

Proposed Residential Development

Grange Moor, Huddersfield



Stabilisation and Mitigation Strategy for Shallow Mine Workings

Reference	GB/SMS/G23054
Client Name	Vivly Living
Date	March 2025
Version	1

CONTENTS

Telephone: 0330 0566900

E-mail: info@rwo.group | Website: www.rwo.group

X RwoAssociates | in RwoAssociates



Confidentiality Statement

Document History

1.0	INTRODUCTION	5
2.0	THE SITE	7
3.0	GEOLOGICAL SETTING	9
4.0	PREVIOUS REPORTS.....	10
5.0	STABILISATION OF MINE WORKINGS PROPOSAL.....	14

APPENDICES

APPENDIX A: FIGURES



CONFIDENTIALITY STATEMENT

This report is addressed to and may be relied upon by the following:

Vivly Living

This report presents observations and factual data obtained during desk study searches and/or ground investigation [GI] by RWO and others. This report presents a strategy to address the ground instability risks associated with coal mining at the site with respect to shallow workings and mine entries.

This report presents a strategy to address the mining instability risks for submission to the regulators and/or warranty providers for approval. The final approved document should then be forwarded to suitably experienced mine workings stabilisation contractors for the costing of any works.

This report has been produced with respect to information provided by the client regarding the proposed development. Further advice should be sought from RWO prior to significant revision of the development proposals. The report should be read in its entirety, including all associated drawings and appendices. RWO cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

The report includes an assessment of, and/or relies on other reports, which assessed numerous sources of third-party information, such as but not limited to: desk study search data, drillers logs and chemical geotechnical laboratory test results. All reasonable care and skill has been applied in examining the information obtained, however, RWO cannot and does not guarantee the authenticity or reliability of third-party information it has relied upon.

Where a site visit/walkover survey has been undertaken by RWO as part of the previous investigations, RWO can only report features present at the site at the time of the visit. RWO cannot be held responsible for any feature/land use etc. associated with the site which may have been present either prior to or following the site visit.

This strategy is based upon the findings of intrusive GI by others. GI's can only investigate the ground beneath a small proportion of the total site area. It is possible therefore that the intrusive investigation undertaken by others, whilst comprehensive, may not have encountered all significant subsurface ground conditions. Consequently, no liability can be accepted for conditions not revealed by the exploratory holes. Any opinion expressed as to the possible configuration of strata between, or below exploratory holes is for guidance only and no responsibility is accepted as to its accuracy.

This report has been produced in general accordance with the current relevant guidance and practice as set out within documents such as CIRIA Abandoned Mine Workings Manual [C758D] [2019].

DOCUMENT HISTORY

VERSION	PURPOSE/DESCRIPTION	DATE
1	First Issue	11 th March 2025



1.0 INTRODUCTION

RWO Associates Ltd (RWO) was instructed by Vivly Living (the Client) to prepare a Stabilisation and Mitigation Strategy for Shallow Mine Workings for land off Denby Lane, Grange Moor, near Wakefield (the Site), prior to its proposed development comprising the construction of new residential properties and associated infrastructure.

General notes and limitations relevant to this report are described in the aforementioned limitations statement which should be read in conjunction with this report.

Published Mining Remediation Authority (MRA) data indicates that there are 7 no. coal seams that are recorded to have historically been worked beneath the property boundary between 5m and 237m bgl.

Shallowest coal seams beneath the site have been identified as the 2nd Brown Metal/Old Hards and the Middleton Little (also known as the 3rd Brown Metal). A third party report by Lithos identified shallow coal workings beneath the site in the 2nd Brown Metal. The 3rd Brown Metal was not encountered by Lithos down to c. 30m bgl, and it was assumed absent.

There are also 3 no. mine entries recorded within the site.

The primary objectives of this report are to provide site specific recommendations for the stabilisation of shallow mine workings and mine entries present within the site. This report should be presented to the regulators, consultees (MRA) and/or warranty provider for approval, the report once approved can be used to guide a mine workings stabilisation Contractor in their implementation of detailed stabilisation works and obtain budget costs for the associated works.

To meet the above objectives, the following previous reports have been reviewed:

- Phase 1 Geo-environmental Report on Proposed Residential Development at Denby Lane, Grange Moor (Phase 2), Ref. E21/7792/R002, issued by Haigh Huddleston & Associates in May 2022.
- Geoenvironmental Appraisal for Land at Denby Lane, Grange Moor for Yorkshire Country Properties undertaken by Lithos, dated June 2024, report reference 4511/1A.
- RWO, Coal Mining Risk Assessment (CMRA), report reference KR/CMRA/G23054, dated November 2023 (this report also included a review of reports produced by others, namely Lithos).
- RWO Geoenvironmental Preliminary Investigation, dated November 2023, report reference KR/GEODS/G23054.

It should be noted that prior to any intrusive site works (drill and grout and/or disturbance/treatment of any mine entries) described in this strategy, the Client will be required to obtain a permit to disturb or change coal mines from the MRA. The permit can be obtained on the client's behalf by a consultant, contractor or other permitted agent.

It is recommended that a suitably qualified and experienced drill and grout contractor (Contractor) is employed to undertake the works. It is also recommended that the works are performed under the supervision of a suitably qualified and experienced Geoenvironmental/Geotechnical Consultant (Consultant) to verify the works have been undertaken in accordance with the proposals contained within this strategy.



2.0 THE SITE

SITE LOCATION AND FEATURES

Information on the location and features of the Site is presented in the table below.

Detail	Remarks
Location	Denby Lane, Grange Moor, Wakefield. WF4 4ED. The site occupies an area of 0.65 hectares (1.6 acres).
National Grid Reference (NGR)	SE 223162
Site Area (Ha)	c.0.65Ha
Site Description	<p>The site is located at the edge of a residential village.</p> <p>The site surfacing is a mix of overgrown grasses and semi mature to mature shrubs, there are several tree stumps visible where the trees have been cut down. The whole of the site is bounded by fencing with the access from Denby Lane down the track beside the houses. There is a public footpath running parallel with the eastern side of the site. The site is located in a predominantly residential/rural area with a number of residential properties to the south and the west.</p> <p>A review of Google Earth information shows site levels generally fall in a southeasterly direction with levels varying between 231m on the northern boundary to 216m AOD to the southeast.</p>
Summary of Site History	From 1854 until possibly 1918 the site was occupied by a sandstone quarry and a coal mine. In 1919, filter beds are recorded relating to sewage works. Beyond these workings, the site remains relatively unchanged up to present day.
Known services	<p>Services plans provided by the Client (Vivly Living), indicate a 3kv overhead service cable along the main road, along with low voltage underground mains to the South of the site. An underground cable is noted to be left in situ within the Southeast of the site. An overhead Aux cable is noted between the site boundary and the adjoining site to the East.</p> <p>A combined sewer is noted within the Southern most boundary of the site, and a second pipe noted parallel to this further inwards of the site.</p>

The site location plan is presented as in Figure 1 in Appendix A, with an extract presented overleaf.

Site Location (Red Line indicates the approximate extents)



Key

 Site Location

PROPOSED DEVELOPMENT

It is understood that the site is currently proposed for development with residential properties, comprising 12 No. dwellings, along with associated roads, drainage and site infrastructure.

A Proposed Development Plan, Figure 2, is presented in Appendix A

3.0 GEOLOGICAL SETTING

Sources of Information	BGS Online Geology of Britain viewer and Online GeoIndex Onshore. BGS Lexicon of Named Rock Units. Coal Authority Interactive Map Viewer. BGS 1:10,000 Series Map, Sheet SE21NW. CA Authority Consultant/ CON29M Mining Report Ref: 51003385245001 dated 24th October 2023.
Made Ground	Areas of Made Ground were identified within the Lithos Ground Investigation, where multiple types of Made Ground were found, and were identified to contain contamination exceeding the allowable tolerable level for human health protection.
Superficial Geology	No superficial deposits are recorded beneath the site.
Solid Geology	Solid geology is Birstall Rock. These strata are described by the BGS as comprising fine grained thickly bedded cross bedded sandstone with common pebbles of ironstone, coal sandstone and mudstone, and common streaks of shaly coal. These sandstones are a part of the Pennine Lower Coal Measures Formation. The geological map shows the site to be underlain by the Pennine Lower Coal Measures. BGS 1:10,000 scale map SE21SW indicates that the shallowest coal seam beneath the site is the First Brown Metal Coal (0.3-0.7m thick) which is in turn underlain by the Second Brown Metal (also known as Old Hards Coal) (0.3-0.7m thick) approximately 10m below, with the Third Brown Metal (0.2-0.6m thick) again approximately 10m below.
Linear Features	The closest fault (inferred) to the site is c. 200m to the west, trending roughly north-south with the downthrow to the west.
Published Mining and Quarrying Information	Mining: According to the CA's Interactive Map Viewer the site is within an area where a coal mining report should be obtained and within a ' development high risk area ' Therefore, a Consultants Coal Mining Report has been obtained the contents of which are discussed below. Quarrying: There are 2no. BGS recorded mineral sites on site, Tile Houses (sandstone quarry) and Square Pit (coal mine), plus another 4no. within 500m of the site.

4.0 PREVIOUS REPORTS

The site has been the subject of a number of geotechnical/geoenvironmental appraisals including ground investigations undertaken between 2022 and 2024. The most recent, undertaken by RWO, was a Coal Mining Risk Assessment in November 2023. The relevant points from the Ground Investigations by Lithos and the RWO CMRA are provided in the table below:

<p>Report</p>	<ul style="list-style-type: none"> • Phase 1 Geo-environmental Report on Proposed Residential Development at Denby Lane, Grange Moor (Phase 2), Ref. E21/7792/R002, issued by Haigh Huddleston & Associates in May 2022. • Geoenvironmental Appraisal for Land at Denby Lane, Grange Moor by Lithos for Yorkshire Country Properties, dated June 2024, report reference 4511/1A. • RWO Coal Mining Risk Assessment, dated 16th November 2023, report reference KR/CMRA/G23054. • RWO Geoenvironmental Preliminary Investigation, dated November 2023, report reference KR/GEODS/G23054.
<p>Summary of Ground Investigation Information</p>	<p>Fieldwork by Lithos Consulting (LC) was undertaken between 10th October 2022 and 13th October 2022. They completed their Ground Investigation across 2 no. sites comprising Area A and Area B.</p> <p>RWO have been commissioned to investigate Area A only, with the Ground Investigation for Area A comprising the following;</p> <ul style="list-style-type: none"> • 5 No. rotary boreholes; • Installation of 3 No. gas and groundwater monitoring wells (PH05A, PH07A and PH08A); • Soakaway testing within 1 no. Trial Pits; • Mine shaft searches to attempt to locate 3 no. shafts; and • 15 No. Trial pits. <p>LC state a third-party drilling company conducted a more focused investigation to locate the mine shaft entry points within Area A of the site. This was undertaken by Demolition and Geotechnical Limited, 9th April 2024.</p> <p>RWO have been commissioned to produce a Remediation Strategy, involving contamination exceedances identified within the Made Ground a detected in the Lithos Geoenvironmental Appraisal Report No. 4511/1, with Lithos soils descriptions as follows:</p> <p>Made Ground: Topsoil type Made Ground was encountered within 13 No. Trial Pits, and in all of the 5No. probeholes.</p>

Made Ground Topsoil was identified between G.L. and 0.40m bgl. The soil was described as dark grey slightly gravelly ashy sand with gravel of clinker, coal, mudstone and sandstone. This material was identified within Trial Pits: TP09, TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP21 and TP22. This material was absent within probehole locations, and absent from TP10 and TP25.

Demolition Rubble in TP11 in Area A between 1.20m and 1.90m bgl. The material was described as gravel of concrete, coal, glass and wood, with frequent full and half bricks. A strong hydrocarbon odour was noted.

Granular Made Ground within TP11 in Area A from Ground Level to a depth of 1.20m bgl in TP11. The soil was described as light grey slightly clayey sand with gravel of brick, mudstone, sandstone and coal.

Colliery Spoil is described as dark grey overburden and dark grey gravelly ash with frequent rootlets. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone, coal and clinker. The colliery spoil spans between depths of Ground Level and 6.10m bgl. The material was identified within Trial Pits: 09, 12, 13, 14, 15, 16, 17, 20, 21 and 22, and was Identified within Boreholes and probeholes: PH04, PH05, PH05a, PH06, PH07, PH07a, PH08 and PH08a.

Lithos stated "Colliery Spoil, Made Ground Topsoil, Demolition Rubble and Granular Made Ground are not considered to be suitable for placement in garden areas given the presence of undesirable surface materials (clinker, ash, brick, burnt shale etc). Therefore, these soils will need isolating beneath clean cover or beneath surface hardstanding and no further analysis of arsenic contamination is considered necessary."

Reworked Natural Soils:

Reworked Natural Ground in Area A within Trial Pits: 15, 16, 17, 18 and 20. The material was identified between 1.90m and 3.30m bgl. The soil was described to be light brown sandy fine to coarse gravel of sandstone.

Natural Soils:

Natural Soils comprised Topsoil (TP10 and TP25) between Ground Level - 0.4m bgl, cohesive residual soils up to 3.10m bgl and granular residential soils between 0.40m and 3.10m. Bristall Rock (sandstone) was encountered between 0.90m and 6.10m bgl. The 2nd Brown Metal was encountered between depths of 1.90m and 2.60m bgl. Lithos believe 5 of 10 holes contained evidence of a worked coal seam, with this more likely in Area A.

Granular Residual Soil was identified between 0.40m-3.00m bgl, within Trial Pits: 10, 11, 14 and 19. The material was described as light brown

sandy, gravelly angular to subangular cobbles of sandstone. Gravel is angular to subangular fine to coarse of sandstone.

Cohesive Residual Soils were described as firm light orangish brown mottled grey slightly gravelly clay. Gravel is angular to subangular fine to medium of sandstone. The material was identified between 2.40-3.10m in Trial Pits: 12 and 25.

Relict Topsoil in Area A TP12. The material was identified underlying colliery spoil, between 2.10m and 2.40m bgl. The soil was described as dark brown sandy slightly gravelly clay with rare rootlets.

Topsoil in TP10 and TP25 was identified as dark brown slightly clayey slightly gravelly SAND with occasional rootlets. Gravel is angular to subangular fine to medium of sandstone, mudstone and coal, and mixed lithologies. This material is present between depths from G.L. to 0.40m depth.

No groundwater was observed within Area A, but a small seepage was noted in TP06 only in Area B at 3.10m bgl.

Suspected hydrocarbon contamination was identified during the Ground Investigation within demolition rubble type Made Ground in TP11 between 1.20m and 1.90m bgl with a hydrocarbon odour being noted. This was later confirmed by lab testing to contain PAH and TPH compounds.

Mine shafts

Initially, LC identified (3 No.) suspected mine shaft within the Area A site boundary through a programme of trenching.

422416-029 was identified to contain a concrete square pad of 3mx3mx0.1m, and was suspected as being the shaft/ well cap.

422416-005 (the confirmed mine shaft) was noted to comprise a double brick lined circular mine entrance, of approximately 2.60m diameter. The entry was reported by Lithos to have been backfilled with colliery Spoil.

422416- 004 was reported by Lithos to comprise square sandstone bricks lining a mine entry, some 4mx2.4m in size and was backfilled with colliery spoil.

Following a review of a third-party investigation comprising rotary boreholes, carried out by Demolition & Geotechnical Limited, Lithos were able to conclude that mine entry 422416-005 is a Shaft of at least 33m deep and has determined that suspected shaft 422416-029 “was more likely a 4m deep wall”.

The third recorded mine entry location at shaft 422416-005 in line with Coal Authority, local authority and NHBC guidance will require treatment. Suspected shaft 422416-004 was not located in the drilling exercise (with the position identifying Made Ground over natural soils. As such, a supplementary phase of Ground Investigation has been proposed to locate this shaft.

Mine entries were recorded on the site likely associated with previous mining activities within the 2nd Brown Metal coal seam and subjacent seams .

LC also identified a viable risk that there are unrecorded shaft entries and pits within the site boundary, especially in the North of the site.

Shallow Workings

The geological map shows the site to be underlain by the Pennine Lower Coal Measures.

BGS 1:10,000 scale map SE21SW indicates that the shallowest coal seam beneath the site is the First Brown Metal Coal (0.3-0.7m thick) which is in turn underlain by the Second Brown Metal (also known as Old Hards Coal) (0.3-0.7m thick) approximately 10m below, with the Third Brown Metal (0.2-0.6m thick) again approximately 10m below.

LC reported that a worked coal seam was present between depths of 1.90m and 11.50m bgl, with a thickness ranging between 0.50m and 1.60m.

LC states the site is underlain with shallow workings in the 2nd Brown Metal coal seam.

As such, RWO have been commissioned to produce a stabilisation and migration strategy for shallow mine workings and mine entries.

Generally, the coal seams appear to dip to the north/northeast, but due to the effect of the topography, the depth to the seams appears to increase also to the south. Information from the Coal Authority Consultants Report indicate the deeper seams (Yard, Low Main and Hutton) generally dip between 0.3 and 4.4° beneath the site. However, the ground investigation was unable to establish any clear and consistent dip values. The Lower Coal Member is dipping towards the South.

5.0 STABILISATION OF MINE WORKINGS PROPOSAL

The GI information as summarised in the LC report has identified that the 2nd Brown Metal seam is worked across the site and requires stabilisation, in order to mitigate the risk of void migration reach surface.

The subjacent 3rd Brown Metal seam was not encountered by Lithos down to a depth of 30m bgl and was not considered a concern given there being at least 10m of bedrock between the seams.

The stabilisation of the shallow workings will be targeted beneath the proposed residential dwellings. It is understood that there are no plans to extend dwellings at this time, such as by the addition of conservatories.

It is further understood that internal roads/highways will remain private and will not be adopted by the Local Authority, apart from a 2m strip of road along Denby Lane adjacent to the site boundary.

Therefore, stabilisations of highways is not currently being considered.

However, it should be noted that given the relatively shallow depth of the workings below rock head across the site, there is a greater risk that crown hole migration could migrate to surface within areas where grout stabilisation has not been undertaken outside of the 12 No. dwellings footprints, such as roads, driveways and even garden/soft landscaping. It is understood that the Client is happy to take on these liabilities.

DRILLING AND GROUTING APPROACH

It is recommended that a suitably qualified and experienced Contractor is employed to undertake the works. It is also recommended that the works are performed under the supervision of a suitably qualified and experienced Geotechnical Consultant to verify the works have been undertaken in accordance with these proposals and any subsequent specification.

The Client should supply the Contractor with records of all known above, and underground services, property and/or equipment prior to commencing works.

Stabilisation works will be undertaken by injecting a Pulverised Fuel Ash (PFA) / cement grout into workings via drilled boreholes. A plan showing the proposed location of the boreholes is provided as Figure 3 in Appendix A.

The recommended drilling and grouting approach is considered as follows:

Primary Grid

Building Footprints

- Due to the extensive mine workings identified within the site boundary a 3m x 3m grid of grout holes should be drilled across the building footprints, with the grid extending 3m beyond each plot. Should significant voids be identified within the drilling locations, the grout will be injected within a 6-point diamond shape pattern to maximise grout stabilisation potential.

Adoptable Highways

Discussions should be held with the local highways authority with regards to the requirements for stabilisation of the small c. 2m strip of Adoptable Highway/pavement.

At this stage it is assumed the 2m strip of adoptable high adjacent to the site along Denby Lane will require grout stabilisation, as follows

- The drilling of a line of boreholes in the centre of the 2m strip at 3m spacings, with a short second row of grout holes at the site entrance.

Remaining roads within the site boundary are not adopted and as such, are not proposed for grouting at this time.

All works should be undertaken in accordance with the Construction Design Management (CDM) Regulations and the Construction Phase Health and Safety Plan.

On completion of the drill and grouting operations at the site, it is recommended that a validation report is produced containing a borehole location plan, borehole records, any results of validation boreholes and pressure tests, procedures followed during the works and any deviations from the specification. The validation report should be provided to the client for use as evidence toward gaining relevant certification from appropriate third parties, e.g. Local Authority planning/mortgage/warranty providers etc.

MATERIALS FOR GROUTING

With regards to materials used by the Contractor, to undertake the works, the following recommendations should be followed:

- A supply of water will be required for drill and grout works; appropriate licences, if not already in place, should be obtained to enable the use of a mains water supply, otherwise the Contractor will be required to secure an alternative source.

- Cement for sand and cement grouts shall be Sulphate Resisting Portland Cement to of BS EN 197-4:2011; cement for use with PFA shall be Ordinary Portland Cement (OPC) to BS EN 197- 1:2011.
- PFA should be conditioned hopper ash, dry powder ash, or a type suitable for use as a constituent for grout and comply with BS EN 450-1:2005 (+A1:2007).
- Sand should comply with BS EN 12620:2013 and be of a grading suitable for use in the Contractor's plant and approved by the Consultant.
- Pea gravel should comply with BS EN 12620:2013 and be of grading approved by the Consultant.
- Any thixotropic admixtures should be bentonite or another admixture approved by the Consultant.

It is recommended that storage of materials is in a manner to prevent contamination and deterioration;

- Cement should be kept in a dry location, and deliveries recorded so that cement can be used in sequence.
- PFA should be stored within a pre-defined area and kept damp to mitigate against dust generation.

GROUTING PLANT

RWO have produced the grouting plan based on a 3m x 3m grid across the footprints, and 3m beyond of the proposed houses within the development.

The Contractor should submit to the Consultant, for comment, details of the proposed method of mixing, batching and pumping of grout to the injection points, together with the means of monitoring grouting pressures and the quantities injected.

The materials should be introduced into the mixer via approved methods (volume or weight batching) as agreed with the Consultant.

The grout mixer should be capable of producing a homogenous mix, all particles being thoroughly wetted without segregation.

GROUT MIXES

Prior to commencement of works, the Contractor should confirm with the Consultant a selection of grout mixes that are likely to satisfy the site requirements, or the Consultant may specify the mix requirements. Where a selection of grout mixes is required, it is recommended the Contractor prepares cubes of the agreed mix to the agreed size, and arrange testing by crushing at 14 and 28 days in accordance with BS 1881. The testing should be undertaken by an independent laboratory, and where time allows, the test results should be provided to the Consultant prior to start of grouting operations.

It is recommended that any mixes produce cubes with crushing strengths of not less than 1.0 MN/m² at 28 days (Note: the 14 day test is performed to indicate that the 28 day strength is achievable i.e. a 14 day value of about 0.5MN/m² is likely to be considered on target.)

Given the proposed use of the site, the filling material is likely to consist of a PFA: cement grout; it is recommended that these be mixed in the proportions of up to 10:1 (in accordance with CIRIA C758) where water is present, but which may range to 20:1 in dry conditions.

If excessive lateral flow of grout is anticipated or where voids greater than 500mm are encountered, the Consultant may request or agree to the addition of sand or pea gravel to the mix in accordance with CIRIA C758. The specified grout mix should have the minimum water content consistent with effective pumping.

The actual proportions to be used initially for the various grouts should be agreed with the Consultant and with consideration to the drilling conditions and results of any trial grouting conducted prior to commencement of works.

GROUT PROPERTIES AND TESTING

Based on widely used water / (cement and PFA) ratios, the mixes proposed should produce pumpable grout with flowability readings of between 300 to 600mm, when measured in a meter of the "Colcrete" type.

The sample for the flowability test should be obtained by the Contractor at the point of injection i.e. from the end of the tremie pipe.

A minimum of two flowability tests per week should be performed by the Contractor as directed by the Consultant.

High-bleed grouts should be avoided, with bleed capacity limited to 5% maximum unless agreed otherwise with the Consultant.

A minimum of two bleed capacity tests should be performed by the Contractor per shift or as directed by the Consultant. The sample of grout for the test should be taken from the point of injection i.e. the end of the tremie pipe.

Bleed capacity should be measured in a clear plastic or glass graduated cylinder which has an internal diameter not less than 50mm and a volume of approximately 1000ml. After placing the grout, a cover should be placed over the cylinder to avoid evaporation. Bleed capacity should be read at hourly intervals for neat cement grout, and readings should continue for not less than 3 hours. For PFA: cement grouts readings should continue for not less than 6 hours.

The Contractor should prepare two sets of test cubes of grout per week, or as directed by the Consultant.

Each cube proportion should be as agreed with the Consultant or should be of 100mm side, and taken from the grout at the point of injection i.e. the end of the tremie pipe.

At the instruction of the Consultant, the Contractor should arrange for the cubes to be tested by crushing at 14 and 28 days in accordance with BS 1881, with the tests conducted by an independent laboratory or as agreed with the Consultant. Mixes should produce cubes with crushing strengths of not less than 1.0 MN/m² at 28 days.

If the Consultant considers the results indicate a change of mix proportions is required, the Contractor should make the appropriate modifications as the Consultant may direct.

PROCEDURES FOR TREATMENT OF SHALLOW MINE WORKINGS

Drill Procedures

All boreholes to be used for the injection of grout, including those which strike coal pillars, should be drilled by rotary or rotary percussive techniques down to a minimum of 1.0m beyond the base of the old workings in the seam or the floor of the seam itself whichever is greater.

The drilling system and flushing medium to be used should be as recorded on the Coal Authority licence, and approved by the Consultant. The Contractor should allow for the provision of appropriate dust suppression for boreholes drilled near sensitive receptors (e.g. nearby houses, highways, active commercial properties, car parks and public footpaths).

Boreholes drilled for the treatment of the plots should ensure treatment extends up to 3m out with the building footprint, based upon anticipated grout flows.

The minimum diameter of the boreholes should be 75mm unless otherwise specified by the Consultant. When it is impracticable to drill at the minimum diameter for the full depth, the diameter of the boreholes shall be increased in the upper lengths.

Boreholes should be temporarily cased through superficial deposits down to the rockhead and if directed by the Consultant, down through the rock strata. The boreholes shall be kept open until grout injection into the workings and rock is complete.

Where a borehole proves abortive because it becomes obstructed, it shall be re-drilled in a suitable location as directed by the Consultant, at a large diameter and re-cased.

Boreholes should be formed in general accordance with the pre-commencement agreed layout supplied by the Contractor. Any deviation from the pre-commencement agreed layout including the drilling of additional secondary and tertiary holes should be recorded by the Contractor and a revised borehole location plan provided to the Consultant.

Grouting Procedures

The aim of the stabilisation work is to substantially fill any old workings within the 2nd Brown Metal coal seam, as well as any voids or broken ground found within the overlying strata to prevent the development of crown holes at the surface / foundation level.

Perimeter grout walls, if required, shall be formed by filling boreholes with a viscous grout composed of appropriate proportions of cement, PFA, sand or pea gravel and water. The mix, proportions and method should be agreed with the Consultant.

Unless specified otherwise, the section of the perimeter wall at the deepest part of the seam should be constructed first.

Immediately prior to grouting each borehole, the Contractor should check that it is unobstructed to the required depth to receive the tubing or tremie pipes for grout injection. Obstructions should be dealt with as described in 'drilling procedures' above.

Grout should be injected into each hole via an approved flexible tube, or series of steel tubes, placed to the base of the hole or to such other depth to receive the tubing or pipes for grout.

Grouting should proceed upwards from the base of each borehole to the base of the surface deposits. It is not intended that, as a general rule, significant quantities of grout shall be injected into the surface deposits unless specified otherwise. This requirement will be subject to the Consultants review.

The grout should be injected at the approved rates until grout appears near the point of injection, when the borehole shall be deemed complete. If this criteria is reached quickly, the grout tubes should be lifted to check a local obstruction is not preventing flow of the grout into the strata.

Pressure should be applied to the grout in every borehole. If grout has not appeared at the point of injection after 5 tonnes of grouting materials have been introduced then sand and/or pea gravel (gravel which passes through a 6.33mm sieve and is retained on a 2.36mm sieve) may be added to the mix or placed down the borehole.

Treatment of adoptable highways, if required, will generally be undertaken as per the plots.

All operations should consider the potential effects on adjacent site users/properties.

SERVICES AND ROADS

The Contractor shall take all necessary precautions, including making all reasonable liaison with the Client (Vivly Living), to ascertain the positions and depths of underground services and drains passing through the site, making full allowance for working around and protecting live services and drains.

The Contractor shall be responsible for maintaining close liaison with the Local Authority and the Public Utility Authorities so as to avoid any disruption of the existing services.

When introducing grout into any borehole the Contractor shall ensure by regular inspections throughout the day that the grout is not entering adjacent drains, services, culverts and ducts. In the event that any such leakage is detected the Contractor shall immediately suspend the grouting operations and remove any accumulated grout.

PROCEDURES FOR TREATMENT OF MINE SHAFTS

Trenching and probeholes during the LC GI at location, identified 3no. suspected mine entries at coordinates: 422416-029, 422416-005, 422416-004.

Mine Entry 422416-005 was proven as mine shaft of at least 33m deep. MRA records record this as 107.9m deep and of 2.6m diameter.

Mine Entry 422416-029 was a likely well which had also been suspected to be the case within by the MRA. As this is not a mine shaft, it is advised that this is excavated and backfilled to a suitable specification such as Specification for Highways Works Series 600.

Mine Entry 422416-004 was not located at these co-ordinates, and remains unlocated. A supplementary phase of Ground Investigation is proposed to be undertaken to ascertain the location of this remaining shaft. MRA records indicate that this is a shaft of 109.7m deep and 4.5m in diameter. A supplementary phase of Ground Investigation is proposed to be undertaken to ascertain the location of this remaining shaft.

The shaft identified was found to be backfilled with a mix of colliery spoil. No evidence of any prior treatment was observed or is held on record by the Coal Authority.

It is recommended that the identified Mine Entry (**422416-005**), and **Mine Entry 422416-004** (if/when confirmed as a mine entry) are suitably treated and an appropriate development standoff is maintained.

Initially, a vertical borehole shall be drilled at the approximate centre of each shaft location either by coring through or breaking out the cap, if present. Provided the shaft is found to be filled or partially filled, the upper 60m only is required to be grout consolidated. Each shaft shall be drilled initially to a target depth of 110m to ensure that no staging is present, or to at least 5.0m below the base of the shaft if proven less than 110m deep. If the shaft is found to be filled or partially filled to this depth, no further investigation drilling is required and grouting treatment shall then proceed from a depth of 60m bgl.

The Contractors tendered price shall be based on an assumed maximum drilling depth of 110m and grouting treatment to 60m bgl.

The Contractor shall provide rates for mass infill if required and grouting treatment to depths greater than 60m bgl if found to be required.

If a cavity is located within the shaft it shall be infilled with 'pea gravel' (10mm single sized gravel) or other material approved by the Engineer in which case the Contractor will be required to insert casing to the upper limit of the cavity to facilitate the placing of the fill into the cavity. The casing must then remain in place until the base of the shaft is proved by the drilling. During drilling the Contractor shall carry out regular checks and any necessary adjustment to the drilling rig to ensure that the drill is vertical.

A minimum of two grout injection treatment holes together with one test/ treatment hole are required for each shaft, increasing to three treatment holes and a fourth test hole/ treatment hole for shafts in excess of 3.0m diameter. Advice from the Engineer should be sought if the shaft is considered to be in excess of 3.0m diameter. The initial investigation drill hole may constitute the first treatment hole.

Any investigation or treatment of the shaft should mitigate against collapse through the use of appropriate measures such as a shaft box, platform drilling etc.

Post treatment all identified and treated shafts should be capped with cap which should be designed by a suitably qualified structural engineer.

It is recommended that a suitable development standoff is maintained around the perimeter of the shaft post treatment and capping. The standoff should be a minimum distance based upon a 45° angle of repose from rockhead around the perimeter of the shaft.

Whilst no mine other entries were encountered during the investigation, their presence cannot be excluded and due regard must be given for the potential presence of shafts, bell pits and/or adits which may have given access to the shallow seams beneath the site.

INSITU TESTING

On completion of the treatment works the Contractor shall carry out a grout acceptance tests to demonstrate to the satisfaction of the Engineer that the shafts have been filled and consolidated in accordance with the specification. The grout acceptance test shall be carried out all in accordance with the requirements for the treatment holes and the grout takes monitored and reported to the Engineer for consideration. The Contractor shall not demobilise from each shaft location until the Engineer has determined that no further works are necessary. The testing and may be varied if required by the Engineer.

The grout acceptance tests shall be undertaken not before 12 hours after grout injection to the shaft treatment holes has been completed, and will be required to demonstrate no significant flow of grout into the shaft under pressure at each stage. Pressures are to be limited to 20 kN per metre of overburden to a maximum of 200 kN/m² (30 psi) maintained for a period not less than three minutes.

The reported results shall include the initial pressure, the pressure after three minutes, the grout take, and all other records required by the Specification for infill holes. If pressure cannot be maintained due to , for example, grout overflow to the surface, the test may be deemed satisfactory but only with the approval of the Engineer.

If the Engineer considers that the quantities of grout accepted are excessive, further holes shall be drilled and grouted. Further pressure testing may then be required to the satisfaction of the Engineer.

Upon completion of the pressure grouting procedure, and following the subsequent withdrawal of the drill string, the Contractor shall ensure that each borehole is backfilled to

the surface with grout. In the event that settlement of each backfill grout subsequently occurs, the Contractor shall return to these boreholes locations to top up the grout level.

RECORDS

The Contractor should prepare and keep available for inspection on site, plans showing the positions and surface levels of all boreholes, daily drilling records (see below), together with the total amounts of grout injected. All levels should be given with reference to a datum to be determined.

As works proceed, the Contractor should maintain separate daily records for drilling, for grouting and for materials and plant received, in a format agreed with the Consultant. The daily records should be signed by the Contractor or their agent and submitted each day to the Consultant for their agreement. The Contractor should provide one copy of the agreed record for the Consultants retention and keep a further copy available for inspection on site.

The plans should be updated daily in accordance with the daily drilling records noted below. On completion of the works, the Contractor should provide clearly legible copies of the plans and sections to the Consultant within one week of completion of the programme of grouting.

Daily drilling records shall be provided for each borehole and contain the following information:

- 1) Job title and location
- 2) Borehole reference number
- 3) Date
- 4) Contractor's name
- 5) Plant in use, crew members and hours worked
- 6) Method of boring or drilling
- 7) Type, diameter and depth of casing used
- 8) Diameter and depth of hole at the beginning and end of each working day or shift
- 9) Standing time, with reason, or time lost overcoming obstructions
- 10) Details of underground services located
- 11) Details of any settlement or ground heave
- 12) Daily and cumulative length drilled

- 13) Depth to each major change of stratum
- 14) Description and identification of the stratum and whether it is intact or broken
- 15) Each depth at which groundwater is encountered (if apparent), the depth to which it rose and any steps taken to stop the flow
- 16) Depths of any samples taken
- 17) Details and results of any permeability tests instructed by the RE
- 18) Details of any voids or suspected workings
- 19) Details of any emissions of gas, water, etc.
- 20) Depth of completed borehole

Daily grouting records shall be provided for each borehole and contain the following information:

- 1) Job title and location
- 2) Borehole reference number
- 3) Date
- 4) Contractor's name
- 5) Plant in use, crew members and hours worked
- 6) Details of type of injection grout-line dimensions and length of standpipes inserted
- 7) Type of grout mix and volumetric quantity injected, including total quantity by weight by each type of grouting material introduced
- 8) Grout pressures recorded and corresponding depths
- 9) The results of all flow and bleed tests
- 10) Details of casing abandoned
- 11) Details of grouting materials delivered to the site and a running total of each of the materials delivered
- 12) The nature, frequency and results of all inspections of services to check for grout penetration

13) Details of all stoppages or delays and any other relevant information

The daily records of materials and plant received should show in particular, that day's quantities by weight of each type of material and cumulative quantities. Alongside these daily records, the Contractor should also submit copies of receipts or invoices for all materials delivered, to the Consultant and keep them on site until the works are complete.

Notwithstanding the information listed above, the Contractor should provide any other information requested by the Consultant.

On completion of the drill and grout programme, the Consultant should prepare a validation report containing copies of borehole records, a borehole location plan, procedures followed during the works, the results of validation boreholes and pressure tests, and a record of any deviation from the agreed specification.

The Contractor should provide a Warranty for the remedial works that they have undertaken. The exact nature of the warranty terms should be confirmed prior to commencement of works.

REGULATORY

The conclusions and recommendations presented above are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other relevant organisations/consultees/warranty providers for their comment and approval prior to undertaking any works on site.

RWO
March 2025



APPENDIX A: FIGURES

LEGEND



Site Location



	TITLE: Site Location Plan Denby Lane, Grange Moor	CLIENT: Yorkshire Country Properties	PROJECT NO: G23054	APPROVED BY: CR	DATE: 18/02/2025
			FIGURE NO: 1	DRAWN BY: KR	SCALE: NTS



- KEY**
- Site Boundary
 - Estate Street - Intended to be offered for adoption via S38 agreement. Prior to adoption, the street is to be maintained privately by development via the Site Management Company
 - Estate Street - To be maintained privately by development via the Site Management Company
 - Private Drive - To be maintained privately by resident

<p>Farrar Barnforth Architecture</p>	
<p>vivily living VIVILY LIVING (YORKSHIRE COUNTRY PROPERTIES)</p>	
<p>Project Name: RESIDENTIAL DEVELOPMENT</p>	
<p>Project Address: DENBY LANE, GRANGE MOOR</p>	
<p>Project 22026 - FBA - ZZ - XX - DR - A - 0750</p>	<p>Drawn By GB</p>
<p>SITE LAYOUT - ADOPTED HIGHWAY</p>	
<p>Code A3</p>	<p>Description DEVELOPED DESIGN</p>
<p>Checked By TS</p>	<p>Date FEB 2025</p>
<p><small>This document is the property of Barnforth Architecture Ltd. Drawing measurements should be taken from the original drawing. Any reproduction or use of this drawing without the written permission of Barnforth Architecture Ltd. is strictly prohibited. This document is to be used in conjunction with approved contracts, specifications and project schedules together documents.</small></p>	

1 Proposed Site Layout - Adopted Highway
1: 200



TITLE:
Proposed Development Plan Extract
Denby Lane, Grange Moor

CLIENT:
Yorkshire Country
Properties

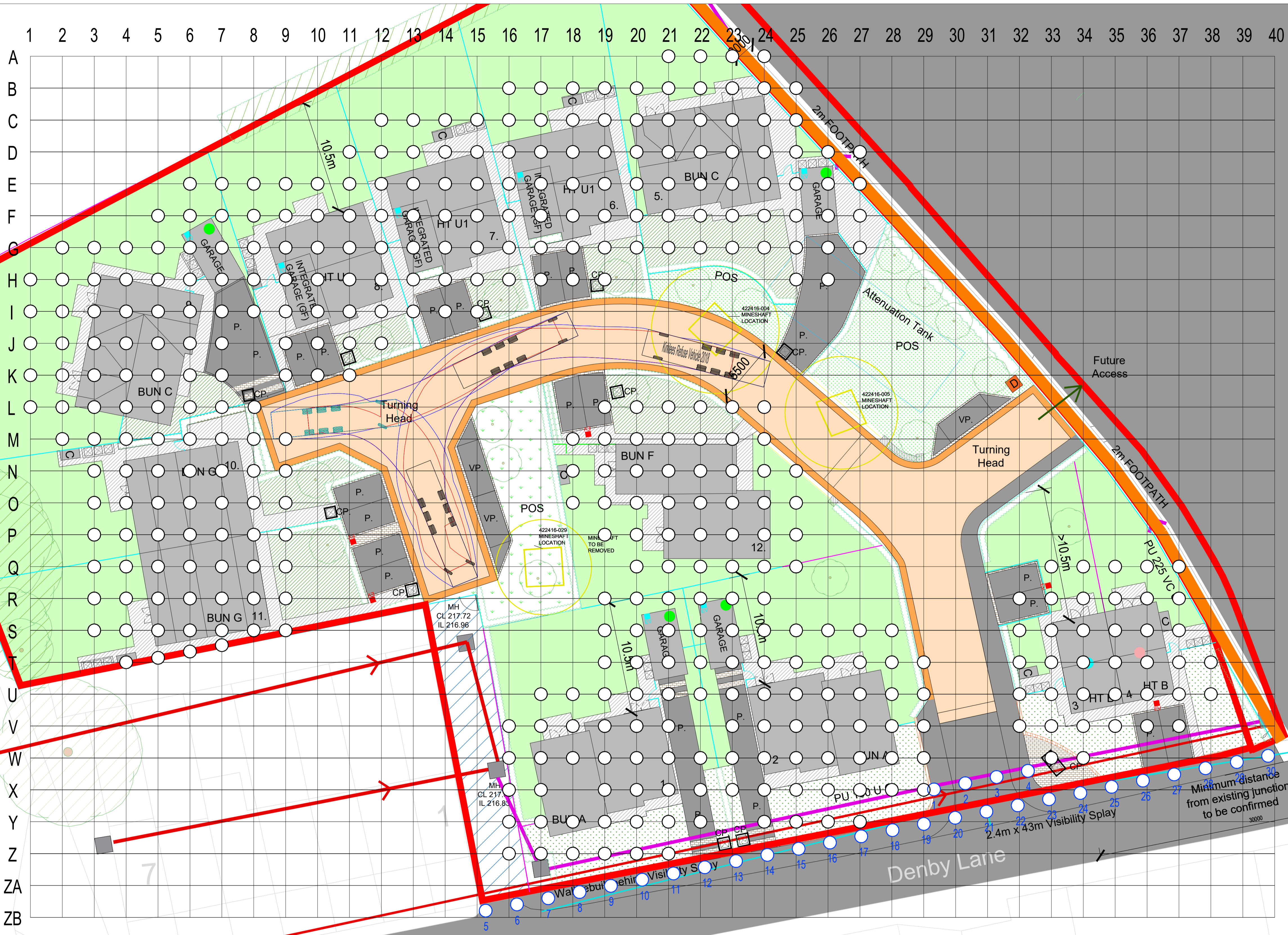
DRAWN BY:
GB
DATE:
25/02/2025

APPROVED BY:
CR

PROJECT NO:
G23054

FIGURE NO:
2

SCALE:
NTS



KEY:
 ○ DENOTES PLOT GROUTING
 ○ DENOTES ADOPTED ROAD / PAVEMENT GROUTING

DATE	FIRST ISSUE	DESCRIPTION	MB	CR	1
			DR	CHK	REV



www.rwo.group | info@rwo.group | 0330 0566900
 NEWCASTLE | LEEDS | LONDON | STOKESLEY

CLIENT: VIVLY LIVING

PROJECT: GRANGE MOOR

TITLE: GROUT HOLE PLAN

PROJECT No:	DISCIPLINE:	SCALE:
G23054	GEO	@:A1 1:200
DRAWING No:		REV:
	FIGURE 3	1

RWO  Civil
Structures
Geoenvironmental



E-mail: info@rwo.group | Website: www.rwo.group | Telephone: 0330 0566900

 [RwoAssociates](#) |  [RwoAssociates](#)

