

Contaminated Land
Air Quality
Environmental Audit



Partnership No: OC 300776

Our Ref: R2259-L01
Your Ref: P/2016/0223 (previously P/2014/0331) - Nant Cottage

06th June 2016

Ms Angela Guy
Contaminated Land Officer - Environmental Protection
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by email care of Mark Davies: "Mark Davies" <Mark.Davies@wrexhamsolicitors.co.uk>

Dear Angela,

REMEDIATION STRATEGY: Land Adjacent to Nant Cottage

Further to our Stage 1 and Stage 2 Contamination assessments of the above site I am writing to provide details of the proposed Remediation Strategy to deal with the lead contamination identified in the shallow soils at the site. As discussed in the reports, the development encompasses an area of land which has not been subjected to any known specific contaminative use: the elevated lead concentrations appear to be the result of aerial deposition from the nearby historical spoil tips or smelting works.

Risk Assessment

Information provided within the Stage 2 Ground Investigation Report was used to produce a Conceptual Site Model (CSM) to identify the sources of contamination, identify receptors and their vulnerability and identify the potential pathways of exposure. It was concluded that the main risks were to human health (construction workers and future site users). These comprised:

- exposure of future residents to lead within the shallow soils;
- the potential presence of a limited quantity of asbestos containing material (ACM) waste at the site surface; and,
- radon gas.

Risks to controlled waters and other receptors than future residents were considered to be minimal: a summary of the pollutant linkages under development and residential use are reproduced below:

Table 1. Summary of the identified pollutant linkages

receptors	pathways	contaminant sources
human health (construction workers)	Direct contact/ dust & soil ingestion; inhalation (short term exposure)	Presence of lead, asbestos and PAHs in limited locations
human health (future site residents)	Direct contact/ dust & soil ingestion; inhalation	Presence of, asbestos and PAHs in limited locations
	Accumulation within voids, confined spaces and service runs	ground gas (radon)

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Remediation Objectives

The remediation objectives, strategy and implementation plan described below address the contamination identified to date and the likely requirements should further contamination be identified during the remediation works. If additional contamination is encountered, and subsequent investigations/risk assessment indicates the requirement for any substantial revisions to the strategy, these will be submitted to the Local Planning Authority for approval.

The key remediation objectives are to break any potential pollution linkages and allow development of the site for its intended use without harm to human health, property and the environment. Each of the viable potential human health contaminant linkages identified in the site conceptual model and risk assessment will be addressed for the remediation strategy to be considered appropriate for the site and to allow construction to continue.

Options Appraisal

Options for the remediation of the identified and potential contamination sources are summarised below:

Table 2 Remedial Options

Method	Advantages	Disadvantages	Feasibility
Do nothing	No cost.	Does not address risks posed from lead, asbestos and radon.	Not acceptable given the future residential use of the site.
Physical Barriers	Well understood technology.	Requirement to install capping system and gas protection.	Well understood technology, verification of correct installation and materials likely to be required.
In-situ treatment (thermal/chemical/biological)	Treat contamination at source, reducing disposal cost and waste generation.	Techniques not appropriate for inorganic contaminants	Not feasible treatment method for asbestos or lead.
In-situ treatment (stabilisation/solidification)	Stabilisation/solidification is an effective means of isolating inorganic substances which are not amenable to treatment using destructive techniques.	Impractical and costly option for small quantity of material.	Expensive and impractical option for small scale sites.
Excavation followed by ex-situ treatment or disposal	Well understood technology. Method can reduce source volume and contaminant level, and can be validated on short timescale.	Disposal would entail, additional haulage, tipping and landfill tax costs.	Well understood technology. Would require vehicle movements off site to remove materials.

The ground on the site locally contains concentrations of contaminants that, in the absence of mitigation, pose a risk to the health of future site users. The "do nothing" option, containing no specific measure to remediate ground contamination and is therefore inappropriate and not acceptable.

Physical barriers, such as hardstanding, the presence of a building, or a 600mm 'clean' cover capping system would effectively cut possible exposure pathways relating to inhalation, ingestion and direct contact and have the benefit of reducing disposal costs and environmental impact (lorry movements, landfill space, etc.). This is the preferred remedial option.

General Approach

The general approach to site preparatory / remediation works is described in Table 3 below:

Table 3. General requirements

Asbestos clearance	The discrete deposit of cement sheeting suspected as ACM will be carefully double-bagged and placed in secure temporary storage, pending off-site disposal at a waste management facility licenced to accept such materials.
Materials recovery / Waste Treatment	It is not envisaged that site generated soil arisings will be recoverable due to the lead content. These materials will therefore require either removal from the site as waste or sequestration at depths or in locations where future exposure will not occur. If removed, waste soils and will require classification for disposal at a waste management facility licenced to accept such materials and transfer documentation must be retained.
Earthworks completion	On completion, the site regrade will be required to leave a 600mm void in garden areas to accommodate the required clean soil cover system and clean imported soils will be placed to achieve final development levels.
Construction	Full radon protection measures will be installed in dwellings

Validation

SGP will attend the site to verify the specific remedial actions relating to soil contamination. Dedicated visits are required only to verify the placement of the appropriate thickness of the soil cover system in the specified garden areas and collect samples to demonstrate material of a sufficient quality has been used. Depths will be recorded by excavation oh hand dug trial pits and comparing thickness of placed material to a graduated staff, a clear photographic record will be maintained.

Any imported material shall be subject to a sampling ratio of 1:50m³ for material sourced from a brownfield or uncharacterised site and 1:250m³ for material sourced from a confirmed specific Greenfield site. Where appropriate documentation cannot be provided to confirm the nature of the source, then a brownfield situation shall be assumed. A minimum requirement of 3 samples per single source shall be applied. Samples may be collected from stockpiles following delivery or in-situ after placement.

Soil samples shall be subject to the analysis and acceptability criteria as below, comprising LQM/CIEH suitable for use levels (S4UL) and Defra Category 4 Screening Level (C4SL) for lead. Reference is initially made to the S4ULs derived for a soil with 1% organic matter as a conservative assumption for screening purposes. All samples shall be submitted to a MCERTs accredited laboratory in a chilled cool box within 24 hours, under full chain of custody.

Table 4: Generic Assessment Criteria for Residential Use

Contaminant	Screening criteria for Residential Use (mg/kg unless stated)
Asbestos fibre	<i>Below quantifiable levels (<0.001%)</i>
Arsenic	37 (S4UL)
Cadmium	11 (S4UL)
Chromium III	910 (S4UL)
Chromium VI	6 (S4UL)
Copper	2400 (C4SL)
Lead	200 (C4SL)
Mercury (elemental)	1.2 (C4SL)
Nickel	130 (S4UL)
Zinc	3700 (S4UL)
Naphthalene	2.3 (S4UL)



Contaminant	Screening criteria for Residential Use (mg/kg unless stated)
Acenaphthene	210 (S4UL)
Acenaphthylene	170 (S4UL)
Fluorene	170 (S4UL)
Phenanthrene	95 (S4UL)
Anthracene	2400 (S4UL)
Fluoranthene	280 (S4UL)
Pyrene	620 (S4UL)
Benzo(a) anthracene	7.2 (S4UL)
Chrysene	15 (S4UL)
Benzo(b) fluoranthene	2.6 (S4UL)
Benzo(k) fluoranthene	77 (S4UL)
Benzo(a) pyrene	2.2 (S4UL)
Indeno(123cd) pyrene	27 (S4UL)
Dibenzo(ah) anthracene	0.24 (S4UL)
Benzo(ghi) perylene	320 (S4UL)
Aliphatic C5-C8	42 (S4UL)
Aliphatic C6-C8	100 (S4UL)
Aliphatic C8-C10	27 (S4UL)
Aliphatic C10-C12	130 (48) vap (S4UL)
Aliphatic C12-C16	1100 (24) sol (S4UL)
Aliphatic C16-C35	65000 (8.48) sol (S4UL)
Aromatic C6-C7	70 (S4UL)
Aromatic C7-C8	130 (S4UL)
Aromatic C8-C10	34 (S4UL)
Aromatic C10-C12	74 (S4UL)
Aromatic C12-C16	140 (S4UL)
Aromatic C16-C21	260 (S4UL)
Aromatic C21-C35	1100 (S4UL)

The results of the soil analysis and depth validation records will be compiled into a validation report. The developer will maintain records of the installation of the required radon protection and removal of the suspected ACM and provide these to WCBC.

I trust this is of assistance and would be grateful if you could confirm your agreement with the proposed remedial and validation measures. Please do not hesitate to contact us if you require any further information.

Yours sincerely
for: Smith Grant LLP

Ben Thomas (Partner) BSc MSc MCIWEM CEnv