

1.2 Legal context

Part IIA of Environment Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) states that land is only contaminated where it appears to the regulatory authority, by reason of substances within or under the land that:

- Significant harm is being caused, or there is a significant possibility of such harm being caused; or
- Pollution of waterways or underground strata is being, or is likely to be, caused.

Inherent in this definition is the requirement for contamination risk assessment to be undertaken on a site-specific basis, as the potential for harm is determined by the site's end use and its specific environmental setting.

1.3 Methodology

This report has been prepared in accordance with the Environment Agency guidance ('Model Procedures for the Management of Land Contamination – Contaminated Land Report (CLR) 11'). CLR 11 provides the technical framework for structured decision making about land contamination and builds on previous work carried out under the Contaminated Land Research Programme (of the former Department of the Environment). CLR 11 has adopted and refined the well recognised methodology and terminology that has been used in contaminated land risk assessment for a number of years.

Pollutant Linkage Concept

In the context of land contamination, there are three essential elements to any risk:

- A **contaminant source** – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters.
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.
- A **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant–pathway–receptor is described as a **pollutant linkage**.

Conceptual Model

An important thread throughout the overall process of risk assessment is the need to formulate and develop a **conceptual model** for the site, which supports the identification and assessment of pollutant linkages. A conceptual model represents the characteristics of the site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors (pollutant linkages).

Risk Assessment

CLR 11 advocates a phased approach to risk assessment comprising:

1. **Preliminary Risk Assessment** – a desk study consisting of a review of documentary, anecdotal and site walk over evidence.
2. **Generic Quantitative Risk Assessment (GQRA)** - comparison of contaminant concentrations with generic assessment criteria.
3. **Detailed Quantitative Risk Assessment (DQRA)** - comparison of contaminant concentrations with site-specific assessment criteria.

1.4 Scope of Works

This study has been designed to complete the Preliminary Risk Assessment (i.e. Desk Study) aspect of the risk assessment approach stipulated in CLR11.

1.5 Terms and Conditions

Attention is drawn to the report conditions, included in Appendix A, Shepherd Gilmour Infrastructure's fee email of 21st January 2011..

2 PRELIMINARY RISK ASSESSMENT

The purpose of preliminary risk assessment is to develop an initial conceptual model of the site and establish whether there are potentially unacceptable human health / environmental risks based on desk study and site walkover information only. In order to develop an outline conceptual model and identify plausible pollutant linkages at the site, the following was undertaken:

- A review of current and historical Ordnance Survey maps;
- A review of geological and hydrogeological maps;
- A review of existing Local Authority search information;
- A review of Environmental Database report information.

2.1 Site Description

Table 2.2: Site Location	
Location	5km east of Wrexham City Centre
National Grid Reference	3392245, 350645

A site location plan is presented in Drawing Number ME1178/01 in Appendix B.

The site can be described as follows:

Table 2.3: Site Description		
Approx size and shape	The site is irregular in shape and covers an approximately area of 20.60 hectares. The site covers a main rectangular area (main body of the development site) with a long spur to the south which is to constitute the proposed development access road.	
Slope	None apparent from data obtained.	
Retaining structures	None apparent from data obtained.	
Access	Off Bryn Lane (western border of site).	
Occupancy/use	Open fields with small ponds, streams and a drainage channel.	
Structures	None apparent.	
Cover	Buildings:	None.
	Hardstand:	None.
	Soft cover:	100%.
Trees	A large number of trees confined to the boundaries of the site and field boundaries/stream channel within the site.	
Contamination sources	None apparent	

The surrounding area can be described as follows:

Table 2.5: Site and Surrounding Area History

Date	Historical Land use	
	Site	Adjacent areas (compass direction)
		development 40m from NW corner of site. Commercial/industrial development (unspecified) serviced by railtracks 350m SW.
1960-1964	No significant change.	Wrexham industrial estate no shown >300m W and SW of the site.
1968	No significant change.	No significant change.
1974	No significant change.	Large factory with tanks and electricity sub-station 350m S of main development area.
1982	No significant change.	Large factory now shown 40m west of main development area. Telephone exchange 40m NW of main development area.
1989-1990	No significant change	Factory 40m W now much larger and with a tank farm located adjacent to its SW corner.
1990-1992	Some of the ponds on-site no longer shown (possibly infilled).	No significant change.
1993	No significant change.	No significant change.
1994	No significant change.	No significant change.
1995	No significant change.	No significant change.
2002	No significant change.	No significant change.
2011	No significant change.	No significant change.

Anecdotal evidence collected as part of the previous desk study for the wider Bryn Lane site suggested that the industrial estate to the southwest of the current study was the site of a WWII munitions depot. This is not shown on historical maps but was in use between 1941 - 1945 (information from Wrexham Council, a copy of all correspondence is included in Appendix D) and not shown on historical maps due to military confidentiality.

The British Geological Survey (BGS) map 1:50,000 Sheet 122 Nantwich (Solid and Drift Edition) and information obtained from the Environmental Database report shows the following geological succession:

Table 2.6: Geology Summary

Drift Geology:	Boulder Clay
Solid Geology:	Lower Mottled Sandstone (Sherwood Sandstone Group) and Salop Formation (Westphalian D) – Sandstones, Mudstones and Conglomerate.

No geological faults are shown upon the site or in its near vicinity. The property is not affected by faulting. The local strata do not appear to be dipping.

2.6 Hydrogeology

Information obtained from the Environment Agency website indicates that the site is predominately underlain by a Secondary A Aquifer (Salop Formation). The south-eastern corner and proposed access road are underlain by a Principal Aquifer. The drift deposits (Glacial Till) are not afforded an aquifer classification.

The site is not situated over a designated groundwater Source Protection Zone (SPZ) and information obtained from the environmental database report indicates that there are no potable groundwater abstractions within close proximity of the site.

2.7 Hydrology

The Environmental Database report indicates that there is an unnamed tertiary river on-site. The channel to this forms the southern boundary of the main development area. There is what appears to be a drainage channel running along the proposed access road location which discharges into the tertiary river.

Statutory Body Consultees

The following information was taken from direct consultation with a number of statutory bodies.

Radon

The Building Research Establishment report “Radon: Guidance on Protective Measures for New Dwellings” (BR211, 2007 edition) shows that “no protection is needed” against radon gas and that further geological assessment is not required. The Health Protection Agency publication ‘Indicative Atlas of Radon in England and Wales’ (Ref. HPA-RPD-033, November 2007) indicates that less than 1% of homes are above the radon gas action level.

Landfills

Information obtained within the Environmental Database Search indicates that there are no licensed landfill sites within 250m of the site.

There is an Environment Agency licensed waste site located 121m south of the site operated by Waste Recycling Group and this receives <25,000 tonnes of Household, Commercial and Industrial waste.

The Local Authority (Wrexham Council) Environmental Health department record one historical (unlicensed) landfill site approximately 800m to the south of the main development area. A copy of all correspondence is included in Appendix D.

The review of the historical plans available for the site show that former ponds present on-site may have been infilled over the years. This is representative of localised infilling.

Mining, Subsidence and Foundations

A Coal Mining Report was obtained from the Coal Authority for the site immediately south of the study area) indicates that the site is not within the likely zone of influence on the surface from past or present mine workings. The property is not in an area where coal is believed to exist at or close to the surface which may have been worked in the past.

The Environmental Database Search does not report any significant issues as a result of collapsible ground, ground dissolution, landslides, running sand, shrinking, swelling clay or compressible ground.

Fuel/Chemical Storage

Historical plans have shown that there has been past land-uses of the site that may have involved fuel and/or chemical storage.

Historical plans and site layout plans show a number of tanks located between 40m and 100m south and west of the main development area. The contents of these tanks are unknown.

The Environmental Database Search indicates one fuel station entries within 250m of the site. Details of these are as follows:-

- Cpl Petroleum Wrexham - 20m west of site.

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Previous Site Uses, Potentially Contaminative Uses Environmentally Sensitive Issues and Other Environmental Information

Further information was requested from the Local Authority Planning Department regarding other environmental information, including past potentially contaminative uses, protected trees, listed buildings, area (development) designations. The information obtained can be summarised as follows:

- There are no listed buildings upon or adjacent to the site.
- Anecdotal information obtained from Building Control stated that natural Clay was thought to have been encountered at shallow depth on a site nearby. However, this was proved to be Fill materials as a historic railway line was encountered at approximately 4mbgl.
- Anecdotal information obtained from the Local Authority Building Control Department suggests that an ecological survey should be undertaken.

Site-specific information was included within the Environmental Database regarding other environmental information, including past potentially contaminative uses, Integrated Pollution Prevention & Control (IPPC) Authorisations and air pollution controls, Radioactive Substances (RAS), pollution incidents, water abstraction, discharge consents and contemporary trade directory entries. The information obtained can be summarised as follows:

Table 2.7: Nearby Potential Impacts	
Activity:	Location:
<i>Authorised Processes – IPC Authorisation:</i> Owens Corning Fiberglass Ltd.	173.0m W.
<i>Authorised Processes – IPPC Authorisations:</i> Kellogg Co Ltd – Cereal Manufacture.	23.0-153.0m SW.
<i>Activities involving radioactive substances:</i> Kellogg Co. Ltd. Owens Corning Fiberglass Ltd.	23.0m SW. 173.0m W.
<i>Pollution incidents:</i>	None within 250m.
<i>Licensed discharge consents:</i> Bryn Lane Industrial Estate: Unspecified Trade Discharges to unnamed tributary of River Dee. Lilac Cottage: Unspecified effluent type to unnamed watercourse. Plum tree House: Sewage discharges to unnamed watercourse.	8.0m E. 225.0m E 247.0m E.
<i>Contaminated land Part IIa sites:</i>	None within 250m

Table 2.7: Nearby Potential Impacts

Activity:	Location:
<i>Current industrial sites:</i>	
Electrical Contractors.	47.0 & 68.0m SW.
Chimney (industrial feature).	73.0 & 109.0m W.
Waste Storage, Processing and Disposal.	77.0m SW.
Telephone Exchange.	105.0m SW.
Tanks (Unspecified).	113.0m S, 139.0m SW, 158.0m SW, 170.0m SW, 210.0m SW & 248.0m NE.
Jewellery Clocks and Watches.	144.0m SW.
Cleaning Equipment and Supplies.	144.0m SW.
Catering and Non specific Food Products.	152.0m W.
Business Park and Industrial Features.	236.0m W.
<i>COMAH & NIHHS sites:</i>	None within 250m.

Due to the anticipated presence of impermeable Glacial Till (Clay) beneath the site it is considered unlikely that any of the industrial processes or potentially contaminative issues/sites previously mentioned will impact the site via the migration of contamination within underlying soils and groundwater. However, the environmental database report has indicated that nearby industrial sites (on the Bryn Lane Industrial Complex) have licensed consents to discharge trade discharges to an unnamed tributary of the River Dee. There is an unnamed tertiary river running through the site and if this is the receiving watercourse for potential trade effluent discharges then there is the potential for any associated contamination to be deposited on-site in times of flooding.

At the time of the previous desk study, the Local Authority have confirmed that there are no sites determined as 'contaminated land' under Part IIA of the Environmental Protection Act 1990 relating to the site or surrounding land. The Local Authority are currently implementing the initial stages of their contaminated land strategy therefore the site is still be considered under Part IIA in the future. Unfortunately as the Local Authority does not yet have a list of prioritised sites for inspection under Part IIA it is impossible for them to advise when such an assessment may take place.

2.8 Industry Profiling of Previous Land Uses

To tailor the conceptual model to the site in question and to inform the ground investigation, the previous industrial land uses on the site have been profiled using the Department of

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Environment (DoE) Industry Profile series. This allows specific industrial processes to be profiled and a site-specific suite of potential contaminants to be determined.

As the site has historically been in use as open fields with no development present, the potential for any contamination to be present in the ground is limited. There is some potential for contamination to be present in fill materials backfilled into former ponds although this is likely to be extremely localised in extent. The desk study has also identified limited potential for contaminants to be present (possibly near to the unnamed tertiary river) associated with possible trade effluent discharges from the adjacent industrial estate.

As there are no specific DOE profiles available for the site, the potential contaminants listed in Table 2.10 below should be used to inform ground investigation proposals, should an intrusive investigation be required:

Table 2.10: Determinands potentially present on site	
Metals, metalloids and compounds	eg: Arsenic, Cadmium, Chromium, Copper, Zinc
Inorganic Compounds	eg: Sulphates, Cyanides,
Organic Compounds	eg: Hydrocarbons, Chlorinated solvents
Acids, Alkalis	eg: Hydrochloric acid, Sulphuric acid,
Other	eg: Asbestos.

2.9 Potential Contamination Sources

The following outlines the potential contamination sources that exist across the site, based upon the above:

- A wide range of contaminants associated with Made Ground materials used to infill ponds and potential unknown Made Ground present on-site;
- Various asbestos types may be potentially present within fill materials in the former ponds;
- There exists a limited potential for the generation of harmful ground gases as a result of imported fill materials (ponds) and possible unknown Made Ground;
- There is the limited potential for areas adjacent to the river (southern boundary of main development area) to have been impacted with contaminants associated with trade effluent discharges into the watercourse.

2.10 Outline Conceptual Model

On the basis of the above, a number of possible pollutant linkages have been identified at the site, which are summarised below:

Source:	Pathway:	Receptor:
Potential organic/inorganic contamination associated with Made Ground (fill and unknown deposits) present on-site Contamination may also be present adjacent to the unnamed river arising from trade effluent discharges into the river.	Direct dermal contact Inhalation of vapours/dust Ingestion	Future site users Construction workers
	Leaching	Adjacent properties, Drainage ponds / ditches, underlying Principal and Secondary A Aquifers
Asbestos potentially present within imported fill materials.	Inhalation of fibres	Future site users Construction workers
Ground gases generated within Made Ground and sub-surface soils	Inhalation of vapours / gases	Future site users
	Vapour / gas ingress and accumulation within buildings	Any proposed buildings on site

3 CONCLUSIONS AND RECOMMENDATIONS

The site is located 5km east of Wrexham town centre. The site was open land with a number of drainage ponds and ditches and an unnamed tertiary river forming the southern boundary of the main development area. Adjacent industrial estates were developed (circa 1939-1945) and now the site has industrial units to the south and west (Wrexham Industrial Estate).

Human Health Risks

The desk study has identified limited potential for contamination to be present on the site associated with past and present landuses (open fields with ponds). The assessment of the historical mapping has identified that a small number of the ponds may have been infilled. Contamination may potentially be present within any imported fill materials used to infill the ponds. As on any site, the historical mapping only goes back to the late 1800's and there exists the possibility that the site could have been in use for human activity prior to this. As such, there is always the potential for unknown Made Ground deposits to be present on-site that may contain contamination.

The desk study has identified that there are a number of trade effluent discharge consents to an unnamed watercourse in close proximity of the site. As there is a small unnamed tertiary river and associated channel forming the southern boundary of the main development area, this may be the receiving watercourse for these discharges. Therefore, there is the potential for soils adjacent to the river to have been impacted by contaminants arising from the discharge of effluents into the watercourse.

Although the risks to human health receptors associated with the future commercial development of the site are likely to be low, an intrusive site investigation, chemical testing and risk assessment is recommended to confirm the anticipated low risks if the site is to be developed for a commercial end-use. This is likely to be required by the regulating authorities to obtain sign off of any environmental planning conditions attached to any development proposals for the site.

Controlled Water Risks

The site is situated on a Principal and a Secondary A Aquifer and there are no designated SPZs or groundwater abstractions within the area. Therefore, the site exists in a high sensitivity area with regard to groundwater receptors.

There are a number of surface water features including an unnamed tertiary river located on the southern boundary of the main development area and there is a drainage channel that runs along the proposed access road that discharges into this watercourse. Therefore, there are potentially sensitive surface water receptors in close proximity of the site.

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As highlighted in the outline conceptual model, the only potential source of soil leachate and/or groundwater contamination would be from possible Made Ground deposits arising from the infilling of ponds on-site or from unknown Made Ground deposits beneath the site. The potential for any significant contamination to be present is considered to be low based on the assessment of the site history.

An intrusive site investigation, chemical testing and risk assessment is recommended to confirm the anticipated low risks if the site is to be developed for this end-use. This is likely to be required to obtain sign off of any environmental planning conditions attached to any development proposals for the site.

Ground Gas Risks

There exists the possibility for deposits of Made Ground to be present on the site and, consequently, a potential for the generation of ground gas. Following an intrusive site investigation gas monitoring will be required to assess for the presence of ground gas and to determine the ground gas characteristic situation for the proposed development.

Geotechnical Risks

A low potential for compressible and collapsible ground was identified in the Environmental Database search, and further investigation of the potential for hazards associated with potential areas of Made Ground, the location of on-site ponds / drainage ditches in relation to the proposed development, and differential settlement from the proposed structure are considered necessary due to the size and potential loadings of the proposed development. Prior to future phases of development a full geotechnical assessment of the soils underlying the site would be required.

Unexploded Ordnance

Ordnance works near to the site, and potentially on-site, may have been the target of bombing during World War II and therefore there exists the potential for UXO at the site. Therefore, UXO desk study is considered necessary prior to any site investigation works.

Ecology

An Ecology survey is considered necessary prior to any site investigation works.

Summary Conclusion

This Preliminary Risk Assessment has identified a number of possible pollutant linkages that require further investigation and assessment if the site is to be redeveloped and the end-use changed. Consequently, a Generic Quantitative Risk Assessment (GQRA) incorporating an intrusive site investigation would be recommended. This would be designed to address the

potential pollutant linkages identified in the outline conceptual model and compare the chemical analysis results with generic assessment criteria.

APPENDICES

APPENDIX A
TERMS & CONDITIONS

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REPORT CONDITIONS

GEO-ENVIRONMENTAL DESK STUDY

This report is produced solely for the benefit of **Kingmoor Park Properties Ltd** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site and surrounding area at the time of the desk study. No warranty is given as to the possibility of future changes in the condition or surrounding area.

This report is based on a visual site inspection, reference to accessible referenced historical records, and information supplied by those parties referenced in the text. Some of the opinions are based on unconfirmed data and information and are presented as the best that can be obtained without further extensive research. The impact of our assessment on other aspects of the development requires evaluation by other involved parties.

With reference to potential sources for ground contamination, whilst the findings detailed within this report reflect our best assessment, because there are not based on the findings of intrusive investigation, laboratory testing and risk assessment, we are unable to give categoric assurances regarding their presence or otherwise. This report is prepared and written for the purposed uses stated in the report and should not be used in a different context without reference to SGE. In time, improved practices or amended legislation may necessitate a re-assessment.

The report is limited to the environmental aspects specifically reported on, and is necessarily restricted and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents. The opinions expressed cannot be absolute due to the limitations of time and resources imposed by the agreed brief, the nature of geology and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites. If migrating pollution or contamination (past or present) exists further research will be required before the effects can be better determined.

APPENDIX B

DRAWINGS