.

If it is proposed to use shallow foundations on improved ground or shallow bedrock, the bearing resistance of the founding strata could be reduced due to the effect of the nearby slope (i.e. lack of lateral support), and the additional surcharge could increase the destabilising force on the slope, therefore special consideration would be required. If the

foundation is to be founded on bedrock, an assessment of the rock mass / discontinuities will be required for detailed assessment. A safe distance to the slope and suitable foundation depth should be allowed.

It should also be noted that part of the slope is within the ownership of Network Rail, and any proposed slope stabilisation works are likely to require third party review and approval, which could take a considerable amount of time.

For the southern end of the slope where the potential risk of slope instability is lower, recommendations would remain as previously stated in the Sirius GA Report, i.e. as per the above recommendations, but on a reduced scale.

Retaining Walls

General:

In accordance with NHBC Standards, Chapter 10.2, all retaining structures more than 600mm high should be designed by an engineer in accordance with Technical Requirement R5.

At this stage, the construction details of any proposed retaining walls are not known. The design of the retaining walls will, to varying degrees, be dependent upon a number of factors, for example the effective strength parameters of the retained material, the strength of founding materials, deformation properties of the founding materials, global stability (i.e., slope stability) and retaining wall type.

Sirius is only able to comment on a very limited number of aspects of retaining wall design at this stage.

Further assessment will be required once the proposed retaining wall details are known, including possible further targeted ground investigation.

Southwestern Slope:

A retaining wall is proposed along most of the length of the southwestern slope. Towards the southern end of this slope (i.e. Plots 97-104) the proposed wall is mostly <0.6m in height, but locally up to between 0.65m and 0.9m in height. However, between Plots 93 and 96, the wall is proposed to be between 0.95m and 2.65m in height. As noted above, this area also coincides with the area at greatest risk from consolidation / creep settlement and at greatest risk from slope instability.

Existing made ground in this area is between c. 6m and 7.5m in thickness, underlain by weathered sandstone bedrock. The underlying made ground may not be suitable as a founding stratum for this feature, and therefore further assessment should be undertaken by the retaining wall designer to ensure the global stability of this feature (including stability of the adjacent slope). It is currently anticipated that some form of ground improvement will be needed, otherwise foundations for this wall may need to be taken down through the made ground to found in suitable natural strata (e.g., piled foundations used).

Remainder of the Site:

Across the remainder of the site, proposed retaining walls are generally <600mm high, the exception to this being in the vicinity of Plots 83 and 84, where short sections are 700mm high.

As per the southwestern retaining wall discussed above, the underlying made ground may not be suitable as a founding stratum for these features in its current condition, and therefore further assessment should be undertaken by the retaining wall designer to ensure the global stability of the walls, with ground improvement undertaken if required.

Foundations

From an assessment of the data obtained during the current phase of investigation, it is considered that the recommendations relating to foundations given within 7.1.6 of the previous GA Report remain applicable.

The assessment has been revised using the most recent proposed ground levels provided by the Client (HBL Proposed External Works drawings ref. 10701/HBL/XX-XX-DR-C-5205-5207 rev. P03, dated 16/11/2025); consequently, this assessment may require further revision should proposed development levels be revised.

This assessment was based on natural residual clay soils being considered to have a characteristic undrained shear strength (Cu) of at least 75 kPa at a typical minimum founding depth of 0.9m below existing ground levels. By way of example, based on Eurocode 7 compliant calculations, a 600mm wide strip foundation a depth of 0.9m bgl bearing on the natural residual clay with a characteristic undrained shear strength of at least 75 kPa, could support a line load of 100 kN/m run. The application of such a line load is expected to induce settlement no greater than 25mm.

An updated assessment of potential suitable foundation types has been undertaken, based on the currently proposed site layout / levels, the results of which are summarised on Drawing No. C10128A/S/05 in Appendix A. In brief, the area in the east of the site within which strip / trench fill foundations may be suitable has been slightly enlarged from previous, with all the plots adjacent to the southwestern slope now likely requiring alternative foundations.

Trees and shrubs may affect the moisture content of clays to greater depths and as such, foundations may be required to extend to greater depths to penetrate to a moisture stable level within the area of influence of existing or proposed trees and shrubs. A tree survey was not included in the scope of this investigation, but should be carried out prior to the production of a detailed plot-specific foundation schedule and the presence of existing and proposed trees should be taken into account during detailed foundation design.

It was previously recommended that plots in the vicinity of the southwestern slope should be piled, in order to avoid transferring loads into the slope. These should be taken down through the made ground and any weak natural soils, to bear within competent natural strata. Given the proposed increases in ground levels, any made ground and low strength / loose soils could settle in relation to the pile and could induce negative skin friction on the pile, which should be taken into account within the design of any piling scheme.

It has also been proposed that vibro stone columns could potentially be used for some areas of the site. Currently, with the exception of the Plots the vicinity of the southwestern slope, where piled foundations have been recommended (i.e. Plots 92-104 and the sub-station), the remainder of the site would be considered to be suitable for the use of vibro stone columns, with predominantly granular made ground being present, or with strength of clay made ground / natural soils being >30kPa. It should be noted that some of the cohesive made

ground adjacent to the slope would not be considered suitable for use of vibro stone columns, even if the presence of the slope did not preclude their use.

The advice of specialist ground improvement / piling contractors should be sought at an early stage when considering the use of vibro stone columns and piles.

Foul and Surface Water Drainage

From the supplied proposed drainage plan (HBL Drawing No. 10701-HBL-XX-XX-DR-C-5513, Rev. P02), it can be seen that the proposed drainage runs are proposed to be installed at up to c. 5m bgl, being shallowest in the northwest and deepest in the southeast, adjacent to Woolley Colliery Road.

Given that shallow bedrock was encountered across much of the site, it can be seen that drainage invert levels may be up to c. 5m deeper than rockhead. Therefore, hard digging conditions are likely to be encountered during installation of the drainage.

It is understood that earthworks at the site are to be designed to limit future settlements in external works to less than 50mm, which may also lead to differential settlements between houses and the surrounding external ground. The drainage will therefore need to be designed to tolerate such total and differential settlements, including, for example, the provision of flexible service connections.

CLOSING REMARKS

The conclusions and recommendations presented in this letter report are considered reasonable based on the findings of the work described. However, these cannot be guaranteed to gain regulatory or other approvals and, therefore, this report should be passed by the client to the appropriate regulatory authorities and / or other appropriate organisations, for their comment and approval prior to undertaking any development works at the site.

We trust the above and attached are sufficient for you; however, please do not hesitate to contact the undersigned should you require any further information.

Yours sincerely,

Andrew Lake
Senior Engineer
For and on behalf of Sirius Geotechnical Ltd

Appendix A: Drawings

Appendix B: Exploratory Hole Logs

Appendix C: Slope Stability Assessment Data

APPENDIX A
Drawings

Reproduced from the Ordnance Survey 1:50,000 scale Landranger® map with the permission of The Controller of Her Majesty's Stationary Office, © Crown Copyright. All rights reserved.Sirius Geotechnical Ltd, Suite 2, Russel House, Mill Road, Langley Moor, Durham DH7 8HJ. Licence No. 100042005

NOTES

Site Location

REVISION	
0	For Information
A	>>
B	>>
C	>>
D	>>

SIRIUS GEOTECHNICAL LTD
4245 Park Approach, Thorpe Park, Leeds
LS15 8GB
www.thesiriusgroup.com
TEL: 0113 264 9960
FAX: 0113 264 9962

CLIENT	DRAWING NO.	REVISION NO.
Gleeson Homes Ltd	C10128/01	0
SITE: Woolley Colliery Road, Darton	DRAWN BY: AL	APPROVED BY: AL
DRAWING TITLE: Site Location Plan	DATE: June 2024	SCALE: 1:25,000 — A4

Key:

Approximate Development Boundary

2026 Exploratory Holes:

WS401 Window Sample Borehole

(W) Monitoring well location

Notes

1. This drawing should not be viewed in isolation from the accompanying report.
2. All exploratory hole locations are approximate and based on handheld GPS coordinates unless stated otherwise on the exploratory hole logs.
3. All marked site features shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

REVISION		BY	DATE
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CLIENT

Gleeson Homes Ltd

SITE

**Woolley Colliery Road,
Darton
- Southern Area**

DRAWING TITLE

**Exploratory Hole
Location Plan
- April 2026**

DRAWING NO.	REVISION NO.
C10128A/S/02	0
DRAWN BY: AL	APPROVED BY: AMG
DATE: April 2026	SCALE: 1:500
PAPER SIZE: A3	

Key:

Approximate Development Boundary

2026 Exploratory Holes:

WS401 Window Sample Borehole

(W) Monitoring well location

2024 Exploratory Holes:

TP301 Trial Pit

RO301 Rotary Probehole

WS301 Window Sample

Notes

1. This drawing should not be viewed in isolation from the accompanying report.
2. All exploratory hole locations are approximate and based on handheld GPS coordinates unless stated otherwise on the exploratory hole logs.
3. All marked site features shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

REVISION		BY	DATE
0	For information	AL	12/05/26
A	>>	>>	>>
B	>>	>>	>>
C	>>	>>	>>
D	>>	>>	>>

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CLIENT

Gleeson Homes Ltd

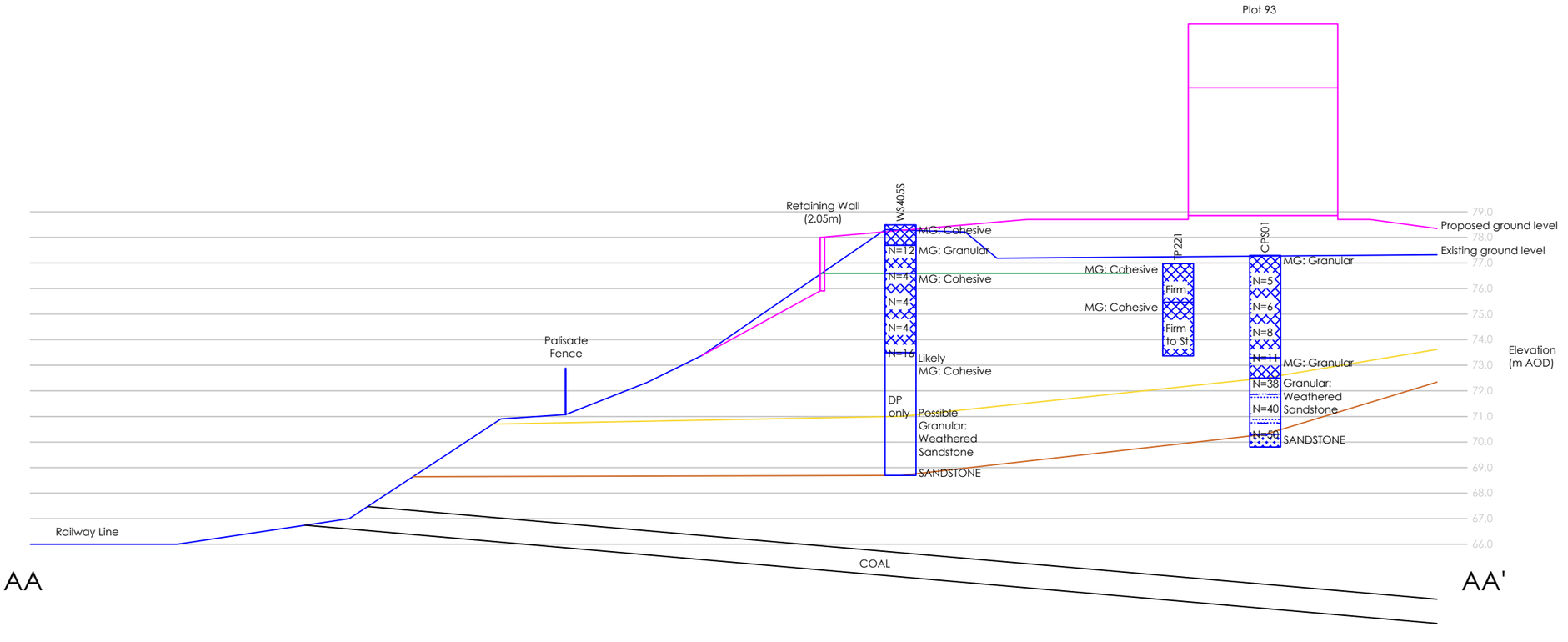
SITE

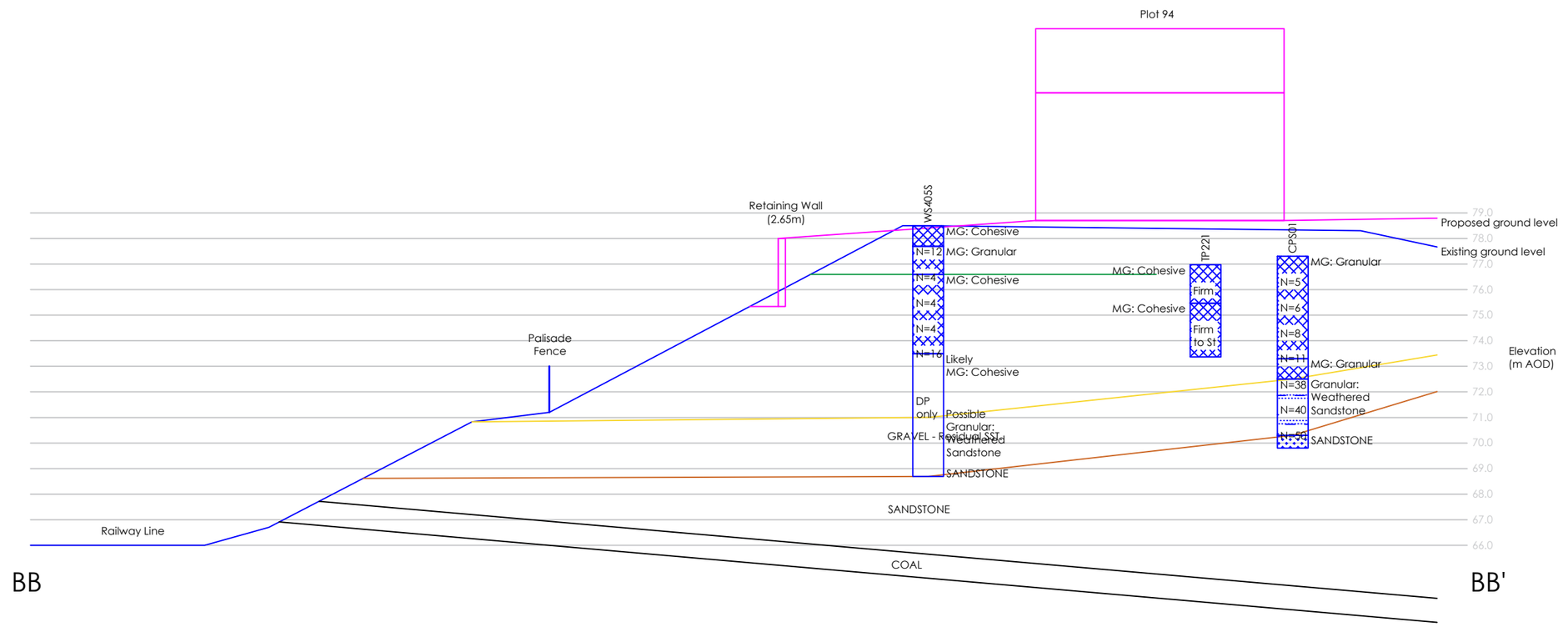
**Woolley Colliery Road,
Darton
- Southern Area**

DRAWING TITLE

**Exploratory Hole
Location Plan
- 2024 and 2026**

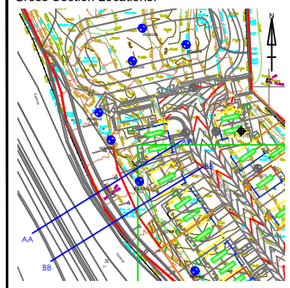
DRAWING NO.	REVISION NO.
C10128A/S/03	0
DRAWN BY: AL	APPROVED BY: AMG
DATE: May 2026	SCALE: 1:500
PAPER SIZE: A3	





Key:

Cross Section Locations:



Notes

1. This drawing should not be viewed in isolation from the accompanying report.
2. All marked site features shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

REVISION		BY	DATE
0	For information	AL	12/05/26
A	>>	>>	>>
B	>>	>>	>>
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D	>>	>>	>>

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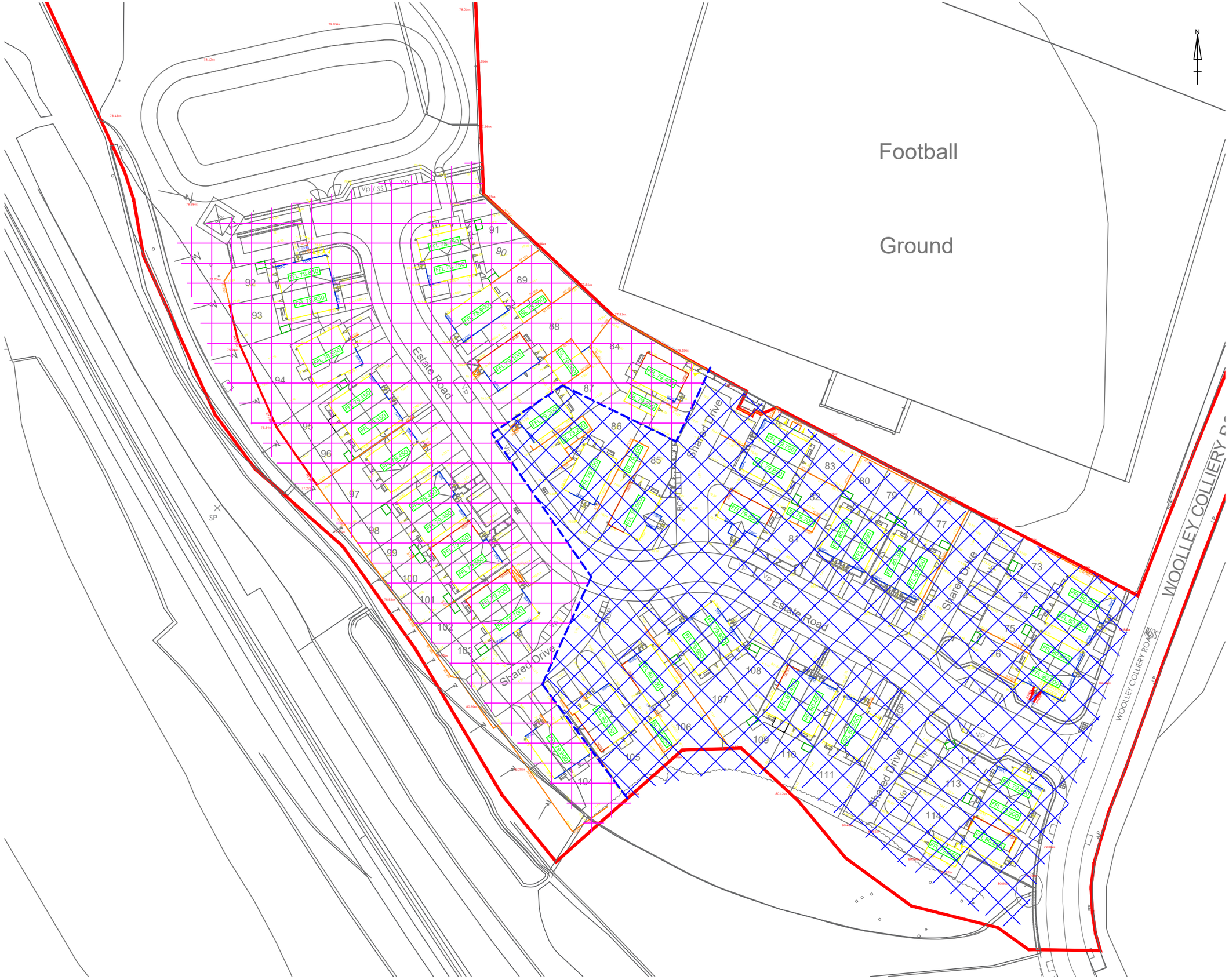
DRAWING TITLE

Slope Stability Cross Sections

DRAWING NO.	REVISION NO.
C10128A/S/04	0
DRAWN BY	APPROVED BY
AL	AMG
DATE	SCALE	PAPER SIZE
May 2026	1:200	A3



Key:

Approximate Development Boundary

Indicative foundation areas:

Made ground plus proposed placed fill generally <2.5m thick.
Potential for strip / trench fill.

Made ground plus proposed placed fill generally >2.5m thick.
Alternative foundations required.

Notes

1. This drawing should not be viewed in isolation from the accompanying report.
2. All marked site features shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

REVISION		BY	DATE
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SITE

**Woolley Colliery Road,
Darton
- Southern Area**

DRAWING TITLE

**Indicative
Foundation
Areas Plan**

DRAWING NO.	REVISION NO.
C10128A/S/05	0
DRAWN BY: AL	APPROVED BY: AMG
DATE: May 2026	SCALE: 1:500
PAPER SIZE: A3	

Key:

Approximate Development Boundary

Indicative extents of area surfaced with asphalt

Notes

1. This drawing should not be viewed in isolation from the accompanying report.

2.

3. All marked site features shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

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CLIENT

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SITE

Woolley Colliery Road, Darton - Southern Area

DRAWING TITLE

Indicative Asphalt-Surfaced Area Plan

DRAWING NO.	REVISION NO.
C10128A/S/06	0
DRAWN BY	APPROVED BY
AL	AMG

DATE	SCALE	PAPER SIZE
May 2026	1:500	A3

Key:

Approximate Development Boundary

Indicative extents of area potentially subject to excessive consolidation / creep settlement and requiring enhanced geotechnical remediation works.

Notes

1. This drawing should not be viewed in isolation from the accompanying report.
2. All marked site features shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

REVISION		BY	DATE
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CLIENT

Gleeson Homes Ltd

SITE

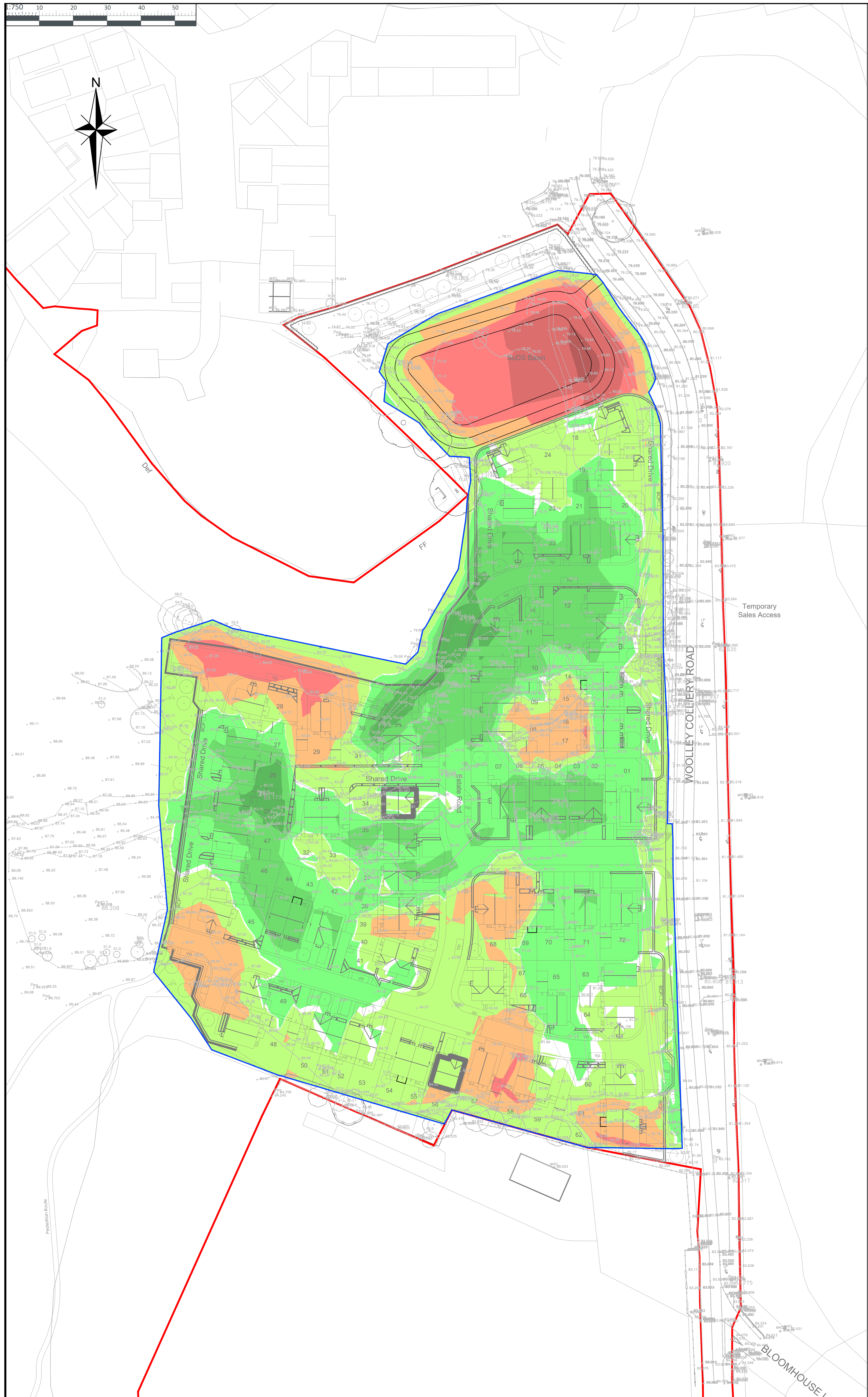
**Woolley Colliery Road,
Darton
- Southern Area**

DRAWING TITLE

Plan Showing Indicative Extents of Enhanced Geotechnical Remediation Area

DRAWING NO.	REVISION NO.
C10128A/S/07	0
DRAWN BY	APPROVED BY
AL	EP

DATE	SCALE	PAPER SIZE
May 2026	1:500	A3



INSET 1 NORTH
1:750

INSET 2 SOUTH
1:750

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH
ALL OTHER HBL DRAWINGS ISSUED FOR THIS PROJECT

GENERAL NOTES:

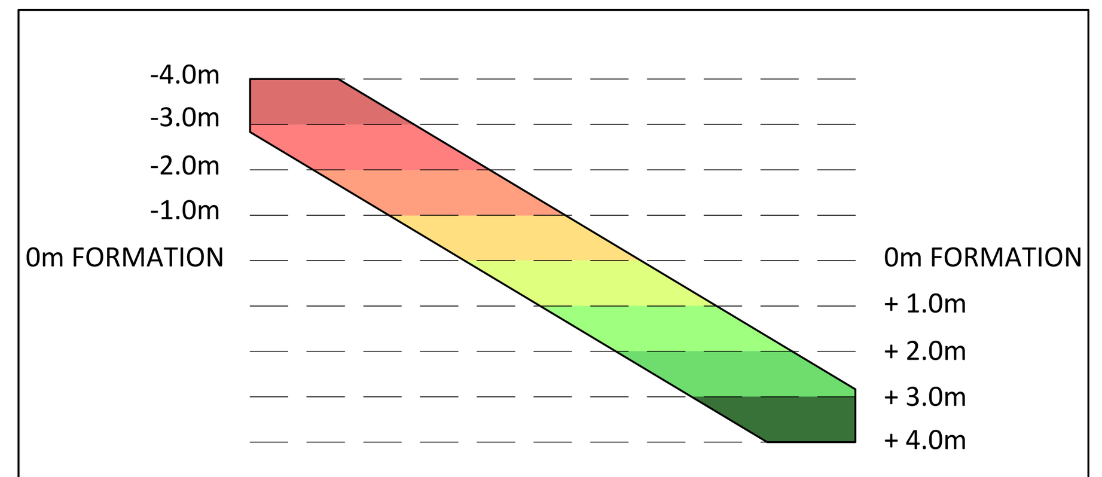
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERING AND ARCHITECT'S DETAILS.
2. THE DESIGN DETAILS PRESENTED MUST BE REVIEWED IN CONJUNCTION WITH THE WIDER SITE INFORMATION AND SITE CONSTRAINTS WHICH MAY NOT BE EVIDENT ON DRAWING AND MUST BE REQUESTED IF NOT ALREADY PROVIDED. THIS INCLUDES, BUT NOT LIMITED TO, GROUND CONDITIONS (GEOTECHNICAL AND GEO-ENVIRONMENTAL), GROUNDWATER LEVELS, BURIED SERVICES, REMNANT OBSTRUCTIONS, ECOLOGY, TREE PROTECTION AND TOPOGRAPHY.
3. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY, IN WRITING, SHOULD ANY ERRORS OR DISCREPANCIES BE FOUND PRIOR TO THE COMMENCEMENT OR CONTINUATION OF ANY WORKS.
4. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT BRITISH STANDARDS, BUILDING REGULATIONS AND NHBC STANDARDS.
5. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO EXECUTE THE WORKS AT ALL TIMES IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE HEALTH AND SAFETY AT WORK ACT 1974, AND THE C.D.M. REGULATIONS 2015. THE CONTRACTOR WILL BE DEEMED TO HAVE ALLOWED FOR FULL COMPLIANCE, INCLUDING FULL LIAISON WITH THE CDM CO-ORDINATOR, WITHIN HIS RATES.
6. ANY EXISTING DETAILS WHICH ARE SHOWN ON THIS DRAWING ARE FOR GUIDANCE ONLY AND ARE TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY VARIATIONS ARE TO BE RECORDED AND REPORTED TO THE ENGINEER IMMEDIATELY.
7. BEFORE WORK COMMENCES CONTRACTOR SHOULD CONSULT THE ENGINEER AND THE SI REPORT REGARDING ANY CONTAMINATION ISSUES. ALL NECESSARY HEALTH AND SAFETY MEASURES TO BE TAKEN

KEY - PLAN

SITE BOUNDARY

CUTFILL BOUNDARY EXTENTS

78.50 EXISTING TOPO
S10840-3D - Woolley Colliery Road, Darton, Barnsley



GENERIC CUT AND FILL BANDING INFOGRAPHIC

SURFACE LEVEL DATA

NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	VOLUME
1	-5.00	-4.00		24m3
2	-4.00	-3.00		431m3
3	-3.00	-2.00		1872m3
4	-2.00	-1.00		6068m3
5	-1.00	-0.05		15439m3
6	0.05	1.00		8851m3
7	1.00	2.00		2342m3
8	2.00	3.00		134m3

EARTHWORKS ASSESSMENT NORTH

CALCULATION ASSUMPTIONS

SITE AREA 122,750m²
NORTHERN DEVELOPABLE AREA 27,500m²

EXISTING SURFACES
TOPSOIL DEPTH ASSUMPTION TAKEN FROM *C10128 GA Report - July 2024 final*
TOPSOIL AND VEGETATION CLEARANCE WILL BE REQUIRED FOR DEVELOPED LAND.
ESTIMATED TOP SOIL STRIP (27,500m²) -100mm

PROPOSED FORMATION SURFACES
PROPOSED SITE LEVELS TAKEN FROM *10701-HBL-XX-XX-DR-C-5201-5208_P01_EXTERNAL WORKS SHEET,* MODELED IN 3D TO FINISHED GROUND LEVELS, WITH SURFACES ADJUSTED TO SUIT ASSUMED CONSTRUCTION DEPTHS.

IN THIS EARTHWORKS ASSESSMENT A 600mm REDUCTION TO FORMATION LEVELS HAS BEEN TAKEN TO ACCOUNT FOR GENERAL SITE ARISING ACROSS THE FULL SITE

DEVELOPABLE AREA (27,500m²) -600mm

GENERAL ALLOWANCES

EARTHWORKS CALCULATIONS ARE NOT EXACT AND SHOULD BE USED AS GUIDANCE ONLY. FACTORS WHICH MAY IMPACT THE ACCURACY OF THE CUT AND FILL VOLUME COULD BE;
- ACCURACY OF THE SURVEY DATA
- +0.050/-0.050m BAND EXCLUDED FROM CUTFILL COLOURING AS DISCREPANCIES
- CONSTRUCTION TECHNIQUES
- MATERIAL BULKING
- MATERIAL COMPACTION
- THICKNESS OF EXISTING SURFACE OR TOPSOIL

CUT AND FILL CALCULATIONS

DEVELOPABLE AREA 27,500m²

EXISTING TOPSOIL STRIP 2,750m³
(TOPSOIL ORGANIC MATTER TO BE STOCKPILED AND TESTED FOR SUITABLE REUSE)

PROPOSED CUT 15,200m³
PROPOSED FILL 10,900m³

NET MATERIAL MOVEMENT 4,300m³ EXPORT

EARTHWORKS ASSESSMENT SOUTH

CALCULATION ASSUMPTIONS

SITE AREA 122,750m²
SOUTHERN DEVELOPABLE AREA 13,600m²

EXISTING SURFACES
TOPSOIL DEPTH ASSUMPTION TAKEN FROM *C10128 GA Report - July 2024 final*
TOPSOIL AND VEGETATION CLEARANCE WILL BE REQUIRED FOR DEVELOPED LAND.
ESTIMATED TOP SOIL STRIP (13,600m²) -100mm

PROPOSED FORMATION SURFACES
PROPOSED SITE LEVELS TAKEN FROM *10701-HBL-XX-XX-DR-C-5201-5208_P01_EXTERNAL WORKS SHEET,* MODELED IN 3D TO FINISHED GROUND LEVELS, WITH SURFACES ADJUSTED TO SUIT ASSUMED CONSTRUCTION DEPTHS.

IN THIS EARTHWORKS ASSESSMENT A 600mm REDUCTION TO FORMATION LEVELS HAS BEEN TAKEN TO ACCOUNT FOR GENERAL SITE ARISING ACROSS THE FULL SITE

DEVELOPABLE AREA (13,600m²) -600mm

GENERAL ALLOWANCES

EARTHWORKS CALCULATIONS ARE NOT EXACT AND SHOULD BE USED AS GUIDANCE ONLY. FACTORS WHICH MAY IMPACT THE ACCURACY OF THE CUT AND FILL VOLUME COULD BE;
- ACCURACY OF THE SURVEY DATA
- +0.050/-0.050m BAND EXCLUDED FROM CUTFILL COLOURING AS DISCREPANCIES
- CONSTRUCTION TECHNIQUES
- MATERIAL BULKING
- MATERIAL COMPACTION
- THICKNESS OF EXISTING SURFACE OR TOPSOIL

CUT AND FILL CALCULATIONS

DEVELOPABLE AREA 13,600m²

EXISTING TOPSOIL STRIP 1,360m³
(TOPSOIL ORGANIC MATTER TO BE STOCKPILED AND TESTED FOR SUITABLE REUSE)

PROPOSED CUT 9,900m³
PROPOSED FILL 1,200m³

NET MATERIAL MOVEMENT 8,700m³ EXPORT

REV.	DATE	DRAWN	DESCRIPTION	CHKD	APPRD
P01	04.11.25	MS	INITIAL ISSUE	MS	RJ

STATUS DESCRIPTION: FOR INFORMATION
STATUS: S3

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Manchester M20 3JD
+44 (0)161 432 9977 | www.hbl.ltd
Consulting Civil & Structural Engineers

PROJECT: WOOLLEY COLLIERY

DRAWING TITLE: CUT AND FILL ASSESSMENT

CLIENT: MJ GLEESON

HBL REF.	DATE	SCALE(S)	
10701	04.11.25	1:750	A1

DRAWN	CHECKED	APPROVED
MS	MS	RJ

DRAWING No.: 10701-HBL-XX-XX-DR-C-5205
REV.: P01

APPENDIX B
Fieldwork Data

WINDOW SAMPLING RECORD

BH No. **WS401S** Sheet 1 of 1

Site: Woolley Colliery Road, Darton

Contract No: C10128A

Client: Gleeson Homes Ltd

Date: 09/03/2026

Method: Tracked window sampling rig.

Scale: 1:25

Logged By: JC | Checked By: AL

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND: Firm dark grey slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone, brick and occasional red mudstone.				
				MADE GROUND: Medium dense dark grey to black clayey sandy angular to subangular fine to coarse GRAVEL of sandstone, coal and mudstone.	0.80	77.96		
		N=17 (3,3/3,3,5,6)	1					
		N=8 (3,2/2,2,2,2)	2	*Loose from c. 2m bgl.*				
				Weak yellowish brown SANDSTONE. Recovered as sandy clayey angular to subangular fine to coarse gravel.	2.30	76.46		
		50 (25 for 125mm/50 for 60mm)	3	End of Borehole at 3.00m	3.00	75.76		
			4					
			5					

Remarks and Groundwater Observations:

1. Window sample refusal at 3.00m bgl. 2. No groundwater encountered. 3. Installed with groundwater monitoring well, as detailed above. 4. Coordinates and elevations obtained using survey grade GPS.

GL (m AOD) 78.76m AOD

Easting: 431071.34

Northing: 410514.52

Fig No. WS401S

WINDOW SAMPLING RECORD

BH No. **WS402S** Sheet 1 of 1

Site: Woolley Colliery Road, Darton

Contract No: C10128A

Client: Gleeson Homes Ltd

Date: 09/03/2026

Method: Tracked window sampling rig.

Scale: 1:25

Logged By: JC Checked By: AL

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND: Firm dark grey to black slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone and coal.				
				MADE GROUND: Medium dense dark grey to black clayey sandy angular to subangular fine to coarse GRAVEL of sandstone, coal, ash and mudstone.	0.40	77.76		
		N=11 (3,3/2,3,3,3)	1					
				Very weak yellowish brown locally light grey SANDSTONE. Recovered as sandy clayey angular to subangular fine to coarse gravel.	1.60	76.56		
		N=31 (12,12/10,8,6,7)	2					
		50 (25 for 30mm/50 for 40mm)	3	End of Borehole at 2.80m	2.80	75.36		
			4					
			5					

Remarks and Groundwater Observations:

1. Window sample refusal at 2.80m bgl. 2. Liner noted to be wet from 1.00m bgl. 3. Installed with groundwater monitoring well, as detailed above. 4. Coordinates and elevations obtained using survey grade GPS.

GL (m AOD) 78.16m AOD

Easting: 431056.21

Northing: 410520.18

Fig No. WS402S

WINDOW SAMPLING RECORD

BH No. **WS403S** Sheet 1 of 1

Site: Woolley Colliery Road, Darton

Contract No: C10128A

Client: Gleeson Homes Ltd

Date: 09/03/2026

Method: Tracked window sampling rig.

Scale: 1:25

Logged By: JC | Checked By: AL

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND: Dark grey to black clayey sandy angular to subangular fine to coarse GRAVEL of sandstone, coal and mudstone.				
				MADE GROUND: Medium dense reddish brown clayey sandy angular to subangular fine to coarse GRAVEL of sandstone, coal, brick and red mudstone.	0.60	77.31		
		N=14 (6,4/2,4,4,4)	1					
		N=30 (6,5/5,6,8,11)	2	*At 2.00m bgl: 1 No. brick cobble.*				
				Very weak yellowish brown locally light grey SANDSTONE. Recovered as sandy clayey angular to subangular fine to coarse gravel.	2.10	75.81		
		50 (12,12/50 for 105mm)	3	End of Borehole at 3.00m	3.00	74.91		
			4					
			5					

Remarks and Groundwater Observations:

1. Window sample refusal at 3.00m bgl. 2. No groundwater encountered. 3. Installed with groundwater monitoring well, as detailed above. 4. Coordinates and elevations obtained using survey grade GPS.

GL (m AOD) 77.91m AOD

Easting: 431052.86

Northing: 410508.94

Fig No. WS403S

WINDOW SAMPLING RECORD

BH No. **WS404S** Sheet 1 of 1

Site: Woolley Colliery Road, Darton

Contract No: C10128A

Client: Gleeson Homes Ltd

Date: 10/03/2026

Method: Tracked window sampling rig.

Scale: 1:25

Logged By: JC Checked By: AL

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
		N=13 (3,2/3,3,3,4)	1	MADE GROUND: Soft dark grey to black slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone and coal. With many roots and rootlets.				
				MADE GROUND: Firm dark grey slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone and occasional coal.	1.30	76.28		
		N=21 (5,5/5,5,5,6)	2	MADE GROUND: Medium dense light grey slightly clayey sandy angular to subangular fine to coarse GRAVEL of sandstone, mudstone and rare coal.	2.00	75.58		
		N=24 (4,6/6,6,6,6)	3					
		N=50 (8,7/50 for 285mm)	4	End of Borehole at 4.00m	4.00	73.58		
			5					

Remarks and Groundwater Observations:

1. Window sample refusal at 4.00m bgl, with dynamic probe follow on to 5.80m bgl. 2. No groundwater encountered. 3. Installed with groundwater monitoring well, as detailed above. 4. Coordinates and elevations obtained using survey grade GPS.

GL (m AOD) 77.58m AOD

Easting: 431041.13

Northing: 410491.06

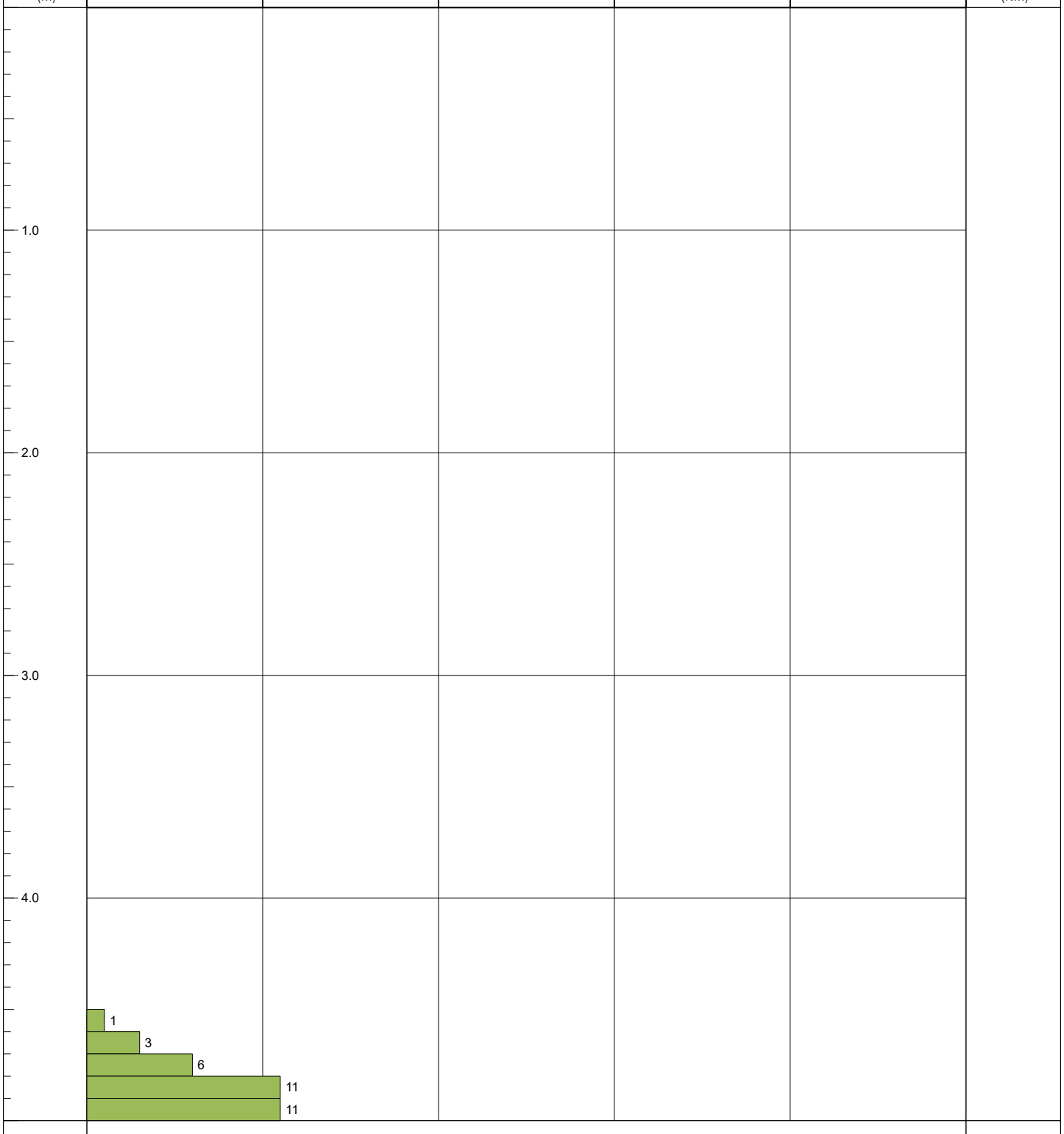
Fig No. WS404S

DYNAMIC PROBE RECORD

		BH No.	WS404S - DP
			Sheet 1 of 2
	Site: Woolley Colliery Road, Darton	Contract No:	C10128A
	Client: Gleeson Homes Ltd	Date:	10/03/2026
	Method: Tracked window sampling rig	Scale: 1:25	

Mass:	64kg	Probe Type:	DPSH-B	Fall Height:	750mm	Max Rod OD:	35mm	Cone Diameter:	50mm	Driller:	RP Drilling Ltd	Logged By:		Checked By:	AL

Insitu Test Results (Blows/100mm)



Remarks and Groundwater Observations

1. Dynamic probe follow-on from WS404S. 2. Refusal at 5.80m bgl.

GL (m AOD) 77.58m AOD

Easting: 431041.13

Northing: 410491.06

Fig No. WS404S - DP

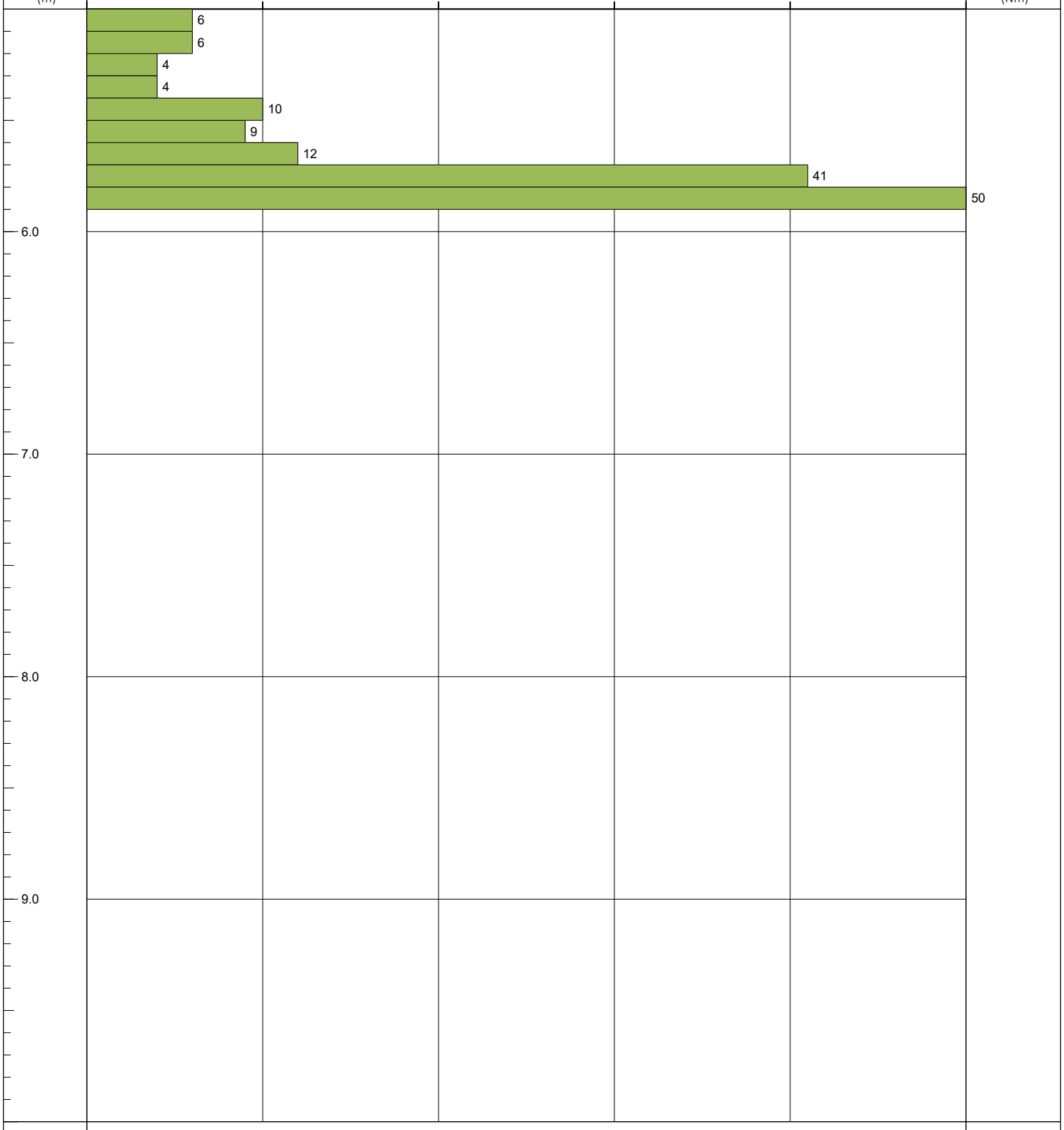
DYNAMIC PROBE RECORD

BH No. **WS404S - DP**

Site: Woolley Colliery Road, Darton	Contract No: C10128A
Client: Gleeson Homes Ltd	Date: 10/03/2026
Method: Tracked window sampling rig	Scale: 1:25

Mass:	64kg	Probe Type:	DPSH-B	Fall Height:	750mm	Max Rod OD:	35mm	Cone Diameter:	50mm	Driller:	RP Drilling Ltd	Logged By:		Checked By:	AL

Insitu Test Results (Blows/100mm)



Remarks and Groundwater Observations

1. Dynamic probe follow-on from WS404S. 2. Refusal at 5.80m bgl.

GL (m AOD) 77.58m AOD

Easting: 431041.13

Northing: 410491.06

Fig No. WS404S - DP

WINDOW SAMPLING RECORD

BH No. **WS405S**
Sheet 1 of 1

Site: Woolley Colliery Road, Darton
Contract No: C10128A
Client: Gleeson Homes Ltd
Date: 10/03/2026
Method: Tracked window sampling rig.
Scale: 1:25
Logged By: JC
Checked By: AL
Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND: Soft dark grey to black slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone, brick and coal. With many rootlets.				
				MADE GROUND: Medium dense black clayey sandy angular to subangular fine to coarse GRAVEL of coal, ash and mudstone.	0.80	77.69		
		N=12 (3,3/3,3,3,3)	1					
		N=4 (1,1/1,1,1,1)	2	MADE GROUND: Soft low strength dark grey slightly sandy gravelly CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone and occasional coal.	1.90	76.59		
		N=4 (1,1/1,1,1,1)	3					
		N=4 (1,1/1,1,1,1)	4					
		N=16 (1,3/4,4,4,4)	5	End of Borehole at 5.00m	5.00	73.49		

Remarks and Groundwater Observations:

1. Window sample complete at 5.00m bgl, with dynamic probe follow on to 9.80m bgl. 2. Liner noted to be damp at 4.90m bgl.3. Installed with groundwater monitoring well, as detailed above. 4. Coordinates and elevations obtained using survey grade GPS.

GL (m AOD)
78.49m AOD
Easting:
431055.25
Northing:
410467.33

Fig No.
WS405S

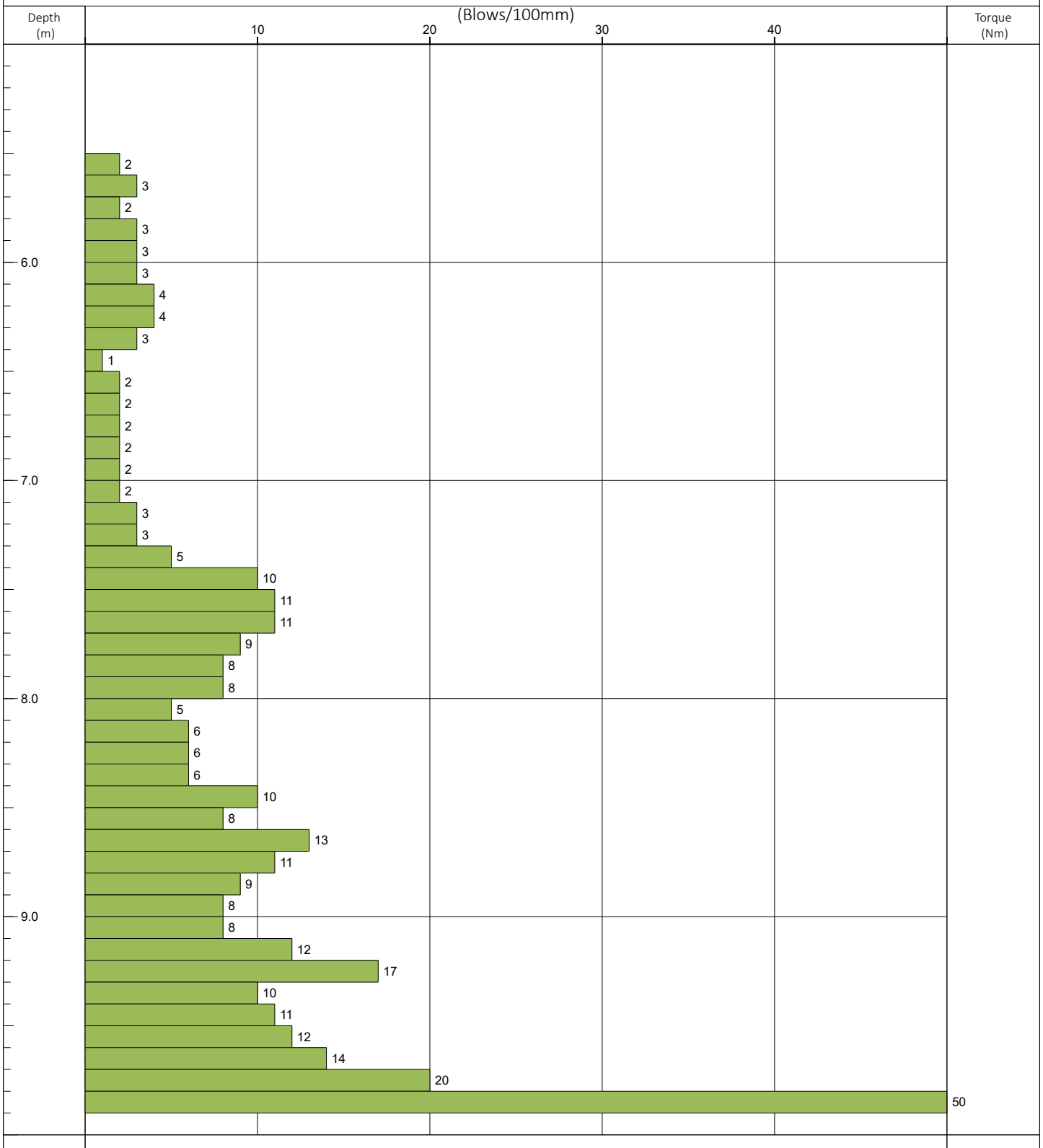
DYNAMIC PROBE RECORD

BH No. **WS405S - DP**

Site: Woolley Colliery Road, Darton	Contract No: C10128A
Client: Gleeson Homes Ltd	Date: 10/03/2026
Method: Tracked window sampling rig	Scale: 1:25

Mass:	64kg	Probe Type:	DPSH-B	Fall Height:	750mm	Max Rod OD:	35mm	Cone Diameter:	51mm	Driller:	RP Drilling Ltd	Logged By:		Checked By:	AL

Insitu Test Results (Blows/100mm)



Remarks and Groundwater Observations

1. Dynamic probe follow-on from WS405S. 2. Refusal at 9.80m bgl.

GL (m AOD) 78.49m AOD

Easting: 431055.25

Northing: 410467.33

Fig No. WS405S - DP

WINDOW SAMPLING RECORD

BH No. **WS406S** Sheet 1 of 1

Site: Woolley Colliery Road, Darton

Contract No: C10128A

Client: Gleeson Homes Ltd

Date: 10/03/2026

Method: Tracked window sampling rig.

Scale: 1:25

Logged By: JC | Checked By: AL

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND: Soft dark grey to black slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone and occasional coal. With many rootlets and occasional fragments of wood.				
				MADE GROUND: Medium dense light grey locally dark grey slightly clayey sandy angular to subangular fine to coarse GRAVEL of sandstone and mudstone.	0.40	79.83		
		N=13 (2,2/2,4,3,4)	1					
		N=12 (4,4/3,3,3,3)	2					
		N=10 (3,3/2,2,3,3)	3					
		N=36 (6,8/10,10,8,8)	4					
				Soft to firm dark grey slightly gravelly sandy silty CLAY of low plasticity (field assessment). Gravel is subangular to subrounded fine to medium of mudstone and sandstone. With faint humic odour.	4.60	75.63		
				Very weak yellowish brown locally light grey SANDSTONE. Recovered as sandy clayey angular to subangular fine to coarse gravel.	4.70	75.53		
		50 (25 for 115mm/50 for 135mm)	5					
				End of Borehole at 5.00m	5.00	75.23		

Remarks and Groundwater Observations:

1. Window sample refusal at 5.00m bgl, with dynamic probe follow on to 5.70m bgl. 2. No groundwater encountered. 3. Installed with groundwater monitoring well, as detailed above. 4. Coordinates and elevations obtained using survey grade GPS.

GL (m AOD) 80.23m AOD

Easting: 431074.47

Northing: 410436.49

Fig No. WS406S

DYNAMIC PROBE RECORD

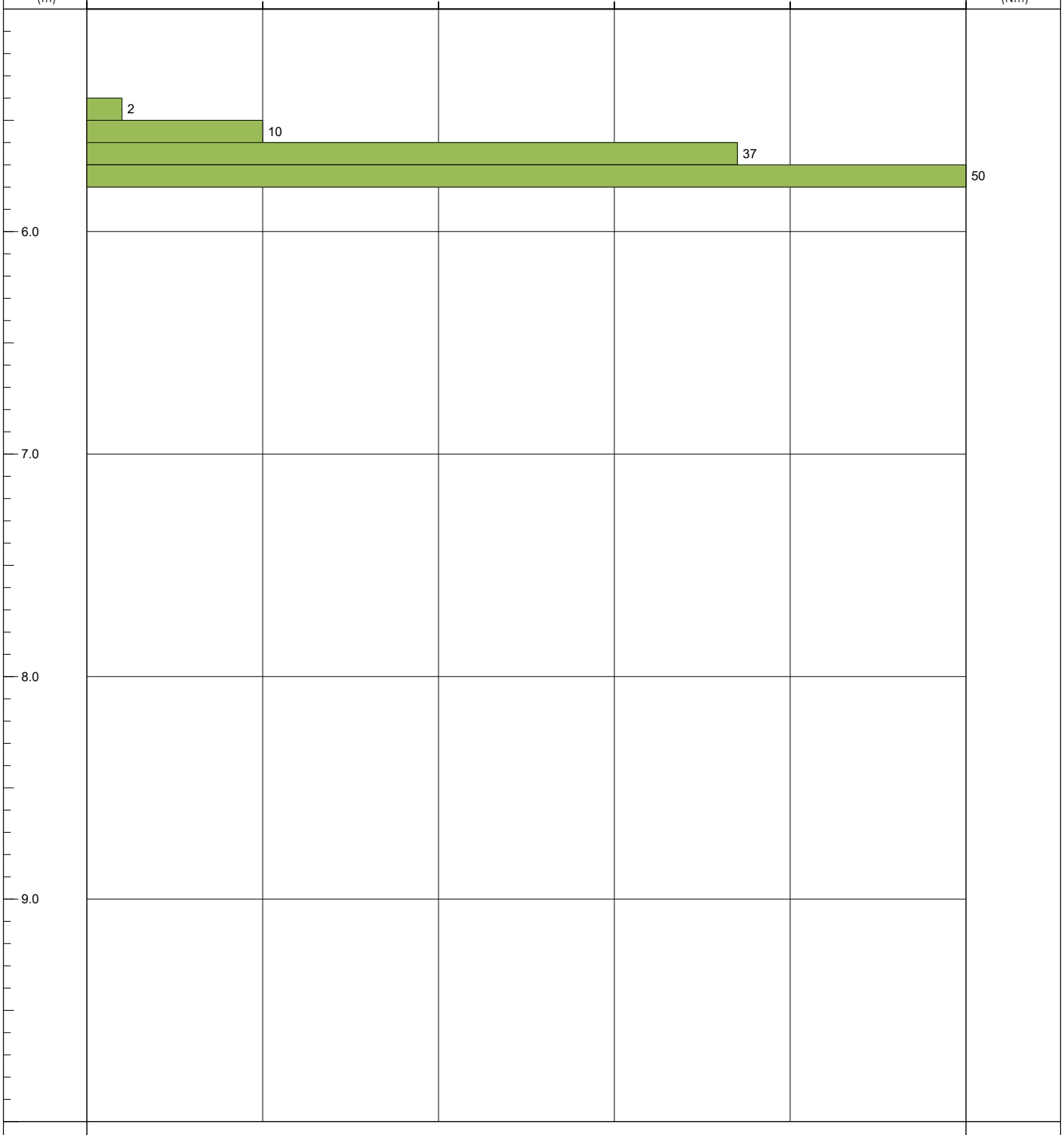
WS406S - DP

Sheet 1 of 2

Site:	Woolley Colliery Road, Darton	BH No.	
Client:	Gleeson Homes Ltd	Contract No:	C10128A
Method:	Tracked window sampling rig	Date:	10/03/2026
		Scale:	1:25

Mass:	64kg	Probe Type:	DPSH-B	Fall Height:	750mm	Max Rod OD:	35mm	Cone Diameter:	51mm	Driller:	RP Drilling Ltd	Logged By:		Checked By:	AL

Insitu Test Results (Blows/100mm)



Remarks and Groundwater Observations

1. Dynamic probe follow-on from WS406S. 2. Refusal at 5.70m bgl.

GL (m AOD) 80.23m AOD

Easting: 431074.47

Northing: 410436.49

Fig No. WS406S - DP

WINDOW SAMPLING RECORD

BH No. **WS407S**
Sheet 1 of 1

Site: Woolley Colliery Road, Darton	Contract No: C10128A
Client: Gleeson Homes Ltd	Date: 10/03/2026
Method: Tracked window sampling rig.	Scale: 1:25
	Logged By: JC — Checked By: AL
	Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND: Soft dark grey slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone and occasional coal. With occasional rootlets.	0.25	81.42		
		N=16 (7,5/4,4,4,4)	1	MADE GROUND: Medium dense light grey slightly clayey sandy angular to subangular fine to coarse GRAVEL of sandstone, mudstone and rare coal.				
		N=8 (2,2/2,2,2,2)	2	*Loose from c. 2-3m bgl.*				
		N=11 (3,3/3,2,3,3)	3					
		50 (25 for 125mm/50 for 105mm)	4	End of Borehole at 4.00m	4.00	77.67		
			5					

Remarks and Groundwater Observations:

1. Window sample refusal at 4.00m bgl, with dynamic probe follow on to 4.60m bgl. 2. No groundwater encountered. 3. Backfilled with arisings upon completion. 4. Coordinates and elevations obtained using survey grade GPS.

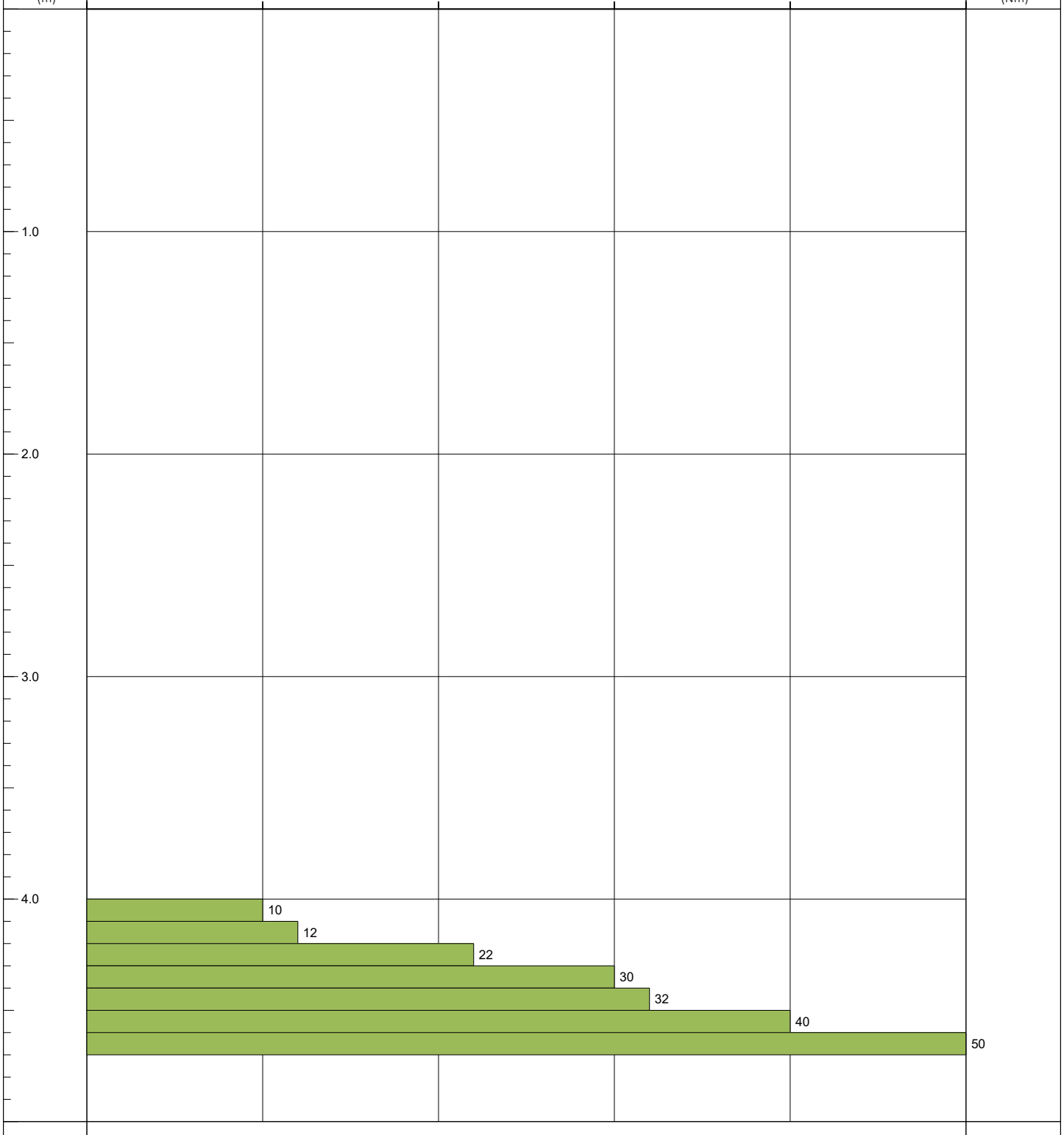
GL (m AOD) 81.67m AOD
Easting: 431087.27
Northing: 410417.49

Fig No. WS407S

	DYNAMIC PROBE RECORD	BH No.	**WS407S - DP** Sheet 1 of 1
	Site: Woolley Colliery Road, Darton	Contract No:	C10128A
	Client: Gleeson Homes Ltd	Date:	10/03/2026
	Method: Tracked window sampling rig	Scale: 1:25	

Mass:	64kg	Probe Type:	DPSH-B	Fall Height:	750mm	Max Rod OD:	35mm	Cone Diameter:	51mm	Driller:	RP Drilling Ltd	Logged By:		Checked By:	AL

Insitu Test Results (Blows/100mm)



Remarks and Groundwater Observations

1. Dynamic probe follow-on from WS407S. 2. Refusal at 4.60m bgl.

GL (m AOD) 81.67m AOD

Easting: 431087.27

Northing: 410417.49

Fig No. WS407S - DP

WINDOW SAMPLING RECORD

BH No. **WS408S** Sheet 1 of 1

Site: Woolley Colliery Road, Darton

Contract No: C10128A

Client: Gleeson Homes Ltd

Date: 09/03/2026

Method: Tracked window sampling rig.

Scale: 1:25

Logged By: JC | Checked By: AL

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND: Firm light grey slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone and mudstone. With occasional rootlets.				
				MADE GROUND: Loose to medium dense light grey slightly clayey sandy angular to subangular fine to coarse GRAVEL of sandstone and mudstone.	0.40	81.66		
		N=8 (2,2/2,2,2,2)	1					
				From 1.50 to 2.00m bgl: With rare coal fragments.				
		N=8 (2,2/2,2,2,2)	2					
		N=11 (4,4/3,2,3,3)	3	*Becoming medium dense from c. 3m bgl.*				
				Soft to firm dark grey slightly gravelly sandy silty CLAY of low plasticity (field assessment). Gravel is subangular to subrounded fine to medium of mudstone. With distinct humic odour.	3.85	78.21		
		50 (25 for 50mm/50 for 105mm)	4	Stiff yellowish brownish slightly sandy gravelly CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone.	3.92	78.14		
				End of Borehole at 4.00m	4.00	78.06		
			5					

Remarks and Groundwater Observations:

1. Window sample refusal at 4.00m bgl, with dynamic probe follow on to 4.60m bgl. 2. No groundwater encountered. 3. Backfilled with arisings upon completion. 4. Coordinates and elevations obtained using survey grade GPS.

GL (m AOD) 82.06m AOD

Easting: 431105.46

Northing: 410399.55

Fig No. WS408S

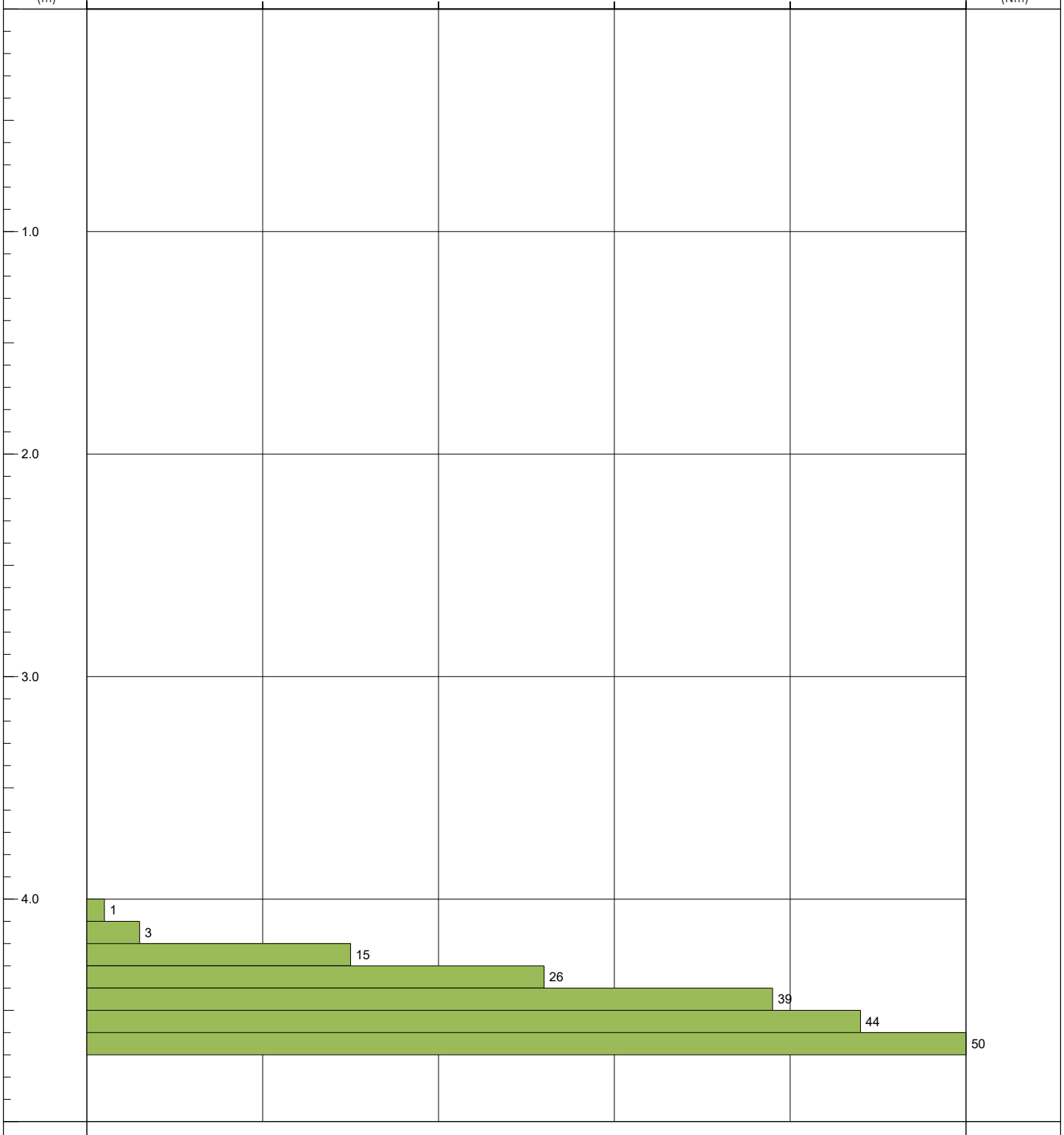
DYNAMIC PROBE RECORD

BH No. **WS408S - DP**

Site: Woolley Colliery Road, Darton	Contract No: C10128A
Client: Gleeson Homes Ltd	Date: 09/03/2026
Method: Tracked window sampling rig	Scale: 1:25

Mass:	64kg	Probe Type:	DPSH-B	Fall Height:	750mm	Max Rod OD:	35mm	Cone Diameter:	51mm	Driller:	RP Drilling Ltd	Logged By:		Checked By:	AL

Insitu Test Results (Blows/100mm)



Remarks and Groundwater Observations

1. Dynamic probe follow-on from WS408S. 2. Refusal at 4.60m bgl.

GL (m AOD) 82.06m AOD

Easting: 431105.46

Northing: 410399.55

Fig No. WS408S - DP

WINDOW SAMPLING RECORD

BH No. **WS409S** Sheet 1 of 1

Site: Woolley Colliery Road, Darton

Contract No: C10128A

Client: Gleeson Homes Ltd

Date: 10/03/2026

Method: Tracked window sampling rig.

Scale: 1:25

Logged By: JC | Checked By: AL

Driller: RP Drilling Ltd

SAMPLE DETAILS				STRATA RECORD				
Type	Depth From - To(m)	SPT (N), {ppm}, Vane Result (kN/m2)	Ground-water	Description	Depth (m)	Level (m AOD)	Legend	Well
				MADE GROUND: Soft dark grey to black slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone and occasional coal. With many rootlets and rare fragments of wood.				
				MADE GROUND: Soft dark grey slightly sandy gravelly CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone and occasional coal.	0.50	77.45		
				MADE GROUND: Dark grey clayey sandy angular to subangular fine to coarse GRAVEL of sandstone and mudstone.	2.00	75.95		
				MADE GROUND: Firm dark grey slightly sandy gravelly friable CLAY of low plasticity (field assessment). Gravel is angular to subangular fine to coarse of sandstone, mudstone and occasional coal.	3.00	74.95		
				End of Borehole at 4.00m	4.00	73.95		

Remarks and Groundwater Observations:

1. Window sample refusal at 4.00m bgl, with dynamic probe follow on to 9.70m bgl. 2. No groundwater encountered. 3. Backfilled with arisings upon completion. 4. Coordinates and elevations obtained using survey grade GPS.

GL (m AOD) 77.95m AOD

Easting: 431045.43

Northing: 410481.62

Fig No. WS409S

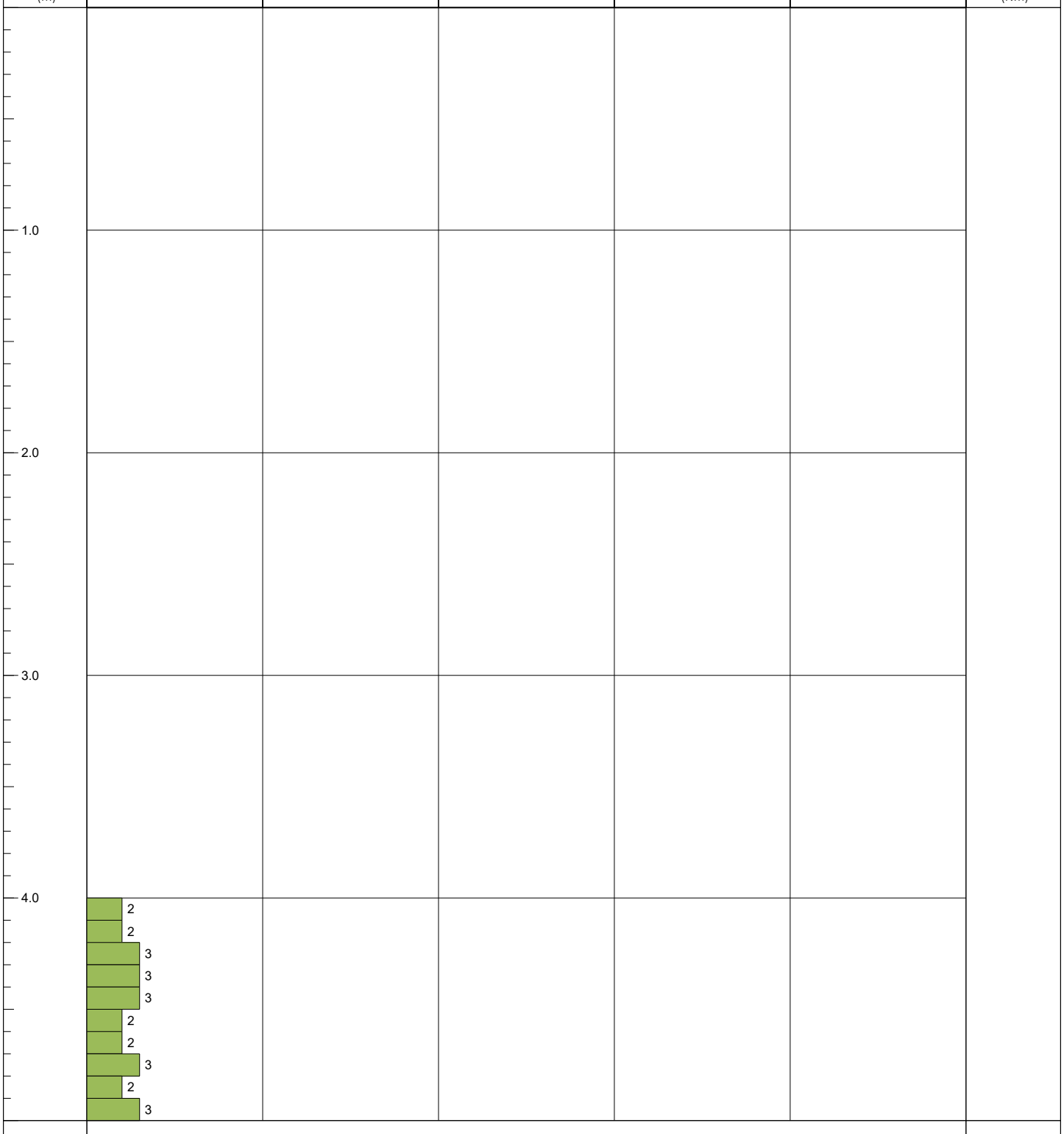
DYNAMIC PROBE RECORD

BH No. **WS409S - DP**

Site: Woolley Colliery Road, Darton	Contract No: C10128A
Client: Gleeson Homes Ltd	Date: 10/03/2026
Method: Tracked window sampling rig	Scale: 1:25

Mass:	64kg	Probe Type:	DPSH-B	Fall Height:	750mm	Max Rod OD:	35mm	Cone Diameter:	51mm	Driller:	RP Drilling Ltd	Logged By:		Checked By:	AL

Insitu Test Results (Blows/100mm)



Remarks and Groundwater Observations

1. Dynamic probe follow-on from WS409S. 2. Refusal at 9.70m bgl.

GL (m AOD) 77.95m AOD

Easting: 431045.43

Northing: 410481.62

Fig No. WS409S - DP

DYNAMIC PROBE RECORD

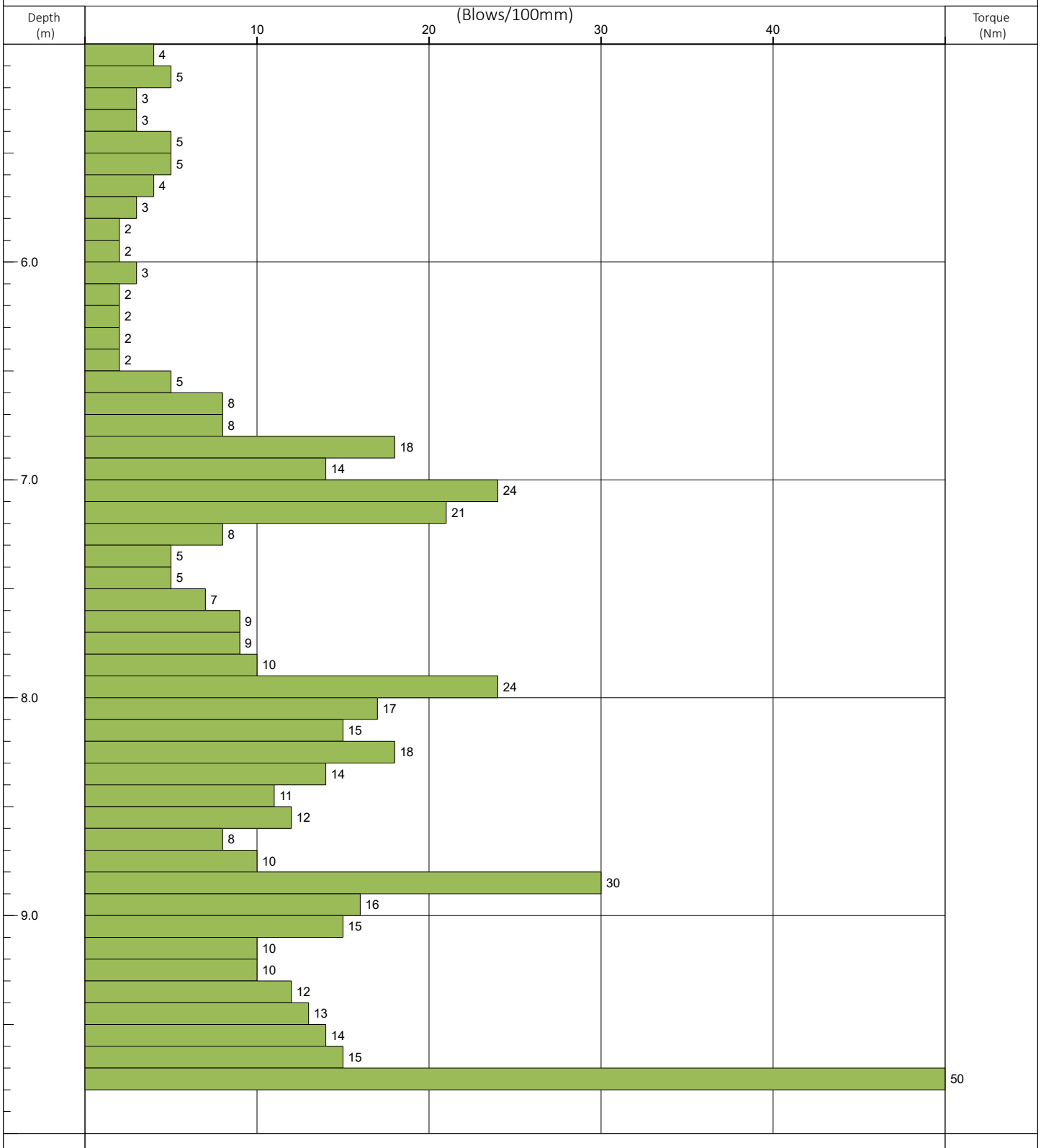
WS409S - DP

Sheet 1 of 2

	Site: Woolley Colliery Road, Darton	BH No.	
	Client: Gleeson Homes Ltd	Contract No:	C10128A
	Method: Tracked window sampling rig	Date:	10/03/2026
		Scale:	1:25

Mass:	64kg	Probe Type:	DPSH-B	Fall Height:	750mm	Max Rod OD:	35mm	Cone Diameter:	51mm	Driller:	RP Drilling Ltd	Logged By:		Checked By:	AL

Insitu Test Results (Blows/100mm)



Remarks and Groundwater Observations

1. Dynamic probe follow-on from WS409S. 2. Refusal at 9.70m bgl.

GL (m AOD) 77.95m AOD

Easting: 431045.43

Northing: 410481.62

Fig No. WS409S - DP

APPENDIX C
Slope Stability Assessment

SLOPE STABILITY OUTPUT

ADOPTED SOIL / ROCK PROPERTIES

Based on the ground investigation data, and taking into account the uncertainly of reliable soil/rock properties, Table I1 shows the soil / rock properties which have been adopted in the preliminary slope stability assessment. For sandstone and mudstone, both Mohr-Coulomb and Hoek-Brown models are adopted, representing properties of soil and rock, respectively.

Table I1 - Summary of Soil / Rock Properties adopted in the Preliminary Slope Stability Assessment

Material	Bulk density γ_b (kN/m^3) Note 1	Mohr-Coulomb Model		Hoek-Brown Model for Rock Note 3			
		Friction angle Ø' (kN/m^2) Note 2	Cohesion c' (kN/m^2)	UCS of intact rock (MN/m^2) Note 4	Intact rock parameter m Note 5	Geological strength index GIS Note 6	Disturbance factor Note 7
Granular Made Ground	18	30	0	n/a	n/a	n/a	n/a
Cohesive Made Ground	18	25	1	n/a	n/a	n/a	n/a
Sandstone (as soil)	21	35	30	n/a	n/a	n/a	n/a
Sandstone (as rock)	21	n/a	n/a	5	10	30	0.5
Coal	15	27	0	n/a	n/a	n/a	n/a
Mudstone (as soil)	21	28	10	n/a	n/a	n/a	n/a
Mudstone (as rock)	21	n/a	n/a	1	8	15	0.5

Note 1: Bulk density of soil determined based on BS 8002:2015 Figures 1 and 2. For rock, it is assumed as dense to very dense materials.
Note 2: Friction angle of granular made ground based on loose granular fill and SPT N values, refer to the correlation of Peck et al (1967). Friction angles of sandstone and mudstone are based on Tomlinson (2001) and former BS 8002:1994 Table 4, which were determined based on the assumed UCS and c' no more than 0.1xUCS. Friction angle of coal is based on the intact coal being loose granular material.
Note 3: Model based on Hoek-Brown Model (1997) to estimate rock mass strength.
Note 4: Assumed conservative values for intact sandstone and mudstone based on engineering judgment, subject to verification by further GI.
Note 5: 'm' value for intact rock depends on rock group refer to Hoek et al 1992 and engineering judgement.
Note 6: GIS of rock determined based on GIS chart after Marinos and Hoek 2000 taking into account engineering judgement.
Note 7: Value between 0 to 1, assumed 0.5 for disturbance.

MODELLING ASSUMPTIONS

The following assumptions have been made as part of the slope stability assessment:

- Bedrock is relatively competent and is not completely weathered or highly weathered (i.e. not recovered as gravel).
- Surcharge loading is assigned on the ground surface. The final foundation solution and depth of foundations should be determined during detailed foundation design.
- Design groundwater level has been considered at c. 1.0m above the recorded groundwater level. Also, a model with Ru = 0.1 for pore water pressure has been considered, to allow for potential shallower groundwater levels during different seasons of the year.
- A foundation loading for the proposed plots at the crest of the slope has not been allowed for within the assessment, owing to the assumption that the foundation will be supported by piled foundations into competent bedrock and will not increase loading to the slope.
- The depth of the cohesive made ground has been assessed via interpretation of the geotechnical data obtained from the window sample boreholes and the data obtained from the follow-on dynamic probes.
- It is noted a coal seam is conjectured on published geological recorded to outcrop at the toe of the slope; and it has been assumed that this seam is not worked in this location (see Coal Mining Risk Assessment in the Geoenvironmental Appraisal).

- The modelling undertaken takes into account potential changes in ground elevation at the crest of the slope, as will be required to achieve final site levels, plus an additional load to account for garden areas / driveways at the crest of the slope.

MODELLING OUTPUT

Previous modelling for this site was undertaken using adopted Eurocode 7 (EC7) Design Approach 1, Combinations 1 and 2. For the current assessment, the software utilised compares Combinations 1 and 2, and only reports the least favourable (most conservative) of these.

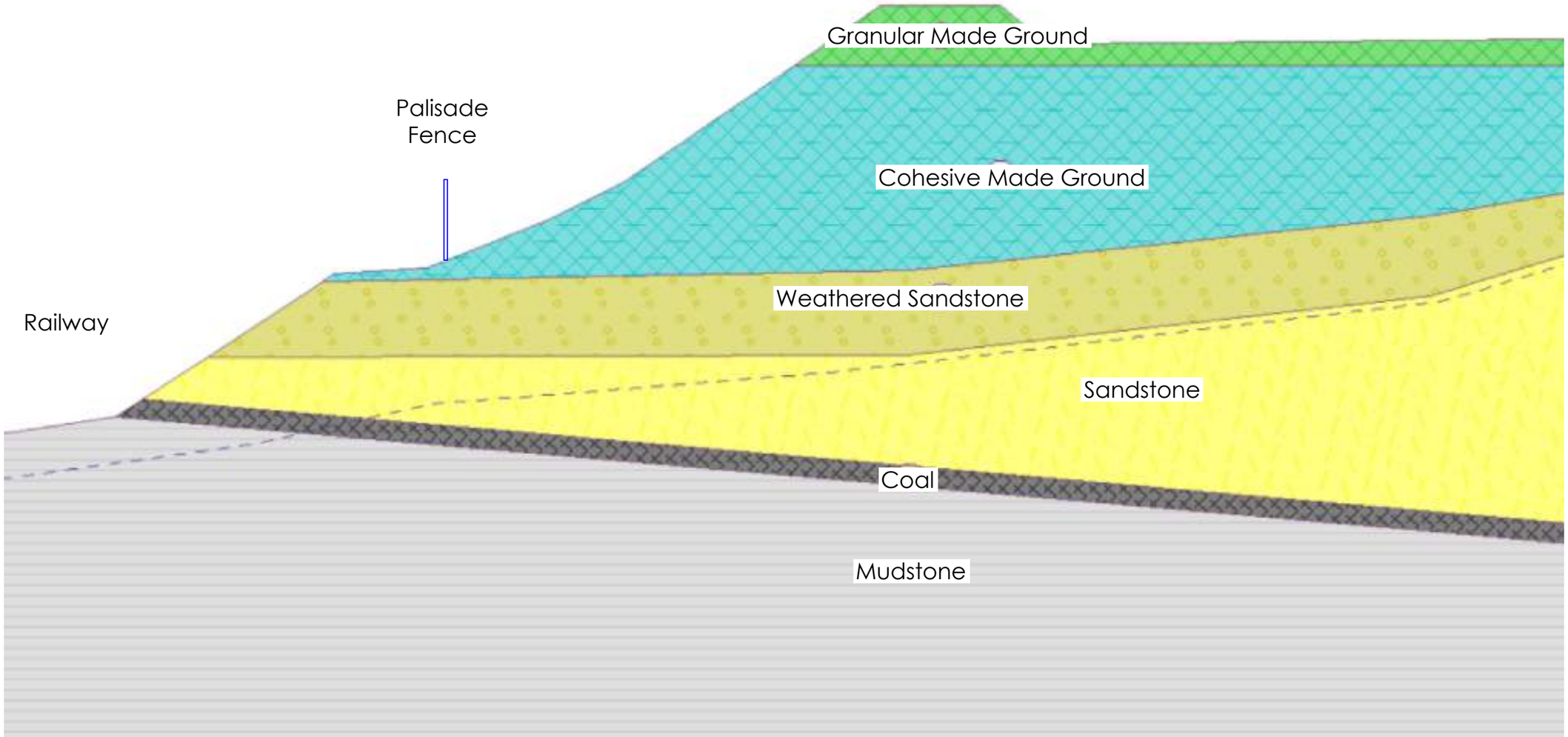
Table 12 - Summary of Outline Slope Stability Assessment

Scenario	Rock Model	Assessment Method	Groundwater Condition	Utilisation (%)
Existing Scenario	Mohr-Coulomb for Rock (Soil Property)	EC7	Piezometric Line	133
			PWP Ru=0.1	151
	Hoek-Brown for Rock (Rock Property)	EC7	Piezometric Line	133
			PWP Ru=0.1	153
Proposed Scenario	Mohr-Coulomb for Rock (Soil Property)	EC7	Piezometric Line	>170
			PWP Ru=0.1	164
	Hoek-Brown for Rock (Rock Property)	EC7	Piezometric Line	>170
			PWP Ru=0.1	>170

Where the Utilisation is greater than 100%, the model results indicate that the slope does not meet the requirements of EC7 for that combination of rock model / design approach / groundwater condition. It should be noted that the reported Utilisation for each combination represents the worst-case scenario (i.e. usually relating to shallow slips within soils on or near the slope surface), and is not necessarily representative of the broader scale Utilisation within the slope itself, which is likely to be lower.

AA

AA'



Key:

Notes
1. This drawing should not be viewed in isolation from the accompanying report.
2. All marked site features shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

REVISION		BY	DATE
0	For information	AL	22/05/26
A	>>	>>	>>
B	>>	>>	>>
C	>>	>>	>>
D	>>	>>	>>

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LS15 8GB
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TEL: 0113 264 9960
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CLIENT

Gleeson Homes Ltd

SITE

**Woolley Colliery Road,
Darton
- Southern Area**

DRAWING TITLE

Indicative Slope Cross-Section with Proposed Ground Raising / Retaining Wall

DRAWING NO.	REVISION NO.
C10128A/S/SA01	0

DRAWN BY	APPROVED BY
AL	AMG

DATE	SCALE	PAPER SIZE
May 2026	1:500	A3

AA

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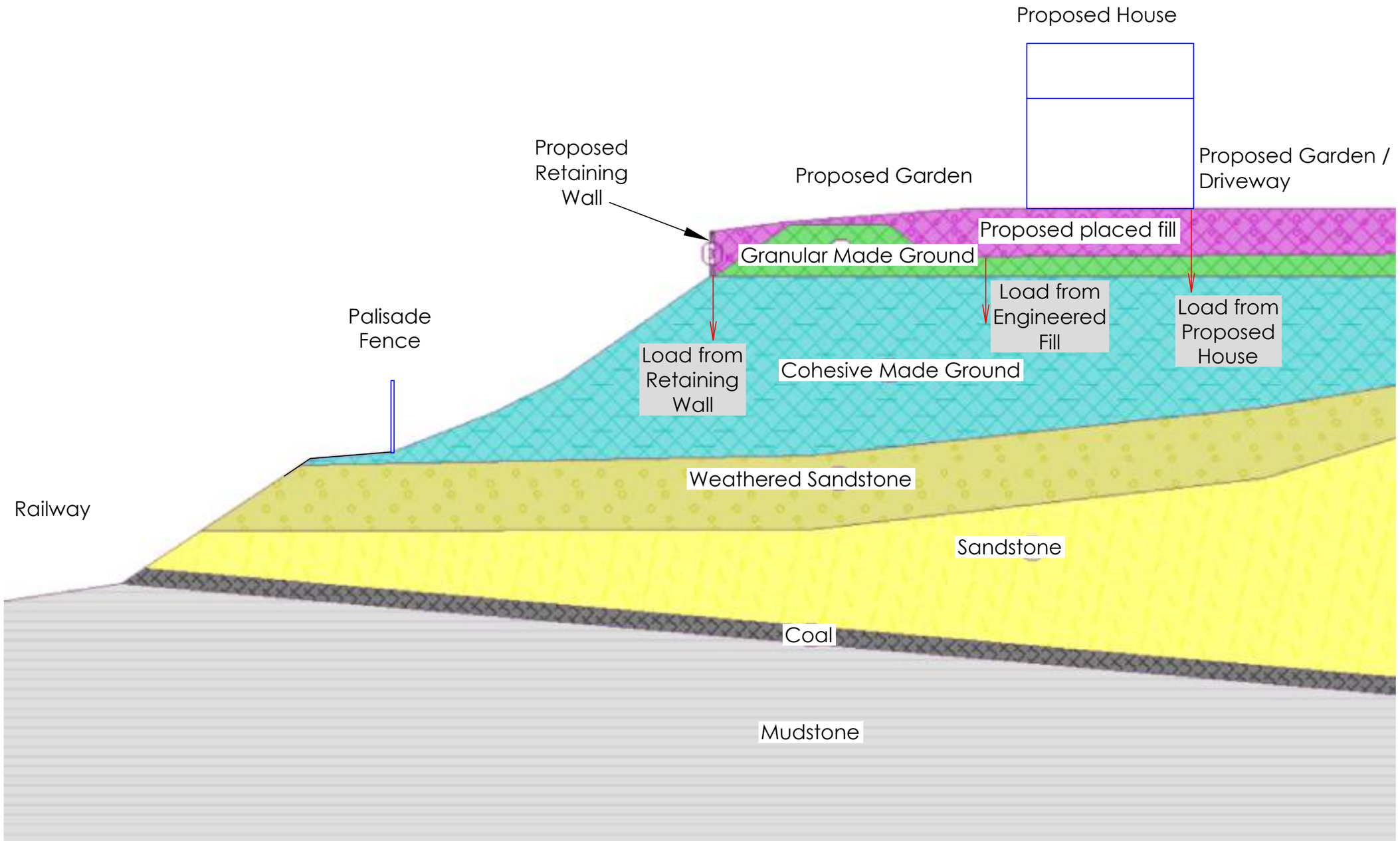

Key:

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DRAWING TITLE

Indicative Slope Cross-Section with Proposed Ground Raising / Retaining Wall

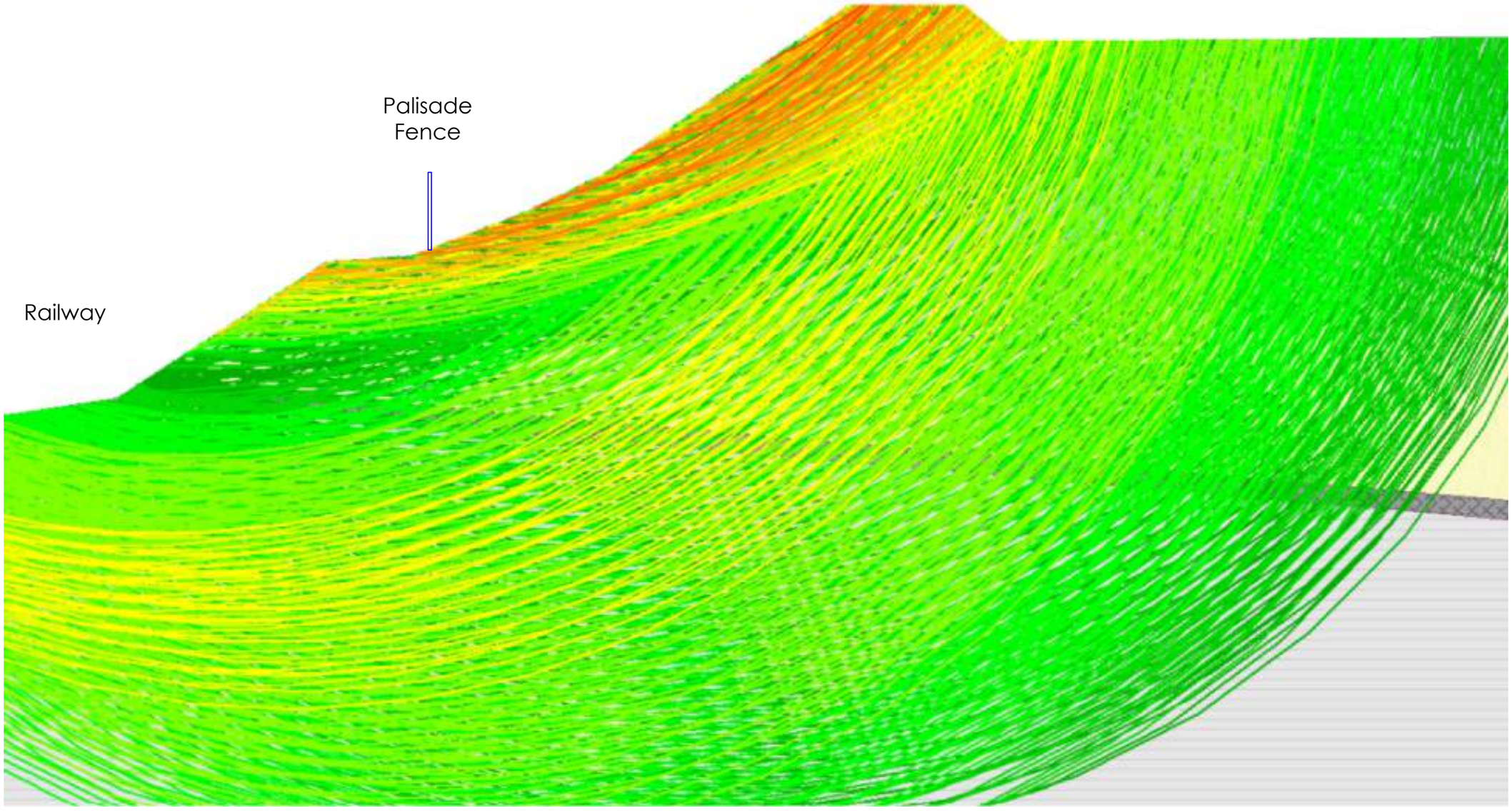
DRAWING NO.	REVISION NO.
C10128A/S/SA02	0

DRAWN BY	APPROVED BY
AL	AMG

DATE	SCALE	PAPER SIZE
May 2026	1:500	A3

AA

AA'



Key:

Utilisation (%)

Notes

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**Woolley Colliery Road,
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DRAWING TITLE

Results of Slope Stability Assessment - Existing Scenario

DRAWING NO.	REVISION NO.
C10128A/S/SA03	0

DRAWN BY	APPROVED BY
AL	AMG

DATE	SCALE	PAPER SIZE
May 2026	1:500	A3

AA

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Surcharge Loading

Palisade Fence

Railway

Key:

Utilisation (%)

Notes

1. The locations of services shown on this drawing are approximate and are based on utility plans provided by the client. Locations of services are given for the purposes of indicating constraints to the site investigation only. Reference should be made to original utility plans and HSG47 for locating of services within the site.
2. All marked site features (including historical features, mining features (ie, opencast boundaries and mineshafts), potential contaminant constraints, and any other potential constraint or feature of note) shown on this drawing are given for indicative purposes only. This drawing should not be underlaid in isolation to determine proposed development layouts. Reference should be made to the accompanying report for commentary on the potential location of these features including coordinates if available and any further works required to locate features if required.

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DRAWING TITLE

Results of Slope Stability Assessment - Proposed Scenario

DRAWING NO.	REVISION NO.
C10128A/S/SA04	0
DRAWN BY: AL	APPROVED BY: AMG
DATE: May 2026	SCALE: 1:500
PAPER SIZE: A3	