Phase 3: Remediation Strategy & Verification Procedure

The Old Nursery, Thornton Road, Goxhill

Produced for Mr R Staves

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Humberside Materials Laboratory Ltd
Atherton Way, Brigg
North Lincolnshire DN20 8AR
Tel 01652 652753

www.humbersidematerialslab.co.uk

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1 Introduction

Humberside Materials Laboratory Limited (HML) were commissioned by Mr R Staves to produce a remediation strategy for a proposed residential development on land at The Old Nursery, Thornton Road, Goxhill. The land is hereinafter referred to as *the site*.

This document is produced solely for the above client and should only be copied in full. When transmitted electronically, the definitive copy of the report is held by Humberside Materials Laboratory Ltd.

1.1 Aims

The aim of this remediation strategy is to provide a robust framework of procedures to ensure the site is suitably remediated and is fit for the proposed residential end use.

This document is intended to provide Step 1 (Remediation Strategy) of *Stage 3 remediation and verification*, as defined in the Environment Agency's Land Contamination Risk Management (LCM) guidance (published online).

1.2 Scope

The scope of this remediation strategy includes details of:

1. What remediation is required
2. Who will undertake the remediation works
3. What remediation methods will be employed
4. How the remediation works will be validated and verified

While health and safety risks involved with the proposed remediation measures described herein have been considered, this document does not provide a method statement that will mitigate on-site health and safety risks during remediation works. Safe systems of work need to be designed and adopted by those implementing the remediation measures detailed herein.

1.3 Background

The site has been the subject of previous site investigation reports by Humberside Material Laboratory (HML), as follows.

- HML Phase 1 (desk study) report: The Old Nursery, Thornton Road, Goxhill (HML ref.: 1720/6810/P/P1 Rev0.0), dated July 2025
- HML Phase 2 (ground investigation) report: The Old Nursery, Thornton Road, Goxhill (HML ref.: 1720/6810/P/P2 Rev0.0), dated October 2025

2 Site Constraints

2.1 Proposed development

The proposed development comprises the following.

- Construction of two residential dwellings to replace a disused and rundown former small nursery / garden centre which includes an existing brick building and polytunnels.

A new site layout plan is included within appendix A.

Details are presented in the plans shown in North Lincolnshire Council (NLC) planning application:

- PA/2025/1425

2.2 Site description

The site site is off Thornton Road, Goxhill, post code DN19 7LW, centred around grid reference 509710, 420680.

The site is about 90m by 50m in plan area.

The site is a former small 1990s nursery and garden centre that includes a small disused brick building, two remnant polytunnels, a large yard (about 70% of the site), a small pond and some densely vegetated rough ground. The yard is mainly of stony gravel and dirt. Near the centre of the site is a temporary skip with an adjacent small pile of scrap metal. A long heap of waste soil and vegetation is in the southeast yard area.

2.3 Site history

Available information about the site's history is summarised as follows.

- Nursery / garden centre – (on-site) possibly during 1990s
- Partly used as a storage ground for hay/stray/manure and construction or equestrian materials – (on-site) during the last 20 years, until recently – probably to support nearby associated horse/pony stables and riding centres

2.4 Geology, hydrogeology and hydrology

The originally anticipated ground conditions are as shown below (in Table 1).

Table 1: Summary of anticipated ground conditions inferred from published geology		
Strata	*Description*	*Depth to base (m BEGL)*
Made Ground	Possible fill below building and hardstanding	<1
Till	Boulder clay with occasional thin bands of granular soil	12
Chalk Bearings	Weathered chalk gravel	12 – 14
Burnham Chalk Formation	White, flinty, occasionally marly, chalk	60 – 120
All anticipated ground conditions are subject to confirmation with site works. BEGL – below existing ground level		

Hydrogeological data and Hydrological data:

- Chalk: Principal Aquifer; Till: Secondary Aquifer – undifferentiated
- Nearest groundwater abstraction: Anglian Water potable well for public supply (733m south)
- The site is partly within a groundwater SPZ Zone II associated with the above well
- Nearest surface water features: on-site pond and adjacent drainage ditches

2.5 Environmental information

Other environmental data includes the following.

- Nearest historical landfill: (663m southwest)
- The site is not affected by radon. No protection measures required
- The site is in an area with a low historical bombing density

3 Ground Conditions & Contamination

3.1 Ground conditions

The findings of the recent HML investigations indicated the following sub-strata at the site, as summarized within Table 2 below.

Table 2: Summary of recently revealed ground conditions

Strata		*Exploratory hole*									
		WS1	WS2	WS3	WS4	WS5	WS6	WS7	WS8	HP 101	HP 102
		Depth to base of strata in m BGL									
MADE GROUND (MGR)	Stony Fill							0.15	0.05		0.05
	Rubble & Tarmac Fill					0.15					
	Asphalt planings					0.20		0.20			
	Slag & Rubble Fill						0.25				
	Chalky Fill	0.35							0.15		0.20
	Crushed concrete Fill		0.25			0.40					
	Rubbly Fill		0.50	0.15	0.20					0.20	
Possible Alluvium	Soft/Firm/Stiff (slightly sandy) SILT or CLAY (with rare stone gravel) (with an organic odour)	0.90	1.00+	1.00+	0.55	1.00+	1.00+	1.00+	1.00+	0.50+	0.50+
GLACIAL TILL (TILL)	Firm/stiff BOULDER CLAY	1.00+			1.00+						

The revealed ground conditions were generally as expected based on geological and historical desktop information.

The natural ground conditions across the site seemed relatively consistent. However, there was much variation in the made ground composition.

3.1.1 Visual olfactory evidence of contamination

No signs of gross contamination were recorded in the revealed made ground. No asbestos containing materials (ACMs) or unusual odours or oily staining were recorded in the made ground. No signs of any petroleum impacted ground material was identified.

On the other hand, there were still signs of some potential contamination in the made ground:

- The rubble and crushed concrete within much of the fill could be a source of metals and PAHs as well as asbestos (although no suspected asbestos cement fragments or fibre bundles were noted)
- The asphalt planings (which smelt quite tarry, at least in WS7) could be a source of highly elevated PAHs

3.2 Contamination screening

The screened contamination test results indicate the following:

- There are detected levels of a few toxic contaminants (genotoxic PAHs, such as benzo[a]pyrene) in shallow made ground above GAC protective of human health
- There is one detected level of a semi-volatile PAH (1-methylnaphthalene) above GAC protective of human health
- The main source of detected PAHs could be coal-tar within asphalt planings – found sporadically within the made ground
- No other contaminant levels of concern have been noted – that might impact human health in a residential setting. Measured concentrations of metals, VOCs, pesticides, other PAHs and other SVOCs are acceptably low and no asbestos fibres have been detected.
- No phytotoxic (nickel, copper, boron or zinc) contamination has been detected that might pose a significant hazard to plant health
- Detected levels of PAHs indicate there could be a hazard to plastic water supply pipework laid in or near the revealed made ground
- No significant pH, sulphate or sulphide levels have been detected that might pose a hazard to buried concrete

3.3 Contamination assessment

A revised contamination-related risk assessment identified three plausible relevant contamination linkages (RPCL1 to RPCL3), as summarised below (in Table 3). Provisionally anticipated potential remediation measures were also identified.

It was previously suggested that the required remediation could comprise:

- 0.6m-deep clean cover systems in garden and soft landscaped areas using imported/site won proven clean soil material underlain by stone and geotextile
- A sub-floor ventilation void
- Barrier pipework for water supply pipework

Table 3: Revised potential contamination linkages (RPCLs)					
Ref.	*Source*	*Pathway*	*Receptor*	*Risk rating*	*Recommended solution**
RPCL1	1. Shallow made ground and hard surfacing 2. Existing building fabric 3. Previous land use: plant nursery / garden centre 4. Previous land use: storage area for nearby stables & riding centres 5. Existing small waste heaps Metals, PAHs, Asbestos, Petroleum hydrocarbons, Pesticides	Inhalation, ingestion, absorption	Future site users	Low / moderate	Engineered clean soil cover system in soft garden areas
RPCL2		Inhalation (indoors)	Future site users	Low / moderate	A sub-floor ventilation void
RPCL3		Chemical attack (by absorption)	Water supply pipes	Low / moderate	Barrier pipework for water supply

4 Remediation options appraisal

The objectives for the remediation works include the following.

- Provide a safe environment for proposed end users (occupants and maintenance workers)
- Minimise contamination risks to construction workers, adjacent residents and other receptors to acceptable levels
- Implement a sustainable approach to the remediation works

Contamination linkages are generally broken by either (a) removing the source, (b) severing the pathway, (c) moving the receptors or (d) a combination of any of the above three (a – c).

As detailed earlier (in Section 3), previous investigations and assessments identified three potential/relevant contamination linkages (RPCL1 to RPCL3) which require remedial action. The remediation options and proposed solutions are discussed in the following.

4.1 RPCL1

RPCL1 concerns the risk of harm to future site users from direct exposure (inhalation of dust, ingestion or absorption) of contaminants (e.g. PAH) within *in situ* made ground material via proposed soft landscaped and garden areas.

4.1.1 Remediation options

Possible remediation options to address RPCL1 could include the following.

Option 1. Install a cover system in soft garden and soft landscaped areas (remove source & break the pathway)
Option 2. Remove all potentially contaminated sub-surface soils from soft gardens and soft landscaped areas (remove the source)
Option 3. On-site clean up of the *in situ* soil materials (remove the source)
Option 4. Install a hardstanding layer across the site (break the pathway)

Option 1, installing a cover system, offers a very robust and practicable solution. It can be reasonably sustainable if local landfills/recycling facilities and local sources of clean soils are used. There may also be potential to re-use any clean, site won (natural) soils within the site to increase the sustainability. The soils for removal from proposed soft landscaping/garden could contain substantial contamination, so will need to be assessed (e.g. with WAC tests) before being recycled.

Option 2, removing all potentially contaminated sub-surface soil from soft landscaped areas, might offer a potentially suitable option in view of the current proposals (for the

contaminated made ground is possibly only relatively thin and potentially of limited lateral extent). However, Option 2 does not offer the simplicity of a fixed remediation depth with a geotextile marker that Option 1 offers. Option 2 might also be less reliable if unidentified shallow contaminated subsoils are present which are not removed.

Option 3, cleaning up the *in situ* soil materials on-site, might theoretically provide a potentially more sustainable remediation solution, eliminating the need to remove waste off-site. However, current remediation technologies do not provide simple solutions for cleaning up a mixture of inorganic and organic contamination. The small size of the site means there is insufficient economy of scale available to make it economically or environmentally viable to bring clean up plant and operations to the site.

Option 4, installing a hardstanding layer across the site, is unrealistic for the development proposed – especially for the proposed garden areas. Soft garden areas are usually an expected element within the gardens of low rise residential dwellings – and it is difficult to guarantee that some area of hardstanding will not be removed in the future to make way for some soft landscaping. The development is low rise residential and is expected to include some soft landscaping areas and/or gardens.

4.1.2 Chosen remediation measures

Accordingly, the salient features of the chosen remediation solution to mitigate RPCL1 (for the reasons given above, in Section 4.1.1) are as follows.

Option 1. Provide a suitable clean barrier / cover system within garden and soft landscaped areas. *The cover system should be 0.6m in thickness, consist of proven clean soil and include geotextile and clean stone gravel at the base, as illustrated later (in Appendix A)*

No soil cover system should be required beneath buildings / roads / permanent hardstanding where there will be no viable (ingestion or absorption) pathway between site occupants and the identified contamination sources. Permanent hardstanding is where the asphalt, concrete, paving or compacted granular stone fill means there is an insignificant likelihood that the area could be converted into soft landscaping in future. Typically, at least 200mm of compacted well-graded gravel or other hard dig material or 100mm of solid surfacing (e.g. asphalt or concrete) might be required to achieve this.

4.2 RPCL2

RPCL2 concerns the risk of harm to residential site users from indoor inhalation of semi-volatile vapours from PAHs (1-methylnaphthalene) within the existing shallow made ground material.

Possible remediation options to address RPCL2 could include the following.

Option I. Provide suitable subfloor ventilation to ensure that heavy SVOC vapours cannot accumulate and migrate into dwellings.

Option II. Remove all made ground below proposed footprints and any made ground that is anticipated to be below foundation depth.

Option I, provide suitable sub-floor ventilation to ensure that heavy SVOC vapours cannot accumulate and migrate into dwellings is probably the most practicable solution for RPCL2 as current foundation proposals include beam and block flooring with associated sub-floor void. If the proposed foundation designs are altered to a piling or ground bearing slab solution option II may be more suitable. Therefore, Option I is the chosen option.

4.3 RPCL3

RPCL3 concerns the risk of harm to future site users from chemical attack (by absorption) of contaminants (e.g. PAHs and TPHs) within *in situ* made ground material via proposed water supply pipes.

Possible remediation options to address RPCL3 could include the following.

Option A. Install barrier pipework and fittings to protect water supply pipework from permeation by hydrocarbon contamination

Option B. Install a suitably wide and deep clean corridor of ground material around proposed water supply pipework

Option B could be feasible but is probably a less sustainable, verifiable and robust solution than Option A. Accordingly, Option A above is the chosen option.

5 Remediation strategy

5.1 Contractors and personnel

The following parties are named key stakeholders in the remediation works.

- *Client and project manager for the site:* Mr R Staves
- *Main contractor:* TBA
- *Appointed independent Environmental Engineer:* HML
- *The licenced landfill site for material removed from site:* to be confirmed
- *Local Planning Authority:* North Lincolnshire Council (NLC)
- *Source of imported topsoil:* to be confirmed
- *Source of imported granular materials:* to be confirmed

The success of the remediation is dependent on good operational procedures and communication links between the different parties. There is a strict obligation to keep the local planning authority informed of any problems or requests for variations to this remediation strategy.

5.2 Outline remediation strategy

The remediation works shall include the following steps (possibly in the order shown).

Step 1. Inform chosen contractor of detected and suspected ground contamination to allow them to develop suitable safe systems of work

Step 2. Carry out site preparation works (e.g. site clearance, utilities surveys)

Step 3. Complete structural construction works including sub-floor ventilation void (while separately stockpiling any clean site won soils, e.g. dug out of footings, for possible re-use)

Step 4. Procure and install barrier pipework (e.g. Protecta-line™) in agreement with local water authority (Anglian Water) for potable water supply

Step 5. Inspect, sample and test, as necessary, any site won soils identified for potential reuse within the site

Step 6. Import clean soils (ideally, following inspections and testing) from off-site, as necessary, for use in soft garden/landscaped areas

Step 7. Remove *in situ* made ground and other near surface material in soft landscaped and garden areas to at least 0.60m below final ground level (BFGL) – and take suitable verification photos

Step 8. Install general cover / barrier system in soft garden and soft landscaped areas using clean (site won / imported) soils

Step 9. Carry out validation works on installed cover system (including at least five inspection pits)

Step 10. Prepare and submit (Phase 4) validation / verification report for the remediation works

The above steps are a summary of the remediation requirements only. All other requirements included within this Phase 3 Remediation Strategy must also be complied with, notably those outlined below (in Section 5.3).

All remediation works are subject to validation and verification at the completion of works. All relevant evidence and documentation related to the remediation works must be retained and included in the verification report. Further details of the verification requirements are presented later (in Section 7) and below (in Section 5.3).

Remediation works must not begin until this remediation strategy (or a revised strategy) has been approved by the local planning authority (LPA).

5.3 Detailed remediation strategy

Step 1: Inform chosen contractor of detected and suspected ground contamination to allow them to develop suitable safe systems of work

This step should be carried out by the Client who must provide the contractor with copies of this remediation strategy as well as previous HML reports (desk study and site investigation). This information should allow the contactor to carry out suitable risk assessments and design and implement appropriate method statements.

Step 2: Carry out site preparation works (e.g. site clearance, utilities surveys)

This step is to be carried out by (or under the direct supervision of) the Main Contractor.

The removal of any existing buildings or hardstanding must be carried out by competent persons following a safe system of work approved in agreement with the local planning authority and relevant demolition and waste regulations. Any demolition material shall be removed off site unless proven to be suitable for reuse within the site (e.g. based on the WRAP Protocol).

Step 3: Complete structural construction works including sub-floor ventilation (while separately stockpiling any clean site won soils, e.g. dug out of footings, for possible re-use)

This step is to be carried out by the Main Contractor.

As discussed above (in Section 5.2), the construction works shall be carried out in such a way as to mitigate risks to groundworkers and members of the public as well as the

natural and built environment. A watching brief should be put in place to monitor for unexpected contamination (e.g. ACMs, strong odours, petroleum staining).

During construction a suitable sub-floor ventilation shall be incorporated to ensure that heavy SVOC vapours cannot accumulate and migrate into dwellings. It is recommended that a minimum 150mm-high sub-floor ventilation void is installed below the proposed building footprint with ventilation openings within internal and external walls as per Building Standards statutory guidance: *Approved Document C: Site preparation and resistance to contaminates and moisture*. Openings within sub-floor walls will need to be at least 1500mm^2/m of wall or 500mm^2/m^2 of floor area, whichever is greater.

If clean, natural soils are excavated during site works, they could be suitable for use within the soil cover system. This could include clean, natural soils excavated from foundation and service trenches or road foundations from around the site.

Any excavated clean soils for re-use should be stockpiled on the site to await inspection. Clean excavated soils shall be set aside (away from potentially contaminated spoil to mitigate any risk of cross contamination) for potential re-use (e.g. within cover systems).

Step 4: Procure and install barrier pipework (e.g. Protecta-line™) in agreement with local water authority (Anglian Water) for potable water supply

This installation of barrier pipe is to be carried out or overseen by the Main Contractor or Client who will need to ensure procurement of suitable barrier pipework and fittings and have them delivered to site. The contractor will need receipts of purchase and/or delivery notes that shall be retained to provide evidence of procurement. The contractor shall take photographs and record the installed barrier pipework.

Barrier pipework shall be Protecta-line or similar Anglian Water Services approved pipework and fittings.

Step 5: Inspect, sample and test, as necessary, any site won soils identified for potential reuse within the site

This step is to be carried out by the Main Contractor. The Environmental Engineer may be employed to carry out some inspections, sampling and testing.

There could be clean glacial clays present at shallow depth below made ground. This is likely to be revealed as brown (slightly gravelly / slightly sandy) clay. Any stained or odorous material will not be suitable for reuse within cover systems.

There could potentially also be some clean topsoil material suitable for re-use. There are some small areas of soft landscaping. The topsoil will need to be free of anthropogenic material, staining and odour.

The Main Contractor shall provide the Environmental Engineer with notes/records of exactly where site won, clean, natural soils have come from (including depths and locations on the site).

Any site won, clean soil to be re-used within cover systems will need to be inspected by an Environmental Engineer to check its suitability. Ideally, this will take place at an early stage. The Environmental Engineer will carry out appropriate sampling and testing to confirm the suitability of site won material.

Step 6: Import clean soils (ideally, following inspections and testing) from off-site, as necessary, for use in soft garden/landscaped areas

This step will be mainly carried out by the Main Contractor and/or Client. The Environmental Engineer will carry out any inspections and ensure sufficient, suitable material is sampled and tested to prove imported soils are clean and suitable for use.

Ideally, sampling and testing of proposed imported material (e.g. topsoil) for the soft gardens and soft landscaping should be undertaken as early as possible and prior to importation. Otherwise, there is a risk of unnecessary costs to remove or treat any unsuitable imported soils.

To help ensure that suitable topsoil material is procured, YALPAG guidance recommends the purchaser (e.g. Client or Contractor) should ask the supplier the following questions.

- *What proof is there of the material source? Is it greenfield, brownfield, etc.?*
- *Will all the material be coming from the same source?*
- *Is the material a suitable growing medium?*
- *Has the supplier evidence of sampling and testing the imported material including tests for the suitable contaminants, as detailed below (in Table 4)?*
- *Were the contamination tests performed by a laboratory with UKAS and MCERTS accreditation for the tests?*
- *Is a copy of the whole laboratory report available and does it include an interpretive section?*
- *Will the provided certificate be dated within the last 2 months?*

Ideally, an Environmental Engineer should perform an initial inspection of (topsoil) material prior to importation. During this inspection and all subsequent inspections, the Environmental Engineer should check the imported topsoil material is:

- A suitable growing medium
- Free from obvious contamination and signs of asbestos containing materials
- Not from a location suspected to be inhabited with invasive or injurious plants
- Free from strong or unsuitable odours
- Free from unsuitable material e.g. bricks, timber and glass

Imported clean cover system soils shall be stored within the site in such a manner that they cannot be cross-contaminated by any other materials (e.g. by placing on a clean plastic sheet).

The Environmental Engineer shall design a suitable test regime to prove imported soils are clean and suitable for use. The scope of testing on imported soils shall depend on the source origin (greenfield / manufactured or brownfield / screened) which must be verified with documentation. The testing provided by suppliers must be performed on the identified material destined for site. If insufficient documentation is provided from the supplier, additional sampling and testing will be needed and the minimum rates of sampling and testing are given below (in Table 4), based on current YALPAG guidance (available online from LPA websites).

Table 4: Imported soil sampling and testing requirements

*Contaminant**	*Greenfield / Manufactured source*	*Brownfield / Screened source*	*Virgin quarried material*	*Crushed hardcore, stone, brick (excluding asphalt)*
Metals	**ü**	**ü**	**ü**	**ü**
PAHs	**ü**	**ü**		**ü**
Asbestos	**ü**	**ü**		**ü**
TPHs		**ü**		**ü**
Soil organic matter	**ü**	**ü**		
pH	**ü**	**ü**		
Minimum rate of testing:	3 samples or 1 per 250m^3 +	6 samples or 1 per 100m^3 +	1 or 2 samples	1 per 500m^3

* other contaminants (e.g. phenols, cyanide, BTEX, MTBE) may require testing for brownfield/screened/recycled sources subject to assessment

+ whichever number of samples is more & dependent on source & receptor (could be up to 1 sample per 50m^3)

Note: the use of topsoil from a greenfield or manufactured source (not a brownfield or screened source) could significantly reduce contamination testing costs.

Any shortfall in test data shall be satisfied with additional testing from sampling by an Environmental Engineer of the imported material. The sample(s) will be taken either from the stockpile or from the placed soil. In practice, samples are often taken from the placed soil when the cover system thickness can also be verified, but there is a risk the material will need to be removed if tests suggest the soils are not sufficiently free of contamination.

Brownfield, screened or recycled imported soils may require testing for additional contaminants depending on the source. This will be subject to an assessment by the Environmental Engineer which will consider former land use of the source site and potential contaminants of concern and will require local planning authority agreement.

The acceptance criteria (or screening values) for the testing on (imported/site won) cover system soils are presented later (in Appendix B). The testing must be undertaken by a UKAS / MCERTS laboratory, accredited for the type of tests involved.

No imported material found to contain contamination above the assessment criteria limits shall be allowed to remain on site. The Environmental Engineer shall keep suitable records of such incidents and inform the Client who shall ensure the Contractor removes the material off site and provides the Environmental Engineer with copies of waste transfer notes as documentary evidence.

Step 7: Remove in situ made ground and other near surface material in soft landscaped and garden areas to at least 0.60m below final ground level (BFGL) – and take suitable verification photos

The Main Contractor shall ensure that *in situ* below ground material is removed down to a depth at least 600mm below final ground level (bfgl) in soft landscaped and garden areas to accommodate a 600mm deep cover system. Should final ground levels be raised, the depth required for removal may be reduced commensurately.

The Main Contractor shall make adjustments for existing or proposed trees. Close to existing trees (i.e. within the root influence area identified by a suitably competent arboriculturist), the cover system shall be reduced to a depth of 300mm (and carefully hand dug). For proposed trees, the cover system depth shall be locally increased for tree planting to accommodate any new tree root balls. Further details about the requirements are presented later (in Appendix A and Table 5).

The Main Contractor shall ensure that *in situ* potentially contaminated made ground soils from garden/soft landscaped areas are removed off-site by a licensed waste operator. It is roughly estimated that the total area in proposed soft landscaped and garden areas for remediation is about 3187m^2 based on available drawings, as shown later (in Appendix A). Therefore, the total volume of soils for removal could be about 1912m^3 (3187m^2 x 0.6m depth) which could be up to about 3251tonnes (about 163 full wagon loads).

Of course, the amount for removal could be much less if (a) some of the near surface material is proven to be suitable for re-use within the site, (b) the final ground levels are higher than existing ground levels or (c) made ground is found to be unexpectedly thin.

The volume of soils for removal (and importation) could be significantly reduced if clean, site won, *in situ* natural soils (from below the made ground and any impacted natural soils) are re-used within the cover system. Some, clean *in situ* natural soils are expected at shallow depth below existing ground level (BEGL). Therefore, significant amounts of site won clean natural soils could be potentially available, including from the location of the proposed cover system.

The Main Contractor shall ensure that contaminated material at this stage and advanced stages is either removed directly from site by loading into vehicles or, alternatively, stockpiled in such a manner (i.e. underlain with plastic sheeting) as to contain it and stop the spread of contamination, prior to loading for transport and disposal.

The Main Contractor shall supply the receiving landfill / recycling site (or soil treatment facility, STF) for waste material with available existing test data from the site (i.e. from the HML Phase 2 site investigation) so the waste receiver can classify the material and check it is suitable for their (landfill / treatment) site. The receiving landfill or STF may also need Waste Acceptance Criteria (WAC) tests or other compliance tests on material for removal which the Main Contractor can arrange (with the assistance of the Environmental Engineer).

The Main Contractor shall retain documentary evidence to demonstrate the suitable removal of waste soils. The volumes and timings of exported material shall be recorded in site notes. Copies of all consignment, transfer and delivery notes and tickets shall be passed onto the Environmental Engineer for inclusion within the (Phase 4) validation / verification report.

Step 8. Install general cover / barrier system in soft gardens and soft landscaped areas using clean (site won / imported) soils

Following successful completion (or before, if necessary) of the structural works, the Main Contractor shall install a clean cover system in garden and soft landscaped areas (e.g. below lawns or plant beds). This shall be placed to a thickness of 0.60m below final ground level which is based on traditional and current industry good practice (e.g. as recommended by BRE Report 465 by Tedd *et al.*, 2004) and a consideration of site-specific contamination risks. The cover system should include at least 100mm of clean topsoil at the surface. The imported topsoil material shall be compliant with BS 3882:2015, Specification for topsoil.

A section of the proposed general cover system is shown later (in Appendix A) along with a plan of the required remediation area.

The Main Contractor shall place a geotextile over the garden / soft landscaped areas prior to the laying of granular fill and soils. This will fulfil the role of separation and marker layer between the cover system and underlying remaining made ground or natural soils.

The Main Contractor shall place a minimum 100mm thickness of granular gravel material, or at least three times the nominal size of the aggregate, whichever is the lesser, on the geotextile as a capillary break and hard dig layer. This will consist of proven clean inert material, e.g. sampled and tested to the requirements detailed in Table 4 (above)

and Appendix B (later). It is recommended that a virgin material be used from a reputable local quarry.

The Main Contractor shall then place the remaining depth (e.g. 500mm of soil if 100mm depth of granular gravel material has been placed as the capillary break layer) of site won or imported soil as described above, the top 100mm shall be imported topsoil material compliant with BS 3882:2015, Specification for topsoil, e.g. sampled and tested to the requirements detailed in Table 3 (above) and Appendix B (later).

The Main Contractor shall take extensive photographs (under guidance from the Environmental Engineer) during installation of the cover system to show the following.

- Location of the geotextile
- Close-up photos to show the quality and thickness of the capillary break layer
- Close-up photos to show the quality and thickness of (imported) placed soils
- Background features to prove the location of the close-up photos
- Site stockpile or quarantine areas

Tape measures or measuring staffs will need to be included in the close-ups to demonstrate the thickness of the cover system elements. Site identification boards or other media should also be included to detail the dates, photo locations and site name.

Table 5 (below) shows the additional requirements for any existing or proposed trees.

Table 5: Cover system requirements for trees	
Proposed trees	*Remaining (existing) trees*
The Main Contractor shall make allowance to increase the cover system thickness at the location of proposed trees to accommodate the root balls	The Main Contractor shall: • Take care to effect a suitable cover system around existing trees and ensure the cover system works comply with any tree protection requirements for the site. Soil around trees will need to be hand dug to a depth of 300mm and any accidental cuts to roots must be trimmed with a sharp blade. Work must only be carried out in small sections and the exposed roots must be kept moist with wet sacking. The roots will need to be backfilled with sharp sand and then covered with (uncompacted) clean topsoil • Ensure that the extent of hand dug cover system around tree roots shall roughly equal (i.e. +/- 20%) the calculated root protection area of the trees based on current best practice. A tree specialist can confirm these areas for specific trees on the site • Take regular photos of the cover system around any existing trees showing partly exposed roots. The photos will be needed for inclusion within the verification report

The Main Contractor shall supply the Environmental Engineer with copies of the photos of the cover system as detailed above for inclusion within the verification report. Where there is any shortfall in photographic evidence to reasonably demonstrate the thickness

and suitability of installed cover systems, the Environmental Engineer shall perform additional validation inspection pits to the satisfaction of the local planning authority.

Step 9. Carry out validation works on installed cover system (including inspection pits)

The Environmental Engineer shall carry out hand dug inspection pits to verify the thickness of installed cover systems. At least five pits shall be carried out within garden and or soft landscaped areas.

The Environmental Engineer shall record the thickness of the cover system and log the revealed materials (soil, stone and geotextile).

The Environmental Engineer shall carry out tests on excavated samples from the inspected cover system, as required. This shall include tests on any samples which are suspected to contain elevated levels of contamination (e.g. due to the presence of man-made materials). Tests may also be carried out to meet the minimum sampling and testing requirements for imported material, as detailed earlier (in Table 4) and later (in Appendix B).

Copies of the Environmental Engineer's photos and records shall be retained for inclusion in the Phase 4 (validation/verification) report.

Where there is any cover system non-compliance (e.g. contaminated backfill or insufficient thickness of clean soil), the Environmental Engineer shall inform the Client as soon as possible. The Main Contractor will then be prompted to remedy any non-compliance and the Environmental Engineer shall re-inspect and re-test as necessary to ensure each non-compliance has been rectified.

Step 10. Prepare and submit (Phase 4) validation / verification report for the remediation works

The Environmental Engineer shall prepare a validation / verification report as per the requirements detailed above and later (in Section 7). This shall be submitted to the local planning authority for review.

6 Site Management Procedures

The proposed remediation measures, discussed previously herein, consider the long-term risk at the site to human health and other environmental receptors. However, in the short-term, there are potential health, safety and environmental risks during the construction works.

The Main Contractor at site is fully responsible for devising their own suitable safe working practices to address all existing health, safety and environmental risks during the construction phase. The following guidance is provided to highlight some of these hazards and risks which should be dealt with by the contractor's method statements and risk assessments.

6.1 Health and safety

The HML (Phase 2) site investigation report identified some contamination in the near surface soils at the site. Some elevated levels of PAHs and SVOCs were detected in shallow made ground soils. These contaminants can be potentially toxic if ingested, inhaled or absorbed (through skin) in sufficient amount.

No asbestos was identified within the site investigations. Nevertheless, there is always the potential for asbestos containing materials within made ground. The risk from asbestos in made ground across the site should never be completely discounted.

Some basic minimum measures to protect site workers from the hazards of contaminated soil should include the following.

- Inform site staff about anticipated soil contaminants and related hazards and safety measures, e.g. through site inductions, toolbox talks, etc.
- Provide personnel protective equipment (PPE), e.g. boots, helmets and gloves, for the use of ground workers
- Provide and enforce designated safe areas for smoking, eating and drinking
- Provide suitable hygiene facilities for washing, drying and changing
- Display contact details for emergency services
- Ensure there are no naked flames or other ignition sources where hazardous ground gas is a potential risk (e.g. in confined spaces)
- Implement suitable procedures to prevent the generation and spread of dust

The site is near some existing residential dwellings. Appropriate safety precautions should be employed for working near to domestic properties.

6.1.1 Site security and working hours

The site is to be secure when work is not being undertaken once construction has started. Entry and egress shall be controlled when the site is active.

Site working hours are expected to be normal working hours (Monday to Friday 07:30am to 17:30pm and 08:00am to 14:00pm on Saturday), unless written consent for extended hours is given by the local authority.

6.2 Dust, odours and fumes

The contractor should minimise emissions to air and take all necessary precautions to prevent the accumulation and spread of smoke emissions, fumes, dust or odours from site plant, stored fuel or other substances and prevent them from drifting around the site or into the nearby properties and public space. A record of any complaints received should be kept for comparison against daily work logs.

6.2.1 Dust

During excavations, soil stockpiling and other earth movements, measures will need to be implemented to prevent migration of dust.

The contractor should introduce suitable working methods and dust suppression techniques to mitigate the generation and spread of dust. Suitable health and safety protocols should be determined through appropriate consultations with qualified asbestos specialists. The following measures are options that should help minimise and control dust.

- Soil dampening (e.g. on bare earth and stockpiles) especially during dry weather
- Dust curtains
- Spoil heap covers
- Wheel washing and street sweeping
- Sheets/hoarding around site, plant or other locations
- Sheeting for lorries entering/leaving the site
- Liaison with neighbours
- Designated areas for parking and loading/unloading
- Low drop heights during movement of soils
- Cessation of potential dust-spreading activities during high winds

6.2.2 Odours

No strong odours are anticipated during the remediation works (apart from near to the existing above ground fuel tank), i.e. during the excavation and movement of soil materials. If unexpected odours are detected, such works must halt and the local

planning authority must be informed. Works shall only continue after further investigation by an environmental specialist and with appropriate local authority approval.

6.2.3 Fumes

All work plant should be maintained in good repair and should meet legal emission standards. Plant should not be left running for long periods when not directly in use. Consideration should be given to the use of electrically powered plant instead of diesel.

6.3 Noise and Vibration

Some noise is unavoidable during construction works. Nevertheless, the following measures should help minimise the generation of noise and vibration:

- Good maintenance of plant
- The use of silencers on plant, if required
- Switching off plant when not in use
- Unloading and loading of material within designated areas
- Coordinating plant and lorry movements to reduce site traffic
- Liaison with neighbours

The site is adjacent to a residential area. Therefore, any activities likely to generate unusually large amounts of noise and ground vibration (e.g. sheet pile driving) might be potentially unsuitable. Any such works should be approved in advance by the local planning authority.

Procedures to reduce noise and vibration are detailed in BS 5228-1:2009+A1:2014 (Code of practice for noise and vibration control on construction and open sites).

6.4 Fuel, oils and chemicals

Measures and procedures should be put in place to prevent leaks and spills of oil, fuel or chemicals. Further information on this is provided in Guidance for Pollution Prevention, GPP2, produced by the EA and other organisations, available free online. The measures and procedures include:

- Suitable bunding or overflow storage (110% capacity of liquid storage volume)
- Locks on valves and covers to prevent vandalism
- Drip trays for diesel-fired engines, pumps and generators
- Suitably maintained diesel-engined plant
- Spill kits with staff suitably trained in their application
- An oil, chemical and product inventory for the site
- Site drainage plans

- Emergency procedures (included in the site induction)

Regular inspections should be made of on-site discharge points, bunding, drainage systems, oil separators (and drip-trays) to check that these are in good condition.

The storage, itinerary, and use of hazardous materials on-site should be conducted in accordance with the Control of Substances Hazardous to Health (COSHH) regulations (2002). Records should be maintained of all hazardous materials on-site.

Work shall not commence in the area of revealed unforeseen contamination until it haas been assessed and plans put in place for remediation to the satisfaction of the local planning authority.

6.5 Unforeseen Contamination

Protocols shall be in place to deal with unforeseen potentially contaminated materials identified by visual or olfactory evidence (i.e. the presence of staining, odours or harmful substances, etc.). The protocols should include the following.

- Cessation of work in the area followed by immediately informing an Environmental Engineer and the local authority to agree how to deal with the material
- Fencing off the area of concern
- Testing of potentially contaminated material, as required
- Removal of contaminated soils for segregation, storage or stockpiling within a bunded and covered area, as appropriate
- Extraction of contaminated groundwater to be placed in suitable containers
- Transfer off-site of contaminated soil, if necessary
- Testing of samples from the base/ sides of excavations
- Recording of the locations, quantities and nature of any removed materials, results of tests and the subsequent actions taken

6.6 Other pollution control measures

Any discharges to local watercourses or surface water drainage should only be made with the appropriate discharge consents. These can be obtained from the Environment Agency and or local drainage authority. For example, appropriate consents should be obtained where wastewater, e.g. from a wheel wash, needs to be poured into drains.

Procedures will be required to reduce the migration of suspended solids (e.g. silts and fine sands). All soil should be stockpiled away from surface water features and drains and where the gradient is at a minimum. Rain protection covers and/or water collection gutters should be used where surface run-off of silty water could occur. These measures

can also mitigate any risks of migration of potentially contaminated leachate from stockpiled or surface soils.

6.7 Utilities

Service locations should be investigated at an early stage in the development to minimise project costs and potential disruptions. Services should be turned off / disconnected as appropriate to make safe during development and minimise any health, safety or environmental risks.

6.8 UXOs

Should any suspected unexploded ordnance (UXOs) be encountered, such as WWII unexploded bombs (UXBs), then work should be immediately halted and a no-entry zone established around the suspected UXO. Specialist UXO consultants (e.g. Zetica™) and relevant local authorities (e.g. fire service) should be contacted immediately to determine a safe plan of action.

7 Validation and Verification

7.1 Verification requirements

Verification of the remediation works comprises:

1 Verification that a suitable sub-floor ventilation system has been incorporated within all proposed dwellings
2 Verification of the depth of the cover system (in the garden and soft landscaped areas) and the suitability of the constituent material as well as the associated removal of potentially contaminated soils and made ground
3 Verification of the installation of suitable barrier pipework for water supply

Validation shall be carried out by suitably qualified and experienced environmental specialists. Validation will be achieved with the aid of appropriate inspections, sampling, testing, photographing and collection of relevant documentation.

Details of the verification requirements for each step in the remediation procedures were presented earlier (in Section 5).

Validation and verification shall meet the requirements of suitable guidance, e.g. as outlined in the latest version of YALPAG's *Verification Requirements for Cover Systems: Technical Guidance for Developers, Landowners and Consultants*.

The purpose of the validation / verification phase (Phase 4) is to ensure that all the remediation works have been carried out as specified. Therefore, the following items shall be directly checked and verified to be satisfactory (or otherwise) compared with the requirements specified within this document.

- Imported (or *in situ*) soil sampling and testing
- Visual / olfactory inspection records of imported materials
- Receipts and/or delivery notes to prove procurement of suitable barrier pipe
- Photos to show installation of barrier pipework
- Photos to show suitable sub-floor void and suitable openings
- Photos to show removal of suitable thickness of existing made ground below soft landscaped and garden areas
- Photos to show placement and thicknesses of suitable layers in the cover system in soft landscaped and garden areas
- Inspection records of garden area cover system inspection pits
- Documentary evidence of import/export of soil to or from the site

7.2 Phase 4 (validation / verification) report

A verification / validation report shall be produced by the appointed independent engineer at the end of all remediation works. The report shall include the following (e.g. as per the latest YALPAG requirements).

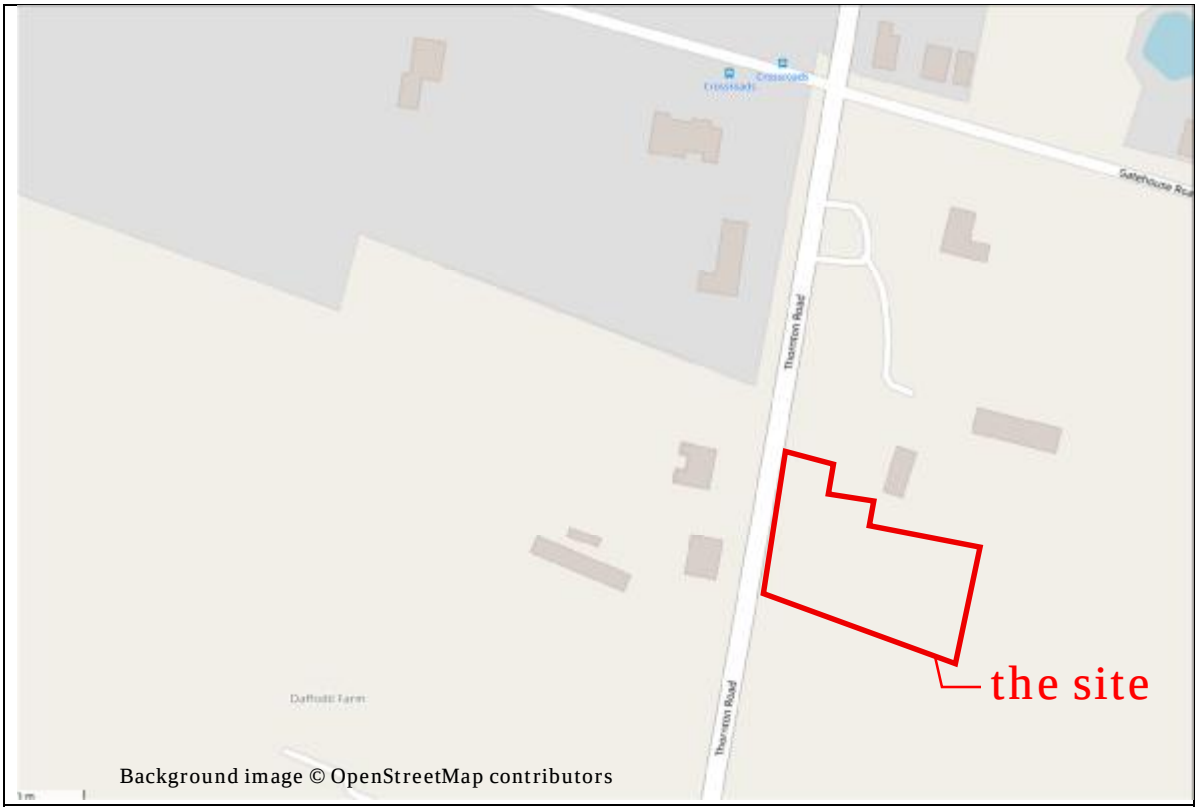
- Site details including planning application reference
- Summary of areas and remediation works undertaken
- Diary of events
- Details of quantity, location for disposal, conveyance notes for contamination materials removed from site
- Details of source, test data and quantity for cover system soils
- Details of geotextile used within the cover system
- Details of imported clean materials including the location, quantity and test data at the specified rate
- Photographic record of the works and depths of soil cover
- Results of chemical analyses
- Photographic record of the sub-floor void and openings
- Evidence of installation of barrier pipe
- Details of any non-conformances and rectifications

A full copy of the final verification report shall be forwarded to the local planning authority for their review and approval.

Appendix A

Plans & Photographs

Site location plan 1 *Date copied:* 26 Sep 2025 *Source:* openstreetmap.org



Site location plan 2 *Date copied:* 26 Sep 2025 *Source:* openstreetmap.org

Aerial photograph: 1 *Date copied:* 26 Sep 2025 *Source:* Google Earth Pro®

Drawing Revisions

A 15-10-25 - Plan revised following clients comments

B 24-10-25 - Plan revised following clients comments

C 03-11-25 - Plan revised following clients comments

D 10-11-25 - Plan revised following clients comments

APPROVAL

Ross Davy Associates

Pelham House, 1 Grosvenor Street, Grimsby, N.E.Lincolnshire, DN32 0QH

Tel: 01472 347956
Email: design@rossdavyltd.co.uk
Web: www.rossdavyltd.co.uk

Project: Proposed Development at The Old Nursery Thornton Road, Goxhill for Mr R. Staves

Drawing Title: Proposed Plans

Drawn: djs

Scale: 1:200

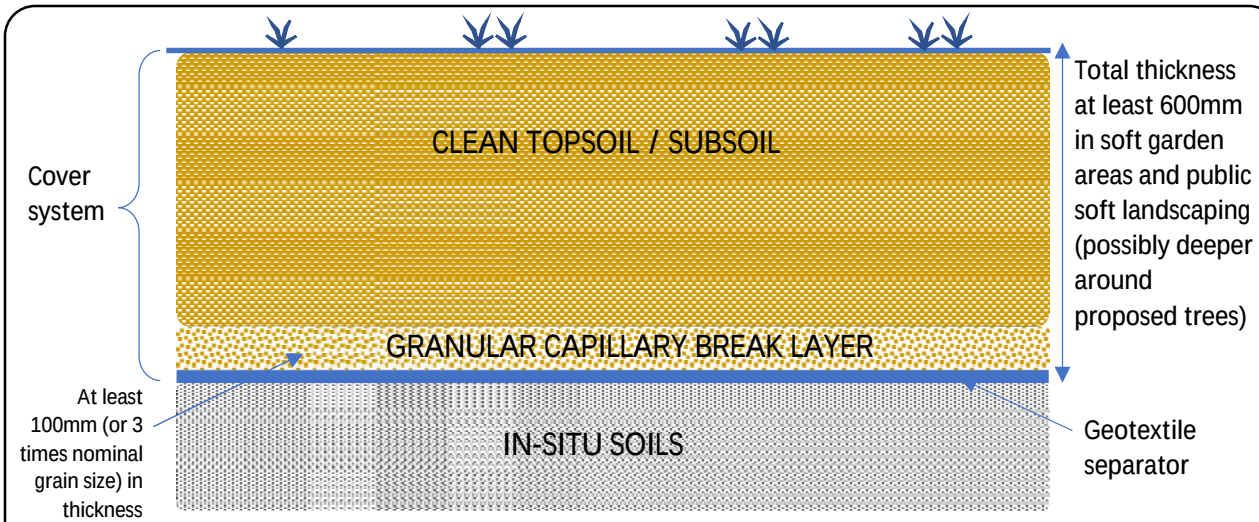
Date: 29-09-2025

Size: A1

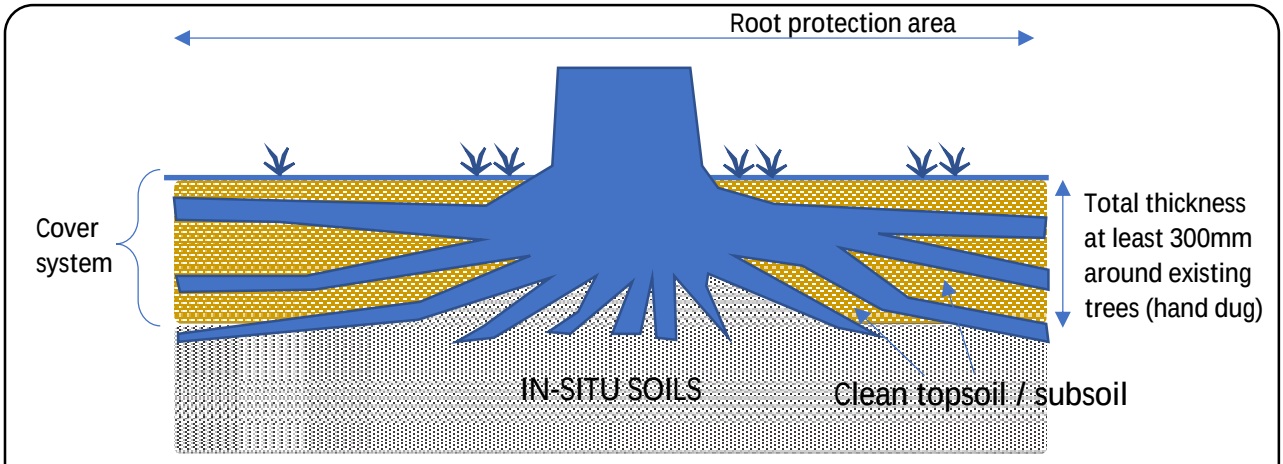
Drawing No.: RD:5986 - 03 D

Notes:

1. Do not scale from this drawing
2. This drawing should be read in conjunction with the HML Phase 3 Remediation strategy (HML ref.: 1720/6810/P/P3)
3. Imported topsoil shall meet British Standards BS 3882:2015 topsoil specification for at least uppermost 100mm
4. Topsoil and subsoil shall be a suitable growing medium
5. Cover system soils shall be free from obvious contamination and signs of asbestos containing materials
6. Cover system soils shall not be from a location suspected to be inhabited with invasive or injurious plants
7. Cover system soils shall be free from strong or unsuitable odours
8. Cover system soils shall be free from unsuitable material e.g. bricks, timber and glass
9. Cover system shall meet latest requirements of Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG) guidance for cover systems including proposed sampling and testing regime
10. Geotextile shall be a suitable separator layer (e.g. Fastrack 1800 or similar)
11. Granular capillary break layer shall be at least 100mm thick and 3 times nominal diameter of particles
12. Allowance shall be made for increasing the cover system thickness below new trees to accommodate the root ball



GENERAL COVER SYSTEM



COVER SYSTEM BENEATH EXISTING TREES

HUMBERSIDE MATERIALS LABORATORY LIMITED
Atherton Way
Brigg
North Lincolnshire
DN20 8AR
Telephone & Fax 01652 652753
www.humbersidematerialslab.co.uk

Drawing Title: Cross-section through cover system
Drawing No.: 1720-6810-P3-01 Revision: - 0.0
Site: The Old Nursery, Thornton Rd, Goxhill
Client: Mr R Staves
Project No.: 1720/6810/P
Date: 22/02/2026

Notes:

1. Do not scale
2. All locations are approximate only
3. This drawing should be read in conjunction with the HML Phase 3: Remediation Strategy, The Old Nursery, Thornton Road, Goxhill for Mr R Staves, HML report ref: 1720/6810/P/P3
4. Records of waste removed off site by authorized contractors will need to be retained for verification

N

Proposed soft landscaping (0.60m-deep cover system)

Water supply pipework: Barrier pipe is required. Protecta-line or similar approved

Legend

- Proposed soft landscaping area
- Proposed hardstanding areas include driveways and patios

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North Lincolnshire
DN20 8AR
Telephone & Fax 01652 652753
www.humbersidematerialslab.co.uk

Drawing Title: Remediation plan
Drawing No.: 1720-6810-P3-02 Revision: - 0.0
Site: The Old Nursery, Thornton Rd, Goxhill
Client: Mr R Staves
Project No.: 1720/6810/P
Date: 22/02/2026

Appendix B

Generic acceptance criteria (GAC) for imported or site won soils for use in gardens

The acceptance criteria (or screening values) for the imported topsoil (and other soils for use in gardens) are mostly taken from the LQM/CIEH S4ULs for human risk assessment based on a residential context (with potential for home grown produce), as reproduced below (in Tables A to C), although some screening values are taken from published C4SLs (e.g. lead and benzoapyrene). The testing must be undertaken by a UKAS / MCERTS laboratory, accredited for the type of tests involved.

Table A – Metals (and metalloids) acceptance criteria	
Element	*mg/kg*
Arsenic	37
Beryllium	1.7
Boron	290
Cadmium	11
Chromium III	910
Chromium VI	6
Lead	200
Mercury Element	1.2
Mercury Inorganic	40
Mercury Methyl	11
Selenium	250
Copper	2400
Nickel	130
Zinc	3700

Table B - Total Petroleum hydrocarbons (TPHs) acceptance criteria							
TPH aliphatic				*TPH aromatic*			
Equivalent carbon fraction	*Residential with plant uptake mg/kg*			*Equivalent carbon fraction*	*Residential with plant uptake mg/kg*		
	1% SOM	*2.5% SOM*	*6% SOM*		*1% SOM*	*2.5% SOM*	*6% SOM*
C5-6	42	78	160	C5-7	70	140	300
C6-8	100	230	530	C7-8	130	290	660
C8-10	27	65	150	C8-10	34	83	190
C10-12	130 (48)	330 (118)	760 (283)	C10-12	74	180	380
C12-16	1100 (24)	2400 (59)	4300 (142)	C12-16	140	330	660
C16-35	65000 (8.5)	92000 (21)	110000	C16-21	260	540	930
C35-44	65000 (8.5)	78	160	C21-35	1100	1500	1700
-	-			C35-44	1100	140	300
Figures in parentheses are the vapour or soluble saturation limits							

Table C – Polycyclic aromatic hydrocarbons (PAHs) acceptance criteria							
Compound	*Residential with plant uptake mg/kg*			*Compound*	*Residential with plant uptake mg/kg*		
	1% SOM	2.5% SOM	6% SOM		1% SOM	2.5% SOM	6% SOM
Genotoxic PAHs				Non genotoxic PAHs			
Benzo(a)pyrene*	5.0	5.0	5.0	Acenaphthene	210	510	1100
*benzo(a)pyrene is a surrogate marker for the eight genotoxic PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenz(ah)anthracene & indeno(123-cd)pyrene based on CL:AIRE (2014) *C4SL – SP1010 Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, Appendix E provisional C4SLs for benzo(a)pyrene as a surrogate marker for PAHs*				Acenaphthylene	170	420	920
				Anthracene	2400	5400	11000
				Fluoranthene	280	560	890
				Fluorene	170	400	860
				Naphthalene	2.3	5.6	13
				Phenanthrene	95	220	440
				Pyrene	620	1200	2000

No asbestos fibres shall be detected (NAD).