Solum House Unit 1 Elliott Court St Johns Road Meadowfield Durham DH7 8PN

Tel: (0191) 378 6380 Fax: (0191) 378 0494

e-mail: admin@arc-environmental.com www.arc-environmental.com

# PHASE 1: DESK TOP STUDY REPORT

# ADEPT CONSULTING ENGINEERS

## PROPOSED COMMERCIAL DEVELOPMENT

### HERCULES DRIVE

**SPEKE** 

### **LIVERPOOL**

L24 8AD

### Project No: 13-249

Prepared By:

Andrew Hampson

Date:

Approved By:

Mark Berriman

Date:

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The information and/or advice contained in this Phase 1: Desk Top Study Report is based solely on, and is limited to, the boundaries of the site, the immediate area around the site, and the historical use(s) unless otherwise stated. This 'Report' has been prepared in order to collate information relating to the physical, environmental and industrial setting of the site, and to highlight, where possible, the likely problems that might be encountered when considering the future development of this site for the proposed end use. All comments, opinions, diagrams, cross sections and/or sketches contained within the report, and/or any configuration of the findings is conjectural and given for guidance only and confirmation of the anticipated ground conditions should be considered before development proceeds. Agreement for the use or copying of this report by any Third Party must be obtained in writing from Arc Environmental Limited (ARC). If a change in the proposed land use is envisaged, then a reassessment of the site should be carried out.





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### May 2013

1.0 Introduction

Arc Environmental Limited has been instructed by Adept Consulting Engineers on behalf of their client Commercial Development Projects Ltd. to undertake a Phase 1: Desk Top Study (DTS) Report for an area of currently undeveloped land located off Hercules Drive / Hurricane Drive within Liverpool Business Park, Speke, Liverpool. As part of this DTS, the whole of the site area has been assessed although at this stage, there are only proposed development details for the northern portion of the site which is to include the construction of a large single structure to be utilised as offices (20,000sqft) and proposed shop floor / warehouse (130,000sqft) with associated car parking, a service yard and areas of soft landscaping.

The primary objectives of the report are to assess the geological and contaminated land conditions on and beneath the surface of the site as a whole. A Preliminary Conceptual Site Model (CSM) has been developed to define the scope and extent of any future investigation works deemed necessary, prior to commencing with any future redevelopment works.

A site walkover (reconnaissance survey) was completed as part of this report and relevant features are noted and summarised in Table 2.1 below. Site photographs are included within Appendix I.

Prior to the completion of this report, contact was made with the Contaminated Land / G.I.S Officer at Liverpool City Council (LCC) to determine if they held any specific information relating to the site, and or nearby adjacent land. Following these discussions and the procurement of a LCC Environmental Search Report for Potentially Contaminated Landuses, a copy of which has been enclosed within Appendix II, it was identified that several previously completed reports on and surrounding the site may be of assistance. Therefore, a visit to their offices was agreed so that the reports of interest could be reviewed and the relevant information documented in Section 3.0.

## 2.0 Physical Setting

### 2.1 Site Details:-

<u>Table 2.1</u>	N=North, S=South etc		
Site Name & Address:	Proposed Commercial Development, Liverpool Business Park, Hercules Drive, Speke,		
	Liverpool, L24 8AD.		
National Grid Reference:	341800, 383110 - Representing the centre of the site.		
Description of Location:	The site is located in a commercial / industrial setting within Speke, Liverpool.		
Site Boundaries:	N = Hercules Drive leading to industrial premises, E = A wooded area leading to		
	undeveloped land, S = Garston Shore Road leading to undeveloped land with the River		
	Mersey beyond, W = Hurricane Drive leading to industrial premises.		
Site Shape &	The whole of the site is irregular in shape occupying an area of c.10.46ha (Hectares). At this		
Development Details:	stage, there are only proposed development plans for the northern portion of the site which		
	covers an area of approximately c.3.48ha (Hectares) which is to comprise the construction		
	of a 150,000sqft structure which is to comprise offices and shop floor / warehouse with		
	associated car parking, a service yard and soft landscaping. A site plan for the proposed		
	development has been provided by the engineers, although the plans may be subject to		
	change, it provides an indication of the proposed development.		
General Topography:	The site falls c.3m-c.4m from north to south and small undulations in the ground have also		
	been noted, although these are likely to be associated with previous historical development.		
Site Surfacing:	The majority of the site surfacing comprises unmanaged grass with sporadic trees / bushes		
	across the site. In addition, former taxi ways and concrete aprons remain present on site		
	although some areas are now becoming overgrown. Adjacent to the eastern and northwest		
	of the site, wooded areas have been recorded.		
Above Ground Structures:	Several small structures have been recorded on site which included a Pill Box, a derelict		
	building structure and an Electric Sub-Station on the north western boundary of the site.		



# 2.0 Physical Setting (Cont'd)

### 2.1 Site Details (Cont'd):-

<u>Table 2.1 (Cont'd)</u>	N=North, S=South etc	
Sub-surface Structures &	When considering the historical development and use of the site, services, i.e. drains, water,	
Services:	electric, etc. will be present below the site. The statutory service plans that have been	
	provided for the site show that there are several public sewers present adjacent to the	
	western boundary of the site as well as numerous telecom service entries.	
Summary of Recorded	The majority of the site remained undeveloped albeit for a 'railway' line present across the	
Historical Features:	east of the site between c.1849 until c.1894. There are also several possible water features	
	recorded on site which may originally have been possible sand extraction features which	
	were subsequently infilled by c.1938. The first sign of development was that of Liverpool	
	(Speke) Airport which started scheduled flights in c.1930. However, by the time of World	
	War II, the airport was taken over by the Royal Air Force and was known as RAF Speke.	
	As can be seen from the historical plans, no significant infrastructure was identified across	
	the site albeit for the presence of "landing" lights along the eastern boundary of the site.	
	Initially, any landing strips are likely to have been strips of grass until the RAF took over the	
	site and the concrete runways, aprons and taxi routes constructed. By c.1952, the site is back	
	to commercial use as Liverpool Airport, with taxi ways / aprons being shown on site along	
	with several buildings. During the site walkover, the former taxi ways / aprons were still	
	present on site as well as an Electric Sub-Station recorded in the northwest of the site. A	
	Pill Box was also recorded in the centre of the site. An additional building structure noted in	
	the southeast of the site may contain possible asbestos containing materials (ACM's).	

### 3.0 Local Authority Search & Historical Records

The LCC Environmental Search Report includes historical plans, locations of water features, infrastructure information etc. which generally concurs with the other source of historical data (Envirocheck Report and Service Plans). In addition, also included in the LCC Report are details of thirteen previously completed site investigation reports which extend into the site and adjacent areas, of which, two have provided relevant data (ID Ref No. 798 & 1000) for this site. Due to copyright, LCC are not in a position to provide copies of these reports and therefore a representative of ARC visited their offices to view the reports of interest, with the findings detailed in the following sub-sections 3.1 & 3.2 below.

In addition to the LCC data, historical borehole and trial pit records undertaken by Soil Mechanics during 1998 across the northern portion of the site (i.e. where the proposed development is to be constructed) have been provided by the client, copies of which can be found in Appendix III, with a review of this data given in section 3.3.

### <u>3.1 LCC Report 1000</u>

The site investigation works completed as part of this report were undertaken for the development of Access Roads D & E with the works completed by Scott Wilson (dated October 2006). This report covered land adjacent to the western and southern boundaries of the site, with exploratory positions put down on or within close proximity to the site.

As part of the site works it was identified that TP's 15 - 22 & WS's 06 - 07 were completed adjacent to the western and southern boundaries of the site. The ground conditions identified comprised topsoil to depths of between c.0.25m up to c.0.40m. At TP16, additional made ground materials comprising gravelly clay with brick, concrete and pipe were recorded to a depth of c.1.00m.

Below these materials, the natural sand and clay drift deposits were encountered to depths of c.3.00m up to c.6.00m.



# 3.0 Local Authority Search & Historical Records (Cont'd)

### 3.1 LCC Report 1000 (Cont'd)

No visual or olfactory evidence of hydrocarbon type contamination (i.e. fuels, oils, etc.) was noted within any of the materials encountered during the fieldworks.

The Human Health Risk Assessment (HHRA) identified generally low levels of metals, metalloids, SVOC's, VOC's and PAH's although the Controlled Waters Risk Assessment (CWRA) identified numerous potentially leachable analytes including Cadmium, Chromium, Lead, Copper, Nickel, Zinc and Ammonia, when assessed against EQS Freshwater Values.

As part of these investigation works, no ground gas monitoring was undertaken.

### 3.2 LCC Report 798

Report 798 titled as Estuary Business Park Plot 6000 and located to the north of the site was completed by Ian Farmers Associates (dated 2006). This investigation, completed adjacent to the northern boundary of the site, identified made ground to a maximum depth of c.4.60m, with this position possibly located within a backfilled pond feature. In addition, at various locations across the site, the made ground was noted to comprise clayey ash, brick, coke, cinder, ceramic, glass, animal bones, shells along with a hydrocarbon type odour.

The HHRA completed as part of the report identified high levels of Lead with all other analytes (i.e. PAH's, TPH's, etc.) all recorded below site assessment criteria for the proposed end use (i.e. Commercial / Industrial). The CWRA included the screening of both perched groundwater and shallow groundwater recorded below the site and the results identified elevated PAH's within the groundwater, as well as elevated Arsenic, Lead, Mercury and TPH's within the perched groundwater, trapped within the former and infilled pond feature.

In addition, generally low ground gas monitoring results were recorded, with a maximum  $CO_2$  result of 0.9% and  $CH_4$  result of 3.0% being recorded as well flow results of up to 3.3l/hr. On one occasion, a flow rate of 20.0l/hr was recorded although this was dismissed due to the windy conditions encountered during the monitoring period.

It is understood that as part of the redevelopment of the site, remedial works (i.e. excavate and removal) were undertaken across the site.

### 3.3 Historical Borehole & Trial Pit Record Sheets (Northern Portion)

As discussed previously, historical borehole and trial pit records (copies of which have been attached in Appendix III) which were undertaken by Soil Mechanics during c.1998 across the northern portion of the site.

The ground conditions identified across this part of the site comprised made ground and topsoil up to a maximum depth of c.1.70m. The majority of the made ground materials present on site appeared to be relatively innocuous, although at a couple of locations ash, slag and a 'bituminous petroleum odour' was noted.

Below these materials, the natural drift deposits (i.e. sand & clay) were encountered to a maximum depth of c.4.00m.

At this stage, due to the age of this report, it is considered that any analytical chemical data is most likely out of date and therefore not deemed reliable for use when assessing the potential risks for the proposed development.



# 3.0 Local Authority Search & Historical Records (Cont'd)

### 3.4 Summary of Previous Works

As can be seen from the previously completed site investigation works, both on & off site, there is topsoil with interspersed areas of made ground associated with the historical use and development of the site (i.e. extraction features/backfilled water features, railway line and Liverpool Airport / RAF Speke). The maximum depth of made ground was adjacent to the northern boundary of the site where a maximum c.4.60m of made ground was identified and which is most likely associated with a backfilled pond feature. Consequently, similar areas of deep made ground may be present within the northern portion of this site since there have been several extraction / water features recorded on site.

With regards to contamination identified within both of the previously completed projects, elevated levels of various analytes which potentially represent a risk to both human health and controlled waters have been identified in the made ground. However, within Report 798, the gas monitoring undertaken, only identified low levels of both CO<sub>2</sub> and CH<sub>4</sub>.

From our experience of investigation of old airfield sites like this, the majority of the site is likely to be relatively inert and may not contain any made ground or other sources of ground contamination. However, as identified in the previous reports, there is the potential for localised areas of made ground, as well as possible 'hot spots' of oils or fuels associated with the historical site use.

### 4.0 Environmental Setting

### 4.1 Site Geology:-

The geological assessment for this site has been based on records produced by the BGS, the LCC Environmental Search Report and previous site investigation data. The following documents have been reviewed as part of this study:-

- Runcorn, Sheet 97, England & Wales, Drift Geology Edition, 1:50,000 scale
- Historical Trial Pit & Borehole Records for the Northern Airfield Phase 2 completed by Soil Mechanics TP's AA12, EE7, EE10, GG12 & BH's CC10, CC12, EE12 and GG9 attached in Appendix III.
- LCC Environmental Search Report 1000 undertaken by Scott Wilson (October 2006)

### 4.1.1 Made Ground:

Published BGS data indicates there is no recorded evidence of significant made ground materials on or within close proximity to the site.

However, taking in to account the sites previous development with the construction of taxi ways and associated buildings it is likely that there will be areas of made ground present on site. In addition, since there have been 3 no. extraction/water features historically recorded on site (see historical plans in Appendix IV) there may be deeper areas of made ground due to the infilling of these features. There is also an additional extraction / water feature which straddles the north-western boundary of the site, but which is only recorded on the earliest historical plan, c.1849 – c.1850.

The historical trial pit & borehole record sheets completed by Soil Mechanics have identified made ground to depths of between c.0.10m up to c.1.70m below ground levels (bgl's) which initially comprised sandy silty topsoil to depths of c.0.10m up to c.0.60m bgl's.

# 4.0 Environmental Setting (Cont'd)



### 4.1 Site Geology (Cont'd):-

### 4.1.1 Made Ground (Cont'd):

At the locations of TP AA12 and BH EE12, these materials were underlain by either slightly silty sand with occasional slag fragments or sandy gravel with brick fragments and cobbles before encountering a gravel comprising slag, ash, glass, rags, wire, brush, bottles, logs, porcelain and a 'bituminous petroleum odour'.

In addition, within Report 1000, undertaken to the west and south of the site, topsoil was identified to a maximum depth of c.0.40m bgl's. At one location (TP16), made ground of gravelly clay with brick, concrete and pipe was recorded to a depth of c.1.00m bgl's.

#### 4.1.2 Drift Deposits:

BGS data indicates the site is initially underlain by Blown Sand (Shirdley Hill Sand) which in turn overlies Boulder Clay deposits.

Due to the presence of the historically recorded extraction / water features present on site as well as the drain / watercourse recorded adjacent to the eastern boundary of the site, some localised "geotechnically poor" natural drift deposits may also be present. These deposits may comprise soft to firm silty clay, silt, sand, gravel and also peat.

Following a review of the available trial pit and borehole data attached in Appendix III, the site is shown to be underlain by loose silty sand to depths of between c.0.55m up to c.1.70m bgl's before encountering the initially firm becoming stiff sandy clay with occasional lenses of sand and occasional gravel.

Within Report 1000, the drift deposits comprised sand and clay deposits to a maximum depth of c.6.00m bgl's.

### 4.1.3 Solid Geology:

The solid geology underlying the site is shown to comprise that of the Triassic Pebble Beds which are contained within the Sherwood Sandstone Formation deposited during the period of the Earth's history known as the Triassic. These deposits normally comprise red, yellow and brown sandstone with occasional red mudstone and siltstone deposits also present.

The underlying solid deposits were not encountered within the historic trial pits and boreholes completed on site. However, these deposits were recorded during the fieldworks completed on the site adjacent to the northern boundary, and encountered at a depth of c.17m bgl.

### 4.2 Coal Mining / Mineral Extraction Assessment:-

The underlying Sherwood Sandstone does not contain productive coal bearing strata, and as such shallow coal workings is not considered to be an issue for this site or the proposed development. From the BGS plans and the historical OS maps there is no evidence of shafts, adits or opencast extraction within the surrounding area. As such, from the information obtained and reviewed no further assessment or intrusive investigation works are required with regards to historical coal mining activities.

Other than the historically recorded water features on site which may represent earlier extraction features (possibly of the Shirdley Hill Sands), there is no evidence of any known or recorded extraction features (i.e. clay pits or quarries) on or within close proximity of the site.



# 4.0 Environmental Setting (Cont'd)

### 4.2 Coal Mining / Mineral Extraction Assessment (Cont'd):-

The closest recorded extraction feature is an Old Clay Pit, noted c.270m to the southwest of the site, from c.1849 up until c.1956, after which it is subsequently no longer recorded, presumably infilled.

### 4.3 Site Ecology:-

There are no recorded sensitive ecological issues on this site, or within the immediate surrounding area. From the site walkover survey completed, there appears to be no potential issues with respect to non-native invasive weed species (i.e. Japanese Knotweed, etc.).

### 4.4 Estimated Soil Chemistry:-

Data provided by the BGS in relation to estimated soil chemistry for a number of key metals and metalloid elements are summarised in Table 4.1 below.

<u>Lable 4.1</u>			
<u>Element</u>	Location	Estimated Soil Concentrations (mg/kg)	
Arsenic	On site	<15	
Cadmium	On site	<1.8	
Chromium (total)	On site	60 - 120	
Lead	On site	<150	
Nickel	On site	15 - 30	

### 4.5 Site Hydrogeology:-

The aquifer designations for the deposits present below this site are based on records produced by the Environment Agency. Aquifer Designation Maps & Groundwater Vulnerability Maps are contained within the Landmark Information Group (Envirocheck Report) attached in Appendix III, and these have identified the following;

#### <u>Table 4.2</u>

-----

<u>STRATA</u>	Aquifer / Soil Leachability EA Classification	Comments
Made Ground:	Recorded as Soils of High Leaching Potential (U).	Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. Subsequently, a worst case vulnerability classification (H) is assumed, until proven otherwise.
Drift Geology:	Blown Sand – Secondary A Aquifer Boulder Clay – Unproductive Strata	The drift deposits present across the site are likely to have a variable permeability due to the varied nature of the drift deposits (i.e. blown sand and clay).
Solid Geology:	Principal Aquifer	These are layers of rock that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

- There are no Source Protection Zones (SPZ) within c.1km.
- There are no water abstractions within c.1km of the site.



# 4.0 Environmental Setting (Cont'd)

### 4.5 Site Hydrogeology (Cont'd):-

• When considering the ground conditions anticipated below the site and the numerous extraction / water features historically recorded on and surrounding the site, a shallow groundwater surface (water table) may be present below this site within the Shirdley Hill Sands and also within any alluvial deposits (if present). From nearby borehole logs, historical water ingresses of between c.4.5m and c.10.0m below ground level have been recorded.

### 4.6 Site Hydrology:-

Table 4	.3

SURFACE WATER	Location	Comments	
<b>FEATURE</b>			
GQA Classified River	None recorded within c.250m.	~	
Unclassified	Two recorded on site and five	There are two drains / sewers recorded within the eastern	
Watercourse(s), Canals,	within c.250m.	site boundary. In addition, there is a drain recorded c.20m	
Ponds & Lakes		to the east of the site as well as a water feature / pond	
		c.200m to the southeast. Another water feature / pond is	
		recorded directly adjacent to the north-western boundary,	
		as well as surface water alongside Estuary Boulevard	
		c.130m to the northwest.	
Flooding	The site is shown to fall	The LA and EA may hold additional information	
(EA Flood Data)	outwith the designated Flood	relating to this site with respect to periodic flooding,	
	Risk Zones II & III and	standing water or poor drainage problems.	
	therefore this site is unlikely to		
	be at significant risk from		
	future flooding.		
RAINFALL	Measurements (mm)	Comments	
Annual	828.8	Decod on 'station success' uses and from Mancheston	
Precipitation, January	72.3	Dased on station average records from Manchester:	
Precipitation, July	63.9	1961-2010.	

### 4.7 Radon Assessment:-

The site lies in an area where less than 1 % of homes are above the action level, in accordance with the BGS, National Geoscience Information Service and their assessment suggests that the site requires no radon protection measures for new dwellings. In accordance with the BRE Digest, BR211 (2007) Radon: Guidance on protective measures for new buildings, the site is situated within a clear grid square (1km), and therefore no radon protective measures are required for the site.

### 5.0 Industrial Setting

### 5.1 Recent Site History:-

Copies of old survey plans covering this site area and adjacent land have been assembled from the Envirocheck Report and LCC Environmental Search Report and are included in Appendix II & IV.

A summary of the site history based on these plans is provided in Table 5.1 on the following page.



# 5.0 Industrial Setting (Cont'd)

### 5.1 Recent Site History (Cont'd):-

1 abic 5.1	<u>ic 5.1</u> Significant features/potential contamination sources nignlighted in <b>bold</b> text.			
Date	<u>Scale</u>	Site	Adjacent Areas	
c.1849	1:2,500	The site is recorded as predominately	The majority of the surrounding area is undeveloped	
-	&	undeveloped land although a single <b>railway</b>	although there are sporadic houses / estates shown.	
c.1925	1:10,560	line is recorded running through the site in	Abundant extraction / water features are recorded	
		a northeast – southwest direction. In	in the surrounding area. A possible <b>drain</b> /	
		addition, there are 4 no. extraction /	watercourse is recorded adjacent to the eastern	
		water features recorded on site, three of	boundary of the site which appears to flow directly	
		which are in the north of the site. By	into the River Mersey, c.500m to the southwest.	
		c.1894, the extraction / water feature	<b>Speke Dams</b> are recorded c.200m to the southeast.	
		present in the northwest of the site is		
		possibly infilled as well as the <b>railway line</b>		
		also being unrecorded although a track		
		remains until c.1912.		
c.1925	1:2,500	The site is recorded as being undeveloped	Generally as c.1849 – c.1928. However, the majority	
-	&	albeit for a strip of lights which are present	of the extraction / water features surrounding the	
c.1938	1:10,560	adjacent to the eastern boundary of the site.	site are now unrecorded (i.e. <b>infilled</b> ).	
		These are likely to be associated with		
		Liverpool (Speke) Airport which was in		
		use by c.1930. The locations of all four		
		extraction / water features previously		
		present on site are now unrecorded and are		
	-	likely to have been <b>infilled</b> .		
c.1938	1:1,250,	By the time of World War II, the Airport	Liverpool Airport is recorded to the northwest with	
-	1:2,500	had been taken over by the <b>Royal Air</b>	the closest <b>runway</b> recorded c.60m to the west of the	
c.1993	&	Force (RAF) and was known as RAF	site. Adjacent to the south-eastern boundary of the	
	1:10,000	Speke which has included the construction	site, several mounds have been recorded. By c.1968,	
		of <b>taxi ways</b> and <b>aprons</b> for <b>aircraft</b> as	an <b>Electric Sub Station</b> is recorded c.40m to the	
		well as several buildings. By c.1952, the site	south.	
		with this infrastructure is associated with		
		Liverpool Airport.		
c.1993	1:10,000	The infrastructure associated with	The surrounding area has undergone development	
-		Liverpool Airport and the taxi ways /	with <b>commercial / industrial</b> premises and	
c.2012		aprons recorded on site are now	associated infrastructure recorded to the north and	
		unrecorded, although a single building	west and is known as Liverpool International Business	
		structure is recorded adjacent to the south-	Park. The Electric Sub-Station is no longer recorded	
		eastern boundary of the site.	to the south of the site. A Drain is recorded c.20m	
			adjacent to the eastern boundary of the site.	

During the site reconnaissance walkover survey, it was noted that the former taxiways remain on site although the historical OS plan dated c.2012 indicated that no structures or infrastructure are present on site. The site layout in fact most resembles the OS plan from c.1993, although the majority of the building structures are no longer present. In the northwest of the site and adjacent to the site boundary, an Electric Sub-Station is present as well as a Pill Box in the centre of the site. An additional building structure which was noted in the southeast of the site, may contain possible asbestos containing materials (ACM's).

### 5.2 Landfill & Waste:-

The following information relating to landfill and waste has been obtained from the Environment Agency;

• There are no active or historical landfill sites recorded on or within c.250m of this site.



# 5.0 Industrial Setting (Cont'd)

### 5.2 Landfill & Waste (Cont'd):-

When considering the infilled extraction / water features historically recorded on site as well as those in the surrounding area, there is a potential from hazardous ground gas migration/ production. In addition, when considering the findings of the gas monitoring completed to the north, levels of both  $CO_2$  and  $CH_4$  were recorded and therefore as part of any future fieldworks and prior to the development of the site, a period of ground gas monitoring in accordance with current guidance (CIRIA C665, 2007) should be completed.

### 5.3 Pollution Incidents and Discharge Consents:-

<u>TYPE</u>	Location	<u>Comments</u>
Discharge Consents	One recorded within c.250m.	The entry is associated with Speke Hall
		comprising Sewage Discharge in to a tributary
		of the River Mersey (See Envirocheck ref no. 1
		for further details).
Water Industry Act Referrals	None recorded within c.250m.	~
Prosecutions Relating to	None recorded within c.250m.	~
Controlled Waters		
Pollution Incidents to Controlled	None recorded within c.250m.	~
Waters		
Substantiated Pollution Incident	None recorded within c.250m.	~
Register		

### 5.4 Statutory Requirements / Authorisations:-

#### Table 5.3

<u>TYPE</u>	Location	Comments	
Local Authority Pollution	None recorded within c.250m.	~	
Prevention and Controls			
Local Authority Integrated	None recorded within c.250m. $\sim$		
Pollution Prevention and Control			
Registered Radioactive	None recorded within c.250m.	~	
Substances			
Prosecutions Relating to	None recorded within c.250m.	~	
Authorised Processes			
Enforcement and Prohibition	None recorded within c.250m.	~	
Notices			
Planning Hazardous Substances	None recorded within c.250m.	~	
Consents / Enforcements			
COMAH Sites	None recorded within c.250m.	~	
Contemporary Trade Entries	Nine recorded within c.250m.	Active entries include commercial cleaning	
		services, manufacturers of electronic	
		equipment, engineering services, leaflet	
		distribution services, materials handling	
		equipment and pharmaceutical manufacturers	
		although these are not fell to represent a	
		The remaining entries are all recorded as being	
		inactive (See Envirocheck ref no's 16 to 22 for	
		further details)	
Fuel Station Entries	None recorded within c.250m.	~	



## 6.0 Conceptual Site Model (CSM)

The preliminary Conceptual Site Model (CSM) is one of the primary planning tools that can be used to support the decision making process of managing contaminated land and groundwater on any given site, and allows a better understanding of what needs to be done to achieve risk management, and from this, appropriate remediation techniques, if required for those risk management goals can be chosen. This can be done by undertaking a *source-pathway-receptor* analysis of the site.

The completion of this DTS covers a large development area (c.10.4ha) which is to be redeveloped probably over an extended period of time and which will consist of varying phases of development. Therefore for this report, the CSM has been developed for the whole of the site with the anticipated *sources, pathways* and *receptors* being summarized in Table 6.1 below. However, it should be noted that since the site is to be redeveloped at varying stages, site specific fieldworks will need to be undertaken and a revised CSM developed to cover each particular development.

A graphical representation of the CSM has been produced for the whole of this site and can be seen attached in Appendix V, which sets out the critical pollutant linkages of concern for this particular site, with regard to contamination as highlighted in Table 6.1 below.

Table	<u>6.1</u>		* = Not included in the Human Health & Controlled Waters Risk Assessment			
	<u>Sources (S)</u>		<u>Pathways (P)</u>			<u>Receptors (R)</u>
<b>S1</b>	Made ground associated	<b>P1</b>	Ingestion		<b>R1</b>	Human health
	with the historical					(End users and construction
	development of the site					workforce)
S2	Possible hazardous ground	P2	Inhalation of indoor /		R2	Groundwater
	gas production / migration		outdoor air			(Secondary A Aquifer &
	from both on site and off	P3	Dermal contact			Principal Aquifer)
	site sources (i.e. made				<b>R3</b>	Building materials*
	ground & infilled extraction	<b>P</b> 4	Migration through permeable			5
	/ water features), as well as		ground, existing services, etc.			
	the presence of organic					
	alluvial deposits.					
<b>S</b> 3	Due to the historical				<b>R</b> 4	Adjacent sites
	development of the site (i.e.					
	railway, Liverpool Airport &					
	RAF Speke) there may be					
	the presence of hydrocarbon					
	'hot spots' associated with					
	oils, fuels, ash, slag, etc. (i.e.					
	TPH's, PAH's). In addition,					
	due to possible demolition					
	works having occurred on					
	site, the presence of ACM's					
	should also be verified.					
<b>S</b> 4	During the site walkover, it	<b>P5</b>	Direct contact with building		R5	Flora and fauna*
	was identified an existing		materials			
	building structure may	<b>P6</b>	Surface run off and leachate		<b>R</b> 6	Nearby culverts and
	contain possible ACM's.		Migration			watercourses.

### 6.1 Geotechnical Considerations:-

The following potential geotechnical issues and hazards have been identified for this site, and these issues should be considered before future redevelopment of the site is to take place.



# 6.0 Conceptual Site Model (CSM) (Cont'd)

### 6.1 Geotechnical Considerations (Cont'd):-

- Actual depth, origin, variability and condition of made ground present on site.
- Presence of relic foundations, floor slabs associated with former / existing structures as well as the "make up" of former taxi ways / aprons present on site.
- Probable active / current services below the site associated with the former use of the site.
- Control of surface drainage.
- Geotechnical parameters of natural drift deposits present below the proposed development area. In addition, due to the presence of the historically recorded extraction / water features on site as well as the drain / watercourse adjacent to the eastern boundary of the site there is a potential for alluvial deposits (soft / loose deposits) to be present along these routes.
- Due to the possible presence of the infilled extraction features / water features on site and the two culverted sewer routes in the east of the site and which run the length of the site, there may possibly be trapped pockets of water.
- Lateral support may be required if localised significant thicknesses of made ground, and areas of "geotechnically poor" natural deposits are present below the site associated with the infilled historical extraction features / water features and also the drain / watercourse recorded adjacent to the eastern boundary of the site.

In order to determine the geotechnical considerations above with more certainty, it is recommended that intrusive investigation works and associated testing are carried out on this site. These should take place prior to commencing with any developments in the future. Following this work, detailed foundation proposals for future structures can then be prepared.

The information reviewed indicates that the site can be considered as being located within a **MODERATE** geotechnical risk setting.

### 6.2 Sources of Contamination and Probable Contaminants:-

The historical Ordnance Survey maps and other environmental information revealed that the site is not considered likely to represent a significant risk of widespread 'heavy' or 'gross' ground contamination.

With regards to DoE industry profiles, no specific profile is available for this former land use, however when taking in to account our professional experience with old airfield sites similar to this site, there is the potential for various types of contaminants to be present on site, as well as the possibility of 'hot spots' of oil / fuels associated with the former land use and which may impact the made ground and the underlying natural strata. In addition, since older buildings have been constructed on site and subsequently demolished, there may be the presence of Asbestos Containing Materials (ACM's) present on site.

In consideration of the above and when taking into account the guidance contained in the DEFRA and EA Contaminated Land Reports, it would be prudent to test samples of soil from this site for a range of contaminants, as discussed below, and which correlate with the three primary sources of contamination.

• Where made ground is present on site, associated with the historical development of the site, as well as the infilling of the historically recorded extraction features / water features noted on site. It is likely that screening for the presence of generic metals, metalloids and inorganics will be required for these materials. In addition, since the site has undergone a period of demolition works, the presence of ACM's should also be verified and asbestos screening undertaken if demolition rubble is present.



# 6.0 Conceptual Site Model (CSM) (Cont'd)

### 6.2 Sources of Contamination and Probable Contaminants (Cont'd):-

- If visual / olfactory evidence of potential 'hot spots' of potential organic contamination (i.e. 'ashy' materials or hydrocarbon impacted soils) then testing inclusive of Speciated Polycyclic Aromatic Hydrocarbons (PAH's) and Speciated Total Petroleum Hydrocarbons (TPH's) may be required.
- Potential hazardous ground gas (Methane, Carbon Dioxide, etc) migration from both on site (i.e. made ground, infilled extraction / water features and organic alluvial deposits) as well as off site sources (i.e. historically infilled extraction / water features).

It is therefore concluded that ground contamination testing will need to be incorporated into the design of any intrusive investigation works.

Consideration may need to be given to the protection of service pipes for the proposed development from any made ground materials present, and therefore a supplementary suite of contamination testing may be required in order to meet the requirements of the local utilities service provider for their 'pipe selection risk assessment' (PSRA), once the location and depth of future services have been determined.

The following issues have also been taken into consideration when assessing the risks towards groundwater / controlled waters;

- Due to the presence of blown sands and alluvial deposits on site, a shallow continuous groundwater surface (water table) may be present.
- The site does not lie within a Source Protection Zone (SPZ).
- There are no groundwater abstractions recorded within c.1km of the site.
- The presence of two culverted sewer routes in the east of the site and which run the length of the site.

### 6.3 Preliminary Risk Assessment Summary:-

<u>Human Health</u> – At this stage, there is felt to be an overall low risk to human health, especially as the majority of the site is likely to be encapsulated by buildings / hardcover not previously developed. Monitoring wells should also be installed on site to assess the potential risks to the site from hazardous ground gases associated with made ground, the infilled extraction / water features historically recorded on site as well as the potential for alluvial deposits associated with these features.

The information reviewed indicates that the site can be considered as being located within a **LOW** ground contamination risk setting for Human Health.

<u>Controlled Waters</u> – At this stage, it is considered that any groundwater beneath the site is at low risk due to the lack of plausible possible heavy / gross contamination on site. However, this will need to be reassessed if elevated levels of contamination are encountered during the intrusive works.

The information reviewed indicates that the site can be considered as being located within a **LOW** ground contamination risk setting for Controlled Waters.



# 6.0 Conceptual Site Model (CSM) (Cont'd)

### 6.3 Preliminary Risk Assessment Summary (Cont'd):-

Therefore, it is recommended that as a part of future Phase 2: Ground Investigation (intrusive investigation) works for this site, consideration is also given to assessing any potential risks associated with any ground contamination, which may be present on the site (or each individual development phase) and which might pose a risk towards the proposed end users or the environment with any investigation works being completed prior to commencing with any future developments.

### 7.0 Recommendations

### 7.1 Requirements for Ground Investigation Works (All Phases):-

As part of any future phased development works, comprehensive site investigation works should be completed to determine any specific geotechnical and contamination issues present for each Phase as it is developed and which will allow the completion of a suitably revised and Phase specific CSM. Since future development is expected to be completed using a phased approach, several different periods of intrusive investigation works are likely to be required.

### 7.2 Requirements for Ground Investigation Works (Northern Portion):-

When taking in to account the potential geotechnical and contamination issues identified across the northern portion of the site, it is recommended that the following intrusive works are undertaken prior to starting on site;

- Strategically positioned trial pits may be required to determine the nature of any made ground & initial drift deposits below the site, and to target potential areas of concern (i.e. railway line, infilled extraction / water features, location of historically recorded building structures). Will also include relevant sampling and in-situ geotechnical testing.
- A series of boreholes, including in-situ geotechnical testing (SPT testing) and sampling to help aid with future foundation design and to collect samples for subsequent laboratory testing.
- Appropriate laboratory geotechnical testing.
- Contamination screening on selected samples recovered to assess the risks to Human Health range of analytes to comprise metals, metalloids, etc.
- Leachate / groundwater screening on selected samples recovered to determine the risks posed to Controlled Waters and adjacent sites Analytes to correlate with soil screening schedule.
- Installation of ground gas monitoring wells in accordance with CIRIA C665. Groundwater levels will also be assessed as part of the monitoring assessment.
- Prior to the completion of any investigation works service information should be obtained (i.e. gas, electricity, drainage & culvert, etc.).
- Site supervision and production of a factual and interpretive Phase 2: Ground Investigation Report, including a Level 1 Ground Contamination Risk Assessment, if required.

The samples of soil collected should be forwarded to UKAS and MCERTS accredited laboratory to undertake the recommended testing. Following the completion of any Phase 2: Ground Investigation works, if significant ground contamination issues are identified across any phase of development, then it is recommended that a Remediation Strategy is prepared and agreed with the Local Authority. After completion of any remediation works, a Validation Report will be required, verifying the successful completion of any remediation works.

### End of Report

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- http://en.wikipedia.org/wiki/Liverpool\_John\_Lennon\_Airport



# APPENDIX I

Location Plan

Aerial Photograph

**Existing Layout Plan** 

Proposed Development Layout Plan

Site Observations - Walkover Record Sheets