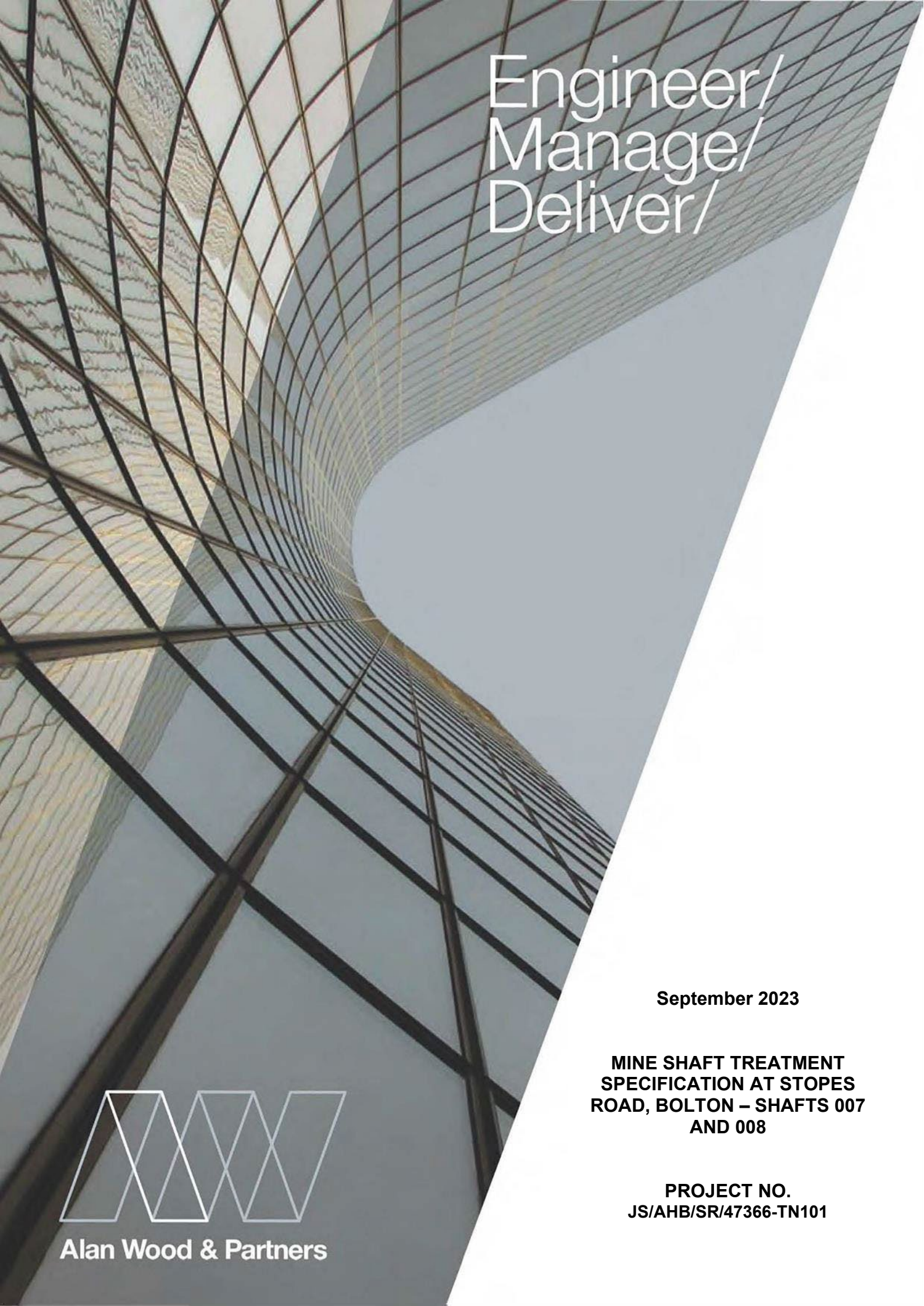




Engineer/ Manage/ Deliver/

September 2023

**MINE SHAFT TREATMENT
SPECIFICATION AT STOPES
ROAD, BOLTON – SHAFTS 007
AND 008**

**PROJECT NO.
JS/AHB/SR/47366-TN101**



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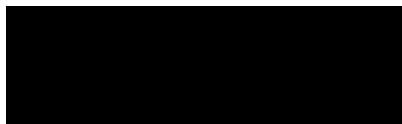
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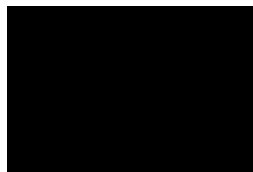
TECHNICAL NOTE – MINE SHAFT TREATMENT SPECIFICATION For VHE Construction Plc

Stopes Road, Bolton

Prepared by: **S L Roberts** *BEng (Hons) MSc CEnv MICE*



Approved by: **A H Borthwick**, *BSc (Hons), FGS*



Date: September 2023

Issue	Revision	Revised by	Approved by	Revised Date
Rev A	Minor amendments to method	SLR	SLR	22.09.23

1.0 INTRODUCTION

Alan Wood & Partners were appointed by VHE Construction Plc (VHE) (the 'Client') to produce a Mine Shaft Treatment Specification in relation to two mine shafts on the proposed residential development off Stopes Road, Little Lever, Bolton.

1.1 General

- 1.1.1 The site is located off Stopes Road, 4.4km southeast of Bolton, Greater Manchester, BL3 1NP (National Grid Reference 376262E, 407648N).
- 1.1.2 The site currently consists of a remediated former Tarmac block manufacturing plant, comprising open land, which has recently undergone earthworks and remediation to provide a suitable development platform for the proposed redevelopment with residential properties, associated infrastructure and open space.
- 1.1.3 The proposed development is to comprise approximately 140 residential houses of 2 storeys, with associated gardens, parking and soft landscaping. The north of the site is to remain as public open space. For the purposes of this report, the latest masterplan reference: 'HAR001MP01' Rev B, provided by Harworth Estates has been used. However, it is recognised that the masterplan may change and so this design is based on providing flexibility with regards to the final site layout. The exception is that it is assumed that the area of POS proposed in the northern section of the site is fixed.
- 1.1.4 The objective of the works covered in this specification is to successfully pressure grout two remaining mine shafts located on the site, shown on Drawing 15220-HYD-XX-XX-DR-GE-1023 P01 – Mine Shaft Investigation. Shafts identified on this drawing as Shaft 376407-007 and Shaft 376407-008 are the subject of this treatment specification. The shaft identified as Shaft 376407-006 has previously been treated by others; the details of which have been submitted to the Coal Authority.
- 1.1.5 The following documents should be referred to alongside this design technical note:
 - Hydrock Technical Design Note – Mine Shaft Investigation, report ref. 15220-HYD-XX-XX-RP-GE-0011 P02, dated June 2022.

1.2 Limitations

- 1.2.1 Interpretation and recommendations should not be assumed valid for adjacent areas of land, or for alternative land uses. Should the proposed site usage change, the recommendations and conclusions presented in this report may need to be re-assessed.
- 1.2.2 The findings and recommendations given in this report are based on fieldwork undertaken by Hydrock in September 2021 and May 2022, details of which are appended to this report.

- 1.2.3 The report has been prepared for the titled project and Alan Wood and Partners can accept no responsibility or liability for the consequences of the use of this document, wholly or in part, for any other purpose than that for which it was commissioned.
- 1.2.4 The findings and opinions provided in this report are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described. Alan Wood and Partners assumes that third party data is reliable, but has not independently confirmed this. The validity and accuracy of this information is therefore outside the control of Alan Wood and Partners. Professional judgement and experience are however used to ensure that uncertainties are reduced to a level appropriate to the site conditions, the purpose of the investigation and the resources devoted to it by the Client.
- 1.2.5 Further information, ground investigation, construction activities, change of site use or the passage of time may reveal conditions that were not indicated in the data and therefore could not have been considered in the preparation of this report. Where such information might impact upon stated opinions, Alan Wood and Partners cannot accept responsibility for conditions not encountered and reserves the right to modify or retract the opinions expressed in this report. Where opinions expressed are based on current available guidelines and legislation, no liability can be accepted by AWP for the effects of any future changes to such guidelines and legislation. New information of improved practices and changes in legislation may require reinterpretation of the report as a whole, or in part.
- 1.2.6 It should be noted that the mine shafts on site may require capping, depending on their location within the proposed development. However, the capping of the shafts is not included within the scope of these works. The design of caps, where required, will need to be designed by a suitably experienced Sub-Contractor/engineer. It is assumed that the two shafts which are the subject of this specification will remain within areas which will be undeveloped and be retained as public open space.

1.3 Works Required

- 1.3.1 The main elements of work required are as follows:
- Construction of a suitable platform from which drilling and pressure grouting can be undertaken safely;
 - Proof drilling to determine shaft depth and infill characteristics of 2 no. (shaft-007 and shaft-008) mine entries;
 - Consolidation/pressure grouting of 2no. (shaft-007 and shaft-008) mine entries as identified on the previously referenced Hydrock Drawing.

2.0 SUMMARY OF INVESTIGATION TO DATE

2.1 Introduction

- 2.1.1 The initial shaft investigation works were completed in September 2021 by Forkers Group Limited with Hydrock supervising the works and undertaking service clearance to allow the drilling to progress.
- 2.1.2 The second phase of shaft investigation works were completed in May 2022 by Sonic Drilling Limited with Hydrock supervising the works and undertaking service clearance to allow the drilling to progress.
- 2.1.3 A summary of the investigation at each shaft location is presented below. For brevity only the two shafts to which this specification relates are summarised below.

2.2 Shaft Reference 376407-007

- 2.4.1 During the initial shaft investigation, in 2021, a total of 86 no. probe holes were completed in this location. The majority of these were drilled to the west of the coordinate provided by the Coal Authority due to the presence of a number of constraints. Completed locations are shown on Figure 2 in Appendix B of the Hydrock Technical Design note.
- 2.4.2 Bedrock was encountered between 5.0m and 5.8m bgl; completed probe hole depths were between 7.0m to 8.0m bgl. No indication of a mineshaft was identified during this phase of drilling works.
- 2.4.3 The remaining probe holes on the grid were inaccessible at the time of the works due to the presence of underground services, vegetation and the discovery of an underground fuel storage tank (UST). It is understood that this fuel tank has now been removed.
- 2.4.4 As part of the service clearance activities for this work, vacuum excavation was used to expose the exact route of the electric cables enabling exploratory hole locations to be drilled as close as possible. Some locations were still unable to be advanced due to proximity to the cables.
- 2.4.5 This investigation was undertaken in May 2022 by Sonic Drilling Limited under Hydrock supervision. A total of 205 no. probe holes were completed as shown on Figure 2 in Appendix B of the Hydrock Technical Design Note. Bedrock was generally encountered between 5.0m and 6.0m bgl. Completed probe hole depths were generally between 6.0m to 8.0m bgl, though apparent shallow workings were found in the south-east quadrant at depths between approximately 7.0m and 9.5m bgl. As such, probe holes were advanced to depths of up to 10.5m bgl in this area in order to rule out the presence of a shaft. In probe hole 128, a coal seam was encountered from 7.50m to 9.50m bgl; it was not recorded in any other probe holes.
- 2.4.6 The mine shaft was located by probing in the north-east quadrant, as indicated on Figure 3 within the Hydrock Technical Design Note. One probe hole was advanced to 42.0m bgl (the limit of the equipment available)

showing that the shaft reaches a greater depth than this. Coal Authority records provide no indication of the depth or construction of this shaft. The diameter of the shaft was delineated and found to be between 2.5m and 3.5m by further probe holes, though proximity to the electric cables meant the diameter couldn't be fully determined. From the delineation achieved it appears that the shaft could be oval or rectangular in shape rather than circular. The drillers noted they believed they hit the edge of the shaft in probe locations 79 and 80 at 6.0m bgl, with the probe deflecting inside the shaft. The surveyed location of the shaft is shown on drawing 15220-HYD-XX-XX-DR-GE-0023. The shaft coordinate provided by the Coal Authority is 376365mE 407557mN and the coordinate for the estimated centre of the located shaft is 376367.595mE, 407559.113mN with a ground level of 102.88m AOD.

2.3 Shaft Reference 376407-008

- 2.5.1 No investigation was completed in this area of the site by Forkers due to the Coal Authority coordinate for the shaft being located within an existing building.
- 2.5.2 Following demolition of the building, Hydrock undertook a total of 22 no. probe holes as shown on Figure 4 in Appendix B of the Hydrock Technical Design Note. Bedrock was generally encountered at 5.0m bgl. Completed probe hole depths were generally 6.0m bgl.
- 2.5.3 The shaft was located by probing approximately 3.0m north of the central co-ordinate, as indicated on Figure 4. One probe hole was advanced to 42.0m bgl (the limit of the equipment available) showing that the shaft reaches a greater depth than this. Coal Authority records provide no indication of the depth of this shaft. The approximate diameter of the shaft was delineated by further probe holes and determined to be approximately 3.0m. The surveyed location of the shaft is shown on drawing 15220-HYD-XX-XX-DR-GE-1023 in Appendix A. The shaft co-ordinate provided by the Coal Authority is E 376365 N 407557 and the coordinate for the estimated centre of the located shaft is E 376380.818, N 407524.433 with a ground level of 102.07m AOD.

3.0 GENERAL

3.1 Method Statement

3.1.1 The Sub-Contractor shall provide a method statement prior to starting works on site, to cover the following operations:

1. Delivery and removal of materials to and from site.
2. Unloading and storage of materials
3. Mixing of grout
4. Drilling and Grouting operations on site (to include drill rig platform construction and tethering)
5. Grout testing
6. Dust Suppression

3.1.2 The method statement must also detail how the works will be executed and measures to ensure the health and safety of workers and the general public.

3.2 Access

3.2.1 Access to the site will be from the main site entrance off Stopes Road. The Sub-Contractor should note that vehicles must abide by site restrictions in terms of speed and traffic routes at all times.

3.2.2 Site working hours are 7:30 am to 6:00 pm, Monday to Thursday and 7.30 am to 4.00 pm on a Friday. No working shall take place on Bank Holidays.

3.3 Protection of Roads, Access and Hardstanding

3.3.1 The Sub-Contractor shall ensure that the roads, access and hardstanding used by him for the execution of the Works or for the transport of plant, labour and materials are kept free from mud, rubble, dust and waste of any sort, and are not damaged in any way. In the event of them becoming dirty or damaged as a result of the Sub-Contractors activity then the Sub-Contractor shall, at his own expense, take all necessary steps to immediately clean and repair them.

3.3.2 The Sub-Contractor shall ensure that the wheels or tracks of any vehicles or other plant leaving the site are thoroughly cleaned and that no dirt is deposited on the public highway.

3.4 Disposal of Materials Off-site

3.4.1 Where materials are to be removed for disposal off-site the Sub-Contractor shall comply with the requirements of current legislation, in particular the Control of Pollution Act 1974 and the Environmental Protection Act 1990, and of the Waste Regulation Authority regulations.

3.4.2 The Sub-Contractor shall dispose of all materials and liquids from the site at an appropriately licensed waste disposal facility. Contaminated water or liquid

oils shall not be mixed with any other material and shall be disposed of off-site in its original liquid state.

3.4.3 For disposal of materials and liquids the Sub-Contractor shall provide VHE with documentary evidence to demonstrate his compliance with the Duty of Care arising under Section 34 of the Environmental Protection Act 1990, this shall include copies of the following:-

- a. Waste management licence or exemption.
- b. Written confirmation from the Waste Regulation Authority that the waste disposal facility is suitable to accept the material or liquid.
- c. Completed Controlled Waste Transfer Note.
- d. Certificate of Registration for any proposed Registered Waste Carriers.
- e. In the case of recovered materials, details of materials recovered, to whom and where they have been delivered, and a copy of a receipt from the receiver.

3.4.4 The Sub-Contractor shall operate a full consignment note system for all materials leaving the site as follows:

A triplicate ticket system shall be operated for each and every load of material leaving the site. Each ticket shall record: Date; Vehicle Registration Number; Description of Waste; Quantity of Waste and Destination together with a unique ticket number. The top copy shall remain on site, copies two and three shall travel with the vehicle to the waste disposal facility where they shall be signed upon receipt of the load. The second copy shall then be retained by the waste disposal facility and the third copy returned to the site. The top copy and third copy shall be provided to VHE on a daily basis, together with a summary list of the loads transported that day.

3.4.5 Special Wastes (asbestos etc.) are to be disposed of in accordance with The Special Waste Regulations 1996. The Sub-Contractor shall be responsible for obtaining all necessary consignment notes from the Environment Agency. The Sub-Contractor's rates are deemed to include for any associated costs, fees etc. Copies of all completed Environment Agency Special Waste consignment notes shall be provided to VHE.

3.5 Regulatory/Statutory Authorities

- 3.5.1 VHE Construction Plc, or their appointed sub-Contractor, shall be responsible for all liaisons with, notification to, and the obtaining of any necessary consents, approvals, licenses, etc. needed to carry out works from the Coal Authority.
- 3.5.2 The Sub-Contractor is required to comply in every respect to the Terms and Conditions of the Coal Authority permission.

3.6 Protection of Structures and Adjacent Properties

- 3.6.1 The Sub-Contractor is to undertake the works in such a way as will not damage existing structures, boundary walls or properties, on or adjacent to the site. The works must not interfere with the normal working activities of the main site, the occupants of adjacent properties or vehicular and pedestrian access thereto.
- 3.6.2 Proposals to protect existing structures, boundary walls or properties, on or adjacent to the site must be provided agreed with VHE Construction Plc.
- 3.6.3 The grouting plant shall be arranged so as to avoid spillage into existing drains or on to roadways or any other property surrounding the site.
- 3.6.4 Care shall be taken to ensure that uplift pressures are not allowed to develop under any adjacent building or structure, including services, during grout injection.
- 3.6.5 Where nearby building or structures might be affected by the grouting operations, the sub-Sub-Contractor shall employ special supervision, and, unless otherwise specified, shall monitor ground levels by precise levelling at intervals, both prior to and during operations.
- 3.6.6 The Sub-Contractor shall take all reasonable steps to ensure that grout is not leaking into sewers, drains, ducts, basements, nearby watercourses etc.

3.7 Legal and Statutory Requirements

- 3.7.1 The Sub-Contractor shall comply with all Legal and Statutory requirements relating to the consolidation works of shallow mine workings and voids by grouting and nothing in this specification shall relieve or limit his obligations, liabilities and responsibility to comply with such requirements.

3.8 Noise

- 3.8.1 The Sub-Contractor shall comply with all statutory noise requirements and take all reasonable and necessary measures to minimise nuisance caused by noise that may affect the general public in and around the site and residents and businesses around the perimeter of the site.

3.9 Dust

- 3.9.1 The Sub-Contractor shall take all reasonable and necessary measures to minimise nuisance and hazard caused by dust that may affect the general public in and around the site and residents and businesses around the perimeter of the site.

3.10 Completion Documents

- 3.10.1 Within 28 days of the completion of the site works the Sub-Contractor shall provide the following to VHE:

- a) Contents
- b) Brief Description of the Works
- c) Sub-Contractors Details Including Independent Analyst
- d) Original Pre-Works Site Plan
- e) Plan indicating grout hole positions including details of grout mixes and areas grouted on each particular day.
- f) Grout mix design / details.
- g) Grout mix testing relating to specific days and areas.
- h) Daily drilling records.
- i) Daily grouting records.
- j) Waste Disposal and Special Waste Consignment Notes
- k) Recovered Materials Receipts
- l) Mine gas monitoring results.
- m) Method statements for the Works

3.11 Health and Safety

- 3.11.1 The Sub-Contractor must ensure that potential risks to public safety and any persons potentially affected by the work are identified and appropriately mitigated.
- 3.11.2 Due consideration is to be given to the potential for mine gas emissions, spontaneous combustion, mine water emissions and collapse of shallow workings and shafts. The Sub-Contractor must be fully conversant with the Coal Authority's guidance. The Sub-Contractor shall monitor for hazardous gases, including carbon dioxide, carbon monoxide, methane, hydrogen sulphide and oxygen, at the rig site. Records must be maintained on site of the daily gas monitoring for the inspection of VHE, Alan Wood and Partners or the Coal Authority.
- 3.11.3 The Sub-Contractor will be required to provide all necessary health and safety documentation for approval prior to commencing works.

4.0 CONSOLIDATION OBJECTIVES AND GENERAL PROCEDURE

4.1 Construction of a Suitable Drilling Platform

- 4.1.1 The Sub-Contractor will provide a design and undertake construction of a suitable drilling platform, upon which the drilling rig can operate. The Contractor shall satisfy themselves that the bearing strata for the platform provides suitable support for the platform and that underlying shallow workings will not affect its stability during the shaft treatment.
- 4.4.2 The drilling platform shall be positioned such that it does not affect the buried services which cross the shafts and take account of overhead services.

4.2 Proof Drilling

- 4.2.1 Exploratory proof drilling is required to a minimum depth of 100m, or 5m below the base of the shaft, whichever is the shallower to confirm the condition and nature of any infill, the presence of voids, platforms or obstructions, and the groundwater level of the 2no. mine shafts identified forming the subject of this specification. The Contractor shall satisfy themselves of the depth of the shaft to be treated.
- 4.2.2 One borehole shall be undertaken at each shaft location to a minimum depth of 100m below existing ground level or, at least 5m into solid competent rock at the base of the shaft, whichever is the shallower. If soft or broken ground is encountered at 100m begl, the probe hole shall be extended to try to locate intact rock, or assess the nature of the shaft infill, to a depth agreed with the Engineer.
- 4.2.3 The Sub-Contractor shall provide full time professional supervision by suitably qualified personnel for the drilling and logging of the boreholes.
- 4.2.4 The proof drilling shall form part of the final borehole pattern. Should there be a passage of time between the proof drilling and grouting, temporary casing shall be left in place to allow grouting at a later date.

4.3 Filling/Grouting

- 4.3.1 Upon completion of the proof drilling, when the nature and conditions of any infill, the shaft dimensions and depth, and the composition of any overlying superficial material evaluated, the most suitable method of treatment can be determined.
- 4.3.2 It may be that some infilling of the shaft is required, should voids be recorded within the shaft. This specification shall be a working document, to be updated following completion of the proof drilling.
- 4.3.3 Grouting/filling shall be completed to a minimum of 100m depth or the full depth of the shaft, whichever is the shallower to prevent collapse of untreated fill, which may result in collapse at the surface.
- 4.3.4 Where it is not possible to establish pressure during grouting, and it appears to the contractor that grout may be being lost through unidentified roadways

or untreated workings, VHE and AWP shall be notified no later than the end of that day and the Contractors proposed methodology for progressing the treatment shall be provided for approval before continuing grouting. The Contractor shall make provision in their site establishment to have the ability to react to such a situation given that there are extensive known (untreated) workings radiating from the two shafts to be treated. It is the Contractors responsibility to seek the necessary approvals from the Coal Authority to changes in the grout mix or treatment methodology as appropriate.

4.4 Testing

- 4.4.1 After the shafts have been treated, they shall be tested by sinking further boreholes to intercept the grouted areas at positions to be indicated by Alan Wood and Partners. The established grouting procedures shall then be employed.
- 4.4.2 Each validation boreholes shall be injected with grout under pressure which should be held for a minimum of 2 minutes to prove the lack of permeability. Where pressure drops no more than 10% in 2 minutes, the test shall be deemed to have passed. Records will be kept of the test holes for inclusion in the validation report.

5.0 GROUTING

5.1 Constituent Materials for Grouting

- 5.1.1 Water - water shall be from the mains supply or other source approved by VHE. The Sub-Contractor is responsible for organising and for all costs in connection with this.
- 5.1.2 Cement - cement shall be Ordinary Portland Cement (OPC) complying with BS 12 or Sulphate Resisting Portland Cement (SRPC) complying with BS 4027.
- 5.1.3 PFA – pulverised fuel ash shall be conditioned hopper ash, or dry powder ash, of a type suitable as a constituent for grout and obtained from an approved supplier.
- 5.1.4 Sand - sand shall comply with BS 882 and be of a grading suitable for use in the Sub-Contractor's plant and approved by Alan Wood and Partners.
- 5.1.5 Pea gravel – pea gravel shall comply with BS 882 and be of a grading approved by Alan Wood and Partners.
- 5.1.6 Thixotropic admixtures – thixotropic admixtures shall be bentonite or other admixture approved by Alan Wood and Partners.
- 5.1.7 Accelerators – accelerators to be used to reduce the setting time for PFA/cement grout shall be subject to approval.
- 5.1.8 Storage - storage of materials shall be as such to prevent contamination and deterioration. Cement shall be kept in a dry location, and the sequence of deliveries recorded so that the cement can be used in rotation.
- 5.1.9 Bulk materials – bulk materials, excluding mixing water, shall be paid for by weight, except that there shall be no payment for the excess weight if the moisture content exceeds 10% by the weight of the dried material, as determined in accordance with BS 1881.

5.2 Grouting Plant

- 5.2.1 The Sub-Contractor shall submit with his tender, 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 shall be introduced into the mixer via approved weight batching equipment. The grout mixer shall be capable of producing an intimate homogenous mix, all particles being thoroughly wetted without segregation occurring. Any grouting reservoir tanks used in the distribution of the grout shall have paddles for continuous agitation.

5.3 Grout Mixes

- 5.3.1 Mix details - the Sub-Contractor shall submit with his tender mix details of all grouts he intends to use for all the grouting work which forms part of this contract.

- 5.3.2 Strength – Before work commences, the Sub-Contractor shall prepare cubes, of an agreed size, representative of the mixes agreed, and he shall arrange for them to be tested by an approved testing house, by crushing at 14 and 28 days in accordance with BS 1881. Where time permits, the results of the tests shall be furnished to VHE and Alan Wood and Partners prior to commencement of grouting operations.

The Sub-Contractor shall make sets of two 150mm test cubes taken from the grouting, at surface positions, on each day of grouting at the discretion of VHE and Alan Wood and Partners. If two batching plants are to be employed to treat the two shafts concurrently, two cubes per plant per day shall be taken, and labelled to clearly identify which plant has produced which cubes. The cubes shall be marked, handled, stored and tested in accordance with BS 1881 to confirm the projected 14- and 28-day strengths of the grout. The testing shall be carried out by an independent laboratory which shall provide certified records of the results. If Alan Wood and Partners considers the results of the tests indicate that a change of mix proportions is required, the Sub-Contractor shall make such modifications as VHE and Alan Wood and Partners may direct.

All grouts except neat cement grout shall have a minimum cube compressive strength of 1.0N/mm^2 within 28 days of mixing. Neat cement grout shall have a minimum cube compressive strength of 20N/mm^2 within 7 days of mixing.

- 5.3.3 Grout Testing – The Sub-Contractor shall check the flowability of the grout on site during operations by means of a flow meter. Flow rates should be checked twice daily and recorded in the daily grouting logs.

Bleed capacity after 2 hours shall be measured in a clear plastic graduated cylinder which has an internal diameter not less than 50mm, with 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, readings should continue for not less than 3 hours and for not less than 6 hours for PFA and cement grouts. Bleed capacity should be checked twice daily and recorded in the daily grouting logs.

- 5.3.4 Other Grout Properties - with water / (cement + PFA) ratios generally in the range 0.4 to 0.45 (including the moisture in the aggregates), the grout mixes should produce pumpable grout with flowability readings of 300mm to 600mm, when measured in a 'Colcrete' type meter.

High bleed grouts are not acceptable. Bleed capacity should be limited to 5% maximum.

6.0 DRILLING PROCEDURES

6.1 General

- 6.1.1 All boreholes to be used for the injection of grout shall be formed by rotary or rotary percussive techniques. The Contractor shall determine the appropriate method based on conditions encountered and provide casing as required.
- 6.1.2 The holes shall be kept open until grout injection into the shaft and rock is complete.
- 6.1.3 When it is impracticable to drill at the minimum diameter for the full depth, the diameter of the holes shall be increased in the upper lengths.
- 6.1.4 Where a hole proves abortive because it becomes obstructed, or because of the Sub-Contractor's failure to progress the hole, it shall be re-drilled at a larger diameter and re-cased, or a new hole drilled and cased at the Sub-Contractor's expense.
- 6.1.5 The drilling system and flushing medium to be used shall be approved by Alan Wood and Partners and undertaken in accordance with the Coal Authority Permit.
- 6.1.6 The Sub-Contractor shall provide a suitably qualified and specialised Professional Engineer for full time attendance during the drilling operations.

6.2 Insitu Testing

- 6.2.1 The Sub-Contractor shall test the consolidated mine shafts for permeability and strength.
- 6.2.2 Permeability by grout acceptance testing shall be checked by drilling test holes in positions to be selected by the VHE's appointed Engineer and injecting grout at pressures appropriate to the depth, in accordance with the requirements for infill grouting. If Alan Wood and Partners considers that the quantities of grout accepted are excessive, further holes shall be drilled and grouted.
- 6.2.3 After testing, holes shall be completed in accordance with the requirements for grouting infill holes.
- 6.2.4 Where deemed appropriate, the strength of consolidated mine shafts and shall be tested by taking sample cores either in newly drilled and cased holes or in re-drilled existing holes, at such places and times during the contract as Alan Wood and Partners may direct. When the samples have been taken, the hole shall be filled up with grout injected in accordance with the requirements for infill grouting.

7.0 RECORDS

7.1 General

- 7.1.1 The Sub-Contractor shall prepare and keep available for inspection on site; plans showing the positions and surface levels of all holes, and sections through the rows of holes to show the results of the Works, in particular the information in items 13 to 20 inclusive of the Daily Drilling Records (see 7.1.4 below), together with the total amounts of grout injected. All levels shall be given with reference to ordnance datum.
- 7.1.2 The plans and sections shall be up-dated daily in conformity with the Records noted in 7.1.4 below. On completion of the Works, the Sub-Contractor shall give fair copies of the plans and sections to VHE.
- 7.1.3 As the work proceeds, the Sub-Contractor shall maintain separate Daily Records for drilling, for grouting and for materials and plant received in a form to be approved by the VHE. The Daily Records signed by the Sub-Contractor's agent shall be submitted each day to the VHE for his agreement. The Sub-Contractor shall provide one copy of the agreed Record for the VHE's retention and keep a further copy available for inspection on site.
- 7.1.4 Daily Drilling Records shall be provided for each hole and contain the following information:
1. Job title and location.
 2. Hole reference number.
 3. Date.
 4. Sub-Contractor's name.
 5. Plant in use, crew members and hours worked.
 6. Method of boring or drilling, flushing medium and type of drill bit.
 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. Loss of any flushing medium during drilling.
 10. Standing time, with reason, or time loss overcoming obstructions.
 11. Details of underground services located.
 12. Details of any settlement or ground heave.
 13. Daily and cumulative length drilled.
 14. Depth to each major change of stratum.
 15. Description, with identification, of the stratum and whether it is intact or broken (when possible).
 16. Depths at which groundwater is encountered (if apparent).
 17. Depths at which any samples are taken.

18. Details of any voids or suspended workings.
19. Details of any emission of gas, water, etc.
20. Depth of completed hole.

7.1.5 Daily Grouting Records shall be provided for each hole and contain the following information:

1. Job title and location.
2. Hole reference number.
3. Date.
4. Sub-Contractor's name.
5. Plant in use, crew members, and hours worked.
6. Details of type of injection and grout-line dimensions (e.g. tremie injection through 25-mm diameter line).
7. Type of grout mix and volumetric quantity injected.
8. Grout pressures recorded, with the corresponding depths.
9. Details of casing abandoned.
10. Grout tests carried out and results.

7.1.6 The Daily Records of materials and plant received shall show in particular that day's quantities by weight of each type of material and the cumulative quantities. With the Daily Records, the Sub-Contractor shall submit to VHE copies of receipts or invoices for all materials delivered, and he shall keep them on site until the works are complete.

7.1.7 Notwithstanding the information listed above, the Sub-Contractor shall provide any other information required by VHE and Alan Wood and Partners.

Project name	Stopes Road, Bolton		
Design note title	Mine Shaft Investigation		
Document reference	15220-HYD-XX-XX-RP-GE-0011		
Author	Rob Crookes		
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Revision	P02		
Date	9 June 2022	Approved	✓

1. INTRODUCTION

The former Tarmac plant at Stopes Road, Bolton is being subject to remediation and earthworks for a residential development.

The site has a legacy of coal mining from a number of seams present below the site. The Phase 1 and Phase 2 investigations and Coal Mining Risk Assessment undertaken to date indicate the presence of four recorded mine entries within the site boundary.

Hydrock has been commissioned to carry out works to further investigate and potentially locate (or confirm the absence of) the four mine shafts that, based on Coal Authority (CA) records, are present at the site. These works have been completed over two investigation phases, in accordance with Hydrock fee proposal documents Ref. C-15220-FP-GE-0007 and C-15220-FP-GE-0012.

2. WORKS COMPLETED

The initial shaft investigation works were completed in September 2021 by Forkers Group Limited with Hydrock supervising the works and undertaking service clearance to allow the drilling to progress.

The second phase of shaft investigation works were completed in May 2022 by Sonic Drilling Limited with Hydrock supervising the works and undertaking service clearance to allow the drilling to progress.

All investigation works on shaft 376407-007 were completed in compliance with Coal Authority Permit 22581. All investigation works on shaft 376407-008 were completed in compliance with Coal Authority Permit 24460.

Drawing 15220-HYD-XX-XX-DR-GE-1023 is presented in Appendix A, and shows the locations of the shafts investigated and the anticipated zone of collapse based on the depth to rockhead. This is accompanied by a co-ordinate sheet. Summary figures for the works are presented in Appendix B. Pertinent photographs are presented in Appendix C. Drillers logs and associated plans are included in Appendix D.

The following sections 2.1 to 2.4 provide a summary of the findings at each shaft location.

2.1 Shaft Reference 376407-003 (Drillers Ref. Shaft 1)

All of the proposed 365 no. probe holes were drilled on a 1m spaced grid within a 10m radius of the Coal Authority coordinated location. Rockhead was encountered at between 6.8m and 10.2m bgl, the probe holes were drilled to depths of between 9.0m and 15.0m bgl to prove solid strata. The shaft co-ordinate provided by the Coal Authority is E 376224.000 N 407701.000. The recorded site level at the time of drilling was 100.44m Above Ordnance Datum (AOD) with a range across the drilling grid between 100.26m and 100.53m AOD.

No indication of a mineshaft from the drilling was recorded. However, it should be noted that soft strata is noted by the drillers below rockhead in a significant number of holes (see Figure 1 in Appendix B), however this is considered unlikely to be associated with a shaft and more likely to be associated with the shallow underground workings. The results have been discussed with the Coal Authority and no further investigation is proposed. An additional watching brief is recommended during the site strip and enabling works to check for any evidence of the shaft. Where evidence of a mine shaft is recorded it should be fully investigated and appropriately treated.

2.2 Shaft Reference 376407-006

This shaft was uncovered at ground level during the service clearance works whilst using vacuum excavation techniques. As such no probing with a drilling rig was required at this shaft location.

The shaft was found to have an internal diameter of 2.90m and is constructed with a three-brick skin. Photographs of the shaft are presented in Appendix C. The shaft appears to have been loosely backfilled with arisings to the surface. Whilst no investigation has been undertaken through the shaft, the Coal Authority records indicate that it is 262m deep. The surveyed location of the shaft is shown on drawing 15220-HYD-XX-XX-DR-GE-1023 in Appendix A. The shaft co-ordinate provided by the Coal Authority is E 376352 N 407591 and the located shaft surveyed centre coordinate is E 376348.333 N 407592.727 with a level of 102.31m AOD.

During these works asbestos cement was recorded in the excavations associated with the shaft, shown by Photo 6 in Appendix C. At the time of writing this asbestos containing material remains where it was found.

The shaft location was fenced off and signage was erected to alert people to the danger. The enabling earthworks contractor VHE, who are in control of the site as Principal Contractor at the time of writing, have been provided with the position of the shaft and advised that a stand-off zone of at least 7.50 metres is required.

The further investigation and treatment for the shaft are to be determined as part of the Contractors design.

2.3 Shaft Reference 376407-007 (Drillers Ref. Shaft 3)

Initial Investigation (Forkers)

During the initial shaft investigation a total of 86 no. probe holes were completed in this location. The majority of these were drilled to the west of the coordinate provided by the Coal Authority due to the presence of a number of constraints. Completed locations are shown on Figure 2 in Appendix B. It should be noted that Forkers original drilling record sheet presented in Appendix D was not centred on the CA provided coordinate; more detail is provided on Figure 2.

Bedrock was encountered between 5.0m and 5.8m bgl; completed probe hole depths were between 7.0m to 8.0m bgl. No indication of a mineshaft was identified during this phase of drilling works. A depth summary is presented as Figure 3 in Appendix B.

The remaining probe holes on the grid were inaccessible at the time of the works due to the presence of underground services, vegetation and the discovery of an underground fuel storage tank (UST). Removal of the fuel tank was undertaken by a demolition contractor in April 2022, details of which can be found in Hydrock Technical Design Note reference 15220-HYD-XX-XX-RP-GE-0014. Hydrock undertook a watching brief during the works to ensure compliance with the Coal Authority Permit.

Remobilisation investigation (Sonic Drilling)

As part of the service clearance activities for this work, vacuum excavation was used to expose the exact route of the electric cables enabling exploratory hole locations to be drilled as close as possible. Note some locations were still unable to be advanced due to proximity to the cables.

This investigation was undertaken in May 2022 by Sonic Drilling Limited under Hydrock supervision. A total of 205 no. probe holes were completed as shown on Figure 2 in Appendix B. Bedrock was generally encountered between 5.0m and 6.0m bgl. Completed probe hole depths were generally between 6.0m to 8.0m bgl, though apparent shallow workings were found in the south east quadrant at depths approximately between 7.0m to 9.5m bgl. As such, probe holes were advanced to depths of up to 10.5m bgl in this area in order to rule out the presence of a shaft. In probe hole 128 a coal seam was encountered from 7.50m to 9.50m bgl; it was not recorded in any other probe holes.

The mine shaft was located by probing in the north east quadrant, as indicated on Figure 3. One probe hole was advanced to 42.0m bgl (the limit of the equipment available) showing that the shaft reaches a greater depth than this. Coal Authority records provide no indication of the depth or construction of this shaft. The diameter of the shaft was delineated and found to be between 2.5m and 3.5m by further probe holes, though proximity to the electric cables meant the diameter couldn't be fully determined. From the delineation achieved it appears that the shaft could be oval or rectangular in shape rather than circular. The drillers noted they believed they hit the edge of the shaft in probe locations 79 and 80 at 6.0m bgl, with the probe deflecting inside the shaft. The surveyed location of the shaft is shown on drawing 15220-HYD-XX-XX-DR-GE-0023 in Appendix A. The shaft co-ordinate provided by the Coal Authority is E 376365 N 407557 and the coordinate for the estimated centre of the located shaft is E 376367.595 N 407559.113 with a ground level of 102.88m AOD.

The shaft location was fenced off and signage was erected to alert people to the danger. The enabling earthworks contractor VHE, who are in control of the site as Principal Contractor at the time of writing, have been provided with the position of the shaft and advised that a stand-off zone of at least 6.0 metres is required.

The further investigation and treatment for the shaft are to be determined as part of the Contractors design.

2.4 Shaft Reference 376407-008

Initial Investigation (Forkers)

No investigation was completed in this area of the site by Forkers due to the Coal Authority coordinate for the shaft being located within an existing building.

Demolition of the building, including removal of the slab and foundations, was undertaken by a demolition contractor in April 2022 details of which can be found in Hydrock Technical Design Note reference 15220-HYD-XX-XX-RP-GE-0014. Hydrock undertook a watching brief during the works to ensure compliance with Coal Authority Permit 24460.

Remobilisation investigation (Sonic Drilling)

A total of 22 no. probe holes were completed as shown on Figure 4 in Appendix BAppendix A. Bedrock was generally encountered at 5.0m bgl. Completed probe hole depths were generally 6.0m bgl.

The shaft was located by probing approximately 3.0m north of the central co-ordinate, as indicated on Figure 4. One probe hole was advanced to 42.0m bgl (the limit of the equipment available) showing that the shaft reaches a greater depth than this. Coal Authority records provide no indication of the depth of this shaft. The approximate diameter of the shaft was delineated by further probe holes and determined to be approximately 3.0m. The surveyed location of the shaft is shown on drawing 15220-HYD-XX-XX-DR-GE-1023 in Appendix A. The shaft co-ordinate provided by the Coal Authority is E 376365 N 407557 and the coordinate for the estimated centre of the located shaft is E 376380.818, N 407524.433 with a ground level of 102.07m AOD.

The shaft location was fenced off and signage was erected to alert people to the danger. The enabling earthworks contractor VHE, who are in control of the site as Principal Contractor at the time of writing, have been provided with the position of the shaft and advised that a stand-off zone of at least 6.0 metres is required.

The further investigation and treatment for the shaft are to be determined as part of the Contractors design.

2.5 Conclusions

The two phases of works have proven the following:

- Shaft reference 376407-003 in the north of the site is unlikely to be present, based on the drilling of 365 probe holes covering a 10m radius from the Coal Authority recorded co-ordinate. This has been discussed with the Coal Authority and the investigation is to conclude that there is a low risk of a mine shaft being present. Additional watching brief is recommended during the enabling earthworks to identify any evidence of the shaft.
- Shaft reference 376407-006 has been identified on site at the surface. It appears to have been loosely backfilled and has an internal diameter of 2.9m.
- Shaft reference 376407-007 has been identified by probing on site. The top of the shaft is likely to be set within the rockhead at approximately 5.0m - 6.0m bgl, and has a diameter of 3.0 - 4.0m, but unable to be fully constrained further due to electric cables in the vicinity.
- Shaft reference 376407-008 has been identified by probing on site. The top of the shaft is likely to be set within the rockhead at approximately 5.0m bgl, and has an approximate diameter of 3.0m.

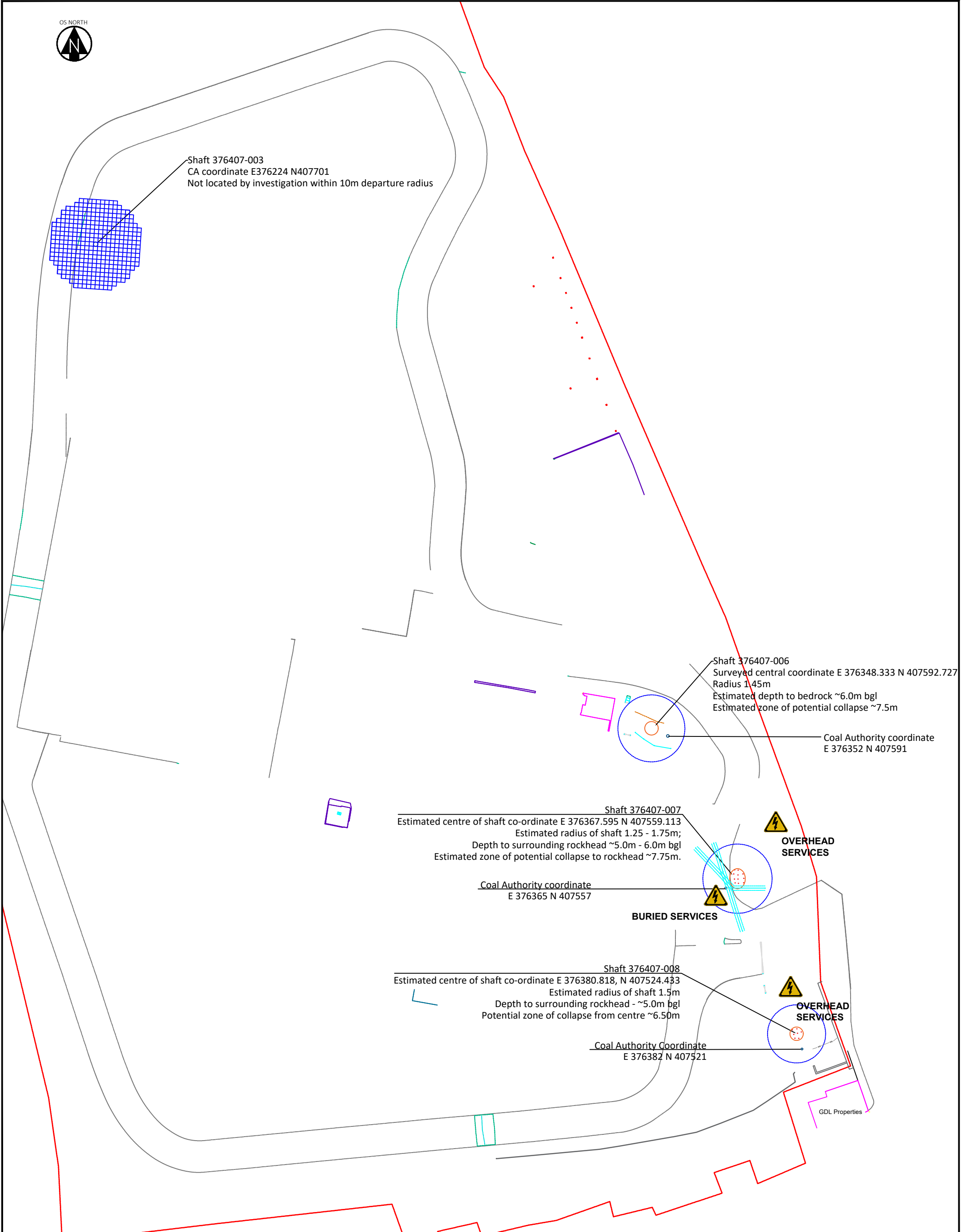
3. FURTHER WORKS

In order to satisfy the relevant Planning Conditions for the site, adherence to the Hydrock Geotechnical Design Report (ref: 15220-HYD-XX-XX-RP-GE-0005), Remediation Strategy and Verification Report (ref: 15220-HYD-XX-XX-RP-GE-0006) and Performance Specification for Stabilisation of Mineworkings (ref: 15220-HYD-XX-XX-RP-GE-0007) is required.

As part of the enabling works for the site the following works in relation to the 4 no. Coal Authority recorded mine shafts are to be undertaken by the Contractor:

- Specific watching brief is recommended during the site strip and enabling works in the area of the shaft 376407-003 to identify any evidence of the mine shaft;
- Detailed design of appropriate treatment for each of the 3 no. located shafts 376407-006, 376407-007, and 376407-008. Appropriate treatment shall satisfy the objectives set out in the Performance Specification for Stabilisation of Mineworkings ref: 15220-HYD-XX-XX-RP-GE-0007 and the requirements of the planning conditions, specifically Condition 12.
- The shaft treatment design shall take into consideration the following (note this is not an exhaustive list and other relevant design parameters are to be determined by the Contractor):
 - » Stability of the shaft and surrounding ground;
 - » Buried services and overhead services;
 - » Potential mine gas emissions;
 - » The nature of the backfill;
 - » The presence of voids and open workings into which excessive grout will flow;
 - » Staging and seams at multiple levels;
 - » The prevention of grout migration off site.
 - » The engineering quality of the rockhead and strength of overburden material;
 - » The end use of the development including the presence of proposed structures and infrastructure; and
 - » Appropriate guidance and recommendations within CIRIA C758 Abandoned Mine Workings Manual 2019.
- Submission of the mine shaft treatment design to the Client for review.
- Submission of the mine shaft treatment design to the Local Planning Authority as part of the discharge of planning conditions.
- Obtain a permit from the Coal Authority for the mine shaft treatment.
- Remediation and treatment of the mine shafts as per the detailed design and Coal Authority Permit.
- Provision of as built records to the Client for review
- Provision of the as built records of the mine shaft treatment to the Local Planning Authority as part of the discharge of planning conditions.
- Submission of appropriate records to the Coal Authority to close the permit.

Appendix A Drawings



KEY Approximate Site Boundary 10m radius drilling grid Probe holes that located mine shaft Estimated mine shaft position Estimated potential zone of collapse Electric cables and 0.5m stand off	NOTES 1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing. 2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.	Hydrock Northern Assurance Building 9-21 Princess Street Albert Square Manchester M2 4DN t: +44(0) 161 8045550 e: manchestercentral@hydrock.com or visit www.hydrock.com						TITLE Mine shaft investigation																	
		CLIENT HARWORTH ESTATES PROPERTY GROUP LTD						HYDROCK PROJECT NO. C-15220-C		SCALE @ A3 1:750															
		PROJECT STOPES ROAD, BOLTON						PURPOSE OF ISSUE SUITABLE FOR INFORMATION			STATUS S2														
		REVISION NOTES/COMMENTS <table><tr><td>REV.</td><td>DRAWN BY</td><td>DATE</td><td>CHECKED BY</td><td>DATE</td><td>APPROVED BY</td><td>DATE</td></tr><tr><td>P01</td><td>RC</td><td>07/06/22</td><td>AC</td><td>07/06/22</td><td>AC</td><td>07/06/22</td></tr></table>						REV.	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE	P01	RC	07/06/22	AC	07/06/22	AC	07/06/22	DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 15220-HYD-XX-XX-DR-GE-1023			REVISION P01
		REV.	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE																	
P01	RC	07/06/22	AC	07/06/22	AC	07/06/22																			



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 Building Measurement Surveyors
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Client Info: Hydrock
 Site: Stopes Road, Bolton,
 Date: 01/06/2022
 Job: U07918 + U06473

Shaft	Probe hole / ID	EASTINGS	NORTHINGS	LEVEL
376407-006	Centre	376348.333	407592.727	102.312
	Shaft edge 1	376346.889	407593.212	102.347
	Shaft edge 2	376348.480	407594.198	102.586
	Shaft edge 3	376348.646	407594.041	102.560
	Shaft edge 4	376348.837	407593.957	102.431
	Shaft edge 5	376349.751	407592.224	102.380
	Shaft edge 6	376348.360	407591.373	102.323
376407-007	10	376367.056	407558.165	102.951
	25	376366.879	407559.027	102.671
	26	376367.687	407559.003	102.876
	27	376367.768	407558.065	102.911
	48	376366.727	407560.145	102.877
	49	376367.673	407559.946	102.882
	50	376368.789	407560.14	102.895
	51	376369.001	407559.183	102.822
	52	376368.953	407558.189	102.543
	79	376366.941	407561.09	102.897
	80	376367.728	407561.02	102.907
	Approx centre	376367.595	407559.113	Modelled on AutoCAD by Hydrock
	CABLE A 1	376373.739	407556.995	102.358
	CABLE A 2	376366.568	407557.006	102.327
	CABLE A 3	376363.616	407560.289	102.172
	CABLE A 4	376358.238	407565.952	102.196
	CABLE B 1	376368.689	407547.394	102.417
	CABLE B 2	376367.065	407552.385	102.402
	CABLE B 3	376365.807	407556.499	102.388
	CABLE B 4	376364.328	407560.740	102.505
	CABLE B 5	376362.801	407565.633	102.619
	CABLE B 6	376362.267	407567.049	102.537
	CABLE B 7	376344.742	407591.795	102.266
	CABLE B 8	376346.608	407590.340	102.348
	CABLE B 9	376348.983	407588.824	102.471
	CABLE B 10	376348.967	407588.860	102.474
	CABLE B 11	376352.641	407588.216	102.472
376407-008	115	376379.841	407525.309	102.174
	116	376380.872	407525.524	102.127
	45	376380.404	407523.435	102.042
	46	376381.289	407523.392	102.022
	76	376380.176	407524.265	102.088
	77	376380.992	407524.543	102.066
	78	376381.843	407524.817	102.065
	Approx centre	376380.818	407524.433	Modelled on AutoCAD by Hydrock
	GA51	376388.763	407522.591	101.861
	GA52	376386.219	407521.867	102.002
	GA53	376384.224	407521.501	102.259

Appendix B Figures

FIGURE 1 – Shaft 1 Drilling depth summary (Forkers, September 2021)



							357	358	359	360	361	362	363	364	365							Key
						319	320	321	322	323	324	325	326	327	328	329						
				271	272	273	274	275	276	277	278	279	280	281	282	283	284	285				
			270	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226			
			269	210	157	158	159	160	161	162	163	164	165	166	167	168	169	170	227			
		318	268	209	156	111	112	113	114	115	116	117	118	119	120	121	122	171	228	286		
	356	317	267	208	155	110	73	74	75	76	77	78	79	80	81	82	123	172	229	287	330	
	355	316	266	207	154	109	72	43	44	45	46	47	48	49	50	83	124	173	230	288	331	
	354	315	265	206	153	108	71	42	21	22	23	24	25	26	51	84	125	174	231	289	332	
	353	314	264	205	152	107	70	41	20	7	8	9	10	27	52	85	126	175	232	290	333	
	352	313	263	204	151	106	69	40	19	6	1	2	11	28	53	86	127	176	233	291	334	
	351	311	262	203	150	105	68	39	18	5	4	3	12	29	54	87	128	177	234	292	335	
	350	310	261	202	149	104	67	38	17	16	15	14	13	30	55	88	129	178	235	293	336	
	349	309	260	201	148	103	66	37	36	35	34	33	32	31	56	89	130	179	236	294	337	
	348	308	259	200	147	102	65	64	63	62	61	60	59	58	57	90	131	180	237	295	338	
		312	258	199	146	101	100	99	98	97	96	95	94	93	92	91	132	181	238	296		
			257	198	145	144	143	142	141	140	139	138	137	136	135	134	133	182	239			
			256	197	196	195	194	193	192	191	190	189	188	187	186	185	184	183	240			
				255	254	253	252	251	250	249	248	247	246	245	244	243	242	241				
						307	306	305	304	303	302	301	300	299	298	297						
							347	346	345	344	343	342	341	340	339							

FIGURE 2 – Shaft 3 drilling records

							357	358	359	360	361	362	363	364	365							Key
						319	320	321	322	323	324	325	326	327	328	329						85 total
				271	272	273	274	275	276	277	278	279	280	281	282	283	284	285				205 total
			270	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226			
			269	210	157	158	159	160	161	162	163	164	165	166	167	168	169	170	227			327
		318	268	209	156	111	112	113	114	115 (281)	116 (282)	117	118	119	120	121	122	171	228	286		
	356	317	267 (214)	208 (215)	155 (216)	110 (217)	73 (218)	74 (219)	75	76	77 (222)	78	79	80	81	82	123	172	229	287	330	
	355	316	266 (159)	207 (160)	154 (161)	109 (162)	72 (163)	43 (164)	44	45	46 (167)	47	48	49	50	83	124	173	230	288	331	
	354	315	265 (112)	206 (113)	153 (114)	108 (115)	71 (116)	42 (117)	21	22	23	24	25	2	51	84	125	174	231	289	332	
	353	314	264 (73)	205 (74)	152 (75)	107 (76)	70 (77)	41 (78)	20	7	8 (81)	9	10	27	52	85	126	175	232	290	333	
	352	313	263 (72)	204 (43)	151 (44)	106 (45)	69 (46)	40 (47)	19	6	1 (50)	2	11	28	53	86	127	176	233	291	334	
	351	311	262 (71)	203 (42)	150 (21)	105 (22)	68 (23)	39 (24)	18 (25)	5	4 (51)	3	12	29	54	87	128	177	234	292	335	
	350	310	261 (70)	202 (41)	149 (20)	104 (7)	67 (8)	38 (9)	17 (10)	16	15 (52)	14 (85)	13	30	55	88	129	178	235	293	336	
	349	309	260 (69)	201 (40)	148 (19)	103 (6)	66 (1)	37 (2)	36 (11)	35	34 (53)	33 (86)	32	31 (176)	56	89	130	179	236	294	337	
	348	308	259 (68)	200 (39)	147 (18)	102 (5)	65 (4)	64 (3)	63 (12)	62	61 (54)	60 (87)	59	58 (177)	57 (234)	90 (292)	131	180	237	295	338	
		312	258 (67)	199 (38)	146 (17)	101 (16)	100 (15)	99 (14)	98 (13)	97	96 (55)	95 (88)	94	93	92 (235)	91 (293)	132	181	238	296		
			257	198	145	144	143	142	141	140	139	138	137	136	135	134	133	182	239			
			256	197	196	195	194	193	192	191	190	189	188	187	186	185	184	183	240			
				255	254	253	252	251	250	249	248	247	246	245	244	243	242	241				
						307	306	305	304	303	302	301	300	299	298	297						
							347	346	345	344	343	342	341	340	339							

Forkers, September 2021*

Sonic, May 2022

Cable or obstruction (not drilled)

Undrilled – mine shaft already located

*Forkers drilling records erroneously recorded the positions of their probe holes on the grid, shifted by 4m east and 3m north. The central coordinate hits grid square 50 on their records. The numbers shown in brackets on this figure match the number recorded on Forker's drilling logs, hence there are numerous repeated numbers shown. A corrected grid was drafted before the second phase of drilling; only two holes were unintentionally drilled in both investigations (Forkers 85, Sonic 14) and (Forkers 67, Sonic 258).

FIGURE 3 – Shaft 3 Drilling depth summary (Forkers, September 2021 & Sonic Drilling, May 2022)

							357	358	359	360	361	362	363	364	365							Key
						319	320	321	322	323	324	325	326	327	328	329						~5.0m bgl rockhead
				271	272	273	274	275	276	277	278	279	280	281	282	283	284	285				~6.0m bgl rockhead
			270	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226			~8.0m – 9.5m bgl rockhead or collapsed shallow workings*
			269	210	157	158	159	160	161	162	163	164	165	166	167	168	169	170	227			~6.0m bgl rockhead with ~2.0m soft strata / broken ground below*
		318	268	209	156	111	112	113	114	115	116	117	118	119	120	121	122	171	228	286		Shaft (with depth probed)
	356	317	267	208	155	110	73	74	75	76	77	78	79 21m	80 21m	81	82	123	172	229	287	330	Not drilled – cable or obstruction present
	355	316	266	207	154	109	72	43	44	45	46	47	48 18m	49 18m	50 18m	83	124	173	230	288	331	xxx Not drilled – mine shaft already located
	354	315	265	206	153	108	71	42	21	22	23	24	25 42m	26 18m	51 18m	84	125	174	231	289	332	*Minimum 1.0m competent rock proven below
	353	314	264	205	152	107	70	41	20	7	8	9	10 18m	27 18m	52 18m	85	126	175	232	290	333	+ Coal seam found 7.5 – 9.0m bgl in 128
	352	313	263	204	151	106	69	40	19	6	1	2	11	28	53	86	127	176	233	291	334	
	351	311	262	203	150	105	68	39	18	5	4	3	12	29	54	87	128 +	177	234	292	335	
	350	310	261	202	149	104	67	38	17	16	15	14	13	30	55	88	129	178	235	293	336	
	349	309	260	201	148	103	66	37	36	35	34	33	32	31	56	89	130	179	236	294	337	
	348	308	259	200	147	102	65	64	63	62	61	60	59	58	57	90	131	180	237	295	338	
		312	258	199	146	101	100	99	98	97	96	95	94	93	92	91	132	181	238	296		
			257	198	145	144	143	142	141	140	139	138	137	136	135	134	133	182	239			
			256	197	196	195	194	193	192	191	190	189	188	187	186	185	184	183	240			
				255	254	253	252	251	250	249	248	247	246	245	244	243	242	241				
						307	306	305	304	303	302	301	300	299	298	297						
							347	346	345	344	343	342	341	340	339							

Hydrock 

Hydrock

Not drilled – mine shaft already located

COAL AUTHORITY SHAFT REFERENCE: 376407-008
COAL AUTHORITY SHAFT COORDINATE: 376382, 407521

Appendix C Photographs

Photograph 1	
Date: 14/09/21	
Description: Shaft Reference 376407-006. Located during Vacuum Excavation works	

Desk Study Photograph 2	
Date: 14/09/21	
Description: Shaft Reference 376407-006.	

Desk Study Photograph 3	
Date: 14/09/21	
Description: Shaft Reference 376407-006.	

Desk Study Photograph 4	
Date: 14/09/21	
Description: Shaft Reference 376407-006. Showing 2.9m diameter of shaft.	

Desk Study Photograph 5	
Date: 14/09/21	
Description: Shaft Reference 376407-006. Following completion of investigation works.	

Desk Study Photograph 6	
Date: 14/09/21	
Description: Shaft Reference 376407-006. Asbestos cement identified in the backfill around Shaft.	

Appendix D Drillers Logs

TECHNICAL DESIGN NOTE



FORKERS SITE LOGS - SEPTEMBER 2021

Foreman's Daily Journal – Rotary Percussive Drilling

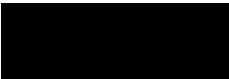
X/C/000/AP19

Forkers Ltd
Civil & Ground Engineering Contractors

Golds Green House, Shaw Street, West Bromwich, West Midlands B70 0TX
Tel: 0121 505 1010 • Email: admin@forkers.com

Contract: Bolton STOKES ROAD		Contract No: G157	Date: 15/09/21	Sheet No: 1	Ground Level (m):
			Date Commenced:		
Drilling Method: Rotary Percussive	Drilling Equipment / Rig No: J.C.B		Drilling / Casing Diam (mm): 138 Rods		Bit Type: BB Flush Type: Water

Borehole No	Angle of Hole	Strata Thickness (m)		Description of Strata	Depth of Casing (m)	Flush Return (%)	Final Depth Borehole (m)
		From	To				
SHAFT 01							
1 to 18	✓	0m	6.9m	Soft			
		6.9m	8.5m	Hard			8.5m
19/20/21	✓	0m	7m	Soft			
22		7m	7.9m	Hard			
		7.9m	10.8m	Soft			
		10.8m	12m	Hard			12.0m
23 to 26m	✓	0m	7m	Hard Soft			
		7m	9m	Hard			9.0m
27/28	✓	0m	7.1m	Soft			
		7.1m	8m	Hard			
		8m	11.5m	Soft			
		11.5m	14m	Hard			14.0m
28 to							
29 to 36	✓	0m	7.1m	Soft			
		7.1m	9m	Hard			9.0m
37/38	✓	0m	7m	Soft			
		7m	7.9m	Hard			
		7.9m	11.5m	Soft			
		11.5m	13.5m	Hard			13.5m

Hours Worked on Site			Remarks: Standing Time / Weather Conditions / Groundwater etc: No GAS DETECTED O2 = 20.9% CO = 0% CO2 = 0% H2S = 0% CH4 = 0%	Signed for Forkers Ltd: 
From	To	Total		Signed for Client:

X/C/000/AP19

Tel: 0121 505 1010 • Email: admin@forkers.com

[illegible]

X/C/000/AP19

Tel: 0121 505 1010 • Email: admin@forkers.com

[illegible]

Hours Worked on Site			Remarks: Standing Time / Weather Conditions / Groundwater etc:	Signed for Forkers Ltd:
From	To	Total		
			NO GAS DETECTED O2 = 20.9% CO = 0% CO2 = 0% H2S = 0% CH4 = 0%	Signed for Client

Forkers Ltd Civil & Ground Engineering Contractors Golds Green House, Shaw Street, West Bromwich, West Midlands B70 0TX Tel: 0121 505 1010 • Email: admin@forkers.com									
Contract: Bolton Stapes Road				Contract No: C157	Date: 21/09/21 Date Commenced:	Sheet No: 5	Ground Level (m):		
Drilling Method: Rotary Percussive		Drilling Equipment / Rig No: J.C.B		Drilling / Casing Diam (mm): T38Rod		Bit Type: BB	Flush Type: Water		
Borehole No	Angle of Hole	Strata Thickness (m)		Description of Strata	Depth of Casing (m)	Flush Return (%)	Final Depth Borehole (m)		
		From	To						
149-152	V	0m	7m						
		7m	9m				9.0m		
153-155	V	0m	10.5m	Soft					
		10.5m	11m	Hard					
		11m	13m	Soft					
		13m	15m	Hard			15.0m		
156-158	V	0m	6.8m	Soft					
		6.8m	9m	Hard			9.0m		
159-161	V	0m	7m	Soft					
		7m	7.6m	Hard					
		7.6m	10.4m	Soft					
		10.4m	12m	Hard			12.0m		
162-178	V	0m	10.2m	Soft					
		10.2m	12m	Hard			12.0m		
179-194	V	0m	6.8m	Soft					
		6.8m	9m	Hard			9.0m		
Hours Worked on Site		Remarks: Standing Time / Weather Conditions / Groundwater etc:				Signed for Forkers Ltd:			
From	To	Total	No GAS DETECTED						
			O2 = 20.9% CO = 0% CO2 = 0% H2S = 0% CH4 = 0%				Signed for Client		

X/C/000/AP19

Civil & Ground Engineering Contractors

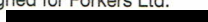
Tel: 0121 505 1010 • Email: admin@forkers.com

Contract:		Contract No:		Date:	Sheet No:	Ground Level (m):		
Bolton Stopes Road		G157		22/09/21	6			
Date Commenced:								
Drilling Method:		Drilling Equipment / Rig No:		Drilling / Casing Diam (mm):		Bit Type:	Flush Type:	
Rotary Percussive		J.C.B		T38 Rod		BB	Water	
Borehole No	Angle of Hole	Strata Thickness (m)		Description of Strata	Depth of Casing (m)	Flush Return (%)	Final Depth Borehole (m)	
		From	To					
195-211	✓	0m	6.8m	7m Soft				
		6.8m	9m	Hard			9.0m	
212-226	✓	0m	7m	Soft				
		7m	7.6m	Hard				
		7.6m	10.8m	Soft				
		10.8m	12m	Hard			12.0m	
227-240	✓	0m	10.2m	Soft				
		10.2m	12m	Hard			12.0m	
Hours Worked on Site		Remarks: Standing Time / Weather Conditions / Groundwater etc:				Signed for Forkers Ltd:		
From	To	Total	No GAS DETECTED				Signed for Client:	
			O2 = 20.9% CO = 0% CO2 = 0% H2S = 0% CH4 = 0%					

X/C/000/AP19

Tel: 0121 505 1010 • Email: admin@forkers.com

[illegible]

Hours Worked on Site			Remarks: Standing Time / Weather Conditions / Groundwater etc:	Signed for Forkers Ltd:
From	To	Total	NO GAS DETECTED $O_2 = 20.9\%$ $CO = 0\%$ $CO_2 = 0\%$ $H_2S = 0\%$ $CH_4 = 0\%$	 Signed for Client

Foreman's Daily Journal - Rotary Percussive Drilling

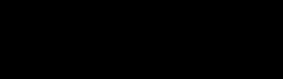
X/C/000/AP19

Forkers Ltd

Golds Green House, Shaw Street, West Bromwich, West Midlands B70 0TX
Tel: 0121 505 1010 • Email: admin@forkers.com

Contract:		Contract No:		Date:	Sheet No:	Ground Level (m):	
BOLTON STOPS ROAD		G-157		28/09/21	10		
Drilling Method:		Drilling Equipment / Rig No:		Drilling / Casing Diam (mm):		Bit Type:	Flush Type:
RIP		SCB		T38		BB	WATER

Borehole No	Angle of Hole	Strata Thickness (m)		Description of Strata	Depth of Casing (m)	Flush Return (%)	Final Depth Borehole (m)
		From	To				
SHAFT 03							
293, 235	V	G/L	5m	SOFT			7.0m
88, 55		5m	7m	HARD			"
13, 14, 15, 16				"			"
17, 38, 292				"			"
234, 177, 176				"			"
54, 84, 53,				"			"
86, 2, 3, 11				"			"
12, 4, 1, 6, 5				"			"
19, 18, 40				"			"
39, 69, 68, 31				"			"
32	V	G/L	5m	SOFT			7.0m
		5m	7m	HARD			
9, 10, 24, 25	V	G/L	5.8m	SOFT			8.0m
8, 7, 22, 23		5.8	8.0m	HARD			"
20, 21, 41, 42				"			"
70, 71, 72, 73				"			"
43, 44, 74				"			"
75, 45, 46				"			"
47, 48, 76				"			"
77, 78, 50				"			"
81	V	G/L	5.8m	SOFT			"
		5.8m	8.0	HARD			8.0m

Hours Worked on Site			Remarks: Standing Time / Weather Conditions / Groundwater etc:	Signed for Forkers Ltd:
From	To	Total		
			No Gms DETECTED O2 = 20.90% CO = 0.1% CO2 = 0.1% H2S = 0.1% CH4 = 0.1%	 Signed for Client

TECHNICAL DESIGN NOTE



SONIC DRILLING SITE LOGS - MAY 2022



24/5/22

[illegible]



DAILY REPORT SD-DR-1



Stopes RD

SHAFT - 007

26/5/22

CONTRACT					CONTRACT INFO			REPORT NUMBER		DATE
Hole No	Angle	Strata Description	From	To	Flush Type	% of Flush	Casing Diameter and Depth	Drill Bit Diameter	Grout Injected	Remarks/Obstructions
Probe holes		122, 181, 238, 296, 131, 180, 237, 295, 338, 55, 56, 87, 130, 179, 220, 277, 327								
		14, 13, 20, 88, 128, 178, 235, 293, 336, 12, 29, 54, 87, 125, 177, 221, 271, 225, 308, 351								
		349, 350, 210, 351, 31, 352, 33, 353, 314, 354, 315, 355, 316, 356, 317, 318, 288, 209, 150,								
		111, 269, 210, 157, 158, 270, 211, 212, 213, 271, 272, 319, 348, 312								
		Mixed fill	0	4	Water	100%	None	70mm	None	
		Brown clay	4	5		100%				
		Grey mudstone	5	6		100%				
										27/5/22
Probe holes		10, 27								
		Very soft	0	12.5	Water	0%	None	70mm	None	
		Harder than	12.5	14		0%				
		Very soft	14	18		0%				
Probe hole		24								
		Very soft	0	7.5	Water	0%	None	70mm	None	
		Hard	7.5	9		0%				
Probe hole		25								
		Very soft	0	42	Water	0%	None	70mm	None	
Signed For			Hrs Worked		Plant on Site			Standing Time or Delays		Site Crew
Client Hydroxide					Klemm RD2					
Main Contractor										
Sonic Drilling Ltd										



DAILY REPORT SD-DR-1



Stopes RD

SHAFT - 007

26/5/22

CONTRACT					CONTRACT INFO			REPORT NUMBER		DATE
Hole No	Angle	Strata Description	From	To	Flush Type	% of Flush	Casing Diameter and Depth	Drill Bit Diameter	Grout Injected	Remarks/Obstructions
Probe holes										
		177, 178, 129, 234, 235, 237								
		Mixed fill	0	4.5	water	50%	NONE	70mm	NONE	
		Brown clay	4.5	6		100%				
		Grey mudstone	6	7.2		100%				
		Very soft Broken	7.2	8.7		0%				
		Gravel lost / hard								
		HARD	8.7	10.5		0%				
Hole no										
128		Mixed fill	0	4.5	water	100%	NONE	70mm	NONE	
		Brown clay	4.5	6		100%				
		Grey mudstone	6	7.5		100%				
		COAL	7.5	9		100%				
		Grey mudstone	9	10		100%				
Probe holes										
		294, 236								
		VERY SOFT	0	6	water	0%	NONE	70mm	NONE	
		Firm	6	7.8		0%				
		VERY SOFT	7.8	9.6		0%				
		HARD	9.6	10.5		0%				
Signed For			Hrs Worked		Plant on Site			Standing Time or Delays		Site Crew
Client Hydracore					Kleppan 812					
Main Contractor										
Sonic Drilling Ltd										



DAILY REPORT SD-DR-1



SHAFT - 007 Stopes RD

27/5/22

CONTRACT					CONTRACT INFO			REPORT NUMBER		DATE
Hole No	Angle	Strata Description	From	To	Flush Type	% of Flush	Casing Diameter and Depth	Drill Bit Diameter	Grout Injected	Remarks/Obstructions
Probe holes		80, 79								
		very soft	0	12	water	0%	None	70mm	None	
		HARD to firm	12	15		0%				
		very soft	15	21		0%				
Probe holes		26, 49, 48, 50, 51, 52								
		very soft	0	18	water	0%	None	70mm	None	
Probe holes		119, 118, 117, 78, 47, 120, 121, 81, 82, 83, 84, 85								
		Mixed fill	0	4.5	water	100%	None	70mm	None	
		Brown clay	4.5	6		100%				
		Grey mudstone	6	12		100%				
					<u>SHAFT - 008</u>					
Probe holes		21, 116, 118, 48, 20								
		mixed fill	0	4	water	100%	None	70mm	None	
		Brown clay	4	5		100%				
		Grey mudstone	5	6		100%				
Signed For			Hrs Worked		Plant on Site			Standing Time or Delays		Site Crew
Client Hydriock					Klemm 802					
Main Contractor										
Sonic Drilling Ltd										

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