

LAND AT ACORNFIELD ROAD, KNOWSLEY REMEDIATION STRATEGY

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ISSUE 2.0



SPIRE
GEOTECHNICAL
Geologists &
Site Investigation Specialists



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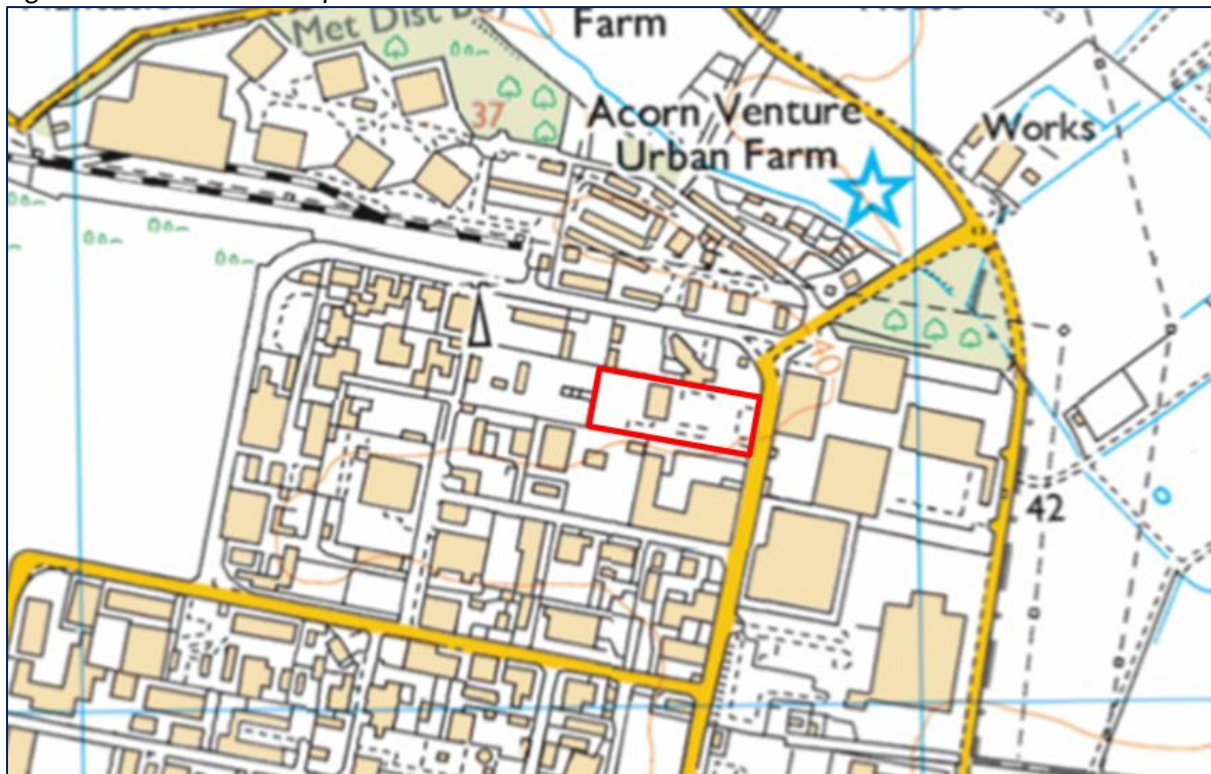
1.0 INTRODUCTION

1.1 Commission Details

Spire Geotechnical Limited (SGL) was commissioned by Building Design Northern Ltd (BDN) to prepare a Remediation Strategy Report for the proposed development located at Acornfield Road in Knowsley Industrial Park. This Remediation Strategy was prepared following the completion of a Phase 2 Ground Investigation (SGL, January 2026, Issue 2.0).

The Remediation Strategy Report should be read in conjunction with the interpretive Phase 2 Ground Investigation Report (Reference S2405/02, Issue 2.0).

Figure 1: Site Location Map



Source: www.bing/maps

The site is being considered for a new commercial development. The existing site will be cleared and replaced with a new commercial unit. Associated work includes the creation of new areas of hardstanding, permeable paving and areas of soft landscaping.

The February 2025 Phase 2 Ground Investigating Report (Issue 2.0) concluded:

- Made ground in the site centre and east is impacted by volatile contaminants which may be currently potentially harmful to human health.
- Whilst a nominal thickness of made ground and polluted shallow groundwaters will be removed from site during ground preparatory work, residual contamination may remain in the ground, and mitigation could include the placement of a hydrocarbon and VOC resistant membrane.
- To manage and reduce the current risk, an Options Appraisal and Remediation Strategy was recommended.

1.2 Report Objectives

This report aims to establish appropriate remedial measures/techniques that can be employed at the site to block, reduce and/or remove the identified contamination linkages. By managing the identified contamination linkages, the site shall be certified as safe and fit for purpose as a commercial development.

This report has been undertaken in general accordance with the following guidance/standards:

- Technical Guidance for Developers, Landowners and Consultants, Yorkshire and Lincolnshire Pollution Advisory Group, YALPAG (Version 3.4, November 2017);
- The VOCs Handbook, CIRIA C682, 2009;
- Remediating and mitigating risks from volatile organic compound (VOC) vapours from land affected by contamination, CIRIA C716, 2012;
- BS10175:2011+A2:2017 Investigation of Potentially Contaminated Sites; and,
- Land Contamination Risk Management, EA 2020

Whilst Knowsley Metropolitan Borough Council may not directly endorse the YALPAG document, the latter has been used as a good practice guide only in terms of making recommendations to the client within this report.

2.0 SITE CONTEXT

2.1 Site Location

The site measuring approximately 1.45Ha is located at Acornfield Road, Knowsley Industrial Park, Kirkby (Figure 2). The site lies at an approximate Ordnance Survey (OS) National Grid Reference (NGR) of 343647, 399369.

Figure 2: Site Aerial Image (pre-demolition)



Source: www.google.com/maps

2.2 Site Description

Table 1: Site Details

Features/Sources	Description/Remarks
Site Description and Walkover Survey	The site is located to the west of Acornfield Road in the northern area of the existing industrial park. The central and eastern areas of the site include a flat disused area of land. Relict surface features including access routes and ground slabs are present. Areas of placed gravel are present in between the existing hard standing, and it is understood this material has been placed post-remediation of the shallow ground in 2017. A large area of the central part of the site was ponded during the walkover, with standing water present above relict ground slabs.

	In the west is an existing commercial unit. To the west of the unit is a gravel surfaced yard area.
Access	Access to the site is gain via the east off Acornfield Road.
General Topography	The site includes a generally flat/level area. LiDAR data suggests that the site falls on an approximate elevation of approximately 39m AOD.
Adjacent Land-use	The site is generally surrounded by units and works, external yards and storage areas associated with the wider industrial park. Applied Nutrition is located to the east beyond Acornfield Road. DD Wilson Gas and Heating Engineers is present to the north. Stericycle is present to the south.
Invasive Species	The majority of the site is void of established vegetation. There were no obvious signs of invasive weed species (such as Japanese Knotweed) present in the site's peripheral areas, although this should be confirmed by a qualified ecologist.

2.3 Summary of Site History

The site in the 1800s was undeveloped. By the 1950s, the site is potentially part of MOD land. By the 1960s, the site is classed as a depot. By the 1970s, the site is named as an oil depot. Several tanks and structures are present on the site. By the 1990s, the site has been developed with a series of structures/works units. By 2013, the majority of the site area was cleared. Remedial work has taken place locally in the site centre in 2017 relating to clean up of shallow hydrocarbons and volatiles in the soils and perched waters.

Land in the surrounding area was initially agricultural. By the 1950s, large areas of land was inferred to be MOD in use. By the 1960s, the surroundings were built up with an industrial estate/park.

3.0 CONTAMINATION LINKAGES

3.1 Previous Investigation (February 2025)

SGL has considered the following previous investigation undertaken in January 2026 (Issue 2.0):

Phase 2 Ground Investigation Report, SGL, S2405/02, January 2026.

Table 2: Summary of February 2025 Investigation

Features/Sources	Description/Remarks
Scope of Previous Works	A ground investigation comprised 6 no. windowless sampling boreholes and 8 No. trial pits with sampling and insitu testing. The boreholes and trial pits were supervised by an experienced geotechnical engineer, and materials were recorded to BS5930. Gas monitoring was conducted on three occasions (assuming a very low risk to the site from ground gasses) from 3 No. borehole wells. Ground gas is not considered a contaminant of concern within this remediation strategy.
Ground Conditions	Made ground was recorded in each position to depths of between 0.20m and 1.20m depth below surface. Made ground generally includes concrete or gravel surfacing. In the west, the made ground included roadstone/aggregate locally overlying a thin clay fill. In the site centre, a placed stone backfill is present (part of previous remedial work in 2017). The made ground overlies firm and stiff cohesive glacial till deposits. The till was initially soft in nature. The clay overlies solid geological deposits of sandstone at an approximate depth of 10m from surface. Localised areas of shallow trapped/perched groundwater were observed generally at the made ground and natural clay interface. Future works should attempt to pump out, store and remove from site groundwaters, which may locally contain residual contaminants.
Land Contamination Assessment	The made ground in the central and eastern areas of site contains elevated VOCs and SVOCs which are potentially harmful to human health (construction workers and future end-users). The above contamination may be seen as residual/background concentrations, and mitigation (such as the placement of a hydrocarbon/vapour membrane) may be acceptable subject to further sampling and assessment. An Options Appraisal and Remediation Strategy should be developed. The strategy should include details relating to the blocking and/or removal of "contaminated" materials. Where limit areas of soft landscaping are proposed, the strategy shall document requirements for the inclusion of clean cover capping materials. If by default, extensive amounts of made ground (and groundwater) require disposal to make way for a new ground slab with supporting

	engineering fill, then this provides betterment to the current site conditions through the removal of a significant quantity of contaminated material/waste.
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3.2 Contamination Sources

The source of contamination originates within the made ground deposits across the site. In summary, the January 2026 investigation recorded:

- Elevated VOCs has been recorded in several locations, including 1,2-dichloroethane: TP03 (1.50-2.00m), TP04 (0.50-1.00m), TP05 (0.40-0.60m), TP07 (0.60-0.80m), TP08 (0.20-0.60m). Cis-1,2-dichloroethylene: TP07 (0.60-0.80m), and 1,2,4-trimethylbenzene: TP04 (0.50-1.00m), TP07 (0.60-0.80m)

For reference purposes, a contamination “hot-spot” location plan is included within Appendix 1.

3.3 Confirmed Contamination Linkages

The January 2026 investigation documented the following contamination linkages at the site.

Table 3: Summary of Contamination Linkages

AVAILABLE CONTAMINANTS, PATHWAYS & RECEPTORS						
Contaminants			Pathways		Receptors	
C1 C2 C6	Elevated concentrations of VOCs in five locations when considering human health GAC.		P1	Direct soil and dust ingestion (including dermal contact)	R1	End-users
			P2	Inhalation of indoor dust	R2	Construction and utility works
	Materials may be unsuitable for reuse due to the VOC/SVOC concentration values.		P3	Inhalation of outdoor dust	R6	Building Structure and Construction Materials
			P4	Direct contact		
RISK EVALUATION						
Linkage			Risk	Risk Action		
C1 C2	P1 P2 P3 P4 P5	R1 R2 R3 R4 R5 R6	LOW-MOD	Remove from site upper made ground soils and perched waters, particularly in the site centre and east. Either a remediation strategy or Materials Management Plan may be required. If materials are to remain onsite and consideration is given to use of hydrocarbon/vapour resistant membranes, further supporting sampling and testing (i.e. risk assessment) may be required.		

4.0 OPTIONS APPRAISAL

4.1 Summary of Available Options

Given the findings of the completed investigation/s described in the above sections, we consider that there are four realistic options available for the management of this material:

- A. Removal from site, thus severing the pollution linkage (remove source)
- B. Removal of contaminated made ground material in proposed soft landscaped areas and areas of permeable paving, and reuse as general fill below areas of hardstanding and building footprints (remove source and block pathway)
- C. Placement of clean/suitable topsoil and subsoil in soft landscaped areas (block source) or placement of clean stone in areas of permeable paving.
- D. Use of a barrier system beneath the proposed building footprint (block source)

Whilst we recommend a combination of all Options A, B, C and D above, where possible option A should be limited considering the overall industry “waste” hierarchy (i.e. reduce, reuse, recycle, disposal – the latter being the least favourable option).

Investigations completed by SGL and others previously, have identified source-zone materials in the site centre and east. The western areas of site are largely not impacted by significant levels of contamination.

It should be noted that in 2017, two remediation cells/locations in the site centre have been remediated. However, areas of residual contamination remain in the ground, and this has been confirmed by SGL.

The Options A to D above serve to offer betterment. Shallow contamination impacted soils, and groundwater can be managed and the risks to end-users can be reduced. Where it is unrealistic to remove all the contamination source materials from beneath the impacted areas, SGL recommend management of the contamination linkages through the removal of materials (soils and waters), placement of clean materials, and placement of barrier membranes. The latter will include hydrocarbon and VOC resistant membranes beneath the new building. In areas of permeable paving and soft landscaping, a hi-viz contamination membrane shall be placed at the remediation formation.

Full details relating to Options A to D have been considered in the following Sections.

4.2 Revised Conceptual Model (Post Remediation)

Table 4: Contamination Linkages (Post Remediation)

Linkage			Contamination Source	Risk Action	Risk Post Remedials
C1	P1	R1	Made Ground materials containing elevated speciated hydrocarbons and VOCs.	Removal from site any obvious grossly contaminated material, including soils, excavated material, and ground waters (source treatment - partial removal of contamination source)	LOW
C2	P2	R2		In all external areas of soft landscaping and permeable paving, remove existing made ground to leave the site surface 0.60m below proposed finished levels. At 0.60m, placement of a hi-viz contamination barrier membrane. (pathway management - partially blocking of contamination source material)	
	P3	R3		Placement of a clean soils (comprising clean topsoil and subsoil) in all soft landscaping areas. Placement of clean imported stone in areas of permeable paving.	
	P4	R4		Placement of a suitable ground barrier system beneath the new building footprint to include a hydrocarbon and VOC/vapour resistant membrane (pathway management - breaking contamination linkage, blocking source).	
	P5	R5			
		R6			

The proposed remedial works aim to block the contamination sources from proposed end-users who will be utilising the site, including the building and external soft landscaped areas. The revised Conceptual Site Model (Table 4) takes into consideration the post-remediation activities.

5.0 REMEDIATION STRATEGY

5.1 Proposed Layouts & Ground Profile

A series of drawings relating to existing site levels, proposed levels and earthworks levels are presented in Appendix 1.

As per the proposed development layout, the proposed building footprint will occupy the site centre extending to the west. In the east, areas of car parking with limited soft landscaping are being considered. The areas of paving will consist of permeable paving. Access will extend to the south of the new building to a yard area located in the south west.

The proposed building will be placed on a raised area. It is assumed that an initial site strip will commence, and all of the existing slabs and hardstanding will be “grubbed” out. An engineered stone fill platform will then be used to raise the ground profile to accommodate the new building.

In contrast, the elevation of the proposed area of new access, the yard in the west, and the eastern areas of car parking will be slightly reduced.

5.2 General Site Activities

Whilst the Remediation Strategies focus is to outline measures to make safe future end users within the building and site, including soft landscaped areas, general good practice requires consideration for those workers (particularly ground and utility workers) who will be coming in contact with made ground soils.

For future site works, particularly during the site strip/clearance and provision of utility/foundation runs and general excavations, the appointed Principal Contractor should make provisions to safeguard (through site documentation, procedures and welfare provisions) all personnel who will potentially come into contact with contaminated material. As a minimum, the following should be considered further:

- site induction regarding handling and managing excavations and excavated material;
- suitable dampening down (particularly during dry spells);
- excavations left open for long periods should be suitably covered (i.e. to reduce the release of windblown materials);
- the use of suitable PPE at all times (including disposable overalls, gloves and dust masks);
- suitable storage / containment of shallow arisings generated during earthworks and excavations; and,
- the provision of suitable welfare and hand-washing facilities.

Further reference should be made to the “Construction Code of Practice for the Sustainable Use of Soils on Construction Sites” (DEFRA, 2009).

It should be noted that acute and medium-term exposure to volatiles and contaminants in the ground needs consideration when factoring the potential health effects on construction workers, particularly during the ground preparatory phase.

In addition to the general good practice measures outlined above, the following should also be considered which take into account (considering the nature of the contaminants present in the ground):

- ✦ Air quality monitoring. These should also include positions at the site boundary to ensure that the works do not potentially impact neighbouring land.
- ✦ Personal monitoring of groundworkers and suitable health surveillance.
- ✦ Development of a suitable emergency action plan

Prior to commencing with any earth-related groundworks, a Health and Safety Plan shall be prepared by the Principal Contractor which will include a detailed method statement for the works.

5.3 Management of Excavated Material

The Principal Contractor has the responsibility to ensure groundworks do not inadvertently cross-contaminate “clean” soils.

As a rule, the Principal Contractor shall ensure that all underground utilities and foundation excavations are completed before preparing the external soft landscaped areas and areas of permeable paving.

The Principal Contractor shall ensure that excavated arisings (from service corridors, foundation excavations and the removal of made ground in soft landscaped and permeable paving areas) are suitably stored / contained (i.e. to avoid potential cross-contamination with clean cover materials or materials elsewhere to be used within soft landscaped area).

A plan shall be developed to illustrate how and where arisings and excavated materials from site will be stored/contained. Such details shall also indicate where imported materials will be located on the site.

The excavation of service corridors, placement of new utilities and backfill, foundation excavations, and removal of made ground in soft landscaped areas shall take place prior to the placement of clean cover capping in soft landscaped areas to prevent cross-contamination.

As a minimum, the Principal Contractor shall ensure that all newly placed utility runs, including drainage, drinking water infrastructure etc, at all locations across the site, are placed in suitably prepared trenches and surrounded by, “clean” backfill material. Granular material will act as a capillary break layer and sever direct contact with any made ground material. The purpose of the clean backfill and surround is to offer protection from potential cross contamination from any residual contaminants left in the ground.

Where material (including soils, water/liquid) is to be removed from site as waste, the Principal Contractor shall keep and provide to SGL all documentation including:

- ✦ Waste Classification Testing results
- ✦ Confirmation of waste acceptance from the landfill/tip
- ✦ Details of waste volumes
- ✦ Waste transfer notes and tickets
- ✦ Supporting drawings and photographic evidence where required

Material shall be exported from site as waste if there is no use onsite for such material, and/or the material is deemed to be contaminated.

The Principal Contractor shall note that shallow perched groundwater is likely beneath the existing areas of hard standing. These waters may contain contaminated material, including free phase liquid. The Principal Contractor shall have measures in place to extract, store and suitable dispose of all groundwater that inundates excavations.

Once the standalone structure in the west has been removed, an inspection of the remedial formation, inline with depths elsewhere onsite, shall be made. The inspection shall rely on photographic evidence, as well as waste tickets and associated WAC analysis.

5.4 Importing Clean Material

Based on the existing ground conditions, importation of clean topsoil for use in soft landscaping is considered necessary. If insufficient quantities of natural ground (i.e. generated during general excavations) are available for use as subsoil, the Principal Contractor shall consider importing subsoil.

In areas beneath the new building footprint, and areas of hardstanding (including permeable paving), a large quantity of clean stone shall be imported to site.

Where materials are imported to site, they shall be tested at source using the sampling and testing matrix presented in Table 5. Appropriate chemical screening shall be carried out to verify whether imported materials are suitable for use at the development site.

The Principal Contractor is responsible for the retaining of all tickets / receipts following delivery of imported material onto site. Tickets / receipts shall be provided to SGL for inclusion within the Validation Completion Report.

Prior to importation, the Principal Contractor shall ensure topsoil, subsoil, and stone materials are clean and suitable for use. The following measures are required:

- ✦ Establish a source of suitable clean garden materials (topsoil/subsoil).
- ✦ Establish a source of suitable granular material for use such as capping and construction fills.
- ✦ These materials shall be tested at source for a range of contaminants to determine their suitability before being brought to site (responsibility: Principal Contractor).
- ✦ Typically, any materials deemed appropriate for use will need to be screened prior to transportation and emplacement using the sampling and testing matrix presented in Table 6 (responsibility: Principal Consultant).
- ✦ Laboratory testing will be undertaken at both the source (i.e. prior to importation) and following emplacement.
- ✦ Test results will be compared against screening values outlined in Appendix 2.

The Principal Contractor shall prepare a designated area of the site where imported clean materials can be contained and stored prior to placement in garden/soft landscaped areas or stone/capping materials.

Table 5: Materials Testing Matrix

Type	Number of Samples	Testing Schedule	Assessment Criteria
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Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As,Cd,Cr,CrVI,Cu,Hg,Ni,Pb,Se,Zn)	This needs to be agreed with the Local Authority. The Assessment criteria need to be UK based, e.g. SGV's, LQM or other similarly derived GAC's.
Crushed Hardcore, Stone, Brick	Minimum 1 per 1000m3	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Greenfield/ Manufactured Soils	Minimum 3 or 1 per 250m3 (whichever is greater)	Standard metals/metalloids (As above) PAH (16 USEPA speciation) Asbestos	
Brownfield/ Screened Soils	Minimum 6 or 1 per 100m3 (whichever is greater)	Standard metals/metalloids (As above) PAH (16 USEPA speciation) TPH (CWG banded) Asbestos Any additional analysis dependant on the history of the donor site.	

5.5 Clean Cover Capping Requirements

Given the anticipated finished external ground levels, a clean cover capping system (protection barrier) layer is required where made ground remains insitu at depths greater than 0.60m from finished external ground levels. If made ground is <0.60m in thickness, the contamination source materials will be removed by default. The excavations shall be backfilled with clean subsoil and topsoil.

In all external areas of soft landscaping, the site surface should be initially left 0.60m below proposed finished levels to allow for the placement of clean soil/ materials. The 0.60m excavation assumes the clean cover materials will be placed above made ground deposits.

The clean cover capping system will include **a minimum 150mm layer of clean topsoil** over a **maximum thickness of 450mm of clean subsoil** (see section outlined in Appendix 2). This assumes that the clean topsoil and subsoil (a minimum of 600mm thickness) will be placed above the made ground materials.

Given the nature of the residual contamination and general uncertainty regarding the longer-term intermixing of materials, a **hi-viz contamination geomembrane** shall be placed above the remaining made ground and below the placed clean subsoil and topsoil.

5.6 VOC Barrier System

Whilst the 2017 remediation cleaned up two large cells positioned beneath the proposed building footprint; residual contamination remains.

The ground preparatory works (earthworks) as detailed in Appendix 1 will include the general “grubbing up” and removal of the existing concrete slabs and surfacing present in the site centre and east, and including the slabs associated with the existing standalone structure in the west.

Once the existing slabs and concrete (site wide) have been lifted, this new formation should be inspected by a suitably qualified geoenvironmental engineer. Any obvious signs of gross contamination, including free phase materials (including liquids), shall be removed to a suitable depth. Whilst residual contamination will remain in the ground within the made ground, attempts to removed as much unsuitable/contaminated material will inevitably lead to betterment. The remedial formation inspection shall include an engineers report and supporting photographic evidence. The contractor shall also provide evidence of waste classification and testing, and tickets relating to the removal of waste.

During all excavation and ground preparatory works beneath the building footprint, any perched/trapped groundwater sitting beneath the concrete slabs and hard standing shall be pumped out, suitably contained and disposed offsite to a suitable waste acceptor.

By removing any inappropriate fills and groundwater, this partially removed some of the contamination source material.

The above measures are considered contamination source treatment by reducing the source through partial removal of impacted soil and water.

Based on the proposed earthworks levels when compared to existing surface level, the proposed building as a whole will be raised and placed onto an earthwork’s platform. It is highly likely that the platform will consist of imported granular fill, suitably compacted in layers to the underside of a new ground bearing slab.

Prior to the design of the construction layers beneath a proposed ground slab, it must be recognised that residual volatile contamination will remain in the ground. Whilst these levels have been reduced from both the 2017 works, and any earth-related preparatory works, mitigation control is still recommended to protect future end-users.

In consideration of the above, the mitigation shall include contamination pathway management through use of a suitable ground barrier system integrating a hydrocarbon and VOC resistant membrane. The barrier system can include both earthworks capping (imported stone to raise the ground), construction sub-base material and the membrane.

Independent to this report, a barrier system including section drawing/s of the proposed construction and methods shall be prepared for the purposes of seeking acceptance through the regulatory process (such as Building Regulations etc.).

The above detail should be prepared by a qualified person, the appointment of which is largely dependent on the system that will be adopted.

Whilst there are several ground barrier systems available, the following should be considered for the supply of construction related information (detailed design) in support of gaining regulatory approvals:

-  Puraflex
-  Juta

Whilst there is no related British Standard for the installation of hydrocarbon/VOC resistant measures, it is recommended that the detailed design should be in keeping with BS8485, 2019 (which relates to ground gas).

Notwithstanding this, the purpose of designs is to reduce and limit the ingress of vapours in order to protect future end-users. Information from the site investigation/s should be provided to the supplier of the membrane barrier system to allow for detail designs and construction sections to be provided.

6.0 VERIFICATION STRATEGY

6.1 Importing Materials

The Principal Contractor shall ensure that all testing/screening certificates are provided to SGL prior to importing materials.

SGL will assess the testing data against the screening values presented in Appendix 2 and advise the Principal Contractor on suitability for use. Where materials fail to meet the required screening values, the Principal Contractor has the responsibility to resource an alternative supply of material.

All certificates of imported clean topsoil, subsoil and stone shall be provided to SGL for inclusion within a Validation Completion Statement.

6.2 Placement of Clean Cover Capping Material

The contractor is responsible for the placement of clean cover capping materials. Once an area or areas are prepared, and clean capping materials have been placed, SGL shall be given 48 hours' notice to attend site for the purposes of undertaking a validation inspection and sampling.

For the purposes of preparing a remedial completion statement for the site, there is a requirement for SGL to validate that a sufficient thickness of clean cover capping materials (topsoil and subsoil) has been placed above a hi-viz contamination geomembrane. For completeness, the geomembrane shall also be placed at the base/formation of permeable pavement areas.

Inspection Ratio

The inspections undertaken by SGL shall be based on the following plot frequencies:

Table 6: Inspection Ratio

No. Plots within Development	Frequency of inspection pits	Notes/Remarks
1 – 5	1 inspection pit per plot	e.g. for 3 plots, dig 3 inspection pits
6 – 12	1 inspection pit per 2 plots	e.g. for 9 plots, dig 5 inspection pits
>13	1 inspection pit per 3 plots	e.g. for 50 plots, dig 17 inspection pits

Given the layout of the proposed soft landscaping (as shown in Appendix 1), the above inspection ratios may not be possible. Given this uncertainty, SGL recommends **a total of 6 No. inspection locations at soft landscaping areas** across the site (i.e. thus providing site wide representation).

Inspection Protocol

On each inspection visit, SGL shall:

- ✦ Inspection the full thickness of the clean materials to ensure this is sufficient thickness (i.e. 600mm). The excavation shall be taken to the hi-viz contamination geomembrane.
- ✦ Take photographic evidence for use within an interim validation report.



- ✦ Retrieve two representative soil samples (one of placed topsoil and one of placed subsoil) from each inspection pit.
- ✦ Subject samples to laboratory analysis and compare the results to a series of assessment criteria values outlined in Appendix 2.

6.3 VOC Barrier System

A qualified person shall be responsible for the inspection and provision of an independent completion report in relation to placement of the vapour barrier system beneath the proposed building ground slab.

At this stage, the following minimum information will be provided within the inspection completion report:

- ✦ Photographic evidence relating to the types, thickness of placement materials, and products used.
- ✦ Provision of a completion statement, to be included within the wider validation report.
- ✦ Photographic evidence of formation inspection and placement of materials relating to the hydrocarbon/vapor barrier system. To include an independent inspection report from the appointed qualified person supplied by Puraflex, Juta, etc. (TBC).

6.4 Validation Reporting

Following the completion of the proposed remedial works, a Validation Completion Report shall be produced by SGL documenting the remedial works undertaken. The following items will be included within the report.

- ✦ Tickets / receipts to be provided to SGL as proof of origin of all imported materials.
- ✦ Tickets/ receipts to be provided to SGL of all exported material, including soil and water/liquids. To be supported with general site photographs.
- ✦ Chemical analysis results from source testing of imported materials (used within clean cover and engineered fills).
- ✦ Chemical analysis results from emplacement testing of imported materials (clean materials based on a minimum of 6 No. validation sampling locations (with testing of 1 No. topsoil and 1 No. subsoil sample).
- ✦ General photographic record of the works showing the progress of the works, stockpiles of materials, depth of excavations, the thickness of placed material etc.
- ✦ General photos showing the excavation and backfill of service corridors around newly placed underground pipes/utilities.
- ✦ During the removal of made ground materials down to the level of an agreed remedial formation (considered 600mm beneath existing ground level), photographs (either by the Principal Contractor or supervising engineer) shall be taken at regular intervals.
- ✦ Evidence of the placement of a hi-viz contamination geomebrane at the base of excavations relating to soft landscaping and permeable pavement areas.
- ✦ Details of air monitoring, including at the perimeter, to ensure compliance with good practice in reducing/limiting offsite contaminants.