Oxfordshire Planning Advice Note

Dealing with Land Contamination During Development: A Guide for Developers

THE OXFORDSHIRE CONTAMINATED LAND GROUP CONSORTIUM






Version 4 – December 2020

Vale of White Horse District Council

South Oxfordshire District Council

Listening Learning Leading

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OXFORD CITY COUNCIL

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1. Scope of Planning Advice Note

To ensure that risks from land contamination are addressed during development in line with the National Planning Policy Framework (NPPF).

To explain what information the LPA(local planning authority) will require from developers to demonstrate that the risks from land contamination have been addressed.

The Planning Advice Note is designed to cover a variety of developments ranging from residential to commercial and industrial. The leaflet is not an exhaustive list of requirements and developers are advised to engage in pre-application discussions with both the LPA and the Contaminated Land Officer for further information. The e-mail contact details are as follows;

Oxford City Council
Planning@oxford.gov.uk – to obtain information from the planning department
LQuality@oxford.gov.uk – to obtain information from the City Council Land Quality Officer

South Oxfordshire District Council and Vale of the White Horse District Council
Planning@southandvale.gov.uk– to obtain information from the planning department
Env.health@southandvale.gov.uk- to obtain information from the Land Quality Officer

2. Introduction

Land contamination is most commonly a result of previous industrial activities such as fuel storage, vehicle maintenance, landfills, gasworks and other industrial activities; although agriculture and horticulture can also be sources of contamination. The operation of these industrial activities and their related practices have not always been as well regulated as they are today and awareness of the impacts of contamination not as well known.

Contamination is more likely to arise in former industrial areas but cannot be ruled out in other locations including in rural areas (e.g. by inappropriate spreading of materials such as sewage sludges). In addition, some areas may be affected by the natural occurrence of potentially hazardous substances, such as methane or elevated concentrations of metallic elements. Unsuitable made ground or nearby landfill sites generating migrating gases can also affect a development site.

Identifying the risks from land contamination requires a ‘source-pathway-receptor’ assessment to be undertaken whereby the sources of hazard (e.g. landfill gas, fuel tanks, heavy metal soil contamination, unsuitable made ground), the current and future receptors (residential dwelling, ground water, local water course, building, etc) and the pathway (linkage by which contamination can come into contact with the receptor) are considered together to assess risk.

Using risk based approaches ensures that all risks from contamination are addressed during development.

3. Managing risk from land contamination during development

3.1 What is expected of the developer?

The developer is required, by the NPPF, to identify land affected by contamination and to ensure that remediation is undertaken to secure a safe development and that the land is suitable for its proposed use. Following development the land must be incapable of being determined as contaminated land under Part 2A of the Environmental Protection Act (1990). This must be accomplished by furnishing the LPA with adequate site investigation information to demonstrate the absence of contaminated land or that any such land contamination has been addressed. The LPA is unlikely to determine the planning application until such a time that sufficient information has been provided to demonstrate the development is viable with respect to any land contamination and its associated risks.

The standard 1APP planning application form makes requirements for '**an appropriate contamination assessment**' to be submitted with any planning application on land that is known or suspected to be contaminated or any development that involves a proposed use that would be particularly vulnerable to land contamination.

When providing any information on contaminated land the developer should be aware that any omissions on their part could lead to planning enforcement action or action under Part 2A of the Environmental Protection Act (1990) by the local authority.

3.2 What is an appropriate contamination assessment?

To ensure that land contamination is addressed during development the LPA will require the following:

- Any planning application on land that is **known or suspected of being contaminated** will need a minimum of a **phase one contaminated land preliminary risk assessment**.

- Planning applications involving proposed uses that are **particularly vulnerable to contamination***, and where there is currently no information to suggest that contaminated land may be present, will require **a "Contaminated Land Questionnaire"** to be completed.

*Developments classed as particularly vulnerable to contamination include; residential housing, nursing homes, allotments, schools, nurseries and crèches, children's playing areas and playing fields, mixed use developments including vulnerable proposals.

3.3 Planning conditions

If the LPA are satisfied that the development is viable with respect to any risks from contaminated land then further contaminated land investigations or remedial works may be required through contaminated land planning approval conditions. If sufficient information has not been provided to determine whether the development is viable then further works will be required before the planning application is determined.

3.4 Unexpected contamination

If the developer discovers any contamination during development in areas where it was not expected and has not been specifically detailed in contaminated land assessment works, such as a preliminary or detailed site investigation reports, work on site should cease and the LPA contacted immediately. Work should not recommence until the developer has written agreement from the LPA, on how the unexpected contamination shall be dealt with.

3.5 Building control bodies

As soon as you are aware that contamination may affect the development or that gas protection needs to be incorporated into the development design, you should inform your building control body. It is the responsibility of the developer, not the building control body, to ensure that any contamination mitigation features implemented are suitable for the purpose for which they are intended. You may be asked to provide evidence that any measures to protect the development from contamination, such as gas protection, have been checked and approved by your building control body before any remediation can be deemed complete and before discharge of any conditions will be considered. The Building Control Service at the relevant local authority may also have specific contaminated land requirements relating to Part C of the Building Regulations and should be consulted accordingly.

3.6 The Environment Agency

The Environment Agency has responsibilities for the water environment and may be consulted by the LPA where controlled waters are potentially at risk from contamination at a development site. The LPA or Environment Agency may require the developer to remediate any contamination of water environments at a development site regardless of whether such contamination may have a significant risk to the proposed development.

3.7 Designing the development

Where contamination is known, or is suspected of being significant, the developer may seek to address this by appropriate design of the site. The design and layout of the development can reflect uneven distribution of contamination. For example, less sensitive uses, such as car parking or commercial buildings, could be placed over areas of higher contamination, enabling the sensitive uses, such as housing, to be located on areas of lower contamination (i.e. zoning the site). This has the benefit of mitigating the potential risks and may also reduce overall costs and increase sustainability of the development.

3.8 Change of use

If a proposed development involves changing to a more sensitive use (from warehouse to residential for example) then land contamination investigations may be required even if no ground disturbance is proposed. These investigations are required to ensure risks to more sensitive receptors that are more vulnerable to contamination, and any risk to the environment from any historic legacy of land contamination, are addressed.

3.9 Pre-application discussions

It is important for developers to initiate pre application discussions with the local authority officer responsible for assessing and reviewing development reports associated with land affected by contamination. In these discussions the officer will be able to provide advice to the

developer as to what the local authority considers to be acceptable and practicable when developing land affected by contamination.

Developers who are aware of possible land contamination are advised to contact the council to discuss any issues prior to submitting a planning application. This will enable discussions on whether preliminary investigations, intrusive site investigations data and remedial proposals will be needed before the planning application can be determined.

3.10 Phased investigation

Phased investigation will be required for development of land that is, or has the potential to be affected by contamination; the process involves identifying and dealing with land contamination in four phases. This will be discussed in the following section.

Reference should be made to LCRM (land Contamination Risk Management) procedures prior to carrying out any site investigation. These procedures are available to download on the following link;
https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm

3.11 Sustainable remediation

Where remediation work is required on site to mitigate against significant contamination risks, the LPA recommends that the principles of sustainable remediation are followed as far as possible in accordance with the standard methodology provided in ISO 18504:2017 and the principles and best practice promoted by SuRF-UK. Details and principles of sustainable remediation can be obtained from CL:AIRE on the following links;
https://www.claire.co.uk/projects-and-initiatives/surf-uk
https://www.claire.co.uk/projects-and-initiatives/surf-uk/77-sustainable-remediation
https://www.claire.co.uk/projects-and-initiatives/surf-uk/82-faqs

4. Completing a phased contaminated land investigation

4.1. Phase one contaminated land preliminary risk assessment

Desk study

The applicant will need to demonstrate in a desk study report that a comprehensive information search has been carried out. Typical information sources include, but are not limited to:

- Historic maps
- Trade directories
- Planning histories
- Environmental data from the authorities
- Local anecdotal information.

A desk study is an important part of a contaminated land investigation as you cannot establish if the development could be at risk from land contamination without this information. This research would establish if land contamination has the potential to be present on land from current and historic land uses both on and surrounding the development site.

Land uses considered in a desk study include but are not limited to former industrial sites, closed and active landfills, fuel storage, infilled ground, vehicle maintenance and agricultural land.

Site walkover

The site walkover would establish if contamination could be present from an undocumented practice or industrial use of the land and surrounding land, and confirm the information gathered in the desk study. Visual assessment of the land to check for signs of industrial activity or landfilling, fly tipping, fuel storage, fuel tanks, asbestos related materials or any land contamination, is typically undertaken and accompanied by photographic evidence to show the condition of the development land.

Risk assessment

A risk assessment will establish how the development, future occupants or the environment could be impacted by any land contamination. The history of the land uses at the development site, adjacent land and any land at greater distances with the potential to generate hazardous gases, will need to be identified and then risk assessed. A conceptual site model is an important part of a contaminated land risk assessment. This model details all the sources of contamination and whether any pathways exist for this contamination to impact the development, future occupants or the environment. These are known as ‘possible pollutant linkages’.

A conceptual site model can be presented as a picture, diagram or text. It is important that the conceptual model is updated regularly as more information about the site is collected.
Preliminary investigation check sheets have been produced to clarify the information required (see Appendix two). If the preliminary conceptual site model identifies a potential pollutant linkage then a Phase Two Intrusive Site Investigation will be required.

4.2. Phase two: intrusive site investigation

The intrusive site investigation phase is designed to reduce the uncertainties in the conceptual model by quantifying potential contamination on site and establishing the risk posed to the development or the environment. Through intrusive investigation, chemical testing and subsequent quantitative risk assessment this phase can confirm possible pollutant linkages and provide details of appropriate remediation options, if required.

It is recommended that the Local Planning Authority is consulted with any investigation proposals before the works are undertaken so as to ensure they conform with the authorities requirements.

The conceptual site model must be revised after the intrusive investigation to determine if the development, or the environment, is at a significant risk. If this is the case a phase three remediation statement should be formulated.

Intrusive site investigation check sheets have been produced to clarify the information required at this phase of an investigation (see Appendix two).

4.3. Phase three: remediation statement

The remediation statement is a document detailing the objectives, methodology and procedures of the proposed remediation works. This may include the removal, treatment or encapsulation of contamination, as well as target levels for residual contamination. This must be submitted to the local authority, for approval prior to work commencing.

4.4. Phase four: validation

Following completion of the remediation works a validation report must be produced, demonstrating that the works have been carried out satisfactorily and that the remediation objectives and targets have been achieved. It must include the results of any validation testing. Please note that the principles of ‘sustainable remediation’ should be followed where possible as stated in paragraph 3.11

Discharge of the contaminated land condition will only be considered once the Local Planning Authority is satisfied that contamination has been sufficiently investigated and dealt with, and that no unacceptable risk remains to the future development or environment.

Certain developments may require post-remediation monitoring. This should be undertaken to the approval of the Local Planning Authority and the results of the monitoring submitted for review. The Environment Agency may need to be consulted for matters relating to groundwater or other water resource contamination.

Generally speaking, no development should commence until any risk to the development or the environment from contamination has been addressed. It is however recognised that some parts of the remediation may form part of the development such as the placing of gas resistant membranes into building or placing clean material/ topsoil in garden areas. In such situations the development may be permitted to proceed but that it should remain unoccupied until the remaining remedial works have been approved by the LPA and a remediation statement and validation report check sheet has been produced to clarify the information required at this Phase of a contaminated land investigation.

A flow chart has been produced in Appendix one to clarify the different stages of undertaking an appropriate contamination assessment.

Investigation check lists for all phases of a contaminated land investigation are attached to this leaflet in Appendix two.

5. Completion & post completion

5.1 Keeping future occupants aware of situation

Where the remediation scheme includes ongoing monitoring and maintenance, or where contamination has remained but it does not present an unacceptable risk, the developer will need to make arrangements to ensure that future owners are made fully aware of the situation and any responsibilities. Examples include gas protection measures designed into the development that should not be damaged or of any membranes placed in gardens underneath a clean soil capping layer. This should be in writing and usually takes the form of a home buyers information pack.

5.2 Environmental information requests

Local Authorities frequently receive requests for environmental information about land and it is obliged to provide the information if it holds it on file. It is common for solicitors acting on behalf of vendors to request environmental information about a property from the local authority. This is particularly the case where new development has been carried out on former industrial land. Where the local authority is not able to advise solicitors that planning conditions have been satisfactorily complied with, there is a risk that a house sale will not proceed. It is therefore in the interests of developers to follow the investigation procedure and maintain good communication with the Local Planning Authority and comply fully with the requirements of the planning conditions.

Under no circumstances will the Local Planning Authority issue a statement that the site is no longer contaminated as we can only comment on the information provided and cannot influence future uses of the site. The landowner, developer and future occupiers therefore will not be released from any liabilities in respect to contaminated land and must ensure that their investigations are sufficient to identify any risk to the development or environment from contamination.

5.3 Applying for discharge of contaminated land conditions

The developer can apply for discharge of a contaminated land condition once the requirements of the condition have been addressed e.g. the completion of the approved remediation works. Appropriate reports would need to be submitted to the LPA demonstrating that the risks from land contamination to the development and the local environment have been addressed, with the condition discharge application fee.

5.4 Developers residual liability for contaminated land

After the developer has dealt with any land contamination to the satisfaction of the LPA and the condition discharged, the developer will still have residual liability for any land contamination that was not addressed during the development.

The LPA can only comment on the information made available and any omission whether intentional or not or any unsuspected land contamination later identified will remain the responsibility of the developer.

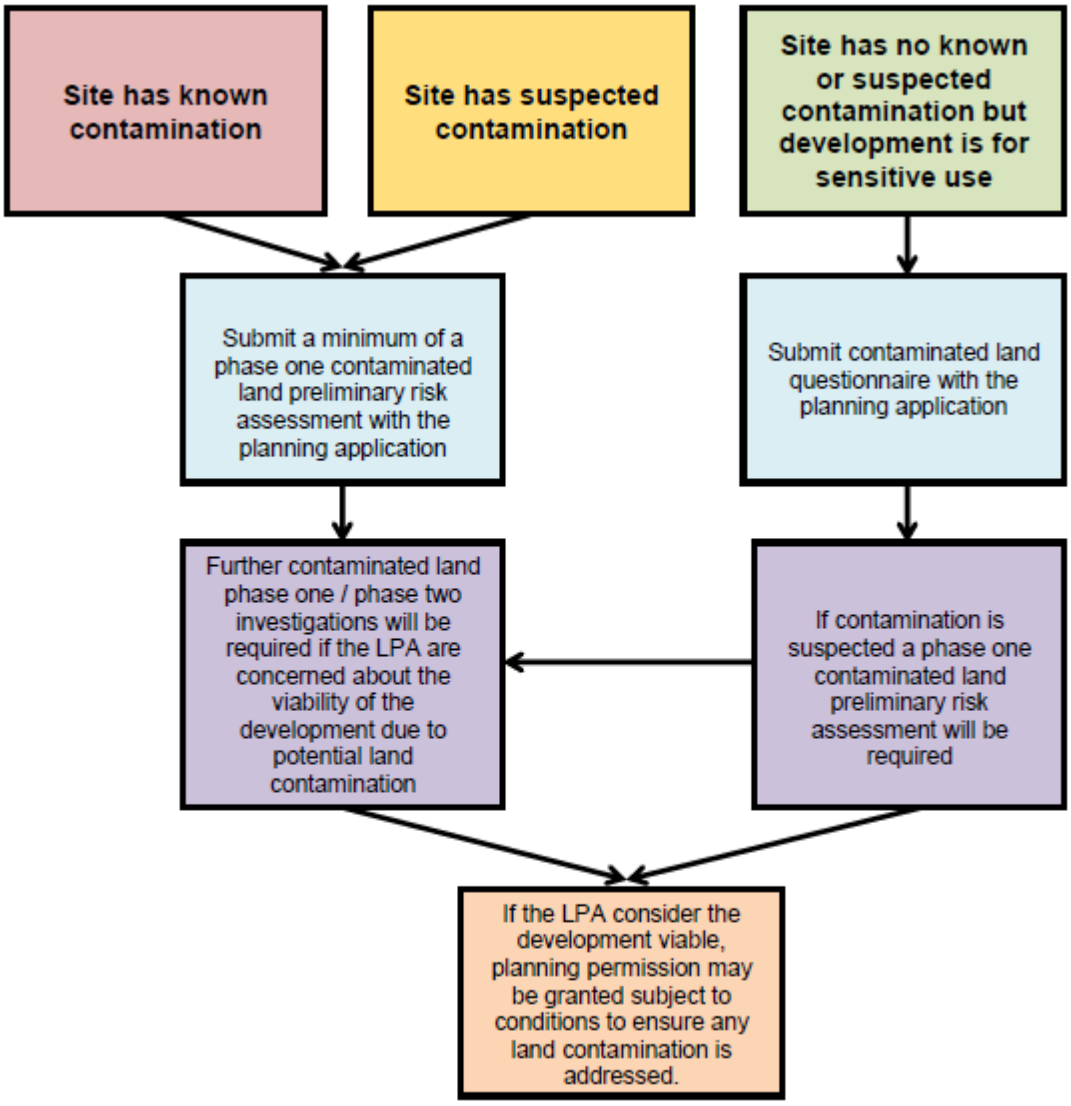
Under Part 2A of the Environmental Protection Act 1990 all local authorities have an additional duty to investigate their districts for contaminated land and secure any necessary remediation from those responsible. Should land contamination be identified at a development site after the contaminated land conditions are discharged then the local authority will use its powers under Part 2A of the EPA 1990 to ensure that any risks from that land contamination are addressed.

6. Further information

The following web sites provide useful background and detailed information on land contamination:

- Department of Environment, Food and Rural Affairs: Guide: Contaminated Land https://www.gov.uk/contaminated-land
- Environment Agency: Land Contamination http://www.environment-agency.gov.uk/research/planning/33706.aspx

Appendix one: Information required to demonstrate a development is viable



Appendix two: Investigation checklist

Phase one: Preliminary risk assessment

1. Clearly defined purpose and aims of study
2. Site Location and layout plans
3. Appraisal of site history, identifying all uses of site / vicinity back until the site was greenfield (including appropriately scaled and annotated historical maps)
4. Appraisal of site walkover survey
5. Assessment of environmental setting, to include:
    - Geology, hydrogeology, hydrology
    - Information from Environment Agency on abstractions, pollution incidents, water quality classifications, landfill sites with 250m etc.
    - Information from English Nature on SSSIs and other interests that warrant protection
    - Information from public authorities
6. Assessment of current / proposed site use and surrounding land uses
7. Review of any previous site contamination studies (desk based or intrusive) or remediation works, whether undertaken on the site or on any adjacent site
8. Preliminary (qualitative) assessment of risks, to include:
    - Appraisal of potential contaminant sources, pathways and receptors Conceptual site model – to show the nature and extent of the potential contamination
    - Health and safety issues
9. Recommendations for intrusive contamination investigation, if necessary

Phase two: Intrusive site investigation

1. Review of any previous site contamination studies (desk based or intrusive) or remediation works
2. Clearly defined purpose and aims of study
3. Site investigation methodology, to include:
    - Methods of investigation including a fully justified sampling strategy and explanations of all investigations methods and techniques used
    - Plan showing exploration locations – to be appropriately scaled and annotated
    - Justification of exploration locations
    - Sampling and analytical strategies
4. Results and findings of investigation, to include
    - Ground conditions (soil and groundwater regimes, including made ground) and the implications for contamination
    - Discussion of soil / groundwater / surface water contamination (visual, olfactory, analytical)
5. Conceptual site model
6. Risk assessment – based on contaminant source – pathway – receptor model. Should take account of severity of consequences (to groundwater, human health etc.) and likelihood of occurrence, both present and future. All details of the site specific QRA models selected and justification for their selection must be stated. Please note all assessments must be made by competent and directly experienced assessors
7. Review of conceptual model and plausible pollutant linkages
8. Recommendation for remediation – justification should relate to proposed site use, risk assessment findings, as well as technical and financial appraisal – should follow the ‘suitable for use’ approach
9. Recommendations for further investigation (if deemed necessary)

Phase three: Remediation statements

1. Clearly defined purpose and objectives of the remediation works
2. Detailed outline of the works to be carried out
    - Description of ground conditions (soil and groundwater)
    - Type, form and scale of contamination to be remediated
    - Remediation methodology
    - Site plans / drawings
    - Phasing of works and approximate timescales
3. Consents, agreements and licenses (discharge consents, waste management license etc.)
4. Site management procedures to protect neighbours, environment and amenity during works, should include where appropriate:
    - Health and safety procedures
    - Dust, noise and odour controls
    - Control of surface water run-off
5. Details of how any necessary variations from the approved remediation statement arising during the course or works will be dealt with including notification of the Council
6. Details of how the works will be validated to ensure the remediation objectives have been met; should include details on:
    - Sampling strategy
    - Use of on-site observations, visual and olfactory evidence
    - Chemical analysis
    - Proposed clean-up standards (i.e. Contaminant concentrations)

Phase four: Validation report

1. Include information as per remediation statement
2. Details of who carried out the works
3. Details of justification of any changes from the original remediation statement
4. Substantiating data – should include where appropriate:
    - Post remediation sampling, laboratory and in-situ test results
    - Monitoring results for soil and groundwater contaminants and gases
    - Summary plots and tables relating to clean up criteria
    - Plans showing treatment areas and details of any differences from original remediation statement
5. Confirmation that remediation objectives have been met
6. Recommendations for future maintenance and long term monitoring of the site (if deemed necessary)

Appendix three: Contaminated land questionnaire

Contaminated Land Questionnaire

This questionnaire is to be used for all planning applications that involve creation of a use that would be particularly vulnerable to land contamination, such as new residential units. The information requested in this questionnaire is considered to be an appropriate contamination assessment and sufficient to comply with Question 15 of the 1APP form.

Examples of vulnerable end uses and potentially contaminating land uses are contained in Appendix One. Residential developments should only complete this questionnaire if one or more new residential units will be created.

If any part of the development site is known or suspected to be contaminated, a contaminated land desk study and preliminary risk assessment consultant's report is likely to be required. The information you provide in this questionnaire will help us make an informed decision as to whether a more formal assessment of land contamination is necessary.

In order to assess whether a proposed development is suitable, the applicant must satisfy the Local Planning Authority that there is no unacceptable risk from contamination. This questionnaire seeks information about the proposed development and the previous uses of the site and will help us assess whether contaminated land is an issue. It is therefore essential that you answer the questions accurately and thoroughly. Failure to provide the required information will result in the questionnaire being rejected and may delay your planning application decision.

This questionnaire is available on the contaminated land pages of the councils' web sites. For more information contact the Environmental Protection Team on:

Vale of the White Horse: 01235 422403
South Oxfordshire District Council: 01235 422403
Oxford City Council: 01865 249811

Obtaining Historical and Environmental Site Data
Historical mapping from 1843 to the present day is required to complete the questionnaire. This information might be available from the library free of charge and can be purchased from commercial search companies such as, but not limited to, Landmark and Groundsure. Historical mapping can be viewed for free and copies of mapping purchased at http://www.old-maps.co.uk/index.html
Landfill and pollution incident data can be obtained from the Environment Agency enquiries_THM@environment-agency.gov.uk 03708 506506

Contaminated Land Questionnaire

Please complete ALL SECTIONS.

1. Development Details

i) Site Name	
Site Address Post Code	
Planning Reference (if known) Eg. 10/99999/FUL or P10/E1111	

(tick all that apply)	Residential	Agricultural	Commercial	Industrial	Other (specify)
ii) What is the proposed site use?					
iii) What is the existing site use?					
iv) What has the site previously been used for in the past 150 years?					
v) What is the current use of adjacent land?					
vi) What has the adjacent land been used for in the past 150 years?					

2. Site History, Land and Building Use

i) If the use of the site has changed, please give date of any known change(s)		
From	To	Land Use

ii) List existing buildings and describe how they are currently and have previously been used. Please provide photographs of site buildings.	

iii) Have any fuels or chemicals ever been stored on the site? (Please tick)	Yes	
	No	
iv) Have there been any fuel/chemical spills or leaks on the site? (Please tick)	Yes	
	No	

If your answer to either of the above questions is 'Yes' please state the type of fuel/ chemical stored, location and details of any spillages including the quantity, location and any action taken to clear the spill if this information is known.

v) Have there been any waste disposal activities (including the burning of waste) carried out on site? (Please tick)	Yes	
	No	
vi) Have there been any waste disposal activities carried out within 250 metres of the site? (Please tick)	Yes	
	No	
If the answer is 'Yes' please detail the areas where waste is or has been stored and the type of waste/ quantity present if this information is known. For information on landfill sites please refer to the Environment Agency website.		

vii) Have there been any pollution incidents, either reported or unreported, on or adjacent to the site? (Please tick) Details of reported pollution incidents are available from the Environment Agency's website.	Reported		Unreported	
	Yes	No	Yes	No
If the answer is 'Yes' please detail the areas where the pollution incident occurred and give information on the type of pollution, quantity and date of occurrence if this information is known.				

3. Signs of Land Contamination

Please detail any signs of ground contamination and any evidence of past industrial use. For example ground staining, discoloration, chemical odours, unnatural ground conditions, industrial structures, oil storage. Please also indicate the distance of any surrounding industrial use including fuel tanks, from the boundary of the development site.

4. Previous Land Contamination Reports

If you are in possession of or have access to any previous land contamination reports relating to the site, please provide this information in support of the application, along with an interpretation of the risks to the proposed development.		
Report(s) and interpretation enclosed? (Please tick)	Yes	
	No	
Please provide a brief description of enclosed reports		

5. Declaration

Based on your knowledge of the development site and the information you have provided in this questionnaire, please state whether land contamination is suspected, may be present or may be a risk to all or part of the proposed development? (Please tick)	
Land contamination is suspected, may be present or may be a risk to the proposed development	
Land contamination is not suspected and there is no information to suggest that land contamination may be present or may pose a risk to the development	

NOTE: Importing Top Soil

Any soil or soil forming materials brought onto the development site for use in garden areas, soft landscaping or for filling or level raising will have to be suitable for use. You are advised to confirm the suitability of all imported soils through independent chemical analysis.

Please sign below to confirm that all the information given on this questionnaire is correct to the best of your knowledge.

Name		**Tel**	
Date		**Email**	
Sign			

Appendix One – Examples of Vulnerable End Uses and Potentially Contaminating Land Uses

A. This is a list of vulnerable end uses that are particularly sensitive to land contamination. If you are in any doubt about the vulnerability of a proposed use please speak to the council's Contaminated Land Officer:

- All residential developments (houses, flats, nursing homes)
- Allotments
- Schools
- Nurseries and crèches
- Children's playing areas and playing fields
- Mixed use developments including any of the above uses

B. This is a list of potentially contaminating land uses, which is derived from Annex Two of Planning Policy Statement 23: Planning and Pollution Control (2004). Further details are available in the Department of the Environment Industry Profiles, which are available to download free of charge from the Environment Agency website.

- Smelters, foundries, steel works, metal processing & finishing works
- Coal & mineral mining & processing, both deep mines and opencast
- Heavy engineering & engineering works, e.g. car manufacture, shipbuilding
- Military/defence related activities
- Electrical & electronic equipment manufacture & repair
- Gasworks, coal carbonisation plants, power stations
- Oil refineries, petroleum storage & distribution sites
- Manufacture & use of asbestos, cement, lime & gypsum
- Manufacture of organic & inorganic chemicals, including pesticides, acids/alkalis, pharmaceuticals, solvents, paints, detergents and cosmetics
- Rubber industry, including tyre manufacture
- Munitions & explosives production, testing & storage sites
- Glass making & ceramics manufacture
- Textile industry, including tanning & dyestuffs
- Paper & pulp manufacture, printing works & photographic processing
- Timber treatment
- Food processing industry & catering establishments
- Railway depots, dockyards (including filled dock basins)
- Garages and road haulage depots
- Airports
- Landfill, storage & incineration of waste
- Sewage works, farms, stables & kennels
- Abattoirs, animal waste processing & burial of diseased livestock
- Scrap yards
- Dry cleaning premises
- All types of laboratories

Other uses and types of land that might be contaminated include:

- Radioactive substances used in industrial activities not mentioned above e.g. gas mantle production, luminising works
- Burial sites & graveyards
- Agriculture excessive use or spills of pesticides, herbicides, fungicides, fuel,
- Sewage sludge & farm/ other waste disposal. Agricultural/ other vehicle maintenance.
- Motor vehicle maintenance
- Fuel storage including domestic heating oil tanks
- Naturally occurring radioactivity, including radon
- Naturally occurring elevated concentrations of metals and other substances
- Methane & carbon dioxide production & emissions in coal mining areas, wetlands, peat moors or former wetlands