Project number	333701974	Project name	Wyndham Terrace, Egremont
Title	Piling Risk Assessment		
Doc ref	333701974-STN-XX-XX-RP-GE-5001		
Status	S2	Issue number	P01
Date	17 December 2025		
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1 Introduction

1.1 Background

This document has been written to support discharge of Planning Condition 8 of Planning Consent 4/24/2044/0F1 at a former petrol station located off Wyndham Terrace, Egremont, CA22 2DY (the site), which states:

Condition 8 – Piling

The development hereby approved shall not include the use of vibro-stone foundations unless it can be demonstrated to the satisfaction of the Local Planning Authority that their use will not cause or exacerbate the transmission of contamination into underlying strata and groundwater. Vibro-stone foundations or piling using penetrative methods shall not be used other than with the written consent of the Local Planning Authority.

1.2 Objectives

The objective of this document is to provide a Piling Method Statement and Foundation Works Risk Assessment to support discharge of Planning Condition 8 (detailed in Section 1.1).

The Piling / Deep Foundations Method Statement will include an assessment on the impacts on vibration, land stability, groundwater levels, underground pipes and other infrastructure, along with measures proposed to mitigate adverse effects.

Stantec will also undertake a Foundation Works Risk Assessment in accordance with Environment Agency Guidance to identify what additional risks to the environment piling may introduce and, if necessary, recommend measures that will mitigate any significant adverse environmental impacts.

The Foundation Works Risk Assessment will be undertaken using the risk assessment flowchart from National Groundwater & Contaminated Land Centre Report NC/99/73 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention', 2001 and will assess the site conditions against the six pollution scenarios suggested in Report NC/99/73 in terms of their potential source-pathway-receptor (SPR) linkages on the site.

1.3 Available information

The following documents, reports etc have been provided to Stantec by the Client for use in the preparation of this report or obtained from the proposed development publicly available planning application:

- 3E (Stantec), September 2021. Proposed Aldi Store, Wyndham Place, Egremont, Cumbria. Phase I Geo-environmental Assessment. Ref: P21-172/P1.
- Hydrock (Stantec), December 2023. Wyndham Place, Egremont: Ground Investigation Report. Ref: 28850-HYD-XX-XX-RP-GE-0001.
- Stantec, December 2025. Wyndham Place, Egremont: Ground Investigation Report. Ref: 333800252-STN-XX-XX-RP-GE-2001.
- Projekt, April 2021. Proposed Site Plan. Wyndham Place Egremont. Ref: 0541 - SK05.

1.4 Limitations

The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, all potential environmental constraints or liabilities associated with the site may not have been revealed.

The report has been prepared for the exclusive benefit of Stoford Properties Ltd and those parties designated by them for the purpose of providing information on the potential environmental risks associated with installing deep foundations at the site during the development. The report contents should only be used in that context. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

Hydrock has used reasonable skill, care and diligence in producing this foundation works risk assessment. The inherent variation of ground conditions allows only definition of the actual conditions at the locations and depths of trial pits and boreholes at the time of the investigation. At intermediate locations, conditions can only be inferred.

Information provided by third parties has been used in good faith and is taken at face value. However, Hydrock cannot guarantee the accuracy or completeness of any information provided by others.

The work has been carried out in general accordance with recognised best practice as detailed in guidance documents such as in the Land Contamination Risk Management (LCRM) guidance (Environment Agency 2023), BS 5930:2015+A1:2020, BS 10175: 2011+A2:2017 and NC/99/73.

2 Summary of Previous Reports

2.1.1 Phase 1 Geo-environmental Assessment

The Phase 1 desk study report identified the site was underdeveloped up until the 1960's, when a vehicle garage was developed, undergoing numerous extensions in the 1990's, with a yard in the southern half of site. The surrounding land historically supported a flax mill, gasometer, coal depots, railway lines and a brewery. Iron ore pits were indicated to the west and south of site.

The British Geological Survey (BGS) records indicated the site is underlain by Glaciofluvial deposits in the northern half and River Terrace Deposits in the south half of site, both underlain by Frizington Limestone Formation. All underlying geological strata are classified as Secondary A aquifers. The report highlighted the potential for deep Made Ground on site, based on available historical logs. The River Ehen is present 75m east of site, with the site not being at risk of flooding.

No landfill or waste transfer sites are within 250m of site. No license groundwater abstractions are present within 500m of site. The site located in an intermediate probability radon area (10% to 30%), with basic radon measures are considered necessary for new buildings on the site.

2.1.2 Phase 2 Ground Investigation Report (Ref: 28850-HYD-XX-XX-RP-GE-0001)

A preliminary ground investigation was undertaken to assess:

- Potential risks from ground or groundwater contamination, and identifying potential geo-environmental mitigation measures, where necessary.
- Risks posed by hazardous ground gases.
- Off-site disposal characterisation of materials on site.
- Geotechnical advice and recommendations.

The ground investigation comprised windowless sample boreholes with follow-on gas and groundwater monitoring, continuous penetration tests (CPTs), geotechnical and chemical testing.

Made Ground underlying hardstanding of the former fuel filling station and garage comprised beige sandy gravel of limestone with occasional cobbles to depths of 0.30m and 1.30m below ground level (bgl), with Made Ground comprising sandy gravel of concrete and mudstone to 0.60m bgl. Made Ground beneath sporadic hardstanding and sub-base materials generally comprised reworked gravelly clays and gravelly sands with gravels of mixed lithologies. Localised pockets of ashy sand with coal and clinker were present in the central and southern portions of site, where made ground was noted to be greatest in thickness. A former roadway was encountered from 0.30 to 0.40m bgl in the central northwest portion of site. Made Ground was recorded to depths of between 0.30m and >3.55m, with standard penetration tests (SPTs) ranging from 7 to 16.

Glaciofluvial Deposits in the northern and northwestern areas of site comprised medium dense gravelly sands and silty sandy gravels of mudstone, sandstone and limestone and were recorded from 0.30m and 1.70m to depths in excess of 2.50m and 5.00m, with SPT's ranging from 4 to 50, averaging 30 from 3m bgl. CPTs targeting the proposed building footprint refused at depths between 4.50m and 11.90m bgl, believed to be associated with dense Superficial Deposits or from cobbles and boulders. Groundwater strikes were recorded from 4.20m to 4.50m bgl in the central portion of site. Subsequent groundwater monitoring identified standing water between 1.05m to 4.13m bgl. Cohesive Superficial Deposits were assessed as having low volume change potential. Particle Size Distribution (PSD) tests identified 14%-16% of fines, 17%-31% of sand and 53%-69% of gravels. Made Ground was classified with a Design Sulphate Class DS-2 with ACEC site classification AC-2. Superficial Deposits were classified as DS-1 and AC-1.

Samples collected from Made Ground across site were compared against chemical screening criteria for a commercial end-use. No samples tested (15 in total) reported contaminants of potential concern (CoPC) above their respective screening criteria. Two samples in the northeast portion of site were found to contain loose asbestos fibres. One groundwater sample from the northwest portion of site was compared to screening criteria based on UK Drinking Water Standards (DWS) and Environmental Quality Standards (EQS). Slightly elevated levels of petroleum hydrocarbons (aliphatic $>EC_{12}$-EC_{35}) were recorded above their respective screening criteria, with all other CoPC below their laboratory detection limit. Effects of attenuation and dispersion were deemed to likely reduce concentrations to negligible levels before reaching a sensitive receptor.

Concentrations of methane and carbon dioxide were recorded to exceed the 5% and 1% Characteristic Situation (CS) 1 threshold, and CS2 gas protective measures were recommended for the proposed development. Gas membranes were recommended to be resistant to volatile organic compounds (VOCs). Waste acceptance criteria (WAC) analysis of soil samples collected from site indicated Made Ground and natural soils likely to be classified as hazardous waste, due to elevated total petroleum hydrocarbon (TPH) concentrations, as well as visible hydrocarbons recorded in this site. Remaining Made Ground was considered likely to be classified as non-hazardous, and non-impacted natural deposits as inert waste.

Due to the general thickness of Made Ground, conventional strip and pad foundations were not considered suitable. It was considered ground improvement techniques such as vibro-stone columns (VSCs) or controlled modulus columns (CMCs) may improve ground conditions to facilitate use of shallow foundation solutions. Should ground improvement techniques not be viable, a piled foundation solution was deemed necessary. A California bearing ratio (CBR) value of 2% with inclusion of 400mm of sub-base was recommended within external hardstanding areas.

The following further works were recommended as part of this assessment:

- Risks to controlled waters.
- Buried structures and voids.
- Ground conditions beneath existing buildings following demolition.
- Decommissioning and remedial works of the known underground storage tanks, infrastructure and impacted soils.
- Consultation with a specialist contractor regarding feasibility of ground improvement and/or piled foundation solutions.
- UKWIR assessment on suitable potable water supply pipe materials.
- Assessment of tree influence on foundation design.

2.1.3 Phase 2 Ground Investigation Report (Ref: 333701974-STN-XX-XX-RP-GE-1001)

Stantec undertook a supplementary ground investigation to resolve uncertainties identified in the previous reports, including the refinement of the conceptual site model (CSM), assess potential risk posed by ground or groundwater contamination, geo-environmental mitigation requirements, assess risks from hazardous ground gases and provide geotechnical recommendations.

The scope of this investigation comprised windowless sample boreholes and cable percussion boreholes, with groundwater monitoring follow-on, with additional chemical and geotechnical analysis.

Ground conditions encountered in the supplementary investigation generally matched those found within the initial investigation. Made Ground was proven between 0.20m to 6.00m in thickness, observed to generally be thicker in the southern portion of site.

Superficial Deposits comprising Glacifluvial Deposits and River Terrace Deposits were encountered beneath the Made Ground, however, were not fully penetrated in any exploratory location. Groundwater was encountered between 2.60m to 4.67m bgl within the Superficial Deposits. Subsequent monitoring found groundwater between 1.64m to 5.80m bgl, indicated to flow in a generally southeast direction.

Weak hydrocarbon odours and sheens were observed in Made Ground and Superficial Deposit soils sporadically, as well as within monitored groundwater in two locations along the northeast portion of site.

Asbestos was encountered within an additional five borehole locations, situated to the east of historical garage buildings in the northern portion of site. Asbestos was encountered as loose fibres of chrysotile and amosite, at concentrations ranging from <0.001% to 0.134%. No other CoPC were identified in excess of their respective screening criteria for human health within a commercial end use. A clean cover system within soft landscaping comprising a minimum of 450mm of clean soil over a geotextile membrane was recommended, along with over-excavation of service trenches to mitigate risks from asbestos fibres within soils. Validation testing of the soil surrounding the historical underground tanks was recommended following removal, to assess the potential impact of residual hydrocarbons within soils underlying site.

Groundwater chemical testing revealed some polycyclic aromatic hydrocarbon (PAH) concentrations in exceedance of their respective EQS/DWS and were considered likely to be associated with leaching from impacted soils in the vicinity of historical petroleum infrastructure. Due to site's proximity to the River Ehen, it was considered there may be a potential risk to controlled waters, which is further assessed within the Stantec detailed quantitative risk assessment (DQRA) included as an appendix to the remediation strategy and verification plan (RSVP).

Made Ground soils were assumed to be classified as hazardous waste without additional asbestos testing and site zoning. Natural soils were considered likely to be suitable for disposal within an inert landfill.

2.1.4 Remediation

The site is classified as Brownfield, due to its historical commercial use as a petrol station and vehicle garage.

2.2 Ground Model

2.2.1 Ground Conditions

Ground conditions encountered during the investigations.

Surface coverings

- Light grey concrete, sometimes reinforced. Encountered in the footprint of the former buildings.
- Black asphalt, found in the areas surrounding the buildings.

Made Ground

Encountered in all locations below the surface covering, where present, or from surface to depths of between 0.13m and 2.50m. In WS09 due to limited recovery, the depth of Made Ground could not be determined, but was between 2.50m and 4.00m bgl. Similarly in WS12 and WS13, limited recovery from 1.85m and 1.70m bgl respectively meant the base of the Made Ground could not be identified. The base of the Made Ground was not proven in WS10, WS204 and WS208.

The Made Ground was generally recorded as:

- upper layers: coarse grey sandy gravel of mixed lithology with brick, concrete and metal present.
- with depth: brown silty, sandy and slightly sandy, slightly gravelly and gravelly clay with frequent brick, rootlets, sandstone and quartzite gravel. Black staining, hydrocarbon odours and oily sheens were recorded.

Superficial Deposits

Glaciofluvial Deposits/River Terrace Deposits: Recorded in all locations below the Made Ground. The base of the strata was not proven.

The superficial deposits were generally described as:

- multi-coloured coarse sandy gravel of mixed natural lithologies (sandstone, mudstone and granite) and occasional cobbles;
- brown sometimes sandy gravelly clay with mixed natural lithologies (sandstone and mudstone);
- dark grey silty gravelly clay with mixed natural lithologies and occasional cobbles;
- orangish brown fine sand with sandstone and mudstone gravel.

Bedrock

Frizington Limestone Formation: Not encountered during the investigations.

2.2.2 Groundwater Conditions

Generally, groundwater was encountered during the site works in exploratory holes in the north of the site, at depths between 3.55m and 4.67m bgl. During the monitoring groundwater levels were recorded at between 1.05m and 5.80m bgl. In general, groundwater was encountered (predominantly) within the granular layers of the Superficial Deposits between 43.17m and 50.86m AOD.

Groundwater flows to the southeast, towards the River Ehen 150m east of the site. The river levels sit at approximately 47m OD.

Limited non-aqueous phase liquid (NAPL) petroleum hydrocarbons have been noted within BH202 with a thickness of 1mm on both 13/11/2025 and 18/11/2025. This appears to be localised, as other visual or olfactory evidence of petroleum hydrocarbons within the groundwater was limited to mild hydrocarbon odours and sheens/residue.

2.2.3 Evidence of Contamination

Visual and olfactory evidence of petroleum hydrocarbon contamination in the Made Ground and Superficial Deposits was reported in WS06 from 0.30m to 0.55m bgl, WS09 from 4.00m to 4.30m bgl, WS10 from 0.40m to 0.70m bgl, WS12 from 0.80m to 1.40m bgl, WS17 between 4.10m and 4.70m bgl, BH203 from 4.50m to 5.50m bgl, WS202 between 0.34m and 1.10m bgl, WS205 between 2.00m and 2.50m bgl, WS206 between 2.25m and 3.70m bgl.

3 Risk Assessment Summary

The risk assessment review and CSM is presented in the RSVP.

4 Summary of Geotechnical and Environmental Considerations for Vibro-Stone Columns

4.1 Introduction

The proposed development comprises the erection of a 3-storey Aldi supermarket, with associated car parking, storage areas and loading bay.

Ground conditions comprise Made Ground beneath existing hardstanding with buried infrastructure in the western and northern portions of site. This is underlain by Superficial Deposits comprising interbedded gravelly sandy and sandy gravelly clays.

In general, groundwater was encountered (predominantly) within the granular layers of the Superficial Deposits between 43.17m and 50.86m AOD and flows to the southeast, towards the River Ehen 150m east of the site.

4.2 Foundation Works Risk Assessment

The use of deep foundations has the potential to form preferential pathways for contamination migration. However, an unacceptable risk of pollution can only occur if there is a source of contamination and a receptor that could be harmed by exposure to those contaminants.

The Contaminated Land Applications in Real Environments (CL:AIRE) '*Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention*' dated 2025 report identifies seven potential source-pathway-receptor (SPR) contaminant linkages to consider in relation to piling and/or ground improvement works. These scenarios are:

1. Creation of preferential pathways, through a low permeability layer (an aquitard), to allow potential contamination of an underlying aquifer.
2. The driving of solid contaminants down into an aquifer during pile driving.
3. Contamination of groundwater and, subsequently, surface waters by concrete, cement paste or grout.
4. Direct contact of the piles or engineered structures with contaminated soil or leachate causing degradation of pile materials (where the secondary effects are to increase the potential for contaminant migration).
5. Creation of preferential pathways, through a low permeability surface layer, to allow upward migration of landfill gas, soil gas, mine gas or contaminant vapours (e.g. VOCs) to the surface.
6. Causing off site migration of ground gas or increased vertical emissions as a result of vibration or other effects from the pile installation process.
7. Direct contact of site workers and others with contaminated soil arisings which have been brought to the surface.

In Section 4.3, each of the proposed foundation solutions are initially screened against the seven preferential pathways to identify if there is a plausible environmental risk. Where a plausible risk is identified, further risk assessment is then undertaken for the proposed foundation solution and preferential pathways that are potentially affected.

4.3 Plausible Environmental Risks

Table 4.1 screens the VSC ground improvement solution against the seven preferential pathways with plausible environmental risks identified or discounted accordingly.

The following assessment is based on the available information from the available ground investigations (see RSVP text for full details).

Table 4.1: Summary of plausible environmental risks from deep foundations

Preferential Pathway Scenario	Proposed Foundation Solution	Plausible Risk	Comments
Scenario 1 Creation of preferential pathways, through a low permeability layer (an aquitard), to allow potential contamination of an underlying aquifer.	VSC	Yes	There is the potential to form a preferential pathway between the Made Ground and the underlying Glaciofluvial Deposits, although there does appear to be some hydraulic continuity between the strata. The permeability of the VSCs is likely to be high, and allow for migration of contaminants to underlying strata.
Scenario 2 The driving of solid contaminants down into an aquifer during pile driving.	VSC	No	VSCs involves horizontal displacement and densification of soil which the column is constructed. In normal circumstances this will not lead to soil being dragged downwards. The SPR linkage is therefore incomplete and this Scenario is not considered further.
Scenario 3 Contamination of groundwater and, subsequently, surface waters by concrete, cement paste or grout.	VSC	No	VSCs will not lead to the leaching of concrete, cement paste or grout into fast flowing groundwater. The SPR linkage is therefore incomplete and this Scenario is not considered further. Note: vibro-replacement concrete columns are at risk of this.
Scenario 4 Direct contact of the piles or engineered structures with contaminated soil or leachate causing degradation of pile materials (where the secondary effects are to increase the potential for contaminant migration).	VSC	No	Certain types of stone, particularly limestone and those derived from calcareous rock, may susceptible to attack under certain conditions. Selection of a durable and chemical resistant stone is an appropriate measure. The SPR linkage is therefore incomplete and this Scenario is not considered further. All below ground concrete to be designed in accordance with the requirements of BRE SD1.
Scenario 5 Creation of preferential pathways, through a low permeability surface layer, to allow upward migration of landfill gas, soil gas or contaminant vapours to the surface.	VSC	Yes	The high permeability of VSCs make them a preferential migration route for ground gas. Gas protective measures may need specific design changes or enhancement to account for the stone columns.
Scenario 6 Causing off site migration of ground gas or increased vertical emissions as a result of vibration	VSC	No	VSCs are designed to densify the ground and therefore reduce the volume of space for gas. Gas is far more likely to migrate up the stone column rather than any distance horizontally.

Preferential Pathway Scenario	Proposed Foundation Solution	Plausible Risk	Comments
or other effects from the pile installation process.			
Scenario 7 Direct contact of site workers and others with contaminated soil arisings which have been brought to the surface.	VSC	No	There are no arisings brought to the surface using this technique hence direct contact is not considered to be a viable pathway. The SPR linkage is therefore incomplete and this Scenario is not considered further.

4.4 Risk Assessment of Potential Environmental Adverse Impacts

4.4.1 Scenario 1 of preferential pathways, through a low permeability layer (an aquitard), to allow potential contamination of an underlying aquifer

The shallow groundwater body is likely to be perched and there appears to be some hydraulic continuity between the Made Ground and Superficial Deposits (Secondary A aquifer). The deeper Frizington Limestone Formation is also classified as a Secondary A, however, the depth and extent of this strata in relation to site is currently unknown. Both strata are likely to comprise permeable layers that can support local water supplies and may form the source of base flow to rivers.

Evidence of hydrocarbon contamination was identified during the two phases of intrusive ground investigation, associated with historical petrol station and garage fuel infrastructure. The first ground investigation identified hydrocarbon contamination within both Made Ground and natural strata which, where tested, was identified at concentrations slightly exceeding their Controlled Waters screening criteria. These concentrations were deemed low enough that natural attenuation through the groundwater would reduce chemical concentrations to which they would not be at risk to sensitive receptors following DQRA.

It is understood APK have undertaken a tank cleaning operation within the fuel infrastructure underlying site in October 2025. A gas free certification was then undertaken following the cleaning operation which confirmed the absence of flammable gases or vapours, indicating the tanks were safe undertaking works in confined spaces and hot works. The risk from contaminants originating directly from the fuel infrastructure is deemed to be negligible with respect to migration to Controlled Waters or to future site users via inhalation of harmful gases. It is understood buried fuel infrastructure will also be removed as part of the site redevelopment.

Given the fuel infrastructure is still within the ground and the site’s commercial history, the full extent of contamination within the underlying made ground or natural strata may not be fully understood. Additionally, both the Made Ground and Glaciofluvial Deposits comprised interbedded low permeability clays between granular strata, which may be preventing migration of contamination into the underlying water-bearing aquifer.

When the fuel infrastructure is removed, any impacted soil encountered during excavation works will be removed prior to any foundation or ground improvement works. Additionally, a concrete plug across the zones of natural strata each column crosses may be prudent to restrict the potential migration of contaminants through an otherwise highly permeable stone column.

4.4.2 Scenario 5 of preferential pathways, through a low permeability surface layer, to allow upward migration of landfill gas, soil gas or contaminant vapours to the surface

VSCs are highly permeable, making them a preferential migration route for ground gas. Slightly elevated methane and carbon dioxide concentrations have been identified in the southwest portion of site during the first ground investigation. These concentrations indicate the site is classified as Characteristic Situation (CS) 2, and the proposed development requires basic gas protective measures. Likewise, the site lies within an area of 10% to 30% radon potential, indicating radon protective measures will also be required for the proposed build.

Gas flow was recorded at a maximum flow rate of 0.3 l/s. While not particularly fast flowing, gas migration may be promoted via the preferential pathway created by the VSCs high permeability. With this in mind, gas protective measures may require specific adjustments or enhancements to account for the preferential pathway of ground gas migrating to the proposed development.

It is not appropriate to increase the site CS nor design the BS 8485 points system where stone columns are present. The gas protection system and sub-slab venting should be designed based on modelling gas generation, flow towards and accumulation in the stone columns, followed by gas generation up the columns. Gas screening values or hazardous gas flow rates are not appropriate in this instance, and models should be based on diffusive and/or advective flow.

Where columns are located below foundations and are covered by concrete foundations, it is likely the columns will not increase gas risk. Where columns are present below floor slabs connected to the sub-base, may increase gas risk if columns are present at sufficient number. If an active gas extraction system is installed in the gas source, the provision of stone columns may allow ingress of air into the ground, with deleterious effects. Active sub slab pressurisation systems can also force air into the ground via the columns, and effects should be considered as this can increase the risk of spontaneous combustion.

4.4.3 Summary

Based on the discussions in the sections above, following removal of tanks and associated infrastructure the use of the proposed VSCs pose a low risk to Controlled Waters beneath the site.

A suitable regime of groundwater sampling and surface water monitoring, sampling and testing should be carried out at regular intervals during and after the construction period (where development allows), to monitor whether contamination has been mobilised and allow for works to be modified if necessary.

4.4.4 VSC QA/QC Control Measures

Outside of normal QA/QC control measures imposed in ground improvement measures, additional groundwater monitoring prior to, during and after VSC installation would be recommended to confirm the presence of contaminants within the underlying groundwater. Should contaminants of concern be observed within the underlying groundwater, advise from a specialist environmental consultant should be sought.

Gas monitoring and headspace testing proposed development should also be undertaken within the vicinity of installed VSCs to assess the potential risk from migrating ground gases to the proposed build. Should hazardous levels of ground gases be detected, advise should be sought from a ground gas specialist to advise on potential mitigation measures.

As mentioned above, concrete may be introduced to the VSCs to act as a relatively impermeable barrier to migrating contaminants in groundwater and upward migrating hazardous gases. Should this be considered further, advise from a specialist ground improvement contractor should be sought to confirm its potential feasibility, and contractors on site should monitor for concrete/grout bleeding into underlying groundwater.

Due to the potential for soil contaminants to be present within Made Ground and natural strata on site, risk to groundworkers is considered low to moderate. All construction workers should use appropriate PPE in the form of gloves, overalls and protective eyewear. Groundworkers should maintain good hand washing regime and adopt designated eating, drinking and smoking areas.

Should evidence of soil contamination be encountered during the proposed development, advise from the specialist environmental consultant should be sought. Site soils will be exposed for a limited duration during construction operations and standard site security measures such as fencing around the works will prevent access by members of the public to any exposed soils. Measures will be taken to prevent dust generation from stockpiles and excavations, and damping down may be necessary during periods of dry windy weather.

5 Vibro-Stone Column Method Statement

5.1 Introduction

The potential environmental impacts of VSCs on vibration, land stability, groundwater levels, underground pipes and other infrastructure is summarised below.

5.2 Vibration

Significant vibration is not likely to be generated by installing VSCs, however, use of vibration monitoring on the surrounding site boundaries and in the vicinity of existing buried services, should they be proposed to remain in situ for the proposed development, may be used to monitor vibration levels and ensure they are kept below threshold values.

5.3 Land Stability

The use of ground improvement rigs on the Made Ground and Superficial Deposits is likely to lead to excessive settlement beneath the rigs and/or stability issues due to the rigs weight and their expected poor bearing capacity and high compressibility.

To mitigate this risk, the design and construction of a working platform for piling rigs should be undertaken in accordance with BRE 470 '*Working platform for tracked plant - good practice guide to the design, installation, maintenance and repair of ground-supported working platforms*', or a working platform design by a specialist supplier.

5.4 Groundwater Levels

The VSC works are not proposed to alter the groundwater levels beneath the site as part of the construction works.

5.5 Underground Infrastructure

Prior to installing the VSCs, service plans should be consulted and underground services located and marked out. This will include using the current utility records and any information obtained from existing Ground Penetrating Radar (GPR) surveys. Vacuum excavated trenches and hand dug pits will also be used to locate underground services and prevent damage to them during the piling works.

It may also be necessary to re-route underground services if they clash with the locations of proposed piles.

5.6 Overhead Infrastructure

There are no overhead services on site.

6 References

BRE 470. 2004. ‘Working platforms for tracked plant: good practise guide to the design, installation, maintenance and repair of ground-supported working platforms’. BRE, Garston, Watford.

BRITISH STANDARDS INSTITUTION 2009. ‘Code of Practise for noise and vibration control on construction and open sites’. BS 5228-1:2009+A1:2014. BSI, London.

BRITISH STANDARDS INSTITUTION. 2020. Code of practice for ground investigations. BS 5930:2015+A1:2020. BSI, London.

FEDERATION OF PILING SPECIALISTS. 2014. ‘CFA Piling: Preventing ground and rig instability through over-flighting’. FPS.

HIRD. C.C., EMMETT K.B. & DAVIES G. 2006. ‘Piling in layered ground: risks to groundwater and archaeology’. Science Report SC020074/SR. Environment Agency.

CL:AIRE 2025 ‘Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention’.