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TECHNICAL NOTE

FOUNDATION WORKS RISK ASSESSMENT – HOPWOOD HALL, ROCHDALE

Client:	Willmott Dixon	Version:	Final
Reference:	TE1880-TE-00-XX-TN-GE-001-V01	Author:	Adrian Read
Date:	24/10/2025	Approved:	Sean Lee

Re: Foundation Works Risk Assessment

1 Introduction

Tier Environmental was commissioned by Willmott Dixon to undertake a Foundation Works Risk Assessment (FWRA) for Hopwood Hall College, Rochdale Campus, St Mary's Gate, Rochdale OL12 6RY.

The purpose of this assessment is to evaluate the proposed foundation solution in accordance with the CL:AIRE (2025) guidance "Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention"**. The FWRA considers potential environmental and human health risks associated with piling or penetrative ground improvement, including the creation of preferential pathways and resultant migration of contaminants, potential risks to groundwater, ground gas migration, and risks to construction workers.

** which formally supersedes the older Environment Agency guidance 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention', May 2001 (reference: NC/99/73)

2 Foundation Works Risk Assessment Approach

The purpose of the FWRA is to identify and assess potential adverse environmental and human health impacts arising from piling and penetrative ground improvement methods, within a site-specific conceptual model. This process follows the principles of hazard identification, risk assessment, and mitigation, consistent with the Land Contamination: Risk Management (LCRM) framework.

Hazard identification has been completed to define potential source–pathway–receptor linkages relevant to the proposed works. The presence and sensitivity of receptors have been defined with reference to the hydrogeological and ground gas conditions at the site. The assessment considers the potential for piling and ground improvement works to alter subsurface conditions in a manner that could increase the risk of pollution, including to controlled waters, surface waters, or human health.

According to CL:AIRE guidance, particular attention is required where:



- Contaminants are present on site and the proposed works could create new or enhanced migration pathways;
- Piling or ground improvement may breach low-permeability strata or link discrete groundwater bodies;
- The site overlies a Principal Aquifer or other sensitive hydrogeological unit, or lies within a Source Protection Zone (SPZ);
- Groundwater is of good quality or occurs at shallow depth and is likely to be intersected by the works;
- The geological sequence includes fractured or fissured materials that could facilitate vertical migration; or,
- The site is adjacent to surface water bodies that could be affected by turbidity or contaminated run-off from arisings or support fluids.

In line with the CL:AIRE framework, the assessment has also considered the seven pollution scenarios defined in the 2025 guidance, which encompass risks associated with:

- 1) Creation of preferential pathways through low-permeability layers;
- 2) Driving of solid contaminants into an aquifer;
- 3) Contamination of groundwater or surface water by turbidity, support fluids, concrete, or grout;
- 4) Direct contact of piles or structures with contaminated materials, leading to material degradation and enhanced migration potential;
- 5) Creation of preferential pathways for ground gas or vapour migration;
- 6) Off-site migration or increased emissions of ground gas due to pile installation effects; and,
- 7) Exposure of workers or others to contaminated arisings brought to the surface.

This report follows the risk assessment framework described in Chapter 6 of the CL:AIRE guidance, which aligns with RIBA design stages. The approach enables early identification of low-risk sites suitable for screening, and ensures that medium- and high-risk scenarios are supported by detailed, auditable FWRA documentation.



3 Site Setting

3.1 Current Site Overview

Site name	Hopwood Hall College
Site address	Hopwood Hall College, Rochdale Campus, St Mary's Gate, Rochdale OL12 6RY. A site location plan is included as Drawing No. TE1880-TE-00-XX-DR-GE-001-V01 within Appendix A.
National Grid Reference (NGR)	389299 413363
Approximate site area	1.75 ha
Site shape	The site is approximately triangular in shape
Current land use on the site	The site currently comprises a college with a building of several storeys (including a basement/undercroft) present in the east of the site, and an asphalt surfaced car park across the majority of the remainder of the site and a drop off lane present along the northern and western boundaries. It is understood that an interceptor is present in the northeastern corner of the car park/drop off lane. Metal fencing around 2m height is present at the northern and western extent of the car park, with a brick retaining wall of between approx. 1.00m and 2.00m height present at the northern boundary of the drop off lane, marking the site boundary with College Road. A second brick retaining wall is present at the south of the car park, separating the car park from the river embankment which lies approx. 1.00m to 2.00m below the car park. No cracks or visible signs of stress were visible on either of the retaining walls. Limited soft landscaped areas are present, including a small sloped grass verge in the northwest of the site, a grassed embankment between the car park/college buildings and the river in the south of the site, and as a grassed terraced area to the north east of the building, which steps down to the basement floor level. The basement/ undercroft area is accessible from the car park and is understood to comprise storage, waste disposal areas (bins/skips) and a plant room. The plant room contains the heating infrastructure for the building, including 2 no. oil tanks, both of which are understood to no longer be used with one understood to have been emptied via tanker (but not decommissioned) in the past couple of years. These oil tanks are present within a separate concrete bunded room, only accessible via locked ladder access. From the limited viewpoint accessible during the walkover, no spills or leakages were observed. An electric substation is present in the northeast of the site, to the northwest of the existing college building. Underground services are known to be present beneath the site, including electricity, gas, water and drainage. There is limited surface water drainage around the car park area, observed only to be present at the car park boundaries. Vehicular access for deliveries and disabled parking is present from College Road close to the centre north of the site, leading to the drop off lane, a small parking area and the basement/undercroft access. An access road for the main car park is present in the northwest of the site, with a smaller car park present to the west of this access road.



	This smaller car park is understood to be let out and was not accessible during the ground investigation. During college opening hours, pedestrian access is freely available. A hedge of approximately 1m height is present surrounding the northeastern soft landscaped area, with limited shrubs present elsewhere around site. mature trees are present in the far northwest of the site, surrounding the smaller car park (it is understood to development is to be undertaken in this area). It should be noted that the car park in the northwest of the site and the terraced soft landscaping in the east of the site were not accessible during the walkover, and are unlikely to be accessible for any ground investigation.
Surrounding land uses	The site is set within a mixed commercial and residential area, with Rochdale Town centre located approximately 500m northeast of the site.
General topography and ground levels	The main car park area of the site is generally level at around 119m AOD. However, College Road to the north of the site lies between approx. the same level as the site in the northeast (120m AOD) rising to around 1.0m higher than the site in the northwest (120m AOD), separated from the site by a brick retaining wall. Similarly, in the south of the site the highest level of the grassed banks of the River Roch lies between 0.5m to 1.00m below the car park level at around 118m AOD, separated by a brick retaining wall. Site levels between the existing building and St. Mary's Gate also vary, with grassed terraces leading from road level (120m AOD) in the northeast to 116m AOD in the centre east and back up to 120m AOD in the southeast. Again, a brick and concrete retaining wall was present at the site boundary (this area was not accessible during the walkover).

3.2 Site History

Historically the River Roch meandered through the centre of the site, with a weir present close to the centre west of the site. Excavation/building up/stockpiling of materials is shown on its northwestern bank at several points in history. The remainder of the site has historically been occupied by a large mill (including a pump) in the east of the site, and several smaller mills and dyeworks (including a tank) in the west of the site at extending offsite beyond the site boundaries.

Holland Street and presumed residential properties (which may have contained basements) were mapped in the northeastern corner of the site. By the 1960s the mill in the east of the site had been replaced with Rochdale Technical College, although some of the smaller mills/works were still shown in the northwest of the site at this time, alongside allotment gardens.

By the late 1960s/early 1970s the River Roch had been diverted along the southern boundary of the site, with the former watercourse on site infilled. Embankments are shown along the watercourse at the southern site boundary, suggesting site levels may have been raised. Allotments and buildings in the northwest of the site were demolished during this time, with a large building labelled as Rochdale College now present across the majority of the west and centre of the site, and additional college buildings shown in the southeast of the site and an access road and car park created in the northwestern corner of the site. Holland Street was rerouted to the north of the site and renamed as



Bury Street and later College Road, with the buildings alongside it demolished. The large college building in the west and centre of the site is last shown in 2008, by 2012 this and the smaller buildings in the southeast of the site have been demolished. The west/centre of the site was resurfaced for car parking (it is understood the concrete floor slab was left in situ beneath the asphalt) and the southeastern area was soft landscaped.

The immediate surrounding area predominantly comprised industrial/commercial land uses including mills and dyeworks, a cattle market, warehouses, unnamed works, with some terraced residential properties. The majority of the surrounding industry was demolished by the 1960s to 1980s, with an embankment and high rise residential constructed from 10m to the north of the site (potentially on built up land) and possible raising of levels shown in the former cattle market area approx. 20m east of the site during the 1970s. By 2000, the former cricket ground and industry to the south of the river was replaced with a supermarket and associated petrol station.

3.3 Geology, Hydrogeology, Hydrology & Ground Gases

Third Party & BGS Information

Made Ground was recorded to depths of between 0.95m and 6.80m bgl (the deeper Made Ground being recorded within a former infilled watercourse) within a previous third party ground investigation. Superficial Deposits comprising Alluvium (Secondary A aquifer) are recorded in the north of the site, with Glaciofluvial deposits (Secondary A aquifer) recorded across the remainder of the site. The solid geology is recorded as the Pennine Lower Coal Measures (Secondary A aquifer).

There are no Source Protection Zones, potable, non-potable or surface water abstractions recorded within 250m of the site. The nearest surface water feature is the River Roch located beyond the southern site boundary, with the River Spodden also located 209m southwest of the site. No further surface water features are located within 250m of the site. Groundwater flow is anticipated to be towards the southwest based on surrounding topography and the presence of the River Roch. There is understood to be limited current surface water drainage in the form of ACO drains at the main car park perimeters, with an interceptor located in the northeast of the car park. The controlled waters sensitivity was regarded as being moderate/high.

Tier Environmental Ground Investigation Information

Information obtained during Tier Environmental's Ground Investigation Report Hopwood Hall College, Rochdale (report reference: TE1880-TE-00-XX-RP-GE-002-V02, dated 3rd March 2025) determined ground conditions as follows:

Hardstanding

Hardstanding comprising asphalt was encountered in the car park, access road, and footpaths across the site to depths between 0.05m and 0.35m bgl. A concrete slab was encountered across the



footprint of the former building which occupied the present-day car park, comprising thicknesses between 0.21m and 0.47m.

Made Ground

Made Ground has been reported to a maximum depth of 6.50m bgl and was found to be thickest towards the southwest and central west of the site within the former infilled watercourse. Made Ground was found to comprise both granular and cohesive deposits, with a layer of suspected Pulverised Fuel Ash (PFA) identified across the site, thickest beneath the former building footprint within the present-day car park area.

Other anthropogenic materials encountered within the Made Ground include brick, concrete, sandstone, limestone, clinker/slag, plastic, metal, glass, timber, and occasional rebar.

Superficial Deposits

The Made Ground was found to be underlain by superficial deposits in some instances, comprising Alluvium (clay) and Glaciofluvial Deposits (silty sand).

Bedrock

The Made Ground and superficial deposits were found to be underlain at depths between 3.30m and 6.50m bgl by bedrock of the Pennine Lower Coal Measures, found to comprise mudstone with interbedded sandstone and siltstone.

Coal

Coal was reported at depths between 6m and 40m bgl within rotary boreholes, with evidence of probable workings within the Arley Mine seam. Specific coal seams encountered include:

- RH101: 30.30m to 30.80m bgl (0.50m thick, hard coal);
- CP104/RH102: 34.20m to 34.40m bgl (0.20m thick, possible coal/shale); and,
- RH103: 16.80m to 17.00m bgl (0.20m thick, coal flash), 29.00m to 29.30m bgl (0.20m thick, hard coal).

Groundwater

Shallow groundwater has been monitored across the site at depths between 0.10m and 4.14m bgl and a separate deeper confined, locally artesian, groundwater body has been reported within the deep sandstone bands at RH101 and RH103C (sandstone bands present from depths of 28.50m bgl and 32.00m bgl). The head of water reported during one groundwater monitoring visit at RH103C was reported as 0.04m.



Landfills

There are no landfills on site or in the immediate vicinity – the nearest is located approximately 200m west of the site (for which there are no details of waste input, other than that it was backfilled pre-1974 Control of Pollution Act). Given this distance, it is not considered that landfills are required to be considered further in this assessment.

Hydrology

The River Roch is located to the south of the site. It is reported as an inland river not influenced by normal tidal action. The watercourse contains water year round (in normal circumstances).

Ground Gases

Due consideration of the conceptual site model (including ground gas generation potential of possible sources) has been considered alongside the results from ground gas monitoring works conducted to date. Based on the information, it is considered that the site may be regarded as a Characteristic Situation 1 – Very Low Risk scenario for which no ground gas protection measures are required.

In addition, separate consideration has been made for potential coal mine gas risk. Multiple lines of evidence have demonstrated a low risk for which no protection measures are required. these include:

- Workings are shallow but permanently flooded;
- Mine entries are >50m from the site boundary according to the Coal Authority information for the shaft;
- Additional lines of evidence include
 - The significant age of the mine workings (pre 1808);
 - No reports of any historical ground related issues in nearby adjacent college building structures developed pre-1977 (at which time gas protection measures were not a standard practice in UK building practices);
 - The absence of any significant ground gases or flow rates monitored at the site and determination of the site based on available data as a Characteristic Situation 1 - Very Low Risk scenario;
 - The ternary plot produced for the steady gas concentrations (see below) does not indicate the presence of thermogenic methane (mine gas) in any wells monitored (either in saturated or unsaturated zone);
 - The shallow flooded mine workings are to be grouted as part of the development works thereby significantly reducing ground gas risks even further by sealing potential migration pathways, reducing void space, and mitigating the risk of any gas displacement.

Tier Environmental reserves the right to update the risk assessment in the event that any unrecorded mine shafts, adits or associated features are identified during earthworks / construction works.



3.4 Contamination Risk Assessments

Human Health

Justification has been provided for screening measured soil concentrations of potential contaminants of concern against commercial / industrial GACs. No measured concentrations of potential contaminants of concern have been reported in excess of these GACs. Sensitivity analysis via comparison against POS Park GACs has reported a single measured concentration of benzo(a)pyrene in Made Ground in the northeast of the site.

Overall, it is not considered that the site presents a risk from potential chemical contaminants of concern for the proposed areas of hardstanding, buildings or peripheral soft landscaping; however, it is recommended that additional, post-demolition, soil sampling and risk assessment is conducted in the vicinity of the proposed contoured landscaped area in the east of the site.

Asbestos has been reported in the Made Ground across the site (in 56% of those samples analysed) at concentrations between <0.001% and 0.03% w/w (amosite and chrysotile - fibre bundles, ACM debris and locally, bitumen products). Further detailed risk assessment was conducted in accordance with CIRIA C733 which concluded that the mesothelioma and lung cancer risk calculations provided a total risk of 0.54 per 100,000 over a lifetime of 80 years with significant conservatism built into the model. On this basis, it was considered that the reported concentrations of chrysotile and amosite asbestos within the Made Ground materials would only a minimal risk for the proposed commercial land use, including soft landscaped areas.

Controlled Waters

Results from controlled waters risk assessment has demonstrated that measured groundwater concentrations of cadmium, copper, nickel, zinc, fluoranthene and ammonia, reported in excess of relevant Water Quality Standards, and localised measured concentrations of glycols, do not present a significant risk to the controlled waters environment when factors including the hydraulic upgradient and downgradient concentrations, aquifer sensitivity, wider commercial and industrial use of the surrounding land and surface water sample results are taken into account.

The results of the surface water testing demonstrate that water quality improved by the point that the water has flowed past the site.



4 Ground Model

The ground model for the site is presented as Drawing No. TE1880-TE-00-XX-DR-GE-025-V01 in Appendix A.

The proposed pile locations are presented as Drawing No. FE0012-ROS-XX-XX-D-C-0500, Rev C01 produced by Roscoe. It is understood that proposed pile design lengths will be up to depths ranging between Circa 2.20m to 5.20m into the bedrock.

It should be noted on the ground model that the Arley Mine coal seam which will be targeted for treatment as described in the Tier Environmental 'Coal Mining Risk Assessment For Hopwood Hall College, Rochdale' (report reference: TE1880-TE-00-XX-RP-GE-003-V01, dated 6th February 2025) and 'Specification For The Stabilisation Of Shallow Mineworkings, Hopwood Hall College, Rochdale' (report reference: TE1880-TE-00-XX-RP-GE-005-V06, dated 15th October 2025) dips below the River Roch thereby reducing risk of connectivity between treatment works and the neighbouring River.



5 Foundation Works Risk Assessment

Tier Environmental has identified potentially adverse environmental impacts and have undertaken a site specific assessment of the identified potential risks in line with the considerations detailed in Section 2 of this report. The assessment has been undertaken assuming the following:

- A site turnover beneath the proposed building footprint to 2m bgl;
- A preferred Continuous Flight Auger (CFA) piling technique will be employed to support the building frame based on the structural, geotechnical, and commercial considerations of the Site;
- Installation of a 800mm thick working platform/piling mat;
- It is also understood that Vibro Stone Columns may be applied to the first 2m to provide a stiff 'crust' for a ground bearing floor slab; and,
- Grouting works are proposed to address identified shallow coal mining risks.

Further details on the control measures proposed during the grouting works may be found in the Tier Environmental 'Specification For The Stabilisation Of Shallow Mineworkings, Hopwood Hall College, Rochdale' (report reference: TE1880-TE-00-XX-RP-GE-005-V06, dated 15th October 2025).

Third party contractor risk assessments that augment the information in the table below can be found in Appendix B.



Table 5.1 Foundation Works Risk Assessment

Potential Pollution Considerations	Site specific Scenarios/Conditions	Risk Assessment
CFA Piling (Socketed into Bedrock 2.2–5.2 m)		
Plant and Installation process: The CFA technique involves the use of a Hydraulic Rotary Bored Piling Rig. A continuous flight auger is screwed into the ground to the required depth with concrete being placed from the base of the auger during extraction of the auger. The auger is fully laden with spoil at all times of installation and extraction. Bore spoil flights up the auger to ground level during the concreting process. The spoil is removed and disposed of by others.		
Pollution Scenario 1 – Creation of preferential pathways	CFA piles installed to depths of approximately 2.2m–5.2 m sockets into the Pennine Lower Coal Measures. Non-displacement piling will not create new pathways for contaminant migration. Controlled waters assessment confirms no risk.	Low / negligible risk. Piling will not increase vertical contaminant migration.
Pollution Scenario 2 – Breach of aquitard or connection of discrete aquifers	No significant cohesive aquitard exists; superficial and bedrock units are already hydraulically connected. CFA piles will not connect discrete aquifers at the depths proposed.	Low / negligible risk. Hydraulic continuity already present.
Pollution Scenario 3 – Contamination of groundwater or surface water by concrete, cement paste, or grout	Concrete placed under low pressure via continuous auger. Loss of material is unlikely; contractors will monitor consistency and pressure during installation. Each pile will be constructed and monitored in real time with regards to the concrete volume being utilised. If excessive concrete take is recorded (unable to construct the pile) then construction shall be ceased and the incident reported to the main contractor for instruction. Constructed piles at ground level will also be monitored to ensure concrete is not lost after a pile has been constructed. This shall also be reported if encountered. A pumped piling mix specifically designed for pumping (without segregation) is to be used on site. This will eliminate segregation and therefore any unnecessary permeation of the surrounding soils with cement / grout.	Low / negligible risk. Controlled under method statement and QA/QC measures.
Pollution Scenario 4 – Degradation of piles through contact with contaminated soils or leachate	Concrete classified as DS-1 / AC-1 per BRE SD1. No aggressive chemical conditions expected in soils or groundwater.	Low / negligible risk. Appropriate concrete class specified.
Pollution Scenario 5 – Pushing solid contaminants down into an aquifer	CFA method is non-displacement, avoiding downward dragging of materials. Soil removed upwards by auger flighting.	Low / negligible risk. No physical transport of impacted soils.
Pollution Scenario 6 – Ground gas migration or preferential pathway creation	Ground gas regime is very low risk (CS1); no evidence of significant methane or carbon dioxide. Pile installation unlikely to modify gas migration pathways. No coal mine gas risk identified.	Low / negligible risk. Piling does not enhance gas migration.
Pollution Scenario 7 – Worker exposure to contaminated arisings	Standard health and safety procedures to be implemented including PPE and dust suppression. Any asbestos above trace levels to be managed per CAR 2012.	Low risk. Controlled through site H&S management.
Vibro Stone Columns (to 2 m bgl after Site Turnover and placement of piling mat/working platform)		
Pollution Scenario 1 – Creation of preferential pathways	VSCs installed to 2m bgl following site turnover. Ground improvement limited to made ground only. No penetration into undisturbed / natural strata.	Negligible risk. No preferential pathways formed.
Pollution Scenario 2 – Breach of aquitard or connection of discrete aquifers	No significant cohesive aquitard exists; superficial and bedrock units are already hydraulically connected. VSCs will not connect discrete aquifers at the depths proposed.	Negligible risk. No aquifer connectivity changes.
Pollution Scenario 3 – Contamination of groundwater or surface water by concrete, cement paste, or grout	Dry vibro technique used; no cementitious binder introduced. No risk of leachate generation.	Negligible risk. Technique inherently low risk.
Pollution Scenario 4 – Degradation of piles through contact with contaminated soils or leachate	Columns formed of inert stone; no risk of chemical degradation. Interaction with soils limited to shallow fill.	Negligible risk. No aggressive environment anticipated.
Pollution Scenario 5 – Downward transport of solid contaminants	Shallow operation above 2m bgl within materials turned over and so no previously undisturbed materials affected. Therefore no potential for driving contaminants downward.	Negligible risk. Depth too shallow to influence underlying soils.
Pollution Scenario 6 – Gas migration or emission due to ground improvement	Ground gas regime indicates very low ground gas risk (CS1). Temporary densification unlikely to modify gas conditions.	Low / negligible risk. No enhanced gas migration anticipated.



Potential Pollution Considerations	Site specific Scenarios/Conditions	Risk Assessment
Pollution Scenario 7 – Worker exposure to contaminated arisings	Standard health and safety procedures to be implemented including PPE and dust suppression. Any asbestos above trace levels to be managed per CAR 2012.	Low risk. Controlled through site H&S management.
Grouting Works (Mine Void Stabilisation)		
Pollution Scenario 1 – Creation of preferential pathways	Grouting to be carried out under controlled pressure to stabilise shallow workings without hydrofracturing or forming new pathways.	Low / negligible risk. Controlled pressure avoids pathway creation.
Pollution Scenario 2 – Breach of aquitard or connection of discrete aquifers	No significant cohesive aquitard exists; superficial and bedrock units are already hydraulically connected. Grouting will not connect discrete aquifers at the depths proposed.	Low / negligible risk. Localised and controlled.
Pollution Scenario 3 – Contamination of groundwater or surface water by concrete, cement paste or grout	Cementitious grout mix designed for low mobility and compatibility with local hydrogeochemistry. No additives with contamination potential. Grouting to be carried out under controlled pressure to stabilise shallow workings without hydrofracturing or forming new pathways. Grout uptake to be monitored. Watching brief of River to be maintained during grouting works. Targeted mine shown on conceptual site model to dip beneath the River Roch reducing risk of connectivity. Potential for grout curtain to be utilised at peripheral extent of grout area if monitored grout takes suggest this is required.	Low / negligible risk. Composition controlled and tested.
Pollution Scenario 4 – Degradation of piles through contact with contaminated soils or leachate	Grouting designed to enhance stability; grout mix compatible with surrounding lithologies. No corrosive environment anticipated.	Low / negligible risk. No degradation concerns.
Pollution Scenario 5 – Downward transport of solid contaminants	Grouting does not involve displacement of soil; injected into voids only. No contaminant transport anticipated.	Low / negligible risk. Non-displacement technique.
Pollution Scenario 6 – Gas migration or emission due to ground improvement	Pressure grouting monitored to prevent excessive pore pressure increase. No significant ground gas present based on monitoring data. Monitoring to take place during the injection works.	Low / negligible risk. No enhancement of gas movement expected.
Pollution Scenario 7 – Worker exposure to contaminated arisings	All works carried out under COSHH and CDM-compliant RAMS. PPE and ventilation as per manufacturer's data sheets.	Low risk. Controlled via H&S procedures.



6 QA / QC Methods and Measures

For the CFA piles:

- Each pile will be constructed and monitored in real time with regards to the concrete volume being utilised.
- If excessive concrete take is recorded (unable to construct the pile) then construction shall be ceased and the incident reported to the main contractor for instruction.
- Constructed piles at ground level will also be monitored to ensure concrete is not lost after a pile has been constructed. This shall also be reported if encountered.
- A pumped piling mix specifically designed for pumping (without segregation) is to be used on site. This will eliminate segregation and therefore any unnecessary permeation of the surrounding soils with cement / grout.

QA/QC measures for the grouting works are stipulated in the 'Specification For The Stabilisation Of Shallow Mineworkings, Hopwood Hall College, Rochdale' (report reference: TE1880-TE-00-XX-RP-GE-005-V06, dated 15th October 2025) and reference should be made to this for more details.

With respect to VSCs, the pollution considerations highlighted in the table above, fall out with any specific QA/QC requirements and are a function of the de facto ground and groundwater conditions that are located beneath the Site. For instance, management of any residual risks associated with the proposed technique puncturing an aquitard are outwith any QA/QC procedure as the ground conditions are such that this hazard will not be realised due to the absence of such an aquitard; however standard cursory checks shall be made in the extremely unlikely event that a localised or previously undiscovered aquitard is identified.



7 CONCLUSIONS

A Foundation Works Risk Assessment has been undertaken for the site following the completion of a Geoenvironmental Appraisal of the site and conceptual site model which has been summarised within this report.

An assessment of the ground conditions and of the subsequent structural, geotechnical and commercial considerations has been undertaken that has determined that CFA piling is the preferred piling technique in the absence of any viable shallow foundation solutions alongside potential VSCs in the shallow 2m turnover extent and proposed grouting of the coal mine workings.

An assessment has been undertaken with reference to Environment Agency approved CL:AIRE guidance and taking into consideration the controlled waters sensitivity and risks to construction workers. The assessment has demonstrated that the proposed foundation works represent a low/negligible risk for the site.

QA/QC protocols shall be sufficient to maintain/ensure the integrity of the piles and to avoid the creation of preferential pathways alongside the inherent low/negligible risks identified for the site.

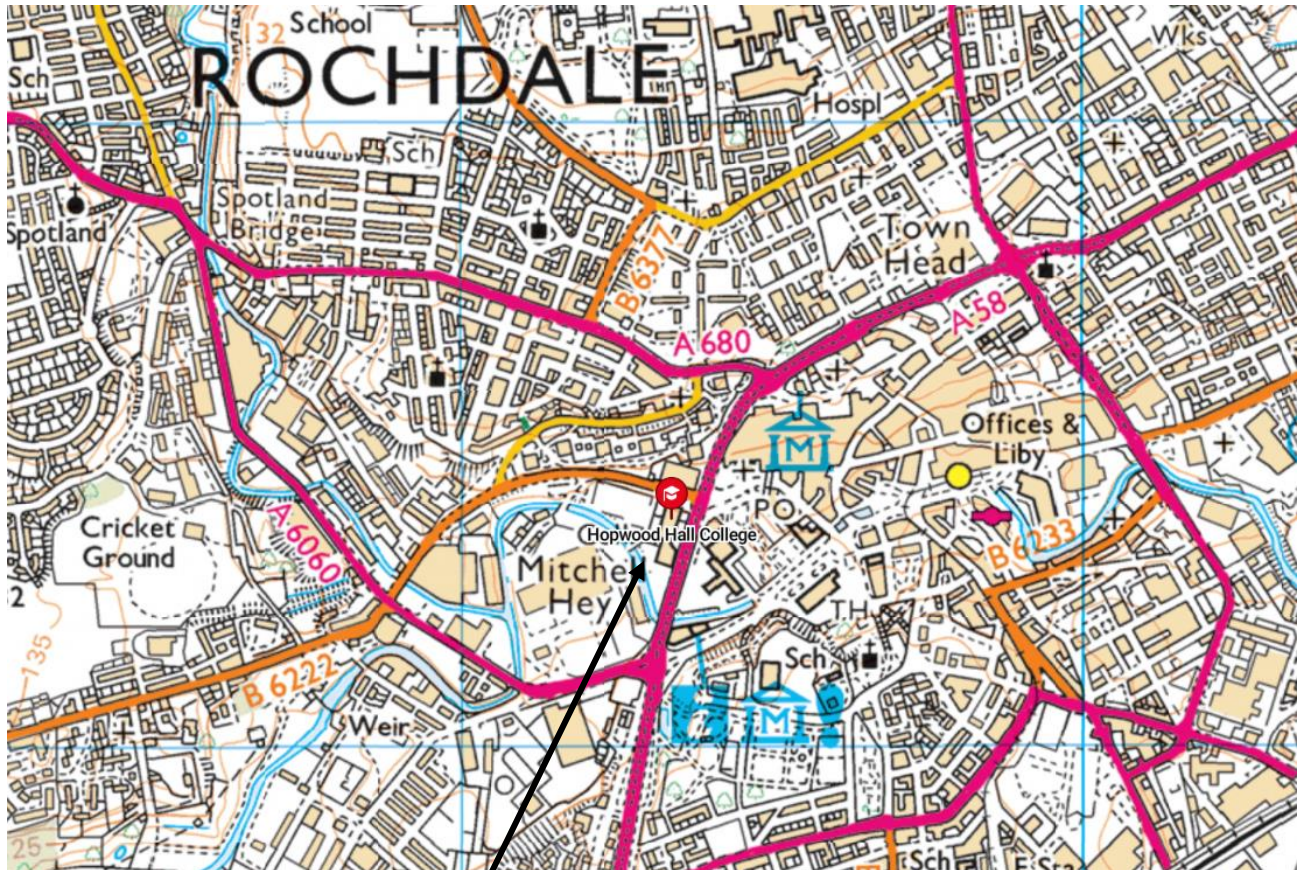


APPENDIX A – DRAWINGS



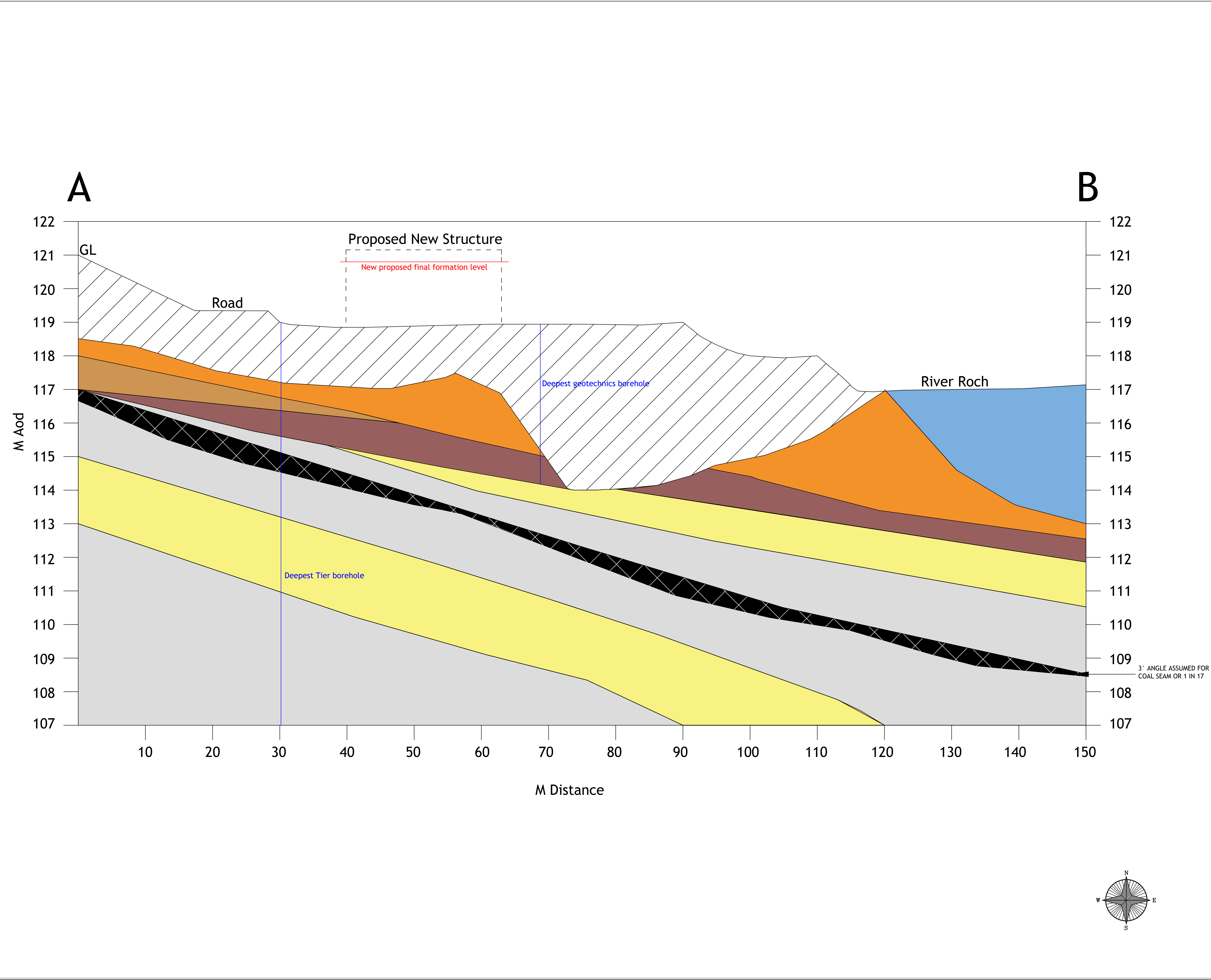
Contract Number:	TE1880
Contract:	Hopwood Hall College, Rochdale
Client:	Wilmott Dixon Construction

Site Location Plan



Site

Scale	NTS	
Drawn by	SE	Approved AR
Drawing Number	TE1880-TE-00-XX-DR-GE-001-V01	



DO NOT SCALE

NOTES

MUDSTONE

SANDSTONE

COAL/POTENTIAL MINEWORKINGS

MUDSTONE

GLACIOFLUVIAL DEPOSITS

RIVER ROCH

MADE GROUND

P1	12.02.2025	CS	ISSUED FOR INFORMATION	AP	AP
REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS: INFORMATION

Tier Environmental Ltd.
Unit 5 Office Village
Sandpiper Court
Chester Business Park
Chester | CH4 9QZ
t: 01925 818 388

CLIENT:
WILLMOTT DIXON CONSTRUCTION

PROJECT:
HOPWOOD HALL COLLEGE ROCHDALE

TITLE:
CROSS SECTION

SCALE: NTS	CHECKED: AP	APPROVED: AP
CAD FILE: -	DESIGN/DRAWN: CS	DATE: 12.02.2025
PROJECT No: TE1880	DRAWING No: TE1880-TE-00-XX-DR-GE-025-V01	REV: P1



APPENDIX B – THIRD PARTY RISK ASSESSMENTS



Piled Foundations & Underpinning

Cohesion Piling Company Ltd
Globe House Business Centre
Moss Bridge Road
Rochdale
OL16 5EB
T: 01706 714555
F: 01706 641041
info@cohesionpiling.co.uk
www.cohesionpiling.co.uk

Job No.:15200	Sheet No.: 1 of 2
Job Title: Hopwood Hall College, Rochdale.	
CFA Bored Piling – Cohesion Piling Company Ltd Pollution scenario risk assessment	

References

- Piling in layered ground - Environment Agency, October 2006.
- Piling in to contaminated sites – Environment Agency, February 2002.
- Piling and penetrative ground improvement methods on land affected on contamination: Guidance on pollution prevention, Environment Agency May 2001.

Soil Profile

The soil profile has been taken from the following site investigation reports –

- Geotechnics reference PN214280 dated November 2021
- Tier reference TE1880 dated 05/02/2025.
-

These generally detail –

Depth from	Depth to	Strata
0m to	Average 5.5m	Made Ground
5.5m- average	-	Pennine Lower Coal Measures – varies 3.3m to 6.8m depth

Pile Type

Continuous Flight Auger (CFA) Bored Piles of 450mm pile diameter. CFA piles are a replacement piling system.

Notes

Potential Source = contaminants in the made ground

Potential Pathway = constructed piles

Receptor = potential to encounter Sandstone aquifer

Plant and Installation process

The CFA technique involves the use of a Hydraulic Rotary Bored Piling Rig. A continuous flight auger is screwed into the ground to the required depth with concrete being placed from the base of the auger during extraction of the auger.

The auger is fully laden with spoil at all times of installation and extraction. Bore spoil flights up the auger to ground level during the concreting process. The spoil is removed and disposed of by others.

Job No.: 15200	Sheet No.: 2 of 2
Job Title: Hopwood Hall College, Rochdale.	
CFA Bored Piling – Cohesion Piling Company Ltd Pollution scenario risk assessment	

The potential for CFA pile installation to cause pollution is considered minimal compared to most other piling techniques and is discussed below:

Transport of contaminants (drag down) during installation

The head of the auger is designed to dig the soil vertically out of the bore as the auger penetrates the soils. Thus, preventing advancement of any plug of potentially contaminated soil from the upper soil profile into the deeper soil profile below the water table.

Creation of preferential flow path

The auger penetrates quickly through the soils, after reaching the required depth concrete pumping down a hollow stem is commenced immediately with positive pumping pressure maintained as the auger is slowly withdrawn from the bore. This ensures intimate contact between concrete and the surrounding soil. The installation technique ensures there is no opportunity for soil relaxation in the sides of the bore and concrete is placed under pressure. The system therefore avoids the creation of any preferential flow paths.

Degradation of pile material

The design of concrete for the piling system is in accordance with the BRE Special Digest: 2005. This takes direct account of type of site, contaminant concentration, and groundwater acidity and mobility. In addition, factors which are specific to the concrete construction, such as type of element, section thickness, curing conditions, exposure conditions and the required structural performance level are assessed. This mitigates possible degradation of pile material and therefore generation of passageways for contaminants.

Concrete loss

There is a perceived risk of loss of fluid concrete during the pile construction. Drilling & grouting is to be undertaken prior to the piling works, therefore the following procedure shall be observed at all times –

- Each pile will be constructed and monitored in real time with regards to the concrete volume being utilised.
- If excessive concrete take is recorded (unable to construct the pile) then construction shall be ceased and the incident reported to the main contractor for instruction.
- Constructed piles at ground level will also be monitored to ensure concrete is not lost after a pile has been constructed. This shall also be reported if encountered.
- A pumped piling mix specifically designed for pumping (without segregation) is to be used on site. This will eliminate segregation and therefore any unnecessary permeation of the surrounding soils with cement / grout.

The resulting risk of contaminating the aquifer is considered minimal.

Conclusion

Referring to the Environment Agency publications, the CFA system will minimize the above discussed risk scenarios.

The system is mentioned in the Environmental Agency report “*Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: guidance on Pollution Prevention*”, Scenario 1, with **CFA being an acceptable piling solution when dealing with an aquifer.**

Controlled Water Design Risk Assessment



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Criteria	Location	Risk	Consequence	Risk before mitigation	Preliminary Design	CONSTRUCTION Design	Risk after mitigation
Use of vibro stone columns on potential contamination pathways	Site and surrounding areas of habitat/controlled waters	on site migration of contamination	1. Risk of contaminemts migrating off site due to increased permeability	High	1. Tier Environmental Ltd, Ground Investigation Report ref TE1880-TE-00-XX-RP-GE-002-V01 assessed the site's risk to controlled waters as none to negligible 2. Treatment by VCS to ground floor slab and sprinkler tank base	Shallow depth of treatment to 3m depth which is above existing ground water levels Vibro Stone columns are treating granular made ground which will not create preferential pathways or have any adverse affect on existing ground water regime	Low