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**Phase 2 Ground  
Investigations, Risk  
Assessment, Remediation  
Strategy and Verification  
reports**

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## 1.0 **Introduction**

- 1.1 A Phase 2 assessment consists of an intrusive site investigation with quantitative risk assessment. Depending on the outcome of this assessment a subsequent remediation strategy and verification report will then also be required. A Phase 2 assessment is only required if the need for one has been identified in the initial Phase 1 Preliminary Risk Assessment or to accord with any conditions the Local Planning Authority have attached to the planning approval.

**It is recommended that a written scope of works should be submitted to, and agreed by, the Local Planning Authority before the commencement of site investigation works. Early consultation with your Local Planning Authority is particularly encouraged for large or complex sites with significant contamination issues.**

- 1.2 The Phase 2 report should be submitted to and approved in writing by the LPA and implemented prior to development commencing. However although it is the final document and implementation of any required remediation works that are likely to be required to fully discharge relevant conditions, a phased approach is recommended.

## 2.0 **Phase II - Intrusive Investigations /Quantitative Risk Assessment**

- 2.1 Carrying out intrusive site investigations is the first part of the next stage and is fundamental to the Phase 2 investigation as it seeks to confirm potential contaminant-pathway-receptor pollutant linkages at the site to allow refinement of the preliminary conceptual site model submitted as part of the Phase I assessment. The data obtained will be used to inform a decision as to whether the site is potentially harmful and will indicate whether any remedial works are required to mitigate any risks from contamination that may be present.
- 2.2 The site investigation can be undertaken in phases in order that resources can be targeted at the areas that are most likely to be contaminated. The separate phases may be submitted individually as separate reports or as one

combined report i.e. Preliminary Risk Assessment or Preliminary and Quantitative Risk Assessment followed by option appraisal and implementation/post remediation verification report.

**2.3** The site investigation procedure involves specialist technical knowledge and it is essential that competent and experienced personnel who should preferably hold recognized and appropriate qualifications conduct all phases of the site investigation procedure. Where a geotechnical study and a contamination study are combined within one report the consultant should be able to demonstrate that he is competent and has expertise to provide advice on both.

**2.4** Investigation should be carried out in accordance with Investigations should be carried out in accordance with relevant British Standards and current UK guidance e.g. BS 10175:2011+A2:2017, BS 5930:2015, BS 8576:2013, BS 8485:2015+A1:2019 and Land Contamination: Risk Management (Environment Agency, 2020). It is also advisable that prior to carrying out any ground investigations, the methodology and sampling strategy has been approved by the Local Planning Authority before commencement of site investigation works. Early consultation is encouraged for large sites in particular which may have significant contamination issues.

The sampling strategy should include the following information:

- Proposed sampling/ monitoring details for soil, water and/ or ground gases including locations, methods involved including, depths, numbers, duration and frequency
- Identify access constraints and additional sampling to be taken later such as after demolition works are completed
- Identify inspection of buildings for asbestos containing material

**2.5** It is essential that developers base their site investigations in accordance with current good practice. Reports that do not use a proper scientific or appropriate sampling strategy to assess risks from land contamination will be rejected by the Council.

**2.6** If asbestos has been identified as a contaminant of concern, the

requirements of the Control of Asbestos Regulations 2012 must be fully complied with. The Joint Industry Working Group (JIWG) has produced guidance, CAR-SOIL (CL:AIRE, 2016), to assist in the compliance of the Control of Asbestos Regulations 2012 when working with asbestos contaminated soils and construction and demolition materials. Guidance is also available in CIRIA document C733 (2014) 'Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks'.

**2.7** Examples of current good practice can be found in the following documents:

- BS 10175:2011 British Standard Institute (2011) Investigation of Potentially Contaminated Sites - Code of Practice, British Standard Institute. London.
- Environment Agency (2020). Land Contamination: Risk Management (LCRM). Environment Agency, Bristol.
- Environment Agency (2000) Technical Aspects of Site Investigation (2 Vols.). Research and Development Technical Report P5-06517R. Water Research Centre, Swindon
- Environment Agency (2000) Guidance for the Safe Development of Housing on Land Affected by Contamination. The Stationary Office. London
- Environment Agency (2001) Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination. R&D Technical Report PS-066/7R. Water Research Centre, Swindon

**2.8** All sampling strategies should be designed to provide data that is representative of the site conditions as a whole. Sampling should be undertaken in accordance with recognised sample collection methodology and guidance. Reference to the historical site information obtained from the desk study is essential in order to target possible sources of contamination and to ensure that appropriate analysis is performed. Underground structures such as fuel tanks, pipework and foundations will also need to be identified. Off site sampling may also be required in order to assess whether migration of contamination is occurring away from the site.

- 2.9** A suitably accredited laboratory should be used to undertake analysis of samples. Where available, chemical analysis of samples must be by methods accredited to the Environment Agency's MCERTS (Monitoring Certification Scheme) standard or UKAS.
- 2.10** Following completion of the investigation, analysis results need to be compared against suitable generic assessment criteria. Gateshead Council will not accept any contaminated land risk assessments derived using the withdrawn CLEA framework or based upon old SGV's. The CLEA software and associated handbook can, however, be used by practitioners to derive and generate their own generic or site specific criteria that comply with the revised and updated approach. This can be used to estimate the risks to people from contaminants in soil. Generic Assessment Criteria (GAC) produced by private sector organisations such as WS Atkins (SSV's) and Land Quality Management/Chartered Institute Environmental Health may also be acceptable provided the revised approach has been used in their derivation and is fully justified and conforms to current UK policy.
- 2.11** Not all contaminants may be covered by the above generic guidelines and some generic guidelines may not always be appropriate for assessing potential risks to human health and the wider environment in the United Kingdom. Some allowance may have to be made to reflect assumptions that were made when the guideline values were derived in order to make them more appropriate for UK conditions. guidelines have been found.
- 2.12** If the observed levels of contamination exceed the GAC, then a more detailed site-specific risk assessment may be required. This involves the formulation of SSAC using risk-modelling. The Contaminated Land Exposure Assessment (CLEA) model is a government supported method that can be used to estimate the risks to people from contaminants in soil. Please ensure that the current version of the CLEA software is used at the time of submission (check the Environment section on the GOV.UK website for details). A number of alternative risk assessment models are available. Other risk assessment models include RISC and RBCA, provided the updated guidance and framework are followed. Please ensure that all

models are in line with UK policy and include all relevant site specific pollutant linkages. All risk-modelling assumptions and uncertainties must also be presented and referenced.

- 2.13** Where ground gas issues have been identified on a site, ground gas investigations and risk assessment will need to be carried out, preferably in accordance with guidance documents published by BSI, CIRIA, CIEH and NHBC/RSK (see References). A suitable period of gas monitoring should be undertaken to characterize any gas regime. A risk assessment should be undertaken which includes the calculation of a Gas Screening Value as described in CIRIA C665. This can be used to identify whether any gas protection measures are required. Gas monitoring should also be undertaken during the worst-case scenario conditions for gas migration. (e.g. falling barometric pressures).
- 2.14** The developer should also provide sufficient information to assess the risks to controlled waters if affected by the development site works. Control waters include groundwater, rivers, streams and lakes/ ponds. The Environment Agency must also be consulted by the developer for advice and assistance, as in general the management of 'controlled waters' is administered by the Environment Agency. The developer should also provide sufficient information to assess the risks to controlled waters. The observed levels of contaminants should be compared against water quality standards such as Environmental Quality Standards (EQS) and Drinking Water Standards (DWS) for example. The use of the Environment Agency's Remedial Targets Methodology (EA, 2004) may also be required.
- 2.15** There may also be potential risks to buildings, structures, crops, livestock or ecology in the vicinity of the development area which may require investigation. Where such receptors have been identified, consultation with the appropriate authoritative body (e.g. Natural England, Historic England) should be undertaken.
- 2.16** Following completion of the investigation, a report detailing the investigation methodologies used, results, conclusions and recommendations should be submitted to the local authority for approval. The report should include:

- Rationalisation for sampling locations including reference to desk study findings;
- Sampling techniques used;
- Plans of sampling locations;
- Borehole and trial pit logs;
- Groundwater and ground gas monitoring where applicable;
- Copies of laboratory analysis certificates;
- Discussion of ground, groundwater and gas conditions and any contamination encountered;
- Qualitative and quantitative risk assessments including comparison of analytical results with appropriate assessment criteria;
- Refinement of the conceptual model and preliminary risk assessment;
- Discussion of any uncertainties in relation to the conclusions; and
- Recommendations for further investigation (if required) and remediation.

**2.17** If the Phase 2 Risk assessment shows that there are unacceptable risks from contamination to human health, property or the wider environment, then remediation to 'clean up' will be required to make the site 'suitable for use'. The development should not commence until the remediation works have been identified and carried out. Details of the remedial works via the production of a Remediation Strategy report should also be submitted to the LPA before being carried out.

***See Appendix A1 for more information on site investigations and quantitative risk assessments***

### **3.0 Remediation Strategy**

**3.1** A remediation strategy should be produced and submitted to the LPA for approval prior to commencement of works on site. It should comprise of an options appraisal, remediation objectives, details and verification of the works involved and license/ regulatory consents.

- 3.2** The 'Remediation Strategy' is a document detailing the objectives, methodology and procedures of the proposed remediation works. This must be submitted to the Council, for approval, before any remediation works commence. It should provide a detailed explanation of the remedial works and include plans and drawings to indicate the area to be remediated. Details of the depths and volumes of contaminated material to be removed should be provided. In addition, the source and volume of imported material to be used on site, as well as details of the volume of remediated material to be re-used on site.
- 3.3** The 'Remediation Strategy' should also provide details of any mitigation measures to protect future site users from potential contamination. This can include gas protection measures, clean cover systems and types of drinking water pipes for example.
- 3.4** The report should include details on how the remedial works will be validated to ensure that the remedial objectives have been met. If remediation of controlled waters is necessary, the Environment Agency will need to approve the proposed works.
- 3.5** As part of the production of the remediation strategy, an options appraisal of feasible remediation options should be performed. It should consider the advantages and disadvantages of different remediation techniques, in order to establish the best strategy to remediate a site. A variety of techniques may be required to remove all the pollutant linkages on a site. A justification of the chosen remediation techniques(s) should be included in the remediation strategy.
- 3.6** A detailed explanation of the exact works to be undertaken must be given along with the full method of the processes to be used. This should include site plans and drawings to indicate the areas to be remediated. Details of the depths and volumes of the material involved, source of any imported material, volume of remediated material to be re-used on site and waste disposal locations must also be given. The roles and responsibilities of the various parties involved in the implementation and verification of the remediation works should be clearly identified in the remediation strategy.

- 3.7** Some remedial works may require applications for environmental permits, licenses or consents, especially those involving waste management activities. All such agreements will need to be in place before site works commence. The Environment Agency should be consulted where works involve mobile plant or have waste management issues.
- 3.8** Where remediation requires importation of soil on to the site for use in garden or soft landscaped areas, this material must be 'clean' and suitable for use. Appropriate validation documentation will need to be submitted to the local authority to confirm that imported material is suitable for use. In certain circumstances, material reclaimed from the site for reuse in garden or soft landscaped areas may also require validation before placement in these areas.
- 3.9** There should be a minimum of 1.15m thick proven clean covering layer incorporating a minimum 300mm of subsoil and 300mm of top soil in all garden and landscaped areas. Consequently, the intrusive site investigation should collect and analyse soil samples throughout made ground and natural strata to prove there is a minimum of 1.15m 'clean' cover in all soft landscaped areas to ensure there is no risk to future site users.

***See Appendix A2 for more information on remediation strategies.***

#### **4.0 Verification/Validation Report**

- 4.1** Following completion of remediation works, the developer will be required to submit a verification report to the LPA to demonstrate that the remediation has been successful and to identify whether further remediation or risk management measures are required to ensure the site is suitable for the proposed use. The verification report should provide confirmation that all measures outlined in the approved remediation strategy have been successfully completed, including where appropriate, validation testing. The report should include:

- A summary of the works carried out and the risks that have been managed;
- Validation sampling of any imported soils, including details of the source of material and appropriate analysis;
- All laboratory and *in-situ* test results and, if applicable, monitoring results for groundwater and ground gas;
- Photographic and other media records;
- Certification of any gas protection measures installed in individual buildings;
- Waste management and disposal documentation ('Duty of Care'); and
- Confirmation that the remediation target criteria objectives have been met.

If further long-term monitoring is required such as groundwater or gas monitoring, an interim report should be submitted which details all the completed remedial verification achieved to date.

**4.2** The developer must demonstrate that the gas protection system has been installed correctly. The verification report should include a summary of all the gas protection works undertaken. The report should include the following:

- Summary of gas risk assessment
- Description of Gas Protection Measures and specification
- Technical drawings, plans, photographs, as built drawings
- Formal qualifications of installer which prove independence of verifier
- Details of the verification inspection regime
- Summary of verification integrity test results data
- Statement that demonstrates that remedial objectives have been achieved
- If necessary details of long term management of measures

**4.3** This report is very valuable for future owners of the properties. It should show where contamination has been found and remediated and provide evidence to confirm that the approved remediation measures have been completed i.e. photographs, results of validation testing etc. Failure to submit all this necessary documentation may lead to legal complications with the future use or sale of development/ housing. In particular the report will be necessary to prove that the development site is unlikely to be defined as contaminated land

for the purposes of Part IIA of the Environmental Protection Act 1990.

- 4.4 In certain circumstances it will be necessary for the developer to conduct post-completion monitoring to verify that the remediation has been successful. This should be undertaken to the satisfaction of the local authority and the results of the monitoring should be submitted for review.
- 4.5 On large schemes where development may be phased, progressive discharge of the planning conditions may be possible provided a satisfactory verification report is received for each phase.
- 4.6 A detailed description of all remediation works carried out on site must be included along with any plans, drawings etc. to show the areas remediated.
- 4.7 The report should detail whether all pollutant linkages have been broken or effectively controlled and whether the site is suitable for its intended use. An updated conceptual site model should also be included

***See Appendix A3 for more information on verification reports.***

## 5.0 **Key Points**

- It is important to identify the potential for contamination to be present at an early stage in order that unexpected costs and delays can be avoided should a potential problem be identified during development works.
- Contaminated land, and the potential for it, requires specialist advice from a suitably qualified consultant.
- All site remediation works should be fully documented and summarised as part of a post validation report submitted to Gateshead Council on completion of the ground works.
- **Remediation works can only commence once the**

remediation strategy has been submitted to and agreed by the LPA. The remediation strategy should include the information listed in Appendix A2

- On completion of remediation and verification works, a verification report must be submitted to the Local Planning Authority for approval. The verification report should include the information listed in the checklist below. If you have any queries please contact the Council's Contaminated Land Officer.
- **WARNING: Non-submission of a verification report when required by planning condition can result in failed environmental searches for house purchasers, the loss of house sales and blight of properties. It is the responsibility of the developer to ensure that a verification report is submitted when required.**

## **6.0 Discharge of Planning Conditions**

To discharge (approve the details required by) land contamination conditions the Local Planning Authority must be satisfied, at all the relevant stages, that satisfactory reports have been submitted to demonstrate that the development is suitable for use. Failure to appropriately resolve planning conditions can lead to delays in the construction and sale of developments.

## **References (Useful Documents)**

### MANDATORY GUIDANCE

- The Contaminated Land (England) Regulations 2000
- Contaminated Land (England) (Amendment) Regulations 2012.
- The Environment Act 1995
- The Environmental Protection Act 1990
- Department for Communities and Local Government, 2019. National Planning Policy Framework.
- Department for Environment, Food and Rural Affairs, April 2012. Environmental Protection Act 1990, Contaminated Land Statutory Guidance. The Stationery Office Ltd.

### ADVISORY GUIDANCE

- BS8485: 2015, Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- British Standards Institution (2015). BS 8485:2015+A1:2019: Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments. BSI, London
- British Standards Institution (2015). BS 5930:2015: Code of Practice for Site Investigations. BSI, London
- British Standards Institution (2013). BS 8576:2013: Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs).
- BS 10175:2011 British Standard Institute Investigation of Potentially Contaminated Sites - Code of Practice, British Standard Institute. London.
- CL:AIRE (2016). Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and

Construction & Demolition Materials: Industry guidance (CAR-SOIL). CL:AIRE, London.

- Construction Industry Research and Information Association (2018). CIRIA C773: A Guide to Small Brownfield Sites and Land Contamination. CIRIA, London.
- Construction Industry Research and Information Association (2014). CIRIA C733: Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks. CIRIA, London.
- Construction Industry Research and Information Association (2007). CIRIA C665: Assessing Risks Posed by Hazardous Ground Gases to Buildings. CIRIA, London.
- Construction Industry Research and Information Association (2001). CIRIA C552: Contaminated Land Risk Assessment: A Guide to Good Practice. CIRIA, London.
- CIRIA C735, Good Practice on the testing and verification of protection systems for buildings against hazardous ground gases, 2014
- CLEA software version V1.07
- CIRIA C659, Assessing risks posed by hazardous ground gases to buildings, 2006
- Chartered Institute of Environmental Health: The Local Authority Guide to Ground Gas, 2009
- Department of the Environment (1995). Industry Profiles (Various Titles). DoE, London (available from: <https://www.claire.co.uk/useful-government-legislation-and-guidance-by-country/198-doe-industry-profiles>).
- Environment Agency (2020). Land Contamination: Risk Management (LCRM). Environment Agency, Bristol.

- Environment Agency (2000) Technical Aspects of Site Investigation (2 Vols.). Research and Development Technical Report P5-06517R. Water Research Centre, Swindon
- Environment Agency/NHBC R&D Publication 66 - 'Guidance for the Safe Development of Housing on Land Affected by Contamination', 2008
- Environment Agency (2001) Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination. R&D Technical Report PS-066/7R. Water Research Centre, Swindon
- Environment Agency, Human health toxicological assessment of contaminants in soil (Science Report Final SC050021/SR2), 2009
- Environment Agency, Updated technical background to the CLEA model (Science Report Final SC050021/SR3), 2009
- Environment Agency (2015). Contaminated Land Exposure Assessment (CLEA): Software and Relevant Publications. Environment Agency, Bristol.
- Environment Agency, 2006 Remedial Targets Methodology, Hydrological Risk Assessment for land contamination
- Ministry of Housing, Communities & Local Government. National Planning Policy Framework (2019) and associated National Planning Practice Guidance on Land Affected By Contamination (2019). Ministry of Housing, Communities & Local Government, London (available from: <http://planningguidance.planningportal.gov.uk/>).
- National House Building Council, Environment Agency & CIEH (2008). R & D Publication 66: Guidance for the Safe Development of Housing on Land Affected by Contamination. NHBC & Environment Agency, London.

- National House Building Council (2007). Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present. NHBC, London.
- Wilson, Card, Haines, 2009: Ground Gas Handbook. Whittles Publishing
- Yorkshire and Lincolnshire Pollution Advisory Group (2017). Verification Requirements for Cover Systems: Technical Guidance for Developers, Landowners and Consultants. Version 3.4. YALPAG, UK (available to download from most council websites in the region).
- Yorkshire and Lincolnshire Pollution Advisory Group (2016). Verification Requirements for Gas Protection Systems: Technical Guidance for Developers, Landowners and Consultants. Version 1.1. YALPAG, UK (available to download from most council websites in the region).

## Appendix A1

### **PHASE 2:- Site Investigation and Risk Assessment Checklist**

<b>A.</b>	Requirements
1	Review of any previous site contamination studies (desk based or intrusive) or remediation works
2	Site investigation methodology to include: <ul style="list-style-type: none"> <li>• Methods of investigation and justification of exploration sampling and analytical strategies</li> <li>• Scaled, annotated plan showing exploration locations, on site structures, storage tanks etc</li> </ul>
3	Results and findings of investigation: <ul style="list-style-type: none"> <li>• Ground conditions (soil, gas and groundwater regimes, including made ground)</li> <li>• All laboratory results (laboratory must be MCERTS accredited)</li> <li>• Discussion of soil/gas/groundwater/surface water findings</li> </ul>
4	Conceptual site model (diagrammatic and written, highlighting any changes to that in Phase 1
5	Risk Assessment at a minimum to be based on the contaminant source-pathway-receptor model. To include: <ul style="list-style-type: none"> <li>• Severity of consequences</li> <li>• Likelihood of occurrence</li> <li>• Justification of any risk assessment models used</li> <li>• A suitable quantitative risk assessment (if required)</li> </ul>
6	Recommendations for remediation (Justifications should relate to proposed end use of site, risk assessment findings, as well as technical and financial appraisal)
7	Recommendations for further investigation (if necessary)
8	Recommendations for intrusive investigation (if necessary) to include: <ul style="list-style-type: none"> <li>• Identification of target areas for more detailed investigation</li> <li>• Rationale behind proposed design of investigation</li> </ul>

## Appendix A2

### Remediation Strategy Checklist

<b>B.</b>	Requirements
1	Objectives of the remediation works
2	Detailed outline of the works to be carried out, to include: <ul style="list-style-type: none"><li>• Description of ground conditions (soil, gas, water)</li><li>• Type, form and scale of contamination to be remediated</li><li>• Remediation methodology, including remedial, protective or other works</li><li>• Scaled site plans/ drawings</li><li>• Phasing of works and approximate timescales</li></ul>
3	<ul style="list-style-type: none"><li>• Consents, agreements and licenses (discharge consents, waste management license, asbestos waste material removal licence etc)</li></ul>
4	Site management procedures to protect site neighbours, environment and amenity during works including (where appropriate): <ul style="list-style-type: none"><li>• Health and safety procedures</li><li>• Dust, noise and odour controls</li><li>• Control of surface run off</li></ul>
5	Details of how any necessary variations from the approved remediation strategy arising during the course of works will be dealt with.
6	Details of how the works will be validated to ensure the remediation objectives have been met, including details where appropriate on: <ul style="list-style-type: none"><li>• Sampling strategy</li><li>• Use of on-site observations, visual/olfactory evidence</li><li>• Chemical analysis and monitoring data</li><li>• Proposed clean-up standards (i.e. contaminant concentrations)</li></ul>
7	Recommendations for further investigation (if necessary)

## Appendix A3

### Post Remediation Verification Report Checklist

<b>C.</b>	Requirements
1	Include information as per B (1) to B (6)
2	Details of who carried out the work
3	Details and justification of any deviation(s) from the original Remediation Statement
4	Substantiating data. This should include where appropriate: <ul style="list-style-type: none"> <li>• Laboratory and in situ test results (laboratory to be MCERTS accredited)</li> <li>• Post remediation monitoring results for groundwater and gases</li> <li>• Summary data plots and tables relating to clean up criteria.</li> <li>• Plans showing treatment areas and details of any deviations from the original remediation statement</li> <li>• Details of material removed from the site (volume, final disposal and waste management documentation etc)</li> <li>• Details of material brought onto the site (volume, details of source, test results*</li> </ul> <i>*All imported materials to be tested to prove that it is free from contaminants.</i>
5	Details and verification of mitigation measures, including where appropriate: <ul style="list-style-type: none"> <li>• - Details of capping/site won material/imported topsoil and test results.</li> <li>• - Details of gas protection systems.</li> <li>• - Specification of drinking water pipes.</li> </ul>
6	Details on any ongoing verification or long term management.
7	Confirmation that remediation objectives have been met and the site is suitable for use

